



UTAH BIG GAME RANGE TREND STUDIES
2016

WILDLIFE MANAGEMENT UNITS
01, 02 , 03, 04, 05, 06, 07, 18A, 18B

PUBLICATION NUMBER 17-06
REPORT FOR FEDERAL AID PROJECT W-82-R-61

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE RESOURCES

**Utah Big Game Range Trend Studies
2016
Wildlife Management Units
01, 02, 03, 04, 05, 06, 07, 18A, 18B**

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Antelope Bitterbrush (*Purshia tridentata*) by Jason Cox (2016)

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PROGRAM NARRATIVE

State: UTAH

Project Number: W-82-R-61

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 (DWR) 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. On certain management units, however, 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 is 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.

Objective: Monitor, evaluate, and report range trend at 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. DWR 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 CDs, and in hard copies located in DWR regional offices, BLM and USFS offices, and public libraries. Special studies (habitat project monitoring and big game/livestock forage utilization studies) will give DWR biologists and public land managers additional information to address local resource management problems.

REMARKS

The work completed during the 2016 field season and reported in this publication involves the reading of interagency range trend studies in the DWR Northeastern 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

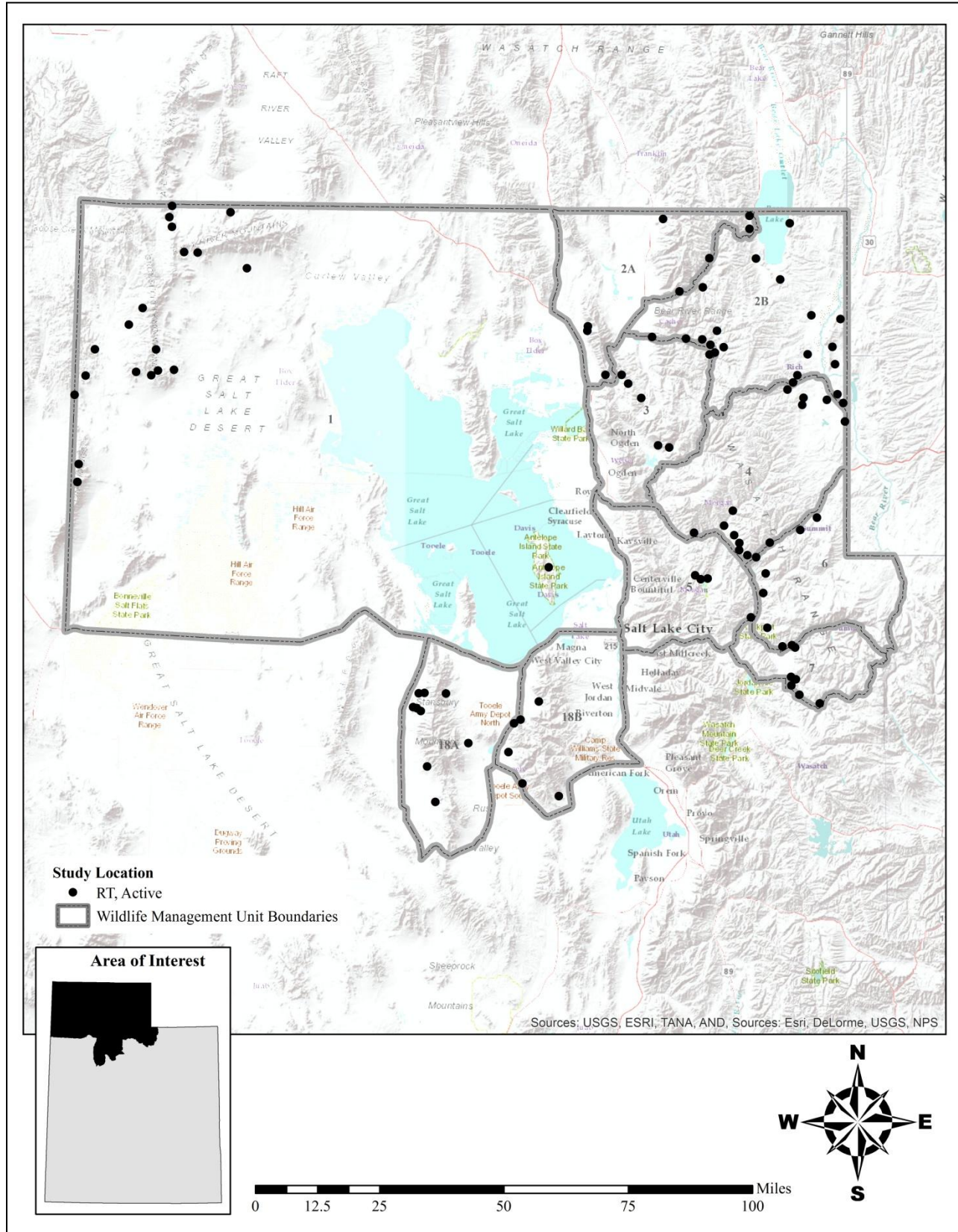
- Salt Lake Field Office

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 2016



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 m² 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.

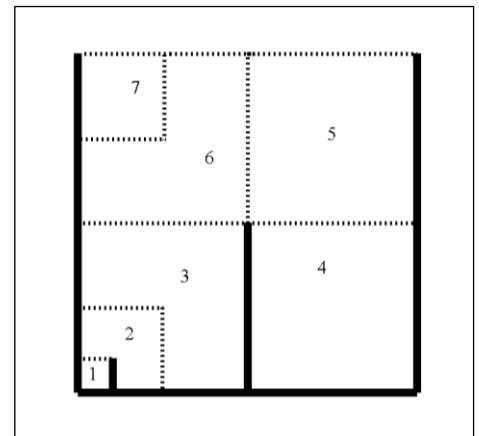


Figure 1 Cover classes of the 1/4 m² sampling quadrat

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, Bates, & Miller 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).

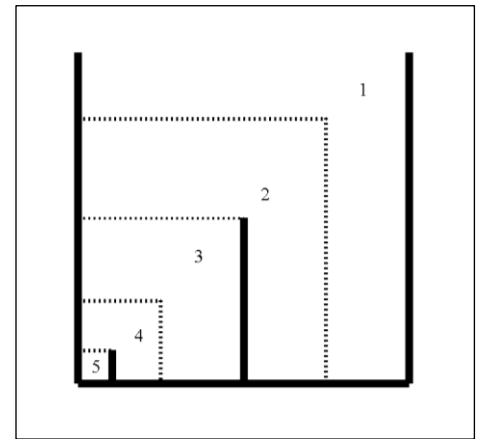


Figure 2 Nested frequency sub-quadrats of the 1/4 m² sampling quadrat.

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 *Seedling*
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 *Young*
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 *Mature*
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 *Decadent*
Class IV captures information for all remaining cohorts in the plot.

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) 100ft² 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 m² 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 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 "Seed Mix." *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 09-01 and 11B-06.

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 it’s 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 09-01.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Herbicide - Herbicide	Taylor Mountain Fire Rehabilitation	3182	Fall 2014	2200
Chaining - Two-Way Ely Chain	Taylor Mountain Fire Rehabilitation	3182	Fall 2014	1100
Seeding - Rangeland Drill	Taylor Mountain Fire Rehabilitation	3182	October 2014	2000
Hand Crew - Lop and Scatter	Steinaker Draw PJ (CCI)	28	September 2015	266
Seeding - Aerial After	Taylor Mountain Fire--BLM ESR Supplement	3207	December 2014	2019
Fire - Wildfire	Taylor Mountain Road	-	July 2014	3146.98

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 09-01.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name		Application Type	Application Date	Acre	
Taylor Mountain fire; drill seed mix		Drill	Oct 2014	200	
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acr
G	Achnatherum hymenoides	Indian Ricegrass		0.50	0.00
G	Agropyron cristatum	Crested Wheatgrass		1.00	0.00
G	Agropyron fragile	Siberian Wheatgrass		1.00	0.00
F	Medicago sativa	Alfalfa		1.00	0.00
F	Onobrychis viciifolia	Sainfoin		4.00	0.00
Mix Name		Application Type	Application Date	Acre	
Taylor Mountain Fire Sage/Kochia		Aerial	Dec 2014	2020	
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acr
	Bassia prostrata	Forage Kochia	Millard UT	0.99	0.83
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Uintah UT	1.22	0.15
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Beaver UT	0.26	0.05

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 09-01.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter

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 subordi 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 09-01.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1982	Wyoming Big Sagebrush	Phase I
1988	Wyoming Big Sagebrush	Phase I
1995	Wyoming Big Sagebrush	Phase I
2000	Wyoming Big Sagebrush	Phase I
2005	Wyoming Big Sagebrush/Annual Grass	Phase I
2010	Wyoming Big Sagebrush/Annual Grass	Phase I
2015	Annual Grass-Forb	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 09-01.5 - 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 Loam	7.9	77.0	12.7	10.3	0.6	6.3	64.0	0.6	08/19/2000

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 1/4m² 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 09-01.6 - 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	21.2	4.1	-	-	-	-
2000	20.0	2.1	-	-	-	-
2005	14.8	0.2	-	20.1	0.8	-
2010	16.3	0.2	-	17.6	0.6	-
2015	-	-	-	-	-	-

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 09-01.7 - 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	408	133	300	69	7.5	1.7	1.7	0.3
2000	356	99	121	8	7.0	1.2	0.4	0.0
2005	485	62	170	13	21.4	0.8	0.8	0.1
2010	405	78	136	9	17.6	1.6	1.6	0.2
2015	192	180	178	114	17.1	4.2	21.8	3.1

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 09-01.8 - 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	21.0	15.9	43.5	0.0	0.0	34.0
2000	25.8	18.3	43.0	0.1	-	30.1
2005	16.3	14.2	44.7	0.1	0.0	37.3
2010	20.7	9.7	56.5	-	0.0	36.5
2015	72.9	0.0	14.4	2.0	0.0	36.2

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 100ft² 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 09-01.9 - 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	Elk	Rabbit
	Quadrat Frequency				
1995	-	-	47	2	14
2000	1	-	30	1	65
2005	1	-	29	1	90
2010	-	-	40	2	28
2015	-	-	4	-	15
Year	Days Use Per Acre (ha)				
1995	-	-	-	-	-
2000	0.7 (1.8)	-	45.6 (112.6)	-	400.8 (989.9)*
2005	2.2 (5.4)	8.7 (21.5)*	59.0 (145.7)	-	-
2010	-	-	65.0 (160.6)	6.0 (14.9)	-
2015	-	-	8.7 (21.5)	-	-

*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 09-01.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus briziformis ^{ai} (rattlesnake brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Sporobolus cryptandrus (sand dropseed)	Vulpia octiflora ^a (sixweeks fescue)
year	Nested Frequency										
1995	-	-	-	294	26	61	3	53	18	-	290
2000	-	-	-	345	4	16	2	47	52	-	35
2005	-	-	-	476	10	16	5	25	16	-	292
2010	4	-	-	405	2	4	11	7	56	-	-
2015	85	56	5	160	-	26	5	-	30	4	50
year	Average Cover (%)										
1995	-	-	-	5.6	0.2	0.3	0.1	0.7	0.4	-	1.8
2000	-	-	-	6.9	0.0	0.1	0.0	0.4	0.6	-	0.1
2005	-	-	-	19.1	0.1	0.1	0.0	0.5	0.1	-	2.3
2010	0.0	-	-	17.6	0.0	0.0	0.1	0.2	1.2	-	-
2015	1.8	0.9	0.0	16.6	-	0.5	0.4	-	0.5	0.0	0.5

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

Table 11: The “Forb Species” table 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 09-01.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Allium (onion)	Alyssum alyssoides ^{ai} (pale madwort)	Androsace septentrionalis ^a (pygmyflower rockjasmine)	Astragalus (milkvetch)	Calochortus nuttallii (sego lily)	Chaenactis (pincushion)	Chenopodium leptophyllum ^a (narrow/leaf goosefoot)	Cleome serrulata ^a (Rocky Mountain beeplant)	Collinsia parviflora ^a (maiden blue eyed Mary)	Cryptantha ^a (annual cryptantha)	Cryptantha (cryptantha)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Erigeron pumilus (shaggy fleabane)	Eriogonum cernuum ^a (nodding buckwheat)	Gilia ^a (gilia)
year	Nested Frequency																
1995	-	11	-	4	-	2	2	17	-	3	-	18	103	-	8	2	16
2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	7
2005	-	-	-	-	2	2	-	-	-	8	-	7	11	-	2	-	-
2010	-	-	-	-	-	-	-	-	-	-	-	1	4	-	-	-	2
2015	1	-	25	-	-	2	-	-	22	-	11	-	60	1	-	-	8
year	Average Cover (%)																
1995	-	0.0	-	0.0	-	0.0	0.0	0.0	-	0.0	-	0.1	0.3	-	0.0	0.0	0.0
2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	0.0
2005	-	-	-	-	0.0	0.0	-	-	-	0.0	-	0.0	0.1	-	0.0	-	-
2010	-	-	-	-	-	-	-	-	-	-	-	0.1	0.0	-	-	-	0.0
2015	0.0	-	2.0	-	-	0.0	-	-	2.2	-	0.2	-	8.2	0.0	-	-	0.7

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 09-01.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)			
	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Linanthus pungens (granite prickly phlox)	Opuntia (pricklypear)
year	Line Intercept Cover (%)			
1995	-	-	-	-
2000	-	-	-	-
2005	20.1	0.8	-	-
2010	17.6	0.4	-	0.2
2015	-	-	-	-
year	Quadrat Cover (%)			
1995	21.2	4.0	0.1	-
2000	20.0	2.1	-	-
2005	14.8	0.2	-	0.0
2010	16.3	0.0	-	0.2
2015	-	-	-	-

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.

Table 09-01.13 - 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	Seedling	Young	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. wyomingensis -- (Wyoming big sagebrush)									
1995	4360	120	8	77	15	39	8	6	83/107
2000	5440	40	1	34	65	28	3	25	74/78
2005	4360	3280	12	26	62	9	30	30	92/94
2010	3080	-	3	65	32	34	1	29	88/106
2015	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
1995	1000	-	6	86	8	0	0	2	60/81
2000	1020	20	8	65	28	0	0	12	46/56
2005	320	40	13	63	25	0	0	6	46/48
2010	120	-	0	50	50	0	0	50	49/65
2015	-	-	-	-	-	-	-	-	-/-

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 11B-06.13a - 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)								
2015	1620	10	62	20	9	27	11	1

- 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 11B-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'	
Abies lasiocarpa (subalpine fir)							
2015	74	-	60	13	-	27	6.4
Pinus flexilis (limber pine)							
2015	6	-	-	50	50	-	6.0
Picea pungens (blue spruce)							
2015	1	-	100	-	-	-	3.0
Populus tremuloides (quaking aspen)							
2015	179	15	55	15	15	-	2.5
Pseudotsuga menziesii (Douglas-fir)							
2015	5	-	50	-	-	50	6.0

PRE-1992 DATA

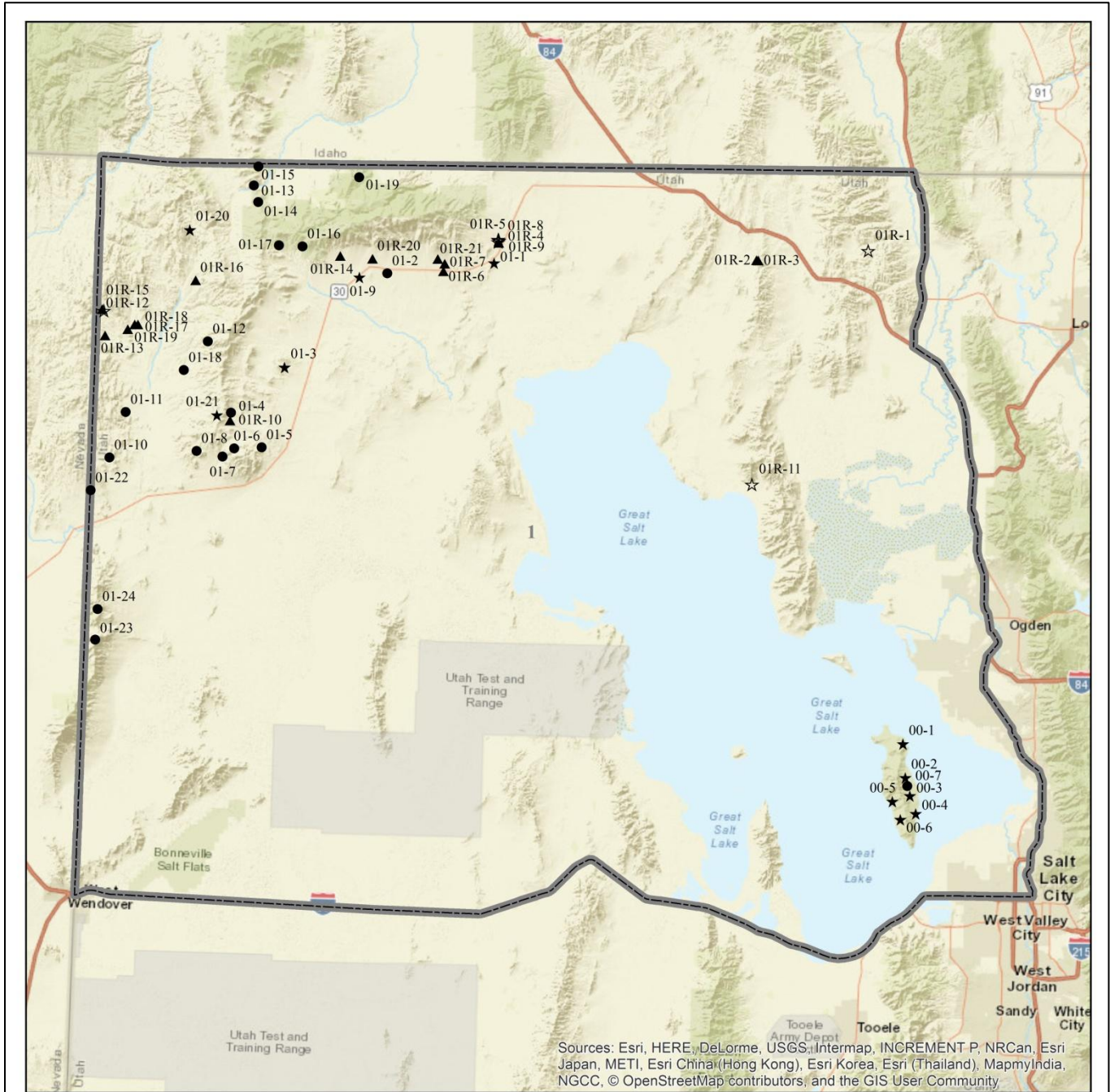
Pre-1992 Data: Data collected before July 19, 1992 has been excluded from the individual site summaries due to differences in sampling techniques and changes in sample size and area. This pre-1992 data can be found in the Utah Big Game Range Trend Studies 1982-1992 report. The following explanations 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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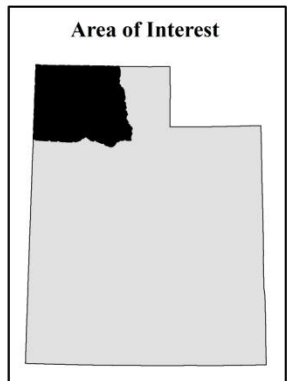
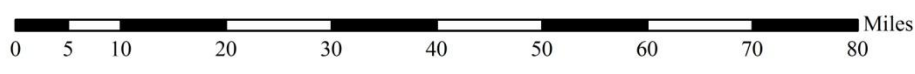
WILDLIFE MANAGEMENT UNIT 01 - BOX ELDER



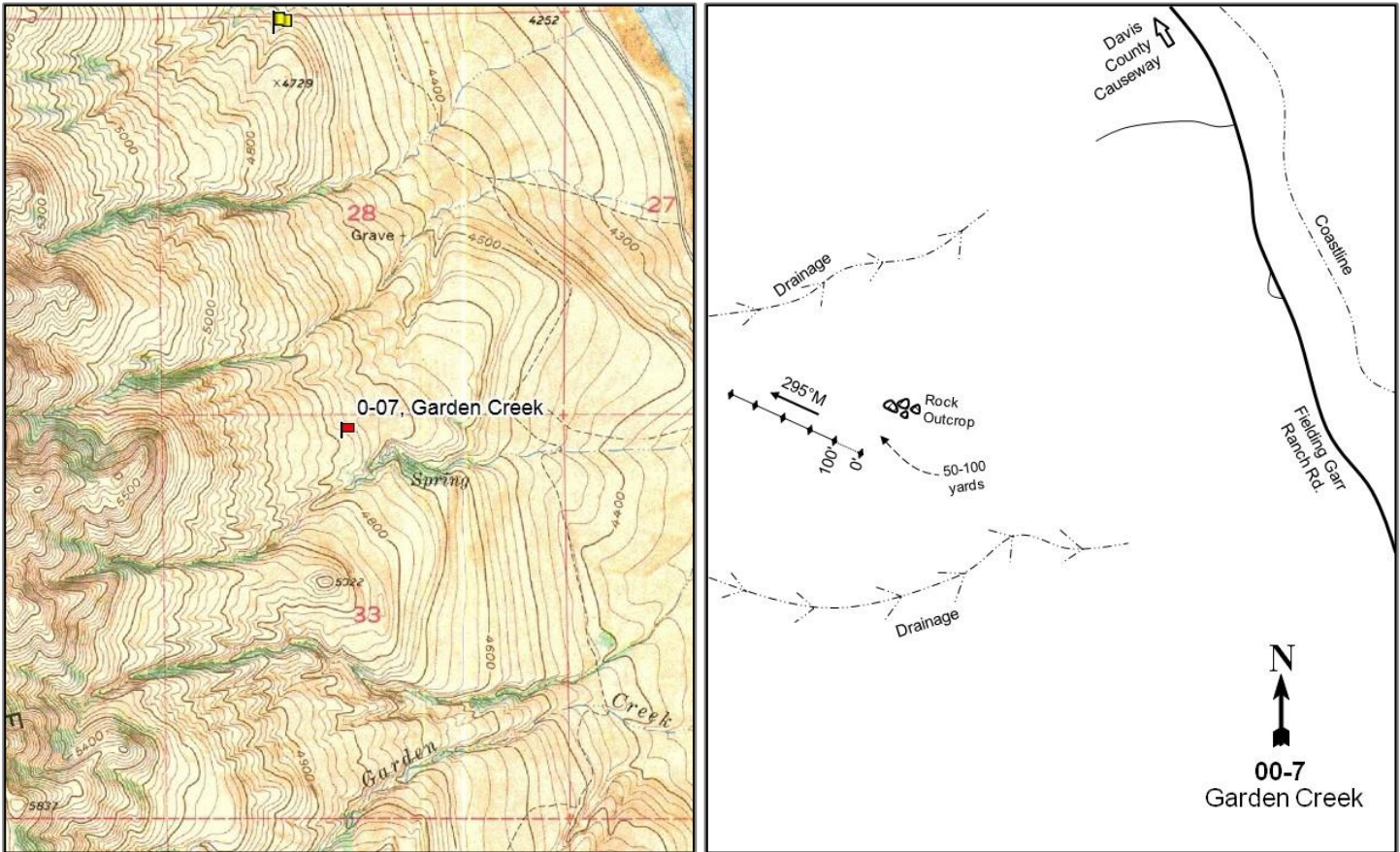
Study Location Project, Status

- RT, Active
- ★ RT, Suspended
- ▲ WRI, Active
- ☆ WRI, Suspended

Unit - 1



GARDEN CREEK - STUDY NO. 00-7

**Location Information**

USGS 7.5 min Map Info Antelope Island NW; Township 3N, Range 3W, Section 33
 GPS (0' Stake) 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 having crossed 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

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
Bison	substantial	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	No Encroachment

Site Notes

No Notes

Site Potential

1981-2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Upland Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	028AY309UT
States and Transitions	No state and transition model is available for this ecological site.

The state and transition model is likely similar to the Upland Loam (Wyoming Big Sagebrush), R025XY314UT ecological site. When established in 2016, the site was in a stable state with Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) being the dominant plant community type (Table 00-07.12). The herbaceous understory was degraded with the weedy perennial grass 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 communities' understory (Table 00-07.7). The site is at risk of catastrophic fire and transitioning to a degraded state that lacks valuable browse for wildlife.

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	-

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

Table 00-07.8 - 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
2016	20.8	2.1	36.8	2.1	6.7	53.0

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	Bison	Mule Deer/Big Horn Sheep	Rabbit
	Quadrat Frequency		
2016	-	4	5
Year	Days Use Per Acre (ha)		
2016	5.1 (12.6)	3.4 (8.3)	-

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

GRASS SPECIES								
Achnatherum hymenoides (Indian ricegrass)								
Aristida purpurea (purple threeawn)								
Bromus briziformis ^{ai} (rattlesnake brome)								
Bromus tectorum ^{ai} (cheatgrass)								
Poa bulbosa ⁱ (bulbous bluegrass)								
Poa secunda (Sandberg bluegrass)								
Sporobolus cryptandrus (sand dropseed)								
Vulpia myuros ^{ai} (annual fescue)								
year	Nested Frequency							
2016	5	95	33	159	358	284	4	103
year	Average Cover (%)							
2016	0.0	3.9	0.1	3.1	24.7	4.4	0.0	0.5

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												
Calochortus nuttallii (sego lily)												
Cirsium (thistle)												
Descurainia pinnata ^a (western tansymustard)												
Draba ^a (draba)												
Erigeron (fleabane)												
Erodium cicutarium ^{ai} (redstem stork's bill)												
Gayophytum ramosissimum ^a (pinyon groundsmoke)												
Helianthus annuus ^a (common sunflower)												
Heterotheca villosa (hairy false goldenaster)												
Tragopogon dubius ^{ai} (yellow salsify)												
Trifolium (clover)												
Verbascum virgatum ^{ai} (wand mullein)												
year	Nested Frequency											
2016	32	2	3	28	5	99	42	147	3	1	1	3
year	Average Cover (%)											
2016	0.1	0.0	0.0	0.1	0.0	1.3	0.1	0.4	0.1	0.0	0.0	0.0

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	Line Intercept Cover (%)		
	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	42.1	0.3
Ericameria nauseosa (rubber rabbitbrush)	29.1	0.0	0.3
Gutierrezia sarothrae (broom snakeweed)			

year	Quadrat Cover (%)		
2016	29.1	0.0	0.3

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

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.

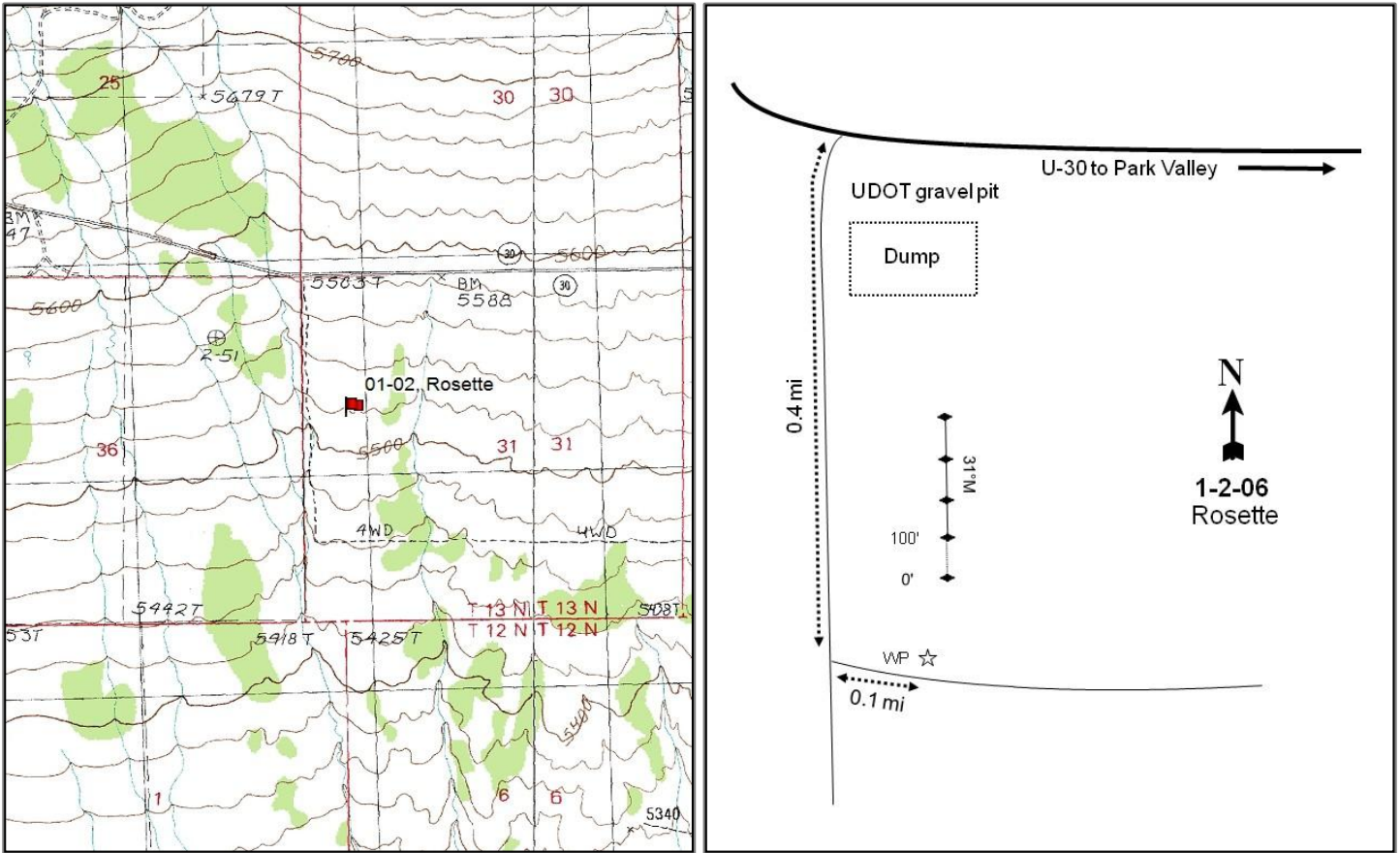
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. wyomingensis ^p -- (Wyoming big sagebrush)									
2016	16460	180860	25	74	1	0	0	1	57/89
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
2016	60	-	0	100	0	0	0	0	26/28
Ericameria nauseosa -- (rubber rabbitbrush)									
2016	60	-	0	33	67	0	33	100	75/82
Gutierrezia sarothrae -- (broom snakeweed)									
2016	1140	60	7	93	0	0	0	0	17/17

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

Table -00-07.15 - Deer Desirable Components Index: Mid 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
2016	30.0	14.7	12.5	16.6	-2.8	0.4	0.0	71.4	Good

ROSETTE - STUDY No. 01-2



Location Information

USGS 7.5 min Map Info	Rosette SE; Township 13N, Range 13W, Section 31
GPS (0' Stake)	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 U-30 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 (passing a left fork) to a left fork. Turn left (i.e., east) and proceed 0.1 miles to a witness post on the left 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 frequency 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

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
Deer	crucial	winter	
Greater Sage Grouse		occupied & 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

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 # 028AY220UT
 States and Transitions No state and transition model is available for this ecological site.

Since establishment in 1984, the site has remained a stable Wyoming big sagebrush community (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 (Table 01-02.10). Additionally, 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, but most trees were removed following a lop and scatter treatment in 2015 (Table 01-02.12, Table 01-02.13).

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	14.9	4.9	1.4	19.3	5.3	6.1
2016	13.3	3.8	-	17.2	3.9	-

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	245	250	241	104	11.0	10.5	3.0	1.9
2016	339	227	174	88	9.2	3.3	1.4	1.7

Table 01-02.8 - 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	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	29.9	3.6	22.8	3.6	0.2	39.9
2016	41.2	8.0	30.3	3.5	0.2	30.8

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	Elk	Rabbit
	Quadrat Frequency			
1996	-	21	-	19
2001	-	11	-	6
2006	-	22	-	55
2011	-	15	-	9
2016	-	23	-	75
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)	-

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

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Pascopyrum smithii (western wheatgrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia octoflora ^a (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	245	31	126	5	178	-	-
2016	0	339	19	157	1	78	-	-
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	11.0	0.4	2.2	0.1	7.8	-	-
2016	0.0	9.2	0.3	2.3	0.0	0.7	-	-

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 ^{ai} (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus purshii (woollypod milkvetch)	Balsamorhiza hookeri (Hooker's balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littelpod false flax)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Collinsia parviflora ^a (maiden blue eyed Mary)	Cryptantha (cryptantha)	Cryptantha watsonii ^a (Watson's cryptantha)	Cymopterus longipes (longstalk springparsley)
year	Nested Frequency																
1996	3	-	4	3	6	3	2	7	2	-	-	9	37	-	49	-	23
2001	-	9	-	7	3	-	-	7	8	-	-	78	5	-	-	-	28
2006	-	3	20	3	2	-	1	4	-	-	-	97	3	2	10	-	10
2011	-	30	17	5	-	1	-	4	-	4	-	142	4	44	12	-	29
2016	-	1	35	5	-	-	2	4	8	1	2	39	-	2	6	5	24
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	-	0.1
2001	-	0.0	-	0.1	0.0	-	-	0.0	0.3	-	-	0.2	0.0	-	-	-	0.2
2006	-	0.0	0.1	0.0	0.0	-	0.0	0.0	-	-	-	0.2	0.0	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	-	0.3
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	0.1

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

FORB SPECIES	Delphinium nuttallianum (twolobe larkspur)	Descurainia pinnata ^a (western tansymustard)	Erigeron eatonii (Eaton's fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum caespitosum (matted buckwheat)	Eriogonum cernuum ^a (nodding buckwheat)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Gilia inconspicua ^a (shy gilia)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis ^a (slender phlox)	Navarretia intertexta ^a (needleleaf navarretia)	Pedicularis centranthera (dwarf lousewort)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	
year	Nested Frequency																	
1996	-	3	-	-	4	24	-	14	-	19	4	-	5	-	40	63	4	
2001	-	43	-	1	-	6	-	6	-	12	-	-	-	-	31	35	-	
2006	-	6	-	-	2	6	4	-	2	13	0	-	-	-	52	1	-	
2011	5	166	-	-	2	2	10	10	-	21	-	-	19	3	35	2	-	
2016	1	89	5	-	-	-	1	64	-	30	-	1	-	-	48	4	-	
year	Average Cover (%)																	
1996	-	0.0	-	-	0.0	0.1	-	0.1	-	0.1	0.1	-	0.0	-	0.8	0.2	0.0	
2001	-	0.1	-	0.0	-	0.0	-	0.0	-	0.0	-	-	-	-	1.0	0.1	-	
2006	-	0.0	-	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	-	-	0.7	0.0	-	
2011	0.1	0.9	-	-	0.1	0.0	0.1	0.0	-	0.1	-	-	0.2	0.4	0.6	0.0	-	
2016	0.0	0.6	0.2	-	-	-	0.0	0.2	-	0.1	-	0.0	-	-	1.0	0.0	-	

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

FORB SPECIES	Salsola tragus ^{ai} (prickly Russian thistle)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Zigadenus paniculatus (foxtail deathcamas)
year	Nested Frequency		
1996	-	4	-
2001	-	-	2
2006	-	-	1
2011	3	-	3
2016	-	1	4
year	Average Cover (%)		
1996	-	0.0	-
2001	-	-	0.0
2006	-	-	0.0
2011	0.0	-	0.0
2016	-	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 ^p (black sagebrush)	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)	Juniperus osteosperma ^t (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	-
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	-	14.9	3.6	-	1.4	1.3	0.0
2016	0.0	13.3	2.0	0.1	-	1.1	0.7

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

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	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)		
Artemisia nova^p -- (black sagebrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	40	-	50	50	0	0	50	0	14/26
2011	20	-	0	100	0	0	0	0	15/44
2016	20	-	0	100	0	0	0	0	36/81
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
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	3600	20	6	71	23	39	2	19	49/79
2016	3500	1980	6	68	26	6	2	13	50/77
Atriplex canescens^p -- (fourwing saltbush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	32/27
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
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	4160	-	19	80	1	0	0	1	26/37
2016	2700	160	13	78	9	1	3	5	23/30

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 (%)				
Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)									
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
Juniperus osteosperma¹ -- (Utah juniper)									
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
Linanthus pungens -- (granite prickly phlox)									
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	2360	-	7	92	2	0	0	1	15/25
2016	1720	60	9	90	1	0	0	1	14/19
Opuntia polyacantha -- (plains pricklypear)									
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
Pinus edulis¹ -- (twoneedle pinyon)									
1996	-	20	0	0	0	0	0	0	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -

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

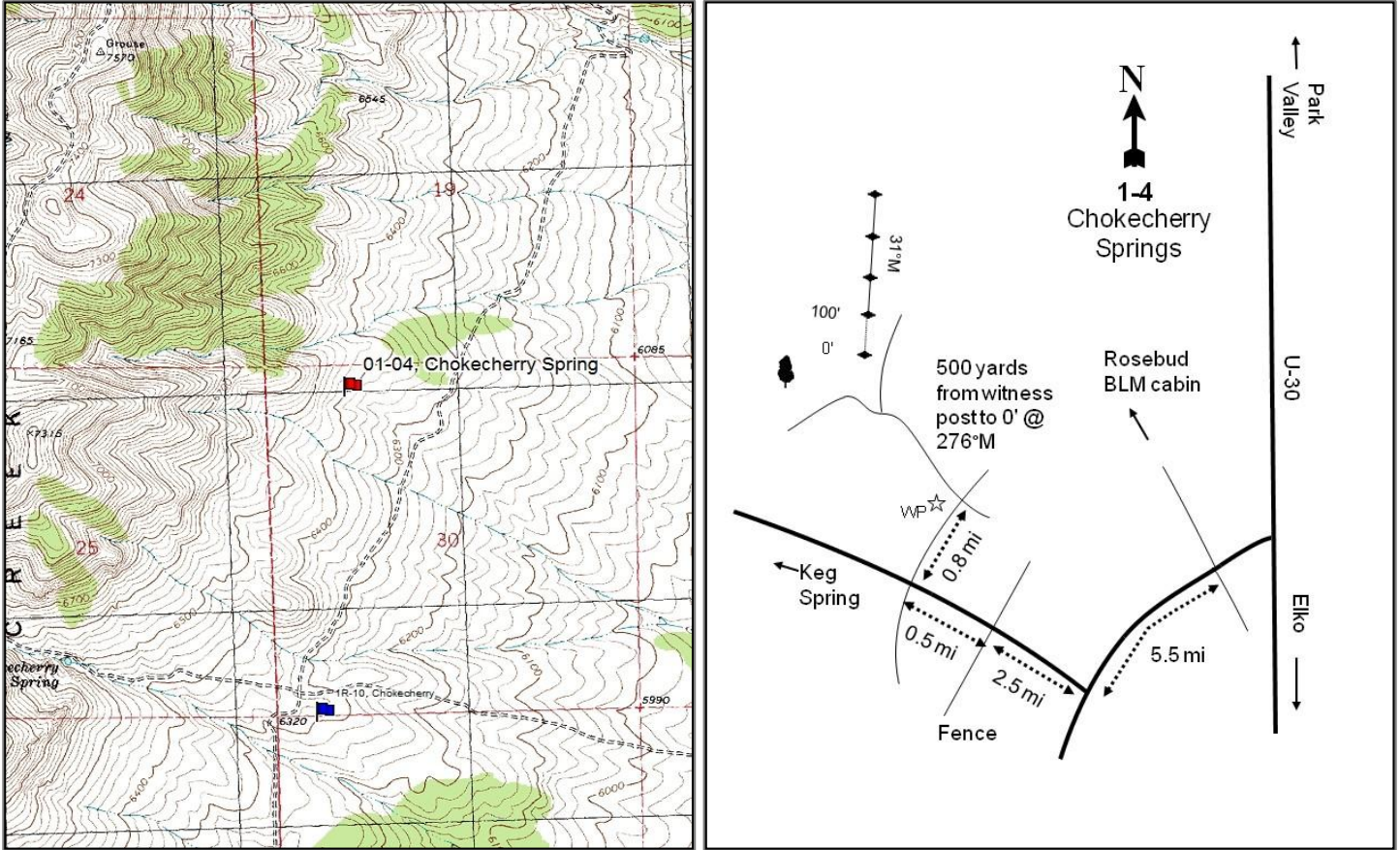
Table 01-02.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
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

Table -01-02.15 - Deer Desirable Components Index: Low 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	17.6	6.3	15.0	12.8	-2.4	3.4	0.0	52.6	Good
2001	23.2	9.6	11.5	18.4	-2.7	3.7	0.0	63.6	Good-Excellent
2006	19.9	4.5	3.5	11.4	-4.0	1.9	0.0	37.2	Fair
2011	18.7	8.1	3.0	21.1	-8.3	3.8	0.0	46.3	Fair-Good
2016	16.6	7.2	3.0	6.6	-6.9	3.4	0.0	29.9	Fair

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

Transect Information

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

Directions to Site

Proceed from State Road 30 towards 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 5.5 miles to a fork. Turn right and travel 2.5 miles to a gate. Pass through the gate, proceed 0.5 miles and turn right at a four way junction. Travel 0.8 miles to a witness post on left side of road and stop. From the witness post, take a bearing of 276 degrees magnetic to a large juniper that is just off the left side of the drainage with several young trees around it. This juniper is located on the slope above the split in the drainage. Walk about 500 yards from the witness post to the large juniper. From this tree, take a bearing of 9 degrees magnetic and walk 9 paces 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

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

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	Chokecherry Springs	155	March-June 2005	571
Seeding - Aerial Before	Chokecherry Springs	155	November 2004	571

Table 01-04.2 Seed Mix.List of known seeded plant species and rates (if available).

Mix Name		Application Type	Application Date	Acres	
Choke Cherry		Aerial	Nov 2004	550	
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
G	Achnatherum hymenoides	Indian Ricegrass		1.00	0.96
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	0.01	0.01
G	Dactylis glomerata	Orchardgrass	Paiute	1.00	0.92
G	Elymus wawawaiensis	Snake River Wheatgrass	Secar	1.73	1.61
G	Elymus wawawaiensis	Snake River Wheatgrass	Secar	0.34	0.30
G	Poa secunda	Sandberg Bluegrass	SID MT	0.09	0.07
G	Poa secunda	Canby Bluegrass		0.55	0.46
F	Achillea millefolium	Western Yarrow		0.09	0.09
F	Linum perenne	Blue Flax	Appar	0.55	0.50
F	Medicago sativa	Alfalfa	Ladak+	2.09	1.99
F	Onobrychis viciifolia	Sainfoin	Eski	3.09	2.90
F	Poa secunda	Sandberg Bluegrass	SID OR	0.45	0.36
F	Sanguisorba minor	Small Burnet	Delar	2.09	1.96

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

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Greater Sage Grouse		occupied	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

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 # 025XY312UT
 States and Transitions No state and transition model is available for this ecological site.

When established in 1984, the site was a mixed stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) (Table 01-04.12, Table 01-04.13). Native perennial grass species made up the majority of the herbaceous understory; However, the invasive annual grass species cheatgrass (*Bromus tectorum*) has had periodic increases in cover (Table 01-04.7). Young Utah juniper (*Juniperus osteosperma*) trees have been sparsely scattered across the site despite a bullhog project that removed juniper trees on the site in 2005. Mountain big sagebrush has remained the dominant browse species on the site since establishment.

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	17.0	11.2	0.0	-	-	-
2001	22.8	8.9	0.3	-	-	0.1
2006	15.4	8.6	1.1	24.0	11.0	2.7
2011	13.4	6.2	1.1	20.9	6.6	3.4
2016	11.6	8.9	2.4	19.2	8.8	2.7

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	164	276	217	6.2	6.2	1.5	6.7
2001	446	249	271	215	23.3	7.6	3.4	6.1
2006	326	278	227	271	3.0	12.3	1.6	10.6
2011	240	301	412	292	2.8	13.6	11.2	8.1
2016	431	257	273	172	19.6	10.0	1.6	6.3

Table 01-04.8 - 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	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

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
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)	-

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

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Festuca ovina ⁱ (sheep fescue)	Melica bulbosa (oniongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency							
1996	12	387	34	16	5	-	62	54
2001	11	446	44	21	-	-	159	57
2006	19	326	55	36	-	-	192	62
2011	25	240	56	36	-	6	234	52
2016	14	431	44	29	-	4	187	57
year	Average Cover (%)							
1996	0.4	6.2	1.2	0.6	0.2	-	1.0	2.9
2001	0.1	23.3	0.8	0.5	-	-	3.9	2.3
2006	1.0	3.0	1.4	0.8	-	-	5.6	3.4
2011	0.4	2.8	1.4	0.5	-	0.2	9.6	1.6
2016	0.2	19.6	0.6	0.9	-	0.0	6.3	1.9

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)	Androsace septentrionalis ^a (pygmyflower rockjasmine)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus cibirius (browse milkvetch)	Balsamorhiza hookeri (Hooker's balsamroot)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littledop false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium arvense ⁿⁱ (Canada thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)
year	Nested Frequency																
1996	6	14	-	37	-	-	11	-	85	-	8	7	4	205	48	31	17
2001	2	95	-	28	-	-	7	5	80	-	16	-	-	174	8	37	11
2006	69	75	3	8	40	-	14	2	23	3	-	-	-	173	-	36	19
2011	129	118	-	45	3	9	12	-	23	-	39	0	2	372	44	31	26
2016	22	19	-	2	41	2	21	1	43	-	-	-	4	184	24	48	17
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	0.3
2001	0.0	0.7	-	0.8	-	-	0.7	0.0	0.8	-	0.0	-	-	1.3	0.0	0.5	0.3
2006	0.4	0.3	0.1	0.3	1.8	-	2.5	0.0	0.1	0.0	-	-	-	0.7	-	0.2	0.6
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	0.6
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	0.2

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

FORB SPECIES	Cryptantha (cryptantha)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriastrum sparsiflorum ^a (Great Basin woollystar)	Galium aparine ^a (stickywilly)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Gilia inconspicua ^a (shy gilia)	Hackelia patens (spotted stickseed)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lithospermum ruderale (western stoneseed)	Lomatium triternatum (nineleaf biscuitroot)	Lupinus argenteus (silvery lupine)	Machaeranthera (tansyaster)	Microsteris gracilis ^a (slender phlox)	Oenothera caespitosa (tufted evening primrose)	
year	Nested Frequency																	
1996	13	-	-	-	-	9	1	-	9	-	-	16	8	24	14	-	2	
2001	-	-	2	-	-	-	54	13	1	-	2	7	4	18	-	33	-	
2006	17	4	-	14	-	-	2	-	10	3	6	15	8	22	-	12	-	
2011	1	-	1	8	-	2	5	-	4	-	1	5	17	14	4	67	-	
2016	2	12	-	-	1	2	3	-	7	-	8	9	-	17	-	28	-	
year	Average Cover (%)																	
1996	0.0	-	-	-	-	0.0	0.0	-	0.0	-	-	1.2	0.0	1.3	0.0	-	0.0	
2001	-	-	0.0	-	-	-	0.7	0.0	0.0	-	0.0	0.3	0.0	1.4	-	0.5	-	
2006	0.1	0.0	-	0.0	-	-	0.0	-	0.1	0.0	0.0	1.0	0.0	1.8	-	0.0	-	
2011	0.0	-	0.0	0.0	-	0.0	0.0	-	0.0	-	0.0	0.3	0.3	0.8	0.0	0.3	-	
2016	0.0	0.1	-	-	0.0	0.0	0.0	-	0.1	-	0.0	0.1	-	1.4	-	0.1	-	

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

FORB SPECIES	Penstemon speciosus (royal penstemon)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Pleiocanthus spinosus (thorn skeletonweed)	Stenotus acaulis (stemless mock goldenweed)	Tragopogon dubius ^{ai} (yellow safsify)	Veronica biloba ^{ai} (two-lobed speedwell)	Viola (violet)
year	Nested Frequency							
1996	-	-	108	37	-	5	25	-
2001	-	-	104	19	-	2	23	-
2006	-	-	102	28	-	7	55	3
2011	10	12	94	11	2	4	57	-
2016	-	-	23	14	2	2	94	1
year	Average Cover (%)							
1996	-	-	0.5	0.7	-	0.0	0.1	-
2001	-	-	0.8	0.6	-	0.0	0.1	-
2006	-	-	0.7	0.8	-	0.1	0.4	0.0
2011	0.1	0.0	0.5	0.2	0.2	0.0	1.0	-
2016	-	-	0.1	0.7	0.0	0.0	0.7	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 ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)	Juniperus osteosperma ⁱ (Utah juniper)	Opuntia polyacantha (plains pricklypear)	Purshia tridentata ^p (antelope bitterbrush)	Symphoricarpos oreophilus (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	2.7	0.3	11.3	2.9
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

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

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 (%)				
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
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	59/89
2016	1400	5560	7	59	34	3	0	41	72/106
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)									
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
Juniperus osteosperma ⁱ -- (Utah juniper)									
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	-/-

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 (%)				
Opuntia polyacantha -- (plains pricklypear)									
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
Purshia tridentata^p -- (antelope bitterbrush)									
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
Symphoricarpos oreophilus -- (mountain snowberry)									
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

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

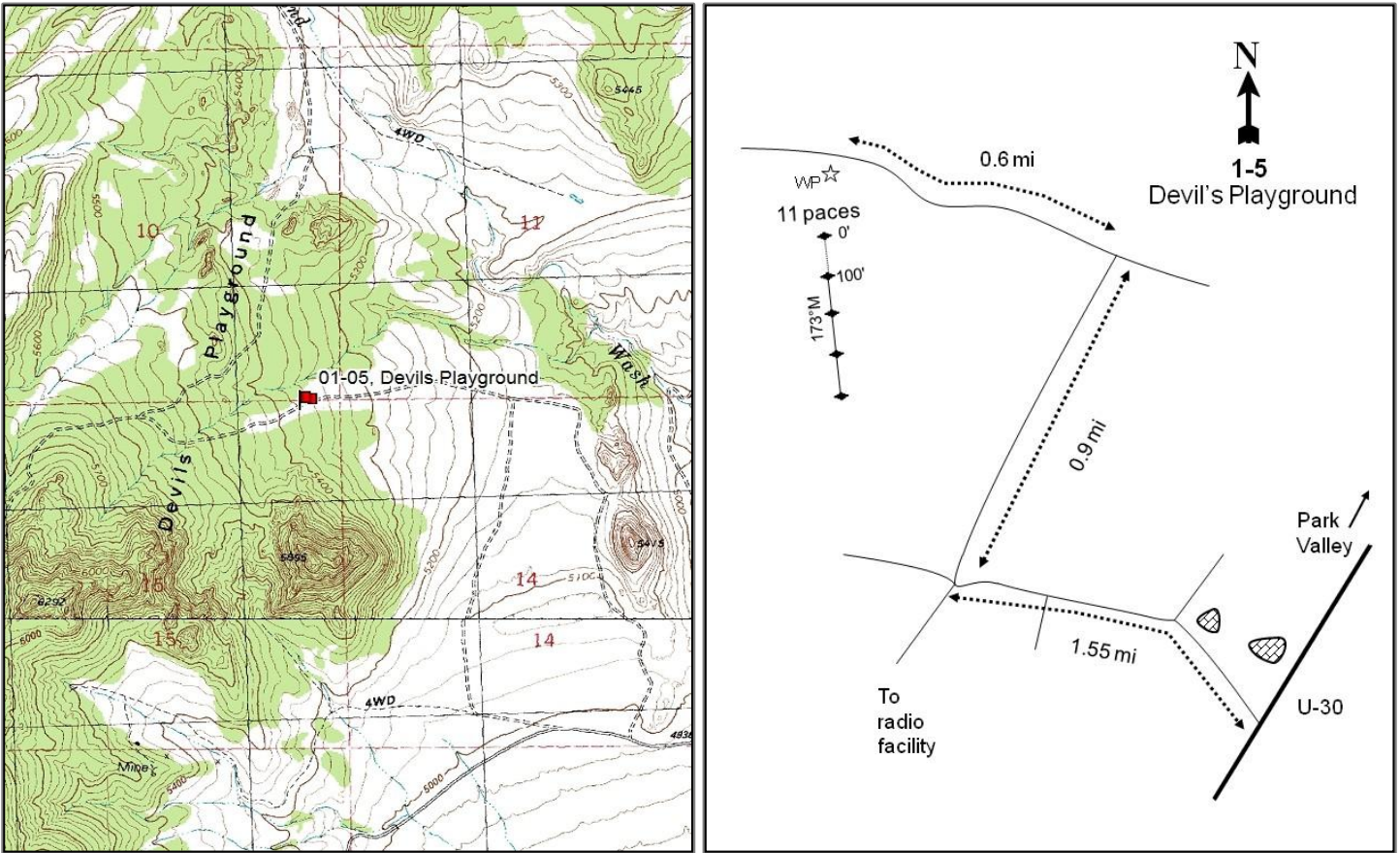
Table 01-04.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
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

Table -01-04.15 - Deer Desirable Components Index: Mid 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	9.0	5.5	17.4	-4.7	10.0	0.0	59.5	Fair
2001	30.0	10.0	1.9	17.0	-17.6	10.0	0.0	51.3	Poor-Fair
2006	20.7	5.8	1.8	26.0	-2.3	10.0	0.0	62.1	Fair
2011	18.3	6.9	0.9	29.8	-2.1	10.0	0.0	63.8	Fair-Good
2016	14.5	11.7	1.1	20.0	-14.7	10.0	-2.0	40.7	Poor

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

708
173° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Standard

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 rock pile and witness post on left side of the road. Walk 11 paces southwest from the rock pile to the 0-foot stake of the frequency baseline. The baseline is marked by a red browse tag #708. 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

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
Deer	crucial	winter
Elk	crucial	year-long
Greater Sage Grouse		occupied & 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

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	Semi-desert Gravelly Sandy Loam (Black Sagebrush)
NRCS Ecological Site #	028AY227UT
States and Transitions	No state and transition model is available for this ecological site.

Since establishment in 1984 the site has remained in a stable state of black sagebrush (*Artemisia nova*) with a diverse herbaceous understory over the sample years (Table 01-05.12, Table 01-05.13). The invasive annual grass species cheatgrass (*Bromus tectorum*) has been the dominant herbaceous species since establishment of the study (Table 01-05.10). Utah juniper (*Juniperus osteosperma*) trees have been present across the site. Few young junipers remain following a chaining treatment that removed many of the mature juniper trees on the between the 2011 and 2016 sample years (Table 01-05.12, Table 01-05.13).

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	13.6	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	13.6
2016	8.6	3.5	0.3	10.8	3.7	1.0

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	361	200	82	70	5.7	6.2	0.3	0.8
2006	382	173	74	43	7.9	4.8	0.2	0.2
2011	289	240	243	98	2.9	10.6	1.5	1.7
2016	425	220	135	117	14.7	6.7	0.6	0.9

Table 01-05.8 - 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	19.4	0.7	26.9	27.7	1.5	25.5
2001	16.4	1.6	29.3	32.3	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

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	Elk	Horse	Rabbit
	Quadrat Frequency				
1996	-	44	2	-	32
2001	-	25	-	-	7
2006	-	24	-	-	65
2011	-	32	3	-	9
2016	1	8	-	-	62
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)	-

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 ⁱ (crested wheatgrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia octoflora ^a (sixweeks fescue)
year	Nested Frequency								
1996	19	-	-	102	60	-	166	50	84
2001	5	-	-	343	47	-	157	40	159
2006	11	-	-	382	40	0	135	20	18
2011	4	-	-	288	48	-	206	34	8
2016	8	17	15	425	41	1	164	62	32
year	Average Cover (%)								
1996	0.7	-	-	0.4	0.7	-	2.9	1.0	0.2
2001	0.1	-	-	5.2	0.4	-	3.4	2.2	0.5
2006	0.3	-	-	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	0.8	0.1	14.6	1.0	0.0	2.8	1.7	0.1

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 ^a (mustard family)	Calochortus nuttallii (sego lily)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Collinsia parviflora ^a (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cryptantha ^a (annual cryptantha)	Cryptantha (cryptantha)	Cryptantha cinerea (James' cryptantha)	Cryptantha watsonii ^a (Watson's cryptantha)	Delphinium nuttallianum (twolobe larkspur)
year	Nested Frequency																
1996	18	-	3	11	33	-	8	-	32	-	-	3	114	100	-	-	3
2001	-	-	5	2	-	-	-	-	4	3	-	-	31	-	-	-	2
2006	10	3	-	4	-	-	-	-	6	8	-	1	23	-	-	-	-
2011	18	-	5	4	-	4	-	3	12	6	-	3	105	11	-	-	20
2016	12	-	3	20	-	3	1	-	12	-	2	0	-	6	27	11	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	-	-	0.1	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	0.4	0.0	-	-	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

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

FORB SPECIES	Descuraimia pinnata ^a (western tansymustard)	Eriastrum sparsiflorum ^a (Great Basin woollystar)	Eriogonum cernuum ^a (nodding buckwheat)	Eriogonum ovalifolium (cushion buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium aparine ^a (stickywilly)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Gilia inconspicua ^a (shy gilia)	Lappula occidentalis ^a (flatspine stickseed)	Layia glandulosa ^a (whitedaisy tidytip)	Lomatium (desertparsley)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Pleiakanthus spinosus (thorn skeletonweed)	Symphytotrichum (aster)	Townsendia florifer ^a (showy Townsend daisy)	Tragopogon dubius ^{ai} (yellow salsify)	
year	Nested Frequency																	
1996	4	85	11	15	-	-	37	23	-	-	5	4	36	0	82	-	2	
2001	11	-	-	-	-	3	18	32	8	-	4	1	52	-	-	-	-	
2006	-	27	-	-	-	-	18	-	11	-	-	-	21	-	-	3	-	
2011	80	-	-	-	-	-	28	109	6	71	-	-	36	-	-	-	-	
2016	21	22	1	-	2	-	4	65	2	45	-	-	56	-	-	-	-	
year	Average Cover (%)																	
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	
2001	0.0	-	-	-	-	0.0	0.0	0.1	0.0	-	0.2	0.0	0.4	-	-	-	-	
2006	-	0.1	-	-	-	-	0.0	-	0.0	-	-	-	0.1	-	-	0.0	-	
2011	0.3	-	-	-	-	-	0.1	0.3	0.0	0.5	-	-	0.3	-	-	-	-	
2016	0.1	0.2	0.0	-	0.0	-	0.0	0.2	0.0	0.1	-	-	0.3	-	-	-	-	

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	Artemisia nova ^p (black sagebrush)	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Juniperus osteosperma ⁱ (Utah juniper)	Linanthus pungens (granite prickly phlox)	Opuntia polyacantha (plains pricklypear)	Pinus monophylla ⁱ (singleleaf pinyon)
year	Line Intercept Cover (%)						
1996	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-
2006	13.2	2	2.6	11.2	0.1	-	0.2
2011	11.7	2.4	3.2	12.4	0.2	-	1.2
2016	10.2	0.6	3.5	0.9	0.2	-	0.1
year	Quadrat Cover (%)						
1996	11.5	0.6	1.5	4.9	0.2	-	0.0
2001	13.4	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

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

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 (%)				
Artemisia nova^P -- (black sagebrush)									
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
Artemisia tridentata ssp. wyomingensis^P -- (Wyoming big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
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
Ephedra nevadensis^P -- (Nevada jointfir)									
1996	-	-	-	-	-	-	-	-	40/43
2001	-	-	-	-	-	-	-	-	37/25
2006	-	-	-	-	-	-	-	-	45/58
2011	-	-	-	-	-	-	-	-	42/71
2016	-	-	-	-	-	-	-	-	50/62
Eriogonum microthecum^P -- (slender buckwheat)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	34/73
Grayia spinosa -- (spiny hopsage)									
1996	-	-	-	-	-	-	-	-	80/90
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	68/80
2011	-	-	-	-	-	-	-	-	70/96
2016	-	-	-	-	-	-	-	-	54/76
Juniperus osteosperma¹ -- (Utah juniper)									
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	-/-
Linanthus pungens -- (granite prickly phlox)									
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
Opuntia polyacantha -- (plains pricklypear)									
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

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 (%)				
Pinus monophylla¹ -- (singleleaf pinyon)									
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	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	68/212
Symphoricarpos oreophilus -- (mountain snowberry)									
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
Tetradymia nuttallii -- (Nuttall's horsebrush)									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	56/104
2016	-	-	-	-	-	-	-	-	48/63

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

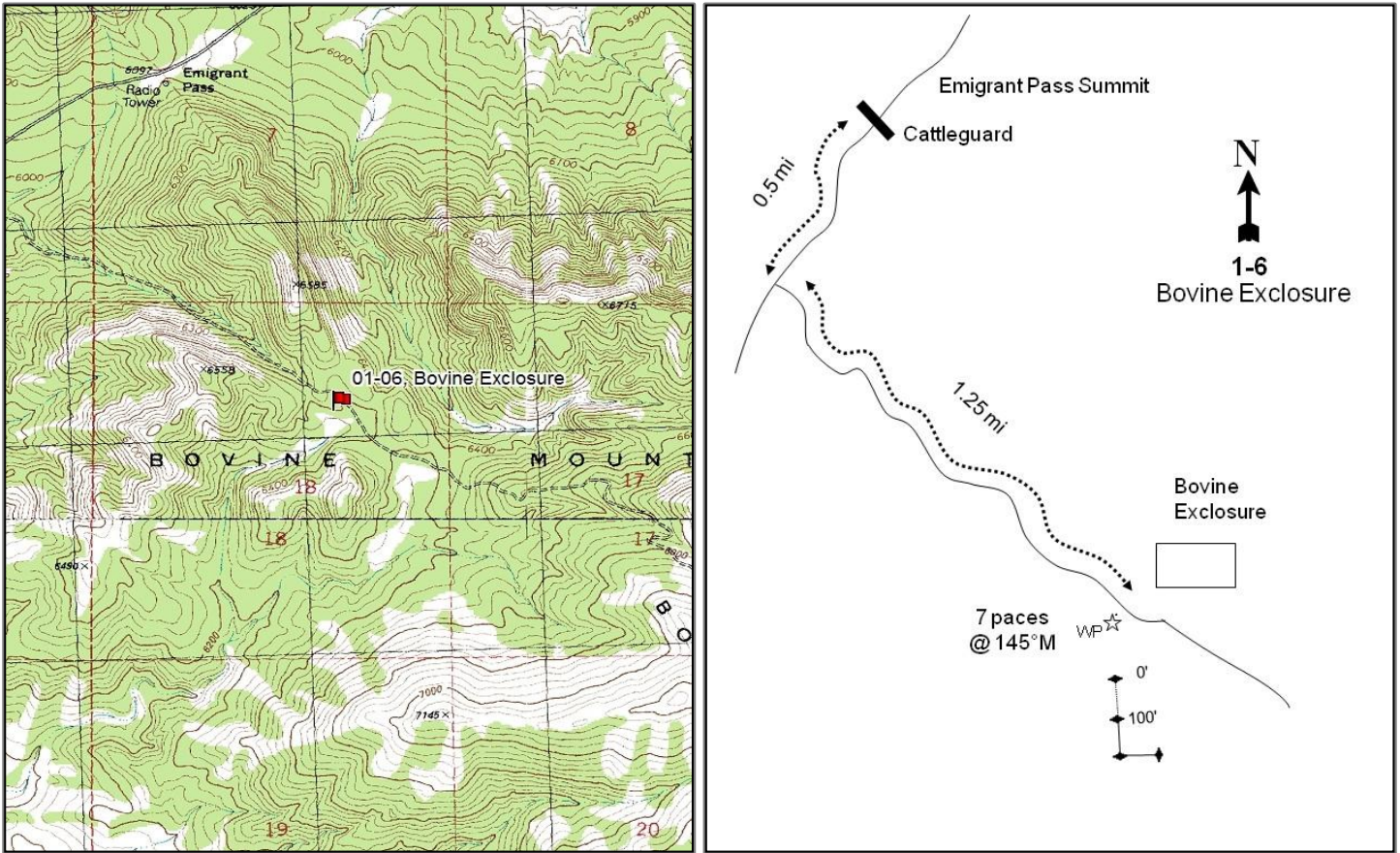
Table 01-05.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density		Size Class Distribution				Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
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
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

Table -01-05.15 - Deer Desirable Components Index: Low 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	15.2	7.4	3.3	10.5	-0.4	2.3	0.0	38.3	Fair
2001	17.1	6.4	1.0	15.8	-4.3	1.7	0.0	37.6	Fair
2006	18.3	5.5	0.9	10.9	-6.0	0.3	0.0	29.9	Fair
2011	14.0	3.6	2.8	21.3	-2.2	4.3	0.0	43.8	Fair-Good
2016	10.8	8.3	2.4	13.4	-11.0	1.8	0.0	25.6	Poor-Fair

BOVINE EXCLOSURE - STUDY NO. 01-6



Location Information

USGS 7.5 min Map Info	Emigrant Pass SW; Township 9N, Range 16W, Section 18
GPS (0' Stake)	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	Standard, 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 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 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	11%
Sample Dates	06/18/1996, 06/04/2001, 05/25/2006, 05/24/2011, 05/24/2016

Wildlife Habitat and Vegetation History

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

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

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 #	025XY312UT
States and Transitions	No state and transition model is available for this ecological site.

When established in 1984, the site was a mixed stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), black sagebrush (*A. nova*) and antelope bitterbrush (*Purshia tridentata*) (Table 01-06.12, Table 01-06.13). Native perennial grass species made up the majority of the herbaceous understory. However, the invasive annual grass species cheatgrass (*Bromus tectorum*) has had periodic increases in cover (Table 01-06.7). Utah juniper (*Juniperus osteosperma*) trees have increased in cover since site establishment and are becoming a dominant species (Table 01-06.12, Table 01-06.13).

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

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	261	85	164	2.3	11.5	0.4	2.1
2001	349	262	156	139	9.5	11.8	0.7	2.8
2006	277	266	98	137	3.7	12.5	0.3	4.7
2011	111	280	304	197	1.5	15.7	3.6	5.0
2016	273	280	271	225	4.7	12.3	1.3	5.1

Table 01-06.8 - 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	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

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
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)	-

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

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency					
1996	8	266	18	11	159	168
2001	11	349	5	19	176	131
2006	7	277	5	14	228	105
2011	5	111	4	9	199	158
2016	8	273	-	13	212	133
year	Average Cover (%)					
1996	0.1	2.3	0.2	0.2	3.3	7.7
2001	0.1	9.5	0.4	0.4	4.4	6.5
2006	0.2	3.7	0.0	0.1	7.2	5.0
2011	0.2	1.5	0.0	0.1	7.9	7.5
2016	0.2	4.7	-	0.2	5.8	6.1

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 ^a (silver rockress)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus cibirius (browse milkvetch)	Balsamorhiza sagittata (arrow/leaf balsamroot)	Calochortus nuttallii (sego lily)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseeded butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cordylanthus ramosus ^a (bushy bird's beak)	Crepis acuminata (tapertip hawkbeard)	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
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

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

FORB SPECIES	Cryptantha watsonii ^a (Watson's cryptantha)	Delphinium nuttallianum (twolobe larkspur)	Descurainia pinnata ^a (western tansymustard)	Erigeron pumilus (shaggy fleabane)	Eriogonum ovalifolium (cushion buckwheat)	Fritillaria atropurpurea (spotted fritillary)	Galium aparine ^a (stickywilly)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Gilia inconspicua ^a (shy gilia)	Hackelia patens (spotted stickseed)	Helianthus annuus ^a (common sunflower)	Lappula occidentalis ^a (flatspine stickseed)	Lewisia rediviva (bitter root)	Lomatium dissectum var. multifidum (carrotleaf biscuitroot)	Lomatium triternatum (nineleaf biscuitroot)	Machaeranthera grindeloides (rayless tansyaster)	Microsteris gracilis ^a (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
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

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

FORB SPECIES	Navarretia intertexta ^a (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)	Symphytotrichum (aster)	Tragopogon dubius ^{ai} (yellow salsify)	Veronica biloba ^{ai} (twolobe speedwell)
year	Nested Frequency										
1996	23	-	7	82	-	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
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

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 ^p (black sagebrush)	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ^t (Utah juniper)	Opuntia polyacantha (plains pricklypear)	Pinus monophylla ^t (singleleaf pinyon)	Purshia tridentata ^p (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
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

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

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 (%)				
Artemisia nova^p -- (black sagebrush)									
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
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)									
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

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 (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
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
Juniperus osteosperma¹ -- (Utah juniper)									
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	- / -
Linanthus pungens -- (granite prickly phlox)									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	14/39
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
Opuntia polyacantha -- (plains pricklypear)									
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
Pinus monophylla¹ -- (singleleaf pinyon)									
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	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
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

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

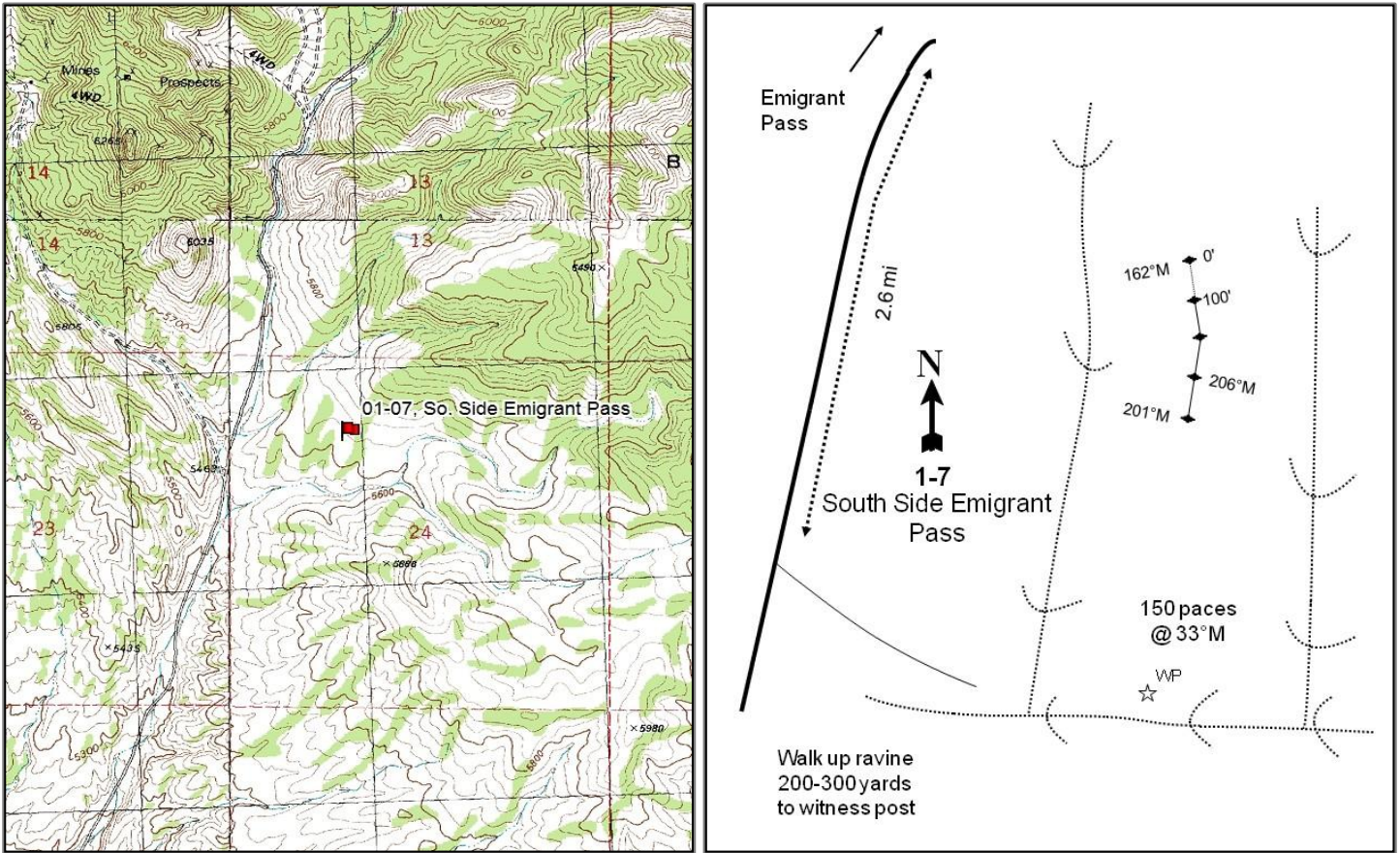
Table 01-06.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
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
Pinus monophylla (singleleaf pinyon)							
1996	5	-	-	-	-	-	11.7
2001	19	-	-	-	-	-	7.0
2006	11	17	33	17	17	17	8.0
2011	10	40	40	-	-	20	5.0
2016	29	36	45	-	-	18	5.0

Table -01-06.15 - Deer Desirable Components Index: Mid 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	8.5	7.8	23.4	-1.7	4.3	0.0	52.3	Fair
2001	11.1	7.5	2.8	24.4	-7.1	5.6	0.0	44.2	Poor
2006	14.1	6.0	2.6	25.7	-2.8	9.5	0.0	55.0	Fair
2011	13.3	10.9	5.7	30.0	-1.1	10.0	0.0	68.8	Good
2016	13.2	8.7	2.2	24.6	-3.5	10.0	0.0	55.1	Fair

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
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Standard

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 and drive east to the wash. 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. The baseline runs at a bearing of 162 degrees magnetic. The 300-foot baseline runs 206 degrees magnetic. The 400-foot baseline runs 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

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

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

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 #	025XY316UT
States and Transitions	No state and transition model is available for this ecological site.

Since establishment in 1984, the site has remained in a stable state of black sagebrush (*Artemisia nova*) with a sparse herbaceous understory over the sample years (Table 01-07.12, Table 01-07.7). Yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *stenophyllus*) comprises the majority of the secondary cover of the study (Table 01- 07.6, Table 01-07.12).

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	-

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

Table 01-07.8 - 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	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

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	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
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)	-	-	-

*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 ^{ai} (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
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

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 ^a (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 ^a (thickstem wild cabbage)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cryptantha (cryptantha)	Cymopterus globosus (globe springparsley)	Descurainia pinnata ^a (western tansymustard)	Erigeron (fleabane)	Erigeron argentatus (silver fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum ovalifolium (cushion buckwheat)	Gilia inconspicua ^a (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
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

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

FORB SPECIES	Malcolmia africana ^{ai} (African mustard)	Penstemon humilis (low beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Sisymbrium altissimum ^{ai} (tall tumbleweed)	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
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

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 ^p (black sagebrush)	Atriplex confertifolia ^p (shadscale saltbush)	Bassia americana ^p (green molly)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Picrothamnus desertorum (bud sagebrush)	Pinus edulis ^t (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
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

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

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 (%)				
Artemisia nova^P -- (black sagebrush)									
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
Atriplex confertifolia^P -- (shadscale saltbush)									
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
Bassia americana^P -- (green molly)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
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
Ephedra nevadensis^P -- (Nevada jointfir)									
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
Grayia spinosa -- (spiny hopsage)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	53/52
2016	-	-	-	-	-	-	-	-	65/89
Juniperus osteosperma¹ -- (Utah juniper)									
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	-/-
Opuntia polyacantha -- (plains pricklypear)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	10/21
Picrothamnus desertorum -- (bud sagebrush)									
1996	-	-	-	-	-	-	-	-	19/34
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	16/33
2016	-	-	-	-	-	-	-	-	9/24

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 (%)				
Pinus edulis¹ -- (twoneedle pinyon)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	20	0	0	0	0	0	0	- / -
2011	20	20	100	0	0	0	0	0	- / -
2016	-	-	-	-	-	-	-	-	-/-
Tetradymia nuttallii -- (Nuttall's horsebrush)									
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

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

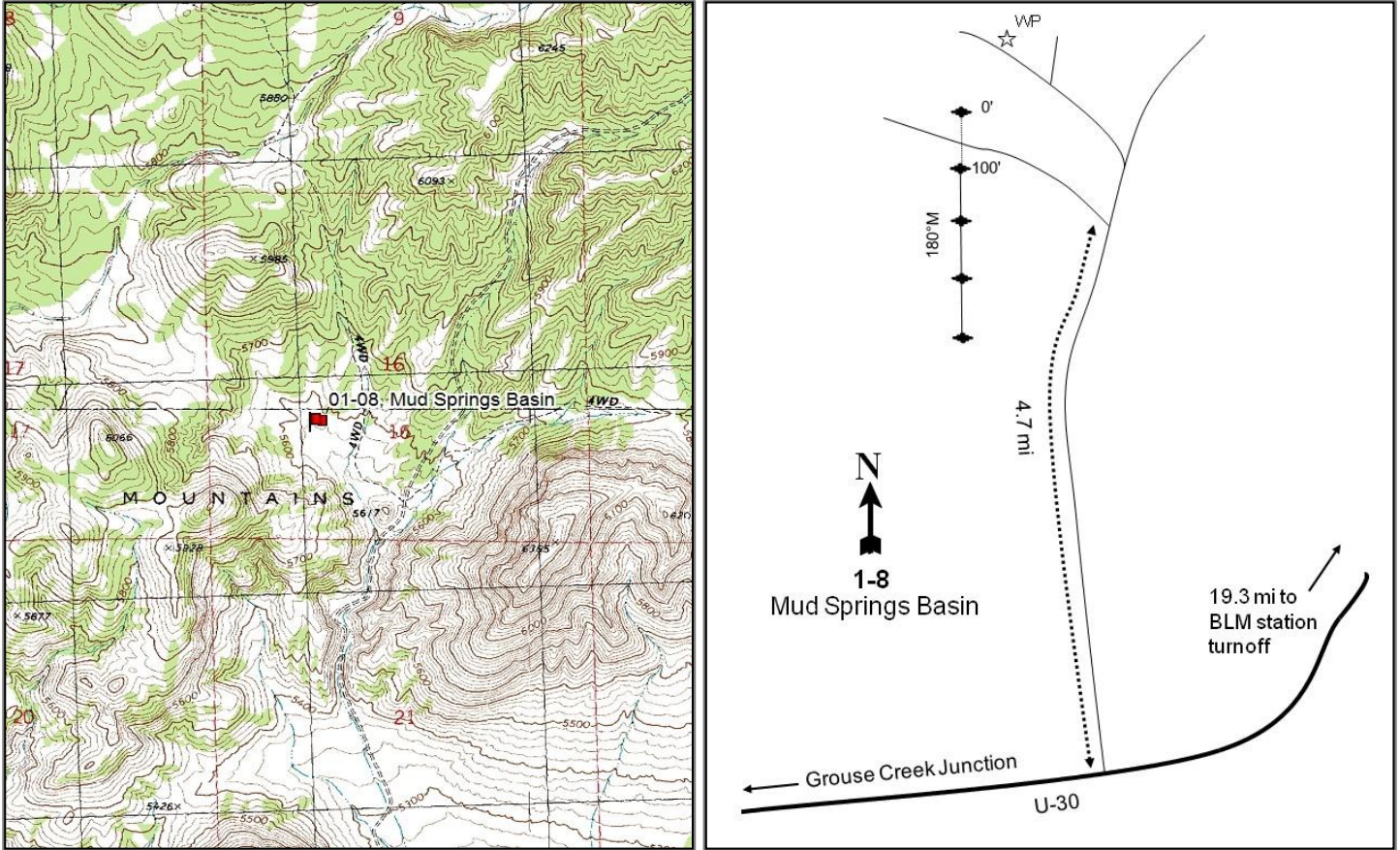
Table 01-07.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2016	25	50	50	-	-	-	4.5

Table -01-07.15 - Deer Desirable Components Index: Mid 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	12.4	12.1	2.7	-0.1	3.7	0.0	54.0	Fair
2001	25.2	9.2	3.1	3.9	-0.5	2.5	0.0	45.2	Poor
2006	30.0	8.6	2.0	3.7	-0.9	2.6	0.0	46.0	Poor
2011	27.8	9.4	1.5	1.4	-0.1	2.8	0.0	42.9	Poor
2016	26.5	8.6	1.5	2.8	-0.1	5.8	0.0	45.0	Poor

MUD SPRINGS BASIN - STUDY NO. 01-8



Location Information

USGS 7.5 min Map Info Lucin NE NE; Township 9N, Range 17W, Section 16
 GPS (0' Stake) 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 Standard

Directions to Site

On State Route 30 proceed 19 miles southwest from the Rosebud BLM station turn-off 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 side of the road, and the 0-foot stake will be found on the right-hand side of the road. The 0-foot stake is marked by browse tag #580. The bearing of the baseline is 180 degrees.

Site Information

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

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
Deer	crucial	winter	
Elk	crucial	year-long	
Greater Sage Grouse		occupied	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	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	25.3	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 #	025XY314UT
States and Transitions	A defined state and transition model is available.

When the study was established 1984, the plant community was in Community Phase 2.2 of the Current Potential State with Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) being the dominant component of the community (Table 09-03.12) with a diverse and abundant herbaceous understory (Table 01-08.7). However, cheatgrass (*Bromus tectorum*) has been a significant component of the site and at times dominated much of the understory (Table 01-08.10). There was some conifer encroachment on the site with mature Utah juniper (*Juniperus osteosperma*) sparsely scattered across the site indicating that encroachment has not been active. However, sometime after 2011 a chaining was performed 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 reestablish and remain in Community Phase 2.2 with Wyoming big sagebrush as the major component within the community (USDA-NRCS, 2011).

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	3.4	1.8	-	5.8	1.6	-

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

Table 01-08.8 - 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	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

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	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
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)	-

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

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Pascopyrum smithii (western wheatgrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea ⁱ (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
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

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 ^{ai} (desert madwort)	Androsace septentrionalis ^a (pygmyflower rockjasmine)	Antennaria dimorpha (low pussytoes)	Arabis puberula ^a (silver rockress)	Arenaria (sandwort)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus cibirius (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 microcapa ^{ai} (littlepod false flax)	Ceratocephala testiculata ^{ai} (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
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

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

FORB SPECIES	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium album ^a (lambsquarters)	Collinsia parviflora ^a (maiden blue eyed Mary)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Descurainia pinnata ^a (western tansymustard)	Erigeron pumilus (shaggy fleabane)	Eriogonum ovalifolium (cushion buckwheat)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Gilia inconspicua ^a (shy gilia)	Hackelia patens (spotted stickseed)	Halogeton glomeratus ^{ai} (saltlover)	Lappula occidentalis ^a (flatspine stickseed)	Linum perenne ⁱ (blue flax)	Malcolmia africana ^{ai} (African mustard)	Medicago sativa ⁱ (alfalfa)	Mentzelia albicaulis ^a (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	-
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	-

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

FORB SPECIES	Monolepis nuttalliana ^a (Nuttall's povertyweed)	Penstemon (beardtongue)	Penstemon cyananthus (Wasatch beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Pseudostellaria jamesiana (tuber starwort)	Salsola tragus ^{ai} (prickly Russian thistle)	Sisymbrium altissimum ^{ai} (tall tumbleweed)	Stenotus acaulis (stemless mock goldenweed)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Veronica biloba ^{ai} (two-lobed 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
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

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 ^p (black sagebrush)	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Bassia prostrata ⁱ (forage kochia)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Juniperus osteosperma ^t (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	-
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

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

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 (%)				
Artemisia nova^p -- (black sagebrush)									
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
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
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
Atriplex canescens^p -- (fourwing saltbush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Bassia prostrataⁱ -- (forage kochia)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	1860	100	24	76	0	0	1	0	11/18

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 (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
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
Ephedra nevadensis^p -- (Nevada jointfir)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	20	-	0	0	100	0	0	100	38/80
2016	-	-	-	-	-	-	-	-	18/79
Gutierrezia sarothrae -- (broom snakeweed)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	23/33
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Juniperus osteospermaⁱ -- (Utah juniper)									
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	-/-
Linanthus pungens -- (granite prickly phlox)									
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
Opuntia polyacantha -- (plains pricklypear)									
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

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

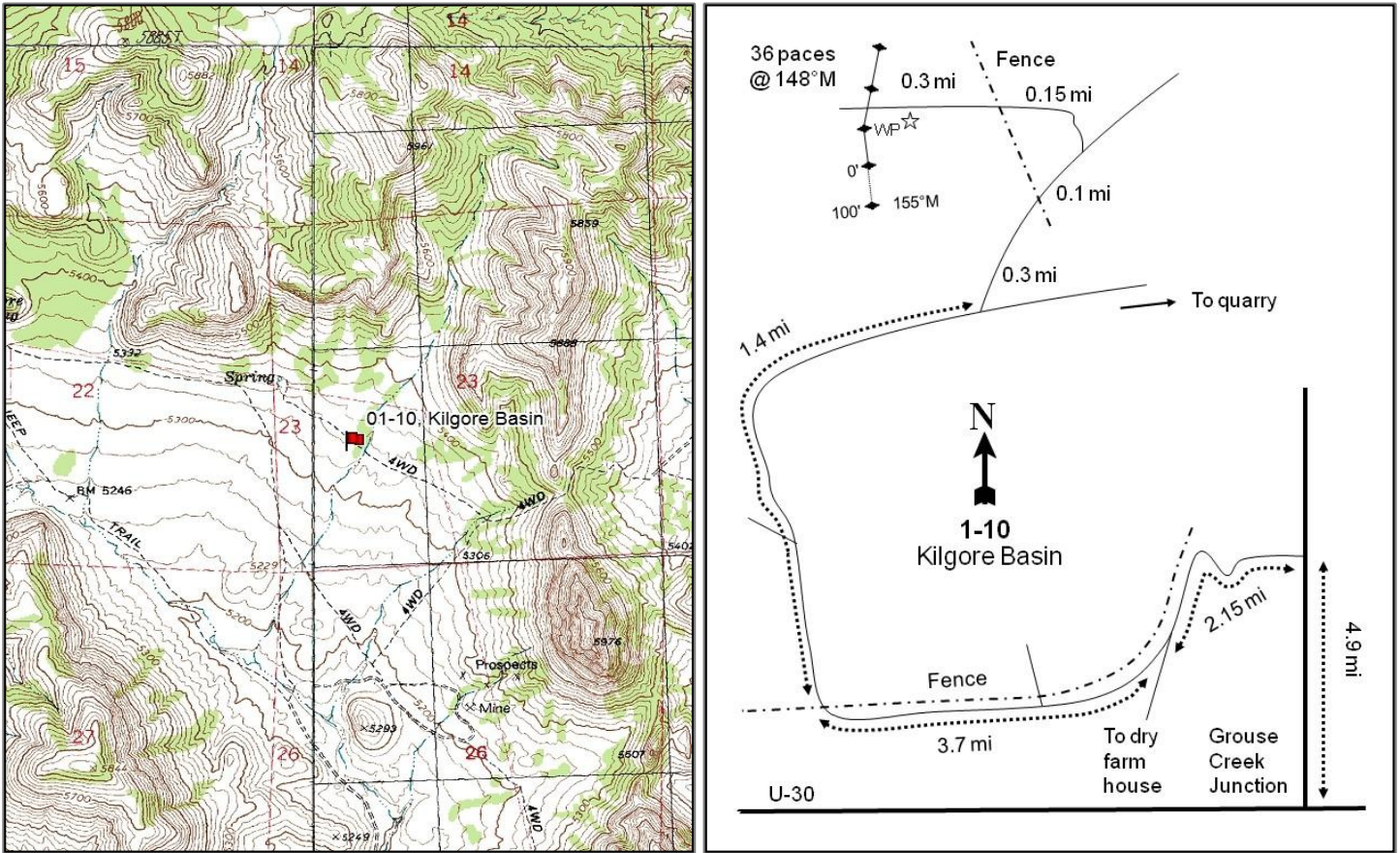
Table 01-08.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
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

Table -01-08.15 - Deer Desirable Components Index: Mid 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	6.0	5.7	29.2	-4.0	6.7	0.0	60.0	Fair
2001	19.1	8.8	1.6	21.1	-9.7	2.1	0.0	42.9	Poor
2006	10.9	5.8	0.7	24.8	-20.0	2.2	0.0	24.5	Very Poor
2011	12.4	9.0	2.1	26.2	-1.4	3.2	0.0	51.5	Poor-Fair
2016	5.0	0.0	0.0	22.2	-20.0	5.8	0.0	13.0	Very Poor

KILGORE BASIN - STUDY NO. 01-10



Location Information

USGS 7.5 min Map Info Lucin NW NW; Township 9N, Range 19W, Section 23
 GPS (0' Stake) NAD 83 UTM ZONE 12, 249604 East 4596726 North

Transect Information

Browse Tag # (0' Stake) 7910
 Transect Bearing 155° 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 State Route 30/Grouse Creek Road junction, proceed north 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. Continue 1.2 miles to another fork. Stay right for 0.3 miles, then turn left and travel 0.4 miles to a gate. Proceed 0.1 miles to a fork. Turn left here into the P/J and go 0.15 miles to another gate. Continue 0.3 miles to a witness post on the 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. The baseline bearing is 155 degrees magnetic.

Site Information

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

Wildlife Habitat and Vegetation History

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

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Elk	crucial	year-long	
Greater Sage Grouse		occupied & 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

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 #	028AY236UT
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 black sagebrush (*Artemisia nova*) being the dominant species (Table 01-10.12). The herbaceous understory has remained un-diversified and sparse (Table 01- 10.10, Table 01-10.11). The invasive annual grass species cheatgrass (*Bromus tectorum*) was sampled in low abundance on the site in most sample years (Table 01-10.10). It is predicted the site will remain in this state without a major disturbance.

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	-

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

Table 01-10.8 - 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	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

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	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
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)	-	-	-

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

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirriltail)	Poa secunda (Sandberg bluegrass)	Vulpia octoflora ^a (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
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

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 rockcress)	Arabis puberula ^a (silver rockcress)	Astragalus cibaricus (browse milkvetch)	Astragalus iodanthus (Humboldt River milkvetch)	Astragalus purshii (woollypod milkvetch)	Brassicaceae ^a (mustard family)	Camissonia minor ^a (small evening primrose)	Castilleja angustifolia (northwestern Indian paintbrush)	Collinsia parviflora ^a (maiden blue eyed Mary)	Cryptantha humilis (roundspike cryptantha)	Cryptantha watsonii ^a (Watson's cryptantha)	Descurainia pinnata ^a (western tansymustard)	Eriastrum sparsiflorum ^a (Great Basin woollystar)	Eriogonum ovalifolium (cushion buckwheat)	Gilia inconspicua ^a (shy gilia)	Halogeton glomeratus ^{ai} (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
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	-
2011	0.1	-	-	-	0.2	0.1	-	-	-	0.1	0.0	-	0.1	0.0	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

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

FORB SPECIES	Lappula occidentalis ^a (flatspine stickseed)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	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	-
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	-

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 ^p (black sagebrush)	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Atriplex confertifolia ^p (shadscale saltbush)	Bassia americana ^p (green molly)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Ephedra nevadensis ^p (Nevada jointfir)	Grayia spinosa (spiny hopsage)	Juniperus osteosperma ^t (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
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

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

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 (%)				
Artemisia nova^P -- (black sagebrush)									
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
Artemisia tridentata ssp. wyomingensis^P -- (Wyoming big sagebrush)									
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
Atriplex confertifolia^P -- (shadscale saltbush)									
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
Bassia americana^P -- (green molly)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
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
Ephedra nevadensis^P -- (Nevada jointfir)									
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
Grayia spinosa -- (spiny hopsage)									
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
Juniperus osteosperma¹ -- (Utah juniper)									
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	- / -
Krascheninnikovia lanata^P -- (winterfat)									
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	-	-	-	-	-	-	-	-	- / -

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 (%)				
Opuntia polyacantha -- (plains pricklypear)									
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
Picrothamnus desertorum -- (bud sagebrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	20/52
2016	-	-	-	-	-	-	-	-	18/43
Sarcobatus vermiculatus -- (greasewood)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	53/96
2006	-	-	-	-	-	-	-	-	99/136
2011	-	-	-	-	-	-	-	-	87/146
2016	-	-	-	-	-	-	-	-	103/149

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

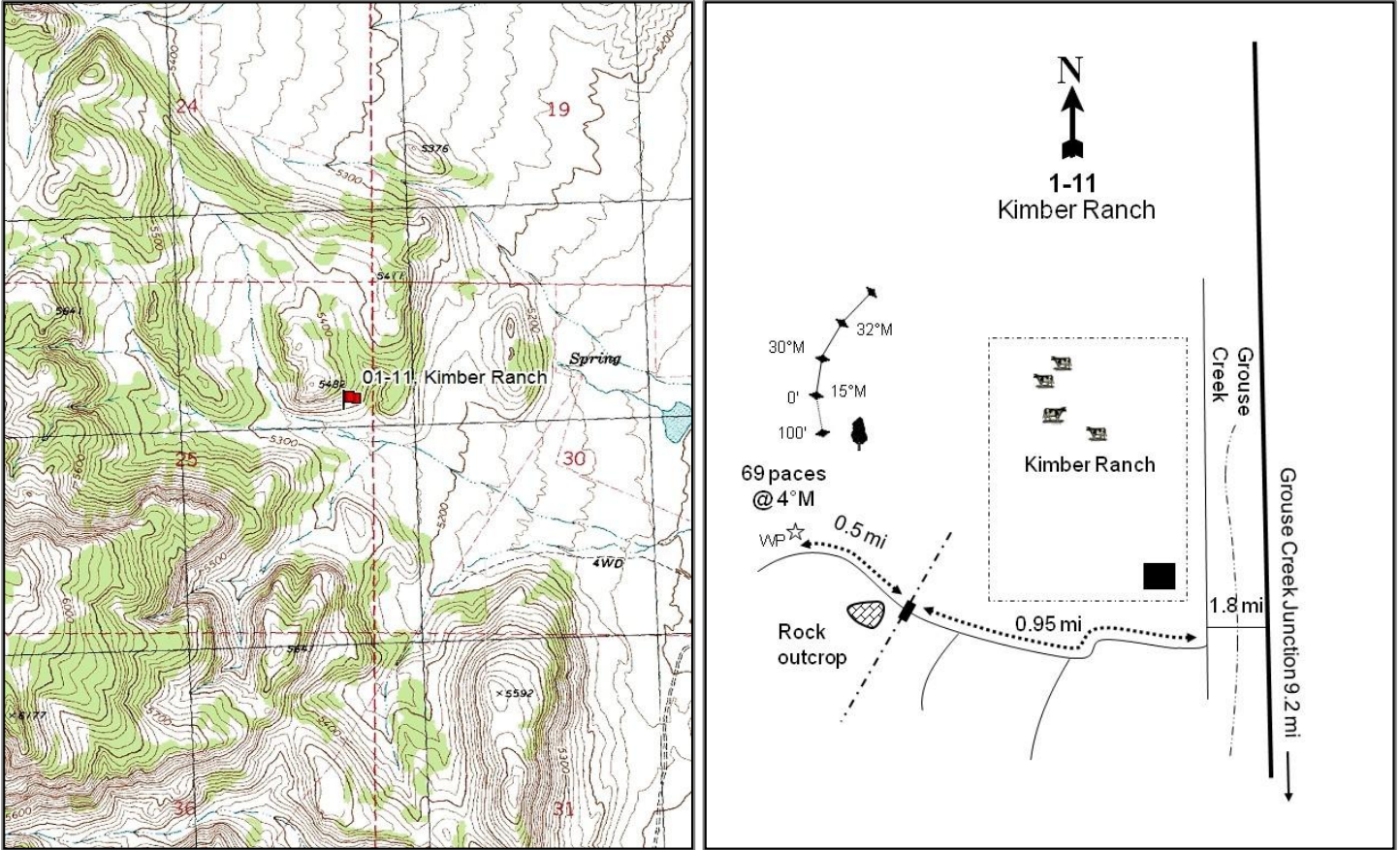
Table 01-10.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

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

Table -01-10.15 - Deer Desirable Components Index: Low 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	7.6	6.2	3.3	-0.2	3.5	0.0	50.4	Good
2001	26.8	8.4	5.1	1.9	-0.4	1.3	0.0	43.2	Fair-Good
2006	29.0	6.3	2.6	2.5	-3.5	3.1	0.0	40.1	Fair
2011	25.4	7.5	7.6	3.8	-0.2	3.2	0.0	47.3	Good
2016	25.2	7.2	6.0	8.0	-0.3	2.6	0.0	48.7	Good

KIMBER RANCH - STUDY NO. 01-11



Location Information

USGS 7.5 min Map Info Toms Cabin Spring SW; Township 10N, Range 19W, Section 25
 GPS (0' Stake) 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 for 0.05 miles. Stay left for another 0.25 miles, then turn right going west for 0.6 miles. Turn right for 0.1 miles to a gate. Continue up the road 0.5 miles to a witness post on the right side of the road. From the witness post walk 69 paces at 4 degrees magnetic to the 100-foot post. 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

Wildlife Habitat and Vegetation History

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

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

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 # 028AY236UT
 States and Transitions A defined state and transition model is available.

Since study establishment in 1984, the site has remained in a stable state with black sagebrush (*Artemisia nova*) being the dominant species (Table 01-11.12). The herbaceous understory has remained un-diversified and sparse (Table 01- 11.10, Table 01-11.11). The invasive annual grass species cheatgrass (*Bromus tectorum*) was sampled in moderate abundance on the site in most sample years (Table 01-11.10). It is predicted the site will remain in this state without a major disturbance, although conifer encroachment is occurring on this site and may pose a risk in the long term.

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

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	130	7	58	3.2	1.5	0.0	0.3
2001	450	101	138	23	11.1	1.1	0.4	0.2
2006	423	109	-	17	10.5	3.7	-	0.1
2011	275	125	212	36	5.0	2.5	1.7	0.4
2016	318	134	122	51	5.4	3.8	0.4	0.4

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	22.5	0.4	19.8	21.3	17.9	31.4
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

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
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)	-	-

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

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Pascopyrum smithii (western wheatgrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia octoflora ^a (sixweeks fescue)
year	Nested Frequency						
1996	26	388	47	-	0	68	27
2001	8	450	22	2	11	64	24
2006	38	423	30	-	-	54	-
2011	41	275	13	-	1	80	3
2016	47	314	31	-	3	72	11
year	Average Cover (%)						
1996	0.3	3.1	0.4	-	0.0	0.7	0.0
2001	0.1	11.0	0.2	0.0	0.1	0.7	0.1
2006	1.1	10.5	0.7	-	-	1.9	-
2011	0.7	5.0	0.1	-	0.0	1.6	0.0
2016	1.5	5.4	0.5	-	0.0	1.8	0.0

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	Agoseris glauca (pale agoseris)	Antennaria (pussytoes)	Astragalus (milkvetch)	Astragalus cibirius (browse milkvetch)	Astragalus iodanthus (Humboldt River milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza hookeri (Hooker's balsamroot)	Castilleja angustifolia (northwestern Indian paintbrush)	Collinsia parviflora ^a (maiden blue eyed Mary)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Cryptantha watsonii ^a (Watson's cryptantha)	Descurainia pinnata ^a (western tansymustard)	Eriastrum sparsiflorum ^a (Great Basin woollystar)	Erigeron aphanactis ^a (rayless shaggy fleabane)	Eriogonum caespitosum (matted buckwheat)	Eriogonum ovalifolium (cushion buckwheat)
year	Nested Frequency																
1996	-	-	-	-	4	25	-	7	-	-	3	-	3	2	-	3	-
2001	-	2	-	-	-	3	1	-	-	1	-	-	12	-	1	-	-
2006	-	-	-	-	-	6	0	1	-	1	2	-	-	-	-	-	3
2011	3	-	7	-	-	12	1	1	11	7	-	-	91	4	5	-	3
2016	-	-	-	3	1	20	1	0	1	7	-	12	12	1	-	-	-
year	Average Cover (%)																
1996	-	-	-	-	0.0	0.1	-	0.0	-	-	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	-	-	-	-	-	0.0
2011	0.0	-	0.1	-	-	0.0	0.0	0.0	0.0	0.2	-	-	0.5	0.0	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	-	-	-

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

FORB SPECIES									
<i>Gilia inconspicua</i> ^a (shy gilia)									
Hymenopappus (hymenopappus)									
<i>Ipomopsis congesta</i> (ballhead ipomopsis)									
<i>Lappula occidentalis</i> ^a (flatspine stickseed)									
<i>Lepidium ramosissimum</i> ^a (manybranched pepperweed)									
<i>Lygodesmia</i> (skeletonplant)									
<i>Mentzelia albicaulis</i> ^a (whitestem blazingstar)									
<i>Orobanche fasciculata</i> (clustered broomrape)									
<i>Phlox longifolia</i> (longleaf phlox)									
year	Nested Frequency								
1996	2	8	-	-	-	3	-	6	6
2001	127	-	-	9	-	-	-	2	14
2006	-	-	-	-	-	-	-	-	4
2011	138	-	-	7	3	-	-	-	5
2016	105	-	2	2	2	-	1	3	21
year	Average Cover (%)								
1996	0.0	0.1	-	-	-	0.0	-	0.0	0.0
2001	0.3	-	-	0.0	-	-	-	0.0	0.0
2006	-	-	-	-	-	-	-	-	0.0
2011	1.1	-	-	0.1	0.0	-	-	-	0.0
2016	0.3	-	0.0	0.0	0.0	-	0.0	0.0	0.1

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									
<i>Artemisia nova</i> ^p (black sagebrush)									
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> ^p (Wyoming big sagebrush)									
<i>Atriplex confertifolia</i> ^p (shadscale saltbush)									
<i>Bassia americana</i> ^p (green molly)									
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>stenophyllus</i> (yellow rabbitbrush)									
<i>Gutierrezia sarothrae</i> (broom snakeweed)									
<i>Juniperus osteosperma</i> ⁱ (Utah juniper)									
<i>Krascheninnikovia lanata</i> ^p (winterfat)									
<i>Opuntia polyacantha</i> (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	-	-
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	0.1	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	-	-

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

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 (%)				
Artemisia nova^p -- (black sagebrush)									
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
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
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
Atriplex confertifolia^p -- (shadscale saltbush)									
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
Bassia americana^p -- (green molly)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
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
Ericameria nauseosa ssp. nauseosa var. hololeuca -- (rubber rabbitbrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	67/130
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	44/68
2016	-	-	-	-	-	-	-	-	55/95
Grayia spinosa -- (spiny hopsage)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	77/114
2011	-	-	-	-	-	-	-	-	45/81
2016	-	-	-	-	-	-	-	-	64/93
Gutierrezia sarothrae -- (broom snakeweed)									
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
Juniperus osteosperma^t -- (Utah juniper)									
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	-/-

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

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 (%)				
Opuntia polyacantha -- (plains pricklypear)									
1996	-	-	-	-	-	-	-	-	-/-
2001	20	-	0	100	0	0	0	0	- / -
2006	-	-	-	-	-	-	-	-	11/4
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	15/21
Tetradymia nuttallii -- (Nuttall's horsebrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	30/50

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

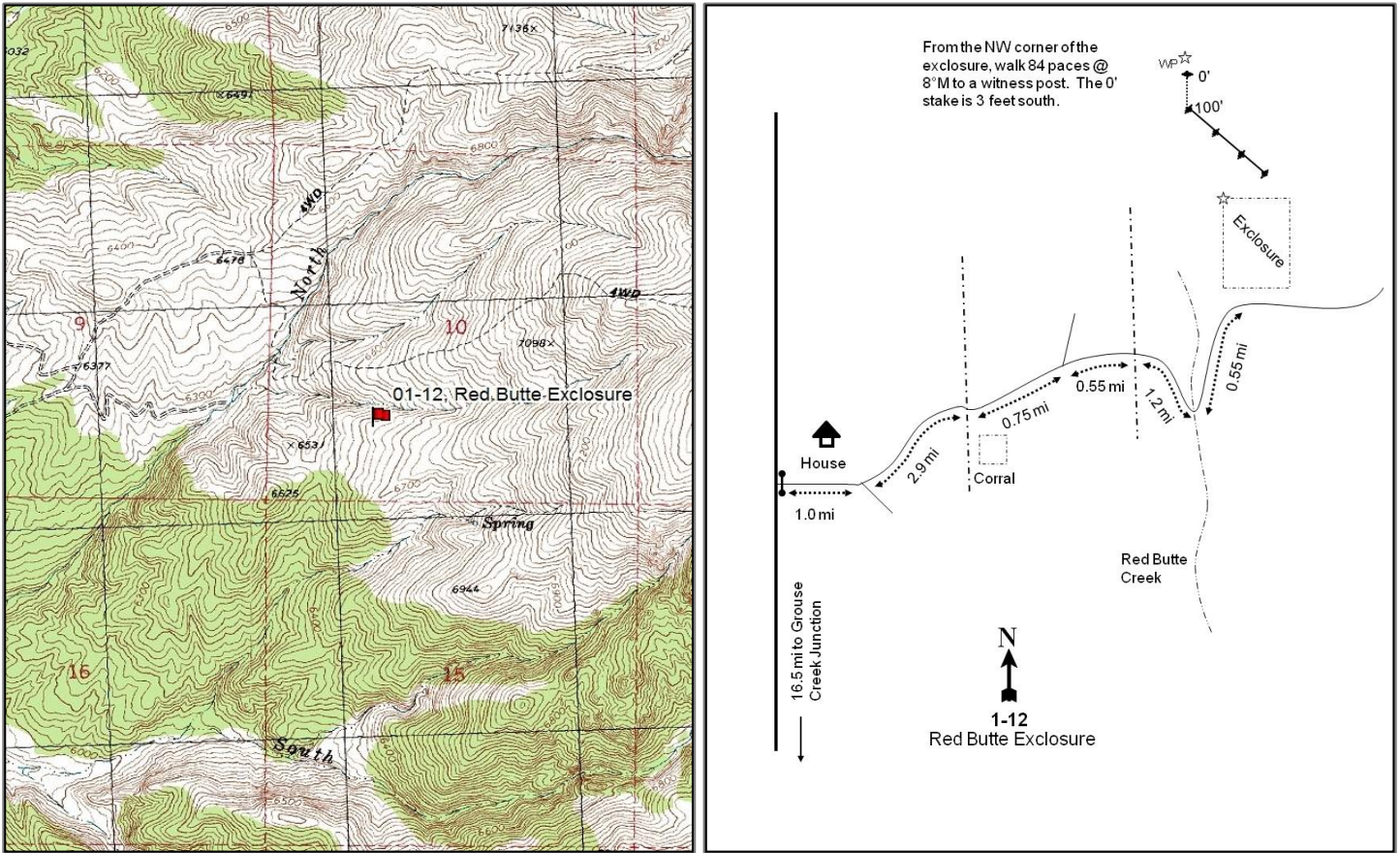
Table 01-11.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1996	53	-	-	-	-	-	10.8
2001	61	-	-	-	-	-	12.7
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: Low 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	20.0	10.3	7.3	3.4	-2.4	0.6	0.0	39.3	Fair
2001	20.2	8.0	8.0	2.5	-8.3	0.3	0.0	30.6	Fair
2006	18.0	5.8	3.9	8.1	-7.9	0.3	0.0	28.2	Fair
2011	17.1	8.9	2.3	5.0	-3.8	0.8	0.0	30.3	Fair
2016	14.8	7.3	1.4	7.6	-4.1	0.8	0.0	27.9	Fair

RED BUTTE EXCLOSURE - STUDY NO. 01-12



Location Information

USGS 7.5 min Map Info Ingham Canyon SE; Township 11N, Range 17W, Section 10
 GPS (0' Stake) NAD 83 UTM ZONE 12, 268107 East 4618628 North

Transect Information

Browse Tag # (0' Stake) 7915
 Transect Bearing 165° magnetic, (Line 2: 91° magnetic)
 Length 400ft
 Belt Placement Line 1 (11ft & 34ft), Line 2 (95ft), Line 3 (59ft), Line 4 (71ft)
 Belt Marker Placement Belt 1-3,5: 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 exclosure. From the northwest corner of the exclosure, 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

Wildlife Habitat and Vegetation History

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

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

Site Notes

No Notes

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 #	025XY312UT
States and Transitions	A defined state and transition model is available.

Since study establishment in 1984, the site has remained in a stable state as a mixed mountain brush plant community type with mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) being the dominant shrub species (Table 01-12.12). The herbaceous understory has remained diverse and abundant over the study years (Table 01-12.10, Table 01-12.11). It is predicted the site will remain in this state unless a major disturbance occurs. There is some conifer encroachment occurring on the site, but appears to be slow (Table 01-12.12, Table 01-12.13).

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	16.6	16.0	-	-	-	-
2001	19.2	17.5	-	-	-	-
2006	17.1	16.9	-	22.4	23.8	-
2011	11.0	13.4	-	17.3	12.3	-
2016	11.1	15.6	-	16.4	20.0	-

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

Table 01-12.8 - 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	6.3	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

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	Elk	Rabbit
	Quadrat Frequency			
1996	4	6	-	-
2001	4	7	-	2
2006	7	11	-	12
2011	6	5	1	1
2016	3	9	1	8
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)	-

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 ^{ai} (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	-
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	-

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	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum ^{ai} (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 ^{ai} (littledod false flax)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium fremontii ^a (Fremont's goosefoot)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)
year	Nested Frequency																
1996	61	22	-	3	10	-	5	29	60	1	-	2	-	-	248	15	1
2001	33	117	-	-	-	-	9	7	48	3	-	-	-	1	277	21	8
2006	146	30	-	3	19	-	6	17	45	3	-	3	-	-	244	34	2
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	5
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	0.0
2001	0.2	0.4	-	-	-	-	0.2	0.1	6.6	0.0	-	-	-	0.0	5.3	0.0	0.2
2006	1.6	0.1	-	0.0	0.1	-	0.0	0.3	8.2	0.0	-	0.0	-	-	0.9	0.1	0.0
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	0.2

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

FORB SPECIES	Cordylanthus ramosus ^a (bushy bird's beak)	Crepis acuminata (tapertip hawkbeard)	Cryptantha ^a (annual cryptantha)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Delphinium nuttallianum (twolobe larkspur)	Descurainia pinnata ^a (western tansymustard)	Eriogonum umbellatum (sulphur-flower buckwheat)	Fritillaria atropurpurea (spotted fritillary)	Galium bifolium ^a (twingleaf bedstraw)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Gilia ^a (gilia)	Hackelia patens (spotted stickseed)	Helianthus multiflorus var. multiflorus (showy goldeneye)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)
year	Nested Frequency																
1996	-	10	-	30	-	-	-	6	-	-	1	-	16	8	3	-	-
2001	4	17	-	-	-	22	2	4	-	-	13	0	1	13	-	-	2
2006	-	16	-	56	-	19	-	4	-	-	9	7	20	-	-	-	3
2011	-	39	36	2	2	59	6	3	-	-	1	-	6	-	-	-	-
2016	-	10	9	11	-	-	2	-	1	2	-	3	14	-	-	11	20
year	Average Cover (%)																
1996	-	0.0	-	0.1	-	-	-	0.2	-	-	0.0	-	0.1	0.0	0.0	-	-
2001	0.1	0.5	-	-	-	0.1	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0
2006	-	0.6	-	0.1	-	0.0	-	0.1	-	-	0.0	0.0	0.6	-	-	-	0.0
2011	-	0.7	1.2	0.0	0.0	0.6	0.0	0.0	-	-	0.0	-	0.3	-	-	-	-
2016	-	0.3	0.0	0.0	-	-	0.0	-	0.0	0.0	-	0.0	0.1	-	-	0.0	0.0

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 ^a (slender phlox)	Nemophila breviflora ^a (basin nemophila)	Orogenia linearifolia (Great Basin Indian potato)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Ranunculus inamoenus (graceful buttercup)	Sedum lanceolatum (spearleaf stonecrop)	Senecio integerrimus ^a (lambstongue ragwort)	Stenotus acaulis (stemless mock goldenweed)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	unknown perennial forb (unknown forb)
year	Nested Frequency																
1996	-	-	3	-	4	-	-	-	94	50	-	6	-	9	-	0	16
2001	-	3	24	1	-	97	-	-	57	-	-	-	-	-	-	3	-
2006	12	-	25	-	-	64	3	-	135	53	-	1	-	2	-	-	-
2011	97	-	27	3	-	11	-	1	42	-	88	-	8	7	-	-	3
2016	-	-	0	-	-	3	-	-	11	3	-	-	-	1	5	-	-
year	Average Cover (%)																
1996	-	-	0.0	-	0.0	-	-	-	0.6	0.1	-	0.0	-	0.0	-	0.0	0.1
2001	-	0.0	0.2	0.0	-	0.7	-	-	0.5	-	-	-	-	-	-	0.0	-
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	-	-	0.0
2016	-	-	0.0	-	-	0.0	-	-	0.0	0.0	-	-	-	0.0	0.1	-	-

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

FORB SPECIES	
Veronica biloba ^{ai} (twolobe speedwell)	
year	Nested Frequency
1996	3
2001	10
2006	48
2011	17
2016	12
year	Average Cover (%)
1996	0.0
2001	0.1
2006	0.5
2011	0.1
2016	0.0

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 ^p (Utah serviceberry)								
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)								
Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)								
Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)								
Eriogonum microthecum ^p (slender buckwheat)								
Opuntia polyacantha (plains pricklypear)								
Purshia tridentata ^p (antelope bitterbrush)								
Symphoricarpos oreophilus (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
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

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

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 (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
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
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Cercocarpus montanus^p -- (alderleaf mountain mahogany)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	76/131
2016	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Eriogonum microthecum^p -- (slender buckwheat)									
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
Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)									
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
Opuntia polyacantha -- (plains pricklypear)									
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
Purshia tridentata^p -- (antelope bitterbrush)									
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
Symphoricarpos oreophilus -- (mountain snowberry)									
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

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

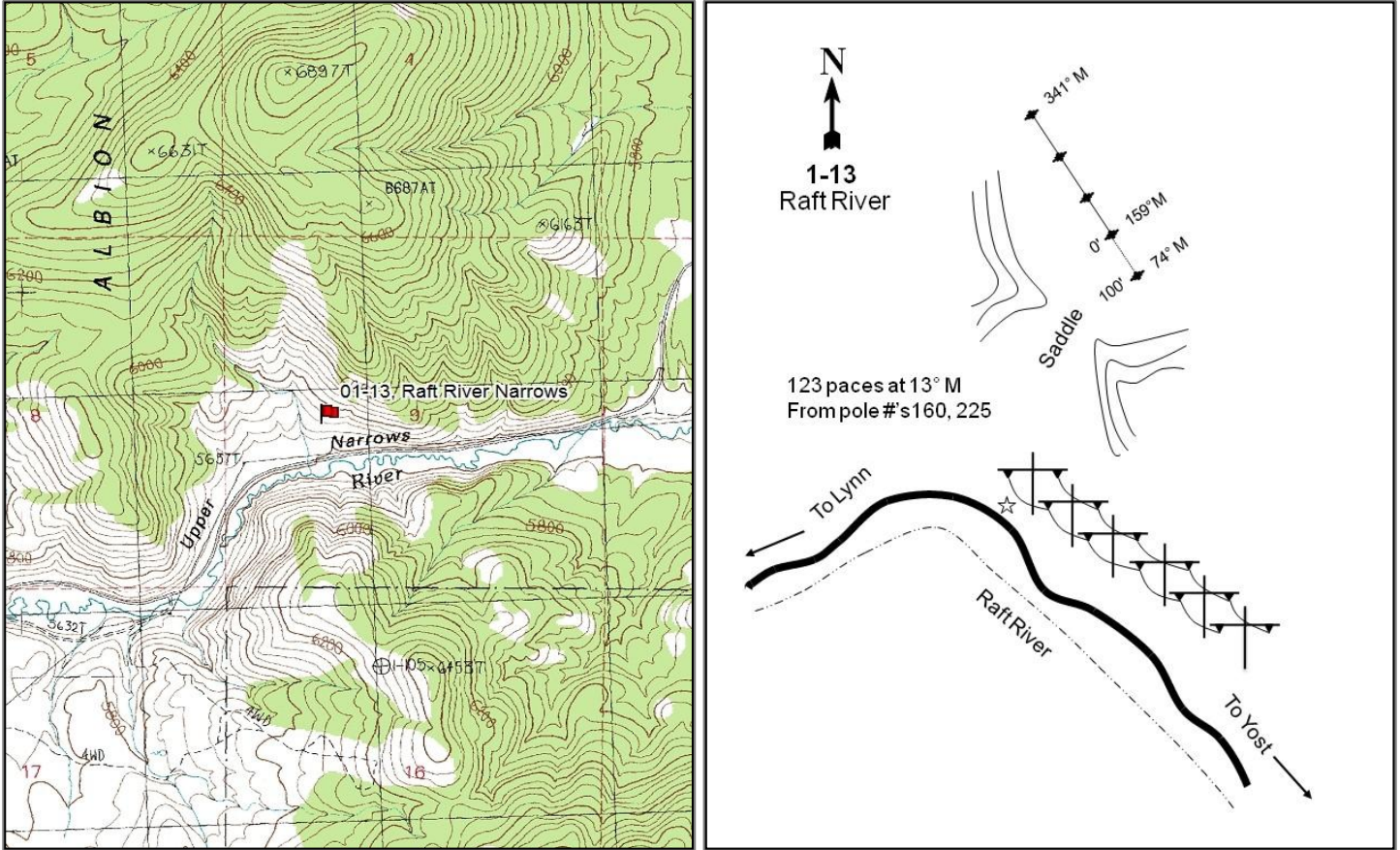
Table 01-12.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

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

Table -01-12.15 - Deer Desirable Components Index: Mid 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	22.6	9.9	5.9	10.9	-11.5	0.0	0.0	37.9	Poor
2001	26.9	5.3	3.3	11.1	-8.1	0.0	0.0	38.4	Poor
2006	23.9	11.2	2.0	9.6	-2.9	0.0	0.0	43.8	Poor
2011	15.0	11.6	7.8	16.3	-2.0	0.0	0.0	48.6	Poor-Fair
2016	14.6	12.2	9.7	3.4	-20.0	10.0	0.0	29.9	Very Poor

RAFT RIVER NARROWS - STUDY NO. 01-13



Location Information

USGS 7.5 min Map Info Buck Hollow NW; Township 14N, Range 16W, Section 09
 GPS (0' Stake) 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, proceed 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 (#'s 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 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

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
Deer	crucial	winter	
Greater Sage Grouse		occupied	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	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

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 #	028AY307UT
States and Transitions	A defined state and transition model is available.

Since study establishment in 1984, the plant community has been in Community Phase 2.2 within the Current Potential State which has consisted of Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) as the dominant browse species (Table 01-13.12) with a diverse, yet sparse herbaceous understory (Table 01-13.7). Cheatgrass (*Bromus tectorum*) has been a major component of the site (Table 01-13.10). Following a fire in 2000, part of the site transitioned to a community dominated by annual grass that is not currently described by the state transition model (Table 01-13.7); however, the site generally has remained in the currently proposed community phase. Cheatgrass has also increased on the site since the fire and is becoming a major site component (Table 01- 13.10). It is predicted that shrub species will continue to reestablish with Wyoming big sagebrush as the major component within the community (USDA- NRCS, 2011).

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	-

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	159	259	41	18.7	3.5	2.4	0.4

Table 01-13.8 - 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	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

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	Elk	Rabbit
	Quadrat Frequency			
1996	-	15	-	4
2001	-	2	-	6
2006	4	19	-	11
2011	3	6	-	9
2016	1	3	-	2
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)	-	-

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

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia octoflora ^a (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	376	19	29	82	38	14
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	18.6	0.4	0.9	0.7	1.0	0.1

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 ^{ai} (desert madwort)	Arabis (rockcress)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus calycosus (Torrey's milkvetch)	Calochortus nuttallii (sego lily)	Camissonia minor ^a (small evening primrose)	Castilleja angustifolia (northwestern Indian paintbrush)	Castilleja linariifolia (Wyoming Indian paintbrush)	Caulanthus crassicaulis ^a (thickstem wild cabbage)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium leptophyllum ^a (narrowleaf goosefoot)	Collinsia parviflora ^a (maiden blue eyed Mary)	Cryptantha (cryptantha)	Cryptantha watsonii ^a (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	-
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	-

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

FORB SPECIES																		
Descurainia pinnata ^a (western tansymustard)																		
Erigeron pumilus (shaggy fleabane)																		
Eriogonum caespitosum (matted buckwheat)																		
Eriogonum ovalifolium (cushion buckwheat)																		
Gayophytum ramosissimum ^a (pinyon groundsmoke)																		
Gilia inconspicua ^a (shy gilia)																		
Lactuca serriola ^{ai} (prickly lettuce)																		
Lappula occidentalis ^{ai} (flatspine stickseed)																		
Machaeranthera canescens (hoary tansyaster)																		
Microsteris gracilis ^a (slender phlox)																		
Mimulus suksdorfii ^a (Suksdorf's monkeyflower)																		
Oenothera caespitosa (tufted evening primrose)																		
Orobanche fasciculata (clustered broomrape)																		
Phlox hoodii (spiny phlox)																		
Phlox longifolia (longleaf phlox)																		
Sisymbrium altissimum ^{ai} (tall tumbledustard)																		
Tragopogon dubius ^{ai} (yellow salsify)																		
year	Nested Frequency																	
1996	23	11	6	-	-	8	1	18	4	-	-	6	-	9	-	-	1	
2001	105	7	-	-	3	115	13	26	-	-	-	-	-	6	-	-	-	
2006	8	4	-	2	-	-	-	30	4	4	-	-	-	-	-	85	0	
2011	83	7	-	-	-	148	4	126	7	13	-	-	-	-	2	186	-	
2016	30	6	-	-	3	128	-	24	-	-	7	-	3	1	4	42	1	
year	Average Cover (%)																	
1996	0.1	0.1	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	-	0.2	-	-	0.0	
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	0.0	
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	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 ^p (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	-
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	-

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

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 (%)				
Artemisia tridentata ssp. wyomingensis^P -- (Wyoming big sagebrush)									
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
Atriplex confertifolia^P -- (shadscale saltbush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
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
Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)									
1996	-	-	-	-	-	-	-	-	92/102
2001	-	-	-	-	-	-	-	-	63/82
2006	-	-	-	-	-	-	-	-	49/67
2011	-	-	-	-	-	-	-	-	64/88
2016	120	-	0	100	0	0	0	0	57/78
Grayia spinosa -- (spiny hopsage)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	134/155
2016	-	-	-	-	-	-	-	-	-/-
Linanthus pungens -- (granite prickly phlox)									
1996	20	-	0	100	0	0	0	0	23/26
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	40	-	0	100	0	0	0	0	54/68
Opuntia polyacantha -- (plains pricklypear)									
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
Sarcobatus vermiculatus -- (greasewood)									
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

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

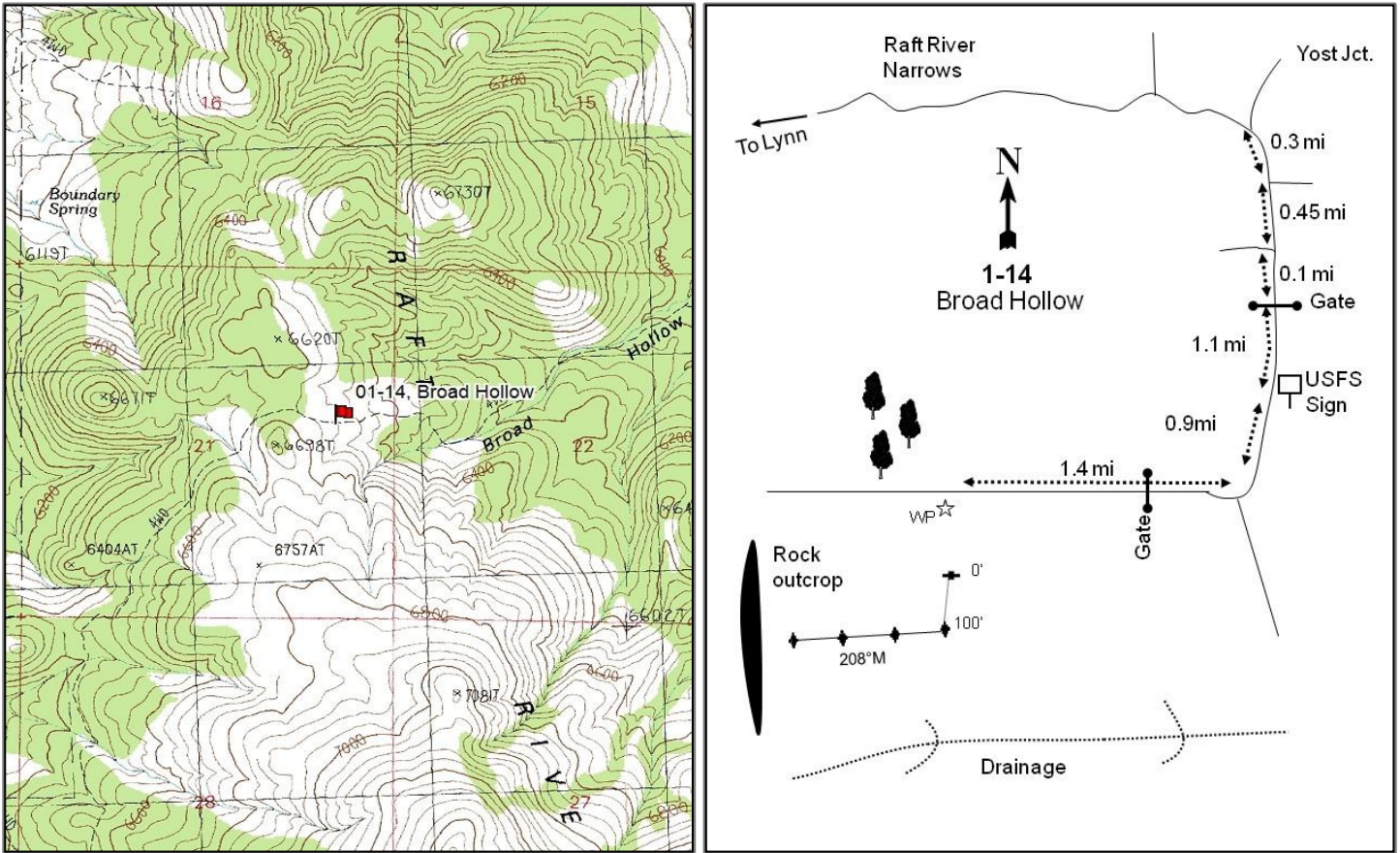
Table 01-13.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2016	14	-	-	-	100	-	15.0
Pinus monophylla (singleleaf pinyon)							
2016	14	-	100	-	-	-	2.0

Table -01-13.15 - Deer Desirable Components Index: Low 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	18.3	13.8	15.0	3.9	-2.7	1.8	0.0	50.1	Poor-Fair
2001	12.2	12.9	15.0	4.0	-9.8	0.3	0.0	34.6	Very Poor-Poor
2006	11.3	9.6	4.0	12.1	-12.5	1.6	0.0	26.2	Very Poor
2011	16.3	13.8	14.0	7.2	-5.6	0.4	0.0	46.1	Poor
2016	17.0	12.0	3.0	7.0	-14.0	0.8	0.0	25.8	Very Poor

BROAD HOLLOW - STUDY NO. 01-14



Location Information

USGS 7.5 min Map Info	Buck Hollow SE; Township 14N, Range 16W, Section 21
GPS (0' Stake)	NAD 83 UTM ZONE 12, 277578 East 4644920 North

Transect Information

Browse Tag # (0' Stake)	7916
Transect Bearing	160° magnetic (Line 2-4: 208° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)
Belt Marker Placement	Standard, Belt 5: 5ft

Directions to Site

From the junction of U-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 and 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 (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 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	Southwest
Slope	12%
Sample Dates	06/12/1996, 06/05/2001, 05/31/2006, 06/01/2011, 06/01/2016

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
Deer	crucial	winter	
Greater Sage Grouse		occupied	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

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 #	025XY312UT
States and Transitions	No state and transition model is available for this ecological site.

Since establishment in 1984, the site has remained a mixed stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), antelope bitterbrush (*Purshia tridentata*), and mountain snowberry (*Symphoricarpos oreophilus*) (Table 01-14.12, Table 01-14.13). Native perennial grasses make up a significant portion of the herbaceous understory; however, the invasive annual grass species cheatgrass (*Bromus tectorum*) has had periodic increases cover and at times dominated the community (Table 01-04.7). Young Utah juniper (*Juniperus osteosperma*) trees have been sparsely scattered across the site, but encroachment appears to be slow. Mountain big sagebrush and bitterbrush has remained the dominant browse species on the site since establishment.

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	15.6	18.4	-	-	-	-
2001	12.9	19.6	-	-	-	-
2006	15.3	22.3	-	16.0	33.2	-
2011	11.8	13.3	-	16.1	18.5	-
2016	14.3	17.2	-	21.4	31.0	-

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	6.4	0.6	4.9
2001	347	332	273	84	6.4	14.8	3.5	5.6
2006	358	292	250	221	6.7	10.8	1.3	8.3
2011	307	272	300	141	3.2	7.8	3.6	3.9
2016	487	205	320	93	37.9	6.8	8.1	4.5

Table 01-14.8 - 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	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

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	Elk	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
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)	-	-

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

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Melica bulbosa (oniongrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia octoflora ^a (sixweeks fescue)
year	Nested Frequency									
1996	15	449	10	150	10	-	2	165	23	4
2001	0	347	-	224	16	3	-	231	16	-
2006	3	358	-	161	10	4	3	192	11	-
2011	2	307	5	121	-	-	3	213	14	-
2016	-	487	3	83	8	8	-	149	9	-
year	Average Cover (%)									
1996	0.5	12.2	0.0	1.8	0.3	-	0.0	3.3	0.5	0.0
2001	0.0	6.4	-	6.0	0.6	0.0	-	8.0	0.2	-
2006	0.0	6.7	-	1.6	0.5	0.0	0.0	8.1	0.5	-
2011	0.0	3.2	0.0	1.4	-	-	0.0	6.0	0.4	-
2016	-	37.9	0.0	1.2	0.2	0.1	-	5.1	0.1	-

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	Agoseris glauca (pale agoseris)	Alyssum desertorum ^{ai} (desert madwort)	Arabis sparsiflora ^a (sicklepod rockcress)	Astragalus beckwithii (Beckwith's milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium leptophyllum ^a (narrowleaf goosefoot)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cryptantha ^a (annual cryptantha)	Cryptantha (cryptantha)	Descurainia pinnata ^a (western tansymustard)	Eriogonum umbellatum (sulphur-flower buckwheat)
year	Nested Frequency																
1996	57	11	29	3	36	-	3	4	-	170	2	6	45	-	61	4	1
2001	10	54	4	-	29	-	3	-	-	250	6	3	42	-	-	9	3
2006	48	22	5	1	35	-	6	2	8	212	-	4	36	-	138	3	4
2011	33	78	5	7	40	3	39	-	7	286	-	7	54	-	4	22	-
2016	13	299	9	-	29	-	-	-	-	38	-	-	33	1	-	17	2
year	Average Cover (%)																
1996	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	0.0
2001	0.0	0.3	0.0	-	4.2	-	0.0	-	-	2.9	0.0	0.0	1.2	-	-	0.2	0.0
2006	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	0.0
2011	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	-
2016	0.1	7.7	0.0	-	3.6	-	-	-	-	0.1	-	-	0.4	0.0	-	0.1	0.0

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

FORB SPECIES																
Galium bifolium ^a (twingleaf bedstraw)																
Gayophytum ramosissimum ^a (pinyon groundsmoke)																
Hackelia patens (spotted stickseed)																
Lactuca serrifolia ^{ai} (prickly lettuce)																
Lappula occidentalis ^{ai} (flatspine stickseed)																
Lathyrus brachycalyx (Bonneville pea)																
Lepidium ^a (pepperweed)																
Lithospermum ruderale (western stoneseed)																
Lomatium triternatum (nineleaf biscuitroot)																
Machaeranthera canescens (hoary tansyaster)																
Microsteris gracilis ^a (slender phlox)																
Navarretia intertexta ^a (needleleaf navarretia)																
Packera multilobata (lobeleaf groundsel)																
Phlox longifolia (longleaf phlox)																
Polygonum douglasii ^a (Douglas' knotweed)																
Tragopogon dubius ^{ai} (yellow salsify)																
year	Nested Frequency															
1996	-	1	15	-	11	-	3	-	-	3	-	-	1	7	5	-
2001	-	4	3	-	29	1	-	-	4	-	9	1	-	3	-	2
2006	6	35	33	-	16	-	-	3	-	2	14	-	-	4	46	-
2011	3	8	19	-	31	-	-	4	2	5	18	-	3	-	-	1
2016	-	2	35	1	26	-	4	-	-	-	5	-	5	4	-	-
year	Average Cover (%)															
1996	-	0.0	0.1	-	0.0	-	0.0	-	-	0.0	-	-	0.1	0.0	0.0	-
2001	-	0.0	0.1	-	0.1	0.0	-	-	0.0	-	0.0	0.0	-	0.0	-	0.0
2006	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	-	-	0.0
2016	-	0.0	0.5	0.0	0.1	-	0.1	-	-	-	0.0	-	0.0	0.0	-	-

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 ^p (Utah serviceberry)										
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)										
Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)										
Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)										
Eriogonum microthecum ^p (slender buckwheat)										
Linanthus pungens (granite prickly phlox)										
Opuntia polyacantha (plains pricklypear)										
Purshia tridentata ^p (antelope bitterbrush)										
Symphoricarpos oreophilus (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	5.4	5.5	-	0.1	7.5	9.2	12.5	-
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	-

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

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 (%)				
Amelanchier utahensis^P -- (Utah serviceberry)									
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
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Eriogonum microthecum^P -- (slender buckwheat)									
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
Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)									
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
Juniperus osteosperma¹ -- (Utah juniper)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	20	-	100	0	0	0	0	0	-/-
2016	20	-	0	100	0	0	0	0	-/-
Linanthus pungens -- (granite prickly phlox)									
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
Opuntia polyacantha -- (plains pricklypear)									
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
Purshia tridentata^P -- (antelope bitterbrush)									
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

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^p -- (currant)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	58/136
Symphoricarpos oreophilus -- (mountain snowberry)									
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
Tetradymia canescens -- (spineless horsebrush)									
1996	-	-	-	-	-	-	-	-	36/92
2001	-	-	-	-	-	-	-	-	42/89
2006	-	-	-	-	-	-	-	-	31/85
2011	-	-	-	-	-	-	-	-	29/59
2016	-	-	-	-	-	-	-	-	43/80

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

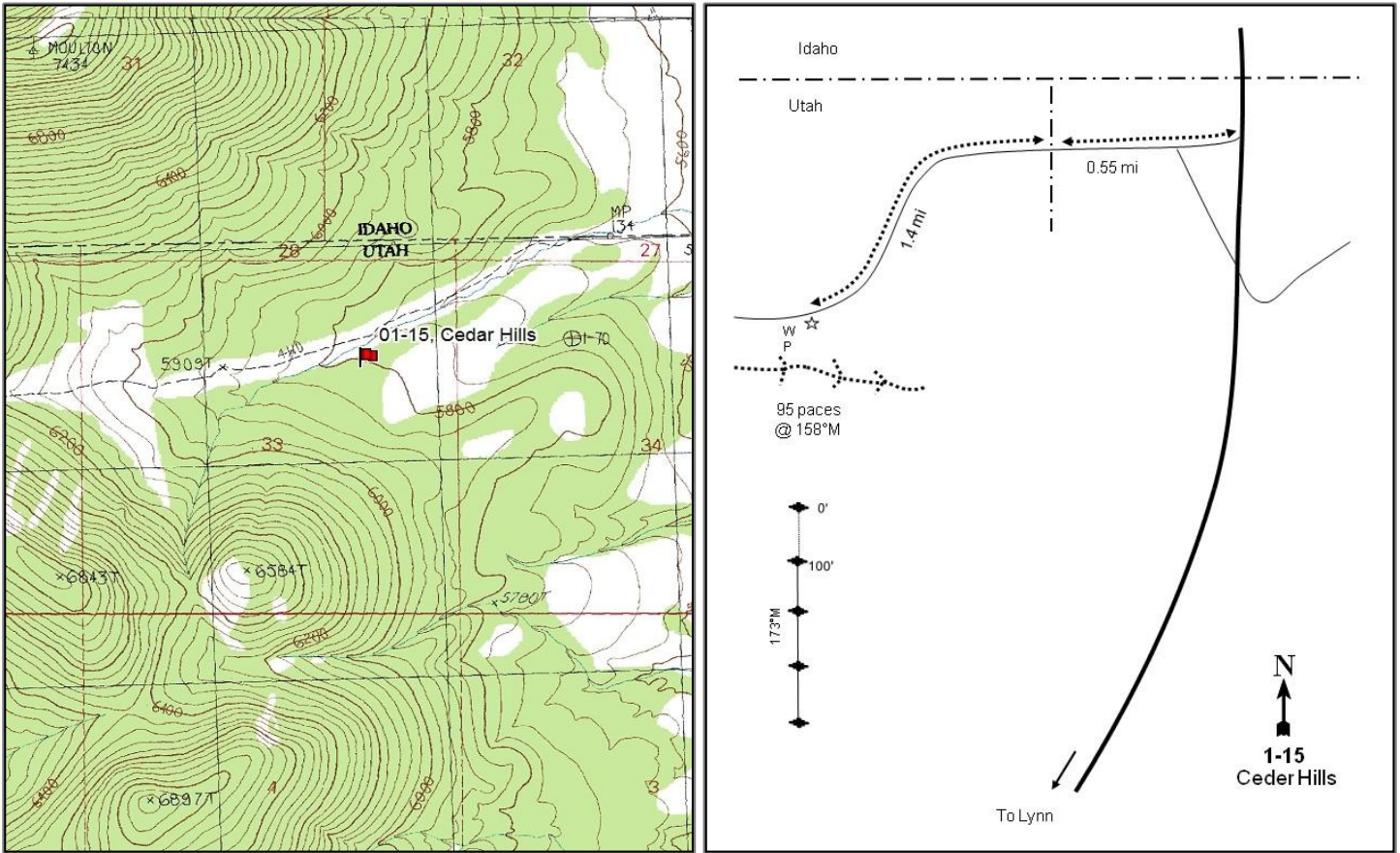
Table 01-14.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

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

Table -01-14.15 - Deer Desirable Components Index: Mid 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	21.2	13.9	7.2	13.0	-9.2	10.0	0.0	56.0	Fair
2001	17.6	12.2	10.0	30.0	-4.8	10.0	0.0	74.9	Good
2006	21.2	9.8	2.9	22.2	-5.0	10.0	0.0	61.0	Fair
2011	16.4	11.6	1.4	15.9	-2.4	7.9	0.0	50.9	Poor-Fair
2016	20.1	12.9	3.4	13.6	-20.0	9.0	0.0	39.1	Poor

CEDAR HILLS - STUDY NO. 01-15



Location Information

USGS 7.5 min Map Info Buck Hollow NE; Township 15N, Range 16W, Section 33
 GPS (0' Stake) NAD 83 UTM ZONE 12, 277610 East 4651637 North

Transect Information

Browse Tag # (0' Stake) 49
 Transect Bearing 173° magnetic
 Length 400ft
 Belt Placement Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
 Belt Marker Placement Standard, 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 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 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

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 Unknown	-	-	Fall 2000	-

Wildlife Habitat and Vegetation History

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

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Greater Sage Grouse		occupied	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

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 #	025XY314UT
States and Transitions	A defined state and transition model is available.

When established in 1990, the site was in the Community Phase 3.1 within the Utah Juniper/Invasive Annuals State (State 3) with Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) encroaching on a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) community type (Table 01-15.12). Following the City of Rocks wildfire and seeding, the community transitioned to community dominated by both native and introduced perennial grasses (Table 01-15.10). The wildfire and subsequent seeding indicate that the community transitioned (T3b) to Community Phase 5.2 within the Seeded Range State (State 5). It is expected that over time and with the proper management, the current community may transition (R5a) to the Current Potential State (State 2).

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	1.1	0.4	11.3	-	-	-
2001	-	0.0	-	-	-	-
2006	1.0	0.5	-	1.1	0.3	-
2011	0.2	1.1	-	1.4	1.4	-
2016	2.5	1.4	-	6.5	3.3	-

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	440	391	176	0.1	27.0	3.2	4.5
2016	52	452	312	154	0.1	39.0	1.7	3.8

Table 01-15.8 - 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	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

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
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)	-

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

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Festuca brevipila ⁱ (hard fescue)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea ⁱ (Russian wildrye)	Pseudoroegneria spicata (bluebunch 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	-	-	4	221	6	57
2016	3	54	9	52	-	382	3	2	5	274	1	38
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	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

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 ^{ai} (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus calycosus (Torrey's milkvetch)	Astragalus cibirius (browse milkvetch)	Astragalus convallianus (lesser rushy milkvetch)	Astragalus purshii (woollypod milkvetch)	Camelina microcarpa ^{ai} (litlepod false flax)	Castilleja angustifolia (northwestern Indian paintbrush)	Caulanthus crassicaulis ^a (thickstem wild cabbage)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium album ^a (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	-
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	-

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

FORB SPECIES	Chenopodium leptophyllum ^a (narrowleaf goosefoot)	Collinsia parviflora ^a (maiden blue eyed Mary)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Descurainia pinnata ^a (western tansymustard)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron (fleabane)	Erigeron pumilus (shaggy fleabane)	Fritillaria atropurpurea (spotted fritillary)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Gilia ^a (gilia)	Hackelia patens (spotted stickseed)	Lactuca scariola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Linum perenne ⁱ (blue flax)	Machaeranthera grindelioides (rayless tansyaster)	Microsteris gracilis ^a (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
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

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 ^{ai} (tall tumbled mustard)	Sphaeralcea grossularifolia (gooseberryleaf globemallow)	Stenotus acaulis (stemless mock goldenweed)	Taraxacum officinale (common dandelion)	Townsendia (Townsend daisy)	Tragopogon dubius ^{ai} (yellow salsify)	Veronica biloba ^{ai} (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
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

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 ^p (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)	Juniperus osteosperma ^t (Utah juniper)	Pinus monophylla ^t (singleleaf pinyon)	Symphoricarpos oreophilus (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	-	-	-
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

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

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 (%)				
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)									
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
Juniperus osteosperma^t -- (Utah juniper)									
1996	900	-	18	80	2	0	0	2	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
Opuntia polyacantha -- (plains pricklypear)									
1996	20	-	0	100	0	0	0	0	11/24
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -

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 (%)				
Pinus monophylla¹ -- (singleleaf pinyon)									
1996		180	56	44	0	0	0	0	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
Symphoricarpos oreophilus -- (mountain snowberry)									
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

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

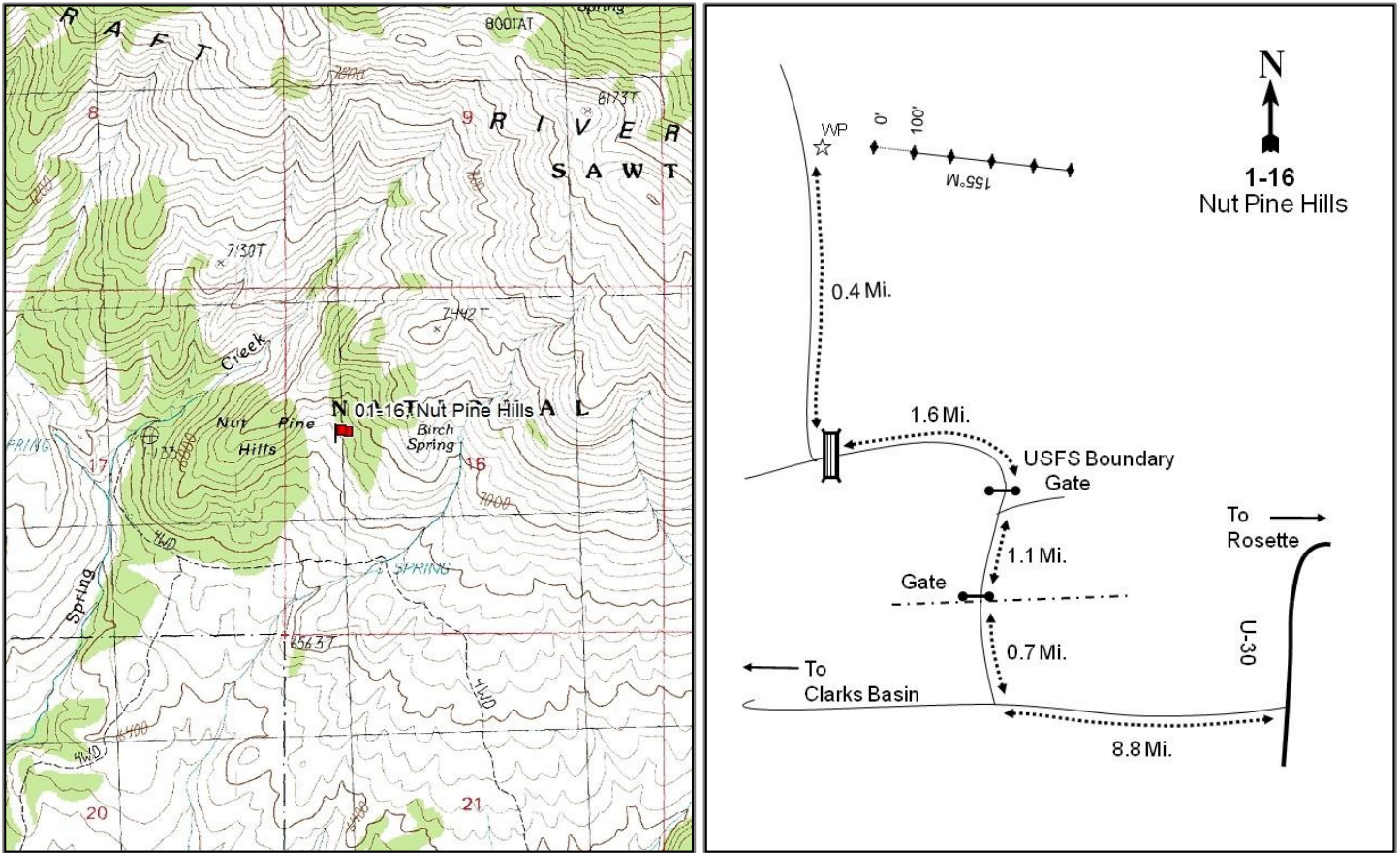
Table 01-15.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

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

Table -01-15.15 - Deer Desirable Components Index: Mid 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	1.3	0.0	0.0	11.0	0.0	10.0	0.0	22.3	Very Poor
2001	0.0	0.0	0.0	8.4	0.0	1.0	0.0	9.4	Very Poor
2006	1.3	0.0	0.0	30.0	-2.5	9.6	0.0	38.3	Poor
2011	0.3	0.0	0.0	30.0	0.0	9.0	0.0	39.3	Poor
2016	3.1	0.0	0.0	30.0	-0.1	7.6	0.0	40.7	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

Not available
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. The zero foot stake is just 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

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

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	summer	
Greater Sage Grouse		occupied	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

Site Notes

Deer were seen bedded near the site in 2016

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 #	025XY312UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1996, the site has remained in a stable state as a mixed mountain brush plant community type with antelope bitterbrush (*Purshia tridentata*) being the dominant shrub species (Table 01-16.12). The herbaceous understory has remained diverse and abundant over the study years (Table 01-16.10, Table 01-16.11). Active conifer encroachment from Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon (*Pinus monophylla*) is occurring and is considered to be in woodland succession phase I. It is predicted that conifer encroachment will continue unless a tree removing disturbance occurs (Table 01-16.)

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	20.2	15.6	0.7	-	-	-
2001	31.0	18.8	0.7	-	-	0.3
2006	26.1	14.9	1.4	33.6	22.4	4.6
2011	23.9	10.0	2.6	32.3	18.4	5.2
2016	30.4	15.7	4.0	36.8	30.1	4.8

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	292	172	298	0.2	5.6	1.0	5.7
2001	11	361	97	205	0.2	14.3	0.8	5.3
2006	2	316	36	251	0.0	6.8	0.1	8.8
2011	-	252	141	212	-	6.4	0.8	4.2
2016	34	296	147	272	0.1	8.1	0.6	7.1

Table 01-16.8 - 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	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

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	Elk	Rabbit
	Quadrat Frequency			
1996	6	22	-	2
2001	2	9	-	3
2006	4	18	-	20
2011	3	18	-	5
2016	1	12	-	14
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)	-	-

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

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

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 ^{ai} (desert madwort)	Antennaria (pussytoes)	Arabis puberula ^a (silver rockress)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus newberryi (Newberry's milkvetch)	Astragalus purshii (woollypod milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)
year	Nested Frequency																
1996	-	68	-	-	5	4	6	3	3	4	-	22	8	131	16	105	31
2001	6	5	-	-	-	3	-	-	-	-	1	8	10	59	22	57	17
2006	-	46	-	4	8	4	-	2	4	-	-	1	13	17	-	58	24
2011	3	62	-	-	-	-	-	2	4	-	4	1	4	120	2	49	23
2016	-	14	3	-	11	-	-	1	7	-	1	7	9	89	3	79	18
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	0.1
2001	0.1	0.0	-	-	-	0.1	-	-	-	-	0.0	0.0	0.2	0.4	0.0	0.6	0.5
2006	-	0.3	-	0.0	0.0	0.0	-	0.0	0.0	-	-	0.0	0.2	0.0	-	1.0	0.6
2011	0.0	0.4	-	-	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.3	0.0	0.2	0.1
2016	-	0.0	0.0	-	0.0	-	-	0.0	0.0	-	0.0	0.0	0.1	0.3	0.0	0.8	0.2

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

FORB SPECIES	Cryptantha (cryptantha)	Cryptantha watsonii ^a (Watson's cryptantha)	Delphinium nuttallianum (twolobe larkspur)	Descurainia pinnata ^a (western tansymustard)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Eriogonum cernuum ^a (nodding buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Galium bifolium ^a (twinleaf bedstraw)	Gilia ^a (gilia)	Hackelia patens (spotted stickseed)	Ipomopsis congesta (ballhead ipomopsis)	Lesquerella (bladderpod)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stoneseed)	Lomatium dissectum (fernleaf biscuitroot)	Microsteris gracilis ^a (slender phlox)
year	Nested Frequency																
1996	22	-	9	16	-	1	10	46	-	-	69	21	5	-	25	21	-
2001	5	-	2	-	-	-	-	27	-	-	15	-	-	-	20	16	26
2006	9	-	-	-	2	-	-	37	-	-	58	20	-	3	21	13	-
2011	-	-	44	2	3	-	-	43	-	-	40	-	3	-	12	20	2
2016	2	5	8	37	-	-	-	39	25	2	85	3	1	5	26	30	19
year	Average Cover (%)																
1996	0.2	-	0.0	0.1	-	0.0	0.0	1.3	-	-	0.9	0.1	0.0	-	0.4	0.4	-
2001	0.0	-	0.0	-	-	-	-	0.9	-	-	0.2	-	-	-	0.7	0.4	0.1
2006	0.0	-	-	-	0.0	-	-	1.3	-	-	2.1	0.2	-	0.0	1.1	0.5	-
2011	-	-	0.2	0.0	0.0	-	-	0.8	-	-	0.5	-	0.0	-	0.2	0.9	0.0
2016	0.0	0.0	0.0	0.1	-	-	-	1.4	0.0	0.0	1.1	0.0	0.0	0.0	0.4	1.4	0.0

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

FORB SPECIES	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Senecio integerrimus ^a (lambstongue ragwort)	Silene menziesii (Menzies' campion)	Stenotus acaulis (stemless mock goldenweed)	Symphotrichum (aster)	Taraxacum officinale (common dandelion)	unknown annual forb ^a (unknown forb)	Veronica biloba ⁱⁱ (twolobe speedwell)	Viola (violet)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency													
1996	59	-	44	86	7	20	-	16	17	5	8	-	21	-
2001	19	-	33	31	2	8	-	12	38	4	-	-	6	2
2006	53	4	33	18	2	9	3	17	12	3	-	-	29	-
2011	11	-	15	15	-	27	-	5	22	9	-	-	37	-
2016	51	2	16	19	-	3	27	12	14	5	-	1	16	2
year	Average Cover (%)													
1996	0.3	-	0.3	0.2	0.0	0.4	-	0.4	0.1	0.0	0.0	-	0.1	-
2001	0.2	-	0.6	0.1	0.0	0.4	-	0.2	0.4	0.0	-	-	0.0	0.0
2006	0.7	0.0	0.4	0.0	0.0	0.1	0.0	0.1	0.0	0.0	-	-	0.2	-
2011	0.1	-	0.2	0.0	-	0.5	-	0.0	0.1	0.1	-	-	0.3	-
2016	0.7	0.0	0.1	0.0	-	0.1	0.3	0.3	0.0	0.0	-	0.0	0.0	0.0

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 ^p (Utah serviceberry)	Artemisia nova ^p (black sagebrush)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Bassia americana ^p (green molly)	Cercocarpus ledifolius var. ledifolius ^p (curl-leaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. lanceolatus (yellow rabbitbrush)	Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)	Eriogonum microthecum ^p (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ⁱ (Utah juniper)	Mahonia repens (creeping barberry)	Opuntia polyacantha (plains pricklypear)	Pinus monophylla ⁱ (singleleaf pinyon)	Purshia tridentata ^p (antelope bitterbrush)	Ribes cereum var. cereum (wax currant)	Rosa woodsii ^p (Woods' rose)	Symphoricarpos oreophilus (mountain snowberry)
year	Line Intercept Cover (%)																
1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2006	6.2	0	9.2	-	-	2.5	0.8	-	-	4.1	-	-	0.5	18.1	-	0.1	18.5
2011	7.4	0.1	7.2	-	-	-	1	-	-	4.5	-	-	0.7	17.5	-	0.1	16.8
2016	6.9	0	6.1	-	-	1.5	1.3	-	-	3.7	0.1	-	1.1	23.7	0.1	0.1	26.6
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	-	-	13.2
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	16.3
2006	5.6	0.1	7.2	-	-	1.8	0.4	0.5	-	1.4	0.2	-	0.0	12.3	-	0.3	12.0
2011	6.2	1.1	5.0	-	-	0.2	0.2	0.1	-	2.6	0.0	0.0	0.0	11.6	-	0.0	9.5
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	14.1

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

SHRUB SPECIES	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)
1996	-
2001	-
2006	0.6
2011	0.6
2016	0.5
year	Quadrat Cover (%)
1996	0.7
2001	0.6
2006	0.5
2011	0.0
2016	0.7

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

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 (%)				
Amelanchier utahensis^P -- (Utah serviceberry)									
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
Artemisia nova^P -- (black sagebrush)									
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
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
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
Bassia americana^P -- (green molly)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	80	-	50	25	25	50	0	0	5/6
Cercocarpus ledifolius var. ledifolius^P -- (curl-leaf mountain mahogany)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	117/116
2016	40	-	100	0	0	0	0	0	158/87
Chrysothamnus viscidiflorus ssp. lanceolatus -- (yellow rabbitbrush)									
1996	1480	80	18	78	4	3	0	1	38/50
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
Eriogonum microthecum^P -- (slender buckwheat)									
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
Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
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

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 (%)				
Juniperus osteosperma¹ -- (Utah juniper)									
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	- / -
Mahonia repens -- (creeping barberry)									
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
Opuntia polyacantha -- (plains pricklypear)									
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
Prunus virginiana^p -- (chokecherry)									
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	-	-	-	-	-	-	-	-	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
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
Ribes cereum var. cereum -- (wax currant)									
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
Rosa woodsii^p -- (Woods' rose)									
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
Symphoricarpos oreophilus -- (mountain snowberry)									
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
Tetradymia canescens -- (spineless horsebrush)									
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

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

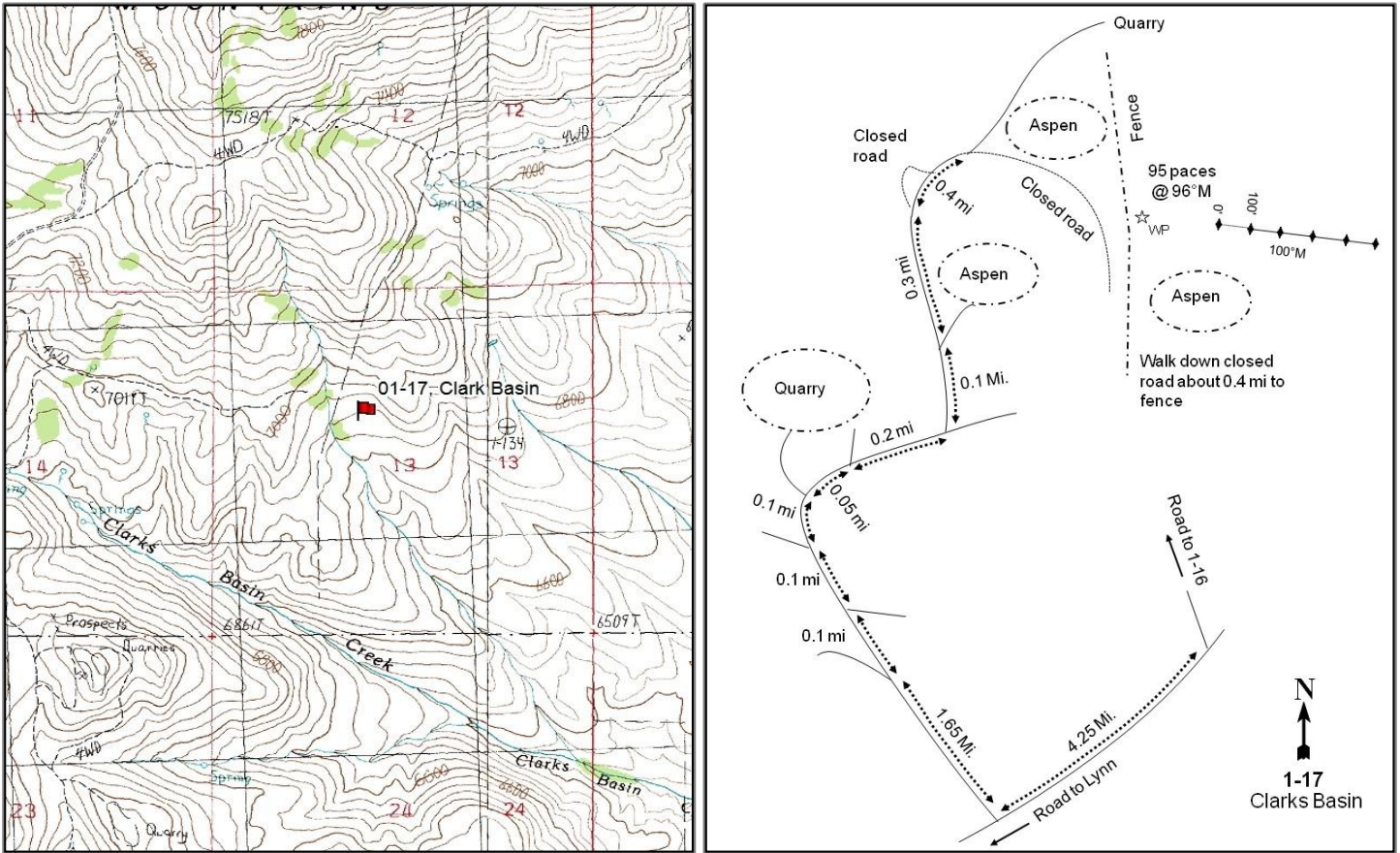
Table 01-16.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
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
Pinus monophylla (singleleaf pinyon)							
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

Table -01-16.15 - Deer Desirable Components Index: Mid 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	29.4	13.7	6.2	11.2	-0.1	10.0	0.0	70.4	Good
2001	30.0	12.3	4.7	29.0	-0.1	10.0	0.0	85.9	Excellent
2006	30.0	11.0	4.9	13.6	0.0	10.0	0.0	69.5	Good
2011	30.0	12.8	4.6	12.8	0.0	9.4	0.0	69.5	Good
2016	30.0	12.8	2.8	16.2	-0.1	10.0	0.0	71.7	Good

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

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

Directions to Site

From U-30, travel up the road towards Lynn to Clark's Basin for 13.05 miles. Take a 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. Take a left turn 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 marked by browse tag #443. The baseline runs 100 degrees magnetic.

Site Information

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

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

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	summer	
Greater Sage Grouse		occupied	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	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	Perennial Grass/Mountain Big Sagebrush	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 #	047XA432UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1996, the site has remained in a stable state as a mixed mountain brush plant community type with mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) being the dominant shrub species (Table 01- 17.12). The herbaceous understory has remained diverse and abundant over the study years (Table 01-17.10, Table 01- 17.11). It is predicted the site will remain in this state unless a major disturbance occurs.

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	23.6	8.3	-	-	-	-
2001	29.5	7.6	-	-	-	-
2006	27.6	9.4	-	38.5	11.3	-
2011	22.1	6.6	-	33.6	12.8	-
2016	25.5	12.4	-	33.6	22.3	-

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	19.6	3.7	11.8
2006	17	362	318	322	0.0	9.5	6.1	10.8
2011	4	348	274	308	0.0	18.1	3.8	6.2
2016	225	409	139	277	13.9	23.4	0.9	7.1

Table 01-17.8 - 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	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	16.3	0.1	44.9	2.5	1.9	52.1
2016	8.4	0.5	44.6	2.2	2.2	67.5

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	Elk	Rabbit
	Quadrat Frequency			
1996	6	4	-	2
2001	2	10	-	1
2006	4	13	1	9
2011	2	8	-	-
2016	6	10	-	24
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)	-	-

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

GRASS SPECIES	Bromus tectorum ^{ai} (cheatgrass)	Carex douglasii (Douglas' sedge)	Carex valliscola (valley sedge)	Elymus lanceolatus (thickspike wheatgrass)	Juncus arcticus (arctic rush)	Koeleria macrantha (prairie Junegrass)	Melica bulbosa (oniongrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency											
1996	17	52	-	279	-	4	4	-	6	49	216	46
2001	25	25	8	299	-	9	5	2	14	159	148	24
2006	17	28	3	233	24	14	17	1	3	150	116	22
2011	4	-	3	202	23	-	-	-	-	172	126	29
2016	225	38	1	277	3	10	9	-	-	248	70	24
year	Average Cover (%)											
1996	0.1	1.1	-	6.0	-	0.1	0.0	-	0.2	1.0	4.5	1.4
2001	0.1	1.0	0.2	7.0	-	0.2	0.1	0.0	0.3	5.8	3.8	1.2
2006	0.0	0.2	0.2	2.7	0.6	0.2	0.2	0.0	0.1	3.5	1.3	0.6
2011	0.0	-	0.1	3.1	0.4	-	-	-	-	6.0	7.4	1.1
2016	13.9	0.5	0.1	9.7	0.0	0.2	0.1	-	-	9.5	2.8	0.6

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	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus cibirius (browse milkvetch)	Astragalus convallianus (lesser rushy milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium (thistle)	Claytonia perfoliata (miner's lettuce)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)
year	Nested Frequency																
1996	62	112	22	-	8	5	1	8	-	-	4	1	-	3	-	287	85
2001	53	48	92	1	-	-	3	18	2	-	-	6	-	11	-	228	24
2006	78	87	79	6	6	3	0	6	8	0	-	-	-	25	-	121	49
2011	55	125	132	10	1	-	-	8	-	-	4	-	-	9	-	206	13
2016	71	8	11	4	1	3	9	1	-	14	-	-	1	13	4	73	3
year	Average Cover (%)																
1996	0.6	0.7	0.1	-	0.0	0.1	0.0	0.4	-	-	0.0	0.0	-	0.1	-	2.3	0.2
2001	0.8	0.4	0.4	0.0	-	-	0.0	0.1	0.1	-	-	0.3	-	0.3	-	2.4	0.1
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	0.1
2011	0.5	1.0	0.6	0.0	0.0	-	-	0.0	-	-	0.0	-	-	0.1	-	1.3	0.0
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	0.0

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

FORB SPECIES	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Crepis intermedia (limestone hawksbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Cynoglossum officinale ^{ani} (gypsyflower)	Delphinium nuttallianum (twolobe larkspur)	Delphinium ×occidentale (null)	Epilobium brachycarpum ^a (tall annual willowherb)	Equisetum (horsetail)	Eriogonum umbellatum (sulphur-flower buckwheat)	Fritillaria atropurpurea (spotted fritillary)	Galium bifolium ^a (twingleaf bedstraw)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Geranium ^a (geranium)	Gilia ^a (gilia)	Hackelia patens (spotted stickseed)
year	Nested Frequency																
1996	15	3	10	7	12	1	7	2	-	4	16	-	-	-	1	-	10
2001	50	8	-	-	-	-	17	1	-	3	12	-	-	23	1	1	2
2006	23	12	-	15	3	-	9	18	122	4	1	-	11	-	2	-	4
2011	18	6	-	3	3	-	71	21	6	-	10	-	29	1	20	-	13
2016	22	7	-	1	-	3	-	-	2	18	1	5	10	-	-	2	18
year	Average Cover (%)																
1996	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	-	0.0	0.1	-	-	-	0.0	-	0.0
2001	0.7	0.1	-	-	-	-	0.1	0.0	-	0.0	0.4	-	-	0.0	0.0	0.0	0.0
2006	0.2	0.6	-	0.0	0.0	-	0.0	0.1	2.2	0.0	0.1	-	0.1	-	0.0	-	0.3
2011	0.0	0.2	-	0.0	0.0	-	0.4	0.1	0.0	-	0.1	-	0.4	0.0	0.2	-	0.2
2016	0.3	0.1	-	0.0	-	0.0	-	-	0.0	0.5	0.0	0.0	0.0	-	-	0.0	0.1

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

FORB SPECIES	Helioteris multiflora var. multiflora (showy goldeneye)	Hydrophyllum capitatum (ballhead waterleaf)	Iva axillaris (povertyweed)	Lappula occidentalis ^a (flatspine stickseed)	Lithophragma parviflorum (smallflower woodland-star)	Lithospermum ruderale (western stoneseed)	Lomatium triternatum (nineleaf biscuitroot)	Lupinus (lupine)	Lupinus argenteus (silvery lupine)	Machaeranthera (tansyaster)	Microsteris gracilis ^a (slender phlox)	Nemophila breviflora ^a (basin nemophila)	Packera multilobata (lobeleaf groundsel)	Penstemon humilis (low beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Ranunculus inamoenus (graceful buttercup)
year	Nested Frequency																
1996	70	-	-	-	-	-	2	-	4	53	-	-	-	7	68	9	-
2001	3	-	-	-	-	-	16	-	6	3	87	-	2	6	75	10	-
2006	-	45	13	-	4	4	-	-	21	-	9	28	-	12	68	110	-
2011	-	57	-	-	4	2	10	7	16	-	35	32	-	25	42	13	9
2016	1	30	34	1	20	2	8	4	21	-	2	10	-	6	6	6	-
year	Average Cover (%)																
1996	0.1	-	-	-	-	-	0.0	-	0.2	0.1	-	-	-	0.0	0.4	0.0	-
2001	0.0	-	-	-	-	-	0.3	-	0.4	0.0	0.2	-	0.0	0.2	0.3	0.0	-
2006	-	0.7	0.5	-	0.0	0.2	-	-	0.6	-	0.0	0.3	-	0.1	0.3	0.3	-
2011	-	0.8	-	-	0.0	0.0	0.0	0.0	0.1	-	0.1	0.4	-	0.4	0.2	0.1	0.1
2016	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	0.0	-

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

FORB SPECIES	Schoenocrambe limifolia (flaxleaf plainsmustard)	Sedum lanceolatum (spearleaf stonecrop)	Senecio integerrimus ^a (lambstongue ragwort)	Symphotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tetranetris acaulis (stemless four-nerve daisy)	Tragopogon dubius ⁱⁱ (yellow salsify)	Trifolium (clover)	unknown annual forb ^a (unknown forb)	unknown perennial forb (unknown forb)	Veronica biloba ⁱⁱ (twolobe speedwell)	Viola (violet)	Wyethia amplexicaulis (mule-ears)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency													
1996	-	-	77	178	30	41	3	-	3	32	3	15	4	14
2001	1	-	40	192	43	35	2	4	-	-	29	6	3	12
2006	-	3	79	166	14	-	-	-	-	-	148	33	1	11
2011	-	-	93	66	4	-	10	-	-	-	47	93	-	14
2016	-	-	44	166	7	-	-	4	-	-	19	27	-	6
year	Average Cover (%)													
1996	-	-	1.2	2.2	0.2	0.4	0.0	-	0.1	0.2	0.0	0.3	0.2	0.1
2001	0.0	-	0.6	5.3	0.2	0.9	0.2	0.0	-	-	0.1	0.0	0.2	0.2
2006	-	0.0	1.7	3.8	0.1	-	-	-	-	-	0.9	0.2	0.0	0.3
2011	-	-	1.1	0.7	0.0	-	0.1	-	-	-	0.2	0.6	-	0.1
2016	-	-	0.6	3.3	0.0	-	-	0.0	-	-	0.0	0.1	-	0.0

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	Amelanchier utahensis ^p (Utah serviceberry)	Artemisia nova ^p (black sagebrush)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. lanceolatus (yellow rabbitbrush)	Ericameria nauseosa (rubber rabbitbrush)	Mahonia repens (creeping barberry)	Purshia tridentata ^p (antelope bitterbrush)	Rosa woodsii ^p (Woods' rose)	Symphoricarpos oreophilus (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)									
1996	-	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-
2006	3.3	4.6	25.1	2	0.2	0.5	5.2	0.3	8.6	-
2011	3.6	3.5	18.6	0.1	-	0.2	7.3	0.6	12.3	0.2
2016	3.8	2.5	20.7	0.3	0.5	1.7	5.5	1.1	19.8	-
year	Quadrat Cover (%)									
1996	1.6	3.4	17.1	1.8	-	0.0	1.1	0.5	6.4	-
2001	2.8	4.1	19.9	1.4	0.0	0.9	1.8	0.9	4.9	0.4
2006	2.7	2.2	20.0	2.7	0.0	1.0	2.1	0.6	5.8	-
2011	3.0	3.0	13.6	0.2	-	0.2	2.1	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	-

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

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 (%)				
Amelanchier utahensis^P -- (Utah serviceberry)									
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
Artemisia nova^P -- (black sagebrush)									
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
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. lanceolatus -- (yellow rabbitbrush)									
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
Eriogonum microthecum^P -- (slender buckwheat)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	15/42
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa -- (rubber rabbitbrush)									
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
Mahonia repens -- (creeping barberry)									
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
Opuntia polyacantha -- (plains pricklypear)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	13/43
2016	-	-	-	-	-	-	-	-	-/-
Purshia tridentata^P -- (antelope bitterbrush)									
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

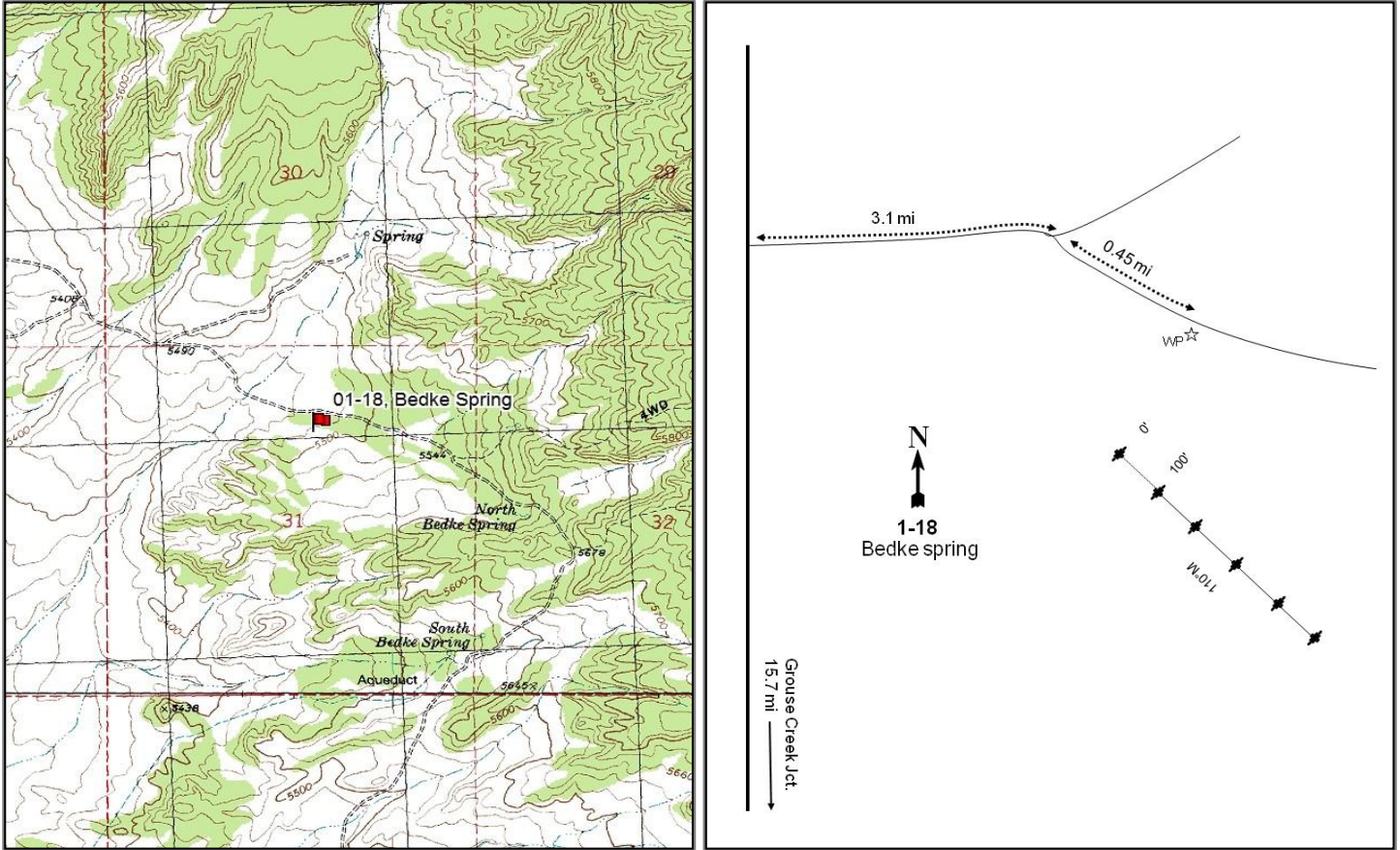
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Ribes cereum -- (wax currant)									
1996	-	-	-	-	-	-	-	-	28/66
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	106/106
2016	20	-	0	100	0	0	0	0	102/113
Rosa woodsii^p -- (Woods' rose)									
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
Symphoricarpos oreophilus -- (mountain snowberry)									
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
Tetradymia canescens -- (spineless horsebrush)									
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

Table -01-17.15 - Deer Desirable Components Index: High 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	13.2	5.2	28.7	0.0	10.0	0.0	87.1	Good
2001	30.0	12.6	5.8	30.0	0.0	10.0	0.0	88.4	Good-Excellent
2006	30.0	10.3	5.6	19.7	0.0	10.0	0.0	75.6	Good
2011	29.1	10.3	4.1	30.0	0.0	10.0	0.0	83.4	Good
2016	30.0	10.5	4.3	30.0	-10.4	10.0	-2.0	72.3	Good

BEDKE SPRING - STUDY NO. 01-18



Location Information

USGS 7.5 min Map Info Ingham Canyon SW; Township 11N, Range 17W, Section 31
 GPS (0' Stake) NAD 83 UTM ZONE 12, 263597 East 4613231 North

Transect Information

Browse Tag # (0' Stake) Not available
 Transect Bearing 110° 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 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 side of the road. The baseline is approximately 300 feet in a southerly direction on a small bench. The baseline runs 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

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
Deer	substantial	winter	
Elk	crucial	year-long	
Greater Sage Grouse		occupied	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/Perennial Grass	No Encroachment

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 #	028AY309UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1996, the site has remained in a stable state as a Wyoming big sagebrush plant (*Artemisia tridentata* ssp. *wyomingensis*) community type (Table 01-18.12) that likely behaves similar to the Upland Loam (Wyoming Big Sagebrush), R025XY314UT ecological site when subjected to disturbances (USDA-NRCS, 2011). The herbaceous understory has remained diverse and abundant over the study years (Table 01-18.10, Table 01-18.11). It is predicted the site will remain in this state unless a major disturbance occurs. There was some conifer encroachment occurring on the site, but a bullhog treatment removed the encroaching trees.

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	8.8	8.1	-	-	-	-
2001	8.1	4.2	-	-	-	-
2006	7.3	3.8	-	9.0	5.2	-
2011	6.9	6.1	-	9.3	5.0	-
2016	5.1	6.8	-	9.0	7.2	-

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

Table 01-18.8 - 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	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

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	Elk	Rabbit
	Quadrat Frequency			
1996	1	6	3	7
2001	3	1	-	2
2006	3	10	-	49
2011	5	1	-	5
2016	1	-	-	45
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)	-

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

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus (wildrye)	Elymus elymoides (squirriltail)	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
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

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 ^{ai} (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus calycosus (Torrey's milkvetch)	Astragalus cibirarius (browse milkvetch)	Astragalus purshii (woollypod milkvetch)	Camelina microcarpa ^{ai} (littlepod false flax)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chorispora tenella ^{ai} (crossflower)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Cordylanthus ramosus ^a (bushy bird's beak)
year	Nested Frequency																
1996	-	1	-	-	5	21	-	35	13	-	2	11	23	-	32	4	2
2001	-	13	-	-	1	43	-	7	5	3	-	196	3	-	10	-	-
2006	3	11	6	12	-	33	-	41	19	66	3	183	7	-	19	-	3
2011	3	15	-	34	2	3	-	41	3	88	-	338	6	4	108	-	-
2016	-	-	28	12	-	8	4	36	10	72	-	1	7	-	10	-	-
year	Average Cover (%)																
1996	-	0.0	-	-	0.0	0.1	-	0.2	0.1	-	0.0	0.0	0.1	-	0.1	0.0	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	-	0.0
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	-	-

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

FORB SPECIES	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Delphinium nuttallianum (twolobe larkspur)	Descurainia pinnata ^a (western tansymustard)	Erigeron (fleafbane)	Erigeron pumilus (shaggy fleabane)	Eriogonum ovalifolium (cushion buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gilia inconspicua ^a (shy gilia)	Hackelia patens (spotted stickseed)	Ionactis alpina (Lava aster)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lathyrus brachycalyx (Bonneville pea)	Lomatium (desertparsley)	Microsteris gracilis ^a (slender phlox)	Penstemon cyananthus (Wasatch beardtongue)
year	Nested Frequency																
1996	-	12	-	11	-	50	1	-	2	-	-	-	22	-	-	-	24
2001	1	-	4	122	6	10	3	1	29	-	-	-	77	1	-	33	-
2006	-	1	3	5	14	5	-	2	3	-	1	-	48	-	0	114	4
2011	4	3	12	46	1	-	2	-	-	5	8	-	12	-	-	5	1
2016	-	1	2	8	-	16	-	-	1	-	9	3	33	-	-	3	-
year	Average Cover (%)																
1996	-	0.1	-	0.0	-	0.3	0.0	-	0.0	-	-	-	0.1	-	-	-	0.3
2001	0.0	-	0.0	0.4	0.2	0.0	0.0	0.0	0.1	-	-	-	0.1	0.0	-	0.1	-
2006	-	0.0	0.0	0.0	0.1	0.0	-	0.0	0.0	-	0.0	-	0.2	-	0.0	0.8	0.0
2011	0.0	0.0	0.1	0.1	0.0	-	0.0	-	-	0.0	0.2	-	0.0	-	-	0.0	0.1
2016	-	0.0	0.0	0.0	-	0.4	-	-	0.0	-	0.1	0.0	0.1	-	-	0.0	-

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

FORB SPECIES	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Tragopogon dubius ^{ai} (yellow safsify)	unknown annual forb ^a (unknown forb)	unknown perennial forb (unknown forb)	Veronica biloba ^{ai} (twolobe speedwell)
year	Nested Frequency					
1996	240	67	-	4	-	-
2001	240	52	-	-	4	-
2006	217	32	1	-	-	3
2011	204	29	-	-	-	15
2016	164	8	6	-	-	-
year	Average Cover (%)					
1996	6.6	0.3	-	0.0	-	-
2001	8.2	0.5	-	-	0.0	-
2006	6.4	0.3	0.0	-	-	0.0
2011	5.4	0.4	-	-	-	0.0
2016	4.6	0.0	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	Line Intercept Cover (%)							
	Artemisia nova ^p (black sagebrush)	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Atriplex confertifolia ^p (shadscale saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)	Grayia spinosa (spiny hopsage)	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
year	Quadrat Cover (%)							
1996	0.8	7.8	0.3	7.3	-	0.3	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	2.1	4.0	0.1	0.9	-	1.2
2016	0.1	3.4	1.6	3.6	1.5	-	0.2	1.4

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

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 (%)				
Artemisia nova^p -- (black sagebrush)									
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
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
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
Atriplex confertifolia^p -- (shadscale saltbush)									
1996	1160	200	76	24	0	2	0	0	20/23
2001	2020	20	39	59	2	0	0	0	20/40
2006	1620	-	9	79	12	0	0	10	32/57
2011	780	-	10	64	26	0	0	28	35/52
2016	940	-	11	77	13	0	0	15	34/45
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
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

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 (%)				
Eriogonum microthecum^p -- (slender buckwheat)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	20/26
Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)									
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
Grayia spinosa -- (spiny hopsage)									
1996	-	-	-	-	-	-	-	-	45/101
2001	20	-	100	0	0	0	0	0	39/65
2006	-	-	-	-	-	-	-	-	42/101
2011	40	-	0	100	0	0	0	0	24/37
2016	-	-	-	-	-	-	-	-	65/68
Opuntia polyacantha -- (plains pricklypear)									
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
Sarcobatus vermiculatus -- (greasewood)									
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

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

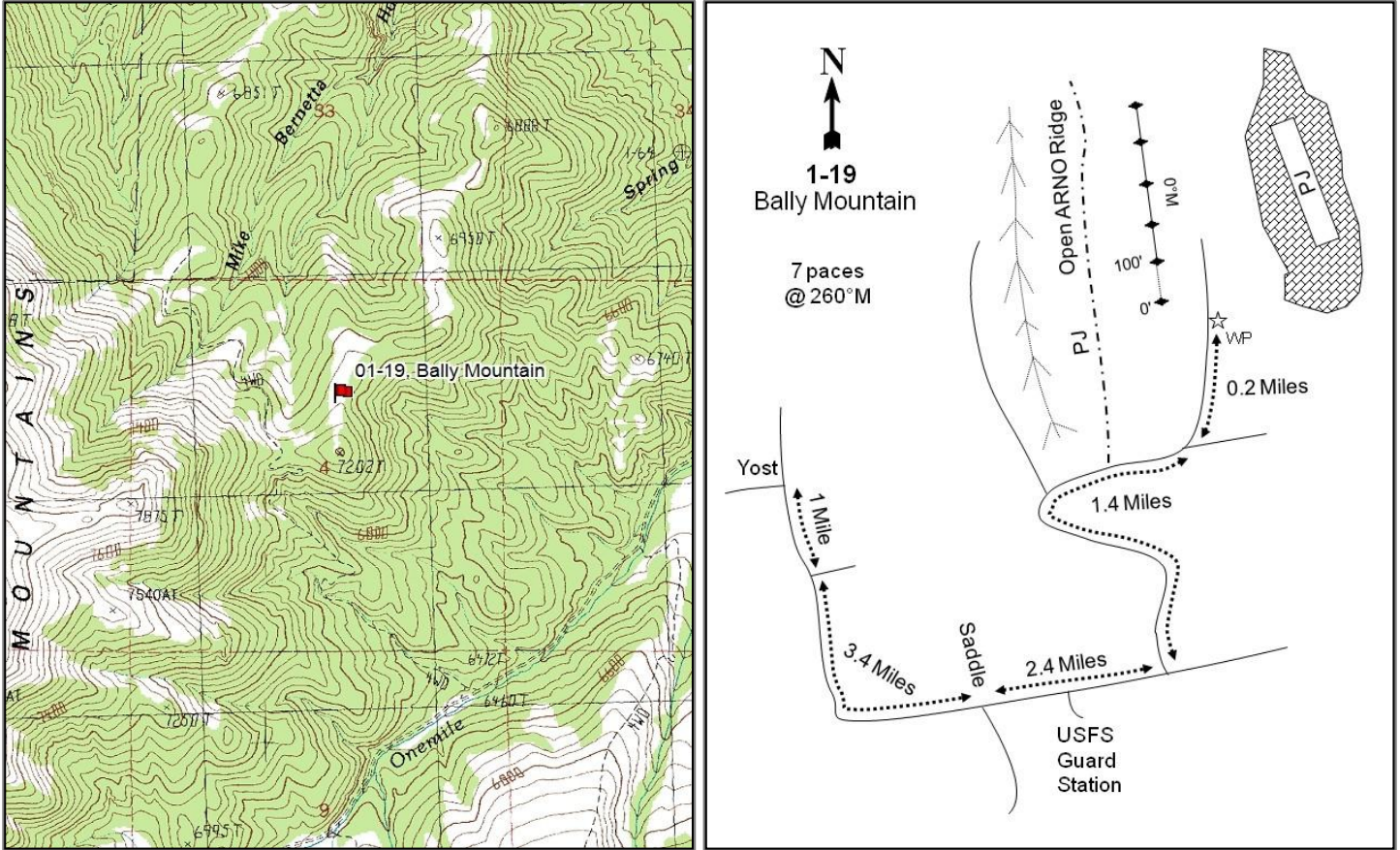
Table 01-18.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution				Average Diameter (cm)	
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'		>12' (%)
Juniperus osteosperma (Utah juniper)							
2016	3	-	100	-	-	-	4.5

Table -01-18.15 - Deer Desirable Components Index: Mid 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	11.0	6.9	4.0	11.0	-0.2	10.0	0.0	42.7	Poor
2001	9.9	6.0	10.1	13.1	-2.6	10.0	0.0	46.5	Poor
2006	8.6	5.6	4.2	17.1	-5.4	10.0	0.0	40.1	Poor
2011	8.1	8.2	3.2	23.2	-3.2	10.0	0.0	49.4	Poor-Fair
2016	6.0	8.6	5.7	22.2	-12.6	10.0	0.0	39.9	Poor

BALLY MOUNTAIN - STUDY No. 01-19



Location Information

USGS 7.5 min Map Info Standrod NW; Township 14N, Range 14W, Section 04
 GPS (0' Stake) NAD 83 UTM ZONE 12, 296543 East 4649612 North

Transect Information

Browse Tag # (0' Stake) 135
 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 the yield sign east of the town of Yost, travel south and then west towards Bally Mountain for 1.0 miles. Stay right and continue for 3.4 miles. Stay left and travel 2.4 miles. Take a left for 1.4 miles then go right for 0.2 miles to the witness post. From the witness post to the 0 foot stake, walk 7 paces at 260 degrees magnetic. The baseline runs 0 degrees magnetic. The 0 foot stake is marked with browse tag #135.

Site Information

Land Ownership Federal
 Land Administrator USFS
 Allotment No data
 Elevation 7,040ft (2,146m)
 Aspect Southwest
 Slope 15%
 Sample Dates 06/13/1996, 05/30/2001, 06/05/2006, 06/02/2011, 06/06/2016

Table 01-19.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Prescribed Fire	Bally Mountain Prescribed Fire	-	Fall 2003	-

Wildlife Habitat and Vegetation History

Table 01-19.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	substantial	winter	
Elk	substantial	winter	
Greater Sage Grouse		occupied	brood-rearing

Table 01-19.4 - 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/Perennial Grass	Phase I
2001	Black Sagebrush/Perennial Grass	Phase I
2006	Perennial Grass	Phase I
2011	Perennial Grass	Phase I
2016	Perennial Grass	Phase I

Site Notes

No Notes

Soils

Table 01-19.5 - 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	7.8	26.7	42.0	31.3	5.0	6.0	297.6	0.7	06/13/1996

Site Potential

1981-2010 Average Annual Precipitation 24 inches
 NRCS Ecological Site Mountain Shallow Gravelly Ridge (Black Sagebrush)
 NRCS Ecological Site # 025XY415UT
 States and Transitions No state and transition model is available for this ecological site.

When the site was established in 1996, the plant community was dominated by black sagebrush (*Artemisia nova*) and a mixture of perennial grasses. A prescribed burn in 2003 reduced the cover of black sagebrush, transitioning the community type to one that is dominated by perennial grass, but black sagebrush has remained prominent site component (Table 01-19.12, Table 01-19.13). Since the fire the herbaceous understory has remained diverse with perennial grasses as the main component with bluebunch wheatgrass (*Pseudoroegneria spicata*) as the dominant species (Table 01-19.7, Table 01-19.10).

Trend Summary Tables

Table 01-19.6 - 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	14.3	4.1	-	-	-	-
2001	17.7	2.5	-	-	-	-
2006	2.3	0.8	-	2.7	0.6	-
2011	1.6	1.3	-	5.3	1.7	-
2016	3.3	14.4	-	5.6	14.6	-

Table 01-19.7 - 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	3	394	292	355	0.0	12.3	2.3	12.1
2001	8	419	303	285	0.0	23.2	2.8	7.3
2006	3	417	195	316	0.0	39.3	1.1	9.5
2011	-	403	258	339	-	20.0	2.2	6.8
2016	47	404	324	377	0.8	22.4	2.2	13.1

Table 01-19.8 - 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	5.2	2.9	28.9	11.3	6.5	44.1
2001	9.2	2.7	23.2	11.4	1.5	62.6
2006	19.4	1.0	18.5	17.0	5.1	49.8
2011	18.6	1.7	17.3	18.0	4.8	37.3
2016	12.2	1.0	24.9	14.2	5.2	57.0

Table 01-19.9 - 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	Rabbit
	Quadrat Frequency		
1996	3	13	2
2001	2	2	1
2006	-	3	4
2011	15	1	-
2016	9	-	4
Days Use Per Acre (ha)			
1996	-	-	-
2001	10.2 (25.1)	6.0 (14.9)	-
2006	-	4.7 (11.6)	-
2011	29.8 (73.5)	1.3 (3.3)	-
2016	18.1 (44.8)	-	-

Table 01-19.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Festuca idahoensis (Idaho fescue)	Koeleria macrantha (prairie Junegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency							
1996	14	3	2	-	-	64	301	334
2001	-	8	-	-	-	100	259	367
2006	3	3	-	6	-	188	277	359
2011	-	-	-	7	2	190	240	319
2016	-	47	-	30	51	145	240	339
year	Average Cover (%)							
1996	0.3	0.0	0.0	-	-	1.1	4.6	6.3
2001	-	0.0	-	-	-	2.2	4.7	16.3
2006	0.0	0.0	-	0.2	-	8.0	5.6	25.5
2011	-	-	-	0.2	0.1	4.7	5.4	9.7
2016	-	0.8	-	0.4	2.1	3.6	4.3	12.1

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

Table 01-19.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Alyssum desertorum ^{ai} (desert madwort)	Antennaria microphylla (littleaf pussytoes)	Arabis puberula ^a (silver rockress)	Arenaria fendleri (Fendler's sandwort)	Astragalus calycosus (Torrey's milkvetch)	Astragalus purshii (woollypod milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littlerpod false flax)	Castilleja angustifolia (northwestern Indian paintbrush)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chenopodium fremontii ^a (Fremont's goosefoot)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)
year	Nested Frequency																
1996	4	2	-	6	37	160	117	-	-	-	11	36	13	-	3	275	2
2001	4	8	-	10	10	84	51	-	-	-	17	55	19	3	4	293	6
2006	7	3	1	12	10	161	84	-	5	-	5	-	71	10	6	117	3
2011	9	6	-	50	30	54	24	-	6	-	12	1	175	-	4	149	4
2016	18	4	98	47	32	150	124	1	21	74	15	-	244	-	2	94	23
year	Average Cover (%)																
1996	0.0	0.0	-	0.1	0.1	1.0	1.5	-	-	-	0.0	0.2	0.2	-	0.0	1.8	0.0
2001	0.2	0.0	-	0.1	0.0	0.4	0.3	-	-	-	0.3	0.5	0.2	0.0	0.0	2.6	0.0
2006	0.1	0.0	0.0	0.3	0.1	2.2	0.3	-	0.0	-	0.0	-	0.3	0.0	0.2	0.2	0.0
2011	0.0	0.0	-	0.5	0.1	0.2	0.1	-	0.0	-	0.1	0.0	1.4	-	0.0	0.4	0.0
2016	0.1	0.0	0.3	0.9	0.1	0.8	1.9	0.0	0.1	0.2	0.3	-	1.0	-	0.0	0.2	0.1

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

FORB SPECIES	Cordylanthus ramosus ^a (bushy bird's beak)	Crepis intermedia (limestone hawkbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Erigeron pumilus (shaggy fleabane)	Hackelia patens (spotted stickseed)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lesquerella (bladderpod)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stone seed)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis ^a (slender phlox)	Packera multilobata (lobeleaf groundsel)	
year	Nested Frequency																	
1996	7	2	21	4	-	-	54	-	-	30	4	55	-	5	4	-	48	
2001	-	-	-	-	-	-	24	-	-	1	11	6	-	7	-	4	25	
2006	-	-	2	7	1	1	14	-	27	76	1	46	1	-	1	6	38	
2011	-	7	4	11	5	-	29	5	1	14	13	92	2	1	-	29	69	
2016	5	-	17	1	4	9	57	14	7	97	1	68	-	12	-	16	63	
year	Average Cover (%)																	
1996	0.0	0.0	0.1	0.0	-	-	0.3	-	-	0.2	0.0	0.3	-	0.0	0.0	-	0.3	
2001	-	-	-	-	-	-	0.1	-	-	0.0	0.0	0.0	-	0.0	-	0.0	0.1	
2006	-	-	0.0	0.1	0.0	0.0	0.3	-	0.1	0.3	0.0	0.5	0.0	-	0.0	0.0	0.5	
2011	-	0.0	0.0	0.0	0.0	-	0.1	0.1	0.0	0.1	0.1	1.0	0.0	0.0	-	0.1	0.4	
2016	0.0	-	0.1	0.0	0.0	0.0	0.4	0.1	0.0	0.2	0.0	0.3	-	0.0	-	0.0	0.3	

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

FORB SPECIES	Penstemon (beardtongue)	Penstemon comarthenus (dusty beardtongue)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Sanguisorba minor ⁱ (small burnet)	Stenotus acaulis (stemless mock goldenweed)	Symphotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow safsify)	Viola (violet)
year	Nested Frequency									
1996	2	-	238	-	-	88	24	92	18	-
2001	-	-	183	6	-	50	6	69	6	3
2006	-	-	149	11	-	33	6	119	3	3
2011	-	-	175	17	4	35	18	66	18	1
2016	-	4	229	3	-	44	-	120	23	-
year	Average Cover (%)									
1996	0.0	-	5.1	-	-	2.6	0.1	0.5	0.1	-
2001	-	-	3.7	0.0	-	0.8	0.2	0.6	0.0	0.0
2006	-	-	2.5	0.1	-	0.8	0.4	1.2	0.0	0.0
2011	-	-	3.3	0.1	0.0	0.3	0.2	0.3	0.1	0.0
2016	-	0.2	5.4	0.0	-	1.2	-	1.0	0.1	-

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

Table 01-19.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)								
	year								
Artemisia nova ^p (black sagebrush)	1996	-	-	-	-	-	-	-	-
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	2001	-	-	-	-	-	-	-	-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	2006	2.2	0.4	-	0.5	0.1	0.1	-	-
Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)	2011	3.9	1.4	0.2	1.4	-	-	-	0.1
Eriogonum microthecum ^p (slender buckwheat)	2016	4.4	0.7	-	3.8	0.5	10.6	-	0.2
Gutierrezia sarothrae (broom snakeweed)	year	Quadrat Cover (%)							
Pediocactus simpsonii (mountain ball cactus)	1996	14.3	-	-	0.8	0.0	3.2	0.0	-
Tetradymia canescens (spineless horsebrush)	2001	17.6	-	-	1.2	0.0	1.3	-	-
	2006	2.3	0.0	0.0	0.5	0.0	0.3	-	-
	2011	1.6	0.0	0.5	0.7	0.0	0.1	-	0.0
	2016	3.2	0.0	1.2	3.8	0.1	9.4	-	0.0

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

Table 01-19.13 - 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 (%)				
Artemisia nova^p -- (black sagebrush)									
1996	26540	380	19	77	4	76	3	1	14/38
2001	24880	180	7	86	7	3	0	1	14/31
2006	2920	-	6	88	6	34	5	1	14/29
2011	1660	20	27	40	34	52	0	28	16/38
2016	5580	400	52	47	1	9	0	3	13/37
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1996	20	-	100	0	0	0	0	0	20/47
2001	40	-	0	100	0	0	0	0	22/48
2006	20	-	0	100	0	0	100	0	59/110
2011	40	-	0	100	0	100	0	0	66/94
2016	-	-	-	-	-	-	-	-	59/121
Cercocarpus ledifolius var. ledifolius^p -- (curl-leaf mountain mahogany)									
1996	20	-	100	0	0	0	100	0	- / -
2001	20	-	100	0	0	100	0	0	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1996	20	-	0	100	0	0	0	0	17/26
2001	20	20	0	0	100	0	0	0	- / -
2006	60	-	0	100	0	0	0	0	17/24
2011	380	40	42	47	11	5	0	16	11/11
2016	1260	-	29	70	2	3	0	2	25/41

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 (%)				
Eriogonum microthecum^p -- (slender buckwheat)									
1996		-	32	68	0	20	0	0	12/21
2001	980	-	20	80	0	0	0	0	13/18
2006	240	-	25	75	0	0	0	0	11/16
2011	260	-	0	85	15	31	0	62	9/18
2016	460	120	13	87	0	4	4	0	15/27
Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)									
1996	620	-	23	61	16	32	13	7	43/58
2001	720	-	33	28	39	0	0	19	38/52
2006	220	-	9	91	0	18	0	0	38/51
2011	360	-	11	72	17	11	6	6	49/61
2016	2280	20	24	74	3	7	0	10	44/61
Gutierrezia sarothrae -- (broom snakeweed)									
1996	19520	1160	28	70	2	0	0	1	8/11
2001	11080	340	12	85	3	0	0	2	6/12
2006	380	100	0	90	11	0	0	11	12/20
2011	460	80	22	61	17	0	17	0	6/15
2016	24160	760	36	64	0	0	0	0	12/22
Pediocactus simpsonii -- (mountain ball cactus)									
1996	80	-	0	100	0	0	0	0	2/5
2001	-	-	-	-	-	-	-	-	-/-
2006	40	-	0	100	0	0	0	0	2/4
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	1/4
Pinus monophylla^t -- (singleleaf pinyon)									
1996	40	20	100	0	0	0	0	0	-/-
2001	20	40	100	0	0	0	0	0	-/-
2006	20	-	100	0	0	0	0	0	-/-
2011	20	-	100	0	0	0	0	0	-/-
2016	20	-	100	0	0	0	0	0	-/-
Symphoricarpos oreophilus -- (mountain snowberry)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	42/83
2011	-	-	-	-	-	-	-	-	59/78
2016	-	-	-	-	-	-	-	-	32/80
Tetradymia canescens -- (spineless horsebrush)									
1996	20	-	0	100	0	0	0	0	28/42
2001	20	-	0	100	0	0	0	0	36/51
2006	60	-	67	33	0	0	0	0	20/23
2011	40	-	0	100	0	50	0	0	19/40
2016	20	-	0	100	0	0	0	0	28/52

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

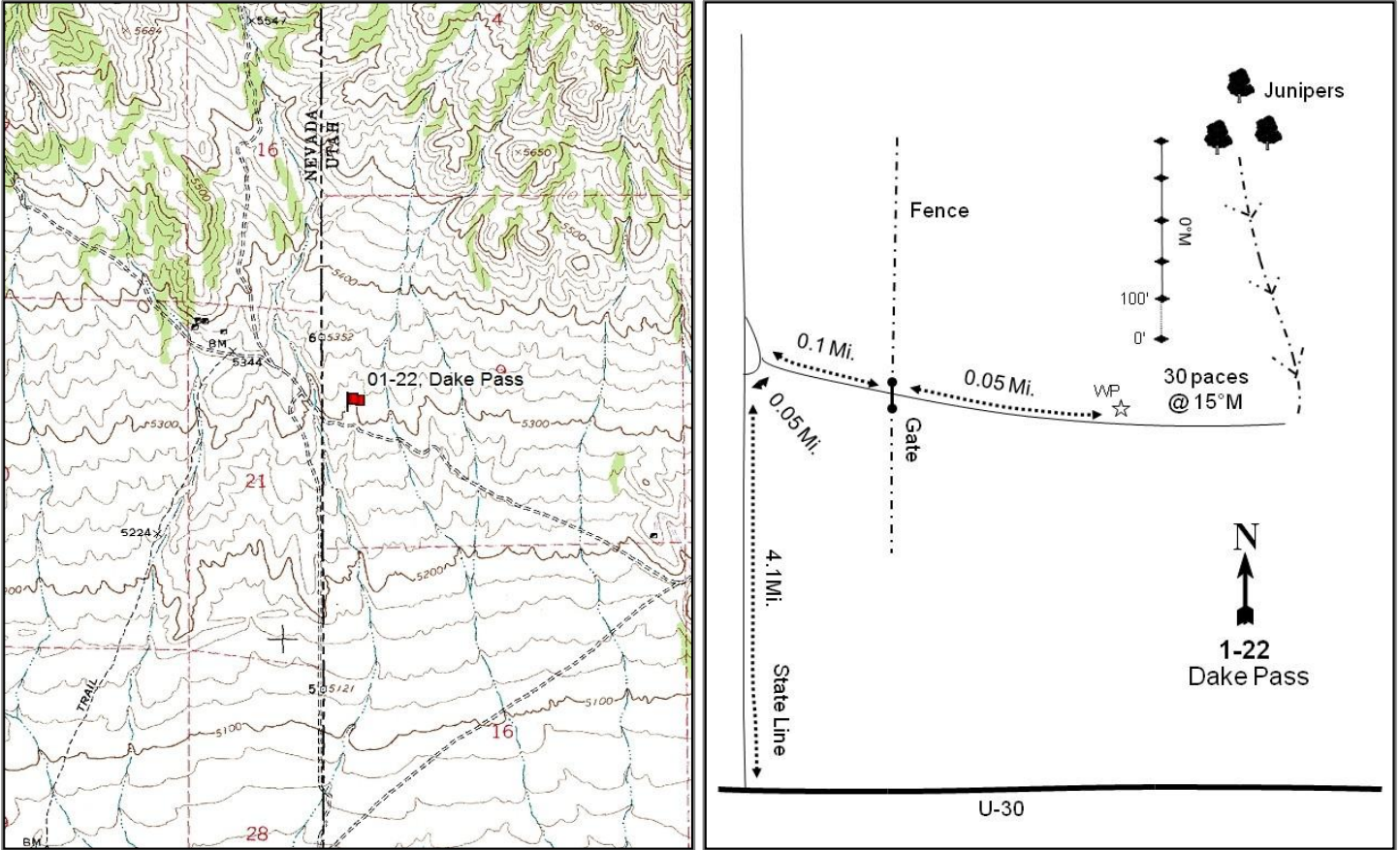
Table 01-19.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Pinus monophylla (singleleaf pinyon)							
1996	6	-	-	-	-	-	4.6
2016	3	-	67	33	-	-	6.7

Table -01-19.15 - Deer Desirable Components Index: High 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	13.8	9.5	24.6	0.0	10.0	0.0	75.9	Good
2001	22.2	12.9	3.5	30.0	0.0	10.0	0.0	78.6	Good
2006	2.9	0.0	0.0	30.0	0.0	10.0	0.0	42.9	Poor
2011	2.1	0.0	0.0	30.0	0.0	10.0	0.0	42.1	Poor
2016	4.1	0.0	0.0	30.0	-0.6	10.0	0.0	43.5	Poor

DAKE PASS - STUDY NO. 01-22



Location Information

USGS 7.5 min Map Info Jackson Spring SE; Township 8N, Range 19W, Section 09
 GPS (0' Stake) NAD 83 UTM ZONE 12, 246041 East 4590513 North

Transect Information

Browse Tag # (0' Stake) Not available
 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. Take a 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 side of the road. From the witness post walk 30 paces at 15 degrees magnetic to the 0-foot baseline stake. The baseline runs 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

Wildlife Habitat and Vegetation History

Table 01-22.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Elk	crucial	year-long	
Greater Sage Grouse		occupied & 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	No Encroachment
2001	Black Sagebrush	No Encroachment
2006	Black Sagebrush	No Encroachment
2011	Black Sagebrush	No Encroachment
2016	Black Sagebrush	No Encroachment

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 # 025AY236UT
 States and Transitions No state and transition model is available for this ecological site.

Since study establishment in 1996, the site has remained in a stable black sagebrush (*Artemisia nova*) plant community type (Table 01-22.12). The herbaceous understory has remained diverse and abundant on the site over the sample years (Table 01-22.10, Table 01-22.11). Utah juniper (*Juniperus osteosperma*) is found adjacent to the site, but has not been sampled since site establishment.

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	13.9	5.2	-	18.4	4.3	-
2016	14.0	5.7	-	20.6	5.0	-

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	62	177	282	69	0.9	6.7	7.0	0.6
2016	210	239	260	89	3.2	14.2	3.0	2.2

Table 01-22.8 - 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	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	10.2	1.5	22.1	33.9	5.9	30.4
2016	21.6	0.8	16.6	37.9	3.7	38.0

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	Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
1996	-	1	1	-	-
2001	-	-	9	-	-
2006	1	1	12	-	13
2011	1	-	12	-	-
2016	-	1	-	-	7
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)	-	-	-

*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 ^{ai} (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	62	45	-	104
2016	54	210	144	1	124
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	0.9	1.4	-	2.9
2016	3.3	3.2	5.9	0.0	4.9

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 ^a (silver rockcress)	Astragalus (milkvetch)	Astragalus purshii (woollypod milkvetch)	Camissonia pterosperma ^a (wingfruit suncup)	Castilleja angustifolia (northwestern Indian paintbrush)	Caulanthus crassicaulis ^a (thickstem wild cabbage)	Collinsia parviflora ^a (maiden blue eyed Mary)	Cryptantha (cryptantha)	Cryptantha spiculifera (Snake River cryptantha)	Cryptantha watsonii ^a (Watson's cryptantha)	Cymopterus globosus (globe springparsley)	Delphinium nuttalianum (two-lobed larkspur)	Descurainia pinnata ^a (western tansymustard)	Erigeron (fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum ovalifolium (cushion buckwheat)
year	Nested Frequency																
1996	3	10	-	12	-	-	4	14	33	-	-	-	-	2	-	2	1
2001	-	-	-	-	-	-	-	-	-	-	-	1	-	15	-	-	-
2006	-	-	1	4	-	-	1	5	27	-	-	-	-	33	1	-	-
2011	-	-	-	2	-	-	-	-	2	-	-	2	2	104	5	-	-
2016	-	0	-	16	17	0	-	-	-	5	13	7	3	45	-	-	-
year	Average Cover (%)																
1996	0.0	0.0	-	0.0	-	-	0.4	0.0	0.4	-	-	-	-	0.0	-	0.0	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	-	-	-

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

FORB SPECIES											
Gilia inconspicua ^a (shy gilia)											
Halogeton glomeratus ^{ai} (saltlover)											
Heterotheca villosa (hairy false goldenaster)											
Ipomopsis aggregata (scarlet gilia)											
Lappula occidentalis ^a (flatspine stickseed)											
Mentzelia albicaulis ^a (whitestem blazingstar)											
Navarretia intertexta ^a (needleleaf navarretia)											
Phlox hoodii (spiny phlox)											
Phlox longifolia (longleaf phlox)											
Sphaeralcea grossularifolia (gooseberryleaf globemallow)											
Townsendia florifer ^a (showy Townsend daisy)											
year	Nested Frequency										
1996	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
year	Average Cover (%)										
1996	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

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 ^p (black sagebrush)											
Atriplex confertifolia ^p (shadscale saltbush)											
Bassia americana ^p (green molly)											
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)											
Ephedra nevadensis ^p (Nevada jointfir)											
Grayia spinosa (spiny hopsage)											
Krascheninnikovia lanata ^p (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
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	10.0	2.8	-	2.8	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

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

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 (%)				
Artemisia nova^P -- (black sagebrush)									
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
Artemisia tridentata ssp. wyomingensis^P -- (Wyoming big sagebrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	77/110
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Atriplex confertifolia^P -- (shadscale saltbush)									
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
Bassia americana^P -- (green molly)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
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
Ephedra nevadensis^P -- (Nevada jointfir)									
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
Eriogonum microthecum^P -- (slender buckwheat)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	10/25
Grayia spinosa -- (spiny hopsage)									
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
Krascheninnikovia lanata^P -- (winterfat)									
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

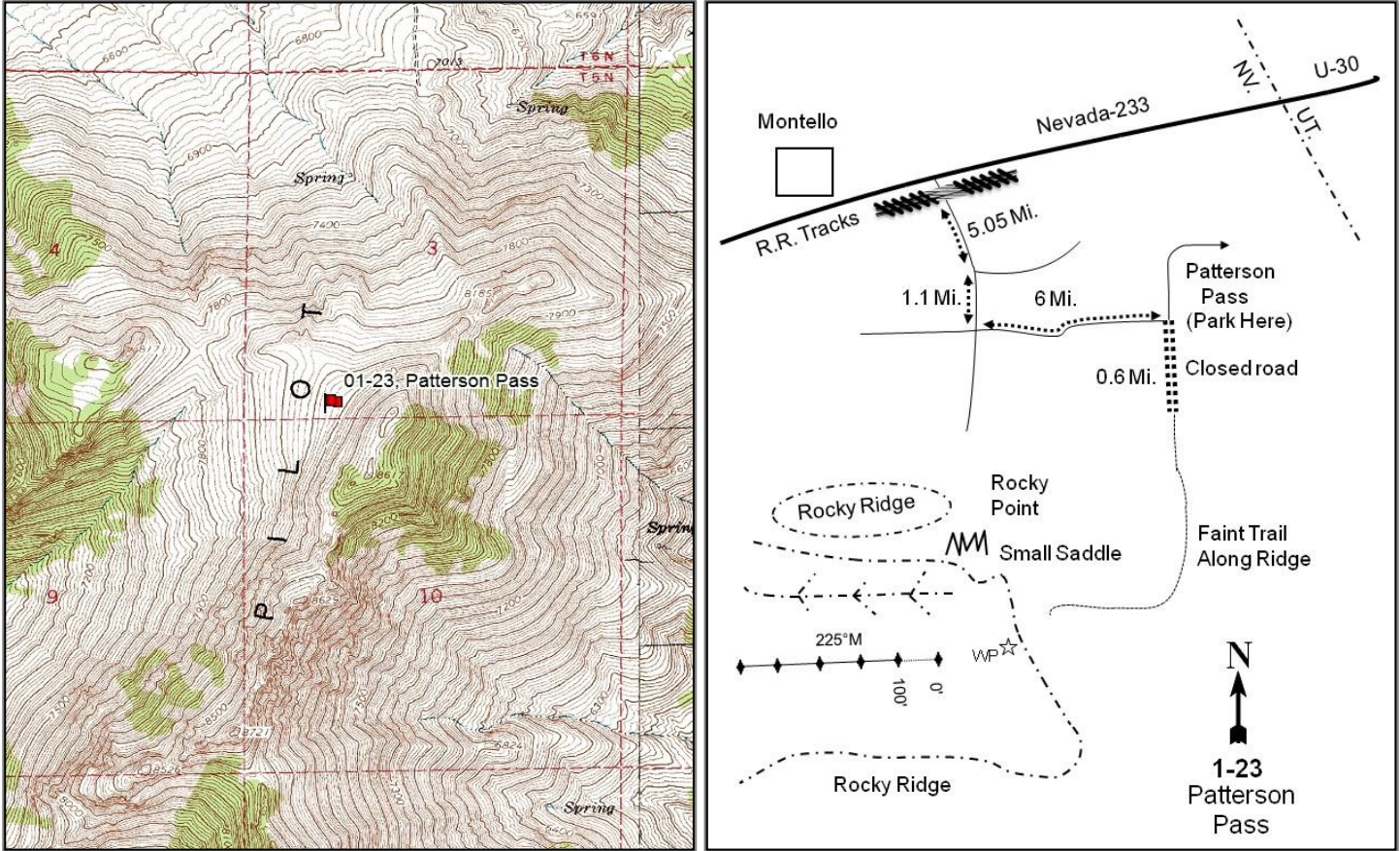
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Linanthus pungens -- (granite prickly phlox)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	17/36
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Opuntia polyacantha -- (plains pricklypear)									
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
Pediocactus simpsonii -- (mountain ball cactus)									
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
Picrothamnus desertorum -- (bud sagebrush)									
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
Tetradymia nuttallii -- (Nuttall's horsebrush)									
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

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

Table -01-22.15 - Deer Desirable Components Index: Low 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	23.6	7.0	7.5	12.0	0.0	7.1	0.0	57.2	Good
2001	20.4	7.5	7.8	17.0	-0.2	1.6	0.0	54.1	Good
2006	19.8	8.1	4.7	12.8	-9.6	2.3	0.0	38.0	Fair
2011	16.8	9.1	6.2	13.4	-0.7	1.3	0.0	46.1	Fair-Good
2016	16.3	10.8	4.7	28.4	-2.4	4.4	0.0	62.2	Good

PATTERSON PASS - STUDY NO. 01-23



Location Information

USGS 7.5 min Map Info	Patterson Pass SE; Township 5N, Range 19W, Section 03
GPS (0' Stake)	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	Standard, Belt 1: 1ft, Belt 2: 15ft, Belt 4: 1ft

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. Take a left turn and drive 6 miles to Patterson Pass. Park here at Patterson Pass. 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 ft. 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 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

Wildlife Habitat and Vegetation History

Table 01-23.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	summer	
Elk	crucial	summer	
Greater Sage Grouse		occupied & 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

Site Notes

Two Cow elk seen on site in early summers of 2001 and 2006. Chukar were heard on nearby 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 #	028AY431UT
States and Transitions	No state and transition model is available for this ecological site.

This mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community likely behaves similar to the Mountain Loam (Mountain Big Sagebrush), R047XA430UT ecological site when subjected to disturbances (USDA-NRCS, 2011). Since establishment in 1996, the site has remained dominated by mountain big sagebrush with black sagebrush (*Artemisia nova*) as subordinate a prominent component within the community (Table 01-23.12, Table 01-23.13). The herbaceous understory has remained diverse and abundant on the site over the sample years with perennial grasses being the dominant component of the herbaceous community (Table 01-23.10, Table 01-23.11).

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	25.7	4.4	-	-	-	-
2006	30.6	3.7	-	41.2	4.3	-
2011	25.2	1.2	-	33.0	1.2	-
2016	29.8	4.0	-	39.4	4.6	-

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	-	363	231	315	-	17.7	2.2	8.5
2001	-	357	161	320	-	24.6	2.9	12.0
2006	-	343	184	294	-	19.1	6.6	14.1
2011	-	298	266	350	-	13.1	5.9	11.0
2016	-	394	325	349	-	29.7	6.4	18.8

Table 01-23.8 - 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	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

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	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	-	-
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)	-	-

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 ovina ⁱ (sheep fescue)	Koeleria macrantha (prairie Junegrass)	Leucopoa kingii (spike fescue)	Melica bulbosa (oniongrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency										
1996	11	-	3	292	-	110	-	47	1	95	43
2001	28	5	-	287	2	84	-	63	-	35	24
2006	14	-	-	281	-	98	1	49	-	67	6
2011	7	-	-	246	-	53	-	14	-	62	10
2016	-	3	-	265	-	61	49	41	16	177	72
year	Average Cover (%)										
1996	0.1	-	0.0	12.9	-	2.5	-	0.8	0.0	1.1	0.3
2001	0.6	0.0	-	15.8	0.3	4.8	-	2.0	-	0.3	0.8
2006	0.4	-	-	12.1	-	4.0	0.1	1.1	-	1.2	0.2
2011	0.0	-	-	9.9	-	2.1	-	0.1	-	0.9	0.1
2016	-	0.1	-	14.7	-	2.9	2.6	1.1	0.1	6.0	2.3

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)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chenopodium album ^a (lambsquarters)	Chenopodium fremontii ^a (Fremont's goosefoot)	Collinsia parviflora ^a (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cymopterus (springparsley)	Descurainia pinnata ^a (western tansymustard)	Erigeron pumilus (shaggy fleabane)	Hackelia patens (spotted stickseed)	Lithophragma parviflorum (smallflower woodland-star)	Lomatium (desertparsley)
year	Nested Frequency																
1996	83	-	-	1	5	-	-	-	198	7	7	-	-	-	33	-	-
2001	106	7	2	-	5	0	-	-	106	13	4	-	-	-	11	-	4
2006	69	3	-	-	12	-	-	-	95	17	-	-	-	-	19	27	-
2011	107	-	-	-	4	-	-	5	247	11	9	-	-	-	4	11	5
2016	102	30	1	-	4	1	1	1	319	50	65	2	6	1	27	76	2
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	-	0.0
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	0.1
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	0.0

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

FORB SPECIES	Lupinus argenteus (silvery lupine)	Mertensia oblongifolia (oblongleaf bluebellis)	Microsteris gracilis ^a (slender phlox)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Pleiocanthus spinosus (thorn skeletonweed)	Polygonum douglasii ^a (Douglas' knotweed)	Potentilla pennsylvanica (Pennsylvania cinquefoil)	Ranunculus jovis (Utah buttercup)	Senecio integerrimus ^a (lambstongue ragwort)	Sisymbrium altissimum ^{at} (tall tumbledustard)	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	153	70	1	17	-	-	155	-	2	57	134	60	-	2	34	
2006	126	88	-	-	-	3	66	-	6	48	107	132	-	-	11	
2011	99	151	-	28	-	2	78	-	3	32	197	87	-	20	28	
2016	191	119	16	-	-	-	68	3	-	46	64	41	-	-	10	
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	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	0.9	2.2	-	0.9	-	0.0	0.5	-	0.0	0.1	4.1	3.6	-	0.1	0.4	
2016	7.5	2.2	0.1	-	-	-	0.6	0.0	-	0.8	0.5	1.1	-	-	0.1	

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 ^p (black sagebrush)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Eriogonum microthecum ^p (slender buckwheat)	Pediocactus simpsonii (mountain ball cactus)	Ribes cereum var. cereum (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
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

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

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.

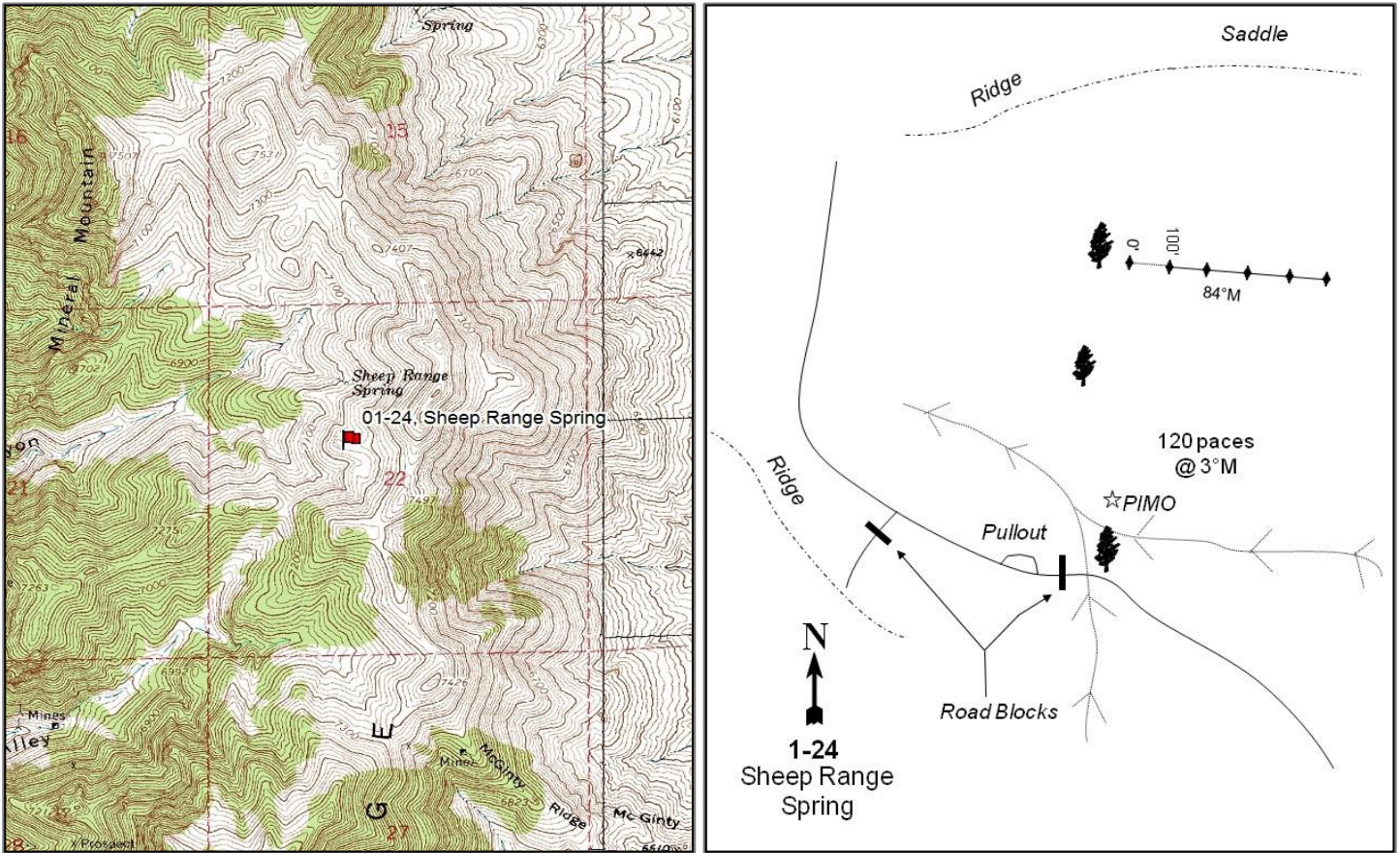
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova^p -- (black sagebrush)									
1996	2100	180	12	79	9	39	1	0	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
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Chamaebatiaria millefolium -- (desert sweet)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	112/205
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	122/230
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Eriogonum microthecum^p -- (slender buckwheat)									
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
Ericameria nauseosa -- (rubber rabbitbrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	60/44
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Pediocactus simpsonii -- (mountain ball cactus)									
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
Ribes cereum var. cereum -- (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

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

Table -01-23.15 - Deer Desirable Components Index: High 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	11.2	7.8	30.0	0.0	10.0	0.0	89.0	Good-Excellent
2001	30.0	11.2	4.2	30.0	0.0	10.0	0.0	85.4	Good
2006	30.0	8.9	1.9	30.0	0.0	10.0	0.0	80.8	Good
2011	30.0	9.8	2.0	27.3	0.0	10.0	0.0	79.2	Good
2016	30.0	12.8	1.5	30.0	0.0	10.0	0.0	84.3	Good

SHEEP RANGE SPRING - STUDY NO. 01-24



Location Information

USGS 7.5 min Map Info	Patterson Pass NE; Township 6N, Range 19W, Section 22
GPS (0' Stake)	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	Standard, 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. Take a right turn and travel 2.1 miles to a four way intersection. Continue straight (stay right) for 2.7 miles to Governors Spring. Take a left at Governors Spring and drive 1.0 mile. Take a right and travel downhill for 1.0 mile. Take the left fork and continue for 1.6 miles to an intersection. From the intersection take the 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 a PIMO). The baseline runs 84 degrees magnetic.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	LUCIN PILOT
Elevation	7,200ft (2,195m)
Aspect	Southwest
Slope	16%
Sample Dates	06/20/1996, 06/06/2001, 06/06/2006, 06/07/2011, 06/08/2016

Wildlife Habitat and Vegetation History

Table 01-24.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	summer	
Elk	crucial	summer	
Greater Sage Grouse		occupied & 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

Site Notes

A sage grouse was flushed in 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 #	028AY431UT
States and Transitions	No state and transition model is available for this ecological site.

This mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community likely behaves similar to the Mountain Loam (Mountain Big Sagebrush), R047XA430UT ecological site when subjected to disturbances (USDA-NRCS, 2011). Since establishment in 1996, the site has remained dominated by mountain big sagebrush with black sagebrush (*Artemisia nova*) as a subordinate to component (Table 01-24.12, Table 01-24.13). The herbaceous understory has remained diverse and abundant over the sample years with perennial grasses being the dominant component of the herbaceous community (Table 01-24.10, Table 01-24.11).

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	-	17.3	7.9	-
2016	14.9	7.1	-	19.0	7.2	-

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

Table 01-24.8 - 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	6.4	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

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	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	-	-
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)	-	-

Table 01-24.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Poa fendleriana (nuttongrass)	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
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

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 ^{ai} (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus cibirius (browse milkvetch)	Balsamorhiza hookeri (Hooker's balsamroot)	Balsamorhiza sagittata (arrow/leaf balsamroot)	Camelina microcarpa ^{ai} (littlupod false flax)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawk/beard)	Descurainia pinnata ^a (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	-
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	-

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

FORB SPECIES	Erigeron pumilus (shaggy fleabane)	Eriogonum heracleoides (parsnipflower buckwheat)	Eriogonum villiflorum (gray buckwheat)	Hackelia patens (spotted stickseed)	Hydrophyllum capitatum (ballhead waterleaf)	Ionactis alpina (Lava aster)	Lappula occidentalis ^a (flatspine stickseed)	Lewisia rediviva (bitter root)	Lithospermum ruderale (western stoneseed)	Lomatium (desertparsley)	Lupinus argenteus (silvery lupine)	Machaeranthera grindelioides (rayless tansyaster)	Microsteris gracilis ^a (slender phlox)	Navaretia intertexta ^a (needleleaf navaretia)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (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	-
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	-

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

FORB SPECIES	Senecio integerrimus ^a (lambstongue ragwort)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Stenotus acaulis (stemless mock goldenweed)	Tragopogon dubius ^{ai} (yellow safsify)	Viola (violet)
year	Nested Frequency				
1996	4	-	2	-	-
2001	16	-	-	-	3
2006	3	-	10	-	8
2011	28	-	4	-	47
2016	20	3	-	2	4
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

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	Line Intercept Cover (%)				
	Artemisia nova ^p (black sagebrush)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. lanceolatus (yellow rabbitbrush)	Eriogonum microthecum ^p (slender buckwheat)	Grayia spinosa (spiny hopsage)
year	Line Intercept Cover (%)				
1996	-	-	-	-	-
2001	-	-	-	-	-
2006	3.2	16.7	6.9	-	-
2011	3.5	13.8	7.9	-	-
2016	3.1	15.9	7.2	-	-
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

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

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 (%)				
Artemisia nova^p -- (black sagebrush)									
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
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. lanceolatus -- (yellow rabbitbrush)									
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
Eriogonum heracleoides -- (parsnipflower buckwheat)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	120	-	0	100	0	0	0	0	20/18

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 (%)				
Eriogonum microthecum^p -- (slender buckwheat)									
1996		-	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
Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)									
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
Grayia spinosa -- (spiny hopsage)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	50/91
Pediocactus simpsonii -- (mountain ball cactus)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	20	-	0	100	0	0	0	0	3/5
2011	20	-	0	100	0	0	0	0	4/8

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

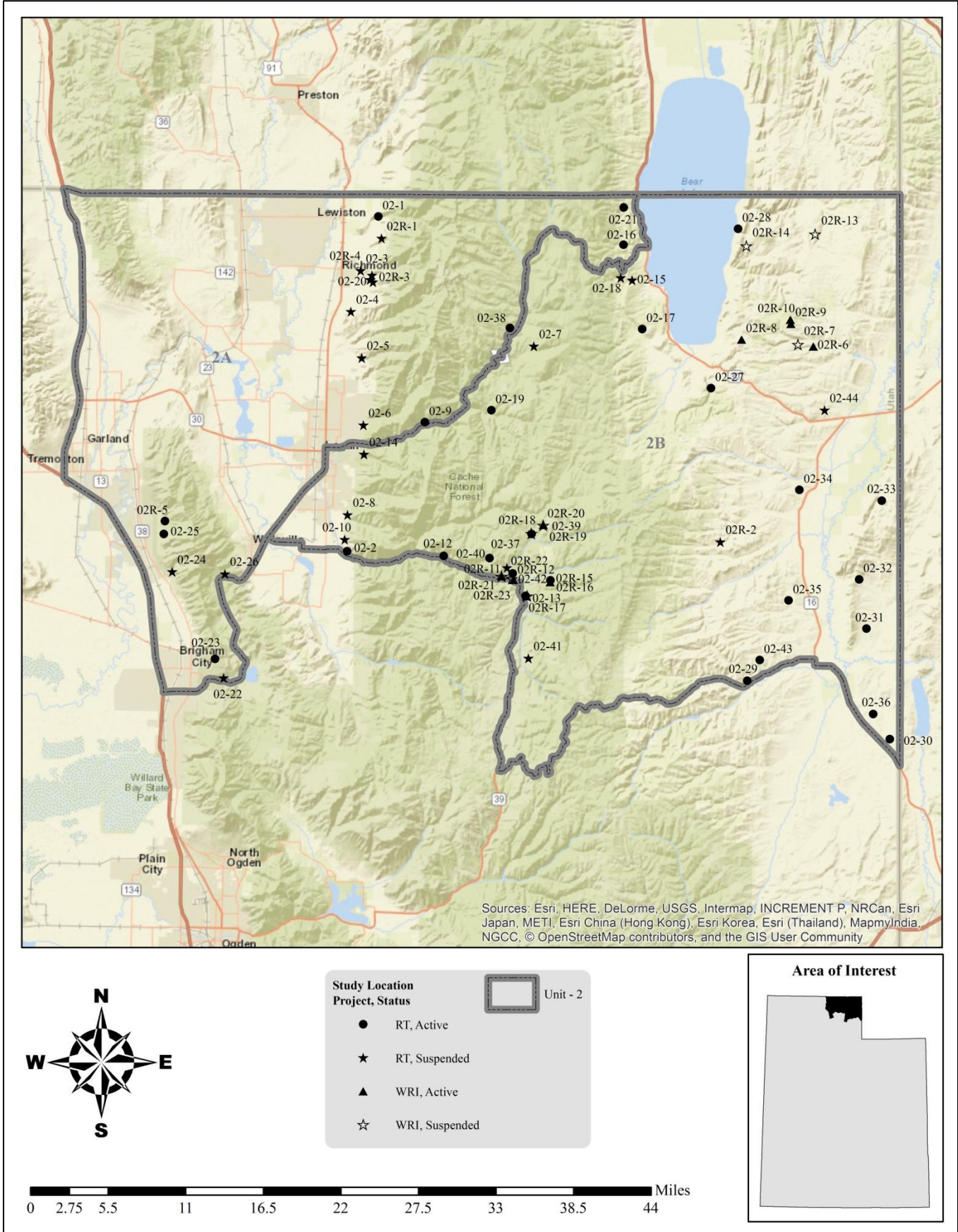
Table 01-24.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Pinus monophylla (singleleaf pinyon)							
2016	8	-	-	33	33	33	28.3

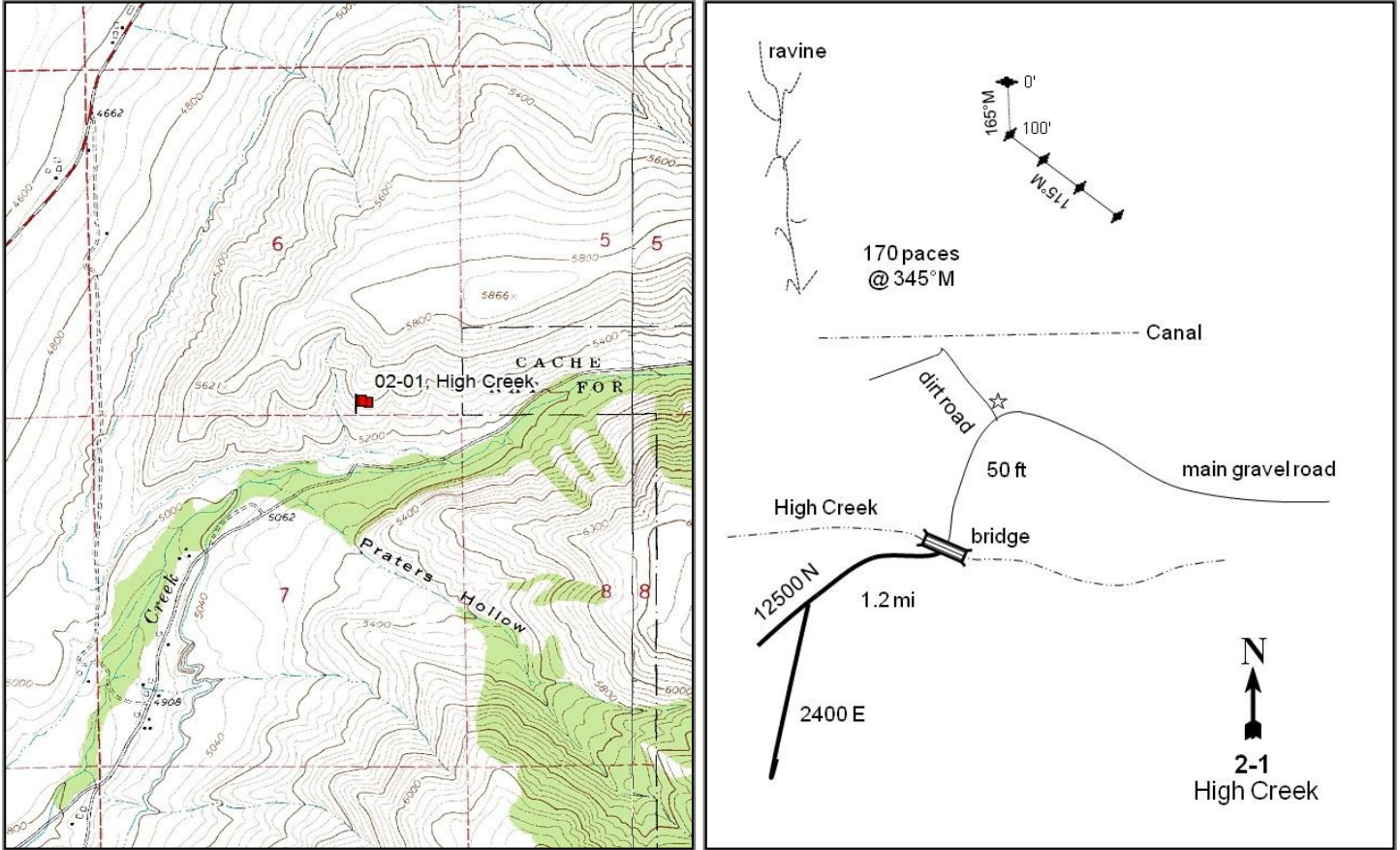
Table -01-24.15 - Deer Desirable Components Index: Mid Potential Scale.

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	12.4	10.6	7.7	22.6	-4.1	10.0	0.0	59.2	Fair
2001	16.2	10.4	2.4	30.0	-3.1	10.0	0.0	65.9	Fair-Good
2006	17.5	8.7	1.2	30.0	0.0	10.0	0.0	67.4	Good
2011	23.4	11.9	12.6	30.0	-0.6	10.0	0.0	87.3	Excellent
2016	18.8	13.8	5.1	25.6	-6.6	10.0	0.0	66.7	Fair-Good

WILDLIFE MANAGEMENT UNIT 02 - CACHE



HIGH CREEK - STUDY NO. 02-1



Location Information

USGS 7.5 min Map Info Richmond NE; Township 14N, Range 2E, Section 06
 GPS (0' Stake) NAD 83 UTM ZONE 12, 436618 East 4647446 North

Transect Information

Browse Tag # (0'Stake) 9150
 Transect Bearing 165° magnetic (Line 2-4: 115° magnetic)
 Length 400ft
 Belt Placement Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)
 Belt Marker Placement Standard, 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, 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

Wildlife Habitat and Vegetation History**Table 02-01.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
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	No Encroachment
2011	Mountain Big Sagebrush	No Encroachment
2016	Mountain Big Sagebrush/Annual Grass	No Encroachment

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 #	047XA334UT
States and Transitions	No state and transition model is available for this ecological site.

Since establishment in 1988, the site has remained in a stable state with mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) as the dominant component of the site (Table 02-1.12). Diversity in the herbaceous understory has remained fairly diverse and abundant over the duration of the study (Table 02-01.7, Table 02-01.11). The annual brome grasses (*Bromus* sp.) is the dominant component of the understory with cheatgrass being the most abundant from year to year (Table 02-01.7, Table 02-01.10).

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	-	-

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

Table 02-01.8 - 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	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

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	Elk	Rabbit
	Quadrat Frequency				
2001	2	-	2	-	-
2006	-	-	5	-	2
2011	-	-	1	-	1
2016	2	-	7	1	-
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)	-	-

*Pellets per acre (ha)

Table 02-01.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES						
Bromus arvensis ^{ai} (field brome)						
Bromus briziformis ^{ai} (rattlesnake brome)						
Bromus tectorum ^{ai} (cheatgrass)						
Poa bulbosa ⁱ (bulbous bluegrass)						
Poa secunda (Sandberg bluegrass)						
Pseudoroegneria spicata (bluebunch wheatgrass)						
year	Nested Frequency					
1996	178	90	382	27	16	33
2001	72	40	462	100	16	36
2006	122	11	450	163	8	40
2011	249	162	288	167	3	66
2016	230	58	354	49	-	31
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

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																		
Agoseris glauca (pale agoseris)																		
Allium acuminatum (tapertip onion)																		
Alyssum desertorum ^{ai} (desert madwort)																		
Ambrosia psilostachya (Cuman ragweed)																		
Artemisia ludoviciana (white sagebrush)																		
Balsamorhiza sagittata (arrowleaf balsamroot)																		
Buglossoides arvensis ^{ai} (corn gromwell)																		
Calochortus nuttallii (sego lily)																		
Camelina microcarpa ^{ai} (littlerod false flax)																		
Ceratocephala testiculata ^{ai} (curvseed butterwort)																		
Chaenactis douglasii (Douglas' dustymaiden)																		
Cirsium undulatum ^a (wavyleaf thistle)																		
Collinsia parviflora ^a (maiden blue eyed Mary)																		
Convolvulus arvensis ^{ai} (field bindweed)																		
Crepis acuminata (tapertip hawk'sbeard)																		
Epilobium brachycarpum ^a (tall annual willowherb)																		
Erodium cicutarium ^{ai} (redstem stork's bill)																		
year	Nested Frequency																	
1996	-	-	98	17	5	-	-	-	-	-	-	-	-	-	7	129	31	
2001	-	-	220	37	16	0	-	31	-	5	-	-	1	-	3	67	222	
2006	4	-	95	47	7	0	12	7	3	1	-	-	65	7	8	201	178	
2011	23	3	172	84	10	-	105	43	9	1	-	3	-	14	6	161	254	
2016	-	-	151	72	16	-	-	14	-	-	8	-	7	15	1	19	338	
year	Average Cover (%)																	
1996	-	-	0.2	0.7	0.2	-	-	-	-	-	-	-	-	-	0.3	1.8	0.4	
2001	-	-	1.6	0.6	0.7	0.1	-	0.2	-	0.0	-	-	0.0	-	0.0	0.3	6.7	
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	3.6	
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	6.4	
2016	-	-	0.6	1.5	0.4	-	-	0.0	-	-	0.0	-	0.0	0.3	0.0	0.1	14.1	

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

FORB SPECIES	Galium aparine ^a (stickywilly)	Grindelia squarrosa (curlycup gumweed)	Hackelia patens (spotted stickseed)	Helianthus annuus ^a (common sunflower)	Holosteum umbellatum ^{ai} (jagged chickweed)	Isatis tinctoria ^{mi} (Dyer's woad)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^{ai} (flatspine stickseed)	Lomatium grayi (Gray's biscuitroot)	Lupinus argenteus (silvery lupine)	Melilotus officinalis ⁱ (sweetclover)	Microsteris gracilis ^a (slender phlox)	Oenothera caespitosa (tufted evening primrose)	Phacelia hastata (silverleaf phacelia)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Rumex crispus ⁱ (curly dock)	
year	Nested Frequency																	
1996	6	6	1	0	-	-	31	10	4	-	-	-	0	-	-	8	-	
2001	8	18	-	6	-	-	5	-	6	12	-	4	-	-	9	23	-	
2006	3	26	-	6	8	1	65	-	-	2	-	38	0	-	1	9	0	
2011	29	38	-	131	7	-	101	-	4	4	-	4	-	2	-	7	-	
2016	28	46	-	34	-	3	5	-	-	5	1	7	0	-	2	-	-	
year	Average Cover (%)																	
1996	0.2	0.2	0.0	0.0	-	-	0.7	0.0	0.0	-	-	-	0.0	-	-	0.0	-	
2001	0.0	0.9	-	0.1	-	-	0.0	-	0.0	0.4	-	0.0	-	-	0.0	0.1	-	
2006	0.0	1.8	-	0.2	0.0	0.0	0.6	-	-	0.8	-	0.1	0.0	-	0.0	0.0	0.0	
2011	0.6	0.8	-	2.5	0.0	-	1.4	-	0.0	0.8	-	0.0	-	0.0	-	0.0	-	
2016	0.5	1.6	-	0.3	-	0.0	0.0	-	-	0.2	0.0	0.0	0.0	-	0.0	-	-	

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

FORB SPECIES	Tragopogon dubius ^{ai} (yellow salsify)	Veronica biloba ^{ai} (two-lobed speedwell)	Zigadenus paniculatus (foxtail deathcamas)
year	Nested Frequency		
1996	37	14	1
2001	33	193	20
2006	28	83	20
2011	158	22	18
2016	5	6	20
year	Average Cover (%)		
1996	0.8	0.0	0.0
2001	0.4	1.7	0.3
2006	0.7	0.5	0.3
2011	1.4	0.2	0.1
2016	0.0	0.0	0.3

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	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)		Purshia tridentata ^p (antelope bitterbrush)	
	year	Line Intercept Cover (%)		
	1996	-	-	
	2001	-	-	
	2006	4.4	2.6	
	2011	10.6	2.2	
	2016	18.1	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	

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

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 (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	28/49
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	37/54
Purshia tridentata^p -- (antelope bitterbrush)									
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
Rosa woodsii^p -- (Woods' rose)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	147/204
2016	-	-	-	-	-	-	-	-	116/143

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

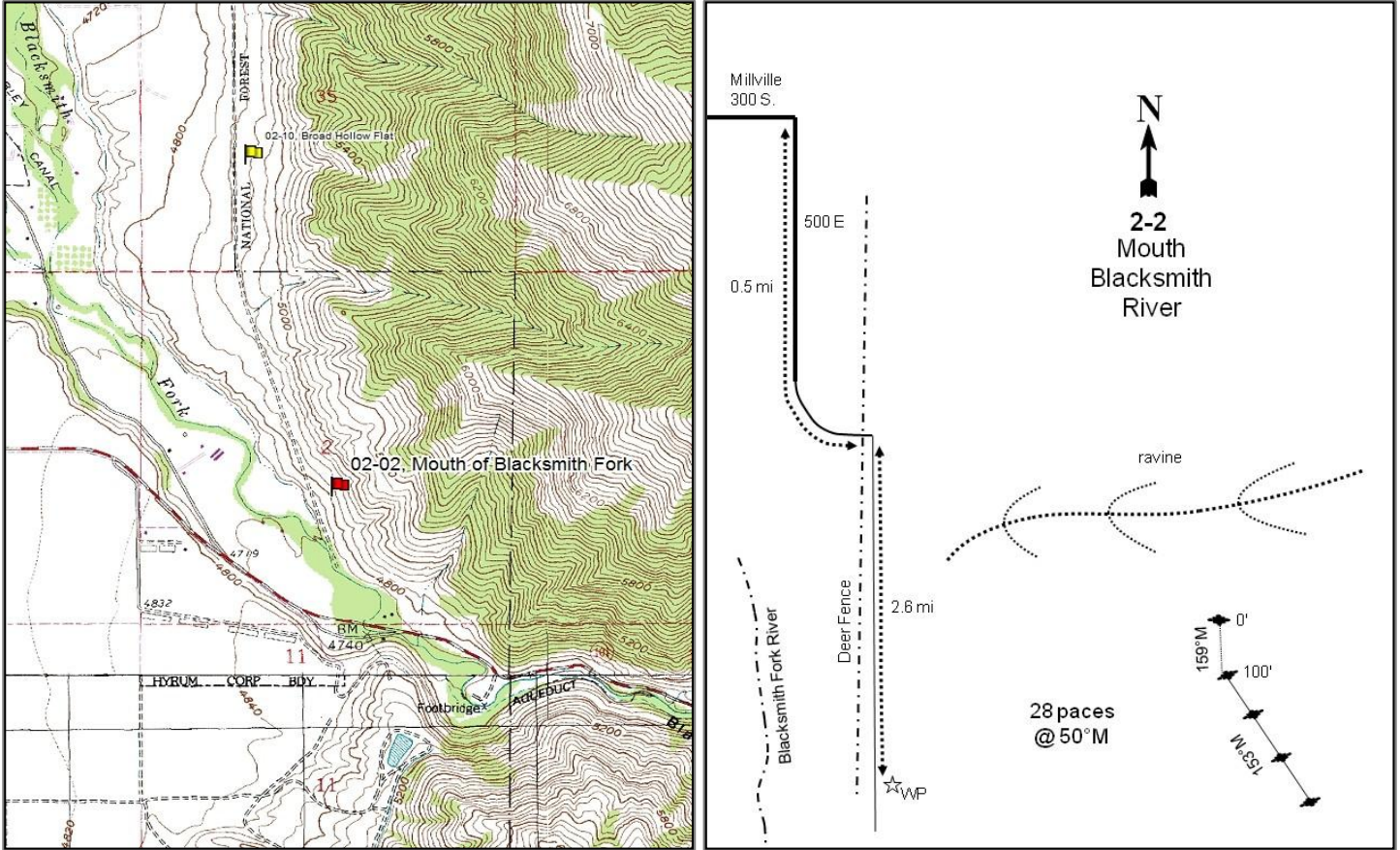
Table 02-01.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution				Average Diameter (cm)	
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'		>12' (%)
Juniperus scopulorum (Rocky Mountain juniper)							
2016	2	-	100	-	-	-	9.0

Table -02-01.15 - Deer Desirable Components Index: Mid 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	18.1	10.3	0.9	5.7	-20.0	2.9	0.0	17.9	Very Poor
2001	18.2	9.0	0.5	3.2	-19.3	6.8	0.0	18.3	Very Poor
2006	9.8	10.3	15.0	2.4	-14.0	10.0	-4.0	29.5	Very Poor
2011	11.7	9.0	0.0	2.6	-8.7	10.0	-2.0	22.5	Very Poor
2016	18.6	11.5	1.3	1.0	-11.5	8.6	-4.0	25.4	Very Poor

MOUTH OF BLACKSMITH FORK - STUDY NO. 02-2



Location Information

USGS 7.5 min Map Info Logan SE; Township 10N, Range 1E, Section 02
 GPS (0' Stake) NAD 83 UTM ZONE 12, 433073 East 4609266 North

Transect Information

Browse Tag # (0' Stake) 90
 Transect Bearing 159° magnetic (Line 2-4: 151° magnetic)
 Length 400ft
 Belt Placement Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
 Belt Marker Placement Standard, Belt 4: 5ft

Directions to Site

Proceed south 0.5 miles from the intersection of 300 South and 500 East in Millville. At 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 marked by browse tag #90. The baseline runs at a bearing of 159 degrees magnetic. The baseline doglegs after 100 feet and 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

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 2013	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 lbs/acre
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	0.17	0.13
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	1.17	0.93
G	Dactylis glomerata	Orchardgrass	Paiute	0.67	0.52
G	Elymus trachycaulus	Slender Wheatgrass	San Luis	1.67	1.58
G	Elymus wawawaiensis	Snake River Wheatgrass	Secar	0.61	0.55
G	Festuca idahoensis	Idaho Fescue	Joseph	0.50	0.34
G	Poa secunda	Canby Bluegrass	Canbar	0.50	0.43
F	Achillea millefolium	Western Yarrow		0.11	0.11
F	Medicago sativa	Alfalfa	Ladak	0.50	0.46
F	Medicago sativa	Alfalfa	Ranger	0.50	0.44
F	Melilotus officinalis	Yellow Sweetclover		0.67	0.62
F	Onobrychis viciifolia	Sainfoin	Eski	0.90	0.88
F	Sanguisorba minor	Small Burnet	Delar	1.11	1.03
S	Artemisia tridentata ssp. vaseyana	Mountain Big Sagebrush	Sanpete UT	0.02	0.01
S	Artemisia tridentata ssp. vaseyana	Mountain Big Sagebrush	Grand UT	0.04	0.01
S	Artemisia tridentata ssp. vaseyana	Mountain Big Sagebrush	Sevier/Wayne UT	0.18	0.05
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Beaver UT	0.25	0.04
S	Bassia prostrata	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 lbs/acre
G	Dactylis glomerata	Orchardgrass	Paiute	0.50	0.43
G	Elymus lanceolatus	Thickspike Wheatgrass	Bannock	2.00	1.79
G	Elymus wawawaiensis	Snake River Wheatgrass	Secar	2.50	2.29
G	Poa secunda	Canby Bluegrass	Canbar	0.50	0.42
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky	2.00	1.70
F	Achillea millefolium	Western Yarrow	Hanford WA	0.20	0.18
F	Linum perenne	Blue Flax	Appar	0.50	0.45
F	Medicago sativa	Alfalfa	Big Sky Ladak	0.70	0.66
F	Medicago sativa	Alfalfa	Ladak	0.70	0.66
F	Medicago sativa	Alfalfa	Ranger (NC)	0.60	0.55
F	Onobrychis viciifolia	Sainfoin	Eski	2.00	1.72
F	Sanguisorba minor	Small Burnet	Delar	1.64	1.44
F	Sanguisorba minor	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 lbs/acre
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

Wildlife Habitat and Vegetation History

Table 02-02.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
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

Site Notes

In the spring of 2008, 4,000 antelope bitterbrush (*Purshia tridentata*) seedlings were transplanted, 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 # 047XA334UT
 States and Transitions No state and transition model is available for this ecological site.

When established in 1984, the plant community was a mountain big sagebrush site with mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) being the dominant browse species (Table 02-02.12) with the herbaceous understory dominated by the invasive annual grasses jointed goatgrass (*Aegilops cylindrica*) and cheatgrass (*Bromus tectorum*) (Table 02-02.7, Table 02- 02.10). The study site burned in 2007 and 2013. Following the fires, the site transitioned into an annual grass community with cereal rye (*Secale cereale*) and jointed goatgrass being the dominant species (Table 02-02.7). The herbaceous understory has remained relatively undiversified despite recent seeding efforts to rehabilitate the area. With the high cover of annual grass, the site may have entered a period of increased fire frequency and lowered resilience to disturbance.

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	-

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	145	35.4	2.3	1.5	5.0
2001	458	251	262	96	32.9	9.0	5.2	3.3
2006	434	281	113	95	36.0	11.7	0.8	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

Table 02-02.8 - 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	0.4	-	70.9	2.9	6.8	59.0
2001	0.3	-	55.4	4.3	3.5	69.7
2006	0.6	-	45.4	5.4	4.3	64.5
2011	0.1	-	79.5	0.8	2.2	82.2
2016	12.7	-	38.6	2.0	4.2	54.5

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	Elk
	Quadrat Frequency		
1996	1	1	1
2001	1	2	-
2006	-	16	1
2011	-	-	-
2016	2	1	-
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)	-	-

Table 02-02.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES											
Aegilops cylindrica ^{ai} (jointed goatgrass)											
Agropyron cristatum ⁱ (crested wheatgrass)											
Bromus arvensis ^{ai} (field brome)											
Bromus briziformis ^{ai} (rattlesnake brome)											
Bromus tectorum ^{ai} (cheatgrass)											
Carex (sedge)											
Poa bulbosa ⁱ (bulbous bluegrass)											
Poa pratensis ⁱ (Kentucky bluegrass)											
Poa secunda (Sandberg bluegrass)											
Pseudoroegneria spicata (bluebunch wheatgrass)											
Secale cereale ^{ai} (cereal rye)											
year	Nested Frequency										
1996	170	-	415	52	319	-	65	-	15	24	124
2001	268	-	78	47	377	5	197	3	66	18	98
2006	328	-	13	13	213	-	229	-	52	19	152
2011	321	4	6	-	183	-	12	-	10	36	351
2016	260	64	-	-	99	-	48	-	4	11	318
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	7.6	0.0	0.8	0.3	2.5
2006	25.9	-	0.0	0.0	4.9	-	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

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																	
Agoseris glauca (pale agoseris)																	
Alyssum desertorum ^{ai} (desert madwort)																	
Ambrosia psilostachya (Cuman ragweed)																	
Asclepias asperula (spider milkweed)																	
Calochortus nuttallii (sego lily)																	
Ceratocephala testiculata ^{ai} (curvseeded butterwort)																	
Cirsium undulatum ^a (wavyleaf thistle)																	
Collinsia parviflora ^a (maiden blue eyed Mary)																	
Crepis acuminata (tapertip hawkbeard)																	
Cryptantha (cryptantha)																	
Epilobium brachycarpum ^a (tall annual willowherb)																	
Erodium cicutarium ^{ai} (redstem stork's bill)																	
Gilia ^a (gilia)																	
Grindelia squarrosa (curlycup gumweed)																	
Helianthus annuus ^a (common sunflower)																	
Holosteum umbellatum ^{ai} (jagged chickweed)																	
Isatis tinctoria ^{ai} (Dyer's woad)																	
year	Nested Frequency																
1996	3	51	123	5	3	-	1	-	-	-	75	8	3	3	-	-	28
2001	-	114	62	12	3	7	2	-	2	-	6	174	9	-	-	108	6
2006	4	22	46	6	8	7	-	5	1	2	-	20	-	-	-	69	6
2011	5	9	140	10	10	2	-	5	-	-	2	10	-	-	9	28	1
2016	-	-	159	9	-	-	-	-	-	-	-	29	-	-	5	-	-
year	Average Cover (%)																
1996	0.0	0.2	3.9	0.5	0.0	-	0.0	-	-	-	0.3	0.1	0.0	0.0	-	-	0.2
2001	-	0.3	2.3	0.2	0.0	0.0	0.1	-	0.0	-	0.0	4.2	0.0	-	-	0.3	0.0
2006	0.0	0.0	1.8	1.0	0.0	0.0	-	0.0	0.0	0.0	-	0.4	-	-	-	0.1	0.1
2011	0.3	0.0	7.2	1.2	0.0	0.0	-	0.0	-	-	0.0	0.0	-	-	0.1	0.8	0.0
2016	-	-	8.7	0.7	-	-	-	-	-	-	-	0.2	-	-	0.2	-	-

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

FORB SPECIES											
Lactuca serriola ^{ai} (prickly lettuce)											
Lithospermum ruderale (western stone seed)											
Lomatium grayi (Gray's biscuitroot)											
Medicago sativa ⁱ (alfalfa)											
Melilotus officinalis ⁱ (sweetclover)											
Phlox longifolia (longleaf phlox)											
Sanguisorba minor ⁱ (small burnet)											
Tragopogon dubius ^{ai} (yellow salsify)											
unknown perennial forb (unknown forb)											
Veronica biloba ^{ai} (twolobe speedwell)											
Zigadenus paniculatus (foothill deathcamas)											
year	Nested Frequency										
1996	2	0	-	17	-	5	-	64	-	-	-
2001	6	-	-	23	-	-	-	8	-	-	5
2006	2	-	-	29	-	-	-	15	3	6	-
2011	98	-	5	68	10	-	-	183	-	-	-
2016	20	-	-	35	31	-	1	32	-	-	-
year	Average Cover (%)										
1996	0.0	0.0	-	0.5	-	0.0	-	0.7	-	-	-
2001	0.0	-	-	0.7	-	-	-	0.2	-	-	0.0
2006	0.0	-	-	1.0	-	-	-	0.1	0.1	0.0	-
2011	1.4	-	0.1	6.3	0.2	-	-	3.6	-	-	-
2016	0.1	-	-	2.2	0.3	-	0.0	0.3	-	-	-

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 ^p (mountain big sagebrush)				
Bassia prostrata ⁱ (forage kochia)				
Gutierrezia sarothrae (broom snakeweed)				
Rosa woodsii ^p (Woods' rose)				
year	Line Intercept Cover (%)			
1996	-	-	-	-
2001	-	-	-	-
2006	17.3	-	0.6	-
2011	-	-	0.2	-
2016	-	2.8	-	-
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	-	-

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

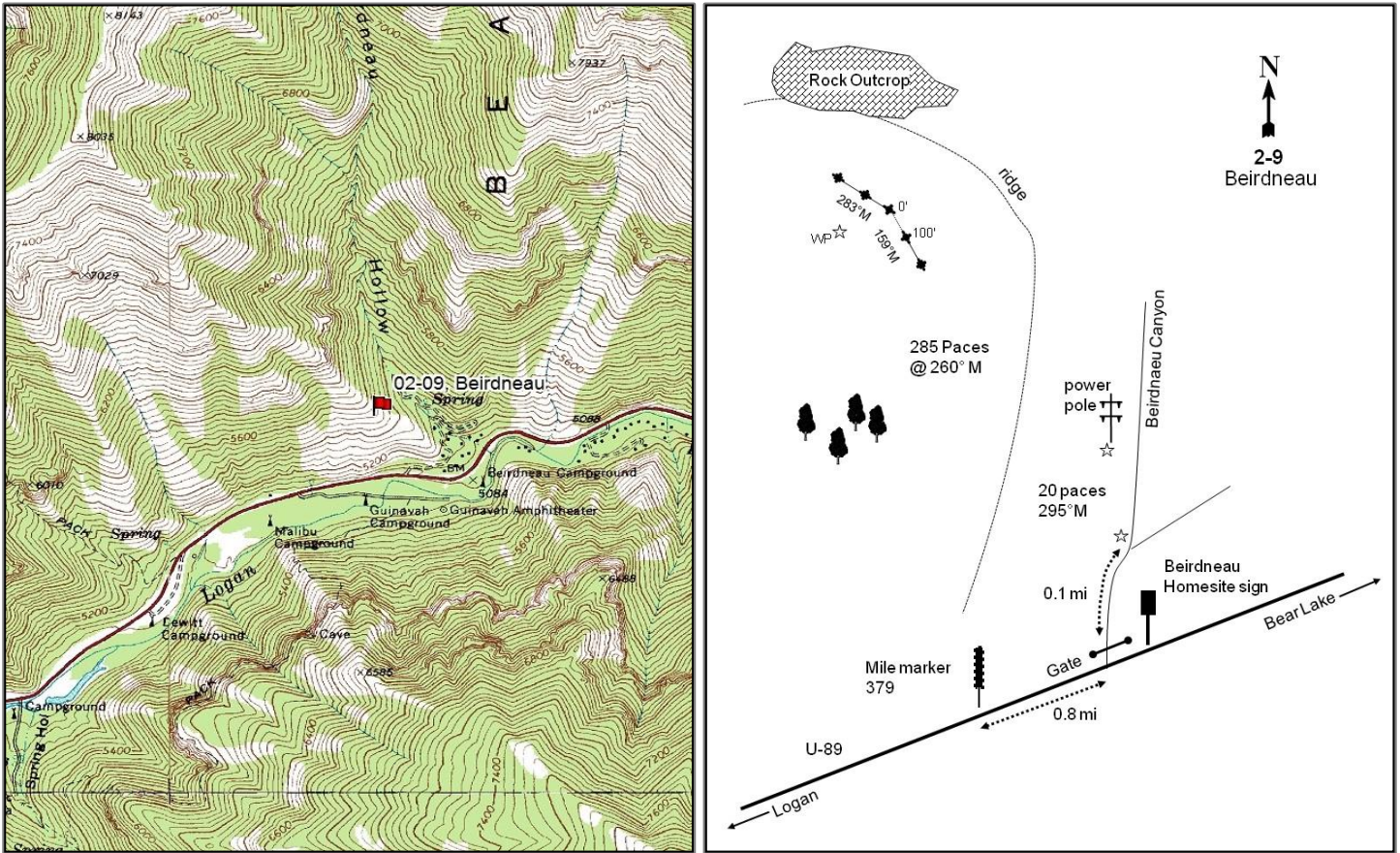
Table 02-02.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

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 (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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	-	-	-	-	-	-	-	-	-/-
Bassia prostrataⁱ -- (forage kochia)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	20	-	0	100	0	0	0	0	45/46
2016	8720	-	5	95	0	18	70	0	14/18
Ericameria nauseosa -- (rubber rabbitbrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	98/170
2016	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
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	-	-	-	-	-	-	-	-	-/-
Rosa woodsii^p -- (Woods' rose)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	20	-	100	0	0	0	0	0	-/-

Table -02-02.15 - Deer Desirable Components Index: Mid 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	12.3	12.6	13.0	1.6	-20.0	10.0	-2.0	27.5	Very Poor
2001	13.7	11.1	0.5	3.5	-20.0	6.9	-2.0	13.7	Very Poor
2006	19.7	9.9	0.0	2.6	-20.0	8.1	-2.0	18.3	Very Poor
2011	0.0	0.0	0.0	3.4	-20.0	10.0	-2.0	-8.6	Very Poor
2016	3.3	0.0	0.0	5.4	-20.0	10.0	0.0	-1.3	Very Poor

BEIRDNEAU - STUDY NO. 02-9



Location Information

USGS 7.5 min Map Info Mount Elmer SW; Township 12N, Range 2E, Section 23
 GPS (0' Stake) NAD 83 UTM ZONE 12, 441938 East 4623977 North

Transect Information

Browse Tag # (0' Stake) 7928
 Transect Bearing 159° magnetic (Line 3-4: 283° magnetic)
 Length 400ft
 Belt Placement Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
 Belt Marker Placement Standard, 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 "Beirdneau Summer Home Sites." Turn left here at the home site, and proceed 0.1 miles to a fork and stop. Walk to the power pole on the left at a bearing of 295 degrees magnetic and 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 marked by browse tag #7928. The baseline runs at 159 degrees magnetic. The second stake is placed 50 feet down the slope at the same bearing. The third and fourth stake 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	50%
Sample Dates	08/14/1996, 07/12/2001, 06/28/2006, 07/28/2011, 06/29/2016

Wildlife Habitat and Vegetation History

Table 02-09.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
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	No Encroachment
2001	Bitterbrush/Annual Grass	No Encroachment
2006	Bitterbrush	No Encroachment
2011	Bitterbrush	No Encroachment
2016	Bitterbrush/Annual Grass	No Encroachment

Site Notes

Several snakes 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 #	047XA456UT
States and Transitions	A defined state and transition model is available.

Since study establishment in 1984, the plant community has remained in the Community Phase 2.1 Antelope Bitterbrush/Rich and Productive Native Perennial Herbaceous Understory within the Antelope Bitterbrush/Introduced Non-natives State (State 2). The presence of Antelope bitterbrush (*Purshia tridentata*), bluebunch wheatgrass (*Pseudoroegneria spicata*), and the introduced annual grass cheatgrass (*Bromus tectorum*) are the main components that comprise this ecological site type (Table 02-09.9, Table 02-09.12). Cheatgrass has been highly variable in both cover and abundance over the sample years, but there is no indication that there has been a transition from one community phase or state to another. It is predicted that the site will remain in the current community phase unless there is a major disturbance (USDA-NRCS, 2011).

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	11.0	2.1	0.8	-	-	-
2001	7.9	2.6	-	-	-	0.1
2006	7.4	2.1	-	11.0	3.0	-
2011	5.5	2.4	0.6	12.1	3.6	1.7
2016	7.9	3.4	0.6	14.3	4.3	2.5

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	223	25.9	5.7	6.0	9.9
2001	410	160	314	228	26.4	5.8	5.6	9.3
2006	267	207	282	271	3.4	6.3	7.8	14.2
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

Table 02-09.8 - 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	6.3	0.2	48.6	5.5	12.7	54.3
2001	5.7	0.1	43.2	16.4	11.3	54.2
2006	11.8	-	31.1	16.3	10.7	40.9
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

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	Elk	Rabbit
	Quadrat Frequency		
1996	1	-	-
2001	6	-	-
2006	8	6	-
2011	2	2	-
2016	6	2	3
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)	-

Table 02-09.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus arvensis ^{ai} (field brome)	Bromus briziformis ^{ai} (rattlesnake brome)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Elymus trachycaulus (slender wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency								
1996	418	2	241	-	8	92	-	3	119
2001	171	10	371	-	-	82	-	19	103
2006	163	1	198	-	-	116	5	7	132
2011	230	-	73	6	-	108	3	5	125
2016	56	13	338	-	0	105	-	3	117
year	Average Cover (%)								
1996	17.6	0.0	8.4	-	0.1	2.6	-	0.0	3.0
2001	2.4	0.1	24.0	-	-	2.4	-	0.1	3.4
2006	1.6	0.0	1.8	-	-	2.4	0.0	0.0	3.8
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

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	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum ^{ai} (desert madwort)	Arctium minus ^{ai} (lesser burdock)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvetch)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus cibaricus (browse milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcapa ^{ai} (litttlepod false flax)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)
year	Nested Frequency																
1996	-	1	6	151	-	11	-	-	-	2	3	-	-	-	5	-	-
2001	9	1	27	169	-	8	-	-	-	1	6	-	6	-	-	-	-
2006	6	12	15	38	-	15	0	2	-	1	2	-	6	1	7	3	-
2011	4	-	90	233	3	9	-	1	-	-	3	-	9	-	-	-	2
2016	0	4	41	84	4	6	-	-	1	-	5	17	5	-	-	4	-
year	Average Cover (%)																
1996	-	0.0	0.0	0.4	-	0.3	-	-	-	0.0	0.5	-	-	-	0.3	-	-
2001	0.2	0.0	0.2	0.7	-	0.3	-	-	-	0.0	0.2	-	0.0	-	-	-	-
2006	0.1	0.1	0.1	0.1	-	1.5	0.0	0.0	-	0.0	0.6	-	0.0	0.0	0.2	0.0	-
2011	0.2	-	0.4	1.5	0.1	1.1	-	0.0	-	-	0.0	-	0.1	-	-	-	0.0
2016	0.0	0.0	0.2	0.3	0.0	0.7	-	-	0.0	-	0.6	0.1	0.0	-	-	0.0	-

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

FORB SPECIES	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cymopterus (springparsley)	Cynoglossum officinale ^{ani} (gypsyflower)	Epilobium brachycarpum ^a (tall annual willowherb)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium aparine ^a (stickywilly)	Hackelia patens (spotted stickseed)	Holosteum umbellatum ^{ai} (jagged chickweed)	Isatis tinctoria ^{ani} (Dyer's woad)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lepidium ramosissimum ^a (manybranched pepperweed)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stoneseed)	Medicago sativa ⁱ (alfalfa)	Melilotus officinalis ⁱ (sweetclover)
year	Nested Frequency																
1996	2	-	117	2	48	-	39	-	5	68	30	-	-	29	10	-	107
2001	-	1	138	12	16	-	-	49	7	25	103	1	-	15	12	-	4
2006	-	2	150	30	40	0	65	13	-	5	131	-	4	21	7	26	81
2011	9	2	163	19	42	-	60	0	-	115	190	-	-	66	17	111	43
2016	-	8	166	15	-	19	26	8	-	15	119	14	-	17	15	94	37
year	Average Cover (%)																
1996	0.0	-	3.0	0.0	0.2	-	0.4	-	0.0	1.3	0.1	-	-	0.4	0.5	-	5.0
2001	-	0.0	6.0	0.1	0.0	-	-	0.8	0.0	1.2	0.9	0.0	-	0.2	0.6	-	0.2
2006	-	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
2011	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
2016	-	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

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

FORB SPECIES	Microsteris gracilis ^a (slender phlox)	Penstemon humilis (low beardtongue)	Phlox hoodii (spiny phlox)	Symphotrichum ascendens (western aster)	Tragopogon dubius ^{ai} (yellow safsify)	Trifolium (clover)	unknown perennial forb (unknown forb)	Veronica biloba ^{ai} (two-lobed speedwell)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency								
1996	-	1	-	2	162	-	1	33	-
2001	-	3	-	4	105	34	-	120	-
2006	9	5	2	4	130	9	-	87	1
2011	-	1	-	1	90	27	-	138	2
2016	-	7	-	4	200	35	-	63	-
year	Average Cover (%)								
1996	-	0.0	-	0.0	3.0	-	0.1	0.1	-
2001	-	0.1	-	0.0	1.9	0.5	-	0.6	-
2006	0.0	0.1	0.0	0.1	1.8	0.0	-	0.6	0.0
2011	-	0.0	-	0.0	1.2	0.2	-	2.5	0.0
2016	-	0.0	-	0.0	5.9	0.1	-	0.5	-

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 ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus scopulorum ⁱ (Rocky Mountain juniper)	Purshia tridentata ^p (antelope bitterbrush)	Symphoricarpos oreophilus (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
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	1.6	0.1	-	0.1	-	5.8	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

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

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 (%)				
Amelanchier alnifolia ^p -- (Saskatoon serviceberry)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	107/134
2011	-	-	-	-	-	-	-	-	90/123
2016	-	-	-	-	-	-	-	-	147/118
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Ericameria nauseosa ssp. nauseosa var. speciosa ^p -- (rubber rabbitbrush)									
1996	-	-	-	-	-	-	-	-	124/159
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	137/184
2011	-	-	-	-	-	-	-	-	154/236
2016	-	-	-	-	-	-	-	-	158/218

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 (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
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
Juniperus scopulorum¹ -- (Rocky Mountain juniper)									
1996	20	-	0	100	0	0	0	0	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	20	-	0	100	0	0	0	0	- / -
2016	-	-	-	-	-	-	-	-	- / -
Purshia tridentata^P -- (antelope bitterbrush)									
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
Symphoricarpos oreophilus -- (mountain snowberry)									
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

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

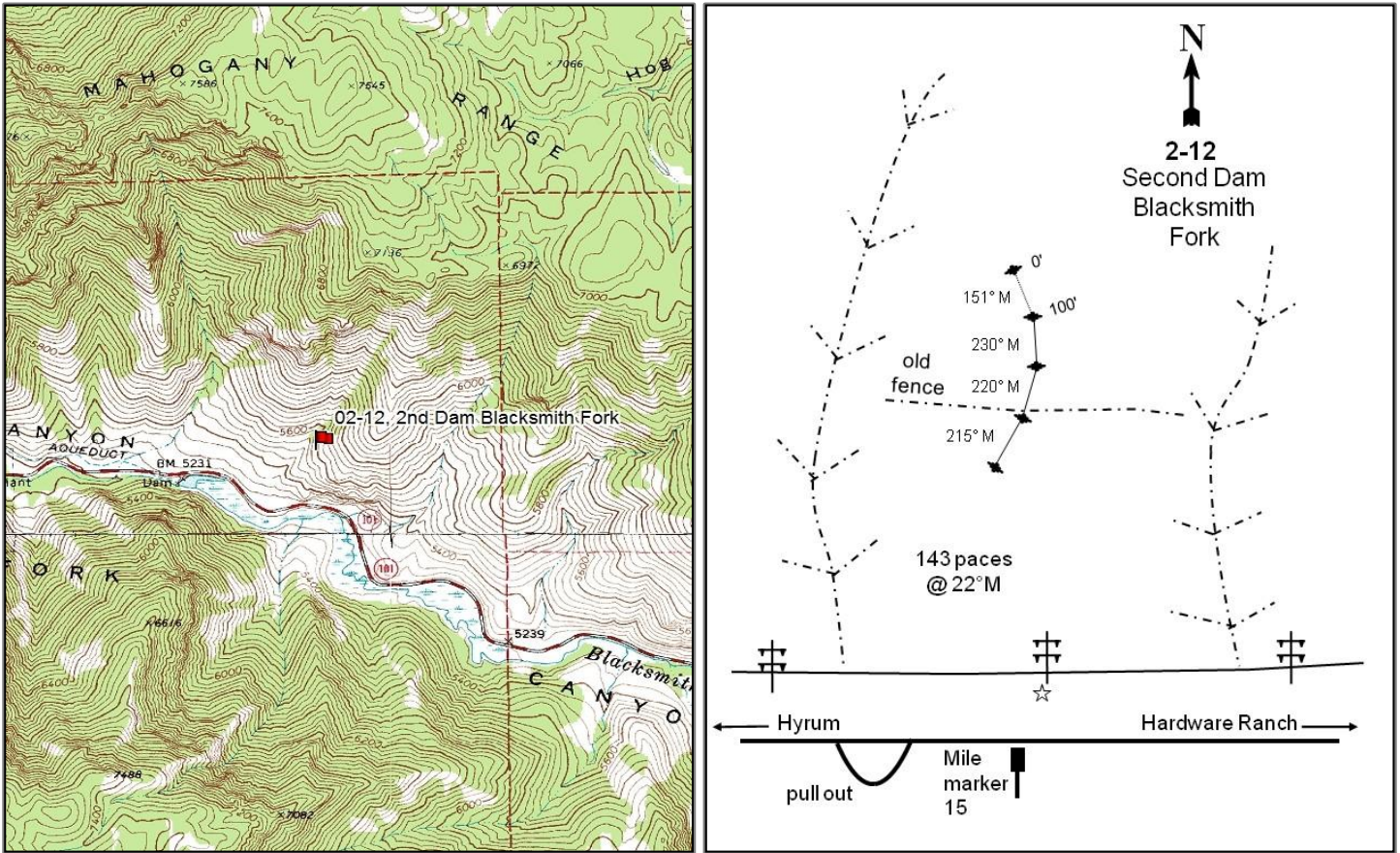
Table 02-09.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Acer grandidentatum (bigtooth maple)							
2016	4	-	50	-	50	-	17.0
Juniperus scopulorum (Rocky Mountain juniper)							
2016	5	-	-	25	50	25	18.3

Table -02-09.15 - Deer Desirable Components Index: High 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	16.1	12.6	0.6	6.2	-19.6	10.0	-2.0	23.8	Very Poor
2001	11.6	8.3	1.6	6.9	-20.0	10.0	-2.0	16.4	Very Poor
2006	10.8	8.2	0.0	7.7	-2.6	10.0	-2.0	32.1	Very Poor
2011	8.3	7.5	0.0	4.9	-1.9	10.0	-2.0	26.8	Very Poor
2016	11.4	5.2	0.0	13.4	-11.1	10.0	-4.0	24.9	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 north of the east of the pull-out. 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. Note: due to the rocky terrain the 100-foot stake is actually at the 95 foot mark; adjust the tape and belts accordingly. Line 2 runs 230 degrees magnetic. Line 3 runs 220 degrees magnetic. Line 4 runs 215 degrees magnetic.

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

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

Wildlife Habitat and Vegetation History**Table 02-12.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
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	Phase I

Site Notes

No Notes

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	35.1	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 #	047XA456UT
States and Transitions	No state and transition model is available.

This plant community does not have a well defined ecological site. However, due to the presence of Utah juniper (*Juniperus osteosperma*) since 1984 the community most resembles Community Phase 4.1 found of the Mountain Big Sagebrush/ Utah Juniper Invasion State (State 4). Antelope bitterbrush (*Purshia tridentata*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) both have a reduced presence in the community with a depleted herbaceous understory indicated by elevated presence of annual brome species (*Bromus* sp.) (Table 02-12.12, Table 02-12.10). Bluebunch wheatgrass (*Pseudoroegneria spicata*) has remained on the site in significant quantities since establishment (Table 02-12.10). There has been no indication that there has been a transition in the community type. It is predicted that the site will remain in the current community type unless there is a major disturbance (USDA-NRCS, 2011).

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	5.2	1.5	-	-	-	-
2001	3.3	2.9	-	-	-	-
2006	3.6	1.5	-	6.8	3.9	-
2011	4.5	0.3	-	7.6	1.5	-
2016	2.5	0.6	-	6.7	1.8	-

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	429	272	324	82	9.6	10.3	4.4	1.8
2001	443	262	392	75	20.5	9.7	8.2	3.2
2006	356	263	351	131	8.6	14.0	8.0	5.9
2011	405	225	393	138	26.0	11.8	13.2	4.0
2016	457	208	330	94	37.6	6.2	7.8	2.9

Table 02-12.8 - 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	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

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	Elk	Rabbit
	Quadrat Frequency			
1996	-	8	6	-
2001	-	4	1	-
2006	1	11	5	4
2011	-	5	2	-
2016	-	1	1	-
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)	-	-

Table 02-12.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus arvensis ^{ai} (field brome)	Bromus briziformis ^{ai} (rattlesnake brome)	Bromus tectorum ^{ai} (cheatgrass)	Koeleria macrantha (prairie Junegrass)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency									
1996	339	11	255	13	-	4	-	-	179	170
2001	103	52	431	10	-	9	-	-	178	189
2006	51	82	313	5	3	11	2	11	132	196
2011	98	212	311	4	-	26	2	-	63	161
2016	87	149	437	12	27	42	7	2	34	123
year	Average Cover (%)									
1996	5.6	0.0	4.0	0.2	-	0.0	-	-	3.7	6.4
2001	1.2	0.4	19.0	0.1	-	0.2	-	-	2.9	6.5
2006	0.3	0.6	7.7	0.0	0.2	0.1	0.0	0.1	2.3	11.3
2011	1.4	7.5	17.0	0.2	-	0.1	0.0	-	6.1	5.4
2016	1.9	1.6	34.1	0.5	0.7	0.3	0.1	0.0	0.2	4.5

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	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum ^{ai} (desert madwort)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Buglossoides arvensis ^{ai} (corn gromwell)	Calochortus nuttallii (sego lily)	Camelina microcapa ^{ai} (littlupod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium (thistle)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)
year	Nested Frequency																
1996	-	3	20	261	-	-	1	12	-	3	-	-	14	-	5	8	1
2001	-	9	25	338	-	-	-	11	-	-	1	1	38	-	0	5	6
2006	0	33	13	246	-	1	-	7	1	6	6	-	90	-	4	28	12
2011	-	4	102	340	-	-	-	9	9	3	5	-	6	-	6	9	11
2016	1	-	42	194	2	-	0	9	3	1	-	-	-	6	2	-	-
year	Average Cover (%)																
1996	-	0.0	0.0	0.9	-	-	0.0	0.4	-	0.0	-	-	0.0	-	0.2	0.0	0.0
2001	-	0.2	0.1	4.4	-	-	-	1.6	-	-	0.0	0.0	0.1	-	0.1	0.0	0.0
2006	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
2011	-	0.0	0.6	7.3	-	-	-	1.7	0.1	0.0	0.2	-	0.0	-	0.2	0.0	0.1
2016	0.0	-	0.2	1.2	0.0	-	0.0	1.1	0.0	0.0	-	-	-	0.2	0.0	-	-

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

FORB SPECIES	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Delphinium nuttallianum (twolobe larkspur)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium aparine ^a (stickywilly)	Hackelia patens (spotted stickseed)	Holosteum umbellatum ^{ai} (jagged chickweed)	Isatis tinctoria ^{ami} (Dyer's woad)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stoneseed)	Lomatium grayi (Gray's biscuitroot)
year	Nested Frequency																
1996	17	18	-	-	-	11	2	-	3	-	10	19	5	-	3	0	4
2001	11	8	-	3	3	-	5	5	3	2	183	-	59	-	-	5	5
2006	3	12	2	-	2	51	-	49	27	3	60	0	25	10	-	6	64
2011	8	14	-	-	-	37	-	42	16	4	30	3	16	-	5	0	15
2016	7	12	-	-	1	-	-	242	5	0	-	-	21	-	-	0	10
year	Average Cover (%)																
1996	0.1	0.3	-	-	-	0.0	0.2	-	0.0	-	0.1	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	0.8	-	0.6	-	-	0.1	0.0
2006	0.0	0.3	0.0	-	0.0	0.5	-	1.4	0.0	0.0	0.2	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	0.1	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

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

FORB SPECIES	Medicago sativa ⁱ (alfalfa)	Melilotus officinalis ⁱ (sweetclover)	Microsteris gracilis ^a (slender phlox)	Oenothera (evening primrose)	Penstemon (beardtongue)	Petrorhiza pumila (rock goldenrod)	Tragopogon dubius ^{ai} (yellow safsify)	Veronica biloba ^{ai} (twolobe speedwell)
year	Nested Frequency							
1996	-	1	-	-	3	10	186	50
2001	-	-	-	-	-	11	102	65
2006	-	3	8	1	-	10	116	108
2011	0	-	2	-	-	7	158	45
2016	7	15	-	7	-	8	122	15
year	Average Cover (%)							
1996	-	0.0	-	-	0.0	0.7	2.9	0.2
2001	-	-	-	-	-	0.9	1.3	0.7
2006	-	0.0	0.0	0.0	-	1.3	3.1	0.4
2011	0.0	-	0.0	-	-	0.7	3.9	0.2
2016	0.3	0.1	-	0.1	-	0.4	1.4	0.0

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 alnifolia ^p (Saskatoon serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. hololeuca (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Purshia tridentata ^p (antelope bitterbrush)	Rosa woodsii ^p (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
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

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

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 (%)				
Amelanchier alnifolia ^p -- (Saskatoon serviceberry)									
1996	-	-	-	-	-	-	-	-	123/108
2001	-	-	-	-	-	-	-	-	116/122
2006	-	-	-	-	-	-	-	-	93/113
2011	-	-	-	-	-	-	-	-	122/120
2016	-	-	-	-	-	-	-	-	112/118
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Eriogonum heracleoides -- (parsnipflower buckwheat)									
1996	20	-	0	100	0	0	0	0	8/11
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-

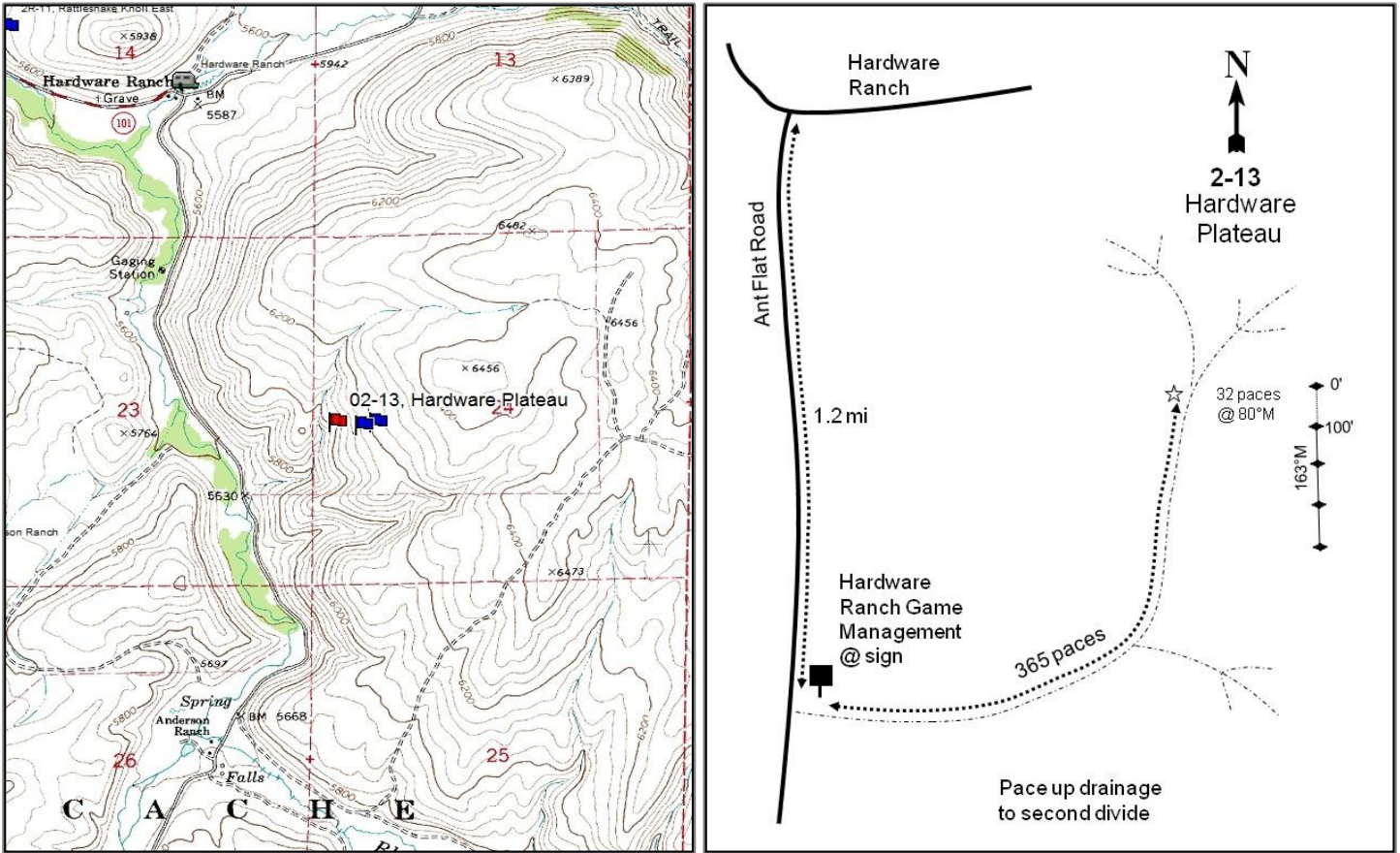
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Ericameria nauseosa ssp. nauseosa var. hololeuca -- (rubber rabbitbrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
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
Purshia tridentata^p -- (antelope bitterbrush)									
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
Rosa woodsii^p -- (Woods' rose)									
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
Sambucus racemosa^p -- (red elderberry)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	157/241
2011	-	-	-	-	-	-	-	-	153/228
2016	-	-	-	-	-	-	-	-	172/238
Symphoricarpos oreophilus -- (mountain snowberry)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	55/67
2016	-	-	-	-	-	-	-	-	75/116
Tetradymia canescens -- (spineless horsebrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	85/120

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

Table -02-12.15 - Deer Desirable Components Index: High 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	0.0	0.0	20.6	-7.2	8.4	-2.0	26.7	Very Poor
2001	4.5	0.0	0.0	19.1	-15.5	6.6	0.0	14.7	Very Poor
2006	5.1	0.0	0.0	28.0	-6.5	10.0	-2.0	34.7	Very Poor
2011	6.6	0.0	0.0	23.4	-19.6	8.8	-2.0	17.2	Very Poor
2016	3.6	0.0	0.0	11.8	-20.0	5.8	0.0	1.2	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, marked by browse tab #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

Wildlife Habitat and Vegetation History

Table 02-13.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Elk	crucial	winter	
Greater Sage Grouse	Crucial	occupied & Winter	brood-rearing
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

Site Notes

Deer carcasses were found in all sample years, except 1990 and 2011; and 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 #	047XA473UT
States and Transitions	No state and transition model is available for this ecological site.

When the study was established in 1984, the plant community was in a perennial grass/forb community type (Table 02-13.7, Photos) with a variety of browse species providing limited cover (Table 02-13.12). Over the course of the study, cheatgrass (*Bromus tectorum*) has fluctuated in abundance but has remained a major component of the plant community over the sample years. Additionally, bluebunch wheatgrass (*Pseudoroegneria spicata*) has been the dominant species on the site, but experienced a significant decrease in cover and abundance in 2016 as there was an increase in cheatgrass (Table 02-13.10, Table Table 02-13.7). Perennial forbs have remained a prominent community component and have had little fluctuation in cover and abundance (Table 02-13.7, Table 02-13.11). Since study establishment, shrubs have slowly increased in both cover and abundance over the duration of the study (Table 02- 13.12). Despite the fluctuations in these communities, it is predicted the site will remain in this state unless a major disturbance occurs.

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	2.5	3.1	-	-	-	-
2001	2.0	3.6	-	-	-	-
2006	1.2	2.6	-	3.2	5.5	-
2011	1.2	2.8	-	3.7	4.8	-
2016	3.1	3.1	-	7.1	6.8	-

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	411	236	260	205	24.4	11.5	5.7	5.7

Table 02-13.8 - 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	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	27.2	49.6

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	Elk	Horse	Rabbit
	Quadrat Frequency				
1996	-	18	7	-	-
2001	-	19	3	-	6
2006	-	8	-	-	-
2011	-	3	2	-	1
2016	1	2	-	-	3
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)	-

Table 02-13.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES									
Bromus arvensis ^{ai} (field brome)									
Bromus tectorum ^{ai} (cheatgrass)									
Koeleria macrantha (prairie Junegrass)									
Poa bulbosa ⁱ (bulbous bluegrass)									
Poa fendleriana (muttongrass)									
Poa pratensis ⁱ (Kentucky bluegrass)									
Poa secunda (Sandberg bluegrass)									
Pseudoroegneria spicata (bluebunch wheatgrass)									
Thinopyrum intermedium ⁱ (intermediate wheatgrass)									
year	Nested Frequency								
1996	11	354	-	-	4	3	225	259	-
2001	14	291	2	-	-	3	279	281	-
2006	2	193	2	-	-	72	186	304	-
2011	30	218	2	3	-	32	134	274	3
2016	56	410	-	-	-	8	54	222	7
year	Average Cover (%)								
1996	0.1	9.6	-	-	0.0	0.0	7.8	9.7	-
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	0.5	10.5	0.2

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																	
Achillea millefolium (Common yarrow)																	
Agoseris glauca (pale agoseris)																	
Alyssum desertorum ^{ai} (desert madwort)																	
Arabis (rockcress)																	
Artemisia ludoviciana (white sagebrush)																	
Balsamorhiza sagittata (arrowleaf balsamroot)																	
Calochortus nuttallii (sego lily)																	
Camelina microcarpa ^{ai} (littlupod false flax)																	
Ceratocephala testiculata ^{ai} (curvseed butterwort)																	
Cirsium undulatum ^a (wavyleaf thistle)																	
Collinsia parviflora ^a (maiden blue eyed Mary)																	
Collomia linearis ^a (tiny trumpet)																	
Comandra umbellata (bastard toadflax)																	
Crepis acuminata (tapertip hawksbeard)																	
Cryptantha ^a (annual cryptantha)																	
Cymopterus (springparsley)																	
Descurainia ^a (tansymustard)																	
year	Nested Frequency																
1996	72	-	69	9	25	27	-	-	24	5	52	-	-	29	-	2	-
2001	70	6	104	2	27	19	-	-	15	13	69	15	1	18	-	21	-
2006	51	7	39	-	23	14	-	-	126	12	52	77	-	34	-	35	-
2011	53	3	154	-	28	2	5	10	51	3	172	71	-	61	-	60	41
2016	100	8	37	-	54	17	4	5	61	4	50	28	-	47	1	15	25
year	Average Cover (%)																
1996	0.8	-	0.4	0.0	2.3	0.8	-	-	0.1	0.2	0.1	-	-	0.3	-	0.0	-
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	-
2006	1.9	0.1	0.1	-	1.0	0.7	-	-	0.5	0.3	0.1	0.2	-	1.2	-	0.4	-
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
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

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

FORB SPECIES	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium aparine ^a (stickywilly)	Hackelia patens (spotted stickseed)	Holosteum umbellatum ^{ai} (jagged chickweed)	Isatis tinctoria ^{aii} (Dyer's woad)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lomatium grayi (Gray's biscuitroot)	Lupinus argenteus (silvery lupine)	Microsteris gracilis ^a (slender phlox)	Navaretia intertexta ^a (needleleaf navaretia)	Packera multilobata (lobeleaf groundsel)	Penstemon humilis (low beardtongue)	Phacelia ^a (phacelia)
year	Nested Frequency																
1996	-	88	7	55	-	34	12	-	16	-	-	12	-	-	-	4	12
2001	25	11	-	158	-	8	187	1	19	1	1	11	4	-	-	4	11
2006	101	139	-	114	2	26	229	3	8	-	6	5	73	-	4	4	0
2011	204	135	-	26	-	3	226	7	116	184	-	6	73	4	3	2	-
2016	41	15	-	107	1	11	67	-	71	53	2	12	17	16	-	3	-
year	Average Cover (%)																
1996	-	0.9	0.3	0.7	-	0.3	0.0	-	0.0	-	-	0.3	-	-	-	0.1	0.5
2001	0.0	0.0	-	7.7	-	0.1	0.7	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	0.5	0.1	0.0	-	0.1	0.3	0.2	-	0.0	0.2	0.0
2011	1.6	1.7	-	0.1	-	0.2	2.7	0.1	0.8	1.8	-	0.2	0.5	0.0	0.0	0.2	-
2016	0.1	0.3	-	2.3	0.0	0.2	0.3	-	0.5	0.6	0.0	0.8	0.0	0.1	-	0.0	-

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

FORB SPECIES	Phlox longifolia (longleaf phlox)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Tragopogon dubius ^{ai} (yellow safsify)
year	Nested Frequency		
1996	-	12	2
2001	-	-	3
2006	2	-	3
2011	-	16	8
2016	-	4	8
year	Average Cover (%)		
1996	-	0.1	0.0
2001	-	-	0.1
2006	0.0	-	0.0
2011	-	0.3	0.2
2016	-	0.0	0.0

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 alnifolia ^p (Saskatoon serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Mahonia repens (creeping barberry)	Prunus virginiana ^p (chokecherry)	Purshia tridentata ^p (antelope bitterbrush)	Rosa woodsii ^p (Woods' rose)	Sambucus nigra ssp. cerulea ^p (blue elderberry)	Symphoricarpos oreophilus (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
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

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

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 (%)				
Amelanchier alnifolia^p -- (Saskatoon serviceberry)									
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
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Eriogonum heracleoides -- (parsnipflower buckwheat)									
1996	-	-	-	-	-	-	-	-	-/-
2001	20	-	0	100	0	0	0	0	10/17
2006	20	-	0	100	0	0	0	0	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	20/40

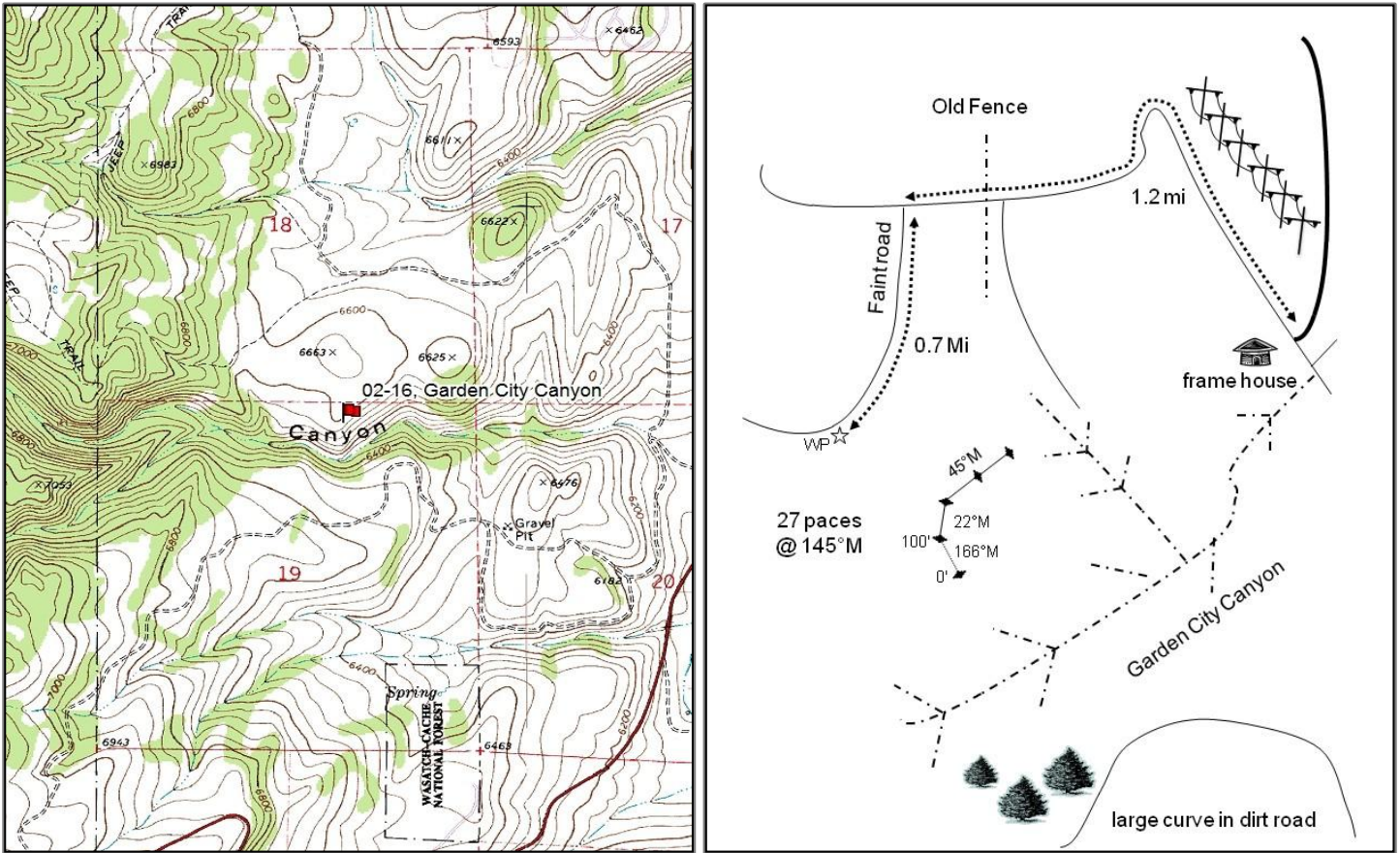
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Mahonia repens -- (creeping barberry)									
1996	980	-	16	84	0	0	0	0	10/12
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
Prunus virginiana^p -- (chokecherry)									
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
Purshia tridentata^p -- (antelope bitterbrush)									
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
Rhus glabra^p -- (smooth sumac)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	138/194
2016	-	-	-	-	-	-	-	-	-/-
Ribes^p -- (currant)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	158/182
Rosa woodsii^p -- (Woods' rose)									
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
Sambucus nigra ssp. cerulea^p -- (blue elderberry)									
1996	-	-	-	-	-	-	-	-	214/343
2001	60	-	0	100	0	0	0	0	120/176
2006	-	-	-	-	-	-	-	-	184/232
2011	-	-	-	-	-	-	-	-	124/197
2016	-	-	-	-	-	-	-	-	191/253
Symphoricarpos oreophilus -- (mountain snowberry)									
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

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

Table -02-13.15 - Deer Desirable Components Index: High 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	3.2	0.0	0.0	30.0	-7.3	10.0	0.0	35.9	Very Poor
2001	2.7	0.0	0.0	30.0	-4.5	10.0	-2.0	36.2	Very Poor
2006	1.6	0.0	0.0	30.0	-0.8	10.0	-2.0	38.8	Very Poor-Poor
2011	1.6	0.0	0.0	30.0	-3.3	10.0	-2.0	36.3	Very Poor
2016	4.3	0.0	0.0	23.0	-18.3	10.0	0.0	19.0	Very Poor

GARDEN CITY CANYON - STUDY NO. 02-16



Location Information

USGS 7.5 min Map Info Garden City NE; Township 14N, Range 5E, Section 19
 GPS (0' Stake) NAD 83 UTM ZONE 12, 464620 East 4644227 North

Transect Information

Browse Tag # (0' Stake) 7936
 Transect Bearing 166° magnetic (Line 2: 22° magnetic, Line 3-4: 45° 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 Garden City, proceed west on US-89. Turn right at 525 W. 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 for 0.7 miles; stay right at the fork to the witness post on the left 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. Azimuth of the baseline is 166 degrees magnetic. Line 2 runs 22 degrees magnetic. Line 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

Wildlife Habitat and Vegetation History

Table 02-16.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	substantial	winter
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	Curleaf Mountain Mahogany/Perennial Grass	Phase I
1990	Curleaf Mountain Mahogany/Perennial Grass	Phase I
1996	Curleaf Mountain Mahogany/Perennial Grass	Phase I
2001	Curleaf Mountain Mahogany/Perennial Grass	Phase I
2006	Curleaf Mountain Mahogany/Perennial Grass	Phase I
2011	Curleaf Mountain Mahogany/Perennial Grass	Phase I
2016	Curleaf Mountain Mahogany/Perennial Grass	Phase I

Site Notes

A deer carcass was seen on the site in 2011.

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	39.1	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 (Curleaf Mountain Mahogany)
NRCS Ecological Site #	047XA440UT
States and Transitions	A defined state and transition model is available.

Since site establishment in 1984, this site has remained in Community Phase 2.1 in the Curleaf Mountain Mahogany/ Introduced Non-natives State (State 2). This community phase is characterized by the presence of low statured curleaf mountain mahogany along with a smattering of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) in the understory. Additionally, the native perennial grass bluebunch wheatgrass (*Pseudoroegneria spicata*) is a dominant component of the understory (Table 02-16.10, Table 02-16.13) with the additional presence of introduced species. The invasive annual grass cheatgrass (*Bromus tectorum*) has been sampled each year, but has varied greatly in its abundance (Table 02-16.10). If heavy grazing and subsequent decrease of herbaceous vegetation were to occur in the future, it could cause this site to transition (Transition T2a) into the Tall Dense Curl-leaf Mountain Mahogany State (State 3) (USDA-NRCS, 2011).

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	12.5	2.1	0.9	-	-	-
2001	13.1	4.2	1.0	1.3	-	0.1
2006	10.7	2.7	1.4	28.6	4.0	2.3
2011	9.9	2.9	0.4	31.1	4.4	1.0
2016	8.9	3.3	2.2	24.9	4.8	2.7

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

Table 02-16.8 - 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	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	54.0	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

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	Elk	Moose	Rabbit
	Quadrat Frequency			
1996	19	25	-	6
2001	36	10	-	8
2006	36	29	-	3
2011	23	10	-	4
2016	9	14	-	5
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)	-

Table 02-16.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Bromus arvensis ^{ai} (field brome)	Bromus briziformis ^{ai} (rattlesnake brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Koeleria macrantha (prairie Junegrass)	Melica bulbosa (oniongrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (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
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

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 ^{ai} (desert madwort)	Arabis (rockcress)	Balsamorhiza sagittata (arrowleaf balsamroot)	Camelina microcarpa ^{ai} (littledod false flax)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cryptantha ^a (annual cryptantha)	Descurainia pinnata ^a (western tansymustard)	Draba verna ^{ai} (spring draba)	Epilobium brachycarpum ^a (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	-
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	-

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

FORB SPECIES																
Erodium cicutarium ^{ai} (redstem stork's bill)																
Galium aparine ^a (stickywilly)																
Gayophytum ramosissimum ^a (pinyon groundsmoke)																
Gilia ^a (gilia)																
Holosteum umbellatum ^{ai} (jagged chickweed)																
Lactuca serriola ^{ai} (prickly lettuce)																
Lappula occidentalis ^a (flatspine stickseed)																
Microsteris gracilis ^a (slender phlox)																
Pedicularis centranthera (dwarf lousewort)																
Petradoria pumila (rock goldenrod)																
Phlox longifolia (longleaf phlox)																
Polygonum douglasii ^a (Douglas' knotweed)																
Sisymbrium altissimum ^{ai} (tall tumbledustard)																
Tragopogon dubius ^{ai} (yellow salsify)																
Wyethia amplexicaulis (mule-ears)																
year	Nested Frequency															
1996	-	-	1	-	-	-	2	-	-	1	-	3	3	7	4	
2001	9	-	-	-	1	-	1	69	-	0	1	2	0	8	-	
2006	4	-	47	-	6	-	17	71	-	-	17	-	-	3	-	
2011	3	7	8	7	19	6	53	27	1	0	-	22	8	0	-	
2016	6	1	-	-	17	5	-	2	-	-	-	13	4	-	-	
year	Average Cover (%)															
1996	-	-	0.0	-	-	-	0.0	-	-	0.0	-	0.0	0.0	0.0	0.0	
2001	0.1	-	-	-	0.0	-	0.0	0.2	-	0.0	0.0	0.0	0.0	0.1	-	
2006	0.1	-	0.2	-	0.0	-	0.0	0.2	-	-	0.0	-	-	0.0	-	
2011	0.0	0.0	0.0	0.0	0.1	0.0	0.3	0.1	0.0	0.0	-	0.1	0.2	0.0	-	
2016	0.0	0.0	-	-	0.2	0.0	-	0.0	-	-	-	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 alnifolia ^p (Saskatoon serviceberry)													
Artemisia arbuscula ^p (little sagebrush)													
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)													
Cercocarpus ledifolius var. ledifolius ^p (curl-leaf mountain mahogany)													
Eriogonum heracleoides (parsnipflower buckwheat)													
Eriogonum microthecum ^p (slender buckwheat)													
Juniperus scopulorum ⁱ (Rocky Mountain juniper)													
Mahonia repens (creeping barberry)													
Opuntia polyacantha (plains pricklypear)													
Paxistima myrsinites (Oregon boxleaf)													
Purshia tridentata ^p (antelope bitterbrush)													
Symphoricarpos oreophilus (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	
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	

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

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 (%)				
Amelanchier alnifolia^P -- (Saskatoon serviceberry)									
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
Artemisia arbuscula^P -- (little sagebrush)									
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
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
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
Brickellia -- (brickellbush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	99/170
Cercocarpus ledifolius var. ledifolius^P -- (curl-leaf mountain mahogany)									
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	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	46/133
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	25/67
Eriogonum heracleoides -- (parsnipflower buckwheat)									
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
Eriogonum microthecum^P -- (slender buckwheat)									
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	-	-	-	-	-	-	-	-	-/-
Mahonia repens -- (creeping barberry)									
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

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 (%)				
Opuntia polyacantha -- (plains pricklypear)									
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
Paxistima myrsinites -- (Oregon boxleaf)									
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
Purshia tridentata^p -- (antelope bitterbrush)									
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
Ribes^p -- (currant)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	36/198
2016	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus -- (mountain snowberry)									
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

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

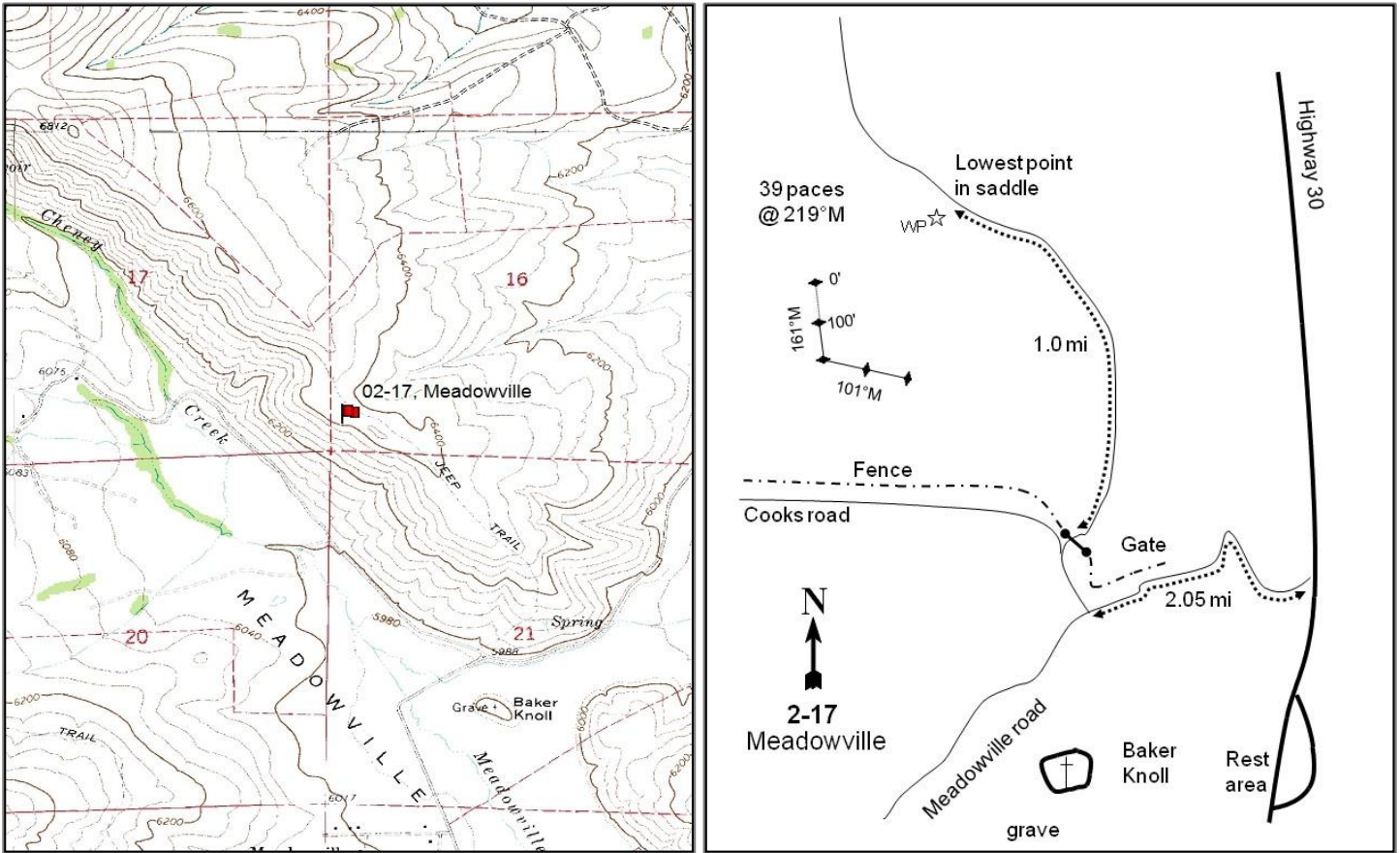
Table 02-16.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Cercocarpus ledifolius var. ledifolius (curl-leaf mountain mahogany)							
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
Juniperus scopulorum (Rocky Mountain juniper)							
1996	10	-	-	-	-	-	19.7
2016	10	-	17	17	-	67	21.0

Table -02-16.15 - Deer Desirable Components Index: High 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	17.0	10.6	2.9	21.1	-15.1	1.6	0.0	38.0	Very Poor-Poor
2001	17.2	9.2	1.8	30.0	-1.8	3.2	0.0	59.5	Fair
2006	14.2	7.8	0.0	29.8	-2.0	2.1	0.0	51.9	Poor
2011	12.9	7.6	1.3	30.0	-4.3	2.3	0.0	49.8	Poor
2016	11.5	13.0	1.6	30.0	-11.9	2.4	0.0	46.6	Poor

MEADOWVILLE - STUDY NO. 02-17



Location Information

USGS 7.5 min Map Info Meadowville NE; Township 13N, Range 5E, Section 16
 GPS (0' Stake) NAD 83 UTM ZONE 12, 466750 East 4634613 North

Transect Information

Browse Tag # (0' Stake) 7939
 Transect Bearing 161° magnetic (Line 3-4: 101° magnetic)
 Length 400ft
 Belt Placement Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
 Belt Marker Placement Standard, Belt 3: 6ft

Directions to Site

At the intersection of Highway 30 and Meadowville Road, turn west on Meadowville Road and proceed 2.05 miles. Turn right (north) onto Cook's Road and turn immediately right 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 of the baseline is marked by browse tag # 7939. The 0-foot state is also approximately 75 yards form a fence to the west. The base line runs 161 degrees magnetic. Line 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

Wildlife Habitat and Vegetation History

Table 02-17.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Elk	substantial	winter	
Greater Sage Grouse	Crucial	occupied	brood-rearing
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/Mountain Big Sagebrush	No Encroachment
2011	Perennial Grass/Mountain Big Sagebrush	No Encroachment
2016	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	34.1	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 #	047XA430UT
States and Transitions	A defined state and transition model is available.

When established in 1984, the site was characterized to be in community phase 2.1 in the Mountain Big Sagebrush Steppe/Non-natives State (State 2) due to a prominent stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) (Table 02-17.12, Table 02-17.13). Native perennial grass species are consistently a major component of the herbaceous understory; However, the invasive annual grass cheatgrass (*Bromus tectorum*) is the dominant species in the understory most sample years (Table 02-17.7, Table 02-17.10). Over time and through no currently described transitional pathway both yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) and spineless horsebrush (*Tetradymia canescens*) have increased in abundance with a reciprocated decrease in mountain big sagebrush. However, other mountain browse species have increased in cover (02-17.12). This dynamic indicates that the site may be in transition to community phase 5.1 of the Yellow Rabbitbrush/Spineless Horsebrush State (State 5). With persistent grazing and a lack of disturbance affecting shrubs, the site may transition to the Mountain Big Sagebrush/Snowberry State (State 6), which lacks valuable forbs for wildlife use (USDA-NRCS, 2011).

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	-

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

Table 02-17.8 - 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	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

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	Elk	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
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)	-

Table 02-17.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency							
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
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

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	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Astragalus (milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza sagittata (arrow/leaf balsamroot)	Camelina microcarpa ^{ai} (littlupod false flax)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)
year	Nested Frequency																
1996	5	-	-	355	-	36	5	2	4	-	5	-	27	3	-	-	-
2001	6	-	-	343	-	18	13	2	-	-	-	-	21	9	10	11	8
2006	8	22	-	205	5	13	15	5	3	-	4	1	6	16	-	2	10
2011	6	8	1	382	-	20	16	2	-	-	2	-	5	2	-	9	2
2016	4	-	-	352	3	42	17	-	-	3	-	-	1	-	-	4	-
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
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
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
2016	0.0	-	-	4.6	0.0	0.4	1.4	-	-	0.0	-	-	0.0	-	-	0.1	-

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

FORB SPECIES	Descuraimia pinnata ^a (western tansymustard)	Draba ^a (draba)	Erodium cicutarium ^{ai} (redstem stork's bill)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serricola ^{ai} (prickly lettuce)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stoneseed)	Lomatium (desertparsley)	Microsteris gracilis ^a (slender phlox)	Navarretia intertexta ^a (needleleaf navarretia)	Oenothera (evening primrose)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Sisymbrium altissimum ^{ai} (tall tumbledustard)	Tragopogon dubius ^{ai} (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
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	3	2	20	-	7	-	-	10	23	-	12	52	12
2011	2	-	-	-	3	3	27	0	-	1	-	7	10	-	11	26	-
2016	1	-	85	-	-	-	17	-	-	-	-	7	17	-	5	1	-
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	0.0	1.1	-	0.0	-	-	0.3	0.3	-	0.5	0.4	0.1
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	-

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 alnifolia ^p (Saskatoon serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Eriogonum microthecum ^p (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Opuntia polyacantha (plains pricklypear)	Purshia tridentata ^p (antelope bitterbrush)	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
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

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

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 (%)				
Amelanchier alnifolia^P -- (Saskatoon serviceberry)									
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
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Eriogonum microthecum^P -- (slender buckwheat)									
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
Ericameria nauseosa -- (rubber rabbitbrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	37/39
Gutierrezia sarothrae -- (broom snakeweed)									
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
Opuntia polyacantha -- (plains pricklypear)									
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
Purshia tridentata^P -- (antelope bitterbrush)									
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
Symphoricarpos oreophilus -- (mountain snowberry)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	86/183
2016	-	-	-	-	-	-	-	-	-/-

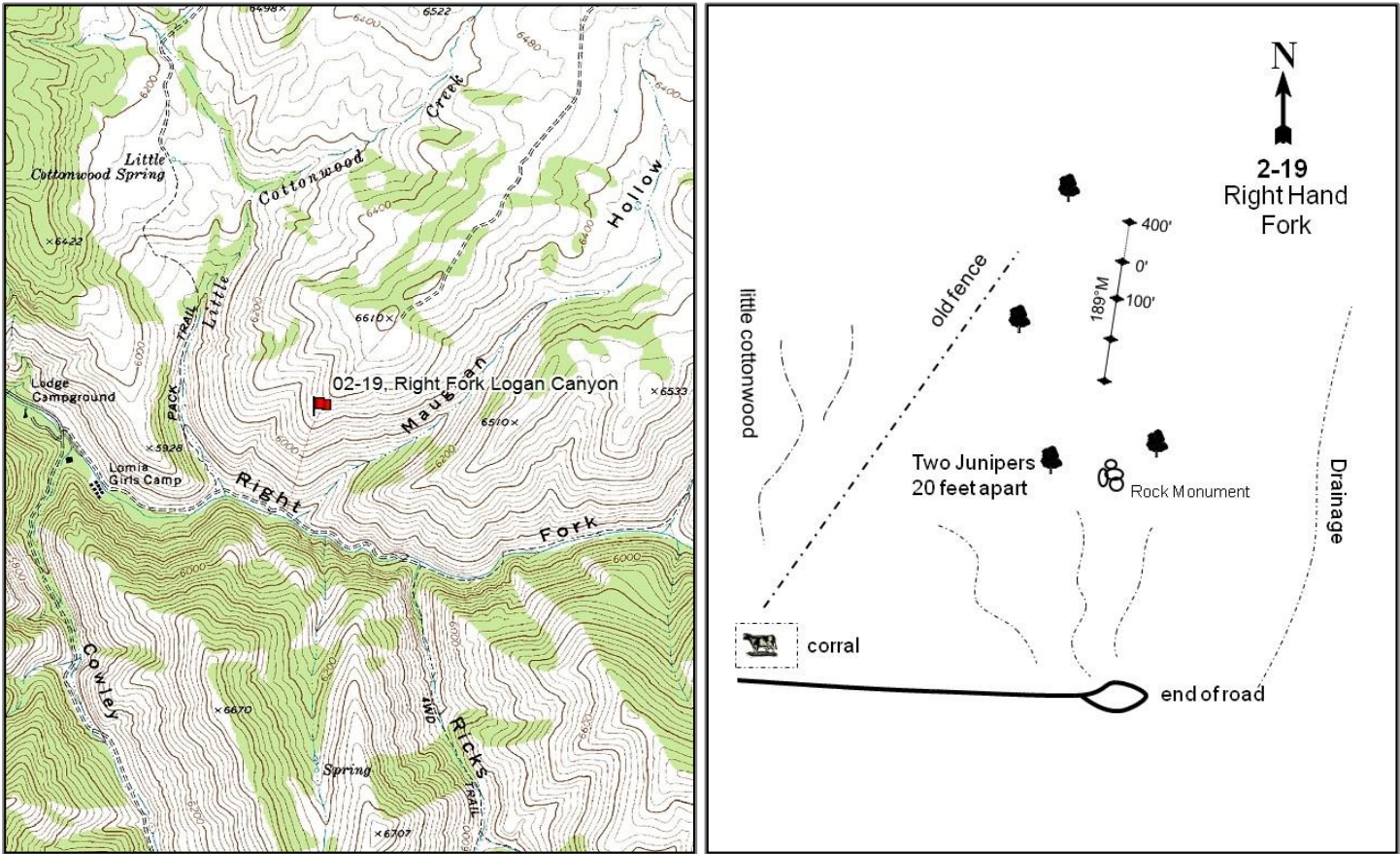
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Tetradymia canescens -- (spineless horsebrush)									
1996	600	-	17	73	10	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

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

Table -02-17.15 - Deer Desirable Components Index: High 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	7.5	0.0	0.0	23.8	-14.7	6.2	0.0	22.7	Very Poor
2001	5.9	0.0	0.0	28.5	-5.1	7.6	0.0	36.9	Very Poor
2006	4.2	0.0	0.0	30.0	-6.1	7.8	0.0	35.8	Very Poor
2011	7.0	0.0	0.0	17.1	-17.5	6.0	0.0	12.5	Very Poor
2016	13.0	15.0	4.2	18.0	-17.5	5.8	0.0	38.6	Very Poor-Poor

RIGHT FORK LOGAN CANYON - STUDY NO. 02-19



Location Information

USGS 7.5 min Map Info Temple Peak SW; Township 12N, Range 3E, Section 16
 GPS (0' Stake) NAD 83 UTM ZONE 12, 449532 East 4625350 North

Transect Information

Browse Tag # (0' Stake) Not Available
 Transect Bearing 189° magnetic (Line 4: 9° magnetic [Off 0-Stake])
 Length 400ft
 Belt Placement Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)
 Belt Marker Placement Standard, Belt 1: 8ft, Belt 3: 1ft, Belt 5: No Rebar

Directions to Site

Drive up the Right Fork of Logan Canyon. Bear left at the girls' camp. Go 0.6 miles to the end of the road just past the corral. 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 9 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

Wildlife Habitat and Vegetation History

Table 02-19.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
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

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 #	047XA456UT
States and Transitions	A defined state and transition model is available.

Since study establishment 1984, the plant community has remained in the Community Phase 2.1 Antelope Bitterbrush/Rich and Productive Native Perennial Herbaceous Understory within the Antelope Bitterbrush/Introduced Non-natives State (State 2). Antelope bitterbrush (*Purshia tridentata*), bluebunch wheatgrass (*Pseudoroegneria spicata*), and the introduced perennial grass bulbous bluegrass (*Poa bulbosa*) are the main components that comprise this ecological site type (Table 02-19.9, Table 02-19.12). The invasive annual grass cheatgrass (*Bromus tectorum*) has been highly variable in both cover and abundance over the sample years (Table 02-19.9, Table 02-19.12). There is no indication that there has been a transition from one community phase or state to another. It is predicted that the site will remain in the current community phase unless there is a major disturbance (USDA-NRCS, 2011).

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	2.9	2.7	-	-	-	-
2001	3.9	3.6	-	-	-	-
2006	5.1	2.3	-	9.1	3.0	-
2011	2.9	2.4	-	6.4	3.4	-
2016	3.8	2.8	-	6.9	4.3	-

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	28.5	1.0	8.8
2001	111	440	304	248	1.5	21.3	3.0	8.9
2006	109	360	55	235	0.7	25.2	0.2	9.9
2011	108	355	205	253	0.6	25.7	1.5	12.7
2016	345	396	380	294	12.5	27.2	5.3	13.5

Table 02-19.8 - 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	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	12.1	3.8	17.4	4.0	19.7	41.7
2011	4.8	0.9	13.6	4.4	15.5	47.2
2016	11.3	9.1	19.6	4.3	18.7	50.1

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	Elk	Rabbit
	Quadrat Frequency			
1996	1	22	47	-
2001	-	22	53	-
2006	1	18	55	-
2011	-	8	40	-
2016	-	26	49	1
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)	-

Table 02-19.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus arvensis ^{ai} (field brome)	Bromus briziformis ^{ai} (rattlesnake brome)	Bromus tectorum ^{ai} (cheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency						
1996	-	16	165	411	-	10	261
2001	-	30	89	419	4	38	197
2006	-	37	92	347	6	27	191
2011	-	100	8	338	-	3	172
2016	1	209	267	372	0	5	207
year	Average Cover (%)						
1996	-	0.2	1.1	17.8	-	0.1	10.6
2001	-	0.5	0.9	14.8	0.1	0.3	6.0
2006	-	0.1	0.6	17.9	0.1	0.2	7.0
2011	-	0.5	0.1	20.5	-	0.0	5.2
2016	0.0	3.4	9.2	20.8	0.0	0.0	6.4

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	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littledod false flax)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cymopterus (springparsley)	Descurainia pinnata ^a (western tansymustard)	Epilobium brachycarpum ^a (tall annual willowherb)	Erodium cicutarium ^{ai} (redstem stork's bill)
year	Nested Frequency																
1996	-	-	200	2	1	-	-	0	1	7	3	5	30	225	2	7	4
2001	1	-	295	3	0	-	-	-	1	-	-	8	46	231	-	-	-
2006	5	3	37	6	7	-	-	-	2	-	-	7	34	225	-	-	-
2011	10	28	157	1	3	2	3	-	-	44	7	9	38	239	-	-	6
2016	4	2	347	1	10	-	-	-	3	1	6	5	50	279	-	-	-
year	Average Cover (%)																
1996	-	-	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
2001	0.0	-	2.1	0.1	0.4	-	-	-	0.0	-	-	0.2	0.8	7.3	-	-	-
2006	0.0	0.0	0.1	0.1	0.4	-	-	-	0.0	-	-	0.1	0.7	8.5	-	-	-
2011	0.0	0.1	0.5	0.0	0.0	0.0	0.0	-	-	0.2	0.0	0.2	0.7	11.4	-	-	0.0
2016	0.0	0.0	3.3	0.0	1.6	-	-	-	0.0	0.0	0.0	0.2	1.0	10.6	-	-	-

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

FORB SPECIES	Hackelia patens (spotted stickseed)	Holosteum umbellatum ^{ai} (jagged chickweed)	Isatis tinctoria ^{mi} (Dyer's woad)	Lactuca serrifolia ^{ai} (prickly lettuce)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis ^a (slender phlox)	Penstemon humilis (low beardtongue)	Petroradia pumila (rock goldenrod)	Phacelia ^a (phacelia)	Phlox longifolia (longleaf phlox)	Sisymbrium altissimum ^{ai} (tall tumbled mustard)	Symphotrichum ascendens (western aster)	Tragopogon dubius ^{ai} (yellow salsify)	Veronica biloba ^{ai} (twolobe speedwell)
year	Nested Frequency													
1996	-	-	-	4	2	-	17	-	2	-	-	4	49	4
2001	2	-	-	15	3	-	8	-	-	1	16	-	42	-
2006	-	-	0	4	-	1	8	-	-	-	3	5	12	3
2011	-	1	-	23	-	-	8	-	-	-	2	-	43	7
2016	-	-	-	41	-	-	5	2	-	-	2	6	162	9
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	-	0.6	0.0
2016	-	-	-	0.2	-	-	0.1	0.0	-	-	0.0	0.0	1.8	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 alnifolia ^p (Saskatoon serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Mahonia repens (creeping barberry)	Purshia tridentata ^p (antelope bitterbrush)	Sambucus nigra ssp. cerulea ^p (blue elderberry)	Symphoricarpos oreophilus (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
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	4.3	0.6	1.9
2011	0.0	0.1	0.2	0.1	2.1	0.6	2.0
2016	0.4	0.1	0.5	0.4	2.8	0.5	1.9

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

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 (%)				
Amelanchier alnifolia^p -- (Saskatoon serviceberry)									
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	68/73
2016	40	-	0	100	0	0	50	50	77/78
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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	73/120
2011	60	-	0	67	33	33	0	67	61/85
2016	40	-	0	100	0	0	50	0	79/123
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
1996	340	-	12	88	0	0	0	0	37/64
2001	400	-	10	80	10	5	0	0	36/55
2006	220	-	0	100	0	0	0	0	31/53
2011	280	-	0	100	0	0	0	0	32/46
2016	340	-	0	100	0	0	0	0	32/46
Mahonia repens -- (creeping barberry)									
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
Purshia tridentata^p -- (antelope bitterbrush)									
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	107/174
2011	280	-	0	50	50	43	43	14	89/145
2016	240	-	0	100	0	42	33	0	106/171
Ribes^p -- (currant)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	110/235
2016	-	-	-	-	-	-	-	-	-/-
Sambucus nigra ssp. cerulea^p -- (blue elderberry)									
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	83/87
2016	20	-	0	100	0	0	0	0	132/185
Symphoricarpos oreophilus -- (mountain snowberry)									
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	69/116
2011	160	-	0	100	0	25	0	0	72/119
2016	240	-	0	100	0	0	0	50	65/100
Tetradymia canescens -- (spineless horsebrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	33/68

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

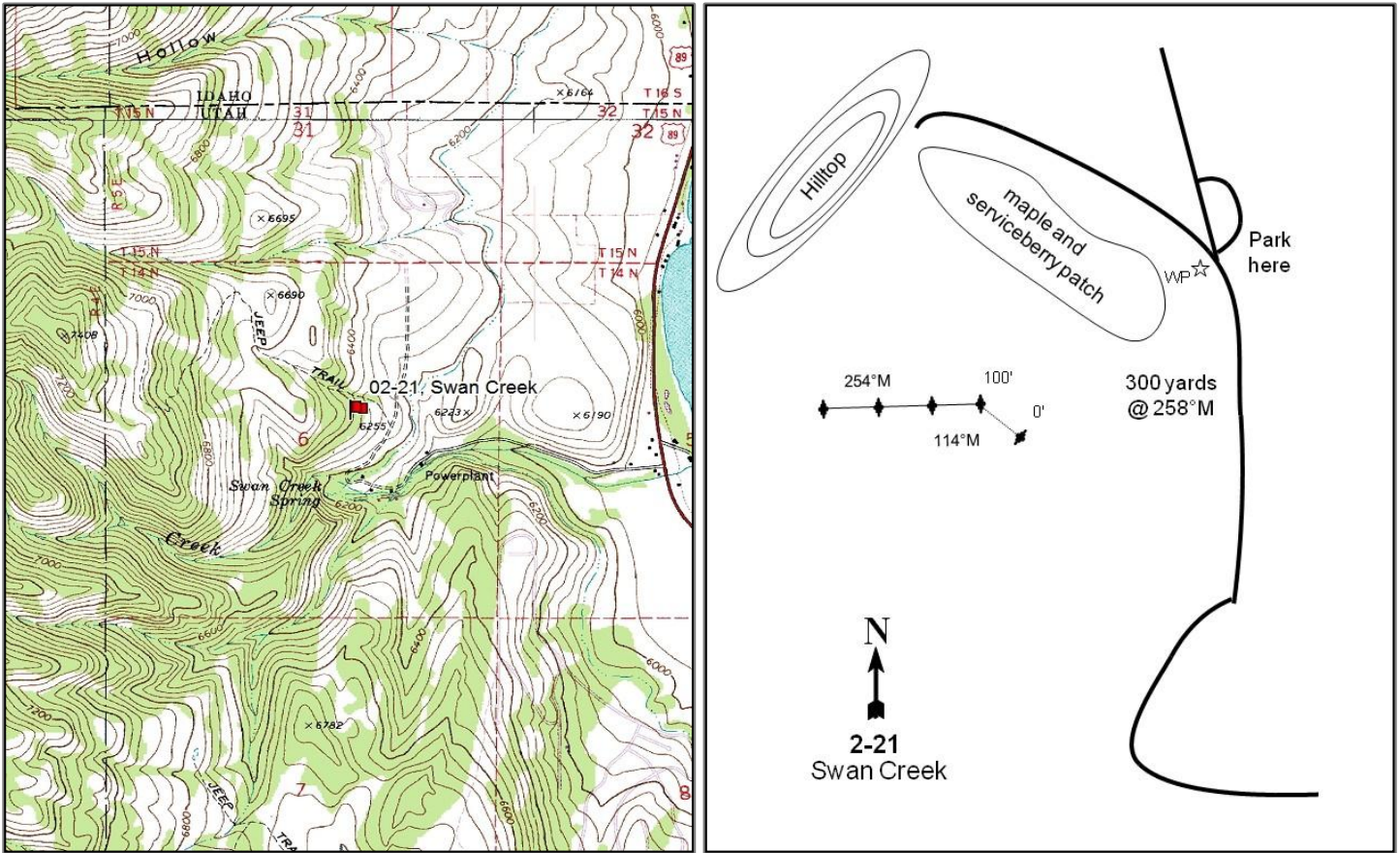
Table 02-19.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus scopulorum (Rocky Mountain juniper)							
2016	13	-	-	33	33	33	35.3

Table -02-19.15 - Deer Desirable Components Index: High 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	4.4	0.0	0.0	21.4	-1.0	10.0	0.0	34.8	Very Poor
2001	5.7	0.0	0.0	13.0	-1.1	10.0	0.0	27.6	Very Poor
2006	7.6	0.0	0.0	14.5	-0.5	10.0	-2.0	29.7	Very Poor
2011	4.3	0.0	0.0	10.4	-0.4	10.0	0.0	24.3	Very Poor
2016	5.7	0.0	0.0	12.8	-9.4	10.0	0.0	19.1	Very Poor

SWAN CREEK - STUDY NO. 02-21



Location Information

USGS 7.5 min Map Info Garden City NE; Township 14N, Range 5E, Section 06
 GPS (0' Stake) NAD 83 UTM ZONE 12, 464642 East 4648468 North

Transect Information

Browse Tag # (0' Stake) 97
 Transect Bearing 114° magnetic (Line 2-4: 254° magnetic)
 Length 400ft
 Belt Placement Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)
 Belt Marker Placement Standard, Belt 1: 5ft, Belt 2: 5ft, Belt 4: No Rebar

Directions to Site

Drive approximately 3.0 miles north of Garden City on US 89. Turn left on 2150 North in Lakota (1 mile south of 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, before the pump house, turn right and go 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 0-foot baseline stake is 100 feet to the northwest. The rest of the baseline runs 254 degrees magnetic off the 0-foot baseline stake. The study site is in the mahogany grove. The 0-foot baseline stake is marked by browse tag #97.

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

Wildlife Habitat and Vegetation History

Table 02-21.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	substantial	winter
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	No Encroachment
1996	Annual Grass	No Encroachment
2001	Perennial Grass	No Encroachment
2006	Perennial Grass	No Encroachment
2011	Perennial Grass	No Encroachment
2016	Perennial Grass	No Encroachment

Site Notes

No Notes

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	38.1	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 (Curlleaf Mountain Mahogany)
NRCS Ecological Site #	047XA440UT
States and Transitions	A defined state and transition model is available.

Since site establishment in 1990, this site has remained in Community Phase 2.1 in the Curl-leaf Mountain Mahogany/ Introduced Non-natives State (State 2). This community phase is characterized by the presence of low statured curlleaf mountain mahogany (*Cercocarpus ledifolius* var. *ledifolius*) along with a sparse amount of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) in the understory. Additionally, the native perennial grass bluebunch wheatgrass (*Pseudoroegneria spicata*) is a dominant component of the understory (Table 02-21.10, Table 02-21.13) with the additional presence of introduced species. The introduced perennial grass bulbous bluegrass (*Poa bulbosa*) has steadily increased in both cover and frequency over the sample years. Additionally, the invasive annual grass cheatgrass (*Bromus tectorum*) has been sampled each year, but has varied greatly in its abundance (Table 02-21.10). If heavy grazing and subsequent decrease of herbaceous vegetation were to occur in the future, it could cause this site to transition (Transition T2a) into the Tall Dense Curlleaf Mountain Mahogany State (State 3) (USDA-NRCS, 2011).

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	6.3	2.9	-	-	-	-
2001	4.9	5.2	-	1.8	-	-
2006	4.6	4.0	-	22.8	4.2	-
2011	4.4	5.4	-	25.8	6.5	-
2016	3.3	8.2	-	31.3	14.2	-

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

Table 02-21.8 - 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	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

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	Elk	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
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)	-

Table 02-21.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Koeleria macrantha (prairie Junegrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency								
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
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

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	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Alyssum desertorum ^{ai} (desert madwort)	Balsamorhiza sagittata (arrowleaf balsamroot)	Buglossoides arvensis ^{ai} (corn gromwell)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littlupod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Delphinium nuttallianum (two-lobed larkspur)	Descurainia pinnata ^a (western tansymustard)
year	Nested Frequency																
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	-	-
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	-	-

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

FORB SPECIES	Draba ^a (draba)	Epilobium brachycarpum ^a (all annual willowherb)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Hackelia patens (spotted stickseed)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis ^a (slender phlox)	Penstemon (beardtongue)	Penstemon humilis (low beardtongue)	Petradoria pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Tragopogon dubius ^{ai} (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	5	1	2	10	6	42	4	15	51	13	-	31
2016	-	-	-	-	14	-	1	-	3	-	16	-	8	64	-	-	61
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	0.0	0.1	0.0	0.1	0.0	0.1	4.3	0.1	-	0.5
2016	-	-	-	-	0.3	-	0.0	-	0.0	-	0.0	-	0.1	3.7	-	-	0.4

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

FORB SPECIES	Veronica biloba ^{ai} (two-lobed speedwell)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency	
1996	11	-
2001	6	5
2006	10	8
2011	10	4
2016	5	4
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

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 alnifolia ^p (Saskatoon serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Cercocarpus ledifolius var. ledifolius ^p (curl-leaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Eriogonum microthecum ^p (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Purshia tridentata ^p (antelope bitterbrush)	Symphoricarpos oreophilus (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	1.1	0.7	7.9	1.8	0.3	3.4
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

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

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 (%)				
Amelanchier alnifolia ^p -- (Saskatoon serviceberry)									
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
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
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
Cercocarpus ledifolius var. ledifolius ^p -- (curl-leaf mountain mahogany)									
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	-/-
Cercocarpus montanus ^p -- (alderleaf mountain mahogany)									
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	-	-	-	-	-	-	-	-	-/-

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 (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Eriogonum microthecum^P -- (slender buckwheat)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
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
Mahonia repens -- (creeping barberry)									
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
Purshia tridentata^P -- (antelope bitterbrush)									
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
Symphoricarpos oreophilus -- (mountain snowberry)									
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

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

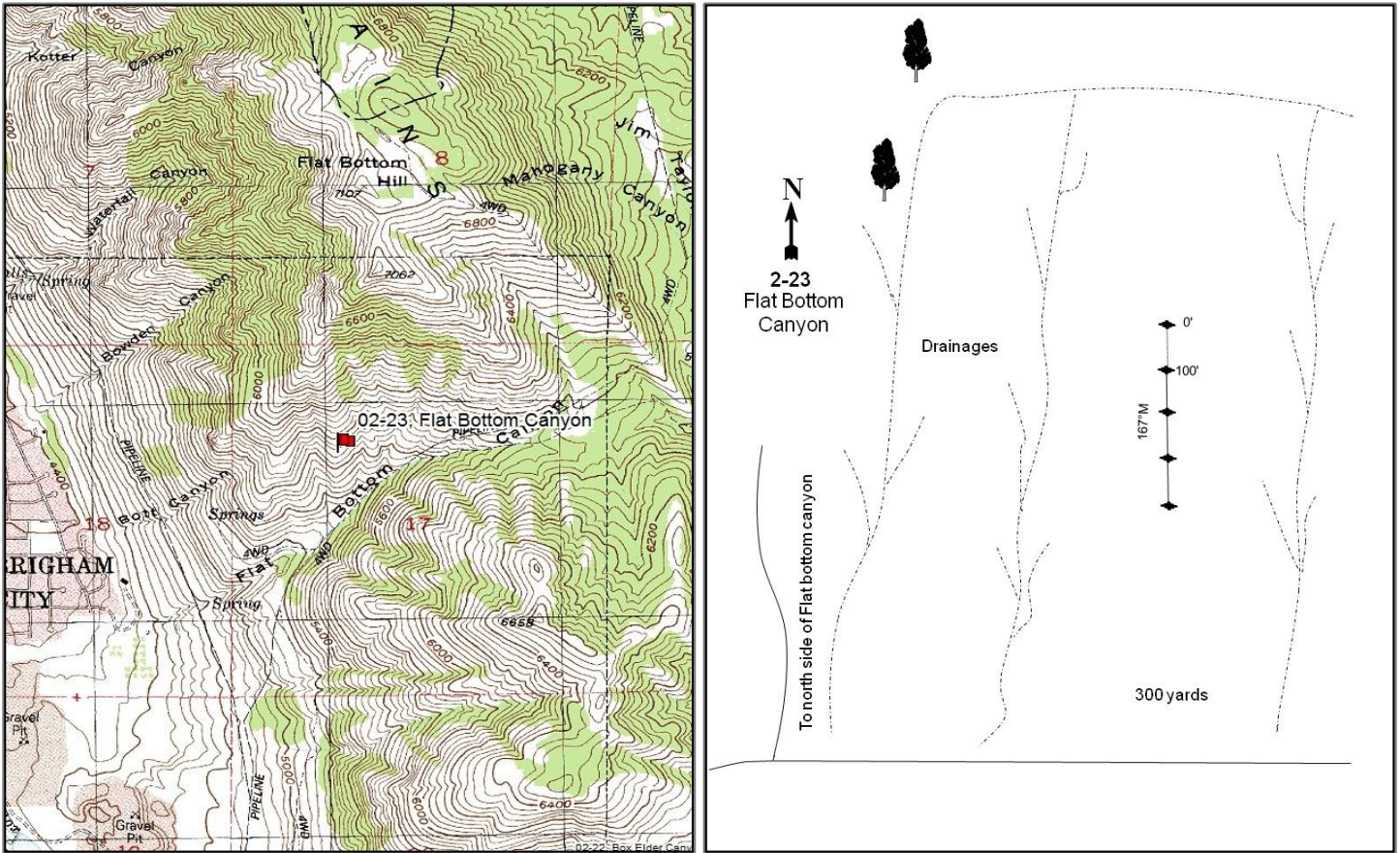
Table 02-21.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Cercocarpus ledifolius var. 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: High 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	9.2	0.0	0.0	16.9	-10.4	10.0	0.0	25.7	Very Poor
2001	7.2	0.0	0.0	22.5	-1.0	10.0	0.0	38.7	Very Poor-Poor
2006	6.2	0.0	0.0	28.3	-1.6	10.0	0.0	42.9	Poor
2011	6.1	0.0	0.0	29.7	-3.9	10.0	0.0	41.9	Very Poor-Poor
2016	5.0	0.0	0.0	24.8	-4.0	10.0	0.0	35.9	Very Poor

FLAT BOTTOM CANYON - STUDY No. 02-23



Location Information

USGS 7.5 min Map Info	Mount Pisgah SW; Township 9N, Range 1W, Section 17
GPS (0' Stake)	NAD 83 UTM ZONE 12, 417992 East 4596973 North

Transect Information

Browse Tag # (0' Stake)	7919
Transect Bearing	167° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard, Belt 5:1ft

Directions to Site

Ask for permission and directions to the mouth of the canyon at the Bingham sand and gravel pit. Four-wheel drive is needed. From mouth of 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. The 0-foot stake is marked with browse tag #7919. This site can be reached by following aqueduct road in Box Elder Canyon and 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

Wildlife Habitat and Vegetation History

Table 02-23.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
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
2016	Perennial Grass	No Encroachment
2016	Perennial Grass	No Encroachment

Site Notes

No Notes

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 #	047XA446UT
States and Transitions	A defined state and transition model is available.

Since site establishment in 1984, this site has remained in Community Phase 4.1 in the Perennial Grass State (State 4), and is characterized by the dominant presence of the perennial grass species bluebunch wheatgrass (*Pseudoroegneria spicata*) and Sandberg bluegrass (*Poa secunda*). The introduced perennial grass bulbous bluegrass (*Poa bulbosa*) has steadily increased in abundance since it was first observed in 1996 (Table 02-23.10). The invasive annual grass species cheatgrass (*Bromus tectorum*) has been observed on the site and has varied greatly in abundance over the sample years (Table 02-23.10). Without a disturbance such as a wildfire (Restoration Pathway R4a), it is predicted that this site will continue to remain in this phase (USDA-NRCS, 2011).

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	0.2	2.0	-	-	-	-
2001	0.0	5.8	-	-	-	-
2006	0.0	-	-	0.4	-	-
2011	0.1	0.1	-	-	-	-
2016	0.8	0.2	-	1.0	0.1	-

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	485	210	256	202	17.5	6.3	2.2	5.4
2001	403	290	407	127	7.6	12.1	7.6	2.3
2006	423	371	388	158	8.7	19.9	4.6	5.2
2011	427	411	188	128	13.7	25.3	1.2	4.0
2016	307	417	282	219	7.2	34.7	6.6	8.5

Table 02-23.8 - 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	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

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	Elk	Rabbit
	Quadrat Frequency		
1996	7	-	-
2001	5	-	-
2006	8	-	-
2011	5	-	-
2016	1	2	1
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)	-	-

Table 02-23.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES								
Aristida purpurea (purple threawn)								
Bromus arvensis ^{ai} (field brome)								
Bromus briziformis ^{ai} (rattlesnake brome)								
Bromus tectorum ^{ai} (cheatgrass)								
Poa bulbosa ⁱ (bulbous bluegrass)								
Poa secunda (Sandberg bluegrass)								
Pseudoroegneria spicata (bluebunch wheatgrass)								
Taeniatherum caput-medusae ^{ai} (medusahead)								
year	Nested Frequency							
1996	51	-	167	484	11	74	138	-
2001	90	4	73	396	48	202	125	-
2006	94	-	18	421	247	159	134	-
2011	93	-	15	427	224	200	141	-
2016	311	-	10	304	212	70	144	1
year	Average Cover (%)							
1996	1.2	-	1.0	16.5	0.0	1.0	4.1	-
2001	2.6	0.0	0.2	7.4	0.8	4.1	4.7	-
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	-
2016	17.9	-	0.0	7.2	7.2	3.5	6.0	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 ^{ai} (desert madwort)																	
Ambrosia psilostachya (Cuman ragweed)																	
Artemisia ludoviciana (white sagebrush)																	
Astragalus convallarius (lesser rushy milkvetch)																	
Astragalus utahensis (Utah milkvetch)																	
Collinsia parviflora ^a (maiden blue eyed Mary)																	
Cymopterus (springparsley)																	
Draba ^a (draba)																	
Epilobium brachycarpum ^a (tall annual willowherb)																	
Erigeron (fleabane)																	
Eriogonum umbellatum (sulphur-flower buckwheat)																	
Erodium cicutarium ^{ai} (redstem stork's bill)																	
Hackelia patens (spotted stickseed)																	
Helianthus annuus ^a (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	-	-
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	-	-

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

FORB SPECIES	Holosteum umbellatum ⁿⁱ (jagged chickweed)	Isatis tinctoria ⁿⁱ (Dyer's woad)	Lactuca serriola ⁿⁱ (prickly lettuce)	Tragopogon dubius ⁿⁱ (yellow salsify)	Veronica biloba ⁿⁱ (twolobe speedwell)
year	Nested Frequency				
1996	23	25	3	34	-
2001	246	15	-	26	-
2006	305	1	-	-	4
2011	5	10	18	31	-
2016	-	-	4	30	-
year	Average Cover (%)				
1996	0.0	0.1	0.0	0.4	-
2001	0.9	0.2	-	0.3	-
2006	0.9	0.0	-	-	0.0
2011	0.0	0.0	0.4	0.3	-
2016	-	-	0.4	0.8	-

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 ^p (mountain big sagebrush)	Ericameria nauseosa ssp. nauseosa var. hololeuca (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Opuntia (pricklypear)
year	Line Intercept Cover (%)			
1996	-	-	-	-
2001	-	-	-	-
2006	0.4	-	-	-
2011	-	-	-	-
2016	1	-	-	0.1
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

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

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.

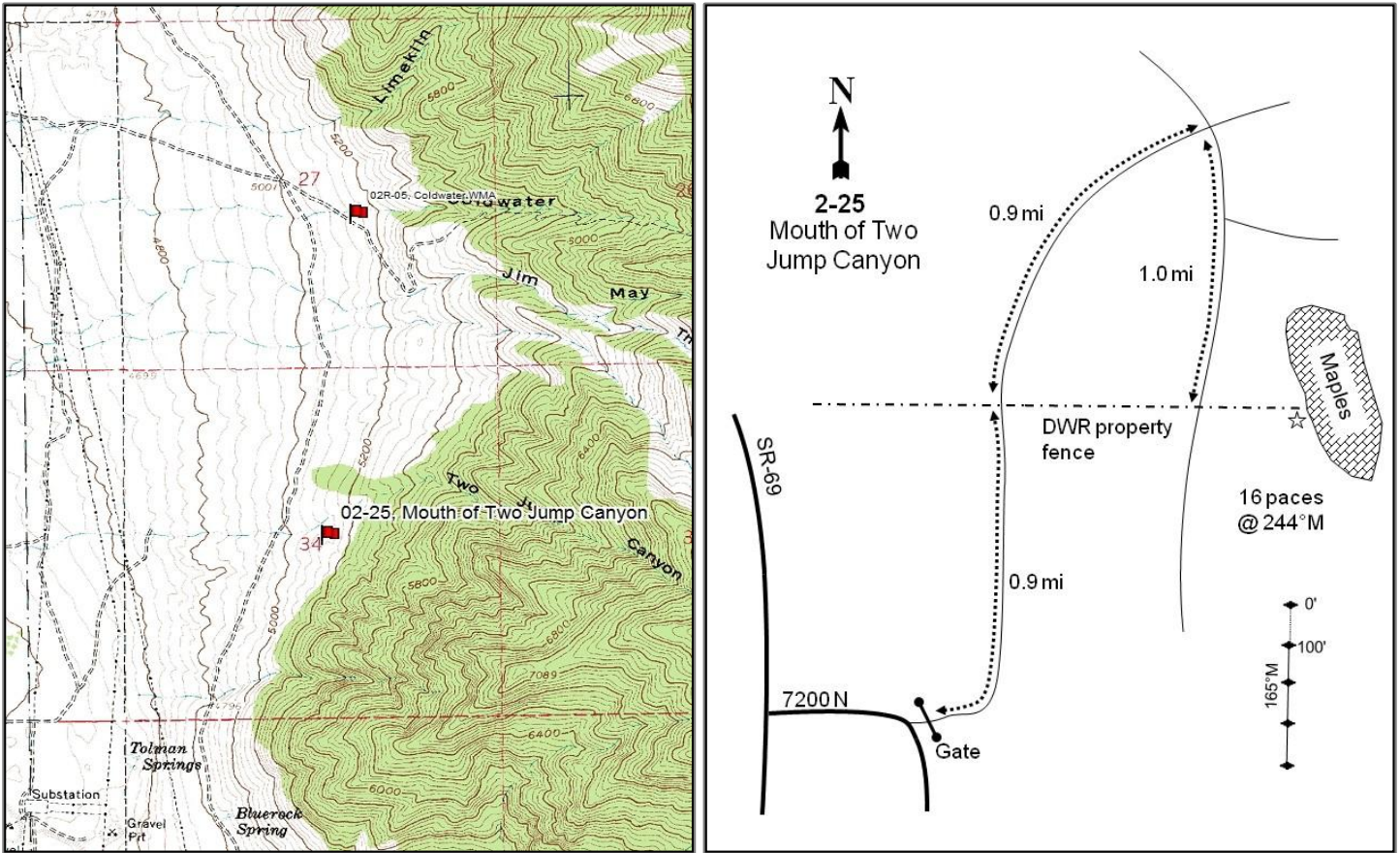
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier alnifolia^p -- (Saskatoon serviceberry)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	109/141
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	93/159
2016	-	-	-	-	-	-	-	-	102/180
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Ericameria nauseosa ssp. nauseosa var. hololeuca -- (rubber rabbitbrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
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
Opuntia -- (pricklypear)									
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

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

Table -02-23.15 - Deer Desirable Components Index: High 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	0.2	0.0	0.0	12.5	-13.9	10.0	-2.0	6.9	Very Poor
2001	0.0	0.0	0.0	22.7	-10.0	5.1	-2.0	15.8	Very Poor
2006	0.0	0.0	0.0	24.7	-6.5	10.0	-2.0	26.2	Very Poor
2011	0.2	0.0	0.0	27.8	-14.0	8.1	-2.0	20.0	Very Poor
2016	1.0	0.0	0.0	30.0	-5.4	10.0	0.0	35.6	Very Poor

MOUTH OF TWO JUMP CANYON - STUDY NO. 02-25



Location Information

USGS 7.5 min Map Info Honeyville SE; Township 11N, Range 2W, Section 34
 GPS (0' Stake) NAD 83 UTM ZONE 12, 412140 East 4611223 North

Transect Information

Browse Tag # (0' Stake) 7923
 Transect Bearing 165° magnetic
 Length 400ft
 Belt Placement Line 1 (11ft & 71ft), Line 2 (34ft), Line 3 (59ft), Line 4 (95ft)
 Belt Marker Placement Standard

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 to the north to a fence. Continue another 0.9 miles and turn right (south) and travel 1.0 mile to a fence running east and west. Walk east along the fence (approximately 200 yards) past one maple stand, and stopping 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 marked with browse tag #7923.

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

Wildlife Habitat and Vegetation History

Table 02-25.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
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

Site Notes

No Notes

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	43.4	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 #	047XA406UT
States and Transitions	A defined state and transition model is available.

When the study was established 1984, the plant community was in the Community Phase 3.1 of within the Mountain Big Sagebrush Super-dominance State (State 3) characterized by the dominance of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) (Pre-1992, 2016; Photos) (Table 02-25.12) with a diminished herbaceous understory (Table 02-25.7). Sagebrush and Cheatgrass (*Bromus tectorum*) were a major component of the site in earlier samplings, but have decreased in abundance (Table 02-25.7, Table 02-25.10). There was some conifer encroachment on the site, but trees have remained young and sparsely scattered. No major disturbance has been observed or recorded that would suggest the site has transitioned from one ecological state to another. However, with the introduction of the invasive perennial grass bulbous bluegrass (*Poa bulbosa*) and its subsequent increase in dominance might be an indicator that the community is or has transitioned to a state not currently described in the this state and transition model. The current community is dominated by bulbous bluegrass with mountain big sagebrush increasing in both cover and density. There is a possibility that the community and its responses are more closely associated with community phases in the Mountain Big Sagebrush-Steppe/Introduced Non-natives State (State 2) (USDA-NRCS, 2011).

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	-	10.3	2.7	-
2011	10.1	1.8	-	13.3	3.6	-
2016	12.2	2.5	-	15.5	3.4	-

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	26.1	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

Table 02-25.8 - 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	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

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	Elk	Rabbit
	Quadrat Frequency			
1996	2	7	-	1
2001	-	14	-	6
2006	1	12	4	18
2011	-	6	-	16
2016	2	2	-	21
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)	-

Table 02-25.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus arvensis ^{ai} (field brome)	Bromus briziformis ^{ai} (rattlesnake brome)	Bromus tectorum ^{ai} (cheatgrass)	Koeleria macrantha (prairie Junegrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)
year	Nested Frequency								
1996	72	309	458	6	7	-	145	43	-
2001	82	189	398	6	26	-	231	47	-
2006	60	250	313	-	189	3	114	111	-
2011	172	274	103	6	232	11	163	98	-
2016	23	103	107	-	371	5	56	119	1
year	Average Cover (%)								
1996	1.1	4.3	20.7	0.1	0.0	-	4.4	3.7	-
2001	0.8	1.2	15.1	0.2	0.2	-	6.3	2.1	-
2006	0.7	2.8	6.7	-	6.8	0.0	2.2	6.3	-
2011	2.8	3.2	1.6	0.3	12.9	0.1	3.9	7.2	-
2016	0.2	0.5	1.2	-	23.5	0.1	0.7	7.2	0.0

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	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Ambrosia psilostachya (Cuman ragweed)	Antennaria (pussytoes)	Apocynum androsaemifolium (spreading dogbane)	Arabis (rockcress)	Arenaria fendleri (Fendler's sandwort)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvech)	Astragalus utahensis (Utah milkvech)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Cirsium undulatum ^a (wavyleaf thistle)
year	Nested Frequency																
1996	13	-	8	162	33	-	-	1	-	17	5	5	65	-	3	-	1
2001	8	-	76	294	35	-	16	-	2	32	3	7	74	5	-	2	4
2006	13	3	13	187	59	-	15	-	-	32	-	6	58	3	-	-	12
2011	5	8	45	280	44	-	29	-	3	52	-	2	61	7	-	-	13
2016	12	3	37	176	58	2	48	-	-	42	-	8	62	1	-	-	25
year	Average Cover (%)																
1996	0.3	-	0.1	1.0	0.6	-	-	0.0	-	0.5	0.0	0.2	5.2	-	0.0	-	0.0
2001	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
2006	0.2	0.0	0.1	0.3	1.7	-	0.4	-	-	1.4	-	0.3	6.5	0.0	-	-	0.5
2011	0.2	0.0	0.3	4.8	1.4	-	0.6	-	0.0	3.3	-	0.2	8.4	0.0	-	-	0.9
2016	0.2	0.0	0.1	0.8	2.2	0.0	1.2	-	-	1.2	-	0.2	6.8	0.0	-	-	1.4

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

FORB SPECIES	Comandra umbellata (bastard toadflax)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Gilia ^a (gilia)	Hackelia patens (spotted stickseed)	Hedysarum boreale (Utah sweetvetch)	Holosteum umbellatum ^{ai} (jagged chickweed)	Isatis tinctoria ^{ami} (Dyer's woad)	Lactuca serriola ^{ai} (prickly lettuce)	Lithospermum ruderale (western stoneseed)	Lomatium grayi (Gray's biscuitroot)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)
year	Nested Frequency																
1996	6	3	-	-	1	18	2	-	13	0	17	-	1	19	8	-	-
2001	6	3	-	52	4	26	-	5	3	1	127	-	-	24	21	-	2
2006	30	8	5	37	13	16	-	-	2	9	71	-	5	4	55	-	14
2011	12	8	4	21	1	20	-	-	2	4	101	1	-	24	13	-	3
2016	22	-	-	4	5	19	5	-	7	6	89	1	1	2	7	4	-
year	Average Cover (%)																
1996	0.1	0.0	-	-	0.0	0.4	0.1	-	0.3	0.1	0.0	-	0.0	0.6	0.1	-	-
2001	0.0	0.0	-	0.1	0.0	0.2	-	0.0	0.0	0.1	0.2	-	-	0.7	0.6	-	0.0
2006	0.4	0.3	0.3	0.1	0.1	0.5	-	-	0.0	0.5	0.2	-	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	1.5	0.0	-	1.1	0.2	-	0.0
2016	0.4	-	-	0.0	0.0	0.5	0.0	-	0.2	0.0	2.3	0.0	0.0	0.0	0.0	0.1	-

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

FORB SPECIES	Machaeranthera grindelioides (rayless tansyaster)	Melilotus officinalis ⁱ (sweetclover)	Microsteris gracilis ^a (slender phlox)	Penstemon (beardtongue)	Petrorhiza pumila (rock goldenrod)	Phacelia ^a (phacelia)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^{ai} (Douglas' knotweed)	Silene antirrhina ^a (sleepy silene)	Tragopogon dubius ^{ai} (yellow salsify)	Veronica biloba ^{ai} (two-lobed speedwell)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency											
1996	-	-	-	0	-	7	2	2	-	7	-	-
2001	2	-	12	4	-	-	4	-	-	35	-	-
2006	-	6	19	-	2	-	4	3	-	54	10	1
2011	-	-	-	-	-	-	3	-	-	62	-	9
2016	-	5	-	-	-	-	-	-	3	28	-	-
year	Average Cover (%)											
1996	-	-	-	0.0	-	0.1	0.0	0.0	-	0.1	-	-
2001	0.0	-	0.0	0.0	-	-	0.1	-	-	0.5	-	-
2006	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.6	0.0	0.0
2011	-	-	-	-	-	-	0.0	-	-	0.8	-	0.1
2016	-	0.0	-	-	-	-	-	-	0.0	0.2	-	-

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	Line Intercept Cover (%)				
	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Eriogonum microthecum ^p (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Purshia tridentata ^p (antelope bitterbrush)	Rhus glabra ^p (smooth sumac)
year	Line Intercept Cover (%)				
1996	-	-	-	-	-
2001	-	-	-	-	-
2006	10.3	-	2.7	-	-
2011	13.3	-	3.6	-	-
2016	15.5	-	3.4	-	-
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

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

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 (%)				
Acer grandidentatumⁱ -- (bigtooth maple)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	20	0	0	0	0	0	0	-/-
2016	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Eriogonum microthecum^p -- (slender buckwheat)									
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	-/-
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	82/134
2016	-	-	-	-	-	-	-	-	-/-

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 (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
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
Juniperus osteosperma^t -- (Utah juniper)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	20	-	100	0	0	0	0	0	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	80	-	0	100	0	100	0	0	81/182
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Rhus glabra^p -- (smooth sumac)									
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

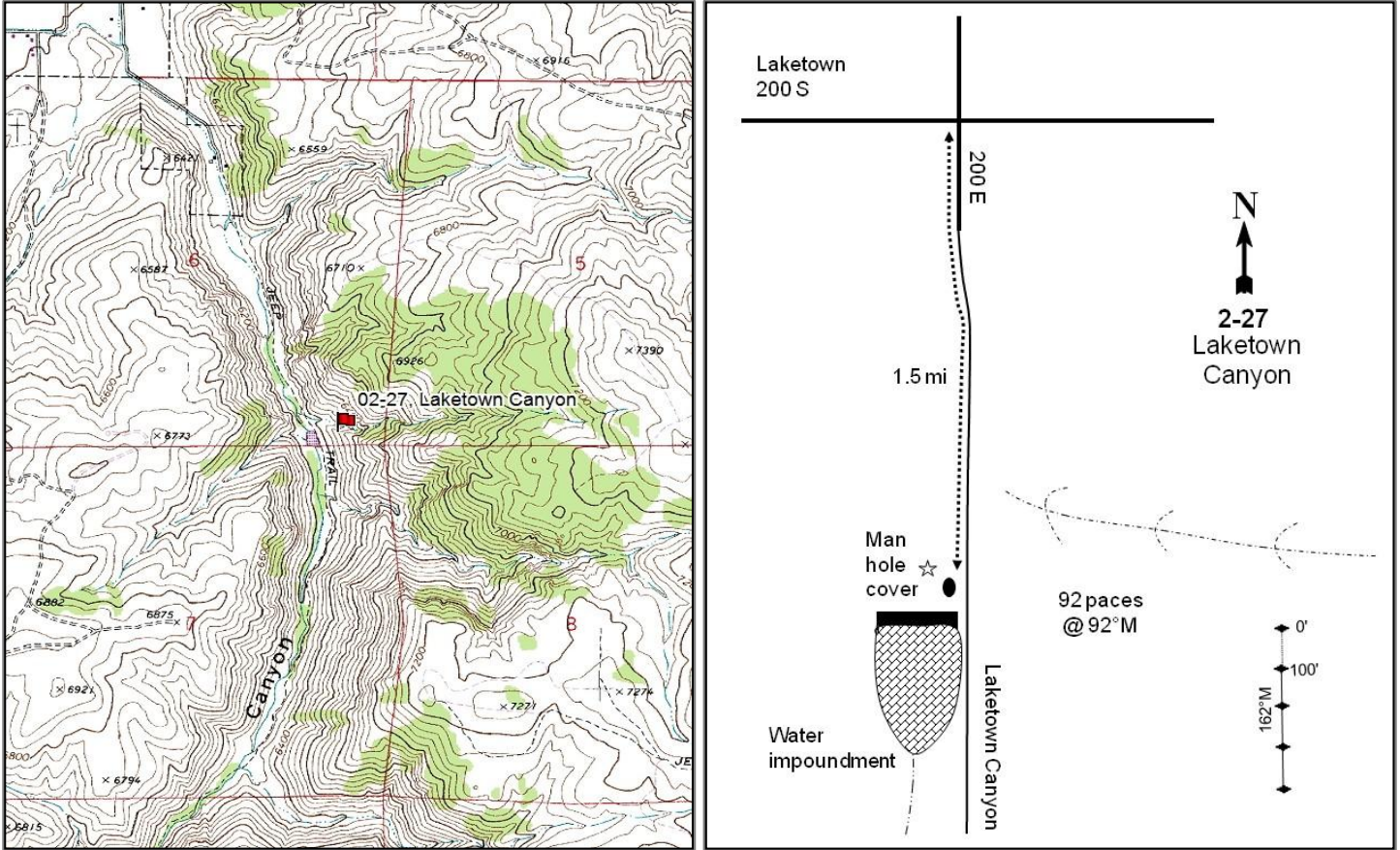
Table 02-25.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Acer grandidentatum (bigtooth maple)							
2016	6	-	-	-	17	83	14.8
Juniperus osteosperma (Utah juniper)							
2016	6	-	-	-	-	100	18.8

Table -02-25.15 - Deer Desirable Components Index: High 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	16.9	3.9	8.1	16.4	-20.0	10.0	0.0	35.3	Very Poor
2001	9.4	-0.6	7.5	17.2	-12.9	10.0	0.0	30.6	Very Poor
2006	9.4	8.6	2.7	17.2	-7.8	10.0	0.0	40.1	Very Poor-Poor
2011	12.7	11.7	6.0	23.1	-5.8	10.0	-2.0	55.8	Poor-Fair
2016	15.3	14.4	2.0	16.2	-1.4	10.0	-2.0	54.5	Poor-Fair

LAKETOWN CANYON - STUDY No. 02-27



Location Information

USGS 7.5 min Map Info Laketown SE; Township 12N, Range 6E, Section 06
 GPS (0' Stake) NAD 83 UTM ZONE 12, 474592 East 4627863 North

Transect Information

Browse Tag # (0' Stake) 7937
 Transect Bearing 162° magnetic
 Length 400ft
 Belt Placement Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
 Belt Marker Placement No Rebar

Directions to Site

From 200 East 200 South in Laketown, proceed south into Laketown Canyon 1.5 miles stopping at a stock pond dam. Walk to the manhole cover on the northeast corner of the dam. Take an azimuth of 92 degrees magnetic and walk 92 paces 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

Wildlife Habitat and Vegetation History

Table 02-27.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Elk	crucial	winter	
Greater Sage Grouse	Crucial	occupied	brood-rearing
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

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		%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.6	39.2	37.4	23.4	2.4		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 #	047XA460UT
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 component of the community (Photos, Table 02-27.10) (Pre-1992, 2016). Additionally, Utah juniper (*Juniperus osteosperma*) has been observed each sample year, but seems it seems that the advancement of encroaching trees is slow (Table 02-27.6, Table 02-27.13). 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, but the browse community has remained dominated by the less desirable species rubber rabbitbrush (*Chrysothamnus nauseosus* ssp. *consimilis* var. *oreophila*) and broom snakeweed (*Gutierrezia sarothrae*) (Table 02-27.12, Table 02-27.13). Due to the high abundance of cheatgrass (*Bromus tectorum*), this site is at an increased risk of a catastrophic fire event and the potential loss of beneficial browse species for wildlife.

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	6.6	-	-	-	-
2006	4.4	7.5	-	7.9	7.7	0.2
2011	4.3	5.2	-	9.3	7.0	-
2016	4.2	6.0	-	8.9	6.2	0.2

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

Table 02-27.8 - 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	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

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	Elk	Moose	Rabbit
	Quadrat Frequency				
1996	-	9	1	-	6
2001	-	5	-	-	-
2006	2	4	-	2	4
2011	-	4	2	-	-
2016	-	4	-	-	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)	-	-

Table 02-27.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus arvensis ^{ai} (field brome)	Bromus briziformis ^{ai} (rattlesnake brome)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	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
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

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 ^{ai} (desert madwort)	Arabis (rockcross)	Artemisia ludoviciana (white sagebrush)	Astragalus convallarius (lesser rusby milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littledrop false flax)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium undulatum ^a (wavyleaf thistle)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (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
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

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

FORB SPECIES																
Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Eriogonum umbellatum (sulphur-flower buckwheat)	Hackelia patens (spotted stickseed)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^{ai} (flatspine stickseed)	Machaeranthera grindelioides (rayless tansyaster)	Microsteris gracilis ^a (slender phlox)	Packera multilobata (lobeleaf groundsel)	Penstemon humilis (low beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Sisymbrium altissimum ^{ai} (tall tumbled mustard)	Tragopogon dubius ^{ai} (yellow salsify)	Verbascum thapsus ^{ai} (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	1	-	3	-	21	4	6	10	-	-	4	3
2011	12	-	11	5	-	-	-	1	-	35	14	16	2	-	-	3
2016	-	1	-	9	-	6	-	-	-	7	-	16	-	2	-	20
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	-	0.0	-	0.1	0.1	0.3	0.2	-	-	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

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 alnifolia ^p (Saskatoon serviceberry)	Artemisia nova ^p (black sagebrush)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Cercocarpus ledifolius var. ledifolius ^p (curl-leaf mountain mahogany)	Cercocarpus montanus ^p (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. constans var. oreophila (rubber rabbitbrush)	Eriogonum microthecum ^p (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ^t (Utah juniper)	Purshia tridentata ^p (antelope bitterbrush)	Symphoricarpos oreophilus (mountain snowberry)	Tetradymia canescens (spineless horsebrush)	Yucca (yuucca)		
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	-	-	-
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	-	-	-

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

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 (%)				
Amelanchier alnifolia^P -- (Saskatoon serviceberry)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	54/56
2016	-	-	-	-	-	-	-	-	61/52
Artemisia nova^P -- (black sagebrush)									
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
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
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
Cercocarpus ledifolius var. ledifolius^P -- (curl-leaf mountain mahogany)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	102/109
2006	-	-	-	-	-	-	-	-	101/142
2011	20	-	100	0	0	0	0	0	69/71
2016	-	-	-	-	-	-	-	-	110/172
Cercocarpus montanus^P -- (alderleaf mountain mahogany)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Eriogonum microthecum^P -- (slender buckwheat)									
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
Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
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

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 (%)				
Juniperus osteosperma¹ -- (Utah juniper)									
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	- / -
Ribes^P -- (currant)									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	76/89
2011	-	-	-	-	-	-	-	-	52/69
2016	-	-	-	-	-	-	-	-	64/97
Symphoricarpos oreophilus -- (mountain snowberry)									
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
Tetradymia canescens -- (spineless horsebrush)									
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

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

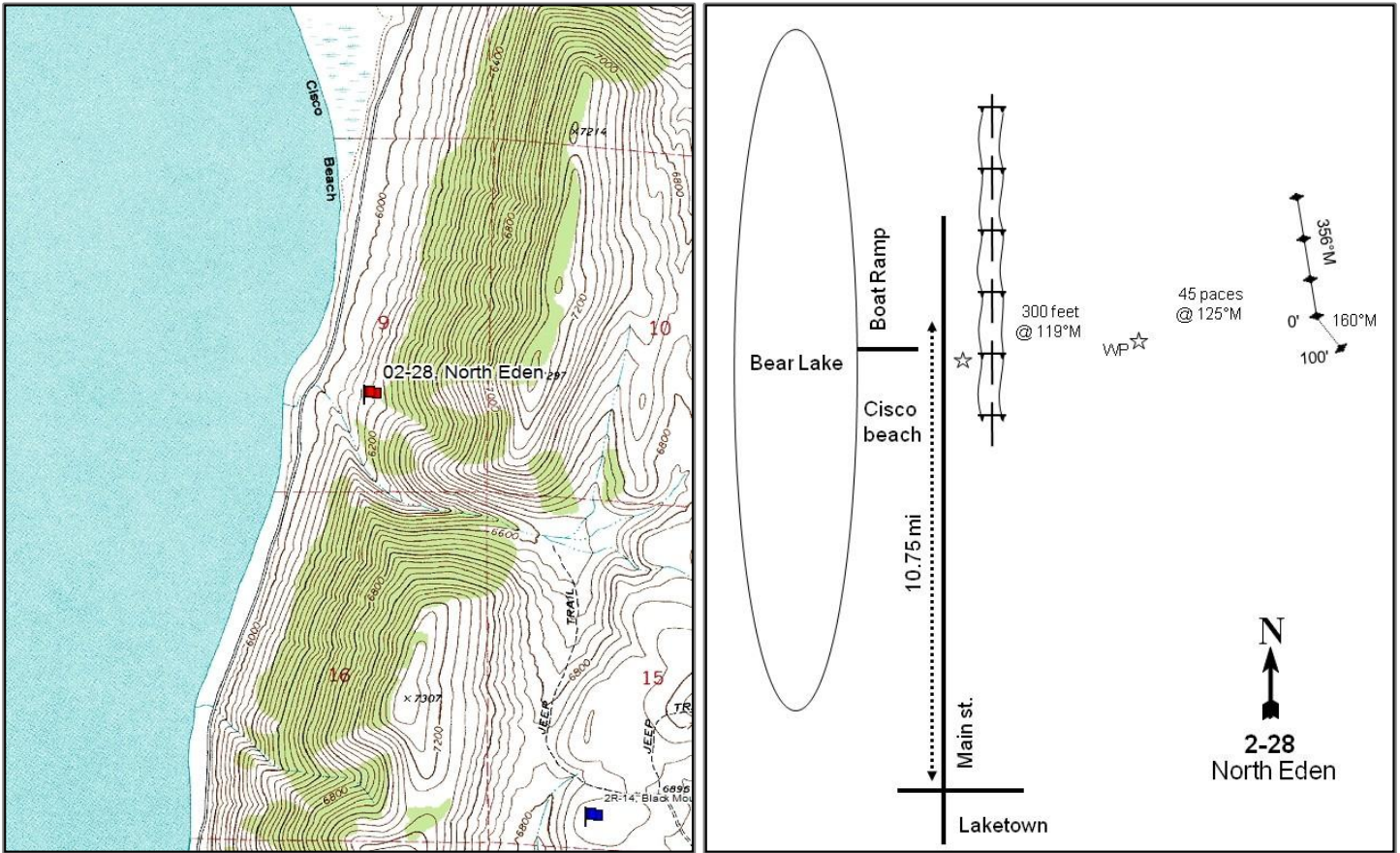
Table 02-27.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1996	25	-	-	-	-	-	16.8
2016	39	-	23	54	15	8	17.4

Table -02-27.15 - Deer Desirable Components Index: High 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	3.6	0.0	33.5	Very Poor
2001	4.8	0.0	0.0	29.6	-4.3	3.6	0.0	33.7	Very Poor
2006	6.0	0.0	0.0	29.5	-3.7	4.2	0.0	36.1	Very Poor
2011	6.0	0.0	0.0	28.6	-8.4	4.5	0.0	30.7	Very Poor
2016	5.5	0.0	0.0	21.0	-10.9	1.8	0.0	17.5	Very Poor

NORTH EDEN - STUDY NO. 02-28



Location Information

USGS 7.5 min Map Info Bear Lake South NE; Township 14N, Range 6E, Section 09
 GPS (0' Stake) NAD 83 UTM ZONE 12, 477685 East 4646044 North

Transect Information

Browse Tag # (0' Stake) 9157
 Transect Bearing 160° magnetic (Line 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 10.75 miles along the east shore. Turn right onto a dirt road proceeding to a power line. From the power line, walk up the slope on a bearing of 119 degrees magnetic for 300 feet to a witness post. From the witness post, walk 45 paces at 119 degrees magnetic to the 0- foot stake of the baseline, marked with browse tag #9157. The first 100 feet of the baseline runs 160 degrees magnetic. The rest of the baseline runs off the 0-foot baseline stake and runs in 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

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	Crucial	occupied	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

Site Notes

There were several older deer bones as well as a new carcass noted 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 - Loamy 12-16
NRCS Ecological Site #	R013XY001ID
States and Transitions	A defined state and transition model is available.

Since site establishment in 1984, this site has remained in Community Phase 1.2 Mountain Big Sagebrush/Utah Juniper of the Reference State (State 3), and is characterized by the dominant presence of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and the presence of encroaching Utah juniper (*Juniperus osteosperma*) seedlings and saplings. Due to the lack of disturbances within the community, Utah juniper has continued encroachment (Table 02-28.12, Table 02-28.13). As a likely result, sagebrush has generally decreased in both cover and density over the sample period (Table 02-28.12, Table 02-28.13). The understory has been consistently dominated by bluebunch wheatgrass (*Pseudoroegneria spicata*) and Sandberg bluegrass (*Poa secunda*), with the invasive grass species cheatgrass (*Bromus tectorum*) displaying variability in abundance each sampled year (Table 02-28.10). Without conifer management, it is predicted that juniper will continue to encroach, possibly causing the community to transition (Transition T1C) to the Juniper/Annuals-Sandberg Bluegrass State (State 3) where juniper trees dominate with Sandberg bluegrass and annual species for the majority of the understory composition. It is suggested that a controlled disturbance such as a fire or grazing may affect community composition by transitioning (Pathway 1.2B) to a more desirable community phase where sagebrush and bluegrass become the dominant species in the community site and avoiding an irreversible and less desirable state transition (USDA-NRCS, 2011).

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	4.7	1.4	2.9	7.3	1.3	9.3
2016	5.5	1.0	6.3	8.0	0.6	11.6

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	200	362	33	59	2.2	19.0	0.8	1.3
2006	188	412	43	98	3.4	34.3	0.2	2.1
2011	275	366	174	104	6.5	24.0	5.8	4.2
2016	347	274	129	64	18.1	18.0	1.5	2.3

Table 02-28.8 - 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	12.7	11.1	43.8	0.8	0.7	43.2
2001	12.1	6.8	60.8	1.6	0.3	45.1
2006	11.5	12.6	39.0	1.3	1.0	57.5
2011	19.0	7.2	40.0	0.3	0.8	46.4
2016	18.7	13.5	38.9	0.9	1.0	45.3

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	Elk	Rabbit
	Quadrat Frequency			
1996	7	39	-	25
2001	1	36	-	41
2006	-	60	1	46
2011	-	37	9	33
2016	-	43	-	41
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)	-	-

Table 02-28.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirriltail)	Hesperostipa comata (needle and thread)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency					
1996	0	179	52	-	335	157
2001	16	200	23	-	277	175
2006	7	188	41	-	335	253
2011	17	275	54	0	272	198
2016	6	347	56	0	142	170
year	Average Cover (%)					
1996	0.0	4.3	1.3	-	8.1	7.2
2001	0.9	2.2	0.8	-	7.4	10.0
2006	0.8	3.4	1.8	-	13.9	17.8
2011	0.7	6.5	1.8	0.0	8.0	13.6
2016	0.5	18.1	1.8	0.0	4.7	11.0

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 ^{ai} (desert madwort)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Cordylanthus ramosus ^a (bushy bird's beak)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (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
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

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

FORB SPECIES	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Hackelia patens (spotted stickseed)	Holosteum umbellatum ^a (jagged chickweed)	Lappula occidentalis ^a (flatspine stickseed)	Lithophragma (woodland-star)	Penstemon watsonii (Watson's penstemon)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Sphaeralcea grossularifolia (gooseberryleaf globemallow)	Tragopogon dubius ^a (yellow salsify)
year	Nested Frequency									
1996	-	-	1	-	-	-	-	55	3	-
2001	-	1	-	-	-	6	7	1	-	-
2006	-	-	12	-	-	0	13	6	-	1
2011	8	1	93	-	2	3	6	15	-	-
2016	-	-	27	1	-	5	3	-	-	3
year	Average Cover (%)									
1996	-	-	0.0	-	-	-	-	0.2	0.1	-
2001	-	0.0	-	-	-	0.0	0.0	0.0	-	-
2006	-	-	0.0	-	-	0.0	0.1	0.0	-	0.0
2011	0.0	0.0	3.0	-	0.0	0.0	0.1	0.1	-	-
2016	-	-	0.1	0.0	-	0.0	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 ^p (black sagebrush)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Atriplex canescens ^p (fourwing saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Juniperus osteosperma ^t (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	-
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	4.7	-	1.0	2.9	0.4
2016	0.1	5.4	-	0.7	6.3	0.4

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

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 (%)				
Artemisia nova^P -- (black sagebrush)									
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
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Eriogonum microthecum^P -- (slender buckwheat)									
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
Ericameria nauseosa -- (rubber rabbitbrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	20	-	100	0	0	0	0	0	71/79
2011	-	-	-	-	-	-	-	-	72/142
2016	-	-	-	-	-	-	-	-	86/112
Gutierrezia sarothrae -- (broom snakeweed)									
1996	-	-	-	-	-	-	-	-	-/-
2001	20	-	0	100	0	0	0	0	15/11
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Juniperus osteosperma^I -- (Utah juniper)									
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	-/-
Krascheninnikovia lanata^P -- (winterfat)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	35/44
2016	-	-	-	-	-	-	-	-	-/-
Opuntia polyacantha -- (plains pricklypear)									
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

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 -- (mountain snowberry)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	66/146
2011	-	-	-	-	-	-	-	-	54/84
2016	-	-	-	-	-	-	-	-	40/59

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

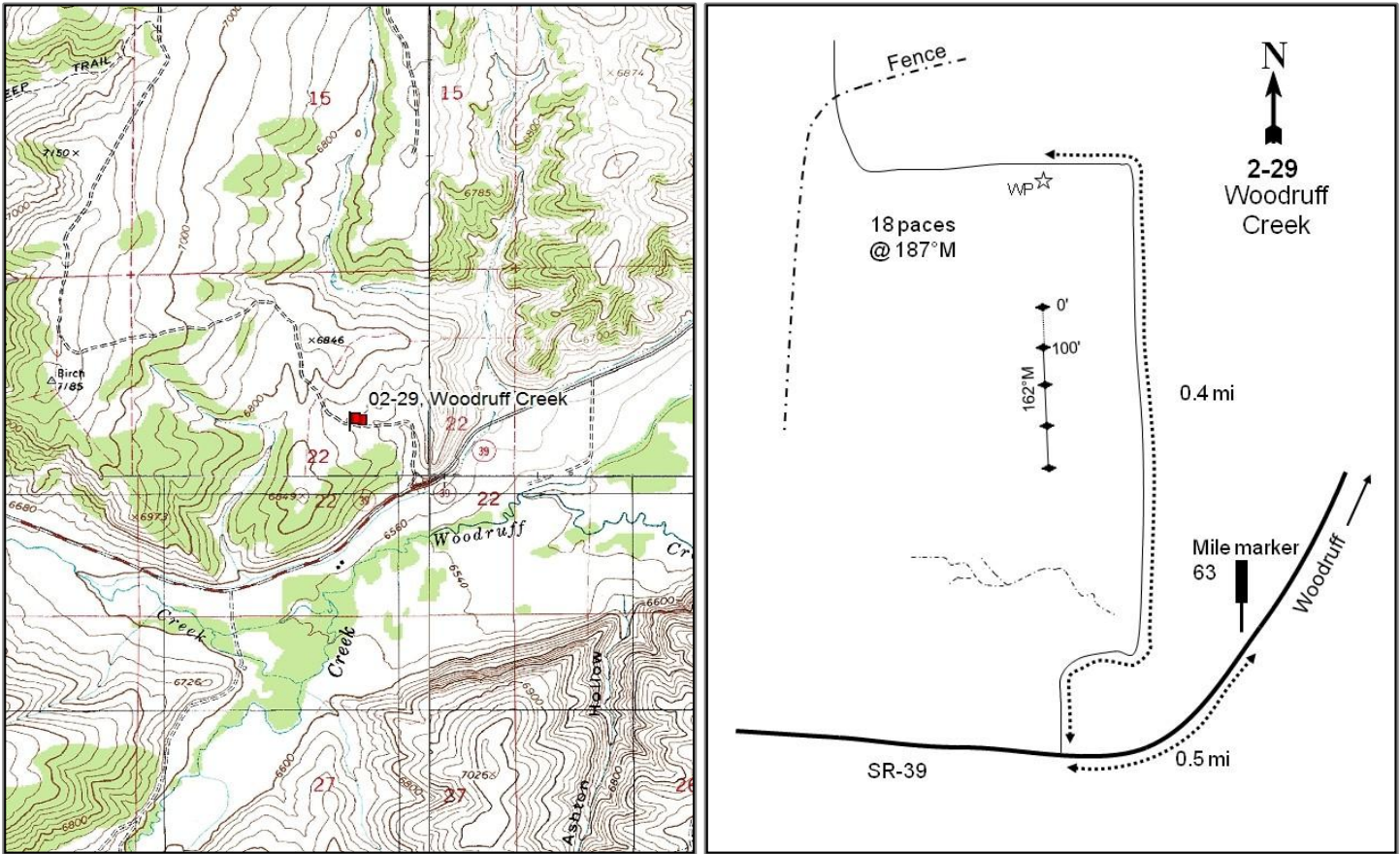
Table 02-28.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution				Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	
Juniperus osteosperma (Utah juniper)						
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
Pinus edulis (twoneedle pinyon)						
1996	39	-	-	-	-	10.4

Table -02-28.15 - Deer Desirable Components Index: Low 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	19.5	2.2	1.6	30.0	-3.2	1.8	0.0	51.8	Good
2001	16.9	0.0	1.4	30.0	-1.6	2.7	0.0	49.3	Good
2006	10.2	-2.3	8.7	30.0	-2.6	4.3	0.0	48.3	Good
2011	5.9	-5.4	2.1	30.0	-4.9	8.4	0.0	36.0	Fair
2016	6.9	0.6	4.6	30.0	-13.6	4.6	0.0	33.1	Fair

WOODRUFF CREEK - STUDY NO. 02-29



Location Information

USGS 7.5 min Map Info Birch Creek Reservoir; Township 9N, Range 6E, Section 22
 GPS (0' Stake) NAD 83 UTM ZONE 12, 478732 East 4594493 North

Transect Information

Browse Tag # (0' Stake) 7989
 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, and 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). From the witness post, walk 18 paces at 187 degrees magnetic to the 0- foot stake of the baseline marked by browse tag #7989.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	WOODRUFF PASTURES
Elevation	6,700ft (2,042m)
Aspect	Northeast
Slope	3%
Sample Dates	08/21/1996, 08/07/2001, 07/20/2006, 07/26/2011, 07/13/2016

Wildlife Habitat and Vegetation History

Table 02-29.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Elk	substantial	winter	
Greater Sage Grouse	Crucial	occupied & Winter	brood-rearing
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

Site Notes

No Notes

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	32.1	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 #	047XA312UT
States and Transitions	No state and transition model is available for this ecological site.

Since establishment in 1988, this site has remained in a relatively stable state with Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) being the dominant species (Table 02-29.12). The site likely behaves similar to the Upland Loam (Wyoming Big Sagebrush), R025XY314UT ecological site. Despite active woodland encroachment, the herbaceous understory has been diverse and has consisted mostly of native perennial grass species. However, cheatgrass (*Bromus tectorum*) is present on the site but has remained rare (Table 02-29.7, Table 02-29.10). Over the sample years, Utah juniper (*Juniperus osteosperma*) trees have increased in abundance and are becoming the prominent species on 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 loss of beneficial shrubs and herbaceous species (Table 02-29.6).

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	5.5	6.1	4.4	-	-	-
2001	5.2	5.3	4.3	-	-	0.8
2006	4.5	9.5	3.7	4.1	7.2	16.0
2011	3.6	9.8	5.6	4.7	8.9	16.6
2016	4.7	7.7	4.8	6.3	7.1	20.6

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	3	298	42	213	0.0	12.0	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

Table 02-29.8 - 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	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	25.9	3.2	28.5	13.8	1.0	36.3
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

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	Elk	Moose	Rabbit
	Quadrat Frequency					
1996	-	-	38	6	-	21
2001	-	-	42	2	-	15
2006	2	-	32	6	-	28
2011	1	-	32	18	-	30
2016	1	-	31	1	1	12
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)	-	-

*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 ⁱ (crested wheatgrass)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (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	16	23	3	-	20	139	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
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	0.7	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

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 ^{ai} (desert madwort)	Antennaria microphylla (littleaf pussytoes)	Arabis holboellii ^{ai} (Holboell's rockcress)	Asclepias speciosa (showy milkweed)	Astragalus cibirius (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 ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium fremontii ^{ai} (Fremont's goosefoot)	Collinsia parviflora ^a (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)
year	Nested Frequency																
1996	1	-	-	3	4	14	-	12	-	2	-	-	1	6	-	-	26
2001	-	-	1	2	-	-	3	35	-	12	-	-	-	7	-	-	24
2006	3	7	-	10	12	-	31	14	-	1	-	-	4	5	-	-	27
2011	2	27	2	7	13	-	12	43	-	4	-	2	40	17	8	3	26
2016	-	-	16	5	10	-	8	13	31	3	3	11	5	1	-	-	35
year	Average Cover (%)																
1996	0.0	-	-	0.0	0.0	0.4	-	0.1	-	0.0	-	-	0.0	0.0	-	-	0.1
2001	-	-	0.0	0.0	-	-	0.0	0.3	-	0.1	-	-	-	0.0	-	-	0.2
2006	0.0	0.0	-	0.1	0.0	-	0.5	0.1	-	0.0	-	-	0.0	0.1	-	-	0.3
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	0.3
2016	-	-	0.0	0.0	0.1	-	0.2	0.3	0.7	0.0	0.0	0.1	0.0	0.0	-	-	0.5

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

FORB SPECIES	Cordylanthus ramosus ^a (bushy bird's beak)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Erigeron pumilus (shaggy fleabane)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Halogeton glomeratus ^{ai} (saltlover)	Ipomopsis aggregata (scarlet gilia)	Lappula occidentalis ^a (flatspine stickseed)	Lesquerella (bladderpod)	Lithospermum ruderale (western stoneseed)	Microsteris gracilis ^a (slender phlox)	Packera multilobata (lobeleaf groundsel)	Penstemon humilis (low beardtongue)
year	Nested Frequency																
1996	13	5	27	11	4	-	-	-	5	1	4	-	-	-	-	82	49
2001	20	3	36	-	-	-	2	-	-	-	-	-	-	5	4	22	55
2006	22	-	29	-	-	2	3	1	12	-	19	2	-	0	-	13	47
2011	132	4	51	-	11	-	2	2	-	-	13	2	-	-	-	29	85
2016	108	-	29	-	5	-	-	-	6	-	3	-	5	-	2	13	85
year	Average Cover (%)																
1996	0.1	0.0	0.5	0.0	0.0	-	-	-	0.0	0.0	0.0	-	-	-	-	0.9	0.6
2001	0.1	0.0	1.1	-	-	-	0.0	-	-	-	-	-	-	0.2	0.0	0.1	0.4
2006	0.3	-	0.5	-	-	0.0	0.0	0.0	0.1	-	0.1	0.0	-	0.0	-	0.1	0.3
2011	4.3	0.0	1.4	-	0.0	-	0.0	0.0	-	-	0.1	0.0	-	-	-	0.3	1.8
2016	1.5	-	0.2	-	0.0	-	-	-	0.2	-	0.0	-	0.0	-	0.0	0.1	1.8

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

FORB SPECIES	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Trifolium (clover)
year	Nested Frequency			
1996	84	35	-	-
2001	85	60	-	-
2006	74	52	-	-
2011	73	97	5	-
2016	75	76	4	2
year	Average Cover (%)			
1996	1.4	0.1	-	-
2001	0.7	0.2	-	-
2006	2.3	0.2	-	-
2011	2.0	0.5	0.0	-
2016	1.1	0.3	0.0	0.0

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 (%)					
	year	1996	2001	2006	2011	2016
Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	-	-	-	-	-	-
Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	-	-	-	-	-	-
Eriogonum microthecum ^p (slender buckwheat)	4.1	6.6	-	16	-	0.6
Juniperus osteosperma ^t (Utah juniper)	4.7	7.9	-	16.6	-	1
Symphoricarpos oreophilus (mountain snowberry)	6.3	5.6	0	20.6	-	1.5
Tetradymia canescens (spineless horsebrush)	Quadrat Cover (%)					
year	1996	2001	2006	2011	2016	
1996	5.5	5.0	-	4.4	0.2	1.0
2001	5.2	4.1	-	4.3	0.3	0.8
2006	4.5	7.9	-	3.7	0.1	1.5
2011	3.6	8.7	-	5.6	0.0	1.0
2016	4.7	5.8	0.0	4.8	-	1.8

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

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 (%)				
Amelanchier alnifolia^p -- (Saskatoon serviceberry)									
1996	-	-	-	-	-	-	-	-	40/60
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	51/69
2011	-	-	-	-	-	-	-	-	44/67
2016	-	-	-	-	-	-	-	-	58/78
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Eriogonum microthecum^p -- (slender buckwheat)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	20	-	100	0	0	0	0	0	12/15

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 (%)				
Juniperus osteosperma¹ -- (Utah juniper)									
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	- / -
Pinus edulis¹ -- (twoneedle pinyon)									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	40	0	0	0	0	0	0	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
Symphoricarpos oreophilus -- (mountain snowberry)									
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
Tetradymia canescens -- (spineless horsebrush)									
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

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

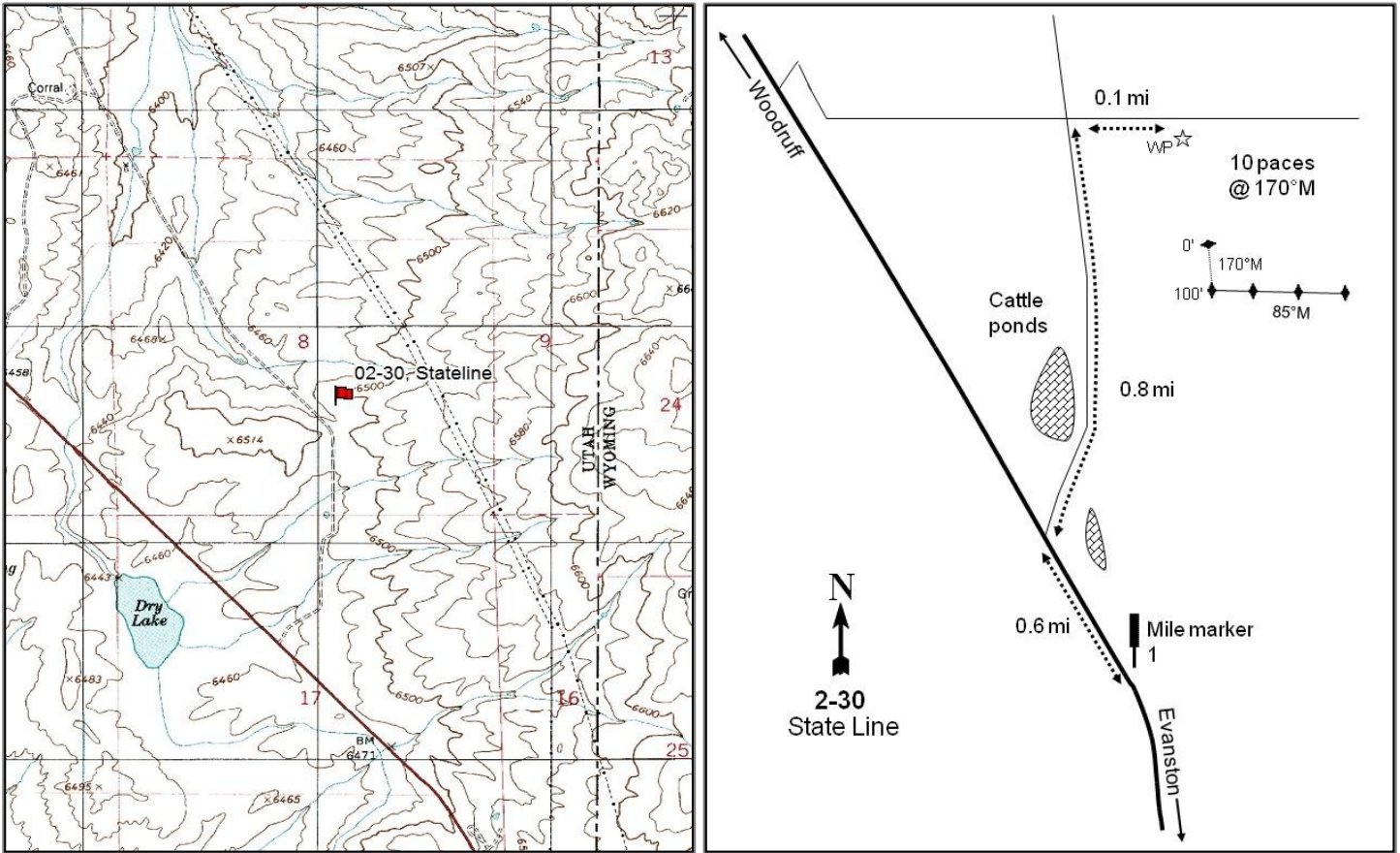
Table 02-29.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
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

Table -02-29.15 - Deer Desirable Components Index: Mid 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	6.9	2.7	0.0	19.9	-0.1	8.2	0.0	37.6	Poor
2001	6.6	-2.1	3.5	21.5	0.0	6.7	0.0	36.2	Very Poor-Poor
2006	5.7	-4.8	3.0	24.1	0.0	10.0	0.0	38.0	Poor
2011	4.6	-0.6	4.5	23.5	0.0	10.0	0.0	41.9	Poor
2016	5.9	0.0	0.0	25.6	-0.1	10.0	0.0	41.4	Poor

STATE LINE - STUDY NO. 02-30



Location Information

USGS 7.5 min Map Info Neponset Reservoir N; Township 8N, Range 8E, Section 08
 GPS (0' Stake) NAD 83 UTM ZONE 12, 495019 East 4587838 North

Transect Information

Browse Tag # (0' Stake) 7991
 Transect Bearing 170° magnetic (Line 2-4: 85° 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 proceeding through 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. Walk ten paces at a bearing of 170 degrees magnetic. From 0' to 100' at 170 degrees magnetic, and from 100' to 400' at 85 degrees magnetic. The 0-foot stake is wired with a browse tag #7991.

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

Wildlife Habitat and Vegetation History

Table 02-30.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Greater Sage Grouse	Crucial	occupied & Winter	brood-rearing
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

Site Notes

No Notes

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 Semi-desert Loam (Wyoming Big Sagebrush)
 NRCS Ecological Site # 034XY212UT
 States and Transitions No state and transition model is available for this ecological site.

The state and transition model is likely similar to the Semi-desert Loam (Wyoming Big Sagebrush), R035XY209UT ecological site. Since study establishment in 1984, the site has remained in a stable state with Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyominensis*) being the dominant plant community type (Table 02-30.12). The herbaceous understory has remained moderately diverse and abundant over the sample years (Table 02-30.10, Table 02-30.11). The site will likely remain in the current plant community phase without a major disturbance.

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	-

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

Table 02-30.8 - 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	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

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	Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
1996	-	27	-	-	4
2001	1	14	-	5	1
2006	2	21	4	-	27
2011	-	36	10	2	21
2016	3	27	-	1	30
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)	-	-	-

Table 02-30.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	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
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

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 ^{ai} (desert madwort)	Antennaria dimorpha (low pussytoes)	Arabis (rockress)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus miser var. tenuifolius (timber milkvetch)	Astragalus purshii (woollypod milkvetch)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Cordylanthus ramosus ^a (bushy bird's beak)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Draba ^a (draba)	Erigeron eatonii (Eaton's fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum cernuum ^a (nodding buckwheat)	Gayophytum ramosissimum ^a (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
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

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

FORB SPECIES	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Stenotus acaulis (stemless mock goldenweed)	Trifolium (clover)
year	Nested Frequency			
1996	143	43	33	-
2001	91	31	16	2
2006	108	76	19	1
2011	87	65	14	22
2016	66	15	16	21
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

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	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Atriplex falcata (sickle saltbush)	Chrysothamnus depressus ^p (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Linanthus pungens (granite prickly phlox)	Opuntia (pricklypear)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)						
1996	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-
2006	24.3	0.2	-	1.6	0.3	0.3	0.1
2011	24.6	1.1	-	2.7	0.1	0.6	0.1
2016	30.2	0.5	-	2.7	-	0.5	0.1
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

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

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.

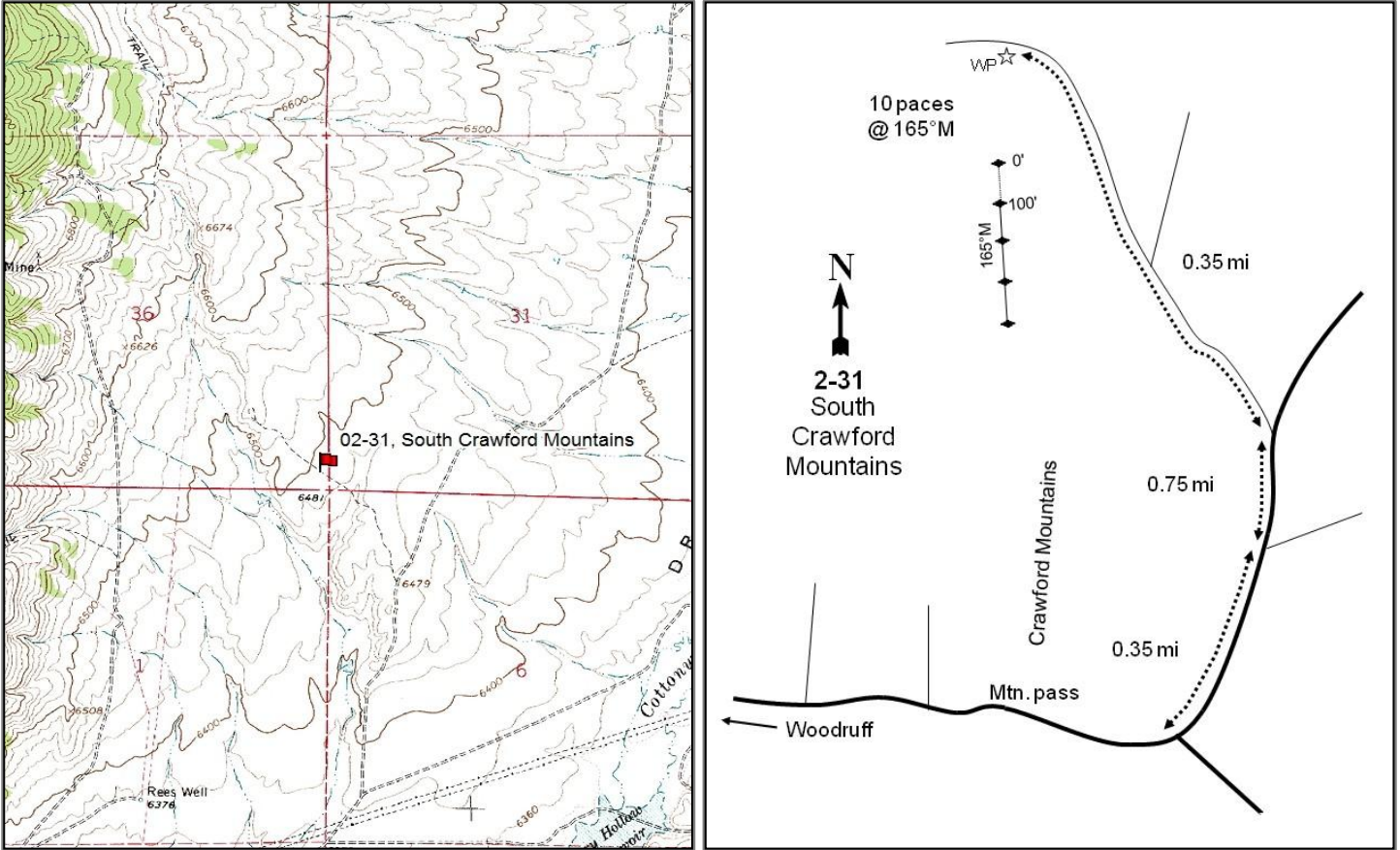
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
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
Atriplex falcata -- (sickle saltbush)									
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
Chrysothamnus depressus^p -- (longflower rabbitbrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	20	-	0	100	0	0	100	100	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Krascheninnikovia lanata^p -- (winterfat)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	13/28
2011	20	-	0	100	0	0	0	0	23/25
2016	-	-	-	-	-	-	-	-	12/14
Linanthus pungens -- (granite prickly phlox)									
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	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
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
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

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

Table -02-30.15 - Deer Desirable Components Index: Low 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	29.2	5.4	1.0	9.5	0.0	6.2	0.0	51.3	Good
2001	30.0	8.7	0.0	12.6	0.0	5.3	0.0	56.6	Good
2006	27.5	6.0	2.0	10.1	0.0	0.0	0.0	45.6	Fair-Good
2011	25.1	5.4	4.0	17.8	0.0	0.0	0.0	52.2	Good
2016	25.5	7.8	6.0	14.6	-1.9	4.2	0.0	56.2	Good

SOUTH CRAWFORD MOUNTAINS - STUDY NO. 02-31



Location Information

USGS 7.5 min Map Info Woodruff Narrows SW; Township 10N, Range 7E, Section 36
 GPS (0' Stake) NAD 83 UTM ZONE 12, 492346 East 4600430 North

Transect Information

Browse Tag # (0' Stake) 7940
 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 intersection of Wilson Lane and Little Crawford Road east of Woodruff proceed east 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 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 side of the road. From the witness post walk 10 paces at 165 degrees magnetic to the 0-foot baseline stake of the baseline. The baseline 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

Wildlife Habitat and Vegetation History

Table 02-31.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Greater Sage Grouse	Crucial	occupied & 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

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	55.3	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 #	034XY225UT
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*) being the dominant plant community type (Table 02-31.12). The herbaceous understory has remained moderately diverse and abundant over the sample years (Table 02-31.10, Table 02-31.11). The site will likely remain in the current plant community phase without a major disturbance.

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	-

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

Table 02-31.8 - 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	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

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	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
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)	-	-

*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 ^{ai} (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
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

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 ^{ai} (desert madwort)	Antennaria microphylla (littleaf 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 ^a (bushy bird's beak)	Cryptantha (cryptantha)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron eatonii (Eaton's fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum umbellatum (sulphur-flower buckwheat)	Lappula occidentalis ^a (flatspine stickseed)
year	Nested Frequency																
1996	-	3	6	-	8	-	-	13	2	26	-	-	-	-	6	1	-
2001	15	-	4	-	20	-	-	10	29	11	-	2	-	-	2	1	35
2006	77	20	4	-	29	10	-	9	10	20	-	3	1	-	3	2	4
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	22
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	0.1
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	0.0
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	0.0

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

FORB SPECIES	Melilotus officinalis ⁱ (sweetclover)	Microsteris gracilis ^a (slender phlox)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Stenotus acaulis (stemless mock goldenweed)	Trifolium (clover)
year	Nested Frequency					
1996	-	-	170	8	1	-
2001	-	-	193	2	1	15
2006	2	1	198	3	1	-
2011	-	-	175	11	1	20
2016	-	3	157	-	1	29
year	Average Cover (%)					
1996	-	-	3.0	0.0	0.0	-
2001	-	-	3.8	0.0	0.0	0.1
2006	0.0	0.0	5.3	0.0	0.0	-
2011	-	-	3.4	0.0	0.0	0.1
2016	-	0.0	3.0	-	0.0	0.2

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	Artemisia nova ^p (black sagebrush)	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Eriogonum microthecum ^p (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Linanthus pungens (granite prickly phlox)	Opuntia (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	-
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

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

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.

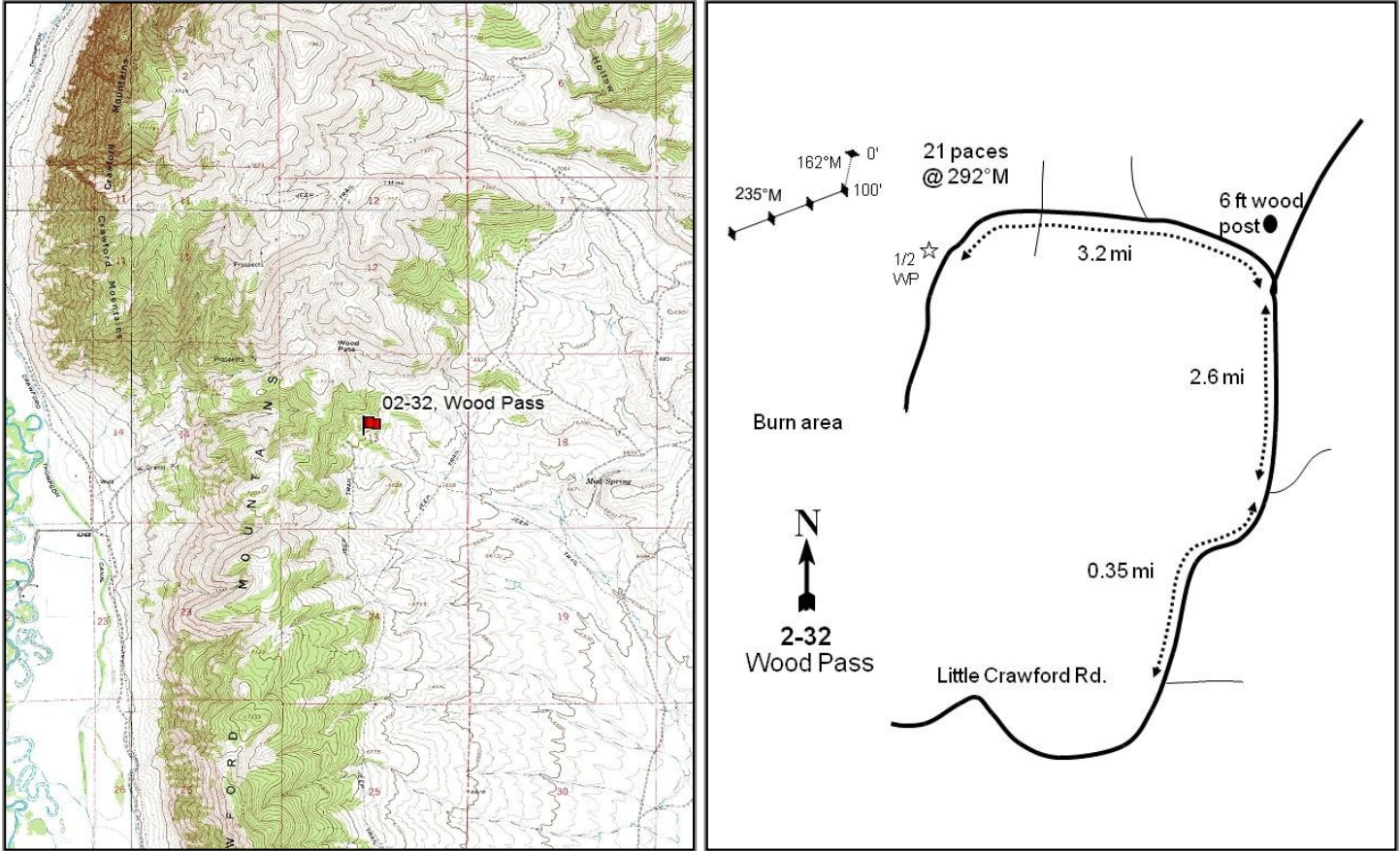
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova^p -- (black sagebrush)									
1996	320	-	6	88	6	6	0	6	24/36
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
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
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
Eriogonum microthecum^p -- (slender buckwheat)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	80	20	0	100	0	0	0	0	16/36
2011	-	-	-	-	-	-	-	-	-/-
2016	400	-	0	100	0	0	0	0	22/32
Krascheninnikovia lanata^p -- (winterfat)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	11/16
2016	-	-	-	-	-	-	-	-	-/-
Linanthus pungens -- (granite prickly phlox)									
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
Opuntia -- (pricklypear)									
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
Tetradymia canescens -- (spineless horsebrush)									
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 -02-31.15 - Deer Desirable Components Index: Low 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	21.0	6.2	2.9	16.1	0.0	7.2	0.0	53.4	Good
2001	27.9	9.3	1.5	17.4	0.0	8.3	0.0	64.5	Good-Excellent
2006	24.9	8.4	1.9	22.7	0.0	10.0	0.0	67.9	Excellent
2011	29.1	9.4	9.0	24.0	0.0	10.0	0.0	81.4	Excellent
2016	26.6	9.1	4.2	25.4	-0.1	9.0	0.0	74.3	Excellent

WOOD PASS - STUDY NO. 02-32



Location Information

USGS 7.5 min Map Info	Woodruff Narrows NW; Township 10N, Range 7E, Section 13
GPS (0' Stake)	NAD 83 UTM ZONE 12, 491501 East 4606053 North

Transect Information

Browse Tag # (0' Stake)	7942
Transect Bearing	162° magnetic (Line 2-4: 235° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (71ft), Line 3 (59ft), Line 4 (34ft)
Belt Marker Placement	Standard, Belt 5: No Rebar

Directions to Site

From the intersection of Wilson Lane and Little Crawford Road east of Woodruff proceed northeast for 1.35 miles to a fork. Turn left and travel 0.35 mile to another fork. Turn left and proceed 2.6 miles to a third fork marked by a six-foot tall wooden post. Turn left and proceed 3.2 miles staying on the main road, to a witness post just off the right side of road. From the witness post walk 21 paces at 292 degrees magnetic to the 100-foot baseline stake. Walk 100 feet at 342 degrees magnetic from the 100-foot stake to the 0-foot baseline stake. The 0-foot stake is marked by browse tag #7942. The baseline doglegs at 100 feet and runs 235 degrees magnetic.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	No data
Elevation	6,800ft (2,073m)
Aspect	Southeast
Slope	1%
Sample Dates	08/22/1996, 08/02/2001, 07/27/2006, 08/10/2011, 07/12/2016

Table 02-32.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	Crawford Mountain Bullhog	1936	October 2011-August 2012	1103

Wildlife Habitat and Vegetation History

Table 02-32.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Greater Sage Grouse	Crucial	occupied	brood-rearing
Pronghorn	substantial	summer	

Table 02-32.4 - 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 transitioning to Phase II
2006	Wyoming Big Sagebrush	Phase I transitioning to Phase II
2011	Utah Juniper/Wyoming Big Sagebrush	Phase I transitioning to Phase II
2016	Wyoming Big Sagebrush	Phase I

Site Notes

No Notes

Soils

Table 02-32.5 - 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	32.9	36.7	30.4	3.3	4.5	70.4	0.7	08/22/1996

Site Potential

1981-2010 Average Annual Precipitation	12 inches
NRCS Ecological Site	Semi-desert Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	034XY212UT
States and Transitions	No state and transition model is available for this ecological site.

The state and transition model is likely similar to the Semi-desert Loam (Wyoming Big Sagebrush), R035XY209UT ecological site. Since study establishment in 1984, the site is a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) as the dominant plant community type (Table 02-32.12). The herbaceous understory has remained moderately diverse yet sparse over the sample years (Table 02-32.10, Table 02-32.11). Conifer encroachment by Utah juniper (*Juniperus osteosperma*) has been active in this community, though a lop and scatter treatment removed most of the conifer trees on the site and surrounding area. The site will likely remain in the current plant community phase without a major disturbance.

Trend Summary Tables

Table 02-32.6 - 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	13.4	0.1	7.6	-	-	-
2001	13.8	0.6	11.0	-	-	1.1
2006	11.5	0.4	12.7	14.0	0.4	18.1
2011	12.8	0.2	14.1	15.4	0.1	20.1
2016	11.9	0.3	3.5	15.0	1.4	8.2

Table 02-32.7 - 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	26	326	22	160	0.1	5.9	0.1	3.0
2001	34	304	63	211	0.5	8.4	0.3	4.2
2006	4	316	73	209	0.0	7.6	0.9	4.4
2011	25	292	193	195	0.1	7.0	5.0	3.1
2016	81	282	198	139	1.4	6.9	5.0	3.0

Table 02-32.8 - 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	21.6	4.8	39.6	4.1	1.2	29.3
2001	36.9	3.9	40.5	3.9	1.0	36.4
2006	28.6	3.7	40.1	11.2	2.4	33.1
2011	36.7	5.5	37.9	7.2	0.8	36.2
2016	34.5	1.9	43.4	2.8	1.1	30.1

Table 02-32.9 - 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	Elk	Rabbit
	Quadrat Frequency			
1996	1	38	2	15
2001	4	17	-	20
2006	6	29	4	21
2011	3	16	1	13
2016	7	23	-	11
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2001	9.4 (23.3)	18.7 (46.3)	-	-
2006	17.4 (43.0)	20.8 (51.3)	32.8 (81.1)	-
2011	3.6 (9.0)	27.5 (67.9)	13.4 (33.1)	-
2016	15.3 (37.7)	26.2 (64.6)	-	-

Table 02-32.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Elymus elymoides (squirriltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency									
1996	34	-	26	-	29	18	96	14	217	39
2001	19	-	34	-	18	28	66	11	223	72
2006	52	11	4	6	10	32	107	22	257	8
2011	68	14	25	10	37	18	71	8	204	53
2016	60	26	81	19	44	15	97	20	154	19
year	Average Cover (%)									
1996	0.5	-	0.1	-	0.1	0.2	1.0	0.1	3.3	0.7
2001	0.6	-	0.5	-	0.6	0.8	0.5	0.1	3.8	2.1
2006	0.9	0.2	0.0	0.1	0.1	0.5	0.9	0.2	4.7	0.1
2011	0.7	0.1	0.1	0.1	0.4	0.1	0.4	0.0	4.8	0.4
2016	0.5	0.5	1.4	0.1	0.5	0.6	1.7	0.3	2.5	0.1

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

Table 02-32.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum ^{ai} (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Arenaria (sandwort)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus purshii (woollypod milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littlupod false flax)	Carduus nutans ^{ai} (nodding plumeless thistle)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium fremontii ^a (Fremont's goosefoot)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)
year	Nested Frequency																
1996	4	-	8	10	-	11	-	21	-	-	-	-	-	-	-	-	-
2001	4	6	16	1	-	8	-	14	-	-	-	-	-	-	3	-	4
2006	11	6	14	-	-	22	-	20	-	2	-	-	-	-	-	12	-
2011	4	50	7	14	3	12	-	21	1	-	-	7	4	6	4	11	-
2016	3	112	4	-	-	14	2	20	-	-	31	2	3	9	-	4	-
year	Average Cover (%)																
1996	0.0	-	0.3	0.0	-	0.0	-	0.1	-	-	-	-	-	-	-	-	-
2001	0.0	0.0	0.3	0.0	-	0.1	-	0.1	-	-	-	-	-	-	0.0	-	0.0
2006	0.1	0.0	0.4	-	-	0.2	-	0.1	-	0.0	-	-	-	-	-	0.0	-
2011	0.0	0.1	0.2	0.0	0.0	0.1	-	0.2	0.0	-	-	0.0	0.0	0.0	0.0	0.2	-
2016	0.0	0.8	0.6	-	-	0.1	0.0	0.6	-	-	0.8	0.0	0.0	0.0	-	0.0	-

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

FORB SPECIES	Comandra umbellata (bastard toadflax)	Cordylanthus ramosus ^a (bushy bird's beak)	Crepis acuminata (lapertip hawkbeard)	Cryptantha (cryptantha)	Cryptantha ^a (annual cryptantha)	Cymopterus (springparsley)	Cynoglossum officinale ^{ani} (gypsyflower)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Erigeron eatonii (Eaton's fleabane)	Erigeron pumilus (shaggy fleabane)	Erigeron brevicaulis (shortstem buckwheat)	Erigeron umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Gilia ^a (gilia)	Holosteum umbellatum ^{ai} (jagged chickweed)	Ipomopsis aggregata (scarlet gilia)
year	Nested Frequency																
1996	-	15	3	8	-	-	-	7	-	-	-	-	-	-	-	-	-
2001	-	36	1	52	-	2	3	8	1	-	-	-	-	-	-	-	-
2006	3	52	5	11	-	1	-	0	-	-	8	-	1	-	-	-	-
2011	5	128	11	9	-	-	-	6	-	-	23	-	3	1	-	10	-
2016	2	77	8	11	3	-	4	1	1	2	9	3	1	-	2	-	1
year	Average Cover (%)																
1996	-	0.1	0.1	0.1	-	-	-	0.0	-	-	-	-	-	-	-	-	-
2001	-	0.2	0.0	0.6	-	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-
2006	0.0	0.9	0.0	0.1	-	0.0	-	0.0	-	-	0.0	-	0.0	-	-	-	-
2011	0.0	4.7	0.1	0.1	-	-	-	0.0	-	-	0.1	-	0.0	0.0	-	0.0	-
2016	0.0	2.9	0.1	0.3	0.0	-	0.0	0.0	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	Isatis tinctoria ^{ani} (Dyer's woad)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Machaeranthera grindelioides (rayless tansyaster)	Microsteris gracilis ^a (slender phlox)	Packera multilobata (lobeleaf groundsel)	Penstemon humilis (low beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Trifolium (clover)
year	Nested Frequency									
1996	-	-	3	-	-	3	3	111	13	3
2001	-	-	9	-	2	5	24	118	5	45
2006	-	-	3	-	-	5	26	109	23	70
2011	-	-	17	-	-	10	24	82	29	52
2016	19	5	8	0	-	10	23	48	2	32
year	Average Cover (%)									
1996	-	-	0.0	-	-	0.0	0.0	2.3	0.0	0.0
2001	-	-	0.0	-	0.0	0.0	0.2	2.5	0.0	0.3
2006	-	-	0.0	-	-	0.0	0.5	2.5	0.1	0.4
2011	-	-	0.1	-	-	0.1	0.2	1.0	0.1	0.6
2016	0.4	0.0	0.0	0.0	-	0.1	0.2	0.6	0.0	0.1

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

Table 02-32.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova ^p (black sagebrush)	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Atriplex canescens ^p (fourwing saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)	Eriogonum microthecum ^p (slender buckwheat)	Juniperus osteosperma ¹ (Utah juniper)	Linanthus pungens (granite prickly phlox)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)								
1996	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-
2006	8.9	5.1	-	0.4	-	-	18.1	-	-
2011	9.2	6.1	-	0.1	-	0.1	20.1	-	-
2016	6	9	-	1.2	0.2	-	8.2	-	-
year	Quadrat Cover (%)								
1996	6.9	6.5	-	0.1	-	0.0	7.6	-	-
2001	7.4	6.2	0.0	0.5	-	0.1	11.0	0.0	-
2006	7.4	4.0	-	0.3	-	0.0	12.7	0.0	0.0
2011	6.8	5.9	-	0.2	-	0.2	14.1	0.0	0.0
2016	4.6	7.3	-	0.3	0.0	-	3.5	-	0.0

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

Table 02-32.13 - 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 (%)				
Amelanchier alnifolia ^p --(Saskatoon serviceberry)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	24/35
2016	-	-	-	-	-	-	-	-	-/-
Artemisia nova ^p --(black sagebrush)									
1996	3800	-	3	73	25	20	2	2	31/54
2001	3760	-	1	68	31	4	0	6	29/48
2006	3560	2060	2	62	37	1	1	30	31/48
2011	2760	520	33	49	19	20	4	10	29/50
2016	2920	80	23	69	8	2	1	2	25/53
Artemisia tridentata ssp. wyomingensis ^p --(Wyoming big sagebrush)									
1996	2440	100	26	44	30	28	2	0	44/78
2001	2000	-	16	63	21	12	0	8	44/75
2006	1940	1360	8	50	42	27	8	70	39/62
2011	2120	320	21	59	20	12	1	18	36/56
2016	2060	-	2	87	11	32	0	5	40/77
Atriplex canescens ^p --(fourwing saltbush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	16/26
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-

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 (%)				
Chrysothamnus depressus^P -- (longflower rabbitbrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	20	-	0	100	0	0	0	0	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
1996	500	-	16	32	52	12	0	36	20/26
2001	380	-	21	79	0	0	0	0	24/42
2006	360	60	0	44	56	0	0	17	24/38
2011	420	20	33	57	10	5	0	19	22/31
2016	600	-	7	90	3	3	3	3	27/43
Eriogonum microthecum^P -- (slender buckwheat)									
1996	20	-	0	100	0	0	0	0	14/24
2001	60	-	0	100	0	0	0	0	13/27
2006	40	-	0	100	0	0	0	0	13/28
2011	20	-	0	100	0	0	0	0	15/20
2016	20	-	0	100	0	0	0	0	15/17
Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)									
1996	-	-	-	-	-	-	-	-	61/72
2001	40	-	0	100	0	0	0	0	79/115
2006	-	-	-	-	-	-	-	-	73/101
2011	40	-	0	0	100	0	0	0	76/98
2016	80	-	0	75	25	0	0	25	54/72
Gutierrezia sarothrae-- (broom snakeweed)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	22/21
Juniperus osteosperma¹-- (Utah juniper)									
1996	500	-	28	72	0	0	0	0	-/-
2001	460	20	26	70	4	4	0	0	-/-
2006	460	60	22	70	9	0	0	9	-/-
2011	500	40	16	60	24	0	0	4	-/-
2016	280	20	36	57	7	0	0	0	-/-
Linanthus pungens -- (granite prickly phlox)									
1996	-	-	-	-	-	-	-	-	-/-
2001	20	-	0	100	0	0	0	0	-/-
2006	20	-	0	100	0	0	0	0	15/28
2011	20	-	0	100	0	0	0	0	8/16
2016	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
1996	60	-	0	100	0	0	0	0	10/20
2001	-	-	-	-	-	-	-	-	10/21
2006	-	-	-	-	-	-	-	-	13/47
2011	-	-	-	-	-	-	-	-	14/46
2016	-	-	-	-	-	-	-	-	13/44
Symphoricarpos oreophilus -- (mountain snowberry)									
1996	-	-	-	-	-	-	-	-	36/69
2001	-	-	-	-	-	-	-	-	38/73
2006	-	-	-	-	-	-	-	-	25/60
2011	-	-	-	-	-	-	-	-	13/49
2016	-	-	-	-	-	-	-	-	20/87

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	-	-	-	-	-	-	-	-	16/20
2001	20	-	0	100	0	0	0	0	27/47
2006	40	-	0	100	0	0	0	0	27/54
2011	60	-	67	33	0	0	0	0	23/40
2016	20	-	0	100	0	0	0	0	10/12

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

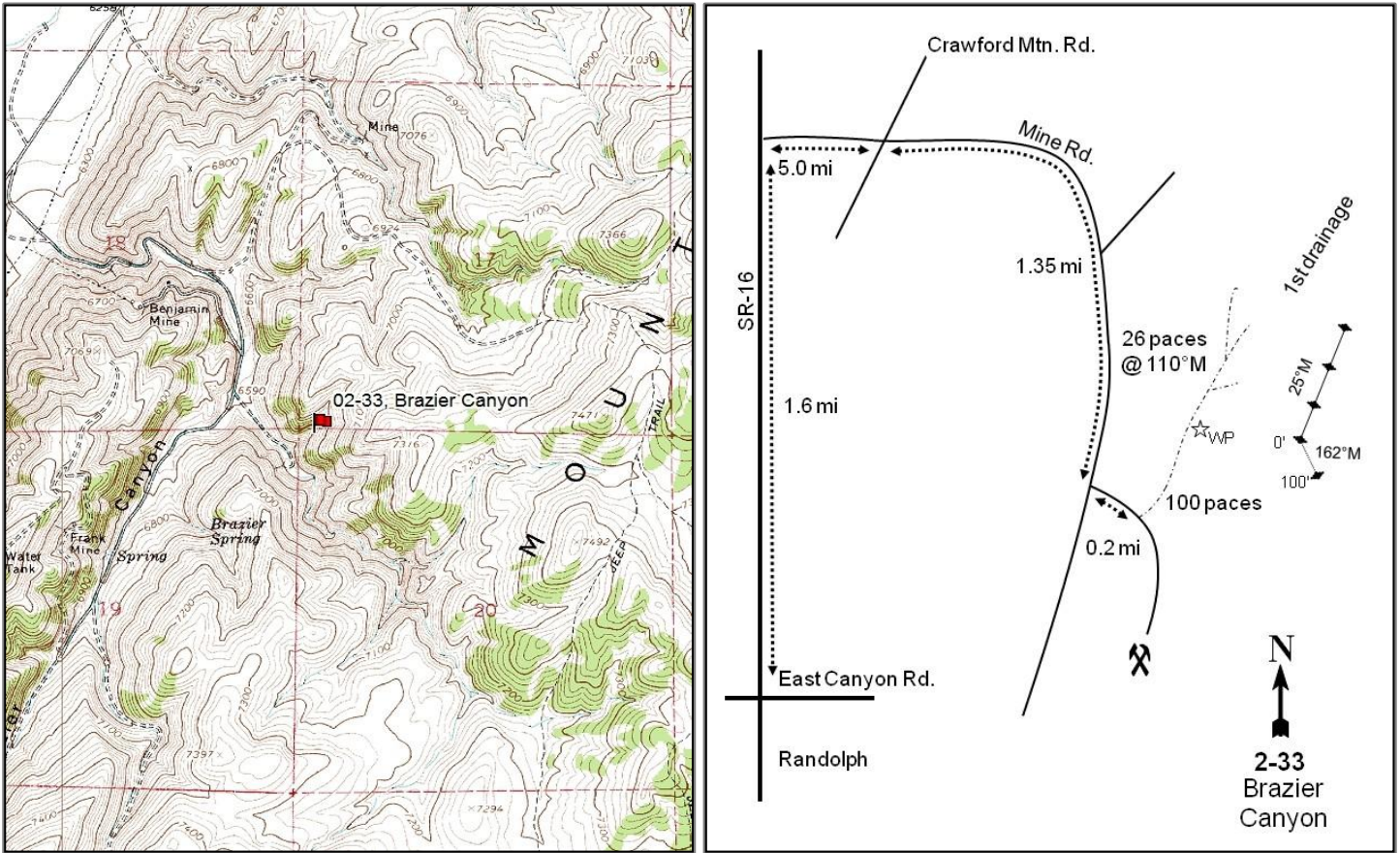
Table 02-32.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma -- (Utah juniper)							
1996	292	-	-	-	-	-	13.2
2001	138	-	-	-	-	-	14.1
2006	309	5	25	35	25	10	12.8
2011	284	-	20	35	30	15	13.6
2016	65	18	47	12	24	-	14.0
Pinus edulis -- (two-needle pinyon)							
2016	116	100	-	-	-	-	1.0

Table 02-32.15 - Deer Desirable Components Index: Low 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	6.8	7.1	11.7	-0.1	6.0	0.0	48.3	Good
2001	17.3	7.1	3.9	16.9	-0.3	8.3	-2.0	51.2	Good
2006	14.4	3.4	2.0	15.2	0.0	8.9	0.0	43.9	Fair-Good
2011	16.1	9.2	13.5	14.0	0.0	6.2	0.0	59.0	Good
2016	14.9	12.0	5.1	13.8	-1.1	6.0	-4.0	46.7	Fair-Good

BRAIZER CANYON - STUDY NO. 02-33



Location Information

USGS 7.5 min Map Info Rex Peak SW; Township 11N, Range 8E, Section 20
 GPS (0' Stake) NAD 83 UTM ZONE 12, 494084 East 4615031 North

Transect Information

Browse Tag # (0' Stake) 7978
 Transect Bearing 162° magnetic (Line 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 U-16 for 1.60 miles, and turn right (east) onto Crawford Mountain Road. Continue east for 5.0 miles to a two way stop. Turn right (i.e. 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 (i.e. east) onto this road, and proceed 0.2 miles to the first ravine on the left (i.e., 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. The 0-foot stake is marked by a browse tag, #7978. The rest of the baseline runs off 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

Wildlife Habitat and Vegetation History

Table 02-33.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Greater Sage Grouse	Crucial	occupied	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

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 Shallow Loam (Black Sagebrush)
NRCS Ecological Site #	047XA432UT
States and Transitions	No state and transition model is available for this ecological site.

When established in 1984, the site was a black sagebrush (*Artemisia nova*) plant community type (Table 02-33.12) with the native perennial grass species bluebunch wheatgrass (*Pseudoroegneria spicata*) dominating to herbaceous understory. Over the course of the study, perennial grasses have become the dominant component of the site as cover of the grasses has increased significantly (Pre-1992, Table 02-33.10). The herbaceous understory has remained fairly diverse and has provided good cover (Table 02-33.11, Table 02-33.7), but the annual grass species cheatgrass (*Bromus tectorum*) has had subtle increase over the course of the study (Table 02-33.11). Community stability is threatened by the presence and gradual encroachment of Utah juniper (*Juniperus osteosperma*) across the site (Table 02-33.6, Table 02-33.13). Without a tree removing disturbance, pinyon and juniper trees have the potential to become a major component on the site.

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	12.8	1.4	0.6	-	-	-
2001	15.3	3.9	1.2	-	-	0.1
2006	11.3	2.6	2.1	13.5	3.9	6.4
2011	13.6	3.8	3.3	14.0	5.1	4.3
2016	11.4	3.6	5.6	14.4	6.6	8.7

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

Table 02-33.8 - 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	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

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	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
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)	-	-

Table 02-33.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum ^{ai} (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
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

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 ^{ai} (desert madwort)	Antennaria (pussytoes)	Arabis holboellii ⁿ (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 (arrow/leaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littelpod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Cordylanthus ramosus ^a (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
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

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

FORB SPECIES	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Erigeron divergens ^a (spreading fleabane)	Hackelia patens (spotted stickseed)	Holosteum umbellatum ^a (jagged chickweed)	Lappula occidentalis ^a (flatspine stickseed)	Linum lewisii (Lewis flax)	Lupinus (lupine)	Machaeranthera canescens (hoary tansyaster)	Melilotus officinalis ⁱ (sweetclover)	Packera multilobata (lobeleaf groundsel)	Penstemon watsonii (Watson's penstemon)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Physaria (twinpod)
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	6	-	-	-	-	1	-	-	70	89	5
2011	-	3	6	17	7	4	9	1	4	2	2	2	-	1	94	31	-
2016	8	-	1	-	9	-	2	-	1	-	9	-	-	3	88	6	-
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	-	-	-	-	0.0	-	-	2.4	0.7	0.0
2011	-	0.0	0.0	0.0	0.6	0.1	0.0	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	-	0.0	-	0.5	-	-	0.2	2.2	0.0	-

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

FORB SPECIES	Polygonum douglasii ^a (Douglas' knotweed)	Stenotus acaulis (stemless mock goldenweed)	Symphotrichum ascendens (western aster)	Tragopogon dubius ^a (yellow safsify)	Trifolium (clover)	Wyethia amplexicaulis (mule-ears)
year	Nested Frequency					
1996	-	15	-	-	6	-
2001	-	2	-	-	13	-
2006	4	11	1	-	6	-
2011	-	7	4	3	-	-
2016	-	14	1	-	7	2
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	-	-
2016	-	0.1	0.0	-	0.0	0.4

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 alnifolia ^p (Saskatoon serviceberry)	Artemisia nova ^p (black sagebrush)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Eriogonum microthecum ^p (slender buckwheat)	Juniperus osteosperma ⁱ (Utah juniper)	Krascheninnikovia lanata ^p (winterfat)	Opuntia (pricklypear)	Symphoricarpos oreophilus (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	4.3	0.6	0.1	0.5	-
2016	0.2	12.4	0.6	5.2	0.9	8.7	0.3	0	1.4	-
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	-

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

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 (%)				
Amelanchier alnifolia^P -- (Saskatoon serviceberry)									
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
Artemisia nova^P -- (black sagebrush)									
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
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Eriogonum microthecum^P -- (slender buckwheat)									
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
Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	70/164
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
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	- / -
Krascheninnikovia lanata^P -- (winterfat)									
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
Linanthus pungens -- (granite prickly phlox)									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	20	-	0	0	100	0	0	100	- / -
2011	-	-	-	-	-	-	-	-	8/14
2016	-	-	-	-	-	-	-	-	- / -

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 (%)				
Opuntia -- (pricklypear)									
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
Rosa woodsii^p -- (Woods' rose)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	52/104
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus -- (mountain snowberry)									
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
Tetradymia canescens -- (spineless horsebrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	31/75
2006	20	-	100	0	0	0	0	0	31/63
2011	-	-	-	-	-	-	-	-	53/63
2016	-	-	-	-	-	-	-	-	42/82

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

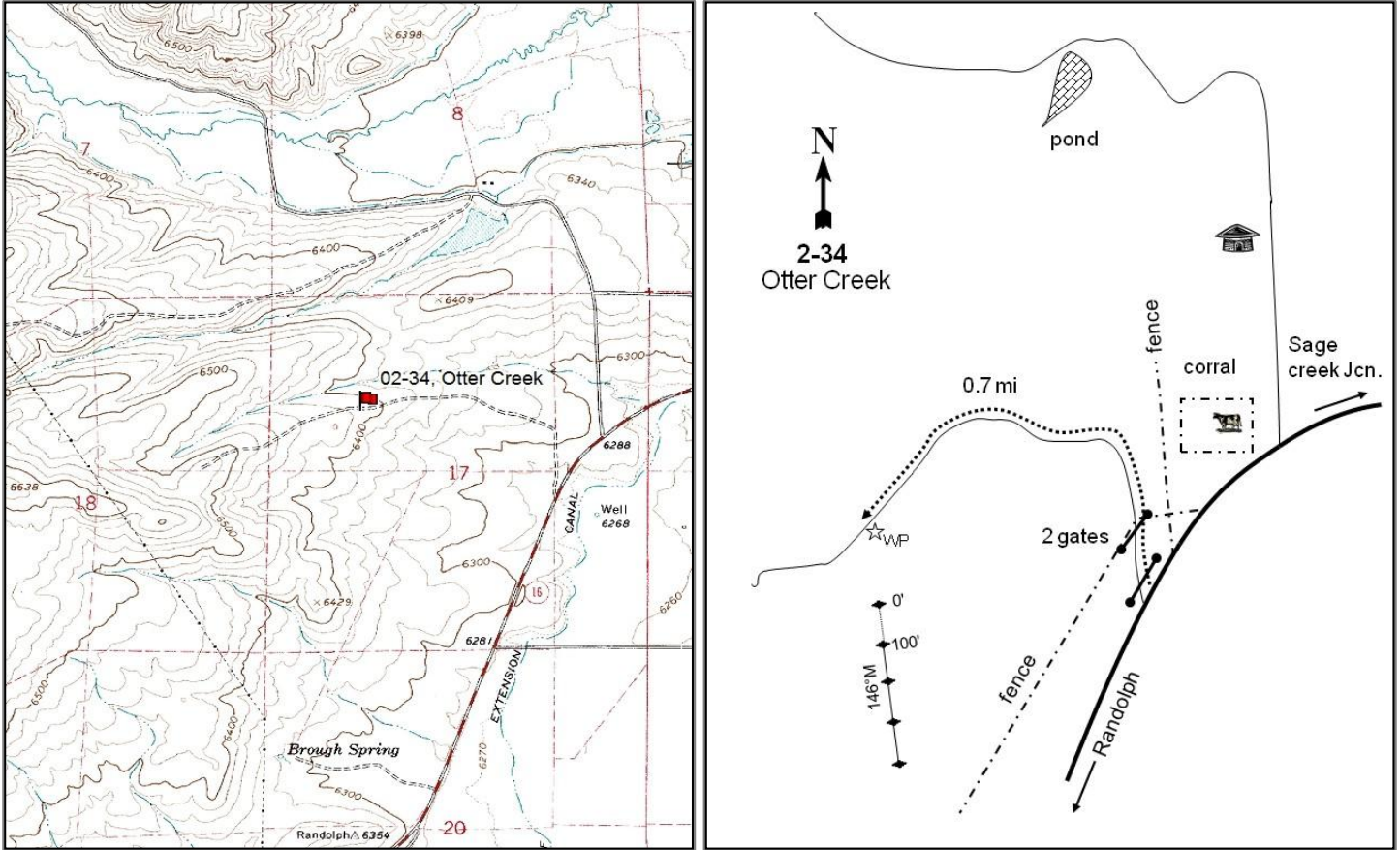
Table 02-33.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
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

Table -02-33.15 - Deer Desirable Components Index: Mid 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	16.1	10.4	1.8	30.0	-0.2	9.5	0.0	67.6	Good
2001	19.2	10.9	3.0	30.0	-0.5	10.0	0.0	72.7	Good
2006	14.2	7.5	2.6	30.0	-0.4	10.0	0.0	63.8	Fair-Good
2011	17.0	9.2	7.6	30.0	-1.8	10.0	0.0	72.0	Good
2016	14.3	10.2	9.9	30.0	-2.5	9.0	0.0	70.8	Good

OTTER CREEK - STUDY No. 02-34



Location Information

USGS 7.5 min Map Info	Randolph NE; Township 11N, Range 7E, Section 17
GPS (0' Stake)	NAD 83 UTM ZONE 12, 484694 East 4616263 North

Transect Information

Browse Tag # (0' Stake)	7977
Transect Bearing	146° 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 north from Randolph on U-16. Travel 0.5 mile past Nor Gray Lane. Turn left here, and proceed 0.7 miles from the first gate to a witness post on the left hand side of the road. From the witness post, walk 15 feet at 160 degrees magnetic to the 0-foot stake of the baseline 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

Table 02-34.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Herbicide - Herbicide	-	-	Prior to 1984	-
Seeding - Rangeland Drill	-	-	Prior to 1984	-
Aerator - Double Drum/Seed	-	-	Spring 2004	355

Wildlife Habitat and Vegetation History

Table 02-34.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Elk	substantial	winter	
Greater Sage Grouse	Crucial	occupied & Winter	brood-rearing
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

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 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 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 thickspike wheatgrass (*Elymus lanceolatus*), crested wheatgrass (*Agropyron cristatum*), slender wheatgrass (*E. trachycaulus*), Lewis flax (*Linum lewisii*), and forage kochia (*Kochia 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	35.1	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 #	047XA314UT
States and Transitions	No state and transition model is available for this ecological site.

The shrub overstory of this study site has been dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) since establishment in 1984; cover of sagebrush has been increasing every sample year following a 2004 aerator treatment (Table 02-34.1, Table 02-34.12). Although lacking in diversity, the herbaceous understory has been very abundant in all sample years with a main component of the perennial grass crested wheatgrass (*Agropyron cristatum*) and Sandberg bluegrass (*Poa secunda*) (Table 02-34.7, Table 02-34.10). This site is expected to remain in this state in the future.

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	17.0	0.2	-	17.3	0.2	-
2016	15.3	0.2	-	20.4	0.2	-

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	-	413	177	143	-	19.2	2.3	2.3
2016	-	390	90	140	-	12.8	0.4	2.2

Table 02-34.8 - 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	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	40.0	1.0	27.0	0.0	0.0	37.2
2016	59.4	5.0	17.0	0.0	0.0	28.2

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	Mule Deer/Pronghorn	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
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)*	-

*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 ⁱ (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	-	364	11	-	289
2016	-	360	17	-	139
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	-	13.4	0.1	-	5.7
2016	-	11.2	0.5	-	1.1

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 ^{ai} (desert madwort)	Arabis (rockcress)	Arenaria (sandwort)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus purshii (woollypod milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chenopodium leptophyllum ^a (narrowleaf goosefoot)	Collinsia parviflora ^a (maiden blue eyed Mary)	Cordylanthus ramosus ^a (bushy bird's beak)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Holosteum umbellatum ^{ai} (jagged chickweed)	Linum lewisii (Lewis flax)	Lomatium (desertparsley)	Microsteris gracilis ^a (slender phlox)	Phlox hoodii (spiny phlox)	
year	Nested Frequency																	
1996	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	83
2001	21	1	-	-	4	2	-	-	-	2	-	1	-	-	9	-	-	59
2006	60	1	1	-	0	-	-	-	-	-	-	1	-	85	-	-	-	91
2011	131	-	-	7	3	-	-	2	-	31	3	1	63	-	-	-	-	91
2016	29	-	-	-	7	2	2	-	8	29	-	1	40	-	-	1	-	95
year	Average Cover (%)																	
1996	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	1.2
2001	0.0	0.0	-	-	0.0	0.0	-	-	-	0.0	-	0.0	-	-	0.0	-	-	0.5
2006	0.1	0.0	0.0	-	0.0	-	-	-	-	-	-	0.0	-	0.9	-	-	-	2.8
2011	0.4	-	-	0.1	0.0	-	-	0.0	-	1.1	0.0	0.0	0.8	-	-	-	-	1.6
2016	0.1	-	-	-	0.0	0.0	0.0	-	0.0	0.2	-	0.0	0.1	-	-	0.0	-	1.6

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

FORB SPECIES	Phlox longifolia (longleaf phlox)	Tragopogon dubius ^{ai} (yellow salsify)	Trifolium (clover)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency			
1996	33	-	-	-
2001	26	5	19	5
2006	52	-	7	3
2011	58	1	26	-
2016	25	-	50	-
year	Average Cover (%)			
1996	0.1	-	-	-
2001	0.1	0.0	0.1	0.0
2006	0.3	-	0.0	0.1
2011	0.5	0.0	0.1	-
2016	0.1	-	0.5	-

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	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Atriplex falcata (sickle saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Eriogonum microthecum ^p (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	-
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	17.0	-	0.2	-
2016	15.3	-	0.2	-

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

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.

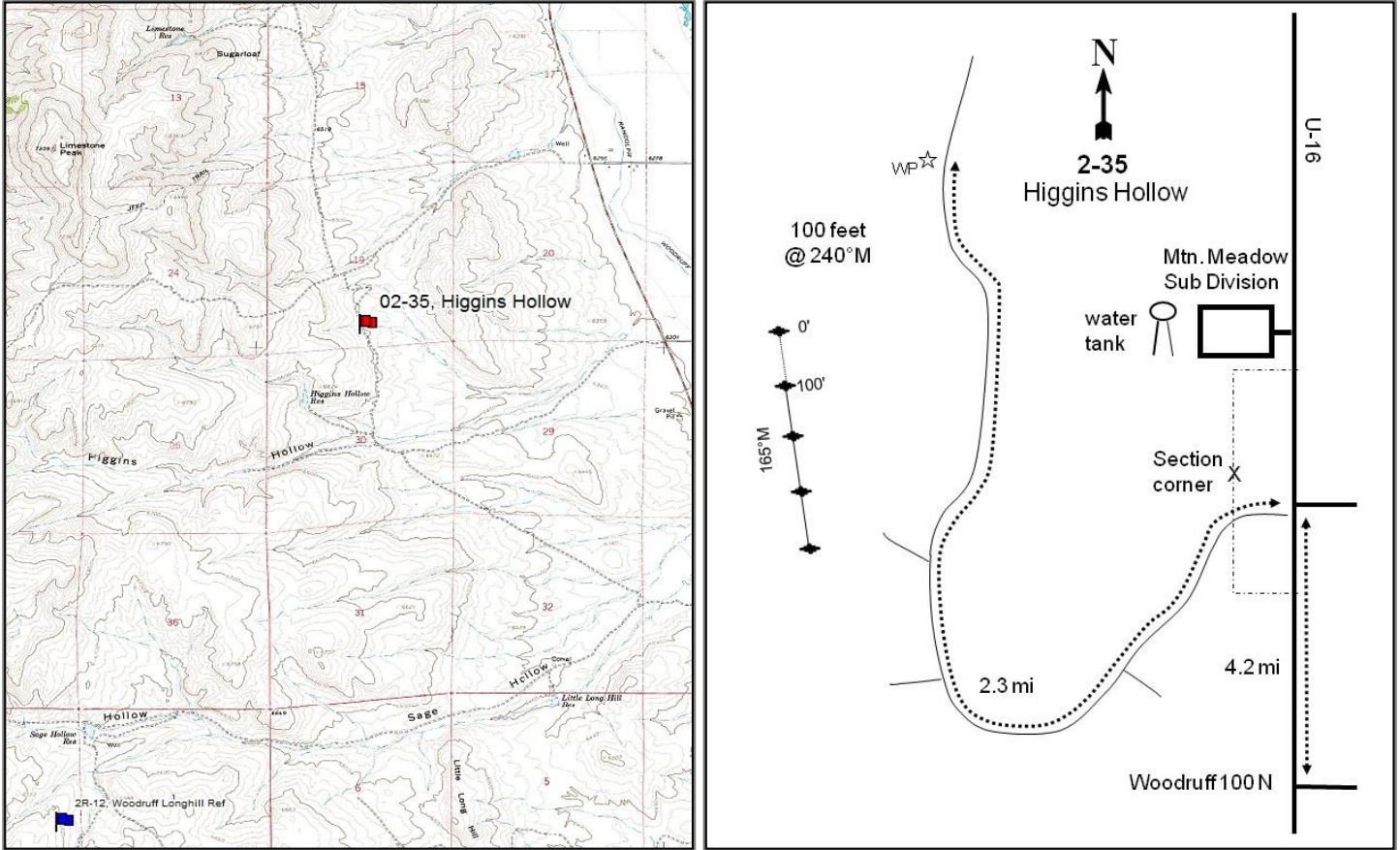
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1996	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
Atriplex falcata -- (sickle saltbush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Eriogonum microthecum^p -- (slender buckwheat)									
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
Linanthus pungens -- (granite prickly phlox)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	84/111
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
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

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

Table -02-34.15 - Deer Desirable Components Index: Mid 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	20.3	12.3	7.9	30.0	0.0	2.7	0.0	73.3	Good
2001	14.2	2.7	6.0	26.3	0.0	1.5	0.0	50.8	Poor-Fair
2006	11.4	8.7	3.5	30.0	0.0	8.2	0.0	61.8	Fair
2011	21.4	12.6	15.0	30.0	0.0	4.6	0.0	83.6	Excellent
2016	19.1	13.5	15.0	25.6	0.0	4.4	0.0	77.6	Good

HIGGINS HOLLOW - STUDY No. 02-35



Location Information

USGS 7.5 min Map Info Woodruff NW; Township 10N, Range 7E, Section 19
 GPS (0' Stake) 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 1st North in Woodruff proceed north on U-16 for 4.2 miles and turn west to 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 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

Wildlife Habitat and Vegetation History

Table 02-35.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Elk	substantial	winter	
Greater Sage Grouse	Crucial	occupied & Winter	brood-rearing
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

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 Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) 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 #	047XA314UT
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 Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) with lesser amounts of other shrubs such as yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) and spineless horsebrush (*Tetradymia canescens*) (Table 02-35.12). The herbaceous understory has been abundant and diverse, with perennial grasses, namely Sandberg bluegrass (*Poa secunda*) and western wheatgrass (*Pascopyrum smithii*), as a co-dominant site components in all study years. The invasive annual grass species cheatgrass (*Bromus tectorum*) was present in 1996, but has not been observed since (Table 02-35.10). Forbs have generally contributed little cover, although perennial forbs were moderately abundant in 2011 and 2016 (Table 02-35.7, Table 02-35.11). Without a major disturbance such as a wildfire, it is predicted that this site will remain in this state in future sample years.

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	-

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

Table 02-35.8 - 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	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

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	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
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)	-	-	-

*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 ^{ai} (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (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
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

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 ^{ai} (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)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chenopodium leptophyllum ^a (narrowleaf goosefoot)	Collinsia parviflora ^a (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Cordylanthus ramosus ^a (bushy bird's beak)	Crepis acuminata (tapertip hawk'sbeard)	Cryptantha (cryptantha)
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	-	1
2016	2	33	-	10	9	-	30	33	16	10	2	-	27	3	72	-	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	-	0.0
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	-	0.0

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

FORB SPECIES	Descuraimia pinnata ^a (western tansymustard)	Draba ^a (draba)	Erigeron eatonii (Eaton's fleabane)	Erigeron pumilus (shaggy fleabane)	Helianthella uniflora (oneflower helianthella)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lomatium triternatum (nineleaf biscuitroot)	Microsteris gracilis ^a (slender phlox)	Penstemon humilis (low beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Salsola tragus ^{ai} (prickly Russian thistle)	Schoenocrambe limifolia (flaxleaf plainsmustard)	Stenotus acaulis (stemless mock goldenweed)	Symphotrichum ascendens (western aster)	Trifolium (clover)
year	Nested Frequency																
1996	5	-	21	3	-	-	-	-	1	55	125	-	-	-	-	-	-
2001	10	-	20	9	-	-	5	16	-	66	94	-	4	1	-	-	25
2006	6	-	13	48	-	-	6	-	6	60	104	-	-	5	0	-	15
2011	10	2	72	6	-	-	1	5	-	53	90	1	-	4	4	-	46
2016	8	-	86	4	1	2	-	1	-	67	12	1	-	2	4	5	40
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	-	-	0.1
2006	0.0	-	0.2	0.7	-	-	0.0	-	0.1	1.3	0.6	-	-	0.0	0.0	-	0.0
2011	0.0	0.0	1.0	0.0	-	-	0.0	0.0	-	1.1	0.4	0.0	-	0.0	0.2	-	0.2
2016	0.0	-	2.1	0.1	0.0	0.0	-	0.0	-	2.2	0.1	0.0	-	0.0	0.3	0.0	0.2

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

FORB SPECIES	Veronica biloba ^{ai} (two-lobed speedwell)	Zizadenus paniculatus (foothill deathcamas)
year	Nested Frequency	
1996	-	2
2001	-	1
2006	-	11
2011	1	6
2016	-	15
year	Average Cover (%)	
1996	-	0.0
2001	-	0.0
2006	-	0.1
2011	0.0	0.0
2016	-	0.2

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 ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Eriogonum microthecum ^p (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
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

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

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 (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Eriogonum microthecum^p -- (slender buckwheat)									
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
Linanthus pungens -- (granite prickly phlox)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	20	-	0	100	0	0	0	0	-/-

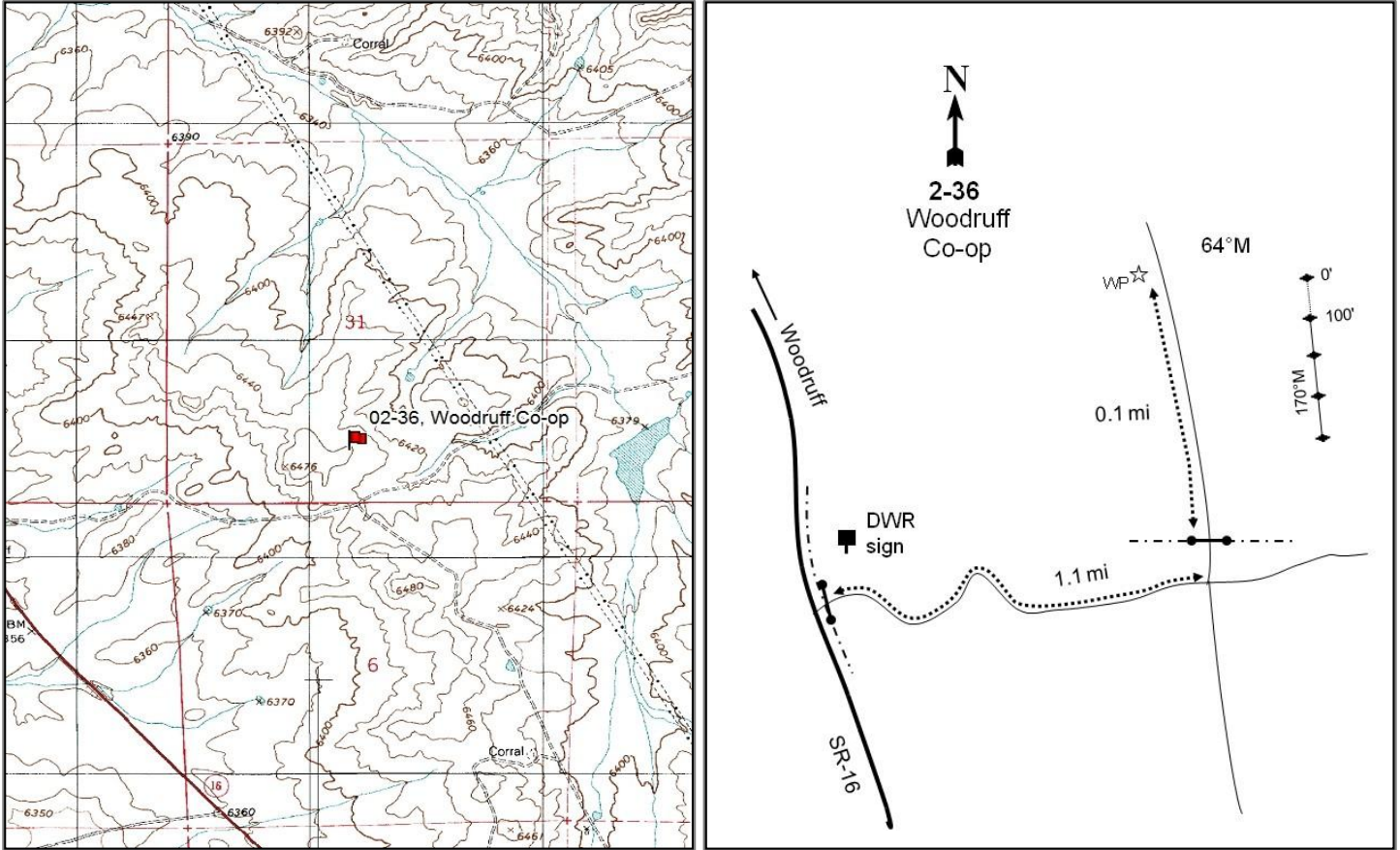
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Opuntia -- (pricklypear)									
1996	100	-	0	100	0	0	0	0	9/29
2001	180	-	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
Symphoricarpos oreophilus -- (mountain snowberry)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	80	-	0	100	0	0	0	0	-/-
Tetradymia canescens -- (spineless horsebrush)									
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

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

Table -02-35.15 - Deer Desirable Components Index: Mid 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	25.7	9.3	9.5	30.0	0.0	4.2	0.0	78.7	Good-Excellent
2001	30.0	0.6	1.0	30.0	0.0	4.4	0.0	66.0	Fair-Good
2006	28.4	4.2	0.5	30.0	0.0	7.0	0.0	70.2	Good
2011	30.0	4.5	1.0	30.0	0.0	10.0	0.0	75.5	Good
2016	28.4	6.3	1.5	30.0	0.0	10.0	0.0	76.2	Good

WOODRUFF CO-OP - STUDY NO. 02-36



Location Information

USGS 7.5 min Map Info Neponset Reservoir N; Township 9N, Range 8E, Section 31
 GPS (0' Stake) NAD 83 UTM ZONE 12, 493110 East 4590692 North

Transect Information

Browse Tag # (0' Stake) 131
 Transect Bearing 170° 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 SR-39 and SR-16 in Woodruff, travel south on SR-16, 5.7 miles to the Woodruff Co-op Livestock Management Area. Turn left (east) through the gate. Drive 1.1 miles to a fork. Turn left and go north through the gate. From the gate, go 0.1 miles. The study is on the east side of the road, approximately 60 paces to the 0-foot baseline stake. The study stakes are short fence posts. The 0-foot baseline stake is marked with browse tag #131. The baseline has a small dogleg from 300-400.

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

Table 02-36.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Seed Unknown	-	-	Historic	-
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 lbs/acre
G	<i>Achnatherum hymenoides</i>	Indian Ricegrass	Rimrock	0.58	0.56
G	<i>Dactylis glomerata</i>	Orchardgrass	Paiute	0.58	0.50
G	<i>Elymus lanceolatus</i>	Thickspike Wheatgrass	Critana	0.58	0.55
G	<i>Leymus cinereus</i>	Great Basin Wildrye	Trailhead	0.41	0.19
G	<i>Leymus cinereus</i>	Great Basin Wildrye	Trailhead	0.29	0.24
G	<i>Psathyrostachys juncea</i>	Russian Wildrye	Bozoisky	1.01	0.76
G	<i>Pseudoroegneria spicata</i>	Bluebunch Wheatgrass	Goldar	0.58	0.54
F	<i>Astragalus cicer</i>	Cicer Milkvetch		0.87	0.77
F	<i>Linum perenne</i>	Blue Flax	Appar	0.14	0.12
F	<i>Medicago sativa</i>	Alfalfa	Ranger	1.45	1.38
F	<i>Melilotus officinalis</i>	Yellow Sweetclover		0.29	0.27
F	<i>Onobrychis viciifolia</i>	Sainfoin	Remont	0.58	0.51
F	<i>Sanguisorba minor</i>	Small Burnet	VNS	1.45	1.29
S	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	Wyoming Big Sagebrush		0.20	0.01
S	<i>Atriplex canescens</i>	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
Deer	crucial	winter	
Greater Sage Grouse	Crucial	occupied & Winter	brood-rearing
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

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 # 034XY212UT
 States and Transitions No state and transition model is available for this ecological site.

The states and transitions for this site are likely similar to those of the Semidesert Loam (Wyoming Big Sagebrush), R035XY209UT ecological site. This study site has existed as a perennial grass community type since its establishment in 1990. Crested wheatgrass (*Agropyron cristatum*) has been the most abundant species in all sample years, although other native species are present in lower amounts (Table 02-36.10). Preferred browse species such as Wyoming big sagebrush and winterfat (*Krascheninnikovia lanata*) are scattered throughout the site and contribute little cover (Table 02-36.12). Forbs are depauperate in both diversity and abundance (Table 02-36.11).

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	-	-

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

Table 02-36.8 - 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	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

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	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
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)	-	-	-

*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 ⁱ (crested wheatgrass)	Bromus tectorum ^{ai} (cheatgrass)	Dactylis glomerata ⁱ (orchardgrass)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea ⁱ (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
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

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 ^{ai} (desert madwort)	Antennaria (pussytoes)	Astragalus (milkvetch)	Astragalus convallarius (lesser rusty milkvetch)	Astragalus utahensis (Utah milkvetch)	Lappula occidentalis ^a (flatspine stickseed)	Linum perenne ⁱ (blue flax)	Lomatium (desertparsley)	Medicago sativa ⁱ (alfalfa)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Sanguisorba minor ⁱ (small burnet)	Schoenocrambe limifolia (flaxleaf plainsmustard)	Tragopogon dubius ^{ai} (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
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

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 ^p (Wyoming big sagebrush)	Atriplex canescens ^p (fourwing saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Krascheninnikovia lanata ^p (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	-
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

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

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 (%)				
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
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
Atriplex canescens^p -- (fourwing saltbush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	40	-	0	100	0	100	0	0	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
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
Krascheninnikovia lanata^p -- (winterfat)									
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
Opuntia polyacantha -- (plains pricklypear)									
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
Tetradymia canescens -- (spineless horsebrush)									
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

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

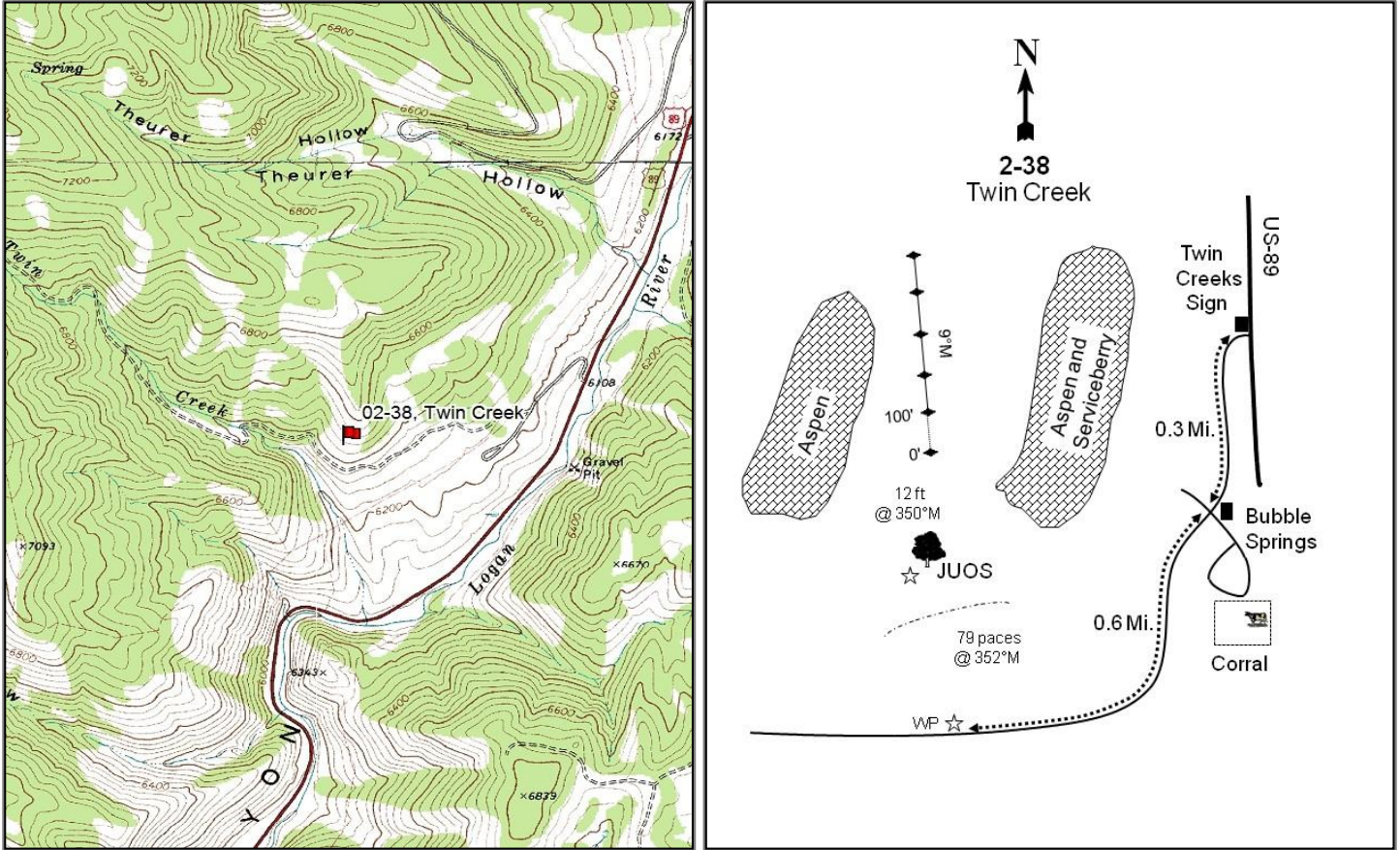
Table 02-36.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1996	88	-	-	-	-	-	10.2

Table -02-36.15 - Deer Desirable Components Index: Low 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	33.5	Fair
2001	1.9	0.0	0.0	30.0	0.0	1.7	0.0	33.6	Fair
2006	1.1	0.0	0.0	30.0	0.0	3.7	0.0	34.8	Fair
2011	2.0	0.0	0.0	30.0	0.0	10.0	0.0	42.0	Fair
2016	4.4	0.0	0.0	30.0	0.0	1.0	0.0	35.4	Fair

TWIN CREEK - STUDY NO. 02-38



Location Information

USGS 7.5 min Map Info Temple Peak NW; Township 13N, Range 3E, Section 14
 GPS (0' Stake) NAD 83 UTM ZONE 12, 451639 East 4634743 North

Transect Information

Browse Tag # (0' Stake) Not Available
 Transect Bearing 9° magnetic
 Length 500ft
 Belt Placement Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
 Belt Marker Placement Standard, Belt 1, 3: 10ft

Directions to Site

Take the Twin Creek turnoff off of U.S. 89 and proceed 0.3 miles to the Bubble Springs turn. Go right and continue for 0.6 miles to a witness post. 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

Wildlife Habitat and Vegetation History

Table 02-38.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	summer
Elk	crucial	winter
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	No Encroachment
2006	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2011	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2016	Mountain Big Sagebrush/Perennial Grass	No Encroachment

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	A defined state and transition model is available.

The current and past states of this study site are not defined by the current state and transition model (USDA-NRCS, 2013). 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*) since study establishment in 1996 (Table 02-38.12). The herbaceous understory has been rich in diversity and abundant in all study years, with perennial grasses mainly bluebunch wheatgrass (*Pseudoroegneria spicata*) -as a co-dominant site component in all years. The introduced species bulbous bluegrass (*Poa bulbosa*) has been observed in all sample years, and has increased in cover each year since 2006 (Table 02-38.7, Table 02-38.10). Forbs are diverse and cover has been mainly contributed by perennial species (Table 02-38.11).

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	9.1	12.9	-	-	-	-
2001	14.1	14.3	-	-	-	-
2006	12.8	11.2	-	20.6	19.2	-
2011	13.5	10.0	-	24.4	22.4	-
2016	19.7	9.0	-	26.8	13.7	-

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	406	331	132	0.1	20.8	5.3	9.0
2001	-	417	259	150	-	18.4	2.8	11.8
2006	14	401	203	167	0.0	21.3	1.3	11.2
2011	19	414	225	217	0.1	23.8	2.6	13.8
2016	52	427	153	248	1.1	30.2	1.4	14.7

Table 02-38.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptograms	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	25.0	6.9	2.1	65.7

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	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
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)	-	-

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 ^{ai} (field brome)	Bromus marginatus (mountain brome)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Elymus trachycaulus (slender wheatgrass)	Melica bulbosa (oniongrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency											
1996	-	9	-	40	3	-	70	9	33	162	27	265
2001	-	13	-	25	-	0	19	64	50	222	67	264
2006	-	-	10	47	4	-	9	27	46	137	36	339
2011	2	4	19	74	-	0	20	51	197	105	22	335
2016	-	62	49	41	7	3	8	25	209	160	25	263
year	Average Cover (%)											
1996	-	0.2	-	0.8	0.1	-	1.9	0.1	1.6	3.4	0.5	12.3
2001	-	0.2	-	0.4	-	0.0	0.5	0.9	1.2	6.8	0.8	7.5
2006	-	-	0.0	0.9	0.0	-	0.2	0.2	0.7	2.0	0.3	17.0
2011	0.0	0.0	0.1	1.1	-	0.0	0.9	0.3	5.0	1.1	0.1	15.4
2016	-	2.1	1.0	1.2	0.2	0.0	0.3	0.3	7.3	7.0	0.2	11.7

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 ^{ai} (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 ^{ai} (littlerpod false flax)	Chenopodium album ^a (lambquarters)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawk'sbeard)	Delphinium nuttalianum (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	49	20	77	1	4	14	2	15	4	-	-	11	1	27	19	28	-
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	1.7	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	-

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

FORB SPECIES	Descuraimia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum heracleoides (parsnipflower buckwheat)	Galium aparine ^a (stickywilly)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Hackelia patens (spotted stickseed)	Helianthella uniflora (oneflower helianthella)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stoneseed)	Lupinus argenteus (silvery lupine)	Microsteris gracilis ^a (slender phlox)	Noccaea 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	12	-	2	38	11	3	9	1	32	2	3	2	-
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	0.2	-	0.0	2.1	0.1	0.0	0.0	0.0	1.0	0.0	0.0	0.0	-

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

FORB SPECIES	Polygonum douglasii ^a (Douglas' knotweed)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Symphotrichum (aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow safsify)	Verbascum blattaria ^{ai} (moth mullein)	Veronica biloba ^{ai} (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	9	33	1	1	41
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

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 alnifolia ^p (Saskatoon serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Eriogonum heracleoides (parsnipflower buckwheat)	Prunus virginiana ^p (chokecherry)	Purshia tridentata ^p (antelope bitterbrush)	Symphoricarpos oreophilus (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
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	16.2	3.3	0.0	0.4	3.1	5.7

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

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 (%)				
Amelanchier alnifolia ^p -- (Saskatoon serviceberry)									
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
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Eriogonum heracleoides -- (parsnipflower buckwheat)									
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

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 (%)				
Ericameria nauseosa -- (rubber rabbitbrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	104/187
2016	-	-	-	-	-	-	-	-	-/-
Prunus virginiana^p -- (chokecherry)									
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
Purshia tridentata^p -- (antelope bitterbrush)									
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
Symphoricarpos oreophilus -- (mountain snowberry)									
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

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

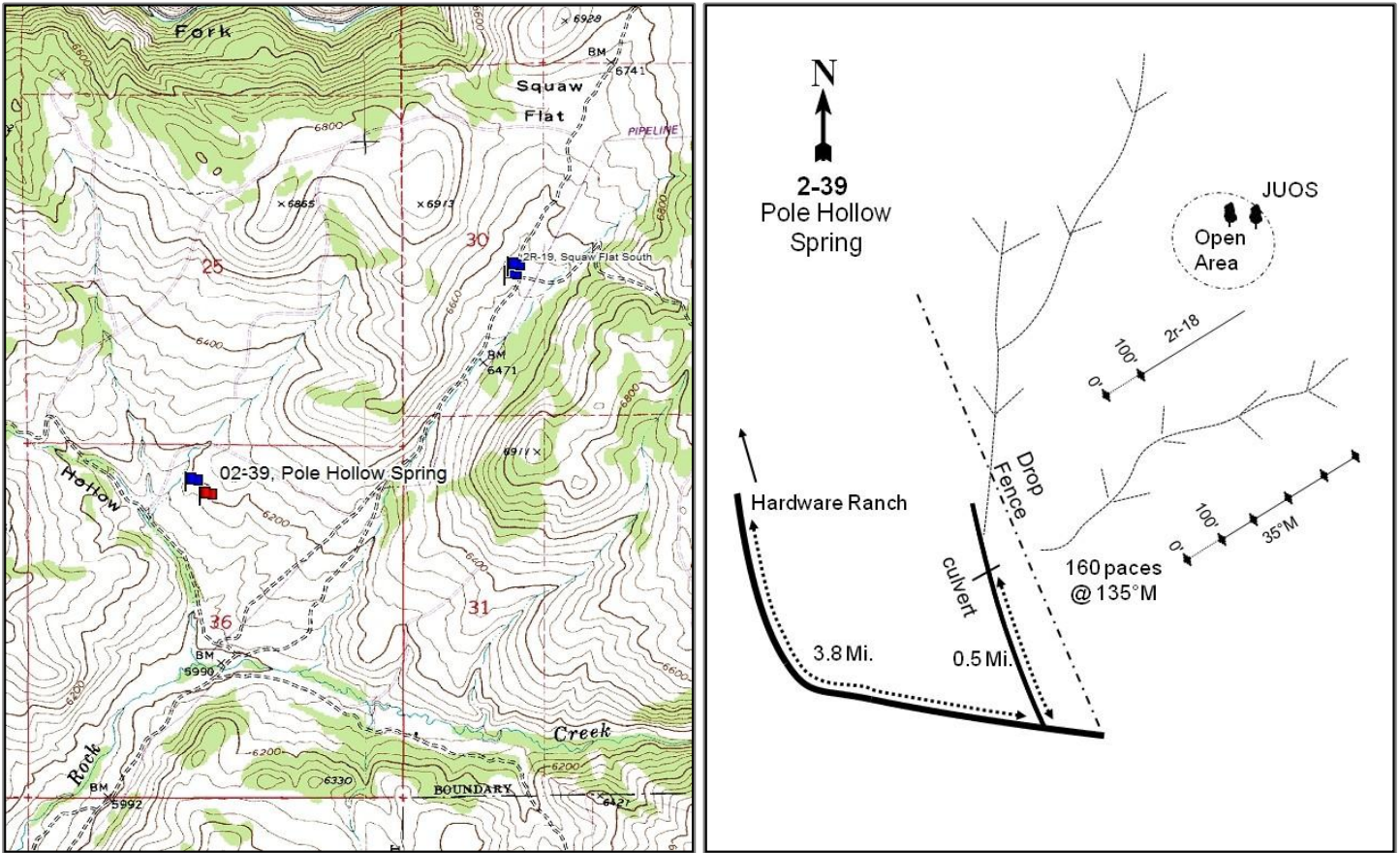
Table 02-38.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2016	3	-	-	-	-	100	49.0

Table -02-38.15 - Deer Desirable Components Index: High 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	12.0	13.6	9.4	30.0	0.0	10.0	0.0	75.0	Good
2001	18.3	11.7	1.8	30.0	0.0	10.0	0.0	71.8	Fair-Good
2006	16.7	12.4	3.4	30.0	0.0	10.0	0.0	72.4	Good
2011	17.5	9.7	6.6	30.0	0.0	10.0	0.0	73.8	Good
2016	25.6	14.3	15.0	30.0	-0.8	10.0	0.0	94.0	Excellent

POLE HOLLOW SPRING - STUDY NO. 02-39



Location Information

USGS 7.5 min Map Info	Boulder Mountain SE; Township 11N, Range 3E, Section 36
GPS (0' Stake)	NAD 83 UTM ZONE 12, 454129 East 4611223 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	35° 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, 5: 1ft, Belt 4: No Rebar

Directions to Site

From Hardware Ranch, travel northeast for 3.8 miles to the Pole Hollow Road. Take a 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

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	2016	2143

Wildlife Habitat and Vegetation History

Table 02-39.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	summer	
Elk	crucial	winter	
Greater Sage Grouse	Crucial	occupied	brood-rearing
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 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

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.

	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	A defined state and transition model is available.

Since study establishment in 1996, this site has been dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and mountain snowberry (*Symphoricarpos oreophilus*) (Table 02-39.12) which places it in Community Phase 6.1 of the Mountain Big Sagebrush/Snowberry state (State 6). The herbaceous component is diverse and abundant, and although the community phase description states that perennial forbs are absent in this phase, perennial forbs and grasses provide the most cover in the understory (Table 02-39.7). Introduced brome grasses have been observed in every sample year, but in low amounts (Table 02-39.10). No transitions from the current community phase or state have been described by this model (USDA-NRCS, 2013). Although cover and density are relatively low, the presence of Utah juniper (*Juniperus osteosperma*) indicates that this study site has the potential for encroachment (Table 02-39.12, Table 02-39.13); a current lop and scatter treatment in the area may target and remove these trees (Table 02-39.1).

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	20.2	15.6	-	-	-	-
2001	27.0	15.2	-	-	-	-
2006	27.7	17.2	-	37.1	23.5	-
2011	30.8	14.5	-	38.2	27.7	0.1
2016	25.8	18.8	0.0	34.1	24.0	-

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	339	132	326	0.0	9.5	2.2	11.6
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

Table 02-39.8 - 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	14.2	-	56.5	1.8	0.5	55.3
2001	15.3	-	40.7	1.9	0.2	61.6
2006	22.3	-	47.2	0.4	0.1	61.0
2011	8.7	-	46.5	1.7	0.0	73.7
2016	13.4	-	43.8	1.2	0.2	60.0

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	Elk	Greater Sage- Grouse	Moose	Rabbit
	Quadrat Frequency					
1996	2	2	6	-	-	-
2001	-	-	-	-	-	-
2006	1	2	-	-	-	-
2011	-	1	-	-	-	3
2016	2	-	1	-	-	1
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)*	-	-

*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)	Bromus arvensis ^{ai} (field brome)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Koeleria macrantha (prairie Junegrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (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	-	41	251	21	109
2006	28	10	15	2	-	2	23	27	-	52	141	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
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	-	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	3.3	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

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 ^{ai} (desert madwort)	Artemisia ludoviciana (white sagebrush)	Astragalus cibirius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus lentiginosus (freckled milkvetch)	Balsamorhiza macrophylla (cutleaf balsamroot)	Calochortus nuttallii (sego lily)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cordylanthus ramosus ^a (bushy bird's beak)	Crepis acuminata (tapertip hawk'sbeard)	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	73	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	-	-
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	-	-

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)	Helioemeris multiflora var. multiflora (showy goldeneye)	Holosteum umbellatum ^{ai} (jagged chickweed)	Ipomopsis aggregata (scarlet gilia)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^{ai} (flatspine stickseed)	Lupinus argenteus (silvery lupine)	Mertensia (bluebells)	Microsteris gracilis ^a (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	-	5	1	5	-	66	-	40	-	-	6	2
2011	0	13	7	-	4	-	1	13	2	-	77	-	21	11	4	3	-
2016	-	7	8	2	13	2	-	1	-	3	76	9	4	-	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	0.0	-	2.4	-	0.1	-	-	0.1	0.0
2011	0.0	0.2	0.3	-	0.3	-	0.0	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	-	-

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

FORB SPECIES	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^{ai} (Douglas' knotweed)	Potentilla diversifolia (varileaf cinquefoil)	Symphotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow safsify)	Veronica biloba ^{ai} (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	168	6	8	15	-	-	3
2011	-	1	-	188	3	17	14	8	20	6
2016	-	3	-	198	2	12	10	-	6	2
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	3.5	0.0	0.1	0.0	-	-	0.1
2011	-	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

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 alnifolia ^p (Saskatoon serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Eriogonum heracleoides (parsnipflower buckwheat)	Juniperus scopulorum ⁱ (Rocky Mountain juniper)	Mahonia repens (creeping barberry)	Purshia tridentata ^p (antelope bitterbrush)	Symphoricarpos oreophilus (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
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

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

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 (%)				
Amelanchier alnifolia ^p -- (Saskatoon serviceberry)									
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
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
1996	4020	420	10	83	8	27	5	1	64/87
2001	4040	-	12	72	16	20	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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Eriogonum heracleoides -- (parsnipflower buckwheat)									
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	-	-	-	-	-	-	-	-	-/-

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 (%)				
Juniperus scopulorum^t -- (Rocky Mountain juniper)									
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	-/-
Mahonia repens -- (creeping barberry)									
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
Purshia tridentata^p -- (antelope bitterbrush)									
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
Symphoricarpos oreophilus -- (mountain snowberry)									
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

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

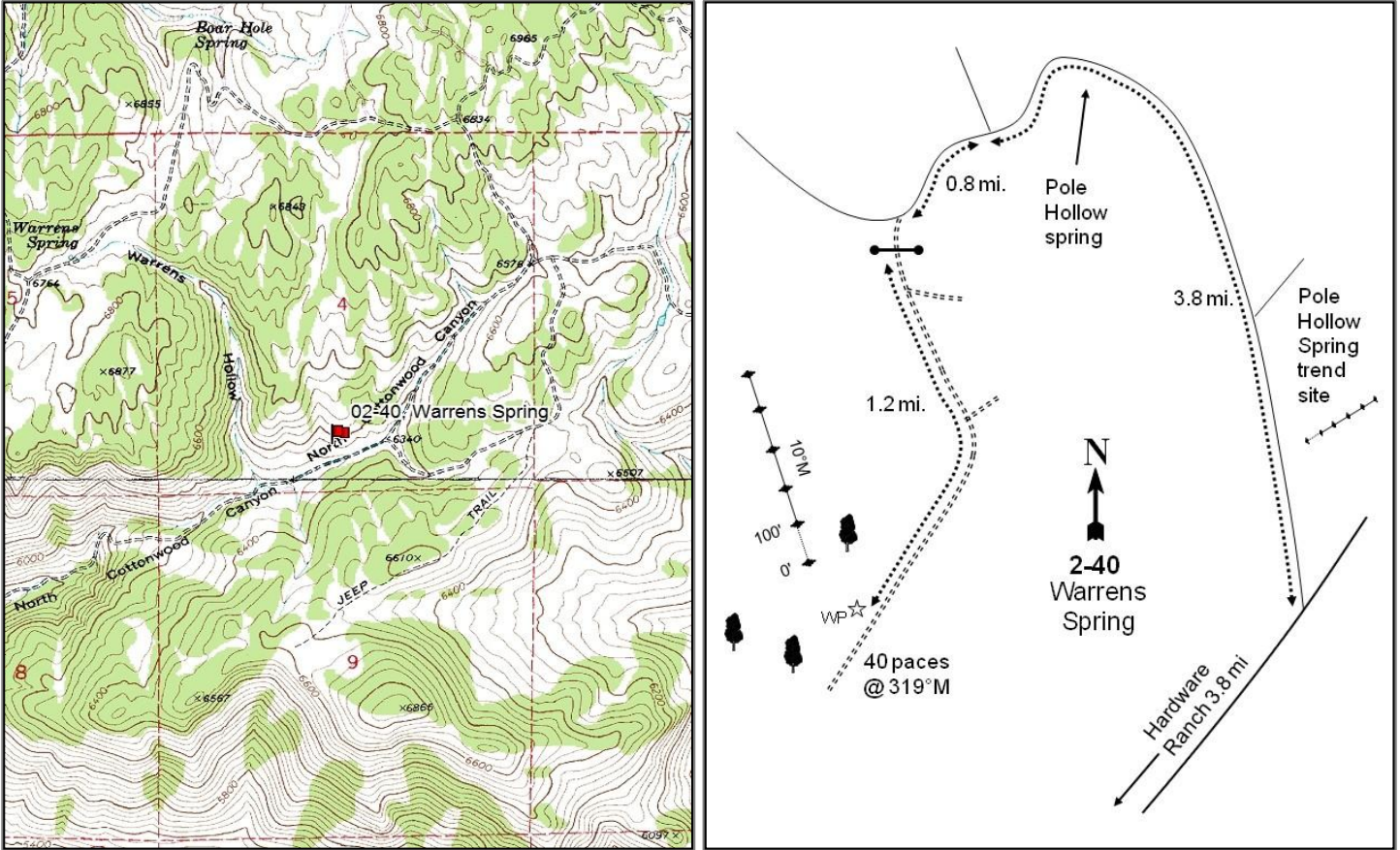
Table 02-39.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus scopulorum (Rocky Mountain juniper)							
1996	3	-	-	-	-	-	17.0
2016	18	18	27	27	27	-	7.8

Table -02-39.15 - Deer Desirable Components Index: High 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	27.4	13.7	5.1	30.0	-3.1	10.0	0.0	83.1	Good
2001	30.0	9.8	5.3	30.0	-0.2	10.0	0.0	84.9	Good
2006	30.0	11.4	1.3	18.9	0.0	10.0	0.0	71.6	Fair-Good
2011	30.0	12.2	5.5	30.0	-0.3	10.0	0.0	87.4	Good
2016	30.0	14.1	3.9	25.6	0.0	10.0	0.0	83.6	Good

WARRENS SPRING - STUDY NO. 02-40



Location Information

USGS 7.5 min Map Info Boulder Mountain SW; Township 10N, Range 3E, Section 04
 GPS (0' Stake) NAD 83 UTM ZONE 12, 449316 East 4608473 North

Transect Information

Browse Tag # (0' Stake) Not Available
 Transect Bearing 10° magnetic
 Length 500ft
 Belt Placement Line 1 (11ft), Line 2 (34ft), Line 3 (71ft), Line 4 (95ft), Line 5 (59ft)
 Belt Marker Placement Standard, Belt 2, Belt 5: 1ft

Directions to Site

From Hardware Ranch, travel northeast for 3.8 miles to the Pole Hollow Road. Take a left and travel up Pole Hollow for 3.8 miles, passing the Pole Hollow trend 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 mile 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

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	2016?	2143

Wildlife Habitat and Vegetation History

Table 02-40.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
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

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 Saskatoon serviceberry (*Amelanchier alnifolia*) 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	A defined state and transition model is available.

Since establishment in 1996, this study site has remained in Community Phase 3.1 of the Mountain Big Sagebrush Superdominance/Low Shrub state (State 3) which is characterized by the dominance of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), the presence of other shrubs, and a reduced understory. A variety of other shrub species contribute to the overstory in lower amounts (Table 02-40.12). Although the model states that this community phase features a decreased understory, the herbaceous component was moderately abundant in 2016 and mainly comprised of perennial forbs and grasses such as arrowleaf balsamroot (*Balsamorhiza sagittata*) and bluebunch wheatgrass (*Pseudoroegneria spicata*) (Table 02-40.7, Table 02-40.10, Table 02-40.11). The model indicates that the site could be tilled and reseeded to follow Transition T3a to transition to the Introduced Grassland state (State 4) or undergo brush management (Transition T3b) to enter the Yellow Rabbitbrush/Spineless Horsebrush state (State 5). This study site could also revert to the Mountain Big Sagebrush-Steppe/Introduced Non-Natives state (State 2) via wildfire and prescribed grazing (Restoration Pathway R3a) or herbicide and prescribed grazing (Restoration Pathway R3b) (USDA-NRCS, 2013).

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	16.2	3.4	-	-	-	-
2001	23.2	5.9	-	-	-	-
2006	17.8	6.3	-	22.7	9.5	-
2011	15.6	5.5	0.0	26.1	7.6	1.4
2016	21.8	6.1	1.0	24.6	8.1	0.7

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	206	319	178	5.9	5.4	4.7	4.0
2001	106	210	281	182	0.9	5.5	2.3	4.0
2006	135	257	315	252	0.9	7.7	2.8	8.1
2011	178	231	372	281	1.7	4.9	9.9	9.2
2016	244	276	269	268	8.5	10.9	5.4	14.6

Table 02-40.8 - 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	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

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	Elk	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
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)	-	-	-

Table 02-40.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus arvensis ^{ai} (field brome)	Bromus marginatus (mountain brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus trachycaulus (slender wheatgrass)	Melica bulbosa (oniongrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency									
1996	142	5	156	7	-	16	1	12	4	184
2001	69	23	42	5	-	23	-	14	14	161
2006	97	32	59	3	0	26	-	21	22	212
2011	139	25	68	14	-	21	-	20	22	188
2016	123	17	197	28	-	90	7	14	5	183
year	Average Cover (%)									
1996	2.7	0.1	3.2	0.2	-	0.3	0.0	0.4	0.0	4.4
2001	0.7	0.2	0.3	0.0	-	0.5	-	0.2	0.1	4.5
2006	0.5	0.2	0.5	0.0	0.0	0.7	-	0.6	0.1	6.2
2011	1.6	0.1	0.1	0.2	-	0.7	-	0.5	0.3	3.1
2016	2.7	0.3	5.7	0.5	-	3.0	0.0	0.1	0.2	6.8

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	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcress)	Artemisia dracunculus (tarragon)	Astragalus (milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza macrophylla (cutleaf balsamroot)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (litlepod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	
year	Nested Frequency																	
1996	19	-	81	213	-	6	14	1	-	15	-	-	1	10	6	44	40	
2001	31	3	113	129	1	-	4	1	-	13	-	3	-	-	5	46	107	
2006	31	5	129	14	2	-	-	4	3	35	2	-	-	4	5	137	92	
2011	32	6	183	151	1	-	8	-	8	46	-	3	-	4	22	16	77	
2016	41	3	165	178	4	3	2	8	16	41	-	-	-	2	9	5	52	
year	Average Cover (%)																	
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	
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	
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	
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	
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	

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 ^a (western tansymustard)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum heracleoides (parsnipflower buckwheat)	Galium aparine ^a (stickywilly)	Hackelia patens (spotted stickseed)	Helianthella uniflora (oneflower helianthella)	Helianthus annuus ^a (common sunflower)	Helionis multiflora var. multiflora (showy goldeneye)	Holosteum umbellatum ^{ai} (jagged chickweed)	Isatis tinctoria ^{aii} (Dyer's woad)	Lactuca serriola ^{ai} (prickly lettuce)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stoneseed)	
year	Nested Frequency																	
1996	5	5	-	2	-	65	1	5	-	0	2	5	1	36	1	15	0	
2001	2	1	5	3	2	54	-	-	4	2	-	-	2	8	8	22	5	
2006	-	3	13	4	-	78	-	3	-	10	-	5	4	-	4	28	10	
2011	1	2	33	1	-	46	3	40	1	21	-	8	6	15	28	69	3	
2016	8	1	11	4	-	27	-	20	8	3	-	22	4	3	30	43	0	
year	Average Cover (%)																	
1996	0.0	0.0	-	0.0	-	0.6	0.0	0.2	-	0.0	0.6	0.0	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	-	-	0.0	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	-	0.0	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	0.0	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	0.0	0.1	0.8	0.0	

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 ^a (slender phlox)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Penstemon humilis (low beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Symphotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Veronica biloba ^{ai} (two-lobed speedwell)	Viola (violet)	Wyethia amplexicaulis (mule-ears)	
year	Nested Frequency															
1996	11	1	-	33	-	-	0	-	50	30	1	21	166	-	1	
2001	5	1	2	60	3	-	5	-	28	32	3	18	121	-	1	
2006	2	34	-	16	-	1	3	3	96	52	-	17	202	-	1	
2011	20	6	-	32	-	-	5	-	50	44	-	77	306	5	11	
2016	10	2	-	21	-	-	1	-	5	16	7	43	99	5	6	
year	Average Cover (%)															
1996	0.8	0.0	-	0.1	-	-	0.0	-	0.1	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	0.8	0.0	0.2	0.3	-	0.1	
2006	0.2	0.4	-	0.0	-	0.0	0.0	0.0	0.3	1.4	-	0.2	1.2	-	0.2	
2011	0.4	0.0	-	0.1	-	-	0.0	-	0.2	1.0	-	1.0	6.4	0.0	0.2	
2016	0.5	0.0	-	0.1	-	-	0.0	-	0.0	0.4	0.0	0.5	0.8	0.0	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 alnifolia ^p (Saskatoon serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)	Juniperus scopulorum ⁱ (Rocky Mountain juniper)	Mahonia repens (creeping barberry)	Prunus virginiana ^p (chokecherry)	Purshia tridentata ^p (antelope bitterbrush)	Rosa woodsii ^p (Woods' rose)	Symphoricarpos oreophilus (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
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

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

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 (%)				
Acer grandidentatumⁱ -- (bigtooth maple)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	231/241
Amelanchier alnifolia^p -- (Saskatoon serviceberry)									
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
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Ceanothus velutinus -- (snowbrush ceanothus)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	22/61

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 (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Eriogonum heracleoides -- (parsnipflower buckwheat)									
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
Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)									
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
Juniperus scopulorum¹ -- (Rocky Mountain juniper)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	20	0	0	0	0	0	0	-/-
2016	-	-	-	-	-	-	-	-	-/-
Mahonia repens -- (creeping barberry)									
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
Prunus virginiana^p -- (chokecherry)									
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
Purshia tridentata^p -- (antelope bitterbrush)									
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
Rosa woodsii^p -- (Woods' rose)									
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	-	-	-	-	-	-	-	-	-/-
Sambucus nigra ssp. cerulea^p -- (blue elderberry)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	94/165
Symphoricarpos oreophilus -- (mountain snowberry)									
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

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

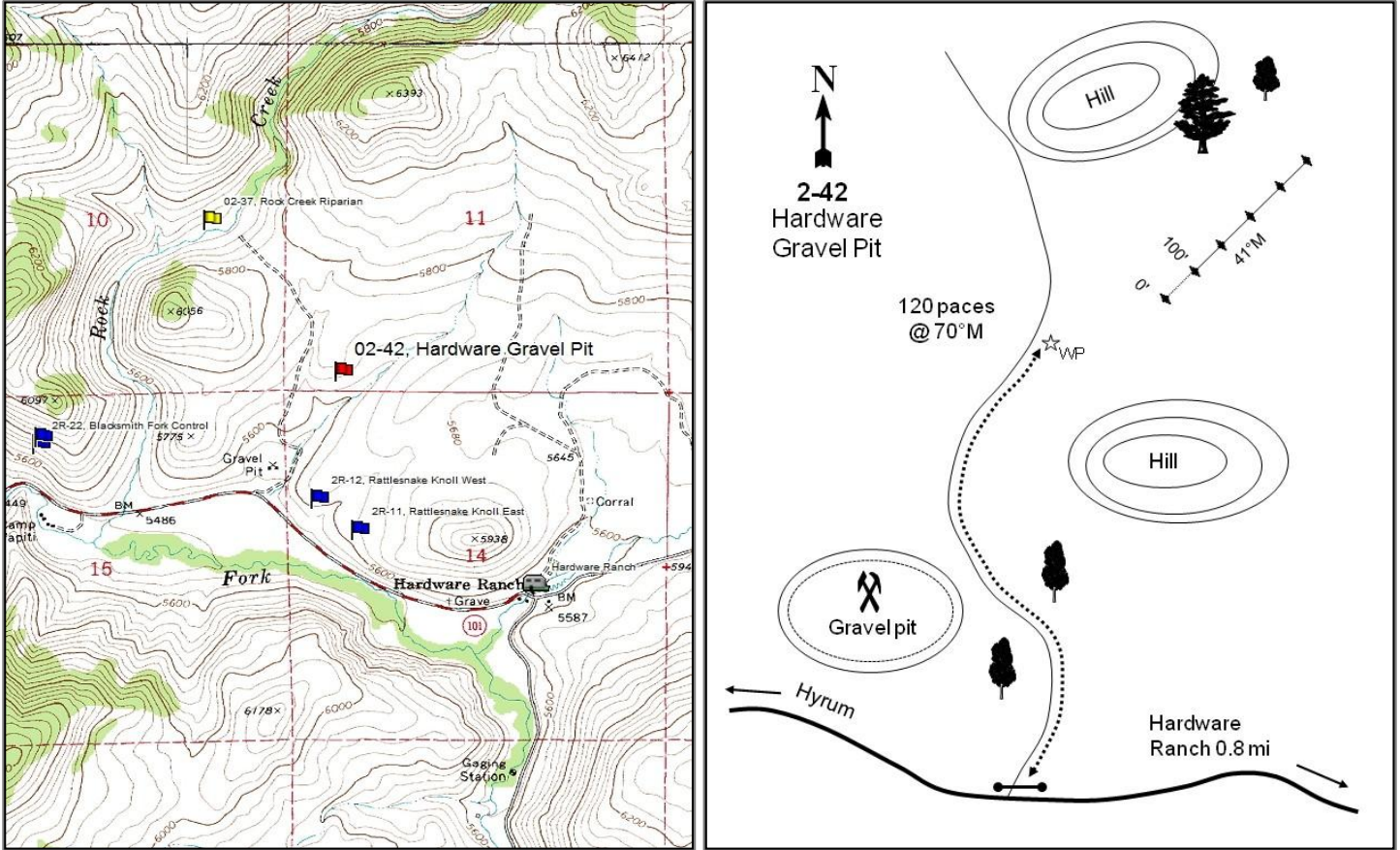
Table 02-40.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Acer grandidentatum (bigtooth maple)							
2016	8	-	-	-	-	100	33.0
Juniperus scopulorum (Rocky Mountain juniper)							
1996	33	-	-	-	-	-	19.0
2001	17	-	-	-	-	-	28.9
2016	15	-	-	-	-	100	41.8

Table -02-40.15 - Deer Desirable Components Index: High 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	21.7	11.1	6.6	11.0	-4.5	9.6	-2.0	53.5	Poor-Fair
2001	29.9	10.7	2.5	10.1	-0.7	8.3	-2.0	58.8	Fair
2006	22.8	9.5	3.3	14.9	-0.7	10.0	0.0	59.8	Fair
2011	19.9	12.0	4.6	8.9	-1.3	10.0	-2.0	52.1	Poor
2016	28.0	10.3	2.4	15.8	-6.4	10.0	0.0	60.2	Fair

HARDWARE GRAVEL PIT - STUDY No. 02-42



Location Information

USGS 7.5 min Map Info	Hardware Ranch NW; Township 10N, Range 3E, Section 11
GPS (0' Stake)	NAD 83 UTM ZONE 12, 451972 East 4606733 North

Transect Information

Browse Tag # (0' Stake)	Not Available
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	Standard, Belt 1: 1ft

Directions to Site

From the Hardware Ranch Visitors' Center, drive westbound on SR 101 for 0.8 miles to a dirt road and gate on the north side of the SR 101. Turn right and travel 0.3 mile 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.

Site Information

Land Ownership	State
Land Administrator	UDWR Allotment No data
Elevation	5,670ft (1,728m)
Aspect	Southeast
Slope	10%
Sample Dates	08/11/2011, 06/28/2016

Wildlife Habitat and Vegetation History

Table 02-42.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Elk	crucial	winter	
Greater Sage Grouse	Crucial	occupied & Winter	brood-rearing
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

Site Notes

The study is located in about a mile northwest of the Hardware Ranch visitor 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 study establishment. Hunting is not allowed within the area. In 2016, there was a rattlesnake noted 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 Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	A defined state and transition model is available.

Since establishment in 2011, this study site has remained in Community Phase 2.1 of the Mountain Big Sagebrush- Steppe/Introduced Non-Natives state (State 2) which is described as exhibiting co-dominance between mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and a diverse and abundant understory. Although sagebrush dominates the overstory (Table 02-42.12), the herbaceous component is mainly composed of the invasive annual grass species cheatgrass (*Bromus tectorum*); other grasses and forbs that are present are not particularly diverse (Table 02-42.10, Table 02-42.11). Through fire suppression and continued heavy grazing (Transition T2a), the model shows that this study site has the potential to transition to the Mountain Big Sagebrush Superdominance/Low Shrub state (State 3) which is characterized by a substantial decrease in native grasses and an increase in sagebrush and other shrubs (USDA-NRCS, 2013). Although cover and density are low, Rocky Mountain juniper (*Juniperus scopulorum*) has been observed in both sample years, indicating that this site has the potential for future encroachment (Table 02-42.12, Table 02-42.13).

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

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

Table 02-42.8 - 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
2011	3.1	0.3	50.8	0.9	12.3	56.9
2016	6.9	-	31.0	2.1	13.4	59.4

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	Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
2011	-	9	3	1	-
2016	2	3	1	-	8
Year	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)*	-

*Pellets per acre (ha)

Table 02-42.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Muhlenbergia filiformis ^a (pullup muhly)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (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
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

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 ^{ai} (desert madwort)	Arenaria serpyllifolia ^{ai} (thymelaf sandwort)	Artemisia ludoviciana (white sagebrush)	Camelina microcarpa ^{ai} (littlepod false flax)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium aparine ^a (stickywilly)	Gayophytum ramosissimum ^a (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
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

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

FORB SPECIES										
Holosteum umbellatum ^{ai} (jagged chickweed)										
Lactuca serriola ^{ai} (prickly lettuce)										
Lappula occidentalis ^a (flatspine stickseed)										
Lomatium (desertparsley)										
Microsteris gracilis ^a (slender phlox)										
Navarretia intertexta ^a (needleleaf navarretia)										
Polygonum douglasii ^a (Douglas' knotweed)										
Taraxacum officinale (common dandelion)										
Tragopogon dubius ^{ai} (yellow salsify)										
Wyethia amplexicaulis (mule-ears)										
year	Nested Frequency									
2011	107	25	140	3	106	9	25	-	9	54
2016	44	12	2	4	45	20	18	3	19	56
year	Average Cover (%)									
2011	0.3	0.1	0.6	0.0	0.3	0.2	0.1	-	0.0	4.7
2016	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	5.0

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 ^p (mountain big sagebrush)				
Gutierrezia sarothrae (broom snakeweed)				
Juniperus scopulorum ^t (Rocky Mountain juniper)				
Purshia tridentata ^p (antelope bitterbrush)				
year	Line Intercept Cover (%)			
2011	21.1	0.7	-	2.4
2016	26	1.1	0.4	1.5
year	Quadrat Cover (%)			
2011	15.9	0.5	-	0.7
2016	20.7	0.5	0.0	0.9

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

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 (%)				
Amelanchier alnifolia^p -- (Saskatoon serviceberry)									
2011	-	-	-	-	-	-	-	-	171/156
2016	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2011	3160	120	3	56	41	39	1	31	69/114
2016	2980	2900	7	88	5	16	3	7	71/100
Gutierrezia sarothrae -- (broom snakeweed)									
2011	420	-	14	86	0	0	0	0	28/37
2016	780	20	8	92	0	0	0	0	25/36
Juniperus scopulorum^t -- (Rocky Mountain juniper)									
2011	20	-	100	0	0	0	0	0	-/-
2016	20	-	100	0	0	0	0	0	-/-
Purshia tridentata^p -- (antelope bitterbrush)									
2011	140	-	0	29	71	29	43	71	102/138
2016	80	-	0	100	0	75	25	0	104/145

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

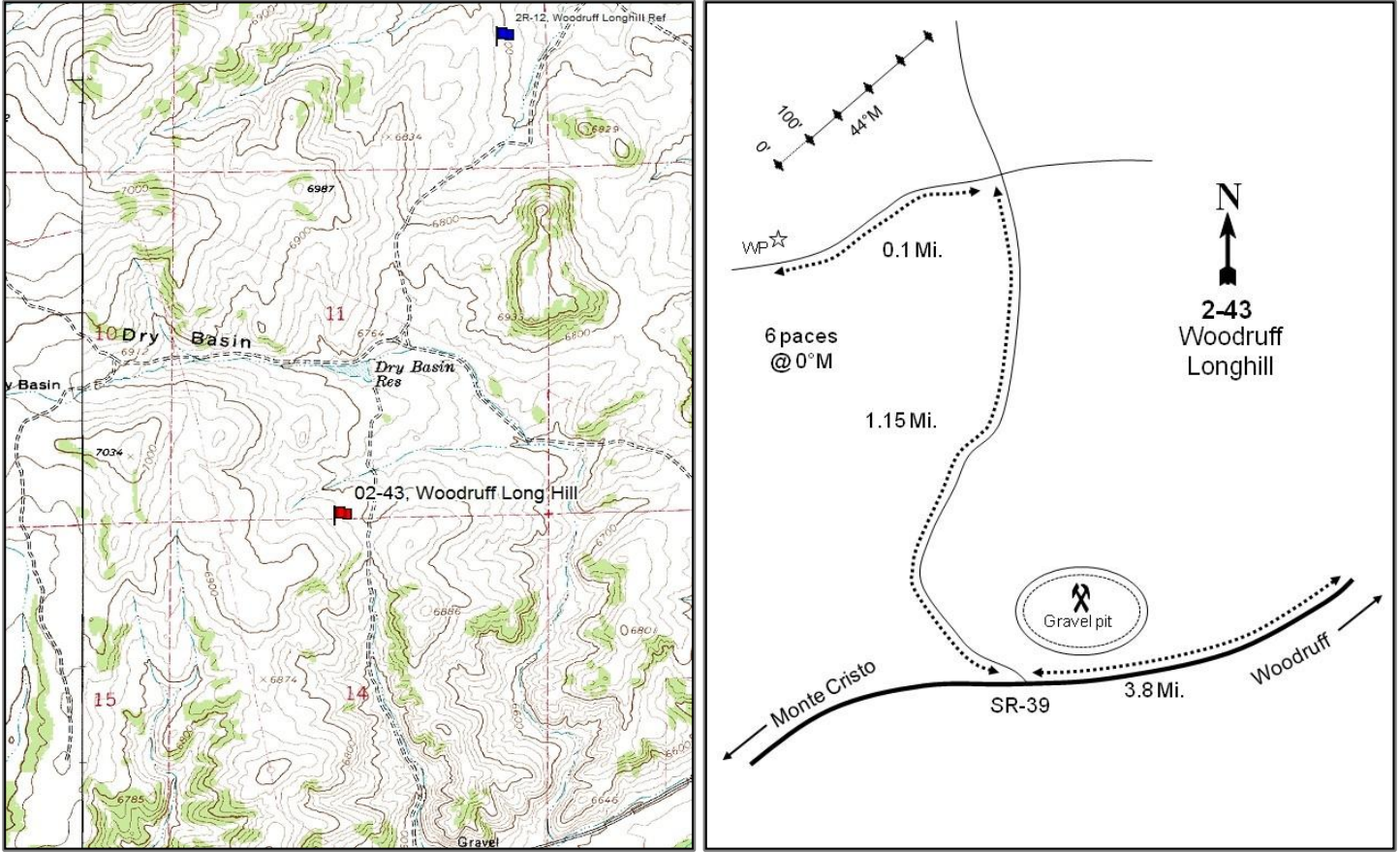
Table 02-42.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus scopulorum (Rocky Mountain juniper)							
2016	10	-	20	60	20	-	8.8

Table -02-42.15 - Deer Desirable Components Index: High 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	21.0	2.3	1.4	4.7	-19.1	10.0	0.0	20.4	Very Poor
2016	27.2	13.6	3.4	3.6	-19.9	10.0	0.0	37.9	Very Poor

WOODRUFF LONGHILL - STUDY No. 02-43



Location Information

USGS 7.5 min Map Info Woodruff SW; Township 9N, Range 6E, Section 14
 GPS (0' Stake) 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 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 and the 0-foot stake is 6 paces 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

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

Wildlife Habitat and Vegetation History

Table 02-43.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Elk	substantial	winter	
Greater Sage Grouse	Crucial	occupied & Winter	brood-rearing
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

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 study site has been mainly comprised of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) since establishment in 2009 (Table 02-43.12). 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 forbs in 2011, forbs have generally remained rare and have lacked diversity (Table 02-43.7, Table 02-43.11). Although Utah juniper (*Juniperus osteosperma*) was recorded in small amounts in 2009, the trees were removed by a lop and scatter treatment in the fall of the same year (Table 02-43.13, Table 02- 43.1).

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	18.1	5.0	-	23.7	6.2	-

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

Table 02-43.8 - 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
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

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	Mule Deer	Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
2009	4	33	-	-	21
2011	3	33	-	2	26
2016	-	18	-	1	3
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)*	-

*Pellets per acre (ha)

Table 02-43.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Carex (sedge)	Elymus elymoides (squirreltail)	Poa fendleriana (nuttongrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea ⁱ (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
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

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 ^{ai} (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Collinsia parviflora ^a (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Cordylanthus ramosus ^a (bushy bird's beak)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Erigeron pumilus (shaggy fleabane)	Eriogonum racemosum (redroot buckwheat)
year	Nested Frequency																
2009	-	-	20	3	-	-	1	-	35	-	-	3	9	-	-	3	0
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	-
year	Average Cover (%)																
2009	-	-	0.1	0.0	-	-	0.0	-	0.3	-	-	0.0	0.1	-	-	0.0	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	-

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

FORB SPECIES										
Eriogonum umbellatum (sulphur-flower buckwheat)										
Gayophytum ramosissimum ^a (pinyon groundsmoke)										
Microsteris gracilis ^a (slender phlox)										
Penstemon (beardtongue)										
Penstemon humilis (low beardtongue)										
Petroradia pumila (rock goldenrod)										
Phlox austromontana (mountain phlox)										
Phlox hoodii (spiny phlox)										
Phlox longifolia (longleaf phlox)										
Polygonum douglasii ^a (Douglas' knotweed)										
year	Nested Frequency									
2009	6	-	-	8	6	-	4	18	8	-
2011	-	1	-	3	24	-	-	28	55	7
2016	-	1	1	-	30	4	-	34	6	5
year	Average Cover (%)									
2009	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

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 ^p (mountain big sagebrush)			
Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)			
Symphoricarpos oreophilus (mountain snowberry)			
year	Line Intercept Cover (%)		
2009	23.8	2.4	-
2011	25.2	7.1	-
2016	23.7	6.2	0
year	Quadrat Cover (%)		
2009	21.2	3.1	-
2011	15.3	5.3	-
2016	18.1	5.0	0.0

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

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 (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2009	-	-	-	-	-	-	-	-	38/60
2011	7200	-	2	63	36	28	38	30	46/70
2016	5040	60	4	78	18	37	27	30	45/70
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
2009	-	-	-	-	-	-	-	-	23/37
2011	5400	20	0	97	3	1	0	3	26/40
2016	4620	-	1	99	0	0	0	0	24/37
Linanthus pungens -- (granite prickly phlox)									
2009	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	19/32
2016	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
2009	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	6/11
Symphoricarpos oreophilus -- (mountain snowberry)									
2009	-	-	-	-	-	-	-	-	-/-
2011	60	-	0	100	0	33	0	0	34/47
2016	20	-	0	100	0	0	0	0	37/62
Tetradymia canescens -- (spineless horsebrush)									
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

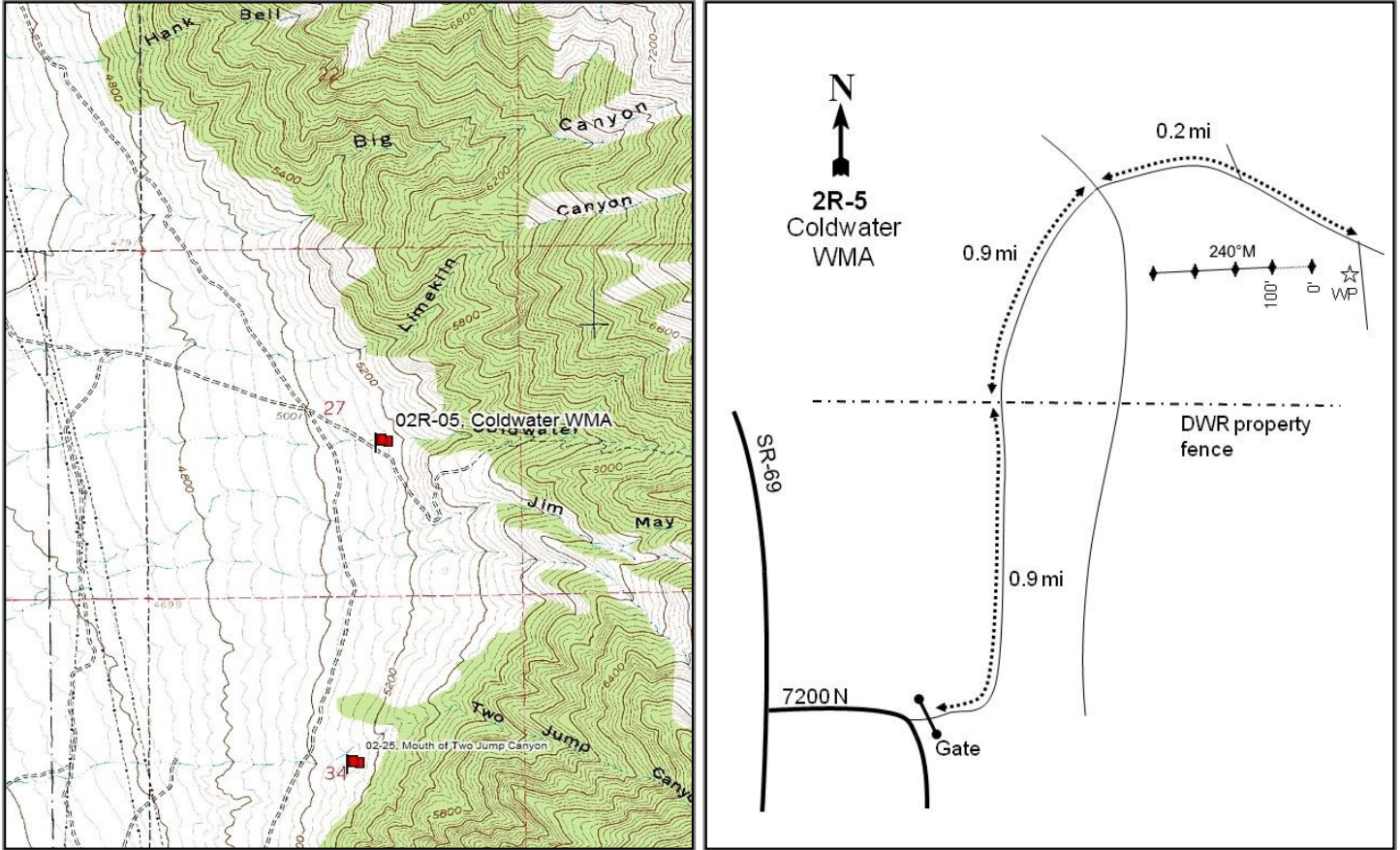
Table 02-43.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2009	7	-	67	33	-	-	4.0

Table -02-43.15 - Deer Desirable Components Index: Low 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	4.2	0.5	27.0	0.0	3.0	0.0	64.8	Fair-Good
2016	22.6	9.6	2.0	30.0	0.0	2.2	0.0	66.4	Fair-Good

COLDWATER WMA - STUDY NO. 02R-5



Location Information

USGS 7.5 min Map Info Honeyville SE; Township 11N, Range 2W, Section 27
 GPS (0' Stake) NAD 83 UTM ZONE 12, 412276 East 4612700 North

Transect Information

Browse Tag # (0' Stake) Not Available
 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 Standard

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 to the north to a fence. Continue another 0.9 miles and as the road turn south keep left for 0.2 miles to a fork, keep right for approximately 300 feet to a witness post. Walk 11 paces at 210 degrees magnetic to the 0-foot stake. 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

Wildlife Habitat and Vegetation History

Table 02R-05.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
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	No Encroachment
2011	Mountain Big Sagebrush	No Encroachment
2016	Mountain Big Sagebrush	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	A defined state and transition model is available.

Since study establishment 1982, the plant community has remained in the Community Phase 2.1 Mountain big sagebrush steppe/Rich & productive herbaceous component within the Mountain Big Sagebrush Steppe/Introduced Non-natives State (State 2) which consists of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) (Table 02R- 5.12) with a diverse and abundant herbaceous understory (Table 02R-5.10, Table 02R-5.11). It is predicted that the site will remain in the current community phase unless there is a major disturbance; However, the introduced perennial grass bulbous bluegrass (*Poa bulbosa*) has increased in abundance over the course of the study and may pose a risk to future browse recruitment (USDA-NRCS, 2011).

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	-

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	196	18.1	2.7	1.3	9.8
2006	268	324	161	176	7.9	14.5	1.1	7.5
2011	325	317	270	227	13.3	10.3	7.5	13.3
2016	340	240	212	328	12.6	13.9	2.3	23.4

Table 02R-05.8 - 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
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

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	Rabbit
	Quadrat Frequency		
2006	-	6	17
2011	-	6	11
2016	-	1	8
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)	-

Table 02R-05.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus arvensis ^{ai} (field brome)	Bromus briziformis ^{ai} (rattlesnake brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Elymus glaucus ssp. jepsonii (Jepson's blue wildrye)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (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
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

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	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Ambrosia psilostachya (Cuman ragweed)	Apocynum androsaemifolium (spreading dogbane)	Artemisia ludoviciana (white sagebrush)	Asclepias asperula (spider milkweed)	Astragalus (milkvetch)	Calochortus nuttallii (sego lily)	Carduus nutans ^{ai} (nodding plumeless thistle)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Draba ^a (draba)	Epilobium brachycapum ^a (tall annual willowherb)	Erodium cicutarium ^{ai} (redstem stork's bill)
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	26
2011	-	234	33	124	6	6	-	5	-	-	2	-	3	-	7	8	31
2016	1	202	14	151	9	2	-	4	-	-	-	2	-	-	1	-	32
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	0.3
2011	-	6.0	0.3	8.9	0.4	0.7	-	0.0	-	-	0.0	-	0.0	-	0.0	0.0	0.1
2016	0.0	1.7	0.3	13.0	0.1	0.4	-	0.0	-	-	-	0.0	-	-	0.0	-	0.3

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

FORB SPECIES	Galium aparine ^a (stickywilly)	Helianthus annuus ^a (common sunflower)	Holosteum umbellatum ⁿⁱ (jagged chickweed)	Isatis tinctoria ⁿⁱ (Dyer's woad)	Lactuca scariola ⁿⁱ (prickly lettuce)	Melilotus officinalis ⁱ (sweetclover)	Microsteris gracilis ^a (slender phlox)	Penstemon (beardtongue)	Phlox longifolia (longleaf phlox)	Symphytotrichum (aster)	Tragopogon dubius ⁿⁱ (yellow salsify)	Veronica biloba ⁿⁱ (twolobe speedwell)	Viola (violet)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency													
1998	-	22	7	-	15	12	-	6	-	-	9	-	-	7
2006	-	9	5	0	-	34	9	-	4	-	3	-	4	40
2011	14	69	13	-	10	88	5	-	1	-	17	2	15	11
2016	2	18	16	-	11	212	6	-	-	3	4	-	16	17
year	Average Cover (%)													
1998	-	0.3	0.2	-	0.1	0.9	-	0.0	-	-	0.1	-	-	0.0
2006	-	0.2	0.0	0.0	-	0.9	0.0	-	0.0	-	0.0	-	0.0	0.7
2011	0.1	0.4	0.4	-	0.0	2.7	0.0	-	0.0	-	0.3	0.0	0.1	0.2
2016	0.0	0.1	0.1	-	0.1	8.8	0.0	-	-	0.4	0.0	-	0.1	0.2

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 ^p (mountain big sagebrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Rhus glabra ^p (smooth sumac)	Rhus trilobata ^p (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
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

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

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 (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
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
Rhus glabra^p -- (smooth sumac)									
1998	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	48/50
2016	120	-	0	100	0	0	0	0	54/46
Rhus trilobata^p -- (skunkbush sumac)									
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
Symphoricarpos oreophilus -- (mountain snowberry)									
1998	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	68/124

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

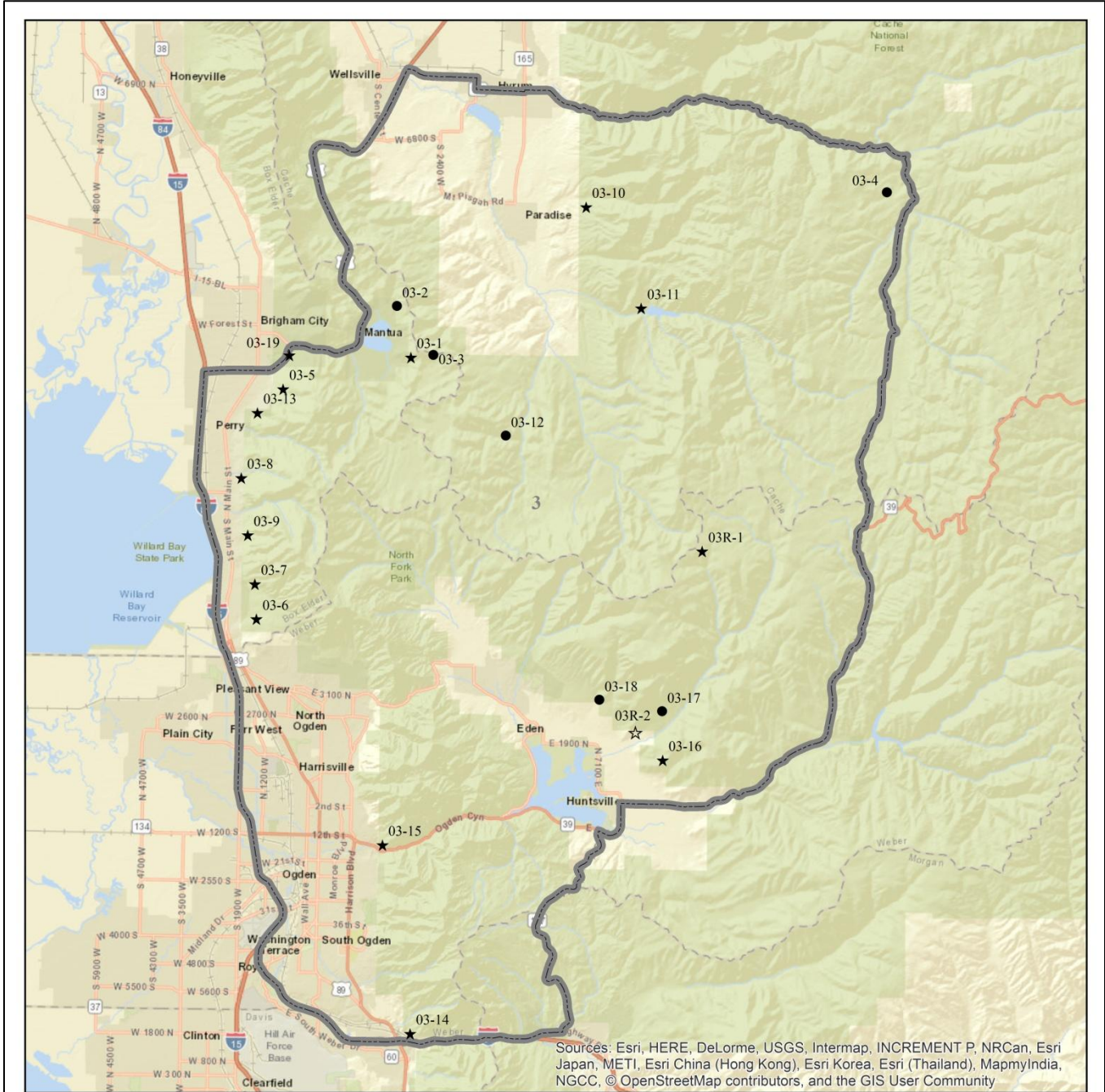
Table 02R-05.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2016	5	25	-	-	-	75	16.6

Table -02R-05.15 - Deer Desirable Components Index: High Potential Scale.

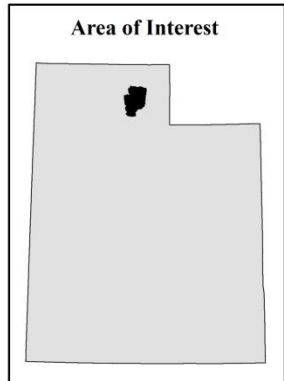
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
1998	23.0	13.0	3.4	5.5	-13.6	10.0	0.0	41.2	Very Poor-Poor
2006	30.0	11.2	0.0	16.8	-6.0	10.0	-2.0	60.1	Fair
2011	30.0	10.9	0.5	1.7	-10.0	10.0	0.0	43.1	Poor
2016	30.0	14.7	0.5	1.0	-9.5	10.0	0.0	46.7	Poor

WILDLIFE MANAGEMENT UNIT 03 - OGDEN

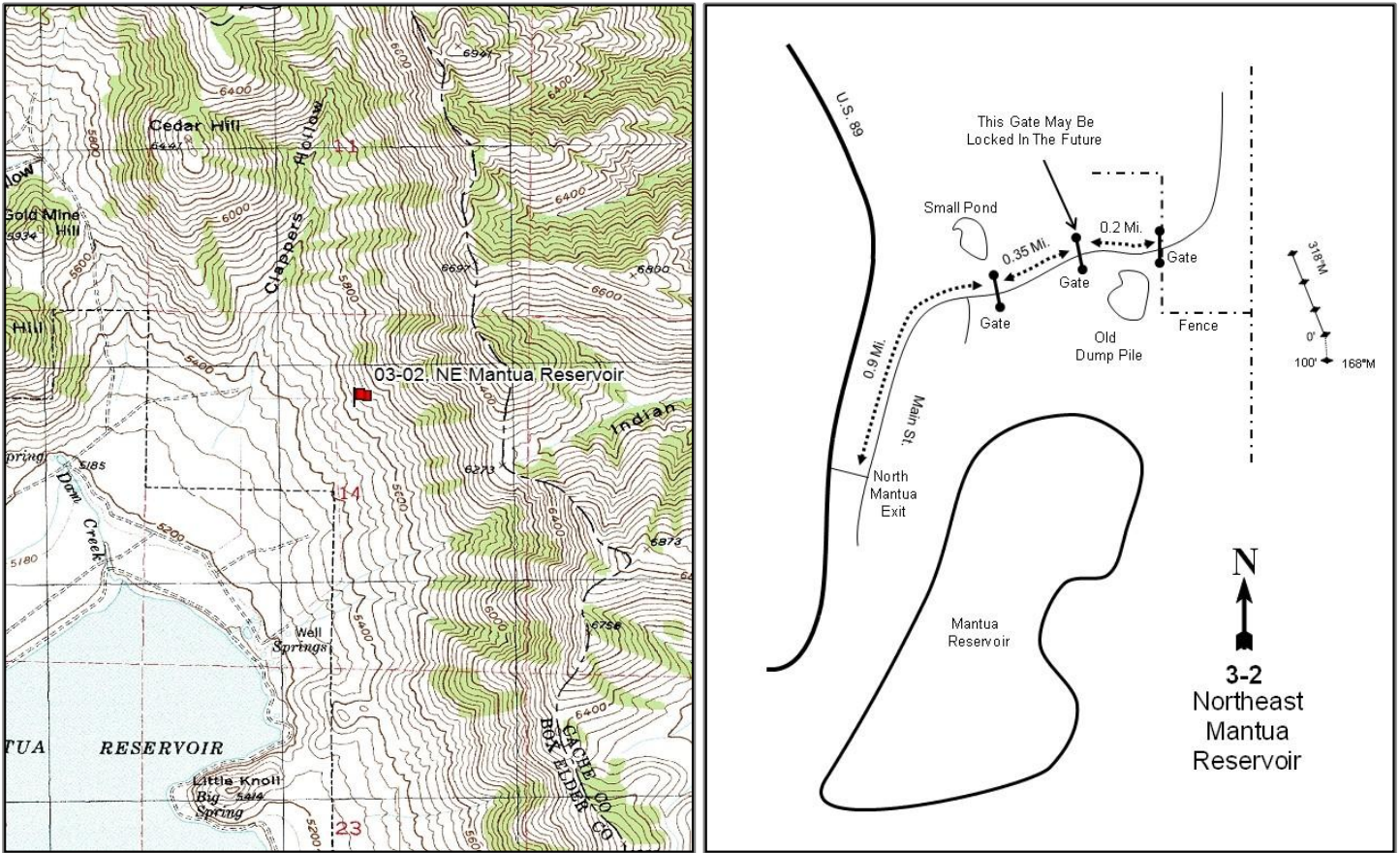


Study Location Project, Status

- RT, Active
- ★ RT, Suspended
- ☆ WRI, Suspended
- Unit - 3



NE MANTUA RESERVOIR - STUDY NO. 03-2



Location Information

USGS 7.5 min Map Info Mount Pisgah SE; Township 9N, Range 1W, Section 14
 GPS (0' Stake) NAD 83 UTM ZONE 12, 423253 East 4597004 North

Transect Information

Browse Tag # (0' Stake) 7105
 Transect Bearing 168° magnetic (Line 2-4: 318° magnetic)
 Length 400ft
 Belt Placement Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (71ft), Line 4 (34ft)
 Belt Marker Placement Standard, 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. Proceed through the gate, stopping at another gate after 0.35 miles (this gate may be locked in the future). Proceed 0.2 mile to another gate with an old dump to the south. From the gate, walk south-east 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 baseline stake is marked by browse tag #7105. The first 100 feet of the baseline runs 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

Table 03-02.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire	-	-	2006-2011	-
Fire	-	-	Historic	-

Wildlife Habitat and Vegetation History

Table 03-02.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
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 Grass	No Encroachment

Site Notes

The study samples a former Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) community that has transitioned to a grass community about one mile northeast of Mantua Reservoir. The study is on private land. The Ruby gas pipeline is about a half mile to the 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	A defined state and transition model is available.

From study establishment in 1984 through the 2001 sample year, this site remained in Community Phase 8.1 in the Wyoming Big Sagebrush/Increased Perennial Herbs state (State 2), which is characterized by a shrub overstory dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and an increased herbaceous understory (Table 03-02.12). Following a die-off of sagebrush and an increase in perennial grass cover in subsequent sample years, this community has transitioned into one dominated by perennial grasses in 2011 and 2016 (Table 03-02.7): this state is not currently defined in the state and transition model (USDA-NRCS, 2014). The herbaceous understory has remained plentiful and fairly diverse throughout the sample years. Although a number of grass species are present, the invasive perennial species bulbous bluegrass (*Poa bulbosa*) has contributed significant cover throughout the study years and the noxious annual grass species medusahead (*Taeniatherum caput-medusae*) was moderately abundant in 2016. Multiple other noxious weeds were recorded in mostly low amounts in the 2016 sample year (Table 03-02.10, Table 03-02.11).

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	-	-

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	207	146	13.6	16.5	4.2	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

Table 03-02.8 - 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	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

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	Elk	Rabbit
	Quadrat Frequency			
1996	2	5	-	-
2001	-	10	1	2
2006	-	7	1	-
2011	-	2	-	-
2016	-	-	-	-
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)	-

Table 03-02.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Aegilops cylindrica ^{ami} (jointed goatgrass)	Alopecurus magellanicus (Alpine Meadow-Foxtail)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Eragrostis cilianensis ^{ai} (stinkgrass)	Koeleria macrantha (prairie Junegrass)	Melica bulbosa (oniongrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Taeniatherum caput-medusae ^{ami} (medusahead)
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
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

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 ^{ai} (desert madwort)	Ambrosia psilostachya (Cuman ragweed)	Arabis (rockcross)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Buglossoides arvensis ^{ai} (corn gromwell)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littledod false flax)	Carduus nutans ^{ami} (nodding plumelless thistle)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Cirsium undulatum ^a (way/leaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)
year	Nested Frequency																
1996	63	1	103	-	-	3	-	-	14	-	3	-	-	2	2	-	5
2001	94	-	-	-	-	4	8	-	15	-	-	0	10	6	-	1	22
2006	50	15	250	-	5	7	1	-	33	-	4	-	-	4	-	22	18
2011	55	6	199	-	-	4	-	-	20	-	3	6	-	-	-	3	12
2016	57	6	99	4	-	1	-	0	31	9	13	1	-	-	-	10	5
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	-	-	0.0	0.1	0.0	-	0.0	0.1
2006	0.9	0.1	0.8	-	0.0	0.5	0.0	-	3.5	-	0.0	-	-	0.0	-	0.0	0.1
2011	2.5	0.1	4.3	-	-	0.0	-	-	5.3	-	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

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

FORB SPECIES	Comandra umbellata (bastard toadflax)	Convolvulus arvensis ⁿⁱ (field bindweed)	Cordylanthus ramosus ^a (bushy bird's beak)	Cryptantha ^a (annual cryptantha)	Cymopterus (springparsley)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium ⁿⁱ (redstem stork's bill)	Galium aparine ^a (stickywilly)	Gilia ^a (gilia)	Hackelia patens (spotted stickseed)	Hedysarum boreale (Utah sweetvetch)	Helianthus annuus ^a (common sunflower)	Holosteum umbellatum ⁿⁱ (jagged chickweed)	Isatis tinctoria ⁿⁱ (Dyer's woad)	Lactuca serriola ⁿⁱ (prickly lettuce)
year	Nested Frequency																
1996	-	-	-	-	-	-	170	-	3	-	-	3	-	-	-	19	-
2001	9	-	-	-	2	-	71	1	-	3	-	11	2	-	16	10	30
2006	8	-	-	16	5	2	260	-	134	11	3	54	-	1	13	20	72
2011	2	-	1	5	-	1	62	-	42	3	-	30	-	8	-	12	205
2016	7	10	-	6	-	-	34	-	237	8	-	12	-	11	6	27	192
year	Average Cover (%)																
1996	-	-	-	-	-	-	1.4	-	0.0	-	-	0.1	-	-	-	0.2	-
2001	0.0	-	-	-	0.0	-	0.2	0.0	-	0.0	-	0.2	0.0	-	0.2	0.1	0.2
2006	0.1	-	-	0.0	0.1	0.0	2.0	-	1.8	0.1	0.0	0.9	-	0.0	0.0	0.4	0.6
2011	0.0	-	0.0	0.0	-	0.0	0.4	-	0.2	0.0	-	0.5	-	0.2	-	0.5	3.4
2016	0.2	0.8	-	0.2	-	-	0.1	-	9.2	0.1	-	0.7	-	0.1	0.0	1.6	6.5

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

FORB SPECIES	Lappula occidentalis ^a (flatspine stickseed)	Lithospermum ruderale (western stoneseed)	Lupinus argenteus (silvery lupine)	Machaeranthera grindelioides (rayless tansyaster)	Madia glomerata ^a (mountain tarweed)	Medicago sativa ^a (alfalfa)	Microsteris gracilis ^a (slender phlox)	Polanisia dodecandra ssp. dodecandra ^a (redwhisker clammyweed)	Polygonum douglasii ^a (Douglas' knotweed)	Rumex (dock)	Senecio spartioides var. multicapitatus (broom-like ragwort)	Symphyotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius ⁿⁱ (yellow salsify)	Trifolium (clover)	Verbascum thapsus ⁿⁱ (common mullein)	Veronica biloba ⁿⁱ (two-lobed speedwell)
year	Nested Frequency																
1996	5	2	4	-	2	-	3	-	8	-	-	-	-	14	-	-	9
2001	5	11	9	-	-	-	7	9	-	3	1	8	-	113	-	-	31
2006	10	18	9	-	-	-	37	-	7	-	-	7	-	73	-	-	49
2011	2	20	17	2	14	1	-	-	3	2	-	-	1	141	-	2	47
2016	24	29	23	-	1	1	-	-	8	1	-	4	2	85	2	5	202
year	Average Cover (%)																
1996	0.0	0.2	0.2	-	0.0	-	0.0	-	0.0	-	-	-	-	0.0	-	-	0.0
2001	0.4	0.4	0.4	-	-	-	0.0	0.0	-	0.0	0.0	0.3	-	2.7	-	-	0.1
2006	0.0	1.7	0.6	-	-	-	0.1	-	0.0	-	-	0.3	-	1.0	-	-	0.1
2011	0.0	1.7	1.0	0.0	0.4	0.0	-	-	0.0	0.0	-	-	0.2	2.0	-	0.0	0.6
2016	0.8	4.8	2.5	-	0.0	0.3	-	-	0.0	0.1	-	0.1	0.0	1.4	0.0	0.3	4.6

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

FORB SPECIES		
	Wyethia amplexicaulis (mule-ears)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency	
1996	4	8
2001	-	0
2006	2	3
2011	2	-
2016	-	1
year	Average Cover (%)	
1996	0.0	0.0
2001	-	0.0
2006	0.1	0.0
2011	0.0	-
2016	-	0.0

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 ^p (Wyoming big sagebrush)	Gutierrezia sarothrae (broom snakeweed)	Prunus virginiana ^p (chokecherry)	Purshia tridentata ^p (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	-
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	-

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

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.

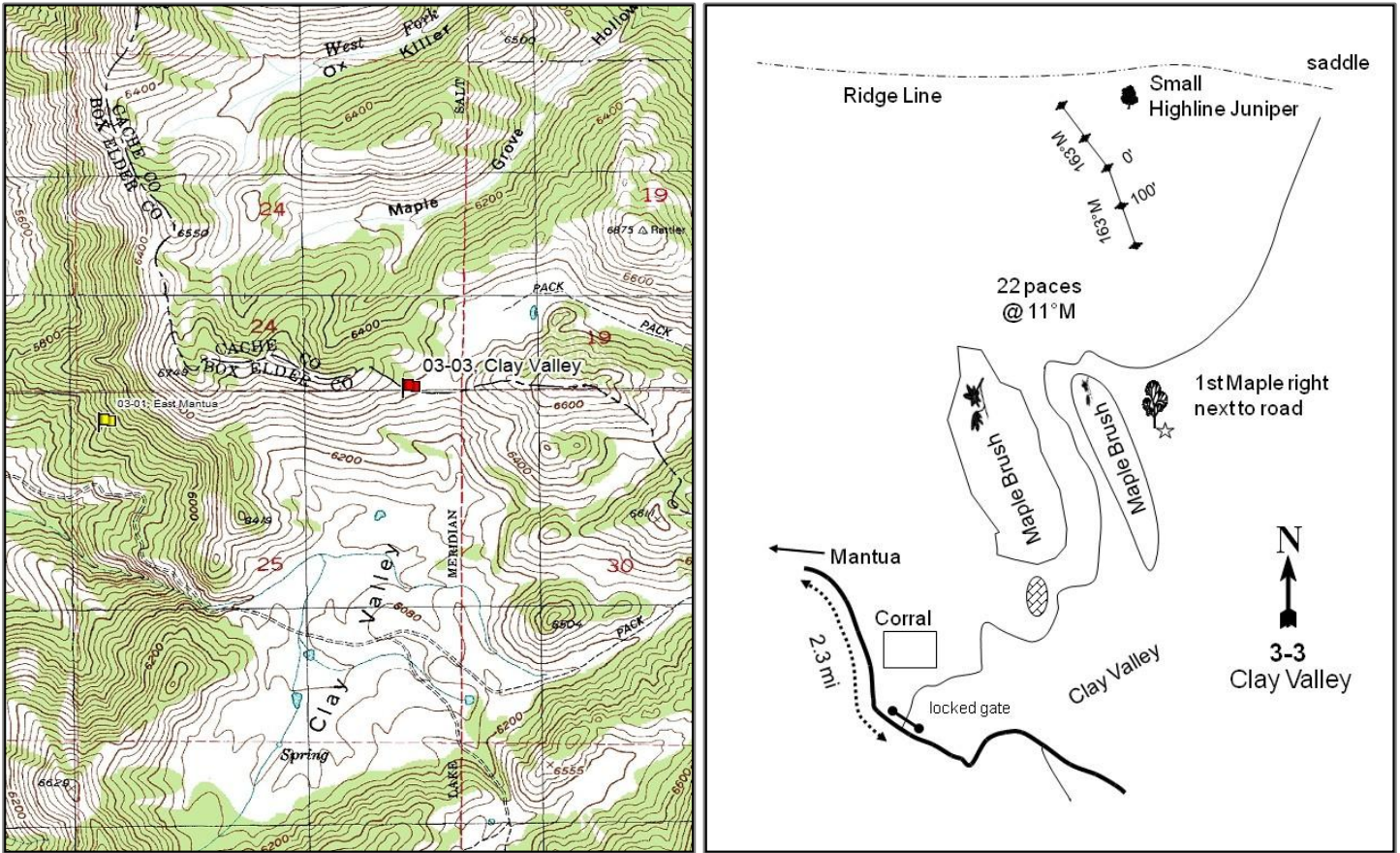
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier alnifolia^p -- (Saskatoon serviceberry)									
1996	-	-	-	-	-	-	-	-	93/94
2001	-	-	-	-	-	-	-	-	77/89
2006	-	-	-	-	-	-	-	-	103/102
2011	-	-	-	-	-	-	-	-	65/60
2016	-	-	-	-	-	-	-	-	72/61
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	33/54
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
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
Prunus virginiana^p -- (chokecherry)									
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
Purshia tridentata^p -- (antelope bitterbrush)									
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: Mid 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	11.0	8.2	10.6	-13.0	6.0	-2.0	42.2	Poor
2001	21.1	6.1	7.1	14.6	-8.3	10.0	-2.0	48.5	Poor-Fair
2006	5.7	0.0	0.0	30.0	-8.2	10.0	-2.0	35.5	Very Poor-Poor
2011	0.7	0.0	0.0	30.0	-7.5	10.0	-4.0	29.1	Very Poor
2016	1.9	0.0	0.0	21.4	-20.0	10.0	-4.0	9.3	Very Poor

CLAY VALLEY - STUDY No. 03-3



Location Information

USGS 7.5 min Map Info Mantua NE; Township 9N, Range 1W, Section 25
 GPS (0' Stake) NAD 83 UTM ZONE 12, 425363 East 4594164 North

Transect Information

Browse Tag # (0' Stake) 7997
 Transect Bearing 163° magnetic (Line 3-4: 282° magnetic)
 Length 400ft
 Belt Placement Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
 Belt Marker Placement Standard, Belt 5: No Rebar

Directions to Site

From the Mantua Hatchery, proceed 0.65 mile (towards Mantua) to first possible right turn. Turn right and 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 northern direction. You will pass a stock pond on the left 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 side of the road. From the maple, walk approximately 22 paces on a bearing of 11 degrees magnetic to the 200-foot stake of the baseline. The 0- foot baseline stake is 200 feet at a bearing of 343 degrees magnetic and is marked by browse tag #7997. The first 200 feet of the baseline run 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

Wildlife Habitat and Vegetation History

Table 03-03.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
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

Site Notes

The study samples a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass community. The area is privately owned and is considered 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	A defined state and transition model is available.

This study site has existed as a community dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and perennial grasses since establishment in 1984; annual forbs are also a dominant site component as of the 2016 sample year (Table 03-03.7). Other shrubs contribute lower amounts of cover, and sagebrush has been decreasing in cover in each sample year since 2006 (Table 03-03.12). The herbaceous understory has remained diverse and plentiful throughout the study years. The invasive perennial grass species bulbous bluegrass (*Poa bulbosa*) has contributed a fair amount of cover in previous sample years, but has decreased overall and is now a minor site component (Table 03- 03.10). The noxious weed Dyer's woad (*Isatis tinctoria*) has been recorded on this site in very low amounts (Table 03- 03.11). These characteristics are typical of Community Phase 2.1 of the Mountain Big Sagebrush-Steppe/Introduced Non-Natives state (State 2). If this site were to undergo continuous heavy grazing and/or continued fire suppression, it could follow the Transitional Pathway T2A and shift to Community Phase 3.1 in the Mountain Big Sagebrush Superdominance/Low Shrub state (State 3) which is characterized by a decrease in native grasses, increased dominance of mountain big sagebrush, and increased amounts of other shrubs (USDA-NRCS, 2013).

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	16.5	0.2	0.6	-	-	-
2001	23.2	1.5	0.2	-	-	0.2
2006	10.0	3.4	0.3	12.7	3.1	1.7
2011	11.0	3.9	0.2	10.5	4.8	2.8
2016	10.2	5.3	1.8	8.8	6.1	3.1

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

Table 03-03.8 - 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	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

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	Elk
	Quadrat Frequency		
1996	4	8	3
2001	1	22	-
2006	2	18	-
2011	1	1	4
2016	1	9	-
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)	-

Table 03-03.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum nelsonii (Columbia needlegrass)	Bromus arvensis ⁿⁱ (field brome)	Bromus inermis ⁱ (smooth brome)	Bromus marginatus (mountain brome)	Bromus tectorum ⁿⁱ (cheatgrass)	Elymus trachycaulus (slender wheatgrass)	Koeleria macrantha (prairie Junegrass)	Melica bulbosa (oniongrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa pratensis ⁱ (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
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

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 ⁿⁱ (desert madwort)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus cibaricus (browse milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa ⁿⁱ (littlepod false flax)	Cirsium undulatum ^a (wavy/leaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Crepis acuminata (tapertip hawkbeard)	Cryptantha ^a (annual cryptantha)	Cryptantha (cryptantha)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (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	-	46	28	3	15
2011	46	36	4	102	-	6	-	3	8	5	16	119	-	57	14	19	20
2016	42	2	1	92	4	-	3	-	8	4	29	18	2	46	-	24	2
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	-	0.3	0.1	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

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

FORB SPECIES																		
Epilobium brachycarpum ^a (tall annual willowherb)																		
Erodium cicutarium ^{ai} (redstem stork's bill)																		
Galium aparine ^a (stickywilly)																		
Geranium ^a (geranium)																		
Gilia ^a (gilia)																		
Grindelia squarrosa (curlycup gumweed)																		
Hackelia patens (spotted stickseed)																		
Helianthus annuus ^a (common sunflower)																		
Holosteum umbellatum ^{ai} (jagged chickweed)																		
Isatis tinctoria ^{aii} (Dyer's woad)																		
Lactuca serriola ^{ai} (prickly lettuce)																		
Lappula occidentalis ^a (flatspine stickseed)																		
Lupinus argenteus (silvery lupine)																		
Madia glomerata ^a (mountain tarweed)																		
Microsteris gracilis ^a (slender phlox)																		
Packera multilobata (lobeleaf groundsel)																		
Polygonum douglasii ^a (Douglas' knotweed)																		
year	Nested Frequency																	
1996	40	-	11	3	-	-	-	13	44	6	1	1	22	20	6	-	39	
2001	6	5	-	-	1	5	-	3	37	5	3	1	125	3	-	8	-	
2006	59	15	15	-	-	-	2	-	90	32	34	-	196	14	62	9	28	
2011	90	-	102	-	5	-	6	16	143	16	214	-	161	28	6	5	27	
2016	14	64	97	-	-	-	43	9	101	6	73	6	138	11	7	-	20	
year	Average Cover (%)																	
1996	0.4	-	0.1	0.0	-	-	-	0.1	0.2	0.0	0.0	0.0	0.5	0.2	0.0	-	0.1	
2001	0.0	0.1	-	-	0.0	0.5	-	0.0	0.2	0.0	0.0	0.0	7.0	0.0	-	0.0	-	
2006	0.2	0.1	0.1	-	-	-	0.0	-	0.2	1.0	0.2	-	11.0	0.1	0.1	0.0	0.1	
2011	0.9	-	3.0	-	0.0	-	0.1	0.4	1.0	0.4	4.7	-	12.8	0.5	0.0	0.1	0.1	
2016	0.1	1.8	2.5	-	-	-	0.4	0.0	1.3	0.2	1.8	0.4	8.1	0.3	0.0	-	0.1	

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

FORB SPECIES							
Sisymbrium altissimum ^{ai} (tall tumbled mustard)							
Taraxacum officinale (common dandelion)							
Tragopogon dubius ^{ai} (yellow salsify)							
unknown annual forb ^a (unknown forb)							
Verbascum thapsus ^{ai} (common mullein)							
Veronica biloba ^{ai} (two-lobed speedwell)							
Vicia americana (American vetch)							
year	Nested Frequency						
1996	-	1	13	-	-	-	-
2001	-	-	67	-	-	-	-
2006	-	11	15	5	-	18	-
2011	-	7	46	-	2	63	5
2016	46	6	16	-	3	85	-
year	Average Cover (%)						
1996	-	0.0	0.1	-	-	-	-
2001	-	-	1.6	-	-	-	-
2006	-	0.0	0.2	0.0	-	0.1	-
2011	-	0.1	0.6	-	0.0	2.1	0.0
2016	2.8	0.0	0.2	-	0.0	3.3	-

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	Line Intercept Cover (%)						
	year	1996	2001	2006	2011	2016	
<i>Acer grandidentatum</i> ^t (bigtooth maple)	-	-	-	-	-	-	-
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> ^p (mountain big sagebrush)	-	-	-	-	-	-	-
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> (yellow rabbitbrush)	0.4	12.4	-	0.3	-	1.3	3.1
<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>speciosa</i> ^p (rubber rabbitbrush)	0.8	10	-	0.5	-	2	4.8
<i>Gutierrezia sarothrae</i> (broom snakeweed)	0.9	8.1	-	0.7	-	2.2	6.1
<i>Juniperus osteosperma</i> ^t (Utah juniper)							
<i>Symphoricarpos oreophilus</i> (mountain snowberry)							

year	Quadrat Cover (%)						
	1996	2001	2006	2011	2016		
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

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

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 (%)				
<i>Acer grandidentatum</i> ^t -- (bigtooth maple)									
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	- / -
<i>Amelanchier alnifolia</i> ^p -- (Saskatoon serviceberry)									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	81/146
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> ^p -- (mountain big sagebrush)									
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
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> -- (yellow rabbitbrush)									
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

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 (%)				
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
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	-	-	-	-	-	-	-	-	-/-
Juniperus osteospermaⁱ -- (Utah juniper)									
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	-/-
Symphoricarpos oreophilus -- (mountain snowberry)									
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

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

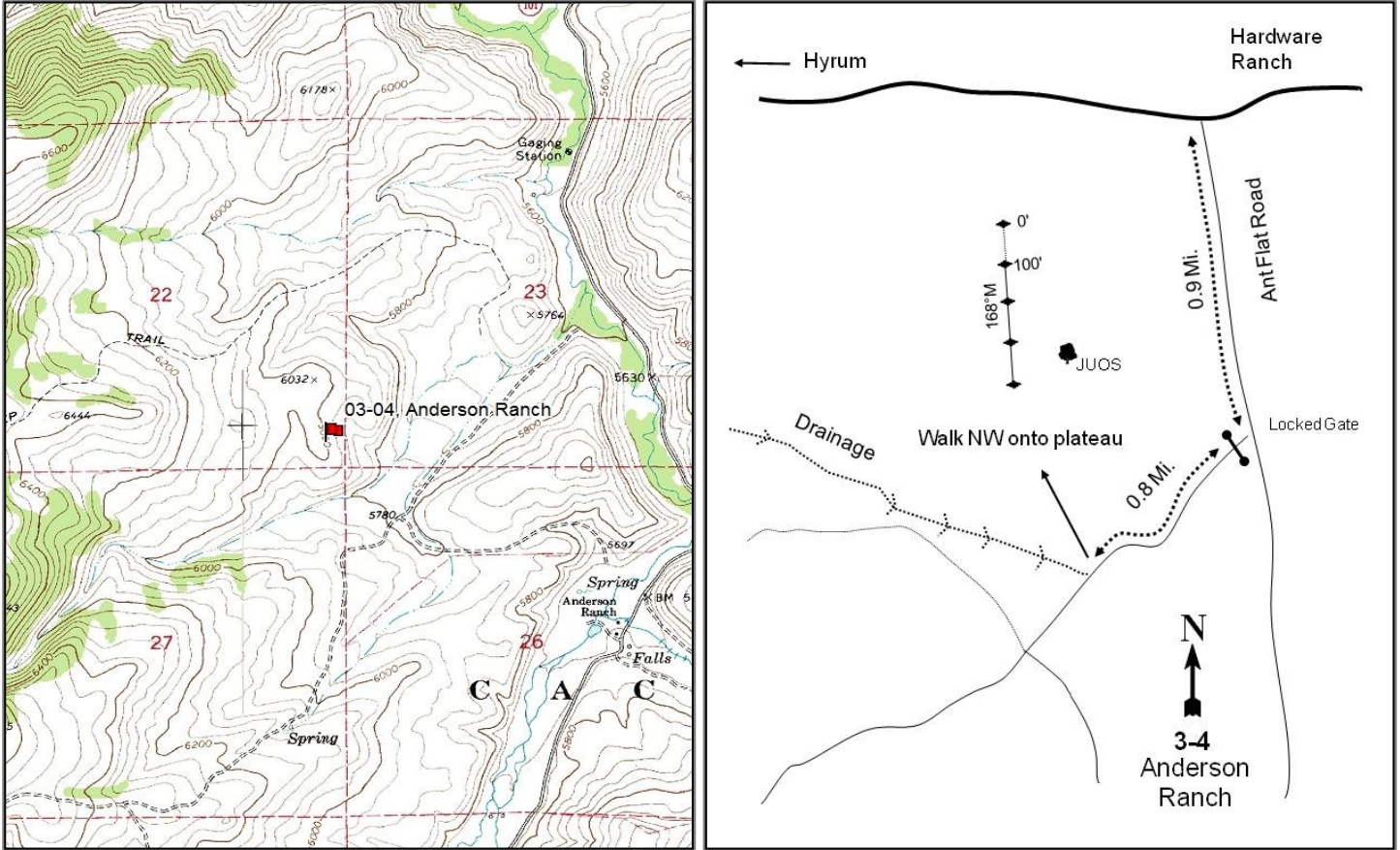
Table 03-03.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2016	1	-	-	-	-	100	40.0

Table -03-03.15 - Deer Desirable Components Index: High 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	20.8	9.6	11.5	24.3	-9.6	4.5	-2.0	59.1	Fair
2001	29.3	9.6	1.0	30.0	-1.1	10.0	-2.0	76.8	Good
2006	12.5	8.1	10.0	30.0	-4.8	10.0	-2.0	63.9	Fair
2011	13.8	11.1	14.5	30.0	-3.2	10.0	-2.0	74.1	Good
2016	12.5	12.6	15.0	30.0	-11.6	10.0	0.0	68.6	Fair-Good

ANDERSON RANCH - STUDY NO. 03-4



Location Information

USGS 7.5 min Map Info Hardware Ranch NW; Township 10N, Range 3E, Section 22
 GPS (0' Stake) NAD 83 UTM ZONE 12, 451663 East 4603595 North

Transect Information

Browse Tag # (0' Stake) 7932
 Transect Bearing 168° 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, travel south on the Ant Flat Road for 0.9 miles. Turn right and go through a locked gate. Cross the Blacksmith Fork River and then proceed up the canyon 0.8 to where the drainage and road separate. Walk approximately 1500 ft. at 310 degrees to the 0 foot stake. The 0-foot stake is marked by browse tag #7932. The baseline bearing is 168 degrees magnetic.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,000ft (1,829m)
Aspect	South
Slope	0%
Sample Dates	08/23/1996, 08/01/2001, 08/29/2006, 07/21/2011, 06/28/2016

Table 03-04.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Herbicide - 2,4-D	-	-	June 2011	-

Wildlife Habitat and Vegetation History

Table 03-04.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Elk	crucial	winter	
Greater Sage Grouse	Crucial	occupied	brood-rearing
Moose	crucial	winter	

Table 03-04.4 - 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/Perennial Grass	No Encroachment
1990	Mixed Shrub/Perennial Grass	Phase I
1996	Mixed Shrub/Perennial Grass	Phase I
2001	Mixed Shrub/Perennial Grass	Phase I
2006	Mixed Shrub/Perennial Grass	Phase I
2011	Mixed Shrub/Perennial Grass	Phase I
2016	Bitterbrush/Perennial Grass	Phase I

Site Notes

The study is located on what was formerly called the Anderson Ranch, but is now part of the Coldwater Ranch. The study is within deer and elk winter range in the upper Blacksmith Fork Canyon. The plant community is dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), antelope bitterbrush (*Purshia tridentata*), and grasses. The landowner treated the area with an aerial application of 2,4-D in June of 2011, which impacted the health of many of the browse species. In 2016 there was a dead winter kill buck noted near the site

Soils

Table 03-04.5 - 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	7.0	42.7	24.0	33.3	3.7	14.3	115.2	0.6	08/23/1996

Site Potential

1981-2010 Average Annual Precipitation	22 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 study site existed as a community dominated by a mixture of browse species and perennial grasses from site establishment in 1984 through the 2011 sample year; browse species included mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), antelope bitterbrush (*Purshia tridentata*) and yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*). However, the cover of mountain big sagebrush and yellow rabbitbrush decreased following treatment with 2,4-D in June of 2011, and the site is now dominated by antelope bitterbrush (Table 03- 04.12) and perennial grasses (Table 03-04.7). The herbaceous understory is diverse and abundant, although the invasive perennial grass species bulbous bluegrass (*Poa bulbosa*) contributes the most cover of any single herbaceous species (Table 03-04.10). It is predicted that barring a major disturbance, this site will remain as a bitterbrush and perennial grass-dominated community.

Trend Summary Tables

Table 03-04.6 - 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	7.5	4.9	-	-	-	-
2001	10.3	3.6	-	-	-	-
2006	11.1	4.6	-	14.6	6.2	-
2011	9.5	3.4	-	14.2	4.6	-
2016	6.1	0.2	-	6.8	0.6	-

Table 03-04.7 - 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	279	379	235	74	7.7	18.6	1.8	1.0
2001	137	404	214	74	1.6	20.8	3.3	0.6
2006	53	426	225	110	1.0	40.5	2.9	1.8
2011	91	429	315	123	1.0	51.2	6.0	2.9
2016	159	376	365	125	8.5	31.3	15.8	5.1

Table 03-04.8 - 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	10.8	12.9	51.0	1.0	0.9	42.9
2001	14.5	6.7	51.9	0.9	0.4	47.1
2006	10.2	5.7	36.0	1.2	0.5	60.7
2011	7.5	1.0	37.6	2.8	0.4	61.5
2016	4.2	2.4	36.0	0.3	0.1	63.2

Table 03-04.9 - 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/Domestic Sheep	Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
1996	2	42	23	-	5
2001	-	56	10	1	8
2006	-	48	13	-	11
2011	2	25	17	-	2
2016	6	20	14	-	7
Days Use Per Acre (ha)					
1996	-	-	-	-	-
2001	-	160.2 (395.6)	32.2 (79.5)	8.7 (21.5)*	-
2006	0.7 (1.8)	82.4 (203.6)	38.2 (94.4)	-	-
2011	5.1 (12.6)	38.2 (94.4)	51.6 (127.5)	-	-
2016	7.2 (17.9)	14.7 (36.4)	28.1 (69.5)	-	-

*Pellets per acre (ha)

Table 03-04.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency									
1996	-	215	129	-	29	-	59	-	178	312
2001	-	89	52	1	35	-	99	4	247	283
2006	1	22	39	-	46	22	264	11	184	258
2011	1	37	57	-	16	127	370	11	121	154
2016	2	59	131	-	8	115	278	-	26	188
year	Average Cover (%)									
1996	-	5.1	2.6	-	0.8	-	1.5	-	3.4	12.8
2001	-	0.8	0.7	0.0	0.6	-	2.8	0.0	4.6	12.8
2006	0.0	0.1	0.9	-	0.9	0.2	15.3	0.0	7.3	16.7
2011	0.0	0.1	0.9	-	0.3	3.6	25.0	0.2	14.9	7.2
2016	0.0	2.7	5.8	-	0.1	3.5	20.9	-	0.7	6.2

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

Table 03-04.11 - 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 ^{ai} (desert madwort)	Antennaria (pussytoes)	Arabis drummondii (Drummond's rockcress)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus lentiginosus (freckled milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chenopodium album ^a (lambquarters)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cordylanthus ^a (bird's-beak)	Crepis acuminata (tapertip hawkbeard)
year	Nested Frequency																
1996	54	1	-	121	-	9	10	-	-	10	-	15	67	9	-	19	-
2001	59	2	1	70	2	-	2	-	1	-	-	7	60	4	-	-	-
2006	60	25	6	42	5	1	19	-	-	6	-	12	63	86	-	13	5
2011	46	15	36	56	-	-	10	-	-	-	-	11	19	153	3	3	9
2016	86	-	-	52	-	17	5	4	-	-	6	2	15	125	-	-	21
year	Average Cover (%)																
1996	0.6	0.0	-	0.3	-	0.0	0.1	-	-	0.0	-	0.4	0.1	0.0	-	0.3	-
2001	0.4	0.0	0.0	0.2	0.0	-	0.0	-	0.0	-	-	0.2	0.2	0.0	-	-	-
2006	1.1	0.1	0.0	0.1	0.0	0.0	0.1	-	-	0.0	-	0.4	0.2	0.2	-	0.6	0.1
2011	1.4	0.1	0.2	0.3	-	-	0.1	-	-	-	-	0.6	0.1	3.0	0.0	0.0	0.2
2016	3.5	-	-	0.3	-	0.7	0.2	0.0	-	-	0.0	0.0	0.1	1.9	-	-	0.6

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

FORB SPECIES	Cryptantha ^a (annual cryptantha)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron (fleabane)	Eriogonum cernuum ^a (nodding buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium aparine ^a (stickywilly)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Hackelia patens (spotted stickseed)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stoneseed)	Lomatium triternatum (nineleaf biscuitroot)
year	Nested Frequency																
1996	-	3	-	13	-	1	1	8	-	-	-	82	-	2	-	11	-
2001	-	-	4	20	3	-	2	56	-	-	-	29	3	12	-	-	-
2006	-	-	12	48	4	-	2	47	-	-	-	17	3	-	-	1	11
2011	-	32	145	1	-	-	1	78	3	-	-	94	-	52	-	-	11
2016	39	-	62	-	4	-	-	236	5	12	3	16	148	-	2	-	2
year	Average Cover (%)																
1996	-	0.0	-	0.0	-	0.0	0.0	0.1	-	-	-	0.3	-	0.0	-	0.2	-
2001	-	-	0.0	0.2	0.1	-	0.0	1.6	-	-	-	0.4	0.0	0.0	-	-	-
2006	-	-	0.0	0.2	0.0	-	0.1	0.8	-	-	-	0.1	0.0	-	-	0.0	0.0
2011	-	0.1	0.4	0.0	-	-	0.1	0.3	0.0	-	-	0.4	-	0.6	-	-	0.1
2016	0.7	-	0.5	-	0.0	-	-	8.8	0.4	0.1	0.0	0.1	1.7	-	0.0	-	0.0

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

FORB SPECIES	Lupinus argenteus (silvery lupine)	Microsteris gracilis ^a (slender phlox)	Orthocarpus tolmiei ^a (Tolmie's owl's-clover)	Packera multilobata (lobeleaf groundsel)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Symphotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Trifolium gymnocarpon (hollyleaf clover)	Veronica biloba ^{ai} (two-lobe speedwell)
year	Nested Frequency										
1996	8	47	-	-	-	34	3	-	10	4	1
2001	3	4	0	-	-	6	4	-	36	-	-
2006	6	3	-	-	10	47	2	-	17	2	6
2011	10	9	-	5	8	24	2	-	2	-	-
2016	-	44	-	-	-	3	7	2	4	-	-
year	Average Cover (%)										
1996	0.1	0.1	-	-	-	0.1	0.0	-	0.1	0.0	0.0
2001	0.0	0.0	0.0	-	-	0.0	0.0	-	0.3	-	-
2006	0.1	0.0	-	-	0.0	0.1	0.0	-	0.2	0.0	0.0
2011	0.3	0.0	-	0.2	0.0	0.1	0.0	-	0.0	-	-
2016	-	1.3	-	-	-	0.0	0.0	0.0	0.0	-	-

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

Table 03-04.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Purshia tridentata ^p (antelope bitterbrush)	Ribes ^p (currant)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)					
1996	-	-	-	-	-	-
2001	-	-	-	-	-	-
2006	5.9	5.8	-	8.7	-	0.4
2011	8.8	4.1	0.1	4.8	0.6	0.4
2016	0.2	0.3	-	6.6	-	0.3
year	Quadrat Cover (%)					
1996	3.5	4.7	0.2	4.1	-	-
2001	5.0	3.6	-	5.2	-	-
2006	4.5	4.4	0.1	6.2	0.4	0.0
2011	6.8	3.3	0.0	2.6	0.1	0.2
2016	0.0	0.2	-	6.0	-	0.0

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

Table 03-04.13 - 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 (%)				
Amelanchier alnifolia ^p -- (Saskatoon serviceberry)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	85/124
2016	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
1996	400	160	25	75	0	65	0	0	82/121
2001	420	-	14	67	19	29	0	0	84/128
2006	620	500	26	61	13	23	23	3	92/136
2011	600	120	7	67	27	7	0	100	82/128
2016	20	-	100	0	0	0	0	0	44/47
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
1996	3120	20	3	96	2	8	0	0	39/59
2001	2380	-	3	85	13	2	0	1	31/51
2006	2620	-	7	86	7	4	3	4	37/59
2011	2020	-	14	68	18	8	0	79	28/49
2016	300	-	0	100	0	0	0	0	35/45
Eriogonum heracleoides -- (parsnipflower buckwheat)									
1996	-	-	-	-	-	-	-	-	-/-
2001	20	-	0	100	0	0	0	0	10/26
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-

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 (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
1996	440	-	5	96	0	0	0	0	19/22
2001	20	-	0	100	0	0	0	0	9/12
2006	140	-	0	100	0	0	0	0	24/40
2011	-	-	-	-	-	-	-	-	36/73
2016	-	-	-	-	-	-	-	-	22/27
Purshia tridentata^P -- (antelope bitterbrush)									
1996	320	-	6	94	0	44	25	0	73/138
2001	340	-	12	82	6	12	53	6	88/148
2006	420	-	10	71	19	48	14	5	94/158
2011	240	-	0	67	33	8	0	92	99/160
2016	240	-	0	67	33	42	33	33	105/172
Ribes^P -- (currant)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	20	-	0	100	0	0	0	0	121/57
2011	20	-	0	100	0	0	0	100	161/85
2016	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus -- (mountain snowberry)									
1996	-	-	-	-	-	-	-	-	37/41
2001	-	-	-	-	-	-	-	-	49/70
2006	-	-	-	-	-	-	-	-	60/61
2011	-	-	-	-	-	-	-	-	58/111
2016	-	-	-	-	-	-	-	-	-/-
Tetradymia canescens -- (spineless horsebrush)									
1996	40	-	0	100	0	0	0	0	48/85
2001	80	-	0	100	0	0	0	0	42/83
2006	180	-	33	22	44	0	0	44	53/97
2011	140	-	29	57	14	14	0	57	37/64
2016	40	-	0	100	0	0	0	0	43/72

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

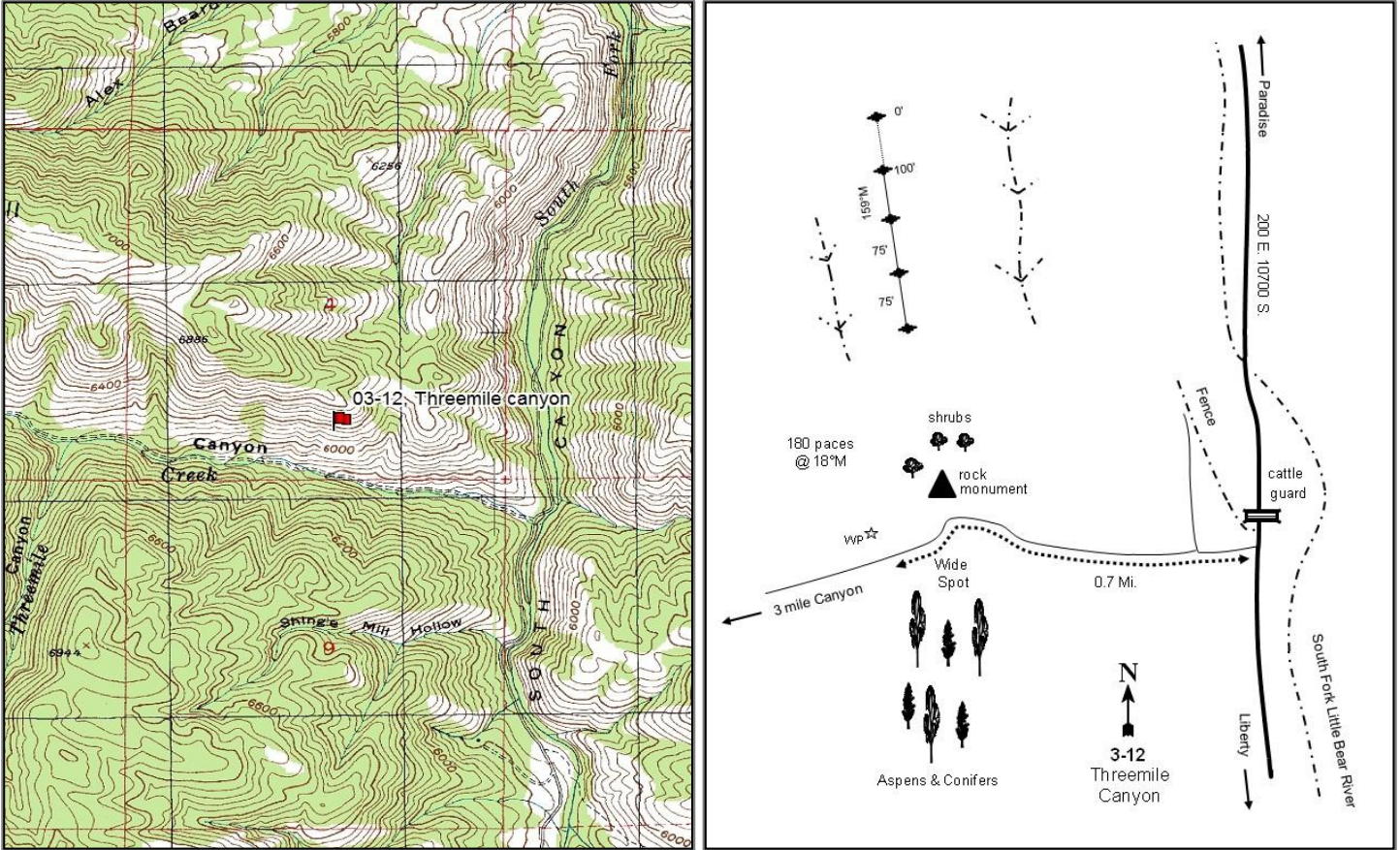
Table 03-04.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus scopulorum (Rocky Mountain juniper)							
2016	1	-	-	-	100	-	24.0

Table -03-04.15 - Deer Desirable Components Index: High 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	10.5	15.0	7.4	30.0	-5.8	2.9	0.0	59.9	Fair
2001	14.2	11.3	6.5	30.0	-1.2	1.8	0.0	62.6	Fair
2006	15.5	10.2	8.1	30.0	-0.8	4.3	0.0	67.3	Fair
2011	12.6	6.5	2.5	30.0	-0.7	7.1	0.0	58.0	Fair
2016	9.0	5.1	0.0	20.8	-6.4	10.0	0.0	38.5	Very Poor-Poor

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 Standard, Belt 1: 3ft

Directions to Site

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 immediately right (west). Travel 0.7 miles up Threemile Canyon and stop adjacent to a green and white witness post on the right side of road. Walk 180 paces at 18 degrees magnetic from the witness post to the last baseline stake. From the last baseline stake 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

Wildlife Habitat and Vegetation History

Table 03-12.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
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/Annual Forb	No Encroachment
2011	Bitterbrush/Annual Forb	No Encroachment
2016	Bitterbrush/Annual 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 remained as the dominant browse component since study establishment in 1984, although other browse species do contribute less cover (Table 03-12.12). The herbaceous understory is plentiful and diverse, and annual grasses, perennial grasses, and/or perennial 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 (Table 03-12.10). Both native and introduced forb species are present, and in 2016 the invasive annual weed gypsyflower (*Cynoglossum officinale*) was accountable for most of the forb cover (Table 03-12.11)

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	-

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	150	314	88	26.2	5.0	8.6	4.4
2001	457	195	301	125	30.2	9.7	7.1	7.0
2006	367	248	374	129	10.4	12.5	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

Table 03-12.8 - 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	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

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	Elk
	Quadrat Frequency			
1996	-	5	-	1
2001	1	13	-	-
2006	-	5	-	-
2011	-	1	-	-
2016	-	7	-	-
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)

*Pellets per acre (ha)

Table 03-12.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency						
1996	428	243	-	13	20	130	-
2001	236	339	4	83	18	149	-
2006	98	354	-	133	33	200	-
2011	140	222	2	204	5	170	2
2016	28	316	4	67	6	73	-
year	Average Cover (%)						
1996	19.9	6.2	-	0.1	0.2	4.6	-
2001	8.0	22.2	0.0	1.6	0.2	7.9	-
2006	0.5	9.8	-	2.6	0.6	9.3	-
2011	1.9	7.4	0.0	8.4	0.2	10.5	0.0
2016	0.1	10.9	0.0	1.1	0.3	3.2	-

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	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum ^{ai} (desert madwort)	Artemisia ludoviciana (white sagebrush)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littlupod false flax)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Cynoglossum officinale ^{ani} (gypsyflower)	Epilobium brachycarpum ^a (tall annual willowherb)
year	Nested Frequency																
1996	6	5	-	95	32	6	-	1	-	-	13	3	46	22	-	-	115
2001	7	1	-	117	65	16	2	5	3	-	2	1	12	7	-	-	19
2006	2	18	4	51	35	13	10	6	5	-	6	58	71	7	-	-	183
2011	11	49	27	105	60	18	7	5	-	3	2	4	11	18	-	-	225
2016	1	0	4	22	27	13	2	-	-	-	1	-	-	11	1	154	47
year	Average Cover (%)																
1996	0.0	0.0	-	0.3	0.9	1.7	-	0.0	-	-	0.4	0.0	0.2	0.2	-	-	0.9
2001	0.1	0.0	-	1.2	3.3	2.8	0.0	0.0	0.0	-	0.1	0.0	0.0	0.1	-	-	0.0
2006	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	-	-	3.2
2011	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	-	-	11.4
2016	0.0	0.0	0.2	0.1	1.2	3.1	0.0	-	-	-	0.2	-	-	0.6	0.0	10.7	0.6

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

FORB SPECIES	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium aparine ^a (stickywilly)	Hackelia patens (spotted stickseed)	Holosteum umbellatum ^{ai} (jagged chickweed)	Isatis tinctoria ^{mi} (Dyer's woad)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lesquerella (bladderpod)	Lithospermum ruderale (western stoneseed)	Lomatium grayi (Gray's biscuitroot)	Madia glomerata ^a (mountain tarweed)	Melilotus officinalis ⁱ (sweetclover)	Microsteris gracilis ^a (slender phlox)	Packera multilobata (lobeleaf groundsel)	Polygonum douglasii ^a (Douglas' knotweed)	Sisymbrium altissimum ^{ai} (tall tumbledustard)	Symphyotrichum ascendens (western aster)
year	Nested Frequency																
1996	-	3	-	8	8	104	2	-	13	-	-	-	-	-	0	-	1
2001	10	-	6	83	16	124	20	2	7	-	-	-	-	2	1	-	1
2006	90	40	42	105	34	138	12	-	5	6	20	-	43	-	6	5	-
2011	37	54	9	13	14	292	19	-	1	1	9	16	23	3	7	3	3
2016	141	30	0	-	15	50	42	-	-	-	-	25	-	-	3	0	11
year	Average Cover (%)																
1996	-	0.0	-	0.0	0.2	1.1	0.0	-	1.1	-	-	-	-	-	0.0	-	0.1
2001	0.1	-	0.1	0.3	0.2	2.8	0.1	0.0	0.5	-	-	-	-	0.0	0.0	-	0.0
2006	1.6	0.2	0.8	0.4	1.4	2.5	0.0	-	0.9	0.2	1.1	-	0.2	-	0.0	0.5	-
2011	0.2	1.9	0.3	0.4	0.4	9.0	0.1	-	0.0	0.0	0.2	0.7	0.1	0.2	0.0	0.0	0.2
2016	4.8	0.6	0.1	-	1.8	1.9	1.2	-	-	-	-	0.5	-	-	0.1	0.1	0.7

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

FORB SPECIES	Tragopogon dubius ^{ai} (yellow salsify)	unknown perennial forb (unknown forb)	Veronica biloba ^{ai} (two-lobed speedwell)
year	Nested Frequency		
1996	210	-	23
2001	80	18	49
2006	99	-	191
2011	145	-	115
2016	64	-	116
year	Average Cover (%)		
1996	5.1	-	0.7
2001	2.1	0.1	0.1
2006	2.0	-	1.1
2011	2.1	-	2.7
2016	0.9	-	4.0

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	Line Intercept Cover (%)			
	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Mahonia repens (creeping barberry)	Purshia tridentata ^p (antelope bitterbrush)	Rosa woodsii ^p (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
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

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

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 (%)				
Acer grandidentatumⁱ -- (bigtooth maple)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	20	-	100	0	0	0	0	0	21/40
Amelanchier alnifolia^p -- (Saskatoon serviceberry)									
1996	-	-	-	-	-	-	-	-	74/87
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	107/107
2011	-	-	-	-	-	-	-	-	109/121
2016	-	-	-	-	-	-	-	-	119/124
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Mahonia repens -- (creeping barberry)									
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

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 (%)				
Prunus virginiana var. melanocarpa -- (black chokecherry)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	34/15
Purshia tridentata^p -- (antelope bitterbrush)									
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
Rosa woodsii^p -- (Woods' rose)									
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
Symphoricarpos oreophilus -- (mountain snowberry)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	86/126
2011	-	-	-	-	-	-	-	-	102/185
2016	-	-	-	-	-	-	-	-	84/113

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

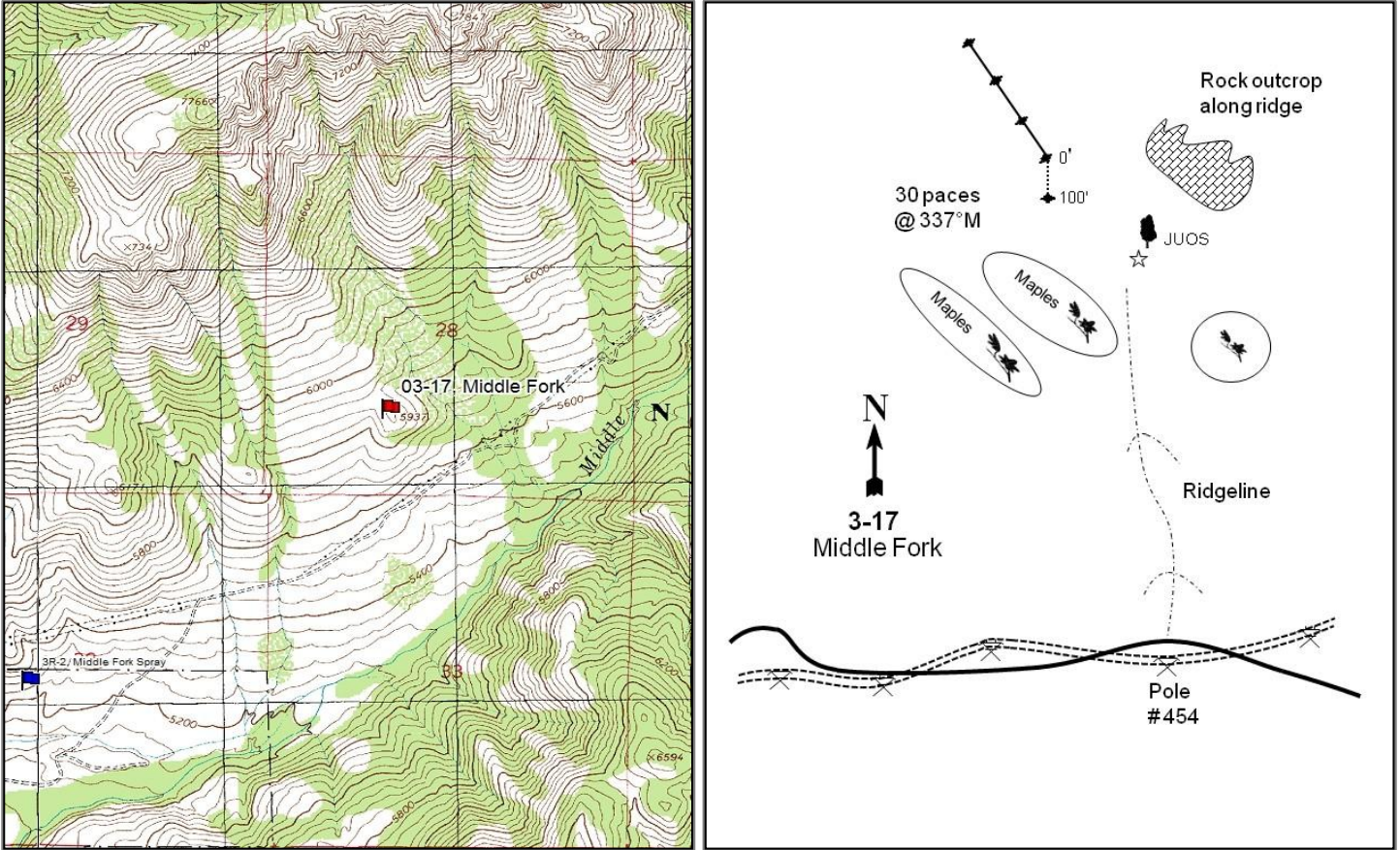
Table 03-12.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Acer grandidentatum (bigtooth maple)							
2016	1	-	100	-	-	-	1.0

Table -03-12.15 - Deer Desirable Components Index: High 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	12.8	13.0	6.3	13.0	-19.8	9.2	-2.0	32.5	Very Poor
2001	11.6	9.9	1.6	19.9	-20.0	10.0	-2.0	31.0	Very Poor
2006	12.5	13.0	2.4	20.6	-7.8	10.0	-2.0	48.7	Poor
2011	15.2	14.9	1.8	21.6	-7.0	10.0	-2.0	54.6	Poor-Fair
2016	18.3	14.4	0.9	7.0	-8.3	10.0	-2.0	40.4	Very Poor-Poor

MIDDLE FORK - STUDY No. 03-17



Location Information

USGS 7.5 min Map Info	Browns Hole SW; Township 7N, Range 2E, Section 28
GPS (0' Stake)	NAD 83 UTM ZONE 12, 438630 East 4573508 North

Transect Information

Browse Tag # (0' Stake)	Not available
Transect Bearing	165° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 71ft), Line 2 (34ft), Line 3 (59ft), Line 4 (95ft)
Belt Marker Placement	Standard, Belt 3: 1ft

Directions to Site

From 5500 East and 2200 North in Eden, proceed 0.4 miles to a bend. Continue east another 1.9 miles to where the main road bends to the southeast. Continue 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 and go through the gate. Continue east 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 which is now a horse trail for 0.8 miles, going 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 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

Wildlife Habitat and Vegetation History

Table 03-17.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
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

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' 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 No state and transition model is available for this ecological site.

Since study establishment in 1985, this site has remained dominated by low sagebrush (*Artemisia arbuscula*) and perennial grasses (Table 03-17.6, Table 03-17.7), a state that is not currently defined by the state and transition model (USDA-NRCS, 2013). Other browse species such as mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) have been recorded on the site, but contribute much less cover (Table 03- 17.12). Grasses have remained abundant and fairly diverse with bluebunch wheatgrass (*Pseudoroegneria spicata*) and the introduced species bulbous bluegrass (*Poa bulbosa*) as the major herbaceous components. The invasive annual grass species cheatgrass (*Bromus tectorum*) has been recorded in each sample year since 1996, but in 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). It is expected that this site will remain in this state without a major disturbance such as wildfire.

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	14.5	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

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	85	445	150	163	0.8	34.8	2.2	9.2
2006	11	416	180	187	0.0	24.6	0.9	10.4
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

Table 03-17.8 - 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	0.3	0.5	56.8	2.0	19.0	47.6
2001	2.3	1.7	44.7	2.8	19.2	55.8
2006	3.5	1.8	36.5	6.8	21.0	45.5
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

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	Elk	Horse	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
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)	-

Table 03-17.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Dactylis glomerata ⁱ (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 ⁱ (bulbous bluegrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency													
1996	51	253	156	-	-	-	10	-	2	29	323	-	35	189
2001	-	43	56	16	1	-	9	7	-	8	391	0	158	240
2006	43	5	6	1	10	10	50	2	-	10	352	1	45	206
2011	14	3	29	-	10	29	16	1	-	21	370	23	32	243
2016	-	11	102	-	9	-	37	4	-	-	305	1	26	184
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	12.3	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

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	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Ambrosia ^a (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' dustymaiden)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)
year	Nested Frequency																
1996	21	22	-	-	1	5	3	-	1	-	1	-	5	1	27	7	-
2001	11	11	3	-	-	11	-	-	5	-	2	-	3	5	10	-	-
2006	9	36	15	-	1	22	-	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
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	-	-	0.3	-	-	0.5	-	0.1	-	0.0	0.0	0.1	-	-
2006	0.2	0.2	0.1	-	0.0	0.7	-	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

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

FORB SPECIES	Descuraimia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron strigosus (prairie fleabane)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium aparine ^a (stickywilly)	Grindelia squarrosa (curlycup gumweed)	Hackelia patens (spotted stickseed)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lomatium dissectum (fernleaf biscuitroot)	Lupinus argenteus (silvery lupine)	Machaeranthera (tansyaster)	Madia glomerata ^a (mountain tarweed)	Microsteris gracilis ^a (slender phlox)	Orobanche fasciculata (clustered broomrape)	
year	Nested Frequency																	
1996	-	47	-	11	1	1	5	8	17	2	-	37	4	62	-	-	-	
2001	3	49	-	5	22	0	-	4	-	1	2	33	5	-	-	1	-	
2006	-	97	34	3	7	16	-	5	1	-	1	54	4	-	16	4	-	
2011	6	156	8	-	45	22	-	1	3	14	-	55	6	-	10	5	-	
2016	41	37	31	9	68	-	3	2	-	14	1	13	1	-	9	-	1	
year	Average Cover (%)																	
1996	-	0.1	-	0.2	0.0	0.0	0.0	0.2	0.2	0.0	-	0.4	0.1	0.2	-	-	-	
2001	0.0	0.1	-	0.0	0.3	0.0	-	0.1	-	0.0	0.0	1.5	0.6	-	-	0.0	-	
2006	-	0.2	0.1	0.0	0.0	0.1	-	0.2	0.0	-	0.0	1.5	0.2	-	0.1	0.0	-	
2011	0.1	0.8	0.0	-	0.2	0.3	-	0.0	0.0	0.2	-	1.5	0.4	-	0.8	0.0	-	
2016	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	

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

FORB SPECIES	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^{ai} (Douglas' knotweed)	Symphoricarum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow safsify)	Verbascum blattaria ^{ai} (moth mullein)	Viola (violet)	Wyethia amplexicaulis (mule-ears)
year	Nested Frequency							
1996	-	14	24	8	178	-	-	46
2001	1	-	53	12	86	-	1	37
2006	-	26	38	-	20	2	9	44
2011	-	9	42	7	100	-	2	41
2016	-	7	32	-	42	2	-	44
year	Average Cover (%)							
1996	-	0.0	0.9	0.1	2.7	-	-	3.8
2001	0.0	-	2.2	0.0	1.6	-	0.0	3.7
2006	-	0.1	1.5	-	0.2	0.0	0.1	3.5
2011	-	0.0	1.3	0.2	0.8	-	0.0	6.2
2016	-	0.0	0.7	-	0.3	0.1	-	3.8

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 ⁱ (bigtooth maple)	Artemisia arbuscula ^p (little sagebrush)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Purshia tridentata ^p (antelope bitterbrush)
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	-
year	Quadrat Cover (%)					
1996	1.3	11.7	1.5	-	0.3	-
2001	1.7	12.9	0.4	-	0.5	-
2006	1.4	14.5	-	-	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

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

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 (%)				
Acer grandidentatum ⁱ -- (bigtooth maple)									
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
Amelanchier utahensis ^p -- (Utah serviceberry)									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	116/85
2011	-	-	-	-	-	-	-	-	64/123
2016	-	-	-	-	-	-	-	-	62/63
Artemisia arbuscula ^p -- (little sagebrush)									
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
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
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

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 (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	40	0	0	0	0	0	0	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
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
Purshia tridentata^p -- (antelope bitterbrush)									
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
Quercus gambelii^p -- (Gambel oak)									
1996	-	-	-	-	-	-	-	-	-/-

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

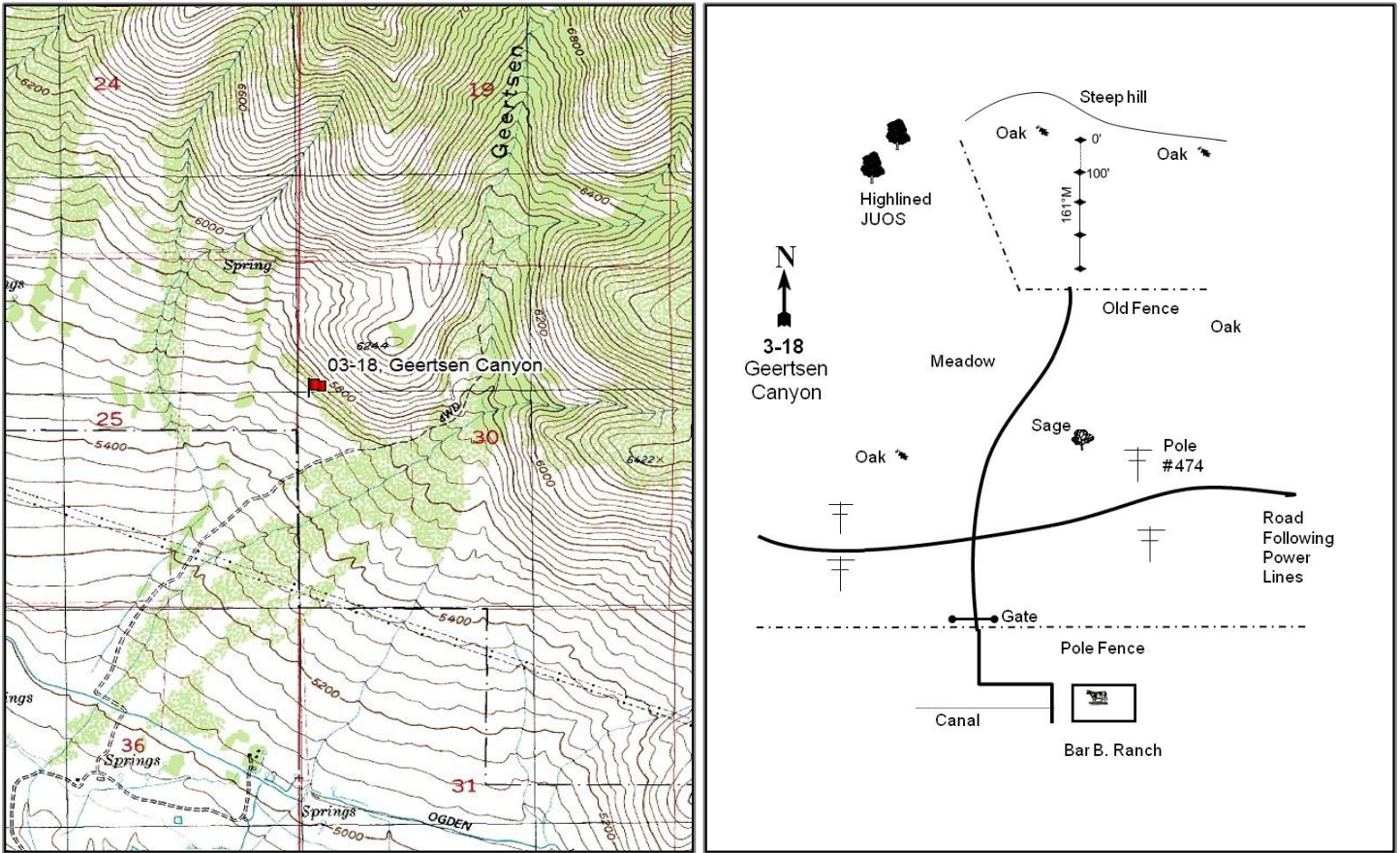
Table 03-17.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Acer grandidentatum (bigtooth maple)							
2016	7	-	50	50	-	-	8.0

Table -03-17.15 - Deer Desirable Components Index: Mid 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	16.6	12.1	9.9	12.7	-2.0	10.0	0.0	59.2	Fair
2001	16.7	11.2	9.7	28.8	-0.6	10.0	0.0	75.9	Good
2006	18.3	8.7	3.0	24.7	0.0	10.0	0.0	64.6	Fair-Good
2011	14.7	9.9	2.6	24.2	-0.1	10.0	0.0	61.4	Fair
2016	18.0	8.5	1.4	11.0	-1.4	10.0	0.0	47.6	Poor

GEERTSEN CANYON - STUDY NO. 03-18



Location Information

USGS 7.5 min Map Info Huntsville NE; Township 7N, Range 2E, Section 30
 GPS (0' Stake) NAD 83 UTM ZONE 12, 434989 East 4574173 North

Transect Information

Browse Tag # (0' Stake) 7026
 Transect Bearing 161° magnetic
 Length 400ft
 Belt Placement Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (71ft), Line 4 (59ft)
 Belt Marker Placement Belt 1: 1ft, Belt 3: 2ft, Belt 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 0.2 miles to the gate of Bar B Ranch. Turn left through the gate and go 0.9 miles north up the ranch road past a farm house on the left to another gate. Park here and walk through this gate 0.2 miles to a road along a canal. Turn left and walk 0.1 miles north to a dirt road, then turn right and go 0.55 miles to the high tension power lines. Just to the east is power pole #474. 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 down from the oak edge and 100 feet southwest of a large maple. The baseline runs 161 degrees magnetic.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,600ft (1,707m)
Aspect	Southwest
Slope	25%
Sample Dates	07/03/1996, 06/21/2001, 06/15/2006, 06/29/2011, 07/07/2016

Wildlife Habitat and Vegetation History

Table 03-18.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
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

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 time it was establishment in 1985 through the 2011 sample year, placing it in Community Phase 2.3 of the Mountain Big Sagebrush/Introduced Non-Natives state (State 2). In 2016, annual grasses, mainly the invasive annual cheatgrass (*Bromus tectorum*), became co-dominant (Table 03- 18.10), shifting the site into a phase that is not yet defined by the state and transition model (USDA-NRCS,2013). Recorded cover of mountain big sagebrush has remained relatively low throughout the study years, but quadrat cover has exhibited a slight increase overall between the 1996 and 2016 study years (Table 03-18.6); density has decreased over the same time period. Other preferred browse species such as Saskatoon serviceberry (*Amalanchier alnifolia*) and Woods' rose (*Rosa woodsii*) have been recorded in height crown measurements over the years, but have not contributed any cover (Table 03-18.13). Forbs have remained plentiful and fairly diverse since study establishment (Table 03-18.7, Table 03-18.11).

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	-

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

Table 03-18.8 - 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	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

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	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	-	-
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)	-	-

Table 03-18.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Bromus arvensis ^{ai} (field brome)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Danthonia californica (California oatgrass)	Danthonia unispicata (onespike danthonia)	Elymus lanceolatus (thickspike wheatgrass)	Juncus (rush)	Melica bulbosa (oniongrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa pratensis ⁱ (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
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

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 ^{ai} (curvseed butterwort)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Descurainia pinnata ^a (western tansymustard)	Epilobium brachycarpum ^a (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	-
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	-

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

FORB SPECIES	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium ^a (bedstraw)	Grindelia squarrosa (curlycup gumweed)	Helianthus annuus ^a (common sunflower)	Isatis tinctoria ^{mi} (Dyer's woad)	Lactuca serriola ^{ai} (prickly lettuce)	Lagophylla ramosissima ^a (branched lagophylla)	Lappula occidentalis ^a (flatspine stickseed)	Lomatium ambiguum (Wyeth biscuitroot)	Machaeranthera canescens (hoary tansyaster)	Madia glomerata ^a (mountain tarweed)	Melilotus officinalis ⁱ (sweetclover)	Navaretia intertexta ^a (needleleaf navaretia)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Rumex crispus ⁱ (curly dock)	Symphotrichum ascendens (western aster)	
year	Nested Frequency																	
1996	31	-	32	-	1	46	-	20	1	210	314	-	-	-	2	2	231	
2001	365	-	-	-	-	73	-	-	6	-	60	3	-	2	-	1	185	
2006	191	2	41	3	3	20	-	8	15	-	267	5	2	-	3	-	228	
2011	235	3	29	16	-	126	-	3	6	-	107	4	16	-	-	3	231	
2016	229	5	27	5	-	37	29	-	-	-	65	6	34	2	-	10	236	
year	Average Cover (%)																	
1996	0.2	-	0.5	-	0.1	0.2	-	0.2	0.0	1.1	4.0	-	-	-	0.0	0.0	4.6	
2001	15.9	-	-	-	-	1.4	-	-	0.2	-	0.2	0.0	-	0.0	-	0.0	3.1	
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	-	7.4	
2011	3.6	0.0	0.8	0.6	-	1.4	-	0.0	0.1	-	2.2	0.0	0.1	-	-	0.0	3.6	
2016	8.5	0.1	0.3	0.0	-	0.2	0.3	-	-	-	1.3	0.1	0.1	0.0	-	0.1	3.8	

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

FORB SPECIES	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Verbascum blattaria ^{ai} (moth mullein)	Veronica biloba ^{ai} (twolobe speedwell)	Viola (violet)
year	Nested Frequency				
1996	-	140	35	-	-
2001	4	12	16	-	-
2006	-	34	21	4	-
2011	-	23	5	-	1
2016	-	17	19	-	-
year	Average Cover (%)				
1996	-	1.4	0.8	-	-
2001	0.0	0.1	0.2	-	-
2006	-	0.3	0.9	0.3	-
2011	-	0.1	0.4	-	0.0
2016	-	0.1	0.4	-	-

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	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)		Gutierrezia sarothrae (broom snakeweed)			
	year	Line Intercept Cover (%)		year	Quadrat Cover (%)	
	1996	-	-	1996	2.2	0.2
	2001	-	-	2001	2.8	-
	2006	3.7	0.2	2006	1.9	0.5
	2011	4.1	0.2	2011	3.0	0.3
	2016	4.1	4	2016	3.6	2.1

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

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 (%)				
Amelanchier alnifolia^p -- (Saskatoon serviceberry)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	148/190
2011	-	-	-	-	-	-	-	-	173/232
2016	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
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
Linanthus pungens -- (granite prickly phlox)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	26/29

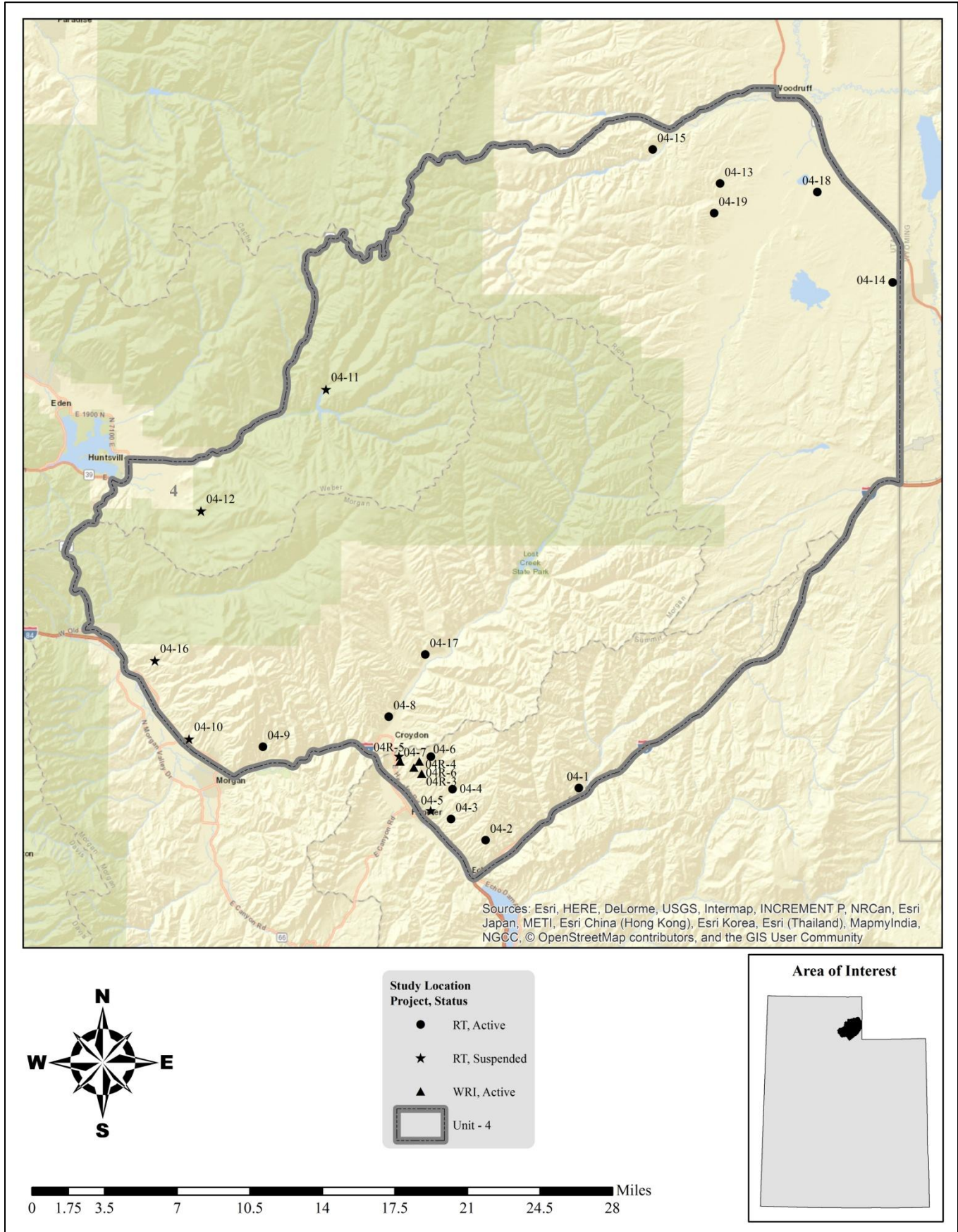
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Opuntia -- (pricklypear)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	24/48
Rosa woodsii ^p -- (Woods' rose)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	67/71
2011	-	-	-	-	-	-	-	-	39/38

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

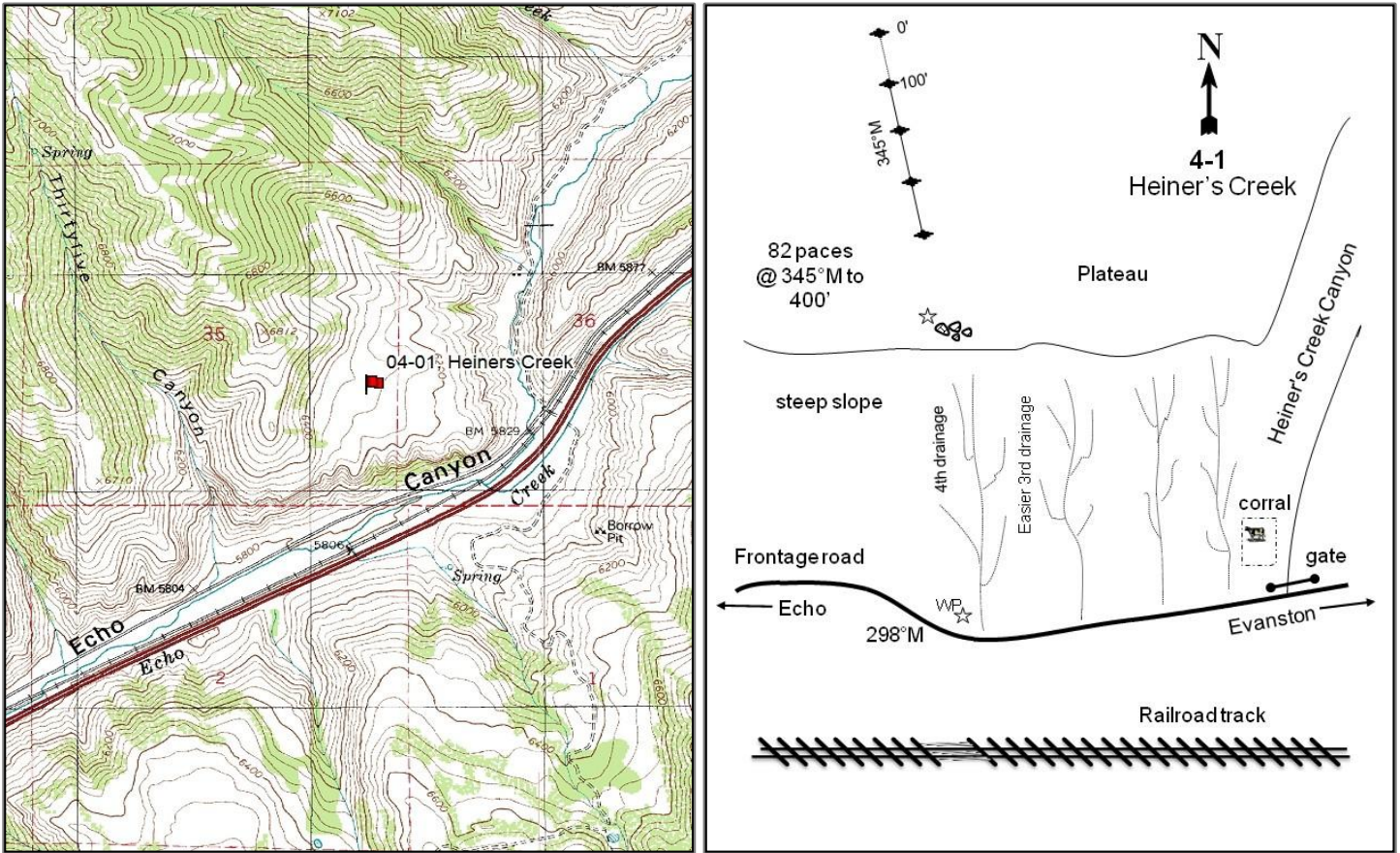
Table -03-18.15 - Deer Desirable Components Index: High Potential Scale.

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	7.0	Very Poor
2001	3.6	0.0	0.0	2.8	-2.6	10.0	0.0	13.8	Very Poor
2006	2.4	0.0	0.0	4.2	-4.3	10.0	-2.0	10.2	Very Poor
2011	3.7	0.0	0.0	5.4	-2.8	10.0	0.0	16.3	Very Poor
2016	4.5	0.0	0.0	2.4	-18.1	10.0	0.0	-1.2	Very Poor

WILDLIFE MANAGEMENT UNIT 04 - MORGAN-SOUTH RICH



HEINER'S CREEK - STUDY NO. 04-1



Location Information

USGS 7.5 min Map Info Heiners Creek SW; Township 4N, Range 5E, Section 35
 GPS (0' Stake) 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 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. 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

Table 04-01.1 Disturbance History. Recorded history of major disturbances.

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

Wildlife Habitat and Vegetation History

Table 04-01.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Elk	crucial	winter	
Greater Sage Grouse	Crucial	occupied & Winter	brood-rearing
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

Site Notes

The study is located on private land on the north side of Echo Canyon, just west of Heiner's Creek. It 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	A defined state and transition model is available.

From the outset of the study in 1984 through 1996, yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) was the sole dominant browse species on this site, placing it in Community Phase 5.1 of the Yellow Rabbitbrush/Spineless Horsebrush state (State 5). The herbaceous understory has remained dominated by perennial grasses such as bluebunch wheatgrass (*Pseudoroegneria spicata*), Kentucky bluegrass (*Poa pratensis*), and Sandberg bluegrass (*P. secunda*) through the study years (Table 04-01.10). Perennial forb cover has increased over the study period while annual grasses and forbs have remained rare (Table 04-01.7). In 2006, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) became co-dominant with yellow rabbitbrush. Although yellow rabbitbrush was and is still prevalent, mountain big sagebrush has continued to increase in cover and overtook yellow rabbitbrush as the dominant browse component in 2011 (Table 04-01.12). This increase in sagebrush cover and the abundant herbaceous understory indicate that this site transitioned (via a currently undefined pathway) to Community Phase 2.1 of the Mountain Big Sagebrush-Steppe/Non-Natives state (State 2). If continued heavy grazing and/or continued fire suppression were to occur, it could cause the site to follow Transition Pathway T2a to Community Phase 3.1 of the Mountain Big Sagebrush Superdominance/Low Shrub state (State 3), which is characterized by increased dominance of mountain big sagebrush and a reduced herbaceous component (USDA-NRCS, 2013).

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	7.5	22.6	-	-	-	-
2001	11.4	20.2	-	-	-	-
2006	20.4	14.5	-	19.8	19.0	-
2011	24.7	12.7	-	27.5	13.1	-
2016	25.8	10.8	-	38.5	16.6	-

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	394	153	221	1.6	11.9	0.5	3.5
2001	65	367	276	283	0.8	20.1	2.7	5.9
2006	76	368	339	258	0.3	16.6	3.6	6.6
2011	85	330	290	304	1.3	10.7	2.8	12.1
2016	116	322	244	293	1.0	9.8	1.1	9.5

Table 04-01.8 - 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	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

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	Mule Deer	Elk	Horse	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
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)	-	-

Table 04-01.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Koeleria macrantha (prairie Junegrass)	Melica bulbosa (oniongrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency										
1996	34	157	3	1	102	4	3	99	47	239	140
2001	6	65	-	1	72	10	-	19	74	283	87
2006	17	76	11	-	105	8	-	39	74	266	119
2011	26	85	3	4	78	13	-	32	78	182	133
2016	12	116	8	-	107	34	-	26	65	80	161
year	Average Cover (%)										
1996	0.7	1.6	0.0	0.0	0.6	0.0	0.0	1.7	1.0	5.2	2.7
2001	0.4	0.8	-	0.0	0.7	0.1	-	1.0	4.1	10.5	3.3
2006	0.2	0.3	0.1	-	1.3	0.1	-	1.1	2.0	8.9	3.0
2011	0.5	1.3	0.0	0.0	1.1	0.1	-	0.3	1.7	4.4	2.5
2016	0.1	1.0	0.0	-	1.9	0.7	-	0.3	2.0	0.9	4.0

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 ^{ai} (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus convallianus (lesser rushy milkvetch)	Astragalus lentiginosus (freckled milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cryptantha (cryptantha)	Draba ^a (draba)
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	-	11
2006	33	1	68	-	-	15	-	31	9	2	256	1	134	6	4	-	35
2011	63	15	145	9	1	9	-	20	18	5	183	4	180	25	22	1	78
2016	74	4	76	12	2	3	2	39	3	6	100	7	119	3	25	-	13
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	-	0.2
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	-	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	0.6
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	-	0.0

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

FORB SPECIES	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum umbellatum (sulphur-flower buckwheat)	Hackelia patens (spotted stickseed)	Helianthella uniflora (oneflower helianthella)	Heterotheca villosa (hairy false goldenaster)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lappula occidentalis ^a (flatspine stickseed)	Lithospermum ruderale (western stoneseed)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis ^a (slender phlox)	Penstemon (beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Senecio integerrimus ^a (lambstongue ragwort)	Sphaeralcea coccinea (scarlet globemallow)	Symphotrichum ascendens (western aster)
year	Nested Frequency																
1996	-	11	7	-	3	-	-	1	11	5	-	-	56	42	-	-	113
2001	-	5	-	-	-	-	5	1	44	-	18	-	72	-	-	0	140
2006	186	7	4	2	-	-	-	1	51	-	142	-	84	6	8	1	99
2011	49	10	-	7	-	17	2	-	53	-	64	1	34	1	4	1	155
2016	11	13	-	3	-	16	-	-	33	-	124	3	41	3	1	1	164
year	Average Cover (%)																
1996	-	0.2	0.1	-	0.0	-	-	0.0	0.1	0.0	-	-	0.1	0.1	-	-	1.9
2001	-	0.1	-	-	-	-	0.0	0.1	0.8	-	0.0	-	0.3	-	-	0.0	2.6
2006	0.5	0.2	0.1	0.0	-	-	-	0.0	1.1	-	0.4	-	0.3	0.0	0.1	0.1	3.0
2011	0.2	0.3	-	0.4	-	0.1	0.0	-	1.7	-	0.2	0.0	0.1	0.0	0.0	0.1	6.6
2016	0.1	0.2	-	0.3	-	0.0	-	-	0.9	-	0.3	0.0	0.1	0.0	0.0	0.0	4.7

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

FORB SPECIES	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Viola (violet)
year	Nested Frequency		
1996	-	-	-
2001	1	3	-
2006	5	7	-
2011	5	-	8
2016	3	6	11
year	Average Cover (%)		
1996	-	-	-
2001	0.0	0.0	-
2006	0.0	0.1	-
2011	0.0	-	0.1
2016	0.0	0.1	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 alnifolia ^p (Saskatoon serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Purshia tridentata ^p (antelope bitterbrush)	Rosa woodsii ^p (Woods' rose)	Symphoricarpos oreophilus (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	-
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	-

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

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 (%)				
Amelanchier alnifolia ^p -- (Saskatoon serviceberry)									
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
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Ericameria nauseosa ssp. nauseosa var. speciosa ^p -- (rubber rabbitbrush)									
1996	20	-	0	0	100	0	0	0	64/88
2001	20	-	0	100	0	0	0	0	45/61
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-

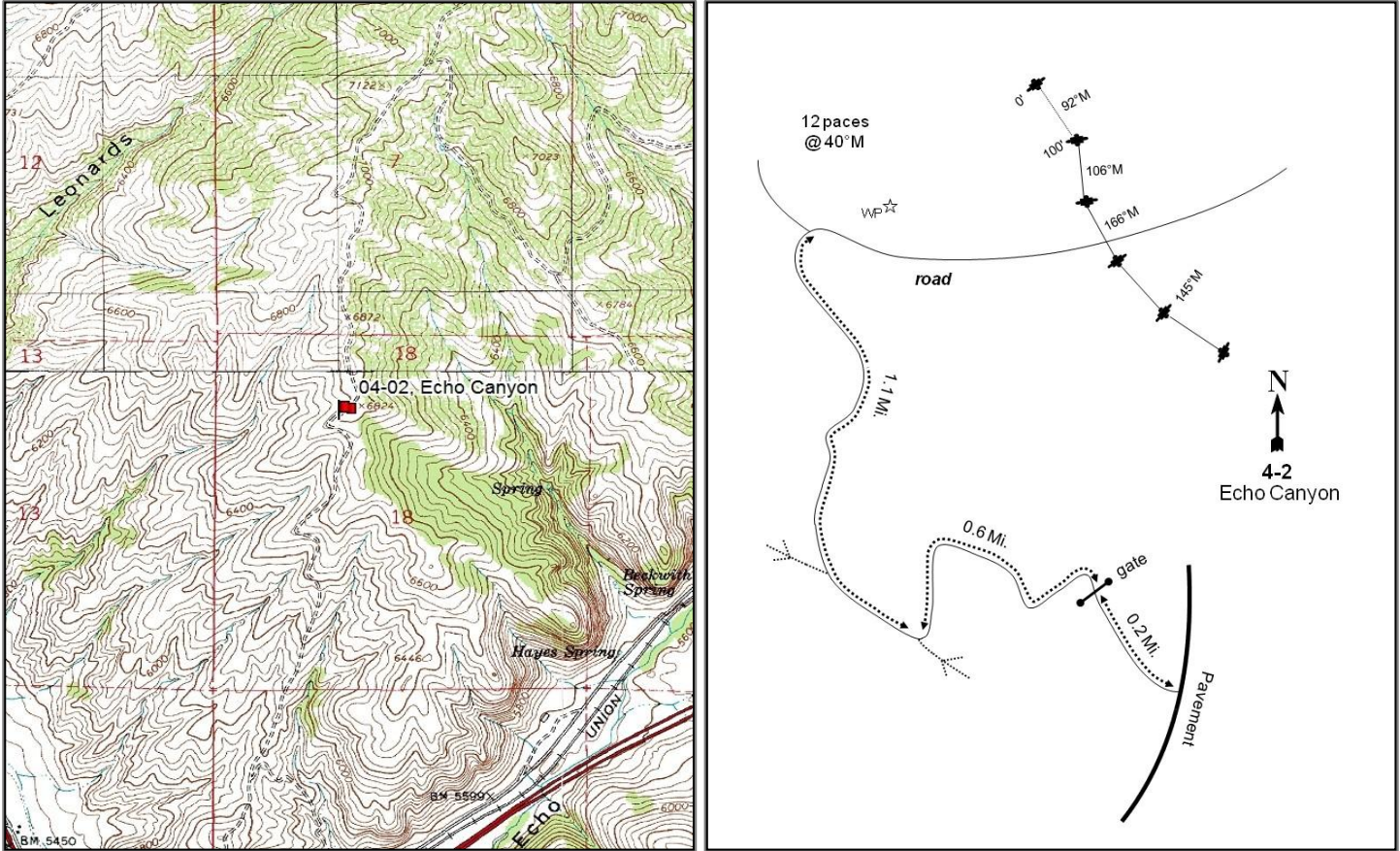
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Purshia tridentata^p -- (antelope bitterbrush)									
1996	100	-	40	60	0	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
Rosa woodsii^p -- (Woods' rose)									
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
Symphoricarpos oreophilus -- (mountain snowberry)									
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
Tetradymia canescens -- (spineless horsebrush)									
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: High 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	9.5	13.1	10.6	24.2	-1.2	7.8	0.0	63.9	Fair
2001	14.5	14.3	15.0	30.0	-0.6	10.0	0.0	83.2	Good
2006	25.9	13.0	15.0	30.0	-0.2	10.0	0.0	93.7	Excellent
2011	30.0	12.6	14.3	21.5	-1.0	10.0	0.0	87.4	Good
2016	30.0	14.2	7.8	19.6	-0.8	10.0	0.0	80.9	Good

ECHO CANYON - STUDY NO. 04-2



Location Information

USGS 7.5 min Map Info Coalville NE; Township 3N, Range 5E, Section 18
 GPS (0' Stake) NAD 83 UTM ZONE 12, 463944 East 4538614 North

Transect Information

Browse Tag # (0' Stake) 7943
 Transect Bearing magnetic) 92° magnetic (Line 2: 106° magnetic, Line 3: 166° magnetic, Line 4-5: 145° magnetic)
 Length 500ft
 Belt Placement Line (11ft), Line 2 (34ft), Line 3 (95ft), Line 4 (59ft), Line 5 (71ft)
 Belt Marker Placement Standard

Directions to Site

From I-80 exit 169, just east of the I-80/I-84 junction, travel northeast towards Emery 0.1 miles, and turn left onto a dirt road. Proceed up the mountain 0.2 miles to a gate. Proceed 0.6 miles to a fork, and turn right. Proceed north 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. The 0-foot baseline stake 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

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 lbs/acre
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	0.48	0.39
G	Poa secunda	Canby Bluegrass	Canbar	0.10	0.08
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
Deer	crucial	winter	
Elk	crucial	winter	
Greater Sage Grouse	Crucial	occupied & Winter	brood-rearing
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

Site Notes

This study is located on the ridge approximately one mile to the 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 A defined state and transition model is available.

This site was dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) from establishment in 1984 through the 2006 sample year (Table 04-02.12). 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: these characteristics place the site in a community phase which has not yet been defined. In 2001 and 2006, perennial grasses -- namely bluebunch wheatgrass (*Pseudoroegneria spicata*) -- replaced cheatgrass as the co- dominant herbaceous component, indicating that the site was in Community Phase 8.1 of the Wyoming Big Sagebrush/Increased Perennial Herbs state (State 8). Decreased sagebrush cover (Table 04-02.12) and increased amounts of bulbous bluegrass (*Poa bulbosa*) caused this site to transition via an unknown pathway to one dominated by perennial grasses in both the 2011 and 2016 sample years (Table 04-02.10). Although not defined by the current model, the increased herbaceous understory and reduced shrub cover indicate that this phase is likely similar to Community Phase 2.1 of the Wyoming Big Sagebrush/Introduced Non-Natives state (State 2) (USDA-NRCS, 2013). Forbs have remained abundant and diverse throughout the study years (Table 04-02.11). It is predicted that this site will remain dominated by perennial grasses in the future.

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	14.2	0.9	-	-	-	-
2001	14.9	1.5	-	-	-	-
2006	9.5	0.9	-	11.8	1.6	-
2011	4.2	0.7	-	5.9	1.7	-
2016	5.1	2.2	-	7.1	3.2	-

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

Table 04-02.8 - 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	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

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	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
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)	-	-

Table 04-02.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (nuttongrass)	Poa pratensis ⁱ (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
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

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 ^{ai} (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 ^{ai} (littlepod false flax)	Castilleja linearifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseeded butterwort)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (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	
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	

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

FORB SPECIES	Crepis acuminata (tapertip hawk's beard)	Cymopterus (springparsley)	Descurainia ^a (tansymustard)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Echium vulgare ^{ai} (common viper's bugloss)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium ^a (bedstraw)	Grindelia squarrosa (curlycup gumweed)	Helianthus annuus ^a (common sunflower)	Heterotheca villosa (hairy false goldenaster)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Lithophragma (woodland-star)	
year	Nested Frequency																	
1996	1	-	-	-	127	-	-	-	-	113	14	22	-	3	281	3	-	
2001	2	13	-	3	107	-	11	3	2	67	2	10	-	2	116	-	-	
2006	-	72	-	-	81	-	4	-	-	39	-	1	6	-	87	-	-	
2011	4	88	8	1	123	-	-	-	-	154	-	-	-	-	122	1	3	
2016	5	29	-	-	8	1	-	-	-	158	-	3	-	-	5	-	-	
year	Average Cover (%)																	
1996	0.0	-	-	-	0.3	-	-	-	-	2.6	0.1	0.1	-	0.0	1.7	0.0	-	
2001	0.0	0.1	-	0.0	0.2	-	0.0	0.0	0.0	2.0	0.0	0.3	-	0.1	0.7	-	-	
2006	-	0.9	-	-	0.3	-	0.0	-	-	0.3	-	0.0	0.0	-	0.3	-	-	
2011	0.0	1.6	0.0	0.0	0.5	-	-	-	-	5.4	-	-	-	-	1.0	0.0	0.0	
2016	0.1	0.1	-	-	0.0	0.4	-	-	-	3.2	-	0.0	-	-	0.0	-	-	

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

FORB SPECIES	Lomatium (desertparsley)	Lupinus argenteus (silvery lupine)	Machaeranthera (tansyaster)	Microsteris gracilis ^a (slender phlox)	Oenothera (evening primrose)	Schoenocrambe limifolia (flaxleaf plainsmustard)	Senecio integerrimus ^a (lambstongue ragwort)	Sisymbrium altissimum ^{ai} (tall tumbledustard)	Sphaeralcea grossularifolia (gooseberryleaf globemallow)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Verbascum thapsus ^{ai} (common mullein)	Veronica biloba ^{ai} (two-lobed speedwell)	Vicia americana (American vetch)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency														
1996	31	28	43	-	-	-	-	-	5	-	64	-	-	69	-
2001	21	31	-	23	-	-	2	-	-	2	33	4	1	38	-
2006	3	32	-	28	9	-	-	-	-	-	13	-	-	69	3
2011	24	45	2	8	-	7	-	10	1	-	2	-	-	92	-
2016	1	35	-	11	2	-	-	1	-	-	2	-	-	51	-
year	Average Cover (%)														
1996	0.1	1.0	0.1	-	-	-	-	-	0.2	-	0.4	-	-	0.6	-
2001	0.1	1.4	-	0.1	-	-	0.0	-	-	0.0	0.5	0.0	0.0	0.4	-
2006	0.0	0.8	-	0.1	0.1	-	-	-	-	-	0.2	-	-	1.7	0.0
2011	0.3	1.9	0.0	0.0	-	0.2	-	0.2	0.0	-	0.0	-	-	2.9	-
2016	0.0	2.1	-	0.0	0.0	-	-	0.4	-	-	0.0	-	-	1.1	-

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	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Opuntia polyacantha (plains pricklypear)	Symphoricarpos oreophilus (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
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

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

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.

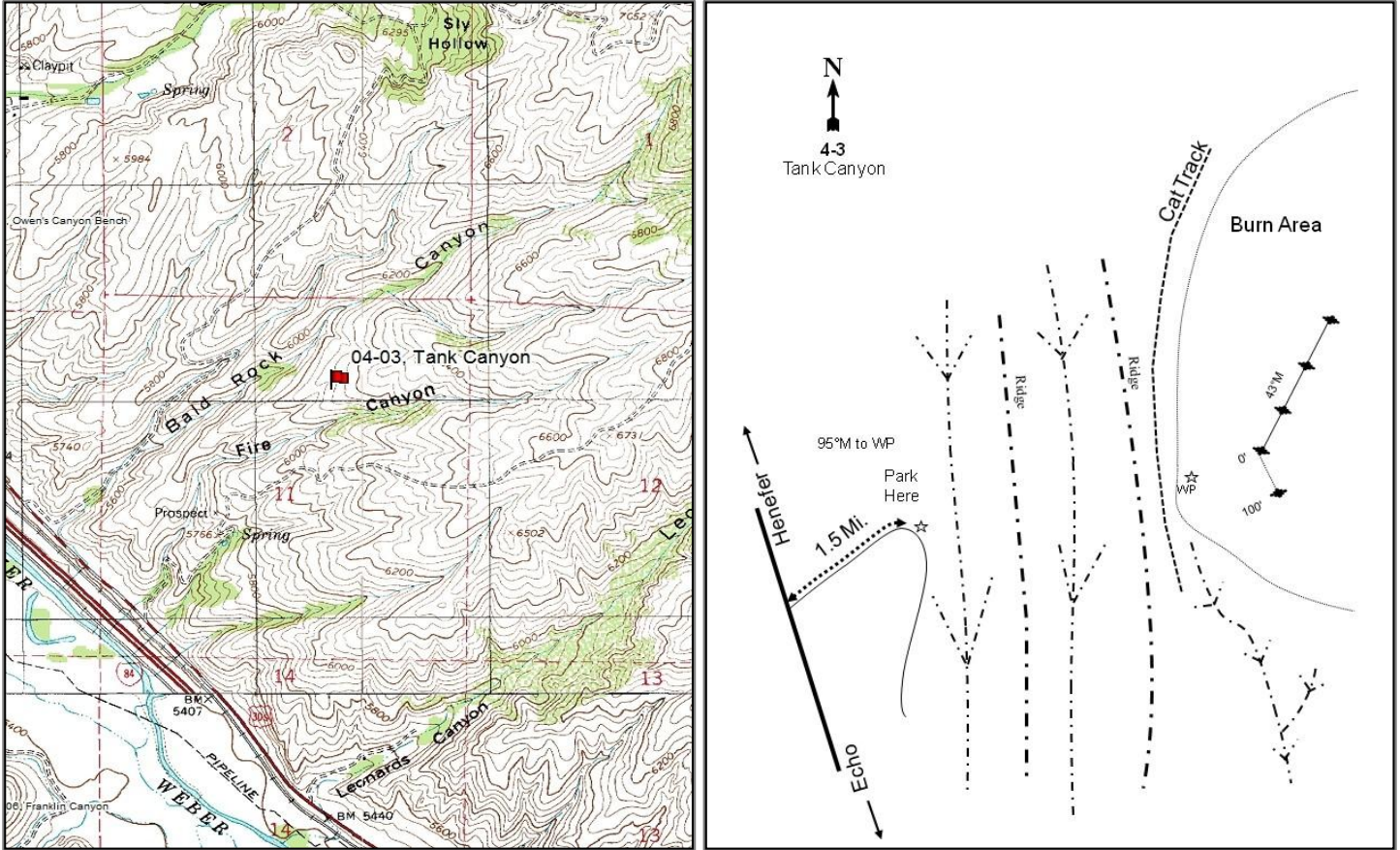
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier alnifolia^p -- (Saskatoon serviceberry)									
1996	-	-	-	-	-	-	-	-	82/74
2001	-	-	-	-	-	-	-	-	87/95
2006	-	-	-	-	-	-	-	-	128/131
2011	-	-	-	-	-	-	-	-	127/127
2016	40	-	50	50	0	0	0	0	120/139
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
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
Opuntia polyacantha -- (plains pricklypear)									
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
Symphoricarpos oreophilus -- (mountain snowberry)									
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

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

Table -04-02.15 - Deer Desirable Components Index: Mid 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	9.3	8.0	19.0	-10.3	10.0	0.0	53.9	Fair
2001	18.8	5.7	0.0	30.0	-3.3	10.0	0.0	61.2	Fair
2006	12.0	0.6	0.5	30.0	-3.4	10.0	0.0	49.7	Poor-Fair
2011	5.3	0.0	0.0	26.5	-3.5	10.0	0.0	38.3	Poor
2016	6.0	0.0	0.0	30.0	-5.8	10.0	0.0	40.2	Poor

TANK CANYON - STUDY NO. 04-3



Location Information

USGS 7.5 min Map Info Henefer SW; Township 3N, Range 4E, Section 11
 GPS (0' Stake) NAD 83 UTM ZONE 12, 461262 East 4540256 North

Transect Information

Browse Tag # (0' Stake) 7944
 Transect Bearing 146° magnetic (Line 2-4: 43° 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 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 3 full high posts before the switchback. Walk at a bearing of 11 degrees magnetic walking 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. The 0-foot baseline stake is marked with browse tag #7944.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,100ft (1,859m)
Aspect	West
Slope	23%
Sample Dates	06/27/1996, 06/19/2001, 06/20/2006, 06/08/2011, 06/15/2016

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	-	-	1984-1990	40
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 lbs/acre
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, Franklin/Bear Lake ID	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
Deer	crucial	winter	
Elk	crucial	winter	
Greater Sage Grouse	Crucial	occupied & Winter	brood-rearing
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

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 fire. Another small fire burned 40 acres of the area, including the study, between 1984 and 1990. In 1990, the frequency data was collected where it had burned and density data was collected mainly in an unburned area, which caused an incongruity between the two. 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 bluebunch wheatgrass (*Pseudoroegneria spicata*) and bulbous bluegrass (*Poa bulbosa*) (Table 04-03.10). Browse species such as mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *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 remain rare, and annual grasses have not been sampled on this site since 2001 (Table 04-03.7). Without a disturbance to reduce perennial grasses, it is predicted that browse will remain relatively rare on this site.

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	2.2	2.3	-	0.6	1.9	-

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

Table 04-03.8 - 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	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

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	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	-
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)	-	-

Table 04-03.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Festuca ovina ⁱ (sheep fescue)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (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
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

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 ^{ai} (desert madwort)	Astragalus (milkvetch)	Astragalus cibaricus (browse milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cymopterus (springparsley)	Descurainia pinnata ^a (western tansymustard)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum ovalifolium (cushion buckwheat)	Erodium cicutarium ^{ai} (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	-	-	-
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	-	-	-

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

FORB SPECIES	Lactuca serriola ^{ai} (prickly lettuce)	Lesquerella (bladderpod)	Linum lewisii (Lewis flax)	Medicago sativa ⁱ (alfalfa)	Microsteris gracilis ^a (slender phlox)	Onobrychis viciifolia ⁱ (sainfoin)	Pedicularis centranthera (dwarf lousewort)	Polygonum douglasii ^a (Douglas' knotweed)	Sanguisorba minor ⁱ (small burnet)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Sphaeralcea coccinea (scarlet globemallow)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Vicia americana (American vetch)
year	Nested Frequency													
1996	-	-	-	186	-	-	-	5	9	-	2	-	25	183
2001	-	3	-	201	-	-	-	-	6	1	-	-	7	111
2006	-	-	-	138	4	-	1	3	-	-	-	-	1	55
2011	15	-	-	132	-	-	-	-	6	-	-	-	-	54
2016	-	-	1	139	-	1	-	-	-	-	-	3	3	48
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

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	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Bassia prostrata ⁱ (forage kochia)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)					
1996	-	-	-	-	-	-
2001	-	-	-	-	-	-
2006	0.2	-	1.3	0.9	0.1	-
2011	0.1	-	1.5	0.2	-	-
2016	0.2	-	1.5	0.4	0.4	-
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	-

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

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 (%)				
Amelanchier alnifolia^p -- (Saskatoon serviceberry)									
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
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Bassia prostrataⁱ -- (forage kochia)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	460	-	61	39	0	26	9	0	12/16
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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

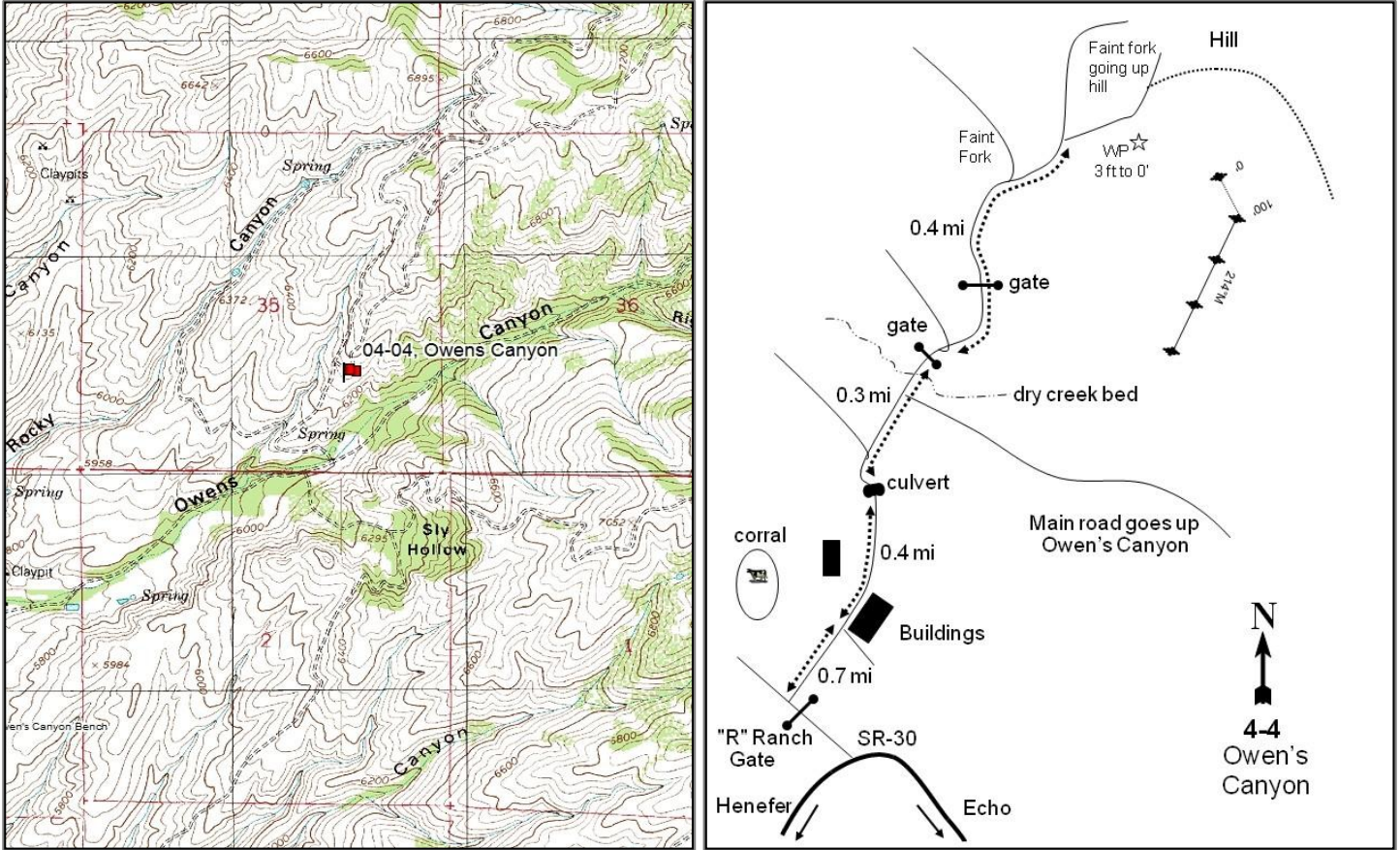
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
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
Opuntia polyacantha -- (plains pricklypear)									
1996	-	-	-	-	-	-	-	-	14/53
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	7/19
2011	-	20	0	0	0	0	0	0	10/18
2016	-	-	-	-	-	-	-	-	14/48
Symphoricarpos oreophilus -- (mountain snowberry)									
1996	-	-	-	-	-	-	-	-	46/114
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	39/71
2011	-	-	-	-	-	-	-	-	61/89
2016	20	-	0	100	0	0	0	0	57/75
Tetradymia canescens -- (spineless horsebrush)									
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: Mid 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	41.3	Poor
2001	1.9	0.0	0.0	30.0	0.0	10.0	0.0	41.9	Poor
2006	1.7	0.0	0.0	30.0	0.0	10.0	0.0	41.7	Poor
2011	1.9	0.0	0.0	30.0	0.0	10.0	0.0	41.9	Poor
2016	1.8	0.0	0.0	30.0	0.0	10.0	0.0	41.8	Poor

OWEN'S CANYON - STUDY No. 04-4



Location Information

USGS 7.5 min Map Info Henefer SW; Township 4N, Range 4E, Section 35
 GPS (0' Stake) NAD 83 UTM ZONE 12, 461369 East 4542573 North

Transect Information

Browse Tag # (0' Stake) 7945
 Transect Bearing 160° magnetic (Line 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 through a white post entrance. Continue straight 0.4 miles to a culvert, then 0.45 miles farther to a DWR gate. Continue through the gate 0.25 miles, turn left, cross the wash, and stay on the main road (left fork leads to DWR cabin). Proceed 0.4 miles to a fork in the road. Continue right for 0.3 miles. A witness post 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

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
Deer	crucial	winter	
Elk	crucial	winter	
Greater Sage Grouse	Crucial	occupied & Winter	brood-rearing
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

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 #	R047XA312UT
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 component on this site from 1984 until the wildfire in 1999 in which most browse was eliminated. 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*), and crested wheatgrass (*Agropyron cristatum*), although native grasses are also present. Annual grass cover -- namely that of cheatgrass (*B. tectorum*) -- has fluctuated throughout the study period, but is low as of the 2016 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 (Table 04-04.11). Perennial forbs have remained rare.

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	-	0.7	-	-	-	-
2006	0.3	1.6	-	0.5	3.3	-
2011	0.3	1.0	-	0.5	2.4	-
2016	1.0	2.3	-	1.3	3.0	-

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

Table 04-04.8 - 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	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

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	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
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)	-	-

Table 04-04.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Dactylis glomerata ⁱ (orchardgrass)	Elymus elymoides (squirreltail)	Elymus repens ^{ai} (quackgrass)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (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
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

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 ^{ai} (desert madwort)	Ambrosia psilostachya (Cuman ragweed)	Arabis (rockcress)	Arenaria (sandwort)	Astragalus (milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littlupod false flax)	Carduus nutans ^{ai} (nodding plumeless thistle)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium undulatum ^{ai} (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Cymopterus (springparsley)	Descurainia pinnata ^a (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	-
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	-

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

FORB SPECIES	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron strigosus (prairie fleabane)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Grindelia squarrosa (curlycup gumweed)	Hedysarum boreale (Utah sweetvetch)	Helianthus annuus ^a (common sunflower)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Machaeranthera (tansyaster)	Medicago sativa ⁱ (alfalfa)	Melilotus officinalis ⁱ (sweetclover)	Microsteris gracilis ^a (slender phlox)	Penstemon (beardtongue)
year	Nested Frequency																
1996	-	-	5	-	-	-	-	42	-	34	-	-	7	-	-	-	-
2001	19	45	-	-	84	-	3	-	-	76	18	-	-	-	6	13	1
2006	43	62	-	-	74	2	1	-	18	139	15	2	-	0	0	49	-
2011	151	23	-	4	126	-	-	-	39	103	35	-	-	3	-	79	-
2016	5	-	4	-	216	-	-	-	7	2	-	-	-	-	-	32	-
year	Average Cover (%)																
1996	-	-	0.0	-	-	-	-	0.4	-	0.4	-	-	0.0	-	-	-	-
2001	0.0	0.7	-	-	3.6	-	0.0	-	-	0.4	0.1	-	-	-	0.2	0.1	0.0
2006	0.1	0.3	-	-	1.1	0.0	0.0	-	0.1	0.5	0.0	0.0	-	0.1	0.0	0.1	-
2011	0.6	0.0	-	0.0	1.3	-	-	-	0.2	0.3	0.1	-	-	0.0	-	0.3	-
2016	0.0	-	0.0	-	3.5	-	-	-	0.0	0.0	-	-	-	-	-	0.1	-

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

FORB SPECIES	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^{ai} (Douglas' knotweed)	Sanguisorba minor ⁱ (small burnet)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Sphaeralcea coccinea (scarlet globemallow)	Symphotrichum (aster)	Symphotrichum ascendens (western aster)	Tragopogon dubius ^{ai} (yellow salsify)	Veronica biloba ^{ai} (two-lobed speedwell)	Vicia americana (American vetch)
year	Nested Frequency									
1996	-	3	-	-	-	5	-	20	-	68
2001	17	3	7	26	5	8	-	13	-	29
2006	-	7	-	1	1	7	-	87	-	66
2011	-	3	-	-	-	1	-	43	-	86
2016	-	-	-	-	-	-	3	7	1	52
year	Average Cover (%)									
1996	-	0.0	-	-	-	0.0	-	0.2	-	0.4
2001	0.4	0.0	0.7	0.2	0.2	0.2	-	0.1	-	0.3
2006	-	0.0	-	0.0	0.0	0.2	-	1.5	-	0.9
2011	-	0.0	-	-	-	0.0	-	0.5	-	0.9
2016	-	-	-	-	-	-	0.0	0.1	0.0	0.5

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 alnifolia ^p (Saskatoon serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Bassia prostrata ⁱ (forage kochia)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (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
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

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

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 (%)				
Amelanchier alnifolia^p -- (Saskatoon serviceberry)									
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
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Bassia prostrataⁱ -- (forage kochia)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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

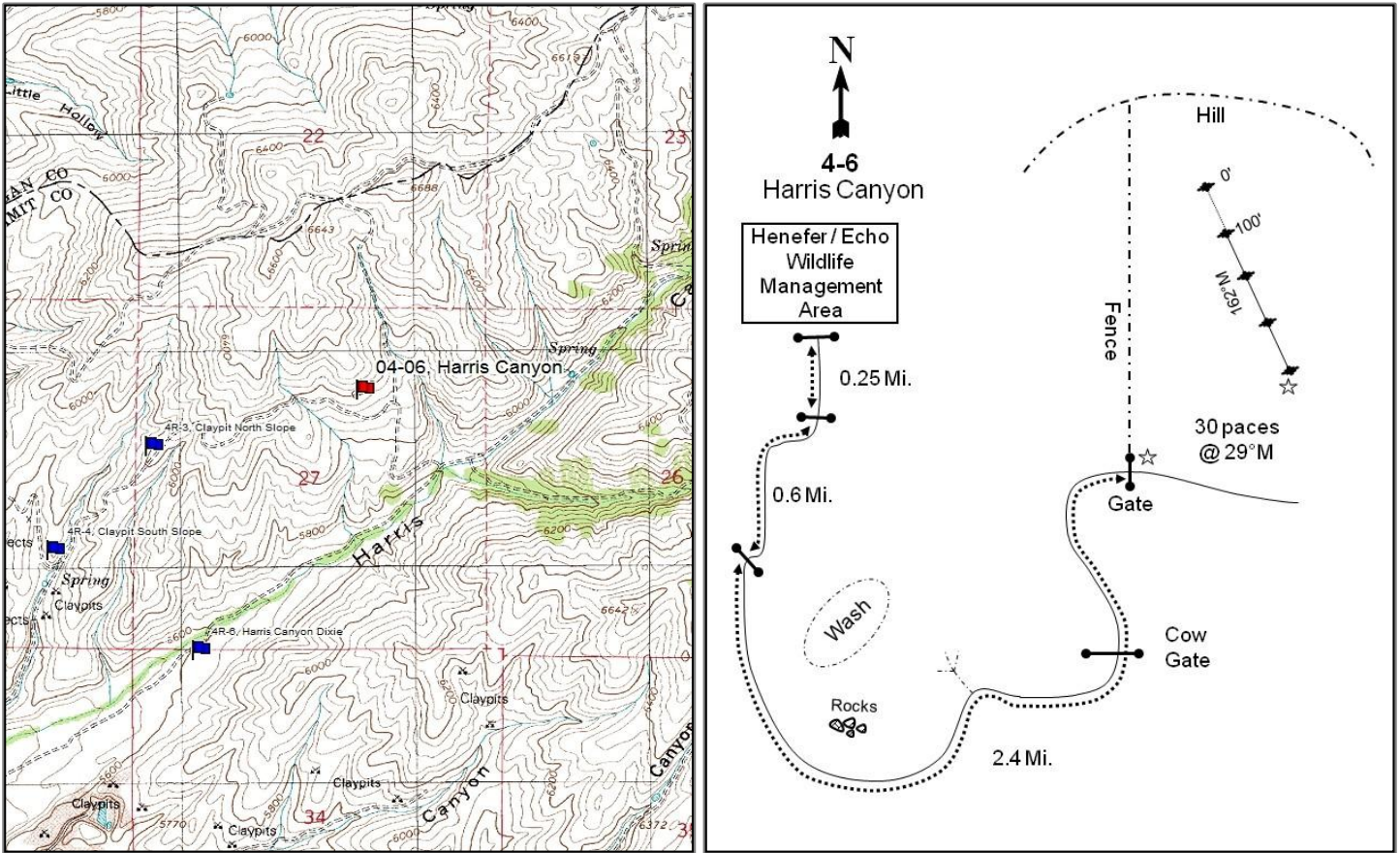
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
1996	160	-	13	50	38	0	0	0	68/100
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	53/60
2011	-	-	-	-	-	-	-	-	68/135
2016	-	-	-	-	-	-	-	-	60/113
Gutierrezia sarothrae -- (broom snakeweed)									
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
Symphoricarpos oreophilus -- (mountain snowberry)									
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: Mid 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	25.9	8.2	4.6	23.3	-14.8	2.0	0.0	49.1	Poor-Fair
2001	0.5	0.0	0.0	30.0	-1.9	4.4	-2.0	31.1	Very Poor
2006	2.0	0.0	0.0	30.0	-7.5	2.9	0.0	27.4	Very Poor
2011	1.2	0.0	0.0	30.0	-5.3	2.2	0.0	28.2	Very Poor
2016	3.2	0.0	0.0	30.0	-1.2	1.2	0.0	33.2	Very Poor-Poor

HARRIS CANYON - STUDY NO. 04-6



Location Information

USGS 7.5 min Map Info Henefer SW; Township 4N, Range 4E, Section 27
 GPS (0' Stake) 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 Standard

Directions to Site

From exit 115 to Henefer, proceed northwest for 3.5 miles (towards Croyden) to the Croyden 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. 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

Wildlife Habitat and Vegetation History

Table 04-06.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Elk	crucial	winter	
Greater Sage Grouse	Crucial	occupied & Winter	brood-rearing
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

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 throughout the study years, although other preferred browse species such as antelope bitterbrush (*Purshia tridentata*) and Utah serviceberry (*Amalanchier utahensis*) are present in lower amounts (Table 04-06.6, Photos). Recruitment of young sagebrush plants has increased slightly as of 2016 (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 site establishment in 1984. 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- 06.7, Table 04-06.10). Annual forbs are fairly abundant, but the most cover has been contributed by the introduced species desert madwort (*Alyssum desertorum*). Perennial forbs are diverse in composition and have fluctuated throughout the study years (Table 04-06.7, Table 04-06.11).

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	6.5	3.1	-	-	-	-
2001	13.4	2.1	-	-	-	-
2006	8.4	2.2	-	12.2	1.9	-
2011	5.3	1.5	-	6.4	3.3	-
2016	4.8	1.9	-	8.3	3.6	-

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	404	215	311	119	9.6	12.2	2.9	1.9
2001	384	236	388	120	8.8	13.2	9.7	3.2
2006	410	259	361	132	18.5	14.3	4.6	4.7
2011	379	297	404	242	11.5	12.2	13.4	7.7
2016	321	332	344	183	9.8	22.4	9.1	3.5

Table 04-06.8 - 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	4.8	0.3	48.1	0.6	13.2	40.2
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	21.9	0.1	36.6	1.7	16.5	44.0

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	Elk	Rabbit
	Quadrat Frequency			
1996	-	25	4	-
2001	1	22	20	-
2006	-	25	31	9
2011	-	14	9	1
2016	-	42	8	25
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)	-

Table 04-06.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES											
Achnatherum hymenoides (Indian ricegrass)											
Agropyron cristatum ⁱ (crested wheatgrass)											
Bromus arvensis ^{ai} (field brome)											
Bromus briziformis ^{ai} (rattlesnake brome)											
Bromus tectorum ^{ai} (cheatgrass)											
Festuca ovina ⁱ (sheep fescue)											
Poa pratensis ⁱ (Kentucky bluegrass)											
Poa secunda (Sandberg bluegrass)											
Psathyrostachys juncea ⁱ (Russian wildrye)											
Pseudoroegneria spicata (bluebunch wheatgrass)											
Thinopyrum intermedium ⁱ (intermediate wheatgrass)											
year	Nested Frequency										
1996	12	-	239	4	328	-	-	7	-	207	5
2001	22	-	262	4	274	2	2	31	-	212	7
2006	5	4	170	3	373	-	-	7	2	245	22
2011	-	-	128	1	358	-	7	22	-	272	51
2016	11	-	96	-	302	-	-	6	-	291	75
year	Average Cover (%)										
1996	0.4	-	2.6	0.0	6.9	-	-	0.1	-	11.8	0.0
2001	0.5	-	3.6	0.0	5.1	0.0	0.0	0.8	-	11.5	0.3
2006	0.3	0.0	1.9	0.0	16.6	-	-	0.0	0.0	12.9	1.0
2011	-	-	0.6	0.0	10.9	-	0.0	0.5	-	10.3	1.3
2016	0.3	-	0.4	-	9.4	-	-	0.1	-	17.3	4.8

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 ^{ai} (desert madwort)																	
Arabis drummondii (Drummond's rockcress)																	
Arenaria (sandwort)																	
Artemisia ludoviciana (white sagebrush)																	
Astragalus beekwithii (Beekwith's milkvetch)																	
Astragalus utahensis (Utah milkvetch)																	
Camelina microcarpa ^{ai} (littlupod false flax)																	
Castilleja linariifolia (Wyoming Indian paintbrush)																	
Ceratocephala testiculata ^{ai} (curvseed butterwort)																	
Cirsium undulatum ^{ai} (wavyleaf thistle)																	
Collinsia parviflora ^a (maiden blue eyed Mary)																	
Collomia linearis ^a (tiny trumpet)																	
Crepis acuminata (tapertip hawk/beard)																	
Cymopterus (springparsley)																	
year	Nested Frequency																
1996	6	-	5	287	-	-	32	8	3	2	4	-	16	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	-	5	16	326	5	-	67	41	5	8	0	1	12	7	-	7	12
year	Average Cover (%)																
1996	0.0	-	0.0	1.1	-	-	0.5	0.2	0.0	0.0	0.2	-	0.2	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	-	1.7	0.5	0.1	0.0	0.0	0.0	0.2	0.0	-	0.1	0.0

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

FORB SPECIES	Cynoglossum officinale ^{ani} (gypsyflower)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Erodium cicutarium ^{ai} (redstem stork's bill)	Gilia ^a (gilia)	Hackelia patens (spotted stickseed)	Hedysarum boreale (Utah sweetvetch)	Helianthus annuus ^a (common sunflower)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lithospermum ruderale (western stoneseed)	Microsteris gracilis ^a (slender phlox)	Oenothera caespitosa (tufted evening primrose)	Sisymbrium altissimum ^{ai} (tall tumbledustard)	Symphotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)
year	Nested Frequency																
1996	2	-	-	25	-	8	2	-	36	6	-	-	-	1	-	1	-
2001	2	9	-	86	-	-	6	-	139	16	-	-	36	-	-	1	2
2006	2	1	14	40	-	-	1	-	193	-	-	0	21	2	-	-	3
2011	-	14	7	142	9	-	4	-	218	16	3	-	10	-	15	3	5
2016	-	-	-	161	-	0	3	6	-	-	-	-	4	-	0	-	-
year	Average Cover (%)																
1996	0.0	-	-	0.1	-	0.0	0.1	-	0.1	0.0	-	-	-	0.0	-	0.0	-
2001	0.0	0.0	-	1.6	-	-	0.0	-	0.6	0.1	-	-	0.2	-	-	0.0	0.0
2006	0.1	0.0	0.0	0.2	-	-	0.0	-	0.7	-	-	0.0	0.1	0.0	-	-	0.0
2011	-	0.1	0.0	1.1	0.0	-	0.0	-	1.7	0.1	0.0	-	0.0	-	0.4	0.0	0.0
2016	-	-	-	2.0	-	0.0	0.0	0.0	-	-	-	-	0.0	-	0.0	-	-

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

FORB SPECIES	Tragopogon dubius ^{ai} (yellow salsify)	Veronica biloba ^{ai} (two-lobed speedwell)	Vicia americana (American vetch)
year	Nested Frequency		
1996	105	-	59
2001	69	-	32
2006	11	-	72
2011	9	4	120
2016	3	3	73
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

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 ^p (Utah serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Linanthus pungens (granite prickly phlox)	Mahonia repens (creeping barberry)	Purshia tridentata ^p (antelope bitterbrush)
year	Line Intercept Cover (%)							
1996	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-
2006	-	7.7	1.8	3.6	-	-	0.1	0.9
2011	-	5.5	2.1	0.9	0.2	-	1	-
2016	0.3	6.8	2.1	0.8	0.5	-	1	0.4
year	Quadrat Cover (%)							
1996	0.4	3.4	1.6	2.0	1.4	-	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

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

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 (%)				
Amelanchier utahensis ^p -- (Utah serviceberry)									
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
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Ericameria nauseosa ssp. nauseosa var. speciosa ^p -- (rubber rabbitbrush)									
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

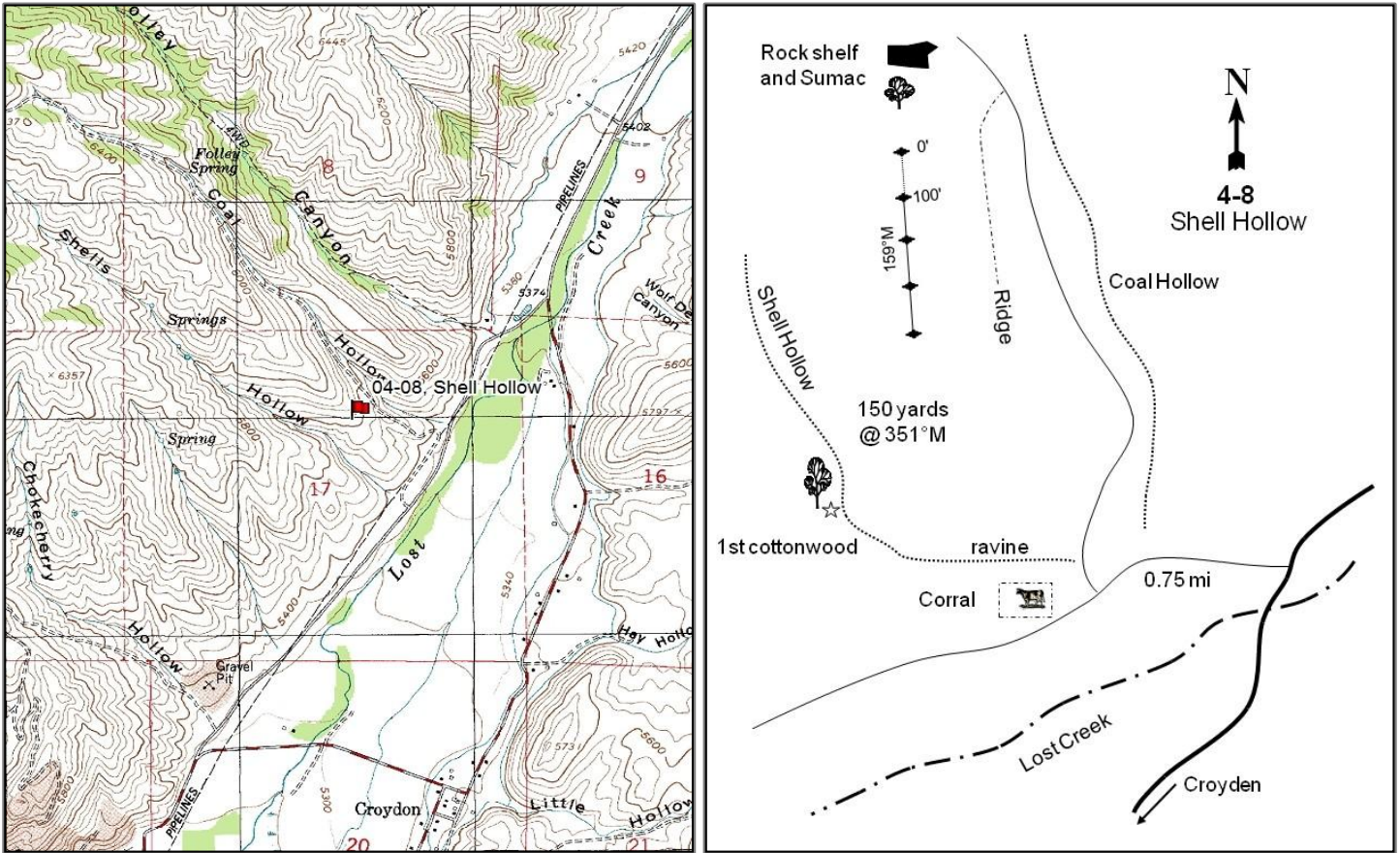
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
1996	2600	4100	53	44	3	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
Mahonia repens -- (creeping barberry)									
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
Purshia tridentata^p -- (antelope bitterbrush)									
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
Symphoricarpos oreophilus -- (mountain snowberry)									
1996	-	-	-	-	-	-	-	-	39/57
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	37/56
2011	-	-	-	-	-	-	-	-	62/103
2016	-	-	-	-	-	-	-	-	57/106
Tetradymia canescens -- (spineless horsebrush)									
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: Mid 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	8.5	11.9	9.5	24.6	-7.2	4.2	-2.0	49.4	Poor-Fair
2001	16.9	7.1	3.3	27.2	-6.6	7.0	-2.0	53.0	Fair
2006	11.0	8.2	3.2	29.4	-13.9	10.0	-2.0	45.9	Poor
2011	6.8	4.9	4.4	25.2	-8.6	10.0	0.0	42.6	Poor
2016	5.6	0.0	0.0	30.0	-7.4	7.0	0.0	35.3	Very Poor-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)	7947
Transect Bearing	159° 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 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 east of the road is a corral. Northwest of the corral is the ravine, Shell Hollow. Walk up Shell Hollow to the first cottonwood tree over 25 feet tall. Nearby 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 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

Wildlife Habitat and Vegetation History

Table 04-08.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Elk	crucial	winter	
Greater Sage Grouse	Crucial	occupied & Winter	brood-rearing
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

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 sample, 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.

This study site has existed as a Wyoming big sagebrush dominated community since its establishment in 1984; line-intercept cover increased by over 10% between the 2006 and 2016 sample years. Although a few other browse species are present, they provide little cover (Table 04-08.12). Annual grasses, mainly field brome (*Bromus arvensis*) and 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, Photos). Annual forbs are fairly abundant on this site, and are mainly comprised of weedy species such as desert madwort (*Alyssum desertorum*), curvseed butterweed (*Ceratocephala testiculata*), and redstem stork's bill (*Erodium cicutarium*) (Table 04-08.11). Perennial forbs and grasses have contributed relatively little cover through the study years (Table 04-08.7). It is expected that this study site will remain in a similar state barring a major disturbance.

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	-

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	50	270	133	25.8	1.8	1.6	1.5
2001	240	49	447	223	2.1	2.1	13.0	2.8
2006	400	50	299	223	25.6	2.4	2.8	7.2
2011	316	47	428	231	9.9	2.2	16.2	2.4
2016	315	53	399	147	15.5	2.7	11.7	1.7

Table 04-08.8 - 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	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

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	Elk	Rabbit
	Quadrat Frequency			
1996	-	10	-	-
2001	1	6	-	6
2006	-	9	2	8
2011	-	3	2	2
2016	-	9	-	4
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)	-

Table 04-08.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus arvensis ^{ai} (field brome)	Bromus briziformis ^{ai} (rattlesnake brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirritail)	Elymus lanceolatus (thickspike wheatgrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency								
1996	1	476	5	7	-	22	-	15	12
2001	7	224	14	29	-	23	-	12	7
2006	4	283	4	296	-	33	1	4	9
2011	4	275	-	160	-	25	-	2	16
2016	-	99	-	285	1	28	2	-	24
year	Average Cover (%)								
1996	0.0	25.8	0.0	0.0	-	1.5	-	0.1	0.2
2001	0.2	1.5	0.1	0.5	-	1.6	-	0.1	0.2
2006	0.3	7.8	0.0	17.8	-	1.5	0.0	0.0	0.5
2011	0.0	7.1	-	2.9	-	1.9	-	0.0	0.3
2016	-	1.4	-	14.2	0.0	2.3	0.1	-	0.3

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	Achillea millefolium (Common yarrow)	Allium acuminatum (tapertip onion)	Alyssum desertorum ^{ai} (desert madwort)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littlerpod false flax)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia grandiflora ^a (grand collomia)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)
year	Nested Frequency																
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	-	4
2006	2	21	196	7	-	-	-	13	115	4	41	12	2	3	2	21	23
2011	0	82	382	14	-	-	-	17	238	7	5	-	16	7	2	-	5
2016	5	60	338	1	-	-	1	-	135	1	-	-	-	4	-	-	7
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	-	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	0.0	0.1
2011	0.0	0.4	7.3	0.1	-	-	-	0.1	1.7	0.2	0.0	-	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	-	-	0.0

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

FORB SPECIES	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium ^a (bedstraw)	Galium aparine ^a (stickywilly)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Hackelia patens (spotted stickseed)	Helianthella uniflora (oneflower helianthella)	Helianthus annuus ^a (common sunflower)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Machaeranthera canescens (hoary tansyaster)	Mentzelia ^a (blazingstar)	Microsteris gracilis ^a (slender phlox)	Phlox longifolia (longleaf phlox)	Symphotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Verbascum thapsus ^{ai} (common mullein)
year	Nested Frequency																
1996	18	-	3	11	15	-	-	-	10	1	-	-	4	-	-	9	33
2001	9	-	1	-	12	-	1	21	0	-	-	63	41	-	-	3	-
2006	29	-	6	-	7	-	3	29	-	-	-	55	46	1	-	9	-
2011	63	-	34	-	10	-	30	79	-	-	-	114	43	-	2	17	5
2016	112	3	4	-	9	2	4	3	4	-	0	6	12	3	2	9	-
year	Average Cover (%)																
1996	0.1	-	0.0	0.0	0.2	-	-	-	0.0	0.0	-	-	0.0	-	-	0.0	0.1
2001	0.0	-	0.0	-	0.3	-	0.0	0.1	0.0	-	-	0.3	0.1	-	-	0.0	-
2006	0.4	-	0.0	-	0.1	-	0.0	0.1	-	-	-	0.1	0.3	0.0	-	0.1	-
2011	1.0	-	0.9	-	0.2	-	0.2	0.2	-	-	-	0.6	0.6	-	0.0	0.1	0.0
2016	1.5	0.0	0.0	-	0.1	0.0	0.0	0.0	0.3	-	0.0	0.0	0.0	0.0	0.0	0.1	-

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

FORB SPECIES	Veronica biloba ^{ai} (two-lobed speedwell)	Vicia americana (American vetch)	Viola (violet)
year	Nested Frequency		
1996	7	95	-
2001	416	102	-
2006	79	174	8
2011	284	128	44
2016	225	73	5
year	Average Cover (%)		
1996	0.0	1.1	-
2001	7.5	1.5	-
2006	0.4	6.2	0.2
2011	3.8	0.7	0.3
2016	2.6	1.2	0.0

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 alnifolia ^p (Saskatoon serviceberry)	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (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
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

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

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 (%)				
Amelanchier alnifolia ^p -- (Saskatoon serviceberry)									
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	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. wyomingensis ^p -- (Wyoming big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Ericameria nauseosa -- (rubber rabbitbrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	20	-	100	0	0	0	0	0	17/11

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 (%)				
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
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
Mahonia repens -- (creeping barberry)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	7/13
2016	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
1996	-	-	-	-	-	-	-	-	11/24
2001	-	-	-	-	-	-	-	-	11/35
2006	-	-	-	-	-	-	-	-	21/52
2011	-	-	-	-	-	-	-	-	13/49
2016	-	-	-	-	-	-	-	-	12/44
Rhus trilobata var. trilobata -- (skunkbush sumac)									
1996	-	-	-	-	-	-	-	-	183/325
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	158/291
2011	-	-	-	-	-	-	-	-	167/229
2016	-	-	-	-	-	-	-	-	224/290

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

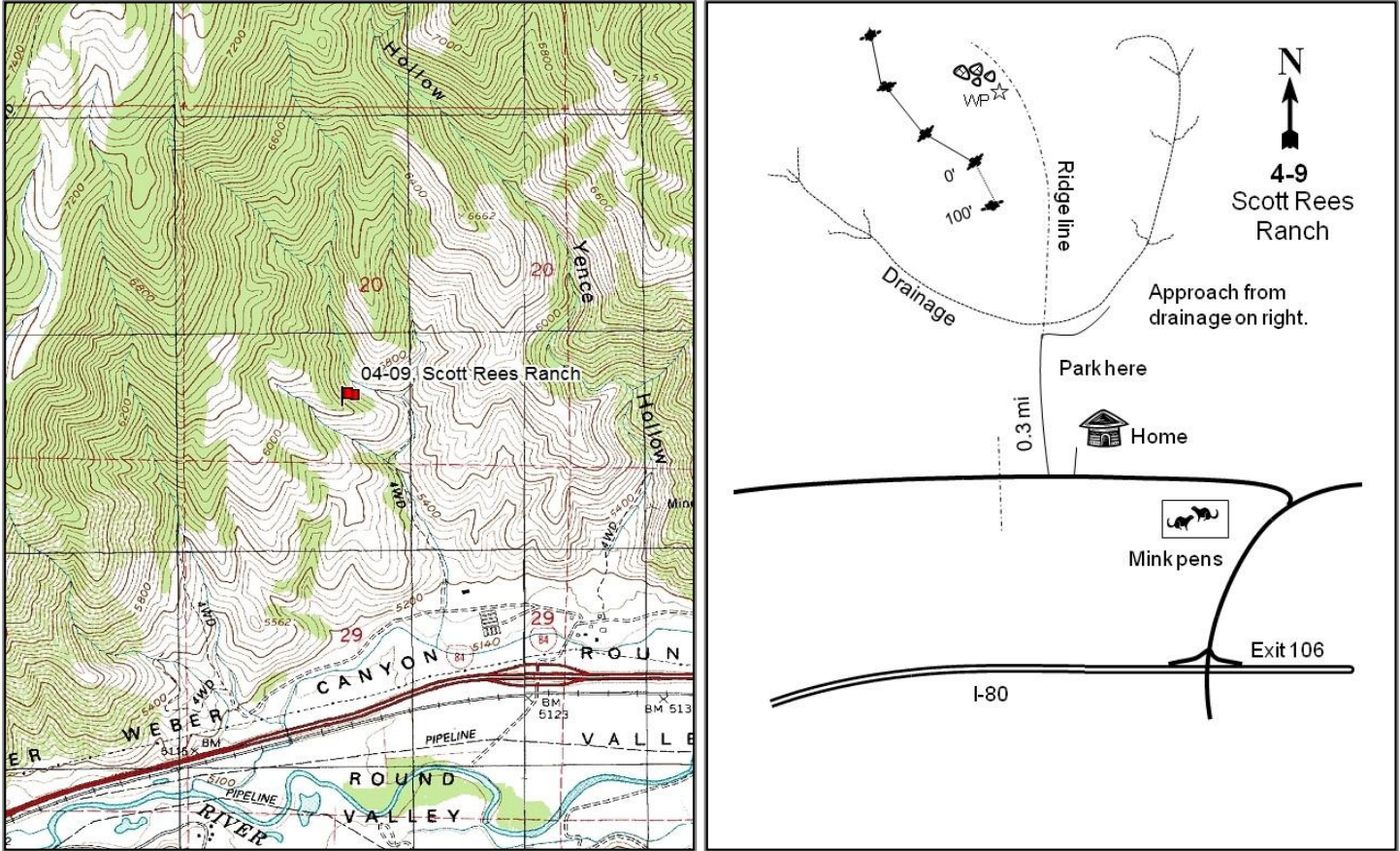
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Symphoricarpos oreophilus -- (mountain snowberry)									
1996	-	-	-	-	-	-	-	-	-/-
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: Mid 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	8.0	4.0	3.8	-19.5	3.4	0.0	29.7	Very Poor
2001	30.0	9.2	1.7	6.0	-1.6	5.8	0.0	51.2	Poor-Fair
2006	27.9	4.2	1.9	9.2	-19.4	10.0	0.0	33.9	Very Poor-Poor
2011	26.5	5.6	0.0	5.0	-7.5	5.2	0.0	34.9	Very Poor-Poor
2016	29.5	11.4	6.5	5.4	-11.6	3.4	0.0	44.6	Poor

SCOTT REES RANCH - STUDY NO. 04-9



Location Information

USGS 7.5 min Map Info Morgan SE; Township 4N, Range 3E, Section 20
 GPS (0' Stake) NAD 83 UTM ZONE 12, 446650 East 4545863 North

Transect Information

Browse Tag # (0' Stake) 7971
 Transect Bearing 165° magnetic (Line 2: 258° magnetic, Line 3: 252° magnetic, Line 4: 277° magnetic)
 Length 400ft
 Belt Placement Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
 Belt Marker Placement Belt 2-5: 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 4-wheeler trail takes off. 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

Wildlife Habitat and Vegetation History**Table 04-09.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
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	No Encroachment
2006	Gambel Oak	No Encroachment
2011	Gambel Oak	No Encroachment
2016	Gambel Oak	No Encroachment

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. It 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 on 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	34.1	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 (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA461UT
States and Transitions	A defined state and transition model is available.

The current and past community phases for this site are not currently defined by the state and transition model (USDA-NRCS, 2013). 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 do not contribute any significant amount of cover (Table 04-09.12). The herbaceous understory has fluctuated, but annual grasses, mainly cheatgrass (*Bromus tectorum*), have been the most prevalent 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 (*A. ludoviciana*) has been the most abundant forb in almost every sample year (Table 04-09.7, Table 04-09.10, Table 04-09.11). It is predicted that this site will remain in a similar state in the future, possibly with fluctuating levels of annual grasses.

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	-

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	23.8	7.5	3.2	4.8
2001	269	284	286	182	9.6	10.6	8.9	4.6
2006	298	266	308	203	5.6	7.1	8.1	5.9
2011	319	218	220	183	11.8	6.1	4.6	6.7
2016	309	213	173	175	23.7	7.6	4.2	8.7

Table 04-09.8 - 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	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

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	Elk	Rabbit	Domestic Sheep
	Quadrat Frequency				
1996	-	11	4	-	4
2001	-	15	1	-	-
2006	2	10	12	5	-
2011	-	7	13	-	-
2016	-	5	-	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)	-	-

Table 04-09.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus arvensis ^{ai} (field brome)	Bromus briziformis ^{ai} (rattlesnake brome)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Dactylis glomerata ⁱ (orchardgrass)	Koeleria macrantha (prairie Junegrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency									
1996	130	112	428	-	-	-	-	21	21	188
2001	81	51	245	5	-	7	11	19	34	250
2006	95	15	281	-	-	2	19	36	1	244
2011	178	20	277	-	0	0	11	42	17	179
2016	52	7	298	0	2	2	2	29	16	192
year	Average Cover (%)									
1996	2.1	0.8	20.8	-	-	-	-	0.4	0.1	7.0
2001	0.4	0.1	9.1	0.1	-	0.1	0.0	0.2	0.4	9.8
2006	0.3	0.0	5.3	-	-	0.0	0.1	0.3	0.0	6.8
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

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	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum simplex ^{ai} (alyssum)	Amsinckia menziesii ⁿ (Menzies' fiddleneck)	Artemisia ludoviciana (white sagebrush)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littledod false flax)	Cirsium undulatum ⁿ (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)
year	Nested Frequency																
1996	23	9	-	-	-	67	6	5	1	-	34	-	14	10	-	-	-
2001	30	20	14	17	3	103	4	7	7	3	17	74	57	11	-	-	3
2006	44	49	14	94	-	90	3	2	11	-	7	34	15	13	-	6	4
2011	20	66	13	82	-	86	10	5	6	-	17	-	11	10	-	-	3
2016	23	40	10	89	-	90	-	8	-	-	10	-	-	21	5	-	-
year	Average Cover (%)																
1996	0.3	0.0	-	-	-	2.1	0.1	0.3	0.0	-	1.2	-	0.0	0.1	-	-	-
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
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	-	0.0	0.2
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
2016	0.8	0.6	0.0	2.2	-	4.5	-	2.4	-	-	0.6	-	-	0.1	0.1	-	-

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

FORB SPECIES	Delphinium nuttallianum (twolobe larkspur)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium aparine ^a (stickywilly)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Geranium ^a (geranium)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lathyrus brachycalyx (Bonneville pea)	Lithophragma (woodland-star)	Machaeranthera (tansyaster)	Microseris nutans (nodding microseris)	Microsteris gracilis ^a (slender phlox)
year	Nested Frequency																
1996	4	-	-	-	79	7	11	52	-	31	8	2	-	-	1	-	-
2001	-	42	10	50	3	58	55	37	2	57	18	-	3	-	-	-	3
2006	-	2	13	178	13	19	55	-	-	57	19	-	3	-	-	-	10
2011	-	13	29	4	10	27	12	7	-	-	14	-	2	3	-	-	2
2016	-	1	-	2	-	32	4	-	-	-	3	-	-	-	-	1	-
year	Average Cover (%)																
1996	0.1	-	-	-	2.0	0.1	0.1	0.2	-	0.1	0.0	0.0	-	-	0.0	-	-
2001	-	0.1	0.1	0.2	0.1	1.4	0.8	0.2	0.0	0.2	0.1	-	0.0	-	-	-	0.0
2006	-	0.0	0.0	1.4	0.3	0.1	1.0	-	-	0.2	0.1	-	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	-

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

FORB SPECIES	Penstemon (beardtongue)	Phacelia linearis ^a (threadleaf phacelia)	Scutellaria antirrhinoides (nose skullcap)	Silene drummondii (Drummond's campion)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow safsify)	unknown fern (unknown fern)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency							
1996	3	-	-	-	-	123	-	-
2001	2	-	13	-	-	159	5	4
2006	1	-	20	10	0	161	5	4
2011	-	-	-	-	-	146	-	3
2016	-	10	3	3	-	80	-	3
year	Average Cover (%)							
1996	0.0	-	-	-	-	1.5	-	-
2001	0.0	-	0.1	-	-	4.2	0.0	0.1
2006	0.0	-	0.4	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

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 ^p (mountain big sagebrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Purshia tridentata ^p (antelope bitterbrush)	Quercus gambelii ^p (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
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

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

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 (%)				
Amelanchier alnifolia ^p -- (Saskatoon serviceberry)									
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
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
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
Cercocarpus ledifolius var. ledifolius ^p -- (curl-leaf mountain mahogany)									
1996	-	-	-	-	-	-	-	-	49/124
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	66/90
2016	-	-	-	-	-	-	-	-	93/78
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	69/141

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 (%)				
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
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
Purshia tridentata^p -- (antelope bitterbrush)									
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
Quercus gambelii^p -- (Gambel oak)									
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

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

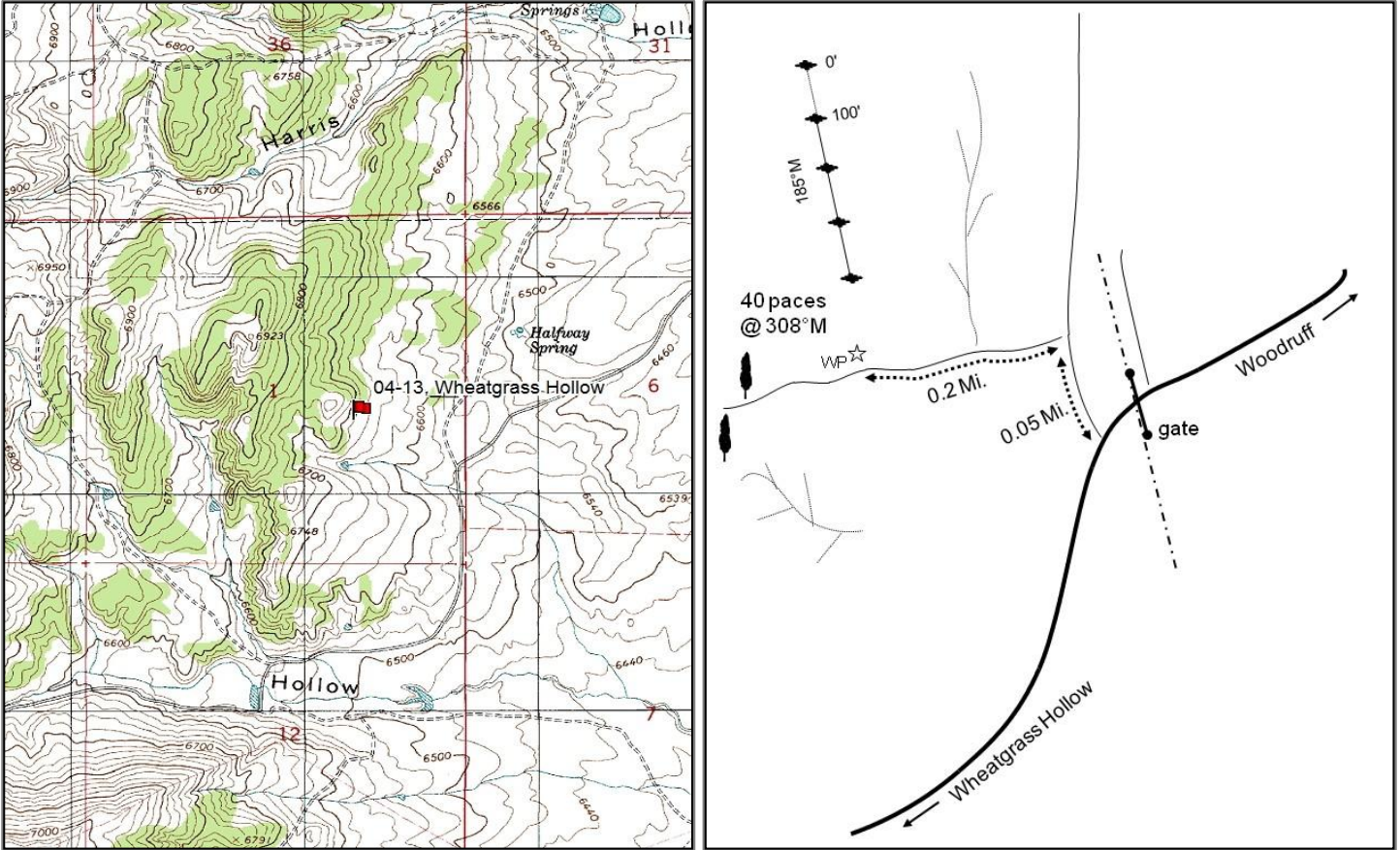
Table 04-09.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2016	1	-	-	100	-	-	6.0

Table -04-09.15 - Deer Desirable Components Index: Mid 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	28.7	12.6	9.3	15.0	-18.3	10.0	0.0	57.3	Fair
2001	30.0	14.4	6.5	21.2	-9.9	10.0	0.0	72.2	Good
2006	27.0	14.3	7.4	14.1	-5.8	10.0	0.0	67.1	Good
2011	28.6	13.2	11.8	12.2	-14.6	7.2	0.0	58.3	Fair
2016	30.0	15.0	15.0	15.2	-17.8	10.0	0.0	67.4	Good

WHEATGRASS HOLLOW - STUDY NO. 04-13



Location Information

USGS 7.5 min Map Info	Neponset Reservoir N; Township 8N, Range 6E, Section 01
GPS (0' Stake)	NAD 83 UTM ZONE 12, 482151 East 4589549 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	135° 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

Where Highway SR-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 the Wheatgrass Road. Go 3.25 miles, crossing several cattleguards, to the fourth cattleguard. Continue past this cattleguard to a fork. Go north 0.05 miles to a fork with a faint road on the left. Go 0.2 miles west on the faint road to a witness post. 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

Wildlife Habitat and Vegetation History

Table 04-13.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Elk	crucial	winter	
Greater Sage Grouse	Crucial	occupied & Winter	brood-rearing
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

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.

The states and transitions for this site are likely similar to those of the Upland Gravelly Loam (Bonneville Big Sagebrush), R028AY306UT ecological site. Since study establishment in 1990, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has contributed the most cover in the shrub overstory, although other browse species have been present in varying amounts. Utah juniper (*Juniperus osteosperma*) is scattered through the site, which is considered to be in Phase I of woodland succession (Table 04-13.4, Table 04-13.12, Photos). The herbaceous understory is sparse in comparison and is dominated by perennial grasses, mainly Sandberg bluegrass (*Poa secunda*) (Table 04-13.10). Annual and perennial forbs have never been particularly diverse, and annual grasses are rare (Table 04-13.7). Considering the largely consistent density of juniper (Table 04-13.13), this site is expected to remain in this state in the future without a major disturbance.

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

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

Table 04-13.8 - 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	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

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	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
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)	-	-

Table 04-13.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Elymus elymoides (squirriltail)	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
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

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 ^{ai} (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 ^{ai} (curvseeded butterwort)	Collinsia parviflora ^a (maiden blue eyed Mary)	Cordylanthus ramosus ^a (bushy bird's beak)	Cryptantha (cryptantha)	Erigeron pumilus (shaggy fleabane)	Gayophytum ramosissimum ^a (pinyon groundsmeke)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lappula occidentalis ^a (flatspine stickseed)
year	Nested Frequency																
1996	1	-	-	27	3	-	9	4	-	-	-	-	1	10	-	-	-
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	3	4
2016	-	3	23	1	-	2	54	2	3	2	-	79	2	18	4	3	-
year	Average Cover (%)																
1996	0.0	-	-	0.4	0.0	-	0.1	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	0.0	-

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

FORB SPECIES	Orobanche (broomrape)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Symphotrichum (aster)	Veronica biloba ^{ai} (twolobe speedwell)
year	Nested Frequency				
1996	3	130	52	-	-
2001	-	123	14	-	-
2006	-	102	39	-	-
2011	1	87	50	-	2
2016	-	83	41	3	-
year	Average Cover (%)				
1996	0.0	1.4	0.1	-	-
2001	-	1.3	0.1	-	-
2006	-	1.8	0.3	-	-
2011	0.0	1.3	0.2	-	0.0
2016	-	1.4	0.2	0.0	-

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 ^p (mountain big sagebrush)	Atriplex confertifolia ^p (shadscale saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Juniperus osteosperma ^t (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
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

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

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 (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Atriplex confertifolia^p -- (shadscale saltbush)									
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	-	-	-	-	-	-	-	-	-/-
Atriplex falcata -- (sickle saltbush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	62/49
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Ericameria nauseosa -- (rubber rabbitbrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	7/90
2006	-	-	-	-	-	-	-	-	63/88
2011	-	-	-	-	-	-	-	-	79/74
2016	-	-	-	-	-	-	-	-	-/-
Juniperus osteosperma^t -- (Utah juniper)									
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	-/-
Opuntia -- (pricklypear)									
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
Sarcobatus vermiculatus -- (greasewood)									
1996	20	-	0	100	0	0	0	0	61/45
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	75/58
2011	-	-	-	-	-	-	-	-	81/75
2016	-	-	-	-	-	-	-	-	76/49

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

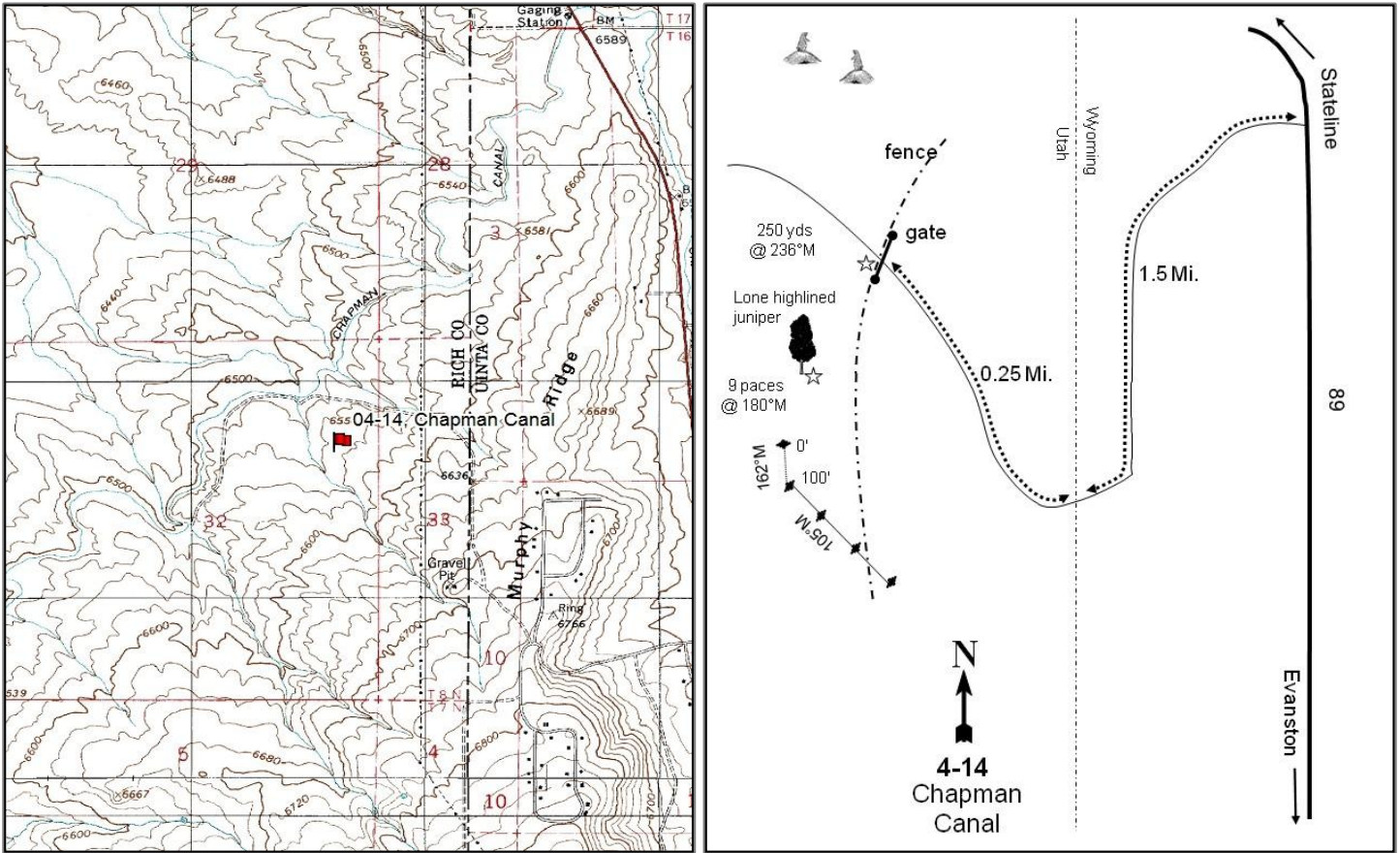
Table 04-13.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2001	64	-	-	-	-	-	8.8
2006	60	-	83	17	-	-	5.2
2011	57	-	76	24	-	-	6.1
2016	60	-	83	17	-	-	6.7
Pinus edulis (two-needle pinyon)							
1996	53	-	-	-	-	-	3.9

Table -04-13.15 - Deer Desirable Components Index: Mid 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	29.3	7.5	5.5	20.3	0.0	4.1	0.0	66.6	Fair-Good
2001	30.0	8.1	11.5	20.6	-0.1	3.3	0.0	73.4	Good
2006	30.0	5.7	6.0	23.8	-0.1	5.9	0.0	71.3	Good
2011	28.7	7.8	4.5	16.2	-0.1	4.1	0.0	61.2	Fair
2016	30.0	11.4	3.0	18.8	-0.5	5.2	0.0	67.9	Good

CHAPMAN CANAL - STUDY NO. 04-14



Location Information

USGS 7.5 min Map Info Neponset Reservoir N; Township 8N, Range 8E, Section 32
 GPS (0' Stake) NAD 83 UTM ZONE 12, 495550 East 4581878 North

Transect Information

Browse Tag # (0' Stake) 9160
 Transect Bearing 165° magnetic (Line 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

From the state line southbound on Highway 16/89, proceed 0.6 miles towards Evanston and turn right (west). Proceed 1.5 miles, crossing Chapman Canal, to a gate (DL&L). Go through the gate and travel 0.25 miles to a fence/gate. From the gate walk approximately 130 paces at 218 degrees magnetic to the 0-foot stake of the baseline, marked with browse tag #9160. The baseline doglegs after 100 feet and runs 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

Wildlife Habitat and Vegetation History

Table 04-14.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

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

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*) is also prevalent (Table 04-14.12, Photos). Sagebrush cover and density had been steadily decreasing since the 2001 sample year, but both values have increased as of 2016 as has the recruitment of young plants (Table 04-14.12, Table 04-14.13). Perennial grasses such as western wheatgrass (*Pascopyrum smithii*) and Sandberg bluegrass (*Poa secunda*) contribute most of the herbaceous cover, and have been a co-dominant component of the site since 1996. The invasive annual grass species cheatgrass (*Bromus tectorum*) has been observed in multiple sample years, but in very low amounts (Table 04-14.10). Annual and perennial forbs have never been particularly abundant on this study site (Table 04-14.7). Without a major disturbance, it is expected that this site will remain in this state (or one similar) in the future.

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	-

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

Table 04-14.8 - 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	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

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	Elk	Greater Sage- Grouse	Rabbit
	Quadrat Frequency					
1996	1	-	24	5	-	9
2001	-	-	25	2	-	28
2006	2	-	56	7	1	38
2011	9	-	34	15	1	41
2016	4	-	30	-	2	16
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)*	-

*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 ⁱ (crested wheatgrass)	Bromus tectorum ^{ai} (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
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

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 ^{ai} (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 ^{ai} (curvseed butterwort)	Chorispota tenella ^{ai} (crossflower)	Collinsia parviflora ^a (maiden blue eyed Mary)	Cordylanthus ramosus ^a (bushy bird's beak)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (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	-
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	-

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

FORB SPECIES	Erigeron pumilus (shaggy fleabane)	Lappula occidentalis ^a (flatspine stickseed)	Microsteris gracilis ^a (slender phlox)	Packera multilobata (lobeleaf groundsel)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Senecio integerrimus ^a (lambstongue ragwort)	Stenotus acaulis (stemless mock goldenweed)	Symphytotrichum (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
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

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 ^p (Wyoming big sagebrush)	Atriplex falcata (sickle saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Krascheninnikovia lanata ^p (winterfat)	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
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

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

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.

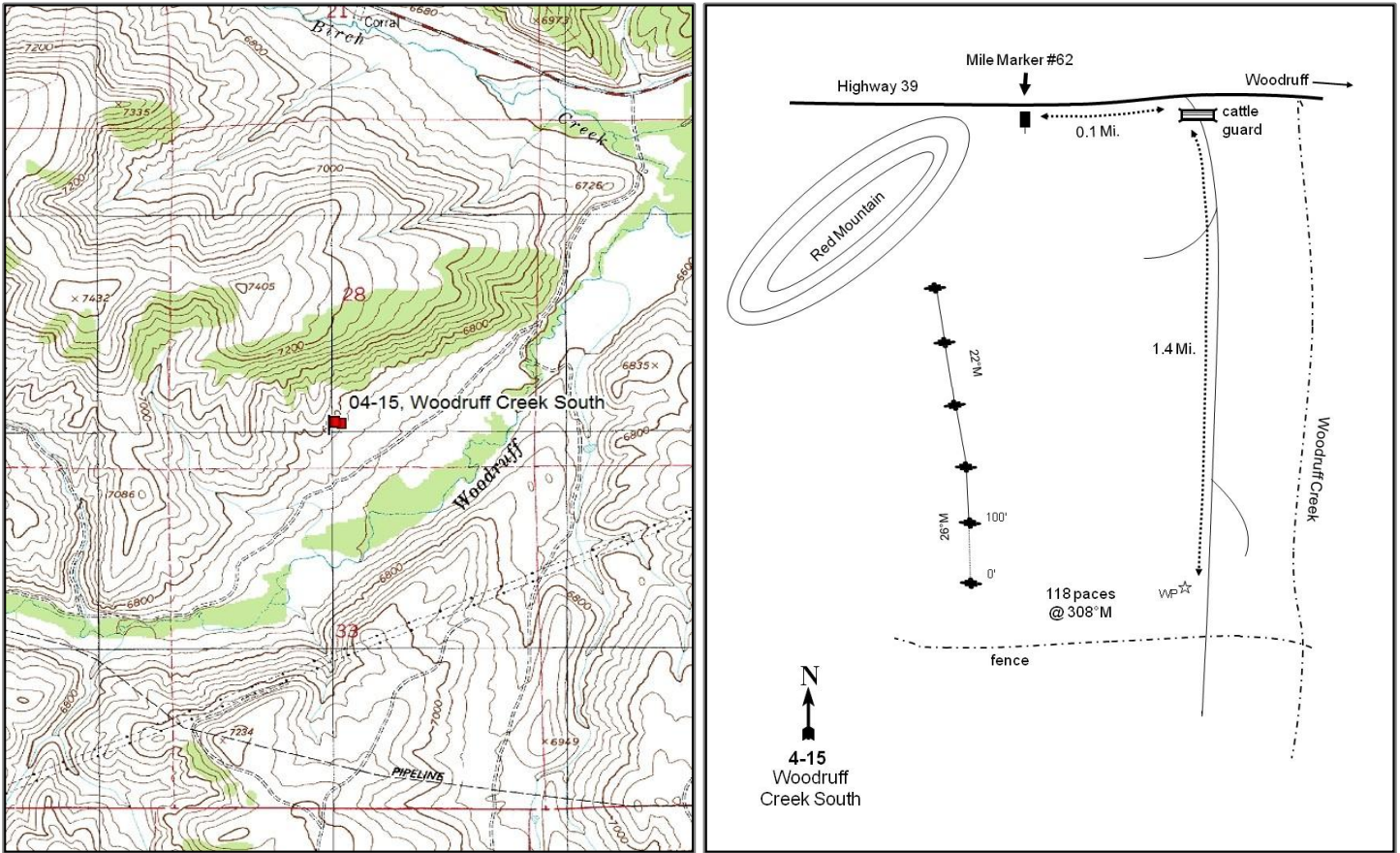
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
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
Atriplex canescens^p -- (fourwing saltbush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	57/91
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Atriplex falcata -- (sickle saltbush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
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
Krascheninnikovia lanata^p -- (winterfat)									
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
Linanthus pungens -- (granite prickly phlox)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	18/47
2016	-	-	-	-	-	-	-	-	16/24
Opuntia polyacantha -- (plains pricklypear)									
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
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

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

Table -04-14.15 - Deer Desirable Components Index: Low 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	18.8	5.8	1.2	12.9	0.0	8.9	0.0	47.5	Good
2001	22.9	7.2	0.5	21.7	0.0	5.3	0.0	57.6	Good
2006	12.9	-10.9	1.0	30.0	0.0	8.2	0.0	41.2	Fair
2011	10.7	0.5	5.1	26.0	0.0	8.1	0.0	50.4	Good
2016	17.1	7.2	4.0	30.0	0.0	2.4	0.0	60.7	Good

WOODRUFF CREEK SOUTH - STUDY No. 04-15



Location Information

USGS 7.5 min Map Info Meachum Ridge NE; Township 9N, Range 6E, Section 28
 GPS (0' Stake) NAD 83 UTM ZONE 12, 476924 East 4592189 North

Transect Information

Browse Tag # (0' Stake) 56
 Transect Bearing 26° magnetic (Line 3-5: 22° 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. The 0-foot baseline stake is marked with a browse tag #56. There is a fence 200 feet to the west from the 0-foot baseline stake. The baseline runs in a direction of 26 degrees magnetic. The baseline doglegs at the 300-foot baseline 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

Wildlife Habitat and Vegetation History

Table 04-15.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Elk	crucial	winter	
Greater Sage Grouse	Crucial	occupied & Winter	brood-rearing
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

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 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 has remained stable, with mountain big sagebrush and Utah juniper being the dominant (Table 04-15.12). The herbaceous understory has fluctuated over the sample periods, but the annual grass species cheatgrass (*Bromus tectorum*) has remained a dominant component (Table 04-15.7). With the moderate to high amounts of cheatgrass being sampled on this site, there is an increased risk for catastrophic wildfire. Also, without a tree removing disturbance, it is predicted that over time, Utah juniper will continue to increase in abundance and mountain big sagebrush will become a minor component of the site.

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

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	9.2	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	327	279	111	79	11.5	12.1	1.0	0.7
2016	386	210	117	30	23.3	8.6	0.7	0.4

Table 04-15.8 - 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	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	10.6	4.1	32.0	13.1	2.3	48.5
2016	7.5	1.7	28.5	17.9	4.2	53.5

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	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
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)	-	-	-

*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 ⁱ (crested wheatgrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency										
1996	36	-	354	22	2	2	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	327	61	31	2	80	16	4	186	27
2016	20	-	386	59	38	-	78	-	1	40	13
year	Average Cover (%)										
1996	0.8	-	15.7	0.2	0.0	0.0	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	-	3.2	-	0.0	0.4	0.9

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 ^{ai} (desert madwort)	Antennaria (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 ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium album ^a (lambquarters)	Cordylanthus ramosus ^a (bushy bird's beak)	Crepis acuminata (tapertip hawk'sbeard)	Cryptantha (cryptantha)	Descurainia pinnata ^a (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	-	-
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	-	-

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

FORB SPECIES	Galium aparine ^a (stickywilly)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Gilia ^a (gilia)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lappula occidentalis ^a (flatspine stickseed)	Orobanche (broomrape)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Sisymbrium altissimum ^{ai} (tall tumbleweed)	Sphaeralcea grossularifolia (gooseberryleaf globemallow)	Tragopogon dubius ^{ai} (yellow salsify)
year	Nested Frequency										
1996	-	-	-	-	-	5	6	3	-	-	-
2001	-	-	-	-	7	-	6	4	-	-	3
2006	-	-	12	1	5	-	1	17	0	-	-
2011	-	49	13	-	34	7	1	34	5	-	2
2016	3	12	-	2	4	1	1	3	-	4	-
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	-	0.0	0.1	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	-

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 ^p (mountain big sagebrush)	Atriplex canescens ^p (fourwing saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ^t (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	-
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	-

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

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 (%)				
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
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
Atriplex canescens^P -- (fourwing saltbush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	35/69
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
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
Juniperus osteosperma^L -- (Utah juniper)									
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	-/-
Krascheninnikovia lanata^P -- (winterfat)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	23/41
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
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
Purshia tridentata^P -- (antelope bitterbrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	24/74
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus -- (mountain snowberry)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	48/45
2011	-	-	-	-	-	-	-	-	57/120
2016	-	-	-	-	-	-	-	-	48/69

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	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

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

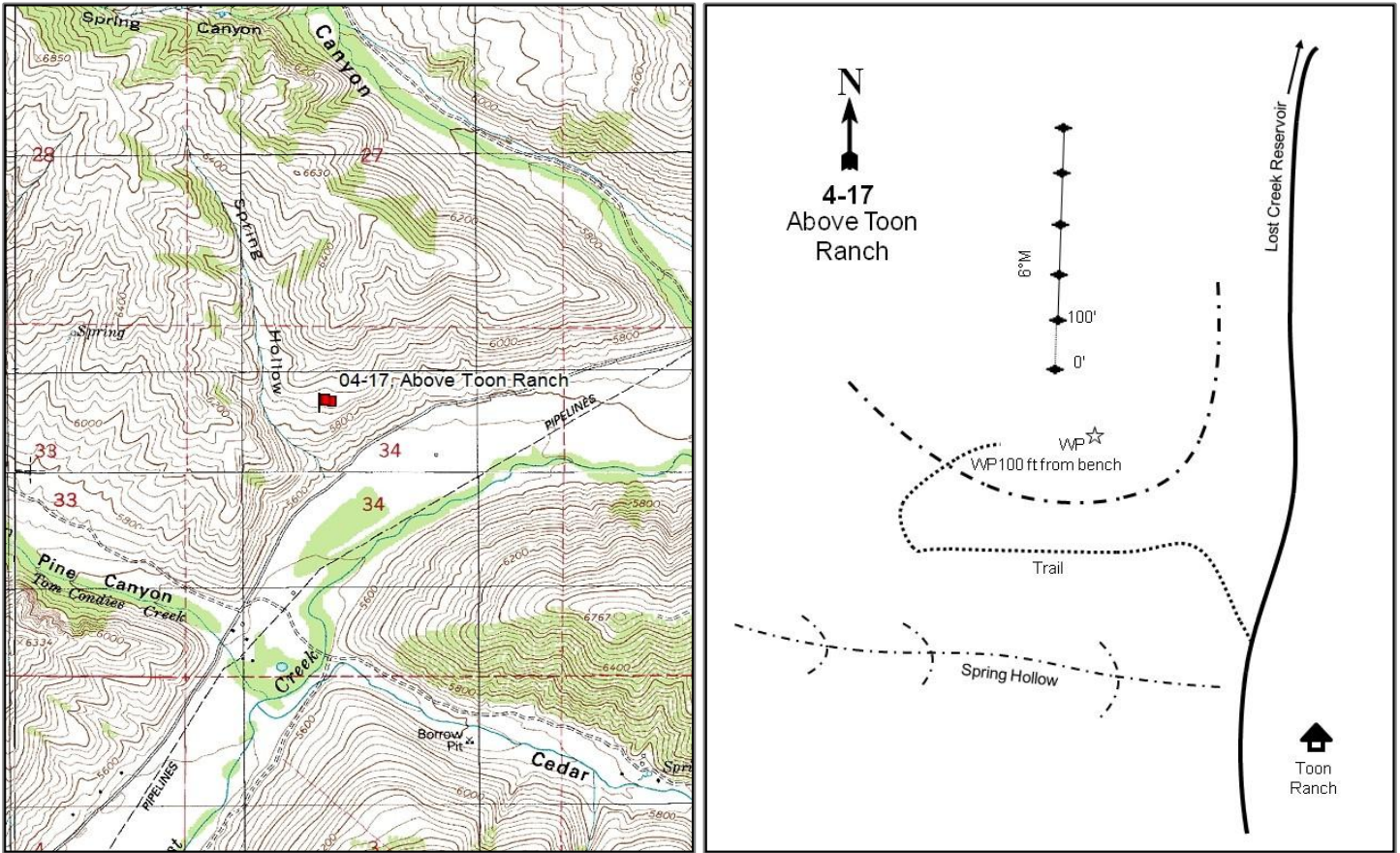
Table 04-15.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
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

Table -04-15.15 - Deer Desirable Components Index: Mid 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	5.1	9.0	18.6	-11.8	0.4	0.0	34.8	Very Poor-Poor
2001	13.8	8.1	14.5	22.2	-1.2	0.6	0.0	58.0	Fair
2006	15.2	9.3	9.5	17.7	-5.8	1.6	0.0	47.5	Poor
2011	16.7	9.9	13.0	24.4	-8.7	1.4	0.0	56.7	Fair
2016	19.1	13.2	5.5	17.2	-17.5	0.8	0.0	38.4	Poor

ABOVE TOON RANCH - STUDY NO. 04-17



Location Information

USGS 7.5 min Map Info Lost Creek Dam SW; Township 5N, Range 4E, Section 34
 GPS (0' Stake) 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 No Rebar

Directions to Site

From Croyden, drive up the main road towards Lost Creek Reservoir about 4 miles. 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 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

Wildlife Habitat and Vegetation History

Table 04-17.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Elk	crucial	winter	
Greater Sage Grouse	Crucial	occupied & Winter	brood-rearing
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

Site Notes

This study is located on private land on a gently sloping bench above the Lost Creek Valley, where deer congregate during the winter. 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 was found on the site, a set of shed antlers was found.

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 study site since its establishment in 1996. Yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) is the only other shrub contributing cover, but other subordinate species have been recorded in height crown measurements throughout the years (Table 04- 17.12, Table 04-17.13). The herbaceous understory has fluctuated over time, but annual grasses -- namely cheatgrass (*Bromus tectorum*) -- and/or perennial forbs, mainly common yarrow (*Achillea millefolium*) and American vetch (*Vicia americana*), have contributed the most cover in each study year. Perennial grasses are not diverse and have provided little cover. Annual forbs have fluctuated, but are rare as of the 2016 sample year (Table 04-17.7, Table 04-17.10, Table 04-17.11). It is predicted that barring a major disturbance such as a wildfire, this site will remain in this state in future sample years.

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	-

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	91	225	346	31.3	2.3	2.2	7.8
2001	369	145	313	325	11.5	4.4	6.5	13.3
2006	389	136	289	363	17.4	6.1	4.4	21.9
2011	297	132	378	423	8.1	4.8	14.9	36.2
2016	436	89	222	384	28.0	3.7	2.8	20.0

Table 04-17.8 - 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	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

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	Elk	Rabbit
	Quadrat Frequency			
1996	-	32	4	2
2001	3	22	-	6
2006	-	33	6	11
2011	-	12	4	1
2016	-	28	2	29
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)	-

Table 04-17.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus lanceolatus (thickspike wheatgrass)	Melica bulbosa (oniongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency						
1996	8	452	-	-	-	68	33
2001	3	369	-	-	-	114	40
2006	11	389	1	5	2	111	23
2011	2	296	4	-	20	83	38
2016	36	424	-	21	-	50	31
year	Average Cover (%)						
1996	0.0	31.2	-	-	-	1.5	0.9
2001	0.0	11.5	-	-	-	2.6	1.8
2006	0.1	17.3	0.0	0.1	0.0	4.5	1.4
2011	0.0	8.1	0.0	-	0.3	2.5	2.0
2016	0.5	27.5	-	0.2	-	1.4	2.1

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	Achillea millefolium (Common yarrow)	Agoseris heterophylla ^a (annual agoseris)	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Artemisia ludoviciana (white sagebrush)	Camelina microcuppa ^{ai} (littlepod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cryptantha ^a (annual cryptantha)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Delphinium nuttallianum (two-lobed larkspur)	Descurainia pinnata ^a (western tansymustard)
year	Nested Frequency																
1996	100	22	12	131	1	68	-	-	12	24	12	-	-	14	-	-	6
2001	139	7	23	106	6	24	4	5	7	90	54	-	-	-	-	-	2
2006	159	28	13	204	2	13	-	2	-	129	23	-	-	14	1	-	-
2011	182	34	27	270	5	5	-	17	-	281	14	3	-	-	-	1	2
2016	169	8	58	117	5	17	-	17	-	25	10	-	5	-	-	-	-
year	Average Cover (%)																
1996	4.0	0.1	0.0	1.3	0.6	0.3	-	-	0.0	0.1	0.0	-	-	0.1	-	-	0.0
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
2006	9.3	0.4	0.1	1.8	0.0	0.0	-	0.0	-	0.7	0.1	-	-	0.2	0.0	-	-
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
2016	10.2	0.1	0.2	0.9	0.0	0.2	-	0.2	-	0.1	0.0	-	0.4	-	-	-	-

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

FORB SPECIES	Draba ^a (draba)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium aparine ^a (stickywilly)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lomatium (desertparsley)	Machaeranthera (tansyaster)	Microsteris gracilis ^a (slender phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Sphaeralcea grossularifolia (gooseberryleaf globemallow)	Symphyotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Veronica biloba ^{ai} (twolobe speedwell)
year	Nested Frequency																
1996	18	-	5	-	61	1	5	-	4	-	9	6	-	77	-	-	2
2001	55	-	13	-	195	-	7	-	-	79	9	6	-	63	-	2	3
2006	63	3	-	10	79	2	6	-	-	79	4	2	-	16	-	0	1
2011	76	-	-	5	88	3	2	1	4	41	-	-	2	23	8	9	-
2016	9	8	7	-	86	-	2	-	-	7	-	-	1	48	4	-	8
year	Average Cover (%)																
1996	0.1	-	0.0	-	0.3	0.0	0.0	-	0.0	-	0.0	0.0	-	0.7	-	-	0.0
2001	0.2	-	0.1	-	2.7	-	0.2	-	-	0.8	0.0	0.0	-	0.9	-	0.0	0.0
2006	0.1	0.0	-	0.2	0.6	0.0	0.0	-	-	0.3	0.0	0.0	-	0.4	-	0.0	0.0
2011	0.9	-	-	0.0	1.6	0.0	0.0	0.0	0.0	0.1	-	-	0.0	0.4	0.0	0.0	-
2016	0.0	0.4	0.0	-	0.3	-	0.0	-	-	0.0	-	-	0.0	0.7	0.0	-	0.0

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	-
year	Average Cover (%)	
1996	2.4	-
2001	5.8	-
2006	11.9	0.0
2011	24.3	0.5
2016	8.8	-

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 ^P (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)
year	Line Intercept Cover (%)	
1996	-	-
2001	-	-
2006	29	3.5
2011	24.5	1.3
2016	26.8	8.2
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

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

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 (%)				
Artemisia tridentata ssp. vaseyana ^P -- (mountain big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Ericameria nauseosa ssp. nauseosa var. speciosa ^P -- (rubber rabbitbrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	62/58
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	84/115
Purshia tridentata ^P -- (antelope bitterbrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	29/69
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-

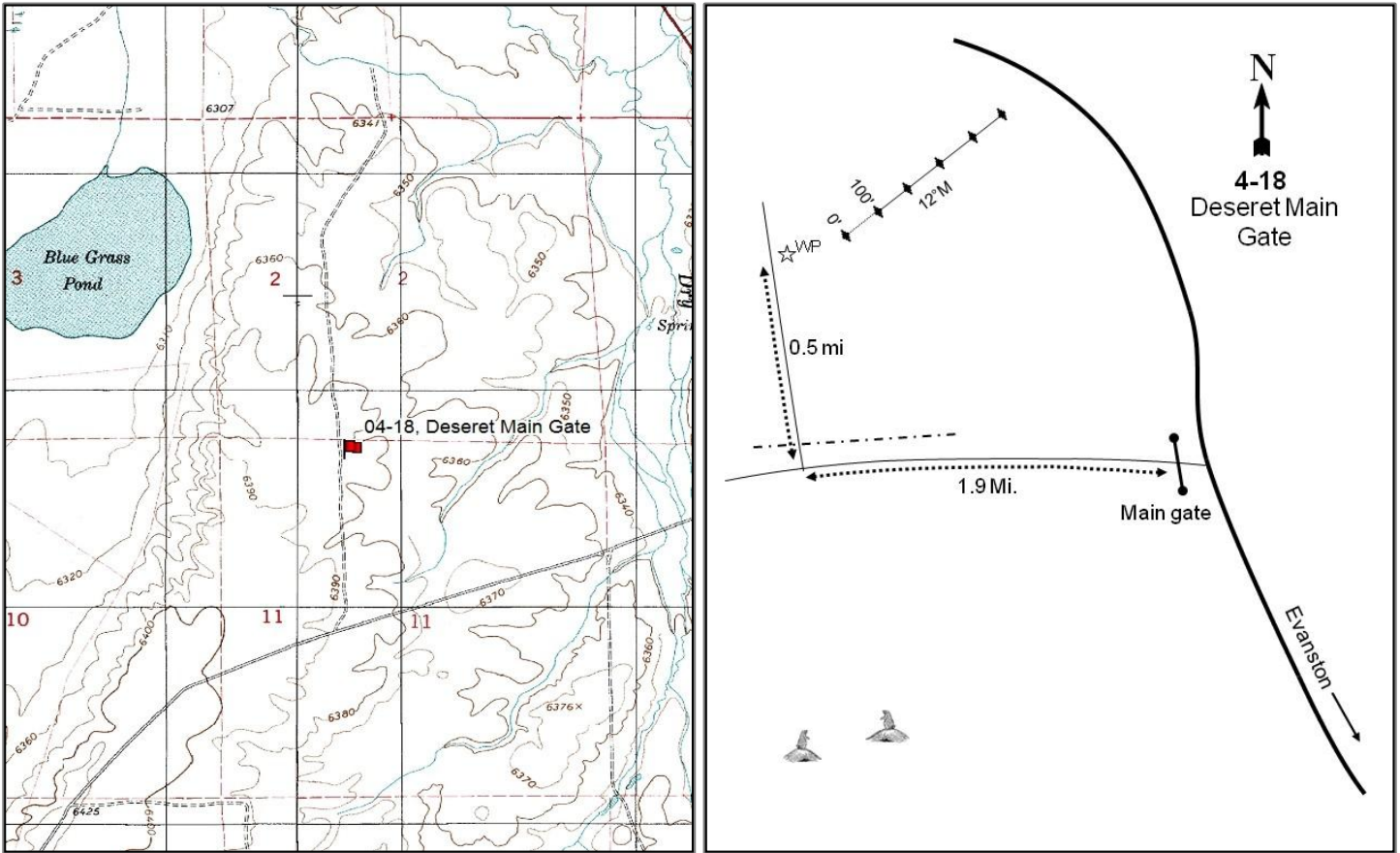
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Tetradymia canescens -- (spineless horsebrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	54/59

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

Table -04-17.15 - Deer Desirable Components Index: Mid 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	12.0	3.5	6.3	-20.0	10.0	0.0	41.8	Poor
2001	30.0	8.7	3.5	12.0	-8.7	10.0	0.0	55.5	Fair
2006	30.0	4.8	2.0	14.1	-13.1	10.0	0.0	47.8	Poor
2011	23.7	2.1	0.0	11.9	-6.1	10.0	0.0	41.6	Poor
2016	27.1	6.3	0.0	7.4	-20.0	10.0	0.0	30.8	Very Poor

DESERET MAIN GATE - STUDY NO. 04-18



Location Information

USGS 7.5 min Map Info	Neponset Reservoir N; Township 8N, Range 7E, Section 11
GPS (0' Stake)	NAD 83 UTM ZONE 12, 489700 East 4588883 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	12° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard, Belt 2: 10ft

Directions to Site

From the Deseret Land & Livestock main gate on Highway 16 between Evanston and Woodruff, proceed west towards the Deseret ranch house 1.9 miles. Turn right and go 0.5 miles north to a witness post on the east side of the road. The 0-foot stake is 9 paces 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

Wildlife Habitat and Vegetation History

Table 04-18.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

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

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 noted on the 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.

The state and transitions for this site are likely similar to those of the Semidesert Loam (Wyoming Big Sagebrush), R035XY209UT ecological site. When established in 1997 and during the 2001 sample year, this study site was dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and perennial grasses, mainly crested wheatgrass (*Agropyron cristatum*). However, cover and density of sagebrush have decreased since that time, causing the site to transition to a perennial grass community type in 2006 (Table 04-18.7, Table 04-18.10, Table 04-18.12). No sagebrush seedlings were reported in either of the two most recent sample years, an occurrence that is likely due to competition with the robust herbaceous understory (Table 04-18.13). Forb diversity and abundance have remained limited throughout the study years (Table 04-18.7, Table 04-18.11). It is predicted that sagebrush cover will continue to decrease if there is no disturbance to remove the perennial grass component.

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	-

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

Table 04-18.8 - 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
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

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	Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
1997	9	22	24	1	1
2001	15	8	5	-	2
2006	25	2	57	1	6
2011	27	4	14	-	15
2016	9	3	3	-	3
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)	-	-

*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 ⁱ (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
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

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 ^a (desert madwort)	Antennaria (pussytoes)	Astragalus convallarius (lesser rushy milkvetch)	Descurainia pinnata ^a (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
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

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 ^p (Wyoming big sagebrush)	Atriplex falcata (sickle saltbush)	Chrysothamnus viscidiflorus ssp. 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
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

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

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 (%)				
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
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
Atriplex falcata -- (sickle saltbush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Krascheninnikovia lanata^p -- (winterfat)									
1997	-	-	-	-	-	-	-	-	-/-
2001	40	-	0	100	0	0	0	0	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-

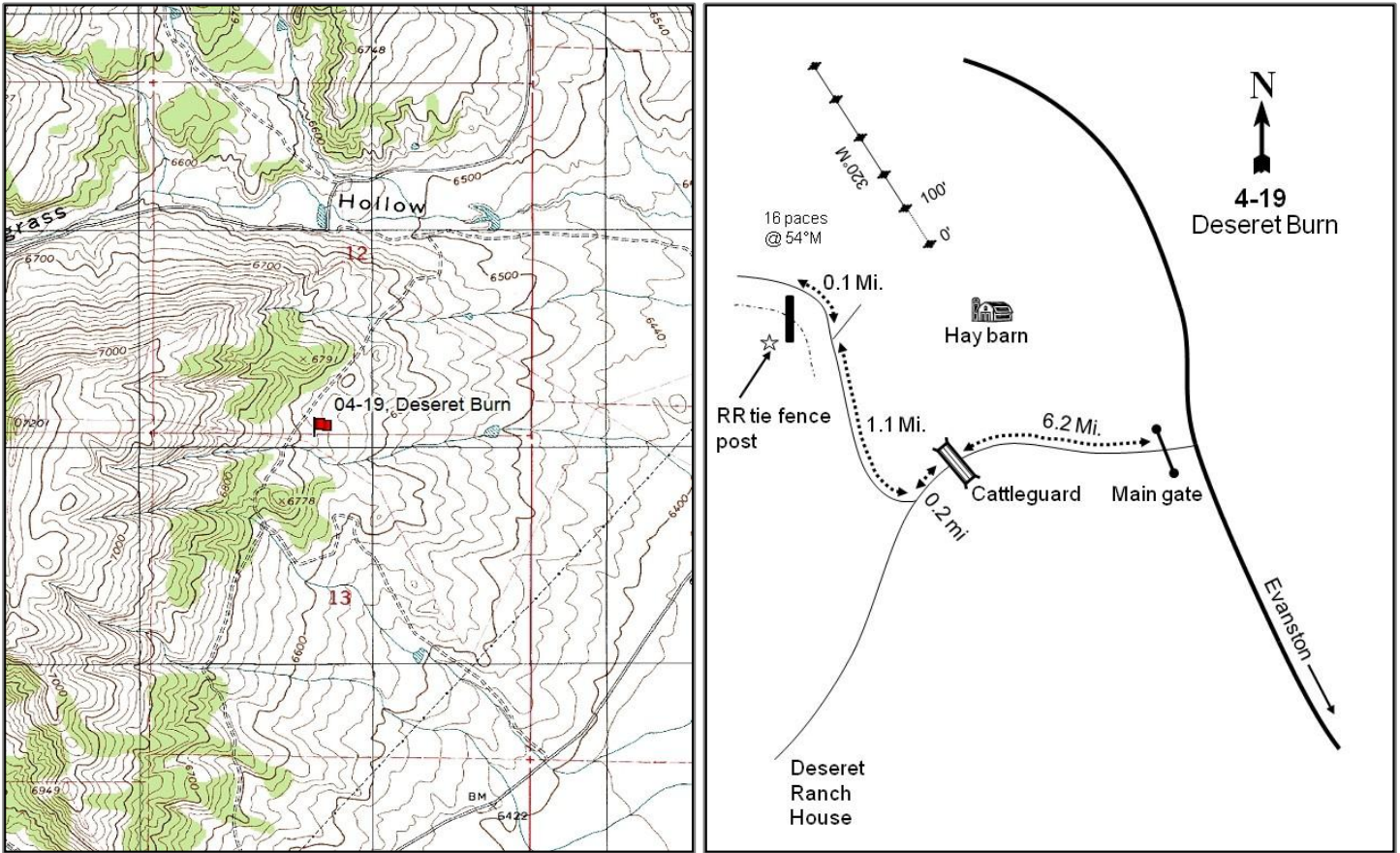
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Opuntia -- (pricklypear)									
1997	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	7/12

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

Table -04-18.15 - Deer Desirable Components Index: Low 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	14.5	6.9	2.0	23.5	0.0	0.3	0.0	47.2	Good
2001	14.5	2.1	4.0	30.0	0.0	0.4	0.0	51.1	Good
2006	7.4	1.5	5.0	30.0	0.0	1.0	0.0	45.0	Fair-Good
2011	6.1	5.7	5.0	30.0	0.0	0.7	0.0	47.5	Good
2016	4.1	0.0	0.0	30.0	0.0	0.0	0.0	34.1	Fair

DESERET BURN - STUDY NO. 04-19



Location Information

USGS 7.5 min Map Info Neponset Reservoir N; Township 8N, Range 6E, Section 13
 GPS (0' Stake) NAD 83 UTM ZONE 12, 481691 East 4587249 North

Transect Information

Browse Tag # (0' Stake) Not Available
 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 & Livestock main gate on highway 16 between Evanston and Woodruff, proceed west towards the Deseret ranch house 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 rail road 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

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 - Chain Unknown	-	-	Fall 1996	-
Seeding - Aerial	-	-	Fall 1996	-
Seeding - Dribbler	-	-	Fall 1996	-

Wildlife Habitat and Vegetation History

Table 04-19.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Elk	crucial	winter	
Greater Sage Grouse	Crucial	occupied & Winter	brood-rearing
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

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 noted 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	49.6	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, this site has remained in a stable state as a perennial grass community type dominated by species such as crested wheatgrass (*Agropyron cristatum*), Sandberg bluegrass (*Poa secunda*), western wheatgrass (*Pascopyrum smithii*), and intermediate wheatgrass (*Thinopyrum intermedium*). The invasive annual grass 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). Browse on the site is limited and a majority of the cover has been contributed by the increaser species yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) (Table 04-19.12). Aside from desert madwort (*Alyssum desertorum*), forbs have remained limited and fairly homogeneous throughout the study years (Table 04-19.11).

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	-

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	27.8	0.8	1.8
2011	27	412	400	12	0.1	34.4	4.6	0.1
2016	43	412	399	48	0.8	29.5	6.5	0.6

Table 04-19.8 - 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
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

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	Elk	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
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)	-	-

*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 ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (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)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency											
1997	3	153	-	56	22	0	7	47	6	144	30	93
2001	-	148	2	295	25	1	34	95	-	175	1	160
2006	1	216	-	25	6	3	31	134	-	340	-	113
2011	2	259	-	27	13	9	48	100	-	299	3	75
2016	7	278	-	43	19	-	28	138	-	139	-	58
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	2.5	-	4.1	0.0	4.9
2006	0.1	8.5	-	0.2	0.0	0.0	1.2	2.1	-	11.8	-	4.0
2011	0.1	15.4	-	0.1	0.1	0.0	1.0	2.8	-	13.0	0.0	1.9
2016	0.1	19.0	-	0.8	0.1	-	1.6	4.7	-	1.8	-	2.4

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 ^{ai} (desert madwort)	Arabis (rockcress)	Astragalus (milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chenopodium ^a (goosefoot)	Crepis acuminata (tapertip hawkbeard)	Cymopterus (springparsley)	Erigeron (fleabane)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Gilia ^a (gilia)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Linum lewisii (Lewis flax)
year	Nested Frequency																
1997	-	32	-	3	2	2	-	-	0	-	-	14	76	18	0	14	13
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	-	-	-
year	Average Cover (%)																
1997	-	0.1	-	0.0	0.0	0.1	-	-	0.4	-	-	0.2	1.7	0.3	0.1	0.3	0.1
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	-	-	-

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

FORB SPECIES	Medicago sativa ⁱ (alfalfa)	Phlox longifolia (longleaf phlox)	Sanguisorba minor ⁱ (small burnet)	Sisymbrium altissimum ^{ai} (all tumbled mustard)	Sphaeralcea coccinea (scarlet globemallow)	Sphaeralcea grossularifolia (gooseberryleaf globemallow)	Tragopogon dubius ^{ai} (yellow salsify)	unknown perennial forb (unknown forb)
year	Nested Frequency							
1997	12	54	65	-	2	-	-	3
2001	17	35	4	-	3	-	4	4
2006	14	24	-	-	4	-	-	-
2011	-	7	-	-	-	-	-	-
2016	3	-	-	2	3	11	-	-
year	Average Cover (%)							
1997	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	-	-

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 ^p (Wyoming big sagebrush)	Atriplex canescens ^p (fourwing saltbush)	Chrysothamnus viscidiflorus ssp. 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
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

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

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.

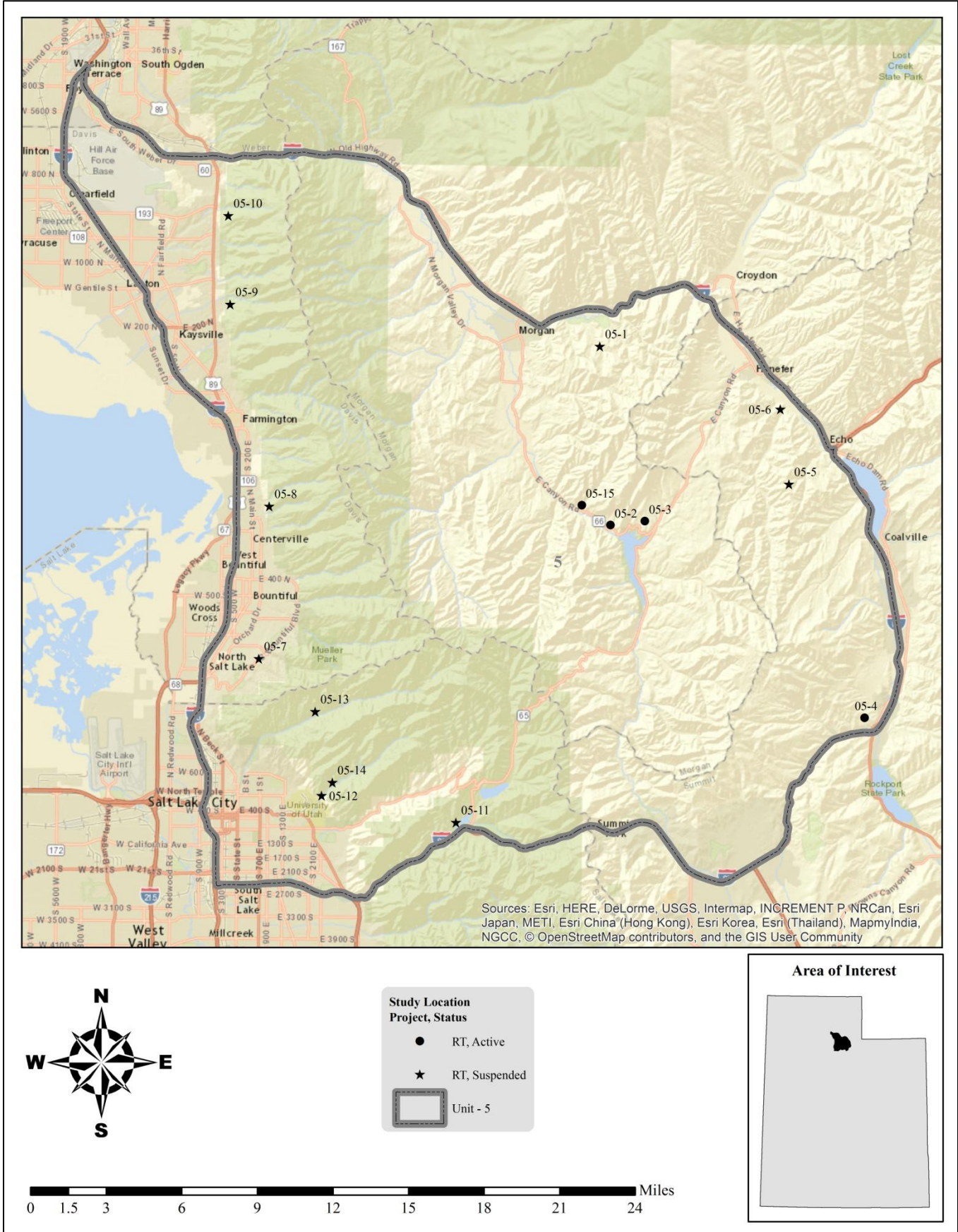
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
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
Atriplex canescens^p -- (fourwing saltbush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Eriogonum microthecum^p -- (slender buckwheat)									
1997	-	-	-	-	-	-	-	-	- / -
2001	20	-	0	100	0	0	0	0	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
Ericameria nauseosa -- (rubber rabbitbrush)									
1997	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	82/44
2016	-	-	-	-	-	-	-	-	79/72
Krascheninnikovia lanata^p -- (winterfat)									
1997	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	22/27
2011	-	-	-	-	-	-	-	-	42/57
2016	-	-	-	-	-	-	-	-	37/51
Opuntia -- (pricklypear)									
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
Tetradymia canescens -- (spineless horsebrush)									
1997	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	63/56

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

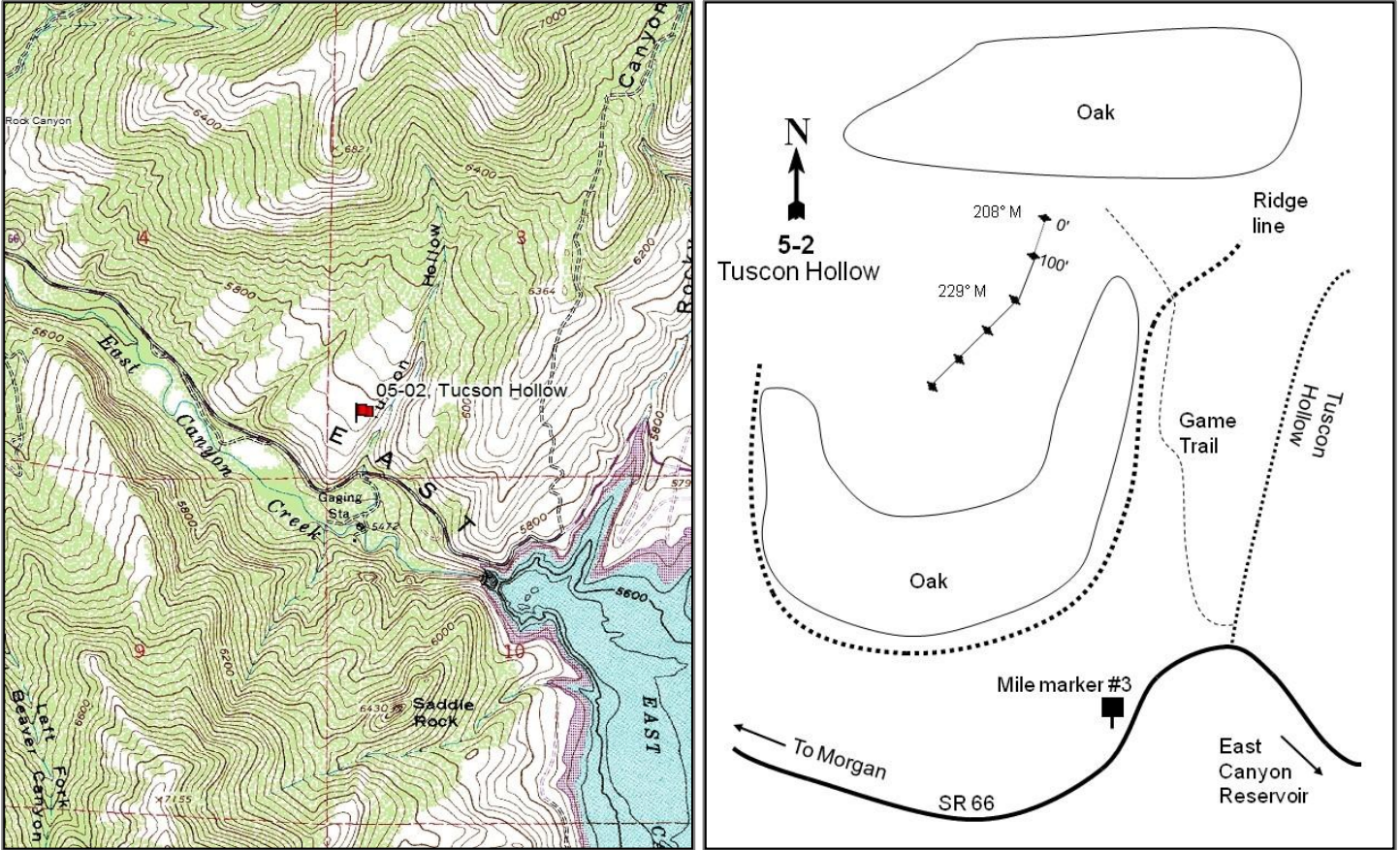
Table -04-19.15 - Deer Desirable Components Index: High Potential Scale.

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	0.1	0.0	0.0	20.2	-0.5	5.9	0.0	25.7	Very Poor
2001	0.0	0.0	0.0	30.0	-4.7	3.2	0.0	28.5	Very Poor
2006	0.4	0.0	0.0	30.0	-0.1	3.7	0.0	34.0	Very Poor-Poor
2011	0.3	0.0	0.0	30.0	0.0	0.1	0.0	30.3	Very Poor
2016	1.4	0.0	0.0	30.0	-16.3	1.2	0.0	16.3	Very Poor

WILDLIFE MANAGEMENT UNIT 05 - EAST CANYON



TUCSON HOLLOW - STUDY NO. 05-2



Location Information

USGS 7.5 min Map Info East Canyon Reservoir; Township 2N, Range 3E, Section 03
 GPS (0' Stake) NAD 83 UTM ZONE 12, 448864 East 4530807 North

Transect Information

Browse Tag # (0' Stake) Not Available
 Transect Bearing 208° magnetic (Line 2-5: 229° 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 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 ridge line 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 208 degrees magnetic. At the 200-foot baseline stake the baseline doglegs and runs 229 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

Wildlife Habitat and Vegetation History

Table 05-02.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
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

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	A defined state and transition model is available.

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, characteristics which place it in Community Phase 2.1 of the Mountain Big Sagebrush-Steppe/Non-Natives state (State 2); cover and density of sagebrush have exhibited an overall decreasing trend. Other valuable browse species including antelope bitterbrush (*Purshia tridentata*) and Saskatoon serviceberry (*Amalanchier alnifolia*) have been present in lesser amounts in all sample years (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 (Table 05-02.7, Table 05-02.10, Table 05-02.11). According to the state and transition model, if this site were to undergo fire suppression and continued heavy grazing, it could follow Transition Pathway T2a to Community Phase 3.1 in the Mountain Big Sagebrush Superdominance/Low Shrub state (State 3) (USDA-NRCS, 2013).

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	11.4	10.4	-	-	-	-
2001	11.5	11.4	-	-	-	-
2006	12.0	11.8	-	15.7	13.4	-
2011	8.6	11.7	-	9.7	11.4	-
2016	7.3	10.7	-	12.9	13.7	-

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	179	182	155	19.2	4.5	3.7	8.2
2001	199	370	295	319	2.9	25.4	10.4	19.1
2006	357	282	271	276	10.1	15.5	3.1	20.7
2011	297	279	368	347	10.1	20.3	17.5	24.8
2016	437	88	350	248	43.9	3.0	17.3	17.4

Table 05-02.8 - 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	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

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	Elk	Rabbit
	Quadrat Frequency			
1996	-	17	5	6
2001	1	17	1	1
2006	-	32	-	7
2011	-	8	-	1
2016	1	9	-	5
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)	-

Table 05-02.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Aegilops cylindrica ^{ani} (jointed goatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus lanceolatus (thickspike wheatgrass)	Melica bulbosa (oniongrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency									
1996	-	344	216	-	-	-	19	141	33	-
2001	-	114	136	4	5	41	71	315	33	3
2006	-	150	334	19	21	49	25	220	32	-
2011	-	180	177	3	9	93	117	122	73	-
2016	14	267	405	0	5	22	8	63	8	1
year	Average Cover (%)									
1996	-	14.8	4.4	-	-	-	0.3	3.2	1.1	-
2001	-	0.7	2.2	0.0	0.1	1.5	2.2	19.8	1.7	0.1
2006	-	0.7	9.5	0.0	0.4	1.6	0.6	10.6	2.2	-
2011	-	6.0	4.1	0.1	0.4	4.2	3.0	8.2	4.4	-
2016	0.1	11.0	32.8	0.0	0.1	1.0	0.1	0.7	1.1	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	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Artemisia ludoviciana (white sagebrush)	Astragalus convallarius (lesser rushy milkvetch)	Balsamorhiza macrophylla (cutleaf balsamroot)	Balsamorhiza sagittata (arrowleaf balsamroot)	Camelina microcarpa ^{ai} (littledod false flax)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia grandiflora ^a (grand collomia)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawk/beard)	Cryptantha ^a (annual cryptantha)	Cynoglossum officinale ^{ani} (gypsyflower)
year	Nested Frequency																
1996	49	-	-	17	-	3	11	-	3	-	24	-	5	17	6	-	4
2001	61	16	137	65	1	15	14	5	17	7	4	117	6	24	14	-	4
2006	69	19	33	57	-	10	13	4	13	21	3	53	9	22	1	-	3
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	-
year	Average Cover (%)																
1996	1.0	-	-	0.1	-	0.1	0.9	-	0.0	-	0.3	-	0.0	0.2	0.1	-	0.2
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	-	0.1
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	-	0.0
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	-

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

FORB SPECIES	Descuraimia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium aparine ^a (stickywilly)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Helianthella uniflora (oneflower helianthella)	Heterotheca villosa (hairy false goldenaster)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lithophragma (woodland-star)	Lithospermum ruderale (western stoneseed)	Lomatium (desertparsley)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Melilotus officinalis ⁱ (sweetclover)	
year	Nested Frequency																	
1996	28	2	-	-	23	57	12	-	18	29	5	-	0	8	28	12	-	
2001	-	10	3	5	29	-	19	5	25	22	48	-	-	-	37	-	-	
2006	-	46	108	11	59	-	28	-	56	4	34	-	-	-	41	-	1	
2011	20	89	80	30	104	9	42	-	56	44	172	23	6	-	41	-	-	
2016	4	6	11	108	70	4	51	-	4	5	17	-	-	-	27	-	2	
year	Average Cover (%)																	
1996	0.6	0.0	-	-	0.2	0.6	1.8	-	0.4	0.1	0.2	-	0.0	0.0	1.9	0.1	-	
2001	-	0.0	0.0	0.1	0.6	-	1.9	1.6	0.7	0.8	0.1	-	-	-	3.3	-	-	
2006	-	0.1	0.7	0.2	0.5	-	6.0	-	0.2	0.0	0.1	-	-	-	2.7	-	0.1	
2011	0.2	1.2	2.6	0.4	2.8	0.0	5.3	-	0.5	0.7	2.3	0.1	0.2	-	2.0	-	-	
2016	0.0	0.0	0.3	1.7	2.2	0.3	7.0	-	0.0	0.1	0.4	-	-	-	2.2	-	0.0	

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

FORB SPECIES	Microsteris gracilis ^a (slender phlox)	Nemophila breviflora ^a (basin nemophila)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Senecio integerrimus ^a (lambstongue ragwort)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Symphotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Veronica biloba ^{ai} (two-lobed speedwell)	Vicia americana (American vetch)
year	Nested Frequency										
1996	-	-	-	51	-	13	27	-	41	-	21
2001	-	-	22	6	2	33	50	12	153	-	117
2006	39	8	-	49	1	12	30	6	31	-	155
2011	45	8	-	43	9	29	27	30	48	23	150
2016	7	4	5	2	4	137	18	21	30	10	116
year	Average Cover (%)										
1996	-	-	-	0.2	-	0.3	2.0	-	0.6	-	0.1
2001	-	-	0.1	0.0	0.0	1.2	1.8	0.2	4.6	-	2.6
2006	0.1	0.1	-	0.1	0.1	0.3	0.8	0.3	0.2	-	3.1
2011	0.5	0.2	-	0.4	0.4	0.6	1.0	0.4	1.2	1.1	4.5
2016	0.2	0.0	0.0	0.0	0.1	8.3	0.4	0.2	0.4	0.1	1.7

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 alnifolia ^p (Saskatoon serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Purshia tridentata ^p (antelope bitterbrush)	Symphoricarpos oreophilus (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
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

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

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 (%)				
Amelanchier alnifolia ^p -- (Saskatoon serviceberry)									
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
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Ericameria nauseosa ssp. nauseosa var. speciosa ^p -- (rubber rabbitbrush)									
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

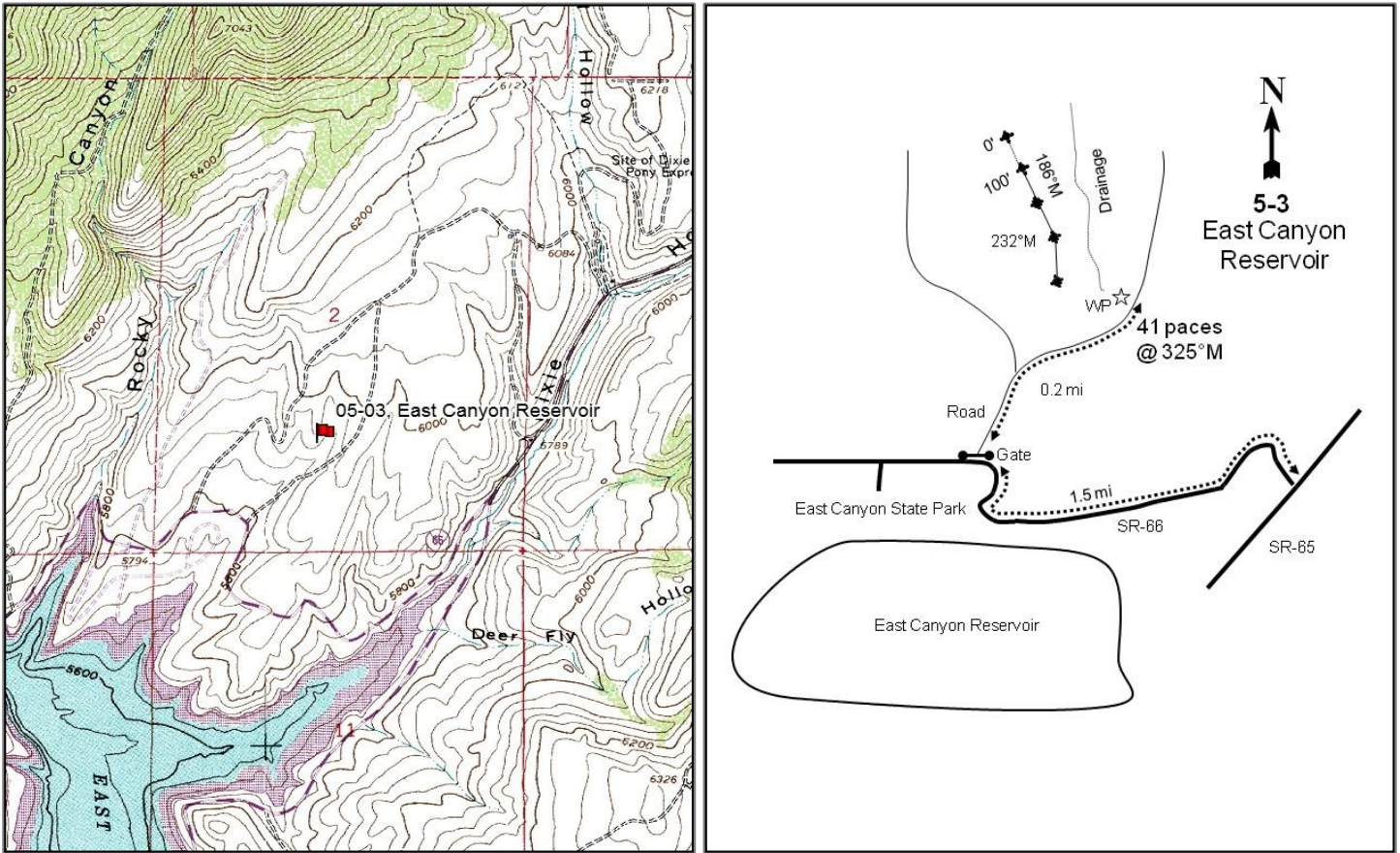
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
1996	-	-	-	-	-	-	-	-	31/23
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
Mahonia repens -- (creeping barberry)									
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
Prunus virginiana^p -- (chokecherry)									
1996	-	-	-	-	-	-	-	-	53/39
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	186/168
2016	-	-	-	-	-	-	-	-	82/80
Purshia tridentata^p -- (antelope bitterbrush)									
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
Quercus gambelii^p -- (Gambel oak)									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	197/144
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	121/111
Rosa woodsii^p -- (Woods' rose)									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	40/27
2016	-	-	-	-	-	-	-	-	43/26
Sambucus nigra ssp. cerulea^p -- (blue elderberry)									
1996	-	-	-	-	-	-	-	-	235/207
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	175/177
2016	-	-	-	-	-	-	-	-	188/195
Symphoricarpos oreophilus -- (mountain snowberry)									
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

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

Table -05-02.15 - Deer Desirable Components Index: High 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	15.4	11.3	2.6	9.0	-14.5	10.0	0.0	33.8	Very Poor
2001	15.4	6.5	0.0	30.0	-2.1	10.0	0.0	59.7	Fair
2006	15.8	8.7	4.3	29.1	-7.6	10.0	0.0	60.2	Fair
2011	11.4	11.4	9.5	30.0	-7.6	10.0	0.0	64.6	Fair
2016	9.7	5.0	3.0	4.0	-20.0	10.0	0.0	11.7	Very Poor

EAST CANYON RESERVOIR - STUDY NO. 05-3



Location Information

USGS 7.5 min Map Info	East Canyon Reservoir; Township 2N, Range 3E, Section 02
GPS (0' Stake)	NAD 83 UTM ZONE 12, 451058 East 4531059 North

Transect Information

Browse Tag # (0' Stake)	7968
Transect Bearing	186° magnetic (Line 3-5: 232° 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

Begin to note mileage at the junction of U-65 and U-66. Proceed towards Porterville on U-66 1.15 miles to a gate on the right. There should be a picnic/campground area on left side of road. Proceed through gate on foot (gate locked), travel 0.2 miles to the witness post on the left hand side of the road. From the witness post, the 400-foot baseline stake is 41 paces at 325 degrees magnetic. The 0-foot baseline stake is 400 feet to the northwest. The 0-foot stake of the baseline is marked by browse tag #7968. The baseline runs 186 degrees. The baseline dologs at the 300-foot baseline stake and runs 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

Wildlife Habitat and Vegetation History

Table 05-03.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Greater Sage Grouse	Crucial	occupied & 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

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*). 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	A defined state and transition model is available.

This study site has remained in Community Phase 2.1 in the Mountain Big Sagebrush-Steppe/Non-Natives state (State 2) since it was established in 1984; a co-dominant shrub overstory of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and other shrubs and a diverse perennial understory are typical of this phase. Sagebrush has dominated the browse layer in all study years, but antelope bitterbrush (*Purshia tridentata*) is present to a lesser extent and has been heavily browsed in the past. The herbaceous understory has fluctuated over the sample years, 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. If this site undergoes fire suppression and continued heavy grazing, it could transition (via Transition Pathway T2a) to Community Phase 3.1 of the Mountain Big Sagebrush Superdominance/Low Shrub state (State 3) (USDA-NRCS, 2013).

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	-	21.4	1.5	-
2011	15.0	2.2	-	16.6	2.6	-
2016	8.7	2.4	-	13.0	3.9	-

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	260	142	257	8.8	10.7	1.9	11.3
2001	170	396	195	189	4.3	31.5	1.7	2.8
2006	220	383	247	111	2.6	33.9	1.4	4.1
2011	186	354	376	155	3.9	37.8	16.8	9.3
2016	354	267	290	102	17.7	16.1	12.9	3.9

Table 05-03.8 - 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	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

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	Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
1996	-	32	5	-	-
2001	-	30	-	1	-
2006	-	38	4	-	10
2011	-	11	1	-	1
2016	1	16	1	-	15
Days Use Per Acre (ha)					
1996	-	-	-	-	-
2001	0.7 (1.8)	88.5 (218.5)	-	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)	-	-	-

*Pellets per acre (ha)

Table 05-03.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)	Vulpia octoflora ^a (sixweeks fescue)
year	Nested Frequency									
1996	44	343	4	-	181	6	31	57	11	7
2001	68	150	9	4	323	60	39	23	25	1
2006	48	203	7	2	354	19	57	27	39	-
2011	40	175	-	2	304	17	75	18	61	-
2016	72	342	14	4	193	4	26	28	65	-
year	Average Cover (%)									
1996	0.4	7.9	0.0	-	7.8	0.0	0.6	2.0	0.2	0.5
2001	0.3	4.0	0.0	0.5	26.7	2.2	0.8	0.3	0.9	0.0
2006	0.3	2.3	0.1	0.0	28.7	0.4	1.0	1.7	2.1	-
2011	0.3	3.5	-	0.2	23.4	0.7	7.8	0.5	5.2	-
2016	2.1	15.6	0.7	0.0	11.9	0.0	0.5	0.5	2.5	-

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	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvetch)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium (thistle)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Cryptantha ^a (annual cryptantha)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)
year	Nested Frequency																
1996	70	-	1	5	4	20	12	-	-	42	3	12	-	-	-	-	141
2001	58	1	3	8	-	28	-	3	-	9	21	32	-	6	60	8	2
2006	28	3	1	13	-	28	7	3	-	8	42	14	-	4	92	59	22
2011	46	-	5	9	-	43	3	-	8	20	78	47	-	42	164	177	36
2016	19	1	-	6	11	44	2	-	3	23	55	11	55	71	18	7	8
year	Average Cover (%)																
1996	1.2	-	0.0	0.0	0.0	0.5	0.5	-	-	1.1	0.0	0.0	-	-	-	-	3.9
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
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
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
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

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

FORB SPECIES	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium aparine ^a (stickywilly)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Hedysarum boreale (Utah sweetvetch)	Heliomeris multiflora var. multiflora (showy goldeneye)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^{ai} (flatspine stickseed)	Lithophragma (woodland-star)	Lithospermum ruderale (western stoneseed)	Lomatium (desertparsley)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis ^a (slender phlox)	Oenothera caespitosa (tufted evening primrose)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)
year	Nested Frequency																
1996	25	-	47	2	7	9	1	7	-	17	2	12	-	-	3	-	36
2001	39	-	-	1	1	83	-	-	-	1	4	23	-	2	2	-	15
2006	57	-	-	0	16	97	4	18	-	2	1	8	1	1	-	-	27
2011	44	-	96	-	4	86	35	131	3	7	-	3	-	1	-	3	16
2016	122	0	50	-	8	19	1	-	-	1	-	4	-	-	-	-	3
year	Average Cover (%)																
1996	0.2	-	0.1	0.2	0.0	0.0	0.0	0.0	-	1.1	0.0	0.1	-	-	0.1	-	0.1
2001	0.8	-	-	0.0	0.0	0.3	-	-	-	0.0	0.0	0.4	-	0.0	0.0	-	0.0
2006	0.3	-	-	0.0	0.3	0.4	0.0	0.1	-	0.0	0.0	0.0	0.0	0.0	-	-	0.1
2011	0.8	-	3.2	-	0.1	1.1	0.5	1.5	0.0	0.2	-	0.4	-	0.0	-	0.0	0.1
2016	6.8	0.0	1.5	-	0.0	0.2	0.0	-	-	0.0	-	0.0	-	-	-	-	0.0

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

FORB SPECIES	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Sphaeralcea grossularifolia (gooseberryleaf globemallow)	Sphaeralcea munroana (Munro's globemallow)	Stenotus acaulis (stemless mock goldenweed)	Symphotrichum (aster)	Symphotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Verbascum thapsus ^{ai} (common mullein)	Veronica biloba ^{ai} (two-lobed speedwell)	Zigadenus paniculatus (foothill deathcamas)
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	-	-
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	-	-

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	Line Intercept Cover (%)					
	year	1996	2001	2006	2011	2016
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	-	-	-	-	-	-
Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	-	-	-	-	-	-
Linanthus pungens (granite prickly phlox)	20.4	0.7	-	0.8	0	1
Mahonia repens (creeping barberry)	15.9	1.4	-	1.2	0	0.7
Opuntia polyacantha (plains pricklypear)	11.9	0.6	-	3.1	0.2	1.1
Purshia tridentata ^p (antelope bitterbrush)						
SHRUB SPECIES	Quadrat Cover (%)					
	year	1996	2001	2006	2011	2016
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	14.3	0.3	-	0.8	0.0	2.4
Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	18.0	0.2	-	0.5	-	1.9
Linanthus pungens (granite prickly phlox)	13.6	0.2	0.0	0.6	0.0	1.1
Mahonia repens (creeping barberry)	14.2	0.7	-	1.5	0.0	0.7
Opuntia polyacantha (plains pricklypear)	8.0	0.3	-	1.8	0.3	0.7

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

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 (%)				
Amelanchier alnifolia^p -- (Saskatoon serviceberry)									
1996	-	-	-	-	-	-	-	-	95/154
2001	-	-	-	-	-	-	-	-	130/140
2006	-	-	-	-	-	-	-	-	81/121
2011	-	-	-	-	-	-	-	-	88/118
2016	-	-	-	-	-	-	-	-	85/68
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
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

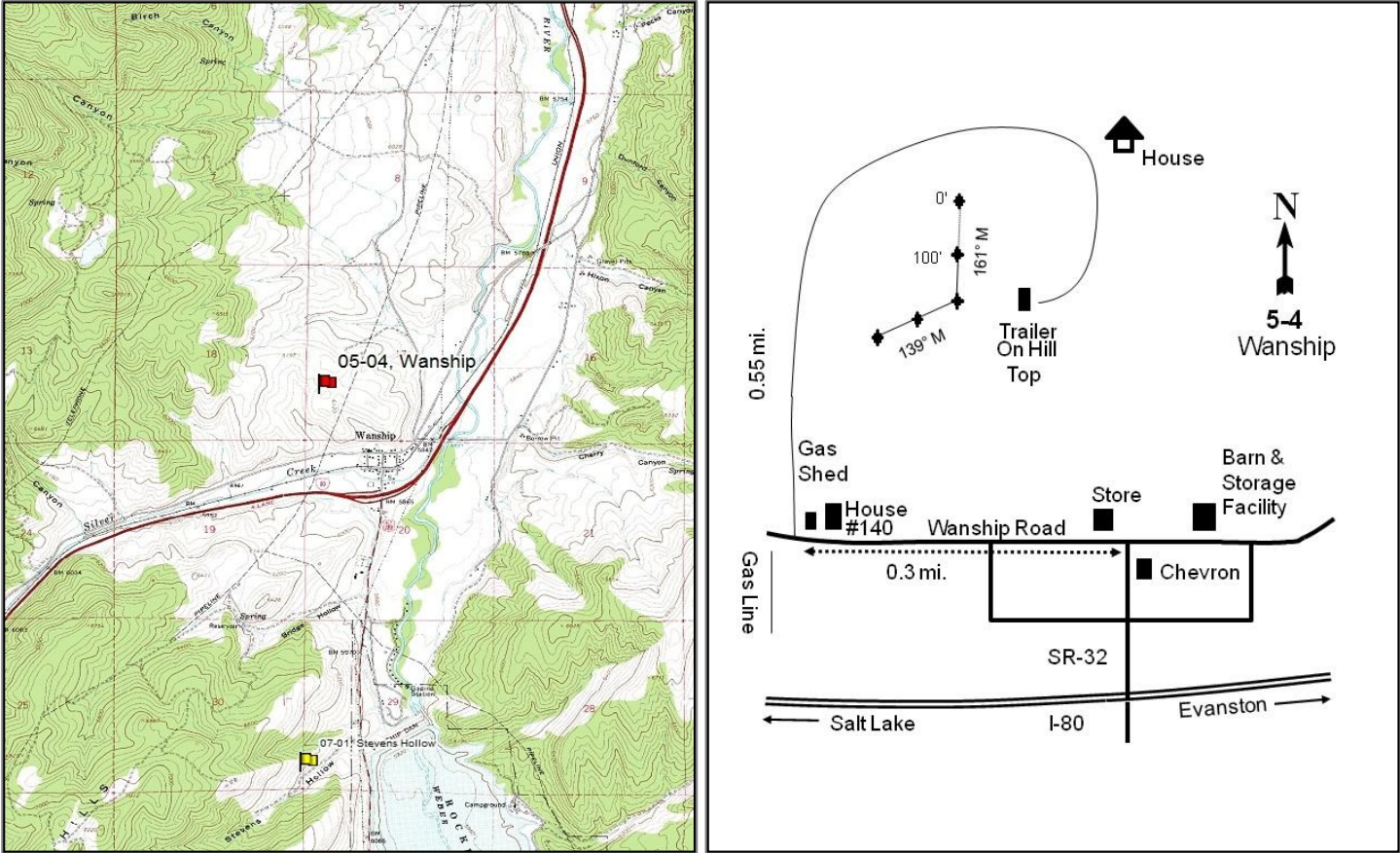
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Mahonia repens -- (creeping barberry)									
1996	2960	40	22	78	0	0	0	0	10/17
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
Opuntia polyacantha -- (plains pricklypear)									
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
Purshia tridentata^p -- (antelope bitterbrush)									
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
Rosa woodsii^p -- (Woods' rose)									
1996	-	-	-	-	-	-	-	-	60/44
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	31/17

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

Table -05-03.15 - Deer Desirable Components Index: High 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	21.6	9.6	6.4	10.9	-6.6	10.0	0.0	51.8	Poor
2001	25.6	8.2	2.7	15.8	-3.2	5.7	0.0	54.7	Poor-Fair
2006	18.7	-1.1	0.9	15.7	-1.9	8.4	0.0	40.7	Very Poor-Poor
2011	19.0	10.3	6.2	30.0	-2.9	10.0	0.0	72.6	Good
2016	11.1	-0.4	1.4	8.4	-13.3	7.8	0.0	15.0	Very Poor

WANSHIP - STUDY NO. 05-4



Location Information

USGS 7.5 min Map Info Wanship NE; Township 1N, Range 5E, Section 17
 GPS (0' Stake) NAD 83 UTM ZONE 12, 465101 East 4518499 North

Transect Information

Browse Tag # (0' Stake) 7955
 Transect Bearing 161° magnetic (Line 2-4: 193° magnetic)
 Length 400ft
 Belt Placement Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
 Belt Marker Placement No Rebar

Directions to Site

From the I-80 overpass in Wanship (Exit 155), proceed north on 189 to the "T" junction. Turn left and go 0.3 miles. Turn right near house #190 and go up the draw 0.55 miles to a house on top of the hill. The owner of this home would like to be contacted when the site is read. From the fork in the road take a bearing of 220 degrees magnetic and walk 36 paces to the baseline. The 0-foot stake of the baseline is marked by browse tag #7955. The baseline runs 161 degrees magnetic. The baseline doglegs at the 200-foot baseline stake and runs 193 degrees magnetic.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,200ft (1,890m)
Aspect	South-Southwest
Slope	3-5%
Sample Dates	07/11/1996, 06/22/2001, 06/19/2006, 07/07/2011, 06/30/2016

Table 05-04.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	1990-1995	-

Wildlife Habitat and Vegetation History**Table 05-04.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Greater Sage Grouse		occupied & Winter

Table 05-04.4 - 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	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

Site Notes

The site was established in 1984 and samples crucial winter range north of Wanship and west of the Weber River that is privately owned. A wildfire burned the entire area sometime after the 1990 reading and eliminated most of the browse, which was dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*).

Soils**Table 05-04.5 - 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	6.6	44.9	28.7	26.4	2.7	15.4	185.6	0.5	07/11/1996

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.

From site establishment in 1984 through the 1990 sample year, this site was a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated plant community. Sometime after 1990, however, a fire burned the area and removed a majority of the sagebrush. The seeded species forage kochia (*Bassia prostrata*) contributed some cover initially, but has decreased in recent sample years (Table 05-04.6, Table 05-04.12, Photos). In 1996 this study site had transitioned to a perennial grass community and it has remained as such through the study years (Table 05-04.7). Crested wheatgrass (*Agropyron cristatum*) has consistently contributed the most grass cover, but other species such as Sandberg bluegrass (*Poa secunda*) and intermediate wheatgrass (*Thinopyrum intermedium*) are also present. Cheatgrass (*Bromus tectorum*) cover has been low in most sample years (Table 05-04.10). Forbs have been somewhat diverse through the study years, but most cover has been contributed by introduced species (Table 05-04.7, Table 05-04.11).

Trend Summary Tables

Table 05-04.6 - 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	1.1	9.8	-	-	-	-
2001	2.0	5.9	-	-	-	-
2006	2.2	3.6	-	2.7	3.9	-
2011	3.8	2.0	-	5.2	2.4	-
2016	0.0	0.5	-	-	1.5	-

Table 05-04.7 - 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	381	221	442	119	6.3	10.2	5.5	3.2
2001	56	369	365	85	0.3	26.0	5.1	1.8
2006	91	374	381	85	0.2	30.3	4.6	1.0
2011	28	392	369	155	0.1	33.1	5.1	1.9
2016	65	422	339	18	0.4	30.0	3.1	0.2

Table 05-04.8 - 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	11.5	0.5	44.5	3.4	11.5	37.3
2001	24.5	0.9	27.0	2.2	9.1	44.5
2006	21.7	1.6	36.5	5.2	10.8	38.2
2011	12.2	0.3	42.6	1.3	10.6	43.3
2016	26.1	0.8	33.3	4.8	10.6	36.6

Table 05-04.9 - 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	Elk	Rabbit
	Quadrat Frequency			
1996	1	38	3	10
2001	1	34	9	-
2006	2	43	22	8
2011	-	24	27	11
2016	-	24	54	22
Days Use Per Acre (ha)				
1996	-	-	-	-
2001	13.1 (32.3)	64.3 (158.9)	24.1 (59.6)	-
2006	1.5 (3.6)	96.5 (238.4)	14.1 (34.8)	-
2011	-	26.8 (66.2)	38.2 (94.4)	-
2016	-	15.4 (38.1)	90.5 (223.5)	-

Table 05-04.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES										
Agropyron cristatum ⁱ (crested wheatgrass)										
Bromus tectorum ^{ai} (cheatgrass)										
Dactylis glomerata ⁱ (orchardgrass)										
Elymus elymoides (squirreltail)										
Elymus lanceolatus (thickspike wheatgrass)										
Festuca ovina ⁱ (sheep fescue)										
Poa bulbosa ⁱ (bulbous bluegrass)										
Poa secunda (Sandberg bluegrass)										
Pseudoroegneria spicata (bluebunch wheatgrass)										
Thinopyrum intermedium ⁱ (intermediate wheatgrass)										
year	Nested Frequency									
1996	110	381	11	1	-	2	1	105	38	25
2001	214	56	1	1	3	-	4	269	12	88
2006	260	91	3	-	-	-	21	243	11	97
2011	280	28	-	-	-	-	96	241	13	114
2016	319	65	-	-	-	-	102	199	10	179
year	Average Cover (%)									
1996	5.3	6.3	0.2	0.0	-	0.0	0.0	2.0	1.1	1.5
2001	16.3	0.3	0.0	0.0	0.0	-	0.0	5.7	0.8	3.2
2006	20.5	0.2	0.0	-	-	-	0.2	5.7	0.7	3.2
2011	18.4	0.1	-	-	-	-	3.3	6.4	0.4	4.6
2016	19.6	0.4	-	-	-	-	1.8	3.1	0.1	5.4

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

Table 05-04.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																	
Allium acuminatum (tapertip onion)																	
Alyssum desertorum ^{ai} (desert madwort)																	
Arabis (rockcress)																	
Astragalus beckwithii (Beckwith's milkvetch)																	
Astragalus cibirius (browse milkvetch)																	
Astragalus convallarius (lesser rushy milkvetch)																	
Astragalus utahensis (Utah milkvetch)																	
Ceratocephala testiculata ^{ai} (curvedseed butterwort)																	
Cirsium (thistle)																	
Collinsia parviflora ^a (maiden blue eyed Mary)																	
Collomia linearis ^a (tiny trumpet)																	
Comandra umbellata (bastard toadflax)																	
Crepis acuminata (tapertip hawkbeard)																	
Cymopterus longipes (longstalk springparsley)																	
Draba ^a (draba)																	
Epilobium brachycarpum ^a (tall annual willowherb)																	
Erigeron pumilus (shaggy fleabane)																	
year	Nested Frequency																
1996	-	221	-	-	1	-	11	314	3	3	1	-	-	55	-	-	1
2001	16	153	-	-	3	5	-	249	-	84	2	5	1	33	118	2	-
2006	44	99	2	-	8	-	-	305	-	143	-	-	-	31	189	7	-
2011	143	224	-	0	1	-	-	152	-	103	3	-	1	23	236	-	2
2016	1	337	-	0	11	-	-	2	-	3	-	-	-	3	-	-	-
year	Average Cover (%)																
1996	-	1.4	-	-	0.0	-	0.2	2.4	0.0	0.0	0.0	-	-	0.5	-	-	0.0
2001	0.0	0.6	-	-	0.2	0.0	-	2.9	-	0.3	0.0	0.0	0.1	0.2	0.4	0.0	-
2006	0.2	0.2	0.0	-	0.1	-	-	2.5	-	0.5	-	-	-	0.3	0.8	0.0	-
2011	1.2	0.6	-	0.0	0.0	-	-	1.0	-	1.2	0.0	-	0.0	0.3	0.9	-	0.0
2016	0.0	3.0	-	0.0	0.1	-	-	0.0	-	0.0	-	-	-	0.0	-	-	-

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

FORB SPECIES														
<i>Erodium cicutarium</i> ^{ai} (redstem stork's bill)														
<i>Gayophytum ramosissimum</i> ^a (pinyon groundsmoke)														
<i>Holosteum umbellatum</i> ^{ai} (jagged chickweed)														
<i>Lactuca scariola</i> ^{ai} (prickly lettuce)														
<i>Lupinus argenteus</i> (silvery lupine)														
<i>Medicago sativa</i> ⁱ (alfalfa)														
<i>Microsteris gracilis</i> ^a (slender phlox)														
<i>Orobanche</i> (broomrape)														
<i>Phlox longifolia</i> (longleaf phlox)														
<i>Polygonum douglasii</i> ^a (Douglas' knotweed)														
<i>Sanguisorba minor</i> ⁱ (small burnet)														
<i>Schoenocrambe limifolia</i> (flaxleaf plainsmustard)														
<i>Sisymbrium altissimum</i> ^{ai} (tall tumbledustard)														
<i>Tragopogon dubius</i> ^{ai} (yellow salsify)														
year	Nested Frequency													
1996	-	15	252	-	-	19	-	-	27	3	16	3	1	3
2001	1	-	206	-	6	11	3	-	11	-	-	1	-	5
2006	-	4	151	-	-	0	9	-	9	1	-	-	-	-
2011	-	-	235	1	-	1	3	2	2	-	-	-	-	-
2016	-	1	18	-	-	3	-	-	-	-	-	-	3	-
year	Average Cover (%)													
1996	-	0.0	1.5	-	-	0.8	-	-	0.3	0.0	1.3	0.0	0.0	0.0
2001	0.0	-	0.8	-	0.2	0.9	0.0	-	0.1	-	-	0.0	-	0.0
2006	-	0.0	0.5	-	-	0.4	0.0	-	0.0	0.0	-	-	-	-
2011	-	-	1.3	0.0	-	0.3	0.0	0.0	0.0	-	-	-	-	-
2016	-	0.0	0.0	-	-	0.1	-	-	-	-	-	-	0.0	-

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

Table 05-04.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES							
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> ^p (mountain big sagebrush)							
<i>Bassia prostrata</i> ⁱ (forage kochia)							
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> (yellow rabbitbrush)							
<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>speciosa</i> ^p (rubber rabbitbrush)							
<i>Gutierrezia sarothrae</i> (broom snakeweed)							
<i>Opuntia polyacantha</i> (plains pricklypear)							
<i>Tetradymia canescens</i> (spineless horsebrush)							
year	Line Intercept Cover (%)						
1996	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-
2006	2.7	2.3	1.1	-	-	0.2	0.3
2011	5.2	1.2	0.7	-	-	0.1	0.4
2016	0	0.6	0.8	-	-	0.1	-
year	Quadrat Cover (%)						
1996	1.1	7.6	2.0	-	-	0.1	-
2001	2.0	4.3	1.5	0.0	0.1	-	-
2006	2.2	1.9	1.2	-	-	0.4	0.0
2011	3.8	1.0	0.6	-	-	0.4	0.0
2016	0.0	0.2	0.2	-	-	0.0	0.0

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

Table 05-04.13 - 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.

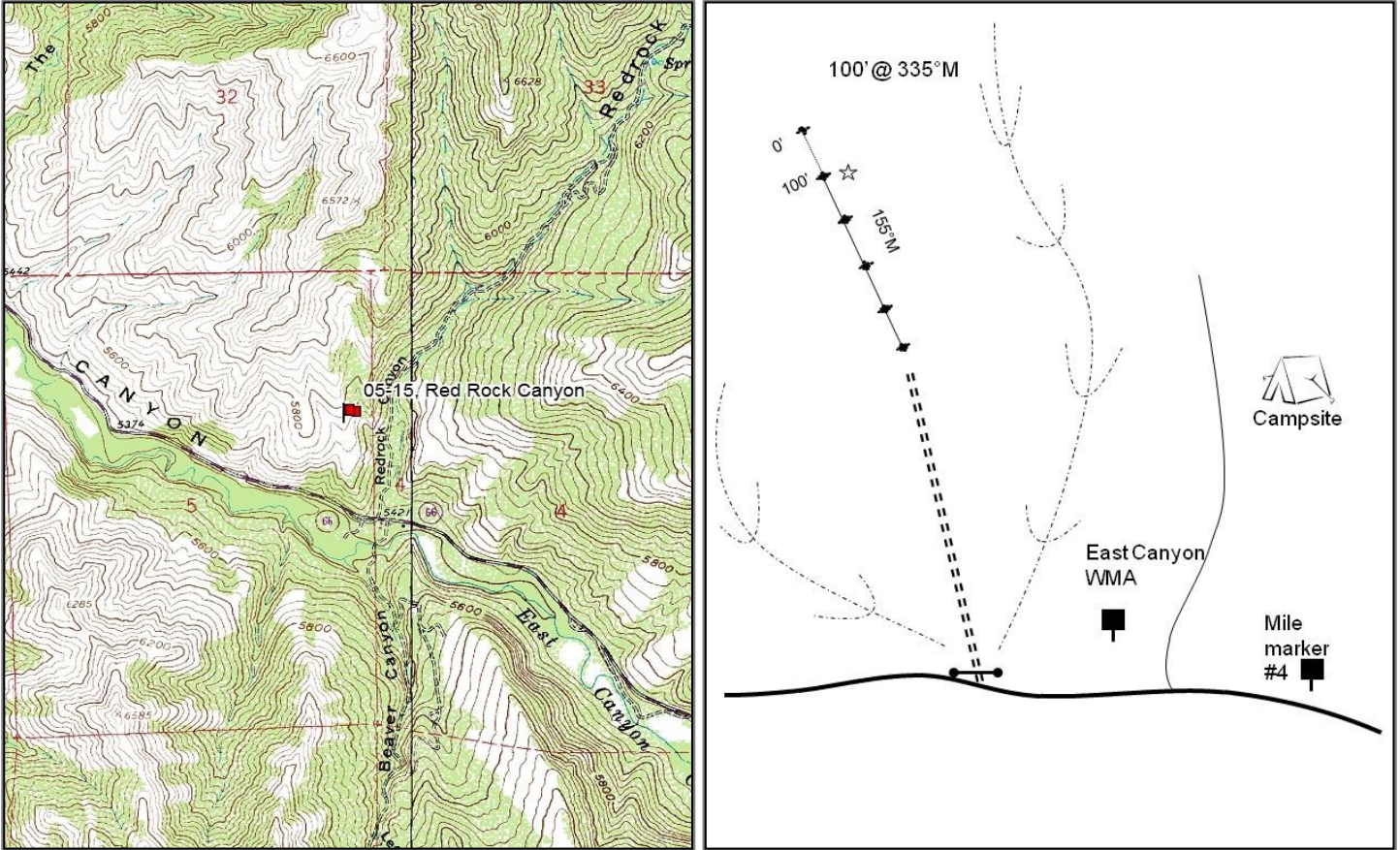
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier alnifolia^p -- (Saskatoon serviceberry)									
1996	-	-	-	-	-	-	-	-	62/70
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	59/72
2011	-	-	-	-	-	-	-	-	65/89
2016	-	-	-	-	-	-	-	-	55/83
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1996	2880	40	98	2	0	0	0	0	23/23
2001	2500	-	6	94	0	38	55	2	26/33
2006	2160	-	9	82	8	33	28	3	31/43
2011	1800	-	3	89	8	77	9	3	40/57
2016	20	-	0	100	0	0	0	0	37/74
Atriplex canescens^p -- (fourwing saltbush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	66/109
2016	-	-	-	-	-	-	-	-	-/-
Bassia prostrataⁱ -- (forage kochia)									
1996	11980	40	28	72	0	9	0	0	18/29
2001	11500	60	15	84	0	56	10	1	15/24
2006	5980	780	16	84	0	31	19	0	18/24
2011	2740	60	8	91	2	14	0	7	17/23
2016	480	20	33	67	0	63	0	0	30/34
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
1996	820	-	0	100	0	0	0	0	31/56
2001	720	-	6	78	17	3	0	3	33/60
2006	800	-	8	80	13	3	3	8	30/45
2011	680	-	6	91	3	0	0	3	28/37
2016	380	-	5	90	5	21	5	16	26/33
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
1996	60	-	0	100	0	0	0	0	34/37
2001	60	-	0	67	33	33	0	0	52/43
2006	20	-	0	100	0	0	0	0	57/67
2011	-	-	-	-	-	-	-	-	54/83
2016	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1996	20	-	0	100	0	0	0	0	20/27
2001	100	-	0	80	20	0	0	20	17/28
2006	40	-	50	50	0	0	0	0	13/14
2011	-	-	-	-	-	-	-	-	29/58
2016	20	-	0	100	0	0	0	0	10/12
Opuntia polyacantha -- (plains pricklypear)									
1996	120	-	33	67	0	0	0	0	10/18
2001	80	-	25	75	0	0	0	0	13/29
2006	100	-	20	80	0	0	0	0	12/38
2011	80	-	0	100	0	0	0	50	11/50
2016	40	-	0	100	0	0	0	0	13/27
Tetradymia canescens -- (spineless horsebrush)									
1996	20	-	0	100	0	0	0	0	29/47
2001	20	-	0	100	0	0	0	0	30/86
2006	40	-	0	100	0	0	0	0	37/49
2011	20	-	0	100	0	0	0	0	33/71
2016	40	-	0	100	0	0	0	0	27/57

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

Table -05-04.15 - Deer Desirable Components Index: Mid 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	12.8	15.0	15.0	20.4	-4.8	6.3	0.0	64.8	Fair-Good
2001	8.9	15.0	6.0	30.0	-0.2	3.7	0.0	63.4	Fair-Good
2006	5.6	13.7	6.1	30.0	-0.2	2.1	0.0	57.4	Fair
2011	6.3	13.0	2.0	30.0	-0.1	3.7	0.0	55.1	Fair
2016	0.3	0.0	0.0	30.0	-0.3	0.4	0.0	30.4	Very Poor

RED ROCK CANYON - STUDY No. 05-15



Location Information

USGS 7.5 min Map Info Porterville NE; Township 2N, Range 3E, Section 05
 GPS (0' Stake) 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

Travel east for 0.2 miles past mile marker 4 on Highway 66 heading towards Porterville 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 the trail. The 0-foot stake is 100 feet at 335 degrees magnetic. The 0-foot baseline stake is marked by a browse tag #52.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,675ft (1,730m)
Aspect	Southeast
Slope	10%
Sample Dates	07/18/1996, 06/12/2001, 06/14/2006, 06/20/2011, 06/14/2016

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
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

Site Notes

This 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. The area is considered winter range, although it also receives year round use.

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	A defined state and transition model is available.

This study site has remained in Community Phase 4.1 of the Introduced Grassland state (State 4) since it's establishment in 1996: this phase is described as having a dominant grass component. Although most cover was contributed by the annual grass species field brome (*Bromus arvensis*) in 1996, this plant community has been mainly comprised of a very diverse mixture of perennial grasses in every other sample year (Table 05-15.7, Table 05-15.10). Forbs are rich in composition and have varied in abundance in each sample year (Table 05-15.11). The site is also host to a small browse component, namely mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) (Table 05-15.12). The model provided suggests that this study site could follow Community Pathway 4.1a and be subjected to brush management and/or prescribed grazing to remain in the current phase. The site could also undergo heavy continuous grazing and follow Transition Pathway T4a to enter the Yellow Rabbitbrush/Spineless Horsebrush state (State 5) which is characterized by a dominant component of unpalatable shrubs (USDA-NRCS, 2013).

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	0.1	9.2	-	-	-	-
2001	0.1	5.5	-	-	-	-
2006	0.4	5.5	-	2.4	9.4	-
2011	1.8	5.5	-	2.2	7.9	-
2016	1.3	2.0	-	1.0	3.5	-

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	229	295	197	24.6	11.3	8.0	4.9
2001	289	384	329	293	4.8	29.2	13.3	11.4
2006	246	392	356	258	5.0	26.6	4.3	6.3
2011	123	424	433	328	2.7	39.7	35.2	21.3
2016	212	328	401	156	13.4	25.8	17.5	2.1

Table 05-15.8 - 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	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

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	Elk	Rabbit
	Quadrat Frequency			
1996	-	5	1	-
2001	-	11	-	-
2006	30	42	5	6
2011	2	11	-	1
2016	29	16	1	4
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)	-	-

Table 05-15.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus briziformis ^{ai} (rattlesnake brome)	Bromus marginatus (mountain brome)	Bromus tectorum ^{ai} (cheatgrass)	Dactylis glomerata ⁱ (orchardgrass)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Melica bulbosa (oniongrass)	Phleum pratense ⁱ (timothy)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Secale cereale ^{ai} (cereal rye)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency																
1996	180	394	-	-	121	18	6	-	-	-	-	-	51	9	27	14	-
2001	183	256	10	22	138	7	1	-	-	3	146	-	63	197	34	0	2
2006	228	156	3	17	191	1	17	-	-	-	180	-	18	216	15	1	1
2011	255	90	3	25	47	-	3	5	1	-	299	3	120	40	35	4	3
2016	274	80	-	29	191	-	-	-	-	-	64	16	31	128	7	-	2
year	Average Cover (%)																
1996	9.2	20.9	-	-	3.4	0.2	0.1	-	-	-	-	-	1.1	0.1	0.7	0.4	-
2001	12.7	3.1	0.2	1.3	1.4	0.2	0.0	-	-	0.0	5.2	-	1.5	5.6	2.7	0.0	0.0
2006	12.0	1.0	0.0	0.6	4.0	0.0	0.1	-	-	-	7.2	-	0.1	5.7	0.8	0.0	0.1
2011	17.5	1.3	0.0	0.9	1.4	-	0.1	0.1	0.0	-	17.0	0.1	1.9	0.5	1.6	0.0	0.0
2016	18.5	1.3	-	1.3	12.1	-	-	-	-	-	1.1	0.1	1.7	2.6	0.4	-	0.0

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 ^{ai} (desert madwort)	Artemisia ludoviciana (white sagebrush)	Camelina microcupa ^{ai} (litlepod false flax)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium undulatum ^{ai} (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia grandiflora ^a (grand collomia)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (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
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

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

FORB SPECIES	Erigeron pumilus (shaggy fleabane)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium aparine ^a (stickywilly)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Gilia ^a (gilia)	Grindelia squarrosa (curlycup gumweed)	Helianthus annuus ^a (common sunflower)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Linum lewisii (Lewis flax)	Lithophragma (woodland-star)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa ⁱ (alfalfa)	Melilotus officinalis ⁱ (sweetclover)	Microsteris gracilis ^a (slender phlox)
year	Nested Frequency																
1996	1	-	8	1	-	-	2	3	-	154	-	99	-	4	48	11	-
2001	-	-	77	5	-	3	-	-	37	6	32	98	-	-	60	7	1
2006	-	-	147	-	3	-	15	21	67	36	7	32	-	16	32	20	19
2011	-	3	217	11	38	2	17	-	65	280	178	2	2	-	71	4	5
2016	-	-	361	-	29	-	-	14	13	11	-	4	-	-	43	-	2
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	-	-	0.1	0.2	0.1	0.7	-	-	6.2	0.1	0.0
2006	-	-	0.9	-	0.0	-	0.2	0.1	0.2	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	-	0.3	8.7	3.9	0.0	0.0	-	8.1	0.2	0.0
2016	-	-	12.3	-	0.1	-	-	0.1	0.1	0.1	-	0.0	-	-	0.5	-	0.0

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

FORB SPECIES	Onobrychis vicifolia ⁱ (sainfoin)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^{ai} (Douglas' knotweed)	Sanguisorba minor ⁱ (small burnet)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Symphotrichum (aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Vicia americana (American vetch)
year	Nested Frequency								
1996	-	2	50	32	16	-	-	190	11
2001	0	9	3	16	35	3	9	191	124
2006	-	-	30	6	15	-	1	76	53
2011	-	-	7	5	22	2	22	78	108
2016	3	-	-	0	55	5	11	11	53
year	Average Cover (%)								
1996	-	0.0	0.2	0.6	0.3	-	-	3.9	0.1
2001	0.0	0.0	0.0	0.2	0.6	0.0	0.2	8.2	2.5
2006	-	-	0.1	0.2	0.1	-	0.1	0.9	0.5
2011	-	-	0.0	0.0	0.4	0.0	0.7	1.9	3.7
2016	0.0	-	-	0.0	2.1	0.1	0.1	0.0	0.5

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 ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Purshia tridentata ^p (antelope bitterbrush)	Symphoricarpos oreophilus (mountain snowberry)
year	Line Intercept Cover (%)					
1996	-	-	-	-	-	-
2001	-	-	-	-	-	-
2006	2	9.2	0.4	-	-	0.2
2011	1.5	7.2	0.7	0.5	-	0.2
2016	1	2.3	-	0.5	-	0.7
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

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

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 (%)				
Amelanchier alnifolia^p -- (Saskatoon serviceberry)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	64/80
2011	-	-	-	-	-	-	-	-	73/88
2016	-	-	-	-	-	-	-	-	45/46
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
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

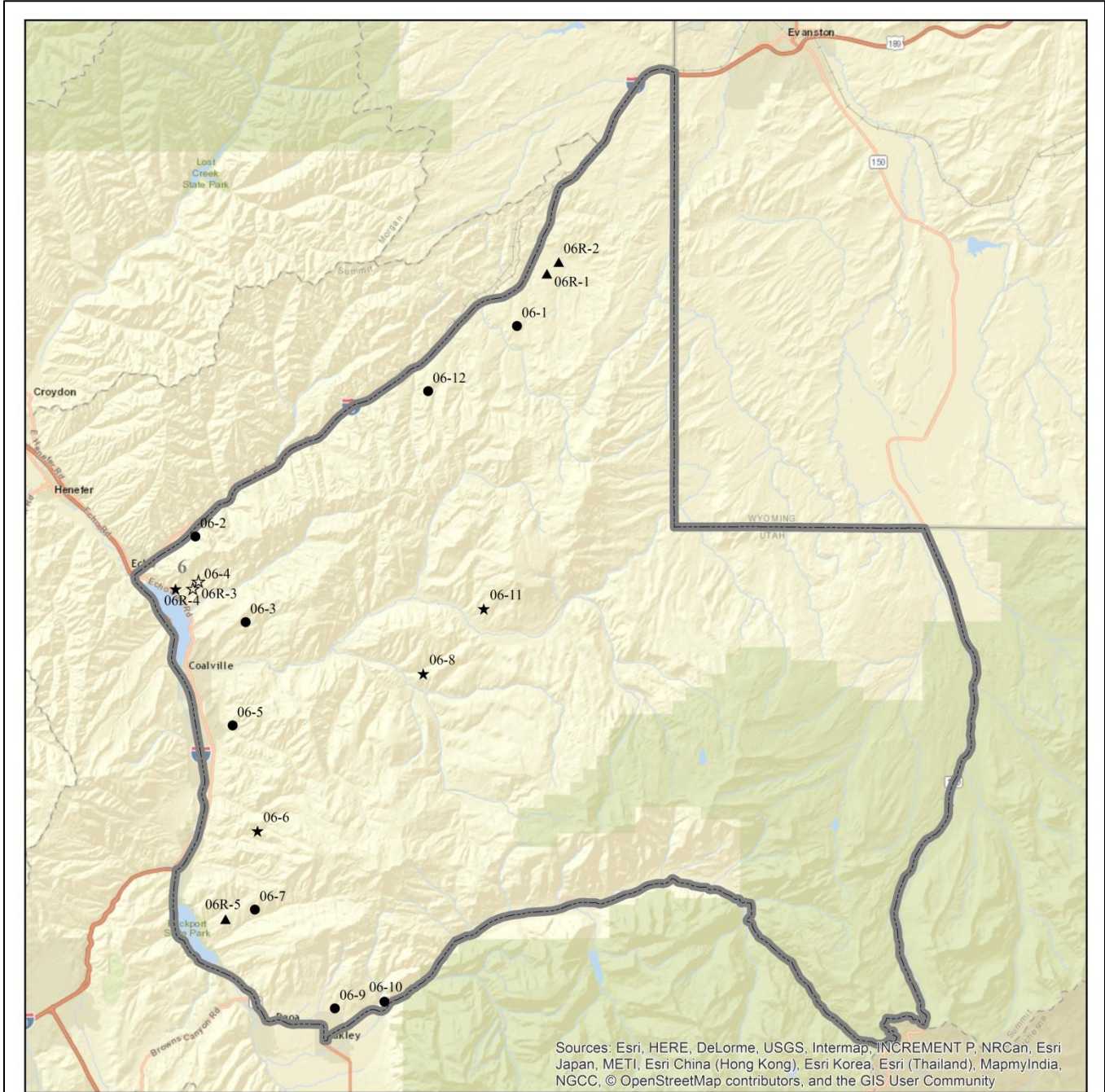
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
1996	1580	-	35	65	0	0	0	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
Purshia tridentata^P -- (antelope bitterbrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	43/72
2011	-	-	-	-	-	-	-	-	74/116
2016	-	-	-	-	-	-	-	-	87/156
Symphoricarpos oreophilus -- (mountain snowberry)									
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

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

Table -05-15.15 - Deer Desirable Components Index: High 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	0.1	0.0	0.0	25.2	-18.3	10.0	0.0	17.0	Very Poor
2001	0.2	0.0	0.0	30.0	-3.6	10.0	0.0	36.6	Very Poor
2006	0.6	0.0	0.0	30.0	-3.7	10.0	0.0	36.8	Very Poor
2011	2.0	0.0	0.0	30.0	-2.0	10.0	0.0	40.0	Very Poor-Poor
2016	1.6	3.0	0.0	30.0	-10.1	4.2	0.0	28.8	Very Poor

WILDLIFE MANAGEMENT UNIT 06 - CHALK CREEK



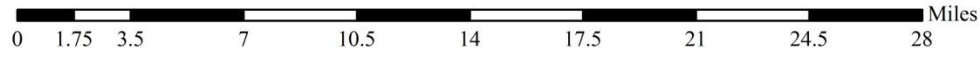
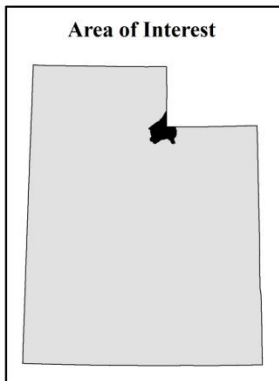
Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community



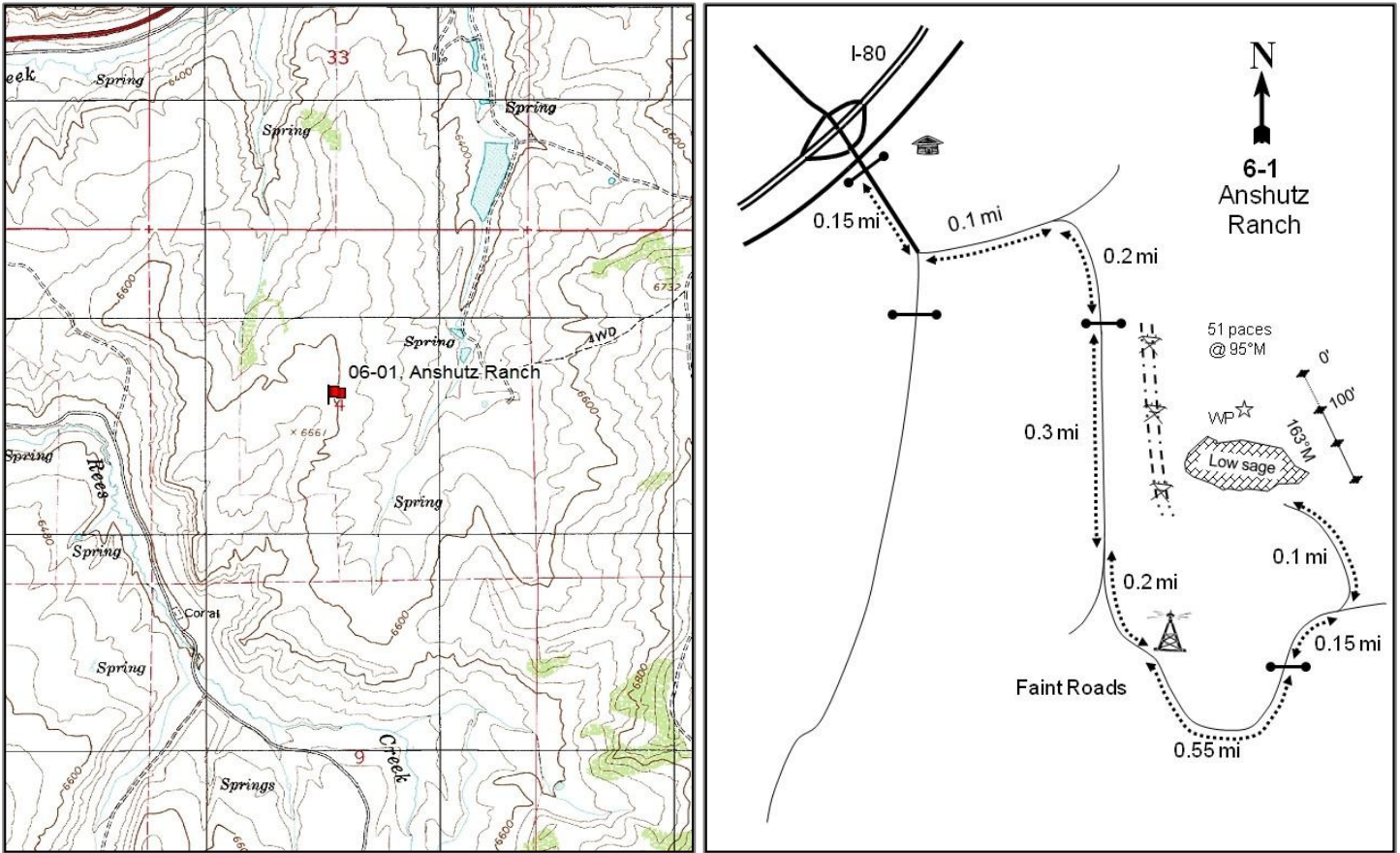
Study Location Project, Status

- RT, Active
- ★ RT, Suspended
- ▲ WRI, Active
- ☆ WRI, Suspended

Unit - 6



ANSHUTZ RANCH - STUDY NO. 06-1



Location Information

USGS 7.5 min Map Info	Castle Rock NE; Township 4N, Range 7E, Section 04
GPS (0' Stake)	NAD 83 UTM ZONE 12, 486468 East 4550801 North

Transect Information

Browse Tag # (0' Stake)	7949
Transect Bearing	163° magnetic
Length	300ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft & 71ft), Line 3 (59ft)
Belt Marker Placement	Standard

Directions to Site

Proceeding east on I-80 from Echo, leave I-80 at exit number 185 and proceed east to Anshutz Ranch headquarters. From the main gate proceed 0.15 miles and turn left. Proceed 0.1 miles and turn right up the hill. Proceed 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 (road not on quad and quite faint) and proceed 0.15 miles to a green steel stake on the right (east) side of the road. From stake, walk 51 paces at 95 degrees magnetic to the 0-foot of the baseline 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

Wildlife Habitat and Vegetation History

Table 06-01.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	summer	
Elk	crucial	summer	
Greater Sage Grouse	Crucial	occupied & Winter	brood-rearing
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

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*) 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 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*) are also common (Table 06-01.12). The herbaceous understory of this site is fairly diverse, and although not overly abundant, has been largely comprised of perennial grasses such as thickspike wheatgrass (*Elymus lanceolatus*) and Sandberg bluegrass (*Poa secunda*); perennial grasses were a co- dominant site component in 1996 and 2006. The invasive annual grass cheatgrass (*Bromus tectorum*) has been observed in the community, but has always been rare (Table 06-01.7, Table 06-01.10). Annual forbs were somewhat common in the 2016 sample year, but most cover was provided by the introduced species desert madwort (*Alyssum desertorum*) (Table 06-01.11). Without a shrub removing disturbance such as a wildfire, this site is expected to remain in this state in future sample years.

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	-

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

Table 06-01.8 - 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	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

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	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
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)	-	-	-

*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 ^{ai} (field brome)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (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
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

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 ^{ai} (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus cibirius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cordylanthus ramosus ^a (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
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

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

FORB SPECIES	Cymopterus (springparsley)	Delphinium nuttallianum (twolobe larkspur)	Epilobium brachycarpum ^a (all annual willowherb)	Erigeron pumilus (shaggy fleabane)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Holosteum umbellatum ^{ai} (jagged chickweed)	Linum lewisii (Lewis flax)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis ^a (slender phlox)	Packera multilobata (lobeleaf groundsel)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Senecio integerrimus ^a (lambstongue ragwort)	Taraxacum officinale (common dandelion)
year	Nested Frequency																
1996	-	-	-	32	3	-	19	3	-	-	-	-	63	178	82	-	9
2001	-	-	3	16	5	4	-	7	-	0	-	2	49	40	30	-	5
2006	-	-	-	15	3	-	-	17	3	-	13	-	64	140	-	-	2
2011	9	11	-	18	35	-	-	12	9	-	17	-	38	119	3	60	3
2016	1	-	10	10	6	-	7	7	3	-	20	-	53	144	-	-	8
year	Average Cover (%)																
1996	-	-	-	0.2	0.1	-	0.0	0.0	-	-	-	-	1.4	1.2	0.2	-	0.1
2001	-	-	0.0	0.1	0.2	0.0	-	0.0	-	0.0	-	0.0	0.9	0.2	0.1	-	0.0
2006	-	-	-	0.2	0.2	-	-	0.1	0.0	-	0.0	-	1.5	0.6	-	-	0.0
2011	0.1	0.1	-	0.4	0.5	-	-	0.2	0.2	-	0.0	-	0.6	0.6	0.0	2.0	0.1
2016	0.0	-	0.0	0.2	0.1	-	0.0	0.0	0.0	-	0.1	-	0.8	0.8	-	-	0.0

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

FORB SPECIES	Tragopogon dubius ^{ai} (yellow salsify)	Viola (violet)
year	Nested Frequency	
1996	11	-
2001	3	-
2006	-	-
2011	1	41
2016	1	11
year	Average Cover (%)	
1996	0.0	-
2001	0.0	-
2006	-	-
2011	0.0	0.5
2016	0.0	0.0

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	Line Intercept Cover (%)					
	Artemisia arbuscula ^p (little sagebrush)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Krascheninikovia lanata ^p (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
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

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

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 (%)				
Artemisia arbuscula^p -- (little sagebrush)									
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
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
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

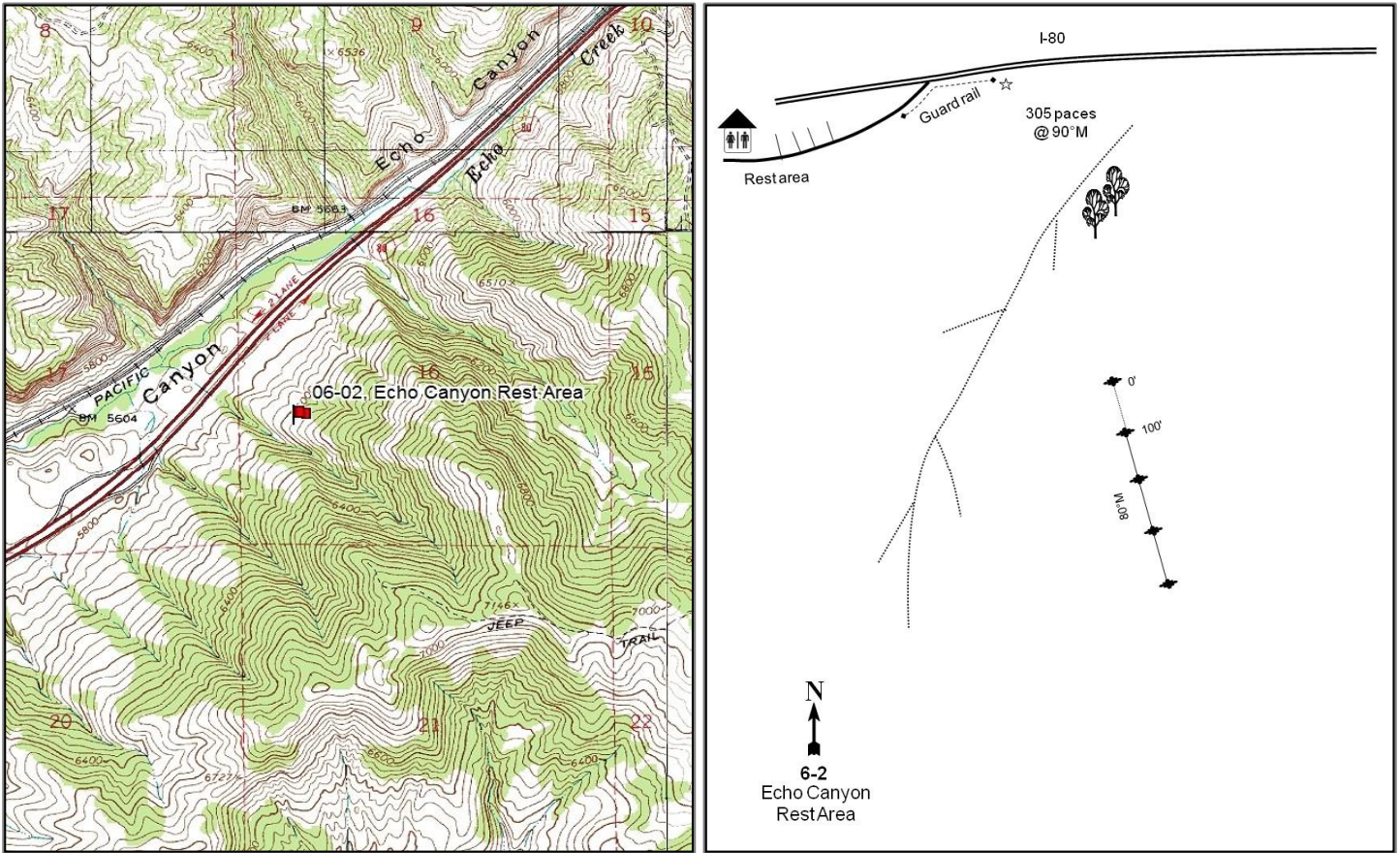
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Krascheninnikovia lanata^p -- (winterfat)									
1996	60	-	33	67	0	33	0	0	17/20
2001	140	-	0	86	14	43	0	14	14/22
2006	60	-	33	67	0	33	67	0	12/12
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Tetradymia canescens -- (spineless horsebrush)									
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

Table -06-01.15 - Deer Desirable Components Index: Mid 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	10.5	2.9	22.2	-1.5	7.0	0.0	71.1	Good
2001	30.0	7.4	1.2	11.3	-0.1	4.3	0.0	54.2	Fair
2006	30.0	10.4	1.5	21.8	-0.1	10.0	0.0	73.6	Good
2011	30.0	12.8	3.7	17.6	-1.0	10.0	0.0	73.0	Good
2016	30.0	12.7	2.0	12.8	-1.8	6.6	0.0	62.3	Fair

ECHO CANYON REST AREA - STUDY NO. 06-2



Location Information

USGS 7.5 min Map Info Coalville NE; Township 3N, Range 5E, Section 16
 GPS (0' Stake) NAD 83 UTM ZONE 12, 466802 East 4537935 North

Transect Information

Browse Tag # (0' Stake) 7950
 Transect Bearing 80° magnetic
 Length 350 ft
 Belt Placement Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (71ft), Line 4 (34ft) ,Note: Line 4: 50ft Long
 Belt Marker Placement No Rebar

Directions to Site

Beginning at Echo Reservoir, travel northeast on Highway I-80 to the rest area (approximately 2 miles). 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 on an azimuth of 90 degrees magnetic for approximately 305 paces to a point on the left-hand or north side of the canyon. The 0-foot stake of the baseline consists of 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

Table 06-02.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	1999	-

Wildlife Habitat and Vegetation History

Table 06-02.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Elk	crucial	winter	
Greater Sage Grouse	Crucial	occupied & Winter	brood-rearing
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

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 true 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 wild fire burned the study area in 1999, removing much of the Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and true 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 component in 1996. However, a wildfire burned the study site in 1999 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*) (Table 06-02.12). 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 invasive annual grass cheatgrass (*Bromus tectorum*) has been observed all sample years, and is fairly abundant as of the 2016 sampling (Table 06-02.10). In general, forbs have been 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). It is predicted that without a major disturbance, this site will remain as a mixed shrub community type in the future.

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	20.0	8.8	-	-	-	-
2001	5.0	10.2	-	-	-	-
2006	6.0	12.2	-	7.4	20.9	-
2011	5.2	13.2	-	7.3	17.2	-
2016	5.0	10.4	-	9.8	18.1	-

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	369	360	403	262	10.5	16.2	7.3	8.1

Table 06-02.8 - 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	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

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	Elk	Moose	Rabbit
	Quadrat Frequency			
1996	38	6	1	3
2001	12	-	-	4
2006	28	18	-	28
2011	19	26	-	-
2016	12	11	-	10
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)	-	-

Table 06-02.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus arvensis ^{ai} (field brome)	Bromus briziformis ^{ai} (rattlesnake brome)	Bromus marginatus (mountain brome)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Festuca ovina ⁱ (sheep fescue)	Koeleria macrantha (prairie Junegrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency												
1996	0	-	-	-	166	-	-	5	3	-	7	318	176
2001	-	-	-	2	214	0	-	-	1	-	14	194	104
2006	1	1	1	2	310	1	3	-	2	4	28	224	186
2011	2	7	-	-	221	-	-	4	-	17	28	298	249
2016	-	1	-	-	369	27	-	-	4	31	15	242	253
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
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
2016	-	0.0	-	-	10.5	0.4	-	-	0.0	0.5	0.1	5.7	9.4

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 ^{ai} (desert madwort)	Ambrosia psilostachya (Cuman ragweed)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus cibirius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (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	-
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	-

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

FORB SPECIES	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Descurainia pinnata ^a (western tansymustard)	Draba verna ^{ai} (spring draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Erodium cicutarium ^{ai} (redstem stork's bill)	Gayophytum ramosissimum ^a (pinon groundsmoke)	Hackelia patens (spotted stickseed)	Hedysarum boreale (Utah sweetvetch)	Helianthella uniflora (oneflower helianthella)	Holosteum umbellatum ^{ai} (jagged chickweed)	Hydrophyllum (waterleaf)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lithophragma (woodland-star)	Lomatium triternatum (nineleaf biscuitroot)
year	Nested Frequency																
1996	3	-	-	-	-	30	-	3	3	-	-	6	-	-	-	-	-
2001	9	-	38	64	96	28	-	3	0	-	0	95	-	1	-	-	4
2006	14	-	1	44	109	7	5	2	0	2	-	85	-	-	-	-	13
2011	16	6	3	50	14	11	3	16	6	-	6	200	6	6	54	14	37
2016	21	7	19	49	8	2	11	7	-	-	2	125	7	-	43	-	10
year	Average Cover (%)																
1996	0.0	-	-	-	-	0.7	-	0.0	0.0	-	-	0.0	-	-	-	-	-
2001	0.1	-	0.2	0.2	0.5	0.3	-	0.0	0.2	-	0.0	1.2	-	0.0	-	-	0.0
2006	0.1	-	0.0	0.2	0.9	0.0	0.0	0.0	0.0	0.0	-	0.3	-	-	-	-	0.1
2011	0.2	0.0	0.0	0.2	0.2	0.1	0.0	0.0	0.2	-	0.2	2.6	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	0.3	0.0	-	0.3	-	0.0

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

FORB SPECIES	Maianthemum (mayflower)	Microsteris gracilis ^a (slender phlox)	Orogenia linearifolia (Great Basin Indian potato)	Penstemon (beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Schoenocrambe limifolia (flaxleaf plainsmustard)	Senecio integerrimus ^a (lambstongue ragwort)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Sphaeralcea grossularifolia (gooseberry/leaf globemallow)	Symphotrichum (aster)	Tragopogon dubius ^{ai} (yellow salsify)	Verbascum thapsus ^{ai} (common mullein)	Vicia americana (American vetch)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency														
1996	-	-	-	1	6	6	-	-	-	3	-	-	37	-	-
2001	-	15	-	-	3	2	22	2	13	-	0	-	18	140	1
2006	-	57	-	4	-	39	4	-	-	1	4	3	1	129	2
2011	2	48	2	-	-	-	4	2	-	-	1	19	-	174	3
2016	-	27	4	-	-	2	12	-	-	0	-	10	1	166	1
year	Average Cover (%)														
1996	-	-	-	0.0	0.0	0.0	-	-	-	0.0	-	-	-	0.3	-
2001	-	0.1	-	-	0.0	0.0	0.5	0.0	0.2	-	0.0	-	0.1	3.0	0.0
2006	-	0.8	-	0.0	-	0.1	0.0	-	-	0.1	0.1	0.0	0.0	1.4	0.0
2011	0.2	0.1	0.0	-	-	-	0.0	0.0	-	-	0.0	0.1	-	7.9	0.0
2016	-	0.1	0.0	-	-	0.0	0.1	-	-	0.0	-	0.1	0.0	4.8	0.0

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 alnifolia ^p (Saskatoon serviceberry)	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Cercocarpus montanus ^p (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Purshia tridentata ^p (antelope bitterbrush)	Quercus gambelii ^p (Gambel oak)	Symphoricarpos oreophilus (mountain snowberry)
year	Line Intercept Cover (%)								
1996	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-
2006	0.4	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
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

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

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 (%)				
Amelanchier alnifolia^p -- (Saskatoon serviceberry)									
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
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
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
Cercocarpus montanus^p -- (alderleaf mountain mahogany)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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

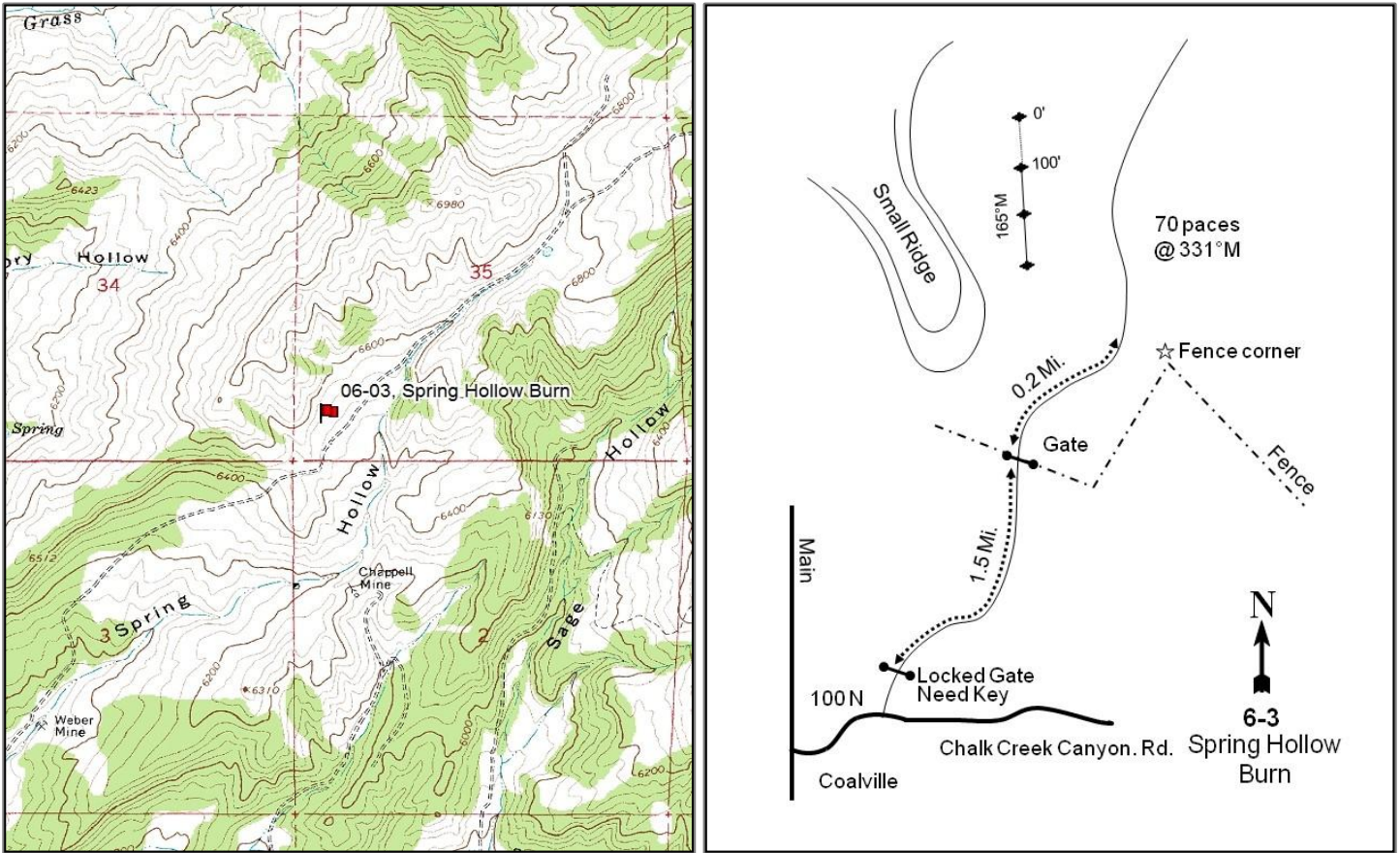
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
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
Opuntia polyacantha -- (plains pricklypear)									
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
Purshia tridentata^p -- (antelope bitterbrush)									
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
Quercus gambelii^p -- (Gambel oak)									
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
Symphoricarpos oreophilus -- (mountain snowberry)									
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
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: High 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	25.7	7.4	6.9	30.0	-2.5	6.2	0.0	73.7	Good
2001	6.5	7.1	15.0	30.0	-6.0	10.0	0.0	62.7	Fair
2006	7.8	12.9	4.6	30.0	-3.7	9.9	0.0	61.4	Fair
2011	6.7	13.1	5.9	30.0	-2.3	10.0	0.0	63.4	Fair
2016	6.5	0.0	0.0	30.0	-7.9	10.0	0.0	38.7	Very Poor-Poor

SPRING HOLLOW BURN - STUDY NO. 06-3



Location Information

USGS 7.5 min Map Info Turner Hollow NW; Township 3N, Range 5E, Section 35
 GPS (0' Stake) NAD 83 UTM ZONE 12, 469867 East 4532699 North

Transect Information

Browse Tag # (0' Stake) 7974
 Transect Bearing 165° magnetic
 Length 300ft
 Belt Placement Line 1 (11ft & 95ft), Line 2 (34ft & 71ft), Line 3 (59ft)
 Belt Marker Placement Standard

Directions to Site

From 100 North and Main in Coalville, travel east 1.3 miles to Spring Hollow Road. Turn left (northeast) and proceed 0.2 miles to a locked gate. Proceed through gate, and continue 1.5 miles to a gate. Continue 0.2 miles to a fence line corner on the right. From corner post, walk 70 paces in 331 degrees magnetic to the 100-foot stake of the baseline. The 0-foot stake is marked by browse tag #7974.

Site Information

Land Ownership Private
 Land Administrator Private
 Allotment No data
 Elevation 6,500ft (1,981m)
 Aspect Southeast
 Slope 7%
 Sample Dates 06/28/2001, 06/21/2006, 06/15/2011, 06/09/2016

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	Historic	-
Seeding - Unknown	-	-	Historic	-

Wildlife Habitat and Vegetation History

Table 06-03.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	summer	
Elk	crucial	summer	
Greater Sage Grouse	Crucial	occupied & Winter	brood-rearing
Moose	crucial	winter	

Table 06-03.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Perennial Grass	No Encroachment
1990	Perennial Grass	No Encroachment
2001	Perennial Grass	No Encroachment
2006	Perennial Grass	No Encroachment
2011	Perennial Grass	No Encroachment
2016	Perennial Grass	No Encroachment

Site Notes

The study is located on an old burn in the upper part of Spring Hollow, near an old line-intercept study. Prior to the fire the area was dominated by sagebrush (*Artemisia* sp.), grass, Utah juniper (*Juniperus osteosperma*), and twoneedle pinyon (*Pinus edulis*) communities. After the burn, the area was seeded with perennial grasses, mostly crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Thinopyrum intermedium*). The area is privately- owned and grazed by a variety of domestic animals in addition to winter use by deer and elk. During heavy winters, it may not be as crucial for wildlife due to the lack of browse. Nearly all of the browse species were infested with ants in 2016.

Soils

Table 06-03.5 - 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	6.5	30.9	38.4	30.6	4.6	25.8	384.0	0.9	06/28/2001

Site Potential

1981-2010 Average Annual Precipitation 18 inches
 NRCS Ecological Site Mountain Loam (Mountain Big Sagebrush)
 NRCS Ecological Site # R047XA430UT
 States and Transitions A defined state and transition model is available.

Since 1984, this study site has remained in Community Phase 4.1 of the Introduced Grassland state (State 4), which is characterized by the dominance of seeded grasses and often the establishment of introduced grasses that have not been seeded. The seeded perennial grass species crested wheatgrass (*Agropyron cristatum*) has contributed the most herbaceous cover in all sample years, although other native and introduced species are present. The introduced perennial grass bulbous bluegrass (*Poa pratensis*) has been increasing in frequency and cover since 2006 (Table 06- 03.10). Forbs are diverse and quantity has fluctuated throughout the study years (Table 06-03.7, Table 06-03.11). Although not included in the data, it was noted that the noxious weed nodding plumeless thistle (*Carduus nutans*) was present on the site in 2016. Shrubs are limited on this site, although broom snakeweed (*Gutierrezia sarothrae*) was common in 2016 (Table 06-03.12, Table 06-03.13). According to the model provided, this community phase can be maintained via shrub management and prescribed grazing (Community Pathway 4.1a). If continuous heavy grazing were to occur, however, this would cause the site to transition (Transition Pathway T4a) to Community Phase 5.1 in the Yellow Rabbitbrush/Spineless Horsebrush state (State 5) which is characterized by the dominance of unpalatable shrubs (USDA-NRCS, 2013).

Trend Summary Tables

Table 06-03.6 - 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
2001	0.7	1.4	-	-	-	-
2006	0.5	2.5	-	0.2	3.9	-
2011	0.0	1.9	-	0.1	1.2	-
2016	0.0	11.2	-	0.2	17.7	-

Table 06-03.7 - 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
2001	-	452	277	196	-	35.8	3.2	3.5
2006	3	416	345	281	0.0	27.5	4.8	7.9
2011	18	417	379	361	0.7	35.2	17.3	15.0
2016	45	421	323	232	1.4	30.3	4.4	5.4

Table 06-03.8 - 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
2001	13.1	0.1	42.7	6.9	3.7	49.0
2006	11.4	-	43.3	10.1	5.7	45.1
2011	21.9	0.1	10.6	11.3	4.5	62.5
2016	31.5	1.2	19.2	13.2	5.0	47.5

Table 06-03.9 - 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	Elk	Horse	Rabbit
	Quadrat Frequency				
2001	16	2	5	1	10
2006	6	11	4	-	10
2011	4	5	1	-	-
2016	9	21	-	-	18
Year	Days Use Per Acre (ha)				
2001	21.1 (52.0)	4.0 (9.9)	8.7 (21.5)	-	-
2006	13.8 (34.1)	13.4 (33.1)	16.8 (41.4)	-	-
2011	8.0 (19.7)	8.1 (19.9)	5.3 (13.2)	-	-
2016	8.0 (19.7)	38.2 (94.4)	6.0 (14.9)	-	-

Table 06-03.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus briziformis ^{ai} (rattlesnake brome)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Elymus lanceolatus (thickspike wheatgrass)	Koeleria macrantha (prairie Junegrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency										
2001	400	-	-	-	12	45	9	8	228	51	6
2006	390	-	3	-	-	12	4	11	102	28	15
2011	365	-	18	-	-	33	25	17	187	12	19
2016	399	13	32	4	-	18	111	-	35	5	41
year	Average Cover (%)										
2001	27.7	-	-	-	0.7	0.6	0.1	0.1	4.6	2.1	0.0
2006	24.1	-	0.0	-	-	0.1	0.0	0.1	1.5	1.2	0.4
2011	24.8	-	0.7	-	-	1.6	1.3	0.6	6.5	0.2	0.3
2016	25.6	0.5	0.9	0.0	-	0.3	3.0	-	0.3	0.1	0.9

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

Table 06-03.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Allium acuminatum (tapertip onion)	Alysum desertorum ^{ai} (desert madwort)	Antennaria dimorpha (low pussytoes)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus cibirius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Descurainia ^a (tansymustard)
year	Nested Frequency																
2001	23	56	47	2	-	9	64	2	-	3	48	4	109	34	-	-	-
2006	7	12	63	3	-	5	147	-	-	10	92	3	85	74	1	5	-
2011	1	265	155	4	-	7	79	-	-	5	127	-	76	49	3	21	177
2016	-	26	247	6	1	5	109	-	4	12	59	2	9	3	-	-	-
year	Average Cover (%)																
2001	0.1	0.2	0.3	0.0	-	0.1	0.4	0.0	-	0.0	0.1	0.1	0.3	0.1	-	-	-
2006	0.2	0.0	0.2	0.0	-	0.2	3.9	-	-	0.1	0.3	0.1	0.2	0.2	0.0	0.0	-
2011	0.0	4.0	1.4	0.2	-	0.3	2.4	-	-	0.0	0.9	-	0.8	0.6	0.0	0.5	1.3
2016	-	0.1	1.3	0.2	0.0	0.0	2.3	-	0.0	0.0	0.2	0.0	0.0	0.0	-	-	-

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

FORB SPECIES	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron divergens ^a (spreading fleabane)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Grindelia squarrosa (curlycup gumweed)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lithospermum ruderale (western stoneseed)	Lupinus argenteus (silvery lupine)	Microseris nutans (nodding microseris)	Microsteris gracilis ^a (slender phlox)	Oenothera pallida ^a (pale evening primrose)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)
year	Nested Frequency																
2001	7	95	91	48	-	3	-	35	8	10	8	2	12	28	15	7	37
2006	-	37	253	6	-	8	-	43	25	8	1	16	109	46	21	-	49
2011	-	147	198	32	2	33	-	25	136	230	9	14	157	15	-	-	-
2016	5	21	11	132	-	109	8	-	3	1	0	6	76	9	8	-	4
year	Average Cover (%)																
2001	0.0	0.2	0.5	0.7	-	0.0	-	0.1	0.0	0.0	0.5	0.1	0.0	0.1	0.2	0.0	0.1
2006	-	0.1	2.7	0.1	-	0.0	-	0.1	0.1	0.0	0.3	0.4	0.4	0.1	0.3	-	0.1
2011	-	0.6	5.7	0.8	0.0	0.2	-	0.1	1.6	2.9	0.3	0.2	3.5	0.0	-	-	-
2016	0.0	0.0	0.0	1.4	-	1.2	0.1	-	0.0	0.0	0.0	0.2	0.4	0.0	0.1	-	0.0

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

FORB SPECIES	Senecio integerrimus ^a (lambstongue ragwort)	Sphaeralcea coccinea (scarlet globemallow)	Symphoricarum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency					
2001	2	4	70	-	58	14
2006	-	8	73	-	12	5
2011	3	-	92	-	16	11
2016	4	8	66	15	15	9
year	Average Cover (%)					
2001	0.0	0.0	1.8	-	0.4	0.2
2006	-	0.1	2.2	-	0.2	0.1
2011	0.0	-	3.4	-	0.2	0.2
2016	0.0	0.0	1.6	0.4	0.0	0.0

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

Table 06-03.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier alnifolia ^p (Saskatoon serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Opuntia polyacantha (plains pricklypear)	Symphoricarpos oreophilus (mountain snowberry)
year	Line Intercept Cover (%)					
2001	-	-	-	-	-	-
2006	0.2	-	0.7	3.1	0	0.1
2011	0.1	-	0.6	0.2	0.1	0.3
2016	0.2	-	1.1	16.3	0.2	0.1
year	Quadrat Cover (%)					
2001	0.0	0.6	0.2	1.2	-	-
2006	0.1	0.4	0.0	2.5	0.0	0.0
2011	0.0	-	0.8	1.2	0.0	0.0
2016	0.0	-	0.6	10.6	0.0	0.0

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

Table 06-03.13 - 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 Plants Per Acre		Age Class Distribution Excluding Seedlings			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier alnifolia ^p -- (Saskatoon serviceberry)									
2001	40	-	0	0	100	50	50	0	54/60
2006	40	-	0	50	50	50	0	0	63/64
2011	40	-	0	100	0	50	50	0	49/67
2016	40	-	0	50	50	0	100	0	61/79
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
2001	20	-	0	100	0	100	0	0	51/85
2006	20	-	0	0	100	100	0	100	53/98
2011	20	-	0	0	100	100	0	100	49/101
2016	-	-	-	-	-	-	-	-	55/145
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
2001	320	-	0	100	0	0	0	0	26/38
2006	180	-	22	78	0	11	11	0	30/58
2011	260	-	8	92	0	0	0	0	32/62
2016	240	-	8	92	0	0	0	0	37/79
Ericameria nauseosa ssp. nauseosa var. speciosa ^p -- (rubber rabbitbrush)									
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	62/70
2011	-	-	-	-	-	-	-	-	34/116
2016	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
2001	4100	-	5	94	1	0	0	2	19/20
2006	3480	-	3	93	4	10	5	3	20/23
2011	1580	-	37	61	3	0	0	0	16/21
2016	43260	-	54	47	0	0	0	0	19/23

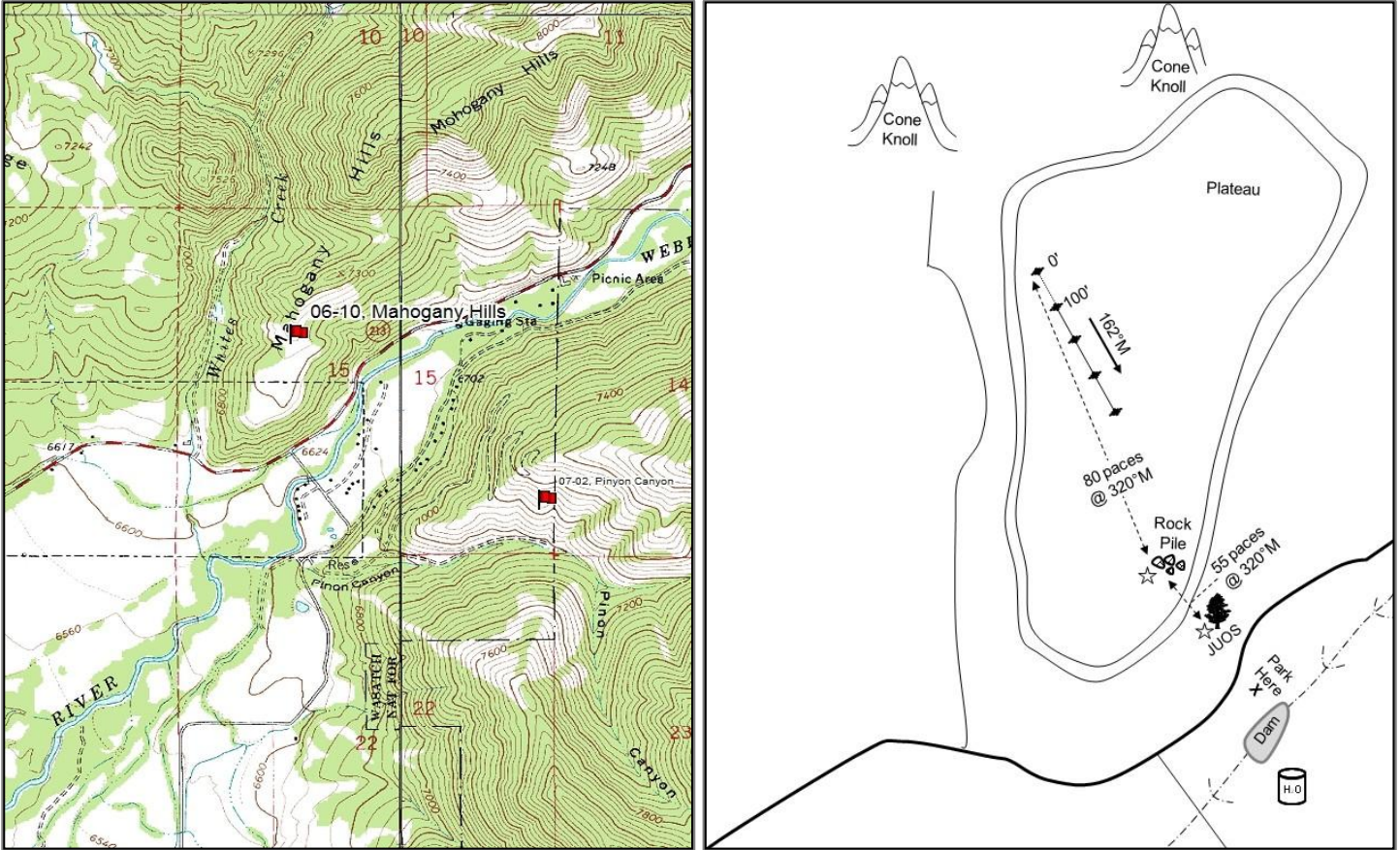
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Linanthus pungens -- (granite prickly phlox)									
2001	60	-	0	100	0	0	0	0	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
Opuntia polyacantha -- (plains pricklypear)									
2001	60	-	0	100	0	0	0	0	10/24
2006	80	-	25	75	0	0	0	0	16/52
2011	60	-	0	100	0	33	0	0	15/52
2016	100	-	0	100	0	0	0	0	13/48
Symphoricarpos oreophilus -- (mountain snowberry)									
2001	20	-	0	100	0	0	0	0	41/65
2006	40	-	0	100	0	0	0	0	51/97
2011	40	-	0	100	0	100	0	0	67/111
2016	20	-	0	0	100	0	0	0	57/93

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

Table -06-03.15 - Deer Desirable Components Index: High 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
2001	0.8	0.0	0.0	30.0	0.0	8.8	0.0	39.7	Very Poor-Poor
2006	0.7	0.0	0.0	30.0	0.0	10.0	0.0	40.7	Very Poor-Poor
2011	0.0	0.0	0.0	30.0	-0.5	10.0	0.0	39.5	Very Poor-Poor
2016	0.0	0.0	0.0	30.0	-1.1	10.0	0.0	39.0	Very Poor-Poor

MAHOGANY HILLS - STUDY NO. 06-10



Location Information

USGS 7.5 min Map Info Kamas NE; Township 1S, Range 6E, Section 15
 GPS (0' Stake) NAD 83 UTM ZONE 12, 478363 East 4509508 North

Transect Information

Browse Tag # (0' Stake) 7952
 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 Oakley, proceed up Weber Canyon watching for Pinyon Canyon Lane which is 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 at 320 degrees magnetic. From the rock pile, the 0-foot baseline stake is approximately 80 paces 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 plateau: from the stake to a cone knoll to the north is 7 degrees magnetic, 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

Wildlife Habitat and Vegetation History

Table 06-10.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
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

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 establishment in 1984, this study site has been dominated by a mixture of mountain browse species including mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), mountain snowberry (*Symphoricarpos oreophilus*), Saskatoon serviceberry (*Amelanchier alnifolia*), and others. Line Intercept cover of sagebrush has been decreasing slightly each sample year since 2006 (Table 06-10.12). Much of the herbaceous cover has been contributed by the introduced perennial grass species smooth brome (*Bromus inermis*), although other species are present. Annual grass has not been recorded on the site since 2001 (Table 06-10.10). Forbs are diverse, moderately abundant, and include valuable and palatable species (Table 06-10.7, Table 06-10.11). It is predicted that this site will continue to be dominated by perennial grasses and mountain browse species, barring a major disturbance.

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	23.5	13.1	-	-	-	-
2001	16.4	8.1	-	0.1	-	-
2006	15.7	9.8	-	16.6	12.3	-
2011	12.8	10.3	-	17.0	14.7	-
2016	15.4	9.5	-	15.5	10.0	-

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

Table 06-10.8 - 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	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

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	Elk	Rabbit
	Quadrat Frequency		
1996	12	22	-
2001	3	17	-
2006	11	14	1
2011	12	12	-
2016	22	10	7
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)	-

Table 06-10.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Dactylis glomerata ⁱ (orchardgrass)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Melica bulbosa (oniongrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency													
1996	8	345	-	-	6	2	25	37	8	11	73	132	124	96
2001	6	360	2	-	1	19	1	23	-	3	86	79	145	42
2006	5	368	-	2	-	-	-	92	1	36	36	38	91	25
2011	6	388	-	5	-	9	-	49	0	32	24	63	124	14
2016	5	413	-	24	-	14	-	45	-	33	4	108	111	36
year	Average Cover (%)													
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
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
2006	0.0	23.8	-	0.1	-	-	-	6.2	0.0	1.1	1.1	0.3	2.9	0.4
2011	0.0	29.3	-	0.0	-	0.0	-	1.4	0.0	0.8	0.6	1.8	2.4	0.2
2016	0.0	25.4	-	0.3	-	0.1	-	1.4	-	0.6	0.2	2.1	2.4	0.5

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	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum ^{ai} (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Arenaria (sandwort)	Artemisia ludoviciana (white sagebrush)	Astragalus convallarius (lesser rushy milkvetch)	Balsamorhiza sagittata (arrow/leaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (litlepod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)
year	Nested Frequency																
1996	1	-	3	14	1	17	-	3	65	5	-	-	11	-	6	24	-
2001	-	7	4	23	-	-	-	3	59	9	-	-	2	-	5	18	-
2006	3	5	68	36	-	11	-	4	36	13	29	-	10	1	-	16	-
2011	2	27	144	92	-	-	18	5	65	17	14	-	8	7	-	57	3
2016	3	27	65	86	-	1	-	4	87	13	27	2	8	1	0	15	-
year	Average Cover (%)																
1996	0.0	-	0.0	0.1	0.0	0.0	-	0.4	1.1	0.6	-	-	0.5	-	0.1	0.1	-
2001	-	0.0	0.0	0.3	-	-	-	0.1	0.8	0.9	-	-	0.1	-	0.2	0.1	-
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	-
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
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	-

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

FORB SPECIES	Comandra umbellata (bastard toadflax)	Cordylanthus ramosus ^a (bushy bird's beak)	Crepis acuminata (lapertip hawkbeard)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Erigeron pumilus (shaggy fleabane)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Hackelia patens (spotted stickseed)	Helianthella uniflora (oneflower helianthella)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lappula occidentalis ^a (flatspine stickseed)	Lithospermum ruderale (western stoneseed)	Lomatium (desertparsley)	Lupinus argenteus (silvery lupine)	Microsteris gracilis ^a (slender phlox)	Penstemon humilis (low beardtongue)
year	Nested Frequency																
1996	11	1	64	-	-	5	10	7	22	34	12	-	7	-	-	-	5
2001	2	7	57	-	-	5	9	5	4	20	3	-	6	-	-	16	-
2006	5	17	76	-	4	4	2	9	0	31	-	6	3	11	-	12	-
2011	11	18	76	46	34	-	-	14	2	34	3	-	3	2	1	44	-
2016	13	16	58	3	69	-	5	5	1	26	-	-	5	0	-	9	-
year	Average Cover (%)																
1996	0.1	0.0	0.6	-	-	0.0	0.2	0.1	0.2	1.4	0.1	-	0.2	-	-	-	0.1
2001	0.2	0.0	0.6	-	-	0.0	0.1	0.1	0.0	1.5	0.0	-	0.1	-	-	0.1	-
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	0.0	-	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	-

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

FORB SPECIES	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Schoenocrambe limifolia (flaxleaf plainsmustard)	Senecio integerrimus ^a (lambstongue ragwort)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency				
1996	-	15	2	-	3
2001	3	-	1	15	3
2006	-	13	-	15	2
2011	-	13	-	39	-
2016	-	11	-	-	4
year	Average Cover (%)				
1996	-	0.0	0.0	-	0.0
2001	0.0	-	0.0	0.1	0.0
2006	-	0.0	-	0.1	0.0
2011	-	0.1	-	0.6	-
2016	-	0.0	-	-	0.1

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 alnifolia ^p (Saskatoon serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Cercocarpus montanus ^p (alderleaf mountain mahogany)	Chrysothamnus depressus ^p (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Purshia tridentata ^p (antelope bitterbrush)	Quercus gambelii ^p (Gambel oak)	Symphoricarpos oreophilus (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	5.5	7.2	0.3	0.3	3.8	0.9	1.3	6	0.2
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	3.7	7.7	0.0	0.7	2.8	0.6	2.6	6.7	0.0

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

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 (%)				
Amelanchier alnifolia ^p -- (Saskatoon serviceberry)									
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
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
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
Cercocarpus ledifolius var. ledifolius ^p -- (curl-leaf mountain mahogany)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	160/125
2016	-	-	-	-	-	-	-	-	160/103
Cercocarpus montanus ^p -- (alderleaf mountain mahogany)									
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

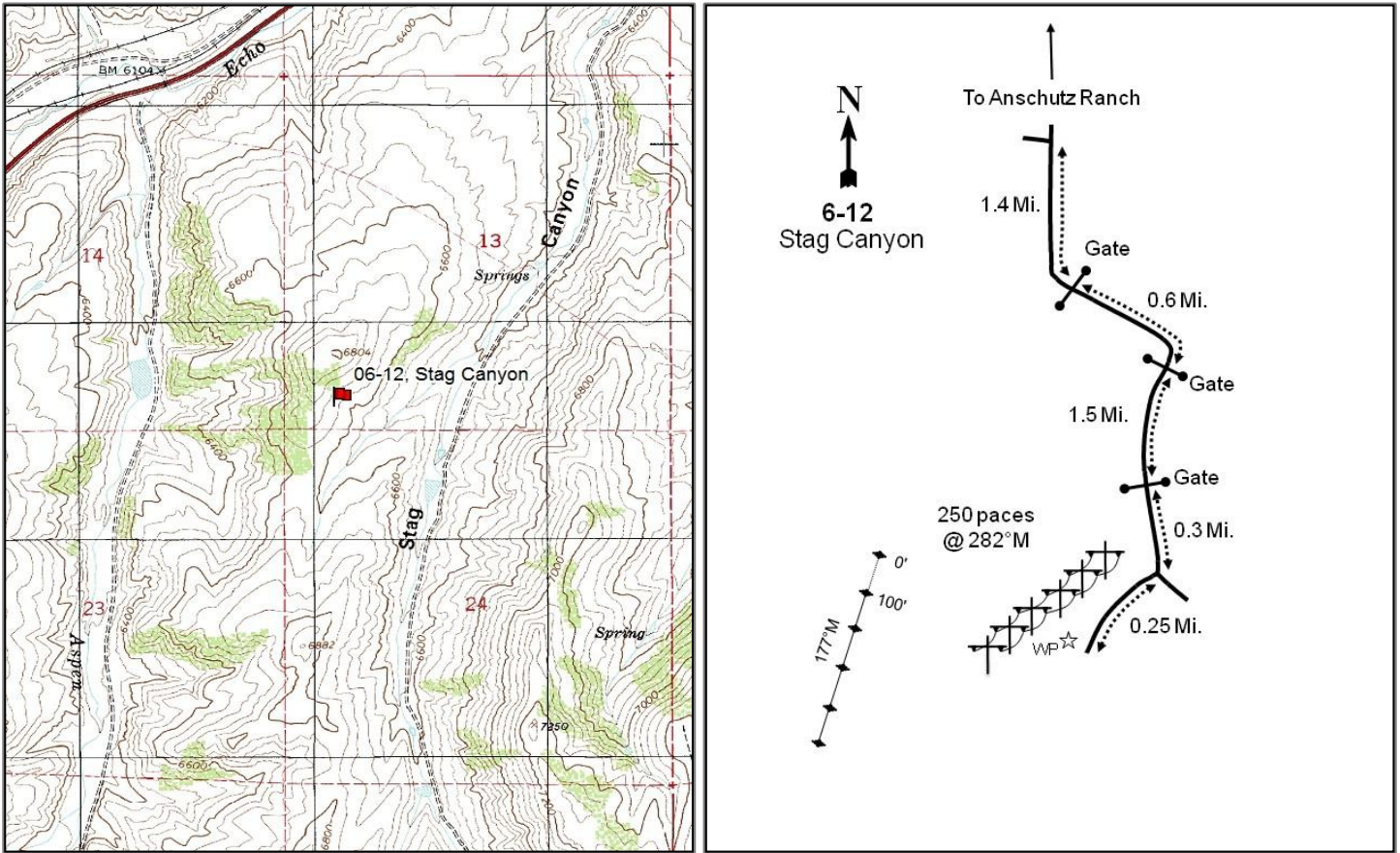
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Chrysothamnus depressus^p -- (longflower rabbitbrush)									
1996	220	-	0	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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	20	-	0	100	0	0	0	0	21/20
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
1996	-	-	-	-	-	-	-	-	14/23
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	10/25
Purshia tridentata^p -- (antelope bitterbrush)									
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
Quercus gambelii^p -- (Gambel oak)									
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
Ribes^p -- (currant)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	52/49
Symphoricarpos oreophilus -- (mountain snowberry)									
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
Tetradymia canescens -- (spineless horsebrush)									
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

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

Table -06-10.15 - Deer Desirable Components Index: High 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	5.4	1.4	30.0	0.0	10.0	0.0	76.8	Good
2001	21.4	4.4	1.6	30.0	0.0	10.0	0.0	67.4	Fair
2006	20.2	4.0	3.5	30.0	0.0	10.0	0.0	67.7	Fair
2011	16.4	4.3	4.0	30.0	0.0	10.0	0.0	64.6	Fair
2016	19.6	14.3	9.2	30.0	0.0	10.0	0.0	83.0	Good

STAG CANYON - STUDY No. 06-12



Location Information

USGS 7.5 min Map Info Castle Rock NW; Township 4N, Range 6E, Section 13
 GPS (0' Stake) NAD 83 UTM ZONE 12, 481027 East 4546813 North

Transect Information

Browse Tag # (0' Stake) 53
 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 up Echo Canyon and turn right on the frontage road (west). Drive 1.4 miles, turn left and go through the locked Aspen Meadows Ranch gate. Go 0.6 miles and turn off to the right through the gate next to the corral. Go 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 which is marked by browse tag #53. The baseline runs 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

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
Deer	crucial	summer	
Elk	crucial	summer	
Greater Sage Grouse	Crucial	occupied & Winter	brood-rearing
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

Site Notes

The study is located on private land that is part of the Ensign Ranches Cooperative Wildlife Management Unit (CWMU) up Echo canyon. The area is an old burn that is again 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 establishment in 1996, this site has existed in a stable state as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) plant community with yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus*) as a subordinate shrub species (Table 06-12.12). The herbaceous understory is dominated by the invasive annual grass cheatgrass (*Bromus tectorum*), although desirable perennial species are present in smaller amounts (Table 06-12.10). Forbs are fairly diverse and abundant, but cover is mainly provided by the introduced annual species desert madwort (*Alyssum desertorum*) (Table 06-12.7, Table 06-12.11). Utah juniper (*Juniperus osteosperma*) seedlings and young were observed in 2006 and 2011 (respectively), indicating that this site has the potential for encroachment in the future (Table 06-12.13).

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	-

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	168	237	74	4.4	5.7	7.8	0.6
2001	154	198	354	43	1.9	5.6	4.9	0.5
2006	273	157	400	112	4.0	6.1	4.8	2.2
2011	349	129	438	161	11.1	4.9	18.8	3.7
2016	366	137	444	110	11.2	6.1	12.5	1.7

Table 06-12.8 - 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	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

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	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
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)	-	-

Table 06-12.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Poa fendleriana (nuttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency							
1996	57	272	78	15	-	14	10	11
2001	64	154	91	14	2	34	8	11
2006	66	273	57	18	3	23	17	11
2011	37	349	63	8	5	2	32	6
2016	29	366	36	46	5	18	13	5
year	Average Cover (%)							
1996	2.1	4.4	2.6	0.3	-	0.5	0.1	0.2
2001	1.4	1.9	2.1	0.4	0.0	1.3	0.1	0.2
2006	3.6	4.0	1.1	0.3	0.0	0.1	0.4	0.5
2011	1.4	11.1	1.3	0.6	0.3	0.1	1.0	0.2
2016	0.9	11.2	0.5	3.2	0.1	0.6	0.5	0.3

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 ^{ai} (desert madwort)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus cibaricus (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Cordylanthus ramosus ^a (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	-
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	-

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

FORB SPECIES	Delphinium nuttallianum (two-lobed larkspur)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Gayophytum ramosissimum ^a (pinion groundsmoke)	Gilia ^a (gilia)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lithospermum ruderale (western stone seed)	Machaeranthera (tansyaster)	Microsteris gracilis ^a (slender phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Sisymbrium altissimum ^{ai} (tall tumbled mustard)	Sphaeralcea coccinea (scarlet globemallow)	Symphyotrichum ascendens (western aster)	Tragopogon dubius ^{ai} (yellow salsify)	unknown perennial forb (unknown forb)
year	Nested Frequency																
1996	-	-	1	3	-	-	5	-	-	-	42	26	1	26	-	6	2
2001	-	-	-	2	2	4	-	0	1	4	19	-	-	9	-	0	-
2006	-	10	9	-	3	-	7	4	-	91	49	-	-	7	-	0	-
2011	9	3	3	4	-	-	4	2	-	40	40	4	-	12	8	6	-
2016	-	2	-	-	-	-	17	3	-	13	31	-	-	10	12	1	-
year	Average Cover (%)																
1996	-	-	0.0	0.0	-	-	0.0	-	-	-	0.2	0.1	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	-	0.0	0.1	-	0.2	0.6	-	-	0.4	-	0.0	-
2011	0.1	0.0	0.0	0.0	-	-	0.0	0.2	-	0.1	0.3	0.0	-	0.5	0.4	0.0	-
2016	-	0.0	-	-	-	-	0.1	0.1	-	0.0	0.1	-	-	0.3	0.6	0.0	-

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

FORB SPECIES	Verbascum thapsus ^{ai} (common mullein)	Viola (violet)
year	Nested Frequency	
1996	59	-
2001	17	-
2006	-	-
2011	-	10
2016	-	-
year	Average Cover (%)	
1996	2.3	-
2001	0.3	-
2006	-	-
2011	-	0.1
2016	-	-

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	Line Intercept Cover (%)			
	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. 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
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

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

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 (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
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
Juniperus osteosperma^t -- (Utah juniper)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	20	0	0	0	0	0	0	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	40	-	100	0	0	50	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 (%)				
Opuntia -- (pricklypear)									
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
Purshia tridentata^P -- (antelope bitterbrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	26/161
2006	-	-	-	-	-	-	-	-	25/197
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	28/107
Tetradymia canescens -- (spineless horsebrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	15/66
2011	-	-	-	-	-	-	-	-	21/57
2016	-	-	-	-	-	-	-	-	22/63

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

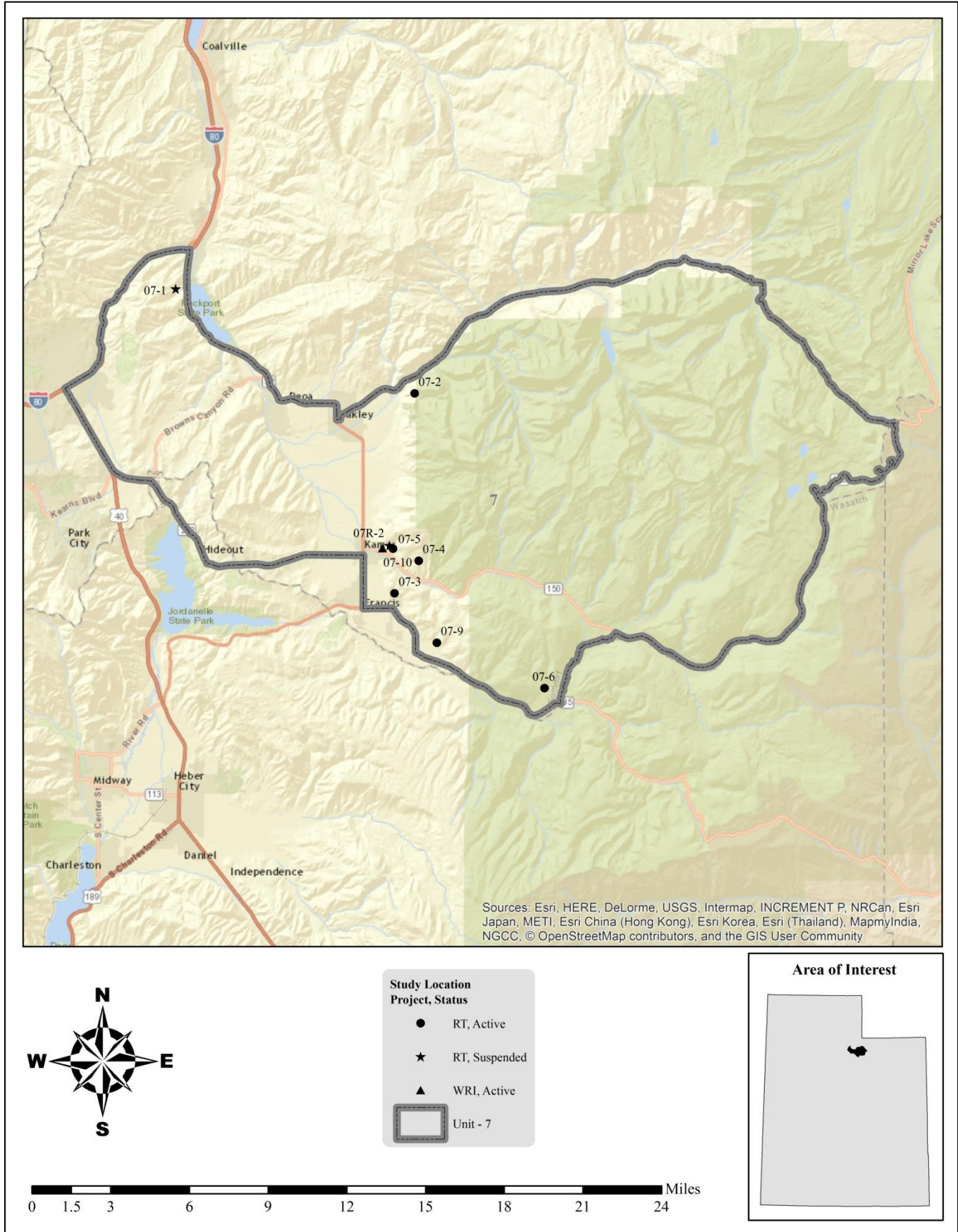
Table 06-12.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2016	4	-	100	-	-	-	2.7

Table -06-12.15 - Deer Desirable Components Index: Mid 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	12.0	15.0	15.0	11.5	-3.3	10.0	0.0	60.2	Fair
2001	14.6	14.4	14.5	12.0	-1.4	2.7	0.0	56.8	Fair
2006	20.8	13.2	10.5	12.5	-3.0	4.5	0.0	58.5	Fair
2011	20.6	11.7	4.0	9.9	-8.3	8.9	0.0	46.7	Poor
2016	22.6	12.3	1.5	12.2	-8.4	3.4	0.0	43.6	Poor

WILDLIFE MANAGEMENT UNIT 07 - KAMAS

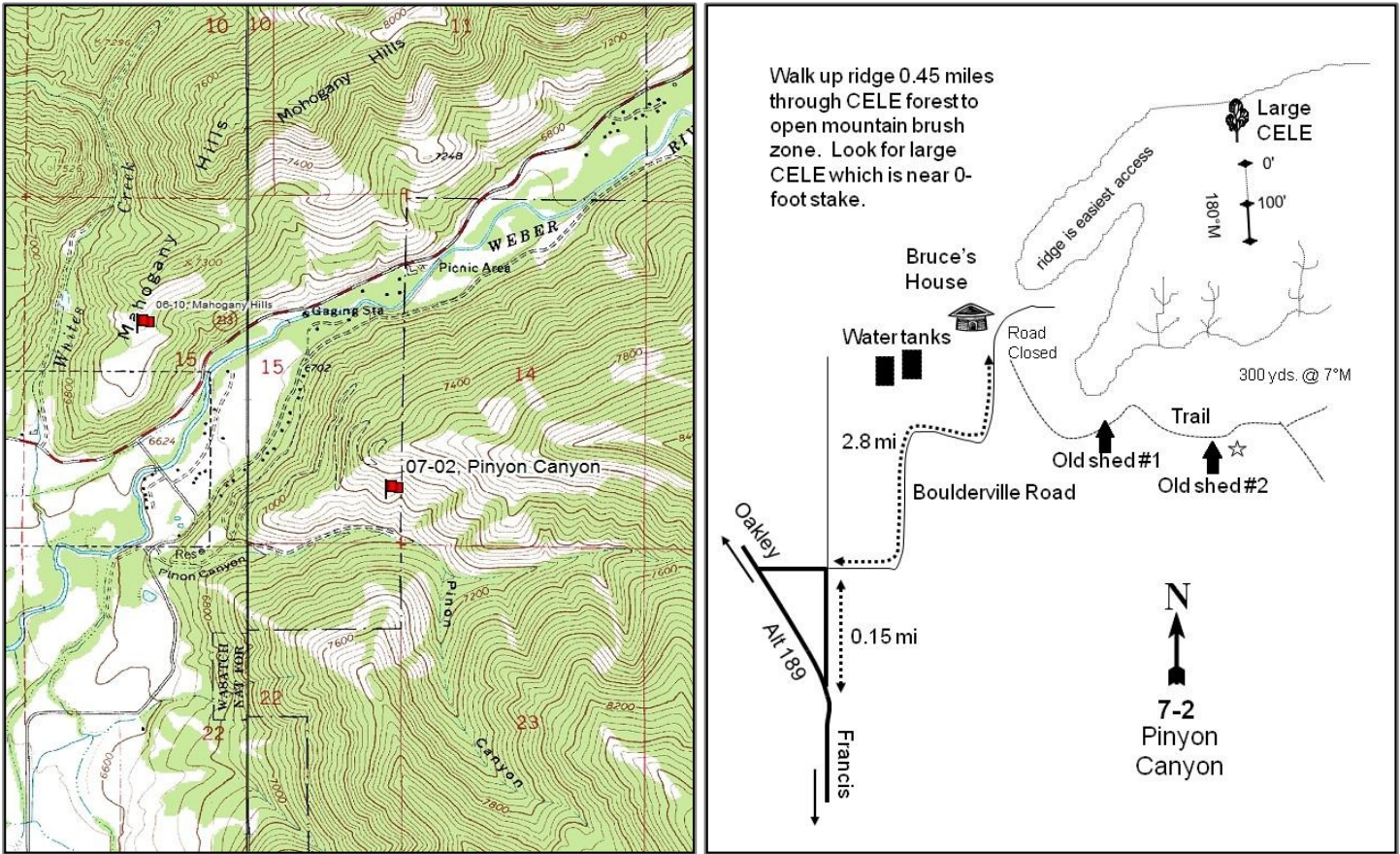


Study Location Project, Status

- RT, Active
- ★ RT, Suspended
- ▲ WRI, Active
- Unit - 7

Area of Interest

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 180° 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 2.8 miles. Turn right onto a dirt road proceeding up Pinyon Canyon to a private home, passing two water storage tanks. Contact landowner before proceeding through private land. From the landowner's home, walk up the ridge through a curlleaf mahogany and pinyon forest for about a half mile. As the forest opens up into a mountain brush vegetation type look for a lone, large curlleaf 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

Wildlife Habitat and Vegetation History

Table 07-02.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
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

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 (Table 07-02.6, Table 07-02.12). 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 invasive annual grass cheatgrass (*Bromus tectorum*) is present and frequency remains high, but cover has decreased overall (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 (Table 07-02.12, Table 07-02.13, Photos). It is therefore expected that this study site will remain in this state in future sample years.

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	7.5	2.7	-	-	-	-
2001	9.3	4.0	-	-	-	-
2006	9.4	3.5	-	14.6	1.7	-
2011	9.8	1.8	-	13.0	1.0	-
2016	12.1	1.7	-	17.2	2.0	-

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

Table 07-02.8 - 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	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

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	Elk	Rabbit
	Quadrat Frequency		
1996	11	32	-
2001	14	43	-
2006	3	49	-
2011	8	59	-
2016	3	40	2
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)	-

Table 07-02.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Koeleria macrantha (prairie Junegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency						
1996	-	318	-	55	-	195	379
2001	-	249	-	29	-	217	337
2006	4	316	-	24	-	133	341
2011	6	244	-	10	7	156	357
2016	-	177	26	2	4	35	370
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

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	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum ^{ai} (desert madwort)	Alyssum szovitsianum ^{ai} (Szowitz' madwort)	Astragalus (milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcapa ^{ai} (littlerod false flax)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium fremontii ^a (Fremont's goosefoot)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawk/beard)	Cymopterus (springparsley)	Descurainia pinnata ^a (western tansymustard)
year	Nested Frequency																
1996	-	5	31	-	-	-	-	131	8	13	-	9	-	29	1	2	-
2001	11	51	73	-	2	-	4	53	51	-	1	12	2	24	2	5	7
2006	11	69	342	-	2	1	6	3	60	-	-	6	-	18	7	1	5
2011	19	112	414	-	6	0	-	2	120	-	-	3	4	16	2	3	5
2016	24	60	273	151	2	0	20	1	12	-	-	15	-	32	2	-	-
year	Average Cover (%)																
1996	-	0.0	0.2	-	-	-	-	0.6	0.0	0.1	-	0.1	-	0.2	0.0	0.0	-
2001	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
2006	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
2011	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
2016	0.2	0.2	3.1	0.9	0.0	0.1	0.1	0.0	0.1	-	-	0.5	-	0.7	0.0	-	-

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

FORB SPECIES	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Erigeron strigosus (prairie fleabane)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Gilia ^a (gilia)	Helianthus (sunflower)	Helionis multiflora var. multiflora (showy goldeneye)	Holosteum umbellatum ^{ai} (jagged chickweed)	Ipomopsis aggregata (scarlet gilia)	Lappula occidentalis ^a (flatspine stickseed)	Lomatium (desertparsley)	Microsteris gracilis ^a (slender phlox)	Penstemon (beardtongue)	Penstemon humilis (low beardtongue)	Petroradia pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	
year	Nested Frequency																	
1996	-	-	2	2	6	-	8	-	9	-	-	1	-	-	19	42	1	
2001	-	9	2	-	-	5	-	5	8	2	-	-	70	-	11	37	-	
2006	6	9	1	-	1	-	-	1	-	-	1	5	7	-	11	24	-	
2011	-	10	5	-	-	1	3	13	12	-	-	13	11	-	16	30	-	
2016	-	3	9	-	-	-	-	1	-	-	-	12	-	4	10	35	-	
year	Average Cover (%)																	
1996	-	-	0.1	0.0	0.0	-	0.1	-	0.1	-	-	0.0	-	-	0.4	1.6	0.0	
2001	-	0.0	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	0.0	-	-	0.3	0.0	-	1.0	2.6	-	
2016	-	0.0	0.1	-	-	-	-	0.1	-	-	-	0.4	-	0.2	0.3	3.3	-	

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

FORB SPECIES	Polygonum douglasii ^a (Douglas' knotweed)	Symphotrichum ascendens (western aster)	Tragopogon dubius ^{ai} (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency			
1996	4	-	8	-
2001	-	-	21	-
2006	-	-	5	-
2011	-	-	16	3
2016	-	1	18	3
year	Average Cover (%)			
1996	0.0	-	0.1	-
2001	-	-	0.4	-
2006	-	-	0.1	-
2011	-	-	0.1	0.2
2016	-	0.1	0.1	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 alnifolia ^p (Saskatoon serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Cercocarpus montanus ^p (alderleaf mountain mahogany)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Purshia tridentata ^p (antelope bitterbrush)	Quercus gambelii ^p (Gambel oak)	Symphoricarpos oreophilus (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
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

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

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 (%)				
Amelanchier alnifolia ^p -- (Saskatoon serviceberry)									
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
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
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
Cercocarpus ledifolius var. ledifolius ^p -- (curl-leaf mountain mahogany)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	39/42
Cercocarpus montanus ^p -- (alderleaf mountain mahogany)									
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

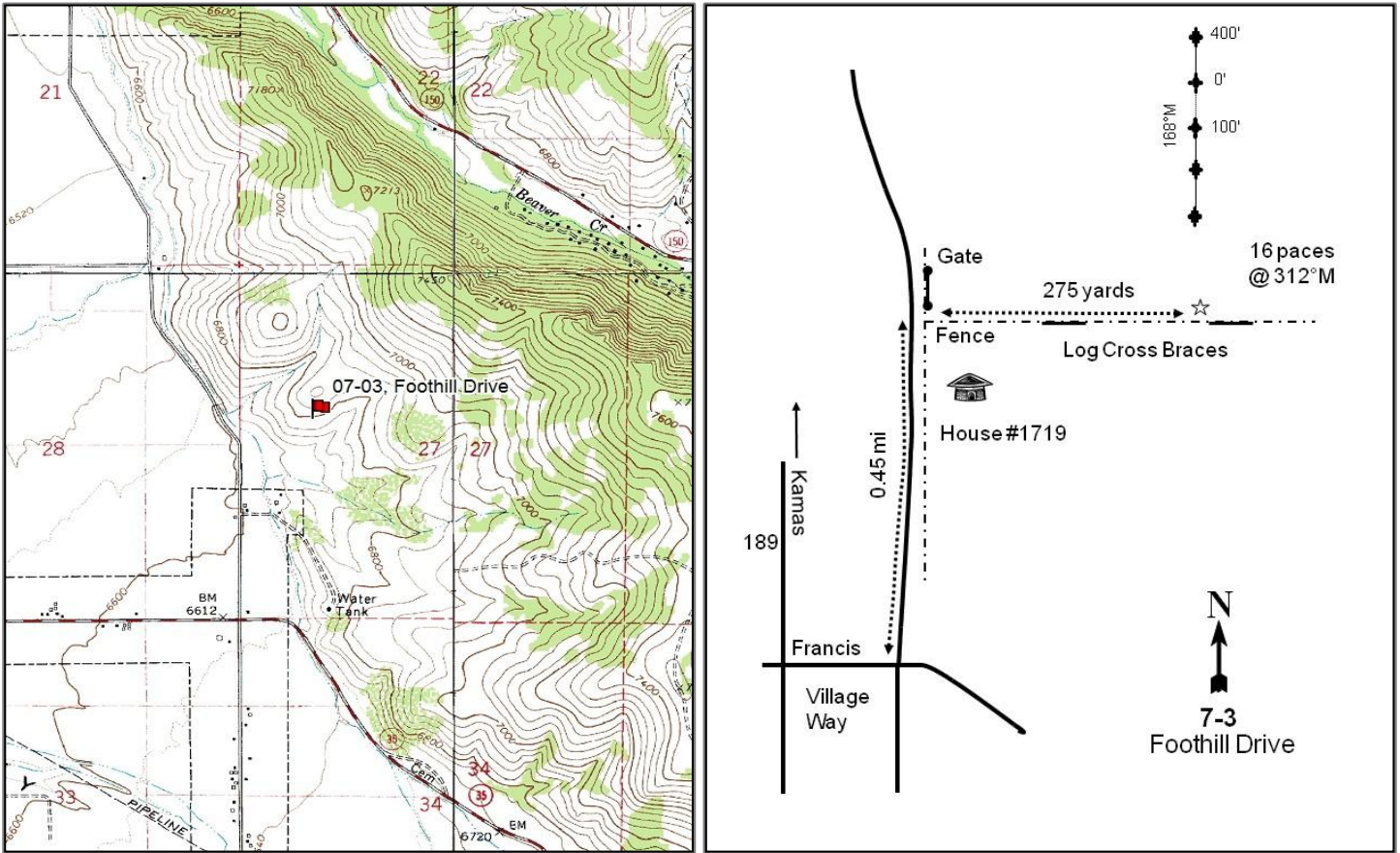
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
1996	-	-	-	-	-	-	-	-	36/53
2001	-	-	-	-	-	-	-	-	47/69
2006	-	-	-	-	-	-	-	-	28/55
2011	-	-	-	-	-	-	-	-	20/59
2016	-	-	-	-	-	-	-	-	19/40
Gutierrezia sarothrae -- (broom snakeweed)									
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
Mahonia repens -- (creeping barberry)									
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
Purshia tridentata^p -- (antelope bitterbrush)									
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
Quercus gambelii^p -- (Gambel oak)									
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
Sambucus nigra ssp. cerulea^p -- (blue elderberry)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	71/167
2006	-	-	-	-	-	-	-	-	93/182
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	96/142
Symphoricarpos oreophilus -- (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

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

Table -07-02.15 - Deer Desirable Components Index: High 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	11.0	13.8	14.9	30.0	-4.9	4.7	0.0	69.6	Fair-Good
2001	13.1	12.1	6.1	30.0	-4.2	7.6	0.0	64.7	Fair
2006	12.9	10.2	5.4	30.0	-3.0	7.5	0.0	63.0	Fair
2011	14.0	9.9	8.4	29.7	-1.4	10.0	0.0	70.5	Fair-Good
2016	16.9	14.2	12.2	30.0	-1.8	10.0	0.0	81.5	Good

FOOTHILL DRIVE - STUDY No. 07-3



Location Information

USGS 7.5 min Map Info Francis NE; Township 2S, Range 6E, Section 27
 GPS (0' Stake) NAD 83 UTM ZONE 12, 478191 East 4496482 North

Transect Information

Browse Tag # (0' Stake) 7958
 Transect Bearing 168° magnetic (Line 4: 348° 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

At the junction of Hwy 189 and Village Way in Francis, proceed east for 1.0 mile. Turn left (north) onto Foothill Drive, and proceed 0.45 miles to house #1719 on the right. Park here and walk southeast for about 1330 feet to the 0-foot baseline stake. The 0-foot stake is marked by browse tag #7958. The first 300 feet of the baseline runs 168 degrees magnetic. Line 4 runs off the 0-foot baseline stake at a bearing of 348 degrees magnetic.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,800ft (2,073m)
Aspect	Southeast
Slope	30%
Sample Dates	09/13/1996, 08/28/2001, 07/05/2006, 06/28/2011, 06/23/2016

Wildlife Habitat and Vegetation History

Table 07-03.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Moose	crucial	winter

Table 07-03.4 - 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/Annual Grass	NA
2001	Mountain Big Sagebrush/Annual Grass	NA
2006	Mountain Big Sagebrush/Annual Grass	NA
2011	Mountain Big Sagebrush/Annual Grass	NA
2016	Mountain Big Sagebrush/Annual Grass	NA

Site Notes

The study is located in the foothills east of Francis on privately owned, crucial deer winter range. This study samples an open mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and grass foothill that is surrounded by adjacent ridges dominated by Gambel oakbrush (*Quercus gambelii*).

Soils

Table 07-03.5 - 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	6.4	42.2	29.1	28.7	5.0	27.4	243.2	0.6	09/13/1996

Site Potential

1981-2010 Average Annual Precipitation 19 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 1984, this site has existed in a stable state with a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated shrub overstory with lesser amounts of preferred browse such as Woods' rose (*Rosa woodsii*) and Saskatoon serviceberry (*Amalanchier alnifolia*) (Table 07-03.12). Due to differences in methodology, annual grass cover was not recorded in 1984 or 1990, but the invasive species cheatgrass (*Bromus tectorum*) has dominated the interspaces of this site since 1996; perennial grasses have remained rare (Table 07-03.10). Forbs are diverse and have generally been fairly abundant, but annual forbs dominate and include undesirable species such as redstem stork's bill (*Erodium cicutarium*) and the noxious weed nodding plumeless thistle (*Carduus nutans*) (Table 07-03.7, Table 07-03.11).

Trend Summary Tables

Table 07-03.6 - 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	6.5	3.0	-	-	-	-
2001	8.2	3.2	-	-	-	-
2006	9.7	1.3	-	11.1	1.3	-
2011	10.1	3.3	-	15.5	3.2	-
2016	10.2	3.7	-	11.5	5.0	-

Table 07-03.7 - 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	428	134	275	180	12.5	2.6	4.9	7.7
2001	376	157	317	170	11.2	3.0	9.9	9.2
2006	414	56	316	130	16.5	0.7	6.9	3.1
2011	437	82	382	117	22.3	2.1	17.3	4.3
2016	400	77	333	207	14.0	1.5	10.1	5.1

Table 07-03.8 - 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	1.3	0.3	41.0	1.2	32.6	40.6
2001	4.9	-	30.2	3.6	36.7	47.4
2006	6.5	0.0	22.0	4.4	43.8	34.4
2011	2.3	-	22.9	2.1	37.8	60.5
2016	9.8	0.0	14.4	6.1	39.8	37.8

Table 07-03.9 - 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	Elk	Horse	Rabbit
	Quadrat Frequency				
1996	7	23	-	-	-
2001	-	11	-	-	7
2006	6	22	1	2	1
2011	-	2	1	-	1
2016	3	14	2	2	14
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	6.5 (16.1)	58.3 (144.0)	2.0 (5.0)	0.6 (1.4)	-
2006	9.4 (23.3)	68.3 (168.8)	-	7.0 (17.2)	-
2011	3.6 (9.0)	32.2 (79.5)	2.7 (6.6)	-	-
2016	2.9 (7.2)	36.2 (89.4)	-	5.8 (14.3)	-

Table 07-03.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency							
1996	179	355	-	-	-	58	68	20
2001	133	347	-	-	-	112	45	16
2006	56	411	0	1	1	32	14	9
2011	169	418	-	-	-	50	21	15
2016	188	389	-	3	4	28	33	16
year	Average Cover (%)							
1996	2.4	10.2	-	-	-	1.1	1.3	0.3
2001	1.1	10.1	-	-	-	2.2	0.4	0.4
2006	0.2	16.3	0.0	0.0	0.0	0.4	0.3	0.0
2011	3.6	18.7	-	-	-	0.9	0.6	0.6
2016	2.5	11.5	-	0.0	0.1	0.3	0.8	0.2

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

Table 07-03.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littlepod false flax)	Carduus nutans ^{ai} (nodding plumeless thistle)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cryptantha (cryptantha)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)
year	Nested Frequency																
1996	-	-	43	-	40	-	-	-	-	-	49	-	-	-	1	-	2
2001	-	2	9	6	77	2	-	-	-	4	16	7	4	-	2	2	-
2006	2	5	63	4	35	3	-	1	5	12	5	13	-	3	-	1	9
2011	-	3	124	-	48	-	3	9	19	10	25	41	4	4	-	8	7
2016	-	-	159	-	68	-	1	-	16	12	40	4	-	6	-	3	4
year	Average Cover (%)																
1996	-	-	0.2	-	2.0	-	-	-	-	-	1.1	-	-	-	0.0	-	0.0
2001	-	0.0	0.1	0.0	3.7	0.0	-	-	-	0.0	1.3	0.0	0.0	-	0.0	0.0	-
2006	0.0	0.0	0.3	0.0	0.3	0.0	-	0.0	0.1	0.1	0.0	0.1	-	0.0	-	0.0	0.0
2011	-	0.0	1.2	-	1.9	-	0.0	0.0	1.3	0.0	0.7	0.6	0.1	0.0	-	0.1	0.1
2016	-	-	0.7	-	1.3	-	0.0	-	0.4	0.0	0.8	0.0	-	0.2	-	0.0	0.0

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

FORB SPECIES																	
Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Gaillardia aristata (blanketflower)	Galium aparine ^a (stickywilly)	Grindelia squarrosa (curlycup gumweed)	Helianthus multiflorus var. multiflorus (showy goldeneye)	Heterotheca villosa (hairy false goldenaster)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Lepidium campestre ^{ai} (field pepperweed)	Lithophragma (woodland-star)	Lithospermum ruderale (western stoneseed)	Lupinus argenteus (silvery lupine)	Malva neglecta ⁱ (common mallow)	
year	Nested Frequency																
1996	179	12	9	-	21	-	-	-	126	33	70	25	-	-	-	0	-
2001	91	-	17	-	257	-	-	3	23	60	44	1	-	-	-	-	-
2006	180	-	13	3	247	-	-	-	61	28	150	9	-	-	-	-	-
2011	280	-	17	4	189	-	4	-	11	33	167	52	-	3	8	-	-
2016	35	-	2	19	284	1	5	-	96	57	-	12	6	-	6	-	1
year	Average Cover (%)																
1996	2.5	0.4	0.1	-	0.3	-	-	-	3.5	1.6	0.4	0.1	-	-	-	0.0	-
2001	0.4	-	0.6	-	7.8	-	-	0.0	0.7	4.1	0.1	0.0	-	-	-	-	-
2006	1.3	-	0.1	0.0	4.3	-	-	-	1.4	1.0	0.6	0.0	-	-	-	-	-
2011	8.7	-	0.5	0.0	2.4	-	0.4	-	0.2	1.1	1.0	0.4	-	0.0	0.2	-	-
2016	0.2	-	0.0	0.4	7.1	0.0	0.1	-	1.7	1.3	-	0.2	0.0	-	0.0	-	0.0

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

FORB SPECIES									
Marrubium vulgare ⁱ (horehound)	Microsteris gracilis ^a (slender phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Potentilla gracilis (slender cinquefoil)	Sphaeralcea grossularifolia (gooseberryleaf globemallow)	Symphytotrichum (aster)	Tragopogon dubius ^{ai} (yellow salsify)	Verbascum thapsus ^{ai} (common mullein)	
year	Nested Frequency								
1996	-	-	-	18	2	1	3	11	5
2001	0	-	1	8	2	-	-	9	-
2006	-	4	1	2	1	-	10	2	1
2011	-	7	-	5	-	-	4	16	-
2016	-	-	-	1	2	-	5	18	13
year	Average Cover (%)								
1996	-	-	-	0.0	0.0	0.0	0.0	0.1	0.3
2001	0.0	-	0.0	0.1	0.0	-	-	0.0	-
2006	-	0.0	0.0	0.0	0.0	-	0.2	0.0	0.0
2011	-	0.0	-	0.0	-	-	0.4	0.3	-
2016	-	-	-	0.0	0.0	-	0.0	0.2	0.4

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

Table 07-03.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier alnifolia ^p (Saskatoon serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus depressus ^p (longflower rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Opuntia polyacantha (plains pricklypear)	Rosa woodsii ^p (Woods' rose)	Symphoricarpos oreophilus (mountain snowberry)
year	Line Intercept Cover (%)							
1996	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-
2006	-	10.1	-	-	1	0.3	1	-
2011	0.3	12.8	-	-	2.9	0.3	2.4	-
2016	0	10	-	0.4	3.8	0.8	1.5	-
year	Quadrat Cover (%)							
1996	0.2	5.7	0.0	2.4	0.4	0.2	0.6	-
2001	0.1	7.4	-	1.7	1.1	0.5	0.8	-
2006	0.1	8.6	-	-	1.1	0.2	0.9	-
2011	0.1	8.4	-	0.1	2.5	0.5	1.6	0.1
2016	0.2	8.4	-	0.3	2.9	0.5	1.7	-

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

Table 07-03.13 - 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 (%)				
Amelanchier alnifolia ^p -- (Saskatoon serviceberry)									
1996	20	-	0	100	0	100	0	0	47/65
2001	40	-	0	100	0	50	50	0	75/95
2006	20	-	0	100	0	100	0	0	60/81
2011	40	-	0	100	0	50	50	0	74/87
2016	40	-	50	50	0	0	50	0	80/98
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
1996	1180	-	10	70	20	32	2	0	47/91
2001	1180	-	10	73	17	5	2	9	54/98
2006	1000	180	6	84	10	36	28	6	64/110
2011	920	-	2	74	24	28	26	28	68/122
2016	1080	-	4	69	28	19	33	24	70/127
Chrysothamnus depressus ^p -- (longflower rabbitbrush)									
1996	80	-	0	100	0	25	0	0	24/45
2001	40	-	0	100	0	0	0	0	- / -
2006	20	-	0	100	0	0	100	0	14/27
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1996	4360	-	4	96	0	0	0	0	22/30
2001	2680	-	0	97	3	0	0	1	23/31
2006	60	-	33	67	0	67	0	0	12/16
2011	100	-	0	100	0	0	0	0	19/18
2016	620	-	10	90	0	0	0	0	26/32

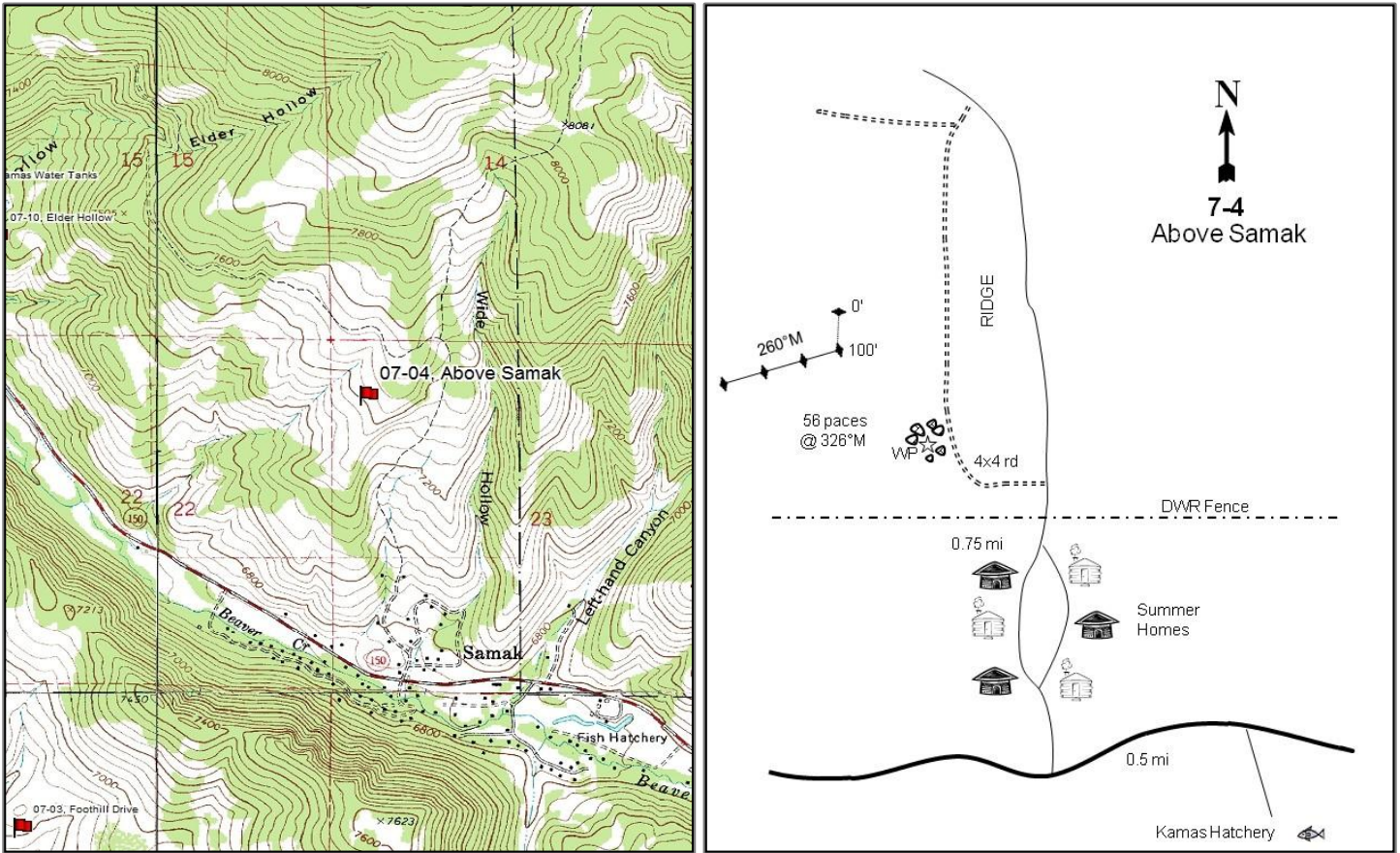
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Mahonia repens -- (creeping barberry)									
1996	3260	-	11	89	0	0	0	0	13/19
2001	7000	-	0	100	0	0	0	0	9/11
2006	6740	-	5	95	0	0	0	0	8/11
2011	11800	-	14	86	0	0	0	0	9/35
2016	16880	-	0	100	0	1	0	0	9/13
Opuntia polyacantha -- (plains pricklypear)									
1996	400	-	10	85	5	0	0	0	11/29
2001	620	-	7	90	3	0	0	0	12/29
2006	540	20	19	67	15	0	0	4	13/45
2011	480	-	0	96	4	0	0	4	12/37
2016	640	20	0	100	0	0	0	0	13/36
Rosa woodsii^p -- (Woods' rose)									
1996	1060	-	47	53	0	0	0	0	41/46
2001	1400	-	0	99	1	69	26	1	20/17
2006	1960	-	24	77	0	0	0	0	18/21
2011	1680	-	0	100	0	0	0	0	40/48
2016	2040	-	0	100	0	10	0	0	41/38
Symphoricarpos oreophilus -- (mountain snowberry)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	39/73
2011	-	-	-	-	-	-	-	-	61/82
2016	-	-	-	-	-	-	-	-	46/81

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

Table -07-03.15 - Deer Desirable Components Index: Mid 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	8.2	9.7	6.5	5.2	-9.4	10.0	0.0	30.3	Very Poor
2001	10.4	10.4	4.5	6.0	-8.4	10.0	0.0	32.8	Very Poor
2006	12.2	12.3	3.8	1.5	-12.5	6.5	0.0	23.8	Very Poor
2011	12.8	9.0	0.8	4.2	-16.9	10.0	0.0	20.0	Very Poor
2016	12.9	8.1	2.1	3.0	-10.5	10.0	-2.0	23.7	Very Poor

ABOVE SAMAK - STUDY NO. 07-4



Location Information

USGS 7.5 min Map Info Hoyt Peak SW; Township 2S, Range 6E, Section 23
 GPS (0' Stake) 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. 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. Proceed 0.1 miles past the gate and turn left, proceeding up a very steep hill (4X4 recommended). Drive north to a half high witness post in the middle of a rock pile on the left 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 marked by browse tag #7959. The baseline doglegs at the 100-foot baseline stake and runs 260 degrees magnetic.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	KAMAS VALLEY
Elevation	7,300ft (2,225m)
Aspect	Southwest
Slope	20-23%
Sample Dates	09/18/1996, 07/03/2001, 07/06/2006, 06/28/2011, 06/15/2016

Table 07-04.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	Early 1960s	-
Seeding - Unknown	-	-	Early 1960s	-

Wildlife Habitat and Vegetation History

Table 07-04.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
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 1960s. 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 Saskatoon serviceberry (*Amalanchier alnifolia*) 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 #	R047XA448UT
States and Transitions	No state and transition model is available for this ecological site.

Since establishment in 1984, this site has remained 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 most abundant shrubs (Table 07-04.12). The introduced perennial grass species smooth brome (*Bromus inermis*) has made up a majority of the herbaceous understory (Table 07-04.10). Perennial forbs were abundant as of the 2016 sample year, with much of the cover being contributed by alfalfa (*Medicago sativa*) (Table 07-04.11). This site is expected to remain in a similar state in future sample years.

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	11.3	4.8	-	-	-	-
2001	12.5	5.5	-	-	-	-
2006	10.3	5.7	-	15.5	6.9	-
2011	10.1	6.3	-	20.8	9.0	-
2016	8.8	4.8	-	17.5	9.5	-

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

Table 07-04.8 - 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	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

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	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
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)	-	-

Table 07-04.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES										
Agropyron cristatum ⁱ (crested wheatgrass)										
Bromus arvensis ^{ai} (field brome)										
Bromus inermis ⁱ (smooth brome)										
Elymus lanceolatus (thickspike wheatgrass)										
Poa bulbosa ⁱ (bulbous bluegrass)										
Poa fendleriana (muttongrass)										
Poa pratensis ⁱ (Kentucky bluegrass)										
Poa secunda (Sandberg bluegrass)										
Pseudoroegneria spicata (bluebunch wheatgrass)										
Thinopyrum intermedium ⁱ (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
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

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 ^{ai} (desert madwort)																	
Arabis (rockcress)																	
Arenaria (sandwort)																	
Astragalus (milkvetch)																	
Astragalus cibirius (browse milkvetch)																	
Astragalus convallarius (lesser rushy milkvetch)																	
Calochortus nuttallii (sego lily)																	
Castilleja angustifolia (northwestern Indian paintbrush)																	
Ceratocephala testiculata ^{ai} (curveseed butterwort)																	
Chaenactis douglasii (Douglas' dustymaiden)																	
Cirsium (thistle)																	
Collinsia parviflora ^a (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	-
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	-

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

FORB SPECIES	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Eriogonum racemosum (redroot buckwheat)	Geranium ^a (geranium)	Holosteum umbellatum ^{ai} (jagged chickweed)	Hydrophyllum occidentale (western waterleaf)	Lithophragma (woodland-star)	Lomatium triternatum (nineleaf biscuitroot)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa ⁱ (alfalfa)	Melilotus officinalis ⁱ (sweetclover)	Microsteris gracilis ^a (slender phlox)	Penstemon humilis (low beardtongue)	Petroradia pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	
year	Nested Frequency																	
1996	-	-	-	16	-	-	-	-	-	-	4	57	-	-	58	28	2	
2001	-	-	2	-	7	-	-	-	-	-	-	64	-	56	31	42	10	
2006	-	-	16	-	1	-	7	-	-	-	-	47	-	12	8	33	11	
2011	2	3	18	5	-	25	-	-	6	2	3	75	-	80	15	23	22	
2016	1	10	3	3	4	-	5	5	-	-	-	54	14	54	21	32	19	
year	Average Cover (%)																	
1996	-	-	-	0.1	-	-	-	-	-	-	0.0	3.0	-	-	1.0	1.1	0.0	
2001	-	-	0.0	-	0.1	-	-	-	-	-	-	4.2	-	0.2	0.3	2.4	0.1	
2006	-	-	0.1	-	0.0	-	0.0	-	-	-	-	2.6	-	0.0	0.1	2.4	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	
2016	0.0	0.0	0.0	0.0	0.1	-	0.0	0.0	-	-	-	5.9	0.6	0.1	0.4	1.5	0.1	

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

FORB SPECIES	Polygonum douglasii ^a (Douglas' knotweed)	Senecio integerrimus ^a (lambstongue ragwort)	Symphoricarichum (aster)	Verbascum thapsus ^{ai} (common mullein)	Veronica biloba ^{ai} (two-lobed speedwell)	Viola (violet)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency						
1996	24	-	-	-	124	-	4
2001	3	12	-	33	130	-	4
2006	24	2	3	-	62	-	-
2011	24	43	-	-	117	18	5
2016	8	3	-	-	13	3	5
year	Average Cover (%)						
1996	0.0	-	-	-	0.5	-	0.1
2001	0.0	0.1	-	0.5	0.5	-	0.1
2006	0.1	0.0	0.0	-	0.3	-	-
2011	0.1	0.8	-	-	2.4	0.1	0.1
2016	0.0	0.0	-	-	0.0	0.0	0.1

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 alnifolia ^p (Saskatoon serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Cercocarpus montanus ^p (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Opuntia polyacantha (plains pricklypear)	Purshia tridentata ^p (antelope bitterbrush)	Quercus gambelii ^p (Gambel oak)	Symphoricarpos oreophilus (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
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

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

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 (%)				
Amelanchier alnifolia ^p -- (Saskatoon serviceberry)									
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
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
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
Cercocarpus montanus ^p -- (alderleaf mountain mahogany)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	20	-	0	100	0	100	0	0	180/150
2016	40	-	50	50	0	50	0	0	79/73
Chrysothamnus depressus ^p -- (longflower rabbitbrush)									
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

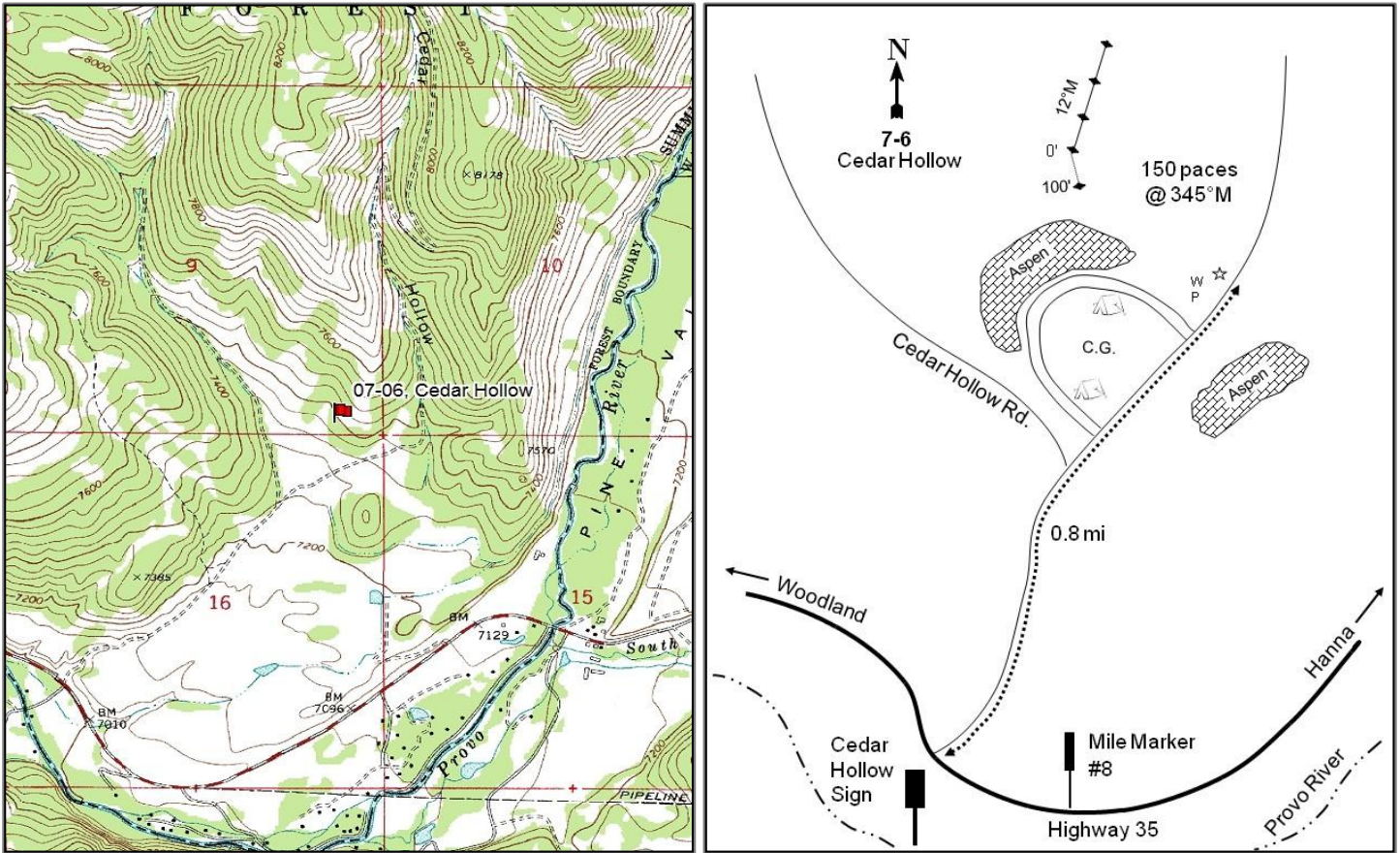
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Mahonia repens -- (creeping barberry)									
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
Opuntia polyacantha -- (plains pricklypear)									
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
Purshia tridentata^P -- (antelope bitterbrush)									
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
Quercus gambelii^P -- (Gambel oak)									
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
Symphoricarpos oreophilus -- (mountain snowberry)									
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
Tetradymia canescens -- (spineless horsebrush)									
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: High 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	13.6	13.0	9.9	30.0	0.0	10.0	0.0	76.5	Good
2001	15.6	10.1	4.7	30.0	0.0	10.0	0.0	70.4	Fair-Good
2006	12.6	8.2	7.1	30.0	0.0	10.0	0.0	67.9	Fair
2011	12.8	11.7	8.8	30.0	0.0	10.0	0.0	73.2	Good
2016	10.9	13.4	7.5	30.0	0.0	10.0	0.0	71.8	Fair-Good

CEDAR HOLLOW - STUDY NO. 07-6



Location Information

USGS 7.5 min Map Info Woodland NE; Township 3S, Range 7E, Section 09
 GPS (0' Stake) NAD 83 UTM ZONE 12, 487389 East 4490658 North

Transect Information

Browse Tag # (0' Stake) 416
 Transect Bearing 166° 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 side of the road. There is a small stand of aspen on the right. From the witness post, walk at a bearing of 345 degrees magnetic for 150 paces to the 0-foot baseline stake. The 0-foot stake 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

Wildlife Habitat and Vegetation History

Table 07-06.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
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

Site Notes

The study is located on a hillside above Cedar Hollow, about a half 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 in a stable state as a mixed mountain brush plant community with mountain snowberry (*Symphoricarpos oreophilus*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and antelope bitterbrush (*Purshia tridentata*) as the most abundant species since its establishment in 1984 (Table 07-06.12, Photos). The herbaceous understory has remained diverse and abundant with perennial grasses as a co-dominant site component in all sample years. The weedy increaser perennial species bulbous bluegrass (*Poa bulbosa*) has been recorded on this site in most sample years in varying abundance, but cover was low as of 2016 (Table 07-06.7, Table 07-06.10, Table 07-06.11, Photos). Rocky Mountain juniper (*Juniperus scopulorum*) seedlings were observed in 2011 and 2016, indicating that this site has the potential for future encroachment (Table 07-06.13).

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	12.4	7.6	-	-	-	-
2001	14.4	12.0	-	0.3	-	-
2006	12.9	11.7	0.0	14.0	16.8	-
2011	11.5	13.3	0.0	16.8	15.8	-
2016	12.1	13.4	0.0	16.7	18.2	-

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

Table 07-06.8 - 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	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

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	Elk	Greater Sage- Grouse	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
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)	-

Table 07-06.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Bromus inermis ⁱ (smooth brome)	Bromus marginatus (mountain brome)	Bromus tectorum ⁿⁱ (cheatgrass)	Carex (sedge)	Elymus lanceolatus (thickspike wheatgrass)	Festuca (fescue)	Koeleria macrantha (prairie Junegrass)	Melica bulbosa (oniongrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch 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
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

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 cibirius (browse milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chenopodium fremontii ^a (Fremont's goosefoot)	Cirsium (thistle)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawk/beard)	Epilobium brachycarpum ^a (tall annual willowherb)
year	Nested Frequency																
1996	-	5	-	-	2	-	13	3	7	-	-	9	-	14	67	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
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

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

FORB SPECIES	Eriogonum heracleoides (parsnipflower buckwheat)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erythronium grandiflorum (yellow avalanche-lily)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Hackelia patens (spotted stickseed)	Holosteum umbellatum ^{ai} (jagged chickweed)	Hydrophyllum occidentale (western waterleaf)	Lithophragma (woodland-star)	Lupinus argenteus (silvery lupine)	Microsteris gracilis ^a (slender phlox)	Penstemon leonardii (Leonard's beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Senecio integerrimus ^a (lambstongue ragwort)	Streptanthus cordatus (heartleaf twistflower)	Symphyotrichum ascendens (western aster)	
year	Nested Frequency																	
1996	5	12	-	-	-	-	2	-	-	0	0	27	15	9	7	-	56	
2001	1	7	7	-	-	-	2	-	-	7	7	19	10	-	24	3	40	
2006	6	10	3	9	8	5	-	-	-	1	5	11	26	15	14	-	48	
2011	11	17	5	3	-	1	8	-	8	4	7	5	7	1	60	2	65	
2016	5	14	3	-	-	1	-	2	-	6	-	2	9	-	10	-	54	
year	Average Cover (%)																	
1996	0.2	0.2	-	-	-	-	0.0	-	-	0.0	0.0	0.7	0.0	0.0	0.1	-	0.5	
2001	0.1	0.0	0.2	-	-	-	0.0	-	-	0.2	0.0	0.3	0.1	-	0.2	0.0	0.4	
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	-	1.0	
2011	0.7	0.2	0.1	0.1	-	0.1	0.0	-	0.1	0.1	0.0	0.1	0.0	0.0	1.1	0.0	2.0	
2016	0.2	0.4	0.0	-	-	0.0	-	0.0	-	0.2	-	0.0	0.1	-	0.0	-	0.6	

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

FORB SPECIES	Tragopogon dubius ^{ai} (yellow salsify)	Veronica biloba ^{ai} (two-lobed speedwell)	Viola (violet)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency			
1996	1	-	-	-
2001	8	-	-	3
2006	-	-	-	5
2011	-	-	12	31
2016	-	1	6	29
year	Average Cover (%)			
1996	0.0	-	-	-
2001	0.0	-	-	0.0
2006	-	-	-	0.1
2011	-	-	0.0	0.3
2016	-	0.0	0.0	0.9

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 alnifolia ^p (Saskatoon serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Ceanothus velutinus (snowbrush ceanothus)	Chrysothamnus depressus ^p (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Eriogonum heracleoides (parsnipflower buckwheat)	Juniperus scopulorum ⁱ (Rocky Mountain juniper)	Mahonia repens (creeping barberry)	Opuntia (pricklypear)	Paxistima myrsinites (Oregon boxleaf)	Purshia tridentata ^p (antelope bitterbrush)	Quercus gambelii ^p (Gambel oak)	Symphoricarpos oreophilus (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	10.8
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

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

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 (%)				
Amelanchier alnifolia^p -- (Saskatoon serviceberry)									
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
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Ceanothus velutinus -- (snowbrush ceanothus)									
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
Chrysothamnus depressus^p -- (longflower rabbitbrush)									
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

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 (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Eriogonum heracleoides -- (parsnipflower buckwheat)									
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
Juniperus scopulorum¹ -- (Rocky Mountain juniper)									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	20	0	0	0	0	0	0	-/-
2016	-	20	0	0	0	0	0	0	-/-
Mahonia repens -- (creeping barberry)									
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
Opuntia -- (pricklypear)									
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
Paxistima myrsinites -- (Oregon boxleaf)									
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
Purshia tridentata^P -- (antelope bitterbrush)									
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
Quercus gambelii^P -- (Gambel oak)									
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
Symphoricarpos oreophilus -- (mountain snowberry)									
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

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

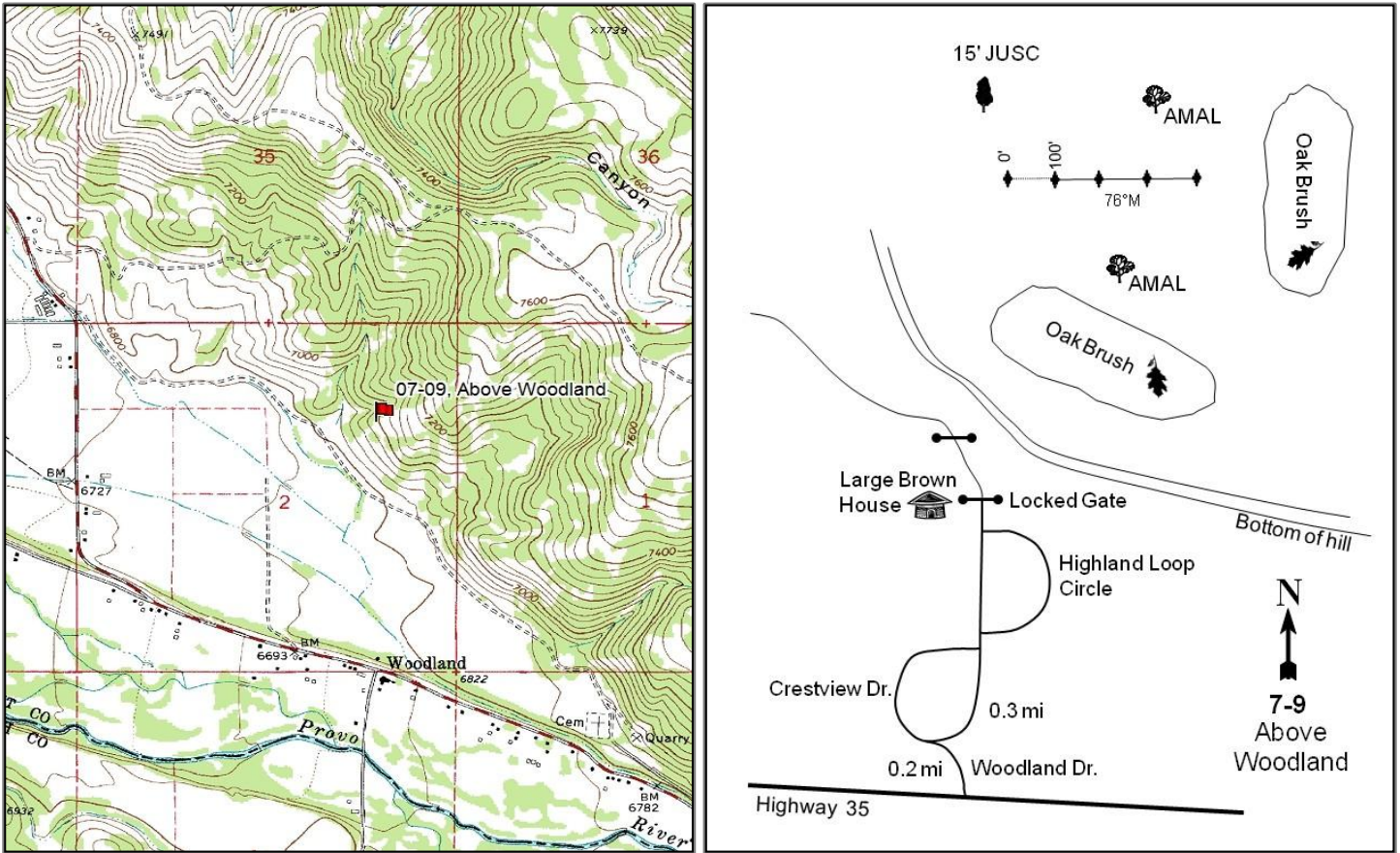
Table 07-06.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus scopulorum (Rocky Mountain juniper)							
1996	10	-	-	-	-	-	7.2
2016	19	-	-	33	50	17	11.0
Quercus gambelii (Gambel oak)							
1996	18	-	-	-	-	-	9.2

Table -07-06.15 - Deer Desirable Components Index: High 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	11.3	3.2	22.4	0.0	4.8	0.0	58.2	Fair
2001	18.9	9.1	1.2	21.6	0.0	10.0	0.0	60.7	Fair
2006	17.4	8.2	1.9	27.8	0.0	10.0	0.0	65.2	Fair
2011	15.4	13.4	3.6	30.0	0.0	10.0	0.0	72.4	Good
2016	15.9	15.0	0.0	29.4	-0.1	10.0	0.0	70.2	Fair-Good

ABOVE WOODLAND - STUDY No. 07-9



Location Information

USGS 7.5 min Map Info	Woodland NW; Township 3S, Range 6E, Section 02
GPS (0' Stake)	NAD 83 UTM ZONE 12, 480781 East 4493449 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	76° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	No Rebar

Directions to Site

From the intersection of Highway 35 and Woodland Drive, west of Woodland, turn onto Woodland Drive and proceed 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 after 0.15 miles to a gate. 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 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

Wildlife Habitat and Vegetation History

Table 07-09.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
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	NA
2006	Mixed Mountain Brush/Perennial Grass	NA
2011	Mixed Mountain Brush/Perennial Grass	NA
2016	Mixed Mountain Brush/Annual Grass	NA

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 Saskatoon serviceberry (*Amelanchier alnifolia*) 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, with browse species such as Saskatoon serviceberry (*Amelanchier alnifolia*), 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). From 2001 through 2011, the herbaceous understory was dominated by perennial grasses such as bluebunch wheatgrass (*Pseudoroegneria spicata*) and Sandberg bluegrass (*Poa secunda*). However, annual grasses such as cheatgrass (*Bromus tectorum*) increased in cover and were dominant in 2016 (Table 07-09.10). It is predicted that this site will remain in this state in the future, although cover of mountain big sagebrush may decrease further.

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	18.6	4.0	-	-	-	-
2001	24.1	3.8	-	-	-	-
2006	19.6	4.0	-	20.0	5.4	-
2011	14.8	6.9	-	15.6	3.4	-
2016	9.3	6.9	-	12.3	10.7	-

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	332	161	230	142	17.0	5.9	3.3	2.2

Table 07-09.8 - 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	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	5.0	0.4	24.8	5.0	17.6	41.9

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	Elk	Moose	Rabbit
	Quadrat Frequency			
1996	1	4	-	3
2001	7	15	-	12
2006	6	31	3	2
2011	4	30	-	3
2016	5	20	1	5
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)	-	-

Table 07-09.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus arvensis ^{ai} (field brome)	Bromus marginatus (mountain brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Koeleria macrantha (prairie Junegrass)	Melica bulbosa (oniongrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (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	-	209	17	311	-	-	3	5	32	9	10	23	116
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	-	1.9	0.1	15.1	-	-	0.0	0.0	1.5	0.1	0.1	0.1	4.0

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 acuminatum (tapertip onion)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseeded butterwort)	Cirsium (thistle)	Cirsium undulatum ^{ai} (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Crepis acuminata (tapertip hawkbeard)	Cymopterus (springparsley)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)
year	Nested Frequency																
1996	1	-	18	116	1	54	-	-	-	-	-	-	25	4	-	-	-
2001	-	7	36	55	4	40	-	6	-	-	8	24	44	-	3	8	-
2006	-	1	20	132	3	33	-	3	4	-	11	46	29	-	17	2	49
2011	2	24	98	250	1	39	0	5	1	-	41	78	103	-	18	22	161
2016	-	24	38	159	-	28	11	16	4	11	31	50	10	-	8	-	-
year	Average Cover (%)																
1996	0.0	-	0.1	0.4	0.0	1.1	-	-	-	-	-	-	0.1	0.0	-	-	-
2001	-	0.0	0.1	0.2	0.1	1.6	-	0.0	-	-	0.1	0.0	0.1	-	0.0	0.0	-
2006	-	0.0	0.1	0.4	0.0	0.8	-	0.0	0.0	-	0.2	0.1	0.3	-	0.1	0.0	0.4
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	-	0.3	0.1	2.8
2016	-	0.1	0.2	0.8	-	0.4	0.6	0.0	0.0	0.3	1.1	0.2	0.0	-	0.0	-	-

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

FORB SPECIES	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium aparine ^a (stickywilly)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Heliomeris multiflora var. multiflora (showy goldeneye)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lappula occidentalis ^a (flatspine stickseed)	Lepidium ^a (pepperweed)	Lithophragma (woodland-star)	Lomatium (desertparsley)	Lupinus argenteus (silvery lupine)	Microsteris gracilis ^a (slender phlox)	Packera multilobata (lobeleaf groundsel)	Phlox longifolia (longleaf phlox)
year	Nested Frequency																
1996	35	-	-	-	-	36	-	8	3	1	9	-	3	-	-	-	18
2001	3	-	4	4	-	3	-	3	7	-	-	-	-	10	2	1	14
2006	72	-	15	2	12	2	-	1	5	-	-	-	-	16	50	-	9
2011	220	4	31	6	50	48	29	26	9	-	-	11	-	7	32	-	2
2016	2	15	12	3	57	30	-	8	3	-	-	-	-	5	8	-	3
year	Average Cover (%)																
1996	0.1	-	-	-	-	0.3	-	0.1	0.0	0.0	0.2	-	0.0	-	-	-	0.1
2001	0.0	-	0.1	0.0	-	0.0	-	0.1	0.0	-	-	-	-	1.0	0.0	0.0	0.0
2006	0.3	-	0.5	0.1	0.0	0.0	-	0.0	0.0	-	-	-	-	1.3	0.2	-	0.1
2011	3.6	0.1	0.5	0.2	0.5	1.5	0.2	0.9	0.0	-	-	0.1	-	1.0	0.1	-	0.0
2016	0.0	0.3	0.2	0.0	0.3	0.7	-	0.0	0.0	-	-	-	-	0.0	0.0	-	0.0

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

FORB SPECIES	Polygonum douglasii ^a (Douglas' knotweed)	Senecio integerrimus ^a (lambstongue ragwort)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow safsify)	Viola (violet)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency						
1996	53	-	-	-	12	-	-
2001	50	2	-	-	25	-	-
2006	14	1	-	-	2	-	0
2011	4	5	-	5	1	2	5
2016	-	-	3	6	24	-	-
year	Average Cover (%)						
1996	0.1	-	-	-	0.0	-	-
2001	0.2	0.0	-	-	0.2	-	-
2006	0.1	0.0	-	-	0.0	-	0.0
2011	0.0	0.0	-	0.1	0.0	0.0	0.0
2016	-	-	0.0	0.0	0.1	-	-

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 alnifolia ^p (Saskatoon serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Cercocarpus montanus ^p (alderleaf mountain mahogany)	Chrysothamnus depressus ^p (longflower rabbitbrush)	Chrysothamnus viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Opuntia polyacantha (plains pricklypear)	Purshia tridentata ^p (antelope bitterbrush)	Quercus gambelii ^p (Gambel oak)	Symphoricarpos oreophilus (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	8.2	3.9	-	0.1	0.7	6.4	1.3	-	0.1	-	2.3
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	4.1	3.7	-	0.8	0.8	4.1	0.8	0.2	0.6	-	1.0

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

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 (%)				
Amelanchier alnifolia ^p -- (Saskatoon serviceberry)									
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	860	-	16	81	2	35	44	9	69/88
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
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	860	-	12	74	14	19	35	23	62/90
Cercocarpus montanus ^p -- (alderleaf mountain mahogany)									
1996	160	-	25	50	25	13	25	0	131/72
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	106/123
Chrysothamnus depressus ^p -- (longflower rabbitbrush)									
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	400	-	10	90	0	15	0	0	21/40

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 (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
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	4260	-	1	100	0	0	0	0	22/30
Mahonia repens -- (creeping barberry)									
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	7600	-	0	100	0	0	6	0	6/9
Opuntia polyacantha -- (plains pricklypear)									
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	60	-	33	67	0	0	0	0	11/29
Paxistima myrsinites -- (Oregon boxleaf)									
1996	20	-	0	100	0	0	0	0	23/43
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Purshia tridentata^p -- (antelope bitterbrush)									
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	60	-	0	100	0	33	67	0	43/113
Quercus gambelii^p -- (Gambel oak)									
1996	4260	20	10	85	5	0	0	1	81/80
2001	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	56/55
Symphoricarpos oreophilus -- (mountain snowberry)									
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	300	-	0	100	0	20	0	0	44/66
Tetradymia canescens -- (spineless horsebrush)									
1996	-	-	-	-	-	-	-	-	-/-
2001	20	-	0	100	0	0	0	0	-/-

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

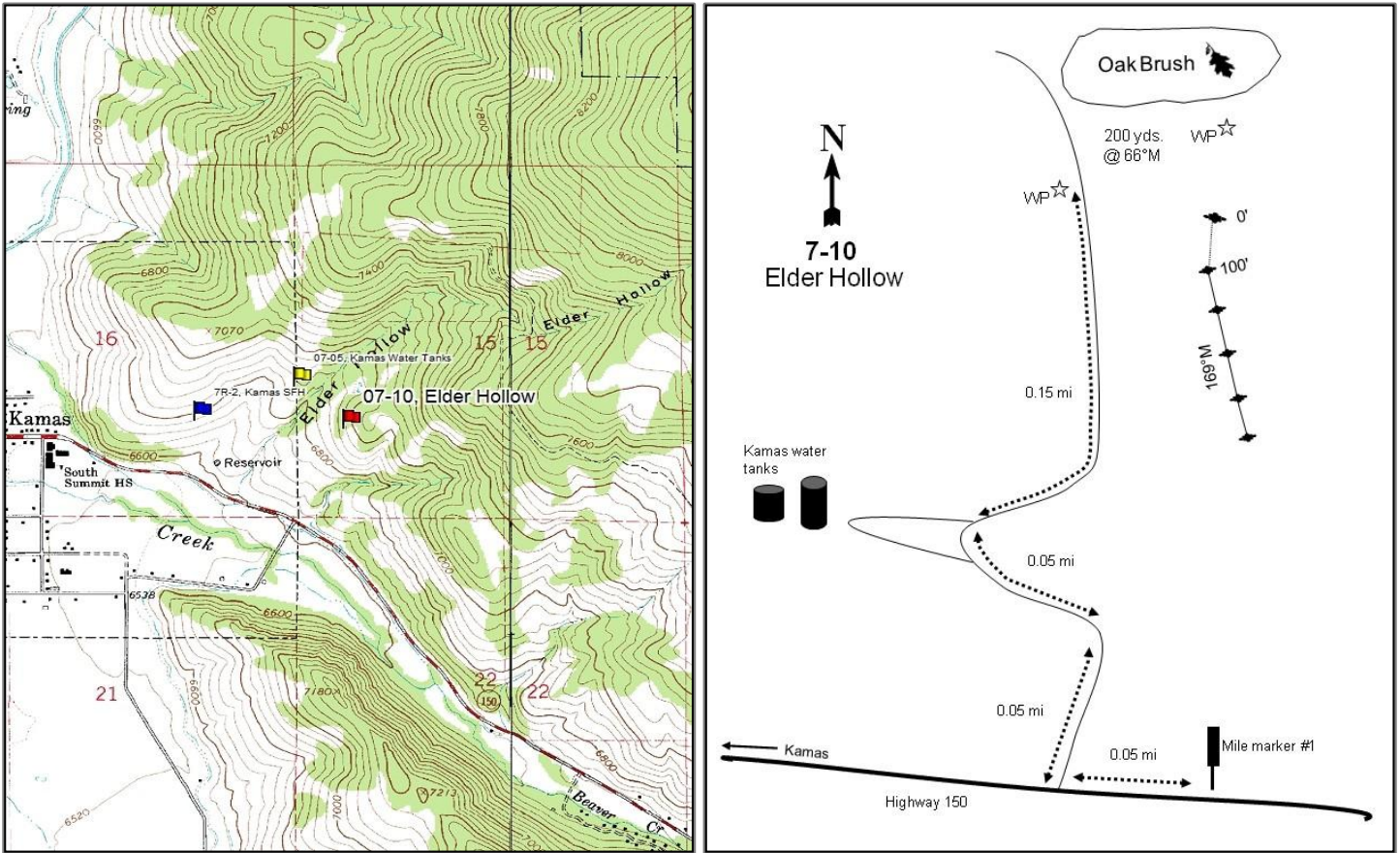
Table 07-09.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Seedling (%)	Size Class Distribution				Average Diameter (cm)
	Trees per Acre		1-4'	4-8'	8-12'	>12' (%)	
Juniperus scopulorum (Rocky Mountain juniper)							
2016	5	-	25	25	25	25	15.8

Table -07-09.15 - Deer Desirable Components Index: High 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
2001	30.0	10.0	3.5	29.6	-1.2	6.4	0.0	78.3	Good
2006	25.9	6.9	3.2	25.1	-4.3	6.7	0.0	63.5	Fair
2011	20.3	8.5	2.6	30.0	-3.5	10.0	0.0	67.8	Fair
2016	12.7	13.0	6.4	8.8	-12.8	4.4	0.0	32.6	Very Poor

ELDER HOLLOW - STUDY No. 07-10



Location Information

USGS 7.5 min Map Info Kamas SE; Township 2S, Range 6E, Section 15
 GPS (0' Stake) NAD 83 UTM ZONE 12, 478093 East 4499215 North

Transect Information

Browse Tag # (0' Stake) Not Available
 Transect Bearing 169° magnetic (Line 2: 151° magnetic, Line 3: 149° magnetic, Line 4-5: 146° magnetic)
 Length 500ft
 Belt Placement Line 1 (11ft), Line 2 (59ft), Line 3 (71ft), Line 4 (95ft), Line 5 (34ft)
 Belt Marker Placement Belt 2-5: No Rebar

Directions to Site

Westbound on Highway 150 (Mirror Lake Highway) from mile marker 1, proceed 0.05 miles to a locked gate on the right. Contact the Wildlife Biologist in the area to obtain a key; the site can also be reached by walking. Proceed through the gate, turn left, travel 0.05 miles, turn right, travel 0.05 miles, bear right, and travel 0.15 miles to green steel stake on the left. The post is in dense sagebrush 3 feet from the road. From the post, walk 200 yards at 66 degrees magnetic to a witness post. The 0-foot stake is just a couple of paces south of the witness post. The baseline doglegs down through the same vegetation type. Line 1 runs 169 degrees magnetic. Line 2 runs 151 degrees magnetic. Line 3 runs 149 degrees magnetic. Lines 4 and 5 run 146 degrees magnetic.

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

Wildlife Habitat and Vegetation History

Table 07-10.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
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

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.

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 establishment in 1996, this study site has remained in a stable state as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) plant community. Preferred browse species such as Saskatoon serviceberry (*Amelanchier alnifolia*) and other less palatable shrubs are present in lower amounts (Table 07-10.12). 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, and annual forbs -- namely desert madwort (*Alyssum desertorum*) -- were co-dominant in 2011 (Table 07-10.7, Table 07-10.10, Table 07- 10.11). It is expected that, barring a major disturbance, this site will continue to remain in this state.

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	23.7	6.3	-	-	-	-
2001	20.8	9.2	-	-	-	-
2006	12.5	6.5	-	16.6	9.9	-
2011	12.3	7.4	-	17.8	10.7	-
2016	11.5	8.7	-	16.8	11.9	-

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	378	215	392	149	7.5	5.6	14.7	3.7
2016	322	202	355	146	4.8	4.3	6.8	1.7

Table 07-10.8 - 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	6.3	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	25.1	0.2	26.0	6.2	20.7	34.3

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	Elk	Rabbit
	Quadrat Frequency			
1996	-	45	27	1
2001	-	39	3	4
2006	1	56	-	10
2011	1	14	2	1
2016	1	17	-	11
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)	-	-

Table 07-10.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus marginatus (mountain brome)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
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
2016	0	61	26	3	315	21	3	14	92	7	10	45	6
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
2016	0.0	0.7	0.2	0.0	4.6	0.1	0.0	0.2	2.4	0.0	0.1	0.5	0.2

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 ^{ai} (desert madwort)	Arabis perennans (perennial rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvetch)	Astragalus cibirius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littledod false flax)	Ceratocephala testiculata ^{ai} (curvseeded butterwort)	Chaenactis douglasii (Douglas' dusty maiden)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (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	318	-	13	4	3	5	1	8	-	50	-	14	5	3	10	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	2.4	-	0.1	0.0	0.0	0.0	0.0	0.0	-	0.1	-	0.2	0.0	0.0	0.1	0.0

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

FORB SPECIES	Cynoglossum officinale ^{ani} (gypsyflower)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum heracleoides (parsnipflower buckwheat)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium aparine ^a (stickywilly)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Hackelia patens (spotted stickseed)	Helianthus multiflorus var. multiflorus (showy goldeneye)	Heterotheca villosa (hairy false goldenaster)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Lithophragma (woodland-star)	Lithospermum ruderale (western stoneseed)	Lomatium (desertparsley)
year	Nested Frequency																
1996	-	24	10	-	29	-	1	-	-	-	20	1	1	-	-	0	-
2001	4	5	10	0	21	1	38	-	-	-	6	5	20	1	-	-	1
2006	-	1	3	-	18	2	86	-	5	4	4	13	8	-	-	11	-
2011	-	7	46	1	17	16	221	4	3	2	-	21	3	1	3	-	-
2016	3	-	3	8	20	14	227	5	-	-	9	27	-	3	-	3	-
year	Average Cover (%)																
1996	-	0.0	0.0	-	0.2	-	0.0	-	-	-	0.2	0.0	0.0	-	-	0.1	-
2001	0.0	0.0	0.0	0.0	0.5	0.0	0.9	-	-	-	0.1	0.4	0.1	0.0	-	-	0.0
2006	-	0.0	0.0	-	0.5	0.1	2.2	-	0.0	0.0	0.2	0.5	0.0	-	-	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	0.0	-	-
2016	0.0	-	0.0	0.1	0.2	0.1	3.7	0.2	-	-	0.1	0.4	-	0.0	-	0.0	-

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

FORB SPECIES	Lomatium triternatum (nineleaf biscuitroot)	Lupinus argenteus (silvery lupine)	Microsteris gracilis ^a (slender phlox)	Oenothera pallida ^a (pale evening primrose)	Penstemon (beardtongue)	Penstemon humilis (low beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^{ai} (Douglas' knotweed)	Sisymbrium altissimum ^{ai} (tall tumbledustard)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency											
1996	-	13	-	3	2	42	-	8	-	-	14	3
2001	-	45	29	7	4	29	3	-	-	5	7	7
2006	-	17	6	4	2	17	-	4	-	2	-	2
2011	8	6	22	0	-	18	-	-	1	3	3	8
2016	3	3	8	2	-	13	-	-	-	3	5	5
year	Average Cover (%)											
1996	-	0.8	-	0.0	0.0	0.9	-	0.0	-	-	0.1	0.0
2001	-	2.5	0.1	0.1	0.0	0.5	0.0	-	-	0.0	0.1	0.1
2006	-	0.6	0.0	0.0	0.1	0.7	-	0.0	-	0.0	-	0.1
2011	0.1	0.7	0.1	0.0	-	0.5	-	-	0.0	0.1	0.0	0.1
2016	0.0	0.2	0.0	0.0	-	0.1	-	-	-	0.0	0.1	0.1

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 alnifolia ^p (Saskatoon serviceberry)	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	Chrysothamnus depressus ^p (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Opuntia polyacantha (plains pricklypear)	Purshia tridentata ^p (antelope bitterbrush)	Symphoricarpos oreophilus (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
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	7.9	-	0.4	0.0	1.8	1.0	1.1	4.9	0.7

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

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 (%)				
Amelanchier alnifolia ^p -- (Saskatoon serviceberry)									
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
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
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
Chrysothamnus depressus ^p -- (longflower rabbitbrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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

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 (%)				
Eriogonum heracleoides -- (parsnipflower buckwheat)									
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
Ericameria nauseosa ssp. nauseosa var. speciosa^P -- (rubber rabbitbrush)									
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	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
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
Mahonia repens -- (creeping barberry)									
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
Opuntia polyacantha -- (plains pricklypear)									
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
Prunus virginiana^P -- (chokecherry)									
1996	20	-	0	100	0	0	0	0	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
Purshia tridentata^P -- (antelope bitterbrush)									
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
Quercus gambelii^P -- (Gambel oak)									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	94/80
Sambucus nigra ssp. cerulea^P -- (blue elderberry)									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	109/124

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 -- (mountain snowberry)									
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
Tetradymia canescens -- (spineless horsebrush)									
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

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

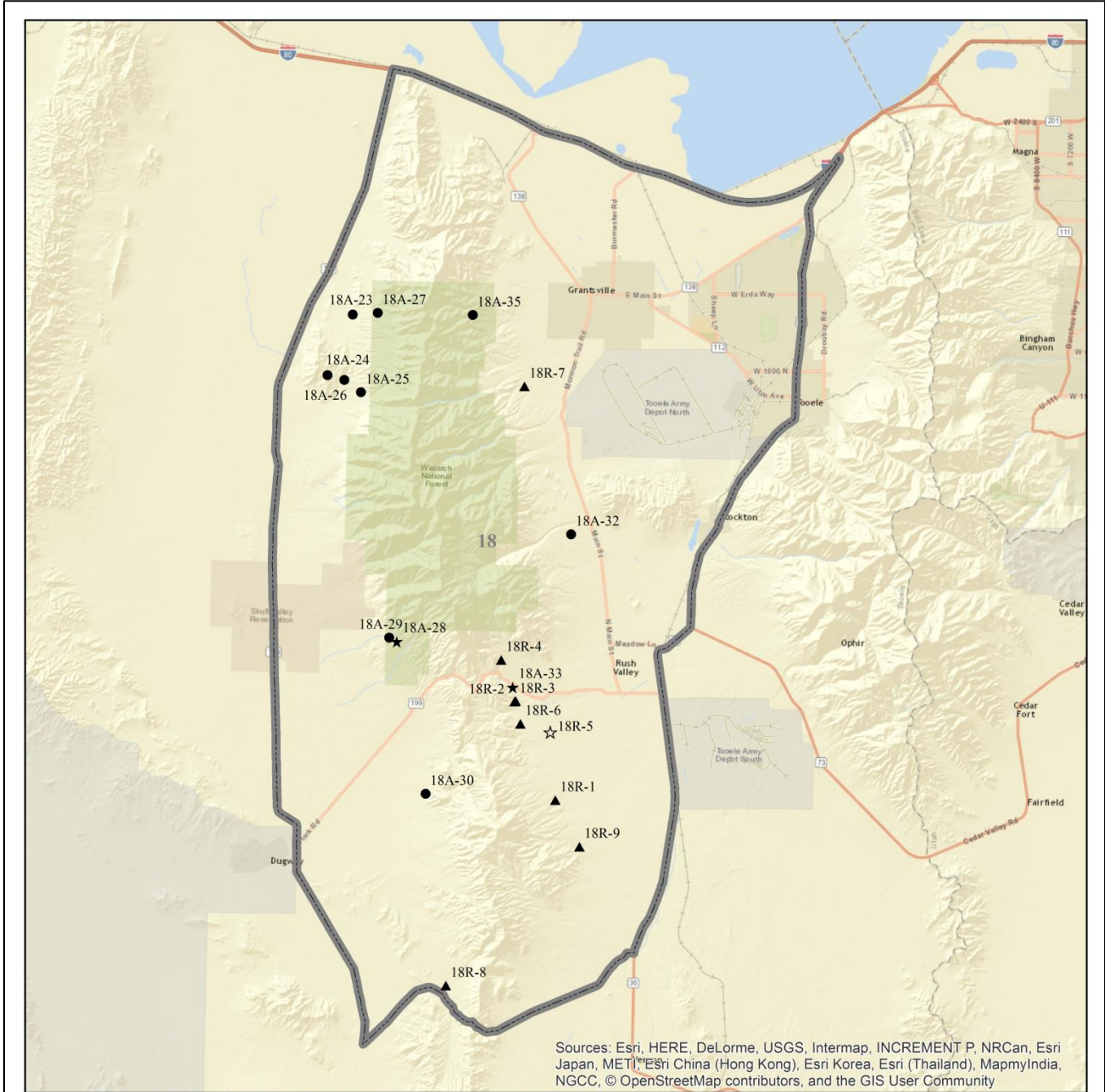
Table 07-10.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus scopulorum (Rocky Mountain juniper)							
2016	4	-	100	-	-	-	13.0

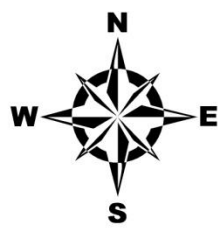
Table -07-10.15 - Deer Desirable Components Index: High Potential Scale.

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	9.5	3.0	12.2	-2.9	6.3	0.0	58.2	Fair
2001	26.8	4.9	1.2	7.4	-3.0	10.0	-2.0	45.4	Poor
2006	16.2	5.5	2.6	10.6	-7.8	9.1	0.0	36.2	Very Poor
2011	16.0	7.0	8.4	10.5	-5.9	9.0	0.0	45.0	Poor
2016	15.4	8.9	3.7	3.8	-3.6	3.4	-2.0	29.6	Very Poor

WILDLIFE MANAGEMENT UNIT 18A - STANSBURY



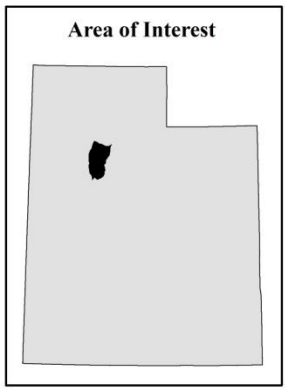
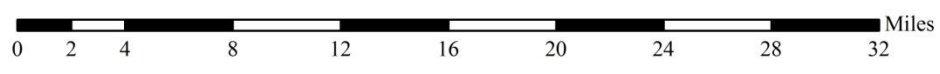
Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community



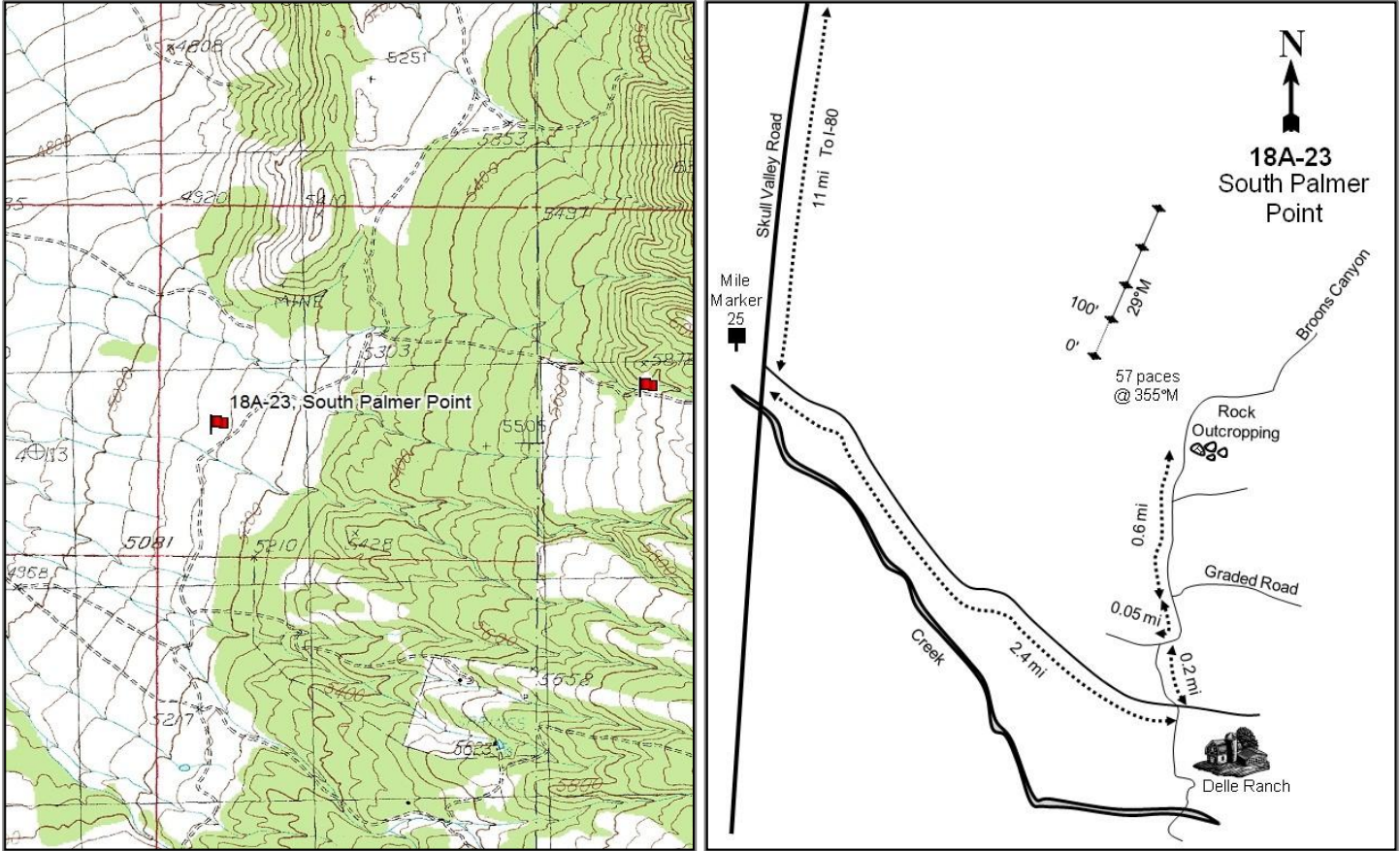
Study Location Project, Status

- RT, Active
- ★ RT, Suspended
- ▲ WRI, Active
- ☆ WRI, Suspended

Unit - 18A



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)	3984
Transect Bearing	29° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	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. Go east 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 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" fence posts 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

Table 18A-23.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
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	-	Fall 2009	9500
Seeding - Aerial Before	BLM-ESR	-	Fall 2009	9500
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 lbs/acre
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 lbs/acre
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 lbs/acre
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
Deer	crucial	winter
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

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.

The states and transitions for this site are likely similar to those of the Upland Loam (Wyoming Big Sagebrush), R025XY314UT ecological site. From the outset of the study in 1983 through the 2007 sample year, this site was a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) dominated community type with Utah juniper (*Juniperus osteosperma*) scattered throughout (Table 18A-23.12, Photos). Annual grasses, mainly cheatgrass (*Bromus tectorum*) contributed the most herbaceous cover and were a co-dominant site component in most sample years during this time period (Table 18A-23.10). In 2012, the first sample year after the 2009 wildfire, the shrub and tree component was almost nonexistent and the site was dominated by cheatgrass. Cover of broom snakeweed (*Gutierrezia sarothrae*) and annual forbs had increased by the 2016 sampling and they had become dominant. Sagebrush cover also increased slightly as of the 2016 sample year, indicating that it may recover in the future (Table 18A-23.11, Table 18A-23.12).

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	0.1	0.9	-	-	1.0	-
2016	0.4	5.9	-	0.2	12.4	-

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	153	88	393	115	0.8	5.3	18.6	2.6

Table 18A-23.8 - 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
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	-	8.2	21.4	3.6	33.0

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	Mule Deer	Elk	Rabbit
	Quadrat Frequency			
1997	2	16	-	18
2002	-	5	-	3
2004	-	8	-	8
2007	-	10	1	14
2012	-	-	-	-
2016	2	-	-	1
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	-	22.8 (56.3)	-	-
2004	-	12.8 (31.5)	-	-
2007	-	14.1 (34.8)	-	-
2012	-	0.7 (1.7)	-	-
2016	6.5 (16.1)	-	-	-

Table 18A-23.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum ⁱ (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Pascopyrum smithii (western wheatgrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)	Vulpia octoflora ^a (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	153	16	34	6	16	1	-
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	0.8	0.3	2.9	0.2	1.4	0.1	-

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 ⁿⁱ (desert madwort)	Antennaria (pussytoes)	Argemone munita (flatbud pricklypoppy)	Astragalus cibarius (browse milkvetch)	Astragalus lentiginosus (freckled milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Cardaria draba ⁿⁱ (whitetop)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata ⁿⁱ (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Cirsium undulatum ^a (wavyleaf thistle)	Collinsia parviflora ^a (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	-	-	251	-	10	-	15	27	-	-	-	132	1	-	13	-
2016	31	-	-	119	-	1	2	9	23	5	0	-	51	3	11	8	2
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	0.0	0.1	0.0	0.0	-	0.2	0.0	0.3	0.3	0.0

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

FORB SPECIES	Comandra umbellata (bastard toadflax)	Convolvulus arvensis ⁿⁱ (field bindweed)	Delphinium nuttallianum (twolobe larkspur)	Draba ^a (draba)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium ⁿⁱ (redstem stork's bill)	Grindelia squarrosa (curlycup gumweed)	Helianthus annuus ^a (common sunflower)	Holosteum umbellatum ⁿⁱ (jagged chickweed)	Lactuca serriola ⁿⁱ (prickly lettuce)	Lathyrus brachycalyx (Bonneville pea)	Linum lewisii (Lewis flax)	Lygodesmia (skeletonplant)	Medicago sativa ^a (alfalfa)	Mellilotus officinalis ⁱ (sweetclover)	Microsteris gracilis ^a (slender phlox)	Phlox longifolia (longleaf phlox)
year	Nested Frequency																
1997	3	-	-	-	-	1	-	-	39	8	-	-	3	-	-	1	26
2002	6	-	-	5	-	11	-	-	19	-	-	-	-	-	-	4	31
2004	4	-	1	-	-	32	-	-	5	-	-	-	-	-	-	1	24
2007	4	-	-	-	-	35	-	-	179	20	11	59	-	1	1	4	43
2012	4	5	-	1	4	197	-	7	5	12	-	49	-	0	2	-	71
2016	-	3	-	-	-	371	3	49	-	23	-	22	-	2	-	-	16
year	Average Cover (%)																
1997	0.0	-	-	-	-	0.0	-	-	0.3	0.0	-	-	0.0	-	-	0.0	0.3
2002	0.0	-	-	0.0	-	0.3	-	-	0.1	-	-	-	-	-	-	0.0	0.2
2004	0.0	-	0.0	-	-	0.4	-	-	0.0	-	-	-	-	-	-	0.0	0.2
2007	0.0	-	-	-	-	0.7	-	-	2.0	0.1	0.3	1.8	-	0.0	0.0	0.0	0.5
2012	0.0	0.0	-	0.0	0.0	4.2	-	0.1	0.0	0.1	-	2.5	-	0.1	0.1	-	2.6
2016	-	0.1	-	-	-	16.2	0.1	0.9	-	0.1	-	0.5	-	0.0	-	-	0.2

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

FORB SPECIES					
Sisymbrium altissimum ^{ai} (tall tumbled mustard)					
Sphaeralcea parvifolia (smallflower globemallow)					
Tragopogon dubius ^{ai} (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	-
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	-

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 ^p (Wyoming big sagebrush)						
Bassia prostrata ⁱ (forage kochia)						
Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)						
Ericameria nauseosa ssp. nauseosa var. spectiosa ^p (rubber rabbitbrush)						
Gutierrezia sarothrae (broom snakeweed)						
Juniperus osteosperma ⁱ (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	-
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	-

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

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 (%)				
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
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
Bassia prostrataⁱ -- (forage kochia)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
1997	20	-	100	0	0	0	0	0	16/13
2002	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
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
Juniperus osteospermaⁱ -- (Utah juniper)									
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	-	-	-	-	-	-	-	-	-/-
Quercus gambelii^p -- (Gambel oak)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2007	20	-	100	0	0	0	0	0	-/-
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Rhus trilobata^p -- (skunkbush sumac)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2007	-	20	0	0	0	0	0	0	-/-

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

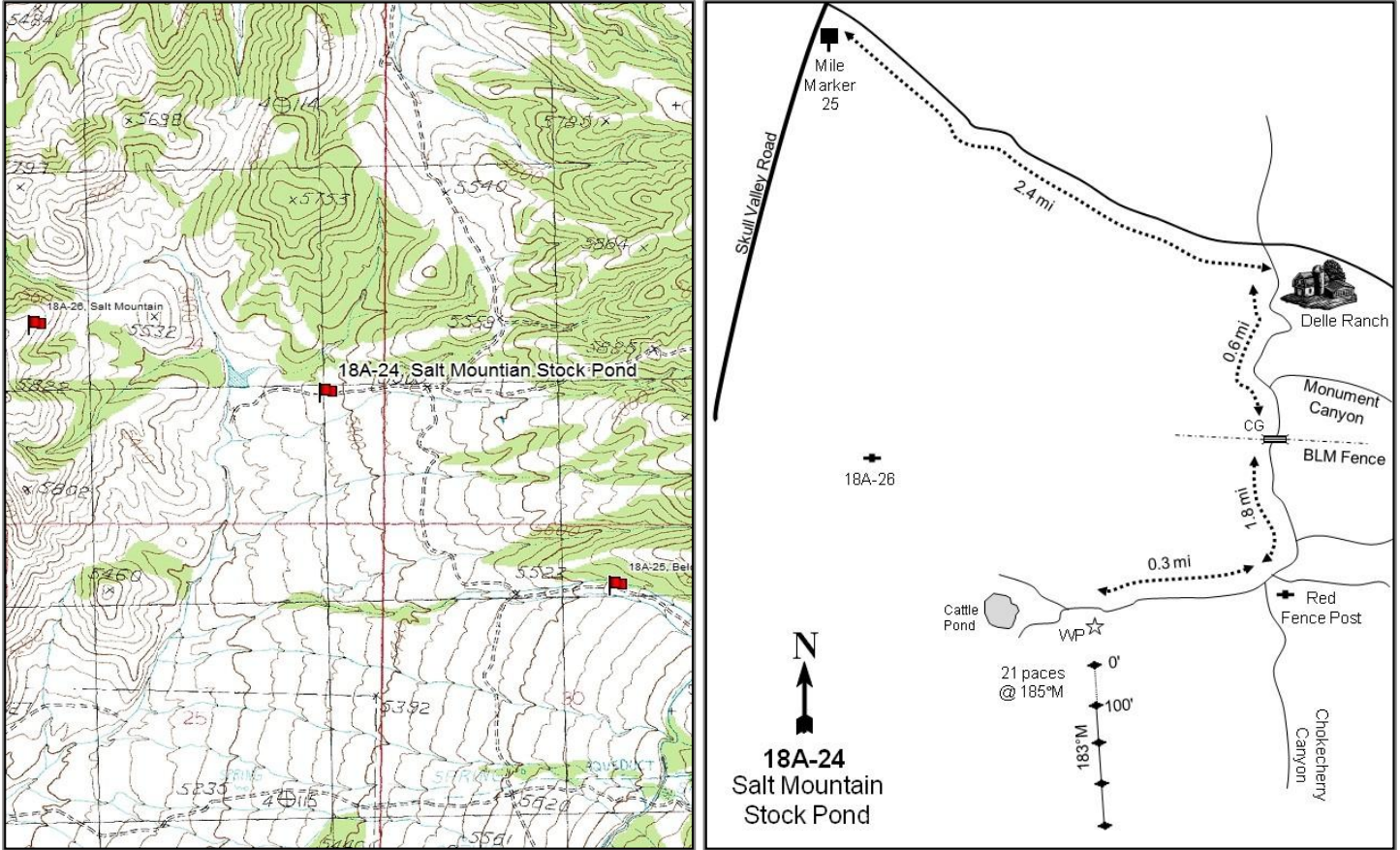
Table 18A-23.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
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: Mid 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	14.8	9.0	15.0	17.1	-6.5	4.4	0.0	53.8	Fair
2002	11.9	9.3	15.0	18.6	-9.6	0.9	0.0	46.1	Poor
2004	12.2	6.6	3.5	13.7	-9.1	0.5	0.0	27.4	Very Poor
2007	14.4	12.6	15.0	17.6	-13.7	9.1	0.0	55.1	Fair
2012	0.7	0.0	0.0	10.6	-12.7	10.0	-2.0	6.5	Very Poor
2016	2.0	0.0	0.0	10.6	-0.6	5.2	-2.0	15.2	Very Poor

SALT MOUNTAIN STOCK POND - STUDY No. 18A-24



Location Information

USGS 7.5 min Map Info Salt Mountain SW; Township 3S, Range 8W, Section 24
 GPS (0' Stake) NAD 83 UTM ZONE 12, 356915 East 4489115 North

Transect Information

Browse Tag # (0' Stake) 5926
 Transect Bearing 190° magnetic
 Length 400ft
 Belt Placement Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft) Note: Line 2: 65ft, Line 4: 78ft
 Belt Marker Placement Standard, Belt 2: 1ft, Belt 4: 13ft,

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 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 side of the road. From the witness post, the 0-foot baseline stake is 21 paces away at an azimuth of 185 degrees magnetic and is marked with browse tag #5926. 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

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	-	Fall 2009	9500
Seeding - Aerial Before	BLM-ESR	-	Fall 2009	9500
Seeding - Aerial After	BLM-ESR	-	Fall 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 lbs/acre
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 lbs/acre
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
Deer	crucial	winter
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	No Encroachment

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.

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 (Mountain Big Sagebrush)
 NRCS Ecological Site # R028A310UT
 States and Transitions No state and transition model is available for this ecological site.

From study establishment in 1983 through 2007, this site existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated plant community with Utah juniper (*Juniperus osteosperma*) scattered throughout (Table 18A-24.12, Photos). The herbaceous understory has been dominated by perennial grasses, mainly crested wheatgrass (*Agropyron cristatum*) and Sandberg bluegrass (*Poa secunda*), in all sample years. A wildfire in 2009 eliminated the browse component, but the herbaceous layer persisted, causing the site to transition into a perennial grassland (Table 18A-24.10). Forbs have remained rare throughout the study years (Table 18A-24.7, Table 18A-24.11).

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	-

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

Table 18A-24.8 - 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
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

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	Elk	Rabbit
	Quadrat Frequency				
1997	2	-	20	-	12
2002	4	-	12	-	49
2007	3	-	20	2	64
2012	-	-	-	-	-
2016	5	-	2	-	1
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)	-	-	-	-

*Pellets per acre (ha)

Table 18A-24.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea ⁱ (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)	Vulpia octoflora ^a (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	-
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	-

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 ^{ai} (desert madwort)	Antennaria (pussytoes)	Astragalus (milkvetch)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus cibirius (browse milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (littledod false flax)	Castilleja (Indian paintbrush)	Castilleja linearifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium neomexicanum ^a (New Mexico thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Crepis acuminata (tapertip hawksbeard)
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	-	-	-
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	-	-	-

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

FORB SPECIES	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erodium cicutarium ^{ai} (redstem stork's bill)	Helianthus annuus ^a (common sunflower)	Heterotheca villosa (hairy false goldenaster)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Linum lewisii (Lewis flax)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grandiflora (rayless tansyaster)	Microsteris gracilis ^a (slender phlox)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Phlox longifolia (longleaf phlox)	Sanguisorba minor ⁱ (small burnet)	Solanum triflorum ^a (cutleaf nightshade)
year	Nested Frequency																
1997	-	5	11	-	-	-	5	1	-	20	-	5	-	10	8	-	-
2002	3	-	-	8	-	-	45	-	-	-	-	9	1	-	1	-	-
2007	-	20	-	9	-	4	321	-	-	-	-	-	-	-	18	-	1
2012	3	18	-	32	-	-	222	-	51	2	-	2	-	-	16	6	-
2016	1	1	-	74	2	-	4	2	6	-	5	-	-	-	1	1	-
year	Average Cover (%)																
1997	-	0.0	0.1	-	-	-	0.0	0.0	-	0.1	-	0.0	-	0.1	0.0	-	-
2002	0.0	-	-	0.0	-	-	0.1	-	-	-	-	0.0	0.0	-	0.0	-	-
2007	-	0.0	-	0.1	-	0.0	4.2	-	-	-	-	-	-	-	0.1	-	0.0
2012	0.0	0.1	-	0.4	-	-	0.6	-	0.7	0.0	-	0.0	-	-	0.1	0.3	-
2016	0.0	0.0	-	1.6	0.0	-	0.0	0.0	0.1	-	0.0	-	-	-	0.0	0.0	-

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

FORB SPECIES	FORB SPECIES		
	Tragopogon dubius ^{ai} (yellow salsify)		
	Trifolium (clover)		
	Zigadenus paniculatus (foothill deathcamas)		
year	Nested Frequency		
1997	7	1	2
2002	-	-	-
2007	-	-	-
2012	3	-	-
2016	29	-	-
year	Average Cover (%)		
1997	0.1	0.0	0.0
2002	-	-	-
2007	-	-	-
2012	0.0	-	-
2016	0.4	-	-

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	SHRUB SPECIES				
	Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)				
	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)				
	Ericameria nauseosa (rubber rabbitbrush)				
	Gutierrezia sarothrae (broom snakeweed)				
	Juniperus osteosperma ⁱ (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	-
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	-

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

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 (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Atriplex canescens^p -- (fourwing saltbush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	0	100	0	0	0	0	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Ericameria nauseosa -- (rubber rabbitbrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
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
Juniperus osteosperma¹ -- (Utah juniper)									
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	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
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
Purshia tridentata^p -- (antelope bitterbrush)									
1997	-	-	-	-	-	-	-	-	22/72
2002	-	-	-	-	-	-	-	-	25/137
2007	-	-	-	-	-	-	-	-	57/164
2012	-	-	-	-	-	-	-	-	56/91
2016	-	-	-	-	-	-	-	-	48/122

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

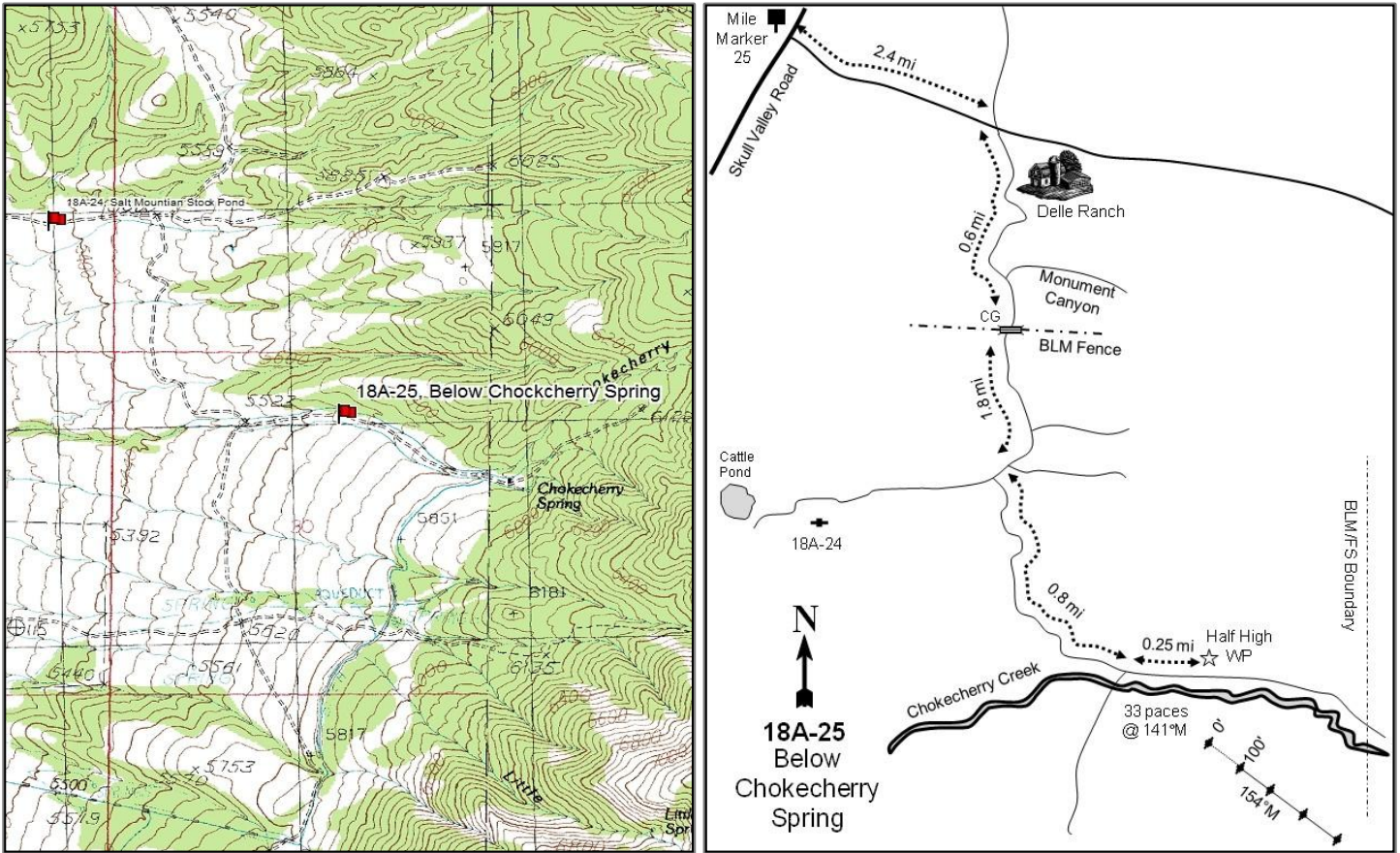
Table 18A-24.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	51	-	-	-	-	-	4.5
2007	67	-	55	35	5	5	6.8
2016	6	100	-	-	-	-	1.0

Table -18A-24.15 - Deer Desirable Components Index: Mid 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	5.1	9.0	30.0	-1.4	1.7	0.0	56.4	Fair
2002	10.1	5.7	11.0	30.0	-1.7	0.1	0.0	55.2	Fair
2007	9.7	4.5	3.5	30.0	-3.5	8.7	0.0	52.9	Fair
2012	0.0	0.0	0.0	30.0	-2.7	4.0	0.0	31.3	Very Poor
2016	0.0	0.0	0.0	30.0	-0.2	4.0	0.0	33.9	Very Poor-Poor

BELOW CHOKECHERRY SPRING - STUDY NO. 18A-25



Location Information

USGS 7.5 min Map Info Salt Mountain SE; Township 3S, Range 7W, Section 30
 GPS (0' Stake) NAD 83 UTM ZONE 12, 358136 East 4488203 North

Transect Information

Browse Tag # (0' Stake) 135
 Transect Bearing 154° 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

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 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

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	-	Fall 2009	9500
Seeding - Aerial Before	BLM-ESR	-	Fall 2009	9500
Seeding - Aerial After	BLM-ESR	-	Fall 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 lbs/acre
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 lbs/acre
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
Deer	crucial	winter/spring
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

Site Notes

The study is located a half 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 bull-hogged 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 (Mountain Big Sagebrush)
 NRCS Ecological Site # R028A310UT
 States and Transitions No state and transition model is available for this ecological site.

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 (Table 18A-25.12). 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 invasive annual grass cheatgrass (*Bromus tectorum*) in 1983 (Photos), but most of the cover has been contributed by the perennial grass species Sandberg bluegrass (*Poa secunda*) and crested wheatgrass (*Agropyron cristatum*) in nearly all other sample years. The introduced grass species bulbous bluegrass (*Poa bulbosa*) has been observed in increasing amounts since 2002 (Table 18A-25.10). Forbs are diverse and have been moderately abundant through the duration of the study (Table 18A- 25.11). Without another major disturbance, this study site is expected to remain in this state in future sample years.

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	-

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	6.3
2012	231	344	385	297	15.9	26.6	6.4	16.7
2016	183	416	279	198	5.9	33.8	12.4	5.0

Table 18A-25.8 - 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
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	15.8	5.0	4.0	55.8

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	Elk	Rabbit
	Quadrat Frequency			
1997	11	11	1	44
2002	4	16	1	31
2007	10	16	-	31
2012	4	-	-	-
2016	19	2	-	2
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)	-	-

Table 18A-25.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium ⁱ (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	352	4	179	-	7	69	1	174	18	-	1
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	5.9	-	0.7	2.6	0.0	4.2	1.8	-	0.0

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 ^{ai} (desert madwort)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseeded butterwort)	Cirsium neomexicanum ^a (New Mexico thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium aparine ^a (stickywilly)	Hackelia patens (spotted stickseed)
year	Nested Frequency																
1997	-	0	73	-	-	8	3	6	20	7	89	11	22	5	6	-	10
2002	-	3	3	3	-	-	-	-	-	-	108	-	3	-	9	-	-
2007	-	2	76	5	-	4	-	13	29	-	87	8	200	-	12	1	-
2012	4	-	12	13	-	-	-	6	5	-	20	1	31	-	99	-	-
2016	12	-	-	20	2	-	-	4	-	1	10	-	-	-	249	-	-
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	-	0.3
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	-	0.2	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	-	-	-	12.0	-	-

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

FORB SPECIES	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Lathyrus brachycalyx (Bonneville pea)	Linum lewisii (Lewis flax)	Lomatium (desertparsley)	Lygodesmia (skeletonplant)	Medicago sativa ⁱ (alfalfa)	Microsteris gracilis ^a (slender phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^{ai} (Douglas' knotweed)	Sanguisorba minor ⁱ (small burnet)	Sphaeralcea grossularifolia (gooseberry/leaf globemallow)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Verbena bracteata (bigbract verbena)	Veronica biloba ^{ai} (two-lobed speedwell)	
year	Nested Frequency																
1997	58	-	149	-	0	2	-	2	57	3	-	-	15	35	-	21	
2002	61	-	162	-	32	-	-	3	39	-	-	-	-	-	-	-	
2007	320	5	182	-	15	-	-	20	56	-	-	-	-	-	-	-	
2012	365	2	260	1	2	-	7	4	45	-	4	4	2	-	1	9	
2016	8	13	178	-	-	-	2	-	45	-	-	-	-	5	-	24	
year	Average Cover (%)																
1997	0.1	-	3.4	-	0.0	0.0	-	0.0	0.4	0.0	-	-	0.1	0.2	-	0.1	
2002	0.3	-	5.8	-	0.6	-	-	0.0	0.1	-	-	-	-	-	-	-	
2007	4.3	0.0	5.3	-	0.1	-	-	0.1	0.5	-	-	-	-	-	-	-	
2012	3.1	0.0	15.1	0.0	0.0	-	0.2	0.0	0.6	-	0.2	0.2	0.0	-	0.0	0.0	
2016	0.0	0.1	4.0	-	-	-	0.1	-	0.3	-	-	-	-	0.1	-	0.0	

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	Line Intercept Cover (%)					
	year	1997	2002	2007	2012	2016
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	-	-	-	-	-	-
Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	18.6	1.1	0.3	1.9	2.3	6.3
Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	22.4	2.1	-	-	-	-
Gutierrezia sarothrae (broom snakeweed)	0.1	2.1	0.3	-	-	-
Juniperus osteosperma ^t (Utah juniper)	1.2	4.4	-	0.6	-	-

SHRUB SPECIES	Quadrat Cover (%)					
	year	1997	2002	2007	2012	2016
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	15.2	2.0	0.4	0.8	-	-
Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	18.0	1.1	0.4	1.9	0.6	3.6
Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	19.5	1.8	-	-	-	-
Gutierrezia sarothrae (broom snakeweed)	0.0	1.1	0.1	-	-	-
Juniperus osteosperma ^t (Utah juniper)	1.3	2.9	-	0.9	-	-

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

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 (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
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

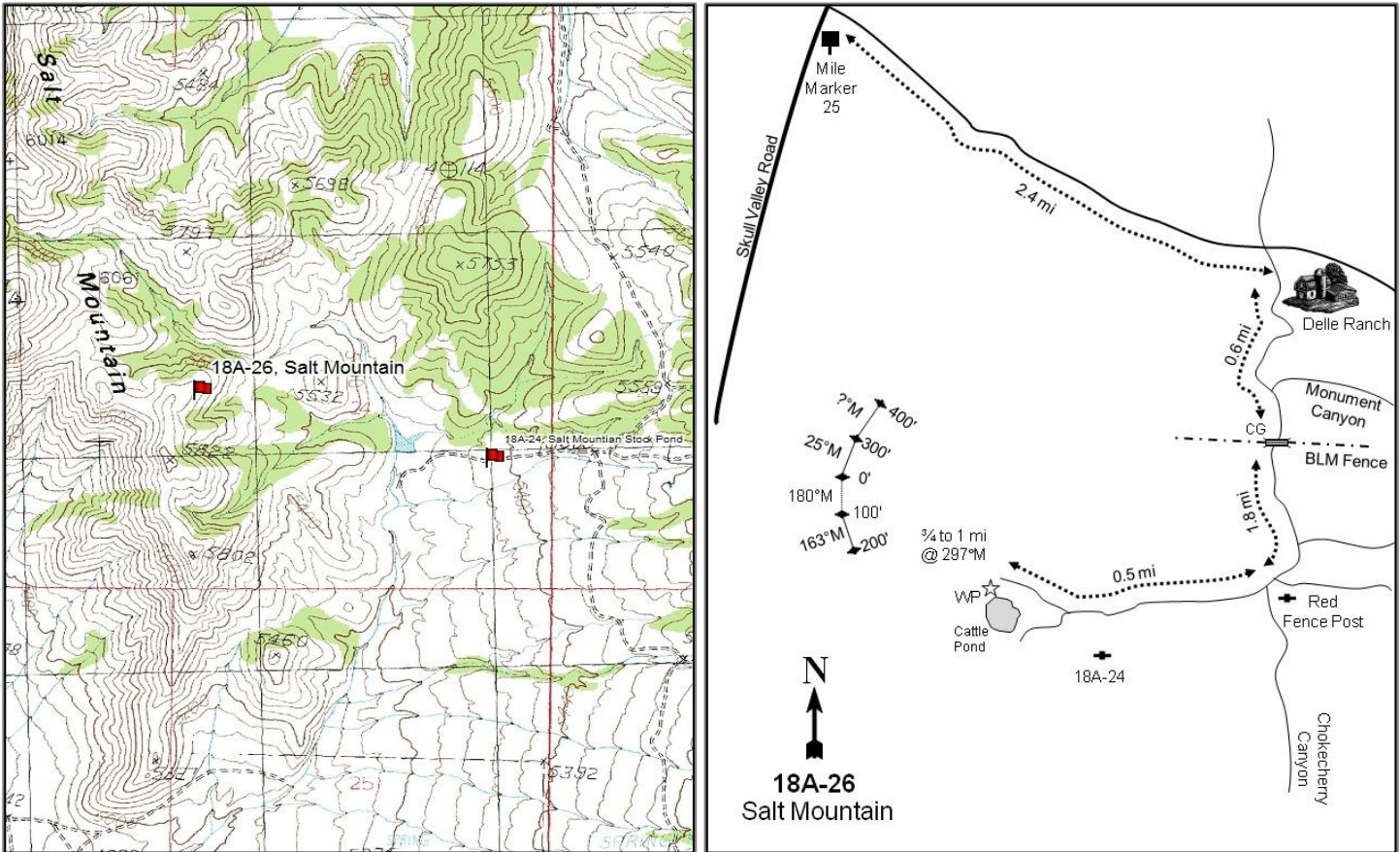
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Juniperus osteosperma¹ -- (Utah juniper)									
1997	40	-	50	50	0	0	0	50	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	40	-	0	100	0	100	0	0	- / -
2012	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
1997	-	-	-	-	-	-	-	-	37/140
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	56/124
2012	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
Rhus trilobata var. trilobata -- (skunkbush sumac)									
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: Mid 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	19.6	14.1	15.0	30.0	-7.0	10.0	0.0	81.7	Good-Excellent
2002	23.2	13.6	13.4	30.0	-5.0	10.0	0.0	85.1	Excellent
2007	24.5	9.9	1.0	30.0	-3.1	10.0	0.0	72.3	Good
2012	0.2	0.0	0.0	30.0	-12.0	10.0	0.0	28.2	Very Poor
2016	1.6	0.0	0.0	30.0	-4.4	10.0	0.0	37.2	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	180° magnetic (Line 2: 163° magnetic, Line 3: 25° magnetic, Line 4: ?° 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 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 (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

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	-	Fall 2009	9500
Seeding - Aerial	BLM-ESR	-	Fall 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 lbs/acre
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 lbs/acre
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
Deer	crucial	winter
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	No Encroachment

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 (Mountain Big Sagebrush)
 NRCS Ecological Site # R047XA334UT
 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 (Table 18A-26.12). 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 in 2012 the site was dominated by cheatgrass. In 2016, perennial grass and annual forb cover increased and they became co-dominant site components (Table 18A-26.7, Table 18A-26.10, Table 18A-26.11).

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	-

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

Table 18A-26.8 - 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
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

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	Elk	Rabbit
	Quadrat Frequency			
2002	-	17	-	19
2007	1	18	2	52
2012	-	3	-	8
2016	-	4	-	12
Year	Days Use Per Acre (ha)			
2002	-	56.3 (139.0)	-	-
2007	-	38.2 (94.4)	3.4 (8.3)	-
2012	-	2.7 (6.6)	-	-
2016	-	8.1 (19.9)	-	-

Table 18A-26.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus tectorum ^{ai} (cheatgrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea ⁱ (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
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

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 desertorum ^{ai} (desert madwort)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (litlepod false flax)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chamaesyce (sandmat)	Cirsium neomexicanum ^a (New Mexico thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Erodium cicutarium ^{ai} (redstem stork's bill)	Gilia ^a (gilia)	Helianthus annuus ^a (common sunflower)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)
year	Nested Frequency																
2002	-	-	3	-	-	-	12	-	-	-	-	-	74	1	-	-	2
2007	-	1	-	-	3	-	70	-	0	-	9	72	122	-	-	18	3
2012	14	2	-	3	-	-	13	-	-	3	-	-	346	-	-	56	8
2016	-	-	-	15	3	6	64	12	4	-	3	-	365	-	1	-	14
year	Average Cover (%)																
2002	-	-	0.0	-	-	-	0.0	-	-	-	-	-	1.2	0.0	-	-	0.0
2007	-	0.0	-	-	0.0	-	0.2	-	0.0	-	0.0	0.1	1.6	-	-	0.0	0.0
2012	0.1	0.1	-	0.0	-	-	0.0	-	-	0.0	-	-	10.8	-	-	0.1	0.0
2016	-	-	-	0.1	0.0	0.0	0.3	0.0	0.0	-	0.0	-	11.9	-	0.0	-	0.1

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

FORB SPECIES							
Lappula occidentalis ^a (flatspine stickseed)							
Linum perenne ⁱ (blue flax)							
Medicago sativa ⁱ (alfalfa)							
Microsteris gracilis ^a (slender phlox)							
Salsola tragus ⁿⁱ (prickly Russian thistle)							
Sisymbrium altissimum ⁿⁱ (tall tumbled mustard)							
Tragopogon dubius ⁿⁱ (yellow salsify)							
year	Nested Frequency						
2002	4	-	-	-	-	-	-
2007	26	-	-	-	-	-	-
2012	-	0	15	2	-	-	20
2016	1	1	22	-	48	6	27
year	Average Cover (%)						
2002	0.0	-	-	-	-	-	-
2007	0.1	-	-	-	-	-	-
2012	-	0.0	1.7	0.0	-	-	0.3
2016	0.0	0.0	2.7	-	0.3	0.1	1.0

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 ^p (mountain big sagebrush)						
Gutierrezia sarothrae (broom snakeweed)						
Juniperus osteosperma ⁱ (Utah juniper)						
Opuntia (pricklypear)						
Purshia stansburiana ^p (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	-	-
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	-	-

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

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 (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Ephedra nevadensis^p -- (Nevada jointfir)									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	96/126
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
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
Juniperus osteosperma^t -- (Utah juniper)									
2002	40	-	0	100	0	0	0	0	- / -
2007	40	-	0	100	0	0	0	0	- / -
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	- / -
Opuntia -- (pricklypear)									
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
Purshia stansburiana^p -- (Stansbury cliffrose)									
2002	120	-	33	67	0	17	17	0	150/159
2007	100	-	20	60	20	40	40	0	137/129
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	42/55
Tetradymia canescens -- (spineless horsebrush)									
2002	-	-	-	-	-	-	-	-	70/131
2007	20	-	0	0	100	0	0	100	67/121

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

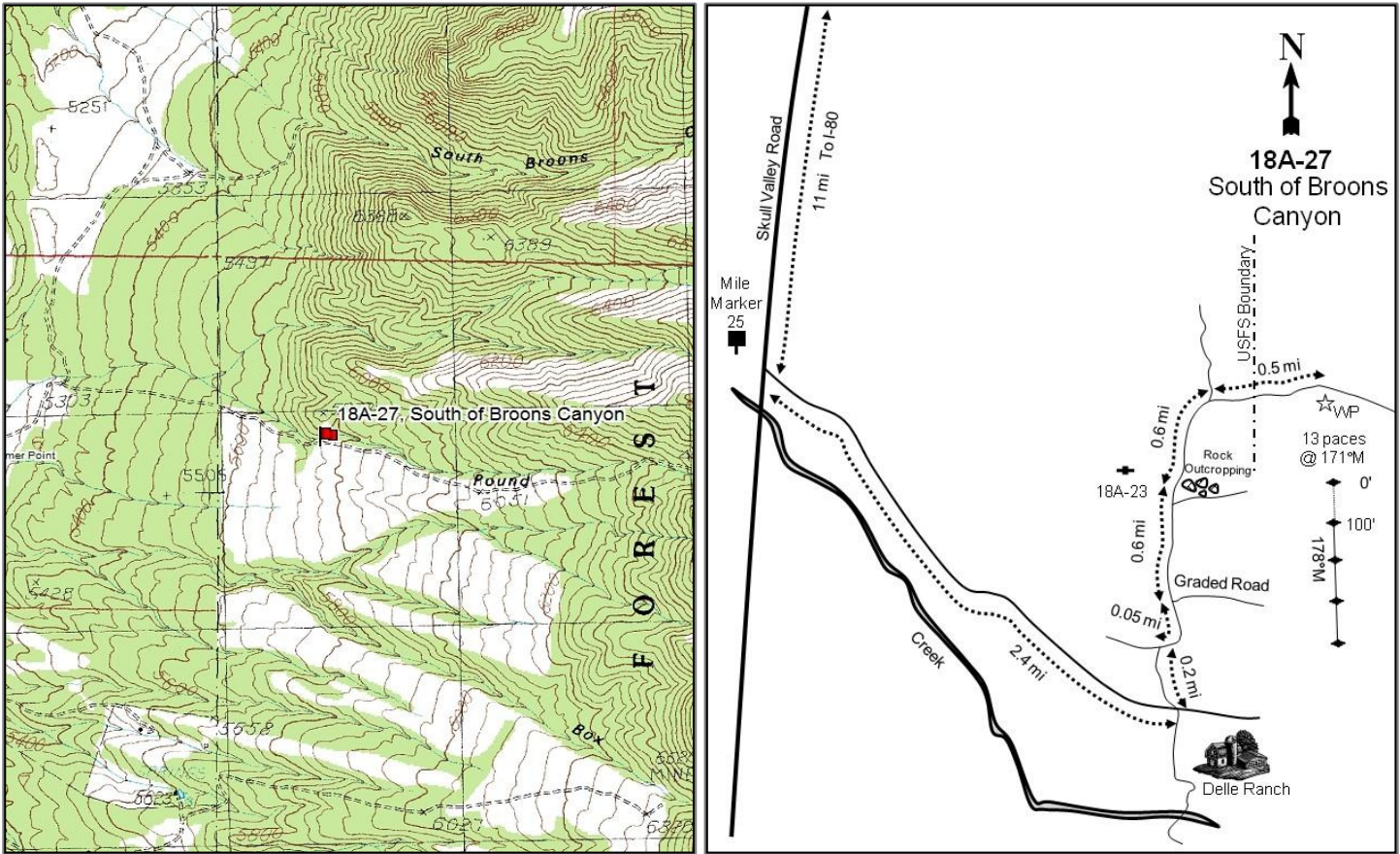
Table 18A-26.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	40	-	-	-	-	-	22.2
2007	34	-	-	38	54	8	30.6

Table -18A-26.15 - Deer Desirable Components Index: Mid 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	4.8	0.0	0.0	23.9	-6.4	0.0	0.0	22.2	Very Poor
2007	6.9	12.7	7.7	23.2	-13.7	0.0	0.0	36.8	Very Poor-Poor
2012	0.0	0.0	0.0	20.3	-19.7	3.8	0.0	4.4	Very Poor
2016	0.0	0.0	0.0	27.6	-1.6	5.6	0.0	31.6	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

Not available
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 of 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 go north for 0.65 miles until you reach a rock outcropping on the right-hand side of the road and the location of study 18A-23. Continue 0.6 miles to a fork and go right (east). Continue approximately 0.5 miles to the USFS boundary fence. From the fence, go 0.4 miles to a witness post on the right side of the road. From this short fencepost, travel 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

Table 18A-27.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Prescribed Fire	Stansbury juniper prescribed burn and mechanical treatment	727	September 2007	80
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
Deer	crucial	winter/spring
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

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*) to a lesser extent. Utah juniper (*Juniperus osteosperma*) was scattered throughout the site, placing it in Phase I of woodland succession. In 2009, this overstory shrub and tree component was completely removed by a wildfire (Table 18A-27.12). The herbaceous understory has remained dominated by the invasive annual grass species cheatgrass (*Bromus tectorum*) since 1997; but 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 (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.

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	-	-	-	-

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	264	15.9	6.2	11.4	14.5
2012	466	95	439	99	39.4	3.3	15.2	2.8
2016	422	125	368	28	31.4	4.1	23.2	0.3

Table 18A-27.8 - 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
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	22.3	5.7	12.5	55.5

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	Elk	Rabbit
	Quadrat Frequency			
1997	1	27	1	35
2002	-	24	-	36
2007	-	17	8	32
2012	-	-	-	1
2016	6	2	-	-
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)	-	-

Table 18A-27.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus tectorum ^{ai} (cheatgrass)	Melica bulbosa (oniongrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency					
1997	408	23	-	5	156	144
2002	409	8	-	5	23	48
2007	420	22	-	1	121	76
2012	466	10	20	6	39	38
2016	422	-	16	3	53	57
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
2016	31.4	-	0.1	0.0	0.7	3.3

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	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Astragalus (milkvech)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Chenopodium ^a (goosefoot)	Cirsium neomexicanum ^a (New Mexico thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis intermedia (limestone hawkbeard)	Descurainia ^a (tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum racemosum (redroot buckwheat)
year	Nested Frequency																
1997	3	66	44	1	2	5	5	6	5	5	36	0	4	3	-	16	2
2002	-	27	32	-	1	-	-	7	-	-	29	-	13	-	-	-	-
2007	10	35	69	4	0	2	-	56	-	1	70	5	11	59	5	-	1
2012	1	11	282	-	-	-	-	1	-	18	81	2	16	-	3	12	-
2016	-	-	55	-	-	-	-	-	-	26	-	4	12	-	-	4	-
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	0.0
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	1.3	0.0	0.2	0.5	0.0	-	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	-

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

FORB SPECIES	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium boreale (northern bedstraw)	Hackelia patens (spotted stickseed)	Helianthus annuus ^a (common sunflower)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca scariola ^{ai} (prickly lettuce)	Lappula occidentalis ^{ai} (flatspine stickseed)	Lithospermum ruderale (western stoneseed)	Lomatium grayi (Gray's biscuitroot)	Lygodesmia (skeletonplant)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis ^a (slender phlox)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Sisymbrium altissimum ^{ai} (tall tumbled mustard)	Tragopogon dubius ^{ai} (yellow salsify)
year	Nested Frequency																
1997	34	18	93	-	110	11	-	3	19	13	14	11	-	60	2	-	11
2002	5	-	41	-	13	-	-	2	10	-	-	3	-	31	-	2	3
2007	95	176	42	-	323	5	-	4	73	-	-	62	2	35	-	7	-
2012	148	-	-	-	257	97	1	0	19	-	-	45	-	67	-	9	11
2016	319	-	4	6	-	79	-	0	5	-	-	-	-	1	-	-	32
year	Average Cover (%)																
1997	0.3	0.4	3.3	-	0.7	0.1	-	0.6	0.4	0.1	0.0	0.2	-	0.3	0.0	-	0.1
2002	0.0	-	1.2	-	0.1	-	-	0.3	0.1	-	-	0.0	-	0.2	-	0.0	0.0
2007	0.9	8.0	1.5	-	7.5	0.0	-	0.5	3.3	-	-	0.4	0.0	0.3	-	0.0	-
2012	5.5	-	-	-	3.1	0.5	0.0	0.0	1.5	-	-	0.1	-	0.8	-	0.6	0.4
2016	20.6	-	0.0	0.0	-	0.6	-	0.0	0.1	-	-	-	-	0.0	-	-	0.4

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

FORB SPECIES	Zizadenus paniculatus (foothill deathcamas)
year	Nested Frequency
1997	-
2002	-
2007	-
2012	1
2016	3
year	Average Cover (%)
1997	-
2002	-
2007	-
2012	0.0
2016	0.0

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				
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	1997	-	-	-	-
Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	2002	15.2	-	0.3	0.2
Gutierrezia sarothrae (broom snakeweed)	2007	16.7	0	-	1.8
Juniperus osteosperma ^t (Utah juniper)	2012	-	-	-	-
Purshia tridentata ^p (antelope bitterbrush)	2016	-	-	-	-
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	-	-	-

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

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 (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	231/287
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	54/82
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
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

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 (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
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	-	-	-	-	-	-	-	-	-/-
Juniperus osteosperma^t -- (Utah juniper)									
1997	-	-	-	-	-	-	-	-	- / -
2002	20	-	0	100	0	0	0	0	- / -
2007	20	-	0	100	0	0	0	0	- / -
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Purshia tridentata^p -- (antelope bitterbrush)									
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

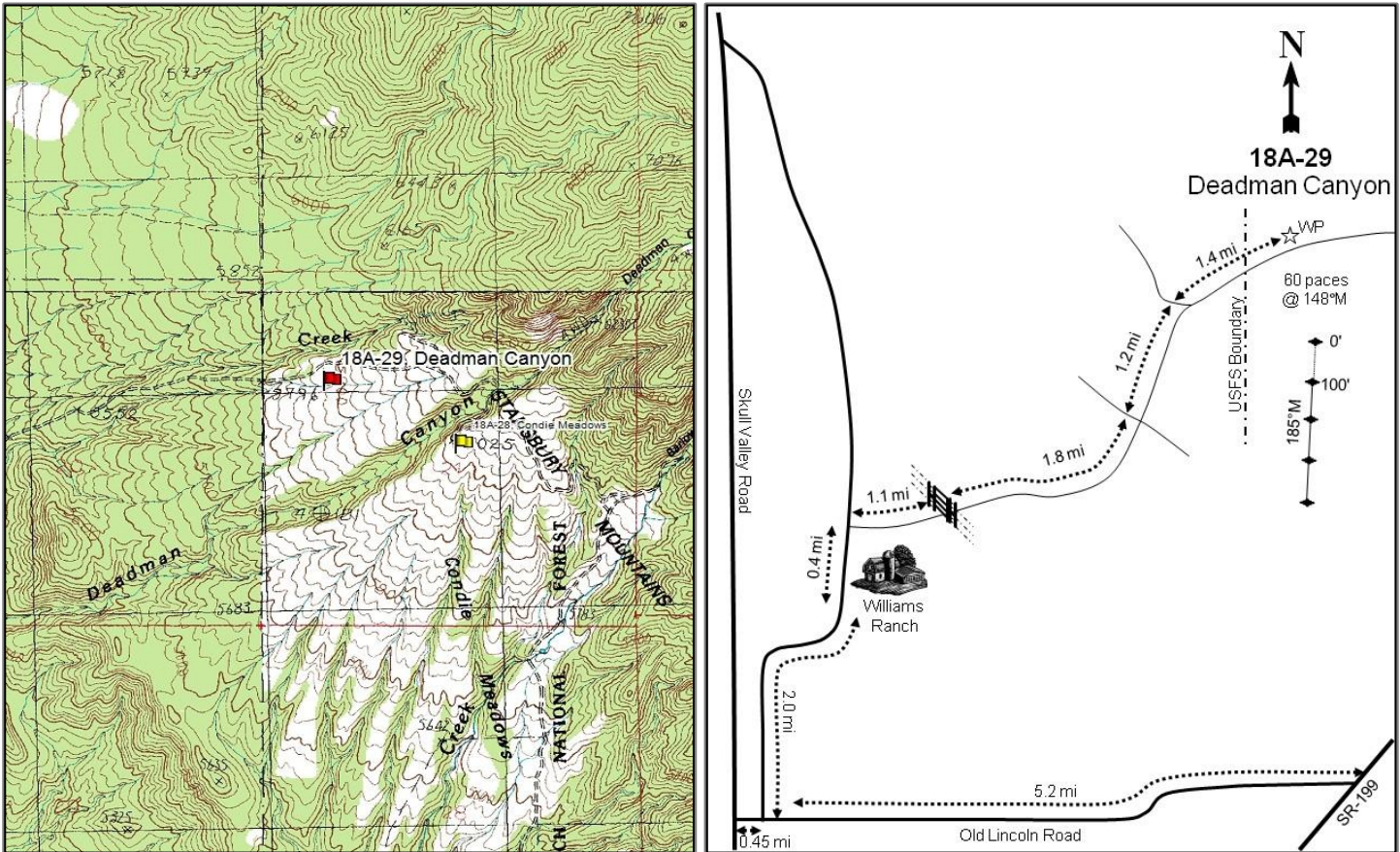
Table 18A-27.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	61	-	-	-	-	-	11.6
2007	61	-	-	65	35	-	17.8

Table -18A-27.15 - Deer Desirable Components Index: High 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	64.1	Fair
2002	30.0	11.9	1.0	3.4	-19.1	5.1	0.0	32.4	Very Poor
2007	30.0	9.4	0.8	12.4	-12.0	10.0	0.0	50.5	Poor
2012	0.0	0.0	0.0	6.4	-20.0	9.0	0.0	-4.6	Very Poor
2016	0	0	0	8	-20	0.6	0	-11.4	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 SR-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 USFS boundary fence and a cattleguard. From the cattleguard, go 0.15 miles to a witness post on the 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

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	-	2013	-

Wildlife Habitat and Vegetation History

Table 18A-29.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
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

Site Notes

The study samples a 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, but a fair browse stand remained until 2013, when the area was burned as part of the Patch wildfire. In 2016, two fawns were seen near the site.

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 (Wyoming Big Sagebrush)
NRCS Ecological Site #	R028AY307UT
States and Transitions	A defined state and transition model is available.

From site 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 (Table 18A-29.12, Photos): these characteristics placed this site in Community Phase 2.2 of the Current Potential state (State 2). Following the Patch wildfire in 2013, the site transitioned via an undefined pathway to a perennial grassland dominated by the native species bluebunch wheatgrass (*Pseudoroegneria spicata*) (Table 18A-29.10): this places the site in a community phase that is not described by the current model, but is likely similar to Community Phase 6.1 in the Seeded Range state (State 6) in which the community is dominated by introduced perennial grasses. The model suggests that through diligent management, it is possible to revert to State 2 from State 6 with the re-establishment of native grass and forb species over a period of 100-150 years (USDA-NRCS, 2007).

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	-	-	-	-

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

Table 18A-29.8 - 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
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

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	Elk	Rabbit
	Quadrat Frequency			
1997	-	29	-	47
2002	-	22	-	55
2007	1	1	-	69
2012	1	6	1	25
2016	-	4	-	3
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)	-	-

Table 18A-29.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirriltail)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (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
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

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 ^{ai} (desert madwort)	Arabis (rockcress)	Calochortus nuttallii (sego lily)	Camelina microcupa ^{ai} (littlerod false flax)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium undulatum ^{ai} (wavyleaf thistle)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Draba ^a (draba)	Erodium cicutarium ^{ai} (redstem stork's bill)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Lathyrus brachycalyx (Bonnevillle pea)	Microsteris gracilis ^a (slender phlox)	Petradoria pumila (rock goldenrod)
year	Nested Frequency																
1997	-	1	287	13	3	-	119	-	-	-	-	-	-	1	52	-	6
2002	-	-	18	-	-	-	2	-	-	-	-	-	2	-	-	-	-
2007	3	-	370	-	-	-	228	-	-	-	-	-	-	-	4	-	-
2012	-	-	233	-	-	-	6	-	2	-	-	-	3	-	6	-	-
2016	2	-	350	-	4	2	7	10	-	5	57	13	4	35	24	2	-
year	Average Cover (%)																
1997	-	0.0	1.8	0.1	0.1	-	0.4	-	-	-	-	-	-	0.0	0.6	-	0.0
2002	-	-	0.0	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-
2007	0.0	-	3.8	-	-	-	2.0	-	-	-	-	-	-	-	0.2	-	-
2012	-	-	1.2	-	-	-	0.0	-	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	0.0	0.4	0.4	0.0	-

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

FORB SPECIES	Phlox longifolia (longleaf phlox)	Salsola tragus ⁿⁱ (prickly Russian thistle)	Sisymbrium altissimum ⁿⁱ (all tumbledustard)	Tragopogon dubius ⁿⁱ (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency				
1997	8	-	2	-	-
2002	-	-	-	-	-
2007	2	-	3	-	-
2012	-	-	-	-	-
2016	2	26	9	1	0
year	Average Cover (%)				
1997	0.2	-	0.0	-	-
2002	-	-	-	-	-
2007	0.0	-	0.0	-	-
2012	-	-	-	-	-
2016	0.0	0.8	0.4	0.0	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	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ⁱ (Utah juniper)	Purshia stansburiana ^p (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	-	-	-	-
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	-	-

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

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 (%)				
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. lanceolatus -- (yellow rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	49/57
2016	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
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
Juniperus osteosperma^t -- (Utah juniper)									
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	-/-
Purshia stansburiana^p -- (Stansbury cliffrose)									
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

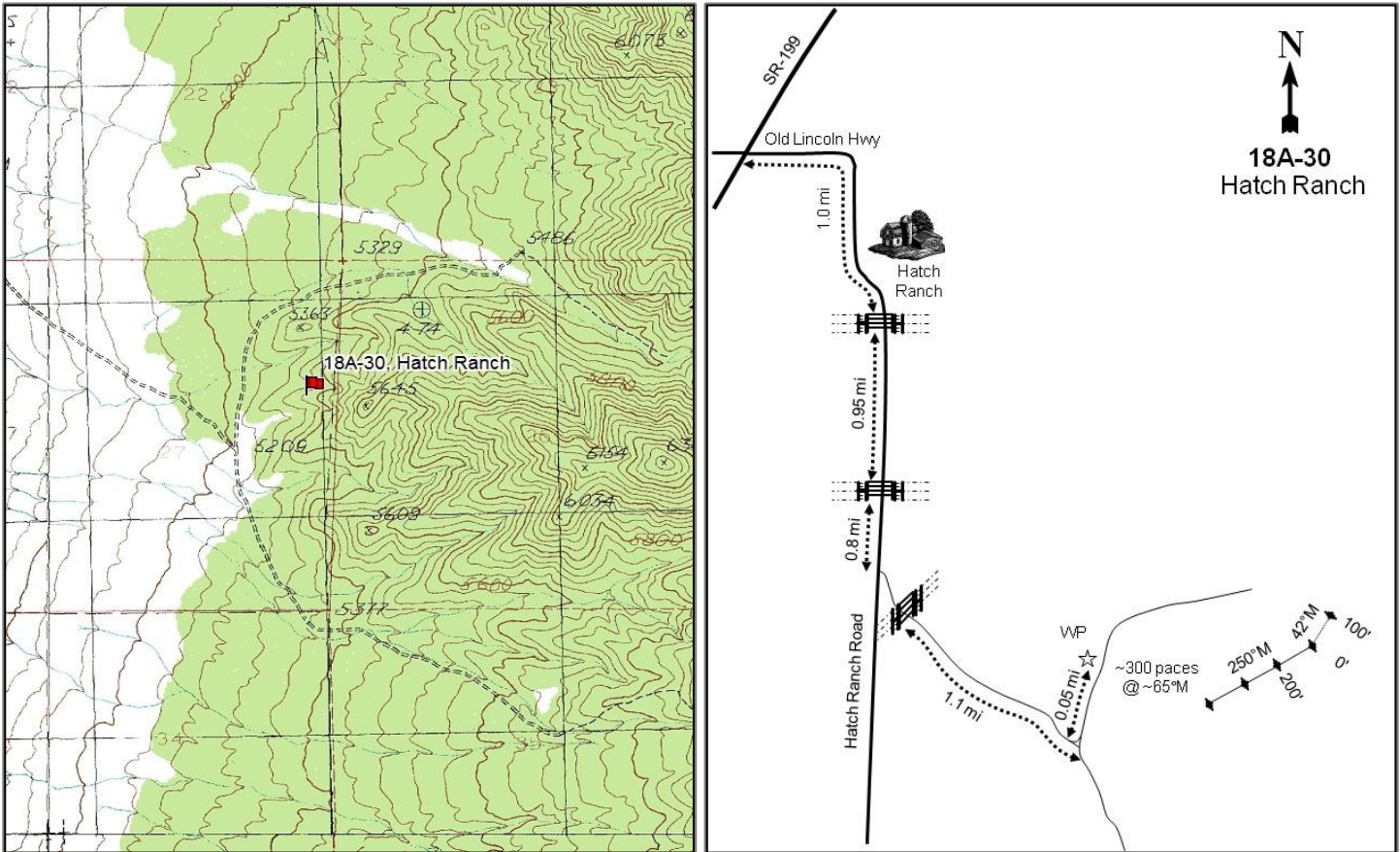
t - Tree Species; p - Preferred Browse; i - Introduced Species

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' (%)	
Juniperus osteosperma (Utah juniper)							
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: Mid 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	10.8	14.6	13.6	30.0	-4.7	2.0	0.0	66.2	Fair-Good
2002	10.4	13.3	3.6	30.0	0.0	0.0	0.0	57.2	Fair
2007	8.3	2.3	0.0	30.0	-1.3	0.4	0.0	39.7	Poor
2012	11.0	11.6	4.3	30.0	-1.3	0.4	0.0	56.0	Fair
2016	0.0	0.0	0.0	30.0	-6.2	1.0	0.0	24.8	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 (Line 2-4: 250° magnetic)
Length 400ft
Belt Placement Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement Standard, Belt 2: No Rebar

Directions to Site

Across from the Old Lincoln Road, turn east off of SR-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 ~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

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
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

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 (Wyoming Big Sagebrush)
NRCS Ecological Site #	R028AY307UT
States and Transitions	A defined state and transition model is available.

This site has been dominated by Stansbury cliffrose (*Purshia stansburiana*) with Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) to a lesser extent since establishment in 1983 (Table 18A-30.12): these characteristics place this site in a community phase that is not defined by the current model, but is likely similar to Community Phase 2.1 in the Current Potential state (State 2) (USDA-NRCS, 2007). The herbaceous understory has fluctuated throughout the study years, but has generally remained limited. Annual grasses such as red brome (*Bromus rubens*) and cheatgrass (*B. tectorum*) have been co-dominant site components in 1983, 2012, and 2016 (Table 18A-30.10, Photos). Although cover of Utah juniper (*Juniperus osteosperma*) was reduced by a 2010 bull-hog treatment (Table 18A-30.1), a small amount remains (Table 18A-30.12), indicating that this site has the potential to be encroached in the future.

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	4.1	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

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	309	262	7	4.3	8.7	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

Table 18A-30.8 - 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
1997	6.4	17.6	28.4	16.0	16.6	34.5
2002	9.9	22.1	25.6	15.3	19.4	26.9
2007	5.7	13.1	28.9	19.4	19.8	28.6
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

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	Elk	Rabbit
	Quadrat Frequency			
1997	1	40	-	45
2002	-	8	-	12
2007	-	9	-	64
2012	-	3	-	3
2016	1	4	-	12
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)	-

Table 18A-30.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus rubens ^{ai} (red brome)	Bromus tectorum ^{ai} (cheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Secale cereale ^{ai} (cereal rye)
year	Nested Frequency						
1997	6	-	335	-	290	26	-
2002	-	-	82	-	321	16	-
2007	3	126	173	-	306	1	-
2012	8	123	328	-	235	14	26
2016	9	193	189	3	95	22	52
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

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 ^{ai} (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chamaesyce (sandmat)	Cirsium (thistle)	Cryptantha (cryptantha)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Erigeron pumilus (shaggy fleabane)	Erodium cicutarium ^{ai} (redstem stork's bill)	Gilia ^a (gilia)	Lactuca serriola ^{ai} (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
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

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

FORB SPECIES						
Lappula occidentalis ^a (flatspine stickseed)						
Microsteris gracilis ^a (slender phlox)						
Phlox hoodii (spiny phlox)						
Phlox longifolia (longleaf phlox)						
Sisymbrium altissimum ^a (tall tumbled mustard)						
Townsendia incana (hoary Townsend daisy)						
year	Nested Frequency					
1997	-	2	9	1	-	4
2002	-	-	9	-	-	-
2007	8	13	3	-	3	1
2012	-	-	9	-	-	5
2016	-	5	6	-	3	-
year	Average Cover (%)					
1997	-	0.0	0.2	0.0	-	0.1
2002	-	-	0.4	-	-	-
2007	0.0	0.0	0.1	-	0.0	0.0
2012	-	-	0.9	-	-	0.0
2016	-	0.0	0.2	-	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 ^p (Wyoming big sagebrush)									
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)									
Gutierrezia sarothrae (broom snakeweed)									
Juniperus osteosperma ^t (Utah juniper)									
Linanthus pungens (granite prickly phlox)									
Pinus monophylla ^t (singleleaf pinyon)									
Purshia stansburiana ^p (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
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	4.1	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

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

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 (%)				
Artemisia tridentata ssp. wyomingensis^P -- (Wyoming big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
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
Juniperus osteosperma¹ -- (Utah juniper)									
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	- / -
Linanthus pungens -- (granite prickly phlox)									
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
Pinus monophylla¹ -- (singleleaf pinyon)									
1997	-	-	-	-	-	-	-	-	- / -
2002	20	-	100	0	0	0	0	0	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
Purshia stansburiana^P -- (Stansbury cliffrose)									
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
Sclerocactus -- (fishhook cactus)									
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
Tetradymia canescens -- (spineless horsebrush)									
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	-	-	-	-	-	-	-	-	- / -

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 nuttallii -- (Nuttall's horsebrush)									
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

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

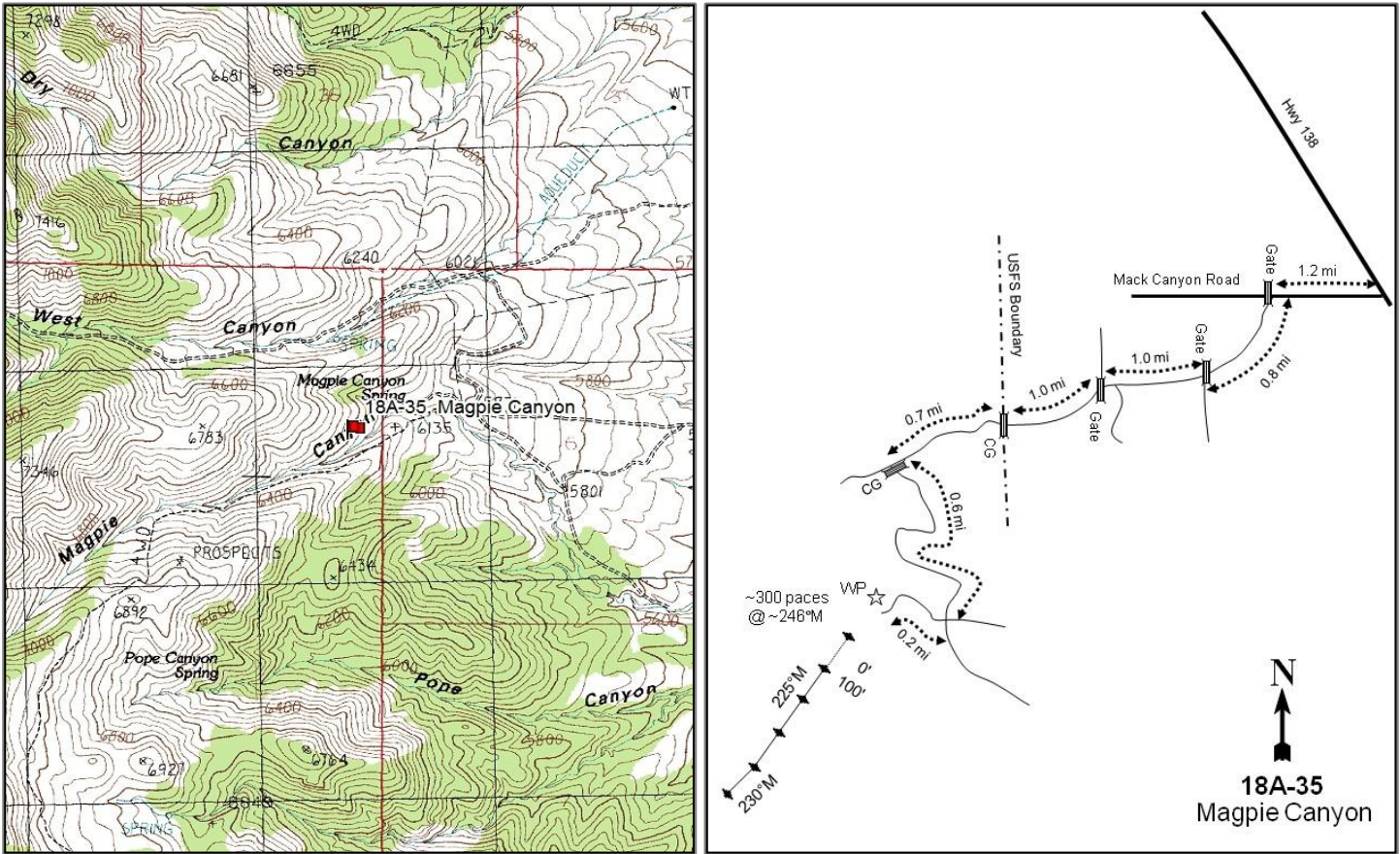
Table 18A-30.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution				Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	
Juniperus osteosperma (Utah juniper)						
2002	104	-	-	-	-	13.4
2007	102	-	24	24	24	14.9
2012	80	31	63	-	6	6.3
2016	102	22	67	6	6	10.7

Table -18A-30.15 - Deer Desirable Components Index: Mid 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	17.9	10.8	9.1	12.2	-6.1	0.9	0.0	44.8	Poor
2002	22.2	11.9	6.0	15.2	-0.3	0.7	0.0	55.6	Fair
2007	18.7	9.9	2.0	17.5	-3.3	0.3	0.0	45.1	Poor
2012	17.8	11.0	6.8	14.3	-13.9	2.2	0.0	38.1	Poor
2016	17.3	12.2	4.5	4.2	-9.2	0.8	0.0	29.9	Very Poor

MAGPIE CANYON - STUDY NO. 18A-35



Location Information

USGS 7.5 min Map Info North Willow Canyon ; Township 3S, Range 7W, Section 01
 GPS (0' Stake) NAD 83 UTM ZONE 12, 366332 East 4493865 North

Transect Information

Browse Tag # (0' Stake) 161
 Transect Bearing 225° magnetic (Line 5: 230° magnetic)
 Length 500ft
 Belt Placement Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
 Belt Marker Placement Standard, Belt 1: No Rebar

Directions to Site

From Grantsville, proceed west on Highway 138 to Mack Canyon Road on the left 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. Travel another 1.0 miles to another gate. Travel 1.0 miles to a cattle guard and 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 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

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
Deer	crucial	spring/fall
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

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 states and transitions for this site are likely similar to those of the Mountain Stony Loam (Antelope Bitterbrush), R047XA456UT 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*) (Table 18A-35.12). The herbaceous understory is not very diverse, but is moderately abundant with the invasive annual grass cheatgrass (*Bromus tectorum*) and the native perennial grass bluebunch wheatgrass (*Pseudoroegneria spicata*) providing a majority of the cover (Table 18A-35.7, Table 18A-35.10). The noxious weed gypsyflower (*Cynoglossum officinale*) has been sampled in both sample years, but in low amounts (Table 18A-35.11). Although cover was low, Utah juniper (*Juniperus osteosperma*) was observed in 2016, indicating that this site has the potential for encroachment in the future (Table 18A-35.12).

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	-

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

Table 18A-35.8 - 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
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

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	Elk
	Quadrat Frequency		
2012	-	2	-
2016	2	5	-
Year	Days Use Per Acre (ha)		
	2012	0.7 (1.8)	10.0 (24.8)
2016	8.0 (19.7)	26.2 (64.6)	6.0 (14.9)

Table 18A-35.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency				
<i>Bromus arvensis</i> ^{ai} (field brome)	46	387	36	50	222
<i>Bromus tectorum</i> ^{ai} (cheatgrass)	19	228	80	16	229
<i>Poa bulbosa</i> ⁱ (bulbous bluegrass)					
<i>Poa secunda</i> (Sandberg bluegrass)					
<i>Pseudoroegneria spicata</i> (bluebunch wheatgrass)					
year	Average Cover (%)				
2012	1.3	11.8	0.5	0.8	10.8
2016	0.3	11.3	2.1	0.1	12.6

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	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Artemisia ludoviciana (white sagebrush)	Astragalus cibirius (browse milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (litlepod false flax)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Cynoglossum officinale ^{ami} (gypsyflower)	Descurainia pinnata ^a (western tansymustard)
year	Nested Frequency																
2012	13	288	10	6	4	14	2	-	18	0	6	-	10	3	-	1	-
2016	27	203	11	5	-	9	9	1	8	-	-	3	13	2	2	5	4
year	Average Cover (%)																
2012	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	-
2016	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

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

FORB SPECIES	Erodium cicutarium ^{ai} (redstem stork's bill)	Galium aparine ⁿ (stickywilly)	Hackelia patens (spotted stickseed)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca scariola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stone seed)	Lomatium (desertparsley)	Phlox longifolia (longleaf phlox)	Tragopogon dubius ^{ai} (yellow salsify)	Veronica biloba ^{ai} (two-lobed speedwell)
year	Nested Frequency											
2012	145	15	1	31	9	-	-	1	38	22	12	-
2016	188	24	5	3	22	1	2	1	21	10	15	4
year	Average Cover (%)											
2012	2.1	0.2	0.0	0.1	0.0	-	-	0.2	0.6	0.2	0.1	-
2016	3.3	1.6	0.0	0.0	0.1	0.0	0.0	0.0	0.4	0.0	0.1	0.0

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	Line Intercept Cover (%)					
	year	Line Intercept Cover (%)				
Amelanchier utahensis ^p (Utah serviceberry)	2012	2.8	4.5	0.2	-	19.3
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	2012	0.7	7.3	1.2	-	23.6
Gutierrezia sarothrae (broom snakeweed)	2016	2.2	2.3	0.0	-	16.6
Juniperus osteosperma ^t (Utah juniper)	2016	0.0	5.5	0.5	0.2	12.6
Purshia tridentata ^p (antelope bitterbrush)						

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

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 (%)				
Amelanchier utahensis ^p -- (Utah serviceberry)									
2012	80	20	0	100	0	0	25	0	131/140
2016	40	-	0	50	50	0	50	0	139/141
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
2012	560	-	4	93	4	14	0	18	65/105
2016	380	-	5	79	16	37	0	5	81/132
Ericameria nauseosa ssp. nauseosa var. speciosa ^p -- (rubber rabbitbrush)									
2012	-	-	-	-	-	-	-	-	77/94
2016	-	-	-	-	-	-	-	-	76/89
Gutierrezia sarothrae -- (broom snakeweed)									
2012	480	-	29	71	0	0	0	0	24/31
2016	500	-	0	100	0	0	0	0	31/40
Purshia stansburiana ^p -- (Stansbury cliffrose)									
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	228/587
Purshia tridentata ^p -- (antelope bitterbrush)									
2012	1960	-	1	92	7	29	4	6	67/123
2016	1380	-	3	94	3	32	22	4	73/159

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

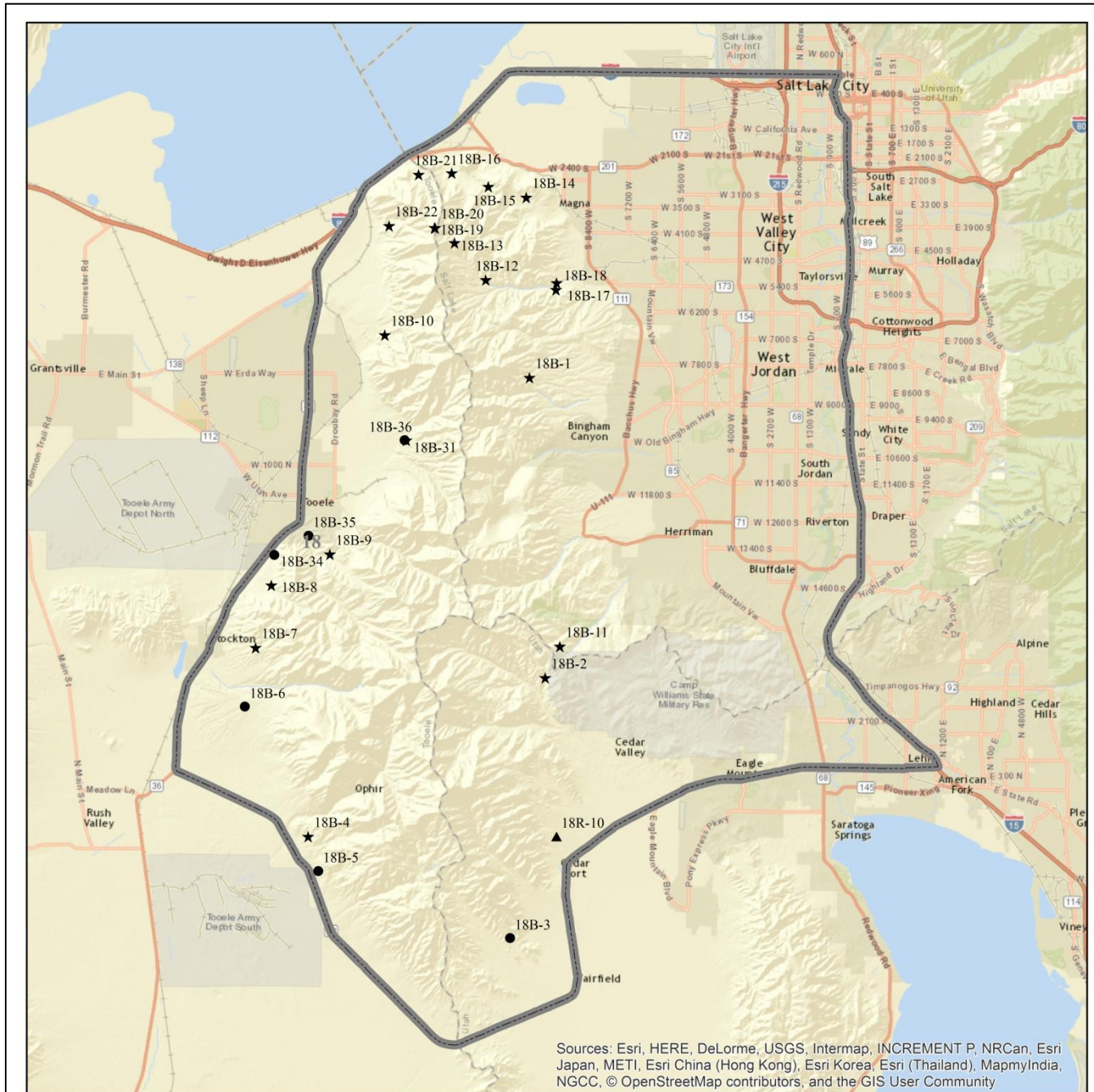
Table 18A-35.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2016	4	-	-	100	-	-	18.5

Table -18A-35.15 - Deer Desirable Components Index: High Potential Scale.

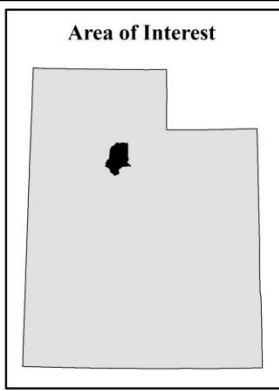
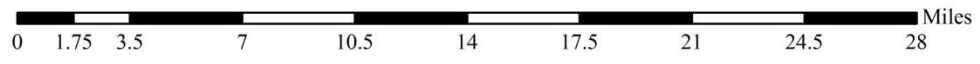
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2012	30.0	13.2	0.6	23.4	-9.9	7.1	-2.0	62.3	Fair
2016	25.8	12.9	1.8	25.6	-8.7	4.4	-2.0	59.8	Fair

WILDLIFE MANAGEMENT UNIT 18B - OQUIRRH MOUNTAINS

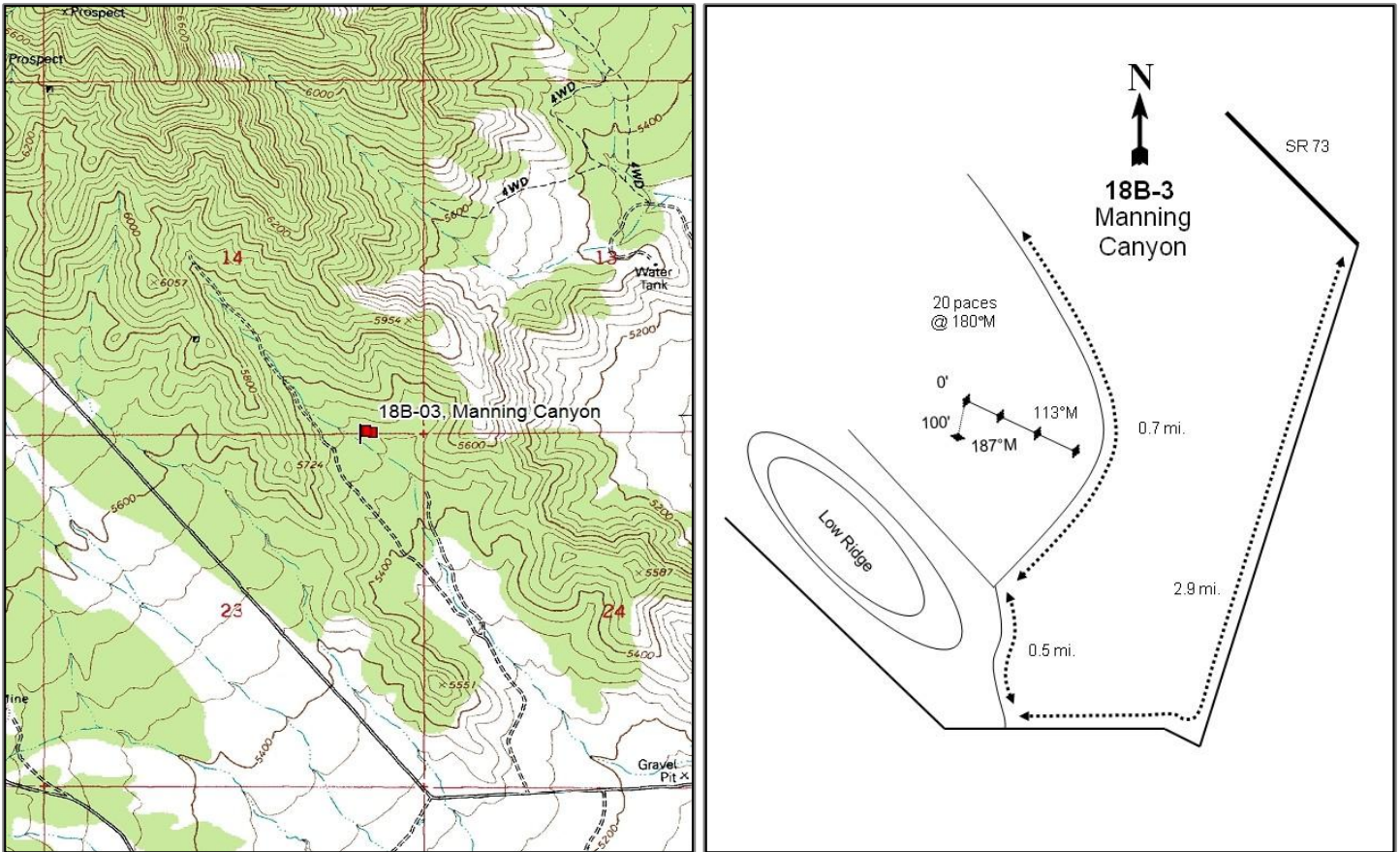


Study Location Project, Status

- RT, Active
- ★ RT, Suspended
- ▲ WRI, Active
- Unit - 18B



MANNING CANYON - STUDY No. 18B-3



Location Information

USGS 7.5 min Map Info	Mercur SE; Township 6S, Range 3W, Section 23
GPS (0' Stake)	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 SR-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) and travel an additional 0.7 miles. The 0-foot stake is 26 paces 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

Wildlife Habitat and Vegetation History

Table 18B-03.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter/spring
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

Site Notes

This study is within crucial winter range at the extreme south end of the Oquirrh Mountains in a small valley surrounded with 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	26.6	2.6	7.7	124.8	0.5	06/16/1997

Site Potential

1981-2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Stony Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R028AY334UT
States and Transitions	No state and transition model is available for this ecological site.

This study site has existed as a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) dominated plant community type since its establishment in 1983. Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon (*Pinus monophylla*) are present on the site in amounts that indicate that it is in transition from Phase I to Phase II of woodland succession. Other shrub species are present in lower amounts (Table 18B-03.4, Table 18B-03.6, Table 18B-03.12). The herbaceous understory has been dominated by perennial grasses in nearly every sample year. However, data and/or site photos show that the invasive annual cheatgrass (*Bromus tectorum*) was dominant in 1983 and co-dominant in 2007. Forbs have remained generally rare throughout the study period (Table 18B-03.7, Table 18B-03.10, Table 18B-03.11, Photos). Without a tree-removing disturbance, it is predicted that juniper and pinyon will continue to increase in cover and that the site will progress in phases of woodland succession.

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

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

Table 18B-03.8 - 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
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

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	Elk	Rabbit
	Quadrat Frequency			
1997	-	52	2	10
2002	-	21	-	45
2007	1	18	8	91
2012	-	4	-	39
2016	-	23	-	38
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)	-	-

Table 18B-03.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia octoflora ^a (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	-
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	-

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 ^{ai} (desert madwort)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus calycosus (Torrey's milkvetch)	Astragalus eurekaensis (Eureka milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcapa ^{ai} (littlepod false flax)	Castilleja (Indian paintbrush)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Cirsium (thistle)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Eriogonum brevicaulle (shortstem buckwheat)	Eriogonum ovalifolium (cushion buckwheat)	Erodium cicutarium ^{ai} (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
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

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

FORB SPECIES	Gilia ^a (gilia)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca scariola ^{ai} (prickly lettuce)	Lathyrus brachycalyx (Bonneville pea)	Petroradia pumila (rock goldenrod)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Sisymbrium altissimum ^{ai} (tall tumbled mustard)	Sphaeralcea coccinea (scarlet globemallow)	Streptanthus cordatus (heartleaf twistflower)
year	Nested Frequency									
1997	3	-	0	7	24	5	-	-	24	6
2002	4	-	-	7	27	-	3	-	9	4
2007	-	22	3	1	19	4	3	2	18	2
2012	-	7	-	9	21	3	-	-	12	-
2016	-	-	-	0	20	1	-	-	9	1
year	Average Cover (%)									
1997	0.0	-	0.0	0.2	0.9	0.0	-	-	0.3	0.2
2002	0.0	-	-	0.3	0.5	-	0.0	-	0.1	0.0
2007	-	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.1	0.0
2012	-	0.0	-	0.1	0.6	0.0	-	-	0.1	-
2016	-	-	-	0.0	0.6	0.0	-	-	0.1	0.0

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	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Ephedra viridis ^p (mormon tea)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ^t (Utah juniper)	Opuntia (pricklypear)	Pinus monophylla ^t (singleleaf pinyon)
year	Line Intercept Cover (%)							
1997	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	0.4	-	-
2007	8.2	-	-	1.8	0.2	6.1	0.1	-
2012	7.7	-	0.1	3.4	0.2	9.8	0.1	0.5
2016	7.4	-	0.1	5.3	0.1	10.1	-	0.7
year	Quadrat Cover (%)							
1997	7.7	0.5	-	0.8	0.2	3.3	-	-
2002	7.9	0.1	-	1.0	0.0	3.6	-	0.6
2007	5.5	0.2	0.0	1.1	0.2	3.8	0.0	0.1
2012	8.6	0.0	0.2	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

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

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 (%)				
Artemisia nova^p -- (black sagebrush)									
1997	-	-	-	-	-	-	-	-	31/37
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	38/45
2016	-	-	-	-	-	-	-	-	44/52
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
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
Ephedra viridis^p -- (mormon tea)									
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
Ericameria nauseosa -- (rubber rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	87/64
Gutierrezia sarothrae -- (broom snakeweed)									
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
Juniperus osteosperma¹ -- (Utah juniper)									
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	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
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

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 (%)				
Pinus monophylla¹ -- (singleleaf pinyon)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Purshia stansburiana^p -- (Stansbury cliffrose)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	232/255
2012	-	-	-	-	-	-	-	-	193/244
2016	-	-	-	-	-	-	-	-	179/177

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

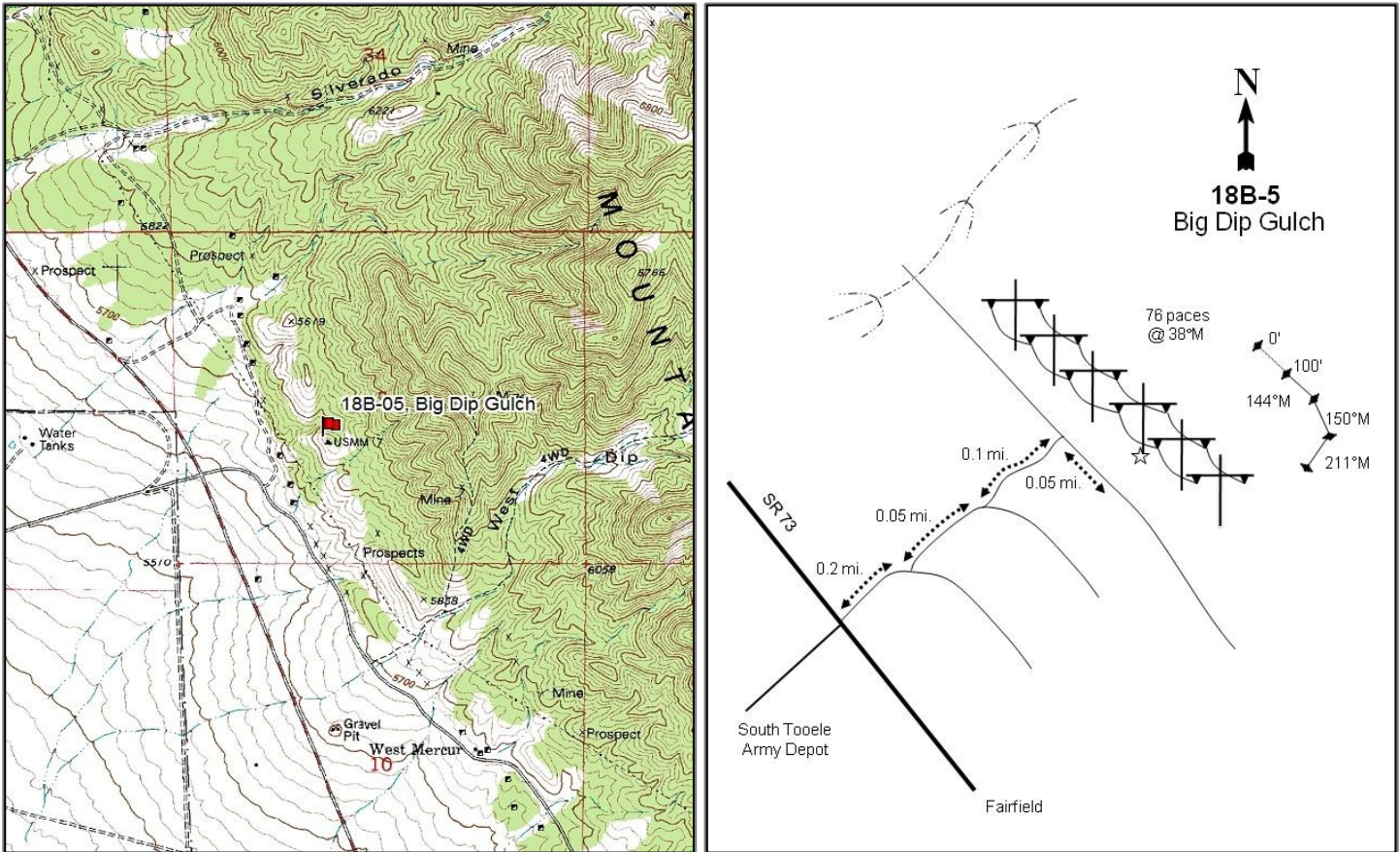
Table 18B-03.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
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
Pinus monophylla (singleleaf pinyon)							
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: Mid 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	6.6	0.9	30.0	-5.0	3.5	0.0	46.7	Poor
2002	11.1	1.1	1.3	23.5	-3.7	2.1	0.0	35.4	Very Poor-Poor
2007	8.3	2.3	5.4	21.5	-6.8	0.8	0.0	31.6	Very Poor
2012	12.4	9.5	8.7	29.5	-5.7	1.7	0.0	56.2	Fair
2016	10.3	3.0	0.8	30.0	-2.5	1.6	0.0	43.2	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)	3969
Transect Bearing	144° magnetic (Line 3: 150° magnetic, Line 4: 211° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard, Belt 1: No Rebar

Directions to Site

From the junction of SR-73 and the east entrance of the South Army Depot, turn east on 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 and proceed 0.05 miles along a power line until you come to two power poles. The 0-foot stake is marked by a green steel fencepost 15 inches in height and is also marked with a red browse tag #3969.

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

Wildlife Habitat and Vegetation History

Table 18B-05.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
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

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, which 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 #	R028AY318UT
States and Transitions	No state and transition model is available for this ecological site.

Since establishment in 1988, this site has remained stable and dominated by black sagebrush (*Artemisia nova*) with yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *stenophyllus*) as the subordinate species. Cover of sagebrush has increased in cover over the sample years (Table 18B-13.10, Table 18B-13.12). The herbaceous understory has remained sparse with limited cover; however, the perennial grass bluebunch wheatgrass (*Pseudoroegneria spicata*) has remained the dominant species (Table 18B-13.7, Table 18B-13.11). Potential for conifer encroachment appears to be low due to the high amount of rock and shallow soils (Table 18B-13.8).

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

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

Table 18B-05.8 - 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
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

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	Elk	Horse	Rabbit
	Quadrat Frequency			
1997	42	-	1	9
2002	22	-	-	15
2007	24	4	-	85
2012	21	-	-	15
2016	38	-	-	48
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)	-	-	-

Table 18B-05.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum ^{ai} (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
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

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 ^{ai} (desert madwort)	Arabis (rockcress)	Astragalus (milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Draba ^a (draba)	Erodium cicutarium ^{ai} (redstem stork's bill)
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
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

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	Line Intercept Cover (%)			
	year	Line Intercept Cover (%)		
Artemisia nova ^p (black sagebrush)	1997	-	-	-
	2002	-	-	-
	2007	10.4	-	0.3
	2012	10.1	-	0.4
	2016	12.9	-	0.4
	2016	10.3	-	0.1
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	1997	6.4	0.0	2.7
	2002	8.1	0.0	0.2
	2007	8.6	0.1	0.5
	2012	10.1	0.0	0.0
	2016	10.3	-	0.1
	2016	10.3	-	0.1
Gutierrezia sarothrae (broom snakeweed)	1997	6.4	0.0	2.7
	2002	8.1	0.0	0.2
	2007	8.6	0.1	0.5
	2012	10.1	0.0	0.0
	2016	10.3	-	0.1
	2016	10.3	-	0.1
Juniperus osteosperma ^t (Utah juniper)	1997	6.4	0.0	2.7
	2002	8.1	0.0	0.2
	2007	8.6	0.1	0.5
	2012	10.1	0.0	0.0
	2016	10.3	-	0.1
	2016	10.3	-	0.1

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

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 (%)				
Artemisia nova^p -- (black sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
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
Ephedra viridis^p -- (mormon tea)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	42/40
2012	-	-	-	-	-	-	-	-	49/70
2016	-	-	-	-	-	-	-	-	85/165
Gutierrezia sarothrae -- (broom snakeweed)									
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

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 (%)				
Juniperus osteosperma¹ -- (Utah juniper)									
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	- / -
Opuntia -- (pricklypear)									
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
Pinus monophylla¹ -- (singleleaf pinyon)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	20	-	100	0	0	0	0	0	- / -
2016	-	-	-	-	-	-	-	-	- / -
Purshia stansburiana^p -- (Stansbury cliffrose)									
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
Tetradymia glabrata -- (littleleaf horsebrush)									
1997	20	-	0	100	0	0	0	0	11/12
2002	20	-	0	0	100	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

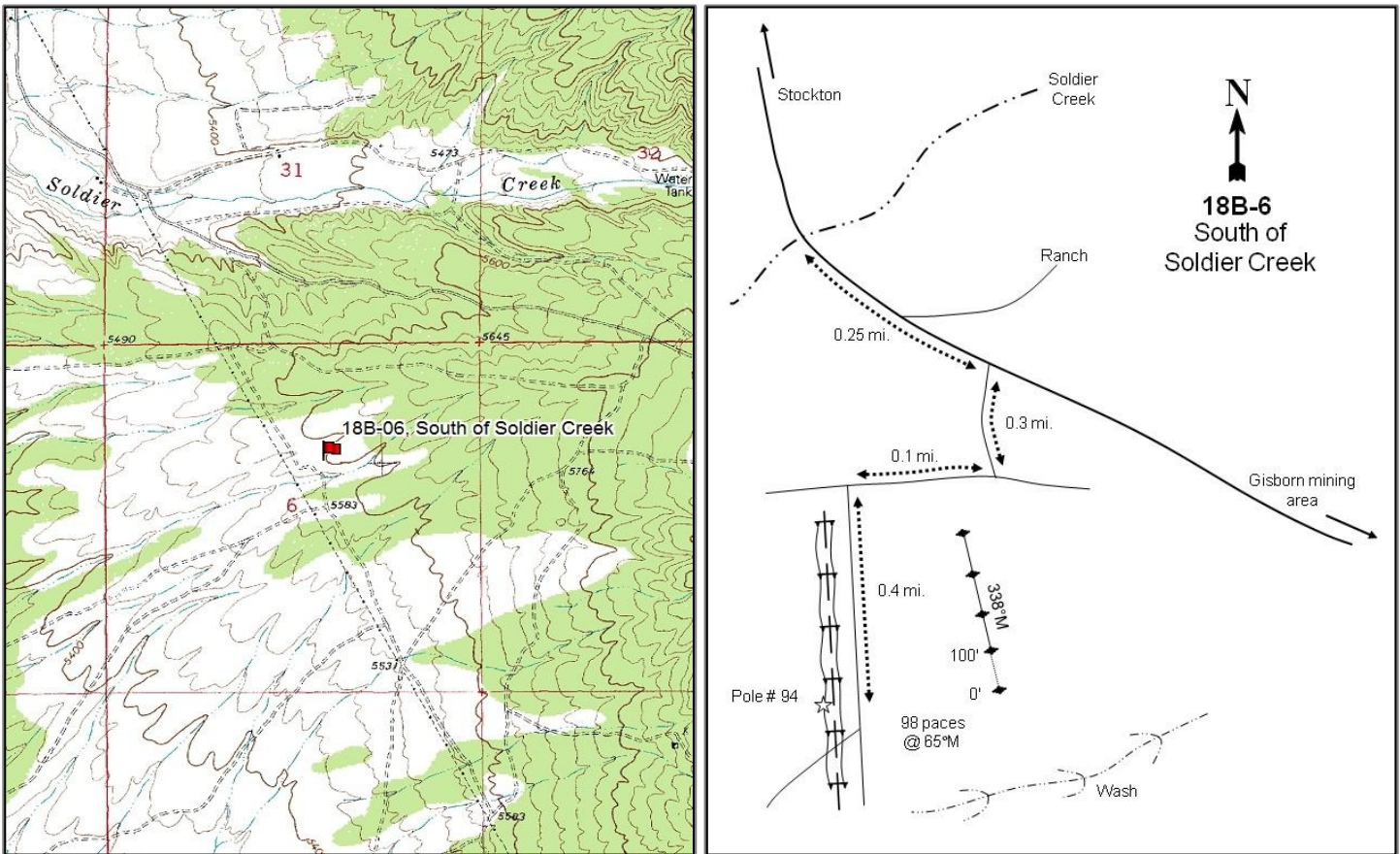
Table 18B-05.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2012	21	15	46	31	8	-	14.8
2016	30	13	50	19	13	6	13.4
Pinus monophylla (singleleaf pinyon)							
2012	4	-	50	50	-	-	27.8
2016	4	-	-	50	50	-	12.5

Table -18B-05.15 - Deer Desirable Components Index: Mid 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	9.6	12.9	8.0	7.6	-0.4	0.1	0.0	37.8	Poor
2002	12.2	8.4	2.5	14.0	-0.2	0.2	0.0	37.1	Poor
2007	12.9	7.5	2.5	21.2	-0.5	0.0	0.0	43.6	Poor
2012	15.2	12.6	2.0	17.1	-0.1	0.0	0.0	46.8	Poor
2016	12.9	9.0	1.0	14.6	-0.1	0.0	0.0	37.4	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)	Not Available
Transect Bearing	338° 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

Heading north on SR-36 in Stockton, turn east on East Silver Avenue. Follow this road through town as it turns to the 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 travel 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

Table 18B-06.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Unknown	-	-	Historic	-
Seeding - Unknown	-	-	Historic	-
Mechanical - Bullhog	Stockton Bullhog	1929	Spring 2012	1561
Seeding - Transplant	Stockton Bullhog	1929	April 2012	-

Wildlife Habitat and Vegetation History**Table 18B-06.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter	
Elk	crucial	winter	
Greater Sage Grouse	Crucial	occupied & 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	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	Mountain Big Sagebrush/Perennial Grass	Phase I
2016	Mountain Big Sagebrush/Perennial Grass	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 (Mountain Big Sagebrush)
NRCS Ecological Site #	R028AY310UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1983, the shrub overstory of this site has been dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). Utah juniper (*Juniperus osteosperma*) was a notable component of the overstory throughout the study years, but a bull-hog treatment prior to the 2012 sampling eliminated most of the trees (Table 18B-06.12, Photos). Perennial grasses such as crested wheatgrass (*Agropyron cristatum*) and bluebunch wheatgrass (*Pseudoroegneria spicata*) contribute a majority of the herbaceous cover and have co-dominated the site in all study years. The invasive annual grass cheatgrass (*Bromus tectorum*) has been present in multiple sample years, but in low amounts (Table 18B-06.7, Table 18B-06.10). Although density is low, singleleaf pinyon (*Pinus monophylla*) has been observed in both sample years following the bull-hog treatment (Table 18B-06.13), indicating that this site has the potential for infilling in the future.

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	-

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

Table 18B-06.8 - 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
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

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	Elk	Rabbit
	Quadrat Frequency			
1997	-	19	1	29
2002	-	8	4	29
2007	-	6	6	54
2012	-	2	-	10
2016	-	4	1	16
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	-	2.0 (5.0)	-	-
2016	-	0.7 (1.7)	-	-

Table 18B-06.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirriltail)	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
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

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 ^{ai} (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus tenellus (looseflower milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcapa ^{ai} (littelpod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaetopappa ericoides (rose heath)	Cirsium (thistle)	Erigeron pumilus (shaggy fleabane)	Eriogonum ovalifolium (cushion buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)
year	Nested Frequency																
1997	-	-	1	4	6	13	15	-	6	3	-	212	-	-	1	-	6
2002	1	23	-	-	3	-	-	3	3	-	-	187	-	1	-	-	-
2007	-	78	-	2	-	13	-	-	6	-	1	311	1	-	-	1	25
2012	-	102	1	3	1	9	2	2	-	-	-	13	-	-	-	-	-
2016	-	188	1	-	7	22	1	5	11	-	-	99	-	3	-	-	-
year	Average Cover (%)																
1997	-	-	0.0	0.0	0.0	0.3	0.4	-	0.0	0.0	-	1.4	-	-	0.0	-	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	0.2
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	-	-	-

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

FORB SPECIES	Gilia ^a (gilia)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca scariola ^{ai} (prickly lettuce)	Lathyrus brachycalyx (Bonnevillie pea)	Petroradia pumila (rock goldenrod)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Salsola tragus ^{ai} (prickly Russian thistle)	Sanguisorba minor ⁱ (small burnet)	Sisymbrium altissimum ^{ai} (tall tumbleweed)
year	Nested Frequency									
1997	-	-	-	22	58	71	15	-	-	3
2002	1	-	-	57	57	70	10	-	-	-
2007	1	27	-	59	51	62	13	-	-	6
2012	-	-	-	74	2	49	8	2	4	-
2016	-	2	1	89	51	46	9	-	-	-
year	Average Cover (%)									
1997	-	-	-	1.0	2.1	1.0	0.0	-	-	0.0
2002	0.0	-	-	2.1	1.7	0.9	0.1	-	-	-
2007	0.0	0.1	-	2.7	2.3	1.7	0.1	-	-	0.1
2012	-	-	-	2.5	0.1	0.9	0.1	0.1	0.0	-
2016	-	0.0	0.0	4.0	2.9	1.3	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 ^p (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa ^p (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ^t (Utah juniper)	Opuntia (pricklypear)	Pinus monophylla ^t (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	-	-	-	-	-
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	-	-	-	-

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

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 (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
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
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2016	20	-	100	0	0	100	0	0	27/31
Gutierrezia sarothrae -- (broom snakeweed)									
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
Juniperus osteosperma^t -- (Utah juniper)									
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	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
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
Pinus monophylla^t -- (singleleaf pinyon)									
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

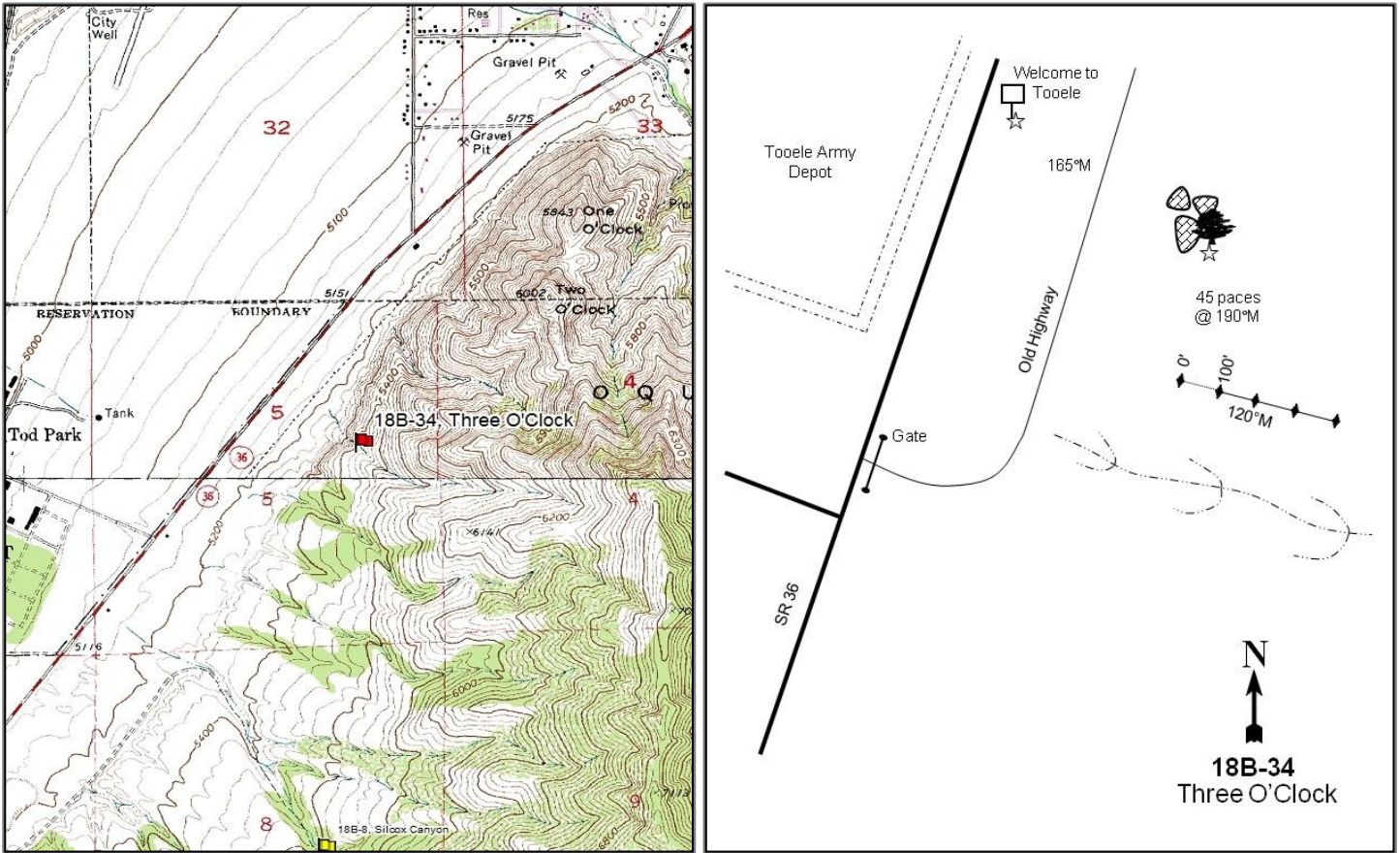
Table 18B-06.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1997	45	-	-	-	-	-	9.8
2002	85	-	-	-	-	-	11.7
2007	100	6	17	61	17	-	21.7
2012	10	-	100	-	-	-	2.5
2016	19	70	30	-	-	-	2.2
Pinus monophylla (singleleaf pinyon)							
2012	3	-	100	-	-	-	4.0
2016	7	50	50	-	-	-	3.5

Table -18B-06.15 - Deer Desirable Components Index: Mid 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	24.8	-2.4	9.8	0.0	35.0	Very Poor-Poor
2002	2.4	0.0	0.0	29.4	-1.3	9.7	0.0	40.2	Poor
2007	3.5	0.0	0.0	30.0	-1.2	10.0	0.0	42.3	Poor
2012	1.2	0.0	0.0	30.0	-0.1	7.4	0.0	38.5	Poor
2016	2.3	0.0	0.0	30.0	-1.7	10.0	0.0	40.5	Poor

THREE O'CLOCK - STUDY NO. 18B-34



Location Information

USGS 7.5 min Map Info Tooele SW; Township 4S, Range 4W, Section 05
 GPS (0' Stake) NAD 83 UTM ZONE 12, 388379 East 4484199 North

Transect Information

Browse Tag # (0' Stake) Not Available
 Transect Bearing 120° 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

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 with a lone juniper and 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

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
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

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 (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 browse component on this site since study establishment in 2002, although cover has decreased each sample year since 2007 (Table 18B-34.12). Perennial grasses have co-dominated throughout the study years; However, a majority of the cover has been contributed by the introduced species bulbous bluegrass (*Poa bulbosa*) (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 2016 (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 (Table 18B-34.12, Table 18B-34.13, Photos).

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	16.8	1.4	-	18.3	4.5	-
2012	14.1	1.1	-	15.9	0.6	-
2016	8.6	4.2	-	12.3	5.6	-

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	105	436	276	172	1.0	30.2	1.6	4.8
2012	163	468	302	205	2.0	35.4	1.7	6.5
2016	207	437	160	162	6.6	24.3	2.1	4.3

Table 18B-34.8 - 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
2002	6.8	3.3	24.7	9.8	13.4	60.7
2007	5.7	10.1	19.7	8.6	9.8	52.3
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

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	Elk	Horse	Rabbit
	Quadrat Frequency				
2002	2	24	27	-	-
2007	1	21	23	3	2
2012	-	22	4	-	5
2016	-	20	4	-	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)	-	-

Table 18B-34.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Aristida purpurea (purple threeawn)	Bromus briziformis ^{ai} (rattlesnake brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum ponticum ⁱ (tall wheatgrass)	Vulpia octoflora ^a (sixweeks fescue)
year	Nested Frequency											
2002	-	94	-	227	3	-	470	29	4	5	-	1
2007	-	91	-	98	2	-	363	264	-	8	-	15
2012	3	67	2	163	8	1	344	349	2	4	-	-
2016	-	122	-	207	-	-	309	214	2	2	4	-
year	Average Cover (%)											
2002	-	1.7	-	1.0	0.2	-	35.5	0.1	0.0	0.1	-	0.0
2007	-	2.8	-	0.9	0.1	-	19.2	7.4	-	0.7	-	0.1
2012	0.0	2.9	0.0	2.0	0.1	0.0	22.4	9.3	0.0	0.7	-	-
2016	-	4.2	-	6.6	-	-	14.1	5.4	0.0	0.4	0.2	-

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	Alyssum desertorum ^{ai} (desert 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 ^{ai} (curveseed butterwort)	Cirsium (thistle)	Cirsium neomexicanum ^a (New Mexico thistle)	Convolvulus arvensis ^{ai} (field bindweed)	Crepis acuminata (tapertip hawkbeard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum racemosum (redroot buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	
year	Nested Frequency																	
2002	15	2	1	53	5	17	7	-	-	22	-	-	21	-	3	40	25	
2007	22	6	2	58	4	29	15	-	10	33	-	-	27	198	3	47	23	
2012	38	4	6	64	12	13	41	2	-	42	-	-	45	159	57	59	49	
2016	23	6	1	10	10	33	-	-	-	-	42	10	3	2	25	34	25	
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	0.1	
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	0.6	0.3	
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	0.2	
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	0.4	

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

FORB SPECIES																
Gilia ^a (gilia)																
Grindelia squarrosa (curlycup gumweed)																
Helianthus annuus ^a (common sunflower)																
Heterotheca villosa (hairy false goldenaster)																
Holosteum umbellatum ^{ai} (jagged chickweed)																
Lactuca serriola ^{ai} (prickly lettuce)																
Linaria dalmatica ^{ai} (Dalmatian toadflax)																
Lomatium (desertparsley)																
Petroragia pumila (rock goldenrod)																
Phlox hoodii (spiny phlox)																
Phlox longifolia (longleaf phlox)																
Polygonum douglasii ^a (Douglas' knotweed)																
Sphaeralcea coccinea (scarlet globemallow)																
Tragopogon dubius ^{ai} (yellow salsify)																
Zigadenus paniculatus (foothill deathcamas)																
year	Nested Frequency															
2002	1	-	137	7	1	-	-	-	2	3	24	10	-	21	22	
2007	-	-	2	9	139	-	-	1	-	3	17	17	2	24	31	
2012	-	13	6	17	204	5	-	-	0	-	31	16	4	68	30	
2016	0	23	41	58	-	18	4	-	3	-	3	7	4	55	27	
year	Average Cover (%)															
2002	0.0	-	0.3	0.3	0.0	-	-	-	0.0	0.0	0.1	0.0	-	0.1	0.4	
2007	-	-	0.0	0.3	0.3	-	-	0.0	-	0.0	0.1	0.1	0.0	0.1	0.5	
2012	-	0.2	0.0	0.7	0.6	0.0	-	-	0.0	-	0.1	0.0	0.0	0.3	0.6	
2016	0.0	0.6	0.3	2.3	-	0.1	0.0	-	0.1	-	0.0	0.0	0.0	0.5	0.2	

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						
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)						
Ericameria nauseosa ssp. nauseosa var. spectiosa ^p (rubber rabbitbrush)						
Gutierrezia sarothrae (broom snakeweed)						
Opuntia polyacantha (plains pricklypear)						
Sarcobatus vermiculatus (greasewood)						
Tetradymia canescens (spineless horsebrush)						
year	Line Intercept Cover (%)					
2002	-	-	-	-	-	-
2007	18.1	0.2	0.3	-	-	4.2
2012	15.8	0.1	0.6	-	-	-
2016	12	0.3	5.6	-	-	0
year	Quadrat Cover (%)					
2002	14.3	0.1	0.9	0.0	-	0.0
2007	16.8	0.0	0.8	0.0	-	0.5
2012	14.1	0.0	0.3	-	0.0	0.8
2016	8.6	0.0	4.2	-	-	0.0

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

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.

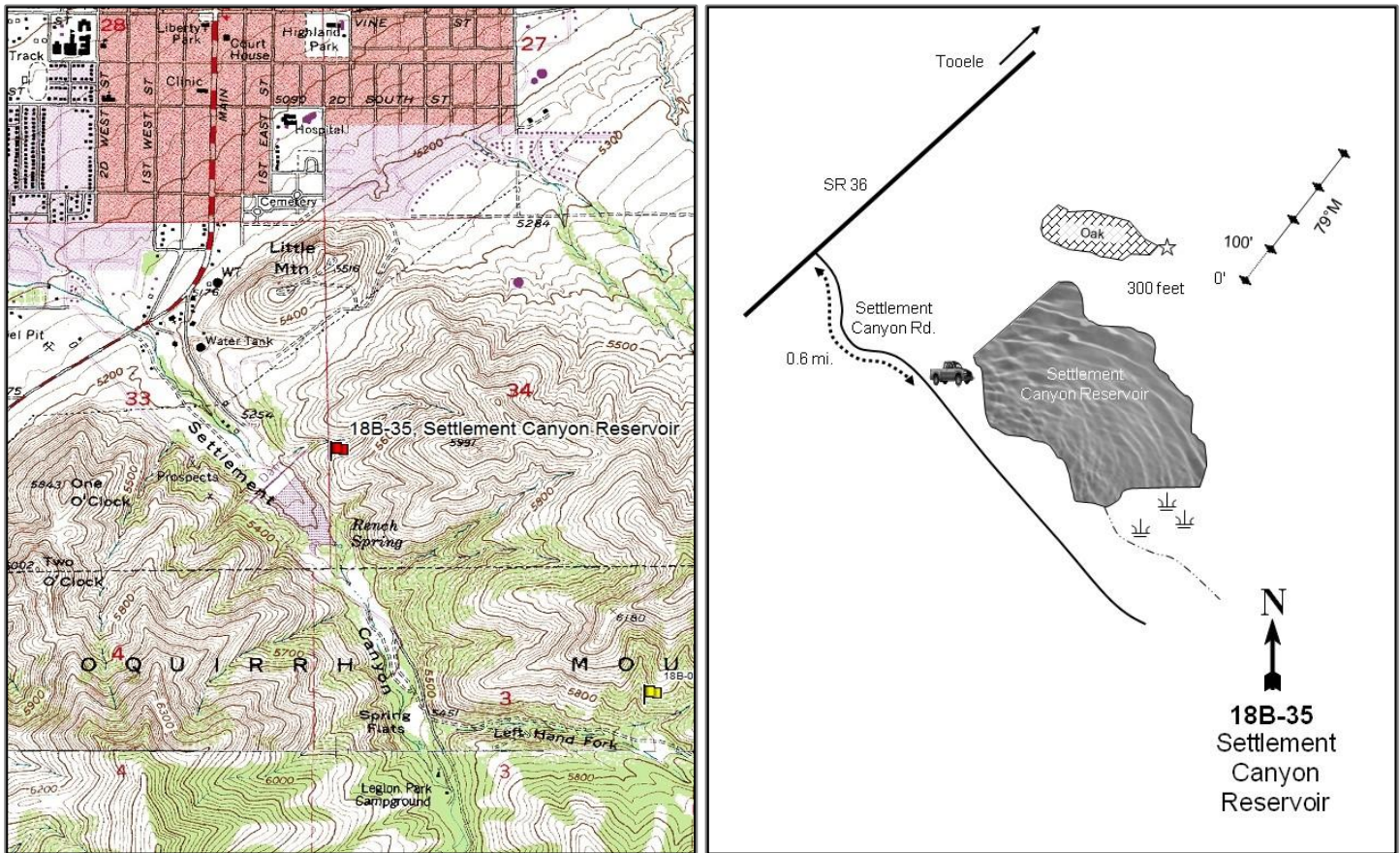
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	84/113
2012	20	-	100	0	0	100	0	0	93/82
2016	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
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
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	45/60
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa ssp. nauseosa var. speciosa^p -- (rubber rabbitbrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
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
Opuntia polyacantha -- (plains pricklypear)									
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
Purshia tridentata^p -- (antelope bitterbrush)									
2002	-	20	0	0	0	0	0	0	57/145
2007	-	-	-	-	-	-	-	-	100/189
2012	-	-	-	-	-	-	-	-	125/254
2016	-	-	-	-	-	-	-	-	164/271
Rhus trilobata^p -- (skunkbush sumac)									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	20	0	0	0	0	0	0	81/127
2012	20	-	100	0	0	0	0	0	16/16
2016	-	-	-	-	-	-	-	-	-/-
Sarcobatus vermiculatus -- (greasewood)									
2002	-	-	-	-	-	-	-	-	-/-
2007	200	-	0	100	0	0	100	0	- / -
2012	100	-	20	80	0	40	0	0	38/47
2016	-	-	-	-	-	-	-	-	-/-
Tetradymia canescens -- (spineless horsebrush)									
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

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

Table -18B-34.15 - Deer Desirable Components Index: Mid 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	18.1	12.9	0.5	4.2	-0.7	7.4	0.0	42.3	Poor
2007	21.2	7.8	1.0	22.1	-0.7	9.7	0.0	61.1	Fair
2012	17.8	8.1	2.0	27.4	-1.8	10.0	0.0	63.5	Fair-Good
2016	10.8	-1.2	0.5	20.4	-5.0	8.6	-4.0	30.1	Very Poor

SETTLEMENT CANYON RESERVOIR - STUDY No. 18B-35

**Location Information**

USGS 7.5 min Map Info Tooele SE; Township 3S, Range 4W, Section 34
 GPS (0' Stake) NAD 83 UTM ZONE 12, 390482 East 4485384 North

Transect Information

Browse Tag # (0' Stake) 246
 Transect Bearing 79° magnetic
 Length 400ft
 Belt Placement Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
 Belt Marker Placement Standard, 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 marked by browse tag #246; there is a rock cairn next to the 0-foot stake.

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

Wildlife Habitat and Vegetation History

Table 18B-35.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
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

Site Notes

This study was established in 2002 to replace the Left Fork Settlement Canyon (18B-9) 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 contributed the most cover of any shrub species since site establishment in 2002, although cover has steadily decreased each sample year since 2007 (Table 18B- 35.12). The herbaceous understory is mainly 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 are abundant, and over 7% cover was contributed by hairy false goldenaster (*Heterotheca villosa*) and rock goldenrod (*Petradoria pumila*) in 2016; annual forbs have remained rare. The noxious weed Dalmatian toadflax was observed in low amounts in previous sample years, but was not recorded in 2016 (Table 18B-35.11).

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	-

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	2.7	34.4	1.1	10.7
2012	198	458	205	247	1.9	29.6	1.2	10.1
2016	208	423	92	242	5.3	22.0	0.9	12.3

Table 18B-35.8 - 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
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	22.8	4.6	23.5	47.1

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	Elk	Rabbit
	Quadrat Frequency		
2002	51	-	-
2007	38	10	15
2012	38	1	2
2016	39	1	1
Year	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	81.1 (200.3)	3.4 (8.3)	-

Table 18B-35.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Aristida purpurea (purple threeawn)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia octoflora ^a (sixweeks fescue)
year	Nested Frequency							
2002	25	102	139	389	1	17	280	-
2007	17	134	138	416	-	91	267	3
2012	15	132	124	391	-	84	260	-
2016	26	109	116	363	-	2	250	-
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	0.0
2012	0.2	0.6	1.3	19.9	-	1.9	7.7	-
2016	0.6	0.8	4.5	12.9	-	0.0	8.4	-

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	Agoseris glauca (pale agoseris)	Allium (onion)	Alysum desertorum ^{ai} (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 ^{ai} (curvseed butterwort)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cordylanthus ramosus ^a (bushy bird's beak)
year	Nested Frequency																
2002	9	10	27	2	-	4	-	24	11	44	17	9	10	-	1	21	-
2007	10	3	23	-	-	6	0	17	8	54	5	4	15	33	-	53	1
2012	7	-	26	-	-	3	2	21	14	70	0	-	7	48	-	60	-
2016	-	2	33	22	3	6	11	1	16	52	1	-	4	-	-	57	-
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	0.1	0.4	0.0	0.1	0.2	0.0	0.8	1.3	0.0	-	0.1	-	-	0.4	-

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

FORB SPECIES	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium ^{ai} (redstem stork's bill)	Heterotheca villosa (hairy false goldenaster)	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca serriola ^{ai} (prickly lettuce)	Linaria dalmatica ^{ai} (Dalmatian toadflax)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stoneseed)	Petradoria pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	
year	Nested Frequency																	
2002	35	-	18	-	-	24	-	-	39	3	-	122	-	-	42	45	2	
2007	20	3	7	3	171	35	-	-	39	98	-	49	1	-	51	77	8	
2012	18	-	7	-	22	10	5	1	51	107	3	45	-	2	51	48	-	
2016	4	-	-	-	-	6	9	-	73	6	6	-	-	-	67	-	6	
year	Average Cover (%)																	
2002	0.2	-	0.1	-	-	0.2	-	-	0.9	0.0	-	2.5	-	-	1.5	0.2	0.0	
2007	0.1	0.0	0.0	0.0	0.3	0.5	-	-	2.2	0.2	-	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	0.2	0.0	0.6	-	0.0	2.0	0.1	-	
2016	0.0	-	-	-	-	0.2	0.1	-	3.9	0.0	0.0	-	-	-	3.5	-	0.0	

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

FORB SPECIES	Symphoricarichum (aster)	Tragopogon dubius ^{ai} (yellow salsify)	Viola (violet)	Wyethia amplexicaulis (mule-ears)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency				
2002	8	8	1	23	6
2007	5	15	-	30	11
2012	9	30	-	25	7
2016	20	53	-	22	3
year	Average Cover (%)				
2002	0.2	0.2	0.0	1.0	0.1
2007	0.2	0.0	-	1.2	0.1
2012	0.4	0.3	-	1.5	0.1
2016	0.4	0.6	-	0.8	0.0

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 ^p (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
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

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

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.

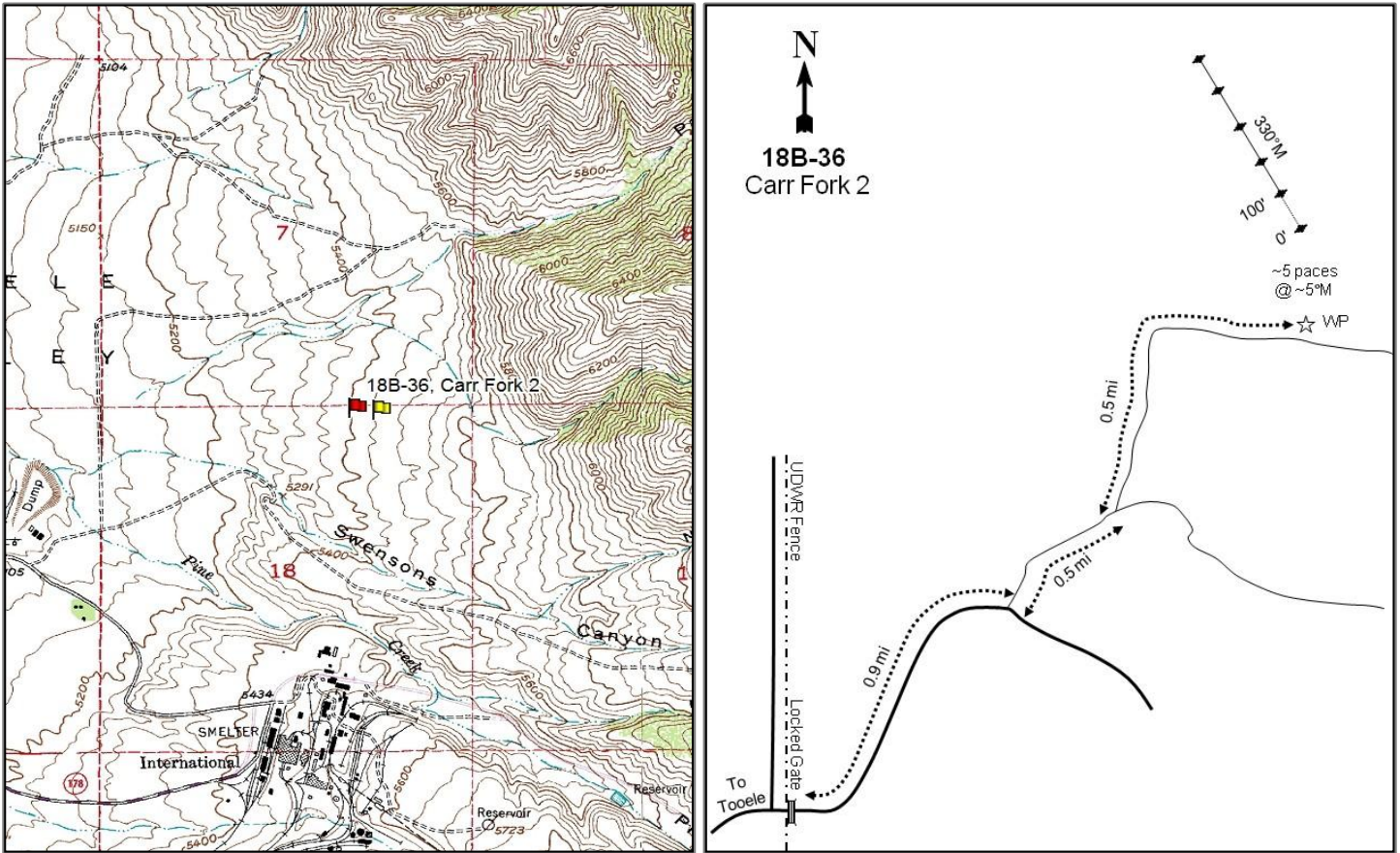
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
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
Gutierrezia sarothrae -- (broom snakeweed)									
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
Mahonia repens -- (creeping barberry)									
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
Opuntia polyacantha -- (plains pricklypear)									
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

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

Table -18B-35.15 - Deer Desirable Components Index: Mid 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	15.4	3.6	1.5	17.3	-1.3	10.0	-2.0	44.4	Poor
2007	12.6	3.0	2.0	25.4	-2.1	10.0	-2.0	48.8	Poor-Fair
2012	10.7	6.0	1.5	19.5	-1.5	10.0	-2.0	44.2	Poor
2016	6.3	3.0	1.0	18.2	-4.0	10.0	0.0	34.5	Very Poor-Poor

CARR FORK 2 - STUDY NO. 18B-36



Location Information

USGS 7.5 min Map Info	Bingham Canyon NW; Township 3S, Range 3W, Section 18
GPS (0' Stake)	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 4th 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

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
Deer	crucial	winter
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

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 disked deeply 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; this new study was up to monitor one of the strips of bitterbrush which is considered to be more valuable to big game.

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 Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R028AY431UT
States and Transitions	No state and transition model is available for this ecological site.

Antelope bitterbrush (*Purshia tridentata*) has been the sole browse species contributing any cover since site establishment in 2012; line intercept cover decreased by ~8% between the 2012 and 2016 sample years (Table 18B- 36.12). Perennial grasses have dominated the herbaceous understory in both sample years, 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. Annual grasses are not a concern on this site (Table 18B- 36.10). Perennial forbs co-dominated the understory in 2016, but were mainly comprised of weedy species such as whitetop (*Cardaria draba*) and the noxious weed field bindweed (*Convolvulus arvensis*) (Table 18B-36.11).

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	-	-

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	-	402	200	359	-	40.0	2.7	15.9
2016	-	292	257	380	-	20.8	4.7	20.3

Table 18B-36.8 - 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
2012	2.4	2.4	58.8	0.3	0.0	74.3
2016	8.6	1.7	47.9	0.3	0.2	54.2

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	Elk
	Quadrat Frequency	
2012	12	-
2016	8	1
Year	Days Use Per Acre (ha)	
	2012	12.8 (31.5)
2016	-	-

Table 18B-36.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Dactylis glomerata ⁱ (orchardgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)	Thinopyrum ponticum ⁱ (tall wheatgrass)
year	Nested Frequency					
2012	51	324	11	7	71	115
2016	92	68	-	-	144	59
year	Average Cover (%)					
2012	3.4	24.4	0.0	0.0	2.9	9.2
2016	5.5	1.8	-	-	10.7	2.8

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 ^{ai} (desert madwort)	Ambrosia psilostachya (Cuman ragweed)	Apocynum cannabinum (Indianhemp)	Asclepias (milkweed)	Camelina microcarpa ^{ai} (littlepod false flax)	Cardaria draba ^{ai} (whitetop)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Chenopodium leptophyllum ^a (narrowleaf goosefoot)	Collinsia parviflora ^a (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Convolvulus arvensis ^{ai} (field bindweed)	Crepis acuminata (tapertip hawksbeard)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Epilobium brachycarpum ^a (tall annual willowherb)	Grindelia squarrosa (curlycup gumweed)	Helianthus annuus ^a (common sunflower)
year	Nested Frequency																
2012	7	67	124	4	12	111	3	1	15	71	204	3	-	16	123	33	-
2016	1	44	157	-	0	153	-	-	47	109	239	-	66	68	36	2	44
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

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

FORB SPECIES	Holosteum umbellatum ^{ai} (jagged chickweed)	Lactuca scariola ^{ai} (prickly lettuce)	Linaria dalmatica ^{ai} (Dalmatian toadflax)	Lithospermum ruderale (western stoneseed)	Onobrychis vicicifolia ⁱ (sainfoin)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Sanguisorba minor ⁱ (small burnet)	Symphoricarum (aster)	Tragopogon dubius ^{ai} (yellow salsify)	Verbascum blattaria ^{ai} (moth mullein)	Veronica biloba ^{ai} (two-lobed speedwell)
year	Nested Frequency											
2012	7	12	143	8	4	9	8	28	51	18	84	6
2016	37	13	51	16	3	3	61	23	41	2	71	-
year	Average Cover (%)											
2012	0.0	0.0	2.8	0.2	0.2	0.0	0.1	1.2	0.6	0.1	1.6	0.1
2016	0.2	0.1	1.2	0.1	0.1	0.0	1.0	0.4	0.4	0.0	1.1	-

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	Purshia tridentata ^p (antelope bitterbrush)	
	year	Line Intercept Cover (%)
	2012	26.3
	2016	19.2
	year	Quadrat Cover (%)
	2012	17.8
	2016	9.7

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

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 (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	37/61
Purshia tridentata ^p -- (antelope bitterbrush)									
2012	280	40	7	86	7	36	7	7	189/289
2016	380	-	11	53	37	16	11	58	145/248

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

Table -18B-36.15 - Deer Desirable Components Index: Mid 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	26.8	12.9	3.5	30	0	10	-6	77.19	Good
2016	14.6	3.9	5.5	30	0	10	-6	57.95	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).

Vegetation Type Code	Vegetation Community Type Name*	Description
EPHED	Ephedra	Major component of the site (typically >5% cover).
QUGA	Gambel Oak	Major component of the site (typically >5% cover).
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	Curleaf 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 ¹). No pinyon present.
PINYON	Pinyon	Major component of the site (Phase III ¹). No juniper present.
PJ	Pinyon-Juniper	Major components of the site (Phase III ¹). 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.

¹Phase of woodland succession