

A close-up photograph of a bumblebee on a branch with green leaves and pink flowers. The bee is black with a prominent yellow patch on its thorax and abdomen. It is positioned on a branch, surrounded by vibrant green, lobed leaves and several small, pink, tubular flowers. The background is softly blurred, showing more of the plant's foliage.

UTAH BIG GAME RANGE TREND STUDIES  
2021

WILDLIFE MANAGEMENT UNITS  
0, 1, 2, 3, 4, 5, 6, 7, 18A & 18B

PUBLICATION NUMBER 22-11  
REPORT FOR FEDERAL AID PROJECT W-82-R-66

STATE OF UTAH  
DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF WILDLIFE RESOURCES



**Utah Big Game Range Trend Studies  
2021  
Wildlife Management Units  
0, 1, 2, 3, 4, 5, 6, 7, 18A & 18B**

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Cover Photo Credit

Wax Currant (*Ribes cereum*) & Nevada Bumble Bee (*Bombus nevadensis*) by Jason Cox (2021)

Performance Report for Federal Aid Project W-82-R-66

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UTAH DEPARTMENT OF NATURAL RESOURCES  
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Reports for study sites, with accompanying photographs, are available online at <http://wildlife.utah.gov/range-trend.html>.

## PROGRAM NARRATIVE

State: UTAH

Project Number: W-82-R-66

Grant Title: Wildlife Habitat Research and Monitoring

Project Title: Wildlife Habitat Monitoring/Range Trend Studies

Need: The ability to detect changes in vegetation composition (range trend) on big game winter ranges is an important part of the Utah Division of Wildlife Resources (UDWR) big game management program. The health and vigor of big game populations are closely correlated to the quality and quantity of forage in key areas. The majority of the permanent range trend studies are located on deer and elk winter ranges, however on certain management units, studies are located on spring and/or summer ranges, if vegetation composition on these ranges is the limiting factor for big game populations. Range trend data are used by wildlife biologists for habitat improvement planning purposes, reviewing Bureau of Land Management (BLM) and United States Forest Service (USFS) allotment management plans, and as one of several sources of information for revising deer and elk herd unit management plans. Range trend data may also be gathered where habitat information is necessary for other wildlife species such as greater sage-grouse.

Objective: Monitor, evaluate, and report range trends within designated key areas throughout the state, and inform DWR biologists, public land managers and private landowners of significant changes in plant community composition in these areas.

Expected Results or Benefits: Range trend studies in each region will be reread every five years, and vegetation condition and trend assessments will be made for key areas. UDWR biologists, land management personnel from the USFS and BLM, and private landowners will use the range trend database to evaluate the impact of land management programs on big game habitat. Annual reports are readily available on the Division's website, on USBs, and in hard copies located in UDWR regional offices, BLM and USFS offices. Special studies (habitat project monitoring and big game/livestock forage utilization studies) will give UDWR biologists and public land managers' additional information to address local resource management problems.



## REMARKS

The work completed during the 2021 field season and reported in this publication involves the reading of interagency range trend studies in the DWR Northern Region. Most trend studies surveyed in these management units were established in the 1980s and reread at 5-year intervals.

The following Bureau of Land Management and U.S. Forest Service offices provided information and/or assistance in completion of the trend studies, which add to the value of this interagency report:

### Bureau of Land Management

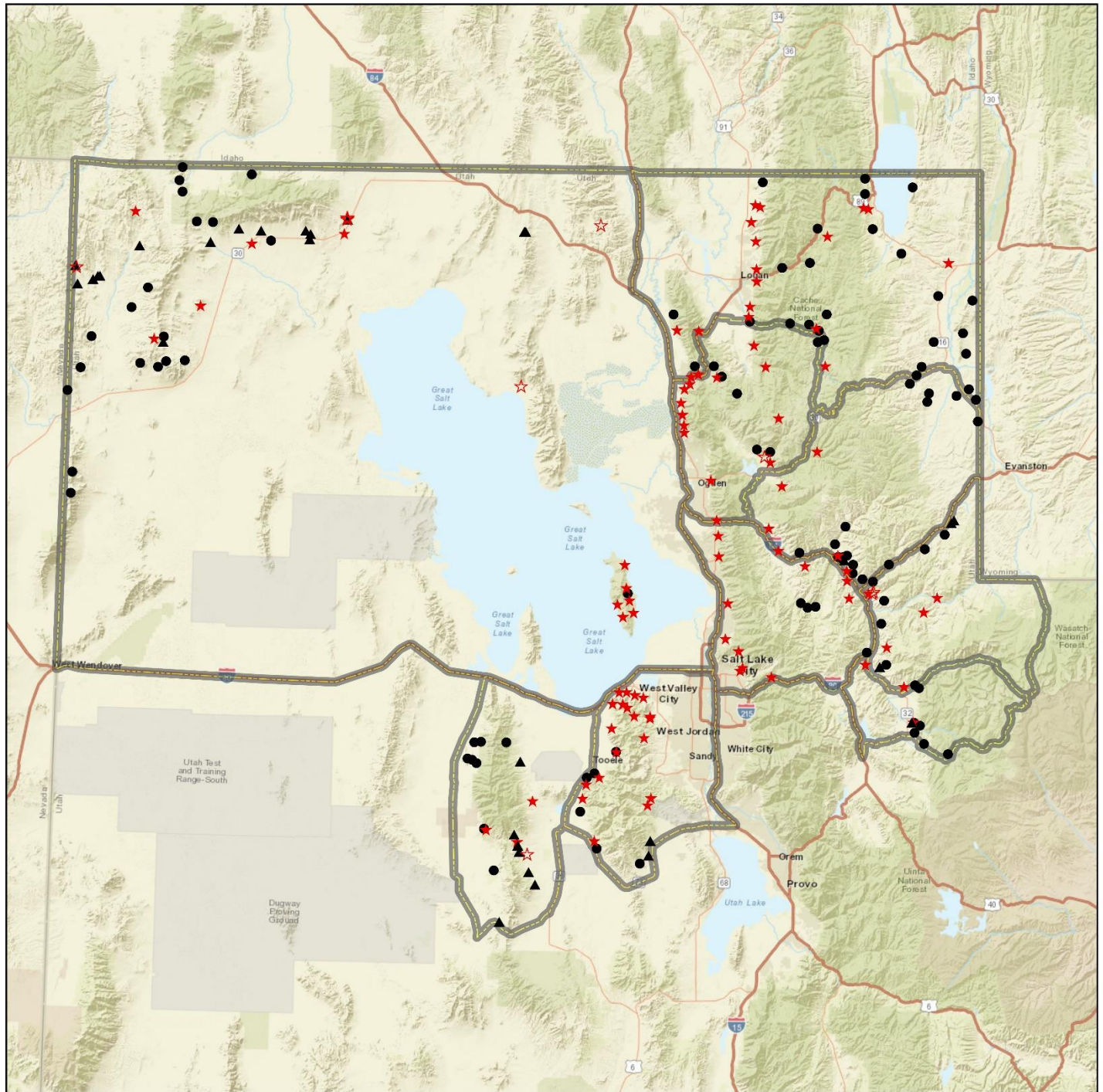
- Salt Lake Field Office

### United States Forest Service

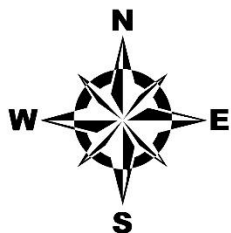
- Sawtooth National Forest
- Wasatch-Cache National Forest

Private landowners were cooperative in allowing access to study sites located on their land.

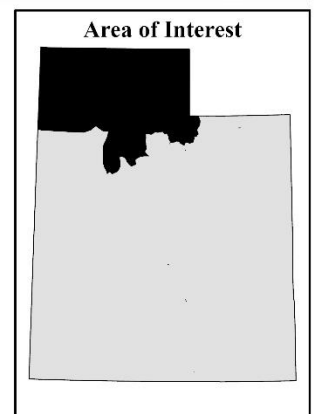
# RANGE TREND STUDY SITES SURVEYED IN 2021



0 5 10 20 30 40 50 60 70 80 Miles



Study Locations Project, Status		Unit Boundary
●	RT, Active	Northern Rotation Unit Boundaries
★	RT, Suspended	
▲	WRI, Active	
☆	WRI, Suspended	



Credits: Esri, HERE, Garmin, NGA, USGS, NPS

## RANGE TREND STUDY METHODS

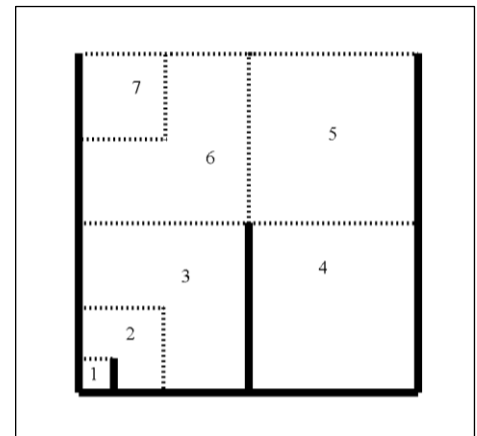
Studies monitoring range trend depend greatly on site selection, especially when dealing with large geographic areas such as wildlife management units. Since it is impossible to intensively monitor all vegetation or habitat types within a unit, it is necessary to concentrate on specific sites and/or “key” areas within distinct plant communities on big game ranges. These “key” areas should be places where big game has demonstrated a definite pattern of use during normal climatic conditions over a long period. Trend studies are located within these areas of high use and/or crucial habitat as agreed upon by DWR, BLM, and USFS personnel. Often, range trend studies are established in conjunction with permanently marked pellet group transects. Once a “key” area has been selected, specific placement for sampling is determined. The sampling grid is carefully placed in order to adequately represent the surrounding area. Half-high steel fence posts or similar material permanently marks all sampling baselines. The first, or “0-foot baseline stake”, is marked with a metal tag for proper identification of the transect.

Study sites for the Watershed Restoration Initiative (WRI) are placed to monitor vegetation treatment projects. Studies are established to assess conditions prior to treatment. Each study is re-read approximately every 3-5 years following treatment.

### Vegetation Composition

Vegetation composition is determined by setting up five consecutive 100 foot transects in the area of interest. This 500-foot line is the baseline and one 100-foot belt is placed perpendicular to each 100-foot section of the baseline at predetermined footmarks and centered on the 50-foot mark of the belt. A rebar stake is placed at the beginning of each belt to ensure that future sampling is in consistent alignment with the originally sampled belt. A 1/4 m<sup>2</sup> quadrat is centered every 5 feet along the same side of the belt, starting at the 5-foot mark. Cover and nested frequency values are determined for vegetation, litter, rock, pavement, cryptogams, and bare ground. Cover and nested frequency values are also estimated for all plant species occurring within a quadrat, including annual species. However, prior to 1992 no data was collected for annual species.

**Percent Cover:** Cover is determined using an ocular cover estimation procedure using seven cover classes (Bailey and Poulton, 1968; Daubenmire, 1959). The seven cover classes are: 1) .01-1%, 2) 1.1-5%, 3) 5.1-25%, 4) 25.1-50%, 5) 50.1-75%, 6) 75.1-95%, and 7) 95.1-100% (Figure 1). For example, to estimate vegetation cover with this method, an observer would visualize which cover class all the vegetation would fit into if the plants were moved together until they were touching. To quantify percent cover for bare ground, litter, rock, pavement, and cryptogams, the observer would visually estimate which cover class could accommodate all of the specified cover type within the quadrat. These numbers are then recorded. To determine percent cover for each belt, the midpoint for each cover class value observed is summed and divided by the number of sampling quadrats (20). The mean for the five belts is the percent cover for a given site.



**Figure 1** Cover classes of the 1/4 m<sup>2</sup> sampling quadrat

Total canopy cover of shrubs or trees is also estimated using the line-intercept method (U.S. Department of Interior Bureau of Land Management, 1999). The total distance intersecting the line by a particular species of tree or shrub along each belt is divided by the total length of the line to give percent canopy cover. A six-inch gap rule is used in measuring intercept; gaps less than six inches between the same tree or shrub species are included in total measurement (Boyd et al., 2007).

**Nested Frequency:** Nested frequency values for the quadrat range from 1-5 according to which area or sub-quadrat the plant species or cover type is rooted in. The notation for each sub-quadrat is as follows: 5 = 1% of the area, 4 = 5% of the area, 3 = 25% of the area, 2 = 50% of the area, and 1 = the remainder of the quadrat. Each time a particular plant species or cover type occurs within the quadrat, it is scored relative to which of the smallest nested quadrats it is rooted in (in the case of vegetation) or where it first occurs (for all other cover types). The highest possible score is 5 for each quadrat occurrence and 100 per belt, for a possible score of 500 for each species or cover type at a given site (Figure 2).

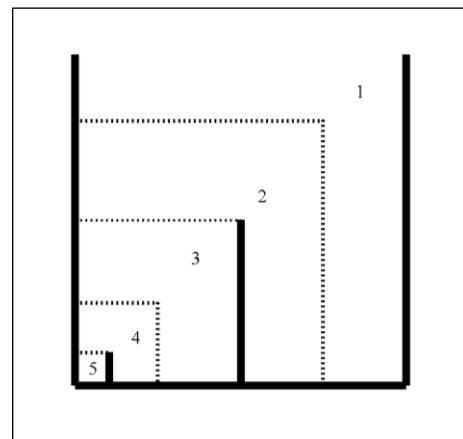
Higher nested frequency scores represent a higher abundance for that plant species or cover type. These summed values are used to help determine changes in trend and composition through time. Nested frequency has been found to be a more sensitive measurement for changes taking place within plant communities than quadrat frequency (Smith et al., 1987; Smith et al., 1986; Mosley et al., 1986). Plant cover and density values are not reliable indicators of trend for herbaceous species and can fluctuate greatly with precipitation and time of season sampled. Therefore, plant cover and density values can be misleading if used independently and do not necessarily indicate changes in composition and/or distribution of key plant species.

**Shrub Density & Characterization:** Shrub densities are estimated using five, 1/100th acre strips centered over the length of each 100-foot belt. All shrubs rooted within each strip are counted and categorized using a modified Cole Browse Method (U.S. Department of Interior Bureau of Land Management 1999):

Seedling:	Plants up to three years old, which have become firmly established, usually less than 1/8-inch diameter.
Young:	Larger with more complex branching. Does not show signs of maturity. Usually between 1/8 and 1/4-inch diameter.
Mature:	Complex branching, rounded growth form, larger size, seed is produced on healthy plants. Generally larger than 1/4-inch diameter.
Decadent:	Plant, regardless of age, that is in a state of decline, usually evidenced by 25% or more dead branches.
Dead:	A plant that is no longer living.

**Data Collection for Aspen Density by Size Class:** Starting in 2011, aspen density was estimated using an aspen classification method by Jones, Burton, and Tate (2005). All aspen stems within 67 cm of each side of 100 ft distance tape are counted and recorded in the following size classes:

Size Class I:	less than or equal to 1.5 feet (18 inches). Scan as <i>Seedling</i> This class size represents the annual or recent recruitment of suckers due to suckering at root buds.
Size Class II:	greater than 1.5 feet to 5 feet. Scan as <i>Young</i> This class size represents the survival of suckers and the progression of recruitment of existing suckers that are vulnerable to browsing of the terminal leader.
Size Class III:	greater than 5 feet and up to 1 inch dbh. Scan as <i>Mature</i> This class size represents the aspen regeneration grown above the height range that is vulnerable to browsing; the minimum height for size class III represents the maximum browse line height for herbivores present.
Size Class IV:	greater than 1 inch dbh. Scan as <i>Decadent</i> Class IV captures information for all remaining cohorts in the plot.



**Figure 2** Nested frequency sub-quadrats of the 1/4 m<sup>2</sup> sampling quadrat.

Shrubs are also rated according to their availability and the amount of use they display, and placed in one of nine form classes:

1. All available, lightly hedged.
2. All available, moderately hedged.
3. All available, heavily hedged.
4. Largely available, lightly hedged.
5. Largely available, moderately hedged.
6. Largely available, heavily hedged.
7. Mostly unavailable.
8. Unavailable due to height.
9. Unavailable due to hedging.

Lightly hedged\*: 0 to 40 percent of twigs browsed.

Moderately hedged\*: 41 to 60 percent of twigs browsed.

Heavily hedged\*: Over 60 percent of twigs browsed.

Largely available: One-third to two-thirds of plant available to animal.

Mostly unavailable: Less than one-third of plant available to animal.

Unavailable: In classifying browse to a form class, unavailability may be the result of height, location, or density.

\*Degree of hedging is based on leader use over the past three years: current annual growth is not included.

Shrubs are also rated on their health and placed into one of four vigor classes:

1. Normal and vigorous.
2. Insect infested or diseased.
3. Poor vigor
4. Dying

Poor vigor: chlorotic or discolored leaves, smaller than normal stems or leaves, flowering restricted, partially trampled, pulled up, or otherwise damaged. Stunted growth, partial crown death.

Dying: substantial portion of crown dead (more than 50%), more extreme than 3 above. Probably an irreversible condition.

In addition, each mature shrub species closest to every 10-foot mark along a sampling belt is measured to determine average height and crown. This allows a maximum sample of 50 plants per species to be measured at a given site depending on their respective densities.

Point-Center Quadrat Method: Tree density is determined using the point-center quarter method (Mitchell, 2007; Dahdouh-Guebas and Koedam, 2006; Pollard, 1971; Cottam and Curtis, 1956) at 100-foot intervals along the baseline measuring to a maximum of 15 meters. The strip method that is used to estimate shrub density can, in most cases, effectively inventory seedling and young tree densities. However, the strip method is less effective at estimating density of mature trees that are often widely distributed.

Animal Occupancy: The pellet group transect utilizes (50) 100ft<sup>2</sup> circular plots that are placed through the study area. These are usually two parallel transects of 25 plots on each side of the vegetation transect which runs 400 feet to 500 feet in length. The number of recent pellet groups for wildlife (usually deer and elk) and pats for cattle are recorded. That number is then converted to days use per acre (hectare) (Neff, 1968). Quadrat frequency of wildlife and livestock droppings is also captured within the 1/4 m<sup>2</sup> quadrat. Rabbit pellet groups are not included in the pellet group transects but are sampled in quadrat frequency.

**Other Information:** Management background information, photographs, and knowledgeable plant identification add to the dataset for each site. Management and background information for each site is obtained from the administering agency. Repeat photographs are taken including a general view down and back up the baseline. A close-up of each half-high baseline post further characterizes individual sites. Correct plant identification is critical for a complete and accurate site analysis. Starting in 2016, species identification and classification is reported following the USDA Plant Database taxonomic nomenclature (USDA, NRCS, 2016). Prior to 2015, species identification mostly followed "A Utah Flora" (Welsh et al., 2003). In some cases, most notably *Agropyron sp.* and *Purshia sp.*, the species names used were those found in the Range Trend Study Plant Species List (Giunta, 1983), Intermountain Flora (Cronquist et al., 1977), and the Intermountain Range Plant Names and Symbols (Plummer et al., 1977) and were retained to maintain continuity and alleviate confusion with earlier published reports.

### **Trend Determination**

The methods described above rely on relative and absolute measurements of plant composition as determined from the frequency, cover, and density data. In addition, estimates of plant vigor, average height and crown diameter, form class, and age class are utilized to characterize shrub populations.

In order to assess and interpret the landscape in a more effective way, trend assessments are no longer formally addressed within the report and have been replaced by the Desirable Components Index (DCI), Woodland Succession Phase models, and State-and-Transition Models that are associated with their Ecological Site as described by the National Resources Conservation Service (NRCS). Using these three methods in conjunction will give land managers a more complete assessment of the area of interest, and what measures, if any, need to be taken in order to improve the ecology of a site.

**Desirable Components Index:** Range Trend Program personnel created the desirable components index (DCI) as a tool to address condition and/or value of winter ranges for mule deer. This index is meant to be a companion to, not a replacement for, the site-specific range trend assessments that are found in the annual Utah Big Game Range Trend Studies report. This index was designed to score mule deer winter range based upon several important vegetation components (i.e. preferred browse cover, shrub decadence, shrub young recruitment, cover of perennial grasses, cover of perennial forbs, cover of annual grasses, and presence of noxious weeds). Although the index may be useful for assessing habitat for other species (i.e. sage-grouse and elk), the rating system was devised to specifically address mule deer winter range requirements.

This index is used primarily to determine if a particular site has the vegetation components necessary to be good winter range for mule deer. It can also be used to identify areas where habitat restoration projects may be needed and assist land managers in determining possible rehabilitation options. Because it does not take into account factors such as soil stability, hydrologic function, and other environmental factors, it should not be used to assess a sites function and/or condition as typically used by the Federal land management agencies.

Desirable mule deer winter range provides 12-20% of preferred browse cover, 20% or less shrub decadency, and 10% or more of the shrub population is young. The herbaceous understory contains 8-15% perennial grass cover, 5% perennial forb cover, and less than 5% annual grass cover. Based on these criteria, communities are scored in a 100-point scale using the following system:

*Preferred Browse (60 points)*

(Preferred Browse species are favorable or crucial to deer and are broken into three categories; Highly Preferred, Preferred and Key).

## Preferred Browse Cover (30 pts. possible)

- Highly Preferred species = 1.5 points for each 1% of cover, Preferred species = 1.25 points for each 1% of cover and Key species = 1 point for each 1% of cover (maximum 30 points)

## Percent Decadence (15 points possible)

- 0.3 points for each 1% under 50% decadence and -0.3 points for each 1% over 50% decadence (maximum 15 points or minimum -15 points)

## Percent Young (15 points possible)

- 0.5 points for each 1% of young

*Herbaceous Understory (40 points)*

## Perennial Grass Cover (30 points possible)

- 2 points for each 1% cover

## Perennial Forb Cover (10 points possible)

- 2 points for each 1% cover

## Annual Grass Cover (-20 points possible)

- -0.75 points for each 1% cover

## Noxious Weeds (State List)

- -2 points for each species present

The Desirable Components Index ratings are divided into four categories because each community has a different ecological potential. These categories include very low potential (Desert Ecological Site), low potential (Semidesert Ecological Site), mid-level potential (Upland Ecological Site) and high potential (Mountain and High Mountain Ecological Sites) categories. The four categories are scored based on the above criteria as follows:

## Very Low potential scale (Desert Ecological Site)

> 50	Excellent
50-40	Good
40-25	Fair
25-10	Poor
< 10	Very Poor

## Low potential scale (Semidesert Ecological Site)

> 65	Excellent
45-64	Good
25-44	Fair
10-24	Poor
< 10	Very Poor

## Mid-level potential scale (Upland Ecological Site)

> 80	Excellent
79-65	Good
64-50	Fair
49-35	Poor
< 35	Very Poor

High potential scale (Mountain and High Mountain Ecological Site)	
> 90	Excellent
89-70	Good
69-55	Fair
54-40	Poor
< 39	Very Poor

Once a DCI score has been determined for a particular site, the score can be compared to previous sample years in order to determine a quality trend and better assess conditions that may need to be addressed within the community for mule deer habitat (i.e. .increasing preferred browse cover, decreasing the decadence to young ratio, increasing perennial herbaceous cover, or control/removal of noxious weeds et cetera).

Woodland Succession: Although pinyon-juniper woodlands are an important community within their own ecotype, sagebrush steppe, mixed shrub, and grassland communities have experienced significant encroachment of pinyon-juniper woodlands. As active encroachment within these communities continues, abiotic and biotic structures and functions are interrupted, which leads to the reduction of wildlife habitat, forage production, and biodiversity. Moreover, encroachment increases fuel load and fire frequency jeopardizing remnant shrub and grass communities to future loss. In an attempt to describe the succession or maturation of pinyon-juniper, phases of succession are presented within the report to aid managers in identifying the progress of infilling on a particular site and what type of input may be necessary for site rehabilitation (Tausch, Miller, Roundy, & Chambers, 2009).

- Phase I: is described as having an open canopy where crown lift is absent, there is active recruitment of young pinyon-juniper trees to the community with low seed production, and an intact shrub understory (Tausch, Miller, Roundy, & Chambers, 2009).
- Phase II: is described by the expansion of the pinyon-juniper canopy where crown lift is absent, there is active recruitment of young pinyon-juniper trees to the community with moderate to high seed production, and a shrub understory that ranges from nearly intact to one that is significantly thinning (Tausch, Miller, Roundy, & Chambers, 2009).
- Phase III: is described by the stabilization of the pinyon-juniper canopy where crown lift is present and lower limbs are dying, recruitment of young trees is limited with low to moderate seed production, and the shrub understory exhibits 75% or greater dead plants throughout the respective population (Tausch, Miller, Roundy, & Chambers, 2009).

State-and-Transition: Ecological sites are individual land types that have the ability to support specific plant species or communities based on the characteristic for their respective land type. Each ecological site therefore has its own potential and responds according to that potential when a site is influenced by natural or anthropomorphic inputs. State-and-Transition modeling attempts to describe an individual ecological site's response to these inputs by dividing the plant communities into states that are comprised of one to multiple community phases and to potentially predict the direction of a community transitioning from one state to another. State-and-Transitions are not trends per se, but rather an illustration of a community's current state in which it has the potential to respond positively or negatively to triggers and thresholds specific to that ecological site. As a tool, State-and-Transition models can provide a way for land managers to interpret a landscape and provide meaningful assessment and monitoring for landscape management. This report identifies each site's potential by supplying the ecological site name and corresponding number, and where available, verifying the provided NRCS state-and-transition models with range trend's quinquennial data, and a description of the transitions between states and phases over the duration of each study. Where not available, state-and-transition models are not referenced, but an attempt is made to describe the transitional processes that have occurred over the duration of a particular study not referenced to a model.

## REPORT FORMAT

The first page of the report is the map page, which has a topographic map and a diagrammatic sketch to illustrate the study location. The map page also contains three sections, *Location information*, *Transect Information* and *Directions to Site*, which contain directions, location, and transect setup descriptions. Following the map page, discussions of the study site are addressed by several topics including *Site Information*, *Wildlife Habitat and Vegetation History*, *Site Notes*, *Soils*, *Site Potential*, and "Trend Summary" tables. Site information contains geographic information such as land ownership, allotment, elevation, aspect, slope, and sample dates. *Disturbance History* contains all known disturbances that have occurred on the site. Known seed mixes are listed within the table named "SeedMix." *Habitat and Vegetation Information* contains wildlife habitat that the site falls within for specific big game and other species of interest. *Vegetation History* follows *Wildlife Seasonal Habitat* and



evaluates any major compositional transitions within the vegetation community. Site notes discuss any miscellaneous information as it relates to the site and immediate area. Site potential presents a table containing average annual precipitation, NRCS taxonomic soil classification, NRCS ecological site, and NRCS ecological site number. If available, the name of the NRCS ecological site will be hyperlinked to the NRCS' website for additional features concerning ecological site. The table titled "Soil Analysis Data" presents texture and chemical characteristics found on the site. The *States and Transitions* portion states if the site has a defined state and transition model available and is followed by, if available, descriptions of any state or phase transitions that have occurred on the site as it relates to the State-and-Transition diagram modeled by the NRCS. Additional assessment is made by comparing photographs from year to year which can be referred to in the accompanying CD or webpage <http://wildlife.utah.gov/range-trend.html>.

The "Trend Summary" tables contain compiled vegetation data for each site. A computer-generated data summary presents the pooled data for nested frequency, quadrat frequency, basic ground cover, soil characterization, shrub density, and shrub characterization.

## Report Description

The following tables and partial tables are examples from study numbers 01-11 and 13R-08.

### Map Page

The name and directions for locating a site are given on the map page. A topographical map and diagrammatic sketch are provided to show spacial reference of site location and arrangement. A 7.5 minute topographical map name and public land survey description are located below the map. In addition, UTM coordinates follow the public land survey location. Compass bearings are in degrees relative to magnetic north, unless specified as true north (T). Directions to a site and baseline are provided starting from a prominent location on a mileage and turn-by-turn basis that is closely referenced to the diagrammatic sketch. Also included on this page are the identification and dimensions of the specified transect, which include the browse tag number by which the transect is identified, transect bearing and length, belt placement as it relates to the baseline, and belt marker placement as it relates to the belt itself.

### Site Information

**Table 1:** The "Disturbance History" table summarizes what type of treatments and/or disturbances have affected the site over its history. Where available, historic treatments have been listed that have occurred on the site prior to establishment. If applicable, treatment projects that are associated with the Utah Watershed Restoration Initiative (WRI) are referenced by their project number. Finalization dates or the date in which a particular disturbance occurred are listed with reported affected acreage of the respective disturbance.

**Table 01-11.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Goose Creek Fire	-	July 2018	132127
Seeding - Aerial Before	Goose Creek Fire Rehabilitation	4758	November 2018	13191
Chaining - One-Way Ely Chaining	Goose Creek Fire Rehabilitation	4758	Between	13191

**Table 2:** The "Seed Mix" tables are included when a seed mix is made available and are referenced to a particular WRI project. Additionally, multiple seed mixes are often associated with one particular treatment and are combined to simplify the appearance of the report.

**Table 01-11.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name		Application Type	Application Date	Acres	
Goose Creek Fire Private/SITLA Aerial		Aerial	Nov 2018	5675	
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acr
G	Achnatherum hymenoides	Indian Ricegrass	Nezpar	0.59	0.50
G	Achnatherum hymenoides	Indian Ricegrass	Nezpar	0.66	0.60
G	Achnatherum hymenoides	Indian Ricegrass	Nezpar	0.41	0.33
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	0.06	0.05
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	0.28	0.26
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	1.18	1.08
G	Agropyron cristatum	Crested Wheatgrass	Nordan	0.29	0.24
G	Agropyron cristatum	Crested Wheatgrass	Nordan	0.53	0.50

Mix Name			Application Type	Application Date	Acres
Goose Creek Fire Private/SITLA Aerial			Aerial	Nov 2018	5675
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acr
G	Agropyron fragile	Siberian Wheatgrass	Vavilov	1.34	1.24
G	Agropyron fragile	Siberian Wheatgrass	Vavilov II	0.66	0.56
G	Elymus trachycaulus	Thickspike Wheatgrass	Bannock II	1.00	0.91
G	Elymus wawawaiensis	Snake River Wheatgrass	Discovery	1.52	1.34
G	Elymus wawawaiensis	Snake River Wheatgrass	Secar	0.48	0.44
G	Poa secunda	Sandberg Bluegrass	Vale	0.25	0.23
G	Poa secunda	Nevada Bluegrass	Opportunity	0.25	0.21
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky	0.82	0.73
F	Achillea millefolium	Western Yarrow	Yakima	0.04	0.04
F	Achillea millefolium	Western Yarrow	Eagle	0.03	0.03
F	Medicago sativa	Alfalfa	Ladak DL	2.00	1.94
F	Sanguisorba minor	Small Burnet	Delar	0.63	0.55
F	Sanguisorba minor	Small Burnet	Delar	0.44	0.41
F	Sanguisorba minor	Small Burnet	Delar	0.90	0.75
F	Sanguisorba minor	Small Burnet	Delar	0.53	0.50

*Habitat and Vegetation Information*

Table 3: The “Wildlife Seasonal Habitat” table is a summarization of habitat for big game and other species of interest, and further categorizes the habitat into seasonal range and a value description of the habitat for the allied species.

**Table 01-11.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	year-long
Greater Sage-Grouse	occupied	year-long
Pronghorn	substantial	summer

Table 4: The “Vegetation History” table summarizes what major vegetation types have occurred on the site over the duration of the study. Ranges of sample years provide the length of time that the dominant vegetation type has persisted on the site with its corresponding species listed in the adjacent cell. Most vegetation types will have one dominant species listed: this is usually a shrub species (Appendix A - Vegetation Type). For example, some sites will have a shrub canopy that dominates the site with a perennial herbaceous understory that has similar average cover as the canopy, but occurs infrequently. In this case, precedence is given to the shrub layer. Vegetation type can also be shared in the case of co-dominance. Using the example above, if the herbaceous understory had a higher cover, then the shrub layer would likely share the vegetation type with the perennial understory. The history of pinyon-juniper encroachment is characterized within the table stating the phase(s) of succession and the corresponding years of persistence. Phases of woodland succession may also influence the vegetation type. For example, pinyon-juniper encroachments in phase I are not considered co-dominant and may not be listed within the vegetation type column as they are a subordinate vegetation type. Trees in phase II are considered co-dominant with the co-dominant understory counterpart, and under these circumstances tree species are then listed with the understory counterpart within the vegetation type column.

The following “Vegetation History” table indicates that Wyoming big sagebrush was the dominant vegetation type on the site from 1982 to 2010, but the site transitioned to an annual grass-forb community in 2015. The table also indicates that woodland succession has remained in Phase I over the sample years until 2015 when the Taylor Mountain Fire removed all of the trees on the site. The transition from Wyoming big sagebrush to an annual grass-forb community that occurred between the 2010 and 2015 sample years indicates that a trigger mechanism has occurred and a threshold has been crossed that lead to the change in community composition, and in this case is related to the Taylor Mountain fire that occurred in 2014.

**Table 01-11.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Black Sagebrush	Phase I
1990	Black Sagebrush	Phase I
1996	Black Sagebrush	Phase I
2001	Black Sagebrush	Phase I
2006	Black Sagebrush	Phase I
2011	Black Sagebrush	Phase I
2016	Black Sagebrush	Phase I
2021	Perennial Grass	No Encroachment

*Site Notes*

This section contains miscellaneous information pertinent to the study site.

*Soils*

**Table 4:** Chemical and textural characteristics are listed here and were determined by laboratory analysis from a composite soil sample taken near each of the five baseline starting stakes (Allison and Moode, 1965; Day, 1965; Kenney and Nelson, 1982; Normandin et. al., 1998; Olsen et. al., 1954; Rhodes, 1982; Schoenau and Karamonos, 1993; Sims and Jackson, 1934; Walkley and Black, 1971).

The descriptive terms used for ranges in pH are as follows:

Ultra Acidic	< 3.5
Extremely Acidic	3.5-4.4
Very Strong Acidic	4.5-5.0
Strongly Acidic	5.1-5.5
Moderately Acidic	5.6-6.0
Slightly Acidic	6.1-6.5
Neutral	6.6-7.3
Slightly Alkaline	7.4-7.8
Moderately Alkaline	7.9-8.4
Strongly Alkaline	8.5-9.0
Very Strongly Alkaline	> 9.1

Percent organic matter (% OM) refers to the amount of organic matter in the top 12 inches of the soil profile. Parts per million (ppm) of phosphorus (P) and potassium (K) are also included. Values for phosphorus and potassium less than 6 ppm and 60 ppm, respectively, are considered to have low availability for plant growth and development (Tiedemann and Lopez 2004).

The electrical conductivity of the soil is reported in decisiemens per meter (dS/m). Electrical conductivity is related to the amount of salts more soluble than gypsum in the soil. The following classes can be used as a reference.

Non saline	0-2
Very slightly saline	2-4
Slightly saline	4-8
Moderately saline	8-16
Strongly saline	>16

**Table 01-11.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.8	42.9	29.1	28.0	1.9	7.0	134.4	0.5	06/04/1996

*Site Potential*

This section is prefaced by the listing of the average annual precipitation, NRCS ecological site name, and NRCS ecological site number. The ecological site name and numbers are determined by range trend personnel by digging a soil pit on site to establish the soil characteristics of the site, which is then dichotomized to establish the name of the ecological site and number.

**State-and-Transitions:** The state-and-transitions section is prefaced by whether or not there is a defined state-and-transitions model proposed for the ecological site. If a model is not proposed, an attempt is made to find a similar ecological site that has a proposed state-and-transition model, but is not directly correlated to the site being evaluated. When state-and-transition models are available, an effort is made to summarize the community transitions that have occurred over the duration of the study in conjunction with the referenced state-and-transition diagram provided by the NRCS. This section closely reflects the transitions captured in the “Vegetation History” table, but an emphasis is placed on the states and community phases of a particular vegetation type and what community pathway (mechanism) drove the community phase to its current ecological state. States are identified in the diagram by whole numbers. For example, the reference state is referred to by 1, the current potential state by 2, and subsequent states are labeled 3, 4 and etc. While community phases are nested within a state and are identified by rational numbers. For example, community phases in state 1 would be identified by 1.1, 1.2, 1.3 etc. Transitions are labeled alpha-numerically and are preceded by the letter “T”. It is important to note that this section of the report does not stand alone and care must be taken by the reader to reference the provided state-and-transition model in order to understand the driving factors within the community.

### *Trend Summary Tables*

**Table 6:** The “Shrub/Tree Summary” table summarizes percent average quadrat cover and percent average line intercept cover for all shrub and tree species occurring on the site. Average quadrat cover is determined using cover classes in conjunction with the 1/4m<sup>2</sup> quadrat to estimate percent quadrat cover. To more accurately estimate canopy cover of trees and shrubs, the line-intercept method is used along each 100-foot belt.

**Table 01-11.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees.

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	16.1	0.4	1.6	-	-	-
2001	16.1	0.5	1.6	-	-	0.2
2006	14.3	0.6	1.6	15.8	1.5	1.7
2011	13.7	0.7	2.3	14.7	1.2	3.7
2016	12.1	1.3	2.0	17.4	2.9	5.5
2021	4.6	-	-	3.6	0.1	-

**Table 7:** The “Herbaceous Summary” table summarizes the total average cover for all grass and forb species and summarizes the nested frequency by life form.

**Table 01-11.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups.

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	392	155	7	58	3.2	1.7	0.0	0.3
2001	450	114	138	23	11.1	1.2	0.4	0.2
2006	427	114	2	17	10.7	4.1	0.0	0.1
2011	275	125	212	36	5.0	2.5	1.7	0.4
2016	318	135	122	51	5.4	4.2	0.4	0.4
2021	387	173	21	146	8.5	11.2	0.2	5.8

**Table 8:** The “Basic Ground Cover” table summarizes average cover of vegetation, rock, pavement, litter, cryptogams, and bare ground. Vegetation crown cover estimates are projected vertically while the remaining cover types’ cover estimates are a planar projection and when combined will usually exceed 100%. Therefore, comparisons can be made for all cover measurements except for general vegetation cover.

**Table 01-11.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptograms	Litter	Pavement	Rock	Vegetation
1996	6.7	0.1	12.9	37.5	17.6	25.0
2001	10.0	0.0	16.2	35.1	19.1	30.9
2006	22.9	0.4	19.9	21.6	17.9	31.6
2011	16.5	1.1	15.2	30.5	20.4	28.6
2016	9.5	0.0	16.5	48.8	22.5	23.9
2021	6.7	0.2	28.2	30.0	22.4	30.0

**Table 9:** The “Pellet Group Data” table summarizes the frequency of animal pellets sampled within the 100 quadrats placed along the sampling belts as well as data from a pellet group transect read parallel to the study site baseline. Quadrat frequency of rabbit or big game pellets indicates a relative amount of presence by a particular animal. This data can help characterize changes in wildlife occupancy patterns on a site.

The data presented in the “Days Use per Acre” section of the table is reported from the pellet group transect in conjunction with the vegetation transects. The pellet group transect utilizes 50 100ft<sup>2</sup> circular plots that are placed in the study area: these are usually two parallel transects of 25 plots on each side of the vegetation transect which runs 400 feet to 500 feet in length. The number of recent pellet groups for wildlife (usually deer and elk) and pats for cattle are recorded. That number is then converted to days use per acre (hectare) (Neff 1968). Animals that do not have a defined defecation rate are recorded as pellets per acre (ha) and are indicated by (\*). Rabbit pellet groups were recorded in a few of the years close to the year 2000, but have not been sample within the transect since that time; these are also recorded as pellets per acre (ha).

**Table 01-11.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Elk	Horse	Rabbit
	Quadrat Frequency				
1996	-	17	-	1	6
2001	7	15	-	-	-
2006	1	22	2	-	15
2011	4	21	-	-	8
2016	2	35	5	-	30
2021	1	30	-	-	2
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	2.2 (5.4)	26.8 (66.2)	-	-	-
2006	1.5 (3.6)	34.9 (86.1)	-	-	-
2011	11.6 (28.7)	47.6 (117.5)	6.7 (16.6)	-	-
2016	1.5 (3.6)	50.2 (124.1)	8.1 (19.9)	-	-
2021	0.7 (1.8)	38.9 (96.0)	0.7 (1.7)	-	-

\*Pellets per acre (ha)

**Table 10:** The “Grass Species” table summarizes the average cover and nested frequency for grass species. Species may be designated as annual species, noxious weeds, and/or introduced species by the associated symbol below the graph. Only species that are on the Utah Noxious Weed List are designated as a noxious weed.

**Table 01-11.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum thurberianum (Thurber's needlegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Pascopyrum smithii (western wheatgrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia octoflora <sup>a</sup> (sixweeks fescue)
year	Nested Frequency								
1996	26	31	-	388	47	-	0	68	27
2001	8	13	-	450	22	2	11	64	24
2006	38	6	-	427	30	-	-	54	-
2011	41	-	-	275	13	-	1	80	3
2016	47	5	-	314	31	-	3	72	11
2021	87	23	18	387	26	-	5	55	-
year	Average Cover (%)								
1996	0.3	0.2	-	3.1	0.4	-	0.0	0.7	0.0
2001	0.1	0.2	-	11.0	0.2	0.0	0.1	0.7	0.1
2006	1.1	0.4	-	10.7	0.7	-	-	1.9	-
2011	0.7	-	-	5.0	0.1	-	0.0	1.6	0.0
2016	1.5	0.5	-	5.4	0.5	-	0.0	1.8	0.0
2021	5.5	0.5	1.0	8.5	0.5	-	0.0	3.8	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 11:** The “Forb Species” table summarizes the average cover and nested frequency for forb species. Species may be designated as annual species, noxious weeds, and/or introduced species by the associated symbol below the graph. Only species that are on the Utah Noxious Weed List are designated as a noxious weed.

**Table 01-11.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Antennaria (pussytoes)	Astragalus (milkvetch)	Astragalus cibarius (browse milkvetch)	Astragalus iodanthus (Humboldt River milkvetch)	Astragalus newberryi (Newberry's milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza hookeri (Hooker's balsamroot)	Castilleja angustifolia (northwestern Indian paintbrush)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Crepis acuminata (taperip hawksbeard)	Cryptantha (cryptantha)	Cryptantha watsonii <sup>a</sup> (Watson's cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Eriastrum sparsiflorum <sup>a</sup> (Great Basin woollystar)	Erigeron aphanactis <sup>a</sup> (rayless shaggy fleabane)
year	Nested Frequency																
1996	-	-	-	-	-	4	-	25	-	7	-	-	3	-	3	2	-
2001	-	-	2	-	-	-	-	3	1	-	-	1	-	-	12	-	1
2006	-	-	-	-	-	-	-	6	0	1	-	1	2	-	-	-	-
2011	-	3	-	7	-	-	-	12	1	1	11	7	-	-	91	4	5
2016	-	-	-	-	3	1	-	20	1	0	1	7	-	12	12	1	-
2021	98	-	-	-	-	3	5	9	0	-	-	5	-	-	-	-	16
year	Average Cover (%)																
1996	-	-	-	-	-	0.0	-	0.1	-	0.0	-	-	0.0	-	0.0	0.0	-
2001	-	-	0.0	-	-	-	-	0.0	0.0	-	-	0.0	-	-	0.1	-	0.0
2006	-	-	-	-	-	-	-	0.1	0.0	0.0	-	0.0	0.0	-	-	-	-
2011	-	0.0	-	0.1	-	-	-	0.0	0.0	0.0	0.0	0.2	-	-	0.5	0.0	0.0
2016	-	-	-	-	0.0	0.0	-	0.1	0.0	0.0	0.0	0.1	-	0.0	0.0	0.0	-
2021	4.4	-	-	-	-	0.0	0.1	0.2	0.1	-	-	0.1	-	-	-	-	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 12:** The “Shrub and Tree Species” table summarizes the quadrat average and line intercept cover for shrub and tree species. Species may be designated as tree species, preferred browse, and/or introduced species by the associated symbol below the graph. Preferred browse species are determined by Range Trend staff.

**Table 01-11.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)									
	year									
Artemisia nova <sup>p</sup> (black sagebrush)	1996	-	-	-	-	-	-	-	-	-
Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	2001	-	-	-	-	-	-	-	-	-
Atriplex confertifolia <sup>p</sup> (shadscale saltbush)	2006	14.6	0.6	0.6	-	-	1.5	-	1.7	-
Bassia americana <sup>p</sup> (green molly)	2011	11.4	2.8	0.5	-	-	1.2	-	3.7	-
Bassia prostrata <sup>pi</sup> (forage kochia)	2016	15.8	0.6	1	-	-	2.6	0.3	5.5	-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	2021	-	0.2	-	-	3.4	-	0.1	-	-
Gutierrezia sarothrae (broom snakeweed)	year									
Juniperus osteosperma <sup>t</sup> (Utah juniper)	1996	14.8	-	1.3	0.1	-	0.4	0.0	1.6	-
Krascheninnikovia lanata <sup>p</sup> (winterfat)	2001	15.1	0.5	0.5	0.1	-	0.5	-	1.6	-
Opuntia polyacantha (plains pricklypear)	2006	13.2	0.7	0.2	0.2	-	0.6	-	1.6	0.0
	2011	11.6	1.6	0.5	0.0	-	0.7	0.0	2.3	-
	2016	11.2	0.1	0.7	0.0	-	1.3	0.0	2.0	-
	2021	0.8	0.3	0.0	-	3.4	-	0.0	-	0.0
	year									
	1996	14.8	-	1.3	0.1	-	0.4	0.0	1.6	-
	2001	15.1	0.5	0.5	0.1	-	0.5	-	1.6	-
	2006	13.2	0.7	0.2	0.2	-	0.6	-	1.6	0.0
	2011	11.6	1.6	0.5	0.0	-	0.7	0.0	2.3	-
	2016	11.2	0.1	0.7	0.0	-	1.3	0.0	2.0	-
	2021	0.8	0.3	0.0	-	3.4	-	0.0	-	0.0

t - Tree Species; p - Preferred Browse; i - Introduced

**Table 13:** The “Shrub/Tree Characteristics” table summarizes shrub and tree species by density, age class distribution, utilization, poor vigor, and average height/crown. **Note:** height/crown measurements were discontinued starting in the 2020 sample year.

**Table 01-11.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia nova<sup>p</sup> -- (black sagebrush)</b>									
1996	7980	340	11	72	17	56	2	3	30/61
2001	7200	-	16	62	23	3	2	8	22/50
2006	6040	1760	8	59	33	10	4	17	26/58
2011	5500	-	4	75	21	40	1	19	21/55
2016	5320	40220	3	70	27	6	0	15	27/61
2021	120	240	83	17	0	0	0	0	- / -
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	60	-	0	67	33	0	0	33	60/58
2006	100	-	0	100	0	40	0	20	47/73
2011	340	-	6	82	12	47	6	6	38/77
2016	40	-	0	50	50	0	0	0	62/108
2021	2140	320	99	1	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 13a:** The “Aspen Characteristics” table summarizes characteristics of the aspen community. Only aspen that was sampled using the size class distribution method is included in this table. Aspen sampled using the modified Cole Browse method is included in the “Browse Characteristics” table. Density is reported for the aspen population and is characterized by age class distribution, which is further subdivided into its corresponding age class demographics; this method was started in 2011. Aspen data prior to 2011 is included in Table 13.

- Class I: Trees are less than or equal to 1.5 ft tall
- Class II: Trees are greater than 1.5 ft to 5 ft
- Class III: Trees are greater than 5ft and up to 1 in. dbh
- Class IV: Trees are greater than 1 in. dbh

The aspen population is then characterized by utilization, which is subcategorized by percentages of moderate and heavily hedged plants, and concluded with the percentage of plants displaying poor vigor.

**Table 13R-08.13a - Aspen Characteristics.** Characteristics of aspen populations including density, size class distribution, and vigor of plants.

Year	Density	Size Class Distribution				Utilization		Poor Vigor (%)
	Plants per Acre	Class I (%)	Class II (%)	Class III (%)	Class IV (%)	Moderate (%)	Heavy (%)	
Populus tremuloides (quaking aspen)								
2013	19140	17	80	3	-	3	1	0
2016	20520	4	31	64	0	1	1	1
2021	19040	8	18	41	33	0	0	0

- Class I - Less than or equal to 1.5 feet
- Class II - Greater than 1.5 feet to 5 feet
- Class III - Greater than 5 feet and up to 1 inch diameter at breast height (dbh)
- Class IV - Greater than 1 in diameter at breast height (dbh)

**Table 14:** The “Tree Characteristics” table tree density estimates using the point-center quarter method which better estimates density of widely distributed trees than the shrub density strips. Average basal diameter is also listed in centimeters.

**Table 01-11.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12'	
Juniperus osteosperma (Utah juniper)							
1996	53	-	-	-	-	-	10.8
2001	62	-	-	-	-	-	13.1
2006	57	-	35	35	24	6	16.1
2011	57	-	33	50	17	-	13.1
2016	70	-	17	61	17	6	15.4



## PRE-1992 DATA

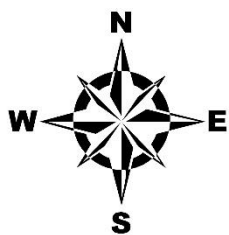
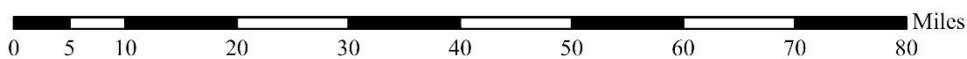
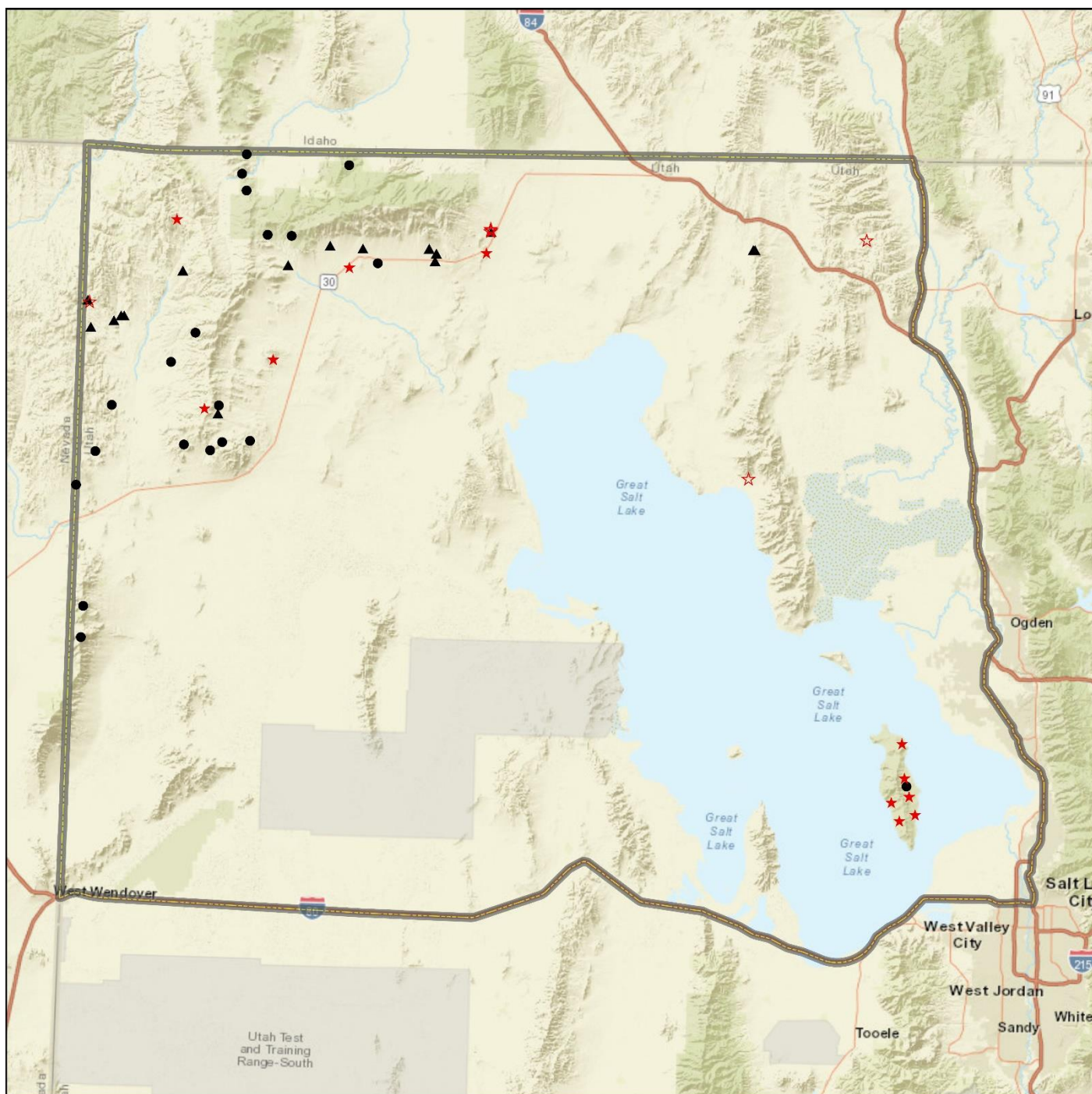
Pre-1992 Data: Data collected before July 19, 1992 has been excluded from the individual site summaries due to differences in sampling techniques and changes in sample size and area. This pre-1992 data can be found in the Utah Big Game Range Trend Studies 1982-1992 report. The following explanations address some of the major changes that occurred with data collection. Nested frequency quadrat divisions and zones were different with four divisions as compared to the five divisions and zones. In addition, nested frequency data for annual species was not collected. Shrub density was collected along a separate transect that was adjacent to the nested frequency transect within three circular plots (radius of 8.3 or 11.7 ft) centered on three permanently marked stakes. Therefore, changes in density (before and after 1992) may not necessarily indicate changes in trend, especially shrub populations that are characteristically clumped and/or have discontinuous distributions. The earlier smaller sample could easily either overestimate or underestimate shrub populations. Other characteristics like percent decadence, percent poor vigor, percent heavy hedging, young recruitment, etc., are given more weight in determining shrub population transitions when comparing survey years where sample sizes were different. For more information on earlier range trend sampling methods, see the Pre-1992 Data report methodologies (Utah Big Game Range Trend Studies 1982-1992).

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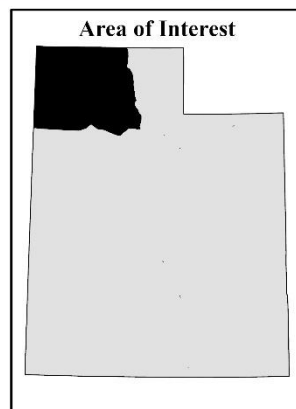
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# WILDLIFE MANAGEMENT UNIT 1 - BOX ELDER

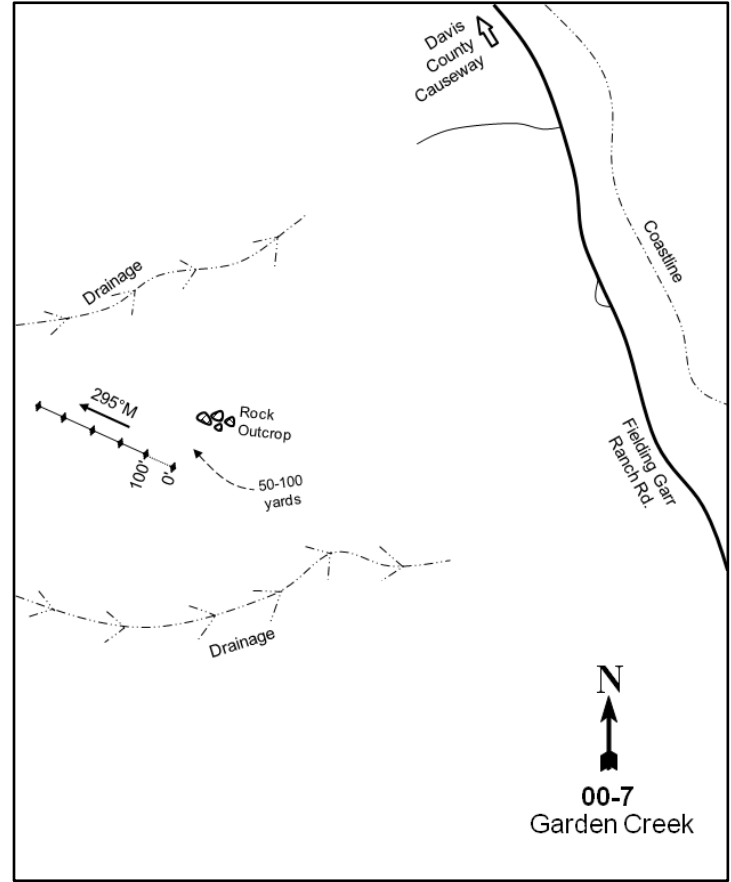
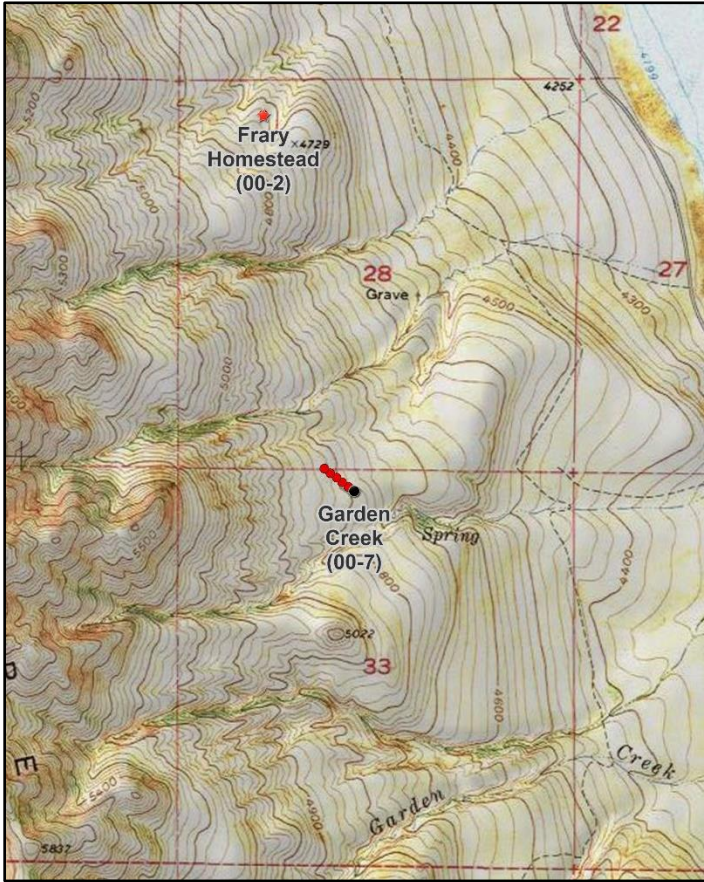


<b>Unit Boundary</b>		<b>Study Locations</b>	
Unit - 1		<b>Project, Status</b>	
		●	RT, Active
		★	RT, Suspended
		▲	WRI, Active
		☆	WRI, Suspended



Credits: Esri, HERE, Garmin, NGA, USGS, NPS

## GARDEN CREEK - STUDY NO. 00-7

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Antelope Island NW; Township 3N, Range 3W, Section 33  
NAD 83 UTM ZONE 12, 399603 East 4534681 North

**Transect Information**

Browse Tag # (0' Stake)	589
Transect Bearing	295° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

**Directions to Site**

After crossing the Davis County Causeway, travel south along the Fielding Garr Ranch Road for approximately 8.5 miles to a small, paved turnout (parking lot) to the west. Turn into the pullout and park. Hike up the steep slope to the west to gain the ridge and flat. Once on the flat, use the GPS to navigate to the 0-foot stake; the hike is nearly a mile if following the flat and ridge contours. Once the sagebrush flat has been gained to where the site is located, the 0-foot stake is found about 50 to 100 yards southwest of a large rock outcrop. The 0-foot stake is identified by the browse tag #589.

**Site Information**

Land Ownership	State
Land Administrator	USP
Allotment	No data
Elevation	4,775ft (1,455m)
Aspect	Northeast
Slope	12%
Sample Dates	05/23/2016, 05/18/2021

**Table 00-07.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	West Antelope	-	July 2016	15088

**Wildlife Habitat and Vegetation History****Table 00-07.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
American Bison	crucial	year-long
California Bighorn	substantial	year-long

**Table 00-07.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2016	Wyoming Big Sagebrush	NA
2021	Wyoming Big Sagebrush/Introduced Perennial Grass	NA

**Site Notes**

No Notes

**Site Potential**

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Upland Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R028AY309UT
States and Transitions	No state and transition model is available for this ecological site.

When the study was established in 2016, the vegetation on this site existed as a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) community type (Table 00-07.12). The herbaceous understory was degraded with the weedy perennial grass species bulbous bluegrass (*Poa bulbosa*) providing the majority of the understory cover. The annual grass species cheatgrass (*Bromus tectorum*) was also a major contributor to the community's understory (Table 00-07.7, Table 00-07.10). Following the 2016 sampling the community was affected by the West Antelope wildfire (Table 00-07.1), causing sagebrush cover and density to decrease substantially (Table 00-07.12, Table 00-07.13). In addition, this disturbance allowed for the introduction of the noxious weed Dalmatian toadflax (*Linaria dalmatica*), furthering the degradation of the community (Table 00-07.11). While in this invaded state, the community is expected to be less resistant to future wildfires and other disturbances that put the community at risk for the loss of remaining sagebrush. A loss of sagebrush could cause this site to transition into a state with a decreased habitat quality for wildlife (Table 00-07.15).

**Trend Summary Tables****Table 00-07.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2016	29.1	0.3	-	42.1	0.3	-
2021	6.1	7.2	-	8.7	4.9	-

**Table 00-07.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2016	217	431	232	42	3.7	33.0	1.8	0.2
2021	356	406	254	31	12.7	26.7	5.7	1.1

**Table 00-07.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2016	20.8	2.1	36.8	2.1	6.7	53.0
2021	11.7	0.4	42.9	4.4	5.5	51.8

**Table 00-07.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	American Bison	Coyote	Mule Deer/Big Horn Sheep	Rabbit
	Quadrat Frequency			
2016	-	-	4	5
2021	3	-	2	2
Year	Days Use Per Acre (ha)			
2016	5.1 (12.6)	-	3.4 (8.3)	-
2021	19.6 (48.4)	8.7 (21.5)*	1.3 (3.3)	-

\*Pellets per acre (ha)

**Table 00-07.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency								
Achnatherum hymenoides (Indian ricegrass)	5	95	-	33	159	358	284	4	103
Aristida purpurea (purple threeawn)	-	89	26	8	339	321	161	6	29
Bromus arvensis <sup>ai</sup> (field brome)	Average Cover (%)								
Bromus briziformis <sup>ai</sup> (rattlesnake brome)	0.0	3.9	-	0.1	3.1	24.7	4.4	0.0	0.5
Bromus tectorum <sup>ai</sup> (cheatgrass)	-	6.7	0.0	0.0	12.5	16.5	3.3	0.1	0.1
Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Nested Frequency								
Poa secunda (Sandberg bluegrass)	5	95	-	33	159	358	284	4	103
Sporobolus cryptandrus (sand dropseed)	-	89	26	8	339	321	161	6	29
Vulpia myuros <sup>ai</sup> (annual fescue)	Average Cover (%)								
	0.0	3.9	-	0.1	3.1	24.7	4.4	0.0	0.5
	-	6.7	0.0	0.0	12.5	16.5	3.3	0.1	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 00-07.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency															
Artemisia ludoviciana (white sagebrush)	-	32	2	3	28	5	99	42	-	147	3	-	-	1	1	3
Calochortus nuttallii (sego lily)	3	12	7	-	-	1	214	-	3	80	3	2	0	17	-	-
Cirsium (thistle)	Average Cover (%)															
Descurainia pinnata <sup>a</sup> (western tansymustard)	-	0.1	0.0	0.0	0.1	0.0	1.3	0.1	-	0.4	0.1	-	-	0.0	0.0	0.0
Draba <sup>a</sup> (draba)	0.1	0.0	0.5	-	-	0.0	5.3	-	0.0	0.2	0.1	0.2	0.0	0.2	-	-
Erigeron (fleabane)	Nested Frequency															
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	5	95	-	33	159	358	284	4	103							
Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	-	89	26	8	339	321	161	6	29							
Grindelia squarrosa (curlycup gumweed)	Average Cover (%)															
Helianthus annuus <sup>a</sup> (common sunflower)	0.0	3.9	-	0.1	3.1	24.7	4.4	0.0	0.5							
Heterotheca villosa (hairy false goldenaster)	-	6.7	0.0	0.0	12.5	16.5	3.3	0.1	0.1							
Linaria dalmatica <sup>ai</sup> (Dalmatian toadflax)	Nested Frequency															
Medicago sativa <sup>i</sup> (alfalfa)	5	95	-	33	159	358	284	4	103							
Tragopogon dubius <sup>ai</sup> (yellow salsify)	-	89	26	8	339	321	161	6	29							
Trifolium (clover)	Average Cover (%)															
Verbascum virgatum <sup>ai</sup> (wand mullein)	0.0	3.9	-	0.1	3.1	24.7	4.4	0.0	0.5							
	-	6.7	0.0	0.0	12.5	16.5	3.3	0.1	0.1							

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species



**Table 00-07.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Ericameria nauseosa (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)
year	Line Intercept Cover (%)		
2016	42.1	0.3	0
2021	8.7	0.9	4
year	Quadrat Cover (%)		
2016	29.1	0.0	0.3
2021	6.1	0.4	6.9

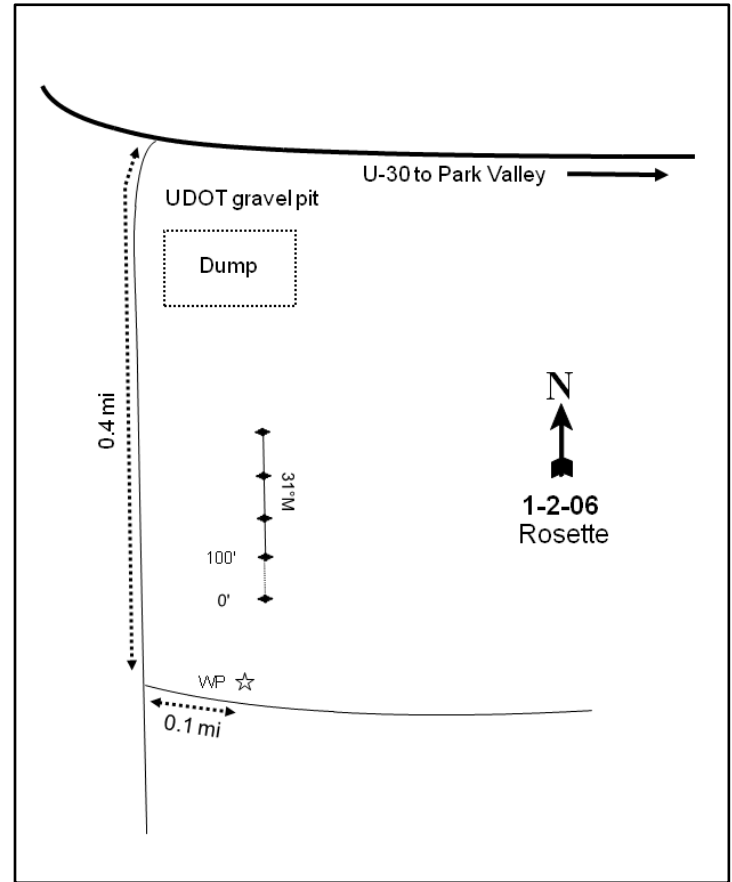
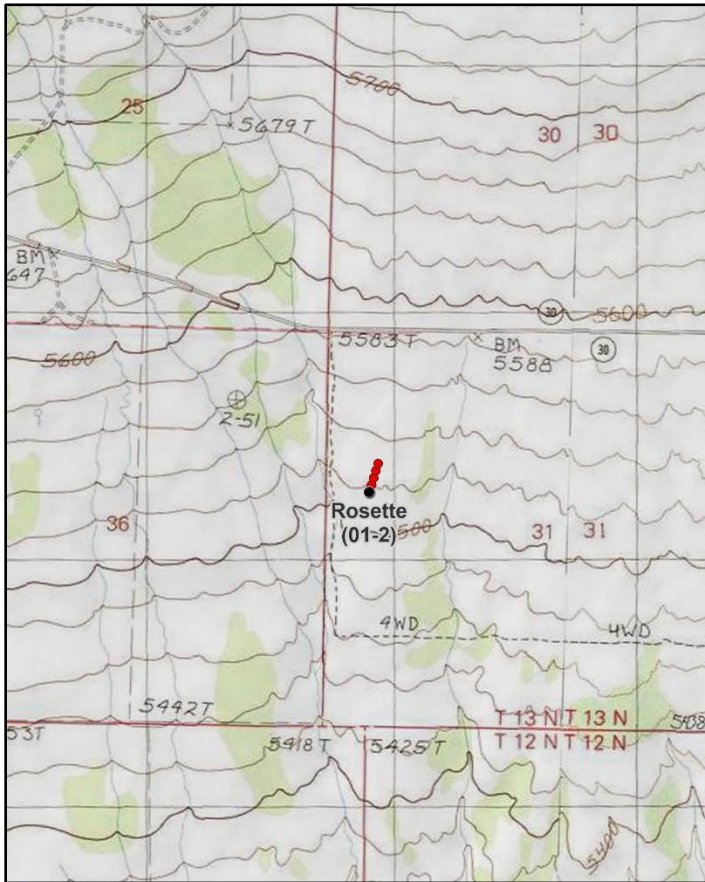
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 00-07.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
2016	16460	180860	25	74	1	0	0	1	57/89
2021	4940	40	35	56	9	0	0	11	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
2016	60	-	0	100	0	0	0	0	26/28
2021	-	-	-	-	-	-	-	-	- / -
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
2016	60	-	0	33	67	0	33	100	75/82
2021	140	-	0	100	0	0	0	0	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
2016	1140	60	7	93	0	0	0	0	17/17
2021	1820	-	13	73	14	0	0	14	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

## ROSETTE - STUDY NO. 01-2

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Rosette SE; Township 13N, Range 13W, Section 31  
NAD 83 UTM ZONE 12, 301847 East 4631471 North

**Transect Information**

Browse Tag # (0' Stake)	7906
Transect Bearing	0° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

**Directions to Site**

From Rosette, Utah and mile marker 51, proceed northeast on State Route 30 for approximately 1.0 miles and turn right. Proceed through the Utah Department of Transportation gravel dump and find a dirt road on the west side of gravel pile area. Proceed south on this road for 0.4 miles to a left fork. Turn left (east), proceed 0.1 miles to a witness post on the left (north) side of the road, and stop. From the witness post take a bearing of 9 degrees magnetic and walk 22 paces to the 0-foot stake of the baseline. The 0-foot stake is wired with a red browse tag #7906.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	HIRSCHI
Elevation	5,500ft (1,676m)
Aspect	South
Slope	1%
Sample Dates	06/17/1996, 05/23/2001, 06/02/2006, 05/23/2011, 05/26/2016, 05/17/2021

**Table 01-02.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Park Valley PJ Treatment Project Phase 2	3400	December 2015-March 2016	680

**Wildlife Habitat and Vegetation History****Table 01-02.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Pronghorn	substantial	summer	

**Table 01-02.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Wyoming Big Sagebrush	Phase I
1990	Wyoming Big Sagebrush	Phase I
1996	Wyoming Big Sagebrush	Phase I
2001	Wyoming Big Sagebrush	Phase I
2006	Wyoming Big Sagebrush	Phase I
2011	Wyoming Big Sagebrush	Phase I
2016	Wyoming Big Sagebrush	Phase I
2021	Wyoming Big Sagebrush	Phase I

**Site Notes**

No Notes

**Soils****Table 01-02.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.3	46.6	25.4	28.0	1.5	7.2	236.8	0.7	06/17/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Semidesert Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R028AY220UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1984, this site has remained dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) (Photos, Pre-1992 Data, Table 01-02.12, Table 01-02.13). The introduced annual grass species cheatgrass (*Bromus tectorum*) has made up the majority of the herbaceous understory in most sample years. However, the perennial grasses Sandberg bluegrass (*Poa secunda*) and thickspike wheatgrass (*Elymus lanceolatus*) dominated the herbaceous understory in 2021 (Table 01-02.10). There has not been a single dominant perennial forb species from sample year to sample year (Table 01-02.11). Utah juniper (*Juniperus osteosperma*) has been present in low abundance since site establishment (Photos, Table 01-02.14), but most trees were removed following a lop and scatter treatment in 2015 (Table 01-02.1). Although the site is currently considered to be within Phase I of woodland succession as of 2021 (Table 01-02.4), the remaining tree component indicates that there may be potential for infilling in future sample years.

**Trend Summary Tables****Table 01-02.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	14.0	7.8	2.5	-	-	-
2001	18.4	5.9	1.5	-	-	0.6
2006	15.8	2.9	3.1	18.0	5.2	6.3
2011	18.4	5.2	1.4	19.3	5.3	6.1
2016	13.3	3.8	-	17.2	3.9	-
2021	17.1	5.6	-	18.7	5.4	-

**Table 01-02.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	303	302	79	168	3.2	6.4	0.3	1.7
2001	261	306	119	106	3.7	9.2	0.5	1.8
2006	349	241	118	81	5.4	5.7	0.4	0.9
2011	307	292	263	113	11.3	11.2	3.0	1.9
2016	339	227	174	88	9.2	3.3	1.4	1.7
2021	106	310	62	124	0.3	7.9	0.1	2.3

**Table 01-02.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	21.9	4.6	38.9	4.6	1.2	34.7
2001	28.5	2.8	37.8	3.9	0.4	42.3
2006	19.6	5.0	47.0	5.8	0.3	35.7
2011	32.5	4.5	32.5	4.3	0.2	44.9
2016	41.2	8.0	30.3	3.5	0.2	30.8
2021	15.0	4.2	57.0	5.2	0.3	34.8

**Table 01-02.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Pronghorn	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	-	21	-	19
2001	-	11	-	6
2006	-	22	-	55
2011	-	20	-	14
2016	-	23	-	75
2021	-	19	-	36
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	-	26.2 (64.6)	-	-
2006	0.7 (1.8)	24.8 (61.2)	-	-
2011	1.5 (3.6)	24.1 (59.6)	-	-
2016	2.2 (5.4)	14.1 (34.8)	0.7 (1.7)	-
2021	7.2 (17.9)	10.7 (26.5)	-	-

**Table 01-02.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia octoflora <sup>a</sup> (sixweeks fescue)
year	Nested Frequency							
1996	-	303	74	78	-	215	16	3
2001	1	261	29	93	-	244	-	-
2006	6	348	22	110	-	196	-	7
2011	3	306	33	140	5	219	-	4
2016	0	339	19	157	1	78	-	-
2021	6	103	39	184	15	178	-	3
year	Average Cover (%)							
1996	-	3.2	0.6	0.6	-	5.1	0.1	0.0
2001	0.0	3.7	0.7	1.1	-	7.4	-	-
2006	0.2	5.3	0.4	1.4	-	3.7	-	0.0
2011	0.0	11.3	0.5	2.4	0.1	8.0	-	0.0
2016	0.0	9.2	0.3	2.3	0.0	0.7	-	-
2021	0.2	0.3	0.8	4.2	0.4	2.3	-	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 01-02.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium nevadense (Nevada onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria (pussytoes)	Arabis (rockerness)	Astragalus (milkvetch)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus calycosus (Torrey's milkvetch)	Astragalus purshii (woollypod milkvetch)	Balsamorhiza hookeri (Hooker's balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littlepod false flax)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Cryptantha (cryptantha)	Cryptantha watsonii <sup>a</sup> (Watson's cryptantha)
year	Nested Frequency																
1996	3	-	4	3	6	3	2	-	7	2	-	-	9	37	-	49	-
2001	-	9	-	7	3	-	-	-	7	8	-	-	78	5	-	-	-
2006	-	3	20	3	2	-	1	-	4	-	-	-	97	3	2	10	-
2011	-	33	17	5	-	1	-	-	4	-	4	-	163	4	44	12	-
2016	-	1	35	5	-	-	2	-	4	8	1	2	39	-	2	6	5
2021	-	-	57	7	-	-	7	3	3	-	-	-	-	-	5	1	3
year	Average Cover (%)																
1996	0.0	-	0.0	0.0	0.0	0.0	0.0	-	0.1	0.2	-	-	0.0	0.1	-	0.2	-
2001	-	0.0	-	0.1	0.0	-	-	-	0.0	0.3	-	-	0.2	0.0	-	-	-
2006	-	0.0	0.1	0.0	0.0	-	0.0	-	0.0	-	-	-	0.2	0.0	0.0	0.0	-
2011	-	0.2	0.1	0.0	-	0.0	-	-	0.0	-	0.0	-	1.4	0.0	0.1	0.0	-
2016	-	0.0	0.4	0.0	-	-	0.0	-	0.0	0.3	0.0	0.0	0.1	-	0.0	0.0	0.0
2021	-	-	0.1	0.1	-	-	0.2	0.0	0.0	-	-	-	-	-	0.0	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cymopterus longipes (longstalk springparsley)	Delphinium nuttallianum (two-lobed larkspur)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Erigeron eatonii (Eaton's fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum caespitosum (matted buckwheat)	Eriogonum cernuum <sup>a</sup> (nodding buckwheat)	Eriogonum ovalifolium (cushion buckwheat)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Gilia inconspicua <sup>a</sup> (shy gilia)	Ipomopsis congesta (ballhead ipomopsis)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Navarretia intertexta <sup>a</sup> (needleleaf navarretia)	Pedicularis centranthera (dwarf lousewort)
year	Nested Frequency																
1996	23	-	3	-	-	4	24	-	-	14	-	-	19	4	-	5	-
2001	28	-	43	-	1	-	6	-	-	6	-	-	12	-	-	-	-
2006	10	-	6	-	-	2	6	-	4	-	-	2	13	0	-	-	-
2011	29	5	167	-	-	2	2	-	10	10	-	-	21	-	-	19	3
2016	24	1	89	5	-	-	-	-	1	64	-	-	30	-	1	-	-
2021	46	0	-	-	-	3	-	1	-	-	1	-	-	-	-	-	1
year	Average Cover (%)																
1996	0.1	-	0.0	-	-	0.0	0.1	-	-	0.1	-	-	0.1	0.1	-	0.0	-
2001	0.2	-	0.1	-	0.0	-	0.0	-	-	0.0	-	-	0.0	-	-	-	-
2006	0.0	-	0.0	-	-	0.0	0.0	-	0.0	-	-	0.0	0.0	0.0	-	-	-
2011	0.3	0.1	1.0	-	-	0.1	0.0	-	0.1	0.0	-	-	0.1	-	-	0.2	0.4
2016	0.1	0.0	0.6	0.2	-	-	-	-	0.0	0.2	-	-	0.1	-	0.0	-	-
2021	0.2	0.0	-	-	-	0.0	-	0.0	-	-	0.0	-	-	-	-	-	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>ai</sup> (Douglas' knotweed)	Rumex crispus <sup>i</sup> (curly dock)	Salsola tragus <sup>ai</sup> (prickly Russian thistle)	Sisymbrium altissimum <sup>ai</sup> (tall tumbleweed)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency						
1996	40	63	4	-	-	4	-
2001	31	35	-	-	-	-	2
2006	52	1	-	-	-	-	1
2011	41	2	-	-	3	-	3
2016	48	4	-	-	-	1	4
2021	55	42	-	0	-	-	4
year	Average Cover (%)						
1996	0.8	0.2	0.0	-	-	0.0	-
2001	1.0	0.1	-	-	-	-	0.0
2006	0.7	0.0	-	-	-	-	0.0
2011	0.6	0.0	-	-	0.0	-	0.0
2016	1.0	0.0	-	-	-	0.0	0.1
2021	1.3	0.3	-	0.0	-	-	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 01-02.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova <sup>p</sup> (black sagebrush)	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)	Juniperus osteosperma <sup>i</sup> (Utah juniper)	Linanthus pungens (granite prickly phlox)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept Cover (%)						
1996	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-
2006	-	18	3.3	-	6.3	1.9	-
2011	-	19.3	4.1	-	6.1	1.2	-
2016	-	17.2	3	-	-	0.9	-
2021	-	18.7	4.7	-	-	0.7	-
year	Quadrat Cover (%)						
1996	-	14.0	5.6	-	2.5	2.0	0.2
2001	-	18.4	3.0	-	1.5	2.8	0.1
2006	0.0	15.8	1.6	-	3.1	1.2	0.1
2011	-	18.4	3.8	-	1.4	1.5	0.0
2016	0.0	13.3	2.0	0.1	-	1.1	0.7
2021	0.1	17.0	4.4	-	-	0.9	0.3

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-02.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia nova<sup>p</sup> -- (black sagebrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	40	-	50	50	0	50	0	0	14/26
2011	20	-	0	100	0	0	0	0	15/44
2016	20	-	0	100	0	0	0	0	36/81
2021	100	20	0	100	0	0	0	0	-/-
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
1996	6160	2620	49	21	29	22	0	9	63/94
2001	5380	20	23	60	18	1	0	7	56/69
2006	4180	2940	7	58	35	21	2	17	58/76
2011	4600	1420	8	68	24	32	1	18	50/78
2016	3500	1980	6	68	26	6	2	13	50/77
2021	3660	240	18	46	36	2	0	28	-/-
<b>Atriplex canescens<sup>p</sup> -- (fourwing saltbush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	32/27
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1996	5900	1660	20	78	2	2	0	0	29/46
2001	3160	80	11	63	26	0	0	1	28/32
2006	3560	800	9	76	15	11	12	2	25/32
2011	4340	-	18	78	3	0	0	1	26/38
2016	2700	160	13	78	9	1	3	5	23/30
2021	3420	40	6	70	23	3	0	29	- / -
<b>Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)</b>									
1996	40	-	0	100	0	0	0	0	42/49
2001	20	-	0	0	100	0	0	0	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	120	-	33	67	0	0	33	0	24/31
2021	20	-	0	100	0	0	0	0	- / -
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1996	160	-	38	63	0	0	0	0	- / -
2001	140	20	43	57	0	0	0	0	- / -
2006	140	20	29	71	0	0	0	0	- / -
2011	140	20	14	86	0	0	0	0	- / -
2016	40	20	100	0	0	0	0	50	22/15
2021	20	20	100	0	0	100	0	0	- / -
<b>Linanthus pungens -- (granite prickly phlox)</b>									
1996	2520	40	10	89	1	0	0	1	25/37
2001	2660	60	9	86	5	0	0	1	17/20
2006	2700	360	19	77	4	0	0	0	15/23
2011	2500	-	10	86	3	0	0	1	15/25
2016	1720	60	9	90	1	0	0	1	14/19
2021	2100	180	8	58	34	2	0	32	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	160	-	13	75	13	0	0	0	11/30
2001	140	-	0	100	0	0	0	0	- / -
2006	80	-	0	75	25	0	0	25	13/23
2011	80	-	0	100	0	0	0	0	9/21
2016	120	20	17	83	0	0	0	0	13/39
2021	60	20	0	100	0	0	0	0	- / -
<b>Pinus edulis<sup>t</sup> -- (twoneedle pinyon)</b>									
1996	-	20	0	0	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-02.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

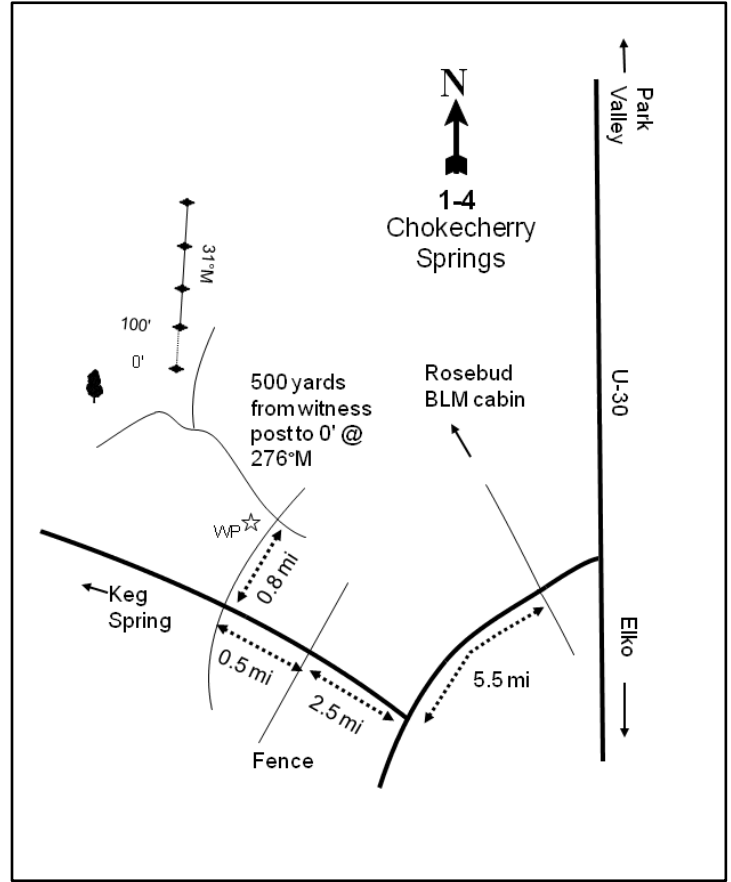
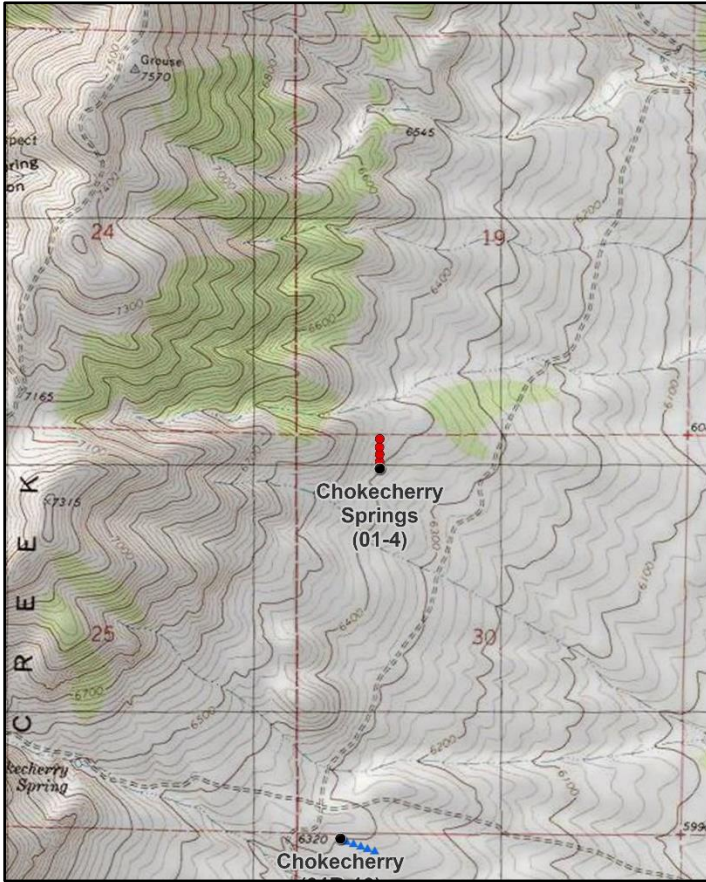
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
1996	55	-	-	-	-	-	9.8
2001	33	-	-	-	-	-	19.8
2006	56	-	25	35	25	15	14.1
2011	48	5	16	47	16	16	12.6
2016	12	90	10	-	-	-	14.6
2021	26	67	33	-	-	-	2.8



**Table 01-02.15 - Deer Desirable Components Index: Semidesert Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	17.5	6.2	15.0	12.8	-2.4	3.4	0.0	<b>52.5</b>	Good
2001	23.0	9.7	11.3	18.4	-2.7	3.7	0.0	<b>63.3</b>	Good-Excellent
2006	22.5	4.5	3.6	11.4	-4.0	1.9	0.0	<b>39.9</b>	Fair
2011	24.1	7.7	3.9	22.3	-8.5	3.8	0.0	<b>53.4</b>	Good
2016	21.5	7.3	3.2	6.6	-6.9	3.5	0.0	<b>35.1</b>	Fair
2021	23.4	4.4	9.0	15.8	-0.2	4.7	0.0	<b>57.0</b>	Good

## CHOKECHERRY SPRINGS - STUDY NO. 01-4



### Location Information

USGS 7.5 min Map Info GPS (0' Stake)	Emigrant Pass NW; Township 10N, Range 16W, Section 30 NAD 83 UTM ZONE 12, 272445 East 4605180 North
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### Transect Information

Browse Tag # (0' Stake) Transect Bearing Length Belt Placement Belt Marker Placement	197 345° magnetic 400ft Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft) Belt 2: No Rebar
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### Directions to Site

Proceed from State Route 30 toward the Rosebud BLM field station; bear left at the fork to the BLM station. Travel 2.1 miles to a canal and intersection with a sign designating Emigrant Pass Road. Proceed southwest on Emigrant Pass Road for 5.5 miles to a fork. Turn right and travel 2.5 miles to a gate. Pass through the gate, continue 0.5 miles, and turn right at a four-way junction. Travel 0.8 miles to a witness post on the left (northwest) side of the road and stop. The transect is approximately 500 yards northwest of the witness post. Use a GPS to navigate to the 0-foot stake of the baseline, which is marked with browse tag #197. The baseline runs at 345 degrees magnetic.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	MUDDY CREEK
Elevation	6,400ft (1,951m)
Aspect	East
Slope	15%
Sample Dates	06/10/1996, 05/31/2001, 06/01/2006, 06/02/2011, 06/08/2016, 05/24/2021

**Table 01-04.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Emigrant Pass Sagebrush Habitat Enhancement	4359	Fall 2018	895

**Wildlife Habitat and Vegetation History**

**Table 01-04.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Greater Sage-Grouse	occupied	year-long	brood-rearing

**Table 01-04.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Mixed Shrub	Phase I
1990	Mixed Shrub	Phase I
1996	Mixed Shrub	Phase I
2001	Mixed Shrub	Phase I
2006	Mixed Shrub	Phase I
2011	Mixed Shrub	Phase I
2016	Mixed Shrub	Phase I
2021	Mixed Shrub	Phase I

**Site Notes**

No Notes

**Soils**

**Table 01-04.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.7	41.7	29.0	29.3	2.6	5.9	201.6	0.5	06/10/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Upland Loam (Browse)
NRCS Ecological Site #	R025XY312UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1984, the vegetation on this site has existed as a mixed stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) (Photos, Pre-1992 Data, Table 01-04.12, Table 01-04.13). Native perennial grass species have made up the majority of the herbaceous understory in most sample years. However, the introduced annual grass species cheatgrass (*Bromus tectorum*) has had periodic increases in cover (Table 01-04.7, Table 01-04.10). The introduced perennial forb and noxious weed Canada thistle (*Cirsium arvense*) increased in both frequency and cover in 2021 (Table 01-04.11). Young Utah juniper (*Juniperus osteosperma*) trees have been sparsely scattered across the site, but some were removed by a lop and scatter treatment in 2018 (Table 01-04.1, Table 01-04.14). Although the site remains in Phase I of woodland succession as of 2021 (Table 01-04.4), the extant tree component indicates that there may be potential for infilling in future sample years. Deer winter range condition has ranged from poor-fair to good, and has generally improved as perennial grass cover has increased. Deer winter range conditions were considered to be good in 2021. Improvement to deer wintering range can be accomplished through efforts that support mature plants and reproduction in the preferred browse community. Reducing cheatgrass and noxious weed presence would also improve winter range conditions (Table 01-04.15).

**Trend Summary Tables**

**Table 01-04.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	17.1	11.1	0.0	-	-	-
2001	24.3	7.5	0.3	-	-	0.1
2006	17.1	7.0	1.1	27.0	8.0	2.7
2011	14.8	4.9	1.1	22.9	4.6	3.4
2016	13.9	6.5	2.4	22.1	5.9	3.2
2021	15.3	8.5	0.2	19.9	6.1	0.2

**Table 01-04.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	387	188	276	217	6.2	8.7	1.5	6.7
2001	446	250	271	215	23.3	8.5	3.4	6.1
2006	326	282	227	271	3.0	13.0	1.6	10.6
2011	240	308	412	292	2.8	14.9	11.2	8.1
2016	431	264	273	172	19.6	10.7	1.6	6.3
2021	226	309	242	277	4.1	14.8	2.7	10.4

**Table 01-04.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	7.0	0.1	55.2	6.1	6.4	46.1
2001	7.9	0.1	44.4	4.7	4.7	61.7
2006	12.1	0.2	45.6	6.4	2.8	50.4
2011	8.3	0.1	36.4	6.2	3.8	56.5
2016	22.1	0.0	33.9	7.6	3.9	52.2
2021	10.9	0.3	39.3	9.8	4.3	50.1

**Table 01-04.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rabbit
	Quadrat Frequency		
1996	3	11	5
2001	1	14	1
2006	3	7	18
2011	1	2	1
2016	2	11	17
2021	4	16	5
Year	Days Use Per Acre (ha)		
1996	-	-	-
2001	2.9 (7.2)	36.2 (89.4)	-
2006	8.7 (21.5)	22.1 (54.6)	-
2011	4.4 (10.8)	21.5 (53.0)	-
2016	-	24.8 (61.2)	-
2021	18.1 (44.8)	42.2 (104.3)	-

**Table 01-04.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum thurberianum (Thurber's needlegrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Festuca idahoensis (Idaho fescue)	Leymus cinereus (basin wildrye)	Melica bulbosa (oniongrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency										
1996	12	28	387	34	16	5	-	-	-	62	54
2001	11	15	446	44	21	-	-	-	-	159	57
2006	19	21	326	55	36	-	-	-	-	192	62
2011	25	32	240	56	36	-	-	6	-	234	52
2016	14	23	431	44	29	-	3	4	-	187	57
2021	20	20	226	71	34	2	-	3	1	233	60
year	Average Cover (%)										
1996	0.4	2.4	6.2	1.2	0.6	0.2	-	-	-	1.0	2.9
2001	0.1	0.8	23.3	0.8	0.5	-	-	-	-	3.9	2.3
2006	1.0	0.7	3.0	1.4	0.8	-	-	-	-	5.6	3.4
2011	0.4	1.2	2.8	1.4	0.5	-	-	0.2	-	9.6	1.6
2016	0.2	0.6	19.6	0.6	0.9	-	0.1	0.0	-	6.3	1.9
2021	0.4	0.8	4.1	2.1	1.6	0.0	-	0.0	0.0	7.5	2.3

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 01-04.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Androsace septentrionalis <sup>ai</sup> (pygmyflower rockjasmine)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus cibaricus (browse milkvetch)	Balsamorhiza hookeri (Hooker's balsamroot)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littledrop false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium arvense <sup>ai</sup> (Canada thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)
year	Nested Frequency																
1996	6	14	-	-	37	-	-	11	-	85	-	8	7	4	205	48	31
2001	2	95	-	-	28	-	-	7	5	80	-	16	-	-	174	8	37
2006	69	75	-	3	8	40	-	14	2	23	3	-	-	-	173	-	36
2011	129	118	-	-	45	3	9	12	-	23	-	39	0	2	372	44	31
2016	22	19	-	-	2	41	2	21	1	43	-	-	-	4	184	24	48
2021	103	52	6	-	2	19	-	33	0	3	-	-	-	14	172	-	30
year	Average Cover (%)																
1996	0.0	0.0	-	-	0.5	-	-	1.3	-	0.2	-	0.0	0.0	0.0	0.9	0.1	0.6
2001	0.0	0.7	-	-	0.8	-	-	0.7	0.0	0.8	-	0.0	-	-	1.3	0.0	0.5
2006	0.4	0.3	-	0.1	0.3	1.8	-	2.5	0.0	0.1	0.0	-	-	-	0.7	-	0.2
2011	1.9	0.5	-	-	1.5	0.0	0.1	0.8	-	0.1	-	0.4	0.0	0.0	9.3	0.1	0.3
2016	0.1	0.1	-	-	0.1	0.6	0.0	1.8	0.0	0.2	-	-	-	0.0	0.4	0.1	1.0
2021	1.2	0.2	0.0	-	0.1	0.5	-	2.6	0.0	0.0	-	-	-	0.2	0.9	-	0.4

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nest Frequency																	
Crepis acuminata (tapertip hawksbeard)																		
Cryptantha (cryptantha)																		
Cymopterus (springparsley)																		
Descurainia pinnata <sup>a</sup> (western tansymustard)																		
Draba <sup>a</sup> (draba)																		
Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)																		
Eriastrum sparsiflorum <sup>a</sup> (Great Basin woollystar)																		
Galium aparine <sup>a</sup> (stickywilly)																		
Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)																		
Gilia inconspicua <sup>a</sup> (shy gilia)																		
Hackelia patens (spotted stickseed)																		
Lactuca serriola <sup>ai</sup> (prickly lettuce)																		
Lappula occidentalis <sup>a</sup> (flatspine stickseed)																		
Lithospermum ruderale (western stone seed)																		
Lomatium triternatum (nineleaf biscuitroot)																		
Lupinus argenteus (silvery lupine)																		
Machaeranthera (tansyaster)																		
year	Average Cover (%)																	
1996	0.3	0.0	-	-	-	-	-	0.0	0.0	-	0.0	-	-	1.2	0.0	1.3	0.0	
2001	0.3	-	-	-	0.0	-	-	-	0.7	0.0	0.0	-	0.0	0.3	0.0	1.4	-	
2006	0.6	0.1	-	0.0	-	0.0	-	-	0.0	-	0.1	0.0	0.0	1.0	0.0	1.8	-	
2011	0.6	0.0	-	-	0.0	0.0	-	0.0	0.0	-	0.0	-	0.0	0.3	0.3	0.8	0.0	
2016	0.2	0.0	-	0.1	-	-	0.0	0.0	0.0	-	0.1	-	0.0	0.1	-	1.4	-	
2021	1.3	-	0.0	-	-	0.0	-	-	0.0	-	0.1	0.1	0.0	0.9	0.2	0.9	-	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nest Frequency									
Microsteris gracilis <sup>a</sup> (slender phlox)										
Oenothera caespitosa (tufted evening primrose)										
Penstemon speciosus (royal penstemon)										
Phlox hoodii (spiny phlox)										
Phlox longifolia (longleaf phlox)										
Pleiocanthus spinosus (thorn skeletonweed)										
Stenotus acaulis (stemless mock goldenweed)										
Tragopogon dubius <sup>ai</sup> (yellow salsify)										
Veronica biloba <sup>ai</sup> (two-lobed speedwell)										
Viola (violet)										
year	Average Cover (%)									
1996	-	0.0	-	-	0.5	0.7	-	0.0	0.1	-
2001	0.5	-	-	-	0.8	0.6	-	0.0	0.1	-
2006	0.0	-	-	-	0.7	0.8	-	0.1	0.4	0.0
2011	0.3	-	0.1	0.0	0.5	0.2	0.2	0.0	1.0	-
2016	0.1	-	-	-	0.1	0.7	0.0	0.0	0.7	0.0
2021	0.1	-	0.0	-	1.1	0.5	-	0.7	0.8	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 01-04.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)	Juniperus osteosperma <sup>i</sup> (Utah juniper)	Opuntia polyacantha (plains pricklypear)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)
year	Line Intercept Cover (%)						
1996	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-
2006	13.1	7.9	0	2.7	0.1	10.9	3
2011	8.5	4.2	0.3	3.4	0.1	12.4	2
2016	7.9	5.1	0.5	3.2	0.3	11.3	2.9
2021	6.9	5.6	0.4	0.2	0.1	10	3
year	Quadrat Cover (%)						
1996	13.1	10.3	0.8	0.0	0.0	3.9	0.1
2001	16.5	6.0	1.0	0.3	0.6	6.4	1.4
2006	10.3	5.8	0.8	1.1	0.3	5.1	1.7
2011	7.9	4.3	0.5	1.1	0.1	5.5	1.3
2016	7.9	5.2	0.9	2.4	0.5	3.7	2.3
2021	7.5	6.3	1.6	0.2	0.5	4.6	3.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-04.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	2960	180	12	62	26	10	1	17	51/82
2001	2520	-	4	75	21	2	0	4	56/85
2006	1760	280	2	61	36	22	2	10	61/92
2011	2100	-	3	51	46	30	0	39	60/89
2016	1400	5560	7	59	34	3	0	41	72/106
2021	1700	40	24	42	34	1	0	33	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	3660	-	6	91	3	7	1	2	35/60
2001	3000	-	3	84	13	3	0	3	28/45
2006	2460	100	7	81	12	0	0	2	33/56
2011	2640	20	21	78	1	1	0	1	30/48
2016	2300	20	2	96	3	3	0	4	35/50
2021	1960	-	20	70	9	0	0	8	- / -
<b>Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)</b>									
1996	200	-	50	30	20	0	0	0	75/106
2001	160	80	25	63	13	25	0	0	71/72
2006	80	-	0	100	0	0	0	0	66/84
2011	40	-	0	50	50	0	0	50	67/73
2016	80	-	0	100	0	0	0	0	58/83
2021	400	-	25	40	35	0	0	35	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Juniperus osteosperma<sup>1</sup> -- (Utah juniper)</b>									
1996	60	40	67	33	0	0	0	0	- / -
2001	120	20	100	0	0	0	0	0	- / -
2006	160	20	100	0	0	0	0	0	- / -
2011	180	20	89	11	0	0	0	0	- / -
2016	200	20	60	40	0	0	0	0	- / -
2021	160	20	75	0	25	0	0	38	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	300	-	7	87	7	0	0	0	12/37
2001	180	-	0	100	0	0	0	0	12/25
2006	160	-	0	100	0	0	13	0	13/29
2011	120	-	0	100	0	0	0	0	10/29
2016	200	-	0	100	0	0	0	0	13/32
2021	80	-	0	75	25	0	0	25	- / -
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	740	-	11	89	0	35	3	0	66/137
2001	800	-	3	93	5	45	8	0	81/139
2006	600	460	7	73	20	43	13	3	81/146
2011	580	-	0	100	0	52	10	3	85/149
2016	560	-	0	75	25	36	25	11	77/148
2021	760	-	5	71	24	16	16	21	- / -
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	120	-	33	67	0	33	17	0	56/131
2001	260	-	0	100	0	0	0	0	53/124
2006	360	-	11	83	6	0	0	0	51/113
2011	420	-	10	91	0	0	0	0	46/87
2016	500	-	12	88	0	8	0	0	49/95
2021	520	20	8	85	8	15	0	8	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-04.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

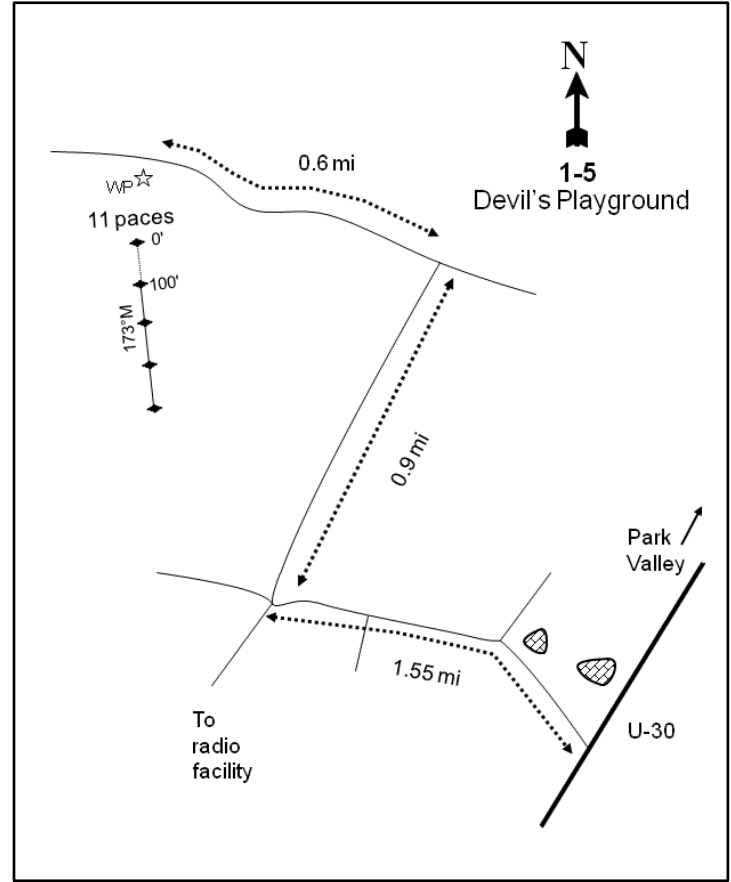
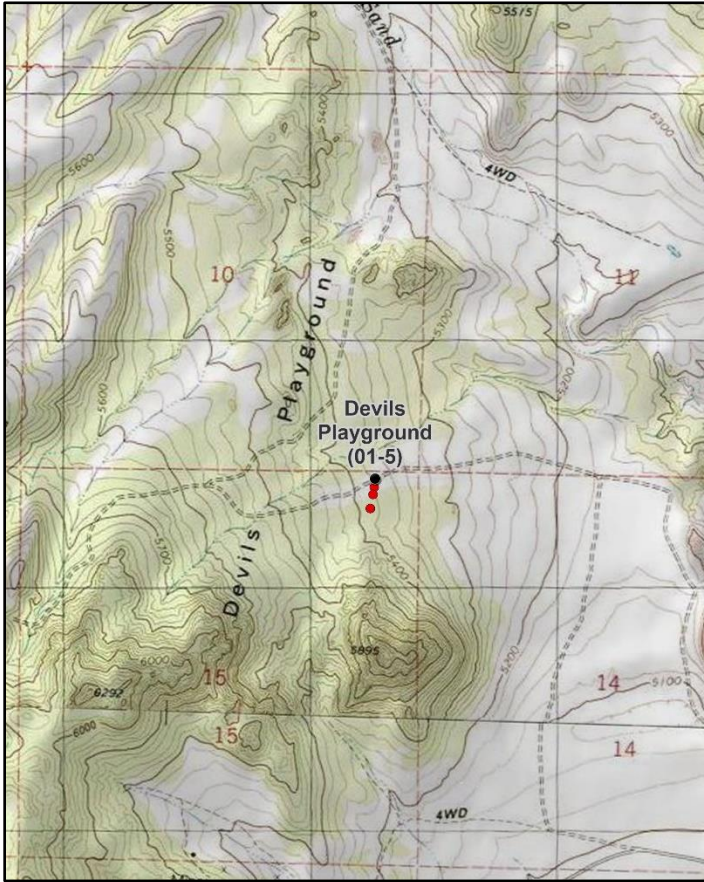
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
1996	30	-	-	-	-	-	11.3
2001	76	-	-	-	-	-	6.5
2006	87	11	47	32	5	5	10.9
2011	104	-	50	40	5	5	9.0
2016	230	-	50	50	-	-	5.9
2021	114	44	56	-	-	-	5.4

**Table 01-04.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	22.3	8.9	5.7	17.3	-4.6	10.0	-2.0	<b>57.6</b>	Fair
2001	30.0	10.2	1.7	17.0	-17.5	10.0	0.0	<b>51.4</b>	Poor-Fair
2006	30.0	7.1	2.5	26.0	-2.3	10.0	0.0	<b>73.3</b>	Good
2011	30.0	9.9	1.0	29.8	-2.1	10.0	-2.0	<b>76.6</b>	Good
2016	29.7	7.5	2.1	21.4	-14.7	10.0	-2.0	<b>53.9</b>	Fair
2021	26.6	7.5	6.0	29.5	-3.1	10.0	-2.0	<b>74.5</b>	Good



## DEVILS PLAYGROUND - STUDY NO. 01-5

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Emigrant Pass SE; Township 9N, Range 16W, Section 15  
NAD 83 UTM ZONE 12, 278207 East 4598628 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

7908  
173° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Belt 1: No Rebar

**Directions to Site**

Proceed toward Elko, Nevada on State Route 30 to mile marker 24 and turn right (west). Travel 1.55 miles to a fork. Bear right and travel 0.9 miles to an intersection. Turn left (west) and travel 0.6 miles to a rock pile and witness post on the left (south) side of the road. Walk 11 paces southwest from the rock pile to the 0-foot stake of the baseline. The 0-foot stake is marked by a red browse tag #7908. The azimuth of the baseline is 173 degrees magnetic.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	WHITE LAKES
Elevation	5,400ft (1,646m)
Aspect	Northeast
Slope	8%
Sample Dates	06/05/1996, 05/29/2001, 05/25/2006, 05/24/2011, 05/17/2016, 05/11/2021

**Table 01-05.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Unknown	-	-	2014-2015	-

**Wildlife Habitat and Vegetation History****Table 01-05.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	year-long
Greater Sage-Grouse	occupied	year-long & Winter
Pronghorn	substantial	summer

**Table 01-05.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Black Sagebrush	Phase I
1990	Black Sagebrush	Phase I
1996	Black Sagebrush	Phase I
2001	Black Sagebrush	Phase I
2006	Black Sagebrush	Phase I
2011	Black Sagebrush	Phase I
2016	Black Sagebrush	Phase I
2021	Black Sagebrush	Phase I

**Site Notes**

No Notes

**Soils****Table 01-05.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	8.0	65.7	17.0	17.3	1.0	3.5	92.8	0.5	06/05/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	10 inches
NRCS Ecological Site	Semidesert Gravelly Sandy Loam (Black Sagebrush)
NRCS Ecological Site #	R028AY227UT
States and Transitions	Current State: Community Phase 2.1

Since study establishment in 1984, this site has remained dominated by black sagebrush (*Artemisia nova*) with a diverse herbaceous understory; line intercept cover of black sagebrush has decreased since 2006 (Photos, Pre-1992 Data, Table 01-05.12, Table 01-05.13). The introduced annual grass species cheatgrass (*Bromus tectorum*) has been the dominant herbaceous species in most sample years. In 2021, however, the perennial grass species crested wheatgrass (*Agropyron cristatum*) became dominant following a possible seeding in 2015 (Table 01-05.10). Forbs have generally remained rare in comparison with grasses (Table 01-05.7, Table 01-05.11). Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon (*Pinus monophylla*) trees have been present across the site. A chaining treatment removed many of the mature trees between the 2011 and 2016 sample years (Table 01-05.1), and mainly young individuals remain as of 2021 (Table 01-05.14, USDA-ARS Jornada Experimental Range et al., 2021). Although the site has been considered to be within Phase I of woodland succession throughout the study period (Table 01-05.4), the remaining tree component indicates that there may be potential for infilling over time. Deer winter range condition has remained generally fair over the course of the study. Improvement to deer wintering range can be accomplished through efforts that increase preferred browse cover, and that diversify the perennial grass and forb communities while reducing cheatgrass presence (Table 01-05.15).

**Trend Summary Tables****Table 01-05.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	12.1	1.7	4.9	-	-	-
2001	14.0	2.6	4.1	-	-	1.1
2006	14.6	2.0	11.6	15.2	2.7	11.4
2011	11.1	2.9	11.5	14.1	3.4	15.4
2016	8.6	3.5	0.3	10.8	3.7	1.0
2021	7.0	3.7	0.3	8.4	3.9	1.1

**Table 01-05.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	162	230	194	206	0.5	5.2	0.9	1.1
2001	365	217	88	73	5.7	8.1	0.3	0.8
2006	382	179	74	43	7.9	5.4	0.2	0.2
2011	289	240	243	98	2.9	10.6	1.5	1.7
2016	425	222	135	117	14.7	6.9	0.6	0.9
2021	142	284	3	69	0.4	8.9	0.0	0.3

**Table 01-05.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	19.4	0.7	26.9	27.7	1.5	25.5
2001	17.4	1.6	29.3	32.6	0.4	38.3
2006	22.1	0.5	25.9	28.1	0.1	38.1
2011	17.9	2.4	26.0	26.0	0.1	38.9
2016	26.6	1.2	35.0	13.3	0.1	34.7
2021	18.5	0.3	56.4	15.1	0.2	21.8

**Table 01-05.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1996	-	44	2	-	32
2001	-	25	-	-	8
2006	-	24	-	-	65
2011	-	32	3	-	9
2016	1	8	-	-	62
2021	4	38	-	-	55
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	-	14.7 (36.4)	-	-	-
2006	5.1 (12.6)	26.8 (66.2)	1.3 (3.3)	-	-
2011	6.5 (16.1)	30.8 (76.1)	0.7 (1.7)	-	-
2016	1.5 (3.6)	22.8 (56.3)	-	0.6 (1.4)	-
2021	10.9 (26.9)	31.5 (77.8)	-	-	-

**Table 01-05.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum thurberianum (Thurber's needlegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)	Vulpia octoflora <sup>a</sup> (sixweeks fescue)
year	Nested Frequency									
1996	19	-	-	102	60	-	166	50	-	84
2001	5	37	-	343	48	-	164	40	-	163
2006	11	14	-	382	40	0	135	20	-	18
2011	4	-	-	288	48	-	206	34	-	5
2016	8	20	15	425	41	1	164	62	-	32
2021	1	-	103	142	24	-	165	79	9	-
year	Average Cover (%)									
1996	0.7	-	-	0.4	0.7	-	2.9	1.0	-	0.2
2001	0.1	1.7	-	5.2	0.4	-	3.6	2.2	-	0.5
2006	0.3	0.7	-	7.9	0.7	0.0	2.6	1.1	-	0.0
2011	0.1	-	-	2.9	1.2	-	7.5	1.8	-	0.0
2016	0.2	1.0	0.1	14.6	1.0	0.0	2.8	1.7	-	0.1
2021	0.2	-	3.0	0.4	0.4	-	2.7	2.5	0.2	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 01-05.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Arabis (rockcress)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus utahensis (Utah milkvetch)	Brassicaceae <sup>a</sup> (mustard family)	Calochortus nuttallii (sego lily)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cryptantha <sup>a</sup> (annual cryptantha)	Cryptantha cinerea (James' cryptantha)	Cryptantha watsonii <sup>a</sup> (Watson's cryptantha)	Delphinium nuttallianum (twolobe larkspur)
year	Nested Frequency																
1996	18	-	3	11	33	-	8	-	32	-	-	3	98	114	-	-	3
2001	-	-	5	2	-	-	-	-	4	3	-	-	-	31	-	-	5
2006	10	3	-	4	-	-	-	-	6	8	-	1	-	23	-	-	-
2011	18	-	5	4	-	4	-	3	12	6	-	3	11	105	-	-	20
2016	12	-	3	20	-	3	1	-	12	-	2	0	6	-	27	11	5
2021	15	-	1	2	-	6	-	-	6	-	-	2	-	-	2	3	5
year	Average Cover (%)																
1996	0.0	-	0.0	0.1	0.1	-	0.1	-	0.1	-	-	0.0	0.4	0.4	-	-	0.0
2001	-	-	0.2	0.1	-	-	-	-	0.0	0.0	-	-	-	0.1	-	-	0.0
2006	0.1	0.0	-	0.0	-	-	-	-	0.0	0.0	-	0.0	-	0.0	-	-	-
2011	0.2	-	0.2	0.0	-	0.0	-	0.0	0.0	0.0	-	0.2	0.0	0.4	-	-	0.7
2016	0.1	-	0.0	0.1	-	0.0	0.0	-	0.0	-	0.0	0.0	0.2	-	0.0	0.0	0.0
2021	0.1	-	0.0	0.0	-	0.0	-	-	0.0	-	-	0.0	-	-	0.0	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nested Frequency																					
Descurainia pinnata <sup>a</sup> (western tansymustard)	4	85	11	15	-	-	37	23	-	-	5	4	36	0	82	-	2					
Eriastrum sparsiflorum <sup>a</sup> (Great Basin woollystar)	11	3	-	-	-	3	21	32	8	-	4	1	52	-	-	-	-					
Eriogonum cernuum <sup>a</sup> (nodding buckwheat)	-	27	-	-	-	-	18	-	11	-	-	-	21	-	-	3	-					
Eriogonum ovalifolium (cushion buckwheat)	80	-	-	-	-	-	28	109	6	71	-	-	36	-	-	-	-					
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	21	22	1	-	2	-	4	65	2	45	-	-	56	-	-	-	-					
Galium aparine <sup>a</sup> (stickywilly)	-	-	-	-	-	-	-	-	-	-	-	-	47	2	-	-	-					
Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Average Cover (%)																					
Gilia inconspicua <sup>a</sup> (shy gilia)	1996	0.0	0.2	0.0	0.1	-	-	0.1	0.0	-	-	0.0	0.0	0.1	0.0	0.2	-	0.0				
Lappula occidentalis <sup>a</sup> (flatspine stickseed)	2001	0.0	0.0	-	-	-	0.0	0.1	0.1	0.0	-	0.2	0.0	0.4	-	-	-	-				
Layia glandulosa <sup>a</sup> (whitedaisy tidytip)	2006	-	0.1	-	-	-	0.0	-	0.0	-	-	-	0.1	-	-	0.0	-					
Lomatium (desertparsley)	2011	0.3	-	-	-	-	0.1	0.3	0.0	0.5	-	-	0.3	-	-	-	-					
Phlox hoodii (spiny phlox)	2016	0.1	0.2	0.0	-	0.0	-	0.0	0.2	0.0	0.1	-	-	0.3	-	-	-					
Phlox longifolia (longleaf phlox)	2021	-	-	-	-	-	-	-	-	-	-	-	0.2	0.0	-	-	-					
Pleiocanthus spinosus (thorn skeletonweed)	Line Intercept Cover (%)																					
Symphotrichum (aster)	1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Townsendia florifer <sup>ai</sup> (showy Townsend daisy)	2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Tragopogon dubius <sup>ai</sup> (yellow salsify)	2006	13.2	2	2.6	11.2	0.1	-	0.2	11.7	2.4	3.2	14.2	0.2	-	1.2	10.2	0.6	3.5	0.9	0.2	-	0.1
	2011	11.7	2.4	3.2	14.2	0.2	-	1.2	10.2	0.6	3.5	0.9	0.2	-	0.1	7.9	0.5	3.8	1	0.1	-	0.1
	2016	10.2	0.6	3.5	0.9	0.2	-	0.1	7.9	0.5	3.8	1	0.1	-	0.1	Quadrat Cover (%)						
	2021	7.9	0.5	3.8	1	0.1	-	0.1	11.5	0.6	1.5	4.9	0.2	-	0.0	13.8	0.1	2.5	3.8	0.0	0.0	0.4
	1996	11.5	0.6	1.5	4.9	0.2	-	0.0	12.9	1.7	2.0	11.0	0.1	0.0	0.6	9.7	1.4	2.8	10.6	0.1	0.0	0.9
	2001	13.8	0.1	2.5	3.8	0.0	0.0	0.4	9.7	1.4	2.8	10.6	0.1	0.0	0.9	8.2	0.4	3.1	0.3	0.4	-	0.0
	2006	12.9	1.7	2.0	11.0	0.1	0.0	0.6	8.2	0.4	3.1	0.3	0.4	-	0.0	6.8	0.2	3.7	0.3	0.0	0.0	0.0
	2011	9.7	1.4	2.8	10.6	0.1	0.0	0.9	6.8	0.2	3.7	0.3	0.0	0.0	-	-	-	-	-	-	-	-
	2016	8.2	0.4	3.1	0.3	0.4	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2021	6.8	0.2	3.7	0.3	0.0	0.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 01-05.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)							
Artemisia nova <sup>p</sup> (black sagebrush)	1996	-	-	-	-	-	-	
Artemisia tridentata ssp. wyomingensi <sup>sp</sup> (Wyoming big sagebrush)	2001	-	-	-	-	-	-	
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	2006	13.2	2	2.6	11.2	0.1	0.2	
Juniperus osteosperma <sup>i</sup> (Utah juniper)	2011	11.7	2.4	3.2	14.2	0.2	1.2	
Linanthus pungens (granite prickly phlox)	2016	10.2	0.6	3.5	0.9	0.2	0.1	
Opuntia polyacantha (plains pricklypear)	2021	7.9	0.5	3.8	1	0.1	0.1	
Pinus monophylla <sup>i</sup> (singleleaf pinyon)	Quadrat Cover (%)							
	1996	11.5	0.6	1.5	4.9	0.2	-	0.0
	2001	13.8	0.1	2.5	3.8	0.0	0.0	0.4
	2006	12.9	1.7	2.0	11.0	0.1	0.0	0.6
	2011	9.7	1.4	2.8	10.6	0.1	0.0	0.9
	2016	8.2	0.4	3.1	0.3	0.4	-	0.0
	2021	6.8	0.2	3.7	0.3	0.0	0.0	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-05.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia nova<sup>P</sup> -- (black sagebrush)</b>									
1996	5960	100	7	66	26	72	14	6	24/58
2001	6440	60	2	70	29	35	17	12	26/54
2006	4620	3040	2	65	33	7	4	22	26/57
2011	4480	160	6	59	35	33	2	32	22/53
2016	4240	1300	5	73	22	16	17	9	26/50
2021	3620	20	4	59	37	37	8	26	- / -
<b>Artemisia tridentata ssp. wyomingensis<sup>P</sup> -- (Wyoming big sagebrush)</b>									
1996	260	-	0	85	15	62	0	0	52/91
2001	100	-	0	100	0	0	0	0	89/103
2006	660	340	0	79	21	12	3	12	54/91
2011	580	-	3	38	59	48	0	35	47/84
2016	220	-	0	73	27	0	9	27	48/70
2021	160	-	0	50	50	13	0	25	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1996	1680	-	8	92	0	6	0	0	23/33
2001	1560	-	6	73	21	4	0	8	24/35
2006	1460	-	8	89	3	4	3	0	25/40
2011	1560	-	4	64	32	0	0	14	28/44
2016	1580	80	8	82	10	0	0	8	32/47
2021	1460	20	7	41	52	7	0	44	- / -
<b>Ephedra nevadensis<sup>P</sup> -- (Nevada jointfir)</b>									
1996	-	-	-	-	-	-	-	-	40/43
2001	-	-	-	-	-	-	-	-	37/25
2006	-	-	-	-	-	-	-	-	45/58
2011	-	-	-	-	-	-	-	-	42/71
2016	-	-	-	-	-	-	-	-	50/62
2021	-	-	-	-	-	-	-	-	-/-
<b>Eriogonum microthecum<sup>P</sup> -- (slender buckwheat)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	34/73
2021	-	-	-	-	-	-	-	-	-/-
<b>Grayia spinosa -- (spiny hopsage)</b>									
1996	-	-	-	-	-	-	-	-	80/90
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	68/80
2011	-	-	-	-	-	-	-	-	70/96
2016	-	-	-	-	-	-	-	-	54/76
2021	-	-	-	-	-	-	-	-	-/-
<b>Juniperus osteosperma<sup>1</sup> -- (Utah juniper)</b>									
1996	60	-	0	100	0	0	0	0	- / -
2001	160	-	25	75	0	0	0	0	- / -
2006	120	-	17	83	0	0	0	0	- / -
2011	120	-	33	67	0	0	0	0	- / -
2016	80	20	75	0	25	0	0	0	- / -
2021	140	-	86	0	14	0	0	29	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Linanthus pungens -- (granite prickly phlox)</b>									
1996	360	-	22	67	11	0	0	0	23/25
2001	520	-	0	81	19	0	0	0	24/30
2006	260	80	0	92	8	0	0	0	14/23
2011	280	-	7	86	7	0	0	7	17/22
2016	280	-	0	93	7	0	0	0	21/27
2021	180	-	11	67	22	11	0	22	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	20	-	0	100	0	0	0	0	12/17
2001	120	-	0	100	0	0	0	0	18/22
2006	60	-	33	67	0	0	0	0	11/21
2011	20	-	0	100	0	0	0	0	10/21
2016	60	-	33	67	0	0	0	0	14/24
2021	40	-	0	50	50	0	0	50	- / -
<b>Pinus monophylla<sup>t</sup> -- (singleleaf pinyon)</b>									
1996	40	20	50	50	0	0	0	0	- / -
2001	20	100	100	0	0	0	0	0	- / -
2006	60	60	67	33	0	0	0	0	- / -
2011	40	60	100	0	0	0	0	0	- / -
2016	40	20	100	0	0	0	0	0	- / -
2021	20	-	100	0	0	0	0	0	- / -
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	68/212
2021	-	-	-	-	-	-	-	-	- / -
<b>Symphoricarpos longiflorus -- (desert snowberry)</b>									
1996	20	-	0	100	0	100	0	0	42/60
2001	40	-	0	100	0	0	0	0	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	20	-	0	100	0	100	0	0	40/55
2016	20	-	0	100	0	100	0	0	36/46
2021	20	-	0	0	100	0	0	100	- / -
<b>Tetradymia nuttallii -- (Nuttall's horsebrush)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	56/104
2016	-	-	-	-	-	-	-	-	48/63

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-05.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
1996	36	-	-	-	-	-	28.2
2001	84	-	-	-	-	-	16.7
2006	38	-	18	53	18	12	21.8
2011	44	6	12	41	18	24	11.4
2016	36	-	57	43	-	-	8.8
2021	46	17	67	17	-	-	10.1

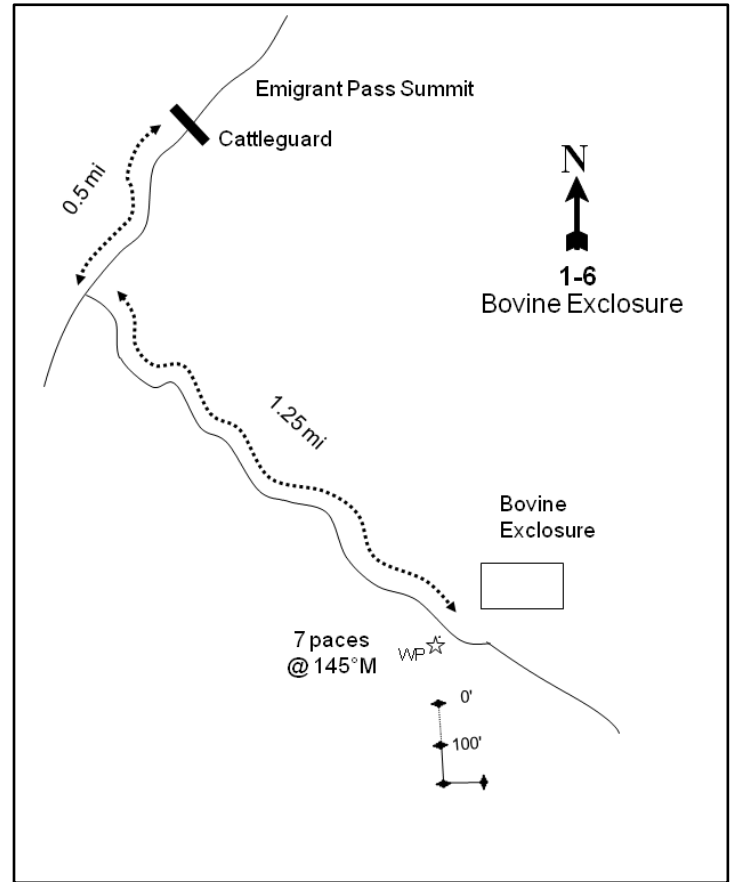
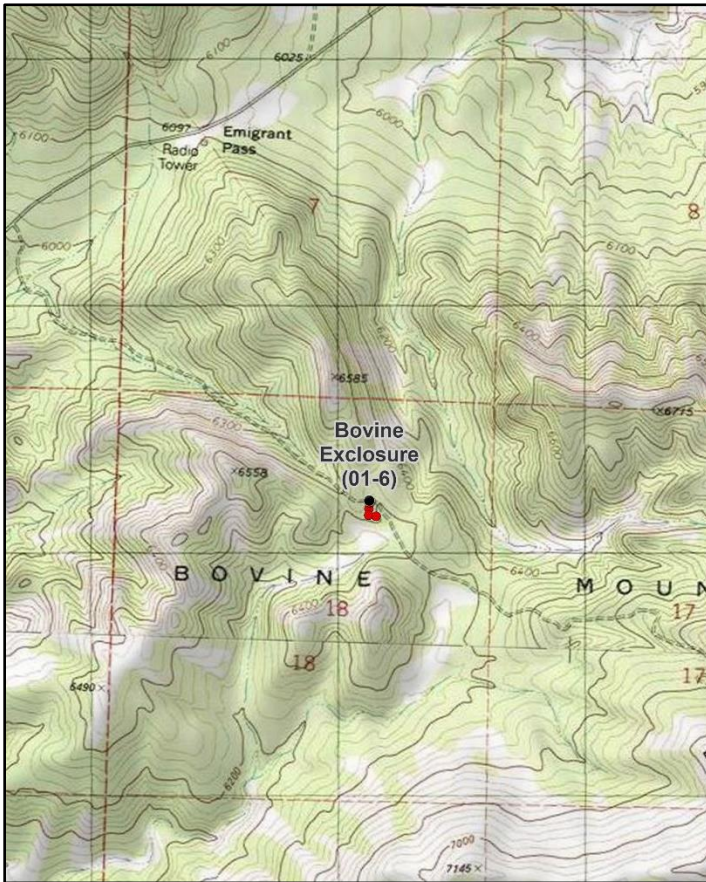
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Pinus monophylla (singleleaf pinyon)							
1996	11	-	-	-	-	-	9.2
2001	36	-	-	-	-	-	6.3
2006	33	70	10	10	-	10	6.2
2011	46	17	67	8	8	-	3.6
2016	45	21	79	-	-	-	2.4
2021	66	35	65	-	-	-	3.1

**Table 01-05.15 - Deer Desirable Components Index: Semidesert Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	15.1	7.3	3.5	10.5	-0.4	2.1	0.0	<b>38.1</b>	Fair
2001	17.5	6.5	0.9	16.1	-4.3	1.7	0.0	<b>38.4</b>	Fair
2006	19.0	5.6	1.0	10.9	-6.0	0.3	0.0	<b>30.8</b>	Fair
2011	17.6	3.3	2.9	21.2	-2.2	3.3	0.0	<b>46.2</b>	Fair-Good
2016	13.5	8.4	2.5	13.7	-11.0	1.7	0.0	<b>28.8</b>	Fair
2021	10.5	3.8	2.1	17.8	-0.3	0.7	0.0	<b>34.6</b>	Fair



## BOVINE EXCLOSURE - STUDY NO. 01-6



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Emigrant Pass SW; Township 9N, Range 16W, Section 18  
NAD 83 UTM ZONE 12, 273065 East 4598397 North

### Transect Information

Browse Tag # (0' Stake)	7909
Transect Bearing	165° magnetic (Line 3: 59° magnetic)
Length	300ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft & 71ft), Line 3 (59ft)
Belt Marker Placement	Belt 4: 13ft

### Directions to Site

Proceed southwest to the summit of Emigrant Pass on Emigrant Pass Road. From the cattle guard at the summit, continue south 0.5 miles to a fork and turn left. Travel 1.25 miles on this road to the Bovine Exclosure where there is a witness post on the right (south) side of the road. From the witness post, follow an azimuth of 145 degrees magnetic for 7 paces to the 0-foot stake of the baseline that is marked with browse tag #7909. The bearing of the baseline is 165 degrees magnetic. The bearing of line 3 changes direction to 59 degrees magnetic.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	WHITE LAKES
Elevation	6,400ft (1,951m)
Aspect	Southeast
Slope	5%
Sample Dates	06/18/1996, 06/04/2001, 05/25/2006, 05/24/2011, 05/24/2016, 05/18/2021

**Wildlife Habitat and Vegetation History****Table 01-06.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	year-long	
Greater Sage-Grouse	occupied	year-long	brood-rearing

**Table 01-06.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Wyoming Big Sagebrush	Phase I
1990	Wyoming Big Sagebrush	Phase I
1996	Wyoming Big Sagebrush	Phase I
2001	Wyoming Big Sagebrush	Phase I
2006	Wyoming Big Sagebrush	Phase I
2011	Wyoming Big Sagebrush/Juniper	Phase I transitioning to Phase II
2016	Wyoming Big Sagebrush/Juniper	Phase I transitioning to Phase II
2021	Wyoming Big Sagebrush/Juniper	Phase I transitioning to Phase II

**Site Notes**

No Notes

**Soils****Table 01-06.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.8	36.7	37.0	26.3	2.8	10.1	217.6	0.5	06/18/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Upland Loam (Browse)
NRCS Ecological Site #	R025XY312UT
States and Transitions	No state and transition model is available for this ecological site.

Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) has been the dominant shrub species on this site since study establishment in 1984, although black sagebrush (*A. nova*) and antelope bitterbrush (*Purshia tridentata*) have also been present (Photos, Pre-1992 Data, Table 01-06.12, Table 01-06.13). Native perennial grass species have made up the majority of the herbaceous understory in most sample years. The introduced annual grass species cheatgrass (*Bromus tectorum*) has had periodic increases in cover, but exhibited a marked decrease in 2021 (Table 01-06.7, Table 01-06.10). Forbs have remained diverse, but have contributed less cover than perennial grasses (Table 01-06.11). Utah juniper (*Juniperus osteosperma*) trees have increased in cover since site establishment and are becoming a dominant species (Table 01-06.12); the site has been considered to be within Phase I transitioning to Phase II of woodland succession since the 2011 sample year (Table 01-06.4). Deer winter range condition has varied from poor to good over the course of the study. As of 2021, deer winter range conditions were considered to be poor. Improvement to deer wintering range can be accomplished through efforts that increase preferred browse cover, and that diversify the perennial forb community while reducing cheatgrass (Table 01-06.15).

**Trend Summary Tables****Table 01-06.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	7.6	0.5	4.5	-	-	-
2001	8.6	1.1	3.7	-	-	0.7
2006	10.9	0.5	5.2	10.8	1.8	7.6
2011	10.2	0.8	6.6	11.6	0.5	8.1
2016	10.3	0.4	7.3	14.2	0.4	11.1
2021	11.9	0.6	9.9	9.7	0.7	11.1

**Table 01-06.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	266	262	85	164	2.3	11.7	0.4	2.1
2001	349	262	156	139	9.5	12.1	0.7	2.8
2006	277	266	98	137	3.7	12.8	0.3	4.7
2011	111	282	304	197	1.5	15.8	3.6	5.0
2016	273	280	271	225	4.7	12.5	1.3	5.1
2021	63	287	92	198	0.3	13.9	0.3	2.9

**Table 01-06.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	15.3	1.9	39.6	6.5	13.2	31.4
2001	12.0	2.3	42.5	10.7	11.4	42.2
2006	25.0	0.4	31.0	10.9	10.8	35.7
2011	17.5	1.6	33.3	7.2	13.3	42.4
2016	20.7	2.5	33.3	15.2	12.2	39.2
2021	13.4	4.1	36.2	14.8	12.1	40.3

**Table 01-06.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rabbit
	Quadrat Frequency		
1996	-	24	6
2001	-	9	8
2006	1	8	28
2011	1	9	5
2016	1	3	23
2021	1	10	24
Year	Days Use Per Acre (ha)		
1996	-	-	-
2001	-	20.1 (49.7)	-
2006	-	10.0 (24.8)	-
2011	3.6 (9.0)	6.7 (16.6)	-
2016	4.4 (10.8)	8.7 (21.5)	-
2021	1.5 (3.6)	10.7 (26.5)	-

**Table 01-06.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achatherum hymenoides (Indian ricegrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Leymus cinereus (basin wildrye)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency						
1996	8	266	18	11	5	159	168
2001	11	349	5	19	2	176	131
2006	7	277	5	14	4	228	105
2011	5	111	4	9	4	199	158
2016	8	273	-	13	3	212	133
2021	1	63	14	38	3	217	136
year	Average Cover (%)						
1996	0.1	2.3	0.2	0.2	0.2	3.3	7.7
2001	0.1	9.5	0.4	0.4	0.4	4.4	6.5
2006	0.2	3.7	0.0	0.1	0.3	7.2	5.0
2011	0.2	1.5	0.0	0.1	0.1	7.9	7.5
2016	0.2	4.7	-	0.2	0.1	5.8	6.1
2021	0.2	0.3	0.4	2.0	0.1	4.2	6.9

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 01-06.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Antennaria dimorpha (low pussytoes)	Arabis puberula <sup>a</sup> (silver rockress)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus cibirarius (browse milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cordylanthus ramosus <sup>a</sup> (bushy bird's beak)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)
year	Nested Frequency																
1996	5	-	-	24	7	2	8	-	-	-	-	30	13	6	-	10	18
2001	-	-	-	0	6	34	3	-	-	-	-	27	18	9	53	21	-
2006	3	-	-	4	14	6	11	-	-	-	6	26	-	15	-	19	4
2011	16	29	-	5	47	-	9	9	-	22	-	170	-	6	-	35	-
2016	15	28	3	5	6	45	12	15	2	24	5	105	-	17	43	22	5
2021	17	14	-	1	3	31	5	10	-	10	2	7	-	21	-	9	-
year	Average Cover (%)																
1996	0.0	-	-	0.1	0.1	0.0	0.9	-	-	-	-	0.1	0.0	0.0	-	0.0	0.1
2001	-	-	-	0.0	0.1	0.2	0.7	-	-	-	-	0.1	0.1	0.1	0.2	0.6	-
2006	0.0	-	-	0.0	0.1	0.3	2.3	-	-	-	0.0	0.1	-	0.4	-	0.6	0.0
2011	0.1	0.1	-	0.0	0.9	-	0.7	0.0	-	0.1	-	1.8	-	0.0	-	1.1	-
2016	0.0	0.0	0.0	0.0	0.3	1.2	1.3	0.0	0.0	0.1	0.0	0.3	-	0.1	0.1	0.3	0.0
2021	0.1	0.0	-	0.0	0.0	0.3	0.7	0.0	-	0.0	0.0	0.0	-	0.2	-	0.2	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cryptantha watsonii <sup>a</sup> (Watson's cryptantha)	Delphinium nuttalianum (two-lobed larkspur)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Erigeron pumilus (shaggy fleabane)	Eriogonum ovalifolium (cushion buckwheat)	Fritillaria atropurpurea (spotted fritillary)	Galium aparine <sup>a</sup> (stickywilly)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Gilia inconspicua <sup>a</sup> (shy gilia)	Hackelia patens (spotted stickseed)	Helianthus annuus <sup>a</sup> (common sunflower)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lewisia rediviva (bitter root)	Lomatium dissectum var. multifidum (carrotleaf biscuitroot)	Lomatium triternatum (nineleaf biscuitroot)	Machaeranthera grindelioides (rayless tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)
year	Nested Frequency																
1996	-	3	-	12	-	-	11	-	-	19	-	1	-	-	-	-	3
2001	-	1	5	16	2	-	3	-	8	7	-	28	-	3	-	-	67
2006	-	5	-	4	-	-	-	11	10	8	-	8	-	3	-	-	34
2011	-	36	24	10	-	-	11	-	19	12	3	10	3	2	6	22	105
2016	5	30	22	12	-	4	9	1	37	7	-	61	1	0	-	-	37
2021	-	7	-	7	-	3	-	-	-	15	-	-	4	2	1	-	-
year	Average Cover (%)																
1996	-	0.0	-	0.1	-	-	0.2	-	-	0.3	-	0.0	-	-	-	-	0.0
2001	-	0.0	0.0	0.3	0.0	-	0.0	-	0.0	0.1	-	0.1	-	0.1	-	-	0.2
2006	-	0.0	-	0.1	-	-	-	0.0	0.0	0.1	-	0.0	-	0.2	-	-	0.1
2011	-	0.5	0.1	0.1	-	-	0.6	-	0.1	0.5	0.0	0.0	0.0	0.1	0.0	0.1	0.9
2016	0.0	0.2	0.0	0.1	-	0.0	0.0	0.0	0.1	0.6	-	0.2	0.0	0.0	-	-	0.1
2021	-	0.1	-	0.0	-	0.0	-	-	-	0.1	-	-	0.0	0.4	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Navarretia intertexta <sup>a</sup> (needleleaf navarretia)	Orogenia linearifolia (Great Basin Indian potato)	Packera multilobata (lobeleaf groundsel)	Penstemon cyananthus (Wasatch beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Schoenocrambe limifolia (flaxleaf plainsmustard)	Stenotus acaulis (stemless mock goldenweed)	Symphotrichum (aster)	Tragopogon dubius <sup>at</sup> (yellow safsify)	Veronica bilobata <sup>at</sup> (two-lobed speedwell)
year	Nested Frequency										
1996	23	-	7	79	-	60	-	-	-	-	-
2001	-	-	-	1	-	85	5	-	-	-	-
2006	10	-	7	11	2	58	-	-	-	-	29
2011	-	-	3	8	-	59	1	-	0	-	42
2016	-	1	18	12	-	98	1	3	-	2	140
2021	-	2	6	23	-	106	-	-	-	4	80
year	Average Cover (%)										
1996	0.0	-	0.1	0.4	-	0.2	-	-	-	-	-
2001	-	-	-	0.0	-	0.6	0.0	-	-	-	-
2006	0.0	-	0.0	0.1	0.0	0.5	-	-	-	-	0.1
2011	-	-	0.0	0.1	-	0.7	0.0	-	0.0	-	0.2
2016	-	0.0	0.1	0.1	-	0.4	0.0	0.2	-	0.0	0.4
2021	-	0.0	0.0	0.2	-	0.5	-	-	-	0.0	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 01-06.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova <sup>p</sup> (black sagebrush)	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Opuntia polyacantha (plains pricklypear)	Pinus monophylla <sup>t</sup> (singleleaf pinyon)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)
year	Line Intercept Cover (%)								
1996	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-
2006	2.9	6.9	1.4	0.2	0.2	7.6	-	-	1
2011	3.5	6.6	-	0.4	0.1	8.1	-	-	1.5
2016	4.7	7.6	-	0.2	0.2	11.1	-	-	1.9
2021	1.7	6.4	0.2	0.2	0.3	10.9	-	0.2	1.6
year	Quadrat Cover (%)								
1996	1.1	4.9	0.0	0.4	0.0	4.1	0.0	0.4	1.6
2001	2.2	5.2	0.6	0.5	0.0	3.5	-	0.1	1.2
2006	2.4	7.0	0.1	0.3	0.0	5.2	0.0	-	1.5
2011	3.0	5.1	0.0	0.7	0.0	6.6	0.0	-	2.1
2016	2.7	6.3	0.0	0.3	0.1	7.3	0.0	-	1.3
2021	3.1	7.0	0.0	0.3	0.2	9.9	0.0	0.0	1.8

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-06.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia nova<sup>p</sup> -- (black sagebrush)</b>									
1996	1360	20	10	82	7	34	0	0	24/45
2001	1220	20	5	75	20	5	0	20	29/46
2006	920	-	2	78	20	28	0	13	26/54
2011	1080	20	20	63	17	9	0	15	27/55
2016	1260	40	6	65	29	3	0	24	32/61
2021	920	-	4	50	46	7	0	48	- / -
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
1996	2040	100	17	56	28	22	3	3	58/72
2001	1900	-	5	64	31	13	1	13	65/79
2006	1560	320	1	59	40	36	6	35	58/101
2011	1440	60	8	75	17	22	1	4	61/94
2016	1380	-	3	78	19	12	1	7	58/93
2021	1100	-	0	46	55	9	2	51	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	220	-	0	100	0	0	0	0	31/48
2001	380	60	11	53	37	16	0	16	36/62
2006	120	-	0	100	0	0	0	0	32/58
2011	60	-	0	67	33	0	0	0	26/42
2016	120	-	17	50	33	0	0	0	25/37
2021	100	-	40	40	20	0	0	20	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)</b>									
1996	180	-	44	56	0	0	0	22	50/53
2001	240	-	0	42	58	8	8	17	53/45
2006	160	-	0	50	50	0	0	25	62/66
2011	180	-	0	56	44	22	0	22	60/63
2016	140	-	0	43	57	0	0	57	54/56
2021	140	-	0	14	86	57	0	71	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	900	280	31	69	0	0	0	0	12/18
2001	520	-	0	100	0	0	0	0	10/17
2006	520	220	4	92	4	0	0	0	10/14
2011	160	-	0	100	0	0	0	100	6/11
2016	720	20	6	89	6	0	0	6	11/16
2021	780	-	0	95	5	0	0	5	- / -
<b>Juniperus osteosperma<sup>1</sup> -- (Utah juniper)</b>									
1996	60	20	0	100	0	0	0	0	- / -
2001	140	-	57	29	14	0	0	14	- / -
2006	120	60	67	33	0	0	0	0	- / -
2011	140	40	57	43	0	0	0	14	- / -
2016	160	40	38	63	0	0	0	0	- / -
2021	200	20	40	60	0	0	0	0	- / -
<b>Linanthus pungens -- (granite prickly phlox)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	14/39
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	20	-	100	0	0	0	0	0	13/33
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	11/31
2011	20	-	0	100	0	0	0	0	13/67
2016	40	-	0	100	0	0	0	0	12/38
2021	20	-	0	0	100	0	0	100	- / -
<b>Pinus monophylla<sup>1</sup> -- (singleleaf pinyon)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	40	20	100	0	0	0	0	50	- / -
2006	-	40	0	0	0	0	0	0	- / -
2011	60	-	100	0	0	0	0	0	- / -
2016	120	-	100	0	0	0	0	0	- / -
2021	100	20	80	20	0	0	0	0	- / -
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	260	-	15	69	15	39	31	8	42/101
2001	220	-	9	82	9	18	18	0	46/95
2006	140	-	29	71	0	14	71	0	51/115
2011	300	-	7	93	0	13	87	47	41/88
2016	260	-	8	77	15	31	8	23	53/120
2021	380	-	0	47	53	79	5	47	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-06.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

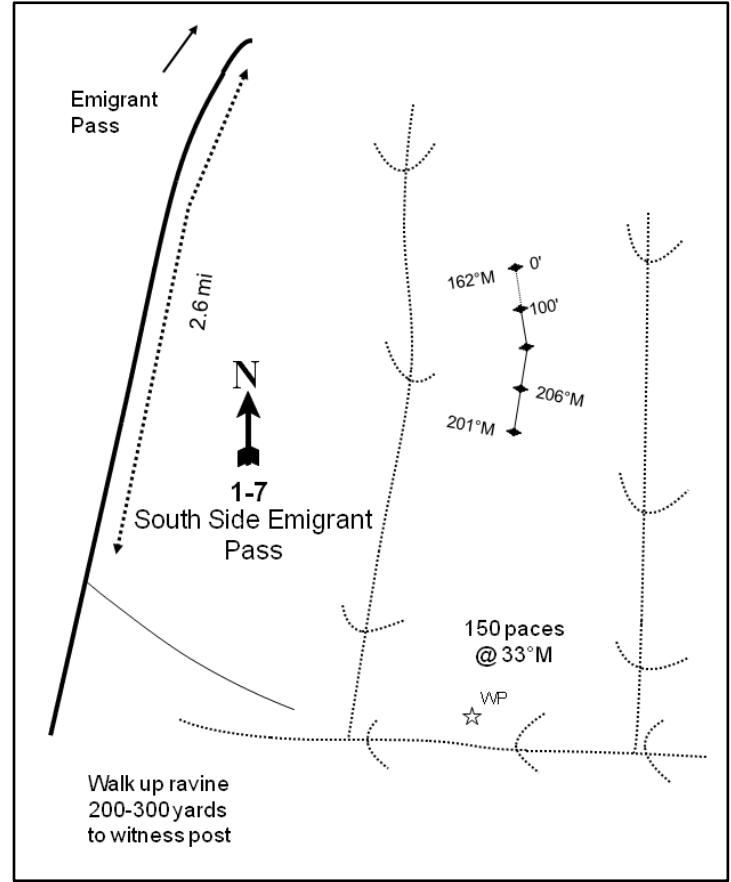
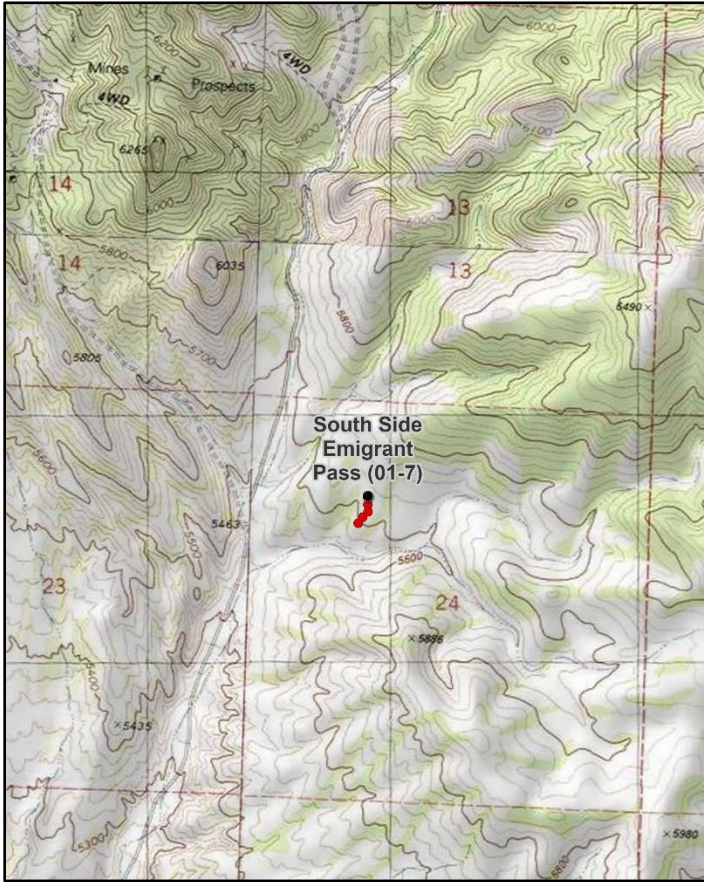
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
1996	55	-	-	-	-	-	24.6
2001	69	-	-	-	-	-	16.2
2006	69	14	7	14	43	21	17.2
2011	73	13	7	27	40	13	13.5
2016	95	5	16	-	5	74	22.1
2021	41	7	13	27	53	-	16.9
<b>Pinus monophylla (singleleaf pinyon)</b>							
1996	5	-	-	-	-	-	11.7
2001	19	-	-	-	-	-	7.0
2006	11	17	33	17	17	17	8.0
2011	11	33	33	-	-	33	5.0
2016	29	36	45	-	-	18	5.0
2021	12	43	43	-	14	-	4.7

**Table 01-06.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	9.9	8.4	7.7	23.3	-1.7	4.2	0.0	<b>51.8</b>	Poor-Fair
2001	11.0	7.6	2.9	24.3	-7.1	5.6	0.0	<b>44.2</b>	Poor
2006	13.8	5.8	2.0	25.6	-2.8	9.4	0.0	<b>53.8</b>	Fair
2011	14.9	10.6	5.9	30.0	-1.1	10.0	0.0	<b>70.3</b>	Good
2016	18.2	8.5	2.3	25.0	-3.6	10.0	0.0	<b>60.5</b>	Fair
2021	12.5	-0.8	0.4	27.7	-0.2	5.9	0.0	<b>45.4</b>	Poor



## SOUTH SIDE EMIGRANT PASS - STUDY NO. 01-7



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Bovine NW; Township 9N, Range 17W, Section 24  
NAD 83 UTM ZONE 12, 270844 East 4596874 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

7911  
162° magnetic (Line 3: 206° magnetic, Line 4: 201° magnetic)  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)

### Directions to Site

From the cattleguard at the summit of Emigrant Pass Road, travel 2.6 miles southwest to a cheatgrass flat on the east side of the road. Turn left, crossing the flat, drive east to the wash, and park. Walk up the wash approximately 200-300 yards to a witness post. Take a bearing of 33 degrees magnetic and walk 150 paces up the ridge to the 400-foot stake of the baseline. The 0-foot stake is marked with a red browse tag, #7911, and the baseline runs at a bearing of 162 degrees magnetic. The 300-foot baseline runs at 206 degrees magnetic. The 400-foot baseline runs at 201 degrees magnetic.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	WHITE LAKES
Elevation	5,620ft (1,713m)
Aspect	Southwest
Slope	11%
Sample Dates	06/05/1996, 06/01/2001, 05/30/2006, 05/19/2011, 05/18/2016, 05/12/2021

**Wildlife Habitat and Vegetation History****Table 01-07.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	year-long	
Greater Sage-Grouse	occupied	year-long	brood-rearing

**Table 01-07.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Black Sagebrush	Phase I
1990	Black Sagebrush	Phase I
1996	Black Sagebrush	Phase I
2001	Black Sagebrush	Phase I
2006	Black Sagebrush	Phase I
2011	Black Sagebrush	Phase I
2016	Black Sagebrush	Phase I
2021	Black Sagebrush	Phase I

**Site Notes**

No Notes

**Soils****Table 01-07.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay	7.7	55.9	9.1	35.0	1.4	3.9	172.8	0.6	06/05/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Upland Shallow Loam (Black Sagebrush)
NRCS Ecological Site #	R025XY316UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1984, this site has remained dominated by black sagebrush (*Artemisia nova*) with a sparse herbaceous understory (Photos, Pre-1992 Data, Table 01-07.7, Table 01-07.12). Yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *stenophyllus*) comprises a majority of the secondary cover on this site (Table 01-07.6, Table 01-07.12). In 2021, encroachment of Utah juniper (*Juniperous osteosperma*) was considered active with density increasing and tree demographics comprised mostly of seedlings (Table 01-07.14). Although the site has been considered to be within Phase I of woodland succession throughout the duration of the study (Table 01-07.4), there may be potential for further encroachment in future sample years. Deer winter range condition has generally decreased in quality from fair to very poor-poor over the course of the study. Improvement to deer wintering range can be accomplished through efforts that promote mature and reproductive sagebrush, and by increasing native perennial grass and forb cover (Table 01-07.15).

**Trend Summary Tables****Table 01-07.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	18.8	2.8	-	-	-	-
2001	20.2	4.1	-	-	-	-
2006	25.1	2.4	0.0	26.9	3.4	-
2011	22.2	2.1	-	24.3	2.5	-
2016	21.4	2.4	-	25.7	2.2	-
2021	24.8	3.0	0.0	22.9	2.1	0.1

**Table 01-07.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	57	103	52	236	0.1	1.3	0.2	1.8
2001	115	141	57	213	0.6	1.9	0.1	1.3
2006	295	98	18	157	1.2	1.8	0.0	1.3
2011	40	88	126	166	0.1	0.7	0.4	1.4
2016	39	114	101	185	0.1	1.4	0.3	2.9
2021	-	145	1	153	-	1.4	0.0	1.9

**Table 01-07.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	8.9	2.6	12.7	33.4	11.6	24.9
2001	11.8	2.2	13.0	45.7	5.5	30.0
2006	13.9	1.7	16.7	39.6	8.2	29.9
2011	12.2	1.7	13.2	43.5	11.0	26.9
2016	14.3	1.3	12.4	44.5	13.3	27.3
2021	9.2	1.9	20.3	38.8	15.3	30.6

**Table 01-07.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
1996	-	17	-	-	16
2001	-	-	48	-	5
2006	-	18	1	-	48
2011	2	8	2	-	-
2016	2	2	-	-	21
2021	-	14	-	-	24
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	-	4.7 (11.6)	71.1 (175.5)	-	-
2006	2.2 (5.4)	26.8 (66.2)	-	8.7 (21.5)*	-
2011	3.6 (9.0)	24.8 (61.2)	-	-	-
2016	-	9.4 (23.2)	-	-	-
2021	-	23.4 (57.9)	-	-	-

\*Pellets per acre (ha)

**Table 01-07.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency				
1996	56	57	32	21	0
2001	22	115	47	47	37
2006	29	295	47	31	1
2011	37	40	12	39	5
2016	40	39	28	56	8
2021	47	-	18	94	8
year	Average Cover (%)				
1996	0.8	0.1	0.3	0.2	0.0
2001	0.4	0.6	0.5	0.7	0.3
2006	0.8	1.2	0.6	0.4	0.0
2011	0.2	0.1	0.1	0.4	0.0
2016	0.6	0.1	0.3	0.5	0.1
2021	0.5	-	0.1	0.7	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 01-07.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium nevadense (Nevada onion)	Arabis puberula <sup>a</sup> (silver rockress)	Artemisia ludoviciana (white sagebrush)	Astragalus newberryi (Newberry's milkvetch)	Astragalus purshii (woollypod milkvetch)	Balsamorhiza hookeri (Hooker's balsamroot)	Castilleja angustifolia (northwestern Indian paintbrush)	Caulanthus crassicaulis <sup>a</sup> (thickstem wild cabbage)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Cryptantha (cryptantha)	Cymopterus globosus (globe springparsley)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Erigeron (fleabane)	Erigeron argentatus (silver fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum ovalifolium (cushion buckwheat)	Gilia inconspicua <sup>a</sup> (shy gilia)
year	Nested Frequency																
1996	3	-	-	24	11	1	0	15	2	97	9	-	3	1	3	4	41
2001	-	-	-	6	4	5	-	-	20	20	30	1	-	-	39	6	36
2006	-	-	-	16	4	3	-	-	15	36	-	3	-	1	-	3	-
2011	17	-	3	1	27	5	-	3	20	9	13	3	-	-	4	-	117
2016	22	1	1	15	6	3	8	0	11	24	10	1	-	-	4	-	99
2021	-	-	-	15	-	7	8	1	-	26	-	-	-	-	1	-	-
year	Average Cover (%)																
1996	0.0	-	-	0.2	0.0	0.0	0.0	0.1	0.0	0.5	0.0	-	0.0	0.0	0.0	0.0	0.1
2001	-	-	-	0.0	0.0	0.0	-	-	0.0	0.1	0.1	0.0	-	-	0.3	0.0	0.1
2006	-	-	-	0.1	0.0	0.1	-	-	0.0	0.1	-	0.0	-	0.0	-	0.0	-
2011	0.0	-	0.0	0.0	0.1	0.2	-	0.0	0.1	0.0	0.1	0.0	-	-	0.0	-	0.3
2016	0.1	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.2	0.0	0.0	-	-	0.0	-	0.3
2021	-	-	-	0.1	-	0.0	0.2	0.0	-	0.1	-	-	-	-	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Malcolmia africana <sup>ai</sup> (African mustard)	Penstemon humilis (low beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Stenotus acaulis (stemless mock goldenweed)
year	Nested Frequency					
1996	5	-	36	143	-	19
2001	-	-	29	140	-	7
2006	-	-	24	103	-	19
2011	-	-	24	95	4	21
2016	2	5	33	130	-	21
2021	-	-	29	103	-	35
year	Average Cover (%)					
1996	0.0	-	0.4	0.6	-	0.1
2001	-	-	0.2	0.3	-	0.0
2006	-	-	0.2	0.5	-	0.2
2011	-	-	0.2	0.3	0.0	0.5
2016	0.0	0.0	0.7	0.6	-	1.0
2021	-	-	0.4	0.3	-	0.8

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 01-07.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova <sup>p</sup> (black sagebrush)	Atriplex confertifolia <sup>p</sup> (shadscale saltbush)	Bassia americana <sup>p</sup> (green molly)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Picrothamnus desertorum (bud sagebrush)	Pinus edulis <sup>t</sup> (twoneedle pinyon)	Tetradymia nuttallii (Nuttall's horsebrush)
year	Line Intercept Cover (%)							
1996	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-
2006	26.6	0.2	0.1	3.3	-	-	-	0.1
2011	24	0.2	0.1	2.3	-	-	-	0.2
2016	25.1	0.3	0.3	2.1	-	-	-	0.1
2021	22.7	0.2	0	1.9	0.1	-	-	0.2
year	Quadrat Cover (%)							
1996	17.3	1.4	0.1	2.5	-	-	-	0.3
2001	19.1	0.9	0.1	2.3	-	-	-	1.8
2006	23.6	1.2	0.3	2.0	-	-	0.0	0.4
2011	21.3	0.9	0.0	1.7	-	-	-	0.4
2016	20.7	0.6	0.2	2.0	-	0.0	-	0.4
2021	23.8	1.0	0.1	2.4	0.0	-	-	0.6

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-07.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia nova<sup>P</sup> -- (black sagebrush)</b>									
1996	11500	340	25	66	9	52	29	2	22/59
2001	12380	60	5	77	18	42	10	5	19/47
2006	11160	50020	3	74	22	42	19	10	23/54
2011	10520	60	3	79	18	28	1	11	22/57
2016	10820	100	3	76	22	10	2	10	23/50
2021	11740	220	3	45	52	16	1	55	- / -
<b>Atriplex confertifolia<sup>P</sup> -- (shadscale saltbush)</b>									
1996	920	40	13	83	4	41	9	0	22/38
2001	840	20	26	29	45	0	0	19	21/31
2006	680	40	21	68	12	6	3	3	26/39
2011	380	-	5	63	32	5	0	26	18/34
2016	260	-	0	100	0	0	8	15	22/39
2021	300	-	0	60	40	0	0	53	- / -
<b>Bassia americana<sup>P</sup> -- (green molly)</b>									
1996	960	100	40	60	0	0	0	0	10/15
2001	1100	20	44	49	7	4	0	7	7/10
2006	1340	120	9	91	0	51	5	0	11/12
2011	380	-	11	90	0	5	5	0	6/8
2016	880	-	14	86	0	0	0	0	7/11
2021	920	80	52	33	15	7	2	26	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1996	3100	300	6	81	13	3	0	3	19/39
2001	2580	20	4	60	36	2	2	12	14/27
2006	2940	180	8	67	25	9	13	16	18/32
2011	2660	-	4	79	17	11	0	11	16/31
2016	2520	-	3	77	20	8	0	10	20/32
2021	2420	-	1	64	36	1	0	47	- / -
<b>Ephedra nevadensis<sup>P</sup> -- (Nevada jointfir)</b>									
1996	-	-	-	-	-	-	-	-	42/48
2001	20	-	0	100	0	0	0	0	30/39
2006	40	-	0	100	0	0	100	0	29/32
2011	40	-	0	100	0	100	0	0	36/57
2016	40	-	0	100	0	50	0	0	34/53
2021	20	-	0	100	0	100	0	100	- / -
<b>Grayia spinosa -- (spiny hopsage)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	53/52
2016	-	-	-	-	-	-	-	-	65/89
2021	-	-	-	-	-	-	-	-	- / -
<b>Juniperus osteosperma<sup>1</sup> -- (Utah juniper)</b>									
1996	-	20	0	0	0	0	0	0	- / -
2001	20	-	100	0	0	0	0	0	- / -
2006	-	20	0	0	0	0	0	0	- / -
2011	-	20	0	0	0	0	0	0	- / -
2016	40	-	100	0	0	0	0	0	- / -
2021	80	60	100	0	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	10/21
2021	-	-	-	-	-	-	-	-	-/-
<b>Picrothamnus desertorum -- (bud sagebrush)</b>									
1996	-	-	-	-	-	-	-	-	19/34
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	16/33
2016	-	-	-	-	-	-	-	-	9/24
2021	-	-	-	-	-	-	-	-	-/-
<b>Pinus edulis<sup>t</sup> -- (twoneedle pinyon)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	20	0	0	0	0	0	0	- / -
2011	20	20	100	0	0	0	0	0	- / -
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Tetradymia nuttallii -- (Nuttall's horsebrush)</b>									
1996	280	-	0	14	86	7	0	36	42/61
2001	280	-	7	29	64	7	0	50	31/37
2006	200	-	10	50	40	0	0	10	42/54
2011	180	-	11	44	44	22	0	56	35/46
2016	140	20	14	57	29	0	0	14	34/39
2021	200	-	0	50	50	0	0	40	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

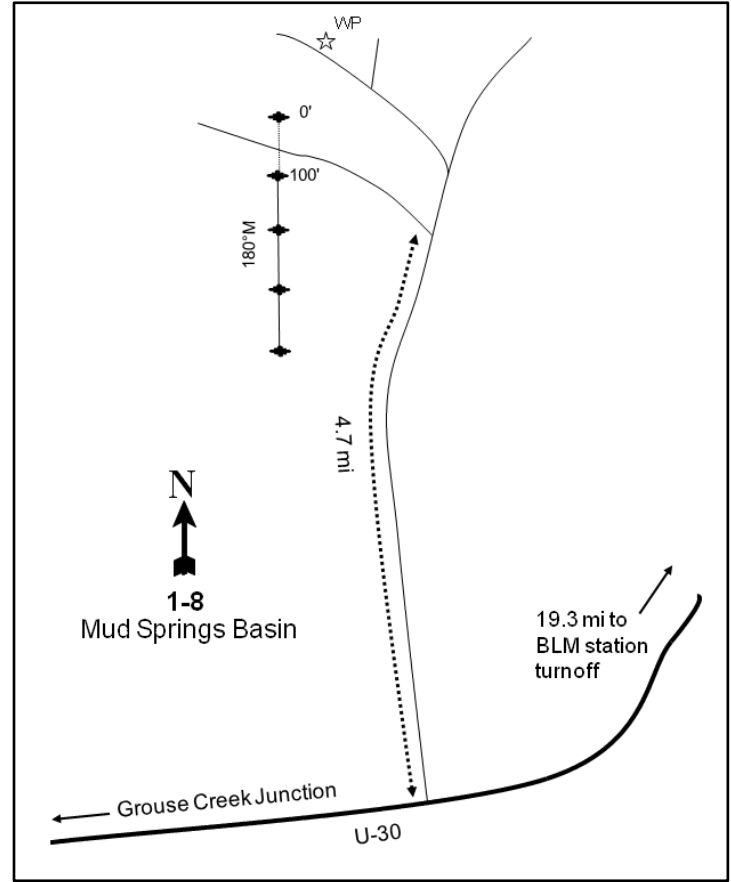
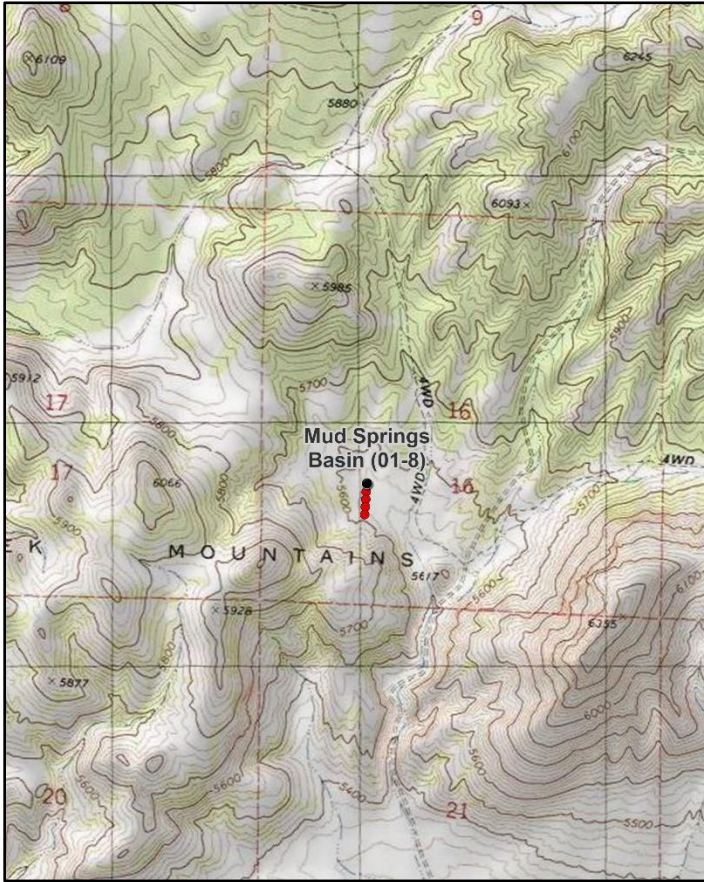
**Table 01-07.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2016	25	50	50	-	-	-	4.5
2021	69	76	18	6	-	-	2.4

**Table 01-07.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	23.1	12.5	12.1	2.7	-0.1	3.5	0.0	<b>53.8</b>	Fair
2001	25.0	9.2	2.9	3.9	-0.5	2.5	0.0	<b>43.0</b>	Poor
2006	30.0	8.3	1.8	3.7	-0.9	2.7	0.0	<b>45.5</b>	Poor
2011	30.0	9.6	1.7	1.4	-0.1	2.8	0.0	<b>45.4</b>	Poor
2016	30.0	8.7	1.4	2.9	-0.1	5.9	0.0	<b>48.8</b>	Poor-Fair
2021	28.6	-0.6	1.3	2.8	0.0	3.7	0.0	<b>35.9</b>	Very Poor-Poor

## MUD SPRINGS BASIN - STUDY NO. 01-8



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Lucin NE NE; Township 9N, Range 17W, Section 16  
NAD 83 UTM ZONE 12, 265979 East 4597940 North

### Transect Information

Browse Tag # (0' Stake)	580
Transect Bearing	180° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 2: No Rebar

### Directions to Site

On State Route 30 proceed 19 miles southwest from the Rosebud BLM station turnoff and turn right (north) onto a gravel road just before mile marker 14. Proceed 4.7 miles, take a fork to the left, and continue for 0.3 miles. The transect intersects with the road. Look for the 100-foot stake on the left (south) side of the road, and the 0-foot stake will be found on the right-hand (north) side of the road. The 0-foot stake is marked by browse tag #580 and the baseline runs at 180 degrees magnetic.



**Site Information**

Land Ownership	State
Land Administrator	SITLA
Allotment	WHITE LAKES
Elevation	5,580ft (1,701m)
Aspect	Southeast
Slope	3-5%
Sample Dates	06/05/1996, 05/24/2001, 05/24/2006, 05/19/2011, 05/19/2016, 05/11/2021

**Table 01-08.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Unknown	-	-	2014-2015	-
Seeding - Unknown	-	-	2014-2015	-

**Wildlife Habitat and Vegetation History****Table 01-08.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	year-long	
Greater Sage-Grouse	occupied	year-long	brood-rearing

**Table 01-08.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Wyoming Big Sagebrush	Phase I
1990	Wyoming Big Sagebrush	Phase I
1996	Wyoming Big Sagebrush	Phase I
2001	Wyoming Big Sagebrush	Phase I
2006	Wyoming Big Sagebrush	Phase I
2011	Wyoming Big Sagebrush	Phase I
2016	Annual Grass/Wyoming Big Sagebrush	Phase I
2021	Perennial Grass/Wyoming Big Sagebrush	Phase I

**Site Notes**

No Notes

**Soils****Table 01-08.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.8	42.4	32.4	25.2	2.3	6.3	540.8	0.7	06/05/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Upland Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R025XY314UT
States and Transitions	Current State: Community Phase 2.2

Since study establishment in 1984, the site has been in Community Phase 2.2 of the Current Potential State as described by the ESD model. Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) has been a dominant component of the plant community throughout the study years (Photos, Pre-1992 Data, Table 09-03.12) and the herbaceous understory has been diverse and abundant (Table 01-08.7). However, cheatgrass (*Bromus tectorum*) has been a significant component of the site and at times has dominated much of the understory (Table 01-08.10). There were some conifers present with mature Utah juniper (*Juniperus osteosperma*) sparsely scattered across the area, indicating that encroachment had not been recently active. However, sometime after 2011 a chaining was performed (Table 01-08.1) that reduced much of the juniper and sagebrush canopy cover. The reduction of juniper and sagebrush cover was likely not a transitional event and it is predicted that shrub species will continue to re-establish. This site will likely continue to remain in Community Phase 2.2 with Wyoming big sagebrush as the major component within the community (USDA-ARS Jornada Experimental Range et al., 2021). Deer winter range condition has generally decreased in quality from fair to very poor over the course of the study. Improvement to deer wintering range can be accomplished through efforts that reestablish the preferred browse community, and that diversify the perennial forb community while reducing cheatgrass (Table 01-08.15).

**Trend Summary Tables****Table 01-08.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	13.1	6.0	0.1	-	-	-
2001	15.2	1.8	0.2	-	-	-
2006	8.7	0.8	0.1	9.6	1.9	0.3
2011	9.9	0.6	0.8	14.6	1.4	0.8
2016	3.9	1.3	-	6.3	1.1	-
2021	3.8	0.5	-	2.7	0.6	-

**Table 01-08.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	180	278	170	217	5.3	14.5	1.0	3.4
2001	326	271	136	102	12.8	10.5	0.6	1.0
2006	364	271	85	86	27.2	12.4	0.6	1.1
2011	204	263	258	130	1.9	13.1	7.5	1.6
2016	347	273	312	142	27.2	11.1	11.3	2.9
2021	148	325	52	83	1.7	11.8	0.3	0.4

**Table 01-08.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	12.8	1.8	41.3	12.9	3.3	46.8
2001	18.9	2.8	31.7	12.3	1.9	42.5
2006	18.3	0.3	32.1	10.6	1.6	52.6
2011	35.7	1.2	21.0	18.9	2.3	35.8
2016	25.4	0.5	23.6	14.8	1.6	47.9
2021	16.4	0.0	58.6	15.3	1.9	19.5

**Table 01-08.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Pronghorn	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	1	53	-	10
2001	-	22	1	2
2006	5	3	-	18
2011	3	8	-	10
2016	2	11	2	6
2021	19	5	-	16
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	-	32.2 (79.5)	-	-
2006	10.9 (26.9)	7.4 (18.2)	0.7 (1.7)	-
2011	17.4 (43.0)	23.4 (57.9)	-	-
2016	-	8.1 (19.9)	8.1 (19.9)	-
2021	55.9 (138.1)	8.7 (21.5)	-	-

**Table 01-08.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Pascopyrum smithii (western wheatgrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea <sup>i</sup> (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency							
1996	36	-	180	63	-	198	-	86
2001	40	-	326	22	31	200	-	81
2006	27	-	364	14	13	221	-	87
2011	30	-	204	36	12	182	-	79
2016	16	-	347	19	10	217	17	84
2021	30	56	148	14	7	273	26	81
year	Average Cover (%)							
1996	2.5	-	5.3	1.9	-	6.2	-	3.9
2001	1.6	-	12.8	0.5	0.6	4.5	-	3.4
2006	1.2	-	27.2	0.4	0.1	7.1	-	3.5
2011	0.9	-	1.9	1.3	0.4	7.8	-	2.5
2016	0.9	-	27.2	0.5	0.5	4.9	0.3	3.9
2021	0.9	1.3	1.7	0.5	0.4	6.0	0.4	2.3

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 01-08.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium nevadense (Nevada onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Androsace septentrionalis <sup>ai</sup> (pygmyflower rockjasmine)	Antennaria dimorpha (low pussytoes)	Arabis puberula <sup>a</sup> (silver rockress)	Arenaria (sandwort)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus cibaricus (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus newberryi (Newberry's milkvetch)	Astragalus purshii (woollypod milkvetch)	Balsamorhiza hookeri (Hooker's balsamroot)	Calochortus bruneauis (Bruneau mariposa lily)	Camelina microcarpa <sup>ai</sup> (littlepod false flax)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)
year	Nested Frequency																
1996	-	-	-	7	-	6	-	-	7	34	-	12	1	7	-	77	-
2001	-	1	2	-	1	4	-	1	3	18	-	-	-	1	-	28	7
2006	-	2	-	36	-	10	-	-	-	29	-	-	1	2	-	6	21
2011	-	-	6	114	-	10	3	2	2	12	-	-	2	0	3	-	55
2016	12	2	1	235	-	10	3	1	1	9	0	0	6	-	-	4	5
2021	2	3	-	31	-	8	3	-	-	6	-	-	-	-	-	-	6
year	Average Cover (%)																
1996	-	-	-	0.0	-	0.1	-	-	0.2	0.5	-	0.1	0.0	0.3	-	0.2	-
2001	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	0.2	-	-	-	0.0	-	0.1	0.0
2006	-	0.0	-	0.2	-	0.2	-	-	-	0.3	-	-	0.0	0.1	-	0.0	0.2
2011	-	-	0.0	3.0	-	0.3	0.0	0.0	0.0	0.5	-	-	0.0	0.0	0.0	-	0.2
2016	0.2	0.0	0.0	5.9	-	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	-	-	0.0	0.0
2021	0.0	0.0	-	0.1	-	0.0	0.0	-	-	0.0	-	-	-	-	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium album <sup>a</sup> (lambsquarters)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Eriogon pumilus (shaggy fleabane)	Eriogonum ovalifolium (cushion buckwheat)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Gilia inconspicua <sup>a</sup> (shy gilia)	Hackelia patens (spotted stickseed)	Halogeton glomeratus <sup>ai</sup> (saltlover)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Linum perenne <sup>i</sup> (blue flax)	Malcolmia africana <sup>ai</sup> (African mustard)	Medicago sativa <sup>i</sup> (alfalfa)	Mentzelia albicaulis <sup>a</sup> (whitestem blazingstar)
year	Nested Frequency																
1996	1	-	-	10	33	51	17	1	21	9	78	-	32	-	4	-	22
2001	-	-	-	1	-	84	5	-	-	4	-	-	44	-	-	-	-
2006	-	-	-	2	-	6	1	-	-	-	-	-	16	-	8	-	-
2011	-	1	4	18	39	155	-	-	-	44	-	-	22	-	27	-	-
2016	-	-	3	1	5	42	-	-	-	11	-	5	102	42	22	45	-
2021	-	-	-	-	-	2	2	-	-	-	-	4	19	-	-	-	-
year	Average Cover (%)																
1996	0.0	-	-	0.3	0.3	0.5	0.1	0.0	0.0	0.0	0.2	-	0.1	-	0.0	-	0.1
2001	-	-	-	0.0	-	0.3	0.1	-	-	0.0	-	-	0.1	-	-	-	-
2006	-	-	-	0.2	-	0.0	0.0	-	-	-	-	-	0.1	-	0.1	-	-
2011	-	0.0	0.0	0.3	0.1	3.0	-	-	-	0.1	-	-	0.1	-	0.9	-	-
2016	-	-	0.0	0.0	0.0	0.7	-	-	-	0.0	-	0.0	0.7	0.5	0.3	1.2	-
2021	-	-	-	-	-	0.0	0.0	-	-	-	-	0.2	0.0	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Monolepis nuttalliana <sup>a</sup> (Nuttall's povertyweed)	Penstemon (beardtongue)	Penstemon cyananthus (Wasatch beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Pseudostellaria jamesiana (tuber starwort)	Salsola tragus <sup>ai</sup> (prickly Russian thistle)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Stenotus acaulis (stemless mock goldenweed)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Veronica bilobata <sup>ai</sup> (twolobe speedwell)
year	Nested Frequency											
1996	-	1	18	56	34	-	-	16	23	4	3	3
2001	-	-	-	53	39	-	-	4	-	-	-	-
2006	-	-	-	31	27	2	-	-	-	-	3	8
2011	-	-	-	6	58	-	-	44	-	-	-	11
2016	2	-	-	37	43	-	4	137	0	-	2	5
2021	-	-	-	27	46	-	-	3	-	-	6	-
year	Average Cover (%)											
1996	-	0.0	0.1	0.7	0.2	-	-	0.1	0.5	0.0	0.0	0.0
2001	-	-	-	0.5	0.2	-	-	0.0	-	-	-	-
2006	-	-	-	0.2	0.1	0.0	-	-	-	-	0.0	0.0
2011	-	-	-	0.0	0.3	-	-	0.3	-	-	-	0.1
2016	0.0	-	-	0.3	0.5	-	0.0	3.4	0.0	-	0.4	0.0
2021	-	-	-	0.2	0.1	-	-	0.0	-	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 01-08.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)						
	Artemisia nova <sup>p</sup> (black sagebrush)	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Bassia prostrata <sup>pt</sup> (forage kochia)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Juniperus osteosperma <sup>i</sup> (Utah juniper)	Linanthus pungens (granite prickly phlox)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept Cover (%)						
1996	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-
2006	2	7.6	-	1.4	0.3	0.3	0.2
2011	2.5	12.1	-	1.1	0.8	0.2	0.1
2016	1	4.8	0.5	0.9	-	0.2	-
2021	1	0.9	0.8	0.6	-	-	-
year	Quadrat Cover (%)						
1996	1.5	11.6	-	5.6	0.1	0.3	0.0
2001	1.3	13.9	-	1.3	0.2	0.5	0.0
2006	1.4	7.2	-	0.5	0.1	0.1	0.2
2011	0.7	9.2	-	0.5	0.8	0.0	0.0
2016	0.7	2.8	0.4	1.3	-	0.0	0.0
2021	0.9	2.1	0.8	0.5	-	0.0	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-08.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia nova<sup>p</sup> -- (black sagebrush)</b>									
1996	320	-	6	25	69	19	69	31	23/64
2001	840	-	5	55	41	0	0	12	19/54
2006	940	-	9	83	9	0	0	9	25/58
2011	680	-	21	47	32	0	0	32	27/60
2016	600	20	17	63	20	17	17	3	21/50
2021	620	-	16	42	42	45	3	42	- / -
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
1996	3240	20	12	64	25	3	1	7	59/95
2001	2540	60	3	78	19	6	1	13	56/74
2006	1300	200	0	65	35	5	0	22	63/85
2011	1400	-	3	79	19	23	0	17	60/106
2016	680	40	0	56	44	0	3	18	48/72
2021	400	40	15	55	30	10	0	35	- / -
<b>Atriplex canescens<sup>p</sup> -- (fourwing saltbush)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Bassia prostrata<sup>PI</sup> -- (forage kochia)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	1860	100	24	76	0	0	1	0	11/18
2021	2060	1680	29	69	2	19	29	2	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1996	3300	-	9	89	2	0	0	1	28/48
2001	1900	-	10	60	31	0	0	11	19/31
2006	860	20	2	98	0	0	0	0	23/40
2011	880	-	2	93	5	2	0	5	18/37
2016	940	60	9	89	2	0	0	2	23/36
2021	840	-	17	26	57	31	0	57	- / -
<b>Ephedra nevadensis<sup>P</sup> -- (Nevada jointfir)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	20	-	0	0	100	0	0	100	38/80
2016	-	-	-	-	-	-	-	-	18/79
2021	-	-	-	-	-	-	-	-	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	23/33
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Juniperus osteosperma<sup>I</sup> -- (Utah juniper)</b>									
1996	40	-	50	50	0	0	0	0	- / -
2001	20	-	0	100	0	0	0	0	- / -
2006	20	-	100	0	0	0	0	0	- / -
2011	20	-	100	0	0	0	0	0	- / -
2016	40	-	50	50	0	0	0	0	- / -
2021	20	-	100	0	0	0	0	100	- / -
<b>Linanthus pungens -- (granite prickly phlox)</b>									
1996	100	-	20	80	0	0	0	0	13/27
2001	280	20	0	100	0	0	0	0	15/17
2006	240	20	0	100	0	0	0	0	22/27
2011	280	-	7	71	21	0	0	21	14/20
2016	240	80	0	100	0	0	0	0	21/19
2021	60	-	67	33	0	0	0	0	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	-	-	-	-	-	-	-	-	12/36
2001	40	-	0	100	0	0	0	0	7/14
2006	60	-	0	100	0	0	0	0	12/24
2011	100	-	0	100	0	0	0	0	10/19
2016	100	-	0	100	0	0	0	0	12/24
2021	80	-	0	50	50	0	0	50	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

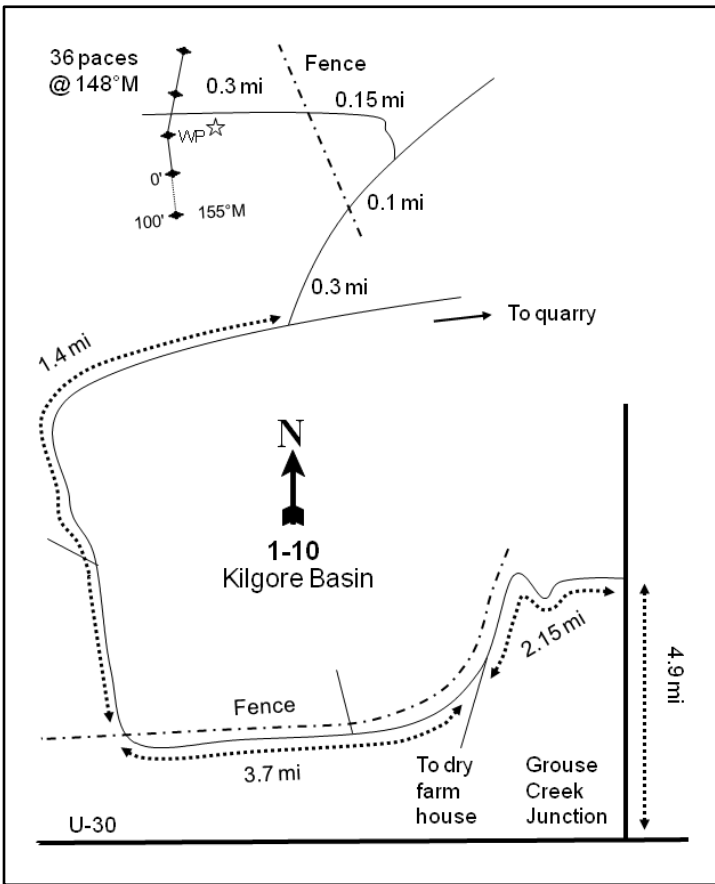
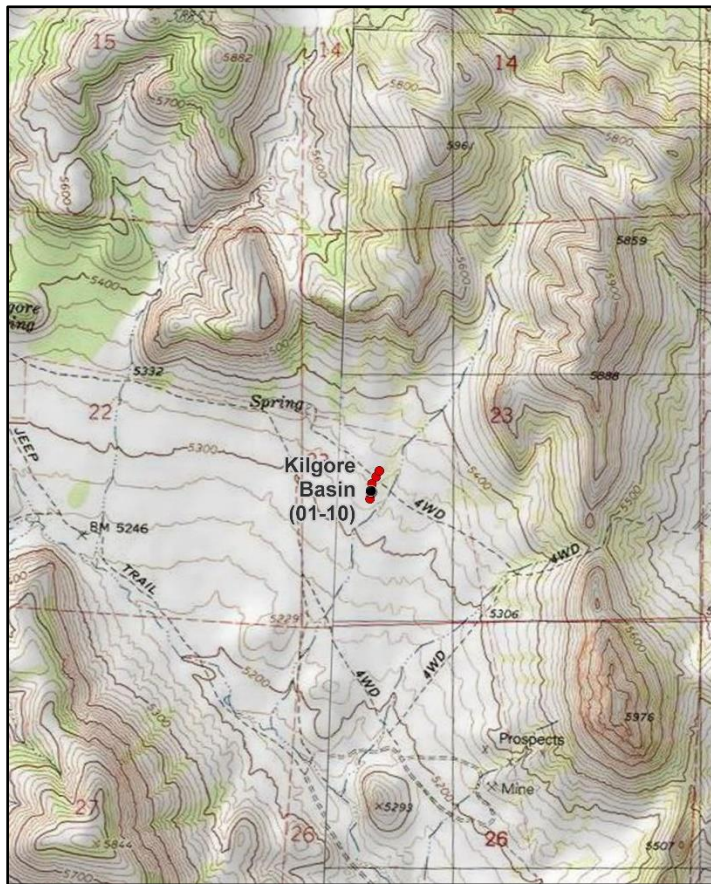
**Table 01-08.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
1996	29	-	-	-	-	-	25.6
2001	26	-	-	-	-	-	17.5
2006	19	-	11	22	11	56	27.2
2011	25	-	11	22	-	67	39.1
2016	8	-	20	20	20	40	26.6
2021	10	25	25	-	-	50	16.3

**Table 01-08.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	16.4	6.0	5.5	29.1	-4.0	6.7	0.0	<b>59.7</b>	Fair
2001	18.9	8.8	1.6	21.1	-9.6	2.1	0.0	<b>42.8</b>	Poor
2006	12.0	6.1	0.9	24.7	-20.0	2.2	0.0	<b>25.9</b>	Very Poor
2011	18.3	8.7	3.0	26.2	-1.4	3.2	0.0	<b>57.8</b>	Fair
2016	8.0	4.0	2.3	22.1	-20.0	5.8	0.0	<b>22.2</b>	Very Poor
2021	3.6	0.0	0.0	23.5	-1.3	0.8	0.0	<b>26.6</b>	Very Poor

### KILGORE BASIN - STUDY NO. 01-10



**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Lucin NW NW; Township 9N, Range 19W, Section 23  
NAD 83 UTM ZONE 12, 249604 East 4596726 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

7910  
155° magnetic (Line 2: 353° magnetic, Lines 3-4: 15° magnetic)  
400ft  
Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)  
Standard

**Directions to Site**

From the junction of State Route 30 and Grouse Creek Road, proceed north for 4.9 miles on the Grouse Creek Road. Turn left (west) and travel 2.15 miles to a fork that leads to a dry farm. Stay on the main road at this fork (right) and continue 3.7 miles to a gate. Pass through the gate and proceed 1.2 miles to another fork. Stay right for 0.3 miles, then turn left and travel 0.4 miles to another gate. Proceed 0.1 miles to a fork. Turn left here into the pinyon-juniper patch and go 0.15 miles to another gate. Continue 0.3 miles to a witness post on the left (south) side of the road. Walk 36 paces from the witness post at a bearing of 148 degrees magnetic to the 0-foot stake. The 0-foot stake is marked by a red browse tag #7910.



**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	KILGORE
Elevation	5,300ft (1,615m)
Aspect	Southwest
Slope	5-7%
Sample Dates	06/04/1996, 05/22/2001, 05/23/2006, 05/18/2011, 05/25/2016, 05/19/2021

**Table 01-10.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Goose Creek Fire	-	July-August 2018	132127
Seeding - Rangeland Drill	Goose Creek Fire Rehabilitation	4758	Between September 2018 and May 2021	10195

**Wildlife Habitat and Vegetation History****Table 01-10.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	year-long	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Pronghorn	substantial	summer	

**Table 01-10.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Black Sagebrush	Phase I
1990	Black Sagebrush	Phase I
1996	Black Sagebrush	Phase I
2001	Black Sagebrush	Phase I
2006	Black Sagebrush	Phase I
2011	Black Sagebrush	Phase I
2016	Black Sagebrush	Phase I
2021	Perennial Grass	No Encroachment

**Site Notes**

Sage-grouse droppings noted outside of sample area in 2006.

**Soils****Table 01-10.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	8.1	48.9	27.1	24.0	1.2	6.3	444.8	0.6	06/04/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	9 inches
NRCS Ecological Site	Semidesert Shallow Loam (Black Sagebrush)
NRCS Ecological Site #	R028AY236UT
States and Transitions	No state and transition model is available for this ecological site.

From study establishment in 1984 through 2016, the site was in a state dominated by black sagebrush (*Artemisia nova*). However, sagebrush cover and density decreased substantially following the Goose Creek Wildfire in 2018 (Photos, Pre-1992 Data, Table 01-10.1, Table 01-10.12, Table 01-10.13). The herbaceous understory remained un-diversified and sparse in most samplings prior to the wildfire. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been sampled in low abundance in the understory in most sample years. Fire rehabilitation efforts through seeding led to increased perennial grass cover in 2021. As such, the vegetation community transitioned from one dominated by sagebrush to one dominated by perennial grasses, with crested wheatgrass (*Agropyron cristatum*) and the native species squirreltail (*Elymus elymoides*) as the predominant species (Table 01-10.7, Table 01-10.10, Table 01-10.11). As of 2021, the site is considered to be in a degraded state that provides limited value to wildlife due to a lack of preferred browse cover; more restoration input will be needed to increase vegetative diversity and abundance to improve habitat quality (Table 01-10.15).

**Trend Summary Tables****Table 01-10.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	26.2	5.7	0.1	-	-	-
2001	21.3	3.8	0.0	-	-	-
2006	23.3	5.7	0.1	26.8	5.1	-
2011	20.4	6.7	0.1	17.9	5.5	-
2016	20.3	7.9	0.0	28.3	11.3	-
2021	1.3	0.8	-	1.4	1.0	-

**Table 01-10.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	59	118	49	185	0.2	1.6	0.2	1.7
2001	62	122	-	90	0.5	1.0	-	0.6
2006	301	122	60	92	4.6	1.3	0.2	1.6
2011	80	104	277	127	0.3	1.9	3.3	1.6
2016	53	128	234	144	0.4	4.0	1.3	1.3
2021	136	288	24	192	2.6	14.3	0.0	5.0

**Table 01-10.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	9.2	1.8	19.4	28.5	11.7	35.8
2001	22.8	0.9	11.1	36.6	4.4	29.8
2006	15.1	1.0	19.2	38.5	5.1	33.3
2011	15.0	1.1	16.9	35.1	4.8	34.1
2016	15.4	0.3	16.0	44.6	6.1	34.8
2021	19.3	0.1	23.5	42.3	5.1	24.2

**Table 01-10.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1996	1	17	1	-	2
2001	2	13	2	-	1
2006	6	13	-	-	12
2011	3	5	1	-	9
2016	-	3	-	-	47
2021	2	1	3	-	10
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	5.1 (12.6)	20.8 (51.3)	-	-	-
2006	13.8 (34.1)	10.7 (26.5)	-	-	-
2011	8.0 (19.7)	10.0 (24.8)	-	0.6 (1.4)	-
2016	2.9 (7.2)	20.1 (49.7)	-	-	-
2021	8.0 (19.7)	4.7 (11.6)	3.4 (8.3)	-	-

**Table 01-10.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)	Vulpia octoflora <sup>a</sup> (sixweeks fescue)
year	Nested Frequency								
1996	5	-	59	95	-	23	-	-	-
2001	-	-	61	102	-	22	-	-	5
2006	25	-	297	86	-	20	-	-	11
2011	8	-	80	63	-	44	-	-	-
2016	7	-	51	104	-	33	-	-	2
2021	35	90	136	180	4	74	1	3	-
year	Average Cover (%)								
1996	0.3	-	0.2	1.0	-	0.3	-	-	-
2001	-	-	0.5	0.9	-	0.1	-	-	0.0
2006	0.2	-	4.6	1.0	-	0.1	-	-	0.0
2011	0.2	-	0.3	1.4	-	0.3	-	-	-
2016	0.1	-	0.4	3.4	-	0.5	-	-	0.0
2021	1.0	4.9	2.6	6.7	0.0	1.5	0.0	0.1	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 01-10.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium nevadense (Nevada onion)	Arabis drummondii (Drummond's rockress)	Arabis puberula <sup>a</sup> (silver rockress)	Astragalus cibaricus (browse milkvetch)	Astragalus iodanthus (Humboldt River milkvetch)	Astragalus utahensis (Utah milkvetch)	Brassicaceae <sup>a</sup> (mustard family)	Camissonia minor <sup>a</sup> (small evening primrose)	Castilleja angustifolia (northwestern Indian paintbrush)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Cryptantha humilis (roundspike cryptantha)	Cryptantha watsoni <sup>a</sup> (Watson's cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Eriastrum sparsiflorum <sup>a</sup> (Great Basin woollystar)	Eriogonum ovalifolium (cushion buckwheat)	Gilia inconspicua <sup>a</sup> (shy gilia)	Halogeton glomeratus <sup>ai</sup> (saltlover)
year	Nested Frequency																
1996	-	-	-	-	30	-	11	-	-	-	23	-	-	21	-	10	-
2001	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2006	-	-	-	-	13	5	-	-	-	8	-	16	27	2	8	-	
2011	14	-	-	-	13	8	-	-	29	17	-	31	7	9	236	-	
2016	6	-	1	4	20	13	-	28	5	-	-	51	31	22	3	193	5
2021	-	-	2	3	40	17	-	-	-	-	-	-	-	-	3	-	19
year	Average Cover (%)																
1996	-	-	-	-	0.4	-	0.0	-	-	-	0.1	-	-	0.0	-	0.0	-
2001	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2006	-	-	-	-	0.1	0.0	-	-	-	0.0	-	0.0	0.1	0.0	0.0	0.0	-
2011	0.1	-	-	-	0.2	0.1	-	-	0.1	0.0	-	0.1	0.0	0.1	0.1	2.8	-
2016	0.0	-	0.0	0.0	0.1	0.1	-	0.1	0.3	-	-	0.1	0.1	0.1	0.0	0.8	0.0
2021	-	-	0.0	0.0	0.6	0.2	-	-	-	-	-	-	-	-	0.0	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Medicago sativa <sup>i</sup> (alfalfa)	Mentzelia albicaulis <sup>a</sup> (whitestem blazingstar)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Sanguisorba minor <sup>i</sup> (small burnet)	Townsendia (Townsend daisy)
year	Nested Frequency						
1996	13	-	-	67	102	-	3
2001	-	-	-	47	51	-	-
2006	11	-	-	52	44	-	-
2011	87	-	-	53	50	-	-
2016	21	-	-	48	83	-	-
2021	-	74	3	30	112	5	-
year	Average Cover (%)						
1996	0.0	-	-	0.7	0.6	-	0.0
2001	-	-	-	0.4	0.3	-	-
2006	0.0	-	-	1.1	0.3	-	-
2011	0.2	-	-	0.9	0.3	-	-
2016	0.1	-	-	0.5	0.3	-	-
2021	-	2.0	0.0	0.2	2.0	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 01-10.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova <sup>p</sup> (black sagebrush)	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Atriplex confertifolia <sup>p</sup> (shadscale saltbush)	Bassia americana <sup>p</sup> (green molly)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Ephedra nevadensis <sup>p</sup> (Nevada jointfir)	Grayia spinosa (spiny hopsage)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept Cover (%)								
1996	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-
2006	25.9	-	0.7	0.2	4.8	-	0.3	-	-
2011	17.1	0.3	0.5	-	5	-	0.5	-	-
2016	27.6	-	0.7	0	10.6	-	0.5	-	0.2
2021	1.1	-	0.3	0	1	-	-	-	-
year	Quadrat Cover (%)								
1996	24.8	0.0	1.4	-	5.3	0.0	0.3	0.1	0.0
2001	21.1	-	0.2	-	3.8	-	-	0.0	-
2006	21.8	-	1.5	0.0	5.5	0.0	0.1	0.1	0.0
2011	19.5	0.0	0.8	-	6.6	0.0	0.1	0.1	-
2016	19.6	-	0.7	0.0	7.7	-	0.1	0.0	0.0
2021	0.8	-	0.6	0.0	0.8	-	-	-	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-10.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia nova<sup>P</sup> -- (black sagebrush)</b>									
1996	13600	560	12	61	27	54	12	1	20/51
2001	15960	40	10	68	22	22	0	10	22/51
2006	12700	117660	5	64	31	6	0	21	22/46
2011	12640	300	15	60	25	22	0	16	21/48
2016	13520	11300	12	62	26	4	0	14	19/45
2021	440	20	5	36	59	0	0	59	- / -
<b>Artemisia tridentata ssp. wyomingensis<sup>P</sup> -- (Wyoming big sagebrush)</b>									
1996	80	-	0	25	75	0	75	0	46/61
2001	20	-	0	100	0	0	0	0	65/114
2006	-	-	-	-	-	-	-	-	42/96
2011	60	-	33	67	0	67	0	0	41/74
2016	-	-	-	-	-	-	-	-	57/80
2021	40	-	50	0	50	0	0	50	- / -
<b>Atriplex confertifolia<sup>P</sup> -- (shadscale saltbush)</b>									
1996	740	40	19	78	3	43	8	0	26/37
2001	360	40	33	61	6	0	0	6	28/39
2006	560	20	7	93	0	4	0	0	23/36
2011	500	-	8	64	28	0	0	24	19/34
2016	360	-	11	67	22	0	0	11	23/35
2021	160	-	13	88	0	0	0	0	- / -
<b>Bassia americana<sup>P</sup> -- (green molly)</b>									
1996	40	-	0	100	0	0	0	0	6/10
2001	40	-	0	100	0	0	0	0	4/17
2006	140	-	14	86	0	29	71	0	12/16
2011	20	-	0	100	0	0	0	0	18/22
2016	140	-	14	86	0	0	0	0	10/15
2021	160	-	25	75	0	13	0	0	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1996	4620	500	2	97	1	3	0	0	23/39
2001	4060	20	4	84	12	0	0	3	24/37
2006	4140	18020	1	93	6	0	0	2	24/41
2011	5900	160	27	65	8	8	0	3	27/41
2016	6460	600	3	90	7	1	0	3	30/44
2021	520	-	4	50	46	0	0	46	- / -
<b>Ephedra nevadensis<sup>P</sup> -- (Nevada jointfir)</b>									
1996	60	-	0	67	33	33	67	0	24/33
2001	20	-	0	100	0	0	0	0	19/38
2006	60	-	100	0	0	0	100	0	30/38
2011	20	-	0	100	0	0	100	0	30/60
2016	20	-	0	100	0	0	0	0	32/61
2021	-	-	-	-	-	-	-	-	- / -
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	20	-	100	0	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Grayia spinosa -- (spiny hopsage)</b>									
1996	100	-	0	40	60	100	0	60	40/85
2001	80	-	0	75	25	0	0	0	29/27
2006	60	-	0	100	0	0	0	0	37/71
2011	60	-	0	67	33	0	0	33	37/61
2016	60	-	0	100	0	0	0	0	42/74
2021	-	-	-	-	-	-	-	-	-/-
<b>Juniperus osteosperma<sup>1</sup> -- (Utah juniper)</b>									
1996	20	-	100	0	0	0	0	0	-/-
2001	20	-	0	100	0	0	0	100	-/-
2006	20	-	100	0	0	0	0	0	-/-
2011	20	-	100	0	0	0	0	100	-/-
2016	40	-	100	0	0	0	0	50	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Krascheninnikovia lanata<sup>p</sup> -- (winterfat)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	120	20	33	67	0	0	0	0	9/8
2006	-	-	-	-	-	-	-	-	16/21
2011	80	-	25	75	0	75	0	0	6/12
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	140	-	29	57	14	0	0	0	11/21
2001	40	-	100	0	0	0	0	0	-/-
2006	40	-	50	50	0	0	0	0	13/20
2011	20	20	0	100	0	0	0	0	10/21
2016	60	20	0	100	0	0	0	0	12/24
2021	20	-	0	100	0	0	0	0	-/-
<b>Picrothamnus desertorum -- (bud sagebrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	20/52
2016	-	-	-	-	-	-	-	-	18/43
2021	-	-	-	-	-	-	-	-	-/-
<b>Sarcobatus vermiculatus -- (greasewood)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	53/96
2006	-	-	-	-	-	-	-	-	99/136
2011	-	-	-	-	-	-	-	-	87/146
2016	-	-	-	-	-	-	-	-	103/149

t - Tree Species; p - Preferred Browse; i - Introduced Species

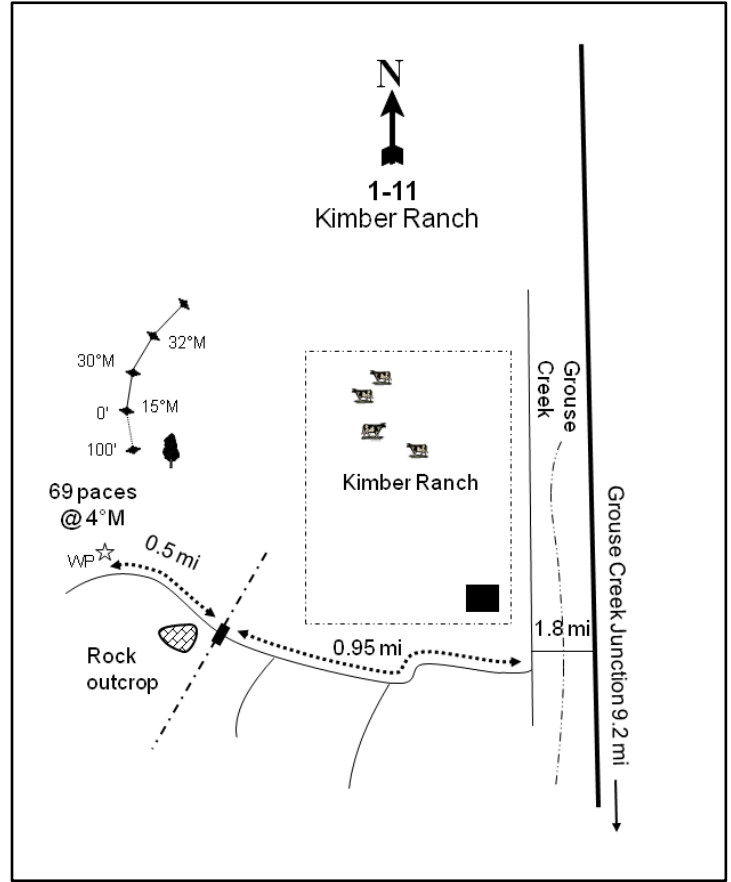
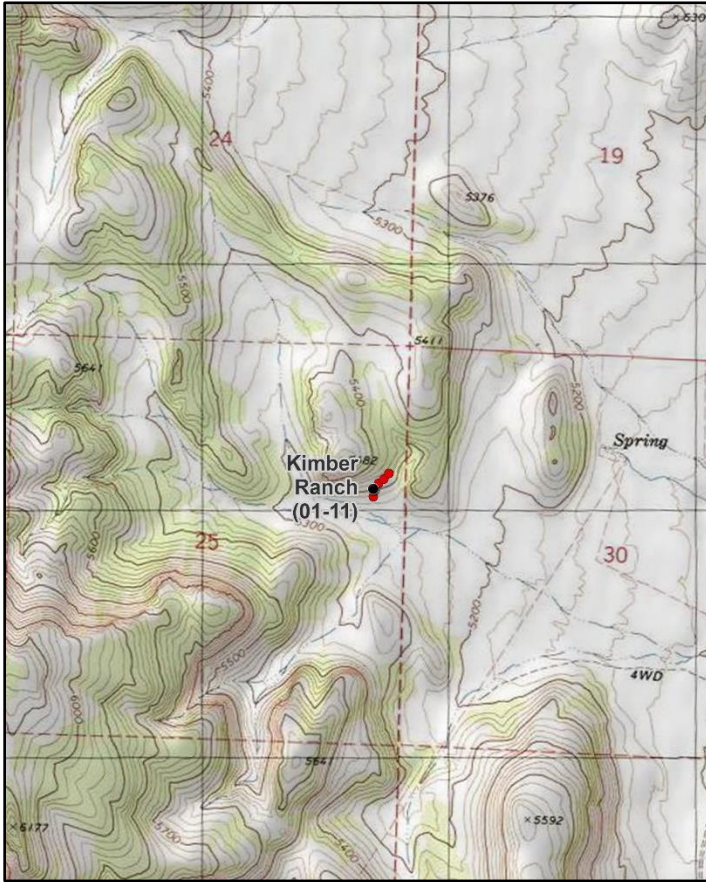
**Table 01-10.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2016	4	20	80	-	-	-	2.4

**Table 01-10.15 - Deer Desirable Components Index: Semidesert Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	30.0	7.4	6.3	3.3	-0.2	3.5	0.0	<b>50.3</b>	Good
2001	26.6	8.4	5.2	2.0	-0.4	1.3	0.0	<b>43.0</b>	Fair
2006	30.0	6.0	2.6	2.5	-3.4	3.1	0.0	<b>40.8</b>	Fair
2011	22.3	7.5	7.4	3.9	-0.2	3.2	0.0	<b>44.0</b>	Fair-Good
2016	30.0	7.2	6.0	7.9	-0.3	2.6	0.0	<b>53.3</b>	Good
2021	1.7	0.0	0.0	28.7	-2.0	10.0	0.0	<b>38.4</b>	Fair

## KIMBER RANCH - STUDY NO. 01-11



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Toms Cabin Spring SW; Township 10N, Range 19W, Section 25  
NAD 83 UTM ZONE 12, 252634 East 4605282 North

### Transect Information

Browse Tag # (0' Stake)	7912
Transect Bearing	165° magnetic (Line 2: 15° magnetic, Line 3: 30° magnetic, Line 4: 32° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

### Directions to Site

Proceed on State Route 30 to Grouse Creek junction, turn right, and travel north for 9.2 miles. Turn left at the ranch complex and proceed 1.8 miles to the Kimber Ranch. At the ranch house stay left and continue for 0.05 miles. Stay left for another 0.25 miles, then turn right and travel west for 0.6 miles. Turn right and proceed for 0.1 miles to a gate. Continue up the road 0.5 miles to a witness post on the right (north) side of the road. From the witness post walk 69 paces at 4 degrees magnetic to the 100-foot stake. The 0-foot stake is 100 feet to the north and is marked by browse tag #7912.



**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	DAIRY VALLEY
Elevation	5,300ft (1,615m)
Aspect	South
Slope	20-25%
Sample Dates	06/04/1996, 05/23/2001, 05/24/2006, 05/18/2011, 05/25/2016, 05/18/2021

**Table 01-11.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Goose Creek Fire	-	July 2018	132127
Seeding - Aerial Before	Goose Creek Fire Rehabilitation	4758	November 2018	13191
Chaining - One-Way Ely Chaining	Goose Creek Fire Rehabilitation	4758	Between November 2018 and May 2021	13191

**Table 01-11.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Goose Creek Fire Private/SITLA Aerial			Aerial	Nov 2018	5675
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Nezpar	0.59	0.50
G	Achnatherum hymenoides	Indian Ricegrass	Nezpar	0.66	0.60
G	Achnatherum hymenoides	Indian Ricegrass	Nezpar	0.41	0.33
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	0.06	0.05
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	0.28	0.26
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	1.18	1.08
G	Agropyron cristatum	Crested Wheatgrass	Nordan	0.29	0.24
G	Agropyron cristatum	Crested Wheatgrass	Nordan	0.53	0.50
G	Agropyron fragile	Siberian Wheatgrass	Vavilov	1.34	1.24
G	Agropyron fragile	Siberian Wheatgrass	Vavilov II	0.66	0.56
G	Elymus trachycaulus	Thickspike Wheatgrass	Bannock II	1.00	0.91
G	Elymus wawawaiensis	Snake River Wheatgrass	Discovery	1.52	1.34
G	Elymus wawawaiensis	Snake River Wheatgrass	Secar	0.48	0.44
G	Poa secunda	Sandberg Bluegrass	Vale	0.25	0.23
G	Poa secunda	Nevada Bluegrass	Opportunity	0.25	0.21
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky	0.82	0.73
F	Achillea millefolium	Western Yarrow	Yakima	0.04	0.04
F	Achillea millefolium	Western Yarrow	Eagle	0.03	0.03
F	Medicago sativa	Alfalfa	Ladak DL	2.00	1.94
F	Sanguisorba minor	Small Burnet	Delar	0.63	0.55
F	Sanguisorba minor	Small Burnet	Delar	0.44	0.41
F	Sanguisorba minor	Small Burnet	Delar	0.90	0.75
F	Sanguisorba minor	Small Burnet	Delar	0.53	0.50

**Table 01-11.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	year-long	
Greater Sage-Grouse	occupied	year-long	brood-rearing
Pronghorn	substantial	summer	

**Table 01-11.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Black Sagebrush	Phase I
1990	Black Sagebrush	Phase I
1996	Black Sagebrush	Phase I
2001	Black Sagebrush	Phase I
2006	Black Sagebrush	Phase I
2011	Black Sagebrush	Phase I
2016	Black Sagebrush	Phase I
2021	Perennial Grass	No Encroachment

**Site Notes**

No Notes

**Soils****Table 01-11.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.8	42.9	29.1	28.0	1.9	7.0	134.4	0.5	06/04/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation                      9 inches  
 NRCS Ecological Site                                                      Semidesert Shallow Loam (Black Sagebrush)  
 NRCS Ecological Site #                                                      R028AY236UT  
 States and Transitions                                                      No state and transition model is available for this ecological site.

From study establishment in 1984 through 2016, this site was dominated by black sagebrush (*Artemisia nova*). However, in 2021 black sagebrush cover and density decreased substantially as a result of the 2018 Goose Creek wildfire (Photos, Pre-1992 Data, Table 01-11.1, Table 01-11.12, Table 01-11.13). The herbaceous understory has generally remained un-diversified and sparse (Table 01-11.7). Fire rehabilitation efforts through seeding have increased perennial grass cover, and the site transitioned from a community dominated by sagebrush to one dominated by perennial grass in 2021; Indian ricegrass (*Achnatherum hymenoides*), crested wheatgrass (*Agropyron cristatum*), and bluebunch wheatgrass (*Pseudoroegneria spicata*) were the predominant species in the understory in 2021. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been sampled with fluctuating cover, but cover was high in 2021 (Table 01-11.10). Forbs have generally remained rare, but in 2021 the seeded perennial forb species common yarrow (*Achillea millefolium*) contributed moderate cover (Table 01-11.11). Deer winter range condition has remained fair over the course of the study. As of 2021, deer winter range conditions were considered to be good. Improvement to deer wintering range can be accomplished through efforts that restore preferred browse cover, and that reduces cheatgrass cover (Table 01-11.15).

**Trend Summary Tables****Table 01-11.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	16.1	0.4	1.6	-	-	-
2001	16.1	0.5	1.6	-	-	0.2
2006	14.3	0.6	1.6	15.8	1.5	1.7
2011	13.7	0.7	2.3	14.7	1.2	3.7
2016	12.1	1.3	2.0	17.4	2.9	5.5
2021	4.6	-	-	3.6	0.1	-

**Table 01-11.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	392	155	7	58	3.2	1.7	0.0	0.3
2001	450	114	138	23	11.1	1.2	0.4	0.2
2006	427	114	2	17	10.7	4.1	0.0	0.1
2011	275	125	212	36	5.0	2.5	1.7	0.4
2016	318	135	122	51	5.4	4.2	0.4	0.4
2021	387	173	21	146	8.5	11.2	0.2	5.8

**Table 01-11.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	6.7	0.1	12.9	37.5	17.6	25.0
2001	10.0	0.0	16.2	35.1	19.1	30.9
2006	22.9	0.4	19.9	21.6	17.9	31.6
2011	16.5	1.1	15.2	30.5	20.4	28.6
2016	9.5	0.0	16.5	48.8	22.5	23.9
2021	6.7	0.2	28.2	30.0	22.4	30.0

**Table 01-11.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1996	-	17	-	1	6
2001	7	15	-	-	-
2006	1	22	2	-	15
2011	4	21	-	-	8
2016	2	35	5	-	30
2021	1	30	-	-	2
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	2.2 (5.4)	26.8 (66.2)	-	-	-
2006	1.5 (3.6)	34.9 (86.1)	-	-	-
2011	11.6 (28.7)	47.6 (117.5)	6.7 (16.6)	-	-
2016	1.5 (3.6)	50.2 (124.1)	8.1 (19.9)	-	-
2021	0.7 (1.8)	38.9 (96.0)	0.7 (1.7)	-	-

**Table 01-11.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achmatherum hymenoides (Indian ricegrass)	Achmatherum thurberianum (Thurber's needlegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Pascopyrum smithii (western wheatgrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia octoflora <sup>a</sup> (sixweeks fescue)
year	Nested Frequency								
1996	26	31	-	388	47	-	0	68	27
2001	8	13	-	450	22	2	11	64	24
2006	38	6	-	427	30	-	-	54	-
2011	41	-	-	275	13	-	1	80	3
2016	47	5	-	314	31	-	3	72	11
2021	87	23	18	387	26	-	5	55	-
year	Average Cover (%)								
1996	0.3	0.2	-	3.1	0.4	-	0.0	0.7	0.0
2001	0.1	0.2	-	11.0	0.2	0.0	0.1	0.7	0.1
2006	1.1	0.4	-	10.7	0.7	-	-	1.9	-
2011	0.7	-	-	5.0	0.1	-	0.0	1.6	0.0
2016	1.5	0.5	-	5.4	0.5	-	0.0	1.8	0.0
2021	5.5	0.5	1.0	8.5	0.5	-	0.0	3.8	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 01-11.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Antennaria (pussytoes)	Astragalus (milkvetch)	Astragalus cibirius (browse milkvetch)	Astragalus iodanthus (Humboldt River milkvetch)	Astragalus newberryi (Newberry's milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza hookeri (Hooker's balsamroot)	Castilleja angustifolia (northwestern Indian paintbrush)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cryptantha watsonii <sup>a</sup> (Watson's cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Eriastrum sparsiflorum <sup>a</sup> (Great Basin woollystar)	Erigeron aphanactis <sup>a</sup> (rayless shaggy fleabane)
year	Nested Frequency																
1996	-	-	-	-	-	4	-	25	-	7	-	-	3	-	3	2	-
2001	-	-	2	-	-	-	-	3	1	-	-	1	-	-	12	-	1
2006	-	-	-	-	-	-	-	6	0	1	-	1	2	-	-	-	-
2011	-	3	-	7	-	-	-	12	1	1	11	7	-	-	91	4	5
2016	-	-	-	-	3	1	-	20	1	0	1	7	-	12	12	1	-
2021	98	-	-	-	-	3	5	9	0	-	-	5	-	-	-	-	16
year	Average Cover (%)																
1996	-	-	-	-	-	0.0	-	0.1	-	0.0	-	-	0.0	-	0.0	0.0	-
2001	-	-	0.0	-	-	-	-	0.0	0.0	-	-	0.0	-	-	0.1	-	0.0
2006	-	-	-	-	-	-	-	0.1	0.0	0.0	-	0.0	0.0	-	-	-	-
2011	-	0.0	-	0.1	-	-	-	0.0	0.0	0.0	0.0	0.2	-	-	0.5	0.0	0.0
2016	-	-	-	-	0.0	0.0	-	0.1	0.0	0.0	0.0	0.1	-	0.0	0.0	0.0	-
2021	4.4	-	-	-	-	0.0	0.1	0.2	0.1	-	-	0.1	-	-	-	-	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Eriogonum caespitosum (matted buckwheat)	Eriogonum ovalifolium (cushion buckwheat)	Gilia inconspicua <sup>a</sup> (shy gilia)	Hymenopappus (hymenopappus)	Ipomopsis congesta (ballhead ipomopsis)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lepidium ramosissimum <sup>a</sup> (manybranched pepperweed)	Lygodesmia (skeletonplant)	Medicago sativa <sup>i</sup> (alfalfa)	Mentzelia albicaulis <sup>a</sup> (whitestem blazingstar)	Orobanche fasciculata (clustered broomrape)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Sanguisorba minor <sup>i</sup> (small burnet)
year	Nested Frequency													
1996	3	-	2	8	-	-	-	3	-	-	6	-	6	-
2001	-	-	127	-	-	9	-	-	-	-	2	-	14	-
2006	-	3	2	-	-	-	-	-	-	-	-	-	4	-
2011	-	3	138	-	-	7	3	-	-	-	-	-	5	-
2016	-	-	105	-	2	2	2	-	-	1	3	-	21	-
2021	-	2	5	-	-	-	-	-	37	-	-	1	10	1
year	Average Cover (%)													
1996	0.0	-	0.0	0.1	-	-	-	0.0	-	-	0.0	-	0.0	-
2001	-	-	0.3	-	-	0.0	-	-	-	-	0.0	-	0.0	-
2006	-	0.0	0.0	-	-	-	-	-	-	-	-	-	0.0	-
2011	-	0.0	1.1	-	-	0.1	0.0	-	-	-	-	-	0.0	-
2016	-	-	0.3	-	0.0	0.0	0.0	-	-	0.0	0.0	-	0.1	-
2021	-	0.0	0.0	-	-	-	-	-	0.8	-	-	0.0	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 01-11.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova <sup>p</sup> (black sagebrush)	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Atriplex confertifolia <sup>p</sup> (shadscale saltbush)	Bassia americana <sup>p</sup> (green molly)	Bassia prostrata <sup>pi</sup> (forage kochia)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>i</sup> (Utah juniper)	Krascheninnikovia lanata <sup>p</sup> (winterfat)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept Cover (%)									
1996	-	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-
2006	14.6	0.6	0.6	-	-	1.5	-	1.7	-	-
2011	11.4	2.8	0.5	-	-	1.2	-	3.7	-	-
2016	15.8	0.6	1	-	-	2.6	0.3	5.5	-	-
2021	-	0.2	-	-	3.4	-	0.1	-	-	-
year	Quadrat Cover (%)									
1996	14.8	-	1.3	0.1	-	0.4	0.0	1.6	-	0.0
2001	15.1	0.5	0.5	0.1	-	0.5	-	1.6	-	-
2006	13.2	0.7	0.2	0.2	-	0.6	-	1.6	0.0	-
2011	11.6	1.6	0.5	0.0	-	0.7	0.0	2.3	-	-
2016	11.2	0.1	0.7	0.0	-	1.3	0.0	2.0	-	-
2021	0.8	0.3	0.0	-	3.4	-	0.0	-	0.0	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-11.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia nova<sup>P</sup> -- (black sagebrush)</b>									
1996	7980	340	11	72	17	56	2	3	30/61
2001	7200	-	16	62	23	3	2	8	22/50
2006	6040	1760	8	59	33	10	4	17	26/58
2011	5500	-	4	75	21	40	1	19	21/55
2016	5320	40220	3	70	27	6	0	15	27/61
2021	120	240	83	17	0	0	0	0	- / -
<b>Artemisia tridentata ssp. wyomingensis<sup>P</sup> -- (Wyoming big sagebrush)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	60	-	0	67	33	0	0	33	60/58
2006	100	-	0	100	0	40	0	20	47/73
2011	340	-	6	82	12	47	6	6	38/77
2016	40	-	0	50	50	0	0	0	62/108
2021	2140	320	99	1	0	0	0	0	- / -
<b>Atriplex confertifolia<sup>P</sup> -- (shadscale saltbush)</b>									
1996	880	120	57	43	0	16	0	0	22/42
2001	380	-	32	37	32	0	0	21	33/57
2006	380	-	11	84	5	0	0	5	30/49
2011	140	20	14	57	29	29	0	29	25/49
2016	200	-	0	100	0	0	0	0	32/57
2021	100	-	100	0	0	0	20	0	- / -
<b>Bassia americana<sup>P</sup> -- (green molly)</b>									
1996	460	20	30	65	4	4	0	0	10/15
2001	340	-	47	53	0	0	0	0	12/12
2006	140	-	14	86	0	0	0	0	14/14
2011	40	-	50	50	0	0	0	0	5/10
2016	60	-	67	33	0	0	0	0	13/13
2021	460	100	78	22	0	0	0	0	- / -
<b>Bassia prostrata<sup>PI</sup> -- (forage kochia)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	8580	1760	66	34	0	0	0	0	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1996	420	40	0	100	0	0	0	0	26/49
2001	520	-	12	77	12	0	0	4	19/38
2006	480	-	8	92	0	4	0	0	25/38
2011	580	-	0	97	3	3	0	0	22/46
2016	440	120	5	96	0	0	0	0	31/51
2021	-	-	-	-	-	-	-	-	- / -
<b>Ericameria nauseosa ssp. nauseosa var. hololeuca<sup>P</sup> -- (rubber rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	67/130
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	44/68
2016	-	-	-	-	-	-	-	-	55/95
2021	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Grayia spinosa -- (spiny hopsage)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	77/114
2011	-	-	-	-	-	-	-	-	45/81
2016	-	-	-	-	-	-	-	-	64/93
2021	-	-	-	-	-	-	-	-	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	360	20	6	94	0	0	0	0	16/23
2001	160	-	0	50	50	0	0	38	11/13
2006	20	-	100	0	0	0	0	0	-/-
2011	20	-	0	100	0	0	0	0	-/-
2016	120	80	0	100	0	0	0	17	21/38
2021	300	-	7	93	0	0	0	0	-/-
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1996	40	-	0	100	0	0	0	0	-/-
2001	60	-	33	67	0	0	0	0	-/-
2006	60	-	67	33	0	0	0	0	-/-
2011	60	-	0	100	0	33	0	0	-/-
2016	80	20	75	25	0	0	0	0	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Krascheninnikovia lanata<sup>p</sup> -- (winterfat)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	120	-	83	17	0	0	0	0	-/-
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	20	-	0	100	0	0	0	0	-/-
2006	-	-	-	-	-	-	-	-	11/4
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	15/21
2021	-	-	-	-	-	-	-	-	-/-
<b>Tetradymia nuttallii -- (Nuttall's horsebrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	30/50

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-11.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

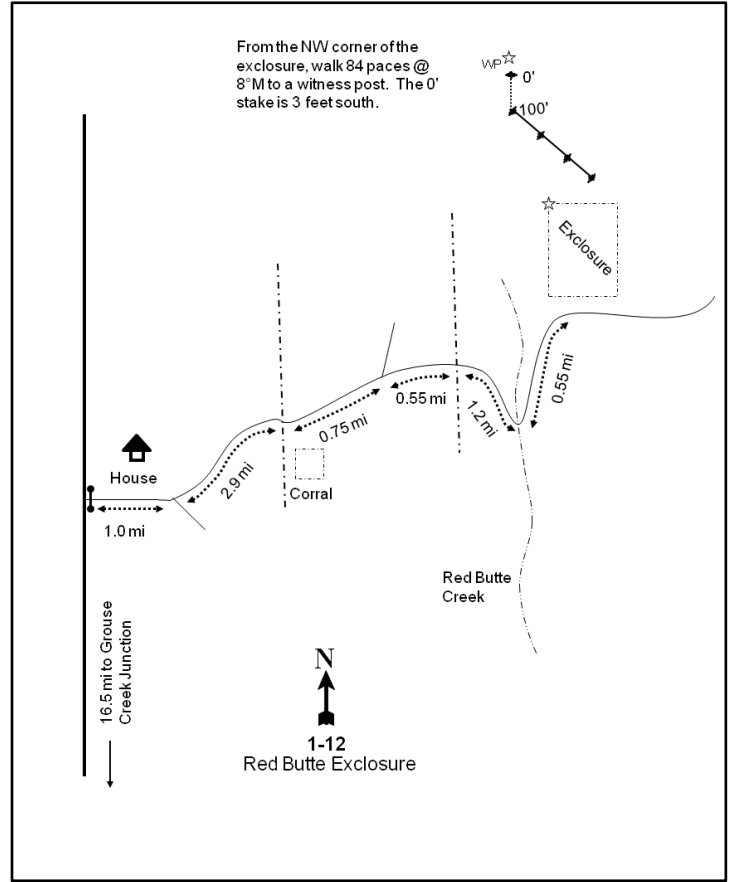
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
1996	53	-	-	-	-	-	10.8
2001	62	-	-	-	-	-	13.1
2006	57	-	35	35	24	6	16.1
2011	57	-	33	50	17	-	13.1
2016	70	-	17	61	17	6	15.4

**Table 01-11.15 - Deer Desirable Components Index: Semidesert Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	19.8	10.5	7.5	3.4	-2.4	0.6	0.0	<b>39.4</b>	Fair
2001	20.0	8.1	7.9	2.5	-8.3	0.3	0.0	<b>30.5</b>	Fair
2006	19.6	5.8	4.0	8.2	-8.0	0.3	0.0	<b>29.9</b>	Fair
2011	18.3	9.2	2.4	5.0	-3.8	0.8	0.0	<b>31.8</b>	Fair
2016	21.5	7.0	1.4	8.5	-4.0	0.7	0.0	<b>35.0</b>	Fair
2021	5.4	0.0	0.0	22.4	-6.4	10.0	0.0	<b>31.4</b>	Fair



## RED BUTTE ENCLOSURE - STUDY NO. 01-12



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Ingham Canyon SE; Township 11N, Range 17W, Section 10  
NAD 83 UTM ZONE 12, 268107 East 4618628 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

7915  
165° magnetic (Line 2: 91° magnetic)  
400ft  
Line 1 (11ft & 34ft), Line 2 (95ft), Line 3 (59ft), Line 4 (71ft)  
Belt 1, 2, 3, 5: No Rebar; Belt 4: 8ft

### Directions to Site

A four-wheel drive vehicle is needed to access this study. Proceed about 16.5 miles north from Grouse Creek Junction and turn right onto Ingham Canyon Road. Travel 1.0 miles to the first significant fork and turn left. Proceed 2.9 miles to a fence with a corral on the east side. Continue east and north for 0.75 miles to a fork and turn right. Proceed 0.55 miles to a fence. From the fence travel 1.2 miles, staying right, to the bottom of the creek. From the creek, proceed up the dugway 0.55 miles to the southwest corner of the Red Butte enclosure. From the northwest corner of the enclosure, walk 84 paces at 8 degrees magnetic to the 0-foot stake of the baseline, which is marked by browse tag #7915. The bearing of the baseline is 165 degrees magnetic and turns to 91 degrees magnetic after the 100-foot stake.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	INGHAM
Elevation	6,590ft (2,009m)
Aspect	Southwest
Slope	10-16%
Sample Dates	06/11/1996, 05/31/2001, 06/01/2006, 05/25/2011, 06/07/2016, 05/25/2021

**Wildlife Habitat and Vegetation History****Table 01-12.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	year-long	
Greater Sage-Grouse	occupied	year-long	brood-rearing

**Table 01-12.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Mixed Mountain Brush	Phase I
1990	Mixed Mountain Brush	Phase I
1996	Mixed Mountain Brush	Phase I
2001	Mixed Mountain Brush	Phase I
2006	Mixed Mountain Brush	Phase I
2011	Mixed Mountain Brush	Phase I
2016	Mixed Mountain Brush	Phase I
2021	Mixed Mountain Brush	Phase I

**Site Notes**

Moose and sage-grouse pellets seen on site in 2016, although neither sampled within the pellet group transect.

**Soils****Table 01-12.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	6.8	68.6	15.4	16.0	2.6	20.7	201.6	0.5	06/11/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Upland Loam (Browse)
NRCS Ecological Site #	R025XY312UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1984, the vegetation on this site has existed as a mixed mountain brush plant community type with mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) as the dominant shrub species (Photos, Pre-1992 Data, Table 01-12.12, Table 01-12.13). The herbaceous understory has remained diverse and abundant over the study years; perennial grasses and forbs had a noticeable increase in cover in 2021 (Table 01-12.10, Table 01-12.11). This site will likely remain in this state unless a major disturbance occurs. There is some conifer encroachment occurring, and the site has been considered to be within Phase I of woodland succession since study establishment (Photos, Table 01-12.12). Density remains low as of 2021 (Table 01-12.14), however, indicating that further tree encroachment may not pose an immediate threat to the ecological integrity of the plant community. Deer winter range condition has generally improved from fair to good over the course of the study. As of 2021, deer winter range conditions were considered to be good. Improvement to deer wintering range can be accomplished through efforts that support mature and reproducing age classes of preferred browse species, and that reduces cheatgrass presence (Table 01-12.15).

**Trend Summary Tables**

**Table 01-12.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	22.7	9.9	-	-	-	-
2001	27.6	9.1	-	-	-	-
2006	25.9	8.1	-	37.0	9.2	-
2011	20.1	4.4	-	26.4	3.2	-
2016	21.5	5.3	-	32.7	3.7	-
2021	25.8	5.1	0.8	30.4	3.7	0.2

**Table 01-12.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	396	280	260	224	15.2	5.5	1.6	7.4
2001	329	247	313	223	10.7	5.5	6.4	9.1
2006	262	254	279	277	3.8	4.8	1.9	13.4
2011	116	236	384	289	2.7	8.1	12.8	8.9
2016	478	193	212	146	43.6	1.7	1.7	9.8
2021	106	331	360	333	0.5	13.5	4.2	18.0

**Table 01-12.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	6.3	0.3	59.2	4.3	4.3	56.3
2001	10.4	0.3	47.0	4.6	3.6	62.6
2006	16.9	0.8	36.0	8.6	3.6	51.0
2011	10.0	0.6	44.5	5.5	4.1	57.2
2016	6.7	0.3	43.6	4.3	0.1	68.3
2021	9.1	0.4	45.6	5.6	0.3	59.0

**Table 01-12.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Shiras Moose	Rabbit
	Quadrat Frequency				
1996	4	6	-	-	-
2001	4	7	-	-	2
2006	7	11	-	-	12
2011	6	5	1	-	1
2016	3	9	1	-	8
2021	5	17	2	-	4
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	2.2 (5.4)	21.5 (53.0)	-	-	-
2006	30.5 (75.3)	17.4 (43.0)	-	-	-
2011	6.5 (16.1)	32.2 (79.5)	-	-	-
2016	-	22.8 (56.3)	3.4 (8.3)	-	-
2021	5.8 (14.3)	33.5 (82.8)	2.0 (5.0)	0.5 (1.2)	-

**Table 01-12.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus porteri (Porter brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency									
1996	10	-	396	14	209	-	5	-	98	21
2001	5	4	329	5	202	-	-	-	99	-
2006	-	-	262	12	168	-	2	1	135	5
2011	-	-	116	14	143	-	-	5	141	5
2016	10	-	478	5	155	8	1	-	67	-
2021	-	-	106	13	212	2	3	3	265	-
year	Average Cover (%)									
1996	0.0	-	15.2	0.0	2.4	-	0.2	-	2.2	0.6
2001	0.0	0.0	10.7	0.0	3.5	-	-	-	1.9	-
2006	-	-	3.8	0.1	1.7	-	0.0	0.0	2.9	0.1
2011	-	-	2.7	0.0	2.6	-	-	0.1	5.2	0.2
2016	0.0	-	43.6	0.0	0.9	0.2	0.0	-	0.5	-
2021	-	-	0.5	0.5	4.0	0.0	0.0	0.0	8.9	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 01-12.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria dimorpha (low pussytoes)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus cibirius (browse milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Camelina microcarpa <sup>ai</sup> (littletop false flax)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium fremontii <sup>a</sup> (Fremont's goosefoot)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)
year	Nested Frequency																
1996	-	61	22	-	3	10	-	5	29	60	1	-	2	-	-	248	15
2001	-	33	117	-	-	-	-	9	7	48	3	-	-	-	1	277	21
2006	-	146	30	-	3	19	-	6	17	45	3	-	3	-	-	244	34
2011	-	48	137	-	3	-	2	19	-	47	-	-	20	3	-	375	2
2016	-	9	15	154	6	6	-	3	11	80	18	1	7	1	-	72	2
2021	0	102	152	211	-	15	-	-	29	111	-	-	7	-	-	288	-
year	Average Cover (%)																
1996	-	0.1	0.1	-	0.1	0.0	-	0.0	0.2	5.6	0.0	-	0.0	-	-	1.5	0.0
2001	-	0.2	0.4	-	-	-	-	0.2	0.1	6.6	0.0	-	-	-	0.0	5.3	0.0
2006	-	1.6	0.1	-	0.0	0.1	-	0.0	0.3	8.2	0.0	-	0.0	-	-	0.9	0.1
2011	-	0.3	1.1	-	0.0	-	0.0	0.4	-	2.7	-	-	0.4	0.3	-	10.8	0.0
2016	-	0.1	0.0	1.2	0.0	0.0	-	0.1	0.3	8.4	0.1	0.0	0.0	0.1	-	0.2	0.0
2021	0.0	1.2	1.1	0.8	-	0.1	-	-	0.5	11.3	-	-	0.0	-	-	2.7	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Comandra umbellata (bastard toadflax)	Cordylanthus ramosus <sup>a</sup> (bushy bird's beak)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Cryptantha <sup>a</sup> (annual cryptantha)	Cymopterus (springparsley)	Delphinium nuttallianum (two-lobed larkspur)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Eriogonum umbellatum (sulphur-flower buckwheat)	Fritillaria atropurpurea (spotted fritillary)	Galium bifolium <sup>a</sup> (twinleaf bedstraw)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Gilia inconspicua <sup>a</sup> (shy gilia)	Hackelia patens (spotted stickseed)	Heliomeris multiflora var. multiflora (showy goldeneye)	Lactuca serriola <sup>a</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)
year	Nested Frequency																
1996	1	-	10	30	-	-	-	-	6	-	-	1	-	16	8	-	-
2001	8	4	17	-	-	-	22	2	4	-	-	13	0	1	13	-	2
2006	2	-	16	56	-	-	19	-	4	-	-	9	7	20	-	-	3
2011	-	-	39	2	36	2	59	6	3	-	-	1	-	6	-	-	-
2016	5	-	10	11	9	-	-	2	-	1	2	-	3	14	-	11	20
2021	2	-	28	-	-	-	26	-	3	2	1	1	18	21	-	21	11
year	Average Cover (%)																
1996	0.0	-	0.0	0.1	-	-	-	-	0.2	-	-	0.0	-	0.1	0.0	-	-
2001	0.2	0.1	0.5	-	-	-	0.1	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	0.0
2006	0.0	-	0.6	0.1	-	-	0.0	-	0.1	-	-	0.0	0.0	0.6	-	-	0.0
2011	-	-	0.7	0.0	1.2	0.0	0.6	0.0	0.0	-	-	0.0	-	0.3	-	-	-
2016	0.2	-	0.3	0.0	0.0	-	-	0.0	-	0.0	0.0	-	0.0	0.1	-	0.0	0.0
2021	0.0	-	1.1	-	-	-	0.2	-	0.2	0.0	0.0	0.0	0.1	0.5	-	0.1	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lithophragma parviflorum (smallflower woodland-star)	Lithospermum ruderale (western stone seed)	Lomatium triternatum (nineleaf biscuitroot)	Lupinus argenteus (silvery lupine)	Machaeranthera (tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Nemophila breviflora <sup>a</sup> (basin nemophila)	Orogenia linearifolia (Great Basin Indian potato)	Packera multilobata (lobeleaf groundsel)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Ranunculus inamoenus (graceful buttercup)	Sedum lanceolatum (spearleaf stonecrop)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Silene antirrhina <sup>a</sup> (sleepy silene)	Stenotus acualis (stemless mock goldenweed)	Taraxacum officinale (common dandelion)
year	Nested Frequency																
1996	-	-	3	-	4	-	-	-	-	94	50	-	6	-	3	9	-
2001	-	3	24	1	-	97	-	-	-	57	-	-	-	-	-	-	-
2006	12	-	25	-	-	64	3	-	-	135	53	-	1	-	-	2	-
2011	97	-	27	3	-	11	-	1	-	42	-	88	-	8	-	7	-
2016	-	-	0	-	-	3	-	-	-	11	3	-	-	-	-	1	5
2021	21	2	68	-	-	44	3	16	3	81	12	35	-	4	-	-	1
year	Average Cover (%)																
1996	-	-	0.0	-	0.0	-	-	-	-	0.6	0.1	-	0.0	-	0.0	0.0	-
2001	-	0.0	0.2	0.0	-	0.7	-	-	-	0.5	-	-	-	-	-	-	-
2006	0.1	-	0.3	-	-	0.1	0.0	-	-	1.3	0.2	-	0.0	-	-	0.0	-
2011	0.9	-	0.1	0.0	-	0.1	-	0.0	-	0.3	-	0.9	-	0.1	-	0.1	-
2016	-	-	0.0	-	-	0.0	-	-	-	0.0	0.0	-	-	-	-	0.0	0.1
2021	0.1	0.2	0.7	-	-	0.2	0.0	0.0	0.0	0.7	0.0	0.2	-	0.0	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES			
	Tragopogon dubius <sup>ai</sup> (yellow salsify)	unknown perennial forb (unknown forb)	Veronica biloba <sup>ai</sup> (two-lobed speedwell)
year	Nested Frequency		
1996	0	16	3
2001	3	-	10
2006	-	-	48
2011	-	3	17
2016	-	-	12
2021	6	-	-
year	Average Cover (%)		
1996	0.0	0.1	0.0
2001	0.0	-	0.1
2006	-	-	0.5
2011	-	0.0	0.1
2016	-	-	0.0
2021	0.1	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 01-12.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES									
Amelanchier utahensis <sup>p</sup> (Utah serviceberry)									
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)									
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)									
Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)									
Eriogonum microthecum <sup>p</sup> (slender buckwheat)									
Juniperus osteosperma <sup>i</sup> (Utah juniper)									
Opuntia polyacantha (plains pricklypear)									
Purshia tridentata <sup>p</sup> (antelope bitterbrush)									
Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)									
year	Line Intercept Cover (%)								
1996	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-
2006	-	11.2	7.5	-	-	-	1.7	11.2	14.6
2011	-	8.6	1.9	0.4	-	-	0.9	8.7	9.1
2016	0.2	12.2	3.4	-	-	-	0.3	4	16.3
2021	-	9.4	3.2	-	-	0.2	0.5	6.4	14.6
year	Quadrat Cover (%)								
1996	0.3	9.4	6.4	0.1	0.1	-	3.3	6.7	6.1
2001	0.0	8.3	6.4	-	0.1	-	2.7	10.7	8.4
2006	-	7.5	5.6	0.1	-	-	2.4	9.6	8.9
2011	0.0	6.6	2.4	0.2	-	-	1.8	4.4	9.1
2016	0.0	8.7	3.9	-	0.2	-	1.4	2.3	10.4
2021	-	7.3	3.4	0.2	-	0.8	1.5	5.3	13.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-12.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1996	60	-	0	33	67	0	33	0	67/77
2001	20	-	0	100	0	100	0	0	67/65
2006	20	-	0	100	0	0	0	0	81/85
2011	20	-	0	100	0	0	0	0	85/81
2016	20	-	0	100	0	0	100	0	86/103
2021	40	-	0	50	50	0	0	50	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1996	1440	80	15	61	24	15	0	10	71/88
2001	1320	-	5	61	35	2	0	14	70/93
2006	1400	2700	9	63	29	11	4	14	80/110
2011	1740	40	24	61	15	5	0	15	81/99
2016	2380	180	25	63	12	0	0	11	78/101
2021	1840	-	4	55	40	11	0	40	- / -
<b>Cercocarpus montanus<sup>P</sup> -- (alderleaf mountain mahogany)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	76/131
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	3640	-	9	91	0	2	0	0	43/68
2001	2940	20	4	82	14	1	0	5	38/50
2006	2240	-	5	87	8	0	0	1	42/63
2011	1380	-	6	67	28	7	0	39	35/53
2016	1920	60	4	90	6	0	0	5	38/44
2021	1480	-	1	47	51	0	0	46	- / -
<b>Eriogonum microthecum<sup>P</sup> -- (slender buckwheat)</b>									
1996	60	-	0	100	0	33	0	0	24/28
2001	40	-	0	100	0	0	0	0	25/43
2006	40	-	0	100	0	50	0	0	30/40
2011	-	-	-	-	-	-	-	-	- / -
2016	80	-	0	100	0	0	0	0	22/34
2021	60	-	0	100	0	0	0	0	- / -
<b>Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)</b>									
1996	100	-	0	100	0	0	0	0	54/52
2001	40	-	0	100	0	0	0	0	54/76
2006	20	-	0	0	100	0	0	100	67/69
2011	60	-	0	33	67	0	0	100	42/60
2016	-	-	-	-	-	-	-	-	59/54
2021	260	-	0	77	23	15	0	23	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	1820	-	6	91	3	0	0	6	12/42
2001	2080	-	10	86	5	0	0	4	11/34
2006	2140	-	2	94	4	0	0	2	13/42
2011	1140	-	7	86	7	0	0	47	9/41
2016	1260	-	0	97	3	0	0	3	12/27
2021	820	-	2	73	24	0	0	24	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	780	-	8	87	5	36	3	3	61/120
2001	720	-	8	61	31	53	17	0	77/156
2006	860	480	0	100	0	35	40	0	80/135
2011	680	-	3	91	6	12	53	56	67/125
2016	640	-	0	100	0	38	34	3	69/123
2021	600	60	0	67	33	23	37	33	- / -
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	3820	140	40	59	2	2	1	1	42/93
2001	2820	-	16	84	1	1	0	4	43/83
2006	2960	-	23	74	3	0	3	0	48/91
2011	3160	160	32	67	1	2	0	1	44/81
2016	4280	-	3	97	0	1	0	1	54/83
2021	4120	-	7	71	21	7	0	22	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-12.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

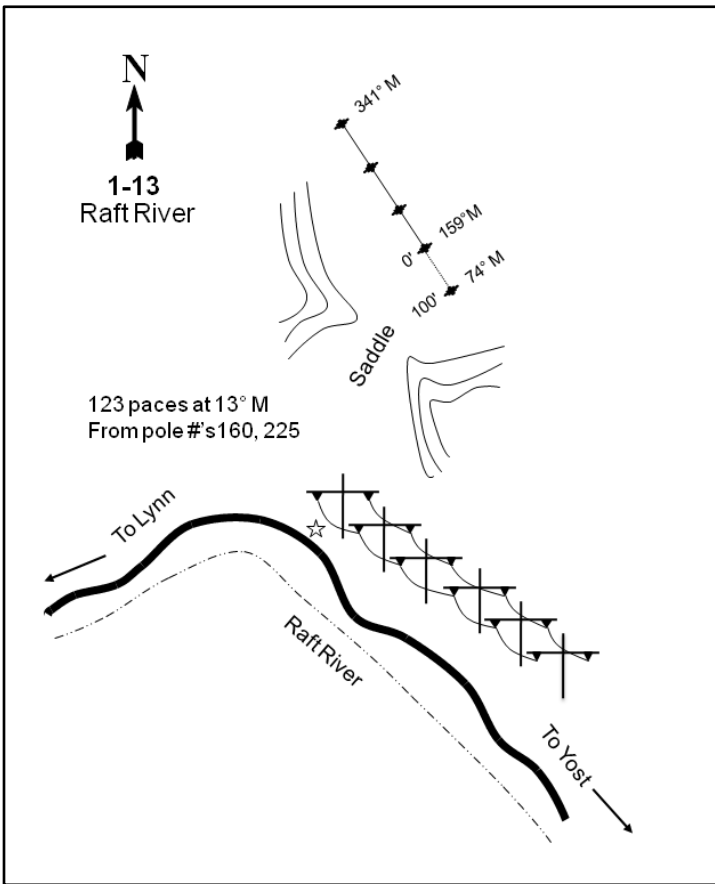
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2016	6	-	33	67	-	-	8.7
2021	9	-	50	50	-	-	10.8

**Table 01-12.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	28.6	11.2	9.7	10.9	-11.4	10.0	0.0	<b>59.0</b>	Fair
2001	30.0	8.2	4.7	11.1	-8.0	10.0	0.0	<b>55.9</b>	Fair
2006	30.0	12.0	5.8	9.6	-2.9	10.0	0.0	<b>64.6</b>	Fair-Good
2011	30.0	12.9	10.0	16.2	-2.0	10.0	0.0	<b>77.1</b>	Good
2016	30.0	13.7	5.5	3.4	-20.0	10.0	0.0	<b>42.6</b>	Poor
2021	30.0	6.1	2.4	27.0	-0.4	10.0	0.0	<b>75.1</b>	Good



## RAFT RIVER NARROWS - STUDY NO. 01-13



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Buck Hollow NW; Township 14N, Range 16W, Section 09  
NAD 83 UTM ZONE 12, 276739 East 4648043 North

### Transect Information

Browse Tag # (0' Stake)	7917
Transect Bearing	160° magnetic (Lines 2-4: 341° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

### Directions to Site

From Lynn, travel to the bridge over the Raft River just before the Upper Narrows. Proceed east 0.95 miles from the bridge to a set of double power poles (numbers 160 and 225). From the northernmost pole, walk 123 paces at 13 degrees magnetic to the 0-foot stake of the frequency baseline, which is marked with browse tag #7917. The bearing of the baseline to the 100-foot stake is 160 degrees magnetic. The rest of the baseline runs 341 degrees magnetic from the 0-foot baseline stake.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	JUNCTION CREEK
Elevation	5,700ft (1,737m)
Aspect	Southwest
Slope	30-35%
Sample Dates	06/12/1996, 05/30/2001, 05/31/2006, 06/01/2011, 06/01/2016, 05/24/2021

**Table 01-13.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	City of Rocks	-	2000	17573

**Wildlife Habitat and Vegetation History**

**Table 01-13.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Greater Sage-Grouse	occupied	year-long	brood-rearing

**Table 01-13.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Wyoming Big Sagebrush	No Encroachment
1990	Wyoming Big Sagebrush	No Encroachment
1996	Wyoming Big Sagebrush	Phase I
2001	Wyoming Big Sagebrush	Phase I
2006	Wyoming Big Sagebrush	Phase I
2011	Wyoming Big Sagebrush	Phase I
2016	Wyoming Big Sagebrush	Phase I
2021	Wyoming Big Sagebrush	Phase I

**Site Notes**

No Notes

**Soils**

**Table 01-13.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	8.2	46.6	23.4	30.0	1.7	3.5	441.6	1.9	06/12/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	12 inches
NRCS Ecological Site	Upland Gravelly Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R028AY307UT
States and Transitions	Current State: Community Phase 2.2

Since study establishment in 1984, this site has remained dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) (Photos, Pre-1992 Data, Table 01-13.12, Table 01-13.13) with a diverse, yet generally sparse herbaceous understory (Table 01-13.7). Following a fire in 2000 (Table 01-13.1), part of the site transitioned to a community dominated by the introduced annual grass species cheatgrass (*Bromus tectorum*) in most sample years, but cheatgrass had minimal cover in 2021 (Table 01-13.10). It is predicted that Wyoming big sagebrush will continue to reestablish as the major component within the plant community (USDA-ARS Jornada Experimental Range et al., 2021). However, 40% of sagebrush plants exhibited poor vigor in 2021 (Table 01-13.13), likely due to drought stress; decreases in sagebrush could occur if similar climatic conditions are sustained in the future. Deer winter range condition has varied little between very poor to poor-fair over the course of the study. As of 2021, deer winter range conditions were considered to be very poor-poor. Improvement to deer wintering range can be accomplished through efforts that increase preferred browse cover and that supports mature, preproducing, plants; and that diversifies the perennial forb community while reducing cheatgrass (Table 01-13.15).

**Trend Summary Tables**

**Table 01-13.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	14.6	8.4	-	-	-	-
2001	9.7	1.4	-	-	-	-
2006	9.0	1.6	-	9.6	3.0	-
2011	13.0	1.5	-	10.9	3.8	-
2016	13.6	2.1	-	16.5	3.5	-
2021	14.0	1.7	-	17.2	2.6	-

**Table 01-13.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	341	119	64	93	3.6	1.9	0.2	0.9
2001	405	110	198	24	13.0	2.0	2.2	0.1
2006	454	130	220	32	16.5	6.1	3.2	0.8
2011	375	142	355	36	7.5	3.6	5.0	0.2
2016	378	163	259	41	18.7	3.7	2.4	0.4
2021	253	178	256	27	3.6	5.7	3.2	0.1

**Table 01-13.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	12.4	2.2	29.5	8.9	26.3	30.6
2001	10.4	3.1	21.0	19.3	21.6	29.3
2006	8.5	3.0	28.0	9.7	21.5	37.1
2011	10.6	0.6	18.2	16.7	25.3	32.5
2016	15.2	1.6	20.5	22.7	28.3	37.7
2021	12.6	1.7	29.1	22.3	22.6	29.7

**Table 01-13.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	-	15	-	4
2001	-	2	-	6
2006	4	19	-	11
2011	3	6	-	9
2016	1	3	-	2
2021	2	1	-	13
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	-	11.4 (28.1)	0.7 (1.7)	-
2006	0.7 (1.8)	26.8 (66.2)	-	-
2011	8.0 (19.7)	23.4 (57.9)	2.0 (5.0)	-
2016	1.5 (3.6)	10.7 (26.5)	-	-
2021	2.2 (5.4)	-	-	-

**Table 01-13.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum thurberianum (Thurber's needlegrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)	Vulpia octoflora <sup>a</sup> (sixweeks fescue)
year	Nested Frequency								
1996	12	-	340	39	17	48	13	-	12
2001	9	-	405	14	18	60	21	-	-
2006	16	-	454	13	16	76	28	-	17
2011	32	-	375	4	-	102	25	-	7
2016	16	5	376	19	29	82	38	-	14
2021	20	1	253	45	23	97	51	3	8
year	Average Cover (%)								
1996	0.1	-	3.5	0.6	0.3	0.7	0.3	-	0.1
2001	0.5	-	13.0	0.1	0.6	0.5	0.3	-	-
2006	1.9	-	16.5	0.2	0.6	2.3	1.0	-	0.0
2011	1.2	-	7.4	0.2	-	1.8	0.4	-	0.0
2016	0.6	0.1	18.6	0.4	0.9	0.7	1.0	-	0.1
2021	0.9	0.0	3.5	0.7	0.8	1.3	1.8	0.1	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 01-13.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus calycosus (Torrey's milkvetch)	Calochortus nuttallii (sego lily)	Camissonia minor <sup>ai</sup> (small evening primrose)	Castilleja angustifolia (northwestern Indian paintbrush)	Castilleja linariifolia (Wyoming Indian paintbrush)	Caulanthus crassicaulis <sup>ai</sup> (thickstem wild cabbage)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium leptophyllum <sup>a</sup> (narrowleaf goosefoot)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Cryptantha (cryptantha)	Cryptantha watsonii <sup>a</sup> (Watson's cryptantha)	Delphinium nuttallianum (twolobe larkspur)
year	Nested Frequency																
1996	-	12	4	21	-	-	-	5	-	2	-	39	-	4	9	-	-
2001	-	5	-	4	-	-	-	1	-	-	-	5	-	-	-	-	1
2006	-	152	-	7	0	-	-	5	3	-	-	9	-	6	-	-	-
2011	4	194	-	10	-	-	-	-	-	-	7	4	3	-	3	-	4
2016	-	136	-	13	6	1	2	-	-	-	-	8	-	-	3	1	-
2021	-	242	-	-	7	1	-	1	-	-	-	8	-	-	-	-	3
year	Average Cover (%)																
1996	-	0.0	0.0	0.2	-	-	-	0.1	-	0.0	-	0.2	-	0.0	0.0	-	-
2001	-	0.0	-	0.0	-	-	-	0.0	-	-	-	0.0	-	-	-	-	0.0
2006	-	2.7	-	0.6	0.0	-	-	0.0	0.0	-	-	0.1	-	0.0	-	-	-
2011	0.0	1.1	-	0.1	-	-	-	-	-	-	0.0	0.0	0.0	-	0.0	-	0.0
2016	-	1.2	-	0.1	0.0	0.0	0.0	-	-	-	-	0.0	-	-	0.1	0.0	-
2021	-	3.0	-	-	0.0	0.0	-	0.0	-	-	-	0.0	-	-	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Descurainia pinnata <sup>a</sup> (western tansymustard)	Erigeron pumilus (shaggy fleabane)	Eriogonum caespitosum (matted buckwheat)	Eriogonum ovalifolium (cushion buckwheat)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Gilia inconspicua <sup>a</sup> (shy gilia)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Mimulus suksdorfii <sup>a</sup> (Suksdorf's monkeyflower)	Oenothera caespitosa (tufted evening primrose)	Orobanche fasciculata (clustered broomrape)	Penstemon (beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Sisymbrium altissimum <sup>ai</sup> (tall tumbledustard)
year	Nested Frequency																
1996	23	11	6	-	-	8	1	18	4	-	-	6	-	-	9	-	-
2001	105	7	-	-	3	115	13	26	-	-	-	-	-	-	6	-	-
2006	8	4	-	2	-	-	-	30	4	4	-	-	-	-	-	-	85
2011	83	7	-	-	-	148	4	126	7	13	-	-	-	-	-	2	186
2016	30	6	-	-	3	128	-	24	-	-	7	-	3	-	1	4	42
2021	4	3	-	1	-	14	-	1	-	-	-	-	-	2	4	-	14
year	Average Cover (%)																
1996	0.1	0.1	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	-	-	0.2	-	-
2001	1.5	0.0	-	-	0.0	0.4	0.1	0.1	-	-	-	-	-	-	0.1	-	-
2006	0.0	0.0	-	0.1	-	-	-	0.1	0.0	0.0	-	-	-	-	-	-	0.3
2011	0.2	0.0	-	-	-	0.5	0.0	0.3	0.0	0.0	-	-	-	-	-	0.0	2.9
2016	0.1	0.1	-	-	0.0	0.8	-	0.2	-	-	0.0	-	0.0	-	0.0	0.0	0.1
2021	0.0	0.0	-	0.0	-	0.0	-	0.0	-	-	-	-	-	0.0	0.0	-	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Sphaeralcea munroana (Munro's globemallow)	Tragopogon dubius <sup>ai</sup> (yellow salsify)
year	Nested Frequency	
1996	-	1
2001	-	-
2006	-	0
2011	-	-
2016	-	1
2021	0	-
year	Average Cover (%)	
1996	-	0.0
2001	-	-
2006	-	0.0
2011	-	-
2016	-	0.0
2021	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 01-13.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)	Opuntia polyacantha (plains pricklypear)	Sarcobatus vermiculatus (greasewood)
year	Line Intercept Cover (%)				
1996	-	-	-	-	-
2001	-	-	-	-	-
2006	9.6	1.4	-	-	1.6
2011	10.9	2.4	-	0.4	1
2016	16.5	2.1	1.2	0.2	-
2021	17.2	1.5	-	0.2	0.9
year	Quadrat Cover (%)				
1996	14.6	7.2	-	1.1	0.1
2001	9.7	0.4	-	0.4	0.6
2006	9.0	1.0	-	0.0	0.6
2011	13.0	1.1	-	0.1	0.4
2016	13.6	0.6	1.3	0.2	-
2021	14.0	0.8	0.7	0.2	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-13.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
1996	15500	14200	84	12	4	2	0	1	61/95
2001	7020	40	47	46	7	0	0	3	49/63
2006	4920	80	8	74	18	35	20	16	56/66
2011	4420	20	28	68	4	7	0	2	45/62
2016	3840	580	6	84	10	8	0	10	57/100
2021	3120	-	5	50	45	3	0	40	- / -
<b>Atriplex confertifolia<sup>p</sup> -- (shadscale saltbush)</b>									
1996	40	-	50	50	0	0	0	0	34/54
2001	60	-	0	100	0	0	0	0	26/33
2006	40	-	0	100	0	0	0	0	35/56
2011	-	-	-	-	-	-	-	-	45/97
2016	40	-	0	100	0	0	0	0	41/68
2021	40	-	0	0	100	0	0	100	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1996	6360	640	22	61	16	4	0	4	31/49
2001	1120	-	7	48	45	0	0	30	19/27
2006	1400	20	9	80	11	3	0	9	26/35
2011	1360	-	28	66	6	2	0	2	32/49
2016	1240	-	5	69	26	0	0	23	35/45
2021	1060	-	2	72	26	4	4	25	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	92/102
2001	-	-	-	-	-	-	-	-	63/82
2006	-	-	-	-	-	-	-	-	49/67
2011	-	-	-	-	-	-	-	-	64/88
2016	120	-	0	100	0	0	0	0	57/78
2021	80	-	25	25	50	0	0	0	- / -
<b>Grayia spinosa -- (spiny hopsage)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	134/155
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Linanthus pungens -- (granite prickly phlox)</b>									
1996	20	-	0	100	0	0	0	0	23/26
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	40	-	0	100	0	0	0	0	54/68
2021	-	-	-	-	-	-	-	-	-/-
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	340	20	12	77	12	0	0	6	10/36
2001	160	-	13	75	13	0	0	0	10/22
2006	160	-	13	75	13	0	0	13	10/21
2011	140	-	0	100	0	0	0	0	10/30
2016	220	-	0	100	0	0	0	0	12/40
2021	320	20	6	94	0	0	0	0	- / -
<b>Sarcobatus vermiculatus -- (greasewood)</b>									
1996	40	-	0	100	0	0	0	0	74/133
2001	40	-	50	50	0	0	0	0	- / -
2006	40	-	0	100	0	0	0	0	96/141
2011	80	-	0	75	25	0	0	25	76/105
2016	40	-	100	0	0	0	0	0	80/125
2021	40	-	0	0	100	0	0	100	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-13.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

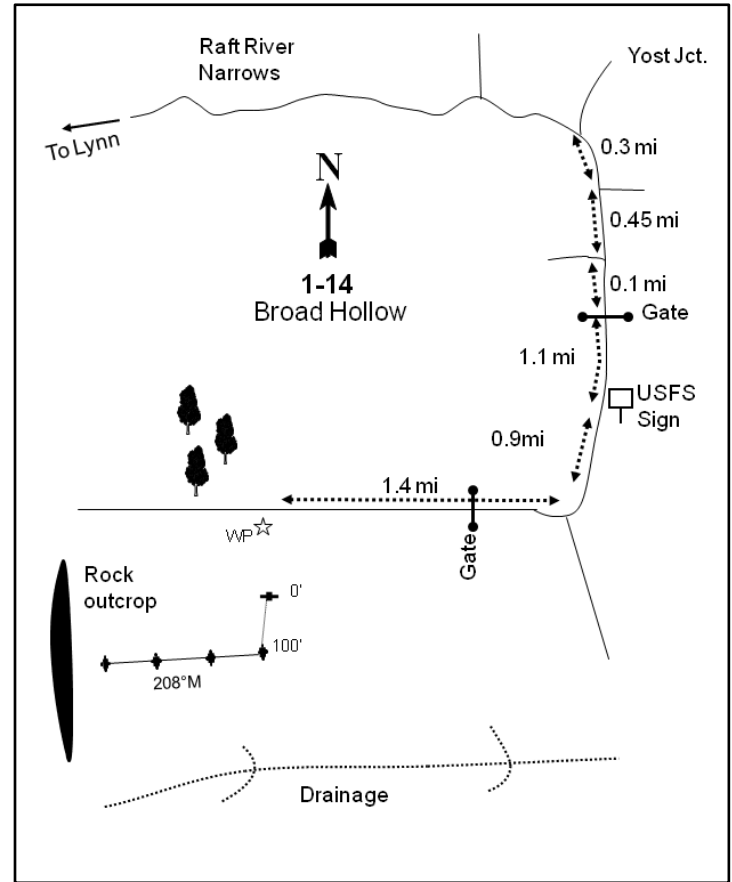
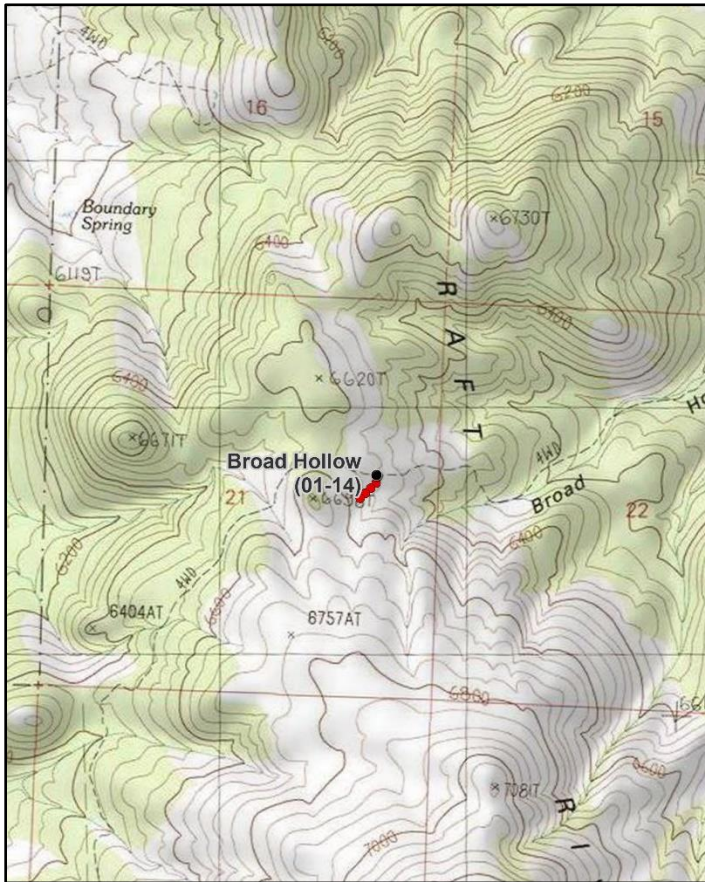
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2016	14	-	-	-	100	-	15.0
2021	5	50	-	50	-	-	10.5
<b>Pinus monophylla (singleleaf pinyon)</b>							
2016	14	-	100	-	-	-	2.0
2021	7	50	50	-	-	-	2.5

**Table 01-13.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	18.2	13.8	15.0	3.9	-2.7	1.7	0.0	<b>49.9</b>	Poor-Fair
2001	12.1	12.9	15.0	4.1	-9.8	0.3	0.0	<b>34.6</b>	Very Poor-Poor
2006	12.0	9.6	3.9	12.1	-12.4	1.6	0.0	<b>26.8</b>	Very Poor
2011	13.6	13.8	14.1	7.2	-5.6	0.4	0.0	<b>43.4</b>	Poor
2016	20.6	11.9	2.9	7.4	-14.0	0.7	0.0	<b>29.4</b>	Very Poor
2021	21.5	1.5	2.6	11.4	-2.7	0.3	0.0	<b>34.6</b>	Very Poor-Poor



## BROAD HOLLOW - STUDY NO. 01-14



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Buck Hollow SE; Township 14N, Range 16W, Section 21  
NAD 83 UTM ZONE 12, 277578 East 4644920 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

7916  
160° magnetic (Lines 2-4: 208° magnetic)  
400ft  
Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)  
Belt 5: 5ft

### Directions to Site

From the junction of State Route 30 and Morris Ranch Road, proceed 29.2 miles to the Yost junction, passing through Lynn and crossing the Raft River. Turn right and proceed for 0.3 miles, passing the creek and the cattleguard. Turn right, travel 0.45 miles, and take the left fork (the right fork leads to a bridge). Proceed 0.1 miles and pass through the gate. Continue 1.1 miles to the Forest Service fence and sign. Continue 0.9 miles, turn right, and proceed 1.4 miles to a witness post on left (south) side of the road (the road is steep, winding and rough). From the rock pile, walk five paces at a bearing of 137 degrees magnetic to the 0-foot stake of the baseline which is marked by browse tag #7916. The bearing of the baseline is 160 degrees magnetic. From the 100-foot baseline stake, the baseline doglegs and runs 208 degrees magnetic.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	6,500ft (1,981m)
Aspect	Northeast
Slope	12%
Sample Dates	06/12/1996, 06/05/2001, 05/31/2006, 06/01/2011, 06/01/2016, 05/25/2021

**Table 01-14.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	Prior to 1984	-
Fire - Wildfire	-	-	1996-2001	-

**Wildlife Habitat and Vegetation History****Table 01-14.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Greater Sage-Grouse	occupied	year-long	brood-rearing

**Table 01-14.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Mixed Mountain Brush	No Encroachment
1990	Mixed Mountain Brush	No Encroachment
1996	Mixed Mountain Brush	No Encroachment
2001	Mixed Mountain Brush	Phase I
2006	Mixed Mountain Brush	Phase I
2011	Mixed Mountain Brush	Phase I
2016	Mixed Mountain Brush	Phase I
2021	Mixed Mountain Brush	Phase I

**Site Notes**

A deer skeleton was found near the site in 2016.

**Soils****Table 01-14.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.2	63.7	19.0	17.3	1.6	9.1	121.6	0.5	06/12/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Upland Loam (Browse)
NRCS Ecological Site #	R025XY312UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1984, the vegetation on this site has existed as a mixed stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), antelope bitterbrush (*Purshia tridentata*), and mountain snowberry (*Symphoricarpos oreophilus*) (Photos, Pre-1992 Data, Table 01-14.12, Table 01-14.13). Native perennial grasses make up a significant portion of the herbaceous understory. However, the introduced annual grass species cheatgrass (*Bromus tectorum*) has had periodic increases in cover and, at times, has dominated the community (Table 01-04.7, Table 01-04.10). Young Utah juniper (*Juniperus osteosperma*) trees have been sparsely scattered across the site, but encroachment appears to be slow; the site has been considered to be within Phase I of woodland succession since 2001 (Table 01-14.4, Table 01-14.14). Deer winter range condition has generally improved from fair-good to excellent. Improvement to deer wintering range can be accomplished through efforts that support mature and reproducing plants, and reduces cheatgrass in the community (Table 01-14.15).

**Trend Summary Tables****Table 01-14.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	23.0	11.1	-	-	-	-
2001	22.1	10.3	-	-	-	-
2006	23.8	13.8	-	35.3	13.9	-
2011	17.9	7.3	-	27.4	7.2	-
2016	21.7	9.8	-	33.9	19.3	-
2021	25.7	10.8	-	31.5	8.8	-

**Table 01-14.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	449	275	200	168	12.2	6.5	0.6	4.9
2001	347	332	273	84	6.4	14.7	3.5	5.6
2006	358	292	250	221	6.7	11.0	1.3	8.3
2011	307	272	300	141	3.2	7.9	3.6	3.9
2016	487	205	320	93	37.9	6.9	8.1	4.5
2021	242	285	254	135	2.3	14.3	5.0	7.9

**Table 01-14.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	10.7	1.4	62.0	1.3	2.1	49.4
2001	15.8	1.2	50.3	0.9	1.5	56.3
2006	20.8	1.8	38.6	2.3	2.1	54.7
2011	19.4	1.4	48.0	0.4	1.3	43.2
2016	12.1	1.9	39.0	1.3	2.0	67.3
2021	14.0	2.5	41.9	1.5	2.3	54.9

**Table 01-14.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Yellow-bellied Marmot	Rabbit
	Quadrat Frequency				
1996	3	32	-	-	17
2001	2	17	-	-	6
2006	3	10	1	-	50
2011	2	13	2	-	10
2016	1	9	1	-	27
2021	2	17	-	2	26
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	10.9 (26.9)	28.8 (71.2)	0.7 (1.7)	-	-
2006	2.9 (7.2)	30.8 (76.1)	-	-	-
2011	-	46.9 (115.9)	-	-	-
2016	-	18.7 (46.3)	-	-	-
2021	5.8 (14.3)	53.0 (130.8)	0.7 (1.7)	-	-

**Table 01-14.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency										
Achnatherum hymenoides (Indian ricegrass)	15	449	10	150	10	1	-	2	165	23	4
Bromus tectorum <sup>ai</sup> (cheatgrass)	0	347	-	224	16	1	3	-	208	16	-
Elymus elymoides (squirreltail)	3	358	-	161	10	4	4	3	192	11	-
Elymus lanceolatus (thickspike wheatgrass)	2	307	5	121	-	0	-	3	213	14	-
Hesperostipa comata (needle and thread)	-	487	3	83	8	1	8	-	149	9	-
Leymus cinereus (basin wildrye)	3	242	14	125	7	0	14	-	210	9	-
Melica bulbosa (oniongrass)	Average Cover (%)										
Poa fendleriana (muttongrass)	0.5	12.2	0.0	1.8	0.3	0.0	-	0.0	3.3	0.5	0.0
Poa secunda (Sandberg bluegrass)	0.0	6.4	-	6.0	0.6	0.1	0.0	-	7.8	0.2	-
Pseudoroegneria spicata (bluebunch wheatgrass)	0.0	6.7	-	1.6	0.5	0.2	0.0	0.0	8.1	0.5	-
Vulpia octoflora <sup>a</sup> (sixweeks fescue)	0.0	3.2	0.0	1.4	-	0.1	-	0.0	6.0	0.4	-
	-	37.9	0.0	1.2	0.2	0.1	0.1	-	5.1	0.1	-
	0.0	2.3	0.2	3.1	0.2	0.1	0.2	-	10.2	0.2	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 01-14.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Agoseris glauca (pale agoseris)	57	11	29	3	36	-	3	4	-	-	170	2	6	45	61	-	4
Alyssum desertorum <sup>ai</sup> (desert madwort)	10	54	4	-	29	-	3	-	-	-	250	6	3	42	-	-	9
Arabis sparsiflora <sup>a</sup> (sicklepod rockcress)	48	22	5	1	35	-	6	2	8	-	212	-	4	36	138	-	3
Astragalus beckwithii (Beckwith's milkvetch)	33	78	5	7	40	3	39	-	7	-	286	-	7	54	4	-	22
Balsamorhiza sagittata (arrowleaf balsamroot)	13	299	9	-	29	-	-	-	-	-	38	-	-	33	-	1	17
Calochortus nuttallii (sego lily)	51	228	11	-	33	3	1	2	-	0	90	-	-	28	-	-	0
Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Average Cover (%)																
Chaenactis douglasii (Douglas' dustymaiden)	0.1	0.0	0.1	0.2	3.6	-	0.0	0.0	-	-	0.5	0.0	0.0	0.5	0.1	-	0.0
Chenopodium leptophyllum <sup>a</sup> (narrowleaf goosefoot)	0.0	0.3	0.0	-	4.2	-	0.0	-	-	-	2.9	0.0	0.0	1.2	-	-	0.2
Cirsium (thistle)	0.2	0.0	0.0	0.0	5.8	-	0.0	0.0	0.0	-	0.9	-	0.0	0.7	0.4	-	0.0
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	0.4	0.6	0.0	0.0	2.7	0.0	0.1	-	0.0	-	2.6	-	0.0	0.4	0.0	-	0.1
Collomia linearis <sup>a</sup> (tiny trumpet)	0.1	7.7	0.0	-	3.6	-	-	-	-	-	0.1	-	-	0.4	-	0.0	0.1
Comandra umbellata (bastard toadflax)	0.4	3.9	0.1	-	3.8	0.0	0.0	0.0	-	0.0	0.7	-	-	0.8	-	-	0.0
Crepis acuminata (tapertip hawksbeard)																	
Cryptantha (cryptantha)																	
Cryptantha <sup>a</sup> (annual cryptantha)																	
Descurainia pinnata <sup>a</sup> (western tansymustard)																	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES																	
Eriogonum umbellatum (sulphur-flower buckwheat)																	
Galium biflorum <sup>a</sup> (twinleaf bedstraw)																	
Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)																	
Hackelia patens (spotted stickseed)																	
Lactuca serriola <sup>ai</sup> (prickly lettuce)																	
Lappula occidentalis <sup>a</sup> (flatspine stickseed)																	
Lathyrus brachycalyx (Bonneville pea)																	
Lepidium <sup>a</sup> (pepperweed)																	
Lithospermum ruderale (western stone seed)																	
Lomatium triternatum (nineleaf biscuitroot)																	
Machaeranthera canescens (hoary tansyaster)																	
Microsteris gracilis <sup>a</sup> (slender phlox)																	
Mimulus suksdorfii <sup>a</sup> (Suksdorf's monkeyflower)																	
Navarretia intertexta <sup>a</sup> (needleleaf navarretia)																	
Packera multilobata (lobeleaf groundsel)																	
Phlox longifolia (longleaf phlox)																	
Polygonum douglasii <sup>a</sup> (Douglas' knotweed)																	
year	Nested Frequency																
1996	1	-	1	15	-	11	-	3	-	-	3	-	-	-	1	7	5
2001	3	-	4	3	-	29	1	-	-	4	-	9	-	1	-	3	-
2006	4	6	35	33	-	16	-	-	3	-	2	14	-	-	-	4	46
2011	-	3	8	19	-	31	-	-	4	2	5	18	-	-	3	-	-
2016	2	-	2	35	1	26	-	4	-	-	-	5	-	-	5	4	-
2021	2	1	25	49	-	27	-	-	2	-	1	10	3	-	2	14	-
year	Average Cover (%)																
1996	0.0	-	0.0	0.1	-	0.0	-	0.0	-	-	0.0	-	-	-	0.1	0.0	0.0
2001	0.0	-	0.0	0.1	-	0.1	0.0	-	-	0.0	-	0.0	-	0.0	-	0.0	-
2006	0.0	0.0	0.1	1.1	-	0.0	-	-	0.0	-	0.0	0.1	-	-	-	0.0	0.1
2011	-	0.0	0.0	0.2	-	0.1	-	-	0.1	0.0	0.0	0.1	-	-	0.0	-	-
2016	0.0	-	0.0	0.5	0.0	0.1	-	0.1	-	-	-	0.0	-	-	0.0	0.0	-
2021	0.0	0.0	0.1	2.7	-	0.1	-	-	0.0	-	0.0	0.0	0.0	-	0.1	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES		
Ranunculus inamoenus (graceful buttercup)		
Tragopogon dubius <sup>ai</sup> (yellow salsify)		
year	Nested Frequency	
1996	-	-
2001	-	2
2006	-	-
2011	-	1
2016	-	-
2021	1	8
year	Average Cover (%)	
1996	-	-
2001	-	0.0
2006	-	-
2011	-	0.0
2016	-	-
2021	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 01-14.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)	Eriogonum microthecum <sup>p</sup> (slender buckwheat)	Linanthus pungens (granite prickly phlox)	Opuntia polyacantha (plains pricklypear)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)	Yucca (yucca)
year	Line Intercept Cover (%)									
1996	-	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-
2006	2.9	7.8	11.3	-	-	-	2.6	5.3	19.3	-
2011	3.1	9.2	3.6	0.1	-	-	3.5	3.8	11.3	-
2016	2.6	9.6	6.2	5.5	-	0.1	7.5	9.2	12.5	-
2021	3.6	6.5	5	0.1	-	0	3.7	11.7	9.7	-
year	Quadrat Cover (%)									
1996	2.0	9.4	6.5	-	0.0	0.3	4.3	4.2	7.3	-
2001	1.9	7.5	7.7	-	-	0.2	2.5	3.5	9.3	-
2006	2.8	7.5	9.8	0.1	-	0.3	3.6	5.0	8.5	-
2011	2.5	5.7	2.9	0.2	-	0.4	3.6	3.7	6.1	0.1
2016	3.0	5.9	4.8	0.7	-	0.1	4.2	5.5	7.3	-
2021	3.7	7.2	6.3	0.1	-	0.5	4.0	7.0	7.9	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-14.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	100	-	0	100	0	80	0	0	105/150
2001	340	140	71	29	0	6	0	0	129/150
2006	100	-	0	80	20	40	0	20	128/152
2011	80	-	0	100	0	25	0	0	133/168
2016	100	-	20	80	0	20	0	0	128/163
2021	120	-	17	67	17	33	0	17	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	2880	140	19	76	5	10	0	0	53/81
2001	1400	-	17	71	11	9	3	6	56/85
2006	1120	60	9	68	23	25	5	16	62/96
2011	960	-	6	73	21	21	6	21	59/88
2016	1020	20	2	84	14	10	0	14	63/104
2021	980	20	2	65	33	10	0	37	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	4700	-	14	82	4	4	0	0	41/56
2001	4100	-	2	93	5	0	0	0	37/50
2006	3420	240	2	87	11	1	1	4	38/58
2011	2180	-	4	55	41	29	6	37	39/53
2016	2440	-	10	82	8	1	0	9	42/53
2021	2360	-	4	55	41	0	1	36	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Eriogonum microthecum<sup>P</sup> -- (slender buckwheat)</b>									
1996	20	-	0	100	0	0	0	0	13/23
2001	60	-	0	100	0	0	0	0	23/35
2006	40	-	0	100	0	0	0	0	17/43
2011	20	-	0	100	0	0	0	0	29/57
2016	40	-	0	100	0	0	0	0	27/38
2021	80	-	25	50	25	0	0	25	- / -
<b>Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	53/76
2001	-	-	-	-	-	-	-	-	78/109
2006	-	-	-	-	-	-	-	-	80/98
2011	60	-	0	33	67	100	0	67	49/71
2016	180	-	11	89	0	0	0	0	42/49
2021	100	-	0	80	20	0	0	20	- / -
<b>Juniperus osteosperma<sup>1</sup> -- (Utah juniper)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	20	-	100	0	0	0	0	0	- / -
2016	20	-	0	100	0	0	0	0	- / -
2021	20	-	0	100	0	0	0	0	- / -
<b>Linanthus pungens -- (granite prickly phlox)</b>									
1996	140	-	0	100	0	0	0	0	27/33
2001	120	-	0	100	0	0	0	0	21/26
2006	80	140	50	25	25	0	0	0	17/25
2011	40	-	0	100	0	0	0	0	19/38
2016	220	20	0	100	0	0	0	0	26/36
2021	160	-	0	75	25	0	0	13	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	2520	-	6	84	10	0	0	4	11/44
2001	4340	-	14	78	8	0	0	6	10/35
2006	2660	-	1	98	2	0	0	2	11/44
2011	3020	-	2	98	0	0	1	5	11/52
2016	7540	20	4	95	1	0	0	21	11/37
2021	6100	-	5	90	5	0	0	5	- / -
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1996	900	20	11	87	2	31	24	0	55/108
2001	540	-	15	74	11	56	22	7	60/142
2006	560	60	4	89	7	36	32	4	64/123
2011	540	-	0	96	4	78	15	7	83/149
2016	780	-	5	92	3	59	10	3	78/157
2021	760	-	3	87	11	29	3	13	- / -
<b>Ribes<sup>P</sup> -- (currant)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	58/136
2021	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	1420	60	17	79	4	3	0	1	67/117
2001	1820	80	24	76	0	0	0	0	63/111
2006	1960	-	14	81	5	2	0	0	64/114
2011	1800	-	24	68	8	3	1	16	58/104
2016	2000	60	18	74	8	0	3	11	66/119
2021	2320	-	33	42	25	3	0	25	- / -
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	-	-	-	-	-	-	-	-	36/92
2001	-	-	-	-	-	-	-	-	42/89
2006	-	-	-	-	-	-	-	-	31/85
2011	-	-	-	-	-	-	-	-	29/59
2016	-	-	-	-	-	-	-	-	43/80

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-14.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

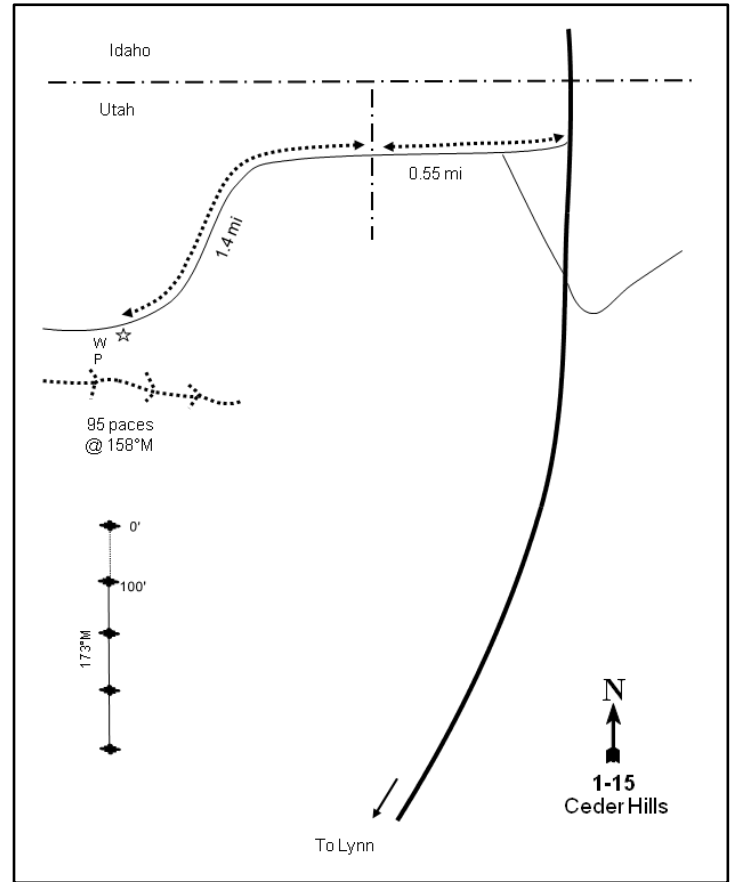
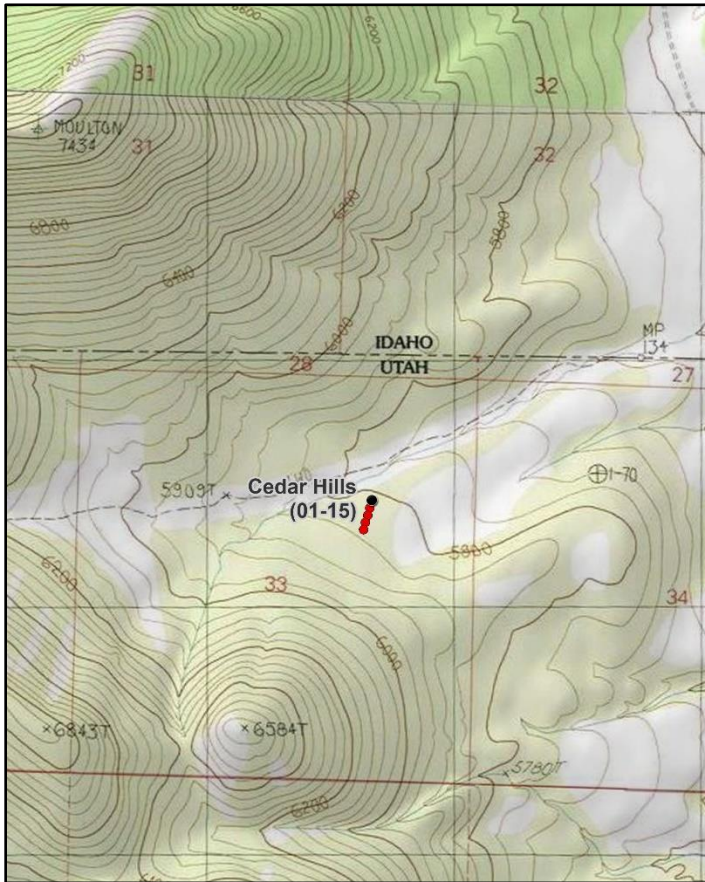
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2016	1	-	-	-	100	-	11.0
2021	1	-	-	100	-	-	13.0

**Table 01-14.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	28.4	13.8	7.6	13.0	-9.2	9.9	0.0	<b>63.5</b>	Fair-Good
2001	26.7	13.3	12.1	29.5	-4.8	10.0	0.0	<b>86.8</b>	Excellent
2006	30.0	11.8	5.2	22.1	-5.0	10.0	0.0	<b>74.0</b>	Good
2011	30.0	11.8	6.1	15.8	-2.4	7.8	0.0	<b>69.1</b>	Good
2016	30.0	12.7	5.1	13.9	-20.0	9.0	0.0	<b>50.7</b>	Poor-Fair
2021	30.0	8.9	6.7	28.6	-1.7	10.0	0.0	<b>82.5</b>	Excellent



## CEDAR HILLS - STUDY NO. 01-15

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Buck Hollow NE; Township 15N, Range 16W, Section 33  
NAD 83 UTM ZONE 12, 277610 East 4651637 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

49  
173° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Belt 1: 5ft

**Directions to Site**

From the town of Lynn, drive north to the cattleguard at the Utah-Idaho border. From the cattleguard at the border, follow a faint road along a fence (on south side) for 0.55 miles to a gate. Go through the next seeded pasture for 0.65 miles and continue as the road turns away from the fence. Proceed 0.75 miles to a small rock pile and a witness post on the south side of the road. Cross the drainage, walking about 95 paces southeast to the 0-foot stake off of the baseline in the trees. The 0-foot baseline stake is labeled with browse tag #49.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	JUNCTION CREEK
Elevation	5,800ft (1,768m)
Aspect	North
Slope	6%
Sample Dates	06/12/1996, 05/30/2001, 05/31/2006, 06/01/2011, 06/01/2016, 05/26/2021

**Table 01-15.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	City of Rocks	-	2000	17573
Seeding - Aerial After	City of Rocks Emergency Fire Rehabilitation	LTDL	Fall 2000	2300

**Table 01-15.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
City of Rocks Emergency Fire Rehabilitation			Aerial	Jan 2001	520
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass		1.00	0.00
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	1.00	0.00
G	Elymus lanceolatus	Thickspike Wheatgrass		1.00	0.00
G	Psathyrostachys juncea	Russian Wildrye		1.00	0.00
G	Pseudoroegneria spicata	Bluebunch Wheatgrass		1.00	0.00
F	Linum lewisii	Blue Flax		1.00	0.00
F	Medicago sativa	Alfalfa		1.00	0.00
F	Melilotus officinalis	Yellow Sweetclover		1.00	0.00
F	Onobrychis viciifolia	Sainfoin		1.00	0.00
F	Sanguisorba minor	Small Burnet		1.00	0.00
S	Artemisia tridentata ssp. vaseyana	Mountain Big Sagebrush		1.00	0.00
S	Purshia tridentata	Bitterbrush		1.00	0.00

**Table 01-15.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Greater Sage-Grouse	occupied	year-long	brood-rearing

**Table 01-15.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1990	Juniper/Perennial Grass	Phase II
1996	Juniper/Perennial Grass	Phase II
2001	Perennial Grass	No Encroachment
2006	Perennial Grass	No Encroachment
2011	Perennial Grass	No Encroachment
2016	Perennial Grass	No Encroachment
2021	Perennial Grass	No Encroachment

**Site Notes**

No Notes

**Soils****Table 01-15.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.8	30.7	40.0	29.3	3.0	6.7	390.4	0.6	06/12/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	12 inches
NRCS Ecological Site	Upland Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R025XY314UT
States and Transitions	Current State: Community Phase 5.1

When the study was established in 1990, the vegetation on this site existed as a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) community type with Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) as co-dominant components (Photos, Pre-1992 Data, Table 01-15.12). Following the City of Rocks wildfire and seeding (Table 01-15.1), the community transitioned to one dominated by both native and introduced perennial grasses (Table 01-15.10). The wildfire and subsequent seeding indicate that the community transitioned to a Seeded Range State; through prescribed grazing and other management practices that favor native plant recovery, sagebrush is predicted to increase over time and become the dominant vegetation component (USDA-ARS Jornada Experimental Range et al., 2021). Deer habitat has remained poor in most sample years and is due to a combination of low cover and recruitment, and high decadence of preferred browse (Table 01-15.15). Deer winter range condition has varied from very poor to good over the course of the study. As of 2021, deer winter range conditions were considered to be poor. Improvement to deer wintering range can be accomplished through efforts to reestablish a preferred browse community and reduces cheatgrass (Table 01-15.15).

**Trend Summary Tables****Table 01-15.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	1.4	0.1	11.3	-	-	-
2001	0.0	-	-	-	-	-
2006	1.4	0.1	-	1.1	0.3	-
2011	0.3	1.1	-	1.5	1.3	-
2016	2.7	1.3	-	6.5	3.3	-
2021	4.5	0.4	-	2.9	1.3	-

**Table 01-15.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	-	350	98	288	-	5.5	0.2	7.5
2001	-	184	140	61	-	4.2	0.7	0.5
2006	98	412	337	191	3.4	37.2	3.4	4.8
2011	29	444	391	176	0.1	27.0	3.2	4.5
2016	52	452	312	154	0.1	39.0	1.7	3.8
2021	16	441	159	198	0.1	30.5	1.1	7.3

**Table 01-15.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	9.3	12.8	40.6	8.9	0.7	26.6
2001	72.0	-	11.1	13.5	0.2	6.1
2006	17.6	1.1	38.5	3.5	0.9	48.0
2011	12.3	5.9	56.3	2.8	0.3	42.9
2016	16.9	9.6	44.7	6.3	0.4	46.5
2021	17.7	5.9	40.6	6.5	0.4	44.3

**Table 01-15.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rabbit
	Quadrat Frequency		
1996	-	4	14
2006	7	2	4
2011	5	-	1
2016	4	1	1
2021	5	3	1
Year	Days Use Per Acre (ha)		
1996	-	-	-
2006	29.8 (73.5)	0.7 (1.7)	-
2011	2.9 (7.2)	-	-
2016	5.8 (14.3)	0.7 (1.7)	-
2021	3.6 (9.0)	1.3 (3.3)	-

**Table 01-15.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Festuca brevipila <sup>i</sup> (hard fescue)	Leymus cinereus (basin wildrye)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea <sup>i</sup> (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency													
1996	-	-	-	-	2	67	-	-	-	-	307	-	79	-
2001	-	-	-	-	-	149	-	-	-	-	72	-	14	-
2006	3	28	-	98	3	360	-	-	-	-	133	2	27	-
2011	5	38	-	29	4	381	-	6	-	4	221	6	57	-
2016	3	54	9	52	-	382	3	-	2	5	274	1	38	-
2021	17	52	6	16	8	341	13	-	-	-	361	-	45	12
year	Average Cover (%)													
1996	-	-	-	-	0.0	0.8	-	-	-	-	4.2	-	0.5	-
2001	-	-	-	-	-	3.4	-	-	-	-	0.5	-	0.3	-
2006	0.2	1.2	-	3.4	0.2	29.1	-	-	-	-	2.3	0.2	4.2	-
2011	0.3	2.3	-	0.1	0.1	15.9	-	0.0	-	0.0	4.8	0.5	3.0	-
2016	0.1	2.8	0.3	0.1	-	26.4	0.0	-	0.0	0.1	5.8	0.0	3.5	-
2021	0.1	3.9	0.3	0.1	0.2	11.1	0.3	-	-	-	11.5	-	2.7	0.3

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 01-15.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus calycosus (Torrey's milkvetch)	Astragalus cibirius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus purshii (woollypod milkvetch)	Camelina microcarpa <sup>ai</sup> (littlepod false flax)	Castilleja angustifolia (northwestern Indian paintbrush)	Caulanthus crassicaulis <sup>ai</sup> (thickstem wild cabbage)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium album <sup>a</sup> (lambsquarters)
year	Nested Frequency																
1996	2	-	-	10	20	11	122	-	-	3	21	-	4	0	-	14	-
2001	5	-	-	-	-	7	-	-	-	-	8	-	-	-	-	4	3
2006	47	4	159	-	1	-	37	2	55	-	5	44	-	-	-	36	-
2011	22	1	325	-	-	-	112	-	8	2	0	-	-	-	15	8	-
2016	1	-	262	-	-	-	35	-	59	-	8	6	-	-	-	3	-
2021	4	-	89	-	-	-	16	3	58	-	1	-	-	-	-	38	-
year	Average Cover (%)																
1996	0.0	-	-	0.1	0.0	0.1	2.3	-	-	0.0	0.1	-	0.0	0.0	-	0.1	-
2001	0.0	-	-	-	-	0.0	-	-	-	-	0.0	-	-	-	-	0.0	0.0
2006	0.2	0.0	0.7	-	0.0	-	1.7	0.0	1.2	-	0.0	0.2	-	-	-	0.3	-
2011	0.0	0.0	2.0	-	-	-	3.5	-	0.1	0.0	0.0	-	-	-	0.0	0.0	-
2016	0.0	-	1.1	-	-	-	1.0	-	1.5	-	0.0	0.0	-	-	-	0.0	-
2021	0.0	-	0.2	-	-	-	0.4	0.0	1.8	-	0.0	-	-	-	-	0.4	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Chenopodium leptophyllum <sup>a</sup> (narrowleaf goosefoot)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron (fleabane)	Erigeron pumilus (shaggy fleabane)	Fritillaria atropurea (spotted fritillary)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Gilia inconspicua <sup>a</sup> (sly gilia)	Hackelia patens (spotted stickseed)	Lactuca serriola <sup>at</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Linum perenne <sup>i</sup> (blue flax)	Machaeranthera grindelioides (rayless tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)
year	Nested Frequency																
1996	-	98	11	5	-	-	7	1	-	-	-	-	-	-	-	-	-
2001	-	140	6	-	1	-	-	-	5	-	-	1	-	-	-	-	-
2006	5	254	16	18	4	89	-	1	1	10	-	-	75	5	9	1	13
2011	8	243	29	-	50	16	-	1	-	-	-	-	4	2	5	3	105
2016	-	148	18	-	7	-	-	1	1	-	5	-	-	1	26	-	34
2021	-	36	13	-	3	-	-	-	4	-	-	-	-	-	76	7	28
year	Average Cover (%)																
1996	-	0.2	0.1	0.0	-	-	0.0	0.0	-	-	-	-	-	-	-	-	-
2001	-	0.7	0.0	-	0.0	-	-	-	0.0	-	-	0.0	-	-	-	-	-
2006	0.0	1.7	0.4	0.0	0.0	0.3	-	0.0	0.0	0.0	-	-	0.2	0.0	0.2	0.0	0.0
2011	0.0	0.7	0.5	-	0.1	0.1	-	0.0	-	-	-	-	0.0	0.0	0.0	0.0	0.2
2016	-	0.3	0.1	-	0.0	-	-	0.0	0.0	-	0.0	-	-	0.0	0.5	-	0.1
2021	-	0.1	0.2	-	0.0	-	-	-	0.0	-	-	-	-	-	1.7	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Orogenia linearifolia (Great Basin Indian potato)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Sisymbrium altissimum <sup>at</sup> (tall tumblemustard)	Sphaeralcea grossularifolia (gooseberry/leaf globemallow)	Stenotus acaulis (stemless mock goldenweed)	Taraxacum officinale (common dandelion)	Townsendia (Townsend daisy)	Tragopogon dubius <sup>at</sup> (yellow safsify)	Veronica bilobata <sup>at</sup> (two-lobed speedwell)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency												
1996	-	30	14	195	-	-	-	26	-	4	-	-	0
2001	-	3	-	3	-	-	-	-	1	-	-	-	22
2006	-	22	9	3	-	30	-	-	-	-	-	-	6
2011	-	5	7	5	-	2	-	-	3	-	1	-	8
2016	3	29	-	11	1	-	7	-	4	-	35	1	22
2021	-	16	2	30	1	-	3	-	7	-	50	-	70
year	Average Cover (%)												
1996	-	0.1	0.4	3.8	-	-	-	0.4	-	0.0	-	-	0.0
2001	-	0.0	-	0.0	-	-	-	-	0.0	-	-	-	0.4
2006	-	0.4	0.2	0.0	-	0.2	-	-	-	-	-	-	0.0
2011	-	0.0	0.1	0.1	-	0.0	-	-	0.0	-	0.0	-	0.1
2016	0.0	0.2	-	0.3	0.0	-	0.0	-	0.0	-	0.2	0.0	0.1
2021	-	0.0	0.0	0.8	0.0	-	0.0	-	0.2	-	0.8	-	1.7

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 01-15.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Pinus monophylla <sup>t</sup> (singleleaf pinyon)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)
year	Line Intercept Cover (%)					
1996	-	-	-	-	-	-
2001	-	-	-	-	-	-
2006	1.1	0.3	-	-	-	0
2011	1.4	0.9	0.4	-	-	0.1
2016	6.5	2.1	1.2	-	-	-
2021	2.7	0.6	0.7	-	-	0.2
year	Quadrat Cover (%)					
1996	1.1	0.0	0.0	9.7	1.6	0.3
2001	-	-	-	-	-	0.0
2006	1.0	0.0	0.0	-	-	0.4
2011	0.2	0.9	0.2	-	-	0.0
2016	2.5	0.6	0.7	-	-	0.1
2021	3.9	0.1	0.4	-	-	0.7

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-15.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
1996	1160	-	9	47	45	7	0	22	39/52
2006	120	2280	0	100	0	0	0	0	73/71
2011	360	340	22	72	6	17	0	0	83/82
2016	1400	8700	53	46	1	0	0	0	95/93
2021	1540	200	56	34	10	0	0	13	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	200	-	20	80	0	0	0	0	18/20
2006	120	-	0	100	0	0	0	0	34/43
2011	120	-	0	100	0	0	0	0	40/60
2016	240	100	42	50	8	0	0	8	47/75
2021	240	-	25	25	50	0	0	50	- / -
<b>Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)</b>									
1996	20	-	100	0	0	0	0	0	- / -
2006	80	-	100	0	0	0	0	0	58/73
2011	120	-	17	83	0	0	0	0	57/78
2016	160	-	25	75	0	0	0	0	53/87
2021	180	20	0	33	67	0	0	67	- / -
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1996	900	-	18	80	2	0	0	2	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	20	-	0	100	0	0	0	0	11/24
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Pinus monophylla<sup>i</sup> -- (singleleaf pinyon)</b>									
1996	180	180	56	44	0	0	0	0	- / -
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	-/-
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	160	20	75	25	0	0	0	0	27/44
2006	140	-	57	43	0	0	0	0	31/56
2011	80	-	0	100	0	0	0	0	35/72
2016	60	-	67	33	0	0	0	0	33/64
2021	120	-	0	100	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-15.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

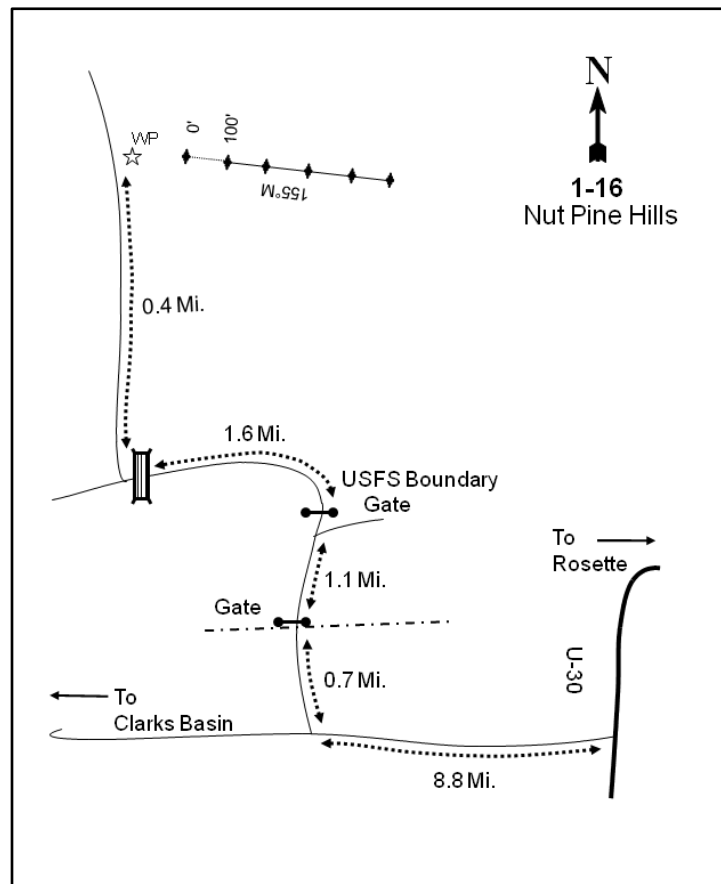
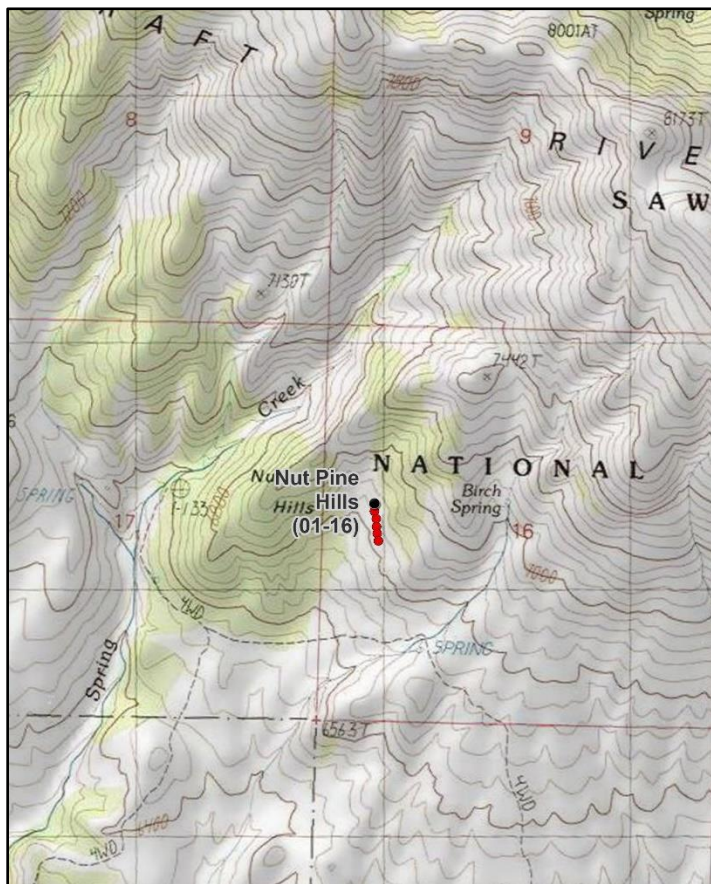
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
1996	459	-	-	-	-	-	9.6
<b>Pinus monophylla (singleleaf pinyon)</b>							
1996	101	-	-	-	-	-	12.8

**Table 01-15.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	1.6	0.0	0.0	11.0	0.0	10.0	0.0	<b>22.6</b>	Very Poor
2001	0.0	0.0	0.0	8.4	0.0	1.0	0.0	<b>9.4</b>	Very Poor
2006	1.4	0.0	0.0	30.0	-2.5	9.6	0.0	<b>38.4</b>	Poor
2011	1.9	0.0	0.0	30.0	0.0	9.0	0.0	<b>40.8</b>	Poor
2016	8.1	14.6	15.0	30.0	-0.1	7.7	0.0	<b>75.2</b>	Good
2021	3.6	0.0	0.0	30.0	0.0	10.0	0.0	<b>43.5</b>	Poor



## NUT PINE HILLS - STUDY NO. 01-16



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Dennis Hill NW; Township 13N, Range 15W, Section 16  
NAD 83 UTM ZONE 12, 285908 East 4636548 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

DWR47  
155° magnetic  
500ft  
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)  
Standard

### Directions to Site

From State Route 30, travel up the road to Clark's Basin for 8.8 miles. Turn right and travel 0.7 miles to a gate. Continue 1.1 miles to a gate marking the forest boundary. Continue 1.6 miles to another gate. Just after the cattleguard, turn right and proceed 0.4 miles to a witness post on the right-hand (east) side of the road. The 0-foot stake is east of the witness post.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	6,850ft (2,088m)
Aspect	Southwest
Slope	20-23%
Sample Dates	06/06/1996, 06/05/2001, 06/07/2006, 05/26/2011, 05/31/2016, 06/01/2021

**Wildlife Habitat and Vegetation History****Table 01-16.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	substantial	summer	
Greater Sage-Grouse	occupied	year-long	brood-rearing

**Table 01-16.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1996	Bitterbrush	Phase I
2001	Bitterbrush	Phase I
2006	Bitterbrush	Phase I
2011	Bitterbrush	Phase I
2016	Bitterbrush	Phase I
2021	Bitterbrush	Phase I

**Site Notes**

No Notes

**Soils****Table 01-16.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	8.1	50.9	25.1	24.0	2.1	8.5	544.0	1.1	06/06/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Upland Loam (Browse)
NRCS Ecological Site #	R025XY312UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1996, the vegetation on this site has existed as a mixed mountain brush plant community type with antelope bitterbrush (*Purshia tridentata*) as the dominant species (Table 01-16.12, Table 01-16.13). The herbaceous understory has remained diverse and abundant throughout the study period, with perennial grasses and/or forbs providing most of the cover since 1996 (Table 01-16.7, Table 01-16.10, Table 01-16.11). Active conifer encroachment from Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon (*Pinus monophylla*) is occurring and the site is considered to be in Phase I of woodland succession as of 2021 (Table 01-16.4, Table 01-16.14). Without the occurrence of a tree-removing disturbance, conifer encroachment will likely continue in future sample years.

**Trend Summary Tables****Table 01-16.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	33.4	2.4	0.7	-	-	-
2001	47.4	2.4	0.7	-	-	0.3
2006	38.1	2.9	1.4	52.1	3.9	4.6
2011	33.5	0.4	2.6	44.4	1.3	5.2
2016	44.5	1.7	4.0	63.5	3.4	4.8
2021	45.8	2.5	2.0	44.7	2.8	8.8

**Table 01-16.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	47	302	172	298	0.2	5.6	1.0	5.7
2001	11	361	97	205	0.2	14.4	0.8	5.3
2006	2	319	36	254	0.0	6.8	0.1	8.9
2011	-	253	141	212	-	6.4	0.8	4.2
2016	34	296	147	272	0.1	8.1	0.6	7.1
2021	14	295	19	219	0.0	11.1	0.2	6.4

**Table 01-16.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	12.7	0.1	45.4	3.8	3.0	43.0
2001	13.3	0.0	47.4	6.1	1.2	61.8
2006	12.6	0.1	41.2	13.8	1.8	52.9
2011	12.7	0.1	50.1	5.5	3.1	46.1
2016	15.3	0.2	40.2	8.6	4.3	59.0
2021	11.3	0.1	41.4	10.0	2.7	58.5

**Table 01-16.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	6	22	-	2
2001	2	9	-	3
2006	4	18	-	20
2011	3	18	-	5
2016	1	12	-	14
2021	-	7	1	4
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	3.6 (9.0)	38.2 (94.4)	-	-
2006	8.0 (19.7)	78.4 (193.7)	-	-
2011	2.9 (7.2)	40.9 (101.0)	4.7 (11.6)	-
2016	3.6 (9.0)	16.8 (41.4)	-	-
2021	5.1 (12.6)	25.5 (62.9)	1.3 (3.3)	-

**Table 01-16.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex rossii (Ross' sedge)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Leymus cinereus (basin wildrye)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency										
1996	1	47	-	140	-	22	10	97	-	21	141
2001	6	11	-	186	-	10	0	27	43	112	123
2006	12	2	2	181	-	18	3	8	53	97	104
2011	4	-	3	116	-	-	1	6	26	79	117
2016	1	34	-	145	21	13	3	13	44	87	92
2021	10	14	3	168	17	5	1	22	53	97	98
year	Average Cover (%)										
1996	0.0	0.2	-	0.9	-	0.4	0.0	1.7	-	0.4	2.1
2001	0.2	0.2	-	3.3	-	0.4	0.1	0.8	0.8	3.2	5.6
2006	0.3	0.0	0.0	1.2	-	0.2	0.0	0.3	0.4	1.6	2.6
2011	0.1	-	0.1	1.0	-	-	0.0	0.0	0.2	1.6	3.2
2016	0.0	0.1	-	2.1	0.3	0.4	0.0	0.1	0.7	2.1	2.4
2021	0.1	0.0	0.0	4.1	0.4	0.1	0.0	0.6	0.3	1.2	4.2

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 01-16.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria (pussytoes)	Arabis puberula <sup>a</sup> (silver rockress)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus newberryi (Newberry's milkvetch)	Astragalus purshii (woollypod milkvetch)	Calochortus nuttallii (sego lily)	Castilleja angustifolia (northwestern Indian paintbrush)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)
year	Nested Frequency																
1996	-	68	-	-	5	4	6	3	3	-	4	-	22	8	131	16	105
2001	6	5	-	-	-	3	-	-	-	-	-	1	8	10	59	22	57
2006	-	46	-	4	8	4	-	2	4	-	-	-	1	13	17	-	58
2011	3	62	-	-	-	-	-	2	4	-	-	4	1	4	120	2	49
2016	-	14	3	-	11	-	-	1	7	-	-	1	7	9	89	3	79
2021	4	24	-	-	-	1	-	-	8	3	-	-	1	8	2	-	57
year	Average Cover (%)																
1996	-	0.1	-	-	0.0	0.0	0.0	0.0	0.0	-	0.0	-	0.1	0.1	0.4	0.0	0.5
2001	0.1	0.0	-	-	-	0.1	-	-	-	-	-	0.0	0.0	0.2	0.4	0.0	0.6
2006	-	0.3	-	0.0	0.0	0.0	-	0.0	0.0	-	-	-	0.0	0.2	0.0	-	1.0
2011	0.0	0.4	-	-	-	-	-	0.0	0.0	-	-	0.0	0.0	0.0	0.3	0.0	0.2
2016	-	0.0	0.0	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.1	0.3	0.0	0.8
2021	0.0	0.1	-	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0	-	1.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Cryptantha watsonii <sup>a</sup> (Watson's cryptantha)	Delphinium nuttalianum (two-lobed larkspur)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Eriogonum cernuum <sup>a</sup> (nodding buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erysimum asperum (western wallflower)	Galium bifolium <sup>a</sup> (twinleaf bedstraw)	Gilia inconspicua <sup>a</sup> (shy gilia)	Hackelia patens (spotted stickseed)	Ipomopsis congesta (ballhead ipomopsis)	Lesquerella (bladderpod)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stone seed)
year	Nested Frequency																
1996	31	22	-	9	16	-	1	10	46	3	-	-	69	21	5	-	25
2001	17	5	-	2	-	-	-	-	27	-	-	-	15	-	-	-	20
2006	24	9	-	-	-	2	-	-	37	9	-	-	58	20	-	3	21
2011	23	-	-	44	2	3	-	-	43	-	-	-	40	-	3	-	12
2016	18	2	5	8	37	-	-	-	39	1	25	2	85	3	1	5	26
2021	33	-	-	6	-	-	1	6	33	-	-	-	47	10	-	4	20
year	Average Cover (%)																
1996	0.1	0.2	-	0.0	0.1	-	0.0	0.0	1.3	0.0	-	-	0.9	0.1	0.0	-	0.4
2001	0.5	0.0	-	0.0	-	-	-	-	0.9	-	-	-	0.2	-	-	-	0.7
2006	0.6	0.0	-	-	-	0.0	-	-	1.3	0.0	-	-	2.1	0.2	-	0.0	1.1
2011	0.1	-	-	0.2	0.0	0.0	-	-	0.8	-	-	-	0.5	-	0.0	-	0.2
2016	0.2	0.0	0.0	0.0	0.1	-	-	-	1.4	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.4
2021	0.5	-	-	0.0	-	-	0.0	0.1	1.1	-	-	-	0.9	0.0	-	0.0	0.9

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lomatium dissectum (fernleaf biscuitroot)	Microsteris gracilis <sup>a</sup> (slender phlox)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Schoenocrambe limifolia (flaxleaf plainsmustard)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Silene menziesii (Menzies' campion)	Stenotus acaulis (stemless mock goldenweed)	Symphyotrichum (aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>a</sup> (yellow salsify)	unknown annual forb <sup>a</sup> (unknown forb)	Veronica bilobata <sup>a</sup> (two-lobed speedwell)	Viola (violet)
year	Nested Frequency																
1996	21	-	59	-	44	86	7	-	20	-	16	17	5	-	8	-	21
2001	16	26	19	-	33	31	2	-	8	-	12	38	4	-	-	-	6
2006	13	-	53	4	33	18	2	-	9	3	17	12	3	-	-	-	29
2011	20	2	11	-	15	15	-	-	27	-	5	22	9	-	-	-	37
2016	30	19	51	2	16	19	-	-	3	27	12	14	5	-	-	1	16
2021	25	2	12	4	11	3	-	2	5	-	9	28	5	2	-	4	15
year	Average Cover (%)																
1996	0.4	-	0.3	-	0.3	0.2	0.0	-	0.4	-	0.4	0.1	0.0	-	0.0	-	0.1
2001	0.4	0.1	0.2	-	0.6	0.1	0.0	-	0.4	-	0.2	0.4	0.0	-	-	-	0.0
2006	0.5	-	0.7	0.0	0.4	0.0	0.0	-	0.1	0.0	0.1	0.0	0.0	-	-	-	0.2
2011	0.9	0.0	0.1	-	0.2	0.0	-	-	0.5	-	0.0	0.1	0.1	-	-	-	0.3
2016	1.4	0.0	0.7	0.0	0.1	0.0	-	-	0.1	0.3	0.3	0.0	0.0	-	-	0.0	0.0
2021	0.3	0.0	0.1	0.2	0.2	0.0	-	0.0	0.1	-	0.1	0.4	0.0	0.0	-	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	
Zigadenus paniculatus (foothill deathcamas)	
year	Nested Frequency
1996	-
2001	2
2006	-
2011	-
2016	2
2021	-
year	Average Cover (%)
1996	-
2001	0.0
2006	-
2011	-
2016	0.0
2021	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 01-16.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES																	
Amelanchier utahensis <sup>p</sup> (Utah serviceberry)																	
Artemisia nova <sup>p</sup> (black sagebrush)																	
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)																	
Bassia americana <sup>p</sup> (green molly)																	
Cercocarpus ledifolius <sup>p</sup> (curl-leaf mountain mahogany)																	
Chrysothamnus viscidiflorus ssp. lanceolatus (yellow rabbitbrush)																	
Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)																	
Eriogonum microthecum <sup>p</sup> (slender buckwheat)																	
Gutierrezia sarothrae (broom snakeweed)																	
Juniperus osteosperma <sup>i</sup> (Utah juniper)																	
Linanthus pungens (granite prickly phlox)																	
Mahonia repens (creeping barberry)																	
Opuntia polyacantha (plains pricklypear)																	
Pinus monophylla <sup>i</sup> (singleleaf pinyon)																	
Purshia tridentata <sup>p</sup> (antelope bitterbrush)																	
Ribes cereum var. cereum <sup>p</sup> (wax currant)																	
Rosa woodsii <sup>p</sup> (Woods' rose)																	
year	Line Intercept Cover (%)																
1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2006	6.2	0	9.2	-	-	2.5	0.8	-	-	4.1	-	-	-	0.5	18.1	-	0.1
2011	6	0.1	6.8	-	-	-	1	-	-	4.5	-	-	-	0.7	15.8	-	0.1
2016	6.9	0	6.1	-	-	1.5	1.3	-	-	3.7	-	0.1	-	1.1	23.7	0.1	0.1
2021	8.3	0	4.9	-	-	1.4	0.8	-	-	5.7	-	0.1	-	3.1	18.1	-	0.1
year	Quadrat Cover (%)																
1996	3.9	0.0	4.1	-	-	1.6	0.0	0.3	0.1	0.7	-	0.0	0.0	-	11.9	-	-
2001	7.6	0.0	6.8	-	-	1.2	0.4	0.2	0.2	0.7	-	0.0	-	0.0	16.1	-	0.3
2006	5.6	0.1	7.2	-	-	1.8	0.4	0.5	-	1.4	-	0.2	-	0.0	12.3	-	0.3
2011	6.2	0.2	5.8	-	-	0.2	0.2	0.1	-	2.6	-	0.0	0.0	0.0	11.6	-	0.0
2016	6.2	0.0	6.1	0.0	0.1	0.4	0.3	0.1	0.0	4.0	-	0.0	0.1	0.0	17.7	0.0	0.2
2021	6.9	0.2	7.0	-	0.0	1.5	0.0	0.6	0.0	2.0	0.0	0.4	0.1	0.0	17.7	0.0	0.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

SHRUB SPECIES	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)		Tetradymia canescens (spineless horsebrush)			
	year	Line Intercept Cover (%)		year	Quadrat Cover (%)	
1996	-	-	-	1996	13.2	0.7
2001	-	-	-	2001	16.3	0.6
2006	18.5	0.6	-	2006	12.0	0.5
2011	15.6	0.3	-	2011	9.5	0.0
2016	26.6	0.5	-	2016	14.1	0.7
2021	13.3	0.5	-	2021	13.2	0.4

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-16.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	860	-	26	65	9	40	14	0	87/102
2001	660	20	18	64	18	12	24	9	98/106
2006	680	40	27	47	27	9	6	3	107/117
2011	620	-	16	81	3	32	7	0	114/122
2016	720	240	14	81	6	28	6	11	93/108
2021	840	40	26	57	17	7	0	17	- / -
<b>Artemisia nova<sup>p</sup> -- (black sagebrush)</b>									
1996	320	-	19	38	44	38	38	13	18/32
2001	220	-	18	73	9	0	0	0	17/29
2006	160	-	0	75	25	0	0	0	18/33
2011	120	-	17	83	0	0	0	0	19/43
2016	80	-	0	50	50	25	0	50	31/57
2021	100	-	20	60	20	0	0	20	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	1140	20	12	84	4	19	4	2	49/74
2001	1480	20	5	88	7	8	0	11	61/74
2006	1640	20	5	84	11	16	0	6	57/86
2011	1600	-	9	69	23	5	0	10	47/71
2016	1040	20	2	89	10	17	0	12	59/87
2021	1360	-	3	57	40	2	0	37	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Bassia americana<sup>P</sup> -- (green molly)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	80	-	50	25	25	50	0	0	5/6
2021	-	-	-	-	-	-	-	-	-/-
<b>Cercocarpus ledifolius<sup>P</sup> -- (curl-leaf mountain mahogany)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	117/116
2016	40	-	100	0	0	0	0	0	158/87
2021	40	-	0	100	0	50	50	0	-/-
<b>Chrysothamnus viscidiflorus ssp. lanceolatus -- (yellow rabbitbrush)</b>									
1996	1480	80	18	78	4	3	0	1	34/49
2001	1160	-	2	95	3	0	0	3	35/46
2006	1200	-	3	93	3	0	0	2	37/54
2011	460	-	17	56	26	0	4	17	32/40
2016	720	20	17	78	6	0	3	3	35/44
2021	980	20	6	86	8	4	0	2	-/-
<b>Eriogonum microthecum<sup>P</sup> -- (slender buckwheat)</b>									
1996	660	20	15	85	0	0	0	0	14/18
2001	440	-	14	77	9	0	0	0	13/20
2006	340	-	0	77	24	6	0	6	15/27
2011	400	-	10	90	0	0	0	0	12/20
2016	140	-	43	57	0	0	0	0	8/12
2021	220	-	27	73	0	18	0	0	-/-
<b>Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)</b>									
1996	120	-	17	33	50	0	0	33	65/71
2001	60	-	0	0	100	0	0	67	76/122
2006	120	-	17	50	33	0	0	33	78/88
2011	60	-	0	67	33	0	0	33	68/87
2016	300	-	13	80	7	0	0	7	54/60
2021	60	-	0	67	33	0	0	67	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	1180	180	34	64	2	0	0	0	12/12
2001	380	-	42	58	0	0	0	0	9/12
2006	80	-	0	75	25	0	0	25	14/26
2011	-	-	-	-	-	-	-	-	-/-
2016	160	-	13	88	0	0	0	0	14/20
2021	80	-	0	75	25	0	0	25	-/-
<b>Juniperus osteosperma<sup>1</sup> -- (Utah juniper)</b>									
1996	140	-	57	43	0	0	0	0	-/-
2001	40	20	50	50	0	0	0	0	-/-
2006	100	20	40	60	0	0	0	0	-/-
2011	100	20	40	60	0	0	0	0	-/-
2016	120	-	50	50	0	0	0	0	-/-
2021	160	-	63	38	0	0	0	0	-/-



Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Linanthus pungens -- (granite prickly phlox)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	40	-	0	100	0	0	0	0	-/-
<b>Mahonia repens -- (creeping barberry)</b>									
1996	360	-	100	0	0	0	0	0	6/8
2001	180	-	44	56	0	0	0	0	5/6
2006	260	-	0	100	0	0	0	0	6/11
2011	20	-	0	100	0	0	0	0	-/-
2016	120	-	100	0	0	0	0	0	8/9
2021	180	-	44	56	0	11	0	0	-/-
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	100	-	0	80	20	0	0	0	12/40
2001	20	-	0	100	0	0	0	0	11/26
2006	60	-	0	100	0	0	0	0	11/42
2011	80	-	0	100	0	0	0	0	8/27
2016	60	-	0	100	0	0	0	33	16/28
2021	40	-	0	100	0	0	0	0	-/-
<b>Prunus virginiana<sup>P</sup> -- (chokecherry)</b>									
1996	40	-	100	0	0	0	0	0	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	60	-	0	33	67	0	0	0	-/-
2011	20	-	0	100	0	0	0	0	99/50
2016	-	-	-	-	-	-	-	-	-/-
2021	20	-	0	100	0	0	0	0	-/-
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1996	1480	100	8	89	3	39	55	1	58/124
2001	1440	40	7	88	6	21	33	4	64/119
2006	1320	80	6	85	9	44	20	6	73/149
2011	1960	60	5	91	4	33	27	4	68/117
2016	2020	40	3	90	7	63	2	5	74/123
2021	2080	20	0	89	12	14	1	11	-/-
<b>Ribes cereum var. cereum<sup>P</sup> -- (wax currant)</b>									
1996	-	-	-	-	-	-	-	-	113/168
2001	-	-	-	-	-	-	-	-	-/-
2006	20	-	0	100	0	0	0	0	141/156
2011	20	-	0	100	0	0	0	0	110/176
2016	40	20	50	50	0	50	0	0	131/103
2021	80	-	0	100	0	0	0	0	-/-
<b>Rosa woodsii<sup>P</sup> -- (Woods' rose)</b>									
1996	60	20	33	67	0	0	100	0	25/10
2001	80	-	25	75	0	0	0	0	51/48
2006	80	-	0	100	0	0	0	0	73/25
2011	60	-	0	100	0	0	33	0	56/18
2016	280	-	7	93	0	50	0	7	44/25
2021	60	-	0	67	33	0	0	0	-/-

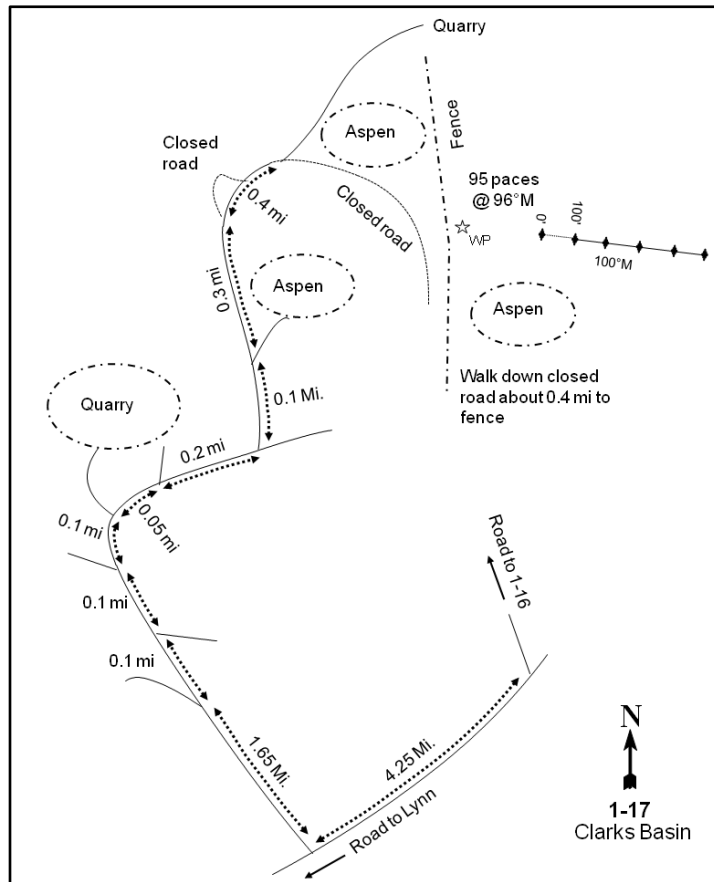
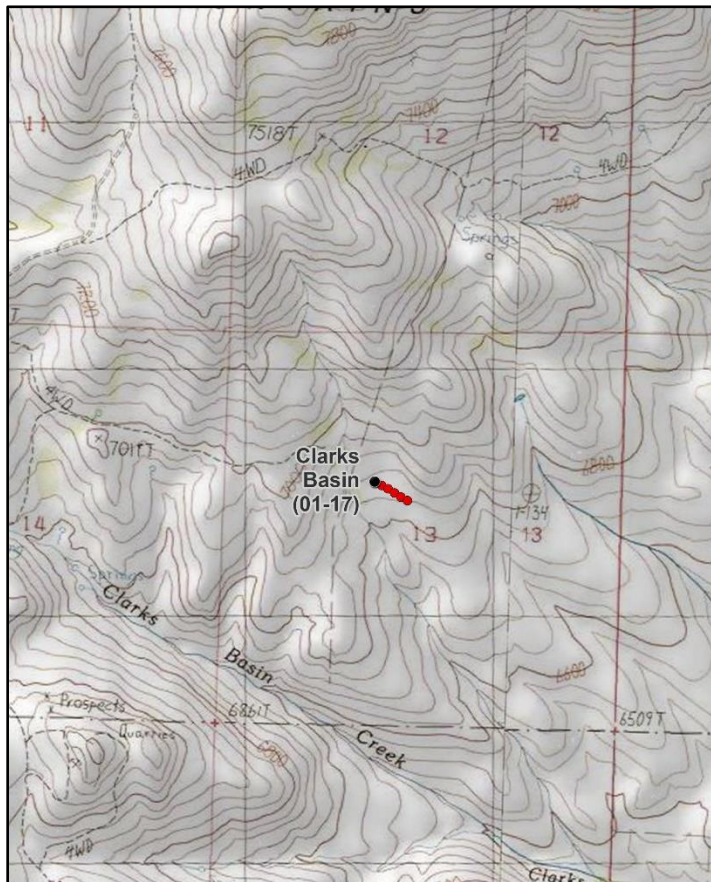
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	4840	80	23	77	0	7	0	0	46/76
2001	3980	-	16	82	2	0	0	0	54/95
2006	5700	-	24	73	3	0	3	2	47/70
2011	4540	-	12	89	0	0	0	0	33/52
2016	11520	160	26	73	1	1	0	2	45/57
2021	6160	20	28	70	3	0	0	3	- / -
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	1040	20	27	67	6	0	0	0	22/29
2001	1020	-	8	90	2	0	0	0	23/26
2006	720	-	14	47	39	0	0	11	27/41
2011	460	-	17	70	13	35	9	13	24/36
2016	760	-	13	87	0	0	0	0	28/40
2021	820	-	20	63	17	0	0	17	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-16.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
1996	130	-	-	-	-	-	9.1
2001	47	-	-	-	-	-	16.1
2006	83	-	17	39	17	28	26.1
2011	86	16	16	32	21	16	15.6
2016	97	-	17	28	17	39	21.7
2021	89	17	6	28	22	28	26.7
<b>Pinus monophylla (singleleaf pinyon)</b>							
1996	9	-	-	-	-	-	25.5
2001	5	-	-	-	-	-	21.5
2006	5	-	33	-	33	33	29.7
2011	5	-	33	-	33	33	27.0
2016	5	-	25	25	25	25	21.0
2021	5	-	33	-	33	33	43.7

### CLARKS BASIN - STUDY NO. 01-17



**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Lynn Reservoir NE; Township 13N, Range 16W, Section 13  
NAD 83 UTM ZONE 12, 281473 East 4636746 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

DWR 443  
100° magnetic  
500ft  
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)  
Standard

**Directions to Site**

From State Route 30, travel up the road towards Lynn to Clark's Basin for 13.05 miles. Turn right and drive 1.65 miles to a fork in the road. Stay right and continue for another 0.35 on the main road to a quarry. Stay right (far right) and continue for 0.2 miles. Turn left and proceed 0.4 miles to a wet meadow and a spring where the road has been moved. Go through the stream and continue 0.4 miles to a spot where the road has been closed. From here, walk down the hill on the old, closed road about 0.4 miles to a witness post near the fence. From the witness post, walk 95 paces at a bearing of 96 degrees magnetic to the 0-foot baseline stake which is marked by browse tag #443. The baseline runs at 100 degrees magnetic.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	6,860ft (2,091m)
Aspect	Southeast
Slope	3-5%
Sample Dates	06/06/1996, 06/05/2001, 06/07/2006, 05/31/2011, 06/02/2016, 06/02/2021

**Wildlife Habitat and Vegetation History****Table 01-17.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	substantial	summer	
Greater Sage-Grouse	occupied	year-long	brood-rearing

**Table 01-17.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1996	Mixed Shrub	No Encroachment
2001	Mixed Shrub	No Encroachment
2006	Mixed Shrub	No Encroachment
2011	Mixed Shrub	No Encroachment
2016	Mixed Shrub	No Encroachment
2021	Mixed Shrub	No Encroachment

**Site Notes**

No Notes

**Soils****Table 01-17.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.8	31.7	35.0	33.3	3.3	24.2	553.6	0.5	06/06/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Loam (Shrub)
NRCS Ecological Site #	R047XA434UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1996, the vegetation on this site has existed as a mixed mountain brush plant community type with mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) as the dominant shrub species (Photos, Table 01-17.12, Table 01-17.13). The herbaceous understory has remained diverse with few species being abundant over the study years; perennial grasses and/or forbs have contributed the most herbaceous cover throughout the study period (Table 01-17.7, Table 01-17.10, Table 01-17.11). This site will likely remain in this state unless a major disturbance occurs. Due to the diversity and abundance of native species this habitat remains in good condition for wildlife. The presence of the introduced annual grass species cheatgrass (*Bromus tectorum*) presents a threat to the stability of the current state, and cheatgrass cover was nearly 14% in 2016 (Table 01-17.10). However, the overall community structure appears to have some level of resistance and resilience to disturbance.

**Trend Summary Tables****Table 01-17.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	30.0	1.8	-	-	-	-
2001	34.3	2.7	-	-	-	-
2006	33.3	3.7	-	47.1	2.7	-
2011	29.2	0.4	-	38.5	0.5	-
2016	35.5	2.4	-	53.4	2.5	-
2021	35.5	3.4	-	49.1	3.6	-

**Table 01-17.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	17	415	323	352	0.1	14.3	4.0	6.8
2001	25	415	287	344	0.1	20.5	3.7	11.8
2006	17	362	318	322	0.0	9.8	6.1	10.8
2011	4	395	326	351	0.0	20.2	6.2	7.4
2016	225	409	139	277	13.9	25.1	0.9	7.1
2021	40	401	180	357	0.1	19.3	1.1	9.5

**Table 01-17.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	9.5	0.3	51.9	2.5	2.4	55.5
2001	7.3	0.2	51.3	2.6	2.6	68.1
2006	14.5	0.1	40.1	2.8	2.5	55.9
2011	17.8	0.1	48.9	2.9	1.9	59.4
2016	8.4	0.5	44.6	2.2	2.2	67.5
2021	5.2	0.1	46.2	3.2	2.1	61.1

**Table 01-17.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Domestic Sheep	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	6	4	-	2
2001	2	10	-	1
2006	4	13	1	9
2011	4	9	-	-
2016	6	10	-	24
2021	12	23	3	5
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	2.2 (5.4)	35.5 (87.7)	-	-
2006	10.9 (26.9)	36.8 (91.0)	-	-
2011	12.3 (30.5)	19.4 (48.0)	1.3 (3.3)	-
2016	3.6 (9.0)	20.8 (51.3)	-	-
2021	14.5 (35.9)	30.8 (76.1)	2.7 (6.6)	-

**Table 01-17.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency														
year	Average Cover (%)														
Bromus tectorum <sup>ai</sup> (cheatgrass)	17	52	-	279	-	4	-	4	-	-	6	49	216	46	
Carex douglasii (Douglas' sedge)	25	25	8	299	-	9	4	5	-	2	14	159	135	24	
Carex valliscola (valley sedge)	17	28	3	233	24	14	2	17	-	1	3	150	116	22	
Elymus lanceolatus (thickspike wheatgrass)	4	10	3	242	44	-	7	-	-	-	-	172	156	29	
Juncus arcticus (arctic rush)	225	38	1	277	3	10	10	9	-	-	-	248	70	24	
Koeleria macrantha (prairie Junegrass)	2021	40	39	28	307	21	5	3	-	3	2	7	128	198	26
Leymus cinereus (basin wildrye)	1996	0.1	1.1	-	6.0	-	0.1	-	0.0	-	-	0.2	1.0	4.5	1.4
Melica bulbosa (oniongrass)	2001	0.1	1.0	0.2	7.0	-	0.2	1.0	0.1	-	0.0	0.3	5.8	3.7	1.2
Muhlenbergia richardsonis (mat muhly)	2006	0.0	0.2	0.2	2.7	0.6	0.2	0.4	0.2	-	0.0	0.1	3.5	1.3	0.6
Poa bulbosa <sup>i</sup> (bulbous bluegrass)	2011	0.0	0.1	0.1	3.5	1.0	-	0.8	-	-	-	-	6.0	7.6	1.1
Poa fendleriana (muttongrass)	2016	13.9	0.5	0.1	9.7	0.0	0.2	1.7	0.1	-	-	-	9.5	2.8	0.6
Poa pratensis <sup>i</sup> (Kentucky bluegrass)	2021	0.1	0.5	0.1	10.0	1.1	0.1	0.4	-	0.1	0.1	0.2	2.2	3.9	0.7
Poa secunda (Sandberg bluegrass)															
Pseudoroegneria spicata (bluebunch wheatgrass)															

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 01-17.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
year	Average Cover (%)																	
Achillea millefolium (Common yarrow)	62	109	22	-	8	5	1	8	-	-	4	1	-	3	-	-	287	
Agoseris glauca (pale agoseris)	53	48	92	1	-	-	3	18	2	-	-	6	-	11	-	-	228	
Allium (onion)	78	87	79	6	6	3	0	6	8	0	-	-	-	25	-	-	121	
Antennaria (pussytoes)	78	140	133	10	1	-	-	10	-	-	4	-	-	9	-	-	220	
Arabis (rockcress)	71	8	11	4	1	3	9	1	-	14	-	-	1	13	4	-	73	
Astragalus (milkvetch)	2021	76	104	26	4	14	5	4	4	-	3	-	-	1	19	9	2	111
Astragalus beckwithii (Beckwith's milkvetch)	1996	0.6	0.7	0.1	-	0.0	0.1	0.0	0.4	-	-	0.0	0.0	-	0.1	-	-	2.3
Astragalus cibirarius (browse milkvetch)	2001	0.8	0.4	0.4	0.0	-	-	0.0	0.1	0.1	-	-	0.3	-	0.3	-	-	2.4
Astragalus convallarius (lesser rushy milkvetch)	2006	1.3	0.6	0.2	0.1	0.0	0.0	0.0	0.1	0.1	0.0	-	-	0.2	-	-	0.4	
Balsamorhiza sagittata (arrowleaf balsamroot)	2011	1.0	1.0	0.6	0.0	0.0	-	-	0.1	-	-	0.0	-	0.1	-	-	1.3	
Calochortus nuttallii (sego lily)	2016	0.5	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-	0.3	-	-	0.0	0.4	0.0	0.2	
Castilleja linariifolia (Wyoming Indian paintbrush)	2021	1.3	0.8	0.1	0.0	0.0	0.1	0.1	0.0	-	0.0	-	-	0.0	0.3	0.0	0.0	0.3
Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)																		
Cirsium (thistle)																		
Claytonia perfoliata (miner's lettuce)																		
Claytonia rosea (western springbeauty)																		
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																		

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Crepis intermedia (limestone hawksbeard)	Cryptantha (cryptantha)	Cryptantha watsonii <sup>a</sup> (Watson's cryptantha)	Cymopterus (springparsley)	Cynoglossum officinale <sup>ami</sup> (gypsyflower)	Delphinium nuttallianum (two-lobed larkspur)	Delphinium ×occidentale (western larkspur)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Equisetum (horsetail)	Eriogonum umbellatum (sulphur-flower buckwheat)	Fritillaria atropurea (spotted fritillary)	Galium bifolium <sup>n</sup> (twinleaf bedstraw)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Geranium <sup>a</sup> (geranium)
year	Nested Frequency																
1996	85	15	3	10	7	-	12	1	7	2	-	4	16	-	-	-	1
2001	24	50	8	-	-	-	-	-	17	1	-	3	12	-	-	23	1
2006	49	23	12	-	15	-	3	-	9	18	122	4	1	-	11	-	2
2011	19	18	6	-	6	-	3	-	72	21	55	-	10	-	29	1	20
2016	3	22	7	-	1	-	-	3	-	-	2	18	1	5	10	-	-
2021	28	21	6	-	5	3	-	-	7	3	21	5	7	-	7	-	5
year	Average Cover (%)																
1996	0.2	0.1	0.0	0.1	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.1	-	-	-	0.0
2001	0.1	0.7	0.1	-	-	-	-	-	0.1	0.0	-	0.0	0.4	-	-	0.0	0.0
2006	0.1	0.2	0.6	-	0.0	-	0.0	-	0.0	0.1	2.2	0.0	0.1	-	0.1	-	0.0
2011	0.0	0.0	0.2	-	0.0	-	0.0	-	0.4	0.1	2.2	-	0.1	-	0.4	0.0	0.2
2016	0.0	0.3	0.1	-	0.0	-	-	0.0	-	-	0.0	0.5	0.0	0.0	0.0	-	-
2021	0.1	0.2	0.0	-	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.2	-	0.0	-	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Gilia inconspicua <sup>a</sup> (shy gilia)	Hackelia patens (spotted stickseed)	Heliomeris multiflora var. multiflora (showy goldeneye)	Hydrophyllum capitatum (ballhead waterleaf)	Iva axillaris (povertyweed)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lithophragma parviflorum (smallflower woodland-star)	Lithospermum ruderale (western stone seed)	Lomatium triternatum (nineleaf biscuitroot)	Lupinus (lupine)	Lupinus argenteus (silvery lupine)	Machaeranthera (tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Nemophila breviflora <sup>a</sup> (basin nemophila)	Packera multilobata (lobeleaf groundsel)	Penstemon humilis (low beardtongue)	Phlox longifolia (longleaf phlox)
year	Nested Frequency																
1996	-	10	70	-	-	-	-	-	2	-	4	53	-	-	-	7	68
2001	1	2	3	-	-	-	-	-	16	-	6	3	87	-	2	6	75
2006	-	4	-	45	13	-	4	4	-	-	21	-	9	28	-	12	68
2011	-	13	-	57	3	-	4	2	10	7	16	-	35	32	-	25	43
2016	2	18	1	30	34	1	20	2	8	4	21	-	2	10	-	6	6
2021	-	15	-	32	19	1	4	-	-	-	18	-	18	6	-	9	107
year	Average Cover (%)																
1996	-	0.0	0.1	-	-	-	-	-	0.0	-	0.2	0.1	-	-	-	0.0	0.4
2001	0.0	0.0	0.0	-	-	-	-	-	0.3	-	0.4	0.0	0.2	-	0.0	0.2	0.3
2006	-	0.3	-	0.7	0.5	-	0.0	0.2	-	-	0.6	-	0.0	0.3	-	0.1	0.3
2011	-	0.2	-	0.8	0.0	-	0.0	0.0	0.0	0.0	0.1	-	0.1	0.4	-	0.4	0.2
2016	0.0	0.1	0.0	0.2	0.4	0.0	0.1	0.0	0.0	0.1	0.7	-	0.0	0.0	-	0.1	0.0
2021	-	0.5	-	0.2	0.3	0.0	0.0	-	-	-	0.1	-	0.1	0.0	-	0.1	0.9

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nested Frequency																
Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	9	-	-	-	77	178	30	41	3	-	3	32	3	15	4	14	
Ranunculus inamoenus (graceful buttercup)	10	-	1	-	40	192	43	35	2	4	-	-	29	6	3	12	
Schoenocrambe linifolia (flaxleaf plainsmustard)	110	-	-	3	79	166	14	-	-	-	-	-	148	33	1	11	
Sedum lanceolatum (spearleaf stonecrop)	22	9	-	-	93	102	11	-	10	-	-	-	72	93	-	17	
Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	6	-	-	-	44	166	7	-	-	4	-	-	19	27	-	6	
Symphotrichum ascendens (western aster)	18	20	-	-	44	156	50	-	-	-	-	-	1	38	-	36	
Taraxacum officinale (common dandelion)	Average Cover (%)																
Tetranneuris acutulis (stemless four-nerve daisy)	1996	0.0	-	-	1.2	2.2	0.2	0.4	0.0	-	0.1	0.2	0.0	0.3	0.2	0.1	
Tragopogon dubius <sup>ai</sup> (yellow salsify)	2001	0.0	-	0.0	0.6	5.3	0.2	0.9	0.2	0.0	-	-	0.1	0.0	0.2	0.2	
Trifolium (clover)	2006	0.3	-	-	0.0	1.7	3.8	0.1	-	-	-	-	0.9	0.2	0.0	0.3	
unknown annual forb <sup>a</sup> (unknown forb)	2011	0.1	0.1	-	-	1.1	1.3	0.0	-	0.1	-	-	0.3	0.6	-	0.1	
unknown perennial forb (unknown forb)	2016	0.0	-	-	-	0.6	3.3	0.0	-	-	0.0	-	-	0.0	0.1	0.0	
Veronica biloba <sup>ai</sup> (two-lobed speedwell)	2021	0.0	0.0	-	-	0.3	2.7	0.9	-	-	-	-	0.0	0.2	-	0.4	
Viola (violet)																	
Wyethia amplexicaulis (mule-ears)																	
Zigadenus paniculatus (foothill deathcamas)																	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 01-17.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)											
Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	1996	-	-	-	-	-	-	-	-	-	-	-
Artemisia nova <sup>p</sup> (black sagebrush)	2001	-	-	-	-	-	-	-	-	-	-	-
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	2006	3.3	4.6	25.1	2	0.2	-	0.5	5.2	0.3	8.6	-
Chrysothamnus viscidiflorus ssp. lanceolatus (yellow rabbitbrush)	2011	3.6	3.5	17.2	0.1	-	-	0.2	5.1	0.6	8.5	0.2
Ericameria nauseosa (rubber rabbitbrush)	2016	3.8	2.5	20.7	0.3	0.5	-	1.7	5.5	1.1	19.8	-
Eriogonum microthecum <sup>p</sup> (slender buckwheat)	2021	5.8	2.3	11.8	0.8	-	0.1	2.8	7.3	1.4	20.4	-
Mahonia repens (creeping barberry)	Quadrat Cover (%)											
Purshia tridentata <sup>p</sup> (antelope bitterbrush)	1996	1.6	3.4	17.1	1.8	-	-	0.0	1.1	0.5	6.4	-
Rosa woodsii <sup>p</sup> (Woods' rose)	2001	2.8	4.1	19.9	1.4	0.0	-	0.9	1.8	0.9	4.9	0.4
Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)	2006	2.7	2.2	20.0	2.7	0.0	-	1.0	2.1	0.6	5.8	-
Tetradymia canescens (spineless horsebrush)	2011	3.2	2.6	14.4	0.2	-	-	0.2	2.5	0.4	6.2	0.0
	2016	2.2	2.5	16.6	0.9	0.0	-	1.5	3.7	0.6	10.0	-
	2021	4.4	2.8	10.4	0.7	-	0.0	2.7	4.9	1.1	11.9	-

t - Tree Species; p - Preferred Browse; i - Introduced Species



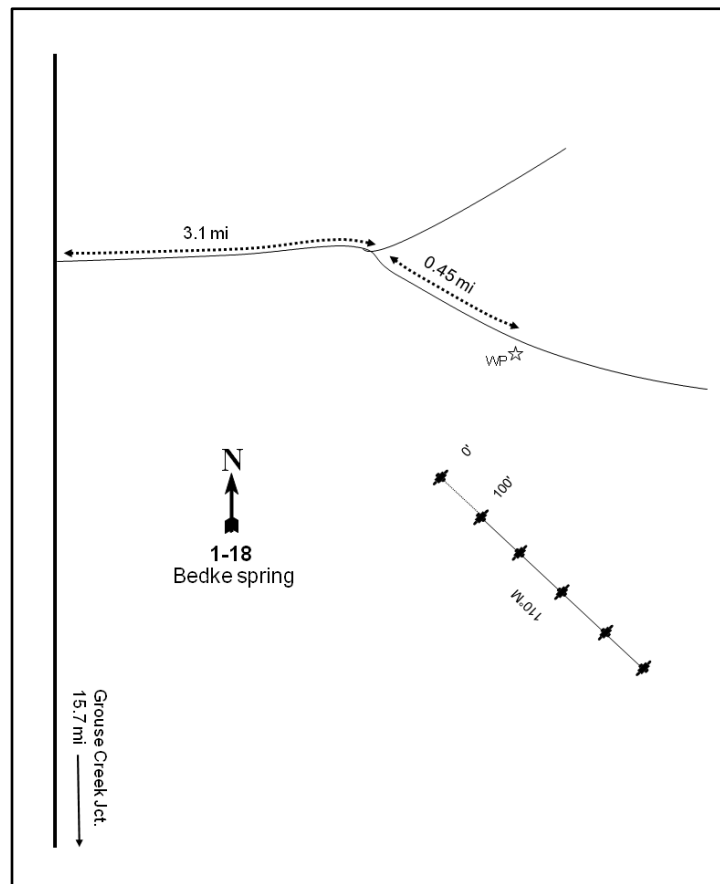
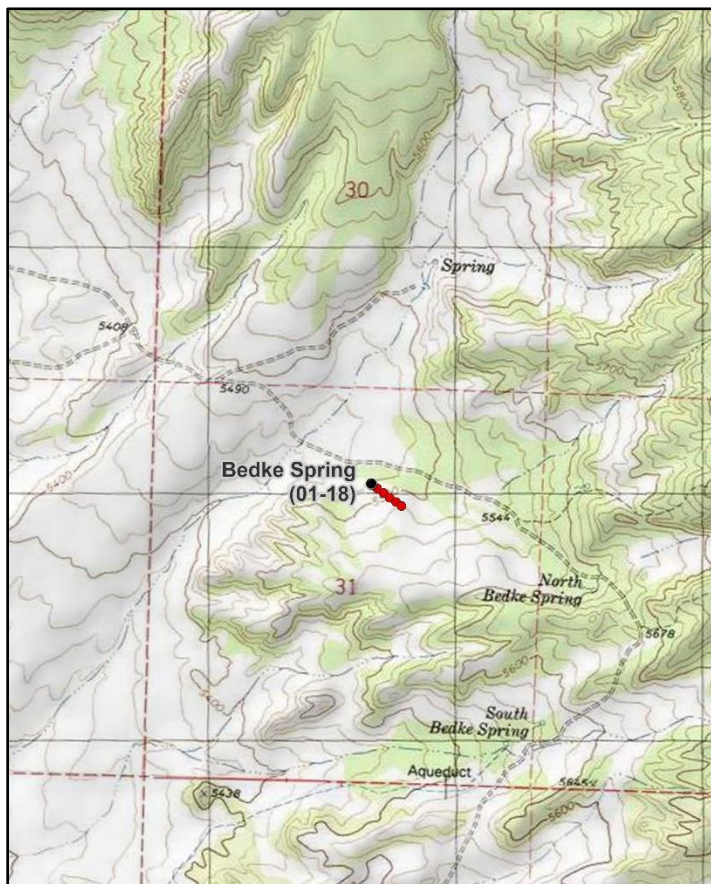
**Table 01-17.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1996	340	-	24	35	41	65	18	18	69/82
2001	300	-	27	67	7	27	27	0	97/107
2006	300	280	20	80	0	33	20	0	96/108
2011	300	-	0	100	0	33	20	0	106/118
2016	500	-	28	68	4	32	12	12	116/137
2021	360	-	0	94	6	22	0	6	- / -
<b>Artemisia nova<sup>P</sup> -- (black sagebrush)</b>									
1996	1560	-	5	92	3	72	14	3	23/51
2001	2200	240	6	87	7	0	0	4	21/48
2006	2160	2140	25	52	23	8	1	10	25/47
2011	2440	200	32	65	3	2	0	3	24/48
2016	1840	-	24	49	27	2	0	27	23/49
2021	920	-	9	50	41	17	0	44	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1996	3500	100	9	89	2	26	1	1	51/77
2001	3180	300	9	82	8	1	1	4	57/85
2006	3180	780	9	72	20	8	4	10	58/89
2011	3840	40	6	69	25	4	2	26	53/85
2016	2540	40	4	79	17	2	1	13	58/91
2021	2940	20	16	40	45	1	0	44	- / -
<b>Chrysothamnus viscidiflorus ssp. lanceolatus -- (yellow rabbitbrush)</b>									
1996	1600	40	9	85	6	19	0	0	33/43
2001	1520	20	7	83	11	0	0	0	32/39
2006	1440	-	7	86	7	0	0	3	34/53
2011	480	-	0	79	21	8	17	8	25/37
2016	520	140	15	77	8	0	0	8	38/41
2021	460	-	39	52	9	0	13	9	- / -
<b>Eriogonum microthecum<sup>P</sup> -- (slender buckwheat)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	15/42
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1996	40	-	0	50	50	50	50	0	37/47
2001	80	-	25	75	0	0	25	0	44/43
2006	40	-	0	0	100	0	0	100	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	104/101
2021	40	-	0	100	0	0	0	0	- / -
<b>Mahonia repens -- (creeping barberry)</b>									
1996	100	-	0	100	0	0	0	0	8/10
2001	1820	-	20	80	0	0	0	0	14/15
2006	2620	-	0	100	0	0	0	0	14/15
2011	600	-	0	100	0	27	0	0	13/14
2016	4240	-	3	97	0	0	0	0	11/13
2021	10360	-	1	98	1	0	0	1	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	13/43
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	420	-	5	62	33	38	38	14	40/72
2001	440	-	18	64	18	36	46	5	47/101
2006	640	60	0	100	0	28	66	0	47/107
2011	720	-	0	100	0	25	31	3	51/105
2016	560	-	4	89	7	21	25	7	54/122
2021	860	-	9	84	7	28	16	7	- / -
<b>Ribes cereum<sup>p</sup> -- (wax currant)</b>									
1996	-	-	-	-	-	-	-	-	28/66
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	106/106
2016	20	-	0	100	0	0	0	0	102/113
2021	-	-	-	-	-	-	-	-	-/-
<b>Rosa woodsii<sup>p</sup> -- (Woods' rose)</b>									
1996	780	-	67	33	0	0	0	0	48/42
2001	1020	-	47	53	0	0	0	0	39/32
2006	640	-	34	63	3	3	0	0	46/35
2011	1300	-	5	95	0	0	0	0	41/41
2016	1540	-	25	74	1	1	0	1	42/28
2021	1200	-	2	93	5	3	0	5	- / -
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	2920	200	25	72	3	17	1	1	42/75
2001	2060	40	15	76	10	1	0	7	37/74
2006	3660	-	30	69	2	0	0	1	35/68
2011	3500	-	5	95	0	2	0	0	38/67
2016	6580	20	22	78	0	3	0	0	46/73
2021	4160	40	6	93	1	7	0	1	- / -
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	100	-	0	100	0	60	0	0	34/40
2001	140	-	29	43	29	0	0	14	25/31
2006	60	120	0	67	33	0	0	0	32/49
2011	60	-	0	67	33	0	67	33	38/69
2016	-	-	-	-	-	-	-	-	41/44

t - Tree Species; p - Preferred Browse; i - Introduced Species

## BEDKE SPRING - STUDY NO. 01-18



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Ingham Canyon SW; Township 11N, Range 17W, Section 31  
NAD 83 UTM ZONE 12, 263597 East 4613231 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

DWR 48  
110° magnetic  
500ft  
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)  
Standard

### Directions to Site

From the Grouse Creek Junction on State Route 30 travel north for 15.7 miles. Turn right and travel east for 3.1 miles. Stay right and continue 0.45 miles to a witness post on the right-hand (south) side of the road. The baseline is approximately 300 feet in a southerly direction on a small bench. The baseline runs at 110 degrees magnetic.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	RED BUTTE
Elevation	5,500ft (1,676m)
Aspect	West
Slope	5%
Sample Dates	06/11/1996, 05/24/2001, 05/24/2006, 05/25/2011, 06/07/2016, 05/26/2021

**Table 01-18.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	Grouse Creek Bullhog Phase 2	1938	Winter 2012	1031

**Wildlife Habitat and Vegetation History****Table 01-18.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	year-long	
Greater Sage-Grouse	occupied	year-long	brood-rearing
Pronghorn	substantial	summer	

**Table 01-18.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1996	Wyoming Big Sagebrush/Perennial Grass	Phase I
2001	Wyoming Big Sagebrush/Perennial Grass	Phase I
2006	Wyoming Big Sagebrush/Perennial Grass	Phase I
2011	Wyoming Big Sagebrush/Perennial Grass	Phase I
2016	Wyoming Big Sagebrush/Annual-Perennial Grass	Phase I
2021	Perennial Grass/Wyoming Big Sagebrush	Phase I

**Site Notes**

No Notes

**Soils****Table 01-18.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.7	36.7	30.0	33.3	2.2	5.4	387.2	0.6	06/11/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Upland Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R028AY309UT
States and Transitions	No state and transition model is available for this ecological site.

The vegetation on this site has existed as a Wyoming big sagebrush (*Artemisia tridentata ssp. wyomingensis*) plant community type since study establishment in 1996 (Photos, Table 01-18.12, Table 01-18.13). The herbaceous understory has remained diverse throughout the study period, but not particularly abundant. The introduced annual grass species cheatgrass (*Bromus tectorum*) has varied in abundance and cover from year to year and presents a potential threat to the stability of the current community state (Table 01-18.10, Table 01-18.11). In 2021, decadence and poor vigor among the preferred browse populations noticeably increased from the previous sample period (Table 01-18.13), likely due to prolonged drought. If high decadence and poor vigor are prolonged, there is an elevated risk of future loss of shrub cover and density, and reduced community health as a whole. Sustained drought would likely make this site susceptible to a community transition if a disturbance occurs. There was some conifer encroachment occurring in previous sample years, but a bullhog treatment in 2012 (Table 01-18.1) reduced the number of encroaching trees (Photos, Table 01-18.14). Deer winter range condition has generally remained poor over the course of the study. Improvement to deer wintering range can be accomplished through efforts that reestablishes the preferred browse community, and that reduces cheatgrass on the site (Table 01-18.15).

**Trend Summary Tables****Table 01-18.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	9.1	7.8	-	-	-	-
2001	8.1	4.2	-	-	-	-
2006	7.3	3.8	-	9.0	5.2	-
2011	7.7	5.2	-	9.3	5.0	-
2016	5.1	6.8	-	9.0	7.2	-
2021	6.1	5.7	-	5.1	5.9	-

**Table 01-18.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	115	300	75	314	0.3	5.5	0.3	8.2
2001	310	285	299	289	3.5	6.5	2.3	9.6
2006	351	296	288	272	7.1	8.6	2.7	9.6
2011	190	336	367	260	4.2	11.5	7.3	8.4
2016	342	342	141	206	16.8	11.1	0.7	6.1
2021	170	385	101	249	2.2	17.3	0.3	6.6

**Table 01-18.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	27.7	7.7	28.7	6.2	2.5	29.7
2001	31.1	12.0	22.5	10.1	0.7	34.2
2006	38.2	7.5	24.6	7.1	0.6	38.2
2011	26.7	8.7	17.7	7.7	0.2	44.3
2016	42.9	6.2	20.8	10.0	0.9	39.9
2021	23.1	4.9	33.5	11.9	0.7	36.7

**Table 01-18.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	1	6	3	7
2001	3	1	-	2
2006	3	10	-	49
2011	5	1	-	5
2016	1	-	-	45
2021	5	2	1	12
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	10.9 (26.9)	2.0 (5.0)	-	-
2006	14.5 (35.9)	6.0 (14.9)	4.7 (11.6)	-
2011	6.5 (16.1)	1.3 (3.3)	-	-
2016	0.7 (1.8)	0.7 (1.7)	0.7 (1.7)	-
2021	11.6 (28.7)	2.0 (5.0)	-	-

**Table 01-18.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus (wildrye)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Festuca (fescue)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency									
1996	-	7	115	10	135	30	2	2	216	51
2001	-	11	310	-	71	21	-	-	218	89
2006	-	14	351	-	55	85	-	-	247	22
2011	3	53	190	-	35	63	3	-	248	80
2016	6	39	342	-	141	136	-	9	190	37
2021	21	42	170	-	126	143	-	5	293	12
year	Average Cover (%)									
1996	-	0.3	0.3	0.1	1.2	0.2	0.0	0.0	2.9	0.7
2001	-	0.1	3.5	-	0.9	0.1	-	-	4.3	1.1
2006	-	0.7	7.1	-	1.1	0.8	-	-	5.2	0.7
2011	0.0	1.3	4.2	-	0.3	0.8	0.0	-	6.8	2.4
2016	0.2	1.5	16.8	-	2.6	2.8	-	0.1	3.1	0.8
2021	0.5	1.6	2.2	-	2.8	2.9	-	0.2	9.1	0.3

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 01-18.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria (pussytoes)	Antennaria dimorpha (low pussytoes)	Arabis (rockcress)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus calycosus (Torrey's milkvetch)	Astragalus cibirarius (browse milkvetch)	Astragalus purshii (woollypod milkvetch)	Camelina microcarpa <sup>ai</sup> (littletop false flax)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chorispora tenella <sup>ai</sup> (crossflower)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)
year	Nested Frequency																
1996	-	1	-	-	-	5	21	-	35	13	-	2	11	23	-	32	4
2001	-	13	-	-	-	1	43	-	7	5	3	-	196	3	-	10	-
2006	3	11	6	12	-	-	33	-	41	19	66	3	183	7	-	19	-
2011	3	15	-	34	-	2	3	-	41	3	88	-	338	6	4	108	-
2016	-	-	28	12	-	-	8	4	36	10	72	-	1	7	-	10	-
2021	0	3	79	16	5	7	2	10	36	11	-	-	30	8	-	7	-
year	Average Cover (%)																
1996	-	0.0	-	-	-	0.0	0.1	-	0.2	0.1	-	0.0	0.0	0.1	-	0.1	0.0
2001	-	0.0	-	-	-	0.0	0.6	-	0.1	0.0	0.0	-	1.6	0.0	-	0.0	-
2006	0.0	0.0	0.0	0.3	-	-	0.7	-	1.4	0.2	0.3	0.0	1.3	0.0	-	0.1	-
2011	0.0	0.0	-	1.0	-	0.0	0.0	-	1.0	0.0	0.6	-	5.9	0.0	0.0	0.5	-
2016	-	-	0.1	0.1	-	-	0.2	0.0	0.6	0.0	0.3	-	0.0	0.0	-	0.0	-
2021	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.3	0.0	-	-	0.1	0.0	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cordylanthus ramosus <sup>a</sup> (bushy bird's beak)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Delphinium nuttallianum (two-lobe larkspur)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Erigeron (fleabane)	Erigeron pumilus (shaggy fleabane)	Erigeron ovalifolium (cushion buckwheat)	Erigeron umbellatum (sulphur-flower buckwheat)	Gilia inconspicua <sup>a</sup> (shy gilia)	Hackelia patens (spotted stickseed)	Ionactis alpina (Lava aster)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lathyrus brachycalyx (Bonneville pea)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)
year	Nested Frequency																
1996	2	-	12	-	11	-	50	1	-	2	-	-	-	22	-	-	-
2001	-	1	-	4	122	6	10	3	1	29	-	-	-	77	1	-	-
2006	3	-	1	3	5	14	5	-	2	3	-	1	-	48	-	0	-
2011	-	4	3	12	46	1	-	2	-	-	5	8	-	12	-	-	-
2016	-	-	1	2	8	-	16	-	-	1	-	9	3	33	-	-	-
2021	-	-	6	1	-	-	35	-	1	-	15	6	-	10	-	-	1
year	Average Cover (%)																
1996	0.0	-	0.1	-	0.0	-	0.3	0.0	-	0.0	-	-	-	0.1	-	-	-
2001	-	0.0	-	0.0	0.4	0.2	0.0	0.0	0.0	0.1	-	-	-	0.1	0.0	-	-
2006	0.0	-	0.0	0.0	0.0	0.1	0.0	-	0.0	0.0	-	0.0	-	0.2	-	0.0	-
2011	-	0.0	0.0	0.1	0.1	0.0	-	0.0	-	-	0.0	0.2	-	0.0	-	-	-
2016	-	-	0.0	0.0	0.0	-	0.4	-	-	0.0	-	0.1	0.0	0.1	-	-	-
2021	-	-	0.0	0.0	-	-	0.3	-	0.0	-	0.0	0.2	-	0.0	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Microsteris gracilis <sup>a</sup> (slender phlox)	Penstemon cyananthus (Wasatch beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	unknown annual forb <sup>a</sup> (unknown forb)	unknown perennial forb (unknown forb)	Veronica biloba <sup>ai</sup> (two-lobe speedwell)
year	Nested Frequency							
1996	-	24	240	67	-	4	-	-
2001	33	-	240	52	-	-	4	-
2006	114	4	217	32	1	-	-	3
2011	5	1	204	29	-	-	-	15
2016	3	-	164	8	6	-	-	-
2021	4	1	172	15	3	-	-	-
year	Average Cover (%)							
1996	-	0.3	6.6	0.3	-	0.0	-	-
2001	0.1	-	8.2	0.5	-	-	0.0	-
2006	0.8	0.0	6.4	0.3	0.0	-	-	0.0
2011	0.0	0.1	5.4	0.4	-	-	-	0.0
2016	0.0	-	4.6	0.0	0.0	-	-	-
2021	0.0	0.0	5.2	0.1	0.0	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 01-18.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova <sup>p</sup> (black sagebrush)	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Atriplex confertifolia <sup>p</sup> (shadscale saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)	Eriogonum microthecum <sup>p</sup> (slender buckwheat)	Opuntia polyacantha (plains pricklypear)	Sarcobatus vermiculatus (greasewood)
year	Line Intercept Cover (%)							
1996	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-
2006	-	6.1	2.9	3.7	0.8	-	0.2	0.5
2011	-	6.3	3	3.3	1.2	-	-	0.5
2016	-	6.1	2.9	5.9	0.6	-	0.2	0.5
2021	-	3.2	1.9	5.3	-	-	-	0.6
year	Quadrat Cover (%)							
1996	0.8	7.8	0.6	7.3	-	-	0.1	0.4
2001	0.0	6.9	1.2	3.3	0.0	-	0.1	0.8
2006	-	4.9	2.5	2.3	0.4	-	0.1	1.0
2011	0.1	4.6	3.0	4.0	0.1	-	-	1.2
2016	0.1	3.4	1.6	3.6	1.5	-	0.2	1.4
2021	0.1	4.6	1.3	5.2	0.1	0.0	-	0.3

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-18.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia nova<sup>p</sup> -- (black sagebrush)</b>									
1996	40	-	0	50	50	100	0	0	26/67
2001	60	-	0	67	33	0	0	0	34/60
2006	-	-	-	-	-	-	-	-	-/-
2011	40	-	0	100	0	0	0	0	21/37
2016	40	-	0	100	0	50	0	0	27/48
2021	40	-	0	100	0	0	0	0	-/-
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
1996	3360	20	6	69	26	13	0	5	56/78
2001	2540	40	17	49	35	5	0	16	57/72
2006	2060	-	8	52	41	8	0	25	53/64
2011	1200	-	5	73	22	13	0	25	63/85
2016	1220	20	12	62	26	3	0	28	61/85
2021	1000	-	4	38	58	2	0	52	-/-
<b>Atriplex confertifolia<sup>p</sup> -- (shadscale saltbush)</b>									
1996	1160	200	76	24	0	2	0	0	25/38
2001	2040	20	39	59	2	0	0	0	22/42
2006	1620	-	9	79	12	0	0	10	32/60
2011	820	-	10	66	24	0	0	27	33/50
2016	940	-	11	77	13	0	0	15	35/45
2021	800	-	0	55	45	0	0	55	-/-



Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1996	6600	20	3	94	2	1	0	0	28/38
2001	3820	340	6	51	44	0	0	15	23/32
2006	3840	360	5	89	6	9	2	1	22/33
2011	3600	440	21	75	4	3	0	2	24/36
2016	4740	60	13	83	4	0	0	5	30/36
2021	3960	20	2	55	43	0	0	49	- / -
<b>Eriogonum microthecum<sup>p</sup> -- (slender buckwheat)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	20/26
2021	-	20	0	0	0	0	0	0	- / -
<b>Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)</b>									
1996	40	-	50	50	0	0	0	0	54/80
2001	20	-	0	100	0	0	0	0	60/124
2006	20	-	0	100	0	0	0	0	72/128
2011	400	-	10	90	0	15	0	10	28/42
2016	820	-	7	90	2	0	0	2	29/37
2021	920	-	2	33	65	0	0	67	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	140	-	29	71	0	0	0	0	11/22
2001	300	40	13	87	0	0	0	0	10/21
2006	320	20	6	88	6	0	0	6	12/32
2011	40	-	0	50	50	0	0	100	10/25
2016	240	-	0	100	0	0	0	0	11/28
2021	120	20	0	83	17	0	0	17	- / -
<b>Sarcobatus vermiculatus -- (greasewood)</b>									
1996	80	-	100	0	0	0	0	0	66/84
2001	60	-	67	33	0	0	0	0	67/101
2006	80	-	50	50	0	0	0	0	67/98
2011	20	20	0	100	0	0	0	0	86/131
2016	60	-	0	100	0	0	0	0	93/146
2021	60	-	33	67	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

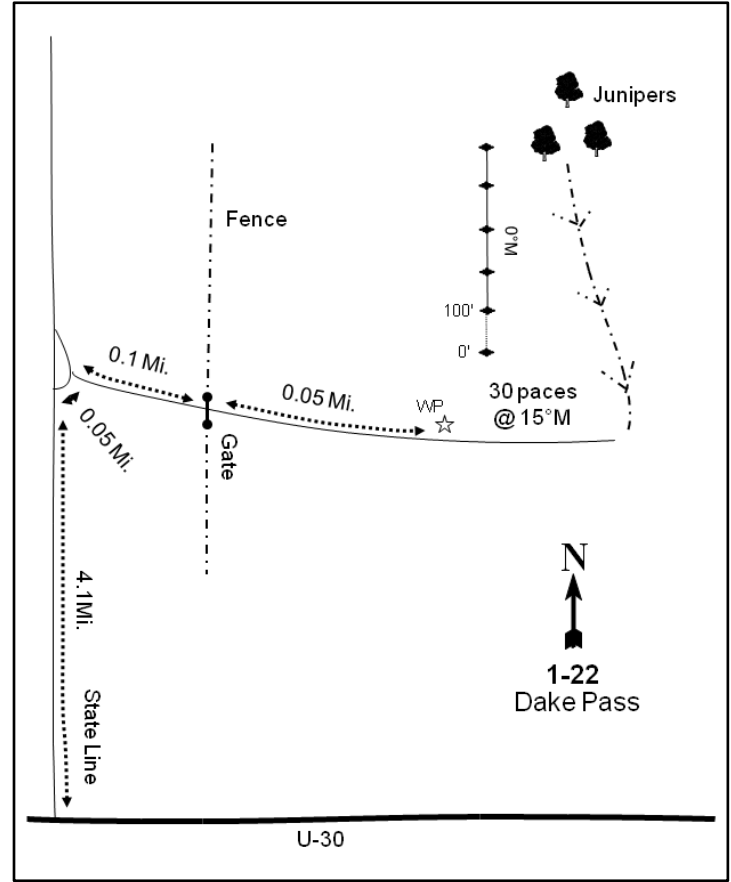
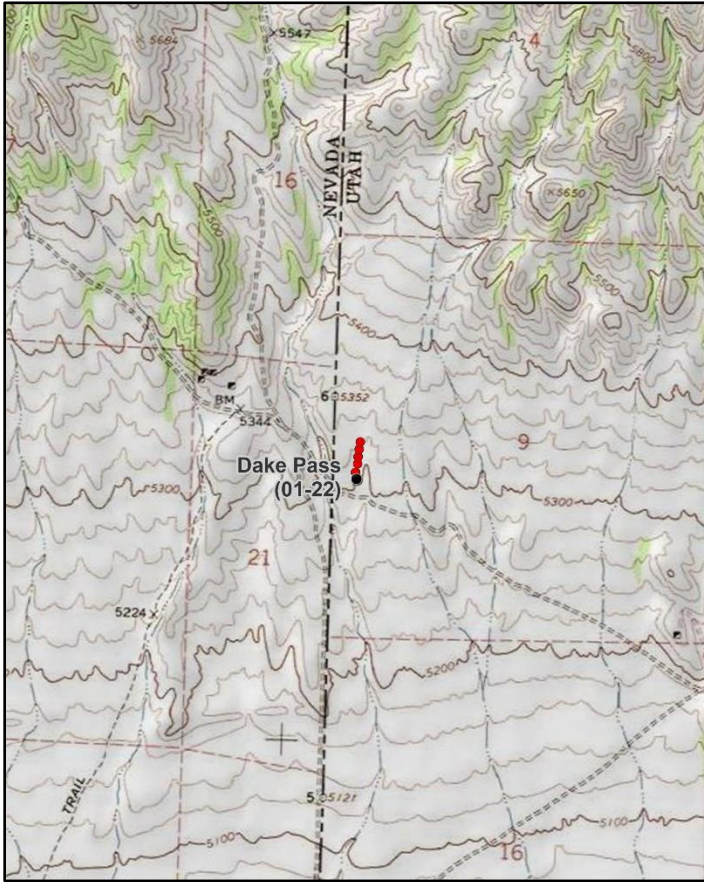
**Table 01-18.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2016	3	-	100	-	-	-	4.5
2021	4	-	100	-	-	-	2.3

**Table 01-18.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	11.3	7.3	5.1	11.0	-0.2	10.0	0.0	<b>44.4</b>	Poor
2001	9.8	6.1	10.0	13.1	-2.6	10.0	0.0	<b>46.4</b>	Poor
2006	10.5	5.5	4.0	17.1	-5.3	10.0	0.0	<b>41.8</b>	Poor
2011	10.9	8.2	3.3	23.1	-3.2	10.0	0.0	<b>52.3</b>	Fair
2016	10.5	8.4	5.6	22.3	-12.6	10.0	0.0	<b>44.2</b>	Poor
2021	5.9	-0.9	1.3	30.0	-1.6	10.0	0.0	<b>44.6</b>	Poor

## DAKE PASS - STUDY NO. 01-22

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Jackson Spring SE; Township 8N, Range 19W, Section 09  
NAD 83 UTM ZONE 12, 246041 East 4590513 North

**Transect Information**

Browse Tag # (0' Stake)	90
Transect Bearing	0° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

**Directions to Site**

From State Route 30 at the Utah/Nevada state line near mile marker 0, turn right and travel 4.1 miles to an intersection. Turn right at the intersection and travel 0.15 miles to a gate. From the gate drive 0.05 miles to a witness post on the left-hand (north) side of the road. From the witness post walk 30 paces at 15 degrees magnetic to the 0-foot baseline stake. The baseline runs at 0 degrees magnetic.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	U AND I
Elevation	5,300ft (1,615m)
Aspect	South
Slope	4%
Sample Dates	06/19/1996, 05/22/2001, 05/23/2006, 05/17/2011, 05/24/2016, 05/18/2021

**Wildlife Habitat and Vegetation History****Table 01-22.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	year-long	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Pronghorn	substantial	summer	

**Table 01-22.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1996	Black Sagebrush	Phase I
2001	Black Sagebrush	Phase I
2006	Black Sagebrush	Phase I
2011	Black Sagebrush	Phase I
2016	Black Sagebrush	Phase I
2021	Black Sagebrush	Phase I

**Site Notes**

No Notes

**Soils****Table 01-22.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	8.2	42.7	28.0	29.3	1.8	9.7	380.8	0.8	06/19/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	9 inches
NRCS Ecological Site	Semidesert Shallow Loam (Black Sagebrush)
NRCS Ecological Site #	R028AY236UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1996, this site has been dominated by a black sagebrush (*Artemisia nova*) plant community (Table 01-22.12). The herbaceous understory has remained diverse and moderately abundant over the study period. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed in all sample years, but with generally low cover (Table 01-22.7, Table 01-22.10, Table 01-22.11). In 2021, decadence and poor vigor among the preferred browse populations noticeably increased from the previous sample period, likely due to prolonged drought (Table 01-22.13). If high decadence and poor vigor are sustained, there is an elevated risk of future loss of shrub cover and density, and decreased community health as a whole. If similar climatic conditions are sustained in the future, the site will likely be more susceptible to a community transition if a disturbance were to occur. Utah juniper (*Juniperus osteosperma*) is present adjacent to the site, but has not been sampled since site establishment (Photos). Deer winter range condition has varied over the sample period and has ranged between fair to excellent. As of 2021, the deer winter range was considered fair. Improvement to deer wintering range can be accomplished through efforts that support a mature and reproducing preferred browse community, and that diversify the perennial grass and forb communities while reducing cheatgrass (Table 01-22.15).

**Trend Summary Tables****Table 01-22.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	19.5	5.3	-	-	-	-
2001	16.7	3.9	-	-	-	-
2006	16.3	5.3	-	17.3	4.8	-
2011	14.1	5.6	-	18.4	4.3	-
2016	14.0	5.7	-	20.6	5.0	-
2021	16.4	7.2	-	16.2	5.9	-

**Table 01-22.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	27	233	58	152	0.0	6.0	0.6	3.1
2001	51	232	21	94	0.2	8.5	0.1	0.8
2006	406	200	68	106	12.8	6.4	0.2	1.1
2011	70	184	282	70	1.3	6.9	7.0	0.6
2016	210	239	260	89	3.2	14.2	3.0	2.2
2021	91	190	3	54	0.8	4.5	0.0	0.8

**Table 01-22.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	4.2	2.3	32.8	26.9	5.5	33.7
2001	17.3	3.9	17.7	29.8	3.0	32.1
2006	13.3	2.0	28.3	26.9	3.8	38.4
2011	10.9	1.5	22.5	34.3	5.9	31.2
2016	21.6	0.8	16.6	37.9	3.7	38.0
2021	7.5	1.4	41.0	27.8	2.6	31.1

**Table 01-22.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Pronghorn	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
1996	-	1	1	-	-
2001	-	-	9	-	-
2006	1	1	12	-	13
2011	1	-	12	-	-
2016	-	1	-	-	7
2021	1	12	2	1	3
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	-	-	18.7 (46.3)	-	-
2006	10.2 (25.1)	-	11.4 (28.1)	17.4 (43.0)*	-
2011	5.1 (12.6)	0.7 (1.7)	26.8 (66.2)	-	-
2016	18.9 (46.6)	2.7 (6.6)	-	-	-
2021	12.3 (30.5)	15.4 (38.1)	8.1 (19.9)	8.7 (21.5)*	-

\*Pellets per acre (ha)

**Table 01-22.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Poa secunda (Sandberg bluegrass)
year	Nested Frequency				
1996	49	27	129	-	136
2001	63	51	126	-	118
2006	57	406	71	-	133
2011	72	70	45	-	111
2016	54	210	144	1	124
2021	43	91	122	-	76
year	Average Cover (%)				
1996	0.6	0.0	2.5	-	2.9
2001	2.3	0.2	3.6	-	2.5
2006	1.4	12.8	1.1	-	3.9
2011	2.4	1.3	1.4	-	3.0
2016	3.3	3.2	5.9	0.0	4.9
2021	0.4	0.8	3.3	-	0.9

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 01-22.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Arabis puberula <sup>a</sup> (silver rockress)	Astragalus (milkvetch)	Astragalus cibirarius (browse milkvetch)	Astragalus newberryi (Newberry's milkvetch)	Astragalus purshii (woollypod milkvetch)	Camissonia pterosperma <sup>a</sup> (wingfruit suncup)	Castilleja angustifolia (northwestern Indian paintbrush)	Caulanthus crassicaulis <sup>a</sup> (thickstem wild cabbage)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Cryptantha (cryptantha)	Cryptantha spiculifera (Snake River cryptantha)	Cryptantha watsoni <sup>a</sup> (Watson's cryptantha)	Cymopterus globosus (globe springparsley)	Delphinium nuttallianum (two-lobed larkspur)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Erigeron (fleabane)
year	Nested Frequency																
1996	3	10	-	-	-	12	-	-	4	14	33	-	-	-	-	2	-
2001	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	15	-
2006	-	-	1	-	-	4	-	-	1	5	27	-	-	-	-	33	1
2011	-	-	-	-	-	2	-	-	-	-	2	-	-	2	2	104	6
2016	-	0	-	-	-	16	17	0	-	-	-	5	13	7	3	45	-
2021	-	-	-	5	1	9	-	-	-	-	-	-	-	2	-	-	-
year	Average Cover (%)																
1996	0.0	0.0	-	-	-	0.0	-	-	0.4	0.0	0.4	-	-	-	-	0.0	-
2001	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	0.0	-
2006	-	-	0.0	-	-	0.1	-	-	0.0	0.0	0.1	-	-	-	-	0.1	0.0
2011	-	-	-	-	-	0.1	-	-	-	-	0.0	-	-	0.1	0.0	1.9	0.2
2016	-	0.0	-	-	-	0.1	0.1	0.0	-	-	-	0.1	0.0	0.0	0.0	0.5	-
2021	-	-	-	0.0	0.0	0.0	-	-	-	-	-	-	-	0.0	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Erigeron pumilus (shaggy fleabane)	Eriogonum ovalifolium (cushion buckwheat)	Gilia inconspicua <sup>a</sup> (shy gilia)	Halogeton glomeratus <sup>ai</sup> (saltlover)	Heterotheca villosa (hairy false goldenaster)	Ipomopsis aggregata (scarlet gilia)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Mentzelia albicaulis <sup>a</sup> (whitestem blazingstar)	Navarretia intertexta <sup>a</sup> (needleleaf navarretia)	Penstemon (beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Sphaeralcea grossularifolia (gooseberryleaf globemallow)	Townsendia florifer <sup>at</sup> (showy Townsend daisy)
year	Nested Frequency													
1996	2	1	5	1	-	-	15	6	7	-	107	27	1	3
2001	-	-	3	-	-	-	4	-	-	-	50	51	1	-
2006	-	-	21	-	-	-	13	1	3	-	49	57	-	-
2011	-	-	268	-	-	-	28	-	2	-	38	23	-	-
2016	-	-	206	30	4	5	50	22	-	-	35	20	13	2
2021	-	-	2	-	-	-	-	-	-	3	33	10	-	1
year	Average Cover (%)													
1996	0.0	0.0	0.0	0.0	-	-	0.1	0.0	0.0	-	2.5	0.2	0.0	0.0
2001	-	-	0.0	-	-	-	0.0	-	-	-	0.6	0.2	0.0	-
2006	-	-	0.1	-	-	-	0.0	0.0	0.0	-	0.6	0.3	-	-
2011	-	-	4.8	-	-	-	0.3	-	0.0	-	0.2	0.1	-	-
2016	-	-	1.2	0.4	0.0	0.0	0.7	0.1	-	-	0.5	1.2	0.3	0.0
2021	-	-	0.0	-	-	-	-	-	-	0.0	0.7	0.1	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 01-22.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova <sup>p</sup> (black sagebrush)	Atriplex confertifolia <sup>p</sup> (shadscale saltbush)	Bassia americana <sup>p</sup> (green molly)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Ephedra nevadensis <sup>p</sup> (Nevada jointfir)	Grayia spinosa (spiny hopsage)	Krascheninnikovia lanata <sup>p</sup> (winterfat)	Opuntia polyacantha (plains pricklypear)	Pediocactus simpsonii (mountain ball cactus)	Picrothamnus desertorum (bud sagebrush)	Tetradymia nuttallii (Nuttall's horsebrush)
year	Line Intercept Cover (%)										
1996	-	-	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-	-
2006	12.3	4	-	2.2	0.6	2.2	0.4	-	-	0.1	0.3
2011	14.6	3.1	-	1.7	0.5	1.9	0.2	0.1	-	0.4	0.2
2016	14.8	4.4	0.3	2.1	1.1	2.4	-	-	-	0.1	0.4
2021	11.7	3.2	-	3.7	1.2	2.2	0.1	-	-	0	-
year	Quadrat Cover (%)										
1996	14.0	4.5	0.8	1.8	0.2	2.7	0.0	-	0.0	0.6	0.3
2001	13.5	2.3	-	1.3	0.6	2.3	0.3	-	0.0	0.2	0.1
2006	12.3	2.7	-	2.4	0.6	2.4	0.7	-	-	0.5	0.0
2011	10.2	2.8	-	3.2	0.8	2.4	0.3	0.0	-	0.0	0.0
2016	10.1	2.8	0.4	2.4	0.7	2.9	-	-	-	0.3	0.0
2021	13.4	2.5	0.0	3.6	0.1	3.6	0.3	-	-	0.0	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-22.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia nova<sup>P</sup> -- (black sagebrush)</b>									
1996	7580	5660	11	57	33	55	21	7	27/59
2001	8360	360	15	57	27	2	1	14	24/46
2006	6920	113560	8	65	27	6	0	16	25/49
2011	6100	780	13	66	22	33	25	15	23/50
2016	7080	3140	10	72	18	1	0	14	20/44
2021	6500	-	13	56	31	6	0	30	- / -
<b>Artemisia tridentata ssp. wyomingensis<sup>P</sup> -- (Wyoming big sagebrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	77/110
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Atriplex confertifolia<sup>P</sup> -- (shadscale saltbush)</b>									
1996	4800	1660	29	59	12	7	8	3	22/38
2001	3480	20	23	60	17	0	0	5	19/34
2006	3200	100	14	78	8	1	0	3	23/39
2011	2320	40	14	78	8	13	4	8	23/45
2016	2720	40	16	81	3	0	0	4	28/50
2021	1640	-	2	48	50	0	0	51	- / -
<b>Bassia americana<sup>P</sup> -- (green molly)</b>									
1996	1360	40	4	94	2	13	0	2	13/25
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	980	100	39	59	2	0	0	0	16/23
2021	60	20	0	33	67	33	0	67	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1996	1120	400	4	89	7	7	0	2	27/41
2001	1240	40	13	73	14	0	0	8	24/40
2006	1440	780	3	89	8	3	3	1	25/37
2011	1580	40	10	82	8	11	0	11	22/39
2016	1580	140	1	95	4	0	0	3	28/54
2021	1460	20	12	60	27	1	0	29	- / -
<b>Ephedra nevadensis<sup>P</sup> -- (Nevada jointfir)</b>									
1996	280	-	21	79	0	29	36	0	45/66
2001	160	-	0	75	25	50	50	0	38/65
2006	260	-	8	62	31	0	69	31	39/56
2011	200	-	10	50	40	40	60	60	41/66
2016	260	-	15	85	0	15	8	8	34/58
2021	180	-	0	56	44	67	0	44	- / -
<b>Eriogonum microthecum<sup>P</sup> -- (slender buckwheat)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	10/25
2021	20	-	0	100	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Grayia spinosa -- (spiny hopsage)</b>									
1996	260	-	0	77	23	15	8	31	49/86
2001	380	-	0	74	26	0	0	0	42/70
2006	320	-	0	81	19	13	0	13	51/78
2011	300	-	0	100	0	27	0	7	46/84
2016	160	20	13	88	0	0	0	0	51/100
2021	340	-	6	59	35	12	0	29	- / -
<b>Krascheninnikovia lanata<sup>p</sup> -- (winterfat)</b>									
1996	60	-	33	67	0	0	67	33	16/25
2001	680	20	27	74	0	3	0	0	11/19
2006	1000	40	16	80	4	30	60	4	17/24
2011	560	-	43	57	0	54	36	0	12/25
2016	60	-	0	100	0	33	0	0	26/39
2021	220	-	9	82	9	55	0	55	- / -
<b>Linanthus pungens -- (granite prickly phlox)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	17/36
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	20	-	0	100	0	0	0	0	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	-	-	-	-	-	-	-	-	10/34
2001	-	-	-	-	-	-	-	-	14/31
2006	-	-	-	-	-	-	-	-	14/45
2011	40	-	0	100	0	0	0	0	11/19
2016	40	-	0	100	0	0	0	0	10/18
2021	40	-	0	100	0	0	0	0	- / -
<b>Pediocactus simpsonii -- (mountain ball cactus)</b>									
1996	60	-	0	100	0	0	0	0	1/6
2001	40	-	0	100	0	0	0	0	2/6
2006	60	-	67	33	0	0	0	0	3/5
2011	60	-	33	67	0	0	0	0	4/9
2016	40	-	0	100	0	0	0	0	2/5
2021	20	-	0	100	0	0	0	0	- / -
<b>Picrothamnus desertorum -- (bud sagebrush)</b>									
1996	1080	20	24	50	26	11	24	22	14/32
2001	780	-	8	62	31	13	18	18	15/23
2006	400	20	0	95	5	35	5	0	13/22
2011	220	20	9	91	0	0	0	0	19/33
2016	340	-	0	100	0	0	0	6	13/25
2021	100	-	0	60	40	0	0	40	- / -
<b>Tetradymia nuttallii -- (Nuttall's horsebrush)</b>									
1996	140	-	29	43	29	0	0	14	39/54
2001	40	-	0	0	100	0	0	100	29/32
2006	20	-	0	100	0	0	0	0	38/54
2011	180	-	0	89	11	0	0	11	29/52
2016	40	-	0	100	0	0	0	0	40/66
2021	60	-	0	67	33	0	0	33	- / -

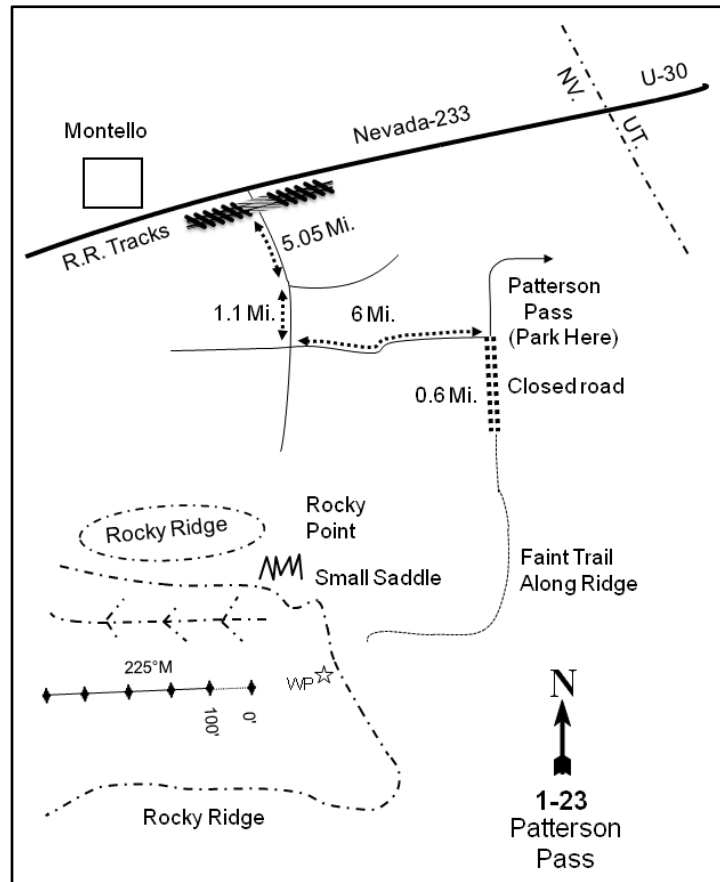
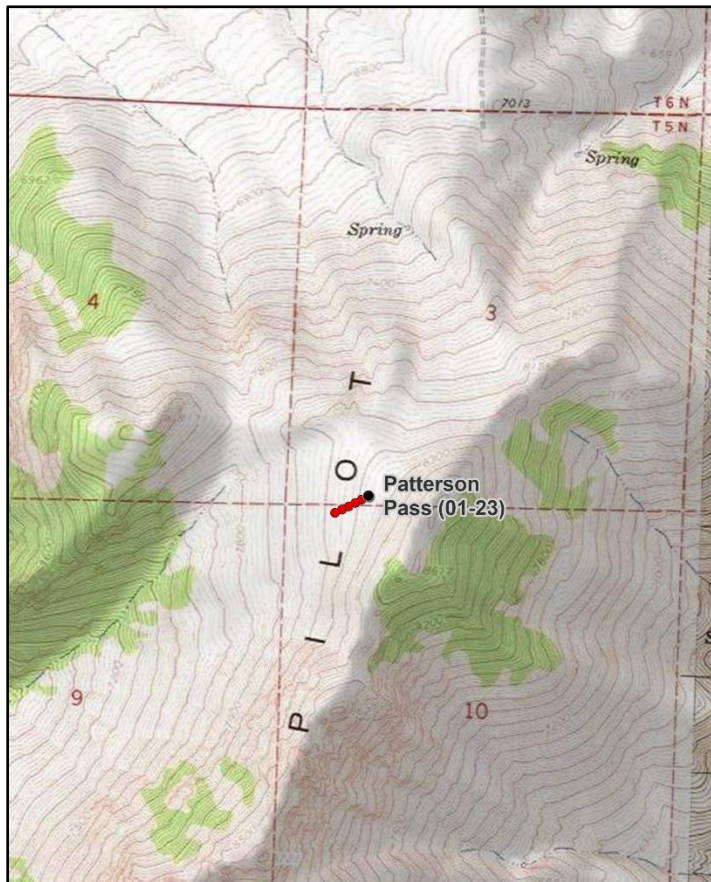
t - Tree Species; p - Preferred Browse; i - Introduced Species



**Table 01-22.15 - Deer Desirable Components Index: Semidesert Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	23.3	7.1	7.4	12.0	0.0	6.3	0.0	<b>55.9</b>	Good
2001	20.3	7.4	8.0	17.0	-0.2	1.6	0.0	<b>54.0</b>	Good
2006	20.6	8.3	4.6	12.8	-9.6	2.3	0.0	<b>39.1</b>	Fair
2011	22.2	9.0	6.5	13.7	-0.9	1.3	0.0	<b>51.8</b>	Good
2016	24.7	10.9	6.0	28.3	-2.4	4.4	0.0	<b>71.9</b>	Excellent
2021	19.5	4.4	4.9	9.1	-0.6	1.7	0.0	<b>38.9</b>	Fair

## PATTERSON PASS - STUDY NO. 01-23



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Patterson Pass SE; Township 5N, Range 19W, Section 03  
NAD 83 UTM ZONE 12, 246926 East 4562320 North

### Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	225° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Belt 1, 4: 1ft; Belt 2: 15ft

### Directions to Site

Drive 0.5 miles past mile marker 25 on Nevada State Road 233. Turn left to cross the railroad tracks and continue straight for 5.05 miles. At this point there will be a road going to the left. Stay right and continue 1.1 miles to a four-way intersection. Turn left and drive 6 miles to Patterson Pass: park here. Walk up a closed road for 0.6 miles to a faint trail. From here, walk on the trail up the ridge to a saddle; stay high on the slope. The witness post is in the saddle about 400 feet from the rocky slope to the east. The 0-foot baseline stake is just a few paces west of the witness post. The baseline runs at 225 degrees magnetic.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	LUCIN PILOT
Elevation	8,200ft (2,499m)
Aspect	Southwest
Slope	15-25%
Sample Dates	06/19/1996, 06/06/2001, 06/06/2006, 06/07/2011, 06/07/2016, 06/01/2021

**Wildlife Habitat and Vegetation History****Table 01-23.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	summer	
Rocky Mountain Elk	crucial	summer	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Pronghorn	substantial	summer	
Rocky Mountain Bighorn	crucial	year-long	

**Table 01-23.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1996	Mountain Big Sagebrush	No Encroachment
2001	Mountain Big Sagebrush	No Encroachment
2006	Mountain Big Sagebrush	No Encroachment
2011	Mountain Big Sagebrush	No Encroachment
2016	Mountain Big Sagebrush	No Encroachment
2021	Mountain Big Sagebrush	No Encroachment

**Site Notes**

Two cow elk were seen on site in early summers of 2001 and 2006. Chukar were heard on nearby rocky slopes in 1996.

**Soils****Table 01-23.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.7	40.6	33.4	26.0	5.4	36.2	444.8	0.5	06/19/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R028AY431UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1996, this site has been dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with black sagebrush (*A. nova*) as an additional prominent shrub species (Table 01-23.12, Table 01-23.13). The understory has remained diverse and abundant over the study period with perennial grasses as the dominant component of the herbaceous community (Table 01-23.10, Table 01-23.11). In 2021, decadence and poor vigor among the preferred browse populations noticeably increased from the previous sample period, likely due to prolonged drought (Table 01-23.13). Despite drought influences, however, the high-elevation potential and community structure of this site affords a high level of resistance and resilience to disturbance. Due to the diversity and abundance of native species, this habitat remains in good condition for wildlife.

**Trend Summary Tables****Table 01-23.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	25.5	4.6	-	-	-	-
2001	26.1	4.0	-	-	-	-
2006	31.0	3.3	-	41.3	4.2	-
2011	25.2	1.2	-	33.0	1.2	-
2016	30.0	3.9	-	39.6	4.4	-
2021	33.0	4.1	-	40.2	3.8	-

**Table 01-23.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	-	368	231	315	-	18.3	2.2	8.5
2001	-	362	161	320	-	25.4	2.9	12.0
2006	-	348	184	294	-	19.7	6.6	14.1
2011	-	307	266	350	-	13.6	5.9	11.0
2016	-	398	325	349	-	30.4	6.4	18.8
2021	-	351	151	342	-	22.8	4.9	18.3

**Table 01-23.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	3.3	0.0	61.4	0.6	12.8	55.5
2001	2.3	0.0	52.4	0.3	9.4	64.2
2006	4.6	0.0	34.2	2.0	11.8	65.2
2011	8.9	0.7	32.7	1.0	11.0	53.1
2016	2.3	0.1	39.3	0.3	7.0	75.7
2021	5.7	0.4	36.3	0.7	7.6	65.5

**Table 01-23.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Big Horn Sheep	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
1996	-	4	58	-	-
2001	-	1	25	1	-
2006	-	2	34	-	14
2011	1	3	29	-	-
2016	-	1	12	-	-
2021	1	7	26	1	4
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	-	0.7 (1.7)	46.9 (115.9)	-	-
2006	-	1.3 (3.3)	40.2 (99.3)	-	-
2011	-	2.0 (5.0)	44.2 (109.2)	-	-
2016	-	0.7 (1.7)	20.8 (51.3)	-	-
2021	-	10.0 (24.8)	47.6 (117.5)	17.4 (43.0)*	-

\*Pellets per acre (ha)

**Table 01-23.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Koeleria macrantha (prairie Junegrass)	Leucopoa kingii (spike fescue)	Leymus cinereus (basin wildrye)	Melica bulbosa (oniongrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency											
1996	11	-	3	292	-	110	5	-	47	1	95	43
2001	28	5	-	287	2	84	5	-	63	-	35	24
2006	14	-	-	281	-	98	5	1	49	-	67	6
2011	7	-	-	246	-	53	32	-	14	-	62	10
2016	-	3	-	265	-	61	4	49	41	16	177	72
2021	3	4	-	264	0	112	14	-	4	1	141	1
year	Average Cover (%)											
1996	0.1	-	0.0	12.9	-	2.5	0.6	-	0.8	0.0	1.1	0.3
2001	0.6	0.0	-	15.8	0.3	4.8	0.8	-	2.0	-	0.3	0.8
2006	0.4	-	-	12.1	-	4.0	0.6	0.1	1.1	-	1.2	0.2
2011	0.0	-	-	9.9	-	2.1	0.5	-	0.1	-	0.9	0.1
2016	-	0.1	-	14.7	-	2.9	0.6	2.6	1.1	0.1	6.0	2.3
2021	0.0	0.1	-	11.5	0.0	7.3	0.8	-	0.0	0.0	3.0	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 01-23.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Arabis (rockcress)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza hookeri (Hooker's balsamroot)	Calochortus bruneauis (Bruneau mariposa lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chenopodium album <sup>a</sup> (lambsquarters)	Chenopodium fremontii <sup>a</sup> (Fremont's goosefoot)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cymopterus (springparsley)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Erigeron pumilus (shaggy fleabane)	Hackelia patens (spotted stickseed)	Lithophragma parviflorum (smallflower woodland-star)
year	Nested Frequency																
1996	83	-	-	1	5	-	-	-	-	198	7	7	-	-	-	33	-
2001	106	7	2	-	5	-	0	-	-	106	13	4	-	-	-	11	-
2006	69	3	-	-	12	-	-	-	-	95	17	-	-	-	-	19	27
2011	107	-	-	-	4	-	-	-	5	247	11	9	-	-	-	4	11
2016	102	30	1	-	4	-	1	1	1	319	50	65	2	6	1	27	76
2021	178	19	-	-	3	5	-	-	-	57	30	8	3	-	-	19	28
year	Average Cover (%)																
1996	0.6	-	-	0.0	0.0	-	-	-	-	0.9	0.1	0.0	-	-	-	0.4	-
2001	0.9	0.0	0.0	-	0.1	-	0.0	-	-	0.8	0.2	0.1	-	-	-	0.4	-
2006	1.3	0.0	-	-	0.9	-	-	-	-	0.3	0.5	-	-	-	-	0.8	0.2
2011	1.3	-	-	-	0.0	-	-	-	0.1	2.1	0.0	0.2	-	-	-	0.1	0.0
2016	2.1	0.3	0.0	-	0.5	-	0.0	0.0	0.0	5.3	0.8	1.3	0.0	0.0	0.0	1.4	0.7
2021	3.1	0.0	-	-	0.1	0.0	-	-	-	0.5	0.5	0.1	0.0	-	-	0.7	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lomatium (desertparsley)	Lupinus argenteus (silvery lupine)	Mertensia oblongifolia (oblongleaf bluebells)	Microsteris gracilis <sup>a</sup> (slender phlox)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Pleiocanthus spinosus (thorn skeletonweed)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Potentilla pensylvanica (Pennsylvania cinquefoil)	Ranunculus jovis (Utah buttercup)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Sisymbrium altissimum <sup>at</sup> (tall tumblemustard)	Stenotus acaulis (stemless mock goldenweed)	Taraxacum officinale (common dandelion)
year	Nested Frequency															
1996	-	150	71	-	-	3	-	188	2	6	50	-	77	4	2	31
2001	4	153	70	1	17	-	-	155	-	2	57	134	60	-	2	34
2006	-	126	88	-	-	-	3	66	-	6	48	107	132	-	-	11
2011	5	99	151	-	28	-	2	78	-	3	32	197	87	-	20	28
2016	2	191	119	16	-	-	-	68	3	-	46	64	41	-	-	10
2021	-	125	82	-	-	-	-	170	-	-	59	157	103	3	-	2
year	Average Cover (%)															
1996	-	4.6	0.8	-	-	0.0	-	0.8	0.0	0.0	0.6	-	1.2	0.0	0.1	0.4
2001	0.0	5.0	0.7	0.0	0.8	-	-	1.1	-	0.0	0.9	1.4	2.1	-	0.0	0.3
2006	-	5.9	1.4	-	-	-	0.0	0.3	-	0.0	1.9	0.8	6.3	-	-	0.1
2011	0.1	0.9	2.2	-	0.9	-	0.0	0.5	-	0.0	0.1	4.1	3.6	-	0.1	0.4
2016	0.0	7.5	2.2	0.1	-	-	-	0.6	0.0	-	0.8	0.5	1.1	-	-	0.1
2021	-	4.9	1.9	-	-	-	-	2.8	-	-	1.3	2.7	4.3	0.1	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 01-23.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova <sup>p</sup> (black sagebrush)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum microthecum <sup>p</sup> (slender buckwheat)	Pediocactus simpsonii (mountain ball cactus)	Ribes cereum var. cereum <sup>p</sup> (wax currant)
year	Line Intercept Cover (%)					
1996	-	-	-	-	-	-
2001	-	-	-	-	-	-
2006	13.1	26.6	4.2	1.5	-	0.1
2011	14.2	18.1	1.2	0.7	-	-
2016	14	24.3	4.4	1.1	-	0.2
2021	15.3	22.9	3.8	2	-	-
year	Quadrat Cover (%)					
1996	6.5	17.6	4.6	1.4	-	0.0
2001	4.0	20.9	4.0	0.9	-	0.4
2006	8.4	20.4	3.1	1.9	0.1	0.4
2011	10.8	14.0	1.2	0.4	-	0.0
2016	12.1	16.6	3.9	1.1	-	0.1
2021	12.2	19.1	4.1	1.7	-	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-23.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

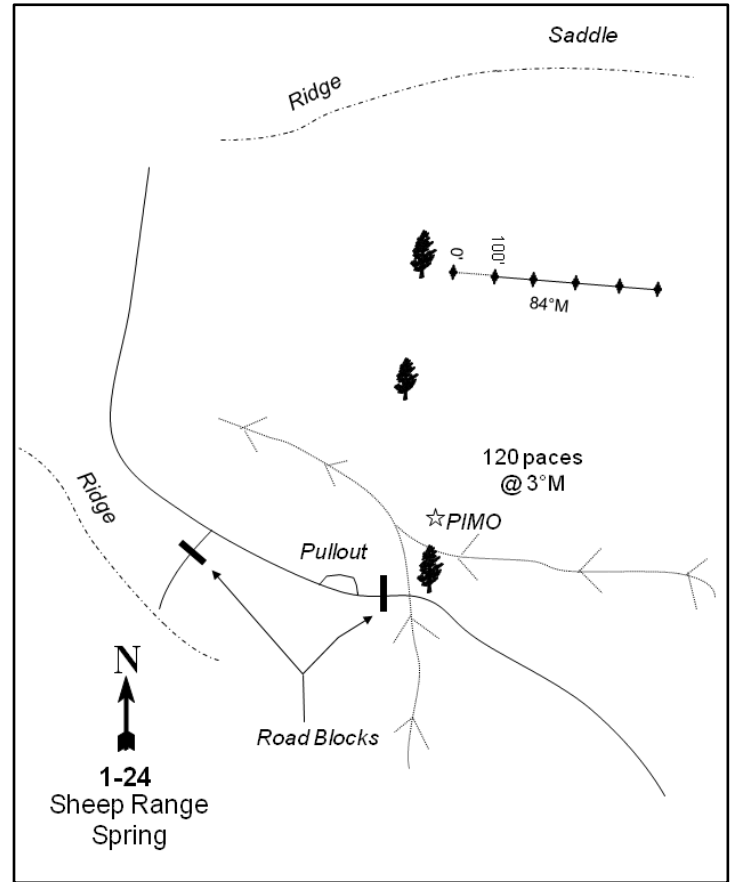
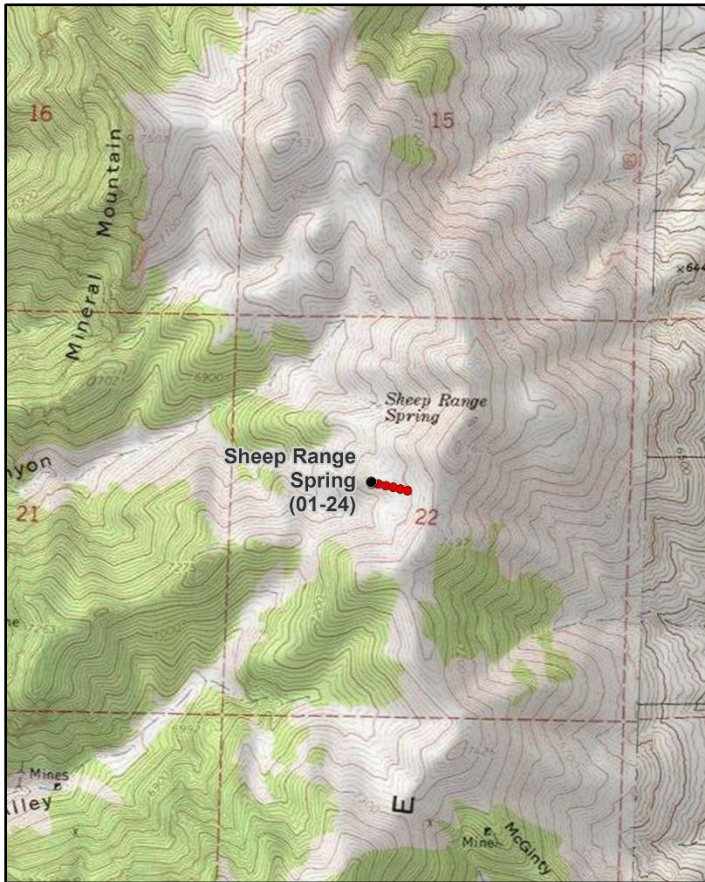
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia nova<sup>P</sup> -- (black sagebrush)</b>									
1996	2100	180	12	79	9	39	1	0	29/64
2001	1900	-	3	93	4	0	0	1	29/52
2006	2980	8540	9	87	4	0	0	1	25/51
2011	3660	100	3	87	10	18	1	4	30/71
2016	3900	-	4	91	5	0	0	5	30/55
2021	3660	-	6	82	13	11	0	13	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1996	5060	340	17	68	15	27	11	4	47/83
2001	6000	60	10	76	15	8	0	9	48/81
2006	4840	1940	3	71	27	9	0	13	50/81
2011	3640	-	6	71	23	37	0	19	52/91
2016	4100	-	2	89	9	1	1	3	61/87
2021	3200	20	3	61	36	3	0	35	- / -
<b>Chamaebatiaria millefolium -- (desert sweet)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	112/205
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	122/230
2021	20	-	0	100	0	0	0	0	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	4100	20	11	78	11	4	0	7	28/41
2001	3280	-	9	76	15	1	0	6	23/40
2006	2760	-	6	89	5	0	0	0	23/38
2011	1620	-	0	80	20	3	0	19	23/32
2016	2040	-	4	95	1	0	0	0	30/45
2021	2440	-	7	77	16	2	0	18	- / -
<b>Eriogonum microthecum<sup>P</sup> -- (slender buckwheat)</b>									
1996	1320	-	15	85	0	12	0	0	15/26
2001	1120	-	0	100	0	0	0	4	16/29
2006	1380	-	1	96	3	4	0	0	15/33
2011	460	-	0	91	9	0	0	13	16/36
2016	820	20	5	95	0	0	0	2	19/29
2021	1000	-	0	86	14	8	0	18	- / -
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	60/44
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Pediocactus simpsonii -- (mountain ball cactus)</b>									
1996	80	-	0	100	0	50	0	0	17/16
2001	20	-	0	100	0	0	0	0	6/9
2006	20	-	0	100	0	0	0	0	11/13
2011	20	-	0	100	0	0	0	0	13/25
2016	-	-	-	-	-	-	-	-	11/12
2021	60	-	0	100	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Ribes cereum var. cereum <sup>p</sup> -- (wax currant)									
1996	-	-	-	-	-	-	-	-	95/198
2001	-	-	-	-	-	-	-	-	94/261
2006	20	-	0	0	100	0	0	100	86/205
2011	20	-	0	0	100	0	0	100	91/168
2016	40	-	0	50	50	0	0	50	109/179
2021	20	-	0	0	100	0	0	100	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species



## SHEEP RANGE SPRING - STUDY NO. 01-24

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Patterson Pass NE; Township 6N, Range 19W, Section 22  
NAD 83 UTM ZONE 12, 247362 East 4568103 North

**Transect Information**

Browse Tag # (0' Stake)	Not Available
Transect Bearing	84° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Belt 4: 21ft

**Directions to Site**

From the State Route 30 and Pilot Mountain Road junction, travel south on the Pilot Mountain Road for 5.4 miles to the railroad tracks. Continue straight for 0.6 miles to the TL Bar Beefmaster Ranch. Take the left fork and travel 5 miles to a fork in the road. Turn right and travel 2.1 miles to a four-way intersection. Continue straight (stay right) for 2.7 miles to Governors Spring. Turn left at Governors Spring and drive 1.0 mile. Proceed to the right and travel downhill for 1.0 mile. Take the left fork and continue for 1.6 miles to an intersection. From the intersection turn left and continue 1.1 miles where there will be a road going up a steep hill to the right. Stay left and travel 0.1 miles to the end of the road. From the single-leaf pine, walk 120 paces at 3 degrees magnetic to the 0-foot baseline stake near another single-leaf pine. The baseline runs at 84 degrees magnetic.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	LUCIN PILOT
Elevation	7,200ft (2,195m)
Aspect	Southwest
Slope	16-30%
Sample Dates	06/20/1996, 06/06/2001, 06/06/2006, 06/07/2011, 06/08/2016, 06/02/2021

**Wildlife Habitat and Vegetation History****Table 01-24.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	summer	
Rocky Mountain Elk	crucial	summer	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Pronghorn	substantial	summer	
Rocky Mountain Bighorn	crucial	year-long	

**Table 01-24.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1996	Mountain Big Sagebrush	Phase I
2001	Mountain Big Sagebrush	Phase I
2006	Mountain Big Sagebrush	Phase I
2011	Mountain Big Sagebrush	Phase I
2016	Mountain Big Sagebrush	Phase I
2021	Mountain Big Sagebrush	Phase I

**Site Notes**

A sage-grouse was flushed from the site and a turkey hen with chicks were seen near the site in 2016.

**Soils****Table 01-24.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.2	40.4	35.0	24.6	3.2	21.1	425.6	0.8	06/20/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R028AY431UT
States and Transitions	No state and transition model is available for this ecological site.

This site has been dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with black sagebrush (*Artemisia nova*) as a subordinate shrub species since study establishment in 1996 (Table 01-24.12, Table 01-24.13). The herbaceous understory has remained diverse and abundant over the sample years with perennial grasses as the dominant component of the herbaceous community (Table 01-24.10, Table 01-24.11). In 2021, decadence and poor vigor among the preferred browse populations noticeably increased from the previous sample period, likely due to prolonged drought (Table 01-24.13). Despite drought influences observed on this site, however, the high-elevation potential and community structure of the site affords a high level of resistance and resilience to disturbance. Due to the diversity and abundance of native species, this habitat remains in good condition for wildlife.

**Trend Summary Tables****Table 01-24.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	9.8	6.2	-	-	-	-
2001	12.9	6.5	-	-	-	-
2006	13.9	4.4	-	19.9	6.9	-
2011	18.6	3.7	-	18.9	6.4	-
2016	14.9	7.1	-	23.6	10.2	-
2021	17.8	5.7	-	25.8	5.8	-

**Table 01-24.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	307	321	177	303	5.5	11.3	0.7	16.2
2001	263	352	335	320	4.1	21.6	3.3	16.0
2006	-	353	10	198	-	15.1	0.1	12.5
2011	37	365	333	328	0.8	24.7	6.5	13.3
2016	248	334	251	291	8.8	12.8	1.2	15.0
2021	147	348	142	307	0.9	15.2	0.9	11.7

**Table 01-24.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	6.4	0.0	52.9	7.6	6.6	48.9
2001	7.0	0.0	50.1	8.1	4.6	61.1
2006	18.8	-	30.4	14.7	5.2	43.6
2011	18.6	0.1	19.2	6.7	4.1	59.4
2016	12.7	1.1	29.7	11.1	5.0	51.1
2021	17.7	0.3	40.7	7.2	5.5	46.8

**Table 01-24.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Big Horn Sheep	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
1996	-	9	40	-	-
2001	-	1	11	-	-
2006	1	1	16	-	1
2011	1	3	14	1	-
2016	1	1	23	-	-
2021	2	3	21	1	-
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	-	5.3 (13.2)	22.1 (54.6)	-	-
2006	2.9 (7.2)	11.4 (28.1)	20.8 (51.3)	-	-
2011	-	8.7 (21.5)	21.5 (53.0)	-	-
2016	-	0.7 (1.7)	24.8 (61.2)	-	-
2021	-	3.4 (8.3)	26.2 (64.6)	34.9 (86.1)*	-

\*Pellets per acre (ha)

**Table 01-24.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency						
1996	3	307	-	122	1	195	106
2001	-	263	-	42	3	237	192
2006	-	-	-	165	4	225	112
2011	-	37	-	149	23	258	87
2016	-	248	1	151	3	243	112
2021	2	147	10	163	-	241	87
year	Average Cover (%)						
1996	0.0	5.5	-	2.1	0.0	7.1	2.1
2001	-	4.1	-	0.9	0.0	12.1	8.7
2006	-	-	-	2.7	0.0	7.4	5.0
2011	-	0.8	-	2.2	1.7	16.3	4.5
2016	-	8.8	0.0	2.5	0.0	5.9	4.4
2021	0.0	0.9	0.2	3.2	-	8.6	3.1

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 01-24.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria (pussytoes)	Arabis (rockerness)	Astragalus (milkvetch)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus cibarius (browse milkvetch)	Balsamorhiza hookeri (Hooker's balsamroot)	Balsamorhiza sagittata (arrowleaf balsamroot)	Camelina microcarpa <sup>ai</sup> (littlerpod false flax)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Descurainia pinnata <sup>a</sup> (western tansymustard)
year	Nested Frequency																
1996	50	1	-	-	-	-	27	62	21	130	19	-	160	3	18	9	-
2001	94	50	-	-	0	-	3	60	16	114	1	1	295	57	32	14	-
2006	13	-	-	-	5	-	-	3	19	81	-	-	-	-	40	6	-
2011	155	98	-	-	-	-	25	8	14	66	-	-	321	11	13	-	6
2016	68	54	4	1	-	1	8	32	18	75	30	-	212	64	20	70	-
2021	190	32	5	10	-	4	-	25	19	62	2	-	107	22	23	7	-
year	Average Cover (%)																
1996	0.2	0.0	-	-	-	-	0.3	0.5	0.2	12.1	0.0	-	0.6	0.0	0.1	0.1	-
2001	0.4	0.2	-	-	0.0	-	0.0	1.2	1.0	9.2	0.0	0.0	1.8	0.1	0.5	0.2	-
2006	0.0	-	-	-	0.0	-	-	0.1	0.5	9.2	-	-	-	-	0.8	0.0	-
2011	1.8	0.5	-	-	-	-	0.8	0.1	0.8	3.3	-	-	5.1	0.0	0.1	-	0.1
2016	0.5	0.2	0.0	0.0	-	0.0	0.1	0.9	0.5	7.8	0.1	-	0.6	0.2	0.2	0.6	-
2021	2.3	0.3	0.0	0.1	-	0.0	-	0.3	0.3	3.8	0.0	-	0.4	0.1	0.3	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Erigeron pumilus (shaggy fleabane)	Eriogonum heracleioides (parsnipflower buckwheat)	Eriogonum villiflorum (gray buckwheat)	Hackelia patens (spotted stickseed)	Hydrophyllum capitatum (ballhead waterleaf)	Ionactis alpina (Lava aster)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lewisia rediviva (bitter root)	Lithospermum ruderale (western stone seed)	Lomatium (desertparsley)	Lupinus argenteus (silvery lupine)	Machaeranthera grindelioides (rayless tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Navarretia intertexta <sup>a</sup> (needleleaf navarretia)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)
year	Nested Frequency																
1996	-	-	-	38	25	-	6	-	1	-	33	2	-	2	-	162	3
2001	14	-	16	14	49	-	-	-	1	11	34	3	217	-	-	125	-
2006	-	-	-	25	-	11	3	-	3	-	5	-	-	-	-	73	4
2011	-	-	-	42	113	2	-	2	-	15	18	-	66	-	5	67	-
2016	-	1	-	70	70	17	17	1	6	18	37	1	23	-	-	19	-
2021	-	-	-	39	75	11	2	1	10	10	56	-	18	-	-	34	7
year	Average Cover (%)																
1996	-	-	-	0.7	0.2	-	0.0	-	0.0	-	0.9	0.0	-	0.0	-	0.8	0.0
2001	0.1	-	0.4	0.1	0.5	-	-	-	0.1	0.2	0.9	0.0	1.2	-	-	1.0	-
2006	-	-	-	1.0	-	0.1	0.0	-	0.3	-	0.1	-	-	-	-	0.2	0.0
2011	-	-	-	0.7	3.9	0.0	-	0.0	-	0.1	0.4	-	0.7	-	0.0	0.6	-
2016	-	0.0	-	2.0	0.7	0.4	0.0	0.0	0.2	0.2	0.7	0.0	0.1	-	-	0.0	-
2021	-	-	-	0.8	0.7	0.1	0.0	0.0	0.4	0.1	2.0	-	0.1	-	-	0.2	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Ranunculus jovis (Utah buttercup)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Stenotus acaulis (stemless mock goldenweed)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Viola (violet)
year	Nested Frequency					
1996	-	4	-	2	-	-
2001	-	16	-	-	-	3
2006	-	3	-	10	-	8
2011	-	28	-	4	-	47
2016	-	20	3	-	2	4
2021	4	22	-	-	1	7
year	Average Cover (%)					
1996	-	0.0	-	0.0	-	-
2001	-	0.2	-	-	-	0.0
2006	-	0.1	-	0.1	-	0.0
2011	-	0.6	-	0.0	-	0.3
2016	-	0.1	0.0	-	0.0	0.0
2021	0.0	0.3	-	-	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 01-24.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova <sup>p</sup> (black sagebrush)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. lanceolatus (yellow rabbitbrush)	Eriogonum microthecum <sup>p</sup> (slender buckwheat)	Grayia spinosa (spiny hopsage)
year	Line Intercept Cover (%)				
1996	-	-	-	-	-
2001	-	-	-	-	-
2006	3.2	16.7	6.9	-	-
2011	3.5	15.4	6.4	-	-
2016	3.1	20.5	10.2	-	-
2021	3.7	22.1	5.8	-	-
year	Quadrat Cover (%)				
1996	2.4	7.4	6.2	0.0	-
2001	1.9	11.0	6.5	0.0	-
2006	1.8	12.1	4.4	0.1	-
2011	2.4	16.3	3.7	-	-
2016	2.1	12.9	6.8	-	0.4
2021	2.7	15.0	5.7	0.1	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 01-24.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia nova<sup>p</sup> -- (black sagebrush)</b>									
1996	1020	-	8	78	14	12	0	0	24/63
2001	500	-	4	84	12	0	0	8	25/60
2006	740	340	5	81	14	0	3	11	22/60
2011	860	140	40	56	5	2	0	5	22/59
2016	1140	320	18	79	4	0	0	5	24/61
2021	1120	-	7	79	14	0	0	14	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	2200	20	18	66	16	10	1	6	50/78
2001	2080	-	5	79	16	3	0	24	60/95
2006	1840	3560	2	76	22	8	0	9	61/100
2011	2460	120	23	67	11	53	0	13	57/98
2016	2800	1780	9	87	4	1	1	2	57/92
2021	3160	40	6	77	17	4	0	17	- / -
<b>Chrysothamnus viscidiflorus ssp. lanceolatus -- (yellow rabbitbrush)</b>									
1996	3600	20	19	73	8	1	0	4	35/56
2001	3340	40	3	88	9	0	0	13	32/52
2006	3160	-	4	87	10	1	0	2	26/52
2011	2500	-	2	91	6	1	0	6	26/50
2016	2840	-	3	97	0	0	0	0	28/51
2021	2780	-	3	66	32	0	0	31	- / -

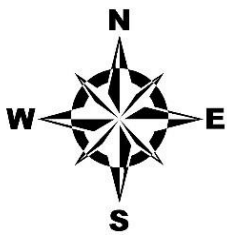
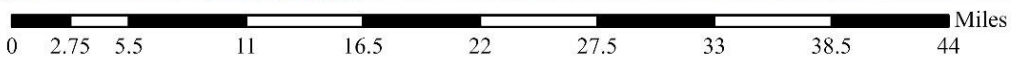
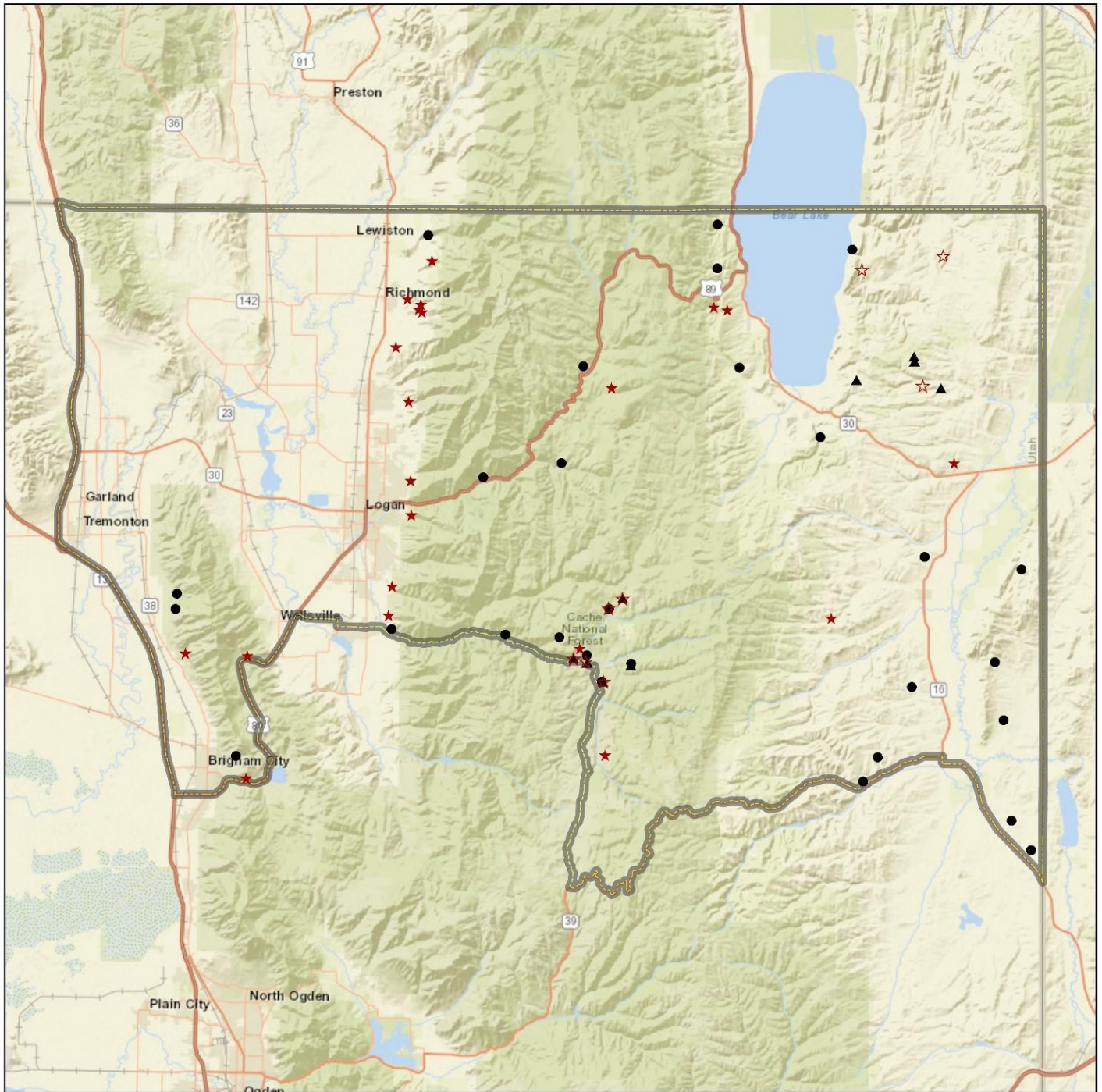
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Eriogonum heracleoides -- (parsnipflower buckwheat)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	120	-	0	100	0	0	0	0	20/18
2021	-	-	-	-	-	-	-	-	-/-
<b>Eriogonum microthecum<sup>p</sup> -- (slender buckwheat)</b>									
1996	180	-	0	89	11	11	0	0	8/26
2001	20	-	0	100	0	0	0	0	8/16
2006	40	-	0	100	0	0	0	0	8/19
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	21/33
2021	-	-	-	-	-	-	-	-	-/-
<b>Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)</b>									
1996	20	-	100	0	0	0	0	0	66/74
2001	20	-	0	100	0	0	0	0	77/166
2006	-	-	-	-	-	-	-	-	88/126
2011	-	-	-	-	-	-	-	-	87/169
2016	-	-	-	-	-	-	-	-	61/60
2021	-	-	-	-	-	-	-	-	-/-
<b>Grayia spinosa -- (spiny hopsage)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	50/91
2021	-	-	-	-	-	-	-	-	-/-
<b>Pediocactus simpsonii -- (mountain ball cactus)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	20	-	0	100	0	0	0	0	3/5
2011	20	-	0	100	0	0	0	0	4/8
2016	-	-	-	-	-	-	-	-	-/-
2021	20	-	0	100	0	0	0	0	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

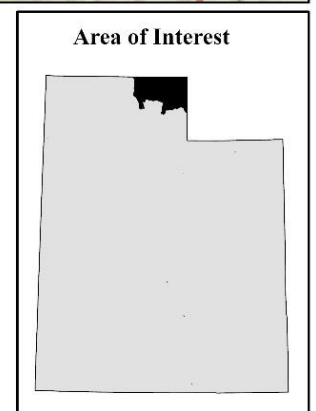
**Table 01-24.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Pinus monophylla (singleleaf pinyon)</b>							
2016	8	-	-	33	33	33	28.3
2021	8	-	-	33	-	67	34.0

# WILDLIFE MANAGEMENT UNIT 2 - CACHE



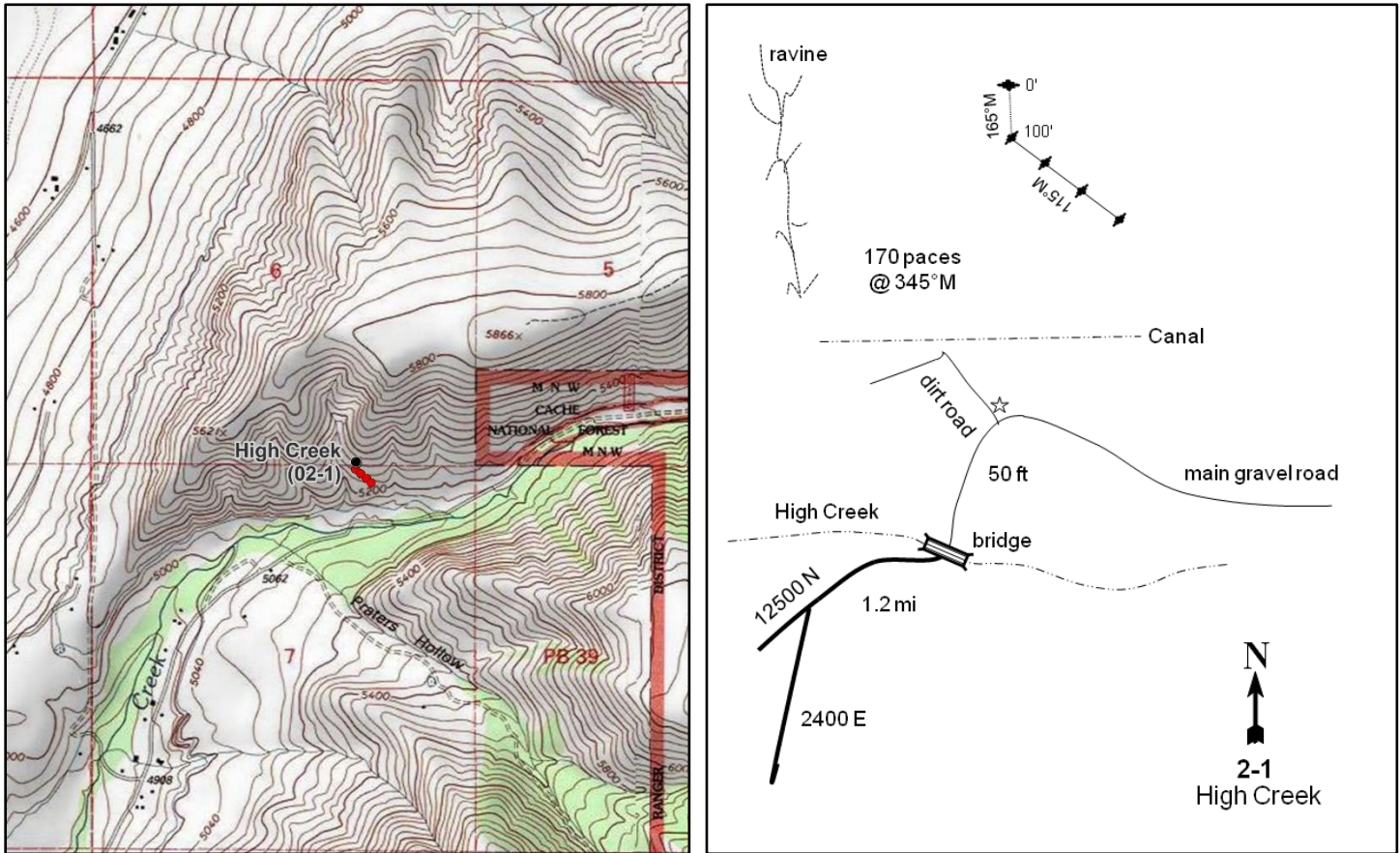
Study Locations Project, Status		Unit Boundary
●	RT, Active	Unit - 2
★	RT, Suspended	
▲	WRI, Active	
☆	WRI, Suspended	



Credits: Esri, HERE, Garmin, NGA, USGS, NPS



## HIGH CREEK - STUDY NO. 02-1

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Richmond NE; Township 14N, Range 2E, Section 06  
NAD 83 UTM ZONE 12, 436618 East 4647446 North

**Transect Information**

Browse Tag # (0' Stake)	9150
Transect Bearing	165° magnetic (Lines 2-4: 115° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)
Belt Marker Placement	Belt 2, 4: 2ft; Belt 5: No Rebar

**Directions to Site**

From 12500 North and 2400 East in Richmond, proceed northeast for 1.2 miles and cross High Creek. Just beyond this crossing (north) a dirt road heads off to the northeast. From this intersection, walk 170 paces at a bearing of 345 degrees magnetic to the 100-foot stake of the frequency baseline. Walk 100 feet beyond this stake to the 0-foot stake, which is marked with browse tag #9150. The baseline runs at 165 degrees magnetic. The baseline doglegs after 100 feet and runs in a direction of 115 degrees magnetic.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,300ft (1,615m)
Aspect	South
Slope	30-32%
Sample Dates	07/30/1996, 07/10/2001, 06/28/2006, 07/27/2011, 06/29/2016, 07/08/2021

**Wildlife Habitat and Vegetation History****Table 02-01.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Shiras Moose	crucial	summer

**Table 02-01.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Mountain Big Sagebrush	No Encroachment
1990	Mountain Big Sagebrush	No Encroachment
1996	Mountain Big Sagebrush/Annual Grass	No Encroachment
2001	Mountain Big Sagebrush/Annual Grass	No Encroachment
2006	Mountain Big Sagebrush/Annual Grass-Forb	No Encroachment
2011	Mountain Big Sagebrush/Annual Grass-Forb	No Encroachment
2016	Mountain Big Sagebrush/Annual Grass-Forb	Phase I
2021	Mountain Big Sagebrush/Annual Grass-Forb	Phase I

**Site Notes**

No Notes

**Soils****Table 02-01.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.2	42.9	29.1	28.0	2.1	16.3	150.4	0.5	07/30/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Upland Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA334UT
States and Transitions	No state and transition model is available for this ecological site.

Since establishment in 1988, this study site has remained in a stable state with mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) as a dominant vegetation component (Table 02-01.12, Table 02-01.13, Photos). The herbaceous understory has remained fairly diverse and abundant over the duration of the study. Annual grasses and forbs have dominated the understory since 2006, with cheatgrass (*Bromus tectorum*) and redstem stork's bill (*Erodium cicutarium*) as the most abundant species in 2021 (Table 02-01.7, Table 02-01.10, Table 02-01.11). Rocky Mountain juniper (*Juniperus scopulorum*) has been present in point-quarter density data since 2016, placing the site within Phase I of woodland succession. As density is low as of 2021 (Table 02-01.4, Table 02-01.14), however, further tree encroachment is likely not an immediate concern. Deer winter range condition has generally remained very poor since site establishment. However, sagebrush cover has increased overall. As of 2021, deer winter range conditions were considered to be very poor. Improvement to deer wintering range can be accomplished through efforts that support mature sagebrush and reproduction; diversifying native perennial grasses and forbs while reducing cheatgrass would also improve winter range conditions (Table 02-01.15).

**Trend Summary Tables****Table 02-01.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	14.0	-	-	-	-	-
2001	14.2	-	-	-	-	-
2006	7.6	-	-	7.0	-	-
2011	9.1	-	-	12.8	-	-
2016	14.6	-	-	20.8	-	-
2021	14.8	-	-	18.9	-	-

**Table 02-01.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	395	68	233	41	28.7	3.7	4.1	1.4
2001	466	142	368	115	25.5	5.9	10.9	3.4
2006	452	186	332	110	18.6	9.0	10.5	6.2
2011	397	211	370	180	11.6	6.7	17.3	6.0
2016	389	80	368	162	15.3	2.1	15.8	4.3
2021	437	150	346	123	12.3	5.7	12.4	3.3

**Table 02-01.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	0.7	0.1	56.6	6.2	19.3	56.5
2001	3.3	0.0	34.6	3.9	19.8	57.5
2006	3.2	0.0	29.4	11.5	22.5	49.0
2011	4.4	0.1	25.9	10.5	24.4	48.6
2016	8.0	0.2	25.5	11.4	23.6	45.8
2021	5.3	1.7	30.9	9.3	30.7	46.0

**Table 02-01.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
2001	2	-	2	-	-
2006	-	-	5	-	2
2011	-	-	1	-	1
2016	2	-	7	1	-
2021	-	-	3	-	6
Year	Days Use Per Acre (ha)				
2001	2.2 (5.4)	8.7 (21.5)*	10.0 (24.8)	-	-
2006	2.2 (5.4)	-	2.7 (6.6)	-	-
2011	3.6 (9.0)	-	0.7 (1.7)	-	-
2016	-	-	24.1 (59.6)	-	-
2021	0.7 (1.8)	-	14.7 (36.4)	-	-

\*Pellets per acre (ha)

**Table 02-01.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency					
<i>Bromus arvensis</i> <sup>ai</sup> (field brome)	178	90	382	27	16	33
<i>Bromus briziformis</i> <sup>ai</sup> (rattlesnake brome)	72	40	462	100	16	36
<i>Bromus tectorum</i> <sup>ai</sup> (cheatgrass)	122	11	450	163	8	40
<i>Poa bulbosa</i> <sup>i</sup> (bulbous bluegrass)	249	162	288	167	3	66
<i>Poa secunda</i> (Sandberg bluegrass)	230	58	354	49	-	31
<i>Pseudoroegneria spicata</i> (bluebunch wheatgrass)	214	73	408	96	3	60
year	Average Cover (%)					
1996	4.8	0.8	23.1	0.8	0.8	2.0
2001	0.7	0.1	24.7	4.4	0.4	1.1
2006	1.0	0.1	17.5	7.8	0.1	1.1
2011	4.7	2.4	4.5	5.3	0.0	1.3
2016	3.9	0.4	10.9	1.6	-	0.4
2021	1.3	0.5	10.5	1.9	0.0	3.8

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-01.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
<i>Agoseris glauca</i> (pale agoseris)	-	-	98	17	5	-	-	-	-	-	-	-	-	-	-	7	129
<i>Allium acuminatum</i> (tapertip onion)	-	-	217	37	16	0	-	31	-	5	-	-	1	-	-	3	67
<i>Alyssum desertorum</i> <sup>ai</sup> (desert madwort)	4	-	95	47	7	0	12	7	3	1	-	-	65	-	7	8	201
<i>Ambrosia psilostachya</i> (Cuman ragweed)	23	3	172	84	10	-	105	43	9	1	-	3	-	-	14	6	161
<i>Artemisia ludoviciana</i> (white sagebrush)	-	-	151	72	16	-	-	14	-	-	8	-	7	-	15	1	19
<i>Balsamorhiza sagittata</i> (arrowleaf balsamroot)	-	-	154	18	38	-	96	2	-	4	-	-	2	2	28	4	12
<i>Buglossoides arvensis</i> <sup>ai</sup> (corn gromwell)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Calochortus nuttallii</i> (sego lily)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Camelina microcarpa</i> <sup>ai</sup> (littlup false flax)	-	-	-	-	-	-	-	-	-	0.0	-	-	0.0	-	-	0.0	0.3
<i>Ceratocephala testiculata</i> <sup>ai</sup> (curvseed butterwort)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Chaenactis douglasii</i> (Douglas' dustymaiden)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Cirsium undulatum</i> <sup>a</sup> (wavyleaf thistle)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Collinsia parviflora</i> <sup>a</sup> (maiden blue eyed Mary)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Collomia linearis</i> <sup>a</sup> (tiny trumpet)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Convolvulus arvensis</i> <sup>ni</sup> (field bindweed)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Crepis acuminata</i> (tapertip hawksbeard)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Epilobium brachycarpum</i> <sup>a</sup> (tall annual willowherb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
year	Average Cover (%)																
1996	-	-	0.2	0.7	0.2	-	-	-	-	-	-	-	-	-	-	0.3	1.8
2001	-	-	1.6	0.6	0.7	0.1	-	0.2	-	0.0	-	-	0.0	-	-	0.0	0.3
2006	0.1	-	0.2	1.5	0.5	0.0	0.0	0.0	0.0	0.0	-	-	0.2	-	1.0	0.2	4.3
2011	0.3	0.0	1.1	2.4	0.6	-	1.6	0.3	0.1	0.0	-	0.2	-	-	0.5	0.0	2.0
2016	-	-	0.6	1.5	0.4	-	-	0.0	-	-	0.0	-	0.0	-	0.3	0.0	0.1
2021	-	-	0.3	0.2	1.2	-	0.6	0.0	-	0.0	-	-	0.0	0.0	0.6	0.2	0.4

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium aparine <sup>a</sup> (stickywilly)	Grindelia squarrosa (curlycup gumweed)	Hackelia patens (spotted stickseed)	Helianthus annuus <sup>ai</sup> (common sunflower)	Isatis tinctoria <sup>ami</sup> (Dyer's woad)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lomatium grayi (Gray's biscuitroot)	Lupinus argenteus (silvery lupine)	Melilotus officinalis <sup>i</sup> (sweetclover)	Microsteris gracilis <sup>a</sup> (slender phlox)	Oenothera caespitosa (tufted evening primrose)	Phacelia hastata (silverleaf phacelia)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Rumex crispus <sup>i</sup> (curly dock)
year	Nested Frequency																
1996	31	6	6	1	0	-	31	10	4	-	-	-	0	-	-	8	-
2001	222	8	18	-	6	-	5	-	6	12	-	4	-	-	9	23	-
2006	178	3	26	-	6	1	65	-	-	2	-	38	0	-	1	9	0
2011	254	29	38	-	131	-	101	-	4	4	-	4	-	2	-	7	-
2016	338	28	46	-	34	3	5	-	-	5	1	7	0	-	2	-	-
2021	260	19	30	-	-	1	8	-	10	-	-	3	4	-	-	4	-
year	Average Cover (%)																
1996	0.4	0.2	0.2	0.0	0.0	-	0.7	0.0	0.0	-	-	-	0.0	-	-	0.0	-
2001	6.7	0.0	0.9	-	0.1	-	0.0	-	0.0	0.4	-	0.0	-	-	0.0	0.1	-
2006	3.6	0.0	1.8	-	0.2	0.0	0.6	-	-	0.8	-	0.1	0.0	-	0.0	0.0	0.0
2011	6.4	0.6	0.8	-	2.5	-	1.4	-	0.0	0.8	-	0.0	-	0.0	-	0.0	-
2016	14.1	0.5	1.6	-	0.3	0.0	0.0	-	-	0.2	0.0	0.0	0.0	-	0.0	-	-
2021	10.2	0.3	0.5	-	-	0.0	0.4	-	0.2	-	-	0.0	0.1	-	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Silene antirrhina <sup>a</sup> (sleepy silene)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Veronica biloba <sup>ai</sup> (two-lobed speedwell)	Zigadenus pumilus <sup>ai</sup> (foothill deathcamas)
year	Nested Frequency			
1996	-	37	14	1
2001	-	33	193	20
2006	8	28	83	20
2011	7	158	22	18
2016	-	5	6	20
2021	-	16	1	21
year	Average Cover (%)			
1996	-	0.8	0.0	0.0
2001	-	0.4	1.7	0.3
2006	0.0	0.7	0.5	0.3
2011	0.0	1.4	0.2	0.1
2016	-	0.0	0.0	0.3
2021	-	0.2	0.0	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02-01.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)		
	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Rosa woodsii <sup>p</sup> (Woods' rose)
year	Line Intercept Cover (%)		
1996	-	-	-
2001	-	-	-
2006	4.4	2.6	-
2011	10.6	2.2	-
2016	18.1	2.7	-
2021	16.2	2.7	-
year	Quadrat Cover (%)		
1996	12.2	1.8	-
2001	13.0	1.2	-
2006	6.2	1.3	-
2011	7.9	1.1	-
2016	13.4	1.2	-
2021	12.3	2.5	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-01.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	2400	40	2	80	18	21	4	9	67/97
2001	1700	20	1	77	22	15	5	5	74/116
2006	1580	580	56	25	19	3	0	8	71/121
2011	1600	200	0	78	23	24	4	20	59/84
2016	1860	480	5	83	12	0	0	16	75/128
2021	1540	-	5	52	43	16	3	43	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	28/49
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	37/54
2021	-	-	-	-	-	-	-	-	- / -
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	220	-	0	100	0	73	0	0	69/180
2001	140	-	0	100	0	29	71	0	68/181
2006	220	-	0	100	0	46	55	0	55/107
2011	260	-	0	92	8	15	46	8	58/107
2016	220	-	9	82	9	36	9	9	61/150
2021	140	-	0	100	0	71	29	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<i>Rosa woodsii</i> <sup>p</sup> -- (Woods' rose)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	147/204
2016	-	-	-	-	-	-	-	-	116/143

t - Tree Species; p - Preferred Browse; i - Introduced Species

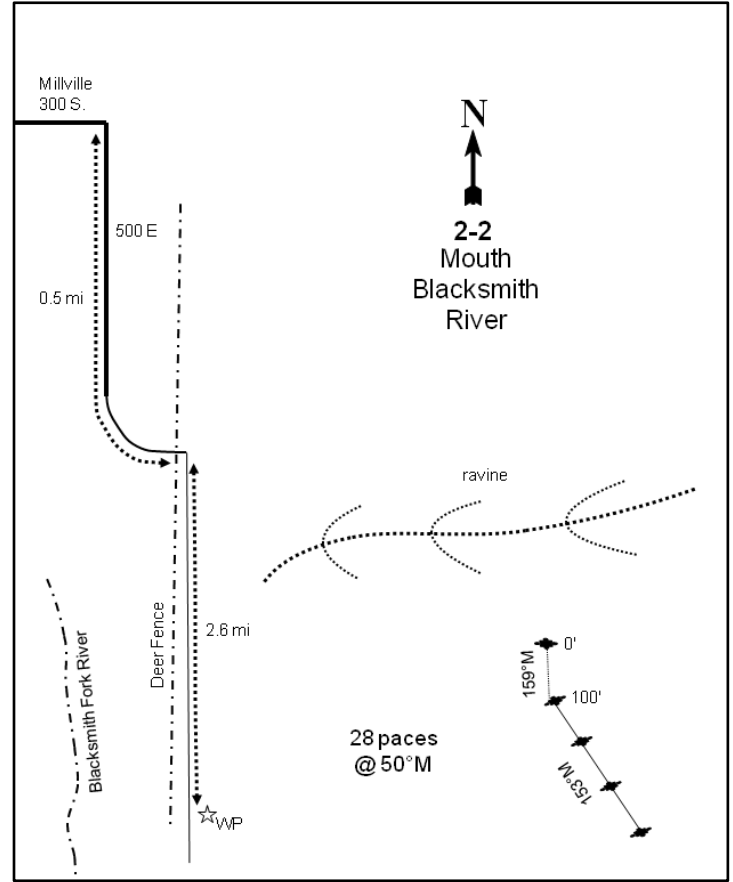
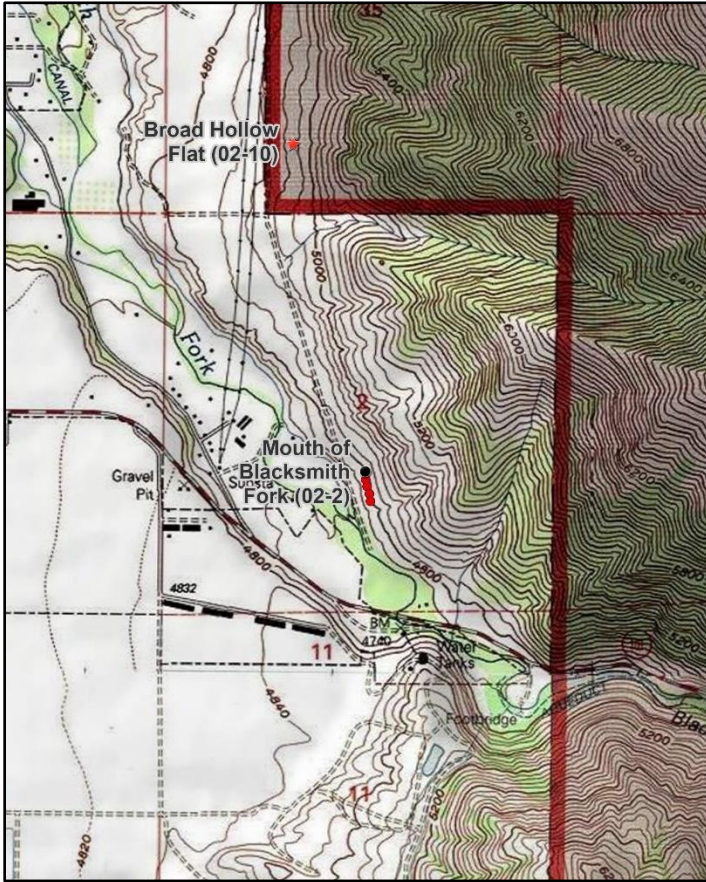
**Table 02-01.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<i>Juniperus scopulorum</i> (Rocky Mountain juniper)							
2016	2	-	100	-	-	-	9.0
2021	2	-	100	-	-	-	12.0

**Table 02-01.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	18.0	10.2	0.7	5.7	-20.0	2.9	0.0	<b>17.6</b>	Very Poor
2001	18.1	8.9	0.5	3.2	-19.2	6.8	0.0	<b>18.3</b>	Very Poor
2006	9.4	11.4	15.0	2.4	-14.0	10.0	-4.0	<b>30.3</b>	Very Poor
2011	16.6	9.0	0.0	2.6	-8.7	10.0	-2.0	<b>27.5</b>	Very Poor
2016	26.7	11.6	2.9	0.9	-11.4	8.1	-4.0	<b>34.7</b>	Very Poor-Poor
2021	24.3	4.0	2.2	7.7	-9.2	5.5	-4.0	<b>30.4</b>	Very Poor

## MOUTH OF BLACKSMITH FORK - STUDY NO. 02-2



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Logan SE; Township 10N, Range 1E, Section 02  
NAD 83 UTM ZONE 12, 433073 East 4609266 North

### Transect Information

Browse Tag # (0' Stake)	90
Transect Bearing	159° magnetic (Lines 2-4: 151° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 4: 5ft

### Directions to Site

Proceed 0.5 miles south from the intersection of 300 South and 500 East in Millville. From the intersection just east of the deer fence, proceed south for 2.6 miles and stop at a witness post, which is at the top of the hill. From the witness post, walk 100 feet at 50 degrees magnetic to the 0-foot stake of the baseline which is marked by browse tag #90. The baseline runs at a bearing of 159 degrees magnetic, doglegs after 100 feet, and then runs 151 degrees magnetic.



**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	4,800ft (1,463m)
Aspect	South
Slope	20%
Sample Dates	07/31/1996, 07/20/2001, 06/28/2006, 07/13/2011, 06/28/2016, 07/20/2021

**Table 02-02.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Aerial	Millville WMA Fire Rehab	2839	January 2014	410
Seeding - Aerial	Millville WMA Fire Rehab	2839	November 2013	410
Fire - Wildfire	Sleepy Hollow	-	2007	900
Herbicide - Plateau	Millville WMA Fire Rehabilitation Project	972	September 2007	792
Seeding - Aerial	Millville WMA Fire Rehabilitation Project	972	December 2007	792
Seeding - Transplant	Millville WMA Fire Rehabilitation Project	972	Spring 2008	792
Fire - Wildfire	Millville	-	August 2013	2864
Herbicide - Plateau	Millville WMA Fire Rehab	2839	September 2013	410

**Table 02-02.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Millville WMA			Aerial	Dec 2007	900
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	<i>Agropyron cristatum</i>	Crested Wheatgrass	Hycrest	0.17	0.13
G	<i>Agropyron cristatum</i>	Crested Wheatgrass	Hycrest	1.17	0.93
G	<i>Dactylis glomerata</i>	Orchardgrass	Paiute	0.67	0.52
G	<i>Elymus trachycaulus</i>	Slender Wheatgrass	San Luis	1.67	1.58
G	<i>Elymus wawawaiensis</i>	Snake River Wheatgrass	Secar	0.61	0.55
G	<i>Festuca idahoensis</i>	Idaho Fescue	Joseph	0.50	0.34
G	<i>Poa secunda</i>	Canby Bluegrass	Canbar	0.50	0.43
F	<i>Achillea millefolium</i>	Western Yarrow		0.11	0.11
F	<i>Medicago sativa</i>	Alfalfa	Ladak	0.50	0.46
F	<i>Medicago sativa</i>	Alfalfa	Ranger	0.50	0.44
F	<i>Melilotus officinalis</i>	Yellow Sweetclover		0.67	0.62
F	<i>Onobrychis viciifolia</i>	Sainfoin	Eski	0.90	0.88
F	<i>Sanguisorba minor</i>	Small Burnet	Delar	1.11	1.03
S	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	Mountain Big Sagebrush	Sanpete UT	0.02	0.01
S	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	Mountain Big Sagebrush	Grand UT	0.04	0.01
S	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	Mountain Big Sagebrush	Sevier/Wayne UT	0.18	0.05
S	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	Wyoming Big Sagebrush	Beaver UT	0.25	0.04
S	<i>Bassia prostrata</i>	Forage Kochia	Humbolt/Lander NV	0.50	0.33
Mix Name			Application Type	Application Date	Acres
Millville WMA fire lower WMA			Aerial	Nov 2013	500
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	<i>Dactylis glomerata</i>	Orchardgrass	Paiute	0.50	0.43
G	<i>Elymus lanceolatus</i>	Thickspike Wheatgrass	Bannock	2.00	1.79
G	<i>Elymus wawawaiensis</i>	Snake River Wheatgrass	Secar	2.50	2.29
G	<i>Poa secunda</i>	Canby Bluegrass	Canbar	0.50	0.42
G	<i>Psathyrostachys juncea</i>	Russian Wildrye	Bozoisky	2.00	1.70
F	<i>Achillea millefolium</i>	Western Yarrow	Hanford WA	0.20	0.18
F	<i>Linum perenne</i>	Blue Flax	Appar	0.50	0.45
F	<i>Medicago sativa</i>	Alfalfa	Big Sky Ladak	0.70	0.66
F	<i>Medicago sativa</i>	Alfalfa	Ladak	0.70	0.66
F	<i>Medicago sativa</i>	Alfalfa	Ranger (NC)	0.60	0.55
F	<i>Onobrychis viciifolia</i>	Sainfoin	Eski	2.00	1.72
F	<i>Sanguisorba minor</i>	Small Burnet	Delar	1.64	1.44
F	<i>Sanguisorba minor</i>	Small Burnet	Delar	1.40	1.24
Mix Name			Application Type	Application Date	Acres

Millville Fire Browse			Aerial	Jan 2014	1440
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	Mountain Big Sagebrush	Beaver UT	1.00	0.43
S	<i>Bassia prostrata</i>	Forage Kochia	Beaver UT	1.01	0.67

**Table 02-02.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Shiras Moose	crucial	summer

**Table 02-02.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Annual Grass/Mountain Big Sagebrush	No Encroachment
1990	Annual Grass/Mountain Big Sagebrush	No Encroachment
1996	Annual Grass/Mountain Big Sagebrush	No Encroachment
2001	Annual Grass/Mountain Big Sagebrush	No Encroachment
2006	Annual Grass/Mountain Big Sagebrush	No Encroachment
2011	Annual Grass	No Encroachment
2016	Annual Grass	No Encroachment
2021	Annual Grass	No Encroachment

**Site Notes**

In the spring of 2008, 4,000 antelope bitterbrush (*Purshia tridentata*) seedlings were transplanted in the area, but may not have been planted on the study site.

**Soils**

**Table 02-02.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.9	33.3	40.7	26.0	2.7	7.3	188.8	0.8	07/31/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation                      22 inches  
 NRCS Ecological Site                                                      Upland Stony Loam (Mountain Big Sagebrush)  
 NRCS Ecological Site #                                                      R047XA334UT  
 States and Transitions                                                      No state and transition model is available for this ecological site.

When the study was established in 1984, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) was the dominant browse species (Photos, Table 02-02.12). The herbaceous understory, largely composed of the invasive annual grasses jointed goatgrass (*Aegilops cylindrica*) and cheatgrass (*Bromus tectorum*), was co-dominant along with sagebrush through the 2006 sample year (Pre-1992 Data, Table 02-02.7, Table 02-02.10). However, the study site burned in 2007 and 2013 (Table 02-02.1). Following the fires, the site transitioned to an annual grass community with cereal rye (*Secale cereale*) and jointed goatgrass as the dominant species. The herbaceous understory has remained relatively undiversified despite seeding efforts to rehabilitate the area (Table 02-02.1, Table 02-02.2, Table 02-02.10, Table 02-02.11). With the high cover of annual grass, the site may have entered a period of increased fire frequency and lowered resilience to disturbance and invasion.

**Trend Summary Tables****Table 02-02.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	9.8	0.0	-	-	-	-
2001	10.9	0.7	-	-	-	-
2006	15.6	0.0	-	17.3	0.6	-
2011	0.0	0.0	-	-	0.2	-
2016	2.2	-	-	2.8	-	-
2021	2.6	0.0	-	2.5	0.1	-

**Table 02-02.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	495	91	169	157	35.4	2.3	1.5	5.3
2001	458	254	262	96	32.9	9.3	5.2	3.3
2006	439	286	117	97	36.8	11.8	1.0	4.0
2011	488	58	243	209	59.9	1.7	6.0	15.3
2016	456	123	73	217	40.3	3.8	0.8	12.0
2021	429	187	135	259	30.6	8.4	4.3	14.6

**Table 02-02.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	0.4	-	70.9	2.9	6.8	59.0
2001	0.3	-	55.4	4.3	3.5	69.7
2006	0.6	-	46.2	5.4	4.3	65.4
2011	0.1	-	79.5	0.8	2.2	82.2
2016	12.7	-	38.6	2.0	4.2	54.5
2021	1.1	0.4	51.8	0.2	2.3	54.8

**Table 02-02.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk
	Quadrat Frequency		
1996	1	1	1
2001	1	2	-
2006	-	16	1
2011	-	-	-
2016	2	1	-
2021	-	3	-
Year	Days Use Per Acre (ha)		
1996	-	-	-
2001	1.5 (3.6)	2.0 (5.0)	-
2006	0.7 (1.8)	32.2 (79.5)	0.7 (1.7)
2011	-	1.3 (3.3)	1.3 (3.3)
2016	26.8 (66.3)	-	-
2021	0.7 (1.8)	6.0 (14.9)	-

**Table 02-02.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency												
Aegilops cylindrica <sup>ai</sup> (jointed goatgrass)													
Agropyron cristatum <sup>i</sup> (crested wheatgrass)													
Bromus arvensis <sup>ai</sup> (field brome)													
Bromus briziformis <sup>ai</sup> (rattlesnake brome)													
Bromus tectorum <sup>ai</sup> (cheatgrass)													
Carex (sedge)													
Leymus cinereus (basin wildrye)													
Poa bulbosa <sup>i</sup> (bulbous bluegrass)													
Poa pratensis <sup>i</sup> (Kentucky bluegrass)													
Poa secunda (Sandberg bluegrass)													
Pseudoroegneria spicata (bluebunch wheatgrass)													
Secale cereale <sup>ai</sup> (cereal rye)													
year	Average Cover (%)												
1996	170	-	415	52	319	-	-	65	-	15	24	124	
2001	268	-	78	47	377	5	8	194	3	66	18	98	
2006	333	-	13	15	218	-	3	232	-	52	19	152	
2011	321	4	6	-	183	-	-	12	-	10	36	351	
2016	260	64	-	-	99	-	-	48	-	4	11	318	
2021	363	14	3	-	114	-	-	99	2	18	69	166	
year	Average Cover (%)												
1996	7.8	-	16.6	0.2	8.0	-	-	1.5	-	0.0	0.7	2.8	
2001	15.2	-	0.3	0.2	14.7	0.4	0.3	7.6	0.0	0.8	0.3	2.5	
2006	26.3	-	0.0	0.1	5.3	-	0.0	10.5	-	1.1	0.2	5.1	
2011	28.1	0.0	0.2	-	2.4	-	-	0.1	-	0.1	1.5	29.2	
2016	10.8	2.0	-	-	1.0	-	-	1.1	-	0.0	0.7	28.5	
2021	22.3	0.9	0.0	-	0.9	-	-	2.0	0.0	0.1	5.5	7.3	

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-02.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
Agoseris glauca (pale agoseris)																		
Alyssum desertorum <sup>ai</sup> (desert madwort)																		
Ambrosia psilostachya (Cuman ragweed)																		
Asclepias asperula (spider milkweed)																		
Buglossoides arvensis <sup>ai</sup> (corn growmwell)																		
Calochortus nuttallii (sego lily)																		
Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)																		
Cirsium undulatum <sup>a</sup> (wavy/leaf thistle)																		
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																		
Collomia linearis <sup>a</sup> (tiny trumpet)																		
Crepis acuminata (tapertip hawksbeard)																		
Cryptantha (cryptantha)																		
Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)																		
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)																		
Gilia inconspicua <sup>a</sup> (shy gilia)																		
Grindelia squarrosa (curlycup gumweed)																		
Helianthus annuus <sup>a</sup> (common sunflower)																		
year	Average Cover (%)																	
1996	3	51	123	5	-	3	-	1	-	-	-	-	75	8	3	3	-	-
2001	-	114	62	12	-	3	7	2	-	-	2	-	6	174	9	-	-	-
2006	4	22	47	8	-	8	7	-	5	-	1	2	-	24	-	-	-	-
2011	5	9	140	10	-	10	2	-	5	-	-	-	2	10	-	-	-	9
2016	-	-	159	9	-	-	-	-	-	-	-	-	-	29	-	-	-	5
2021	3	6	199	7	0	-	-	-	-	-	1	-	-	32	-	-	-	-
year	Average Cover (%)																	
1996	0.0	0.2	3.9	0.5	-	0.0	-	0.0	-	-	-	-	0.3	0.1	0.0	0.0	-	-
2001	-	0.3	2.3	0.2	-	0.0	0.0	0.1	-	-	0.0	-	0.0	4.2	0.0	-	-	-
2006	0.0	0.0	1.8	1.0	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.6	-	-	-	-
2011	0.3	0.0	7.2	1.2	-	0.0	0.0	-	0.0	-	-	-	0.0	0.0	-	-	-	0.1
2016	-	-	8.7	0.7	-	-	-	-	-	-	-	-	-	0.2	-	-	-	0.2
2021	0.1	0.0	6.5	0.4	0.0	-	-	-	-	-	0.0	-	-	0.5	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES													
Isatis tinctoria <sup>ani</sup> (Dyer's woad)													
Lactuca serriola <sup>ai</sup> (prickly lettuce)													
Lithospermum ruderale (western stoneseed)													
Lomatium grayi (Gray's biscuitroot)													
Medicago sativa <sup>i</sup> (alfalfa)													
Melilotus officinalis <sup>i</sup> (sweetclover)													
Phlox longifolia (longleaf phlox)													
Sanguisorba minor <sup>i</sup> (small burnet)													
Silene antirrhina <sup>a</sup> (sleepy silene)													
Tragopogon dubius <sup>ai</sup> (yellow salsify)													
unknown perennial forb (unknown forb)													
Veronica biloba <sup>ai</sup> (two-lobed speedwell)													
Zigadenus paniculatus (foothill deathcamas)													
year	Nested Frequency												
1996	28	2	0	-	17	30	5	-	-	64	-	-	-
2001	6	6	-	-	23	-	-	-	108	8	-	-	5
2006	6	2	-	-	29	-	-	-	69	15	3	6	-
2011	1	98	-	5	68	10	-	-	28	183	-	-	-
2016	-	20	-	-	35	31	-	1	-	32	-	-	-
2021	1	-	-	-	100	-	-	-	-	99	-	-	1
year	Average Cover (%)												
1996	0.2	0.0	0.0	-	0.5	0.3	0.0	-	-	0.7	-	-	-
2001	0.0	0.0	-	-	0.7	-	-	-	0.3	0.2	-	-	0.0
2006	0.1	0.0	-	-	1.0	-	-	-	0.1	0.1	0.1	0.0	-
2011	0.0	1.4	-	0.1	6.3	0.2	-	-	0.8	3.6	-	-	-
2016	-	0.1	-	-	2.2	0.3	-	0.0	-	0.3	-	-	-
2021	0.1	-	-	-	7.4	-	-	-	-	3.6	-	-	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02-02.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES				
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)				
Bassia prostrata <sup>pi</sup> (forage kochia)				
Gutierrezia sarothrae (broom snakeweed)				
Rosa woodsii <sup>p</sup> (Woods' rose)				
year	Line Intercept Cover (%)			
1996	-	-	-	-
2001	-	-	-	-
2006	17.3	-	0.6	-
2011	-	-	0.2	-
2016	-	2.8	-	-
2021	-	2.5	0.1	-
year	Quadrat Cover (%)			
1996	9.8	-	0.0	-
2001	10.9	-	0.7	-
2006	15.6	-	0.0	-
2011	-	-	0.0	0.0
2016	-	2.2	-	-
2021	-	2.6	0.0	-

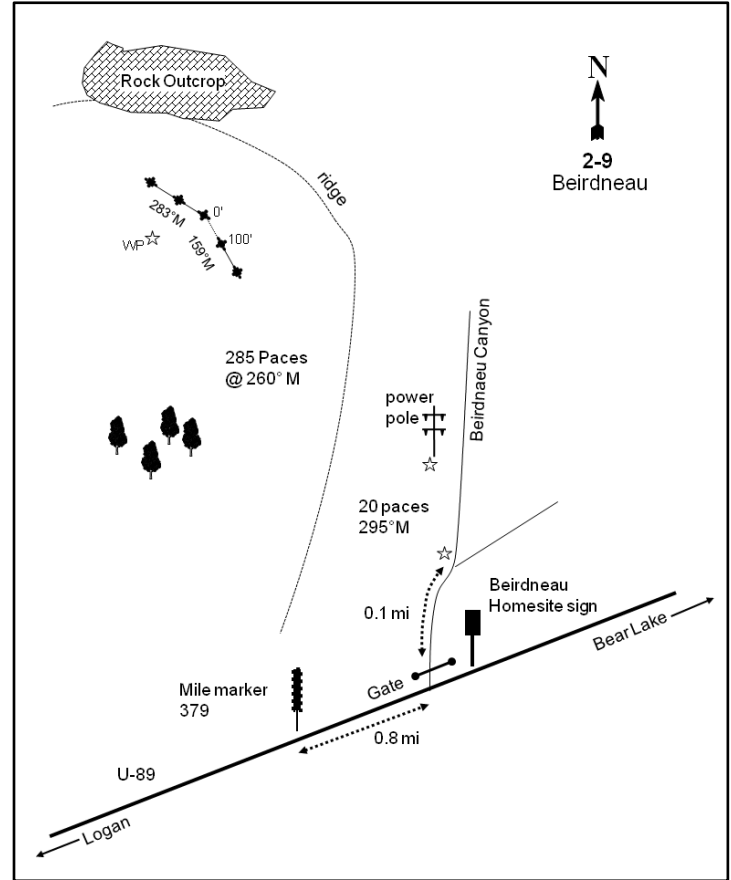
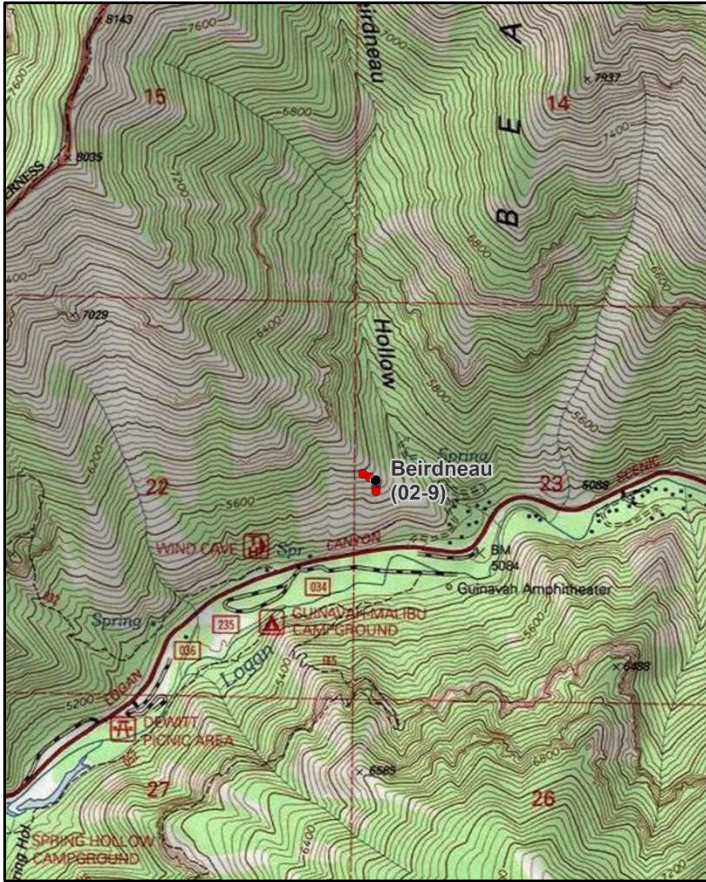
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-02.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	1680	220	26	66	8	6	0	1	80/128
2001	1860	-	1	86	13	16	0	5	84/109
2006	1440	-	0	83	17	36	10	3	86/129
2011	-	-	-	-	-	-	-	-	63/59
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Bassia prostrata<sup>pi</sup> -- (forage kochia)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	20	-	0	100	0	0	0	0	45/46
2016	8720	-	5	95	0	18	70	0	14/18
2021	3700	20	20	80	1	9	5	1	- / -
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	98/170
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	620	-	45	55	0	0	0	0	34/47
2001	560	-	0	100	0	4	0	4	30/47
2006	140	-	0	100	0	0	0	0	32/44
2011	120	-	17	83	0	0	0	0	40/44
2016	-	-	-	-	-	-	-	-	-/-
2021	40	-	0	0	100	0	0	100	- / -
<b>Rosa woodsii<sup>p</sup> -- (Woods' rose)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	20	-	100	0	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

## BEIRDNEAU - STUDY NO. 02-9

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Mount Elmer SW; Township 12N, Range 2E, Section 23  
NAD 83 UTM ZONE 12, 441938 East 4623977 North

**Transect Information**

Browse Tag # (0' Stake)	7928
Transect Bearing	170° magnetic (Lines 3-4: 283° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 3, 4: No Rebar

**Directions to Site**

Proceed up Logan Canyon to mile marker 379 and begin to note mileage. Continue 0.8 miles to the Forest Service sign that says "Beirdneau Summer Home Sites." Turn left here at the home site, proceed 0.1 miles to a fork, and stop. Walk to the power pole on the left at a bearing of 295 degrees magnetic for about 20 paces. Take a bearing of 260 degrees magnetic from the pole and walk 285 paces to the 0-foot stake of the baseline which is marked by browse tag #7928. The baseline runs at 159 degrees magnetic, and the second stake is placed 50 feet down the slope at the same bearing. The third and fourth stakes are placed 100 feet apart above the 0-foot baseline stake at a bearing of 283 degrees magnetic.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	5,450ft (1,661m)
Aspect	South
Slope	40%
Sample Dates	08/14/1996, 07/12/2001, 06/28/2006, 07/28/2011, 06/29/2016, 06/28/2021

**Wildlife Habitat and Vegetation History****Table 02-09.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	summer

**Table 02-09.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Bitterbrush	No Encroachment
1990	Bitterbrush	No Encroachment
1996	Bitterbrush/Annual Grass	Phase I
2001	Bitterbrush/Annual Grass	Phase I
2006	Bitterbrush	Phase I
2011	Bitterbrush	Phase I
2016	Bitterbrush/Annual Grass	Phase I
2021	Perennial Grass/Bitterbrush	Phase I

**Site Notes**

Several snakes were seen on the site in 2016, including one rattlesnake.

**Soils****Table 02-09.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.9	26.7	38.0	35.3	3.2	8.7	211.2	0.5	08/14/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	26 inches
NRCS Ecological Site	Mountain Stony Loam (Antelope Bitterbrush)
NRCS Ecological Site #	R047XA456UT
States and Transitions	No state and transition model is available for this ecological site.

Antelope bitterbrush (*Purshia tridentata*) has been the dominant browse species on this site since study establishment in 1984. Other species such as mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and mountain snowberry (*Symphoricarpos oreophilus*) have also been present, but have generally contributed less cover than bitterbrush (Photos, Pre-1992 Data, Table 02-09.12, Table 02-09.13). The herbaceous understory has generally remained abundant over the sample period, but composition has fluctuated. Introduced annual grasses cheatgrass such as cheatgrass (*Bromus tectorum*) and field brome (*B. arvensis*) have dominated the understory in some sample years, and were co-dominant site vegetation components in 1996, 2001, and 2016. However, the introduced perennial grass bulbous bluegrass (*Poa bulbosa*) and native species bluebunch wheatgrass (*Pseudoroegneria spicata*) co-dominated in 2021. Perennial and/or annual forbs have also contributed significant cover since 2006 (Table 02-09.7, Table 02-09.10, Table 02-09.11). Rocky Mountain juniper (*Juniperus scopulorum*) has been observed on site since 1996 (Photos, Table 02-09.12, Table 02-09.13, Table 02-09.14). However, the study site has remained in Phase I of woodland succession since that time (Table 02-09.4), indicating that further tree encroachment likely does not pose an immediate threat to the vegetation community. Deer winter range condition has generally remained very poor since site establishment; sagebrush cover has fluctuated, but has remained moderate. As of 2021, deer winter range conditions were considered to be very poor. Improvement to deer wintering range can be accomplished through efforts that support mature sagebrush and sagebrush reproduction. Diversifying native perennial grasses and forbs while reducing bulbous bluegrass and cheatgrass would also improve winter range conditions (Table 02-09.15).



**Trend Summary Tables****Table 02-09.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	12.4	0.7	0.8	-	-	-
2001	9.8	0.7	-	-	-	0.1
2006	10.7	0.3	-	13.7	0.3	-
2011	7.8	0.1	0.6	15.1	0.6	1.7
2016	10.5	0.8	0.6	17.2	1.4	2.5
2021	9.9	0.1	0.4	11.5	0.9	3.0

**Table 02-09.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	475	165	296	218	25.9	5.7	6.0	9.8
2001	410	160	314	228	26.4	5.8	5.6	9.3
2006	292	210	298	286	4.1	6.4	7.9	14.3
2011	255	184	371	337	2.5	4.2	15.5	18.7
2016	354	175	312	318	14.8	8.7	11.2	19.5
2021	307	299	309	272	10.7	17.5	7.1	18.7

**Table 02-09.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	6.3	0.2	48.6	5.5	12.7	54.3
2001	5.7	0.1	43.2	16.4	11.3	54.2
2006	12.2	-	33.6	17.1	10.9	43.9
2011	10.2	0.0	29.4	12.9	16.5	49.6
2016	6.2	0.0	26.8	11.1	12.3	57.8
2021	5.2	0.0	40.7	12.0	13.6	49.9

**Table 02-09.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1996	1	-	-
2001	6	-	-
2006	8	6	-
2011	2	2	-
2016	6	2	3
2021	10	9	-
Year	Days Use Per Acre (ha)		
1996	-	-	-
2001	16.1 (39.7)	3.4 (8.3)	-
2006	24.8 (61.2)	14.1 (34.8)	-
2011	10.7 (26.5)	18.1 (44.7)	-
2016	7.4 (18.2)	11.4 (28.1)	-
2021	14.1 (34.8)	-	-

**Table 02-09.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency									
<i>Bromus arvensis</i> <sup>ai</sup> (field brome)	418	2	241	-	8	92	-	3	119	
<i>Bromus briziformis</i> <sup>ai</sup> (rattlesnake brome)	171	10	371	-	-	82	-	19	103	
<i>Bromus tectorum</i> <sup>ai</sup> (cheatgrass)	183	1	215	-	-	116	5	7	135	
<i>Carex</i> (sedge)	230	-	73	6	-	108	3	5	125	
<i>Elymus trachycaulus</i> (slender wheatgrass)	2016	56	338	-	0	105	-	3	117	
<i>Poa bulbosa</i> <sup>i</sup> (bulbous bluegrass)	2021	127	271	-	-	248	-	2	117	
<i>Poa pratensis</i> <sup>i</sup> (Kentucky bluegrass)	Average Cover (%)									
<i>Poa secunda</i> (Sandberg bluegrass)	1996	17.6	0.0	8.4	-	0.1	2.6	-	0.0	3.0
<i>Pseudoroegneria spicata</i> (bluebunch wheatgrass)	2001	2.4	0.1	24.0	-	-	2.4	-	0.1	3.4
	2006	2.1	0.0	2.0	-	-	2.4	0.0	0.0	3.9
	2011	1.7	-	0.8	0.0	-	1.8	0.0	0.1	2.3
	2016	1.1	0.1	13.6	-	0.0	2.0	-	0.0	6.7
	2021	2.0	-	8.7	-	-	10.4	-	0.0	7.1

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-09.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
<i>Achillea millefolium</i> (Common yarrow)	-	1	6	151	-	11	-	-	-	2	3	-	-	-	5	-	-
<i>Agoseris glauca</i> (pale agoseris)	9	1	27	169	-	8	-	-	-	1	6	-	6	-	-	-	-
<i>Allium acuminatum</i> (tapertip onion)	6	12	22	46	-	15	0	2	-	1	7	-	6	1	7	3	-
<i>Alyssum desertorum</i> <sup>ai</sup> (desert madwort)	4	-	90	233	3	9	-	1	-	-	3	-	9	-	-	-	2
<i>Arctium minus</i> <sup>ai</sup> (lesser burdock)	2016	0	4	41	84	4	6	-	-	1	5	17	5	-	-	4	-
<i>Artemisia ludoviciana</i> (white sagebrush)	2021	-	-	42	140	0	4	-	-	1	4	-	2	-	-	-	-
<i>Astragalus</i> (milkvetch)	Average Cover (%)																
<i>Astragalus beckwithii</i> (Beckwith's milkvetch)	1996	-	0.0	0.0	0.4	-	0.3	-	-	-	0.0	0.5	-	-	-	0.3	-
<i>Astragalus cibirius</i> (browse milkvetch)	2001	0.2	0.0	0.2	0.7	-	0.3	-	-	-	0.0	0.2	-	0.0	-	-	-
<i>Astragalus utahensis</i> (Utah milkvetch)	2006	0.1	0.1	0.2	0.1	-	1.5	0.0	0.0	-	0.0	0.6	-	0.0	0.0	0.2	0.0
<i>Balsamorhiza sagittata</i> (arrowleaf balsamroot)	2011	0.2	-	0.4	1.5	0.1	1.1	-	0.0	-	-	0.0	-	0.1	-	-	0.0
<i>Calochortus nuttallii</i> (sego lily)	2016	0.0	0.0	0.2	0.3	0.0	0.7	-	-	0.0	-	0.6	0.1	0.0	-	-	0.0
<i>Camelina microcarpa</i> <sup>ai</sup> (litlepod false flax)	2021	-	-	0.2	0.5	0.0	0.0	-	-	0.0	-	0.5	-	0.0	-	-	-
<i>Ceratocephala testiculata</i> <sup>ai</sup> (curvseed butterwort)																	
<i>Cirsium undulatum</i> <sup>a</sup> (wavy/leaf thistle)																	
<i>Collinsia parviflora</i> <sup>a</sup> (maiden blue eyed Mary)																	
<i>Collomia linearis</i> <sup>a</sup> (tiny trumpet)																	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nested Frequency																	
Comandra umbellata (bastard toadflax)	2	-	112	2	48	-	39	-	68	30	-	-	29	10	-	107	-	
Crepis acuminata (tapertip hawkbeard)	-	1	138	12	16	-	-	49	25	103	1	-	15	12	-	4	-	
Cymopterus (springparsley)	-	2	155	30	40	0	65	13	5	132	-	4	21	7	26	81	9	
Cynoglossum officinale <sup>ami</sup> (gypsyflower)	9	2	163	19	42	-	60	0	115	190	-	-	66	17	111	43	-	
Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	-	8	166	15	-	19	26	8	15	119	14	-	17	15	94	37	-	
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	-	3	123	12	-	26	37	5	34	82	-	-	22	20	120	4	-	
Galium aparine <sup>a</sup> (stickywilly)	Average Cover (%)																	
Hackelia patens (spotted stickseed)	0.0	-	3.0	0.0	0.2	-	0.4	-	1.3	0.1	-	-	0.4	0.5	-	5.0	-	
Isatis tinctoria <sup>ami</sup> (Dyer's woad)	-	0.0	6.0	0.1	0.0	-	-	0.8	1.2	0.9	0.0	-	0.2	0.6	-	0.2	-	
Lactuca serriola <sup>ai</sup> (prickly lettuce)	-	0.0	7.2	1.3	0.2	0.1	0.4	0.1	0.1	2.9	-	0.0	0.3	0.5	2.1	1.3	0.0	
Lappula occidentalis <sup>a</sup> (flatspine stickseed)	0.0	0.0	11.4	0.3	0.6	-	0.7	0.0	5.1	3.4	-	-	0.2	0.9	3.8	0.2	-	
Lepidium ramosissimum <sup>a</sup> (manybranched pepperweed)	-	0.2	8.1	0.1	-	0.1	0.2	0.2	0.4	3.1	0.4	-	0.4	0.7	6.4	1.7	-	
Linum lewisii (Lewis flax)	-	0.0	5.6	0.2	-	0.6	0.8	0.0	0.9	0.6	-	-	0.3	1.2	10.6	0.0	-	
Lithospermum ruderale (western stone seed)	Nested Frequency																	
Medicago sativa <sup>i</sup> (alfalfa)	1	-	5	2	162	-	1	33	-									
Melilotus officinalis <sup>i</sup> (sweetclover)	3	-	7	4	105	34	-	120	-									
Microsteris gracilis <sup>a</sup> (slender phlox)	5	2	-	4	136	9	-	97	1									
	1	-	-	1	90	27	-	138	2									
	7	-	-	4	200	35	-	63	-									
	-	-	-	-	144	9	2	84	-									
	Average Cover (%)																	
	0.0	-	0.0	0.0	3.0	-	0.1	0.1	-									
	0.1	-	0.0	0.0	1.9	0.5	-	0.6	-									
	0.1	0.0	-	0.1	1.8	0.0	-	0.7	0.0									
	0.0	-	-	0.0	1.2	0.2	-	2.5	0.0									
	0.0	-	-	0.0	5.9	0.1	-	0.5	-									
	-	-	-	-	2.4	0.1	0.0	1.1	-									

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nested Frequency									
Penstemon humilis (low beardtongue)	1	-	5	2	162	-	1	33	-	
Phlox hoodii (spiny phlox)	3	-	7	4	105	34	-	120	-	
Silene antirrhina <sup>a</sup> (sleepy silene)	5	2	-	4	136	9	-	97	1	
Symphoricarum ascendens (western aster)	1	-	-	1	90	27	-	138	2	
Tragopogon dubius <sup>ai</sup> (yellow salsify)	7	-	-	4	200	35	-	63	-	
Trifolium (clover)	-	-	-	-	144	9	2	84	-	
unknown perennial forb (unknown forb)	Average Cover (%)									
Veronica biloba <sup>ai</sup> (two-lobed speedwell)	0.0	-	0.0	0.0	3.0	-	0.1	0.1	-	
Zigadenus paniculatus (foothill deathcamas)	0.1	-	0.0	0.0	1.9	0.5	-	0.6	-	
	0.1	0.0	-	0.1	1.8	0.0	-	0.7	0.0	
	0.0	-	-	0.0	1.2	0.2	-	2.5	0.0	
	0.0	-	-	0.0	5.9	0.1	-	0.5	-	
	-	-	-	-	2.4	0.1	0.0	1.1	-	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02-09.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus scopulorum <sup>t</sup> (Rocky Mountain juniper)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)
year	Line Intercept Cover (%)						
1996	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-
2006	1.6	0.2	-	0.1	-	9.4	2.7
2011	0.6	0.6	0	-	1.7	11.5	3
2016	0.7	0.3	-	1.1	2.5	13.6	2.9
2021	0.2	0.1	0.8	0.8	3	9	1.5
year	Quadrat Cover (%)						
1996	2.0	0.3	-	0.4	0.8	9.0	1.4
2001	1.6	0.1	-	0.5	0.0	6.3	1.9
2006	1.7	0.1	-	0.2	-	7.3	1.8
2011	0.2	0.1	0.0	-	0.6	5.3	2.2
2016	0.6	0.0	-	0.8	0.6	7.4	2.6
2021	0.1	0.0	0.1	0.1	0.4	7.4	2.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-09.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	107/134
2011	-	-	-	-	-	-	-	-	90/123
2016	-	-	-	-	-	-	-	-	147/118
2021	-	-	-	-	-	-	-	-	-/-
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	360	-	6	50	44	33	0	6	66/110
2001	300	-	0	73	27	13	0	0	79/116
2006	220	-	0	36	64	46	9	36	68/105
2011	160	-	0	75	25	13	0	50	67/95
2016	100	-	0	80	20	0	0	20	73/108
2021	100	-	0	20	80	20	0	80	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	100	-	20	80	0	0	0	0	63/90
2001	140	-	0	86	14	0	0	0	54/58
2006	60	-	0	100	0	0	0	0	41/68
2011	60	-	0	100	0	0	0	0	48/53
2016	20	-	0	100	0	0	0	0	51/39
2021	40	-	0	50	50	0	0	50	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	124/159
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	137/184
2011	-	-	-	-	-	-	-	-	154/236
2016	-	-	-	-	-	-	-	-	158/218
2021	-	-	-	-	-	-	-	-	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	400	-	0	100	0	0	0	0	33/45
2001	580	-	0	100	0	0	0	0	34/50
2006	60	-	0	100	0	0	0	0	36/58
2011	-	-	-	-	-	-	-	-	36/66
2016	300	-	0	100	0	0	0	0	38/58
2021	160	-	0	88	13	0	0	13	-/-
<b>Juniperus scopulorum<sup>t</sup> -- (Rocky Mountain juniper)</b>									
1996	20	-	0	100	0	0	0	0	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	20	-	0	100	0	0	0	0	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	20	-	0	100	0	100	0	0	-/-
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	380	-	0	100	0	74	5	0	126/206
2001	560	-	4	75	21	75	11	4	149/223
2006	180	-	0	89	11	33	44	0	137/200
2011	240	-	0	75	25	25	17	25	132/198
2016	360	-	0	67	33	11	0	6	149/192
2021	280	-	0	50	50	0	43	50	-/-
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	240	-	25	67	8	8	0	17	62/128
2001	200	160	0	100	0	0	0	0	77/150
2006	300	-	0	100	0	7	0	0	80/123
2011	240	-	17	75	8	0	0	17	65/117
2016	500	-	0	96	4	4	0	0	72/108
2021	380	-	0	100	0	0	16	0	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

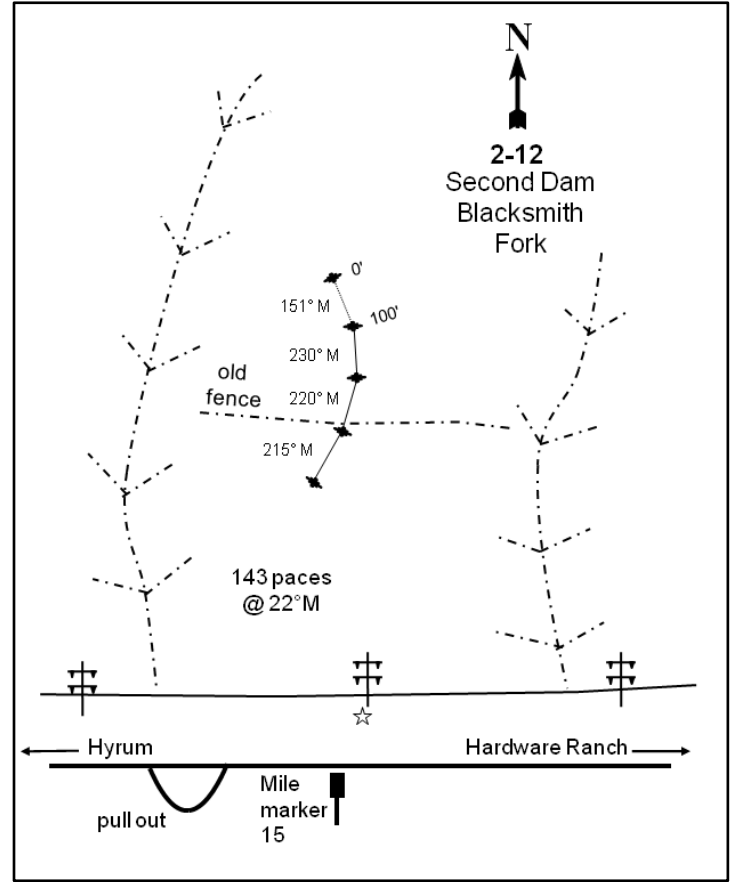
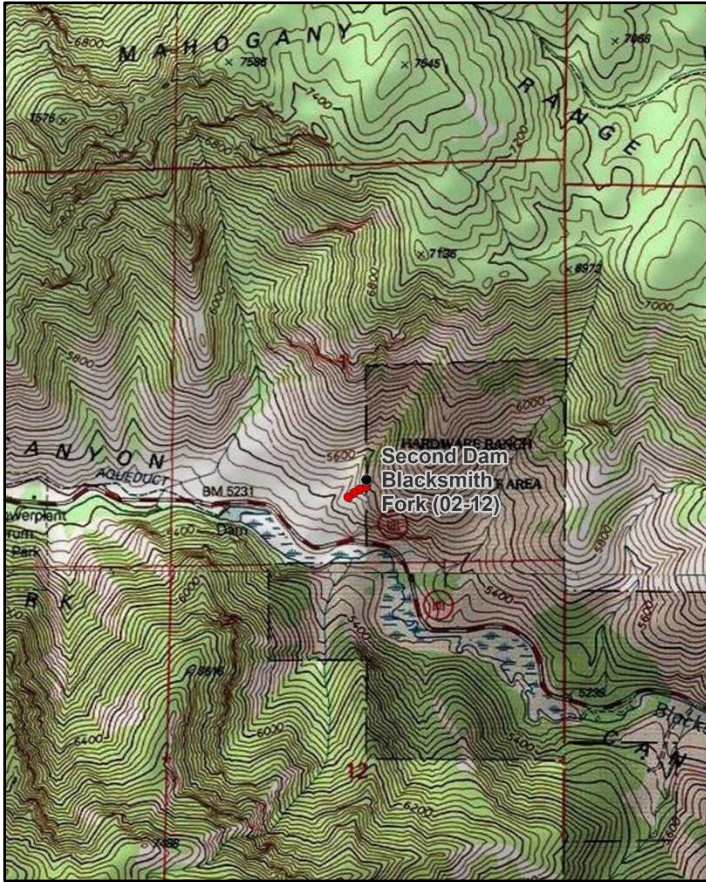
**Table 02-09.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Acer grandidentatum (bigtooth maple)</b>							
2016	4	-	50	-	50	-	17.0
<b>Juniperus scopulorum (Rocky Mountain juniper)</b>							
2016	5	-	-	25	50	25	18.3
2021	4	-	-	-	33	67	18.0

**Table 02-09.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	17.4	12.5	1.8	6.2	-19.4	10.0	-4.0	<b>24.4</b>	Very Poor
2001	13.4	9.6	1.2	6.9	-19.8	10.0	-4.0	<b>17.3</b>	Very Poor
2006	18.8	10.5	0.0	8.0	-3.1	10.0	-4.0	<b>40.2</b>	Very Poor-Poor
2011	21.0	8.5	1.7	4.9	-1.9	10.0	-4.0	<b>40.1</b>	Very Poor-Poor
2016	24.2	6.7	0.0	13.5	-11.1	10.0	-4.0	<b>39.2</b>	Very Poor-Poor
2021	16.3	1.8	0.0	14.2	-8.0	10.0	-4.0	<b>30.2</b>	Very Poor

## SECOND DAM BLACKSMITH FORK - STUDY NO. 02-12



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Logan Peak SE; Township 10N, Range 2E, Section 01  
NAD 83 UTM ZONE 12, 444089 East 4608733 North

### Transect Information

Browse Tag # (0' Stake)	7985
Transect Bearing	151° magnetic (Line 2: 230° magnetic, Line 3: 220° magnetic, Line 4: 215° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 71ft), Line 2 (59ft), Line 3 (34ft), Line 4 (95ft)
Belt Marker Placement	Standard

### Directions to Site

In Hyrum, proceed east up Blacksmith Fork Canyon (State Route 101) to mile marker 15. Continue 200 feet to the pullout before mile marker 15. Look for a power pole northeast of the pullout. From the pole, take an azimuth of 22 degrees magnetic and walk 143 paces to the 400-foot baseline stake marked by browse tag #7985. The baseline bearing is 151 degrees magnetic. Line 2 runs 230 degrees magnetic. Line 3 runs 220 degrees magnetic. Line 4 runs 215 degrees magnetic.

Note: due to the rocky terrain the 100-foot stake is actually at the 95 foot mark: adjust the tape and belts accordingly.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	5,600ft (1,707m)
Aspect	Southwest
Slope	36%
Sample Dates	08/30/1996, 06/29/2001, 07/10/2006, 07/21/2011, 06/27/2016, 06/30/2021

**Table 02-12.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Blacksmith Fork Juniper Thinning and Shrub Restoration	2697	October-November 2013	1200
Hand Crew - Lop and Scatter	UWC FS North Zone Watershed Improvements (Proposed)	5548	2022	1444

**Wildlife Habitat and Vegetation History****Table 02-12.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	winter

**Table 02-12.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Perennial Grass/Mountain Big Sagebrush	Phase I
1990	Perennial Grass/Mountain Big Sagebrush	Phase I
1996	Perennial Grass/Mountain Big Sagebrush	Phase I
2001	Annual Grass/Mountain Big Sagebrush	Phase I
2006	Perennial Grass/Mountain Big Sagebrush	Phase I
2011	Annual Grass/Mountain Big Sagebrush	Phase I
2016	Annual Grass/Mountain Big Sagebrush	No Encroachment
2021	Perennial Grass-Annual Forb/Bitterbrush	No Encroachment

**Site Notes**

This study samples crucial deer winter range north of the second reservoir in Blacksmith Fork Canyon. The study is dominated by a mountain big sagebrush (*Artemisia tridentata*) and bitterbrush (*Purshia tridentata*) community with scattered Rocky Mountain junipers (*Juniperus scopulorum*).

**Soils****Table 02-12.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.4	36.6	35.0	28.4	3.4	10.0	176.0	0.7	08/30/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	24 inches
NRCS Ecological Site	Mountain Stony Loam (Antelope Bitterbrush)
NRCS Ecological Site #	R047XA456UT
States and Transitions	No state and transition model is available.

The herbaceous understory on this site has remained abundant and diverse over the sample period, although composition has fluctuated. Perennial grasses, namely bluebunch wheatgrass (*Pseudoroegneria spicata*), and/or the introduced annual brome grass species (*Bromus sp.*) have contributed most of the herbaceous cover in all years. However, the introduced annual forb species yellow salsify (*Tragopogon dubius*) and redstem stork's bill (*Erodium cicutarium*) also provided significant cover and co-dominated in 2021 (Photos, Pre-1992 Data, Table 02-12.7, Table 02-12.10, Table 02-12.11). The browse component on this site has had a reduced presence throughout the study period. Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) was the dominant species from study establishment in 1984 through the 2016 sample year. Sagebrush has decreased over time, however, and antelope bitterbrush (*Purshia tridentata*) became dominant in 2021. Fifty six percent and 67% of bitterbrush and sagebrush plants, respectively, were considered to have poor vigor in 2021 (Table 02-12.12, Table 02-12.13): this is likely due to drought stress. Similar climatic conditions could possibly lead to further decreases in both browse species if they are sustained in future sample years. Deer winter range condition has ranged from very poor and poor-fair. As of 2021, deer winter range conditions were considered to be very poor. Improvement of deer wintering range can be accomplished through efforts that support mature plants and reproduction in the preferred browse community. Diversifying native perennial grasses and forbs, while reducing cheatgrass, would also improve winter range conditions (Table 02-12.15).



**Trend Summary Tables****Table 02-12.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	5.9	0.7	-	-	-	-
2001	5.2	0.9	-	-	-	-
2006	4.3	0.7	-	9.0	1.7	-
2011	4.8	0.0	-	9.0	0.1	-
2016	3.0	0.0	-	8.3	0.2	-
2021	4.6	0.0	-	6.8	0.5	-

**Table 02-12.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996								
2001								
2006								
2011								
2016								
2021								

**Table 02-12.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	4.6	4.3	31.6	3.8	31.4	32.8
2001	4.5	3.3	36.5	3.0	29.6	52.0
2006	9.0	1.8	30.1	6.9	36.6	34.3
2011	5.3	2.5	25.1	7.8	35.2	50.5
2016	2.9	0.3	21.1	4.4	31.6	53.1
2021	10.3	2.5	29.7	10.2	37.8	33.9

**Table 02-12.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	-	8	6	-
2001	-	4	1	-
2006	1	11	5	4
2011	-	5	2	-
2016	-	1	1	-
2021	-	20	5	-
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	-	12.1 (29.8)	6.0 (14.9)	-
2006	-	16.1 (39.7)	16.1 (39.7)	-
2011	-	10.0 (24.8)	3.4 (8.3)	-
2016	-	0.7 (1.7)	-	-
2021	-	17.4 (43.0)	-	-

**Table 02-12.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency									
Bromus arvensis <sup>ai</sup> (field brome)	339	11	255	13	-	4	-	-	179	170
Bromus briziformis <sup>ai</sup> (rattlesnake brome)	103	52	431	10	-	9	-	-	178	189
Bromus tectorum <sup>ai</sup> (cheatgrass)	51	82	313	5	3	11	2	11	132	196
Koeleria macrantha (prairie Junegrass)	98	212	311	4	-	26	2	-	63	161
Pascopyrum smithii (western wheatgrass)	87	149	437	12	27	42	7	2	34	123
Poa bulbosa <sup>i</sup> (bulbous bluegrass)	52	193	234	-	18	76	5	-	117	92
Poa fendleriana (muttongrass)	Average Cover (%)									
Poa pratensis <sup>i</sup> (Kentucky bluegrass)	5.6	0.0	4.0	0.2	-	0.0	-	-	3.7	6.4
Poa secunda (Sandberg bluegrass)	1.2	0.4	19.0	0.1	-	0.2	-	-	2.9	6.5
Pseudoroegneria spicata (bluebunch wheatgrass)	0.3	0.6	7.7	0.0	0.2	0.1	0.0	0.1	2.3	11.3
	1.4	7.5	17.0	0.2	-	0.1	0.0	-	6.1	5.4
	1.9	1.6	34.1	0.5	0.7	0.3	0.1	0.0	0.2	4.5
	0.1	1.1	2.9	-	0.1	1.9	0.0	-	3.5	4.7

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-12.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Achillea millefolium (Common yarrow)	-	3	20	261	-	-	1	12	-	3	-	-	14	-	5	8	1
Agoseris glauca (pale agoseris)	-	9	25	338	-	-	-	11	-	-	1	1	38	-	0	5	6
Allium acuminatum (tapertip onion)	0	33	13	246	-	1	-	7	1	6	6	-	90	-	4	28	12
Alyssum desertorum <sup>ai</sup> (desert madwort)	-	4	102	340	-	-	-	9	9	3	5	-	6	-	6	9	11
Artemisia ludoviciana (white sagebrush)	1	-	42	194	2	-	0	9	3	1	-	-	-	6	2	-	-
Astragalus (milkvetch)	-	2	41	90	-	-	-	12	53	8	6	-	10	-	2	15	6
Astragalus utahensis (Utah milkvetch)	Average Cover (%)																
Balsamorhiza sagittata (arrowleaf balsamroot)	-	0.0	0.0	0.9	-	-	0.0	0.4	-	0.0	-	-	0.0	-	0.2	0.0	0.0
Buglossoides arvensis <sup>ai</sup> (corn gromwell)	-	0.2	0.1	4.4	-	-	-	1.6	-	-	0.0	0.0	0.1	-	0.1	0.0	0.0
Calochortus nuttallii (sego lily)	0.0	0.2	0.1	1.3	-	0.0	-	1.2	0.0	0.0	0.0	-	0.4	-	0.2	0.1	0.0
Camelina microcarpa <sup>ai</sup> (tittlepod false flax)	-	0.0	0.6	7.3	-	-	-	1.7	0.1	0.0	0.2	-	0.0	-	0.2	0.0	0.1
Castilleja linariifolia (Wyoming Indian paintbrush)	0.0	-	0.2	1.2	0.0	-	0.0	1.1	0.0	0.0	-	-	-	0.2	0.0	-	-
Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	0.0	-	0.2	1.2	0.0	-	0.0	1.1	0.0	0.0	-	-	-	0.2	0.0	-	-
Cirsium (thistle)	-	0.0	0.2	0.3	-	-	-	1.5	0.2	0.1	0.0	-	0.0	-	0.0	0.0	0.0
Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	-	0.0	0.2	0.3	-	-	-	1.5	0.2	0.1	0.0	-	0.0	-	0.0	0.0	0.0
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	-	0.0	0.2	0.3	-	-	-	1.5	0.2	0.1	0.0	-	0.0	-	0.0	0.0	0.0
Collomia linearis <sup>a</sup> (tiny trumpet)	-	0.0	0.2	0.3	-	-	-	1.5	0.2	0.1	0.0	-	0.0	-	0.0	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES																		
Comandra umbellata (bastard toadflax)																		
Crepis acuminata (tapertip hawkbeard)																		
Delphinium nuttallianum (two-lobed larkspur)																		
Descurainia pinnata <sup>a</sup> (western tansymustard)																		
Draba <sup>a</sup> (draba)																		
Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)																		
Eriogonum umbellatum (sulphur-flower buckwheat)																		
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)																		
Galium aparine <sup>a</sup> (stickywilly)																		
Hackelia patens (spotted stickseed)																		
Holosteum umbellatum <sup>ai</sup> (jagged chickweed)																		
Isatis tinctoria <sup>ami</sup> (Dyer's woad)																		
Lactuca serriola <sup>ai</sup> (prickly lettuce)																		
Lappula occidentalis <sup>a</sup> (flatspine stickseed)																		
Linum lewisii (Lewis flax)																		
Lithospermum ruderale (western stone seed)																		
Lomatium grayi (Gray's biscuitroot)																		
year	Nested Frequency																	
1996	17	18	-	-	-	11	2	-	3	-	-	19	5	-	3	0	4	
2001	11	8	-	3	3	-	5	5	3	2	-	-	59	-	-	5	5	
2006	3	12	2	-	2	51	-	49	27	3	-	0	25	10	-	6	64	
2011	8	14	-	-	-	37	-	42	16	4	-	3	16	-	5	0	15	
2016	7	12	-	-	1	-	-	242	5	0	-	-	21	-	-	0	10	
2021	3	11	-	-	-	19	-	121	-	1	1	12	2	-	1	2	8	
year	Average Cover (%)																	
1996	0.1	0.3	-	-	-	0.0	0.2	-	0.0	-	-	0.1	0.1	-	0.0	0.0	0.0	
2001	0.1	0.2	-	0.0	0.0	-	0.0	0.1	0.0	0.0	-	-	0.6	-	-	0.1	0.0	
2006	0.0	0.3	0.0	-	0.0	0.5	-	1.4	0.0	0.0	-	0.0	0.2	0.0	-	0.2	2.6	
2011	0.1	0.3	-	-	-	0.4	-	0.3	0.1	0.0	-	0.1	0.2	-	0.2	0.1	0.2	
2016	0.0	0.2	-	-	0.0	-	-	4.7	0.0	0.0	-	-	0.3	-	-	0.0	0.2	
2021	0.0	0.1	-	-	-	0.2	-	2.4	-	0.0	0.0	0.0	0.0	-	0.1	0.0	0.1	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES										
Medicago sativa <sup>i</sup> (alfalfa)										
Melilotus officinalis <sup>i</sup> (sweetclover)										
Microsteris gracilis <sup>a</sup> (slender phlox)										
Oenothera (evening primrose)										
Penstemon (beardtongue)										
Petroradia pumila (rock goldenrod)										
Silene antirrhina <sup>a</sup> (sleepy silene)										
Tragopogon dubius <sup>ai</sup> (yellow salsify)										
Veronica biloba <sup>ai</sup> (two-lobed speedwell)										
year	Nested Frequency									
1996	-	1	-	-	3	10	10	186	50	
2001	-	-	-	-	-	11	183	102	65	
2006	-	3	8	1	-	10	60	116	108	
2011	0	-	2	-	-	7	30	158	45	
2016	7	15	-	7	-	8	-	122	15	
2021	7	2	24	-	-	5	-	230	62	
year	Average Cover (%)									
1996	-	0.0	-	-	0.0	0.7	0.1	2.9	0.2	
2001	-	-	-	-	-	0.9	0.8	1.3	0.7	
2006	-	0.0	0.0	0.0	-	1.3	0.2	3.1	0.4	
2011	0.0	-	0.0	-	-	0.7	0.1	3.9	0.2	
2016	0.3	0.1	-	0.1	-	0.4	-	1.4	0.0	
2021	0.2	0.0	0.1	-	-	0.7	-	6.2	0.2	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02-12.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. hololeuca <sup>p</sup> (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Rosa woodsii <sup>p</sup> (Woods' rose)
year	Line Intercept Cover (%)						
1996	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-
2006	-	0.8	0.8	2.2	0.9	5.6	0.4
2011	-	0.9	0	1.4	0.1	6.3	0.4
2016	0	1.5	0.1	1.6	0.1	5	0.2
2021	0.2	0.5	0.2	0.2	0.3	5.9	0
year	Quadrat Cover (%)						
1996	-	3.2	0.1	0.8	0.7	2.0	-
2001	-	1.7	0.2	1.9	0.7	1.4	0.1
2006	-	0.7	0.3	0.8	0.4	2.7	0.1
2011	-	0.5	0.0	0.3	0.0	3.9	0.1
2016	0.0	0.5	0.0	0.5	0.0	1.8	0.2
2021	0.0	0.1	0.0	0.1	0.0	4.2	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-12.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	-	-	-	-	-	-	-	-	123/108
2001	-	-	-	-	-	-	-	-	116/122
2006	-	-	-	-	-	-	-	-	93/113
2011	-	-	-	-	-	-	-	-	122/120
2016	-	-	-	-	-	-	-	-	112/118
2021	-	-	-	-	-	-	-	-	-/-
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	380	-	5	42	53	21	5	16	77/121
2001	300	20	0	47	53	80	0	27	82/123
2006	160	20	0	38	63	25	25	63	78/112
2011	140	-	14	29	57	29	29	57	74/110
2016	160	-	0	88	13	25	13	0	81/117
2021	60	-	0	33	67	0	0	67	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	140	-	14	86	0	0	0	0	48/76
2001	100	-	0	100	0	0	0	0	40/72
2006	80	-	0	75	25	0	0	0	43/79
2011	80	-	0	100	0	0	0	0	49/76
2016	20	-	0	100	0	0	0	0	42/61
2021	80	-	0	100	0	0	0	0	-/-

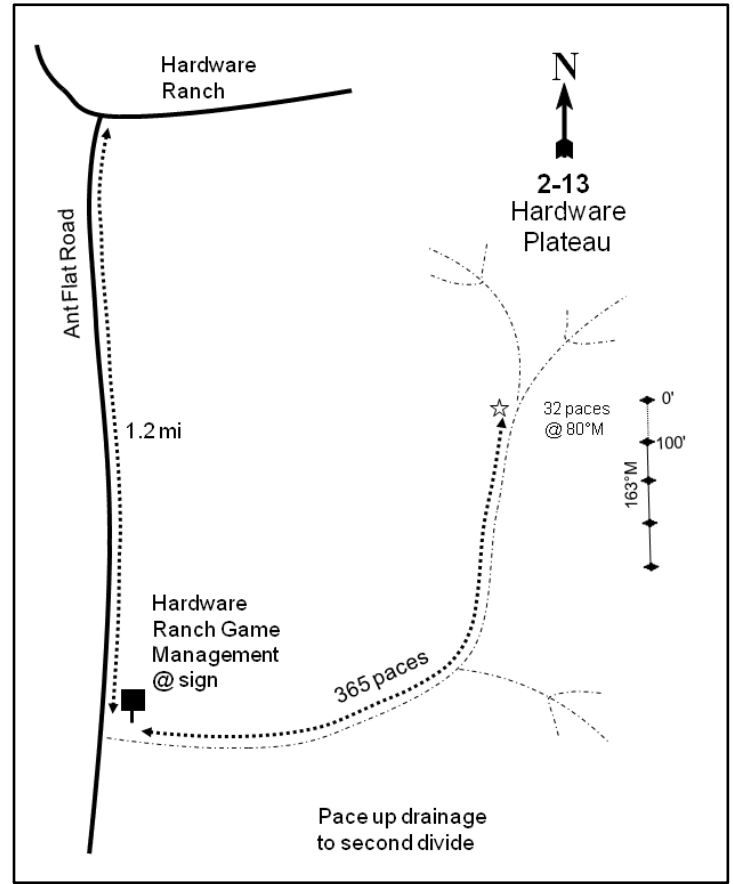
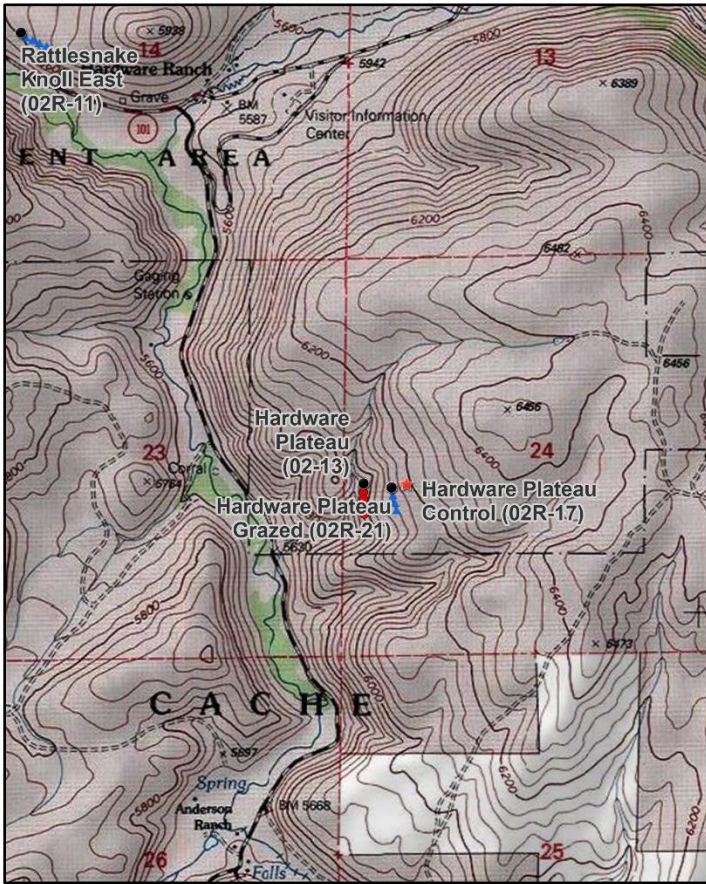
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Eriogonum heracloides -- (parsnipflower buckwheat)</b>									
1996	20	-	0	100	0	0	0	0	8/11
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Ericameria nauseosa ssp. nauseosa var. hololeuca<sup>p</sup> -- (rubber rabbitbrush)</b>									
1996	40	-	0	100	0	0	0	0	107/165
2001	40	-	0	100	0	0	0	0	80/103
2006	60	-	0	67	33	0	0	0	66/86
2011	60	-	0	100	0	0	0	0	73/181
2016	80	-	0	0	100	0	0	100	80/123
2021	60	-	0	0	100	0	0	100	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	1260	60	35	65	0	0	0	0	25/41
2001	1080	-	0	100	0	0	0	0	22/34
2006	500	-	0	92	8	0	0	4	28/41
2011	100	-	0	100	0	0	0	0	27/29
2016	180	-	0	100	0	0	0	0	39/58
2021	160	-	13	50	38	0	0	38	- / -
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	180	-	11	89	0	44	0	0	84/185
2001	100	-	0	60	40	60	20	0	100/188
2006	100	-	0	100	0	20	80	0	95/181
2011	240	40	50	42	8	42	8	25	107/175
2016	140	-	0	100	0	71	29	0	118/187
2021	180	-	0	44	56	78	0	56	- / -
<b>Rosa woodsii<sup>p</sup> -- (Woods' rose)</b>									
1996	20	-	0	100	0	0	0	0	25/16
2001	40	-	100	0	0	0	0	0	- / -
2006	180	-	11	89	0	0	0	0	40/29
2011	180	-	33	67	0	0	0	0	46/38
2016	420	-	0	100	0	0	0	0	36/24
2021	180	-	100	0	0	0	0	0	- / -
<b>Sambucus racemosa<sup>p</sup> -- (red elderberry)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	157/241
2011	-	-	-	-	-	-	-	-	153/228
2016	-	-	-	-	-	-	-	-	172/238
2021	-	-	-	-	-	-	-	-	-/-
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	55/67
2016	-	-	-	-	-	-	-	-	75/116
2021	-	-	-	-	-	-	-	-	-/-
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	85/120

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-12.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	7.9	6.5	3.3	20.5	-7.2	3.6	-2.0	<b>32.7</b>	Very Poor
2001	6.9	6.5	1.4	19.0	-15.4	6.3	0.0	<b>24.9</b>	Very Poor
2006	12.7	10.9	0.2	27.9	-6.4	10.0	-2.0	<b>53.2</b>	Poor-Fair
2011	12.8	11.5	15.0	23.4	-19.5	8.0	-2.0	<b>49.2</b>	Poor
2016	11.6	8.5	0.0	11.9	-20.0	5.9	0.0	<b>17.9</b>	Very Poor
2021	10.0	-2.3	0.0	16.7	-3.1	6.3	-2.0	<b>25.7</b>	Very Poor

## HARDWARE PLATEAU - STUDY NO. 02-13



### Location Information

USGS 7.5 min Map Info Hardware Ranch NE; Township 10N, Range 3E, Section 24  
 GPS (0' Stake) NAD 83 UTM ZONE 12, 453428 East 4604171 North

### Transect Information

Browse Tag # (0' Stake) 7984  
 Transect Bearing 163° magnetic  
 Length 400ft  
 Belt Placement Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
 Belt Marker Placement Standard

### Directions to Site

From Hardware Ranch, proceed south on the Ant Flat road for 1.2 miles. This mileage should end at a sign that reads: "Welcome to Hardware Ranch Game Management Area." Stop here. Walk up the bottom of the wash (to the east of the sign) 365 paces to the second very definite fork in the drainage. From the point where the wash divides, take a bearing of 80 degrees magnetic and walk 32 paces to the 0-foot stake of the baseline, which is marked by browse tag #7984. The baseline runs at 163 degrees magnetic.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,600ft (1,707m)
Aspect	West
Slope	50%
Sample Dates	07/25/1996, 07/13/2001, 07/12/2006, 07/13/2011, 07/07/2016, 06/28/2021

**Wildlife Habitat and Vegetation History****Table 02-13.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	winter	

**Table 02-13.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Perennial Grass	No Encroachment
1990	Perennial Grass	No Encroachment
1996	Perennial Grass	No Encroachment
2001	Perennial Grass	No Encroachment
2006	Perennial Grass	No Encroachment
2011	Perennial Grass	No Encroachment
2016	Annual Grass	No Encroachment
2021	Perennial Grass	No Encroachment

**Site Notes**

Deer carcasses were found in all sample years except 1990 and 2011; a deer was flushed from a draw in 1996. Chukars were seen in 1990, and yellow bellied marmots were seen in 2001. In 2016, several deer carcasses were found in the drainage just below the site and cranes were heard from the site, likely from the river in the bottom of the canyon.

**Soils****Table 02-13.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.7	42.3	31.7	26.0	4.0	34.0	307.2	0.5	07/25/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Mountain Very Steep Stony (Antelope Bitterbrush)
NRCS Ecological Site #	R047XA472UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1984, the vegetation community on this site has existed in a grass-dominated state with a variety of browse species providing limited cover (Photos, Pre-1992 Data, Table 02-13.7, Table 02-13.12). Perennial grasses, particularly bluebunch wheatgrass (*Pseudoroegneria spicata*), have been the dominant site component in most sample years. However, the introduced annual grass species cheatgrass (*Bromus tectorum*) has fluctuated in cover over the study period and was considered to be dominant in 2016. Perennial and annual forbs have remained diverse, but have contributed less cover than grasses throughout the duration of the study (Table 02-13.10, Table 02-13.11). Cover and density of various browse species have fluctuated from year to year, but have generally remained low (Table 02-13.12, Table 02-13.13). Barring a major disturbance, it is likely that this study site will remain in this herbaceous-dominated state in future sample years. Deer winter range condition has ranged from very poor and fair-good, and has generally improved as preferred browse cover has increased. As of 2021, deer winter range conditions were considered to be fair. Improvement of deer wintering range can be accomplished through efforts that support mature plants and reproduction in the preferred browse community. Diversifying native perennial grasses and forbs while reducing cheatgrass would also improve winter range conditions (Table 02-13.15).



**Trend Summary Tables**

**Table 02-13.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	3.8	1.8	-	-	-	-
2001	3.6	1.9	-	-	-	-
2006	2.5	1.4	-	5.6	3.1	-
2011	2.1	1.9	-	4.9	3.6	-
2016	4.3	1.9	-	10.1	3.8	-
2021	5.4	2.6	-	8.6	2.5	-

**Table 02-13.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	356	339	143	159	9.7	17.5	3.1	5.3
2001	292	358	335	147	6.1	25.7	10.1	5.5
2006	195	362	341	151	1.1	22.1	4.7	6.5
2011	230	322	382	177	4.4	23.6	13.2	8.4
2016	414	240	265	207	24.4	11.7	6.0	5.7
2021	163	315	255	219	1.3	20.3	2.2	11.8

**Table 02-13.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	7.0	1.2	45.5	5.0	25.1	43.3
2001	4.9	1.9	32.7	4.3	29.9	48.5
2006	16.0	0.6	28.9	3.7	30.1	36.5
2011	5.4	4.3	27.4	3.5	30.2	53.4
2016	5.2	0.0	26.6	5.2	27.4	50.3
2021	13.0	2.2	15.3	6.2	36.9	39.6

**Table 02-13.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1996	-	18	7	-	-
2001	-	19	3	-	6
2006	-	8	-	-	-
2011	-	3	2	-	1
2016	1	2	-	-	3
2021	1	14	5	-	2
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	-	38.9 (96.0)	12.8 (31.5)	-	-
2006	2.9 (7.2)	28.1 (69.5)	8.7 (21.5)	-	-
2011	-	7.4 (18.2)	9.4 (23.2)	-	-
2016	-	4.7 (11.6)	-	0.6 (1.4)	-
2021	2.2 (5.4)	16.8 (41.4)	-	-	-

**Table 02-13.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency									
Bromus arvensis <sup>ai</sup> (field brome)	11	354	-	-	4	3	225	259	-	
Bromus tectorum <sup>ai</sup> (cheatgrass)	14	291	2	-	-	3	279	281	-	
Koeleria macrantha (prairie Junegrass)	2	193	2	-	-	72	186	304	-	
Poa bulbosa <sup>i</sup> (bulbous bluegrass)	30	218	2	3	-	32	134	274	3	
Poa fendleriana (muttongrass)	56	413	-	-	-	8	57	226	7	
Poa pratensis <sup>i</sup> (Kentucky bluegrass)	31	150	-	16	-	4	212	212	8	
Poa secunda (Sandberg bluegrass)	Average Cover (%)									
Pseudoroegneria spicata (bluebunch wheatgrass)	1996	0.1	9.6	-	-	0.0	0.0	7.8	9.7	-
Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)	2001	0.1	5.9	0.0	-	-	0.0	7.9	17.7	-
	2006	0.0	1.1	0.0	-	-	1.5	2.5	18.1	-
	2011	0.2	4.3	0.0	0.0	-	2.1	2.7	18.7	0.0
	2016	0.8	23.6	-	-	-	0.3	0.6	10.6	0.2
	2021	0.2	1.1	-	0.5	-	0.1	5.9	13.7	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-13.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
Achillea millefolium (Common yarrow)	72	-	69	9	25	27	-	-	24	5	52	-	-	29	-	2	-	
Agoseris glauca (pale agoseris)	70	6	104	2	27	19	-	-	15	13	69	15	1	18	-	21	-	
Alyssum desertorum <sup>ai</sup> (desert madwort)	51	7	39	-	23	14	-	-	126	12	52	77	-	34	-	35	-	
Arabis (rockcress)	53	3	154	-	28	2	5	10	51	3	172	71	-	61	-	60	41	
Artemisia ludoviciana (white sagebrush)	100	8	37	-	54	17	4	5	61	4	50	31	-	49	1	15	29	
Balsamorhiza sagittata (arrowleaf balsamroot)	65	2	23	-	45	17	3	-	75	12	115	50	-	83	-	-	1	
Calochortus nuttallii (sego lily)	Average Cover (%)																	
Camelina microcarpa <sup>ai</sup> (tittlepod false flax)	1996	0.8	-	0.4	0.0	2.3	0.8	-	-	0.1	0.2	0.1	-	-	0.3	-	0.0	-
Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	2001	1.5	0.0	0.3	0.0	1.8	0.6	-	-	0.1	0.7	0.2	0.0	0.0	0.5	-	0.4	-
Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	2006	1.9	0.1	0.1	-	1.0	0.7	-	-	0.5	0.3	0.1	0.2	-	1.2	-	0.4	-
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	2011	2.0	0.0	0.4	-	2.4	0.2	0.0	0.2	0.3	0.2	1.7	0.4	-	1.5	-	1.6	0.2
Collomia linearis <sup>a</sup> (tiny trumpet)	2016	1.7	0.0	0.2	-	2.0	0.6	0.0	0.0	0.5	0.4	0.3	0.1	-	0.4	0.0	0.1	0.1
Comandra umbellata (bastard toadflax)	2021	1.9	0.0	0.1	-	2.0	2.6	0.0	-	0.4	0.5	0.4	0.1	-	1.8	-	-	0.0
Crepis acuminata (tapertip hawksbeard)																		
Cryptantha <sup>a</sup> (annual cryptantha)																		
Cymopterus (springparsley)																		
Descurainia pinnata <sup>a</sup> (western tansymustard)																		

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium aparine <sup>a</sup> (stickywilly)	Hackelia patens (spotted stickseed)	Isatis tinctoria <sup>ami</sup> (Dyer's woad)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lomatium grayi (Gray's biscuitroot)	Lupinus argenteus (silvery lupine)	Microsteris gracilis <sup>a</sup> (slender phlox)	Navarretia intertexta <sup>a</sup> (needleleaf navarretia)	Packera multilobata (lobeleaf groundsel)	Penstemon humilis (low beardtongue)	Phacelia <sup>a</sup> (phacelia)	Phlox longifolia (longleaf phlox)
year	Nested Frequency																
1996	-	88	7	55	-	34	-	16	-	-	12	-	-	-	4	12	-
2001	25	11	-	158	-	8	1	19	1	1	11	4	-	-	4	11	-
2006	101	139	-	114	2	26	3	8	-	6	5	73	-	4	4	0	2
2011	204	135	-	26	-	3	7	116	184	-	6	73	4	3	2	-	-
2016	46	15	-	107	1	11	-	71	58	2	12	20	16	-	3	-	-
2021	-	72	2	12	-	6	0	3	9	98	0	26	-	-	5	-	1
year	Average Cover (%)																
1996	-	0.9	0.3	0.7	-	0.3	-	0.0	-	-	0.3	-	-	-	0.1	0.5	-
2001	0.0	0.0	-	7.7	-	0.1	0.1	0.1	0.0	0.0	0.4	0.0	-	-	0.2	0.1	-
2006	0.3	0.9	-	1.5	0.0	0.7	0.1	0.0	-	0.1	0.3	0.2	-	0.0	0.2	0.0	0.0
2011	1.6	1.7	-	0.1	-	0.2	0.1	0.8	1.8	-	0.2	0.5	0.0	0.0	0.2	-	-
2016	0.3	0.3	-	2.3	0.0	0.2	-	0.5	0.6	0.0	0.8	0.1	0.1	-	0.0	-	-
2021	-	0.4	0.1	0.1	-	0.5	0.0	0.0	0.0	2.6	0.1	0.1	-	-	0.1	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Symphoricarichum ascendens (western aster)	Tragopogon dubius <sup>ai</sup> (yellow salsify)
year	Nested Frequency			
1996	12	12	-	2
2001	187	-	-	3
2006	229	-	-	3
2011	226	16	-	8
2016	71	4	-	8
2021	-	-	2	15
year	Average Cover (%)			
1996	0.0	0.1	-	0.0
2001	0.7	-	-	0.1
2006	0.5	-	-	0.0
2011	2.7	0.3	-	0.2
2016	0.3	0.0	-	0.0
2021	-	-	0.0	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02-13.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Mahonia repens (creeping barberry)	Prunus virginiana <sup>p</sup> (chokecherry)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Rosa woodsii <sup>p</sup> (Wood's rose)	Sambucus nigra ssp. cerulea <sup>p</sup> (blue elderberry)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)
year	Line Intercept Cover (%)								
1996	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-
2006	1	0.2	2.2	0.9	0.4	0.9	0.7	-	2.4
2011	0.9	0.5	2.3	1.3	0.5	0.9	0.9	-	1.2
2016	2	0.3	1.8	2	0.6	1.8	2.4	-	3
2021	1.2	0.3	1.2	1.3	0.5	2.1	1.6	-	2.9
year	Quadrat Cover (%)								
1996	0.1	1.3	1.8	0.1	0.0	0.4	0.7	-	1.3
2001	0.0	0.4	1.3	0.7	0.0	1.0	0.5	0.0	1.6
2006	0.1	0.0	0.9	0.5	0.0	0.2	0.9	-	1.2
2011	0.0	0.0	0.6	1.3	0.1	0.3	0.7	-	0.9
2016	0.4	0.0	1.0	0.9	0.1	1.1	1.5	-	1.2
2021	0.7	0.2	1.4	1.2	0.1	1.0	1.3	-	2.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-13.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	440	-	55	46	0	36	36	0	45/64
2001	160	-	13	88	0	38	25	0	52/57
2006	200	-	50	50	0	0	90	0	58/56
2011	160	-	0	100	0	13	38	0	49/65
2016	200	40	0	100	0	80	10	0	73/71
2021	160	-	0	88	13	63	13	25	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	280	-	14	64	21	71	14	7	68/100
2001	120	-	17	33	50	67	0	17	79/96
2006	120	-	17	50	33	33	17	0	74/97
2011	80	-	0	75	25	0	0	25	74/77
2016	100	-	20	60	20	20	20	20	88/101
2021	100	-	60	20	20	0	0	20	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	440	-	0	100	0	9	0	9	40/64
2001	500	-	4	96	0	0	0	12	31/53
2006	480	-	13	83	4	0	4	13	43/69
2011	240	-	8	92	0	0	0	8	36/47
2016	380	-	0	100	0	0	0	0	48/70
2021	340	-	0	94	6	24	0	6	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Eriogonum heracleoides -- (parsnipflower buckwheat)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	20	-	0	100	0	0	0	0	10/17
2006	20	-	0	100	0	0	0	0	- / -
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	20/40
2021	-	-	-	-	-	-	-	-	-/-
<b>Mahonia repens -- (creeping barberry)</b>									
1996	980	-	16	84	0	0	0	0	10/12
2001	3120	-	2	97	1	0	0	1	9/12
2006	3380	-	0	100	0	0	0	0	6/15
2011	1040	100	56	44	0	0	0	4	8/11
2016	5440	-	0	100	0	0	0	0	10/23
2021	11780	-	0	100	0	0	0	0	- / -
<b>Prunus virginiana<sup>P</sup> -- (chokecherry)</b>									
1996	100	-	40	60	0	20	40	0	49/45
2001	100	-	40	60	0	80	0	0	42/90
2006	260	-	92	8	0	39	62	0	38/46
2011	240	-	50	42	8	33	8	8	37/43
2016	520	-	4	96	0	19	0	0	32/23
2021	360	-	61	39	0	44	22	0	- / -
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1996	80	-	0	75	25	0	50	0	41/79
2001	80	-	0	75	25	25	75	0	51/122
2006	80	-	0	100	0	0	100	0	60/148
2011	100	-	0	100	0	20	40	0	71/152
2016	80	-	0	100	0	75	25	0	110/201
2021	80	-	0	75	25	50	25	25	- / -
<b>Rhus glabra<sup>P</sup> -- (smooth sumac)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	138/194
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Ribes<sup>P</sup> -- (currant)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	158/182
2021	-	-	-	-	-	-	-	-	-/-
<b>Rosa woodsii<sup>P</sup> -- (Woods' rose)</b>									
1996	1520	20	22	78	0	11	62	0	29/29
2001	1220	-	36	64	0	8	0	0	34/33
2006	1900	-	15	85	0	26	0	0	33/32
2011	1460	-	36	64	0	12	0	0	26/28
2016	1880	-	11	89	0	0	0	0	35/30
2021	2340	-	38	56	7	9	0	7	- / -

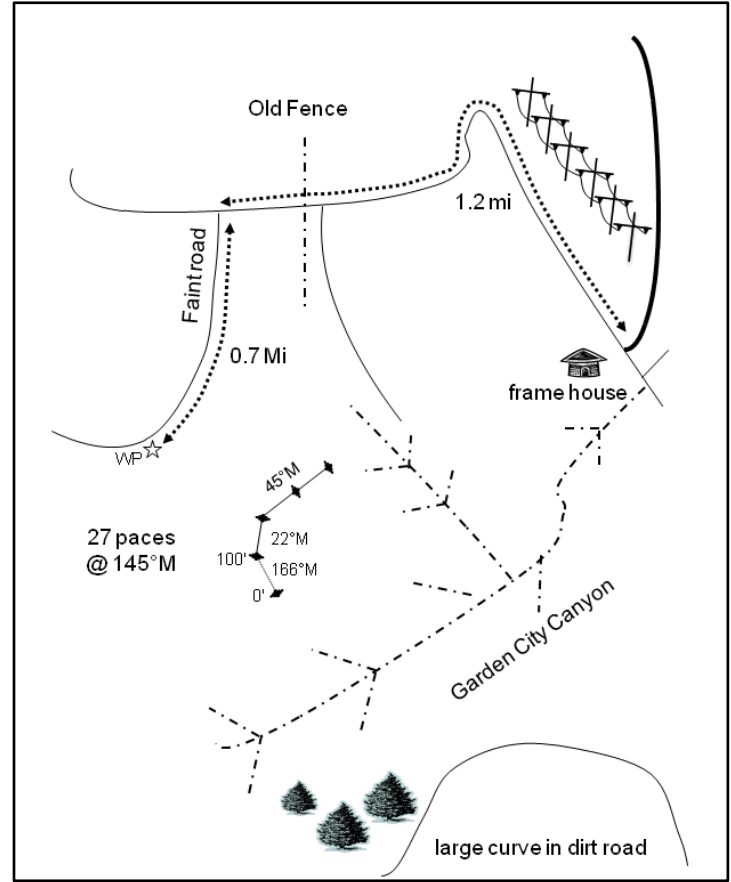
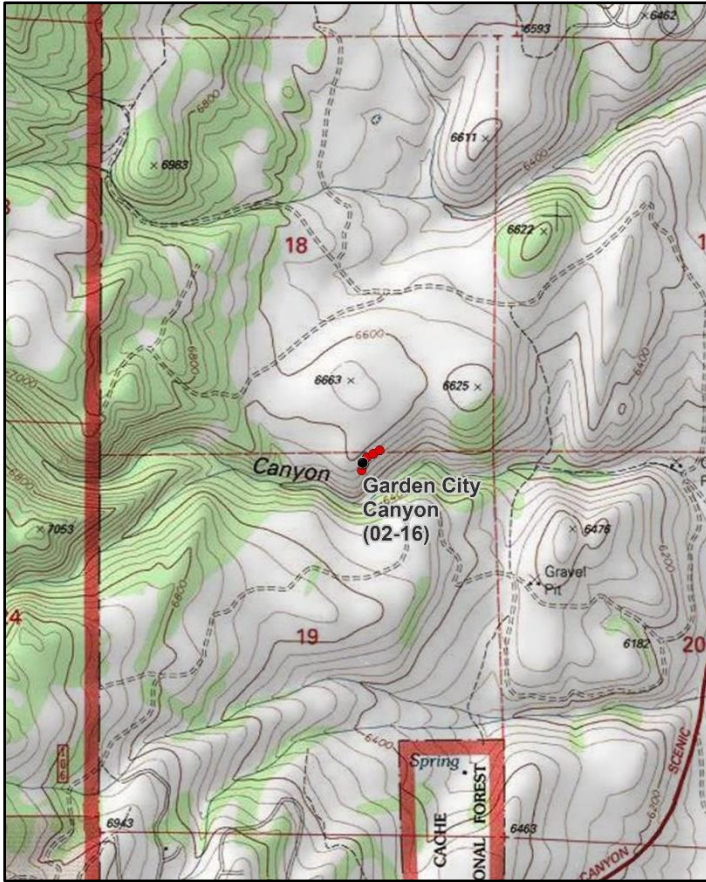
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Sambucus nigra ssp. cerulea<sup>p</sup> -- (blue elderberry)</b>									
1996	-	-	-	-	-	-	-	-	214/343
2001	60	-	0	100	0	0	0	0	120/176
2006	-	-	-	-	-	-	-	-	184/232
2011	-	-	-	-	-	-	-	-	124/197
2016	-	-	-	-	-	-	-	-	191/253
2021	-	-	-	-	-	-	-	-	-/-
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	460	-	35	65	0	78	0	0	51/72
2001	100	-	0	100	0	0	0	20	61/122
2006	180	-	11	89	0	44	0	0	67/111
2011	180	-	22	67	11	11	0	11	53/76
2016	200	-	0	100	0	40	0	0	70/96
2021	220	-	0	100	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-13.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	4.5	0.0	0.0	30.0	-7.3	10.0	0.0	<b>37.3</b>	Very Poor
2001	4.3	0.0	0.0	30.0	-4.5	10.0	-2.0	<b>37.8</b>	Very Poor
2006	6.9	14.6	11.4	30.0	-0.8	10.0	-2.0	<b>70.1</b>	Fair-Good
2011	6.3	0.0	0.0	30.0	-3.3	10.0	-2.0	<b>41.0</b>	Very Poor-Poor
2016	12.8	14.8	1.7	23.4	-18.3	10.0	0.0	<b>44.4</b>	Poor
2021	10.9	12.1	6.3	30.0	-1.0	10.0	-2.0	<b>66.2</b>	Fair

## GARDEN CITY CANYON - STUDY NO. 02-16

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Garden City NE; Township 14N, Range 5E, Section 19  
NAD 83 UTM ZONE 12, 464620 East 4644227 North

**Transect Information**

Browse Tag # (0' Stake)	7936
Transect Bearing	166° magnetic (Line 2: 22° magnetic, Lines 3-4: 45° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)
Belt Marker Placement	Belt 1: No Rebar

**Directions to Site**

From Garden City, proceed west on US-89, then turn right onto 525 West. Proceed 0.25 miles and turn right. While staying on the main road, continue for 1.2 miles to a fence. Turn onto a faint road immediately after the fence and continue for 0.7 miles; stay right at the fork to the witness post on the left (south) side of the road at the edge of the canyon. From the witness post, walk 27 paces at 145 degrees magnetic to the 0-foot stake of the baseline. The 0-foot stake is marked by browse tag #7936. The azimuth of the baseline is 166 degrees magnetic; line 2 runs 22 degrees magnetic, and lines 3 and 4 run 45 degrees magnetic.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,580ft (2,006m)
Aspect	Southeast
Slope	38%
Sample Dates	08/06/1996, 07/26/2001, 07/26/2006, 08/02/2011, 07/06/2016, 07/07/2021

**Wildlife Habitat and Vegetation History****Table 02-16.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter
Shiras Moose	crucial	winter

**Table 02-16.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Curlleaf Mountain Mahogany/Perennial Grass	Phase I
1990	Curlleaf Mountain Mahogany/Perennial Grass	Phase I
1996	Curlleaf Mountain Mahogany/Perennial Grass	Phase I
2001	Curlleaf Mountain Mahogany/Perennial Grass	Phase I
2006	Curlleaf Mountain Mahogany/Perennial Grass	Phase I
2011	Curlleaf Mountain Mahogany/Perennial Grass	Phase I
2016	Curlleaf Mountain Mahogany/Perennial Grass	Phase I
2021	Curlleaf Mountain Mahogany/Perennial Grass	Phase I

**Site Notes**

No Notes

**Soils****Table 02-16.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	5.8	32.6	39.0	28.4	4.7	31.5	259.2	0.4	08/06/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Shallow Loam (Curl-leaf Mountain Mahogany)
NRCS Ecological Site #	R047XA440UT
States and Transitions	No state and transition model is available for this ecological site.

Curlleaf mountain mahogany (*Cercocarpus ledifolius*) has been the dominant browse species on this site since study establishment in 1984. A diverse number of other browse species have generally contributed less cover: the exception to this is little sagebrush (*Artemisia arbuscula*), which provided 10% cover in 2021 (Photos, Pre-1992 Data, Table 02-16.12, Table 02-16.13, Table 02-16.14). The herbaceous understory has remained diverse and abundant throughout the study period; perennial grasses, particularly the native species bluebunch wheatgrass (*Pseudoroegneria spicata*), have been a co-dominant site component in all sample years. The introduced annual grass species field brome (*Bromus arvensis*) and cheatgrass (*B. tectorum*) have been observed with fluctuating cover in all years since 1996 (Table 02-16.7, Table 02-16.10, Table 02-16.11). Deer winter range condition has improved from very poor to good over the course of the study. As of 2021, deer winter range conditions were considered to be good. Improvement to deer wintering range can be accomplished through efforts that diversify the perennial forb community while reducing cheatgrass (Table 02-16.15).



**Trend Summary Tables****Table 02-16.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	14.2	0.4	0.9	-	-	-
2001	16.3	1.0	1.0	1.3	-	0.1
2006	12.7	0.7	1.4	31.8	0.8	2.3
2011	12.1	0.8	0.4	34.6	0.9	1.0
2016	11.1	1.0	2.2	27.9	1.8	2.7
2021	15.5	1.2	2.6	25.3	1.0	6.1

**Table 02-16.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	425	250	183	44	20.0	10.5	1.2	0.5
2001	166	334	238	62	2.4	15.9	2.2	1.2
2006	203	314	223	73	2.7	14.9	1.7	1.1
2011	311	310	315	61	5.7	16.9	3.8	1.1
2016	341	277	249	53	15.8	17.1	2.1	1.2
2021	228	348	166	90	2.8	28.2	1.9	1.9

**Table 02-16.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	2.3	0.5	56.6	0.6	20.5	49.9
2001	8.3	0.6	44.5	3.3	22.2	37.0
2006	6.9	0.3	49.6	1.1	27.6	33.5
2011	7.2	0.2	42.9	2.0	25.0	38.7
2016	5.2	1.2	38.2	1.7	19.6	49.9
2021	4.3	4.3	40.1	1.6	22.9	48.1

**Table 02-16.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Shiras Moose	Rabbit
	Quadrat Frequency			
1996	19	25	-	6
2001	36	10	-	8
2006	36	29	-	3
2011	23	10	-	4
2016	9	14	-	5
2021	25	20	-	2
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	57.0 (140.7)	16.1 (39.7)	-	-
2006	22.8 (56.3)	67.0 (165.5)	1.5 (3.6)	-
2011	38.2 (94.4)	15.4 (38.1)	-	-
2016	27.5 (67.9)	19.4 (48.0)	1.5 (3.6)	-
2021	29.5 (72.8)	13.4 (33.1)	-	-

**Table 02-16.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus briziformis <sup>ai</sup> (rattlesnake brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Koeleria macrantha (prairie Junegrass)	Melica bulbosa (oniongrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency											
1996	-	63	-	412	1	-	-	-	-	-	151	183
2001	1	26	-	160	-	3	-	-	-	-	258	203
2006	-	46	-	176	-	3	11	-	0	-	252	173
2011	0	194	1	171	-	3	5	3	21	2	163	232
2016	16	116	-	322	2	3	15	53	20	-	49	208
2021	-	76	5	194	8	1	25	90	-	-	213	238
year	Average Cover (%)											
1996	-	1.2	-	18.8	0.0	-	-	-	-	-	3.5	7.0
2001	0.0	0.1	-	2.3	-	0.0	-	-	-	-	7.5	8.4
2006	-	0.1	-	2.5	-	0.1	0.1	-	0.0	-	8.2	6.5
2011	0.0	2.1	0.0	3.6	-	0.0	0.1	0.0	0.2	0.1	5.8	10.7
2016	0.2	1.6	-	14.1	0.0	0.0	0.1	0.6	0.2	-	1.4	14.5
2021	-	0.4	0.1	2.4	0.2	0.0	0.6	4.1	-	-	9.2	14.1

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-16.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Balsamorhiza sagittata (arrowleaf balsamroot)	Camelina microcarpa <sup>ai</sup> (littleaf false flax)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cryptantha <sup>a</sup> (annual cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba verna <sup>ai</sup> (spring draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Eriogonum heracleoides (parsnipflower buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)
year	Nested Frequency																
1996	5	140	4	-	3	12	4	-	25	7	-	-	-	52	-	-	-
2001	13	165	4	0	6	5	144	3	25	21	-	3	17	29	-	-	0
2006	14	76	4	0	14	-	108	2	20	19	-	-	37	70	3	0	3
2011	2	240	12	-	4	4	126	-	22	26	-	2	101	80	-	-	4
2016	4	207	-	-	7	12	64	-	23	20	1	-	16	26	-	8	-
2021	22	96	-	0	-	7	52	-	37	20	-	-	36	11	-	2	7
year	Average Cover (%)																
1996	0.0	0.6	0.0	-	0.0	0.3	0.0	-	0.1	0.2	-	-	-	0.3	-	-	-
2001	0.1	0.7	0.0	0.0	0.1	0.4	0.4	0.0	0.3	0.7	-	0.0	0.1	0.1	-	-	0.0
2006	0.1	0.1	0.0	0.0	0.0	-	0.4	0.0	0.3	0.6	-	-	0.1	0.4	0.0	0.0	0.0
2011	0.0	0.8	0.1	-	0.0	0.1	0.7	-	0.3	0.5	-	0.0	0.7	0.7	-	-	0.1
2016	0.0	1.2	-	-	0.0	0.1	0.2	-	0.5	0.4	0.0	-	0.1	0.1	-	0.3	-
2021	0.1	0.5	-	0.0	-	0.4	0.3	-	1.0	0.1	-	-	0.2	0.0	-	0.0	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium aparine <sup>a</sup> (stickywilly)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Gilia inconspicua <sup>a</sup> (shy gilia)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Microsteris gracilis <sup>a</sup> (slender phlox)	Pedicularis centranthera (dwarf lousewort)	Petradoria pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Wyethia amplexicaulis (mule-ears)
year	Nested Frequency														
1996	-	-	1	-	-	2	-	-	1	-	3	-	3	7	4
2001	9	-	-	-	-	1	69	-	0	1	2	1	0	8	-
2006	4	-	47	-	-	17	71	-	-	17	-	6	-	3	-
2011	3	7	8	7	6	53	27	1	0	-	22	19	8	0	-
2016	6	1	-	-	5	-	2	-	-	-	13	17	4	-	-
2021	28	3	-	-	-	8	-	-	5	-	12	-	-	5	-
year	Average Cover (%)														
1996	-	-	0.0	-	-	0.0	-	-	0.0	-	0.0	-	0.0	0.0	0.0
2001	0.1	-	-	-	-	0.0	0.2	-	0.0	0.0	0.0	0.0	0.0	0.1	-
2006	0.1	-	0.2	-	-	0.0	0.2	-	-	0.0	-	0.0	-	0.0	-
2011	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.0	0.0	-	0.1	0.1	0.2	0.0	-
2016	0.0	0.0	-	-	0.0	-	0.0	-	-	-	0.1	0.2	0.0	-	-
2021	0.5	0.0	-	-	-	0.0	-	-	0.4	-	0.1	-	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02-16.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia arbuscula <sup>p</sup> (little sagebrush)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Cercocarpus ledifolius <sup>p</sup> (curl-leaf mountain mahogany)	Eriogonum heracleoides (parsnipflower buckwheat)	Eriogonum microthecum <sup>p</sup> (slender buckwheat)	Juniperus scopulorum <sup>t</sup> (Rocky Mountain juniper)	Mahonia repens (creeping barberry)	Opuntia polyacantha (plains pricklypear)	Paxistima myrsinites (Oregon boxleaf)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)
year	Line Intercept Cover (%)											
1996	-	-	-	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-	-	-
2006	0.5	8.8	0.5	17.1	0.1	0.1	2.3	0.3	0.4	-	1.6	3.2
2011	0.9	11	0.2	17.3	-	-	1	0.6	-	0.3	1.7	3.5
2016	1.3	8.4	0.3	13.4	0.9	-	2.7	0.3	0.3	0.3	1.5	3
2021	1.9	10	1.1	7.8	-	0.1	6.1	1	-	-	1.5	2.9
year	Quadrat Cover (%)											
1996	0.4	7.8	-	3.6	-	-	0.9	0.0	0.2	0.2	0.7	1.7
2001	0.3	8.1	1.1	1.7	-	0.1	1.0	0.5	0.4	0.2	1.6	3.2
2006	0.3	6.5	1.1	1.7	0.0	0.4	1.4	0.1	0.6	-	0.8	2.0
2011	0.6	7.5	0.4	0.4	-	-	0.4	0.5	0.1	0.1	1.1	2.2
2016	0.6	7.5	0.1	0.2	0.0	-	2.2	0.5	0.4	0.1	0.5	2.2
2021	0.3	10.6	1.1	0.5	-	0.0	2.6	1.1	0.1	-	0.9	2.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-16.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1996	220	-	18	55	27	64	0	73	73/73
2001	200	-	50	40	10	60	20	10	69/72
2006	140	-	0	86	14	14	57	0	64/88
2011	140	-	0	100	0	43	57	0	77/105
2016	140	-	0	100	0	14	29	14	83/117
2021	180	-	11	78	11	44	22	11	- / -
<b>Artemisia arbuscula<sup>P</sup> -- (little sagebrush)</b>									
1996	2600	-	5	84	11	19	2	2	32/65
2001	2160	-	2	78	20	8	0	5	34/75
2006	2140	-	0	81	19	0	3	12	26/60
2011	2160	320	2	75	23	41	2	13	27/73
2016	2480	60	3	89	8	16	11	7	27/69
2021	2320	20	1	74	25	3	9	36	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	100	-	0	80	20	0	0	0	50/76
2006	60	-	0	33	67	0	0	67	84/167
2011	80	80	0	25	75	75	25	25	58/120
2016	260	-	15	77	8	8	0	8	54/84
2021	180	-	11	78	11	11	22	11	- / -
<b>Brickellia -- (brickellbush)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	99/170
2021	-	-	-	-	-	-	-	-	- / -
<b>Cercocarpus ledifolius<sup>P</sup> -- (curl-leaf mountain mahogany)</b>									
1996	280	-	7	71	21	7	14	0	- / -
2001	220	-	9	55	36	9	27	18	129/129
2006	140	180	0	100	0	0	0	0	- / -
2011	220	420	27	64	9	0	0	0	89/110
2016	160	280	25	75	0	0	0	0	- / -
2021	240	20	33	58	8	8	17	8	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	46/133
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	25/67
2021	-	-	-	-	-	-	-	-	- / -
<b>Eriogonum heracleoides -- (parsnipflower buckwheat)</b>									
1996	40	-	0	100	0	0	0	0	- / -
2001	40	-	0	100	0	0	0	0	40/24
2006	60	-	0	100	0	0	0	0	14/29
2011	80	-	0	100	0	0	0	0	15/45
2016	180	-	11	89	0	0	0	0	20/58
2021	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Eriogonum microthecum<sup>P</sup> -- (slender buckwheat)</b>									
1996	20	-	0	100	0	0	0	0	26/67
2001	-	-	-	-	-	-	-	-	30/55
2006	20	-	0	100	0	0	0	0	- / -
2011	40	-	0	100	0	0	0	0	27/47
2016	-	-	-	-	-	-	-	-	- / -
2021	20	-	0	100	0	0	0	0	- / -
<b>Mahonia repens -- (creeping barberry)</b>									
1996	800	-	0	100	0	0	0	0	11/13
2001	2140	-	0	100	0	0	0	0	9/11
2006	2260	-	0	100	0	0	0	0	11/13
2011	820	-	0	100	0	0	0	0	10/63
2016	2420	-	0	100	0	0	0	0	14/16
2021	3660	-	0	100	0	0	0	0	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	100	-	0	100	0	0	0	0	16/64
2001	160	-	13	88	0	0	0	0	11/33
2006	120	-	0	83	17	0	0	17	14/49
2011	140	-	0	71	29	0	0	57	15/44
2016	380	-	0	95	5	0	0	5	16/48
2021	200	-	30	70	0	0	0	0	- / -
<b>Paxistima myrsinites -- (Oregon boxleaf)</b>									
1996	180	-	33	67	0	0	0	0	17/29
2001	140	-	43	57	0	0	0	0	12/19
2006	40	-	0	100	0	0	0	0	22/37
2011	140	-	0	100	0	0	0	0	47/60
2016	400	-	0	100	0	0	0	0	23/63
2021	80	-	0	100	0	0	0	0	- / -
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1996	140	-	0	86	14	43	57	0	41/88
2001	120	-	0	100	0	50	17	0	44/108
2006	120	-	0	33	67	33	50	50	37/100
2011	160	-	0	63	38	50	50	50	48/118
2016	100	-	0	100	0	20	20	0	44/115
2021	120	-	0	100	0	0	33	0	- / -
<b>Ribes<sup>P</sup> -- (currant)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	36/198
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Symphoricarpos oreophilus<sup>P</sup> -- (mountain snowberry)</b>									
1996	460	-	22	70	9	4	0	4	53/88
2001	400	-	0	95	5	0	0	5	60/105
2006	600	-	7	87	7	0	0	13	53/78
2011	260	-	15	85	0	15	0	8	57/100
2016	980	-	0	100	0	2	0	0	53/99
2021	400	-	10	85	5	30	15	35	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

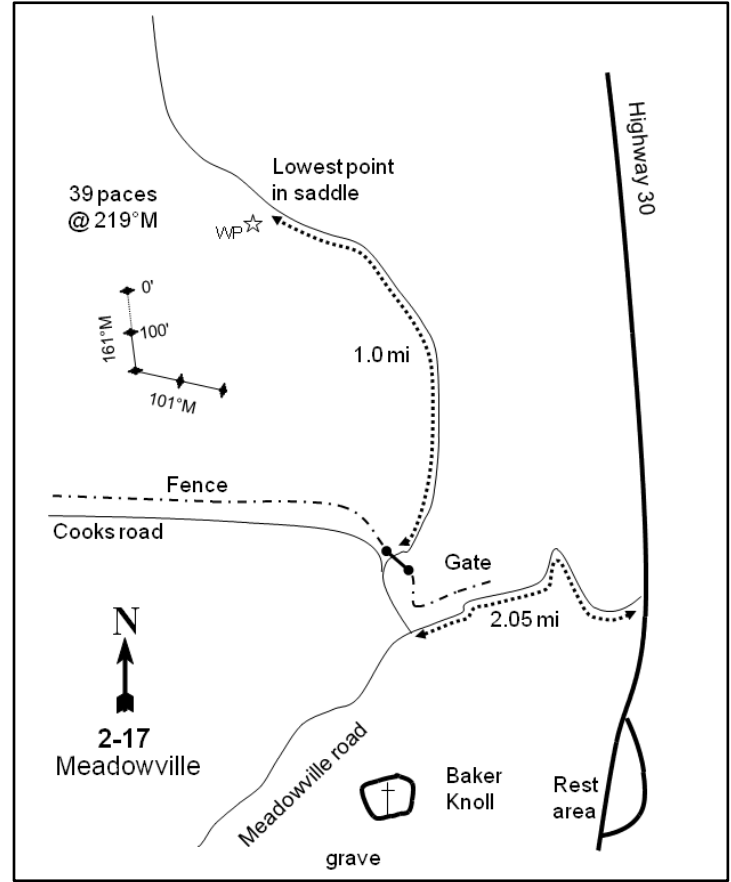
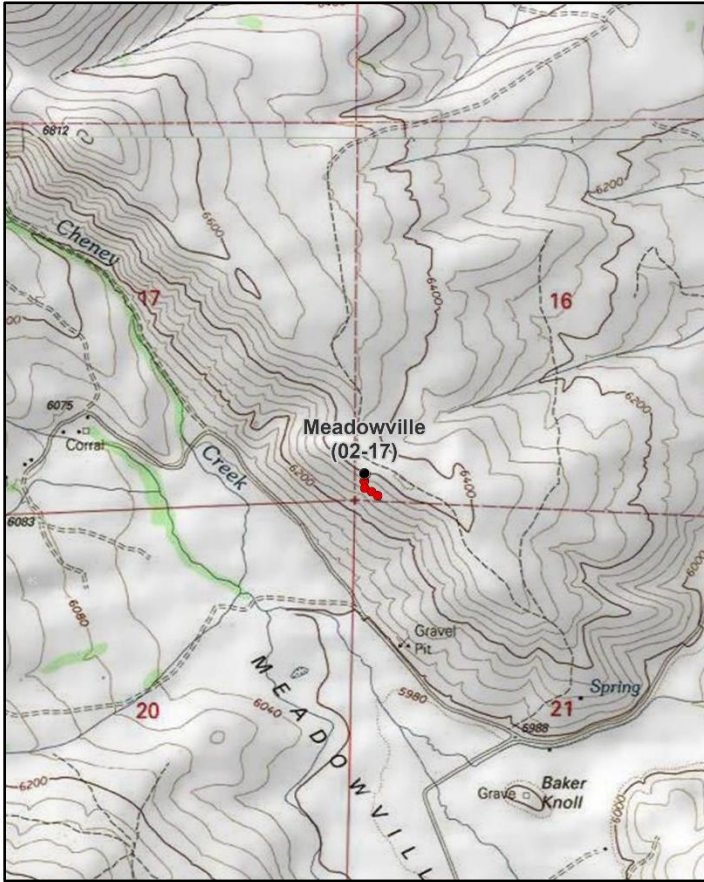
**Table 02-16.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Cercocarpus ledifolius (curl-leaf mountain mahogany)</b>							
1996	72	-	-	-	-	-	15.3
2006	72	-	18	6	53	24	16.0
2011	70	-	18	24	29	29	15.2
2016	85	12	12	18	12	47	17.1
<b>Juniperus scopulorum (Rocky Mountain juniper)</b>							
1996	10	-	-	-	-	-	19.7
2016	10	-	17	17	-	67	21.0
2021	11	14	29	14	-	43	21.7

**Table 02-16.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	18.6	10.9	4.0	21.0	-15.0	1.0	0.0	<b>40.4</b>	Very Poor-Poor
2001	20.4	9.9	1.4	30.0	-1.8	2.5	0.0	<b>62.4</b>	Fair
2006	30.0	11.9	0.3	29.7	-2.0	2.1	0.0	<b>72.0</b>	Good
2011	30.0	10.7	7.9	30.0	-4.3	2.1	0.0	<b>76.5</b>	Good
2016	30.0	14.2	6.6	30.0	-11.8	2.4	0.0	<b>71.4</b>	Fair-Good
2021	30.0	10.7	6.5	30.0	-2.1	3.8	0.0	<b>78.9</b>	Good

## MEADOWVILLE - STUDY NO. 02-17

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Meadowville NE; Township 13N, Range 5E, Section 16  
NAD 83 UTM ZONE 12, 466750 East 4634613 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

7938  
161° magnetic (Line 3-4: 101° magnetic)  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
No Rebar

**Directions to Site**

At the intersection of Highway 30 and Meadowville Road, turn west on Meadowville Road and proceed for 2.05 miles. Turn right (north) onto Cook's Road and immediately turn right, passing through a large gate. Proceed 1.1 miles, passing a spring on the right and following the ridgetop, to the witness post in the low spot of a small saddle. Walk 39 paces at 219 degrees magnetic from the witness post to the 0-foot baseline stake. The 0-foot stake is approximately 75 yards from a fence to the west and is marked by browse tag #7938. The baseline runs at 161 degrees magnetic, while lines 3 and 4 dogleg and run parallel to the fence at a bearing of 101 degrees magnetic.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,400ft (1,951m)
Aspect	South
Slope	24%
Sample Dates	08/07/1996, 07/27/2001, 08/28/2006, 08/08/2011, 07/06/2016, 07/07/2021

**Wildlife Habitat and Vegetation History****Table 02-17.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	substantial	winter	
Greater Sage-Grouse	occupied	year-long	brood-rearing
Shiras Moose	crucial	summer	

**Table 02-17.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Mountain Big Sagebrush/Perennial Grass	No Encroachment
1990	Mountain Big Sagebrush/Perennial Grass	No Encroachment
1996	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2001	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2006	Perennial Grass/Yellow Rabbitbrush	No Encroachment
2011	Perennial Grass/Yellow Rabbitbrush	No Encroachment
2016	Perennial Grass/Mountain Big Sagebrush-Yellow Rabbitbrush	No Encroachment
2021	Perennial Grass/Mountain Big Sagebrush	No Encroachment

**Site Notes**

Deer shed antlers were found in 1984, and deer carcasses were found in 1984 and 2006.

**Soils****Table 02-17.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.1	36.6	34.0	29.4	3.6	8.6	236.8	0.6	11/18/1996
Sandy Clay Loam	7.0	46.2	20.0	33.8	2.2	14.2	192.0	0.7	08/28/2006

**Site Potential**

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this site.

Since 1984, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been the dominant shrub species on this study site with cover and density increasing since 2006; other browse species have also been present to a lesser extent. Yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*) has been observed in considerable amounts, but has decreased in both line intercept cover and density since 2006 (Photos, Pre-1992 Data, Table 02-17.12, Table 02-17.13). The herbaceous understory has remained abundant throughout the study period, although composition has varied. Perennial grasses, namely the native species bluebunch wheatgrass (*Pseudoroegneria spicata*) and Sandberg bluegrass (*Poa secunda*), have contributed much of the herbaceous cover in many sample years. The introduced species bulbous bluegrass (*P. bulbosa*) has also been present, but in low amounts. However, the introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed with fluctuating cover, and was the dominant herbaceous component in 1996, 2011, and 2016 (Table 02-17.10). Should cheatgrass again increase in cover and frequency, it could pose a threat to the plant community's ecological resiliency and may have the potential to influence the fire regime of the site. Forbs have remained diverse, but have had generally less cover and frequency than grasses (Table 02-17.11). Deer winter range condition has ranged from very poor to poor, and has generally improved as preferred browse cover has increased. Deer winter range conditions were considered to be poor in 2021. Improvement to deer wintering range can be accomplished through efforts that support mature plants and reproduction in the preferred browse community. Diversifying native perennial grasses and forbs while reducing cheatgrass would also improve winter range conditions (Table 02-17.15).



**Trend Summary Tables****Table 02-17.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	5.7	5.2	-	-	-	-
2001	4.3	4.7	-	-	-	-
2006	2.9	7.3	-	4.0	9.7	-
2011	4.9	8.8	-	6.1	9.8	-
2016	9.4	8.6	-	12.0	9.5	-
2021	11.2	6.2	-	13.9	7.7	-

**Table 02-17.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	457	265	371	85	19.5	11.9	3.5	2.2
2001	345	305	352	107	6.8	14.2	3.3	2.9
2006	365	287	251	124	8.2	16.4	1.8	3.4
2011	436	283	387	81	23.2	8.6	9.2	2.7
2016	428	282	365	90	23.3	10.1	7.0	2.9
2021	330	300	259	58	6.1	8.8	3.6	1.1

**Table 02-17.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	4.1	0.1	51.9	3.9	10.9	53.2
2001	10.9	0.2	38.4	17.4	8.1	41.0
2006	12.6	0.2	43.2	11.2	8.4	40.6
2011	5.8	0.2	39.1	14.4	6.6	54.3
2016	12.3	0.1	24.1	14.7	7.5	54.4
2021	9.1	0.1	41.1	16.9	10.2	38.4

**Table 02-17.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Horse	Rabbit
	Quadrat Frequency					
1996	2	15	7	-	-	3
2001	1	25	4	-	-	2
2006	3	16	8	-	-	6
2011	3	7	15	-	-	8
2016	5	10	9	-	-	25
2021	1	12	1	1	-	33
Year	Days Use Per Acre (ha)					
1996	-	-	-	-	-	-
2001	3.6 (9.0)	56.3 (139.0)	2.7 (6.6)	-	-	-
2006	5.8 (14.3)	24.1 (59.6)	18.7 (46.3)	-	-	-
2011	5.8 (14.3)	7.4 (18.2)	19.4 (48.0)	-	-	-
2016	5.8 (14.3)	22.8 (56.3)	17.4 (43.0)	-	-	-
2021	2.2 (5.4)	53.6 (132.4)	8.7 (21.5)	-	1.2 (2.9)	-

**Table 02-17.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency							
Achnatherum hymenoides (Indian ricegrass)								
Bromus arvensis <sup>ai</sup> (field brome)								
Bromus tectorum <sup>ai</sup> (cheatgrass)								
Elymus elymoides (squirreltail)								
Poa bulbosa <sup>i</sup> (bulbous bluegrass)								
Poa pratensis <sup>i</sup> (Kentucky bluegrass)								
Poa secunda (Sandberg bluegrass)								
Pseudoroegneria spicata (bluebunch wheatgrass)								
year	Average Cover (%)							
1996	80	-	457	5	-	4	95	162
2001	77	-	345	-	-	1	152	175
2006	47	-	365	2	4	15	131	211
2011	40	-	436	-	5	6	176	174
2016	49	27	421	-	60	-	43	179
2021	55	9	329	1	20	1	142	203
year	Average Cover (%)							
1996	3.8	-	19.5	0.0	-	0.0	1.5	6.5
2001	5.7	-	6.8	-	-	0.0	1.4	7.1
2006	1.9	-	8.2	0.0	0.0	1.0	1.8	11.7
2011	0.8	-	23.2	-	0.0	0.1	3.4	4.3
2016	1.6	0.3	23.0	-	1.1	-	1.2	6.3
2021	0.7	0.0	6.1	0.0	0.4	0.0	2.4	5.4

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-17.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
Achillea millefolium (Common yarrow)																		
Agoseris glauca (pale agoseris)																		
Allium (onion)																		
Alyssum desertorum <sup>ai</sup> (desert madwort)																		
Astragalus (milkvetch)																		
Astragalus utahensis (Utah milkvetch)																		
Balsamorhiza sagittata (arrowleaf balsamroot)																		
Camelina microcarpa <sup>ai</sup> (tittlepod false flax)																		
Castilleja angustifolia (northwestern Indian paintbrush)																		
Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)																		
Chaenactis douglasii (Douglas' dustymaiden)																		
Cirsium (thistle)																		
Cirsium undulatum <sup>a</sup> (wavyleaf thistle)																		
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																		
Collomia linearis <sup>a</sup> (tiny trumpet)																		
Comandra umbellata (bastard toadflax)																		
Crepis acuminata (tapertip hawkbeard)																		
year	Average Cover (%)																	
1996	5	-	-	355	-	36	5	2	4	-	5	-	27	3	-	-	-	-
2001	6	-	-	343	-	18	13	2	-	-	-	-	21	9	10	11	8	8
2006	8	22	-	205	5	13	15	5	3	-	4	1	6	16	-	2	10	10
2011	6	8	1	382	-	20	16	2	-	-	2	-	5	2	-	9	2	2
2016	4	-	-	352	3	42	17	-	-	3	-	-	1	-	-	4	-	-
2021	2	-	-	228	-	13	10	-	-	-	-	-	2	-	-	11	5	5
year	Average Cover (%)																	
1996	0.0	-	-	2.4	-	0.5	0.4	0.0	0.0	-	0.0	-	0.4	0.0	-	-	-	-
2001	0.1	-	-	2.3	-	0.2	0.3	0.0	-	-	-	-	0.6	0.0	0.0	0.1	0.2	0.2
2006	0.1	0.1	-	0.6	0.1	0.1	0.8	0.0	0.0	-	0.0	0.0	0.0	0.1	-	0.0	0.3	0.3
2011	0.1	0.0	0.0	8.8	-	0.1	0.7	0.0	-	-	0.0	-	0.1	0.0	-	0.0	0.1	0.1
2016	0.0	-	-	4.6	0.0	0.4	1.4	-	-	0.0	-	-	0.0	-	-	0.1	-	-
2021	0.0	-	-	0.8	-	0.1	0.7	-	-	-	-	-	0.0	-	-	0.1	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES																	
Descurainia pinnata <sup>a</sup> (western tansymustard)																	
Draba <sup>a</sup> (draba)																	
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)																	
Heterotheca villosa (hairy false goldenaster)																	
Lactuca serriola <sup>ai</sup> (prickly lettuce)																	
Linum lewisii (Lewis flax)																	
Lithospermum ruderale (western stone seed)																	
Lomatium (desertparsley)																	
Microsteris gracilis <sup>a</sup> (slender phlox)																	
Navarretia intertexta <sup>a</sup> (needleleaf navarretia)																	
Oenothera (evening primrose)																	
Phlox hoodii (spiny phlox)																	
Phlox longifolia (longleaf phlox)																	
Polygonum douglasii <sup>a</sup> (Douglas' knotweed)																	
Silene antirrhina <sup>a</sup> (sleepy silene)																	
Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)																	
Tragopogon dubius <sup>ai</sup> (yellow salsify)																	
year	Nested Frequency																
1996	17	-	-	-	-	10	22	-	-	3	-	16	11	3	-	3	52
2001	15	1	-	-	2	5	22	-	3	-	0	20	38	3	-	-	45
2006	5	3	-	-	3	2	20	-	7	-	-	10	23	-	3	12	52
2011	2	-	-	-	3	3	27	0	-	1	-	7	10	-	-	11	26
2016	1	-	85	-	-	-	17	-	-	-	-	7	17	-	-	5	1
2021	-	-	106	3	-	-	6	-	-	-	-	7	10	-	-	8	4
year	Average Cover (%)																
1996	0.0	-	-	-	-	0.0	1.0	-	-	0.0	-	0.2	0.0	0.0	-	0.0	0.5
2001	0.0	0.0	-	-	0.0	0.1	1.3	-	0.0	-	0.0	0.3	0.3	0.0	-	-	0.4
2006	0.0	0.0	-	-	0.0	0.0	1.1	-	0.0	-	-	0.3	0.3	-	0.0	0.5	0.4
2011	0.0	-	-	-	0.0	0.0	1.4	0.0	-	0.0	-	0.2	0.0	-	-	0.1	0.2
2016	0.0	-	2.2	-	-	-	0.9	-	-	-	-	0.1	0.0	-	-	0.0	0.0
2021	-	-	2.7	0.0	-	-	0.1	-	-	-	-	0.0	0.0	-	-	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES																	
Zigadenus paniculatus (foothill deathcamas)																	
year	Nested Frequency																
1996	-																
2001	-																
2006	12																
2011	-																
2016	-																
2021	-																
year	Average Cover (%)																
1996	-																
2001	-																
2006	0.1																
2011	-																
2016	-																
2021	-																

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02-17.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa (rubber rabbitbrush)	Eriogonum microthecum <sup>p</sup> (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Opuntia polyacantha (plains pricklypear)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)									
1996	-	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-
2006	-	0.8	8.2	-	-	0.3	0.2	3.2	-	1
2011	0.3	1.8	7.3	-	0.4	0.3	0.2	3.6	-	2
2016	0.1	5.4	5.6	-	0.1	2.1	0.1	6.4	-	1.7
2021	0.2	8.3	4.2	-	0.2	1.7	-	4.7	0.5	1.8
year	Quadrat Cover (%)									
1996	-	4.4	4.0	-	0.1	0.3	0.3	1.1	-	0.6
2001	-	2.4	2.9	-	-	0.4	0.5	1.9	-	1.0
2006	-	0.7	4.5	-	0.0	0.2	0.9	2.2	-	1.7
2011	0.0	1.2	5.8	-	0.1	0.2	0.5	3.6	-	2.5
2016	0.0	4.3	5.0	-	0.0	1.4	0.2	5.1	-	2.0
2021	0.0	6.9	3.2	0.1	0.0	1.7	0.0	4.3	0.0	1.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-17.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	-	40	0	0	0	0	0	0	- / -
2001	20	-	0	100	0	0	0	0	43/47
2006	40	-	50	50	0	50	0	0	64/84
2011	40	-	50	50	0	100	0	0	78/99
2016	40	-	0	100	0	0	50	50	75/93
2021	40	-	50	50	0	50	50	0	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	860	60	9	30	61	28	28	65	65/86
2001	520	-	4	50	46	39	4	42	53/84
2006	400	-	0	90	10	25	0	5	38/59
2011	400	20	25	65	10	50	0	5	45/78
2016	440	460	9	91	0	18	14	0	57/103
2021	580	-	10	86	3	3	0	3	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	1900	40	2	95	3	0	0	0	34/61
2001	1960	20	2	80	18	0	0	2	29/51
2006	1720	-	4	90	7	4	1	4	34/61
2011	1640	-	10	90	0	1	1	0	36/59
2016	1540	-	4	96	0	22	1	0	32/52
2021	1180	-	3	59	37	0	0	37	- / -

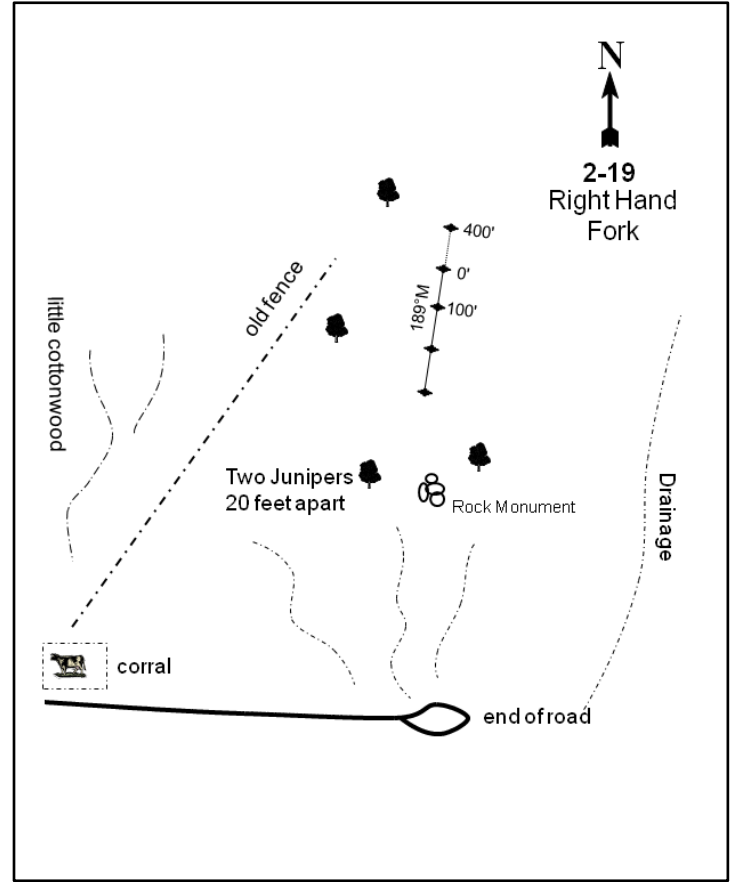
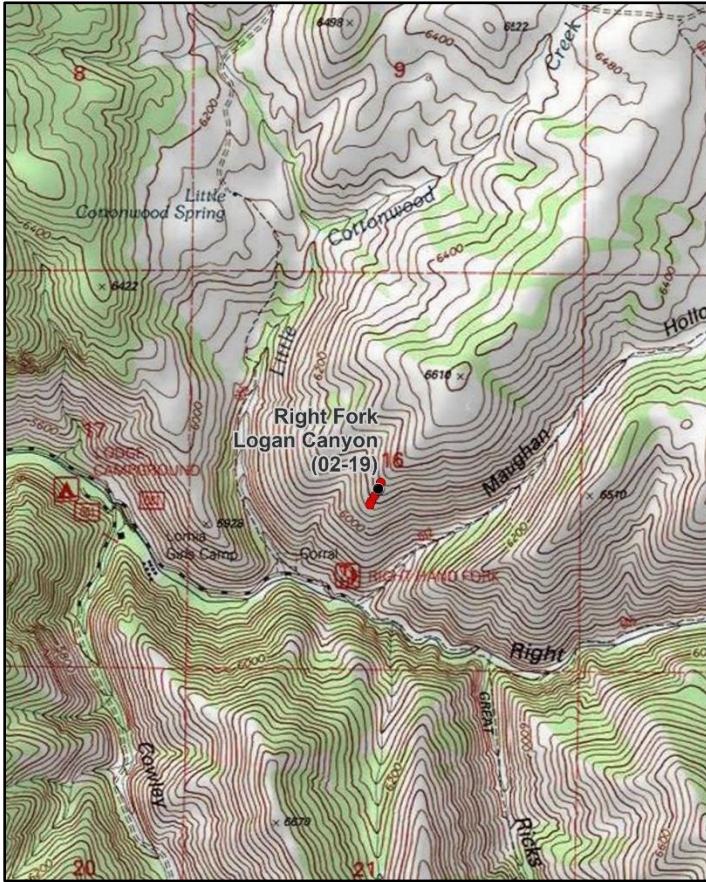
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Eriogonum microthecum<sup>p</sup> -- (slender buckwheat)</b>									
1996	100	-	20	80	0	0	0	0	32/30
2001	20	-	0	100	0	0	0	0	37/43
2006	120	-	0	100	0	0	0	0	38/60
2011	140	-	0	100	0	14	0	14	26/46
2016	40	-	0	100	0	50	0	0	20/30
2021	20	-	0	0	100	0	0	100	- / -
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	37/39
2021	-	-	-	-	-	-	-	-	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	1400	120	11	86	3	0	0	1	18/25
2001	820	40	2	98	0	0	0	0	13/23
2006	480	-	4	92	4	0	0	0	17/28
2011	260	-	31	69	0	0	0	0	25/32
2016	1460	-	3	97	0	0	0	0	23/35
2021	2500	-	12	68	20	0	0	20	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	180	20	44	56	0	0	0	0	12/32
2001	300	-	7	93	0	0	0	0	12/30
2006	320	-	19	81	0	0	0	0	12/40
2011	280	-	0	100	0	0	0	7	11/35
2016	380	-	0	100	0	0	0	11	12/33
2021	120	-	0	100	0	0	0	0	- / -
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	200	-	30	60	10	30	40	10	33/105
2001	200	-	0	100	0	50	50	0	49/114
2006	400	-	10	90	0	30	0	0	65/134
2011	220	-	0	100	0	27	73	0	70/152
2016	240	-	8	92	0	33	58	0	77/185
2021	260	-	8	69	23	54	31	23	- / -
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	86/183
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	600	-	17	73	10	10	10	3	27/46
2001	820	40	7	81	12	2	0	2	21/35
2006	860	-	9	88	2	16	0	0	23/44
2011	720	-	25	75	0	0	0	3	28/49
2016	880	-	16	82	2	36	0	0	26/48
2021	800	-	18	60	23	10	0	25	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-17.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	7.4	0.3	6.9	23.7	-14.6	4.3	0.0	<b>28.1</b>	Very Poor
2001	5.9	0.0	0.0	28.4	-5.1	5.8	0.0	<b>35.0</b>	Very Poor
2006	5.8	0.0	0.0	30.0	-6.1	6.7	0.0	<b>36.4</b>	Very Poor
2011	8.6	14.1	4.9	17.1	-17.4	5.5	0.0	<b>32.8</b>	Very Poor
2016	16.6	15.0	4.3	18.1	-17.5	5.9	0.0	<b>42.3</b>	Poor
2021	18.5	11.1	4.7	16.9	-4.6	2.2	0.0	<b>48.9</b>	Poor

## RIGHT FORK LOGAN CANYON - STUDY NO. 02-19



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Temple Peak SW; Township 12N, Range 3E, Section 16  
NAD 83 UTM ZONE 12, 449532 East 4625350 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

Not Available  
195° magnetic (Line 4: 16° magnetic)  
400ft  
Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)  
Belt 1: 8ft; Belt 3: 1ft; Belt 5: No Rebar

### Directions to Site

Drive up the Right Fork of Logan Canyon and bear left at the girls' camp. Go 0.6 miles to the end of the road just past the corral and park. Hike up the ridge to the north, going about 3/4 mile towards the ridgeline. Look for a rock monument between two junipers that are 20 feet apart. The hike from the bottom to the study is about 600 feet in elevation gain. The baseline runs 189 degrees magnetic. Lines 2 and 3 continue south from the 100 foot baseline. Line 4 runs off the 0-foot baseline stake at 16 degrees magnetic.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	Not an allotment
Elevation	6,200ft (1,890m)
Aspect	South
Slope	35%
Sample Dates	08/13/1996, 07/19/2001, 07/18/2006, 07/27/2011, 07/05/2016, 07/06/2021

**Table 02-19.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Temple Fork Juniper Restoration 4	4420	October 2018 and June 2019	2142

**Wildlife Habitat and Vegetation History****Table 02-19.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	winter

**Table 02-19.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1990	Perennial Grass/Bitterbrush	No Encroachment
1996	Perennial Grass/Bitterbrush	No Encroachment
2001	Perennial Grass/Bitterbrush	No Encroachment
2006	Perennial Grass/Bitterbrush	No Encroachment
2011	Perennial Grass/Bitterbrush	Phase I
2016	Perennial Grass/Bitterbrush	Phase I
2021	Perennial Grass/Bitterbrush	Phase I

**Site Notes**

There were some chukar flushed from the site in 2016.

**Soils****Table 02-19.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.6	27.6	34.4	38.0	4.2	13.8	115.2	0.7	08/13/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	26 inches
NRCS Ecological Site	Mountain Stony Loam (Antelope Bitterbrush)
NRCS Ecological Site #	R047XA456UT
States and Transitions	No state and transition model is available for this ecological site.

Antelope bitterbrush (*Purshia tridentata*) has been the dominant browse species on this site since study establishment in 1990. Additional preferred browse species such as mountain snowberry (*Symphoricarpos oreophilus*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) have also been present to a lesser extent (Photos, Pre-1992 Data, Table 02-19.12, Table 02-19.13). The herbaceous understory has remained diverse and abundant with perennial grasses as a co-dominant vegetation component throughout the duration of the study (Table 02-19.7). However, the introduced species bulbous bluegrass (*Poa bulbosa*) has been the most abundant perennial grass species in all sample years. In addition, introduced annual brome species (*Bromus tectorum*, *B. briziformis*, and *B. arvensis*) have been present and highly variable in both cover and abundance over the study period (Table 02-19.10). Perennial forbs have increased over time, with springparsley (*Cymopterus* sp.) providing the most cover of any species in 2021 (Table 02-19.7, Table 02-19.11). Rocky Mountain juniper (*Juniperus scopulorum*) has been present in the area in all years, placing the site within Phase I of woodland succession (Photos, Table 02-19.4, Table 02-19.14). A 2018-2019 lop and scatter treatment (Table 02-19.1) removed some of the trees, but the remaining population indicates that there may be potential for infilling in the future. Deer winter range condition has ranged from very poor to poor, and has generally improved as preferred browse cover, although variable, has slightly increased overall. Deer winter range conditions are considered to be poor as of 2021. Improvement to deer wintering range can be accomplished through efforts that support mature plants and reproduction in the preferred browse community. Diversifying native perennial grasses while reducing cheatgrass would also improve winter range conditions (Table 02-19.15).



**Trend Summary Tables**

**Table 02-19.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	4.9	0.7	-	-	-	-
2001	5.9	1.5	-	-	-	-
2006	7.6	0.3	-	12.0	0.1	-
2011	4.9	0.4	-	9.1	0.7	-
2016	5.7	0.8	-	10.9	0.3	-
2021	7.9	0.2	-	10.7	0.5	-

**Table 02-19.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	178	423	231	239	1.3	27.8	1.0	8.8
2001	111	440	304	248	1.5	21.3	3.0	8.9
2006	133	446	60	281	0.7	28.6	0.2	10.5
2011	155	432	264	310	0.7	30.1	1.7	15.5
2016	345	396	380	294	12.5	27.2	5.3	13.5
2021	131	426	199	278	0.9	23.9	3.9	15.9

**Table 02-19.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	13.0	1.8	30.6	3.6	22.9	42.3
2001	14.2	3.4	20.7	5.8	21.5	45.6
2006	13.6	3.8	22.0	4.5	22.3	49.8
2011	11.3	1.8	17.7	4.7	18.6	53.8
2016	11.3	9.1	19.6	4.3	18.7	50.1
2021	7.3	10.6	29.7	3.9	22.8	45.0

**Table 02-19.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	1	22	47	-
2001	-	22	53	-
2006	1	18	55	-
2011	-	12	51	-
2016	-	26	49	1
2021	-	12	64	-
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	1.5 (3.6)	16.8 (41.4)	89.8 (221.8)	-
2006	2.9 (7.2)	6.0 (14.9)	164.2 (405.5)	-
2011	2.2 (5.4)	8.7 (21.5)	148.1 (365.8)	-
2016	-	9.4 (23.2)	54.9 (135.7)	-
2021	-	3.4 (8.3)	138.1 (341.0)	-

**Table 02-19.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency						
<i>Bromus arvensis</i> <sup>ai</sup> (field brome)	-	16	165	411	-	10	215
<i>Bromus briziformis</i> <sup>ai</sup> (rattlesnake brome)	-	30	89	419	4	38	197
<i>Bromus tectorum</i> <sup>ai</sup> (cheatgrass)	-	42	111	430	6	27	223
<i>Poa bulbosa</i> <sup>i</sup> (bulbous bluegrass)	4	147	11	409	-	6	213
<i>Poa pratensis</i> <sup>i</sup> (Kentucky bluegrass)	1	209	267	372	0	5	207
<i>Poa secunda</i> (Sandberg bluegrass)	-	116	28	415	-	5	184
<i>Pseudoroegneria spicata</i> (bluebunch wheatgrass)	Average Cover (%)						
1996	-	0.2	1.1	17.8	-	0.1	9.9
2001	-	0.5	0.9	14.8	0.1	0.3	6.0
2006	-	0.1	0.6	21.1	0.1	0.2	7.3
2011	0.0	0.6	0.1	23.8	-	0.0	6.3
2016	0.0	3.4	9.2	20.8	0.0	0.0	6.4
2021	-	0.3	0.6	15.1	-	0.0	8.8

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-19.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
<i>Agoseris glauca</i> (pale agoseris)	-	-	200	2	1	-	-	0	1	7	3	5	30	225	2	7	4
<i>Allium</i> (onion)	1	-	295	3	0	-	-	-	1	-	-	8	46	231	-	-	-
<i>Alyssum desertorum</i> <sup>ai</sup> (desert madwort)	5	3	37	6	7	-	-	-	2	-	-	7	37	266	-	-	-
<i>Astragalus utahensis</i> (Utah milkvetch)	10	37	216	1	7	2	3	-	-	44	7	9	47	291	-	-	6
<i>Balsamorhiza sagittata</i> (arrowleaf balsamroot)	4	2	347	1	10	-	-	-	3	1	6	5	50	279	-	-	-
<i>Calochortus nuttallii</i> (sego lily)	-	7	29	-	23	-	-	-	-	-	-	5	38	263	-	-	-
<i>Camelina microcarpa</i> <sup>ai</sup> (litttlepod false flax)	Average Cover (%)																
<i>Chaenactis douglasii</i> (Douglas' dusty-aiden)	-	-	0.5	0.1	0.7	-	-	0.0	0.0	0.0	0.0	0.1	0.6	7.0	0.0	0.0	0.0
<i>Cirsium undulatum</i> <sup>a</sup> (wavyleaf thistle)	0.0	-	2.1	0.1	0.4	-	-	-	0.0	-	-	0.2	0.8	7.3	-	-	-
<i>Collinsia parviflora</i> <sup>a</sup> (maiden blue eyed Mary)	0.0	0.0	0.1	0.1	0.4	-	-	0.0	-	-	-	0.1	0.7	9.2	-	-	-
<i>Collomia linearis</i> <sup>a</sup> (tiny trumpet)	0.0	0.1	0.7	0.0	1.0	0.0	0.0	-	-	0.2	0.0	0.2	0.8	13.2	-	-	0.0
<i>Comandra umbellata</i> (bastard toadflax)	0.0	0.0	3.3	0.0	1.6	-	-	-	0.0	0.0	0.0	0.2	1.0	10.6	-	-	-
<i>Crepis acuminata</i> (tapertip hawkbeard)	-	0.0	0.1	-	2.4	-	-	-	-	-	-	0.2	1.6	11.6	-	-	-
<i>Cymopterus</i> (springparsley)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Descurainia pinnata</i> <sup>a</sup> (western tansymustard)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Epilobium brachycarpum</i> <sup>a</sup> (tall annual willowherb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Erodium cicutarium</i> <sup>ai</sup> (redstem stork's bill)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Hackelia patens (spotted stickseed)	Holosteum umbellatum <sup>ai</sup> (jagged chickweed)	Isatis tinctoria <sup>ami</sup> (Dyer's woad)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Penstemon humilis (low beardtongue)	Petradoria pumila (rock goldenrod)	Phacelia <sup>a</sup> (phacelia)	Phlox longifolia (longleaf phlox)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>ai</sup> (tall tumbledmustard)	Symphotrichum ascendens (western aster)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Veronica biloba <sup>ai</sup> (two-lobed speedwell)
year	Nested Frequency														
1996	-	-	-	4	2	-	17	-	2	-	-	-	4	49	4
2001	2	-	-	15	3	-	8	-	-	1	-	16	-	42	-
2006	-	-	0	7	-	1	8	-	-	-	-	3	5	12	3
2011	-	1	-	23	-	-	9	-	-	-	1	2	-	44	10
2016	-	-	-	41	-	-	5	2	-	-	-	2	6	162	9
2021	-	-	-	3	-	-	3	-	-	-	-	-	5	184	3
year	Average Cover (%)														
1996	-	-	-	0.0	0.0	-	0.1	-	0.0	-	-	-	0.1	0.4	0.0
2001	0.0	-	-	0.1	0.0	-	0.1	-	-	0.0	-	0.1	-	0.6	-
2006	-	-	0.0	0.0	-	0.0	0.1	-	-	-	-	0.0	0.0	0.1	0.0
2011	-	0.0	-	0.1	-	-	0.2	-	-	-	0.0	0.0	-	0.6	0.0
2016	-	-	-	0.2	-	-	0.1	0.0	-	-	-	0.0	0.0	1.8	0.0
2021	-	-	-	0.0	-	-	0.1	-	-	-	-	-	0.0	3.8	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02-19.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Mahonia repens (creeping barberry)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Sambucus nigra ssp. cerulea <sup>p</sup> (blue elderberry)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)
year	Line Intercept Cover (%)						
1996	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-
2006	0.4	0.8	0.1	0	7.5	0.4	2.9
2011	0.1	0.9	0.5	0.2	5.2	0.2	2.7
2016	0.3	1.1	0	0.3	4.4	1.1	4
2021	0.1	0.6	0.5	-	6.3	-	3.7
year	Quadrat Cover (%)						
1996	0.2	0.0	0.5	0.2	2.3	0.4	2.0
2001	0.0	0.7	1.4	0.2	2.6	0.6	2.0
2006	0.0	0.2	0.2	0.1	4.9	0.6	1.9
2011	0.0	0.2	0.3	0.1	2.1	0.6	2.0
2016	0.4	0.1	0.5	0.4	2.8	0.5	1.9
2021	0.0	0.4	0.0	0.2	3.9	0.5	3.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-19.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1996	60	-	0	67	33	67	33	100	66/72
2001	40	-	0	100	0	100	0	0	77/88
2006	60	-	33	67	0	0	67	0	77/84
2011	60	60	67	33	0	33	0	0	69/76
2016	40	-	0	100	0	0	50	50	77/78
2021	-	-	-	-	-	-	-	-	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1996	160	-	25	63	13	25	0	13	64/111
2001	140	-	0	100	0	29	14	0	81/112
2006	60	-	0	100	0	0	0	0	69/113
2011	80	-	0	50	50	25	0	75	68/107
2016	40	-	0	100	0	0	50	0	79/123
2021	40	-	0	50	50	0	0	50	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	340	-	12	88	0	0	0	0	37/64
2001	400	-	10	80	10	5	0	0	36/55
2006	240	-	0	100	0	0	0	0	31/53
2011	500	-	0	100	0	0	0	0	31/44
2016	340	-	0	100	0	0	0	0	32/46
2021	220	-	18	82	0	9	27	0	- / -
<b>Mahonia repens -- (creeping barberry)</b>									
1996	520	-	8	92	0	0	0	0	7/10
2001	760	-	8	92	0	0	0	0	8/16
2006	940	-	0	100	0	0	0	0	5/10
2011	1640	-	0	100	0	0	0	0	7/12
2016	1160	-	0	100	0	0	0	0	8/8
2021	1020	-	10	90	0	0	0	0	- / -
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1996	320	-	6	75	19	56	44	0	100/178
2001	380	-	0	90	11	37	42	0	107/177
2006	220	-	0	91	9	18	82	9	101/167
2011	280	-	0	50	50	43	43	14	89/144
2016	240	-	0	100	0	42	33	0	106/171
2021	280	-	0	50	50	21	71	50	- / -
<b>Ribes<sup>P</sup> -- (currant)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	110/235
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Sambucus nigra ssp. cerulea<sup>P</sup> -- (blue elderberry)</b>									
1996	40	-	0	100	0	0	0	0	73/113
2001	40	-	0	100	0	0	0	0	95/195
2006	20	-	0	100	0	100	0	0	119/174
2011	40	-	0	100	0	100	0	0	77/114
2016	20	-	0	100	0	0	0	0	132/185
2021	80	-	0	100	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	200	-	10	90	0	0	0	10	65/114
2001	120	-	0	100	0	0	0	0	76/119
2006	180	-	0	89	11	0	0	33	69/112
2011	160	-	0	100	0	25	0	0	68/111
2016	240	-	0	100	0	0	0	50	65/100
2021	300	-	33	60	7	7	0	7	- / -
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	33/68

t - Tree Species; p - Preferred Browse; i - Introduced Species

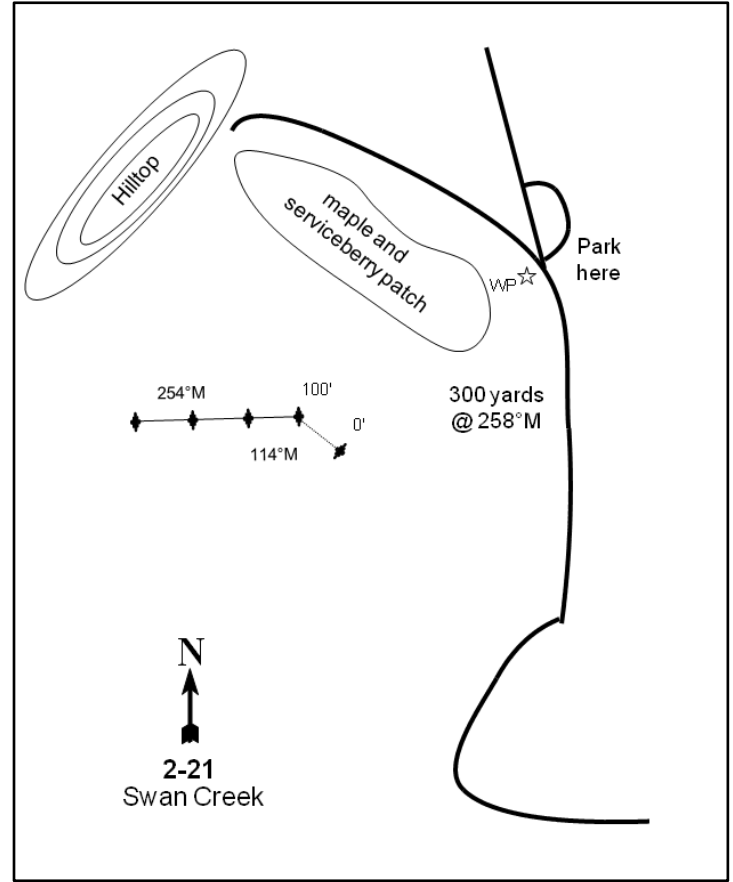
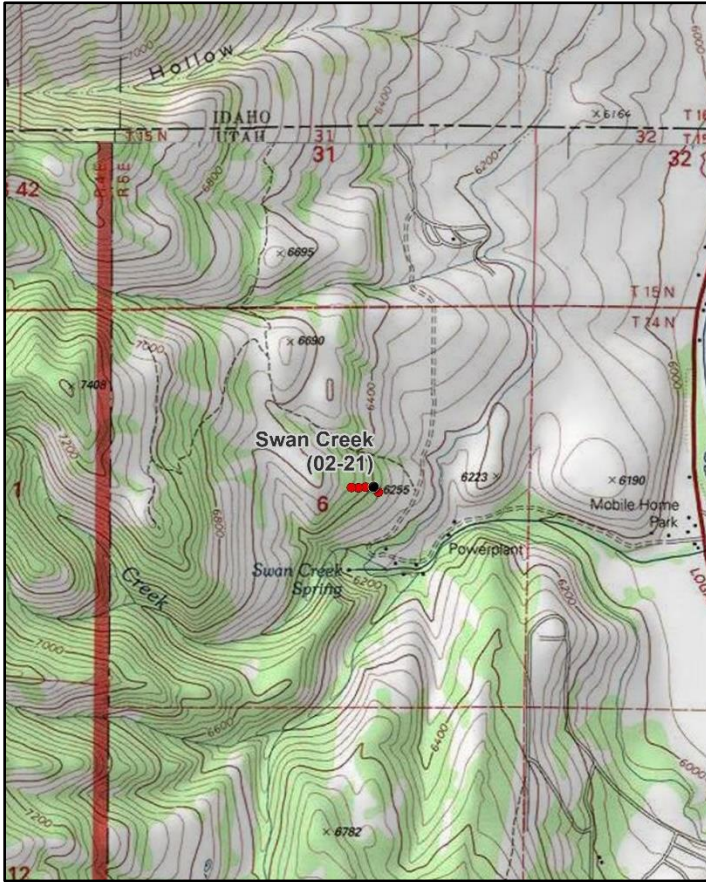
**Table 02-19.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus scopulorum (Rocky Mountain juniper)</b>							
2016	13	-	-	33	33	33	35.3
2021	5	-	100	-	-	-	44.0

**Table 02-19.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	6.4	0.0	0.0	20.0	-1.0	10.0	0.0	<b>35.4</b>	Very Poor
2001	7.7	13.7	0.0	12.9	-1.1	10.0	0.0	<b>43.3</b>	Poor
2006	16.4	12.5	0.6	15.1	-0.6	10.0	-2.0	<b>51.9</b>	Poor
2011	12.1	4.9	0.4	12.7	-0.5	10.0	0.0	<b>39.5</b>	Very Poor-Poor
2016	14.1	15.0	0.0	12.8	-9.4	10.0	0.0	<b>42.5</b>	Poor
2021	14.1	4.5	5.8	17.6	-0.7	10.0	0.0	<b>51.1</b>	Poor

## SWAN CREEK - STUDY NO. 02-21



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Garden City NE; Township 14N, Range 5E, Section 06  
NAD 83 UTM ZONE 12, 464642 East 4648468 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

97  
120° magnetic (Lines 2-4: 254° magnetic)  
400ft  
Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)  
Belt 1, 2: 5ft; Belt 4, 5: No Rebar

### Directions to Site

Drive approximately 3.0 miles north of Garden City on US-89. Turn left onto 2150 North in Lakota (1 mile south of the Idaho border). Go approximately 1 mile on the narrow road up Swan Creek, staying right at one major fork. Just past the creek from the spring and before the pump house, turn right and continue 0.2 miles up a jeep road to another fork. Park here, then walk up and across the slope 300 yards at 258 degrees magnetic to the 100-foot baseline stake; the study site is in the mahogany grove. The 0-foot baseline stake is 100 feet to the northwest and is marked by browse tag #97. The rest of the baseline runs 254 degrees magnetic off of the 0-foot baseline stake.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,400ft (1,951m)
Aspect	East
Slope	27%
Sample Dates	08/06/1996, 07/26/2001, 07/26/2006, 08/02/2011, 07/06/2016, 07/07/2021

**Wildlife Habitat and Vegetation History****Table 02-21.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter
Shiras Moose	crucial	winter

**Table 02-21.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1990	Perennial Grass/Curl-leaf Mountain Mahogany	No Encroachment
1996	Annual Grass/Curl-leaf Mountain Mahogany	No Encroachment
2001	Perennial Grass/Curl-leaf Mountain Mahogany	No Encroachment
2006	Perennial Grass/ Curl-leaf Mountain Mahogany	No Encroachment
2011	Perennial Grass/ Curl-leaf Mountain Mahogany	No Encroachment
2016	Perennial Grass/ Curl-leaf Mountain Mahogany	No Encroachment
2021	Perennial Grass/ Curl-leaf Mountain Mahogany	No Encroachment

**Site Notes**

This study was established on Utah Division of Wildlife Resources (UDWR) property in the Swan Creek drainage. The UDWR administrates only a portion of the section; the remainder is privately owned and is used for cabins, recreation, and limited agriculture. The site is dominated by curl-leaf mountain mahogany (*Cercocarpus ledifolius*) and has areas that receive significant use by wintering elk, deer, and moose.

**Soils****Table 02-21.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.5	34.6	38.0	27.4	6.6	9.6	230.4	0.7	08/06/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Shallow Loam (Curl-leaf Mountain Mahogany)
NRCS Ecological Site #	R047XA440UT
States and Transitions	No state and transition model is available for this ecological site.

Curl-leaf mountain mahogany (*Cercocarpus ledifolius*) has dominated the shrub overstory of this site since study establishment in 1990; other preferred browse species such as Utah serviceberry (*Amelanchier utahensis*) and mountain snowberry (*Symphoricarpos oreophilus*) have also been present (Photos, Pre-1992 Data, Table 02-21.12, Table 02-21.13). The herbaceous understory has remained abundant and diverse throughout the study period (Table 02-21.7). Perennial grasses have been a co-dominant site component in most years; the native species bluebunch wheatgrass (*Pseudoroegneria spicata*) has been the most abundant perennial grass species in all sample years. However, the introduced species bulbous bluegrass (*Poa bulbosa*) has increased in both cover and abundance over the study period and may threaten the diversity of the herbaceous component if the trend continues in the future. In addition, the introduced annual grass species cheatgrass (*Bromus tectorum*) has been sampled each year and was the dominant herbaceous component in 1996, but has varied greatly in abundance over time (Table 02-21.10). Perennial and annual forbs have been abundant and diverse, but have provided less cover than grasses (Table 02-21.11). Deer winter range condition has ranged from poor to excellent, and has generally improved as preferred browse age structure has diversified and perennial grass cover has increased. Deer winter range conditions were considered to be excellent in 2021. Improvement of deer wintering range can be accomplished through efforts to maintain and support mature plants and their reproduction in the preferred browse community. Reducing cheatgrass would also improve winter range conditions (Table 02-21.15).

**Trend Summary Tables****Table 02-21.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	7.3	2.0	-	-	-	-
2001	6.0	4.1	-	1.8	-	-
2006	5.4	3.1	-	23.2	3.8	-
2011	5.8	4.0	-	27.9	4.4	-
2016	5.4	6.2	-	34.7	11.2	-
2021	6.7	6.8	-	26.1	9.0	-

**Table 02-21.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	364	295	206	158	13.8	8.5	1.4	7.5
2001	112	324	284	160	1.3	11.9	1.8	8.8
2006	190	303	230	180	2.2	15.4	1.3	8.4
2011	300	339	319	194	5.7	18.0	2.8	7.6
2016	273	327	324	169	5.3	18.9	3.7	6.5
2021	154	411	165	156	2.6	26.5	1.6	9.9

**Table 02-21.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	5.1	0.5	48.0	1.2	21.5	38.9
2001	9.4	1.0	45.2	2.8	22.8	33.5
2006	8.1	0.8	42.2	2.5	28.7	34.3
2011	6.0	1.4	42.0	0.8	22.4	42.5
2016	9.7	2.0	38.8	1.3	20.4	43.3
2021	5.9	5.1	42.0	1.3	20.7	48.9

**Table 02-21.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Shiras Moose	Rabbit
	Quadrat Frequency				
1996	-	32	27	-	2
2001	-	29	13	-	1
2006	1	38	34	1	1
2011	-	28	21	-	4
2016	-	26	7	2	15
2021	-	25	19	-	2
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	-	46.9 (115.9)	36.2 (89.4)	-	-
2006	-	55.6 (137.4)	80.4 (198.6)	0.5 (1.2)	-
2011	-	41.5 (102.6)	20.1 (49.7)	-	-
2016	-	34.9 (86.1)	15.4 (38.1)	0.5 (1.2)	-
2021	-	29.5 (72.8)	14.7 (36.4)	-	-



**Table 02-21.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency								
Achnatherum hymenoides (Indian ricegrass)									
Bromus arvensis <sup>ai</sup> (field brome)									
Bromus tectorum <sup>ai</sup> (cheatgrass)									
Elymus elymoides (squirreltail)									
Koeleria macrantha (prairie Junegrass)									
Poa bulbosa <sup>i</sup> (bulbous bluegrass)									
Poa pratensis <sup>i</sup> (Kentucky bluegrass)									
Poa secunda (Sandberg bluegrass)									
Pseudoroegneria spicata (bluebunch wheatgrass)									
year	Average Cover (%)								
1996	4	191	203	-	-	3	1	113	254
2001	1	49	82	-	-	23	1	129	281
2006	2	96	151	-	2	44	7	144	241
2011	6	267	102	-	5	81	14	82	291
2016	1	185	167	3	3	135	1	26	270
2021	2	84	106	-	-	277	-	79	288
year	Average Cover (%)								
1996	0.0	5.2	8.5	-	-	0.1	0.0	1.5	6.9
2001	0.1	0.3	1.0	-	-	0.7	0.0	1.5	9.7
2006	0.1	0.6	1.6	-	0.1	1.3	0.3	3.2	10.4
2011	0.1	3.2	2.5	-	0.0	3.2	0.1	2.0	12.6
2016	0.0	2.2	3.2	0.0	0.1	6.5	0.0	0.2	12.0
2021	0.0	1.0	1.6	-	-	11.0	-	1.5	14.0

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-21.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Achillea millefolium (Common yarrow)																	
Agoseris glauca (pale agoseris)																	
Alyssum desertorum <sup>ai</sup> (desert madwort)																	
Balsamorhiza sagittata (arrowleaf balsamroot)																	
Buglossoides arvensis <sup>ai</sup> (corn gromwell)																	
Calochortus nuttallii (sego lily)																	
Camelina microcarpa <sup>ai</sup> (tittlepod false flax)																	
Castilleja linariifolia (Wyoming Indian paintbrush)																	
Chaenactis douglasii (Douglas' dustymaiden)																	
Cirsium undulatum <sup>a</sup> (wavyleaf thistle)																	
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																	
Collomia linearis <sup>a</sup> (tiny trumpet)																	
Comandra umbellata (bastard toadflax)																	
Crepis acuminata (tapertip hawksbeard)																	
Cryptantha (cryptantha)																	
Delphinium nuttallianum (two-lobed larkspur)																	
Descurainia pinnata <sup>a</sup> (western tansymustard)																	
year	Average Cover (%)																
1996	7	27	199	53	-	-	12	-	-	4	9	-	5	16	-	-	-
2001	1	24	220	41	-	4	43	2	-	2	110	7	2	35	-	2	13
2006	9	25	140	33	-	-	10	-	-	6	90	-	3	57	-	-	3
2011	12	38	299	42	6	7	29	-	4	6	66	2	6	48	-	-	5
2016	11	21	307	15	4	-	9	4	-	4	16	4	10	58	3	-	-
2021	2	15	142	42	3	3	5	-	-	2	2	-	11	48	-	-	-
year	Average Cover (%)																
1996	0.2	0.1	1.0	3.7	-	-	0.1	-	-	0.2	0.0	-	0.0	0.2	-	-	-
2001	0.0	0.1	0.8	4.3	-	0.0	0.1	0.0	-	0.2	0.2	0.0	0.0	0.5	-	0.0	0.0
2006	0.1	0.2	0.4	2.9	-	-	0.1	-	-	0.2	0.2	-	0.1	1.5	-	-	0.0
2011	0.2	0.2	1.7	1.6	0.0	0.0	0.1	-	0.0	0.1	0.2	0.0	0.1	0.6	-	-	0.0
2016	0.1	0.4	3.0	1.2	0.0	-	0.0	0.0	-	0.1	0.0	0.0	0.2	0.4	0.0	-	-
2021	0.0	0.3	1.2	3.7	0.0	0.0	0.0	-	-	0.1	0.0	-	0.1	0.6	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Hackelia patens (spotted stickseed)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Penstemon (beardtongue)	Penstemon humilis (low beardtongue)	Petroradia pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (sleepy silene)	Tragopogon dubius <sup>ai</sup> (yellow salsify)
year	Nested Frequency																
1996	-	2	-	-	16	-	-	-	-	-	14	-	63	-	-	-	9
2001	4	-	-	3	18	3	27	1	0	46	9	2	54	8	-	-	20
2006	-	-	0	5	11	-	24	-	2	65	10	30	52	21	1	-	26
2011	-	10	11	-	2	1	2	10	6	42	4	15	51	13	-	5	31
2016	-	-	-	-	14	1	-	3	-	16	-	8	64	-	-	-	61
2021	-	-	-	-	8	-	-	1	1	-	-	12	63	-	-	-	33
year	Average Cover (%)																
1996	-	0.0	-	-	0.2	-	-	-	-	-	0.1	-	3.0	-	-	-	0.0
2001	0.0	-	-	0.0	0.2	0.0	0.2	0.0	0.0	0.1	0.1	0.0	3.4	0.0	-	-	0.2
2006	-	-	0.0	0.0	0.1	-	0.1	-	0.0	0.2	0.3	0.2	2.8	0.1	0.0	-	0.1
2011	-	0.0	0.2	-	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	4.3	0.1	-	0.0	0.5
2016	-	-	-	-	0.3	0.0	-	0.0	-	0.0	-	0.1	3.7	-	-	-	0.4
2021	-	-	-	-	0.1	-	-	0.0	0.0	-	-	0.3	4.8	-	-	-	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Veronica biloba <sup>ai</sup> (two-lobed speedwell)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency	
1996	11	-
2001	6	5
2006	10	8
2011	10	4
2016	5	4
2021	1	13
year	Average Cover (%)	
1996	0.1	-
2001	0.0	0.0
2006	0.0	0.1
2011	0.0	0.0
2016	0.0	0.0
2021	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02-21.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Cercocarpus ledifolius <sup>p</sup> (curl-leaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum microthecum <sup>p</sup> (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)
year	Line Intercept Cover (%)								
1996	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-
2006	2.9	0.6	18.3	1.1	0.6	2	0.7	0.4	0.4
2011	2	0.9	21.5	2.1	1.4	1.2	1.1	0	2.1
2016	6.6	0.5	23.2	1.5	0.7	7.9	1.8	0.3	3.4
2021	2.3	1.3	17.8	0.9	0.5	7.7	0.4	-	4.2
year	Quadrat Cover (%)								
1996	2.7	0.3	2.4	0.9	0.9	0.7	0.4	0.1	0.9
2001	2.4	0.0	1.8	1.4	0.7	1.7	0.9	0.0	1.1
2006	2.2	0.0	1.3	1.1	0.7	1.4	0.7	0.3	0.9
2011	2.4	0.1	0.3	1.7	1.6	0.9	1.4	0.0	1.4
2016	2.7	0.2	0.2	1.1	0.1	3.3	1.8	0.2	2.0
2021	2.8	0.4	0.7	1.7	0.6	3.8	1.4	0.2	2.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-21.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	840	-	24	60	17	55	17	41	47/81
2001	1060	20	38	62	0	49	19	0	46/71
2006	1220	60	31	64	5	33	39	7	43/76
2011	1400	-	27	70	3	29	56	3	52/95
2016	920	20	28	72	0	4	28	4	61/83
2021	960	-	52	44	4	29	21	4	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	180	-	22	33	44	44	0	11	26/54
2001	100	-	0	60	40	0	0	0	39/79
2006	60	-	0	100	0	0	0	0	33/64
2011	100	-	0	100	0	40	0	0	31/62
2016	200	-	20	80	0	10	10	0	31/59
2021	60	-	0	67	33	33	33	33	- / -
<b>Cercocarpus ledifolius<sup>p</sup> -- (curl-leaf mountain mahogany)</b>									
1996	280	-	14	86	0	29	36	0	29/62
2001	220	-	46	46	9	18	27	0	50/58
2006	380	80	16	47	37	0	11	37	- / -
2011	220	2760	36	64	0	9	0	0	46/60
2016	180	940	44	56	0	0	0	0	- / -
2021	380	80	58	32	11	21	0	11	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Cercocarpus montanus<sup>p</sup> -- (alderleaf mountain mahogany)</b>									
1996	20	-	0	100	0	0	100	0	92/137
2001	20	-	0	100	0	100	0	0	82/149
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	63/121
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	300	-	7	93	0	7	0	0	37/67
2001	500	-	0	100	0	0	0	0	33/63
2006	440	-	5	96	0	0	0	36	27/45
2011	560	-	0	100	0	0	0	0	34/66
2016	300	-	0	100	0	0	0	0	36/60
2021	580	-	3	97	0	3	0	0	- / -
<b>Eriogonum microthecum<sup>p</sup> -- (slender buckwheat)</b>									
1996	540	-	0	85	15	7	0	4	33/48
2001	760	-	0	100	0	0	0	0	30/47
2006	480	-	0	100	0	0	0	0	29/45
2011	540	20	0	100	0	15	0	0	33/51
2016	240	-	0	100	0	0	0	0	31/45
2021	200	-	10	60	30	20	0	30	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	1100	-	9	91	0	0	0	0	21/25
2001	1600	20	3	96	1	0	0	3	27/39
2006	1080	80	2	89	9	0	0	4	22/35
2011	1240	20	0	98	2	0	0	5	27/38
2016	7140	-	2	98	0	0	0	0	26/33
2021	5720	20	6	79	14	2	0	14	- / -
<b>Mahonia repens -- (creeping barberry)</b>									
1996	2380	-	43	57	0	0	0	0	11/14
2001	4360	-	5	95	0	0	0	0	9/13
2006	5020	-	0	100	0	0	0	0	10/11
2011	4060	-	2	98	0	0	0	2	10/24
2016	5660	-	0	100	0	0	0	0	11/16
2021	3640	-	3	97	0	0	0	0	- / -
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	80	-	0	100	0	100	0	0	19/50
2001	120	-	17	83	0	33	33	0	40/92
2006	100	-	0	100	0	0	80	0	25/63
2011	80	-	0	100	0	0	0	0	34/95
2016	100	-	60	40	0	60	20	0	36/129
2021	100	-	20	60	20	20	60	20	- / -
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	600	-	30	67	3	0	0	7	37/61
2001	600	-	3	90	7	3	0	7	35/58
2006	620	-	0	77	23	0	0	42	39/64
2011	660	-	15	85	0	42	3	3	37/60
2016	740	20	8	92	0	0	0	0	41/69
2021	860	-	2	93	5	5	5	14	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

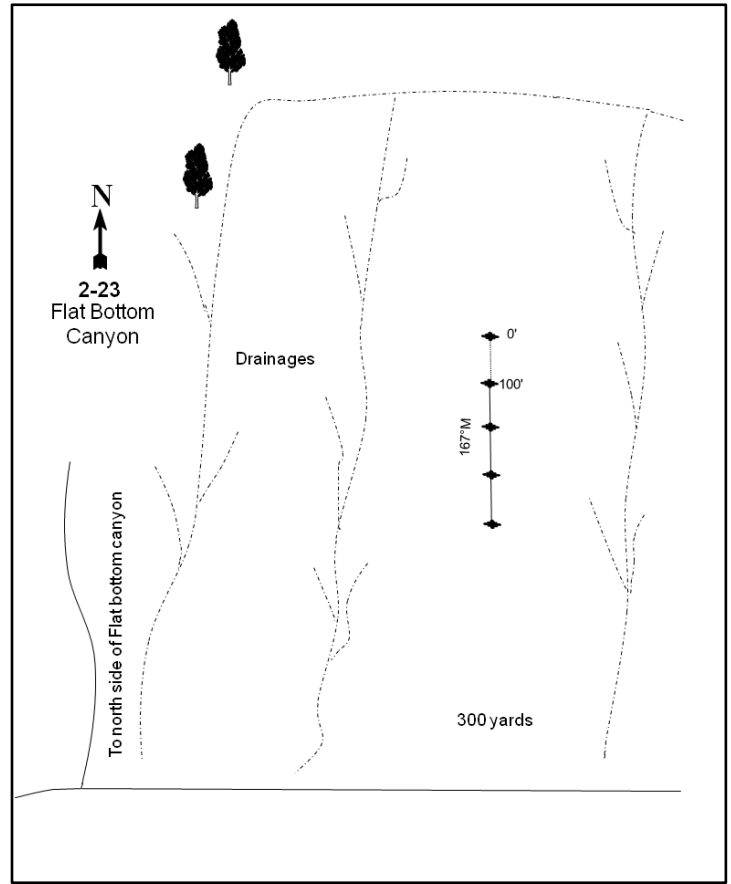
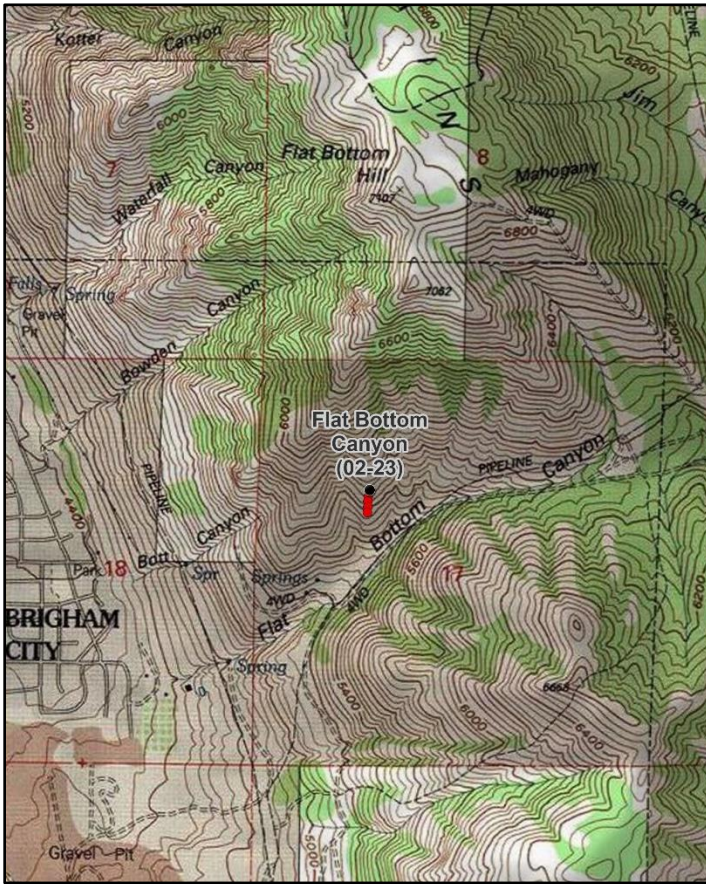
**Table 02-21.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Cercocarpus ledifolius (curl-leaf mountain mahogany)							
1996	148	-	-	-	-	-	11.9
2006	134	-	5	-	5	89	25.1
2011	224	21	5	-	26	47	17.3
2016	150	5	-	-	74	21	31.1

**Table 02-21.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	10.2	11.9	9.2	16.8	-10.3	10.0	0.0	<b>47.7</b>	Poor
2001	8.3	13.8	14.8	22.5	-1.0	10.0	0.0	<b>68.4</b>	Fair-Good
2006	30.0	6.0	8.2	28.2	-1.6	10.0	0.0	<b>80.8</b>	Good
2011	30.0	14.9	15.0	29.5	-4.3	10.0	0.0	<b>95.2</b>	Excellent
2016	30.0	15.0	15.0	24.8	-4.0	10.0	0.0	<b>90.8</b>	Good-Excellent
2021	30.0	11.8	15.0	30.0	-1.9	10.0	0.0	<b>94.9</b>	Excellent

## FLAT BOTTOM CANYON - STUDY NO. 02-23



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Mount Pisgah SW; Township 9N, Range 1W, Section 17  
NAD 83 UTM ZONE 12, 417992 East 4596973 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

7919  
167° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Belt 5: 1ft

### Directions to Site

While traveling east on 100 North, turn north onto 600 East. From there, travel one block to Beecher Ave and turn right (east). Continue on Beecher Avenue and follow this road through a curve that turns south. Continue to Marie Drive and turn left (east). Follow Marie Drive to a gate that accesses National Forest land: the gate has a Division lock. Follow this road along the bench up a couple of switchbacks and past the Brigham City water tanks until the mouth of Flat Bottom Canyon is reached. From the mouth of the canyon, proceed to the ridge on north side of canyon where the site is located. Walk up the ridge about 300 yards to the 400-foot stake. The 0-foot baseline stake is further up the ridge and is marked with browse tag #7919. This site can also be reached by following Aqueduct Road in Box Elder Canyon and going around the bench to Flat Bottom Canyon.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,600ft (1,707m)
Aspect	South
Slope	45%
Sample Dates	08/29/1996, 07/31/2001, 06/29/2006, 08/22/2011, 07/28/2016, 07/21/2021

**Wildlife Habitat and Vegetation History****Table 02-23.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	summer

**Table 02-23.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Perennial Grass	No Encroachment
1990	Perennial Grass	No Encroachment
1996	Annual Grass/Perennial Grass	No Encroachment
2001	Perennial Grass	No Encroachment
2006	Perennial Grass	No Encroachment
2011	Perennial Grass	No Encroachment
2016	Perennial Grass	No Encroachment
2021	Perennial Grass	No Encroachment

**Site Notes**

This study is located in Flat Bottom Canyon, which is just east of the Brigham City gravel pit. The site is utilized by deer in winter, but the study area produces relatively little browse forage. Due to the steep south-facing canyon slopes, the soils are shallow and likely limit plant growth and plant densities.

**Soils****Table 02-23.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	5.9	48.2	29.4	22.4	1.8	10.7	140.8	0.3	08/29/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	30 inches
NRCS Ecological Site	Mountain Shallow Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA446UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1984, this site has remained dominated by perennial grasses (Photos, Pre-1992 Data, Table 02-23.7) including the native species bluebunch wheatgrass (*Pseudoroegneria spicata*) and Sandberg bluegrass (*Poa secunda*). However, the introduced species bulbous bluegrass (*P. bulbosa*) has steadily increased since it was first observed in 1996 and has been the most abundant perennial grass since 2001. The introduced annual grass species cheatgrass (*Bromus tectorum*) has varied greatly in abundance and cover over the sample years, but was considered to be a co-dominant vegetation component in 2011. The introduced annual grass and noxious weed medusahead (*Taeniatherium caput-medusae*) has been observed in the understory since 2016. Abundance of medusahead is low as of 2021 (Table 02-23.10), but there may be potential for it to increase and threaten the ecological integrity of the site in future sample years. Forbs have fluctuated (Table 02-23.7), but the introduced annual forb species redstem stork's bill (*Erodium cicutarium*) was very abundant in 2021 (Table 02-23.11). Shrubs have remained low in both cover and density throughout the duration of the study (Photos, Table 02-23.12, Table 02-23.13). Deer winter range condition has remained very poor over the study period, which is primarily due to the lack of preferred browse species and the presence of cheatgrass. Improvement to deer wintering range can be accomplished through efforts that establish a preferred browse community, likely one centered around curl-leaf mountain mahogany (*Cercocarpus ledifolius*) due to soil type. Diversifying native perennial grasses and forbs while reducing cheatgrass would also improve winter range conditions (Table 02-23.15).

**Trend Summary Tables**

**Table 02-23.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	0.7	1.5	-	-	-	-
2001	1.4	4.4	-	-	-	-
2006	0.0	-	-	0.4	-	-
2011	0.1	0.1	-	-	-	-
2016	0.8	0.2	-	1.0	0.1	-
2021	0.6	0.5	-	0.4	0.3	-

**Table 02-23.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	486	210	256	202	18.4	6.3	2.2	5.4
2001	457	290	407	127	13.3	12.1	7.6	2.3
2006	423	371	388	158	8.7	19.9	4.6	5.2
2011	434	411	188	128	18.6	25.3	1.2	4.0
2016	307	417	282	219	7.2	34.7	6.6	8.5
2021	322	412	390	84	3.2	23.8	14.3	3.0

**Table 02-23.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	1.4	1.9	41.4	10.9	18.4	42.0
2001	6.2	2.0	19.5	19.4	17.7	47.3
2006	8.2	4.8	11.5	20.9	22.2	43.2
2011	2.5	0.7	13.9	22.8	21.6	47.3
2016	2.6	0.0	12.7	24.9	25.5	48.7
2021	4.0	0.3	17.4	27.9	28.4	39.8

**Table 02-23.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1996	7	-	-
2001	5	-	-
2006	8	-	-
2011	5	-	-
2016	1	2	1
2021	7	1	-
Year	Days Use Per Acre (ha)		
1996	-	-	-
2001	25.5 (62.9)	-	-
2006	14.7 (36.4)	-	-
2011	8.1 (19.9)	-	-
2016	3.4 (8.3)	-	-
2021	22.8 (56.3)	9.4 (23.2)	-



**Table 02-23.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES									
Aristida purpurea (purple threeawn)									
Bromus arvensis <sup>ai</sup> (field brome)									
Bromus briziformis <sup>ai</sup> (rattlesnake brome)									
Bromus tectorum <sup>ai</sup> (cheatgrass)									
Poa bulbosa <sup>i</sup> (bulbous bluegrass)									
Poa secunda (Sandberg bluegrass)									
Pseudoroegneria spicata (bluebunch wheatgrass)									
Taeniatherum caput-medusae <sup>ai</sup> (medusahead)									
Vulpia myuros <sup>ai</sup> (annual fescue)									
year	Nested Frequency								
1996	51	-	167	484	11	74	138	-	97
2001	90	4	73	396	48	202	125	-	331
2006	94	-	18	421	247	159	134	-	-
2011	93	-	15	427	224	200	141	-	149
2016	311	-	10	304	212	70	144	1	-
2021	181	14	1	319	376	14	99	3	-
year	Average Cover (%)								
1996	1.2	-	1.0	16.5	0.0	1.0	4.1	-	0.9
2001	2.6	0.0	0.2	7.4	0.8	4.1	4.7	-	5.7
2006	3.6	-	0.0	8.6	7.6	1.5	7.2	-	-
2011	3.5	-	0.1	13.7	11.4	4.2	6.1	-	4.9
2016	17.9	-	0.0	7.2	7.2	3.5	6.0	0.0	-
2021	7.3	0.1	0.0	3.2	10.3	0.1	6.1	0.0	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-23.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																	
Achillea millefolium (Common yarrow)																	
Agoseris glauca (pale agoseris)																	
Allium (onion)																	
Alyssum desertorum <sup>ai</sup> (desert madwort)																	
Ambrosia psilostachya (Cuman ragweed)																	
Artemisia ludoviciana (white sagebrush)																	
Astragalus convallarius (lesser rushy milkvetch)																	
Astragalus utahensis (Utah milkvetch)																	
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																	
Cymopterus (springparsley)																	
Draba <sup>a</sup> (draba)																	
Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)																	
Erigeron (fleabane)																	
Eriogonum umbellatum (sulphur-flower buckwheat)																	
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)																	
Hackelia patens (spotted stickseed)																	
Helianthus annuus <sup>a</sup> (common sunflower)																	
year	Nested Frequency																
1996	2	12	-	131	166	9	-	21	-	25	-	6	2	4	152	-	-
2001	13	-	0	347	76	6	2	13	-	21	44	-	-	2	250	3	-
2006	2	1	9	223	135	12	-	1	-	15	192	2	-	5	160	-	-
2011	-	2	-	129	100	6	-	9	2	37	3	3	-	-	22	-	8
2016	-	-	-	20	202	26	-	5	-	12	-	-	-	3	259	-	-
2021	-	-	-	-	55	15	-	2	-	21	-	5	-	-	380	-	-
year	Average Cover (%)																
1996	0.0	0.1	-	0.4	4.2	0.2	-	0.5	-	0.1	-	0.0	0.1	0.1	1.2	-	-
2001	0.2	-	0.0	1.1	1.8	0.1	0.0	0.1	-	0.1	0.2	-	-	0.0	5.0	0.0	-
2006	0.0	0.0	0.0	0.5	4.8	0.1	-	0.0	-	0.1	0.3	0.0	-	0.2	2.8	-	-
2011	-	0.0	-	0.3	3.3	0.2	-	0.3	0.0	0.3	0.0	0.0	-	-	0.1	-	0.1
2016	-	-	-	0.1	7.5	0.8	-	0.1	-	0.1	-	-	-	0.0	5.4	-	-
2021	-	-	-	-	2.2	0.7	-	0.0	-	0.1	-	0.1	-	-	14.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES					
Isatis tinctoria <sup>ami</sup> (Dyer's woad)					
Lactuca serriola <sup>ai</sup> (prickly lettuce)					
Silene antirrhina <sup>a</sup> (sleepy silene)					
Tragopogon dubius <sup>ai</sup> (yellow salsify)					
Veronica biloba <sup>ai</sup> (two-lobed speedwell)					
year	Nested Frequency				
1996	25	3	23	34	-
2001	15	-	246	26	-
2006	1	-	305	-	4
2011	10	18	5	31	-
2016	-	4	-	30	-
2021	6	-	-	7	-
year	Average Cover (%)				
1996	0.1	0.0	0.0	0.4	-
2001	0.2	-	0.9	0.3	-
2006	0.0	-	0.9	-	0.0
2011	0.0	0.4	0.0	0.3	-
2016	-	0.4	-	0.8	-
2021	0.0	-	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02-23.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES					
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)					
Ericameria nauseosa ssp. nauseosa var. hololeuca <sup>p</sup> (rubber rabbitbrush)					
Gutierrezia sarothrae (broom snakeweed)					
Opuntia (pricklypear)					
Opuntia fragilis (brittle pricklypear)					
year	Line Intercept Cover (%)				
1996	-	-	-	-	-
2001	-	-	-	-	-
2006	0.4	-	-	-	-
2011	-	-	-	-	-
2016	1	-	-	0.1	-
2021	0.4	-	0	0.3	-
year	Quadrat Cover (%)				
1996	0.2	0.5	1.5	-	-
2001	0.0	1.4	4.4	0.0	-
2006	0.0	-	-	-	-
2011	0.1	-	-	0.1	-
2016	0.8	-	0.0	0.2	-
2021	0.6	-	0.2	0.2	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-23.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

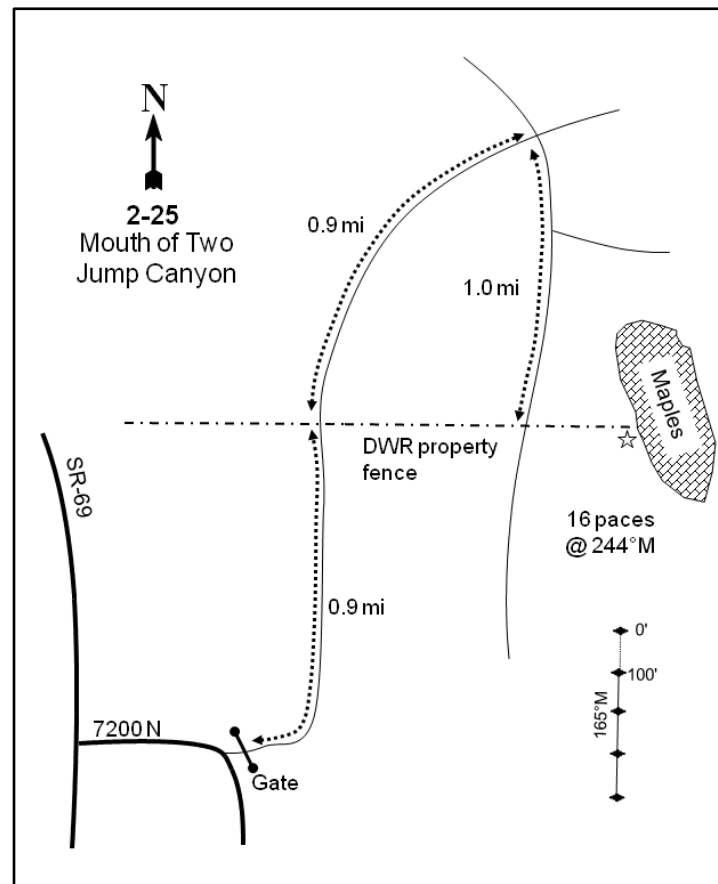
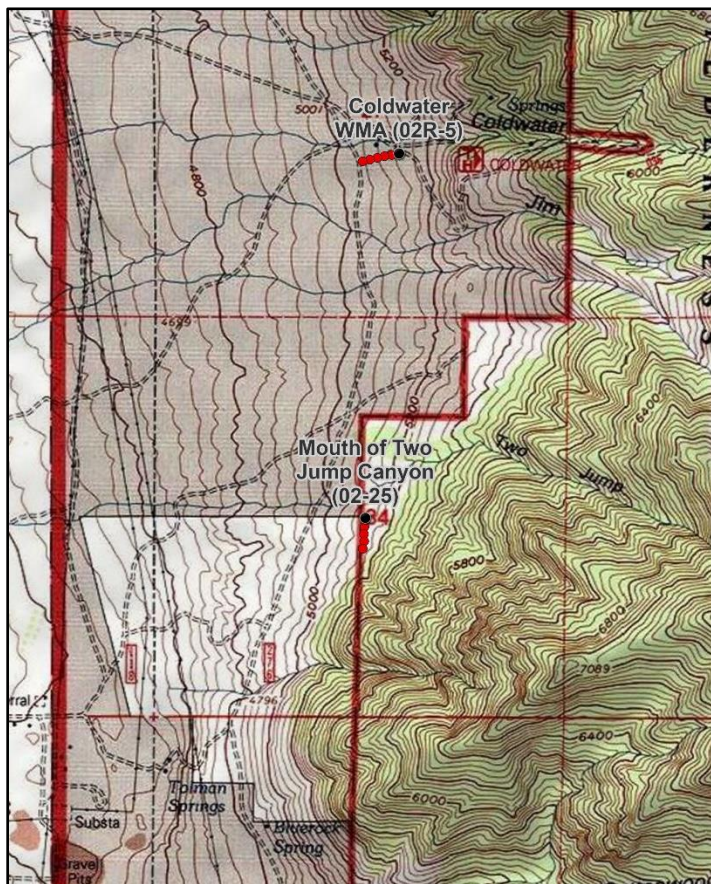
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	109/141
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	93/159
2016	-	-	-	-	-	-	-	-	102/180
2021	-	-	-	-	-	-	-	-	-/-
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1996	200	-	70	30	0	0	0	0	30/59
2001	160	-	0	88	13	63	0	0	33/67
2006	20	-	0	100	0	100	0	0	34/56
2011	40	-	0	100	0	50	0	0	44/69
2016	20	20	0	100	0	0	0	100	50/116
2021	60	-	0	33	67	0	0	67	- / -
<b>Ericameria nauseosa ssp. nauseosa var. hololeuca<sup>P</sup> -- (rubber rabbitbrush)</b>									
1996	60	-	67	33	0	0	0	0	82/139
2001	120	-	17	67	17	0	0	0	85/140
2006	-	-	-	-	-	-	-	-	61/81
2011	-	-	-	-	-	-	-	-	82/124
2016	-	-	-	-	-	-	-	-	88/151
2021	20	-	0	100	0	0	0	0	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	3240	80	30	62	8	0	0	0	23/34
2001	4760	-	1	93	6	0	0	5	21/40
2006	-	-	-	-	-	-	-	-	25/39
2011	-	-	-	-	-	-	-	-	30/56
2016	20	-	0	100	0	0	0	0	29/50
2021	180	-	11	89	0	0	0	0	- / -
<b>Opuntia fragilis -- (brittle pricklypear)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	100	-	0	100	0	0	0	0	- / -
<b>Opuntia -- (pricklypear)</b>									
1996	20	-	0	100	0	0	0	0	8/25
2001	160	-	25	63	13	0	0	0	6/20
2006	40	-	0	100	0	0	0	0	7/22
2011	80	-	0	100	0	0	0	0	9/19
2016	300	-	13	87	0	0	0	0	8/28
2021	140	-	0	86	14	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-23.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	0.9	0.0	0.0	12.5	-13.8	10.0	-2.0	<b>7.6</b>	Very Poor
2001	1.8	0.0	0.0	22.7	-10.0	4.7	-2.0	<b>17.1</b>	Very Poor
2006	0.5	0.0	0.0	24.6	-6.5	10.0	-2.0	<b>26.6</b>	Very Poor
2011	0.0	0.0	0.0	27.7	-14.0	8.0	-2.0	<b>19.8</b>	Very Poor
2016	1.3	0.0	0.0	30.0	-5.4	10.0	-2.0	<b>33.8</b>	Very Poor
2021	0.5	0.0	0.0	27.0	-2.4	6.0	-4.0	<b>27.1</b>	Very Poor

## MOUTH OF TWO JUMP CANYON - STUDY NO. 02-25

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Honeyville SE; Township 11N, Range 2W, Section 34  
NAD 83 UTM ZONE 12, 412140 East 4611223 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

Not Available  
165° magnetic  
400ft  
Line 1 (11ft & 71ft), Line 2 (34ft), Line 3 (59ft), Line 4 (95ft)  
Belt 1, 4: No Rebar

**Directions to Site**

From the junction of 7200 North and State Route 69 in Honeyville, proceed east and north for 0.55 miles to a gate. Proceed 0.9 miles north to a fence. Continue another 0.9 miles, turn right (south), and travel 1.0 mile to a fence running east and west: park here. Walk east along the fence (approximately 200 yards) past one maple stand and stop at the second stand that the fence passes through. From where the fence enters the maples, walk 16 paces at 244 degrees magnetic to the 0-foot stake of the baseline; there is no browse tag.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	5,100ft (1,554m)
Aspect	West
Slope	24%
Sample Dates	07/26/1996, 07/17/2001, 06/29/2006, 07/19/2011, 06/29/2016, 07/20/2021

**Wildlife Habitat and Vegetation History****Table 02-25.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	year-long

**Table 02-25.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Mountain Big Sagebrush	No Encroachment
1990	Mountain Big Sagebrush	Phase I
1996	Annual Grass/Mountain Big Sagebrush	Phase I
2001	Annual Grass/Mountain Big Sagebrush	Phase I
2006	Perennial Grass/Mountain Big Sagebrush	Phase I
2011	Mountain Big Sagebrush/Perennial Grass	Phase I
2016	Mountain Big Sagebrush/Perennial Grass	Phase I
2021	Mountain Big Sagebrush/Perennial Grass	Phase I

**Site Notes**

This study is located east of Honeyville, just south of Two Jump Canyon. At the time of establishment in 1984, the site was considered to sample one of the better mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) communities in the unit.

**Soils****Table 02-25.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.9	43.3	33.4	23.3	3.5	13.3	70.4	0.6	07/26/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Mountain Gravelly Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA406UT
States and Transitions	No state and transition model is available for this ecological site.

The plant community on this site has been dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) since study establishment in 1984; other browse species have been observed in some sample years, but have contributed much less cover than sagebrush (Photos, Pre-1992 Data, Table 02-25.12, Table 02-25.13). The herbaceous understory has been abundant since 1996, but composition has fluctuated. The introduced annual grass species cheatgrass (*Bromus tectorum*) provided the most cover of any herbaceous species in 1996 and 2001, and was considered to be a co-dominant vegetation component in those years. Perennial grasses became the dominant herbaceous component in 2006. However, the most abundant perennial grass has been the introduced species bulbous bluegrass (*Poa bulbosa*) in 2006 and all subsequent sample years; bulbous bluegrass may pose a threat to the ecological diversity of the understory. Forbs have remained diverse, and perennial forbs provided significant cover from 2006 through the 2016 sampling (Table 02-35.7, Table 02-35.10, Table 02-35.11). Utah juniper (*Juniperus osteosperma*) has been observed in the area and the site has been considered to be within Phase I of woodland succession throughout the duration of the study (Photos, Table 02-25.4, Table 02-25.12, Table 02-25.13, Table 02-25.14). Density of trees is low as of 2021, however, indicating that further tree encroachment may not pose an immediate threat to the ecological integrity of the site. Deer winter range condition has ranged between poor and fair, and has generally improved as preferred browse cover has increased. As of 2021, deer winter range condition is considered to be poor. Improvement to deer wintering range can be accomplished through efforts that support mature plants and their reproduction in the preferred browse community. Reducing cheatgrass would also improve winter range condition (Table 02-25.15).

**Trend Summary Tables****Table 02-25.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	13.7	3.3	-	-	-	-
2001	7.5	4.0	-	-	-	-
2006	7.3	1.8	-	9.0	2.1	-
2011	10.1	1.8	-	13.3	3.6	-
2016	12.2	2.5	-	15.5	3.4	-
2021	13.3	4.2	0.0	16.0	4.8	-

**Table 02-25.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	471	180	168	169	27.2	8.2	1.4	8.6
2001	411	267	325	232	17.1	8.8	2.5	7.8
2006	357	319	260	229	10.3	15.3	1.8	14.1
2011	358	370	321	231	7.7	24.4	8.1	16.7
2016	172	425	258	219	1.8	31.6	4.8	13.2
2021	195	431	32	185	0.9	24.6	0.3	7.2

**Table 02-25.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	0.4	0.7	65.4	3.6	13.9	55.9
2001	0.3	0.5	49.4	3.7	11.9	55.6
2006	4.5	0.9	43.6	4.6	12.3	50.4
2011	2.5	3.0	48.5	7.7	13.6	57.3
2016	6.0	2.7	29.3	8.0	11.6	56.5
2021	3.4	1.3	47.7	3.4	12.5	48.3

**Table 02-25.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	2	7	-	1
2001	-	14	-	6
2006	1	12	4	18
2011	-	6	-	16
2016	2	2	-	21
2021	-	7	-	14
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	2.9 (7.2)	46.2 (114.2)	-	-
2006	-	28.8 (71.2)	-	-
2011	0.7 (1.8)	24.1 (59.6)	2.7 (6.6)	-
2016	-	1.3 (3.3)	2.0 (5.0)	-
2021	1.5 (3.6)	6.0 (14.9)	-	-

**Table 02-25.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency									
Bromus arvensis <sup>ai</sup> (field brome)	72	309	458	6	7	-	145	43	-	52
Bromus briziformis <sup>ai</sup> (rattlesnake brome)	82	189	398	6	26	-	231	47	-	-
Bromus tectorum <sup>ai</sup> (cheatgrass)	60	250	313	-	189	3	114	111	-	8
Koeleria macrantha (prairie Junegrass)	172	274	103	6	232	11	163	98	-	6
Poa bulbosa <sup>i</sup> (bulbous bluegrass)	23	103	107	-	371	5	56	119	1	-
Poa fendleriana (muttongrass)	57	118	90	5	288	-	125	133	1	-
Poa secunda (Sandberg bluegrass)	Average Cover (%)									
Pseudoroegneria spicata (bluebunch wheatgrass)	1.1	4.3	20.7	0.1	0.0	-	4.4	3.7	-	1.1
Sporobolus cryptandrus (sand dropseed)	0.8	1.2	15.1	0.2	0.2	-	6.3	2.1	-	-
Vulpia myuros <sup>ai</sup> (annual fescue)	0.7	2.8	6.7	-	6.8	0.0	2.2	6.3	-	0.1
	2.8	3.2	1.6	0.3	12.9	0.1	3.9	7.2	-	0.0
	0.2	0.5	1.2	-	23.5	0.1	0.7	7.2	0.0	-
	0.2	0.3	0.3	0.2	15.7	-	3.0	5.5	0.1	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-25.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Achillea millefolium (Common yarrow)	13	-	8	162	33	-	-	1	-	17	5	5	65	-	3	-	1
Agoseris glauca (pale agoseris)	8	-	76	294	35	-	16	-	2	32	3	7	74	5	-	2	4
Allium (onion)	13	3	13	187	59	-	15	-	-	32	-	6	58	3	-	-	12
Alyssum desertorum <sup>ai</sup> (desert madwort)	5	8	45	280	44	-	29	-	3	52	-	2	61	7	-	-	13
Ambrosia psilostachya (Cuman ragweed)	12	3	37	176	58	2	48	-	-	42	-	8	62	1	-	-	25
Antennaria (pussytoes)	9	-	25	7	2	-	43	-	-	49	-	0	66	3	1	-	5
Apocynum androsaemifolium (spreading dogbane)	Average Cover (%)																
Arabis (rockcress)	0.3	-	0.1	1.0	0.6	-	-	0.0	-	0.5	0.0	0.2	5.2	-	0.0	-	0.0
Arenaria fendleri (Fendler's sandwort)	0.1	-	0.2	1.6	0.4	-	0.2	-	0.0	0.4	0.0	0.5	4.3	0.0	-	0.0	0.1
Artemisia ludoviciana (white sagebrush)	0.2	0.0	0.1	0.3	1.7	-	0.4	-	-	1.4	-	0.3	6.5	0.0	-	-	0.5
Astragalus (milkvetch)	0.2	0.0	0.3	4.8	1.4	-	0.6	-	0.0	3.3	-	0.2	8.4	0.0	-	-	0.9
Astragalus utahensis (Utah milkvetch)	0.2	0.0	0.1	0.8	2.2	0.0	1.2	-	-	1.2	-	0.2	6.8	0.0	-	-	1.4
Balsamorhiza sagittata (arrowleaf balsamroot)	0.0	-	0.1	0.0	0.0	-	0.9	-	-	0.7	-	0.0	4.8	0.0	0.1	-	0.2
Calochortus nuttallii (sego lily)																	
Castilleja linariifolia (Wyoming Indian paintbrush)																	
Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)																	
Cirsium undulatum <sup>a</sup> (wavyleaf thistle)																	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Comandra umbellata (bastard toadflax)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Gilia inconspicua <sup>a</sup> (shy gilia)	Hackelia patens (spotted stickseed)	Hedysarum boreale (Utah sweetvetch)	Isatis tinctoria <sup>ami</sup> (Dyer's woad)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lithospermum ruderale (western stoneseed)	Lomatium grayi (Gray's biscuitroot)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grindelioides (rayless tansyaster)
year	Nested Frequency																
1996	6	3	-	-	1	18	2	-	13	0	-	1	19	8	-	-	-
2001	6	3	-	52	4	26	-	5	3	1	-	-	24	21	-	2	2
2006	30	8	5	37	13	16	-	-	2	9	-	5	4	55	-	14	-
2011	12	8	4	21	1	20	-	-	2	4	1	-	24	13	-	3	-
2016	22	-	-	4	5	19	5	-	7	6	1	1	2	7	4	-	-
2021	18	-	8	4	-	10	6	-	4	0	-	-	0	10	-	-	-
year	Average Cover (%)																
1996	0.1	0.0	-	-	0.0	0.4	0.1	-	0.3	0.1	-	0.0	0.6	0.1	-	-	-
2001	0.0	0.0	-	0.1	0.0	0.2	-	0.0	0.0	0.1	-	-	0.7	0.6	-	0.0	0.0
2006	0.4	0.3	0.3	0.1	0.1	0.5	-	-	0.0	0.5	-	0.0	0.4	0.7	-	0.4	-
2011	0.1	0.1	0.0	0.0	0.0	0.5	-	-	0.0	0.2	0.0	-	1.1	0.2	-	0.0	-
2016	0.4	-	-	0.0	0.0	0.5	0.0	-	0.2	0.0	0.0	0.0	0.0	0.0	0.1	-	-
2021	0.2	-	0.0	0.0	-	0.3	0.0	-	0.0	0.0	-	-	0.0	0.1	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Melilotus officinalis <sup>i</sup> (sweetclover)	Microsteris gracilis <sup>a</sup> (slender phlox)	Penstemon (beardtongue)	Petrorhiza pumila (rock goldenrod)	Phacelia <sup>a</sup> (phacelia)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (sleepy silene)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Veronica biloba <sup>ai</sup> (two-lobed speedwell)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency										
1996	-	-	0	-	7	2	2	17	7	-	-
2001	-	12	4	-	-	4	-	127	35	-	-
2006	6	19	-	2	-	4	3	71	54	10	1
2011	-	-	-	-	-	3	-	101	62	-	9
2016	5	-	-	-	-	-	-	92	28	-	-
2021	-	3	-	-	-	5	-	-	12	-	-
year	Average Cover (%)										
1996	-	-	0.0	-	0.1	0.0	0.0	0.0	0.1	-	-
2001	-	0.0	0.0	-	-	0.1	-	0.2	0.5	-	-
2006	0.0	0.0	-	0.0	-	0.0	0.0	0.2	0.6	0.0	0.0
2011	-	-	-	-	-	0.0	-	1.5	0.8	-	0.1
2016	0.0	-	-	-	-	-	-	2.4	0.2	-	-
2021	-	0.0	-	-	-	0.0	-	-	0.1	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species



**Table 02-25.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Eriogonum microthecum <sup>p</sup> (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>i</sup> (Utah juniper)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Rhus glabra <sup>p</sup> (smooth sumac)
year	Line Intercept Cover (%)					
1996	-	-	-	-	-	-
2001	-	-	-	-	-	-
2006	9	-	2.1	-	-	-
2011	13.3	-	3.6	-	-	-
2016	15.5	-	3.4	-	-	-
2021	15.8	0.2	4.8	-	-	-
year	Quadrat Cover (%)					
1996	12.3	-	3.3	-	-	1.4
2001	7.5	-	4.0	-	-	-
2006	6.6	-	1.8	-	0.8	-
2011	10.1	-	1.8	-	-	-
2016	12.2	0.0	2.5	-	-	0.0
2021	13.1	0.1	4.2	0.0	-	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-25.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Acer grandidentatum<sup>i</sup> -- (bigtooth maple)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	20	0	0	0	0	0	0	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	1860	200	18	41	41	32	2	16	69/103
2001	1460	100	15	33	52	12	0	21	65/88
2006	1320	840	6	70	24	5	0	17	71/105
2011	1640	120	12	77	11	5	0	18	60/104
2016	1700	20	4	94	2	1	9	41	71/92
2021	1860	-	2	59	39	2	0	76	-/-
<b>Eriogonum microthecum<sup>p</sup> -- (slender buckwheat)</b>									
1996	40	-	0	100	0	0	0	0	46/57
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	24/52
2011	20	-	0	100	0	0	0	0	-/-
2016	20	-	0	100	0	0	0	0	-/-
2021	60	-	33	67	0	0	0	33	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	82/134
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	5580	3820	25	75	0	0	0	0	29/36
2001	7460	20	1	88	11	0	0	16	28/33
2006	3120	100	8	83	9	10	6	3	23/30
2011	2040	-	11	89	0	0	0	0	36/38
2016	2660	1100	14	87	0	0	0	0	32/35
2021	5560	-	0	84	16	0	0	60	- / -
<b>Juniperus osteosperma<sup>i</sup> -- (Utah juniper)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	20	-	100	0	0	0	0	0	- / -
2021	20	20	100	0	0	0	0	0	- / -
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	80	-	0	100	0	100	0	0	81/182
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Rhus glabra<sup>p</sup> -- (smooth sumac)</b>									
1996	-	420	0	0	0	0	0	0	177/272
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	20	0	0	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

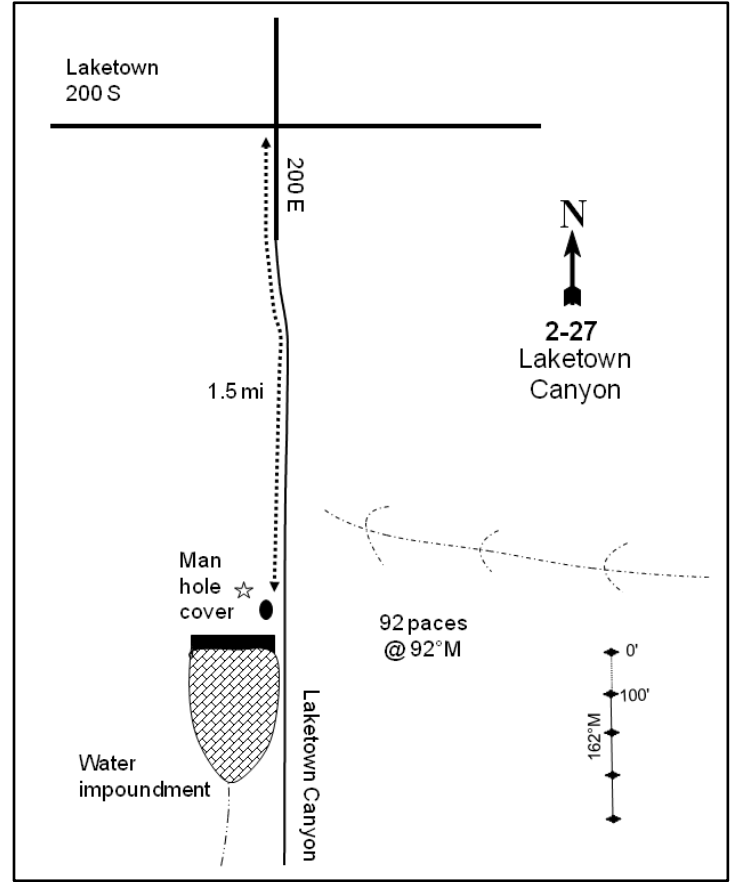
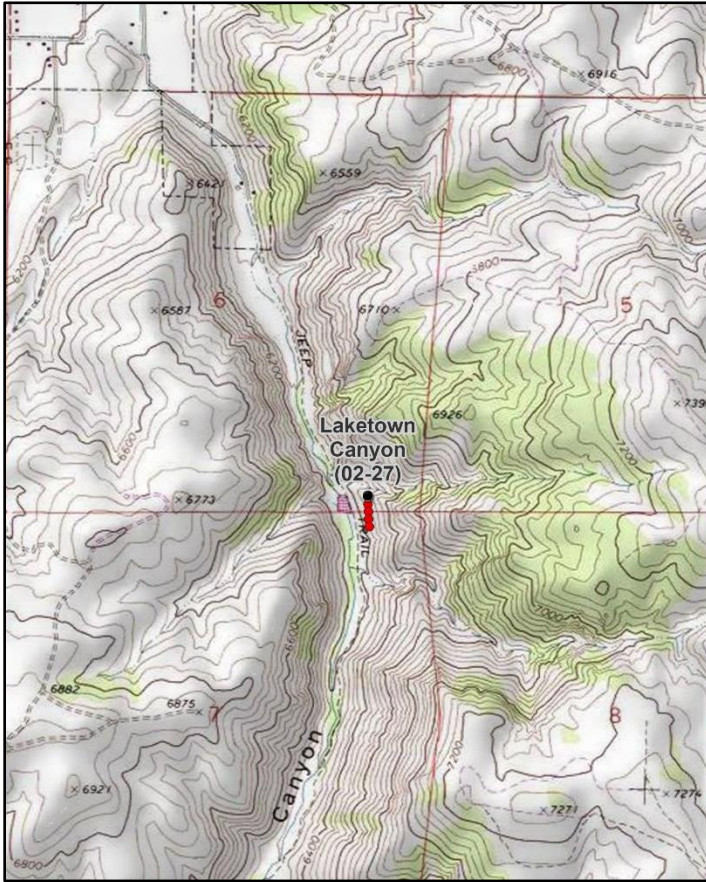
**Table 02-25.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Acer grandidentatum (bigtooth maple)</b>							
2016	6	-	-	-	17	83	14.8
2021	6	-	-	-	33	67	31.2
<b>Juniperus osteosperma (Utah juniper)</b>							
2016	6	-	-	-	-	100	18.8
2021	6	-	20	20	60	-	19.6

**Table 02-25.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	16.8	2.5	8.2	16.3	-20.0	10.0	0.0	<b>33.8</b>	Very Poor
2001	9.4	-0.6	7.5	17.1	-12.8	10.0	0.0	<b>30.6</b>	Very Poor
2006	11.3	7.7	3.1	17.0	-7.7	10.0	0.0	<b>41.3</b>	Very Poor-Poor
2011	16.6	11.7	6.1	23.0	-5.8	10.0	-2.0	<b>59.6</b>	Fair
2016	19.4	14.3	1.8	16.1	-1.4	10.0	-2.0	<b>58.2</b>	Fair
2021	20.0	3.5	1.3	17.8	-0.6	10.0	0.0	<b>52.0</b>	Poor

## LAKETOWN CANYON - STUDY NO. 02-27



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Laketown SE; Township 12N, Range 6E, Section 06  
NAD 83 UTM ZONE 12, 474592 East 4627863 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

7937  
162° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
No Rebar

### Directions to Site

From 200 East and 200 South in Laketown, proceed south into Laketown Canyon for 1.5 miles, then stop at a stock pond dam. Walk to the manhole cover on the northeast corner of the dam. From the manhole cover, walk 92 paces at 92 degrees magnetic up the ridge to the 0-foot baseline stake. The 0-foot stake is marked with browse tag #7937.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	LAKETOWN
Elevation	6,300ft (1,920m)
Aspect	West
Slope	40-43%
Sample Dates	08/07/1996, 07/25/2001, 08/01/2006, 08/02/2011, 07/06/2016, 07/07/2021

**Wildlife Habitat and Vegetation History****Table 02-27.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	substantial	winter	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long	brood-rearing
Shiras Moose	crucial	summer	
Pronghorn	substantial	summer	

**Table 02-27.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Perennial Grass/Annual Grass	Phase I
1990	Perennial Grass/Annual Grass	Phase I
1996	Perennial Grass/Annual Grass	Phase I
2001	Perennial Grass/Annual Grass	Phase I
2006	Perennial Grass/Annual Grass	Phase I
2011	Perennial Grass/Annual Grass	Phase I
2016	Annual Grass/Perennial Grass	Phase I
2021	Perennial Grass/Annual Grass	Phase I

**Site Notes**

No Notes

**Soils****Table 02-27.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.6	39.2	37.4	23.4	2.4	5.6	153.6	0.8	08/07/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Mountain Stony Loam (Browse)
NRCS Ecological Site #	R047XA460UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1984, the site has remained in an invaded state with perennial and annual grasses as the dominant components of the plant community. More specifically, the dominant grass species in the understory have been bluebunch wheatgrass (*Pseudoroegneria spicata*) and cheatgrass (*Bromus tectorum*) in most sample years. Forbs have generally remained rare (Photos, Pre-1992 Data, Table 02-27.7, Table 02-27.10, Table 02-27.11). Utah juniper (*Juniperus osteosperma*) has been observed each sample year, but it seems that the advancement of encroaching trees is slow; the study site has remained within Phase I of woodland succession since 1984 (Table 02-27.6, Table 02-27.13, Table 02-27.14). There is a diverse mixture of mountain browse species on the site that has experienced fluctuations in population densities and cover over the sample period (Table 02-27.12, Table 02-27.13). Due to the continued presence of cheatgrass, this site may be at an increased risk of a catastrophic fire event and the associated loss of beneficial browse species for wildlife. Deer winter range condition has ranged between very poor and poor-fair, which is primarily due to a decadent preferred browse community and the presence of cheatgrass. Improvement to deer wintering range can be accomplished through efforts that increase preferred browse cover and encourage a younger age class. Diversifying native perennial grasses and forbs while reducing cheatgrass would also improve winter range conditions (Table 02-27.15).

**Trend Summary Tables****Table 02-27.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	4.7	5.8	0.0	-	-	-
2001	3.6	6.5	-	-	-	-
2006	4.9	6.9	-	9.3	6.3	0.2
2011	4.5	5.0	-	9.7	6.6	-
2016	4.3	5.8	-	9.0	6.1	0.2
2021	4.2	4.5	0.3	8.3	3.2	1.3

**Table 02-27.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	375	365	54	91	8.5	16.3	0.3	1.6
2001	204	301	64	97	5.7	14.8	0.3	1.8
2006	278	353	120	74	4.9	14.7	0.7	1.8
2011	374	277	225	124	11.1	14.2	0.9	2.3
2016	387	215	304	50	14.5	10.5	6.1	0.9
2021	335	268	148	61	8.5	10.8	1.0	0.7

**Table 02-27.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	7.3	2.8	30.6	6.0	26.4	37.1
2001	14.3	2.5	32.0	8.7	24.6	34.7
2006	14.9	2.6	24.1	8.5	25.5	39.6
2011	13.5	3.5	29.4	3.8	24.6	34.2
2016	9.4	1.2	19.8	10.3	25.6	43.2
2021	11.0	4.6	38.2	7.4	23.8	31.9

**Table 02-27.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Shiras Moose	Rabbit
	Quadrat Frequency				
1996	-	9	1	-	6
2001	-	5	-	-	-
2006	2	4	-	2	4
2011	-	4	2	-	-
2016	-	4	-	-	2
2021	-	12	2	-	2
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	-	41.5 (102.6)	-	-	-
2006	5.1 (12.6)	4.7 (11.6)	-	1.9 (4.8)	-
2011	-	18.7 (46.3)	2.7 (6.6)	-	-
2016	0.7 (1.8)	17.4 (43.0)	2.7 (6.6)	-	-
2021	-	63.0 (155.6)	1.3 (3.3)	-	-

**Table 02-27.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus briziformis <sup>ai</sup> (rattlesnake brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency									
1996	43	3	9	375	-	23	2	-	320	87
2001	60	5	38	189	5	32	4	-	200	125
2006	30	34	38	275	-	17	1	-	284	137
2011	37	64	128	300	-	46	-	-	148	143
2016	44	21	93	385	-	27	3	-	18	164
2021	34	13	129	305	7	12	5	24	115	141
year	Average Cover (%)									
1996	2.6	0.0	0.0	8.5	-	0.8	0.1	-	6.8	6.0
2001	3.9	0.0	0.7	5.1	0.0	1.0	0.0	-	1.9	7.8
2006	2.0	0.1	0.2	4.7	-	0.4	0.1	-	5.6	6.5
2011	1.8	0.9	3.4	6.9	-	1.7	-	-	2.0	8.7
2016	0.8	0.2	0.8	13.5	-	1.0	0.0	-	0.1	8.6
2021	0.9	0.2	1.4	6.9	0.0	0.5	0.4	0.6	1.0	7.4

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-27.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (litlepod false flax)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)
year	Nested Frequency																
1996	-	31	4	-	3	-	-	-	1	-	-	4	5	-	46	-	-
2001	-	52	6	-	-	-	-	1	4	-	-	-	-	6	58	8	3
2006	2	98	11	5	0	-	0	-	2	-	4	1	2	2	43	13	5
2011	3	188	13	7	2	5	0	-	-	-	2	3	1	1	39	33	29
2016	-	281	5	4	-	3	-	-	-	4	-	-	20	4	7	11	3
2021	3	131	-	0	2	6	0	-	4	-	-	4	1	3	18	3	-
year	Average Cover (%)																
1996	-	0.1	0.0	-	0.0	-	-	-	0.0	-	-	0.0	0.1	-	0.9	-	-
2001	-	0.1	0.0	-	-	-	-	0.0	0.1	-	-	-	-	0.1	1.6	0.0	0.0
2006	0.0	0.2	0.0	0.0	0.1	-	0.0	-	0.0	-	0.0	0.0	0.0	0.2	0.5	0.0	0.0
2011	0.0	0.7	0.0	0.3	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0	0.1	0.5	0.1	0.1
2016	-	3.5	0.0	0.0	-	0.2	-	-	-	0.0	-	-	0.5	0.0	0.1	0.0	0.0
2021	0.0	0.6	-	0.0	0.0	0.0	0.0	-	0.0	-	-	0.0	0.0	0.2	0.1	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Eriogonum umbellatum (sulphur-flower buckwheat)	Hackelia patens (spotted stickseed)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Machaeranthera grindelioides (rayless tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Packera multilobata (lobeleaf groundsel)	Penstemon humilis (low beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Verbascum thapsus <sup>ai</sup> (common mullein)
year	Nested Frequency															
1996	8	-	-	12	-	-	4	-	31	16	4	-	-	-	1	10
2001	-	-	2	11	-	9	3	1	-	8	7	-	-	-	-	1
2006	12	-	-	12	-	3	-	21	4	6	10	-	1	-	4	3
2011	12	-	11	5	-	-	1	-	35	14	16	2	-	-	-	3
2016	-	1	-	9	6	-	-	-	7	-	16	-	-	2	-	20
2021	-	-	-	3	1	-	-	1	4	7	13	6	-	6	1	8
year	Average Cover (%)															
1996	0.0	-	-	0.1	-	-	0.0	-	0.2	0.3	0.0	-	-	-	0.0	0.1
2001	-	-	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.1	-	-	-	-	0.0
2006	0.2	-	-	0.4	-	0.0	-	0.1	0.1	0.3	0.2	-	0.0	-	0.1	0.1
2011	0.1	-	0.1	0.0	-	-	0.0	-	0.4	0.5	0.3	0.0	-	-	-	0.0
2016	-	0.0	-	0.2	0.0	-	-	-	0.1	-	0.3	-	-	0.0	-	1.9
2021	-	-	-	0.0	0.0	-	-	0.0	0.0	0.0	0.2	0.0	-	0.2	0.0	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02-27.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia nova <sup>p</sup> (black sagebrush)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Cercocarpus ledifolius <sup>p</sup> (curl-leaf mountain mahogany)	Cercocarpus montanus <sup>p</sup> (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)	Eriogonum microthecum <sup>p</sup> (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>i</sup> (Utah juniper)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)	Tetradymia canescens (spineless horsebrush)	Yucca (yucca)
year	Line Intercept Cover (%)													
1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2006	-	3.8	0.4	-	3.7	0.9	3.9	-	1.2	0.2	-	1.4	0.3	-
2011	-	2.3	0.4	-	6.3	0.6	4.2	-	0.5	-	0.3	0.4	1.3	-
2016	-	4.8	0.1	-	3.9	0.4	2.1	0.1	3.6	0.2	-	0.1	-	-
2021	-	2.4	0.9	0.1	3.7	0.8	0.8	-	0.5	1.3	-	1.2	1.1	-
year	Quadrat Cover (%)													
1996	-	3.4	0.2	-	1.2	0.7	3.1	0.0	1.6	0.0	-	-	0.4	-
2001	-	2.2	-	-	1.3	0.5	3.5	-	2.0	-	-	0.1	0.5	-
2006	-	1.7	0.6	-	2.1	0.7	3.6	0.0	1.2	0.0	-	0.5	1.4	-
2011	0.4	1.8	0.4	0.1	1.7	0.6	2.8	-	1.1	-	0.0	0.1	0.5	0.1
2016	-	2.5	0.0	-	1.6	0.6	0.9	0.0	4.3	0.0	-	0.1	-	-
2021	-	1.6	0.5	0.1	1.6	1.3	1.4	-	0.8	0.3	-	0.4	1.0	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-27.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	54/56
2016	-	-	-	-	-	-	-	-	61/52
2021	-	-	-	-	-	-	-	-	-/-
<b>Artemisia nova<sup>P</sup> -- (black sagebrush)</b>									
1996	1460	20	3	63	34	3	0	16	35/63
2001	1160	20	5	76	19	16	2	5	33/53
2006	880	60	2	61	36	30	0	14	37/70
2011	1020	20	0	75	26	4	0	10	37/75
2016	1680	60	25	61	14	4	1	17	35/80
2021	1220	20	10	39	51	71	0	54	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1996	200	-	0	30	70	50	20	80	46/70
2001	100	-	20	60	20	0	0	20	79/94
2006	60	20	0	100	0	0	0	67	69/96
2011	20	-	0	100	0	0	0	0	58/92
2016	80	-	50	50	0	50	0	0	66/113
2021	40	-	0	50	50	0	0	50	- / -
<b>Cercocarpus ledifolius<sup>P</sup> -- (curl-leaf mountain mahogany)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	102/109
2006	-	-	-	-	-	-	-	-	101/142
2011	20	-	100	0	0	0	0	0	69/71
2016	-	-	-	-	-	-	-	-	110/172
2021	40	-	0	100	0	0	50	0	- / -
<b>Cercocarpus montanus<sup>P</sup> -- (alderleaf mountain mahogany)</b>									
1996	200	-	20	80	0	80	20	20	94/138
2001	240	-	0	100	0	67	0	0	128/175
2006	180	20	0	100	0	22	44	0	111/168
2011	240	-	8	92	0	8	83	0	119/150
2016	160	-	13	88	0	50	13	0	125/165
2021	240	20	8	67	25	58	25	25	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	400	-	5	80	15	0	0	15	36/55
2001	340	-	0	59	41	6	0	0	38/50
2006	220	-	9	64	27	9	0	36	36/55
2011	440	-	5	96	0	0	0	0	38/47
2016	420	-	0	91	10	0	0	10	31/54
2021	300	-	0	20	80	0	0	80	- / -
<b>Eriogonum microthecum<sup>P</sup> -- (slender buckwheat)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	20	-	0	0	100	0	0	0	- / -
2006	40	-	0	100	0	50	50	0	33/60
2011	-	-	-	-	-	-	-	-	-/-
2016	20	-	0	100	0	0	100	0	20/33
2021	20	-	0	0	100	0	0	100	- / -



Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)</b>									
1996	620	-	3	81	16	0	0	23	65/96
2001	420	-	0	62	38	0	0	0	78/118
2006	520	-	8	42	50	23	0	23	64/111
2011	400	-	0	60	40	0	0	10	69/117
2016	460	-	4	96	0	0	0	4	69/101
2021	160	-	0	0	100	0	0	100	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	3420	100	20	80	0	0	0	0	24/28
2001	3180	-	1	99	1	0	0	3	21/31
2006	1520	20	9	74	17	1	0	7	20/30
2011	1640	80	2	95	2	0	0	0	23/27
2016	3420	-	3	97	0	0	0	0	29/34
2021	1160	20	9	57	35	0	0	35	- / -
<b>Juniperus osteosperma<sup>1</sup> -- (Utah juniper)</b>									
1996	20	-	100	0	0	0	0	0	- / -
2001	20	-	0	100	0	0	0	0	- / -
2006	20	-	100	0	0	0	0	0	- / -
2011	20	-	100	0	0	0	0	0	- / -
2016	40	20	100	0	0	0	0	0	- / -
2021	60	-	33	67	0	0	0	0	- / -
<b>Ribes<sup>p</sup> -- (currant)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	76/89
2011	-	-	-	-	-	-	-	-	52/69
2016	-	-	-	-	-	-	-	-	64/97
2021	-	-	-	-	-	-	-	-	- / -
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	80	-	50	50	0	50	0	100	44/72
2001	40	-	0	50	50	0	0	0	28/34
2006	140	-	14	71	14	0	0	0	90/127
2011	120	-	0	100	0	0	0	0	63/104
2016	60	-	67	33	0	33	0	0	83/181
2021	60	-	0	100	0	0	0	0	- / -
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	280	-	7	79	14	0	0	50	29/51
2001	300	20	0	33	67	0	0	0	24/44
2006	300	-	20	53	27	33	7	33	29/48
2011	420	20	10	91	0	0	0	0	30/57
2016	20	-	0	100	0	0	0	0	29/33
2021	520	-	0	31	69	0	0	69	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

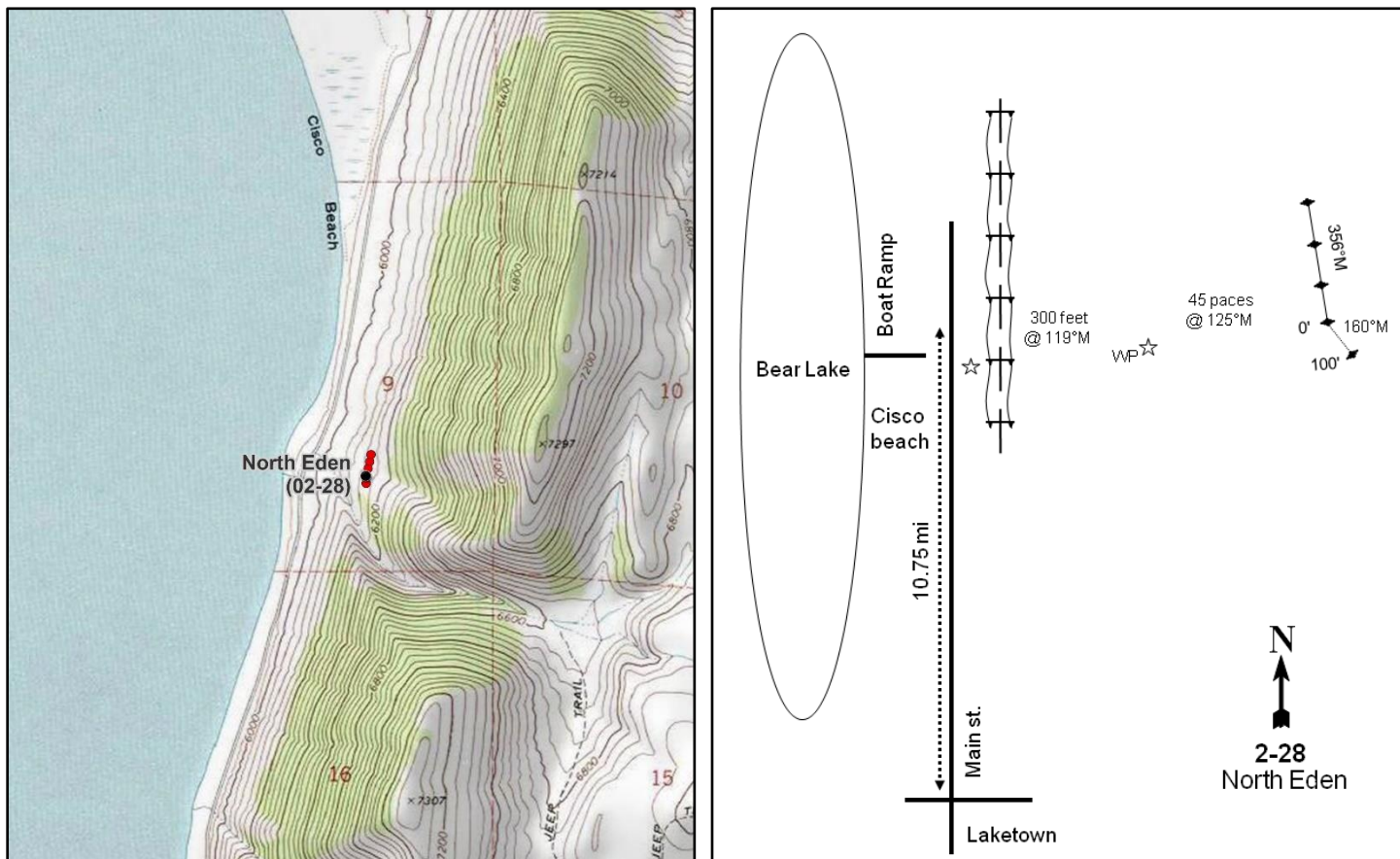
**Table 02-27.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
1996	25	-	-	-	-	-	16.8
2016	39	-	23	54	15	8	17.4
2021	47	-	29	36	36	-	13.9

**Table 02-27.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	6.2	0.0	0.0	30.0	-6.4	3.3	0.0	<b>33.1</b>	Very Poor
2001	4.8	0.0	0.0	29.5	-4.3	3.5	0.0	<b>33.6</b>	Very Poor
2006	12.2	9.9	1.5	29.4	-3.7	3.6	0.0	<b>52.9</b>	Poor
2011	13.7	12.7	2.7	28.4	-8.3	4.5	0.0	<b>53.7</b>	Poor-Fair
2016	12.2	12.7	10.0	21.1	-10.9	1.7	0.0	<b>46.8</b>	Poor
2021	11.0	5.6	3.3	20.4	-6.4	1.4	0.0	<b>35.4</b>	Very Poor

## NORTH EDEN - STUDY NO. 02-28

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Bear Lake South NE; Township 14N, Range 6E, Section 09  
NAD 83 UTM ZONE 12, 477685 East 4646044 North

**Transect Information**

Browse Tag # (0' Stake)	9157
Transect Bearing	160° magnetic (Lines 2-4: 356° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)
Belt Marker Placement	Standard

**Directions to Site**

From Bear Lake Road and Main Street in Laketown, proceed north on Main Street for 10.75 miles along the eastern shore. Turn right onto a dirt road proceeding to a power line. From the power line, walk up the slope for 300 feet at a bearing of 119 degrees magnetic to a witness post. From the witness post, walk 45 paces at 119 degrees magnetic to the 0-foot baseline stake which is marked with browse tag #9157. The first 100 feet of the baseline run at 160 degrees magnetic. The rest of the baseline runs off of the 0-foot baseline stake at a direction of 356 degrees magnetic.

**Site Information**

Land Ownership	State
Land Administrator	USP
Allotment	No data
Elevation	6,140ft (1,871m)
Aspect	West
Slope	20-25%
Sample Dates	08/07/1996, 07/25/2001, 08/01/2006, 08/04/2011, 07/06/2016, 07/07/2021

**Wildlife Habitat and Vegetation History****Table 02-28.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Greater Sage-Grouse	occupied	year-long	brood-rearing

**Table 02-28.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Mountain Big Sagebrush	Phase I
1990	Mountain Big Sagebrush	Phase I
1996	Mountain Big Sagebrush/Perennial Grass	Phase I
2001	Perennial Grass/Mountain Big Sagebrush	Phase I
2006	Perennial Grass	Phase I
2011	Perennial Grass	Phase I
2016	Annual Grass/Perennial Grass	Phase I
2021	Perennial Grass	Phase I

**Site Notes**

This study is located on the east side of Bear Lake between North and South Eden Canyons. This study is located on the border of private land and land administered by the State Institutional Trust Land Administration (SITLA). The vegetation is a mixture of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and black sagebrush (*A. nova*) interspersed with Utah juniper (*Juniperus osteosperma*) trees. There were several older deer bones as well as a new carcass observed on the site in 2016.

**Soils****Table 02-28.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.2	34.9	36.1	29.0	1.8	9.7	134.4	0.6	08/07/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XC310UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated the browse component of this site from study establishment in 1984 through the 2001 sample year. However, sagebrush has generally decreased in both cover and density over the sample period (Photos, Pre-1992 Data, Table 02-28.12, Table 02-28.13): this is likely because of continued encroachment of Utah juniper (*Juniperus osteosperma*) trees due to the lack of disturbances within the community (Table 02-28.12, Table 02-28.13, Table 02-28.14). The herbaceous understory has remained abundant since study establishment (Table 02-28.7). Perennial grasses, particularly Sandberg bluegrass (*Poa secunda*) and bluebunch wheatgrass (*Pseudoroegneria spicata*), have been co-dominant or dominant site components since 1996. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been rare in comparison with perennial grasses. This exception to this is the 2016 sample year, when cheatgrass was a co-dominant site component (Table 02-28.10). Without conifer management, juniper will likely continue to encroach, further adversely affecting the shrub and herbaceous components as the site progresses in the phases of woodland succession (Table 02-28.4).

**Trend Summary Tables****Table 02-28.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	15.5	1.3	3.9	-	-	-
2001	13.4	2.3	5.1	-	-	0.8
2006	8.1	1.0	5.6	11.0	1.0	8.9
2011	4.8	1.4	2.9	7.3	1.3	9.3
2016	5.5	1.0	6.3	8.0	0.6	11.6
2021	6.3	0.7	8.8	9.2	0.7	14.9

**Table 02-28.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	179	386	40	77	4.3	16.5	0.7	0.9
2001	201	367	33	59	2.2	19.4	0.8	1.3
2006	188	412	43	98	3.4	34.3	0.2	2.1
2011	279	371	175	104	6.9	24.1	5.8	4.2
2016	347	274	129	64	18.1	18.0	1.5	2.3
2021	243	361	4	52	3.1	16.4	0.0	0.9

**Table 02-28.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	12.7	11.1	43.8	0.8	0.7	43.2
2001	12.1	7.0	61.2	1.6	0.3	45.5
2006	11.5	12.6	39.0	1.3	1.0	57.5
2011	19.0	7.2	40.6	0.3	0.8	47.0
2016	18.7	13.5	38.9	0.9	1.0	45.3
2021	12.0	11.8	60.2	0.6	0.9	34.3

**Table 02-28.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	7	39	-	25
2001	1	37	-	41
2006	-	60	1	46
2011	-	38	9	33
2016	-	43	-	41
2021	1	53	-	39
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	2.9 (7.2)	107.9 (266.5)	-	-
2006	-	168.9 (417.1)	-	-
2011	-	59.6 (147.3)	-	-
2016	-	57.7 (142.4)	-	-
2021	-	59.6 (147.3)	-	-

**Table 02-28.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency					
1996	0	179	52	-	335	157
2001	16	201	23	-	282	175
2006	7	188	41	-	335	253
2011	17	279	56	0	277	198
2016	6	347	56	0	142	170
2021	8	243	30	-	315	156
year	Average Cover (%)					
1996	0.0	4.3	1.3	-	8.1	7.2
2001	0.9	2.2	0.8	-	7.8	10.0
2006	0.8	3.4	1.8	-	13.9	17.8
2011	0.7	6.9	1.8	0.0	8.0	13.6
2016	0.5	18.1	1.8	0.0	4.7	11.0
2021	0.1	3.1	0.4	-	8.3	7.6

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-28.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Chaenactis douglasii (Douglas' dusty-aiden)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Cordylanthus ramosus <sup>a</sup> (bushy bird's beak)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Erigeron (fleabane)
year	Nested Frequency																
1996	-	-	-	-	-	6	-	3	-	8	-	32	16	-	-	-	6
2001	-	-	1	-	10	4	-	-	-	5	-	27	27	-	3	-	12
2006	10	-	3	3	12	5	2	-	-	3	9	17	38	7	6	3	24
2011	-	-	5	0	1	4	-	-	-	13	-	48	41	2	49	7	40
2016	3	4	3	-	1	6	-	-	0	53	-	32	16	2	3	19	33
2021	-	2	-	-	-	2	3	-	-	2	-	-	14	-	-	-	31
year	Average Cover (%)																
1996	-	-	-	-	-	0.3	-	0.0	-	0.2	-	0.5	0.1	-	-	-	0.1
2001	-	-	0.0	-	0.0	0.2	-	-	-	0.0	-	0.8	0.6	-	0.0	-	0.5
2006	0.1	-	0.0	0.0	0.1	0.3	0.0	-	-	0.0	0.0	0.1	1.0	0.0	0.0	0.0	0.5
2011	-	-	0.0	0.0	0.0	0.7	-	-	-	0.0	-	2.5	1.7	0.0	0.3	0.0	1.5
2016	0.0	0.0	0.0	-	0.0	0.4	-	-	0.0	0.8	-	0.5	0.4	0.0	0.0	0.1	1.4
2021	-	0.0	-	-	-	0.2	0.0	-	-	0.0	-	-	0.0	-	-	-	0.6

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Hackelia patens (spotted stickseed)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lithophragma (woodland-star)	Penstemon watsonii (Watson's penstemon)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sphaeralcea grossularifolia (gooseberry/leaf globemallow)	Tragopogon dubius <sup>at</sup> (yellow salsify)
year	Nested Frequency									
1996	-	-	-	-	-	-	55	1	3	-
2001	-	1	-	-	6	7	1	-	-	-
2006	-	-	-	-	0	13	6	12	-	1
2011	8	1	-	2	3	6	15	93	-	1
2016	-	-	1	-	5	3	-	27	-	3
2021	-	-	-	-	0	2	-	-	-	-
year	Average Cover (%)									
1996	-	-	-	-	-	-	0.2	0.0	0.1	-
2001	-	0.0	-	-	0.0	0.0	0.0	-	-	-
2006	-	-	-	-	0.0	0.1	0.0	0.0	-	0.0
2011	0.0	0.0	-	0.0	0.0	0.1	0.1	3.0	-	0.0
2016	-	-	0.0	-	0.0	0.0	-	0.1	-	0.0
2021	-	-	-	-	0.0	0.0	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02-28.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova <sup>p</sup> (black sagebrush)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Atriplex canescens <sup>p</sup> (fourwing saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept Cover (%)					
1996	-	-	-	-	-	-
2001	-	-	-	-	-	-
2006	1.4	9.6	-	1	8.9	-
2011	0.8	6.5	-	1.3	9.3	-
2016	0.8	7.2	-	0.6	11.6	-
2021	1.2	8	-	0.7	14.9	-
year	Quadrat Cover (%)					
1996	1.6	13.9	-	1.3	3.9	0.0
2001	1.9	11.1	0.4	2.3	5.1	-
2006	1.1	7.1	-	0.9	5.6	0.2
2011	0.0	4.8	-	1.0	2.9	0.4
2016	0.1	5.4	-	0.7	6.3	0.4
2021	0.5	5.8	-	0.7	8.8	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-28.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia nova<sup>P</sup> -- (black sagebrush)</b>									
1996	440	-	5	82	14	82	0	9	32/55
2001	240	-	8	67	25	17	0	17	38/74
2006	280	-	7	64	29	0	0	29	38/64
2011	180	-	33	11	56	0	0	67	20/51
2016	340	-	18	41	41	47	41	12	32/54
2021	380	-	5	21	74	0	0	74	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1996	2800	-	3	51	46	40	10	26	73/97
2001	2560	40	2	41	56	43	12	16	69/99
2006	2280	80	19	18	62	23	5	44	66/97
2011	2320	80	4	28	68	43	4	61	51/71
2016	2000	-	9	43	48	25	12	32	54/70
2021	1580	-	0	33	67	17	19	72	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	400	-	5	85	10	20	0	45	38/57
2001	360	-	0	61	39	0	0	11	40/66
2006	360	20	11	44	44	22	0	17	36/60
2011	500	-	16	84	0	0	0	0	33/43
2016	460	20	9	91	0	0	0	4	32/45
2021	540	-	15	33	52	33	37	26	- / -
<b>Eriogonum microthecum<sup>P</sup> -- (slender buckwheat)</b>									
1996	40	-	0	100	0	0	0	0	21/23
2001	-	-	-	-	-	-	-	-	- / -
2006	40	-	0	50	50	0	0	50	22/28
2011	20	-	0	100	0	0	0	100	15/20
2016	20	-	100	0	0	0	0	0	24/22
2021	-	-	-	-	-	-	-	-	- / -
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	20	-	100	0	0	0	0	0	71/79
2011	-	-	-	-	-	-	-	-	72/142
2016	-	-	-	-	-	-	-	-	86/112
2021	-	-	-	-	-	-	-	-	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	20	-	0	100	0	0	0	0	15/11
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Juniperus osteosperma<sup>1</sup> -- (Utah juniper)</b>									
1996	60	-	33	67	0	0	0	0	- / -
2001	60	-	33	67	0	0	0	0	- / -
2006	100	20	40	60	0	0	0	0	- / -
2011	100	-	40	60	0	0	0	0	- / -
2016	140	60	57	43	0	0	0	0	- / -
2021	160	-	38	63	0	0	0	0	- / -



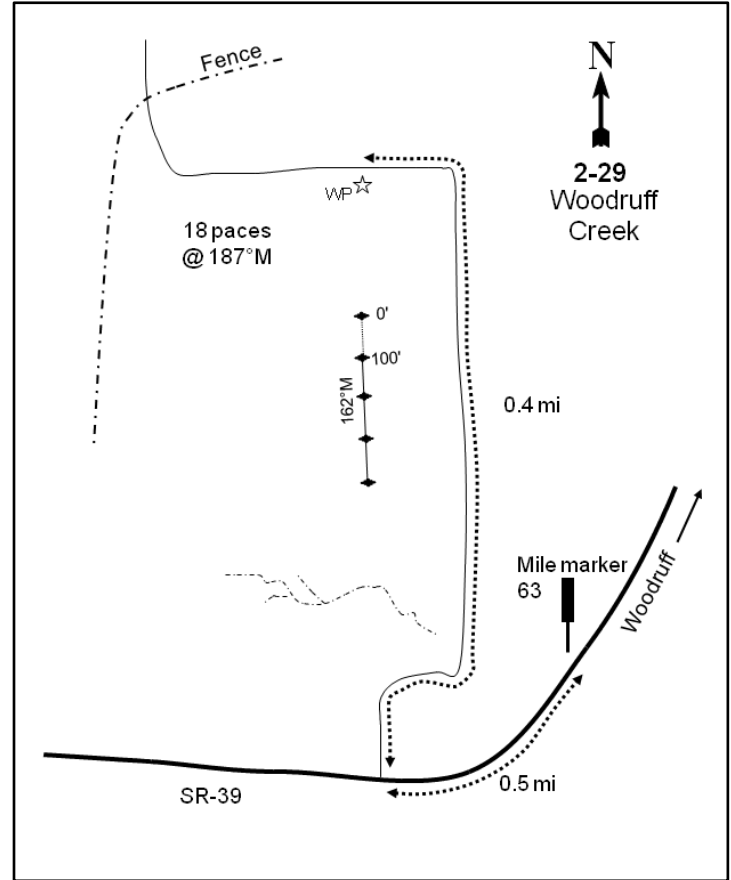
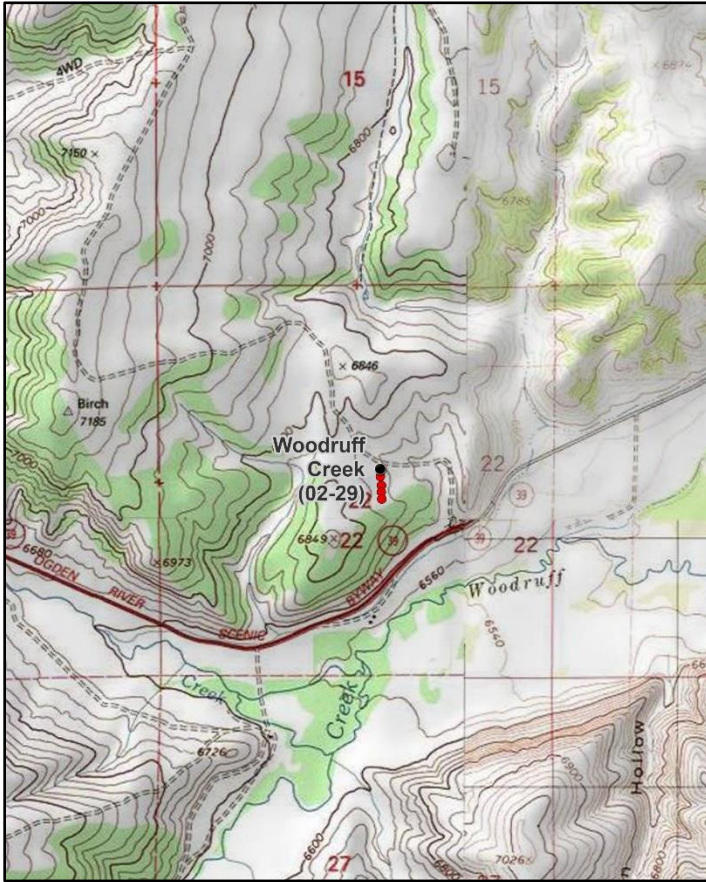
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Krascheninnikovia lanata<sup>p</sup> -- (winterfat)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	35/44
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	80	-	0	100	0	0	0	0	16/56
2001	60	-	0	100	0	0	0	0	15/38
2006	100	-	20	80	0	0	0	0	13/31
2011	120	-	0	100	0	0	0	0	13/27
2016	160	-	0	100	0	0	0	0	16/53
2021	120	-	0	100	0	0	0	0	- / -
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	66/146
2011	-	-	-	-	-	-	-	-	54/84
2016	-	-	-	-	-	-	-	-	40/59

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-28.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2001	72	-	-	-	-	-	7.8
2006	35	6	19	38	38	-	22.9
2011	45	-	22	39	39	-	16.1
2016	62	11	26	37	26	-	13.5
2021	64	5	16	37	37	5	18.8
<b>Pinus edulis (twoneedle pinyon)</b>							
1996	39	-	-	-	-	-	10.4

## WOODRUFF CREEK - STUDY NO. 02-29

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Birch Creek Reservoir; Township 9N, Range 6E, Section 22  
NAD 83 UTM ZONE 12, 478732 East 4594493 North

**Transect Information**

Browse Tag # (0' Stake)	7988
Transect Bearing	162° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

**Directions to Site**

From the junction of State Route 39 and State Route 16 in Woodruff, proceed west on State Route 39 for 5.05 miles. Turn right onto a dirt road: this road should be 0.05 miles past marker 63. Proceed north on this road, stopping after 0.4 miles at a witness post on the left (south) side of the road. From the witness post, walk 18 paces at 187 degrees magnetic to the 0-foot stake of the baseline which is marked by browse tag #7989.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	WOODRUFF PASTURES
Elevation	6,700ft (2,042m)
Aspect	Northeast
Slope	11%
Sample Dates	08/21/1996, 08/07/2001, 07/20/2006, 07/26/2011, 07/13/2016, 06/29/2021

**Wildlife Habitat and Vegetation History****Table 02-29.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	substantial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	summer	
Pronghorn	substantial	summer	

**Table 02-29.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Wyoming Big Sagebrush/Utah Juniper	Phase I transitioning to Phase II
1990	Wyoming Big Sagebrush/Utah Juniper	Phase I transitioning to Phase II
1996	Wyoming Big Sagebrush/Utah Juniper	Phase I transitioning to Phase II
2001	Utah Juniper/Wyoming Big Sagebrush	Phase II
2006	Utah Juniper/Wyoming Big Sagebrush	Phase II
2011	Utah Juniper/Wyoming Big Sagebrush	Phase II
2016	Utah Juniper/Wyoming Big Sagebrush	Phase II
2021	Utah Juniper/Wyoming Big Sagebrush	Phase II

**Site Notes**

This study is located north of Woodruff Creek on crucial winter range in a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and scattered Utah juniper (*Juniperus osteosperma*) woodland. Prior to the establishment of the study in 1984, the surrounding habitat was chained and seeded. However, the study area was left unchained. The design of the chaining resulted in an extremely large open area which has little edge and browse cover. Because of the lack of browse species in the chained area, wildlife occupancy may have increased on the unchained study plot.

**Soils****Table 02-29.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.3	34.6	32.0	33.4	2.5	6.2	25.6	0.6	08/21/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R047XA312UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1988, this site has remained in a relatively stable state with Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) as the dominant browse species (Photos, Pre-1992 Data, Table 02-29.12, Table 02-29.13). The herbaceous understory has been diverse and has consisted of mostly native perennial grass species. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed every sample year since 1996, but in very low amounts. Forbs have remained diverse, but have contributed less cover than grasses throughout the study period (Table 02-29.7, Table 02-29.10, Table 02-29.11). Utah juniper (*Juniperus osteosperma*) trees have increased in cover and abundance and are becoming the dominant vegetation component of the site. Without a tree-removing disturbance and as conifers continue to encroach, the community will continue to transition from Phase II to Phase III of woodland succession and risks the associated loss of beneficial shrubs and herbaceous species (Table 02-29.4, Table 02-29.6, Table 02-29.12, Table 02-29.13, Table 02-29.14). Deer winter range condition has ranged between poor and fair, which is primarily due to reduced cover in the preferred browse community and a high degree of preferred browse decadence. As of 2021, deer winter range was considered poor. Improvement to deer wintering range can be accomplished through efforts that increase preferred browse cover and encourage a younger age class. Diversifying native perennial forbs and increasing cover would also improve winter range conditions (Table 02-29.15).

**Trend Summary Tables****Table 02-29.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	5.7	6.0	4.4	-	-	-
2001	5.5	5.0	4.3	-	-	0.8
2006	4.7	9.5	3.7	4.1	7.2	16.0
2011	3.7	9.7	5.6	4.7	8.9	16.6
2016	4.7	7.7	4.8	6.3	7.1	20.6
2021	3.9	5.3	7.8	5.4	3.1	20.9

**Table 02-29.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	12	297	23	227	0.2	9.9	0.1	4.1
2001	7	321	25	221	0.0	10.7	0.1	3.4
2006	5	301	45	217	0.0	12.2	0.3	5.0
2011	5	332	182	263	0.0	11.7	4.6	7.2
2016	12	318	134	219	0.1	12.8	1.7	5.7
2021	6	339	4	168	0.4	16.6	0.0	1.9

**Table 02-29.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	27.6	2.0	38.1	9.3	1.5	30.3
2001	31.3	3.3	41.9	9.8	0.8	31.0
2006	26.2	3.2	29.5	14.2	1.0	36.8
2011	29.1	3.0	30.4	9.8	1.0	38.7
2016	33.2	5.1	33.5	8.9	1.1	36.0
2021	34.4	3.0	40.4	9.1	1.1	31.4

**Table 02-29.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Shiras Moose	Rabbit
	Quadrat Frequency					
1996	-	-	38	6	-	21
2001	-	-	42	2	-	15
2006	2	-	33	6	-	28
2011	1	-	32	18	-	30
2016	1	-	31	1	1	12
2021	-	-	31	12	1	24
Year	Days Use Per Acre (ha)					
1996	-	-	-	-	-	-
2001	2.2 (5.4)	8.7 (21.5)*	105.2 (259.9)	-	-	-
2006	4.4 (10.8)	-	88.5 (218.5)	-	-	-
2011	5.8 (14.3)	-	36.8 (91.0)	5.3 (13.2)	-	-
2016	0.7 (1.8)	-	46.9 (115.9)	1.3 (3.3)	-	-
2021	1.5 (3.6)	-	54.3 (134.1)	15.4 (38.1)	-	-

\*Pellets per acre (ha)

**Table 02-29.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency										
1996	12	1	12	-	29	115	-	145	1	110	27
2001	26	13	7	-	10	156	-	119	-	124	10
2006	18	23	5	-	20	140	10	99	24	86	11
2011	18	37	5	-	79	199	1	89	-	131	9
2016	8	54	12	2	55	147	-	80	-	110	36
2021	51	67	6	-	44	153	6	93	-	138	3
year	Average Cover (%)										
1996	0.6	0.0	0.2	-	0.6	0.5	-	5.2	0.0	2.5	0.4
2001	1.2	0.5	0.0	-	0.2	2.0	-	4.1	-	2.3	0.4
2006	0.9	1.1	0.0	-	0.3	2.5	0.1	3.7	0.6	2.5	0.5
2011	0.6	1.2	0.0	-	2.6	2.1	0.0	2.1	-	2.9	0.2
2016	0.3	1.7	0.1	0.0	1.8	2.9	-	3.0	-	1.8	1.3
2021	2.6	4.1	0.4	-	0.6	2.3	0.1	3.0	-	3.7	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-29.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Allium acuminatum (tapertip onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria dimorpha (low pussytoes)	Antennaria microphylla (litttleleaf pussytoes)	Arabis holboellii <sup>a</sup> (Holboell's rockcress)	Asclepias speciosa (showy milkweed)	Astragalus cibirarius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus miser var. tenuifolius (timber milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus bruneauis (Bruneau mariposa lily)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium fremontii <sup>a</sup> (Fremont's goosefoot)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)
year	Nested Frequency																
1996	1	-	-	-	3	4	14	-	12	-	2	-	-	1	6	-	-
2001	-	-	1	-	2	-	-	3	35	-	12	-	-	-	7	-	-
2006	3	7	-	-	10	12	-	31	14	-	1	-	-	4	5	-	-
2011	2	27	2	-	7	13	-	12	43	-	4	-	2	40	17	8	3
2016	-	-	16	-	5	10	-	8	13	31	3	3	11	5	1	-	-
2021	3	-	-	5	6	4	-	-	10	-	-	-	-	-	6	-	-
year	Average Cover (%)																
1996	0.0	-	-	-	0.0	0.0	0.4	-	0.1	-	0.0	-	-	0.0	0.0	-	-
2001	-	-	0.0	-	0.0	-	-	0.0	0.3	-	0.1	-	-	-	0.0	-	-
2006	0.0	0.0	-	-	0.1	0.0	-	0.5	0.1	-	0.0	-	-	0.0	0.1	-	-
2011	0.0	0.2	0.0	-	0.1	0.0	-	0.1	0.4	-	0.0	-	0.0	0.1	0.1	0.0	0.0
2016	-	-	0.0	-	0.0	0.1	-	0.2	0.3	0.7	0.0	0.0	0.1	0.0	0.0	-	-
2021	0.0	-	-	0.1	0.1	0.0	-	-	0.0	-	-	-	-	-	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Comandra umbellata (bastard toadflax)	Cordylanthus ramosus <sup>a</sup> (bushy bird's beak)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Eriogon pumilus (shaggy fleabane)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Halogeton glomeratus <sup>a,i</sup> (saltflower)	Ipomopsis aggregata (scarlet gilia)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lesquerella (bladderpod)	Lithospermum ruderale (western stone seed)	Microsteris gracilis <sup>a</sup> (slender phlox)	Packera multilobata (lobeleaf groundsel)
year	Nested Frequency																
1996	26	13	5	27	11	4	-	-	-	5	1	4	-	-	-	-	82
2001	24	20	3	36	-	-	-	2	-	-	-	-	-	-	5	4	22
2006	27	25	-	33	-	-	2	3	1	12	-	19	2	-	0	-	14
2011	26	132	4	51	-	11	-	2	2	-	-	13	2	-	-	-	29
2016	35	108	-	29	-	5	-	-	-	6	-	3	-	5	-	2	13
2021	11	-	-	6	-	-	-	-	-	8	-	-	-	-	-	-	-
year	Average Cover (%)																
1996	0.1	0.1	0.0	0.5	0.0	0.0	-	-	-	0.0	0.0	0.0	-	-	-	-	0.9
2001	0.2	0.1	0.0	1.1	-	-	-	0.0	-	-	-	-	-	-	0.2	0.0	0.1
2006	0.3	0.3	-	0.5	-	-	0.0	0.0	0.0	0.1	-	0.1	0.0	-	0.0	-	0.1
2011	0.3	4.3	0.0	1.4	-	0.0	-	0.0	0.0	-	-	0.1	0.0	-	-	-	0.3
2016	0.5	1.5	-	0.2	-	0.0	-	-	-	0.2	-	0.0	-	0.0	-	0.0	0.1
2021	0.0	-	-	0.1	-	-	-	-	-	0.1	-	-	-	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Penstemon humilis (low beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Trifolium (clover)
year	Nested Frequency				
1996	49	84	35	-	-
2001	55	85	60	-	-
2006	47	74	52	-	-
2011	85	73	97	5	-
2016	85	75	76	4	2
2021	55	61	68	-	-
year	Average Cover (%)				
1996	0.6	1.4	0.1	-	-
2001	0.4	0.7	0.2	-	-
2006	0.3	2.3	0.2	-	-
2011	1.8	2.0	0.5	0.0	-
2016	1.8	1.1	0.3	0.0	0.0
2021	0.5	0.8	0.2	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02-29.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)					
	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum microthecum <sup>p</sup> (slender buckwheat)	Juniperus osteosperma <sup>i</sup> (Utah juniper)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)					
1996	-	-	-	-	-	-
2001	-	-	-	-	-	-
2006	4.1	6.6	-	16	-	0.6
2011	4.7	7.9	-	16.6	-	1
2016	6.3	5.6	0	20.6	-	1.5
2021	5.4	2.4	-	20.9	-	0.7
year	Quadrat Cover (%)					
1996	5.5	5.0	-	4.4	0.2	1.0
2001	5.2	4.1	-	4.3	0.3	0.8
2006	4.7	7.9	-	3.7	0.1	1.6
2011	3.6	8.7	-	5.6	0.0	1.0
2016	4.7	5.8	0.0	4.8	-	1.8
2021	3.9	4.1	-	7.8	0.1	1.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-29.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	-	-	-	-	-	-	-	-	40/60
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	51/69
2011	-	-	-	-	-	-	-	-	44/67
2016	-	-	-	-	-	-	-	-	58/78
2021	-	-	-	-	-	-	-	-	-/-
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
1996	2260	60	0	59	41	41	11	26	42/70
2001	2540	100	7	36	57	57	2	9	38/63
2006	1860	80	7	28	66	16	1	68	40/71
2011	2320	20	9	40	52	51	13	39	34/53
2016	2040	-	9	58	33	6	7	30	34/62
2021	2380	60	18	26	56	5	0	79	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	4900	-	3	95	2	0	0	1	23/37
2001	4720	-	2	89	9	0	0	4	22/34
2006	5240	40	8	86	7	0	0	5	23/39
2011	6920	80	8	92	0	0	0	1	25/37
2016	5900	-	4	88	8	0	0	0	24/38
2021	5420	120	23	31	46	5	3	84	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Eriogonum microthecum<sup>p</sup> -- (slender buckwheat)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	20	-	100	0	0	0	0	0	12/15
2021	-	-	-	-	-	-	-	-	-/-
<b>Juniperus osteosperma<sup>i</sup> -- (Utah juniper)</b>									
1996	160	-	0	100	0	25	0	0	-/-
2001	160	-	38	63	0	0	0	25	-/-
2006	220	20	27	73	0	0	0	0	-/-
2011	240	40	17	58	25	0	0	0	-/-
2016	280	-	14	86	0	0	14	14	-/-
2021	240	40	25	67	8	0	0	17	-/-
<b>Pinus edulis<sup>i</sup> -- (twoneedle pinyon)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	40	0	0	0	0	0	0	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	80	-	0	100	0	0	0	25	25/49
2001	20	-	0	100	0	0	0	0	30/59
2006	20	-	0	100	0	0	0	0	27/57
2011	120	-	50	50	0	83	17	0	33/59
2016	40	-	0	100	0	0	0	0	34/57
2021	60	-	33	67	0	0	0	0	-/-
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	440	-	0	91	9	9	0	5	27/40
2001	400	-	0	80	20	0	0	0	29/53
2006	440	40	14	68	18	9	0	23	29/46
2011	600	-	3	97	0	23	0	0	29/49
2016	380	-	16	68	16	0	0	0	31/55
2021	480	20	17	25	58	4	0	88	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-29.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

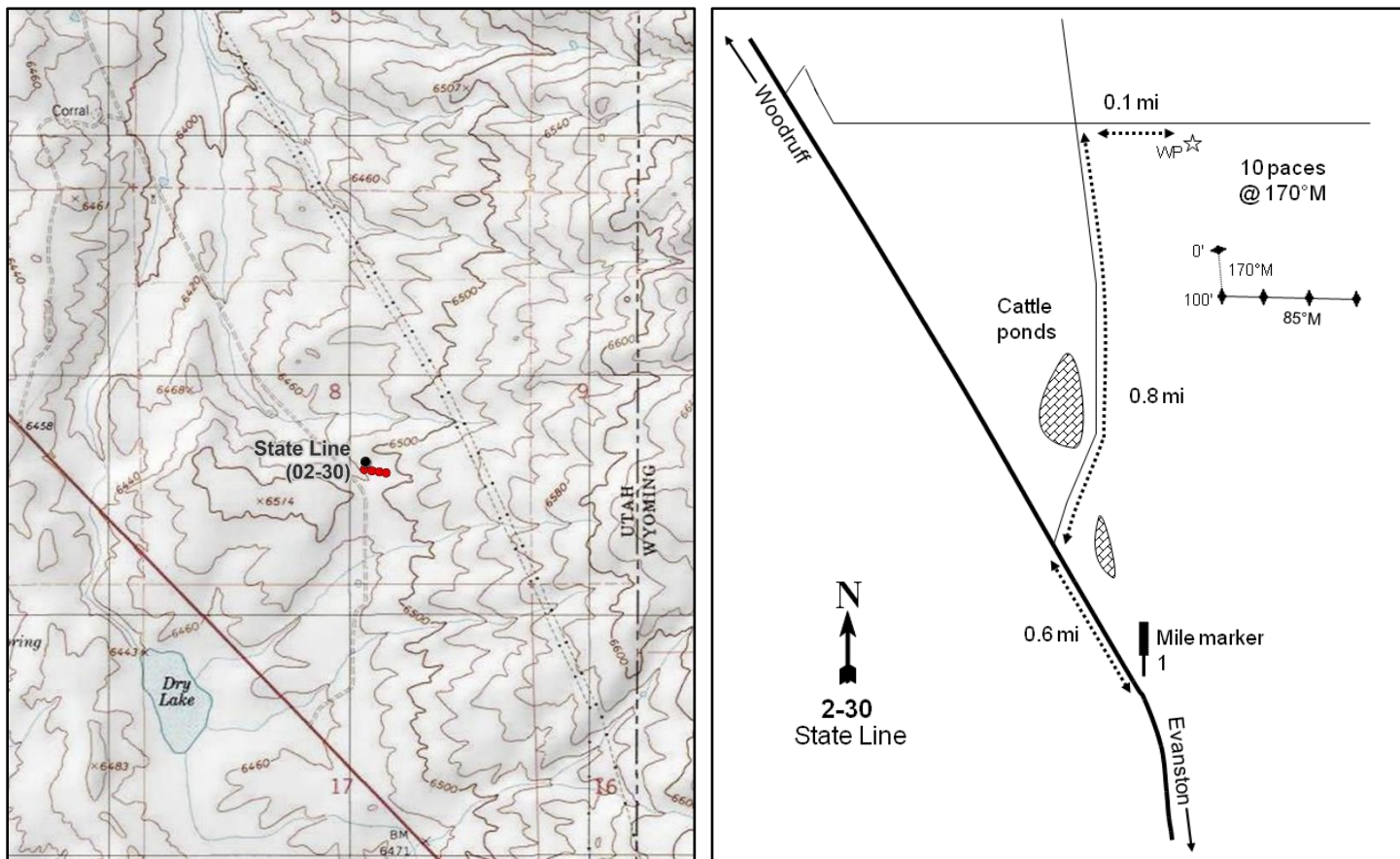
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
1996	205	-	-	-	-	-	14.1
2001	218	-	-	-	-	-	18.1
2006	226	15	10	5	20	50	16.8
2011	229	15	20	5	20	40	18.0
2016	279	20	20	20	40	-	16.9
2021	249	10	15	30	25	20	19.2



**Table 02-27.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	7.0	3.1	0.0	19.9	-0.1	8.2	0.0	<b>38.1</b>	Poor
2001	6.8	-1.1	3.4	21.4	0.0	6.8	0.0	<b>37.3</b>	Poor
2006	5.1	0.0	0.0	24.4	0.0	10.0	0.0	<b>39.5</b>	Poor
2011	5.9	0.0	0.0	23.4	0.0	10.0	0.0	<b>39.2</b>	Poor
2016	7.9	5.0	4.4	25.6	0.0	10.0	0.0	<b>52.9</b>	Fair
2021	6.8	-1.9	8.8	30.0	-0.3	3.9	0.0	<b>47.2</b>	Poor

## STATE LINE - STUDY NO. 02-30

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Neponset Reservoir N; Township 8N, Range 8E, Section 08  
NAD 83 UTM ZONE 12, 495019 East 4587838 North

**Transect Information**

Browse Tag # (0' Stake)	7991
Transect Bearing	173° magnetic (Lines 2-4: 91° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (71ft), Line 3 (59ft), Line 4 (34ft)
Belt Marker Placement	Standard

**Directions to Site**

From the Utah/Wyoming border, proceed north on Highway 16 for 0.6 miles past mile marker 1. Turn right, proceed through a gate, and travel 0.8 miles north to an intersection in a wash. Turn right and drive 0.1 miles east to a witness post on the south side of the road. Walk ten paces at a bearing of 170 degrees magnetic to the 0-foot stake which is marked with browse tag #7991. Line 1 runs at 173 degrees magnetic and lines 2-4 run at 91 degrees magnetic.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	EAST WOODRUFF
Elevation	6,500ft (1,981m)
Aspect	Near Level - West
Slope	3%
Sample Dates	08/21/1996, 08/03/2001, 07/28/2006, 08/24/2011, 07/11/2016, 06/28/2021

**Wildlife Habitat and Vegetation History****Table 02-30.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	summer	
Pronghorn	crucial	year-long	

**Table 02-30.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Wyoming Big Sagebrush	No Encroachment
1990	Wyoming Big Sagebrush	No Encroachment
1996	Wyoming Big Sagebrush	No Encroachment
2001	Wyoming Big Sagebrush	No Encroachment
2006	Wyoming Big Sagebrush	No Encroachment
2011	Wyoming Big Sagebrush	No Encroachment
2016	Wyoming Big Sagebrush	No Encroachment
2021	Wyoming Big Sagebrush	No Encroachment

**Site Notes**

A dead pronghorn was seen on site in 2021.

**Soils****Table 02-30.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.8	41.9	28.1	30.0	2.0	8.4	99.2	0.8	08/21/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	10 inches
NRCS Ecological Site	Semidesert Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R034XY212UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1984, this site has remained in a stable state with Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyominensis*) dominating the plant community (Photos, Pre-1992 Data, Table 02-30.12). However, 63% of sagebrush plants showed signs of poor vigor in 2021, possibly due to drought stress. Loss of sagebrush as a dominant component could potentially occur if similar climatic conditions are sustained in the future (Table 02-30.13). The herbaceous understory has remained moderately diverse and abundant over the sample years with mainly native perennial grass species contributing much of the cover (Table 02-30.10, Table 02-30.11). The site will likely remain in the current plant community phase without a major disturbance. Deer winter range condition has generally remained good since site establishment; sagebrush cover has fluctuated very little, but younger plants have been lacking within the population. Deer winter range condition is considered to be good as of 2021. Improvement to deer wintering range can be accomplished through efforts that support mature sagebrush and sagebrush reproduction. Diversifying and increasing cover of native perennial grasses and forbs, while reducing cheatgrass presence, would also improve winter range conditions (Table 02-30.15).

**Trend Summary Tables****Table 02-30.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	23.2	2.2	-	-	-	-
2001	25.0	2.9	-	-	-	-
2006	21.8	2.5	-	24.3	2.5	-
2011	19.9	2.6	-	24.6	4.6	-
2016	20.4	2.8	-	30.2	3.8	-
2021	20.3	2.8	-	25.9	2.2	-

**Table 02-30.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	-	294	5	197	-	4.7	0.0	3.1
2001	-	318	240	133	-	6.3	0.7	2.6
2006	-	279	163	188	-	5.1	0.6	2.2
2011	-	327	402	188	-	8.9	3.0	3.2
2016	-	302	365	129	-	7.3	2.5	2.1
2021	4	311	8	147	0.0	7.7	0.0	2.6

**Table 02-30.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	39.2	8.7	26.6	1.2	0.3	31.6
2001	42.4	12.4	28.2	1.0	0.1	38.9
2006	43.3	11.3	30.7	0.7	0.4	30.7
2011	37.1	7.5	28.0	0.2	0.0	36.6
2016	41.6	13.4	22.2	0.7	0.0	36.2
2021	39.4	13.8	27.0	0.8	0.2	31.4

**Table 02-30.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Pronghorn	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
1996	-	27	-	-	4
2001	1	13	-	5	1
2006	2	21	4	-	27
2011	-	36	10	2	21
2016	3	27	-	1	30
2021	2	42	2	-	12
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	11.6 (28.7)	30.8 (76.1)	6.7 (16.6)	-	-
2006	13.8 (34.1)	25.5 (62.9)	4.7 (11.6)	-	-
2011	1.5 (3.6)	64.3 (158.9)	4.0 (9.9)	-	-
2016	11.6 (28.7)	43.6 (107.6)	-	-	-
2021	3.6 (9.0)	34.2 (84.4)	1.3 (3.3)	26.2 (64.6)*	-

\*Pellets per acre (ha)

**Table 02-30.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa secunda (Sandberg bluegrass)
year	Nested Frequency						
1996	8	-	-	25	-	56	259
2001	10	-	-	-	-	103	276
2006	12	-	-	18	-	117	231
2011	8	5	-	45	3	139	284
2016	7	1	-	62	-	165	211
2021	24	16	4	20	1	156	253
year	Average Cover (%)						
1996	0.2	-	-	0.1	-	0.4	4.1
2001	0.5	-	-	-	-	0.9	4.9
2006	0.1	-	-	0.1	-	1.2	3.7
2011	0.1	0.0	-	0.2	0.0	1.0	7.5
2016	0.1	0.0	-	0.6	-	2.3	4.3
2021	0.2	0.1	0.0	0.2	0.0	1.7	5.6

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-30.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria dimorpha (low pussytoes)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus miser var. tenuifolius (timber milkvetch)	Astragalus purshii (woollypod milkvetch)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Cordylanthus ramosus <sup>a</sup> (bushy bird's beak)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Draba <sup>a</sup> (draba)	Erigeron eatonii (Eaton's fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum cernuum <sup>a</sup> (nodding buckwheat)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)
year	Nested Frequency																
1996	-	2	2	-	-	2	-	1	-	-	-	-	3	-	-	-	-
2001	-	239	1	3	-	9	-	1	-	-	-	3	3	-	-	1	-
2006	-	162	3	1	-	-	-	-	5	-	-	15	-	-	-	-	-
2011	3	397	2	17	3	19	-	8	78	12	1	2	-	-	-	-	5
2016	-	365	2	7	-	3	7	5	20	7	2	3	-	2	7	-	7
2021	-	5	1	1	-	6	-	4	3	-	-	11	-	-	-	-	-
year	Average Cover (%)																
1996	-	0.0	0.1	-	-	0.0	-	0.0	-	-	-	-	0.0	-	-	-	-
2001	-	0.7	0.0	0.0	-	0.1	-	0.0	-	-	-	0.0	0.0	-	-	0.0	-
2006	-	0.6	0.0	0.0	-	-	-	-	0.0	-	-	0.1	-	-	-	-	-
2011	0.0	2.6	0.0	0.0	0.0	0.3	-	0.1	0.3	0.1	0.0	0.0	-	-	-	-	0.0
2016	-	2.4	0.0	0.1	-	0.1	0.2	0.1	0.0	0.1	0.0	0.0	-	0.0	0.0	-	0.0
2021	-	0.0	0.0	0.0	-	0.0	-	0.0	0.0	-	-	0.0	-	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nested Frequency			
Phlox hoodii (spiny phlox)	143	43	33	-
Phlox longifolia (longleaf phlox)	91	31	16	2
Stenotus acaulis (stemless mock goldenweed)	108	76	19	1
Trifolium (clover)	87	65	14	22
year	Average Cover (%)			
1996	2.1	0.1	0.7	-
2001	1.9	0.1	0.5	0.0
2006	1.3	0.3	0.4	0.0
2011	1.5	0.3	0.8	0.0
2016	0.8	0.1	0.7	0.1
2021	1.6	0.1	0.8	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02-30.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)						
Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	-	-	-	-	-	-	-
Atriplex falcata (sickle saltbush)	-	-	-	-	-	-	-
Chrysothamnus depressus <sup>p</sup> (longflower rabbitbrush)	24.3	0.2	-	1.6	0.3	0.3	0.1
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	24.6	1.1	-	2.7	0.1	0.6	0.1
Linanthus pungens (granite prickly phlox)	30.2	0.5	-	2.7	-	0.5	0.1
Opuntia (pricklypear)	25.9	0.1	-	1.4	-	0.6	0.1
Tetradymia canescens (spineless horsebrush)							
year	Quadrat Cover (%)						
1996	23.2	0.6	-	1.4	-	0.2	0.0
2001	25.0	0.3	-	1.9	0.5	0.2	0.0
2006	21.8	0.3	0.0	1.7	0.3	0.2	0.0
2011	19.9	0.7	-	1.3	0.0	0.4	0.2
2016	20.4	0.4	-	1.7	-	0.7	0.0
2021	20.3	0.2	0.0	1.6	-	0.9	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-30.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
1996	6500	40	2	67	32	46	11	8	37/77
2001	6700	40	0	79	21	58	15	10	45/76
2006	6600	17180	4	66	30	14	0	19	41/70
2011	6380	220	8	60	32	29	39	39	43/71
2016	7900	100	12	64	24	26	18	17	42/72
2021	7760	60	6	31	63	35	54	63	- / -
<b>Atriplex falcata -- (sickle saltbush)</b>									
1996	1840	-	0	98	2	0	0	0	7/19
2001	1060	-	6	94	0	23	38	4	10/21
2006	1100	40	29	67	4	2	0	2	10/17
2011	1260	20	22	78	0	0	0	0	26/33
2016	1360	20	2	99	0	0	53	0	13/26
2021	840	-	45	55	0	52	2	0	- / -
<b>Chrysothamnus depressus<sup>p</sup> -- (longflower rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	20	-	0	100	0	0	100	100	- / -
2021	40	-	50	0	50	50	0	50	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	2020	-	0	82	18	0	0	10	21/32
2001	2000	-	1	92	7	0	0	6	20/31
2006	1880	200	3	64	33	11	0	25	18/31
2011	2260	-	0	100	0	6	2	5	21/31
2016	2280	-	4	96	0	4	1	2	21/27
2021	1900	40	16	12	73	39	30	74	- / -
<b>Krascheninnikovia lanata<sup>p</sup> -- (winterfat)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	13/28
2011	20	-	0	100	0	0	0	0	23/25
2016	-	-	-	-	-	-	-	-	12/14
2021	-	-	-	-	-	-	-	-	- / -
<b>Linanthus pungens -- (granite prickly phlox)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	220	-	9	91	0	0	0	0	10/22
2006	180	-	0	100	0	0	0	0	12/31
2011	260	-	8	92	0	0	0	0	7/16
2016	-	-	-	-	-	-	-	-	- / -
2021	140	-	57	29	14	0	0	14	- / -
<b>Opuntia -- (pricklypear)</b>									
1996	500	-	20	68	12	0	0	4	9/27
2001	440	20	5	77	18	0	0	9	8/19
2006	540	60	15	82	4	0	0	0	9/28
2011	500	-	0	100	0	0	0	0	10/28
2016	600	-	0	100	0	0	0	3	12/25
2021	620	-	3	52	45	0	0	45	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Tetradymia canescens -- (spineless horsebrush)									
1996	360	-	0	56	44	0	17	11	12/25
2001	80	-	0	100	0	25	0	0	19/30
2006	120	-	17	33	50	17	0	33	15/26
2011	120	-	17	83	0	0	0	33	17/33
2016	100	-	0	100	0	0	20	0	15/32
2021	60	-	33	0	67	67	0	67	- / -

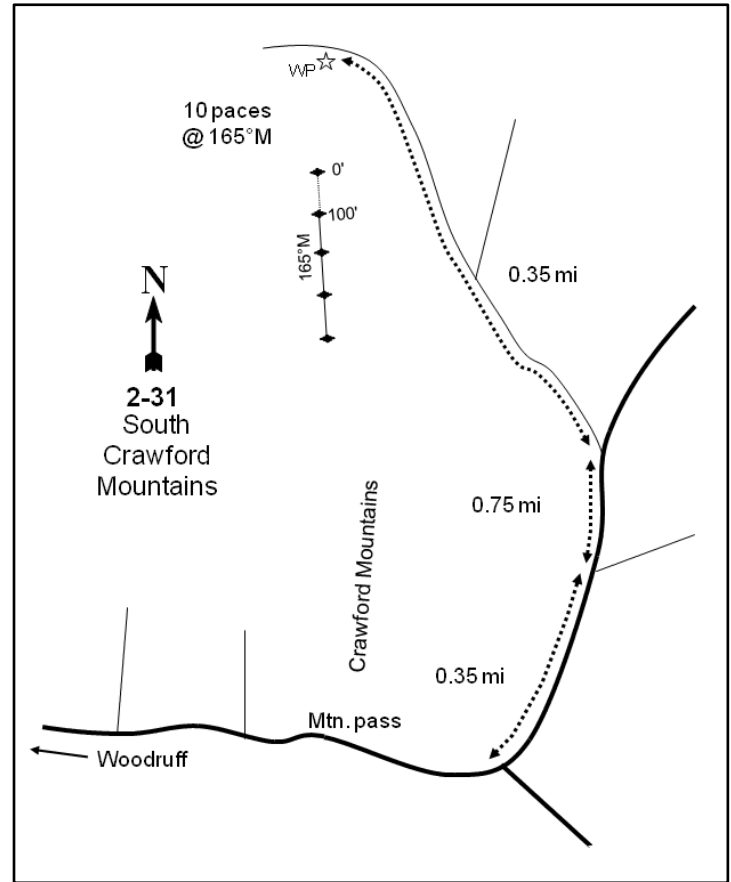
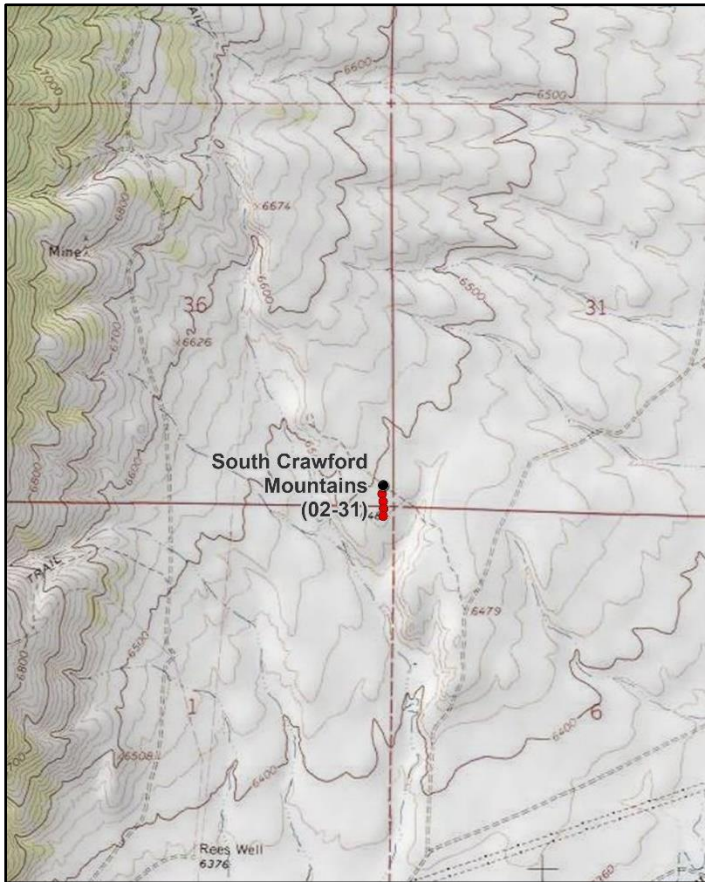
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-30.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	29.0	5.4	0.7	9.5	0.0	6.2	0.0	<b>50.8</b>	Good
2001	30.0	8.6	0.1	12.6	0.0	5.3	0.0	<b>56.7</b>	Good
2006	30.0	5.9	1.8	10.2	0.0	4.3	0.0	<b>52.2</b>	Good
2011	30.0	5.3	4.1	17.7	0.0	6.4	0.0	<b>63.5</b>	Good-Excellent
2016	30.0	7.7	6.0	14.6	0.0	4.1	0.0	<b>62.4</b>	Good
2021	30.0	-3.9	2.9	15.5	0.0	5.1	0.0	<b>49.6</b>	Good



## SOUTH CRAWFORD MOUNTAINS - STUDY NO. 02-31

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Woodruff Narrows SW; Township 10N, Range 7E, Section 36  
NAD 83 UTM ZONE 12, 492346 East 4600430 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

7940  
165° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Standard

**Directions to Site**

From the intersection of Wilson Lane and Little Crawford Road east of Woodruff, proceed east for 1.6 miles through the small pass to the east side of the mountains. Take the left fork and travel northeast for 0.35 miles. Turn left here and proceed northeast again for 0.75 miles. At this point, turn left onto a lightly-used jeep trail and travel northwest for an additional 0.35 miles to a witness post on the left-hand (south) side of the road. From the witness post walk 10 paces at 165 degrees magnetic to the 0-foot baseline stake which is marked by browse tag #7940.

**Site Information**

Land Ownership	State
Land Administrator	SITLA
Allotment	No data
Elevation	6,450ft (1,966m)
Aspect	South
Slope	4%
Sample Dates	08/22/1996, 08/26/2001, 07/19/2006, 08/23/2011, 07/12/2016, 07/13/2021

**Wildlife Habitat and Vegetation History****Table 02-31.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Pronghorn	crucial	year-long	

**Table 02-31.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Wyoming Big Sagebrush	No Encroachment
1990	Wyoming Big Sagebrush	No Encroachment
1996	Wyoming Big Sagebrush	No Encroachment
2001	Wyoming Big Sagebrush	No Encroachment
2006	Wyoming Big Sagebrush	No Encroachment
2011	Wyoming Big Sagebrush	No Encroachment
2016	Wyoming Big Sagebrush	No Encroachment
2021	Wyoming Big Sagebrush	Phase I

**Site Notes**

No Notes

**Soils****Table 02-31.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.1	55.2	17.4	27.4	1.9	160.3	51.2	0.6	08/22/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Semidesert Shallow Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R034XY225UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1984, the site has remained in a stable state with Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyominensis*) as the dominant vegetation component. However, sagebrush decadence increased in 2021, with 96% of plants having poor vigor: this is likely due to drought stress (Photos, Pre-1992 Data, Table 02-31.12, Table 02-31.13). The herbaceous understory has remained moderately diverse and abundant over the sample years with native perennial grasses contributing most of the cover (Table 02-31.10, Table 02-31.11). Utah juniper (*Juniperus osteosperma*) was observed in point-quarter density measurements for the first time in 2021, placing the site in Phase I of woodland succession. As density is low (Table 02-31.4, Table 02-31.14), however, further tree encroachment likely does not pose an immediate threat to the ecological integrity of the site. Deer winter range condition has generally remained good to excellent since site establishment; sagebrush cover has fluctuated very little, but younger plants have been lacking within the population. As of 2021, deer winter range condition was considered to be good due to the lack of younger sagebrush plants in the population and low native perennial grass cover. Improvement to deer wintering range can be accomplished through efforts that support mature sagebrush and sagebrush reproduction. Diversifying and increasing cover of native perennial grasses and forbs would also improve winter range conditions (Table 02-31.15).

**Trend Summary Tables****Table 02-31.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	16.7	2.0	-	-	-	-
2001	22.1	2.0	-	-	-	-
2006	19.8	3.2	-	26.9	2.9	-
2011	23.1	4.2	-	29.5	5.1	-
2016	21.3	3.2	-	32.1	4.3	-
2021	20.8	1.9	-	29.1	1.5	-

**Table 02-31.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	1	357	2	190	0.0	8.0	0.0	3.6
2001	-	370	75	212	-	8.7	0.4	4.2
2006	1	344	88	233	0.0	11.3	0.3	6.6
2011	6	364	361	235	0.0	12.0	6.7	5.7
2016	14	359	377	201	0.1	12.7	5.2	4.5
2021	-	338	8	174	-	6.5	0.0	3.5

**Table 02-31.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	32.7	9.6	30.1	7.3	1.1	28.8
2001	37.6	7.5	34.4	2.6	0.1	37.1
2006	39.6	5.7	30.0	5.2	0.1	39.8
2011	33.3	3.3	32.9	3.6	0.1	42.4
2016	36.6	3.9	25.7	1.7	0.1	44.6
2021	33.8	5.4	35.9	4.0	0.3	31.3

**Table 02-31.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Pronghorn	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
1996	1	31	2	-	3
2001	1	13	-	2	7
2006	7	15	4	1	16
2011	3	24	5	1	9
2016	4	28	-	1	19
2021	2	48	-	2	8
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	13.1 (32.3)	23.4 (57.9)	0.7 (1.7)	26.2 (64.6)*	-
2006	10.2 (25.1)	8.1 (19.9)	8.7 (21.5)	26.2 (64.6)*	-
2011	2.2 (5.4)	36.2 (89.4)	5.3 (13.2)	-	-
2016	21.8 (53.8)	26.8 (66.2)	1.3 (3.3)	-	-
2021	5.8 (14.3)	30.2 (74.5)	-	-	-

\*Pellets per acre (ha)

**Table 02-31.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency								
1996	23	1	-	31	88	-	35	279	88
2001	31	-	13	18	63	5	2	312	108
2006	37	1	33	10	127	17	3	245	80
2011	37	6	42	51	173	85	7	280	51
2016	42	14	71	31	169	87	5	221	22
2021	36	-	47	22	183	139	-	168	3
year	Average Cover (%)								
1996	0.2	0.0	-	0.2	1.1	-	0.5	5.2	0.8
2001	0.6	-	0.1	0.1	0.6	0.1	0.0	6.0	1.1
2006	0.7	0.0	0.2	0.1	2.9	0.0	0.0	6.1	1.3
2011	0.5	0.0	0.4	0.5	3.9	0.7	0.1	5.5	0.3
2016	0.5	0.1	0.7	0.3	5.3	0.9	0.0	4.9	0.2
2021	0.4	-	0.3	0.1	2.5	1.1	-	2.0	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-31.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria microphylla (littleleaf pussytoes)	Arabis drummondii (Drummond's rockcress)	Arenaria (sandwort)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus lentiginosus (freckled milkvetch)	Astragalus purshii (woollypod milkvetch)	Astragalus utahensis (Utah milkvetch)	Cordylanthus ramosus <sup>a</sup> (bushy bird's beak)	Cryptantha (cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron eatonii (Eaton's fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum cernuum <sup>a</sup> (nodding buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)
year	Nested Frequency																
1996	-	3	6	-	8	-	-	13	2	26	-	-	-	-	6	-	1
2001	15	-	4	-	20	-	-	10	29	11	-	2	-	-	2	-	1
2006	77	20	4	-	29	10	-	9	10	20	-	3	1	-	3	-	2
2011	335	17	12	-	35	8	-	16	176	27	-	2	-	4	19	-	7
2016	369	8	2	7	38	4	1	15	106	21	5	2	-	3	7	-	5
2021	6	-	-	-	4	-	3	6	-	31	-	-	-	-	4	1	-
year	Average Cover (%)																
1996	-	0.0	0.1	-	0.0	-	-	0.2	0.0	0.2	-	-	-	-	0.0	-	0.0
2001	0.0	-	0.0	-	0.1	-	-	0.1	0.3	0.0	-	0.0	-	-	0.0	-	0.0
2006	0.2	0.5	0.0	-	0.2	0.1	-	0.1	0.1	0.3	-	0.0	0.0	-	0.0	-	0.1
2011	1.5	0.2	0.0	-	0.7	0.2	-	0.1	5.2	0.1	-	0.0	-	0.1	0.2	-	0.6
2016	3.3	0.0	0.0	0.0	0.5	0.0	0.0	0.1	1.8	0.3	0.0	0.0	-	0.0	0.1	-	0.0
2021	0.0	-	-	-	0.0	-	0.0	0.0	-	0.2	-	-	-	-	0.0	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES							
<i>Lappula occidentalis</i> <sup>a</sup> (flatspine stickseed)							
<i>Melilotus officinalis</i> <sup>i</sup> (sweetclover)							
<i>Microsteris gracilis</i> <sup>a</sup> (slender phlox)							
<i>Phlox hoodii</i> (spiny phlox)							
<i>Phlox longifolia</i> (longleaf phlox)							
<i>Stenotus acaulis</i> (stemless mock goldenweed)							
<i>Trifolium</i> (clover)							
year	Nested Frequency						
1996	-	-	-	170	8	1	-
2001	35	-	-	193	2	1	15
2006	4	2	1	198	3	1	-
2011	-	-	-	175	11	1	20
2016	22	-	3	157	-	1	29
2021	1	-	-	150	2	5	4
year	Average Cover (%)						
1996	-	-	-	3.0	0.0	0.0	-
2001	0.1	-	-	3.8	0.0	0.0	0.1
2006	0.0	0.0	0.0	5.3	0.0	0.0	-
2011	-	-	-	3.4	0.0	0.0	0.1
2016	0.0	-	0.0	3.0	-	0.0	0.2
2021	0.0	-	-	3.2	0.0	0.1	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02-31.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES							
<i>Artemisia nova</i> <sup>p</sup> (black sagebrush)							
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> <sup>p</sup> (Wyoming big sagebrush)							
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>stenophyllus</i> (yellow rabbitbrush)							
<i>Eriogonum microthecum</i> <sup>p</sup> (slender buckwheat)							
<i>Gutierrezia sarothrae</i> (broom snakeweed)							
<i>Linanthus pungens</i> (granite prickly phlox)							
<i>Opuntia</i> (pricklypear)							
year	Line Intercept Cover (%)						
1996	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-
2006	1.8	24.9	2.6	0.2	-	0.3	-
2011	1.9	27	4.6	0.6	-	0.4	0.1
2016	2.4	29.6	3.6	0.1	0.4	0.3	-
2021	0.8	28.3	1.3	-	-	0.1	0.1
year	Quadrat Cover (%)						
1996	0.2	16.2	1.8	0.3	-	0.2	0.0
2001	1.2	20.5	1.8	0.3	-	0.2	-
2006	1.5	18.0	2.8	0.2	0.0	0.3	0.0
2011	1.1	21.9	3.4	0.1	-	0.7	0.0
2016	1.1	20.1	2.5	0.1	0.3	0.3	0.1
2021	1.2	19.5	1.6	0.2	0.0	0.2	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-31.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia nova<sup>P</sup> -- (black sagebrush)</b>									
1996	320	-	6	88	6	6	0	6	24/36
2001	440	-	5	91	5	86	0	0	30/42
2006	660	340	0	91	9	0	0	9	24/40
2011	460	-	0	65	35	13	48	9	23/46
2016	580	-	0	100	0	69	10	0	26/49
2021	540	-	0	48	52	0	0	100	- / -
<b>Artemisia tridentata ssp. wyomingensis<sup>P</sup> -- (Wyoming big sagebrush)</b>									
1996	6420	40	6	65	30	63	4	11	39/69
2001	7420	-	3	77	20	23	3	11	41/64
2006	6260	2160	5	73	23	18	3	20	40/67
2011	7480	160	19	64	18	11	34	24	44/81
2016	8460	-	9	71	21	23	22	18	37/72
2021	8960	-	7	28	66	0	0	96	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1996	2880	-	5	83	12	3	7	9	24/29
2001	2940	-	1	88	10	5	2	7	20/25
2006	3840	-	4	93	4	1	0	2	20/30
2011	3940	-	1	97	3	0	0	2	30/33
2016	3860	-	1	100	0	0	0	0	26/30
2021	3160	-	11	20	70	22	12	91	- / -
<b>Eriogonum microthecum<sup>P</sup> -- (slender buckwheat)</b>									
1996	700	-	0	97	3	0	0	0	15/24
2001	540	-	0	93	7	4	0	7	11/17
2006	680	-	6	79	15	12	3	3	13/20
2011	320	-	0	100	0	0	0	6	15/26
2016	160	-	0	100	0	38	0	0	12/15
2021	320	-	19	19	63	6	6	69	- / -
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	20	-	100	0	0	0	0	100	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	80	20	0	100	0	0	0	0	16/36
2011	-	-	-	-	-	-	-	-	- / -
2016	400	-	0	100	0	0	0	0	22/32
2021	20	-	0	100	0	0	0	100	- / -
<b>Krascheninnikovia lanata<sup>P</sup> -- (winterfat)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	11/16
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Linanthus pungens -- (granite prickly phlox)</b>									
1996	400	-	0	95	5	0	0	0	17/29
2001	440	-	0	91	9	0	0	0	10/22
2006	420	-	10	86	5	0	0	10	14/30
2011	460	-	0	100	0	0	0	0	11/22
2016	560	-	0	100	0	0	0	0	14/20
2021	300	-	0	20	80	53	0	80	- / -
<b>Opuntia -- (pricklypear)</b>									
1996	80	-	0	75	25	0	0	0	10/28
2001	100	-	0	100	0	0	0	0	7/26
2006	160	-	13	75	13	0	0	13	10/26
2011	140	-	0	100	0	0	0	0	11/31
2016	480	-	13	88	0	0	0	4	11/24
2021	320	-	6	94	0	0	0	0	- / -
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	20	-	0	100	0	0	0	0	10/24
2001	20	-	0	100	0	0	0	0	8/32
2006	20	-	0	100	0	0	0	0	11/18
2011	20	-	100	0	0	0	0	0	10/34
2016	40	-	0	100	0	0	0	0	13/18

t - Tree Species; p - Preferred Browse; i - Introduced Species

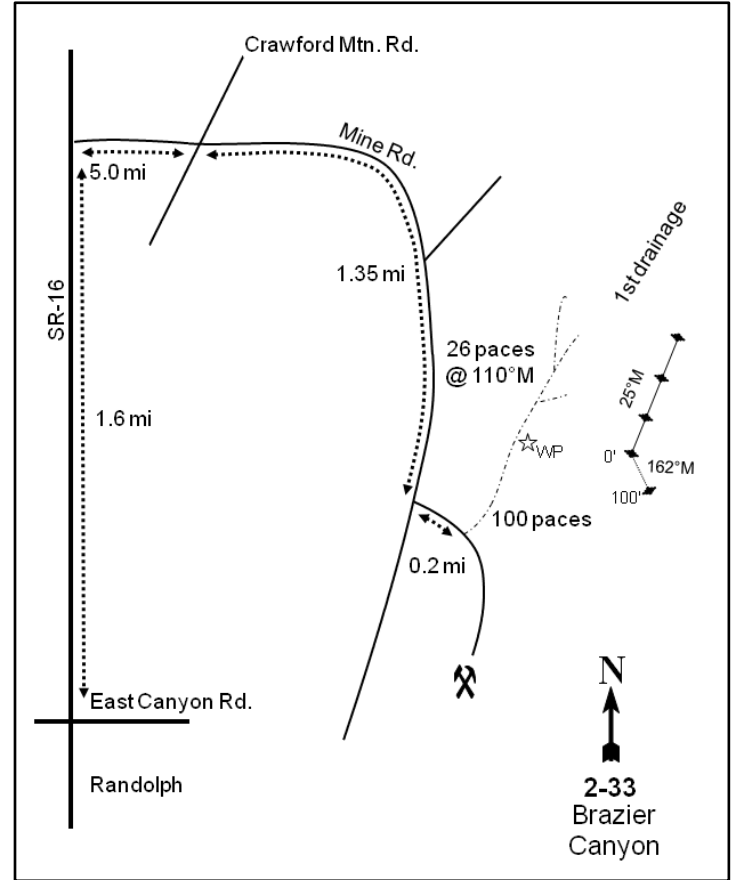
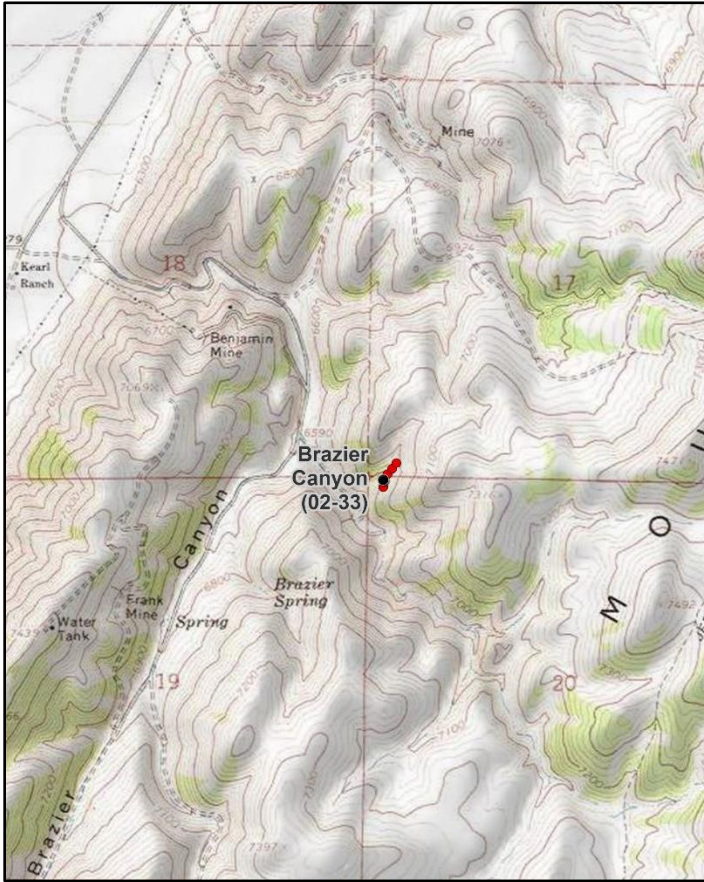
**Table 02-31.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2021	20	100	-	-	-	-	1.0

**Table 02-31.15 - Deer Desirable Components Index: Semidesert Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	20.9	6.3	2.8	16.1	0.0	7.2	0.0	<b>53.2</b>	Good
2001	27.6	9.3	1.6	17.4	0.0	8.3	0.0	<b>64.3</b>	Good-Excellent
2006	30.0	8.5	2.1	22.7	0.0	10.0	0.0	<b>73.3</b>	Excellent
2011	30.0	9.5	8.6	24.0	0.0	10.0	0.0	<b>82.0</b>	Excellent
2016	30.0	9.2	3.9	25.5	-0.1	8.9	0.0	<b>77.5</b>	Excellent
2021	30.0	-4.6	3.2	13.0	0.0	7.0	0.0	<b>48.6</b>	Good

## BRAZIER CANYON - STUDY NO. 02-33

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Rex Peak SW; Township 11N, Range 8E, Section 20  
NAD 83 UTM ZONE 12, 494084 East 4615031 North

**Transect Information**

Browse Tag # (0' Stake)	7978
Transect Bearing	162° magnetic (Lines 2-4: 25° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)
Belt Marker Placement	Standard

**Directions to Site**

From North Main and East Canyon Road (100 North) in Randolph proceed north on State Route 16 for 1.6 miles, then turn right (east) onto Crawford Mountain Road. Continue east for 5.0 miles to a two-way stop. Turn right (southeast) and proceed 1.35 miles on this road to where there is a small canyon on the left with a road going up it. Turn left (east) onto this road and proceed 0.2 miles to the first ravine on the left (north) side of the road. Walk up the ravine 100 paces to a witness post. From the witness post walk 26 paces at a bearing of 110 degrees magnetic to the 0-foot baseline stake which is marked by browse tag #7978. The rest of the baseline runs off of the 0-foot baseline stake at a bearing of 25 degrees magnetic.



**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,800ft (2,073m)
Aspect	West
Slope	52%
Sample Dates	08/22/1996, 08/02/2001, 07/19/2006, 08/10/2011, 07/13/2016, 07/13/2021

**Wildlife Habitat and Vegetation History****Table 02-33.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Greater Sage-Grouse	occupied	year-long	brood-rearing
Pronghorn	substantial	summer	

**Table 02-33.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Black Sagebrush	Phase I
1990	Black Sagebrush	Phase I
1996	Black Sagebrush/Perennial Grass	Phase I
2001	Black Sagebrush/Perennial Grass	Phase I
2006	Perennial Grass/Black Sagebrush	Phase I
2011	Perennial Grass/Black Sagebrush	Phase I
2016	Perennial Grass/Black Sagebrush	Phase I
2021	Black Sagebrush/Perennial Grass	Phase I

**Site Notes**

Deer carcasses were found near the study in 1984 and 2011, and two deer antler sheds were found in 1996.

**Soils****Table 02-33.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.7	36.7	39.0	24.3	4.0	14.4	105.6	0.7	08/22/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Upland Stony Loam (Black Sagebrush)
NRCS Ecological Site #	R047XA332UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1984, this site has existed as a black sagebrush (*Artemisia nova*) plant community type (Photos, Pre-1992 Data, Table 02-33.12, Table 02-33.13). The herbaceous understory has remained fairly diverse and has provided good cover. Perennial grasses, mainly the native species bluebunch wheatgrass (*Pseudoroegneria spicata*), have been a co-dominant site component throughout the study period. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed in the understory since 1996 in fluctuating amounts, but cover has generally remained low. Perennial and annual forbs have remained rare in comparison to grasses (Table 02-33.7, Table 02-33.10, Table 02-33.11). Community stability may be threatened by the presence and gradual encroachment of juniper (*Juniperus osteosperma* and *J. scopulorum*) across the area (Table 02-33.6, Table 02-33.13, Table 02-33.14). Although the site has been considered to be within Phase I of woodland succession in all sample years (Table 02-33.4), juniper trees may have the potential to become a major vegetation component if a tree-removing disturbance does not occur. Furthermore, 80% of black sagebrush plants were considered to have poor vigor in 2021 (Table 02-33.13), likely due to drought stress. Should this drought stress continue, the associated loss of sagebrush may cause this site to transition to a different plant community type. Deer winter range condition has generally remained good since site establishment; sagebrush cover has fluctuated, but younger plants have been lacking within the population. As of 2021, deer winter range condition was considered to be fair. Improvement to deer wintering range can be accomplished through efforts that increase sagebrush cover and encourage sagebrush reproduction. Diversifying and increasing cover of native perennial forbs, while reducing cheatgrass presence, would also improve winter range conditions (Table 02-33.15).

**Trend Summary Tables****Table 02-33.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	13.2	1.0	0.6	-	-	-
2001	15.6	3.7	1.2	-	-	0.1
2006	11.4	2.6	2.1	13.8	3.6	6.4
2011	13.7	3.7	3.3	14.5	4.6	6.7
2016	11.9	3.1	5.6	15.8	5.2	8.7
2021	15.5	2.4	4.3	14.9	2.0	7.1

**Table 02-33.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	21	389	25	201	0.2	16.1	0.2	4.6
2001	47	356	18	203	0.7	15.1	0.2	5.4
2006	59	362	41	205	0.6	17.5	0.1	5.7
2011	153	381	76	223	2.4	25.5	0.9	5.4
2016	165	374	45	165	3.3	20.5	0.4	4.5
2021	19	364	4	98	0.0	13.4	0.0	1.9

**Table 02-33.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	11.3	5.0	26.1	16.3	13.3	34.8
2001	18.9	2.7	33.5	13.5	5.9	41.8
2006	24.1	2.2	24.3	16.6	13.2	39.0
2011	10.8	1.5	24.2	23.8	6.8	50.6
2016	19.1	3.4	16.2	24.6	9.1	43.2
2021	15.9	3.2	33.5	19.4	11.2	32.5

**Table 02-33.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	1	33	-	7
2001	1	25	2	5
2006	3	27	7	9
2011	1	16	1	4
2016	2	13	1	8
2021	3	30	1	10
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	0.7 (1.8)	47.6 (117.5)	1.3 (3.3)	-
2006	4.4 (10.8)	78.4 (193.7)	8.1 (19.9)	-
2011	-	41.5 (102.6)	-	-
2016	2.2 (5.4)	30.2 (74.5)	-	-
2021	0.7 (1.8)	27.5 (67.9)	-	-

**Table 02-33.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency								
1996	-	21	3	-	1	-	27	365	177
2001	-	47	-	-	7	-	16	290	231
2006	-	59	-	2	-	-	3	301	231
2011	11	153	2	-	13	-	4	306	239
2016	2	165	1	-	-	3	5	312	259
2021	5	19	5	14	8	21	-	308	216
year	Average Cover (%)								
1996	-	0.2	0.1	-	0.0	-	0.3	8.9	6.8
2001	-	0.7	-	-	0.1	-	0.3	4.3	10.4
2006	-	0.6	-	0.0	-	-	0.0	5.4	12.0
2011	0.5	2.4	0.0	-	1.2	-	0.1	8.0	15.7
2016	0.4	3.3	0.0	-	-	0.1	0.1	7.4	12.5
2021	0.2	0.0	0.0	0.3	0.1	0.1	-	4.9	7.8

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-33.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria (pussytoes)	Arabis holboellii <sup>a</sup> (Holboell's rockcross)	Arenaria fendleri (Fendler's sandwort)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus miser var. tenuifolius (timber milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (tittlepod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Cordylanthus ramosus <sup>a</sup> (bushy bird's beak)	Crepis acuminata (tapertip hawkbeard)
year	Nested Frequency																
1996	-	-	6	10	36	26	9	-	2	-	-	-	-	6	-	7	26
2001	-	-	6	6	21	47	4	2	15	-	0	4	-	-	10	1	44
2006	5	14	-	3	30	18	39	4	7	-	-	-	-	3	9	1	29
2011	7	20	2	7	15	13	25	8	8	6	-	5	3	6	17	12	62
2016	9	29	3	2	2	5	15	1	7	4	-	1	3	2	12	2	18
2021	-	-	2	-	30	2	-	-	10	-	-	-	-	3	-	-	21
year	Average Cover (%)																
1996	-	-	0.1	0.0	1.6	0.5	0.1	-	0.1	-	-	-	-	0.0	-	0.1	0.5
2001	-	-	0.1	0.1	0.4	0.9	0.0	0.0	0.3	-	0.0	0.1	-	-	0.1	0.0	0.6
2006	0.0	0.0	-	0.0	0.6	0.4	0.5	0.0	0.2	-	-	-	-	0.0	0.0	0.0	0.4
2011	0.0	0.1	0.1	0.0	0.2	0.1	0.6	0.0	0.7	0.0	-	0.0	0.0	0.0	0.1	0.0	0.8
2016	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.3	0.0	-	0.0	0.0	0.0	0.3	0.0	0.2
2021	-	-	0.0	-	0.8	0.0	-	-	0.1	-	-	-	-	0.0	-	-	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Erigeron divergens <sup>a</sup> (spreading fleabane)	Hackelia patens (spotted stickseed)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Linum lewisii (Lewis flax)	Lupinus (lupine)	Machaeranthera canescens (hoary tansyaster)	Melilotus officinalis <sup>i</sup> (sweetclover)	Packera multilobata (lobeleaf groundsel)	Penstemon watsonii (Watson's penstemon)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Physaria (twinpod)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)
year	Nested Frequency																
1996	-	-	3	-	4	-	-	-	-	-	-	-	3	82	63	-	-
2001	-	8	4	-	7	3	-	-	2	2	-	1	1	87	40	-	-
2006	1	3	12	3	2	4	-	-	-	-	1	-	-	70	89	5	4
2011	-	3	6	17	7	4	1	4	2	2	2	-	1	94	31	-	-
2016	8	-	1	-	9	-	-	1	-	9	-	-	3	88	6	-	-
2021	1	-	-	-	1	-	-	-	-	-	-	-	5	36	-	-	-
year	Average Cover (%)																
1996	-	-	0.0	-	0.1	-	-	-	-	-	-	-	0.0	0.9	0.5	-	-
2001	-	0.1	0.0	-	0.1	0.0	-	-	0.0	0.0	-	0.0	0.0	2.6	0.2	-	-
2006	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-	0.0	-	-	2.4	0.7	0.0	0.0
2011	-	0.0	0.0	0.0	0.6	0.1	0.0	0.1	0.0	0.0	0.0	-	0.0	2.1	0.2	-	-
2016	0.0	-	0.0	-	0.2	-	-	0.0	-	0.5	-	-	0.2	2.2	0.0	-	-
2021	0.0	-	-	-	0.0	-	-	-	-	-	-	-	0.0	0.4	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Silene antirrhina <sup>a</sup> (sleepy silene)	Stenotus acaulis (stemless mock goldenweed)	Symphoricarichum ascendens (western aster)	Tragopogon dubius <sup>a</sup> (yellow salsify)	Trifolium (clover)	Wyethia amplexicaulis (mule-ears)
year	Nested Frequency					
1996	-	15	-	-	6	-
2001	-	2	-	-	13	-
2006	6	11	1	-	6	-
2011	9	7	4	3	-	-
2016	2	14	1	-	7	2
2021	-	18	1	-	-	-
year	Average Cover (%)					
1996	-	0.2	-	-	0.0	-
2001	-	0.0	-	-	0.1	-
2006	0.0	0.3	0.0	-	0.0	-
2011	0.0	0.0	0.0	0.0	-	-
2016	0.0	0.1	0.0	-	0.0	0.4
2021	-	0.4	0.0	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02-33.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia nova <sup>p</sup> (black sagebrush)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum microthecum <sup>p</sup> (slender buckwheat)	Juniperus osteosperma <sup>i</sup> (Utah juniper)	Juniperus scopulorum <sup>i</sup> (Rocky Mountain juniper)	Krascheninnikovia lanata <sup>p</sup> (winterfat)	Linanthus pungens (granite prickly phlox)	Opuntia (pricklypear)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)											
1996	-	-	-	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-	-	-
2006	-	10.8	0.2	3.5	2	6.4	-	0.5	-	0.1	0.3	-
2011	0.4	10.6	0.3	4.5	2.1	6.7	-	0.6	-	0.1	0.5	-
2016	0.2	12.4	0.6	5.2	0.9	8.7	-	0.3	-	0	1.4	-
2021	-	11.7	0.7	1.8	1	5.6	1.5	0.1	-	-	1.4	0.2
year	Quadrat Cover (%)											
1996	-	10.0	1.9	1.0	0.9	0.6	-	0.1	-	-	0.4	-
2001	0.0	13.0	1.0	3.7	1.1	1.2	-	0.3	-	-	0.2	0.0
2006	-	9.2	0.2	2.6	1.5	2.1	-	0.5	-	0.0	0.1	-
2011	0.0	11.0	0.4	3.7	1.6	3.3	-	0.5	-	0.0	0.1	-
2016	0.0	10.4	0.2	3.1	0.5	5.6	-	0.3	-	0.0	0.5	-
2021	0.1	13.3	0.1	2.3	1.1	3.2	1.2	0.2	0.0	-	0.7	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-33.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	80	-	50	0	50	0	0	50	35/36
2001	20	-	0	0	100	0	100	100	49/53
2006	-	-	-	-	-	-	-	-	52/66
2011	100	-	60	40	0	0	0	0	50/75
2016	40	-	100	0	0	0	50	0	56/70
2021	40	-	0	50	50	50	50	100	- / -
<b>Artemisia nova<sup>p</sup> -- (black sagebrush)</b>									
1996	5340	180	3	83	14	28	0	2	32/53
2001	5760	560	7	80	13	17	1	10	31/51
2006	5680	1080	5	66	30	1	0	20	34/54
2011	4840	200	15	62	23	13	2	19	26/49
2016	6940	1220	21	62	17	8	2	2	32/53
2021	7100	-	18	39	43	19	1	80	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	1460	-	7	63	30	52	6	11	37/60
2001	1060	20	2	57	42	40	17	23	33/56
2006	40	40	50	0	50	50	0	50	- / -
2011	260	40	31	46	23	23	0	31	26/36
2016	140	-	29	43	29	0	0	14	32/53
2021	240	-	8	33	58	0	0	92	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	840	-	2	83	14	2	0	0	32/46
2001	1020	-	0	92	8	0	0	10	32/51
2006	1160	-	3	90	7	2	0	10	30/39
2011	1340	-	15	76	9	0	0	0	37/51
2016	1420	-	0	99	1	0	0	0	39/52
2021	1140	-	2	12	86	4	0	93	- / -
<b>Eriogonum microthecum<sup>P</sup> -- (slender buckwheat)</b>									
1996	1300	-	2	99	0	0	0	0	18/23
2001	1380	-	0	100	0	0	1	1	16/22
2006	1740	20	3	97	0	1	0	0	19/30
2011	1600	-	15	84	1	3	0	1	23/31
2016	1060	-	2	96	2	0	0	0	19/27
2021	1840	-	3	39	58	0	0	86	- / -
<b>Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	70/164
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Juniperus osteosperma<sup>1</sup> -- (Utah juniper)</b>									
1996	80	20	25	75	0	0	0	0	- / -
2001	140	-	71	29	0	0	0	0	- / -
2006	180	100	44	56	0	0	0	0	- / -
2011	180	60	78	22	0	0	0	0	- / -
2016	320	-	63	38	0	0	0	0	- / -
2021	140	-	71	29	0	0	0	0	- / -
<b>Juniperus scopulorum<sup>1</sup> -- (Rocky Mountain juniper)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	60	-	0	100	0	0	0	0	- / -
<b>Krascheninnikovia lanata<sup>P</sup> -- (winterfat)</b>									
1996	580	-	7	93	0	38	10	0	20/24
2001	680	-	0	100	0	6	0	6	20/34
2006	580	-	0	100	0	0	21	0	25/25
2011	460	100	9	91	0	0	0	0	28/31
2016	440	-	0	100	0	0	0	0	24/31
2021	200	-	20	40	40	70	10	70	- / -
<b>Linanthus pungens -- (granite prickly phlox)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	20	-	0	0	100	0	0	100	- / -
2011	-	-	-	-	-	-	-	-	8/14
2016	-	-	-	-	-	-	-	-	- / -
2021	20	-	0	100	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Opuntia -- (pricklypear)</b>									
1996	40	-	0	100	0	0	0	0	10/30
2001	40	-	0	100	0	0	0	0	16/31
2006	80	-	25	75	0	0	0	0	8/8
2011	20	-	0	100	0	0	0	0	23/25
2016	40	-	0	100	0	0	0	0	14/25
2021	40	-	50	50	0	0	0	0	- / -
<b>Rosa woodsii<sup>p</sup> -- (Woods' rose)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	52/104
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	140	-	14	86	0	0	0	14	40/81
2001	120	-	0	100	0	0	0	0	44/78
2006	200	-	10	90	0	0	0	0	46/94
2011	80	-	0	100	0	25	0	0	51/89
2016	200	-	0	100	0	0	0	0	45/84
2021	540	-	22	63	15	0	0	37	- / -
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	31/75
2006	20	-	100	0	0	0	0	0	31/63
2011	-	-	-	-	-	-	-	-	53/63
2016	-	-	-	-	-	-	-	-	42/82
2021	280	-	14	86	0	7	0	14	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

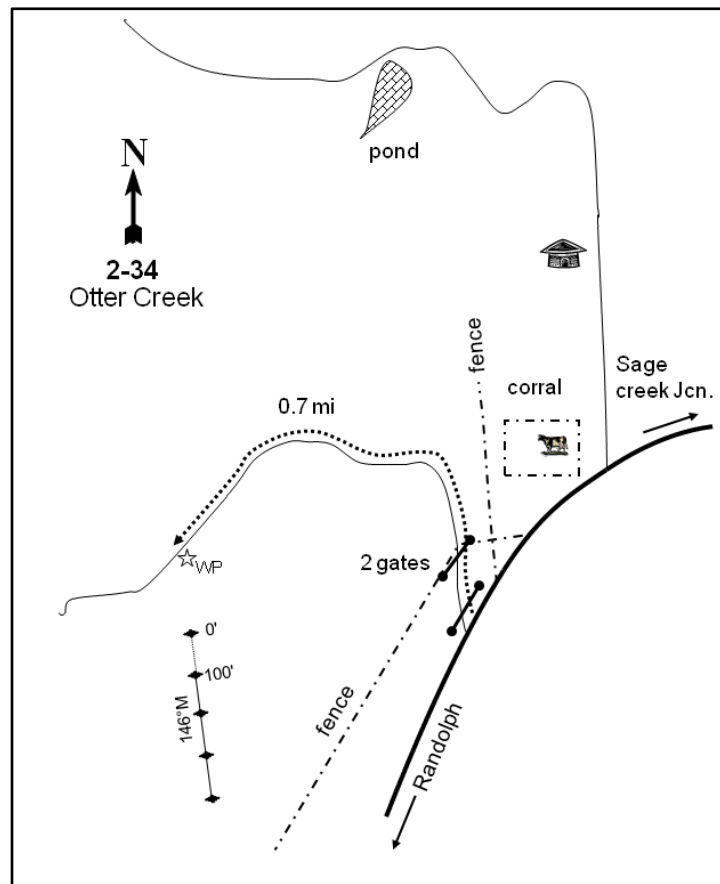
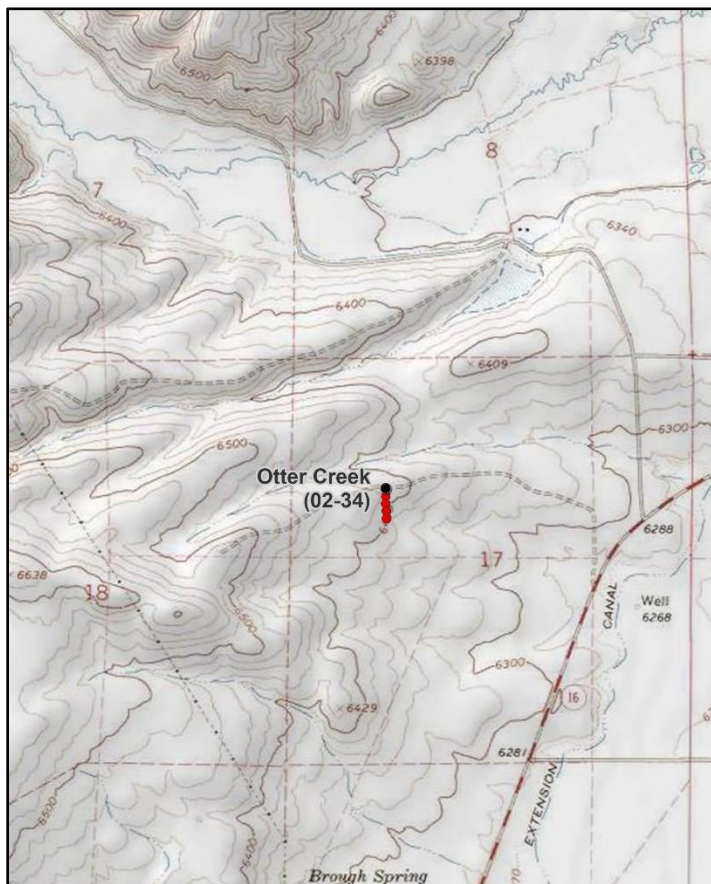
**Table 02-33.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
1996	112	-	-	-	-	-	4.7
2001	146	-	-	-	-	-	9.5
2006	122	10	65	5	20	-	7.1
2011	116	10	50	35	-	5	5.9
2016	161	10	45	45	-	-	11.9
2021	171	-	10	80	10	-	13.8
<b>Juniperus scopulorum (Rocky Mountain juniper)</b>							
2021	1	-	-	-	100	-	27.0

**Table 02-33.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	16.4	10.5	1.9	30.0	-0.2	9.3	0.0	<b>67.9</b>	Good
2001	19.4	11.0	3.1	30.0	-0.5	10.0	0.0	<b>73.0</b>	Good
2006	17.2	7.8	2.5	30.0	-0.4	10.0	0.0	<b>67.1</b>	Good
2011	18.1	9.7	8.0	30.0	-1.8	10.0	0.0	<b>74.0</b>	Good
2016	19.5	10.6	9.5	30.0	-2.5	9.0	0.0	<b>76.1</b>	Good
2021	18.3	2.4	8.5	26.9	0.0	3.9	0.0	<b>59.9</b>	Fair

### OTTER CREEK - STUDY NO. 02-34



**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Randolph NE; Township 11N, Range 7E, Section 17  
NAD 83 UTM ZONE 12, 484694 East 4616263 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

7977  
165° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Standard

**Directions to Site**

Proceed north from Randolph on State Route (SR) 16 and travel 0.5 miles past North Gray Lane. Turn left here (the road may be faint when it begins to go through the sagebrush) and proceed 0.7 miles from the first gate to a witness post on the left-hand (south) side of the road. From the witness post, walk 15 feet at 160 degrees magnetic to the 0-foot stake of the baseline which is marked with browse tag #7977.



**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	NEW CANYON
Elevation	6,400ft (1,951m)
Aspect	East
Slope	5%
Sample Dates	08/07/1996, 08/07/2001, 07/27/2006, 08/09/2011, 07/13/2016, 07/07/2021

**Table 02-34.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Herbicide - Herbicide Unknown	-	-	Prior to 1984	-
Seeding - Rangeland Drill	-	-	Prior to 1984	-
Aerator - Double Drum/Seed	-	-	Spring 2004	355

**Table 02-34.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Sage Creek Seeding			Broadcast	May 2004	787
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G		Wildrye		1.00	0.00
G	Bromus inermis	Smooth Brome		1.00	0.00
G	Dactylis glomerata	Orchardgrass	Paiute	0.63	0.00
G	Elymus lanceolatus	Thickspike Wheatgrass	Sodar	2.00	0.00
G	Pascopyrum smithii	Western Wheatgrass		2.00	0.00
G	Poa secunda	Canby Bluegrass	Canbar	0.69	0.00
G	Psathyrostachys juncea	Russian Wildrye		0.10	0.00
G	Thinopyrum ponticum	Tall Wheatgrass		0.80	0.00
F	Linum lewisii	Blue Flax		1.00	0.00
F	Sanguisorba minor	Small Burnet		0.25	0.00

**Wildlife Habitat and Vegetation History**

**Table 02-34.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	substantial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	summer	
Pronghorn	substantial	summer	

**Table 02-34.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Mountain Big Sagebrush/Perennial Grass	NA
1990	Mountain Big Sagebrush/Perennial Grass	NA
1996	Mountain Big Sagebrush/Perennial Grass	NA
2001	Mountain Big Sagebrush/Perennial Grass	NA
2006	Mountain Big Sagebrush/Perennial Grass	NA
2011	Mountain Big Sagebrush/Perennial Grass	NA
2016	Mountain Big Sagebrush/Perennial Grass	NA
2021	Mountain Big Sagebrush/Perennial Grass	NA

**Site Notes**

This study is located approximately two miles north of Randolph on the west side of SR-16. Prior to 1984, the study area was treated with an unknown herbicide or some kind of mechanical means to control sagebrush. In addition, crested wheatgrass (*Agropyron cristatum*) was drill seeded to increase forage production for livestock. By 2001, the area had returned to a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community. In the spring of 2004, a total of 355 acres were treated with a Lawson aerator: a greenstripping design was used, which left some untreated strips of sagebrush. Although the exact seed mix is unknown, the seed mix included crested wheatgrass, thickspike wheatgrass (*Elymus lanceolatus*), slender wheatgrass (*E. trachycaulus*), Lewis flax (*Linum lewisii*), and forage kochia (*Bassia prostrata*). The pasture just south of the study area remains a thick sagebrush community.

**Soils**

**Table 02-34.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.9	40.6	35.0	24.4	1.4	15.2	108.8	0.6	08/07/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation                      14 inches  
 NRCS Ecological Site                                                      Upland Loam (Bonneville Big Sagebrush)  
 NRCS Ecological Site #                                                      R047XA314UT  
 States and Transitions                                                      No state and transition model is available for this ecological site.

The shrub overstory of this site has been dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) since study establishment in 1984; cover of sagebrush has increased following a 2004 aerator treatment (Photos, Pre-1992 Data, Table 02-34.1, Table 02-34.12). Although lacking in diversity, the herbaceous understory has been very abundant in all sample years. Perennial grasses, particularly crested wheatgrass (*Agropyron cristatum*) and Sandberg bluegrass (*Poa secunda*), have been a co-dominant vegetation component throughout the duration of the study. Annual grasses have not been present in any sample year, and forbs have generally contributed little cover (Table 02-34.7, Table 02-34.10, Table 02-34.11). This site is expected to remain in this or a similar state in the future barring the occurrence of a major disturbance. However, 68% of sagebrush plants were considered to have poor vigor in 2021 (Table 02-34.13), likely due to drought stress. Should this drought stress continue, the associated loss of sagebrush may cause this site to transition to a different plant community type. Deer winter range condition has ranged between poor-fair and excellent due to fluctuations in sagebrush cover and demographics. As of 2021, deer winter range condition was considered to be fair. Improvement to deer wintering range can be accomplished through efforts that decrease sagebrush decadence, but also increase reproduction. Diversifying the number of species and increasing cover of native perennial forbs would also improve winter range conditions (Table 02-34.15).

**Trend Summary Tables**

**Table 02-34.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	16.1	0.7	-	-	-	-
2001	11.3	0.2	-	-	-	-
2006	9.1	0.2	-	7.8	0.4	-
2011	17.1	0.2	-	17.3	0.2	-
2016	15.3	0.2	-	20.4	0.2	-
2021	14.4	-	-	18.7	-	-

**Table 02-34.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	-	431	-	110	-	16.9	-	1.3
2001	-	410	26	107	-	13.2	0.1	0.8
2006	-	390	60	198	-	26.8	0.1	4.1
2011	-	418	177	147	-	19.4	2.3	2.3
2016	-	390	90	140	-	12.8	0.4	2.2
2021	-	395	18	159	-	13.2	0.0	2.3

**Table 02-34.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	42.1	3.8	29.0	0.2	0.0	35.9
2001	46.1	4.2	35.4	0.1	0.0	28.4
2006	32.9	1.5	42.8	0.0	0.0	37.8
2011	40.1	1.0	27.6	0.0	0.0	37.6
2016	59.4	5.0	17.0	0.0	0.0	28.2
2021	38.0	3.2	36.8	0.7	0.0	28.8

**Table 02-34.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer/Pronghorn	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency					
1996	5	-	17	7	-	1
2001	6	-	27	-	-	-
2006	3	-	20	1	-	2
2011	4	-	20	1	1	16
2016	4	-	8	1	-	12
2021	5	1	13	-	-	11
Year	Days Use Per Acre (ha)					
1996	-	-	-	-	-	-
2001	10.9 (26.9)	-	44.9 (110.9)	-	-	-
2006	10.9 (26.9)	-	28.1 (69.5)	-	-	-
2011	13.8 (34.1)	-	16.1 (39.7)	1.3 (3.3)	8.7 (21.5)*	-
2016	8.0 (19.7)	-	20.8 (51.3)	-	8.7 (21.5)*	-
2021	6.5 (16.1)	-	18.1 (44.7)	-	8.7 (21.5)*	-

\*Pellets per acre (ha)

**Table 02-34.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Carex (sedge)	Hesperostipa comata (needle and thread)	Poa secunda (Sandberg bluegrass)
year	Nested Frequency				
1996	-	357	-	2	305
2001	4	347	4	3	260
2006	-	363	6	-	211
2011	-	368	11	-	294
2016	-	360	17	-	139
2021	17	322	32	-	268
year	Average Cover (%)				
1996	-	11.6	-	0.0	5.3
2001	0.0	10.6	0.0	0.0	2.5
2006	-	23.2	0.2	-	3.4
2011	-	13.5	0.1	-	5.8
2016	-	11.2	0.5	-	1.1
2021	0.1	8.7	0.4	-	4.0

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-34.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Arenaria (sandwort)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus purshii (woollypod milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chenopodium leptophyllum <sup>a</sup> (narrowleaf goosefoot)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Cordylanthus ramosus <sup>a</sup> (bushy bird's beak)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Linum lewisii (Lewis flax)	Lomatium (desertparsley)	Microsteris gracilis <sup>a</sup> (slender phlox)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)
year	Nested Frequency																
1996	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-	83	33
2001	21	1	-	-	4	2	-	-	-	2	-	1	-	9	-	59	26
2006	60	1	1	-	0	-	-	-	-	-	-	1	85	-	-	91	52
2011	131	-	-	7	3	-	-	2	-	31	3	1	4	-	-	91	59
2016	29	-	-	-	7	2	2	-	8	29	-	1	-	-	1	95	25
2021	14	-	-	-	-	-	-	-	3	1	-	-	-	-	-	120	56
year	Average Cover (%)																
1996	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	1.2	0.1
2001	0.0	0.0	-	-	0.0	0.0	-	-	-	0.0	-	0.0	-	0.0	-	0.5	0.1
2006	0.1	0.0	0.0	-	0.0	-	-	-	-	-	-	0.0	0.9	-	-	2.8	0.3
2011	0.4	-	-	0.1	0.0	-	-	0.0	-	1.1	0.0	0.0	0.0	-	-	1.6	0.5
2016	0.1	-	-	-	0.0	0.0	0.0	-	0.0	0.2	-	0.0	-	-	0.0	1.6	0.1
2021	0.0	-	-	-	-	-	-	-	0.0	0.0	-	-	-	-	-	2.1	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES				
<i>Silene antirrhina</i> <sup>a</sup> (sleepy silene)				
<i>Tragopogon dubius</i> <sup>ai</sup> (yellow salsify)				
<i>Trifolium</i> (clover)				
<i>Zizadenus paniculatus</i> (foothill deathcamas)				
year	Nested Frequency			
1996	-	-	-	-
2001	-	5	19	5
2006	-	-	7	3
2011	63	1	26	-
2016	40	-	50	-
2021	-	-	5	1
year	Average Cover (%)			
1996	-	-	-	-
2001	-	0.0	0.1	0.0
2006	-	-	0.0	0.1
2011	0.8	0.0	0.1	-
2016	0.1	-	0.5	-
2021	-	-	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02-34.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES				
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <sup>p</sup> (mountain big sagebrush)				
<i>Atriplex falcata</i> (sickle saltbush)				
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>viscidiflorus</i> (yellow rabbitbrush)				
<i>Eriogonum microthecum</i> <sup>p</sup> (slender buckwheat)				
year	Line Intercept Cover (%)			
1996	-	-	-	-
2001	-	-	-	-
2006	7.8	0.2	0.2	-
2011	17.3	-	0.2	-
2016	20.4	-	0.2	-
2021	18.5	-	-	0.2
year	Quadrat Cover (%)			
1996	16.0	0.1	0.6	0.1
2001	11.3	0.2	0.0	0.0
2006	9.1	0.0	0.2	-
2011	17.1	-	0.2	-
2016	15.3	-	0.2	-
2021	14.1	-	-	0.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-34.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

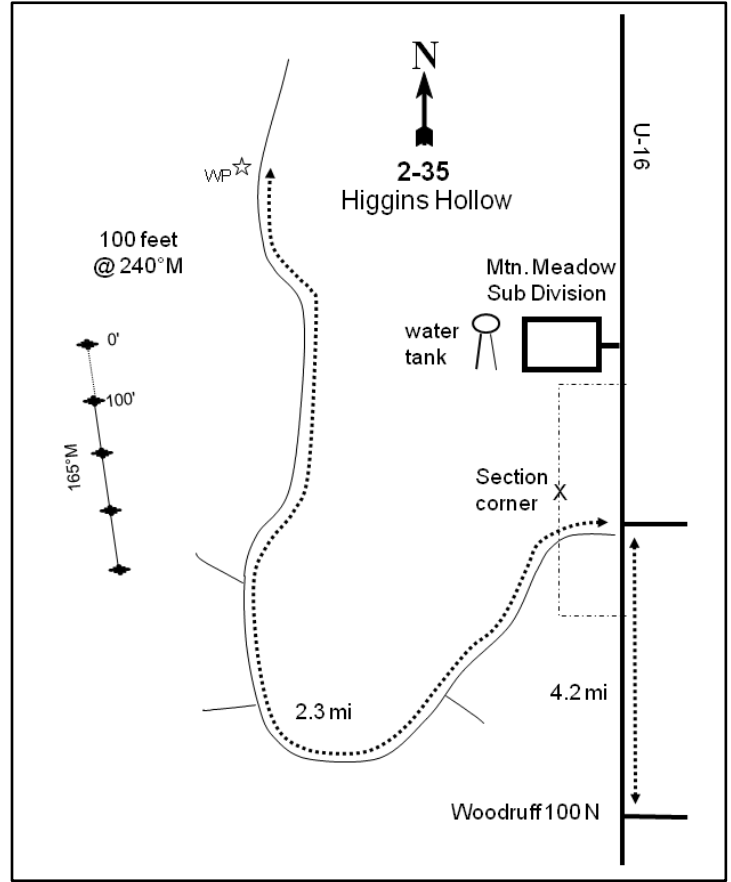
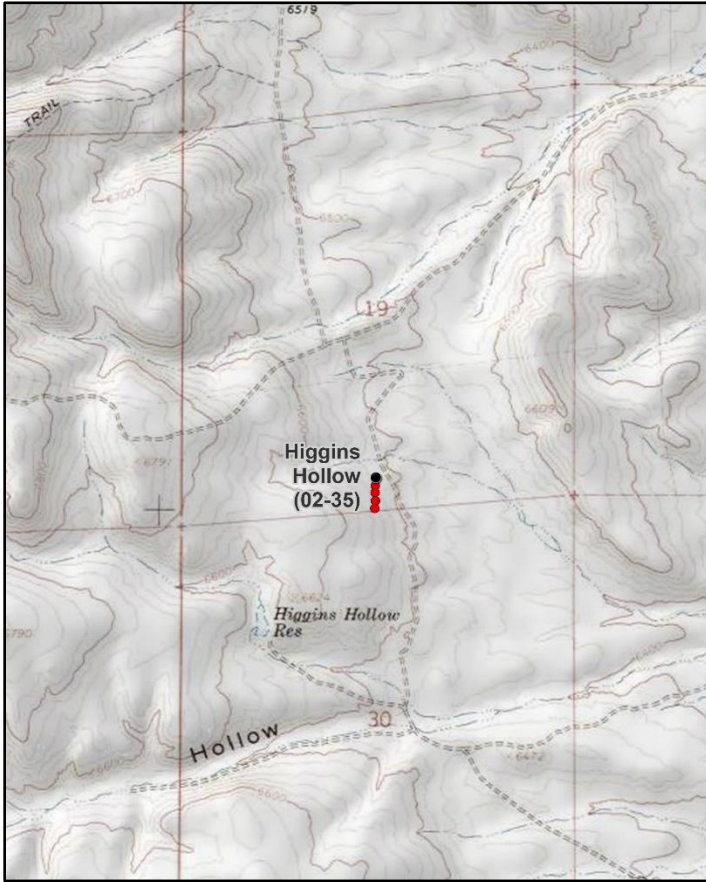
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	9620	400	16	76	9	31	3	88	40/59
2001	10440	-	12	47	41	32	0	4	39/57
2006	6760	340	7	72	21	20	14	14	31/45
2011	7720	27560	43	50	8	12	0	4	40/60
2016	19880	60	35	61	5	23	0	4	32/52
2021	13240	60	13	31	56	33	12	68	- / -
<b>Atriplex falcata -- (sickle saltbush)</b>									
1996	180	-	0	100	0	0	0	0	11/26
2001	240	-	0	100	0	0	0	0	5/18
2006	160	-	13	88	0	0	0	0	10/25
2011	20	-	0	100	0	0	0	0	9/18
2016	40	-	50	50	0	0	100	0	7/21
2021	100	-	0	100	0	100	0	0	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	340	-	0	94	6	0	0	88	25/42
2001	140	-	0	57	43	0	0	0	19/36
2006	320	-	0	88	13	0	0	19	25/41
2011	340	-	0	100	0	6	0	0	22/40
2016	220	-	0	91	9	0	9	0	17/32
2021	40	-	0	0	100	0	0	100	- / -
<b>Eriogonum microthecum<sup>p</sup> -- (slender buckwheat)</b>									
1996	20	-	0	100	0	0	0	0	14/29
2001	20	-	0	0	100	0	0	0	14/22
2006	-	-	-	-	-	-	-	-	- / -
2011	20	-	0	100	0	0	0	0	16/20
2016	20	-	0	100	0	0	0	0	12/12
2021	160	-	0	0	100	75	25	100	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	20	-	0	0	100	0	0	100	- / -
<b>Linanthus pungens -- (granite prickly phlox)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	84/111
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Opuntia -- (pricklypear)</b>									
1996	60	-	33	67	0	0	0	0	10/17
2001	20	-	0	100	0	0	0	0	9/32
2006	20	-	0	100	0	0	0	0	15/46
2011	20	-	0	100	0	0	0	0	11/29
2016	20	-	0	100	0	0	0	0	11/32
2021	40	-	0	100	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-34.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	20.2	12.4	7.7	30.0	0.0	2.7	0.0	<b>73.0</b>	Good
2001	14.2	2.7	6.0	26.3	0.0	1.6	0.0	<b>50.8</b>	Poor-Fair
2006	9.8	8.7	3.6	30.0	0.0	8.2	0.0	<b>60.2</b>	Fair
2011	21.6	12.8	15.0	30.0	0.0	4.6	0.0	<b>84.0</b>	Excellent
2016	25.5	13.6	15.0	25.6	0.0	4.3	0.0	<b>84.0</b>	Excellent
2021	23.4	-2.0	6.5	26.5	0.0	4.7	0.0	<b>59.0</b>	Fair

## HIGGINS HOLLOW - STUDY NO. 02-35



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Woodruff NW; Township 10N, Range 7E, Section 19  
NAD 83 UTM ZONE 12, 483457 East 4603655 North

### Transect Information

Browse Tag # (0' Stake)	9158
Transect Bearing	165° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

### Directions to Site

From 100 North in Woodruff, travel north on State Route (SR) 16 for 4.2 miles, then turn west onto a dirt road. Proceed through a pasture, passing a section marker at the west gate. Travel a total of 2.3 miles (staying right) to a witness post on the left (west) side of the road. From the witness post, walk 100 feet at 240 degrees magnetic to the 0-foot stake (browse tag #9158) of the baseline.



**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	WOODRUFF PASTURES
Elevation	6,500ft (1,981m)
Aspect	Northeast
Slope	14%
Sample Dates	08/28/1996, 08/07/2001, 07/27/2006, 08/09/2011, 07/12/2016, 07/12/2021

**Wildlife Habitat and Vegetation History****Table 02-35.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	substantial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	summer	
Pronghorn	crucial	year-long	

**Table 02-35.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Mountain Big Sagebrush/Perennial Grass	NA
1990	Mountain Big Sagebrush/Perennial Grass	NA
1996	Mountain Big Sagebrush/Perennial Grass	NA
2001	Mountain Big Sagebrush/Perennial Grass	NA
2006	Mountain Big Sagebrush/Perennial Grass	NA
2011	Mountain Big Sagebrush/Perennial Grass	NA
2016	Mountain Big Sagebrush/Perennial Grass	NA
2021	Mountain Big Sagebrush	NA

**Site Notes**

This study is located north of Woodruff on the west side of SR-16. The area is similar physically and edaphically to the Otter Creek study (2-34): the principal differences between these two areas are slope and past management practices. This study samples a relatively undisturbed mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community.

**Soils****Table 02-35.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.1	42.9	31.1	26.0	1.9	11.8	137.6	0.6	02/28/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Upland Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R047XA314UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1984, this site has been dominated by a dense stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with lesser amounts of other shrubs such as yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*) and spineless horsebrush (*Tetradymia canescens*) (Photos, Pre-1992 Data, Table 02-35.12, Table 02-35.13). The herbaceous understory has remained abundant and diverse, with perennial grasses, namely Sandberg bluegrass (*Poa secunda*) and western wheatgrass (*Pascopyrum smithii*), as a co-dominant site component in all years except 2021. The introduced annual grass species cheatgrass (*Bromus tectorum*) was present in 1996 and again in 2021, but in low amounts. Forbs have generally contributed little cover, although perennial forbs were moderately abundant in 2011 and 2016 (Table 02-35.7, Table 02-35.10, Table 02-35.11). Decadence of sagebrush increased in 2021, with 98% of plants having poor vigor (Table 02-35.13): this is likely due to drought stress. Should similar conditions continue in the future, this site may be at risk for sagebrush die-off and could transition into a different vegetation type. Deer winter range condition has decreased from good-excellent to fair due to a general increase in sagebrush decadence. As of 2021, deer winter range condition was considered to be fair. Improvement to deer wintering range can be accomplished through efforts that decrease sagebrush decadence, but also increase reproduction. Diversifying the number of species and increasing cover of native perennial forbs would also improve winter range conditions (Table 02-35.15).

**Trend Summary Tables****Table 02-35.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	20.4	1.4	-	-	-	-
2001	26.5	2.0	-	-	-	-
2006	22.5	2.8	-	30.6	3.5	-
2011	29.0	3.8	-	31.3	3.6	-
2016	22.8	3.1	-	36.5	9.1	-
2021	20.8	2.0	-	29.9	1.9	-

**Table 02-35.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	2	414	14	179	0.0	16.2	0.1	2.1
2001	-	409	50	166	-	15.7	0.2	2.2
2006	-	376	50	189	-	18.3	0.2	3.5
2011	-	393	191	236	-	21.2	5.5	5.3
2016	-	399	121	231	-	22.7	1.2	6.1
2021	4	384	3	204	0.1	12.6	0.0	1.6

**Table 02-35.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	23.1	10.2	37.9	0.4	0.1	38.9
2001	17.6	13.3	43.9	0.5	0.1	49.2
2006	21.6	6.6	43.6	1.0	0.1	45.5
2011	19.8	3.4	44.1	0.3	0.1	51.4
2016	23.0	9.0	34.2	0.4	0.2	53.2
2021	20.5	8.5	49.0	0.9	0.1	35.1

**Table 02-35.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Pronghorn	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
1996	9	13	-	-	12
2001	2	11	-	-	14
2006	2	9	1	-	23
2011	-	6	2	2	29
2016	-	11	-	3	13
2021	6	7	-	7	27
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	11.6 (28.7)	6.7 (16.6)	-	-	-
2006	4.4 (10.8)	10.7 (26.5)	-	-	-
2011	3.6 (9.0)	21.5 (53.0)	-	8.7 (21.5)*	-
2016	7.2 (17.9)	28.1 (69.5)	-	-	-
2021	5.8 (14.3)	16.1 (39.7)	-	26.2 (64.6)*	-

\*Pellets per acre (ha)

**Table 02-35.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency										
1996	1	2	4	31	-	16	5	4	-	406	9
2001	-	-	2	38	2	93	-	10	2	379	26
2006	2	-	12	54	-	120	-	12	11	329	54
2011	1	-	22	33	-	100	-	12	1	362	60
2016	15	-	72	68	2	184	-	2	-	329	17
2021	9	4	47	52	8	189	-	2	10	326	12
year	Average Cover (%)										
1996	0.0	0.0	0.0	0.3	-	0.1	0.1	0.0	-	15.7	0.0
2001	-	-	0.0	0.5	0.0	0.6	-	0.1	0.0	14.1	0.3
2006	0.0	-	0.0	0.8	-	1.1	-	0.4	0.1	14.1	1.7
2011	0.0	-	0.1	0.5	-	0.9	-	0.1	0.0	18.8	0.8
2016	0.2	-	0.4	1.3	0.0	3.8	-	0.0	-	16.4	0.5
2021	0.2	0.1	0.3	0.5	0.0	2.3	-	0.0	0.0	9.1	0.3

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-35.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Arenaria (sandwort)	Astragalus (milkvetch)	Astragalus cibirius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus miser var. tenuifolius (timber milkvetch)	Astragalus purshii (woollypod milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Chenopodium leptophyllum <sup>a</sup> (narrowleaf goosefoot)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Cordylanthus ramosus <sup>a</sup> (bushy bird's beak)	Crepis acuminata (tapertip hawkbeard)
year	Nested Frequency																
1996	-	-	5	4	-	-	-	3	-	-	-	-	-	-	-	9	-
2001	4	-	2	6	-	-	-	4	-	-	3	-	-	1	-	23	-
2006	3	-	3	-	-	21	-	7	-	-	1	-	-	4	-	40	1
2011	-	7	4	14	-	43	-	1	-	-	37	-	1	38	-	160	-
2016	2	33	-	10	9	-	30	33	16	-	10	2	-	27	3	72	-
2021	-	-	-	-	-	-	-	1	-	2	-	3	-	-	-	-	-
year	Average Cover (%)																
1996	-	-	0.1	0.0	-	-	-	0.0	-	-	-	-	-	-	-	0.0	-
2001	0.0	-	0.0	0.0	-	-	-	0.0	-	-	0.0	-	-	0.0	-	0.1	-
2006	0.0	-	0.1	-	-	0.4	-	0.0	-	-	0.0	-	-	0.0	-	0.2	0.0
2011	-	0.0	0.0	0.1	-	0.3	-	0.0	-	-	1.9	-	0.0	0.4	-	5.0	-
2016	0.0	0.3	-	0.0	0.0	-	0.4	0.2	0.1	-	0.0	0.0	-	0.1	0.0	0.7	-
2021	-	-	-	-	-	-	-	0.0	-	0.0	-	0.0	-	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cryptantha (cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Erigeron eatonii (Eaton's fleabane)	Erigeron pumilus (shaggy fleabane)	Helianthella uniflora (oneflower helianthella)	Lomatium triternatum (nineleaf biscuitroot)	Microsteris gracilis <sup>a</sup> (slender phlox)	Penstemon humilis (low beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Salsola tragus <sup>a</sup> (prickly Russian thistle)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Silene antirrhina <sup>a</sup> (sleepy silene)	Stenotus acaulis (stemless mock goldenweed)	Symphotrichum ascendens (western aster)
year	Nested Frequency																
1996	-	5	-	21	3	-	-	-	1	55	125	-	-	-	-	-	-
2001	-	10	-	20	9	-	5	16	-	66	94	-	4	1	-	-	-
2006	-	6	-	13	48	-	6	-	6	60	104	-	-	5	-	0	-
2011	1	10	2	72	6	-	1	5	-	53	90	1	-	4	-	4	-
2016	3	8	-	86	4	1	-	1	-	67	12	1	-	2	2	4	5
2021	-	-	-	69	1	-	1	-	-	70	97	-	-	-	-	2	1
year	Average Cover (%)																
1996	-	0.0	-	0.3	0.0	-	-	-	0.0	1.1	0.6	-	-	-	-	-	-
2001	-	0.0	-	0.1	0.0	-	0.2	0.0	-	1.2	0.4	-	0.0	0.0	-	-	-
2006	-	0.0	-	0.2	0.7	-	0.0	-	0.1	1.3	0.6	-	-	0.0	-	0.0	-
2011	0.0	0.0	0.0	1.0	0.0	-	0.0	0.0	-	1.1	0.4	0.0	-	0.0	-	0.2	-
2016	0.0	0.0	-	2.1	0.1	0.0	-	0.0	-	2.2	0.1	0.0	-	0.0	0.0	0.3	0.0
2021	-	-	-	0.4	0.0	-	0.0	-	-	0.5	0.3	-	-	-	-	0.1	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Trifolium (clover)	Veronica biloba <sup>a</sup> (two-lobed speedwell)	Zigadenus pumilus (foothill deathcamas)
year	Nested Frequency		
1996	-	-	2
2001	25	-	1
2006	15	-	11
2011	46	1	6
2016	40	-	15
2021	10	-	4
year	Average Cover (%)		
1996	-	-	0.0
2001	0.1	-	0.0
2006	0.0	-	0.1
2011	0.2	0.0	0.0
2016	0.2	-	0.2
2021	0.0	-	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02-35.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum microthecum <sup>p</sup> (slender buckwheat)	Linanthus pungens (granite prickly phlox)	Opuntia (pricklypear)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)					
1996	-	-	-	-	-	-
2001	-	-	-	-	-	-
2006	30.5	3.4	0.1	-	0.1	-
2011	31.2	3.4	0.1	-	0	0.2
2016	36.5	8.4	-	0.1	0.4	0.2
2021	29.9	1.6	-	-	0.3	-
year	Quadrat Cover (%)					
1996	20.4	1.4	0.0	-	0.0	-
2001	26.5	1.9	0.0	-	-	0.1
2006	22.4	2.6	0.1	-	0.0	0.2
2011	28.9	3.4	0.1	-	0.1	0.2
2016	22.7	2.8	0.1	0.0	0.4	0.0
2021	20.8	1.7	-	-	0.3	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-35.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	6760	80	19	62	19	43	4	2	61/84
2001	8080	20	2	51	48	23	1	4	60/78
2006	6200	-	1	64	36	14	2	25	58/83
2011	4520	260	2	62	35	39	6	29	61/89
2016	6300	100	3	68	29	13	0	27	56/79
2021	6420	-	3	24	73	0	0	98	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	1620	-	0	96	4	0	0	9	24/38
2001	2320	-	0	90	10	0	0	9	24/40
2006	2480	20	0	91	9	0	0	12	25/42
2011	2460	-	6	93	2	0	0	0	25/41
2016	2680	-	0	97	3	0	0	5	28/48
2021	2760	-	2	13	85	5	0	94	- / -
<b>Eriogonum microthecum<sup>p</sup> -- (slender buckwheat)</b>									
1996	220	-	9	82	9	0	0	9	16/18
2001	80	-	0	100	0	0	0	0	14/23
2006	140	-	0	100	0	0	0	0	16/24
2011	140	-	0	100	0	0	0	0	14/25
2016	140	-	0	100	0	0	0	0	17/20
2021	-	-	-	-	-	-	-	-	- / -

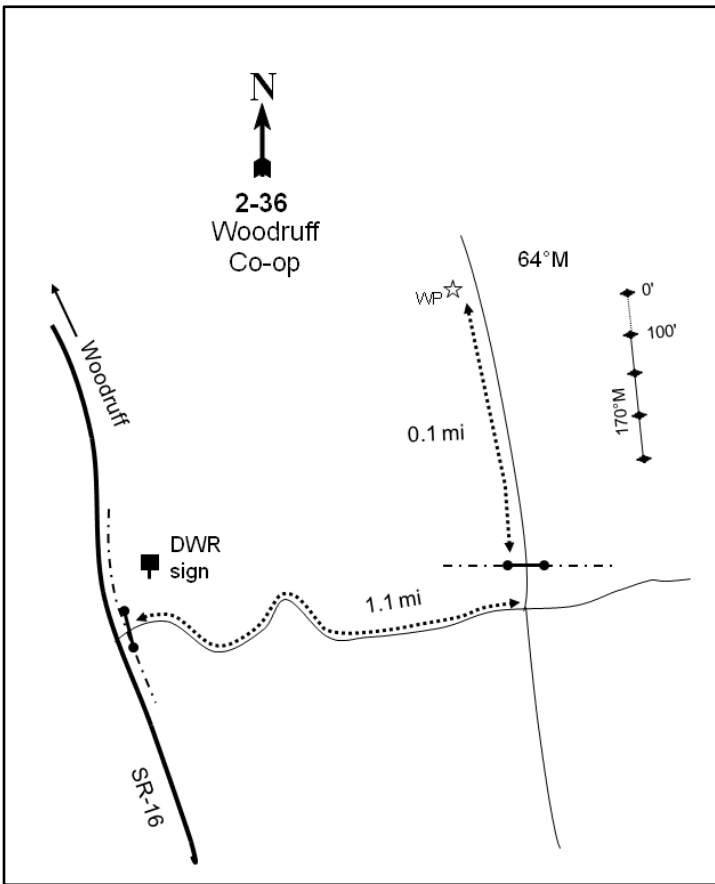
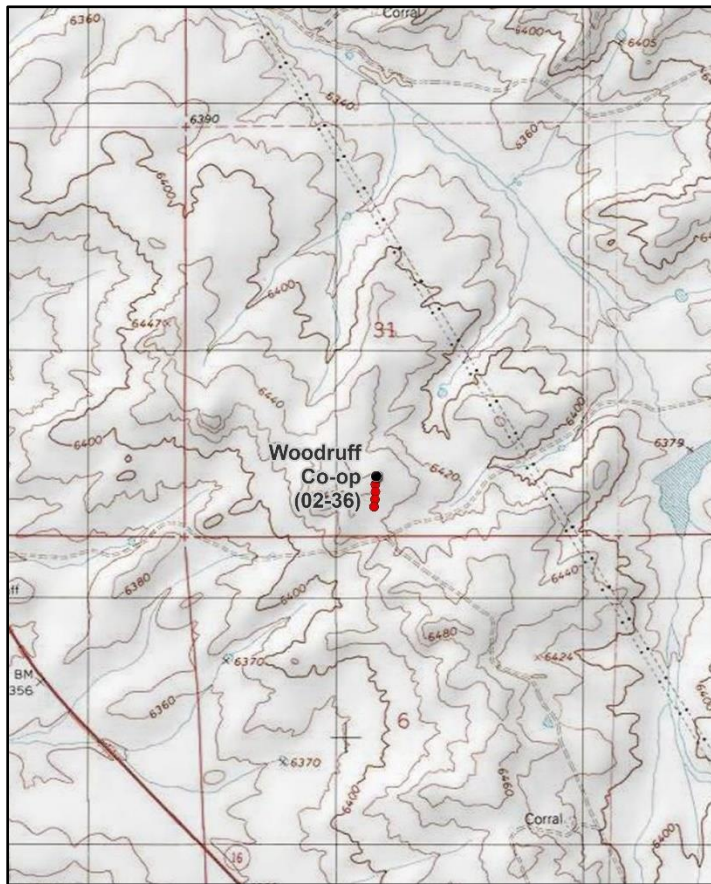
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Linanthus pungens -- (granite prickly phlox)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	20	-	0	100	0	0	0	0	- / -
2021	-	-	-	-	-	-	-	-	-/-
<b>Opuntia -- (pricklypear)</b>									
1996	100	-	0	100	0	0	0	0	9/29
2001	180	-	0	89	11	0	0	22	8/22
2006	140	-	0	100	0	0	0	0	12/36
2011	80	-	0	75	25	0	0	25	12/37
2016	200	-	0	100	0	0	0	0	16/36
2021	300	-	0	87	13	0	0	60	- / -
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	80	-	0	100	0	0	0	0	- / -
2021	-	-	-	-	-	-	-	-	-/-
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	60	-	0	67	33	0	0	33	12/27
2001	180	-	11	67	22	33	0	22	19/31
2006	140	-	14	71	14	0	0	0	17/22
2011	100	-	20	80	0	0	0	0	17/26
2016	100	-	0	100	0	0	0	0	17/26
2021	100	-	0	0	100	0	0	100	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-35.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	25.5	9.3	9.6	30.0	0.0	4.2	0.0	<b>78.6</b>	Good-Excellent
2001	30.0	0.8	1.0	30.0	0.0	4.4	0.0	<b>66.2</b>	Fair-Good
2006	30.0	4.4	0.3	30.0	0.0	7.0	0.0	<b>71.7</b>	Good
2011	30.0	4.4	1.1	30.0	0.0	10.0	0.0	<b>75.5</b>	Good
2016	30.0	6.2	1.3	30.0	0.0	10.0	0.0	<b>77.5</b>	Good
2021	30.0	-7.0	1.6	25.3	-0.1	3.2	0.0	<b>53.0</b>	Fair

## WOODRUFF CO-OP - STUDY NO. 02-36



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Neponset Reservoir N; Township 9N, Range 8E, Section 31  
NAD 83 UTM ZONE 12, 493110 East 4590692 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

554  
170° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Standard

### Directions to Site

From the junction of SR-39 and SR-16 in Woodruff, travel south on SR-16 for 5.7 miles to the Woodruff Co-op Livestock Management Area. Turn left (east) and pass through the gate. Drive 1.1 miles to a fork. Turn left, go north through the gate, and continue for 0.1 miles. The study is on the east side of the road, and the 0-foot baseline stake is approximately 60 paces away and marked with browse tag #554. The study stakes are short fence posts and the baseline has a small dogleg between the 300- and 400-foot stakes.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	EAST WOODRUFF
Elevation	6,550ft (1,996m)
Aspect	South
Slope	2%
Sample Dates	08/21/1996, 08/03/2001, 07/28/2006, 08/09/2011, 07/12/2016, 07/13/2021

**Table 02-36.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Seed Unknown	-	-	Historic	-
Disc - Disc Unknown	Woodruff Co-op WMA	-	2003	173
Seeding - Rangeland Drill	Woodruff Co-op WMA	-	2003	173

**Table 02-36.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Past. 1 Disk and Seed			Drill	Oct 2002	173
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	0.58	0.56
G	Dactylis glomerata	Orchardgrass	Paiute	0.58	0.50
G	Elymus lanceolatus	Thickspike Wheatgrass	Critana	0.58	0.55
G	Leymus cinereus	Great Basin Wildrye	Trailhead	0.41	0.19
G	Leymus cinereus	Great Basin Wildrye	Trailhead	0.29	0.24
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky	1.01	0.76
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Goldar	0.58	0.54
F	Astragalus cicer	Cicer Milkvetch		0.87	0.77
F	Linum perenne	Blue Flax	Appar	0.14	0.12
F	Medicago sativa	Alfalfa	Ranger	1.45	1.38
F	Melilotus officinalis	Yellow Sweetclover		0.29	0.27
F	Onobrychis viciifolia	Sainfoin	Remont	0.58	0.51
F	Sanguisorba minor	Small Burnet	VNS	1.45	1.29
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush		0.20	0.01
S	Atriplex canescens	Fourwing Saltbush		1.16	0.43

**Wildlife Habitat and Vegetation History****Table 02-36.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	summer	
Pronghorn	crucial	year-long	

**Table 02-36.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1990	Perennial Grass	NA
1996	Perennial Grass	NA
2001	Perennial Grass	NA
2006	Perennial Grass	NA
2011	Perennial Grass	NA
2016	Perennial Grass	NA
2021	Perennial Grass	NA

**Site Notes**

This study was established in 1990 to monitor Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) reestablishment in an area which is dominated by introduced perennial grasses. In 2002-2003, 173 acres were disked twice and drill seeded in the fall to establish more shrubs and to increase diversity within the community. Livestock were allowed back onto the allotment in 2005. The allotment continues to be used for spring cattle grazing.



**Soils****Table 02-36.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay	7.2	56.6	14.1	29.4	2.1	3.9	108.8	0.7	08/21/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	10 inches
NRCS Ecological Site	Semidesert Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R034XY212UT
States and Transitions	No state and transition model is available for this ecological site.

The vegetation on this site has existed as a perennial grass community since study establishment in 1990 (Photos, Pre-1992 Data, Table 02-36.7). Crested wheatgrass (*Agropyron cristatum*) has been the most abundant grass species in all sample years, although other native species are present in lower amounts. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed in some sample years, but with very low cover and abundance (Table 02-36.10). Forbs are depauperate in diversity and have generally remained rare (Table 02-36.11). Preferred browse species such as Wyoming big sagebrush, fourwing saltbush (*Atriplex canescens*) and winterfat (*Krascheninnikovia lanata*) are scattered throughout the site, but contribute little cover (Table 02-36.12, Table 02-36.13). This site will likely remain in this or a similar state in future sample years if a major disturbance does not occur. Deer winter range condition has remained fair. Improvement to deer wintering range can be accomplished through efforts to reestablish a preferred browse community. Diversifying the number of species and increasing cover of native perennial forbs would also improve winter range conditions (Table 02-36.15).

**Trend Summary Tables****Table 02-36.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	0.9	0.5	-	-	-	-
2001	1.5	1.4	-	-	-	-
2006	0.8	0.1	-	0.8	-	-
2011	1.6	0.1	-	2.1	0.1	-
2016	3.6	0.0	-	3.7	-	-
2021	3.4	0.3	-	3.8	0.1	-

**Table 02-36.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	-	454	48	82	-	23.7	0.1	1.2
2001	-	434	187	121	-	32.4	0.5	0.9
2006	5	352	135	150	0.0	23.7	1.0	1.9
2011	6	422	319	138	0.0	42.3	2.4	5.2
2016	1	445	79	52	0.0	33.4	0.2	0.5
2021	-	421	27	24	-	16.6	0.1	0.1

**Table 02-36.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	26.6	0.3	33.9	3.0	2.1	27.7
2001	35.8	2.1	43.7	1.9	1.0	39.5
2006	38.9	-	42.3	2.0	2.5	27.0
2011	23.4	0.3	34.1	3.7	1.0	49.5
2016	47.1	0.0	10.3	9.8	1.1	36.7
2021	38.8	0.2	49.9	3.1	1.7	19.8

**Table 02-36.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Pronghorn	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
1996	15	14	-	-	10
2001	19	6	-	-	7
2006	4	9	1	-	76
2011	7	16	3	-	7
2016	17	8	-	-	16
2021	12	21	1	1	11
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	41.4 (102.2)	7.4 (18.2)	2.7 (6.6)	26.2 (64.6)*	-
2006	17.4 (43.0)	12.8 (31.5)	6.7 (16.6)	8.7 (21.5)*	-
2011	-	39.6 (97.7)	-	-	-
2016	61.0 (150.6)	0.7 (1.7)	-	-	-
2021	8.0 (19.7)	36.8 (91.0)	0.7 (1.7)	34.9 (86.1)*	-

\*Pellets per acre (ha)

**Table 02-36.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Dactylis glomerata <sup>i</sup> (orchardgrass)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea <sup>i</sup> (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency								
1996	-	450	-	-	-	1	99	-	-
2001	5	423	-	-	-	26	107	-	-
2006	21	333	5	15	-	6	39	-	1
2011	35	422	6	1	10	1	10	4	4
2016	12	444	1	-	16	-	6	14	15
2021	1	416	-	-	2	4	42	92	1
year	Average Cover (%)								
1996	-	22.3	-	-	-	0.0	1.4	-	-
2001	0.0	30.5	-	-	-	0.5	1.4	-	-
2006	0.5	22.5	0.0	0.2	-	0.1	0.3	-	0.1
2011	0.4	41.5	0.0	0.0	0.1	0.0	0.0	0.1	0.2
2016	0.3	32.5	0.0	-	0.1	-	0.1	0.2	0.2
2021	0.0	15.1	-	-	0.0	0.2	0.1	1.1	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-36.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria (pussytoes)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Lappula occidentalis <sup>sa</sup> (flatspine stickseed)	Linum perenne <sup>i</sup> (blue flax)	Lomatium (desertparsley)	Medicago sativa <sup>i</sup> (alfalfa)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Sanguisorba minor <sup>i</sup> (small burnet)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Trifolium (clover)
year	Nested Frequency														
1996	45	2	-	-	-	-	-	-	-	46	41	-	4	3	-
2001	182	-	-	4	3	-	-	-	-	34	77	-	-	8	26
2006	135	-	9	-	2	-	36	-	118	-	-	5	-	-	8
2011	319	-	1	1	-	1	13	1	111	-	3	-	-	-	16
2016	79	-	-	8	4	-	5	-	4	-	1	-	-	3	31
2021	27	-	-	1	3	-	-	-	-	-	2	-	-	-	19
year	Average Cover (%)														
1996	0.1	0.0	-	-	-	-	-	-	-	1.1	0.1	-	0.0	0.0	-
2001	0.4	-	-	0.1	0.0	-	-	-	-	0.4	0.2	-	-	0.1	0.1
2006	1.0	-	0.1	-	0.0	-	0.2	-	1.5	-	-	0.0	-	-	0.0
2011	2.4	-	0.0	0.0	-	0.0	0.1	0.0	5.0	-	0.0	-	-	-	0.1
2016	0.2	-	-	0.1	0.0	-	0.1	-	0.1	-	0.0	-	-	0.0	0.2
2021	0.1	-	-	0.0	0.0	-	-	-	-	-	0.0	-	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02-36.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Atriplex canescens <sup>p</sup> (fourwing saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Krascheninnikovia lanata <sup>p</sup> (winterfat)	Opuntia polyacantha (plains pricklypear)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)						
1996	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-
2006	0.2	0.6	-	-	-	-	-
2011	0.3	1.3	-	-	0.5	0.1	0
2016	1.2	2.4	-	-	0.1	0	-
2021	1.6	2.1	-	-	0.1	0.1	-
year	Quadrat Cover (%)						
1996	0.3	-	0.3	0.0	0.6	0.2	0.1
2001	1.0	-	0.8	0.3	0.5	0.3	-
2006	0.2	0.5	0.1	-	-	-	0.0
2011	0.4	1.2	0.1	-	0.0	0.0	0.1
2016	0.9	2.6	0.0	-	0.0	0.0	0.0
2021	1.4	1.6	0.3	-	0.4	0.0	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-36.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
1996	320	-	0	94	6	31	0	0	36/61
2001	420	20	24	76	0	19	0	0	47/78
2006	620	20	42	58	0	26	23	0	17/19
2011	480	-	25	71	4	29	63	8	17/23
2016	420	220	0	100	0	81	14	0	29/41
2021	1380	120	67	32	1	13	13	14	- / -
<b>Atriplex canescens<sup>p</sup> -- (fourwing saltbush)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	460	20	39	61	0	22	9	0	40/39
2011	440	-	5	96	0	27	0	5	51/57
2016	460	-	9	91	0	35	0	0	57/79
2021	480	-	0	33	67	29	38	58	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	880	-	0	91	9	0	0	7	18/28
2001	1060	-	0	98	2	0	0	0	18/29
2006	40	-	0	100	0	100	0	0	12/26
2011	40	-	0	100	0	0	0	0	18/25
2016	60	-	0	100	0	0	33	0	17/24
2021	140	20	57	43	0	29	29	29	- / -

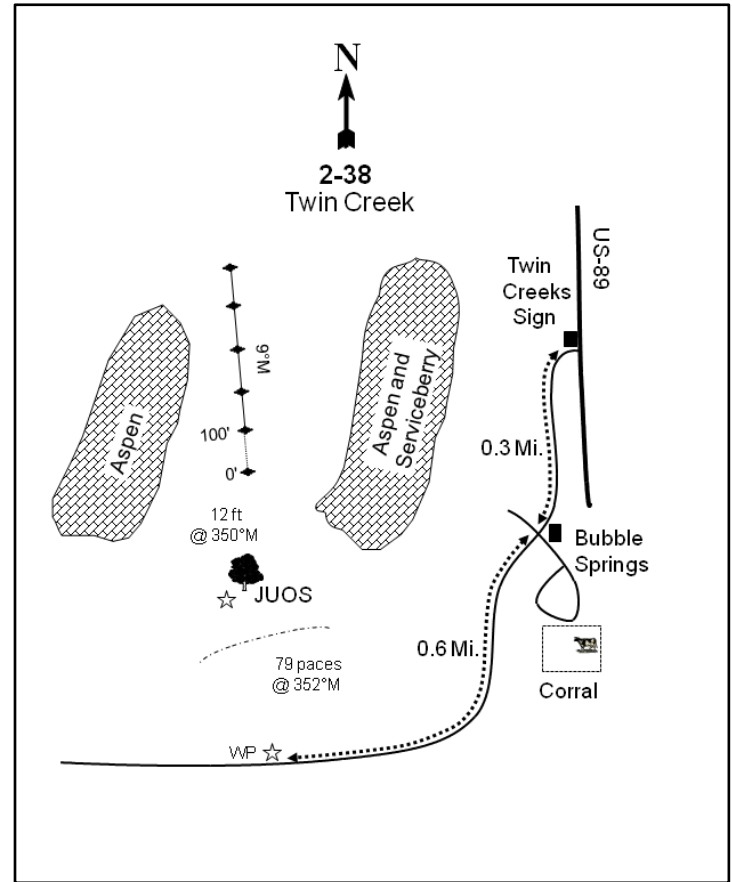
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	40	-	0	100	0	100	0	0	- / -
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	120	-	0	100	0	0	0	0	13/17
2001	220	-	0	100	0	0	0	0	17/29
2006	-	-	-	-	-	-	-	-	13/24
2011	20	-	0	100	0	0	0	0	18/24
2016	120	-	0	100	0	0	0	0	15/24
2021	120	-	0	100	0	0	0	0	- / -
<b>Krascheninnikovia lanata<sup>p</sup> -- (winterfat)</b>									
1996	2660	-	11	87	2	48	35	0	15/22
2001	2500	-	10	90	0	54	1	0	18/23
2006	20	-	0	100	0	100	0	0	12/17
2011	20	-	0	100	0	0	0	0	27/29
2016	20	-	0	100	0	100	0	0	15/19
2021	140	20	0	57	43	0	57	43	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	280	-	7	71	21	0	0	14	9/28
2001	420	20	5	95	0	0	0	5	8/23
2006	80	-	25	75	0	0	0	0	8/11
2011	100	-	0	100	0	0	0	0	8/15
2016	60	-	0	100	0	0	0	0	11/32
2021	80	20	0	50	50	0	0	0	- / -
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	200	-	0	90	10	40	10	0	13/24
2001	60	-	0	100	0	0	0	0	14/32
2006	80	20	0	100	0	25	75	0	14/27
2011	180	-	0	100	0	0	0	0	29/36
2016	260	-	23	77	0	8	8	0	14/20
2021	40	-	0	0	100	0	50	100	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-36.15 - Deer Desirable Components Index: Semidesert Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	1.1	0.0	0.0	30.0	0.0	2.4	0.0	<b>33.5</b>	Fair
2001	1.9	0.0	0.0	30.0	0.0	1.7	0.0	<b>33.6</b>	Fair
2006	1.0	0.0	0.0	30.0	0.0	3.7	0.0	<b>34.7</b>	Fair
2011	2.6	0.0	0.0	30.0	0.0	10.0	0.0	<b>42.6</b>	Fair
2016	4.6	0.0	0.0	30.0	0.0	1.0	0.0	<b>35.6</b>	Fair
2021	4.8	0.0	0.0	30.0	0.0	0.2	0.0	<b>35.0</b>	Fair

## TWIN CREEK - STUDY NO. 02-38

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Temple Peak NW; Township 13N, Range 3E, Section 14  
NAD 83 UTM ZONE 12, 451639 East 4634743 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

Not Available  
9° magnetic  
500ft  
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)  
Belt 3: 10ft; Belt 1: No Rebar

**Directions to Site**

Take the Twin Creek turnoff off of US-89 and proceed 0.3 miles to the Bubble Springs turn. Turn right and continue for 0.6 miles to a witness post on the right (north) side of the road. From the witness post, walk 74 paces at a bearing of 352 degrees magnetic to a lone juniper. From the juniper, the 0-foot baseline stake is 12 feet away at a bearing of 350 degrees magnetic. The baseline runs up the slope at 9 degrees magnetic.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	LOGAN CANYON
Elevation	6,500ft (1,981m)
Aspect	South
Slope	33-35%
Sample Dates	08/13/1996, 07/19/2001, 07/18/2006, 07/28/2011, 07/05/2016, 07/06/2021

**Wildlife Habitat and Vegetation History****Table 02-38.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	winter

**Table 02-38.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1996	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2001	Mountain Big Sagebrush/Perennial Grass	Phase I
2006	Mountain Big Sagebrush/Perennial Grass	Phase I
2011	Mountain Big Sagebrush/Perennial Grass	Phase I
2016	Mountain Big Sagebrush/Perennial Grass	Phase I
2021	Mountain Big Sagebrush/Perennial Grass	Phase I

**Site Notes**

This study is located in Logan Canyon, just east of the Twin Creek corrals. The study was established to monitor elk concentrations during the winter months.

**Soils****Table 02-38.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.3	42.9	32.1	25.0	6.5	38.4	278.4	0.5	08/13/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	26 inches
NRCS Ecological Site	High Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA516UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1996, the shrub overstory of this site has been dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with subordinate species such as antelope bitterbrush (*Purshia tridentata*) and chokecherry (*Prunus virginiana*) also present (Table 02-38.12, Table 02-38.13). The herbaceous understory has been abundant and rich in diversity in all study years; perennial grasses have been a co-dominant vegetation component throughout the duration of the study (Table 02-38.7). Bluebunch wheatgrass (*Pseudoroegneria spicata*) has been the dominant perennial grass species in most sample years. However, the introduced species bulbous bluegrass (*Poa bulbosa*) has been observed with increasing cover throughout the duration of the study and provided much of the perennial grass cover along with bluebunch wheatgrass in 2021 (Table 02-38.10). Forb diversity has remained high and cover has mainly been contributed by perennial species (Table 02-38.11). Utah juniper (*Juniperus osteosperma*) has been present since 2001 (Photos, Table 02-38.14). The site has been considered to be within Phase I of woodland succession since that time (Table 02-38.4), however, indicating that further tree encroachment may not be an immediate concern.

**Trend Summary Tables****Table 02-38.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	14.7	7.3	-	-	-	-
2001	21.7	6.6	-	-	-	-
2006	19.2	4.8	-	29.9	9.9	-
2011	19.6	3.9	-	37.4	9.4	-
2016	26.0	3.3	-	32.7	7.8	-
2021	25.8	4.0	-	34.4	2.8	-

**Table 02-38.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	3	412	331	132	0.1	21.8	5.3	9.0
2001	-	424	259	150	-	18.9	2.8	11.8
2006	14	406	203	167	0.0	22.5	1.3	11.2
2011	19	419	225	217	0.1	25.5	2.6	13.8
2016	52	441	157	251	1.1	33.5	1.4	15.5
2021	14	406	135	203	0.0	22.1	2.0	11.7

**Table 02-38.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	5.3	0.6	54.7	2.8	5.7	53.3
2001	10.9	0.6	41.8	5.8	2.7	58.3
2006	18.6	0.0	33.5	5.7	3.7	58.4
2011	4.7	0.1	41.0	4.0	2.1	64.4
2016	12.2	0.2	25.9	6.9	2.1	66.5
2021	9.2	0.0	33.1	4.6	4.1	62.5

**Table 02-38.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Domestic Sheep	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1996	2	6	28	-	-
2001	-	5	18	-	-
2006	7	4	2	-	-
2011	2	4	6	-	-
2016	4	7	1	-	1
2021	2	6	8	-	-
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	2.9 (7.2)	6.0 (14.9)	42.2 (104.3)	-	-
2006	13.1 (32.3)	14.1 (34.8)	10.0 (24.8)	-	-
2011	13.1 (32.3)	2.0 (5.0)	12.1 (29.8)	0.6 (1.4)	-
2016	5.1 (12.6)	8.7 (21.5)	10.7 (26.5)	-	-
2021	2.9 (7.2)	22.1 (54.6)	16.1 (39.7)	-	-



**Table 02-38.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus marginatus (mountain brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Elymus trachycaulus (slender wheatgrass)	Leymus cinereus (basin wildrye)	Melica bulbosa (oniongrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency												
1996	-	9	-	40	3	-	70	23	9	33	162	27	265
2001	-	13	-	25	-	0	19	9	64	50	222	67	264
2006	-	-	10	47	4	-	9	10	27	46	137	36	339
2011	2	4	19	74	-	0	20	32	51	197	105	22	335
2016	-	64	49	41	7	3	10	38	25	212	160	25	263
2021	24	27	14	23	-	25	15	15	25	248	30	58	276
year	Average Cover (%)												
1996	-	0.2	-	0.8	0.1	-	1.9	1.0	0.1	1.6	3.4	0.5	12.3
2001	-	0.2	-	0.4	-	0.0	0.5	0.5	0.9	1.2	6.8	0.8	7.5
2006	-	-	0.0	0.9	0.0	-	0.2	1.2	0.2	0.7	2.0	0.3	17.0
2011	0.0	0.0	0.1	1.1	-	0.0	0.9	1.7	0.3	5.0	1.1	0.1	15.4
2016	-	2.1	1.0	1.2	0.2	0.0	0.3	3.3	0.3	7.3	7.0	0.2	11.7
2021	0.6	0.8	0.0	0.3	-	0.1	0.1	0.9	0.2	8.4	0.4	0.8	9.6

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-38.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis drummondii (Drummond's rockcress)	Astragalus (milkvetch)	Astragalus beckwithii (Beckwith's milkvetch)	Balsamorhiza macrophylla (cutleaf balsamroot)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littledrop false flax)	Chenopodium album <sup>a</sup> (lambsquarters)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Delphinium nuttallianum (twolobe larkspur)
year	Nested Frequency																
1996	16	-	173	3	-	-	-	2	-	-	-	3	106	46	22	5	10
2001	10	-	117	0	-	-	-	6	-	4	-	0	99	94	14	7	3
2006	27	21	35	3	2	7	1	13	7	-	3	4	32	86	11	7	-
2011	43	8	55	2	19	7	2	11	4	-	5	9	19	63	20	4	-
2016	52	20	77	1	4	14	2	15	4	-	-	11	1	27	19	28	-
2021	25	18	57	-	1	11	6	40	-	-	-	6	8	9	16	15	3
year	Average Cover (%)																
1996	0.3	-	0.9	0.0	-	-	-	0.5	-	-	-	0.2	0.3	0.2	0.5	0.0	0.0
2001	0.1	-	0.3	0.0	-	-	-	0.9	-	0.0	-	0.0	0.5	0.3	0.1	0.2	0.0
2006	0.4	0.1	0.1	0.0	0.1	0.0	0.4	1.1	0.0	-	0.0	0.4	0.1	0.2	0.1	0.1	-
2011	1.7	0.0	0.1	0.0	0.2	0.1	0.4	1.3	0.0	-	0.0	0.0	0.1	0.2	0.4	0.0	-
2016	2.1	0.1	0.2	0.0	0.0	0.2	0.1	2.1	0.0	-	-	0.2	0.0	0.2	0.6	0.4	-
2021	0.9	0.1	0.2	-	0.0	0.1	0.5	3.5	-	-	-	0.6	0.1	0.0	0.2	0.2	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Eriogonum heracleoides (parsnip/flower buckwheat)	Galium aparine <sup>a</sup> (stickywilly)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Hackelia patens (spotted stickseed)	Helianthella uniflora (oneflower helianthella)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stone seed)	Lupinus argenteus (silvery lupine)	Microsteris gracilis <sup>a</sup> (slender phlox)	Nocca fendleri ssp. glauca (alpine pennycress)	Packera multilobata (lobeleaf groundsel)	Phlox longifolia (longleaf phlox)
year	Nested Frequency																
1996	-	3	99	20	4	-	-	5	18	8	-	14	20	46	1	5	-
2001	6	-	53	39	2	-	3	9	3	3	-	19	9	54	-	9	-
2006	-	-	62	38	1	1	-	21	1	3	1	10	9	22	0	0	2
2011	2	-	37	46	59	-	13	15	-	14	4	4	21	28	-	2	-
2016	-	-	22	44	16	-	2	39	11	3	9	1	32	2	3	2	-
2021	-	-	7	44	-	-	1	32	1	5	6	5	15	23	1	-	-
year	Average Cover (%)																
1996	-	0.0	0.7	2.1	0.0	-	-	0.4	0.1	0.1	-	0.2	0.4	0.2	0.0	0.0	-
2001	0.0	-	0.1	2.3	0.0	-	0.0	0.3	0.0	0.0	-	0.8	0.3	0.2	-	0.0	-
2006	-	-	0.2	2.0	0.0	0.0	-	1.6	0.0	0.0	0.0	0.4	0.2	0.0	0.0	0.0	0.0
2011	0.0	-	0.2	2.4	0.9	-	0.1	1.4	-	0.1	0.0	0.3	0.8	0.1	-	0.0	-
2016	-	-	0.1	1.9	0.3	-	0.0	2.5	0.1	0.0	0.0	0.0	1.0	0.0	0.0	0.0	-
2021	-	-	0.0	1.9	-	-	0.0	1.3	0.0	0.1	0.3	0.1	0.4	0.2	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Symphoricarum (aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Verbascum blattaria <sup>ai</sup> (moth mullein)	Veronica biloba <sup>ai</sup> (two-lobed speedwell)	Wyethia amplexicaulis (mule-ears)
year	Nested Frequency							
1996	69	-	9	4	88	8	132	31
2001	22	-	-	-	94	-	18	58
2006	68	-	-	-	17	17	3	42
2011	51	-	5	8	64	3	21	69
2016	1	2	4	12	33	1	1	41
2021	1	3	-	8	53	4	-	33
year	Average Cover (%)							
1996	0.2	-	0.7	0.0	1.1	0.1	1.4	3.8
2001	0.1	-	-	-	1.2	-	0.0	6.8
2006	0.2	-	-	-	0.1	0.0	0.0	4.6
2011	0.2	-	0.0	0.0	0.5	0.0	0.1	4.5
2016	0.0	0.0	0.0	0.1	0.4	0.0	0.0	4.3
2021	0.0	0.0	-	0.1	0.8	0.0	-	2.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02-38.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum heracleoides (parsnipflower buckwheat)	Prunus virginiana <sup>p</sup> (chokecherry)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)
year	Line Intercept Cover (%)						
1996	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-
2006	-	18.5	7.4	2.5	0.2	1.9	9.3
2011	-	21.5	6.4	3	0.2	2.7	13
2016	-	24.6	5.2	2.6	0.1	2.1	5.9
2021	-	22.6	2.8	-	0.2	4.9	6.7
year	Quadrat Cover (%)						
1996	0.4	6.6	7.3	-	0.1	2.0	5.6
2001	0.1	11.4	6.6	-	0.3	2.2	7.7
2006	-	10.2	4.8	0.0	0.5	2.1	6.4
2011	0.0	11.2	3.9	0.0	0.4	1.9	6.1
2016	0.1	16.8	3.3	0.0	0.4	3.1	5.7
2021	-	15.6	4.0	-	0.1	4.6	5.6

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-38.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	20	-	0	100	0	0	100	100	88/63
2001	20	-	0	0	100	0	100	0	83/68
2006	-	-	-	-	-	-	-	-	109/110
2011	-	-	-	-	-	-	-	-	105/100
2016	60	-	67	33	0	33	0	33	92/71
2021	20	-	100	0	0	0	0	0	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	1460	280	18	80	3	51	4	10	69/109
2001	1260	20	3	89	8	11	5	3	75/121
2006	1280	600	8	81	11	3	0	9	75/128
2011	1980	460	11	69	20	16	0	9	67/109
2016	2700	80	43	54	3	1	10	7	81/127
2021	2300	-	10	70	19	6	1	37	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	2180	-	3	96	1	0	0	2	42/66
2001	2260	20	7	88	5	0	0	2	38/65
2006	1740	-	2	97	1	0	0	1	35/63
2011	1800	-	1	92	7	0	0	1	36/58
2016	1500	-	5	93	1	1	1	4	38/57
2021	1580	-	8	76	17	6	0	17	- / -

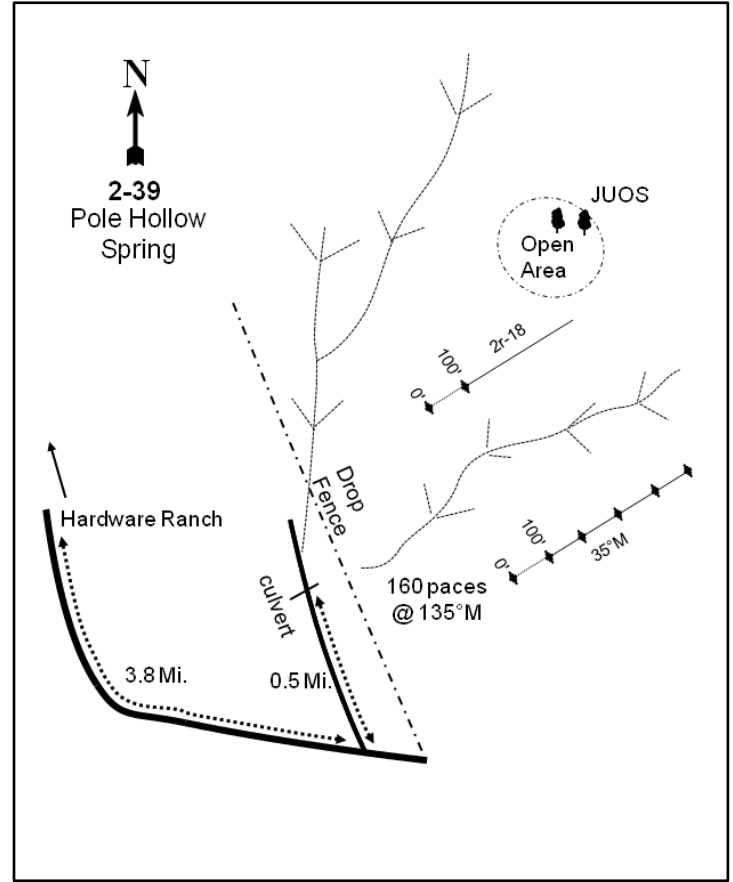
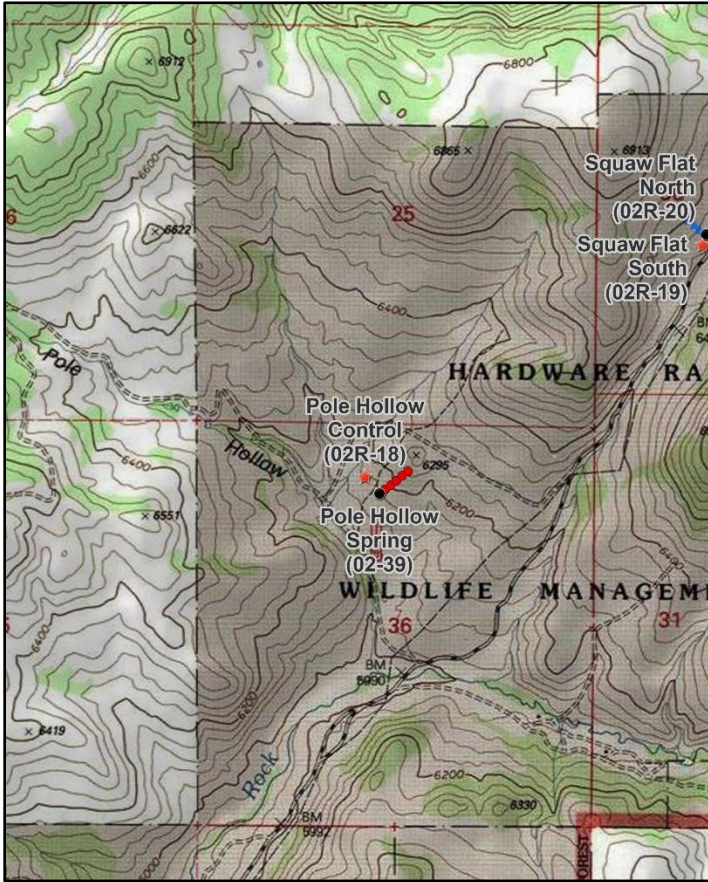
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Eriogonum heracleoides -- (parsnipflower buckwheat)</b>									
1996	860	-	0	98	2	0	0	0	19/53
2001	1060	-	0	98	2	0	0	2	24/54
2006	840	-	0	100	0	7	0	0	19/54
2011	840	-	0	100	0	0	0	0	12/47
2016	1040	20	0	100	0	0	0	2	17/45
2021	-	-	-	-	-	-	-	-	-/-
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	104/187
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Prunus virginiana<sup>p</sup> -- (chokecherry)</b>									
1996	140	-	86	14	0	43	0	0	34/26
2001	260	-	54	46	0	0	0	0	56/64
2006	400	-	10	90	0	0	90	0	30/32
2011	520	40	42	58	0	23	8	0	45/30
2016	760	-	97	3	0	0	0	29	49/72
2021	280	-	21	79	0	0	0	0	-/-
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	180	-	22	67	11	44	44	0	55/112
2001	180	-	0	78	22	0	89	22	63/117
2006	180	-	0	100	0	22	67	0	63/112
2011	280	-	21	71	7	21	14	0	67/125
2016	180	-	56	44	0	22	0	0	74/132
2021	300	-	40	53	7	13	7	7	-/-
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	1220	20	10	84	7	10	18	13	73/115
2001	1060	-	0	93	8	0	0	2	79/121
2006	1000	-	8	92	0	0	0	0	74/116
2011	1480	-	5	95	0	3	0	0	66/111
2016	1000	-	14	86	0	2	8	0	72/117
2021	1460	-	15	81	4	1	0	0	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-38.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2016	3	-	-	-	-	100	49.0
2021	3	-	-	-	-	100	51.0

## POLE HOLLOW SPRING - STUDY NO. 02-39



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Boulder Mountain SE; Township 11N, Range 3E, Section 36  
NAD 83 UTM ZONE 12, 454129 East 4611223 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

Not Available  
41° magnetic  
500ft  
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)  
Belt 4: No Rebar

### Directions to Site

From Hardware Ranch, travel northeast for 3.8 miles to the Pole Hollow Road. Turn left and travel up Pole Hollow for 0.5 miles to a culvert. From the open area, walk 160 paces at a bearing of approximately 135 degrees magnetic to the 0-foot baseline stake. The baseline runs at a bearing of 35 degrees magnetic.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,177ft (1,883m)
Aspect	Southwest
Slope	15-18%
Sample Dates	08/20/1996, 07/16/2001, 07/12/2006, 07/18/2011, 06/28/2016, 06/29/2021

**Table 02-39.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Hardware Plateau Lop and Scatter	3701	September-November 2016	2143
Herbicide - Milestone	Hardware Ranch WMA Weed Abatement	4762	July 2019-June 2020	269

**Wildlife Habitat and Vegetation History****Table 02-39.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	summer	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long	brood-rearing
Shiras Moose	crucial	winter	

**Table 02-39.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1996	Mixed Shrub	Phase I
2001	Mixed Shrub	Phase I
2006	Mixed Shrub	Phase I
2011	Mixed Shrub	Phase I
2016	Mixed Shrub	Phase I
2021	Mixed Shrub	Phase I

**Site Notes**

This study is located four miles northeast of the Hardware Ranch Visitors' Center on land administered by the Utah Division of Wildlife Resources (UDWR). The study monitors a mountain brush community and is best classified as summer/transitional range for wildlife. Cattle also use the area in summer. In the past, the study area may have been intensively grazed as part of the Hardware grazing study. A control study, temporarily surrounded by an electric fence, is located 300 feet to the northeast. In 2016, one doe and one fawn were found bedded on the site.

**Soils****Table 02-39.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay	7.0	28.6	27.4	44.0	5.1	28.8	249.6	1.3	08/20/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	24 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1996, this site has remained dominated by a mixture of shrub species including mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), mountain snowberry (*Symphoricarpos oreophilus*), and antelope bitterbrush (*Purshia tridentata*). Additional shrub species are present, but contribute less cover (Photos, Table 02-39.12, Table 02-39.14). The herbaceous component has remained diverse and abundant, with perennial forbs and grasses providing most of the understory cover. Introduced annual brome grasses (*Bromus* sp.) were present with low abundance between 1996 and 2016, but were not recorded in cover or frequency data in 2021 (Table 02-39.7, Table 02-39.10, Table 02-39.11). Rocky Mountain juniper (*Juniperus scopulorum*) has been observed in the area throughout the duration of the study, placing the site within Phase I of woodland succession in all years (Photos, Table 02-39.4, Table 02-39.12, Table 02-39.13, Table 02-39.14). A lop and scatter treatment occurred in the fall of 2016 (Table 02-39.1), however, and tree density is low as of 2021 (Table 02-39.14). Although encroachment likely does not pose an immediate threat to the ecological integrity of the plant community, the extant tree component indicates that there may be potential for infilling over time.

**Trend Summary Tables****Table 02-39.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	31.3	4.4	-	-	-	-
2001	38.3	3.8	-	-	-	-
2006	39.7	5.2	-	54.4	6.2	-
2011	40.4	4.9	-	61.4	4.5	0.1
2016	38.2	6.3	0.0	51.7	6.4	-
2021	31.1	6.3	0.4	47.1	6.5	0.6

**Table 02-39.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	154	406	76	258	4.1	15.9	0.8	6.5
2001	67	418	149	282	0.3	18.5	1.8	8.5
2006	11	344	133	330	0.0	9.8	2.3	11.8
2011	14	359	143	363	0.4	19.3	2.8	24.0
2016	3	360	130	325	0.0	12.8	2.4	12.5
2021	-	337	90	262	-	15.5	1.6	7.5

**Table 02-39.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	14.2	-	56.5	1.8	0.5	55.3
2001	15.3	-	40.7	1.9	0.2	61.6
2006	22.3	-	47.5	0.4	0.1	61.8
2011	8.7	-	46.5	1.7	0.0	73.7
2016	13.4	-	43.8	1.2	0.2	60.0
2021	10.1	0.1	43.8	1.3	0.2	61.6

**Table 02-39.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Shiras Moose	Rabbit
	Quadrat Frequency					
1996	2	2	6	-	-	-
2001	-	-	-	-	-	-
2006	1	2	-	-	-	-
2011	-	1	-	-	-	3
2016	2	-	1	-	-	1
2021	-	2	2	-	-	2
Year	Days Use Per Acre (ha)					
1996	-	-	-	-	-	-
2001	1.5 (3.6)	12.8 (31.5)	-	-	-	-
2006	8.0 (19.7)	6.7 (16.6)	2.7 (6.6)	8.7 (21.5)*	1.0 (2.4)	-
2011	-	0.7 (1.7)	0.7 (1.7)	-	-	-
2016	3.6 (9.0)	9.4 (23.2)	-	26.2 (64.6)*	-	-
2021	9.4 (23.3)	14.1 (34.8)	4.7 (11.6)	-	-	-

\*Pellets per acre (ha)

**Table 02-39.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Koeleria macrantha (prairie Junegrass)	Leymus cinereus (basin wildrye)	Melica bulbosa (oniongrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency															
1996	42	-	144	3	32	-	14	-	29	-	-	-	13	279	8	214
2001	50	-	66	16	1	-	14	-	32	1	-	-	41	251	21	109
2006	28	-	10	15	2	-	2	23	27	-	-	-	52	146	11	164
2011	32	-	14	20	-	5	15	35	65	-	-	1	28	41	-	259
2016	46	-	3	26	-	1	11	61	11	-	-	-	8	86	-	208
2021	30	21	-	49	-	10	35	38	3	-	4	-	5	33	-	254
year	Average Cover (%)															
1996	0.4	-	2.5	0.0	1.6	-	0.1	-	0.3	-	-	-	0.1	8.0	0.2	6.7
2001	1.5	-	0.3	0.5	0.0	-	0.5	-	0.5	0.0	-	-	1.1	11.5	0.5	2.5
2006	0.8	-	0.0	0.1	0.0	-	0.0	0.2	0.5	-	-	-	0.6	3.7	0.2	3.8
2011	1.6	-	0.4	1.8	-	0.0	0.2	0.4	2.7	-	-	0.0	0.3	0.9	-	11.3
2016	0.6	-	0.0	0.7	-	0.0	0.2	1.4	0.2	-	-	-	0.0	1.9	-	7.8
2021	0.8	0.2	-	1.1	-	0.0	1.3	1.1	0.0	-	0.2	-	0.1	0.7	-	10.0

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-39.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Artemisia ludoviciana (white sagebrush)	Astragalus cibirarius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus lentiginosus (freckled milkvetch)	Balsamorhiza macrophylla (cutleaf balsamroot)	Calochortus nuttallii (sego lily)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cordylanthus ramosus <sup>a</sup> (bushy bird's beak)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)
year	Nested Frequency																
1996	98	5	-	-	6	-	9	-	5	-	19	3	-	4	1	-	1
2001	77	-	47	-	7	-	16	-	0	3	14	27	48	54	21	-	-
2006	95	2	90	1	3	5	47	4	3	2	3	9	12	44	74	2	-
2011	115	-	177	1	6	1	36	-	7	2	22	5	28	38	71	-	-
2016	84	3	26	5	8	-	29	1	4	-	17	3	65	45	69	-	-
2021	93	5	-	-	6	2	7	3	-	-	21	4	4	52	2	2	-
year	Average Cover (%)																
1996	1.7	0.0	-	-	0.3	-	0.0	-	0.0	-	0.5	0.0	-	0.1	0.0	-	0.0
2001	0.9	-	0.3	-	0.3	-	0.2	-	0.0	0.0	0.2	0.1	0.2	0.9	0.7	-	-
2006	3.1	0.0	0.4	0.0	0.0	0.2	0.5	0.1	0.0	0.0	0.2	0.0	0.0	0.7	1.7	0.0	-
2011	2.6	-	10.4	0.0	0.3	0.0	0.7	-	0.2	0.0	0.9	0.0	0.1	1.0	1.5	-	-
2016	0.6	0.0	0.1	0.0	0.5	-	0.2	0.1	0.1	-	0.6	0.0	0.2	0.5	1.4	-	-
2021	2.9	0.0	-	-	0.1	0.0	0.0	0.0	-	-	0.4	0.0	0.0	0.5	0.0	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species



FORB SPECIES	Eriogonum heracleoides (parsnipflower buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Geranium viscosissimum (sticky purple geranium)	Hackelia patens (spotted stickseed)	Helianthella uniflora (oneflower helianthella)	Heliomeris multiflora var. multiflora (showy goldeneye)	Ipomopsis aggregata (scarlet gilia)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Mertensia (bluebells)	Microsteris gracilis <sup>a</sup> (slender phlox)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Penstemon humilis (low beardtongue)	Phlox hoodii (spiny phlox)
year	Nested Frequency																
1996	-	7	0	-	2	3	2	-	3	50	-	-	10	3	-	4	-
2001	-	-	2	2	-	-	-	-	-	63	-	-	23	4	-	4	-
2006	-	6	13	2	7	-	1	5	-	66	-	-	40	-	-	6	2
2011	0	13	7	-	4	-	13	2	-	77	-	-	21	11	4	3	-
2016	-	7	8	2	13	2	1	-	3	76	-	9	4	-	6	-	-
2021	-	9	6	5	1	1	-	5	-	49	2	-	1	2	0	6	-
year	Average Cover (%)																
1996	-	0.1	0.0	-	0.1	0.0	0.0	-	0.0	1.1	-	-	0.0	0.0	-	0.0	-
2001	-	-	0.0	0.0	-	-	-	-	-	1.7	-	-	0.1	0.1	-	0.0	-
2006	-	0.2	0.2	0.0	0.0	-	0.0	0.0	-	2.4	-	-	0.1	-	-	0.1	0.0
2011	0.0	0.2	0.3	-	0.3	-	0.0	0.0	-	2.4	-	-	0.1	0.0	0.0	0.2	-
2016	-	0.2	0.2	0.1	0.1	0.0	0.0	-	0.0	3.0	-	0.2	0.0	-	0.1	-	-
2021	-	0.1	0.0	0.0	0.0	0.0	-	0.2	-	1.1	0.0	-	0.0	0.0	0.0	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Potentilla diversifolia (varleaf cinquefoil)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Silene antirrhina <sup>a</sup> (sleepy silene)	Symphotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Veronica biloba <sup>ai</sup> (two-lobed speedwell)	Viola (violet)	Wyethia amplexicaulis (mule-ears)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency											
1996	5	14	1	-	-	166	3	19	12	-	3	2
2001	-	20	-	-	-	170	7	28	13	-	3	2
2006	-	6	4	-	5	172	6	8	15	-	-	3
2011	-	1	-	-	1	188	3	17	14	8	20	6
2016	-	3	-	-	-	198	2	12	10	-	6	2
2021	2	-	6	16	-	145	4	51	5	1	-	1
year	Average Cover (%)											
1996	0.0	0.0	0.2	-	-	2.8	0.0	0.2	0.0	-	0.0	0.0
2001	-	0.0	-	-	-	4.0	0.0	0.4	0.0	-	0.0	0.0
2006	-	0.0	0.1	-	0.0	3.6	0.0	0.1	0.0	-	-	0.1
2011	-	0.0	-	-	0.0	4.8	0.0	0.2	0.1	0.0	0.5	0.1
2016	-	0.0	-	-	-	6.4	0.0	0.1	0.0	-	0.0	0.0
2021	0.0	-	0.1	0.1	-	2.5	0.0	0.9	0.0	0.0	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02-39.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum heracleoides (parsnipflower buckwheat)	Juniperus scopulorum <sup>t</sup> (Rocky Mountain juniper)	Mahonia repens (creeping barberry)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)
year	Line Intercept Cover (%)							
1996	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-
2006	1.1	26.3	5.1	-	-	1.1	9.7	17.3
2011	2.6	21.6	3.4	0.1	0.1	1	14	23.2
2016	1.5	19.2	5.2	-	-	1.2	13.4	17.6
2021	2.9	11.8	4.3	-	0.6	2.2	17.2	15.2
year	Quadrat Cover (%)							
1996	0.2	12.2	2.9	-	-	1.5	7.8	11.2
2001	1.0	16.5	2.7	-	-	1.1	9.5	11.3
2006	1.1	19.4	3.3	-	-	1.9	7.2	12.0
2011	1.7	21.1	3.1	0.0	0.0	1.8	8.0	9.5
2016	1.4	15.7	4.3	-	0.0	2.0	8.7	12.4
2021	1.1	11.0	3.5	-	0.4	2.8	10.6	8.4

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-39.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	500	-	8	92	0	24	4	32	84/87
2001	180	20	33	67	0	22	0	0	104/112
2006	140	-	0	100	0	71	29	0	94/97
2011	320	-	13	88	0	25	0	25	94/106
2016	100	20	0	100	0	20	0	40	97/108
2021	560	-	39	43	18	0	57	7	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	4020	420	10	83	8	27	5	1	64/87
2001	4040	-	12	72	16	19	3	6	73/89
2006	3440	180	1	86	13	36	3	17	71/99
2011	3200	20	7	84	9	26	0	41	72/99
2016	3200	-	4	91	5	4	2	4	79/91
2021	3500	40	10	53	37	7	19	37	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	3200	-	4	89	8	1	0	4	45/54
2001	2280	-	1	99	0	0	0	4	34/40
2006	2400	-	4	88	8	1	0	16	36/45
2011	1720	40	5	94	1	0	0	5	37/44
2016	2380	20	9	91	0	0	1	0	38/38
2021	2060	40	4	81	16	7	6	17	- / -

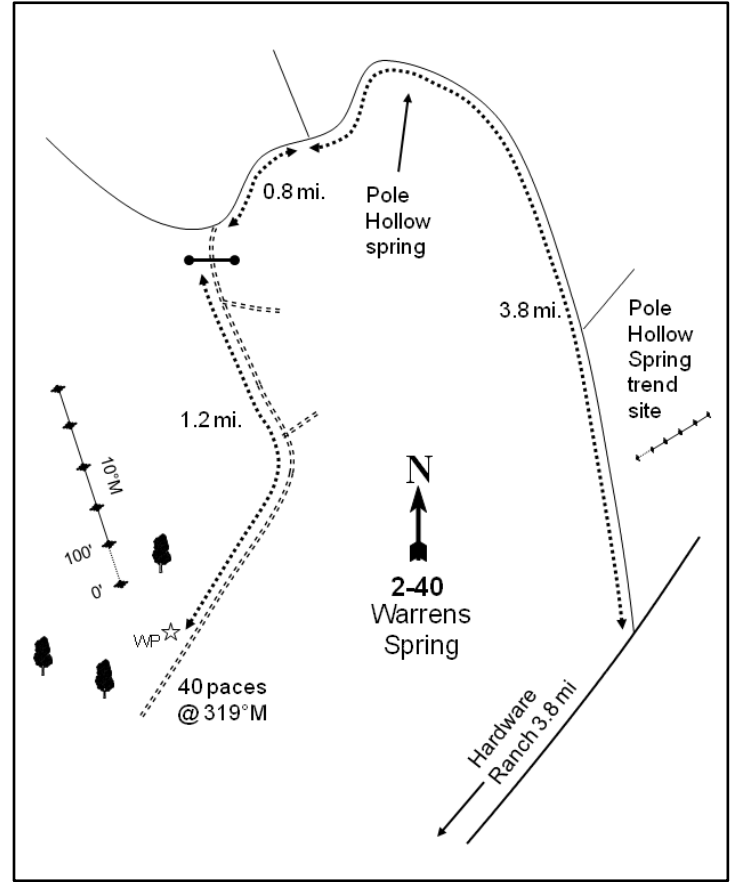
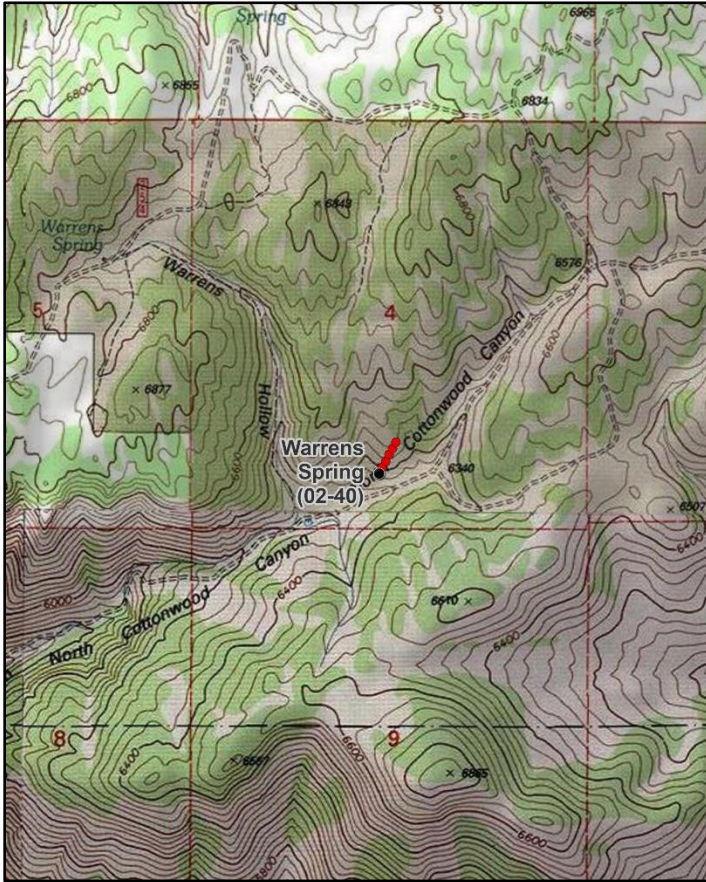
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Eriogonum heracleoides -- (parsnipflower buckwheat)</b>									
1996	60	-	0	100	0	0	0	0	17/47
2001	20	-	0	100	0	100	0	0	14/24
2006	-	-	-	-	-	-	-	-	-/-
2011	60	-	100	0	0	0	0	0	48/10
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Juniperus scopulorum<sup>t</sup> -- (Rocky Mountain juniper)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	20	-	100	0	0	0	0	0	-/-
2011	-	20	0	0	0	0	0	0	-/-
2016	80	-	100	0	0	0	0	0	-/-
2021	80	-	50	25	25	0	0	25	-/-
<b>Mahonia repens -- (creeping barberry)</b>									
1996	5640	40	21	79	0	0	0	0	9/12
2001	6080	-	0	100	0	0	0	5	7/9
2006	6900	40	0	100	0	0	0	0	8/13
2011	3860	-	10	89	1	0	0	0	9/11
2016	8080	-	1	99	0	0	0	0	9/11
2021	9480	-	0	99	0	0	0	0	-/-
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	500	-	12	88	0	40	0	0	89/163
2001	660	-	6	73	21	30	9	3	91/131
2006	560	20	7	82	11	29	50	4	80/154
2011	860	20	21	67	12	37	7	12	93/155
2016	740	40	16	84	0	22	46	0	92/152
2021	1120	-	2	79	20	11	11	14	-/-
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	2140	100	12	85	3	1	0	2	80/131
2001	1820	-	3	89	8	0	0	2	82/130
2006	2280	-	5	95	0	3	0	0	80/123
2011	2520	20	4	96	0	2	0	1	76/127
2016	4400	-	11	89	0	1	0	0	65/88
2021	3800	-	12	83	6	10	14	6	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-39.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus scopulorum (Rocky Mountain juniper)</b>							
1996	3	-	-	-	-	-	17.0
2016	18	18	27	27	27	-	7.8
2021	5	40	20	40	-	-	4.2

## WARRENS SPRING - STUDY NO. 02-40



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Boulder Mountain SW; Township 10N, Range 3E, Section 04  
NAD 83 UTM ZONE 12, 449316 East 4608473 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

9149  
10° magnetic  
500ft  
Line 1 (11ft), Line 2 (34ft), Line 3 (71ft), Line 4 (95ft), Line 5 (59ft)  
Belt 2, 5: 1ft

### Directions to Site

From Hardware Ranch, travel northeast for 3.8 miles to the Pole Hollow Road. Turn left and travel up Pole Hollow for 3.8 miles, passing the Pole Hollow study site and Pole Hollow Spring. Continue on the main road for 0.8 miles to a fork. Turn left and go over a cattleguard. Continue down the canyon 1.2 miles to a witness post on the right-hand (north) side of the road. From the witness post, walk 40 paces at 319 degrees magnetic to the 0-foot baseline stake. The baseline runs at a bearing of 10 degrees magnetic.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,350ft (1,935m)
Aspect	Southwest
Slope	25-30%
Sample Dates	08/20/1996, 08/01/2001, 07/10/2006, 07/14/2011, 06/28/2016, 06/29/2021

**Table 02-40.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Hardware Plateau Lop and Scatter	3701	Fall 2016	2143

**Wildlife Habitat and Vegetation History****Table 02-40.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	winter

**Table 02-40.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1996	Mountain Big Sagebrush	Phase I
2001	Mountain Big Sagebrush	Phase I
2006	Mountain Big Sagebrush	Phase I
2011	Mountain Big Sagebrush	Phase I
2016	Mountain Big Sagebrush	Phase I
2021	Mountain Big Sagebrush	Phase I

**Site Notes**

This study is located on private land in North Cottonwood Canyon, which is a side canyon of Blacksmith Fork Canyon. The study monitors winter range in a mountain brush community and water is available at Warren Spring about a third of a mile to the southwest. Numerous trails run through the area and off the hills down to the road in the bottom of the canyon and south to the spring.

In 2016, it was noted that many Utah serviceberry (*Amelanchier utahensis*) appeared to be diseased.

**Soils****Table 02-40.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.8	29.9	35.7	34.4	4.7	12.8	278.4	0.7	08/20/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	25 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

This site has remained dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) since study establishment in 1996. A variety of other browse species such as mountain snowberry (*Symphoricarpos oreophilus*), antelope bitterbrush (*Purshia tridentata*), and chokecherry (*Prunus virginiana*) are also present, but contribute less cover than sagebrush (Table 02-40.12, Table 02-40.13). The herbaceous understory has been diverse and moderately abundant with perennial grasses and forbs as the dominant components. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed in the understory, but cover was low in 2021 (Table 02-40.7, Table 02-40.10, Table 02-40.11). Rocky Mountain juniper (*Juniperus scopulorum*) has been present in all sample years (Photos, Table 02-40.12, Table 02-40.13, Table 02-40.14), placing the study in Phase I of woodland succession (Table 02-40.4). A lop and scatter treatment took place in 2016 (Table 02-40.1), but the residual tree component on site indicates that there may be potential for infilling in the future. Deer winter range condition has generally remained fair. Improvement to deer wintering range can be accomplished through efforts that decrease preferred browse decadence, but increase reproduction. Diversifying the number of species and increasing cover of both native perennial grasses and forbs, while reducing cheatgrass presence, would also improve winter range conditions (Table 02-40.15).

**Trend Summary Tables**

**Table 02-40.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	18.3	1.3	-	-	-	-
2001	26.9	2.2	-	-	-	-
2006	22.1	1.9	-	29.2	3.0	-
2011	19.4	1.8	0.0	31.1	2.6	1.4
2016	26.0	1.9	1.0	30.5	2.2	0.7
2021	23.4	1.9	-	29.6	1.6	-

**Table 02-40.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	253	210	319	178	5.9	5.8	4.7	4.0
2001	106	214	281	182	0.9	5.6	2.3	4.0
2006	135	261	315	252	0.9	8.1	2.8	8.1
2011	178	231	372	281	1.7	5.1	9.9	9.2
2016	244	277	269	268	8.5	11.2	5.4	14.6
2021	25	261	193	156	0.5	7.1	2.5	8.5

**Table 02-40.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	19.1	0.1	48.4	2.7	5.3	37.9
2001	28.2	0.0	45.9	2.4	7.1	41.3
2006	30.5	-	36.5	3.0	7.6	40.3
2011	11.9	0.0	42.2	3.1	7.8	49.3
2016	18.6	0.0	25.4	2.8	7.1	54.9
2021	29.3	0.0	34.0	2.8	8.6	42.3

**Table 02-40.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Shiras Moose	Rabbit
	Quadrat Frequency				
1996	1	22	4	-	2
2001	3	14	1	-	1
2006	-	14	3	-	1
2011	-	7	2	-	1
2016	1	21	-	-	5
2021	1	21	-	-	1
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	9.4 (23.3)	43.6 (107.6)	11.4 (28.1)	0.5 (1.2)	-
2006	7.2 (17.9)	51.6 (127.5)	0.7 (1.7)	-	-
2011	0.7 (1.8)	16.8 (41.4)	6.7 (16.6)	-	-
2016	3.6 (9.0)	32.2 (79.5)	-	-	-
2021	3.6 (9.0)	44.2 (109.2)	-	-	-

**Table 02-40.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency											
Bromus arvensis <sup>ai</sup> (field brome)	142	5	156	7	5	-	16	1	12	4	184	
Bromus marginatus (mountain brome)	69	23	42	5	5	-	23	-	14	14	161	
Bromus tectorum <sup>ai</sup> (cheatgrass)	97	32	59	3	5	0	26	-	21	22	212	
Elymus trachycaulus (slender wheatgrass)	139	25	68	14	6	-	21	-	20	22	188	
Leymus cinereus (basin wildrye)	123	17	197	28	8	-	90	7	14	5	183	
Melica bulbosa (oniongrass)	2021	13	18	38	6	-	114	11	1	18	136	
Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Average Cover (%)											
Poa fendleriana (muttongrass)	1996	2.7	0.1	3.2	0.2	0.4	-	0.3	0.0	0.4	0.0	4.4
Poa pratensis <sup>i</sup> (Kentucky bluegrass)	2001	0.7	0.2	0.3	0.0	0.0	-	0.5	-	0.2	0.1	4.5
Poa secunda (Sandberg bluegrass)	2006	0.5	0.2	0.5	0.0	0.4	0.0	0.7	-	0.6	0.1	6.2
Pseudoroegneria spicata (bluebunch wheatgrass)	2011	1.6	0.1	0.1	0.2	0.2	-	0.7	-	0.5	0.3	3.1
	2016	2.7	0.3	5.7	0.5	0.3	-	3.0	0.0	0.1	0.2	6.8
	2021	0.2	-	0.2	0.8	0.3	-	2.0	0.2	0.0	0.4	3.3

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-40.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
Achillea millefolium (Common yarrow)	19	-	81	213	-	6	14	1	-	15	-	-	1	10	6	44	40	
Agoseris glauca (pale agoseris)	31	3	113	129	1	-	4	1	-	13	-	3	-	-	5	46	107	
Allium (onion)	31	5	129	14	2	-	-	4	3	35	2	-	-	4	5	137	92	
Alyssum desertorum <sup>ai</sup> (desert madwort)	32	6	183	151	1	-	8	-	8	46	-	3	-	4	22	16	77	
Arabis (rockcress)	41	3	165	178	4	3	2	8	16	41	-	-	-	2	9	5	52	
Artemisia dracunculus (tarragon)	2021	8	15	31	10	-	-	1	4	6	49	2	5	-	-	4	16	5
Astragalus (milkvetch)	Average Cover (%)																	
Astragalus utahensis (Utah milkvetch)	1996	0.2	-	0.3	1.0	-	0.0	0.2	0.0	-	1.3	-	-	0.0	0.0	0.3	0.4	0.1
Balsamorhiza macrophylla (cutleaf balsamroot)	2001	0.4	0.0	0.4	0.4	0.0	-	0.1	0.0	-	1.3	-	0.0	-	-	0.1	0.1	0.5
Balsamorhiza sagittata (arrowleaf balsamroot)	2006	0.4	0.0	0.4	0.0	0.0	-	-	0.0	0.2	3.6	0.0	-	-	0.2	0.3	0.2	0.3
Calochortus nuttallii (sego lily)	2011	0.9	0.1	1.4	0.5	0.0	-	0.2	-	0.1	4.0	-	0.0	-	0.0	0.3	0.2	0.3
Camelina microcarpa <sup>ai</sup> (litlepod false flax)	2016	1.5	0.1	2.5	2.4	0.0	0.0	0.0	0.0	0.2	6.8	-	-	-	0.0	0.5	0.0	0.1
Castilleja linariifolia (Wyoming Indian paintbrush)	2021	0.3	0.2	0.1	0.0	-	-	0.0	0.0	0.6	5.3	0.0	0.0	-	-	0.2	0.0	0.0
Chaenactis douglasii (Douglas' dustymaiden)																		
Cirsium undulatum <sup>a</sup> (wavyleaf thistle)																		
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																		
Collomia linearis <sup>a</sup> (tiny trumpet)																		

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Eriogonum heracleoides (parsnipflower buckwheat)	Galium aparine <sup>a</sup> (stickywilly)	Hackelia patens (spotted stickseed)	Helianthella uniflora (oneflower helianthella)	Helianthus annuus <sup>a</sup> (common sunflower)	Helioneris multiflora var. multiflora (showy goldeneye)	Isatis tinctoria <sup>ami</sup> (Dyer's woad)	Lactuca serriola <sup>at</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stoneseed)
year	Nested Frequency																
1996	5	5	-	2	-	65	1	5	-	0	2	5	36	1	-	15	0
2001	2	1	5	3	2	54	-	-	4	2	-	-	8	8	-	22	5
2006	-	3	13	4	-	78	-	3	-	10	-	5	-	4	-	28	10
2011	1	2	33	1	-	46	3	40	1	21	-	8	15	28	-	69	3
2016	8	1	11	4	-	27	-	20	8	3	-	22	3	30	-	43	0
2021	-	12	3	5	-	2	-	11	5	1	-	1	4	4	5	25	-
year	Average Cover (%)																
1996	0.0	0.0	-	0.0	-	0.6	0.0	0.2	-	0.0	0.6	0.0	0.5	0.0	-	0.1	0.0
2001	0.0	0.1	0.0	0.1	0.0	0.3	-	-	0.0	0.2	-	-	0.1	0.0	-	0.1	0.0
2006	-	0.1	0.1	0.1	-	0.2	-	0.0	-	0.1	-	0.2	-	0.0	-	0.2	0.2
2011	0.0	0.0	0.2	0.0	-	0.3	0.0	0.3	0.0	0.2	-	0.0	0.2	0.1	-	0.2	0.0
2016	0.1	0.0	0.0	0.1	-	0.4	-	0.5	0.2	0.1	-	0.6	0.0	0.1	-	0.8	0.0
2021	-	0.2	0.0	0.0	-	0.0	-	0.0	0.0	0.0	-	0.1	0.1	0.0	0.0	0.4	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grindelioides (rayless tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Penstemon humilis (low beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (sleepy silene)	Symphoricarum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>at</sup> (yellow safsify)	Veronica biloba <sup>at</sup> (twolobe speedwell)	Viola (violet)	Wyethia amplexicaulis (mule-ears)
year	Nested Frequency															
1996	11	1	-	33	-	-	0	-	50	1	30	1	21	166	-	1
2001	5	1	2	60	3	-	5	-	28	2	32	3	18	121	-	1
2006	2	34	-	16	-	1	3	3	96	4	52	-	17	202	-	1
2011	20	6	-	32	-	-	5	-	50	6	44	-	77	306	5	11
2016	10	2	-	21	-	-	1	-	5	4	16	7	43	99	5	6
2021	8	1	-	17	-	-	-	-	7	-	24	4	142	46	-	5
year	Average Cover (%)															
1996	0.8	0.0	-	0.1	-	-	0.0	-	0.1	0.0	0.7	0.0	0.4	0.4	-	0.2
2001	0.2	0.0	0.0	0.1	0.0	-	0.1	-	0.1	0.0	0.8	0.0	0.2	0.3	-	0.1
2006	0.2	0.4	-	0.0	-	0.0	0.0	0.0	0.3	0.0	1.4	-	0.2	1.2	-	0.2
2011	0.4	0.0	-	0.1	-	-	0.0	-	0.2	0.0	1.0	-	1.0	6.4	0.0	0.2
2016	0.5	0.0	-	0.1	-	-	0.0	-	0.0	0.0	0.4	0.0	0.5	0.8	0.0	0.5
2021	0.4	0.0	-	0.0	-	-	-	-	0.0	-	0.3	0.1	1.8	0.2	-	0.5

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species



**Table 02-40.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)	Juniperus scopulorum <sup>t</sup> (Rocky Mountain juniper)	Mahonia repens (creeping barberry)	Prunus virginiana <sup>p</sup> (chokecherry)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Rosa woodsii <sup>p</sup> (Woods' rose)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)
year	Line Intercept Cover (%)									
1996	-	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-
2006	0.1	19.4	2.8	0	-	0.2	0.8	2.4	-	6.5
2011	0.3	21.9	2.4	-	1.4	0.2	1.1	2.7	0.1	5
2016	0.1	21.7	2	-	0.7	0.2	0.4	2.4	-	5.9
2021	0.8	16.7	1.4	0	-	0.2	0.9	2.9	-	8.3
year	Quadrat Cover (%)									
1996	0.1	14.0	1.2	-	-	0.1	0.4	1.7	0.0	2.1
2001	-	20.1	1.9	-	-	0.2	0.4	2.8	0.0	3.7
2006	0.0	15.2	1.7	0.0	-	0.2	0.4	2.1	0.0	4.3
2011	0.0	14.1	1.7	0.0	0.0	0.1	0.7	0.8	0.0	3.7
2016	0.2	19.1	1.7	0.0	1.0	0.2	0.2	2.4	-	4.2
2021	0.1	14.4	1.6	0.0	-	0.3	0.7	2.9	-	5.4

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-40.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Acer grandidentatum<sup>t</sup> -- (bigtooth maple)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	231/241
2021	-	-	-	-	-	-	-	-	-/-
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	60	-	0	100	0	100	0	0	90/72
2001	20	-	0	100	0	100	0	0	103/103
2006	20	-	0	100	0	0	100	0	88/101
2011	80	-	50	50	0	25	0	0	85/99
2016	100	-	40	60	0	20	40	20	86/79
2021	120	-	67	33	0	33	0	0	-/-
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	2460	60	14	73	13	24	0	3	59/98
2001	2560	20	4	81	15	5	0	4	58/89
2006	2700	80	7	73	20	7	0	14	66/97
2011	2300	20	10	79	11	25	0	15	57/93
2016	2500	220	5	78	18	23	15	26	67/106
2021	2120	20	6	63	31	1	0	51	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Ceanothus velutinus -- (snowbrush ceanothus)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	22/61
2021	-	-	-	-	-	-	-	-	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	880	-	5	93	2	0	0	5	44/62
2001	840	-	5	93	2	0	0	0	33/55
2006	800	60	13	88	0	0	0	0	36/60
2011	720	-	0	97	3	6	0	6	35/50
2016	980	-	2	94	4	4	0	8	41/56
2021	980	-	4	84	12	0	0	12	- / -
<b>Eriogonum heracleoides -- (parsnipflower buckwheat)</b>									
1996	20	-	0	100	0	0	0	0	4/9
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	40	-	0	100	0	0	0	0	8/9
2016	-	-	-	-	-	-	-	-	18/35
2021	-	-	-	-	-	-	-	-	-/-
<b>Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)</b>									
1996	40	-	0	100	0	50	0	0	84/148
2001	20	-	0	100	0	0	0	0	56/45
2006	20	-	0	100	0	0	0	0	60/76
2011	40	-	50	50	0	50	0	0	66/102
2016	40	-	50	50	0	0	50	0	60/79
2021	40	-	0	100	0	0	0	0	- / -
<b>Juniperus scopulorum<sup>t</sup> -- (Rocky Mountain juniper)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	20	0	0	0	0	0	0	- / -
2016	-	-	-	-	-	-	-	-	-/-
2021	20	-	100	0	0	0	0	0	- / -
<b>Mahonia repens -- (creeping barberry)</b>									
1996	520	-	12	89	0	0	0	0	12/17
2001	660	-	6	94	0	0	0	0	7/13
2006	1040	60	0	100	0	0	0	0	9/13
2011	1080	-	0	100	0	0	0	0	10/9
2016	540	-	0	100	0	0	0	0	10/17
2021	1140	-	5	95	0	0	0	0	- / -
<b>Prunus virginiana<sup>p</sup> -- (chokecherry)</b>									
1996	120	-	67	33	0	0	0	83	77/71
2001	320	20	88	13	0	6	0	0	81/80
2006	360	-	28	72	0	11	17	0	58/37
2011	140	-	0	100	0	57	0	0	64/59
2016	160	-	13	88	0	0	0	25	69/51
2021	160	-	0	88	13	25	13	13	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	180	-	0	78	22	22	22	22	58/132
2001	180	-	0	89	11	22	67	0	57/131
2006	180	-	0	89	11	22	67	0	50/133
2011	180	-	0	100	0	67	22	11	55/119
2016	300	-	0	100	0	33	60	0	73/165
2021	200	-	0	80	20	10	40	20	- / -
<b>Rosa woodsii<sup>p</sup> -- (Woods' rose)</b>									
1996	40	-	0	100	0	0	0	0	36/9
2001	20	-	100	0	0	0	0	0	55/29
2006	40	-	0	100	0	0	0	0	- / -
2011	40	-	0	100	0	0	0	0	24/21
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Sambucus nigra ssp. cerulea<sup>p</sup> -- (blue elderberry)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	94/165
2021	-	-	-	-	-	-	-	-	- / -
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	760	-	5	79	16	0	0	8	54/88
2001	840	20	5	83	12	0	0	7	61/99
2006	960	-	8	92	0	0	0	0	51/99
2011	1100	40	4	96	0	13	0	0	46/86
2016	940	-	17	83	0	0	9	0	55/90
2021	1640	-	6	92	2	0	0	2	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

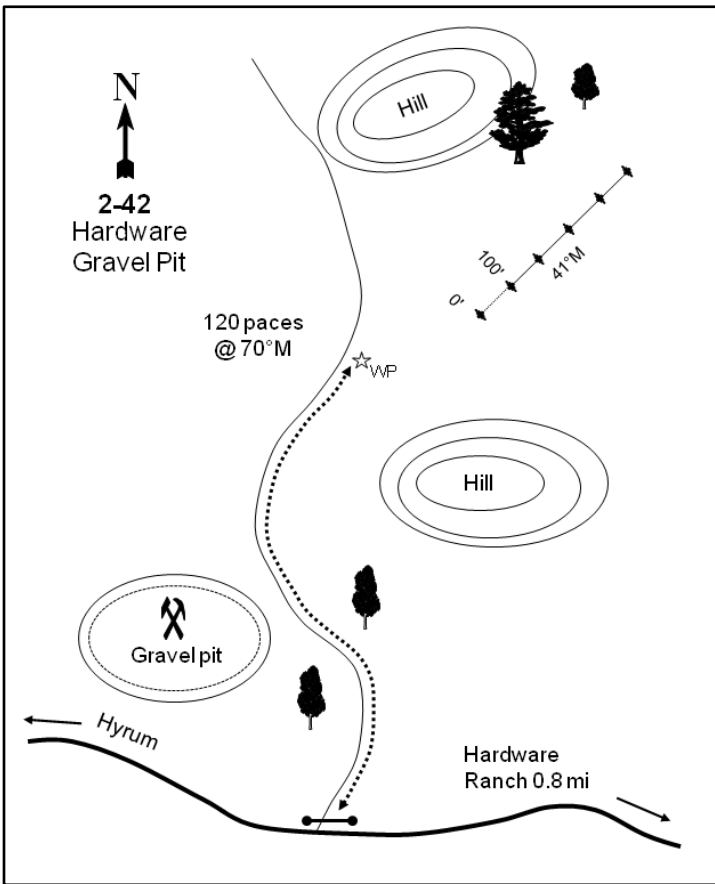
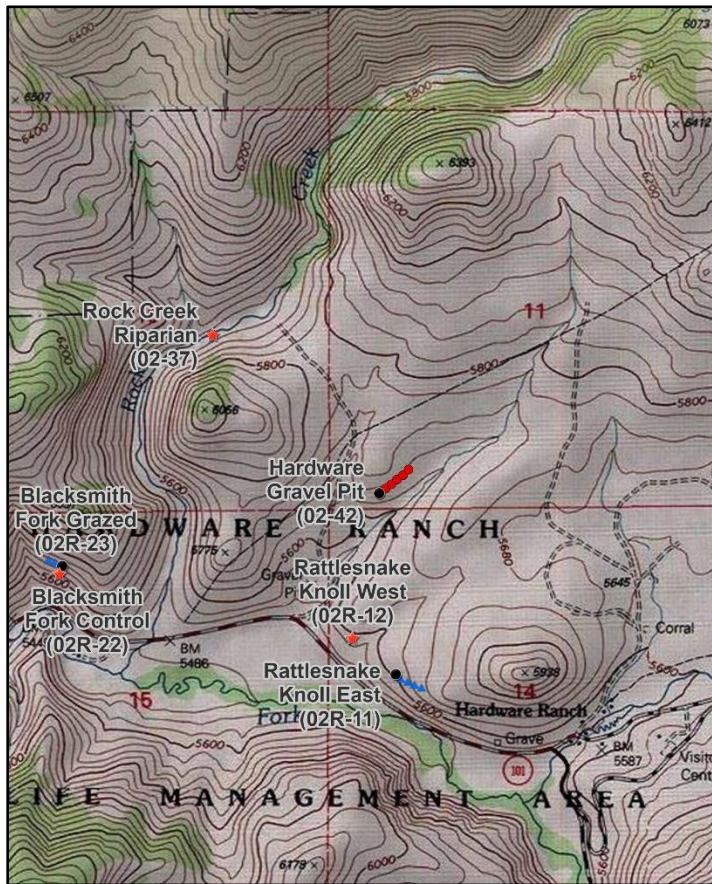
**Table 02-40.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Acer grandidentatum (bigtooth maple)</b>							
2016	8	-	-	-	-	100	33.0
<b>Juniperus scopulorum (Rocky Mountain juniper)</b>							
1996	33	-	-	-	-	-	19.0
2001	17	-	-	-	-	-	28.9
2016	15	-	-	-	-	100	41.8
2021	10	50	17	-	-	33	23.5

**Table 02-40.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	22.8	10.9	6.3	11.0	-4.4	8.1	-2.0	<b>52.6</b>	Poor
2001	30.0	10.9	2.4	10.1	-0.7	8.0	-2.0	<b>58.7</b>	Fair
2006	30.0	10.7	3.5	14.8	-0.7	10.0	0.0	<b>68.4</b>	Fair-Good
2011	30.0	12.6	3.9	8.9	-1.3	10.0	-2.0	<b>62.2</b>	Fair
2016	30.0	11.2	3.5	16.3	-6.3	10.0	-2.0	<b>62.7</b>	Fair
2021	30.0	8.8	3.4	10.2	-0.3	10.0	-2.0	<b>60.1</b>	Fair

## HARDWARE GRAVEL PIT - STUDY NO. 02-42



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Hardware Ranch NW; Township 10N, Range 3E, Section 11  
NAD 83 UTM ZONE 12, 451972 East 4606733 North

### Transect Information

Browse Tag # (0' Stake)	9147
Transect Bearing	41° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Belt 1: 1ft

### Directions to Site

From the Hardware Ranch Visitors' Center, drive westbound on State Route (SR) 101 for 0.8 miles to a dirt road and gate on the north side of SR-101. Turn right and travel 0.3 miles to a witness post on the right-hand (east) side of the road. From the witness post, walk 120 paces at a bearing of 70 degrees magnetic to the 0-foot stake which is marked by browse tag #9147.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,670ft (1,728m)
Aspect	Northeast
Slope	10%
Sample Dates	08/11/2011, 06/28/2016, 06/30/2021

**Wildlife Habitat and Vegetation History**

**Table 02-42.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	winter	

**Table 02-42.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2011	Mountain Big Sagebrush/Annual Grass	Phase I
2016	Mountain Big Sagebrush/Annual Grass	Phase I
2021	Mountain Big Sagebrush/Perennial Grass	Phase I

**Site Notes**

The study is located about a mile northwest of the Hardware Ranch Visitors' Center near an old gravel pit. The study monitors a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) community within winter range that is crucial to deer and elk. The study was placed in a location that has experienced a high amount of winter kill in recent years prior to the establishment of the study. Hunting is not allowed within the area. In 2016, there was a rattlesnake observed on the site and chukars were heard calling.

**Soils**

**Table 02-42.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	6.6	54.0	32.9	13.1	2.9	17.1	187.2	0.4	08/11/2011

**Site Potential**

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA461UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 2011, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been the dominant browse species on this site (Table 02-42.12, Table 02-42.13). The herbaceous understory has remained abundant throughout the study period, although composition has fluctuated. The introduced annual grass species cheatgrass (*Bromus tectorum*) and/or field brome (*B. arvensis*) contributed most of the cover in 2011 and 2016 and were considered to be co-dominant with sagebrush in those sample years. In 2021, however, perennial grasses and forbs provided most of the herbaceous cover (Table 02-42.7, Table 02-42.10, Table 02-42.11). Rocky Mountain juniper (*Juniperus scopulorum*) has been present throughout the duration of the study with low density (Photos, Table 02-42.13, Table 02-42.14). As the site has been considered to be within Phase I of woodland succession since study establishment (Table 02-42.4), further tree encroachment likely does not pose an immediate threat to the ecological integrity of the plant community. Deer winter range condition has generally improved from very poor to fair due to increases in perennial grasses and a decrease in annual grass. Improvement to deer wintering range can be accomplished through efforts that decrease preferred browse decadence, but increase reproduction. Further diversifying the number of species and increasing cover of native perennial grasses, while reducing cheatgrass presence, would continue to improve winter range conditions (Table 02-42.15).

**Trend Summary Tables**

**Table 02-42.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2011	16.5	0.5	-	23.5	0.7	-
2016	21.6	0.5	-	27.5	1.1	0.4
2021	18.4	0.7	0.0	25.5	1.5	0.7

**Table 02-42.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2011	439	136	368	73	25.3	2.4	6.5	5.5
2016	447	80	307	84	26.5	2.3	5.8	6.2
2021	235	271	254	79	3.2	10.9	3.6	6.2

**Table 02-42.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2011	3.1	0.3	50.8	0.9	12.3	56.9
2016	6.9	-	31.0	2.1	13.4	59.4
2021	12.1	0.7	38.8	2.7	14.7	43.2

**Table 02-42.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
2011	-	9	3	1	-
2016	2	3	1	-	8
2021	-	23	11	1	2
Days Use Per Acre (ha)					
2011	-	21.5 (53.0)	5.3 (13.2)	217.8 (538.0)*	-
2016	0.7 (1.8)	16.1 (39.7)	2.0 (5.0)	113.2 (279.7)*	-
2021	0.7 (1.8)	21.5 (53.0)	13.4 (33.1)	8.7 (21.5)*	-

\*Pellets per acre (ha)

**Table 02-42.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES											
Bromus arvensis <sup>ai</sup> (field brome)											
Bromus tectorum <sup>ai</sup> (cheatgrass)											
Elymus elymoides (squirreltail)											
Elymus lanceolatus (thickspike wheatgrass)											
Melica bulbosa (oniongrass)											
Muhlenbergia filiformis <sup>a</sup> (pullup muhly)											
Poa bulbosa <sup>i</sup> (bulbous bluegrass)											
Poa fendleriana (muttongrass)											
Poa pratensis <sup>i</sup> (Kentucky bluegrass)											
Poa secunda (Sandberg bluegrass)											
Pseudoroegneria spicata (bluebunch wheatgrass)											
year	Nested Frequency										
2011	374	202	5	-	-	45	4	12	-	89	29
2016	156	440	7	-	-	-	5	3	17	23	31
2021	120	154	1	3	4	2	58	-	45	195	22
year	Average Cover (%)										
2011	14.1	7.2	0.1	-	-	4.0	0.0	0.3	-	1.2	0.8
2016	1.8	24.7	0.1	-	-	-	0.5	0.0	0.4	0.3	1.0
2021	0.8	2.2	0.0	0.0	0.0	0.1	2.8	-	0.9	6.7	0.5

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-42.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																	
Achillea millefolium (Common yarrow)																	
Agoseris glauca (pale agoseris)																	
Alyssum desertorum <sup>ai</sup> (desert madwort)																	
Arenaria serpyllifolia <sup>ai</sup> (thymeleaf sandwort)																	
Artemisia ludoviciana (white sagebrush)																	
Camelina microcarpa <sup>ai</sup> (littlepod false flax)																	
Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)																	
Cirsium (thistle)																	
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																	
Collomia linearis <sup>a</sup> (tiny trumpet)																	
Descurainia pinnata <sup>a</sup> (western tansymustard)																	
Draba <sup>a</sup> (draba)																	
Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)																	
Erigeron pumilus (shaggy fleabane)																	
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)																	
Galium aparine <sup>a</sup> (stickywilly)																	
Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)																	
year	Nested Frequency																
2011	7	10	208	9	2	1	17	10	98	112	38	64	105	-	116	2	-
2016	14	6	150	-	4	2	18	8	56	40	4	7	45	1	159	6	2
2021	14	-	35	-	13	-	25	4	24	18	-	0	60	1	144	-	-
year	Average Cover (%)																
2011	0.3	0.0	0.9	0.5	0.0	0.0	0.1	0.3	0.3	0.5	0.2	0.3	1.2	-	0.8	0.0	-
2016	0.5	0.0	1.0	-	0.2	0.0	0.1	0.4	0.2	0.1	0.0	0.0	0.3	0.1	3.5	0.1	0.0
2021	0.7	-	0.1	-	0.5	-	0.1	0.1	0.1	0.1	-	0.0	0.4	0.0	2.1	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Holosteum umbellatum <sup>ai</sup> (jagged chickweed)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>ia</sup> (flatspine stickseed)	Lomatium (desertparsley)	Microsteris gracilis <sup>ia</sup> (slender phlox)	Navarretia intertexta <sup>a</sup> (needleleaf navarretia)	Polygonum douglasii <sup>ia</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (sleepy silene)	Symphoricarum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Viola (violet)	Wyethia amplexicaulis (mule-ears)
year	Nested Frequency												
2011	-	25	140	3	106	9	25	107	-	-	9	-	54
2016	-	12	2	4	45	20	18	44	-	3	19	-	56
2021	10	2	-	-	36	-	13	-	4	9	68	2	53
year	Average Cover (%)												
2011	-	0.1	0.6	0.0	0.3	0.2	0.1	0.3	-	-	0.0	-	4.7
2016	-	0.0	0.0	0.0	0.1	0.1	0.1	0.1	-	0.0	0.0	-	5.0
2021	0.0	0.0	-	-	0.1	-	0.0	-	0.0	0.0	0.6	0.0	4.9

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02-42.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus scopulorum <sup>i</sup> (Rocky Mountain juniper)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)
year	Line Intercept Cover (%)			
2011	21.1	0.7	-	2.4
2016	26	1.1	0.4	1.5
2021	23.9	1.5	0.7	1.6
year	Quadrat Cover (%)			
2011	15.9	0.5	-	0.7
2016	20.7	0.5	0.0	0.9
2021	17.8	0.7	0.0	0.6

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-42.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
2011	-	-	-	-	-	-	-	-	171/156
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
2011	3160	120	3	56	41	39	1	31	69/114
2016	2980	2900	7	88	5	16	3	7	71/100
2021	3340	40	5	53	41	0	0	47	-/-



Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
2011	420	-	14	86	0	0	0	0	28/37
2016	780	20	8	92	0	0	0	0	25/36
2021	1060	-	8	93	0	0	0	0	- / -
<b>Juniperus scopulorum<sup>t</sup> -- (Rocky Mountain juniper)</b>									
2011	20	-	100	0	0	0	0	0	- / -
2016	20	-	100	0	0	0	0	0	- / -
2021	20	-	100	0	0	0	0	0	- / -
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
2011	140	-	0	29	71	29	43	71	102/138
2016	80	-	0	100	0	75	25	0	104/145
2021	100	20	0	40	60	60	0	60	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

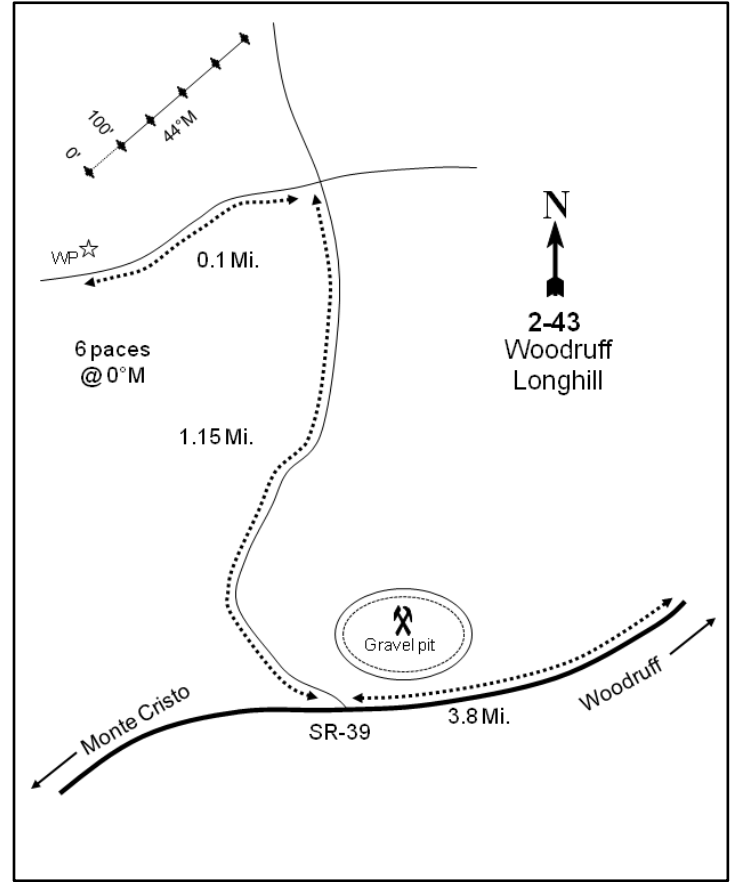
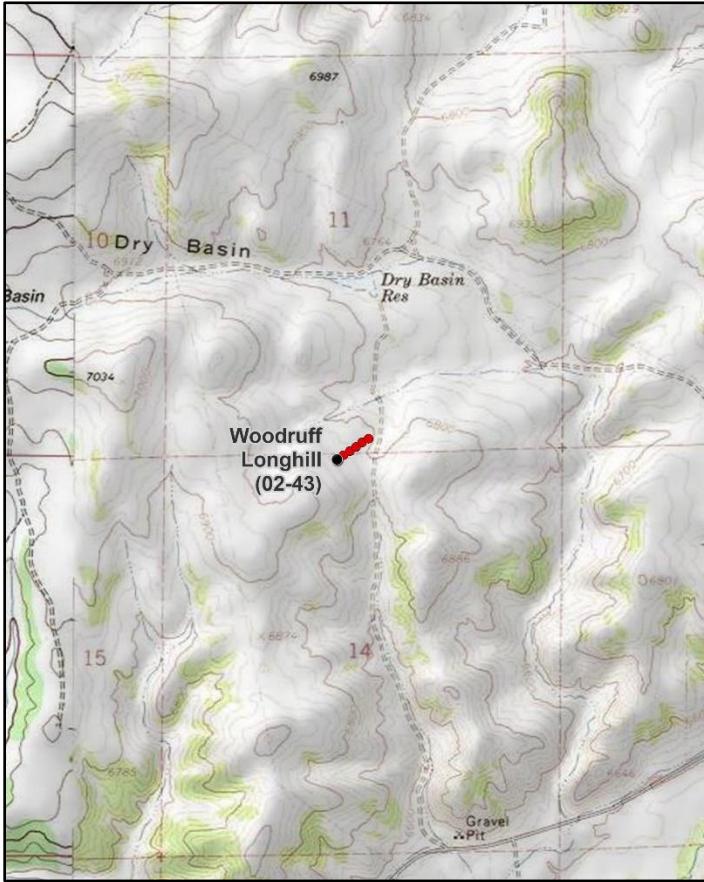
**Table 02-42.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus scopulorum (Rocky Mountain juniper)</b>							
2016	10	-	20	60	20	-	8.8
2021	14	14	14	57	14	-	6.0

**Table 02-42.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2011	30.0	1.7	1.4	4.7	-19.0	10.0	0.0	<b>28.9</b>	Very Poor
2016	30.0	13.7	3.5	3.5	-19.8	10.0	0.0	<b>40.8</b>	Very Poor-Poor
2021	30.0	2.3	2.5	16.3	-2.4	10.0	0.0	<b>58.7</b>	Fair

## WOODRUFF LONGHILL - STUDY NO. 02-43



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Woodruff SW; Township 9N, Range 6E, Section 14  
NAD 83 UTM ZONE 12, 480155 East 4596848 North

### Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	44° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

### Directions to Site

From State Route (SR) 16 (Woodruff Main Street) turn left onto SR-39 (towards Monte Cristo) and continue for 3.8 miles. Turn right (north) onto a dirt road and continue for 1.15 miles to an intersecting dirt road just north of a saddle. Turn left (west) and proceed for 0.1 miles. The witness post is on the right (north) side of the road and the 0-foot stake is 6 paces away at 0 degrees magnetic.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	WOODRUFF PASTURES
Elevation	6,794ft (2,071m)
Aspect	Northeast
Slope	11-12%
Sample Dates	08/11/2009, 08/25/2011, 07/13/2016, 06/28/2021

**Table 02-43.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Woodruff Longhill Sagebrush Improvement	1477	Fall 2009	3069
Seeding - Rangeland Drill	Woodruff Seeding #2	LTDL	Summer 1962-Winter 1963	2381
Mechanical - Plow	Woodruff Seeding #2	LTDL	Summer 1962-Winter 1963	2381

**Table 02-43.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Woodruff Seeding #2			Drill	Jun 1962	2381
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass		7.00	5.99

**Wildlife Habitat and Vegetation History****Table 02-43.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	substantial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	summer	
Pronghorn	substantial	summer	

**Table 02-43.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2009	Mountain Big Sagebrush/Perennial Grass	Phase I
2011	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2016	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2021	Mountain Big Sagebrush/Perennial Grass	Phase I

**Site Notes**

This study is located approximately four miles west of Woodruff on the north side of SR-32. The study monitors a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community within crucial winter range for deer. In 2009, data was collected along the baseline rather than along belts and no shrub density data was collected.

**Site Potential**

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R047XA314UT
States and Transitions	No state and transition model is available for this ecological site.

The browse component of this site has been mainly comprised of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) since study establishment in 2009 (Table 02-43.12, Table 02-43.13). Perennial grasses, mainly crested wheatgrass (*Agropyron cristatum*) and Sandberg bluegrass (*Poa secunda*), have been a co-dominant site component in all sample years (Table 02-43.10). With the exception of annual species in 2011, forbs have generally remained rare (Table 02-43.7, Table 02-43.11). Utah juniper (*Juniperus osteosperma*) was recorded in small amounts in 2009, but the trees were removed by a lop and scatter treatment later that same year (Table 02-43.1). Juniper was again observed in 2021 with low density (Table 02-43.14), placing the site within Phase I of woodland succession (Table 02-43.4): this indicates that there may be potential for the site to be infilled over time. Decadence of sagebrush increased in 2021, with 77% of plants having poor vigor (Table 02-43.13): this is likely due to drought stress. Should similar conditions continue in the future, this site may be at risk for sagebrush die-off and could transition into a different vegetation type. Deer winter range condition has ranged from fair to good, and has generally improved over time; winter range conditions were considered to be fair in 2021. Improvement to deer wintering range can be accomplished through efforts that support mature plants and reproduction in the preferred browse community, namely sagebrush. Diversifying native perennial forbs, while reducing cheatgrass, would also improve winter range conditions (Table 02-43.15).

**Trend Summary Tables****Table 02-43.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2009	21.2	3.1	-	23.8	2.4	-
2011	15.3	5.3	-	25.2	7.1	-
2016	18.2	5.0	-	23.7	6.2	-
2021	20.4	4.7	-	25.7	4.9	-

**Table 02-43.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2009	-	311	55	56	-	15.4	0.5	0.5
2011	-	335	272	133	-	13.5	8.2	1.5
2016	3	368	223	102	0.0	19.4	2.3	1.1
2021	-	365	20	54	-	16.4	0.0	0.9

**Table 02-43.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2009	27.2	2.5	39.6	1.6	0.1	40.9
2011	36.9	3.8	35.7	0.9	0.4	35.5
2016	42.2	2.5	18.0	1.8	0.8	43.9
2021	34.5	5.9	43.0	2.4	0.5	34.2

**Table 02-43.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency					
2009	4	-	33	-	-	21
2011	3	-	33	-	2	26
2016	-	-	18	-	1	3
2021	1	-	25	-	-	14
Days Use Per Acre (ha)						
2009	20.3 (50.2)	-	81.7 (201.9)	0.7 (1.7)	-	-
2011	5.1 (12.6)	-	40.2 (99.3)	5.3 (13.2)	17.4 (43.0)*	-
2016	20.3 (50.2)	-	27.5 (67.9)	-	78.4 (193.7)*	-
2021	3.6 (9.0)	8.7 (21.5)*	9.4 (23.2)	-	43.6 (107.6)*	-

Pellets per acre (ha)

**Table 02-43.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Carex (sedge)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea <sup>i</sup> (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency								
2009	284	-	-	-	-	4	131	1	-
2011	259	-	8	-	-	-	213	3	9
2016	319	3	9	2	-	-	188	-	3
2021	293	-	11	-	18	-	255	-	-
year	Average Cover (%)								
2009	12.8	-	-	-	-	0.1	2.5	0.0	-
2011	10.0	-	0.1	-	-	-	3.4	0.0	0.0
2016	13.3	0.0	0.0	0.0	-	-	5.9	-	0.1
2021	8.1	-	0.0	-	0.1	-	8.1	-	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02-43.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus purshii (woollypod milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Cordylanthus ramosus <sup>a</sup> (bushy bird's beak)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Erigeron pumilus (shaggy fleabane)
year	Nested Frequency																
2009	-	-	20	3	-	-	1	-	-	35	-	-	3	9	-	-	3
2011	-	20	21	6	2	8	-	-	-	72	3	73	11	209	0	1	2
2016	3	-	151	-	0	28	2	-	7	51	-	13	1	102	-	-	2
2021	-	-	-	-	-	-	-	3	-	12	-	-	-	8	-	-	-
year	Average Cover (%)																
2009	-	-	0.1	0.0	-	-	0.0	-	-	0.3	-	-	0.0	0.1	-	-	0.0
2011	-	0.0	0.0	0.2	0.0	0.0	-	-	-	1.2	0.0	0.2	0.1	6.8	0.0	0.0	0.0
2016	0.0	-	0.7	-	0.0	0.2	0.0	-	0.0	0.1	-	0.0	0.0	1.4	-	-	0.0
2021	-	-	-	-	-	-	-	0.0	-	0.0	-	-	-	0.0	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Microsteris gracilis <sup>a</sup> (slender phlox)	Penstemon (beardtongue)	Penstemon humilis (low beardtongue)	Petradoria pumila (rock goldenrod)	Phlox austromontana (mountain phlox)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)
year	Nested Frequency										
2009	0	6	-	-	8	6	-	4	18	8	-
2011	-	-	1	-	3	24	-	-	28	55	7
2016	-	-	1	1	-	30	4	-	34	6	5
2021	-	-	-	1	-	11	-	-	30	10	-
year	Average Cover (%)										
2009	0.0	0.2	-	-	0.0	0.0	-	0.0	0.1	0.0	-
2011	-	-	0.0	-	0.0	0.3	-	-	0.5	0.2	0.0
2016	-	-	0.0	0.0	-	0.4	0.0	-	0.5	0.0	0.0
2021	-	-	-	0.0	-	0.1	-	-	0.8	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02-43.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)			
2009	23.8	2.4	-	-
2011	25.2	7.1	-	-
2016	23.7	6.2	0	-
2021	25.7	4.9	-	-
year	Quadrat Cover (%)			
2009	21.2	3.1	-	-
2011	15.3	5.3	-	-
2016	18.1	5.0	0.0	-
2021	20.4	4.6	-	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-43.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
2009	-	-	-	-	-	-	-	-	38/60
2011	7200	-	2	63	36	28	38	30	46/70
2016	5040	60	4	78	18	37	27	30	45/70
2021	7340	-	4	33	63	14	0	77	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
2009	-	-	-	-	-	-	-	-	23/37
2011	5400	20	0	97	3	1	0	3	26/40
2016	4620	-	1	99	0	0	0	0	24/37
2021	6540	-	10	41	49	1	1	65	- / -
<b>Linanthus pungens -- (granite prickly phlox)</b>									
2009	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	19/32
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Opuntia -- (pricklypear)</b>									
2009	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	6/11
2021	-	-	-	-	-	-	-	-	-/-
<b>Symphoricarpos oreophilus<sup>P</sup> -- (mountain snowberry)</b>									
2009	-	-	-	-	-	-	-	-	-/-
2011	60	-	0	100	0	33	0	0	34/47
2016	20	-	0	100	0	0	0	0	37/62
2021	-	-	-	-	-	-	-	-	-/-
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
2009	-	-	-	-	-	-	-	-	11/33
2011	20	-	0	100	0	0	0	0	19/27
2016	20	-	0	100	0	0	0	0	30/40

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02-43.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

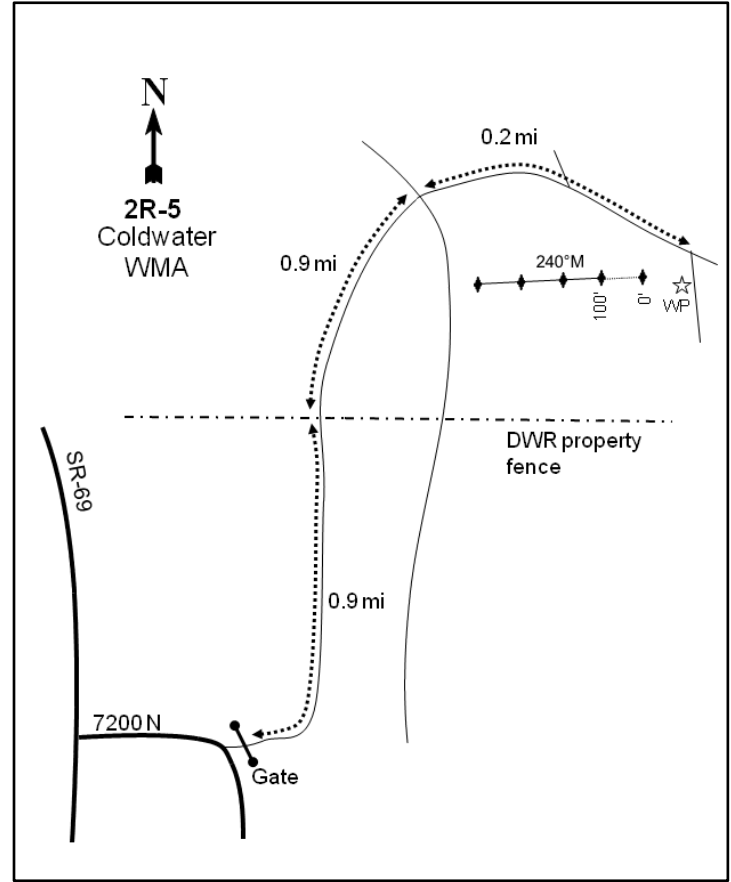
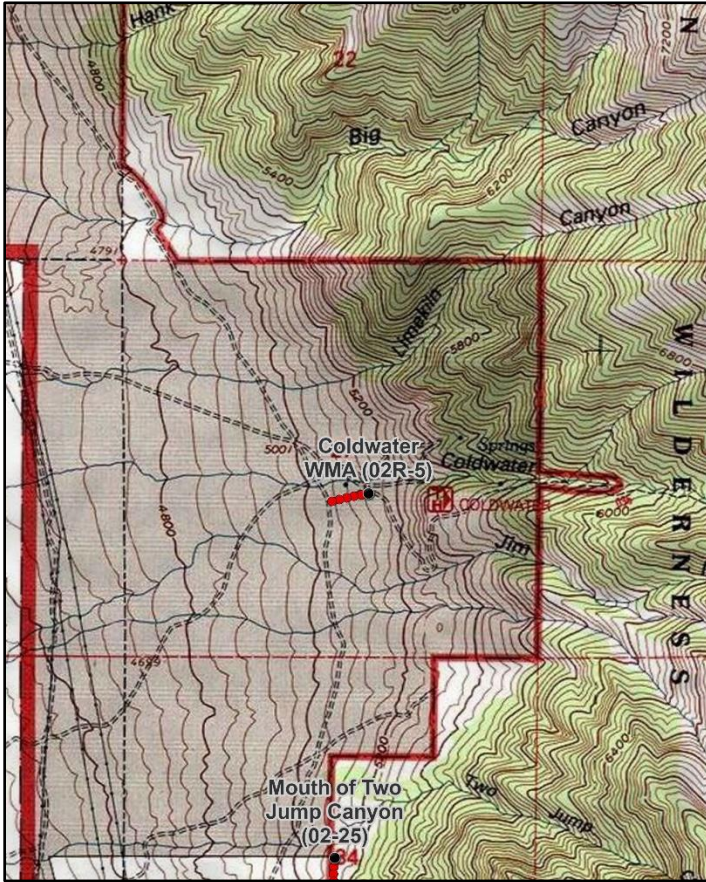
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2009	4	-	67	33	-	-	4.0
2021	2	-	100	-	-	-	5.5

**Table 02-43.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2009	29.8	0.0	0.0	30.0	0.0	1.0	0.0	<b>60.7</b>	Fair
2011	30.0	4.3	0.9	26.9	0.0	3.0	0.0	<b>65.1</b>	Fair-Good
2016	29.6	9.5	2.0	30.0	0.0	2.3	0.0	<b>73.4</b>	Good
2021	30.0	-3.8	2.1	30.0	0.0	1.7	0.0	<b>60.0</b>	Fair



## COLDWATER WMA - STUDY NO. 02R-5

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Honeyville SE; Township 11N, Range 2W, Section 27  
NAD 83 UTM ZONE 12, 412276 East 4612700 North

**Transect Information**

Browse Tag # (0' Stake)	119
Transect Bearing	240° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Belt 1: 100ft

**Directions to Site**

From the junction of 7200 North and State Route 69 in Honeyville, proceed east and north for 0.55 miles to a gate. Pass through the gate and continue 0.9 miles north to a fence. Travel another 0.9 miles, and as the road turns south, keep left for 0.2 miles to a fork. At the fork, stay right and continue for approximately 300 feet to a witness post on the left (west) side of the road. Walk 11 paces at 210 degrees magnetic to the 0-foot stake which is marked by browse tag #119. The baseline runs 240 degrees magnetic.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,100ft (1,554m)
Aspect	Southwest
Slope	15-18%
Sample Dates	08/07/1998, 07/17/2006, 07/19/2011, 06/29/2016, 07/20/2021

**Table 02R-05.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Herbicide - Roundup	Cold Water WMA Fire Rehab	4366	March 2018	491
Herbicide - Plateau/Laramie/Roundup	Cold Water WMA Fire Rehab	4366	December 2017	491
Herbicide - Roundup	Cold Water WMA Fire Rehab	4366	May 2018	491
Seeding - Aerial	Cold Water WMA Fire Rehab Phase II	4598	November 2018	473
Fire - Wildfire	Honeyville	-	August 2017	856

**Table 02R-05.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Coldwater Fire Aerial			Aerial	Nov 2018	500
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass	Hycrest II	1.00	0.83
G	Dactylis glomerata	Orchardgrass	Paiute	0.50	0.45
G	Elymus wawawaiensis	Snake River Wheatgrass	Discovery	1.50	1.32
G	Leymus cinereus	Great Basin Wildrye	Trailhead	1.50	1.18
G	Poa secunda	Sandberg Bluegrass	Mountain Home	0.10	0.08
G	Poa secunda	Big Bluegrass	Sherman	0.20	0.18
G	Poa secunda	Canby Bluegrass	Canbar	0.20	0.17
F	Achillea millefolium	Western Yarrow	Eagle	0.10	0.09
F	Astragalus cicer	Cicer Milkvetch	Lutana	0.50	0.47
F	Cleome serrulata	Rocky Mountain Beeplant	Carbon UT	0.74	0.68
F	Cleome serrulata	Rocky Mountain Beeplant	Sanpete UT	0.26	0.24
F	Linum perenne	Blue Flax	Appar	0.50	0.43
F	Medicago sativa	Alfalfa	Ladak DL	1.00	0.92
F	Onobrychis viciifolia	Sainfoin	Eski	2.00	1.74
F	Sanguisorba minor	Small Burnet	Delar	1.00	0.94
S	Artemisia tridentata ssp. vaseyana	Mountain Big Sagebrush	Sanpete UT	1.00	0.22
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Elko NV	2.00	0.48
S	Bassia prostrata	Forage Kochia	Box Elder UT	1.00	0.58

**Wildlife Habitat and Vegetation History****Table 02R-05.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	year-long

**Table 02R-05.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1998	Mountain Big Sagebrush	No Encroachment
2006	Mountain Big Sagebrush	Phase I
2011	Mountain Big Sagebrush	Phase I
2016	Mountain Big Sagebrush	Phase I
2021	Perennial Forb-Grass	No Encroachment

**Site Notes**

No Notes

**Soils****Table 02R-05.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.1	38.7	36.7	24.6	6.7	11.5	150.4	0.9	08/07/1998

**Site Potential**

1981 - 2010 Average Annual Precipitation	23 inches
NRCS Ecological Site	Mountain Gravelly Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA406UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated this site from study establishment in 1998 through 2016; a 2017 wildfire removed much of the mature sagebrush. Density of sagebrush exhibited a very minor decrease between 2016 and 2021. However, the dominant age class shifted between 2016, when 98% of plants were mature, and 2021, when 84% of plants were young: this is likely due to rehabilitation seedings that occurred after the fire (Photos, Table 02R-05.1, Table 02R-05.12, Table 02R-05.13). The herbaceous understory has remained abundant, but composition has fluctuated from year to year. Perennial grasses dominated the understory in many years and were considered to be the dominant site component in 2021. Much of the cover was provided by the introduced species bulbous bluegrass (*Poa bulbosa*) before the fire and crested wheatgrass (*Agropyron cristatum*) afterwards. Annual brome species (*Bromus arvensis*, *B. briziformis*, and *B. tectorum*) have also contributed significant cover in many years (Table 02R-05.10). Perennial forbs were a co-dominant site component in 2021 and were primarily composed of the seeded and introduced species alfalfa (*Medicago sativa*) and small burnet (*Sanguisorba minor*) (Table 02R-05.7, Table 02R-05.11). If the young sagebrush plants present on site as of 2021 continue to persist and age, this site will likely transition back to a sagebrush-dominated state. However, 93% of plants were considered to have poor vigor in 2021 (Table 02R-05.13), likely due to drought stress. Decreases in sagebrush in future sample years could possibly occur if similar climatic conditions are sustained. Deer winter range condition has ranged from fair to very poor: this can be attributed to the loss of the preferred browse community, namely sagebrush. As of 2021, deer winter range conditions were considered to be very poor (Table 02R-05.15).

**Trend Summary Tables****Table 02R-05.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1998	18.5	4.3	-	-	-	-
2006	33.4	0.4	-	39.2	0.1	-
2011	33.6	0.1	-	40.7	0.6	-
2016	30.2	0.8	-	40.7	0.6	-
2021	1.7	0.3	-	0.4	-	-

**Table 02R-05.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1998	456	126	162	210	18.1	2.7	1.3	11.2
2006	268	324	161	181	7.9	14.5	1.1	8.7
2011	325	317	270	227	13.3	10.3	7.5	13.3
2016	340	240	212	328	12.6	13.9	2.3	23.6
2021	81	190	362	233	2.2	10.4	7.6	15.9

**Table 02R-05.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	8.6	0.0	42.3	6.5	11.8	53.0
2006	3.1	-	42.9	3.9	8.3	65.2
2011	6.3	0.0	48.7	7.1	10.4	62.8
2016	6.3	0.4	27.2	6.0	7.9	65.5
2021	10.6	0.0	38.9	12.0	11.9	38.7

**Table 02R-05.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit	Wild Turkey
	Quadrat Frequency				
2006	-	6	-	17	-
2011	-	6	-	11	-
2016	-	1	-	8	-
2021	-	15	-	4	-
Days Use Per Acre (ha)					
2006	0.7 (1.8)	12.8 (31.5)	-	-	-
2011	-	12.8 (31.5)	-	-	-
2016	1.5 (3.6)	2.0 (5.0)	-	-	-
2021	-	9.4 (23.2)	1.3 (3.3)	-	8.7 (21.5)*

\*Pellets per acre (ha)

**Table 02R-05.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus briziformis <sup>ai</sup> (rattlesnake brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Dactylis glomerata <sup>i</sup> (orchardgrass)	Elymus elymoides (squirreltail)	Elymus glaucus ssp. jepsonii (Jepson's blue wildrye)	Leymus cinereus (basin wildrye)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)
year	Nested Frequency													
1998	-	320	20	415	-	-	-	-	-	3	80	48	-	-
2006	-	128	13	216	-	-	-	-	177	3	80	120	-	5
2011	-	310	25	43	-	-	-	-	288	4	4	45	-	1
2016	-	304	7	128	-	2	11	-	231	-	-	15	3	3
2021	137	23	2	67	60	-	-	1	23	-	-	36	10	-
year	Average Cover (%)													
1998	-	6.8	0.5	10.8	-	-	-	-	-	0.1	1.7	1.0	-	-
2006	-	1.6	0.1	6.2	-	-	-	-	6.1	0.0	2.7	5.0	-	0.6
2011	-	12.7	0.1	0.4	-	-	-	-	9.4	0.2	0.0	0.7	-	0.0
2016	-	9.1	0.1	3.4	-	0.0	0.4	-	13.4	-	-	0.1	0.0	0.0
2021	8.0	0.2	0.0	2.0	1.2	-	-	0.0	0.3	-	-	0.6	0.2	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02R-05.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Ambrosia psilostachya (Cuman ragweed)	Apocynum androsaemifolium (spreading dogbane)	Artemisia ludoviciana (white sagebrush)	Asclepias asperula (spider milkweed)	Astragalus (milkverch)	Calochortus nuttallii (sego lily)	Carduus nutans <sup>ai</sup> (nodding plumeless thistle)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)
year	Nested Frequency																
1998	-	-	63	178	-	8	4	3	-	4	1	-	3	-	-	-	79
2006	-	2	83	37	76	10	11	-	0	-	2	2	-	-	2	3	90
2011	-	-	234	33	124	6	6	-	5	-	-	2	-	3	-	7	8
2016	-	1	202	14	151	9	2	-	4	-	-	-	2	-	-	1	-
2021	2	2	279	44	57	9	-	3	-	-	-	3	-	-	-	-	-
year	Average Cover (%)																
1998	-	-	0.3	8.1	-	0.5	0.2	0.0	-	0.0	0.0	-	0.0	-	-	-	0.4
2006	-	0.0	0.2	1.2	3.1	0.9	0.6	-	0.0	-	0.1	0.0	-	-	0.0	0.0	0.2
2011	-	-	6.0	0.3	8.9	0.4	0.7	-	0.0	-	-	0.0	-	0.0	-	0.0	0.0
2016	-	0.0	1.7	0.3	13.0	0.1	0.4	-	0.0	-	-	-	0.0	-	-	0.0	-
2021	0.0	0.0	1.2	0.8	1.8	0.1	-	0.0	-	-	-	0.0	-	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium aparine <sup>a</sup> (stickywilly)	Helianthus annuus <sup>ai</sup> (common sunflower)	Isatis tinctoria <sup>ami</sup> (Dyer's woad)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Linum perenne <sup>i</sup> (blue flax)	Medicago sativa <sup>i</sup> (alfalfa)	Melilotus officinalis <sup>i</sup> (sweetclover)	Microsteris gracilis <sup>a</sup> (slender phlox)	Onobrychis viciifolia <sup>i</sup> (sainfoin)	Penstemon (beardtongue)	Phlox longifolia (longleaf phlox)	Sanguisorba minor <sup>i</sup> (small burnet)	Silene antirrhina <sup>a</sup> (sleepy silene)	Symphotrichum (aster)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Veronica biloba <sup>ai</sup> (two-lobed speedwell)
year	Nested Frequency																
1998	-	-	22	-	15	-	-	29	-	-	6	-	-	7	-	9	-
2006	26	-	9	0	-	-	-	42	9	-	-	4	-	5	-	3	-
2011	31	14	69	-	10	-	-	88	5	-	-	1	-	13	-	17	2
2016	32	2	18	-	11	-	-	216	6	-	-	-	-	16	3	4	-
2021	234	-	-	-	3	3	127	17	5	14	-	-	55	-	-	27	16
year	Average Cover (%)																
1998	-	-	0.3	-	0.1	-	-	2.4	-	-	0.0	-	-	0.2	-	0.1	-
2006	0.3	-	0.2	0.0	-	-	-	2.1	0.0	-	-	0.0	-	0.0	-	0.0	-
2011	0.1	0.1	0.4	-	0.0	-	-	2.7	0.0	-	-	0.0	-	0.4	-	0.3	0.0
2016	0.3	0.0	0.1	-	0.1	-	-	9.0	0.0	-	-	-	-	0.1	0.4	0.0	-
2021	5.8	-	-	-	0.0	0.1	9.3	0.5	0.0	0.4	-	-	2.8	-	-	0.6	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Viola (violet)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency	
1998	-	7
2006	4	40
2011	15	11
2016	16	17
2021	-	-
year	Average Cover (%)	
1998	-	0.0
2006	0.0	0.7
2011	0.1	0.2
2016	0.1	0.2
2021	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02R-05.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Bassia prostrata <sup>pt</sup> (forage kochia)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Rhus glabra <sup>p</sup> (smooth sumac)	Rhus trilobata <sup>p</sup> (skunkbush sumac)
year	Line Intercept Cover (%)					
1998	-	-	-	-	-	-
2006	32.3	-	6.5	0.1	-	0.4
2011	38.1	-	2.6	0.6	-	-
2016	36.7	-	1.5	0.6	0.6	1.9
2021	0.3	0.1	-	-	-	0
year	Quadrat Cover (%)					
1998	11.6	-	5.7	4.3	-	1.3
2006	29.3	-	3.8	0.4	-	0.3
2011	31.8	-	1.7	0.1	-	0.0
2016	27.0	-	1.4	0.8	0.4	1.5
2021	0.9	0.1	-	0.3	-	0.7

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02R-05.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1998	2820	100	11	84	6	9	0	8	76/93
2006	2780	260	0	96	4	6	0	1	85/104
2011	3040	1720	1	91	9	1	0	18	82/119
2016	2500	160	1	98	1	1	19	22	94/133
2021	2460	20	84	14	2	0	0	93	- / -
<b>Bassia prostrata<sup>pt</sup> -- (forage kochia)</b>									
1998	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	140	-	0	86	14	14	0	57	- / -
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1998	400	-	0	90	10	0	0	0	122/175
2006	420	-	0	19	81	0	0	86	95/134
2011	340	-	0	0	100	0	0	94	79/88
2016	320	-	0	94	6	0	0	6	81/96
2021	-	-	-	-	-	-	-	-	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1998	1960	-	2	98	0	0	0	0	43/54
2006	320	-	0	63	38	0	0	31	26/27
2011	480	-	17	83	0	0	0	4	41/39
2016	400	-	0	100	0	0	0	0	38/46
2021	260	-	0	31	69	0	0	85	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Rhus glabra<sup>p</sup> -- (smooth sumac)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	48/50
2016	120	-	0	100	0	0	0	0	54/46
2021	40	-	0	0	100	0	0	100	-/-
<b>Rhus trilobata<sup>p</sup> -- (skunkbush sumac)</b>									
1998	3340	40	100	0	0	0	0	0	-/-
2006	20	-	0	100	0	0	0	0	114/186
2011	20	-	100	0	0	0	0	0	122/192
2016	60	-	0	100	0	0	0	0	110/139
2021	340	-	0	0	100	0	0	100	-/-
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	68/124

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02R-05.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

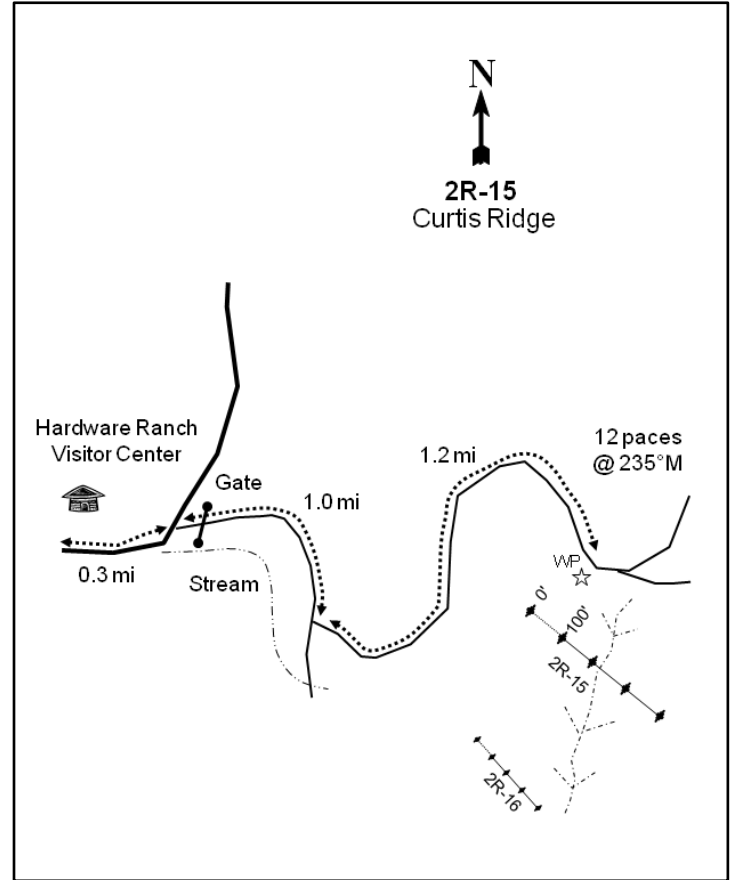
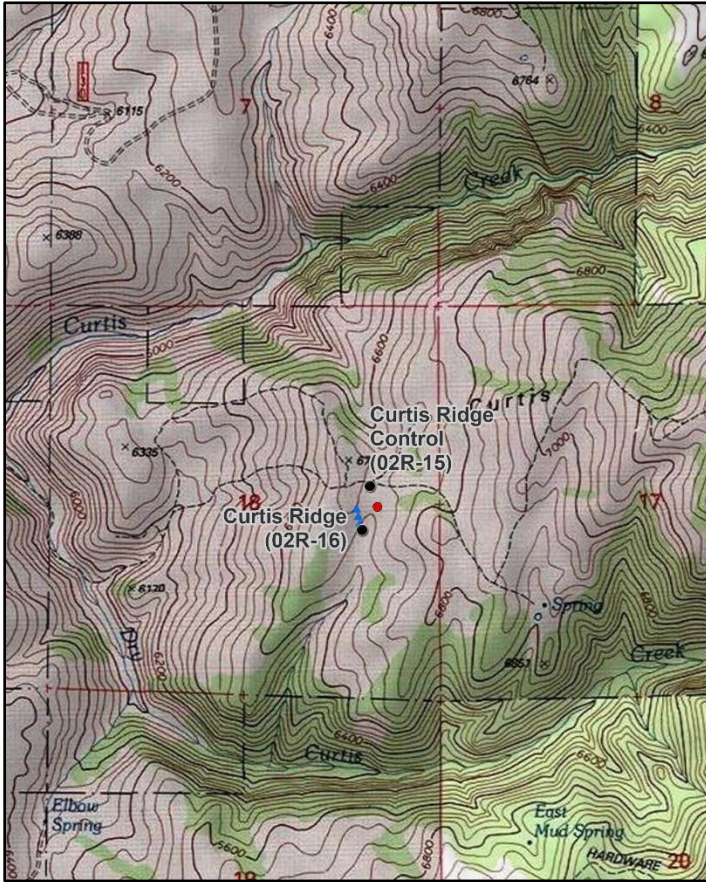
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2016	5	25	-	-	-	75	16.6

**Table 02R-05.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1998	22.8	13.0	6.7	5.5	-13.6	10.0	-2.0	<b>42.5</b>	Poor
2006	30.0	9.9	0.0	16.7	-5.9	10.0	-2.0	<b>58.7</b>	Fair
2011	30.0	10.7	0.3	1.7	-10.0	10.0	0.0	<b>42.8</b>	Poor
2016	30.0	14.7	0.4	1.1	-9.4	10.0	0.0	<b>46.7</b>	Poor
2021	0.5	0.0	0.0	20.1	-1.7	10.0	0.0	<b>28.9</b>	Very Poor



## CURTIS RIDGE CONTROL - STUDY NO. 02R-15

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Hardware Ranch NE; Township 10N, Range 4E, Section 18  
NAD 83 UTM ZONE 12, 456275 East 4605932 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

144  
145° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft & 71ft), Line 3 (59ft)  
No Rebar

**Directions to Site**

From the Hardware Ranch Visitors' Center, drive 0.3 miles to a fork in the road and a gate. Take a right through a gate (this road follows a stream a short distance). Proceed 1.0 miles to a fork. Take a left and drive 1.2 miles to a witness post on the right. From the witness post, walk 12 paces at 235 degrees magnetic to the 0-foot stake with browse tag #144. Transect baseline is at a bearing of 140 degrees magnetic.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,700ft (2,042m)
Aspect	Northeast
Slope	4%
Sample Dates	07/11/2006, 08/22/2011, 06/30/2021

**Table 02R-15.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Curtis Ridge Lop and Scatter	4730	2019	400

**Wildlife Habitat and Vegetation History****Table 02R-15.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	winter	

**Table 02R-15.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2006	Little Sagebrush	Phase I
2011	Little Sagebrush	Phase I
2021	Little Sagebrush	Phase I

**Site Notes**

This study was established as a control to an intensive grazing project conducted on Hardware Ranch to improve browse composition. Hardware Ranch is administered by the Utah Division of Wildlife Resources (UDWR).

**Site Potential**

1981 - 2010 Average Annual Precipitation	26 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

When established in 2006 to sample a grazing project, the site was dominated by a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and low sagebrush (*A. arbuscula*) community, with several belts also sampling a dry meadow (Photos, table 02R-15.12). Both mountain big and low sagebrush have generally decreased in cover over the duration of the study; however, density has been mixed; low sagebrush has steadily decreased in density while density of mountain big sagebrush has generally increased (Table 02R-12, Table 02R-15.13). A majority of low sagebrush are considered to display poor vigor and decadence, which could be an indicator of a current community transition. Overall preferred browse cover has steady decreased with each sampling (table 02R-15.6). The herbaceous understory is diverse and abundant. The perennial grass species Letterman needlegrass (*Achnatherum lettermanii*) was the dominant grass in 2006 and 2011, but bulbous bluegrass (*Poa bulbosa*) became dominant in 2021 (Table 02R-15.10). The weedy annual species mountain tarweed (*Madia glomerata*) was present on the site in 2006 and 2011, but not observed in 2021 (Table 02R-15.11). The site is generally considered to be good wintering habitat for mule deer; however, further monitoring is needed to observe the browse component and its health; any additional disturbance has the potential to trigger a community transition away from one dominated by browse and decreasing its value for deer (Table 02R-15.15).

**Trend Summary Tables****Table 02R-15.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2006	29.3	-	1.1	36.9	-	3.7
2011	23.1	-	0.7	32.6	0.3	3.2
2021	15.2	0.0	-	20.2	-	4.1

**Table 02R-15.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2006	-	329	242	368	-	15.0	3.1	20.6
2011	2	352	336	383	0.0	13.2	7.0	17.6
2021	2	406	127	381	0.0	29.9	1.7	17.3

**Table 02R-15.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2006	20.7	0.5	37.6	0.6	1.1	60.9
2011	12.9	0.6	43.2	0.3	0.8	54.5
2021	15.8	2.8	46.5	0.4	0.9	51.5

**Table 02R-15.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Domestic Sheep	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
2006	6	5	1	-	-
2011	1	5	11	-	1
2021	4	31	20	1	5
Year	Days Use Per Acre (ha)				
2006	17.4 (43.0)	2.7 (6.6)	8.1 (19.9)	-	-
2011	3.6 (9.0)	1.3 (3.3)	6.7 (16.6)	-	-
2021	-	7.4 (18.2)	19.4 (48.0)	15.7 (38.7)	-

**Table 02R-15.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Elymus trachycaulus (slender wheatgrass)	Festuca idahoensis (Idaho fescue)	Juncus (rush)	Koeleria macrantha (prairie Junegrass)	Melica bulbosa (oniongrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency														
2006	169	-	17	20	18	15	54	-	101	34	43	12	26	59	5
2011	193	2	27	43	46	60	28	2	56	50	103	1	22	59	4
2021	197	2	78	58	120	11	21	11	17	62	294	23	14	5	0
year	Average Cover (%)														
2006	6.0	-	0.3	0.3	0.1	0.8	2.0	-	1.6	0.7	1.5	0.2	0.4	1.1	0.0
2011	5.1	0.0	0.4	0.4	0.4	0.6	0.9	0.0	0.7	0.5	3.2	0.0	0.3	0.8	0.0
2021	5.3	0.0	0.8	1.6	1.2	0.3	0.5	0.2	0.2	1.8	17.4	0.2	0.3	0.0	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 02R-15.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Antennaria (pussytoes)	Calochortus nuttallii (sego lily)	Chaenactis douglasii (Douglas' dustymaiden)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Eriogonum heracleoides (parsnipflower buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Geranium richardsonii (Richardson's geranium)	Heuchera rubescens (pink alumroot)
year	Nested Frequency																
2006	250	129	76	-	1	-	33	13	2	1	-	-	41	-	8	15	-
2011	268	65	25	1	-	16	33	13	8	5	5	2	25	33	-	7	-
2021	317	43	13	1	-	-	7	47	-	4	-	-	-	5	14	5	3
year	Average Cover (%)																
2006	7.0	1.4	0.4	-	0.0	-	0.2	0.1	0.0	0.0	-	-	0.2	-	0.4	0.8	-
2011	7.4	0.3	0.1	0.0	-	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	1.0	-	0.5	-
2021	12.0	0.1	0.0	0.0	-	-	0.0	0.9	-	0.1	-	-	-	0.3	0.2	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>ai</sup> (flatspine stickseed)	Lomatium (desertparsley)	Lupinus argenteus (silvery lupine)	Madia glomerata <sup>ai</sup> (mountain tarweed)	Mertensia (bluebells)	Microseris nutans (nodding microseris)	Microseris gracilis <sup>ai</sup> (slender phlox)	Navarretia intertexta <sup>ai</sup> (needleleaf navarretia)	Orthocarpus luteus <sup>ai</sup> (yellow owl's-clover)	Orthocarpus purpureoalbus <sup>ai</sup> (purplewhite owl's-clover)	Polygonum douglasii <sup>ai</sup> (Douglas' knotweed)	Potentilla gracilis (slender cinquefoil)	Senecio integerrimus <sup>ai</sup> (lambstongue ragwort)	Silene antirrhina <sup>ai</sup> (sleepy silene)	Stellaria longipes (longstalk starwort)	Symphotrichum ascendens (western aster)
year	Nested Frequency																
2006	-	2	1	2	37	-	-	21	-	31	1	131	2	86	6	5	230
2011	-	35	-	1	52	-	-	14	5	111	-	246	0	95	3	13	236
2021	3	-	-	3	-	61	16	3	-	53	-	33	-	-	-	-	210
year	Average Cover (%)																
2006	-	0.0	0.0	0.4	0.1	-	-	0.0	-	0.1	0.0	1.3	0.0	1.1	0.0	0.3	9.4
2011	-	0.2	-	0.1	1.2	-	-	0.0	0.0	1.9	-	2.5	0.0	0.7	0.0	0.6	7.2
2021	0.0	-	-	0.0	-	1.0	0.0	0.0	-	0.5	-	0.1	-	-	-	-	3.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Veronica biloba <sup>ai</sup> (two-lobed speedwell)	Viola (violet)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency				
2006	23	2	-	5	7
2011	32	-	11	1	8
2021	38	1	4	9	11
year	Average Cover (%)				
2006	0.3	0.0	-	0.1	0.1
2011	0.2	-	0.2	0.0	0.0
2021	0.2	0.0	0.1	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 02R-15.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia arbuscula <sup>p</sup> (little sagebrush)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum heracleoides (parsnipflower buckwheat)	Juniperus scopulorum <sup>t</sup> (Rocky Mountain juniper)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Rosa woodsii <sup>p</sup> (Wood's rose)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)
year	Line Intercept Cover (%)								
2006	0.4	22.1	9.8	0	-	3.7	3.1	0.3	1.2
2011	-	21	8.4	-	0.3	3.2	2.4	0.1	0.7
2021	-	7.9	7.6	-	-	4.1	3.1	-	1.6
year	Quadrat Cover (%)								
2006	0.0	16.7	8.7	0.0	-	1.1	3.5	0.1	0.3
2011	-	15.9	5.3	-	0.0	0.7	1.5	0.1	0.2
2021	-	6.3	6.9	0.0	-	0.0	1.6	0.1	0.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02R-15.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
2006	40	-	50	50	0	0	0	0	79/79
2011	20	-	0	100	0	0	0	0	98/94
2021	-	-	-	-	-	-	-	-	-/-
<b>Artemisia arbuscula<sup>p</sup> -- (little sagebrush)</b>									
2006	9080	960	16	78	6	8	0	5	30/51
2011	8840	1180	15	77	8	25	2	5	26/59
2021	5080	60	13	24	63	9	1	64	-/-
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
2006	1640	180	7	71	22	7	0	7	77/112
2011	1040	380	10	65	25	31	6	4	66/98
2021	1720	-	21	38	41	2	1	40	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2021	20	-	100	0	0	0	100	0	-/-
<b>Eriogonum heracleoides -- (parsnipflower buckwheat)</b>									
2006	-	-	-	-	-	-	-	-	17/26
2011	1320	-	6	94	0	0	0	0	16/28
2021	-	-	-	-	-	-	-	-	-/-
<b>Juniperus scopulorum<sup>t</sup> -- (Rocky Mountain juniper)</b>									
2006	20	20	100	0	0	0	0	100	-/-
2011	20	-	100	0	0	0	0	0	-/-
2021	20	20	100	0	0	0	0	0	-/-
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
2006	380	120	0	74	26	16	42	11	61/129
2011	300	-	0	87	13	53	7	0	67/126
2021	340	-	0	35	65	18	59	59	-/-

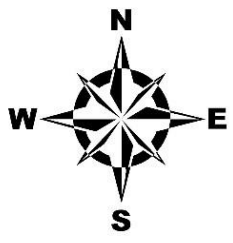
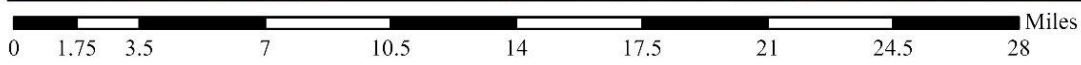
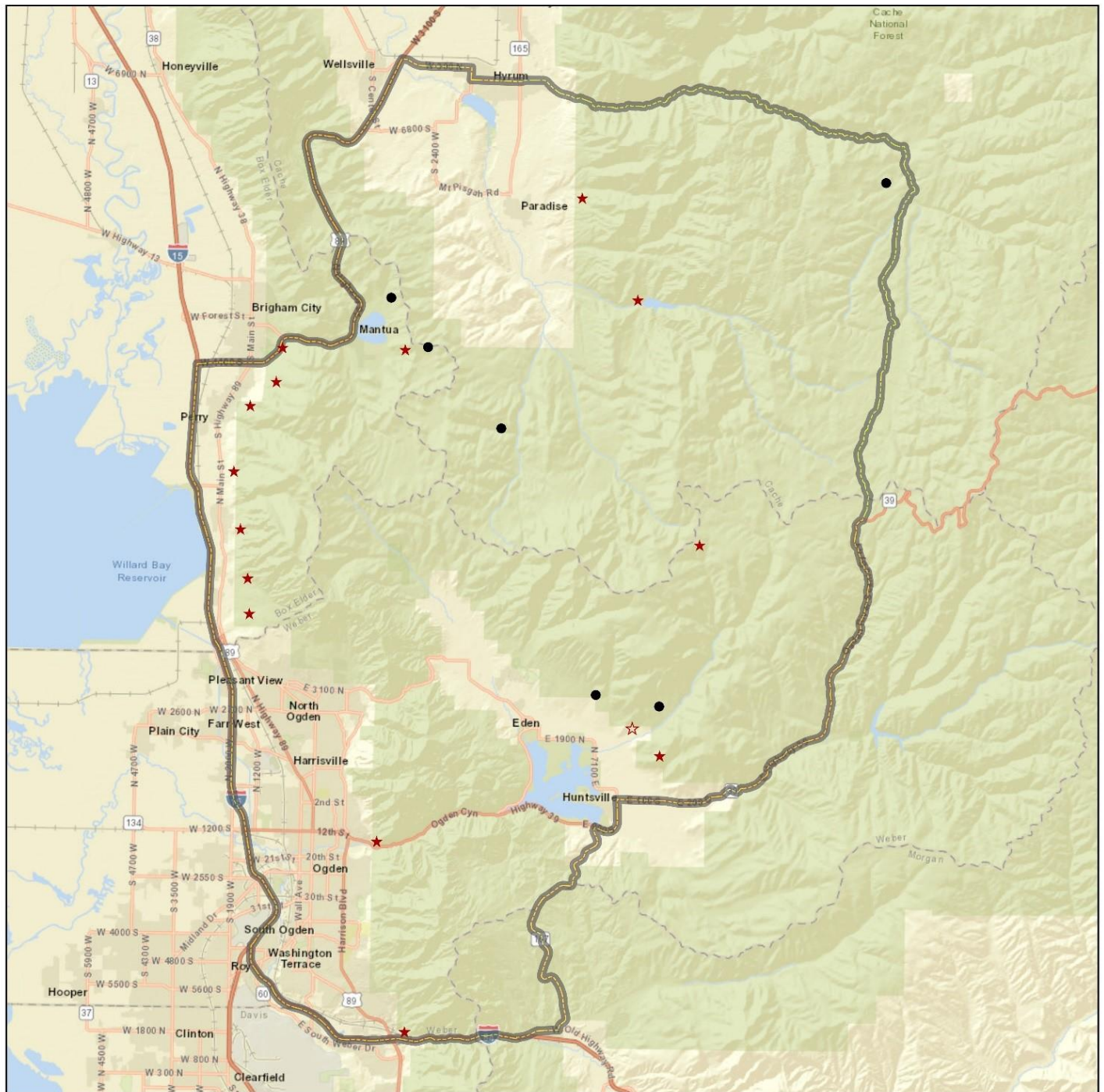
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Rosa woodsii <sup>p</sup> -- (Woods' rose)									
2006	40	-	50	50	0	0	0	0	68/49
2011	60	-	0	100	0	0	0	0	52/26
2021	40	-	0	100	0	0	0	0	- / -
Symphoricarpos oreophilus <sup>p</sup> -- (mountain snowberry)									
2006	280	100	7	86	7	0	0	7	47/66
2011	220	-	9	91	0	0	0	0	48/70
2021	280	-	57	43	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 02R-15.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2006	30.0	11.4	6.4	27.1	0.0	10.0	0.0	<b>84.9</b>	Good
2011	30.0	11.2	6.1	20.0	0.0	10.0	0.0	<b>77.2</b>	Good
2021	25.6	0.0	8.7	24.9	0.0	10.0	0.0	<b>69.3</b>	Fair-Good

# WILDLIFE MANAGEMENT UNIT 3 - OGDEN

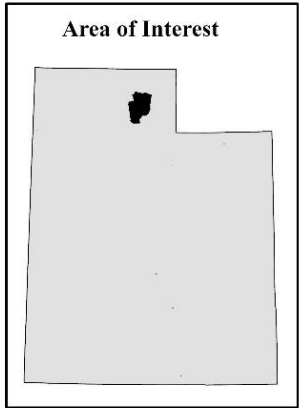


**Study Locations  
Project, Status**

- RT, Active
- ★ RT, Suspended
- ★ WRI, Suspended

**Unit Boundary**

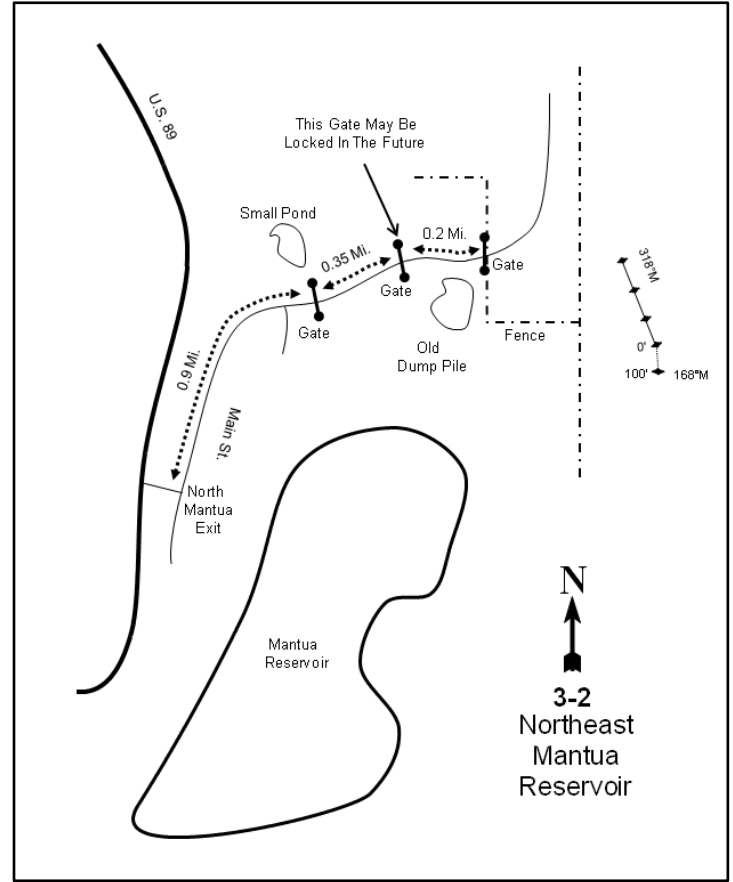
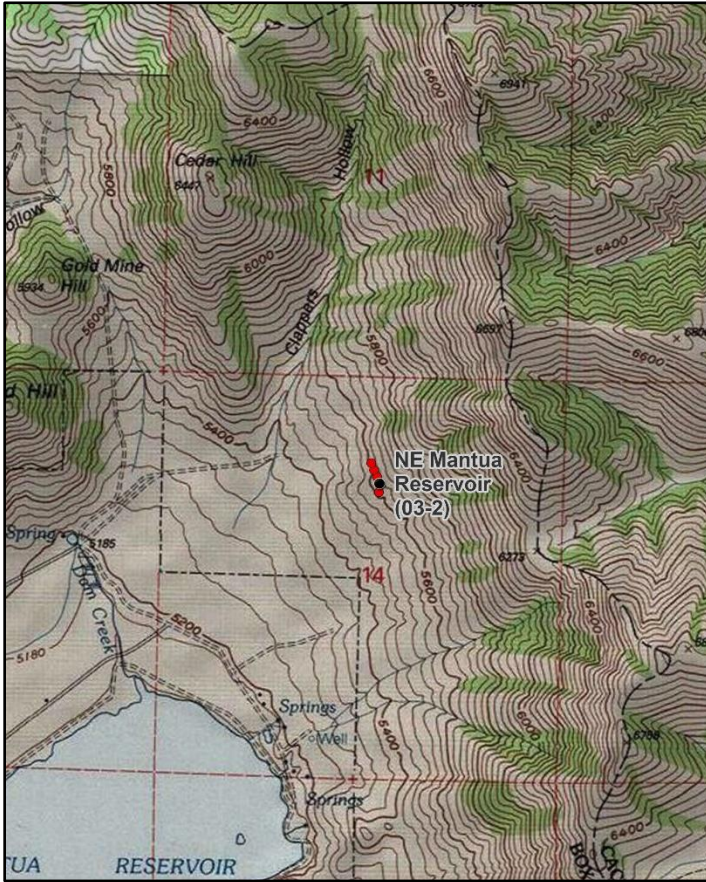
- ▭ Unit - 3



Credits: Bureau of Land Management, Utah AGRC, Esri, HERE, Garmin, NGA, USGS, NPS



## NE MANTUA RESERVOIR - STUDY NO. 03-2



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Mount Pisgah SE; Township 9N, Range 1W, Section 14  
NAD 83 UTM ZONE 12, 423253 East 4597004 North

### Transect Information

Browse Tag # (0' Stake)	7105
Transect Bearing	168° magnetic (Lines 2-4: 318° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (71ft), Line 4 (34ft)
Belt Marker Placement	Belt 1: No Rebar

### Directions to Site

Turn east off of U.S. 89-91 at the north Mantua exit and travel east to Main Street. Turn left (north) on Main Street and proceed 0.9 miles to a gate with a small pond to the left (north). Proceed through the gate, stopping at another gate after 0.35 miles (this gate may be locked in the future). Proceed 0.2 miles to another gate with an old dump to the south. From the gate, walk southeast to a "T" in the fence. From the "T" in the fence, walk 60 paces at a bearing of 112 degrees magnetic to the 0-foot baseline stake; the 0-foot stake is marked by browse tag #7105. The first 100 feet of the baseline run south at a bearing of 165 degrees magnetic. The last 300 feet run north off of the 0-foot stake at a bearing of 318 degrees magnetic.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,560ft (1,695m)
Aspect	West
Slope	30%
Sample Dates	08/27/1996, 07/18/2001, 07/11/2006, 07/20/2011, 06/30/2016, 07/21/2021

**Table 03-02.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Facer	-	2006	588
Fire - Wildfire	-	-	1963	-

**Wildlife Habitat and Vegetation History****Table 03-02.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	summer

**Table 03-02.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Wyoming Big Sagebrush	No Encroachment
1990	Wyoming Big Sagebrush	No Encroachment
1996	Wyoming Big Sagebrush	Phase I
2001	Wyoming Big Sagebrush	Phase I
2006	Wyoming Big Sagebrush/Perennial Grass	Phase I
2011	Perennial Grass	No Encroachment
2016	Perennial-Annual Grass/Annual Forb	No Encroachment
2021	Perennial Grass	No Encroachment

**Site Notes**

The study is located approximately one mile northeast of Mantua Reservoir and samples a former Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) community that has transitioned to a weedy grass community. The study is on private land. The Ruby gas pipeline is about a half of a mile north of the site.

**Soils****Table 03-02.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay	7.4	22.0	36.4	41.6	3.6	29.4	179.2	0.5	08/27/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	31 inches
NRCS Ecological Site	Upland Stony Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R047XA338UT
States and Transitions	No state and transition model is available for this ecological site.

From study establishment in 1984 through the 2006 sample year, this site remained dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). Sagebrush decreased in both cover and density over time (Photos, Pre-1992 Data, Table 03-02.12, Table 03-02.13) while perennial grasses increased, becoming a dominant vegetation component in 2011. The native species bluebunch wheatgrass (*Pseudoroegneria spicata*) has contributed much of the perennial grass cover over the sample years, but the introduced species bulbous bluegrass (*Poa bulbosa*) has also provided significant cover in some years. Annual grasses such as introduced brome species (*Bromus tectorum* and *B. arvensis*) have been present in fluctuating amounts and were co-dominant with perennial grasses and annual forbs in 2016. Furthermore, the introduced annual grasses and noxious weed species jointed goatgrass (*Aegilops cylindrica*) and medusahead (*Taeniatherum caput-medusae*) have been present since 2011. Although both noxious weed species had low cover and abundance in 2021 (Table 03-02.7, Table 03-02.10, Table 03-02.11), they could pose a threat to the diversity and ecological integrity of the understory should they increase in the future. Deer winter range condition has ranged between poor-fair and very poor; this difference can be attributed to an overall decrease in sagebrush cover and increases in annual grass and noxious weed cover. As of 2021, deer winter range conditions were considered to be very poor (Table 03-02.15).

**Trend Summary Tables****Table 03-02.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	16.9	0.4	-	-	-	-
2001	16.6	0.8	-	-	-	-
2006	4.5	0.3	-	5.8	0.2	-
2011	0.5	-	-	1.2	-	-
2016	1.5	0.0	-	2.3	-	-
2021	0.0	0.6	-	0.7	-	-

**Table 03-02.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	433	238	242	92	17.2	9.5	2.0	2.8
2001	359	373	204	154	13.6	16.5	4.1	5.7
2006	272	332	372	171	10.9	23.1	7.2	9.0
2011	305	413	329	122	10.0	43.9	12.1	11.4
2016	429	312	399	164	27.6	24.9	25.3	19.8
2021	250	415	283	141	5.6	32.1	6.4	12.0

**Table 03-02.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	5.3	-	58.2	3.8	5.7	50.3
2001	9.8	-	45.1	3.8	4.3	55.4
2006	11.0	0.0	40.8	3.4	4.7	59.2
2011	7.4	-	49.5	5.4	6.1	67.9
2016	11.2	-	18.1	2.7	7.9	70.5
2021	14.1	0.1	30.2	5.4	6.5	57.6

**Table 03-02.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	2	5	-	-
2001	-	10	1	2
2006	-	7	1	-
2011	-	1	-	-
2016	-	-	-	-
2021	-	14	6	-
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	-	20.8 (51.3)	-	-
2006	-	26.8 (66.2)	-	-
2011	-	0.7 (1.7)	2.7 (6.6)	-
2016	-	0.7 (1.7)	2.0 (5.0)	-
2021	-	18.7 (46.3)	7.4 (18.2)	-

**Table 03-02.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Aegilops cylindrica <sup>ami</sup> (jointed goatgrass)	Alopecurus magellanicus (Alpine Meadow-Foxtail)	Bromus arvensis <sup>sai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Eragrostis cilianensis <sup>ai</sup> (stinkgrass)	Koeleria macrantha (prairie Junegrass)	Melica bulbosa (oniongrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Taeniatherum caput-medusae <sup>ami</sup> (medusahead)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency												
1996	-	-	-	431	39	-	2	-	90	13	183	-	-
2001	-	-	231	228	210	91	6	-	222	45	184	-	-
2006	2	-	-	151	209	-	6	30	203	44	191	-	-
2011	-	-	-	253	113	-	6	14	328	26	247	18	-
2016	-	3	-	271	342	-	5	1	163	9	249	102	-
2021	-	7	-	115	87	22	3	6	369	4	210	98	12
year	Average Cover (%)												
1996	-	-	-	16.3	0.9	-	0.0	-	4.2	0.1	5.3	-	-
2001	-	-	1.6	3.6	7.5	2.5	0.1	-	7.7	0.4	6.8	-	-
2006	0.0	-	-	2.7	8.3	-	0.2	1.1	7.8	0.8	13.2	-	-
2011	-	-	-	7.9	2.1	-	0.2	0.1	23.9	0.7	19.0	0.1	-
2016	-	0.0	-	7.2	13.7	-	0.0	0.0	7.1	0.3	17.5	6.7	-
2021	-	0.0	-	0.5	1.6	0.5	0.2	0.3	18.5	0.1	12.3	2.9	0.7

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 03-02.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Ambrosia psilostachya (Cuman ragweed)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Buglossoides arvensis <sup>sai</sup> (corn gromwell)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littledod false flax)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)
year	Nested Frequency																
1996	63	1	103	-	-	3	-	-	14	-	3	-	2	2	-	5	-
2001	94	-	-	-	-	4	8	-	15	-	10	0	6	-	1	22	9
2006	50	15	250	-	5	7	1	-	33	-	4	-	4	-	22	18	8
2011	55	6	199	-	-	4	-	-	20	-	3	6	-	-	3	12	2
2016	57	6	99	4	-	1	-	0	31	9	13	1	-	-	10	5	7
2021	27	1	34	8	-	5	-	4	40	4	3	-	-	1	-	-	-
year	Average Cover (%)																
1996	1.4	0.0	0.2	-	-	0.1	-	-	0.7	-	0.0	-	0.0	0.0	-	0.0	-
2001	1.9	-	-	-	-	0.4	0.1	-	1.9	-	0.1	0.0	0.0	-	0.0	0.1	0.0
2006	0.9	0.1	0.8	-	0.0	0.5	0.0	-	3.5	-	0.0	-	0.0	-	0.0	0.1	0.1
2011	2.5	0.1	4.3	-	-	0.0	-	-	5.3	-	0.0	0.0	-	-	0.0	0.0	0.0
2016	2.4	0.0	0.4	0.2	-	0.0	-	0.0	7.4	0.1	0.0	0.0	-	-	0.0	0.0	0.2
2021	0.5	0.0	0.1	0.1	-	0.2	-	0.1	6.7	0.0	0.0	-	-	0.0	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Convulvulus arvensis <sup>ni</sup> (field bindweed)	Cordylanthus ramosus <sup>ai</sup> (bushy bird's beak)	Crepis acuminata (tapertip hawkbeard)	Cryptantha <sup>a</sup> (annual cryptantha)	Cymopterus (springparsley)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium aparine <sup>a</sup> (stickywilly)	Gilia inconspicua <sup>a</sup> (shy gilia)	Hackelia patens (spotted stickseed)	Hedysarum boreale (Utah sweetvetch)	Helianthus annuus <sup>ai</sup> (common sunflower)	Isatis tinctoria <sup>ami</sup> (Dyer's woad)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)
year	Nested Frequency																
1996	-	-	-	-	-	-	170	-	3	-	-	3	-	-	19	-	5
2001	-	-	-	-	2	-	71	1	-	3	-	11	2	-	10	30	5
2006	-	-	-	16	5	2	260	-	134	11	3	54	-	1	20	72	10
2011	-	1	-	5	-	1	62	-	42	3	-	30	-	8	12	205	2
2016	10	-	-	6	-	-	34	-	237	8	-	12	-	11	27	192	24
2021	17	-	1	3	-	-	14	-	74	8	-	3	-	5	2	10	6
year	Average Cover (%)																
1996	-	-	-	-	-	-	1.4	-	0.0	-	-	0.1	-	-	0.2	-	0.0
2001	-	-	-	-	0.0	-	0.2	0.0	-	0.0	-	0.2	0.0	-	0.1	0.2	0.4
2006	-	-	-	0.0	0.1	0.0	2.0	-	1.8	0.1	0.0	0.9	-	0.0	0.4	0.6	0.0
2011	-	0.0	-	0.0	-	0.0	0.4	-	0.2	0.0	-	0.5	-	0.2	0.5	3.4	0.0
2016	0.8	-	-	0.2	-	-	0.1	-	9.2	0.1	-	0.7	-	0.1	1.6	6.5	0.8
2021	1.2	-	0.0	0.0	-	-	0.0	-	2.4	0.0	-	0.0	-	0.1	0.2	0.1	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lithospermum ruderales (western stone seed)	Lupinus argenteus (silvery lupine)	Machaeranthera grindelioides (rayless tansyaster)	Madia glomerata <sup>a</sup> (mountain tarweed)	Medicago sativa <sup>i</sup> (alfalfa)	Microsteris gracilis <sup>a</sup> (slender phlox)	Polygonum douglasii <sup>ai</sup> (Douglas' knotweed)	Rumex (dock)	Senecio spartioides var. multicapitatus (broom-like ragwort)	Silene antirrhina <sup>a</sup> (sleepy silene)	Symphoricarum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ai</sup> (yellow safsify)	Trifolium (clover)	Verbascum thapsus <sup>ai</sup> (common mullein)	Veronica biloba <sup>ai</sup> (twolobe speedwell)	Wyethia amplexicaulis (mule-ears)
year	Nested Frequency																
1996	2	4	-	2	-	3	8	-	-	-	-	-	14	-	-	9	4
2001	11	9	-	-	-	7	9	3	1	16	8	-	113	-	-	31	-
2006	18	9	-	-	-	37	7	-	-	13	7	-	73	-	-	49	2
2011	20	17	2	14	1	-	3	2	-	-	-	1	141	-	2	47	2
2016	29	23	-	1	1	-	8	1	-	6	4	2	85	2	5	202	-
2021	31	8	4	108	12	-	-	-	-	-	4	-	130	-	-	64	-
year	Average Cover (%)																
1996	0.2	0.2	-	0.0	-	0.0	0.0	-	-	-	-	-	0.0	-	-	0.0	0.0
2001	0.4	0.4	-	-	-	0.0	0.0	0.0	0.0	0.2	0.3	-	2.7	-	-	0.1	-
2006	1.7	0.6	-	-	-	0.1	0.0	-	-	0.0	0.3	-	1.0	-	-	0.1	0.1
2011	1.7	1.0	0.0	0.4	0.0	-	0.0	0.0	-	-	-	0.2	2.0	-	0.0	0.6	0.0
2016	4.8	2.5	-	0.0	0.3	-	0.0	0.1	-	0.0	0.1	0.0	1.4	0.0	0.3	4.6	-
2021	2.2	0.4	0.1	1.4	0.4	-	-	-	-	-	0.1	-	1.6	-	-	0.5	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency
1996	8
2001	0
2006	3
2011	-
2016	1
2021	-
year	Average Cover (%)
1996	0.0
2001	0.0
2006	0.0
2011	-
2016	0.0
2021	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 03-02.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Prunus virginiana <sup>p</sup> (chokecherry)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)
year	Line Intercept Cover (%)				
1996	-	-	-	-	-
2001	-	-	-	-	-
2006	4.7	-	0.2	0.1	1
2011	0.7	-	-	0.5	-
2016	1.2	-	-	1.1	-
2021	-	-	-	0.7	-
year	Quadrat Cover (%)				
1996	16.2	-	0.4	0.0	0.7
2001	15.6	-	0.8	0.1	0.8
2006	4.0	-	0.3	0.4	0.1
2011	0.0	-	-	0.5	-
2016	1.3	-	0.0	0.2	-
2021	-	0.6	-	0.0	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 03-02.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

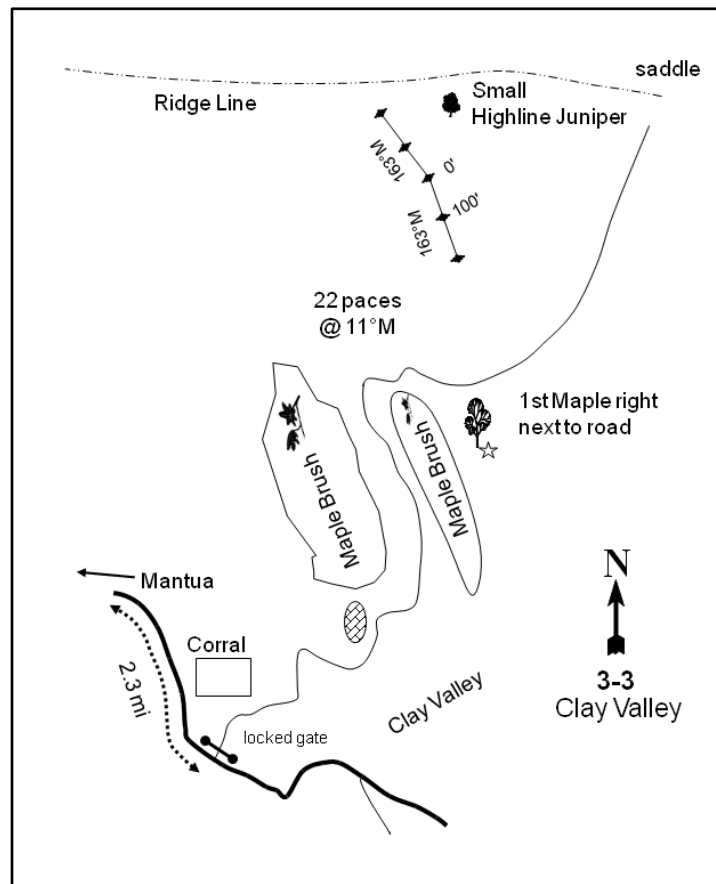
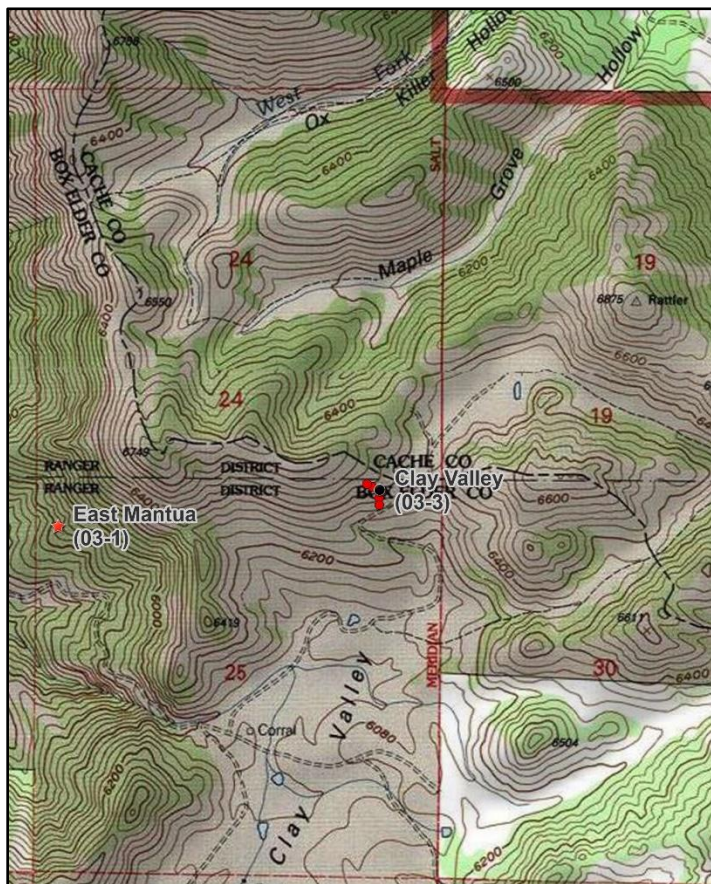
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1996	-	-	-	-	-	-	-	-	93/94
2001	-	-	-	-	-	-	-	-	77/89
2006	-	-	-	-	-	-	-	-	103/102
2011	-	-	-	-	-	-	-	-	65/60
2016	-	-	-	-	-	-	-	-	72/61
2021	-	-	-	-	-	-	-	-	-/-
<b>Artemisia tridentata ssp. wyomingensis<sup>P</sup> -- (Wyoming big sagebrush)</b>									
1996	1860	20	17	69	14	32	0	4	68/125
2001	1840	40	15	59	26	42	8	5	70/112
2006	940	240	9	36	55	55	11	38	56/80
2011	80	-	0	100	0	0	0	0	63/91
2016	200	1080	60	40	0	30	0	0	66/105
2021	20	-	0	100	0	0	0	0	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	33/54
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	740	-	43	57	0	0	0	0	27/36
2001	740	-	0	92	8	0	0	5	28/39
2006	140	-	0	100	0	0	0	0	32/41
2011	20	-	0	100	0	0	0	0	42/53
2016	40	-	0	100	0	0	0	0	38/44
2021	100	-	40	60	0	0	0	40	-/-
<b>Prunus virginiana<sup>P</sup> -- (chokecherry)</b>									
1996	60	-	100	0	0	0	0	0	50/34
2001	120	-	0	100	0	0	0	0	-/-
2006	200	-	100	0	0	60	0	0	77/18
2011	160	-	25	75	0	75	0	0	81/85
2016	120	-	0	100	0	100	0	0	95/90
2021	220	-	55	46	0	100	0	0	-/-
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1996	20	-	0	100	0	0	100	0	191/248
2001	20	-	0	0	100	0	0	0	-/-
2006	20	-	0	100	0	0	100	0	111/168
2011	-	-	-	-	-	-	-	-	55/85

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 03-02.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	21.3	11.0	8.3	10.6	-12.9	5.5	-2.0	<b>41.8</b>	Poor
2001	21.0	6.1	7.1	17.7	-10.2	10.0	-2.0	<b>49.7</b>	Poor-Fair
2006	7.5	1.6	4.3	30.0	-8.2	10.0	-2.0	<b>43.2</b>	Poor
2011	1.5	0.0	0.0	30.0	-7.5	10.0	-4.0	<b>30.0</b>	Very Poor
2016	2.9	0.0	0.0	30.0	-15.7	10.0	-8.0	<b>19.2</b>	Very Poor
2021	0.9	0.0	0.0	27.3	-2.0	10.0	-8.0	<b>28.1</b>	Very Poor

## CLAY VALLEY - STUDY NO. 03-3

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Mantua NE; Township 9N, Range 1W, Section 25  
NAD 83 UTM ZONE 12, 425363 East 4594164 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

7997  
163° magnetic (Lines 3-4: 282° magnetic)  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Belt 5: No Rebar

**Directions to Site**

From the Mantua Hatchery, proceed 0.65 miles towards Mantua to the first possible right turn. Turn right, proceed 2.3 miles up the canyon to Clay Valley, and stop at a locked gate on the east end of the corral. Cross the gate and begin walking down the road in a northerly direction; you will pass a stock pond on the left (north) side of the road. After approximately 0.75 miles, the road will pass through a dense stand of maples; hook sharply to the right and break out of the maples. Proceed 54 paces past the switchback to the first lone maple on the right (south) side of the road. From the maple, walk approximately 22 paces at a bearing of 11 degrees magnetic to the 200-foot stake of the baseline. The 0-foot baseline stake is 200 feet away at a bearing of 343 degrees magnetic and is marked by browse tag #7997. The first 200 feet of the baseline run at 163 degrees magnetic. The second 200 feet run off the 0-foot baseline stake at a bearing of 282 degrees magnetic.



**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,420ft (1,957m)
Aspect	Southeast
Slope	28%
Sample Dates	08/27/1996, 07/31/2001, 07/11/2006, 07/20/2011, 07/07/2016, 07/21/2021

**Wildlife Habitat and Vegetation History****Table 03-03.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	summer

**Table 03-03.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Mountain Big Sagebrush/Perennial Grass	Phase I
1990	Mountain Big Sagebrush/Perennial Grass	Phase I
1996	Mountain Big Sagebrush/Perennial Grass	Phase I
2001	Mountain Big Sagebrush/Perennial Grass	Phase I
2006	Mountain Big Sagebrush/Perennial Grass	Phase I
2011	Mountain Big Sagebrush/Perennial Grass	Phase I
2016	Mountain Big Sagebrush/Perennial Grass-Annual Forb	Phase I
2021	Mountain Big Sagebrush/Perennial Grass	Phase I

**Site Notes**

The study samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass community. The area is privately owned and is considered to be crucial winter range. The area is grazed by sheep from May to early June to control Dyer's woad (*Isatis tinctoria*). Cattle graze the property, but typically stay at lower elevations. It was noted in 2016 that many sagebrush plants had leaves that were diseased, but the plants themselves were vigorous regardless.

**Soils****Table 03-03.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.3	28.7	42.0	29.3	5.3	29.3	240.0	0.5	08/27/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	36 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been the dominant browse species on this site since study establishment in 1984, although other shrubs are present that contribute less cover (Photos, Pre-1992 Data, Table 03-03.12, Table 03-03.13). The herbaceous understory has remained diverse and plentiful throughout the study years with perennial grasses as the dominant component (Table 03-03.7). The native species bluebunch wheatgrass (*Pseudoroegneria spicata*) contributed the most cover of any perennial grass species in most samplings. The exception to this was 1996, 2001, and 2021, when the introduced species bulbous bluegrass (*Poa bulbosa*) provided more cover than bluebunch wheatgrass (Table 03-03.10). The annual forb and noxious weed Dyer's woad (*Isatis tinctoria*) has been recorded on this site in very low amounts (Table 03-03.11). Should Dyer's woad increase in the future, however, it could negatively affect the diversity of the herbaceous understory. Utah juniper (*Juniperus osteosperma*) has been present in all sample years (Photos, Table 03-03.12, Table 03-03.14). However, the site has remained in Phase I of woodland succession throughout the study period (table 03-03.4), indicating that further tree encroachment may not be an immediate threat to the ecological integrity of the plant community. Deer winter range condition has ranged between good and fair: this difference can be attributed to fluctuations in annual grass cover, and sagebrush demographics and cover. As of 2021, deer winter range conditions were considered to be good due to high sagebrush and low cheatgrass cover (Table 03-03.15).

**Trend Summary Tables****Table 03-03.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	16.7	0.0	0.6	-	-	-
2001	24.7	0.0	0.2	-	-	0.2
2006	13.4	-	0.3	15.8	-	1.7
2011	14.6	0.2	0.2	15.3	-	2.8
2016	15.5	-	1.8	14.9	-	3.1
2021	21.8	0.0	0.9	21.9	-	4.1

**Table 03-03.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	363	376	174	84	12.7	25.0	2.2	1.4
2001	87	453	127	175	1.5	35.4	2.4	9.1
2006	240	381	280	236	6.4	26.7	3.6	12.8
2011	228	365	356	223	4.3	35.9	19.3	15.0
2016	329	225	334	186	15.4	18.9	18.6	9.7
2021	209	375	248	158	3.3	34.9	6.1	9.0

**Table 03-03.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	2.2	0.1	66.6	3.9	0.6	58.1
2001	5.5	0.2	55.0	1.9	0.3	67.3
2006	10.3	0.0	46.7	1.8	0.3	65.0
2011	4.7	-	52.1	0.8	0.1	70.8
2016	10.2	-	31.6	3.1	0.0	64.5
2021	8.5	0.4	33.8	3.1	0.7	69.2

**Table 03-03.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Domestic Sheep	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	4	8	3	-
2001	1	22	-	-
2006	2	17	-	-
2011	1	1	4	-
2016	1	8	-	-
2021	6	21	13	1
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	2.2 (5.4)	62.3 (153.9)	3.4 (8.3)	-
2006	1.5 (3.6)	43.6 (107.6)	1.3 (3.3)	-
2011	1.5 (3.6)	3.4 (8.3)	2.7 (6.6)	-
2016	6.5 (16.1)	26.8 (66.2)	-	-
2021	5.1 (12.6)	54.3 (134.1)	4.7 (11.6)	-

**Table 03-03.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum nelsonii (Columbia needlegrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus marginatus (mountain brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus trachycaulus (slender wheatgrass)	Koeleria macrantha (prairie Junegrass)	Melica bulbosa (oniongrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency											
1996	-	350	-	-	29	-	-	15	251	48	100	172
2001	4	66	-	-	33	1	-	30	373	96	46	197
2006	0	198	-	-	117	0	2	73	233	55	99	210
2011	-	207	-	9	42	6	1	37	231	19	16	248
2016	-	231	6	-	263	10	-	9	69	3	4	187
2021	3	92	4	12	176	3	-	17	299	5	1	209
year	Average Cover (%)											
1996	-	12.4	-	-	0.3	-	-	0.2	12.9	1.3	2.4	8.1
2001	0.1	0.9	-	-	0.6	0.0	-	0.2	19.2	3.4	0.7	11.8
2006	0.0	3.6	-	-	2.8	0.0	0.1	2.3	7.8	1.3	1.5	13.8
2011	-	2.4	-	0.2	1.9	0.2	0.0	0.3	9.2	0.5	0.3	25.2
2016	-	5.8	0.0	-	9.7	0.6	-	0.1	2.4	0.1	0.0	15.6
2021	0.3	0.8	0.2	0.2	2.5	0.0	-	0.3	16.8	0.6	0.0	16.5

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 03-03.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockerness)	Astragalus (milkvetch)	Astragalus cibaricus (browse milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littledod false flax)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Cryptantha <sup>a</sup> (annual cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)
year	Nested Frequency																
1996	53	10	-	27	-	-	-	-	3	16	1	30	1	3	-	-	1
2001	55	32	3	11	0	-	-	-	-	12	9	1	-	3	-	-	11
2006	45	8	12	38	-	-	-	-	13	9	64	87	-	28	46	3	15
2011	46	36	4	102	-	6	-	3	8	5	16	119	-	14	57	19	20
2016	42	2	1	92	4	-	3	-	8	4	29	18	2	-	46	24	2
2021	81	15	-	76	-	-	-	-	5	-	35	23	-	-	-	-	-
year	Average Cover (%)																
1996	0.9	0.0	-	0.1	-	-	-	-	0.0	0.8	0.0	0.1	0.0	0.0	-	-	0.0
2001	1.2	0.3	0.0	0.1	0.0	-	-	-	-	0.3	0.0	0.0	-	0.0	-	-	0.0
2006	1.5	0.0	0.0	0.1	-	-	-	-	0.1	0.1	0.2	0.4	-	0.2	0.2	0.0	0.0
2011	1.7	0.1	0.1	0.4	-	0.0	-	0.0	0.0	0.1	0.2	4.4	-	0.1	0.3	0.2	0.0
2016	1.1	0.0	0.0	1.2	0.0	-	0.0	-	0.0	0.0	0.5	0.4	0.0	-	1.2	0.4	0.0
2021	3.6	0.1	-	0.3	-	-	-	-	0.2	-	0.1	0.2	-	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nest Frequency																	
Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	40	-	11	3	-	-	-	13	-	6	1	1	22	20	6	-	39	
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	6	5	-	-	1	5	-	3	-	5	3	1	125	3	-	8	-	
Galium aparine <sup>a</sup> (stickywilly)	59	15	15	-	-	-	2	-	-	32	34	-	196	14	62	9	28	
Geranium <sup>a</sup> (geranium)	90	-	102	-	5	-	6	16	-	16	214	-	161	28	6	5	27	
Gilia inconspicua <sup>a</sup> (shy gilia)	14	64	97	-	-	-	43	9	-	6	73	6	138	11	7	-	20	
Grindelia squarrosa (curlycup gumweed)	2021	9	125	29	-	-	-	-	11	0	-	22	97	-	31	-	15	
Hackelia patens (spotted stickseed)	Average Cover (%)																	
Helianthus annuus <sup>ai</sup> (common sunflower)	1996	0.4	-	0.1	0.0	-	-	0.1	-	0.0	0.0	0.0	0.5	0.2	0.0	-	0.1	
Holosteum umbellatum <sup>ai</sup> (jagged chickweed)	2001	0.0	0.1	-	-	0.0	0.5	0.0	-	0.0	0.0	0.0	7.0	0.0	-	0.0	-	
Isatis tinctoria <sup>ami</sup> (Dyer's woad)	2006	0.2	0.1	0.1	-	-	-	0.0	-	-	1.0	0.2	-	11.0	0.1	0.1	0.0	
Lactuca serriola <sup>ai</sup> (prickly lettuce)	2011	0.9	-	3.0	-	0.0	-	0.1	0.4	-	0.4	4.7	-	12.8	0.5	0.0	0.1	
Lappula occidentalis <sup>a</sup> (flatspine stickseed)	2016	0.1	1.8	2.5	-	-	-	0.4	0.0	-	0.2	1.8	0.4	8.1	0.3	0.0	-	
Lupinus argenteus (silvery lupine)	2021	0.0	3.4	0.4	-	-	-	-	-	0.0	0.0	-	0.3	5.3	-	0.1	-	
Madia glomerata <sup>a</sup> (mountain tarweed)	Average Cover (%)																	
Microsteris gracilis <sup>a</sup> (slender phlox)	1996	0.4	-	0.1	0.0	-	-	0.1	-	0.0	0.0	0.0	0.5	0.2	0.0	-	0.1	
Packera multilobata (lobeleaf groundsel)	2001	0.0	0.1	-	-	0.0	0.5	0.0	-	0.0	0.0	0.0	7.0	0.0	-	0.0	-	
Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	2006	0.2	0.1	0.1	-	-	-	0.0	-	-	1.0	0.2	-	11.0	0.1	0.1	0.0	
	2011	0.9	-	3.0	-	0.0	-	0.1	0.4	-	0.4	4.7	-	12.8	0.5	0.0	0.1	
	2016	0.1	1.8	2.5	-	-	-	0.4	0.0	-	0.2	1.8	0.4	8.1	0.3	0.0	-	
	2021	0.0	3.4	0.4	-	-	-	-	-	0.0	0.0	-	0.3	5.3	-	0.1	-	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nest Frequency							
Silene antirrhina <sup>a</sup> (sleepy silene)	44	-	1	13	-	-	-	-
Sisymbrium altissimum <sup>ai</sup> (tall tumbled mustard)	37	-	-	67	-	-	-	-
Taraxacum officinale (common dandelion)	90	-	11	15	5	-	18	-
Tragopogon dubius <sup>ai</sup> (yellow salsify)	143	-	7	46	-	2	63	5
unknown annual forb <sup>a</sup> (unknown forb)	101	46	6	16	-	3	85	-
Verbascum thapsus <sup>ai</sup> (common mullein)	2021	-	3	-	27	-	-	33
Veronica biloba <sup>ai</sup> (two-lobed speedwell)	Average Cover (%)							
Vicia americana (American vetch)	1996	0.2	-	0.0	0.1	-	-	-
	2001	0.2	-	-	1.6	-	-	-
	2006	0.2	-	0.0	0.2	0.0	-	0.1
	2011	1.0	-	0.1	0.6	-	0.0	2.1
	2016	1.3	2.8	0.0	0.2	-	0.0	3.3
	2021	-	0.1	-	0.1	-	-	0.8

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 03-03.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Acer grandidentatum <sup>t</sup> (bigtooth maple)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)
year	Line Intercept Cover (%)						
1996	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-
2006	0.4	12.4	-	0.3	-	1.3	3.1
2011	0.8	10	-	0.5	-	2	4.8
2016	0.9	8.1	-	0.7	-	2.2	6.1
2021	1	15.4	-	0.6	0	3.1	5.9
year	Quadrat Cover (%)						
1996	0.0	16.5	0.0	0.0	-	0.5	0.2
2001	0.1	23.2	0.0	-	-	0.0	1.5
2006	0.1	10.0	-	0.0	-	0.2	3.4
2011	0.1	10.9	0.1	0.0	0.0	0.1	3.7
2016	0.4	10.0	-	0.1	-	1.4	5.3
2021	0.8	15.1	-	0.6	0.0	0.0	6.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 03-03.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Acer grandidentatum<sup>t</sup> -- (bigtooth maple)</b>									
1996	20	-	100	0	0	0	0	0	55/74
2001	20	-	0	100	0	0	0	0	- / -
2006	20	-	100	0	0	0	0	0	- / -
2011	20	-	0	100	0	0	0	0	137/132
2016	20	-	0	100	0	100	0	0	- / -
2021	20	-	0	100	0	100	0	0	- / -
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	81/146
2021	-	-	-	-	-	-	-	-	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	2900	100	23	59	18	7	0	2	57/105
2001	2620	40	2	81	18	18	0	10	73/115
2006	1620	760	20	57	24	33	7	14	72/110
2011	1580	1400	29	58	13	9	1	13	54/93
2016	2040	4040	40	52	8	3	12	12	69/112
2021	2760	-	7	79	14	12	0	17	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	40	-	0	50	50	0	0	50	32/60
2001	80	-	0	75	25	0	0	25	41/62
2006	60	-	0	100	0	0	0	0	34/59
2011	40	-	50	50	0	0	0	0	49/67
2016	-	-	-	-	-	-	-	-	36/31
2021	20	-	0	100	0	0	0	0	- / -
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1996	40	-	0	50	50	0	0	0	82/152
2001	40	-	0	50	50	0	0	50	75/105
2006	40	-	0	100	0	0	0	0	66/110
2011	20	-	0	100	0	0	0	0	52/81
2016	20	-	0	100	0	0	0	0	84/128
2021	20	-	0	100	0	0	0	0	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	20	-	0	100	0	0	0	0	33/52
2001	-	-	-	-	-	-	-	-	21/299
2006	-	-	-	-	-	-	-	-	28/36
2011	120	-	0	100	0	0	0	0	28/28
2016	-	-	-	-	-	-	-	-	-/-
2021	100	-	0	100	0	0	0	0	- / -
<b>Juniperus osteosperma<sup>i</sup> -- (Utah juniper)</b>									
1996	20	-	0	100	0	0	0	0	- / -
2001	20	-	0	100	0	0	0	0	- / -
2006	20	-	0	100	0	0	0	0	- / -
2011	20	-	0	100	0	0	0	0	- / -
2016	20	-	0	100	0	0	0	0	- / -
2021	20	-	0	100	0	0	0	0	- / -
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	140	-	0	57	43	14	14	29	58/123
2001	240	-	0	100	0	25	0	0	102/120
2006	380	-	0	100	0	5	0	0	71/117
2011	380	-	11	90	0	5	0	0	74/132
2016	400	-	0	95	5	0	0	5	79/128
2021	320	-	0	56	44	19	0	38	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

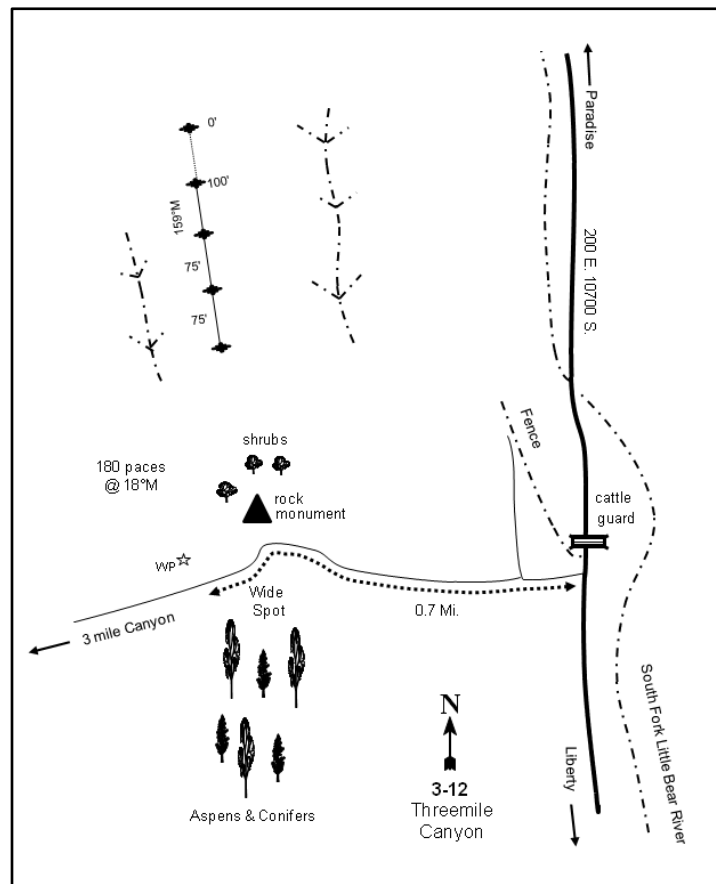
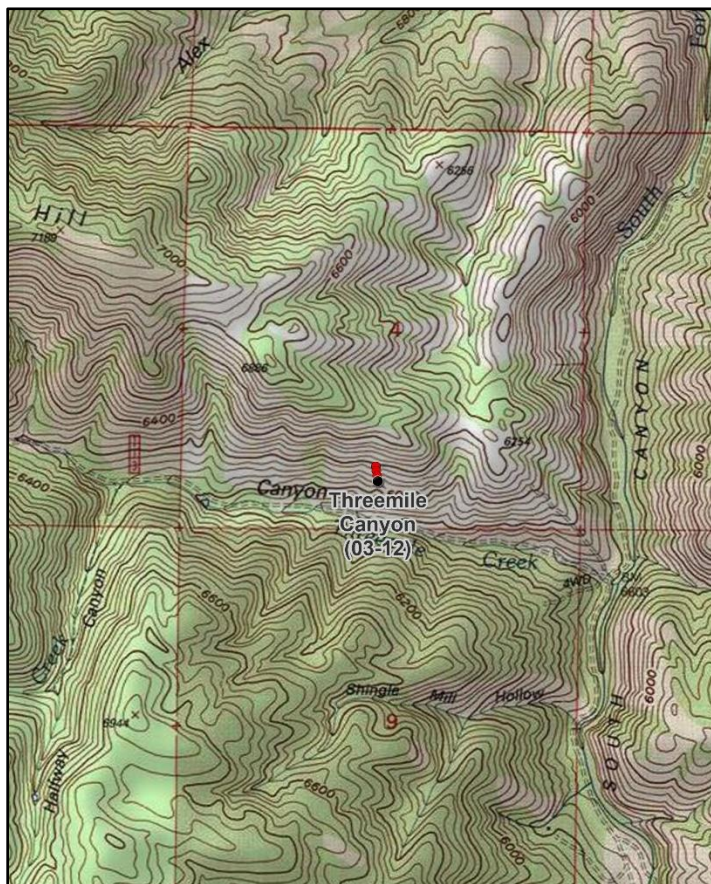
**Table 03-03.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Acer grandidentatum (bigtooth maple)</b>							
2021	3	-	100	-	-	-	5.0
<b>Juniperus osteosperma (Utah juniper)</b>							
2016	1	-	-	-	-	100	40.0

**Table 03-03.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	20.9	9.5	11.3	24.2	-9.6	2.9	-2.0	<b>57.1</b>	Fair
2001	30.0	10.0	0.7	30.0	-1.1	10.0	-2.0	<b>77.6</b>	Good
2006	19.0	9.5	7.8	30.0	-4.8	10.0	-2.0	<b>69.4</b>	Fair-Good
2011	17.9	12.5	11.2	30.0	-3.2	10.0	-2.0	<b>76.4</b>	Good
2016	17.1	13.1	10.9	30.0	-11.6	10.0	-2.0	<b>67.6</b>	Fair
2021	25.9	8.5	2.5	30.0	-2.5	10.0	-2.0	<b>72.5</b>	Good

## THREEMILE CANYON - STUDY NO. 03-12

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

James Peak NW; Township 8N, Range 1E, Section 04  
NAD 83 UTM ZONE 12, 429564 East 4589493 North

**Transect Information**

Browse Tag # (0' Stake)	7982
Transect Bearing	159° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 1: 3ft

**Directions to Site**

From 200 East and 10700 South in Avon, proceed south (towards Liberty) on a dirt road for 7.0 miles. Cross the cattle guard and turn right (west) immediately. Travel 0.7 miles up Threemile Canyon and stop adjacent to a green and white witness post on the right (north) side of the road. Walk 180 paces at 18 degrees magnetic from the witness post to the last baseline stake. To get to the 0-foot baseline stake, walk 400 feet at an azimuth of 340 degrees magnetic. The 0-foot stake is marked by browse tag #7982.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	6,100ft (1,859m)
Aspect	South
Slope	65%
Sample Dates	08/15/1996, 07/11/2001, 06/27/2006, 07/11/2011, 06/14/2016, 07/20/2021

**Wildlife Habitat and Vegetation History****Table 03-12.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	summer

**Table 03-12.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Bitterbrush	No Encroachment
1990	Bitterbrush	No Encroachment
1996	Bitterbrush/Annual Grass	No Encroachment
2001	Bitterbrush/Annual Grass	No Encroachment
2006	Bitterbrush/Annual-Perennial Grass-Forb	No Encroachment
2011	Bitterbrush/Annual Forb	No Encroachment
2016	Bitterbrush/Annual Forb	No Encroachment
2021	Bitterbrush/Annual Grass-Forb	No Encroachment

**Site Notes**

This study samples a sparse antelope bitterbrush (*Purshia tridentata*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community on a steep, south-facing side hill in Threemile Canyon, a tributary of the South Fork of the Little Bear River.

**Soils****Table 03-12.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.2	27.3	40.7	32.0	3.1	15.8	201.6	0.6	08/15/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	35 inches
NRCS Ecological Site	Mountain Loam (Shrub)
NRCS Ecological Site #	R047XA434UT
States and Transitions	No state and transition model is available for this ecological site.

Antelope bitterbrush (*Purshia tridentata*) has been the dominant browse species on this site since study establishment in 1984, although other species have been present with less cover (Photos, Pre-1992 Data, Table 03-12.12, Table 03-12.13). The herbaceous understory has remained plentiful and diverse, and annual and perennial grasses and/or forbs have been co-dominant with bitterbrush since the 1996 study year (Table 03-12.7). Weedy species such as cheatgrass (*Bromus tectorum*), field brome (*B. arvensis*) and bulbous bluegrass (*Poa bulbosa*) have consistently contributed the most graminoid cover since 1996. In addition, the annual grass and noxious weed medusahead (*Taeniatherum caput-medusae*) was observed for the first time in 2021, albeit in low amounts (Table 03-12.10). Both native and introduced forb species are present in the understory, including the introduced annual forb and noxious weed gypsyflower (*Cynoglossum officinale*) (Table 03.12.11). Noxious weed species may have the potential to negatively affect the ecological diversity and resiliency of the plant community on this site should they become more abundant in the future. Deer winter range condition has ranged between poor-fair and very poor: this difference can be attributed to fluctuations in decadence in the preferred browse populations, fluctuations in perennial and annual grass cover, and the presence of noxious weeds. As of 2021, deer winter range conditions were considered to be very poor due to increases in annual grass cover and the number of noxious weed species; perennial grass cover is also down considerably (Table 03-12.15).



**Trend Summary Tables****Table 03-12.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	8.6	0.1	-	-	-	-
2001	7.7	0.0	-	-	-	-
2006	8.3	0.2	-	12.2	0.2	-
2011	10.2	0.2	-	15.5	-	-
2016	12.4	0.3	-	16.8	0.5	-
2021	10.9	0.1	0.1	14.0	0.2	0.3

**Table 03-12.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	474	177	314	88	26.2	6.6	8.6	4.4
2001	457	209	301	125	30.2	11.5	7.1	7.0
2006	367	257	374	129	10.4	12.9	14.8	7.5
2011	294	282	400	171	9.3	19.1	30.4	10.3
2016	321	113	342	80	11.0	4.6	26.7	6.7
2021	348	232	407	75	15.1	9.5	25.2	5.1

**Table 03-12.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	4.8	-	63.8	0.5	5.5	56.5
2001	7.3	-	33.2	5.1	8.7	62.5
2006	14.3	0.0	35.3	3.7	14.7	54.9
2011	3.4	-	41.6	8.9	8.3	74.8
2016	11.9	0.0	30.9	12.3	11.6	51.5
2021	8.7	0.1	26.4	10.4	13.0	59.6

**Table 03-12.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Dusky Grouse	Rocky Mountain Elk
	Quadrat Frequency			
1996	-	5	-	1
2001	1	13	-	-
2006	-	5	-	-
2011	-	1	-	-
2016	-	7	-	-
2021	-	14	-	1
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	-	26.2 (64.6)	-	2.0 (5.0)
2006	-	13.4 (33.1)	-	0.7 (1.7)
2011	-	2.0 (5.0)	8.7 (21.5)*	-
2016	-	17.4 (43.0)	-	8.7 (21.5)
2021	-	77.1 (190.4)	-	8.7 (21.5)

\*Pellets per acre (ha)

**Table 03-12.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency								
Bromus arvensis <sup>ai</sup> (field brome)	428	243	-	27	13	20	130	-	-
Bromus tectorum <sup>ai</sup> (cheatgrass)	236	339	4	14	83	18	149	-	-
Carex (sedge)	98	354	-	10	133	33	200	-	-
Leymus cinereus (basin wildrye)	140	222	2	-	204	5	170	-	2
Poa bulbosa <sup>i</sup> (bulbous bluegrass)	28	316	4	0	67	6	73	-	-
Poa secunda (Sandberg bluegrass)	68	330	-	-	213	3	53	4	18
Pseudoroegneria spicata (bluebunch wheatgrass)	Average Cover (%)								
Taeniatherum caput-medusae <sup>ai</sup> (medusahead)	19.9	6.2	-	1.6	0.1	0.2	4.6	-	-
Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)	8.0	22.2	0.0	1.8	1.6	0.2	7.9	-	-
	0.5	9.8	-	0.4	2.6	0.6	9.3	-	-
	1.9	7.4	0.0	-	8.4	0.2	10.5	-	0.0
	0.1	10.9	0.0	0.0	1.1	0.3	3.2	-	-
	0.9	14.2	-	-	6.4	0.2	2.6	0.0	0.4

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 03-12.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Achillea millefolium (Common yarrow)	6	5	-	95	32	6	-	-	1	-	-	13	-	3	46	22	-
Agoseris glauca (pale agoseris)	7	1	-	117	65	16	-	2	5	3	-	2	-	1	12	7	-
Allium acuminatum (tapertip onion)	2	18	4	51	35	13	-	10	6	5	-	6	-	58	71	7	-
Alyssum desertorum <sup>ai</sup> (desert madwort)	11	49	27	105	60	18	-	7	5	-	3	2	-	4	11	18	-
Artemisia ludoviciana (white sagebrush)	1	0	4	22	27	13	-	2	-	-	-	1	2	-	-	11	1
Balsamorhiza sagittata (arrowleaf balsamroot)	2	12	-	18	33	11	70	-	-	-	-	2	-	-	-	9	-
Buglossoides arvensis <sup>ai</sup> (corn gromwell)	Average Cover (%)																
Calochortus nuttallii (sego lily)	0.0	0.0	-	0.3	0.9	1.7	-	-	0.0	-	-	0.4	-	0.0	0.2	0.2	-
Camelina microcarpa <sup>ai</sup> (littledrop false flax)	0.1	0.0	-	1.2	3.3	2.8	-	0.0	0.0	0.0	-	0.1	-	0.0	0.0	0.1	-
Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	0.2	0.1	0.0	0.2	1.7	2.7	-	0.0	0.0	0.0	-	0.4	-	0.1	0.3	0.5	-
Chaenactis douglasii (Douglas' dustymaiden)	0.3	0.6	0.4	1.8	3.4	3.1	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	1.0	-
Cirsium (thistle)	0.0	0.0	0.2	0.1	1.2	3.1	-	0.0	-	-	-	0.2	0.0	-	-	0.6	0.0
Claytonia perfoliata ssp. perfoliata (miner's lettuce)	0.1	0.4	-	0.1	2.0	1.9	1.3	-	-	-	-	0.2	-	-	-	0.1	-
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																	
Collomia linearis <sup>a</sup> (tiny trumpet)																	
Crepis acuminata (tapertip hawkbeard)																	
Cryptantha (cryptantha)																	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cynoglossum officinale <sup>ani</sup> (gypsoflower)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium aparine <sup>a</sup> (stickywilly)	Hackelia patens (spotted stickseed)	Isatis tinctoria <sup>ani</sup> (Dyer's woad)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lesquerella (bladderpod)	Lithospermum ruderale (western stone seed)	Lomatium grayi (Gray's biscuitroot)	Madia glomerata <sup>a</sup> (mountain tarweed)	Melilotus officinalis <sup>i</sup> (sweetclover)	Microsteris gracilis <sup>a</sup> (slender phlox)	Packera multilobata (lobeleaf groundsel)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (sleepy silene)
year	Nested Frequency																
1996	-	115	-	3	-	8	104	2	-	13	-	-	-	-	-	0	8
2001	-	19	10	-	6	16	124	20	2	7	-	-	-	-	2	1	83
2006	-	183	90	40	42	34	138	12	-	5	6	20	-	43	-	6	105
2011	-	225	37	54	9	14	292	19	-	1	1	9	16	23	3	7	13
2016	154	47	141	30	0	15	50	42	-	-	-	-	25	-	-	3	-
2021	44	1	340	38	11	17	30	6	-	4	3	-	-	3	-	8	-
year	Average Cover (%)																
1996	-	0.9	-	0.0	-	0.2	1.1	0.0	-	1.1	-	-	-	-	-	0.0	0.0
2001	-	0.0	0.1	-	0.1	0.2	2.8	0.1	0.0	0.5	-	-	-	-	0.0	0.0	0.3
2006	-	3.2	1.6	0.2	0.8	1.4	2.5	0.0	-	0.9	0.2	1.1	-	0.2	-	0.0	0.4
2011	-	11.4	0.2	1.9	0.3	0.4	9.0	0.1	-	0.0	0.0	0.2	0.7	0.1	0.2	0.0	0.4
2016	10.7	0.6	4.8	0.6	0.1	1.8	1.9	1.2	-	-	-	-	0.5	-	-	0.1	-
2021	1.1	0.0	18.9	2.1	0.0	0.3	0.2	0.2	-	0.1	0.1	-	-	0.0	-	0.1	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Symphoricarichum ascendens (western aster)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	unknown perennial forb (unknown forb)	Veronica biloba <sup>ai</sup> (two-lobed speedwell)
year	Nested Frequency				
1996	-	1	210	-	23
2001	-	1	80	18	49
2006	5	-	99	-	191
2011	3	3	145	-	115
2016	0	11	64	-	116
2021	-	6	26	-	52
year	Average Cover (%)				
1996	-	0.1	5.1	-	0.7
2001	-	0.0	2.1	0.1	0.1
2006	0.5	-	2.0	-	1.1
2011	0.0	0.2	2.1	-	2.7
2016	0.1	0.7	0.9	-	4.0
2021	-	0.3	0.4	-	0.5

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 03-12.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	<i>Acer grandidentatum</i> <sup>i</sup> (bigtooth maple)	<i>Amelanchier utahensis</i> <sup>p</sup> (Utah serviceberry)	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <sup>p</sup> (mountain big sagebrush)	<i>Mahonia repens</i> (creeping barberry)	<i>Purshia tridentata</i> <sup>p</sup> (antelope bitterbrush)	<i>Rosa woodsii</i> <sup>p</sup> (Woods' rose)
year	Line Intercept Cover (%)					
1996	-	-	-	-	-	-
2001	-	-	-	-	-	-
2006	-	-	-	0.2	11.8	0.4
2011	-	-	0.4	-	14.8	0.3
2016	-	-	-	0.5	16.4	0.4
2021	0.3	0.2	-	0.2	12.9	0.9
year	Quadrat Cover (%)					
1996	-	-	0.4	0.1	8.0	0.2
2001	-	-	-	0.0	7.7	0.0
2006	-	-	-	0.2	8.0	0.3
2011	-	-	0.1	0.2	9.6	0.5
2016	-	-	-	0.3	11.6	0.7
2021	0.1	0.0	-	0.1	10.2	0.7

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 03-12.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b><i>Acer grandidentatum</i><sup>i</sup> -- (bigtooth maple)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	20	-	100	0	0	0	0	0	21/40
2021	20	-	100	0	0	0	0	0	-/-
<b><i>Amelanchier utahensis</i><sup>p</sup> -- (Utah serviceberry)</b>									
1996	-	-	-	-	-	-	-	-	74/87
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	107/107
2011	-	-	-	-	-	-	-	-	109/121
2016	-	-	-	-	-	-	-	-	119/124
2021	-	-	-	-	-	-	-	-	-/-
<b><i>Artemisia tridentata</i> ssp. <i>vaseyana</i><sup>p</sup> -- (mountain big sagebrush)</b>									
1996	180	-	11	44	44	22	0	0	47/60
2001	100	-	0	60	40	0	0	20	48/56
2006	-	-	-	-	-	-	-	-	58/89
2011	100	20	60	40	0	0	0	0	61/84
2016	20	-	0	100	0	0	0	0	54/59
2021	20	-	0	0	100	0	0	100	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Mahonia repens -- (creeping barberry)</b>									
1996	320	-	0	100	0	0	0	0	15/17
2001	440	-	5	96	0	0	0	0	- / -
2006	620	-	0	100	0	0	0	0	7/12
2011	40	-	50	50	0	0	0	0	13/15
2016	980	-	6	94	0	0	0	0	12/12
2021	1160	-	5	95	0	0	0	0	- / -
<b>Prunus virginiana var. melanocarpa<sup>p</sup> -- (black chokecherry)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	34/15
2021	-	-	-	-	-	-	-	-	- / -
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	820	20	12	83	5	51	15	0	81/148
2001	700	-	3	80	17	37	17	0	83/151
2006	820	-	5	88	7	61	22	2	81/136
2011	640	-	3	97	0	50	6	3	77/156
2016	960	-	2	96	2	56	2	2	90/158
2021	940	-	0	55	45	34	32	45	- / -
<b>Rosa woodsii<sup>p</sup> -- (Woods' rose)</b>									
1996	420	-	38	62	0	33	0	0	31/28
2001	340	-	41	59	0	0	0	0	43/31
2006	400	-	0	100	0	0	0	0	59/57
2011	320	-	0	94	6	0	0	0	50/39
2016	640	-	0	100	0	0	0	0	36/22
2021	1480	-	4	96	0	0	0	0	- / -
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	86/126
2011	-	-	-	-	-	-	-	-	102/185
2016	-	-	-	-	-	-	-	-	84/113

t - Tree Species; p - Preferred Browse; i - Introduced Species

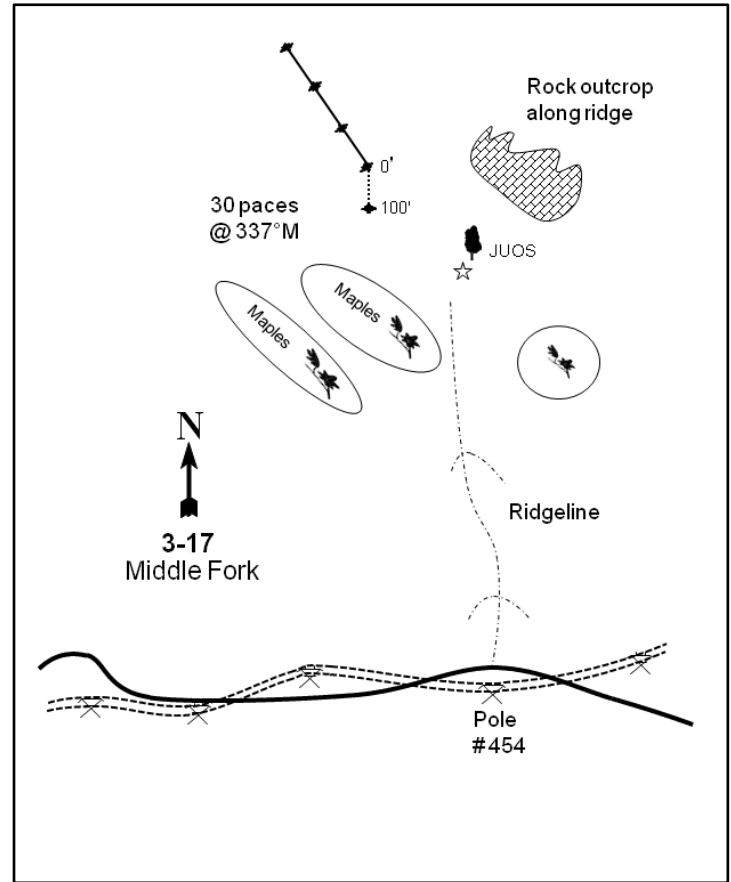
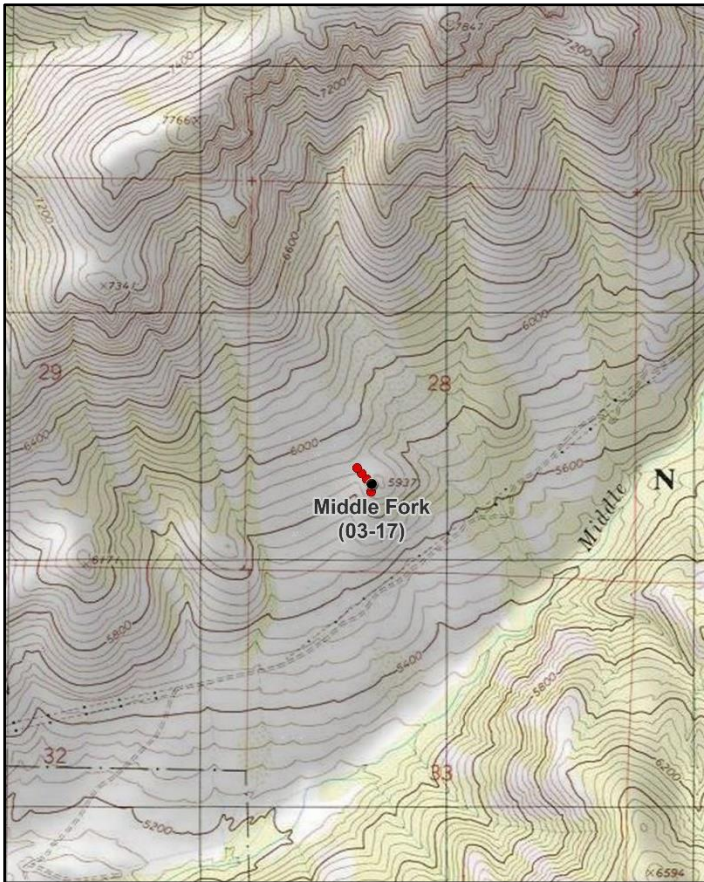
**Table 03-12.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Acer grandidentatum (bigtooth maple)</b>							
2016	1	-	100	-	-	-	1.0

**Table 03-12.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	12.7	13.0	6.4	12.9	-19.6	8.8	-2.0	<b>32.2</b>	Very Poor
2001	11.6	9.9	1.5	19.8	-20.0	10.0	-2.0	<b>30.8</b>	Very Poor
2006	18.2	12.9	2.4	20.5	-7.8	10.0	-2.0	<b>54.2</b>	Poor-Fair
2011	23.1	15.0	2.3	21.4	-7.0	10.0	-2.0	<b>62.8</b>	Fair
2016	25.1	14.4	1.0	7.0	-8.3	10.0	-4.0	<b>45.2</b>	Poor
2021	20.8	2.4	0.1	6.3	-11.3	10.0	-6.0	<b>22.3</b>	Very Poor

## MIDDLE FORK - STUDY NO. 03-17

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Browns Hole SW; Township 7N, Range 2E, Section 28  
NAD 83 UTM ZONE 12, 438630 East 4573508 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

Not Available  
170° magnetic (Lines 2-4: 310° magnetic)  
400ft  
Line 1 (11ft & 71ft), Line 2 (34ft), Line 3 (59ft), Line 4 (95ft)  
Belt 4: No Rebar

**Directions to Site**

From 5500 East and 2200 North in Eden, proceed 0.4 miles to a bend. Continue east for another 1.9 miles to where the main road bends to the southeast. Travel straight for 1.9 miles to state land (Middle Fork Wildlife Management Area). From the sign, drive 0.1 miles to a three-way intersection. Stay left, go through the gate, and continue east for 0.05 miles to a fork. Stay to the left side and continue 0.05 miles to a creek. Cross the creek and continue down a ripped rough road (now a horse trail) for 0.8 miles, passing under power lines, to pole #454. Park here and walk up the ridge line beyond the maples to a lone juniper. The 100-foot stake of the frequency baseline is 30 paces away from the juniper at a bearing of 337 degrees magnetic.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,900ft (1,798m)
Aspect	Southwest
Slope	20%
Sample Dates	06/25/1996, 06/21/2001, 06/15/2006, 06/29/2011, 07/07/2016, 07/14/2021

**Wildlife Habitat and Vegetation History****Table 03-17.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	winter

**Table 03-17.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Low Sagebrush/Perennial Grass	No Encroachment
1990	Low Sagebrush/Perennial Grass	No Encroachment
1996	Low Sagebrush/Perennial Grass	No Encroachment
2001	Low Sagebrush/Perennial Grass	No Encroachment
2006	Low Sagebrush/Perennial Grass	No Encroachment
2011	Low Sagebrush/Perennial Grass	No Encroachment
2016	Low Sagebrush/Perennial Grass	No Encroachment
2021	Low Sagebrush/Perennial Grass	No Encroachment

**Site Notes**

The study samples a low sagebrush (*Artemisia arbuscula*) and grass community overlooking the Middle Fork of the Ogden River. The study lies within the Division of Wildlife Resources (DWR) Middle Fork Wildlife Management Area (WMA).

There is a rock cairn marking the 300-foot mark rather than a stake. If a stake was present, it would have been on the south side of this cairn.

**Soils****Table 03-17.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.4	38.6	32.4	29.0	3.6	13.8	105.6	0.4	06/25/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	35 inches
NRCS Ecological Site	Mountain Shallow Loam (Low Sagebrush)
NRCS Ecological Site #	R047XA442UT
States and Transitions	Depauperate Low Sagebrush State: Community Phase 3.1

The browse component on this site has remained dominated by low sagebrush (*Artemisia arbuscula*) since study establishment in 1985. Other browse species such as mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) have been observed, but with less density and cover (Photos, Pre-1992 Data, Table 03-17.12, Table 03-17.13). Grasses have remained abundant and fairly diverse with the native species bluebunch wheatgrass (*Pseudoroegneria spicata*) and the introduced species bulbous bluegrass (*Poa bulbosa*) as the major herbaceous components; perennial grasses have been a co-dominant site component throughout the duration of the study. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been recorded in each sample year since 1996, but in generally low amounts (Table 03-17.10). Perennial forbs have fluctuated over the study period, and annual/biennial forbs have remained rare (Table 03-17.7, Table 03-17.11). Barring the occurrence of a major disturbance such as a wildfire, this site will likely continue to remain in this or a similar state in future sample years. Deer winter range condition has ranged between good and poor-fair: this difference can be attributed to fluctuations in perennial and annual grass cover. As of 2021, deer winter range conditions were considered to be fair. Improvement to deer wintering range can be accomplished through efforts to diversify preferred browse age class structures (Table 03-17.15).

**Trend Summary Tables****Table 03-17.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	13.2	0.3	1.3	-	-	-
2001	13.3	0.5	1.7	-	-	-
2006	14.6	0.3	1.4	19.8	0.7	2.9
2011	11.7	0.1	1.0	16.9	0.4	6.2
2016	14.5	0.1	1.1	19.4	0.2	3.1
2021	16.7	0.2	2.7	21.1	-	3.8

**Table 03-17.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	298	391	219	168	2.7	15.5	3.7	7.0
2001	86	448	150	164	0.8	34.7	2.2	9.2
2006	12	421	181	190	0.0	25.0	0.9	10.6
2011	32	421	257	260	0.1	27.6	4.0	14.8
2016	109	383	192	188	1.8	19.8	2.0	8.6
2021	50	407	83	140	0.2	22.7	0.7	7.4

**Table 03-17.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	0.3	0.5	56.8	2.0	19.0	47.6
2001	2.3	1.7	44.7	2.8	20.2	55.8
2006	3.5	1.8	37.1	6.8	21.2	46.1
2011	2.2	2.1	35.0	4.0	22.2	51.0
2016	4.4	1.3	38.2	1.5	20.5	47.1
2021	4.9	1.3	42.9	2.0	20.8	46.9

**Table 03-17.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Shiras Moose	Rabbit
	Quadrat Frequency					
1996	-	8	25	-	-	1
2001	1	4	9	-	-	-
2006	-	14	12	-	1	1
2011	2	16	11	-	-	-
2016	-	22	13	-	-	5
2021	3	16	4	-	-	3
Year	Days Use Per Acre (ha)					
1996	-	-	-	-	-	-
2001	-	14.7 (36.4)	7.4 (18.2)	0.6 (1.4)	-	-
2006	-	13.4 (33.1)	13.4 (33.1)	-	-	-
2011	-	28.1 (69.5)	15.4 (38.1)	-	-	-
2016	-	34.9 (86.1)	20.1 (49.7)	0.6 (1.4)	1.0 (2.4)	-
2021	-	24.1 (59.6)	5.3 (13.2)	-	-	-



**Table 03-17.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency														
Achnatherum lettermanii (Letterman's needlegrass)															
Bromus arvensis <sup>si</sup> (field brome)															
Bromus tectorum <sup>ai</sup> (cheatgrass)															
Dactylis glomerata <sup>i</sup> (orchardgrass)															
Danthonia californica (California oatgrass)															
Danthonia unispicata (onespike danthonia)															
Elymus lanceolatus (thickspike wheatgrass)															
Elymus trachycaulus (slender wheatgrass)															
Koeleria macrantha (prairie Junegrass)															
Melica bulbosa (oniongrass)															
Poa bulbosa <sup>i</sup> (bulbous bluegrass)															
Poa pratensis <sup>i</sup> (Kentucky bluegrass)															
Poa secunda (Sandberg bluegrass)															
Pseudoroegneria spicata (bluebunch wheatgrass)															
year	Average Cover (%)														
1996	51	253	156	-	-	-	10	-	2	29	323	-	35	189	
2001	-	43	57	16	1	-	9	7	-	8	391	0	160	240	
2006	43	5	7	1	10	10	50	2	-	10	356	1	45	211	
2011	14	3	29	-	10	29	16	1	-	21	370	23	32	243	
2016	-	11	102	-	9	-	37	4	-	-	305	1	26	184	
2021	67	35	22	1	9	-	6	3	1	3	370	8	4	125	
year	Average Cover (%)														
1996	1.0	1.3	1.4	-	-	-	0.1	-	0.0	0.2	9.2	-	0.5	4.5	
2001	-	0.2	0.6	1.5	0.0	-	0.1	0.1	-	0.1	20.4	0.0	3.5	9.0	
2006	0.6	0.0	0.0	0.0	0.2	0.1	1.8	0.0	-	0.2	12.7	0.0	0.8	8.6	
2011	0.2	0.0	0.1	-	1.1	2.9	0.4	0.0	-	0.1	15.6	0.1	0.2	6.9	
2016	-	0.2	1.5	-	0.0	-	0.8	0.0	-	-	14.3	0.0	0.3	4.3	
2021	1.1	0.1	0.1	0.0	0.4	-	0.1	0.1	0.0	0.2	16.1	0.2	0.0	4.6	

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 03-17.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Achillea millefolium (Common yarrow)																	
Agoseris glauca (pale agoseris)																	
Allium (onion)																	
Ambrosia <sup>a</sup> (ragweed)																	
Arabis (rockcress)																	
Artemisia ludoviciana (white sagebrush)																	
Astragalus beckwithii (Beckwith's milkvetch)																	
Balsamorhiza macrophylla (cutleaf balsamroot)																	
Balsamorhiza sagittata (arrowleaf balsamroot)																	
Calochortus nuttallii (sego lily)																	
Castilleja (Indian paintbrush)																	
Chaenactis douglasii (Douglas' dusty maiden)																	
Cirsium (thistle)																	
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																	
Collomia linearis <sup>a</sup> (tiny trumpet)																	
Comandra umbellata (bastard toadflax)																	
Crepis acuminata (tapertip hawkbeard)																	
year	Average Cover (%)																
1996	21	22	-	-	1	5	3	-	1	-	1	-	5	1	27	7	-
2001	12	11	3	-	1	11	-	-	5	-	2	-	3	5	10	-	-
2006	9	36	15	-	1	25	-	1	10	-	9	-	9	14	3	4	3
2011	14	38	138	0	12	24	-	2	4	14	5	-	1	4	55	10	-
2016	18	6	57	-	36	23	-	2	5	-	3	8	5	4	18	4	0
2021	1	3	5	-	-	14	-	0	4	-	2	-	2	5	5	19	-
year	Average Cover (%)																
1996	0.3	0.1	-	-	0.0	0.1	0.0	-	0.2	-	0.0	-	0.0	0.0	0.7	0.2	-
2001	0.2	0.1	0.0	-	0.0	0.3	-	-	0.5	-	0.1	-	0.0	0.0	0.1	-	-
2006	0.2	0.2	0.1	-	0.0	0.8	-	0.1	1.7	-	0.1	-	0.3	0.0	0.0	0.0	0.0
2011	0.3	0.6	1.5	0.0	0.0	0.8	-	0.4	1.4	0.0	0.2	-	0.0	0.0	0.8	0.0	-
2016	0.5	0.0	0.4	-	0.5	0.9	-	0.4	0.8	-	0.0	0.1	0.1	0.0	0.1	0.1	0.0
2021	0.0	0.0	0.0	-	-	0.2	-	0.0	0.9	-	0.0	-	0.0	0.0	0.0	0.2	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nested Frequency																
Descurainia pinnata <sup>a</sup> (western tansymustard)	-	47	-	11	1	1	5	8	2	-	37	4	62	-	-	-	-
Draba <sup>a</sup> (draba)	3	49	-	5	22	0	-	4	1	2	34	5	-	-	1	-	1
Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	-	98	34	4	7	16	-	5	-	1	55	4	-	16	4	-	-
Erigeron strigosus (prairie fleabane)	6	156	8	-	45	22	-	1	14	-	55	6	-	10	5	-	-
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	41	37	31	9	68	-	3	2	14	1	13	1	-	9	-	1	-
Galium aparine <sup>a</sup> (stickywilly)	-	5	-	-	6	-	2	-	-	-	35	1	-	4	-	-	3
Grindelia squarrosa (curlycup gumweed)	Average Cover (%)																
Hackelia patens (spotted stickseed)	-	0.1	-	0.2	0.0	0.0	0.0	0.2	0.0	-	0.4	0.1	0.2	-	-	-	-
Lactuca serriola <sup>ai</sup> (prickly lettuce)	0.0	0.1	-	0.0	0.3	0.0	-	0.1	0.0	0.0	1.5	0.6	-	-	0.0	-	0.0
Lappula occidentalis <sup>a</sup> (flatspine stickseed)	-	0.2	0.1	0.0	0.0	0.1	-	0.2	-	0.0	1.6	0.2	-	0.1	0.0	-	-
Lomatium dissectum (fernleaf biscuitroot)	0.1	0.8	0.0	-	0.2	0.3	-	0.0	0.2	-	1.5	0.4	-	0.8	0.0	-	-
Lupinus argenteus (silvery lupine)	0.1	0.1	0.1	0.1	1.0	-	0.0	0.0	0.1	0.0	0.1	0.1	-	0.0	-	0.0	-
Machaeranthera (tansyaster)	-	0.0	-	-	0.1	-	0.0	-	-	-	0.8	0.0	-	0.0	-	-	0.0
Madia glomerata <sup>a</sup> (mountain tarweed)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Microsteris gracilis <sup>a</sup> (slender phlox)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Orobanche fasciculata (clustered broomrape)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phlox longifolia (longleaf phlox)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nested Frequency							
Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	14	17	24	8	178	-	-	46
Silene antirrhina <sup>a</sup> (sleepy silene)	-	-	53	12	86	-	1	37
Symphoricarum ascendens (western aster)	26	1	38	-	20	2	9	44
Taraxacum officinale (common dandelion)	9	3	42	7	100	-	2	41
Tragopogon dubius <sup>ai</sup> (yellow salsify)	7	-	32	-	42	2	-	44
Verbascum blattaria <sup>ai</sup> (moth mullein)	1	-	35	1	67	-	-	47
Viola (violet)	Average Cover (%)							
Wyethia amplexicaulis (mule-ears)	0.0	0.2	0.9	0.1	2.7	-	-	3.8
	-	-	2.2	0.0	1.6	-	0.0	3.7
	0.1	0.0	1.5	-	0.2	0.0	0.1	3.5
	0.0	0.0	1.3	0.2	0.8	-	0.0	6.2
	0.0	-	0.7	-	0.3	0.1	-	3.8
	0.0	-	0.5	0.0	0.6	-	-	4.6

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 03-17.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Acer grandidentatum <sup>t</sup> (bigtooth maple)	Artemisia arbuscula <sup>p</sup> (litttle sagebrush)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Quercus gambelii <sup>p</sup> (Gambel oak)
year	Line Intercept Cover (%)						
1996	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-
2006	2.9	19.8	-	-	0.7	-	-
2011	6.2	15.4	1.5	-	0.4	-	-
2016	3.1	19.1	0.3	-	0.2	-	-
2021	3.8	20.2	0.4	-	0	0.5	-
year	Quadrat Cover (%)						
1996	1.3	11.7	1.5	-	0.3	-	-
2001	1.7	12.9	0.4	-	0.5	-	-
2006	1.4	14.6	-	-	0.3	-	-
2011	1.0	10.2	1.4	-	0.1	0.1	-
2016	1.1	13.5	0.9	0.0	0.1	0.0	-
2021	2.7	15.5	0.5	-	0.2	0.4	0.4

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 03-17.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Acer grandidentatum<sup>t</sup> -- (bigtooth maple)</b>									
1996	40	-	50	50	0	0	0	0	- / -
2001	20	-	0	100	0	0	0	0	- / -
2006	20	-	0	100	0	0	0	0	- / -
2011	20	-	0	100	0	0	0	0	119/180
2016	20	-	0	100	0	0	0	0	143/192
2021	40	-	0	100	0	0	0	0	- / -
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	116/85
2011	-	-	-	-	-	-	-	-	64/123
2016	-	-	-	-	-	-	-	-	62/63
2021	120	-	100	0	0	0	0	0	- / -
<b>Artemisia arbuscula<sup>p</sup> -- (litttle sagebrush)</b>									
1996	6620	1260	22	67	12	34	1	12	31/54
2001	8560	-	19	69	13	14	1	5	30/69
2006	7560	460	6	74	21	11	1	12	33/60
2011	6500	140	6	78	17	5	21	8	29/65
2016	6740	2740	3	74	23	2	0	23	26/61
2021	8040	-	15	56	29	10	0	56	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	200	-	10	90	0	30	0	0	65/117
2001	120	-	33	67	0	0	0	0	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	340	-	0	82	18	41	0	6	61/96
2016	140	180	0	100	0	0	0	0	42/93
2021	140	-	0	57	43	0	0	57	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	40	0	0	0	0	0	0	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	400	920	50	50	0	0	0	0	22/27
2001	760	-	0	100	0	0	0	3	22/63
2006	760	20	18	79	3	0	0	0	20/26
2011	380	-	0	95	5	0	0	0	20/29
2016	180	-	0	100	0	0	0	0	26/31
2021	120	-	17	67	17	0	0	17	- / -
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	40	-	0	100	0	100	0	0	44/120
2001	20	-	0	100	0	100	0	0	35/139
2006	20	-	100	0	0	0	0	0	60/111
2011	20	-	0	100	0	100	0	0	57/160
2016	40	-	0	100	0	0	0	0	60/175
2021	20	-	0	100	0	0	0	0	- / -
<b>Quercus gambelii<sup>p</sup> -- (Gambel oak)</b>									
1996	-	-	-	-	-	-	-	-	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

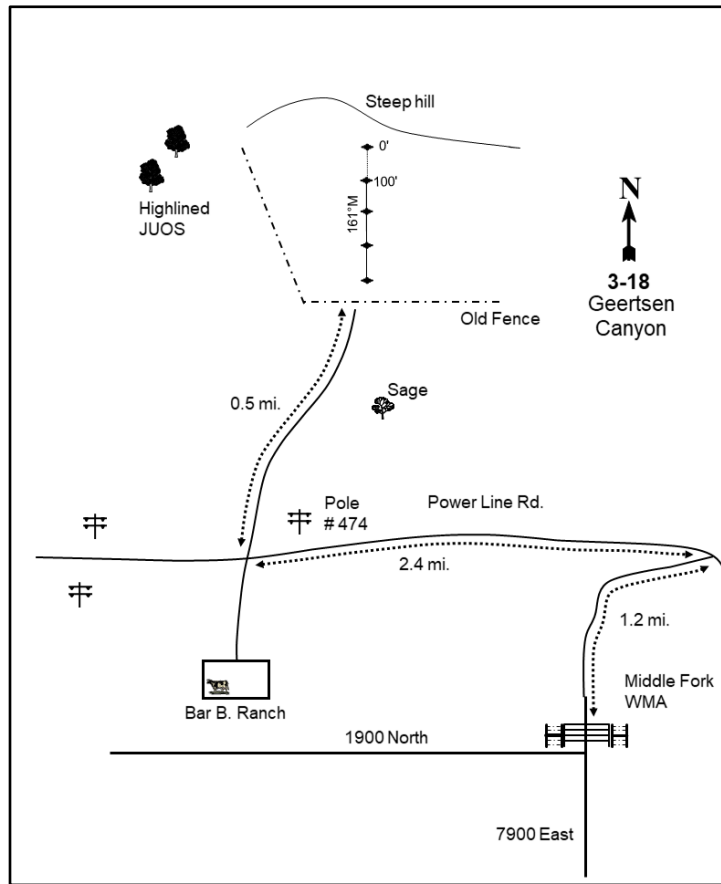
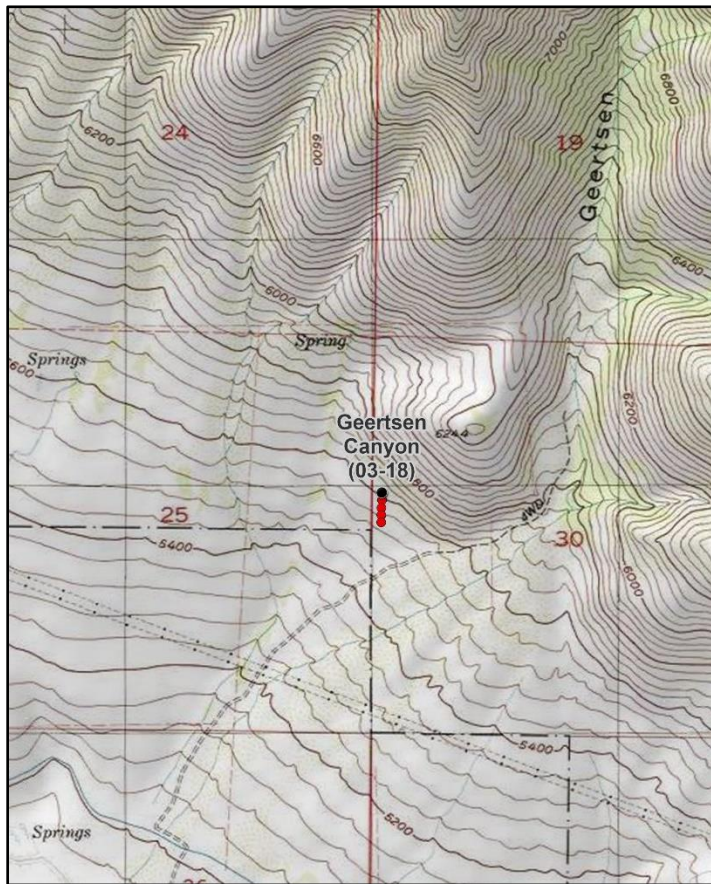
**Table 03-17.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Acer grandidentatum (bigtooth maple)</b>							
2016	7	-	50	50	-	-	8.0
2021	7	-	-	100	-	-	14.7

**Table 03-17.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	16.5	11.9	10.1	12.7	-2.0	10.0	0.0	<b>59.2</b>	Fair
2001	16.6	11.2	9.5	28.6	-0.6	10.0	0.0	<b>75.4</b>	Good
2006	24.8	8.8	2.9	24.7	0.0	10.0	0.0	<b>71.1</b>	Fair-Good
2011	21.1	10.0	2.6	24.1	-0.1	10.0	0.0	<b>67.8</b>	Fair
2016	24.3	8.1	1.5	10.9	-1.3	10.0	0.0	<b>53.4</b>	Poor-Fair
2021	26.5	6.5	7.1	13.2	-0.1	10.0	0.0	<b>63.2</b>	Fair

## GEERTSEN CANYON - STUDY NO. 03-18



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Huntsville NE; Township 7N, Range 2E, Section 30  
NAD 83 UTM ZONE 12, 434989 East 4574173 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

7026  
174° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (71ft), Line 4 (59ft)  
Belt 1: 1ft; Belt 3, 4: No Rebar; Belt 5: 3ft

### Directions to Site

From the intersection of 5500 East and 2200 North in Eden, go south for 0.35 miles, then turn left and go 0.75 miles east to the Huntsville Stake Center. Continue east for 2.02 miles to 7100 East. Turn left and travel to the Middle Fork WMA gate, then go 1.2 miles north up to the powerline road. Turn left (west), drive along the powerline road for 2.4 miles to pole #474, and park. From pole #474, walk 1/3 of a mile at 11 degrees magnetic to the 0-foot baseline stake. The 0-foot baseline is marked by a 4-foot rebar stake (tagged #7026) located 100 feet edge and 100 feet southwest of a large maple. The baseline runs at 161 degrees magnetic.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,600ft (1,707m)
Aspect	Southwest
Slope	18%
Sample Dates	07/03/1996, 06/21/2001, 06/15/2006, 06/29/2011, 07/07/2016, 07/14/2021

**Wildlife Habitat and Vegetation History**

**Table 03-18.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	winter

**Table 03-18.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Perennial Grass/Mountain Big Sagebrush	No Encroachment
1990	Perennial Grass/Mountain Big Sagebrush	No Encroachment
1996	Perennial Grass/Mountain Big Sagebrush	No Encroachment
2001	Perennial Grass/Mountain Big Sagebrush	No Encroachment
2006	Perennial Grass/Mountain Big Sagebrush	No Encroachment
2011	Perennial Grass/Mountain Big Sagebrush	No Encroachment
2016	Annual-Perennial Grass/Mountain Big Sagebrush	No Encroachment
2021	Perennial Grass	No Encroachment

**Site Notes**

The study samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass community located on a hillside north of the mouth of Geertsen Canyon. The study is located within the Wolf Creek conservation easement that is managed by the Division of Wildlife Resources (DWR) for wildlife and recreation. The Geertsen Hollow area is known for concentrations of wintering deer.

**Soils**

**Table 03-18.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.2	44.7	27.0	28.3	3.0	14.5	153.6	0.6	07/03/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	33 inches
NRCS Ecological Site	Mountain Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA461UT
States and Transitions	No state and transition model is available for this ecological site.

This study site was dominated by perennial grasses, namely the introduced species bulbous bluegrass (*Poa bulbosa*), and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) from it's establishment in 1985 through the 2011 sample year. In 2016, annual grasses, mainly the invasive annual cheatgrass (*Bromus tectorum*), became co-dominant (Table 03-18.10). Recorded cover of mountain big sagebrush has remained relatively low throughout the study years, but quadrat cover exhibited a slight decrease in 2021 (Table 03-18.6); sagebrush density has also decreased over the same time period (Table 03-18.13). Forbs have remained plentiful and fairly diverse since study establishment (Table 03-18.7, Table 03-18.11). Deer winter range condition has remained very poor throughout the study period: this can largely be attributed to a lack of preferred browse and fluctuations in annual grass cover. As of 2021, deer winter range conditions were considered to be very poor. Improvement to deer wintering range can be accomplished through efforts to establish referred browse species, like mountain big sagebrush, and native perennial grasses (Table 03-18.15).

**Trend Summary Tables**

**Table 03-18.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	2.2	0.2	-	-	-	-
2001	2.8	-	-	-	-	-
2006	1.9	0.5	-	3.7	0.2	-
2011	3.0	0.3	-	4.1	0.2	-
2016	3.6	2.1	-	4.1	4.0	-
2021	3.0	0.7	-	2.2	0.6	-

**Table 03-18.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	409	457	363	368	8.3	33.1	7.1	9.9
2001	233	453	392	260	3.4	43.6	18.1	7.1
2006	317	440	347	365	5.8	43.4	12.0	21.3
2011	309	450	326	378	3.8	33.5	8.8	20.3
2016	425	298	314	354	24.1	17.6	11.9	12.6
2021	202	425	329	235	1.6	29.0	10.9	5.8

**Table 03-18.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	1.1	0.0	35.0	1.0	11.8	61.6
2001	1.1	-	31.9	0.9	13.4	70.4
2006	1.7	0.2	19.5	0.7	16.0	72.9
2011	10.8	0.0	17.2	2.2	15.6	63.5
2016	13.9	0.0	21.5	1.4	14.1	62.7
2021	4.7	0.1	42.4	1.0	16.5	46.7

**Table 03-18.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1996	4	4	27	-	-
2001	7	11	2	-	-
2006	4	4	5	-	-
2011	1	1	6	-	1
2016	2	5	4	-	-
2021	1	11	2	-	7
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	2.9 (7.2)	14.1 (34.8)	13.4 (33.1)	1.2 (2.9)	-
2006	13.1 (32.3)	24.8 (61.2)	5.3 (13.2)	-	-
2011	5.8 (14.3)	5.3 (13.2)	12.1 (29.8)	2.3 (5.7)	-
2016	2.2 (5.4)	31.5 (77.8)	8.7 (21.5)	-	-
2021	3.6 (9.0)	22.8 (56.3)	6.7 (16.6)	-	-

**Table 03-18.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Danthonia californica (California oatgrass)	Danthonia unispicata (onespike danthonia)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Juncus (rush)	Melica bulbosa (oniongrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency													
1996	30	404	-	34	-	-	-	1	-	-	455	5	15	2
2001	12	231	-	10	4	-	-	-	-	-	448	15	19	5
2006	20	312	6	27	4	4	-	2	-	5	437	13	10	8
2011	52	245	6	72	17	4	-	2	3	-	438	4	9	6
2016	10	407	5	66	34	-	-	2	-	6	280	6	-	9
2021	95	140	17	98	12	-	1	1	-	24	393	30	-	5
year	Average Cover (%)													
1996	1.0	8.0	-	0.3	-	-	-	0.0	-	-	31.9	0.0	0.0	0.2
2001	0.4	3.3	-	0.1	0.1	-	-	-	-	-	42.2	0.1	0.4	0.4
2006	0.7	5.6	0.2	0.1	0.2	0.2	-	0.0	-	0.0	41.4	0.1	0.1	0.6
2011	1.6	3.1	0.0	0.7	0.4	0.0	-	0.0	0.0	-	30.8	0.4	0.0	0.1
2016	0.2	21.7	0.2	2.4	0.7	-	-	0.0	-	0.1	16.4	0.1	-	0.0
2021	5.2	0.8	0.8	0.8	0.5	-	0.0	0.0	-	1.2	20.6	0.5	-	0.2

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 03-18.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Ambrosia psilostachya (Cuman ragweed)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus beckwithii (Beckwith's milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron strigosus (prairie fleabane)
year	Nested Frequency																
1996	35	4	-	141	-	37	-	-	-	2	-	12	-	-	-	-	3
2001	15	1	-	110	-	44	-	0	2	-	-	6	3	0	-	47	10
2006	7	6	2	277	-	25	3	-	-	-	-	1	-	-	-	179	3
2011	1	22	17	302	3	42	-	5	-	-	-	-	-	-	-	54	14
2016	5	5	-	286	-	25	-	-	-	-	21	-	3	2	4	54	-
2021	-	2	8	46	-	37	-	-	-	-	-	3	-	-	-	9	-
year	Average Cover (%)																
1996	0.4	0.0	-	2.5	-	0.8	-	-	-	0.0	-	0.2	-	-	-	-	0.0
2001	0.3	0.0	-	1.6	-	1.7	-	0.0	0.0	-	-	0.0	0.0	0.0	-	0.1	0.1
2006	0.5	0.1	0.0	9.1	-	1.1	0.2	-	-	-	-	0.0	-	-	-	1.1	0.1
2011	0.0	0.2	0.1	14.5	0.0	1.0	-	0.0	-	-	-	-	-	-	-	0.3	0.1
2016	0.0	0.0	-	7.6	-	0.7	-	-	-	-	0.1	-	0.0	0.0	0.2	0.5	-
2021	-	0.0	0.0	0.9	-	0.8	-	-	-	-	-	0.0	-	-	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species



FORB SPECIES	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium <sup>n</sup> (bedstraw)	Grindelia squarrosa (curlycup gumweed)	Helianthus annuus <sup>ai</sup> (common sunflower)	Isatis tinctoria <sup>ami</sup> (Dyer's woad)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lagophylla ramosissima <sup>a</sup> (branched lagophylla)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lomatium ambiguum (Wyeth biscuitroot)	Machaeranthera canescens (hoary tansyaster)	Madia glomerata <sup>a</sup> (mountain tarweed)	Melilotus officinalis <sup>i</sup> (sweetclover)	Navarretia intertexta <sup>a</sup> (needleleaf navarretia)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Potentilla gracilis (slender cinquefoil)	Rumex crispus <sup>i</sup> (curly dock)
year	Nested Frequency																
1996	31	-	32	-	1	46	-	20	1	210	314	-	-	-	2	-	2
2001	365	-	-	-	-	73	-	-	6	-	60	3	-	2	-	-	1
2006	191	2	41	3	3	20	-	8	15	-	267	5	2	-	3	-	-
2011	235	3	29	16	-	126	-	3	6	-	107	4	16	-	-	-	3
2016	229	5	27	5	-	37	29	-	-	-	65	6	34	2	-	-	10
2021	308	-	37	-	-	-	26	-	7	6	7	-	-	1	1	2	1
year	Average Cover (%)																
1996	0.2	-	0.5	-	0.1	0.2	-	0.2	0.0	1.1	4.0	-	-	-	0.0	-	0.0
2001	15.9	-	-	-	-	1.4	-	-	0.2	-	0.2	0.0	-	0.0	-	-	0.0
2006	1.8	0.0	1.5	0.0	0.0	0.3	-	0.0	1.2	-	7.1	0.2	0.0	-	0.0	-	-
2011	3.6	0.0	0.8	0.6	-	1.4	-	0.0	0.1	-	2.2	0.0	0.1	-	-	-	0.0
2016	8.5	0.1	0.3	0.0	-	0.2	0.3	-	-	-	1.3	0.1	0.1	0.0	-	-	0.1
2021	9.9	-	1.4	-	-	-	0.1	-	0.5	0.0	0.0	-	-	0.0	0.0	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Symphoricarum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Verbascum blattaria <sup>ai</sup> (moth mullein)	Veronica biloba <sup>ai</sup> (two-lobed speedwell)	Viola (violet)
year	Nested Frequency					
1996	231	-	140	35	-	-
2001	185	4	12	16	-	-
2006	228	-	34	21	4	-
2011	231	-	23	5	-	1
2016	236	-	17	19	-	-
2021	162	1	43	7	2	2
year	Average Cover (%)					
1996	4.6	-	1.4	0.8	-	-
2001	3.1	0.0	0.1	0.2	-	-
2006	7.4	-	0.3	0.9	0.3	-
2011	3.6	-	0.1	0.4	-	0.0
2016	3.8	-	0.1	0.4	-	-
2021	2.1	0.0	0.7	0.2	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 03-18.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)	
	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Gutierrezia sarothrae (broom snakeweed)
year	Line Intercept Cover (%)	
1996	-	-
2001	-	-
2006	3.7	0.2
2011	4.1	0.2
2016	4.1	4
2021	2.2	0.6
year	Quadrat Cover (%)	
1996	2.2	0.2
2001	2.8	-
2006	1.9	0.5
2011	3.0	0.3
2016	3.6	2.1
2021	3.0	0.7

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 03-18.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	148/190
2011	-	-	-	-	-	-	-	-	173/232
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	1860	140	61	32	7	22	3	7	46/98
2001	1020	-	0	84	16	57	2	8	40/64
2006	980	40	4	61	35	31	16	41	40/65
2011	680	-	0	88	12	38	18	15	42/86
2016	640	700	0	66	34	3	38	25	46/95
2021	500	-	0	60	40	4	0	52	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	740	60	24	76	0	0	0	0	28/39
2001	-	-	-	-	-	-	-	-	-/-
2006	120	-	0	100	0	0	0	0	32/49
2011	180	-	0	100	0	0	0	0	31/40
2016	1860	-	0	98	2	0	0	0	32/44
2021	660	-	3	70	27	3	0	30	- / -

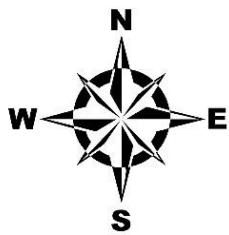
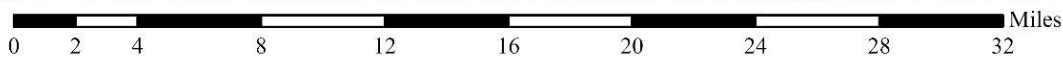
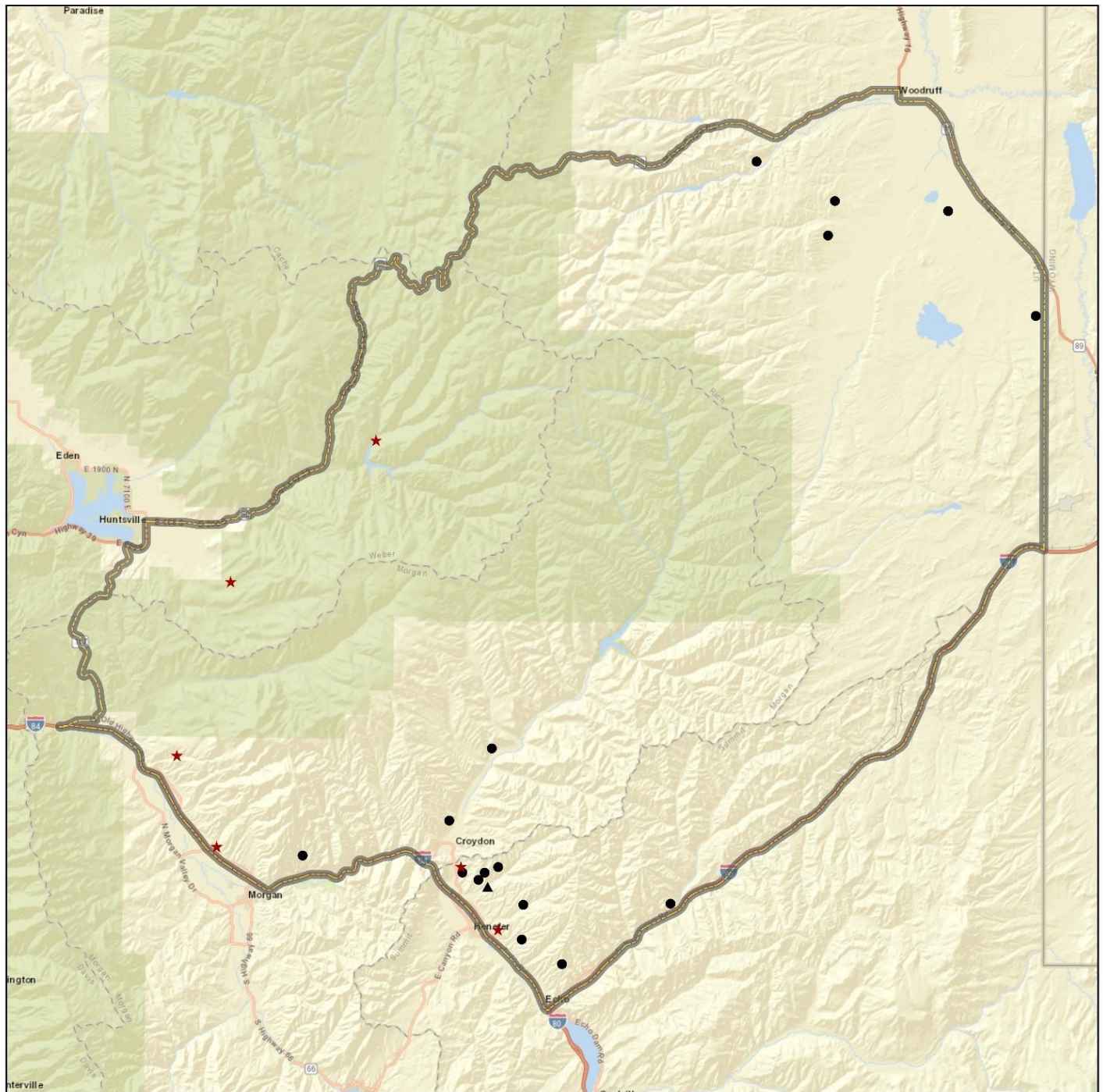
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Linanthus pungens -- (granite prickly phlox)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	26/29
2021	-	-	-	-	-	-	-	-	-/-
<b>Opuntia -- (pricklypear)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	24/48
2021	-	-	-	-	-	-	-	-	-/-
<b>Rosa woodsii<sup>P</sup> -- (Woods' rose)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	67/71
2011	-	-	-	-	-	-	-	-	39/38

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 03-18.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	2.8	0.0	0.0	2.4	-6.2	10.0	-2.0	<b>7.0</b>	Very Poor
2001	3.6	0.0	0.0	2.8	-2.6	10.0	0.0	<b>13.8</b>	Very Poor
2006	4.6	0.0	0.0	4.2	-4.3	10.0	-2.0	<b>12.5</b>	Very Poor
2011	5.1	0.0	0.0	5.4	-2.8	10.0	0.0	<b>17.7</b>	Very Poor
2016	5.1	0.0	0.0	2.4	-18.0	10.0	0.0	<b>-0.5</b>	Very Poor
2021	2.8	0.0	0.0	16.7	-1.2	10.0	0.0	<b>28.2</b>	Very Poor

# WILDLIFE MANAGEMENT UNIT 4 - MORGAN-SOUTH RICH

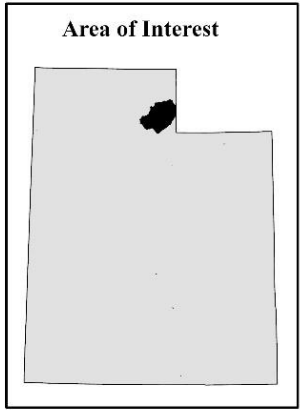


**Study Locations  
Project, Status**

- RT, Active
- ★ RT, Suspended
- ▲ WRI, Active

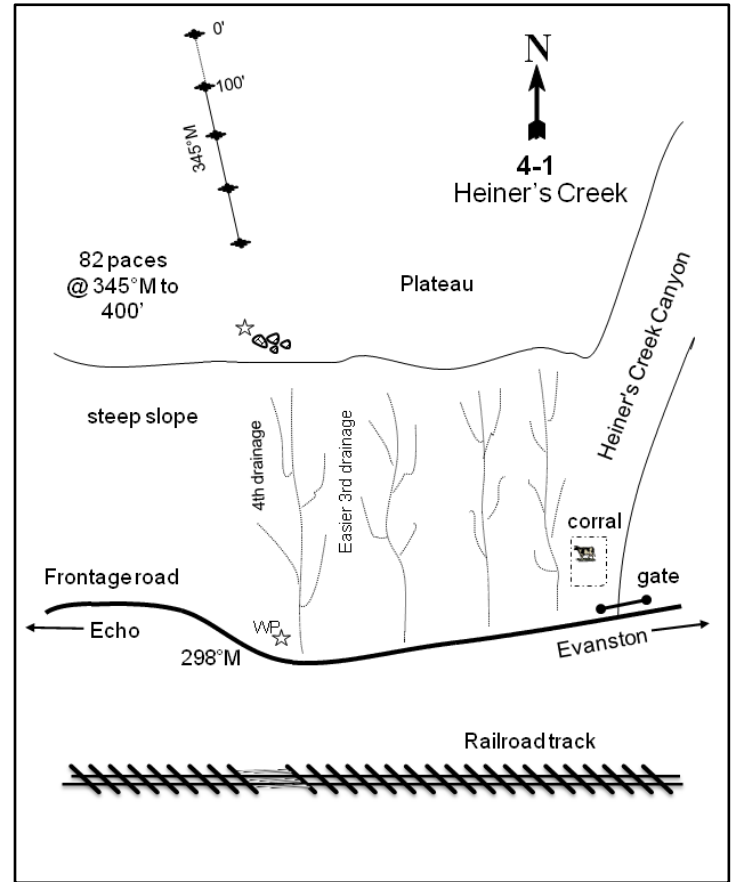
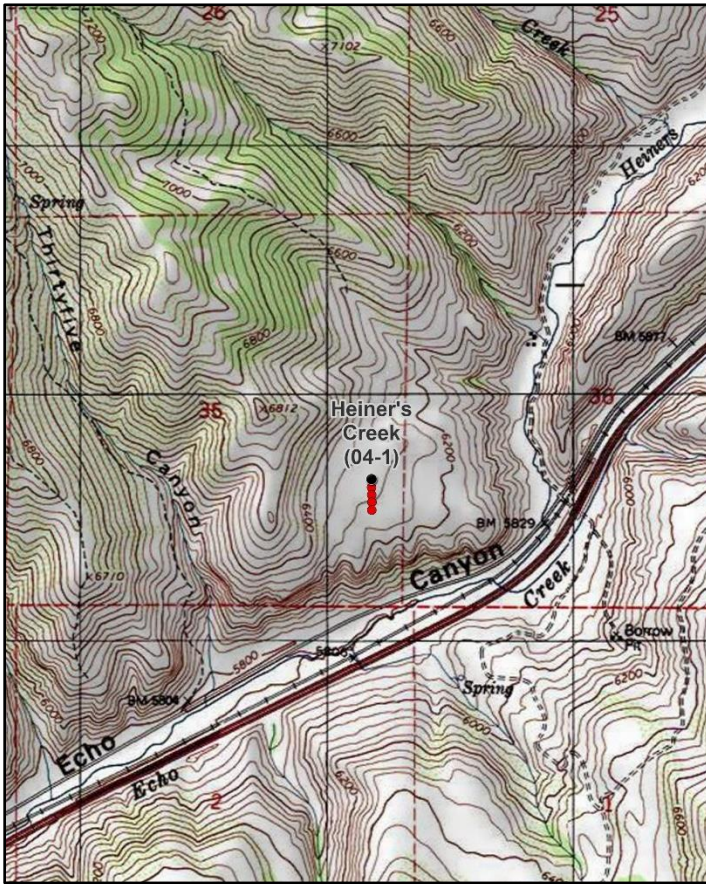
**Unit Boundary**

- ▭ Unit - 4



Credits: Bureau of Land Management, Utah AGRC, Esri, HERE, Garmin, NGA, USGS, NPS

## HEINER'S CREEK - STUDY NO. 04-1

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Heiners Creek SW; Township 4N, Range 5E, Section 35  
NAD 83 UTM ZONE 12, 471182 East 4542649 North

**Transect Information**

Browse Tag # (0' Stake)	7941
Transect Bearing	164° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (71ft), Line 4 (34ft)
Belt Marker Placement	Belt 1: No Rebar

**Directions to Site**

From exit 169 on I-80, travel 6.2 miles northeast on the frontage road to a witness post on the north side of the road next to a large rock. Hike up the third drainage west of Heiner's Creek: this drainage is wider and easier to hike up. Once on the top of the bench, walk west to the head of the next drainage to the west. The 400-foot stake is located at the head of this gully. The 0-foot baseline stake is 400 feet to the north at a bearing of 326 degrees magnetic and is marked by browse tag #7941.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,300ft (1,920m)
Aspect	Southeast
Slope	10%
Sample Dates	07/01/1996, 06/11/2001, 06/08/2006, 06/16/2011, 06/15/2016, 06/16/2021

**Table 04-01.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Echo Canyon	-	1977	-

**Wildlife Habitat and Vegetation History****Table 04-01.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	summer	

**Table 04-01.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Yellow Rabbitbrush	No Encroachment
1990	Yellow Rabbitbrush	No Encroachment
1996	Yellow Rabbitbrush	No Encroachment
2001	Yellow Rabbitbrush/Mountain Big Sagebrush	No Encroachment
2006	Yellow Rabbitbrush/Mountain Big Sagebrush	No Encroachment
2011	Mountain Big Sagebrush	No Encroachment
2016	Mountain Big Sagebrush	No Encroachment
2021	Mountain Big Sagebrush	No Encroachment

**Site Notes**

The study is located on private land on the north side of Echo Canyon, just west of Heiner's Creek. The site is located above the steep bluffs, or cliffs, that are prevalent in Echo Canyon. The study samples a mixed mountain brush community which appears to have been burned prior to the 1984 reading. The area is considered important winter range for deer and, to a lesser extent, elk.

**Soils****Table 04-01.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.6	31.9	32.1	36.0	3.2	19.9	144.0	0.4	07/01/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

From the outset of the study in 1984 through 1996, yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*) was the sole dominant browse species on this site. In 2006, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) became co-dominant with yellow rabbitbrush. Although yellow rabbitbrush was and is still prevalent as of 2021, mountain big sagebrush has continued to increase in cover and overtook yellow rabbitbrush as the dominant browse component in 2011 (Photos, Pre-1992 Data, Table 04-01.12, Table 04-01.13). The herbaceous understory has remained both abundant and diverse. Perennial grasses; namely bluebunch wheatgrass (*Pseudoroegneria spicata*), Kentucky bluegrass (*Poa pratensis*), and Sandberg bluegrass (*P. secunda*); have provided a majority of the herbaceous cover in many sample years. Perennial forbs have remained abundant throughout the duration of the study. However, annual grasses and forbs have consistently contributed little cover (Table 04-01.7, Table 04-01.10, Table 04-01.11). Barring the occurrence of a major disturbance, this site will likely remain in this or a similar state in the future. Mule deer winter range has been considered to be in good condition most sample years, which can largely be attributed to high amounts preferred browse cover, namely sagebrush. Furthermore, sagebrush on this site has displayed low amounts of decadence with a fair amount of recruitment in most sample years. Mule deer winter range condition was considered to be good in 2021 (Table 04-01.15).

**Trend Summary Tables****Table 04-01.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	8.1	21.9	-	-	-	-
2001	11.9	19.7	-	-	-	-
2006	20.6	14.3	-	20.8	18.0	-
2011	25.2	12.1	-	28.4	12.2	-
2016	26.6	10.0	-	39.2	15.9	-
2021	27.8	8.6	-	31.4	7.3	-

**Table 04-01.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	157	395	153	221	1.6	12.1	0.5	3.5
2001	65	368	276	283	0.8	20.3	2.7	5.9
2006	76	368	339	258	0.3	17.0	3.6	6.6
2011	85	331	290	304	1.3	10.8	2.8	12.1
2016	116	324	244	293	1.0	10.0	1.1	9.5
2021	-	283	30	260	-	8.1	0.1	9.1

**Table 04-01.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	22.2	0.3	44.9	0.7	0.1	48.2
2001	26.7	0.3	38.3	0.6	0.6	54.7
2006	25.8	1.8	34.8	1.2	0.1	51.6
2011	27.7	1.3	36.3	0.4	0.1	52.4
2016	28.2	0.4	36.8	0.7	0.0	52.9
2021	23.7	1.1	50.3	1.8	0.2	46.7

**Table 04-01.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Horse	Shiras Moose	Rabbit
	Quadrat Frequency						
1996	1	-	15	-	3	-	-
2001	2	-	17	2	-	-	2
2006	4	-	32	23	-	-	56
2011	3	-	23	6	-	-	18
2016	1	-	33	3	1	1	19
2021	1	-	29	6	-	-	11
Year	Days Use Per Acre (ha)						
1996	-	-	-	-	-	-	-
2001	5.1 (12.6)	-	40.9 (101.0)	2.0 (5.0)	-	-	-
2006	5.8 (14.3)	-	45.6 (112.6)	16.1 (39.7)	-	-	-
2011	7.2 (17.9)	-	18.1 (44.7)	10.7 (26.5)	-	-	-
2016	1.5 (3.6)	-	29.5 (72.8)	4.0 (9.9)	2.3 (5.7)	-	-
2021	-	8.7 (21.5)*	85.1 (210.2)	4.7 (11.6)	0.6 (1.4)	-	-

\*Pellets per acre (ha)



**Table 04-01.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Koeleria macrantha (prairie Junegrass)	Leymus cinereus (basin wildrye)	Melica bulbosa (oniongrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency											
1996	34	157	3	1	102	4	10	3	99	47	239	140
2001	6	65	-	1	72	10	7	-	19	74	283	87
2006	17	76	11	-	105	8	8	-	39	74	266	119
2011	26	85	3	4	78	13	7	-	32	78	182	133
2016	12	116	8	-	107	34	6	-	26	65	80	161
2021	8	-	16	2	65	2	4	-	38	9	85	182
year	Average Cover (%)											
1996	0.7	1.6	0.0	0.0	0.6	0.0	0.2	0.0	1.7	1.0	5.2	2.7
2001	0.4	0.8	-	0.0	0.7	0.1	0.2	-	1.0	4.1	10.5	3.3
2006	0.2	0.3	0.1	-	1.3	0.1	0.4	-	1.1	2.0	8.9	3.0
2011	0.5	1.3	0.0	0.0	1.1	0.1	0.1	-	0.3	1.7	4.4	2.5
2016	0.1	1.0	0.0	-	1.9	0.7	0.2	-	0.3	2.0	0.9	4.0
2021	0.0	-	0.1	0.0	0.8	0.0	0.0	-	0.6	0.1	1.3	5.2

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 04-01.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus lentiginosus (freckled milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chaenactis douglasii (Douglas' dusty maiden)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cryptantha (cryptantha)
year	Nested Frequency																
1996	77	-	2	-	1	4	-	4	-	-	118	-	17	6	-	4	-
2001	64	-	34	-	5	47	-	11	6	-	221	-	3	131	10	19	-
2006	33	1	68	-	-	15	-	31	9	2	256	-	1	134	6	4	-
2011	63	15	145	9	1	9	-	20	18	5	183	-	4	180	25	22	1
2016	74	4	76	12	2	3	2	39	3	6	100	-	7	119	3	25	-
2021	83	1	3	1	-	4	-	58	5	-	20	1	5	2	-	12	-
year	Average Cover (%)																
1996	0.8	-	0.0	-	0.0	0.0	-	0.0	-	-	0.4	-	0.2	0.0	-	0.0	-
2001	1.0	-	0.2	-	0.0	0.2	-	0.2	0.1	-	1.9	-	0.1	0.5	0.0	0.1	-
2006	0.6	0.0	0.2	-	-	0.0	-	0.4	0.3	0.0	2.2	-	0.0	0.3	0.0	0.1	-
2011	0.9	0.1	1.0	0.0	0.0	0.0	-	0.2	0.4	0.0	0.8	-	0.0	0.8	0.1	0.3	0.0
2016	1.7	0.0	0.2	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.3	-	0.4	0.3	0.0	0.3	-
2021	1.8	0.0	0.0	0.0	-	0.0	-	1.1	0.2	-	0.0	0.0	0.0	0.0	-	0.3	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Eriogonum umbellatum (sulphur-flower buckwheat)	Hackelia patens (spotted stickseed)	Helianthella uniflora (oneflower helianthella)	Heterotheca villosa (hairy false goldenaster)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lithospermum ruderale (western stone seed)	Lomatium triternatum (nineleaf biscuitroot)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Penstemon (beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Silene antirrhina <sup>a</sup> (sleepy silene)
year	Nested Frequency																
1996	-	-	11	7	-	3	-	1	-	11	5	-	-	56	42	-	-
2001	11	-	5	-	-	-	5	1	-	44	-	18	-	72	-	-	-
2006	35	186	7	4	2	-	-	1	-	51	-	142	-	84	6	8	-
2011	78	49	10	-	7	-	2	-	-	53	-	64	1	34	1	4	17
2016	13	11	13	-	3	-	-	-	-	33	-	124	3	41	3	1	16
2021	-	-	4	-	6	-	-	2	5	31	-	10	-	29	-	8	-
year	Average Cover (%)																
1996	-	-	0.2	0.1	-	0.0	-	0.0	-	0.1	0.0	-	-	0.1	0.1	-	-
2001	0.2	-	0.1	-	-	-	0.0	0.1	-	0.8	-	0.0	-	0.3	-	-	-
2006	0.1	0.5	0.2	0.1	0.0	-	-	0.0	-	1.1	-	0.4	-	0.3	0.0	0.1	-
2011	0.6	0.2	0.3	-	0.4	-	0.0	-	-	1.7	-	0.2	0.0	0.1	0.0	0.0	0.1
2016	0.0	0.1	0.2	-	0.3	-	-	-	-	0.9	-	0.3	0.0	0.1	0.0	0.0	0.0
2021	-	-	0.1	-	0.9	-	-	0.0	0.0	1.4	-	0.0	-	0.1	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Sphaeralcea coccinea (scarlet globemallow)	Symphoricarichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>a</sup> (yellow salsify)	Viola (violet)
year	Nested Frequency				
1996	-	113	-	-	-
2001	0	140	1	3	-
2006	1	99	5	7	-
2011	1	155	5	-	8
2016	1	164	3	6	11
2021	-	140	5	2	-
year	Average Cover (%)				
1996	-	1.9	-	-	-
2001	0.0	2.6	0.0	0.0	-
2006	0.1	3.0	0.0	0.1	-
2011	0.1	6.6	0.0	-	0.1
2016	0.0	4.7	0.0	0.1	0.0
2021	-	3.2	0.0	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 04-01.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Rosa woodsii <sup>p</sup> (Woods' rose)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)							
1996	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-
2006	0.4	17.1	18	-	0.2	2.1	1	-
2011	0.8	24.3	12.2	-	0.7	1.7	0.9	-
2016	0.7	33.9	15.9	-	0.7	3.2	0.7	-
2021	1.1	27.1	7.3	-	1.2	1.1	0.9	-
year	Quadrat Cover (%)							
1996	0.4	4.9	21.9	0.4	0.0	1.8	0.7	-
2001	0.7	8.7	19.7	0.4	0.0	1.6	0.5	-
2006	1.0	16.9	14.3	-	0.0	2.4	0.2	0.0
2011	0.9	21.9	12.1	-	0.0	1.9	0.6	0.0
2016	0.4	23.0	10.0	-	0.1	2.2	0.8	-
2021	1.2	24.6	8.6	-	0.3	1.3	0.5	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-01.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	80	-	25	75	0	0	25	0	46/63
2001	320	-	44	56	0	31	6	0	51/71
2006	100	-	40	60	0	40	60	0	72/93
2011	180	-	0	100	0	44	56	0	79/104
2016	260	-	31	69	0	23	46	23	70/87
2021	340	-	24	53	24	12	0	18	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	1060	180	19	79	2	23	0	2	66/89
2001	4120	1000	67	31	3	4	0	6	71/97
2006	4360	760	42	50	8	15	2	4	63/98
2011	4180	100	29	62	9	35	0	11	62/98
2016	3800	1380	11	86	3	11	1	4	59/89
2021	4840	120	19	57	23	12	0	27	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	14240	160	14	83	3	3	0	0	34/59
2001	14840	120	8	88	4	1	0	2	29/48
2006	13180	120	14	80	6	5	0	2	26/45
2011	10900	20	20	75	6	4	0	2	25/42
2016	7980	-	8	92	0	0	0	0	24/33
2021	9860	40	21	59	20	0	0	21	- / -

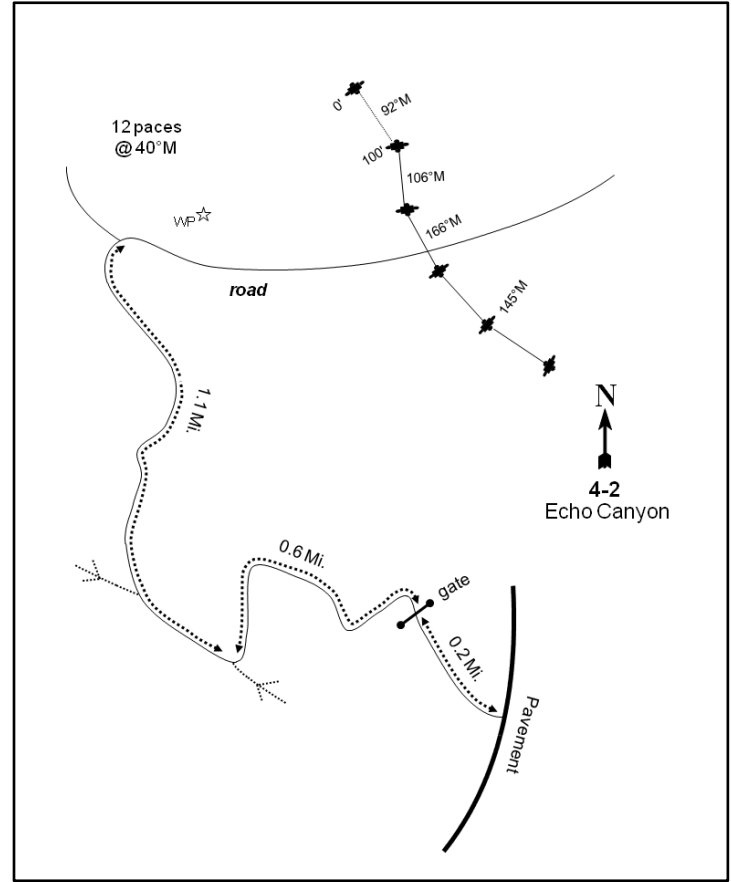
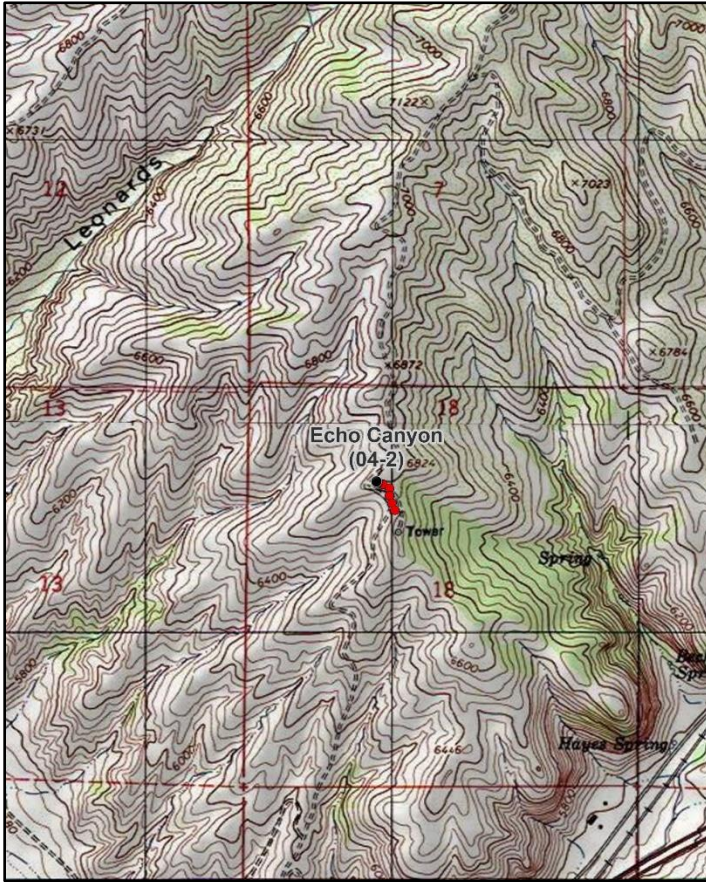
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1996	20	-	0	0	100	0	0	0	64/88
2001	20	-	0	100	0	0	0	0	45/61
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1996	100	-	40	60	0	20	20	20	36/110
2001	100	-	20	80	0	20	60	0	32/88
2006	40	-	0	100	0	0	100	0	38/130
2011	100	-	0	80	20	40	60	0	33/139
2016	120	-	17	83	0	0	100	0	40/108
2021	160	-	0	38	63	13	38	63	- / -
<b>Rosa woodsii<sup>P</sup> -- (Woods' rose)</b>									
1996	3780	500	31	69	0	0	0	0	35/39
2001	5960	-	94	6	0	55	0	0	38/28
2006	6980	420	73	26	0	1	0	1	23/20
2011	3700	80	37	63	0	0	0	0	22/20
2016	5320	80	61	39	0	0	0	0	31/20
2021	7100	-	18	82	0	9	0	0	- / -
<b>Symphoricarpos oreophilus<sup>P</sup> -- (mountain snowberry)</b>									
1996	200	-	10	90	0	30	0	0	45/95
2001	240	-	0	100	0	42	0	0	39/80
2006	220	-	9	91	0	0	0	0	40/80
2011	220	-	9	91	0	9	0	0	56/125
2016	320	-	19	81	0	0	6	6	46/77
2021	160	-	13	88	0	0	0	25	- / -
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	20	-	0	0	100	0	0	0	- / -
2011	20	-	0	100	0	0	0	0	28/55
2016	-	-	-	-	-	-	-	-	28/45

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-01.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	10.1	13.3	10.2	24.1	-1.2	7.1	0.0	<b>63.6</b>	Fair
2001	15.0	14.4	15.0	30.0	-0.6	10.0	0.0	<b>83.8</b>	Good
2006	25.9	13.1	15.0	30.0	-0.2	10.0	0.0	<b>93.8</b>	Excellent
2011	30.0	12.5	13.8	21.5	-1.0	10.0	0.0	<b>86.8</b>	Good
2016	30.0	14.2	7.9	20.0	-0.7	10.0	0.0	<b>81.3</b>	Good
2021	30.0	8.1	9.3	16.2	0.0	10.0	0.0	<b>73.5</b>	Good

## ECHO CANYON - STUDY NO. 04-2

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Coalville NE; Township 3N, Range 5E, Section 18  
NAD 83 UTM ZONE 12, 463944 East 4538614 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

7943  
92° magnetic (Line 2: 106° magnetic, Line 3: 166° magnetic, Line 4-5: 145° magnetic)  
500ft  
Line 1 (11ft), Line 2 (34ft), Line 3 (95ft), Line 4 (59ft), Line 5 (71ft)  
Standard

**Directions to Site**

From exit 169 off of I-80 (just east of the I-80/I-84 junction), travel northeast towards Emery for 0.1 miles, then turn left onto a dirt road. Proceed up the mountain for 0.2 miles to a gate (**you will need a key**). Proceed 0.6 miles to a fork and turn right. Continue north for 1.1 miles to a fork in the road and stop. From this point, walk 12 paces at 40 degrees magnetic to the witness post; the 0-foot baseline stake is 18 paces at 40 degrees magnetic from the witness post and is marked by browse tag #7943. The baseline doglegs along the hillside. Line 1 runs 92 degrees magnetic. Line 2 runs 106 degrees magnetic. Line 3 runs 166 degrees magnetic. Lines 4 and 5 run 145 degrees magnetic.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,800ft (2,073m)
Aspect	Southwest
Slope	30%
Sample Dates	06/21/1996, 06/14/2001, 06/13/2006, 06/14/2011, 06/16/2016, 06/16/2021

**Table 04-02.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Aerial After	Henefer Echo - Roadshed Fire, Rehab	3895	November 2016	315
Fire - Wildfire	Echo Road Shed	-	August 2016	317

**Table 04-02.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Road Shed Fire			Aerial	Nov 2016	315
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Bromus marginatus	Mountain Brome	Garnet	3.02	2.88
G	Elymus wawawaiensis	Snake River Wheatgrass	Discovery	1.43	1.12
G	Poa secunda	Canby Bluegrass	Canbar	0.10	0.08
G	Poa secunda	Canby Bluegrass	Canbar	0.48	0.39
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Anatone	1.43	1.33
F	Achillea millefolium	Western Yarrow	Eagle	0.10	0.09
F	Linum perenne	Blue Flax	Appar	0.48	0.43
F	Medicago sativa	Alfalfa	Ladak	0.95	0.89
F	Medicago sativa ssp. falcata	Yellow Alfalfa	Don	0.63	0.63
F	Sanguisorba minor	Small Burnet		3.97	3.55
S	Artemisia tridentata ssp. vaseyana	Mountain Big Sagebrush	Wasatch UT	0.95	0.21
S	Bassia prostrata	Forage Kochia	Box Elder UT	0.95	0.71
S	Ericameria nauseosa	Whitestem Rubber Rabbitbrush	Carbon/Emery UT	0.23	0.09

**Wildlife Habitat and Vegetation History****Table 04-02.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	summer	

**Table 04-02.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Wyoming Big Sagebrush	No Encroachment
1990	Wyoming Big Sagebrush	No Encroachment
1996	Wyoming Big Sagebrush/Annual Grass	No Encroachment
2001	Wyoming Big Sagebrush/Perennial Grass	No Encroachment
2006	Wyoming Big Sagebrush/Perennial Grass	No Encroachment
2011	Perennial Grass	No Encroachment
2016	Perennial Grass	No Encroachment
2021	Perennial Grass	No Encroachment

**Site Notes**

This study is located on the ridge approximately one mile northeast of Echo Junction.

**Soils****Table 04-02.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.0	46.7	27.0	26.3	3.1	25.9	192.0	0.7	06/21/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Upland Stony Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R047XA338UT
States and Transitions	No state and transition model is available for this ecological site.

This site was dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) from study establishment in 1984 through the 2006 sample year. Cover and density decreased over time, and sagebrush became a minor vegetation component in 2011 (Photos, Pre-1992 Data, Table 04-02.12, Table 04-02.13): this decrease was further accelerated by a 2016 wildfire (Table 04-02.1). Annual grasses, mainly cheatgrass (*Bromus tectorum*), were co-dominant in 1996, although it is important to note that cover and frequency of these grasses were not recorded prior to that year. Perennial grasses replaced cheatgrass as the co-dominant herbaceous component in 2001 and became the sole dominant vegetation type in 2011. The native species bluebunch wheatgrass (*Pseudoroegneria spicata*) was the most abundant perennial grass through 2006, but the introduced species bulbous bluegrass (*Poa bulbosa*) has been the dominant herbaceous species since 2011 (Table 04-02.7, Table 04-02.10). Forbs have remained diverse and moderately abundant (Table 04-02.11). Should introduced perennial grasses persist or increase in the future, they may have the potential to lead to reduced herbaceous diversity and/or decreased seedling establishment of browse species. Mule deer winter range has ranged between fair to poor condition over the sample years due to fluctuations of annual grasses and a large decrease in cover for preferred browse species, namely that of sagebrush. Furthermore, sagebrush has generally had high decadence with little recruitment in most sample years. Mule deer winter range condition was considered to be poor in 2021 (Table 04-02.15).

**Trend Summary Tables****Table 04-02.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	14.4	0.7	-	-	-	-
2001	14.9	1.4	-	-	-	-
2006	9.6	0.9	-	13.0	0.4	-
2011	4.9	0.0	-	7.4	0.2	-
2016	6.5	0.8	-	9.9	0.4	-
2021	4.3	0.8	-	3.7	0.1	-

**Table 04-02.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	408	265	379	218	13.7	10.8	10.6	5.3
2001	208	334	342	204	4.4	18.6	6.3	6.5
2006	201	374	218	221	4.5	25.2	2.0	6.5
2011	155	430	344	267	4.6	36.7	8.7	9.8
2016	255	423	280	184	7.7	33.1	5.1	7.1
2021	77	469	173	151	0.9	35.0	5.8	4.4

**Table 04-02.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	2.9	0.0	59.1	6.8	9.8	49.0
2001	9.3	0.1	42.8	11.6	11.9	50.6
2006	6.4	0.1	41.9	11.4	8.9	47.1
2011	3.0	0.1	44.8	3.0	9.1	60.5
2016	2.0	-	37.8	4.0	7.2	57.7
2021	2.3	0.2	43.9	4.8	10.5	50.0

**Table 04-02.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	2	17	17	-
2001	1	29	1	-
2006	1	36	22	5
2011	1	38	14	2
2016	12	38	4	11
2021	2	48	16	12
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	5.1 (12.6)	50.2 (124.1)	6.0 (14.9)	-
2006	-	83.8 (206.9)	26.8 (66.2)	-
2011	-	7.4 (18.2)	5.3 (13.2)	-
2016	31.9 (78.9)	43.6 (107.6)	-	-
2021	1.5 (3.6)	60.3 (149.0)	14.7 (36.4)	-



**Table 04-02.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)
year	Nested Frequency										
1996	-	-	18	407	1	67	6	11	91	209	4
2001	9	-	37	197	-	93	3	20	198	209	8
2006	-	-	6	199	-	182	18	5	138	264	4
2011	-	-	5	150	-	370	1	6	93	265	-
2016	15	-	1	255	-	360	-	-	39	276	9
2021	1	1	4	73	6	386	-	-	116	290	-
year	Average Cover (%)										
1996	-	-	0.1	13.6	0.0	1.3	0.0	0.1	1.8	7.5	0.0
2001	0.1	-	0.4	4.0	-	2.6	0.0	0.7	7.9	7.4	0.1
2006	-	-	0.0	4.5	-	5.0	0.1	0.4	4.5	15.1	0.1
2011	-	-	0.0	4.6	-	23.5	0.0	0.0	3.0	10.1	-
2016	0.9	-	0.0	7.7	-	18.0	-	-	0.5	13.6	0.1
2021	0.0	0.0	0.0	0.8	0.2	17.0	-	-	5.4	12.4	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 04-02.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Ambrosia psilostachya (Cuman ragweed)	Antennaria (pussytoes)	Artemisia ludoviciana (white sagebrush)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus cibirius (browse milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littlepod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Cirsium undulatum <sup>a</sup> (wavy/leaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)
year	Nested Frequency																
1996	4	6	-	232	-	-	22	10	16	79	1	-	2	26	14	23	15
2001	5	15	22	184	0	3	33	9	23	40	6	8	5	62	5	107	39
2006	4	14	2	85	-	1	30	12	17	18	1	5	-	53	2	56	-
2011	3	18	24	135	-	-	39	20	2	13	24	-	1	28	3	40	13
2016	4	8	16	152	-	-	50	-	23	13	7	6	0	5	-	44	22
2021	1	-	2	5	2	-	50	3	9	3	-	-	-	-	0	2	-
year	Average Cover (%)																
1996	0.0	0.0	-	5.1	-	-	1.3	0.1	0.1	1.8	0.0	-	0.0	0.1	0.3	0.1	0.0
2001	0.0	0.1	0.1	1.1	0.0	0.0	1.8	0.2	0.3	1.4	0.0	0.1	0.0	0.5	0.2	0.7	0.2
2006	0.0	0.1	0.0	0.3	-	0.0	0.7	1.2	0.5	0.4	0.0	0.0	-	0.4	0.0	0.1	-
2011	0.0	0.3	0.1	0.6	-	-	0.8	0.9	0.0	0.5	0.1	-	0.0	0.2	0.2	0.2	0.2
2016	0.1	0.1	0.2	0.6	-	-	2.2	-	0.5	0.1	0.0	0.0	0.0	0.0	-	0.6	0.1
2021	0.0	-	0.0	0.0	0.0	-	1.9	0.0	0.1	0.0	-	-	-	-	0.0	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Crepis acuminata (tapertip hawksbeard)	Cymopterus (springparsley)	Descurainia <sup>a</sup> (tansymustard)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Echium vulgare <sup>ni</sup> (common viper's bugloss)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium <sup>ni</sup> (redstem stork's bill)	Galium <sup>ni</sup> (bedstraw)	Grindelia squarrosa (curlycup gumweed)	Helianthus annuus <sup>ni</sup> (common sunflower)	Heterotheca villosa (hairy false goldenaster)	Lactuca serriola <sup>ni</sup> (prickly lettuce)	Lithophragma (woodland-star)	Lomatium (desertparsley)
year	Nested Frequency																
1996	1	-	-	-	127	-	-	-	-	113	14	22	-	3	3	-	31
2001	2	13	-	3	107	-	11	3	2	67	2	10	-	2	-	-	21
2006	-	72	-	-	81	-	4	-	-	39	-	1	6	-	-	-	3
2011	4	88	8	1	123	-	-	-	-	154	-	-	-	-	1	3	24
2016	5	29	-	-	8	1	-	-	-	158	-	3	-	-	-	-	1
2021	-	6	-	-	3	1	-	-	-	147	-	-	-	-	-	3	41
year	Average Cover (%)																
1996	0.0	-	-	-	0.3	-	-	-	-	2.6	0.1	0.1	-	0.0	0.0	-	0.1
2001	0.0	0.1	-	0.0	0.2	-	0.0	0.0	0.0	2.0	0.0	0.3	-	0.1	-	-	0.1
2006	-	0.9	-	-	0.3	-	0.0	-	-	0.3	-	0.0	0.0	-	-	-	0.0
2011	0.0	1.6	0.0	0.0	0.5	-	-	-	-	5.4	-	-	-	-	0.0	0.0	0.3
2016	0.1	0.1	-	-	0.0	0.4	-	-	-	3.2	-	0.0	-	-	-	-	0.0
2021	-	0.0	-	-	0.0	0.1	-	-	-	5.5	-	-	-	-	-	0.0	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lupinus argenteus (silvery lupine)	Machaeranthera (tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Oenothera (evening primrose)	Schoenocrambe limifolia (flaxleaf plainsmustard)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>ni</sup> (tall tumblemustard)	Sphaeralcea grossularifolia (gooseberryleaf globemallow)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ni</sup> (yellow safsify)	Verbascum thapsus <sup>ni</sup> (common mullein)	Veronica biloba <sup>ni</sup> (two-lobed speedwell)	Vicia americana (American vetch)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency														
1996	28	43	-	-	-	-	281	-	5	-	64	-	-	69	-
2001	31	-	23	-	-	2	116	-	-	2	33	4	1	38	-
2006	32	-	28	9	-	-	87	-	-	-	13	-	-	69	3
2011	45	2	8	-	7	-	122	10	1	-	2	-	-	92	-
2016	35	-	11	2	-	-	5	1	-	-	2	-	-	51	-
2021	34	-	-	-	-	-	-	3	-	-	26	-	2	37	2
year	Average Cover (%)														
1996	1.0	0.1	-	-	-	-	1.7	-	0.2	-	0.4	-	-	0.6	-
2001	1.4	-	0.1	-	-	0.0	0.7	-	-	0.0	0.5	0.0	0.0	0.4	-
2006	0.8	-	0.1	0.1	-	-	0.3	-	-	-	0.2	-	-	1.7	0.0
2011	1.9	0.0	0.0	-	0.2	-	1.0	0.2	0.0	-	0.0	-	-	2.9	-
2016	2.1	-	0.0	0.0	-	-	0.0	0.4	-	-	0.0	-	-	1.1	-
2021	0.8	-	-	-	-	-	-	0.0	-	-	0.2	-	0.1	1.2	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 04-02.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Opuntia polyacantha (plains pricklypear)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)
year	Line Intercept Cover (%)						
1996	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-
2006	-	11.8	0.1	-	0.1	0.2	1.2
2011	-	5.9	0.2	-	-	-	1.5
2016	-	7.1	0.3	-	-	0.1	2.8
2021	0.7	2.3	0	-	0.1	-	0.7
year	Quadrat Cover (%)						
1996	-	14.2	0.5	-	0.3	-	0.2
2001	-	14.9	0.5	-	0.9	-	0.0
2006	-	9.5	0.7	-	0.0	0.1	0.1
2011	-	4.0	0.0	0.1	0.0	-	0.7
2016	-	4.8	0.6	0.4	0.2	0.0	1.4
2021	0.4	3.4	0.7	-	0.0	-	0.5

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-02.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	-	-	-	-	-	-	-	-	82/74
2001	-	-	-	-	-	-	-	-	87/95
2006	-	-	-	-	-	-	-	-	128/131
2011	-	-	-	-	-	-	-	-	127/127
2016	40	-	50	50	0	0	0	0	120/139
2021	20	-	0	100	0	100	0	0	- / -
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
1996	3300	20	16	64	19	44	4	1	45/93
2001	2780	80	0	69	31	53	12	11	59/113
2006	1880	280	1	51	48	40	37	30	61/99
2011	1180	20	2	31	68	56	14	63	57/95
2016	1040	-	2	75	23	10	10	8	53/96
2021	660	-	0	67	33	30	6	30	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	80	-	0	100	0	0	0	0	27/49
2001	40	-	0	100	0	0	0	0	25/44
2006	100	-	0	100	0	0	0	0	34/61
2011	40	-	0	100	0	0	0	0	29/44
2016	100	-	0	100	0	0	0	0	39/63
2021	80	-	0	75	25	0	0	25	- / -

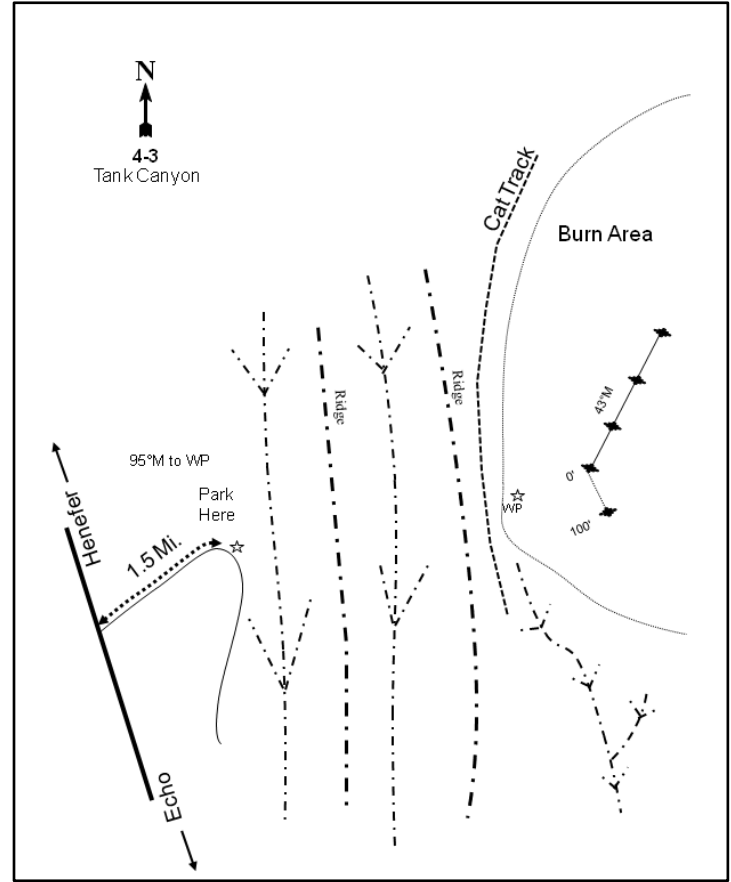
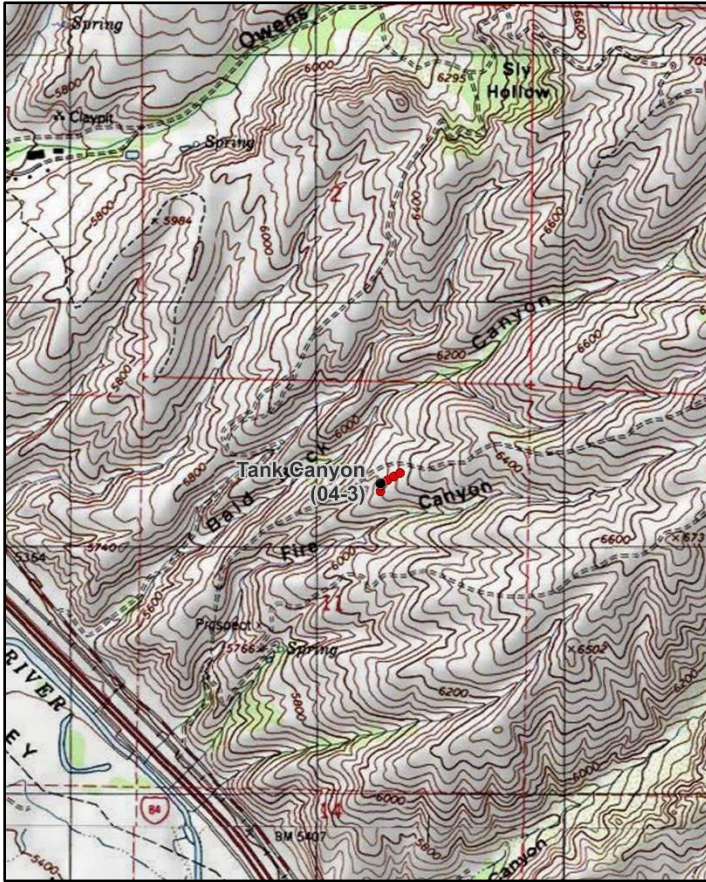
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1996	80	-	0	100	0	0	0	0	44/69
2001	20	-	0	100	0	0	0	0	70/99
2006	20	-	0	100	0	0	0	0	74/116
2011	-	-	-	-	-	-	-	-	70/107
2016	40	-	0	100	0	0	0	0	77/123
2021	-	-	-	-	-	-	-	-	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	1340	980	39	61	0	0	0	0	21/29
2001	1540	-	3	91	7	0	0	3	16/23
2006	140	-	14	86	0	0	0	0	18/24
2011	20	20	0	100	0	0	0	0	12/11
2016	120	-	0	100	0	0	0	0	20/21
2021	60	-	33	67	0	0	0	0	-/-
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	240	-	8	92	0	0	0	0	14/36
2001	260	-	15	85	0	8	0	23	12/23
2006	80	-	0	100	0	0	0	0	11/33
2011	20	-	0	100	0	0	0	0	15/46
2016	40	-	0	100	0	0	0	0	15/42
2021	-	-	-	-	-	-	-	-	-/-
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	80	-	75	25	0	0	0	0	64/63
2001	120	-	0	100	0	0	0	0	40/55
2006	80	-	0	100	0	0	0	0	63/107
2011	160	-	0	100	0	0	0	0	64/89
2016	120	-	0	100	0	0	0	0	77/104
2021	100	-	0	100	0	20	0	0	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-02.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	17.9	9.2	8.6	19.0	-10.3	10.0	0.0	<b>54.5</b>	Fair
2001	18.7	5.7	0.0	30.0	-3.3	10.0	0.0	<b>61.1</b>	Fair
2006	16.0	2.0	0.5	30.0	-3.4	10.0	0.0	<b>55.0</b>	Fair
2011	8.9	-1.2	0.7	26.4	-3.5	10.0	0.0	<b>41.2</b>	Poor
2016	11.7	10.0	0.7	30.0	-5.8	10.0	-2.0	<b>54.6</b>	Fair
2021	4.6	0.0	0.0	30.0	-0.6	8.5	-2.0	<b>40.5</b>	Poor

## TANK CANYON - STUDY NO. 04-3

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Henefer SW; Township 3N, Range 4E, Section 11  
NAD 83 UTM ZONE 12, 461262 East 4540256 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

7944  
172° magnetic (Lines 2-4: 52° magnetic)  
400ft  
Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)  
Standard

**Directions to Site**

From the East Henefer/Echo Exit, travel east, parallel to the freeway. Turn left (north) up Fire Canyon to the DWR gate. Proceed 0.8 miles on the Fire Canyon access road to a point where the road switchbacks. Park at three full-high posts before the switchback. Walk at a bearing of 11 degrees magnetic, down and back up the ravine to the next ridge, to an open area that has been burned: a witness post is in the opening. The 0-foot baseline stake is just north of the witness post and is marked with browse tag #7944.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,100ft (1,859m)
Aspect	Southwest
Slope	23%
Sample Dates	06/27/1996, 06/19/2001, 06/20/2006, 06/08/2011, 06/15/2016, 06/16/2021

**Table 04-03.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	1982	-
Seeding - Seed Unknown	-	-	1982	-
Fire - Wildfire	-	-	1985	40
Herbicide - Glyphosate	Henefer Echo WMA Fire Canyon Rehab	5541	April-May 2021	43
Seeding - Aerial After	Henefer Echo WMA Fire Canyon Rehab	5541	October 2021	43
Seeding - Aerial After	Henefer Echo WMA Project	1212	December 2008	261
Chaining - Two-Way Ely	Henefer Echo WMA Project	1212	November-December 2008	261

**Table 04-03.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Henefer Echo WMA			Aerial	Dec 2008	300
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
F	Achillea millefolium	Western Yarrow		0.10	0.10
F	Astragalus cicer	Cicer Milkvetch	Lutana	0.50	0.48
F	Balsamorhiza sagittata	Arrowleaf Balsamroot	Box Elder/Cache UT,	0.17	0.15
F	Heliomeris multiflora var. multiflora	Showy Goldeneye	Sanpete UT	0.03	0.03
F	Linum perenne	Blue Flax	Appar	0.49	0.44
F	Medicago sativa	Alfalfa	Ladak	1.75	1.59
F	Medicago sativa	Alfalfa	Ranger	1.50	1.38
F	Onobrychis viciifolia	Sainfoin	Eski	3.00	2.91
F	Sanguisorba minor	Small Burnet	Delar	3.00	2.84
S	Artemisia tridentata ssp. vaseyana	Mountain Big Sagebrush	Sanpete UT	3.00	0.52
S	Bassia prostrata	Forage Kochia	Humbolt/Lander NV	3.00	2.02
S	Chrysothamnus viscidiflorus	Low Rabbitbrush		0.14	0.00

**Wildlife Habitat and Vegetation History****Table 04-03.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	summer	

**Table 04-03.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Mountain Big Sagebrush	NA
1990	Mountain Big Sagebrush	NA
1996	Perennial Grass	NA
2001	Perennial Grass	NA
2006	Perennial Grass	NA
2011	Perennial Grass	NA
2016	Perennial Grass	NA
2021	Perennial Grass	NA

### Site Notes

This study samples crucial deer winter range on the Division of Wildlife Resources (DWR) Henefer-Echo Wildlife Management Area (WMA) between Tank Canyon and Bald Rock Canyon. The area was dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) prior to a 1982 fire, and appears to have been seeded following the burn. Another small fire burned 40 acres of the area (including the study) between 1984 and 1990. In 1990, the frequency data was collected where the fire had burned and density data was collected mainly in an unburned area, causing an incongruity between the two datasets. During the 1996 reading, the sampling area was enlarged and the entire study was moved completely into the burned area. Therefore all data and trends from 1984 and 1990 can be found in previous reports, but only data collected since 1996 will be discussed in this report.

### Soils

**Table 04-03.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.0	41.9	29.7	28.4	3.8	9.8	108.8	0.6	06/27/1996

### Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Upland Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R047XA314UT
States and Transitions	No state and transition model is available for this ecological site.

Since the location shift in 1996 this study site has remained dominated by perennial grasses, mainly the introduced species crested wheatgrass (*Agropyron cristatum*) and bulbous bluegrass (*Poa bulbosa*) (Photos, Table 04-03.10). Shrub species such as mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*), and forage kochia (*Bassia prostrata*) are present, but contribute very little cover (Table 04-03.12); competition with grasses could be preventing seedling establishment of these species (Table 04-03.13). Perennial forbs are prevalent, yet not diverse; the seeded species alfalfa (*Medicago sativa*) has been the most abundant forb since 1996 (Table 04-03.11). Annual forbs and grasses are not abundant (Table 04-03.7). Without a disturbance to reduce perennial grasses, browse is likely to remain relatively rare on this site. Mule deer winter range has been in poor condition in most sample years, which is due largely to a lack of preferred browse species, namely sagebrush. Mule deer winter range condition was considered to be very poor to poor in 2021 (Table 04-03.15).

**Trend Summary Tables****Table 04-03.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	1.2	3.0	-	-	-	-
2001	1.5	1.4	-	-	-	-
2006	1.3	2.6	-	1.1	1.4	-
2011	1.5	1.8	-	0.3	1.5	-
2016	2.3	2.2	-	0.6	1.9	-
2021	0.9	0.9	-	0.7	1.0	-

**Table 04-03.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	20	457	94	295	0.2	35.7	0.4	13.1
2001	1	481	73	280	0.0	57.1	0.6	18.0
2006	-	471	40	180	-	50.3	0.1	10.9
2011	-	479	82	182	-	49.1	0.4	6.3
2016	-	481	73	184	-	68.6	0.2	9.9
2021	3	464	18	97	0.0	42.9	0.2	1.6

**Table 04-03.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	1.6	0.4	63.2	1.3	3.1	53.0
2001	3.5	0.6	34.5	3.8	2.7	68.3
2006	4.7	0.3	28.9	4.4	3.7	66.3
2011	8.1	0.3	36.5	4.0	2.1	64.5
2016	11.3	8.3	15.6	3.0	2.4	72.0
2021	13.7	2.9	29.3	7.2	6.2	47.4

**Table 04-03.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit	Domestic Sheep
	Quadrat Frequency				
1996	-	11	9	-	26
2001	4	12	15	6	-
2006	24	12	63	26	-
2011	7	13	15	8	-
2016	12	14	17	31	-
2021	9	30	-	34	-
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	-	20.8 (51.3)	45.6 (112.6)	-	-
2006	34.9 (86.1)	17.4 (43.0)	55.6 (137.4)	-	-
2011	50.8 (125.5)	10.7 (26.5)	36.8 (91.0)	-	-
2016	30.5 (75.3)	5.3 (13.2)	12.8 (31.5)	-	-
2021	10.2 (25.1)	20.1 (49.7)	0.7 (1.7)	-	-



**Table 04-03.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Festuca idahoensis (Idaho fescue)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency											
1996	327	3	58	17	1	13	3	346	-	-	16	64
2001	389	-	22	1	1	-	3	440	-	19	4	79
2006	384	-	38	-	-	-	-	404	-	62	-	48
2011	199	-	192	-	-	-	-	417	16	32	21	19
2016	440	-	41	-	-	-	-	441	10	19	-	63
2021	387	1	5	2	-	7	-	241	4	163	-	17
year	Average Cover (%)											
1996	14.3	0.0	0.7	0.2	0.0	0.1	0.2	18.5	-	-	1.1	0.8
2001	28.5	-	0.4	0.0	0.0	-	0.0	24.3	-	0.8	0.2	2.9
2006	14.7	-	0.6	-	-	-	-	28.9	-	5.0	-	1.0
2011	7.4	-	6.9	-	-	-	-	29.7	1.4	2.3	1.1	0.4
2016	29.1	-	0.7	-	-	-	-	37.4	0.1	0.1	-	1.1
2021	20.9	0.0	0.0	0.0	-	0.0	-	13.8	0.1	7.6	-	0.5

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 04-03.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Astragalus (milkvetch)	Astragalus cibirarius (browse milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cymopterus (springparsley)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Eriogonum ovalifolium (cushion buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)
year	Nested Frequency																
1996	-	-	-	75	-	-	-	-	2	-	-	1	-	-	-	3	-
2001	-	-	-	58	-	-	3	-	4	2	2	-	5	1	-	-	7
2006	-	-	-	27	2	0	-	-	4	13	-	-	3	-	9	-	1
2011	0	4	1	66	4	-	-	3	-	3	1	-	5	14	4	-	2
2016	-	0	-	66	-	4	-	-	2	2	-	-	5	2	-	-	-
2021	-	-	-	-	-	-	-	1	-	-	-	-	2	-	-	-	8
year	Average Cover (%)																
1996	-	-	-	0.3	-	-	-	-	0.0	-	-	0.0	-	-	-	0.0	-
2001	-	-	-	0.2	-	-	0.0	-	0.3	0.0	0.0	-	0.0	0.0	-	-	0.0
2006	-	-	-	0.1	0.0	0.0	-	-	0.0	0.0	-	-	0.0	-	0.0	-	0.0
2011	0.0	0.0	0.0	0.3	0.2	-	-	0.0	-	0.0	0.0	-	0.1	0.0	0.0	-	0.0
2016	-	0.0	-	0.1	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	-	-	-
2021	-	-	-	-	-	-	-	0.0	-	-	-	-	0.0	-	-	-	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nest Frequency														
<i>Lactuca serriola</i> <sup>ai</sup> (prickly lettuce)															
<i>Lesquerella</i> (bladderpod)															
<i>Linum lewisii</i> (Lewis flax)															
<i>Medicago sativa</i> <sup>i</sup> (alfalfa)															
<i>Microsteris gracilis</i> <sup>a</sup> (slender phlox)															
<i>Onobrychis vicifolia</i> <sup>i</sup> (sainfoin)															
<i>Pedicularis centranthera</i> (dwarf lousewort)															
<i>Polygonum douglasii</i> <sup>a</sup> (Douglas' knotweed)															
<i>Sanguisorba minor</i> <sup>i</sup> (small burnet)															
<i>Sisymbrium altissimum</i> <sup>ai</sup> (tall tumblemustard)															
<i>Sphaeralcea coccinea</i> (scarlet globemallow)															
<i>Taraxacum officinale</i> (common dandelion)															
<i>Tragopogon dubius</i> <sup>ai</sup> (yellow salsify)															
<i>Vicia americana</i> (American vetch)															
year	Average Cover (%)														
1996	-	-	-	11.7	-	-	-	0.0	0.1	-	0.0	-	0.1	1.2	
2001	-	0.0	-	16.3	-	-	-	-	0.2	0.0	-	-	0.1	1.5	
2006	-	-	-	10.3	0.0	-	0.1	0.0	-	-	-	-	0.0	0.4	
2011	0.1	-	-	5.3	-	-	-	-	0.1	-	-	-	-	0.7	
2016	-	-	0.0	9.2	-	0.0	-	-	-	-	-	0.0	0.0	0.7	
2021	-	-	-	1.5	-	-	-	-	-	0.0	-	-	0.1	0.1	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 04-03.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)						
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <sup>p</sup> (mountain big sagebrush)							
<i>Bassia prostrata</i> <sup>pi</sup> (forage kochia)							
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>viscidiflorus</i> (yellow rabbitbrush)							
<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>speciosa</i> <sup>p</sup> (rubber rabbitbrush)							
<i>Gutierrezia sarothrae</i> (broom snakeweed)							
<i>Tetradymia canescens</i> (spineless horsebrush)							
year	Quadrat Cover (%)						
1996	0.7	-	3.0	0.5	0.0	-	-
2001	1.1	-	1.4	0.4	-	-	-
2006	0.4	-	2.6	0.9	0.0	-	-
2011	0.9	-	1.7	0.6	0.0	0.0	-
2016	1.3	0.1	1.8	0.9	0.4	-	-
2021	0.9	0.0	0.7	0.0	0.2	-	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-03.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1996	60	-	0	100	0	67	33	0	55/65
2001	220	-	100	0	0	0	0	0	37/52
2006	20	-	0	100	0	0	0	0	36/64
2011	20	-	100	0	0	0	0	0	47/69
2016	-	-	-	-	-	-	-	-	51/85
2021	20	-	0	100	0	100	0	0	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1996	200	-	40	60	0	10	0	0	51/65
2001	60	-	0	100	0	0	33	0	60/69
2006	60	160	33	33	33	0	0	33	68/108
2011	140	-	57	29	14	14	43	14	42/75
2016	140	80	29	71	0	57	0	0	43/87
2021	120	-	67	17	17	0	0	17	- / -
<b>Bassia prostrata<sup>P</sup> -- (forage kochia)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	460	-	61	39	0	26	9	0	12/16
2021	220	20	27	64	9	27	0	9	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	3500	140	16	82	2	26	0	2	33/49
2001	1900	-	6	88	5	0	0	3	21/30
2006	2060	20	11	86	3	10	0	3	21/31
2011	1440	-	42	58	0	15	6	0	26/38
2016	1160	-	9	91	0	2	2	2	30/43
2021	1020	20	29	43	28	0	0	24	- / -
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1996	140	-	14	71	14	0	0	0	60/81
2001	140	-	14	43	43	0	0	0	50/59
2006	140	-	29	57	14	57	0	0	66/97
2011	180	40	44	33	22	33	11	22	54/71
2016	120	40	17	67	17	50	33	17	63/89
2021	60	-	0	33	67	0	0	67	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	220	40	64	36	0	0	0	0	20/28
2001	280	-	7	93	0	0	0	0	25/28
2006	120	-	0	83	17	0	0	17	26/28
2011	20	-	100	0	0	0	0	0	13/11
2016	320	20	13	88	0	6	6	0	23/24
2021	300	-	40	60	0	0	7	0	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	-	-	-	-	-	-	-	-	14/53
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	7/19
2011	-	20	0	0	0	0	0	0	10/18
2016	-	-	-	-	-	-	-	-	14/48
2021	-	-	-	-	-	-	-	-	- / -

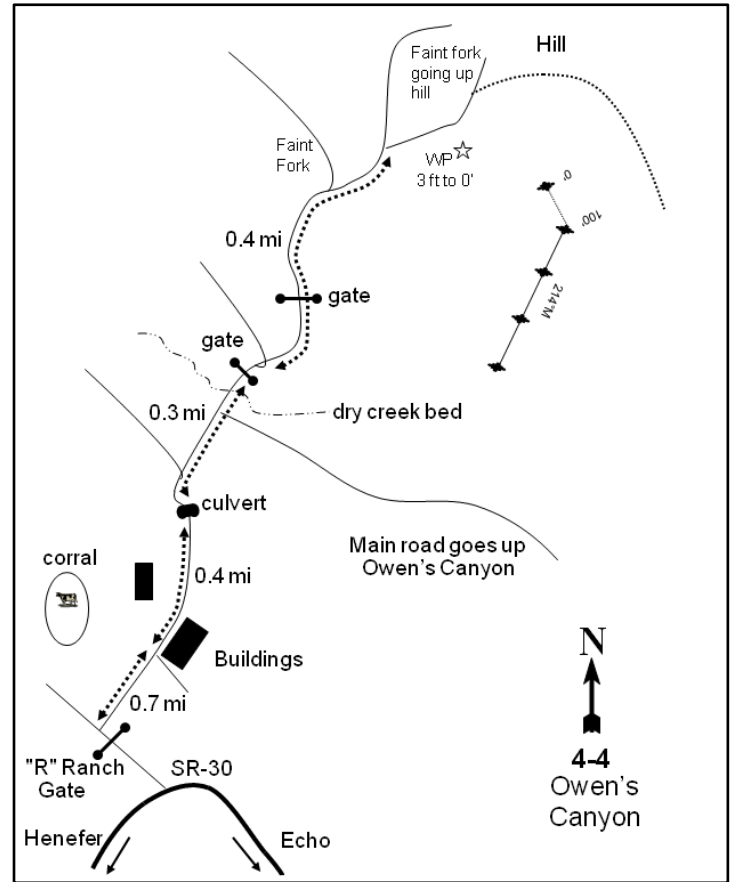
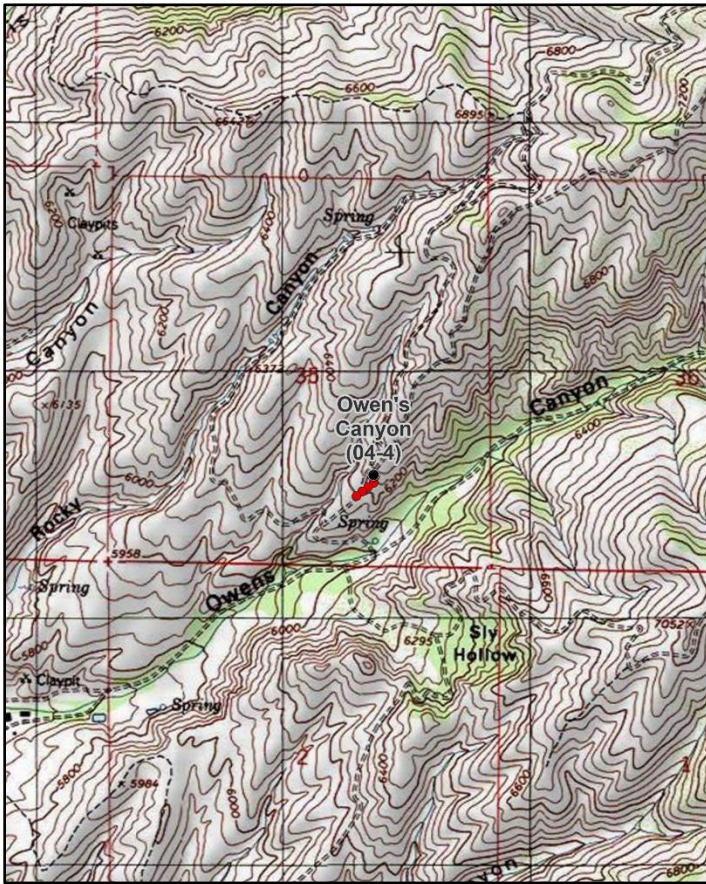
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	-	-	-	-	-	-	-	-	46/114
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	39/71
2011	-	-	-	-	-	-	-	-	61/89
2016	20	-	0	100	0	0	0	0	57/75
2021	-	-	-	-	-	-	-	-	-/-
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	33/52
2011	-	40	0	0	0	0	0	0	16/29
2016	-	-	-	-	-	-	-	-	42/85

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-03.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	1.5	0.0	0.0	30.0	-0.2	10.0	0.0	<b>41.3</b>	Poor
2001	1.9	0.0	0.0	30.0	0.0	10.0	0.0	<b>41.9</b>	Poor
2006	1.4	0.0	0.0	30.0	0.0	10.0	0.0	<b>41.4</b>	Poor
2011	0.4	0.0	0.0	30.0	0.0	10.0	0.0	<b>40.4</b>	Poor
2016	0.8	0.0	0.0	30.0	0.0	10.0	0.0	<b>40.8</b>	Poor
2021	0.9	0.0	0.0	30.0	0.0	3.1	0.0	<b>34.0</b>	Very Poor-Poor

## OWEN'S CANYON - STUDY NO. 04-4

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Henefer SW; Township 4N, Range 4E, Section 35  
NAD 83 UTM ZONE 12, 461369 East 4542573 North

**Transect Information**

Browse Tag # (0' Stake)	7945
Transect Bearing	160° magnetic (Lines 2-4: 214° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 71ft), Line 2 (59ft), Line 3 (34ft), Line 4 (95ft)
Belt Marker Placement	Standard

**Directions to Site**

From the "R" Ranch main gate proceed 0.7 miles to the ranch buildings and a fork. Take the left fork and pass through a white post entrance. Continue straight for 0.4 miles to a culvert, then travel 0.45 miles farther to a DWR gate. Pass through the gate and travel 0.25 miles, turn left, cross the wash, and stay on the main road (the left fork leads to a DWR cabin). Proceed 0.4 miles to a fork in the road. Continue to the right and travel for 0.3 miles. A witness post is on the south side of the road and is three feet from the 0-foot stake. The 0-foot baseline stake is marked by browse tag #7945.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,300ft (1,920m)
Aspect	South
Slope	15-30%
Sample Dates	06/27/1996, 06/19/2001, 06/20/2006, 07/06/2011, 06/15/2016, 06/15/2021

**Table 04-04.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Eagle Canyon	-	1999	3744

**Wildlife Habitat and Vegetation History****Table 04-04.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	winter	

**Table 04-04.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Mountain Big Sagebrush	No Encroachment
1990	Mountain Big Sagebrush	No Encroachment
1996	Mountain Big Sagebrush	No Encroachment
2001	Perennial Grass	No Encroachment
2006	Perennial Grass	No Encroachment
2011	Perennial Grass	No Encroachment
2016	Perennial Grass	No Encroachment
2021	Perennial Grass	No Encroachment

**Site Notes**

The study is located in the Division of Wildlife Resources (DWR) Henefer-Echo Wildlife Management Area (WMA) on the north side of Owen's Canyon. The study samples a former mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass community. The Eagle Canyon fire burned 3,744 acres (including the study site) in 1999, effectively removing the sagebrush and other browse species. The site is now dominated by grasses.

**Soils****Table 04-04.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.7	44.6	27.4	28.0	3.2	22.4	176.0	0.4	06/27/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Upland Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R047XA314UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) was the dominant browse species on this site from 1984 until the wildfire in 1999 (Table 04-04.1) in which most browse was eliminated (Photos, Pre-1992 Data, Table 04-04.12, Table 04-04.13). In all sample years following the burn, perennial grasses have contributed the most cover in the community (Table 04-04.7); these grasses have mainly been comprised of the introduced species intermediate wheatgrass (*Thinopyrum intermedium*), smooth brome (*Bromus inermis*), crested wheatgrass (*Agropyron cristatum*), and bulbous bluegrass (*Poa bulbosa*). However, native grasses have also been present. Annual grass cover, namely that of cheatgrass (*B. tectorum*), has fluctuated throughout the study period, but is low as of the 2021 sampling (Table 04-04.10). Annual forbs have fluctuated with desert madwort (*Alyssum desertorum*) and redstem stork's bill (*Erodium cicutarium*) contributing the most cover. Perennial forbs have remained rare (Table 04-04.11). Mule deer winter range has been in very poor condition since the Eagle Canyon Fire, which is due largely to a lack of preferred browse species on the site, namely that of sagebrush. Mule deer winter range condition was considered to be very poor in 2021 (Table 04-04.15).

**Trend Summary Tables****Table 04-04.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	20.5	1.0	-	-	-	-
2001	0.3	0.4	-	-	-	-
2006	1.3	0.6	-	2.8	1.0	-
2011	0.9	0.4	-	2.3	0.6	-
2016	2.3	1.0	-	2.9	1.4	-
2021	1.9	0.9	-	1.6	0.9	-

**Table 04-04.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	449	273	194	122	19.6	11.6	1.4	0.9
2001	126	317	434	108	2.5	25.3	31.8	2.2
2006	229	365	380	96	10.0	28.8	6.6	1.5
2011	276	423	434	130	7.0	30.1	9.7	1.1
2016	161	445	368	59	1.6	42.3	6.9	0.6
2021	177	433	343	61	1.5	36.9	6.6	0.6

**Table 04-04.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	1.6	0.9	68.1	2.9	2.5	50.1
2001	15.2	0.0	32.2	5.8	4.0	62.8
2006	18.6	0.0	42.4	5.4	4.6	44.3
2011	14.9	0.0	29.2	8.0	3.2	57.8
2016	30.2	0.1	25.6	6.0	3.4	49.1
2021	11.8	1.4	34.4	3.5	4.3	49.7

**Table 04-04.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1996	1	12	4	-	1
2001	-	3	3	-	-
2006	4	2	49	-	1
2011	3	4	27	-	2
2016	4	16	30	-	18
2021	2	35	36	-	30
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	-	4.0 (9.9)	9.4 (23.2)	0.6 (1.4)	-
2006	10.2 (25.1)	4.7 (11.6)	66.4 (163.9)	-	-
2011	4.4 (10.8)	4.7 (11.6)	64.3 (158.9)	-	-
2016	5.1 (12.6)	5.3 (13.2)	29.5 (72.8)	-	-
2021	0.7 (1.8)	14.7 (36.4)	48.3 (119.2)	2.9 (7.2)	-

**Table 04-04.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Dactylis glomerata <sup>i</sup> (orchardgrass)	Elymus elymoides (squirreltail)	Elymus repens <sup>ai</sup> (quackgrass)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency														
1996	5	155	244	120	399	-	-	-	33	2	-	5	2	2	18
2001	11	96	76	125	95	23	-	-	55	28	5	9	-	-	64
2006	5	143	103	135	198	1	0	-	50	43	-	1	15	4	92
2011	-	165	157	170	205	-	1	-	126	118	-	-	48	2	89
2016	-	174	53	136	135	-	-	19	78	165	-	6	-	-	199
2021	13	171	21	51	168	-	-	24	78	307	-	-	2	15	171
year	Average Cover (%)														
1996	0.0	6.6	4.5	3.8	15.2	-	-	-	0.4	0.0	-	0.1	0.0	0.0	0.7
2001	0.4	5.3	0.5	9.8	2.0	0.4	-	-	4.5	1.4	0.1	0.2	-	-	3.4
2006	0.1	8.2	0.8	8.6	9.2	0.1	0.0	-	3.9	1.1	-	0.0	0.3	0.8	5.5
2011	-	8.4	1.9	5.8	5.1	-	0.0	-	6.8	3.5	-	-	0.5	0.1	4.8
2016	-	10.5	0.1	7.0	1.5	-	-	2.0	5.2	3.8	-	0.0	-	-	13.8
2021	0.8	8.6	0.1	0.8	1.4	-	-	0.5	2.8	14.1	-	-	0.0	0.6	8.7

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 04-04.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Ambrosia psilostachya (Cuman ragweed)	Arabis (rockcress)	Arenaria (sandwort)	Astragalus (milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littledrop false flax)	Carduus nutans <sup>ai</sup> (nodding plumelless thistle)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Cymopterus (springparsley)	Descurainia pinnata <sup>a</sup> (western tansymustard)
year	Nested Frequency																
1996	-	-	171	-	2	-	2	-	-	2	-	3	10	3	-	1	-
2001	3	34	397	8	-	-	1	-	3	26	0	9	5	52	14	-	10
2006	-	10	324	-	-	5	-	-	-	-	-	99	-	64	19	8	3
2011	-	39	406	-	-	-	-	1	-	-	-	42	-	25	24	6	3
2016	-	2	345	-	-	-	-	-	2	-	-	42	-	14	-	1	-
2021	-	-	194	-	-	-	2	0	-	-	-	28	-	12	-	-	-
year	Average Cover (%)																
1996	-	-	0.8	-	0.0	-	0.0	-	-	0.0	-	0.0	0.1	0.0	-	0.0	-
2001	0.0	0.2	25.6	0.0	-	-	0.0	-	0.0	0.1	0.0	0.0	0.0	0.7	0.0	-	0.0
2006	-	0.0	2.2	-	-	0.0	-	-	-	-	-	0.5	-	0.2	0.1	0.1	0.0
2011	-	0.1	6.3	-	-	-	-	0.0	-	-	-	0.1	-	0.1	0.1	0.0	0.0
2016	-	0.0	2.9	-	-	-	-	-	0.0	-	-	0.2	-	0.0	-	0.0	-
2021	-	-	1.1	-	-	-	0.0	0.0	-	-	-	0.2	-	0.0	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species



FORB SPECIES	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron strigosus (prairie fleabane)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Grindelia squarrosa (curlycup gumweed)	Hedysamum boreale (Utah sweetvetch)	Helianthus annuus <sup>ai</sup> (common sunflower)	Holosteum umbellatum <sup>ai</sup> (jagged chickweed)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Machaeranthera (tansyaster)	Medicago sativa <sup>i</sup> (alfalfa)	Melilotus officinalis <sup>i</sup> (sweetclover)	Microsteris gracilis <sup>a</sup> (slender phlox)	Penstemon (beardtongue)
year	Nested Frequency																
1996	-	-	5	-	-	-	-	42	-	-	-	-	7	-	-	-	-
2001	19	45	-	-	84	-	3	-	-	-	18	-	-	-	6	13	1
2006	43	62	-	-	74	2	1	-	18	-	15	2	-	0	0	49	-
2011	151	23	-	4	126	-	-	-	39	-	35	-	-	3	-	79	-
2016	5	-	4	-	216	-	-	-	7	-	-	-	-	-	-	32	-
2021	37	-	-	14	293	-	-	-	1	55	-	-	-	-	-	11	-
year	Average Cover (%)																
1996	-	-	0.0	-	-	-	-	0.4	-	-	-	-	0.0	-	-	-	-
2001	0.0	0.7	-	-	3.6	-	0.0	-	-	-	0.1	-	-	-	0.2	0.1	0.0
2006	0.1	0.3	-	-	1.1	0.0	0.0	-	0.1	-	0.0	0.0	-	0.1	0.0	0.1	-
2011	0.6	0.0	-	0.0	1.3	-	-	-	0.2	-	0.1	-	-	0.0	-	0.3	-
2016	0.0	-	0.0	-	3.5	-	-	-	0.0	-	-	-	-	-	-	0.1	-
2021	0.1	-	-	0.1	4.9	-	-	-	0.0	0.1	-	-	-	-	-	0.1	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Sanguisorba minor <sup>i</sup> (small burnet)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>ai</sup> (tall tumbled mustard)	Sphaeralcea coccinea (scarlet globemallow)	Symphotrichum (aster)	Symphotrichum ascendens (western aster)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Veronica biloba <sup>ai</sup> (two-lobed speedwell)	Vicia americana (American vetch)
year	Nested Frequency										
1996	-	3	-	34	-	-	5	-	20	-	68
2001	17	3	7	76	26	5	8	-	13	-	29
2006	-	7	-	139	1	1	7	-	87	-	66
2011	-	3	-	103	-	-	1	-	43	-	86
2016	-	-	-	2	-	-	-	3	7	1	52
2021	-	-	-	-	-	-	-	-	10	-	46
year	Average Cover (%)										
1996	-	0.0	-	0.4	-	-	0.0	-	0.2	-	0.4
2001	0.4	0.0	0.7	0.4	0.2	0.2	0.2	-	0.1	-	0.3
2006	-	0.0	-	0.5	0.0	0.0	0.2	-	1.5	-	0.9
2011	-	0.0	-	0.3	-	-	0.0	-	0.5	-	0.9
2016	-	-	-	0.0	-	-	-	0.0	0.1	0.0	0.5
2021	-	-	-	-	-	-	-	-	0.0	-	0.4

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 04-04.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Bassia prostrata <sup>pi</sup> (forage kochia)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)
year	Line Intercept Cover (%)					
1996	-	-	-	-	-	-
2001	-	-	-	-	-	-
2006	0.2	0.3	2.3	1	-	-
2011	-	0.5	1.8	0.6	-	-
2016	-	1.3	1.6	1.1	-	0.3
2021	-	1.6	0	0.4	-	0.5
year	Quadrat Cover (%)					
1996	-	19.7	-	1.0	0.8	0.1
2001	-	-	0.3	0.4	-	-
2006	0.1	0.2	1.0	0.6	-	-
2011	-	0.3	0.6	0.4	-	-
2016	-	1.0	1.3	0.8	-	0.2
2021	-	1.6	0.3	0.4	-	0.6

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-04.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	60	-	33	67	0	0	0	0	63/45
2001	-	-	-	-	-	-	-	-	30/22
2006	20	-	0	100	0	100	0	0	42/67
2011	20	-	0	100	0	100	0	100	54/60
2016	20	-	0	100	0	0	100	100	48/57
2021	20	-	0	100	0	0	100	0	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	3420	120	9	69	22	14	2	6	67/114
2001	60	140	100	0	0	0	0	33	- / -
2006	180	-	0	100	0	11	78	0	35/36
2011	200	-	0	100	0	90	10	0	43/58
2016	180	760	22	78	0	0	78	0	53/82
2021	220	-	9	91	0	18	0	0	- / -
<b>Bassia prostrata<sup>pi</sup> -- (forage kochia)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	1460	20	71	29	0	0	0	1	14/17
2006	2520	6380	33	68	0	40	21	0	25/33
2011	2740	-	10	90	0	34	1	0	19/25
2016	4740	1260	25	75	0	35	45	0	15/23
2021	820	40	46	54	0	24	7	0	- / -

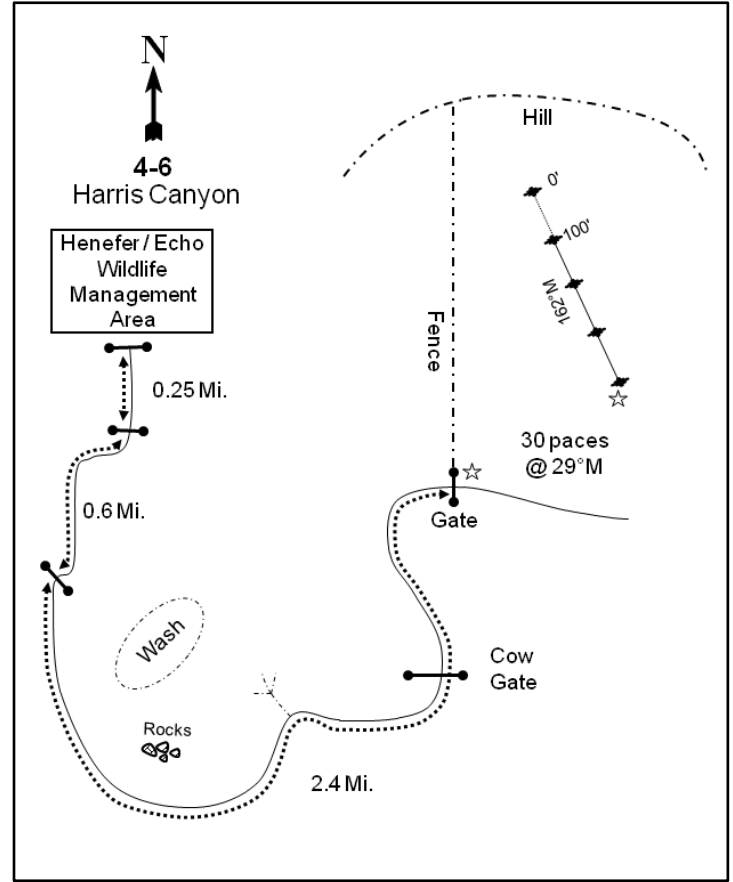
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	420	-	10	81	10	0	0	0	36/57
2001	460	-	0	100	0	0	0	0	29/44
2006	400	-	10	85	5	10	0	5	38/64
2011	360	-	0	78	22	0	0	11	29/42
2016	260	-	0	85	15	0	8	8	33/52
2021	160	-	13	50	38	0	0	38	- / -
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1996	160	-	13	50	38	0	0	0	68/100
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	53/60
2011	-	-	-	-	-	-	-	-	68/135
2016	-	-	-	-	-	-	-	-	60/113
2021	80	-	0	0	100	0	0	100	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	200	180	20	80	0	0	0	0	24/29
2001	20	-	0	100	0	0	0	0	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	560	-	0	100	0	0	0	0	17/23
2021	440	-	0	100	0	0	0	0	- / -
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	20	-	0	100	0	0	0	0	46/45
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	54/80
2011	-	-	-	-	-	-	-	-	49/94
2016	-	-	-	-	-	-	-	-	48/81

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-04.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	25.6	8.3	4.8	23.3	-14.7	1.8	0.0	<b>49.1</b>	Poor-Fair
2001	0.5	0.0	0.0	30.0	-1.9	4.4	-2.0	<b>31.1</b>	Very Poor
2006	4.1	0.0	0.0	30.0	-7.5	3.0	0.0	<b>29.6</b>	Very Poor
2011	3.3	0.0	0.0	30.0	-5.3	2.2	0.0	<b>30.3</b>	Very Poor
2016	4.0	0.0	0.0	30.0	-1.2	1.1	-2.0	<b>32.0</b>	Very Poor
2021	2.0	0.0	0.0	30.0	-1.1	1.2	-2.0	<b>30.1</b>	Very Poor

## HARRIS CANYON - STUDY NO. 04-6



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Henefer SW; Township 4N, Range 4E, Section 27  
NAD 83 UTM ZONE 12, 459690 East 4545092 North

### Transect Information

Browse Tag # (0' Stake)	7975
Transect Bearing	164° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 2, 4: No Rebar

### Directions to Site

From exit 115 to Henefer, proceed northwest for 3.5 miles (towards Croydon) to the Croydon access road. At the DWR/R-Ranch property, turn right and travel 0.25 miles. Turn right at the DWR fence line and proceed 0.6 miles to another gate. Stay to the right, traveling around a wash for 2.4 miles to a fence with a gate: stop here and park. From the gate walk 30 paces (at 29 degrees magnetic) to the 400-foot baseline stake. From here, walk 400 feet to the north at a bearing of 342 degrees magnetic to the 0-foot baseline stake. The 0-foot stake is marked by browse tag #7975.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,254ft (1,906m)
Aspect	South
Slope	35%
Sample Dates	06/27/1996, 06/19/2001, 06/20/2006, 06/08/2011, 06/13/2016, 06/14/2021

**Wildlife Habitat and Vegetation History****Table 04-06.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	winter	

**Table 04-06.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Mountain Big Sagebrush/Perennial Grass	No Encroachment
1990	Mountain Big Sagebrush/Perennial Grass	No Encroachment
1996	Mountain Big Sagebrush/Annual-Perennial Grass	No Encroachment
2001	Mountain Big Sagebrush/Annual-Perennial Grass	No Encroachment
2006	Mountain Big Sagebrush/Annual-Perennial Grass	No Encroachment
2011	Mountain Big Sagebrush/Annual-Perennial Grass	No Encroachment
2016	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2021	Mountain Big Sagebrush/Perennial Grass	No Encroachment

**Site Notes**

The study is located in the hills to the north of Harris Canyon within the Division of Wildlife Resources (DWR) Henefer-Echo Wildlife Management Area (WMA). The study samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass community.

**Soils****Table 04-06.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.2	43.3	26.7	30.0	4.0	6.9	163.2	0.8	06/27/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Upland Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA334UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has dominated the shrub overstory of this site throughout the study years. Other preferred browse species such as antelope bitterbrush (*Purshia tridentata*) and Utah serviceberry (*Amalanchier utahensis*) have also been present, but have contributed less cover than sagebrush. However, sagebrush cover and density have decreased over time (Photos, Pre-1992 Data, Table 04-06.12, Table 04-06.13). Perennial grasses such as bluebunch wheatgrass (*Pseudoroegneria spicata*) have contributed much of the cover in the herbaceous understory and have been co-dominant with sagebrush since study establishment in 1984. The introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) was observed for the first time in 2021, but in low amounts. Annual grasses, mainly cheatgrass (*Bromus tectorum*), were not recorded before the 1996 sample year, but have also had notable cover and co-dominated the community from 1996 to 2011 (Table 04-06.10). Annual forbs have been fairly abundant, but most cover has been contributed by the introduced species desert madwort (*Alyssum desertorum*). Perennial forbs have remained diverse in composition, but have fluctuated in cover and abundance throughout the study years (Table 04-06.7, Table 04-06.11). Mule deer winter range condition has ranged from fair to poor over the sample years, which can largely be attributed to fluctuations in decadence and consistently low recruitment of preferred browse. Mule deer winter range condition was considered to be poor in 2021 (Table 04-06.15).

**Trend Summary Tables****Table 04-06.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	6.9	3.1	-	-	-	-
2001	13.4	2.1	-	-	-	-
2006	8.4	2.2	-	12.2	1.9	-
2011	5.3	1.5	-	5.4	2.6	-
2016	4.8	1.9	-	8.3	3.6	-
2021	6.4	1.6	-	8.5	1.2	-

**Table 04-06.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	447	224	347	133	11.1	12.5	4.0	2.0
2001	384	241	388	120	8.8	13.5	9.7	3.2
2006	410	259	361	132	18.5	14.7	4.6	4.7
2011	379	302	404	242	11.5	12.5	13.4	7.7
2016	326	332	347	187	10.2	22.4	9.2	3.7
2021	328	344	319	82	8.2	17.7	7.0	1.3

**Table 04-06.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	5.7	0.3	49.5	0.8	14.8	44.3
2001	14.8	0.1	33.1	0.8	17.9	51.8
2006	14.4	0.5	33.0	0.7	20.5	46.8
2011	14.5	0.9	22.5	0.9	19.2	49.9
2016	22.0	0.1	36.8	1.7	16.8	44.4
2021	15.1	0.8	38.5	1.2	20.8	39.5

**Table 04-06.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	-	27	5	-
2001	1	22	20	-
2006	-	25	31	9
2011	-	14	9	1
2016	-	42	8	25
2021	2	34	22	13
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	-	80.4 (198.6)	22.1 (54.6)	-
2006	-	45.6 (112.6)	28.8 (71.2)	-
2011	-	49.6 (122.5)	31.5 (77.8)	-
2016	-	58.3 (144.0)	10.7 (26.5)	-
2021	2.9 (7.2)	31.5 (77.8)	37.5 (92.7)	-

**Table 04-06.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus briziformis <sup>ai</sup> (rattlesnake brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Festuca idahoensis (Idaho fescue)	Leymus cinereus (basin wildrye)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea <sup>i</sup> (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency												
1996	21	-	240	4	371	-	-	-	-	7	-	208	5
2001	22	-	262	4	274	2	5	-	2	31	-	212	7
2006	5	4	170	3	373	-	0	-	-	7	2	245	22
2011	-	-	128	1	358	-	5	-	7	22	-	272	51
2016	11	-	96	-	307	-	2	-	-	6	-	291	75
2021	22	-	176	1	233	1	2	11	-	42	-	218	157
year	Average Cover (%)												
1996	0.6	-	2.6	0.0	8.5	-	-	-	-	0.1	-	11.8	0.0
2001	0.5	-	3.6	0.0	5.1	0.0	0.4	-	0.0	0.8	-	11.5	0.3
2006	0.3	0.0	1.9	0.0	16.6	-	0.4	-	-	0.0	0.0	12.9	1.0
2011	-	-	0.6	0.0	10.9	-	0.4	-	0.0	0.5	-	10.3	1.3
2016	0.3	-	0.4	-	9.8	-	0.0	-	-	0.1	-	17.3	4.8
2021	0.2	-	3.9	0.0	4.4	0.0	0.0	0.1	-	0.7	-	11.3	5.3

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 04-06.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis drummondii (Drummond's rockcress)	Arenaria (sandwort)	Artemisia ludoviciana (white sagebrush)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus utahensis (Utah milkvetch)	Camelina microcarpa <sup>ai</sup> (littledod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Crepis acuminata (tapertip hawkbeard)	Cymopterus (springparsley)
year	Nested Frequency																
1996	6	-	5	321	-	-	44	8	5	2	4	-	17	10	-	-	3
2001	2	5	12	358	-	-	76	-	2	18	-	3	6	7	2	-	2
2006	2	1	4	336	0	4	47	6	0	5	3	2	8	11	-	4	2
2011	6	24	31	370	3	-	76	11	-	8	-	5	2	2	2	9	51
2016	-	9	16	326	5	-	70	41	5	8	0	1	12	7	-	7	12
2021	-	1	6	295	-	-	19	11	1	-	6	2	8	4	3	4	3
year	Average Cover (%)																
1996	0.0	-	0.0	1.6	-	-	0.6	0.2	0.1	0.0	0.2	-	0.3	0.0	-	-	0.0
2001	0.1	0.0	0.0	6.3	-	-	2.4	-	0.0	0.0	-	0.0	0.2	0.1	0.0	-	0.0
2006	0.1	0.0	0.0	2.8	0.0	0.0	1.5	0.4	0.0	0.0	0.1	0.0	0.4	0.1	-	0.1	0.0
2011	0.0	0.3	0.2	9.8	0.0	-	2.4	0.3	-	0.0	-	0.0	0.0	0.0	0.0	0.1	0.3
2016	-	0.0	0.1	6.8	0.0	-	1.8	0.5	0.1	0.0	0.0	0.0	0.2	0.0	-	0.1	0.0
2021	-	0.0	0.0	4.6	-	-	0.6	0.0	0.0	-	0.1	0.0	0.4	0.0	0.0	0.1	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cynoglossum officinale <sup>ani</sup> (gypsoflower)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Gilia inconspicua <sup>a</sup> (shy gilia)	Hackelia patens (spotted stickseed)	Hedysanum boreale (Utah sweetvetch)	Helianthus annuus <sup>ai</sup> (common sunflower)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lithospermum ruderale (western stone seed)	Microsteris gracilis <sup>a</sup> (slender phlox)	Oenothera caespitosa (tufted evening primrose)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Symphotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)
year	Nested Frequency																
1996	2	-	-	48	-	8	2	-	6	-	-	3	1	42	-	1	-
2001	2	9	-	86	-	-	6	-	16	-	-	36	-	139	-	1	2
2006	2	1	14	40	-	-	1	-	-	-	0	21	2	193	-	-	3
2011	-	14	7	142	9	-	4	-	16	3	-	10	-	218	15	3	5
2016	-	-	-	161	-	0	3	6	-	-	-	4	-	3	0	-	-
2021	-	-	-	122	-	-	-	-	-	-	-	-	-	-	-	-	-
year	Average Cover (%)																
1996	0.0	-	-	0.6	-	0.0	0.1	-	0.0	-	-	0.0	0.0	0.1	-	0.0	-
2001	0.0	0.0	-	1.6	-	-	0.0	-	0.1	-	-	0.2	-	0.6	-	0.0	0.0
2006	0.1	0.0	0.0	0.2	-	-	0.0	-	-	-	0.0	0.1	0.0	0.7	-	-	0.0
2011	-	0.1	0.0	1.1	0.0	-	0.0	-	0.1	0.0	-	0.0	-	1.7	0.4	0.0	0.0
2016	-	-	-	2.0	-	0.0	0.0	0.0	-	-	-	0.0	-	0.0	0.0	-	-
2021	-	-	-	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Veronica biloba <sup>ai</sup> (two-lobed speedwell)	Vicia americana (American vetch)
year	Nested Frequency		
1996	107	-	59
2001	69	-	32
2006	11	-	72
2011	9	4	120
2016	3	3	73
2021	15	-	41
year	Average Cover (%)		
1996	1.3	-	0.7
2001	0.5	-	0.4
2006	0.1	-	2.2
2011	0.1	0.0	3.9
2016	0.0	0.0	0.9
2021	0.2	-	0.4

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species



**Table 04-06.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Linanthus pungens (granite prickly phlox)	Mahonia repens (creeping barberry)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)
year	Line Intercept Cover (%)							
1996	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-
2006	-	7.7	1.8	3.6	-	-	0.1	0.9
2011	-	4.7	1.9	0.7	0.2	-	0.5	-
2016	0.3	6.8	2.1	0.8	0.5	-	1	0.4
2021	0.6	4.9	0.6	1	0.4	-	0.2	2
year	Quadrat Cover (%)							
1996	0.4	3.4	1.6	2.4	1.5	-	0.1	0.7
2001	0.1	7.8	0.9	5.2	0.8	0.1	0.3	0.2
2006	0.6	4.6	1.4	2.0	0.1	-	0.6	1.1
2011	0.4	4.2	0.9	0.6	0.1	-	0.5	0.1
2016	0.8	3.4	1.0	0.5	0.2	-	0.8	0.1
2021	0.6	4.0	1.0	0.6	0.2	-	0.5	1.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-06.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	80	-	0	50	50	50	25	0	68/71
2001	20	-	0	0	100	0	0	0	123/75
2006	20	-	0	100	0	100	0	0	89/88
2011	20	-	0	100	0	0	100	0	70/82
2016	-	-	-	-	-	-	-	-	83/93
2021	20	-	0	100	0	100	0	0	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	840	-	24	67	10	17	2	5	63/111
2001	680	-	6	74	21	27	3	15	71/113
2006	440	20	9	73	18	32	5	14	76/109
2011	620	-	10	55	36	45	19	26	64/109
2016	440	140	9	82	9	18	50	14	70/128
2021	440	-	0	55	46	27	0	50	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	1380	20	17	83	0	4	3	0	28/45
2001	1020	-	6	92	2	2	0	6	22/34
2006	900	20	2	98	0	0	0	0	40/44
2011	760	960	11	82	8	8	0	5	24/41
2016	1060	-	0	96	4	4	0	4	31/50
2021	620	-	10	71	19	16	0	19	- / -

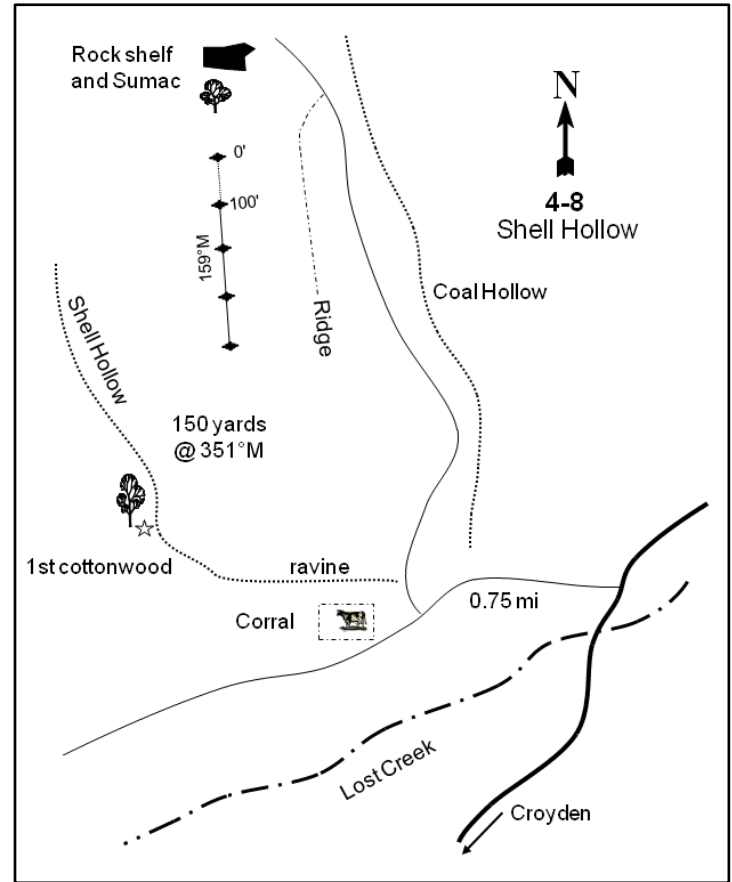
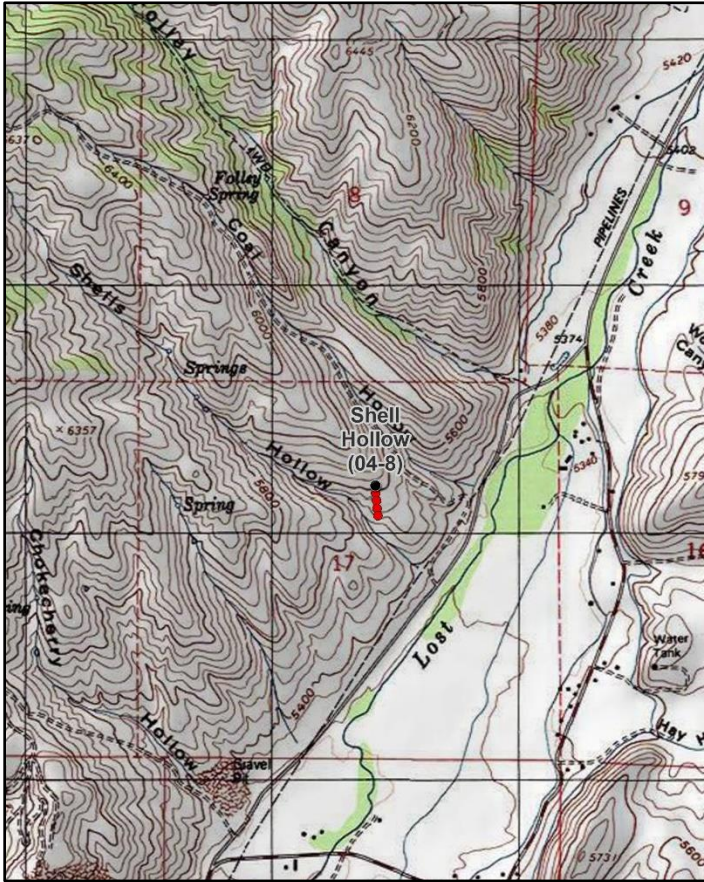
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1996	1180	20	19	76	5	20	0	0	55/88
2001	800	-	8	60	33	30	18	18	64/85
2006	640	-	6	53	41	13	0	16	63/84
2011	360	20	6	50	44	44	0	44	49/61
2016	280	-	14	57	29	21	36	21	58/87
2021	300	-	7	60	33	0	13	33	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	2600	4100	53	44	3	0	0	3	26/32
2001	2140	-	7	90	4	0	0	4	20/24
2006	80	-	0	100	0	0	0	0	25/32
2011	120	-	17	83	0	0	0	0	19/29
2016	120	-	0	100	0	0	0	0	25/29
2021	380	-	16	79	5	0	0	5	- / -
<b>Mahonia repens -- (creeping barberry)</b>									
1996	660	-	100	0	0	0	0	0	- / -
2001	3300	-	7	93	0	0	0	0	7/10
2006	2540	-	0	100	0	0	0	0	5/10
2011	1700	-	0	100	0	0	0	0	5/10
2016	4260	-	0	100	0	0	0	0	7/12
2021	2880	-	0	100	0	0	0	0	- / -
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	380	-	5	90	5	42	47	0	36/77
2001	300	-	0	100	0	0	93	0	28/65
2006	280	40	0	79	21	14	86	0	42/84
2011	180	-	11	44	44	11	89	22	48/87
2016	200	-	0	90	10	0	70	30	54/130
2021	820	-	0	98	2	95	5	0	- / -
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	-	-	-	-	-	-	-	-	39/57
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	37/56
2011	-	-	-	-	-	-	-	-	62/103
2016	-	-	-	-	-	-	-	-	57/106
2021	-	-	-	-	-	-	-	-	- / -
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	21/34
2011	-	-	-	-	-	-	-	-	31/95
2016	-	-	-	-	-	-	-	-	78/151

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-06.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	8.9	12.0	9.4	25.0	-8.4	4.0	-2.0	<b>48.9</b>	Poor-Fair
2001	16.8	7.3	3.2	27.1	-6.6	6.4	-2.0	<b>52.1</b>	Fair
2006	15.5	7.5	3.8	29.3	-13.9	9.3	-2.0	<b>49.6</b>	Poor-Fair
2011	6.8	4.0	4.6	25.1	-8.6	10.0	0.0	<b>41.8</b>	Poor
2016	10.6	11.2	4.4	30.0	-7.7	7.4	0.0	<b>55.9</b>	Fair
2021	11.3	5.8	0.4	30.0	-6.2	2.5	0.0	<b>43.8</b>	Poor

## SHELL HOLLOW - STUDY NO. 04-8

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Devils Slide NE; Township 4N, Range 4E, Section 17  
NAD 83 UTM ZONE 12, 456425 East 4548191 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

7947  
159° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Belt 2, 3, 5: No Rebar

**Directions to Site**

From 6900 East and 1900 South in Croyden, proceed east for 1.55 miles to a road paralleling Lost Creek. Turn left here and travel 0.75 miles to Coal Hollow Road: just to the east of the road is a corral. Shell Hollow, a ravine, is northwest of the corral. Walk up Shell Hollow to the first cottonwood tree over 25 feet tall. Near this stream should be a small drainage up the slope to the right. From the tree, take a bearing of 351 degrees true and walk approximately 150 yards up-slope to the 0-foot stake of the baseline which is marked by browse tag #7947. Ten feet north of the 0-foot stake is a sumac and a rocky shelf behind. Just east of the 0-foot stake is a large rock with a perfect seat carved by the wind. Contact the land owner prior to accessing the site.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,575ft (1,699m)
Aspect	Southwest
Slope	15-32%
Sample Dates	07/08/1996, 06/20/2001, 06/22/2006, 07/05/2011, 06/21/2016, 06/21/2021

**Wildlife Habitat and Vegetation History****Table 04-08.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	summer	

**Table 04-08.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Wyoming Big Sagebrush	No Encroachment
1990	Wyoming Big Sagebrush	No Encroachment
1996	Wyoming Big Sagebrush/Annual Grass	No Encroachment
2001	Wyoming Big Sagebrush	No Encroachment
2006	Wyoming Big Sagebrush/Annual Grass	No Encroachment
2011	Wyoming Big Sagebrush	No Encroachment
2016	Wyoming Big Sagebrush	No Encroachment
2021	Wyoming Big Sagebrush	No Encroachment

**Site Notes**

This study is located on a small privately-owned ridge between Shell Hollow and Coal Hollow on the west side of Lost Creek. The study samples a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) community on a hillside 150 yards above Shell Hollow. A road near the site was improved just prior to the 2011 sampling, and a bulldozer had crossed one of the sample belts. It was noted in 2016 that there were multiple roads through the site, a fence had been constructed to the west, and that multiple sheep bones were found on the site and three deer carcasses were identified below the study area. A deer skeleton was identified in the study area in 2006.

**Soils****Table 04-08.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.8	49.6	23.4	27.0	2.5	18.1	217.6	0.7	07/08/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Upland Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R047XA314UT
States and Transitions	No state and transition model is available for this ecological site.

The vegetation on this site has existed as a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) dominated community since study establishment in 1984, although there was a nearly 8% decrease in cover between 2016 and 2021. A few other browse species are also present, but provide little cover (Photos, Pre-1992 Data, Table 04-08.12, Table 04-08.13). Annual grasses, namely field brome (*Bromus arvensis*) and/or cheatgrass (*B. tectorum*), have filled the interspaces in many sample years, and were co-dominant with sagebrush in 1996 and 2006 (Table 04-08.10). Annual forbs have remained fairly abundant on this site, and have mainly been comprised of weedy species such as madwort (*Alyssum* sp.), curvseed butterwort (*Ceratocephala testiculata*), and redstem stork's bill (*Erodium cicutarium*). Perennial forbs and grasses have contributed relatively little cover through the study years. However, the perennial forb American vetch (*Vicia americana*) provided the most cover of any single forb species in 2021 (Table 04-08.7, Table 04-08.11). Barring a major disturbance, this site will likely remain in this or a similar state in future sample years. Mule deer winter range condition has ranged between poor and very poor over the sample years. Although these condition statuses can largely be attributed to fluctuations in decadence and consistently low recruitment of sagebrush over the sample years, sagebrush cover and density have remained high. In addition, annual grass cover has fluctuated from year to year, but has generally been high while perennial grass cover has remained low. Mule deer winter range condition was considered to be poor in 2021 (Table 04-08.15).

**Trend Summary Tables****Table 04-08.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	23.9	6.0	-	-	-	-
2001	28.3	3.2	-	-	-	-
2006	22.1	6.3	-	20.0	5.4	-
2011	21.0	3.0	-	32.2	3.9	-
2016	24.4	2.4	-	32.1	1.7	-
2021	19.9	2.3	-	24.4	1.6	-

**Table 04-08.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	478	58	270	133	25.8	1.9	1.6	1.5
2001	240	56	447	223	2.1	3.0	13.0	2.8
2006	400	59	299	223	25.6	4.6	2.8	7.2
2011	316	49	428	231	9.9	2.5	16.2	2.4
2016	315	58	399	147	15.5	3.4	11.7	1.7
2021	302	74	258	207	7.5	3.1	3.5	4.8

**Table 04-08.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	8.1	0.1	51.2	1.6	1.8	55.5
2001	17.9	0.0	46.4	5.8	1.6	51.8
2006	16.3	0.0	47.0	4.2	1.6	54.4
2011	23.7	0.4	32.2	6.3	1.7	48.8
2016	21.9	0.1	23.0	10.9	1.2	53.4
2021	33.0	1.4	39.4	3.8	1.1	34.7

**Table 04-08.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Domestic Sheep	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	-	10	-	-
2001	1	6	-	6
2006	-	9	2	8
2011	-	3	2	2
2016	-	9	-	4
2021	-	10	4	23
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	2.2 (5.4)	21.5 (53.0)	-	-
2006	2.2 (5.4)	42.9 (105.9)	6.0 (14.9)	-
2011	-	26.8 (66.2)	1.3 (3.3)	-
2016	-	37.5 (92.7)	0.7 (1.7)	-
2021	0.7 (1.8)	6.0 (14.9)	13.4 (33.1)	-

**Table 04-08.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency									
Achnatherum hymenoides (Indian ricegrass)										
Bromus arvensis <sup>ai</sup> (field brome)										
Bromus briziformis <sup>ai</sup> (rattlesnake brome)										
Bromus tectorum <sup>ai</sup> (cheatgrass)										
Elymus elymoides (squirreltail)										
Elymus lanceolatus (thickspike wheatgrass)										
Leymus cinereus (basin wildrye)										
Poa pratensis <sup>i</sup> (Kentucky bluegrass)										
Poa secunda (Sandberg bluegrass)										
Pseudoroegneria spicata (bluebunch wheatgrass)										
year	Average Cover (%)									
1996	1	476	5	7	-	22	8	-	15	12
2001	7	224	14	29	-	23	8	-	12	7
2006	4	283	4	296	-	33	11	1	4	9
2011	4	275	-	160	-	25	7	-	2	16
2016	-	99	-	285	1	28	10	2	-	24
2021	4	51	16	291	6	34	0	-	10	22
year	Average Cover (%)									
1996	0.0	25.8	0.0	0.0	-	1.5	0.1	-	0.1	0.2
2001	0.2	1.5	0.1	0.5	-	1.6	0.8	-	0.1	0.2
2006	0.3	7.8	0.0	17.8	-	1.5	2.2	0.0	0.0	0.5
2011	0.0	7.1	-	2.9	-	1.9	0.2	-	0.0	0.3
2016	-	1.4	-	14.2	0.0	2.3	0.7	0.1	-	0.3
2021	0.0	0.5	0.2	6.8	0.0	1.6	0.0	-	0.3	1.1

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 04-08.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Achillea millefolium (Common yarrow)																	
Allium acuminatum (tapertip onion)																	
Alyssum alyssoides <sup>ai</sup> (pale madwort)																	
Alyssum desertorum <sup>ai</sup> (desert madwort)																	
Astragalus beckwithii (Beckwith's milkvetch)																	
Astragalus convallarius (lesser rushy milkvetch)																	
Astragalus utahensis (Utah milkvetch)																	
Calochortus nuttallii (sego lily)																	
Camelina microcarpa <sup>ai</sup> (littletop false flax)																	
Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)																	
Chenopodium album <sup>a</sup> (lambsquarters)																	
Cirsium undulatum <sup>a</sup> (wavy/leaf thistle)																	
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																	
Collomia grandiflora <sup>a</sup> (grand collomia)																	
Collomia linearis <sup>a</sup> (tiny trumpet)																	
Comandra umbellata (bastard toadflax)																	
Descurainia pinnata <sup>a</sup> (western tansymustard)																	
year	Average Cover (%)																
1996	3	26	-	244	-	7	2	-	16	60	-	15	-	-	8	10	-
2001	4	128	-	89	10	-	1	2	13	265	-	6	39	-	30	11	2
2006	2	21	-	196	7	-	-	-	13	115	-	4	41	12	2	3	2
2011	0	82	-	382	14	-	-	-	17	238	-	7	5	-	16	7	2
2016	5	60	-	338	1	-	-	1	-	135	-	1	-	-	-	4	-
2021	4	32	47	139	4	-	-	-	-	118	1	-	2	-	-	13	-
year	Average Cover (%)																
1996	0.0	0.1	-	1.0	-	0.1	0.0	-	0.0	0.1	-	0.1	-	-	0.0	0.1	-
2001	0.1	0.6	-	0.2	0.2	-	0.0	0.0	0.0	4.4	-	0.1	0.2	-	0.1	0.1	0.0
2006	0.0	0.1	-	0.8	0.2	-	-	-	0.1	0.4	-	0.0	0.1	0.0	0.0	0.2	0.0
2011	0.0	0.4	-	7.3	0.1	-	-	-	0.1	1.7	-	0.2	0.0	-	0.0	0.0	0.0
2016	0.1	0.1	-	6.2	0.0	-	-	0.0	-	1.0	-	0.0	-	-	-	0.0	-
2021	0.0	0.1	1.2	1.0	0.2	-	-	-	-	0.3	0.0	-	0.0	-	-	0.2	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium <sup>a</sup> (bedstraw)	Galium aparine <sup>a</sup> (stickywilly)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Hackelia patens (spotted stickseed)	Helianthella uniflora (oneflower helianthella)	Helianthus annuus <sup>ai</sup> (common sunflower)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Machaeranthera canescens (hoary tansyaster)	Mentzelia <sup>a</sup> (blazingstar)	Microsteris gracilis <sup>a</sup> (slender phlox)	Phlox longifolia (longleaf phlox)	Silene antirrhina <sup>a</sup> (sleepy silene)	Symphotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)
year	Nested Frequency																
1996	-	-	18	-	3	11	15	-	-	10	1	-	-	4	-	-	-
2001	-	4	9	-	1	-	12	-	1	0	-	-	63	41	21	-	-
2006	21	23	29	-	6	-	7	-	3	-	-	-	55	46	29	1	-
2011	-	5	63	-	34	-	10	-	30	-	-	-	114	43	79	-	2
2016	-	7	112	3	4	-	9	2	4	4	-	0	6	12	3	3	2
2021	-	-	40	-	-	-	6	-	0	-	-	-	15	32	-	-	3
year	Average Cover (%)																
1996	-	-	0.1	-	0.0	0.0	0.2	-	-	0.0	0.0	-	-	0.0	-	-	-
2001	-	0.0	0.0	-	0.0	-	0.3	-	0.0	0.0	-	-	0.3	0.1	0.1	-	-
2006	0.0	0.1	0.4	-	0.0	-	0.1	-	0.0	-	-	-	0.1	0.3	0.1	0.0	-
2011	-	0.0	1.0	-	0.9	-	0.2	-	0.2	-	-	-	0.6	0.6	0.2	-	0.0
2016	-	0.0	1.5	0.0	0.0	-	0.1	0.0	0.0	0.3	-	0.0	0.0	0.0	0.0	0.0	0.0
2021	-	-	0.5	-	-	-	0.1	-	0.0	-	-	-	0.0	0.2	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Verbascum thapsus <sup>ai</sup> (common mullein)	Veronica biloba <sup>ai</sup> (two-lobed speedwell)	Vicia americana (American vetch)	Viola (violet)
year	Nested Frequency				
1996	9	33	7	95	-
2001	3	-	416	102	-
2006	9	-	79	174	8
2011	17	5	284	128	44
2016	9	-	225	73	5
2021	12	-	55	176	15
year	Average Cover (%)				
1996	0.0	0.1	0.0	1.1	-
2001	0.0	-	7.5	1.5	-
2006	0.1	-	0.4	6.2	0.2
2011	0.1	0.0	3.8	0.7	0.3
2016	0.1	-	2.6	1.2	0.0
2021	0.1	-	0.5	3.7	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 04-08.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa (rubber rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)
year	Line Intercept Cover (%)					
1996	-	-	-	-	-	-
2001	-	-	-	-	-	-
2006	-	19.2	5.4	-	0.8	-
2011	-	30.7	3.9	-	1.5	-
2016	-	31	1.3	-	1.1	0.4
2021	-	23.3	1.5	-	1.1	0.1
year	Quadrat Cover (%)					
1996	-	22.1	6.0	-	1.8	-
2001	-	26.5	2.8	-	1.9	0.4
2006	-	20.4	6.3	-	1.8	0.0
2011	0.0	20.3	3.0	-	0.7	-
2016	-	23.6	2.2	-	0.8	0.2
2021	-	19.1	1.5	0.3	0.8	0.5

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-08.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	20	-	0	100	0	0	100	0	60/102
2001	20	-	100	0	0	0	0	0	63/110
2006	-	-	-	-	-	-	-	-	63/78
2011	-	20	0	0	0	0	0	0	75/104
2016	-	-	-	-	-	-	-	-	-/-
2021	80	-	0	100	0	0	0	0	-/-
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
1996	4780	20	8	68	24	43	8	28	73/121
2001	3340	-	3	77	20	20	2	8	86/118
2006	2820	40	2	59	39	28	4	15	85/115
2011	2340	-	0	68	32	29	2	14	86/137
2016	2680	60	13	75	12	11	8	5	81/122
2021	2700	-	4	50	46	0	0	59	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	5360	-	12	85	3	2	0	6	33/40
2001	4560	-	4	93	3	4	0	2	25/34
2006	4080	-	3	96	1	3	0	3	32/44
2011	4120	-	3	97	0	10	0	2	23/26
2016	2080	-	11	89	0	14	7	0	25/28
2021	2180	-	43	56	1	2	11	2	-/-



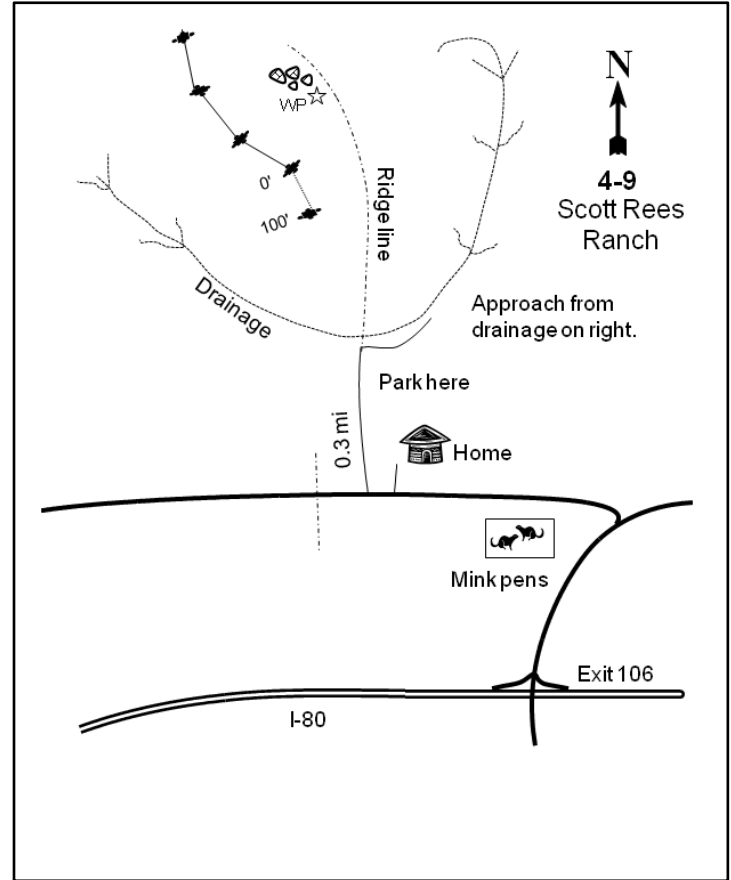
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	20	-	100	0	0	0	0	0	17/11
2021	60	-	0	33	67	0	0	67	- / -
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1996	220	-	9	73	18	0	0	9	69/98
2001	200	-	10	40	50	10	0	10	85/123
2006	240	-	25	58	17	25	0	17	62/74
2011	200	-	0	100	0	0	0	0	65/88
2016	120	-	0	100	0	0	0	67	66/97
2021	140	-	0	86	14	29	0	14	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	140	60	0	100	0	0	0	0	26/24
2001	280	-	0	79	21	0	0	7	21/25
2006	20	-	0	100	0	0	0	0	20/19
2011	20	-	0	100	0	0	0	0	28/35
2016	40	-	0	100	0	0	0	0	22/36
2021	840	100	76	24	0	0	0	0	- / -
<b>Mahonia repens -- (creeping barberry)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	7/13
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Opuntia -- (pricklypear)</b>									
1996	-	-	-	-	-	-	-	-	11/24
2001	-	-	-	-	-	-	-	-	11/35
2006	-	-	-	-	-	-	-	-	21/52
2011	-	-	-	-	-	-	-	-	13/49
2016	-	-	-	-	-	-	-	-	12/44
2021	-	-	-	-	-	-	-	-	-/-
<b>Rhus trilobata var. trilobata<sup>p</sup> -- (skunkbush sumac)</b>									
1996	-	-	-	-	-	-	-	-	183/325
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	158/291
2011	-	-	-	-	-	-	-	-	167/229
2016	-	-	-	-	-	-	-	-	224/290
2021	-	-	-	-	-	-	-	-	-/-
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	58/103
2011	-	-	-	-	-	-	-	-	69/134
2016	-	-	-	-	-	-	-	-	29/56

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-08.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	29.9	7.8	4.0	3.8	-19.4	3.0	0.0	<b>29.1</b>	Very Poor
2001	30.0	8.5	1.7	6.0	-1.6	5.6	0.0	<b>50.2</b>	Poor-Fair
2006	25.0	3.6	1.5	9.1	-19.2	10.0	0.0	<b>30.0</b>	Very Poor
2011	30.0	6.0	0.0	5.0	-7.5	4.8	0.0	<b>38.3</b>	Poor
2016	30.0	11.6	6.5	6.8	-11.7	3.4	0.0	<b>46.6</b>	Poor
2021	30.0	1.7	1.8	6.2	-5.6	9.5	0.0	<b>43.5</b>	Poor

## SCOTT REES RANCH - STUDY NO. 04-9

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Morgan SE; Township 4N, Range 3E, Section 20  
NAD 83 UTM ZONE 12, 446650 East 4545863 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

7971  
165° magnetic (Line 2: 258° magnetic, Line 3: 252° magnetic, Line 4: 277° magnetic)  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Belt 2, 3: No Rebar

**Directions to Site**

On I-84 between Morgan and Henefer, take exit 106 and go north to the Scott Rees Ranch. Turn left (west) on the road north of the mink pens. Drive on this road approximately 0.3 miles past the main house and turn right (north). Drive up a rough road 0.3 miles to the end of the road at a fork in the canyon and where a four-wheeler trail begins. From here, walk up the road past the draw and continue around the hill to the next draw. Start walking up the east slope of the draw to the ridge top. On top of a knoll in low-growing oak, there is a rock pile with a witness post sticking out of it. The 0-foot baseline stake is just south of the rock monument and is marked by browse tag #7971. Contact the land owner prior to accessing the site.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,800ft (1,768m)
Aspect	South
Slope	40%
Sample Dates	07/15/1996, 06/15/2001, 06/12/2006, 06/13/2011, 06/16/2016, 06/16/2021

**Wildlife Habitat and Vegetation History****Table 04-09.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	winter

**Table 04-09.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Gambel Oak	No Encroachment
1990	Gambel Oak	No Encroachment
1996	Gambel Oak/Annual Grass	No Encroachment
2001	Gambel Oak	Phase I
2006	Gambel Oak	Phase I
2011	Gambel Oak	Phase I
2016	Gambel Oak	Phase I
2021	Gambel Oak	Phase I

**Site Notes**

The study is located in the Division of Wildlife Resources (DWR) Round Valley Wildlife Management Area (WMA) in Upper Weber Canyon, east of Morgan and north of Round Valley. Access to the site is through private land. The study area is dominated by low-growing Gambel oak (*Quercus gambelii*) interspersed with occasional mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and rubber rabbitbrush (*Ericameria nauseosa* ssp. *nauseosa* var. *speciosa*). The area was historically grazed by sheep crossing the WMA from Round Valley to a property to the north, but this is no longer the case. However, the area is occasionally grazed by stray cattle from the valley. Longer durations of grazing are not practical because of a lack of water in the WMA. Four deer were seen in the study area in 2001, and a fawn carcass was identified in 2006.

**Soils****Table 04-09.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.9	38.6	34.0	27.4	2.9	22.5	217.6	0.6	07/15/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Mountain Stony Loam (Gambel Oak)
NRCS Ecological Site #	R047XA463UT
States and Transitions	No state and transition model is available for this ecological site.

Gambel oak (*Quercus gambelii*) has dominated the plant community on this site since the study began in 1984. Browse species such as antelope bitterbrush (*Purshia tridentata*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) are scattered throughout the site, but have not been observed with any significant cover or density amounts (Photos, Pre-1992 Data, Table 04-09.12, Table 04-09.13). The herbaceous understory has fluctuated. However, annual grasses, mainly cheatgrass (*Bromus tectorum*), have been the major component in most sample years and were co-dominant in 1996 (Table 04-09.10). Perennial forbs and grasses and annual forbs are less prevalent, but are fairly diverse in composition. White sage (*Artemisia ludoviciana*) has provided the most cover of any single forb species in every sample year since 1996 (Table 04-09.7, Table 04-09.10, Table 04-09.11). Utah juniper (*Juniperus osteosperma*) has been observed in the area since 2001 (Photos, Table 04-09.14). The site has been considered to be within Phase I of woodland succession since that time (Table 04-09.4), however, indicating that further tree encroachment may not pose an immediate threat to the ecological integrity of the plant community. Over the sample years, mule deer winter range has ranged between fair-good and poor condition due to large fluctuations of annual and perennial grasses. Preferred browse species, namely Gambel oak, have generally been in fair to good condition in most sample years. Mule deer winter range condition is poor as of 2021 (Table 04-09.15).

**Trend Summary Tables****Table 04-09.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	28.3	0.7	-	-	-	-
2001	31.0	0.8	-	-	-	-
2006	26.7	0.2	-	45.7	0.2	-
2011	28.2	0.3	-	45.6	0.6	-
2016	35.2	0.6	-	47.5	1.4	-
2021	27.6	0.0	-	40.8	-	-

**Table 04-09.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	458	210	202	169	24.2	7.5	3.2	4.8
2001	278	284	286	182	13.1	10.6	8.9	4.6
2006	326	266	308	203	7.7	7.1	8.1	5.9
2011	346	218	220	183	19.3	6.1	4.6	6.7
2016	309	213	173	175	23.7	7.6	4.2	8.7
2021	413	95	277	145	28.0	2.9	8.1	7.3

**Table 04-09.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	0.3	0.3	63.7	0.1	15.0	56.6
2001	1.1	0.1	58.7	0.0	15.4	63.0
2006	0.6	0.8	51.0	0.1	18.7	48.3
2011	0.5	1.2	56.2	0.2	22.9	58.3
2016	4.5	0.0	38.2	0.8	16.6	71.2
2021	2.6	1.2	37.6	0.5	19.0	62.1

**Table 04-09.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit	Domestic Sheep
	Quadrat Frequency				
1996	-	11	4	-	4
2001	-	15	1	-	-
2006	2	10	12	5	-
2011	-	7	13	-	-
2016	-	5	-	2	-
2021	-	11	1	2	-
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	-	34.2 (84.4)	4.0 (9.9)	-	-
2006	-	56.3 (139.0)	58.3 (144.0)	-	-
2011	-	34.2 (84.4)	28.8 (71.2)	-	-
2016	-	10.7 (26.5)	13.4 (33.1)	-	-
2021	-	7.4 (18.2)	4.0 (9.9)	-	-

**Table 04-09.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency											
Bromus arvensis <sup>ai</sup> (field brome)	130	112	428	-	-	-	-	21	21	188	15	
Bromus briziformis <sup>ai</sup> (rattlesnake brome)	81	51	245	5	-	7	11	19	34	250	104	
Bromus tectorum <sup>ai</sup> (cheatgrass)	95	15	281	-	-	2	19	36	1	244	95	
Carex (sedge)	178	20	277	-	0	0	11	42	17	179	165	
Dactylis glomerata <sup>i</sup> (orchardgrass)	2016	52	298	0	2	2	2	29	16	192	-	
Koeleria macrantha (prairie Junegrass)	2021	137	28	395	6	-	-	3	6	14	14	
Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Average Cover (%)											
Poa pratensis <sup>i</sup> (Kentucky bluegrass)	1996	2.1	0.8	20.8	-	-	-	0.4	0.1	7.0	0.4	
Poa secunda (Sandberg bluegrass)	2001	0.4	0.1	9.1	0.1	-	0.1	0.0	0.2	0.4	3.5	
Pseudoroegneria spicata (bluebunch wheatgrass)	2006	0.3	0.0	5.3	-	-	0.0	0.1	0.3	0.0	6.8	
Vulpia myuros <sup>ai</sup> (annual fescue)	2011	1.5	0.2	10.1	-	0.0	0.0	0.1	1.5	0.1	4.4	
	2016	0.3	0.1	23.4	0.0	0.1	0.0	0.0	1.2	0.1	6.2	
	2021	2.1	0.9	24.8	0.1	-	-	0.0	0.2	0.4	2.3	

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 04-09.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Achillea millefolium (Common yarrow)	23	9	-	-	-	67	6	5	1	-	34	-	14	10	-	-	-
Agoseris glauca (pale agoseris)	30	20	14	17	3	103	4	7	7	3	17	74	57	11	-	-	3
Allium (onion)	2006	44	49	14	94	-	90	3	2	11	-	7	34	15	13	-	6
Alyssum simplex <sup>ai</sup> (alyssum)	2011	20	66	13	82	-	86	10	5	6	-	17	-	11	10	-	3
Amsinckia menziesii <sup>a</sup> (Menzies' fiddleneck)	2016	23	40	10	89	-	90	-	8	-	-	10	-	-	21	5	-
Artemisia ludoviciana (white sagebrush)	2021	3	3	6	136	-	106	-	9	1	-	9	4	-	14	1	-
Astragalus utahensis (Utah milkvetch)	Average Cover (%)																
Balsamorhiza sagittata (arrowleaf balsamroot)	1996	0.3	0.0	-	-	-	2.1	0.1	0.3	0.0	-	1.2	-	0.0	0.1	-	-
Calochortus nuttallii (sego lily)	2001	0.7	0.2	0.1	0.2	0.0	2.5	0.2	0.5	0.0	0.0	0.9	0.4	0.1	0.1	-	0.0
Camelina microcarpa <sup>ai</sup> (littledrop false flax)	2006	1.4	0.5	0.0	0.7	-	2.0	0.1	0.7	0.1	-	0.1	0.1	0.1	0.1	-	0.2
Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	2011	0.3	1.1	0.1	0.7	-	2.4	0.5	1.9	0.0	-	1.0	-	0.0	0.3	-	0.0
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	2016	0.8	0.6	0.0	2.2	-	4.5	-	2.4	-	-	0.6	-	-	0.1	0.1	-
Collomia linearis <sup>a</sup> (tiny trumpet)	2021	0.2	0.0	0.0	2.4	-	3.7	-	2.7	0.0	-	0.0	0.0	-	0.3	0.0	0.0
Comandra umbellata (bastard toadflax)																	
Crepis acuminata (tapertip hawkbeard)																	
Cryptantha (cryptantha)																	
Cymopterus (springparsley)																	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Delphinium nuttallianum (two-lobed larkspur)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium aparine <sup>a</sup> (stickywilly)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Geranium <sup>a</sup> (geranium)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lathyrus brachycalyx (Bonneville pea)	Lithophragma (woodland-star)	Machaeranthera (tansyaster)	Microseris nutans (nodding microseris)	Microsteris gracilis <sup>a</sup> (slender phlox)	Penstemon (beardtongue)
year	Nested Frequency																
1996	4	-	-	-	79	7	11	52	-	8	2	-	-	1	-	-	3
2001	-	42	10	49	3	58	55	37	2	18	-	3	-	-	-	3	2
2006	-	2	13	178	13	19	55	-	-	19	-	3	-	-	-	10	1
2011	-	13	29	4	10	27	12	7	-	14	-	2	3	-	-	2	-
2016	-	1	-	2	-	32	4	-	-	3	-	-	-	-	1	-	-
2021	-	-	-	-	-	103	6	-	-	152	-	-	-	-	-	-	5
year	Average Cover (%)																
1996	0.1	-	-	-	2.0	0.1	0.1	0.2	-	0.0	0.0	-	-	0.0	-	-	0.0
2001	-	0.1	0.1	0.2	0.1	1.4	0.8	0.2	0.0	0.1	-	0.0	-	-	-	0.0	0.0
2006	-	0.0	0.0	1.4	0.3	0.1	1.0	-	-	0.1	-	0.0	-	-	-	0.0	0.0
2011	-	0.1	0.1	0.0	0.0	0.1	0.1	0.1	-	0.3	-	0.0	0.0	-	-	0.0	-
2016	-	0.0	-	0.0	-	0.4	0.0	-	-	0.0	-	-	-	-	0.0	-	-
2021	-	-	-	-	-	1.4	0.1	-	-	2.8	-	-	-	-	-	-	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Phacelia linearis <sup>a</sup> (threadleaf phacelia)	Scutellaria antirrhinoides (nose skullcap)	Silene antirrhina <sup>a</sup> (sleepy silene)	Silene drummondii (Drummond's campion)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	unknown fern (unknown fern)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency							
1996	-	-	31	-	-	123	-	-
2001	-	13	57	-	-	159	5	4
2006	-	20	57	10	0	161	5	4
2011	-	-	-	-	-	146	-	3
2016	10	3	-	3	-	80	-	3
2021	-	-	-	-	-	92	-	4
year	Average Cover (%)							
1996	-	-	0.1	-	-	1.5	-	-
2001	-	0.1	0.2	-	-	4.2	0.0	0.1
2006	-	0.4	0.2	0.0	0.0	4.4	0.0	0.0
2011	-	-	-	-	-	2.1	-	0.1
2016	0.0	0.0	-	0.0	-	0.9	-	0.0
2021	-	-	-	-	-	1.5	-	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 04-09.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Quercus gambelii <sup>p</sup> (Gambel oak)
year	Line Intercept Cover (%)				
1996	-	-	-	-	-
2001	-	-	-	-	-
2006	0.5	-	0.2	0.1	45.1
2011	0.5	-	0.6	-	45.1
2016	0.4	-	1.4	0.4	46.7
2021	-	-	-	-	40.8
year	Quadrat Cover (%)				
1996	0.5	-	0.7	0.1	27.6
2001	-	-	0.8	0.1	30.9
2006	0.2	-	0.2	0.1	26.4
2011	0.2	0.0	0.3	0.3	27.7
2016	0.0	-	0.6	0.0	35.2
2021	0.1	-	0.0	0.6	26.8

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-09.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	20	-	0	100	0	0	100	0	132/45
2001	20	-	0	0	100	0	0	0	- / -
2006	20	-	0	100	0	0	0	0	79/76
2011	20	-	0	0	100	100	0	100	71/80
2016	-	-	-	-	-	-	-	-	78/62
2021	20	-	0	100	0	100	0	0	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	220	-	0	64	36	64	18	0	57/69
2001	180	-	0	44	56	0	11	11	62/74
2006	160	-	0	63	38	38	63	0	62/76
2011	140	-	0	71	29	43	14	43	62/86
2016	40	-	0	50	50	0	100	0	68/91
2021	100	-	20	80	0	0	0	0	- / -
<b>Cercocarpus ledifolius<sup>p</sup> -- (curl-leaf mountain mahogany)</b>									
1996	-	-	-	-	-	-	-	-	49/124
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	66/90
2016	-	-	-	-	-	-	-	-	93/78
2021	-	-	-	-	-	-	-	-	- / -



Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	69/141
2021	-	-	-	-	-	-	-	-	-/-
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	20	-	100	0	0	0	0	0	- / -
2006	20	-	0	100	0	0	0	0	41/22
2011	20	-	0	100	0	0	0	0	46/75
2016	-	-	-	-	-	-	-	-	70/94
2021	-	-	-	-	-	-	-	-	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	960	20	0	100	0	0	0	0	37/47
2001	600	-	3	97	0	0	0	0	26/34
2006	280	-	0	79	21	0	0	21	34/35
2011	480	-	17	79	4	0	0	4	22/25
2016	420	20	0	91	10	0	0	10	41/60
2021	60	-	0	100	0	0	0	0	- / -
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	20	-	0	0	100	0	0	100	94/138
2001	20	-	0	100	0	0	0	0	119/154
2006	20	-	0	100	0	0	100	0	80/107
2011	20	-	0	100	0	0	100	0	66/137
2016	20	-	0	0	100	0	100	0	98/178
2021	20	-	0	0	100	0	0	100	- / -
<b>Quercus gambelii<sup>p</sup> -- (Gambel oak)</b>									
1996	9240	620	19	74	7	71	6	0	60/77
2001	26120	20	13	85	2	1	0	1	57/40
2006	25460	620	15	82	2	0	2	0	58/44
2011	21980	580	24	70	6	5	0	2	66/49
2016	20080	60	41	59	0	0	0	0	76/62
2021	15240	220	15	74	11	4	0	11	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

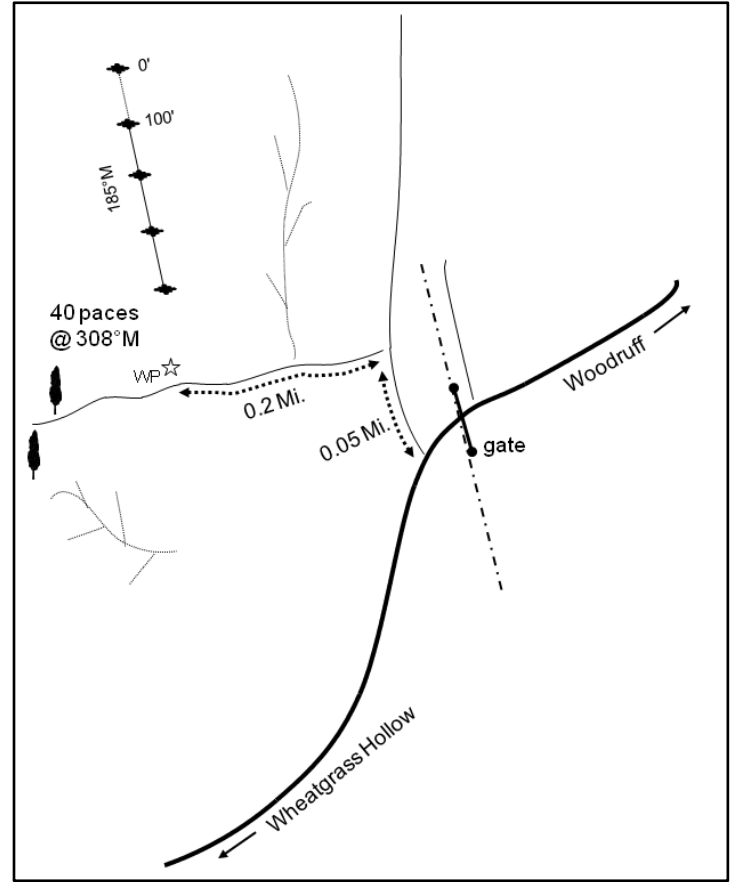
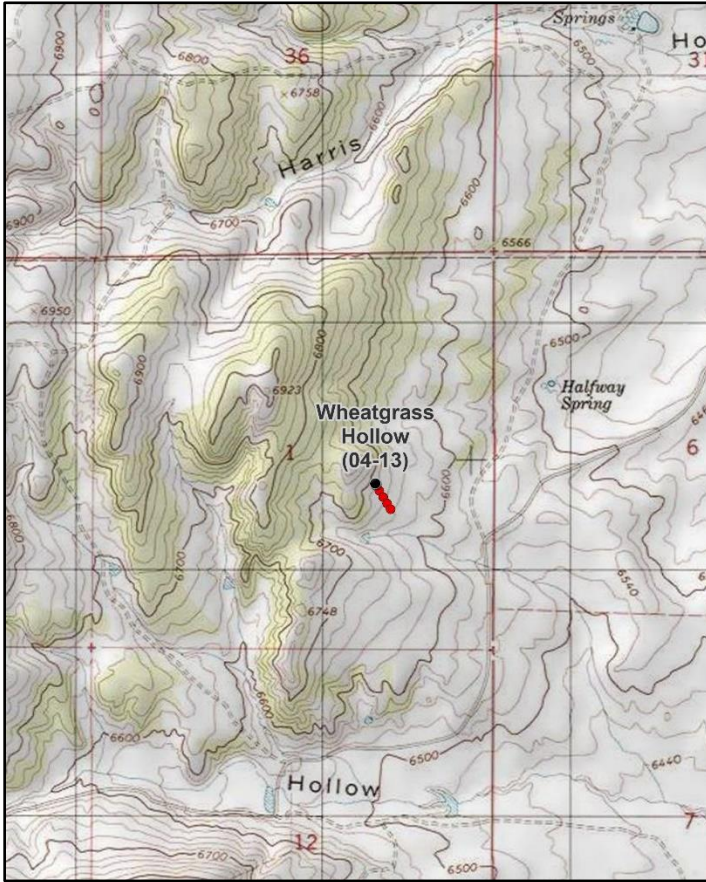
**Table 04-09.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2016	1	-	-	100	-	-	6.0

**Table 04-09.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	28.5	12.6	9.4	14.9	-18.1	9.6	0.0	<b>56.9</b>	Poor-Fair
2001	30.0	14.4	6.4	21.1	-9.8	9.1	0.0	<b>71.2</b>	Fair-Good
2006	30.0	14.2	7.6	14.1	-5.8	10.0	0.0	<b>70.2</b>	Fair-Good
2011	30.0	13.2	12.0	12.2	-14.5	10.0	0.0	<b>62.8</b>	Fair
2016	30.0	14.6	15.0	15.3	-17.8	10.0	0.0	<b>67.1</b>	Fair
2021	30.0	11.7	7.7	5.8	-20.0	10.0	0.0	<b>45.2</b>	Poor

## WHEATGRASS HOLLOW - STUDY NO. 04-13

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Neponset Reservoir N; Township 8N, Range 6E, Section 01  
NAD 83 UTM ZONE 12, 482151 East 4589549 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

Not Available  
135° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Standard

**Directions to Site**

Where State Route 16 bends to the east on the south side of Woodruff, continue straight on Deseret Road (South Main). Go 2.5 miles and turn right (west) onto Wheatgrass Road. Travel 3.25 miles, crossing several cattleguards, to the fourth cattleguard. Continue past this cattleguard to a fork. Continue north for 0.05 miles to a fork with a faint road on the left. Travel 0.2 miles west on the faint road to a witness post on the right (north) side of the road. From the witness post, walk 40 paces at 308 degrees magnetic to the 400-foot baseline stake. The 0-foot baseline stake is located 400 feet to the north at a bearing of 315 degrees magnetic.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	SOUTH WOODRUFF
Elevation	6,700ft (2,042m)
Aspect	Southeast
Slope	10%
Sample Dates	08/28/1996, 08/08/2001, 08/02/2006, 08/24/2011, 07/13/2016, 07/12/2021

**Table 04-13.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Home Ranch Bullhog	4025	Winter 2019-2020	1866

**Wildlife Habitat and Vegetation History****Table 04-13.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	summer	

**Table 04-13.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1990	Mountain Big Sagebrush	Phase I
1996	Mountain Big Sagebrush	Phase I
2001	Mountain Big Sagebrush	Phase I
2006	Mountain Big Sagebrush	Phase I
2011	Mountain Big Sagebrush	Phase I
2016	Mountain Big Sagebrush	Phase I
2021	Mountain Big Sagebrush	Phase I

**Site Notes**

The study samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community with scattered Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) and a sparse understory. The woodland is moderately dense on the ridge above the study area.

**Soils****Table 04-13.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.2	49.0	22.0	29.0	2.5	10.3	204.8	0.7	08/28/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Upland Gravelly Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R047XA314UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1990, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been the dominant component of the plant community on this site; additional browse species have been present in varying amounts. However, 61% of sagebrush plants were considered to have poor vigor in 2021 (Photos, Pre-1992 Data, Table 04-13.12, Table 04-13.13): this is likely due to drought stress. Should similar climatic conditions continue in the future, loss of sagebrush could cause the site to transition to a different plant community type. The herbaceous understory has remained dominated by perennial grasses, mainly Sandberg bluegrass (*Poa secunda*), throughout the study period. Annual and perennial forbs have never been particularly diverse, and annual grasses have remained rare (Table 04-13.7, Table 04-13.10, Table 04-13.11). Utah juniper (*Juniperus osteosperma*) is scattered throughout the area and the site has been considered to be within Phase I of woodland succession in all sample years (Photos, Table 04-13.4, Table 04-13.12). Point-quarter density decreased in 2021 as a result of a 2019 lop and scatter treatment (Table 04-13.1, Table 04-13.14), but the remaining tree component indicates that there may be potential for infilling in the future. Over the sample years, mule deer winter range condition has ranged between fair and good: this is largely due to substantial populations of mountain big sagebrush and perennial grasses. Mule deer winter range condition was fair to good in 2021 despite the poor vigor of much of the sagebrush (Table 04-13.15).

**Trend Summary Tables****Table 04-13.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	23.2	0.1	0.0	-	-	-
2001	25.6	0.4	-	-	-	-
2006	26.2	0.4	0.3	24.3	0.7	-
2011	22.8	0.4	0.0	24.1	0.8	0.2
2016	25.7	0.5	0.4	28.5	0.6	0.5
2021	25.6	0.6	-	30.0	0.6	-

**Table 04-13.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	30	376	-	187	0.1	10.2	-	2.0
2001	33	359	54	160	0.1	10.3	0.6	1.6
2006	48	345	22	175	0.2	11.9	0.3	3.0
2011	47	328	132	183	0.1	8.1	4.4	2.1
2016	105	327	104	170	0.7	9.4	2.6	2.6
2021	78	332	-	119	0.4	12.6	-	2.2

**Table 04-13.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	15.4	8.8	25.7	17.6	3.2	33.9
2001	25.9	8.5	27.3	18.8	2.1	39.6
2006	14.3	6.6	21.7	23.7	2.6	43.0
2011	13.5	7.8	28.4	22.1	0.6	34.5
2016	21.0	8.2	16.8	22.5	0.5	36.1
2021	13.2	16.3	32.9	21.5	2.3	36.8

**Table 04-13.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Pronghorn	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1996	1	38	4	-	10
2001	1	20	4	1	3
2006	-	18	4	1	26
2011	-	16	7	-	36
2016	-	14	1	-	3
2021	-	23	-	-	8
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	-	58.3 (144.0)	0.7 (1.7)	1.2 (2.9)	-
2006	2.9 (7.2)	28.1 (69.5)	2.0 (5.0)	-	-
2011	1.5 (3.6)	41.5 (102.6)	2.0 (5.0)	-	-
2016	0.7 (1.8)	28.1 (69.5)	5.3 (13.2)	-	-
2021	-	53.0 (130.8)	-	-	-

**Table 04-13.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency								
1996	9	-	30	-	40	15	-	367	15
2001	4	-	33	-	7	41	16	338	48
2006	5	3	48	1	65	38	36	323	25
2011	4	2	47	8	78	32	69	274	9
2016	3	8	105	5	68	77	31	232	9
2021	36	2	78	2	64	73	56	288	27
year	Average Cover (%)								
1996	0.2	-	0.1	-	0.4	0.5	-	8.7	0.3
2001	0.0	-	0.1	-	0.2	0.5	0.1	8.4	1.0
2006	0.1	0.0	0.2	0.0	1.3	0.8	0.4	8.8	0.6
2011	0.0	0.0	0.1	0.0	1.3	0.9	0.8	5.0	0.0
2016	0.0	0.0	0.7	0.0	1.3	2.0	0.5	5.3	0.2
2021	0.5	0.2	0.4	0.0	1.0	1.9	0.9	7.3	0.8

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 04-13.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus spatulatus (tufted milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Cordylanthus ramosus <sup>a</sup> (bushy bird's beak)	Cryptantha (cryptantha)	Erigeron pumilus (staggy fleabane)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Orobanche (broomrape)
year	Nested Frequency																
1996	1	-	-	27	3	-	9	4	-	-	-	-	1	10	-	-	3
2001	-	-	-	32	-	2	14	4	-	-	-	53	-	6	-	1	-
2006	-	5	-	56	-	6	0	-	-	-	-	22	9	13	-	-	-
2011	-	47	-	29	8	6	14	-	-	5	3	112	6	6	6	4	1
2016	-	3	23	1	-	2	54	2	3	2	-	79	2	18	4	-	-
2021	-	-	-	-	-	3	-	4	-	-	-	-	-	4	-	-	-
year	Average Cover (%)																
1996	0.0	-	-	0.4	0.0	-	0.1	0.0	-	-	-	-	0.0	0.0	-	-	0.0
2001	-	-	-	0.2	-	0.0	0.1	0.0	-	-	-	0.6	-	0.0	-	0.0	-
2006	-	0.0	-	0.7	-	0.1	0.0	-	-	-	-	0.3	0.1	0.1	-	-	-
2011	-	0.2	-	0.2	0.0	0.1	0.0	-	-	0.0	0.0	4.3	0.0	0.0	0.0	0.0	0.0
2016	-	0.0	0.0	0.0	-	0.0	0.7	0.0	0.0	0.0	-	2.5	0.0	0.2	0.0	-	-
2021	-	-	-	-	-	0.0	-	0.0	-	-	-	-	-	0.0	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Silene antirrhina <sup>a</sup> (sleepy silene)	Symphotrichum (aster)	Veronica biloba <sup>ai</sup> (two-lobed speedwell)
year	Nested Frequency				
1996	130	52	-	-	-
2001	123	14	-	-	-
2006	102	39	-	-	-
2011	87	50	3	-	2
2016	83	41	3	3	-
2021	104	19	-	-	-
year	Average Cover (%)				
1996	1.4	0.1	-	-	-
2001	1.3	0.1	-	-	-
2006	1.8	0.3	-	-	-
2011	1.3	0.2	0.0	-	0.0
2016	1.4	0.2	0.0	0.0	-
2021	2.0	0.2	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 04-13.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Atriplex confertifolia <sup>p</sup> (shadscale saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Opuntia (pricklypear)
year	Line Intercept Cover (%)				
1996	-	-	-	-	-
2001	-	-	-	-	-
2006	24.1	0.2	0.6	-	0.1
2011	24.1	-	0.6	0.2	0.2
2016	28.5	-	0.4	0.5	0.2
2021	30	-	0.2	-	0.4
year	Quadrat Cover (%)				
1996	23.2	-	0.1	0.0	0.0
2001	25.6	0.0	0.3	-	0.1
2006	26.2	0.0	0.2	0.3	0.2
2011	22.8	-	0.0	0.0	0.4
2016	25.7	-	0.2	0.4	0.3
2021	25.5	0.0	0.3	-	0.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-13.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1996	5940	1120	11	65	25	60	8	5	36/84
2001	8560	260	23	54	23	28	6	8	37/72
2006	8100	4680	12	56	31	2	1	12	34/71
2011	7380	40	9	67	24	23	31	31	32/61
2016	5960	20	6	82	12	31	42	17	38/76
2021	7460	-	4	51	45	23	8	61	- / -
<b>Atriplex confertifolia<sup>P</sup> -- (shadscale saltbush)</b>									
1996	60	-	0	100	0	0	0	0	28/26
2001	40	-	0	100	0	0	0	0	37/30
2006	40	-	0	100	0	0	50	0	31/42
2011	20	-	0	100	0	0	100	0	39/31
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Atriplex falcata -- (sickle saltbush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	62/49
2021	-	-	-	-	-	-	-	-	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	460	-	13	74	13	0	0	9	26/42
2001	280	-	14	79	7	14	0	0	28/50
2006	240	-	8	58	33	0	0	17	27/44
2011	460	-	9	87	4	0	0	4	27/41
2016	260	-	23	69	8	0	0	0	25/36
2021	260	-	0	39	62	31	0	62	- / -
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	7/90
2006	-	-	-	-	-	-	-	-	63/88
2011	-	-	-	-	-	-	-	-	79/74
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Juniperus osteosperma<sup>1</sup> -- (Utah juniper)</b>									
1996	20	-	100	0	0	0	0	0	- / -
2001	20	-	0	100	0	0	0	0	- / -
2006	40	-	50	50	0	0	0	0	- / -
2011	20	-	100	0	0	0	0	0	- / -
2016	40	-	50	50	0	50	0	0	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Opuntia -- (pricklypear)</b>									
1996	540	40	0	100	0	0	0	0	9/32
2001	720	-	8	75	17	8	0	0	9/26
2006	620	60	10	81	10	0	0	0	11/36
2011	640	40	6	94	0	0	0	0	10/30
2016	460	20	4	96	0	0	0	0	12/35
2021	640	20	13	75	13	0	0	16	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Sarcobatus vermiculatus -- (greasewood)</b>									
1996	20	-	0	100	0	0	0	0	61/45
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	75/58
2011	-	-	-	-	-	-	-	-	81/75
2016	-	-	-	-	-	-	-	-	76/49
2021	20	-	0	100	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-13.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

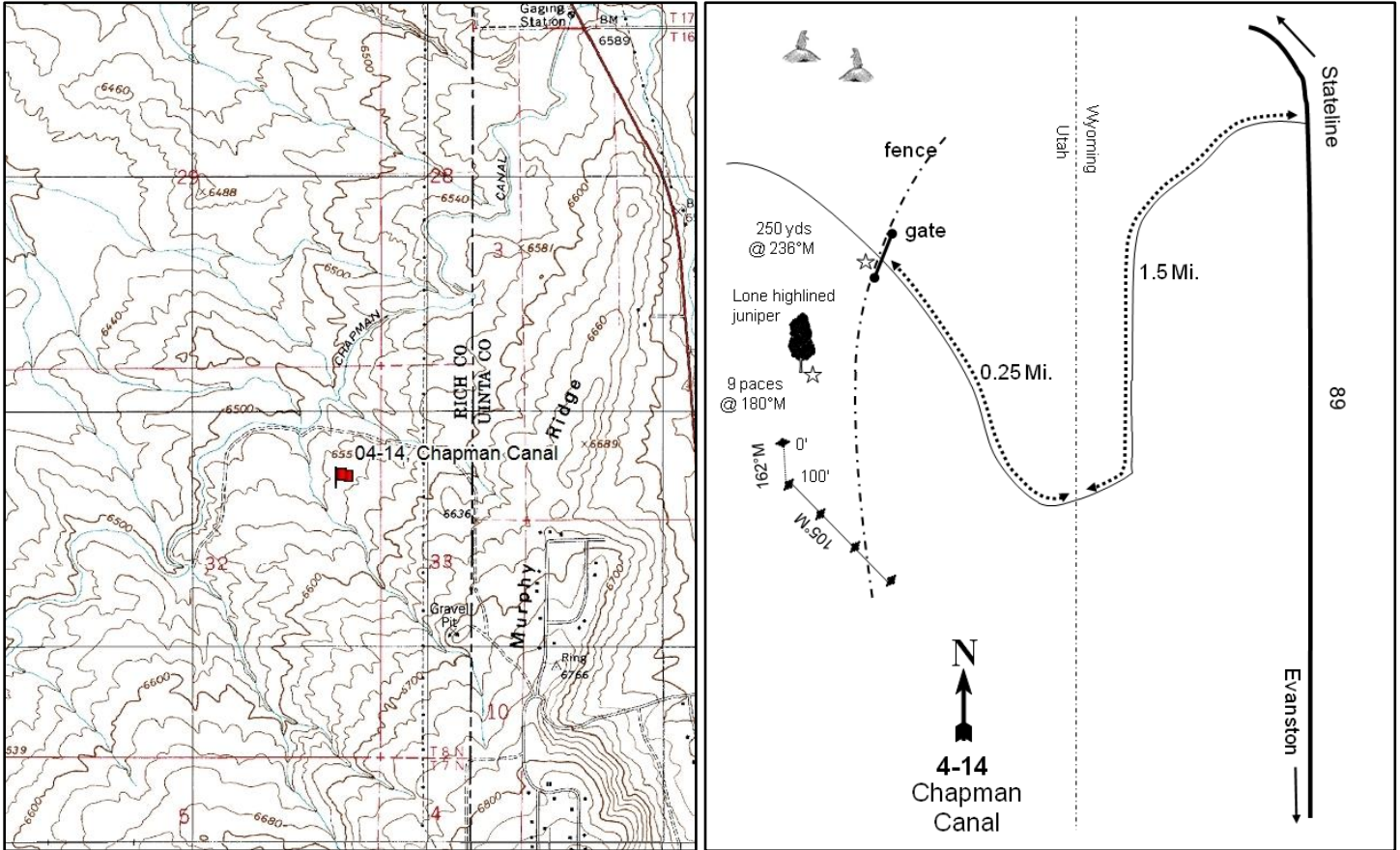
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2001	64	-	-	-	-	-	8.8
2006	60	-	83	17	-	-	5.2
2011	57	-	76	24	-	-	6.1
2016	60	-	83	17	-	-	6.7
2021	10	25	75	-	-	-	2.8
<b>Pinus edulis (twoneedle pinyon)</b>							
1996	53	-	-	-	-	-	3.9

**Table 04-13.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	29.0	7.6	5.4	20.3	0.0	4.1	0.0	<b>66.3</b>	Fair-Good
2001	30.0	8.2	11.4	20.6	-0.1	3.3	0.0	<b>73.4</b>	Good
2006	30.0	5.7	6.1	23.8	-0.1	5.9	0.0	<b>71.4</b>	Good
2011	30.0	7.7	4.5	16.2	-0.1	4.1	0.0	<b>62.4</b>	Fair
2016	30.0	11.4	3.0	18.7	-0.6	5.1	0.0	<b>67.7</b>	Good
2021	30.0	1.6	2.2	25.1	-0.3	4.5	0.0	<b>63.0</b>	Fair-Good



## CHAPMAN CANAL - STUDY NO. 04-14



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Neponset Reservoir N; Township 8N, Range 8E, Section 32  
NAD 83 UTM ZONE 12, 495550 East 4581878 North

### Transect Information

Browse Tag # (0' Stake)	9160
Transect Bearing	165° magnetic (Lines 2-4: 105° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (71ft), Line 3 (59ft), Line 4 (34ft)
Belt Marker Placement	Standard

### Directions to Site

While traveling southbound on Highway 16/89 from the state line, proceed 0.6 miles towards Evanston and turn right (west). Continue for 1.5 miles, crossing Chapman Canal, to a gate (DL&L). Go through the gate and travel 0.25 miles to another fence and gate. From the gate, walk approximately 130 paces at 218 degrees magnetic to the 0-foot stake of the baseline which is marked with browse tag #9160. The baseline doglegs after 100 feet and runs at 105 degrees magnetic.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	DESERET
Elevation	6,500ft (1,981m)
Aspect	West
Slope	8%
Sample Dates	08/21/1996, 08/08/2001, 08/03/2006, 08/25/2011, 07/11/2016, 07/14/2021

**Wildlife Habitat and Vegetation History**

**Table 04-14.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	year-long	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	summer	
Pronghorn	crucial	year-long	

**Table 04-14.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Wyoming Big Sagebrush	No Encroachment
1990	Wyoming Big Sagebrush	No Encroachment
1996	Wyoming Big Sagebrush/Perennial Grass	No Encroachment
2001	Wyoming Big Sagebrush/Perennial Grass	No Encroachment
2006	Wyoming Big Sagebrush/Perennial Grass	No Encroachment
2011	Wyoming Big Sagebrush/Perennial Grass	No Encroachment
2016	Wyoming Big Sagebrush/Perennial Grass	No Encroachment
2021	Wyoming Big Sagebrush	No Encroachment

**Site Notes**

The study is located three miles east of Neponset Reservoir near the Utah-Wyoming state line. This section of land was owned by the School and Institutional Trust Lands Administration (SITLA) until 2006, when it was purchased by Deseret Land and Livestock. This area of rolling hills is dominated by an extensive Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and grass community that extends for miles before any cover from trees or terrain is discernible. A pronghorn carcass was identified in the area in 2006.

**Soils**

**Table 04-14.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	8.0	44.7	26.0	29.3	1.9	5.5	67.2	0.7	08/21/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	10 inches
NRCS Ecological Site	Semidesert Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R034XY212UT
States and Transitions	No state and transition model is available for this ecological site.

Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) has been the dominant browse component on this site since study establishment in 1984, although yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *stenophyllus*) has also been prevalent in many sample years. Decreases in sagebrush cover and density were small between 2016 and 2021. However, 51% of sagebrush plants exhibited poor vigor in 2021 (Photos, Pre-1992 Data, Table 04-14.12, Table 04-14.13), likely due to drought stress. Sustained drought conditions could lead to a larger loss of sagebrush in future sample years. Perennial grasses such as western wheatgrass (*Pascopyrum smithii*), Sandberg bluegrass (*Poa secunda*), and/or Indian ricegrass (*Achnatherum hymenoides*) have contributed most of the herbaceous cover, and were a co-dominant component of the site from 1996 through 2016. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed in multiple sample years, but in very low amounts. Annual and perennial forbs have never been particularly abundant on this study site, and annual forbs were not observed at all in 2021 (Table 04-14.7, Table 04-14.10, Table 04-14.11). Over the sample years, mule deer winter range condition has ranged between fair and excellent, which is largely due to fluctuations in decadence and vigor in the sagebrush population. Perennial grasses have also fluctuated in cover, which also contributes to the community's overall value to mule deer winter range condition. In 2021, deer winter range condition was considered to be fair (Table 04-14.15).

**Trend Summary Tables****Table 04-14.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	14.9	6.3	-	-	-	-
2001	18.2	5.3	-	-	-	-
2006	10.3	6.6	-	10.8	5.7	-
2011	8.5	8.1	-	8.7	10.3	-
2016	13.9	8.9	-	16.0	8.8	-
2021	14.5	7.9	-	12.3	4.3	-

**Table 04-14.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	-	368	29	204	-	6.4	0.1	4.4
2001	16	374	219	178	0.0	10.9	0.6	2.6
2006	-	386	261	220	-	18.5	1.0	4.1
2011	29	390	412	233	0.1	13.0	3.8	4.0
2016	10	431	301	121	0.0	16.8	2.7	1.2
2021	5	370	-	121	0.0	6.7	-	1.9

**Table 04-14.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	40.1	12.7	27.6	0.6	0.1	28.7
2001	31.7	21.0	31.6	1.2	0.1	37.9
2006	32.7	12.2	25.5	0.8	0.0	40.1
2011	33.7	12.4	28.1	0.1	0.0	34.7
2016	36.5	16.5	15.7	0.2	0.2	39.6
2021	38.6	16.9	36.6	0.8	0.0	27.9

**Table 04-14.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer/Pronghorn	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency					
1996	1	-	24	5	-	9
2001	-	-	25	2	-	28
2006	2	-	55	7	1	38
2011	9	-	34	15	1	41
2016	4	-	30	-	2	16
2021	6	-	37	1	2	19
Year	Days Use Per Acre (ha)					
1996	-	-	-	-	-	-
2001	5.1 (12.6)	8.7 (21.5)*	30.2 (74.5)	5.3 (13.2)	-	-
2006	2.9 (7.2)	-	126.0 (311.2)	15.4 (38.1)	8.7 (21.5)*	-
2011	7.2 (17.9)	-	47.6 (117.5)	10.7 (26.5)	-	-
2016	4.4 (10.8)	-	18.1 (44.7)	4.7 (11.6)	8.7 (21.5)*	-
2021	21.8 (53.8)	-	67.0 (165.5)	-	17.4 (43.0)*	-

\*Pellets per acre (ha)

**Table 04-14.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency								
1996	30	0	-	14	-	231	-	263	-
2001	21	2	16	-	6	250	9	265	1
2006	26	1	-	8	10	296	-	271	6
2011	12	5	29	61	25	342	1	253	-
2016	38	3	10	47	24	326	-	227	9
2021	77	20	5	10	28	279	6	114	-
year	Average Cover (%)								
1996	0.2	0.0	-	0.1	-	1.8	-	4.3	-
2001	0.2	0.1	0.0	-	0.2	3.0	0.1	7.3	0.0
2006	1.2	0.1	-	0.3	0.1	9.0	-	7.3	0.3
2011	0.7	0.2	0.1	0.7	0.3	5.6	0.0	5.5	-
2016	1.0	0.1	0.0	0.5	0.6	11.1	-	2.9	0.6
2021	1.9	0.7	0.0	0.1	0.2	3.0	0.0	0.8	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 04-14.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria (pussytoes)	Arabis drummondii (Drummond's rockcress)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chorispora tenella <sup>ai</sup> (crossflower)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Cordylanthus ramosus <sup>a</sup> (bushy bird's beak)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)
year	Nested Frequency																
1996	-	-	20	9	2	4	-	-	-	9	-	-	-	5	3	-	-
2001	-	-	192	4	-	8	1	-	-	17	-	-	2	-	5	8	1
2006	-	-	234	32	1	7	2	-	-	43	-	-	-	5	11	3	-
2011	6	7	394	41	1	21	6	6	-	233	1	-	-	5	25	7	1
2016	-	1	284	2	-	8	5	3	1	92	-	6	1	4	11	4	-
2021	-	-	-	27	-	2	-	5	-	-	-	-	-	8	4	-	-
year	Average Cover (%)																
1996	-	-	0.0	0.2	0.0	0.0	-	-	-	0.0	-	-	-	0.1	0.0	-	-
2001	-	-	0.4	0.2	-	0.1	0.0	-	-	0.0	-	-	0.0	-	0.0	0.0	0.0
2006	-	-	0.9	0.7	0.0	0.0	0.0	-	-	0.1	-	-	-	0.1	0.0	0.0	-
2011	0.0	0.0	2.2	1.2	0.0	0.3	0.1	0.1	-	1.6	0.0	-	-	0.1	0.1	0.0	0.0
2016	-	0.0	2.2	0.0	-	0.1	0.1	0.0	0.0	0.3	-	0.0	0.1	0.2	0.0	0.0	-
2021	-	-	-	0.4	-	0.0	-	0.0	-	-	-	-	-	0.2	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Erigeron pumilus (shaggy fleabane)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Microsteris gracilis <sup>a</sup> (slender phlox)	Packera multilobata (lobeleaf groundsel)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Stenotus acaulis (stemless mock goldenweed)	Symphotrichum (aster)	Trifolium (clover)
year	Nested Frequency									
1996	7	-	-	-	159	61	-	3	-	-
2001	11	6	6	-	116	67	1	1	-	1
2006	5	-	-	2	130	111	-	1	-	-
2011	10	1	-	-	113	116	2	2	1	2
2016	3	4	-	-	81	13	-	1	-	14
2021	6	-	-	-	79	2	-	4	-	3
year	Average Cover (%)									
1996	0.0	-	-	-	3.8	0.3	-	0.0	-	-
2001	0.1	0.0	0.0	-	1.9	0.2	0.0	0.0	-	0.0
2006	0.0	-	-	0.0	2.5	0.6	-	0.1	-	-
2011	0.0	0.0	-	-	1.3	0.7	0.0	0.1	0.0	0.0
2016	0.0	0.0	-	-	0.7	0.0	-	0.0	-	0.1
2021	0.0	-	-	-	1.0	0.0	-	0.2	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 04-14.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Atriplex falcata (sickle saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Krascheninnikovia lanata <sup>p</sup> (winterfat)	Linanthus pungens (granite prickly phlox)	Opuntia polyacantha (plains pricklypear)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)						
1996	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-
2006	10.7	0.2	5.4	0.1	-	0	0.1
2011	8.5	0	10.3	0.2	-	-	-
2016	15.8	0	8.6	0.2	-	-	0.2
2021	12.3	-	4.3	-	-	0	-
year	Quadrat Cover (%)						
1996	14.7	0.5	5.5	0.2	-	0.2	-
2001	18.2	0.1	4.5	-	-	0.5	0.1
2006	10.0	0.4	5.5	0.3	-	0.5	0.1
2011	8.2	0.5	6.8	0.3	-	0.7	0.1
2016	13.7	0.2	7.4	0.2	-	1.1	0.1
2021	14.4	0.1	6.8	0.0	0.0	0.9	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-14.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. wyomingensis<sup>P</sup> -- (Wyoming big sagebrush)</b>									
1996	3700	20	2	67	31	32	2	9	47/86
2001	4040	-	2	73	26	43	4	4	49/85
2006	3500	140	2	10	89	3	1	93	44/75
2011	3260	-	10	39	50	34	7	47	36/62
2016	3640	6340	8	66	26	17	27	17	45/83
2021	3480	80	9	41	50	22	10	51	- / -
<b>Atriplex canescens<sup>P</sup> -- (fourwing saltbush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	57/91
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Atriplex falcata -- (sickle saltbush)</b>									
1996	600	-	0	100	0	0	0	0	10/21
2001	840	-	52	48	0	2	0	0	7/19
2006	840	-	41	60	0	10	0	0	6/17
2011	540	-	0	100	0	0	0	0	21/27
2016	500	-	0	100	0	0	0	0	16/24
2021	380	-	32	63	5	21	5	5	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1996	4260	-	1	75	24	1	0	4	26/44
2001	4240	-	1	73	26	1	0	4	21/38
2006	4180	-	4	80	15	3	1	11	24/37
2011	5060	20	0	99	0	0	0	0	27/45
2016	4100	80	4	96	0	2	0	0	26/48
2021	4540	-	1	22	77	8	14	76	- / -
<b>Krascheninnikovia lanata<sup>P</sup> -- (winterfat)</b>									
1996	300	60	27	73	0	13	0	0	14/19
2001	240	-	8	92	0	17	17	0	16/26
2006	240	-	0	100	0	33	67	0	12/19
2011	220	-	18	82	0	0	0	18	30/36
2016	300	-	0	100	0	40	33	0	21/26
2021	380	20	63	37	0	5	37	0	- / -
<b>Linanthus pungens -- (granite prickly phlox)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	18/47
2016	-	-	-	-	-	-	-	-	16/24
2021	20	-	0	0	100	0	0	100	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	480	-	0	92	8	0	0	0	10/38
2001	80	-	0	75	25	0	0	0	9/27
2006	200	-	20	70	10	0	0	0	10/27
2011	300	-	0	100	0	0	0	0	10/32
2016	220	-	0	100	0	0	0	0	12/38
2021	460	20	9	87	4	0	0	13	- / -

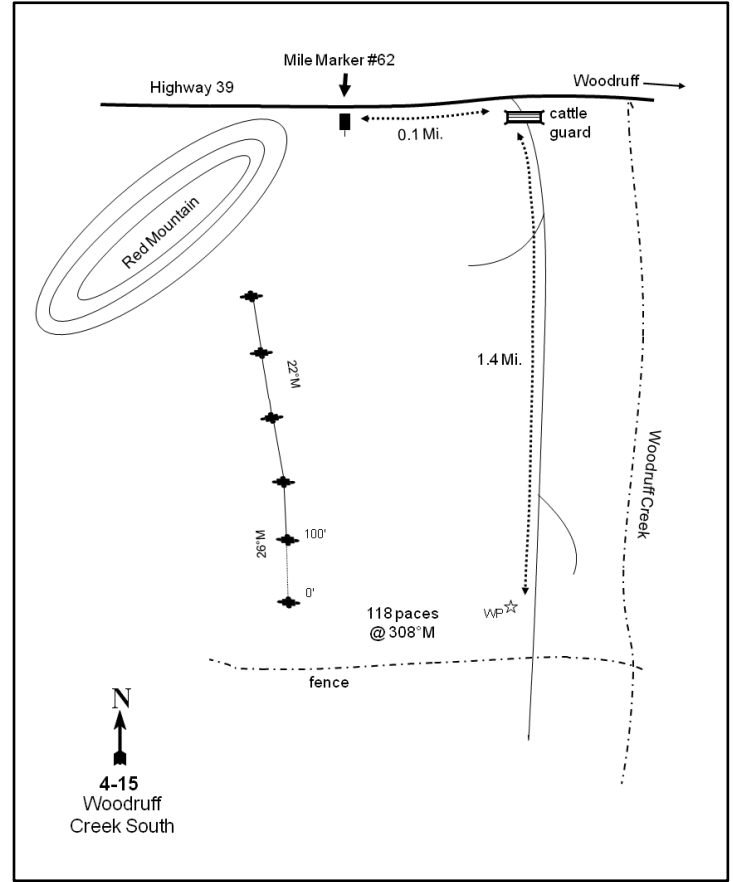
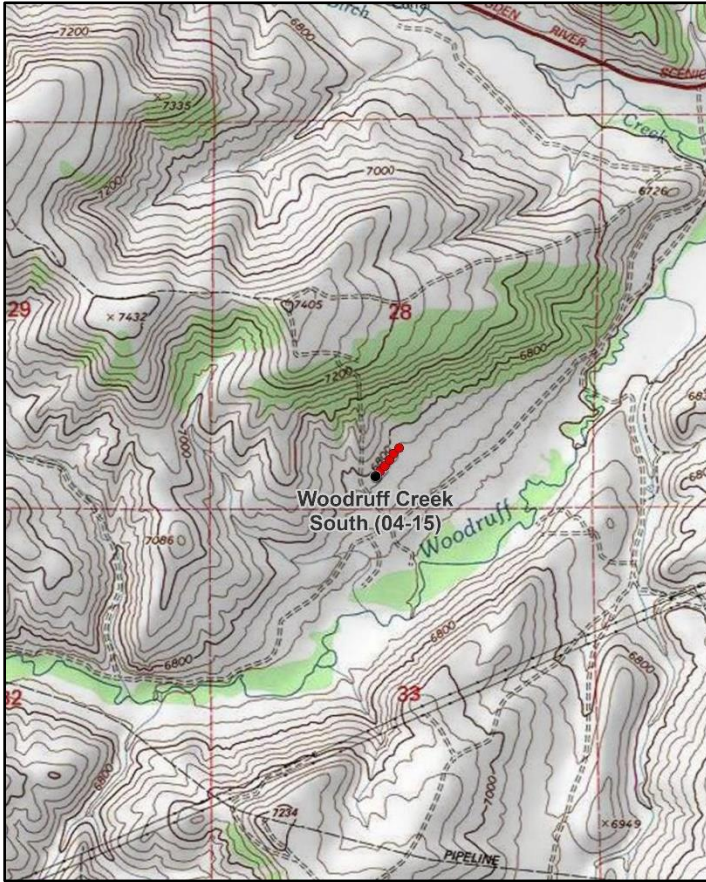
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Tetradymia canescens -- (spineless horsebrush)									
1996	20	-	0	0	100	0	0	100	20/18
2001	40	-	0	100	0	0	0	0	17/27
2006	40	-	0	100	0	0	50	50	21/49
2011	60	-	0	100	0	0	0	0	28/53
2016	60	-	0	100	0	33	0	0	26/49
2021	60	-	0	0	100	33	0	100	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-14.15 - Deer Desirable Components Index: Semidesert Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	18.6	5.7	1.0	12.9	0.0	8.9	0.0	<b>47.1</b>	Good
2001	22.7	7.3	0.7	21.7	0.0	5.3	0.0	<b>57.7</b>	Good
2006	13.5	-11.3	0.8	30.0	0.0	8.3	0.0	<b>41.3</b>	Fair
2011	10.9	0.3	5.3	26.0	0.0	8.1	0.0	<b>50.4</b>	Good
2016	20.0	7.2	3.8	30.0	0.0	2.4	0.0	<b>63.4</b>	Good-Excellent
2021	15.4	0.0	4.3	13.4	0.0	3.8	0.0	<b>36.8</b>	Fair

## WOODRUFF CREEK SOUTH - STUDY No. 04-15



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Meachum Ridge NE; Township 9N, Range 6E, Section 28  
NAD 83 UTM ZONE 12, 476924 East 4592189 North

### Transect Information

Browse Tag # (0' Stake)	56
Transect Bearing	25° magnetic (Lines 3-5: 28° magnetic)
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

### Directions to Site

Travel east on Highway 39 and turn right (south) 0.1 miles past mile marker #62. Travel west for 1.4 miles to a cattleguard. From the cattleguard, walk 118 paces at 205 degrees magnetic to the 0-foot baseline stake which is marked with browse tag #56. There is a fence 200 feet to the west of the 0-foot baseline stake. The baseline runs in a direction of 26 degrees magnetic. The baseline doglegs at the 300-foot stake and runs in a direction of 22 degrees magnetic.



**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	MIDDLE RIDGE
Elevation	6,800ft (2,073m)
Aspect	Southeast
Slope	21%
Sample Dates	08/28/1996, 08/07/2001, 07/20/2006, 08/01/2011, 07/13/2016, 07/08/2021

**Wildlife Habitat and Vegetation History****Table 04-15.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	winter	

**Table 04-15.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1996	Mountain Big Sagebrush/Utah Juniper	Phase I transitioning to Phase II
2001	Mountain Big Sagebrush/Utah Juniper	Phase I transitioning to Phase II
2006	Mountain Big Sagebrush/Utah Juniper	Phase I transitioning to Phase II
2011	Mountain Big Sagebrush/Utah Juniper	Phase I transitioning to Phase II
2016	Mountain Big Sagebrush/Utah Juniper	Phase I transitioning to Phase II
2021	Utah Juniper/Mountain Big Sagebrush	Phase II

**Site Notes**

The study is located on private land downstream from Woodruff Reservoir, about a third of a mile north of Woodruff Creek. The study samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community with a Utah juniper (*Juniperus osteosperma*) overstory. The Ruby Pipeline is just to the south of the study on the other side of the canyon. The area has been heavily used in winter by deer, with five winter-killed deer found in 1996. Several deer carcasses were observed near the site in 2011.

**Soils****Table 04-15.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	6.8	53.7	19.3	27.0	2.8	20.9	163.2	0.6	08/28/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Upland Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R047XA314UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1996, the plant community on this site has been dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Utah juniper (*Juniperus osteosperma*); other shrub species have remained rare (Photos, Table 04-15.12, Table 04-15.13, Table 04-15.14). The herbaceous understory has fluctuated over the study period. The annual grass species cheatgrass (*Bromus tectorum*) was a dominant herbaceous component in 1996, 2011, and 2016, but perennial grasses contributed most of the herbaceous cover in 2021 (Table 04-15.7, Table 04-15.10). However, cheatgrass could potentially alter the fire regime and affect the ecological resiliency of the plant community should it increase in the future. Forbs have remained rare (Table 04-15.11). Juniper has increased in cover and density over time (Table 04-15.12, Table 04-15.14), and the site is in Phase II of woodland succession as of the 2021 sample year (Table 04-15.4). If a tree-removing disturbance does not occur, the site will likely continue to progress through the phases of woodland succession in the future and exhibit the associated decreases in understory diversity and abundance. Over the sample years, mule deer winter range has ranged between good and poor condition: this is largely due to fluctuations in annual grass cover, and variations in decadence and recruitment within the sagebrush population. Sagebrush cover has been increasing over the sample years and provides a stabilizing component to wintering habitat. Mule deer winter range condition was considered to be poor in 2021 (Table 04-15.15).

**Trend Summary Tables**

**Table 04-15.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	10.8	2.9	6.9	-	-	-
2001	11.0	1.9	8.2	-	-	0.9
2006	12.0	0.9	10.6	13.4	2.7	15.6
2011	13.3	1.4	8.8	22.0	4.4	15.8
2016	15.3	1.0	7.9	16.2	3.3	13.4
2021	16.3	0.3	10.3	16.6	0.8	20.1

**Table 04-15.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	354	294	6	34	15.7	9.3	0.0	0.2
2001	232	348	12	34	1.6	11.1	0.1	0.3
2006	253	295	48	44	7.6	8.8	0.3	0.8
2011	328	283	111	79	11.5	12.2	1.0	0.7
2016	386	210	117	30	23.3	8.6	0.7	0.4
2021	100	329	15	23	0.4	9.8	0.0	0.2

**Table 04-15.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	7.9	2.2	45.9	10.8	3.1	44.0
2001	14.8	4.9	47.3	13.3	1.9	37.1
2006	13.9	4.1	42.1	17.0	2.1	41.2
2011	10.7	4.2	32.0	13.7	2.4	49.1
2016	7.5	1.7	28.5	17.9	4.2	53.5
2021	20.0	3.8	48.5	8.9	3.7	33.3

**Table 04-15.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency					
1996	6	-	28	7	1	13
2001	12	-	34	1	-	25
2006	18	-	4	2	-	32
2011	8	-	14	5	1	13
2016	3	-	9	-	-	11
2021	5	-	13	-	-	29
Year	Days Use Per Acre (ha)					
1996	-	-	-	-	-	-
2001	34.1 (84.3)	-	31.5 (77.8)	-	1.2 (2.9)	-
2006	35.6 (87.9)	-	18.1 (44.7)	-	-	-
2011	42.8 (105.8)	8.7 (21.5)*	78.4 (193.7)	3.4 (8.3)	0.6 (1.4)	-
2016	10.9 (26.9)	-	20.8 (51.3)	-	-	-
2021	5.1 (12.6)	-	28.1 (69.5)	-	-	-

\*Pellets per acre (ha)

**Table 04-15.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Leymus cinereus (basin wildrye)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency											
1996	36	-	354	22	2	2	4	37	9	1	257	52
2001	22	-	232	13	31	-	-	123	-	-	309	2
2006	21	-	253	24	31	-	-	105	-	2	241	13
2011	24	0	328	61	31	2	-	84	16	4	189	27
2016	20	-	386	59	38	-	0	78	-	1	40	13
2021	42	1	100	58	14	-	-	93	4	-	252	16
year	Average Cover (%)											
1996	0.8	-	15.7	0.2	0.0	0.0	0.1	0.3	0.2	0.0	6.2	1.4
2001	0.5	-	1.6	0.0	1.1	-	-	2.3	-	-	7.1	0.0
2006	0.5	-	7.6	0.3	0.5	-	-	2.8	-	0.0	4.3	0.3
2011	1.0	0.0	11.5	1.3	0.9	0.0	-	3.4	0.3	0.0	4.3	0.9
2016	1.3	-	23.3	0.8	2.0	-	0.0	3.2	-	0.0	0.4	0.9
2021	0.8	0.0	0.4	0.5	0.2	-	-	3.1	0.0	-	5.0	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 04-15.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria dimorpha (low pussytoes)	Arabis drummondii (Drummond's rockcress)	Asclepias speciosa (showy milkweed)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium album <sup>a</sup> (lambsquarters)	Cordylanthus ramosus <sup>a</sup> (bushy bird's beak)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Erigeron pumilus (shaggy fleabane)
year	Nested Frequency																
1996	-	-	-	12	-	2	2	5	-	-	1	-	-	-	0	6	-
2001	-	-	5	0	-	-	15	5	-	-	3	-	-	-	-	2	1
2006	2	2	4	-	-	3	8	-	-	17	1	7	-	-	13	6	4
2011	-	12	9	5	-	4	8	2	-	26	3	-	3	1	21	17	-
2016	-	92	-	1	3	-	9	-	4	20	-	-	2	0	5	-	-
2021	-	13	-	-	-	1	4	4	-	2	-	-	-	-	11	-	1
year	Average Cover (%)																
1996	-	-	-	0.0	-	0.0	0.0	0.0	-	-	0.0	-	-	-	0.0	0.0	-
2001	-	-	0.0	0.0	-	-	0.2	0.1	-	-	0.0	-	-	-	-	0.0	0.0
2006	0.0	0.0	0.2	-	-	0.0	0.1	-	-	0.1	0.0	0.0	-	-	0.2	0.1	0.0
2011	-	0.0	0.0	0.0	-	0.0	0.1	0.0	-	0.1	0.0	-	0.0	0.1	0.2	0.1	-
2016	-	0.5	-	0.0	0.0	-	0.1	-	0.0	0.0	-	-	0.0	0.0	0.2	-	-
2021	-	0.0	-	-	-	0.0	0.0	0.0	-	0.0	-	-	-	-	0.1	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Galium aparine <sup>a</sup> (stickywilly)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Gilia inconspicua <sup>a</sup> (shy gilia)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Orobanche (broomrape)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>at</sup> (tall tumblemustard)	Sphaeralcea grossularifolia (gooseberry/leaf globemallow)	Tragopogon dubius <sup>at</sup> (yellow salsify)
year	Nested Frequency										
1996	-	-	-	-	5	6	3	-	-	-	-
2001	-	-	-	7	-	6	4	-	-	-	3
2006	-	-	12	5	-	1	17	1	0	-	-
2011	-	49	13	34	7	1	34	-	5	-	2
2016	3	12	-	4	1	1	3	2	-	4	-
2021	-	-	-	-	-	-	-	-	-	3	-
year	Average Cover (%)										
1996	-	-	-	-	0.0	0.0	0.0	-	-	-	-
2001	-	-	-	0.0	-	0.0	0.0	-	-	-	0.0
2006	-	-	0.1	0.0	-	0.0	0.1	0.0	0.0	-	-
2011	-	0.2	0.1	0.3	0.0	0.0	0.1	-	0.2	-	0.0
2016	0.0	0.1	-	0.0	0.0	0.0	0.0	0.0	-	0.0	-
2021	-	-	-	-	-	-	-	-	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 04-15.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Atriplex canescens <sup>p</sup> (fourwing saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Opuntia (pricklypear)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)						
1996	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-
2006	13.4	-	2.4	-	15.6	0.3	-
2011	22	-	4	-	15.8	0.2	0.2
2016	16.2	-	3.2	-	13.4	0.1	-
2021	16.6	-	0.6	-	20.1	0.1	0.1
year	Quadrat Cover (%)						
1996	10.8	-	2.7	-	6.9	0.2	0.0
2001	10.9	0.0	1.9	-	8.2	0.0	-
2006	12.0	-	0.9	-	10.6	0.0	-
2011	13.3	-	1.4	-	8.8	0.0	0.0
2016	15.3	-	1.0	0.0	7.9	0.0	-
2021	16.3	-	0.3	0.0	10.3	0.0	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-15.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1996	3300	1100	18	49	33	19	1	6	47/91
2001	5480	360	29	49	23	21	1	0	42/69
2006	4700	7760	19	63	19	5	0	19	45/68
2011	6860	320	26	57	17	27	7	10	32/56
2016	4380	80	11	83	6	8	22	8	44/68
2021	5040	-	10	46	44	2	0	55	- / -
<b>Atriplex canescens<sup>P</sup> -- (fourwing saltbush)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	35/69
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	2540	80	7	87	6	0	0	2	31/52
2001	2340	-	3	86	11	0	0	3	25/38
2006	2180	20	15	83	3	2	0	0	26/41
2011	2260	-	4	96	1	0	0	2	25/40
2016	1380	-	6	93	1	0	0	1	30/41
2021	1600	-	13	25	63	5	6	64	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	13/20
2006	20	-	0	100	0	0	0	0	15/19
2011	20	-	0	100	0	0	0	0	22/35
2016	40	-	0	100	0	0	0	0	9/24
2021	20	-	0	100	0	0	0	100	- / -
<b>Juniperus osteosperma<sup>1</sup> -- (Utah juniper)</b>									
1996	140	-	0	100	0	0	0	0	- / -
2001	180	-	11	89	0	0	0	11	- / -
2006	180	20	11	78	11	0	0	11	- / -
2011	200	-	10	80	10	0	0	0	- / -
2016	100	-	20	80	0	0	0	0	- / -
2021	220	-	18	82	0	0	0	18	- / -
<b>Krascheninnikovia lanata<sup>P</sup> -- (winterfat)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	23/41
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Opuntia -- (pricklypear)</b>									
1996	420	-	29	67	5	0	0	0	9/29
2001	300	-	47	33	20	0	0	20	9/24
2006	120	-	33	67	0	0	0	0	10/28
2011	100	20	0	100	0	0	0	0	9/29
2016	240	-	8	92	0	0	0	0	10/27
2021	180	-	0	78	22	0	0	22	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	24/74
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	48/45
2011	-	-	-	-	-	-	-	-	57/120
2016	-	-	-	-	-	-	-	-	48/69
2021	-	-	-	-	-	-	-	-	-/-
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	80	-	0	100	0	0	0	0	31/60
2001	80	-	0	100	0	0	0	0	22/54
2006	140	-	14	86	0	14	14	0	17/31
2011	140	-	0	100	0	0	0	0	23/39
2016	40	-	50	50	0	0	0	0	27/44
2021	140	-	14	14	71	0	0	71	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

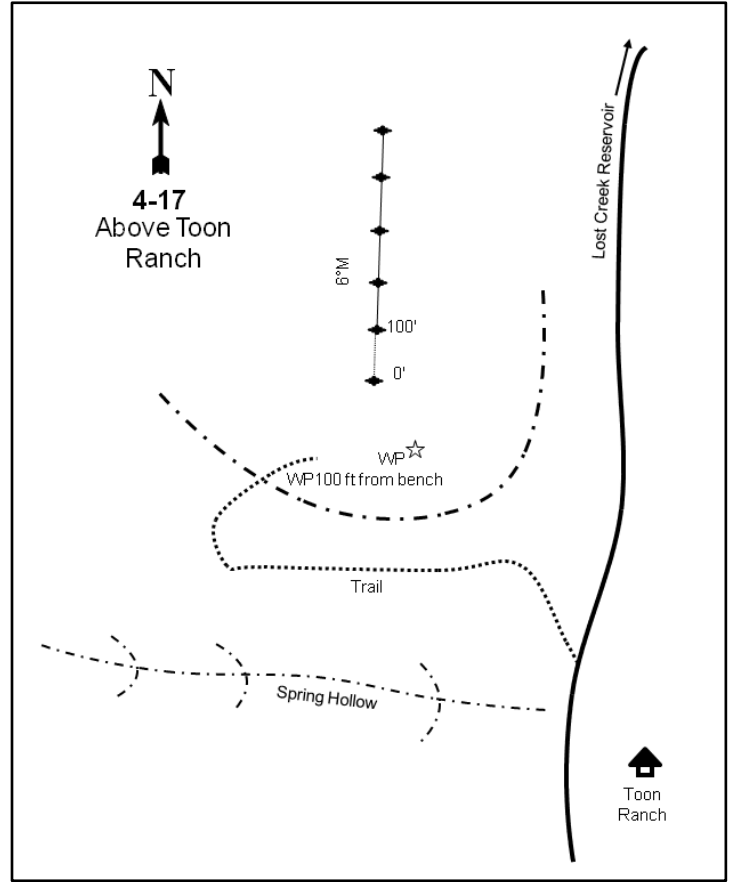
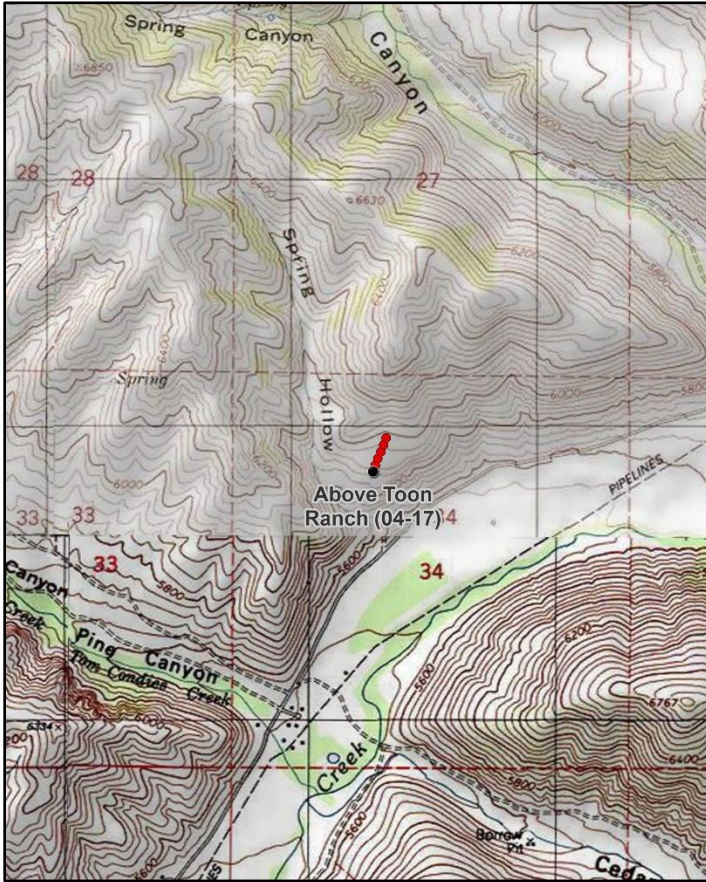
**Table 04-15.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2001	106	-	-	-	-	-	19.7
2006	127	11	11	11	32	37	13.8
2011	94	-	26	37	37	-	15.9
2016	107	-	25	30	30	15	21.9
2021	115	-	25	20	40	15	19.4

**Table 04-15.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	13.5	5.0	9.1	18.6	-11.7	0.4	0.0	<b>34.8</b>	Very Poor-Poor
2001	13.7	8.2	14.3	22.1	-1.2	0.6	0.0	<b>57.7</b>	Fair
2006	16.8	9.4	9.4	17.7	-5.7	1.6	0.0	<b>49.0</b>	Poor-Fair
2011	27.5	10.0	13.1	24.4	-8.6	1.4	0.0	<b>67.8</b>	Good
2016	20.3	13.1	5.3	17.2	-17.4	0.9	0.0	<b>39.2</b>	Poor
2021	20.8	1.8	4.8	19.5	-0.3	0.4	0.0	<b>46.9</b>	Poor

## ABOVE TOON RANCH - STUDY NO. 04-17



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Lost Creek Dam SW; Township 5N, Range 4E, Section 34  
NAD 83 UTM ZONE 12, 459264 East 4553010 North

### Transect Information

Browse Tag # (0' Stake)	136
Transect Bearing	6° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Belt 1, 3: No Rebar

### Directions to Site

From Croydon, drive up the main road towards Lost Creek Reservoir for about 4 miles, then stop at Spring Hollow. Walk up the trail (up Spring Hollow) on the west side of the road until you reach the top of the bench; a witness post will be visible about 100 feet from the edge of the bench. From the witness post, walk 100 feet north to the 0-foot baseline stake that is marked with browse tag #136. The baseline runs in a direction of 6 degrees magnetic.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,846ft (1,782m)
Aspect	South
Slope	19%
Sample Dates	06/28/1996, 06/18/2001, 06/19/2006, 06/08/2011, 06/14/2016, 06/15/2021

**Wildlife Habitat and Vegetation History**

**Table 04-17.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	winter	

**Table 04-17.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1996	Mountain Big Sagebrush/Annual Grass	NA
2001	Mountain Big Sagebrush/Annual Grass-Perennial Forb	NA
2006	Mountain Big Sagebrush/Annual Grass-Perennial Forb	NA
2011	Mountain Big Sagebrush/Perennial Forb	NA
2016	Mountain Big Sagebrush/Annual Grass-Perennial Forb	NA
2021	Mountain Big Sagebrush	NA

**Site Notes**

This study is located on private land on a gently sloping bench where deer congregate during the winter above the Lost Creek Valley. Vegetation in the area is comprised of a dense stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). The site is isolated from the road, and some of the sagebrush is tall enough to provide protective cover for deer. The land owner grazes sheep during the fall and winter. A dead fawn and a set of shed antlers have been found on the site in past sample years.

**Soils**

**Table 04-17.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.5	41.3	31.7	27.0	3.4	30.9	153.6	0.5	06/28/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Upland Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R047XA314UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has dominated this site since study establishment in 1996. Yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*) is the only additional shrub contributing cover, but other subordinate species have been recorded in height crown measurements throughout the years (Photos, Table 04-17.12, Table 04-17.13). The herbaceous understory has fluctuated over time. Annual grasses, namely cheatgrass (*Bromus tectorum*), and/or perennial forbs, mainly common yarrow (*Achillea millefolium*) and American vetch (*Vicia americana*), have contributed a majority of the cover in most study years. In 2021, however, largely native perennial grass species provided the most herbaceous cover. Annual forbs have fluctuated, but are rare as of the 2021 sample year (Table 04-17.7, Table 04-17.10, Table 04-17.11). Barring a major disturbance such as a wildfire, this site will likely remain in this or a similar state in future sample years. Mule deer winter range has ranged between fair and very poor condition, which is due to large fluctuations of annual and perennial grasses. Although cover of mountain big sagebrush has been good, the sagebrush population displays high decadence with little recruitment in most sample years. In 2021, mule deer winter range condition was considered to be poor to fair (Table 04-17.15).



**Trend Summary Tables**

**Table 04-17.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	27.4	3.4	-	-	-	-
2001	33.2	2.8	-	-	-	-
2006	26.5	3.4	-	29.0	3.5	-
2011	18.8	1.3	-	24.5	1.3	-
2016	21.7	5.1	-	26.8	8.2	-
2021	19.9	4.7	-	23.8	3.8	-

**Table 04-17.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	452	95	225	346	31.3	3.1	2.2	7.8
2001	369	163	313	325	11.5	6.0	6.5	13.3
2006	389	149	289	363	17.4	7.0	4.4	21.9
2011	297	142	378	423	8.1	5.9	14.9	36.2
2016	436	95	222	384	28.0	4.5	2.8	20.0
2021	270	207	128	324	6.8	8.4	1.0	7.6

**Table 04-17.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	1.0	0.5	75.7	0.2	0.2	64.5
2001	6.3	0.8	56.7	0.5	0.4	66.5
2006	5.2	0.1	46.9	0.7	1.0	65.7
2011	4.9	0.2	54.3	0.5	0.4	77.8
2016	8.8	1.4	37.4	0.6	0.7	68.7
2021	12.3	3.6	48.4	1.1	0.6	44.3

**Table 04-17.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Domestic Sheep	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	-	29	4	2
2001	3	22	-	6
2006	-	32	6	11
2011	-	12	4	1
2016	-	28	2	29
2021	-	39	2	39
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	-	70.4 (173.8)	0.7 (1.7)	-
2006	-	103.2 (254.9)	10.7 (26.5)	-
2011	-	53.6 (132.4)	3.4 (8.3)	-
2016	-	51.6 (127.5)	1.3 (3.3)	-
2021	-	83.8 (206.9)	2.0 (5.0)	-

**Table 04-17.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency								
Bromus arvensis <sup>ai</sup> (field brome)	8	452	-	5	-	-	68	33	
Bromus tectorum <sup>ai</sup> (cheatgrass)	3	369	-	18	-	-	114	40	
Elymus lanceolatus (thickspike wheatgrass)	11	389	1	13	5	2	111	23	
Leymus cinereus (basin wildrye)	2	296	4	15	-	20	83	38	
Melica bulbosa (oniongrass)	36	424	-	6	21	-	50	31	
Poa pratensis <sup>i</sup> (Kentucky bluegrass)	80	199	-	16	-	5	160	47	
Poa secunda (Sandberg bluegrass)	Average Cover (%)								
Pseudoroegneria spicata (bluebunch wheatgrass)	1996	0.0	31.2	-	0.8	-	-	1.5	0.9
	2001	0.0	11.5	-	1.6	-	-	2.6	1.8
	2006	0.1	17.3	0.0	0.9	0.1	0.0	4.5	1.4
	2011	0.0	8.1	0.0	1.1	-	0.3	2.5	2.0
	2016	0.5	27.5	-	0.8	0.2	-	1.4	2.1
	2021	2.4	4.4	-	1.8	-	0.0	4.3	2.3

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 04-17.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
Achillea millefolium (Common yarrow)	100	22	12	131	1	68	-	-	12	24	12	-	14	-	-	-	6	
Agoseris heterophylla <sup>a</sup> (annual agoseris)	139	7	23	103	6	24	4	5	7	90	54	-	-	-	-	-	2	
Allium (onion)	159	28	13	204	2	13	-	2	-	129	23	-	14	-	1	-	-	
Alyssum desertorum <sup>ai</sup> (desert madwort)	182	34	27	270	5	5	-	17	-	281	14	3	-	-	-	1	2	
Artemisia ludoviciana (white sagebrush)	169	8	58	117	5	17	-	17	-	25	10	-	-	5	-	-	-	
Camelina microcarpa <sup>ai</sup> (tittlepod false flax)	147	12	3	86	3	-	-	17	1	47	-	4	-	-	-	-	-	
Castilleja linariifolia (Wyoming Indian paintbrush)	Average Cover (%)																	
Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	1996	4.0	0.1	0.0	1.3	0.6	0.3	-	-	0.0	0.1	0.0	-	0.1	-	-	-	0.0
Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	2001	6.3	0.0	0.2	0.7	0.0	0.1	0.0	0.0	0.2	1.0	0.3	-	-	-	-	-	0.0
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	2006	9.3	0.4	0.1	1.8	0.0	0.0	-	0.0	-	0.7	0.1	-	0.2	-	0.0	-	-
Collomia linearis <sup>a</sup> (tiny trumpet)	2011	10.6	0.5	0.1	8.5	0.2	0.0	-	0.6	-	2.5	0.1	0.0	-	-	-	0.0	0.0
Comandra umbellata (bastard toadflax)	2016	10.2	0.1	0.2	0.9	0.0	0.2	-	0.2	-	0.1	0.0	-	-	0.4	-	-	-
Cryptantha (cryptantha)	2021	4.1	0.0	0.0	0.3	0.1	-	-	0.3	0.0	0.1	-	0.0	-	-	-	-	-
Cryptantha <sup>a</sup> (annual cryptantha)																		
Cymopterus (springparsley)																		
Delphinium nuttallianum (twolobe larkspur)																		
Descurainia pinnata <sup>a</sup> (western tansymustard)																		

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Draba <sup>a</sup> (draba)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium aparine <sup>a</sup> (stickywilly)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lomatium (desertparsley)	Machaeranthera (tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Sphaeralcea grossularifolia (gooseberry/leaf globemallow)	Symphotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Veronica biloba <sup>ai</sup> (two-lobed speedwell)
year	Nested Frequency																
1996	18	-	5	-	1	5	-	4	-	9	61	6	-	77	-	-	2
2001	55	-	13	-	-	7	-	-	79	9	195	6	-	63	-	2	3
2006	63	3	-	10	2	6	-	-	79	4	79	2	-	16	-	0	1
2011	76	-	-	5	3	2	1	4	41	-	88	-	2	23	8	9	-
2016	9	8	7	-	-	2	-	-	7	-	86	-	1	48	4	-	8
2021	-	20	-	-	2	-	-	-	15	6	-	-	2	34	12	-	-
year	Average Cover (%)																
1996	0.1	-	0.0	-	0.0	0.0	-	0.0	-	0.0	0.3	0.0	-	0.7	-	-	0.0
2001	0.2	-	0.1	-	-	0.2	-	-	0.8	0.0	2.7	0.0	-	0.9	-	0.0	0.0
2006	0.1	0.0	-	0.2	0.0	0.0	-	-	0.3	0.0	0.6	0.0	-	0.4	-	0.0	0.0
2011	0.9	-	-	0.0	0.0	0.0	0.0	0.0	0.1	-	1.6	-	0.0	0.4	0.0	0.0	-
2016	0.0	0.4	0.0	-	-	0.0	-	-	0.0	-	0.3	-	0.0	0.7	0.0	-	0.0
2021	-	0.1	-	-	0.0	-	-	-	0.0	0.0	-	-	0.0	0.6	0.1	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Vicia americana (American vetch)	Viola (violet)
year	Nested Frequency	
1996	289	-
2001	250	-
2006	324	5
2011	377	20
2016	349	-
2021	261	3
year	Average Cover (%)	
1996	2.4	-
2001	5.8	-
2006	11.9	0.0
2011	24.3	0.5
2016	8.8	-
2021	2.6	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 04-17.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)	
	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)
year	Line Intercept Cover (%)	
1996	-	-
2001	-	-
2006	29	3.5
2011	24.5	1.3
2016	26.8	8.2
2021	23.8	3.8
year	Quadrat Cover (%)	
1996	27.4	3.4
2001	33.2	2.8
2006	26.5	3.4
2011	18.8	1.3
2016	21.7	5.1
2021	19.9	4.7

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-17.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	2880	40	7	83	10	6	0	10	87/133
2001	2700	60	7	72	21	7	0	4	105/135
2006	2280	40	4	62	34	18	7	14	91/123
2011	1820	200	0	57	43	44	4	33	90/132
2016	1940	3580	0	71	29	29	4	25	88/152
2021	2180	120	7	50	43	0	0	46	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	3320	20	10	88	2	0	0	1	34/54
2001	2460	-	11	85	3	0	0	0	26/39
2006	2120	-	9	90	1	9	2	1	32/39
2011	1160	-	19	79	2	2	0	2	29/42
2016	2060	-	0	99	1	4	1	4	40/58
2021	2100	20	11	65	24	4	5	21	- / -
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	62/58
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	84/115
2021	-	-	-	-	-	-	-	-	- / -

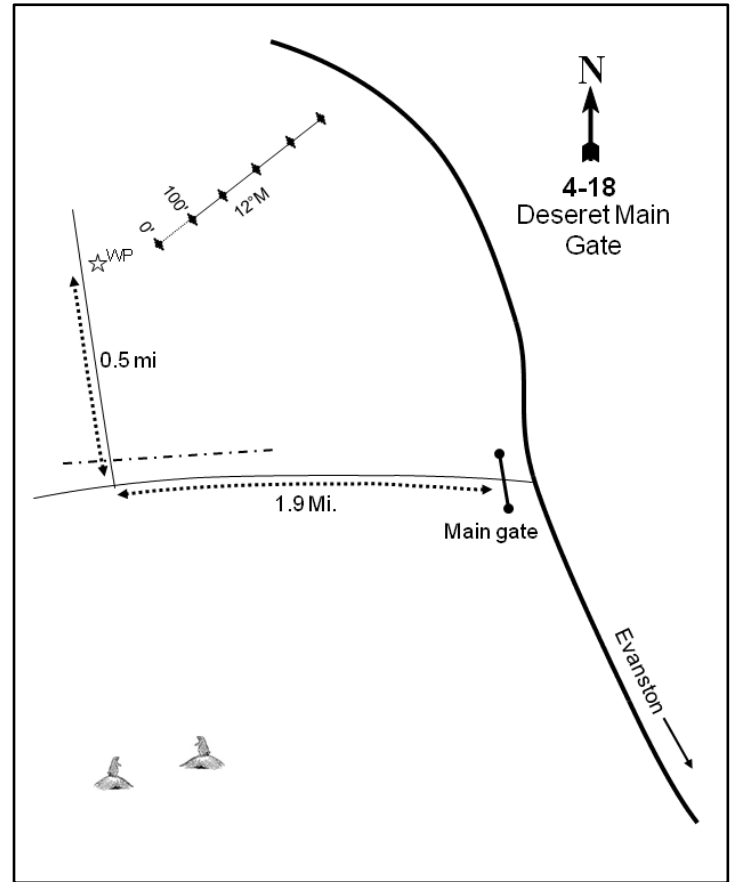
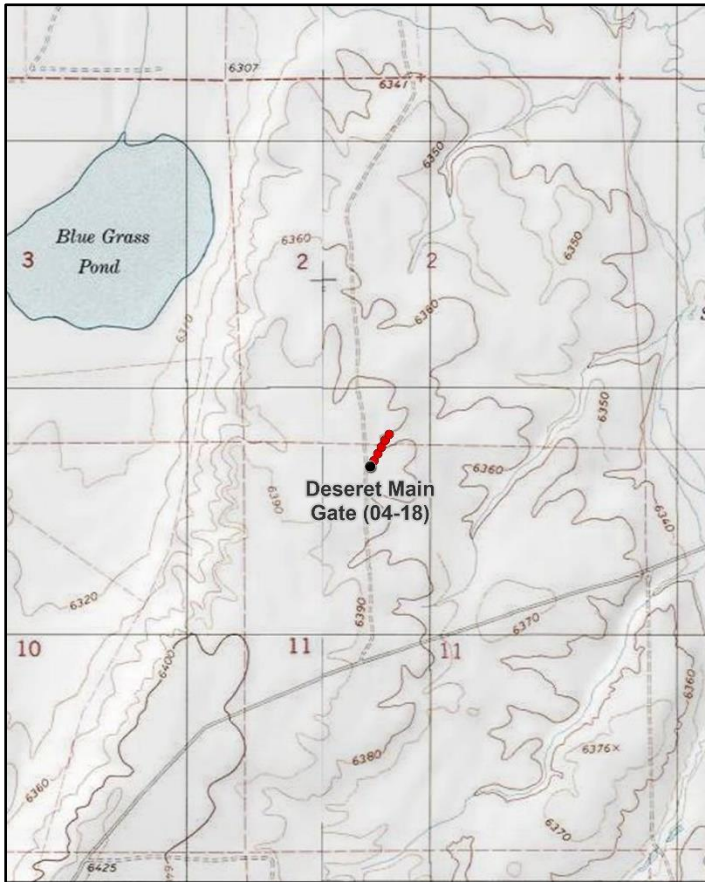
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	29/69
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	54/59

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-17.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	30.0	11.9	3.5	6.3	-20.0	10.0	0.0	<b>41.6</b>	Poor
2001	30.0	8.8	3.7	12.0	-8.6	10.0	0.0	<b>55.8</b>	Fair
2006	30.0	4.7	1.8	14.0	-13.0	10.0	0.0	<b>47.5</b>	Poor
2011	30.0	2.1	0.0	11.9	-6.1	10.0	0.0	<b>47.9</b>	Poor
2016	30.0	6.3	0.0	9.0	-20.0	10.0	0.0	<b>35.3</b>	Very Poor-Poor
2021	29.8	2.1	3.7	16.9	-5.1	10.0	0.0	<b>57.2</b>	Fair

## DESERET MAIN GATE - STUDY NO. 04-18

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Neponset Reservoir N; Township 8N, Range 7E, Section 11  
NAD 83 UTM ZONE 12, 489700 East 4588883 North

**Transect Information**

Browse Tag # (0' Stake)	545
Transect Bearing	30° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Belt 2: 10ft

**Directions to Site**

From the Deseret Land and Livestock main gate on Highway 16 between Evanston and Woodruff, proceed west towards the Deseret Ranch house for 1.9 miles. Turn right and go 0.5 miles north to a witness post on the right (east) side of the road. The 0-foot stake is 9 paces away from the witness post at 48 degrees magnetic.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,400ft (1,951m)
Aspect	South
Slope	0%
Sample Dates	08/28/1997, 08/08/2001, 08/14/2006, 08/24/2011, 07/12/2016, 07/14/2021

**Wildlife Habitat and Vegetation History****Table 04-18.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	year-long	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	summer	
Pronghorn	substantial	summer	

**Table 04-18.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1997	Perennial Grass/Wyoming Big Sagebrush	NA
2001	Perennial Grass/Wyoming Big Sagebrush	NA
2006	Perennial Grass	NA
2011	Perennial Grass	NA
2016	Perennial Grass	NA
2021	Perennial Grass	NA

**Site Notes**

This study is located on the Deseret Land and Livestock Ranch near the east entrance off of Highway 16. The study samples a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and crested wheatgrass (*Agropyron cristatum*) community. This area is occupied by elk, mule deer, pronghorn, cattle, and sage-grouse. There was an active prairie dog colony observed on site in 2016.

**Soils****Table 04-18.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.3	48.0	28.1	23.9	1.5	22.1	185.6	0.4	08/28/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	10 inches
NRCS Ecological Site	Semidesert Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R034XY212UT
States and Transitions	No state and transition model is available for this ecological site.

When the study was established in 1997 and during the 2001 sample year, this site was dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and perennial grasses, mainly crested wheatgrass (*Agropyron cristatum*). Cover and density of sagebrush have decreased overall since that time, causing the site to transition to a perennial grass community type in 2006. However, sagebrush seedlings were observed in higher amounts in 2021, and the percentage of young plants in the population also increased (Table 04-18.10, Table 04-18.12, Table 04-18.13). Forb diversity and abundance have remained limited throughout the study years (Table 04-18.7, Table 04-18.11). Mule deer winter range condition has declined overall since study establishment and has ranged between good and fair condition: this is largely due to an overall decrease in Wyoming big sagebrush cover. Remaining sagebrush has displayed high amounts of decadence and little recruitment in most sample years. However, perennial grasses are a stabilizing influence on wintering conditions; mule deer winter range condition was considered to be fair in 2021 (Table 04-18.15).

**Trend Summary Tables****Table 04-18.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	11.5	1.3	-	-	-	-
2001	11.5	0.9	-	-	-	-
2006	5.9	0.4	-	4.3	0.3	-
2011	4.9	0.6	-	5.3	0.4	-
2016	3.3	0.4	-	2.9	0.6	-
2021	5.6	0.6	-	4.7	0.3	-

**Table 04-18.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	-	374	-	20	-	11.7	-	0.2
2001	-	405	6	32	-	18.5	0.0	0.2
2006	-	421	1	57	-	38.1	0.0	0.5
2011	-	432	8	38	-	31.4	0.0	0.4
2016	-	433	2	20	-	40.2	0.0	0.0
2021	-	393	-	19	-	13.3	-	0.1

**Table 04-18.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	32.8	9.6	22.1	5.1	0.6	21.7
2001	31.8	10.4	46.7	1.0	0.1	27.9
2006	35.9	3.5	32.9	0.7	0.4	46.7
2011	29.7	2.5	39.5	0.4	0.1	36.8
2016	27.6	2.4	32.7	2.3	0.1	44.3
2021	29.6	3.8	61.0	0.9	0.1	18.9

**Table 04-18.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Pronghorn	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
1997	9	22	24	1	1
2001	15	8	5	-	2
2006	25	2	54	1	6
2011	27	4	14	-	15
2016	9	3	3	-	3
2021	24	2	5	-	-
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2001	53.0 (130.9)	8.7 (21.5)	19.4 (48.0)	17.4 (43.0)*	-
2006	44.3 (109.4)	11.4 (28.1)	62.3 (153.9)	52.3 (129.1)*	-
2011	69.7 (172.1)	6.7 (16.6)	33.5 (82.8)	-	-
2016	52.3 (129.1)	4.7 (11.6)	4.7 (11.6)	-	-
2021	18.1 (44.8)	3.4 (8.3)	4.7 (11.6)	17.4 (43.0)*	-

\*Pellets per acre (ha)



**Table 04-18.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Pascopyrum smithii (western wheatgrass)	Poa secunda (Sandberg bluegrass)
year	Nested Frequency			
1997	-	373	-	6
2001	3	403	-	27
2006	-	417	-	83
2011	-	423	2	110
2016	-	433	-	15
2021	-	389	6	47
year	Average Cover (%)			
1997	-	11.7	-	0.0
2001	0.0	18.2	-	0.3
2006	-	36.8	-	1.3
2011	-	30.1	0.0	1.2
2016	-	40.0	-	0.2
2021	-	13.1	0.0	0.2

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 04-18.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum <sup>a</sup> (desert madwort)	Antennaria (pussytoes)	Astragalus convallarius (lesser rushy milkvetch)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Trifolium (clover)
year	Nested Frequency						
1997	-	-	-	-	10	10	-
2001	5	-	11	1	22	-	2
2006	-	4	2	1	35	19	1
2011	8	-	7	-	23	8	-
2016	2	-	2	-	8	9	1
2021	-	-	4	-	15	-	-
year	Average Cover (%)						
1997	-	-	-	-	0.1	0.1	-
2001	0.0	-	0.1	0.0	0.1	-	0.0
2006	-	0.1	0.0	0.0	0.3	0.1	0.0
2011	0.0	-	0.0	-	0.3	0.0	-
2016	0.0	-	0.0	-	0.0	0.0	0.0
2021	-	-	0.0	-	0.1	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 04-18.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)		
	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Atriplex falcata (sickle saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)
year	Line Intercept Cover (%)		
1997	-	-	-
2001	-	-	-
2006	4.3	0.2	0.1
2011	5.3	0.1	0.3
2016	2.9	0.4	0.2
2021	4.7	0	0.3
year	Quadrat Cover (%)		
1997	11.5	0.1	1.3
2001	11.5	0.3	0.6
2006	5.9	0.1	0.3
2011	4.9	0.2	0.4
2016	3.3	0.3	0.1
2021	5.6	0.3	0.3

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-18.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
1997	5280	40	4	69	27	49	42	10	35/55
2001	5780	60	8	49	43	29	10	11	31/51
2006	3900	80	10	45	45	42	11	40	32/53
2011	2780	-	10	59	31	22	25	34	28/49
2016	2040	-	5	73	23	26	22	10	29/43
2021	2700	1120	26	40	34	10	12	35	- / -
<b>Atriplex falcata -- (sickle saltbush)</b>									
1997	260	-	15	85	0	0	0	0	11/13
2001	980	-	33	67	0	0	0	0	8/10
2006	880	-	32	68	0	30	11	0	10/17
2011	660	-	24	76	0	3	0	0	9/21
2016	400	-	0	100	0	0	0	0	17/31
2021	780	20	21	72	8	10	54	8	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	2720	-	0	100	0	0	0	0	16/22
2001	1820	-	10	77	13	0	0	0	11/16
2006	620	-	36	52	13	13	16	13	13/17
2011	520	-	15	85	0	0	0	8	16/24
2016	300	-	27	73	0	0	0	0	19/28
2021	460	20	17	65	17	0	4	22	- / -

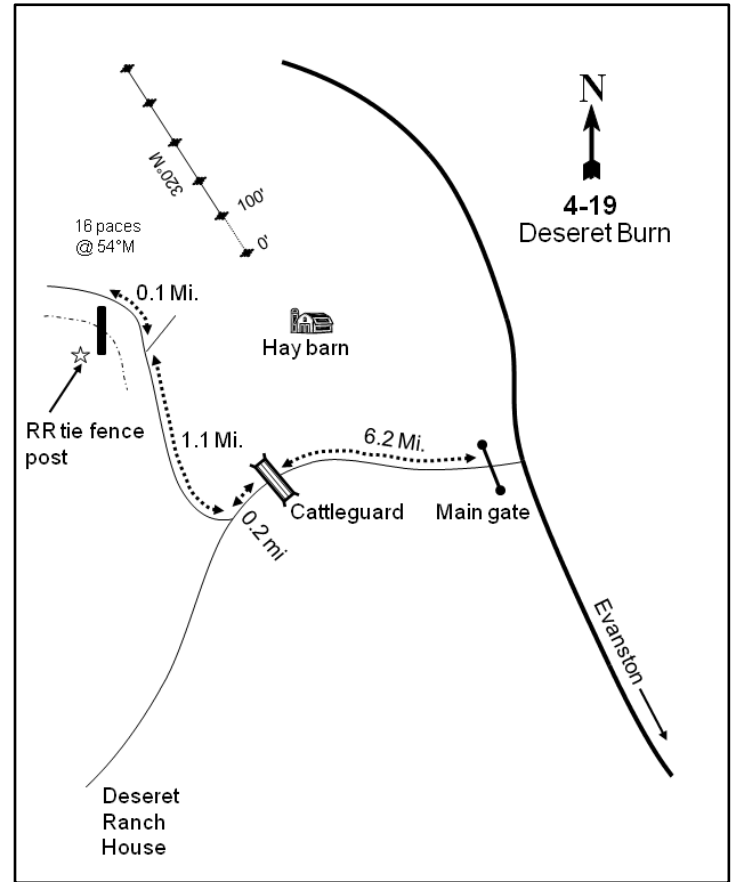
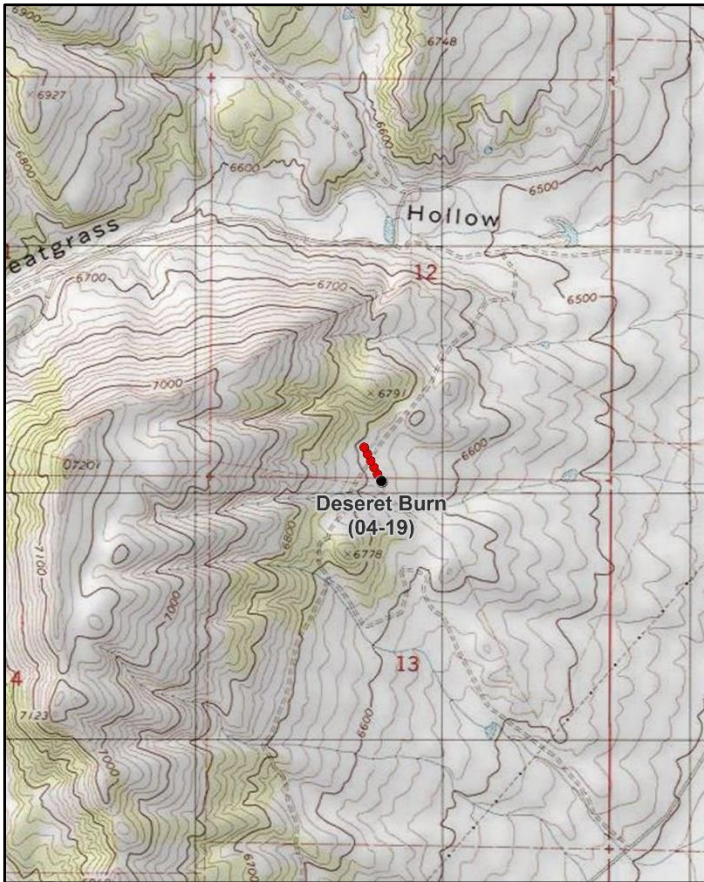
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Krascheninnikovia lanata<sup>p</sup> -- (winterfat)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2001	40	-	0	100	0	0	0	0	- / -
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Opuntia -- (pricklypear)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	7/12

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-18.15 - Deer Desirable Components Index: Semidesert Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	14.4	7.1	2.1	23.5	0.0	0.3	0.0	<b>47.3</b>	Good
2001	14.4	2.2	4.2	30.0	0.0	0.5	0.0	<b>51.3</b>	Good
2006	5.4	0.0	0.0	30.0	0.0	1.1	0.0	<b>36.4</b>	Fair
2011	6.6	5.7	5.1	30.0	0.0	0.7	0.0	<b>48.1</b>	Good
2016	3.6	0.0	0.0	30.0	0.0	0.1	0.0	<b>33.7</b>	Fair
2021	5.9	0.0	0.0	26.6	0.0	0.2	0.0	<b>32.7</b>	Fair

## DESERET BURN - STUDY NO. 04-19

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Neponset Reservoir N; Township 8N, Range 6E, Section 13  
NAD 83 UTM ZONE 12, 481691 East 4587249 North

**Transect Information**

Browse Tag # (0' Stake)	147
Transect Bearing	320° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

**Directions to Site**

From the Deseret Land and Livestock main gate on Highway 16 between Evanston and Woodruff, proceed west towards the Deseret Ranch house for 6.2 miles to a cattleguard. Continue 0.2 miles and turn right onto a two-track. Follow the two-track for 1.2 miles, staying left. The 0-foot stake is 16 paces at 54 degrees magnetic from a railroad tie in the fence line. The baseline runs at 320 degrees magnetic.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	DESERET
Elevation	6,700ft (2,042m)
Aspect	East
Slope	12%
Sample Dates	08/28/1997, 08/08/2001, 08/03/2006, 08/24/2011, 07/12/2016, 07/14/2021

**Table 04-19.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Wheat Grass	-	August 1996	630
Chaining - One-Way Unknown	Wheatgrass Hollow EFR	LTDL	Fall 1996	-
Seeding - Aerial Before	Wheatgrass Hollow EFR	LTDL	Fall 1996	-
Seeding - Dribbler	Wheatgrass Hollow EFR	LTDL	Fall 1996	-

**Table 04-19.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Wheatgrass Hollow EFR			Aerial	Sep 1996	
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass	Nordan	Infinity	NaN
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	Infinity	NaN
G	Leymus cinereus	Great Basin Wildrye		Infinity	NaN
G	Thinopyrum intermedium	Intermediate Wheatgrass		Infinity	NaN
F	Linum lewisii	Blue Flax		Infinity	NaN
F	Onobrychis viciifolia	Sainfoin		Infinity	NaN
S	Atriplex canescens	Fourwing Saltbush		Infinity	NaN
S	Bassia prostrata	Forage Kochia		Infinity	NaN
S	Krascheninnikovia lanata	Winterfat		Infinity	NaN

Mix Name			Application Type	Application Date	Acres
Wheatgrass Hollow EFR Dribbler Mix			Dribbler	Sep 1996	
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Purshia tridentata	Bitterbrush		Infinity	NaN

**Wildlife Habitat and Vegetation History****Table 04-19.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	summer	

**Table 04-19.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1997	Perennial Grass	No Encroachment
2001	Perennial Grass	No Encroachment
2006	Perennial Grass	No Encroachment
2011	Perennial Grass	No Encroachment
2016	Perennial Grass	No Encroachment
2021	Perennial Grass	No Encroachment

**Site Notes**

This study is located on Deseret Land and Livestock land approximately one and a half miles north of the ranch house. The area burned in 1996, and was aerially seeded and chained afterward; shrubs were seeded either by a dribbler or planted from root stock. The study was established to monitor vegetation recovery following the treatment. There was very little wildlife presence when the study was established in 1997, but this has since increased. An active prairie dog colony was observed on the site in 2016.

**Soils****Table 04-19.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	6.7	49.7	19.5	30.8	2.7	27.7	249.6	0.8	08/28/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Upland Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R047XA314UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1997, the vegetation on this site has existed as a perennial grass community type dominated by species such as crested wheatgrass (*Agropyron cristatum*), Sandberg bluegrass (*Poa secunda*), western wheatgrass (*Pascopyrum smithii*), and/or intermediate wheatgrass (*Thinopyrum intermedium*). The introduced annual grass species cheatgrass (*Bromus tectorum*) was abundant in 2001, but has been observed in low amounts in all other sample years (Table 04-19.7, Table 04-19.10). Aside from the introduced annual species desert madwort (*Alyssum desertorum*), forbs have remained limited and fairly homogeneous throughout the study years (Table 04-19.11). Browse on this site has been limited. A majority of the browse cover has been contributed by the increaser species yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*), the cover and density of which increased between 2016 and 2021 (Table 04-19.12, Table 04-19.13). Mule deer winter range condition has been very poor in most sample years, largely due to the absence of preferred browse species. Perennial grass cover is the only metric contributing a stabilizing influence for winter range; mule deer winter range condition was considered to be very poor in 2021 (Table 04-19.15).

**Trend Summary Tables****Table 04-19.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	0.0	0.8	-	-	-	-
2001	0.0	1.6	-	-	-	-
2006	0.3	2.3	-	0.6	2.7	-
2011	0.2	2.7	-	0.3	5.2	-
2016	1.1	3.5	-	2.2	5.0	-
2021	0.9	7.4	-	1.3	6.9	-

**Table 04-19.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	56	308	93	155	0.7	10.1	2.7	2.9
2001	295	378	311	63	6.2	17.6	1.7	1.6
2006	25	410	228	47	0.2	27.9	0.8	1.8
2011	27	412	400	12	0.1	34.6	4.6	0.1
2016	43	417	399	48	0.8	30.5	6.5	0.6
2021	21	437	87	29	0.3	23.3	0.2	0.4

**Table 04-19.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	51.0	0.5	5.6	10.3	3.8	16.3
2001	23.2	0.3	55.3	2.2	1.2	38.3
2006	25.3	0.3	38.8	2.6	1.2	40.9
2011	32.7	0.4	27.8	2.2	0.4	43.8
2016	32.0	0.9	21.7	11.8	1.5	43.0
2021	23.6	5.7	51.5	4.3	1.2	34.5

**Table 04-19.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer/Pronghorn	Rocky Mountain Elk	Shiras Moose	Rabbit
	Quadrat Frequency					
2001	13	-	5	14	-	5
2006	30	-	5	44	2	29
2011	12	-	11	21	-	49
2016	13	-	8	6	-	7
2021	14	-	12	35	-	11
Year	Days Use Per Acre (ha)					
2001	33.4 (82.5)	-	4.0 (9.9)	32.8 (81.1)	-	-
2006	54.5 (134.5)	-	2.7 (6.6)	62.3 (153.9)	-	-
2011	33.4 (82.5)	8.7 (21.5)*	6.0 (14.9)	18.7 (46.3)	-	-
2016	22.5 (55.6)	-	9.4 (23.2)	8.1 (19.9)	-	-
2021	2.9 (7.2)	-	22.8 (56.3)	16.1 (39.7)	-	-

\*Pellets per acre (ha)

**Table 04-19.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Leymus cinereus (basin wildrye)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency												
1997	3	153	-	56	22	0	7	-	47	6	144	30	93
2001	-	148	2	295	25	1	34	1	95	-	175	1	160
2006	1	216	-	25	6	3	31	0	134	-	340	-	113
2011	2	259	-	27	13	9	48	3	100	-	299	3	75
2016	7	278	-	43	19	-	28	10	138	-	139	-	58
2021	11	337	-	21	-	-	52	5	121	-	290	-	38
year	Average Cover (%)												
1997	0.2	3.5	-	0.7	0.7	0.0	0.1	-	1.1	0.2	2.1	0.5	1.7
2001	-	5.3	0.0	6.2	0.5	0.0	0.3	0.0	2.5	-	4.1	0.0	4.9
2006	0.1	8.5	-	0.2	0.0	0.0	1.2	0.0	2.1	-	11.8	-	4.0
2011	0.1	15.4	-	0.1	0.1	0.0	1.0	0.2	2.8	-	13.0	0.0	1.9
2016	0.1	19.0	-	0.8	0.1	-	1.6	1.0	4.7	-	1.8	-	2.4
2021	0.2	14.3	-	0.3	-	-	0.9	0.5	1.9	-	5.0	-	0.4

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 04-19.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Astragalus (milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Chenopodium <sup>a</sup> (goosefoot)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Erigeron (fleabane)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Gilia inconspicua <sup>a</sup> (shy gilia)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)
year	Nested Frequency																
1997	-	32	-	3	2	2	-	-	0	-	-	-	14	76	18	0	14
2001	1	-	292	-	3	1	-	-	-	2	-	1	-	-	27	-	72
2006	7	-	228	-	0	1	-	2	-	-	-	-	-	-	-	-	-
2011	-	-	400	1	3	2	-	12	-	-	-	-	-	5	-	-	7
2016	-	-	399	-	24	3	2	5	-	-	-	-	3	11	1	-	-
2021	-	-	79	-	-	1	-	14	-	4	1	-	12	-	-	-	-
year	Average Cover (%)																
1997	-	0.1	-	0.0	0.0	0.1	-	-	0.4	-	-	-	0.2	1.7	0.3	0.1	0.3
2001	0.0	-	1.4	-	0.0	0.3	-	-	-	0.0	-	0.0	-	-	0.1	-	0.2
2006	0.0	-	0.8	-	0.0	0.0	-	0.0	-	-	-	-	-	-	-	-	-
2011	-	-	4.5	0.0	0.0	0.0	-	0.1	-	-	-	-	-	0.0	-	-	0.0
2016	-	-	6.4	-	0.2	0.2	0.0	0.0	-	-	-	-	0.0	0.1	0.0	-	-
2021	-	-	0.1	-	-	0.1	-	0.0	-	0.0	0.0	-	0.1	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species



FORB SPECIES	Linum lewisii (Lewis flax)	Medicago sativa <sup>i</sup> (alfalfa)	Phlox longifolia (longleaf phlox)	Sanguisorba minor <sup>i</sup> (small burnet)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Sphaeralcea coccinea (scarlet globemallow)	Sphaeralcea grossularifolia (gooseberry/leaf globemallow)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	unknown perennial forb (unknown forb)
year	Nested Frequency								
1997	13	12	54	65	-	2	-	-	3
2001	-	17	35	4	-	3	-	4	4
2006	-	14	24	-	-	4	-	-	-
2011	-	-	7	-	-	-	-	-	-
2016	-	3	-	-	2	3	11	-	-
2021	-	2	-	-	-	3	8	1	-
year	Average Cover (%)								
1997	0.1	0.2	0.2	1.8	-	0.0	-	-	0.0
2001	-	0.6	0.1	0.0	-	0.1	-	0.0	0.3
2006	-	1.5	0.1	-	-	0.1	-	-	-
2011	-	-	0.0	-	-	-	-	-	-
2016	-	0.1	-	-	0.0	0.0	0.1	-	-
2021	-	0.1	-	-	-	0.0	0.0	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 04-19.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Atriplex canescens <sup>p</sup> (fourwing saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Opuntia (pricklypear)
year	Line Intercept Cover (%)			
1997	-	-	-	-
2001	-	-	-	-
2006	0.2	0.4	2.6	0.1
2011	0.3	-	5.1	0.1
2016	0.5	1.7	4.7	0.3
2021	1.2	0.1	6.8	0.1
year	Quadrat Cover (%)			
1997	-	0.0	0.8	-
2001	0.0	0.0	1.6	0.0
2006	0.2	0.1	2.3	0.0
2011	0.0	0.2	2.7	0.0
2016	0.7	0.4	3.5	0.0
2021	0.7	0.1	7.4	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-19.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

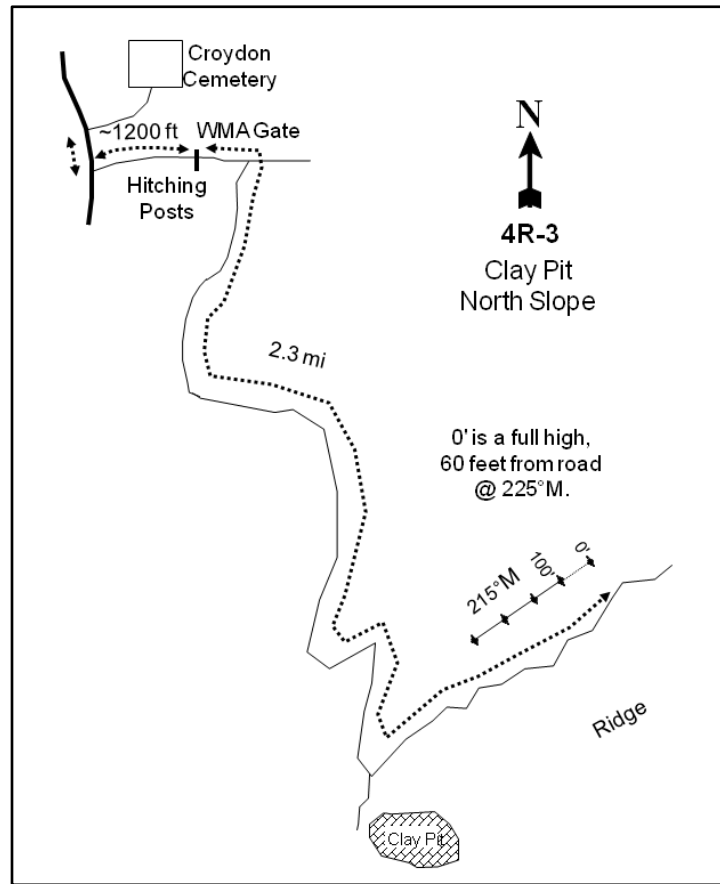
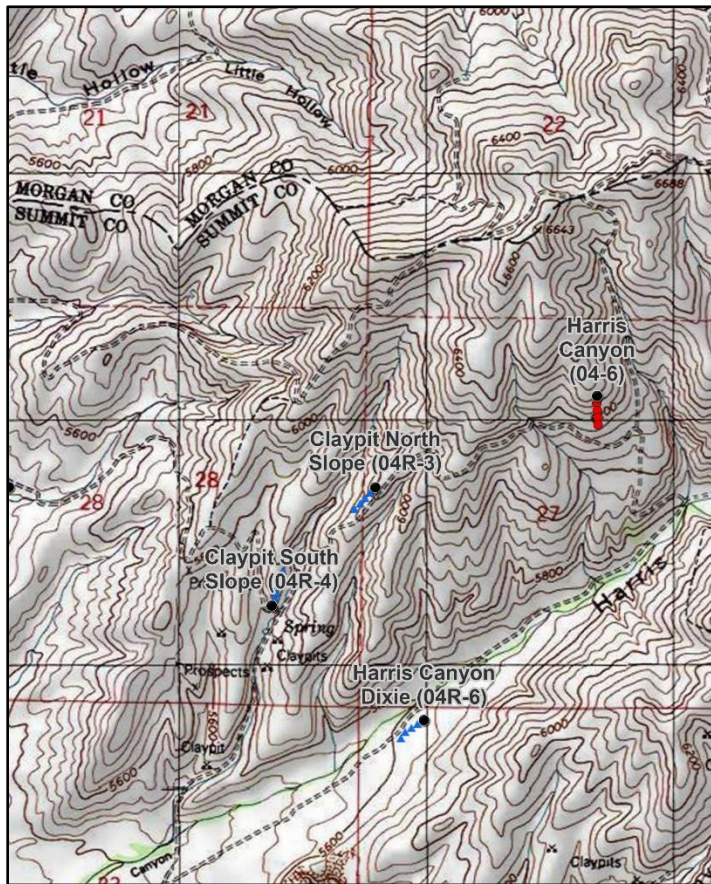
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
1997	-	-	-	-	-	-	-	-	- / -
2001	60	-	33	67	0	0	0	0	23/26
2006	60	-	0	100	0	0	100	0	29/45
2011	100	-	40	60	0	20	0	0	43/75
2016	160	60	13	88	0	50	13	0	48/86
2021	580	20	62	31	7	48	24	3	- / -
<b>Atriplex canescens<sup>p</sup> -- (fourwing saltbush)</b>									
1997	360	20	50	50	0	0	0	0	56/57
2001	100	20	20	80	0	60	0	0	49/46
2006	60	-	0	100	0	33	0	0	82/104
2011	80	-	0	100	0	75	0	0	100/123
2016	80	-	0	75	25	75	0	75	101/121
2021	40	-	0	0	100	50	0	100	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	1480	-	1	97	1	0	0	1	30/42
2001	1600	-	3	73	25	0	0	3	24/45
2006	1400	320	7	84	9	16	10	3	26/54
2011	1680	-	20	80	0	0	0	0	34/65
2016	1920	-	14	85	1	4	0	0	33/56
2021	3080	80	18	48	34	21	0	28	- / -
<b>Eriogonum microthecum<sup>p</sup> -- (slender buckwheat)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2001	20	-	0	100	0	0	0	0	- / -
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	82/44
2016	-	-	-	-	-	-	-	-	79/72
2021	-	-	-	-	-	-	-	-	-/-
<b>Krascheninnikovia lanata<sup>p</sup> -- (winterfat)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	22/27
2011	-	-	-	-	-	-	-	-	42/57
2016	-	-	-	-	-	-	-	-	37/51
2021	-	-	-	-	-	-	-	-	-/-
<b>Opuntia -- (pricklypear)</b>									
1997	40	-	0	100	0	0	0	0	8/21
2001	100	-	20	80	0	0	0	0	7/16
2006	80	20	0	100	0	0	0	0	9/32
2011	80	-	0	100	0	0	0	0	13/45
2016	120	-	17	83	0	0	0	0	13/59
2021	80	-	0	100	0	0	0	0	- / -
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	63/56

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04-19.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	0.1	0.0	0.0	20.2	-0.5	5.8	0.0	<b>25.6</b>	Very Poor
2001	0.1	0.0	0.0	30.0	-4.7	3.2	0.0	<b>28.5</b>	Very Poor
2006	0.8	0.0	0.0	30.0	-0.1	3.7	0.0	<b>34.3</b>	Very Poor-Poor
2011	0.4	0.0	0.0	30.0	0.0	0.1	0.0	<b>30.5</b>	Very Poor
2016	2.8	0.0	0.0	30.0	-0.6	1.2	0.0	<b>33.3</b>	Very Poor-Poor
2021	1.6	0.0	0.0	30.0	-0.2	0.9	0.0	<b>32.3</b>	Very Poor

## CLAYPIT NORTH SLOPE - STUDY NO. 04R-3



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Henefer SW; Township 4N, Range 4E, Section 27  
NAD 83 UTM ZONE 12, 458791 East 4544720 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

Not Available  
230° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Belt 3: No Rebar

### Directions to Site

About 250 feet from the Croydon Cemetery road, turn left onto a dirt road and drive approximately 1,200 feet to a WMA gate. From the WMA gate, drive 2.3 miles (staying right) through the first fork in the road immediately after the WMA gate. Then, where the road splits to the right to a clay mine (after a distance of about 1.8 miles), stay left until you reach a full-high 0-foot stake on the left (north) side about 60 feet from the road. There is no browse tag.

\*\*\*Quadrat cover and frequency were only read on belt 1 in 2006-2016, but in subsequent years, cover and frequency should be read on all belts.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,940ft (1,811m)
Aspect	Northwest
Slope	30%%
Sample Dates	08/30/2006, 07/06/2011, 06/22/2016, 06/15/2021

**Table 04R-03.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Insect - Aroga Moth	Aroga Moth Study	-	Approx. 2006	-

**Wildlife Habitat and Vegetation History****Table 04R-03.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	summer	

**Table 04R-03.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2006	Mountain Big Sagebrush	NA
2011	Mountain Big Sagebrush	NA
2016	Mountain Big Sagebrush	NA
2021	Mountain Big Sagebrush	NA

**Site Notes**

The study is located approximately one and a half miles southeast of Croydon in the Echo-Henefer Wildlife Management Area (WMA), north of Harris Canyon. The study samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community. The study was established in 2006 to monitor the long-term effects of the sagebrush defoliator moth (*Aroga websteri*) on the sagebrush population; the defoliator moth had affected several sagebrush populations in northern Utah. Two other studies, Claypit South Slope (04R-04) and Croydon Cemetery (04R-05), were also established in the area. On all three study sites prior to 2021, browse density and line intercept cover were read on all five belts, but cover and nested frequency were only read on belt 1: for purposes of this study, cover and frequency data were extrapolated over all five belts. In subsequent sample years (2021 and onwards), cover and frequency should be read on all five belts. The area is heavily occupied by big game.

**Soils****Table 04R-03.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.0	53.3	21.8	24.9	2.1	29.1	364.8	0.7	08/30/2006

**Site Potential**

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Upland Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R047XA314UT
States and Transitions	No state and transition model is available for this ecological site.

The plant community on this site has existed as a stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) since study establishment in 2006 (Photos, Table 04R-03.12). Most of the sagebrush had poor vigor in 2006 due the sagebrush defoliator moth, and vigor has since improved. However, 42% of sagebrush plants were considered to have poor vigor in 2021 (Table 04R-03.13), likely because of drought stress. Sagebrush loss could occur in the future if drought conditions are sustained over time. The herbaceous understory has remained abundant throughout the study period (Table 04R-03.7). Perennial grasses have been the dominant herbaceous component, with the introduced species crested wheatgrass (*Agropyron cristatum*) and native species Sandberg bluegrass (*Poa secunda*) generally contributing most of the cover (Table 04R-03.10). Forbs have fluctuated, but in 2021 perennial forbs were moderately abundant while annual forbs were rare (Table 04R-03.7, Table 04R-03.11). Mule deer winter range has ranged between fair and good condition over the sample period, largely due to high amounts of mountain big sagebrush cover. However, the sagebrush population has generally had high decadence with little recruitment in most sample years. Mule deer winter range condition was considered to be fair to good in 2021 (Table 04R-03.15). Wintering conditions could be improved by decreasing decadence and diversifying sagebrush age classes.

**Trend Summary Tables****Table 04R-03.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2006	22.9	1.8	-	14.8	2.7	-
2011	20.6	3.1	-	17.9	4.6	-
2016	21.0	4.9	-	20.0	8.6	-
2021	17.1	8.1	-	18.9	6.3	-

**Table 04R-03.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2006	-	395	185	220	-	26.3	0.6	3.8
2011	15	345	400	370	0.1	24.1	14.6	14.2
2016	50	380	370	270	3.2	29.0	7.7	5.7
2021	75	375	56	227	0.5	11.7	0.2	2.8

**Table 04R-03.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2006	8.1	5.8	51.0	4.4	4.6	58.1
2011	9.9	0.3	54.1	2.9	1.1	66.6
2016	9.6	0.9	36.1	5.0	1.1	57.3
2021	11.6	2.9	57.9	7.0	3.1	37.5

**Table 04R-03.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2006	10	40	15	25
2011	5	25	5	10
2016	-	30	-	-
2021	8	47	1	4
Year	Days Use Per Acre (ha)			
2006	2.9 (7.2)	91.8 (226.8)	15.4 (38.1)	-
2011	18.1 (44.8)	63.0 (155.6)	10.7 (26.5)	-
2016	12.3 (30.5)	49.6 (122.5)	-	-
2021	18.9 (46.6)	64.3 (158.9)	0.7 (1.7)	-

**Table 04R-03.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES									
Agropyron cristatum <sup>i</sup> (crested wheatgrass)									
Bromus tectorum <sup>ai</sup> (cheatgrass)									
Melica bulbosa (oniongrass)									
Pascopyrum smithii (western wheatgrass)									
Poa bulbosa <sup>i</sup> (bulbous bluegrass)									
Poa pratensis <sup>i</sup> (Kentucky bluegrass)									
Poa secunda (Sandberg bluegrass)									
Pseudoroegneria spicata (bluebunch wheatgrass)									
Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)									
year	Nested Frequency								
2006	260	-	-	0	-	5	255	40	20
2011	190	15	5	-	-	-	155	100	20
2016	190	50	-	-	15	-	230	55	100
2021	190	75	-	-	22	-	188	110	17
year	Average Cover (%)								
2006	15.8	-	-	0.0	-	0.1	8.8	1.2	0.3
2011	12.3	0.1	0.2	-	-	-	5.8	4.0	1.9
2016	11.3	3.2	-	-	0.8	-	13.3	2.6	1.1
2021	5.5	0.5	-	-	0.2	-	4.0	1.9	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 04R-03.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																	
Achillea millefolium (Common yarrow)																	
Agoseris glauca (pale agoseris)																	
Allium (onion)																	
Alyssum desertorum <sup>ai</sup> (desert madwort)																	
Arabis (rockcress)																	
Astragalus cibarius (browse milkvetch)																	
Calochortus nuttallii (sego lily)																	
Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)																	
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																	
Collomia linearis <sup>a</sup> (tiny trumpet)																	
Crepis acuminata (tapertip hawkbeard)																	
Cryptantha (cryptantha)																	
Cymopterus (springparsley)																	
Descurainia <sup>a</sup> (tansymustard)																	
Draba <sup>a</sup> (draba)																	
Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)																	
Helianthus annuus <sup>a</sup> (common sunflower)																	
year	Nested Frequency																
2006	-	-	30	70	25	-	-	-	135	20	-	0	25	-	-	15	-
2011	5	-	180	95	0	-	20	-	160	55	15	-	-	165	225	-	-
2016	10	-	65	105	-	-	-	10	235	10	-	-	-	20	180	55	15
2021	20	1	3	36	-	22	0	4	12	-	-	-	9	-	-	-	-
year	Average Cover (%)																
2006	-	-	0.1	0.1	0.3	-	-	-	0.3	0.1	-	0.0	0.5	-	-	0.0	-
2011	0.1	-	3.1	0.2	0.0	-	0.0	-	3.4	0.2	0.0	-	-	2.5	3.0	-	-
2016	0.2	-	0.6	3.0	-	-	-	0.1	1.2	0.1	-	-	-	0.2	0.6	0.6	0.0
2021	0.3	0.0	0.0	0.1	-	0.1	0.0	0.0	0.0	-	-	-	0.0	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES								
Lomatium triternatum (nineleaf biscuitroot)								
Microsteris gracilis <sup>a</sup> (slender phlox)								
Silene antirrhina <sup>a</sup> (sleepy silene)								
Tragopogon dubius <sup>ai</sup> (yellow salsify)								
Trifolium (clover)								
Vicia americana (American vetch)								
Viola (violet)								
Zigadenus paniculatus (foothill deathcamas)								
year	Nested Frequency							
2006	-	-	-	-	-	205	-	10
2011	55	40	270	20	15	310	45	-
2016	0	50	75	-	-	245	5	-
2021	-	11	-	3	-	162	5	44
year	Average Cover (%)							
2006	-	-	-	-	-	2.8	-	0.1
2011	0.4	0.4	4.8	0.2	0.1	9.8	0.5	-
2016	0.0	0.1	1.7	-	-	4.8	0.0	-
2021	-	0.0	-	0.0	-	2.1	0.0	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 04R-03.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES				
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)				
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)				
Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)				
Gutierrezia sarothrae (broom snakeweed)				
year	Line Intercept Cover (%)			
2006	13	2.7	1.8	-
2011	17.8	4.6	0.1	-
2016	19.8	8.6	0.2	-
2021	18.5	6.2	0.4	0.1
year	Quadrat Cover (%)			
2006	22.9	1.8	0.0	-
2011	20.6	3.1	0.0	-
2016	21.0	4.9	0.0	-
2021	17.1	8.0	0.0	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species



**Table 04R-03.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

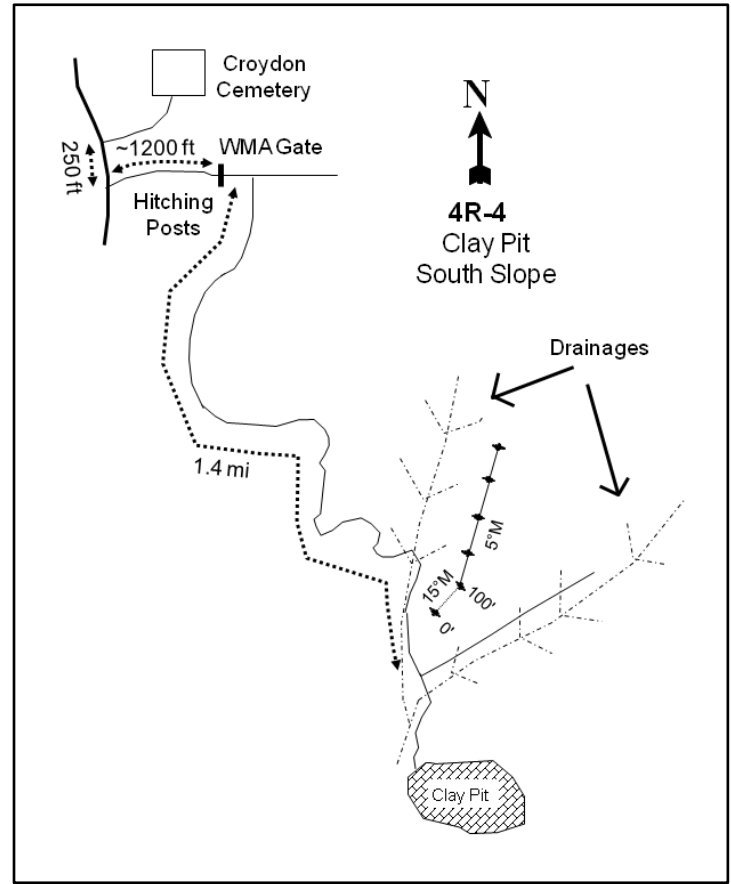
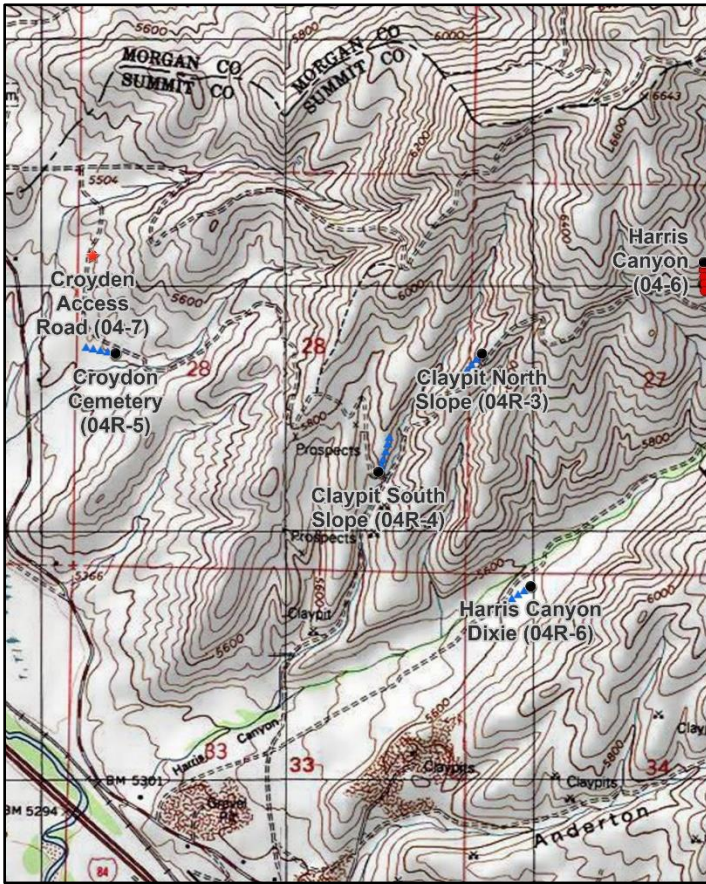
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
2006	2800	140	7	57	36	26	5	83	93/121
2011	2140	3340	3	54	43	35	2	29	85/119
2016	2600	1600	12	49	40	22	25	19	81/125
2021	2420	-	22	41	38	28	12	42	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
2006	1600	40	3	96	1	0	0	0	35/43
2011	1960	-	8	92	0	0	0	0	34/48
2016	2020	20	2	97	1	1	0	2	43/62
2021	2060	-	6	64	30	12	0	32	- / -
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
2006	40	20	0	100	0	0	0	0	88/110
2011	80	-	50	0	50	0	0	50	76/81
2016	40	-	0	100	0	0	0	0	69/101
2021	40	20	0	50	50	0	0	50	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	42/49
2016	-	-	-	-	-	-	-	-	-/-
2021	60	-	0	67	33	0	0	33	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04R-03.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2006	18.5	5.6	3.1	30.0	0.0	7.6	0.0	<b>64.8</b>	Fair-Good
2011	22.4	2.1	1.5	30.0	0.0	10.0	0.0	<b>66.0</b>	Fair-Good
2016	25.0	3.1	5.7	30.0	-2.4	10.0	0.0	<b>71.4</b>	Good
2021	23.6	3.5	10.5	22.9	-0.3	5.7	0.0	<b>65.9</b>	Fair-Good

## CLAYPIT SOUTH SLOPE - STUDY NO. 04R-4

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Henefer SW; Township 4N, Range 4E, Section 28  
NAD 83 UTM ZONE 12, 458371 East 4544241 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

Not Available  
15° magnetic (Lines 2-5: 5° magnetic)  
500ft  
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)  
Standard

**Directions to Site**

About 250 feet from the Croydon Cemetery road, turn left onto a dirt road and drive approximately 1,200 feet to a WMA gate. From the WMA gate, drive 1.4 miles (staying right) through the first fork in the road immediately after the WMA gate. Stop where two drainages meet and the road takes a sharp bend. The 0-foot stake is a full-high post on the ridge to the left (northeast). There is no browse tag.

\*\*\*Quadrat cover and frequency were only read on belt 1 in 2006-2016, but in subsequent years, cover and frequency should be read on all belts.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,700ft (1,737m)
Aspect	Southeast
Slope	20%
Sample Dates	08/30/2006, 07/06/2011, 06/22/2016, 06/15/2021

**Table 04R-04.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Scalper - Dozer	Henefer WMA Browse Scalping and Pipeline Arc C	4590	November 2018-January 2019	378
Insect - Aroga Moth	Aroga Moth Study	-	Approx. 2006	-
Seeding - Broadcast	Henefer WMA Browse Scalping and Pipeline Arc C	4590	November 2018-January 2019	378

**Table 04R-04.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Henefer WMA Browse Scalping and Pipeling Arc Clearance			Broadcast	Jan 2019	350
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
F	Achillea millefolium	Western Yarrow	Eagle	0.10	0.08
F	Linum perenne	Blue Flax		1.00	0.81
F	Medicago sativa	Alfalfa	Ladak DL	0.71	0.66
F	Sanguisorba minor	Small Burnet	Delar	0.50	0.44
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Carbon UT	0.29	0.11
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Sevier UT	1.05	0.13
S	Bassia prostrata	Forage Kochia	Beaver UT	1.00	0.79

**Wildlife Habitat and Vegetation History****Table 04R-04.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	summer	

**Table 04R-04.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2006	Annual-Perennial Grass/Mountain Big Sagebrush	NA
2011	Annual-Perennial Grass/Mountain Big Sagebrush	NA
2016	Annual-Perennial Grass/Mountain Big Sagebrush	NA
2021	Annual-Perennial Grass/Mountain Big Sagebrush	NA

**Site Notes**

The study is located approximately one and a half miles southeast of Croydon in the Echo-Henefer Wildlife Management Area (WMA), north of Harris Canyon. The study samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community within the WMA. The study was established in 2006 to monitor the long-term effects of the sagebrush defoliator moth (*Aroga websteri*) on the sagebrush population; the defoliator moth had affected several sagebrush populations in northern Utah. Two other studies, Claypit North Slope (04R-03) and Croydon Cemetery (04R-05), were also established in the area. On all three study sites prior to 2021, browse density and line intercept cover were read on all five belts, but cover and nested frequency were only read on belt 1: for purposes of this study, cover and frequency data were extrapolated over all five belts. In subsequent sample years (2021 and onwards), cover and frequency should be read on all five belts. The area is heavily occupied by big game. In 2021, it was noted that there was some confusion when distinguishing intermediate wheatgrass (*Thinopyrum intermedium*) from western wheatgrass (*Pascopyrum smithii*) due to grazing that had occurred earlier in the year.

**Soils****Table 04R-04.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.1	43.3	31.8	24.9	2.2	26.8	368.0	0.7	08/30/2006

**Site Potential**

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Upland Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA334UT
States and Transitions	No state and transition model is available for this ecological site.

Annual and perennial grasses have been dominant vegetation components on this site since study establishment in 2006. The native species western wheatgrass (*Pascopyrum smithii*) has contributed much of the perennial grass cover in most sample years, while the introduced species cheatgrass (*Bromus tectorum*) has provided a majority of the annual grass cover. Forbs have remained rare in comparison with grasses (Table 04R-04.7, Table 04R-04.10). Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) is the most abundant browse species and has been a co-dominant site component throughout the duration of the study. Sagebrush demographics have diversified following a 2018/2019 scalper treatment (Table 04R-04.1): 66% of plants were young in 2021 compared to 0% in 2016. In addition, most of the sagebrush had poor vigor in 2006 due the sagebrush defoliator moth, but vigor has since improved substantially (Table 04R-04.12, Table 04R-04.13). Mule deer winter range has ranged between very poor and poor condition over the study period, largely due to low amounts of mountain big sagebrush cover with much of the sagebrush population generally displaying high decadence and little recruitment in most sample years. Wintering conditions could be improved by decreasing sagebrush decadence and diversifying age classes; mule deer winter range condition was considered poor in 2021 (Table 04R-04.15).

**Trend Summary Tables****Table 04R-04.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2006	7.9	0.2	-	5.9	-	-
2011	3.5	0.9	-	5.2	0.1	-
2016	6.5	0.1	-	6.6	0.3	-
2021	4.1	0.0	-	5.5	0.1	-

**Table 04R-04.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2006	405	285	70	15	11.6	14.3	0.3	0.0
2011	385	370	395	150	12.9	25.6	5.8	0.8
2016	395	320	180	30	10.0	19.8	1.6	0.2
2021	361	285	195	47	6.8	7.0	2.4	1.1

**Table 04R-04.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2006	11.9	0.5	44.1	7.8	10.6	34.7
2011	13.1	0.0	41.0	10.9	11.0	46.3
2016	33.0	0.2	40.4	8.0	5.6	33.1
2021	11.1	0.0	49.9	8.2	20.1	23.8

**Table 04R-04.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2006	5	35	10	15
2011	5	-	-	-
2016	-	5	-	15
2021	3	12	1	3
Days Use Per Acre (ha)				
2006	5.8 (14.3)	46.9 (115.9)	35.5 (87.7)	-
2011	0.7 (1.8)	12.8 (31.5)	6.0 (14.9)	-
2016	2.9 (7.2)	13.4 (33.1)	-	-
2021	10.2 (25.1)	9.4 (23.2)	0.7 (1.7)	-

**Table 04R-04.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES										
Agropyron cristatum <sup>i</sup> (crested wheatgrass)										
Bromus arvensis <sup>ai</sup> (field brome)										
Bromus tectorum <sup>ai</sup> (cheatgrass)										
Pascopyrum smithii (western wheatgrass)										
Poa bulbosa <sup>i</sup> (bulbous bluegrass)										
Poa secunda (Sandberg bluegrass)										
Pseudoroegneria spicata (bluebunch wheatgrass)										
Sporobolus cryptandrus (sand dropseed)										
Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)										
Vulpia octoflora <sup>a</sup> (sixweeks fescue)										
year	Nested Frequency									
2006	25	-	405	55	-	120	45	-	165	10
2011	40	65	380	285	-	180	30	-	25	-
2016	40	15	395	265	30	-	30	-	-	-
2021	17	128	293	186	5	46	34	1	58	-
year	Average Cover (%)									
2006	2.2	-	11.6	2.3	-	1.0	2.5	-	6.3	0.0
2011	1.8	0.6	12.4	17.1	-	2.1	1.5	-	3.1	-
2016	1.2	0.1	9.9	17.6	0.1	-	0.9	-	-	-
2021	0.1	1.4	5.4	4.3	0.0	0.3	1.3	0.0	1.0	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 04R-04.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																	
Allium (onion)																	
Alyssum desertorum <sup>ai</sup> (desert madwort)																	
Artemisia ludoviciana (white sagebrush)																	
Astragalus (milkvetch)																	
Astragalus cibirius (browse milkvetch)																	
Astragalus utahensis (Utah milkvetch)																	
Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)																	
Cirsium undulatum <sup>a</sup> (wavyleaf thistle)																	
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																	
Collomia linearis <sup>a</sup> (tiny trumpet)																	
Convolvulus arvensis <sup>ai</sup> (field bindweed)																	
Cymopterus (springparsley)																	
Descurainia <sup>a</sup> (tansymustard)																	
Draba <sup>a</sup> (draba)																	
Erigeron divergens <sup>a</sup> (spreading fleabane)																	
Erigeron pumilus (shaggy fleabane)																	
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)																	
year	Nested Frequency																
2006	15	-	-	-	-	-	-	-	65	-	-	-	-	15	-	-	-
2011	100	95	-	5	-	5	65	15	-	25	-	55	220	235	-	-	-
2016	-	80	-	-	-	25	40	5	-	-	-	5	20	10	-	-	125
2021	2	27	8	3	2	5	18	3	4	-	7	1	4	-	4	5	169
year	Average Cover (%)																
2006	0.0	-	-	-	-	-	-	-	0.1	-	-	-	-	0.1	-	-	-
2011	0.5	0.4	-	0.0	-	0.0	0.1	0.8	-	0.2	-	0.3	1.2	1.3	-	-	-
2016	-	0.1	-	-	-	0.2	0.1	0.0	-	-	-	0.0	0.1	0.0	-	-	1.3
2021	0.0	0.0	0.3	0.0	0.0	0.2	0.1	0.0	0.0	-	0.1	0.0	0.0	-	0.0	0.0	2.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Helianthus annuus <sup>at</sup> (common sunflower)	Lactuca serriola <sup>at</sup> (prickly lettuce)	Linum perenne <sup>i</sup> (blue flax)	Medicago sativa <sup>i</sup> (alfalfa)	Microsteris gracilis <sup>at</sup> (slender phlox)	Sanguisorba minor <sup>i</sup> (small burnet)	Silene antirrhina <sup>a</sup> (sleepy silene)	Tragopogon dubius <sup>at</sup> (yellow salsify)	Verbascum thapsus <sup>at</sup> (common mullein)
year	Nested Frequency								
2006	5	-	-	-	-	-	5	-	-
2011	-	25	-	-	40	-	290	-	-
2016	15	-	-	-	-	-	-	-	-
2021	-	1	14	5	5	3	-	12	1
year	Average Cover (%)								
2006	0.0	-	-	-	-	-	0.0	-	-
2011	-	0.5	-	-	0.1	-	1.3	-	-
2016	0.0	-	-	-	-	-	-	-	-
2021	-	0.0	0.4	0.0	0.0	0.0	-	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 04R-04.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept Cover (%)			
2006	5.5	0.4	-	-
2011	3.2	2	-	0.1
2016	5.8	0.8	-	0.3
2021	4.5	1	0.1	-
year	Quadrat Cover (%)			
2006	4.8	3.1	0.2	-
2011	2.6	0.9	0.9	0.0
2016	3.9	2.6	0.1	0.0
2021	2.8	1.3	0.0	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04R-04.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
2006	1240	-	3	48	48	37	10	97	65/101
2011	760	-	5	50	45	26	16	40	59/97
2016	720	40	0	58	42	36	6	22	59/117
2021	1520	60	66	24	11	5	9	12	- / -
<b>Bassia prostrata<sup>pi</sup> -- (forage kochia)</b>									
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	100	-	0	100	0	80	0	0	- / -
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
2006	140	-	14	86	0	0	0	0	73/78
2011	160	-	0	75	25	13	0	38	62/87
2016	160	-	0	50	50	0	0	25	67/108
2021	1140	60	75	19	5	0	0	7	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
2006	200	-	0	100	0	0	0	0	22/26
2011	140	-	0	100	0	0	0	0	30/34
2016	40	-	0	50	50	0	0	50	35/39
2021	120	-	0	83	17	0	0	17	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
2006	220	-	18	82	0	0	0	0	13/22
2011	180	-	22	67	11	0	0	0	7/14
2016	380	-	5	95	0	0	0	0	13/30
2021	200	-	30	70	0	0	0	0	- / -

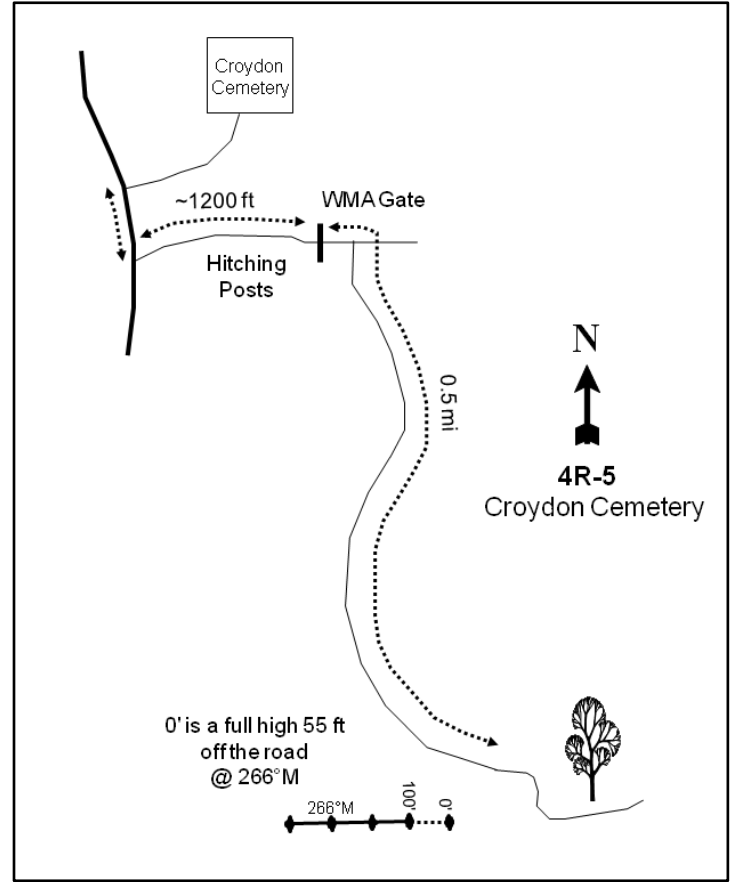
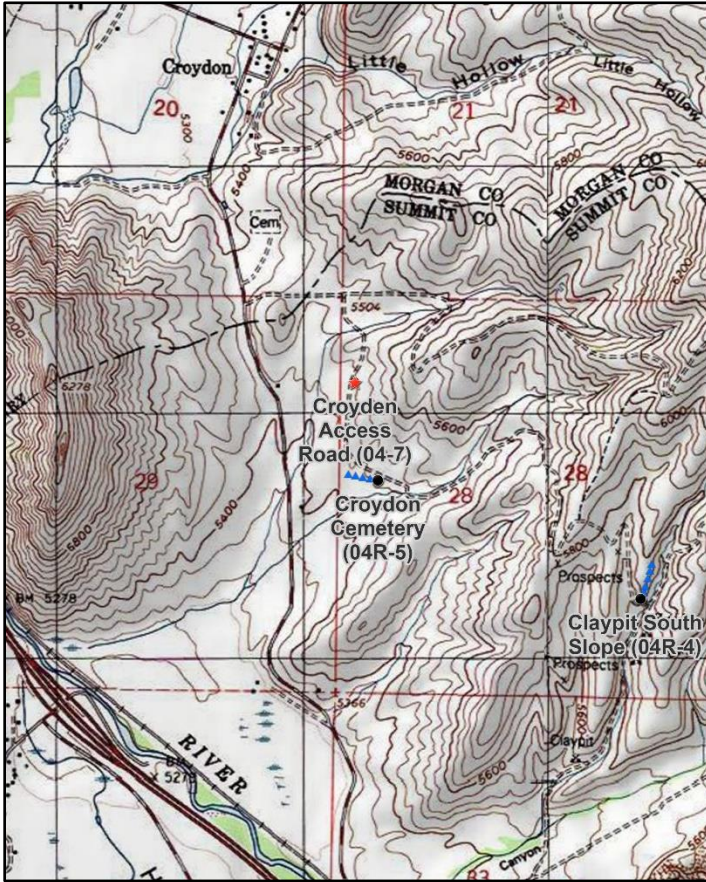
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04R-04.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2006	7.4	1.5	2.0	28.6	-8.7	0.1	0.0	<b>30.7</b>	Very Poor
2011	6.5	3.9	1.6	30.0	-9.7	1.6	0.0	<b>33.8</b>	Very Poor-Poor
2016	8.3	2.2	0.0	30.0	-7.5	0.5	0.0	<b>33.4</b>	Very Poor-Poor
2021	6.9	12.1	15.0	14.0	-5.1	2.1	-2.0	<b>43.0</b>	Poor



## CROYDON CEMETERY - STUDY NO. 04R-5



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Devils Slide SE; Township 4N, Range 4E, Section 28  
NAD 83 UTM ZONE 12, 457306 East 4544722 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

Not Available  
266° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Belt 5: 1ft

### Directions to Site

About 250 feet from the Croydon Cemetery road, turn left onto a dirt road and drive approximately 1,200 feet to a WMA gate. From the WMA gate, drive 0.5 miles (staying right) through the first fork in the road immediately after the WMA gate. The 0-foot stake is a full-high post 55 feet off of the road. There is no browse tag.

\*\*\*Quadrat cover and frequency were read only on belt 1 in 2006-2016, but in subsequent years, cover and frequency should be read on all belts.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,450ft (1,661m)
Aspect	Southwest
Slope	5%
Sample Dates	08/30/2006, 07/06/2011, 06/22/2016, 06/24/2021

**Table 04R-05.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Insect - Aroga Moth	Aroga Moth Study	-	Approx. 2006	-

**Wildlife Habitat and Vegetation History****Table 04R-05.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	summer	

**Table 04R-05.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2006	Mountain Big Sagebrush	NA
2011	Mountain Big Sagebrush	NA
2016	Mountain Big Sagebrush	NA
2021	Mountain Big Sagebrush	NA

**Site Notes**

The study is located approximately one mile southeast of Croydon in the Echo-Henefer Wildlife Management Area (WMA), north of the mouth of Harris Canyon. The study samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community in the WMA. The study was established in 2006 to monitor the long-term effects of the sagebrush defoliator moth (*Aroga websteri*) on the sagebrush population; the defoliator moth had affected several sagebrush populations in northern Utah. Two other studies, Claypit North Slope (04R-03) and Claypit South Slope (04R-04), were also established in the area. On all three study sites prior to 2021, browse density and line intercept cover were read on all five belts, but cover and nested frequency were only read on belt 1: for purposes of this study cover and frequency data were extrapolated over all five belts. In subsequent sample years (2021 and onwards), cover and frequency should be read on all five belts. The area is heavily occupied by big game.

**Soils****Table 04R-05.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.7	28.0	42.7	29.3	1.9	31.1	323.2	0.7	08/30/2006

**Site Potential**

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Upland Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R047XA314UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 2006, the plant community on this site has remained dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) (Table 04R-05.12). In 2006, most of the sagebrush had poor vigor due to the sagebrush defoliator moth, but vigor has since improved. However, 55% of plants exhibited poor vigor in 2021 (Table 04R-05.13), likely due to drought stress; sagebrush loss could potentially occur if drought conditions are sustained in the future. The herbaceous understory has remained abundant throughout the study period, but has mainly been comprised of the introduced perennial grass species crested wheatgrass (*Agropyron cristatum*) and bulbous bluegrass (*Poa bulbosa*). Forbs have remained rare (Table 04R-05.7, Table 04R-05.10, Table 04R-05.11). Mule deer winter range has ranged between very poor and fair condition over the study period, which is largely due to high cover amounts of mountain big sagebrush. However, the sagebrush population has generally had high decadence with little recruitment most in sample years; wintering conditions could be improved by decreasing sagebrush decadence and diversifying age classes. Mule deer winter range condition was considered to be very-poor to poor in 2021 (Table 04R-03.15).

**Trend Summary Tables****Table 04R-05.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2006	14.1	0.6	-	15.7	0.8	-
2011	17.2	3.1	-	20.2	4.0	-
2016	16.4	5.2	-	24.6	7.6	-
2021	11.4	4.3	-	14.3	3.5	-

**Table 04R-05.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2006	-	400	40	-	-	31.7	0.5	-
2011	20	425	205	10	0.2	39.0	3.4	0.1
2016	20	420	100	-	0.0	25.3	0.6	-
2021	102	378	94	13	0.9	13.4	0.5	0.3

**Table 04R-05.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2006	28.7	1.1	32.4	0.6	0.3	48.6
2011	30.8	0.2	36.4	0.4	-	53.4
2016	44.0	1.1	35.4	0.1	0.1	43.0
2021	27.6	1.3	53.0	1.6	0.8	28.8

**Table 04R-05.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
2006	5	20	-	-	15
2011	-	5	-	-	5
2016	-	15	-	-	5
2021	4	28	-	1	10
Days Use Per Acre (ha)					
2006	11.6 (28.7)	46.2 (114.2)	2.7 (6.6)	-	-
2011	10.2 (25.1)	2.7 (6.6)	-	-	-
2016	10.2 (25.1)	21.5 (53.0)	-	-	-
2021	8.0 (19.7)	22.8 (56.3)	-	-	-

**Table 04R-05.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES					
Agropyron cristatum <sup>i</sup> (crested wheatgrass)					
Bromus arvensis <sup>s,ii</sup> (field brome)					
Bromus tectorum <sup>ai</sup> (cheatgrass)					
Poa bulbosa <sup>i</sup> (bulbous bluegrass)					
Poa secunda (Sandberg bluegrass)					
year	Nested Frequency				
2006	280	-	-	295	35
2011	315	5	15	355	5
2016	350	20	-	305	15
2021	264	75	33	278	19
year	Average Cover (%)				
2006	11.2	-	-	20.3	0.3
2011	17.5	0.0	0.2	21.4	0.1
2016	12.3	0.0	-	12.8	0.1
2021	3.7	0.6	0.3	9.6	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 04R-05.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES														
Achillea millefolium (Common yarrow)														
Alyssum desertorum <sup>ai</sup> (desert madwort)														
Astragalus (milkvetch)														
Ceratocephala testiculata <sup>ai</sup> (curviseed butterwort)														
Cirsium undulatum <sup>a</sup> (wavyleaf thistle)														
Collomia linearis <sup>a</sup> (tiny trumpet)														
Cordylanthus <sup>a</sup> (bird's-beak)														
Erigeron pumilus (shaggy fleabane)														
Hackelia patens (spotted stickseed)														
Helianthus annuus <sup>a</sup> (common sunflower)														
Medicago sativa <sup>i</sup> (alfalfa)														
Silene antirrhina <sup>a</sup> (sleepy silene)														
Tragopogon dubius <sup>ai</sup> (yellow safsify)														
year	Nested Frequency													
2006	-	10	-	-	-	-	20	-	-	10	-	-	0	
2011	-	90	-	45	15	5	90	-	10	15	-	15	-	
2016	-	35	-	5	10	-	65	-	-	5	-	-	-	
2021	3	25	10	51	6	-	-	2	-	-	1	-	19	
year	Average Cover (%)													
2006	-	0.0	-	-	-	-	0.5	-	-	0.0	-	-	0.0	
2011	-	0.2	-	0.2	0.8	0.0	2.1	-	0.1	0.1	-	0.1	-	
2016	-	0.1	-	0.0	0.2	-	0.3	-	-	0.0	-	-	-	
2021	0.1	0.1	0.1	0.2	0.0	-	-	0.0	-	-	0.0	-	0.2	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 04R-05.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)				
	year	2006	2011	2016	2021
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <sup>p</sup> (mountain big sagebrush)	15.7	-	-	0.8	
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>viscidiflorus</i> (yellow rabbitbrush)	20.2	-	-	4	
<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>speciosa</i> <sup>p</sup> (rubber rabbitbrush)	24.6	-	0	7.6	
<i>Gutierrezia sarothrae</i> (broom snakeweed)	14.3	0.5	-	3	

SHRUB SPECIES	Quadrat Cover (%)				
	year	2006	2011	2016	2021
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <sup>p</sup> (mountain big sagebrush)	14.1	-	-	0.6	
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>viscidiflorus</i> (yellow rabbitbrush)	17.2	-	-	3.1	
<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>speciosa</i> <sup>p</sup> (rubber rabbitbrush)	16.4	-	0.0	5.2	
<i>Gutierrezia sarothrae</i> (broom snakeweed)	11.4	0.1	-	4.2	

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04R-05.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

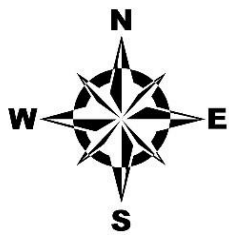
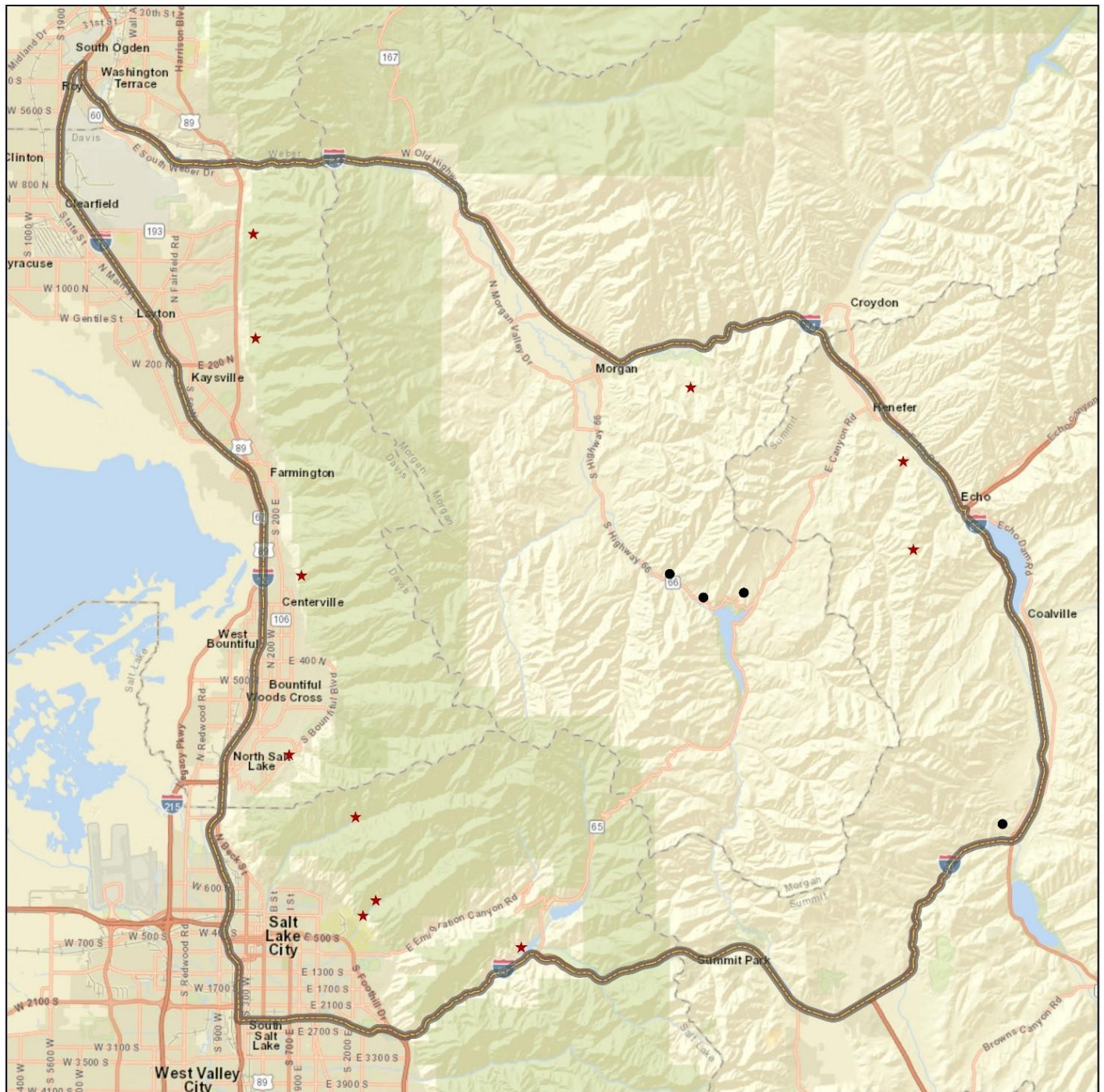
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b><i>Artemisia tridentata</i> ssp. <i>vaseyana</i><sup>p</sup> -- (mountain big sagebrush)</b>									
2006	3380	140	2	40	58	30	5	91	71/86
2011	2660	-	5	48	47	48	0	26	76/97
2016	2940	1080	8	44	48	14	2	33	69/105
2021	3880	80	19	31	50	25	1	55	- / -
<b><i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>viscidiflorus</i> -- (yellow rabbitbrush)</b>									
2006	140	-	0	100	0	43	29	0	24/34
2011	200	-	0	100	0	0	0	0	33/51
2016	220	-	0	91	9	0	0	9	39/53
2021	120	-	0	50	50	33	0	50	- / -
<b><i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>speciosa</i><sup>p</sup> -- (rubber rabbitbrush)</b>									
2006	20	-	100	0	0	0	0	0	141/187
2011	40	-	0	100	0	0	0	0	56/97
2016	20	-	0	0	100	0	0	100	76/133
2021	20	-	100	0	0	0	0	0	- / -
<b><i>Gutierrezia sarothrae</i> -- (broom snakeweed)</b>									
2006	1040	20	6	94	0	0	0	0	22/26
2011	2800	-	7	91	2	0	0	1	29/36
2016	10920	40	7	93	0	2	0	0	26/28
2021	16660	-	7	87	7	10	0	7	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 04R-05.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2006	19.6	-2.4	0.9	22.9	0.0	0.0	0.0	<b>41.0</b>	Poor
2011	25.3	1.0	2.7	30.0	-0.2	0.2	0.0	<b>58.9</b>	Fair
2016	30.0	0.7	4.1	24.8	0.0	0.0	0.0	<b>59.6</b>	Fair
2021	17.9	0.0	9.3	7.6	-0.7	0.6	0.0	<b>34.6</b>	Very Poor-Poor

# WILDLIFE MANAGEMENT UNIT 5 - EAST CANYON

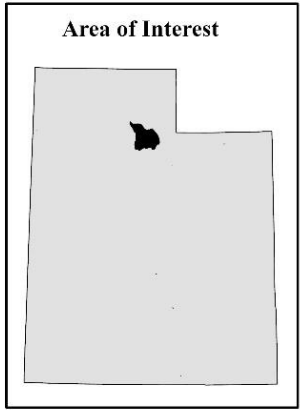


**Study Locations  
Project, Status**

- RT, Active
- ★ RT, Suspended

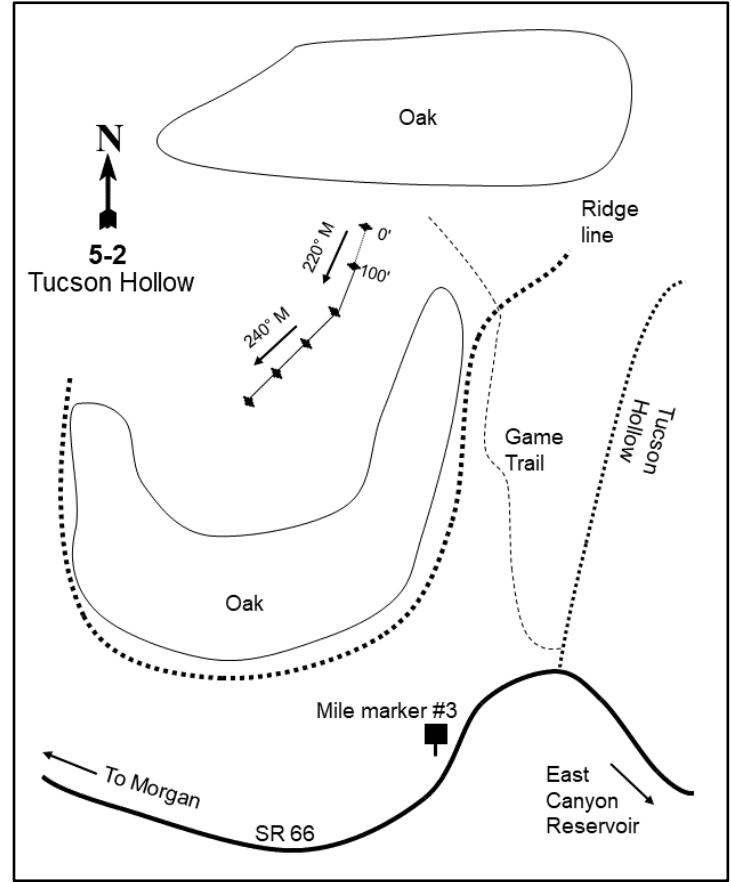
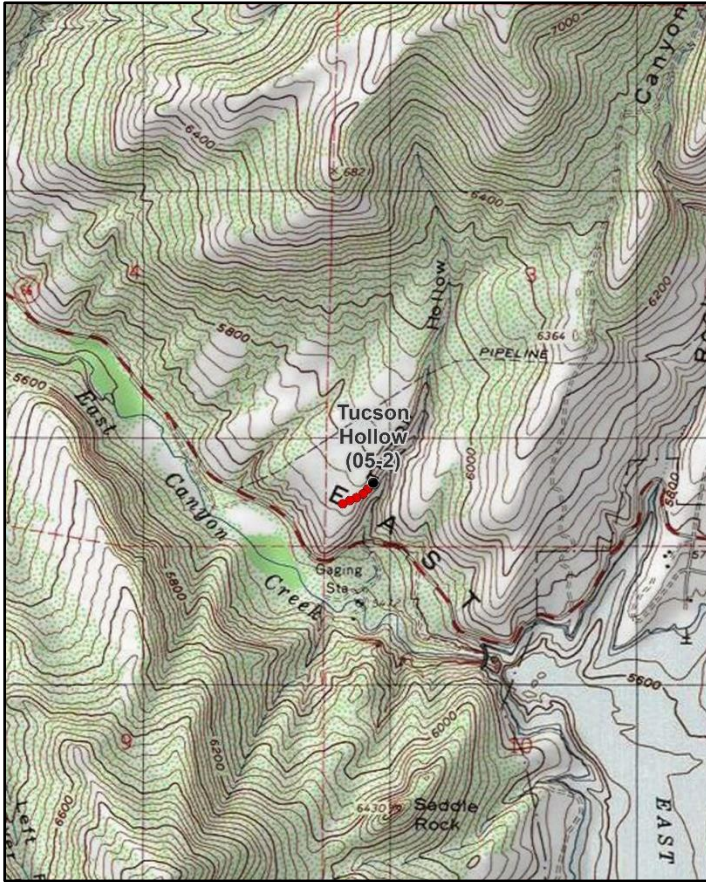
**Unit Boundary**

- ▭ Unit - 5



Credits: Esri, HERE, Garmin, NGA, USGS, NPS

## TUCSON HOLLOW - STUDY NO. 05-2

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

East Canyon Reservoir; Township 2N, Range 3E, Section 03  
NAD 83 UTM ZONE 12, 448864 East 4530807 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

7973  
220° magnetic (Lines 3-5: 240° magnetic)  
500ft  
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)  
No Rebar

**Directions to Site**

From the dam at East Canyon Reservoir, proceed 0.2 miles northwest past Tucson Hollow and stop near mile marker 3. Walk up the slope following a game trail (to the northeast) to the plateau. Walk through the oak stand bordering the ridgeline, continuing northeast to an opening in the oak. Look for a full-high fence post on the north side of the opening: this full-high fence post is the 0-foot stake. The baseline runs at 220 degrees magnetic. At the 200-foot baseline stake the baseline doglegs and runs at 240 degrees magnetic.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,720ft (1,743m)
Aspect	South
Slope	3%
Sample Dates	07/10/1996, 06/12/2001, 06/14/2006, 06/21/2011, 06/21/2016, 06/21/2021

**Wildlife Habitat and Vegetation History****Table 05-02.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

**Table 05-02.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1996	Mountain Big Sagebrush/Annual Grass	NA
2001	Mountain Big Sagebrush/Perennial Grass	NA
2006	Mountain Big Sagebrush/Perennial Grass-Forb	NA
2011	Mountain Big Sagebrush/Perennial Grass-Forb	NA
2016	Mountain Big Sagebrush/Annual Grass	NA
2021	Perennial Grass-Forb/Mountain Big Sagebrush	NA

**Site Notes**

This study is located on a nearly level bench just northwest of East Canyon Reservoir. It was originally placed in a nearby thick patch of Gambel oak (*Quercus gambelii*) brush. Because there was very little apparent utilization in the dense oak, the study was moved just south of the original study in 1996. The study now samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass opening about 25 to 30 acres in size that is surrounded on three sides by oak clones. In 2016, deer were present on and around the site at time of surveying.

**Soils****Table 05-02.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.5	33.9	37.1	29.0	4.2	29.8	304.0	0.6	07/10/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

This study site has had a dominant browse component of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and a diverse and abundant herbaceous understory in all sample years; cover and density of sagebrush have exhibited an overall decreasing trend. In addition, 57% of sagebrush plants showed signs of poor vigor in 2021, possibly due to drought stress. Loss of sagebrush as a dominant component could potentially occur if similar climatic conditions are sustained in the future. Other valuable browse species including antelope bitterbrush (*Purshia tridentata*) and Utah serviceberry (*Amelanchier utahensis*) have been present in lesser amounts (Photos, Table 05-02.12, Table 05-02.13). Herbaceous composition has been variable over the study period, and dominant components have fluctuated between annual grasses such as field brome (*Bromus arvensis*) and cheatgrass (*B. tectorum*); perennial grasses, mainly Sandberg bluegrass (*Poa secunda*); and perennial and annual forbs. The introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) has been present in the understory since 2001 and contributed moderate amounts of cover in 2021 (Table 05-02.7, Table 05-02.10, Table 05-02.11). Mule deer winter range has ranged between fair and very poor condition over the sample years, which is due to large fluctuations of annual and perennial grasses. Preferred browse species, namely sagebrush, have generally been in fair condition in most sample years. Mule deer winter range condition is considered to be poor as of 2021 (Table 05-02.15).



**Trend Summary Tables****Table 05-02.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	12.4	9.4	-	-	-	-
2001	12.4	10.5	-	-	-	-
2006	13.7	10.1	-	17.2	11.9	-
2011	10.1	10.2	-	11.1	10.0	-
2016	8.4	9.6	-	14.8	11.8	-
2021	6.6	9.5	-	7.8	10.0	-

**Table 05-02.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	449	181	182	155	19.2	4.5	3.7	8.2
2001	199	371	295	319	2.9	26.0	10.4	19.1
2006	357	288	271	276	10.1	16.1	3.1	20.7
2011	297	281	368	347	10.1	21.1	17.5	24.8
2016	437	91	350	248	43.9	3.7	17.3	17.4
2021	195	343	208	246	3.8	22.5	4.9	20.1

**Table 05-02.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	3.4	0.0	68.3	0.7	1.4	57.3
2001	3.3	-	51.9	0.3	1.6	72.3
2006	3.5	0.2	46.6	0.4	1.2	67.8
2011	4.1	0.0	38.0	0.1	1.3	78.1
2016	2.5	-	39.7	0.1	0.8	82.5
2021	4.5	0.0	47.5	0.7	1.3	59.0

**Table 05-02.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	-	17	5	6
2001	1	17	1	1
2006	-	32	-	7
2011	-	8	-	1
2016	1	9	-	5
2021	-	16	2	10
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	-	30.8 (76.1)	0.7 (1.7)	-
2006	-	69.0 (170.5)	24.1 (59.6)	-
2011	-	6.7 (16.6)	8.1 (19.9)	-
2016	-	11.4 (28.1)	0.7 (1.7)	-
2021	0.7 (1.8)	56.3 (139.0)	-	-

**Table 05-02.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency											
<i>Aegilops cylindrica</i> <sup>ani</sup> (jointed goatgrass)												
<i>Bromus arvensis</i> <sup>ai</sup> (field brome)												
<i>Bromus tectorum</i> <sup>ai</sup> (cheatgrass)												
<i>Elymus lanceolatus</i> (thickspike wheatgrass)												
<i>Leymus cinereus</i> (basin wildrye)												
<i>Melica bulbosa</i> (oniongrass)												
<i>Poa bulbosa</i> <sup>i</sup> (bulbous bluegrass)												
<i>Poa pratensis</i> <sup>i</sup> (Kentucky bluegrass)												
<i>Poa secunda</i> (Sandberg bluegrass)												
<i>Pseudoroegneria spicata</i> (bluebunch wheatgrass)												
<i>Thinopyrum intermedium</i> <sup>i</sup> (intermediate wheatgrass)												
year	Average Cover (%)											
1996	-	344	216	-	2	-	-	19	141	33	-	-
2001	-	114	136	4	1	5	41	71	315	33	3	-
2006	-	150	334	19	8	21	49	25	220	32	-	-
2011	-	180	177	3	3	9	93	117	122	73	-	-
2016	14	267	405	0	3	5	22	8	63	8	1	-
2021	9	55	162	-	-	13	154	-	275	42	2	-
year	Average Cover (%)											
1996	-	14.8	4.4	-	0.0	-	-	0.3	3.2	1.1	-	-
2001	-	0.7	2.2	0.0	0.6	0.1	1.5	2.2	19.8	1.7	0.1	-
2006	-	0.7	9.5	0.0	0.5	0.4	1.6	0.6	10.6	2.2	-	-
2011	-	6.0	4.1	0.1	0.9	0.4	4.2	3.0	8.2	4.4	-	-
2016	0.1	11.0	32.8	0.0	0.7	0.1	1.0	0.1	0.7	1.1	0.0	-
2021	0.0	0.4	3.3	-	-	1.0	5.1	-	13.5	2.9	0.0	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 05-02.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
<i>Achillea millefolium</i> (Common yarrow)																	
<i>Agoseris glauca</i> (pale agoseris)																	
<i>Allium acuminatum</i> (tapertip onion)																	
<i>Alyssum desertorum</i> <sup>ai</sup> (desert madwort)																	
<i>Artemisia ludoviciana</i> (white sagebrush)																	
<i>Astragalus convallarius</i> (lesser rushy milkvetch)																	
<i>Balsamorhiza hookeri</i> (Hooker's balsamroot)																	
<i>Balsamorhiza macrophylla</i> (cutleaf balsamroot)																	
<i>Balsamorhiza sagittata</i> (arrowleaf balsamroot)																	
<i>Camelina microcarpa</i> <sup>ai</sup> (littletop false flax)																	
<i>Ceratocephala testiculata</i> <sup>ai</sup> (curvseed butterwort)																	
<i>Cirsium undulatum</i> <sup>a</sup> (wavyleaf thistle)																	
<i>Collinsia parviflora</i> <sup>a</sup> (maiden blue eyed Mary)																	
<i>Collomia grandiflora</i> <sup>a</sup> (grand collomia)																	
<i>Comandra umbellata</i> (bastard toadflax)																	
<i>Crepis acuminata</i> (tapertip hawksbeard)																	
<i>Cryptantha</i> <sup>a</sup> (annual cryptantha)																	
year	Average Cover (%)																
1996	49	-	-	17	-	3	-	11	-	3	-	24	-	5	17	6	-
2001	61	16	137	65	1	15	-	14	5	17	7	4	117	6	24	14	-
2006	69	19	33	57	-	10	-	13	4	13	21	3	53	9	22	1	-
2011	96	7	194	146	-	1	-	17	8	5	14	0	37	4	16	8	-
2016	58	5	72	212	3	3	-	13	9	15	6	-	27	-	20	2	15
2021	74	12	29	28	-	6	1	6	2	13	17	-	49	1	36	8	-
year	Average Cover (%)																
1996	1.0	-	-	0.1	-	0.1	-	0.9	-	0.0	-	0.3	-	0.0	0.2	0.1	-
2001	1.9	0.1	1.4	0.7	0.0	0.3	-	2.1	0.8	0.1	0.0	0.1	1.1	0.0	0.4	0.6	-
2006	3.7	0.2	0.1	0.1	-	0.1	-	2.4	0.5	0.0	0.1	0.0	0.2	0.0	0.4	0.2	-
2011	6.0	0.0	3.2	2.0	-	0.0	-	1.8	0.2	0.0	0.1	0.0	0.3	0.0	0.1	0.0	-
2016	2.1	0.0	0.7	3.0	0.0	0.1	-	1.9	0.7	0.1	0.0	-	0.1	-	0.1	0.1	0.1
2021	2.6	0.1	0.2	0.1	-	0.0	0.4	0.8	0.7	0.3	0.2	-	0.6	0.0	0.5	0.2	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nested Frequency																	
<i>Cynoglossum officinale</i> <sup>ani</sup> (gypsoflower)	4	28	2	-	-	23	57	12	-	29	5	-	0	8	28	12	-	
<i>Descurainia pinnata</i> <sup>a</sup> (western tansymustard)	4	-	10	3	5	29	-	19	5	22	48	-	-	-	37	-	-	
<i>Draba</i> <sup>a</sup> (draba)	3	-	46	108	11	59	-	28	-	4	34	-	-	-	41	-	-	
<i>Epilobium brachycarpum</i> <sup>a</sup> (tall annual willowherb)	-	20	89	80	30	104	9	42	-	44	172	23	6	-	41	-	-	
<i>Erodium cicutarium</i> <sup>ai</sup> (redstem stork's bill)	-	4	6	11	108	70	4	51	-	5	17	-	-	-	27	-	-	
<i>Galium aparine</i> <sup>a</sup> (stickywilly)	-	-	-	2	72	33	-	51	-	2	-	-	8	-	19	-	4	
<i>Gayophytum ramosissimum</i> <sup>a</sup> (pinyon groundsmoke)	Average Cover (%)																	
<i>Helianthella uniflora</i> (oneflower helianthella)	0.2	0.6	0.0	-	-	0.2	0.6	1.8	-	0.1	0.2	-	0.0	0.0	1.9	0.1	-	
<i>Heterotheca villosa</i> (hairy false goldenaster)	0.1	-	0.0	0.0	0.1	0.6	-	1.9	1.6	0.8	0.1	-	-	-	3.3	-	-	
<i>Lactuca serriola</i> <sup>ai</sup> (prickly lettuce)	0.0	-	0.1	0.7	0.2	0.5	-	6.0	-	0.0	0.1	-	-	-	2.7	-	-	
<i>Lappula occidentalis</i> <sup>a</sup> (flatspine stickseed)	-	0.2	1.2	2.6	0.4	2.8	0.0	5.3	-	0.7	2.3	0.1	0.2	-	2.0	-	-	
<i>Lithophragma</i> (woodland-star)	-	0.0	0.0	0.3	1.7	2.2	0.3	7.0	-	0.1	0.4	-	-	-	2.2	-	-	
<i>Lithospermum ruderale</i> (western stone seed)	-	-	-	0.0	1.0	0.6	-	8.9	-	0.0	-	-	0.3	-	0.7	-	0.0	
<i>Lomatium</i> (desertparsley)	Nested Frequency																	
<i>Lupinus argenteus</i> (silvery lupine)	1996	2001	2006	2011	2016	2021	1996	2001	2006	2011	2016	2021	1996	2001	2006	2011	2016	2021
<i>Machaeranthera canescens</i> (hoary tansyaster)	4	-	-	-	-	-	0.2	0.1	0.0	-	-	-	0.2	0.1	0.0	-	-	-
<i>Medicago sativa</i> <sup>i</sup> (alfalfa)	-	-	-	-	-	-	0.6	-	-	-	-	-	0.6	-	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nested Frequency													
<i>Melilotus officinalis</i> <sup>i</sup> (sweetclover)	-	-	-	-	51	-	18	13	27	-	41	-	21	
<i>Microsteris gracilis</i> <sup>a</sup> (slender phlox)	-	-	-	22	6	2	25	33	50	12	153	-	117	
<i>Nemophila breviflora</i> <sup>a</sup> (basin nemophila)	1	39	8	-	49	1	56	12	30	6	31	-	155	
<i>Phlox longifolia</i> (longleaf phlox)	-	45	8	-	43	9	56	29	27	30	48	23	150	
<i>Polygonum douglasii</i> <sup>a</sup> (Douglas' knotweed)	2	7	4	5	2	4	4	137	18	21	30	10	116	
<i>Senecio integerrimus</i> <sup>a</sup> (lambstongue ragwort)	-	29	-	1	14	-	4	60	5	1	27	7	139	
<i>Silene antirrhina</i> <sup>a</sup> (sleepy silene)	Average Cover (%)													
<i>Sisymbrium altissimum</i> <sup>ai</sup> (tall tumblemustard)	-	-	-	-	0.2	-	0.4	0.3	2.0	-	0.6	-	0.1	
<i>Symphoricarum ascendens</i> (western aster)	-	-	-	0.1	0.0	0.0	0.7	1.2	1.8	0.2	4.6	-	2.6	
<i>Taraxacum officinale</i> (common dandelion)	0.1	0.1	0.1	-	0.1	0.1	0.2	0.3	0.8	0.3	0.2	-	3.1	
<i>Tragopogon dubius</i> <sup>ai</sup> (yellow safsify)	-	0.5	0.2	-	0.4	0.4	0.5	0.6	1.0	0.4	1.2	1.1	4.5	
<i>Veronica bilobata</i> <sup>ai</sup> (two-lobed speedwell)	0.0	0.2	0.0	0.0	0.0	0.1	0.0	8.3	0.4	0.2	0.4	0.1	1.7	
<i>Vicia americana</i> (American vetch)	-	0.1	-	0.0	0.1	-	0.0	1.1	0.2	0.0	0.3	0.6	4.5	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 05-02.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Rosa woodsii <sup>p</sup> (Wood's rose)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)
year	Line Intercept Cover (%)								
1996	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-
2006	0.1	10.5	8.8	0.3	-	3.1	4.8	-	1.5
2011	0.2	6.1	5.6	0.3	-	4.4	3.1	-	1.4
2016	0.2	8.4	4.4	0.2	-	7.4	4.1	-	1.9
2021	0.8	2.4	4	-	-	6	3.5	-	1.1
year	Quadrat Cover (%)								
1996	0.2	6.7	6.9	0.4	-	2.5	4.1	-	1.1
2001	0.0	7.7	8.6	-	0.0	1.9	3.7	-	0.9
2006	0.1	9.4	6.8	0.0	-	3.3	2.5	-	1.8
2011	0.0	6.5	4.8	0.0	0.8	4.7	2.1	-	1.5
2016	0.0	5.0	3.4	0.0	0.1	6.1	2.3	-	1.1
2021	0.1	1.4	2.6	0.4	-	6.9	2.6	0.1	1.9

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 05-02.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	40	-	0	100	0	50	50	0	69/73
2001	60	-	33	67	0	0	67	0	86/72
2006	40	-	0	100	0	50	50	0	89/81
2011	20	-	0	100	0	0	100	0	123/103
2016	40	-	0	50	50	0	100	50	136/100
2021	60	-	0	67	33	0	100	33	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	1400	-	6	76	19	31	0	9	67/90
2001	1220	-	0	85	15	5	0	8	81/95
2006	860	140	5	72	23	42	12	5	85/114
2011	1020	-	26	59	16	22	0	14	75/102
2016	660	-	6	64	30	12	27	24	93/120
2021	420	-	19	24	57	38	14	57	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	1620	-	1	96	3	1	0	0	51/94
2001	1740	-	1	94	5	0	0	0	53/84
2006	1540	-	4	70	26	4	0	5	52/79
2011	1120	-	11	89	0	0	0	0	33/63
2016	1300	-	0	100	0	8	8	2	45/64
2021	1320	-	5	73	23	30	3	23	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1996	60	-	33	67	0	0	0	33	135/173
2001	-	-	-	-	-	-	-	-	-/-
2006	60	-	33	67	0	0	0	0	85/104
2011	20	-	0	100	0	0	0	0	58/84
2016	60	-	0	100	0	0	0	0	64/82
2021	40	-	0	100	0	50	0	0	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	-	-	-	-	-	-	-	-	31/23
2001	60	-	0	100	0	0	0	0	-/-
2006	20	-	0	100	0	0	0	0	30/43
2011	140	-	29	71	0	14	0	0	32/39
2016	-	-	-	-	-	-	-	-	22/31
2021	-	-	-	-	-	-	-	-	-/-
<b>Mahonia repens -- (creeping barberry)</b>									
1996	8680	80	16	84	0	0	0	0	11/16
2001	18740	-	4	96	0	0	0	0	10/13
2006	16360	-	3	97	0	0	0	0	9/12
2011	17720	-	0	100	0	0	0	4	11/15
2016	22420	-	0	100	0	0	0	0	13/14
2021	26880	-	8	92	0	0	0	0	-/-
<b>Prunus virginiana<sup>P</sup> -- (chokecherry)</b>									
1996	-	-	-	-	-	-	-	-	53/39
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	186/168
2016	-	-	-	-	-	-	-	-	82/80
2021	-	-	-	-	-	-	-	-	-/-
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1996	200	-	0	100	0	0	100	0	104/158
2001	180	-	0	44	56	11	56	22	87/169
2006	260	-	23	62	15	0	46	8	86/149
2011	200	-	0	100	0	60	10	0	84/170
2016	340	-	6	53	41	6	88	24	86/135
2021	280	-	0	50	50	14	64	50	-/-
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	197/144
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	121/111
2021	-	-	-	-	-	-	-	-	-/-
<b>Rosa woodsii<sup>P</sup> -- (Woods' rose)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	40/27
2016	-	-	-	-	-	-	-	-	43/26
2021	60	-	0	100	0	0	0	0	-/-

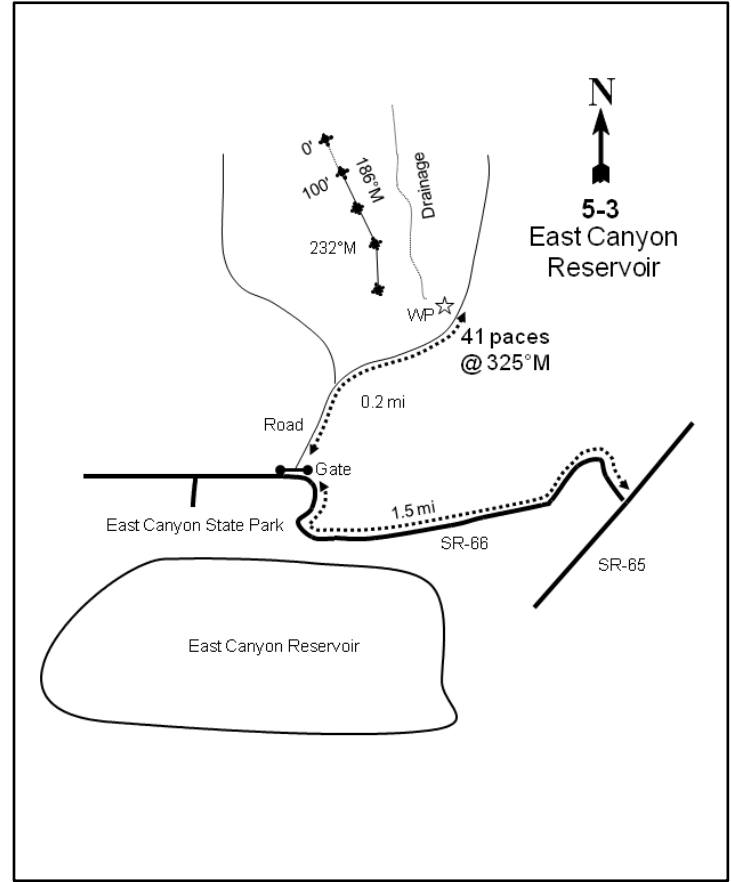
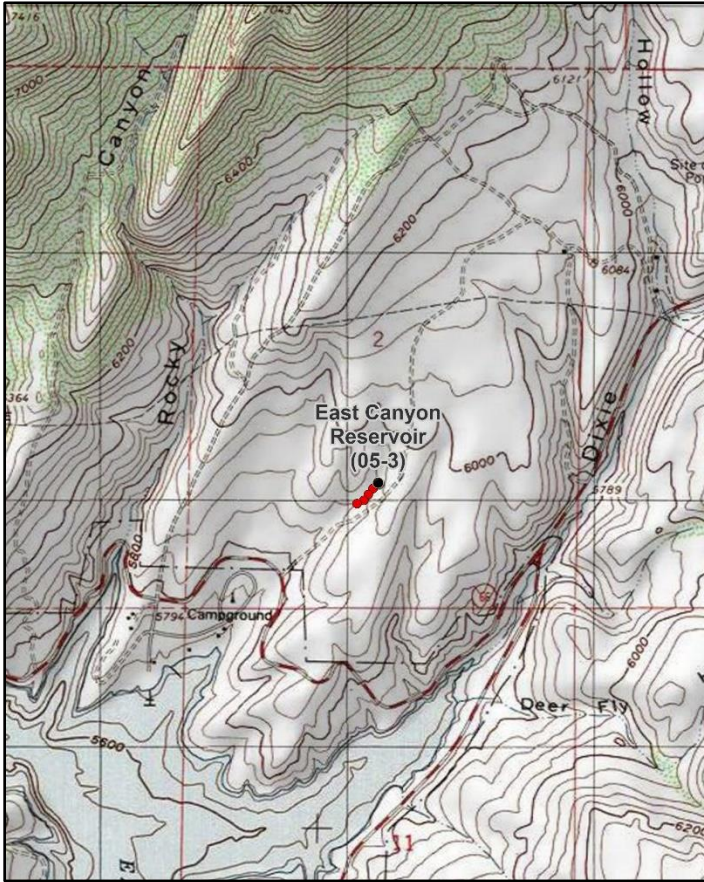
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Sambucus nigra ssp. cerulea<sup>p</sup> -- (blue elderberry)</b>									
1996	-	-	-	-	-	-	-	-	235/207
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	175/177
2016	-	-	-	-	-	-	-	-	188/195
2021	-	-	-	-	-	-	-	-	-/-
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	240	-	17	83	0	0	17	0	50/75
2001	140	-	0	100	0	0	0	0	61/110
2006	160	-	13	75	13	0	0	13	63/118
2011	120	-	0	100	0	0	0	0	77/154
2016	160	-	25	75	0	0	0	0	85/132
2021	200	-	10	90	0	30	0	0	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 05-02.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	16.3	12.0	2.8	9.0	-14.4	10.0	-2.0	<b>33.7</b>	Very Poor
2001	16.2	7.2	0.0	30.0	-2.1	10.0	-2.0	<b>59.2</b>	Fair
2006	22.4	9.1	5.5	28.9	-7.6	10.0	-2.0	<b>66.2</b>	Fair
2011	14.4	12.4	7.0	30.0	-7.6	10.0	0.0	<b>66.2</b>	Fair
2016	19.1	6.2	4.2	5.4	-20.0	10.0	-2.0	<b>22.8</b>	Very Poor
2021	10.6	2.0	3.6	30.0	-2.8	10.0	-2.0	<b>51.3</b>	Poor

## EAST CANYON RESERVOIR - STUDY NO. 05-3

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

East Canyon Reservoir; Township 2N, Range 3E, Section 02  
NAD 83 UTM ZONE 12, 451058 East 4531059 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

7968  
186° magnetic (Lines 3-5: 232° magnetic)  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Standard

**Directions to Site**

Begin to note mileage at the junction of U-65 and U-66. Proceed towards Porterville on U-66 for 1.15 miles to a gate on the right (north) side of the road; there should be a picnic/campground area on left (south) side of the road. Proceed through the gate on foot (gate is locked) and walk 0.2 miles to the witness post on the left-hand (west) side of the road. From the witness post, the 400-foot baseline stake is 41 paces away at 325 degrees magnetic. The 0-foot baseline stake is 400 feet to the northwest and is marked by browse tag #7968. The baseline runs at 186 degrees, but doglegs at the 300-foot baseline stake and runs at 232 degrees magnetic.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,900ft (1,798m)
Aspect	Southeast
Slope	20%
Sample Dates	07/10/1996, 06/20/2001, 06/14/2006, 06/22/2011, 06/21/2016, 06/22/2021

**Wildlife Habitat and Vegetation History****Table 05-03.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing

**Table 05-03.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Mountain Big Sagebrush	NA
1990	Mountain Big Sagebrush	NA
1996	Mountain Big Sagebrush/Perennial Grass-Forb	NA
2001	Mountain Big Sagebrush/Perennial Grass	NA
2006	Mountain Big Sagebrush/Perennial Grass	NA
2011	Mountain Big Sagebrush/Perennial Grass	NA
2016	Mountain Big Sagebrush/Annual-Perennial Grass	NA
2021	Perennial Grass/Mountain Big Sagebrush	NA

**Site Notes**

This study is located immediately north of East Canyon Reservoir. The vegetation is comprised of a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass community with a substantial amount of antelope bitterbrush (*Purshia tridentata*) also present. In 2016, a deer carcass was found on the site.

**Soils****Table 05-03.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.3	48.7	28.0	23.3	2.4	20.6	163.2	0.4	07/10/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been the dominant browse species on this site since study establishment in 1984, although cover and density have decreased over time. In addition, 42% of sagebrush plants were considered to have poor vigor in 2021, possibly due to drought stress. Further decreases in density and cover of sagebrush could potentially occur if similar climatic conditions are sustained in the future. Antelope bitterbrush (*Purshia tridentata*) has also been present to a lesser extent and has been heavily browsed in most sample years (Photos, Pre-1992 Data, Table 05-03.12, Table 05-03.13). The herbaceous understory has fluctuated over the study period, but dominant components have varied between annual grasses such as cheatgrass (*Bromus tectorum*); perennial grasses, particularly the introduced species bulbous bluegrass (*Poa bulbosa*); and perennial forbs since the 1996 sample year. It should be noted, however, that due to differences in sampling methods, it is difficult to tell whether annual grass was also a dominant component in 1984 and 1990 (Pre-1992 Data, Table 05-03.7, Table 05-03.10, Table 05-03.11). Mule deer winter range has ranged between good and very poor condition over the sample years, which is due to large fluctuations of annual grasses and a large decrease in cover for preferred browse species, namely sagebrush. Furthermore, sagebrush has generally had high decadence with little recruitment in most sample years. Mule deer winter range condition was considered to be very poor in 2021 (Table 05-03.15).



**Trend Summary Tables****Table 05-03.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	16.6	1.2	-	-	-	-
2001	19.9	0.6	-	-	-	-
2006	14.6	0.9	-	16.0	1.5	-
2011	15.0	2.2	-	16.6	2.6	-
2016	8.7	2.4	-	13.0	3.9	-
2021	5.4	2.6	-	4.5	2.8	-

**Table 05-03.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	348	285	142	257	8.8	13.2	1.9	11.3
2001	170	408	195	189	4.3	34.5	1.7	2.8
2006	220	395	247	111	2.6	36.5	1.4	4.1
2011	186	368	376	155	3.9	41.7	16.8	9.3
2016	354	277	290	102	17.7	20.6	12.9	3.9
2021	221	333	144	54	9.4	24.7	2.3	1.4

**Table 05-03.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	4.2	0.1	61.0	1.3	5.5	50.4
2001	8.6	0.9	49.5	1.5	4.0	60.3
2006	3.0	0.7	44.9	0.7	3.7	61.3
2011	2.9	0.2	43.9	0.7	4.1	75.0
2016	6.2	0.2	41.3	1.4	2.9	61.9
2021	3.3	0.1	59.6	1.3	4.0	44.0

**Table 05-03.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Domestic Sheep	Rocky Mountain Elk	Greater Sage-Grouse	Horse	Rabbit
	Quadrat Frequency					
1996	-	32	5	-	-	-
2001	-	30	-	1	-	-
2006	-	38	4	-	-	10
2011	-	11	1	-	-	1
2016	1	14	1	-	-	15
2021	6	21	4	1	1	9
Year	Days Use Per Acre (ha)					
1996	-	-	-	-	-	-
2001	0.7 (1.8)	87.8 (216.8)	-	17.4 (43.0)*	-	-
2006	0.7 (1.8)	36.2 (89.4)	37.5 (92.7)	-	-	-
2011	-	20.8 (51.3)	3.4 (8.3)	-	-	-
2016	-	27.5 (67.9)	-	-	-	-
2021	13.8 (34.1)	70.4 (173.8)	-	-	-	-

Pellets per acre (ha)

**Table 05-03.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency											
Bromus arvensis <sup>ai</sup> (field brome)	44	343	4	33	-	181	6	31	57	11	7	
Bromus tectorum <sup>ai</sup> (cheatgrass)	68	150	9	28	4	323	60	39	23	25	1	
Carex (sedge)	48	203	7	28	2	354	19	57	27	39	-	
Leymus cinereus (basin wildrye)	40	175	-	31	2	304	17	75	18	61	-	
Pascopyrum smithii (western wheatgrass)	72	342	14	28	4	193	4	26	28	65	-	
Poa bulbosa <sup>i</sup> (bulbous bluegrass)	2021	189	1	26	3	215	3	70	32	91	-	
Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Average Cover (%)											
Poa secunda (Sandberg bluegrass)	1996	0.4	7.9	0.0	2.5	-	7.8	0.0	0.6	2.0	0.2	0.5
Pseudoroegneria spicata (bluebunch wheatgrass)	2001	0.3	4.0	0.0	3.0	0.5	26.7	2.2	0.8	0.3	0.9	0.0
Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)	2006	0.3	2.3	0.1	2.5	0.0	28.7	0.4	1.0	1.7	2.1	-
Vulpia octoflora <sup>a</sup> (sixweeks fescue)	2011	0.3	3.5	-	3.9	0.2	23.4	0.7	7.8	0.5	5.2	-
	2016	2.1	15.6	0.7	4.5	0.0	11.9	0.0	0.5	0.5	2.5	-
	2021	1.8	7.6	0.0	4.5	0.0	10.1	0.0	2.1	0.8	7.2	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 05-03.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
Achillea millefolium (Common yarrow)	70	-	1	5	4	20	12	-	-	42	3	12	-	-	-	-	141	
Agoseris glauca (pale agoseris)	2001	58	1	3	8	-	28	-	3	-	9	21	32	-	6	60	8	2
Allium (onion)	2006	28	3	1	13	-	28	7	3	-	8	42	14	-	4	92	59	22
Alyssum desertorum <sup>ai</sup> (desert madwort)	2011	46	-	5	9	-	43	3	-	8	20	78	47	-	42	164	177	36
Arabis (rockcress)	2016	19	1	-	6	11	44	2	-	3	23	55	11	55	71	18	7	8
Artemisia ludoviciana (white sagebrush)	2021	24	-	-	-	-	20	-	-	-	-	9	-	-	-	-	-	-
Astragalus (milkvetch)	Average Cover (%)																	
Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	1996	1.2	-	0.0	0.0	0.0	0.5	0.5	-	-	1.1	0.0	0.0	-	-	-	-	3.9
Cirsium (thistle)	2001	0.9	0.0	0.0	0.0	-	0.7	-	0.0	-	0.1	0.1	0.1	-	0.0	0.2	0.0	0.0
Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	2006	1.1	0.0	0.0	0.0	-	2.0	0.0	0.0	-	0.1	0.1	0.0	-	0.0	0.2	0.2	0.3
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	2011	3.4	-	0.0	0.1	-	2.9	0.1	-	0.4	1.4	0.7	0.2	-	0.9	4.6	1.8	0.8
Collomia linearis <sup>a</sup> (tiny trumpet)	2016	0.5	0.0	-	0.0	0.3	2.4	0.1	-	0.0	0.3	0.2	0.0	0.4	2.7	0.3	0.1	0.2
Cryptantha <sup>a</sup> (annual cryptantha)	2021	0.5	-	-	-	-	0.7	-	-	-	-	0.0	-	-	-	-	-	-
Descurainia pinnata <sup>a</sup> (western tansymustard)																		
Draba <sup>a</sup> (draba)																		
Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)																		
Erigeron pumilus (shaggy fleabane)																		

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES																		
<i>Erodium cicutarium</i> <sup>ai</sup> (redstem stork's bill)																		
<i>Galium aparine</i> <sup>a</sup> (stickywilly)																		
<i>Gayophytum ramosissimum</i> <sup>a</sup> (pinyon groundsmoke)																		
<i>Hedysamum boreale</i> (Utah sweetvetch)																		
<i>Heliomeris multiflora</i> var. <i>multiflora</i> (showy goldeneye)																		
<i>Lactuca serriola</i> <sup>ai</sup> (prickly lettuce)																		
<i>Lappula occidentalis</i> <sup>a</sup> (flatspine stickseed)																		
<i>Lithophragma</i> (woodland-star)																		
<i>Lithospermum ruderale</i> (western stone seed)																		
<i>Lomatium</i> (desertparsley)																		
<i>Lupinus argenteus</i> (silvery lupine)																		
<i>Machaeranthera canescens</i> (hoary tansyaster)																		
<i>Microsteris gracilis</i> <sup>a</sup> (slender phlox)																		
<i>Oenothera caespitosa</i> (tufted evening primrose)																		
<i>Phlox longifolia</i> (longleaf phlox)																		
<i>Polygonum douglasii</i> <sup>a</sup> (Douglas' knotweed)																		
<i>Silene antirrhina</i> <sup>a</sup> (sleepy silene)																		
year	Nested Frequency																	
1996	25	-	47	2	7	1	7	-	17	2	12	-	-	3	-	36	9	
2001	39	-	-	1	1	-	-	-	1	4	23	-	2	2	-	15	83	
2006	57	-	-	0	16	4	18	-	2	1	8	1	1	-	-	27	97	
2011	44	-	96	-	4	35	131	3	7	-	3	-	1	-	3	16	86	
2016	122	0	50	-	8	1	-	-	1	-	4	-	-	-	-	3	19	
2021	134	3	-	-	-	3	-	-	-	-	3	-	-	-	-	-	-	
year	Average Cover (%)																	
1996	0.2	-	0.1	0.2	0.0	0.0	0.0	-	1.1	0.0	0.1	-	-	0.1	-	0.1	0.0	
2001	0.8	-	-	0.0	0.0	-	-	-	0.0	0.0	0.4	-	0.0	0.0	-	0.0	0.3	
2006	0.3	-	-	0.0	0.3	0.0	0.1	-	0.0	0.0	0.0	0.0	0.0	-	-	0.1	0.4	
2011	0.8	-	3.2	-	0.1	0.5	1.5	0.0	0.2	-	0.4	-	0.0	-	0.0	0.1	1.1	
2016	6.8	0.0	1.5	-	0.0	0.0	-	-	0.0	-	0.0	-	-	-	-	0.0	0.2	
2021	2.2	0.0	-	-	-	0.0	-	-	-	-	0.1	-	-	-	-	-	-	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES												
<i>Sisymbrium altissimum</i> <sup>ai</sup> (tall tumblemustard)												
<i>Sphaeralcea grossularifolia</i> (gooseberry/leaf globemallow)												
<i>Sphaeralcea munroana</i> (Munro's globemallow)												
<i>Stenotus acaulis</i> (stemless mock goldenweed)												
<i>Symphotrichum</i> (aster)												
<i>Symphotrichum ascendens</i> (western aster)												
<i>Taraxacum officinale</i> (common dandelion)												
<i>Tragopogon dubius</i> <sup>ai</sup> (yellow salsify)												
<i>Verbascum thapsus</i> <sup>ai</sup> (common mullein)												
<i>Veronica biloba</i> <sup>ai</sup> (two-lobed speedwell)												
<i>Zigadenus paniculatus</i> (foothill death camas)												
year	Nested Frequency											
1996	-	-	17	1	-	102	2	19	-	-	-	-
2001	-	-	9	-	-	100	-	4	-	-	-	2
2006	-	0	8	-	-	11	3	1	-	-	-	3
2011	1	-	6	-	6	11	-	5	-	3	5	
2016	-	-	14	3	-	2	1	-	3	-	-	
2021	-	6	-	-	-	3	-	3	1	-	-	
year	Average Cover (%)											
1996	-	-	0.6	0.0	-	3.0	0.0	0.3	-	-	-	-
2001	-	-	0.1	-	-	0.7	-	0.0	-	-	-	0.0
2006	-	0.0	0.3	-	-	0.1	0.0	0.0	-	-	-	0.0
2011	0.0	-	0.4	-	0.2	0.5	-	0.0	-	0.0	0.0	
2016	-	-	0.2	0.0	-	0.0	0.0	-	0.4	-	-	
2021	-	0.0	-	-	-	0.0	-	0.0	0.0	-	-	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 05-03.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Linanthus pungens (granite prickly phlox)	Mahonia repens (creeping barberry)	Opuntia polyacantha (plains pricklypear)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)
year	Line Intercept Cover (%)					
1996	-	-	-	-	-	-
2001	-	-	-	-	-	-
2006	15.1	0.7	-	0.8	0	0.9
2011	15.9	1.4	-	1.2	0	0.7
2016	11.9	0.6	-	3.1	0.2	1.1
2021	4.2	0.5	-	2.3	-	0.3
year	Quadrat Cover (%)					
1996	14.3	0.3	-	0.8	0.0	2.4
2001	18.0	0.2	-	0.5	-	1.9
2006	13.6	0.2	0.0	0.6	0.0	1.1
2011	14.2	0.7	-	1.5	0.0	0.7
2016	8.0	0.3	-	1.8	0.3	0.7
2021	5.3	0.8	-	1.8	-	0.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 05-03.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	-	-	-	-	-	-	-	-	95/154
2001	-	-	-	-	-	-	-	-	130/140
2006	-	-	-	-	-	-	-	-	81/121
2011	-	-	-	-	-	-	-	-	88/118
2016	-	-	-	-	-	-	-	-	85/68
2021	-	-	-	-	-	-	-	-	-/-
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	1900	20	15	64	21	32	2	8	75/114
2001	1580	-	6	71	23	23	3	6	82/120
2006	1040	-	2	42	56	31	0	46	82/132
2011	1100	160	13	71	16	9	0	24	65/106
2016	760	220	3	50	47	29	16	24	82/136
2021	520	-	19	31	50	31	0	42	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	320	-	6	94	0	0	0	6	39/68
2001	320	-	0	94	6	0	0	0	31/45
2006	340	-	0	100	0	0	0	0	32/56
2011	320	-	13	88	0	0	0	0	29/52
2016	380	-	37	63	0	5	47	0	22/37
2021	360	-	33	50	17	22	33	17	-/-

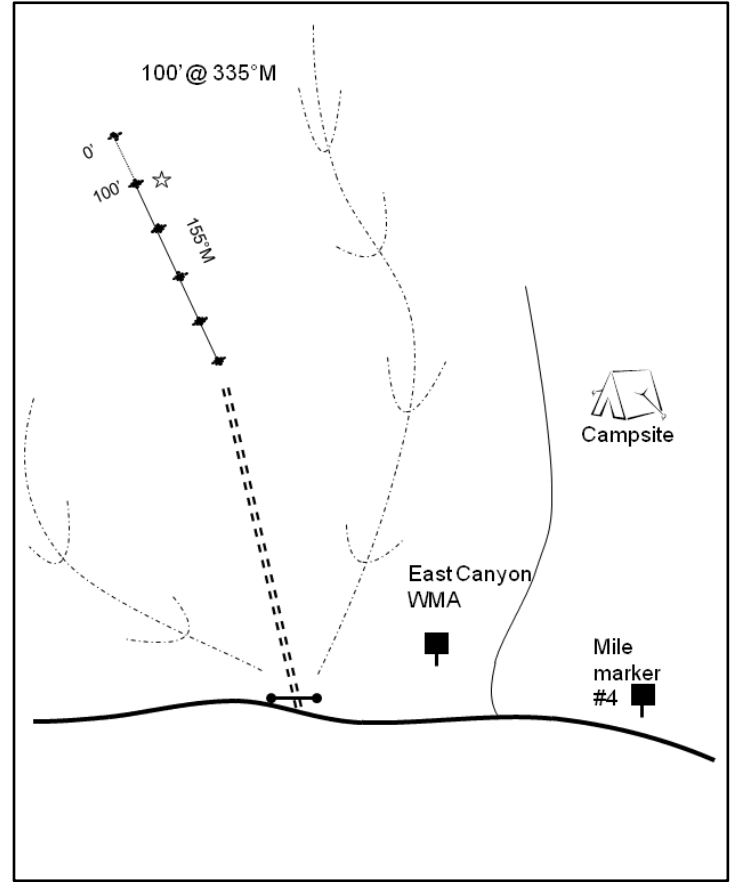
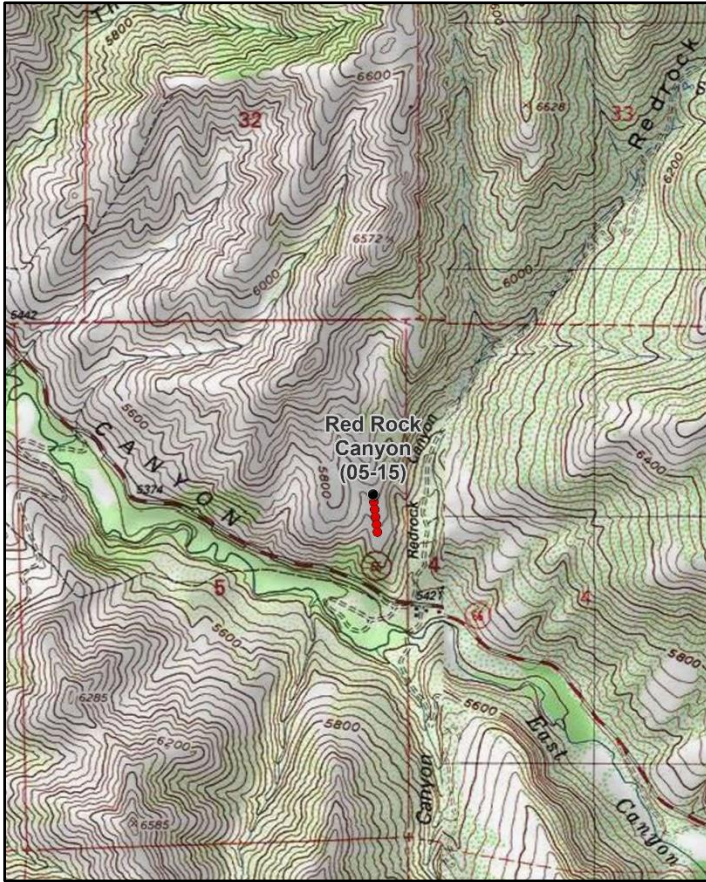
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1996	20	-	0	100	0	0	0	0	- / -
2001	20	-	0	100	0	0	0	0	- / -
2006	-	-	-	-	-	-	-	-	78/116
2011	-	-	-	-	-	-	-	-	80/68
2016	20	-	100	0	0	0	0	0	68/111
2021	40	-	0	50	50	50	0	50	- / -
<b>Mahonia repens -- (creeping barberry)</b>									
1996	2960	40	22	78	0	0	0	0	10/17
2001	4460	-	14	86	0	0	0	0	7/10
2006	4480	100	16	84	0	0	0	0	9/12
2011	5580	-	4	96	0	0	0	0	9/11
2016	9840	-	0	100	0	0	0	0	9/11
2021	11020	-	12	88	0	0	0	0	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	380	-	32	68	0	0	0	5	14/41
2001	180	-	11	89	0	0	0	0	14/33
2006	80	-	0	100	0	0	0	0	16/41
2011	100	-	0	100	0	0	0	0	9/27
2016	160	-	0	100	0	0	0	0	18/50
2021	-	-	-	-	-	-	-	-	- / -
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1996	120	-	0	100	0	0	100	0	92/214
2001	100	-	0	80	20	20	80	0	93/173
2006	80	20	0	75	25	0	100	25	88/157
2011	200	-	0	90	10	10	80	10	70/128
2016	160	-	0	0	100	0	25	100	86/163
2021	80	-	0	0	100	0	100	100	- / -
<b>Rosa woodsii<sup>P</sup> -- (Woods' rose)</b>									
1996	-	-	-	-	-	-	-	-	60/44
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	31/17

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 05-03.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	21.4	9.6	6.3	10.8	-6.6	10.0	0.0	<b>51.5</b>	Poor
2001	25.4	8.3	2.9	15.6	-3.2	5.5	0.0	<b>54.5</b>	Poor-Fair
2006	20.2	-1.2	0.9	15.6	-1.9	8.2	0.0	<b>41.8</b>	Very Poor-Poor
2011	20.9	10.2	6.1	30.0	-2.9	10.0	0.0	<b>74.3</b>	Good
2016	16.5	-0.6	1.2	17.3	-13.3	7.9	0.0	<b>29.1</b>	Very Poor
2021	5.7	0.0	0.0	29.3	-7.0	2.8	0.0	<b>30.7</b>	Very Poor

## RED ROCK CANYON - STUDY NO. 05-15

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Porterville NE; Township 2N, Range 3E, Section 05  
NAD 83 UTM ZONE 12, 447035 East 4532080 North

**Transect Information**

Browse Tag # (0' Stake)	52
Transect Bearing	155° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

**Directions to Site**

On Highway 66 heading towards Porterville, travel east for 0.2 miles past mile marker 4 and turn right (sign says East Canyon Wildlife Management Area). Travel north for 0.2 miles to a small 4-wheeler gate on the west (left) side of the road. Follow the 4-wheeler trail up and along the ridge. The 100-foot stake is marked by a full-high fence post just off of the trail. The 0-foot stake is 100 feet away at 335 degrees magnetic and is marked by browse tag #52.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,675ft (1,730m)
Aspect	South
Slope	10%
Sample Dates	07/18/1996, 06/12/2001, 06/14/2006, 06/20/2011, 06/14/2016, 06/14/2021

**Table 05-15.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	1992	-
Seeding - Unknown	Redrock Burn	-	1992	-

**Wildlife Habitat and Vegetation History****Table 05-15.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

**Table 05-15.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1996	Annual Grass	NA
2001	Perennial Grass	NA
2006	Perennial Grass	NA
2011	Perennial Grass	NA
2016	Perennial Grass	NA
2021	Perennial Grass	NA

**Site Notes**

This range trend study was established in 1996 on a small bench north of East Canyon. The site burned and was seeded in 1992 with a combination of grasses, forbs, and browse species. Although the area also receives year-round use, it is considered to be deer winter range. The 200-foot stake is a piece of rebar.

**Soils****Table 05-15.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.2	44.6	25.4	30.0	3.3	41.4	291.2	0.6	07/18/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

This site has remained dominated by grasses since study establishment in 1996. Most cover was contributed by the annual grass species field brome (*Bromus arvensis*) in 1996. However, the community has been mainly comprised of a very diverse mixture of perennial grasses in every other sample year; the introduced species crested wheatgrass (*Agropyron cristatum*) and bulbous bluegrass (*Poa bulbosa*) provided most of the perennial grass cover in 2021 (Table 05-15.7, Table 05-15.10). Forbs have been rich in composition and have varied in abundance in each sample year (Table 05-15.11). Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) have also been observed on site, but the browse population has remained small throughout the study period (Photos, Table 05-15.12, Table 05-15.13). Mule deer winter range has generally been in very poor condition over the sample years: this is due to the presence of annual grasses and a lack of preferred browse species occurring on the site, namely sagebrush. Mule deer winter range condition was considered to be very poor in 2021 (Table 05-15.15).

**Trend Summary Tables****Table 05-15.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	0.5	8.8	-	-	-	-
2001	0.3	5.4	-	-	-	-
2006	0.6	5.3	-	1.7	8.1	-
2011	1.8	5.5	-	2.4	7.7	-
2016	1.3	2.0	-	1.7	2.8	-
2021	0.7	1.6	-	1.6	2.5	-

**Table 05-15.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	458	231	295	197	24.6	12.1	8.0	4.9
2001	289	389	329	293	4.8	30.0	13.3	11.4
2006	246	399	356	258	5.0	27.0	4.3	6.3
2011	124	427	433	328	2.7	39.8	35.2	21.3
2016	212	328	401	156	13.4	26.3	17.5	2.1
2021	44	442	241	145	0.5	45.0	8.3	5.0

**Table 05-15.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	3.7	0.0	79.9	0.2	0.4	63.3
2001	4.7	0.1	49.4	2.6	0.5	63.7
2006	17.7	0.1	38.1	2.1	0.6	53.3
2011	3.5	0.1	31.1	0.9	0.0	81.6
2016	23.5	0.5	28.6	1.4	0.2	60.2
2021	14.2	0.8	26.9	1.8	0.3	60.3

**Table 05-15.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	-	5	1	-
2001	-	11	-	-
2006	30	42	5	6
2011	2	11	-	1
2016	29	16	1	4
2021	13	25	1	9
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	-	50.2 (124.1)	-	-
2006	42.1 (104.0)	39.6 (97.7)	28.1 (69.5)	-
2011	2.9 (7.2)	-	-	-
2016	29.0 (71.7)	25.5 (62.9)	-	-
2021	10.9 (26.9)	24.8 (61.2)	2.0 (5.0)	-



**Table 05-15.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus briziformis <sup>ai</sup> (rattlesnake brome)	Bromus marginatus (mountain brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Dactylis glomerata <sup>i</sup> (orchardgrass)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Leymus cinereus (basin wildrye)	Melica bulbosa (oniongrass)	Phleum pratense <sup>i</sup> (timothy)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Secale cereale <sup>ai</sup> (cereal rye)
year	Nested Frequency																
1996	180	394	-	-	121	18	6	-	2	-	-	-	-	51	9	27	14
2001	183	256	10	22	138	7	1	-	7	-	3	146	-	63	197	34	0
2006	228	156	3	17	191	1	17	-	10	-	-	180	-	18	216	15	1
2011	255	90	3	25	47	-	3	5	5	1	-	299	3	120	40	35	4
2016	274	80	-	29	191	-	-	-	2	-	-	64	16	31	128	7	-
2021	304	22	-	8	22	-	10	-	5	2	-	349	2	-	149	2	-
year	Average Cover (%)																
1996	9.2	20.9	-	-	3.4	0.2	0.1	-	0.8	-	-	-	-	1.1	0.1	0.7	0.4
2001	12.7	3.1	0.2	1.3	1.4	0.2	0.0	-	0.8	-	0.0	5.2	-	1.5	5.6	2.7	0.0
2006	12.0	1.0	0.0	0.6	4.0	0.0	0.1	-	0.3	-	-	7.2	-	0.1	5.7	0.8	0.0
2011	17.5	1.3	0.0	0.9	1.4	-	0.1	0.1	0.2	0.0	-	17.0	0.1	1.9	0.5	1.6	0.0
2016	18.5	1.3	-	1.3	12.1	-	-	-	0.5	-	-	1.1	0.1	1.7	2.6	0.4	-
2021	19.9	0.2	-	0.2	0.3	-	0.2	-	1.0	0.0	-	18.4	0.0	-	4.7	0.1	-

a - Annual; n - Noxious Weed; i - Introduced Species

GRASS SPECIES	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)	Vulpia myuros <sup>ai</sup> (annual fescue)
year	Nested Frequency	
1996	-	-
2001	2	-
2006	1	-
2011	3	3
2016	2	-
2021	16	-
year	Average Cover (%)	
1996	-	-
2001	0.0	-
2006	0.1	-
2011	0.0	0.0
2016	0.0	-
2021	0.5	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 05-15.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Artemisia ludoviciana (white sagebrush)	Camelina microcarpa <sup>ai</sup> (littledod false flax)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia grandiflora <sup>a</sup> (grand collomia)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)
year	Nested Frequency																
1996	27	17	-	11	-	-	-	-	39	-	1	13	19	-	-	-	122
2001	39	32	89	116	-	21	-	3	21	69	1	18	13	-	5	19	13
2006	42	40	162	102	-	21	4	-	11	41	7	2	3	-	3	24	257
2011	33	46	262	218	1	4	4	-	6	27	10	13	3	6	45	176	238
2016	23	9	33	188	-	-	-	-	-	11	-	-	9	-	13	10	10
2021	22	21	30	5	1	-	-	-	-	32	-	-	2	-	0	-	-
year	Average Cover (%)																
1996	0.2	0.1	-	0.0	-	-	-	-	0.7	-	0.0	0.0	0.1	-	-	-	1.1
2001	0.7	0.5	0.4	1.1	-	0.2	-	0.0	0.8	0.4	0.0	0.1	0.1	-	0.0	0.1	0.1
2006	1.4	0.4	0.8	0.3	-	0.1	0.0	-	0.1	0.1	0.0	0.0	0.0	-	0.0	0.1	1.1
2011	1.7	0.5	5.2	2.5	0.0	0.0	0.0	-	0.4	0.1	0.0	0.0	0.0	0.2	0.5	3.3	7.7
2016	0.7	0.1	0.1	2.4	-	-	-	-	-	0.0	-	-	0.0	-	0.1	0.0	0.0
2021	1.7	0.1	0.2	0.0	0.0	-	-	-	-	0.1	-	-	0.0	-	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Erigeron pumilus (shaggy fleabane)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium aparine <sup>a</sup> (stickywilly)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Gilia inconspicua <sup>a</sup> (shy gilia)	Grindelia squarrosa (curlycup gumweed)	Helianthus annuus <sup>a</sup> (common sunflower)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Linum lewisii (Lewis flax)	Lithophragma (woodland-star)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa <sup>a</sup> (alfalfa)	Melilotus officinalis <sup>a</sup> (sweetclover)	Microsteris gracilis <sup>a</sup> (slender phlox)	Onobrychis vicifolia <sup>a</sup> (sainfoin)
year	Nested Frequency																
1996	1	-	8	1	-	-	2	3	154	-	99	-	4	48	11	-	-
2001	-	-	77	5	-	3	-	-	6	32	98	-	-	60	7	1	0
2006	-	-	147	-	3	-	15	21	36	7	32	-	16	32	20	19	-
2011	-	3	217	11	38	2	17	-	280	178	2	2	-	71	4	5	-
2016	-	-	361	-	29	-	-	14	11	-	4	-	-	43	-	2	3
2021	3	-	210	-	-	-	17	-	0	-	-	-	-	28	-	5	-
year	Average Cover (%)																
1996	0.0	-	0.1	0.0	-	-	0.0	0.0	1.8	-	1.4	-	0.2	1.7	0.5	-	-
2001	-	-	1.3	0.0	-	0.0	-	-	0.2	0.1	0.7	-	-	6.2	0.1	0.0	0.0
2006	-	-	0.9	-	0.0	-	0.2	0.1	0.3	0.0	0.2	-	0.0	1.6	0.9	0.1	-
2011	-	0.0	4.9	0.1	0.4	0.0	0.9	-	8.7	3.9	0.0	0.0	-	8.1	0.2	0.0	-
2016	-	-	12.3	-	0.1	-	-	0.1	0.1	-	0.0	-	-	0.5	-	0.0	0.0
2021	0.1	-	7.5	-	-	-	0.9	-	0.1	-	-	-	-	0.9	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES									
Phlox longifolia (longleaf phlox)									
Polygonum douglasii <sup>a</sup> (Douglas' knotweed)									
Sanguisorba minor <sup>i</sup> (small burnet)									
Silene antirrhina <sup>a</sup> (sleepy silene)									
Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)									
Symphotrichum (aster)									
Taraxacum officinale (common dandelion)									
Tragopogon dubius <sup>ai</sup> (yellow salsify)									
Vicia americana (American vetch)									
year	Nested Frequency								
1996	2	50	32	-	16	-	-	190	11
2001	9	3	16	37	35	3	9	191	124
2006	-	30	6	67	15	-	1	76	53
2011	-	7	5	65	22	2	22	78	108
2016	-	-	0	13	55	5	11	11	53
2021	-	1	-	-	3	-	7	32	60
year	Average Cover (%)								
1996	0.0	0.2	0.6	-	0.3	-	-	3.9	0.1
2001	0.0	0.0	0.2	0.1	0.6	0.0	0.2	8.2	2.5
2006	-	0.1	0.2	0.2	0.1	-	0.1	0.9	0.5
2011	-	0.0	0.0	0.3	0.4	0.0	0.7	1.9	3.7
2016	-	-	0.0	0.1	2.1	0.1	0.1	0.0	0.5
2021	-	0.0	-	-	0.0	-	0.1	0.5	0.9

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 05-15.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES						
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)						
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)						
Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)						
Gutierrezia sarothrae (broom snakeweed)						
Purshia tridentata <sup>p</sup> (antelope bitterbrush)						
Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)						
year	Line Intercept Cover (%)					
1996	-	-	-	-	-	-
2001	-	-	-	-	-	-
2006	1.1	8.1	0.4	-	-	0.2
2011	1.5	7.2	0.7	0.5	-	0.2
2016	1	2.3	-	0.5	-	0.7
2021	1	2	0.3	0.5	-	0.3
year	Quadrat Cover (%)					
1996	0.1	7.4	-	1.4	0.0	0.4
2001	0.1	4.7	-	0.7	-	0.2
2006	0.4	5.3	0.0	-	-	0.2
2011	1.6	5.5	0.2	0.0	-	0.0
2016	1.3	1.5	-	0.5	-	0.1
2021	0.6	0.7	0.0	1.0	-	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 05-15.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

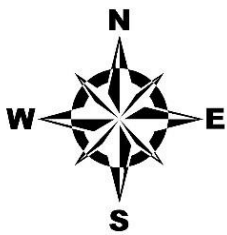
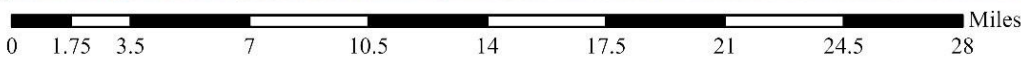
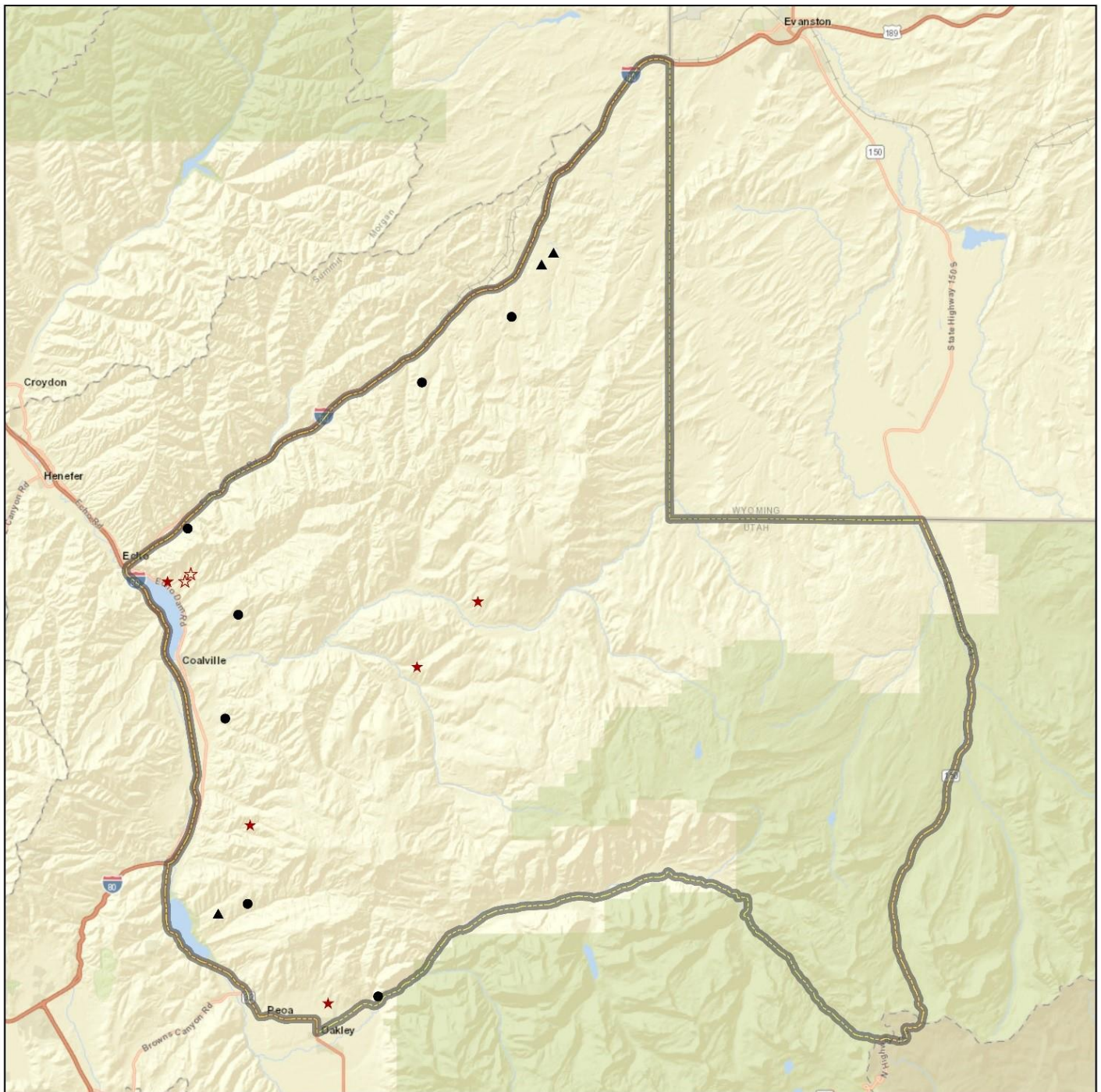
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	64/80
2011	-	-	-	-	-	-	-	-	73/88
2016	-	-	-	-	-	-	-	-	45/46
2021	20	-	0	100	0	0	0	0	-/-
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1996	220	80	100	0	0	0	0	0	44/24
2001	220	-	64	36	0	0	0	9	47/50
2006	280	-	0	100	0	21	36	0	56/57
2011	220	20	0	91	9	9	0	9	61/70
2016	200	-	0	60	40	40	0	30	64/93
2021	120	-	17	50	33	0	0	17	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	2200	-	7	92	1	0	0	0	44/70
2001	1360	-	2	87	12	0	0	0	43/67
2006	1220	-	0	98	2	0	0	0	48/76
2011	860	-	0	100	0	0	0	0	47/76
2016	700	-	0	60	40	23	6	37	39/62
2021	520	-	8	62	31	0	0	31	-/-
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1996	20	-	0	100	0	0	0	0	65/63
2001	60	-	100	0	0	0	0	0	24/79
2006	60	-	0	100	0	0	0	0	70/99
2011	40	-	0	100	0	100	0	0	64/104
2016	40	-	0	100	0	0	50	0	52/82
2021	40	-	0	100	0	0	0	0	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	1580	-	35	65	0	0	0	0	27/26
2001	580	-	0	93	7	0	0	0	18/23
2006	-	-	-	-	-	-	-	-	23/19
2011	180	-	33	67	0	0	0	0	28/36
2016	1060	-	0	100	0	0	0	0	26/24
2021	800	20	18	80	3	0	0	3	-/-
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	43/72
2011	-	-	-	-	-	-	-	-	74/116
2016	-	-	-	-	-	-	-	-	87/156
2021	-	-	-	-	-	-	-	-	-/-
<b>Symphoricarpos oreophilus<sup>P</sup> -- (mountain snowberry)</b>									
1996	80	-	50	50	0	0	0	0	56/83
2001	80	-	50	50	0	25	0	0	34/55
2006	60	-	33	67	0	0	0	0	49/92
2011	80	-	75	25	0	0	0	0	51/101
2016	100	-	20	80	0	40	20	0	58/107
2021	80	-	50	25	25	25	0	25	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

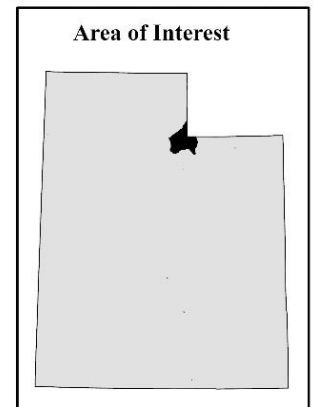
**Table 05-15.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	0.5	0.0	0.0	24.3	-18.5	9.8	0.0	<b>16.2</b>	Very Poor
2001	0.3	0.0	0.0	30.0	-3.6	10.0	0.0	<b>36.8</b>	Very Poor
2006	2.1	0.0	0.0	30.0	-3.7	10.0	0.0	<b>38.3</b>	Very Poor-Poor
2011	3.0	0.0	0.0	30.0	-2.1	10.0	0.0	<b>40.9</b>	Very Poor-Poor
2016	2.0	0.0	0.0	30.0	-10.0	4.1	0.0	<b>26.0</b>	Very Poor
2021	1.9	0.0	0.0	30.0	-0.4	10.0	0.0	<b>41.6</b>	Very Poor-Poor

# WILDLIFE MANAGEMENT UNIT 6 - CHALK CREEK

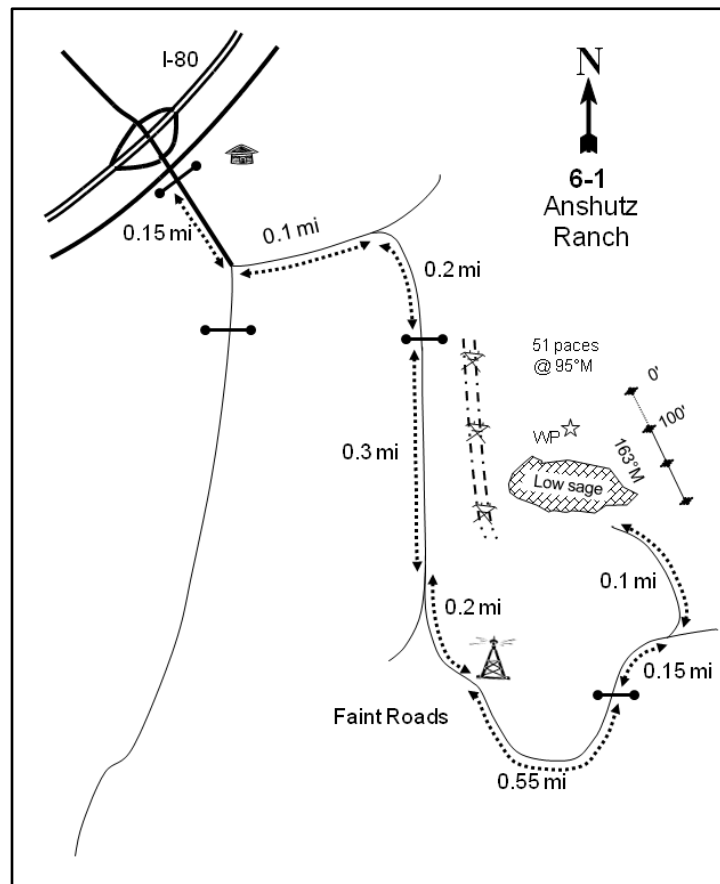
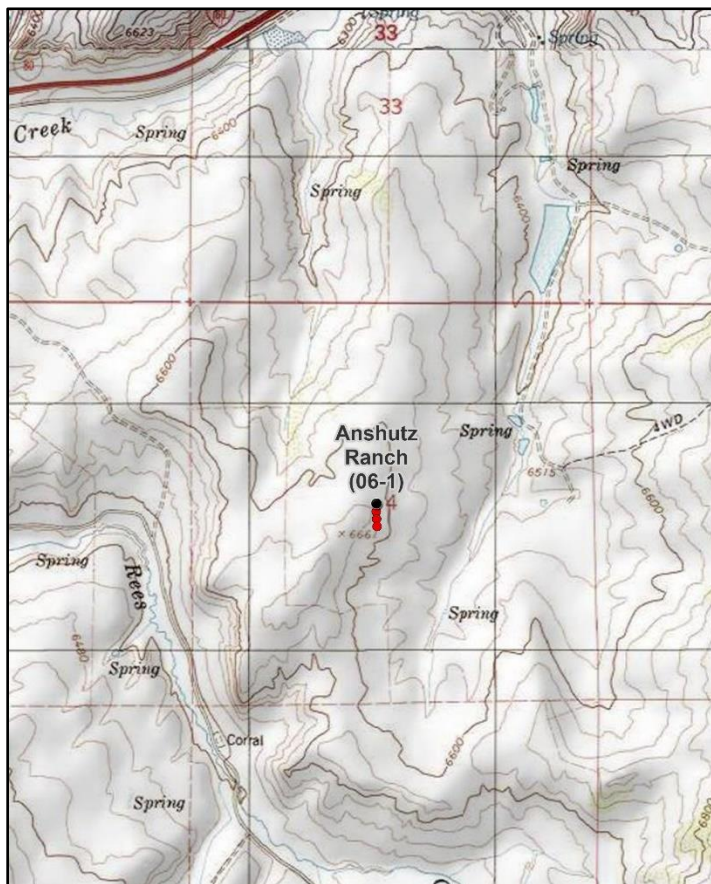


Study Locations Project, Status		Unit Boundary
●	RT, Active	Unit - 6
★	RT, Suspended	
▲	WRI, Active	
☆	WRI, Suspended	



Credits: Bureau of Land Management, Utah AGRC, Esri, HERE, Garmin, NGA, USGS, NPS

### ANSHUTZ RANCH - STUDY NO. 06-1



**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Castle Rock NE; Township 4N, Range 7E, Section 04  
NAD 83 UTM ZONE 12, 486468 East 4550801 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

7949  
163° magnetic  
300ft  
Line 1 (11ft & 95ft), Line 2 (34ft & 71ft), Line 3 (59ft)  
Standard

**Directions to Site**

Proceeding east on I-80 from Echo, leave I-80 at exit number 185 and proceed east to the Anshutz Ranch headquarters. From the main gate proceed 0.15 miles and turn left. Continue 0.1 miles and turn right, traveling up the hill. Travel 0.5 miles to an intersection near the radio tower. Turn left, proceed 0.8 miles (passing through the gate) to a crossroad on a small ridge. Turn left again (road not on quad and quite faint) and continue 0.15 miles to a green steel stake on the right (east) side of the road. From the stake, walk 51 paces at 95 degrees magnetic to the 0-foot stake of the baseline which is marked by browse tag #7949.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,580ft (2,006m)
Aspect	Northeast
Slope	6%
Sample Dates	07/23/1996, 08/27/2001, 06/26/2006, 06/22/2011, 06/22/2016, 06/23/2021

**Wildlife Habitat and Vegetation History****Table 06-01.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	summer	
Rocky Mountain Elk	crucial	summer	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	summer	

**Table 06-01.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Little Sagebrush	NA
1990	Little Sagebrush	NA
1996	Little Sagebrush/Perennial Grass	NA
2001	Little Sagebrush	NA
2006	Little Sagebrush/Perennial Grass	NA
2011	Little Sagebrush	NA
2016	Little Sagebrush	NA
2021	Little Sagebrush	NA

**Site Notes**

The study is located on private land south of Interstate 80 on the hills east of Rees Creek; the land is part of the Ensign Ranch and is utilized by sheep, cattle, and horses. The entire area is very open with little protective cover and gently rolling topography. A number of range types are closely intermixed in the general area. In swales, grass and/or basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) is/are often dominant. Gentle slopes and flat areas are typically mixed communities of basin big sagebrush and low sagebrush (*A. arbuscula*), with occasional Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*) and mountain big sagebrush (*A. tridentata* ssp. *vaseyana*). On the well-drained ridge tops, low sagebrush is dominant. Scattered around the whole area is an abundance of yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) and broom snakeweed (*Gutierrezia sarothrae*), which are dominant in a few patches. The study area's vegetation consists of a mixture of mountain big sagebrush and low sagebrush.

**Soils****Table 06-01.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.6	40.7	26.0	33.3	2.9	5.9	83.2	0.8	07/23/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Upland Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R047XA314UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1984, the dominant browse component of this site has been comprised of little sagebrush (*Artemisia arbuscula*), although mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) and yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*) are also common (Photos, Pre-1992 Data, Table 06-01.12). In 2021, 44% of little sagebrush plants and 65% of big sagebrush plants showed signs of poor vigor, likely due to drought stress (Table 06-01.13); losses in the browse community could be possible over time should similar climatic conditions be sustained in the future. The herbaceous understory of this site is fairly diverse, and has been largely comprised of perennial grasses such as thickspike wheatgrass (*Elymus lanceolatus*) and Sandberg bluegrass (*Poa secunda*). Although the understory has never been overly abundant, perennial grasses were a co-dominant site component in 1996 and 2006. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed in the community, but has always been rare (Table 06-01.7, Table 06-01.10). Annual and perennial forbs have fluctuated from year to year, but both contributed little cover in 2021 (Table 06-01.11).



**Trend Summary Tables**

**Table 06-01.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	29.2	5.8	-	-	-	-
2001	27.1	5.5	-	-	-	-
2006	28.6	5.6	-	38.8	7.3	-
2011	34.3	5.5	-	43.9	7.5	-
2016	32.6	6.0	-	40.1	8.2	-
2021	34.7	5.2	-	43.0	5.2	-

**Table 06-01.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	87	365	141	232	2.0	11.1	0.6	3.4
2001	27	301	120	130	0.1	5.6	1.7	2.0
2006	20	329	86	264	0.1	10.8	0.4	5.0
2011	50	320	335	294	1.3	8.8	6.1	7.4
2016	125	313	385	265	2.4	6.4	9.2	3.3
2021	-	279	17	218	-	3.1	0.1	2.4

**Table 06-01.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	16.2	0.8	54.6	1.4	2.0	49.5
2001	20.8	6.7	46.4	1.8	1.7	45.5
2006	28.2	2.3	40.5	2.3	1.4	44.9
2011	21.6	0.7	31.3	1.2	0.8	56.9
2016	32.0	0.7	28.1	0.9	0.9	50.4
2021	22.1	2.4	52.1	2.8	2.5	41.4

**Table 06-01.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Horse	Rabbit
	Quadrat Frequency					
1996	1	6	8	-	-	11
2001	-	2	7	1	2	7
2006	2	2	9	1	1	18
2011	1	5	2	-	1	2
2016	2	6	-	-	-	15
2021	2	14	3	1	-	9
Year	Days Use Per Acre (ha)					
1996	-	-	-	-	-	-
2001	3.6 (9.0)	3.4 (8.3)	47.6 (117.5)	8.7 (21.5)*	6.4 (15.8)	-
2006	3.6 (9.0)	14.1 (34.8)	37.5 (92.7)	34.9 (86.1)*	0.6 (1.4)	-
2011	2.2 (5.4)	11.4 (28.1)	10.0 (24.8)	-	-	-
2016	0.7 (1.8)	24.8 (61.2)	3.4 (8.3)	-	-	-
2021	16.0 (39.5)	9.4 (23.2)	2.0 (5.0)	17.4 (43.0)*	2.3 (5.7)	-

\*Pellets per acre (ha)

**Table 06-01.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency												
1996	8	10	2	-	87	-	137	82	16	27	31	171	115
2001	-	21	3	-	26	2	34	123	16	37	11	199	28
2006	5	43	-	-	20	-	53	179	21	6	13	115	47
2011	8	35	-	1	50	-	-	229	6	41	12	126	15
2016	16	12	11	2	123	5	86	107	15	5	2	72	96
2021	-	30	-	-	-	5	87	175	-	14	-	77	4
year	Average Cover (%)												
1996	0.1	0.3	0.0	-	2.0	-	2.6	1.8	0.3	0.4	0.8	2.0	2.8
2001	-	0.2	0.0	-	0.1	0.0	0.5	0.8	0.6	0.5	0.1	2.6	0.4
2006	0.1	1.5	-	-	0.1	-	0.9	4.2	0.6	0.0	0.2	2.1	1.1
2011	0.2	0.7	-	0.0	1.3	-	-	3.7	0.0	0.4	0.1	3.1	0.5
2016	0.3	0.3	0.1	0.0	2.3	0.0	1.9	1.4	0.5	0.1	0.0	0.5	1.6
2021	-	0.2	-	-	-	0.0	0.8	1.2	-	0.1	-	0.7	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 06-01.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria dimorpha (low pussytoes)	Arabis (rockcress)	Astragalus cibarius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cordylanthus ramosus <sup>a</sup> (bushy bird's beak)
year	Nested Frequency																
1996	7	-	-	-	10	10	-	7	-	-	-	14	12	45	-	-	-
2001	9	6	-	8	19	-	-	19	3	-	-	6	6	13	27	-	45
2006	8	3	8	13	40	18	111	9	1	5	0	58	4	3	4	2	-
2011	8	54	102	150	32	15	106	21	9	35	1	138	5	66	122	-	4
2016	9	13	21	371	23	8	94	15	-	19	4	68	6	15	57	2	5
2021	8	40	-	-	55	3	30	15	9	-	-	4	2	5	-	1	-
year	Average Cover (%)																
1996	0.1	-	-	-	0.3	0.0	-	0.1	-	-	-	0.0	0.1	0.1	-	-	-
2001	0.2	0.0	-	0.0	0.1	-	-	0.2	0.0	-	-	0.0	0.1	0.0	0.1	-	1.4
2006	0.3	0.0	0.0	0.1	0.6	0.1	1.1	0.1	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.1	-
2011	0.3	0.8	0.5	1.7	0.5	0.0	1.6	0.2	0.0	0.1	0.0	1.2	0.0	0.3	0.7	-	0.0
2016	0.2	0.0	0.1	8.6	0.2	0.0	0.5	0.2	-	0.0	0.0	0.2	0.1	0.0	0.2	0.0	0.0
2021	0.0	0.2	-	-	0.8	0.0	0.1	0.0	0.0	-	-	0.0	0.0	0.0	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cymopterus (springparsley)	Delphinium nuttalianum (two-lobed larkspur)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stone seed)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Packera multilobata (lobeleaf groundsel)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Silene antirrhina <sup>a</sup> (sleepy silene)
year	Nested Frequency																
1996	-	-	-	32	3	-	3	-	-	-	-	-	63	178	82	-	19
2001	-	-	3	16	5	4	7	-	-	0	-	2	49	40	30	-	-
2006	-	-	-	15	3	-	17	-	3	-	13	-	64	140	-	-	-
2011	9	11	-	18	35	-	12	-	9	-	17	-	38	119	3	60	-
2016	1	-	10	10	6	-	7	-	3	-	20	-	53	144	-	-	7
2021	6	-	-	10	5	-	6	4	-	-	-	-	47	116	-	8	-
year	Average Cover (%)																
1996	-	-	-	0.2	0.1	-	0.0	-	-	-	-	-	1.4	1.2	0.2	-	0.0
2001	-	-	0.0	0.1	0.2	0.0	0.0	-	-	0.0	-	0.0	0.9	0.2	0.1	-	-
2006	-	-	-	0.2	0.2	-	0.1	-	0.0	-	0.0	-	1.5	0.6	-	-	-
2011	0.1	0.1	-	0.4	0.5	-	0.2	-	0.2	-	0.0	-	0.6	0.6	0.0	2.0	-
2016	0.0	-	0.0	0.2	0.1	-	0.0	-	0.0	-	0.1	-	0.8	0.8	-	-	0.0
2021	0.0	-	-	0.1	0.1	-	0.1	0.0	-	-	-	-	0.6	0.4	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Viola (violet)
year	Nested Frequency		
1996	9	11	-
2001	5	3	-
2006	2	-	-
2011	3	1	41
2016	8	1	11
2021	-	-	-
year	Average Cover (%)		
1996	0.1	0.0	-
2001	0.0	0.0	-
2006	0.0	-	-
2011	0.1	0.0	0.5
2016	0.0	0.0	0.0
2021	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 06-01.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia arbuscula <sup>p</sup> (little sagebrush)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Krascheninnikovia lanata <sup>p</sup> (winterfat)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)					
1996	-	-	-	-	-	-
2001	-	-	-	-	-	-
2006	27.2	11.6	6.2	1.1	-	-
2011	30.3	13.6	7.2	0.2	-	0.1
2016	29.9	10.2	7.6	0.1	-	0.5
2021	32.3	10.5	5.1	0.1	0.2	-
year	Quadrat Cover (%)					
1996	21.8	7.4	5.5	0.3	-	0.0
2001	20.4	6.6	4.3	1.2	0.0	0.0
2006	21.5	7.2	4.4	1.1	-	0.2
2011	27.5	6.8	5.1	0.4	-	0.0
2016	24.8	7.8	5.9	0.0	-	0.1
2021	27.9	6.7	5.2	0.0	0.0	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

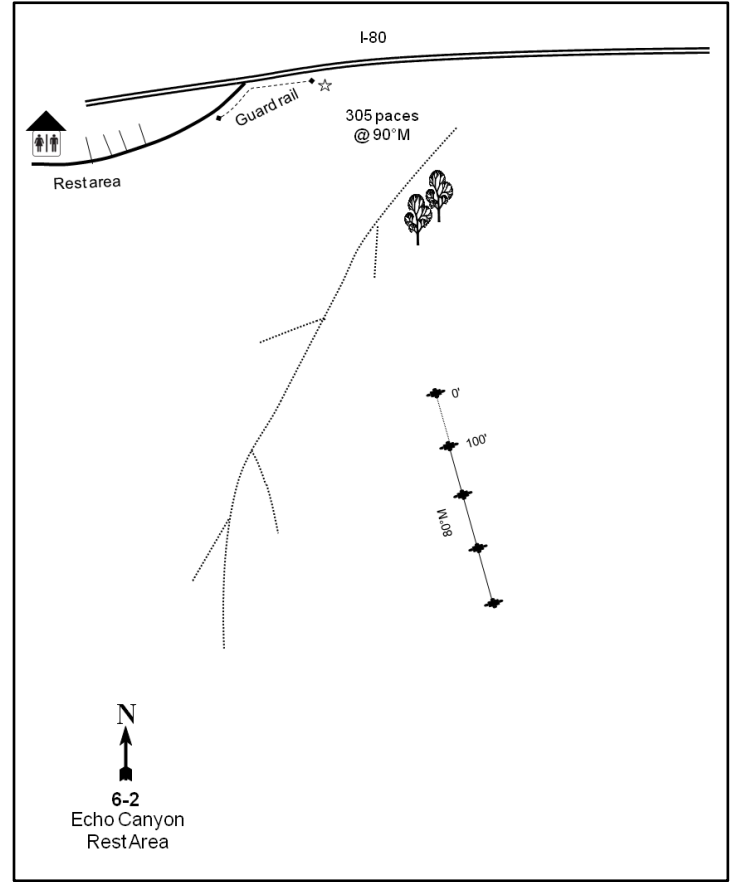
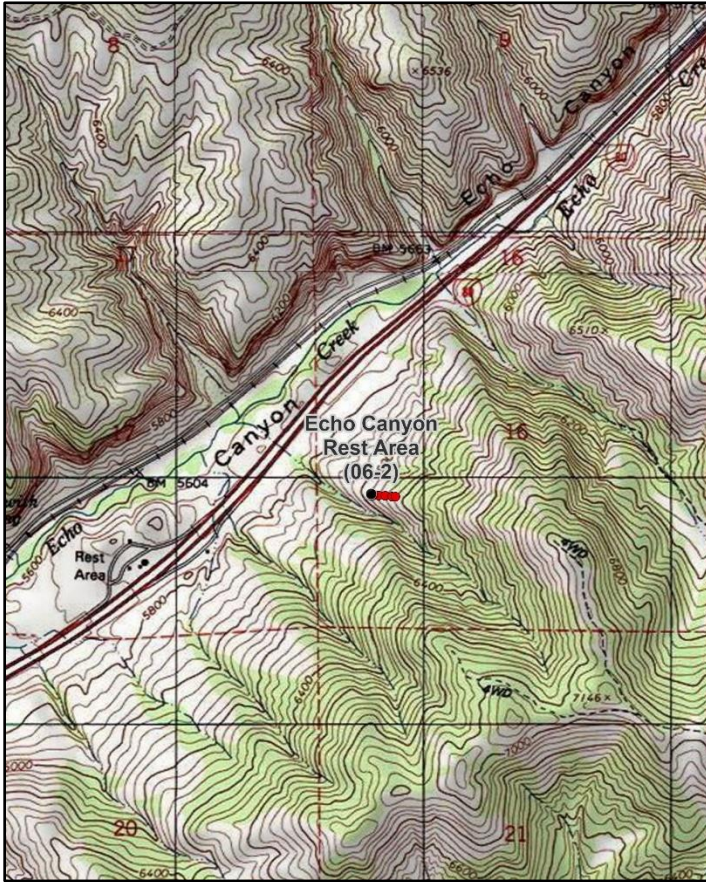
**Table 06-01.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia arbuscula<sup>p</sup> -- (little sagebrush)</b>									
1996	8040	40	5	82	13	18	1	5	23/52
2001	9580	80	2	76	22	22	0	10	24/51
2006	8280	500	3	87	10	1	0	11	27/52
2011	8320	-	9	87	4	18	0	2	26/52
2016	7100	-	3	95	2	12	0	4	28/58
2021	11120	-	2	60	39	33	2	44	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	2200	-	8	71	21	49	6	21	73/86
2001	3120	-	5	60	35	6	0	4	74/101
2006	2200	20	3	66	32	9	0	24	79/88
2011	1720	-	1	78	21	26	0	20	76/88
2016	1520	-	7	67	26	21	46	32	81/102
2021	1480	-	1	42	57	19	8	65	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	8100	180	24	76	1	1	0	0	19/31
2001	7340	40	1	92	7	0	0	2	18/29
2006	6620	40	6	91	3	0	0	1	20/33
2011	5000	20	22	78	0	0	0	0	16/30
2016	5340	-	8	93	0	3	0	0	21/36
2021	9080	60	7	80	13	8	6	14	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	900	-	9	91	0	0	0	0	14/15
2001	1620	-	1	99	0	4	0	12	14/28
2006	1200	-	10	90	0	0	0	0	13/22
2011	100	-	0	100	0	0	0	0	12/18
2016	180	-	11	89	0	0	0	0	18/25
2021	220	-	18	73	9	9	0	9	- / -
<b>Krascheninnikovia lanata<sup>p</sup> -- (winterfat)</b>									
1996	60	-	33	67	0	33	0	0	17/20
2001	140	-	0	86	14	43	0	14	14/22
2006	60	-	33	67	0	33	67	0	12/12
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	280	-	0	79	21	21	36	21	- / -
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	240	-	25	67	8	8	33	0	17/33
2001	180	-	0	67	33	0	0	11	16/28
2006	280	-	7	86	7	0	0	7	22/36
2011	220	-	9	91	0	0	0	9	21/38
2016	120	-	0	100	0	17	0	0	23/30

t - Tree Species; p - Preferred Browse; i - Introduced Species

## ECHO CANYON REST AREA - STUDY NO. 06-2



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Coalville NE; Township 3N, Range 5E, Section 16  
NAD 83 UTM ZONE 12, 466802 East 4537935 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

7950  
80° magnetic  
350ft  
Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (71ft), Line 4 (34ft), Note: Line 4: 50ft Long  
Belt 5: No Rebar

### Directions to Site

Beginning at Echo Reservoir, travel northeast on Highway I-80 to the rest area (approximately two miles away). From the rest area, follow the guard-rail on the right side of the freeway until it ends (approximately 100 yards). From the end of the guard-rail, proceed at an azimuth of 90 degrees magnetic for approximately 305 paces to a point on the left-hand (north) side of the canyon. The 0-foot stake of the baseline is a green steel fencepost, 12"-18" high, that is marked with browse tag #7950.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,000ft (1,829m)
Aspect	Northwest
Slope	32%
Sample Dates	07/16/1996, 06/14/2001, 06/13/2006, 06/14/2011, 06/09/2016, 07/15/2021

**Table 06-02.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Echo Fire	-	July 1998	40
Fire - Wildfire	-	-	Between June 2016 and July 2021	-
Seeding - Herd Seeder	Tervels Fire Rehab	4766	November 2018	19

**Table 06-02.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Tervels Fire			Ground	Nov 2018	50
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Artemisia tridentata ssp. vaseyana	Mountain Big Sagebrush	Sevier UT	0.50	0.15
S	Bassia prostrata	Forage Kochia	Beaver UT	1.50	1.29
S	Bassia prostrata	Forage Kochia	Snowstorm	0.30	0.18

**Wildlife Habitat and Vegetation History****Table 06-02.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	substantial	winter	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	winter	

**Table 06-02.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1996	Wyoming Big Sagebrush/Perennial Grass	NA
2001	Mixed Shrub/Perennial Grass-Forb	NA
2006	Mixed Shrub/Perennial Grass	NA
2011	Mixed Shrub/Perennial Grass	NA
2016	Mixed Shrub/Perennial Grass	NA
2021	Perennial Grass/Mixed Shrub	NA

**Site Notes**

The study is located on the hillside east of the Echo Canyon Rest Area on the south side of Interstate 80. This study replaced a line-intercept transect established in 1977 which sampled a similar alderleaf mountain mahogany (*Cercocarpus montanus*) community. In 1984, a new study was established slightly up slope from the line-intercept transect, but was on a steep rocky south-facing slope (70%) with very little big game use. The current study was reestablished a second time in 1996 on a ridge that is up slope and to the north of the 1984 study; as such, only data from 1996 onward will be discussed in this report. A wildfire burned the study area in 1999, removing much of the Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and alderleaf mountain mahogany that was found on the site.

**Soils****Table 06-02.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.7	44.7	22.0	33.3	2.9	14.4	92.8	0.4	07/16/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Loam (Shrub)
NRCS Ecological Site #	R047XA434UT
States and Transitions	No state and transition model is available for this ecological site.

Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) was the dominant browse species on this site upon study establishment in 1996. However, a wildfire burned the study site in 1999 (Table 06-02.1) and removed nearly all of the sagebrush. Since 2001, the shrub overstory has been comprised of a mixture of various browse species including (but not limited to) mountain snowberry (*Symphoricarpos oreophilus*), antelope bitterbrush (*Purshia tridentata*), and yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) (Photos, Table 06-02.12, Table 06-02.13). The herbaceous understory is rich in both composition and quantity, with perennial grasses such as bluebunch wheatgrass (*Pseudoroegneria spicata*) and Sandberg bluegrass (*Poa secunda*) being co-dominant in the plant community in all years. The introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) has been observed in increasing amounts since 2006, but remains rare in comparison with other species. In addition, the introduced annual grass cheatgrass (*Bromus tectorum*) has been observed all sample years in fluctuating amounts, but contributed little cover in 2021 (Table 06-02.10). Forbs have generally remained abundant and diverse throughout the duration of the study, and perennial forbs were co-dominant in 2001 (Table 06-02.7, Table 06-02.11). Without a major disturbance, this site will likely remain in this or a similar state in future sample years. Deer winter range condition has generally remained good since study establishment. However, preferred browse cover has decreased overall since 2006. As of 2021, deer winter range conditions were considered to be good. Improvement to deer wintering range can be accomplished through efforts that support mature preferred browse and reproduction; diversifying native perennial forbs while reducing cheatgrass would also improve winter range conditions (Table 06-02.15).



**Trend Summary Tables****Table 06-02.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	24.9	3.9	-	-	-	-
2001	9.4	5.8	-	-	-	-
2006	11.7	6.5	-	18.0	11.3	-
2011	11.8	6.5	-	17.6	6.9	-
2016	11.5	3.9	-	20.9	7.0	-
2021	10.5	2.8	-	13.4	4.1	-

**Table 06-02.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	166	386	71	179	3.3	20.5	0.3	3.0
2001	214	248	357	302	7.9	15.5	11.0	15.6
2006	311	326	332	241	5.0	21.3	5.0	4.7
2011	222	394	378	305	3.1	25.6	13.1	13.5
2016	375	360	403	262	10.6	16.2	7.3	8.1
2021	104	421	51	198	1.4	35.0	0.3	3.6

**Table 06-02.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	7.2	6.5	55.3	2.7	1.8	50.7
2001	14.3	1.9	36.1	3.6	2.4	61.1
2006	16.0	2.8	37.8	5.0	3.2	49.7
2011	10.0	5.8	34.6	3.4	1.8	62.1
2016	6.1	3.1	42.4	6.4	3.2	51.3
2021	14.8	0.7	39.6	3.6	2.8	51.3

**Table 06-02.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Shiras Moose	Rabbit
	Quadrat Frequency			
1996	38	6	1	3
2001	12	-	-	4
2006	28	18	-	28
2011	19	26	-	-
2016	12	11	-	10
2021	28	15	-	3
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	26.2 (64.6)	7.4 (18.2)	-	-
2006	27.5 (67.9)	36.2 (89.4)	0.5 (1.2)	-
2011	6.7 (16.6)	14.7 (36.4)	-	-
2016	15.4 (38.1)	12.1 (29.8)	-	-
2021	20.1 (49.7)	14.7 (36.4)	-	-

**Table 06-02.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus briziformis <sup>ai</sup> (rattlesnake brome)	Bromus marginatus (mountain brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Koeleria macrantha (prairie Junegrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia myuros <sup>ai</sup> (annual fescue)
year	Nested Frequency														
1996	0	-	-	-	-	166	-	-	5	3	-	7	318	176	-
2001	-	-	-	-	2	214	0	-	-	1	-	14	194	104	2
2006	1	-	1	1	2	310	1	3	-	2	4	28	224	186	-
2011	2	-	7	-	-	221	-	-	4	-	17	28	298	249	2
2016	-	-	1	-	-	369	27	-	-	4	31	15	242	253	12
2021	-	1	8	2	1	99	17	-	-	-	49	4	332	276	-
year	Average Cover (%)														
1996	0.0	-	-	-	-	3.3	-	-	0.0	0.0	-	0.2	13.4	6.8	-
2001	-	-	-	-	0.1	7.9	0.0	-	-	0.0	-	0.6	8.0	6.8	0.0
2006	0.2	-	0.0	0.0	0.0	5.0	0.0	0.0	-	0.0	0.0	1.1	8.3	11.7	-
2011	0.0	-	0.0	-	-	3.1	-	-	0.0	-	0.3	0.7	10.7	13.9	0.0
2016	-	-	0.0	-	-	10.5	0.4	-	-	0.0	0.5	0.1	5.7	9.4	0.1
2021	-	0.0	0.0	0.0	0.0	1.3	0.0	-	-	-	1.7	0.0	16.0	17.2	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 06-02.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Ambrosia psilostachya (Cuman ragweed)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus cibirarius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)
year	Nested Frequency																
1996	117	-	4	28	-	1	1	-	4	-	-	3	9	14	12	1	3
2001	176	2	86	104	1	1	8	14	6	-	3	1	83	36	188	7	-
2006	48	18	63	200	1	3	2	6	1	-	18	-	139	12	111	10	-
2011	72	15	131	304	-	6	-	8	-	-	14	-	86	22	95	3	-
2016	74	-	29	363	-	4	3	10	7	1	30	-	30	14	100	18	-
2021	32	3	2	22	-	-	-	1	13	3	-	-	18	8	5	-	-
year	Average Cover (%)																
1996	1.8	-	0.0	0.1	-	0.0	0.0	-	0.0	-	-	0.0	0.0	0.1	0.0	0.0	0.0
2001	10.1	0.0	0.5	3.0	0.1	0.0	0.0	0.4	0.2	-	0.0	0.0	1.3	0.8	3.3	0.0	-
2006	1.6	0.0	0.5	0.8	0.1	0.1	0.0	0.2	0.0	-	0.1	-	1.2	0.2	0.4	0.0	-
2011	3.2	0.1	0.6	5.5	-	0.3	-	0.2	-	-	0.1	-	0.7	0.3	0.7	0.0	-
2016	2.0	-	0.1	5.3	-	0.2	0.0	0.1	0.1	0.0	0.1	-	0.1	0.5	0.3	0.1	-
2021	0.9	0.0	0.0	0.0	-	-	-	0.0	0.3	0.0	-	-	0.0	0.1	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba verna <sup>ai</sup> (spring draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Eriogon pumilus (shaggy fleabane)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Hackelia patens (spotted stickseed)	Hedysarum boreale (Utah sweetvetch)	Helianthella uniflora (oneflower helianthella)	Heterotheca villosa (hairy false goldenaster)	Hydrophyllum (waterleaf)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lithophragma (woodland-star)	Lomatium triternatum (nineleaf biscuitroot)
year	Nested Frequency																
1996	3	-	-	-	-	30	-	3	3	-	-	-	-	-	-	-	-
2001	9	-	38	64	96	28	-	3	0	-	0	-	-	1	-	-	4
2006	14	-	1	44	109	7	5	2	0	2	-	-	-	-	-	-	13
2011	16	6	3	50	14	11	3	16	6	-	6	-	6	6	54	14	37
2016	21	7	19	49	8	2	11	7	-	-	2	-	7	-	43	-	10
2021	11	0	-	-	-	1	6	-	-	-	-	1	-	-	-	-	-
year	Average Cover (%)																
1996	0.0	-	-	-	-	0.7	-	0.0	0.0	-	-	-	-	-	-	-	-
2001	0.1	-	0.2	0.2	0.5	0.3	-	0.0	0.2	-	0.0	-	-	0.0	-	-	0.0
2006	0.1	-	0.0	0.2	0.9	0.0	0.0	0.0	0.0	0.0	-	-	-	-	-	-	0.1
2011	0.2	0.0	0.0	0.2	0.2	0.1	0.0	0.0	0.2	-	0.2	-	0.1	0.0	2.6	0.1	0.2
2016	0.1	0.2	0.0	0.1	0.0	0.1	0.1	0.0	-	-	0.1	-	0.0	-	0.3	-	0.0
2021	0.2	0.0	-	-	-	0.0	0.0	-	-	-	-	0.2	-	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Maianthemum (mayflower)	Microsteris gracilis <sup>a</sup> (slender phlox)	Orogeria linearifolia (Great Basin Indian potato)	Penstemon (beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Schoenocrambe limifolia (flaxleaf plainsmustard)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Sphaeralcea grossularifolia (gooseberryleaf globemallow)	Symphoricarum (aster)	Tragopogon dubius <sup>ai</sup> (yellow safsify)	Verbascum thapsus <sup>ai</sup> (common mullein)	Vicia americana (American vetch)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency															
1996	-	-	-	1	6	6	-	-	6	-	-	3	-	-	37	-
2001	-	15	-	-	3	2	22	2	95	13	-	0	-	18	140	1
2006	-	57	-	4	-	39	4	-	85	-	1	4	3	1	129	2
2011	2	48	2	-	-	-	4	2	200	-	-	1	19	-	174	3
2016	-	27	4	-	-	2	12	-	125	-	0	-	10	1	166	1
2021	-	2	-	-	2	1	4	-	-	-	-	2	2	-	156	-
year	Average Cover (%)															
1996	-	-	-	0.0	0.0	0.0	-	-	0.0	-	-	0.0	-	-	0.3	-
2001	-	0.1	-	-	0.0	0.0	0.5	0.0	1.2	0.2	-	0.0	-	0.1	3.0	0.0
2006	-	0.8	-	0.0	-	0.1	0.0	-	0.3	-	0.1	0.1	0.0	0.0	1.4	0.0
2011	0.2	0.1	0.0	-	-	-	0.0	0.0	2.6	-	-	0.0	0.1	-	7.9	0.0
2016	-	0.1	0.0	-	-	0.0	0.1	-	0.3	-	0.0	-	0.1	0.0	4.8	0.0
2021	-	0.0	-	-	0.0	0.0	0.0	-	-	-	-	0.1	0.0	-	1.8	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 06-02.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Cercocarpus montanus <sup>p</sup> (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Quercus gambelii <sup>p</sup> (Gambel oak)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)
year	Line Intercept Cover (%)								
1996	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-
2006	1.4	0.3	1.1	11.2	0.2	0.1	1.2	4.2	9.6
2011	1.1	0.8	0.9	6.8	0.2	0.1	1.9	2.4	10.3
2016	0.4	0.7	2	6.8	0.3	0.2	2	4.4	11.1
2021	1.1	-	0.7	4	-	0.1	1.5	4.9	5.2
year	Quadrat Cover (%)								
1996	0.1	12.7	3.7	3.9	-	0.1	1.0	2.6	4.9
2001	0.6	-	1.0	5.7	-	0.2	1.3	2.2	4.3
2006	0.9	0.4	0.7	6.5	0.1	0.0	1.7	2.1	5.7
2011	0.8	0.2	0.4	6.5	0.1	0.1	1.7	2.0	6.6
2016	1.5	0.1	0.0	3.7	0.1	0.2	1.7	1.6	6.4
2021	1.4	-	0.7	2.7	-	0.1	0.8	2.6	5.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 06-02.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	120	20	50	50	0	0	67	50	87/91
2001	200	-	40	30	30	10	0	0	63/76
2006	440	120	36	59	5	9	36	5	61/82
2011	360	-	44	50	6	72	17	0	59/91
2016	240	-	25	75	0	0	25	0	73/85
2021	540	-	33	33	33	44	15	33	- / -
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
1996	2440	-	5	56	39	61	26	37	58/94
2001	80	-	100	0	0	0	0	0	57/86
2006	160	-	13	88	0	25	13	0	52/58
2011	160	-	0	75	25	75	0	0	51/67
2016	220	-	9	91	0	36	0	0	59/84
2021	-	-	-	-	-	-	-	-	- / -
<b>Cercocarpus montanus<sup>p</sup> -- (alderleaf mountain mahogany)</b>									
1996	420	-	14	86	0	52	33	71	129/126
2001	300	-	13	33	53	0	0	0	56/79
2006	180	-	0	56	44	11	89	33	58/69
2011	260	-	0	100	0	39	39	0	59/90
2016	260	-	8	92	0	8	39	0	64/76
2021	160	-	0	25	75	25	0	63	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	2400	-	3	94	3	0	0	4	39/54
2001	2320	-	8	92	0	0	0	3	37/58
2006	2460	60	9	81	11	0	0	2	43/68
2011	2720	-	8	85	7	0	0	0	39/67
2016	2520	-	10	91	0	0	0	0	35/50
2021	2480	-	1	80	19	2	0	39	- / -
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	40	-	100	0	0	0	0	0	- / -
2006	20	-	0	100	0	0	0	0	54/82
2011	20	-	0	0	100	100	0	0	49/66
2016	20	-	0	100	0	0	0	0	50/69
2021	-	-	-	-	-	-	-	-	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	120	-	0	100	0	0	0	0	17/20
2001	80	-	25	75	0	0	0	0	20/40
2006	160	-	13	75	13	0	0	0	21/31
2011	120	-	0	100	0	0	0	0	14/26
2016	360	-	17	83	0	0	0	0	21/21
2021	80	-	0	100	0	0	0	0	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	40	-	0	100	0	0	0	0	17/66
2001	20	-	0	100	0	0	0	0	10/24
2006	20	-	0	100	0	0	0	0	14/31
2011	-	-	-	-	-	-	-	-	10/30
2016	20	-	0	100	0	0	0	0	9/30
2021	-	-	-	-	-	-	-	-	- / -
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1996	60	-	0	100	0	0	33	0	87/163
2001	40	-	0	50	50	0	0	0	30/94
2006	40	-	0	100	0	0	100	0	41/130
2011	40	-	0	100	0	0	100	0	47/185
2016	40	-	0	100	0	0	100	0	42/158
2021	380	-	0	37	63	11	90	63	- / -
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1996	760	80	61	34	5	8	0	8	40/74
2001	2040	-	100	0	0	0	0	0	85/46
2006	2880	-	8	89	3	0	0	0	62/47
2011	1620	-	14	83	4	0	0	4	67/37
2016	1180	-	63	37	0	0	0	0	89/65
2021	2420	140	74	26	0	0	0	0	- / -
<b>Symphoricarpos oreophilus<sup>P</sup> -- (mountain snowberry)</b>									
1996	1280	-	27	72	2	34	13	8	58/111
2001	680	-	9	88	3	0	0	0	50/115
2006	1240	-	11	89	0	3	0	0	56/118
2011	1520	-	17	83	0	11	1	1	63/123
2016	1120	-	20	80	0	7	2	0	59/117
2021	1760	-	2	84	14	13	0	51	- / -

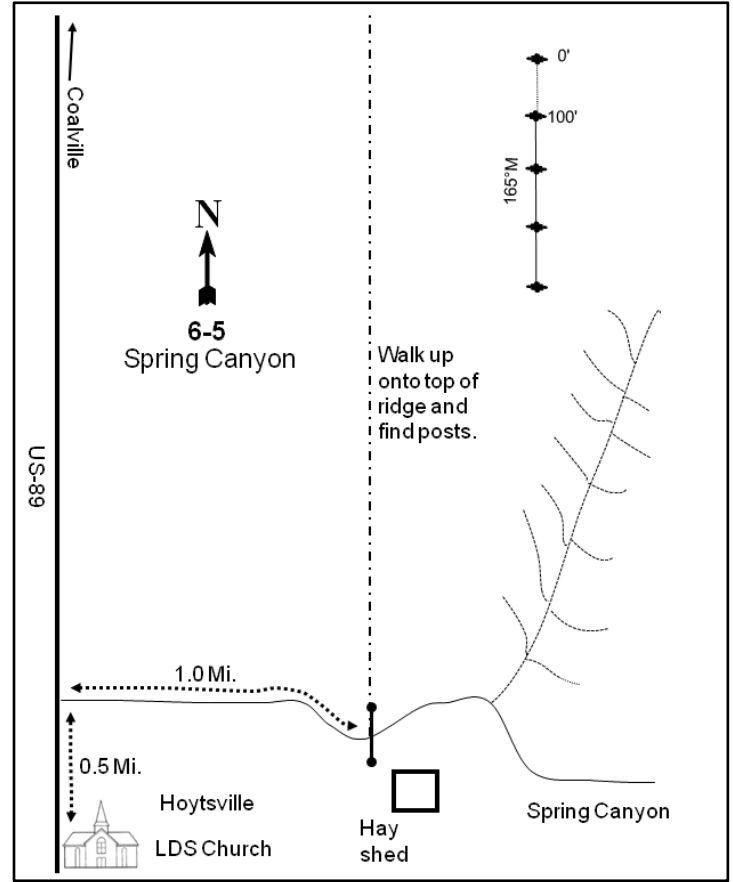
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Tetradymia canescens -- (spineless horsebrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	30/58
2016	-	-	-	-	-	-	-	-	28/35

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 06-02.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	30.0	8.8	8.1	30.0	-2.5	6.0	0.0	<b>80.4</b>	Good
2001	10.8	10.3	15.0	30.0	-5.9	10.0	0.0	<b>70.2</b>	Fair-Good
2006	20.0	13.9	5.5	30.0	-3.7	9.3	0.0	<b>75.0</b>	Good
2011	19.8	14.1	7.3	30.0	-2.3	10.0	0.0	<b>78.9</b>	Good
2016	23.4	15.0	12.6	30.0	-8.0	10.0	0.0	<b>83.0</b>	Good
2021	15.1	9.3	15.0	30.0	-1.0	7.3	0.0	<b>75.6</b>	Good

## SPRING CANYON - STUDY NO. 06-5



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Turner Hollow SW; Township 2N, Range 5E, Section 22  
NAD 83 UTM ZONE 12, 469074 East 4526392 North

### Transect Information

Browse Tag # (0' Stake)	7953
Transect Bearing	165° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

### Directions to Site

From the LDS Church in Hoytsville, travel north for 0.5 miles on old US-189. At 0.5 miles, note a dirt road to the right with a sign that says "Echo-Chalk Creek Range Owners Protective Association" and turn right (east). Proceed 1.0 miles to a gate and a sharp bend to the right (south). The site is on the ridge on the left (east) side of the gate from the property entrance. Walk to the north side of the road to a north/south-running fence. From here, walk north along the fence to the 40th metal fence post. From post number 40, walk 35 paces at 73 degrees true to the 400-foot baseline stake.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,100ft (1,859m)
Aspect	South
Slope	5-10%
Sample Dates	07/11/1996, 06/27/2001, 06/21/2006, 06/15/2011, 06/23/2021

**Wildlife Habitat and Vegetation History**

**Table 06-05.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	winter

**Table 06-05.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1996	Utah Juniper	Phase III
2001	Utah Juniper	Phase III
2006	Utah Juniper	Phase III
2011	Utah Juniper	Phase III
2021	Utah Juniper	Phase III

**Site Notes**

No Notes

**Soils**

**Table 06-05.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.3	32.6	30.7	36.7	2.9	3.8	38.4	0.6	07/11/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

The vegetation community on this site has existed as a Utah juniper (*Juniperus osteosperma*) woodland since study establishment in 1996. As expected from a site within Phase III of woodland succession, the browse component has remained degraded and rare throughout the study period; no preferred browse species were observed in cover or density measurements in 2021 (Photos, Table 06-05.4, Table 06-05.12, Table 06-05.13, Table 06-05.14). The herbaceous understory has remained moderately diverse. However, annual forbs have been the most abundant herbaceous component in many sample years, and have largely been comprised of the introduced species desert madwort (*Alyssum desertorum*) and curvseed butterwort (*Ceratocephala testiculata*). Annual forbs were rare in 2021. The introduced annual grass species cheatgrass (*Bromus tectorum*) and perennial grass species bulbous bluegrass (*Poa bulbosa*) have been observed over the study period, but with low abundance and cover (Table 06-05.7, Table 06-05.10, Table 06-05.11). Without the occurrence of a tree-removing disturbance, this site will likely remain in this or a similar state in the future with a degraded and depauperate shrub and herbaceous understory. Deer winter range condition has remained very poor since site establishment due to a lack of preferred browse species. Improvement to deer wintering range can be accomplished through efforts that support preferred shrub establishment. Diversifying native perennial grasses and forbs, while reducing cheatgrass, would also improve winter range conditions (Table 06-05.15).



**Trend Summary Tables**

**Table 06-05.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	-	0.4	16.6	-	-	-
2001	-	0.1	8.3	-	-	3.1
2006	-	0.5	7.8	-	0.2	44.9
2011	-	0.4	7.0	-	0.4	43.3
2021	-	0.2	5.3	-	0.3	40.6

**Table 06-05.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	152	199	316	82	2.8	2.7	1.4	1.1
2001	115	198	350	81	0.4	4.9	2.1	1.4
2006	80	188	372	70	0.6	3.3	2.6	1.8
2011	82	186	380	117	0.3	5.1	12.7	3.9
2021	32	131	73	43	0.4	1.9	0.1	0.5

**Table 06-05.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	27.9	3.5	40.1	3.8	2.9	25.4
2001	31.7	14.1	40.3	5.4	2.8	18.4
2006	36.0	9.5	45.4	7.2	2.2	16.5
2011	32.4	12.8	35.9	3.9	2.8	23.5
2021	33.7	16.7	39.0	3.9	3.5	8.1

**Table 06-05.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	-	44	1	12
2001	1	22	1	37
2006	-	23	2	51
2011	-	19	3	26
2021	-	30	5	39
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	0.7 (1.8)	58.3 (144.0)	-	-
2006	1.5 (3.6)	85.8 (211.9)	3.4 (8.3)	-
2011	-	67.7 (167.2)	25.5 (62.9)	-
2021	0.7 (1.8)	37.5 (92.7)	1.3 (3.3)	-

**Table 06-05.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency						
1996	86	152	24	31	-	54	49
2001	91	115	26	9	-	61	60
2006	99	80	20	-	3	45	63
2011	46	82	3	-	8	105	60
2021	16	32	23	4	-	81	40
year	Average Cover (%)						
1996	1.1	2.8	0.3	0.3	-	0.5	0.6
2001	1.6	0.4	0.5	0.3	-	1.0	1.4
2006	1.4	0.6	0.4	-	0.0	0.5	1.0
2011	0.6	0.3	0.2	-	0.1	2.1	2.1
2021	0.2	0.4	0.2	0.0	-	0.9	0.5

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 06-05.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria (pussytoes)	Arabis (rockerness)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littledod false flax)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Cryptantha (cryptantha)	Cymopterus longipes (longstalk springparsley)	Delphinium (larkspur)	Descurainia pinnata <sup>a</sup> (western tansymustard)
year	Nested Frequency																
1996	-	-	289	1	5	-	2	-	6	92	-	1	2	21	5	-	-
2001	-	-	304	7	-	-	1	-	2	191	-	-	4	17	3	-	2
2006	2	-	298	10	-	2	-	-	4	271	-	-	-	20	2	-	-
2011	5	8	202	2	2	1	4	5	6	351	1	-	5	30	26	3	25
2021	-	-	27	2	-	2	2	-	-	41	-	-	1	15	1	-	-
year	Average Cover (%)																
1996	-	-	1.1	0.0	0.0	-	0.0	-	0.0	0.3	-	0.0	0.0	0.3	0.0	-	-
2001	-	-	1.1	0.0	-	-	0.0	-	0.0	1.0	-	-	0.0	0.5	0.0	-	0.0
2006	0.0	-	0.7	0.0	-	0.0	-	-	0.0	1.8	-	-	-	0.4	0.0	-	-
2011	0.2	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.1	9.6	0.0	-	0.0	0.5	0.7	0.0	0.5
2021	-	-	0.1	0.0	-	0.0	0.0	-	-	0.1	-	-	0.0	0.3	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nested Frequency															
Eriogonum umbellatum (sulphur-flower buckwheat)																
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)																
Gilia inconspicua <sup>a</sup> (shy gilia)																
Hackelia patens (spotted stickseed)																
Lactuca serriola <sup>ai</sup> (prickly lettuce)																
Machaeranthera grindelioides (rayless tansyaster)																
Microsteris gracilis <sup>a</sup> (slender phlox)																
Packera multilobata (lobeleaf groundsel)																
Penstemon (beardtongue)																
Penstemon humilis (low beardtongue)																
Phlox austromontana (mountain phlox)																
Phlox longifolia (longleaf phlox)																
Silene antirrhina <sup>a</sup> (sleepy silene)																
Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)																
Veronica biloba <sup>ai</sup> (two-lobed speedwell)																
year	Average Cover (%)															
1996	-	-	-	0.0	-	0.0	-	0.0	0.0	0.0	0.0	0.7	0.0	-	0.0	-
2001	-	-	-	0.0	-	0.0	0.1	-	0.0	0.0	0.0	0.8	0.0	-	-	-
2006	-	-	-	0.2	-	0.0	0.0	-	-	0.0	1.1	0.0	0.0	-	-	-
2011	0.0	0.0	0.0	0.8	0.0	0.0	0.1	0.0	-	-	0.5	1.1	-	0.0	0.0	0.0
2021	-	-	-	0.2	-	-	-	-	-	-	0.0	0.0	-	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 06-05.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)		
Gutierrezia sarothrae (broom snakeweed)			
Juniperus osteosperma <sup>a</sup> (Utah juniper)			
Opuntia (pricklypear)			
year	Quadrat Cover (%)		
1996	0.2	16.6	0.2
2001	0.0	8.3	0.1
2006	-	7.8	0.5
2011	-	7.0	0.4
2021	0.0	5.3	0.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 06-05.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	158/141
2011	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	20	-	100	0	0	0	0	0	- / -
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Cercocarpus montanus<sup>P</sup> -- (alderleaf mountain mahogany)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	51/69
2021	-	-	-	-	-	-	-	-	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	14/29
2011	-	-	-	-	-	-	-	-	9/48
2021	20	-	100	0	0	0	0	0	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	240	20	17	83	0	0	0	0	18/22
2001	400	-	75	20	5	0	0	5	13/12
2006	-	-	-	-	-	-	-	-	15/16
2011	-	-	-	-	-	-	-	-	18/24
2021	40	-	0	0	100	0	0	100	- / -
<b>Juniperus osteosperma<sup>I</sup> -- (Utah juniper)</b>									
1996	260	-	15	85	0	0	0	0	- / -
2001	280	20	7	79	14	0	0	14	- / -
2006	520	20	4	92	4	0	31	0	- / -
2011	220	-	9	64	27	0	0	0	- / -
2021	360	-	17	61	22	17	22	22	- / -
<b>Opuntia -- (pricklypear)</b>									
1996	280	-	7	57	36	0	0	29	14/31
2001	260	20	23	69	8	0	0	8	10/29
2006	380	-	21	68	11	0	0	11	13/41
2011	180	-	0	78	22	0	0	33	12/40
2021	520	-	4	50	46	0	0	46	- / -
<b>Symphoricarpos oreophilus<sup>P</sup> -- (mountain snowberry)</b>									
1996	20	-	0	100	0	0	0	0	19/31
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	12/28

t - Tree Species; p - Preferred Browse; i - Introduced Species

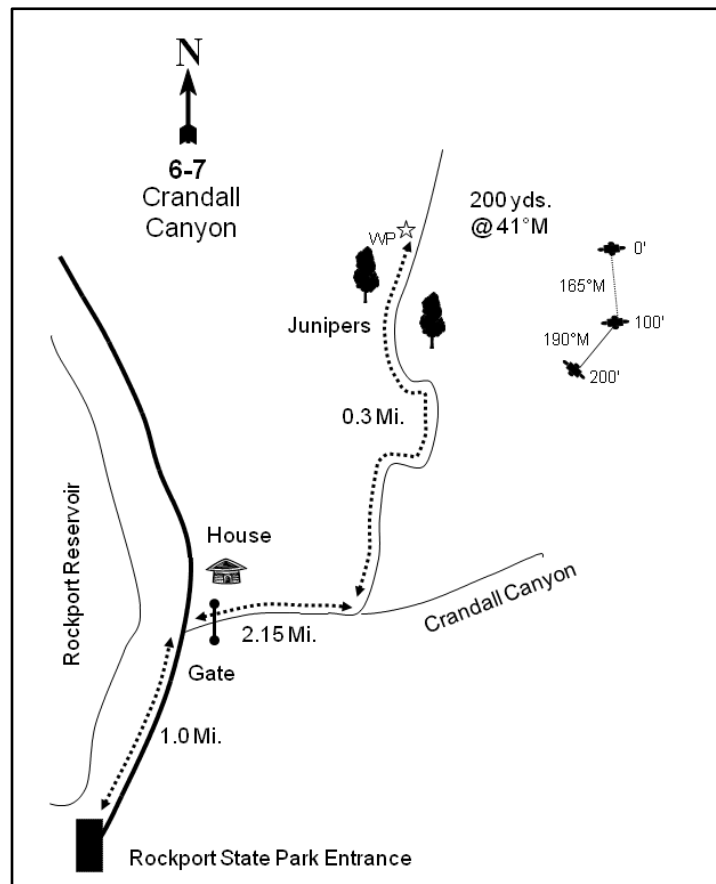
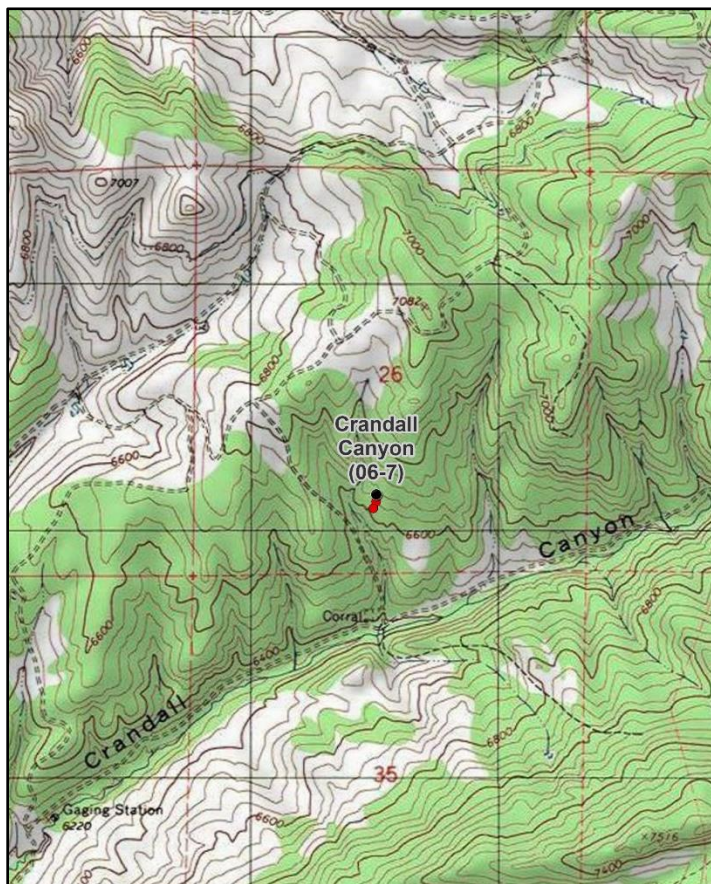
**Table 06-05.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1996	159	-	-	-	-	-	30.1
2001	189	-	-	-	-	-	50.9
2006	155	-	-	5	15	80	24.8
2011	173	-	-	5	15	80	19.3
2021	141	-	-	5	25	70	49.5

**Table 06-05.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	0.0	0.0	0.0	5.5	-2.1	2.3	0.0	<b>5.6</b>	Very Poor
2001	0.0	0.0	0.0	9.7	-0.3	2.9	0.0	<b>12.3</b>	Very Poor
2006	0.0	0.0	0.0	6.6	-0.5	3.6	0.0	<b>9.7</b>	Very Poor
2011	0.0	0.0	0.0	10.0	-0.2	7.8	0.0	<b>17.7</b>	Very Poor
2021	0.0	0.0	0.0	3.9	-0.3	1.0	0.0	<b>4.6</b>	Very Poor

## CRANDALL CANYON - STUDY NO. 06-7

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Crandall Canyon SW; Township 1N, Range 5E, Section 26  
NAD 83 UTM ZONE 12, 470437 East 4515135 North

**Transect Information**

Browse Tag # (0' Stake)	7956
Transect Bearing	180° magnetic (Line 2: 190° magnetic)
Length	200ft
Belt Placement	Line 1 (11ft, 34ft, & 71ft), Line 2 (59ft & 95ft)
Belt Marker Placement	Belt 2: 4ft

**Directions to Site**

From the guardhouse at Rockport State Park, proceed north and east on the paved road for 1.0 mile. Turn right, proceed through the locked gates (you will need two combos), and travel up Crandall Canyon (dirt road) for 2.15 miles. Turn left at the fork and travel 0.3 miles north on this road to a pair of junipers on either side of the road. Just past the junipers on the left-hand (west) side of the road is a witness post. From the witness post walk approximately 200 yards at 41 degrees magnetic to the 0-foot stake of the baseline, which is marked by browse tag #7956. The 200-foot baseline doglegs and runs at 190 degrees magnetic.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,640ft (2,024m)
Aspect	South
Slope	31-36%
Sample Dates	07/22/1996, 06/27/2001, 08/16/2006, 07/12/2011, 07/26/2017, 06/23/2021

**Wildlife Habitat and Vegetation History****Table 06-07.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	winter

**Table 06-07.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Mixed Mountain Brush	Phase I
1990	Mixed Mountain Brush	Phase I
1996	Mixed Mountain Brush	Phase I
2001	Mixed Mountain Brush	Phase I
2006	Mixed Mountain Brush	Phase I
2011	Mixed Mountain Brush	Phase I
2017	Mixed Mountain Brush	Phase I
2021	Mixed Mountain Brush	Phase I

**Site Notes**

Two deer carcasses were found on site in 2011. Elk tracks were seen in 2017, as were ungulate bones. A dead cow was observed on the eastern portion of the site in 2021.

**Soils****Table 06-07.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	8.0	58.7	12.0	29.3	1.7	5.1	32.0	0.5	07/22/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Loam (Browse)
NRCS Ecological Site #	R047XA420UT
States and Transitions	No state and transition model is available for this ecological site.

This site has remained dominated by various mixed mountain brush species such as Utah serviceberry (*Amelanchier utahensis*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and alderleaf mountain mahogany (*Cercocarpus montanus*) since study establishment in 1984; Gambel oak (*Quercus gambelii*) is also abundant. Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) trees have been present in all sample years, placing this site in Phase I of woodland succession throughout the duration of the study (Photos, Pre-1992 Data, Table 06-07.4, Table 06-07.12, Table 06-07.13, Table 06-07.14). Without a tree-removing disturbance, this site will likely continue to be encroached by juniper and pinyon in the future and progress through the phases of woodland succession. The herbaceous understory has remained diverse and has largely been comprised of perennial grasses, including (but not limited to) the native species thickspike wheatgrass (*Elymus lanceolatus*) and bluebunch wheatgrass (*Pseudoroegneria spicata*), in all study years (Pre-1992 Data, Table 06-07.10). Cover of forbs has fluctuated from year to year, but neither annual or perennial forbs were abundant in 2021 (Table 06-07.7, Table 06-07.11). Deer winter range condition has ranged from fair to good. Improvement to deer wintering range can be accomplished through efforts that diversify native perennial grasses and forbs while reducing cheatgrass (Table 06-07.15).

**Trend Summary Tables****Table 06-07.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	13.7	5.4	2.4	-	-	-
2001	12.0	6.0	3.4	-	-	-
2006	10.6	2.2	5.9	15.2	2.1	13.2
2011	15.5	2.6	4.4	21.3	3.3	18.6
2017	14.1	4.8	6.3	19.8	7.7	17.5
2021	10.0	1.6	2.5	18.6	1.8	11.3

**Table 06-07.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	61	343	271	129	0.2	10.4	1.7	1.5
2001	48	305	223	114	0.2	10.9	1.8	1.8
2006	45	314	223	67	0.1	16.8	1.2	1.0
2011	112	300	285	100	2.8	18.6	9.0	2.6
2017	33	267	234	127	0.3	6.0	4.2	2.1
2021	-	255	27	94	-	6.6	0.1	1.3

**Table 06-07.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	31.0	0.0	38.6	5.3	3.7	34.5
2001	41.3	-	26.8	4.4	4.0	37.1
2006	45.0	-	26.5	4.3	4.2	37.8
2011	30.1	0.2	19.2	6.0	3.7	52.7
2017	34.5	0.2	32.9	8.2	3.8	36.3
2021	52.9	2.0	25.7	2.3	5.1	21.0

**Table 06-07.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Horse	Shiras Moose	Rabbit
	Quadrat Frequency						
1996	-	-	15	5	-	-	-
2001	1	-	22	2	-	-	11
2006	-	-	7	2	-	-	3
2011	-	-	6	1	-	-	1
2017	1	1	9	8	-	-	6
2021	-	-	22	5	-	-	7
Year	Days Use Per Acre (ha)						
1996	-	-	-	-	-	-	-
2001	6.5 (16.1)	-	50.2 (124.1)	2.0 (5.0)	0.6 (1.4)	-	-
2006	-	-	14.7 (36.4)	1.3 (3.3)	-	-	-
2011	5.1 (12.6)	-	9.4 (23.2)	4.7 (11.6)	-	-	-
2017	1.5 (3.6)	8.7 (21.5)*	23.4 (57.9)	12.1 (29.8)	-	0.5 (1.2)	-
2021	3.6 (9.0)	-	36.8 (91.0)	4.0 (9.9)	-	-	-

\*Pellets per acre (ha)



**Table 06-07.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Leymus cinereus (basin wildrye)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency										
1996	78	-	61	8	5	150	8	-	1	20	173
2001	50	11	41	6	3	121	17	1	6	15	154
2006	56	22	23	1	-	260	14	-	3	18	48
2011	54	98	17	3	-	143	17	-	8	14	135
2017	39	20	13	-	36	189	19	-	-	12	14
2021	37	-	-	5	17	173	33	-	-	18	32
year	Average Cover (%)										
1996	1.6	-	0.2	0.2	0.0	3.5	0.5	-	0.0	0.2	4.6
2001	1.8	0.0	0.2	0.1	0.0	2.9	0.6	0.0	0.1	0.0	5.3
2006	3.0	0.1	0.1	0.0	-	9.8	1.1	-	0.0	0.1	2.7
2011	1.8	2.6	0.1	0.0	-	5.5	0.9	-	0.1	0.5	9.7
2017	0.8	0.2	0.1	-	0.3	3.8	0.7	-	-	0.2	0.1
2021	1.0	-	-	0.0	0.4	3.1	1.1	-	-	0.3	0.6

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 06-07.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Alyssum szovitsianum <sup>ai</sup> (Szowitz' madwort)	Arabis (rockcress)	Astragalus convallarius (lesser rushy milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littlupod false flax)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cryptantha (cryptantha)	Cymopterus (springparsley)
year	Nested Frequency																
1996	4	-	259	-	-	-	5	-	-	-	13	-	24	-	29	24	-
2001	1	-	218	-	1	-	2	5	1	14	5	-	28	4	25	32	-
2006	-	3	195	-	-	1	0	-	31	-	1	1	16	-	24	13	-
2011	5	-	267	-	-	-	2	5	15	1	5	-	32	-	35	4	-
2017	4	-	216	-	-	2	-	-	-	-	19	10	21	-	24	28	2
2021	4	3	12	11	-	2	0	-	-	-	4	4	4	-	16	15	1
year	Average Cover (%)																
1996	0.0	-	1.0	-	-	-	0.1	-	-	-	0.1	-	0.6	-	0.2	0.3	-
2001	0.0	-	0.8	-	0.0	-	0.0	0.2	0.0	0.0	0.0	-	0.9	0.0	0.2	0.5	-
2006	-	0.0	0.4	-	-	0.0	0.0	-	0.1	-	0.0	0.0	0.6	-	0.1	0.4	-
2011	0.1	-	7.0	-	-	-	0.1	0.0	0.3	0.0	0.0	-	1.6	-	0.3	0.2	-
2017	0.4	-	3.6	-	-	0.0	-	-	-	-	0.1	0.1	0.4	-	0.2	0.3	0.0
2021	0.0	0.0	0.0	0.0	-	0.0	0.0	-	-	-	0.2	0.1	0.1	-	0.1	0.3	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Descurainia pinnata <sup>a</sup> (western tansymustard)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Eriogonum umbellatum (sulphur-flower buckwheat)	Euphorbia brachycera (horned spurge)	Hackelia patens (spotted stickseed)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stone seed)	Maianthemum racemosum (feathery false lily of the valley)	Oenothera caespitosa (tufted evening primrose)	Penstemon humilis (low beardtongue)	Phlox longifolia (longleaf phlox)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Symphotrichum ascendens (western aster)	Tragopogon dubius <sup>ai</sup> (yellow salsify)
year	Nested Frequency														
1996	1	1	-	-	23	1	-	-	6	-	9	-	-	35	4
2001	-	-	-	-	8	-	-	-	3	1	16	-	-	38	-
2006	1	1	3	-	5	-	-	-	-	-	11	1	-	14	6
2011	1	-	3	3	-	-	-	-	3	-	25	-	3	26	5
2017	7	-	11	5	-	-	7	0	-	-	8	-	1	45	4
2021	-	-	-	0	11	1	2	-	3	-	22	9	-	7	-
year	Average Cover (%)														
1996	0.0	0.0	-	-	0.2	0.0	-	-	0.1	-	0.1	-	-	0.5	0.1
2001	-	-	-	-	0.0	-	-	-	0.0	0.0	0.2	-	-	0.5	-
2006	0.0	0.0	0.0	-	0.2	-	-	-	-	-	0.1	0.0	-	0.1	0.1
2011	0.0	-	0.0	0.0	-	-	-	-	0.0	-	0.8	-	0.0	0.8	0.1
2017	0.2	-	0.1	0.0	-	-	0.0	0.0	-	-	0.1	-	0.0	0.6	0.0
2021	-	-	-	0.0	0.0	0.0	0.1	-	0.0	-	0.1	0.0	-	0.2	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 06-07.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Cercocarpus montanus <sup>p</sup> (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Opuntia (pricklypear)	Pinus edulis <sup>t</sup> (twoneedle pinyon)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Quercus gambelii <sup>p</sup> (Gambel oak)	Rosa woodsii <sup>p</sup> (Woods' rose)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)												
1996	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-	-	-	-
2006	3.5	0.3	2.6	1	1	13.2	0.1	-	1	4.3	-	3.5	-
2011	4.1	1	5.9	1.4	1.9	14.2	-	4.4	1.2	5.2	0	3.9	-
2017	3	0.7	6.5	1.5	6.2	13.1	-	4.4	1.2	7.3	-	1.1	-
2021	4	0.6	4.4	0.9	0.9	11.3	-	-	0.9	7	-	1.7	-
year	Quadrat Cover (%)												
1996	1.7	0.9	5.0	0.7	4.0	2.4	0.5	-	0.6	2.6	0.1	2.7	0.2
2001	1.2	0.6	4.7	1.5	3.7	3.4	0.5	-	0.4	1.7	-	3.6	0.4
2006	2.6	0.6	2.9	1.5	0.4	5.9	0.2	-	0.4	2.2	-	2.0	-
2011	1.7	1.2	5.4	1.3	1.2	4.4	0.0	0.0	0.4	4.9	0.0	1.9	-
2017	1.7	1.4	5.5	1.7	2.9	6.3	0.0	0.0	0.6	3.7	0.1	1.0	0.2
2021	1.4	0.6	2.5	0.8	0.8	2.5	-	-	0.4	3.5	-	1.6	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 06-07.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1996	580	20	21	69	10	21	21	14	54/59
2001	640	-	25	63	13	28	34	9	56/66
2006	320	-	25	63	13	19	44	19	66/81
2011	220	-	9	91	0	18	18	0	55/69
2017	740	-	14	87	0	5	32	0	61/63
2021	280	-	36	57	7	7	86	7	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1996	340	-	24	71	6	24	41	0	40/68
2001	280	-	7	64	29	36	43	0	40/69
2006	200	60	0	80	20	50	20	20	54/80
2011	160	20	0	100	0	50	0	13	54/87
2017	200	-	0	90	10	40	40	0	43/84
2021	300	-	27	13	60	27	27	53	- / -
<b>Cercocarpus montanus<sup>P</sup> -- (alderleaf mountain mahogany)</b>									
1996	1120	20	20	77	4	27	43	2	54/74
2001	1200	-	3	78	18	7	80	13	65/90
2006	1060	-	9	70	21	9	66	6	50/86
2011	1020	20	12	86	2	29	31	6	50/72
2017	1200	20	7	88	5	20	48	7	58/76
2021	1080	-	22	69	9	13	82	9	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	1020	-	2	94	4	2	2	0	24/32
2001	1640	-	4	96	0	0	0	0	22/34
2006	1120	-	9	89	2	5	0	0	25/43
2011	960	20	21	79	0	0	0	2	24/39
2017	1560	-	5	92	3	0	0	3	22/36
2021	1160	-	35	48	17	19	21	16	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	7640	620	11	89	0	0	0	0	22/27
2001	10680	20	2	91	7	0	0	4	15/19
2006	1360	40	16	82	2	0	0	0	19/25
2011	940	20	23	77	0	0	0	0	26/33
2017	5520	20	4	95	0	0	0	0	23/33
2021	1060	20	11	32	57	11	9	57	- / -
<b>Juniperus osteosperma<sup>1</sup> -- (Utah juniper)</b>									
1996	40	-	100	0	0	0	0	0	- / -
2001	120	-	0	100	0	0	0	0	- / -
2006	140	-	14	86	0	0	0	0	- / -
2011	60	-	33	67	0	0	0	0	- / -
2017	80	-	0	100	0	0	0	0	- / -
2021	120	-	17	50	33	17	0	33	- / -
<b>Opuntia -- (pricklypear)</b>									
1996	380	-	16	84	0	0	0	0	12/38
2001	300	20	0	60	40	0	0	27	11/22
2006	440	-	14	86	0	0	0	0	10/28
2011	40	20	0	100	0	0	0	0	12/33
2017	120	-	0	50	50	0	0	50	10/15
2021	40	-	0	100	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Pinus edulis<sup>t</sup> -- (twoneedle pinyon)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2017	20	-	100	0	0	0	0	0	- / -
2021	-	-	-	-	-	-	-	-	-/-
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	40	-	0	50	50	50	0	0	- / -
2001	60	-	0	100	0	0	0	0	36/130
2006	20	-	0	100	0	100	0	0	30/137
2011	60	-	0	100	0	0	100	0	24/97
2017	160	-	0	100	0	0	100	0	32/105
2021	160	-	25	75	0	0	100	0	- / -
<b>Quercus gambelii<sup>p</sup> -- (Gambel oak)</b>									
1996	720	60	17	83	0	0	0	0	63/44
2001	1320	-	26	74	0	0	0	0	132/73
2006	1460	-	23	77	0	0	0	0	107/48
2011	520	-	39	62	0	15	0	0	- / -
2017	2260	-	51	48	1	0	0	1	84/57
2021	1400	-	36	63	1	10	20	4	- / -
<b>Rosa woodsii<sup>p</sup> -- (Woods' rose)</b>									
1996	-	-	-	-	-	-	-	-	41/25
2001	40	-	0	100	0	0	0	0	23/15
2006	-	-	-	-	-	-	-	-	47/31
2011	-	-	-	-	-	-	-	-	30/31
2017	140	-	86	14	0	0	0	0	19/24
2021	-	-	-	-	-	-	-	-	-/-
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	940	20	36	55	9	32	2	2	48/68
2001	560	-	21	79	0	0	0	0	48/89
2006	1000	-	8	64	28	0	4	16	42/66
2011	900	20	16	84	0	4	0	0	40/55
2017	1340	-	2	97	2	0	0	0	31/36
2021	1440	-	33	64	3	6	1	3	- / -
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	200	-	10	90	0	90	0	0	34/45
2001	100	-	20	80	0	0	0	0	24/35
2006	-	-	-	-	-	-	-	-	16/37
2011	-	-	-	-	-	-	-	-	26/54
2017	260	-	46	54	0	0	0	0	22/30
2021	160	-	38	38	25	0	50	25	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

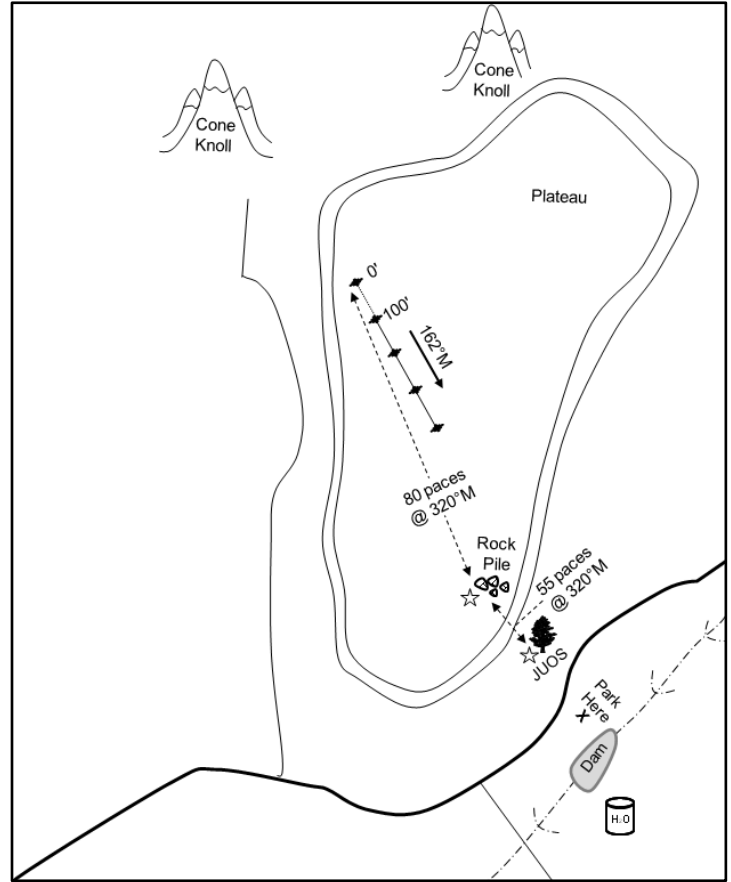
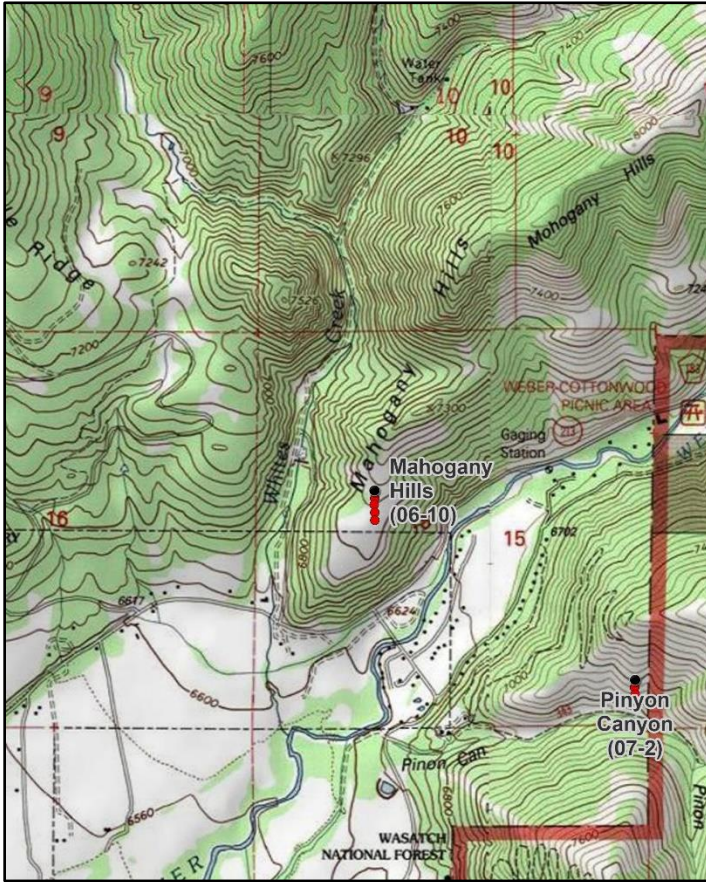
**Table 06-07.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2006	32	13	13	50	-	25	20.9
2011	52	-	27	36	18	18	18.8
2017	38	11	33	33	-	22	20.1
2021	63	9	27	36	18	9	13.1

**Table 06-07.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	17.7	12.8	10.9	20.9	-0.2	3.1	0.0	<b>65.1</b>	Fair
2001	15.2	12.1	7.0	21.9	-0.2	3.6	0.0	<b>59.7</b>	Fair
2006	18.8	11.0	7.9	30.0	-0.1	2.0	0.0	<b>69.7</b>	Fair-Good
2011	27.2	14.8	8.6	30.0	-2.1	5.2	0.0	<b>83.8</b>	Good
2017	25.3	14.3	11.6	12.0	-0.2	4.2	0.0	<b>67.1</b>	Fair
2021	23.4	13.1	15.0	13.1	0.0	2.5	0.0	<b>67.1</b>	Fair

## MAHOGANY HILLS - STUDY NO. 06-10



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Kamas NE; Township 1S, Range 6E, Section 15  
NAD 83 UTM ZONE 12, 478363 East 4509508 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

7952  
166° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Standard

### Directions to Site

From Oakley, proceed up Weber Canyon while watching for Pinyon Canyon Lane (a right turn). From this road proceed 0.15 miles farther up Weber Canyon and park opposite a small irrigation canal dam; the main river dam that supplies the canal is 100 yards upstream. From the river diversion, walk up the steep slope at 273 degrees magnetic to a large, lone juniper and mahogany. From the lone juniper and mahogany, a rock pile can be found 55 paces away at 320 degrees magnetic. From the rock pile, the 0-foot baseline stake is approximately 80 paces away at a bearing of 320 degrees magnetic. The 0-foot stake is marked by with browse tag #7952. To triangulate on the 0-foot stake when in the middle of the plateau: from the stake to a cone knoll to the north is 7 degrees magnetic, and from the stake to a water tank on the right at the mouth of Pinyon Canyon is 150 degrees magnetic.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	7,020ft (2,140m)
Aspect	Southeast
Slope	12-15%
Sample Dates	07/16/1996, 06/25/2001, 06/21/2006, 07/07/2011, 06/20/2016, 06/22/2021

**Wildlife Habitat and Vegetation History**

**Table 06-10.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	winter
Shiras Moose	crucial	winter

**Table 06-10.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Mixed Mountain Brush/Perennial Grass	No Encroachment
1990	Mixed Mountain Brush/Perennial Grass	No Encroachment
1996	Mixed Mountain Brush/Perennial Grass	No Encroachment
2001	Mixed Mountain Brush/Perennial Grass	No Encroachment
2006	Mixed Mountain Brush/Perennial Grass	No Encroachment
2011	Mixed Mountain Brush/Perennial Grass	No Encroachment
2016	Mixed Mountain Brush/Perennial Grass	No Encroachment
2021	Mixed Mountain Brush/Perennial Grass	No Encroachment

**Site Notes**

The study is located on private land on a ridge at the mouth of the Upper Weber River Canyon. The area has a lot of recreational development, with newer cabins and summer homes in the general vicinity of the site. The vegetation is a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), other mountain brush, and grass community. In 2016, a deer skeleton was found near the site and several recent bedding areas were found in and around the site.

**Soils**

**Table 06-10.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.7	38.9	35.1	26.0	3.7	32.5	195.2	0.6	07/16/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Loam (Shrub)
NRCS Ecological Site #	R047XA434UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1984, this site has remained dominated by a mixture of mountain browse species including mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), mountain snowberry (*Symphoricarpos oreophilus*), Utah serviceberry (*Amelanchier utahensis*), and others. Density of sagebrush has been decreasing slightly each sample year since 2011. In addition, 44% of sagebrush plants were considered to have poor vigor in 2021, likely due to drought stress; further decreases in sagebrush density could potentially occur if similar climatic conditions are sustained in future sample years (Photos, Pre-1992 Data, Table 06-10.12, Table 06-10.13). Much of the herbaceous cover has been contributed by the introduced perennial grass species smooth brome (*Bromus inermis*); although other species are present, perennial grasses have been a co-dominant vegetation component throughout the study period. The introduced annual grass species cheatgrass (*Bromus tectorum*) was observed in 2001 and 2021, but in very low abundance (Table 06-10.10). Forbs have been diverse, moderately abundant, and have included valuable and palatable species (Table 06-10.7, Table 06-10.11). Deer winter range condition has generally improved from good to excellent since site establishment. Maintaining excellent deer winter range can be accomplished through efforts that support mature sagebrush and sagebrush reproduction (Table 06-10.15).

**Trend Summary Tables**

**Table 06-10.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	33.9	2.7	-	-	-	-
2001	22.9	1.6	-	0.1	-	-
2006	22.8	2.7	-	25.7	3.2	-
2011	21.2	1.9	-	28.4	3.3	-
2016	22.1	2.8	-	23.0	4.0	-
2021	22.4	3.0	-	25.6	3.2	-

**Table 06-10.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	-	463	53	191	-	33.2	0.4	5.6
2001	2	463	68	149	0.0	34.4	0.8	4.7
2006	-	459	77	213	-	36.1	0.7	8.3
2011	-	453	173	246	-	36.7	2.9	9.7
2016	-	469	163	195	-	32.9	1.6	8.4
2021	15	427	24	110	0.5	37.3	0.1	5.0

**Table 06-10.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	5.8	0.7	75.0	0.1	0.1	61.5
2001	3.9	0.2	70.5	0.1	0.0	61.5
2006	5.3	0.1	58.2	0.1	0.0	65.8
2011	5.6	0.2	63.1	-	0.0	65.3
2016	5.0	0.0	48.5	0.1	0.0	61.4
2021	10.2	2.1	49.4	0.3	0.1	54.3

**Table 06-10.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1996	12	22	-
2001	3	17	-
2006	11	14	1
2011	12	12	-
2016	22	10	7
2021	25	34	11
Year	Days Use Per Acre (ha)		
1996	-	-	-
2001	10.7 (26.5)	40.9 (101.0)	-
2006	48.3 (119.2)	59.0 (145.7)	-
2011	23.4 (57.9)	41.5 (102.6)	-
2016	22.1 (54.6)	10.0 (24.8)	-
2021	44.9 (110.9)	32.2 (79.5)	-



**Table 06-10.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency														
Agropyron cristatum <sup>i</sup> (crested wheatgrass)	8	345	-	-	6	2	25	37	8	11	73	132	118	96	
Bromus inermis <sup>i</sup> (smooth brome)	6	360	2	-	1	19	1	23	-	3	86	79	145	42	
Bromus tectorum <sup>ai</sup> (cheatgrass)	5	368	-	2	-	-	-	92	1	36	36	38	91	25	
Carex (sedge)	6	388	-	5	-	9	-	49	0	32	24	63	124	14	
Dactylis glomerata <sup>i</sup> (orchardgrass)	5	413	-	24	-	14	-	45	-	33	4	108	111	36	
Elymus lanceolatus (thickspike wheatgrass)	2021	34	353	15	5	-	18	3	5	-	130	4	4	117	1
Hesperostipa comata (needle and thread)	Average Cover (%)														
Koeleria macrantha (prairie Junegrass)	1996	0.3	19.8	-	-	0.2	0.0	0.6	0.8	0.0	0.3	2.6	3.4	2.7	2.5
Melica bulbosa (oniongrass)	2001	0.0	24.9	0.0	-	0.0	0.5	0.0	0.8	-	0.1	2.4	1.4	3.3	1.0
Poa bulbosa <sup>i</sup> (bulbous bluegrass)	2006	0.0	23.8	-	0.1	-	-	-	6.2	0.0	1.1	1.1	0.3	2.9	0.4
Poa fendleriana (muttongrass)	2011	0.0	29.3	-	0.0	-	0.0	-	1.4	0.0	0.8	0.6	1.8	2.4	0.2
Poa pratensis <sup>i</sup> (Kentucky bluegrass)	2016	0.0	25.4	-	0.3	-	0.1	-	1.4	-	0.6	0.2	2.1	2.4	0.5
Poa secunda (Sandberg bluegrass)	2021	1.1	19.6	0.5	0.5	-	0.6	0.0	0.0	-	8.4	0.0	0.1	6.9	0.0
Pseudoroegneria spicata (bluebunch wheatgrass)															

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 06-10.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
Achillea millefolium (Common yarrow)	1	-	3	14	1	17	-	3	65	5	-	-	11	-	6	24	-	
Agoseris glauca (pale agoseris)	2001	-	7	4	23	-	-	-	3	59	9	-	-	2	-	5	18	-
Allium acuminatum (tapertip onion)	2006	3	5	68	36	-	11	-	4	36	13	29	-	10	1	-	16	-
Alyssum desertorum <sup>ai</sup> (desert madwort)	2011	2	27	144	92	-	-	18	5	65	17	14	-	8	7	-	57	3
Antennaria (pussytoes)	2016	3	27	65	86	-	1	-	4	87	13	27	2	8	1	0	15	-
Arabis (rockcress)	2021	-	4	9	3	-	-	-	5	12	18	2	-	-	-	1	7	-
Arenaria (sandwort)	Average Cover (%)																	
Artemisia ludoviciana (white sagebrush)	1996	0.0	-	0.0	0.1	0.0	0.0	-	0.4	1.1	0.6	-	-	0.5	-	0.1	0.1	-
Astragalus convallarius (lesser rushy milkvetch)	2001	-	0.0	0.0	0.3	-	-	-	0.1	0.8	0.9	-	-	0.1	-	0.2	0.1	-
Balsamorhiza sagittata (arrowleaf balsamroot)	2006	0.1	0.0	0.3	0.1	-	0.1	-	0.4	0.6	2.1	0.1	-	0.3	0.0	-	0.1	-
Calochortus nuttallii (sego lily)	2011	0.1	0.2	1.1	0.7	-	-	0.1	0.4	1.3	2.2	0.1	-	0.3	0.0	-	0.3	0.0
Camelina microcarpa <sup>ai</sup> (littlepod false flax)	2016	0.0	0.2	0.3	0.3	-	0.0	-	0.1	1.2	2.3	0.1	0.0	0.3	0.0	0.0	0.0	-
Castilleja linariifolia (Wyoming Indian paintbrush)	2021	-	0.1	0.0	0.0	-	-	-	0.1	0.1	2.2	0.0	-	-	-	0.0	0.0	-
Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)																		
Cirsium undulatum <sup>a</sup> (wavyleaf thistle)																		
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																		
Collomia linearis <sup>a</sup> (tiny trumpet)																		

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Comandra umbellata (bastard toadflax)	Cordylanthus ramosus <sup>a</sup> (bushy bird's beak)	Crepis acuminata (tapertip hawkbeard)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Eriogon pumilus (shaggy fleabane)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Hackelia patens (spotted stickseed)	Helianthella uniflora (oneflower helianthella)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lithospermum ruderale (western stone seed)	Lomatium (desertparsley)	Lupinus argenteus (silvery lupine)	Microsteris gracilis <sup>a</sup> (slender phlox)	Penstemon humilis (low beardtongue)	Phlox longifolia (longleaf phlox)
year	Nested Frequency																
1996	11	1	64	-	-	5	10	7	22	34	-	7	-	-	-	5	-
2001	2	7	57	-	-	5	9	5	4	20	-	6	-	-	16	-	3
2006	5	17	76	-	4	4	2	9	0	31	6	3	11	-	12	-	-
2011	11	18	76	46	34	-	-	14	2	34	-	3	2	1	44	-	-
2016	13	16	58	3	69	-	5	5	1	26	-	5	0	-	9	-	-
2021	-	0	32	-	-	0	-	3	-	28	-	8	1	-	5	-	-
year	Average Cover (%)																
1996	0.1	0.0	0.6	-	-	0.0	0.2	0.1	0.2	1.4	-	0.2	-	-	-	0.1	-
2001	0.2	0.0	0.6	-	-	0.0	0.1	0.1	0.0	1.5	-	0.1	-	-	0.1	-	0.0
2006	0.6	0.3	1.5	-	0.0	0.1	0.0	0.3	0.0	1.6	0.0	0.2	0.1	-	0.0	-	-
2011	0.1	0.3	1.6	0.4	0.2	-	-	0.5	0.0	1.6	-	0.2	0.0	0.0	0.3	-	-
2016	0.1	0.4	0.7	0.0	0.8	-	0.1	0.0	0.0	2.2	-	0.7	0.0	-	0.0	-	-
2021	-	0.0	0.4	-	-	0.0	-	0.0	-	1.7	-	0.2	0.0	-	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Schoenocrambe limifolia (flaxleaf plainsmustard)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Silene antirrhina <sup>a</sup> (sleepy silene)	Zigadenus pamiculatus (foothill deathcamas)
year	Nested Frequency				
1996	15	2	-	12	3
2001	-	1	15	3	3
2006	13	-	15	-	2
2011	13	-	39	3	-
2016	11	-	-	-	4
2021	3	-	8	1	9
year	Average Cover (%)				
1996	0.0	0.0	-	0.1	0.0
2001	-	0.0	0.1	0.0	0.0
2006	0.0	-	0.1	-	0.0
2011	0.1	-	0.6	0.0	-
2016	0.0	-	-	-	0.1
2021	0.0	-	0.0	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 06-10.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Cercocarpus montanus <sup>p</sup> (alderleaf mountain mahogany)	Chrysothamnus depressus <sup>p</sup> (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Quercus gambelii <sup>p</sup> (Gambel oak)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)								
1996	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-
2006	4	9.5	-	0.1	2.9	2	1	9.1	0.3
2011	4.7	7.6	0.2	-	3.2	2.1	2.4	11.4	0.1
2016	3.9	7.2	0.3	0.3	3.8	0.9	1.3	9.1	0.2
2021	5.3	10.4	0.2	-	3.2	0.8	2.4	6.5	-
year	Quadrat Cover (%)								
1996	3.3	16.2	1.3	0.3	2.6	1.5	0.9	10.4	0.2
2001	2.8	11.0	0.2	0.3	1.4	1.1	1.1	6.5	0.2
2006	2.0	11.4	0.1	0.7	2.6	0.6	0.9	7.1	0.1
2011	1.8	7.8	0.2	0.2	1.8	0.9	1.9	8.4	0.1
2016	1.9	7.7	0.0	0.7	2.8	0.6	2.6	8.6	0.0
2021	2.6	10.1	0.2	-	2.5	0.8	1.9	7.0	0.5

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 06-10.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	560	-	0	68	32	64	25	43	83/97
2001	880	-	5	80	16	23	30	0	89/93
2006	620	-	13	81	7	48	36	3	92/82
2011	620	-	10	77	13	55	39	0	93/91
2016	1400	-	40	57	3	13	41	31	76/74
2021	820	120	42	32	27	22	44	29	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	2780	-	4	56	40	60	32	19	71/99
2001	1920	-	1	51	48	56	21	22	65/86
2006	1960	-	4	48	48	43	27	21	67/84
2011	2140	140	9	54	36	54	19	20	73/95
2016	2060	60	2	96	2	34	40	7	65/87
2021	1680	80	7	48	45	42	12	44	- / -
<b>Cercocarpus ledifolius<sup>p</sup> -- (curl-leaf mountain mahogany)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	160/125
2016	-	-	-	-	-	-	-	-	160/103
2021	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Cercocarpus montanus<sup>P</sup> -- (alderleaf mountain mahogany)</b>									
1996	20	-	0	100	0	0	0	0	136/159
2001	60	-	33	67	0	0	33	0	108/108
2006	40	-	0	100	0	0	100	0	110/131
2011	80	-	25	75	0	0	75	0	105/118
2016	100	-	20	80	0	0	80	0	99/105
2021	-	-	-	-	-	-	-	-	- / -
<b>Chrysothamnus depressus<sup>P</sup> -- (longflower rabbitbrush)</b>									
1996	220	-	0	100	0	0	0	0	19/26
2001	200	-	0	100	0	0	0	0	20/22
2006	340	-	35	65	0	53	0	0	20/33
2011	200	-	20	80	0	0	0	0	20/34
2016	300	-	7	93	0	0	0	0	21/28
2021	-	-	-	-	-	-	-	-	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	1740	-	1	99	0	0	0	1	35/40
2001	1680	40	1	99	0	0	0	0	30/40
2006	1500	-	4	96	0	4	0	0	34/47
2011	2000	-	0	100	0	4	0	0	33/41
2016	1780	-	6	94	0	0	0	0	35/51
2021	1500	20	4	63	33	9	15	39	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	20	-	0	100	0	0	0	0	21/20
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	20	-	0	0	100	0	0	100	- / -
<b>Opuntia -- (pricklypear)</b>									
1996	-	-	-	-	-	-	-	-	14/23
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	10/25
2021	-	-	-	-	-	-	-	-	- / -
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1996	240	-	0	100	0	42	42	0	43/93
2001	280	-	7	93	0	7	64	0	36/85
2006	360	-	11	89	0	28	28	0	43/88
2011	340	-	6	94	0	6	77	0	38/104
2016	460	40	26	74	0	44	39	0	36/77
2021	340	-	24	47	29	41	41	29	- / -
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1996	460	-	0	100	0	83	4	0	82/57
2001	1120	-	9	79	13	68	4	70	55/45
2006	1180	-	22	68	10	34	0	36	59/28
2011	1260	-	79	21	0	76	24	8	74/54
2016	1140	-	37	60	4	5	60	4	67/39
2021	1020	20	82	8	10	0	100	10	- / -

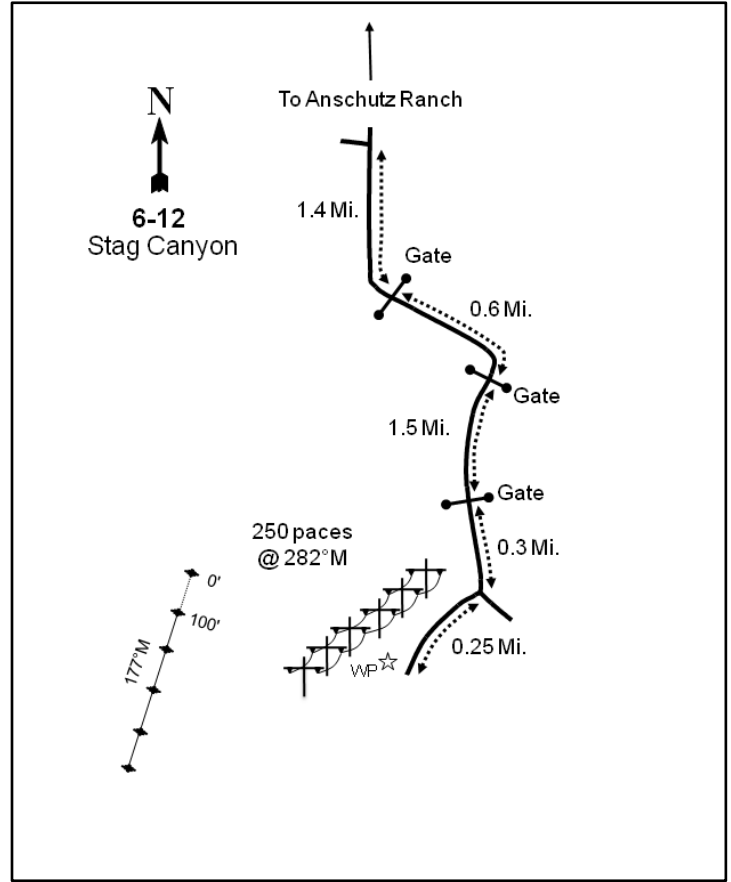
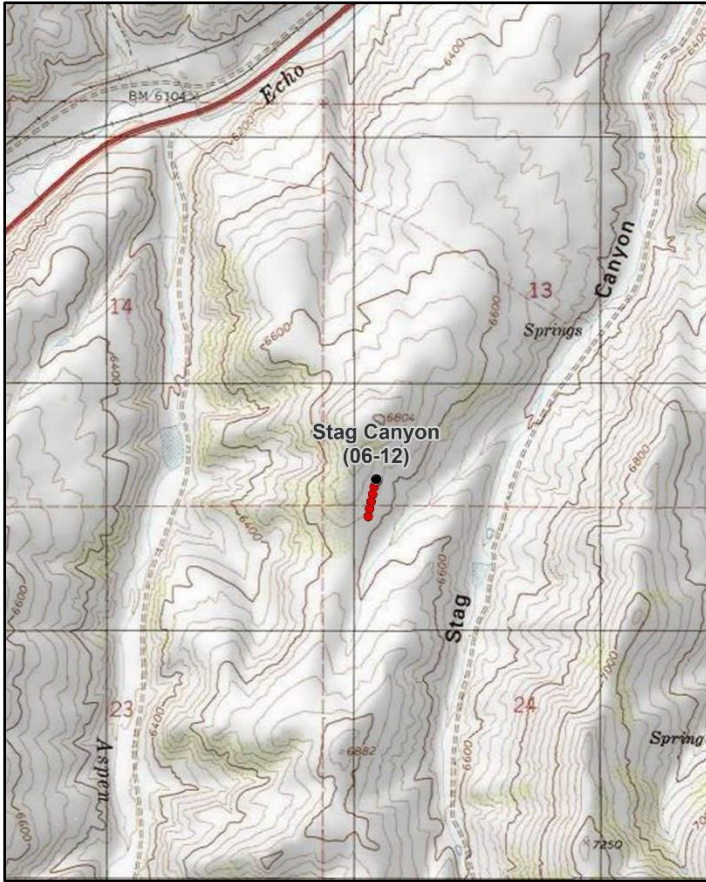
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Ribes<sup>p</sup> -- (currant)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	52/49
2021	-	-	-	-	-	-	-	-	-/-
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	3380	100	15	84	1	18	0	0	48/82
2001	1860	-	3	93	4	4	0	2	45/95
2006	3720	60	7	94	0	0	0	0	45/69
2011	2700	-	17	83	0	7	0	0	53/97
2016	1720	-	16	84	0	0	1	0	53/91
2021	3240	160	42	52	6	26	19	6	- / -
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	80	-	0	100	0	25	0	0	41/51
2001	100	-	0	100	0	0	0	0	36/48
2006	100	-	0	100	0	40	0	0	33/43
2011	120	-	17	50	33	17	0	0	39/53
2016	100	-	0	100	0	0	0	0	38/51
2021	120	-	0	83	17	0	0	17	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 06-10.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	30.0	8.2	3.2	30.0	0.0	10.0	0.0	<b>81.5</b>	Good
2001	27.8	7.0	1.5	30.0	0.0	9.5	0.0	<b>75.8</b>	Good
2006	30.0	9.3	3.8	30.0	0.0	10.0	0.0	<b>83.1</b>	Good
2011	30.0	11.4	9.1	30.0	0.0	10.0	0.0	<b>90.6</b>	Good-Excellent
2016	27.4	14.6	8.6	30.0	0.0	10.0	0.0	<b>90.7</b>	Good-Excellent
2021	30.0	6.7	15.0	30.0	-0.3	10.0	0.0	<b>91.3</b>	Good-Excellent

## STAG CANYON - STUDY NO. 06-12



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Castle Rock NW; Township 4N, Range 6E, Section 13  
NAD 83 UTM ZONE 12, 481027 East 4546813 North

### Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	177° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

### Directions to Site

Take exit #185 on I-80 in Echo Canyon and turn right on the frontage road (west). Drive 1.4 miles, turn left, and pass through the locked Aspen Meadows Ranch gate. Go 0.6 miles and turn off to the right through the gate next to the corral. Travel 1.5 miles to another gate and proceed 0.3 miles from the gate to a fork. Turn right and drive 0.25 miles to a witness post on the right-hand (west) side of the road. From the witness post, walk 90 paces at 282 degrees magnetic to the 0-foot baseline stake. The baseline runs at 177 degrees magnetic.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,610ft (2,015m)
Aspect	East
Slope	15%
Sample Dates	07/23/1996, 08/27/2001, 06/26/2006, 06/22/2011, 06/22/2016, 06/23/2021

**Table 06-12.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	Historic	-

**Wildlife Habitat and Vegetation History****Table 06-12.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	summer	
Rocky Mountain Elk	crucial	summer	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	summer	

**Table 06-12.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1996	Mountain Big Sagebrush	No Encroachment
2001	Mountain Big Sagebrush	No Encroachment
2006	Mountain Big Sagebrush	Phase I
2011	Mountain Big Sagebrush	Phase I
2016	Mountain Big Sagebrush	Phase I
2021	Mountain Big Sagebrush	Phase I

**Site Notes**

The study is located on private land that is part of the Ensign Ranches Cooperative Wildlife Management Unit (CWMU) in Echo Canyon. The area is an old burn that has again been dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), with adequate Utah juniper (*Juniperus osteosperma*) located a short distance up the ridge that provides thermal cover. The study was established in 1996 because of concerns about heavy elk presence.

In 2016, it was noted that many of the sagebrush plants had galls and appeared to be chlorotic/discolored.

**Soils****Table 06-12.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.4	47.3	26.7	26.0	2.9	11.9	169.6	0.7	07/23/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Upland Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R047XA314UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1996, this site has remained dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*) as a subordinate shrub species (Photos, Table 06-12.12). In 2021, 42% of sagebrush plants were considered to have poor vigor (Table 06-12.13), likely due to drought stress; sagebrush could decrease in abundance should similar drought conditions be sustained in future sample years. The herbaceous understory has fluctuated in composition and abundance over the study period. The introduced annual grass species cheatgrass (*Bromus tectorum*) and annual forb desert madwort (*Alyssum desertorum*) have provided much of the herbaceous cover in some sample years. In other years, however, perennial grass species such as Indian ricegrass (*Achnatherum hymenoides*) and thickspike wheatgrass (*Elymus lanceolatus*) have contributed a majority of the cover. Perennial forbs have remained diverse, but not abundant (Table 06-12.7, Table 06-12.10, Table 06-12.11). Utah juniper (*Juniperus osteosperma*) trees have been observed in the area and the site has been considered to be within Phase I of woodland succession since 2006. Point-quarter density has remained low (Table 06-12.4, Table 06-12.13, Table 06-12.14), however, indicating that further tree encroachment may not pose an immediate threat to the ecological integrity of this site.



**Trend Summary Tables****Table 06-12.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	9.5	7.2	-	-	-	-
2001	11.6	6.5	-	-	-	-
2006	16.6	5.4	-	25.9	6.7	-
2011	16.4	5.1	-	29.9	5.7	-
2016	18.1	6.4	-	26.0	9.1	-
2021	16.7	8.6	-	20.9	10.7	-

**Table 06-12.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	272	173	237	74	4.4	5.8	7.8	0.6
2001	154	203	354	43	1.9	6.0	4.9	0.5
2006	273	161	400	112	4.0	6.3	4.8	2.2
2011	349	130	438	161	11.1	4.9	18.8	3.7
2016	366	142	444	110	11.2	6.2	12.5	1.7
2021	157	187	85	91	2.5	3.4	0.9	0.8

**Table 06-12.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	34.3	0.0	40.0	2.6	1.7	32.8
2001	45.1	0.2	35.9	5.5	1.4	32.5
2006	44.8	0.6	26.7	5.0	1.8	34.4
2011	29.8	1.1	23.3	5.7	0.6	49.5
2016	30.8	0.2	27.8	4.1	0.9	48.8
2021	37.7	1.0	48.3	2.1	0.9	28.0

**Table 06-12.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1996	6	10	47	-	3
2001	4	13	9	-	5
2006	1	10	6	2	22
2011	-	7	18	-	2
2016	-	19	-	-	14
2021	2	29	4	-	28
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	10.9 (26.9)	14.7 (36.4)	60.3 (149.0)	-	-
2006	-	20.8 (51.3)	34.9 (86.1)	1.2 (2.9)	-
2011	-	25.5 (62.9)	27.5 (67.9)	-	-
2016	-	49.6 (122.5)	8.7 (21.5)	-	-
2021	4.4 (10.8)	22.8 (56.3)	-	-	-

**Table 06-12.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Leymus cinereus (basin wildrye)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency								
1996	57	272	78	15	5	-	14	10	11
2001	64	154	91	14	5	2	34	8	11
2006	66	273	57	18	5	3	23	17	11
2011	37	349	63	8	1	5	2	32	6
2016	29	366	36	46	5	5	18	13	5
2021	51	157	95	6	-	-	12	47	11
year	Average Cover (%)								
1996	2.1	4.4	2.6	0.3	0.0	-	0.5	0.1	0.2
2001	1.4	1.9	2.1	0.4	0.4	0.0	1.3	0.1	0.2
2006	3.6	4.0	1.1	0.3	0.2	0.0	0.1	0.4	0.5
2011	1.4	11.1	1.3	0.6	0.0	0.3	0.1	1.0	0.2
2016	0.9	11.2	0.5	3.2	0.2	0.1	0.6	0.5	0.3
2021	1.0	2.5	1.6	0.2	-	-	0.1	0.4	0.2

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 06-12.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus cibirius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Cordylanthus ramosus <sup>a</sup> (bushy bird's beak)	Crepis acuminata (tapertip hawkbeard)
year	Nested Frequency																
1996	-	-	-	103	2	-	-	3	2	-	-	5	144	18	-	1	-
2001	-	-	2	342	-	-	1	9	-	-	-	3	32	6	4	19	-
2006	-	-	13	355	-	0	28	16	2	-	9	178	8	167	-	51	1
2011	-	3	35	420	-	-	48	4	7	-	23	213	24	110	-	39	19
2016	4	-	8	437	-	-	44	10	1	2	6	39	13	57	-	45	-
2021	8	-	-	42	-	-	21	11	1	-	-	16	12	23	-	1	-
year	Average Cover (%)																
1996	-	-	-	0.3	0.0	-	-	0.0	0.0	-	-	0.0	5.0	0.1	-	0.0	-
2001	-	-	0.0	3.5	-	-	0.1	0.1	-	-	-	0.0	0.5	0.0	0.0	0.6	-
2006	-	-	0.1	1.2	-	0.0	0.6	0.3	0.0	-	0.0	1.1	0.1	0.5	-	1.5	0.0
2011	-	0.0	0.1	13.8	-	-	1.4	0.1	0.3	-	0.1	3.1	0.8	0.5	-	0.4	0.1
2016	0.0	-	0.0	11.1	-	-	0.4	0.2	0.0	0.0	0.0	0.1	0.1	0.1	-	1.0	-
2021	0.2	-	-	0.1	-	-	0.1	0.0	0.0	-	-	0.0	0.7	0.1	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Delphinium nuttallianum (two-lobed larkspur)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Gilia inconspicua <sup>a</sup> (shy gilia)	Lithospermum ruderale (western stone seed)	Machaeranthera (tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>ai</sup> (tall tumbleweed)	Sphaeralcea coccinea (scarlet globemallow)	Symphotrichum ascendens (western aster)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	unknown perennial forb (unknown forb)
year	Nested Frequency																
1996	-	-	1	3	-	-	-	-	-	42	26	5	1	26	-	6	2
2001	-	-	-	2	2	4	0	1	4	19	-	-	-	9	-	0	-
2006	-	10	9	-	3	-	4	-	91	49	-	7	-	7	-	0	-
2011	9	3	3	4	-	-	2	-	40	40	4	4	-	12	8	6	-
2016	-	2	-	-	-	-	3	-	13	31	-	17	-	10	12	1	-
2021	-	-	-	-	1	-	18	-	2	39	-	2	-	6	5	-	-
year	Average Cover (%)																
1996	-	-	0.0	0.0	-	-	-	-	-	0.2	0.1	0.0	0.0	0.3	-	0.0	0.0
2001	-	-	-	0.0	0.0	0.0	0.0	0.2	0.0	0.1	-	-	-	0.1	-	0.0	-
2006	-	0.0	0.0	-	0.0	-	0.1	-	0.2	0.6	-	0.0	-	0.4	-	0.0	-
2011	0.1	0.0	0.0	0.0	-	-	0.2	-	0.1	0.3	0.0	0.0	-	0.5	0.4	0.0	-
2016	-	0.0	-	-	-	-	0.1	-	0.0	0.1	-	0.1	-	0.3	0.6	0.0	-
2021	-	-	-	-	0.0	-	0.2	-	0.0	0.1	-	0.0	-	0.0	0.1	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Verbascum thapsus <sup>ai</sup> (common mullein)	Viola (violet)
year	Nested Frequency	
1996	59	-
2001	17	-
2006	-	-
2011	-	10
2016	-	-
2021	-	-
year	Average Cover (%)	
1996	2.3	-
2001	0.3	-
2006	-	-
2011	-	0.1
2016	-	-
2021	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 06-12.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Opuntia (pricklypear)
year	Line Intercept Cover (%)			
1996	-	-	-	-
2001	-	-	-	-
2006	25.9	6.7	-	-
2011	29.9	5.7	0	-
2016	26	7.7	1.2	0.2
2021	20.9	9.7	0.8	0.2
year	Quadrat Cover (%)			
1996	9.5	5.4	1.6	0.1
2001	11.6	5.7	0.9	0.0
2006	16.6	5.3	0.1	0.0
2011	16.4	4.9	0.0	0.1
2016	18.1	5.7	0.6	0.1
2021	16.7	7.6	1.0	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 06-12.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	5120	1960	71	28	0	2	1	0	83/103
2001	5720	20	29	68	2	2	0	0	77/90
2006	3880	400	21	73	6	13	0	26	83/105
2011	2860	-	8	80	11	43	0	10	74/96
2016	2340	40	3	87	9	12	28	4	94/128
2021	2620	80	11	49	41	15	4	42	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	2660	40	3	93	5	5	1	0	28/60
2001	3480	40	1	87	12	0	0	10	22/52
2006	2280	-	7	84	9	2	0	4	27/58
2011	2060	20	16	85	0	0	0	0	24/55
2016	2440	-	7	93	0	3	0	0	27/56
2021	3880	-	3	86	11	13	5	14	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	3120	-	18	81	1	0	0	0	17/25
2001	1840	-	0	97	3	0	0	3	17/25
2006	240	-	8	83	8	0	0	8	15/18
2011	320	-	6	94	0	0	0	0	12/17
2016	1080	80	7	93	0	0	0	0	22/30
2021	1360	60	3	56	41	0	0	41	- / -

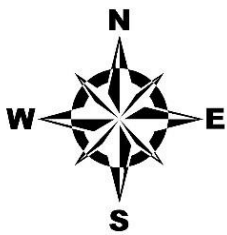
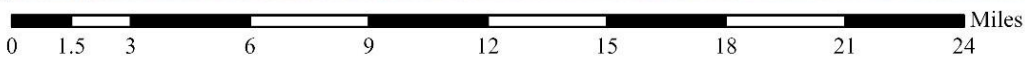
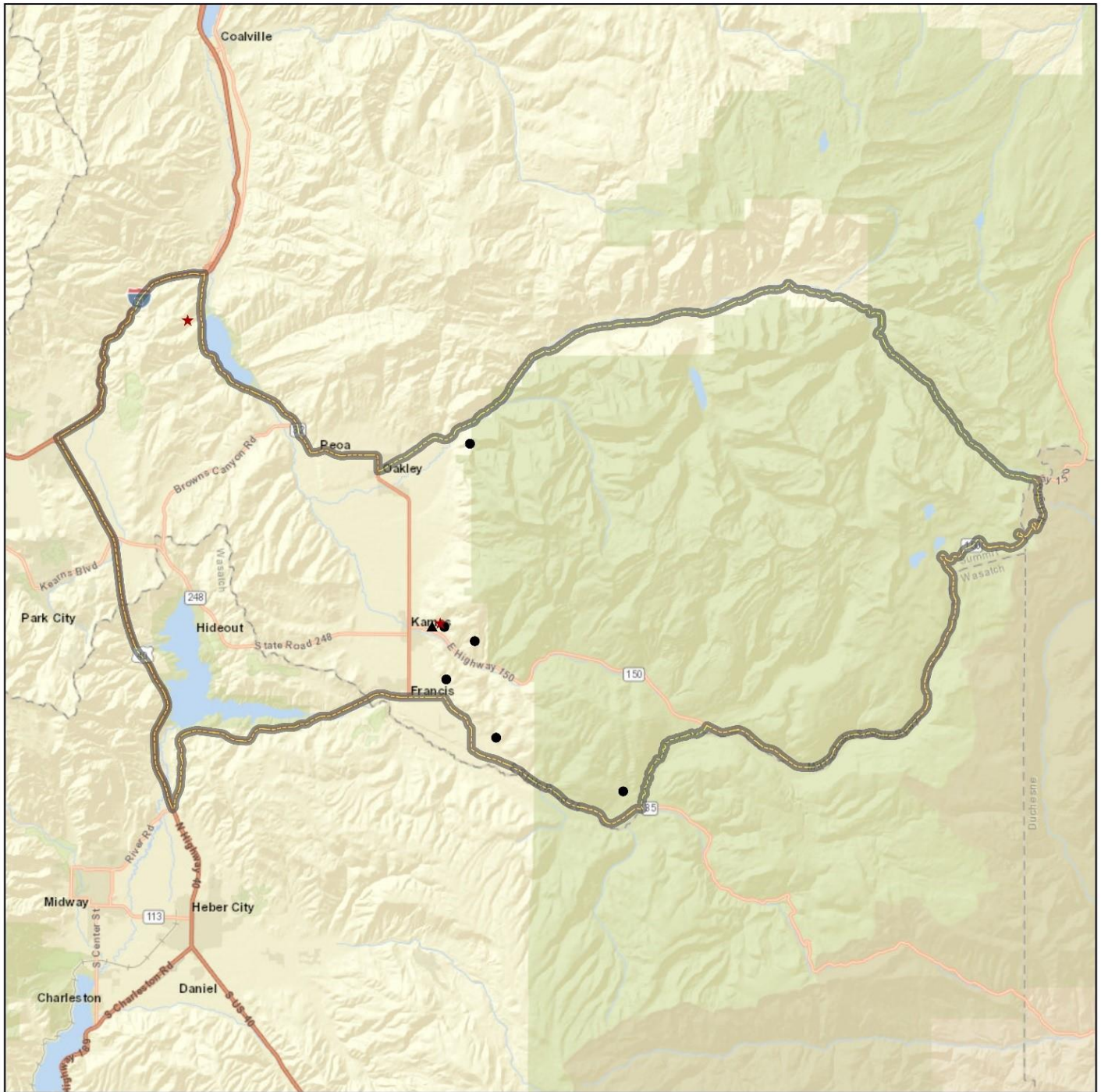
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	20	0	0	0	0	0	0	- / -
2011	-	-	-	-	-	-	-	-	-/-
2016	40	-	100	0	0	50	0	50	- / -
2021	20	-	100	0	0	0	0	0	- / -
<b>Opuntia -- (pricklypear)</b>									
1996	100	-	0	100	0	0	0	0	13/20
2001	140	-	0	100	0	0	0	0	11/26
2006	100	-	0	100	0	0	0	0	12/18
2011	40	-	0	100	0	0	0	0	10/21
2016	80	-	0	100	0	0	0	0	13/31
2021	100	-	0	100	0	0	0	0	- / -
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	26/161
2006	-	-	-	-	-	-	-	-	25/197
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	28/107
2021	-	-	-	-	-	-	-	-	-/-
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	15/66
2011	-	-	-	-	-	-	-	-	21/57
2016	-	-	-	-	-	-	-	-	22/63

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 06-12.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2016	4	-	100	-	-	-	2.7
2021	3	-	100	-	-	-	4.3

# WILDLIFE MANAGEMENT UNIT 7 - KAMAS

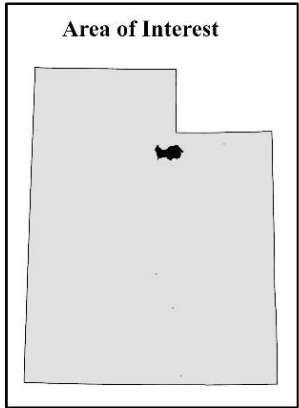


**Study Locations  
Project, Status**

- RT, Active
- ★ RT, Suspended
- ▲ WRI, Active

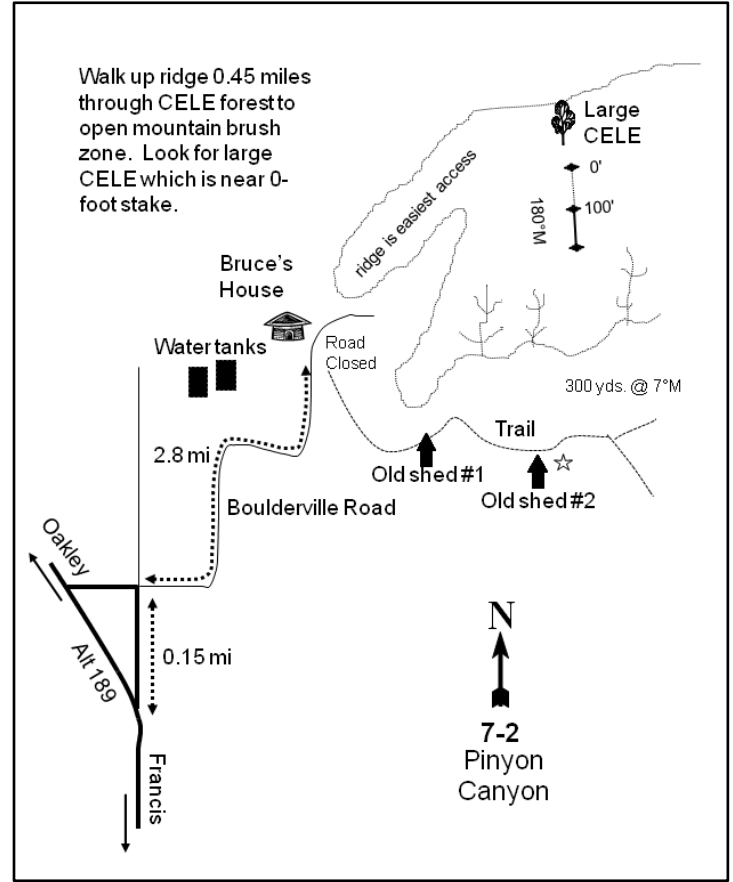
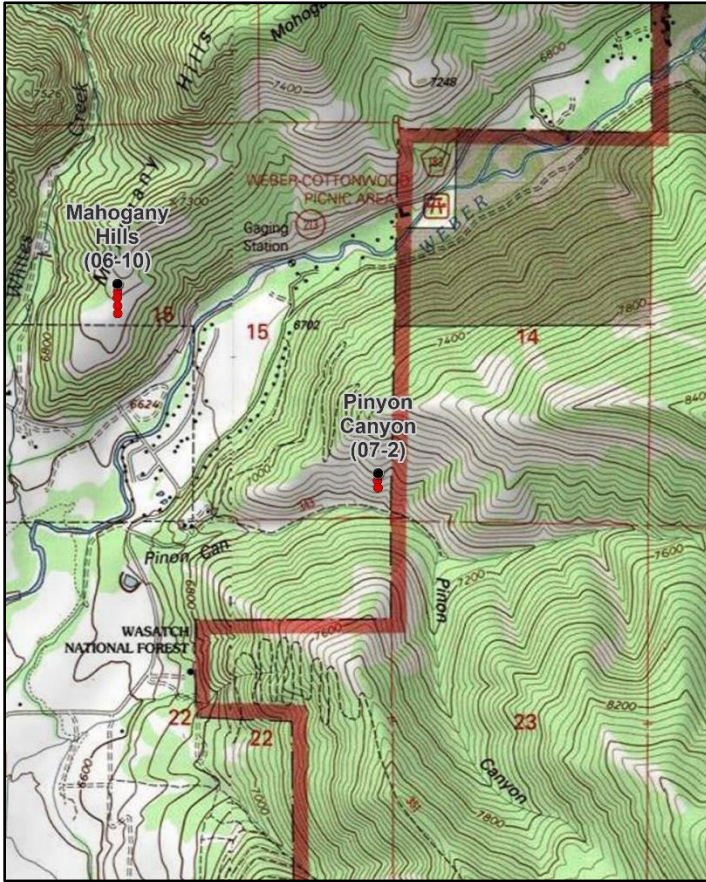
**Unit Boundary**

- ▭ Unit - 7



Credits: Bureau of Land Management, Utah AGRC, Esri, HERE, Garmin, INCREMENT P, NGA, USGS

## PINYON CANYON - STUDY NO. 07-2



**Location Information**

USGS 7.5 min Map Info Hoyt Peak NW; Township 1S, Range 6E, Section 15  
 GPS (0' Stake) NAD 83 UTM ZONE 12, 479419 East 4508740 North

**Transect Information**

Browse Tag # (0' Stake) 7957  
 Transect Bearing 169° magnetic  
 Length 200ft  
 Belt Placement Line 1 (11ft, 59ft, & 95ft), Line 2 (34ft & 71ft)  
 Belt Marker Placement Standard

**Directions to Site**

Where Highway 189 turns northwest between Kamas and Oakley, proceed north for 0.15 miles. At this intersection turn right (east) onto Boulderville Road and travel for 2.8 miles. Turn right (east) onto a dirt road proceeding up Pinyon Canyon to a private home, passing two water storage tanks (contact the landowner before proceeding through private land). From the landowner's home, walk up the ridge through a curl-leaf mahogany and pinyon forest for about one half of a mile. As the forest opens up into a mountain brush vegetation type look for a lone, large curl-leaf mahogany on the southwest-facing slope: the 0-foot baseline stake is just below this mahogany. The 0-foot stake is marked by browse tag #7957.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	7,160ft (2,182m)
Aspect	South
Slope	45-60%
Sample Dates	07/18/1996, 06/26/2001, 07/05/2006, 06/30/2011, 06/21/2016, 06/22/2021

**Wildlife Habitat and Vegetation History**

**Table 07-02.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	winter

**Table 07-02.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Mixed Mountain Brush/Perennial Grass	No Encroachment
1990	Mixed Mountain Brush/Perennial Grass	No Encroachment
1996	Mixed Mountain Brush/Perennial Grass	No Encroachment
2001	Mixed Mountain Brush/Perennial Grass	No Encroachment
2006	Mixed Mountain Brush/Perennial Grass	No Encroachment
2011	Mixed Mountain Brush/Perennial Grass	No Encroachment
2016	Mixed Mountain Brush/Perennial Grass	No Encroachment
2021	Mixed Mountain Brush/Annual-Perennial Grass	No Encroachment

**Site Notes**

The study is located in a drainage containing one of the better and more important mountain brush big game wintering areas in the herd unit. This site is at a high elevation for winter range, but with the favorable aspect and slope, the area remains available to big game during all but the most severe winters.

**Soils**

**Table 07-02.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.7	40.6	32.4	27.0	3.8	8.4	89.6	0.8	07/18/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	23 inches
NRCS Ecological Site	Mountain Stony Loam (Browse)
NRCS Ecological Site #	R047XA460UT
States and Transitions	No state and transition model is available for this ecological site.

This study site has been dominated by a mixture of mountain browse species since its establishment in 1984. Browse is rich in composition, and includes mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), alderleaf mountain mahogany (*Cercocarpus montanus*), and antelope bitterbrush (*Purshia tridentata*) among others (Photos, Pre-1992 Data, Table 07-02.12, Table 07-02.13). Perennial grasses have been co-dominant in all sample years, and while abundant, are not particularly diverse: bluebunch wheatgrass (*Pseudoroegneria spicata*) has consistently provided the most cover. The introduced annual grass species cheatgrass (*Bromus tectorum*) has also been present and was considered to be co-dominant along with perennial grasses in 2021 (Table 07-02.10). Forbs are diverse and abundance has fluctuated each study year (Table 07-02.7, Table 07-02.11). Although conifers are present downhill from the site, there is no encroachment occurring as of the 2021 sample year (Photos, Table 07-02.12, Table 07-02.13). Since study establishment, browse and herbaceous requirements favor good to excellent deer winter habitat in most sample years (Table 07-02.15).



**Trend Summary Tables**

**Table 07-02.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	9.9	0.3	-	-	-	-
2001	13.0	0.2	-	-	-	-
2006	12.7	0.1	-	16.2	0.1	-
2011	11.4	0.2	-	13.9	0.1	-
2016	13.6	0.2	-	18.7	0.5	-
2021	13.8	0.3	-	18.1	0.1	-

**Table 07-02.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	318	406	181	99	6.5	23.4	1.1	2.6
2001	249	376	216	122	5.6	16.2	2.6	3.2
2006	317	360	356	119	3.9	20.0	4.0	3.2
2011	245	372	416	175	1.9	14.8	12.6	6.2
2016	177	379	349	150	2.4	16.7	4.7	5.6
2021	350	277	341	93	13.0	14.8	6.1	3.9

**Table 07-02.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	14.7	0.4	40.9	6.6	17.1	43.1
2001	33.1	0.1	30.0	5.9	15.8	38.9
2006	22.3	0.0	25.3	7.3	18.6	39.5
2011	24.7	0.4	17.0	3.5	16.9	46.0
2016	22.0	0.1	22.4	6.4	16.9	40.9
2021	26.7	1.7	32.6	2.5	17.6	43.4

**Table 07-02.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1996	11	32	-
2001	14	43	-
2006	3	49	-
2011	8	59	-
2016	3	40	2
2021	17	44	9
Year	Days Use Per Acre (ha)		
1996	-	-	-
2001	30.2 (74.5)	69.0 (170.5)	-
2006	12.1 (29.8)	100.5 (248.3)	-
2011	10.7 (26.5)	160.2 (395.6)	-
2016	1.3 (3.3)	42.2 (104.3)	-
2021	5.3 (13.2)	34.9 (86.1)	-

**Table 07-02.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency							
Bromus arvensis <sup>ai</sup> (field brome)	-	318	-	-	55	-	195	379
Bromus tectorum <sup>ai</sup> (cheatgrass)	-	249	-	-	29	-	217	337
Koeleria macrantha (prairie Junegrass)	4	316	-	-	24	-	133	341
Poa bulbosa <sup>i</sup> (bulbous bluegrass)	6	244	-	-	10	7	156	357
Poa fendleriana (muttongrass)	-	177	26	-	2	4	35	370
Poa pratensis <sup>i</sup> (Kentucky bluegrass)	13	345	20	28	12	-	96	219
year	Average Cover (%)							
1996	-	6.5	-	-	0.7	-	3.4	19.3
2001	-	5.6	-	-	0.6	-	4.3	11.3
2006	0.0	3.9	-	-	0.5	-	1.9	17.6
2011	0.0	1.9	-	-	0.2	0.0	2.5	12.1
2016	-	2.4	0.6	-	0.1	0.0	0.2	15.8
2021	0.0	12.9	0.1	1.2	0.6	-	2.8	10.1

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 07-02.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Agoseris glauca (pale agoseris)	-	5	31	-	-	-	-	131	8	13	-	9	-	29	1	2	-
Allium acuminatum (tapertip onion)	11	51	73	-	2	-	4	53	51	-	1	12	2	24	2	5	7
Alyssum desertorum <sup>ai</sup> (desert madwort)	11	69	342	-	2	1	6	3	60	-	-	6	-	18	7	1	5
Alyssum szovitsianum <sup>ai</sup> (Szowitz' madwort)	19	112	414	-	6	0	-	2	120	-	-	3	4	16	2	3	5
Astragalus cibarius (browse milkvetch)	24	60	273	151	2	0	20	1	12	-	-	15	-	32	2	-	-
Balsamorhiza sagittata (arrowleaf balsamroot)	1	20	254	236	1	4	1	1	29	-	-	1	-	22	10	-	-
Calochortus nuttallii (sego lily)	-	-	-	-	-	-	-	0.6	0.0	0.1	-	0.1	-	0.2	0.0	0.0	-
Camelina microcarpa <sup>ai</sup> (littledrop false flax)	0.1	0.3	0.6	-	0.0	-	0.0	0.2	0.4	-	0.0	0.6	0.0	0.3	0.0	0.4	0.1
Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	0.1	0.3	2.6	-	0.1	0.1	0.0	0.0	0.6	-	-	0.6	-	0.5	0.1	0.0	0.0
Chaenactis douglasii (Douglas' dustymaiden)	0.3	0.6	11.8	-	0.3	0.0	-	0.0	0.5	-	-	0.1	0.0	0.7	0.1	0.0	0.0
Chenopodium fremontii <sup>a</sup> (Fremont's goosefoot)	0.2	0.2	3.1	0.9	0.0	0.1	0.1	0.0	0.1	-	-	0.5	-	0.7	0.0	-	-
Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	0.0	0.2	3.5	2.4	0.0	0.5	0.0	0.0	0.1	-	-	0.0	-	0.3	0.1	-	-
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	-	-	-	-	-	-	-	0.6	0.0	0.1	-	0.1	-	0.2	0.0	0.0	-
Comandra umbellata (bastard toadflax)	0.1	0.3	0.6	-	0.0	-	0.0	0.2	0.4	-	0.0	0.6	0.0	0.3	0.0	0.4	0.1
Crepis acuminata (tapertip hawksbeard)	0.1	0.3	2.6	-	0.1	0.1	0.0	0.0	0.6	-	-	0.6	-	0.5	0.1	0.0	0.0
Cymopterus (springparsley)	0.3	0.6	11.8	-	0.3	0.0	-	0.0	0.5	-	-	0.1	0.0	0.7	0.1	0.0	0.0
Descurainia pinnata <sup>a</sup> (western tansymustard)	0.2	0.2	3.1	0.9	0.0	0.1	0.1	0.0	0.1	-	-	0.5	-	0.7	0.0	-	-
	0.0	0.2	3.5	2.4	0.0	0.5	0.0	0.0	0.1	-	-	0.0	-	0.3	0.1	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Erigeron strigosus (prairie fleabane)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Gilia inconspicua <sup>a</sup> (shy gilia)	Helianthus (sunflower)	Heliomeris multiflora var. multiflora (showy goldeneye)	Ipomopsis aggregata (scarlet gilia)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lomatium (desertparsley)	Microsteris gracilis <sup>a</sup> (slender phlox)	Penstemon (beardtongue)	Penstemon humilis (low beardtongue)	Petradoria pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)
year	Nested Frequency																
1996	-	-	2	2	-	6	-	8	-	-	-	1	-	-	19	42	1
2001	-	9	2	-	-	-	5	-	5	2	-	-	70	-	11	37	-
2006	6	9	1	-	-	1	-	-	1	-	1	5	7	-	11	24	-
2011	-	10	5	-	-	-	1	3	13	-	-	13	11	-	16	30	-
2016	-	3	9	-	-	-	-	-	1	-	-	12	-	4	10	35	-
2021	-	-	11	-	12	-	-	-	4	-	-	8	3	-	19	30	-
year	Average Cover (%)																
1996	-	-	0.1	0.0	-	0.0	-	0.1	-	-	-	0.0	-	-	0.4	1.6	0.0
2001	-	0.0	0.0	-	-	-	0.0	-	0.0	0.0	-	-	0.2	-	0.3	1.9	-
2006	0.0	0.0	0.0	-	-	0.0	-	-	0.0	-	0.0	0.2	0.0	-	0.5	1.1	-
2011	-	0.1	0.0	-	-	-	0.0	0.0	0.1	-	-	0.3	0.0	-	1.0	2.6	-
2016	-	0.0	0.1	-	-	-	-	-	0.1	-	-	0.4	-	0.2	0.3	3.3	-
2021	-	-	0.3	-	0.1	-	-	-	0.1	-	-	0.2	0.0	-	0.3	1.9	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (sleepy silene)	Symphoricarum ascendens (western aster)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Zigadenus pumilatus (foothill deathcamas)
year	Nested Frequency				
1996	4	9	-	8	-
2001	-	8	-	21	-
2006	-	-	-	5	-
2011	-	12	-	16	3
2016	-	-	1	18	3
2021	-	-	-	2	0
year	Average Cover (%)				
1996	0.0	0.1	-	0.1	-
2001	-	0.0	-	0.4	-
2006	-	-	-	0.1	-
2011	-	0.0	-	0.1	0.2
2016	-	-	0.1	0.1	0.0
2021	-	-	-	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 07-02.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Cercocarpus montanus <sup>p</sup> (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Quercus gambelii <sup>p</sup> (Gambel oak)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)
year	Line Intercept Cover (%)								
1996	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-
2006	3.1	3.6	3.9	-	-	0.1	2.9	1.1	1.6
2011	2.2	3.9	3.7	-	-	0.1	3	0.2	0.9
2016	1.8	5.2	6.7	-	0.3	0.2	3.1	0.4	1.5
2021	1.9	5.1	5.2	-	-	0.1	3.9	0.5	1.5
year	Quadrat Cover (%)								
1996	1.4	0.7	4.0	-	0.2	0.1	1.1	0.3	2.4
2001	0.7	1.9	4.2	-	-	0.2	1.7	0.9	3.7
2006	0.9	2.5	3.0	-	-	0.1	1.8	1.2	3.4
2011	2.3	3.1	2.8	-	-	0.2	1.6	0.0	1.6
2016	1.3	5.0	4.2	-	0.0	0.2	1.6	0.0	1.5
2021	0.5	4.7	4.4	0.3	-	0.0	1.9	0.8	1.6

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 07-02.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	940	80	45	53	2	53	13	2	66/88
2001	1260	-	51	37	13	19	22	14	66/86
2006	560	20	36	57	7	0	50	4	74/87
2011	980	40	45	53	2	25	20	2	74/100
2016	640	100	41	59	0	19	22	16	64/76
2021	240	-	33	50	17	0	75	17	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	380	-	37	42	21	47	0	11	53/82
2001	280	-	7	79	14	14	0	14	59/88
2006	240	-	8	83	8	33	17	17	82/108
2011	340	-	6	77	18	41	6	24	73/115
2016	560	-	39	57	4	14	14	0	67/113
2021	720	-	28	67	6	8	3	6	- / -
<b>Cercocarpus ledifolius<sup>p</sup> -- (curl-leaf mountain mahogany)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	39/42
2021	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Cercocarpus montanus<sup>P</sup> -- (alderleaf mountain mahogany)</b>									
1996	780	-	26	72	3	44	41	13	89/103
2001	760	20	16	71	13	34	50	3	85/93
2006	740	40	16	65	19	19	70	11	82/93
2011	520	-	15	62	23	23	58	15	72/83
2016	700	20	11	86	3	37	51	0	80/89
2021	880	20	25	73	2	39	61	2	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	36/53
2001	-	-	-	-	-	-	-	-	47/69
2006	-	-	-	-	-	-	-	-	28/55
2011	-	-	-	-	-	-	-	-	20/59
2016	-	-	-	-	-	-	-	-	19/40
2021	120	-	0	50	50	0	0	50	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	140	-	0	100	0	0	0	0	18/24
2001	-	-	-	-	-	-	-	-	24/81
2006	20	-	0	100	0	0	0	0	20/22
2011	-	-	-	-	-	-	-	-	-/-
2016	40	-	0	100	0	0	0	0	28/43
2021	-	-	-	-	-	-	-	-	-/-
<b>Mahonia repens -- (creeping barberry)</b>									
1996	380	20	21	79	0	0	0	0	10/12
2001	680	-	0	100	0	0	0	0	11/15
2006	840	-	7	93	0	0	0	0	10/11
2011	1140	-	0	100	0	0	0	0	8/34
2016	660	-	0	100	0	0	0	0	8/12
2021	120	360	100	0	0	0	0	0	- / -
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1996	240	-	0	100	0	75	25	0	49/119
2001	60	-	0	100	0	100	0	0	54/229
2006	420	-	0	95	5	29	5	0	67/127
2011	220	-	0	73	27	18	82	27	48/103
2016	180	-	0	100	0	100	0	0	53/128
2021	400	-	0	90	10	55	25	10	- / -
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1996	20	-	100	0	0	0	0	0	163/166
2001	120	-	0	100	0	0	0	0	147/87
2006	40	80	0	50	50	0	0	50	148/100
2011	20	-	0	0	100	0	100	100	126/84
2016	60	-	33	67	0	67	0	0	121/83
2021	40	-	50	50	0	0	0	0	- / -
<b>Sambucus nigra ssp. cerulea<sup>P</sup> -- (blue elderberry)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	71/167
2006	-	-	-	-	-	-	-	-	93/182
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	96/142
2021	-	-	-	-	-	-	-	-	-/-

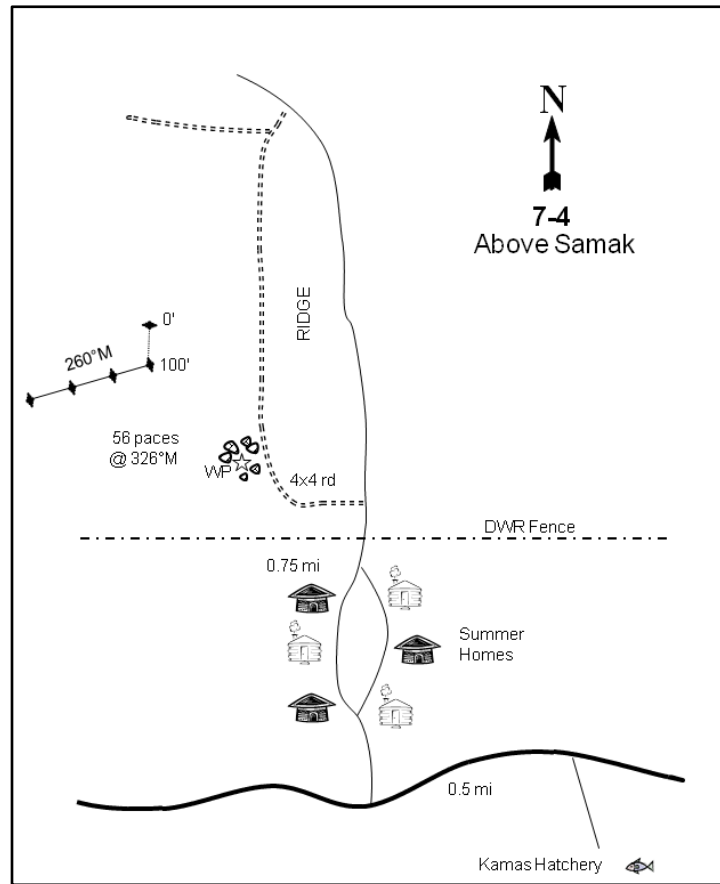
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Symphoricarpos oreophilus <sup>p</sup> -- (mountain snowberry)									
1996	600	40	27	73	0	27	0	0	46/84
2001	420	-	0	100	0	14	0	0	52/115
2006	700	40	11	83	6	0	3	3	53/67
2011	700	-	17	83	0	20	0	0	44/74
2016	620	-	7	94	0	3	0	0	37/64
2021	500	-	12	88	0	28	16	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 07-02.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	13.3	14.1	14.4	30.0	-4.9	5.3	0.0	<b>72.2</b>	Good
2001	16.8	12.9	4.4	30.0	-4.2	6.5	0.0	<b>66.3</b>	Fair
2006	22.1	11.2	6.9	30.0	-3.0	6.4	0.0	<b>73.5</b>	Good
2011	19.3	9.4	7.0	29.6	-1.4	10.0	0.0	<b>73.9</b>	Good
2016	25.8	14.4	10.1	30.0	-1.8	10.0	0.0	<b>88.5</b>	Good-Excellent
2021	24.9	13.2	10.4	27.2	-9.7	7.8	0.0	<b>73.7</b>	Good

### ABOVE SAMAK - STUDY NO. 07-4



**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Hoyt Peak SW; Township 2S, Range 6E, Section 23  
NAD 83 UTM ZONE 12, 479672 East 4498471 North

**Transect Information**

Browse Tag # (0' Stake)	7959
Transect Bearing	180° magnetic (Line 2-4: 260° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (71ft), Line 4 (34ft)
Belt Marker Placement	Standard

**Directions to Site**

From the Kamas fish hatchery, proceed west for 0.5 miles, then turn right onto a dirt road and proceed north. The road will split (go left) around the summer houses and reunite in 0.2 miles. After passing the homes, you will come to a DWR fence and gate. Continue 0.1 miles past the gate and turn left, proceeding up a very steep hill (4x4 low recommended). Drive north to a half-high witness post in the middle of a rock pile on the left (west) side of the road; the rockpile is 0.50 miles from the highway. From the rockpile, walk 56 paces at 326 degrees magnetic to the 100-foot stake of the baseline. The 0-foot stake is 100 feet north of the 100-foot stake and is marked by browse tag #7959. The baseline doglegs at the 100-foot stake and runs at 260 degrees magnetic.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	KAMAS VALLEY
Elevation	7,300ft (2,225m)
Aspect	Southeast
Slope	20-23%
Sample Dates	09/18/1996, 07/03/2001, 07/06/2006, 06/28/2011, 06/15/2016, 06/16/2021

**Table 07-04.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	1951	-
Seeding - Unknown	-	-	1951	-

**Wildlife Habitat and Vegetation History**

**Table 07-04.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	winter

**Table 07-04.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Mixed Mountain Brush/Perennial Grass	NA
1990	Mixed Mountain Brush/Perennial Grass	NA
1996	Mixed Mountain Brush/Perennial Grass	NA
2001	Mixed Mountain Brush/Perennial Grass	NA
2006	Mixed Mountain Brush/Perennial Grass	NA
2011	Mixed Mountain Brush/Perennial Grass	NA
2016	Mixed Mountain Brush/Perennial Grass	NA

**Site Notes**

The study is located on the Kamas Wildlife Management Area in Beaver Creek Canyon. This area can be classified as deer and elk winter range during more mild winters or transitional spring-fall range during harsher winters. The site and surrounding area was burned and seeded in the early 1950s. Prior to the fire, the community was dominated by Gambel oak (*Quercus gambelii*) with a few other mountain brush species and little herbaceous cover. The site is now made up of scattered openings of mountain brush and seeded grasses interspersed with Gambel oak clones.

In 2016 it was noted that many Utah serviceberry (*Amalanchier utahensis*) plants had what appeared to be insect eggs on the leaves.

**Soils**

**Table 07-04.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.8	25.3	38.7	36.0	4.7	13.4	147.2	0.7	09/18/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	23 inches
NRCS Ecological Site	Mountain Stony Loam (Gambel Oak)
NRCS Ecological Site #	R047XA463UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1984, the vegetation on this site has existed as a mixed mountain brush plant community with Gambel oak (*Quercus gambelii*), mountain snowberry (*Symphoricarpos oreophilus*), and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) as the dominant shrubs; density and cover of sagebrush have decreased between 2011 and 2021 (Photos, Pre-1992 Data, Table 07-04.12, Table 07-04.13). The introduced perennial grass species smooth brome (*Bromus inermis*) has made up a majority of the herbaceous understory in most sample years, although bulbous bluegrass (*Poa bulbosa*) contributed almost equal amounts of cover in 2021. The introduced annual grass species field brome (*Bromus arvensis*) was observed in 2001 and 2021, but with low abundance and cover (Table 07-04.10). Much of the forb cover has been provided by perennial forbs, particularly alfalfa (*Medicago sativa*) and rock goldenrod (*Petroradia pumila*) in 2021 (Table 07-04.11). Over the sample years, deer winter range on and near this site appears to range between good and excellent condition (Table 07-04.15).



**Trend Summary Tables**

**Table 07-04.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	15.1	1.0	-	-	-	-
2001	17.7	0.3	-	-	-	-
2006	15.0	0.9	-	21.7	0.7	-
2011	15.3	1.1	-	28.8	1.0	-
2016	12.8	0.7	-	25.6	1.4	-
2021	17.0	1.6	-	26.3	1.5	-

**Table 07-04.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	-	433	152	152	-	22.7	0.7	5.5
2001	3	416	276	186	0.0	16.2	3.4	7.8
2006	-	403	173	129	-	16.7	1.6	5.9
2011	-	438	288	240	-	25.3	4.6	12.9
2016	-	451	181	208	-	23.7	0.9	10.6
2021	12	411	88	129	0.1	20.9	0.4	7.1

**Table 07-04.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	9.8	0.7	44.8	4.0	16.7	44.5
2001	21.4	0.3	35.1	5.6	15.2	43.9
2006	15.1	0.1	39.6	6.3	16.2	35.0
2011	10.0	0.0	39.1	2.1	15.0	56.4
2016	7.9	0.1	37.9	3.2	14.0	49.5
2021	7.8	0.1	46.9	6.1	16.6	43.0

**Table 07-04.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	3	12	8	-
2001	4	8	17	1
2006	6	13	11	5
2011	3	2	1	-
2016	6	6	-	14
2021	6	10	1	10
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	9.4 (23.3)	30.8 (76.1)	22.8 (56.3)	-
2006	21.8 (53.8)	20.8 (51.3)	10.7 (26.5)	-
2011	6.5 (16.1)	20.1 (49.7)	8.1 (19.9)	-
2016	31.2 (77.1)	46.2 (114.2)	-	-
2021	13.1 (32.3)	6.7 (16.6)	-	-

**Table 07-04.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus inermis <sup>i</sup> (smooth brome)	Elymus lanceolatus (thickspike wheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency									
1996	167	-	293	-	4	1	-	8	17	121
2001	140	3	322	13	10	6	-	15	5	84
2006	171	-	306	-	10	3	-	17	-	84
2011	123	-	348	-	89	6	3	7	1	71
2016	140	-	272	3	124	22	4	30	3	209
2021	121	12	282	-	205	3	-	33	4	108
year	Average Cover (%)									
1996	5.5	-	12.6	-	0.0	0.0	-	0.1	0.5	4.1
2001	2.9	0.0	10.5	0.3	0.2	0.2	-	0.3	0.0	1.9
2006	4.3	-	9.6	-	0.1	0.2	-	0.6	-	1.9
2011	4.8	-	15.3	-	2.3	0.0	0.1	0.0	0.0	2.6
2016	4.3	-	10.3	0.0	2.1	0.3	0.0	0.3	0.0	6.5
2021	2.0	0.1	8.4	-	7.4	0.0	-	0.6	0.0	2.4

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 07-04.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Arenaria (sandwort)	Astragalus (milkvetch)	Astragalus cibirarius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)
year	Nested Frequency																
1996	1	-	6	-	4	-	-	-	7	-	-	21	1	-	32	-	-
2001	2	3	31	2	9	-	15	-	-	4	-	108	-	-	94	5	-
2006	5	-	20	-	1	-	11	-	7	-	4	115	-	-	54	4	0
2011	8	30	95	6	2	-	55	-	2	3	4	105	-	1	118	12	-
2016	12	4	39	33	6	1	4	41	0	1	6	85	-	-	79	20	-
2021	2	-	15	41	-	-	8	22	2	-	-	56	-	-	8	8	-
year	Average Cover (%)																
1996	0.1	-	0.0	-	0.0	-	-	-	0.1	-	-	0.1	0.0	-	0.1	-	-
2001	0.0	0.0	0.1	0.0	0.1	-	0.3	-	-	0.0	-	1.8	-	-	0.3	0.1	-
2006	0.0	-	0.1	-	0.0	-	0.1	-	0.3	-	0.0	0.9	-	-	0.1	0.0	0.0
2011	0.2	0.2	0.4	0.0	0.0	-	1.8	-	0.0	0.0	0.1	0.4	-	0.0	0.4	0.1	-
2016	0.1	0.0	0.2	0.2	0.0	0.0	0.0	1.4	0.0	0.0	0.1	0.2	-	-	0.2	0.1	-
2021	0.0	-	0.1	0.1	-	-	0.1	0.3	0.0	-	-	0.2	-	-	0.0	0.1	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Eriogonum racemosum (redroot buckwheat)	Geranium <sup>a</sup> (geranium)	Hydrophyllum occidentale (western waterleaf)	Lithophragma (woodland-star)	Lomatium triternatum (nineleaf biscuitroot)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa <sup>i</sup> (alfalfa)	Melilotus officinalis <sup>i</sup> (sweetclover)	Microsteris gracilis <sup>a</sup> (slender phlox)	Penstemon humilis (low beardtongue)	Petroradia pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)
year	Nested Frequency																
1996	-	-	-	16	-	-	-	-	-	4	57	-	-	58	28	2	24
2001	-	-	2	-	7	-	-	-	-	-	64	-	56	31	42	10	3
2006	-	-	16	-	1	-	-	-	-	-	47	-	12	8	33	11	24
2011	2	3	18	5	-	25	-	6	2	3	75	-	80	15	23	22	24
2016	1	10	3	3	4	-	5	-	-	-	54	14	54	21	32	19	8
2021	-	2	-	-	-	-	-	-	-	-	55	3	33	4	27	9	2
year	Average Cover (%)																
1996	-	-	-	0.1	-	-	-	-	-	0.0	3.0	-	-	1.0	1.1	0.0	0.0
2001	-	-	0.0	-	0.1	-	-	-	-	-	4.2	-	0.2	0.3	2.4	0.1	0.0
2006	-	-	0.1	-	0.0	-	-	-	-	-	2.6	-	0.0	0.1	2.4	0.1	0.1
2011	0.0	0.0	0.1	0.2	-	0.2	-	0.0	0.0	0.0	7.1	-	0.3	0.6	1.9	0.1	0.1
2016	0.0	0.0	0.0	0.0	0.1	-	0.0	-	-	-	5.9	0.6	0.1	0.4	1.5	0.1	0.0
2021	-	0.0	-	-	-	-	-	-	-	-	3.9	0.0	0.1	0.1	2.5	0.2	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Silene antirrhina <sup>a</sup> (sleepy silene)	Symphoricarichum (aster)	Verbascum thapsus <sup>ai</sup> (common mullein)	Veronica biloba <sup>ai</sup> (two-lobed speedwell)	Viola (violet)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency						
1996	-	-	-	-	124	-	4
2001	12	-	-	33	130	-	4
2006	2	7	3	-	62	-	-
2011	43	-	-	-	117	18	5
2016	3	5	-	-	13	3	5
2021	-	-	-	-	-	-	-
year	Average Cover (%)						
1996	-	-	-	-	0.5	-	0.1
2001	0.1	-	-	0.5	0.5	-	0.1
2006	0.0	0.0	0.0	-	0.3	-	-
2011	0.8	-	-	-	2.4	0.1	0.1
2016	0.0	0.0	-	-	0.0	0.0	0.1
2021	-	-	-	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 07-04.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Cercocarpus montanus <sup>p</sup> (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Opuntia polyacantha (plains pricklypear)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Quercus gambelii <sup>p</sup> (Gambel oak)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)
year	Line Intercept Cover (%)									
1996	-	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-
2006	0.7	6.7	-	0.3	-	0.4	-	1.2	6.9	6.2
2011	0.6	8.6	-	-	-	1	-	1.5	10.1	8
2016	0.7	5.2	-	0.7	-	0.7	-	1.4	10.2	8.1
2021	1.1	4.6	-	0.7	-	0.8	-	1.7	13.4	5.5
year	Quadrat Cover (%)									
1996	1.3	6.2	-	0.1	-	0.9	-	0.0	3.8	3.8
2001	1.4	8.0	-	0.1	-	0.2	-	0.5	2.7	5.2
2006	1.1	5.7	-	0.2	-	0.7	-	0.6	3.0	4.7
2011	1.3	4.9	-	0.2	0.0	0.8	-	1.4	2.4	5.2
2016	0.8	2.8	0.0	0.2	-	0.6	0.0	1.9	3.3	4.0
2021	1.7	4.8	-	0.3	-	1.2	-	1.6	4.7	4.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 07-04.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	280	20	0	79	21	14	71	7	77/107
2001	260	-	0	77	23	46	46	8	76/89
2006	180	-	0	44	56	22	78	22	100/108
2011	200	-	10	80	10	60	30	10	92/109
2016	180	-	11	78	11	0	33	11	95/94
2021	300	-	20	73	7	40	0	7	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	1320	20	5	89	6	61	6	0	52/88
2001	1180	40	2	81	17	41	14	9	63/88
2006	900	100	11	64	24	20	9	9	69/106
2011	820	20	7	73	20	32	5	22	69/122
2016	820	-	17	71	12	5	10	5	60/95
2021	640	-	3	75	22	6	3	28	- / -
<b>Cercocarpus montanus<sup>p</sup> -- (alderleaf mountain mahogany)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	20	-	0	100	0	100	0	0	180/150
2016	40	-	50	50	0	50	0	0	79/73
2021	80	-	0	25	75	0	50	75	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Chrysothamnus depressus<sup>P</sup> -- (longflower rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	20	-	0	0	100	100	0	0	- / -
2006	20	-	0	0	100	0	0	0	6/6
2011	20	-	0	100	0	0	0	0	18/46
2016	20	-	0	100	0	0	0	0	19/20
2021	-	-	-	-	-	-	-	-	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	60	-	0	100	0	0	0	0	33/44
2001	180	-	0	100	0	0	0	0	24/35
2006	280	-	0	93	7	0	0	7	31/48
2011	480	-	42	58	0	0	0	0	37/60
2016	240	-	8	92	0	8	0	0	31/43
2021	200	-	0	70	30	0	0	30	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	100	-	0	80	20	0	0	20	- / -
<b>Mahonia repens -- (creeping barberry)</b>									
1996	2880	-	4	97	0	0	0	0	9/13
2001	4880	20	7	93	0	0	0	0	6/7
2006	4940	-	2	97	1	0	0	0	8/11
2011	3800	-	5	95	0	0	0	0	11/19
2016	5460	-	3	97	0	0	0	0	7/9
2021	5940	-	3	97	0	0	0	0	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	11/20
2006	-	-	-	-	-	-	-	-	14/32
2011	20	-	0	100	0	0	0	0	11/37
2016	40	20	0	100	0	0	0	100	14/42
2021	-	-	-	-	-	-	-	-	-/-
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1996	20	-	0	100	0	0	100	0	28/104
2001	40	-	0	100	0	50	0	0	49/174
2006	40	-	0	100	0	50	50	0	32/121
2011	60	-	0	100	0	67	33	0	51/148
2016	80	-	0	100	0	0	75	0	27/96
2021	100	-	0	100	0	60	0	0	- / -
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1996	1360	220	52	46	3	24	0	0	77/65
2001	3340	-	38	49	13	0	0	18	159/63
2006	1500	820	28	59	13	1	0	33	111/61
2011	2240	-	53	47	0	0	0	0	- / -
2016	3880	-	23	77	1	0	0	1	50/38
2021	2680	100	31	61	8	40	0	8	- / -

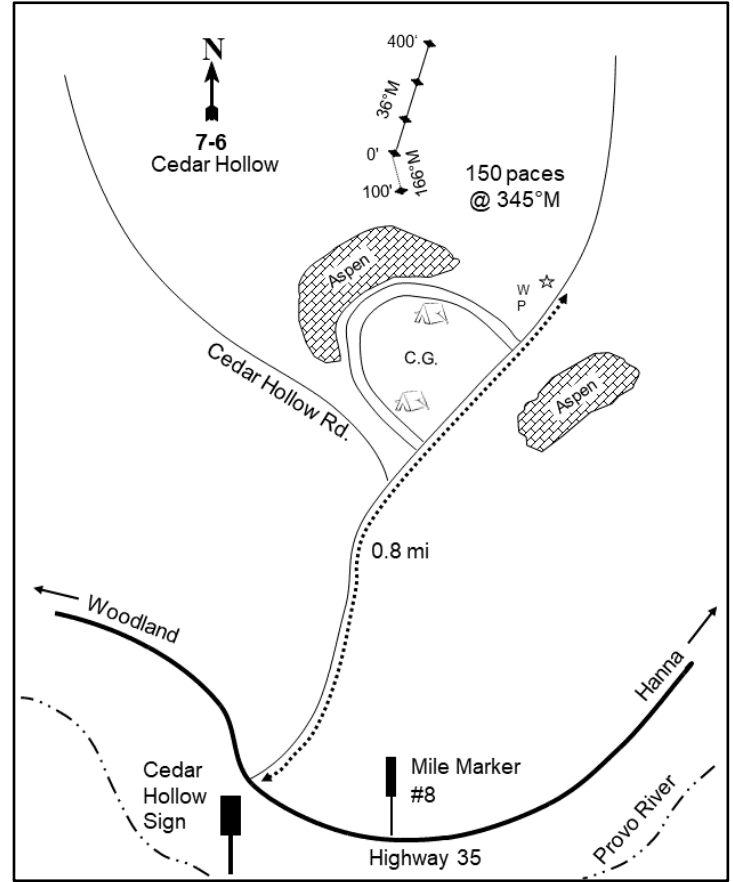
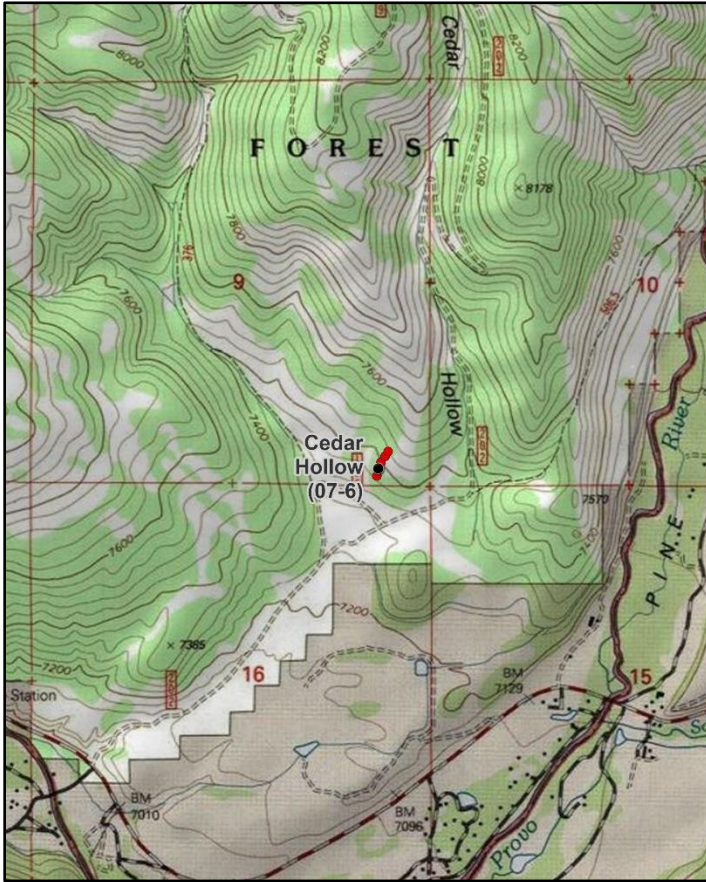
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	1200	-	10	77	13	38	12	7	45/83
2001	1500	-	9	88	3	0	0	5	40/72
2006	2240	180	29	70	2	2	1	1	41/74
2011	1500	-	8	92	0	3	0	1	44/95
2016	1800	-	44	56	0	1	0	0	53/74
2021	1900	-	36	51	14	2	2	14	- / -
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	21/51
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	31/48

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 07-04.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	17.3	12.5	8.7	30.0	0.0	10.0	0.0	<b>78.5</b>	Good
2001	20.7	11.4	4.7	30.0	0.0	10.0	0.0	<b>76.7</b>	Good
2006	24.3	10.8	10.3	30.0	0.0	10.0	0.0	<b>85.4</b>	Good
2011	30.0	13.2	11.5	30.0	0.0	10.0	0.0	<b>94.7</b>	Excellent
2016	28.0	14.1	13.4	30.0	0.0	10.0	0.0	<b>95.5</b>	Excellent
2021	28.9	11.7	12.2	27.0	-0.1	10.0	0.0	<b>89.7</b>	Good-Excellent

## CEDAR HOLLOW - STUDY NO. 07-6

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Woodland NE; Township 3S, Range 7E, Section 09  
NAD 83 UTM ZONE 12, 487389 East 4490658 North

**Transect Information**

Browse Tag # (0' Stake)	416
Transect Bearing	166° magnetic (Lineas 2-4: 36° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (71ft), Line 3 (59ft), Line 4 (34ft)
Belt Marker Placement	Standard

**Directions to Site**

Travel eastbound on Highway 35 from Woodland and turn left (north) at the Cedar Hollow sign; if you pass mile-marker 8 you have gone too far. Travel 0.8 miles on the main dirt road passing two left turns, and stop next to a small witness post on the left (northwest) side of the road. There is a small stand of aspen on the right (southeast) side of the road. From the witness post, walk at a bearing of 345 degrees magnetic for 150 paces to the 0-foot baseline stake that is marked by browse tag #416.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	KAMAS VALLEY
Elevation	7,320ft (2,231m)
Aspect	South
Slope	15-25%
Sample Dates	09/10/1996, 07/02/2001, 07/07/2006, 06/23/2011, 06/13/2016, 06/14/2021

**Wildlife Habitat and Vegetation History****Table 07-06.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	winter

**Table 07-06.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Mixed Mountain Brush/Perennial Grass	No Encroachment
1990	Mixed Mountain Brush/Perennial Grass	No Encroachment
1996	Mixed Mountain Brush/Perennial Grass	No Encroachment
2001	Mixed Mountain Brush/Perennial Grass	No Encroachment
2006	Mixed Mountain Brush/Perennial Grass	No Encroachment
2011	Mixed Mountain Brush/Perennial Grass	Phase I
2016	Mixed Mountain Brush/Perennial Grass	Phase I
2021	Mixed Mountain Brush/Perennial Grass	Phase I

**Site Notes**

The study is located on a hillside above Cedar Hollow, about one half of a mile west of Pine Valley and the Provo River. The hillside is intermixed with areas of quaking aspen (*Populus tremuloides*), Gambel oak (*Quercus gambelii*), and open areas of mixed mountain brush communities. The study samples one of the areas dominated by mixed mountain brush.

**Soils****Table 07-06.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.0	40.2	30.4	29.4	4.9	11.4	166.4	0.6	09/10/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	25 inches
NRCS Ecological Site	Mountain Loam (Shrub)
NRCS Ecological Site #	R047XA434UT
States and Transitions	No state and transition model is available for this ecological site.

This site has remained dominated by a mixture of mountain brush species including mountain snowberry (*Symphoricarpos oreophilus*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and antelope bitterbrush (*Purshia tridentata*) since study establishment in 1984. A variety of other shrub species are present, but contribute less cover (Photos, Pre-1992 Data, Table 07-06.12, Table 07-06.13). The herbaceous understory has remained diverse and abundant with perennial grasses as a co-dominant site component in all sample years. The weedy introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) has been recorded on this site in most sample years: it contributed much of the perennial grass cover along with bluebunch wheatgrass (*Pseudoroegneria spicata*) in 2021. Forbs have remained diverse throughout the study period, with perennial forbs being more abundant than annual forbs in all years (Table 07-06.7, Table 07-06.10, Table 07-06.11). Rocky Mountain juniper (*Juniperus scopulorum*) has been observed in the area since 1996, and the site has been classified as being within Phase I of woodland succession since that time (Photos, Table 07-06.4, Table 07-06.12, Table 07-06.13, Table 07-06.14). Juniper seedlings have been recorded in density data since 2011, indicating that active encroachment is occurring (Table 07-06.13). Although it likely does not pose an immediate threat to the plant community, further tree encroachment could be possible in future sample years. Since study establishment, browse and herbaceous requirements favor good to excellent deer winter habitat in most sample years (Table 07-06.15).



**Trend Summary Tables****Table 07-06.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	16.9	3.1	-	-	-	-
2001	21.6	4.8	-	0.3	-	-
2006	20.5	4.2	0.0	24.3	6.5	-
2011	18.6	6.2	0.0	27.5	5.1	-
2016	18.9	6.6	0.0	28.0	7.4	-
2021	25.7	8.4	0.1	25.7	6.3	0.8

**Table 07-06.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	1	402	39	172	0.0	14.7	0.2	2.5
2001	-	406	103	211	-	15.7	0.6	5.0
2006	5	381	70	201	0.0	20.1	0.7	6.5
2011	-	407	133	258	-	26.2	1.7	12.8
2016	5	400	105	231	0.1	17.1	0.8	10.5
2021	4	396	27	204	0.0	18.4	0.4	11.3

**Table 07-06.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	11.1	0.5	42.2	4.5	15.0	39.0
2001	17.3	0.2	34.9	7.0	14.4	51.1
2006	21.5	0.6	25.7	7.9	14.8	43.9
2011	13.1	0.5	31.6	8.4	11.7	55.6
2016	11.9	0.8	35.5	7.8	12.3	45.8
2021	12.0	0.2	40.4	8.3	15.3	53.2

**Table 07-06.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Shiras Moose	Rabbit
	Quadrat Frequency					
1996	1	7	5	-	-	-
2001	2	11	-	-	2	-
2006	1	22	1	-	1	9
2011	1	12	2	-	-	2
2016	1	10	2	1	1	9
2021	1	8	3	-	-	4
Year	Days Use Per Acre (ha)					
1996	-	-	-	-	-	-
2001	-	20.1 (49.7)	4.7 (11.6)	-	1.0 (2.4)	-
2006	5.8 (14.3)	18.1 (44.7)	2.0 (5.0)	-	-	-
2011	1.5 (3.6)	7.4 (18.2)	0.7 (1.7)	-	-	-
2016	2.9 (7.2)	12.1 (29.8)	0.7 (1.7)	-	0.5 (1.2)	-
2021	-	34.2 (84.4)	4.0 (9.9)	-	-	-

**Table 07-06.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus marginatus (mountain brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Elymus lanceolatus (thickspike wheatgrass)	Festuca (fescue)	Koeleria macrantha (prairie Junegrass)	Melica bulbosa (oniongrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency														
1996	9	-	-	1	80	-	3	-	3	124	118	124	63	163	-
2001	7	-	25	-	92	2	-	2	1	229	156	51	24	119	-
2006	10	4	6	5	54	-	-	4	21	181	136	70	52	185	-
2011	-	7	4	-	60	-	-	40	3	255	49	59	56	175	-
2016	-	27	8	5	35	93	-	39	0	141	18	70	30	207	-
2021	5	16	-	4	32	86	-	2	-	234	25	19	19	181	22
year	Average Cover (%)														
1996	0.1	-	-	0.0	4.1	-	0.0	-	0.0	3.6	1.5	2.8	0.7	2.0	-
2001	0.2	-	0.2	-	4.3	0.0	-	0.0	0.0	5.0	2.8	0.8	0.3	2.1	-
2006	0.2	0.1	0.1	0.0	2.4	-	-	0.1	0.3	6.3	2.1	1.3	1.5	5.8	-
2011	-	0.1	0.1	-	4.0	-	-	0.8	0.0	10.9	1.1	2.0	2.0	5.1	-
2016	-	1.2	0.0	0.1	1.3	3.1	-	0.9	0.0	2.4	0.4	1.2	0.2	6.5	-
2021	0.0	0.8	-	0.0	0.5	1.6	-	0.0	-	5.9	0.2	0.3	1.0	7.5	0.6

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 07-06.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus argophyllus (silverleaf milkvetch)	Astragalus cibirarius (browse milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chenopodium fremontii <sup>a</sup> (Fremont's goosefoot)	Cirsium (thistle)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)
year	Nested Frequency																
1996	-	5	-	-	2	-	13	3	7	-	-	9	-	14	66	3	-
2001	4	25	-	-	70	-	14	4	6	-	-	9	8	39	77	-	28
2006	13	61	1	4	57	13	24	5	12	-	-	5	13	21	37	1	1
2011	17	102	3	-	86	-	48	34	6	1	-	4	19	62	47	1	19
2016	13	4	1	-	66	36	57	23	3	-	2	16	19	44	61	1	41
2021	6	1	1	-	3	80	56	12	-	-	0	7	-	-	42	4	-
year	Average Cover (%)																
1996	-	0.0	-	-	0.0	-	0.5	0.0	0.0	-	-	0.1	-	0.0	0.3	0.0	-
2001	0.0	0.1	-	-	0.8	-	1.6	0.0	0.2	-	-	0.1	0.0	0.2	0.8	-	0.1
2006	0.1	0.2	0.0	0.0	1.0	0.3	2.2	0.0	0.2	-	-	0.3	0.1	0.1	0.4	0.0	0.0
2011	0.1	0.5	0.1	-	2.5	-	5.1	0.1	0.1	0.0	-	0.1	0.0	0.4	0.3	0.0	0.1
2016	0.1	0.0	0.0	-	1.9	1.3	4.3	0.1	0.0	-	0.0	0.4	0.0	0.1	0.4	0.0	0.2
2021	0.0	0.0	0.1	-	0.0	2.0	7.5	0.0	-	-	0.0	0.2	-	-	0.4	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nest Frequency																	
Eriogonum heracleoides (parsnip/flower buckwheat)	5	12	-	-	-	-	-	-	-	0	0	27	15	9	7	2	-	
Eriogonum racemosum (redroot buckwheat)	1	7	7	-	-	-	-	-	-	7	7	19	10	-	24	2	3	
Eriogonum umbellatum (sulphur-flower buckwheat)	6	10	3	9	8	5	-	-	-	1	5	11	26	15	14	-	-	
Erythronium grandiflorum (yellow avalanche-lily)	11	17	5	3	-	1	-	-	8	4	7	5	7	1	60	8	2	
Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	2016	5	14	3	-	-	1	-	2	-	6	-	2	9	-	10	-	
Hackelia patens (spotted stickseed)	2021	9	5	7	-	-	-	3	-	-	0	-	1	36	-	14	-	
Heliomeris multiflora (showy goldeneye)	year	Average Cover (%)																
Hydrophyllum occidentale (western waterleaf)	1996	0.2	0.2	-	-	-	-	-	-	0.0	0.0	0.7	0.0	0.0	0.1	0.0	-	
Lithophragma (woodland-star)	2001	0.1	0.0	0.2	-	-	-	-	-	0.2	0.0	0.3	0.1	-	0.2	0.0	0.0	
Lupinus argenteus (silvery lupine)	2006	0.2	0.2	0.2	0.0	0.0	0.1	-	-	0.0	0.0	0.1	0.1	0.0	0.1	-	-	
Microsteris gracilis <sup>a</sup> (slender phlox)	2011	0.7	0.2	0.1	0.1	-	0.1	-	-	0.1	0.1	0.0	0.1	0.0	0.0	1.1	0.0	
Penstemon leonardii (Leonard's beardtongue)	2016	0.2	0.4	0.0	-	-	0.0	-	0.0	-	0.2	-	0.0	0.1	-	0.0	-	
Phlox longifolia (longleaf phlox)	2021	0.2	0.0	0.1	-	-	-	0.1	-	-	0.0	-	0.1	0.2	-	0.2	-	
Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	year	Average Cover (%)																
Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	1996	0.2	0.2	-	-	-	-	-	-	0.0	0.0	0.7	0.0	0.0	0.1	0.0	-	
Silene antirrhina <sup>a</sup> (sleepy silene)	2001	0.1	0.0	0.2	-	-	-	-	-	0.2	0.0	0.3	0.1	-	0.2	0.0	0.0	
Streptanthus cordatus (heartleaf twistflower)	2006	0.2	0.2	0.2	0.0	0.0	0.1	-	-	0.0	0.0	0.1	0.1	0.0	0.1	-	-	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nest Frequency					
Symphoricarum ascendens (western aster)	56	-	1	-	-	-
Taraxacum officinale (common dandelion)	40	-	8	-	-	3
Tragopogon dubius <sup>ai</sup> (yellow salsify)	48	-	-	-	-	5
Veronica biloba <sup>ai</sup> (two-lobed speedwell)	65	-	-	-	12	31
Viola (violet)	54	-	-	1	6	29
Zigadenus pumilus (foothill deathcamas)	2021	24	1	9	-	18
year	Average Cover (%)					
1996	0.5	-	0.0	-	-	-
2001	0.4	-	0.0	-	-	0.0
2006	1.0	-	-	-	-	0.1
2011	2.0	-	-	-	0.0	0.3
2016	0.6	-	-	0.0	0.0	0.9
2021	0.2	0.0	0.0	-	-	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 07-06.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Ceanothus velutinus (snowbrush ceanothus)	Chrysothamnus depressus <sup>p</sup> (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum heracleoides (parsnipflower buckwheat)	Juniperus scopulorum <sup>i</sup> (Rocky Mountain juniper)	Mahonia repens (creeping barberry)	Opuntia (pricklypear)	Paxistima myrsinites (Oregon boxleaf)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Quercus gambelii <sup>p</sup> (Gambel oak)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)
year	Line Intercept Cover (%)												
1996	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-	-	-	-
2006	0.6	6.3	0.4	-	3.6	0.5	-	1.9	0.1	-	4.8	2.3	10.3
2011	1.3	7.4	-	-	3.6	0.1	-	1.3	0.1	-	5	3.1	10.7
2016	0.9	7.1	-	-	3.8	0.1	-	3.5	-	-	5.5	3.2	11.3
2021	1.1	6.5	-	-	2.7	-	0.8	3.6	-	-	8.2	1.8	8.1
year	Quadrat Cover (%)												
1996	0.2	8.0	-	-	1.8	-	-	1.2	0.0	0.0	2.9	1.3	4.5
2001	0.9	8.0	0.2	-	2.0	-	-	2.6	-	-	3.9	1.6	7.3
2006	0.6	6.2	0.0	-	2.3	0.0	0.0	1.7	0.1	-	5.1	1.1	7.5
2011	0.4	6.0	0.4	0.1	2.9	0.0	0.0	2.9	0.0	0.0	4.5	0.6	7.1
2016	0.2	6.2	0.0	-	2.6	0.0	0.0	3.9	0.0	-	4.5	1.1	6.9
2021	1.6	7.4	-	-	3.7	-	0.1	4.7	0.0	-	6.1	3.3	7.3

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 07-06.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	380	-	26	63	11	63	5	42	74/77
2001	600	-	40	23	37	17	27	17	85/67
2006	280	-	29	43	29	14	43	14	69/81
2011	480	-	25	75	0	0	13	0	55/58
2016	520	-	27	62	12	12	0	15	62/60
2021	1260	-	49	44	6	6	0	6	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	1820	-	3	77	20	33	1	6	54/83
2001	1800	-	0	71	29	20	10	18	59/88
2006	940	80	2	55	43	13	0	15	56/92
2011	980	-	8	82	10	45	4	8	57/92
2016	1200	-	3	90	7	7	0	12	49/78
2021	1140	-	2	72	26	12	2	28	- / -
<b>Ceanothus velutinus -- (snowbrush ceanothus)</b>									
1996	40	-	0	100	0	0	0	0	57/221
2001	80	-	0	100	0	0	0	0	49/127
2006	40	-	0	100	0	100	0	0	51/182
2011	-	-	-	-	-	-	-	-	34/75
2016	60	-	33	67	0	67	0	0	42/152
2021	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Chrysothamnus depressus<sup>P</sup> -- (longflower rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	20	-	0	100	0	0	0	0	-/-
2006	20	-	0	100	0	0	0	0	14/36
2011	40	-	0	100	0	0	0	0	13/37
2016	20	-	0	100	0	0	0	0	28/37
2021	80	-	100	0	0	0	0	0	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	2120	-	7	93	0	1	0	0	30/40
2001	1980	-	2	88	10	3	0	1	26/40
2006	1860	-	7	87	7	2	0	1	27/45
2011	1400	-	14	86	0	0	0	0	25/41
2016	1420	-	4	96	0	1	0	0	28/42
2021	1560	40	14	74	12	3	0	14	-/-
<b>Eriogonum heracleoides -- (parsnipflower buckwheat)</b>									
1996	360	-	6	94	0	0	0	0	15/30
2001	80	-	0	100	0	0	0	0	23/23
2006	140	-	14	71	14	0	0	0	13/27
2011	100	-	0	100	0	0	0	20	21/36
2016	80	-	0	100	0	0	0	0	11/34
2021	-	-	-	-	-	-	-	-	-/-
<b>Juniperus scopulorum<sup>1</sup> -- (Rocky Mountain juniper)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	20	0	0	0	0	0	0	-/-
2016	-	20	0	0	0	0	0	0	-/-
2021	20	40	100	0	0	0	0	0	-/-
<b>Mahonia repens -- (creeping barberry)</b>									
1996	9660	-	26	74	0	0	0	0	10/15
2001	14260	-	0	100	0	0	0	0	9/12
2006	14500	240	7	92	1	0	0	0	9/12
2011	9860	-	6	94	0	0	0	0	9/11
2016	18180	380	0	100	0	0	0	6	9/11
2021	20060	60	5	91	4	0	0	0	-/-
<b>Opuntia -- (pricklypear)</b>									
1996	60	-	0	100	0	0	0	0	10/31
2001	180	-	11	89	0	0	0	0	10/27
2006	40	-	0	100	0	0	0	0	20/38
2011	60	-	0	100	0	0	0	0	14/43
2016	180	-	0	100	0	0	0	0	11/36
2021	260	-	0	100	0	0	0	0	-/-
<b>Paxistima myrsinites -- (Oregon boxleaf)</b>									
1996	200	-	40	60	0	0	0	0	35/117
2001	-	-	-	-	-	-	-	-	-/-
2006	180	-	0	100	0	0	0	0	13/16
2011	200	-	10	90	0	0	0	0	39/129
2016	40	-	0	100	0	0	0	0	7/13
2021	80	-	0	100	0	0	0	0	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	320	-	6	94	0	56	13	0	39/150
2001	380	-	0	95	5	11	32	0	37/160
2006	420	40	0	100	0	10	91	0	43/134
2011	520	20	4	96	0	0	62	4	29/129
2016	740	-	0	100	0	22	16	0	40/102
2021	1180	-	2	93	5	22	27	5	- / -
<b>Quercus gambelii<sup>p</sup> -- (Gambel oak)</b>									
1996	60	20	0	100	0	0	0	0	196/248
2001	900	-	0	100	0	0	9	100	- / -
2006	340	260	18	71	12	0	0	6	145/61
2011	480	-	13	88	0	0	0	0	- / -
2016	460	-	13	83	4	0	0	4	52/50
2021	640	-	41	34	25	19	0	25	- / -
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	2640	80	14	84	2	2	0	5	43/71
2001	2100	-	0	97	3	5	0	4	41/73
2006	3740	20	16	83	1	0	0	0	41/69
2011	4820	20	10	90	0	1	0	0	38/63
2016	5060	40	34	66	0	4	0	1	45/57
2021	10640	100	8	90	2	1	0	2	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

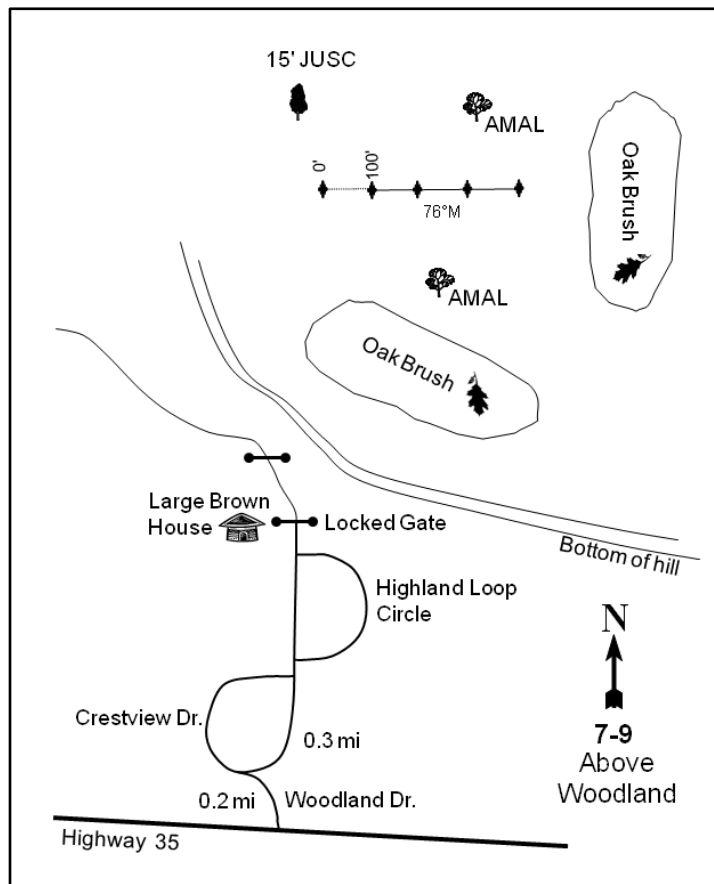
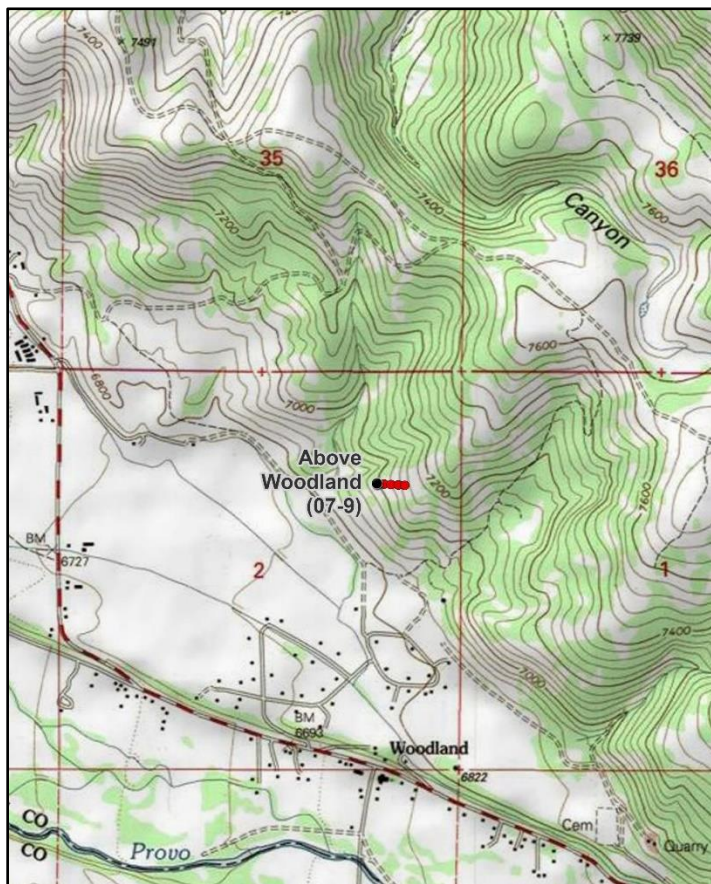
**Table 07-06.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus scopulorum (Rocky Mountain juniper)</b>							
1996	10	-	-	-	-	-	7.2
2016	19	-	-	33	50	17	11.0
2021	12	-	-	30	40	30	17.9
<b>Pseudotsuga menziesii (Douglas-fir)</b>							
2021	1	-	-	-	-	100	21.0
<b>Quercus gambelii (Gambel oak)</b>							
1996	18	-	-	-	-	-	9.2

**Table 07-06.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	20.5	11.9	3.3	22.4	0.0	5.0	0.0	<b>63.1</b>	Fair
2001	26.0	10.8	0.8	21.5	0.0	10.0	0.0	<b>69.1</b>	Fair-Good
2006	28.6	11.1	4.8	27.7	0.0	10.0	0.0	<b>82.2</b>	Good
2011	30.0	14.2	4.8	30.0	0.0	10.0	0.0	<b>88.9</b>	Good-Excellent
2016	30.0	14.2	8.5	29.4	-0.1	10.0	0.0	<b>92.0</b>	Excellent
2021	30.0	11.7	4.3	25.0	0.0	10.0	0.0	<b>80.9</b>	Good

## ABOVE WOODLAND - STUDY NO. 07-9



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Woodland NW; Township 3S, Range 6E, Section 02  
NAD 83 UTM ZONE 12, 480781 East 4493449 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

Not Available  
76° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
No Rebar

### Directions to Site

From the intersection of Highway 35 and Woodland Drive (west of Woodland) turn onto Woodland Drive and proceed for 0.2 miles. Turn onto Crestview Drive and proceed 0.3 miles to Highland Loop Circle. Turn left and follow the circle 0.1 miles to a dirt road. Travel along the road past a large brown house to a fork; there will be a gate after 0.15 miles. From here, cross the fence and walk up the slope. Walk around the west end of a large oak clone and continue up the slope. Look for a large, lone high-lined Rocky Mountain juniper: the 0-foot baseline stake is ten feet from this tree. The baseline runs between two large serviceberry plants.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,960ft (2,121m)
Aspect	Southwest
Slope	25-35%
Sample Dates	09/11/1996, 08/28/2001, 07/07/2006, 06/23/2011, 06/23/2016, 06/30/2021

**Wildlife Habitat and Vegetation History**

**Table 07-09.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	winter

**Table 07-09.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2001	Mixed Mountain Brush/Perennial Grass	Phase I
2006	Mixed Mountain Brush/Perennial Grass	Phase I
2011	Mixed Mountain Brush/Perennial Grass	Phase I
2016	Mixed Mountain Brush/Annual Grass	Phase I
2021	Mixed Mountain Brush/Perennial Grass	Phase I

**Site Notes**

The study is located on private land north of Woodland. A study was originally established in 1984 that sampled an intermixed mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), grass, and Gambel oak (*Quercus gambelii*) winter range farther to the north. Due to low big game use and low numbers of mountain big sagebrush sampled, the site was moved about a quarter of a mile to the south in 2001; as such, only data from 2001 onward will be discussed in this report. The new study area supports a denser stand of sagebrush in association with other preferred browse species including Utah serviceberry (*Amelanchier utahensis*) and antelope bitterbrush (*Purshia tridentata*). This area is at a high enough elevation that deep snow may preclude use during severe winters.

**Soils**

**Table 07-09.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.2	36.2	35.4	28.4	3.8	27.6	214.4	0.5	09/11/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Stony Loam (Browse)
NRCS Ecological Site #	R047XA460UT
States and Transitions	No state and transition model is available for this ecological site.

This study site has existed as a mixed mountain brush-dominated community since 2001, being comprised of browse species such as Utah serviceberry (*Amelanchier utahensis*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and mountain snowberry (*Symphoricarpos oreophilus*); cover of mountain big sagebrush has decreased each sample year (Table 07-09.12, Table 07-09.13). The herbaceous understory has been a co-dominant site component throughout the study period. Perennial grasses such as bluebunch wheatgrass (*Pseudoroegneria spicata*) and Sandberg bluegrass (*Poa secunda*) have provided much of the herbaceous cover in most sample years. However, annual grasses such as cheatgrass (*Bromus tectorum*) increased in cover and were dominant in 2016 (Table 07-09.10). Forbs on this site are diverse, and annual forbs have generally been more abundant than perennial forbs (Table 07-09.7, Table 07-09.11). Rocky Mountain juniper (*Juniperus scopulorum*) has been observed in all sample years, placing the site in Phase I of woodland succession (Photos, Table 07-09.4). However, point-quarter density remains low as of 2021 (Table 07-09.14), indicating that further tree encroachment likely does not pose an immediate threat to the ecological integrity of the plant community. Since study establishment, browse and herbaceous requirements have varied causing the site to range from poor to good deer winter habitat over the sample years. More specifically, much of the habitat quality variation has been due to fluctuations of cheatgrass incursions and perennial grass cover (Table 07-09.15).



**Trend Summary Tables**

**Table 07-09.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	19.0	3.5	-	-	-	-
2001	25.5	2.5	-	-	-	-
2006	22.0	1.7	-	23.9	1.5	-
2011	16.8	4.9	-	17.4	1.6	-
2016	13.3	6.8	0.0	20.5	9.3	-
2021	16.3	2.2	-	17.0	1.6	-

**Table 07-09.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	316	256	206	98	3.5	7.2	1.1	1.4
2001	163	348	165	110	1.7	14.7	1.0	3.0
2006	301	323	217	104	5.7	12.6	2.1	3.1
2011	286	333	388	201	4.7	19.6	13.9	5.3
2016	421	218	301	177	21.8	7.9	5.1	2.8
2021	281	333	308	102	6.5	18.3	4.0	2.6

**Table 07-09.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	2.8	0.0	45.6	6.9	24.9	35.9
2001	5.3	0.4	36.2	15.2	23.5	48.3
2006	13.5	0.6	31.9	7.8	22.1	41.2
2011	5.7	0.4	34.0	8.6	18.7	52.5
2016	5.9	0.4	31.2	5.3	20.7	54.0
2021	13.5	1.3	38.9	6.8	22.4	40.4

**Table 07-09.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Shiras Moose	Rabbit
	Quadrat Frequency			
1996	1	4	-	3
2001	7	15	-	12
2006	6	31	3	2
2011	4	30	-	3
2016	7	26	1	9
2021	18	39	-	12
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	16.1 (39.7)	30.8 (76.1)	-	-
2006	12.1 (29.8)	63.7 (157.3)	-	-
2011	14.1 (34.8)	12.8 (31.5)	-	-
2016	12.8 (31.5)	28.8 (71.2)	-	-
2021	54.9 (135.7)	25.5 (62.9)	-	-

**Table 07-09.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus marginatus (mountain brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Dactylis glomerata <sup>i</sup> (orchardgrass)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Koeleria macrantha (prairie Junegrass)	Melica bulbosa (oniongrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency													
1996	-	193	-	222	-	-	-	-	-	-	-	144	84	76
2001	-	135	1	48	-	23	17	8	-	-	28	87	135	198
2006	3	179	29	233	-	1	4	6	3	5	23	47	159	205
2011	-	175	17	208	-	-	-	8	8	32	7	72	114	211
2016	-	249	26	393	1	-	-	15	5	32	9	23	26	154
2021	-	100	7	250	-	3	-	5	-	117	23	-	140	208
year	Average Cover (%)													
1996	-	1.3	-	2.2	-	-	-	-	-	-	-	4.0	1.6	1.6
2001	-	1.3	0.0	0.4	-	0.4	0.5	0.6	-	-	0.2	1.6	1.9	9.4
2006	0.0	1.8	0.8	3.9	-	0.0	0.0	0.4	0.0	0.1	0.5	0.7	1.9	8.2
2011	-	1.5	0.1	3.1	-	-	-	0.2	0.2	1.8	0.1	1.6	2.4	13.2
2016	-	2.3	0.2	19.4	0.0	-	-	0.1	0.0	1.5	0.1	0.9	0.2	4.9
2021	-	1.0	0.1	5.5	-	0.0	-	0.2	-	5.2	0.2	-	4.6	8.1

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 07-09.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Allium acuminatum (tapertip onion)	Alyssum alyssoides <sup>ai</sup> (pale madwort)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus cibirius (browse milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littledod false flax)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Cirsium (thistle)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)
year	Nested Frequency																
1996	1	-	-	18	-	116	1	54	-	-	-	-	-	-	-	-	25
2001	-	7	-	36	-	55	4	40	-	-	6	-	-	-	8	24	44
2006	-	1	-	20	-	132	3	33	-	-	3	-	4	-	11	46	29
2011	2	24	-	98	-	250	1	39	-	0	5	-	1	-	41	78	103
2016	-	26	6	38	-	205	-	33	1	11	22	-	4	11	33	83	22
2021	-	1	4	25	2	123	-	50	-	-	1	11	35	-	13	142	35
year	Average Cover (%)																
1996	0.0	-	-	0.1	-	0.4	0.0	1.1	-	-	-	-	-	-	-	-	0.1
2001	-	0.0	-	0.1	-	0.2	0.1	1.6	-	-	0.0	-	-	-	0.1	0.0	0.1
2006	-	0.0	-	0.1	-	0.4	0.0	0.8	-	-	0.0	-	0.0	-	0.2	0.1	0.3
2011	0.0	0.1	-	0.3	-	2.5	0.0	1.6	-	0.0	0.0	-	0.0	-	1.5	0.3	0.6
2016	-	0.1	0.0	0.2	-	1.0	-	0.4	0.0	0.6	0.1	-	0.0	0.3	1.1	0.3	0.1
2021	-	0.0	0.0	0.1	0.0	0.3	-	1.8	-	-	0.0	0.0	0.2	-	0.2	0.4	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Crepis acuminata (tapertip hawksbeard)	Cymopterus (springparsley)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium aparine <sup>a</sup> (stickywilly)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Heliomeris multiflora var. multiflora (showy goldeneye)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lepidium <sup>a</sup> (pepperweed)	Linaria dalmatica <sup>ai</sup> (Dalmatian toadflax)	Lithophragma (woodland-star)	Lomatium (desertparsley)
year	Nested Frequency																
1996	4	-	-	-	35	-	-	-	-	36	-	8	1	9	-	-	3
2001	-	3	8	-	3	-	4	4	-	3	-	3	-	-	-	-	-
2006	-	17	2	49	72	-	15	2	12	2	-	1	-	-	-	-	-
2011	-	18	22	161	220	4	31	6	50	48	29	26	-	-	-	11	-
2016	-	11	-	5	4	26	12	3	102	34	2	12	-	-	-	-	-
2021	-	9	-	-	17	-	6	2	124	2	2	-	-	-	1	-	-
year	Average Cover (%)																
1996	0.0	-	-	-	0.1	-	-	-	-	0.3	-	0.1	0.0	0.2	-	-	0.0
2001	-	0.0	0.0	-	0.0	-	0.1	0.0	-	0.0	-	0.1	-	-	-	-	-
2006	-	0.1	0.0	0.4	0.3	-	0.5	0.1	0.0	0.0	-	0.0	-	-	-	-	-
2011	-	0.3	0.1	2.8	3.6	0.1	0.5	0.2	0.5	1.5	0.2	0.9	-	-	-	0.1	-
2016	-	0.0	-	0.0	0.0	0.6	0.2	0.0	1.2	0.7	0.0	0.2	-	-	-	-	-
2021	-	0.0	-	-	0.1	-	0.3	0.0	1.4	0.0	0.0	-	-	-	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lupinus argenteus (silvery lupine)	Microsteris gracilis <sup>a</sup> (slender phlox)	Packera multilobata (lobeleaf groundsel)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Viola (violet)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency											
1996	-	-	-	18	53	-	3	-	-	12	-	-
2001	10	2	1	14	50	2	7	-	-	25	-	-
2006	16	50	-	9	14	1	5	-	-	2	-	0
2011	7	32	-	2	4	5	9	-	5	1	2	5
2016	6	8	-	3	-	-	3	5	9	26	-	2
2021	2	95	-	4	17	-	-	12	12	29	-	3
year	Average Cover (%)											
1996	-	-	-	0.1	0.1	-	0.0	-	-	0.0	-	-
2001	1.0	0.0	0.0	0.0	0.2	0.0	0.0	-	-	0.2	-	-
2006	1.3	0.2	-	0.1	0.1	0.0	0.0	-	-	0.0	-	0.0
2011	1.0	0.1	-	0.0	0.0	0.0	0.0	-	0.1	0.0	0.0	0.0
2016	0.1	0.0	-	0.0	-	-	0.0	0.4	0.0	0.1	-	0.0
2021	0.0	0.5	-	0.2	0.0	-	-	0.2	0.0	0.4	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 07-09.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Cercocarpus montanus <sup>p</sup> (alderleaf mountain mahogany)	Chrysothamnus depressus <sup>p</sup> (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus scopulorum <sup>t</sup> (Rocky Mountain juniper)	Mahonia repens (creeping barberry)	Opuntia polyacantha (plains pricklypear)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Quercus gambelii <sup>p</sup> (Gambel oak)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)
year	Line Intercept Cover (%)											
1996	-	-	-	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-	-	-
2006	8	9.2	-	0.9	0.2	0.5	-	0.8	-	1.9	-	3.9
2011	8.1	6.6	-	0.5	-	0.5	-	1.1	-	0.4	-	1.8
2016	11.6	5.3	-	0.1	0.7	6.8	-	1.8	-	0.5	-	3
2021	7.7	2.3	-	0.7	0.2	0.8	-	0.6	-	2.3	-	4
year	Quadrat Cover (%)											
1996	0.4	4.4	0.2	-	0.1	1.0	-	2.4	0.0	0.4	13.2	0.4
2001	6.1	15.8	-	0.5	0.1	1.0	-	1.3	0.0	1.8	-	1.4
2006	6.4	12.1	-	0.5	0.0	0.5	-	1.2	0.0	0.7	-	2.4
2011	7.1	6.6	-	0.3	1.4	0.9	-	2.5	0.0	0.8	-	2.0
2016	6.3	4.5	-	0.8	0.8	4.5	0.0	1.3	0.2	0.6	-	1.2
2021	6.2	3.4	-	0.7	0.0	0.7	-	1.3	0.2	3.0	-	2.9

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 07-09.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	540	-	0	96	4	11	0	0	59/63
2001	840	20	17	74	10	48	26	7	77/98
2006	940	20	19	72	9	6	72	2	85/106
2011	1080	-	4	94	2	35	52	4	70/90
2016	1180	-	15	83	2	27	54	9	77/92
2021	1060	-	13	53	34	21	60	30	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	940	-	4	64	32	23	0	15	52/93
2001	2260	-	4	75	21	6	0	8	56/87
2006	1260	20	0	62	38	21	3	30	57/93
2011	1140	20	7	53	40	39	2	39	56/96
2016	1060	-	17	70	13	15	40	19	61/83
2021	640	-	3	75	22	3	6	22	- / -
<b>Cercocarpus montanus<sup>p</sup> -- (alderleaf mountain mahogany)</b>									
1996	160	-	25	50	25	13	25	0	131/72
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	106/123
2021	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Chrysothamnus depressus<sup>P</sup> -- (longflower rabbitbrush)</b>									
1996	20	-	0	100	0	0	0	0	- / -
2001	260	-	0	100	0	0	0	0	17/36
2006	300	20	0	100	0	0	7	0	16/32
2011	220	-	0	100	0	0	0	0	15/36
2016	480	-	17	83	0	13	0	0	21/37
2021	520	-	0	96	4	31	35	4	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	40	-	0	100	0	0	0	0	22/42
2001	140	-	0	100	0	0	0	0	26/37
2006	20	-	0	100	0	0	0	0	39/52
2011	180	-	44	56	0	0	0	0	20/34
2016	520	-	0	100	0	0	0	0	26/47
2021	60	-	33	67	0	0	0	0	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	700	-	11	89	0	0	0	0	32/45
2001	700	-	9	89	3	0	0	3	20/34
2006	520	-	4	96	0	0	0	0	20/29
2011	600	-	0	100	0	0	0	0	16/33
2016	4420	-	1	100	0	0	0	0	23/33
2021	1420	20	23	52	25	18	1	25	- / -
<b>Mahonia repens -- (creeping barberry)</b>									
1996	8220	100	18	83	0	0	0	0	10/15
2001	10760	-	1	99	0	0	0	0	9/13
2006	8420	-	2	98	0	0	0	0	8/11
2011	4660	-	20	80	0	0	0	3	9/12
2016	8920	-	5	95	0	0	5	0	6/9
2021	7220	40	3	95	2	0	0	0	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	40	-	50	50	0	0	0	0	10/32
2001	340	-	6	94	0	0	0	0	10/24
2006	120	-	17	83	0	0	0	0	10/22
2011	20	-	0	100	0	0	0	0	11/25
2016	80	-	25	75	0	0	0	0	11/27
2021	120	-	0	100	0	0	0	0	- / -
<b>Paxistima myrsinites -- (Oregon boxleaf)</b>									
1996	20	-	0	100	0	0	0	0	23/43
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1996	20	-	0	100	0	100	0	0	51/152
2001	20	-	0	100	0	100	0	0	65/292
2006	80	-	0	100	0	0	100	0	57/168
2011	80	-	0	50	50	50	50	50	36/96
2016	100	-	0	100	0	20	80	0	42/116
2021	300	-	0	93	7	7	93	7	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Quercus gambelii<sup>p</sup> -- (Gambel oak)</b>									
1996	4260	20	10	85	5	0	0	1	81/80
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	56/55
2021	-	-	-	-	-	-	-	-	-/-
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	560	-	7	89	4	0	0	4	43/63
2001	500	-	4	80	16	0	0	4	48/81
2006	700	-	6	89	6	6	3	6	43/64
2011	440	40	9	86	5	27	5	14	50/72
2016	480	-	13	88	0	13	0	0	47/67
2021	560	-	7	71	21	7	50	25	- / -
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	20	-	0	100	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

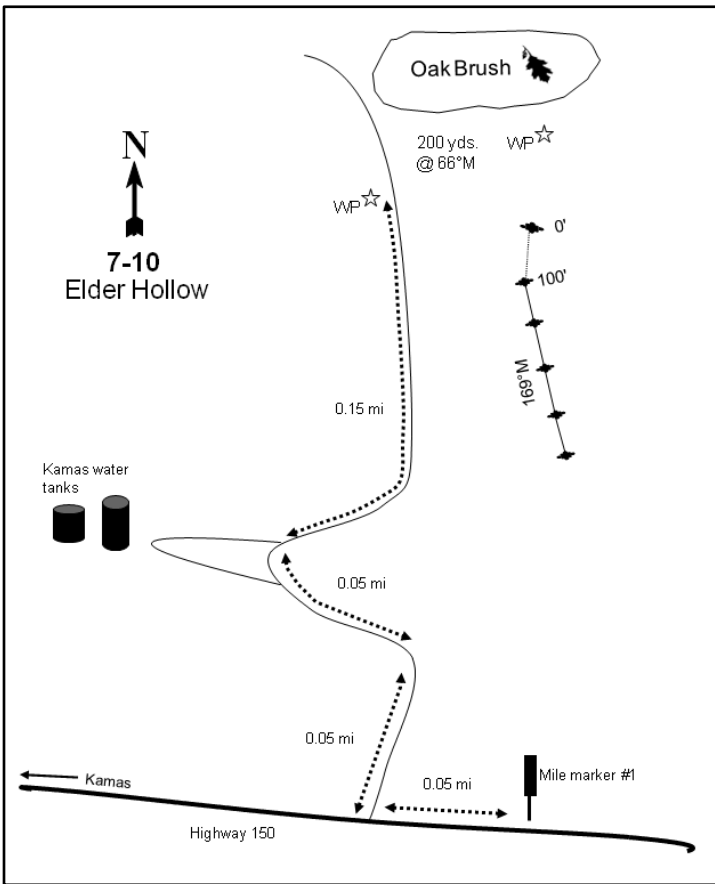
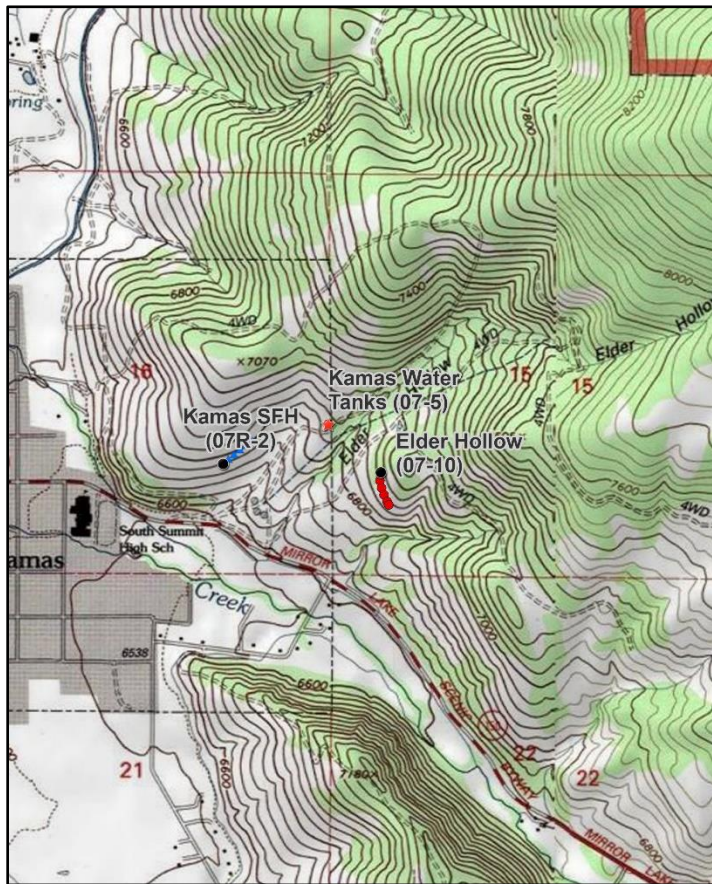
**Table 07-09.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus scopulorum (Rocky Mountain juniper)</b>							
2016	5	-	25	25	25	25	15.8
2021	5	-	-	25	50	25	19.5

**Table 07-09.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	20.6	11.7	4.3	14.4	-2.6	2.8	0.0	<b>51.2</b>	Poor
2001	30.0	10.1	3.2	29.5	-1.2	6.1	0.0	<b>77.6</b>	Good
2006	30.0	9.5	3.7	25.1	-4.3	6.3	0.0	<b>70.2</b>	Fair-Good
2011	23.4	9.7	2.7	30.0	-3.5	10.0	0.0	<b>72.2</b>	Good
2016	27.9	13.7	7.5	12.8	-16.3	5.7	0.0	<b>51.3</b>	Poor
2021	22.8	7.7	4.0	26.4	-4.9	5.1	-2.0	<b>59.0</b>	Fair

## ELDER HOLLOW - STUDY NO. 07-10



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Kamas SE; Township 2S, Range 6E, Section 15  
NAD 83 UTM ZONE 12, 478093 East 4499215 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

Not Available  
169° magnetic (Line 2: 151° magnetic, Line 3: 149° magnetic, Lines 4-5: 146° magnetic)  
500ft  
Line 1 (11ft), Line 2 (59ft), Line 3 (71ft), Line 4 (95ft), Line 5 (34ft)  
Belt 2, 3, 4, 5: No Rebar

### Directions to Site

Traveling westbound on Highway 150 (Mirror Lake Highway) from mile marker 1, proceed 0.05 miles to a locked gate on the right (north) side of the road. Contact the private landowner to access the site, which can be reached by walking. Proceed through the gate, turn left, and travel 0.05 miles. At this point turn right, continue 0.05 miles, and bear right again. Proceed for 0.15 miles to a green steel stake on the left (east) side of the road -- the post is in dense sagebrush about three feet from the road. From the post, walk 200 yards at 66 degrees magnetic to a witness post; the 0-foot stake is just few paces south of the witness post. The baseline doglegs down through the same vegetation type.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	7,000ft (2,134m)
Aspect	Southwest
Slope	25-35%
Sample Dates	09/19/1996, 07/03/2001, 07/06/2006, 06/27/2011, 06/20/2016, 06/21/2021

**Wildlife Habitat and Vegetation History****Table 07-10.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	winter

**Table 07-10.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1996	Mountain Big Sagebrush	Phase I
2001	Mountain Big Sagebrush	Phase I
2006	Mountain Big Sagebrush/Annual Grass	Phase I
2011	Mountain Big Sagebrush/Annual Forb	Phase I
2016	Mountain Big Sagebrush	Phase I
2021	Mountain Big Sagebrush	Phase I

**Site Notes**

This study replaces the Kamas Water Tank trend study established in 1984, which sampled crucial deer winter range located immediately east of Kamas. This new study is on privately-owned land in the foothills east of Kamas that has been intensively grazed by sheep, cattle, and horses for many years. The study is in a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass community that also contains a diverse mix of other shrub species. In 2016, a doe and two fawns were seen on the site, and two fawns were seen near the site.

**Soils****Table 07-10.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.0	48.2	27.1	24.7	3.7	16.6	198.4	0.6	09/19/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Loam (Shrub)
NRCS Ecological Site #	R047XA434UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1996, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been the dominant browse species on this site. Other preferred browse species such as Utah serviceberry (*Amelanchier utahensis*) and mountain snowberry (*Symphoricarpos oreophilus*) have also been present, but with less density and cover than sagebrush (Table 07-10.12, Table 07-10.13). The herbaceous understory has been diverse throughout the study years, but generally not very abundant. The annual grass cheatgrass (*Bromus tectorum*) provided most of the herbaceous cover and was a co-dominant site component in 2006. However, the annual forb desert madwort (*Alyssum desertorum*) was co-dominant in 2011 (Table 07-10.7, Table 07-10.10, Table 07-10.11). Rocky Mountain juniper (*Juniperus scopulorum*) has been present throughout the study period, placing the site in Phase I of woodland succession. Point-quarter density remains low as of 2021 (Photos, Table 07-10.4, Table 07-10.14): this may indicate that further tree encroachment likely does not pose an immediate threat to the plant community.



**Trend Summary Tables****Table 07-10.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	27.5	2.5	-	-	-	-
2001	27.7	2.2	-	-	-	-
2006	17.3	1.8	-	24.4	2.1	-
2011	17.7	2.0	-	26.1	2.4	-
2016	16.8	3.8	-	23.9	4.8	-
2021	18.2	6.8	-	24.9	3.4	-

**Table 07-10.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	303	205	298	116	3.8	6.1	2.7	2.6
2001	277	197	362	152	4.0	3.7	7.2	5.2
2006	388	182	348	118	10.4	5.7	7.8	3.8
2011	382	215	392	149	7.8	5.6	14.7	3.7
2016	342	207	378	146	5.2	4.4	7.5	1.7
2021	266	218	259	81	2.9	5.9	3.5	1.0

**Table 07-10.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	6.3	0.3	43.5	4.7	22.2	41.6
2001	13.2	0.3	38.3	4.8	19.2	46.2
2006	13.1	0.3	29.3	4.8	21.6	42.6
2011	9.1	0.4	24.0	3.7	22.6	48.7
2016	25.2	0.2	26.7	6.7	21.9	36.2
2021	14.3	0.1	35.8	5.5	26.9	33.9

**Table 07-10.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	-	45	27	1
2001	-	39	3	4
2006	1	56	-	10
2011	1	14	2	1
2016	2	18	-	11
2021	2	17	-	7
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	5.8 (14.3)	102.6 (253.3)	8.1 (19.9)	-
2006	2.9 (7.2)	132.7 (327.7)	8.7 (21.5)	-
2011	5.1 (12.6)	34.2 (84.4)	0.7 (1.7)	-
2016	5.1 (12.6)	24.8 (61.2)	-	-
2021	5.8 (14.3)	55.6 (137.4)	-	-

**Table 07-10.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus marginatus (mountain brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia myuros <sup>ai</sup> (annual fescue)
year	Nested Frequency													
1996	0	16	-	10	303	17	13	-	-	4	125	50	6	-
2001	3	25	-	2	277	17	25	8	-	1	65	74	11	-
2006	3	43	-	-	388	15	12	6	11	4	33	69	25	-
2011	-	34	-	10	378	9	11	1	33	4	53	108	1	4
2016	0	61	26	3	335	21	3	14	92	7	11	49	6	-
2021	7	25	74	-	218	13	6	1	65	-	8	120	16	-
year	Average Cover (%)													
1996	0.0	0.3	-	0.1	3.8	0.4	0.3	-	-	0.1	4.1	0.9	0.0	-
2001	0.0	0.5	-	0.0	4.0	0.3	0.1	0.1	-	0.0	0.6	2.0	0.1	-
2006	0.0	1.4	-	-	10.4	0.3	0.1	0.0	0.4	0.2	0.3	1.9	1.1	-
2011	-	1.1	-	0.0	7.5	0.3	0.1	0.0	0.4	0.1	0.8	2.8	0.0	0.4
2016	0.0	0.7	0.2	0.0	5.0	0.1	0.0	0.2	2.4	0.0	0.1	0.6	0.2	-
2021	0.1	0.2	0.6	-	2.3	0.1	0.2	0.0	1.2	-	0.0	4.0	0.1	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 07-10.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis perennans (perennial rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvetch)	Astragalus cibaricus (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littledrop false flax)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)
year	Nested Frequency																
1996	2	272	6	14	-	-	1	1	6	-	60	5	35	8	-	7	-
2001	13	316	1	26	0	-	8	-	10	6	211	-	32	138	14	9	-
2006	11	318	-	18	1	-	7	-	1	-	217	-	9	14	9	7	4
2011	23	363	-	26	9	-	4	2	8	-	95	-	14	58	12	13	3
2016	13	340	-	13	4	3	5	1	8	-	60	-	14	5	3	10	7
2021	3	196	-	13	-	-	-	-	-	-	69	-	6	16	-	7	-
year	Average Cover (%)																
1996	0.0	1.8	0.0	0.2	-	-	0.0	0.0	0.0	-	0.2	0.0	0.6	0.0	-	0.1	-
2001	0.1	2.4	0.0	0.6	0.0	-	0.2	-	0.0	0.0	2.0	-	0.9	0.5	0.1	0.1	-
2006	0.1	3.4	-	0.4	0.0	-	0.1	-	0.0	-	1.3	-	0.7	0.0	0.0	0.1	0.0
2011	0.1	8.1	-	0.5	0.0	-	0.2	0.0	0.0	-	0.3	-	0.8	0.2	0.0	0.1	0.0
2016	0.2	2.7	-	0.1	0.0	0.0	0.0	0.0	0.0	-	0.2	-	0.2	0.0	0.0	0.1	0.0
2021	0.0	1.5	-	0.2	-	-	-	-	-	-	0.3	-	0.2	0.0	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cynoglossum officinale <sup>ani</sup> (gypsoflower)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Eriogonum heracleoides (parsnipflower buckwheat)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium aparine <sup>a</sup> (stickywilly)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Hackelia patens (spotted stickseed)	Heliomeris multiflora var. multiflora (showy goldeneye)	Heterotheca villosa (hairy false goldenaster)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lithophragma (woodland-star)	Lithospermum ruderale (western stoneseed)	Lomatium (desertparsley)	Lomatium triternatum (nineleaf biscuitroot)
year	Nested Frequency																
1996	-	24	10	-	29	-	1	-	-	-	20	1	-	-	0	-	-
2001	4	5	10	0	21	1	38	-	-	-	6	5	1	-	-	1	-
2006	-	1	3	-	18	2	86	-	5	4	4	13	-	-	11	-	-
2011	-	7	46	1	17	16	221	4	3	2	-	21	1	3	-	-	8
2016	3	-	9	8	20	14	248	5	-	-	9	27	3	-	3	-	3
2021	-	-	-	-	21	15	134	-	-	-	-	11	-	-	5	-	4
year	Average Cover (%)																
1996	-	0.0	0.0	-	0.2	-	0.0	-	-	-	0.2	0.0	-	-	0.1	-	-
2001	0.0	0.0	0.0	0.0	0.5	0.0	0.9	-	-	-	0.1	0.4	0.0	-	-	0.0	-
2006	-	0.0	0.0	-	0.5	0.1	2.2	-	0.0	0.0	0.2	0.5	-	-	0.3	-	-
2011	-	0.0	0.4	0.0	0.1	0.2	4.7	0.0	0.0	0.1	-	0.7	0.0	0.0	-	-	0.1
2016	0.0	-	0.1	0.1	0.2	0.1	4.0	0.2	-	-	0.1	0.4	0.0	-	0.0	-	0.0
2021	-	-	-	-	0.2	0.2	1.5	-	-	-	-	0.1	-	-	0.1	-	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lupinus argenteus (silvery lupine)	Microsteris gracilis <sup>a</sup> (slender phlox)	Oenothera pallida <sup>a</sup> (pale evening primrose)	Penstemon (beardtongue)	Penstemon humilis (low beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency											
1996	13	-	3	2	42	-	8	1	-	-	14	3
2001	45	29	7	4	29	3	-	20	-	5	7	7
2006	17	6	4	2	17	-	4	8	-	2	-	2
2011	6	22	0	-	18	-	-	3	1	3	3	8
2016	3	8	2	-	13	-	-	-	-	3	5	5
2021	-	13	-	-	8	5	3	-	-	-	-	3
year	Average Cover (%)											
1996	0.8	-	0.0	0.0	0.9	-	0.0	0.0	-	-	0.1	0.0
2001	2.5	0.1	0.1	0.0	0.5	0.0	-	0.1	-	0.0	0.1	0.1
2006	0.6	0.0	0.0	0.1	0.7	-	0.0	0.0	-	0.0	-	0.1
2011	0.7	0.1	0.0	-	0.5	-	-	0.0	0.0	0.1	0.0	0.1
2016	0.2	0.0	0.0	-	0.1	-	-	-	-	0.0	0.1	0.1
2021	-	0.0	-	-	0.1	0.0	0.0	-	-	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 07-10.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus depressus <sup>p</sup> (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. spectiosa <sup>p</sup> (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Opuntia polyacantha (plains pricklypear)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)										
1996	-	-	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-	-
2006	2.6	12.6	0.2	0.6	0.4	0.4	-	0.2	0.8	7.8	0.9
2011	5.3	10.9	0.3	0.7	0.3	0.6	-	0.2	1	8.3	0.9
2016	4.1	10.3	-	0.3	0.6	3.1	-	0.6	1.8	7.1	0.8
2021	3.9	12.4	-	0.2	0.2	1.9	-	0.2	2	6.4	1.1
year	Quadrat Cover (%)										
1996	1.5	21.6	-	0.5	-	1.2	-	0.5	0.6	3.8	0.2
2001	1.8	18.4	-	0.2	0.1	1.4	-	0.2	0.5	6.9	0.5
2006	1.3	10.8	0.0	0.6	0.0	0.3	-	0.3	0.4	4.8	0.6
2011	0.9	9.8	0.2	0.1	0.0	1.4	-	0.3	1.3	5.5	0.2
2016	2.6	8.2	-	0.4	0.0	1.8	-	1.0	1.1	4.9	0.7
2021	1.9	10.7	-	0.8	0.0	2.5	0.0	0.5	1.4	4.3	2.9

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 07-10.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	520	-	8	92	0	35	54	0	56/70
2001	840	-	7	93	0	45	33	2	56/71
2006	460	-	9	91	0	9	87	0	66/76
2011	500	-	0	100	0	28	68	0	74/93
2016	920	-	9	91	0	35	52	0	85/84
2021	520	-	12	58	31	19	58	27	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	2540	-	6	74	20	50	28	3	49/110
2001	2140	-	2	60	38	51	17	11	55/100
2006	1520	20	5	58	37	37	24	54	56/100
2011	1680	20	21	45	33	33	7	12	61/107
2016	1520	60	8	62	30	36	28	28	55/108
2021	2160	-	7	66	27	23	19	30	- / -
<b>Chrysothamnus depressus<sup>p</sup> -- (longflower rabbitbrush)</b>									
1996	100	-	0	100	0	0	0	0	17/44
2001	100	-	0	100	0	40	0	0	13/40
2006	60	-	0	100	0	0	0	0	17/39
2011	220	-	0	91	9	0	9	9	21/34
2016	200	-	0	100	0	0	10	0	10/15
2021	120	-	33	50	17	17	33	17	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	160	-	25	75	0	0	0	0	31/47
2001	340	-	0	100	0	18	18	0	23/124
2006	260	-	0	92	8	31	0	0	26/54
2011	380	-	11	84	5	0	0	0	24/42
2016	340	-	6	77	18	0	35	18	20/32
2021	460	-	26	65	9	13	65	4	- / -
<b>Eriogonum heracleoides -- (parsnipflower buckwheat)</b>									
1996	20	-	0	100	0	0	0	0	- / -
2001	20	-	0	100	0	0	0	0	21/39
2006	-	-	-	-	-	-	-	-	- / -
2011	100	-	0	100	0	100	0	0	21/12
2016	200	-	20	80	0	0	0	0	10/9
2021	-	-	-	-	-	-	-	-	- / -
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1996	20	-	0	100	0	0	0	0	- / -
2001	60	-	33	67	0	0	0	0	128/135
2006	-	-	-	-	-	-	-	-	- / -
2011	20	-	0	100	0	0	0	0	140/205
2016	20	-	0	100	0	0	0	0	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	4100	40	17	83	0	0	0	0	20/29
2001	3100	-	4	96	0	0	0	0	18/23
2006	1140	40	12	86	2	5	0	2	18/20
2011	1180	-	44	56	0	0	0	0	21/26
2016	6720	-	2	98	0	14	0	0	20/21
2021	6300	-	11	78	11	44	20	10	- / -
<b>Mahonia repens -- (creeping barberry)</b>									
1996	100	-	0	100	0	0	0	0	11/11
2001	180	-	0	100	0	0	0	0	5/7
2006	40	-	0	100	0	0	0	0	- / -
2011	-	-	-	-	-	-	-	-	9/16
2016	100	-	0	100	0	0	0	0	8/12
2021	80	-	0	100	0	0	0	0	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	560	-	4	93	4	0	0	7	11/30
2001	340	-	18	82	0	0	0	0	10/21
2006	400	-	20	70	10	0	0	10	11/32
2011	340	-	12	88	0	6	0	0	12/35
2016	540	-	7	93	0	0	0	15	13/39
2021	600	-	3	77	20	0	0	20	- / -
<b>Prunus virginiana<sup>p</sup> -- (chokecherry)</b>									
1996	20	-	0	100	0	0	0	0	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	80	-	0	100	0	0	100	0	28/127
2001	60	-	0	100	0	33	67	0	25/134
2006	220	-	0	100	0	18	73	0	24/87
2011	300	-	0	100	0	47	33	0	30/94
2016	320	-	0	100	0	0	100	0	33/99
2021	600	-	7	93	0	20	40	30	- / -
<b>Quercus gambelii<sup>p</sup> -- (Gambel oak)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	94/80
2021	-	-	-	-	-	-	-	-	-/-
<b>Sambucus nigra ssp. cerulea<sup>p</sup> -- (blue elderberry)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	109/124
2021	-	-	-	-	-	-	-	-	-/-
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1996	1260	20	18	81	2	10	0	2	52/74
2001	1200	20	12	87	2	7	2	2	57/84
2006	1600	20	9	89	3	9	1	1	60/86
2011	1380	-	6	94	0	30	0	3	59/95
2016	1500	-	9	83	8	52	11	12	59/92
2021	1700	-	20	65	15	39	21	15	- / -
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	480	-	25	67	8	0	0	4	19/45
2001	440	-	5	91	5	14	0	0	20/32
2006	480	-	8	79	13	8	0	4	26/52
2011	460	-	4	91	4	17	0	4	26/50
2016	520	-	0	100	0	0	0	0	31/61
2021	800	120	23	73	5	15	0	5	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

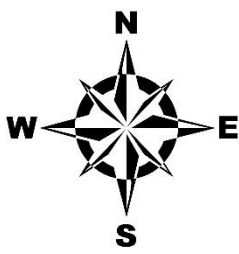
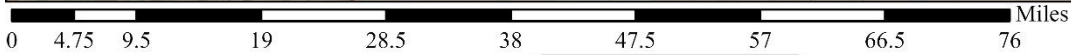
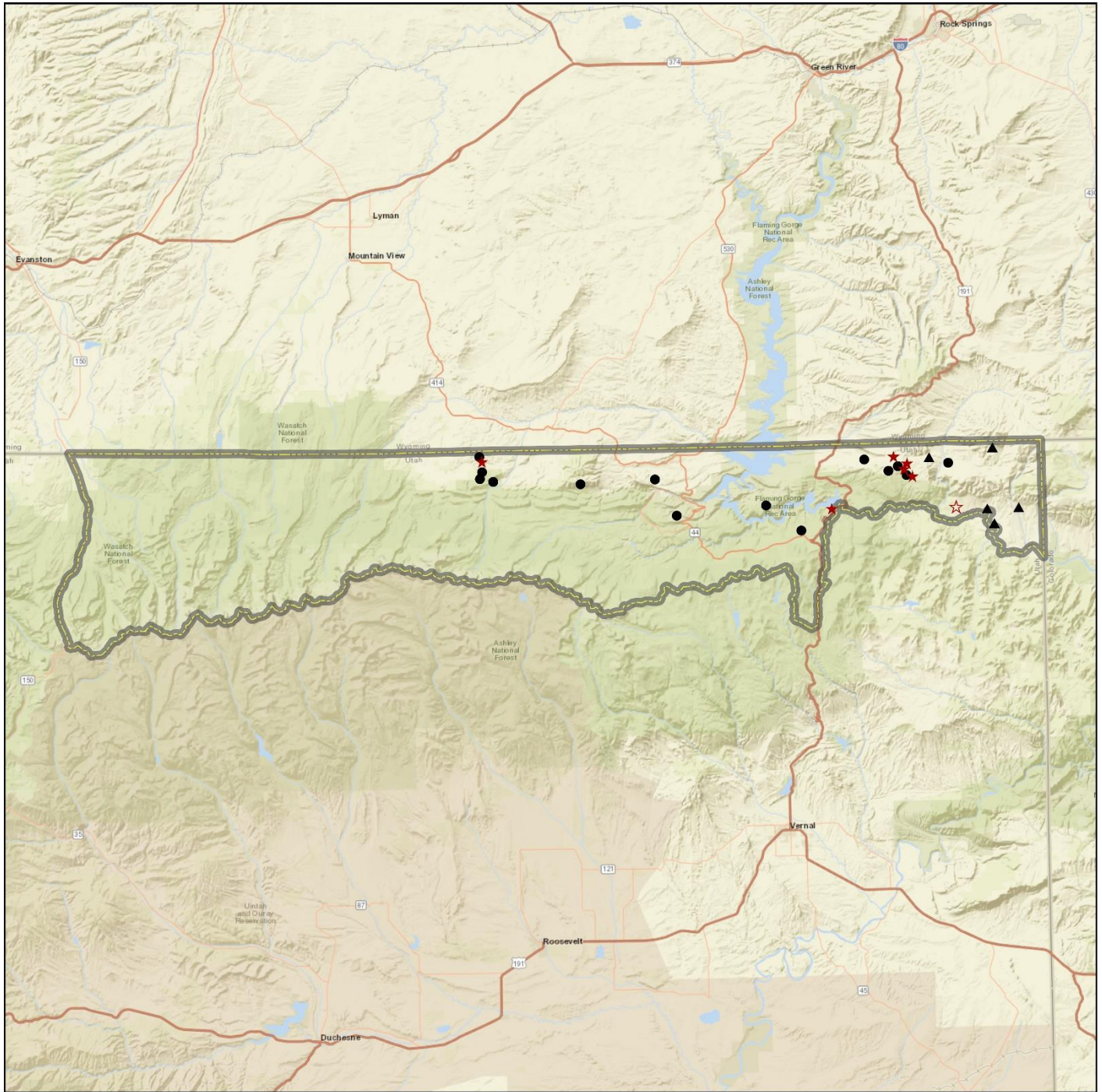
**Table 07-10.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus scopulorum (Rocky Mountain juniper)</b>							
2016	4	-	100	-	-	-	13.0
2021	5	-	100	-	-	-	5.0

**Table 07-10.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1996	30.0	10.3	3.9	12.2	-2.9	5.1	0.0	<b>58.6</b>	Fair
2001	30.0	7.3	2.4	7.4	-3.0	10.0	-2.0	<b>52.1</b>	Poor
2006	29.4	8.8	3.2	10.6	-7.8	7.7	0.0	<b>51.9</b>	Poor
2011	30.0	10.8	5.4	10.5	-5.9	7.4	0.0	<b>58.1</b>	Fair
2016	29.6	10.4	3.8	4.0	-3.9	3.5	-2.0	<b>45.3</b>	Poor
2021	30.0	8.2	5.6	9.4	-2.1	2.0	0.0	<b>53.0</b>	Poor-Fair

# WILDLIFE MANAGEMENT UNIT 8 - NORTH SLOPE

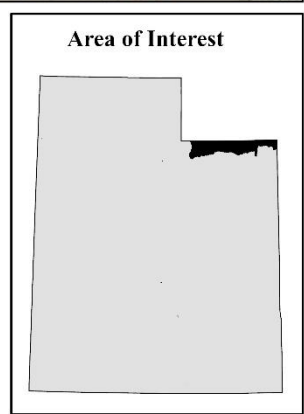


**Study Location Project, Status**

- RT, Active
- ★ RT, Suspended
- ▲ WRI, Active
- ☆ WRI, Suspended

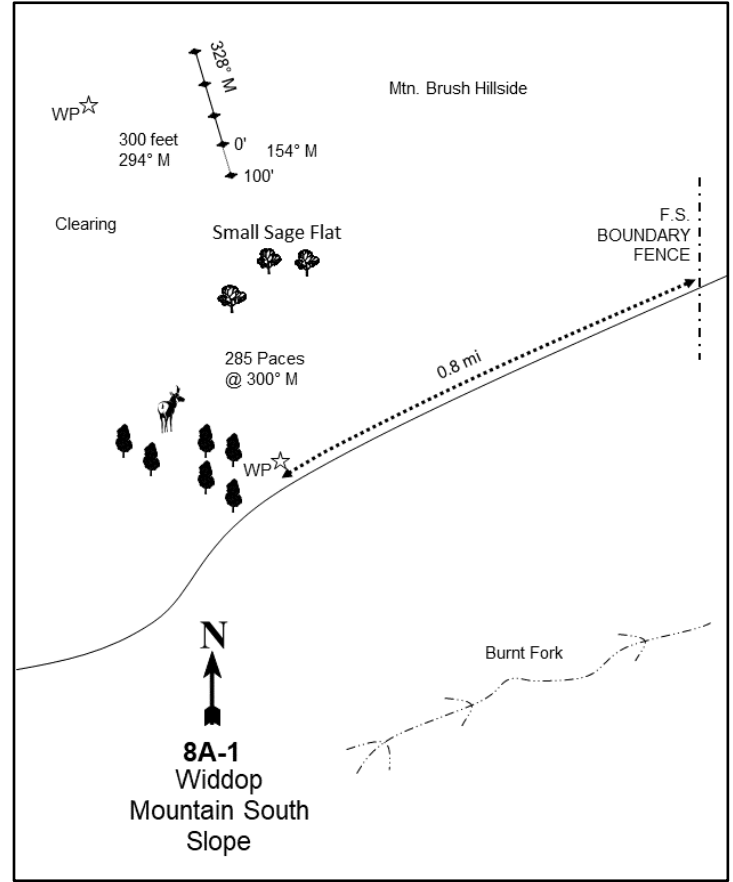
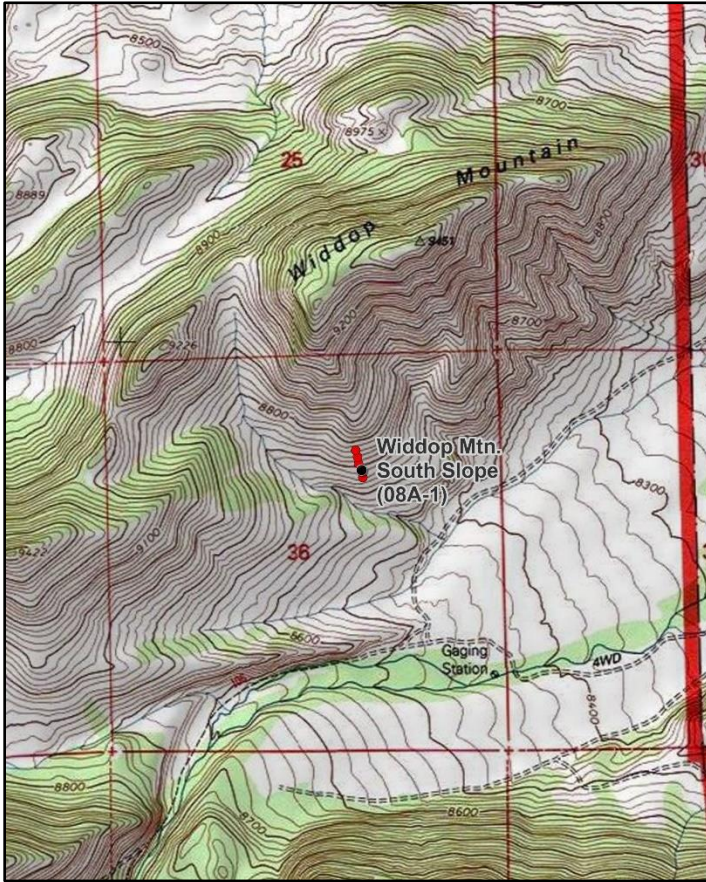
**Unit Boundary**

- ▭ Unit - 8



Credits: Esri, HERE, Garmin, NGA, USGS, NPS

## WIDDOP MTN. SOUTH SLOPE - STUDY NO. 08A-1



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Hoop Lake NW; Township 3N, Range 16E, Section 36  
NAD 83 UTM ZONE 12, 578061 East 4534013 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

7155  
154° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Standard

### Directions to Site

From the intersection of Hoop Lake Road and State Highway 414, travel south along the Middle Fork of Beaver Creek for 7.4 miles to the Hole in the Rock Guard Station. From there, turn east toward Gregory Basin and travel along the canal road for 2.6 miles until the intersection at Telephone Hollow is reached. Travel to the Widdop Mountain North Slope site. From there, go 0.9 miles (past study 08A-02) to a FS fence. Continue 1.8 miles to a gate. Go through the gate and continue 0.4 miles to a fork. Bear right at the fork and travel 2.3 miles southwest back to a FS boundary fence. Proceed 0.8 miles to a faint fork. Turn right and pull up about 50 yards along a small drainage. Stop by a witness post (tall green fence post) next to a clump of aspens. From here, walk 285 paces at 300 degrees magnetic up the slope. The 0-foot baseline stake is marked by browse tag #7155.



**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	BURNT FK
Elevation	8,707ft (2,654m)
Aspect	South
Slope	26%
Sample Dates	08/30/1995, 08/03/2000, 08/03/2005, 08/10/2010, 07/07/2015, 08/04/2021

**Wildlife Habitat and Vegetation History****Table 08A-01.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	winter
Rocky Mountain Bighorn	crucial	spring/fall

**Table 08A-01.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Alderleaf Mountain Mahogany	No Encroachment
1995	Alderleaf Mountain Mahogany	No Encroachment
2000	Alderleaf Mountain Mahogany	No Encroachment
2005	Alderleaf Mountain Mahogany	No Encroachment
2010	Alderleaf Mountain Mahogany	No Encroachment
2015	Alderleaf Mountain Mahogany	No Encroachment
2021	Alderleaf Mountain Mahogany	No Encroachment

**Site Notes**

Cattle that graze the area tend to stay in the valley bottom near water, so livestock use is light on the steep, brushy mountain slopes. Slopes similar to the study site mostly receive use from wintering elk. Moose also use the site, but do so infrequently. It was noted in the 2015 sample year that insects infested many of the alderleaf mountain mahogany (*Cercocarpus montanus*) plants.

**Soils****Table 08A-01.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.3	55.3	20.7	24.0	3.2	4.6	99.2	0.7	08/30/1995
Sandy Clay Loam	7.2	53.6	23.8	22.6	3.8	3.3	70.4	0.8	08/03/2000

**Site Potential**

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Stony Loam (Browse)
NRCS Ecological Site #	R047XC460UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1988, the vegetation on this site has remained in a stable state as a mixed mountain brush plant community type with alderleaf mountain mahogany (*Cercocarpus montanus*) as the dominant shrub species (Photos, Pre-1992 Data, Table 08A-01.12). A slight, but noticeable, shift in shrub composition is occurring with the gradual loss of preferred shrub species and increase in broom snakeweed (*Gutierrezia sarothrae*) densities (Table 08A-01.13). The herbaceous understory has remained diverse and abundant over the study years (Table 08A-01.10, Table 08A-01.11). This site will likely remain in this or a similar state unless a major disturbance occurs. There is some conifer encroachment in the drainage below the site, but encroachment is not occurring on the study itself (Photos). Due to the abundance and diversity of the shrub and herbaceous communities, this site likely serves as good habitat for summering mule deer.

**Trend Summary Tables****Table 08A-01.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1995	23.6	1.9	-	-	-	-
2000	27.5	2.6	-	-	-	-
2005	28.2	4.3	-	28.5	3.6	-
2010	29.5	2.8	-	35.6	2.6	-
2015	33.1	3.4	-	37.0	4.2	-
2021	31.1	4.3	-	38.4	5.1	-

**Table 08A-01.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1995	-	377	59	215	-	15.7	0.2	4.3
2000	-	397	2	226	-	20.3	0.0	5.4
2005	-	331	-	163	-	11.6	-	3.8
2010	-	356	11	178	-	17.2	0.0	2.9
2015	-	370	14	186	-	18.6	0.1	4.5
2021	-	379	3	213	-	20.5	0.1	5.5

**Table 08A-01.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1995	10.5	0.0	47.7	13.4	6.3	38.8
2000	15.5	-	42.8	18.5	5.5	50.9
2005	14.4	0.3	34.3	17.6	4.9	45.4
2010	8.2	0.1	34.4	18.3	3.7	54.7
2015	12.2	0.3	32.2	12.6	3.3	59.9
2021	10.6	2.7	36.1	20.9	4.4	51.6

**Table 08A-01.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Pronghorn	Mule Deer	Rocky Mountain Elk	Horse	Shiras Moose	Rabbit
	Quadrat Frequency						
1995	-	20	-	40	-	4	1
2000	2	-	-	28	-	3	1
2005	3	4	-	23	-	9	-
2010	-	17	-	10	-	2	-
2015	-	6	-	43	-	5	-
2021	1	20	-	34	-	8	-
Year	Days Use Per Acre (ha)						
1995	-	-	-	-	-	-	-
2000	1.5 (3.6)	18.1 (44.7)	-	66.4 (163.9)	-	9.2 (22.7)	-
2005	4.4 (10.8)	-	0.7 (1.7)	47.6 (117.5)	0.6 (1.4)	13.1 (32.3)	-
2010	2.9 (7.2)	-	53.6 (132.4)	24.8 (61.2)	-	2.9 (7.2)	-
2015	2.9 (7.2)	-	10.7 (26.5)	36.8 (91.0)	-	-	-
2021	1.5 (3.6)	2.7 (6.6)	-	48.3 (119.2)	-	10.6 (26.3)	-

**Table 08A-01.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency											
Achnatherum hymenoides (Indian ricegrass)	63	11	148	3	-	6	49	11	15	-	330	
Bromus inermis <sup>i</sup> (smooth brome)	48	2	181	14	5	-	28	10	-	1	326	
Carex (sedge)	54	3	186	27	-	19	21	-	5	3	258	
Elymus lanceolatus (thickspike wheatgrass)	38	-	175	48	-	4	35	12	9	2	287	
Festuca idahoensis (Idaho fescue)	48	-	165	47	2	21	62	2	-	3	305	
Hesperostipa comata (needle and thread)	2021	52	4	133	27	-	26	74	15	17	4	318
Koeleria macrantha (prairie Junegrass)	Average Cover (%)											
Leucopoa kingii (spike fescue)	1995	1.7	0.1	3.6	0.0	-	0.1	0.6	0.0	0.1	-	9.6
Poa fendleriana (muttongrass)	2000	1.3	0.0	6.0	0.1	0.0	-	0.2	0.1	-	0.0	12.5
Poa secunda (Sandberg bluegrass)	2005	0.7	0.0	4.3	0.3	-	0.3	0.2	-	0.0	0.1	5.7
Pseudoroegneria spicata (bluebunch wheatgrass)	2010	1.6	-	5.0	0.3	-	0.1	0.3	0.1	0.2	0.0	9.6
	2015	1.6	-	3.8	0.7	0.0	0.7	0.8	0.0	-	0.0	10.9
	2021	2.1	0.0	4.3	0.2	-	1.4	1.8	0.2	0.4	0.0	10.1

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 08A-01.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
Arabis (rockcress)	3	-	7	-	-	1	11	2	47	1	97	-	57	-	-	19	5	
Astragalus purshii (woollypod milkvech)	-	1	2	-	-	7	17	-	60	-	73	1	1	1	-	40	23	
Calochortus nuttallii (sego lily)	4	1	2	1	-	1	20	-	9	3	25	-	-	5	-	15	25	
Castilleja angustifolia (northwestern Indian paintbrush)	14	4	-	-	-	-	21	9	8	4	38	-	-	-	-	54	18	
Castilleja flava (yellow Indian paintbrush)	6	2	6	2	3	5	11	-	5	4	47	1	2	1	10	20	19	
Chaenactis douglasii (Douglas' dusty-aiden)	2021	6	4	-	3	-	1	23	3	11	-	55	-	-	6	-	13	28
Chaetopappa ericoides (rose heath)	Average Cover (%)																	
Chenopodium leptophyllum <sup>a</sup> (narrowleaf goosefoot)	1995	0.0	-	0.1	-	-	0.0	0.0	0.0	1.6	0.0	1.0	-	0.2	-	-	0.1	0.0
Cirsium (thistle)	2000	-	0.0	0.0	-	-	0.0	0.1	-	1.5	-	0.9	0.0	0.0	0.0	-	0.3	0.1
Comandra umbellata (bastard toadflax)	2005	0.0	0.0	0.0	0.0	-	0.0	0.1	-	0.3	0.0	0.5	-	-	0.0	-	0.1	0.4
Cryptantha (cryptantha)	2010	0.0	0.0	-	-	-	-	0.1	0.0	0.3	0.0	0.3	-	-	-	-	0.2	0.0
Cymopterus (springparsley)	2015	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-	0.1	0.0	0.7	0.0	0.0	0.0	0.1	0.1	0.2
Descurainia pinnata <sup>a</sup> (western tansymustard)	2021	0.0	0.0	-	0.0	-	0.0	0.2	0.1	0.1	-	0.3	-	-	0.0	-	0.0	0.2
Eriogonum umbellatum (sulphur-flower buckwheat)																		
Erysimum capitatum <sup>a</sup> (sanddune wallflower)																		
Lesquerella alpina (alpine bladderpod)																		
Linum lewisii (Lewis flax)																		

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lithospermum incisum (narrowleaf stone seed)	Lithospermum ruderae (western stone seed)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grindelioides (rayless tansyaster)	Packera multiflora (lobeleaf groundsel)	Penstemon (beardtongue)	Penstemon humilis (low beardtongue)	Phlox hoodii (spiny phlox)	Physaria (twinpod)	Silene drummondii (Drummond's campion)	Symphotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tetraneuris acaulis (stemless four-nerve daisy)	Tragopogon dubius <sup>at</sup> (yellow salsify)	Trifolium (clover)	Zigadenus paniculatus (foothill death camas)
year	Nested Frequency															
1995	-	27	-	18	7	-	40	36	-	-	4	11	-	-	-	6
2000	-	30	1	27	26	-	32	35	-	-	-	2	-	1	-	1
2005	-	28	-	25	6	-	39	39	17	-	-	7	1	-	-	9
2010	-	23	-	19	-	-	52	17	-	-	2	17	2	2	2	1
2015	21	21	-	31	8	5	47	29	36	1	5	13	-	2	-	12
2021	11	29	8	31	5	-	76	37	12	2	2	4	1	-	-	19
year	Average Cover (%)															
1995	-	0.4	-	0.2	0.0	-	0.2	0.4	-	-	0.1	0.0	-	-	-	0.0
2000	-	0.4	0.0	0.5	0.4	-	0.5	0.6	-	-	-	0.0	-	0.0	-	0.0
2005	-	0.4	-	0.9	0.0	-	0.3	0.7	0.0	-	-	0.0	0.0	-	-	0.1
2010	-	0.5	-	0.7	-	-	0.4	0.1	-	-	0.0	0.1	0.0	0.0	0.1	0.0
2015	0.3	0.8	-	0.7	0.2	0.0	0.4	0.3	0.1	0.0	0.1	0.1	-	0.0	-	0.1
2021	0.1	1.4	0.1	0.5	0.0	-	1.5	0.6	0.2	0.0	0.0	0.0	0.0	-	-	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 08A-01.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia frigida <sup>p</sup> (prairie sagewort)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Cercocarpus montanus <sup>p</sup> (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. lanceolatus (yellow rabbitbrush)	Eriogonum microthecum <sup>p</sup> (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Krascheninnikovia lanata <sup>p</sup> (winterfat)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Symphoricarpos oreophilus <sup>p</sup> (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)										
1995	-	-	-	-	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-	-	-	-	-
2005	0.9	0.3	0.2	26.6	0.3	0	2.8	-	-	0.5	0.5
2010	1.9	0.1	0.1	33	0.4	0.2	1.7	-	-	0.3	0.5
2015	1.8	0.3	-	34.9	0.1	0	2.8	-	-	-	1.3
2021	1.4	0.1	-	36.2	0.6	0.1	3.5	0	-	0.6	1
year	Quadrat Cover (%)										
1995	1.1	0.0	0.7	21.5	0.5	0.1	0.6	0.0	0.0	0.2	0.8
2000	1.5	0.2	1.0	23.9	0.3	0.3	1.5	-	0.1	0.4	0.8
2005	1.8	0.2	0.5	25.1	0.6	0.2	2.6	-	0.0	0.4	1.1
2010	0.7	0.2	0.3	27.4	0.5	0.4	1.2	-	0.4	0.1	1.1
2015	1.2	0.4	0.0	30.7	0.3	0.4	2.2	-	0.1	0.4	0.9
2021	1.3	0.0	0.0	29.1	0.3	0.0	3.2	0.0	0.0	0.5	0.8

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 08A-01.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1995	200	-	50	50	0	30	20	0	70/80
2000	120	20	0	67	33	33	50	0	56/75
2005	180	-	0	89	11	11	89	0	58/75
2010	140	-	14	71	14	29	57	14	61/68
2015	320	-	44	56	0	75	19	0	70/75
2021	240	-	8	75	17	25	67	8	- / -
<b>Artemisia frigida<sup>P</sup> -- (prairie sagewort)</b>									
1995	140	-	14	86	0	14	0	0	7/19
2000	280	40	21	79	0	0	0	0	5/16
2005	160	-	13	88	0	13	0	0	13/21
2010	260	-	0	100	0	0	15	0	9/18
2015	260	20	8	92	0	8	0	0	16/18
2021	140	-	0	100	0	0	29	0	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1995	120	-	33	67	0	50	0	0	20/38
2000	140	-	0	71	29	71	0	14	21/46
2005	160	-	0	50	50	50	38	25	23/41
2010	80	-	0	25	75	50	50	25	17/37
2015	40	20	50	50	0	50	50	0	14/22
2021	-	-	-	-	-	-	-	-	- / -
<b>Cercocarpus montanus<sup>P</sup> -- (alderleaf mountain mahogany)</b>									
1995	4320	40	27	72	1	44	34	30	79/129
2000	5160	140	30	61	10	29	57	3	58/95
2005	4920	140	28	70	2	8	88	1	70/109
2010	5120	140	29	71	0	31	27	6	72/102
2015	5500	100	14	85	1	27	64	87	63/93
2021	5100	40	27	66	8	4	92	9	- / -
<b>Chrysothamnus depressus<sup>P</sup> -- (longflower rabbitbrush)</b>									
1995	20	-	100	0	0	0	0	0	- / -
2000	-	-	-	-	-	-	-	-	- / -
2005	-	-	-	-	-	-	-	-	- / -
2010	-	-	-	-	-	-	-	-	- / -
2015	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Chrysothamnus viscidiflorus ssp. lanceolatus -- (yellow rabbitbrush)</b>									
1995	820	-	20	81	0	0	0	0	23/30
2000	660	-	0	97	3	0	0	0	16/26
2005	420	20	5	95	0	5	0	0	18/34
2010	560	-	0	100	0	0	0	0	22/32
2015	540	-	4	96	0	15	0	0	17/26
2021	260	-	8	92	0	0	0	0	- / -
<b>Eriogonum microthecum<sup>P</sup> -- (slender buckwheat)</b>									
1995	600	-	3	97	0	0	0	0	13/24
2000	420	60	0	91	10	0	0	5	10/18
2005	300	-	7	80	13	0	0	0	15/26
2010	380	-	0	100	0	0	0	0	11/25
2015	360	-	0	100	0	56	44	0	10/20
2021	160	-	0	100	0	0	0	13	- / -

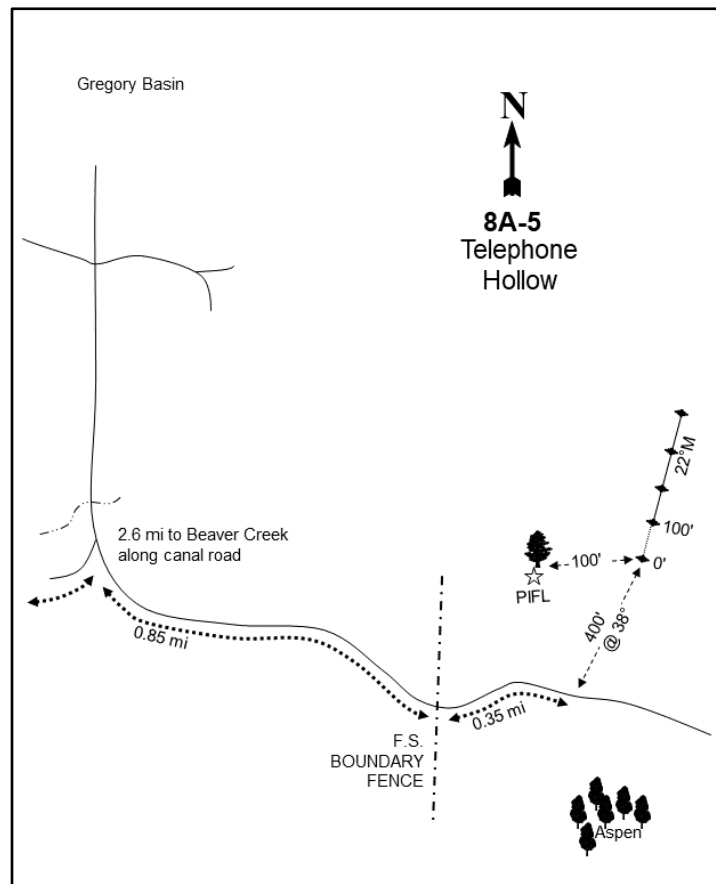
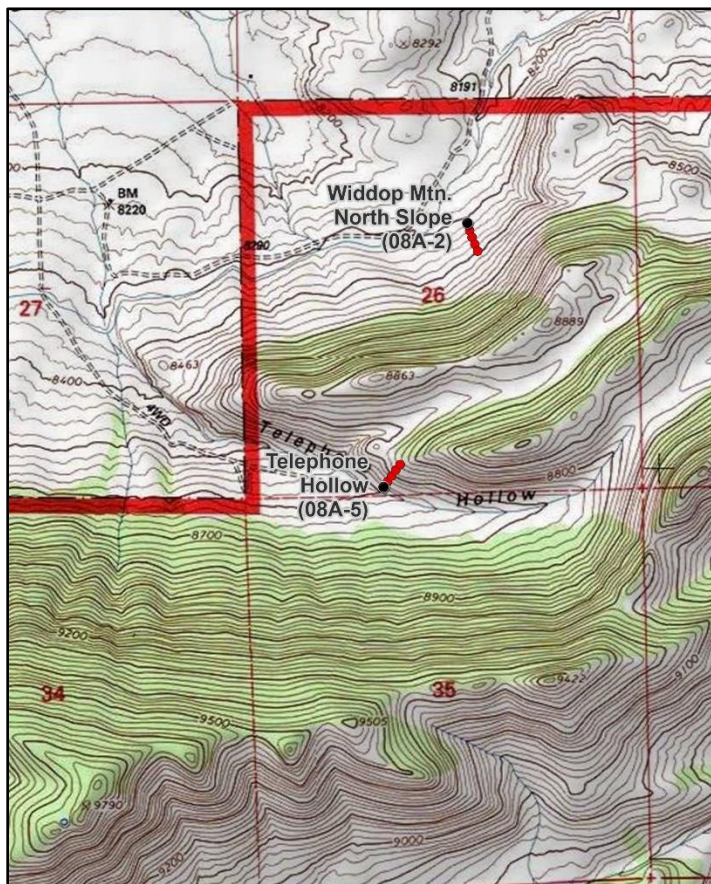
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Ericameria nauseosa ssp. nauseosa var. hololeuca<sup>P</sup> -- (rubber rabbitbrush)</b>									
1995	-	-	-	-	-	-	-	-	-/-
2000	20	-	0	100	0	0	0	0	-/-
2005	20	-	0	100	0	0	0	0	41/41
2010	20	-	0	100	0	0	0	0	36/46
2015	-	-	-	-	-	-	-	-	-/-
2021	20	-	0	100	0	0	0	0	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1995	780	-	3	97	0	0	0	0	18/16
2000	2520	240	3	94	2	0	0	1	13/21
2005	3800	-	3	97	0	0	0	0	17/29
2010	2000	40	2	98	0	1	0	0	17/23
2015	4980	20	3	97	0	0	0	0	15/22
2021	5940	300	19	81	0	0	0	0	-/-
<b>Krascheninnikovia lanata<sup>P</sup> -- (winterfat)</b>									
1995	40	-	0	100	0	0	0	0	17/10
2000	20	-	0	100	0	0	0	0	14/28
2005	20	-	0	100	0	0	100	0	20/19
2010	20	-	0	100	0	0	0	0	38/25
2015	-	-	-	-	-	-	-	-	-/-
2021	40	-	0	100	0	0	0	0	-/-
<b>Linanthus pungens -- (granite prickly phlox)</b>									
1995	-	-	-	-	-	-	-	-	-/-
2000	-	-	-	-	-	-	-	-	13/21
2005	-	-	-	-	-	-	-	-	-/-
2010	-	-	-	-	-	-	-	-	-/-
2015	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1995	20	-	100	0	0	100	0	0	-/-
2000	20	-	100	0	0	100	0	100	-/-
2005	20	-	0	100	0	0	100	0	10/35
2010	20	-	0	100	0	0	0	0	14/47
2015	20	-	0	100	0	0	100	0	20/55
2021	20	20	0	0	100	100	0	100	-/-
<b>Symphoricarpos oreophilus<sup>P</sup> -- (mountain snowberry)</b>									
1995	80	-	0	100	0	0	0	0	19/60
2000	120	-	33	67	0	33	0	0	22/74
2005	60	-	0	100	0	0	0	0	35/77
2010	100	-	0	100	0	0	0	0	27/43
2015	80	-	0	100	0	0	50	0	45/70
2021	120	-	0	83	17	17	33	17	-/-
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1995	1280	-	6	94	0	3	0	0	16/21
2000	1240	-	8	81	11	8	5	3	15/25
2005	960	-	13	83	4	48	27	2	16/29
2010	1200	-	2	98	0	17	2	5	17/26
2015	1400	-	13	87	0	51	10	0	17/27
2021	900	-	11	80	9	11	18	9	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 08A-01.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution				Average Diameter (cm)	
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)		>12' (%)
Pinus flexilis (limber pine)							
2021	1	-	100	-	-	-	6.0

## TELEPHONE HOLLOW - STUDY NO. 08A-5



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Hoop Lake NW; Township 3N, Range 16E, Section 26  
NAD 83 UTM ZONE 12, 575966 East 4534457 North

### Transect Information

Browse Tag # (0' Stake)	7148
Transect Bearing	22° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

### Directions to Site

From the Hoop Lake Road along Beaver Creek and the intersection that leads to the Hole in the Rock Guard Station, proceed east on the road to Telegraph Hollow. Go 2.6 miles along a canal road all the way to Telegraph Hollow. Turn south and drive 0.85 miles to a gate at the Forest Service boundary. Go through the gate and continue for 0.35 miles. Stop across from a lone limber pine (*Pinus flexilis*) tree on the bottom of the south-facing slope. The 0-foot stake is approximately 100 feet to the east of the lone limber pine tree. There is a red browse tag, #7148, attached to the green fence post marking the 0-foot end of the baseline.



**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	BURNT FK
Elevation	8,700ft (2,652m)
Aspect	South
Slope	38-40%
Sample Dates	08/29/1995, 08/03/2000, 08/02/2005, 08/10/2010, 07/07/2015, 08/04/2021

**Table 08A-05.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Telephone Hollow Lop and Scatter	2536	September 2014	303

**Wildlife Habitat and Vegetation History****Table 08A-05.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	summer	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long	brood-rearing
Shiras Moose	crucial	winter	

**Table 08A-05.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Alderleaf Mountain Mahogany	NA
1995	Alderleaf Mountain Mahogany	NA
2000	Alderleaf Mountain Mahogany	NA
2005	Alderleaf Mountain Mahogany	NA
2010	Alderleaf Mountain Mahogany	NA
2015	Alderleaf Mountain Mahogany	NA
2021	Alderleaf Mountain Mahogany	NA

**Site Notes**

At the elevation of the study site, the valley is generally covered by snow throughout the winter and much of the spring. These south slopes are important to wintering elk, and are also commonly used by moose and deer. Thermal cover is provided by conifer on the nearby north-facing slopes. Cattle graze the area as part of the Burnt Fork allotment, but typically graze mostly in the seeded hollow at the base of the slope. It was noted in the 2015 sample year that insects infested many of the alderleaf mountain mahogany (*Cercocarpus montanus*) plants.

**Soils****Table 08A-05.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.6	50.9	23.1	26.0	3.2	4.5	48.0	0.5	08/29/1995
Loam	7.4	49.4	33.0	17.6	4.1	2.8	35.2	0.6	08/03/2000

**Site Potential**

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Stony Loam (Browse)
NRCS Ecological Site #	R047XC460UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1988, this site has remained dominated by a mixed mountain brush plant community type with alderleaf mountain mahogany (*Cercocarpus montanus*) as the dominant shrub species (Photos, Pre-1992 Data, Table 08A-05.12, Table 08A-05.13). The herbaceous understory has remained diverse and abundant over the study years (Table 08A-05.10, Table 08A-05.11). It is predicted the site will remain in this or a similar state unless a major disturbance occurs. There was some conifer encroachment occurring on the site, but a lop and scatter treatment in 2014 (Table 08A-05.1) removed the encroaching trees. Due to the abundance and diversity of the shrub and herbaceous communities, this site likely serves as good habitat for summering mule deer.

**Trend Summary Tables****Table 08A-05.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1995	19.6	0.6	-	-	-	-
2000	20.1	3.0	-	-	-	-
2005	23.4	2.7	0.0	28.4	4.1	0.5
2010	20.8	2.1	2.2	33.2	3.3	3.1
2015	23.9	4.2	-	32.5	5.1	-
2021	25.0	6.3	0.0	32.3	6.0	0.2

**Table 08A-05.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1995	-	329	28	266	-	9.0	0.1	4.6
2000	-	323	-	262	-	12.2	-	7.3
2005	-	292	-	273	-	8.7	-	8.2
2010	-	290	10	290	-	6.2	0.1	5.6
2015	-	332	22	317	-	9.8	0.2	8.6
2021	-	310	1	271	-	11.2	0.0	5.9

**Table 08A-05.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1995	7.2	0.1	29.9	21.2	16.1	31.8
2000	23.2	-	28.8	24.8	12.1	41.9
2005	20.6	0.1	17.4	22.2	13.1	38.3
2010	13.4	0.0	23.5	31.0	9.5	41.8
2015	14.5	0.1	21.8	25.7	10.0	44.8
2021	13.2	1.4	23.7	31.9	11.9	39.3

**Table 08A-05.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Shiras Moose	Rabbit
	Quadrat Frequency					
1995	-	-	4	15	6	-
2000	-	-	-	12	9	-
2005	-	-	4	33	6	1
2010	-	-	5	15	5	-
2015	-	-	11	20	3	-
2021	-	-	12	20	1	3
Year	Days Use Per Acre (ha)					
1995	-	-	-	-	-	-
2000	1.5 (3.6)	-	3.4 (8.3)	30.8 (76.1)	16.0 (39.5)	-
2005	-	-	2.7 (6.6)	29.5 (72.8)	10.6 (26.3)	-
2010	-	-	22.8 (56.3)	34.2 (84.4)	6.3 (15.5)	-
2015	-	-	19.4 (48.0)	12.1 (29.8)	2.9 (7.2)	-
2021	-	17.4 (43.0)*	34.2 (84.4)	23.4 (57.9)	2.9 (7.2)	-

\*Pellets per acre (ha)

**Table 08A-05.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Carex (sedge)	Elymus lanceolatus (thickspike wheatgrass)	Elymus trachycaulus (slender wheatgrass)	Festuca idahoensis (Idaho fescue)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Leucopoa kingii (spike fescue)	Poa fendleriana (muttongrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency									
1995	74	177	4	-	-	10	7	-	-	242
2000	44	138	3	-	-	1	10	2	-	261
2005	54	158	4	-	-	1	12	-	-	217
2010	34	183	3	-	-	-	15	1	5	186
2015	16	173	18	-	3	4	35	-	4	257
2021	46	136	33	7	-	8	31	-	-	204
year	Average Cover (%)									
1995	1.7	2.7	0.2	-	-	0.0	0.1	-	-	4.3
2000	1.4	3.1	0.0	-	-	0.0	0.2	0.0	-	7.4
2005	1.6	3.0	0.0	-	-	0.0	0.1	-	-	3.9
2010	0.3	2.6	0.0	-	-	-	0.2	0.0	0.0	3.1
2015	0.3	2.8	0.1	-	0.1	0.0	0.6	-	0.0	5.8
2021	1.2	3.3	0.2	0.0	-	0.1	0.3	-	-	6.1

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 08A-05.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Antennaria (pussytoes)	Antennaria microphylla (littleleaf pussytoes)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus gilviflorus (plains milkvetch)	Camelina microcarpa <sup>ai</sup> (littletop false flax)	Castilleja flava (yellow Indian paintbrush)	Chaetopappa ericoides (rose heath)	Chenopodium leptophyllum <sup>a</sup> (narrowleaf goosefoot)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Cryptantha (cryptantha)	Erigeron (fleabane)	Erigeron eatonii (Eaton's fleabane)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erysimum capitatum <sup>a</sup> (sanddune wallflower)
year	Nested Frequency																
1995	-	-	2	64	-	-	-	-	28	25	-	17	100	-	-	-	-
2000	3	-	-	2	-	-	-	-	-	28	-	26	102	2	12	-	-
2005	5	-	-	-	-	-	-	10	-	5	-	31	80	-	-	-	-
2010	-	-	4	-	-	-	3	10	3	6	-	37	67	-	-	4	-
2015	14	-	15	-	74	7	4	7	-	12	1	43	78	-	-	3	11
2021	6	3	-	-	-	-	-	-	1	6	-	17	99	-	16	8	-
year	Average Cover (%)																
1995	-	-	0.0	1.5	-	-	-	-	0.1	0.4	-	0.1	0.8	-	-	-	-
2000	0.0	-	-	0.2	-	-	-	-	-	0.5	-	0.5	0.9	0.0	0.0	-	-
2005	0.0	-	-	-	-	-	-	0.1	-	0.3	-	0.4	0.8	-	-	-	-
2010	-	-	0.0	-	-	-	0.0	0.0	0.0	0.1	-	0.5	0.6	-	-	0.0	-
2015	0.4	-	0.1	-	2.0	0.0	0.0	0.0	-	0.7	0.0	0.6	0.8	-	-	0.0	0.1
2021	0.2	0.0	-	-	-	-	-	-	0.0	0.0	-	0.1	0.9	-	0.1	0.1	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Heterotheca villosa (hairy false goldenaster)	Lepidium <sup>a</sup> (pepperweed)	Lesquerella alpina (alpine bladderpod)	Linum lewisii (Lewis flax)	Lithospermum incisum (narrowleaf stoneseed)	Machaeranthera grindelioides (rayless tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Oenothera (evening primrose)	Penstemon humilis (low beardtongue)	Petradoria pumila (rock goldenrod)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Physaria (twinpod)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Silene drummondii (Drummond's campion)	Symphotrichum (aster)	Taraxacum officinale (common dandelion)
year	Nested Frequency																
1995	-	-	53	11	12	51	-	-	95	-	48	-	-	-	-	-	-
2000	2	-	49	18	14	25	-	1	77	-	73	-	-	-	-	-	-
2005	-	-	20	6	8	43	-	-	101	-	61	2	47	14	1	-	1
2010	-	-	25	20	10	29	7	-	76	30	50	3	64	6	1	1	-
2015	1	3	39	18	19	57	-	-	135	-	79	3	96	-	5	9	4
2021	-	-	47	13	13	49	-	-	82	-	71	16	23	-	-	-	-
year	Average Cover (%)																
1995	-	-	0.1	0.0	0.1	0.3	-	-	0.7	-	0.5	-	-	-	-	-	-
2000	0.0	-	0.4	0.2	0.2	0.3	-	0.0	0.7	-	1.5	-	-	-	-	-	-
2005	-	-	0.1	0.1	0.0	1.2	-	-	1.0	-	0.7	0.0	0.2	0.0	0.0	-	0.0
2010	-	-	0.2	0.1	0.1	0.4	0.1	-	0.5	0.6	0.4	0.0	0.6	0.0	0.0	0.0	-
2015	0.0	0.1	0.2	0.2	0.2	1.0	-	-	1.1	-	0.6	0.0	0.4	-	0.0	0.1	0.1
2021	-	-	0.2	0.1	0.1	0.8	-	-	0.7	-	1.2	0.2	0.1	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Tetradneuris acaulis (stemless four-nerve daisy)	Townsendia incana (hoary Townsend daisy)	Trifolium (clover)	Zigadenus elegans (mountain deathcamas)
year	Nested Frequency			
1995	13	-	-	13
2000	3	4	59	0
2005	13	11	75	3
2010	20	2	65	-
2015	9	-	-	13
2021	-	-	61	11
year	Average Cover (%)			
1995	0.0	-	-	0.0
2000	0.0	0.1	1.6	0.0
2005	0.2	0.1	2.9	0.0
2010	0.1	0.0	1.3	-
2015	0.1	-	-	0.1
2021	-	-	1.1	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 08A-05.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia frigida <sup>p</sup> (prairie sagewort)	Artemisia nova <sup>p</sup> (black sagebrush)	Cercocarpus montanus <sup>p</sup> (alderleaf mountain mahogany)	Eriogonum microthecum <sup>p</sup> (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Pinus flexilis <sup>i</sup> (limber pine)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)							
1995	-	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-	-
2005	2.2	0.3	0.7	24.9	0.3	4.1	0.5	-
2010	2.4	1.1	0.2	29.1	0.4	3.3	3.1	0
2015	2.6	0.3	0.5	28.5	0.6	5	-	0.1
2021	3.3	0.2	-	28.4	0.4	5.9	0.2	0.1
year	Quadrat Cover (%)							
1995	-	0.2	0.0	18.9	0.4	0.5	-	0.0
2000	1.1	0.4	1.1	17.2	0.3	3.0	-	0.1
2005	0.7	0.3	0.4	21.8	0.2	2.7	0.0	0.0
2010	2.0	0.3	0.2	17.9	0.4	2.1	2.2	0.0
2015	2.4	0.2	0.2	20.9	0.2	4.2	-	0.0
2021	2.5	0.3	0.1	21.7	0.3	6.2	0.0	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 08A-05.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1995	140	-	29	71	0	57	0	14	51/84
2000	200	-	10	90	0	70	30	0	45/70
2005	380	-	47	53	0	21	32	0	48/81
2010	460	-	39	61	0	39	4	4	56/85
2015	420	20	48	52	0	57	38	0	62/91
2021	260	-	8	92	0	15	85	0	- / -
<b>Artemisia frigida<sup>p</sup> -- (prairie sagewort)</b>									
1995	500	60	4	96	0	0	0	0	10/18
2000	700	80	14	86	0	0	0	0	8/15
2005	600	-	3	97	0	17	0	0	17/18
2010	720	-	14	86	0	11	8	0	8/20
2015	480	100	33	67	0	0	0	13	8/15
2021	360	-	22	72	6	0	0	6	- / -
<b>Artemisia nova<sup>p</sup> -- (black sagebrush)</b>									
1995	520	-	0	100	0	0	42	0	14/34
2000	460	-	4	74	22	13	0	4	13/34
2005	280	-	0	86	14	0	0	0	16/46
2010	320	-	6	63	31	44	19	6	17/40
2015	320	-	6	63	31	56	31	56	15/34
2021	120	-	0	67	33	0	0	50	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Cercocarpus montanus<sup>P</sup> -- (alderleaf mountain mahogany)</b>									
1995	6200	240	29	70	1	68	22	30	53/92
2000	6720	80	29	67	4	17	63	2	46/72
2005	6980	120	32	62	6	6	87	2	49/83
2010	7240	100	36	64	1	24	29	7	47/74
2015	6780	140	28	72	0	27	67	63	54/80
2021	7120	60	35	62	3	14	74	3	- / -
<b>Chrysothamnus viscidiflorus ssp. lanceolatus -- (yellow rabbitbrush)</b>									
1995	20	-	0	100	0	0	0	0	13/20
2000	20	-	0	0	100	0	0	0	24/33
2005	-	-	-	-	-	-	-	-	24/33
2010	40	-	0	100	0	0	0	0	- / -
2015	-	-	-	-	-	-	-	-	33/42
2021	-	-	-	-	-	-	-	-	- / -
<b>Eriogonum microthecum<sup>P</sup> -- (slender buckwheat)</b>									
1995	300	-	0	100	0	0	0	0	14/29
2000	440	-	5	91	5	0	0	0	12/18
2005	320	-	0	100	0	6	0	0	11/25
2010	800	-	0	100	0	0	0	0	10/21
2015	660	-	3	97	0	70	27	0	12/22
2021	600	-	13	87	0	0	7	0	- / -
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1995	-	-	-	-	-	-	-	-	- / -
2000	-	-	-	-	-	-	-	-	- / -
2005	-	-	-	-	-	-	-	-	- / -
2010	40	-	100	0	0	0	0	0	- / -
2015	-	-	-	-	-	-	-	-	- / -
2021	20	-	0	0	100	0	0	100	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1995	1940	20	9	91	0	0	0	0	14/14
2000	5520	80	3	95	2	0	3	0	13/22
2005	6300	80	4	95	1	0	0	1	15/23
2010	6260	-	1	99	0	0	0	0	16/20
2015	12140	880	18	82	0	19	0	0	12/21
2021	13240	160	16	83	1	1	0	1	- / -
<b>Krascheninnikovia lanata<sup>P</sup> -- (winterfat)</b>									
1995	-	-	-	-	-	-	-	-	- / -
2000	-	-	-	-	-	-	-	-	- / -
2005	-	-	-	-	-	-	-	-	- / -
2010	-	-	-	-	-	-	-	-	- / -
2015	-	-	-	-	-	-	-	-	16/21
2021	-	-	-	-	-	-	-	-	- / -
<b>Pinus flexilis<sup>1</sup> -- (limber pine)</b>									
1995	-	-	-	-	-	-	-	-	- / -
2000	40	-	100	0	0	0	0	0	- / -
2005	40	-	50	50	0	0	0	0	- / -
2010	60	-	0	100	0	0	0	0	- / -
2015	-	-	-	-	-	-	-	-	- / -
2021	40	-	100	0	0	0	0	0	- / -

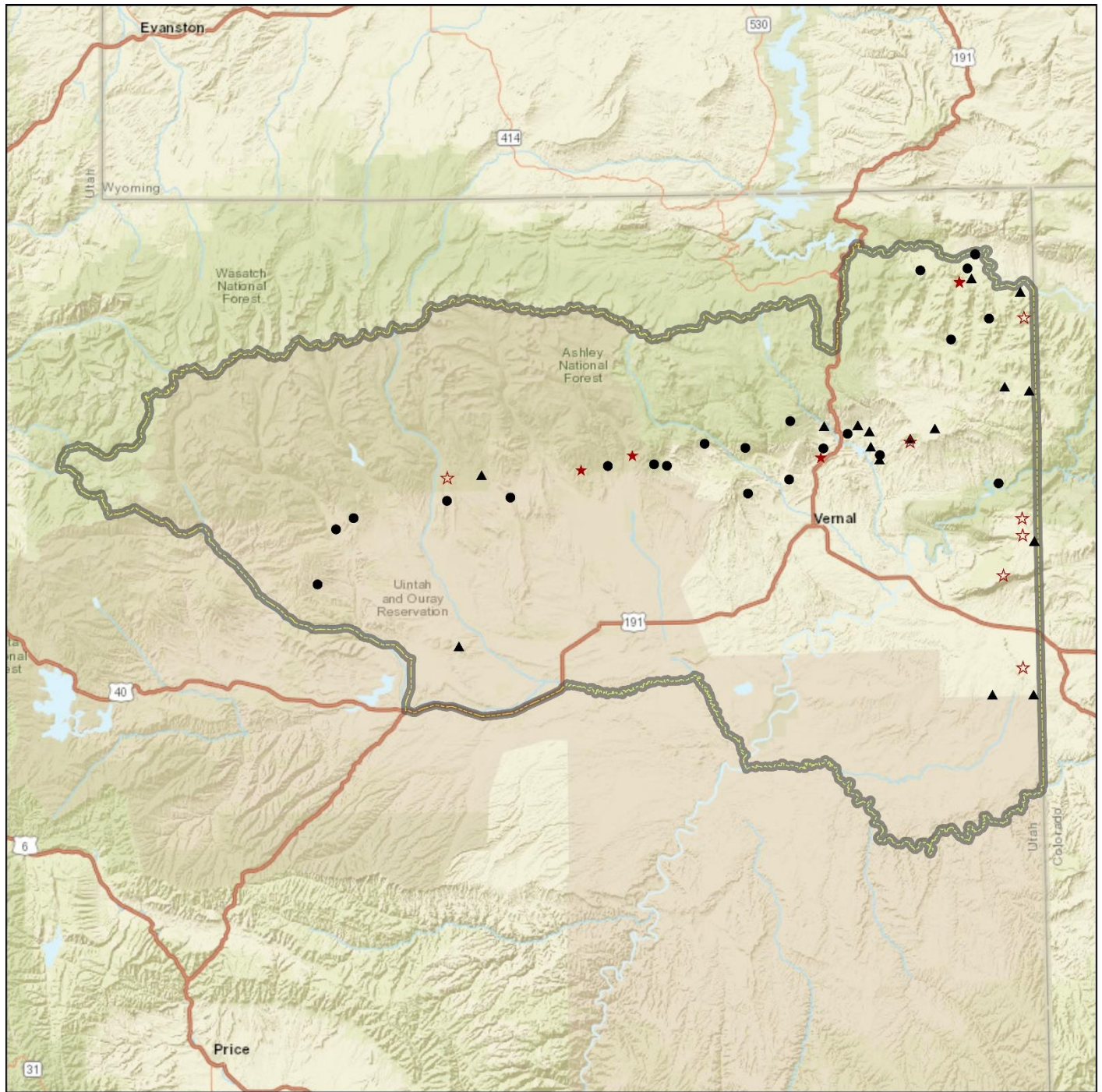
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Symphoricarpos oreophilus<sup>p</sup> -- (mountain snowberry)</b>									
1995	-	-	-	-	-	-	-	-	-/-
2000	-	-	-	-	-	-	-	-	-/-
2005	-	-	-	-	-	-	-	-	-/-
2010	-	-	-	-	-	-	-	-	23/31
2015	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1995	200	-	10	90	0	30	0	0	17/31
2000	160	-	0	100	0	25	13	0	15/23
2005	200	-	10	80	10	60	0	10	21/31
2010	160	-	25	75	0	0	0	0	19/31
2015	140	-	14	86	0	29	29	0	18/30
2021	180	-	11	89	0	11	22	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

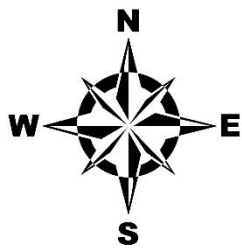
**Table 08A-05.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Pinus flexilis (limber pine)</b>							
2000	21	-	-	-	-	-	3.0
2015	34	13	87	-	-	-	6.3
2021	11	-	100	-	-	-	7.2
<b>Pseudotsuga menziesii (Douglas-fir)</b>							
2000	4	-	-	-	-	-	1.5
2021	4	-	100	-	-	-	4.5

# WILDLIFE MANAGEMENT UNIT 9 - SOUTH SLOPE



0 5 10 20 30 40 50 60 70 80 Miles

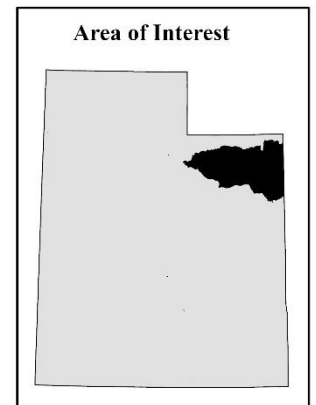


**Project, Status**

- RT, Active
- ★ RT, Suspended
- ▲ WRI, Active
- ☆ WRI, Suspended

**Unit Boundary**

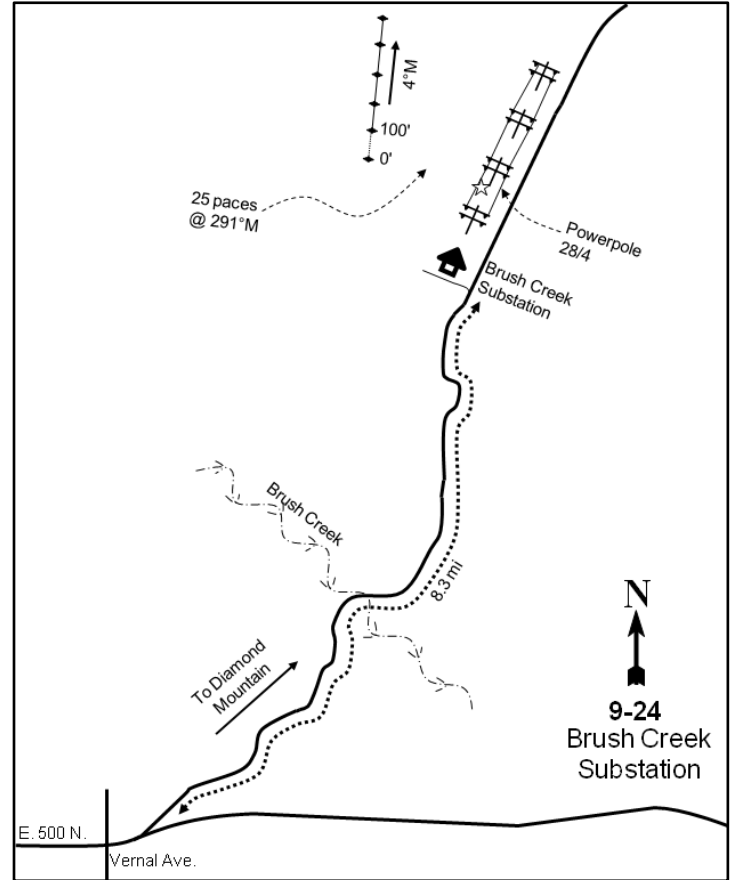
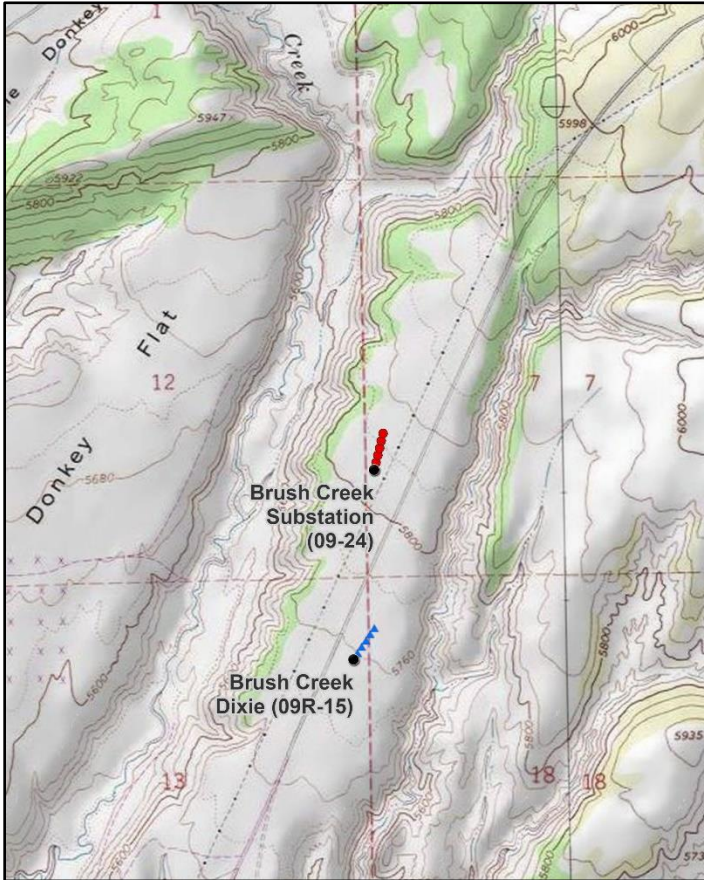
- ▭ Unit - 9



Credits: Esri, HERE, Garmin, NGA, USGS, NPS



## BRUSH CREEK SUBSTATION - STUDY NO. 09-24

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Donkey Flat NE; Township 3S, Range 23E, Section 07  
NAD 83 UTM ZONE 12, 636733 East 4492292 North

**Transect Information**

Browse Tag # (0' Stake)	61
Transect Bearing	4° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

**Directions to Site**

Driving from the intersection of Vernal Avenue and 500 North in Vernal, travel east on 500 North. Turn north on the road that leads to Diamond Mountain. Drive 8.3 miles to a short road on the left that leads to the Brush Creek Substation. Turn north and follow the power lines to the second set of power poles and to power pole #28/4. From the westernmost pole, walk 25 paces at 291 degrees magnetic to the 0-foot stake, which is marked with browse tag number #61.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	S.J. HATCH
Elevation	5,845ft (1,782m)
Aspect	South
Slope	2%
Sample Dates	07/10/1997, 07/14/2005, 07/27/2010, 07/06/2015, 08/05/2021

**Table 09-24.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Rangeland Drill	Brush Creek Bench Seeding	1659	October 2010	408
Herbicide - Plateau	Brush Creek Bench Sage Restoration	315	September 2008	279
Seeding - Aerial After	Brush Creek Bench Sage Restoration	315	March 2009	279
Harrow - One-Way Dixie	Brush Creek Bench Sage Restoration	315	December 2008	279
Seeding - Broadcast Before	Brush Creek Bench Sage Restoration	315	December 2008	279

**Table 09-24.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Brush Creek Bench Sage Restoration			Broadcast	Dec 2008	300
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass	Douglas	1.50	1.23
G	Agropyron desertorum	Crested Wheatgrass	Hycrest	1.00	0.91
G	Elymus lanceolatus	Thickspike Wheatgrass	Critana	1.00	0.87
G	Elymus wawawaiensis	Snake River Wheatgrass	Secar	1.00	0.76
G	Poa secunda	Sandberg Bluegrass	Toole MT	0.50	0.42
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky	1.00	0.85
F	Medicago sativa	Alfalfa	Ladak	2.00	1.81

Mix Name			Application Type	Application Date	Acres
Brush Creek Bench - Sagebrush/Kochia			Aerial	Mar 2009	300
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Sanpete UT	1.00	0.19
S	Bassia prostrata	Forage Kochia	Lander NV	1.00	0.66

Mix Name			Application Type	Application Date	Acres
Brush Creek Bench Seeding			Drill	Oct 2010	410
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass	Ephraim	0.98	0.92
G	Agropyron cristatum	Crested Wheatgrass	Nordan	0.98	0.82
G	Agropyron fragile	Siberian Wheatgrass	Vavilov (NC)	0.49	0.38
G	Elymus wawawaiensis	Snake River Wheatgrass	Secar	1.10	0.87
G	Pascopyrum smithii	Western Wheatgrass	Arriba	1.10	0.94
G	Poa secunda	Sandberg Bluegrass	UP/Colorado Plateau	0.49	0.45
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky	0.98	0.79
F	Linum perenne	Blue Flax	Appar	0.98	0.87
F	Medicago sativa	Alfalfa	Ladak +	0.49	0.46
F	Medicago sativa	Alfalfa	Ranger	0.49	0.46
F	Medicago sativa	Alfalfa	Spredor 4	0.49	0.43
F	Sanguisorba minor	Small Burnet	Delar	0.98	0.92
S	Atriplex canescens	Fourwing Saltbush	Grand UT	0.16	0.06
S	Atriplex canescens	Fourwing Saltbush	Emery/Grand UT	0.85	0.33

Mix Name			Application Type	Application Date	Acres
Brush Creek Bench Seeding - Browse			Drill	Oct 2010	410
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Sanpete UT	0.98	0.14
S	Bassia prostrata	Forage Kochia	Sanpete UT	0.73	0.37

**Wildlife Habitat and Vegetation History****Table 09-24.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	year-long	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing

**Table 09-24.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1997	Wyoming Big Sagebrush	No Encroachment
2005	Annual-Perennial Forb/Wyoming Big Sagebrush	No Encroachment
2010	Annual-Perennial Weed/Wyoming Big Sagebrush	No Encroachment
2015	Annual-Perennial Weed/Wyoming Big Sagebrush	No Encroachment
2021	Annual-Perennial Weed/Wyoming Big Sagebrush	Phase I

**Site Notes**

The area to the east of the site was treated with the herbicide Plateau, a Dixie harrow, and aerial seeding as part of the Brush Creek Bench Sage Restoration in the fall of 2008. It appears that the last belt of the transect may have been affected by the treatment.

**Soils****Table 09-24.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.8	57.4	22.1	20.6	1.4	8.4	67.2	0.4	07/10/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	10 inches
NRCS Ecological Site	Semidesert Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R034BY212UT
States and Transitions	No state and transition model is available for this ecological site.

When the study was established in 1997, the plant community on this site was dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) (Photos, Table 09-24.12). The herbaceous understory was in poor condition with cheatgrass (*Bromus tectorum*) as the dominant species (Table 09-24.10). After 1997, sagebrush decreased substantially (Table 09-24.13), which could possibly be attributed to the drought in 2002-2003. In 2005, the site transitioned to a perennial-annual forb/annual grass community (Table 09-24.7) with sagebrush scattered across the area. In 2008, a herbicide, Dixie harrow, and seeding project occurred. An additional rangeland drill seeding occurred in 2010 due to the low success of the 2008 seeding (Table 09-24.1). Following the treatments, the site has remained in poor condition as an annual grass/forb community (Table 09-24.7, Table 09-24.10, Table 09-24.11). Sagebrush has also remained in poor condition, providing little cover (Table 09-24.12) while decadence and poor vigor have increased in the population (Table 09-24.13). Due to the the lack of preferred browse species, perennial grass, and the presence of annual grass, this site has remained in poor condition for wintering deer (Table 09-24.15).

**Trend Summary Tables****Table 09-24.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	16.0	0.0	-	-	-	-
2005	2.4	0.3	-	3.4	-	-
2010	2.5	0.3	-	4.4	-	-
2015	1.4	0.5	-	2.1	0.1	-
2021	3.8	1.4	-	3.8	1.2	-

**Table 09-24.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	292	146	29	109	3.5	1.0	0.1	0.5
2005	139	30	341	288	3.5	0.5	11.9	21.7
2010	346	16	303	187	5.1	0.3	18.1	6.0
2015	471	67	353	304	16.5	3.0	8.2	6.6
2021	156	98	94	243	1.0	1.9	5.9	5.0

**Table 09-24.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	44.4	5.0	22.5	4.3	0.5	18.6
2005	38.3	1.1	33.6	1.8	0.4	35.0
2010	41.0	0.3	31.7	2.6	0.1	33.1
2015	20.3	-	55.1	1.5	0.2	36.6
2021	34.3	1.2	41.4	2.0	0.4	19.3

**Table 09-24.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	-	61	16	9
2005	-	46	1	26
2010	8	24	1	6
2015	10	45	-	8
2021	14	43	5	30
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2005	5.8 (14.3)	44.9 (110.9)	0.7 (1.7)	-
2010	6.5 (16.1)	20.8 (51.3)	0.7 (1.7)	-
2015	10.2 (25.1)	40.2 (99.3)	-	-
2021	13.1 (32.3)	44.2 (109.2)	5.3 (13.2)	-

**Table 09-24.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea <sup>i</sup> (Russian wildrye)	Sporobolus cryptandrus (sand dropseed)
year	Nested Frequency								
1997	-	-	292	146	-	3	-	-	-
2005	5	-	139	23	-	3	-	-	-
2010	12	-	346	3	-	1	-	-	-
2015	9	29	471	13	5	15	1	3	-
2021	21	32	156	14	-	16	17	6	2
year	Average Cover (%)								
1997	-	-	3.5	0.9	-	0.0	-	-	-
2005	0.0	-	3.5	0.5	-	0.0	-	-	-
2010	0.2	-	5.1	0.1	-	0.1	-	-	-
2015	0.4	1.7	16.5	0.1	0.0	0.6	0.0	0.2	-
2021	0.2	1.0	1.0	0.2	-	0.3	0.1	0.1	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 09-24.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Arenaria (sandwort)	Astragalus convallarius (lesser rushy milkvetch)	Chaenactis stevioides <sup>a</sup> (Estevé's pincushion)	Chamaesyce (sandmat)	Chenopodium leptophyllum <sup>a</sup> (narrowleaf goosefoot)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Cryptantha (cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Eriogonum cernuum <sup>a</sup> (nodding buckwheat)	Eriogonum racemosum (redroot buckwheat)	Gilia inconspicua <sup>a</sup> (shy gilia)	Halogeton glomeratus <sup>ai</sup> (saltlover)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)
year	Nested Frequency																
1997	-	6	1	-	28	-	-	8	-	15	-	1	2	-	-	-	14
2005	1	48	-	-	46	18	-	2	27	1	147	33	0	37	51	24	134
2010	-	10	-	2	33	-	-	23	-	6	2	3	5	-	45	-	31
2015	-	161	7	-	47	-	17	-	-	8	47	-	-	-	-	-	25
2021	3	15	-	-	18	-	46	-	-	1	-	-	-	-	-	-	-
year	Average Cover (%)																
1997	-	0.0	0.0	-	0.2	-	-	0.0	-	0.0	-	0.0	0.1	-	-	-	0.0
2005	0.0	0.9	-	-	3.5	0.4	-	0.0	0.2	0.0	3.1	0.5	0.0	0.7	0.5	0.3	2.1
2010	-	0.0	-	0.0	2.1	-	-	0.1	-	0.2	0.0	0.0	0.0	-	1.2	-	0.4
2015	-	1.7	0.2	-	1.4	-	0.0	-	-	0.0	0.6	-	-	-	-	-	0.2
2021	0.0	0.0	-	-	0.1	-	0.1	-	-	0.0	-	-	-	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES												
Machaeranthera canescens (hoary tansyaster)												
Machaeranthera grindelioides (rayless tansyaster)												
Microsteris gracilis <sup>a</sup> (slender phlox)												
Navarretia intertexta <sup>a</sup> (needleleaf navarretia)												
Oenothera (evening primrose)												
Phlox longifolia (longleaf phlox)												
Plantago patagonica <sup>a</sup> (woolly plantain)												
Salsola tragus <sup>ai</sup> (prickly Russian thistle)												
Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)												
Sphaeralcea coccinea (scarlet globemallow)												
Streptanthus cordatus (heartleaf twistflower)												
Townsendia (Townsend daisy)												
year	Nested Frequency											
1997	28	-	-	-	-	13	-	-	-	42	-	-
2005	116	-	-	17	-	9	6	124	10	195	-	41
2010	70	-	2	-	-	1	-	252	2	116	-	4
2015	152	3	-	-	3	3	1	296	87	195	37	20
2021	9	1	-	-	-	3	-	69	21	229	-	-
year	Average Cover (%)											
1997	0.1	-	-	-	-	0.0	-	-	-	0.1	-	-
2005	3.9	-	-	0.4	-	0.0	0.0	2.2	0.4	13.6	-	0.6
2010	0.4	-	0.0	-	-	0.0	-	16.3	0.0	3.2	-	0.0
2015	1.4	0.0	-	-	0.0	0.0	0.0	1.8	4.0	3.1	0.2	0.2
2021	0.1	0.0	-	-	-	0.0	-	5.6	0.3	4.6	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 09-24.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES				
Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)				
Atriplex canescens <sup>p</sup> (fourwing saltbush)				
Bassia prostrata <sup>pi</sup> (forage kochia)				
Opuntia (pricklypear)				
year	Line Intercept Cover (%)			
1997	-	-	-	-
2005	3.4	-	-	-
2010	4.4	-	-	-
2015	2.1	-	-	0.1
2021	3	0.8	-	1.2
year	Quadrat Cover (%)			
1997	16.0	-	-	0.0
2005	2.4	-	-	0.3
2010	2.5	-	-	0.3
2015	1.4	-	-	0.5
2021	2.7	0.8	0.2	1.4

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 09-24.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. wyomingensis<sup>P</sup> -- (Wyoming big sagebrush)</b>									
1997	8240	-	2	82	16	56	42	12	37/62
2005	1280	15000	5	11	84	36	61	69	34/46
2010	3380	-	47	49	5	20	10	3	36/52
2015	2860	40	25	49	27	62	12	27	22/36
2021	2020	60	20	47	34	33	37	35	- / -
<b>Atriplex canescens<sup>P</sup> -- (fourwing saltbush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2005	-	-	-	-	-	-	-	-	-/-
2010	-	-	-	-	-	-	-	-	-/-
2015	20	-	100	0	0	0	0	0	34/29
2021	60	-	33	67	0	0	0	0	- / -
<b>Bassia prostrata<sup>PI</sup> -- (forage kochia)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2005	-	-	-	-	-	-	-	-	-/-
2010	-	-	-	-	-	-	-	-	-/-
2015	-	-	-	-	-	-	-	-	49/82
2021	600	200	60	40	0	13	50	0	- / -
<b>Chrysothamnus viscidiflorus -- (yellow rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2005	-	-	-	-	-	-	-	-	-/-
2010	-	-	-	-	-	-	-	-	-/-
2015	20	-	0	100	0	0	0	0	48/57
2021	-	-	-	-	-	-	-	-	-/-
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2005	-	-	-	-	-	-	-	-	-/-
2010	-	-	-	-	-	-	-	-	61/75
2015	20	-	0	100	0	0	100	0	44/53
2021	-	-	-	-	-	-	-	-	-/-
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2005	-	-	-	-	-	-	-	-	-/-
2010	-	-	-	-	-	-	-	-	-/-
2015	-	-	-	-	-	-	-	-	65/110
2021	20	-	0	0	100	0	100	100	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2005	-	-	-	-	-	-	-	-	-/-
2010	-	-	-	-	-	-	-	-	28/41
2015	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Opuntia -- (pricklypear)</b>									
1997	180	-	0	89	11	0	0	11	10/27
2005	260	-	0	62	39	0	0	23	11/38
2010	140	-	0	100	0	0	14	29	10/29
2015	200	-	0	100	0	30	0	10	12/34
2021	620	-	7	90	3	0	0	7	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Sarcobatus vermiculatus -- (greasewood)									
1997	-	-	-	-	-	-	-	-	-/-
2005	-	-	-	-	-	-	-	-	-/-
2010	-	-	-	-	-	-	-	-	69/90
2015	-	-	-	-	-	-	-	-	57/49

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 09-24.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

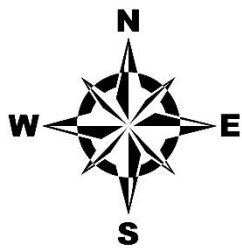
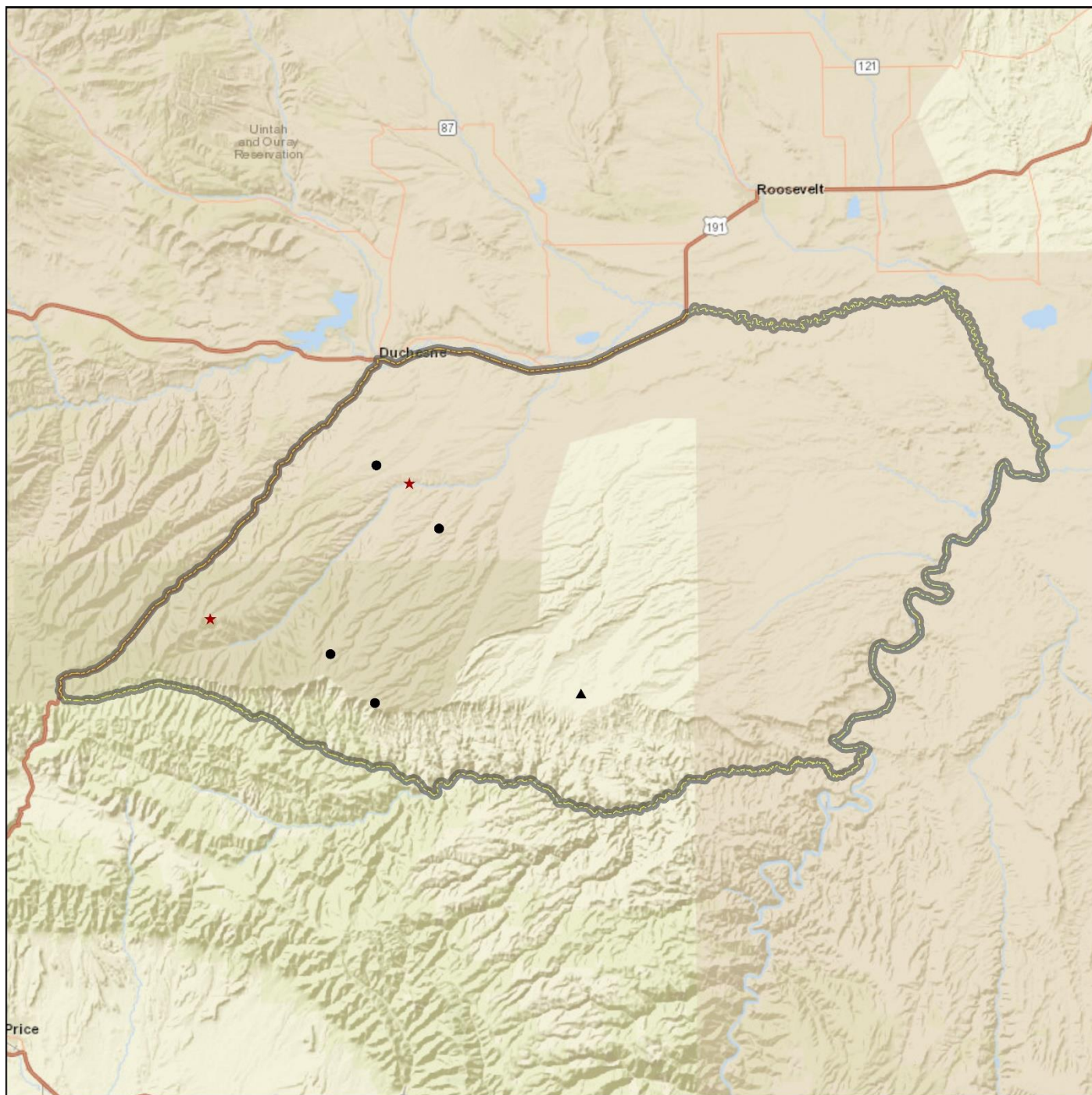
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2021	1	-	100	-	-	-	2.0

**Table 09-24.15 - Deer Desirable Components Index: Semidesert Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	20.0	10.3	1.2	1.9	-2.6	1.1	0.0	<b>31.9</b>	Fair
2005	4.3	0.0	0.0	1.0	-2.7	10.0	0.0	<b>12.6</b>	Poor
2010	5.5	0.0	0.0	0.6	-3.9	10.0	0.0	<b>12.2</b>	Poor
2015	2.6	0.0	0.0	6.1	-12.4	10.0	0.0	<b>6.3</b>	Very Poor
2021	4.8	0.0	0.0	3.8	-0.8	10.0	0.0	<b>17.7</b>	Poor



# WILDLIFE MANAGEMENT UNIT 11A - NINE MILE, ANTHRO

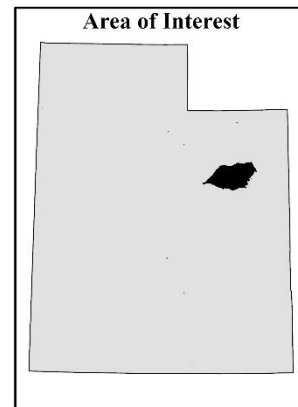


**Project, Status**

- RT, Active
- ★ RT, Suspended
- ▲ WRI, Active

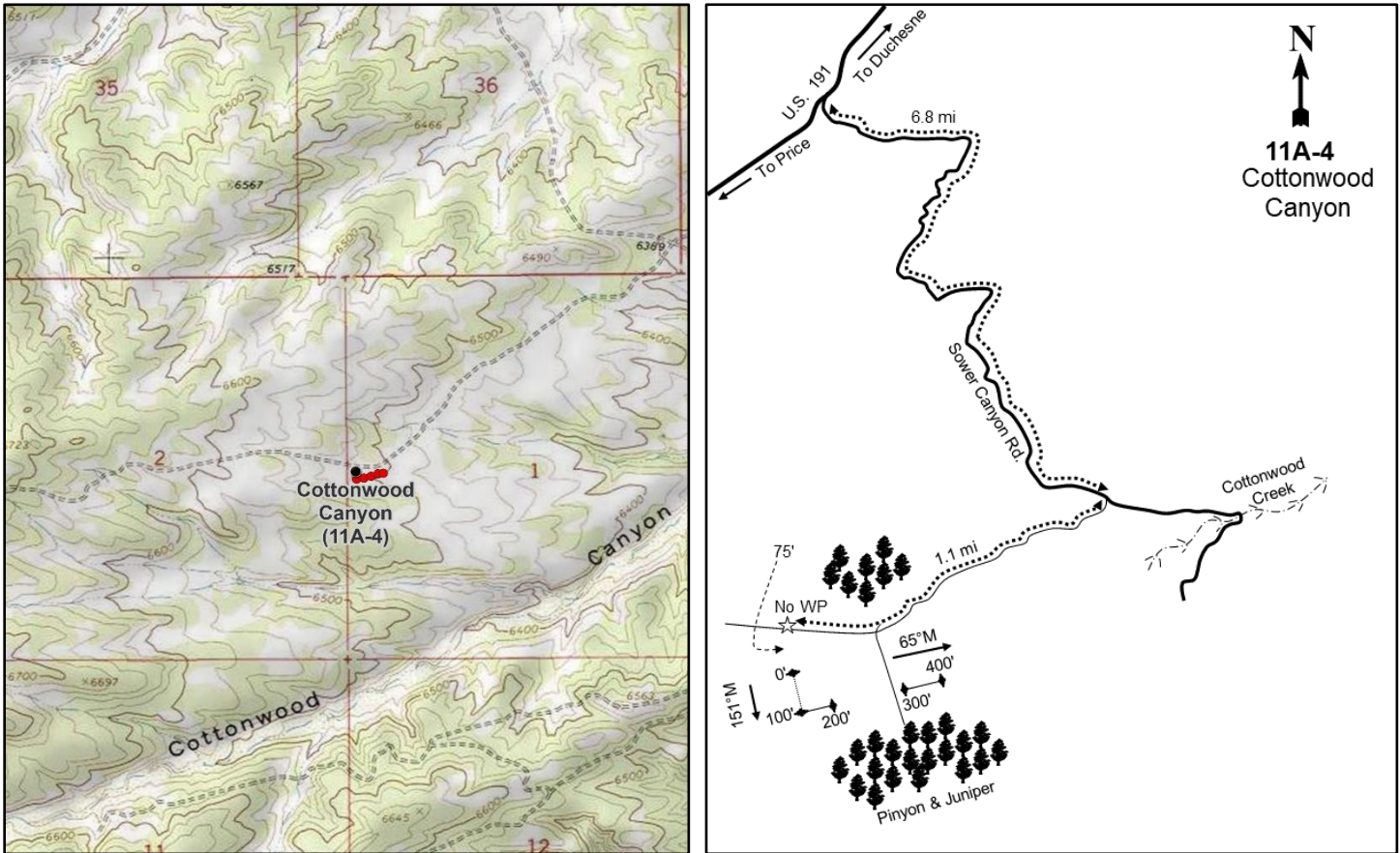
**Unit Boundary**

- ▭ Unit - 11A



Credits: Esri, HERE, Garmin, NGA, USGS, NPS

## COTTONWOOD CANYON - STUDY NO. 11A-4

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Duchesne SW NE; Township 5S, Range 5W, Section 01  
NAD 83 UTM ZONE 12, 550716 East 4436264 North

**Transect Information**

Browse Tag # (0' Stake)	9037
Transect Bearing	151° magnetic (Lines 2-4: 65° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft & 59ft), Line 3, Line 4 (71ft)
Belt Marker Placement	Belt 4: No Rebar, Line 4: 74ft Long

**Directions to Site**

From Duchesne, travel up Indian Canyon (U.S. 191) approximately 2.5 miles to Cottonwood-Sowers Canyon Road. Turn left and continue to the southeast on the main road for 6.4 miles to a jeep trail on top of the ridge just before Cottonwood Creek. Turn right on the jeep trail and drive 1 mile west to a fork. Continue approximately 0.1 miles up the right fork to the study site. The 0-foot baseline stake is 15 paces south of the road and is marked with browse tag #9037. The baseline is interrupted between the second and third lines. Due to a new oil and gas road that crosses Line 3, there may be 300-foot stakes on both sides of the road. If so, Belt 4 should be placed measuring away from the 400-foot stake and **not** the 300-foot stake.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,500ft (1,981m)
Aspect	East
Slope	2%
Sample Dates	07/18/1995, 07/11/2000, 06/30/2005, 07/15/2010, 06/29/2015, 07/21/2021

**Wildlife Habitat and Vegetation History****Table 11A-04.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Pronghorn	substantial	year-long

**Table 11A-04.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Perennial Grass/Prairie Sagewort	No Encroachment
1995	Perennial Grass/Shadscale	No Encroachment
2000	Perennial Grass	No Encroachment
2005	Perennial Grass/Shadscale	No Encroachment
2010	Perennial Grass/Shadscale/Winterfat	No Encroachment
2015	Perennial Grass/Winterfat	No Encroachment
2021	Perennial Grass/Winterfat	No Encroachment

**Site Notes**

The study is in a mixed desert shrub and grass community surrounded by twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) woodlands. It is important to note that sometime after 2010, a new oil and gas road was put in and it was noted that line 2 could be colonized by plant species that may not be representative of the stand. Data gathered from the two belts on this line could possibly explain the marked increase of prairie sagewort (*Artemisia frigida*) in 2015.

**Soils****Table 11A-04.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.5	36.9	34.8	28.3	1.9	8.7	233.6	0.7	07/11/2000

**Site Potential**

1981 - 2010 Average Annual Precipitation	12 inches
NRCS Ecological Site	Semidesert Silt Loam (Winterfat)
NRCS Ecological Site #	R034BY240UT
States and Transitions	Current State: Community Phase 2.1

From study establishment in 1988 through 1995, this site was dominated by perennial grass with varying amounts of prairie sagewort (*Artemisia frigida*), shadscale (*Atriplex confertifolia*) and winterfat (*Krascheninnikovia lanata*) as subordinate shrub species (Photos, Pre-1992 Data, Table 11A-04.7, Table 11A-04.13). However, in 2000 the total cover of all shrub species decreased and the vegetation on site was primarily comprised of perennial grasses. In 2005, shrub cover increased substantially, with shadscale being the most dominant species. Winterfat and/or shadscale have remained the dominant shrub species since 2010 (Table 11A-04.12). The herbaceous understory has remained fairly abundant throughout the study period and has consistently been dominated by perennial grasses; forbs have remained rare. The perennial grass species needle and thread (*Hesperostipa comata*) has increased steadily over the years, but decreased significantly in 2021 (Table 11A-04.10, 11A-04.11): this could be attributed to the substantial moisture that the site received during the 2015 sample year. Due to increased human activity in the area, there is a potential for change in vegetation composition in the future.

**Trend Summary Tables****Table 11A-04.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1995	7.7	0.3	-	-	-	-
2000	3.7	0.2	-	-	-	-
2005	8.7	0.2	-	14.5	0.1	-
2010	6.3	0.0	-	8.5	-	-
2015	12.8	0.0	-	13.5	-	-
2021	8.6	0.0	-	11.2	-	-

**Table 11A-04.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1995	1	406	217	77	0.0	18.1	2.6	0.5
2000	-	418	-	21	-	21.4	-	0.1
2005	-	370	175	39	-	19.4	1.3	2.3
2010	-	344	31	45	-	22.4	0.3	1.0
2015	7	402	47	45	0.0	35.4	0.3	0.5
2021	-	378	11	6	-	20.5	0.0	0.1

**Table 11A-04.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1995	19.9	4.3	28.0	7.8	0.9	30.9
2000	39.6	1.8	29.2	8.6	0.1	28.7
2005	57.4	0.3	13.5	8.1	0.1	30.1
2010	28.6	0.4	46.4	6.0	0.0	32.2
2015	29.5	1.1	23.9	6.3	0.3	50.5
2021	24.7	2.7	39.7	10.0	0.3	31.1

**Table 11A-04.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1995	2	13	15	26
2000	-	7	28	36
2005	-	14	39	48
2010	-	12	27	25
2015	-	2	3	4
2021	-	21	12	29
Year	Days Use Per Acre (ha)			
1995	-	-	-	-
2000	-	15.4 (38.1)	78.4 (193.7)	-
2005	-	0.7 (1.7)	34.9 (86.1)	-
2010	-	4.7 (11.6)	42.9 (105.9)	-
2015	-	4.0 (9.9)	6.0 (14.9)	-
2021	-	6.7 (16.6)	6.7 (16.6)	-

**Table 11A-04.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achmatherum hymenoides (Indian ricegrass)	Bouteloua gracilis (blue grama)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)
year	Nested Frequency							
1995	47	220	1	15	304	176	4	-
2000	21	169	-	40	327	195	-	-
2005	18	87	-	14	189	283	-	6
2010	19	81	-	7	126	282	-	-
2015	7	91	7	1	107	366	-	-
2021	3	122	-	13	100	281	22	7
year	Average Cover (%)							
1995	1.1	4.8	0.0	0.1	6.5	5.6	0.0	-
2000	0.5	4.8	-	0.8	5.8	9.4	-	-
2005	0.5	2.4	-	0.3	4.6	11.3	-	0.2
2010	0.6	1.7	-	0.0	2.6	17.4	-	-
2015	0.4	2.6	0.0	0.0	2.3	30.0	-	-
2021	0.2	4.2	-	1.0	1.0	13.0	0.9	0.2

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 11A-04.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Arabis (rockcress)	Astragalus purshii (woollypod milkveich)	Chenopodium fremontii <sup>a</sup> (Fremont's goosefoot)	Chenopodium leptophyllum <sup>a</sup> (narrowleaf goosefoot)	Cryptantha (cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Halogeton glomeratus <sup>ai</sup> (saltflower)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Machaeranthera grindelioides (rayless tansyaster)	Navarretia intertexta <sup>a</sup> (needleleaf navarretia)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Sphaeralcea coccinea (scarlet globemallow)	Streptanthus cordatus (heartleaf twistflower)	Taraxacum officinale (common dandelion)	Townsendia incana (hoary Townsend daisy)
year	Nested Frequency																
1995	-	6	81	69	4	39	-	35	4	140	-	-	51	15	-	2	4
2000	-	-	-	-	-	-	-	-	-	-	5	-	5	8	-	-	4
2005	-	-	16	20	-	3	4	121	-	65	-	-	6	31	-	-	2
2010	-	-	2	-	-	-	11	16	-	7	-	-	22	25	-	-	-
2015	4	-	-	-	-	27	-	18	-	3	-	7	6	22	5	-	4
2021	-	-	4	7	-	-	-	-	-	-	-	-	-	6	-	-	-
year	Average Cover (%)																
1995	-	0.0	0.6	0.2	0.0	0.4	-	0.3	0.0	1.1	-	-	0.3	0.1	-	0.0	0.0
2000	-	-	-	-	-	-	-	-	-	-	0.0	-	0.0	0.0	-	-	0.0
2005	-	-	0.0	0.2	-	0.0	0.0	0.8	-	0.2	-	-	0.1	2.2	-	-	0.0
2010	-	-	0.0	-	-	-	0.2	0.1	-	0.0	-	-	0.3	0.6	-	-	-
2015	0.0	-	-	-	-	0.2	-	0.1	-	0.0	-	0.0	0.0	0.3	0.1	-	0.0
2021	-	-	0.0	0.0	-	-	-	-	-	-	-	-	-	0.1	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 11A-04.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia frigida <sup>p</sup> (prairie sagewort)	Artemisia nova <sup>p</sup> (black sagebrush)	Atriplex confertifolia <sup>p</sup> (shadscale saltbush)	Gutierrezia sarothrae (broom snakeweed)	Krascheninnikovia lanata <sup>p</sup> (winterfat)	Opuntia (pricklypear)	Pediocactus simpsonii (mountain ball cactus)	Picrothamnus desertorum (bud sagebrush)
year	Line Intercept Cover (%)							
1995	-	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-	-
2005	1.1	0.4	8.9	0.1	4.1	-	-	-
2010	0.5	0.2	4.1	-	3.7	-	-	-
2015	4.7	-	2.4	-	6.4	-	-	-
2021	-	-	3.3	-	7.9	-	-	-
year	Quadrat Cover (%)							
1995	1.3	-	4.8	0.2	1.6	-	-	0.2
2000	1.6	0.1	1.6	-	0.3	-	-	0.2
2005	0.5	0.0	4.6	0.0	3.6	-	-	0.1
2010	0.3	0.0	2.1	-	3.9	-	-	0.0
2015	4.8	0.0	1.3	-	6.6	0.0	0.0	-
2021	-	0.0	1.6	-	7.0	0.0	-	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 11A-04.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia frigida<sup>p</sup> -- (prairie sagewort)</b>									
1995	14260	2920	68	32	0	2	0	0	39/23
2000	8680	20	17	62	21	21	1	43	4/11
2005	960	1020	0	100	0	4	8	0	39/36
2010	800	20	38	60	3	5	3	3	14/18
2015	10480	1220	35	65	0	7	0	0	16/24
2021	40	-	0	50	50	50	0	50	- / -
<b>Artemisia nova<sup>p</sup> -- (black sagebrush)</b>									
1995	160	-	0	100	0	63	0	0	34/41
2000	160	-	0	0	100	13	63	100	15/53
2005	100	960	0	40	60	0	0	60	24/46
2010	120	-	33	17	50	67	0	50	15/39
2015	180	-	33	67	0	33	44	44	16/48
2021	180	-	11	22	67	22	0	78	- / -
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
1995	20	-	0	100	0	100	0	0	44/66
2000	40	-	0	50	50	0	100	100	53/101
2005	-	-	-	-	-	-	-	-	- / -
2010	-	-	-	-	-	-	-	-	44/85
2015	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Atriplex canescens<sup>P</sup> -- (fourwing saltbush)</b>									
1995	-	-	-	-	-	-	-	-	46/80
2000	-	-	-	-	-	-	-	-	-/-
2005	-	-	-	-	-	-	-	-	-/-
2010	-	-	-	-	-	-	-	-	22/38
2015	20	-	0	100	0	0	0	0	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Atriplex confertifolia<sup>P</sup> -- (shadscale saltbush)</b>									
1995	2100	60	2	89	10	10	2	5	33/59
2000	1740	-	0	30	70	31	48	54	22/46
2005	1420	300	4	86	10	0	0	7	38/80
2010	1120	40	20	77	4	2	0	7	28/58
2015	1060	-	9	77	13	17	0	17	27/48
2021	860	-	5	28	67	5	0	72	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1995	20	-	0	100	0	0	0	0	26/29
2000	40	-	0	100	0	0	0	0	5/9
2005	-	-	-	-	-	-	-	-	24/58
2010	-	-	-	-	-	-	-	-	17/32
2015	20	-	0	100	0	0	0	0	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1995	120	40	0	100	0	0	0	0	23/29
2000	60	-	0	33	67	0	0	0	9/15
2005	20	-	0	100	0	0	0	0	23/29
2010	-	-	-	-	-	-	-	-	17/29
2015	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Krascheninnikovia lanata<sup>P</sup> -- (winterfat)</b>									
1995	1420	-	4	96	0	38	1	0	30/27
2000	1080	-	4	33	63	30	52	63	8/14
2005	6480	4960	40	59	0	20	2	0	28/32
2010	11120	80	35	65	0	0	0	9	21/25
2015	9540	-	23	77	0	43	19	11	21/29
2021	8940	20	3	63	34	35	5	44	-/-
<b>Opuntia -- (pricklypear)</b>									
1995	20	-	0	0	100	0	0	100	19/38
2000	-	-	-	-	-	-	-	-	8/27
2005	20	-	100	0	0	0	0	0	10/29
2010	20	-	0	100	0	0	0	0	12/38
2015	80	-	0	100	0	0	0	50	14/35
2021	100	-	20	80	0	20	0	0	-/-
<b>Pediocactus simpsonii -- (mountain ball cactus)</b>									
1995	60	-	0	100	0	0	0	0	3/6
2000	-	-	-	-	-	-	-	-	-/-
2005	-	-	-	-	-	-	-	-	-/-
2010	-	-	-	-	-	-	-	-	-/-
2015	40	-	0	100	0	0	0	0	-/-
2021	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Picrothamnus desertorum -- (bud sagebrush)</b>									
1995	440	-	5	96	0	27	73	0	15/30
2000	20	-	0	100	0	0	0	0	9/33
2005	20	20	0	0	100	0	0	100	14/36
2010	20	-	0	100	0	0	0	0	- / -
2015	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Sarcobatus vermiculatus -- (greasewood)</b>									
1995	-	-	-	-	-	-	-	-	- / -
2000	-	-	-	-	-	-	-	-	- / -
2005	-	-	-	-	-	-	-	-	72/93
2010	-	-	-	-	-	-	-	-	65/69

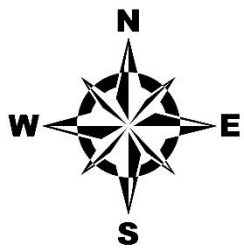
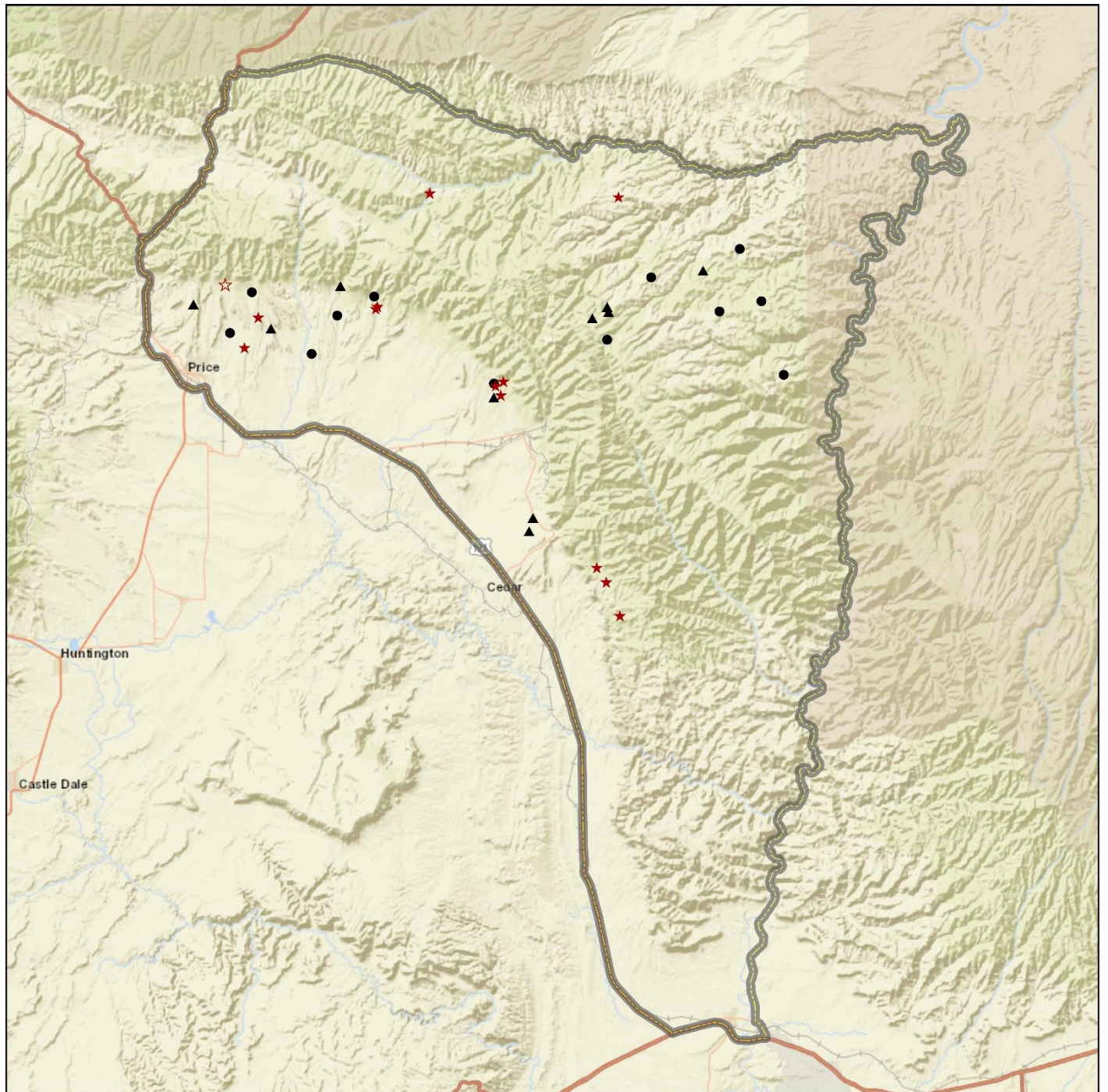
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 11A-04.15 - Deer Desirable Components Index: Semidesert Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1995	8.1	13.3	7.0	30.0	0.0	0.9	0.0	<b>59.3</b>	Good
2000	3.8	0.0	0.0	30.0	0.0	0.2	0.0	<b>34.0</b>	Fair
2005	15.6	12.7	7.0	30.0	0.0	4.6	0.0	<b>69.8</b>	Excellent
2010	9.5	14.1	13.9	30.0	0.0	2.0	0.0	<b>69.4</b>	Excellent
2015	15.1	14.3	12.5	30.0	0.0	1.0	0.0	<b>72.8</b>	Excellent
2021	13.2	1.9	1.8	30.0	0.0	0.1	0.0	<b>47.0</b>	Fair-Good



# WILDLIFE MANAGEMENT UNIT 11B - NINE MILE, RANGE CREEK

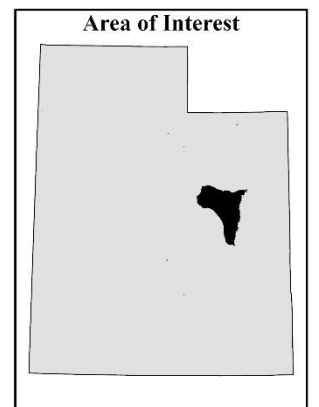


**Project, Status**

- RT, Active
- ★ RT, Suspended
- ▲ WRI, Active
- ☆ WRI, Suspended

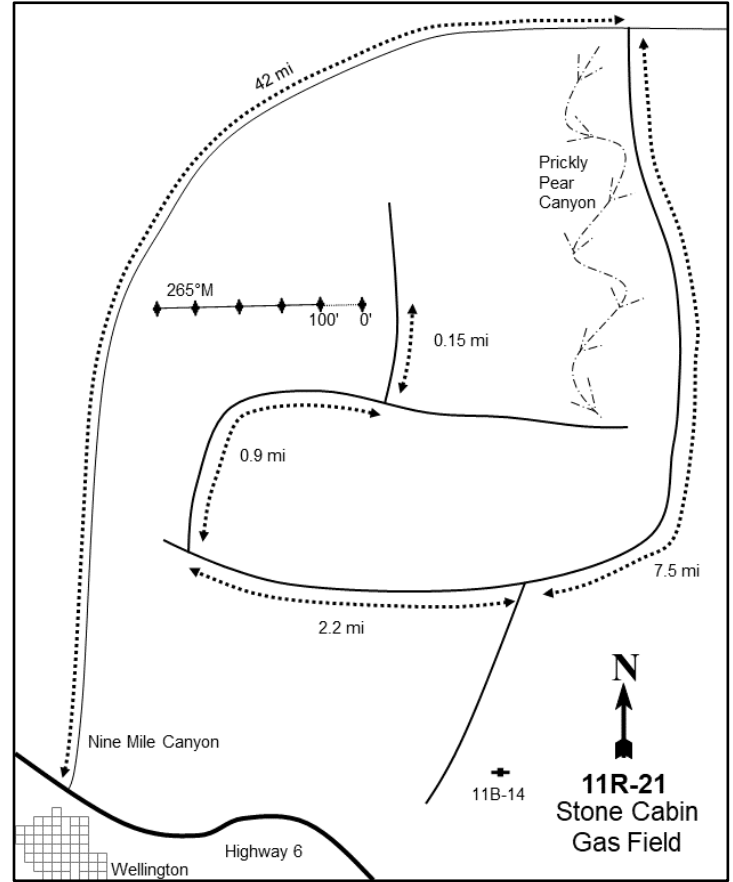
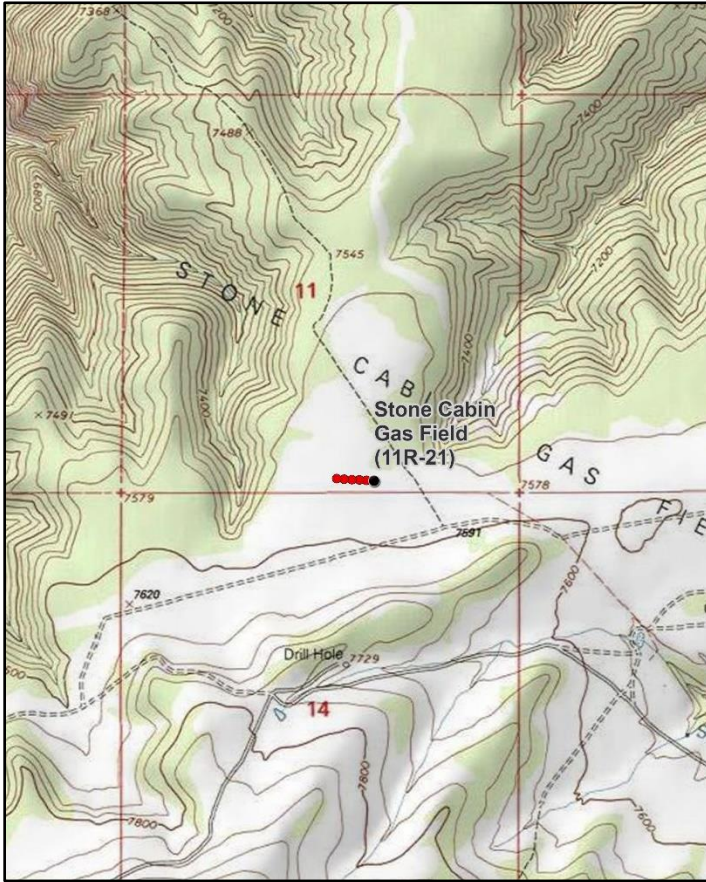
**Unit Boundary**

- ▭ Unit - 11B



Credits: Esri, HERE, Garmin, NGA, USGS, NPS

## STONE CABIN GAS FIELD - STUDY NO. 11R-21



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Currant Canyon SW; Township 12S, Range 14E, Section 11  
NAD 83 UTM ZONE 12, 558870 East 4403615 North

### Transect Information

Browse Tag # (0' Stake)	239
Transect Bearing	265° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

### Directions to Site

If traveling west from the Cold Spring WMA or Dry Canyon along Nine Mile Canyon Road, turn left (south) onto Prickly Pear Canyon Road and travel for 7.5 miles to the intersection that turns to the Prickly Pear site (11B-14). Continue straight for 2.2 miles while passing the gas facility to Harmon Canyon Road and Stone Cabin Gas Field Road. Turn right (north) onto Stone Cabin Gas Field Road and travel for 0.9 miles to another intersection; turn left (north). Travel for 0.15 miles or until the GPS indicates that the truck is close to the 0-foot baseline stake. Walk approximately 89 feet to the 0-foot stake.

**\*If coming from Wellington along Nine Mile Canyon, then the site should be accessed from Harmon Canyon.\***

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	STONE CABIN
Elevation	7,600ft (2,316m)
Aspect	Southeast
Slope	3%
Sample Dates	08/03/2021

**Table 11R-21.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chaining Unknown	-	-	1960s	-
Hand Crew - Lop and Scatter	Interplanetary Airstrip Lop and Scatter	2163	October-November 2011	1295

**Wildlife Habitat and Vegetation History****Table 11R-21.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Greater Sage-Grouse		undefined & undefined
Shiras Moose	substantial	year-long
Pronghorn	substantial	year-long
Rocky Mountain Bighorn	RMBS	year-long

**Table 11R-21.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2021	Mountain Big Sagebrush	Phase I

**Site Notes**

No Notes

**Soils****Table 11R-21.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.2	46.3	36.3	17.4	2.3				

**Site Potential**

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R048AY405UT
States and Transitions	No state and transition model is available for this ecological site.

When the study was established in 2021, the vegetation on this site existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*)-dominated shrubland community (Photos, Table 11R-21.12). The sagebrush population was considered decadent with the majority of the plants displaying poor vigor (Table 11R-21.13), which was likely due to prolonged drought. The herbaceous understory was comprised mostly of perennial grasses with crested wheatgrass (*Agropyron cristatum*) and thickspike wheatgrass (*Elymus lanceolatus*) as the dominant species (Table 11R-21.10). Forbs were rare and contributed little to community diversity (Table 11R-21.11). Without a major disturbance, the site is expected to remain in this or a similar sagebrush-dominated state in the future. Despite a 2011 lop and scatter treatment (Table 11R-21.1), point-quarter density data indicates that Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) were observed in the area (Table 11R-21.14). However, the site is considered to be within Phase I of woodland succession as of 2021 (Table 11R-21.4), suggesting that infilling may not pose an immediate threat to the plant community.

**Trend Summary Tables****Table 11R-21.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2021	15.7	0.1	0.1	21.8	0.1	-

**Table 11R-21.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2021	4	315	0	107	0.0	11.5	0.0	0.6

**Table 11R-21.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2021	61.0	0.5	23.6	0.8	0.6	24.4

**Table 11R-21.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rabbit
	Quadrat Frequency			
2021	5	-	28	30
Year	Days Use Per Acre (ha)			
2021	6.5 (16.1)	8.7 (21.5)*	13.4 (33.1)	-

\*Pellets per acre (ha)

**Table 11R-21.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES											
	Achnatherum hymenoides (Indian ricegrass)										
	Agropyron cristatum <sup>i</sup> (crested wheatgrass)										
	Bromus tectorum <sup>ai</sup> (cheatgrass)										
	Carex geyeri (Geyer's sedge)										
	Elymus elymoides (squirreltail)										
	Elymus lanceolatus (thickspike wheatgrass)										
	Hesperostipa comata (needle and thread)										
	Koeleria macrantha (prairie Junegrass)										
	Leymus salinus (saline wildrye)										
	Poa fendleriana (muttongrass)										
	Poa secunda (Sandberg bluegrass)										
year	Nested Frequency										
2021	38	156	4	17	3	177	5	11	9	10	44
year	Average Cover (%)										
2021	0.5	6.6	0.0	0.1	0.0	2.6	0.2	0.1	0.2	0.6	0.6

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 11R-21.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES											
	Arabis (rockcress)										
	Astragalus convallarius (lesser rushy milkvetch)										
	Cryptantha (cryptantha)										
	Cymopterus (springparsley)										
	Erigeron eatonii (Eaton's fleabane)										
	Machaeranthera canescens (hoary tansyaster)										
	Machaeranthera gracilis <sup>a</sup> (slender goldenweed)										
	Packera multilobata (lobeleaf groundsel)										
	Penstemon comarrhenus (dusty beardtongue)										
	Phlox longifolia (longleaf phlox)										
	Trifolium gymnocarpon (hollyleaf clover)										
year	Nested Frequency										
2021	6	4	5	8	10	1	0	4	1	69	19
year	Average Cover (%)										
2021	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.2	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 11R-21.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES					
	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)				
	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)				
	Chrysothamnus viscidiflorus ssp. lanceolatus				
	Pinus edulis <sup>i</sup> (twoneedle pinyon)				
	Tetradymia canescens (spineless horsebrush)				
year	Line Intercept Cover (%)				
2021	-	21.8	-	-	0.1
year	Quadrat Cover (%)				
2021	0.0	15.7	0.1	0.1	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 11R-21.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
2021	20	-	0	0	100	0	0	100	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
2021	5020	140	13	41	46	11	12	51	- / -
<b>Chrysothamnus viscidiflorus ssp. lanceolatus -- (yellow rabbitbrush)</b>									
2021	80	-	25	75	0	0	25	25	- / -
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
2021	20	-	100	0	0	0	0	0	- / -
<b>Pinus edulis<sup>t</sup> -- (twoneedle pinyon)</b>									
2021	20	-	100	0	0	0	0	0	- / -
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
2021	20	-	0	100	0	0	0	100	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

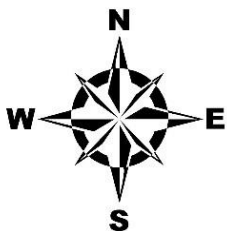
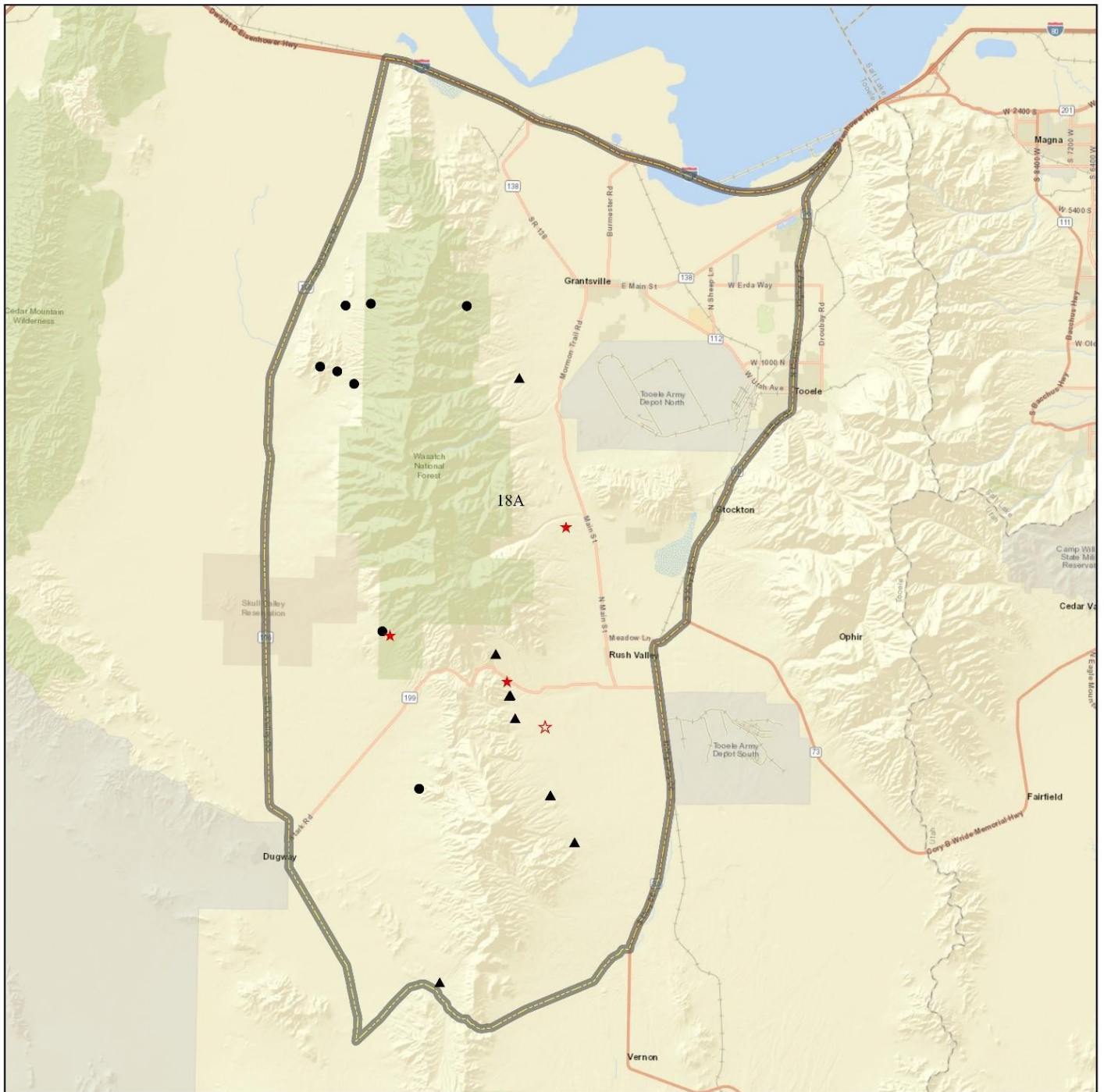
**Table 11R-21.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2021	9	-	100	-	-	-	3.0
<b>Pinus edulis (twoneedle pinyon)</b>							
2021	8	33	67	-	-	-	1.7

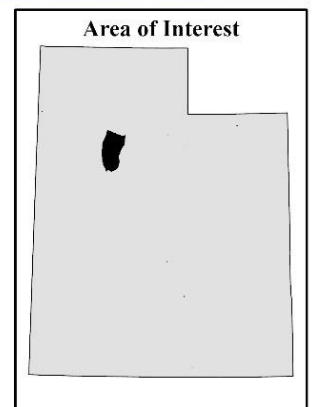
**Table 11R-21.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2021	27.3	1.3	6.6	23.0	0.0	1.2	0.0	<b>59.2</b>	Fair

# WILDLIFE MANAGEMENT UNIT 18A - STANSBURY OQUIRRH-STANSBURY

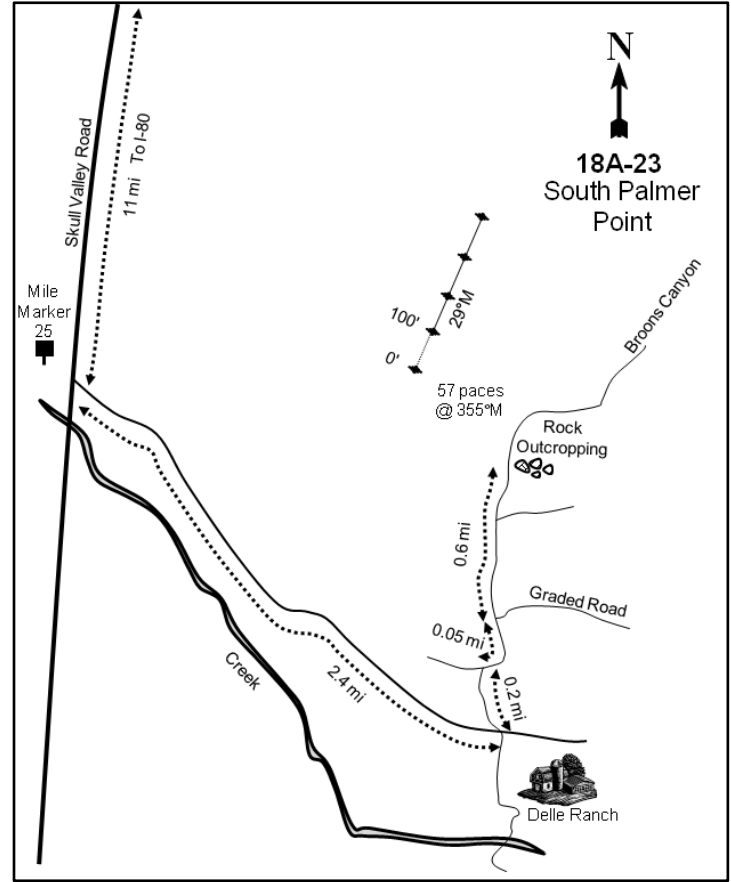
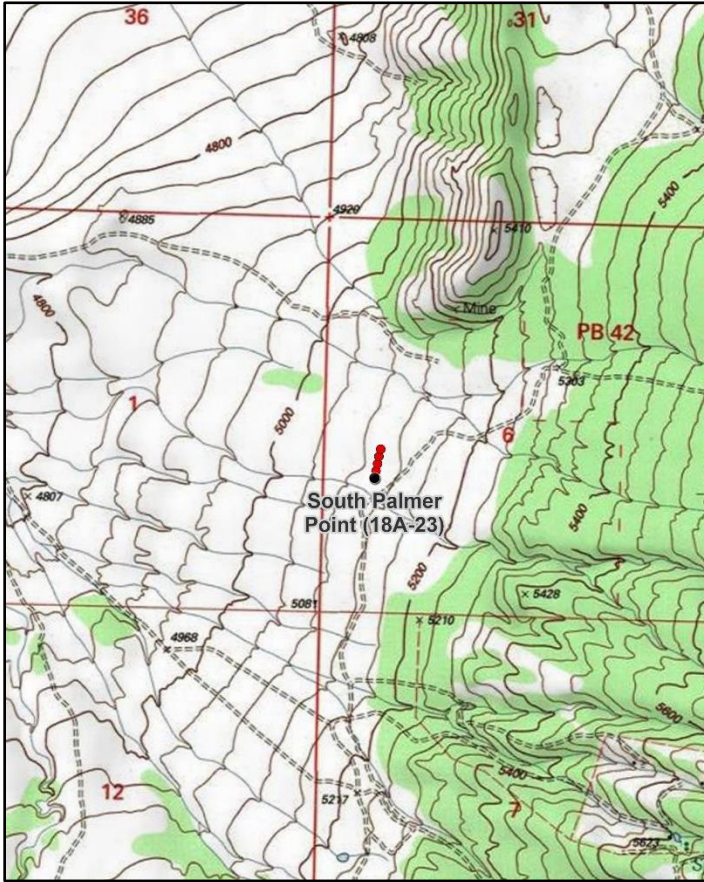


Study Locations Project, Status		Unit Boundary
●	RT, Active	Unit - 18A
★	RT, Suspended	
▲	WRI, Active	
☆	WRI, Suspended	



Credits: Esri, HERE, Garmin, NGA, USGS, NPS

## SOUTH PALMER POINT - STUDY NO. 18A-23



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Salt Mountain NE; Township 3S, Range 7W, Section 06  
NAD 83 UTM ZONE 12, 357525 East 4493900 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

3984  
29° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Standard, Belt 1: Rebar 1 inch tall

### Directions to Site

From I-80, proceed south on Skull Valley Road for 11 miles. Turn east onto a dirt road (between mile markers 25 and 26) and continue along this road for 2.4 miles to Delle Ranch. From the creek crossing on the road at Delle Ranch, proceed north towards Broons Canyon for 0.2 miles to an intersection. Proceed to the right (east) and travel for 0.5 miles to another intersection. Turn left and proceed north for 0.6 miles until you reach a rock outcropping on the right-hand (east) side of the road. From the base of the rock outcropping, walk 57 paces at an azimuth of 355 degrees magnetic to the 0-foot baseline stake which is marked with browse tag #3984. The study is marked by green "T" fenceposts approximately 12 to 19 inches high.



**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	SALT MOUNTAIN
Elevation	5,100ft (1,554m)
Aspect	West
Slope	5%
Sample Dates	07/22/1997, 07/31/2002, 07/12/2004, 06/04/2007, 06/11/2012, 07/19/2016, 06/08/2021

**Table 18A-23.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Harrow - Harrow Unknown	Stansbury Mountains Winter Range Improvement and Solar Farm Mitigation (Proposed)	5625	Fall 2021	6747
Seeding - Hand Transplant	Stansbury Mountains Winter Range Improvement and Solar Farm Mitigation (Proposed)	5625	Fall 2021	6747
Seeding - Broadcast	Stansbury Mountains Winter Range Improvement and Solar Farm Mitigation (Proposed)	5625	Fall 2021	6747
Mechanical - Bullhog	Round Canyon	-	November 2004	780
Seeding - Aerial Before	Round Canyon	-	November 2004	780
Fire - Wildfire	Big Pole	-	August 2009	44470
Chaining - One-Way Ely	BLM-ESR	-	November 2009	9500
Seeding - Aerial Before	BLM-ESR	-	October 2009	9808
Seeding - Aerial After	BLM-ESR	-	Fall 2009	4900

**Table 18A-23.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Round Canyon Seed Mix			Aerial	Nov 2004	780
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron fragile	Siberian Wheatgrass	Vavilov	2.00	0.00
G	Pascopyrum smithii	Western Wheatgrass	Arriba	2.00	0.00
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky	2.00	0.00
F	Achillea millefolium	Western Yarrow		0.25	0.00
F	Linum perenne	Lewis Blue Flax		1.00	0.00
F	Medicago sativa	Alfalfa	Ladak	0.50	0.00

Mix Name			Application Type	Application Date	Acres
BLM Big Pole Fire ESR			Aerial	Oct 2009	9808
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass		2.00	0.00
G	Agropyron fragile	Siberian Wheatgrass		2.00	0.00
G	Pascopyrum smithii	Western Wheatgrass		2.00	0.00
G	Poa secunda	Canby Bluegrass		1.00	0.00
G	Psathyrostachys juncea	Russian Wildrye		1.00	0.00
F	Achillea millefolium	Western Yarrow		0.25	0.00
F	Linum perenne	Lewis Blue Flax		0.75	0.00
F	Medicago sativa	Alfalfa		0.50	0.00

Mix Name			Application Type	Application Date	Acres
BLM Big Pole Fire ESR			Aerial	Dec 2009	4900
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush		0.50	0.00

**Wildlife Habitat and Vegetation History****Table 18A-23.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	winter
Rocky Mountain Elk	crucial	winter/spring

**Table 18A-23.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Wyoming Big Sagebrush/Annual Grass	Phase I
1989	Wyoming Big Sagebrush	Phase I
1997	Wyoming Big Sagebrush	Phase I
2002	Wyoming Big Sagebrush/Annual Grass	Phase I
2004	Wyoming Big Sagebrush/Annual Grass	Phase I transitioning to Phase II
2007	Wyoming Big Sagebrush/Annual Grass	Phase I
2012	Annual Grass	No Encroachment
2016	Broom Snakeweed/Annual Forb	No Encroachment
2021	Broom Snakeweed/Annual Grass	No Encroachment

**Site Notes**

The study was treated in November of 2004 as part of the Round Canyon treatment. The whole area then burned as part of the Big Pole wildfire in 2009. Prior to the fire, the site was dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and Utah juniper (*Juniperus osteosperma*).

**Soils****Table 18A-23.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.9	42.0	33.1	24.9	2.1	3.4	259.2	0.5	07/22/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Upland Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R028AY309UT
States and Transitions	No state and transition model is available for this ecological site.

From the outset of the study in 1983 through the 2007 sample year, this site was dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) with Utah juniper (*Juniperus osteosperma*) scattered throughout the area. In 2009, a wildfire occurred that removed nearly all of the shrubs and trees. Broom snakeweed (*Gutierrezia sarothrae*) has been the dominant shrub species since the burn despite a chaining and seeding treatment that took place soon after the fire (Table 18A-23.1). However, sagebrush cover and density have increased slightly as of the 2021 sample year, indicating that it may recover in the future (Photos, Pre-1992 Data, Table 18A-23.12, Table 18A-23.13). Annual grasses, mainly the introduced species cheatgrass (*Bromus tectorum*), contributed the most herbaceous cover and have been a co-dominant site component in most sample years before and after the burn. The exception to this was in 2016, when the introduced annual forb species redstem stork's bill (*Erodium cicutarium*) provided a majority of the herbaceous cover (Table 18A-23.7, Table 18A-23.10, Table 18A-23.11). A harrow and seeding treatment is proposed for the Fall of 2021 (Table 18A-23.1), which may lead to the diversification of shrub and herbaceous species in future sample years. Deer winter range has never been in good condition: condition has ranged between fair to very poor and can be partially attributed to the consistent presence of cheatgrass. Furthermore, deer winter range condition has been considered very poor since 2012 due to the lack of preferred browse species (Table 18A-23.15).

**Trend Summary Tables****Table 18A-23.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	11.7	0.3	7.7	-	-	-
2002	9.5	2.2	8.8	9.6	1.4	10.9
2004	9.7	0.4	8.8	10.2	0.5	13.1
2007	11.4	0.6	1.1	12.5	0.4	3.7
2012	0.5	0.6	-	0.5	0.5	-
2016	1.4	4.9	-	3.4	9.2	-
2021	2.5	7.3	-	3.5	8.2	-

**Table 18A-23.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	362	260	206	101	8.6	8.5	1.7	2.1
2002	359	276	159	49	12.7	9.3	0.8	0.5
2004	379	240	182	41	12.1	6.8	1.7	0.3
2007	429	241	336	169	18.1	8.8	4.5	4.6
2012	421	96	373	167	16.9	5.3	8.7	7.6
2016	158	90	397	118	1.0	5.6	18.7	3.0
2021	293	167	196	107	6.6	7.5	2.1	2.1

**Table 18A-23.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	10.2	10.1	43.5	5.1	2.6	39.7
2002	16.8	12.0	36.7	5.5	2.9	42.1
2004	19.3	6.9	42.5	5.6	2.6	40.1
2007	14.9	2.6	39.0	4.8	2.1	47.3
2012	29.4	-	24.7	8.4	3.7	37.3
2016	38.9	-	8.8	21.5	3.6	33.3
2021	25.2	0.0	45.1	12.7	4.1	26.4

**Table 18A-23.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
1997	2	-	16	-	18
2002	-	-	5	-	3
2004	-	-	8	-	8
2007	-	-	10	1	14
2012	-	-	-	-	-
2016	2	-	-	-	1
2021	-	-	1	1	1
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	-	-	22.8 (56.3)	-	-
2004	-	-	12.8 (31.5)	-	-
2007	-	8.7 (21.5)*	14.1 (34.8)	-	-
2012	-	-	0.7 (1.7)	-	-
2016	6.5 (16.1)	-	-	-	-
2021	6.5 (16.1)	-	3.4 (8.3)	0.7 (1.7)	-

\*Pellets per acre (ha)

**Table 18A-23.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Pascopyrum smithii (western wheatgrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)	Vulpia octoflora <sup>a</sup> (sixweeks fescue)
year	Nested Frequency								
1997	-	-	362	23	-	255	11	-	-
2002	-	3	359	10	-	269	22	-	-
2004	-	-	379	23	-	222	20	-	-
2007	7	-	429	31	-	230	28	-	2
2012	-	-	421	3	-	57	30	10	-
2016	10	9	158	16	34	7	18	1	-
2021	8	2	293	23	75	51	7	33	-
year	Average Cover (%)								
1997	-	-	8.6	0.3	-	7.6	0.6	-	-
2002	-	0.0	12.7	0.4	-	7.9	0.9	-	-
2004	-	-	12.1	0.8	-	4.8	1.3	-	-
2007	0.2	-	18.1	0.8	-	6.2	1.6	-	0.0
2012	-	-	16.9	0.0	-	1.7	3.3	0.2	-
2016	0.3	0.1	1.0	0.3	2.9	0.3	1.5	0.1	-
2021	0.4	0.3	6.6	0.8	3.4	1.0	0.1	1.6	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 18A-23.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria (pussytoes)	Argemone munita (flatbud pricklypoppy)	Astragalus cibirius (browse milkvetch)	Astragalus lentiginosus (freckled milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Cardaria draba <sup>ai</sup> (whitetop)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)
year	Nested Frequency																
1997	-	-	-	-	5	-	37	-	18	11	-	-	171	8	-	10	5
2002	-	1	-	-	6	-	-	-	1	4	-	-	136	-	-	-	3
2004	-	-	-	-	-	-	5	-	1	6	-	-	170	-	-	-	-
2007	15	3	3	31	27	-	-	25	7	29	-	2	222	-	-	1	-
2012	21	-	-	249	-	10	-	15	27	-	-	-	132	1	-	13	-
2016	31	-	-	123	-	1	2	12	23	5	0	-	51	3	11	8	2
2021	11	-	-	76	-	-	-	23	16	15	-	-	103	-	1	13	-
year	Average Cover (%)																
1997	-	-	-	-	0.1	-	1.4	-	0.2	0.0	-	-	1.1	0.0	-	0.1	0.0
2002	-	0.0	-	-	0.2	-	-	-	0.0	0.0	-	-	0.4	-	-	-	0.0
2004	-	-	-	-	-	-	0.0	-	0.0	0.0	-	-	1.3	-	-	-	-
2007	0.4	0.0	0.0	0.2	0.5	-	-	0.7	0.2	0.1	-	0.0	1.5	-	-	0.0	-
2012	0.6	-	-	3.4	-	0.1	-	0.5	0.8	-	-	-	0.5	0.0	-	0.3	-
2016	1.0	-	-	0.7	-	0.1	0.0	0.4	0.1	0.0	0.0	-	0.2	0.0	0.3	0.3	0.0
2021	0.1	-	-	0.3	-	-	-	0.6	0.4	0.1	-	-	0.6	-	0.0	0.1	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Comandra umbellata (bastard toadflax)	Convolvulus arvensis <sup>ni</sup> (field bindweed)	Delphinium nuttallianum (twolobe larkspur)	Draba <sup>a</sup> (draba)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Grindelia squarrosa (curlycup gumweed)	Helianthus annuus <sup>ai</sup> (common sunflower)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lathyrus brachycalyx (Bonneville pea)	Linum lewisii (Lewis flax)	Lygodesmia (skeletonplant)	Medicago sativa <sup>i</sup> (alfalfa)	Melilotus officinalis <sup>i</sup> (sweetclover)	Microsteris gracilis <sup>a</sup> (slender phlox)	Phlox longifolia (longleaf phlox)	Silene antirrhina <sup>a</sup> (sleepy silene)
year	Nested Frequency																
1997	3	-	-	-	-	1	-	-	8	-	-	3	-	-	1	26	39
2002	6	-	-	5	-	11	-	-	-	-	-	-	-	-	4	31	19
2004	4	-	1	-	-	32	-	-	-	-	-	-	-	-	1	24	5
2007	4	-	-	-	-	35	-	-	20	11	59	-	1	1	4	43	179
2012	4	5	-	1	4	197	-	7	12	-	49	-	0	2	-	71	5
2016	-	3	-	-	-	371	3	49	23	-	22	-	2	-	-	16	-
2021	3	9	-	-	-	55	6	15	-	-	2	-	-	-	12	44	-
year	Average Cover (%)																
1997	0.0	-	-	-	-	0.0	-	-	0.0	-	-	0.0	-	-	0.0	0.3	0.3
2002	0.0	-	-	0.0	-	0.3	-	-	-	-	-	-	-	-	0.0	0.2	0.1
2004	0.0	-	0.0	-	-	0.4	-	-	-	-	-	-	-	-	0.0	0.2	0.0
2007	0.0	-	-	-	-	0.7	-	-	0.1	0.3	1.8	-	0.0	0.0	0.0	0.5	2.0
2012	0.0	0.0	-	0.0	0.0	4.2	-	0.1	0.1	-	2.5	-	0.1	0.1	-	2.6	0.0
2016	-	0.1	-	-	-	16.2	0.1	0.9	0.1	-	0.5	-	0.0	-	-	0.2	-
2021	0.1	0.3	-	-	-	0.7	0.0	0.1	-	-	0.0	-	-	-	0.1	0.3	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Sphaeralcea parvifolia (smallflower globemallow)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Trifolium (clover)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency				
1997	-	-	7	-	1
2002	-	-	-	-	2
2004	-	-	-	-	0
2007	-	-	1	-	1
2012	1	-	15	-	3
2016	-	3	25	4	-
2021	-	-	10	-	3
year	Average Cover (%)				
1997	-	-	0.0	-	0.0
2002	-	-	-	-	0.1
2004	-	-	-	-	0.0
2007	-	-	0.0	-	0.0
2012	0.0	-	0.1	-	0.0
2016	-	0.0	0.2	0.0	-
2021	-	-	0.2	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 18A-23.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Bassia prostrata <sup>pi</sup> (forage kochia)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>t</sup> (Utah juniper)
year	Line Intercept Cover (%)					
1997	-	-	-	-	-	-
2002	9.6	-	-	-	1.4	10.9
2004	10.2	-	-	-	0.5	13.1
2007	12.5	-	-	-	0.4	3.7
2012	-	0.5	-	-	0.5	-
2016	0.2	3.2	-	-	9.2	-
2021	1.2	1	0.1	1.3	8.1	-
year	Quadrat Cover (%)					
1997	11.7	-	0.0	0.0	0.3	7.7
2002	9.5	-	-	-	2.2	8.8
2004	9.7	-	-	-	0.4	8.8
2007	11.4	-	-	-	0.6	1.1
2012	0.1	0.3	-	-	0.6	-
2016	0.4	1.0	-	0.0	4.9	-
2021	1.0	1.0	0.0	0.5	7.3	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 18A-23.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
1997	2420	940	40	41	20	14	0	12	69/106
2002	3820	-	24	58	19	5	0	9	52/78
2004	2640	-	7	65	28	13	0	11	51/69
2007	7200	7200	65	27	8	11	2	9	56/75
2012	20	-	0	100	0	0	0	0	37/35
2016	20	880	0	100	0	0	0	0	57/81
2021	320	580	56	44	0	0	0	0	- / -
<b>Bassia prostrata<sup>pi</sup> -- (forage kochia)</b>									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2004	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	720	-	0	100	0	3	0	0	22/34
2016	1600	520	10	90	0	13	63	0	21/41
2021	1860	-	11	88	1	7	91	1	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	20	-	100	0	0	0	0	0	16/13
2002	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	80	-	25	75	0	0	0	0	-/-
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1997	20	-	0	100	0	0	0	0	38/46
2002	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2007	40	-	50	50	0	0	0	50	66/84
2012	-	-	-	-	-	-	-	-	43/59
2016	40	-	50	50	0	0	0	0	40/60
2021	200	-	0	100	0	20	0	0	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	2520	60	30	70	0	3	0	0	18/17
2002	2600	-	1	71	28	0	0	6	20/28
2004	460	-	0	83	17	0	0	13	20/28
2007	860	80	21	77	2	0	0	2	19/23
2012	1380	-	25	75	0	0	1	1	25/33
2016	3240	740	19	80	1	0	0	1	33/50
2021	7340	80	20	69	11	1	0	14	-/-
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1997	120	40	17	83	0	0	0	0	-/-
2002	200	20	30	70	0	0	0	0	-/-
2004	200	-	40	60	0	0	0	0	-/-
2007	180	40	78	0	22	0	0	11	-/-
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2007	20	-	100	0	0	0	0	0	-/-
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	100	-	0	100	0	0	0	0	-/-
<b>Rhus trilobata<sup>P</sup> -- (skunkbush sumac)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2007	-	20	0	0	0	0	0	0	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 18A-23.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

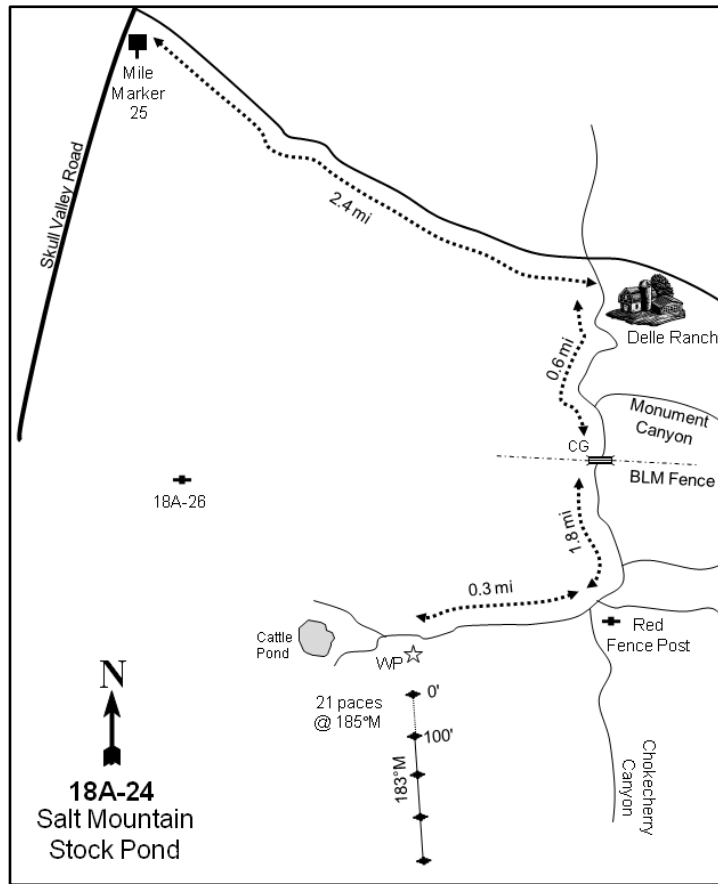
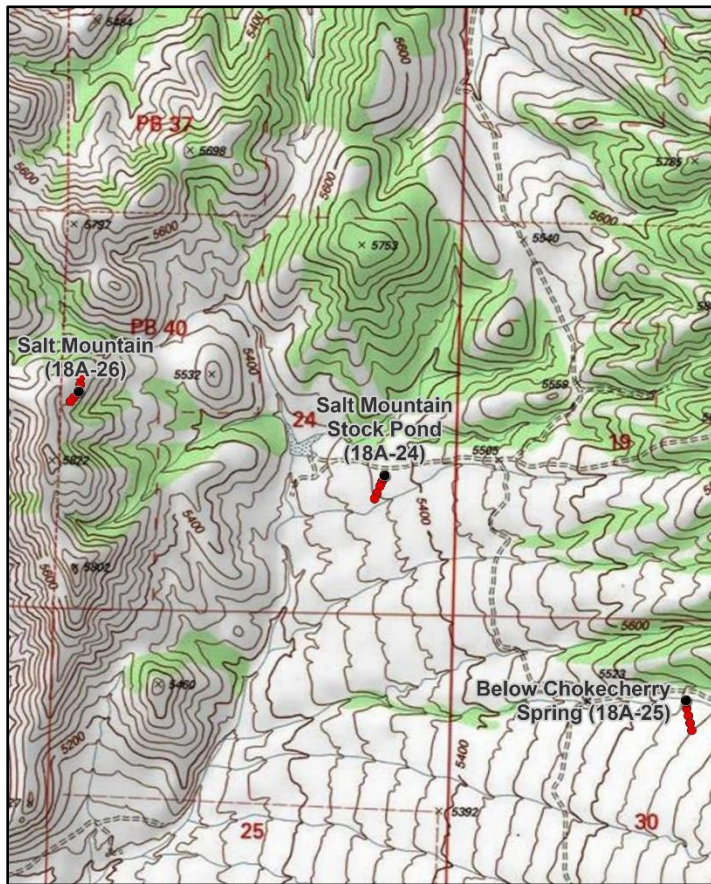
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2002	71	-	-	-	-	-	17.9
2004	71	-	16	37	21	26	14.7
2007	67	-	72	-	-	28	15.2



**Table 18A-23.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	14.7	9.1	15.0	17.1	-6.4	4.1	0.0	<b>53.5</b>	Fair
2002	11.9	9.4	11.8	18.5	-9.5	0.9	0.0	<b>42.9</b>	Poor
2004	12.8	6.6	3.4	13.7	-9.1	0.5	0.0	<b>27.9</b>	Very Poor
2007	15.6	12.8	15.0	17.6	-13.6	9.1	0.0	<b>56.5</b>	Fair
2012	0.8	0.0	0.0	10.5	-12.7	10.0	-2.0	<b>6.6</b>	Very Poor
2016	5.1	0.0	0.0	11.1	-0.7	5.9	-4.0	<b>17.3</b>	Very Poor
2021	4.6	0.0	0.0	15.1	-4.9	3.4	-2.0	<b>16.2</b>	Very Poor

## SALT MOUNTAIN STOCK POND - STUDY NO. 18A-24



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Salt Mountain SW; Township 3S, Range 8W, Section 24  
NAD 83 UTM ZONE 12, 356915 East 4489115 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

Not Available  
190° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Belt 2: 1ft; Belt 4: 13ft; Line 2: 65ft Long; Line 4: 78ft Long

### Directions to Site

Turn east off of Skull Valley Road between mile markers 25 and 26 and go 2.4 miles, staying right on the main road, to the Delle Ranch ponds and trees; the road then turns south. From Delle Ranch, proceed south for 2.4 miles to an intersection to the right (west) heading to Salt Mountain; there will be a red post on the east side of the road. Turn right and proceed 0.3 miles to a witness post on the left (south) side of the road. From the witness post, the 0-foot baseline stake is 21 paces away at an azimuth of 185 degrees magnetic. The study is marked by green steel "T" fence posts approximately 12-18 inches in height.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	SALT MOUNTAIN
Elevation	5,400ft (1,646m)
Aspect	Southwest
Slope	5-8%
Sample Dates	07/22/1997, 07/30/2002, 06/05/2007, 06/12/2012, 07/19/2016, 06/08/2021

**Table 18A-24.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Unknown	-	-	Historic	-
Seeding - Unknown	-	-	Historic	-
Fire - Wildfire	Big Pole	-	August 2009	44470
Chaining - One-Way Ely Chain	BLM-ESR	-	November 2009	9500
Seeding - Aerial Before	BLM-ESR	-	October 2009	9808
Seeding - Aerial After	BLM-ESR	-	December 2009	4900

**Table 18A-24.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
BLM Big Pole Fire ESR			Aerial	Oct 2009	9808
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass		2.00	0.00
G	Agropyron fragile	Siberian Wheatgrass		2.00	0.00
G	Pascopyrum smithii	Western Wheatgrass		2.00	0.00
G	Poa secunda	Canby Bluegrass		1.00	0.00
G	Psathyrostachys juncea	Russian Wildrye		1.00	0.00
F	Achillea millefolium	Western Yarrow		0.25	0.00
F	Linum perenne	Lewis Blue Flax		0.75	0.00
F	Medicago sativa	Alfalfa		0.50	0.00

Mix Name			Application Type	Application Date	Acres
BLM Big Pole Fire ESR			Aerial	Dec 2009	4900
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush		0.50	0.00

**Wildlife Habitat and Vegetation History****Table 18A-24.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
California Bighorn	substantial	year-long
Mule Deer	substantial	winter
Rocky Mountain Elk	crucial	winter/spring

**Table 18A-24.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush/Perennial Grass	Phase I
1989	Mountain Big Sagebrush/Perennial Grass	Phase I
1997	Mountain Big Sagebrush/Perennial Grass	Phase I
2002	Mountain Big Sagebrush/Perennial Grass	Phase I
2007	Mountain Big Sagebrush/Perennial Grass	Phase I
2012	Perennial Grass	No Encroachment
2016	Perennial Grass	Phase I
2021	Perennial Grass	Phase I

**Site Notes**

The study is located on a chained and seeded Utah juniper (*Juniperus osteosperma*) woodland immediately east of Salt Mountain in Skull Valley. The area was treated again between the 1983 and 1989 samplings to remove most of the remaining juniper trees. The whole area then burned as part of the Big Pole wildfire in 2009. There are multiple rebar stakes on the site from the study before it burned. The currently-used rebar is 10 feet away from the original rebar.

**Soils**

**Table 18A-24.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.6	52.0	20.4	27.6	2.1	4.8	224.0	0.5	07/22/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R028AY310UT
States and Transitions	Current State: Community Phase 5.1

From study establishment in 1983 through 2007, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) was the dominant browse species on this site (Photos, Pre-1992 Data, Table 18A-24.12, Table 18A-24.13). The herbaceous understory has been dominated by perennial grasses such as crested wheatgrass (*Agropyron cristatum*), Sandberg bluegrass (*Poa secunda*), and intermediate wheatgrass (*Thinopyrum intermedium*) in all sample years. A wildfire in 2009 eliminated the browse component (Table 18A-24.1). However, the herbaceous layer persisted, causing the site to transition into a perennial grassland (Table 18A-24.10). This site is likely within Community Phase 5.1 within a seeded range state that is dominated by introduced perennial species as described by the ESD model following the burn and seeding (USDA-ARS Jornada Experimental Range, 2021). Forbs have remained rare throughout the study years (Table 18A-24.7, Table 18A-24.11). Utah juniper (*Juniperus osteosperma*) was scattered throughout the area prior to the wildfire, but no trees were observed in the first sample year following the burn (Photos, Table 18A-24.12, Table 18A-24.13). In 2016 and 2021, young juniper trees were recorded in low amounts in point-quarter data (Table 18A-24.14). Although the site remains in Phase I of woodland succession as of 2021 (Table 18A-24.4), the reintroduction of the tree component indicates that infilling may occur in the future. Deer winter range has never been in good condition: condition has ranged between fair and very poor, which can partially be attributed to the consistent presence of cheatgrass. Furthermore, deer winter range condition has been considered very poor since 2012 due to the lack of preferred browse species (Table 18A-24.15).

**Trend Summary Tables****Table 18A-24.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	9.6	1.1	-	-	-	-
2002	8.0	2.5	1.6	9.0	2.8	1.3
2007	7.7	0.5	1.6	8.7	0.6	1.5
2012	-	0.3	-	-	0.3	-
2016	-	3.0	-	-	1.4	-
2021	-	3.3	-	-	3.9	-

**Table 18A-24.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	180	373	226	111	1.9	19.5	2.0	0.8
2002	175	393	105	12	2.3	25.8	0.4	0.0
2007	341	387	350	135	4.6	24.3	4.7	4.4
2012	250	369	308	89	3.6	30.5	1.9	2.0
2016	46	371	175	59	0.2	25.6	2.5	2.0
2021	161	343	59	66	2.6	18.1	0.9	1.2

**Table 18A-24.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	15.9	3.7	45.3	7.2	0.8	36.4
2002	16.0	2.9	48.7	5.0	1.8	40.7
2007	16.0	2.0	40.6	6.9	1.8	49.0
2012	33.1	0.0	32.5	6.7	2.4	36.9
2016	40.9	0.8	26.3	11.5	0.9	33.8
2021	27.3	0.1	42.9	7.1	1.7	27.8

**Table 18A-24.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
1997	2	-	20	-	12
2002	4	-	12	-	49
2007	3	-	20	2	64
2012	-	-	-	-	-
2016	5	-	2	-	1
2021	5	-	1	-	7
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	8.0 (19.7)	8.7 (21.5)*	26.8 (66.2)	-	-
2007	10.2 (25.1)	-	4.0 (9.9)	4.7 (11.6)	-
2012	0.7 (1.8)	-	1.3 (3.3)	-	-
2016	8.7 (21.5)	-	-	-	-
2021	5.8 (14.3)	-	0.7 (1.7)	3.4 (8.3)	-

\*Pellets per acre (ha)

**Table 18A-24.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Agropyron fragile <sup>i</sup> (Siberian wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea <sup>i</sup> (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)	Vulpia octoflora <sup>a</sup> (sixweeks fescue)
year	Nested Frequency												
1997	311	-	29	153	-	-	-	-	230	-	-	-	-
2002	330	-	28	166	3	-	-	-	190	-	15	-	1
2007	323	-	40	340	1	-	-	-	261	-	14	-	-
2012	315	-	5	249	-	-	-	12	182	-	9	25	1
2016	335	-	3	45	-	24	-	3	39	25	1	19	-
2021	239	10	21	155	3	-	22	1	88	15	32	77	-
year	Average Cover (%)												
1997	15.9	-	0.1	1.8	-	-	-	-	3.6	-	-	-	-
2002	23.0	-	0.1	2.2	0.1	-	-	-	2.0	-	0.7	-	0.0
2007	17.9	-	0.1	4.5	0.0	-	-	-	5.5	-	0.8	-	-
2012	24.3	-	0.0	3.6	-	-	-	0.2	5.3	-	0.2	0.5	0.0
2016	22.6	-	0.0	0.2	-	0.8	-	0.0	0.2	1.4	0.1	0.4	-
2021	10.4	0.0	0.3	2.3	0.0	-	0.7	0.0	1.5	0.7	0.9	3.9	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 18A-24.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria (pussytoes)	Astragalus (milkvetch)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus cibaricus (browse milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (tittlepod false flax)	Castilleja (Indian paintbrush)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium neomexicanum <sup>a</sup> (New Mexico thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Crepis acuminata (tapertip hawkbeard)
year	Nested Frequency																
1997	-	8	5	7	1	-	30	2	18	12	3	2	193	18	5	4	2
2002	-	4	2	2	-	-	3	-	1	2	-	-	56	-	-	11	-
2007	-	7	27	-	-	-	87	2	30	1	-	4	130	8	-	10	3
2012	20	-	119	-	-	-	-	7	-	13	-	-	50	-	-	2	3
2016	18	-	74	-	-	3	5	5	13	-	-	-	57	3	-	-	-
2021	49	7	8	-	-	-	4	1	1	-	-	-	1	-	-	-	3
year	Average Cover (%)																
1997	-	0.0	0.0	0.0	0.0	-	0.4	0.1	0.0	0.0	0.0	0.0	1.7	0.1	0.1	0.0	0.0
2002	-	0.0	0.0	0.0	-	-	0.0	-	0.0	0.0	-	-	0.1	-	-	0.0	-
2007	-	0.0	0.1	-	-	-	3.7	0.0	0.2	0.0	-	0.0	0.4	0.2	-	0.0	0.0
2012	0.6	-	0.6	-	-	-	-	0.0	-	0.0	-	-	0.1	-	-	0.0	0.2
2016	1.6	-	0.3	-	-	0.0	0.0	0.2	0.1	-	-	-	0.2	0.0	-	-	-
2021	1.0	0.0	0.0	-	-	-	0.0	0.0	0.0	-	-	-	0.0	-	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nest Frequency																
Descurainia pinnata <sup>a</sup> (western tansymustard)																	
Draba <sup>a</sup> (draba)																	
Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)																	
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)																	
Helianthus annuus <sup>a</sup> (common sunflower)																	
Heterotheca villosa (hairy false goldenaster)																	
Lactuca serriola <sup>ai</sup> (prickly lettuce)																	
Linum lewisii (Lewis flax)																	
Machaeranthera canescens (hoary tansyaster)																	
Machaeranthera grindelioides (rayless tansyaster)																	
Microsteris gracilis <sup>a</sup> (slender phlox)																	
Packera multilobata (lobeleaf groundsel)																	
Penstemon (beardtongue)																	
Phlox longifolia (longleaf phlox)																	
Sanguisorba minor <sup>i</sup> (small burnet)																	
Silene antirrhina <sup>a</sup> (sleepy silene)																	
Solanum triflorum <sup>a</sup> (cutleaf nightshade)																	
year	Average Cover (%)																
1997	-	0.0	0.1	-	-	-	0.0	-	0.1	-	0.0	-	0.1	0.0	-	0.0	-
2002	0.0	-	-	0.0	-	-	-	-	-	-	0.0	0.0	-	0.0	-	0.1	-
2007	-	0.0	-	0.1	-	0.0	-	-	-	-	-	-	-	0.1	-	4.2	0.0
2012	0.0	0.1	-	0.4	-	-	-	0.7	0.0	-	0.0	-	-	0.1	0.3	0.6	-
2016	0.0	0.0	-	1.6	0.0	-	0.0	0.1	-	0.0	-	-	-	0.0	0.0	0.0	-
2021	-	-	-	0.3	0.1	-	-	-	-	-	-	-	-	0.0	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nest Frequency		
Tragopogon dubius <sup>ai</sup> (yellow salsify)			
Trifolium (clover)			
Zigadenus pumilus (foothill deathcamas)			
year	Average Cover (%)		
1997	0.1	0.0	0.0
2002	-	-	-
2007	-	-	-
2012	0.0	-	-
2016	0.4	-	-
2021	0.5	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 18A-24.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>i</sup> (Utah juniper)
year	Line Intercept Cover (%)				
1997	-	-	-	-	-
2002	9	-	-	2.8	1.3
2007	8.7	-	-	0.6	1.5
2012	-	-	-	0.3	-
2016	-	-	-	1.4	-
2021	-	-	-	3.9	-
year	Quadrat Cover (%)				
1997	9.6	-	0.0	1.1	-
2002	8.0	0.1	-	2.3	1.6
2007	7.7	-	-	0.5	1.6
2012	-	-	-	0.3	-
2016	-	-	-	3.0	-
2021	-	-	-	3.3	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 18A-24.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1997	3060	520	18	49	33	29	9	20	51/89
2002	3060	-	22	48	31	14	0	17	49/70
2007	2720	-	7	57	35	25	15	35	55/81
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	42/77
2021	-	-	-	-	-	-	-	-	-/-
<b>Atriplex canescens<sup>p</sup> -- (fourwing saltbush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	0	100	0	0	0	0	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	20	-	0	100	0	0	0	0	14/23
2002	20	-	0	100	0	0	0	0	17/18
2007	60	-	0	100	0	0	67	0	15/18
2012	20	-	0	100	0	0	0	0	20/28
2016	60	-	0	100	0	0	0	0	39/77
2021	-	-	-	-	-	-	-	-	-/-



Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1997	20	-	100	0	0	0	0	0	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	20	-	0	100	0	0	0	0	31/35
2016	20	-	0	100	0	0	0	0	66/91
2021	120	-	50	50	0	17	0	0	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	4540	320	29	69	2	0	0	1	19/26
2002	4680	-	0	88	12	0	0	13	16/24
2007	1000	140	10	62	28	8	2	20	17/24
2012	280	-	0	100	0	0	0	0	22/30
2016	2080	80	39	61	0	0	0	0	31/58
2021	8000	280	42	49	9	0	0	9	- / -
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1997	100	20	80	20	0	0	0	0	- / -
2002	100	-	20	80	0	0	0	0	- / -
2007	120	-	50	50	0	0	0	0	- / -
2012	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Opuntia -- (pricklypear)</b>									
1997	40	-	0	100	0	0	0	0	11/24
2002	40	-	0	100	0	0	0	0	- / -
2007	20	-	0	100	0	0	0	0	10/18
2012	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	12/20
2021	-	-	-	-	-	-	-	-	- / -
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1997	-	-	-	-	-	-	-	-	22/72
2002	-	-	-	-	-	-	-	-	25/137
2007	-	-	-	-	-	-	-	-	57/164
2012	-	-	-	-	-	-	-	-	56/91
2016	-	-	-	-	-	-	-	-	48/122

t - Tree Species; p - Preferred Browse; i - Introduced Species

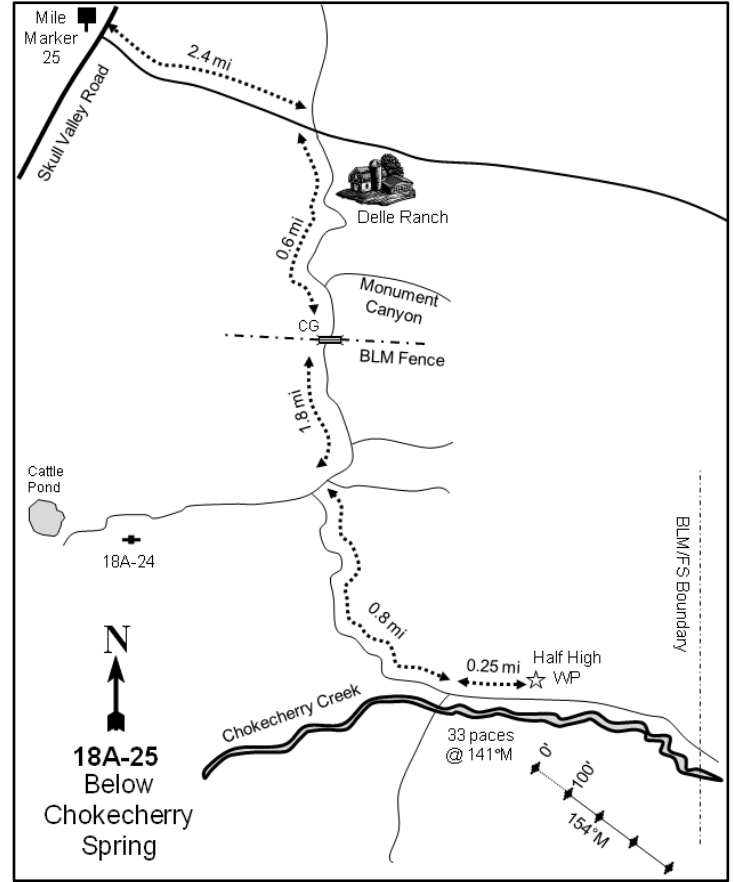
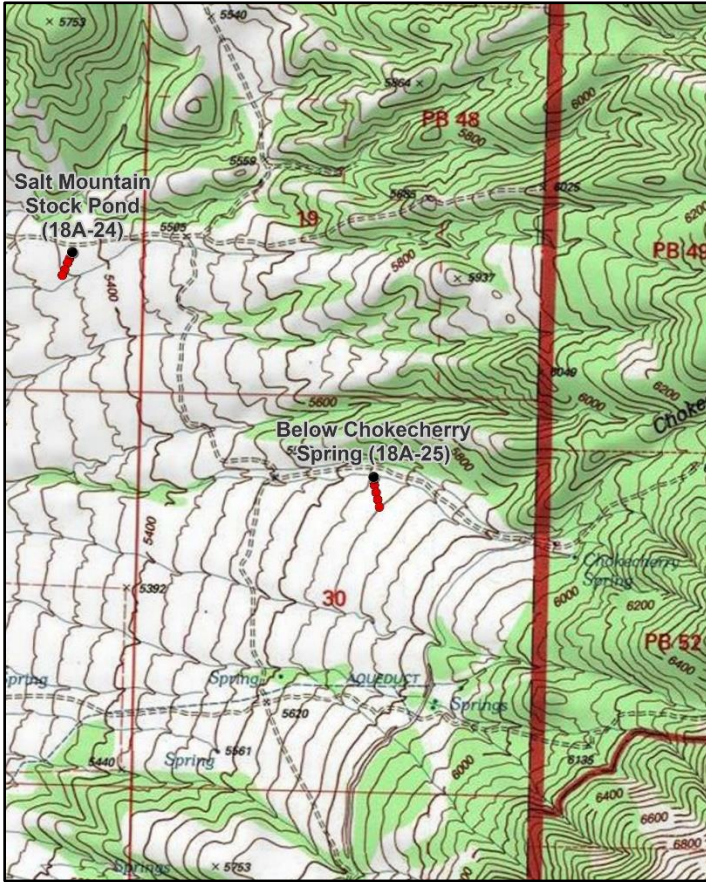
**Table 18A-24.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2002	51	-	-	-	-	-	4.5
2007	67	-	55	35	5	5	6.8
2016	6	100	-	-	-	-	1.0
2021	7	-	100	-	-	-	4.0

**Table 18A-24.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	12.0	5.2	9.1	30.0	-1.4	1.6	0.0	<b>56.4</b>	Fair
2002	10.0	5.8	10.8	30.0	-1.7	0.1	0.0	<b>55.1</b>	Fair
2007	10.9	4.4	3.7	30.0	-3.5	8.7	0.0	<b>54.2</b>	Fair
2012	0.0	0.0	0.0	30.0	-2.7	4.0	0.0	<b>31.3</b>	Very Poor
2016	0.0	0.0	0.0	30.0	-0.1	4.1	0.0	<b>34.0</b>	Very Poor-Poor
2021	0.0	0.0	0.0	30.0	-1.9	2.4	0.0	<b>30.5</b>	Very Poor

## BELOW CHOKECHERRY SPRING - STUDY NO. 18A-25



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Salt Mountain SE; Township 3S, Range 7W, Section 30  
NAD 83 UTM ZONE 12, 358136 East 4488203 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

135  
154° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Standard

### Directions to Site

Turn east off of Skull Valley Road between mile markers 25 and 26 and travel 2.4 miles, staying right on the main road, to the Delle Ranch ponds and trees; the road then turns south. From Delle Ranch, proceed south for 2.4 miles to an intersection on the right (west) heading to Salt Mountain; there will be a red post on the east side of the road. Stay to the left (south) and continue for 0.8 miles to another intersection. Turn left (east) and proceed 0.25 miles along Chokecherry Creek. From this point, walk south across the creek bed into the chaining area where the study is located. The 0-foot baseline stake is 33 paces from the witness post at 141 degrees magnetic and is marked with browse tag #135.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	SALT MOUNTAIN
Elevation	5,600ft (1,707m)
Aspect	West
Slope	5-10%
Sample Dates	07/23/1997, 07/30/2002, 06/05/2007, 06/12/2012, 07/19/2016, 06/08/2021

**Table 18A-25.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Big Pole	-	August 2009	44470
Chaining - One-Way Ely Chain	BLM-ESR	-	November 2009	9500
Seeding - Aerial Before	BLM-ESR	-	October 2009	9808
Seeding - Aerial After	BLM-ESR	-	December 2009	4900

**Table 18A-25.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
BLM Big Pole Fire ESR			Aerial	Oct 2009	9808
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass		2.00	0.00
G	Agropyron fragile	Siberian Wheatgrass		2.00	0.00
G	Pascopyrum smithii	Western Wheatgrass		2.00	0.00
G	Poa secunda	Canby Bluegrass		1.00	0.00
G	Psathyrostachys juncea	Russian Wildrye		1.00	0.00
F	Achillea millefolium	Western Yarrow		0.25	0.00
F	Linum perenne	Lewis Blue Flax		0.75	0.00
F	Medicago sativa	Alfalfa		0.50	0.00

Mix Name			Application Type	Application Date	Acres
BLM Big Pole Fire ESR			Aerial	Dec 2009	4900
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush		0.50	0.00

**Wildlife Habitat and Vegetation History****Table 18A-25.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
California Bighorn	substantial	year-long
Mule Deer	crucial	winter/spring
Rocky Mountain Elk	crucial	winter/spring

**Table 18A-25.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush/Annual Grass	Phase I
1989	Mountain Big Sagebrush	Phase I
1997	Mountain Big Sagebrush/Perennial Grass	Phase I
2002	Mountain Big Sagebrush/Perennial Grass	Phase I
2007	Mountain Big Sagebrush/Perennial Grass	Phase I
2012	Perennial Grass	No Encroachment
2016	Perennial Grass	No Encroachment
2021	Perennial Grass/Mountain Big Sagebrush	No Encroachment

**Site Notes**

The study is located a half of a mile west of Chokecherry Spring on a low-lying alluvial site near an intermittent drainage channel. Historically, the area was a large mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community surrounded by singleleaf pinyon (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) woodland. The woodland was apparently chained and seeded prior to study establishment, and some of the pinyon-juniper trees on the periphery of the study had been bullhogged prior to the 2007 sampling. The whole area then burned as part of the Big Pole wildfire in 2009.

**Soils****Table 18A-25.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.3	44.0	31.4	24.6	3.2	6.3	236.8	0.6	07/23/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Upland Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R028AY310UT
States and Transitions	Current State: Community Phase 5.1

When this site was established in 1983, it was dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with other shrubs and Utah juniper (*Juniperus osteosperma*) scattered throughout the area (Photos, Pre-1992 Data, Table 18A-25.12, Table 18A-25.13). However, the fire in 2009 completely removed the shrub overstory (Table 18A-25.1), causing the site to transition to a perennial grass community type. The understory was dominated by the introduced annual grass cheatgrass (*Bromus tectorum*) in 1983 (Photos), but most of the cover was contributed by the perennial grass species Sandberg bluegrass (*Poa secunda*) and crested wheatgrass (*Agropyron cristatum*) in most other sample years. However, the introduced perennial grass bulbous bluegrass (*Poa bulbosa*) increased significantly in 2021 and contributed the most cover of any herbaceous species that year (Table 18A-25.10). Forbs have been diverse and moderately abundant through the duration of the study (Table 18A-25.11). Without another major disturbance, this study site will likely remain in this or a similar state in future sample years. Deer winter range has never been in good condition and has ranged between excellent and very poor: this change can be attributed to the loss of preferred browse during the Big Pole wildfire. More specifically, deer winter range condition has been considered very poor to poor since 2012 due to the lack of preferred browse species (Table 18A-25.15).

**Trend Summary Tables****Table 18A-25.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	15.6	2.8	-	-	-	-
2002	18.4	3.0	0.6	18.9	3.0	2.3
2007	19.5	1.8	3.6	22.4	2.1	6.3
2012	0.1	1.1	-	0.4	2.1	-
2016	1.3	3.8	-	1.2	5.0	-
2021	2.6	5.1	-	3.9	9.0	-

**Table 18A-25.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	312	348	205	230	9.3	19.6	0.9	4.9
2002	196	361	157	216	6.7	26.8	0.9	6.6
2007	206	375	380	243	4.1	23.1	6.1	6.4
2012	231	344	385	297	15.9	26.6	6.4	16.7
2016	187	419	284	201	6.1	33.8	12.4	5.3
2021	75	428	39	175	0.4	34.1	0.4	2.3

**Table 18A-25.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	2.7	6.7	54.3	1.6	2.2	53.5
2002	2.9	2.7	49.9	1.8	3.6	60.0
2007	8.0	1.0	35.6	2.2	3.3	66.8
2012	9.2	0.0	56.4	1.1	4.9	66.3
2016	30.1	0.1	16.2	5.0	4.0	56.5
2021	20.8	0.1	31.7	7.5	5.0	42.6

**Table 18A-25.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1997	11	11	1	-	44
2002	4	16	1	-	31
2007	10	16	-	-	31
2012	4	-	-	-	-
2016	19	2	-	-	2
2021	13	7	-	-	7
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	13.8 (34.1)	30.8 (76.1)	-	-	-
2007	66.1 (163.2)	10.7 (26.5)	21.5 (53.0)	-	-
2012	2.9 (7.2)	-	-	-	-
2016	36.3 (89.7)	0.7 (1.7)	-	-	-
2021	29.0 (71.7)	2.7 (6.6)	-	2.3 (5.7)	-

**Table 18A-25.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency											
1997	200	4	312	2	-	-	-	2	246	14	1	-
2002	279	10	194	-	-	-	51	-	149	-	-	-
2007	256	15	200	1	-	-	28	-	269	42	-	-
2012	217	11	228	-	-	-	47	-	158	8	1	37
2016	353	4	183	-	7	-	69	1	177	18	-	1
2021	251	11	65	-	-	62	354	-	-	18	-	-
year	Average Cover (%)											
1997	12.8	0.0	9.3	0.0	-	-	-	0.0	6.4	0.3	0.0	-
2002	20.6	0.0	6.7	-	-	-	2.4	-	3.8	-	-	-
2007	13.8	0.1	4.1	0.0	-	-	0.4	-	7.4	1.5	-	-
2012	15.5	0.2	15.7	-	-	-	1.5	-	6.2	0.8	0.0	2.5
2016	24.6	0.0	6.0	-	0.7	-	2.6	0.0	4.2	1.8	-	0.0
2021	10.2	0.0	0.4	-	-	1.8	21.8	-	-	0.3	-	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 18A-25.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Cirsium neomexicanum <sup>a</sup> (New Mexico thistle)	Claytonia perfoliata ssp. perfoliata (miner's lettuce)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium aparine <sup>a</sup> (stickywilly)
year	Nested Frequency																
1997	-	0	73	-	-	8	3	6	20	7	-	89	11	22	5	6	-
2002	-	3	3	3	-	-	-	-	-	-	-	108	-	3	-	9	-
2007	-	2	76	5	-	4	-	13	29	-	3	87	8	200	-	12	1
2012	4	-	12	13	-	-	-	6	5	-	-	20	1	31	-	99	-
2016	12	-	-	20	2	-	-	4	-	1	-	10	-	5	-	253	-
2021	19	-	-	14	-	-	-	-	-	-	-	-	-	-	-	17	-
year	Average Cover (%)																
1997	-	0.0	0.6	-	-	0.0	0.0	0.0	0.0	0.2	-	0.2	0.0	0.1	0.0	0.0	-
2002	-	0.0	0.0	0.0	-	-	-	-	-	-	-	0.5	-	0.0	-	0.0	-
2007	-	0.0	0.3	0.0	-	0.1	-	0.0	0.1	-	0.0	0.2	0.0	1.4	-	0.1	0.0
2012	0.1	-	0.0	0.0	-	-	-	0.2	0.0	-	-	0.1	0.0	0.1	-	3.1	-
2016	0.6	-	-	0.1	0.0	-	-	0.0	-	0.0	-	0.0	-	0.0	-	12.0	-
2021	0.5	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	0.1	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES																		
Hackelia patens (spotted stickseed)																		
Lactuca serriola <sup>ai</sup> (prickly lettuce)																		
Lathyrus brachycalyx (Bonneville pea)																		
Linum lewisii (Lewis flax)																		
Lomatium (desertparsley)																		
Lygodesmia (skeletonplant)																		
Medicago sativa <sup>i</sup> (alfalfa)																		
Microsteris gracilis <sup>a</sup> (slender phlox)																		
Phlox longifolia (longleaf phlox)																		
Polygonum douglasii <sup>a</sup> (Douglas' knotweed)																		
Sanguisorba minor <sup>a</sup> (small burnet)																		
Silene antirrhina <sup>a</sup> (sleepy silene)																		
Sphaeralcea grossularifolia (gooseberry/leaf globemallow)																		
Taraxacum officinale (common dandelion)																		
Tragopogon dubius <sup>ai</sup> (yellow salsify)																		
Verbena bracteata (bigbract verbenae)																		
Veronica biloba <sup>ai</sup> (two-lobed speedwell)																		
year	Nested Frequency																	
1997	10	-	149	-	0	2	-	2	57	3	-	58	-	15	35	-	21	
2002	-	-	162	-	32	-	-	3	39	-	-	61	-	-	-	-	-	
2007	-	5	182	-	15	-	-	20	56	-	-	320	-	-	-	-	-	
2012	-	2	260	1	2	-	7	4	45	-	4	365	4	2	-	1	9	
2016	-	13	181	-	-	-	2	-	45	-	-	12	-	-	5	-	24	
2021	-	3	95	-	-	-	-	-	103	-	-	-	0	-	6	-	-	
year	Average Cover (%)																	
1997	0.3	-	3.4	-	0.0	0.0	-	0.0	0.4	0.0	-	0.1	-	0.1	0.2	-	0.1	
2002	-	-	5.8	-	0.6	-	-	0.0	0.1	-	-	0.3	-	-	-	-	-	
2007	-	0.0	5.3	-	0.1	-	-	0.1	0.5	-	-	4.3	-	-	-	-	-	
2012	-	0.0	15.1	0.0	0.0	-	0.2	0.0	0.6	-	0.2	3.1	0.2	0.0	-	0.0	0.0	
2016	-	0.1	4.4	-	-	-	0.1	-	0.3	-	-	0.1	-	-	0.1	-	0.0	
2021	-	0.2	0.6	-	-	-	-	-	1.2	-	-	-	0.0	-	0.1	-	-	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 18A-25.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES					
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)					
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)					
Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)					
Gutierrezia sarothrae (broom snakeweed)					
Juniperus osteosperma <sup>i</sup> (Utah juniper)					
year	Line Intercept Cover (%)				
1997	-	-	-	-	-
2002	18.6	1.1	0.3	1.9	2.3
2007	22.4	2.1	-	-	6.3
2012	0.1	2.1	0.3	-	-
2016	1.2	4.4	-	0.6	-
2021	3.7	6.5	0.2	2.5	-
year	Quadrat Cover (%)				
1997	15.2	2.0	0.4	0.8	-
2002	18.0	1.1	0.4	1.9	0.6
2007	19.5	1.8	-	-	3.6
2012	0.0	1.1	0.1	-	-
2016	1.3	2.9	-	0.9	-
2021	2.6	2.6	0.0	2.5	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 18A-25.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1997	10840	2420	68	30	3	20	0	2	66/104
2002	10920	-	27	69	4	8	1	2	50/58
2007	6320	-	2	81	17	23	13	44	64/75
2012	320	-	50	50	0	0	0	6	31/26
2016	280	-	0	100	0	0	7	0	59/73
2021	260	-	0	69	31	8	0	31	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	1320	-	12	86	2	2	0	0	43/56
2002	840	-	2	81	17	0	0	33	41/55
2007	1100	40	2	80	18	6	0	20	41/53
2012	820	-	2	98	0	0	0	0	34/49
2016	1020	40	0	90	10	0	0	8	46/77
2021	520	-	12	58	31	23	0	31	- / -
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1997	460	20	56	39	4	0	0	0	53/56
2002	160	-	13	50	38	13	13	13	56/69
2007	80	-	50	25	25	0	25	50	73/100
2012	300	-	13	87	0	0	0	0	34/51
2016	-	-	-	-	-	-	-	-	78/136
2021	500	-	0	80	20	0	0	20	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	2900	-	10	87	3	0	0	0	25/24
2002	2120	-	1	68	31	1	0	18	22/24
2007	-	-	-	-	-	-	-	-	21/30
2012	20	-	100	0	0	0	0	0	24/27
2016	240	40	25	67	8	0	0	8	32/48
2021	4000	40	45	53	3	0	0	3	- / -
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1997	40	-	50	50	0	0	0	50	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	40	-	0	100	0	100	0	0	- / -
2012	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1997	-	-	-	-	-	-	-	-	37/140
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	56/124
2012	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Rhus trilobata var. trilobata<sup>p</sup> -- (skunkbush sumac)</b>									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	113/279
2016	40	-	0	100	0	0	0	0	43/106

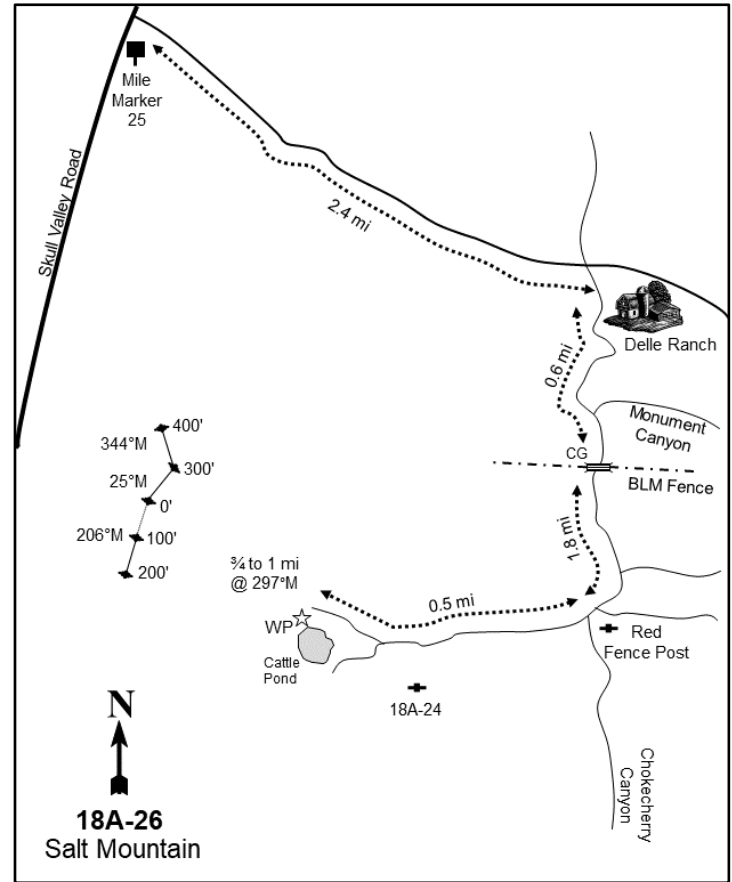
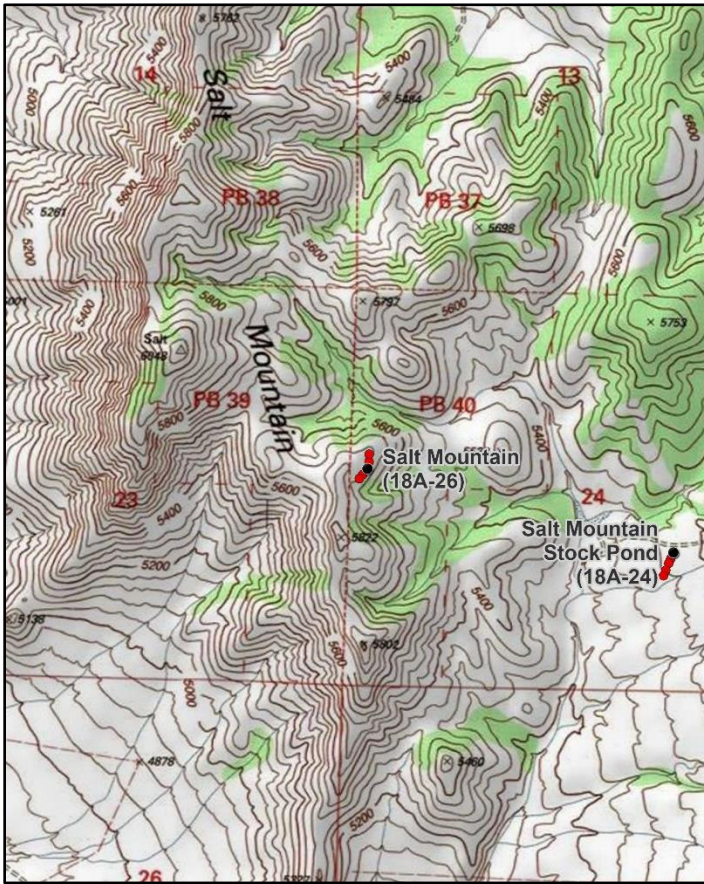
t - Tree Species; p - Preferred Browse; i - Introduced Species



**Table 18A-25.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	19.5	14.2	15.0	30.0	-7.0	9.8	0.0	<b>81.5</b>	Good-Excellent
2002	23.0	13.7	13.3	30.0	-5.0	10.0	0.0	<b>85.0</b>	Excellent
2007	28.0	10.0	1.1	30.0	-3.1	10.0	0.0	<b>75.9</b>	Good
2012	0.5	0.0	0.0	30.0	-11.9	10.0	0.0	<b>28.6</b>	Very Poor
2016	1.5	0.0	0.0	30.0	-4.5	10.0	0.0	<b>37.0</b>	Very Poor-Poor
2021	4.9	0.0	0.0	24.7	-0.3	4.7	0.0	<b>33.9</b>	Very Poor-Poor

## SALT MOUNTAIN - STUDY NO. 18A-26

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Salt Mountain SW; Township 3S, Range 8W, Section 24  
NAD 83 UTM ZONE 12, 355675 East 4489455 North

**Transect Information**

Browse Tag # (0' Stake)	169
Transect Bearing	206° magnetic (Line 2: 206° magnetic, Line 3: 6° magnetic, Line 4: 344° magnetic)
Length	400ft
Belt Placement	Line 1 (71ft), Line 2 (34ft), Line 3 (11ft), Line 4 (59ft & 95ft)
Belt Marker Placement	Standard

**Directions to Site**

Turn east off of Skull Valley Road between mile markers 25 and 26 and go 2.4 miles, staying right on the main road. At the Delle Ranch ponds and trees, the road turns south. From Delle Ranch, proceed south for 2.4 miles to an intersection to the right (west) heading to Salt Mountain; there will be a red post on the east side of the road. Turn right (west) and continue for 0.5 miles to a stock pond, passing study 18A-24. From the right fork of the road to the north of the stock ponds, walk at 297 degrees magnetic for 0.75 to 1.0 miles to the study area. An old marked browse study runs along the ridge at the top of this slope while the trend study is located among the sparse junipers and cliffrose below the ridge. The baseline runs north across the slope and the 0-foot baseline stake is marked by browse tag #169.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	SALT MOUNTAIN
Elevation	5,600ft (1,707m)
Aspect	Southeast
Slope	55%
Sample Dates	07/30/2002, 06/05/2007, 06/12/2012, 07/19/2016, 06/08/2021

**Table 18A-26.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Big Pole	-	August 2009	44470
Seeding - Aerial	BLM-ESR	-	October 2009	9808
Seeding - Aerial	BLM-ESR	-	December 2009	4900

**Table 18A-26.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
BLM Big Pole Fire ESR			Aerial	Oct 2009	9808
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass		2.00	0.00
G	Agropyron fragile	Siberian Wheatgrass		2.00	0.00
G	Pascopyrum smithii	Western Wheatgrass		2.00	0.00
G	Poa secunda	Canby Bluegrass		1.00	0.00
G	Psathyrostachys juncea	Russian Wildrye		1.00	0.00
F	Achillea millefolium	Western Yarrow		0.25	0.00
F	Linum perenne	Lewis Blue Flax		0.75	0.00
F	Medicago sativa	Alfalfa		0.50	0.00

Mix Name			Application Type	Application Date	Acres
BLM Big Pole Fire ESR			Aerial	Dec 2009	4900
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush		0.50	0.00

**Wildlife Habitat and Vegetation History****Table 18A-26.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
California Bighorn	substantial	year-long
Mule Deer	substantial	winter
Rocky Mountain Elk	crucial	winter/spring

**Table 18A-26.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush/Perennial Grass	Phase I
1989	Mountain Big Sagebrush/Perennial Grass	Phase I
2002	Mountain Big Sagebrush/Perennial Grass	Phase I
2007	Mountain Big Sagebrush/Annual Grass	Phase I
2012	Annual Grass	No Encroachment
2016	Perennial Grass/Annual Forb	Phase I
2021	Perennial-Annual Grass	Phase I

**Site Notes**

The study is located on the east side of Salt Mountain, an area which was comprised of a Stansbury cliffrose (*Purshia stansburiana*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community at the time of study establishment. The whole area then burned as part of the Big Pole wildfire in 2009.

**Soils****Table 18A-26.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.4	47.3	20.7	32.0	1.7	6.0	156.8	0.7	07/30/2002

**Site Potential**

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Stony Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

From study establishment in 1983 through the 2007 sample year, the browse component of this site was dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with Stansbury cliffrose (*Purshia stansburiana*) present in lesser amounts (Photos, Pre-1992 Data, Table 18A-26.12, Table 18A-26.13). The herbaceous understory was dominated by perennial grasses, namely bluebunch wheatgrass (*Pseudoroegneria spicata*) and Sandberg bluegrass (*Poa secunda*), until 2002; in the 2007 sample year the annual grass cheatgrass (*Bromus tectorum*) was the most abundant herbaceous species. A 2009 wildfire virtually eliminated the browse component, and the site has remained dominated by perennial grasses, annual grasses, and/or annual forbs in all sample years since 2012 (Table 18A-26.7, Table 18A-26.10, Table 18A-26.11). Utah juniper (*Juniperus osteosperma*) trees were present from 1983 through the 2007 sample year, then were completely removed by the burn (Photos, Table 18A-26.12, Table 18A-26.13). No juniper was sampled in 2012, but young trees were recorded with low density in point-quarter data in 2016 and 2021 (Table 18A-26.14). Although the site is considered to be within Phase I of woodland succession as of 2021 (Table 18A-26.4), the reappearance of young trees indicates that infilling could potentially occur in future sample years. Deer winter range has never been in good condition. Condition has ranged between poor to very poor and can be attributed to the consistent presence of cheatgrass, and lack of perennial forbs and preferred browse. More specifically, deer winter range condition has been considered very poor since 2012 (Table 18A-26.15).

**Trend Summary Tables****Table 18A-26.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2002	3.7	0.3	2.2	6.8	0.1	2.6
2007	5.2	0.1	1.4	7.8	0.2	3.0
2012	-	0.1	-	-	-	-
2016	-	0.7	-	-	0.4	-
2021	-	0.9	-	-	0.3	-

**Table 18A-26.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2002	361	307	90	3	8.5	11.9	1.3	0.0
2007	453	250	219	4	18.2	11.6	2.1	0.0
2012	456	197	350	31	26.1	10.1	11.3	1.9
2016	237	173	378	38	2.1	13.8	13.8	2.8
2021	334	171	177	9	8.2	10.1	2.5	0.0

**Table 18A-26.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2002	18.7	5.2	30.5	7.9	16.3	29.2
2007	12.6	7.2	29.3	9.1	16.9	38.4
2012	10.7	0.0	31.7	5.2	23.6	48.3
2016	32.6	0.3	10.1	14.0	25.3	30.7
2021	17.1	0.4	34.8	10.3	22.7	22.3

**Table 18A-26.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2002	-	17	-	19
2007	1	18	2	52
2012	-	3	-	8
2016	-	4	-	12
2021	-	3	1	5
Year	Days Use Per Acre (ha)			
2002	-	56.3 (139.0)	-	-
2007	-	39.6 (97.7)	3.4 (8.3)	-
2012	-	2.7 (6.6)	-	-
2016	-	8.1 (19.9)	-	-
2021	-	4.7 (11.6)	0.7 (1.7)	-

**Table 18A-26.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Agropyron fragile <sup>i</sup> (Siberian wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea <sup>i</sup> (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency						
2002	-	-	-	361	259	-	173
2007	-	-	-	453	192	-	145
2012	1	-	-	456	104	-	130
2016	2	29	-	237	14	0	142
2021	-	18	0	334	43	4	127
year	Average Cover (%)						
2002	-	-	-	8.5	5.3	-	6.6
2007	-	-	-	18.2	3.7	-	7.9
2012	0.0	-	-	26.1	2.3	-	7.7
2016	0.0	1.7	-	2.1	0.1	0.0	12.0
2021	-	1.1	0.0	8.2	0.3	0.2	8.4

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 18A-26.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum alyssoides <sup>ai</sup> (pale madwort)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littledod false flax)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Chamaesyce (sandmat)	Cirsium neomexicanum <sup>a</sup> (New Mexico thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Gilia inconspicua <sup>a</sup> (shy gilia)	Helianthus annuus <sup>ai</sup> (common sunflower)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)
year	Nested Frequency																
2002	-	-	3	-	-	-	12	-	-	-	-	-	74	1	-	2	4
2007	-	1	-	-	3	-	70	-	0	-	9	72	122	-	-	3	26
2012	14	2	-	3	-	-	13	-	-	3	-	-	346	-	-	8	-
2016	-	-	-	15	3	6	64	12	4	-	3	-	365	-	1	14	1
2021	-	3	-	49	-	-	35	-	-	-	25	-	97	-	1	4	-
year	Average Cover (%)																
2002	-	-	0.0	-	-	-	0.0	-	-	-	-	-	1.2	0.0	-	0.0	0.0
2007	-	0.0	-	-	0.0	-	0.2	-	0.0	-	0.0	0.1	1.6	-	-	0.0	0.1
2012	0.1	0.1	-	0.0	-	-	0.0	-	-	0.0	-	-	10.8	-	-	0.0	-
2016	-	-	-	0.1	0.0	0.0	0.3	0.0	0.0	-	0.0	-	11.9	-	0.0	0.1	0.0
2021	-	0.0	-	0.2	-	-	0.1	-	-	-	0.4	-	1.7	-	0.0	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Linum perenne <sup>i</sup> (blue flax)	Medicago sativa <sup>i</sup> (alfalfa)	Microsteris gracilis <sup>a</sup> (slender phlox)	Salsola tragus <sup>ai</sup> (prickly Russian thistle)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Tragopogon dubius <sup>ai</sup> (yellow salsify)
year	Nested Frequency						
2002	-	-	-	-	-	-	-
2007	-	-	-	-	18	-	-
2012	0	15	2	-	56	-	20
2016	1	22	-	48	-	6	27
2021	-	6	-	-	-	-	5
year	Average Cover (%)						
2002	-	-	-	-	-	-	-
2007	-	-	-	-	0.0	-	-
2012	0.0	1.7	0.0	-	0.1	-	0.3
2016	0.0	2.7	-	0.3	-	0.1	1.0
2021	-	0.0	-	-	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 18A-26.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>i</sup> (Utah juniper)	Opuntia (pricklypear)	Purshia stansburiana <sup>p</sup> (Stansbury cliffrose)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)					
2002	4.4	0.1	2.6	-	2.4	0
2007	5	0	3	0.2	2.8	-
2012	-	-	-	-	-	-
2016	-	0.3	-	0.1	-	-
2021	-	0.2	-	0.1	-	-
year	Quadrat Cover (%)					
2002	3.5	0.0	2.2	0.1	0.2	0.2
2007	4.0	0.0	1.4	0.0	1.2	0.0
2012	-	0.1	-	-	-	-
2016	-	0.3	-	0.4	-	-
2021	-	0.5	-	0.4	-	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 18A-26.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
2002	960	20	10	81	8	33	0	0	56/78
2007	1000	100	14	82	4	26	2	40	68/105
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	30/38
2021	-	-	-	-	-	-	-	-	-/-
<b>Ephedra nevadensis<sup>p</sup> -- (Nevada jointfir)</b>									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	96/126
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
2002	60	-	0	100	0	0	0	0	32/48
2007	100	40	0	100	0	0	0	0	16/22
2012	20	-	100	0	0	0	0	0	14/16
2016	500	-	12	88	0	0	0	0	25/30
2021	540	-	30	70	0	0	0	0	-/-
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
2002	40	-	0	100	0	0	0	0	-/-
2007	40	-	0	100	0	0	0	0	-/-
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Opuntia -- (pricklypear)</b>									
2002	80	-	0	100	0	0	0	0	9/27
2007	80	-	0	100	0	0	0	0	16/22
2012	-	-	-	-	-	-	-	-	-/-
2016	60	-	0	67	33	0	0	33	18/46
2021	60	-	0	100	0	0	0	0	-/-
<b>Purshia stansburiana<sup>p</sup> -- (Stansbury cliffrose)</b>									
2002	120	-	33	67	0	17	17	0	150/159
2007	100	-	20	60	20	40	40	0	137/129
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	42/55
2021	-	-	-	-	-	-	-	-	-/-
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
2002	-	-	-	-	-	-	-	-	70/131
2007	20	-	0	0	100	0	0	100	67/121

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 18A-26.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

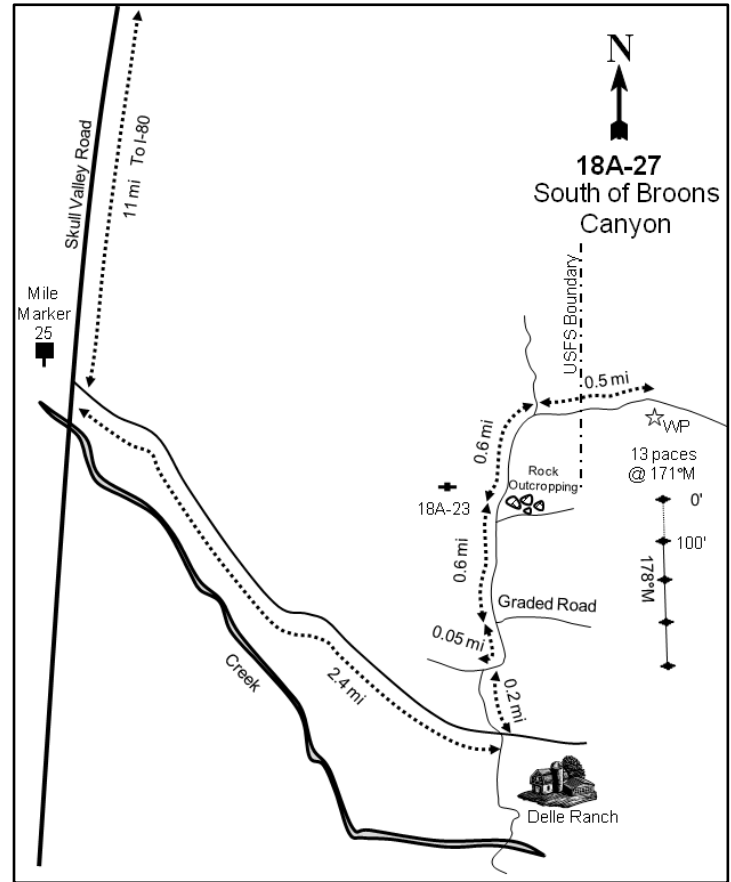
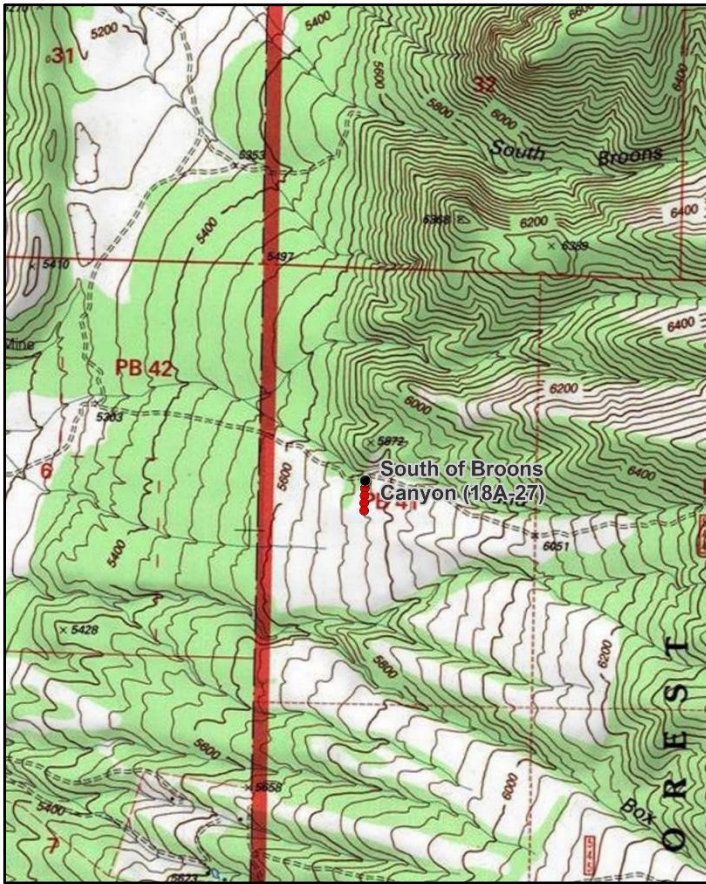
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2002	40	-	-	-	-	-	22.2
2007	34	-	-	38	54	8	30.6
2016	2	100	-	-	-	-	-
2021	2	-	100	-	-	-	3.0



**Table 18A-26.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2002	4.7	0.0	0.0	23.8	-6.4	0.0	0.0	<b>22.2</b>	Very Poor
2007	10.5	12.1	8.1	23.2	-13.6	0.0	0.0	<b>40.2</b>	Poor
2012	0.0	0.0	0.0	20.2	-19.6	3.8	0.0	<b>4.4</b>	Very Poor
2016	0.0	0.0	0.0	27.7	-1.6	5.5	0.0	<b>31.6</b>	Very Poor
2021	0.0	0.0	0.0	20.2	-6.1	0.0	0.0	<b>14.1</b>	Very Poor

## SOUTH OF BROONS CANYON - STUDY NO. 18A-27

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Salt Mountain NE; Township 3S, Range 7W, Section 05  
NAD 83 UTM ZONE 12, 359359 East 4494035 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

3977  
178° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Standard

**Directions to Site**

From I-80, proceed south on Skull Valley Road for 11 miles. Turn east onto a dirt road (between mile posts 25 and 26) and continue along this road for 2.4 miles to Delle Ranch. From the creek crossing on the road at Delle Ranch, proceed north towards Broons Canyon for 0.2 miles to an intersection. Go east for 0.5 miles to another intersection. Turn left and travel north for 0.65 miles until you reach a rock outcropping on the right-hand (east) side of the road and the location of study 18A-23. Continue 0.6 miles to a fork and go right (east). Proceed for approximately 0.5 miles to the USFS boundary fence. From the fence, go 0.4 miles to a witness post on the right (south) side of the road. From this short fencepost, walk 13 paces south to the 0-foot baseline stake. The 400-foot stake has multiple stakes in the vicinity; the baseline should be based off of the one that is shorter and bent over.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	SKULL VALLEY NORTH
Elevation	5,800ft (1,768m)
Aspect	West
Slope	18%
Sample Dates	07/22/1997, 07/31/2002, 06/04/2007, 06/11/2012, 07/19/2016, 06/07/2021

**Table 18A-27.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Big Pole	-	August 2009	44470

**Wildlife Habitat and Vegetation History****Table 18A-27.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
California Bighorn	substantial	year-long
Mule Deer	crucial	winter/spring
Rocky Mountain Elk	substantial	spring/fall

**Table 18A-27.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Bitterbrush	Phase I
1989	Bitterbrush	Phase I
1997	Bitterbrush/Annual Grass	Phase I
2002	Bitterbrush/Annual Grass	Phase I
2007	Bitterbrush/Annual Grass	Phase I
2012	Annual Grass	No Encroachment
2016	Annual Grass	No Encroachment
2021	Annual Grass-Forb	No Encroachment

**Site Notes**

The study lies on land administered by the U.S. Forest Service just above the enclosure located in Round Canyon. The area was an antelope bitterbrush (*Purshia tridentata*) community with interspersed mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) at study establishment. The site was treated as part of the Stansbury juniper prescribed burn and mechanical treatment project in the Fall of 2007 following the site being read that year. The whole area then burned as part of the Big Pole wildfire in 2009, which burned 44,470 acres. The wildfire removed all of the shrub species from the site.

**Soils****Table 18A-27.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	6.7	50.0	27.4	22.6	3.6	16.8	275.2	0.4	07/22/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Stony Loam (Antelope Bitterbrush)
NRCS Ecological Site #	R028AY456UT
States and Transitions	No state and transition model is available for this ecological site.

From study establishment in 1983 through 2007, this site was dominated by a dense stand of antelope bitterbrush (*Purshia tridentata*) with mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) also present to a lesser extent (Photos, Pre-1992 Data, Table 18A-27.12, Table 18A-27.13). Utah juniper (*Juniperus osteosperma*) was scattered throughout the site, placing it in Phase I of woodland succession (Table 18A-27.4, Table 18A-27.14). In 2009, this overstory shrub and tree component was completely removed by a wildfire (Table 18A-27.1). The herbaceous understory has remained dominated by the introduced annual grass species cheatgrass (*Bromus tectorum*) since 1997. Due to differences in sampling methodologies, annual grasses were not recorded in 1983 or 1992, but photos show that they may have been present in these sample years (Table 18A-27.10). Forbs have been diverse throughout the study years and cover has fluctuated, but they have generally been composed of annual and weedy species. Annual forbs, namely the introduced species redstem stork's bill (*Erodium cicutarium*); yellow salsify (*Tragopogon dubius*); and native species New Mexico thistle (*Cirsium neomexicanum*), were a co-dominant site component in 2021 (Table 18A-27.11). The large amounts of cheatgrass threaten the resiliency of the site and increase fuel loads, exacerbating the risk of catastrophic fire. Deer winter range has never been in

good condition; condition has ranged between fair and very poor which can be attributed to the consistent presence of cheatgrass. Furthermore, deer winter range condition has been considered to be very poor since 2012 due to the lack of preferred browse species and high abundance of annual grass (Table 18A-27.15).

### Trend Summary Tables

**Table 18A-27.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	36.4	0.8	0.0	-	-	-
2002	45.8	0.5	1.0	54.6	0.3	0.2
2007	31.2	0.4	0.8	48.7	-	1.8
2012	-	-	-	-	-	-
2016	-	0.1	-	-	-	-
2021	0.4	0.0	-	0.7	-	-

**Table 18A-27.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	408	254	202	193	10.8	8.2	1.9	5.9
2002	409	78	80	104	25.2	1.7	0.4	2.6
2007	420	173	362	269	15.9	6.2	11.4	15.2
2012	466	95	439	99	39.4	3.3	15.2	2.8
2016	427	125	373	28	31.7	4.1	23.6	0.3
2021	337	156	255	93	15.2	8.4	13.8	2.8

**Table 18A-27.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	3.7	1.2	61.8	1.6	7.9	56.4
2002	4.0	1.0	48.8	0.6	8.0	66.8
2007	4.5	1.4	34.8	1.2	10.6	68.4
2012	4.5	0.0	44.1	1.2	17.9	54.1
2016	8.8	0.2	22.4	5.7	12.6	56.4
2021	8.4	0.3	52.9	1.7	16.5	36.8

**Table 18A-27.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	1	27	1	35
2002	-	24	-	36
2007	-	17	8	32
2012	-	-	-	1
2016	6	2	-	-
2021	2	5	-	1
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	-	55.6 (137.4)	-	-
2007	-	79.1 (195.3)	0.7 (1.7)	-
2012	-	-	-	-
2016	1.5 (3.6)	0.7 (1.7)	-	-
2021	5.8 (14.3)	12.1 (29.8)	-	-

**Table 18A-27.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency							
Aristida purpurea (purple threeawn)	-	408	23	-	5	156	144	-
Bromus tectorum <sup>ai</sup> (cheatgrass)	-	409	8	-	5	23	48	-
Melica bulbosa (oniongrass)	-	420	22	-	1	121	76	-
Poa bulbosa <sup>i</sup> (bulbous bluegrass)	-	466	10	20	6	39	38	4
Poa fendleriana (muttongrass)	-	427	-	16	3	53	57	-
Poa secunda (Sandberg bluegrass)	3	337	-	76	5	22	69	-
Pseudoroegneria spicata (bluebunch wheatgrass)	-	-	-	-	-	-	-	-
Vulpia myuros <sup>ai</sup> (annual fescue)	-	-	-	-	-	-	-	-

year	Average Cover (%)							
1997	-	10.8	0.3	-	0.0	4.2	3.7	-
2002	-	25.2	0.4	-	0.1	0.2	1.0	-
2007	-	15.9	0.2	-	0.0	2.6	3.4	-
2012	-	39.4	0.2	0.1	0.2	0.8	2.0	0.0
2016	-	31.7	-	0.1	0.0	0.7	3.3	-
2021	0.2	15.2	-	3.4	0.0	0.1	4.7	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 18A-27.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Agoseris glauca (pale agoseris)	3	66	44	1	2	5	5	6	5	5	-	36	0	4	3	-	16
Allium (onion)	-	27	32	-	1	-	-	7	-	-	-	29	-	13	-	-	-
Alyssum desertorum <sup>ai</sup> (desert madwort)	10	35	69	4	0	2	-	56	-	1	41	70	5	11	59	5	-
Astragalus (milkvetch)	1	11	282	-	-	-	-	1	-	18	-	81	2	16	-	3	12
Balsamorhiza sagittata (arrowleaf balsamroot)	-	-	59	-	-	-	-	-	-	26	-	-	4	12	-	-	4
Calochortus nuttallii (sego lily)	-	-	31	0	1	-	-	-	2	47	-	2	2	40	-	-	8
Castilleja linariifolia (Wyoming Indian paintbrush)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chenopodium <sup>a</sup> (goosefoot)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cirsium neomexicanum <sup>a</sup> (New Mexico thistle)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Claytonia perfoliata ssp. perfoliata (miner's lettuce)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Comandra umbellata (bastard toadflax)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Crepis intermedia (limestone hawkbeard)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Descurainia <sup>a</sup> (tansymustard)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Draba <sup>a</sup> (draba)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

year	Average Cover (%)																
1997	0.0	0.5	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.2	-	0.1	0.0	0.1	0.0	-	0.1
2002	-	0.5	0.1	-	0.0	-	-	0.0	-	-	-	0.1	-	0.2	-	-	-
2007	0.5	0.2	0.5	0.1	0.0	0.0	-	0.2	-	0.0	0.7	1.3	0.0	0.2	0.5	0.0	-
2012	0.0	0.0	2.8	-	-	-	-	0.0	-	1.6	-	0.6	0.0	0.5	-	0.0	0.0
2016	-	-	0.3	-	-	-	-	-	-	1.3	-	-	0.0	0.2	-	-	0.0
2021	-	-	0.4	0.0	0.1	-	-	-	0.0	3.5	-	0.0	0.1	0.8	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Eriogonum racemosum (redroot buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium boreale (northern bedstraw)	Hackelia patens (spotted stickseed)	Helianthus annuus <sup>ai</sup> (common sunflower)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lithospermum ruderale (western stone seed)	Lomatium grayi (Gray's biscuitroot)	Lygodesmia (skeletonplant)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>ai</sup> (tall tumbleweed)
year	Nested Frequency																
1997	2	34	18	93	-	11	-	3	19	13	14	11	-	60	2	110	-
2002	-	5	-	41	-	-	-	2	10	-	-	3	-	31	-	13	2
2007	1	95	176	42	-	5	-	4	73	-	-	62	2	35	-	323	7
2012	-	148	-	-	-	97	1	0	19	-	-	45	-	67	-	257	9
2016	-	324	-	4	6	79	-	0	5	-	-	3	-	1	-	-	-
2021	1	147	-	2	1	23	-	-	18	-	-	3	-	37	-	-	-
year	Average Cover (%)																
1997	0.0	0.3	0.4	3.3	-	0.1	-	0.6	0.4	0.1	0.0	0.2	-	0.3	0.0	0.7	-
2002	-	0.0	-	1.2	-	-	-	0.3	0.1	-	-	0.0	-	0.2	-	0.1	0.0
2007	0.0	0.9	8.0	1.5	-	0.0	-	0.5	3.3	-	-	0.4	0.0	0.3	-	7.5	0.0
2012	-	5.5	-	-	-	0.5	0.0	0.0	1.5	-	-	0.1	-	0.8	-	3.1	0.6
2016	-	20.9	-	0.0	0.0	0.6	-	0.0	0.1	-	-	0.0	-	0.0	-	-	-
2021	0.0	4.4	-	0.0	0.0	0.3	-	-	1.6	-	-	0.0	-	0.1	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Zizadenus paniculatus (foothill deathcamas)
year	Nested Frequency	
1997	11	-
2002	3	-
2007	-	-
2012	11	1
2016	32	3
2021	112	-
year	Average Cover (%)	
1997	0.1	-
2002	0.0	-
2007	-	-
2012	0.4	0.0
2016	0.4	0.0
2021	5.1	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 18A-27.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)						
	year	1997	2002	2007	2012	2016	2021
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	-	-	-	-	-	-	-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	15.2	-	-	0.3	0.2	39.4	-
Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	16.7	0	-	-	1.8	32	-
Gutierrezia sarothrae (broom snakeweed)	-	-	-	-	-	-	-
Juniperus osteosperma <sup>i</sup> (Utah juniper)	-	-	-	-	-	-	-
Purshia tridentata <sup>p</sup> (antelope bitterbrush)	-	-	0.7	-	-	-	-
year	Quadrat Cover (%)						
1997	13.2	0.1	-	0.7	0.0	23.1	-
2002	12.5	0.3	-	0.1	1.0	33.3	-
2007	11.8	0.0	-	0.4	0.8	19.4	-
2012	-	-	-	-	-	-	-
2016	-	0.1	-	-	-	-	-
2021	-	0.0	0.4	-	-	-	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 18A-27.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	231/287
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	54/82
2021	-	-	-	-	-	-	-	-	-/-
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1997	1700	140	8	78	14	18	0	5	68/94
2002	2220	-	5	82	14	12	0	8	75/96
2007	2000	240	1	64	35	7	0	41	87/125
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	100	-	20	80	0	0	0	0	41/73
2002	120	-	0	100	0	0	0	0	43/58
2007	60	-	0	67	33	0	0	0	37/61
2012	-	-	-	-	-	-	-	-	39/80
2016	40	-	0	100	0	0	0	0	59/128
2021	20	-	0	100	0	0	0	0	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	0	100	0	100	0	0	37/52
2007	20	-	0	0	100	0	0	100	-/-
2012	-	-	-	-	-	-	-	-	59/91
2016	-	-	-	-	-	-	-	-	135/197
2021	20	-	0	100	0	0	0	0	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	840	40	12	88	0	0	0	0	32/30
2002	220	-	0	82	18	0	0	0	25/30
2007	20	-	0	100	0	0	0	0	26/41
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Juniperus osteosperma<sup>i</sup> -- (Utah juniper)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	0	100	0	0	0	0	-/-
2007	20	-	0	100	0	0	0	0	-/-
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1997	680	20	3	97	0	15	0	0	134/231
2002	1580	-	1	90	9	56	29	4	137/242
2007	900	40	2	89	9	27	22	9	143/225
2012	-	-	-	-	-	-	-	-	33/45
2016	-	-	-	-	-	-	-	-	45/133

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 18A-27.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

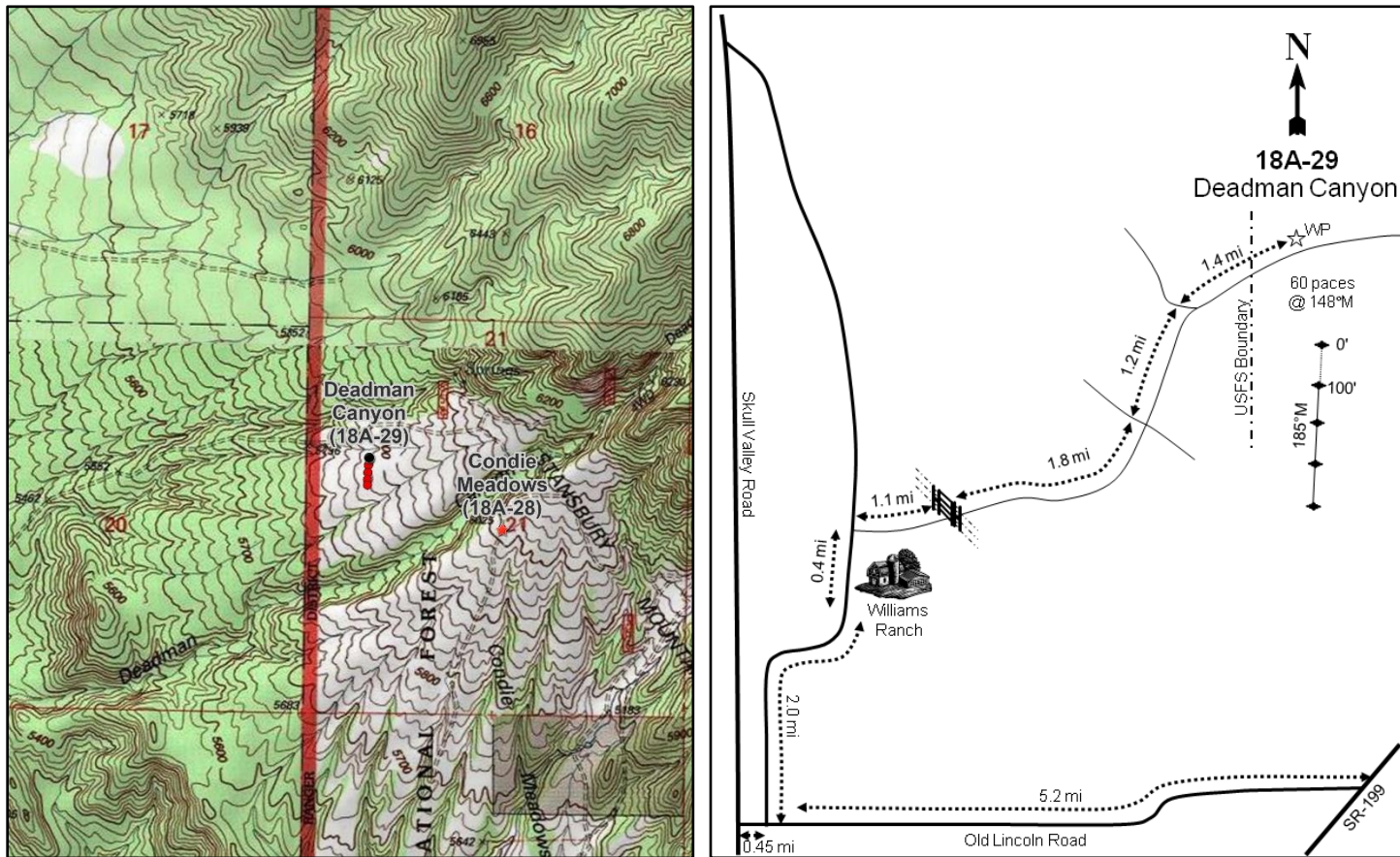
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2002	61	-	-	-	-	-	11.6
2007	61	-	-	65	35	-	17.8

**Table 18A-27.15 - Deer Desirable Components Index: Mountain Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	30.0	13.5	2.4	16.4	-8.1	10.0	0.0	<b>64.1</b>	Fair
2002	30.0	11.9	1.1	3.4	-18.9	5.1	0.0	<b>32.6</b>	Very Poor
2007	30.0	9.6	0.9	12.4	-11.9	10.0	0.0	<b>51.0</b>	Poor
2012	0.0	0.0	0.0	6.4	-20.0	5.7	0.0	<b>-7.9</b>	Very Poor
2016	0.0	0.0	0.0	8.0	-20.0	0.7	0.0	<b>-11.4</b>	Very Poor
2021	0.9	0.0	0.0	9.9	-11.4	5.6	0.0	<b>5.0</b>	Very Poor



## DEADMAN CANYON - STUDY NO. 18A-29



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Terra NE; Township 5S, Range 7W, Section 21  
NAD 83 UTM ZONE 12, 360197 East 4470211 North

### Transect Information

Browse Tag # (0' Stake) 3927  
Transect Bearing 185° magnetic  
Length 400ft  
Belt Placement Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Belt Marker Placement Standard

### Directions to Site

From State Route 199, travel 5.2 miles west on Old Lincoln Road. Turn north and proceed 2.0 miles to the Williams Ranch. Continue for 0.4 miles and turn right at the fork, just past a fence. Proceed 1.1 miles to a gate. Continue 1.8 miles to an intersection and proceed in a northeasterly direction. Travel 2.6 miles to the U.S. Forest Service boundary fence and a cattleguard. From the cattleguard, go 0.15 miles to a witness post on the right-hand (north) side of the road. From this witness post, walk 60 paces at 148 degrees magnetic to the 0-foot baseline stake which is marked by browse tag #3927.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	BARLOW DEADMAN
Elevation	5,880ft (1,792m)
Aspect	West
Slope	10%
Sample Dates	07/25/1997, 08/01/2002, 08/16/2007, 06/05/2012, 07/20/2016, 06/08/2021

**Table 18A-29.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	Historic	-
Seeding - Seed Unknown	-	-	Historic	-
Fire - Wildfire	Patch Springs	-	August 2013	31010

**Wildlife Habitat and Vegetation History****Table 18A-29.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	winter
Rocky Mountain Elk	substantial	spring/fall

**Table 18A-29.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Wyoming Big Sagebrush-Stansbury Cliffrose/Perennial Grass	Phase I
1989	Wyoming Big Sagebrush-Stansbury Cliffrose/Perennial Grass	Phase I
1997	Wyoming Big Sagebrush-Stansbury Cliffrose/Perennial Grass	Phase I
2002	Wyoming Big Sagebrush-Stansbury Cliffrose/Perennial Grass	Phase I
2007	Wyoming Big Sagebrush-Stansbury Cliffrose/Perennial Grass	Phase I
2012	Wyoming Big Sagebrush-Stansbury Cliffrose/Perennial Grass	Phase I
2016	Perennial Grass	No Encroachment
2021	Perennial Grass	No Encroachment

**Site Notes**

The study samples a historic singleleaf pinyon (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) chaining that was seeded with perennial grasses. There was no initial evidence that any shrub or forb species were included in the seed mixture. However, a fair browse stand remained until 2013, when the area was burned as part of the Patch Springs wildfire.

**Soils****Table 18A-29.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.3	42.7	28.7	28.6	3.7	6.8	198.4	0.6	07/25/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Upland Gravelly Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

From study establishment in 1983 through the 2012 sample year, this site was co-dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), Stansbury cliffrose (*Purshia stansburiana*), and perennial grasses with Utah juniper (*Juniperus osteosperma*) throughout (Photos, Pre-1992 Data, Table 18A-29.12, Table 18A-29.13, Table 18A-29.14). Following the Patch Springs wildfire in 2013 that removed nearly all of the shrub component (Table 18A-29.1), the site transitioned to a perennial grassland dominated by the native species bluebunch wheatgrass (*Pseudoroegneria spicata*). The introduced perennial grass bulbous bluegrass (*Poa bulbosa*) has been observed since 2002, but in low amounts. In addition, the introduced annual grasses field brome (*Bromus arvensis*) and/or cheatgrass (*B. tectorum*) have been present since 1997, but cover is low as of 2021 (Table 18A-29.10). Forbs have been rare in most sample years (Table 18A-29.7, Table 18A-29.11). Deer winter range condition has ranged between fair-good and very poor. A dominating presence of sagebrush has had a positive influence, but consistent presence of cheatgrass in earlier years prevented conditions from being considered good for mule deer. Due to the lack of preferred browse species and high abundance of annual grass, deer winter range condition has been considered very poor since 2012 (Table 18A-29.15).

**Trend Summary Tables****Table 18A-29.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	7.7	0.8	4.0	-	-	-
2002	7.7	-	5.9	10.2	-	6.2
2007	6.0	0.1	3.4	12.0	0.8	7.8
2012	8.1	0.0	5.2	11.9	0.3	5.9
2016	-	0.2	-	-	-	-
2021	-	0.6	-	-	0.3	-

**Table 18A-29.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	265	329	309	77	6.3	15.5	2.2	1.0
2002	20	345	22	-	0.0	17.9	0.0	-
2007	101	326	377	9	1.7	20.9	5.8	0.2
2012	71	340	236	8	1.7	25.2	1.2	0.2
2016	182	320	366	36	8.3	28.2	10.6	0.5
2021	166	329	94	60	1.8	26.9	0.7	0.6

**Table 18A-29.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	7.6	1.5	51.1	7.4	1.7	34.2
2002	20.1	2.1	49.6	11.0	3.2	30.9
2007	22.6	2.0	33.8	10.8	1.8	36.6
2012	16.9	4.4	49.1	8.2	2.3	37.6
2016	16.9	0.0	34.3	12.8	2.2	44.4
2021	17.5	0.2	49.4	11.1	3.2	28.6

**Table 18A-29.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1997	-	29	-	-	47
2002	-	22	-	-	55
2007	1	1	-	-	69
2012	1	6	1	-	25
2016	-	4	-	-	3
2021	1	5	-	1	4
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	-	57.7 (142.4)	-	-	-
2007	-	14.1 (34.8)	0.7 (1.7)	-	-
2012	-	5.3 (13.2)	-	-	-
2016	-	0.7 (1.7)	-	-	-
2021	6.5 (16.1)	1.3 (3.3)	-	1.7 (4.3)	-

**Table 18A-29.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Pascopyron smithii (western wheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency										
1997	2	38	-	265	8	-	-	-	99	245	59
2002	3	2	-	20	-	-	2	-	130	298	8
2007	0	-	7	97	-	-	44	-	191	275	3
2012	2	22	-	71	-	-	89	5	185	247	3
2016	4	46	2	182	-	-	73	-	73	247	6
2021	4	-	4	162	15	49	44	-	102	250	18
year	Average Cover (%)										
1997	0.0	1.2	-	6.3	0.1	-	-	-	1.7	10.5	2.0
2002	0.1	0.0	-	0.0	-	-	0.0	-	1.7	15.6	0.4
2007	0.0	-	0.0	1.7	-	-	0.6	-	3.9	16.4	0.0
2012	0.0	0.3	-	1.7	-	-	2.4	0.0	5.3	17.1	0.0
2016	0.2	1.9	0.0	8.3	-	-	0.8	-	1.5	23.0	0.8
2021	0.5	-	0.0	1.8	1.1	0.9	1.1	-	1.8	20.3	1.1

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 18A-29.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (tittlepod false flax)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Draba <sup>a</sup> (draba)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lathyrus brachycalyx (Bonneville pea)	Microsteris gracilis <sup>a</sup> (slender phlox)	Petradoria pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)
year	Nested Frequency																
1997	-	1	287	13	3	-	119	-	-	-	-	-	1	52	-	6	8
2002	-	-	18	-	-	-	2	-	-	-	-	-	-	-	-	-	-
2007	3	-	370	-	-	-	228	-	-	-	-	-	-	4	-	-	2
2012	-	-	233	-	-	-	6	-	2	-	-	-	-	6	-	-	-
2016	2	-	350	-	4	2	7	10	-	5	57	13	35	24	2	-	2
2021	5	-	58	-	11	-	28	-	-	-	-	12	10	41	-	-	5
year	Average Cover (%)																
1997	-	0.0	1.8	0.1	0.1	-	0.4	-	-	-	-	-	0.0	0.6	-	0.0	0.2
2002	-	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-
2007	0.0	-	3.8	-	-	-	2.0	-	-	-	-	-	-	0.2	-	-	0.0
2012	-	-	1.2	-	-	-	0.0	-	0.0	-	-	-	-	0.2	-	-	-
2016	0.0	-	5.1	-	0.0	0.0	0.4	0.6	-	0.0	2.3	0.4	0.4	0.4	0.0	-	0.0
2021	0.0	-	0.3	-	0.1	-	0.1	-	-	-	-	0.1	0.0	0.5	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES					
<i>Salsola tragus</i> <sup>ai</sup> (prickly Russian thistle)					
<i>Silene antirrhina</i> <sup>a</sup> (sleepy silene)					
<i>Sisymbrium altissimum</i> <sup>ai</sup> (tall tumblemustard)					
<i>Tragopogon dubius</i> <sup>ai</sup> (yellow salsify)					
<i>Zizgadenus paniculatus</i> (foothill deathcamas)					
year	Nested Frequency				
1997	-	-	2	-	-
2002	-	2	-	-	-
2007	-	-	3	-	-
2012	-	3	-	-	-
2016	26	4	9	1	0
2021	-	-	2	10	0
year	Average Cover (%)				
1997	-	-	0.0	-	-
2002	-	0.0	-	-	-
2007	-	-	0.0	-	-
2012	-	0.0	-	-	-
2016	0.8	0.0	0.4	0.0	0.0
2021	-	-	0.0	0.1	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 18A-29.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES				
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> <sup>p</sup> (Wyoming big sagebrush)				
<i>Gutierrezia sarothrae</i> (broom snakeweed)				
<i>Juniperus osteosperma</i> <sup>a</sup> (Utah juniper)				
<i>Purshia stansburiana</i> <sup>p</sup> (Stansbury cliffrose)				
year	Line Intercept Cover (%)			
1997	-	-	-	-
2002	5.2	-	6.2	5
2007	6.4	0.8	7.8	5.6
2012	5.7	0.3	5.9	6.2
2016	-	-	-	-
2021	-	0.3	-	-
year	Quadrat Cover (%)			
1997	3.4	0.8	4.0	4.4
2002	5.0	-	5.9	2.7
2007	3.4	0.1	3.4	2.6
2012	4.6	0.0	5.2	3.5
2016	-	0.2	-	-
2021	-	0.6	-	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 18A-29.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
1997	800	40	48	50	3	8	0	0	64/96
2002	880	-	2	89	9	36	0	0	67/99
2007	1000	-	0	58	42	24	6	18	72/94
2012	740	-	0	95	5	8	0	0	72/84
2016	-	-	-	-	-	-	-	-	41/32
2021	-	-	-	-	-	-	-	-	-/-
<b>Chrysothamnus viscidiflorus ssp. lanceolatus -- (yellow rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	49/57
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	1700	-	22	66	12	0	0	7	23/25
2002	120	-	0	67	33	0	0	17	12/20
2007	420	-	0	100	0	5	0	0	18/18
2012	300	20	7	80	13	0	0	7	17/27
2016	80	-	25	75	0	0	0	0	36/53
2021	80	-	50	0	50	0	0	50	-/-
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1997	60	-	33	67	0	0	0	0	-/-
2002	60	-	0	67	33	0	0	0	-/-
2007	40	-	0	100	0	0	0	0	-/-
2012	40	-	0	100	0	0	0	0	-/-
2016	20	-	0	100	0	0	0	0	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Purshia stansburiana<sup>p</sup> -- (Stansbury cliffrose)</b>									
1997	180	60	11	89	0	0	0	0	180/166
2002	120	20	17	83	0	33	17	0	197/203
2007	140	-	0	57	43	43	14	14	251/259
2012	100	40	20	60	20	20	0	0	203/214
2016	20	-	100	0	0	0	100	0	30/32
2021	20	-	0	100	0	0	100	0	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

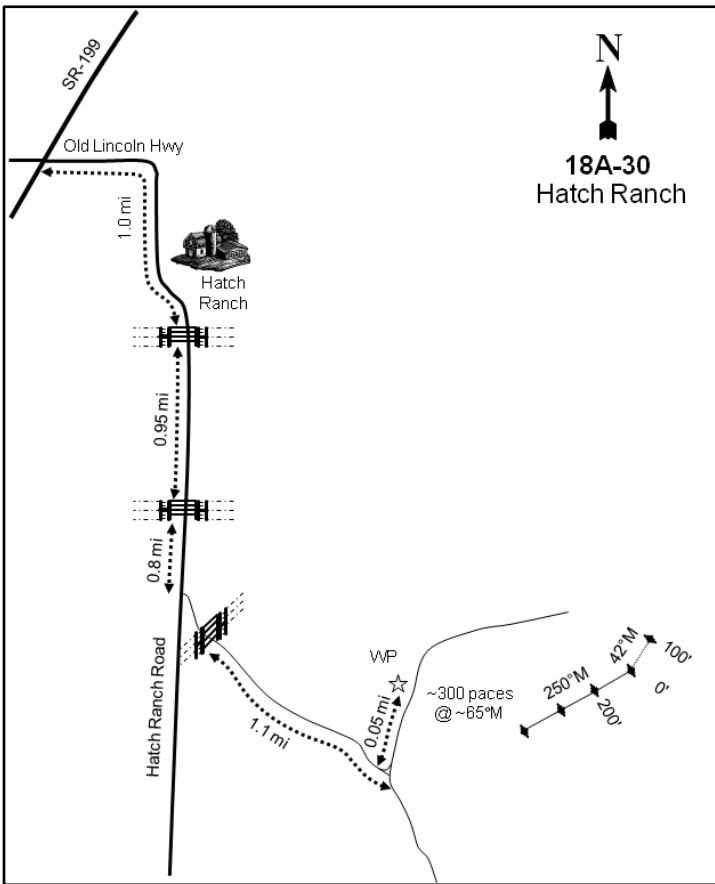
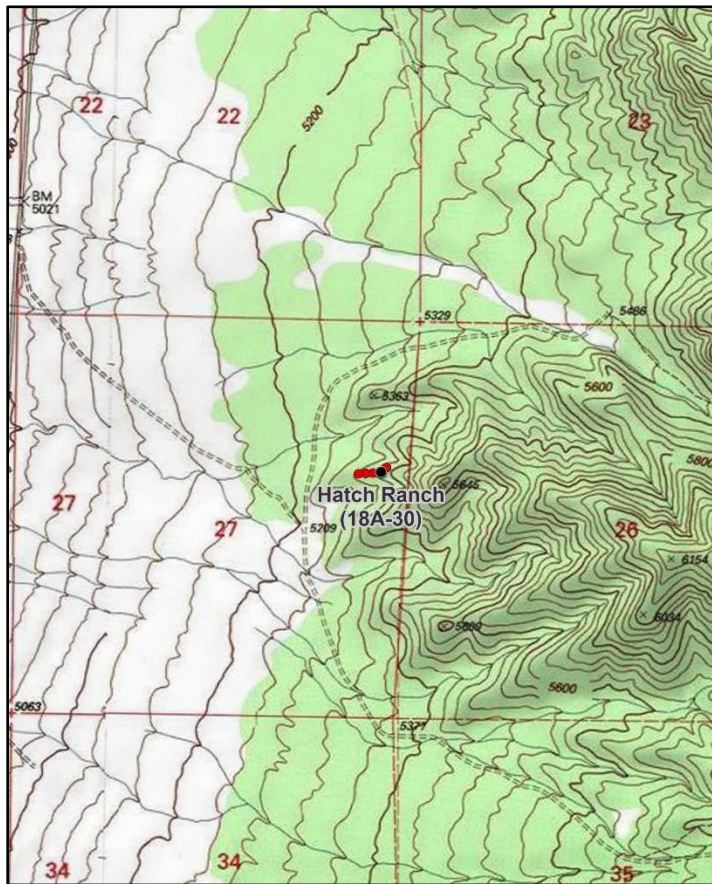
**Table 18A-29.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2002	89	-	-	-	-	-	16.6
2007	83	-	-	11	53	37	18.4
2012	88	-	5	11	32	53	15.1

**Table 18A-29.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	10.7	14.7	13.5	30.0	-4.7	2.0	0.0	<b>66.2</b>	Fair-Good
2002	10.3	13.2	3.7	30.0	0.0	0.0	0.0	<b>57.1</b>	Fair
2007	16.4	2.3	0.0	30.0	-1.3	0.4	0.0	<b>47.8</b>	Poor
2012	16.4	11.1	5.2	30.0	-1.3	0.5	0.0	<b>61.9</b>	Fair
2016	0.0	0.0	0.0	30.0	-6.3	0.9	0.0	<b>24.7</b>	Very Poor
2021	0.0	0.0	0.0	30.0	-1.4	1.2	0.0	<b>29.8</b>	Very Poor

## HATCH RANCH - STUDY NO. 18A-30



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Johnson Pass SW; Township 6S, Range 7W, Section 27  
NAD 83 UTM ZONE 12, 362869 East 4458762 North

### Transect Information

Browse Tag # (0' Stake)	9081
Transect Bearing	42° magnetic (Lines 2-4: 250° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 2: No Rebar

### Directions to Site

Across from the Old Lincoln Road, turn east off of State Route 199 onto Hatch Ranch Road. Go east and then south for 1.0 mile to the Hatch Ranch. From the south gate, continue down the valley for 0.95 miles to another gate. Continue 0.8 miles on the main road to a fork that angles southeast through a gate. Take this fork and travel 1.1 miles to a fork at the base of the Onaqui Mountains. Bear left, going just 300 yards to the base of a ridge. From here, walk up the ridge at about 60 degrees magnetic for about 400 yards to the 0-foot baseline stake (which is a short green fencepost marked with browse tag #9081) on the ridge top.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	ONAQUI MOUNTAIN WEST
Elevation	5,350ft (1,631m)
Aspect	West
Slope	17%
Sample Dates	07/23/1997, 08/01/2002, 08/20/2007, 06/05/2012, 07/21/2016, 06/10/2021

**Table 18A-30.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	Terra East Juniper Thinning-Phase 2	1362	October 2009-February 2010	2190

**Wildlife Habitat and Vegetation History****Table 18A-30.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter/spring

**Table 18A-30.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Stansbury Cliffrose-Wyoming Big Sagebrush/Annual Grass	Phase I
1989	Stansbury Cliffrose-Wyoming Big Sagebrush	Phase I
1997	Stansbury Cliffrose-Wyoming Big Sagebrush	Phase I
2002	Stansbury Cliffrose-Wyoming Big Sagebrush	Phase I
2007	Stansbury Cliffrose-Wyoming Big Sagebrush	Phase I
2012	Stansbury Cliffrose-Wyoming Big Sagebrush/Annual Grass	Phase I
2016	Stansbury Cliffrose-Wyoming Big Sagebrush/Annual Grass	Phase I
2021	Stansbury Cliffrose-Wyoming Big Sagebrush	Phase I

**Site Notes**

The study samples crucial deer winter range located at the base of the Onaqui Mountains, approximately three miles southeast of Hatch Ranch in Skull Valley. There was also sign of wild horses in the area in 2002, but not on the study. Stud piles were found down slope from the study, and ten wild horses were seen on the nearby sagebrush flat.

**Soils****Table 18A-30.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.1	35.1	32.7	32.2	2.5	9.5	233.6	0.7	07/22/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Gravelly Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

This site has been dominated by Stansbury cliffrose (*Purshia stansburiana*) with Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) to a lesser extent since study establishment in 1983 (Photos, Pre-1992 Data, Table 18A-30.12, Table 18A-30.13). The herbaceous understory has fluctuated throughout the study years, but has generally remained limited (Table 18A-30.7). Annual grasses such as red brome (*Bromus rubens*) and cheatgrass (*B. tectorum*) have been co-dominant site components in 1983, 2012, and 2016 (Photos, Table 18A-30.10); forbs have contributed little cover in all sample years (Table 18A-30.11). Although cover of Utah juniper (*Juniperus osteosperma*) was reduced by a 2010 bullhog treatment (Table 18A-30.1), a small amount remains as of 2021 (Table 18A-30.12). Juniper has also been observed in point-quarter density data in all sample years since 2002 (Table 18A-30.14); the extant tree component following treatment may indicate that this site has the potential to be infilled in the future. Deer winter range condition has ranged between poor-fair and poor. A dominating presence of sagebrush has had a positive influence on mule deer winter range conditions, but consistent presence of cheatgrass and lack of perennial forbs in most sample years prevented conditions from being considered good. Due to poor vigor and high decadence within the preferred browse community, deer winter range condition was considered poor-fair in 2021 (Table 18A-30.15).



**Trend Summary Tables****Table 18A-30.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	12.4	8.1	4.1	-	-	-
2002	15.2	0.4	4.5	18.8	0.1	6.2
2007	13.1	1.1	4.8	23.4	1.2	7.3
2012	14.6	0.6	0.8	19.6	0.6	0.5
2016	12.1	1.0	0.4	27.7	0.9	0.2
2021	16.0	0.5	1.4	22.3	0.6	0.7

**Table 18A-30.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	335	292	179	44	8.0	6.1	0.8	0.5
2002	82	324	11	12	0.5	7.6	0.0	0.4
2007	239	313	262	9	4.3	8.8	1.6	0.2
2012	391	242	61	24	18.4	7.1	0.2	1.1
2016	351	111	220	50	12.2	2.1	3.3	0.4
2021	328	264	129	14	4.0	6.7	0.7	0.1

**Table 18A-30.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	6.4	17.2	28.4	16.0	16.6	34.5
2002	9.9	22.1	25.6	15.3	19.4	26.9
2007	5.7	13.2	29.3	19.4	20.0	29.3
2012	10.1	6.6	36.8	7.1	15.7	41.2
2016	10.3	7.9	24.2	18.2	18.8	30.8
2021	21.5	7.2	36.5	8.3	17.4	27.8

**Table 18A-30.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	1	40	-	45
2002	-	8	-	12
2007	-	9	-	64
2012	-	3	-	3
2016	1	4	-	12
2021	1	28	-	15
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	-	30.8 (76.1)	-	-
2007	-	3.4 (8.3)	-	-
2012	-	2.7 (6.6)	-	-
2016	5.8 (14.3)	13.4 (33.1)	1.3 (3.3)	-
2021	2.2 (5.4)	30.2 (74.5)	-	-

**Table 18A-30.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus rubens <sup>si</sup> (red brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Secale cereale <sup>ai</sup> (cereal rye)
year	Nested Frequency						
1997	6	-	335	-	290	26	-
2002	-	-	82	-	321	16	-
2007	3	126	173	-	310	4	-
2012	8	123	328	-	235	14	26
2016	9	193	189	3	95	22	52
2021	21	165	265	-	247	30	4
year	Average Cover (%)						
1997	0.1	-	8.0	-	5.1	0.9	-
2002	-	-	0.5	-	7.0	0.6	-
2007	0.0	2.1	2.2	-	8.6	0.2	-
2012	0.2	3.6	14.7	-	6.2	0.8	0.1
2016	0.4	5.5	5.7	0.0	0.7	1.0	1.0
2021	0.5	1.4	2.5	-	6.0	0.2	0.2

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 18A-30.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria dimorpha (low pussytoes)	Arabis (rockcress)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chamaesyce (sandmat)	Cirsium (thistle)	Cryptantha (cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Erigeron pumilus (shaggy fleabane)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Gilia inconspicua <sup>a</sup> (shy gilia)	Lactuca serriola <sup>ai</sup> (prickly lettuce)
year	Nested Frequency																
1997	3	12	11	4	-	3	1	167	5	1	-	-	-	7	2	-	2
2002	-	-	-	4	-	-	-	11	-	-	-	-	-	-	-	-	-
2007	-	-	11	3	-	-	-	224	-	-	0	22	60	-	11	-	-
2012	3	7	28	-	-	-	3	25	-	-	-	-	4	-	11	-	1
2016	-	28	100	1	5	-	11	52	-	-	-	14	20	-	85	2	2
2021	2	-	28	5	-	-	1	49	-	-	2	-	-	-	77	-	-
year	Average Cover (%)																
1997	0.0	0.1	0.0	0.0	-	0.0	0.0	0.7	0.0	0.0	-	-	-	0.0	0.0	-	0.0
2002	-	-	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	-	-
2007	-	-	0.0	0.0	-	-	-	1.2	-	-	0.0	0.1	0.1	-	0.1	-	-
2012	0.1	0.0	0.1	-	-	-	0.0	0.1	-	-	-	-	0.0	-	0.0	-	0.0
2016	-	0.1	1.5	0.0	0.0	-	0.0	0.2	-	-	-	0.1	0.0	-	1.5	0.0	0.0
2021	0.0	-	0.1	0.0	-	-	0.0	0.1	-	-	0.0	-	-	-	0.5	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Microsteris gracilis <sup>a</sup> (slender phlox)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Sisymbrium altissimum <sup>at</sup> (tall tumblemustard)	Townsendia incana (hoary Townsend daisy)
year	Nested Frequency					
1997	-	2	9	1	-	4
2002	-	-	9	-	-	-
2007	8	13	5	-	3	1
2012	-	-	9	-	-	5
2016	-	5	6	-	3	-
2021	-	1	4	4	-	-
year	Average Cover (%)					
1997	-	0.0	0.2	0.0	-	0.1
2002	-	-	0.4	-	-	-
2007	0.0	0.0	0.2	-	0.0	0.0
2012	-	-	0.9	-	-	0.0
2016	-	0.0	0.2	-	0.0	-
2021	-	0.0	0.0	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 18A-30.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Linanthus pungens (granite prickly phlox)	Pinus monophylla <sup>t</sup> (singleleaf pinyon)	Purshia stansburiana <sup>p</sup> (Stansbury cliffrose)	Tetradymia canescens (spineless horsebrush)	Tetradymia nuttallii (Nuttall's horsebrush)
year	Line Intercept Cover (%)								
1997	-	-	-	-	-	-	-	-	-
2002	4.1	0	0	6.2	-	-	14.7	-	0.1
2007	6.2	-	1.2	7.3	-	-	17.2	-	-
2012	6.1	-	0.2	0.5	0.1	-	13.5	-	0.3
2016	7.2	0.1	0.5	0.2	-	-	20.5	-	0.3
2021	6.1	0.5	-	0.7	-	-	16.2	-	0.1
year	Quadrat Cover (%)								
1997	3.1	0.1	7.5	4.1	-	-	9.3	0.1	0.4
2002	3.3	0.0	0.3	4.5	0.0	0.0	11.9	-	0.1
2007	4.4	-	0.9	4.8	0.0	-	8.7	-	0.1
2012	6.4	0.0	0.4	0.8	0.0	-	8.2	-	0.1
2016	4.0	0.4	0.5	0.4	0.0	-	8.2	-	0.1
2021	5.1	0.3	-	1.4	-	-	10.9	-	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 18A-30.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
1997	960	320	10	73	17	4	0	33	50/74
2002	1260	-	19	59	22	5	3	8	54/79
2007	860	-	0	81	19	21	14	12	63/93
2012	1140	-	12	75	12	7	2	19	60/86
2016	660	-	3	97	0	24	6	0	62/101
2021	940	-	11	53	36	6	2	45	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1997	380	-	5	79	16	0	5	11	25/32
2002	-	-	-	-	-	-	-	-	24/35
2007	20	-	100	0	0	0	0	0	- / -
2012	40	-	0	100	0	0	0	50	21/33
2016	140	-	14	86	0	0	0	29	33/46
2021	120	-	0	100	0	0	0	33	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	12920	-	14	83	3	0	0	1	23/25
2002	520	-	4	81	15	4	0	15	15/15
2007	2720	40	8	90	2	1	0	7	16/21
2012	360	160	11	78	11	0	0	6	16/20
2016	620	-	0	97	3	0	0	3	25/30
2021	160	-	63	38	0	0	0	0	- / -
<b>Juniperus osteosperma<sup>1</sup> -- (Utah juniper)</b>									
1997	100	20	40	60	0	0	0	0	- / -
2002	100	-	20	80	0	0	0	0	- / -
2007	120	20	33	67	0	0	0	0	- / -
2012	60	-	100	0	0	0	0	0	- / -
2016	60	-	67	33	0	0	0	0	- / -
2021	60	-	67	33	0	0	0	0	- / -
<b>Linanthus pungens -- (granite prickly phlox)</b>									
1997	60	-	33	67	0	0	0	0	25/67
2002	20	-	0	0	100	0	0	100	- / -
2007	20	-	0	100	0	0	0	0	28/28
2012	80	-	0	100	0	0	0	0	22/20
2016	80	-	0	100	0	0	0	75	25/37
2021	40	-	0	100	0	0	0	0	- / -
<b>Pinus monophylla<sup>1</sup> -- (singleleaf pinyon)</b>									
1997	-	-	-	-	-	-	-	-	- / -
2002	20	-	100	0	0	0	0	0	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Purshia stansburiana<sup>p</sup> -- (Stansbury cliffrose)</b>									
1997	780	80	21	67	13	5	3	3	131/143
2002	1200	-	10	83	7	22	48	0	128/134
2007	980	20	6	78	16	31	22	4	140/163
2012	940	180	15	70	15	40	2	13	116/137
2016	860	-	12	74	14	44	9	12	118/133
2021	1080	-	9	56	35	65	7	37	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Sclerocactus -- (fishhook cactus)</b>									
1997	20	-	0	100	0	0	0	0	13/25
2002	40	-	0	50	50	0	0	0	19/30
2007	20	-	0	100	0	0	0	0	5/31
2012	-	-	-	-	-	-	-	-	12/29
2016	20	-	0	100	0	0	0	0	22/36
2021	-	-	-	-	-	-	-	-	-/-
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1997	60	-	0	100	0	0	0	100	43/56
2002	40	-	0	0	100	0	0	50	51/72
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	63/117
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Tetradymia nuttallii -- (Nuttall's horsebrush)</b>									
1997	580	-	7	10	83	0	0	35	42/55
2002	280	-	0	29	71	0	0	57	54/83
2007	80	-	0	25	75	25	0	75	46/67
2012	80	-	0	100	0	0	0	50	46/63
2016	40	-	0	50	50	0	0	50	50/73
2021	100	-	20	80	0	40	0	20	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

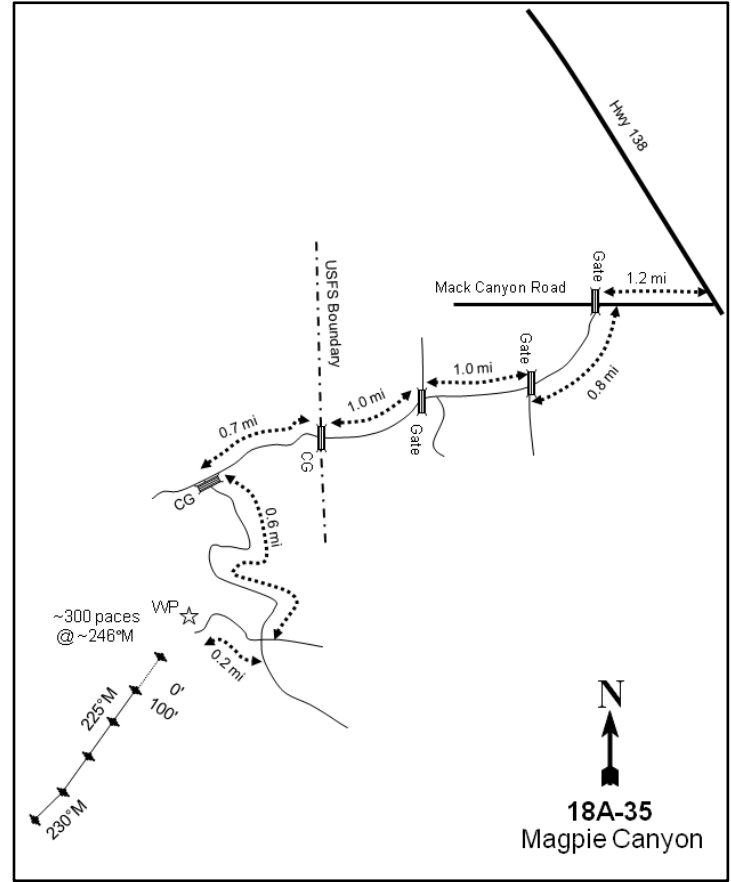
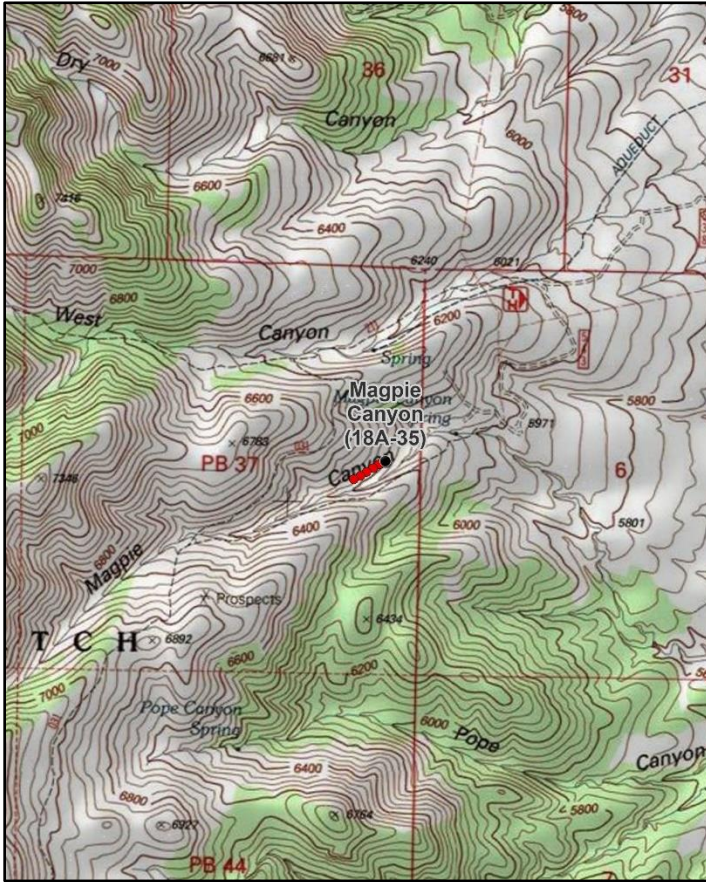
**Table 18A-30.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2002	104	-	-	-	-	-	13.4
2007	102	-	24	24	24	29	14.9
2012	80	31	63	-	6	-	6.3
2016	102	22	67	6	6	-	10.7
2021	89	5	79	11	-	5	6.3

**Table 18A-30.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	17.8	10.8	9.0	12.2	-6.0	0.9	0.0	<b>44.6</b>	Poor
2002	22.0	12.0	6.0	15.2	-0.4	0.7	0.0	<b>55.6</b>	Fair
2007	30.0	9.9	2.2	17.6	-3.2	0.4	0.0	<b>56.9</b>	Fair
2012	27.9	10.8	7.0	14.3	-13.8	2.2	0.0	<b>48.3</b>	Poor-Fair
2016	30.0	11.9	4.7	4.1	-9.1	0.8	0.0	<b>42.3</b>	Poor
2021	30.0	4.4	4.8	13.3	-3.0	0.2	0.0	<b>49.7</b>	Poor-Fair

## MAGPIE CANYON - STUDY NO. 18A-35

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

North Willow Canyon; Township 3S, Range 7W, Section 01  
NAD 83 UTM ZONE 12, 366332 East 4493865 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

161  
225° magnetic (Line 5: 230° magnetic)  
500ft  
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)  
Belt 1: No Rebar

**Directions to Site**

From Grantsville, proceed west on Highway 138 to Mack Canyon Road on the left (west) side of the road just after Highway 138 bends to the north. Turn left and travel 1.2 miles to a gate, then keep right and travel for another 0.8 miles to another gate. Continue another 1.0 miles to another gate. Proceed 1.0 miles to a cattle guard, continue for another 0.7 miles, and turn left. Travel for 0.6 miles and turn right. The witness post is 0.2 miles away. The 0-foot stake is approximately 300 paces from the witness post at 246 degrees magnetic and is marked with browse tag #161.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	GRANTSVILLE NORTH
Elevation	6,201ft (1,890m)
Aspect	Southeast
Slope	37%
Sample Dates	06/13/2012, 07/18/2016, 06/09/2021

**Wildlife Habitat and Vegetation History****Table 18A-35.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
California Bighorn	substantial	year-long
Mule Deer	crucial	spring/fall
Rocky Mountain Elk	substantial	spring/fall

**Table 18A-35.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2012	Bitterbrush/Annual-Perennial Grass	Phase I
2016	Bitterbrush/Annual-Perennial Grass	Phase I
2021	Bitterbrush/Perennial Grass	Phase I

**Site Notes**

The study samples a steep, south-facing sidehill with a mixture of antelope bitterbrush (*Purshia tridentata*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and Utah serviceberry (*Amelanchier utahensis*) providing valuable browse for wildlife.

In 2016, it was noted that Utah serviceberry plants had thin crowns and diseased leaves.

**Soils****Table 18A-35.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.7	28.4	40.1	31.5	2.6	10.4	157.0	1.0	02/26/2013

**Site Potential**

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Stony Loam (Antelope Bitterbrush)
NRCS Ecological Site #	R028AY456UT
States and Transitions	No state and transition model is available for this ecological site.

The dominant browse component on this site has been antelope bitterbrush (*Purshia tridentata*) since study establishment in 2012; subordinate shrub species include mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Utah serviceberry (*Amelanchier utahensis*) (Photos, Table 18A-35.12, Table 18A-35.13). The herbaceous understory has not been very diverse, but has remained moderately abundant. The introduced annual grass cheatgrass (*Bromus tectorum*) and native perennial grass species bluebunch wheatgrass (*Pseudoroegneria spicata*) provided a majority of the cover and were co-dominant vegetation components in 2012 and 2016. However, annual grasses decreased in 2021 (Table 18A-35.7, Table 18A-35.10). The annual forb and noxious weed gypsyflower (*Cynoglossum officinale*) was sampled in 2012 and 2016 with low abundance, but was not observed in 2021 (Table 18A-35.11). Although cover and density were low, Utah juniper (*Juniperus osteosperma*) was present in 2016 and 2021 (Table 18A-35.12, Table 18A-35.14). Further tree encroachment may not pose an immediate threat as this site is considered to be within Phase I (Table 18A-35.4), but progression through the phases of woodland succession could be possible over time.

**Trend Summary Tables****Table 18A-35.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2012	21.1	0.0	-	26.6	0.2	-
2016	18.1	0.5	0.2	31.6	1.2	-
2021	22.8	0.3	1.3	28.8	0.4	0.2

**Table 18A-35.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2012	394	250	309	109	13.2	12.1	3.3	3.5
2016	239	266	292	103	11.6	14.9	6.4	2.2
2021	287	243	279	152	7.0	17.9	4.8	8.4

**Table 18A-35.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2012	16.3	0.1	37.7	3.3	20.2	47.6
2016	13.8	0.2	19.2	9.2	22.8	49.9
2021	10.1	0.2	42.8	6.7	24.2	48.6

**Table 18A-35.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2012	-	2	-	-
2016	2	5	-	-
2021	2	1	-	3
Days Use Per Acre (ha)				
2012	0.7 (1.8)	10.0 (24.8)	2.7 (6.6)	-
2016	8.0 (19.7)	26.2 (64.6)	6.0 (14.9)	-
2021	3.6 (9.0)	5.3 (13.2)	-	-



**Table 18A-35.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency				
<i>Bromus arvensis</i> <sup>ai</sup> (field brome)	46	387	36	50	222
<i>Bromus tectorum</i> <sup>ai</sup> (cheatgrass)	19	228	80	16	229
<i>Poa bulbosa</i> <sup>i</sup> (bulbous bluegrass)	53	252	126	7	194
<i>Poa secunda</i> (Sandberg bluegrass)	Average Cover (%)				
<i>Pseudoroegneria spicata</i> (bluebunch wheatgrass)	1.3	11.8	0.5	0.8	10.8
	0.3	11.3	2.1	0.1	12.6
	0.4	6.6	5.7	0.2	12.1

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 18A-35.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
<i>Allium</i> (onion)	13	288	10	6	4	14	2	-	18	0	6	-	10	3	-	1	-	
<i>Alyssum desertorum</i> <sup>ai</sup> (desert madwort)	27	203	11	5	-	9	9	1	8	-	-	3	13	2	2	5	4	
<i>Artemisia ludoviciana</i> (white sagebrush)	62	225	11	9	1	6	6	-	3	1	1	-	11	10	-	-	-	
<i>Astragalus cibarius</i> (browse milkvetch)	Average Cover (%)																	
<i>Astragalus utahensis</i> (Utah milkvetch)	0.1	0.8	0.5	0.1	0.0	1.7	0.0	-	0.0	0.0	0.0	-	0.1	0.0	-	0.0	-	
<i>Balsamorhiza sagittata</i> (arrowleaf balsamroot)	0.1	1.2	0.2	0.0	-	1.2	0.0	0.0	0.0	-	-	0.0	0.1	0.0	0.0	0.0	0.0	
<i>Calochortus nuttallii</i> (sego lily)	0.9	2.7	0.8	0.8	0.1	2.1	0.0	-	0.0	0.0	0.0	-	0.4	0.2	-	-	-	
<i>Camelina microcarpa</i> <sup>ai</sup> (littledod false flax)																		
<i>Ceratocephala testiculata</i> <sup>ai</sup> (curveseed butterwort)																		
<i>Cirsium</i> (thistle)																		
<i>Collinsia parviflora</i> <sup>a</sup> (maiden blue eyed Mary)																		
<i>Collomia linearis</i> <sup>a</sup> (tiny trumpet)																		
<i>Comandra umbellata</i> (bastard toadflax)																		
<i>Crepis acuminata</i> (tapertip hawkbeard)																		
<i>Cryptantha</i> (cryptantha)																		
<i>Cynoglossum officinale</i> <sup>mi</sup> (gypsyflower)																		
<i>Descurainia pinnata</i> <sup>a</sup> (western tansymustard)																		

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES													
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)													
Galium aparine <sup>a</sup> (stickywilly)													
Hackelia patens (spotted stickseed)													
Holosteum umbellatum <sup>ai</sup> (jagged chickweed)													
Lactuca serriola <sup>ai</sup> (prickly lettuce)													
Lappula occidentalis <sup>ai</sup> (flatspine stickseed)													
Linum lewisii (Lewis flax)													
Lithospermum ruderale (western stoneseed)													
Lomatium (desertparsley)													
Phlox longifolia (longleaf phlox)													
Silene antirrhina <sup>a</sup> (sleepy silene)													
Tragopogon dubius <sup>ai</sup> (yellow salsify)													
Veronica biloba <sup>ai</sup> (two-lobed speedwell)													
year	Nested Frequency												
2012	145	15	1	-	9	-	-	1	38	22	31	12	-
2016	188	24	5	-	22	1	2	1	21	10	3	15	4
2021	60	29	14	1	9	3	-	2	43	41	-	24	-
year	Average Cover (%)												
2012	2.1	0.2	0.0	-	0.0	-	-	0.2	0.6	0.2	0.1	0.1	-
2016	3.3	1.6	0.0	-	0.1	0.0	0.0	0.0	0.4	0.0	0.0	0.1	0.0
2021	0.7	0.9	0.2	0.0	0.1	0.0	-	0.2	2.2	0.4	-	0.5	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 18A-35.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES					
Amelanchier utahensis <sup>p</sup> (Utah serviceberry)					
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)					
Gutierrezia sarothrae (broom snakeweed)					
Juniperus osteosperma <sup>t</sup> (Utah juniper)					
Purshia tridentata <sup>p</sup> (antelope bitterbrush)					
year	Line Intercept Cover (%)				
2012	2.8	4.5	0.2	-	19.3
2016	0.7	7.3	1.2	-	23.6
2021	0.3	3.5	0.4	0.2	25
year	Quadrat Cover (%)				
2012	2.2	2.3	0.0	-	16.6
2016	0.0	5.5	0.5	0.2	12.6
2021	1.0	4.3	0.3	1.3	17.5

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 18A-35.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
2012	80	20	0	100	0	0	25	0	131/140
2016	40	-	0	50	50	0	50	0	139/141
2021	80	-	0	50	50	50	0	50	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
2012	560	-	4	93	4	14	0	18	65/105
2016	380	-	5	79	16	37	0	5	81/132
2021	340	-	0	59	41	6	0	35	- / -

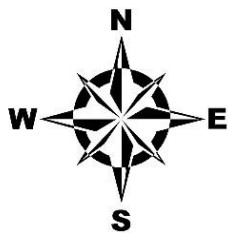
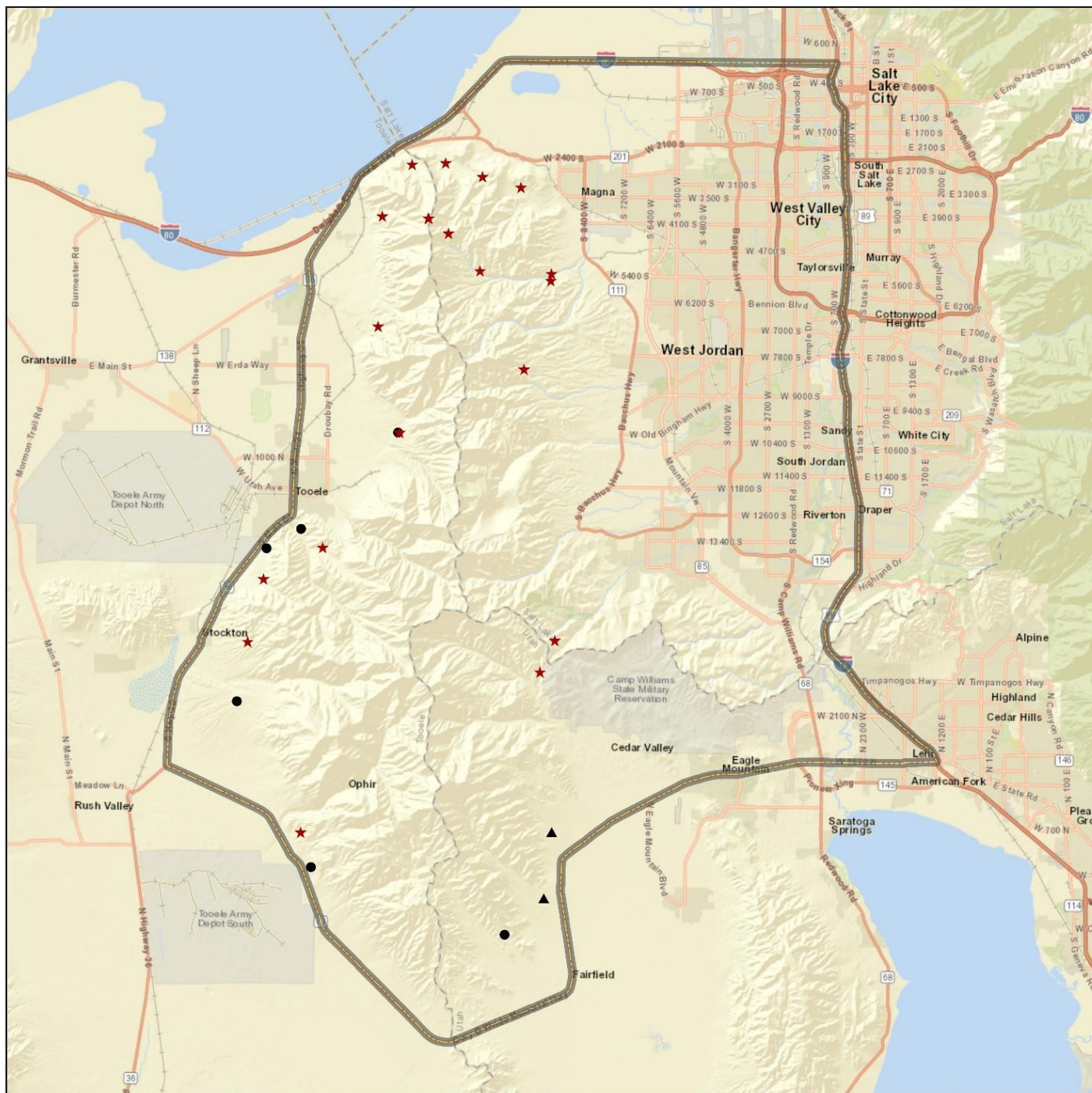
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
2012	-	-	-	-	-	-	-	-	77/94
2016	-	-	-	-	-	-	-	-	76/89
2021	-	-	-	-	-	-	-	-	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
2012	480	-	29	71	0	0	0	0	24/31
2016	500	-	0	100	0	0	0	0	31/40
2021	580	-	59	35	7	0	0	7	-/-
<b>Juniperus osteosperma<sup>i</sup> -- (Utah juniper)</b>									
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	20	-	100	0	0	0	0	0	-/-
<b>Purshia stansburiana<sup>p</sup> -- (Stansbury cliffrose)</b>									
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	228/587
2021	-	-	-	-	-	-	-	-	-/-
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
2012	1960	-	1	92	7	29	4	6	67/123
2016	1380	-	3	94	3	32	22	4	73/159
2021	1440	-	1	69	29	13	0	31	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 18A-35.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2016	4	-	-	100	-	-	18.5
2021	5	-	-	67	33	-	11.0

# WILDLIFE MANAGEMENT UNIT 18B - OQUIRRH MOUNTAINS/STANSBURY

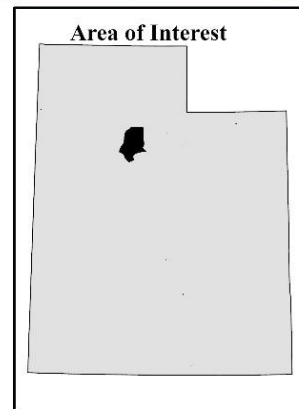


**Study Locations  
Project, Status**

- RT, Active
- ★ RT, Suspended
- ▲ WRI, Active

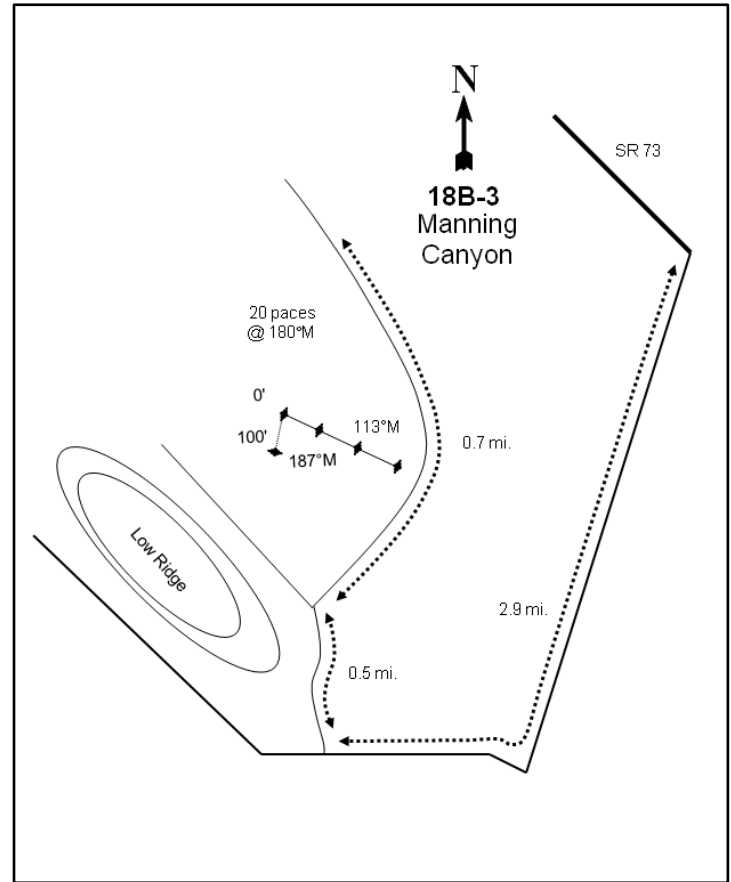
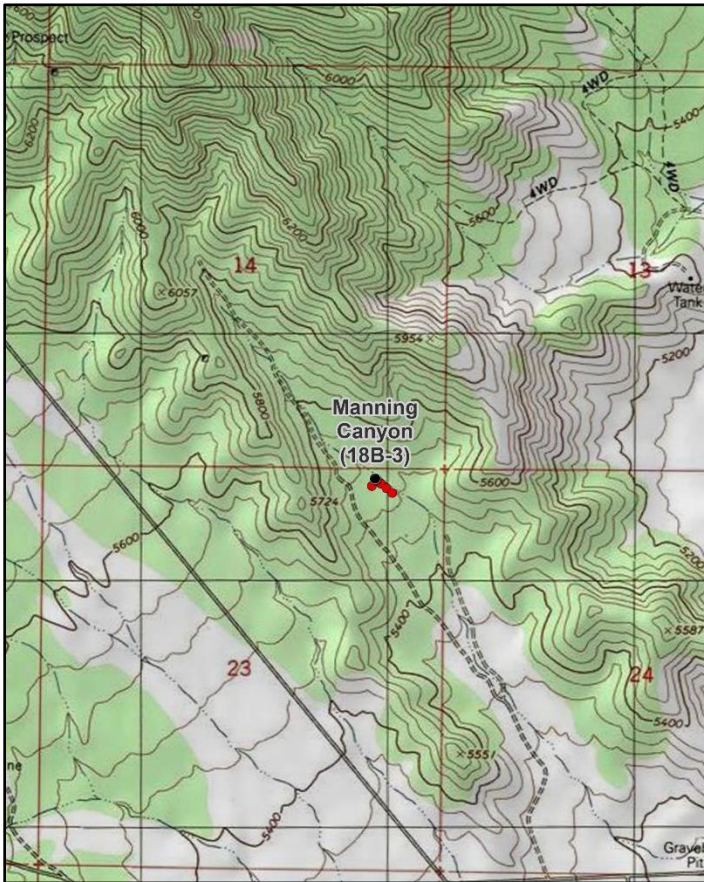
**Unit Boundary**

- ▭ Unit - 18B



Credits: Esri, HERE, Garmin, NGA, USGS, NPS

## MANNING CANYON - STUDY NO. 18B-3

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Mercur SE; Township 6S, Range 3W, Section 23  
NAD 83 UTM ZONE 12, 402893 East 4460614 North

**Transect Information**

Browse Tag # (0' Stake)	3985
Transect Bearing	187° magnetic (Line 2-4: 113° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)
Belt Marker Placement	Standard

**Directions to Site**

From the junction of State Route 73 and Manning Canyon Road between Cedar Fort and Fairfield, travel west on Manning Canyon Road for 2.9 miles. Turn north (right) onto a dirt road and travel for 0.5 miles to a fork. Take the right fork (east), travel an additional 0.7 miles, and park. The 0-foot stake is 26 paces away at 180 degrees magnetic and is marked with a red browse tag #3985.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	POLE CANYON
Elevation	5,500ft (1,676m)
Aspect	Southeast
Slope	7-8%
Sample Dates	06/16/1997, 05/23/2002, 06/07/2007, 06/06/2012, 07/21/2016, 06/07/2021

**Table 18B-03.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Aerial	Pole Canyon Fire Rehabilitation	5482	November 2020	487
Fire - Wildfire	Pole Canyon Fire	-	July 2020	487

**Table 18B-03.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Pole Canyon Fire			Aerial	Nov 2020	486
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	<i>Pascopyrum smithii</i>	Western Wheatgrass	Arriba	0.67	0.61
G	<i>Pascopyrum smithii</i>	Western Wheatgrass	Arriba	1.44	1.23
G	<i>Pseudoroegneria spicata</i>	Bluebunch Wheatgrass	Columbia	2.06	1.78
F	<i>Achillea millefolium</i>	Western Yarrow	Eagle	0.21	0.17
F	<i>Helianthus annuus</i>	Annual Sunflower		0.26	0.19
F	<i>Linum perenne</i>	Blue Flax	Appar	0.93	0.76
F	<i>Medicago sativa</i>	Alfalfa	Ladak 65	1.03	0.96
F	<i>Medicago sativa ssp. falcata</i>	Yellow Alfalfa	Don	0.93	0.92
F	<i>Onobrychis viciifolia</i>	Sainfoin	Shoshone	2.06	1.95
F	<i>Sanguisorba minor</i>	Small Burnet	Delar	2.98	2.91
S	<i>Artemisia tridentata ssp. wyomingensis</i>	Wyoming Big Sagebrush	Utah, UT	0.81	0.08
S	<i>Artemisia tridentata ssp. wyomingensis</i>	Wyoming Big Sagebrush	Utah, UT	1.15	0.17
S	<i>Bassia prostrata</i>	Forage Kochia	Millard, UT	0.51	0.34

**Wildlife Habitat and Vegetation History****Table 18B-03.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter/spring
Rocky Mountain Elk	substantial	year-long

**Table 18B-03.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Wyoming Big Sagebrush/Annual Grass	Phase I
1990	Wyoming Big Sagebrush/Perennial Grass	Phase I
1997	Wyoming Big Sagebrush/Perennial Grass	Phase I
2002	Wyoming Big Sagebrush/Perennial Grass	Phase I
2007	Wyoming Big Sagebrush/Annual-Perennial Grass	Phase I transitioning to Phase II
2012	Wyoming Big Sagebrush/Perennial Grass	Phase I transitioning to Phase II
2016	Wyoming Big Sagebrush/Perennial Grass	Phase I transitioning to Phase II
2021	Annual Forb	Phase I

**Site Notes**

This study is within crucial winter range at the extreme south end of the Oquirrh Mountains in a small valley surrounded by Utah juniper (*Juniperus osteosperma*) covered hills. The range type is a pinyon-juniper and Wyoming big sagebrush (*Artemisia tridentata ssp. wyomingensis*) community and juniper trees on and around the study provide excellent thermal cover.

**Soils****Table 18B-03.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.8	40.3	33.2	26.5	2.6	7.7	124.8	0.5	06/16/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Gravelly Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R028AY307UT
States and Transitions	Yellow Rabbitbrush/Invasive Annuals State: Community Phase 5.2

Wyoming big sagebrush (*Artemisia tridentata* ssp. *ywomingensis*) was the dominant browse species on this site from study establishment in 1983 through the 2016 sample year. A 2020 wildfire removed nearly all of the shrubs, and a rehabilitation seeding occurred in November of that year (Table 18B-03.1). In 2021, young sagebrush and forage kochia (*Bassia prostrata*) were the only shrub species observed and were present with low density (Photos, Pre-1992 Data, Table 18B-03.12, Table 18B-03.13). The herbaceous understory was abundant prior to the burn (Table 18B-03.7). Native perennial grasses such as bluebunch wheatgrass (*Pseudoroegneria spicata*) and/or the introduced annual grass species cheatgrass (*Bromus tectorum*) were considered to be co-dominant site components in all years through 2016 (Table 18B-03.10). In 2021, however, the introduced annual forbs desert madwort (*Alyssum desertorum*) and redstem stork's bill (*Erodium cicutarium*) contributed the most herbaceous cover and were the dominant vegetation type (Table 18B-03.11). As such, as of 2021 this site is likely within Community Phase 5.2 within the Yellow Rabbitbrush/Invasive Annuals State as described by the ESD model (USDA-ARS Jornada Experimental Range, 2021). Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon (*Pinus monophylla*) have been observed in all sample years. In 2016, trees were present in amounts that indicate that the site was in transition from Phase I to Phase II of woodland succession. However, many of the pinyon and juniper trees were removed by the burn. Although the site is within Phase I of woodland succession as of 2021 (Table 18B-03.4, Table 18B-03.12, Table 18B-03.14), the extant tree component indicates that there may be potential for infilling in the future. Due to the removal of preferred browse species following the wildfire, deer winter range condition is considered to be very poor as of 2021 (Table 18A-03.15).

**Trend Summary Tables****Table 18B-03.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	8.5	0.7	3.3	-	-	-
2002	8.8	0.1	4.3	-	-	0.4
2007	6.7	0.4	3.9	10.0	0.3	6.1
2012	9.9	0.4	6.5	11.1	0.4	10.3
2016	8.2	0.2	8.6	12.7	0.2	10.8
2021	0.0	-	-	-	-	-

**Table 18B-03.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	337	296	385	88	6.7	15.2	3.3	1.8
2002	308	288	299	68	4.9	11.7	1.4	1.0
2007	374	261	389	65	9.0	10.7	4.7	0.4
2012	266	272	282	49	7.5	14.7	1.3	0.9
2016	174	287	354	37	3.3	17.6	3.5	0.8
2021	73	103	138	55	1.8	1.6	3.4	1.1

**Table 18B-03.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	8.9	4.6	39.6	13.4	6.6	38.1
2002	7.2	21.5	34.9	7.9	9.9	36.6
2007	11.6	20.2	33.1	8.0	7.5	36.1
2012	12.1	13.4	41.4	8.3	8.1	42.3
2016	15.6	13.6	36.3	12.3	4.7	37.1
2021	27.5	0.8	17.1	40.4	12.5	8.4

**Table 18B-03.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	-	52	2	10
2002	-	21	-	45
2007	1	18	8	91
2012	-	4	-	39
2016	-	23	-	38
2021	-	-	-	12
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	-	31.5 (77.8)	0.7 (1.7)	-
2007	-	18.1 (44.7)	1.3 (3.3)	-
2012	-	6.7 (16.6)	-	-
2016	-	13.4 (33.1)	-	-
2021	-	-	-	-



**Table 18B-03.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia octoflora <sup>a</sup> (sixweeks fescue)
year	Nested Frequency									
1997	42	-	337	34	58	-	-	42	192	-
2002	49	2	308	3	70	7	2	84	171	-
2007	15	-	374	10	60	-	-	86	178	8
2012	17	-	266	4	67	-	-	121	149	-
2016	26	-	174	9	94	-	1	85	167	-
2021	7	-	73	28	-	-	1	24	67	-
year	Average Cover (%)									
1997	1.8	-	6.7	0.5	2.6	-	-	0.3	9.9	-
2002	1.1	0.0	4.9	0.2	3.5	0.0	0.0	0.8	6.0	-
2007	0.4	-	9.0	0.4	1.0	-	-	0.8	8.1	0.0
2012	0.5	-	7.5	0.1	3.8	-	-	1.8	8.5	-
2016	0.9	-	3.3	0.4	7.7	-	0.0	1.0	7.7	-
2021	0.0	-	1.8	0.6	-	-	0.0	0.1	0.9	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 18B-03.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus calycosus (Torrey's milkvetch)	Astragalus eurekaensis (Eureka milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (tittlepod false flax)	Castilleja (Indian paintbrush)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Cirsium (thistle)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Eriogonum brevicaulle (shortstem buckwheat)	Eriogonum ovalifolium (cushion buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)
year	Nested Frequency																
1997	-	385	-	1	-	-	15	-	4	8	3	1	3	-	-	4	3
2002	4	285	-	-	-	-	11	-	-	2	28	-	-	-	-	11	11
2007	-	360	5	-	10	2	-	-	-	5	121	-	4	25	-	3	46
2012	-	266	-	-	2	-	-	35	-	-	16	-	-	-	9	-	-
2016	3	349	-	-	2	-	3	-	-	-	20	-	-	3	-	-	15
2021	-	108	-	1	-	2	8	-	-	-	22	-	-	-	-	-	27
year	Average Cover (%)																
1997	-	3.3	-	0.0	-	-	0.0	-	0.0	0.1	0.0	0.0	0.0	-	-	0.0	0.0
2002	0.0	1.3	-	-	-	-	0.0	-	-	0.0	0.1	-	-	-	-	0.0	0.0
2007	-	2.5	0.0	-	0.1	0.0	-	-	-	0.0	0.5	-	0.0	0.1	-	0.0	1.4
2012	-	1.1	-	-	0.0	-	-	0.2	-	-	0.0	-	-	-	0.1	-	-
2016	0.0	3.3	-	-	0.0	-	0.0	-	-	-	0.0	-	-	0.0	-	-	0.1
2021	-	1.8	-	0.0	-	0.0	0.1	-	-	-	0.1	-	-	-	-	-	1.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Nested Frequency														
year	Average Cover (%)														
Gilia inconspicua <sup>a</sup> (shy gilia)	3	0	7	-	-	-	24	5	-	-	-	-	24	6	
Lactuca serriola <sup>ai</sup> (prickly lettuce)	4	-	7	-	-	-	27	-	3	-	-	-	9	4	
Lathyrus brachycalyx (Bonneville pea)	-	3	1	-	-	-	19	4	3	-	22	2	18	2	
Linum perenne <sup>i</sup> (blue flax)	-	-	9	-	-	-	21	3	-	-	7	-	12	-	
Medicago sativa <sup>i</sup> (alfalfa)	-	-	0	-	-	-	20	1	-	-	-	-	9	1	
Nicotiana attenuata <sup>a</sup> (coyote tobacco)	13	-	4	8	4	1	1	1	6	1	-	-	23	-	
Petroradia pumila (rock goldenrod)	1997	0.0	0.0	0.2	-	-	-	0.9	0.0	-	-	-	-	0.3	0.2
Phlox hoodii (spiny phlox)	2002	0.0	-	0.3	-	-	-	0.5	-	0.0	-	-	-	0.1	0.0
Phlox longifolia (longleaf phlox)	2007	-	0.0	0.0	-	-	-	0.2	0.0	0.0	-	0.0	0.1	0.1	0.0
Salsola tragus <sup>ai</sup> (prickly Russian thistle)	2012	-	-	0.1	-	-	-	0.6	0.0	-	-	0.0	-	0.1	-
Silene antirrhina <sup>a</sup> (sleepy silene)	2016	-	-	0.0	-	-	-	0.6	0.0	-	-	-	-	0.1	0.0
Sisymbrium altissimum <sup>ai</sup> (tall tumbleweed)	2021	0.2	-	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.8	-
Sphaeralcea coccinea (scarlet globemallow)															
Streptanthus cordatus (heartleaf twistflower)															

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 18B-03.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)									
year	Quadrat Cover (%)									
Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	1997	-	-	-	-	-	-	-	-	-
Bassia prostrata <sup>pi</sup> (forage kochia)	2002	-	-	-	-	-	0.4	-	-	-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	2007	8.2	-	-	-	1.8	0.2	6.1	0.1	-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	2012	7.7	-	0.1	-	3.4	0.2	9.8	0.1	0.5
Ephedra viridis <sup>p</sup> (mormon tea)	2016	7.4	-	0.1	-	5.3	0.1	10.1	-	0.7
Gutierrezia sarothrae (broom snakeweed)	2021	0	-	-	-	-	-	-	-	-
Juniperus osteosperma <sup>i</sup> (Utah juniper)	1997	7.7	-	-	0.5	0.8	0.2	3.3	-	-
Opuntia (pricklypear)	2002	7.9	-	-	0.1	1.0	0.0	3.6	-	0.6
Pinus monophylla <sup>i</sup> (singleleaf pinyon)	2007	5.5	-	0.0	0.2	1.1	0.2	3.8	0.0	0.1
	2012	8.6	-	0.2	0.0	1.3	0.2	5.8	0.0	0.6
	2016	6.9	-	0.2	-	1.3	0.0	7.2	0.0	1.4
	2021	0.0	0.0	-	-	-	-	-	-	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 18B-03.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia nova<sup>P</sup> -- (black sagebrush)</b>									
1997	-	-	-	-	-	-	-	-	31/37
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	38/45
2016	-	-	-	-	-	-	-	-	44/52
2021	-	-	-	-	-	-	-	-	-/-
<b>Artemisia tridentata ssp. wyomingensis<sup>P</sup> -- (Wyoming big sagebrush)</b>									
1997	2160	-	2	67	32	17	5	12	60/98
2002	2040	20	3	51	46	31	6	26	53/79
2007	1440	-	1	47	51	35	11	60	72/100
2012	1440	20	8	71	21	15	4	25	65/94
2016	1220	-	2	61	38	26	39	46	62/98
2021	-	220	0	0	0	0	0	0	-/-
<b>Bassia prostrata<sup>Pi</sup> -- (forage kochia)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	20	0	0	0	0	0	0	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	160	-	13	50	38	13	50	25	21/27
2012	120	-	0	100	0	0	17	0	25/34
2016	180	-	22	78	0	11	22	0	23/26
2021	-	-	-	-	-	-	-	-	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	340	20	6	88	6	0	6	6	27/33
2002	320	-	0	56	44	31	0	19	22/30
2007	80	-	0	100	0	50	50	0	31/64
2012	40	-	0	100	0	0	0	0	46/76
2016	20	-	0	100	0	0	0	0	43/73
2021	-	-	-	-	-	-	-	-	-/-
<b>Ephedra viridis<sup>P</sup> -- (mormon tea)</b>									
1997	20	-	0	100	0	0	0	0	102/126
2002	40	-	0	50	50	0	50	0	112/169
2007	40	-	50	50	0	0	0	0	113/149
2012	180	-	78	22	0	0	0	0	120/171
2016	80	-	0	50	50	0	25	50	107/142
2021	-	-	-	-	-	-	-	-	-/-
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	87/64
2021	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	160	-	13	88	0	0	0	0	24/25
2002	380	-	11	53	37	0	0	26	12/18
2007	80	-	50	25	25	0	0	25	15/15
2012	100	60	0	100	0	0	0	0	22/24
2016	140	-	0	100	0	0	0	0	31/41
2021	-	-	-	-	-	-	-	-	-/-
<b>Juniperus osteosperma<sup>1</sup> -- (Utah juniper)</b>									
1997	20	-	0	100	0	0	0	0	-/-
2002	20	-	0	100	0	0	0	0	-/-
2007	20	20	0	100	0	0	0	0	-/-
2012	20	-	0	100	0	0	0	0	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Opuntia -- (pricklypear)</b>									
1997	80	-	0	100	0	0	0	0	20/39
2002	120	-	0	100	0	0	0	0	14/33
2007	120	-	0	100	0	17	0	0	14/38
2012	100	-	0	80	20	0	0	20	12/28
2016	200	-	0	100	0	0	0	0	14/28
2021	-	-	-	-	-	-	-	-	-/-
<b>Pinus monophylla<sup>1</sup> -- (singleleaf pinyon)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Purshia stansburiana<sup>2</sup> -- (Stansbury cliffrose)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	232/255
2012	-	-	-	-	-	-	-	-	193/244
2016	-	-	-	-	-	-	-	-	179/177

t - Tree Species; p - Preferred Browse; i - Introduced Species

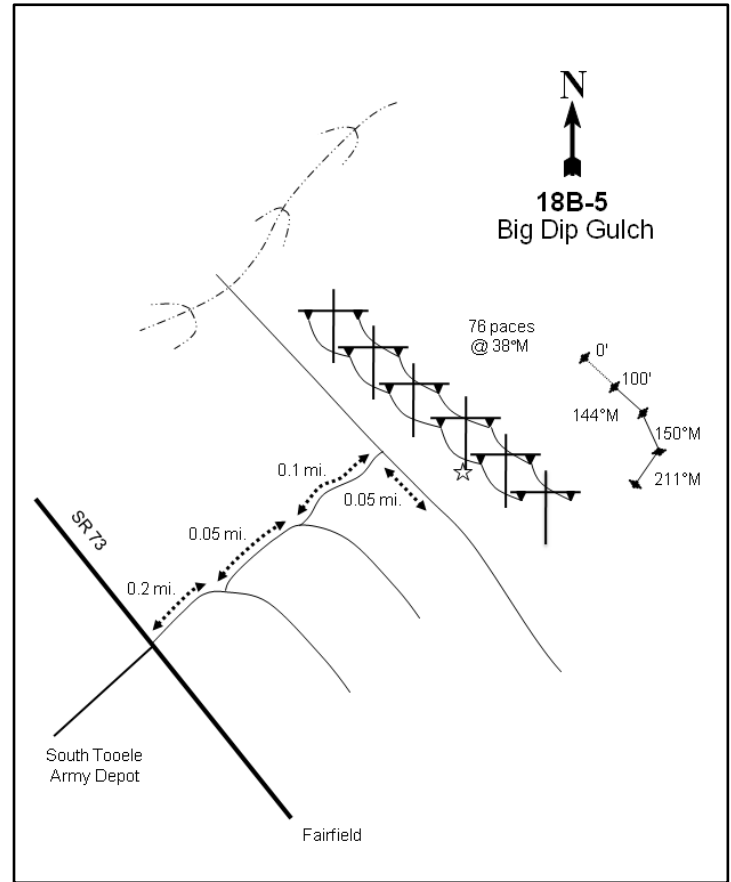
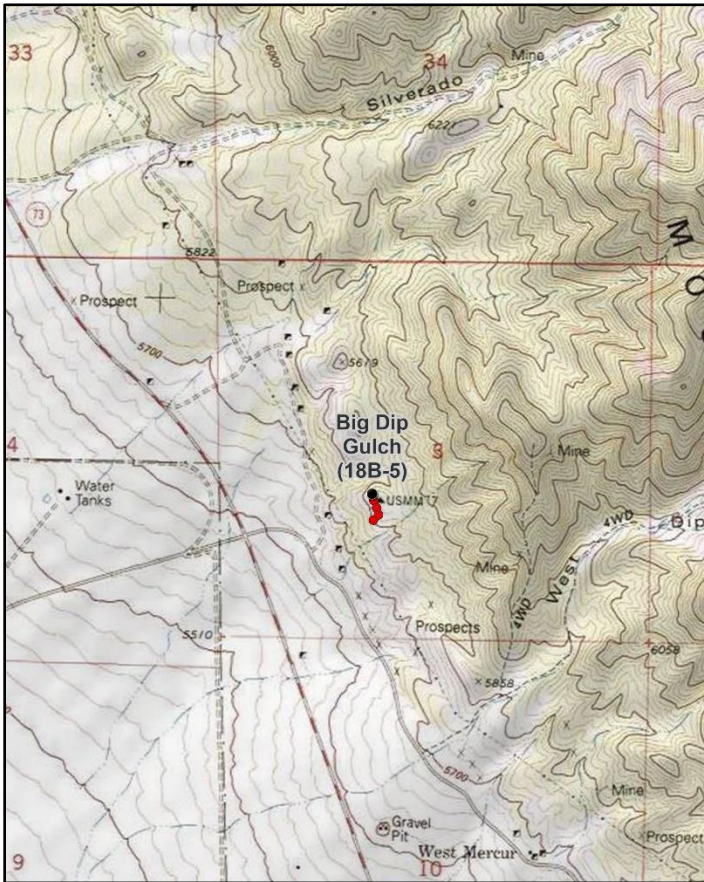
**Table 18B-03.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
1997	31	-	-	-	-	-	20.9
2002	32	-	-	-	-	-	25.7
2007	24	-	-	-	29	71	22.6
2012	26	14	-	7	14	64	21.9
2016	26	-	-	13	20	67	28.9
2021	1	-	-	-	100	-	33.0
<b>Pinus monophylla (singleleaf pinyon)</b>							
1997	5	-	-	-	-	-	4.5
2002	7	-	-	-	-	-	7.7
2007	9	17	-	67	-	17	11.8
2012	8	33	17	17	17	17	11.7
2016	6	20	20	-	40	20	15.0

**Table 18B-03.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	10.6	6.5	0.9	30.0	-5.0	3.5	0.0	<b>46.5</b>	Poor
2002	11.0	1.0	1.3	23.4	-3.7	2.1	0.0	<b>35.2</b>	Very Poor-Poor
2007	12.5	2.4	5.1	21.5	-6.7	0.8	0.0	<b>35.5</b>	Very Poor-Poor
2012	13.9	10.7	14.8	29.3	-5.7	1.7	0.0	<b>64.7</b>	Fair-Good
2016	15.9	2.2	0.5	30.0	-2.4	1.6	0.0	<b>47.7</b>	Poor
2021	0.0	0.0	0.0	3.2	-1.4	2.2	0.0	<b>3.9</b>	Very Poor

## BIG DIP GULCH - STUDY NO. 18B-5

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Ophir NE; Township 6S, Range 4W, Section 03  
NAD 83 UTM ZONE 12, 391082 East 4464747 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

Not Available  
144° magnetic (Line 3: 150° magnetic, Line 4: 211° magnetic)  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Belt 1, 4: No Rebar

**Directions to Site**

From the junction of State Route 73 and the east entrance of the South Army Depot, turn east onto the dirt road directly across from the depot entrance towards West Dip Gulch and travel 0.2 miles to an intersection. Turn left and travel 0.05 miles to another intersection. Turn left again and drive 0.1 miles to another intersection. Turn right, proceed 0.05 miles along a power line until two power poles are reached, and stop. The 0-foot stake is marked by a green steel fencepost 15 inches in height.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	MERCUR CAN-W. OPHIR
Elevation	5,700ft (1,737m)
Aspect	West
Slope	12-25%
Sample Dates	06/16/1997, 05/23/2002, 06/07/2007, 06/06/2012, 07/20/2016, 06/07/2021

**Wildlife Habitat and Vegetation History****Table 18B-05.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	year-long

**Table 18B-05.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Black Sagebrush	Phase I
1989	Black Sagebrush	Phase I
1997	Black Sagebrush	Phase I
2002	Black Sagebrush	Phase I
2007	Black Sagebrush	Phase I
2012	Black Sagebrush	Phase I
2016	Black Sagebrush	Phase I
2021	Black Sagebrush	Phase I

**Site Notes**

This study is located on a hillside between Silverado Canyon and West Dip Gulch. The sample vegetation is dominated by black sagebrush (*Artemisia nova*) with a limited understory that transitions to Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*) downslope.

**Soils****Table 18B-05.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.5	28.0	39.4	32.6	2.8	4.9	195.2	0.5	06/16/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Upland Shallow Loam (Black Sagebrush)
NRCS Ecological Site #	R028AY325UT
States and Transitions	Current Potential State: Community Phase 2.1

Since study establishment in 1988, this site has remained dominated by black sagebrush (*Artemisia nova*) with broom snakeweed (*Gutierrezia sarothrae*) as a subordinate species. Sagebrush has exhibited an overall decrease in cover and density over the sample years (Photos, Pre-1992 Data, Table 18B-05.12, Table 18B-05.13). In addition, 46% of sagebrush plants were considered to have poor vigor in 2021 (Table 18B-05.13), likely due to drought stress. Further decreases in sagebrush could potentially occur if similar climatic conditions are sustained in the future. The herbaceous understory has remained sparse with limited cover. However, the perennial grass bluebunch wheatgrass (*Pseudoroegneria spicata*) has been the dominant species in most sample years; forbs have remained rare (Table 18B-13.7, Table 18B-13.10, Table 18B-13.11). Community structure as of 2021 suggests that the site is within Community Phase 2.1 as described by the current ESD model due to the co-dominance of black sagebrush and bluebunch wheatgrass (USDA-ARS Jornada Experimental Range, 2021). Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon (*Pinus monophylla*) have been observed in the area, placing the site in Phase I of woodland succession in all sample years (Photos, Table 18B-05.12, Table 18B-05.13, Table 18B-05.14). Although trees likely do not pose a threat to the ecological integrity of the site as of 2021, further encroachment could be detrimental to the plant community should it increase in the future. Deer winter range has never been in good condition, and condition has ranged from poor to very poor over the sample years due to poor vigor and high decadence within the preferred browse community. More specifically, deer wintering conditions were considered to be very poor in 2021 due to low sagebrush cover with most plants being decadent (Table 18B-05.15).

**Trend Summary Tables****Table 18B-05.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	6.4	2.7	-	-	-	-
2002	8.1	0.3	0.0	-	-	-
2007	8.6	0.6	0.1	10.4	0.3	-
2012	10.1	0.1	0.0	10.1	0.4	0.2
2016	10.3	0.1	0.4	12.9	0.4	0.1
2021	8.1	-	0.4	8.7	-	0.1

**Table 18B-05.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	231	236	155	31	0.5	3.8	0.4	0.1
2002	84	246	199	21	0.2	7.0	0.5	0.1
2007	182	301	294	2	0.6	10.6	1.4	0.0
2012	61	314	41	4	0.1	8.5	0.1	0.0
2016	31	254	160	6	0.1	7.3	0.5	0.0
2021	26	285	40	6	0.1	7.0	0.1	0.0

**Table 18B-05.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	2.1	1.1	7.8	45.6	25.0	13.7
2002	9.6	1.2	10.0	42.7	31.8	15.0
2007	8.6	1.9	6.9	41.4	31.6	20.3
2012	8.7	3.3	7.5	39.6	26.2	18.8
2016	7.6	2.8	8.3	50.8	30.4	17.4
2021	8.4	2.9	12.9	41.0	23.8	15.2

**Table 18B-05.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency			
1997	42	-	1	9
2002	22	-	-	15
2007	24	4	-	85
2012	21	-	-	15
2016	38	-	-	48
2021	21	-	-	33
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	44.2 (109.2)	-	-	-
2007	62.3 (153.9)	-	-	-
2012	24.8 (61.2)	-	-	-
2016	52.3 (129.1)	-	-	-
2021	32.8 (81.1)	-	-	-



**Table 18B-05.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency				
1997	5	231	0	203	78
2002	3	84	12	197	110
2007	3	182	3	267	134
2012	-	61	4	260	149
2016	10	31	-	135	149
2021	1	26	14	234	128
year	Average Cover (%)				
1997	0.0	0.5	0.0	1.4	2.4
2002	0.0	0.2	0.1	2.7	4.2
2007	0.0	0.6	0.0	4.0	6.5
2012	-	0.1	0.0	1.8	6.7
2016	0.1	0.1	-	0.5	6.7
2021	0.0	0.1	0.4	3.2	3.4

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 18B-05.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Astragalus (milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Draba <sup>a</sup> (draba)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Phlox longifolia (longleaf phlox)
year	Nested Frequency											
1997	2	-	4	3	-	149	22	-	-	-	11	-
2002	9	-	4	-	5	195	2	-	1	-	9	-
2007	-	-	2	-	-	287	-	-	-	1	38	-
2012	-	13	1	-	-	36	-	3	-	-	-	-
2016	-	86	-	1	-	93	5	-	-	1	7	-
2021	-	3	-	-	1	37	-	-	-	-	3	5
year	Average Cover (%)											
1997	0.0	-	0.0	0.0	-	0.4	0.0	-	-	-	0.0	-
2002	0.1	-	0.0	-	0.0	0.5	0.0	-	0.0	-	0.0	-
2007	-	-	0.0	-	-	1.1	-	-	-	0.0	0.3	-
2012	-	0.0	0.0	-	-	0.1	-	0.0	-	-	-	-
2016	-	0.3	-	0.0	-	0.2	0.0	-	-	0.0	0.0	-
2021	-	0.0	-	-	0.0	0.1	-	-	-	-	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 18B-05.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova <sup>p</sup> (black sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>i</sup> (Utah juniper)	Purshia stansburiana <sup>p</sup> (Stansbury cliffrose)
year	Line Intercept Cover (%)				
1997	-	-	-	-	-
2002	-	-	-	-	-
2007	10.4	-	0.3	0	-
2012	10.1	-	0.4	0.2	-
2016	12.9	-	0.4	0.1	-
2021	8.5	-	-	0.1	0.2
year	Quadrat Cover (%)				
1997	6.4	0.0	2.7	-	-
2002	8.1	0.0	0.2	0.0	-
2007	8.6	0.1	0.5	0.1	-
2012	10.1	0.0	0.0	0.0	-
2016	10.3	-	0.1	0.4	-
2021	8.1	-	-	0.4	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 18B-05.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia nova<sup>p</sup> -- (black sagebrush)</b>									
1997	5640	340	16	78	7	48	0	5	23/43
2002	7040	20	5	73	22	38	3	4	21/44
2007	6700	620	5	70	25	13	2	18	19/55
2012	6480	-	4	88	8	61	33	3	21/45
2016	5800	180	2	77	20	17	63	29	24/51
2021	5320	-	2	49	50	26	1	46	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1997	40	-	100	0	0	0	0	0	- / -
2002	20	-	100	0	0	0	0	0	- / -
2007	40	-	0	100	0	0	0	0	9/14
2012	20	-	100	0	0	0	0	0	- / -
2016	-	-	-	-	-	-	-	-	23/30
2021	-	-	-	-	-	-	-	-	- / -
<b>Ephedra viridis<sup>p</sup> -- (mormon tea)</b>									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	42/40
2012	-	-	-	-	-	-	-	-	49/70
2016	-	-	-	-	-	-	-	-	85/165
2021	20	-	0	100	0	100	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	4300	-	4	87	9	0	0	1	18/25
2002	580	-	17	31	52	0	0	38	8/14
2007	1280	100	25	75	0	0	0	0	10/14
2012	200	-	0	100	0	0	0	0	9/15
2016	760	-	8	92	0	0	0	0	18/20
2021	60	-	67	33	0	0	0	0	- / -
<b>Juniperus osteosperma<sup>1</sup> -- (Utah juniper)</b>									
1997	20	-	100	0	0	0	0	0	- / -
2002	20	-	0	100	0	0	0	0	- / -
2007	20	-	100	0	0	0	0	0	- / -
2012	20	-	100	0	0	0	0	0	- / -
2016	40	-	100	0	0	0	0	0	- / -
2021	40	-	100	0	0	0	0	0	- / -
<b>Opuntia -- (pricklypear)</b>									
1997	20	-	0	100	0	0	0	0	19/35
2002	20	-	0	100	0	0	0	0	- / -
2007	-	-	-	-	-	-	-	-	9/24
2012	-	-	-	-	-	-	-	-	12/33
2016	20	-	0	100	0	0	0	0	11/21
2021	-	-	-	-	-	-	-	-	- / -
<b>Pinus monophylla<sup>1</sup> -- (singleleaf pinyon)</b>									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	20	-	100	0	0	0	0	0	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
<b>Purshia stansburiana<sup>2</sup> -- (Stansbury cliffrose)</b>									
1997	20	-	100	0	0	100	0	0	- / -
2002	20	-	0	100	0	0	0	0	142/325
2007	20	-	0	100	0	0	0	0	103/128
2012	20	-	0	100	0	0	100	0	82/125
2016	20	-	0	100	0	100	0	0	103/137
2021	20	-	0	100	0	100	0	0	- / -
<b>Tetradymia glabrata -- (littleleaf horsebrush)</b>									
1997	20	-	0	100	0	0	0	0	11/12
2002	20	-	0	100	0	0	0	0	25/27
2007	20	-	0	0	100	0	0	100	52/85
2012	-	-	-	-	-	-	-	-	50/72
2016	-	-	-	-	-	-	-	-	71/73

t - Tree Species; p - Preferred Browse; i - Introduced Species

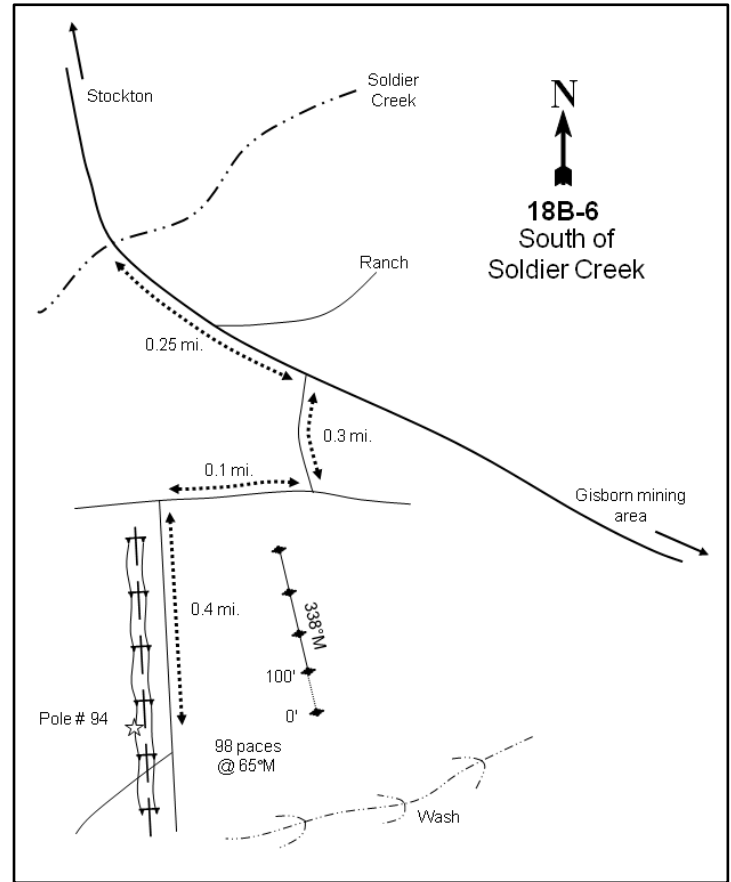
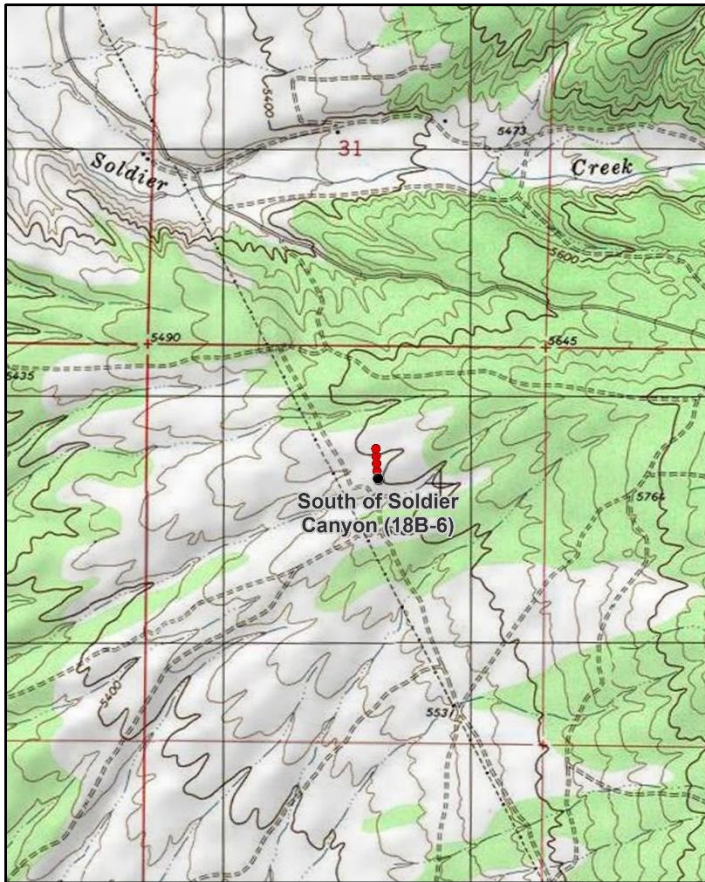
**Table 18B-05.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2012	21	15	46	31	8	-	14.8
2016	30	13	50	19	13	6	13.4
2021	31	-	69	25	6	-	19.8
<b>Pinus monophylla (singleleaf pinyon)</b>							
2012	4	-	50	50	-	-	28.0
2016	4	-	-	50	50	-	12.5
2021	7	33	33	-	33	-	10.7

**Table 18B-05.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	8.0	13.0	7.8	7.6	-0.4	0.1	0.0	<b>36.1</b>	Very Poor-Poor
2002	10.1	8.3	2.2	14.0	-0.2	0.2	0.0	<b>34.7</b>	Very Poor-Poor
2007	13.0	7.5	2.6	21.1	-0.5	0.0	0.0	<b>43.7</b>	Poor
2012	12.6	12.6	2.0	17.1	-0.1	0.0	0.0	<b>44.2</b>	Poor
2016	16.1	8.9	1.2	14.5	-0.1	0.0	0.0	<b>40.7</b>	Poor
2021	10.9	0.3	0.7	14.0	-0.1	0.1	0.0	<b>26.0</b>	Very Poor

## SOUTH OF SOLDIER CANYON - STUDY NO. 18B-6

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Stockton SW; Township 5S, Range 4W, Section 06  
NAD 83 UTM ZONE 12, 386565 East 4474868 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

Not Available  
338° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Standard

**Directions to Site**

Traveling north on State Route 36 in Stockton, turn east onto East Silver Avenue. Follow this road through town as it turns south and becomes Soldier Canyon Road. Proceed south on this road until it crosses over Soldier Creek. Go 0.25 miles past the creek and turn right (south) on a road that goes up on the bench to the south. Travel on this road for 0.3 miles to an intersection at the top of the hill. Turn right (west) and continue 0.1 miles to another intersection. Turn left (south) and travel 0.4 miles to where there is a double power pole on the west side of the road. From the power pole marked with #94, walk 98 paces at 65 degrees magnetic to the 0-foot stake.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	MERCUR CAN-W. OPHIR
Elevation	5,600ft (1,707m)
Aspect	Southwest
Slope	6%
Sample Dates	06/17/1997, 06/06/2002, 06/07/2007, 06/05/2012, 07/18/2016, 06/09/2021

**Table 18B-06.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Broadcast	Russell Seeding-Browse	LTDL	October 1968	1300
Chaining - Two-Way Ely	Russell Chaining	LTDL	September-October 1968	1300
Seeding - Aerial Before	Russell Seeding	LTDL	September-October 1968	1300
Mechanical - Bullhog	Stockton Bullhog	1929	January-May 2012	1561
Seeding - Transplant	Stockton Bullhog	1929	April 2012	-

**Table 18B-06.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Russell Seeding			Aerial	Sep 1968	1300
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron desertorum	Desert Wheatgrass		8.00	0.00

Mix Name			Application Type	Application Date	Acres
Russell Seeding			Broadcast	Oct 1968	1300
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
F	Medicago sativa	Alfalfa	Ladak	0.08	0.00
F	Melilotus officinalis	Yellow Sweetclover		0.15	0.00
S	Atriplex canescens	Fourwing Saltbush		0.38	0.00
S	Purshia tridentata	Antelope Bitterbrush		0.08	0.00

Mix Name			Application Type	Application Date	Acres
MDF volunteers bitterbrush seedling planting			Seedling Transplant	Apr 2012	
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Purshia tridentata	Antelope Bitterbrush		NaN	NaN

**Wildlife Habitat and Vegetation History****Table 18B-06.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing

**Table 18B-06.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountian Big Sagebrush/Perennial Grass	Phase I
1989	Mountian Big Sagebrush/Perennial Grass	Phase I
1997	Mountian Big Sagebrush/Perennial Grass	Phase I
2002	Mountian Big Sagebrush/Perennial Grass	Phase I
2007	Mountian Big Sagebrush/Perennial Grass	Phase I
2012	Mountian Big Sagebrush/Perennial Grass	Phase I
2016	Mountian Big Sagebrush/Perennial Grass	Phase I
2021	Perennial Grass/Mountain Big Sagebrush	Phase I

**Site Notes**

This study is located south of Soldier Creek and samples crucial deer winter range that was formerly populated by a dense stand of Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon pine (*Pinus monophylla*) trees.

**Soils****Table 18B-06.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.5	36.0	34.4	29.6	3.2	5.6	284.8	0.6	06/17/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Upland Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R028AY310UT
States and Transitions	Current Potential State: Community Phase 5.1

The shrub overstory of this site has been dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) since study establishment in 1983 with yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *stenophyllus*) as a subordinate species. Utah juniper (*Juniperus osteosperma*) was a notable component of the overstory through 2007, but a bullhog treatment prior to the 2012 sampling eliminated most of the trees (Photos, Table 18B-06.1, Table 18B-06.12). Perennial grasses such as crested wheatgrass (*Agropyron cristatum*) and bluebunch wheatgrass (*Pseudoroegneria spicata*) contribute a majority of the herbaceous cover as of 2021 and have co-dominated the site throughout the study period. The community structure of crested wheatgrass being a dominant component and a lacking sagebrush population suggests that the site is in Community Phase 5.1 as described by the current ESD model (USDA-ARS Jornada Experimental Range, 2021). The introduced annual grass cheatgrass (*Bromus tectorum*) has been present since 1997, but in low amounts (Table 18B-06.7, Table 18B-06.10). Annual and perennial forbs have fluctuated in abundance (Table 18B-06.11). Although density has been low, singleleaf pinyon (*Pinus monophylla*) and juniper have been observed following the bullhog treatment (Table 18B-06.13, Table 18B-06.14). The site remains in Phase I of woodland succession as of 2021 (Table 18B-06.4), but the extant tree component indicates that there may be potential for infilling in future sample years. Deer winter range has never been in good condition and has ranged between poor and very poor-poor: these similar conditions can be attributed to a combination of low preferred browse cover and high decadence within the community. As of 2021, deer wintering conditions were considered to be poor due to the previously listed reasons (Table 18B-06.15).

**Trend Summary Tables****Table 18B-06.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	2.3	3.2	4.1	-	-	-
2002	1.9	2.9	6.6	-	-	0.5
2007	2.8	2.4	6.3	2.1	1.7	7.2
2012	0.9	2.8	-	1.4	3.3	-
2016	1.8	2.5	-	4.6	2.7	-
2021	1.2	3.3	0.0	3.0	2.3	-

**Table 18B-06.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	96	306	215	165	3.1	12.3	1.5	4.9
2002	73	297	209	175	1.8	14.6	0.8	4.9
2007	137	343	369	169	1.6	18.4	5.3	6.9
2012	55	285	111	148	0.2	17.4	0.4	3.7
2016	58	336	235	199	2.3	25.1	2.2	9.1
2021	26	332	33	105	0.1	25.8	0.1	3.3

**Table 18B-06.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	13.6	7.6	31.0	16.9	2.0	29.0
2002	19.2	13.0	30.4	20.7	2.8	33.9
2007	24.8	10.4	25.8	16.2	1.8	37.5
2012	23.5	4.2	44.0	10.2	2.1	22.8
2016	14.6	3.9	37.3	18.8	1.4	40.9
2021	21.1	7.4	36.1	10.6	3.0	34.2

**Table 18B-06.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	-	19	1	29
2002	-	8	4	29
2007	-	6	6	54
2012	-	2	-	10
2016	-	4	1	16
2021	-	1	4	19
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	-	4.0 (9.9)	4.7 (11.6)	-
2007	1.5 (3.6)	53.0 (130.8)	28.8 (71.2)	-
2012	-	2.7 (6.6)	-	-
2016	-	0.7 (1.7)	-	-
2021	1.5 (3.6)	4.7 (11.6)	6.7 (16.6)	-



**Table 18B-06.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency					
1997	9	178	96	-	145	76
2002	13	157	73	-	160	65
2007	5	139	137	-	229	104
2012	3	124	55	-	161	80
2016	8	177	58	12	107	154
2021	10	164	26	6	159	155
year	Average Cover (%)					
1997	0.2	6.6	3.1	-	2.2	3.3
2002	0.3	7.0	1.8	-	2.8	4.4
2007	0.2	5.6	1.6	-	6.1	6.6
2012	0.0	8.6	0.2	-	4.3	4.4
2016	0.7	13.1	2.3	0.1	1.3	9.9
2021	1.2	11.3	0.1	0.2	2.9	10.2

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 18B-06.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus purshii (woollypod milkvetch)	Astragalus tenellus (looseflower milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littleneck false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chaetopappa ericoides (rose heath)	Cirsium (thistle)	Erigeron pumilus (shaggy fleabane)	Eriogonum ovalifolium (cushion buckwheat)
year	Nested Frequency																
1997	-	-	1	4	6	13	-	15	-	6	3	-	212	-	-	1	-
2002	1	23	-	-	3	-	-	-	3	3	-	-	187	-	1	-	-
2007	-	78	-	2	-	13	-	-	-	6	-	1	311	1	-	-	1
2012	-	102	1	3	1	9	-	2	2	-	-	-	13	-	-	-	-
2016	-	188	1	-	7	22	-	1	5	11	-	-	99	-	3	-	-
2021	-	16	-	-	-	-	8	-	5	3	-	-	18	-	-	-	-
year	Average Cover (%)																
1997	-	-	0.0	0.0	0.0	0.3	-	0.4	-	0.0	0.0	-	1.4	-	-	0.0	-
2002	0.0	0.2	-	-	0.0	-	-	-	0.0	0.0	-	-	0.6	-	0.0	-	-
2007	-	1.4	-	0.0	-	0.1	-	-	-	0.0	-	0.0	3.5	0.0	-	-	0.0
2012	-	0.2	0.0	0.0	0.0	0.1	-	0.0	0.0	-	-	-	0.0	-	-	-	-
2016	-	1.6	0.0	-	0.0	0.7	-	0.0	0.0	0.0	-	-	0.6	-	0.1	-	-
2021	-	0.0	-	-	-	-	0.1	-	0.0	0.0	-	-	0.0	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES												
Erodium cicutarium <sup>at</sup> (redstem stork's bill)												
Gilia inconspicua <sup>a</sup> (shy gilia)												
Lactuca serriola <sup>at</sup> (prickly lettuce)												
Lathyrus brachycalyx (Bonneville pea)												
Petroradia pumila (rock goldenrod)												
Phlox hoodii (spiny phlox)												
Phlox longifolia (longleaf phlox)												
Salsola tragus <sup>at</sup> (prickly Russian thistle)												
Sanguisorba minor <sup>a</sup> (small burnet)												
Silene antirrhina <sup>a</sup> (sleepy silene)												
Sisymbrium altissimum <sup>at</sup> (tall tumblemustard)												
Tragopogon dubius <sup>at</sup> (yellow salsify)												
year	Nested Frequency											
1997	6	-	-	22	58	71	15	-	-	-	3	-
2002	-	1	-	57	57	70	10	-	-	-	-	-
2007	25	1	-	59	51	62	13	-	-	27	6	-
2012	-	-	-	74	2	49	8	2	4	-	-	-
2016	-	-	1	89	51	46	9	-	-	2	-	-
2021	-	-	-	35	48	16	8	-	-	-	-	5
year	Average Cover (%)											
1997	0.0	-	-	1.0	2.1	1.0	0.0	-	-	-	0.0	-
2002	-	0.0	-	2.1	1.7	0.9	0.1	-	-	-	-	-
2007	0.2	0.0	-	2.7	2.3	1.7	0.1	-	-	0.1	0.1	-
2012	-	-	-	2.5	0.1	0.9	0.1	0.1	0.0	-	-	-
2016	-	-	0.0	4.0	2.9	1.3	0.0	-	-	0.0	-	-
2021	-	-	-	0.5	1.8	0.9	0.0	-	-	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 18B-06.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES							
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)							
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)							
Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)							
Gutierrezia sarothrae (broom snakeweed)							
Juniperus osteosperma <sup>a</sup> (Utah juniper)							
Opuntia (pricklypear)							
Pinus monophylla <sup>a</sup> (singleleaf pinyon)							
year	Line Intercept Cover (%)						
1997	-	-	-	-	-	-	-
2002	-	-	-	-	0.5	-	-
2007	2.1	1.7	-	-	7.2	-	-
2012	1.4	2.1	-	1.2	-	-	-
2016	4.6	2.7	-	-	-	-	-
2021	3	2.3	-	-	-	-	-
year	Quadrat Cover (%)						
1997	2.3	2.7	-	0.4	3.8	0.1	0.4
2002	1.9	2.3	-	0.4	6.0	0.1	0.5
2007	2.8	2.4	-	0.0	6.3	0.0	-
2012	0.9	1.7	-	1.0	-	-	-
2016	1.8	2.5	0.0	-	-	-	-
2021	1.2	3.3	-	-	0.0	0.0	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 18B-06.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1997	680	-	24	68	9	18	3	3	53/78
2002	880	-	2	64	34	30	27	21	49/74
2007	920	-	4	76	20	52	2	13	45/64
2012	560	-	11	61	29	46	11	0	44/69
2016	760	-	11	71	18	8	24	16	48/77
2021	660	20	9	46	46	3	0	58	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1997	3220	-	6	73	21	0	0	16	24/39
2002	2660	-	3	70	27	5	1	10	19/31
2007	2540	-	1	79	21	34	6	13	21/34
2012	1240	-	0	86	14	2	0	3	22/34
2016	1600	-	3	89	9	3	3	11	26/41
2021	1300	-	8	42	51	0	0	60	- / -
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2016	20	-	100	0	0	100	0	0	27/31
2021	20	-	0	0	100	0	0	100	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	780	200	18	82	0	0	0	0	18/19
2002	780	-	0	80	21	0	0	0	12/20
2007	80	-	0	100	0	0	0	0	16/21
2012	2220	-	19	81	0	0	0	0	10/16
2016	-	-	-	-	-	-	-	-	28/37
2021	20	-	0	100	0	0	0	0	- / -
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1997	100	-	0	100	0	0	0	0	- / -
2002	180	-	0	100	0	0	0	0	- / -
2007	140	-	0	100	0	14	0	0	- / -
2012	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	40	-	100	0	0	0	0	0	- / -
<b>Opuntia -- (pricklypear)</b>									
1997	120	-	0	100	0	0	0	0	13/42
2002	100	-	0	80	20	0	0	20	12/38
2007	40	-	0	100	0	0	0	0	14/33
2012	-	-	-	-	-	-	-	-	17/41
2016	40	-	0	100	0	0	0	0	14/27
2021	20	20	0	100	0	0	0	0	- / -
<b>Pinus monophylla<sup>t</sup> -- (singleleaf pinyon)</b>									
1997	20	-	0	100	0	0	0	0	- / -
2002	20	-	0	100	0	0	0	0	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	20	0	0	0	0	0	0	- / -
2016	20	-	100	0	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

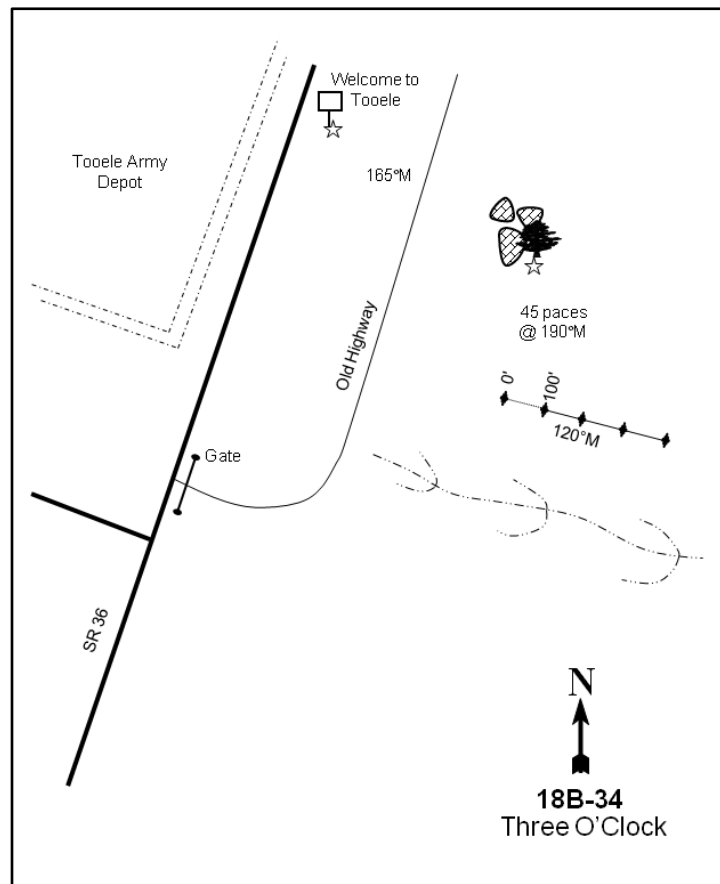
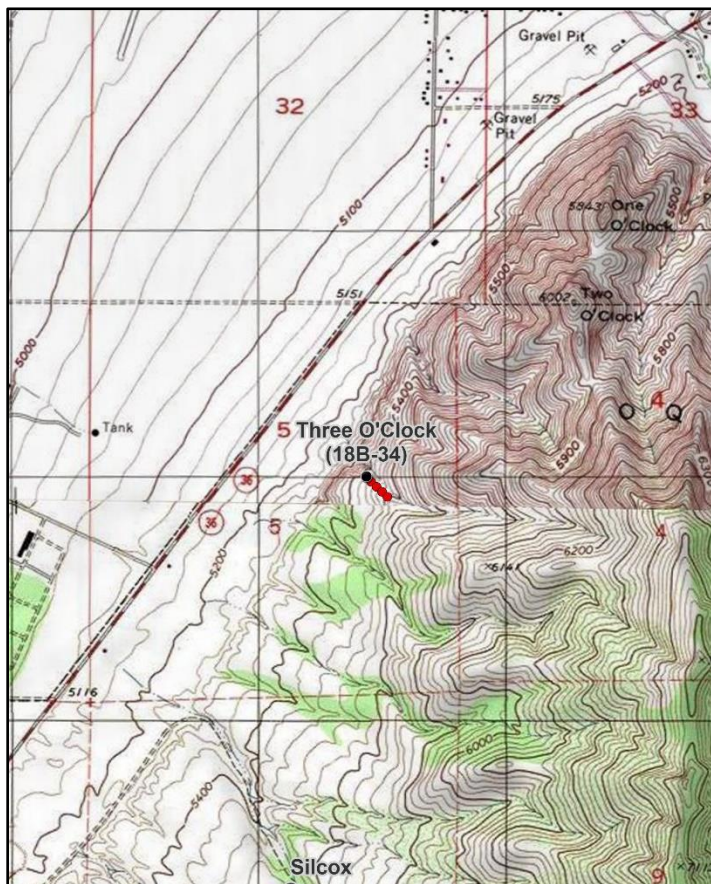
**Table 18B-06.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
1997	45	-	-	-	-	-	9.8
2002	88	-	-	-	-	-	11.7
2007	100	6	17	61	17	-	21.7
2012	10	-	100	-	-	-	2.5
2016	19	70	30	-	-	-	2.2
2021	26	30	60	10	-	-	2.5
<b>Pinus monophylla (singleleaf pinyon)</b>							
2012	3	-	100	-	-	-	4.0
2016	7	50	50	-	-	-	3.5
2021	5	-	100	-	-	-	2.3

**Table 18B-06.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1997	2.9	0.0	0.0	24.7	-2.4	9.8	0.0	<b>34.9</b>	Very Poor-Poor
2002	2.4	0.0	0.0	29.3	-1.3	9.7	0.0	<b>40.0</b>	Poor
2007	2.6	0.0	0.0	30.0	-1.2	10.0	0.0	<b>41.4</b>	Poor
2012	1.8	0.0	0.0	30.0	-0.1	7.4	0.0	<b>39.1</b>	Poor
2016	5.8	0.0	0.0	30.0	-1.7	10.0	0.0	<b>44.0</b>	Poor
2021	3.8	0.0	0.0	30.0	-0.1	6.6	0.0	<b>40.2</b>	Poor

## THREE O'CLOCK - STUDY NO. 18B-34

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Tooele SW; Township 4S, Range 4W, Section 05  
NAD 83 UTM ZONE 12, 388379 East 4484199 North

**Transect Information**

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

Not Available  
120° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Standard

**Directions to Site**

Park at the "Welcome to Tooele" sign south of Tooele; you can also park closer to the site on the shoulder of the highway. From the sign, walk at 165 degrees magnetic to a rock outcrop to a lone juniper. From the lone juniper, walk 45 paces at 190 degrees magnetic to a rock cairn or the 0-foot stake.

**Site Information**

Land Ownership	State
Land Administrator	SITLA
Allotment	STOCKTON
Elevation	5,440ft (1,658m)
Aspect	West
Slope	20%
Sample Dates	06/10/2002, 06/11/2007, 06/06/2012, 07/20/2016, 06/09/2021

**Table 18B-34.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	Late 1980s	-

**Wildlife Habitat and Vegetation History****Table 18B-34.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

**Table 18B-34.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2002	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2007	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2012	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2016	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2021	Perennial Grass/Mountain Big Sagebrush	No Encroachment

**Site Notes**

This study was established to monitor deer and elk winter range east of Highway 36 between Tooele and Stockton. This study samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community on a terrace formed by ancient Lake Bonneville. The whole area burned in the late 1980s, but now has a healthy stand of mountain big sagebrush.

**Soils****Table 18B-34.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	% sand	% silt	% clay	% OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	6.4	46.9	24.4	28.7	2.7	20.7	518.4	0.8	06/10/2002

**Site Potential**

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Upland Stony Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R047XA334UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been the dominant browse component on this site since study establishment in 2002, although cover and density have decreased since 2007 (Table 18B-34.12, Table 18B-34.13). Perennial grasses have co-dominated throughout the study period. However, a majority of the perennial grass cover has been contributed by the introduced species bulbous bluegrass (*Poa bulbosa*) in every sample year (Table 18B-34.7, Table 18B-34.10). Forbs are diverse and moderately abundant, with hairy false goldenaster (*Heterotheca villosa*) having the most cover of any single forb species in 2021 (Table 18B-34.11). Utah juniper (*Juniperus osteosperma*) is present in the area surrounding the study site, but encroachment is not occurring on the site itself as of 2021 (Photos, Table 18B-34.12, Table 18B-34.13). Should sagebrush continue to decrease in future sample years, this site will likely transition to one dominated by introduced perennial grasses. Deer winter range condition has ranged between fair-good and very poor: this change can be attributed to an overall decrease in sagebrush cover while decadence has increased within the same population. As of 2021, deer wintering conditions were considered to be very poor due to low perennial grass cover in addition to the reasons previously mentioned (Table 18B-34.15).

**Trend Summary Tables****Table 18B-34.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2002	14.4	0.9	-	-	-	-
2007	18.2	1.4	-	18.3	4.5	-
2012	14.1	1.1	-	16.8	4.9	-
2016	8.6	4.2	-	12.3	5.6	-
2021	5.0	6.0	-	6.8	6.7	-

**Table 18B-34.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2002	227	477	173	153	1.0	37.6	0.7	3.7
2007	127	471	291	184	1.1	32.0	1.6	5.0
2012	175	468	302	205	2.4	35.4	1.7	6.5
2016	207	437	160	162	6.6	24.3	2.1	4.3
2021	266	430	168	208	2.8	26.2	2.4	5.7

**Table 18B-34.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2002	6.8	3.3	24.7	9.8	13.4	60.7
2007	6.4	10.2	21.1	9.5	11.0	56.2
2012	4.5	9.2	31.7	8.4	11.8	57.4
2016	12.1	4.1	21.2	9.8	7.6	54.0
2021	5.2	5.2	47.5	5.1	9.0	42.6

**Table 18B-34.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
2002	2	24	27	-	-
2007	1	24	25	3	2
2012	-	22	4	-	5
2016	-	20	4	-	1
2021	-	37	27	-	1
Year	Days Use Per Acre (ha)				
2002	13.1 (32.3)	30.2 (74.5)	42.9 (105.9)	-	-
2007	-	38.2 (94.4)	53.0 (130.8)	2.9 (7.2)	-
2012	-	10.0 (24.8)	2.0 (5.0)	1.7 (4.3)	-
2016	1.5 (3.6)	17.4 (43.0)	7.4 (18.2)	-	-
2021	-	34.2 (84.4)	42.2 (104.3)	0.6 (1.4)	-

**Table 18B-34.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bromus briziformis <sup>ai</sup> (rattlesnake brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum ponticum <sup>i</sup> (tall wheatgrass)	Vulpia myuros <sup>ai</sup> (annual fescue)	Vulpia octoflora <sup>a</sup> (sixweeks fescue)
year	Nested Frequency													
2002	-	-	94	-	227	3	-	470	29	4	5	-	-	1
2007	-	-	99	-	120	2	-	398	274	-	8	-	2	15
2012	3	-	67	2	163	8	1	344	349	2	4	-	24	-
2016	-	-	122	-	207	-	-	309	214	2	2	4	0	-
2021	-	0	45	-	266	0	14	428	2	3	1	13	-	-
year	Average Cover (%)													
2002	-	-	1.7	-	1.0	0.2	-	35.5	0.1	0.0	0.1	-	-	0.0
2007	-	-	2.8	-	1.0	0.1	-	20.9	7.4	-	0.7	-	0.0	0.1
2012	0.0	-	2.9	0.0	2.0	0.1	0.0	22.4	9.3	0.0	0.7	-	0.4	-
2016	-	-	4.2	-	6.6	-	-	14.1	5.4	0.0	0.4	0.2	0.0	-
2021	-	0.0	0.6	-	2.8	0.0	0.2	24.4	0.0	0.4	0.0	0.6	-	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 18B-34.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum alyssoides <sup>ai</sup> (pale madwort)	Antennaria (pussytoes)	Asclepias (milkweed)	Astragalus cibirius (browse milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Cerastium beeringianum (Bering chickweed)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Cirsium (thistle)	Cirsium neomexicanum <sup>a</sup> (New Mexico thistle)	Convolvulus arvensis <sup>ai</sup> (field bindweed)	Crepis acuminata (tapertip hawksbeard)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Eriogonum racemosum (redroot buckwheat)
year	Nested Frequency																
2002	-	15	2	1	53	5	17	7	-	-	22	-	-	21	-	3	40
2007	-	22	6	2	58	4	30	15	-	10	36	-	-	32	198	3	51
2012	-	38	4	6	64	12	13	41	2	-	42	-	-	43	159	57	59
2016	-	23	6	1	10	10	33	-	-	-	-	42	10	3	2	25	34
2021	3	8	-	4	52	-	35	3	-	3	16	18	10	60	-	20	34
year	Average Cover (%)																
2002	-	0.0	0.0	0.1	1.2	0.1	0.1	0.4	-	-	0.5	-	-	0.2	-	0.0	0.2
2007	-	0.1	0.0	0.4	1.2	0.1	0.1	0.3	-	0.0	0.9	-	-	0.2	0.7	0.0	0.7
2012	-	0.1	0.0	0.4	1.4	0.3	0.0	0.3	0.0	-	1.8	-	-	0.2	0.3	0.1	0.6
2016	-	0.1	0.2	0.2	0.1	0.2	0.1	-	-	-	-	0.6	0.0	0.0	0.0	0.1	0.2
2021	0.0	0.0	-	0.1	1.0	-	0.2	0.3	-	0.0	0.1	0.8	0.1	0.9	-	0.1	0.4

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species



FORB SPECIES	Nestled Frequency																
year	Average Cover (%)																
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	25	1	-	137	7	-	-	-	2	3	24	10	1	-	21	22	
Gilia inconspicua <sup>a</sup> (shy gilia)	23	-	-	17	9	-	-	1	-	3	21	17	139	2	24	35	
Grindelia squarrosa (curlycup gumweed)	49	-	13	6	17	5	-	-	0	-	31	16	204	4	68	30	
Helianthus annuus <sup>ai</sup> (common sunflower)	25	0	23	41	58	18	4	-	3	-	3	7	-	4	55	27	
Heterotheca villosa (hairy false goldenaster)	62	-	4	86	41	18	1	-	6	-	34	3	-	9	13	28	
Lactuca serriola <sup>ai</sup> (prickly lettuce)	2002	0.1	0.0	-	0.3	0.3	-	-	-	0.0	0.0	0.1	0.0	0.0	-	0.1	0.4
Linaria dalmatica <sup>ai</sup> (Dalmatian toadflax)	2007	0.3	-	-	0.1	0.3	-	-	0.0	-	0.0	0.1	0.1	0.3	0.0	0.1	0.5
Lomatium (desertparsley)	2012	0.2	-	0.2	0.0	0.7	0.0	-	-	0.0	-	0.1	0.0	0.6	0.0	0.3	0.6
Petradoria pumila (rock goldenrod)	2016	0.4	0.0	0.6	0.3	2.3	0.1	0.0	-	0.1	-	0.0	0.0	-	0.0	0.5	0.2
Phlox hoodii (spiny phlox)	2021	0.6	-	0.0	0.6	1.9	0.2	0.0	-	0.2	-	0.2	0.0	-	0.0	0.1	0.3
Phlox longifolia (longleaf phlox)																	
Polygonum douglasii <sup>a</sup> (Douglas' knotweed)																	
Silene antirrhina <sup>a</sup> (sleepy silene)																	
Sphaeralcea coccinea (scarlet globemallow)																	
Tragopogon dubius <sup>ai</sup> (yellow salsify)																	
Zigadenus paniculatus (foothill deathcamas)																	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 18B-34.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)							
year	Quadrat Cover (%)							
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	2002	-	-	-	-	-	-	-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	2007	18.1	-	0.2	0.3	-	-	4.2
Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	2012	16.7	-	0.1	0.7	-	-	4.2
Gutierrezia sarothrae (broom snakeweed)	2016	12	-	0.3	5.6	-	-	0
Opuntia polyacantha (plains pricklypear)	2021	6.5	0.5	-	6.2	0	0.3	0
Rhus trilobata <sup>p</sup> (skunkbush sumac)	2002	14.3	-	0.1	0.9	0.0	-	0.0
Sarcobatus vermiculatus (greasewood)	2007	18.1	-	0.0	0.8	0.0	-	0.5
Tetradymia canescens (spineless horsebrush)	2012	14.1	-	0.0	0.3	-	-	0.0
	2016	8.6	-	0.0	4.2	-	-	0.0
	2021	4.7	0.4	0.1	5.4	0.0	0.1	0.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 18B-34.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	84/113
2012	20	-	100	0	0	100	0	0	93/82
2016	-	-	-	-	-	-	-	-	-/-
2021	20	-	0	100	0	100	0	0	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
2002	6480	20	1	92	7	40	39	3	38/62
2007	4620	460	2	74	24	36	33	21	43/84
2012	4600	-	4	73	24	84	5	4	43/84
2016	2380	-	1	45	54	40	31	42	42/81
2021	2380	-	4	45	50	15	4	46	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	45/60
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	40	-	0	50	50	50	0	50	- / -
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
2002	60	-	0	100	0	33	33	0	27/24
2007	80	-	25	25	50	50	25	25	46/74
2012	140	-	14	86	0	43	0	0	33/31
2016	80	-	0	100	0	0	0	0	43/51
2021	40	-	0	50	50	0	0	50	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
2002	3320	40	3	88	9	0	0	3	15/17
2007	1980	20	12	76	12	0	0	6	18/23
2012	1180	40	9	92	0	0	0	0	19/21
2016	5900	-	2	98	0	0	0	1	24/32
2021	5540	180	28	60	12	0	0	12	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
2002	60	-	33	67	0	0	0	0	12/29
2007	80	-	25	75	0	0	0	0	11/31
2012	20	-	0	100	0	0	0	0	11/18
2016	100	-	40	60	0	0	0	0	11/28
2021	60	-	33	67	0	0	0	0	- / -
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
2002	-	20	0	0	0	0	0	0	57/145
2007	-	-	-	-	-	-	-	-	100/189
2012	-	-	-	-	-	-	-	-	125/254
2016	-	-	-	-	-	-	-	-	164/271
2021	-	-	-	-	-	-	-	-	-/-
<b>Rhus trilobata<sup>p</sup> -- (skunkbush sumac)</b>									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	20	0	0	0	0	0	0	81/127
2012	20	-	100	0	0	0	0	0	16/16
2016	-	-	-	-	-	-	-	-	-/-
2021	20	-	0	100	0	100	0	0	- / -

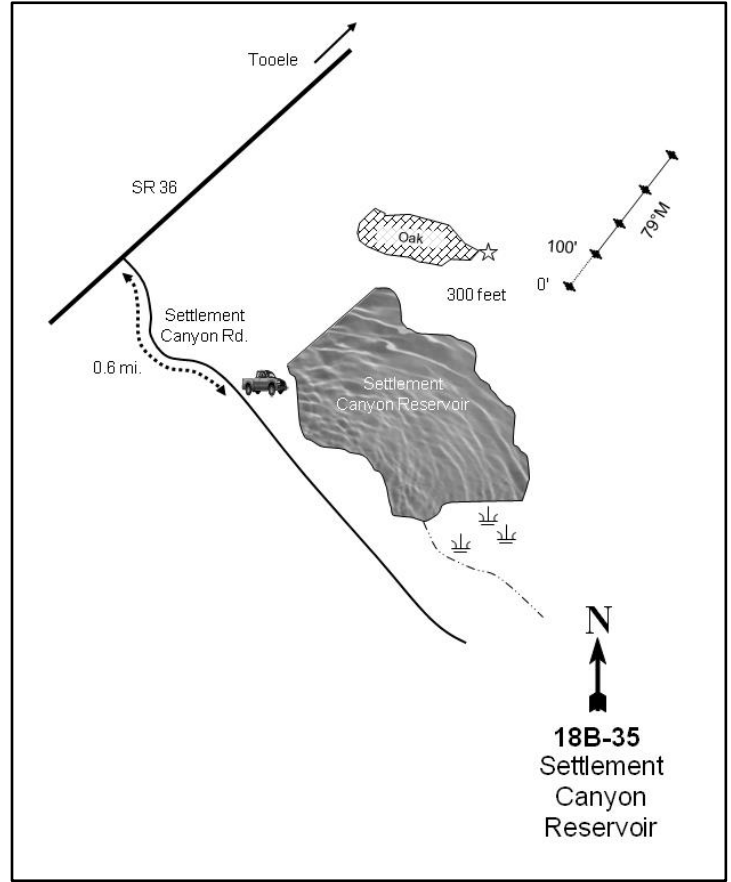
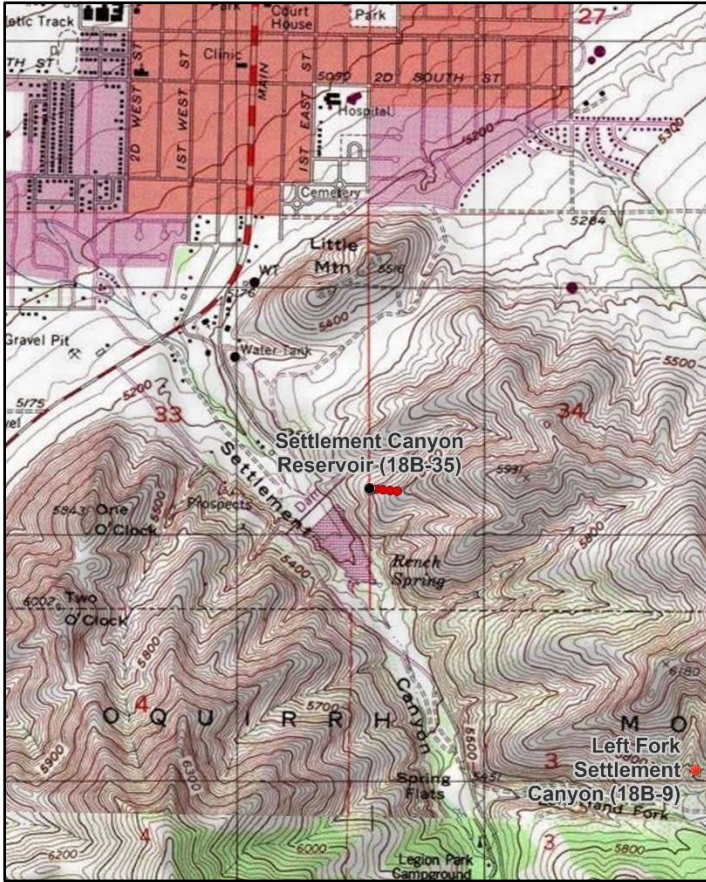
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Sarcobatus vermiculatus -- (greasewood)</b>									
2002	-	-	-	-	-	-	-	-	-/-
2007	200	-	0	100	0	0	100	0	- / -
2012	100	-	20	80	0	40	0	0	38/47
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
2002	100	-	0	100	0	20	0	0	36/54
2007	120	-	17	67	17	17	0	0	29/60
2012	60	-	33	67	0	33	0	0	15/26
2016	140	-	0	86	14	14	14	29	35/55
2021	160	-	25	63	13	0	0	13	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 18B-34.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2002	18.0	12.9	0.6	4.2	-0.7	7.4	0.0	<b>42.3</b>	Poor
2007	22.9	7.7	1.0	22.2	-0.8	10.0	0.0	<b>62.9</b>	Fair
2012	21.0	8.0	2.0	26.1	-1.8	10.0	0.0	<b>65.3</b>	Fair-Good
2016	15.4	-0.7	0.4	20.4	-4.9	8.5	-4.0	<b>35.0</b>	Very Poor-Poor
2021	8.4	0.5	2.0	3.5	-2.1	10.0	-4.0	<b>18.5</b>	Very Poor

## SETTLEMENT CANYON RESERVOIR - STUDY NO. 18B-35



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Tooele SE; Township 3S, Range 4W, Section 34  
NAD 83 UTM ZONE 12, 390482 East 4485384 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement  
Belt Marker Placement

Not Available  
79° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Belt 1, 2: No Rebar

### Directions to Site

From the intersection of Highway 36 and Settlement Canyon Road in Tooele, drive 0.6 miles to the parking lot at Settlement Canyon Reservoir. Walk across the dam and spillway. From the spillway, walk southeast up the ridge (there is a well-worn trail) for 300 feet through an oak patch. Continue above the oak and walk along the contour for a short distance to the 0-foot stake which has a rock cairn next to it.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	STOCKTON
Elevation	5,500ft (1,676m)
Aspect	West
Slope	22%
Sample Dates	06/11/2002, 06/11/2007, 06/06/2012, 07/20/2016, 06/08/2021

**Wildlife Habitat and Vegetation History****Table 18B-35.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

**Table 18B-35.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2002	Mountain Big Sagebrush/Perennial Grass	NA
2007	Mountain Big Sagebrush/Perennial Grass	NA
2012	Mountain Big Sagebrush/Perennial Grass	NA
2016	Mountain Big Sagebrush/Perennial Grass	NA
2021	Perennial Grass-Forb/Mountain Big Sagebrush	NA

**Site Notes**

This study was established in 2002 to replace the Left Fork Settlement Canyon (18B-09) trend study; the new study is more representative of crucial winter range in the area and is more often frequented by deer and elk. The study samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community located on a mountain slope east of the Settlement Canyon Reservoir dam.

**Soils****Table 18B-35.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.6	36.9	32.4	30.7	3.2	21.7	259.2	0.9	06/11/2002

**Site Potential**

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Upland Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA334UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been the dominant shrub species since study establishment in 2002, although cover and density have steadily decreased each sample year since 2007. In addition, 48% of sagebrush plants displayed signs of poor vigor in 2021, likely due to drought stress (Table 18B-35.12, Table 18B-35.13). Further decreases in sagebrush could occur should similar climatic conditions be sustained in the future. The herbaceous understory has mainly been comprised of perennial grasses, although the most abundant species has been the introduced species bulbous bluegrass (*Poa bulbosa*) in all study years (Table 18B-35.10). Perennial forbs have remained abundant, and were considered to be a co-dominant herbaceous component in 2021: Hooker's balsamorhiza (*Balsamorhiza hookeri*) and rock goldenrod (*Petradoria pumila*) contributed most of the perennial forb cover in that year. Annual forbs have remained rare. The noxious weed and introduced perennial forb Dalmatian toadflax has been observed in many sample years, but in low amounts (Table 18B-35.7, Table 18B-35.11). Although it likely does not currently pose a threat as of 2021, Dalmatian toadflax may have the potential to reduce understory diversity should it increase in the future. Deer winter range condition has ranged between fair and very poor: this change can be attributed to an overall decrease in sagebrush cover while decadence has increased within the same population. Deer wintering conditions were considered to be very poor in 2021 due to low sagebrush cover, high sagebrush decadence, and the presence of invasive and noxious species (Table 18B-35.15).

**Trend Summary Tables****Table 18B-35.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2002	12.2	1.8	-	12.2	1.1	-
2007	10.0	0.8	-	14.3	0.3	-
2012	8.5	0.9	-	9.6	0.6	-
2016	5.0	1.3	-	7.3	2.7	-
2021	4.6	1.6	-	4.4	2.0	-

**Table 18B-35.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2002	173	438	48	254	1.8	27.1	0.3	9.9
2007	213	461	236	253	2.8	34.4	1.1	10.7
2012	198	458	205	247	1.9	29.6	1.2	10.1
2016	211	427	92	245	5.4	22.6	0.9	12.3
2021	161	394	73	248	0.7	25.6	0.7	16.1

**Table 18B-35.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2002	4.6	3.6	30.3	6.1	24.4	47.2
2007	4.7	3.5	23.6	4.7	21.4	54.9
2012	2.1	1.4	40.4	3.3	25.1	49.7
2016	6.7	3.1	22.9	4.6	23.9	47.7
2021	1.6	0.4	41.9	3.7	28.2	41.9

**Table 18B-35.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
2002	51	-	-
2007	38	10	15
2012	38	1	2
2016	40	1	1
2021	38	-	4
Days Use Per Acre (ha)			
2002	90.5 (223.5)	-	-
2007	130.0 (321.1)	-	-
2012	48.3 (119.2)	3.4 (8.3)	-
2016	48.3 (119.2)	3.4 (8.3)	-
2021	37.5 (92.7)	1.3 (3.3)	-

**Table 18B-35.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency								
Aristida purpurea (purple threeawn)									
Bromus arvensis <sup>ai</sup> (field brome)									
Bromus tectorum <sup>ai</sup> (cheatgrass)									
Poa bulbosa <sup>i</sup> (bulbous bluegrass)									
Poa pratensis <sup>i</sup> (Kentucky bluegrass)									
Poa secunda (Sandberg bluegrass)									
Pseudoroegneria spicata (bluebunch wheatgrass)									
Vulpia myuros <sup>ai</sup> (annual fescue)									
Vulpia octoflora <sup>a</sup> (sixweeks fescue)									
year	Average Cover (%)								
2002	0.4	0.3	1.5	18.5	0.0	0.1	8.0	-	-
2007	0.3	0.5	2.2	21.8	-	2.0	10.4	0.1	0.0
2012	0.2	0.6	1.3	19.9	-	1.9	7.7	-	-
2016	0.6	0.8	4.5	13.5	-	0.0	8.4	-	-
2021	0.2	0.1	0.6	17.8	-	0.0	7.6	-	-

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 18B-35.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
Agoseris glauca (pale agoseris)																		
Allium (onion)																		
Alyssum desertorum <sup>ai</sup> (desert madwort)																		
Ambrosia psilostachya (Cuman ragweed)																		
Antennaria (pussytoes)																		
Artemisia ludoviciana (white sagebrush)																		
Asclepias (milkweed)																		
Astragalus cibirius (browse milkvetch)																		
Astragalus utahensis (Utah milkvetch)																		
Balsamorhiza hookeri (Hooker's balsamroot)																		
Calochortus nuttallii (sego lily)																		
Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)																		
Cirsium (thistle)																		
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																		
Collomia linearis <sup>a</sup> (tiny trumpet)																		
Comandra umbellata (bastard toadflax)																		
Cordylanthus ramosus <sup>a</sup> (bushy bird's beak)																		
year	Average Cover (%)																	
2002	0.1	0.0	0.1	0.0	-	0.1	-	0.3	0.1	1.4	0.1	0.0	0.5	-	0.0	0.3	-	
2007	0.1	0.0	0.0	-	-	0.0	0.0	0.2	0.1	2.3	0.0	0.0	0.3	0.4	-	0.4	0.0	
2012	0.0	-	0.0	-	-	0.0	0.0	0.1	0.3	2.4	0.0	-	0.0	0.5	-	0.4	-	
2016	0.0	0.0	0.1	0.4	0.0	0.1	0.2	0.0	0.8	1.3	0.0	-	0.1	-	-	0.4	-	
2021	0.0	0.0	0.0	0.0	-	0.1	0.0	0.1	0.0	5.7	0.0	-	0.1	-	-	0.9	-	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Heterotheca villosa (hairy false goldenaster)	Holosteum umbellatum <sup>ai</sup> (jagged chickweed)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Linaria dalmatica <sup>ai</sup> (Dalmatian toadflax)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stone seed)	Petroradia pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)
year	Nested Frequency																
2002	35	-	18	-	-	24	-	-	39	-	-	122	-	-	42	45	2
2007	20	3	7	3	171	35	-	-	39	-	-	49	1	-	51	77	8
2012	18	-	7	-	22	10	5	1	51	-	3	45	-	2	51	48	-
2016	4	-	-	-	-	6	9	-	73	-	6	-	-	-	67	3	6
2021	2	-	-	-	3	26	0	26	48	5	1	2	-	-	61	40	-
year	Average Cover (%)																
2002	0.2	-	0.1	-	-	0.2	-	-	0.9	-	-	2.5	-	-	1.5	0.2	0.0
2007	0.1	0.0	0.0	0.0	0.3	0.5	-	-	2.2	-	-	0.5	0.0	-	2.0	0.5	0.0
2012	0.1	-	0.0	-	0.0	0.1	0.0	0.0	1.8	-	0.0	0.6	-	0.0	2.0	0.1	-
2016	0.0	-	-	-	-	0.2	0.1	-	3.9	-	0.0	-	-	-	3.5	0.0	0.0
2021	0.0	-	-	-	0.0	0.3	0.0	0.1	1.7	0.0	0.0	0.0	-	-	4.6	0.2	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Silene antirrhina <sup>a</sup> (sleepy silene)	Symphoricarum (aster)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Viola (violet)	Wyethia amplexicaulis (mule-ears)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency					
2002	3	8	8	1	23	6
2007	98	5	15	-	30	11
2012	107	9	30	-	25	7
2016	6	20	53	-	22	3
2021	-	22	44	-	26	10
year	Average Cover (%)					
2002	0.0	0.2	0.2	0.0	1.0	0.1
2007	0.2	0.2	0.0	-	1.2	0.1
2012	0.2	0.4	0.3	-	1.5	0.1
2016	0.0	0.4	0.6	-	0.8	0.0
2021	-	0.4	0.6	-	1.7	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species



**Table 18B-35.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)			
	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept Cover (%)			
2002	12.2	0.9	-	0.2
2007	14.3	0.3	-	0
2012	9.6	0.4	-	0.2
2016	7.3	1.7	0	1
2021	4.4	1.8	-	0.2
year	Quadrat Cover (%)			
2002	12.2	1.5	0.0	0.3
2007	10.0	0.6	0.0	0.2
2012	8.5	0.3	-	0.5
2016	5.0	0.7	0.0	0.6
2021	4.6	1.4	0.0	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 18B-35.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

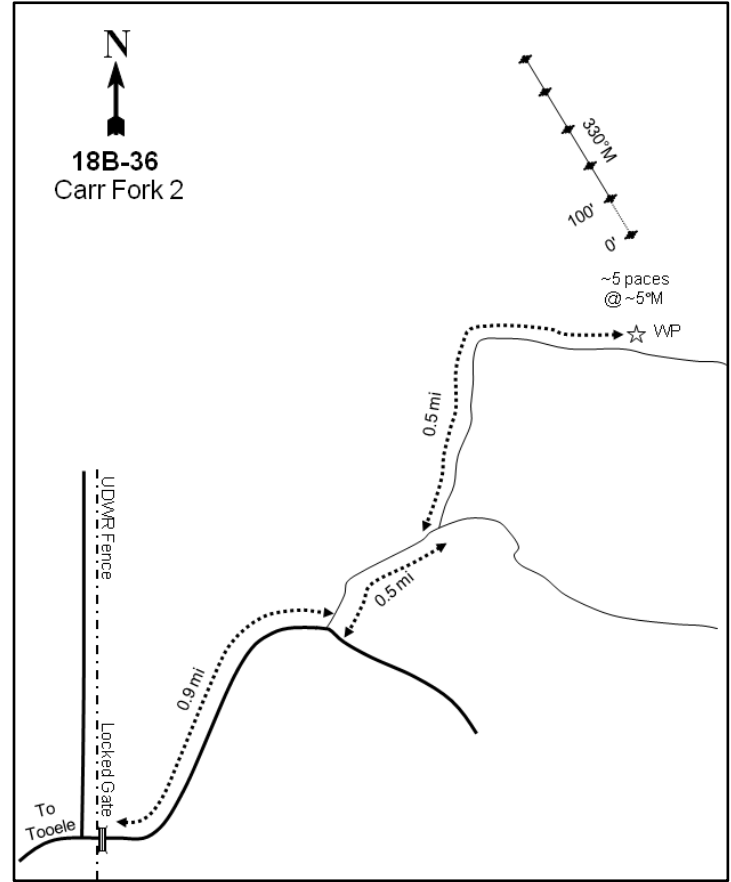
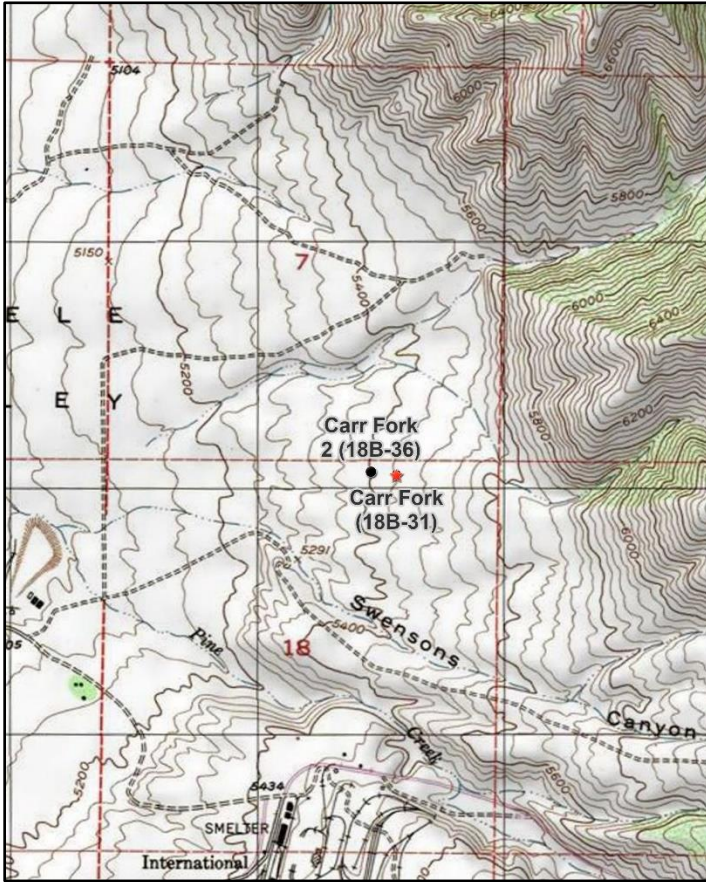
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
2002	3240	-	3	59	38	32	45	14	34/74
2007	2880	20	4	56	40	32	34	22	39/85
2012	2340	20	3	67	30	39	33	14	36/74
2016	1740	-	2	57	40	29	38	32	44/86
2021	1300	-	8	51	42	22	6	48	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
2002	1860	20	7	80	14	0	0	13	17/23
2007	1300	-	5	91	5	5	0	0	17/23
2012	680	140	3	88	9	6	0	6	18/23
2016	1340	20	6	93	2	0	0	2	23/30
2021	1700	20	18	58	25	2	0	27	- / -
<b>Mahonia repens -- (creeping barberry)</b>									
2002	440	-	0	100	0	0	0	0	3/11
2007	140	-	0	100	0	0	0	0	- / -
2012	220	-	0	100	0	0	0	0	7/13
2016	400	-	5	95	0	0	0	0	4/8
2021	200	-	0	100	0	0	0	0	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
2002	800	-	25	63	13	0	0	8	11/27
2007	560	20	7	93	0	0	0	0	12/27
2012	500	20	0	100	0	0	0	0	13/35
2016	600	-	3	97	0	0	10	20	14/37
2021	360	20	11	78	11	0	0	11	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 18B-35.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2002	15.2	3.7	1.5	17.2	-1.3	10.0	-2.0	<b>44.3</b>	Poor
2007	17.9	2.9	2.1	25.3	-2.1	10.0	-2.0	<b>54.0</b>	Fair
2012	12.0	6.0	1.7	19.4	-1.5	10.0	-2.0	<b>45.7</b>	Poor
2016	9.1	2.9	1.2	18.2	-4.0	10.0	0.0	<b>37.4</b>	Poor
2021	5.5	0.0	0.0	15.7	-0.5	10.0	-2.0	<b>28.6</b>	Very Poor

## CARR FORK 2 - STUDY NO. 18B-36

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Bingham Canyon NW; Township 3S, Range 3W, Section 18  
NAD 83 UTM ZONE 12, 396397 East 4491267 North

**Transect Information**

Browse Tag # (0' Stake)	177
Transect Bearing	330° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

**Directions to Site**

Drive east on 400 North (Smelter Road) in Tooele for 1.5 miles to Ericson Road. Turn left and continue for 0.8 miles to a fork in the road. Take the right fork and proceed 0.1 miles to a locked gate (UDWR lock). Stay on this "old" road for 0.9 miles; when you go past a gate on the right the road gets very, very faint. Continue for another 0.4 miles to another gate (this gate may not exist anymore), and then travel 0.1 miles to a left fork. Take the left fork and drive another 0.5 miles. The witness post is on the left (north) side of the road. The 0-foot stake is 5 paces from the witness post at 5 degrees magnetic and is marked with browse tag #177.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	OQUIRRH MTN - NORTH
Elevation	5,406ft (1,648m)
Aspect	West
Slope	8%
Sample Dates	06/06/2012, 07/20/2016, 06/09/2021

**Table 18B-36.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Disc - Unknown	-	-	Fall 1986-Spring 1987	-
Seeding - Rangeland Drill	-	-	Fall 1986-Spring 1987	-
Seeding - Transplant	-	-	2002	-

**Wildlife Habitat and Vegetation History****Table 18B-36.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

**Table 18B-36.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2012	Bitterbrush/Perennial Grass	NA
2016	Bitterbrush/Perennial Grass-Forb	NA
2021	Bitterbrush/Perennial Grass-Forb	NA

**Site Notes**

This study lies on property that originally belonged to Anaconda Mining Company and was transferred to the Utah Division of Wildlife Resources (UDWR) in 1994. The site is in an old tailings area for a copper mine and was mostly composed of weeds. In the fall of 1986 and spring of 1987, the area was deeply disked twice and drill seeded with a mixture of grasses and forbs. Antelope bitterbrush (*Purshia tridentata*) was transplanted in large strips throughout the area in 2002. The study was established in 2012 to replace the original Carr Fork study (18A-31) which monitored an area of annual grasses and weeds with a limited browse component. In addition, this new study was set up to monitor one of the strips of bitterbrush which is considered to be more valuable to big game than the old study.

**Soils****Table 18B-36.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	5.5	32.0	41.4	26.6	2.2	51.0	275.2	0.4	09/03/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Stony Loam (Antelope Bitterbrush)
NRCS Ecological Site #	R028AY456UT
States and Transitions	No state and transition model is available for this ecological site.

Antelope bitterbrush (*Purshia tridentata*) has been the dominant browse species on this site since study establishment in 2012, and broom snakeweed (*Gutierrezia sarothrae*) has been the only other shrub species observed. Bitterbrush cover has decreased each sample year since 2012, but density has increased (Table 18B-36.12, Table 18B-36.13). Perennial grasses have dominated the herbaceous understory in all sample years (Table 18B-36.7), although composition has shifted: bulbous bluegrass (*Poa bulbosa*) was the most abundant species in 2012 and intermediate wheatgrass (*Thinopyrum intermedium*) was most abundant in 2016 and 2021. The introduced annual grasses field brome (*Bromus arvensis*) and cheatgrass (*B. tectorum*) were observed for the first time in 2021, but in low amounts (Table 18B-36.10). Perennial forbs co-dominated the understory in 2016 and 2021, but were mainly comprised of noxious weeds such as whitetop (*Cardaria draba*), Dalmatian toadflax (*Linaria dalmatica*), and field bindweed (*Convolvulus arvensis*) (Table 18B-36.11). Without treatment to diversify the herbaceous understory, it will likely continue to be dominated by introduced grasses and noxious weedy perennial forbs. Deer winter range condition has ranged between good and poor-fair: this difference can be attributed to an overall decrease in bitterbrush cover while decadence has increased. As of 2021, deer wintering conditions were considered to be poor-fair due to high decadence and low recruitment within the site's bitterbrush population. The presence of noxious weeds also contributed to the unfavorable deer wintering conditions in 2021 (Table 18B-35.15).

**Trend Summary Tables****Table 18B-36.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2012	17.8	-	-	26.3	-	-
2016	9.7	-	-	19.2	-	-
2021	8.9	0.0	-	11.9	0.1	-

**Table 18B-36.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2012	-	401	200	359	-	40.0	2.6	15.9
2016	-	297	259	384	-	21.5	4.7	20.4
2021	5	328	161	351	0.0	34.7	2.4	17.8

**Table 18B-36.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2012	2.4	2.4	58.8	0.3	0.0	74.3
2016	8.6	1.9	48.1	0.3	0.2	55.0
2021	7.9	0.9	56.3	1.2	0.6	54.5

**Table 18B-36.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk
	Quadrat Frequency	
2012	12	-
2016	8	1
2021	23	-
Year	Days Use Per Acre (ha)	
2012	12.8 (31.5)	-
2016	-	-
2021	71.1 (175.5)	-

**Table 18B-36.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Dactylis glomerata <sup>i</sup> (orchardgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)	Thinopyrum ponticum <sup>i</sup> (tall wheatgrass)
year	Nested Frequency							
2012	-	-	51	324	11	7	71	110
2016	-	-	94	73	-	-	144	60
2021	1	4	148	127	1	11	200	6
year	Average Cover (%)							
2012	-	-	3.4	24.4	0.0	0.0	2.9	9.2
2016	-	-	5.6	2.4	-	-	10.7	2.9
2021	0.0	0.0	14.6	3.9	0.0	0.2	15.7	0.3

a - Annual; n - Noxious Weed; i - Introduced Species

**Table 18B-36.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum <sup>ai</sup> (desert madwort)	Ambrosia psilostachya (Cuman ragweed)	Apocynum cannabinum (Indianhemp)	Asclepias (milkweed)	Camelina microcarpa <sup>ai</sup> (littlepod false flax)	Cardaria draba <sup>ni</sup> (whitetop)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Chenopodium leptophyllum <sup>a</sup> (narrowleaf goosefoot)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Convolvulus arvensis <sup>ni</sup> (field bindweed)	Crepis acuminata (tapertip hawkbeard)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Grindelia squarrosa (curlycup gumweed)	Helianthus annuus <sup>a</sup> (common sunflower)	
year	Nested Frequency																	
2012	7	67	124	4	12	111	3	1	15	71	204	3	-	16	114	33	-	
2016	1	45	157	-	0	157	-	-	47	109	239	-	66	68	38	2	44	
2021	33	3	18	22	-	187	-	-	78	95	151	-	-	28	28	10	-	
year	Average Cover (%)																	
2012	0.0	0.6	3.0	0.0	0.1	2.4	0.0	0.0	0.0	0.7	3.9	0.0	-	0.0	0.6	0.2	-	
2016	0.0	0.7	5.4	-	0.0	5.3	-	-	0.3	0.9	5.8	-	1.1	0.3	0.2	0.0	0.4	
2021	0.2	0.0	1.0	0.6	-	5.0	-	-	1.5	1.6	2.7	-	-	0.4	0.1	0.1	-	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES																
Holosteum umbellatum <sup>ai</sup> (jagged chickweed)																
Lactuca serriola <sup>ai</sup> (prickly lettuce)																
Linaria dalmatica <sup>ai</sup> (Dalmatian toadflax)																
Lithospermum ruderale (western stoneseed)																
Onobrychis vicifolia <sup>i</sup> (sainfoin)																
Phlox longifolia (longleaf phlox)																
Polygonum douglasii <sup>a</sup> (Douglas' knotweed)																
Sanguisorba minor <sup>i</sup> (small burnet)																
Silene antirrhina <sup>a</sup> (sleepy silene)																
Symphotrichum (aster)																
Tragopogon dubius <sup>ai</sup> (yellow salsify)																
Urtica dioica ssp. holosericea (stinging nettle)																
Verbascum blattaria <sup>ai</sup> (moth mullein)																
Veronica biloba <sup>ai</sup> (two-lobed speedwell)																
Zigadenus paniculatus (foothill deathcamas)																
year	Nested Frequency															
2012	-	12	143	8	4	9	8	28	7	51	18	-	84	6	-	
2016	-	13	54	16	3	3	61	23	37	45	2	-	72	-	-	
2021	1	-	138	10	3	28	33	16	-	17	1	4	23	1	4	
year	Average Cover (%)															
2012	-	0.0	2.8	0.2	0.2	0.0	0.1	1.2	0.0	0.6	0.1	-	1.6	0.1	-	
2016	-	0.1	1.2	0.1	0.1	0.0	1.0	0.4	0.2	0.4	0.0	-	1.1	-	-	
2021	0.0	-	6.0	0.3	0.0	0.1	0.1	0.3	-	0.1	0.0	0.0	0.2	0.0	0.0	

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

**Table 18B-36.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES		
Gutierrezia sarothrae (broom snakeweed)		
Purshia tridentata <sup>p</sup> (antelope bitterbrush)		
year	Line Intercept Cover (%)	
2012	-	26.3
2016	-	19.2
2021	0.1	11.9
year	Quadrat Cover (%)	
2012	-	17.8
2016	-	9.7
2021	0.0	8.9

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 18B-36.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	37/61
2021	140	-	0	71	29	0	0	29	- / -
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
2012	280	40	7	86	7	36	7	7	189/289
2016	380	-	11	53	37	16	11	58	145/248
2021	680	-	0	62	38	27	3	38	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 18B-36.15 - Deer Desirable Components Index: Upland Potential Scale.**

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2012	30.0	12.9	3.6	30.0	0.0	10.0	-6.0	<b>80.4</b>	Good
2016	28.8	4.0	5.3	30.0	0.0	10.0	-6.0	<b>72.0</b>	Good
2021	17.9	3.5	0.0	30.0	0.0	8.3	-6.0	<b>53.7</b>	Poor-Fair



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## APPENDIX A - VEGETATION TYPE

### VEGETATION COMMUNITY TYPE CLASSIFICATION--

Vegetation Type Code	Vegetation Community Type Name*	Description
ANN GRASS	Annual Grass	Annual grasses provide the dominant vegetation cover.
PER GRASS	Perennial Grass	Perennial grasses provide the dominant vegetation cover.
ANN-PER GRASS	Annual-Perennial Grass	Mixture of Annual and Perennial grass species provide the dominant vegetation cover.
ANN GRASS-FORB	Annual Grass-Forb	Mixture of Annual grass and forb species provide the dominant vegetation cover.
PER GRASS-FORB	Perennial Grass-Forb	Mixture of Perennial grass and forb species provide the dominant vegetation cover.
ANN FORB	Annual Forb	Annual forbs provide the dominant vegetation cover
PER FORB	Perennial Forb	Perennial forbs provide the dominant vegetation cover
ANN-PER FORB	Annual-Perennial Forb	Mixture of Annual and Perennial forb species provide the dominant vegetation cover.
WEED	Annual-Perennial Weed	Annual and/or Perennial weedy species provide the dominant vegetation cover.
WET MEADOW	Wet Meadow	Riparian vegetation species provide the dominant vegetation cover
DRY MEADOW	Dry Meadow	High elevation subalpine meadow
RIPAR	Riparian	Riparian vegetation species provide the dominant vegetation cover.
ALP GRASS	Alpine Grass	Grass or grass-like species provide the dominant vegetation cover
ALP FORB	Alpine Forb	Forb species provide the dominant vegetation cover
ALP SHRUB	Alpine Shrub	Alpine shrub species provide the dominant vegetation cover
ALP MIX	Alpine-Mixed	Mixture of grass, forb, or shrub species provide the dominant vegetation cover
ARTRT	Basin Big Sagebrush	Major component of the site (typically >5% cover).
ARTRV	Mountain Big Sagebrush	Major component of the site (typically > 5% cover).
ARTRW	Wyoming Big Sagebrush	Major component of the site (typically >5% cover).
ARAR	Low Sagebrush	Major component of the site (typically >5% cover).
ARCA	Silver Sagebrush	Major component of the site (typically >5% cover).
ARNO	Black Sagebrush	Major component of the site (typically >5% cover).
ARSP	Bud Sagebrush	Major component of the site (typically >5% cover).
ARFR	Fringed Sagebrush	Major component of the site (typically >5% cover).
CHNA	Rubber Rabbitbrush	Major component of the site (typically >5% cover).
CHPA	Parry Rabbitbrush	Major component of the site (typically >5% cover).
CHVI	Low Rabbitbrush	Major component of the site (typically >5% cover).
GUSA	Broom Snakeweed	Major component of the site (typically >5% cover).
SAVE	Black Greasewood	Major component of the site (typically >5% cover).
CELA	Winterfat	Major component of the site (typically >5% cover).
ATCO	Shadscale	Major component of the site (typically >5% cover).
ATCA	Fourwing Saltbush	Major component of the site (typically >5% cover).
GRSP	Spiny Hopsage	Major component of the site (typically >5% cover).
MSDS	Mixed Salt Desert Shrub	Mixture of one or more Salt Desert species (ATCO, ATCA, GRSP, etc.) with no one species expressing dominance.
LARRE	Creosote Bush	Major component of the site (typically >5% cover).
CORA	Blackbrush	Major component of the site (typically >5% cover).
PRFA	Desert Almond	Major component of the site (typically >5% cover).
EPHED	Ephedra	Major component of the site (typically >5% cover).
QUGA	Gambel Oak	Major component of the site (typically >5% cover).

Vegetation Type Code	Vegetation Community Type Name*	Description
QUTU	Live Oak	Major component of the site (typically >5% cover).
SYOR	Snowberry	Major component of the site (typically >5% cover).
AMAL	Serviceberry	Major component of the site (typically >5% cover).
PUTR	Bitterbrush	Major component of the site (typically >5% cover).
PUGL	Desert Bitterbrush	Major component of the site (typically >5% cover).
ARCT2	Manzanita	Major component of the site (typically >5% cover).
CEMOM	True Mountain Mahogany	Major component of the site (typically >5% cover).
CELEL	Curlleaf Mountain Mahogany	Major component of the site (typically >5% cover).
COMES	Stansbury Cliffrose	Major component of the site (typically >5% cover).
KOPR	Forage Kochia	Major component of the site (typically >5% cover).
TAMARIX	Tamarix	Major component of the site (typically >5% cover).
MMB	Mixed Mountain Brush	Mixture of one or more Mountain brush species (ARTRV, AMAL, CEMOM, etc.) with no one species expressing dominance.
MB	Mixed Shrub	Mixture of various shrub species with none expressing dominance.
CHAPARRAL	Chaparral	Mixture of fire tolerant shrub species.
JUNIPER	Juniper	Major component of the site (Phase III <sup>1</sup> ). No pinyon present.
PINYON	Pinyon	Major component of the site (Phase III <sup>1</sup> ). No juniper present.
PJ	Pinyon-Juniper	Major components of the site (Phase III <sup>1</sup> ). Pinyon and Juniper present.
POTR	Quaking Aspen	POTR provides the dominant overstory (typically >5% cover).
POTR-CE	Quaking Aspen-Conifer Encroached	Mixture of QUGA and Conifers (conifers typically provide >5% cover).
PIPO	Ponderosa Pine	PIPO provides the dominant overstory (typically >5% cover).
PSMEM	Douglas Fir	Major component of the site (typically >5% cover).
ABCO	White Fir	Major component of the site (typically >5% cover).
PIFL	Limber Pine	Major component of the site (typically >5% cover).
PICO	Lodgepole Pine	Major component of the site (typically >5% cover).
PILO	Bristlecone Pine	Major component of the site (typically >5% cover).
PIEN	Engelmann Spruce	Major component of the site (typically >5% cover).
ABLA	Subalpine Fir	Major component of the site (typically >5% cover).
SUBALP	Subalpine Forest	Mixture of PIEN and ABLA provide the dominant vegetation cover
MIX CON	Mixed Conifer Forest	Mixture of conifer tree species provide the dominant vegetation cover
AG-PAST	Agricultural-Pasture	Active or abandoned agricultural pasture
AG-CL	Agricultural-Cropland	Active or abandoned agricultural cropland

\*Vegetation types can be co-dominant on the study site and when more than one vegetation community types are co-dominant and are major components of the site a (/) is used to separate vegetation community types.

<sup>1</sup>Phase of woodland succession