



UTAH BIG GAME RANGE TREND STUDIES  
2017

WILDLIFE MANAGEMENT UNITS  
16A, 17, 19A, 19B, 19C, 20, 21A, 21B, 23

PUBLICATION NUMBER 18-06  
REPORT FOR FEDERAL AID PROJECT W-82-R-62

STATE OF UTAH  
DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF WILDLIFE RESOURCES





**Utah Big Game Range Trend Studies  
2017  
Wildlife Management Units  
16A, 17, 19A, 19B, 19C, 20, 21A, 21B, 23**

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Desert sweet (*Chamaebatiaria millefolium*) by Jason Cox (2017)

Performance Report for Federal Aid Project W-82-R-62

Publication No. 18-06

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



## Program Narrative

State: UTAH

Project Number: W-82-R-62

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 2017 field season and reported in this publication involves the reading of interagency range trend studies in the DWR Central and Southern 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

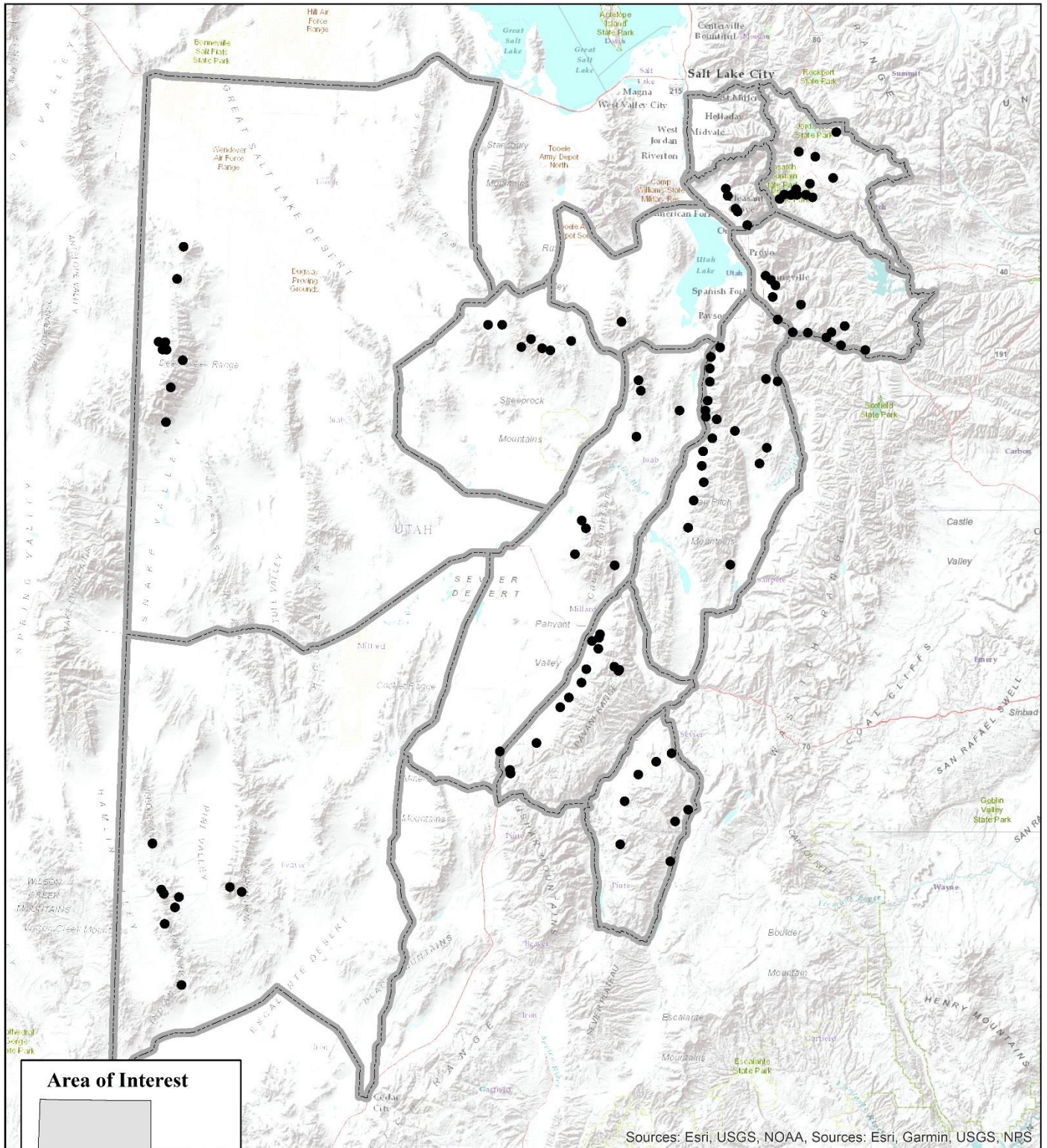
- Salt Lake Field Office
- Fillmore Field Office
- Richfield Field Office

### United States Forest Service

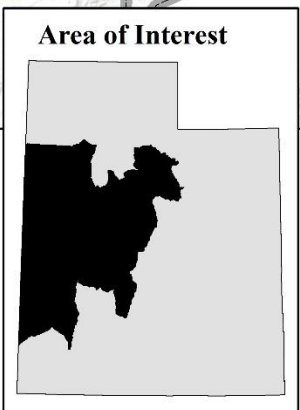
- Uinta National Forest
- Fishlake National Forest

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

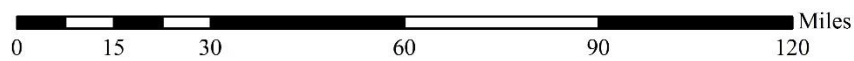
# RANGE TREND STUDY SITES SURVEYED IN 2017



Sources: Esri, USGS, NOAA, Sources: Esri, Garmin, USGS, NPS



- Study Location**
- RT, Active
- ▭ Wildlife Management Unit Boundaries





## RANGE TREND STUDY METHODS

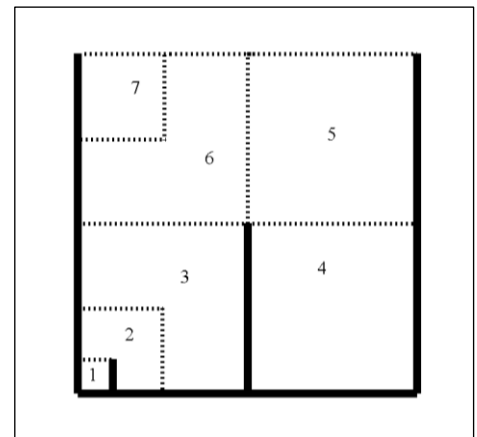
Studies monitoring range trend depend greatly on site selection, especially when dealing with large geographic areas such as wildlife management units. Since it is impossible to intensively monitor all vegetation or habitat types within a unit, it is necessary to concentrate on specific sites and/or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

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

### Vegetation Composition

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

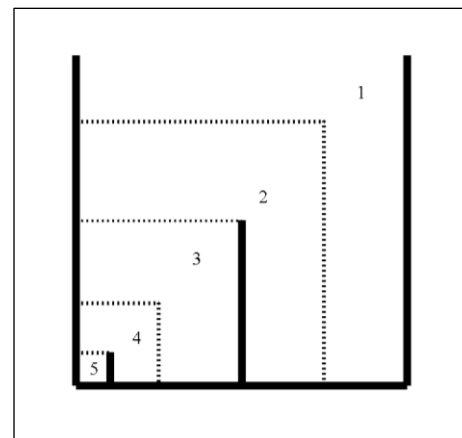
**Percent Cover:** Cover is determined using an ocular cover estimation procedure using seven cover classes (Bailey and Poulton 1968, Daubenmire 1959). The seven cover classes are: 1) .01-1%, 2) 1.1-5%, 3) 5.1-25%, 4) 25.1-50%, 5) 50.1-75%, 6) 75.1-95%, and 7) 95.1-100% (Figure 1). For example, to estimate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



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

Total canopy cover of shrubs or trees is also estimated using the line-intercept method (U.S. Department of Interior Bureau of Land Management 1999). The total distance intersecting the line by a particular species of tree or shrub along each belt is divided by the total length of the line to give percent canopy cover. A six-inch gap rule is used in measuring intercept; gaps less than six inches between the same tree or shrub species are included in total measurement (Boyd, 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 m<sup>2</sup> 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 <i>Seedling</i> This class size represents the annual or recent recruitment of suckers due to suckering at root buds.
Size Class II:	greater than 1.5 feet to 5 feet. Scan as <i>Young</i> This class size represents the survival of suckers and the progression of recruitment of existing suckers that are vulnerable to browsing of the terminal leader.
Size Class III:	greater than 5 feet and up to 1 inch dbh. Scan as <i>Mature</i> This class size represents the aspen regeneration grown above the height range that is vulnerable to browsing; the minimum height for size class III represents the maximum browse line height for herbivores present.
Size Class IV:	greater than 1 inch dbh. Scan as <i>Decadent</i> Class IV captures information for all remaining cohorts in the plot.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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



## Trend Determination

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

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

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

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

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

### *Preferred Browse (60 points)*

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

#### Preferred Browse Cover (30 pts. possible)

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

#### Percent Decadence (15 points possible)

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

#### Percent Young (15 points possible)

- 0.5 points for each 1% of young

### *Herbaceous Understory (40 points)*

#### Perennial Grass Cover (30 points possible)

- 2 points for each 1% cover

## Perennial Forb Cover (10 points possible)

- 2 points for each 1% cover

## Annual Grass Cover (-20 points possible)

- -0.75 points for each 1% cover

## Noxious Weeds (State List)

- -2 points for each species present

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

## Very Low potential scale (Desert Ecological Site)

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

## Low potential scale (Semidesert Ecological Site)

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

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

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

## High potential scale (Mountain and High Mountain Ecological Site)

> 90	Excellent
89-70	Good
69-55	Fair
54-40	Poor
< 39	Very Poor

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

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

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

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

## REPORT FORMAT

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

it's 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 1/4m<sup>2</sup> quadrat to estimate percent quadrat cover. To more accurately estimate canopy cover of trees and shrubs, the line-intercept method is used along each 100-foot belt.

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

**Table 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 <sup>i</sup> (crested wheatgrass)	Bromus briziformis <sup>ai</sup> (rattlesnake brome)	Bromus tectorum <sup>ai</sup> (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 octoflora <sup>a</sup> (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 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 <sup>ai</sup> (pale madwort)	Androsace septentrionalis <sup>a</sup> (pygmyflower rockjasmine)	Astragalus (milkvetch)	Calochortus nuttallii (sego lily)	Chaenactis (pincushion)	Chenopodium leptophyllum <sup>a</sup> (narrowleaf goosefoot)	Cleome serrulata <sup>a</sup> (Rocky Mountain beeplant)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Cryptantha <sup>a</sup> (annual cryptantha)	Cryptantha (cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Erigeron pumilus (shaggy fleabane)	Eriogonum cernuum <sup>a</sup> (nodding buckwheat)	Gilia <sup>a</sup> (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 (%)			
	year	1995	2000	2005
Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	-	-	-	-
Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	20.1	0.8	-	-
Linanthus pungens (granite prickly phlox)	17.6	0.4	-	0.2
Opuntia (pricklypear)	-	-	-	-

year	Quadrat Cover (%)			
	1995	2000	2005	2010
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 (%)				
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
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	-	-	-	-	-	-	-	-	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)</b>									
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).

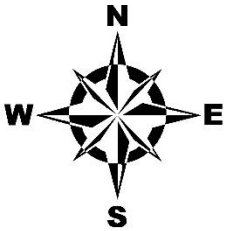
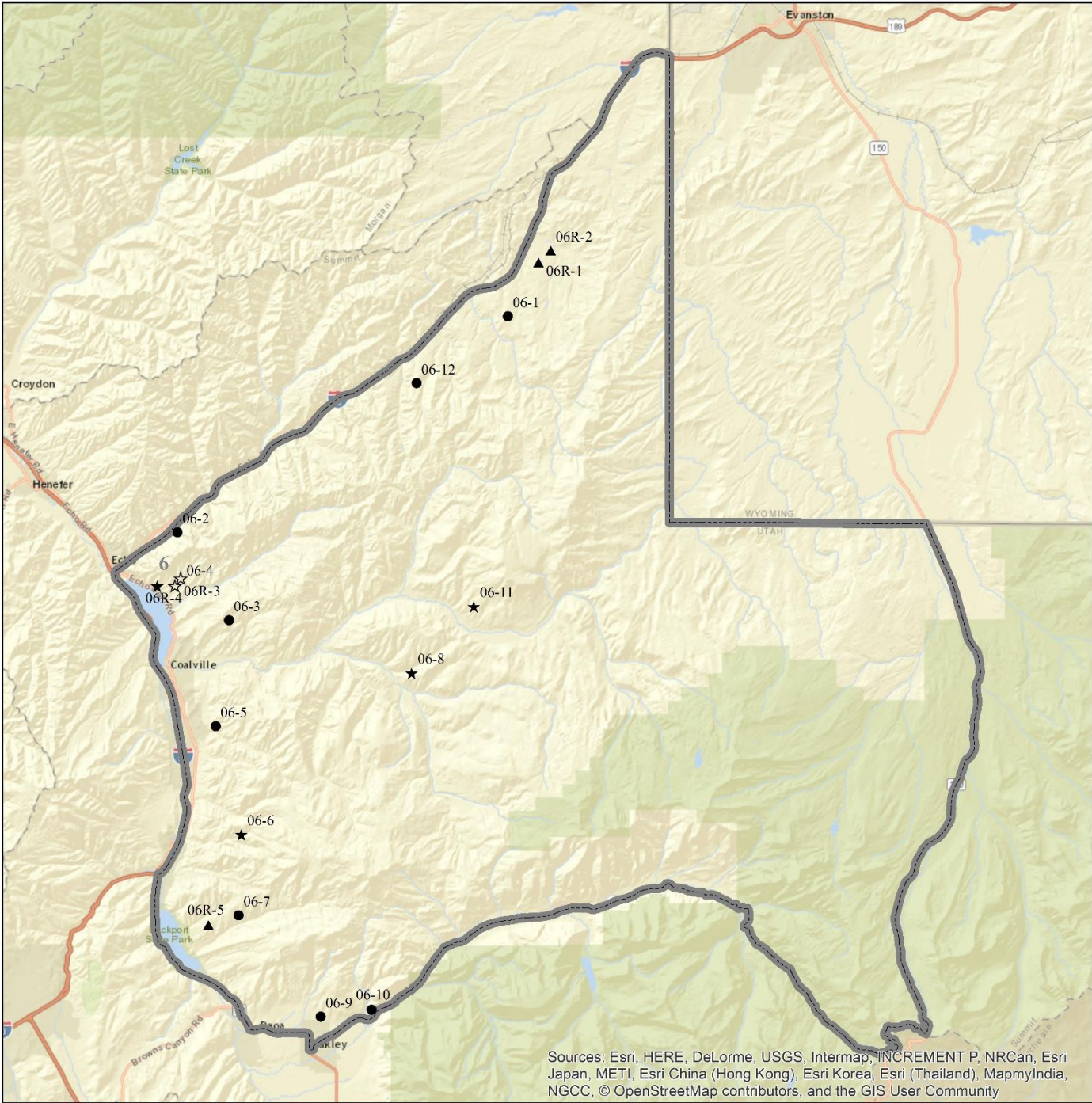
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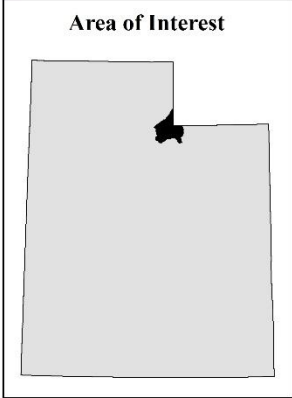
# WILDLIFE MANAGEMENT UNIT 6 – CHALK CREEK



**Study Location Project, Status**

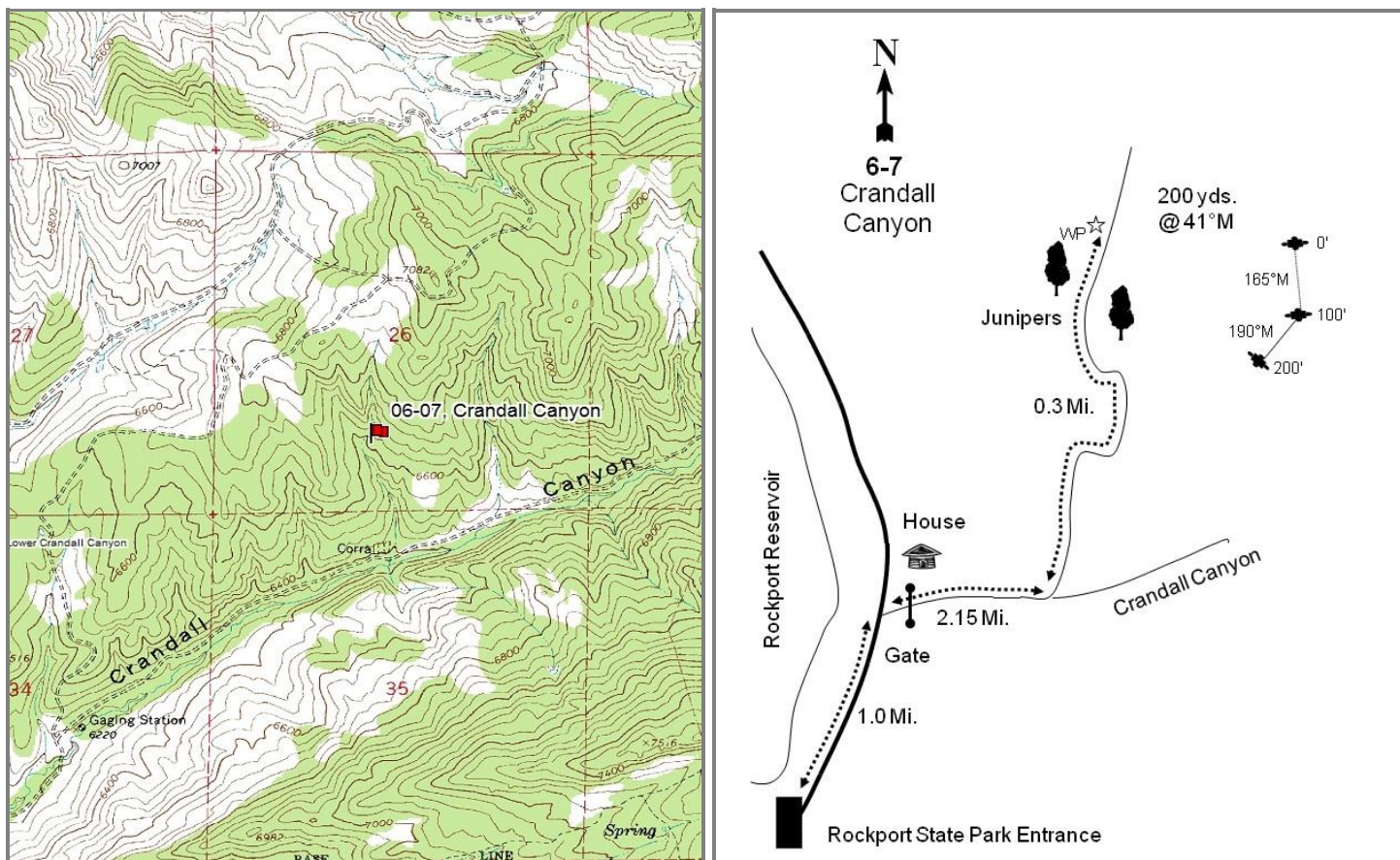
- RT, Active
- ★ RT, Suspended
- ▲ WRI, Active
- ☆ WRI, Suspended

 Unit - 6





## CRANDALL CANYON - STUDY NO. 06-7

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Crandall Canyon SW; Township 1N, Range 5E, Section 26  
NAD 83 UTM ZONE 12, 470437 East 4515135 North

**Transect Information**

Browse Tag # (0' Stake)	7956
Transect Bearing	180° magnetic (Line 2: 190° magnetic)
Length	200ft
Belt Placement	Line 1 (11ft, 34ft, & 71ft), Line 2 (59ft & 95ft)
Belt Marker Placement	Belt 2: 4ft

**Directions to Site**

From the guardhouse at Rockport State Park, proceed north and east on the paved road for 1.0 mile. Turn right, proceed up through the locked gates (you will need two combos) and up Crandall Canyon (dirt road) for 2.15 miles, and turn left at the fork. Travel 0.3 miles north on this road to a pair of junipers on either side of the road. Just past the junipers on the left hand side of the road is a witness post. From the witness post walk approximately 200 yards at 41 degrees magnetic to the 0-foot stake of the baseline, which is marked by browse tag #7956. The 200-foot baseline doglegs and runs 190 degrees magnetic.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,640ft (2,024m)
Aspect	South
Slope	31-36%
Sample Dates	07/22/1996, 06/27/2001, 08/16/2006, 07/12/2011, 07/26/2017

**Wildlife Habitat and Vegetation History****Table 06-07.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	substantial	winter
Elk	crucial	winter
Moose	crucial	winter

**Table 06-07.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Mixed Mountain Brush	Phase I
1990	Mixed Mountain Brush	Phase I
1996	Mixed Mountain Brush	Phase I
2001	Mixed Mountain Brush	Phase I
2006	Mixed Mountain Brush	Phase I
2011	Mixed Mountain Brush	Phase I
2017	Mixed Mountain Brush	Phase I

**Site Notes**

Two deer carcasses were found on site in 2011. Elk tracks were seen in 2017, as were ungulate bones.

**Soils****Table 06-07.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	8.0	58.7	12.0	29.3	1.7	5.1	32.0	0.5	07/22/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Loam (Browse)
NRCS Ecological Site #	047XA420UT
States and Transitions	No state and transition model is available for this ecological site.

This site has remained dominated by various mixed mountain brush species such as Utah serviceberry (*Amelanchier utahensis*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and alderleaf mountain mahogany (*Cercocarpus montanus*) since study establishment in 1984; Gambel oak (*Quercus gambelii*) is also abundant. Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) trees have also been present in all sample years, placing this site in Phase I of woodland succession throughout the duration of the study (photos, Table 06-07.4, Table 06-07.12, Table 06-07.13, Table 06-07.14). The herbaceous understory has remained diverse and abundant, and has largely been comprised of perennial grasses -- namely the native species thickspike wheatgrass (*Elymus lanceolatus*) and bluebunch wheatgrass (*Pseudoroegneria spicata*) -- in all study years (Table 06-07.10). Cover of forbs has fluctuated from year to year, and annual forbs, mainly the introduced species desert madwort (*Alyssum desertorum*), have been more abundant than perennial forbs since 2011 (Table 06-07.7, Table 06-07.11).

**Trend Summary Tables****Table 06-07.6 - Shrub/Tree Summary.** Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees.

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1996	11.0	8.2	2.4	-	-	-
2001	8.4	9.6	3.4	-	-	-
2006	8.6	4.1	5.9	11.7	5.6	13.2
2011	13.4	4.5	4.4	17.4	7.2	13.6
2017	13.1	5.8	6.3	18.7	8.8	17.5

**Table 06-07.7 - Herbaceous Summary.** Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups.

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1996	61	343	271	129	0.2	10.4	1.7	1.5
2001	48	305	223	114	0.2	10.9	1.8	1.8
2006	45	314	223	67	0.1	16.8	1.2	1.0
2011	112	295	284	100	2.8	18.5	8.9	2.6
2017	33	267	234	127	0.3	6.0	4.2	2.1

**Table 06-07.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	31.0	0.0	38.6	5.3	3.7	34.5
2001	41.3	-	26.8	4.4	4.0	37.1
2006	45.0	-	26.5	4.3	4.2	37.8
2011	30.0	0.2	18.8	6.0	3.7	52.1
2017	34.5	0.2	32.9	8.2	3.8	36.3

**Table 06-07.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Horse	Moose	Rabbit
	Quadrat Frequency						
1996	-	-	15	5	-	-	-
2001	1	-	22	2	-	-	11
2006	-	-	7	2	-	-	3
2011	-	-	6	1	-	-	1
2017	1	1	9	8	-	-	6
Year	Days Use Per Acre (ha)						
1996	-	-	-	-	-	-	-
2001	6.5 (16.1)	-	50.2 (124.1)	2.0 (5.0)	0.6 (1.4)	-	-
2006	-	-	14.7 (36.4)	1.3 (3.3)	-	-	-
2011	5.1 (12.6)	-	9.4 (23.2)	4.7 (11.6)	-	-	-
2017	1.5 (3.6)	8.7 (21.5)*	23.4 (57.9)	12.1 (29.8)	-	0.5 (1.2)	-

\*Pellets per acre (ha)

**Table 06-07.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Leymus cinereus (basin wildrye)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency										
1996	78	-	61	8	5	150	8	-	1	20	173
2001	50	11	41	6	3	121	17	1	6	15	154
2006	56	22	23	1	-	260	14	-	3	18	48
2011	54	98	17	3	-	138	17	-	8	14	133
2017	39	20	13	-	36	189	19	-	-	12	14
year	Average Cover (%)										
1996	1.6	-	0.2	0.2	0.0	3.5	0.5	-	0.0	0.2	4.6
2001	1.8	0.0	0.2	0.1	0.0	2.9	0.6	0.0	0.1	0.0	5.3
2006	3.0	0.1	0.1	0.0	-	9.8	1.1	-	0.0	0.1	2.7
2011	1.8	2.6	0.1	0.0	-	5.4	0.9	-	0.1	0.5	9.6
2017	0.8	0.2	0.1	-	0.3	3.8	0.7	-	-	0.2	0.1

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

**Table 06-07.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Astragalus convallarius (lesser rushy milkvetch)	Balsamorhiza sagittata (arrow/leaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littledod false flax)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata <sup>a</sup> (western tansymustard)
year	Nested Frequency																
1996	4	-	259	-	-	5	-	-	-	13	-	24	-	29	24	-	1
2001	1	-	218	1	-	2	5	1	14	5	-	28	4	25	32	-	-
2006	-	3	195	-	1	0	-	31	-	1	1	16	-	24	13	-	1
2011	5	-	266	-	-	2	5	14	1	5	-	32	-	35	4	-	1
2017	4	-	216	-	2	-	-	-	-	19	10	21	-	24	28	2	7
year	Average Cover (%)																
1996	0.0	-	1.0	-	-	0.1	-	-	-	0.1	-	0.6	-	0.2	0.3	-	0.0
2001	0.0	-	0.8	0.0	-	0.0	0.2	0.0	0.0	0.0	-	0.9	0.0	0.2	0.5	-	-
2006	-	0.0	0.4	-	0.0	0.0	-	0.1	-	0.0	0.0	0.6	-	0.1	0.4	-	0.0
2011	0.1	-	7.0	-	-	0.1	0.0	0.3	0.0	0.0	-	1.6	-	0.3	0.2	-	0.0
2017	0.4	-	3.6	-	0.0	-	-	-	-	0.1	0.1	0.4	-	0.2	0.3	0.0	0.2

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

FORB SPECIES	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Eriogonum umbellatum (sulphur-flower buckwheat)	Euphorbia brachycera (horned spurge)	Hackelia patens (spotted stickseed)	Lactuca serriola <sup>ii</sup> (prickly lettuce)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stoneseed)	Maianthemum racemosum ssp. amplexicaule (feathery false lily of the valley)	Oenothera caespitosa (tufted evening primrose)	Penstemon humilis (low beardtongue)	Phlox longifolia (longleaf phlox)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Symphyotrichum ascendens (western aster)	Tragopogon dubius <sup>ii</sup> (yellow salsify)
year	Nested Frequency													
1996	1	-	-	23	1	-	-	6	-	9	-	-	35	4
2001	-	-	-	8	-	-	-	3	1	16	-	-	38	-
2006	1	3	-	5	-	-	-	-	-	11	1	-	14	6
2011	-	3	3	-	-	-	-	3	-	25	-	3	26	5
2017	-	11	5	-	-	7	0	-	-	8	-	1	45	4
year	Average Cover (%)													
1996	0.0	-	-	0.2	0.0	-	-	0.1	-	0.1	-	-	0.5	0.1
2001	-	-	-	0.0	-	-	-	0.0	0.0	0.2	-	-	0.5	-
2006	0.0	0.0	-	0.2	-	-	-	-	-	0.1	0.0	-	0.1	0.1
2011	-	0.0	0.0	-	-	-	-	0.0	-	0.8	-	0.0	0.8	0.1
2017	-	0.1	0.0	-	-	0.0	0.0	-	-	0.1	-	0.0	0.6	0.0

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

**Table 06-07.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Cercocarpus montanus <sup>p</sup> (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Opuntia (pricklypear)	Pinus edulis <sup>t</sup> (twoneedle pinyon)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Quercus gambelii <sup>p</sup> (Gambel oak)	Rosa woodsii <sup>p</sup> (Woods' rose)	Symphoricarpos oreophilus (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)												
1996	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-	-	-	-
2006	3.5	0.3	2.6	1	1	13.2	0.1	-	1	4.3	-	3.5	-
2011	4.1	1	5.9	1.4	1.9	9.2	-	4.4	1.2	5.2	0	3.9	-
2017	3	0.7	6.5	1.5	6.2	13.1	-	4.4	1.2	7.3	-	1.1	-
year	Quadrat Cover (%)												
1996	1.7	0.9	5.0	0.7	4.0	2.4	0.5	-	0.6	2.6	0.1	2.7	0.2
2001	1.2	0.6	4.7	1.5	3.7	3.4	0.5	-	0.4	1.7	-	3.6	0.4
2006	2.6	0.6	2.9	1.5	0.4	5.9	0.2	-	0.4	2.2	-	2.0	-
2011	1.5	1.2	5.4	1.3	1.2	4.4	0.0	0.0	0.4	4.9	0.0	1.9	-
2017	1.7	1.4	5.5	1.7	2.9	6.3	0.0	0.0	0.6	3.7	0.1	1.0	0.2

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



**Table 06-07.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1996	580	20	21	69	10	21	21	14	54/59
2001	640	-	25	63	13	28	34	9	56/66
2006	320	-	25	63	13	19	44	19	66/81
2011	220	-	9	91	0	18	18	0	55/69
2017	740	-	14	87	0	5	32	0	61/63
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1996	340	-	24	71	6	24	41	0	40/68
2001	280	-	7	64	29	36	43	0	40/69
2006	200	60	0	80	20	50	20	20	54/80
2011	160	20	0	100	0	50	0	13	54/87
2017	200	-	0	90	10	40	40	0	43/84
<b>Cercocarpus montanus<sup>P</sup> -- (alderleaf mountain mahogany)</b>									
1996	1120	20	20	77	4	27	43	2	54/74
2001	1200	-	3	78	18	7	80	13	65/90
2006	1060	-	9	70	21	9	66	6	50/86
2011	1020	20	12	86	2	29	31	6	50/72
2017	1200	20	7	88	5	20	48	7	58/76
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	1020	-	2	94	4	2	2	0	24/32
2001	1640	-	4	96	0	0	0	0	22/34
2006	1120	-	9	89	2	5	0	0	25/43
2011	960	20	21	79	0	0	0	2	24/39
2017	1560	-	5	92	3	0	0	3	22/36
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	7640	620	11	89	0	0	0	0	22/27
2001	10680	20	2	91	7	0	0	4	15/19
2006	1360	40	16	82	2	0	0	0	19/25
2011	940	20	23	77	0	0	0	0	26/33
2017	5520	20	4	95	0	0	0	0	23/33
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1996	40	-	100	0	0	0	0	0	- / -
2001	120	-	0	100	0	0	0	0	- / -
2006	140	-	14	86	0	0	0	0	- / -
2011	60	-	33	67	0	0	0	0	- / -
2017	80	-	0	100	0	0	0	0	- / -
<b>Opuntia -- (pricklypear)</b>									
1996	380	-	16	84	0	0	0	0	12/38
2001	300	20	0	60	40	0	0	27	11/22
2006	440	-	14	86	0	0	0	0	10/28
2011	40	20	0	100	0	0	0	0	12/33
2017	120	-	0	50	50	0	0	50	10/15
<b>Pinus edulis<sup>t</sup> -- (twoneedle pinyon)</b>									
1996	-	-	-	-	-	-	-	-	- / -
2001	-	-	-	-	-	-	-	-	- / -
2006	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2017	20	-	100	0	0	0	0	0	- / -
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1996	40	-	0	50	50	50	0	0	- / -
2001	60	-	0	100	0	0	0	0	36/130
2006	20	-	0	100	0	100	0	0	30/137
2011	60	-	0	100	0	0	100	0	24/97
2017	160	-	0	100	0	0	100	0	32/105
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1996	720	60	17	83	0	0	0	0	63/44
2001	1320	-	26	74	0	0	0	0	132/73
2006	1460	-	23	77	0	0	0	0	107/48
2011	520	-	39	62	0	15	0	0	- / -
2017	2260	-	51	48	1	0	0	1	84/57

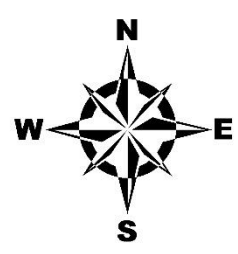
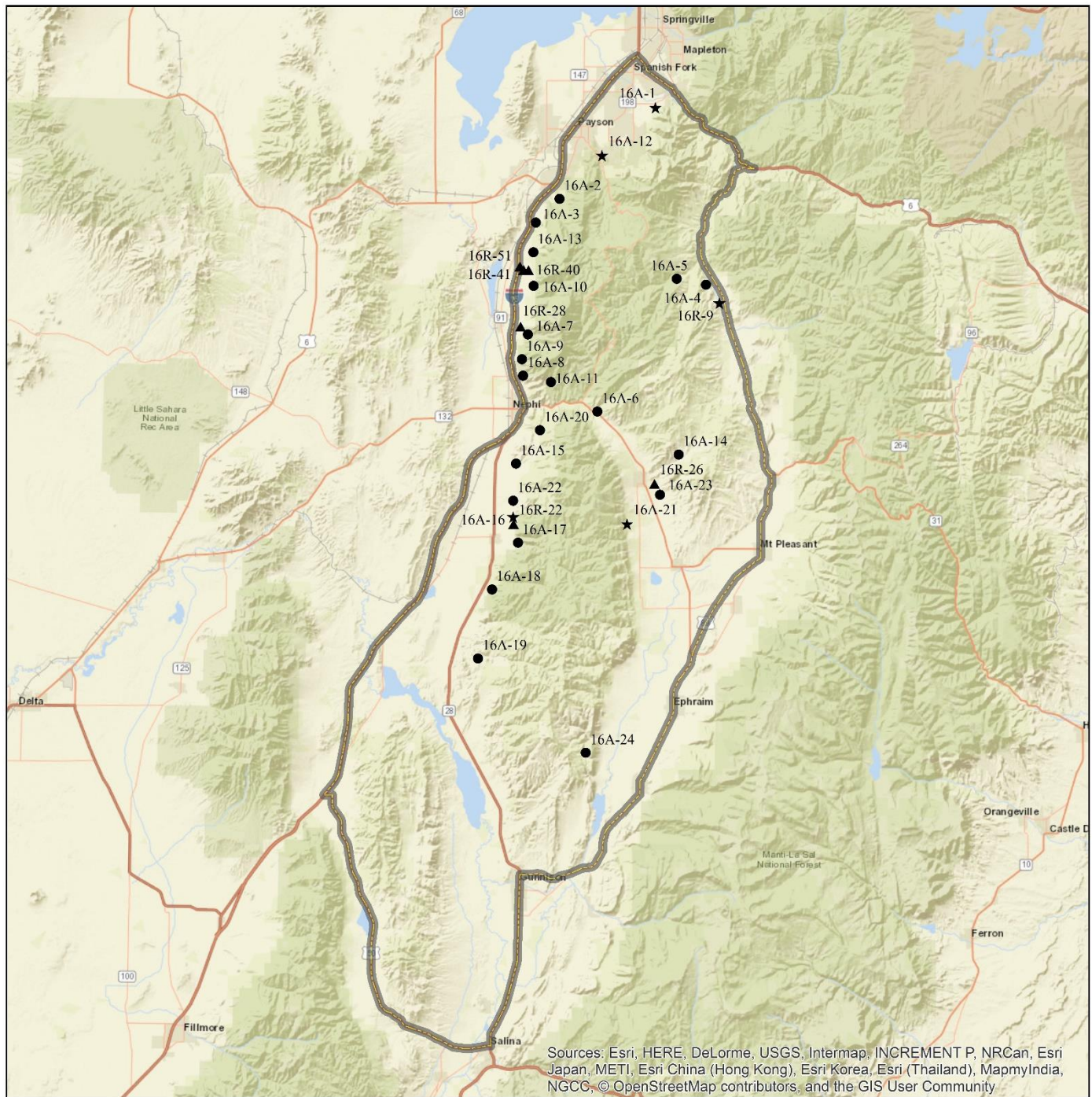
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Rosa woodsii<sup>P</sup> -- (Woods' rose)</b>									
1996	-	-	-	-	-	-	-	-	41/25
2001	40	-	0	100	0	0	0	0	23/15
2006	-	-	-	-	-	-	-	-	47/31
2011	-	-	-	-	-	-	-	-	30/31
2017	140	-	86	14	0	0	0	0	19/24
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1996	940	20	36	55	9	32	2	2	48/68
2001	560	-	21	79	0	0	0	0	48/89
2006	1000	-	8	64	28	0	4	16	42/66
2011	900	20	16	84	0	4	0	0	40/55
2017	1340	-	2	97	2	0	0	0	31/36
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	200	-	10	90	0	90	0	0	34/45
2001	100	-	20	80	0	0	0	0	24/35
2006	-	-	-	-	-	-	-	-	16/37
2011	-	-	-	-	-	-	-	-	26/54
2017	260	-	46	54	0	0	0	0	22/30

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

**Table 06-07.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

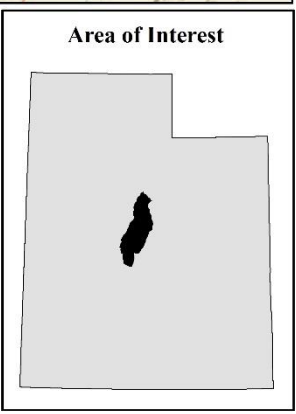
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2006	32	13	13	50	-	25	20.9
2011	52	-	27	36	18	18	18.8
2017	38	11	33	33	-	22	20.1

# WILDLIFE MANAGEMENT UNIT 16A - NEBO CENTRAL MOUNTAINS



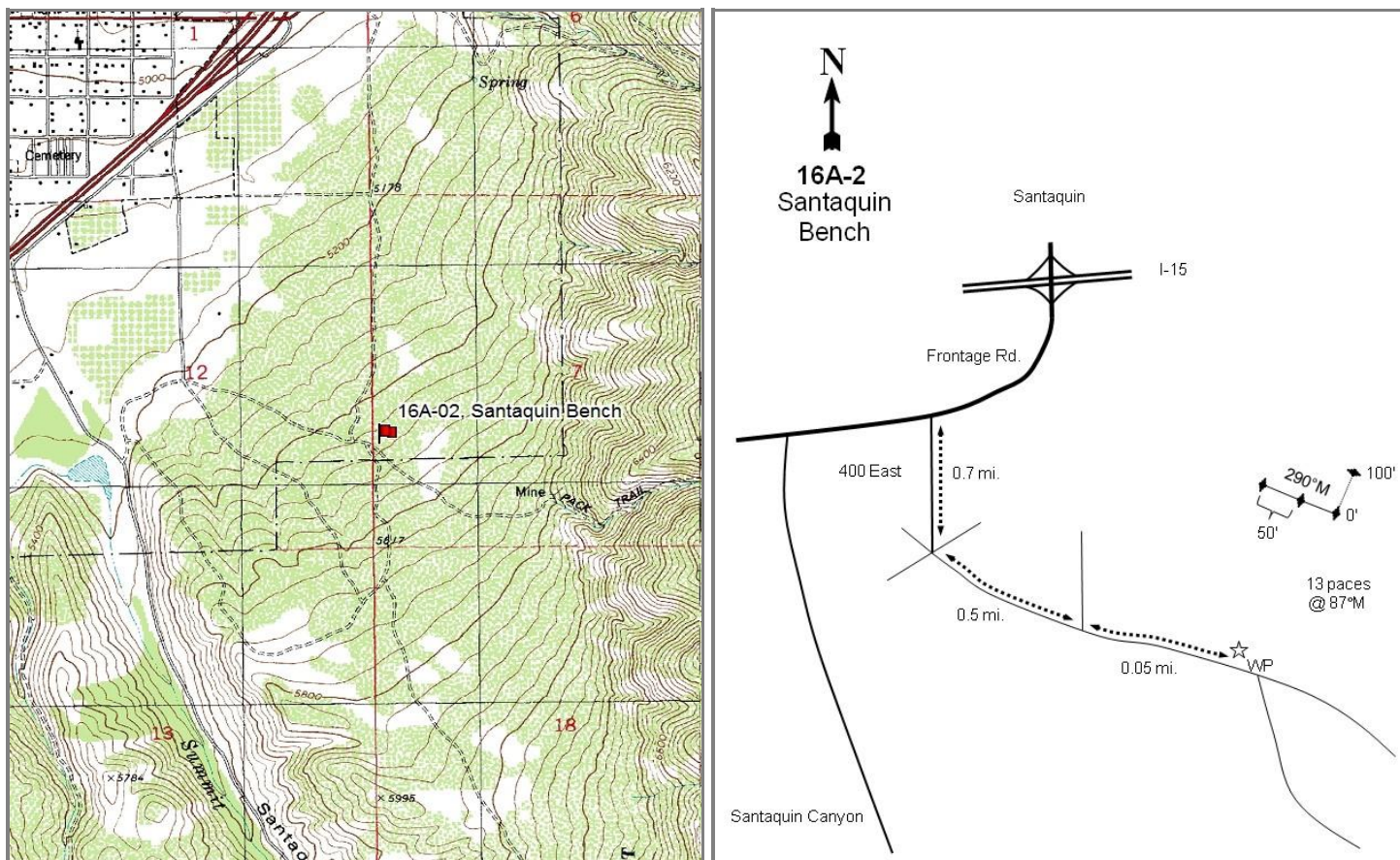
**Study Location  
Project, Status**

- RT, Active
- ★ RT, Suspended
- ▲ WRI, Active
- ▭ Unit - 16A





## SANTAQUIN BENCH - STUDY NO. 16A-2

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Santaquin NE; Township 10S, Range 2E, Section 07  
NAD 83 UTM ZONE 12, 434517 East 4423382 North

**Transect Information**

Browse Tag # (0' Stake)	3929
Transect Bearing	28° magnetic (Line 2: 309° magnetic, Line 3: 320° magnetic)
Length	300ft
Belt Placement	Line 1 (11ft, 59ft, & 95ft), Line 2 (71 ft), Line 3 (34ft)
Belt Marker Placement	Belt 2, 4: No Rebar, Line 3: 50ft Long

**Directions to Site**

From the I-15 interchange on the east side of Santaquin, proceed southwest on the frontage road (Highland Drive) for a short distance to where there are several forks. Turn left on 400 East, which turns due south and passes through some orchards and home sites. Travel 0.7 miles to where the road forks at the end of a maintained road. Turn immediately to the left (east) and travel 0.50 miles to a fork in the road. Stop just beyond the fork at the witness post on the left. The 0-foot baseline stake is located 13 paces from the witness post at an azimuth of 87 degrees magnetic. The 0-foot baseline stake is marked by browse tag #3929. The last baseline is only 50 feet long.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,460ft (1,664m)
Aspect	West
Slope	7%
Sample Dates	05/23/1997, 05/24/2002, 06/01/2007, 05/23/2012, 05/24/2017

**Table 16A-02.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRIDB#	Date	Size (acres)
Fire - Wildfire	Mollie Fire	-	August 2001	8021
Seeding - Seed Unknown	-	-	2002?	-

**Wildlife Habitat and Vegetation History****Table 16A-02.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter

**Table 16A-02.4 - 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/Gambel Oak	NA
1989	Mountain Big Sagebrush/Gambel Oak	NA
1997	Mountain Big Sagebrush/Gambel Oak	NA
2002	Perennial Grass	NA
2007	Gambel Oak/Perennial Grass	NA
2012	Gambel Oak/Perennial Grass	NA
2017	Gambel Oak/Perennial Grass	NA

**Site Notes**

No Notes

**Soils****Table 16A-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	6.0	46.4	29.1	24.6	3.9	20.2	211.2	0.7	05/23/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Loam (Oak)
NRCS Ecological Site #	R047XA432UT
States and Transitions	No state and transition model is available for this ecological site.

From study establishment in 1983 through the 1997 sample year, this site was dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Gambel oak (*Quercus gambelii*). The Mollie Fire removed the browse component, but oak recovered and has been the dominant browse species since 2002 (Table 16A-02.12, Table 16A- 02.13). A diverse mixture of perennial grasses, namely bulbous bluegrass (*Poa bulbosa*) and intermediate wheatgrass (*Thinopyrum intermedium*), have provided the most herbaceous cover and have been a co-dominant component in the sample years following the fire (Table 16A-02.7, Table 16A-02.10). Forbs have remained diverse, with the perennial species Bonneville pea (*Lathyrus brachycalyx*) as the most abundant species (Table 16A-02.11).

**Trend Summary Tables****Table 16A-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
1997	22.3	0.6	-	-	-	-
2002	2.7	-	-	-	-	-
2007	21.4	-	-	35.7	-	-
2012	24.4	-	-	40.6	-	-
2017	11.0	-	-	27.4	-	-

**Table 16A-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
1997	97	382	346	240	0.7	19.0	7.5	8.3
2002	56	193	289	213	0.2	4.9	2.7	7.2
2007	293	375	332	166	5.8	28.1	6.9	4.9
2012	47	434	201	206	0.1	39.8	3.4	8.0
2017	34	467	152	275	0.3	54.6	3.5	8.6

**Table 16A-02.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	2.0	0.2	67.7	1.8	3.7	53.9
2002	55.3	0.0	19.5	12.8	4.9	18.5
2007	3.2	0.2	49.2	0.8	2.9	67.0
2012	0.9	0.0	68.4	0.9	2.1	69.0
2017	2.6	0.1	73.1	1.7	1.3	65.8

**Table 16A-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	Coyote	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	-	7	1	-
2002	-	2	1	-
2007	-	3	2	11
2012	-	-	-	1
2017	-	2	-	2
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	-	1.3 (3.3)	-	-
2007	17.4 (43.0)*	8.1 (19.9)	16.8 (41.4)	-
2012	-	4.7 (11.6)	-	-
2017	-	2.7 (6.6)	-	-

\*Pellets per acre (ha)



**Table 16A-02.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Aegilops cylindrica <sup>ni</sup> (jointed goatgrass)	Bromus arvensis <sup>ni</sup> (field brome)	Bromus briziformis <sup>ni</sup> (rattlesnake brome)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus tectorum <sup>ni</sup> (cheatgrass)	Leymus cinereus (basin wildrye)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)	unknown annual grass <sup>a</sup> (unknown grass)
year	Nested Frequency												
1997	-	-	-	-	58	-	33	7	242	72	162	-	51
2002	-	-	-	-	56	-	24	-	80	50	93	-	-
2007	8	238	5	30	180	2	230	1	46	45	137	187	-
2012	-	21	-	10	26	3	143	-	41	120	39	356	-
2017	-	13	-	1	21	-	277	-	38	43	10	409	-
year	Average Cover (%)												
1997	-	-	-	-	0.3	-	1.0	0.2	10.0	1.2	6.6	-	0.4
2002	-	-	-	-	0.2	-	0.3	-	2.2	0.4	2.0	-	-
2007	0.1	3.4	0.0	0.6	2.3	0.1	13.2	0.0	0.9	0.9	5.8	6.6	-
2012	-	0.1	-	0.3	0.1	0.4	8.0	-	1.3	7.8	0.9	21.1	-
2017	-	0.0	-	0.0	0.2	-	15.8	-	0.3	1.6	0.3	36.6	-

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

**Table 16A-02.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum desertorum <sup>ni</sup> (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus (milkvech)	Astragalus cibirius (browse milkvech)	Ceratocephala testiculata <sup>ni</sup> (curveseed butterwort)	Cirsium undulatum <sup>a</sup> (wayleaf thistle)	Claytonia perfoliata (miner's lettuce)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Cymopterus (springparsley)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium <sup>ni</sup> (redstem stork's bill)
year	Nested Frequency																
1997	82	50	2	4	6	-	64	8	-	108	33	3	19	92	6	8	-
2002	98	35	1	-	-	-	42	7	-	168	5	1	-	3	3	-	-
2007	12	166	-	-	3	11	49	0	-	90	7	0	35	39	7	-	5
2012	-	9	-	-	3	6	-	5	-	4	-	-	-	55	7	-	3
2017	8	5	-	-	-	44	-	1	80	17	-	-	-	4	5	-	19
year	Average Cover (%)																
1997	0.3	0.1	0.0	0.0	0.1	-	0.2	0.2	-	0.4	0.1	0.0	0.0	0.3	0.0	0.0	-
2002	0.3	0.1	0.0	-	-	-	0.1	0.0	-	1.1	0.0	0.0	-	0.0	0.0	-	-
2007	0.0	0.8	-	-	0.0	0.3	0.1	0.1	-	0.3	0.0	0.0	0.1	0.2	0.1	-	0.0
2012	-	0.0	-	-	0.0	0.1	-	0.1	-	0.0	-	-	-	0.1	0.1	-	0.0
2017	0.0	0.0	-	-	-	0.8	-	0.1	1.6	0.1	-	-	-	0.0	0.0	-	0.5

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

FORB SPECIES	Galium aparine <sup>a</sup> (stickywilly)	Geranium <sup>a</sup> (geranium)	Hydrophyllum occidentale (western waterleaf)	Lactuca serriola <sup>ii</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lathyrus brachycalyx (Bonneville pea)	Medicago sativa <sup>i</sup> (alfalfa)	Microsteris gracilis <sup>a</sup> (slender phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>ii</sup> (tall tumblemustard)	Solidago (goldenrod)	Symphyotrichum (aster)	Taraxacum officinale (common dandelion)	Tetranuris acaulis (stemless four-nerve daisy)	Tragopogon dubius <sup>ii</sup> (yellow salsify)
year	Nested Frequency																
1997	223	2	-	3	-	173	-	29	27	18	7	-	-	4	-	-	10
2002	99	-	-	1	2	138	-	6	26	93	4	-	13	-	0	8	7
2007	93	-	4	8	6	114	2	35	52	38	151	4	-	-	-	-	41
2012	121	9	5	-	3	166	3	1	77	2	26	-	-	-	1	-	37
2017	114	-	9	7	-	138	5	2	49	4	2	-	-	-	-	-	3
year	Average Cover (%)																
1997	5.7	0.0	-	0.0	-	7.5	-	0.1	0.1	0.0	0.0	-	-	0.0	-	-	0.1
2002	0.9	-	-	0.0	0.0	6.1	-	0.0	0.1	0.3	0.0	-	0.0	-	0.0	0.5	0.0
2007	3.7	-	0.0	0.0	0.2	3.8	0.2	0.1	0.2	0.1	0.5	0.0	-	-	-	-	0.7
2012	2.7	0.0	0.2	-	0.0	7.0	0.2	0.0	0.4	0.0	0.1	-	-	-	0.0	-	0.3
2017	2.6	-	0.1	0.0	-	5.5	0.2	0.0	0.3	0.0	0.0	-	-	-	-	-	0.0

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

FORB SPECIES	Trifolium (clover)	unknown annual forb <sup>a</sup> (unknown forb)	Viola (violet)	Wyethia amplexicaulis (mule-ears)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency				
1997	-	64	-	-	5
2002	1	-	-	-	3
2007	1	-	2	3	4
2012	-	-	3	-	4
2017	-	-	-	0	-
year	Average Cover (%)				
1997	-	0.3	-	-	0.1
2002	0.0	-	-	-	0.1
2007	0.0	-	0.0	0.0	0.0
2012	-	-	0.0	-	0.1
2017	-	-	-	0.0	-

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

**Table 16A-02.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)		
	Artemisia tridentata ssp. vaseyana <sup>P</sup> (mountain big sagebrush)	Gutierrezia sarothrae (broom snakeweed)	Quercus gambelii <sup>P</sup> (Gambel oak)
year	Line Intercept Cover (%)		
1997	-	-	-
2002	-	-	-
2007	-	-	35.7
2012	-	-	40.6
2017	0.1	-	27.3
year	Quadrat Cover (%)		
1997	10.8	0.6	11.5
2002	0.0	-	2.7
2007	-	-	21.4
2012	-	-	24.4
2017	0.0	-	11.0

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

**Table 16A-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.

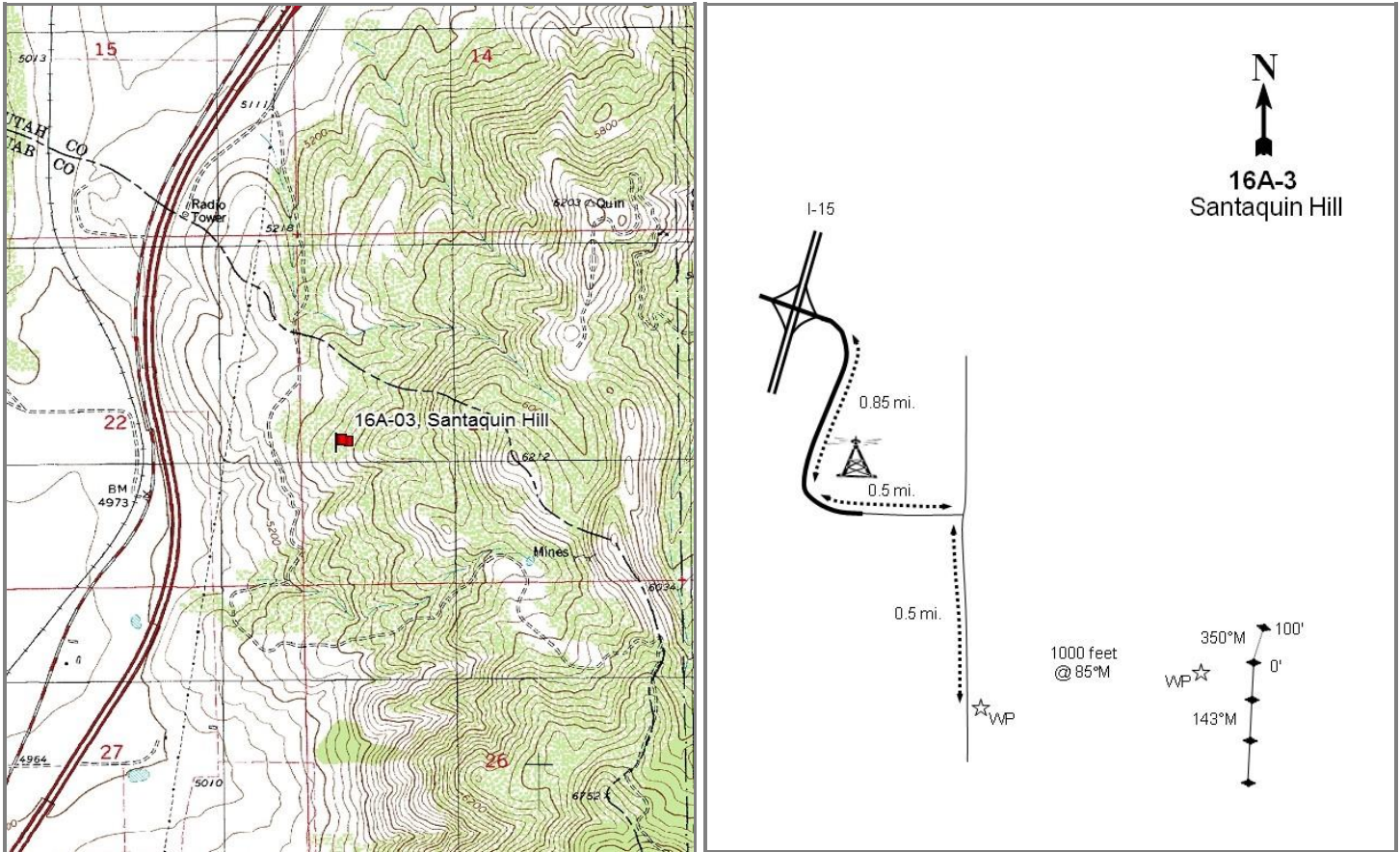
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana <sup>P</sup> -- (mountain big sagebrush)									
1997	2540	-	10	74	16	28	4	11	68/99
2002	-	20	0	0	0	0	0	0	- / -
2007	80	-	0	100	0	0	75	0	30/33
2012	60	-	33	67	0	33	33	0	43/47
2017	100	-	0	80	20	80	0	0	50/57
Gutierrezia sarothrae -- (broom snakeweed)									
1997	80	-	25	50	25	0	0	25	23/31
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	20	-	0	100	0	0	0	0	17/16
2017	-	-	-	-	-	-	-	-	- / -
Quercus gambelii <sup>P</sup> -- (Gambel oak)									
1997	5100	280	33	67	1	5	2	44	171/114
2002	7960	-	100	0	0	0	3	1	19/23
2007	13560	340	6	94	0	0	0	56	115/67
2012	11100	40	28	72	0	0	0	0	132/80
2017	5240	140	16	80	5	15	2	13	143/89

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

**Table 16A-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' (%)
Quercus gambelii (Gambel oak)							
2007	298	6	88	6	-	-	1.8

## SANTAQUIN HILL - STUDY NO. 16A-3



### Location Information

USGS 7.5 min Map Santaquin SE; Township 10S, Range 1E, Section 23  
 Info GPS (0' Stake) NAD 83 UTM ZONE 12, 431423 East 4420245 North

### Transect Information

Browse Tag # (0' Stake) 3967  
 Transect Bearing 350° 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 south Santaquin exit on I-15, proceed east from the overpass and then southerly onto the frontage road for 0.85 miles to the radio tower. Proceed over the ridge to the east of the radio tower on a faint road for 0.5 miles to an intersection with a dirt road. Proceed south for 0.5 miles to a half-high witness post on the east side of the road. From the witness post, walk 1,000 feet at 85 degrees magnetic up the ridge to a full-high witness post; the 0-foot baseline stake is 20 feet south of the witness post. A red browse tag, #3967, is attached to the 0-foot baseline stake.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,510ft (1,679m)
Aspect	West
Slope	25%
Sample Dates	06/04/1997, 05/17/2002, 05/15/2007, 05/23/2012, 05/24/2017

**Wildlife Habitat and Vegetation History****Table 16A-03.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter

**Table 16A-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	Mountain Big Sagebrush/Gambel Oak	Phase I
1989	Mountain Big Sagebrush/Gambel Oak	Phase I
1997	Mountain Big Sagebrush/Gambel Oak	Phase I
2002	Mountain Big Sagebrush/Gambel Oak	Phase I
2007	Mountain Big Sagebrush/Gambel Oak	Phase I
2012	Mountain Big Sagebrush/Gambel Oak	Phase I
2017	Mountain Big Sagebrush/Gambel Oak	Phase I

**Site Notes**

No Notes

**Soils****Table 16A-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	6.8	40.4	29.1	30.6	3.2	16.3	204.8	0.6	06/04/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Loam (Oak)
NRCS Ecological Site #	R047XA432UT
States and Transitions	No state and transition model is available for this ecological site.

This site has existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Gambel oak (*Quercus gambelii*) dominated plant community since study establishment in 1983. Utah juniper (*Juniperus osteosperma*) is scattered throughout the site, placing it in Phase I of woodland succession (photos, Table 16A-03.4, Table 16A-03.12, Table 16A-03.13, Table 16A-03.14). Perennial grasses, mainly the native species bluebunch wheatgrass (*Pseudoroegneria spicata*), have been the most abundant herbaceous component since 1983. The introduced annual species field brome (*Bromus arvensis*) and cheatgrass (*B. tectorum*) have been sampled each year since 1997, but have contributed little cover. In addition, the introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) was observed for the first time in 2017 in low abundance (Table 16A-03.10). Forbs have remained diverse, with annual species being more common than perennial species (Table 16A-03.7, Table 16A-03.11).

**Trend Summary Tables****Table 16A-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	19.6	0.8	-	-	-	-
2002	14.0	0.0	-	-	-	-
2007	19.0	-	-	22.7	-	-
2012	22.3	0.0	-	32.7	0.5	-
2017	15.1	1.1	-	19.4	0.9	0.1

**Table 16A-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	235	312	378	66	2.7	11.4	3.2	0.5
2002	145	314	388	55	1.8	11.4	4.0	0.3
2007	219	286	440	43	5.3	9.0	10.5	0.9
2012	179	314	392	64	1.5	11.8	2.9	1.7
2017	176	335	402	75	1.8	15.5	8.7	0.3

**Table 16A-03.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	7.1	0.6	47.6	3.1	22.9	35.7
2002	5.8	0.3	47.3	4.2	25.5	33.0
2007	7.4	0.4	38.4	2.9	25.3	43.0
2012	8.8	0.0	41.4	4.3	26.9	40.1
2017	10.3	0.1	36.2	8.9	28.6	42.3

**Table 16A-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	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1997	20	2	11
2002	33	2	15
2007	52	1	21
2012	17	3	16
2017	24	2	13
Days Use Per Acre (ha)			
1997	-	-	-
2002	111.9 (276.4)	-	-
2007	138.7 (342.6)	-	-
2012	24.8 (61.2)	-	-
2017	50.2 (124.1)	0.7 (1.7)	-



**Table 16A-03.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency					
Bromus arvensis <sup>ai</sup> (field brome)	152	128	-	-	110	267
Bromus tectorum <sup>ai</sup> (cheatgrass)	-	145	-	3	93	287
Poa bulbosa <sup>i</sup> (bulbous bluegrass)	7	219	-	-	111	263
Poa pratensis <sup>i</sup> (Kentucky bluegrass)	130	80	-	-	121	284
Poa secunda (Sandberg bluegrass)	74	125	13	2	69	323
Pseudoroegneria spicata (bluebunch wheatgrass)						
year	Average Cover (%)					
1997	1.9	0.8	-	-	0.9	10.5
2002	-	1.8	-	0.0	0.5	10.9
2007	0.0	5.2	-	-	0.9	8.2
2012	1.2	0.2	-	-	1.2	10.6
2017	0.6	1.2	0.5	0.0	0.6	14.4

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

**Table 16A-03.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Alyssum desertorum <sup>ai</sup> (desert madwort)	352	1	7	2	11	-	12	0	58	8	-	-	22	-	-	5	3
Antennaria (pussytoes)	371	2	-	1	-	2	18	1	75	-	-	0	17	4	-	2	-
Arabis (rockcress)	433	-	-	10	-	0	13	-	65	-	-	5	54	-	1	-	-
Astragalus beekwithii (Beekwith's milkvetch)	387	-	-	15	-	14	2	12	18	-	-	9	10	-	-	2	-
Astragalus cibaricus (browse milkvetch)	380	-	-	8	-	1	56	4	54	-	1	0	84	2	-	-	-
Astragalus eurekaensis (Eureka milkvetch)																	
Calochortus nuttallii (sego lily)																	
Castilleja angustifolia (northwestern Indian paintbrush)																	
Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)																	
Chaenactis douglasii (Douglas' dustymaiden)																	
Chaetopappa ericoides (rose heath)																	
Cirsium undulatum <sup>a</sup> (wavyleaf thistle)																	
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																	
Comandra umbellata (bastard toadflax)																	
Convolvulus arvensis <sup>ni</sup> (field bindweed)																	
Crepis acuminata (tapertip hawksbeard)																	
Draba <sup>a</sup> (draba)																	
year	Average Cover (%)																
1997	2.4	0.0	0.0	0.1	0.2	-	0.0	0.0	0.1	0.0	-	-	0.1	-	-	0.0	0.0
2002	3.4	0.0	-	0.0	-	0.0	0.1	0.0	0.3	-	-	0.0	0.1	0.0	-	0.0	-
2007	9.6	-	-	0.7	-	0.0	0.0	-	0.1	-	-	0.1	0.2	-	0.0	-	-
2012	2.4	-	-	0.7	-	0.6	0.0	0.1	0.0	-	-	0.2	0.0	-	-	0.0	-
2017	6.2	-	-	0.1	-	0.0	0.2	0.0	0.3	-	0.0	0.0	0.4	0.0	-	-	-

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

FORB SPECIES														
Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)														
Erigeron pumilus (shaggy fleabane)														
Erodium cicutarium <sup>ii</sup> (redstem stork's bill)														
Galium aparine <sup>a</sup> (stickywilly)														
Helianthus annuus <sup>a</sup> (common sunflower)														
Lactuca serriola <sup>ii</sup> (prickly lettuce)														
Microsteris gracilis <sup>a</sup> (slender phlox)														
Oenothera (evening primrose)														
Petradoria pumila (rock goldenrod)														
Phlox longifolia (longleaf phlox)														
Silene antirrhina <sup>a</sup> (sleepy silene)														
Taraxacum officinale (common dandelion)														
Tragopogon dubius <sup>ii</sup> (yellow salsify)														
year	Nested Frequency													
1997	38	1	-	46	3	10	30	-	1	29	5	-	2	
2002	22	-	-	43	-	1	29	-	3	25	8	1	5	
2007	-	-	5	76	-	8	62	-	0	22	-	-	2	
2012	34	-	-	24	-	5	10	2	5	19	8	-	3	
2017	23	-	36	71	-	13	8	-	-	6	4	-	2	
year	Average Cover (%)													
1997	0.1	0.0	-	0.5	0.0	0.0	0.1	-	0.0	0.1	0.0	-	0.0	
2002	0.1	-	-	0.1	-	0.0	0.1	-	0.2	0.1	0.0	0.0	0.0	
2007	-	-	0.0	0.3	-	0.0	0.1	-	0.2	0.1	-	-	0.0	
2012	0.1	-	-	0.1	-	0.0	0.0	0.0	0.1	0.1	0.0	-	0.0	
2017	0.1	-	1.1	0.6	-	0.0	0.0	-	-	0.0	0.0	-	0.0	

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

**Table 16A-03.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES					
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)					
Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)					
Gutierrezia sarothrae (broom snakeweed)					
Juniperus osteosperma <sup>t</sup> (Utah juniper)					
Quercus gambelii <sup>p</sup> (Gambel oak)					
year	Line Intercept Cover (%)				
1997	-	-	-	-	-
2002	-	-	-	-	-
2007	13	1.2	-	-	8.5
2012	16.5	0.9	0.5	-	15.3
2017	9.4	0.6	0.9	0.1	9.4
year	Quadrat Cover (%)				
1997	10.3	0.7	0.8	-	8.6
2002	8.9	0.2	0.0	-	4.9
2007	11.6	0.8	-	-	6.6
2012	12.4	0.2	0.0	-	9.7
2017	7.2	0.0	1.1	0.0	7.9

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

**Table 16A-03.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

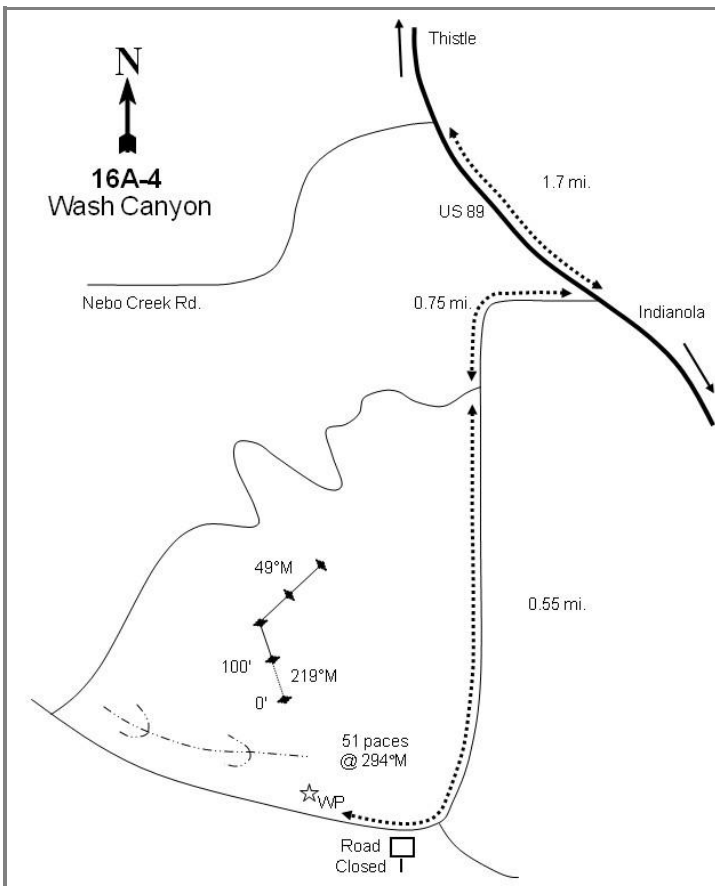
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1997	2780	100	19	54	27	43	12	19	43/63
2002	2940	20	5	55	40	38	28	26	52/81
2007	2820	20	4	53	43	29	45	27	67/89
2012	2420	100	7	72	22	33	13	13	61/95
2017	2940	80	24	48	28	40	19	20	55/86
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1997	140	-	0	100	0	14	14	0	68/90
2002	80	-	0	75	25	0	0	25	75/120
2007	80	-	0	0	100	0	25	75	75/107
2012	60	-	0	67	33	0	0	33	75/116
2017	40	-	0	100	0	0	0	0	64/101
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	740	20	8	89	3	0	0	0	24/22
2002	260	-	8	77	15	0	0	31	16/21
2007	160	20	38	63	0	0	0	13	24/31
2012	560	60	0	100	0	0	0	0	20/27
2017	1580	40	24	75	1	0	0	1	22/27
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1997	3140	100	27	71	3	26	43	1	76/74
2002	6860	-	2	98	0	1	16	9	74/48
2007	5020	100	44	51	6	7	0	2	85/69
2012	5220	380	17	83	0	8	0	0	81/77
2017	3100	420	10	88	2	5	7	9	85/81

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

**Table 16A-03.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution				Average Diameter (cm)	
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'		>12' (%)
<b>Juniperus osteosperma (Utah juniper)</b>							
2017	22	10	-	30	20	40	14.5

## WASH CANYON - STUDY NO. 16A-4



### Location Information

USGS 7.5 min Map Info	Spencer Canyon NE; Township 11S, Range 3E, Section 13
GPS (0' Stake)	NAD 83 UTM ZONE 12, 453705 East 4412098 North

### Transect Information

Browse Tag # (0' Stake)	N/A
Transect Bearing	315° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 1: 2ft

### Directions to Site

From the intersection of Nebo Creek Road and U.S. 89, proceed south on U.S. 89 for 1.7 miles (0.6 miles south of mile marker 302) to a road to the west. Turn right (west) and proceed westerly for 0.75 miles, crossing a stream at 0.25 miles and an old railroad bed at 0.30 miles in route to a faint fork in the road. Take the left fork and proceed for 0.5 miles to the end of the road. Walk up the old road for 0.05 miles to a half-high witness post on the north side of the road. From the witness post, walk 51 paces at an azimuth of 295 degrees magnetic to the 0-foot baseline stake (the baseline stake is 17 paces away from a lone juniper at an azimuth of 56 degrees). The 0-foot baseline stake is a green post located just north of a clump of oak.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,040ft (1,841m)
Aspect	northeast
Slope	15-20%
Sample Dates	08/22/1997, 06/18/2002, 06/20/2007, 05/29/2012, 05/30/2017

**Wildlife Habitat and Vegetation History****Table 16A-04.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Greater Sage Grouse	occupied	year-long
Moose	substantial	year-long

**Table 16A-04.4 - 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	Phase I
1989	Mountain Big Sagebrush	Phase I
1997	Mountain Big Sagebrush	Phase I
2002	Mountain Big Sagebrush	Phase I
2007	Mountain Big Sagebrush	Phase I
2012	Mountain Big Sagebrush	Phase I
2017	Mountain Big Sagebrush	Phase I

**Site Notes**

Antler drops and winter-killed deer were noted during the 1983 reading. In addition, a deer carcass was observed in the gully north of the site in 2017.

**Soils****Table 16A-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	35.0	31.2	33.8	3.4	13.5	99.2	0.6	08/11/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has dominated this study site since establishment in 1983. Other preferred browse species including Utah serviceberry (*Amelanchier utahensis*) and antelope bitterbrush (*Purshia tridentata*) are also present as minor components (Table 16A-04.12, Table 16A-04.13). The herbaceous understory is abundant and very diverse, with perennial grasses as the most abundant component. The introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) has been observed each sample year since 2002 and increased in cover between 2012 and 2017 (Table 16A-04.10). Perennial forbs have generally been more common than annual forbs in most sample years, with scarlet globemallow (*Sphaeralcea coccinea*) contributing the most cover of any single species in 2017 (Table 16A-04.7, Table 16A-04.11). Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have been scattered throughout the area for the duration of the study, and the study site is considered to be within Phase I of encroachment (photos, Table 16A-04.4, Table 16A-04.14).

**Trend Summary Tables****Table 16A-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
1997	8.0	11.5	-	-	-	-
2002	11.5	8.5	0.1	8.5	5.0	0.4
2007	10.2	8.0	0.1	11.4	7.4	0.4
2012	12.2	6.8	0.4	11.5	3.8	0.7
2017	9.1	8.6	1.0	8.4	6.8	0.8

**Table 16A-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
1997	314	318	213	209	6.1	9.2	1.2	2.9
2002	172	281	254	133	0.7	11.5	1.4	1.7
2007	312	291	427	223	3.5	9.4	6.4	3.3
2012	96	325	317	294	0.4	14.0	2.3	7.7
2017	237	329	398	295	7.3	20.9	4.3	8.4

**Table 16A-04.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	14.3	0.4	40.6	9.3	5.8	43.7
2002	31.5	0.0	40.5	6.2	5.5	32.0
2007	25.7	0.0	30.7	6.3	5.5	41.0
2012	21.4	0.7	36.6	6.6	6.3	44.3
2017	30.9	0.5	28.4	8.0	6.9	49.0

**Table 16A-04.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1997	2	58	21	-	2
2002	1	68	12	-	14
2007	1	48	17	-	22
2012	1	14	1	-	8
2017	2	25	-	-	9
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	0.7 (1.8)	174.9 (432.0)	10.7 (26.5)	-	-
2007	9.4 (23.3)	92.5 (228.4)	9.4 (23.2)	0.6 (1.4)	-
2012	10.2 (25.1)	36.8 (91.0)	3.4 (8.3)	-	-
2017	31.2 (77.1)	105.2 (259.9)	6.7 (16.6)	-	-



**Table 16A-04.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Dactylis glomerata <sup>i</sup> (orchardgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Melica bulbosa (oniongrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency											
1997	93	-	314	1	51	27	-	-	5	92	54	89
2002	93	4	171	-	35	25	2	12	-	29	40	124
2007	31	33	303	-	49	27	-	53	2	-	87	169
2012	24	-	96	-	25	54	-	38	6	52	132	136
2017	31	109	202	-	41	47	7	170	4	10	126	98
year	Average Cover (%)											
1997	1.8	-	6.1	0.0	0.6	0.6	-	-	0.1	3.0	0.9	2.2
2002	3.7	0.0	0.7	-	0.8	1.5	0.1	0.1	-	0.2	0.5	4.5
2007	0.5	0.2	3.4	-	0.6	1.0	-	0.9	0.0	-	1.4	5.0
2012	0.9	-	0.4	-	0.4	1.5	-	0.3	0.0	1.2	2.2	7.4
2017	1.4	1.8	5.4	-	1.0	2.6	0.0	6.4	0.0	0.2	3.7	5.7

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

**Table 16A-04.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria dimorpha (low pussytoes)	Arabis (rockcross)	Astragalus cibirarius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza sagittata (arrow/leaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littledod false flax)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium <sup>a</sup> (goosefoot)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)
year	Nested Frequency																
1997	4	13	116	1	-	-	9	1	-	5	-	-	-	1	3	18	3
2002	9	-	216	1	-	2	1	-	-	-	-	-	17	-	-	16	97
2007	17	11	368	14	-	12	6	2	0	-	3	3	291	2	-	10	131
2012	12	-	287	6	1	37	16	14	0	2	2	26	69	4	-	10	7
2017	36	99	390	2	-	50	17	18	1	4	3	18	81	-	-	14	46
year	Average Cover (%)																
1997	0.0	0.0	0.3	0.0	-	-	0.1	0.0	-	0.0	-	-	-	0.0	0.0	0.2	0.0
2002	0.0	-	0.8	0.0	-	0.0	0.0	-	-	-	-	-	0.1	-	-	0.2	0.2
2007	0.2	0.0	2.6	0.2	-	0.1	0.1	0.0	0.0	-	0.0	0.1	3.1	0.0	-	0.2	0.3
2012	0.1	-	1.7	0.2	0.0	0.6	0.1	0.3	0.0	0.0	0.0	0.4	0.1	0.0	-	0.2	0.0
2017	0.3	0.3	3.5	0.0	-	0.8	0.3	0.1	0.1	0.0	0.0	0.2	0.3	-	-	0.1	0.2

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

FORB SPECIES	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron divergens <sup>a</sup> (spreading fleabane)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Hackelia patens (spotted stickseed)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Linum lewisii (Lewis flax)	Lithophragma (woodland-star)	Lithospermum ruderale (western stone seed)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)
year	Nested Frequency																
1997	9	2	3	13	-	41	11	1	0	2	39	5	87	6	-	-	3
2002	1	-	-	11	-	1	2	-	3	1	39	-	-	-	1	-	-
2007	1	5	11	10	2	4	2	-	12	-	13	22	8	-	1	5	-
2012	3	13	53	19	11	-	-	-	3	18	34	6	22	-	5	2	-
2017	-	9	15	22	10	17	1	3	13	2	27	2	12	-	0	3	-
year	Average Cover (%)																
1997	0.0	0.0	0.0	0.1	-	0.1	0.1	0.0	0.0	0.0	0.4	0.0	0.7	0.3	-	-	0.0
2002	0.0	-	-	0.1	-	0.0	0.0	-	0.1	0.0	0.3	-	-	-	0.0	-	-
2007	0.0	0.1	0.0	0.1	0.0	0.0	0.0	-	0.1	-	0.1	0.2	0.1	-	0.2	0.0	-
2012	0.0	0.0	0.6	0.1	0.0	-	-	-	0.1	0.1	0.6	0.0	0.1	-	0.2	0.0	-
2017	-	0.1	0.1	0.4	0.1	0.1	0.0	0.0	0.2	0.0	0.4	0.0	0.1	-	0.1	0.0	-

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

FORB SPECIES	Microseris nutans (nodding microseris)	Microsteris gracilis <sup>a</sup> (slender phlox)	Oenothera (evening primrose)	Orobanche fasciculata (clustered broomrape)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Schoenocrambe limifolia (flaxleaf plainsmustard)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sphaeralcea coccinea (scarlet globemallow)	Streptanthus cordatus (heartleaf twistflower)	Symphoricarum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ai</sup> (yellow salsify)
year	Nested Frequency																
1997	-	-	2	4	-	-	-	3	22	-	-	-	98	-	1	1	69
2002	-	2	-	-	-	-	-	5	1	7	-	-	80	-	4	-	4
2007	-	-	-	-	-	-	-	38	-	-	-	-	106	3	5	-	9
2012	-	-	-	-	5	0	4	40	-	4	-	4	86	1	2	-	20
2017	7	-	-	-	-	-	-	5	-	-	4	12	109	-	10	3	10
year	Average Cover (%)																
1997	-	-	0.0	0.0	-	-	-	0.0	0.1	-	-	-	1.0	-	0.0	0.0	0.4
2002	-	0.0	-	-	-	-	-	0.0	0.0	0.0	-	-	1.0	-	0.0	-	0.0
2007	-	-	-	-	-	-	-	0.2	-	-	-	-	0.9	0.0	0.0	-	0.0
2012	-	-	-	-	0.0	0.0	0.0	0.5	-	0.0	-	0.0	0.7	0.0	0.0	-	0.2
2017	0.1	-	-	-	-	-	-	0.0	-	-	0.0	0.0	1.5	-	0.3	0.0	0.0

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

FORB SPECIES			
	Vicia americana (American vetch)	Viola (violet)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency		
1997	3	-	-
2002	8	-	-
2007	69	-	-
2012	145	-	-
2017	112	25	3
year	Average Cover (%)		
1997	0.0	-	-
2002	0.0	-	-
2007	0.6	-	-
2012	2.8	-	-
2017	2.5	0.1	0.1

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

**Table 16A-04.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES										
	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Cercocarpus montanus <sup>p</sup> (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Opuntia polyacantha (plains pricklypear)	Pinus edulis <sup>i</sup> (twoneedle pinyon)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Quercus gambelii <sup>p</sup> (Gambel oak)
year	Line Intercept Cover (%)									
1997	-	-	-	-	-	-	-	-	-	-
2002	0.2	7.3	-	4	0.3	0.7	0.3	0.4	0.5	0.2
2007	0.1	10	0.1	4.4	0.5	2.5	0.5	0.4	0.4	0.3
2012	0.2	9.7	0.1	3.1	0.6	0.3	0.4	0.7	0.5	0.4
2017	0.4	6	0.2	3.8	0.7	2.2	0.8	0.8	0.8	0.3
year	Quadrat Cover (%)									
1997	-	7.2	0.1	8.1	-	2.7	0.7	-	0.6	-
2002	0.1	9.7	0.1	6.8	0.0	0.6	1.1	0.1	0.4	1.0
2007	0.0	8.8	0.1	4.8	0.0	2.5	0.7	0.1	0.6	0.8
2012	0.0	10.6	0.0	4.4	0.0	1.1	1.3	0.4	0.9	0.8
2017	0.0	8.3	0.2	4.9	0.0	2.5	1.1	1.0	0.2	0.4

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

**Table 16A-04.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1997	40	-	0	50	50	0	50	50	- / -
2002	60	-	33	0	67	0	0	0	24/42
2007	40	-	50	50	0	100	0	0	32/50
2012	40	-	0	100	0	0	100	0	37/54
2017	80	-	25	75	0	25	0	0	45/51
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1997	1800	-	20	52	28	14	0	17	71/80
2002	1980	-	4	78	18	39	35	11	64/81
2007	1760	420	17	61	22	50	8	63	69/96
2012	1960	-	19	66	14	32	25	5	54/81
2017	1880	20	18	55	27	55	17	28	51/77
<b>Cercocarpus montanus<sup>P</sup> -- (alderleaf mountain mahogany)</b>									
1997	40	-	50	50	0	0	50	0	28/48
2002	20	-	0	100	0	0	100	0	45/63
2007	40	-	0	100	0	0	100	0	42/67
2012	20	-	0	100	0	100	0	0	44/73
2017	40	-	0	50	50	0	50	50	44/78
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	7280	-	13	82	6	0	0	2	28/30
2002	7520	-	2	65	34	1	0	17	23/33
2007	6140	420	4	87	9	0	0	3	21/31
2012	5300	20	19	81	0	3	0	0	22/33
2017	4620	-	11	88	0	0	0	1	25/37
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1997	20	-	0	100	0	0	0	0	- /41
2002	40	-	0	100	0	100	0	0	64/64
2007	40	-	0	50	50	0	0	0	97/89
2012	40	-	0	100	0	0	0	0	85/112
2017	40	-	0	50	50	50	0	50	42/54
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	6420	360	15	85	1	0	0	1	27/28
2002	1600	-	0	16	84	0	3	76	16/18
2007	7420	20	12	86	2	0	0	1	20/18
2012	1480	-	45	54	1	0	0	0	17/23
2017	4700	80	11	89	0	0	0	0	20/20
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1997	920	20	11	87	2	0	0	2	15/22
2002	1240	-	3	77	19	0	0	7	12/25
2007	780	20	5	87	8	0	0	21	15/32
2012	620	-	3	97	0	3	0	0	14/31
2017	700	-	0	100	0	0	0	3	14/32
<b>Pinus edulis<sup>t</sup> -- (twoneedle pinyon)</b>									
1997	20	-	100	0	0	0	0	0	- / -
2002	20	-	100	0	0	0	0	0	- / -
2007	20	-	0	100	0	0	0	0	- / -
2012	20	-	100	0	0	0	0	0	- / -
2017	20	-	0	100	0	0	0	0	- / -
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1997	140	-	0	100	0	71	14	0	22/41
2002	120	-	0	33	67	0	50	33	23/38
2007	140	-	14	86	0	14	71	0	21/45
2012	140	-	0	71	29	29	71	0	27/76
2017	120	-	17	83	0	0	83	0	26/77
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1997	60	-	67	33	0	33	0	0	- / -
2002	100	-	60	20	20	20	20	80	72/143
2007	300	-	0	100	0	0	0	0	125/88
2012	40	-	0	100	0	0	0	0	- / -
2017	20	-	0	0	100	0	0	100	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Ribes <sup>p</sup> -- (currant)									
1997	40	-	100	0	0	0	0	0	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
Symphoricarpos oreophilus -- (mountain snowberry)									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	20	-	0	100	0	100	0	0	54/58

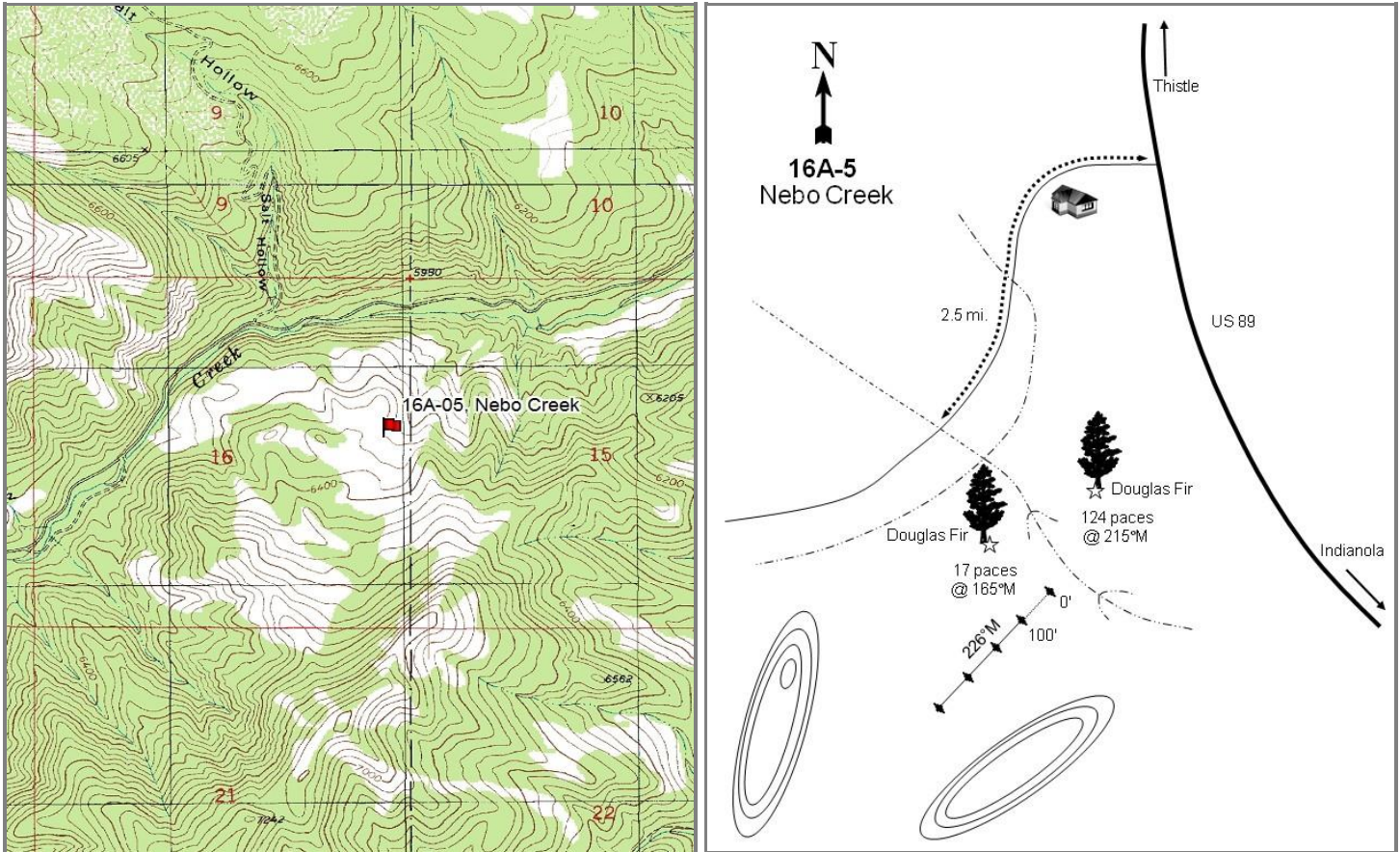
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 16A-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)							
2002	27	-	-	-	-	-	5.4
2007	15	-	25	38	25	13	13.8
2012	15	-	22	56	-	22	7.7
2017	15	-	-	44	22	33	24.4
Pinus edulis (twoneedle pinyon)							
2017	11	-	20	40	20	20	9.0



## NEBO CREEK - STUDY NO. 16A-5

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Spencer Canyon NW; Township 11S, Range 3E, Section 16  
NAD 83 UTM ZONE 12, 449858 East 4412881 North

**Transect Information**

Browse Tag # (0' Stake)	3966
Transect Bearing	226° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 4: No Rebar

**Directions to Site**

Beginning at the intersection of Highway US-89 and Nebo Creek Road, proceed 2.5 miles westerly up Nebo Creek to the USFS boundary sign and/or the cattle guard: park here. Walk at an azimuth of 185 degrees magnetic, across Nebo Creek and uphill, to a lone Douglas fir. From here, walk at an azimuth of 215 degrees magnetic up a drainage to a fence line. From the fence line, walk 124 paces at the same azimuth to a second, but smaller Douglas fir within a clump of oak brush. From this tree, the 0-foot baseline stake is 17 paces away at an azimuth of 165 degrees magnetic.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	PAYSON
Elevation	6,300ft (1,920m)
Aspect	Northeast
Slope	10%
Sample Dates	05/28/1997, 06/18/2002, 06/13/2007, 07/04/2012, 05/25/2017

**Table 16A-05.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Nebo Creek	-	July 2001	4378

**Wildlife Habitat and Vegetation History****Table 16A-05.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter/spring
Elk	substantial	spring/fall
Moose	substantial	year-long

**Table 16A-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	Gambel Oak	NA
1989	Gambel Oak	NA
1997	Mountain Big Sagebrush	NA
2002	Perennial Grass	NA
2007	Annual Grass	NA
2012	Perennial Grass	NA
2017	Annual Grass	NA

**Site Notes**

This study initially sampled a Gambel oak (*Quercus gambelii*) clone, but the transect was moved in 1997 to sample the mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and basin big sagebrush (*A. tridentata* ssp. *tridentata*) community that was more prevalent on the slopes. As such, only data collected since 1997 is included in this discussion.

**Soils****Table 16A-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	6.0	34.7	34.7	30.6	3.5	39.6	320.0	0.5	05/28/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Gravelly Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA406UT
States and Transitions	No state and transition model is available for this ecological site.

This study site was dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) in 1997, but the shrub component was mostly removed by the 2001 Nebo Creek Fire. Yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*) has been the most common shrub following the burn (Table 16A-05.12, Table 16A-05.13). The herbaceous understory has remained abundant and diverse. Perennial grasses -- mainly Sandberg bluegrass (*Poa secunda*), bluebunch wheatgrass (*Pseudoroegneria spicata*), and the introduced species bulbous bluegrass (*Poa bulbosa*) -- and the introduced annual species cheatgrass (*Bromus tectorum*) have fluctuated in cover, but have been the dominant vegetation components in the sample years following the burn (Table 16A-05.7, Table 16A-05.10). Forbs have remained very diverse and fairly abundant. The introduced and noxious perennial forb whitetop (*Cardaria draba*) was sampled in 2017, and the annual species gypsyflower (*Cynoglossum officinale*) was observed in many sample years prior to 2017. However, both species contribute/have contributed little cover (Table 16A-05.11).

**Trend Summary Tables****Table 16A-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	7.6	8.9	-	-	-	-
2002	-	0.4	-	-	0.4	-
2007	0.1	8.2	-	-	12.4	-
2012	-	7.3	-	0.3	9.2	-
2017	0.1	7.9	-	0.2	13.3	-

**Table 16A-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	148	392	350	387	2.5	22.7	7.3	23.8
2002	35	231	174	226	0.5	10.2	1.7	6.6
2007	382	290	338	263	24.3	15.2	4.9	6.0
2012	275	362	343	293	3.5	19.3	6.4	5.8
2017	444	348	268	304	34.3	23.8	6.5	12.3

**Table 16A-05.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	8.3	0.5	55.0	1.7	1.9	60.8
2002	64.3	-	7.3	10.5	5.8	18.3
2007	18.8	0.0	24.7	1.5	2.1	62.3
2012	22.6	0.0	25.5	1.6	2.6	54.1
2017	8.1	-	55.9	2.2	2.4	71.8

**Table 16A-05.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	6	7	4	-
2002	-	3	1	-
2007	3	6	9	-
2012	4	3	4	-
2017	4	4	4	1
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	0.7 (1.8)	6.7 (16.6)	2.7 (6.6)	-
2007	29.0 (71.7)	0.7 (1.7)	23.4 (57.9)	-
2012	8.7 (21.5)	8.7 (21.5)	6.0 (14.9)	-
2017	46.5 (114.8)	3.4 (8.3)	8.7 (21.5)	-

**Table 16A-05.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Leymus cinereus (basin wildrye)	Melica bulbosa (oniongrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea <sup>i</sup> (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency														
1997	1	5	6	2	-	148	-	5	84	-	-	200	182	-	86
2002	-	5	-	-	-	35	4	2	56	-	7	25	165	7	31
2007	-	1	-	-	1	382	-	10	44	21	3	38	215	-	60
2012	-	-	-	-	5	273	4	15	20	61	5	28	299	0	108
2017	-	2	-	5	5	444	4	17	79	163	16	34	186	2	98
year	Average Cover (%)														
1997	0.0	0.0	0.0	0.1	-	2.5	-	1.0	2.0	-	-	8.1	8.4	-	3.0
2002	-	0.0	-	-	-	0.5	0.0	0.1	1.7	-	0.0	0.3	5.6	1.4	0.9
2007	-	0.0	-	-	0.0	24.3	-	1.2	0.4	0.5	0.0	0.7	8.9	-	3.4
2012	-	-	-	-	0.0	3.5	0.0	0.9	0.1	1.3	0.1	0.1	12.6	0.0	4.1
2017	-	0.4	-	0.0	0.2	34.1	0.1	0.6	1.2	8.8	0.4	0.9	6.7	0.0	4.6

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

**Table 16A-05.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium campanulatum (null)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus beekwithii (Beckwith's milkvetch)	Astragalus cibaricus (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Balsamorhiza sagittata (arrow/leaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littletop false flax)	Cardaria draba <sup>ai</sup> (whitetop)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Chenopodium album <sup>a</sup> (lambsquarters)	Cirsium undulatum <sup>a</sup> (wavy/leaf thistle)
year	Nested Frequency																
1997	19	71	64	7	-	-	3	53	-	-	8	6	38	-	33	3	14
2002	2	63	10	26	4	-	-	13	-	1	12	7	-	-	23	-	-
2007	-	59	2	120	-	-	7	-	-	-	5	2	63	-	42	-	-
2012	-	70	-	195	3	3	10	6	-	-	10	-	56	-	51	-	11
2017	-	90	31	103	-	-	12	8	22	5	11	-	2	4	20	-	6
year	Average Cover (%)																
1997	0.9	0.8	0.3	0.0	-	-	0.1	1.8	-	-	0.7	0.0	0.1	-	0.1	0.0	0.1
2002	0.0	0.4	0.1	0.2	0.0	-	-	0.2	-	0.0	1.2	0.0	-	-	0.1	-	-
2007	-	0.4	0.0	1.0	-	-	0.8	-	-	-	0.2	0.0	0.2	-	0.3	-	-
2012	-	0.6	-	2.0	0.0	0.0	0.3	0.2	-	-	0.6	-	0.3	-	0.3	-	0.1
2017	-	0.8	0.1	0.6	-	-	0.5	0.2	0.3	0.0	2.0	-	0.0	0.1	0.1	-	0.4

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

FORB SPECIES																		
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																		
Collomia linearis <sup>a</sup> (tiny trumpet)																		
Comandra umbellata (bastard toadflax)																		
Crepis acuminata (tapertip hawkbeard)																		
Cymopterus longipes (longstalk springparsley)																		
Cynoglossum officinale <sup>ami</sup> (gypsyflower)																		
Delphinium nuttallianum (two-lobed larkspur)																		
Descurainia pinnata <sup>a</sup> (western tansymustard)																		
Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)																		
Eriogonum racemosum (redroot buckwheat)																		
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)																		
Hackelia patens (spotted stickseed)																		
Heliomeris multiflora var. multiflora (showy goldeneye)																		
Lactuca serriola <sup>ai</sup> (prickly lettuce)																		
Lappula occidentalis <sup>a</sup> (flatspine stickseed)																		
Lathyrus brachycalyx (Bonneville pea)																		
Lithospermum ruderale (western stone seed)																		
year	Nested Frequency																	
1997	298	124	-	62	8	13	5	10	16	3	-	81	0	20	-	198	11	
2002	134	-	-	55	-	-	1	15	-	5	-	5	6	1	-	178	1	
2007	53	3	-	38	-	13	-	35	8	1	-	23	-	29	66	163	1	
2012	91	9	2	49	-	5	-	35	12	9	-	83	-	62	46	196	-	
2017	50	7	-	80	-	-	-	2	-	-	42	85	-	32	82	12	2	
year	Average Cover (%)																	
1997	4.0	0.7	-	0.8	0.0	0.2	0.0	0.1	0.1	0.0	-	2.1	0.0	0.4	-	9.1	0.5	
2002	0.6	-	-	1.9	-	-	0.0	0.2	-	0.0	-	0.1	0.0	0.3	-	2.2	0.0	
2007	0.1	0.0	-	0.8	-	0.1	-	0.1	0.0	0.0	-	0.3	-	0.1	0.3	1.6	0.0	
2012	0.9	0.2	0.0	0.4	-	0.1	-	0.2	0.1	0.0	-	1.0	-	0.4	0.4	1.5	-	
2017	0.3	0.0	-	1.2	-	-	-	0.0	-	-	1.7	2.3	-	0.4	0.4	0.0	0.0	

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

FORB SPECIES																
Lupinus argenteus (silvery lupine)																
Microseris nutans (nodding microseris)																
Microsteris gracilis <sup>a</sup> (slender phlox)																
Penstemon (beardtongue)																
Phlox longifolia (longleaf phlox)																
Polygonum douglasii <sup>a</sup> (Douglas' knotweed)																
Senecio integerrimus <sup>a</sup> (lambstongue ragwort)																
Silene antirrhina <sup>a</sup> (sleepy silene)																
Sisymbrium altissimum <sup>ai</sup> (tall tumbled mustard)																
Symphotrichum ascendens (western aster)																
Taraxacum officinale (common dandelion)																
Tetranneuris acaulis (stemless four-nerve daisy)																
Tragopogon dubius <sup>ai</sup> (yellow salsify)																
Veronica biloba <sup>ai</sup> (two-lobed speedwell)																
Vicia americana (American vetch)																
year	Nested Frequency															
1997	4	-	-	-	18	18	39	-	-	83	49	2	16	20	120	
2002	4	-	23	-	1	6	-	4	-	1	7	-	-	-	6	
2007	9	-	175	1	19	1	4	-	116	76	-	-	24	-	3	
2012	13	-	31	1	2	14	2	31	18	40	1	-	100	-	-	
2017	7	4	7	-	6	8	1	4	84	46	24	-	45	-	151	
year	Average Cover (%)															
1997	0.1	-	-	-	0.1	0.1	1.1	-	-	1.9	0.4	0.3	0.1	0.3	3.7	
2002	0.2	-	0.3	-	0.0	0.0	-	0.0	-	0.0	0.0	-	-	-	0.2	
2007	0.2	-	1.2	0.0	0.1	0.0	0.1	-	1.0	1.6	-	-	0.3	-	0.1	
2012	0.3	-	0.3	0.0	0.0	0.0	0.0	0.1	0.2	0.7	0.0	-	0.7	-	-	
2017	1.0	0.1	0.0	-	0.0	0.0	0.0	0.0	1.9	1.1	0.3	-	0.6	-	2.3	

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



**Table 16A-05.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Opuntia polyacantha (plains pricklypear)	Quercus gambelii <sup>p</sup> (Gambel oak)
year	Line Intercept Cover (%)						
1997	-	-	-	-	-	-	-
2002	-	-	0.4	-	-	-	-
2007	-	-	12.4	0	-	-	-
2012	-	-	9.2	-	-	-	0.3
2017	-	-	12.9	-	0.4	0	0.2
year	Quadrat Cover (%)						
1997	0.0	6.9	8.7	0.1	0.0	0.1	0.6
2002	-	-	0.4	0.0	-	-	-
2007	-	-	8.1	0.1	-	-	0.1
2012	-	-	7.3	0.0	-	-	0.0
2017	-	-	7.5	-	0.3	0.0	0.1

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

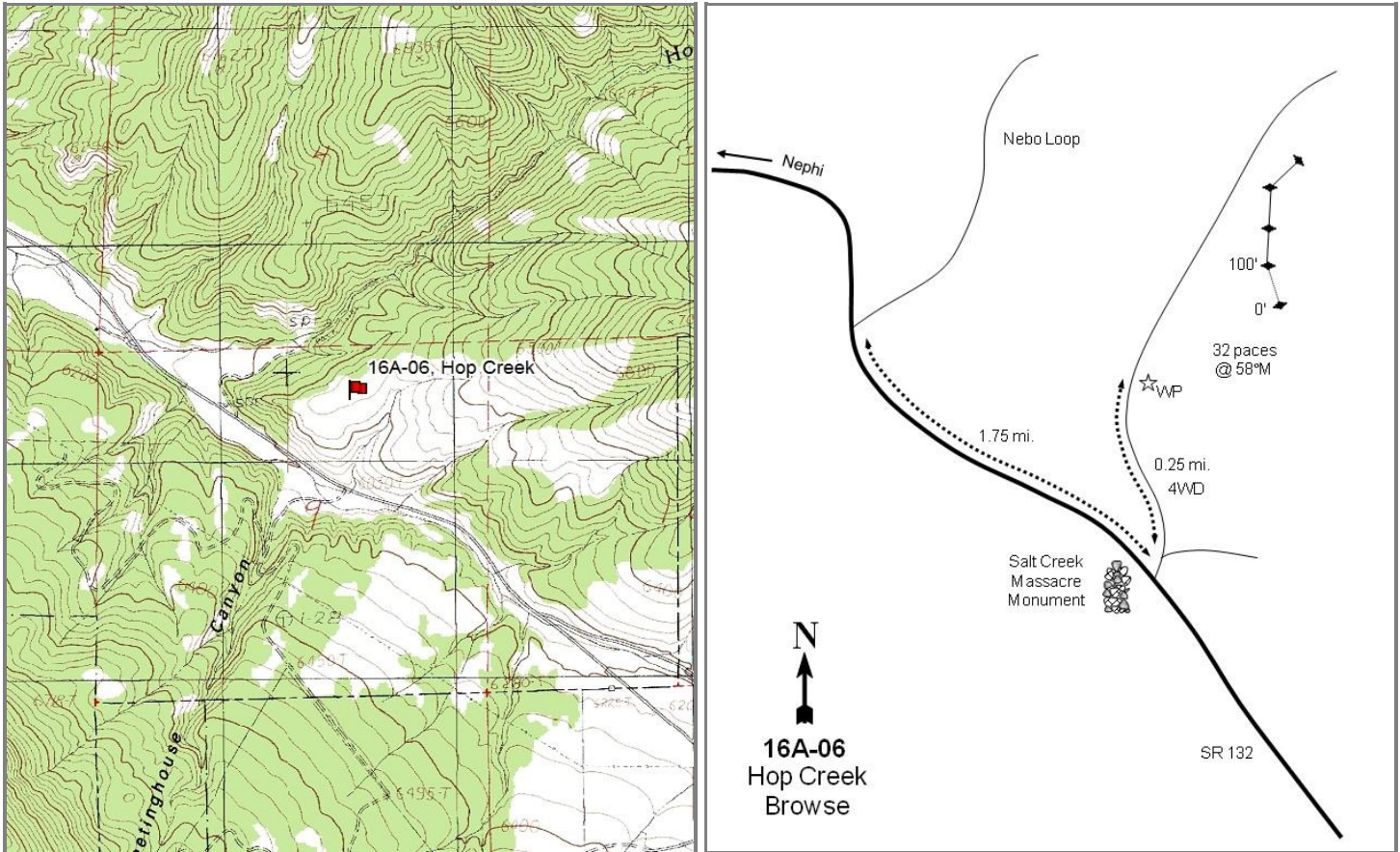
**Table 16A-05.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1997	20	-	0	100	0	0	100	0	74/110
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1997	1480	20	19	78	3	1	0	0	89/115
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	41/47
2012	-	-	-	-	-	-	-	-	63/93
2017	-	-	-	-	-	-	-	-	59/82
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	3540	-	1	98	2	0	0	2	43/59
2002	720	-	61	39	0	0	0	3	15/19
2007	2800	-	1	98	1	1	0	0	41/61
2012	2560	20	9	86	6	1	0	48	44/76
2017	2700	40	18	80	2	0	0	0	42/70
<b>Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)</b>									
1997	20	-	0	100	0	0	0	0	95/103
2002	20	-	0	100	0	0	0	0	22/21
2007	20	-	0	100	0	100	0	0	78/140
2012	40	-	100	0	0	0	0	50	80/145
2017	20	-	100	0	0	0	0	0	62/64
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	20	-	0	100	0	0	0	0	- / -
2017	180	-	44	56	0	0	0	0	28/49

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1997	80	-	0	100	0	0	0	0	12/31
2002	-	-	-	-	-	-	-	-	-/-
2007	20	-	0	100	0	0	0	0	13/20
2012	-	-	-	-	-	-	-	-	21/37
2017	20	-	0	100	0	0	0	0	19/78
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1997	60	-	0	100	0	0	0	0	53/31
2002	-	-	-	-	-	-	-	-	-/-
2007	20	-	0	100	0	0	0	0	70/43
2012	20	-	0	100	0	0	0	0	117/104
2017	40	-	0	100	0	0	0	0	131/78
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	54/104

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

## HOP CREEK BROWSE - STUDY NO. 16A-6

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Fountain Green North; Township 13S, Range 2E, Section 09  
NAD 83 UTM ZONE 12, 439487 East 4395491 North

**Transect Information**

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

3959  
163° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Standard

**Directions to Site**

From the intersection of Highway 132 and Nebo Loop Road, proceed south on Highway 132 for 1.75 miles. Just past the Salt Creek Massacre Monument, stop at a turnoff on the north side of the road. Drive up the left fork of a four-wheel drive road for 0.25 miles to a witness post on the right (east) side of the road. From the witness post, walk 32 paces at 58 degrees magnetic to the 0-foot stake.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,300ft (1,920m)
Aspect	South
Slope	5%
Sample Dates	05/28/1997, 10/25/2002, 05/24/2007, 05/16/2012, 05/18/2017

**Table 16A-06.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Dribbler	Salt Creek Wildfire Rehabilitation	970	December 2007	1197
Fire - Wildfire	Salt Creek	-	July-August 2007	25913
Chaining - One-Way Ely	Salt Creek Wildfire Rehabilitation	970	December 2007	1197
Seeding - Aerial Before	Salt Creek Wildfire Rehabilitation	970	November 2007	1197

**Table 16A-06.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Salt Creek Fire DWR Aerial			Aerial	Nov 2007	1150
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
G	<i>Achnatherum hymenoides</i>	Indian Ricegrass	Rimrock	1.00	0.91
G	<i>Agropyron cristatum</i>	Crested Wheatgrass	Hycrest	1.00	0.76
G	<i>Agropyron cristatum</i>	Crested Wheatgrass	Nordan	1.00	0.86
G	<i>Agropyron fragile</i>	Siberian Wheatgrass	Vavilov	1.00	0.84
G	<i>Dactylis glomerata</i>	Orchardgrass	Paiute	0.50	0.47
G	<i>Pseudoroegneria spicata</i>	Bluebunch Wheatgrass	Anatone	0.61	0.54
G	<i>Pseudoroegneria spicata</i>	Bluebunch Wheatgrass	Anatone	0.39	0.34
G	<i>Thinopyrum intermedium</i>	Intermediate Wheatgrass	Oahe	1.00	0.92
G	<i>Thinopyrum intermedium</i>	Pubescent Wheatgrass		2.00	1.82
F	<i>Achillea millefolium</i>	Western Yarrow		0.10	0.10
F	<i>Medicago sativa</i>	Alfalfa	Ladak	1.00	0.99
F	<i>Medicago sativa</i>	Alfalfa	Ranger	1.00	0.93
F	<i>Melilotus officinalis</i>	Yellow Sweetclover		0.25	0.20
F	<i>Onobrychis viciifolia</i>	Sainfoin	Eski	2.00	1.84
F	<i>Sanguisorba minor</i>	Small Burnet	Delar	1.00	0.94
S	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	Mountain Big Sagebrush	Sanpete UT	0.25	0.09
S	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	Wyoming Big Sagebrush	Sanpete UT	0.25	0.08
Mix Name			Application Type	Application Date	Acres
Salt Creek Fire DWR Dribbler			Dribbler	Dec 2007	335
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
F	<i>Sanguisorba minor</i>	Small Burnet	Delar	0.45	0.42
S	<i>Purshia tridentata</i>	Bitterbrush	Millard UT	0.45	0.39

**Wildlife Habitat and Vegetation History****Table 16A-06.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Moose	substantial	year-long

**Table 16A-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	Phase I
1989	Mountain Big Sagebrush	Phase I
1997	Mountain Big Sagebrush	Phase I
2002	Mountain Big Sagebrush	Phase I
2007	Mountain Big Sagebrush	Phase I
2012	Perennial Grass	No Encroachment
2017	Perennial-Annual Grass	No Encroachment

**Site Notes**

No Notes

**Soils**

**Table 16A-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	6.9	42.4	27.1	30.6	3.2	9.6	67.2	0.6	05/29/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation 18 inches  
 NRCS Ecological Site Mountain Loam (Mountain Big Sagebrush)  
 NRCS Ecological Site # R047XA430UT  
 States and Transitions No state and transition model is available for this ecological site.

From study establishment in 1983 through the 2007 sample year, this study site existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated plant community with other preferred browse such as Utah serviceberry (*Amelanchier utahensis*) and antelope bitterbrush (*Purshia tridentata*) present to a lesser extent (photos, Table 16A- 06.12, Table 16A-06.13). A fire soon after the 2007 sampling removed most of the shrubs, and the site transitioned into one dominated by perennial grasses including bluebunch wheatgrass (*Pseudoroegneria spicata*) and western wheatgrass (*Pascopyrum smithii*). The introduced perennial species bulbous bluegrass (*Poa bulbosa*) has been observed each sample year since 2007, but in low amounts. In addition, the introduced annual grass species cheatgrass (*Bromus tectorum*) has been sampled since 1997, and was a co-dominant site component in 2017 (Table 16A-06.10). Forbs have remained diverse and were abundant in 2017, with most of the cover being contributed by the annual species desert madwort (*Alyssum desertorum*) (Table 16A-06.7, Table 16A-06.11).

**Trend Summary Tables**

**Table 16A-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	12.2	0.3	0.8	-	-	-
2002	12.7	2.1	0.8	-	-	-
2007	11.6	0.3	0.8	16.1	1.0	3.9
2012	0.0	0.5	-	0.3	1.5	-
2017	0.2	1.0	-	0.9	1.6	-

**Table 16A-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	71	441	310	252	0.7	19.6	2.9	5.2
2002	93	379	313	207	0.8	16.7	4.4	4.1
2007	256	394	397	258	6.5	25.7	8.0	6.6
2012	98	404	274	258	1.0	23.5	1.8	6.7
2017	296	420	458	236	12.6	23.5	22.1	6.5

**Table 16A-06.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)						
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation	
1997	17.6	4.6	51.0	1.9	0.2	43.6	
2002	17.7	2.6	51.5	1.2	0.1	43.2	
2007	14.5	3.0	41.3	1.3	0.1	57.4	
2012	18.0	0.0	56.5	1.4	0.2	39.0	
2017	11.4	0.5	51.4	3.6	0.2	61.1	

**Table 16A-06.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1997	-	34	24	-	4
2002	1	43	17	-	18
2007	-	64	19	-	44
2012	1	2	4	-	1
2017	1	11	12	-	8
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	2.2 (5.4)	146.1 (360.9)	22.8 (56.3)	-	-
2007	8.7 (21.5)	147.4 (364.2)	23.4 (57.9)	-	-
2012	-	2.0 (5.0)	4.7 (11.6)	0.6 (1.4)	-
2017	-	5.3 (13.2)	14.7 (36.4)	-	-



**Table 16A-06.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Dactylis glomerata <sup>i</sup> (orchardgrass)	Festuca idahoensis (Idaho fescue)	Hesperostipa comata (needle and thread)	Melica bulbosa (oniongrass)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency													
1997	-	-	71	-	1	41	10	138	-	78	207	95	195	-
2002	3	-	93	-	3	44	37	140	-	30	91	130	191	-
2007	2	-	256	-	-	20	3	157	3	38	68	205	184	-
2012	2	28	98	1	-	22	-	237	1	29	52	133	168	33
2017	6	53	296	-	-	37	3	304	33	34	15	142	50	73
year	Average Cover (%)													
1997	-	-	0.7	-	0.0	1.0	0.2	1.6	-	1.6	7.6	2.5	5.0	-
2002	0.1	-	0.8	-	0.0	1.2	1.2	3.1	-	0.9	2.2	2.8	5.0	-
2007	0.1	-	6.5	-	-	0.3	0.1	2.4	0.0	0.6	2.2	7.7	12.2	-
2012	0.0	0.7	1.0	0.0	-	0.4	-	3.8	0.0	0.7	0.9	2.8	13.1	1.0
2017	0.4	1.9	12.6	-	-	1.6	0.0	10.5	0.9	0.4	0.2	2.8	2.9	1.9

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

**Table 16A-06.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria parvifolia (small-leaf pussytoes)	Arabis (rockcress)	Astragalus cibirius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littledod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium album <sup>a</sup> (lambsquarters)	Chorispora tenella <sup>ai</sup> (crossflower)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)
year	Nested Frequency																
1997	23	0	138	5	1	1	9	10	8	33	84	2	-	-	19	195	47
2002	36	1	187	7	-	2	8	38	-	8	54	-	3	2	16	216	27
2007	36	-	359	7	-	-	36	16	7	9	103	-	-	-	14	131	7
2012	54	-	194	-	3	1	6	3	-	-	21	-	-	8	32	19	5
2017	120	-	455	-	-	1	18	17	4	-	-	-	-	-	8	5	-
year	Average Cover (%)																
1997	0.1	0.0	0.5	0.0	0.0	0.0	0.1	0.0	0.0	0.6	0.5	0.0	-	-	0.2	1.3	0.1
2002	0.4	0.0	0.8	0.0	-	0.0	0.0	0.1	-	0.1	0.5	-	0.0	0.1	0.3	2.2	0.1
2007	0.2	-	4.5	0.2	-	-	0.5	0.0	0.0	0.1	0.9	-	-	-	0.3	0.4	0.0
2012	0.5	-	1.1	-	0.0	0.0	0.0	0.0	-	-	0.1	-	-	0.2	0.2	0.0	0.0
2017	1.6	-	18.9	-	-	0.0	0.3	0.1	0.6	-	-	-	-	-	0.3	0.0	-

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

FORB SPECIES	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cymopterus longipes (longstalk springparsley)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Erysimum (wallflower)	Galium <sup>a</sup> (bedstraw)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Linum lewisii (Lewis flax)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)
year	Nested Frequency																
1997	94	45	-	53	3	3	40	1	3	-	1	-	3	-	98	2	-
2002	32	69	-	44	6	-	25	5	3	-	-	1	-	2	23	1	1
2007	89	111	-	48	6	82	28	1	3	-	-	-	5	-	65	2	-
2012	29	197	1	46	11	1	12	2	-	-	-	-	5	9	1	8	-
2017	14	117	-	31	-	-	-	3	-	13	-	-	31	-	14	3	-
year	Average Cover (%)																
1997	0.9	0.5	-	0.4	0.0	0.0	0.1	0.0	0.1	-	0.0	-	0.0	-	0.6	0.4	-
2002	0.2	1.3	-	0.5	0.0	-	0.1	0.1	0.0	-	-	0.0	-	0.0	0.1	0.0	0.0
2007	0.7	1.6	-	0.5	0.0	1.4	0.1	0.0	0.1	-	-	-	0.0	-	0.7	0.1	-
2012	0.2	4.3	0.0	0.5	0.0	0.0	0.0	0.0	-	-	-	-	0.0	0.0	0.0	0.0	-
2017	0.1	1.9	-	0.2	-	-	-	0.0	-	0.3	-	-	0.2	-	0.1	0.0	-

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

FORB SPECIES	Microsteris gracilis <sup>a</sup> (slender phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Sphaeralcea coccinea (scarlet globemallow)	Symphoricarpos ascendens (western aster)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency							
1997	9	41	3	-	3	29	17	24
2002	42	28	4	-	1	31	15	35
2007	45	51	4	-	-	39	13	35
2012	1	27	27	1	10	26	16	34
2017	-	-	-	21	4	27	53	32
year	Average Cover (%)							
1997	0.0	0.1	0.0	-	0.0	1.2	0.1	0.2
2002	0.1	0.2	0.0	-	0.0	0.9	0.1	0.3
2007	0.1	0.3	0.0	-	-	1.1	0.3	0.3
2012	0.0	0.2	0.1	0.0	0.0	0.3	0.0	0.4
2017	-	-	-	0.9	0.0	0.3	0.8	1.9

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

**Table 16A-06.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)						
	year	1997	2002	2007	2012	2017	
Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	-	-	-	-	-	-	-
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	-	-	-	-	-	-	-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	0.2	13.6	0.6	0.3	3.9	2.3	0.1
Gutierrezia sarothrae (broom snakeweed)	-	-	-	-	-	0.3	1.5
Juniperus osteosperma <sup>i</sup> (Utah juniper)	-	0.3	0.2	0.2	-	0.6	1.2
Purshia tridentata <sup>p</sup> (antelope bitterbrush)	-	-	-	-	-	-	-
Tetradymia canescens (spineless horsebrush)	-	-	-	-	-	-	-

year	Quadrat Cover (%)						
	1997	2002	2007	2012	2017		
1997	0.2	9.1	0.2	0.1	0.8	3.0	0.0
2002	0.4	9.9	0.3	1.2	0.8	2.5	0.5
2007	0.5	9.1	0.1	0.1	0.8	2.0	0.2
2012	0.0	-	0.2	-	-	0.0	0.3
2017	0.0	0.0	0.1	0.3	-	0.2	0.6

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

**Table 16A-06.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1997	100	-	20	60	20	80	0	20	72/74
2002	60	-	0	100	0	33	33	0	82/81
2007	60	-	33	67	0	0	67	0	105/103
2012	20	-	100	0	0	0	100	100	39/50
2017	20	-	0	100	0	0	100	0	32/28
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1997	2300	40	33	55	12	29	4	9	83/114
2002	3120	20	33	36	31	27	5	15	77/100
2007	2260	200	3	64	34	27	9	22	77/95
2012	20	-	100	0	0	0	100	0	36/39
2017	20	-	0	100	0	100	0	0	41/57
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	300	-	0	100	0	0	0	0	34/57
2002	740	-	14	76	11	0	3	8	29/44
2007	640	-	25	66	9	13	9	6	34/48
2012	280	-	7	93	0	7	0	7	33/50
2017	380	20	11	90	0	0	0	0	35/70
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	32/45
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	840	20	36	60	5	0	0	5	15/16
2002	1780	-	6	81	14	0	0	6	15/36
2007	480	-	13	79	8	4	0	33	21/26
2012	40	-	0	100	0	0	0	0	15/25
2017	120	-	0	100	0	0	0	0	16/32

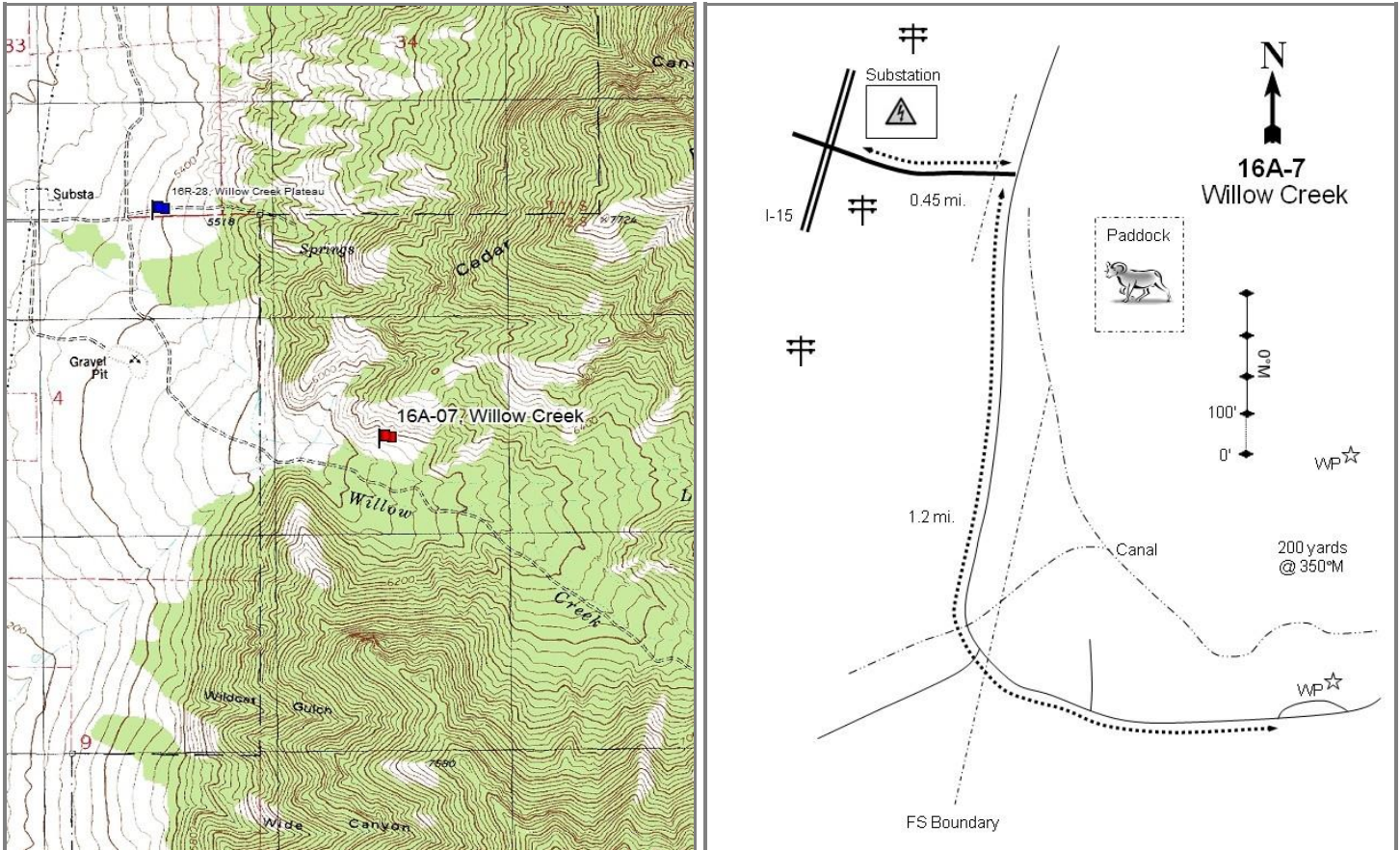
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	20	0	0	0	0	0	0	- / -
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1997	540	40	4	89	7	15	70	11	98/141
2002	480	-	8	63	29	4	63	4	104/121
2007	520	20	8	50	42	15	85	23	115/129
2012	40	20	0	100	0	50	50	0	36/91
2017	60	-	0	100	0	0	100	0	38/109
<b>Quercus gambelii<sup>p</sup> -- (Gambel oak)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	100/168
2017	-	-	-	-	-	-	-	-	60/45
<b>Rosa woodsii<sup>p</sup> -- (Woods' rose)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	38/15
2017	-	-	-	-	-	-	-	-	33/31
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	40/60
2012	-	-	-	-	-	-	-	-	19/15
2017	-	-	-	-	-	-	-	-	29/39
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1997	80	-	0	100	0	0	0	0	35/29
2002	260	-	15	85	0	0	8	8	28/41
2007	220	-	0	91	9	27	9	9	27/42
2012	400	60	5	95	0	0	0	0	26/40
2017	280	-	0	100	0	0	0	0	32/68

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

**Table 16A-06.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2002	22	-	-	-	-	-	25.2
2007	57	-	11	11	-	78	19.8

## WILLOW CREEK - STUDY NO. 16A-7

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Mona SW; Township 12S, Range 1E, Section 37  
NAD 83 UTM ZONE 12, 430381 East 4405594 North

**Transect Information**

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

3958  
0° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
No Rebar

**Directions to Site**

Beginning at the east side of the underpass where Cemetery Road passes over I-15 southeast of Mona, proceed east for 0.45 miles to an intersection. Take the right fork and proceed for 1.2 miles on the main road to a pullout. From this point, walk 200 yards at 350 degrees magnetic to the witness post (you will need to cross the irrigation canal). The 0- foot baseline stake is 3 paces west of the witness post: it is a green fencepost with a red browse tag #3958 attached. The baseline runs at an azimuth of 0 degrees magnetic.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	5,850ft (1,783m)
Aspect	South
Slope	40%
Sample Dates	05/19/1997, 05/20/2002, 05/16/2007, 05/22/2012, 05/23/2017

**Wildlife Habitat and Vegetation History****Table 16A-07.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Moose	substantial	year-long
Mountain Goat	unknown	unknown

**Table 16A-07.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Cliffrose	No Encroachment
1989	Cliffrose	No Encroachment
1997	Cliffrose/Annual Grass	No Encroachment
2002	Cliffrose/Annual Grass	No Encroachment
2007	Cliffrose/Annual Grass	No Encroachment
2012	Cliffrose/Annual Grass	No Encroachment
2017	Cliffrose/Annual Grass	No Encroachment

**Site Notes**

No Notes

**Soils****Table 16A-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 Loam	7.0	58.4	25.1	16.6	1.8	6.4	38.4	0.6	05/19/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Upland Very Steep Stony Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

Stansbury cliffrose (*Purshia stansburiana*) has been the dominant browse species on this site since study establishment in 1983, with other preferred species including (but not limited to) mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and fourwing saltbush (*Atriplex canescens*) present as minor components (Table 16A-07.12, Table 16A- 07.13). The introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed each sample year since 1997 in the herbaceous understory as a co-dominant site component (Table 16A-07.7, Table 16A-07.10). Forbs are diverse, but were relatively rare every sample year except 2017, in which the introduced and weedy annual species desert madwort (*Alyssum desertorum*) and redstem stork's bill (*Erodium cicutarium*) provided the most forb cover (Table 16A-07.11). Unless a major disturbance occurs, this site is expected to remain in a similar state in future sample years.



**Trend Summary Tables****Table 16A-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
1997	15.8	0.4	-	-	-	-
2002	16.3	1.2	-	-	-	-
2007	11.2	0.2	-	25.3	0.1	-
2012	14.4	0.9	-	22.0	2.3	-
2017	10.7	0.1	-	12.5	0.3	-

**Table 16A-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
1997	435	180	361	72	17.3	5.5	3.3	1.7
2002	421	193	262	57	14.8	7.2	2.5	1.2
2007	404	227	287	48	15.6	11.7	5.3	1.0
2012	395	203	272	60	18.2	11.5	1.3	1.5
2017	364	233	393	80	18.4	12.3	10.7	2.0

**Table 16A-07.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	12.0	0.1	40.0	15.5	7.4	40.3
2002	17.9	-	36.6	16.6	7.7	39.9
2007	11.7	0.1	34.8	17.1	9.3	40.9
2012	7.0	0.1	47.1	14.1	4.8	48.3
2017	18.5	0.0	32.1	26.0	8.0	45.5

**Table 16A-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	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1997	11	32	-
2002	30	19	-
2007	35	6	2
2012	27	3	5
2017	17	5	6
Days Use Per Acre (ha)			
1997	-	-	-
2002	87.8 (216.8)	39.6 (97.7)	-
2007	122.0 (301.3)	13.4 (33.1)	-
2012	67.0 (165.5)	2.0 (5.0)	-
2017	83.1 (205.3)	16.8 (41.4)	-

**Table 16A-07.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus arvensis <sup>ni</sup> (field brome)	Bromus tectorum <sup>ni</sup> (cheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency				
1997	-	435	36	30	147
2002	20	412	68	17	131
2007	-	404	100	17	152
2012	-	395	55	34	157
2017	-	364	152	11	128
year	Average Cover (%)				
1997	-	17.3	1.2	0.1	4.2
2002	0.4	14.4	1.5	0.1	5.5
2007	-	15.6	4.3	0.3	7.2
2012	-	18.2	1.3	0.6	9.6
2017	-	18.4	5.5	0.1	6.8

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

**Table 16A-07.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ni</sup> (desert madwort)	Artemisia ludoviciana (white sagebrush)	Asclepias (milkweed)	Astragalus cibirius (browse milkvetch)	Astragalus utahensis (Utah milkvetch)	Camelina microcapa <sup>ni</sup> (littlepod false flax)	Chaetopappa ericoides (rose heath)	Cryptantha (cryptantha)	Descurainia incana <sup>a</sup> (mountain tansymustard)	Draba <sup>a</sup> (draba)	Eriogonum brevicaulle (shortstem buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium <sup>ni</sup> (redstem stork's bill)	Galium aparine <sup>a</sup> (stickywilly)	Gilia inconspicua <sup>a</sup> (shy gilia)	Hackelia patens (spotted stickseed)	
year	Nested Frequency																	
1997	-	352	6	-	-	11	3	14	-	8	-	8	-	36	9	-	7	
2002	1	244	3	6	-	0	-	19	-	2	-	-	-	101	-	-	-	
2007	-	249	-	-	3	2	-	20	-	8	5	-	1	157	1	-	-	
2012	3	255	-	-	-	2	1	15	-	-	-	-	-	26	9	-	-	
2017	-	333	11	-	1	4	3	1	0	32	3	1	-	206	32	2	-	
year	Average Cover (%)																	
1997	-	3.1	0.1	-	-	0.2	0.0	0.3	-	0.0	-	0.1	-	0.2	0.0	-	0.0	
2002	0.0	0.8	0.0	0.2	-	0.0	-	0.2	-	0.0	-	-	-	1.7	-	-	-	
2007	-	2.5	-	-	0.0	0.0	-	0.4	-	0.1	0.0	-	0.0	2.7	0.0	-	-	
2012	0.0	1.0	-	-	-	0.0	0.0	0.3	-	-	-	-	-	0.2	0.0	-	-	
2017	-	4.0	0.1	-	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.0	-	4.9	1.1	0.0	-	

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

FORB SPECIES												
<i>Lactuca serriola</i> <sup>ai</sup> (prickly lettuce)												
<i>Lappula occidentalis</i> <sup>a</sup> (flatspine stickseed)												
<i>Lygodesmia grandiflora</i> (largeflower skeletonplant)												
<i>Oenothera</i> (evening primrose)												
<i>Penstemon</i> (beardtongue)												
<i>Phlox longifolia</i> (longleaf phlox)												
<i>Silene antirrhina</i> <sup>a</sup> (sleepy silene)												
<i>Sisymbrium altissimum</i> <sup>ai</sup> (tall tumblemustard)												
<i>Sphaeralcea coccinea</i> (scarlet globemallow)												
<i>Stenotus acaulis</i> (stemless mock goldenweed)												
<i>Taraxacum officinale</i> (common dandelion)												
<i>Tragopogon dubius</i> <sup>ai</sup> (yellow salsify)												
year	Nested Frequency											
1997	1	-	-	1	-	3	-	-	28	-	4	-
2002	2	1	-	-	1	3	3	-	34	-	-	-
2007	8	17	5	-	-	1	5	-	25	0	-	3
2012	3	11	-	-	-	3	5	-	47	-	-	4
2017	1	21	3	-	2	7	3	9	50	-	-	-
year	Average Cover (%)											
1997	0.0	-	-	0.0	-	0.0	-	-	1.0	-	0.0	-
2002	0.0	0.0	-	-	0.0	0.1	0.0	-	0.6	-	-	-
2007	0.0	0.1	0.1	-	-	0.0	0.0	-	0.4	0.0	-	0.0
2012	0.0	0.0	-	-	-	0.0	0.0	-	1.2	-	-	0.0
2017	0.0	0.1	0.0	-	0.0	0.1	0.1	0.2	1.6	-	-	-

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

**Table 16A-07.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES				
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <sup>p</sup> (mountain big sagebrush)				
<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>speciosa</i> <sup>p</sup> (rubber rabbitbrush)				
<i>Gutierrezia sarothrae</i> (broom snakeweed)				
<i>Purshia stansburiana</i> <sup>p</sup> (Stansbury cliffrose)				
year	Line Intercept Cover (%)			
1997	-	-	-	-
2002	-	-	-	-
2007	0.9	1.4	0.1	23
2012	0.2	-	2.3	21.8
2017	0.1	-	0.3	12.4
year	Quadrat Cover (%)			
1997	0.5	1.0	0.4	14.2
2002	0.9	0.5	1.2	14.9
2007	0.4	0.3	0.2	10.5
2012	0.2	-	0.9	14.2
2017	0.0	-	0.1	10.7

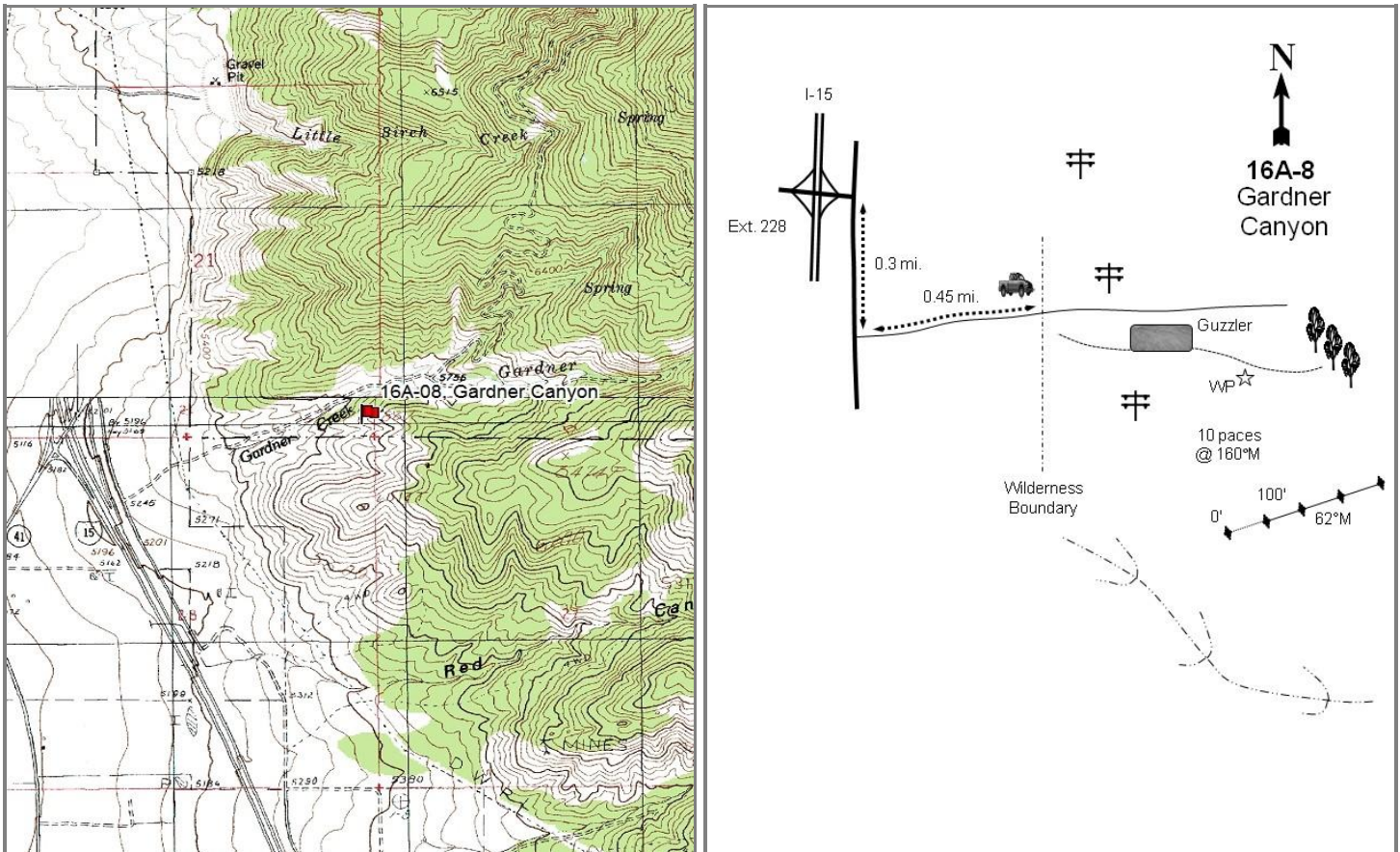
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 16A-07.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1997	40	-	0	100	0	50	0	0	70/127
2002	40	-	0	50	50	0	50	0	81/138
2007	40	-	0	50	50	0	50	50	79/140
2012	40	-	0	50	50	50	0	0	66/85
2017	60	-	0	67	33	33	33	33	63/93
<b>Atriplex canescens<sup>P</sup> -- (fourwing saltbush)</b>									
1997	-	-	-	-	-	-	-	-	150/118
2002	20	-	0	100	0	0	100	0	123/174
2007	-	-	-	-	-	-	-	-	197/166
2012	20	-	0	100	0	0	0	0	115/178
2017	20	-	0	100	0	100	0	0	138/142
<b>Brickellia californica -- (California brickellbush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	151/285
2017	-	-	-	-	-	-	-	-	-/-
<b>Celtis laevigata var. reticulata -- (netleaf hackberry)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	195/300
2017	-	-	-	-	-	-	-	-	455/508
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1997	320	-	13	88	0	31	44	0	73/123
2002	60	-	0	0	100	67	0	33	61/95
2007	60	-	0	33	67	0	0	0	92/118
2012	-	-	-	-	-	-	-	-	79/121
2017	-	-	-	-	-	-	-	-	62/101
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	1780	20	49	49	1	0	0	0	28/27
2002	520	-	4	50	46	0	0	39	18/27
2007	680	-	38	62	0	0	0	0	25/37
2012	700	120	17	83	0	0	0	0	34/60
2017	440	20	36	64	0	0	0	0	18/27
<b>Purshia stansburiana<sup>P</sup> -- (Stansbury cliffrose)</b>									
1997	580	20	0	97	3	7	93	0	143/174
2002	900	-	4	73	22	0	93	20	163/170
2007	600	-	10	70	20	7	90	10	172/179
2012	760	20	5	82	13	37	16	3	165/177
2017	840	260	2	50	48	29	57	41	156/176
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1997	-	-	-	-	-	-	-	-	73/114
2002	-	-	-	-	-	-	-	-	182/146
2007	-	-	-	-	-	-	-	-	194/136
2012	-	-	-	-	-	-	-	-	248/313
2017	-	-	-	-	-	-	-	-	237/225
<b>Rhus trilobata<sup>P</sup> -- (skunkbush sumac)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	136/291
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	283/543
2017	-	-	-	-	-	-	-	-	314/527

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

## GARDNER CANYON - STUDY NO. 16A-8

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Nephi NW; Township 12S, Range 1E, Section 21  
NAD 83 UTM ZONE 12, 429755 East 440200 North

**Transect Information**

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

3964  
62° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Standard

**Directions to Site**

From exit #228 on I-15, turn south on the frontage road on the east side of the freeway and drive 0.3 miles to an intersection with a gate. Turn left (west) at the intersection and drive 0.45 miles to the wilderness boundary fence. Walk up the old road under some powerlines. Perpendicular to the road and to the south is a steep slope with a Gambel oak and cliffrose community. Walk up the slope to a guzzler on the ridgetop. The witness post lies 75 yards up the ridge from the guzzler. From the witness post, the 0-foot stake is 10 paces at an azimuth of 160 degrees magnetic and has a red browse tag #3964 attached.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	5,700ft (1,737m)
Aspect	South
Slope	45%
Sample Dates	05/19/1997, 10/25/2002, 05/21/2007, 05/17/2012, 05/23/2017

**Wildlife Habitat and Vegetation History****Table 16A-08.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Moose	substantial	year-long

**Table 16A-08.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mixed Mountain Brush	No Encroachment
1989	Mixed Mountain Brush	No Encroachment
1997	Mixed Mountain Brush/Annual Grass	No Encroachment
2002	Mixed Mountain Brush	No Encroachment
2007	Mixed Mountain Brush/Annual Grass	No Encroachment
2012	Mixed Mountain Brush	No Encroachment
2017	Mixed Mountain Brush	No Encroachment

**Site Notes**

These foothills are heavily used by deer and elk, and carcasses were found in the area during the 1989, 2007, and 2012 readings.

**Soils****Table 16A-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	7.0	38.7	40.7	20.6	1.6	4.4	57.6	0.5	05/19/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Upland Very Steep Stony Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

Mixed mountain brush species such as Stansbury cliffrose (*Purshia stansburiana*) and alderleaf mountain mahogany (*Cercocarpus montanus*) have dominated this site since the study began in 1983; density of cliffrose has decreased over time, while decadence has increased (Table 16A-08.12, Table 16A-08.13). The herbaceous understory has remained moderately diverse and abundant (Table 16A-08.7). Perennial grasses, particularly the native species bluebunch wheatgrass (*Pseudoroegneria spicata*), and the introduced annual grass cheatgrass (*Bromus tectorum*) have been the most common herbaceous species throughout the duration of the study, and annual grasses were a co-dominant site component in 1997 and 2007 (Table 16A-08.10). Forbs have remained rare in comparison: the 2017 sample year is an exception to this, with just over 12% cover being contributed by the introduced annual species desert madwort (*Alyssum desertorum*) (Table 16A-08.11).



**Trend Summary Tables****Table 16A-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
1997	7.8	0.7	-	-	-	-
2002	9.6	2.5	-	-	-	-
2007	8.6	2.1	-	12.8	2.6	-
2012	8.1	3.6	-	13.5	4.9	-
2017	5.3	1.7	-	8.8	3.2	-

**Table 16A-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
1997	424	258	438	116	11.3	7.6	5.6	0.9
2002	361	205	362	106	9.3	8.5	3.3	2.2
2007	390	206	387	141	11.9	9.3	5.9	1.5
2012	353	233	364	142	8.2	10.3	1.4	1.8
2017	242	243	444	148	6.2	9.3	15.0	2.4

**Table 16A-08.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	17.7	1.0	30.7	7.8	18.2	33.3
2002	26.2	0.8	30.4	5.3	17.9	33.1
2007	17.1	0.7	37.8	4.1	18.4	37.8
2012	19.4	0.1	40.0	4.3	16.3	34.5
2017	23.4	0.3	27.1	14.6	20.6	39.0

**Table 16A-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	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1997	21	20	5
2002	26	20	2
2007	51	15	11
2012	21	8	2
2017	19	17	17
Year	Days Use Per Acre (ha)		
1997	-	-	-
2002	69.7 (172.1)	24.1 (59.6)	-
2007	101.2 (249.9)	19.4 (48.0)	-
2012	34.9 (86.1)	7.4 (18.2)	-
2017	42.9 (105.9)	18.1 (44.7)	-

**Table 16A-08.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency				
<i>Bromus arvensis</i> <sup>ai</sup> (field brome)	-	424	1	-	258
<i>Bromus tectorum</i> <sup>ai</sup> (cheatgrass)	-	361	6	6	200
<i>Poa bulbosa</i> <sup>i</sup> (bulbous bluegrass)	3	390	16	0	195
<i>Poa secunda</i> (Sandberg bluegrass)	16	350	17	5	224
<i>Pseudoroegneria spicata</i> (bluebunch wheatgrass)	-	242	30	17	219
year	Average Cover (%)				
1997	-	11.3	0.0	-	7.6
2002	-	9.3	0.6	0.0	7.8
2007	0.0	11.8	0.5	0.0	8.8
2012	0.1	8.2	0.4	0.1	9.8
2017	-	6.2	0.6	0.1	8.6

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

**Table 16A-08.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
<i>Alyssum desertorum</i> <sup>ai</sup> (desert madwort)	438	-	7	-	17	-	6	-	13	2	-	5	-	-	-	5	-
<i>Asclepias subverticillata</i> (horsetail milkweed)	351	0	-	-	9	-	-	-	93	-	-	-	3	-	19	16	-
<i>Calochortus nuttallii</i> (sego lily)	378	-	3	-	20	2	-	1	128	-	-	-	-	-	44	11	1
<i>Ceratocephala testiculata</i> <sup>ai</sup> (curvseed butterwort)	362	-	-	-	17	2	-	-	24	-	-	-	-	-	13	9	6
<i>Chaetopappa ericoides</i> (rose heath)	440	3	7	12	16	3	10	-	108	5	4	5	-	3	40	11	-
<i>Cirsium undulatum</i> <sup>a</sup> (wavyleaf thistle)	5.5	-	0.0	-	0.3	-	0.0	-	0.1	0.0	-	0.0	-	-	-	0.0	-
<i>Descurainia incana</i> <sup>a</sup> (mountain tansymustard)	1.8	0.0	-	-	0.2	-	-	-	1.3	-	-	-	0.0	-	0.2	0.1	-
<i>Draba</i> <sup>a</sup> (draba)	3.9	-	0.0	-	0.1	0.0	-	0.0	1.6	-	-	-	-	-	0.5	0.1	0.0
<i>Erodium cicutarium</i> <sup>ai</sup> (redstem stork's bill)	1.2	-	-	-	0.3	0.0	-	-	0.1	-	-	-	-	-	0.0	0.1	0.0
<i>Galium aparine</i> <sup>a</sup> (stickywilly)	12.1	0.1	0.0	0.1	0.2	0.0	0.1	-	2.4	0.0	0.0	0.0	-	0.0	0.2	0.1	-
<i>Gilia inconspicua</i> <sup>a</sup> (shy gilia)																	
<i>Hackelia patens</i> (spotted stickseed)																	
<i>Helianthus annuus</i> <sup>a</sup> (common sunflower)																	
<i>Lactuca serriola</i> <sup>ai</sup> (prickly lettuce)																	
<i>Lappula occidentalis</i> <sup>a</sup> (flatspine stickseed)																	
<i>Lygodesmia grandiflora</i> (largeflower skeletonplant)																	
<i>Phlox longifolia</i> (longleaf phlox)																	

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

FORB SPECIES					
<i>Silene antirrhina</i> <sup>a</sup> (sleepy silene)					
<i>Sphaeralcea coccinea</i> (scarlet globemallow)					
<i>Streptanthus cordatus</i> (heartleaf twistflower)					
<i>Tragopogon dubius</i> <sup>ai</sup> (yellow salsify)					
<i>Trifolium</i> (clover)					
year	Nested Frequency				
1997	-	87	7	4	1
2002	-	87	-	-	-
2007	6	117	-	-	-
2012	6	118	-	4	-
2017	17	122	-	-	-
year	Average Cover (%)				
1997	-	0.5	0.0	0.0	0.0
2002	-	1.8	-	-	-
2007	0.0	1.3	-	-	-
2012	0.0	1.4	-	0.0	-
2017	0.1	1.9	-	-	-

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

**Table 16A-08.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES								
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <sup>p</sup> (mountain big sagebrush)								
<i>Cercocarpus montanus</i> <sup>p</sup> (alderleaf mountain mahogany)								
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>stenophyllus</i> (yellow rabbitbrush)								
<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>speciosa</i> <sup>p</sup> (rubber rabbitbrush)								
<i>Gutierrezia sarothrae</i> (broom snakeweed)								
<i>Peraphyllium ramosissimum</i> <sup>p</sup> (wild crab apple)								
<i>Purshia stansburiana</i> <sup>p</sup> (Stansbury cliffrose)								
<i>Rhus trilobata</i> <sup>p</sup> (skunkbush sumac)								
year	Line Intercept Cover (%)							
1997	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-
2007	-	7.4	0.9	-	1.7	-	5.4	-
2012	-	7	3.2	-	1.7	-	6.5	-
2017	-	5.8	1.9	-	1.3	-	3	-
year	Quadrat Cover (%)							
1997	-	2.8	0.2	0.4	0.5	-	4.6	-
2002	-	3.3	0.5	0.3	2.1	-	5.3	0.8
2007	0.0	4.4	0.8	0.1	1.3	-	3.9	0.2
2012	-	4.9	2.0	0.1	1.6	-	3.0	0.0
2017	-	2.8	0.4	0.0	1.3	0.0	2.5	-

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

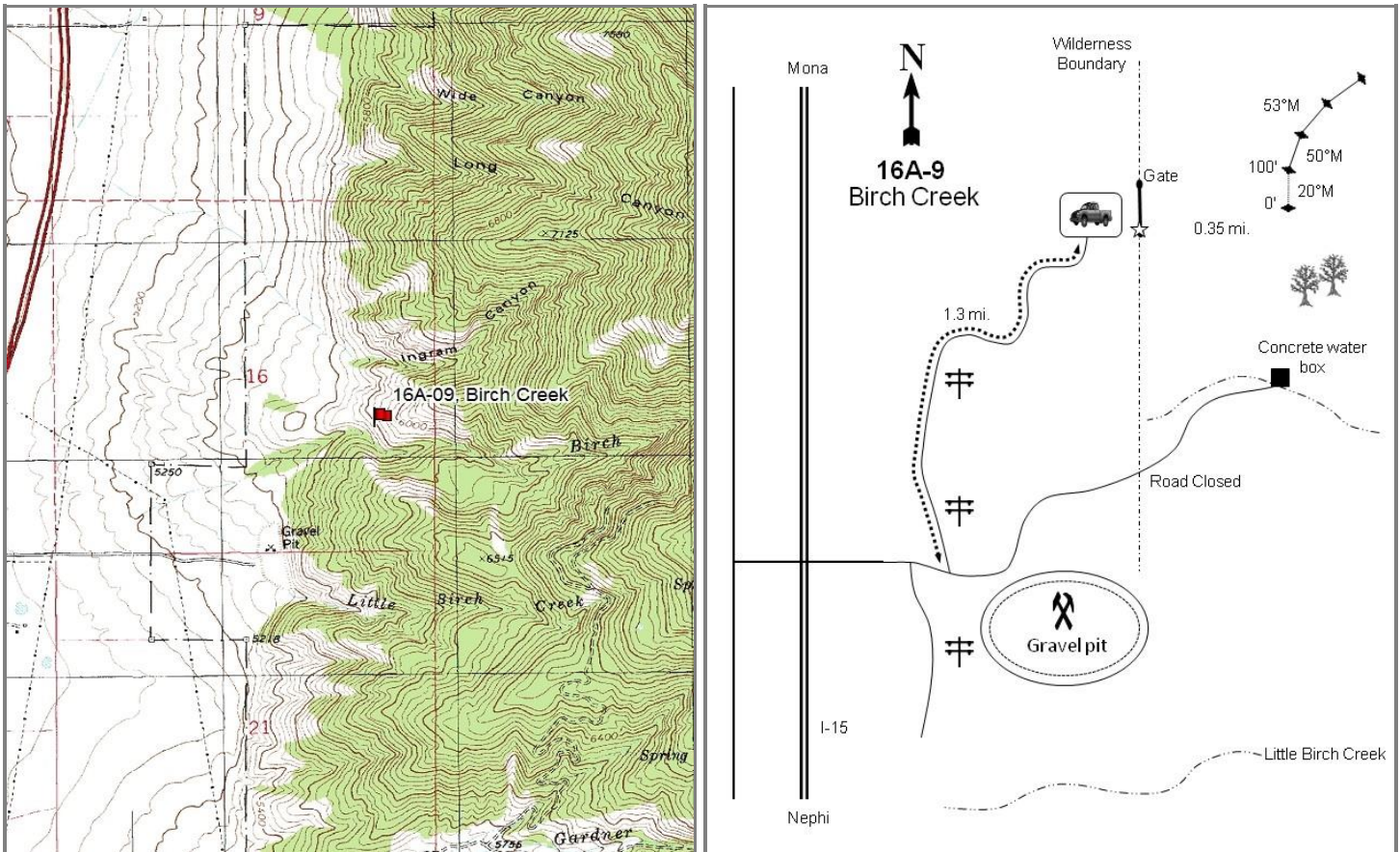
**Table 16A-08.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	53/93
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	135/198
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1997	40	-	0	0	100	100	0	100	62/97
2002	-	-	-	-	-	-	-	-	54/89
2007	-	20	0	0	0	0	0	0	58/68
2012	-	-	-	-	-	-	-	-	56/78
2017	-	-	-	-	-	-	-	-	58/72
<b>Cercocarpus montanus<sup>P</sup> -- (alderleaf mountain mahogany)</b>									
1997	240	-	8	83	8	25	75	0	158/199
2002	300	-	0	67	33	27	67	27	167/187
2007	200	-	0	70	30	10	70	20	163/201
2012	300	-	7	53	40	40	20	7	143/184
2017	300	40	0	93	7	93	0	7	141/177
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1997	440	-	0	91	9	0	0	5	35/62
2002	360	-	0	78	22	6	0	0	34/65
2007	420	-	0	100	0	29	0	0	36/72
2012	660	20	0	100	0	0	0	0	35/73
2017	120	-	0	100	0	0	0	0	42/88
<b>Eriogonum heracleoides -- (parsnipflower buckwheat)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	37/75
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1997	20	-	0	100	0	100	0	0	73/169
2002	20	-	0	0	100	0	0	100	63/129
2007	-	-	-	-	-	-	-	-	52/114
2012	-	-	-	-	-	-	-	-	56/119
2017	60	-	0	100	0	0	0	0	42/89
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	1280	60	45	52	3	0	0	2	18/22
2002	2280	-	1	84	15	0	0	5	19/32
2007	2060	160	52	44	4	0	1	3	21/31
2012	600	-	0	100	0	3	0	0	27/37
2017	980	-	8	92	0	0	0	0	22/32
<b>Peraphyllum ramosissimum<sup>P</sup> -- (wild crab apple)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	110/146
2017	-	-	-	-	-	-	-	-	134/141
<b>Purshia stansburiana<sup>P</sup> -- (Stansbury cliffrose)</b>									
1997	600	-	10	67	23	3	80	7	118/125
2002	500	-	4	76	20	0	80	8	100/112
2007	440	-	0	68	32	0	96	23	125/126
2012	380	20	5	63	32	26	68	26	123/130
2017	320	-	0	63	38	6	94	38	137/120
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1997	-	-	-	-	-	-	-	-	197/207
2002	-	-	-	-	-	-	-	-	78/60
2007	-	-	-	-	-	-	-	-	147/109
2012	-	-	-	-	-	-	-	-	180/149
2017	-	-	-	-	-	-	-	-	111/77

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Rhus trilobata <sup>P</sup> -- (skunkbush sumac)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	146/477
2007	-	-	-	-	-	-	-	-	159/272
2012	-	-	-	-	-	-	-	-	191/403

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

## BIRCH CREEK - STUDY NO. 16A-9



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Mona SW; Township 12S, Range 1E, Section 16  
NAD 83 UTM ZONE 12, 429593 East 4402339 North

### Transect Information

Browse Tag # (0' Stake)	197
Transect Bearing	20° 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

Beginning at the overpass where the road to Little Birch Canyon passes over I-15 (north of the northernmost Nephi exit), take the first left (north) just before the powerlines cross the road. Proceed about 1.3 miles east-northeast to a parking lot. From the wilderness boundary, walk east for about 0.35 miles to the 0-foot stake. The 0-foot baseline stake is near a small trail running parallel along the bench and is marked by browse tag #197.



**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	5,730ft (1,747m)
Aspect	Southwest
Slope	55%
Sample Dates	05/20/1997, 05/22/2002, 05/29/2007, 05/21/2012, 05/22/2017

**Table 16A-09.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Birch	-	September 2001	2681

**Wildlife Habitat and Vegetation History****Table 16A-09.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Moose	substantial	year-long

**Table 16A-09.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mixed Mountain Brush	Phase I
1989	Mixed Mountain Brush	Phase I
1997	Mixed Mountain Brush	Phase I
2002	Annual Grass	No Encroachment
2007	Annual Grass/Mixed Mountain Brush	No Encroachment
2012	Annual Grass/Mixed Mountain Brush	No Encroachment
2017	Annual Grass/Mixed Mountain Brush	No Encroachment

**Site Notes**

Water is available in Birch Creek approximately 150 yards (137m) downslope from the baseline.

**Soils****Table 16A-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
Sandy Loam	7.1	54.4	30.1	15.6	3.1	9.7	80.0	0.7	05/20/1997

**Site Potential**

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

This site was dominated by a diverse number of mixed mountain brush species such as Utah serviceberry (*Amelanchier utahensis*) and alderleaf mountain mahogany (*Cercocarpus montanus*) from establishment in 1983 through the 1997 sample year. A wildfire in 2001 removed much of the browse on this site, with the remaining shrubs being situated toward the end of the transect (photos, Table 16A-09.12, Table 16A-09.13). The herbaceous understory has remained abundant and diverse, with the introduced annual grass species cheatgrass (*Bromus tectorum*) as a (co-)dominant site component since 2002. Perennial grass cover has been largely contributed by the native species bluebunch wheatgrass (*Pseudoroegneria spicata*); the introduced species bulbous bluegrass (*Poa bulbosa*) was sampled for the first time in 2017, albeit in low amounts (Table 16A-09.7, Table 16A-09.10). In general, forbs have remained relatively rare (Table 16A-09.11).

**Trend Summary Tables****Table 16A-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
1997	6.8	0.9	2.9	-	-	-
2002	2.3	0.0	-	-	-	-
2007	6.4	0.4	-	8.1	1.5	-
2012	4.1	0.9	-	5.5	1.9	-
2017	3.4	0.6	-	6.8	0.8	-

**Table 16A-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
1997	352	247	325	55	6.1	7.1	3.7	1.8
2002	325	176	284	26	9.8	5.5	3.7	0.8
2007	379	194	299	35	17.2	11.5	5.8	1.1
2012	336	227	320	40	12.5	11.0	3.9	1.0
2017	366	206	338	23	20.5	9.5	8.3	1.1

**Table 16A-09.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	7.5	0.9	26.2	9.2	47.8	26.5
2002	13.1	0.0	19.0	9.4	50.7	21.9
2007	5.5	0.0	21.8	6.9	37.3	43.2
2012	4.6	0.0	33.2	5.3	36.1	34.7
2017	9.3	0.2	21.9	15.2	47.8	41.0

**Table 16A-09.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1997	15	30	-
2002	25	12	-
2007	14	8	1
2012	10	12	2
2017	15	11	5
Days Use Per Acre (ha)			
1997	-	-	-
2002	44.2 (109.2)	20.1 (49.7)	-
2007	38.9 (96.0)	38.9 (96.0)	-
2012	18.7 (46.3)	8.7 (21.5)	-
2017	12.8 (31.5)	28.1 (69.5)	-

**Table 16A-09.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia octoflora <sup>a</sup> (sixweeks fescue)
year	Nested Frequency						
1997	-	-	352	-	23	243	-
2002	-	46	325	-	61	151	-
2007	-	3	379	-	26	188	9
2012	5	4	336	-	31	213	-
2017	-	-	365	3	29	197	5
year	Average Cover (%)						
1997	-	-	6.1	-	0.1	7.0	-
2002	-	0.2	9.7	-	0.6	4.9	-
2007	-	0.0	17.0	-	0.5	10.9	0.2
2012	0.4	0.0	12.5	-	0.2	10.4	-
2017	-	-	20.3	0.0	0.3	9.2	0.2

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

**Table 16A-09.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Calochortus nuttallii (sego lily)	Camelina microcapa <sup>ai</sup> (littledod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Eriogonum brevicaulle (shortstem buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium aparine <sup>a</sup> (stickywilly)	Gilia inconspicua <sup>a</sup> (shy gilia)	Hackelia patens (spotted stickseed)
year	Nested Frequency																
1997	-	291	1	4	2	-	3	-	7	-	9	-	8	26	61	9	-
2002	3	217	-	3	1	3	-	6	-	3	20	1	11	46	60	20	-
2007	-	218	-	3	-	11	-	-	-	5	27	-	6	100	34	0	-
2012	-	230	-	3	-	25	-	-	1	2	3	-	16	68	36	-	1
2017	-	207	-	5	-	15	-	6	3	4	-	1	1	170	65	-	-
year	Average Cover (%)																
1997	-	2.7	0.0	0.0	0.0	-	0.0	-	0.0	-	0.0	-	0.7	0.1	0.8	0.0	-
2002	0.0	1.2	-	0.0	0.0	0.0	-	0.0	-	0.0	0.1	0.0	0.5	1.4	0.2	0.1	-
2007	-	1.3	-	0.0	-	0.0	-	-	-	0.0	0.5	-	0.4	2.6	0.4	0.0	-
2012	-	1.1	-	0.0	-	0.1	-	-	0.0	0.0	0.0	-	0.1	0.8	0.5	-	0.0
2017	-	2.2	-	0.1	-	0.1	-	0.0	0.0	0.0	-	0.0	0.2	3.9	1.4	-	-

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

FORB SPECIES												
Hedysarum boreale (Utah sweetvetch)												
Lactuca serriola <sup>ai</sup> (prickly lettuce)												
Lappula occidentalis <sup>a</sup> (flatspine stickseed)												
Lygodesmia grandiflora (largeflower skeletonplant)												
Machaeranthera canescens (hoary tansyaster)												
Phacelia linearis <sup>a</sup> (threadleaf phacelia)												
Phlox longifolia (longleaf phlox)												
Silene antirrhina <sup>a</sup> (sleepy silene)												
Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)												
Streptanthus cordatus (heartleaf twistflower)												
Tragopogon dubius <sup>ai</sup> (yellow salsify)												
unknown annual forb <sup>a</sup> (unknown forb)												
year	Nested Frequency											
1997	22	-	6	-	10	-	2	-	-	5	1	33
2002	2	2	7	-	-	75	5	11	-	1	-	-
2007	9	46	6	-	5	8	10	59	4	4	8	-
2012	9	81	6	4	-	2	6	87	12	1	17	-
2017	3	53	15	2	9	29	3	-	11	-	2	-
year	Average Cover (%)											
1997	0.8	-	0.0	-	0.0	-	0.0	-	-	0.2	0.0	0.1
2002	0.2	0.0	0.0	-	-	0.5	0.1	0.0	-	0.0	-	-
2007	0.6	0.3	0.0	-	0.1	0.0	0.0	0.2	0.2	0.0	0.1	-
2012	0.8	0.5	0.0	0.0	-	0.0	0.0	0.5	0.3	0.0	0.1	-
2017	0.4	0.4	0.2	0.1	0.3	0.2	0.0	-	0.0	-	0.0	-

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

**Table 16A-09.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES												
Amelanchier utahensis <sup>p</sup> (Utah serviceberry)												
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)												
Atriplex canescens <sup>p</sup> (fourwing saltbush)												
Brickellia californica (California brickellbush)												
Cercocarpus montanus <sup>p</sup> (alderleaf mountain mahogany)												
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)												
Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)												
Gutierrezia sarothrae (broom snakeweed)												
Juniperus osteosperma <sup>t</sup> (Utah juniper)												
Purshia stansburiana <sup>p</sup> (Stansbury cliffrose)												
Rhus glabra <sup>p</sup> (smooth sumac)												
year	Line Intercept Cover (%)											
1997	-	-	-	-	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-	-	-	-	-
2007	2.9	-	-	0.2	1.4	1.2	-	0.1	-	1.8	2	-
2012	2.6	-	-	0.2	1.1	1.4	-	0.3	-	0.4	1.4	-
2017	3.8	-	0.5	0.1	0.9	0.7	0.6	-	-	0.7	0.3	-
year	Quadrat Cover (%)											
1997	1.9	0.9	-	0.8	1.0	0.0	-	-	2.9	3.0	-	-
2002	1.1	0.0	-	-	0.1	0.0	-	-	-	1.1	-	-
2007	1.6	-	-	0.0	1.0	0.2	-	0.2	-	2.1	1.6	-
2012	2.1	-	-	0.0	1.5	0.0	-	0.8	-	0.2	0.3	-
2017	1.9	-	0.4	0.0	0.4	0.6	0.0	0.0	-	0.6	0.1	-

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

**Table 16A-09.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

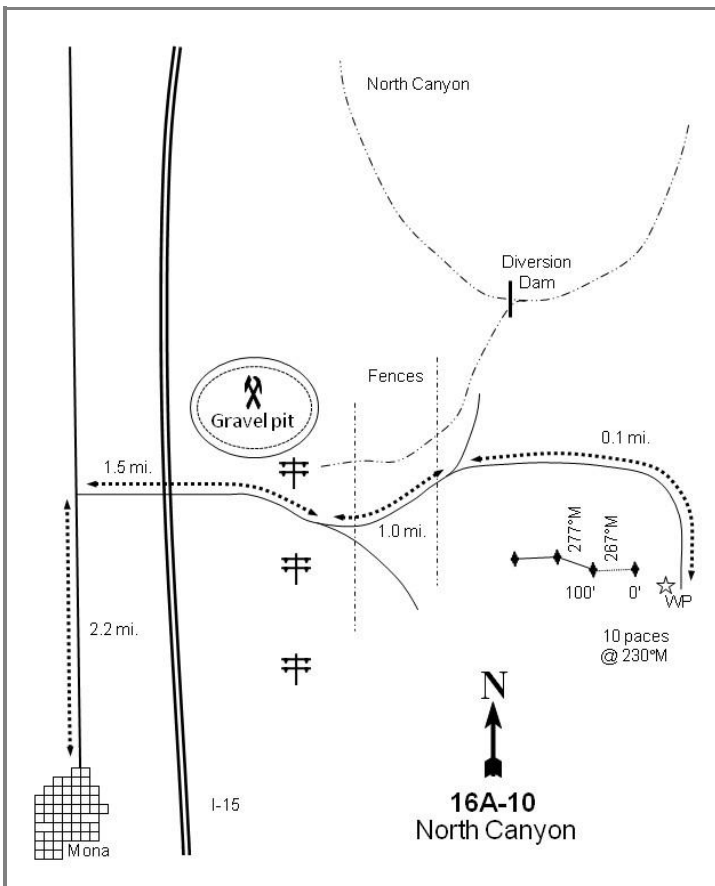
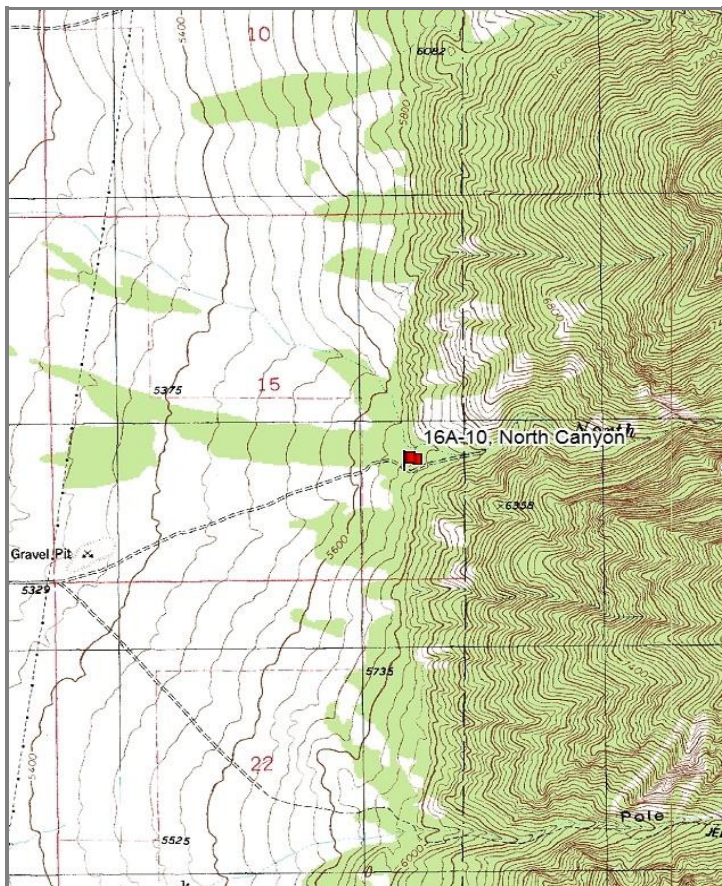
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1997	640	160	41	56	3	50	34	0	104/132
2002	1300	-	95	3	2	0	5	0	100/120
2007	920	100	59	35	7	17	20	4	62/88
2012	620	40	29	68	3	61	3	0	52/72
2017	620	-	23	77	0	45	48	0	66/82
<b>Artemisia nova<sup>P</sup> -- (black sagebrush)</b>									
1997	120	-	0	83	17	50	17	17	38/68
2002	-	-	-	-	-	-	-	-	16/70
2007	80	-	0	25	75	25	0	75	24/51
2012	-	-	-	-	-	-	-	-	50/61
2017	-	-	-	-	-	-	-	-	22/44
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1997	360	-	17	83	0	50	33	0	69/103
2002	80	-	0	25	75	0	50	50	47/77
2007	-	-	-	-	-	-	-	-	47/76
2012	60	-	0	100	0	33	0	0	52/67
2017	40	-	0	100	0	100	0	0	48/64
<b>Atriplex canescens<sup>P</sup> -- (fourwing saltbush)</b>									
1997	20	-	0	100	0	0	100	0	56/93
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	106/151
2012	-	-	-	-	-	-	-	-	88/124
2017	20	-	0	100	0	0	0	0	108/152
<b>Brickellia californica -- (California brickellbush)</b>									
1997	100	-	0	100	0	0	0	0	54/70
2002	-	-	-	-	-	-	-	-	-/-
2007	40	-	0	100	0	0	0	0	42/79
2012	40	-	0	100	0	0	0	0	31/67
2017	40	-	0	100	0	0	0	0	30/51
<b>Cercocarpus montanus<sup>P</sup> -- (alderleaf mountain mahogany)</b>									
1997	40	-	0	100	0	0	100	0	139/126
2002	20	20	0	100	0	0	100	0	180/144
2007	40	-	0	100	0	100	0	0	147/146
2012	40	-	0	100	0	100	0	0	184/145
2017	40	-	0	100	0	0	0	0	150/146
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1997	60	20	0	100	0	0	0	0	43/86
2002	60	-	33	33	33	0	0	0	28/46
2007	80	-	0	75	25	0	0	0	34/65
2012	40	-	0	100	0	0	0	0	46/68
2017	40	-	0	100	0	0	0	0	43/83
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	152/240
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	90/139
2012	-	-	-	-	-	-	-	-	94/217
2017	40	-	0	100	0	50	0	0	86/133
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	160	20	38	63	0	0	0	0	21/31
2002	60	-	0	67	33	0	0	33	15/24
2007	140	20	43	57	0	0	0	0	19/30
2012	160	-	0	100	0	0	0	0	28/48
2017	100	-	0	100	0	0	0	0	23/27
<b>Juniperus osteosperma<sup>1</sup> -- (Utah juniper)</b>									
1997	40	-	0	100	0	0	0	0	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Pediocactus simpsonii -- (mountain ball cactus)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	22/29
2017	-	-	-	-	-	-	-	-	-/-
Purshia stansburiana <sup>P</sup> -- (Stansbury cliffrose)									
1997	180	-	0	78	22	44	44	11	149/184
2002	60	-	0	67	33	0	100	0	123/188
2007	40	-	50	50	0	50	50	0	147/143
2012	40	-	50	50	0	50	50	0	118/139
2017	20	-	0	0	100	0	100	0	109/117
Quercus gambelii <sup>P</sup> -- (Gambel oak)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	116/143
2017	-	-	-	-	-	-	-	-	28/49
Rhus glabra <sup>P</sup> -- (smooth sumac)									
1997	-	-	-	-	-	-	-	-	84/48
2002	40	-	100	0	0	0	0	0	- / -
2007	60	20	0	100	0	0	0	0	109/133
2012	100	-	0	100	0	100	0	0	117/109
2017	320	-	31	63	6	0	38	75	95/81
Rhus trilobata <sup>P</sup> -- (skunkbush sumac)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	189/390
2012	-	-	-	-	-	-	-	-	160/555
2017	-	-	-	-	-	-	-	-	175/529

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



## NORTH CANYON - STUDY NO. 16A-10



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Mona NE; Township 11S, Range 1E, Section 15  
NAD 83 UTM ZONE 12, 431119 East 4411974 North

### Transect Information

Browse Tag # (0' Stake)	3957
Transect Bearing	267° magnetic
Length	300ft
Belt Placement	Line 1 (11ft & 71ft), Line 2 (Belt 3 on 41ft), Line 3 (34ft center on 40ft & 95ft)
Belt Marker Placement	Belt 2: 1ft, Belt 4: 2ft

### Directions to Site

Beginning at the intersection of 200 North and Main Street in Mona, drive north on Main Street for 2.2 miles to an improved gravel road on the east side. Take this road east for 1.5 miles (passing beneath the freeway) to where the road forks after crossing an irrigation ditch. Stay left (north) at this fork and continue another mile to where the road faintly forks again. Proceed for 0.1 miles on the right (south) side of the fork; the witness post is located 15 feet off the right (south) side of the road. The 0-foot stake is 10 paces away at 270 degrees magnetic, with a red browse tag #3957 attached.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,670ft (1,728m)
Aspect	West
Slope	15-16%
Sample Dates	05/20/1997, 05/20/2002, 05/21/2007, 05/21/2012, 05/22/2017

**Wildlife Habitat and Vegetation History****Table 16A-10.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter

**Table 16A-10.4 - 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	No Encroachment
1989	Mountain Big Sagebrush	No Encroachment
1997	Mountain Big Sagebrush	No Encroachment
2002	Mountain Big Sagebrush	No Encroachment
2007	Mountain Big Sagebrush	No Encroachment
2012	Mountain Big Sagebrush	No Encroachment
2017	Mountain Big Sagebrush/Bulbous Bluegrass	No Encroachment

**Site Notes**

There is a creek approximately 650 feet (200m) north of the study.

**Soils****Table 16A-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 Loam	7.1	56.4	28.1	15.6	3.2	8.2	51.2	0.8	05/20/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Stony Loam (Oak)
NRCS Ecological Site #	R047XA463UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1983, this study site has remained dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with Gambel oak (*Quercus gambelii*) scattered throughout (Table 16A-10.12, Table 16A- 10.13). The herbaceous understory has remained abundant with perennial grasses contributing a majority of the cover since 1997; the introduced species bulbous bluegrass (*Poa bulbosa*) was a co-dominant site component in 2017 with just over 11% cover. In addition, the introduced annual species cheatgrass (*Bromus tectorum*) has been observed since 1997 in fluctuating amounts. Finally, the noxious weeds jointed goatgrass (*Aegilops cylindrica*) and gypsyflower (*Cynoglossum officinale*) were present in previous sample years, but were not found in 2012 or 2017 (Table 16A-10.7, Table 16A-10.10, Table 16A-10.11).

**Trend Summary Tables****Table 16A-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
1997	22.3	2.5	-	-	-	-
2002	23.9	0.4	-	-	-	-
2007	19.3	1.1	-	25.8	0.6	-
2012	20.6	1.9	-	20.9	3.3	-
2017	15.2	1.5	-	20.5	2.5	-

**Table 16A-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
1997	323	245	255	130	5.7	4.0	1.1	2.7
2002	347	265	330	101	5.6	13.5	2.2	1.7
2007	328	351	332	113	5.7	20.5	6.6	1.9
2012	172	365	212	127	2.1	20.1	1.6	1.5
2017	237	383	290	115	9.1	26.3	7.3	1.9

**Table 16A-10.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	4.2	1.2	42.9	15.7	18.2	33.8
2002	0.9	1.2	43.6	16.1	20.8	48.4
2007	2.5	0.5	38.8	14.0	16.8	49.7
2012	1.3	0.4	56.2	10.2	15.7	47.9
2017	4.7	1.4	42.4	13.4	14.6	52.3

**Table 16A-10.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	-	6	-	-
2002	-	16	1	4
2007	-	26	-	3
2012	1	6	-	4
2017	1	17	-	11
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	-	21.5 (53.0)	-	-
2007	0.7 (1.8)	53.6 (132.4)	-	-
2012	0.7 (1.8)	10.7 (26.5)	-	-
2017	-	16.8 (41.4)	0.7 (1.7)	-

**Table 16A-10.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Aegilops cylindrica <sup>ani</sup> (jointed goatgrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus marginatus (mountain brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)	Vulpia octoflora <sup>a</sup> (sixweeks fescue)
year	Nested Frequency														
1997	-	7	20	-	-	323	9	7	18	-	188	-	26	28	-
2002	-	6	20	4	7	342	2	19	72	2	182	-	24	26	8
2007	1	13	23	10	-	328	3	23	188	12	197	1	31	61	24
2012	-	10	20	10	-	169	4	13	132	11	207	1	39	119	-
2017	-	-	37	-	1	237	3	23	274	3	104	4	32	137	-
year	Average Cover (%)														
1997	-	0.0	0.8	-	-	5.7	0.0	0.5	0.2	-	1.4	-	0.4	0.6	-
2002	-	0.6	0.8	0.0	0.7	5.5	0.1	1.0	2.9	0.0	4.3	-	0.5	2.7	0.0
2007	0.0	0.3	0.8	0.0	-	5.6	0.1	1.2	7.8	0.1	4.7	0.0	1.4	4.1	0.1
2012	-	0.3	0.5	0.4	-	1.7	0.0	0.5	5.3	0.4	6.0	0.2	0.9	6.2	-
2017	-	-	1.2	-	0.0	9.1	0.0	0.7	11.3	0.2	2.2	0.0	0.9	9.7	-

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

**Table 16A-10.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria dimorpha (low pussytoes)	Apocynum cannabinum (Indianhemp)	Astragalus eurekaensis (Eureka milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Chaetopappa ericoides (rose heath)	Cirsium vulgare <sup>ai</sup> (bull thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Cryptantha (cryptantha)	Cynoglossum officinale <sup>ani</sup> (gypsyflower)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)
year	Nested Frequency																
1997	8	94	-	-	-	28	18	-	86	6	7	21	4	3	-	-	11
2002	-	205	5	-	15	8	28	2	106	17	0	87	-	-	-	16	6
2007	-	147	3	-	9	16	13	-	44	21	2	146	1	-	-	88	1
2012	2	112	-	-	1	27	3	3	4	22	5	104	3	-	3	9	1
2017	2	101	-	6	5	16	11	-	-	27	-	18	4	-	-	-	-
year	Average Cover (%)																
1997	0.0	0.3	-	-	-	0.3	0.0	-	0.2	0.0	0.0	0.1	0.0	0.0	-	-	0.0
2002	-	0.4	0.0	-	0.1	0.1	0.1	0.0	0.6	0.4	0.0	0.3	-	-	-	0.0	0.0
2007	-	0.6	0.0	-	0.0	0.3	0.1	-	0.1	0.4	0.0	2.9	0.0	-	-	0.2	0.0
2012	0.0	0.2	-	-	0.0	0.5	0.0	0.0	0.0	0.4	0.1	0.4	0.0	-	0.0	0.0	0.0
2017	0.0	2.3	-	0.2	0.0	0.1	0.1	-	-	0.5	-	0.3	0.0	-	-	-	-

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

FORB SPECIES	Erigeron divergens <sup>a</sup> (spreading fleabane)	Eriogonum racemosum (redroot buckwheat)	Erodium cicutarium <sup>ii</sup> (redstem stork's bill)	Galium aparine <sup>a</sup> (stickywilly)	Hackelia patens (spotted stickseed)	Helianthus annuus <sup>a</sup> (common sunflower)	Lactuca serriola <sup>ii</sup> (prickly lettuce)	Lithospermum incisum (narrowleaf stone seed)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa <sup>i</sup> (alfalfa)	Microsteris gracilis <sup>a</sup> (slender phlox)	Oenothera pallida <sup>a</sup> (pale evening primrose)	Phlox longifolia (longleaf phlox)	Silene antirrhina <sup>a</sup> (sleepy silene)	Symphotrichum ascendens (western aster)	Tragopogon dubius <sup>ii</sup> (yellow salsify)	unknown annual forb <sup>a</sup> (unknown forb)
year	Nested Frequency																
1997	9	80	-	110	-	-	-	4	10	2	-	-	3	33	-	-	2
2002	1	47	-	88	-	9	-	6	-	-	14	3	9	92	-	1	-
2007	-	63	-	107	-	-	7	3	3	-	8	3	8	53	3	-	-
2012	1	44	-	18	16	-	1	11	-	-	5	11	22	52	-	8	-
2017	-	47	15	41	-	-	23	2	19	-	-	-	4	169	7	9	-
year	Average Cover (%)																
1997	0.1	2.1	-	0.4	-	-	-	0.0	0.0	0.0	-	-	0.0	0.1	-	-	0.0
2002	0.0	0.8	-	0.6	-	0.0	-	0.0	-	-	0.0	0.0	0.0	0.2	-	0.0	-
2007	-	0.7	-	2.4	-	-	0.0	0.0	0.2	-	0.0	0.1	0.1	0.1	0.0	-	-
2012	0.0	0.3	-	0.1	0.2	-	0.0	0.0	-	-	0.0	0.5	0.0	0.1	-	0.0	-
2017	-	0.4	0.1	0.7	-	-	0.1	0.0	0.3	-	-	-	0.0	3.7	0.0	0.1	-

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

FORB SPECIES	Verbascum thapsus <sup>ii</sup> (common mullein)	Wyethia amplexicaulis (mule-ears)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency		
1997	-	-	4
2002	-	-	2
2007	3	2	3
2012	3	-	5
2017	-	-	6
year	Average Cover (%)		
1997	-	-	0.0
2002	-	-	0.0
2007	0.1	0.1	0.0
2012	0.2	-	0.0
2017	-	-	0.2

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

**Table 16A-10.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Cercocarpus ledifolius <sup>p</sup> (curl-leaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Opuntia (pricklypear)	Pediocactus simpsonii (mountain ball cactus)	Quercus gambelii <sup>p</sup> (Gambel oak)	Rhus trilobata <sup>p</sup> (skunkbush sumac)
year	Line Intercept Cover (%)								
1997	-	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-	-
2007	18.1	0.1	-	2.4	0.6	-	-	4.7	0.5
2012	11.6	-	-	1.3	3.3	-	-	7.4	0.6
2017	11.7	0.1	-	0.8	2.5	-	-	7.9	-
year	Quadrat Cover (%)								
1997	19.9	0.0	0.4	1.4	2.1	0.0	-	1.1	-
2002	18.0	-	-	3.1	0.4	-	0.0	2.4	0.4
2007	13.5	0.0	-	1.0	0.9	-	0.1	4.2	0.7
2012	11.8	-	-	1.5	1.9	-	-	6.3	1.0
2017	10.3	0.0	-	2.1	1.5	-	-	2.8	0.0

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

**Table 16A-10.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

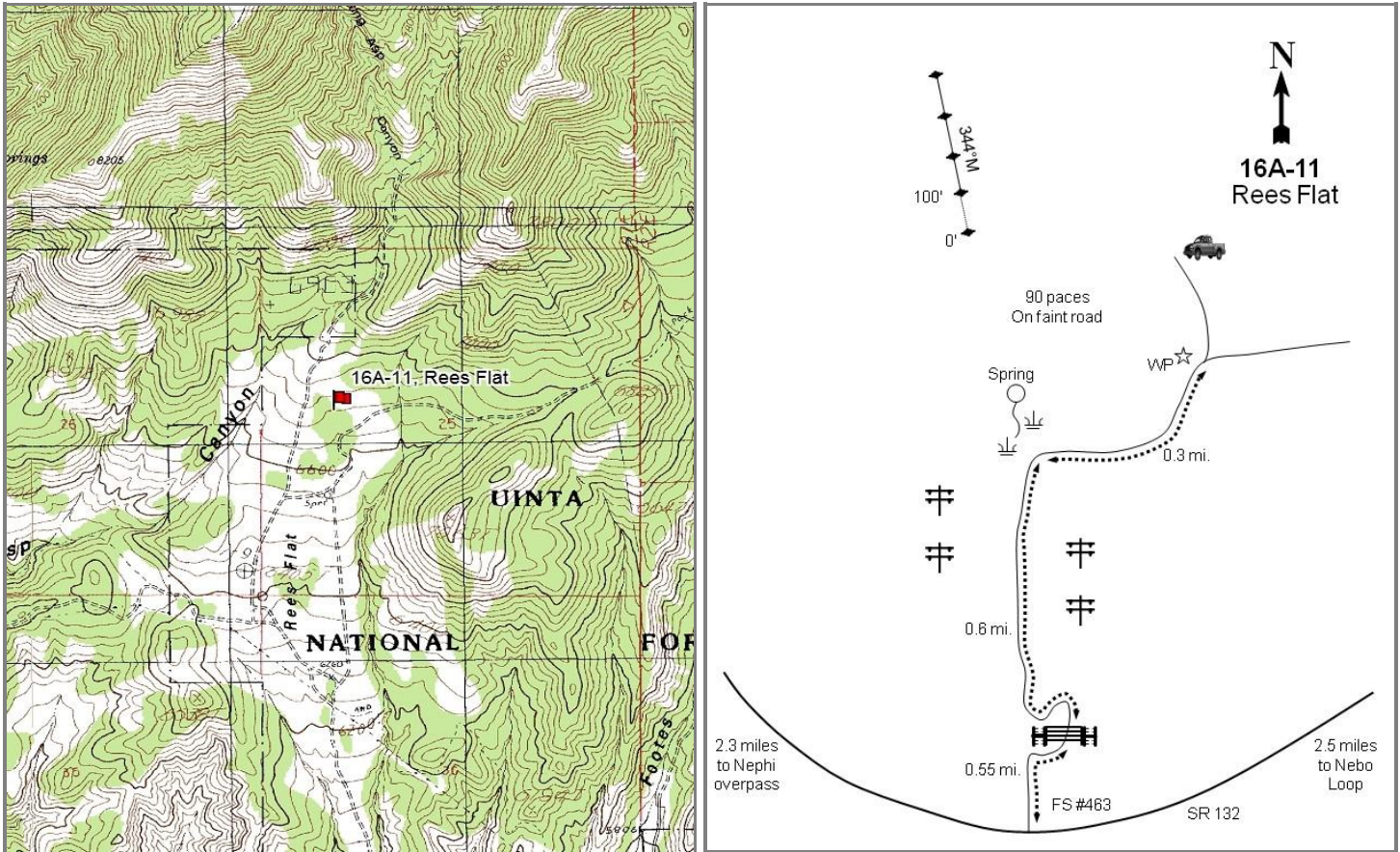
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1997	3880	40	10	79	11	49	17	5	61/103
2002	3460	-	3	55	42	14	1	21	58/83
2007	2900	20	2	59	39	46	14	25	65/85
2012	1800	80	1	70	29	21	4	16	64/97
2017	1520	7440	3	63	34	28	11	17	62/101
<b>Cercocarpus ledifolius<sup>p</sup> -- (curl-leaf mountain mahogany)</b>									
1997	20	-	100	0	0	0	0	0	- / -
2002	20	-	0	0	100	0	100	0	7/11
2007	40	-	50	50	0	0	100	0	23/25
2012	20	-	0	100	0	0	100	0	23/33
2017	20	-	100	0	0	0	100	0	12/17
<b>Cercocarpus montanus<sup>p</sup> -- (alderleaf mountain mahogany)</b>									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	38/52
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	20	-	0	100	0	0	0	0	87/96
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1997	40	-	0	100	0	50	0	0	74/115
2002	220	-	0	9	91	9	0	0	94/84
2007	100	-	0	60	40	0	0	20	85/97
2012	120	-	0	83	17	17	0	0	82/117
2017	160	-	0	75	25	13	13	13	71/78



Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	2020	80	28	70	2	0	0	0	15/13
2002	1700	-	5	88	7	0	0	7	14/16
2007	2660	100	60	36	4	0	0	2	26/36
2012	2680	40	8	90	2	0	1	1	22/29
2017	3700	-	16	82	3	0	0	1	19/22
<b>Opuntia -- (pricklypear)</b>									
1997	80	-	0	100	0	0	0	0	13/18
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	20	-	0	100	0	0	0	0	5/7
2017	-	-	-	-	-	-	-	-	-/-
<b>Pediocactus simpsonii -- (mountain ball cactus)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	40	-	0	100	0	0	0	0	17/17
2007	60	-	67	33	0	0	0	0	15/15
2012	20	-	0	100	0	0	0	0	17/16
2017	20	-	0	100	0	0	0	0	12/17
<b>Prunus virginiana<sup>P</sup> -- (chokecherry)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	184/361
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	248/46
2017	-	-	-	-	-	-	-	-	232/210
<b>Purshia stansburiana<sup>P</sup> -- (Stansbury cliffrose)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	130/286
2017	-	-	-	-	-	-	-	-	-/-
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1997	140	-	43	57	0	57	0	0	122/156
2002	420	-	38	62	0	0	0	38	130/86
2007	620	-	39	61	0	0	0	0	178/124
2012	480	20	21	79	0	0	0	0	-/-
2017	560	20	7	93	0	11	7	0	149/145
<b>Rhus trilobata<sup>P</sup> -- (skunkbush sumac)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	141/271
2007	20	-	100	0	0	0	0	0	198/364
2012	20	-	100	0	0	0	0	0	172/240
2017	-	-	-	-	-	-	-	-	100/133

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

## REES FLAT - STUDY NO. 16A-11



### Location Information

USGS 7.5 min Map Info                      Nephi NE; Township 12S, Range 1E, Section 25  
 GPS (0' Stake)                                NAD 83 UTM ZONE 12, 433389 East 4399356 North

### Transect Information

Browse Tag # (0' Stake)                      3956  
 Transect Bearing                              4° magnetic (Lines 2-5: 344° magnetic)  
 Length    400ft  
 Belt Placement                                 Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)  
 Belt Marker Placement                        Belt 5: 5ft

### Directions to Site

Beginning at the overpass where Highway 132 crosses beneath I-15 in Nephi, take Highway 132 east for 2.3 miles. Turn north onto Forest Service Road #463 and proceed for 0.2 miles to a fork in the road. Stay left and continue for another 0.35 miles to a gate. From the gate, go 0.65 miles to another fork. Stay right on the main road for 0.6 miles, passing through a 4-way intersection beneath the powerlines and reaching a spring on the left. Continue 0.3 miles farther to a 3-foot tall witness post 6 paces northwest of the road near some oak brush. Stop here and walk 90 paces west on a faint road. The 0-foot baseline stake is 9 paces north of the faint road and is a 12-inch-high red post marked by browse tag #3956.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,700ft (2,042m)
Aspect	South
Slope	15-17%
Sample Dates	05/22/1997, 10/25/2002, 05/29/2007, 05/16/2012, 05/18/2017

**Table 16A-11.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	Prior to 1983	-
Seeding - Seed Unknown	-	-	Prior to 1983	-

**Wildlife Habitat and Vegetation History****Table 16A-11.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Moose	substantial	year-long

**Table 16A-11.4 - 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/Gambel Oak	NA
1989	Mountain Big Sagebrush/Gambel Oak/Bulbous Bluegrass	NA
1997	Mountain Big Sagebrush/Gambel Oak/Bulbous Bluegrass	NA
2002	Mountain Big Sagebrush/Gambel Oak/Bulbous Bluegrass	NA
2007	Mountain Big Sagebrush/Gambel Oak/Bulbous Bluegrass	NA
2012	Mountain Big Sagebrush/Gambel Oak/Bulbous Bluegrass	NA
2017	Mountain Big Sagebrush/Gambel Oak/Bulbous Bluegrass	NA

**Site Notes**

No Notes

**Soils****Table 16A-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
Loam	5.9	40.4	33.1	26.6	2.4	29.8	179.2	0.4	05/22/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	24 inches
NRCS Ecological Site	Mountain Gravelly Loam (Oak)
NRCS Ecological Site #	R047XA410UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Gambel oak (*Quercus gambelii*) have been the dominant browse species on this study site since 1983, with antelope bitterbrush (*Purshia tridentata*) also present; densities of sagebrush and bitterbrush have exhibited an overall increase over the study period (Table 16A-11.12, Table 16A-12.13). The herbaceous understory has remained abundant in all sample years since 1997, with perennial grasses contributing a majority of the cover. However, most of this cover can be attributed to the introduced species smooth brome (*Bromus inermis*) and bulbous bluegrass (*Poa bulbosa*) (Table 16A-11.10). Both annual and perennial forbs have remained rare (Table 16A-11.7, Table 16A-11.11).

**Trend Summary Tables****Table 16A-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
1997	10.8	0.5	-	-	-	-
2002	18.6	1.5	-	-	-	-
2007	21.2	0.2	-	28.6	0.3	-
2012	23.1	0.0	-	31.3	0.1	-
2017	21.3	0.4	-	31.5	0.3	-

**Table 16A-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
1997	58	453	28	86	2.3	34.2	0.2	1.4
2002	-	473	6	47	-	41.1	0.0	0.9
2007	-	470	15	67	-	45.8	0.1	0.8
2012	3	444	5	65	0.0	43.4	0.0	1.1
2017	-	450	11	58	-	42.4	0.0	0.7

**Table 16A-11.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	7.5	8.6	33.7	5.2	2.8	49.7
2002	11.8	4.1	38.2	2.7	3.0	57.3
2007	10.9	1.2	33.3	4.7	2.8	62.7
2012	3.6	1.8	57.2	1.7	3.6	60.1
2017	12.7	1.6	61.6	2.0	2.7	52.1

**Table 16A-11.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	2	26	38	2
2002	4	29	13	3
2007	1	33	9	5
2012	-	17	16	3
2017	-	31	14	22
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	8.7 (21.5)	55.6 (137.4)	26.8 (66.2)	-
2007	1.5 (3.6)	24.8 (61.2)	22.1 (54.6)	-
2012	-	14.1 (34.8)	13.4 (33.1)	-
2017	1.5 (3.6)	96.5 (238.4)	37.5 (92.7)	-

**Table 16A-11.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency							
1997	104	205	58	439	-	-	27	-
2002	35	290	-	414	-	4	32	5
2007	44	329	-	395	14	8	9	0
2012	13	364	3	342	-	6	20	-
2017	7	384	-	357	4	8	-	3
year	Average Cover (%)							
1997	2.1	5.1	2.3	26.6	-	-	0.4	-
2002	0.4	8.3	-	31.5	-	0.4	0.5	0.0
2007	0.6	18.6	-	26.2	0.1	0.2	0.0	0.0
2012	0.2	14.5	0.0	27.9	-	0.3	0.5	-
2017	0.1	19.5	-	22.1	0.0	0.8	-	0.0

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

**Table 16A-11.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Astragalus cibaribus (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia (trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cymopterus longipes (longstalk springparsley)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron divergens <sup>a</sup> (spreading fleabane)	Eriogonum brevicaulis (shortstem buckwheat)	Galium aparine <sup>a</sup> (stickywilly)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Machaeranthera canescens (hoary tansyaster)
year	Nested Frequency																
1997	8	15	2	7	4	-	1	11	-	15	-	19	2	-	-	1	2
2002	1	15	-	-	5	-	-	6	-	6	-	-	-	3	-	-	-
2007	-	21	-	2	2	3	6	9	-	7	11	-	-	-	-	1	-
2012	1	27	-	1	1	2	-	15	-	10	3	-	-	-	-	-	-
2017	1	11	9	6	7	1	-	6	4	3	-	-	-	-	1	3	-
year	Average Cover (%)																
1997	0.2	0.4	0.0	0.0	0.0	-	0.0	0.5	-	0.1	-	0.0	0.1	-	-	0.0	0.0
2002	0.0	0.2	-	-	0.2	-	-	0.0	-	0.0	-	-	-	0.0	-	-	-
2007	-	0.4	-	0.0	0.2	0.0	0.0	0.0	-	0.0	0.1	-	-	-	-	0.0	-
2012	0.0	0.7	-	0.0	0.0	0.0	-	0.2	-	0.1	0.0	-	-	-	-	-	-
2017	0.0	0.3	0.2	0.0	0.0	0.0	-	0.0	0.0	0.0	-	-	-	-	0.0	0.0	-

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

FORB SPECIES	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	unknown annual forb <sup>a</sup> (unknown forb)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency				
1997	29	-	6	2	3
2002	12	3	3	-	1
2007	32	-	-	-	4
2012	16	-	-	-	7
2017	9	6	2	-	7
year	Average Cover (%)				
1997	0.1	-	0.0	0.0	0.0
2002	0.4	0.0	0.0	-	0.0
2007	0.1	-	-	-	0.0
2012	0.0	-	-	-	0.1
2017	0.0	0.0	0.0	-	0.1

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

**Table 16A-11.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Quercus gambelii <sup>p</sup> (Gambel oak)
year	Line Intercept Cover (%)					
1997	-	-	-	-	-	-
2002	-	-	-	-	-	-
2007	16.4	-	0.1	0.3	5.6	6.5
2012	17.4	-	-	0.1	9.6	4.3
2017	15.6	-	-	0.3	9.6	6.3
year	Quadrat Cover (%)					
1997	4.9	-	0.1	0.5	1.5	4.3
2002	9.8	-	0.0	1.5	4.2	4.5
2007	12.7	-	0.0	0.2	5.2	3.3
2012	13.8	0.0	-	0.0	8.4	0.9
2017	11.3	0.1	-	0.2	8.1	1.9

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

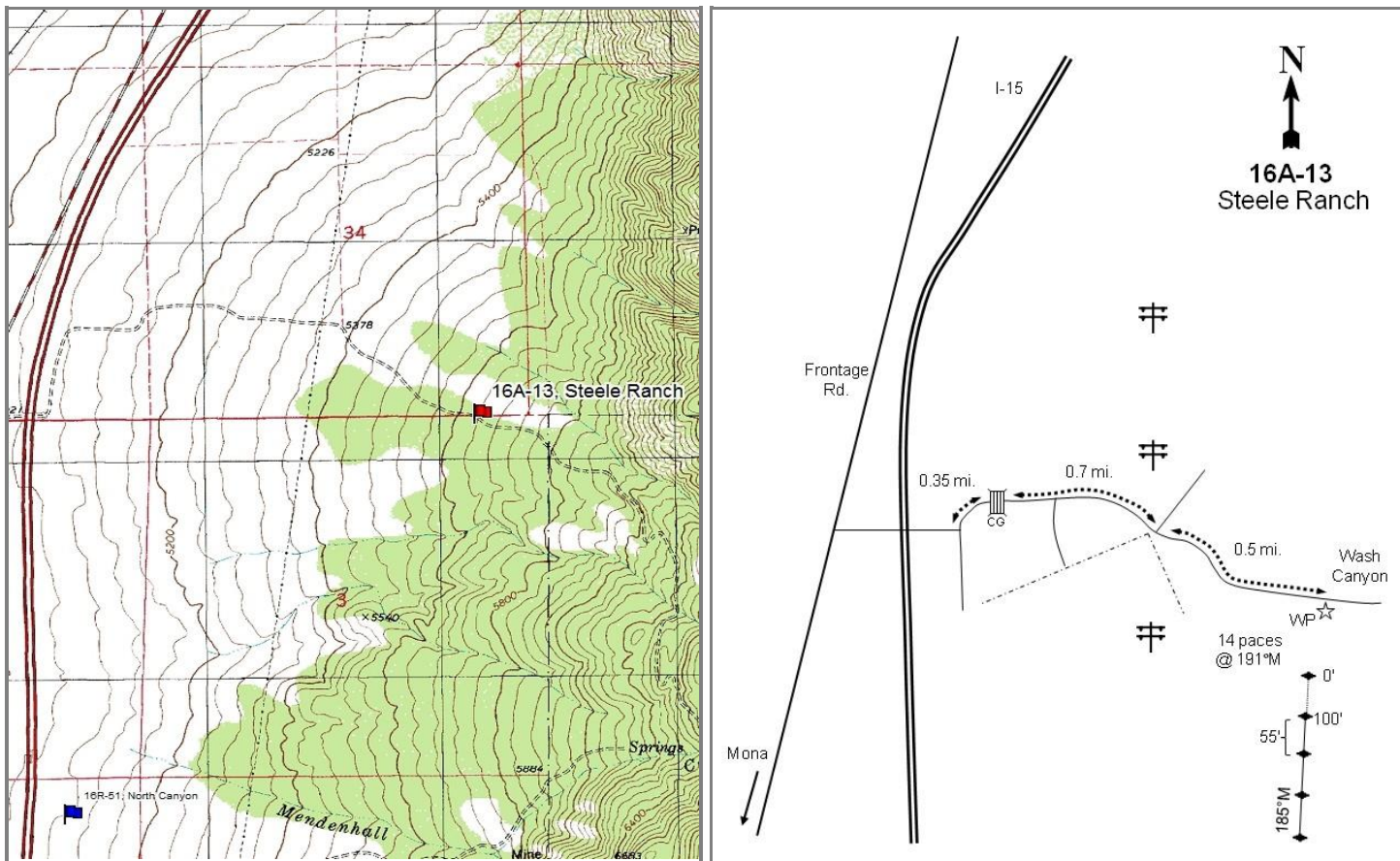


**Table 16A-11.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1997	1900	560	72	25	3	6	4	3	62/114
2002	3460	360	48	46	6	19	5	6	47/91
2007	2900	-	7	91	2	14	1	2	57/92
2012	2440	-	2	85	13	27	4	6	56/91
2017	2080	760	5	73	22	46	14	14	56/103
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	26/70
2002	40	-	50	50	0	0	0	0	23/55
2007	-	-	-	-	-	-	-	-	17/36
2012	20	-	100	0	0	0	0	0	28/42
2017	-	-	-	-	-	-	-	-	22/26
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1997	20	-	0	100	0	100	0	0	23/33
2002	20	-	0	0	100	100	0	100	49/95
2007	80	-	0	100	0	0	0	0	48/45
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	66/40
<b>Grayia spinosa -- (spiny hopsage)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	20	0	0	0	0	0	0	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	40	-	0	100	0	0	0	0	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	1500	380	33	60	7	0	0	7	14/23
2002	2600	-	5	72	23	0	0	9	11/18
2007	2140	80	65	27	8	10	0	4	17/20
2012	740	60	19	81	0	0	0	0	14/20
2017	940	2760	38	55	6	0	0	6	16/22
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1997	200	40	20	80	0	60	10	0	69/202
2002	420	-	14	86	0	10	81	0	68/169
2007	420	-	10	91	0	19	52	0	77/159
2012	1180	-	25	75	0	61	17	3	61/148
2017	1020	-	4	96	0	29	47	0	65/146
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1997	1740	40	38	62	0	1	0	0	197/136
2002	2480	-	4	90	7	0	14	31	148/91
2007	1640	20	10	79	11	0	0	99	170/121
2012	1200	-	15	85	0	0	0	2	196/156
2017	1320	-	11	89	0	77	3	0	158/104

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

## STEELE RANCH - STUDY NO. 16A-13



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Santaquin SE; Township 11S, Range 1E, Section 03  
NAD 83 UTM ZONE 12, 431086 East 4416364 North

### Transect Information

Browse Tag # (0' Stake) 182  
Transect Bearing 185° magnetic  
Length 400ft  
Belt Placement Line 1 (11ft & 95ft), Line 2 (55ft), Line 3 (59ft), Line 4 (71ft)  
Belt Marker Placement Standard

### Directions to Site

From 200 North Main Street in Mona, take the frontage road north towards Santaquin. Continue for 5.35 miles and turn east onto a gravel road that goes beneath the I-15 overpass. After passing beneath I-15, the road comes to a "T": turn left and proceed for 0.35 miles to a cattle guard. Continue up the road 0.7 miles to a fence corner and a fork in the road. Stay to the right (south) and drive for 0.5 miles to the witness post on the south side of the road. From the witness post, the 0-foot baseline stake is 14 paces away at 187 degrees magnetic and is marked with browse tag #182.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,650ft (1,722m)
Aspect	West
Slope	10-15%
Sample Dates	05/22/1997, 05/17/2002, 05/16/2007, 05/22/2012, 05/23/2017

**Wildlife Habitat and Vegetation History**

**Table 16A-13.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter

**Table 16A-13.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Mountain Big Sagebrush/Gambel Oak	NA
1997	Mountain Big Sagebrush/Gambel Oak	NA
2002	Mountain Big Sagebrush/Gambel Oak	NA
2007	Mountain Big Sagebrush/Gambel Oak	NA
2012	Mountain Big Sagebrush/Gambel Oak	NA
2017	Mountain Big Sagebrush/Gambel Oak	NA

**Site Notes**

No Notes

**Soils**

**Table 16A-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	7.2	37.1	41.1	21.8	4.0	9.1	86.4	0.7	05/22/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Gravelly Loam (Oak)
NRCS Ecological Site #	R047XA410UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Gambel oak (*Quercus gambelii*) have dominated this study site since it was established in 1989; no other preferred browse has been observed in any sample year (Table 16A- 13.12, Table 16A-13.13). The herbaceous understory has fluctuated throughout the duration of the study, but has largely remained diverse. Annual forbs, mainly stickywilly (*Galium aparine*) and desert madwort (*Alyssum desertorum*), provided the most herbaceous cover in 2017. Perennial forbs have remained rare, and perennial and annual grasses have never been particularly abundant (Table 16A-13.7, Table 16A-13.10, Table 16A-13.11).

**Trend Summary Tables**

**Table 16A-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
1997	31.9	0.1	-	-	-	-
2002	27.4	0.2	-	-	-	-
2007	35.1	0.0	-	59.0	0.2	-
2012	33.7	0.4	-	55.5	0.6	-
2017	28.9	0.8	-	49.8	1.4	-

**Table 16A-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
1997	112	276	392	126	0.3	3.4	2.2	0.9
2002	148	284	297	151	0.7	5.4	3.2	1.2
2007	144	247	414	170	0.9	6.5	8.1	1.3
2012	133	225	352	116	0.5	4.7	3.0	0.9
2017	176	190	380	145	4.5	3.7	11.6	1.7

**Table 16A-13.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	4.8	3.9	58.4	9.7	5.6	38.2
2002	6.1	4.7	60.3	8.8	5.3	35.8
2007	3.5	5.4	52.6	7.9	5.8	47.3
2012	5.7	5.2	65.2	6.6	4.5	44.3
2017	8.8	4.7	63.7	8.2	5.0	48.0

**Table 16A-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	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1997	7	-	5
2002	15	-	3
2007	19	-	8
2012	9	-	5
2017	17	-	9
Days Use Per Acre (ha)			
1997	-	-	-
2002	62.3 (153.9)	-	-
2007	90.5 (223.5)	-	-
2012	33.5 (82.8)	2.0 (5.0)	-
2017	24.8 (61.2)	-	-

**Table 16A-13.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency						
Bromus tectorum <sup>ai</sup> (cheatgrass)	112	-	-	-	17	270	-
Elymus elymoides (squirreltail)	148	2	-	-	29	252	9
Festuca idahoensis (Idaho fescue)	144	-	3	-	18	234	20
Poa bulbosa <sup>i</sup> (bulbous bluegrass)	133	10	-	-	9	202	24
Poa fendleriana (muttongrass)	176	15	-	15	11	125	42
Poa secunda (Sandberg bluegrass)							
Pseudoroegneria spicata (bluebunch wheatgrass)							

year	Average Cover (%)						
1997	0.3	-	-	-	0.1	3.3	-
2002	0.7	0.0	-	-	0.6	4.7	0.1
2007	0.9	-	0.0	-	0.3	5.6	0.5
2012	0.5	0.2	-	-	0.5	3.0	0.9
2017	4.5	0.1	-	0.2	0.3	1.6	1.5

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

**Table 16A-13.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Agoseris glauca (pale agoseris)	8	2	284	-	1	12	2	-	36	9	135	-	-	6	-	-	4
Allium (onion)	5	-	195	1	2	-	34	-	82	6	178	-	-	23	4	5	-
Alyssum desertorum <sup>ai</sup> (desert madwort)	13	-	311	-	6	-	15	-	69	6	134	7	-	10	13	9	1
Antennaria dimorpha (low pussytoes)	9	4	252	-	-	-	15	-	13	22	11	3	-	15	6	6	-
Arabis (rockcress)	8	-	281	3	-	-	8	4	61	-	28	4	25	-	14	7	-
Astragalus beekwithii (Beekwith's milkvetch)																	
Astragalus eurekaensis (Eureka milkvetch)																	
Buglossoides arvensis <sup>ai</sup> (corn gromwell)																	
Calochortus nuttallii (sego lily)																	
Castilleja linariifolia (Wyoming Indian paintbrush)																	
Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)																	
Cirsium undulatum <sup>a</sup> (wavyleaf thistle)																	
Claytonia perfoliata (miner's lettuce)																	
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																	
Comandra umbellata (bastard toadflax)																	
Crepis acuminata (tapertip hawksbeard)																	
Cryptantha (cryptantha)																	

year	Average Cover (%)																
1997	0.0	0.0	0.5	-	0.0	0.1	0.0	-	0.1	0.1	0.5	-	-	0.0	-	-	0.0
2002	0.0	-	0.8	0.0	0.0	-	0.2	-	0.2	0.1	2.0	-	-	0.0	0.0	0.1	-
2007	0.1	-	3.7	-	0.0	-	0.0	-	0.2	0.1	0.6	0.0	-	0.0	0.1	0.2	0.0
2012	0.2	0.0	0.9	-	-	-	0.1	-	0.0	0.1	0.0	0.1	-	0.0	0.0	0.1	-
2017	0.0	-	6.8	0.0	-	-	0.0	0.0	0.2	-	0.1	0.0	0.1	-	0.0	0.2	-

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

FORB SPECIES	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Eriogonum racemosum (redroot buckwheat)	Galium aparine <sup>a</sup> (stickywilly)	Helianthella uniflora (oneflower helianthella)	Helianthus annuus <sup>a</sup> (common sunflower)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Linum lewisii (Lewis flax)	Lomatium (desertparsley)	Microsteris gracilis <sup>a</sup> (slender phlox)	Petradoria pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Sanguisorba minor <sup>i</sup> (small burnet)	Silene antirrhina <sup>a</sup> (sleepy silene)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	unknown annual forb <sup>a</sup> (unknown forb)
year	Nested Frequency																
1997	-	12	-	2	93	-	-	-	-	37	-	-	37	-	58	5	7
2002	1	6	0	-	63	-	-	3	-	23	6	1	26	-	34	1	-
2007	141	7	-	9	124	5	5	23	-	48	54	2	39	3	185	34	-
2012	33	131	-	9	80	-	-	14	1	39	7	8	16	-	92	74	-
2017	5	24	-	5	137	-	-	26	-	23	22	4	7	-	20	28	-
year	Average Cover (%)																
1997	-	0.0	-	0.0	1.0	-	-	-	-	0.5	-	-	0.1	-	0.1	0.0	0.0
2002	0.0	0.0	0.0	-	0.2	-	-	0.0	-	0.4	0.0	0.0	0.1	-	0.1	0.0	-
2007	0.5	0.0	-	0.0	1.7	0.0	0.1	0.1	-	0.4	0.1	0.1	0.1	0.0	1.0	0.2	-
2012	0.1	0.3	-	0.0	0.8	-	-	0.0	0.0	0.2	0.0	0.0	0.0	-	0.3	0.3	-
2017	0.0	0.0	-	0.0	4.2	-	-	0.1	-	0.8	0.1	0.2	0.0	-	0.1	0.2	-

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

FORB SPECIES	Veronica biloba <sup>ai</sup> (two-lobed speedwell)	Viola (violet)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency		
1997	2	3	0
2002	8	5	1
2007	7	-	-
2012	-	2	6
2017	-	-	15
year	Average Cover (%)		
1997	0.0	0.0	0.0
2002	0.0	0.0	0.0
2007	0.1	-	-
2012	-	0.0	0.0
2017	-	-	0.1

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



**Table 16A-13.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)		
	Artemisia tridentata ssp. vaseyana <sup>P</sup> (mountain big sagebrush)	Gutierrezia sarothrae (broom snakeweed)	Quercus gambelii <sup>P</sup> (Gambel oak)
year	Line Intercept Cover (%)		
1997	-	-	-
2002	-	-	-
2007	16.3	0.2	42.7
2012	11.3	0.6	44.2
2017	10.3	1.4	39.5
year	Quadrat Cover (%)		
1997	13.2	0.1	18.6
2002	13.8	0.2	13.5
2007	12.5	0.0	22.6
2012	7.2	0.4	26.5
2017	5.6	0.8	23.4

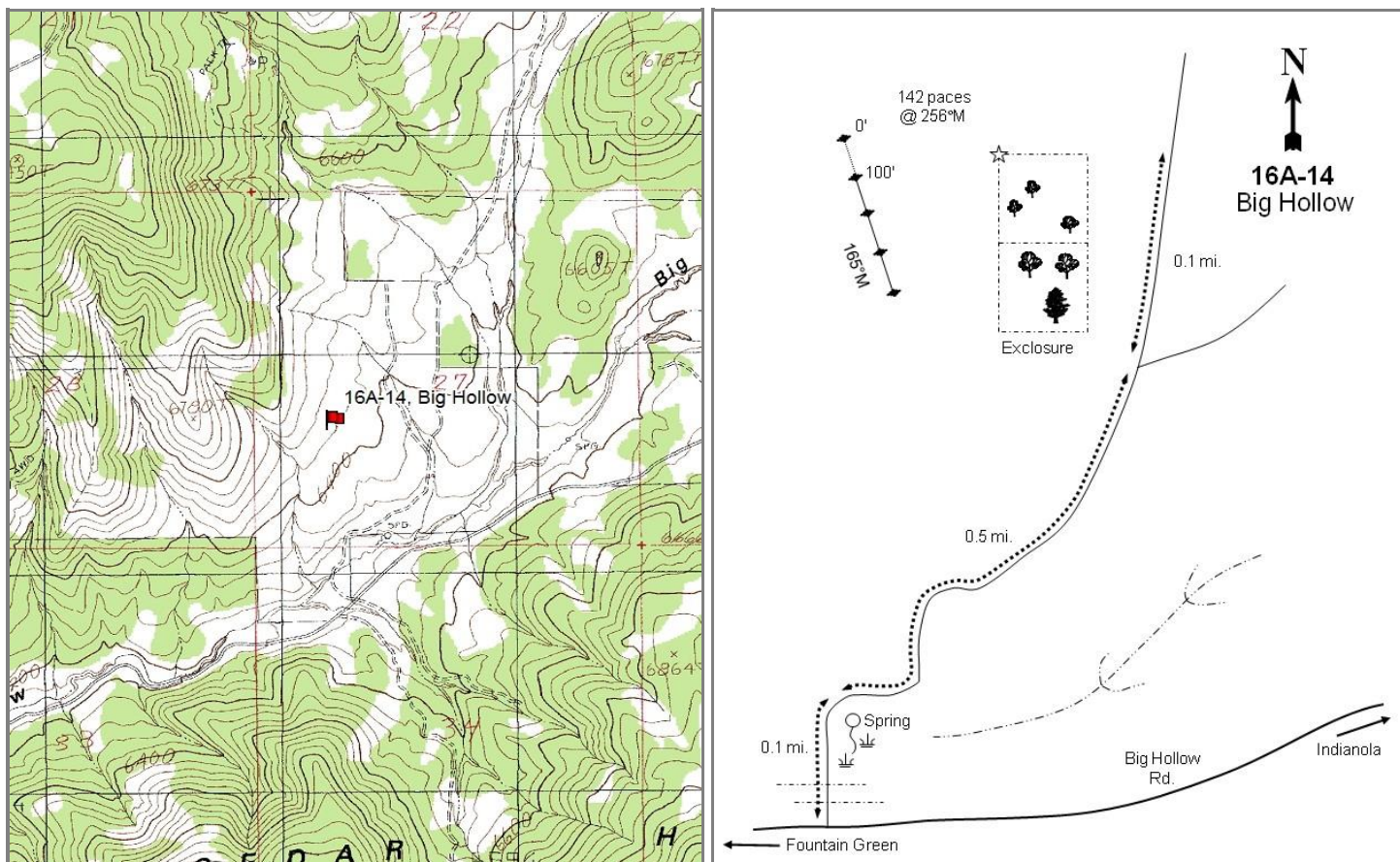
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 16A-13.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1997	2480	80	1	81	19	44	22	7	66/101
2002	3340	40	7	32	61	29	37	35	64/93
2007	2680	180	5	43	53	28	17	39	58/85
2012	2220	1460	14	45	41	31	15	24	59/78
2017	2840	240	20	43	37	24	6	20	45/63
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	40	-	0	50	50	0	0	50	- / -
2017	-	-	-	-	-	-	-	-	20/16
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	80	-	0	100	0	0	0	0	15/23
2002	120	-	0	83	17	0	0	17	10/14
2007	360	1160	39	56	6	0	0	0	22/26
2012	1000	220	20	80	0	0	0	0	22/29
2017	1840	720	12	85	3	0	0	2	19/25
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1997	10320	260	17	81	2	0	0	0	124/95
2002	15940	20	6	94	0	4	11	25	105/68
2007	10560	920	40	56	5	2	1	6	100/67
2012	12720	440	37	62	1	6	0	1	118/95
2017	13640	200	31	67	2	4	0	2	73/65

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

## BIG HOLLOW - STUDY NO. 16A-14

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Big Hollow SW; Township 13S, Range 3E, Section 27  
NAD 83 UTM ZONE 12, 450138 East 4389859 North

**Transect Information**

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

Not Available  
165° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Standard

**Directions to Site**

At the intersection of State Street and 100 North in Fountain Green, go east on 100 North for 0.3 miles to the old dump. Continue up Big Hollow for 3.3 miles to a gate parallel to the road onto DWR land. Turn left (north) through the gates and go 0.1 miles to a spring in a wash. Continue on this road for 0.5 miles to a fork. Stay left at the fork and continue for 0.1 miles to the north end of an exclosure: park here. From the northwest corner of the exclosure, walk 142 paces at a bearing of 256 degrees magnetic to a tall fencepost: this 4-foot tall green fencepost is the 0-foot baseline stake.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,450ft (1,966m)
Aspect	Southeast
Slope	10-15%
Sample Dates	08/22/1997, 10/25/2002, 05/24/2007, 05/15/2012, 05/16/2017

**Table 16A-14.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	1964	-
Seeding - Dribbler	Salt Creek Wildfire Rehabilitation	970	November 2007	221
Fire - Wildfire	Salt Creek	-	July 2007	25913
Chaining - One-Way Ely	Salt Creek Wildfire Rehabilitation	970	November 2007	221
Seeding - Aerial Before	Salt Creek Wildfire Rehabilitation	970	November 2007	1197
Fire - Wildfire	Wood Hollow	-	July 2012	47387
Seeding - Aerial	Wood Hollow Fire	2481	January 2013	301

**Table 16A-14.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Salt Creek Fire DWR Aerial			Aerial	Nov 2007	1150
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
G	<i>Achnatherum hymenoides</i>	Indian Ricegrass	Rimrock	1.00	0.91
G	<i>Agropyron cristatum</i>	Crested Wheatgrass	Hycrest	1.00	0.76
G	<i>Agropyron cristatum</i>	Crested Wheatgrass	Nordan	1.00	0.86
G	<i>Agropyron fragile</i>	Siberian Wheatgrass	Vavilov	1.00	0.84
G	<i>Dactylis glomerata</i>	Orchardgrass	Paiute	0.50	0.47
G	<i>Pseudoroegneria spicata</i>	Bluebunch Wheatgrass	Anatone	0.61	0.54
G	<i>Pseudoroegneria spicata</i>	Bluebunch Wheatgrass	Anatone	0.39	0.34
G	<i>Thinopyrum intermedium</i>	Intermediate Wheatgrass	Oahe	1.00	0.92
G	<i>Thinopyrum intermedium</i>	Pubescent Wheatgrass		2.00	1.82
F	<i>Achillea millefolium</i>	Western Yarrow		0.10	0.10
F	<i>Medicago sativa</i>	Alfalfa	Ladak	1.00	0.99
F	<i>Medicago sativa</i>	Alfalfa	Ranger	1.00	0.93
F	<i>Melilotus officinalis</i>	Yellow Sweetclover		0.25	0.20
F	<i>Onobrychis viciifolia</i>	Sainfoin	Eski	2.00	1.84
F	<i>Sanguisorba minor</i>	Small Burnet	Delar	1.00	0.94
S	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	Mountain Big Sagebrush	Sanpete UT	0.25	0.09
S	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	Wyoming Big Sagebrush	Sanpete UT	0.25	0.08
Mix Name			Application Type	Application Date	Acres
Salt Creek Fire DWR Dribbler			Dribbler	Nov 2007	335
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
F	<i>Sanguisorba minor</i>	Small Burnet	Delar	0.45	0.42
S	<i>Purshia tridentata</i>	Bitterbrush	Millard UT	0.45	0.39
Mix Name			Application Type	Application Date	Acres
Wood Hollow Sage and Kochia			Aerial	Jan 2013	10486
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
F	<i>Medicago sativa</i>	Alfalfa	Ladak DL	0.51	0.47
S	<i>Artemisia tridentata</i> ssp. <i>tridentata</i>	Basin Big Sagebrush	Sanpete UT	0.05	0.01
S	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	Mountain Big Sagebrush	Sevier UT	0.27	0.09
S	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	Mountain Big Sagebrush	Sevier UT	0.07	0.02
S	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	Mountain Big Sagebrush	Sevier UT	0.61	0.17
S	<i>Bassia prostrata</i>	Forage Kochia	Elmore ID	0.25	0.20
S	<i>Bassia prostrata</i>	Forage Kochia	Sevier UT	0.25	0.19

**Wildlife Habitat and Vegetation History****Table 16A-14.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Moose	substantial	year-long

**Table 16A-14.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Mountain Big Sagebrush	Phase I
1997	Mountain Big Sagebrush	Phase I
2002	Mountain Big Sagebrush	Phase I
2007	Mountain Big Sagebrush/Annual Grass	Phase I
2012	Perennial Grass	Phase I
2017	Perennial-Annual Grass	No Encroachment

**Site Notes**

There is a perennial spring 200 yards (183m) southeast of the study. During the dry year of 1989, deer were using the area during the summer due to the availability of water. However, the majority of big game use usually occurs in winter and spring. A winter-killed fawn was found in 1989, and an antler drop was noted in 2007.

**Soils****Table 16A-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 Clay Loam	6.8	48.0	27.1	24.9	2.9	13.3	166.4	0.5	08/21/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation 18 inches  
 NRCS Ecological Site Mountain Loam (Mountain Big Sagebrush)  
 NRCS Ecological Site # R047XA430UT  
 States and Transitions No state and transition model is available for this ecological site.

From study establishment in 1989 through the 2007 sample year, this study site existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated plant community with antelope bitterbrush (*Purshia tridentata*) scattered throughout. A wildfire after the 2007 sampling removed most of the browse component, and although some browse did remain, another fire in 2012 removed most of the extant shrubs (Table 16A-14.12, Table 16A-14.13). The site transitioned into one dominated by herbaceous species following the first fire in 2007. A mixture of perennial grasses including (but not limited to) the native species Indian ricegrass (*Achnatherum hymenoides*), needle and thread (*Hesperostipa comata*), and the introduced species crested wheatgrass (*Agropyron cristatum*) dominated the site in 2012 and 2017. Cover of the introduced annual species cheatgrass (*Bromus tectorum*) has fluctuated throughout the duration of the study, and it was a co-dominant site component in 2007 and 2012 (Table 16A-14.10). Forbs have remained rare in most years. However, annual forbs -- namely the introduced and weedy species desert madwort (*Alyssum desertorum*) and redstem stork's bill (*Erodium cicutarium*) -- contributed nearly 24% cover in 2017 (Table 16A-14.7, Table 16A-14.11).

**Trend Summary Tables****Table 16A-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
1997	17.2	5.9	-	-	-	-
2002	17.7	0.0	0.0	-	-	-
2007	11.6	7.5	0.1	15.5	7.2	0.1
2012	4.1	0.2	-	5.4	0.5	-
2017	0.0	0.7	-	-	0.8	-

**Table 16A-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
1997	266	218	188	64	3.7	5.2	1.1	0.6
2002	284	248	295	56	4.9	9.2	2.5	0.7
2007	409	200	422	63	13.3	8.6	9.1	0.7
2012	263	296	362	100	4.9	17.2	4.1	1.0
2017	386	311	479	132	11.3	16.4	23.5	1.3

**Table 16A-14.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	11.1	1.6	43.9	17.5	5.1	33.6
2002	20.8	5.3	37.9	15.0	4.7	35.5
2007	13.1	4.5	35.3	13.0	4.1	48.3
2012	12.9	0.0	44.2	4.8	3.3	35.6
2017	15.6	0.0	27.0	17.9	7.5	48.0

**Table 16A-14.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	1	32	2	26
2002	3	14	1	73
2007	3	9	3	50
2012	4	1	4	2
2017	2	5	3	27
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	8.0 (19.7)	62.3 (153.9)	0.7 (1.7)	-
2007	8.0 (19.7)	58.3 (144.0)	4.7 (11.6)	-
2012	3.6 (9.0)	0.7 (1.7)	3.4 (8.3)	-
2017	-	1.3 (3.3)	0.7 (1.7)	-

**Table 16A-14.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Hesperotipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency											
1997	72	-	-	266	49	42	50	-	-	3	41	-
2002	50	-	22	284	73	88	60	5	-	-	42	-
2007	45	-	-	409	70	26	42	37	-	-	36	-
2012	78	56	3	262	86	7	37	56	-	-	65	40
2017	54	73	-	386	96	46	79	63	4	-	23	44
year	Average Cover (%)											
1997	1.9	-	-	3.7	0.7	0.9	1.1	-	-	0.0	0.7	-
2002	1.1	-	0.1	4.8	2.3	2.2	1.0	0.0	-	-	2.4	-
2007	1.4	-	-	13.3	1.5	1.1	1.5	1.0	-	-	2.2	-
2012	3.3	2.3	0.1	4.7	4.6	0.2	1.3	2.2	-	-	2.3	0.9
2017	2.9	3.8	-	11.3	2.4	0.6	3.0	1.6	0.0	-	1.0	1.0

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

**Table 16A-14.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Astragalus newberryi (Newberry's milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littledod false flax)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium <sup>a</sup> (goosefoot)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Cryptantha humilis (roundspike cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Eriogonum cernuum <sup>a</sup> (nodding buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Gilia inconspicua <sup>a</sup> (shy gilia)
year	Nested Frequency																
1997	-	163	-	-	2	-	-	21	2	18	-	-	-	-	2	-	1
2002	-	287	-	3	5	-	33	5	-	18	5	-	1	-	3	5	-
2007	-	415	6	-	15	-	42	6	1	-	11	3	47	4	1	9	6
2012	-	348	-	6	9	7	6	2	-	26	-	-	5	-	-	-	-
2017	2	474	-	2	16	-	2	2	-	9	-	-	-	-	2	294	-
year	Average Cover (%)																
1997	-	1.0	-	-	0.0	-	-	0.1	0.0	0.0	-	-	-	-	0.0	-	0.0
2002	-	2.1	-	0.0	0.0	-	0.1	0.0	-	0.3	0.0	-	0.0	-	0.0	0.0	-
2007	-	8.4	0.0	-	0.0	-	0.1	0.0	0.0	-	0.0	0.0	0.3	0.0	0.0	0.0	0.0
2012	-	3.3	-	0.0	0.0	0.0	0.0	0.0	-	0.1	-	-	0.0	-	-	-	-
2017	0.0	17.5	-	0.0	0.1	-	0.0	0.0	-	0.1	-	-	-	-	0.0	5.8	-

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



FORB SPECIES														
<i>Hackelia patens</i> (spotted stickseed)														
<i>Lactuca serriola</i> <sup>ai</sup> (prickly lettuce)														
<i>Lappula occidentalis</i> <sup>a</sup> (flatspine stickseed)														
<i>Machaeranthera canescens</i> (hoary tansyaster)														
<i>Medicago sativa</i> <sup>i</sup> (alfalfa)														
<i>Microsteris gracilis</i> <sup>a</sup> (slender phlox)														
<i>Onobrychis vicifolia</i> <sup>i</sup> (sainfoin)														
<i>Orobanche fasciculata</i> (clustered broomrape)														
<i>Penstemon</i> (beardtongue)														
<i>Polygonum douglasii</i> <sup>ai</sup> (Douglas' knotweed)														
<i>Salsola tragus</i> <sup>ai</sup> (prickly Russian thistle)														
<i>Sisymbrium altissimum</i> <sup>ai</sup> (tall tumblemustard)														
<i>Sphaeralcea coccinea</i> (scarlet globemallow)														
<i>Tragopogon dubius</i> <sup>ai</sup> (yellow salsify)														
year	Nested Frequency													
1997	5	1	-	-	-	-	-	1	-	16	-	-	37	3
2002	-	-	-	-	-	12	-	-	1	2	-	-	46	1
2007	-	6	38	-	-	-	-	-	-	-	-	3	39	3
2012	-	1	-	3	3	-	7	-	-	-	-	2	81	75
2017	-	2	2	-	3	-	-	-	-	-	4	-	117	14
year	Average Cover (%)													
1997	0.0	0.0	-	-	-	-	-	0.0	-	0.1	-	-	0.5	0.0
2002	-	-	-	-	-	0.0	-	-	0.0	0.0	-	-	0.6	0.0
2007	-	0.0	0.1	-	-	-	-	-	-	-	-	0.0	0.6	0.0
2012	-	0.0	-	0.0	0.0	-	0.1	-	-	-	-	0.0	0.8	0.6
2017	-	0.0	0.0	-	0.0	-	-	-	-	-	0.1	-	1.2	0.1

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

**Table 16A-14.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES						
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <sup>p</sup> (mountain big sagebrush)						
<i>Bassia prostrata</i> <sup>pt</sup> (forage kochia)						
<i>Gutierrezia sarothrae</i> (broom snakeweed)						
<i>Juniperus osteosperma</i> <sup>i</sup> (Utah juniper)						
<i>Opuntia polyacantha</i> (plains pricklypear)						
<i>Purshia tridentata</i> <sup>p</sup> (antelope bitterbrush)						
year	Line Intercept Cover (%)					
1997	-	-	-	-	-	-
2002	-	-	-	-	-	-
2007	13.5	-	7.1	0.1	0.1	2
2012	2	-	0.4	-	0.1	3.4
2017	-	-	0.8	-	-	-
year	Quadrat Cover (%)					
1997	15.0	-	5.7	-	0.2	2.3
2002	15.4	-	0.0	0.0	-	2.4
2007	9.9	-	7.3	0.1	0.1	1.8
2012	2.0	-	0.1	-	0.0	2.0
2017	-	0.0	0.7	-	-	-

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

**Table 16A-14.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

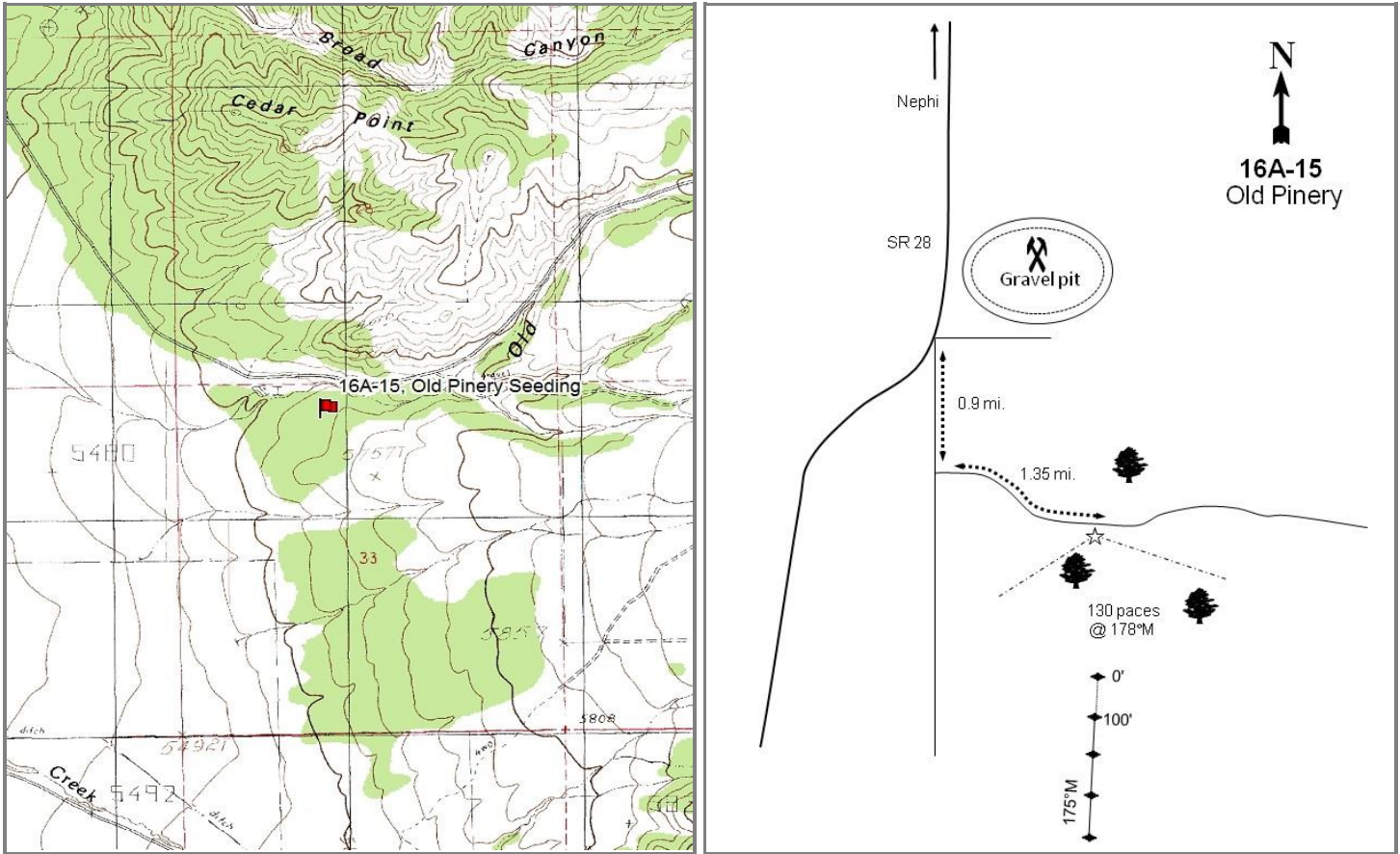
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1997	1800	80	10	63	27	3	0	9	83/97
2002	1900	180	7	58	35	18	5	19	110/128
2007	1580	20	1	53	46	22	1	29	89/112
2012	440	-	0	82	18	0	0	9	42/70
2017	-	-	-	-	-	-	-	-	33/38
<b>Bassia prostrata<sup>Pi</sup> -- (forage kochia)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	40	-	50	50	0	0	50	0	5/16
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	14/23
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	22560	20	30	70	0	0	0	0	24/27
2002	160	20	100	0	0	0	0	0	-/-
2007	9400	1120	1	98	0	0	0	11	23/31
2012	840	-	14	71	14	17	0	17	14/22
2017	1280	80	14	86	0	3	0	0	16/24
<b>Juniperus osteosperma<sup>I</sup> -- (Utah juniper)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	0	100	0	100	0	0	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1997	160	-	13	88	0	0	0	0	-/15
2002	60	-	0	67	33	67	0	0	13/26
2007	60	-	0	100	0	0	0	0	16/36
2012	40	-	0	100	0	0	0	50	10/16
2017	-	-	-	-	-	-	-	-	14/42
<b>Pediocactus simpsonii -- (mountain ball cactus)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	20	-	0	100	0	0	0	0	7/11
2017	-	-	-	-	-	-	-	-	-/-
<b>Purshia stansburiana<sup>P</sup> -- (Stansbury cliffrose)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	164/238
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1997	280	-	29	50	21	36	29	21	121/172
2002	320	-	0	38	63	6	88	25	173/156
2007	260	-	0	23	77	8	69	8	152/158
2012	140	-	0	86	14	57	0	0	68/116
2017	20	-	0	100	0	100	0	0	47/107
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	20/36
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	20/26

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

**Table 16A-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)							
2002	23	-	-	-	-	-	16.0
2007	30	-	10	20	20	50	16.6
2012	6	-	-	60	40	-	24.0

## OLD PINERY - STUDY NO. 16A-15



### Location Information

USGS 7.5 min Map Info	Nephi SW; Township 13S, Range 1E, Section 33
GPS (0' Stake)	NAD 83 UTM ZONE 12, 428825 East 4388668 North

### Transect Information

Browse Tag # (0' Stake)	3960
Transect Bearing	175° 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 southern exit (exit 222) of I-15 in Nephi, proceed south on U.S. 28 for about 1.0 mile to a dirt road just past a gravel pit. Turn left on the dirt road and continue south for 0.9 miles to another intersection. Turn left at the intersection and proceed southeast for 1.35 miles toward Old Pinery Canyon. Stop at the corner of the fence line. From the easternmost of the two middle fenceposts, the 0-foot marker of the baseline is located 130 paces away at an azimuth of 178 degrees magnetic and is marked by browse tag #3960.

**Site Information**

Land Ownership Private  
 Land Administrator Private  
 Allotment No data  
 Elevation 5,670ft (1,728m)  
 Aspect West  
 Slope 5%  
 Sample Dates 05/27/1997, 10/25/2002, 05/31/2007, 05/24/2012, 05/17/2017

**Table 16A-15.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRIDB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	Early 1980s	-
Seeding - Seed Unknown	-	-	Early 1980s	-

**Wildlife Habitat and Vegetation History**

**Table 16A-15.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter

**Table 16A-15.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Annual Grass	No Encroachment
1989	Perennial Grass	Phase I
1997	Perennial Grass/Mountain Big Sagebrush	Phase I
2002	Mountain Big Sagebrush/Bulbous Bluegrass	Phase I
2007	Mountain Big Sagebrush/Bulbous Bluegrass	Phase I
2012	Mountain Big Sagebrush/Bulbous Bluegrass	Phase I
2017	Mountain Big Sagebrush/Bulbous Bluegrass	Phase I

**Site Notes**

A dead deer and cow were observed on site in 2007.

**Soils**

**Table 16A-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
Loam	6.2	37.4	39.7	22.8	1.8	19.2	208.0	0.4	05/27/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation 16 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.

From establishment in 1983 through 1989, annual grasses and perennial grasses (respectively) were the dominant components on this study site (photos). Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), however, has been present through the duration of the study period, and the site transitioned to one dominated by sagebrush in 1997; density has exhibited an overall increase from 1997, although recruitment of young has decreased (Table 16A-15.12, Table 16A-15.13). Cover and abundance of the introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) has also increased each sample year, and it has been a co-dominant site component since 2002 (Table 16A-15.10). Annual forbs have generally been more common than their perennial counterparts, and the introduced weedy species redstem stork's bill (*Erodium cicutarium*) provided over 18% cover in 2017 (Table 16A-15.7, Table 16A-15.11). Utah juniper (*Juniperus osteosperma*) has been observed on site since 1989, and the site has been considered to be within Phase I of woodland succession since that time (photos, Table 16A-15.14).

**Trend Summary Tables**

**Table 16A-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
1997	5.9	0.5	0.1	-	-	-
2002	10.0	0.8	0.8	-	-	-
2007	12.6	0.1	0.8	14.9	0.1	1.6
2012	17.0	0.3	1.0	22.0	0.4	2.2
2017	9.5	0.0	2.2	14.1	-	3.3

**Table 16A-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
1997	305	362	452	133	2.3	14.8	6.1	0.8
2002	300	418	281	64	3.3	31.0	2.6	0.3
2007	382	450	343	71	9.0	33.4	6.8	0.4
2012	198	464	79	69	1.8	44.2	0.4	0.4
2017	317	454	352	100	12.8	41.7	18.6	1.2

**Table 16A-15.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	14.3	4.0	35.8	0.7	1.0	42.7
2002	16.3	1.6	38.3	1.0	1.2	53.6
2007	11.8	3.7	35.5	1.6	1.0	61.1
2012	4.6	3.5	41.5	1.5	0.7	66.5
2017	11.5	6.9	30.9	2.5	1.4	69.3

**Table 16A-15.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1997	18	42	-	-	12
2002	9	58	1	-	12
2007	7	67	4	-	77
2012	4	28	1	-	13
2017	-	31	-	-	26
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	21.8 (53.8)	95.1 (235.0)	-	1.2 (2.9)	-
2007	11.6 (28.7)	89.8 (221.8)	-	-	-
2012	1.5 (3.6)	19.4 (48.0)	-	-	-
2017	4.4 (10.8)	60.3 (149.0)	-	-	-



**Table 16A-15.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency								
1997	122	-	305	-	191	74	-	211	38
2002	116	20	298	3	170	297	5	155	67
2007	96	12	382	-	146	426	-	49	38
2012	11	-	198	4	156	393	-	162	30
2017	28	-	317	2	106	438	-	143	72
year	Average Cover (%)								
1997	5.2	-	2.3	-	3.5	0.9	-	3.8	1.4
2002	6.1	0.0	3.3	0.0	3.8	14.8	0.1	2.8	3.4
2007	1.0	0.1	9.0	-	1.6	29.0	-	0.6	1.2
2012	0.3	-	1.8	0.0	2.8	34.4	-	5.3	1.5
2017	0.9	-	12.8	0.0	1.8	32.4	-	3.1	3.5

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

**Table 16A-15.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria dimorpha (low pussytoes)	Astragalus cibirarius (browse milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Convolvulus arvensis <sup>ai</sup> (field bindweed)	Cymopterus longipes (longstalk springparsley)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron (fleabane)	Eriogonum racemosum (redroot buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)
year	Nested Frequency																
1997	8	50	337	-	9	2	13	345	10	226	2	18	-	80	2	6	184
2002	5	5	147	-	4	3	3	192	3	110	-	8	5	7	-	6	34
2007	5	-	51	-	1	3	1	35	1	118	1	10	147	-	-	1	279
2012	2	-	14	-	3	2	-	-	-	1	-	2	18	2	-	-	22
2017	17	11	57	3	2	-	17	17	0	14	-	14	8	-	-	-	324
year	Average Cover (%)																
1997	0.0	0.1	0.9	-	0.1	0.1	0.0	2.1	0.1	0.8	0.0	0.2	-	0.1	0.0	0.0	1.7
2002	0.0	0.0	0.3	-	0.0	0.0	0.0	1.0	0.1	0.6	-	0.1	0.0	0.0	-	0.0	0.6
2007	0.0	-	0.3	-	0.0	0.0	0.0	0.1	0.0	0.6	0.0	0.0	0.7	-	-	0.0	4.9
2012	0.0	-	0.0	-	0.0	0.0	-	-	-	0.0	-	0.0	0.2	0.0	-	-	0.0
2017	0.1	0.0	0.3	0.0	0.3	-	0.1	0.1	0.0	0.0	-	0.1	0.0	-	-	-	18.2

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

FORB SPECIES	Galium aparine <sup>a</sup> (stickywilly)	Grindelia squarrosa (curlycup gumweed)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Microseris nutans (nodding microseris)	Microsteris gracilis <sup>a</sup> (slender phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sphaeralcea coccinea (scarlet globemallow)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Vicia americana (American vetch)
year	Nested Frequency										
1997	-	3	11	-	67	37	23	-	-	9	11
2002	-	-	-	-	5	26	1	7	-	-	11
2007	1	-	3	-	13	44	1	74	1	3	9
2012	-	-	5	-	-	55	-	42	-	3	9
2017	-	-	22	3	-	44	-	-	-	3	9
year	Average Cover (%)										
1997	-	0.0	0.0	-	0.2	0.1	0.1	-	-	0.1	0.1
2002	-	-	-	-	0.0	0.1	0.0	0.0	-	-	0.1
2007	0.0	-	0.0	-	0.0	0.2	0.0	0.1	0.0	0.0	0.1
2012	-	-	0.0	-	-	0.3	-	0.1	-	0.0	0.0
2017	-	-	0.0	0.0	-	0.5	-	-	-	0.0	0.0

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

**Table 16A-15.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)
year	Line Intercept Cover (%)			
1997	-	-	-	-
2002	-	-	-	-
2007	14.9	0.1	1.6	-
2012	20.6	0.4	2.2	1.4
2017	12.9	-	3.3	1.2
year	Quadrat Cover (%)			
1997	5.5	0.5	0.1	0.4
2002	10.0	0.8	0.8	0.1
2007	12.5	0.1	0.8	0.1
2012	15.8	0.3	1.0	1.3
2017	8.9	0.0	2.2	0.7

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

**Table 16A-15.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

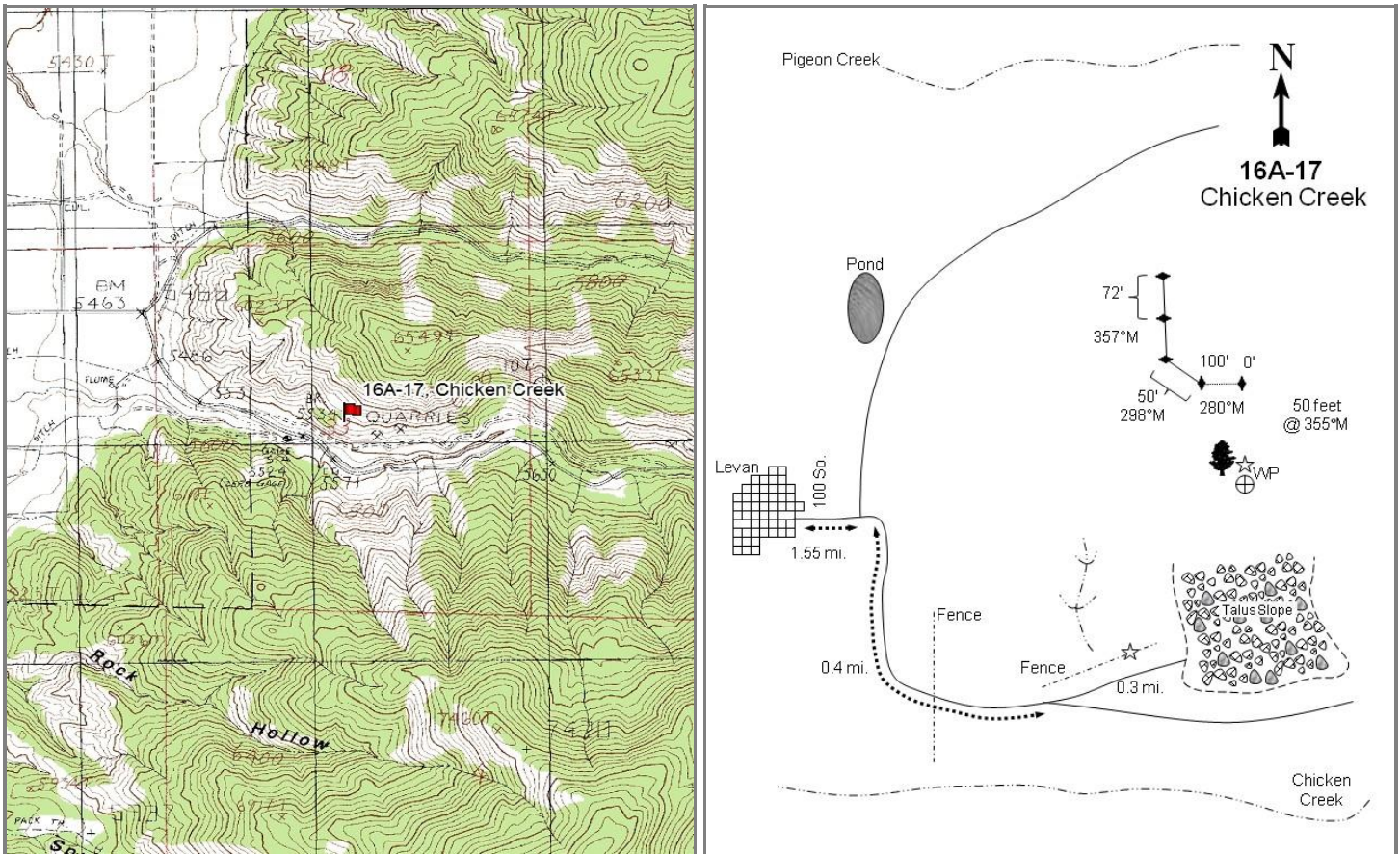
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1997	2040	920	69	30	1	11	10	0	57/103
2002	3340	140	35	60	5	23	8	1	47/70
2007	2700	40	4	92	4	35	17	3	61/89
2012	2220	20	6	85	9	17	5	5	63/96
2017	2460	20	0	49	51	24	2	45	55/90
<b>Ericameria nauseosa ssp. nauseosa var. hololeuca<sup>P</sup> -- (rubber rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	46/66
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	1560	140	18	82	0	0	0	0	18/20
2002	900	-	0	76	24	0	0	4	18/21
2007	1100	60	24	73	4	0	0	0	21/19
2012	320	-	6	94	0	0	0	0	22/23
2017	120	-	50	50	0	0	0	0	19/21
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1997	20	-	100	0	0	0	0	0	-/-
2002	20	-	0	100	0	0	0	0	-/-
2007	20	-	0	100	0	0	0	0	-/-
2012	20	-	0	100	0	0	0	0	342/231
2017	20	-	0	100	0	0	0	0	-/-
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	13/55
2017	-	-	-	-	-	-	-	-	-/-
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1997	60	-	0	100	0	0	100	0	30/118
2002	80	-	0	100	0	0	100	0	45/140
2007	100	-	0	100	0	0	100	0	44/131
2012	60	-	0	100	0	0	100	0	43/143
2017	80	-	0	75	25	0	75	25	47/155

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

**Table 16A-15.14 - 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' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2002	30	-	-	-	-	-	15.8
2007	10	-	-	43	14	43	25.1
2012	10	-	-	25	13	63	24.5
2017	10	-	-	-	43	57	23.7

## CHICKEN CREEK - STUDY NO. 16A-17

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Levan SW; Township 14S, Range 1E, Section 33  
NAD 83 UTM ZONE 12, 429071 East 4378303 North

**Transect Information**

Browse Tag # (0' Stake)	590
Transect Bearing	280° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 71ft), Line 2 (34ft), Line 3 (95ft), Line 4 (59ft)
Belt Marker Placement	No Rebar

**Directions to Site**

From the intersection of 100 South and Main Street in Levan, proceed east on 100 South for 1.55 miles to a fork. Turn right (south) and proceed 0.40 miles toward Chicken Creek to a road to the left. Turn left and proceed east for 0.30 miles to a green steel "T" fencepost on the north side of the road (fencepost may no longer exist). From the fencepost, walk up-slope at an azimuth of 344 degrees true to the eastern most juniper on the ridge; there is a section marker and witness post next to the juniper. The 0-foot baseline stake is located 50 feet away at an azimuth 355 degrees magnetic.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	CHICKEN CREEK C & H
Elevation	5,775ft (1,760m)
Aspect	South
Slope	10-60%
Sample Dates	05/29/1997, 05/22/2002, 05/30/2007, 05/24/2012, 05/25/2017

**Wildlife Habitat and Vegetation History****Table 16A-17.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter

**Table 16A-17.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mixed Mountain Brush	Phase I
1989	Mixed Mountain Brush	Phase I
1997	Mixed Mountain Brush/Annual Grass	Phase I
2002	Mixed Mountain Brush	Phase I
2007	Mixed Mountain Brush/Annual Grass	Phase I
2012	Mixed Mountain Brush	Phase I
2017	Mixed Mountain Brush	Phase I

**Site Notes**

Three live and two dead deer were noted in 2007, and deer bones were seen in 2017.

**Soils****Table 16A-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	6.9	39.4	30.7	29.8	2.8	11.6	192.0	1.2	05/29/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Very Steep Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

Since 1983, this study site has remained dominated by a number of mixed mountain brush species, including alderleaf mountain mahogany (*Cercocarpus montanus*) and Utah serviceberry (*Amelanchier utahensis*), among others. Stansbury cliffrose (*Purshia stansburiana*) and Gambel oak (*Quercus gambelii*) are also common, though decadence of cliffrose has exhibited an overall increase (Table 16A-17.12, Table 16A-17.13). Perennial grasses, mainly bluebunch wheatgrass (*Pseudoroegneria spicata*), have provided a majority of the herbaceous cover in many sample years. However, the introduced annual grass cheatgrass (*Bromus tectorum*) has also been observed each sample year, and annual grasses co-dominated the site in 1997 and 2007 (Table 16A-17.10). Forbs have generally remained rare, though cover of annual forbs increased over 12% between 2012 and 2017. The introduced and noxious annual forb gypsyflower (*Cynoglossum officinale*) was observed in 2012, but was not present in 2017 (Table 16A-17.7, Table 16A-17.11). Utah juniper trees (*Juniperus osteosperma*) have been present throughout the study period, placing the site in Phase I of encroachment (photos, Table 16A-17.12, Table 16A-17.13, Table 16A-17.14).

**Trend Summary Tables****Table 16A-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
1997	5.9	0.1	-	-	-	-
2002	5.1	0.5	1.0	-	-	-
2007	3.8	1.0	2.1	12.2	1.0	4.7
2012	7.7	1.4	2.2	17.7	1.7	7.5
2017	5.3	1.0	1.8	15.9	0.7	6.0

**Table 16A-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
1997	310	168	159	93	10.2	12.7	3.1	1.4
2002	301	143	142	46	8.6	11.7	2.5	0.8
2007	300	174	123	60	10.3	12.8	2.7	1.6
2012	229	178	185	83	6.8	15.8	2.8	2.1
2017	216	179	313	71	7.7	13.5	15.0	1.9

**Table 16A-17.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	8.9	0.3	27.7	26.3	13.5	29.6
2002	5.5	0.1	30.6	25.9	22.5	29.3
2007	3.0	0.1	32.5	22.5	20.3	31.7
2012	2.6	0.0	37.8	26.8	18.4	39.8
2017	2.1	0.3	26.9	33.8	28.0	40.8

**Table 16A-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	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1997	39	2	-
2002	36	-	2
2007	26	3	11
2012	14	-	9
2017	16	1	3
Days Use Per Acre (ha)			
1997	-	-	-
2002	75.1 (185.4)	2.0 (5.0)	-
2007	54.3 (134.1)	-	-
2012	26.2 (64.6)	0.7 (1.7)	-
2017	34.2 (84.4)	-	-



**Table 16A-17.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency				
<i>Bromus arvensis</i> <sup>ai</sup> (field brome)	-	310	-	20	157
<i>Bromus tectorum</i> <sup>ai</sup> (cheatgrass)	7	301	-	17	135
<i>Poa bulbosa</i> <sup>i</sup> (bulbous bluegrass)	-	300	-	29	161
<i>Poa secunda</i> (Sandberg bluegrass)	-	229	2	19	169
<i>Pseudoroegneria spicata</i> (bluebunch wheatgrass)	6	211	8	7	177
year	Average Cover (%)				
1997	-	10.2	-	0.4	12.4
2002	0.0	8.6	-	0.1	11.6
2007	-	10.3	-	0.7	12.2
2012	-	6.8	0.0	0.3	15.5
2017	0.0	7.7	0.0	0.1	13.3

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

**Table 16A-17.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
<i>Allium acuminatum</i> (tapertip onion)	-	-	-	-	-	-	9	24	6	7	18	-	-	-	-	-	21	
<i>Alyssum alyssoides</i> <sup>ai</sup> (pale madwort)	1	-	-	-	-	-	-	12	15	14	3	2	-	2	1	-	8	
<i>Alyssum desertorum</i> <sup>ai</sup> (desert madwort)	1	-	19	-	3	-	-	6	9	8	1	-	2	4	-	8		
<i>Apocynum cannabinum</i> (Indianhemp)	-	-	74	-	5	-	-	52	7	2	2	1	9	1	11	3	15	
<i>Artemisia ludoviciana</i> (white sagebrush)	1	90	162	3	3	0	-	4	15	3	2	4	-	9	-	-	13	
<i>Asclepias asperula</i> (spider milkweed)	Average Cover (%)																	
1997	-	-	-	-	-	-	0.0	0.1	0.0	0.0	0.5	-	-	-	-	-	0.1	
2002	0.0	-	-	-	-	-	-	0.1	0.1	0.1	0.5	0.0	-	0.0	0.0	-	0.0	
2007	0.0	-	0.1	-	0.1	-	-	0.0	0.0	0.1	0.3	-	0.0	0.0	-	-	0.0	
2012	-	-	0.2	-	0.0	-	-	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.4	0.0	
2017	0.0	1.5	5.7	0.2	0.1	0.0	-	0.0	0.0	0.0	0.1	0.0	-	0.0	-	-	0.3	

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

FORB SPECIES	Erigeron divergens <sup>a</sup> (spreading fleabane)	Eriogonum brevicaulis (shortstem buckwheat)	Erodium cicutarium <sup>ii</sup> (redstem stork's bill)	Galium aparine <sup>a</sup> (stickywilly)	Gilia inconspicua <sup>a</sup> (shy gilia)	Hackelia patens (spotted stickseed)	Lactuca serriola <sup>ii</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lathyrus brachycalyx (Bonneville pea)	Lithospermum ruderale (western stone seed)	Machaeranthera canescens (hoary tansyaster)	Phacelia linearis <sup>a</sup> (threadleaf phacelia)	Phlox longifolia (longleaf phlox)	Physalis hederifolia (ivyleaf groundcherry)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>ii</sup> (tall tumblemustard)	Streptanthus cordatus (heartleaf twistflower)
year	Nested Frequency																
1997	-	11	15	70	-	20	6	8	28	-	1	-	23	2	-	40	24
2002	-	5	30	62	6	3	7	25	7	4	-	9	7	-	-	13	19
2007	2	6	22	48	3	14	3	16	12	-	-	-	10	-	10	6	19
2012	11	12	19	67	3	11	30	2	19	-	-	-	14	-	9	4	29
2017	2	1	38	101	-	21	9	25	13	-	2	2	14	-	4	5	8
year	Average Cover (%)																
1997	-	0.5	0.1	2.0	-	0.4	0.0	0.0	0.3	-	0.0	-	0.1	0.0	-	0.2	0.1
2002	-	0.1	0.3	0.9	0.0	0.4	0.0	0.2	0.0	0.1	-	0.0	0.0	-	-	0.1	0.1
2007	0.0	0.1	0.1	1.6	0.0	0.8	0.0	0.2	0.4	-	-	-	0.1	-	0.0	0.1	0.1
2012	0.3	0.8	0.1	1.2	0.0	0.5	0.1	0.0	0.5	-	-	-	0.0	-	0.0	0.0	0.1
2017	0.1	0.0	0.3	6.8	-	1.1	0.0	0.1	0.2	-	0.0	0.0	0.1	-	0.0	0.0	0.1

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

FORB SPECIES	Tragopogon dubius <sup>ii</sup> (yellow salsify)	unknown annual forb <sup>a</sup> (unknown forb)	Veronica biloba <sup>ii</sup> (two-lobed speedwell)
year	Nested Frequency		
1997	0	5	-
2002	-	-	5
2007	0	-	3
2012	7	-	-
2017	-	-	6
year	Average Cover (%)		
1997	0.0	0.0	-
2002	-	-	0.0
2007	0.0	-	0.0
2012	0.0	-	-
2017	-	-	0.0

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

**Table 16A-17.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Cercocarpus montanus <sup>p</sup> (alderleaf mountain mahogany)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Mahonia repens (creeping barberry)	Prunus virginiana <sup>p</sup> (chokecherry)	Purshia stansburiana <sup>p</sup> (Stansbury cliffrose)	Quercus gambelii <sup>p</sup> (Gambel oak)	Rhus glabra <sup>p</sup> (smooth sumac)	Rhus trilobata <sup>p</sup> (skunkbush sumac)
year	Line Intercept Cover (%)											
1997	-	-	-	-	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-	-	-	-	-
2007	0.5	-	0	1.5	0.2	4.7	0.8	-	2	8.2	-	-
2012	0.5	0.3	0.7	0.9	0.1	7.5	1.6	0.3	3.4	11	-	0.6
2017	0.5	-	1.2	0.1	-	6	0.7	-	1.7	12.4	-	-
year	Quadrat Cover (%)											
1997	0.4	-	-	0.9	0.0	-	0.1	0.0	3.0	1.6	0.0	-
2002	-	-	0.4	0.7	0.1	1.0	0.3	-	3.2	0.8	-	-
2007	0.4	-	0.0	0.5	0.0	2.1	1.0	-	1.5	1.3	-	-
2012	0.4	0.0	0.4	0.5	0.1	2.2	1.3	0.0	1.9	3.7	0.0	0.8
2017	1.1	0.1	0.0	1.0	-	1.8	1.0	-	1.9	1.2	-	-

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

**Table 16A-17.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1997	80	-	75	25	0	75	25	0	134/178
2002	60	-	0	0	100	0	100	0	150/162
2007	80	-	50	0	50	25	50	0	98/138
2012	140	-	86	14	0	14	0	0	123/186
2017	80	-	0	100	0	0	50	0	164/180
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
1997	-	-	-	-	-	-	-	-	86/76
2002	-	-	-	-	-	-	-	-	60/74
2007	-	-	-	-	-	-	-	-	76/83
2012	-	-	-	-	-	-	-	-	93/113
2017	20	40	0	0	100	0	100	100	82/89
<b>Cercocarpus montanus<sup>p</sup> -- (alderleaf mountain mahogany)</b>									
1997	20	-	0	100	0	100	0	0	210/192
2002	20	-	0	100	0	0	100	0	182/230
2007	-	-	-	-	-	-	-	-	224/253
2012	60	-	33	67	0	33	0	0	166/222
2017	-	-	-	-	-	-	-	-	168/218
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1997	120	-	17	50	33	33	0	17	68/107
2002	100	-	0	40	60	0	40	0	68/89
2007	80	-	0	25	75	25	0	50	78/111
2012	40	-	0	50	50	50	0	50	71/112
2017	100	-	0	60	40	20	0	40	82/118
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	180	-	22	78	0	0	0	0	22/39
2002	140	-	0	57	43	0	0	14	12/27
2007	40	-	50	50	0	0	0	0	40/69
2012	140	-	0	100	0	0	0	0	34/47
2017	20	-	0	100	0	0	0	0	29/52

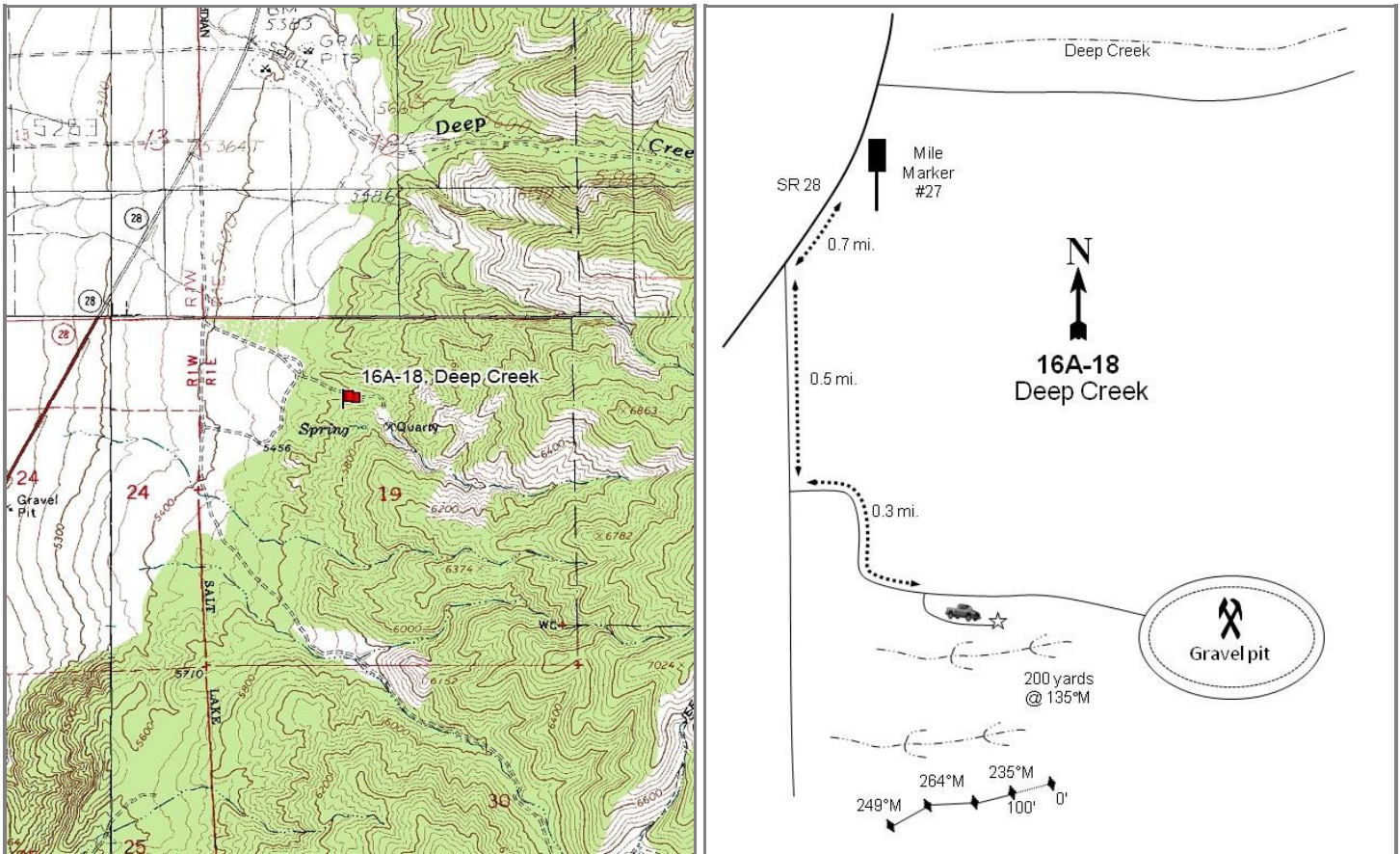
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	0	100	0	0	0	0	-/-
2007	20	-	0	100	0	0	0	0	-/-
2012	20	-	0	100	0	0	0	0	-/-
2017	20	-	0	100	0	0	0	0	-/-
<b>Mahonia repens -- (creeping barberry)</b>									
1997	2740	-	17	83	0	0	0	0	8/12
2002	4840	-	10	87	3	0	0	7	6/9
2007	7300	-	7	93	0	0	0	0	8/12
2012	6140	-	37	63	0	0	0	0	9/13
2017	5100	-	5	95	0	0	0	0	9/14
<b>Prunus virginiana<sup>p</sup> -- (chokecherry)</b>									
1997	300	80	73	20	7	20	13	0	47/41
2002	40	-	0	50	50	50	50	50	15/20
2007	60	-	100	0	0	0	100	0	20/32
2012	320	-	0	100	0	0	0	0	24/32
2017	-	-	-	-	-	-	-	-	24/26
<b>Purshia stansburiana<sup>p</sup> -- (Stansbury cliffrose)</b>									
1997	240	20	0	67	33	25	50	17	132/121
2002	460	-	0	39	61	4	56	22	135/147
2007	320	-	0	50	50	6	75	38	157/167
2012	220	-	9	73	18	9	27	9	150/158
2017	260	-	0	46	54	39	46	39	124/131
<b>Quercus gambelii<sup>p</sup> -- (Gambel oak)</b>									
1997	2060	280	83	18	0	0	0	0	288/356
2002	2180	-	95	5	0	0	0	0	264/166
2007	2900	-	0	99	1	0	0	0	51/39
2012	2240	220	88	13	0	0	0	0	42/41
2017	2760	-	74	23	3	58	0	3	185/157
<b>Rhus glabra<sup>p</sup> -- (smooth sumac)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	223/324
2007	-	-	-	-	-	-	-	-	-/-
2012	20	-	100	0	0	0	0	0	214/217
2017	-	-	-	-	-	-	-	-	-/-
<b>Rhus trilobata<sup>p</sup> -- (skunkbush sumac)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	245/342
2012	-	-	-	-	-	-	-	-	192/313
2017	-	-	-	-	-	-	-	-	166/320

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

**Table 16A-17.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution				Average Diameter (cm)	
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'		>12' (%)
<b>Juniperus osteosperma (Utah juniper)</b>							
2017	7	-	17	33	-	50	34.8

## DEEP CREEK - STUDY NO. 16A-18

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Chriss Canyon NW; Township 15S, Range 1E, Section 19  
NAD 83 UTM ZONE 12, 425690 East 4372188 North

**Transect Information**

Browse Tag # (0' Stake)	508
Transect Bearing	235° 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 post office in Levan (75 N. Main St.), drive south on US-28 for 3.8 miles. Turn left 0.7 miles past mile marker 27 (east then south) and go 0.5 miles to a fork in the road. Take a left (east) at the fork and continue for 0.3 miles to another fork. Take the old road to the right and park when it ends. From here, the 0-foot baseline stake is 200 yards away at an azimuth of 135 degrees magnetic. There are some large boulders around the 100-foot baseline stake.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	DEEP CANYON S & G
Elevation	5,670ft (1,728m)
Aspect	Northwest
Slope	15-25%
Sample Dates	05/29/1997, 10/25/2002, 05/30/2007, 05/30/2012, 05/25/2017

**Wildlife Habitat and Vegetation History****Table 16A-18.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter

**Table 16A-18.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Alderleaf Mountain Mahogany	Phase I
1989	Alderleaf Mountain Mahogany	Phase I
1997	Alderleaf Mountain Mahogany	Phase I
2002	Alderleaf Mountain Mahogany	Phase I
2007	Alderleaf Mountain Mahogany	Phase I
2012	Alderleaf Mountain Mahogany	Phase I
2017	Alderleaf Mountain Mahogany	Phase I

**Site Notes**

The vegetation composition of this site is typical of the west-facing foothills from Levan south to the unit boundary. Several deer carcasses were found in 1989.

**Soils****Table 16A-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	7.2	28.7	19.4	51.8	1.2	6.6	124.8	0.4	05/29/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

Alderleaf mountain mahogany (*Cercocarpus montanus*) has been the dominant browse species on this site since study establishment in 1983, although other preferred browse species such as Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and mormon tea (*Ephedra viridis*) are also present to a lesser extent. Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) trees are scattered throughout the site, and it is considered to be within Phase I of woodland succession (photos, Table 16A-18.4, Table 16A-18.12, Table 16A-18.13, Table 16A-18.14). Although diverse, the herbaceous understory has never been very abundant; perennial grasses -- namely bluebunch wheatgrass (*Pseudoroegneria spicata*) -- have been the most abundant herbaceous component in all sample years (Table 16A-18.7, Table 16A-18.10, Table 16A-18.11).



**Trend Summary Tables****Table 16A-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	8.0	0.4	3.9	-	-	-
2002	10.3	0.2	3.1	-	-	-
2007	6.9	0.2	4.6	9.5	0.5	6.0
2012	12.8	0.2	7.1	13.5	0.2	12.7
2017	9.3	0.7	3.9	14.1	0.6	5.2

**Table 16A-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	120	167	356	204	1.0	7.6	4.0	3.2
2002	39	162	175	180	0.3	3.4	0.9	2.7
2007	193	183	275	157	3.4	7.6	3.7	2.9
2012	58	180	228	174	1.0	6.6	0.9	4.8
2017	16	167	329	190	0.0	6.0	3.5	4.9

**Table 16A-18.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	24.8	0.7	25.8	19.9	8.2	27.7
2002	46.8	0.9	27.6	10.1	7.3	23.4
2007	46.8	1.1	19.0	13.6	7.3	26.8
2012	39.6	1.6	27.7	6.9	8.4	32.1
2017	39.9	3.0	29.7	20.7	6.1	27.9

**Table 16A-18.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit	Domestic Sheep
	Quadrat Frequency				
1997	-	16	2	9	-
2002	-	13	1	15	-
2007	-	30	-	36	-
2012	1	-	-	8	-
2017	1	4	-	5	-
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	-	9.4 (23.2)	-	-	-
2007	-	6.7 (16.6)	-	-	47.6 (117.5)
2012	3.6 (9.0)	4.7 (11.6)	-	-	-
2017	-	2.7 (6.6)	-	-	-

**Table 16A-18.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency							
1997	-	-	120	-	-	-	67	143
2002	-	-	39	-	-	-	73	131
2007	4	4	189	2	-	5	100	134
2012	2	-	58	-	-	2	98	137
2017	16	-	16	2	3	5	78	110
year	Average Cover (%)							
1997	-	-	1.0	-	-	-	1.4	6.2
2002	-	-	0.3	-	-	-	0.3	3.1
2007	0.0	0.0	3.4	0.0	-	0.1	1.4	6.0
2012	0.0	-	1.0	-	-	0.0	1.9	4.7
2017	0.3	-	0.0	0.0	0.0	0.0	0.9	4.7

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

**Table 16A-18.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Astragalus (milkvech)	Calochortus nuttallii (sego lily)	Camelina microcapa <sup>ai</sup> (littletop false flax)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chaetopappa ericoides (rose heath)	Chorispura tenella <sup>ai</sup> (crossflower)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Crepis acuminata (tapertip hawksbeard)	Cryptantha flavocolata (roughseed cryptantha)	Cryptantha gracilis <sup>a</sup> (narrowstem cryptantha)	Cryptantha humilis (roundspike cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)
year	Nested Frequency																
1997	-	5	5	-	10	-	331	-	18	-	5	44	-	-	28	19	-
2002	4	-	6	1	8	-	160	2	12	-	1	16	-	-	12	15	-
2007	3	111	6	8	8	1	233	-	8	30	28	13	-	-	13	31	3
2012	9	189	4	-	-	-	72	-	9	-	10	28	-	-	25	-	-
2017	11	317	1	7	18	2	79	-	16	12	5	24	15	2	1	1	-
year	Average Cover (%)																
1997	-	0.0	0.0	-	0.0	-	3.5	-	0.2	-	0.0	0.5	-	-	0.1	0.0	-
2002	0.0	-	0.0	0.0	0.0	-	0.8	0.0	0.0	-	0.0	0.1	-	-	0.0	0.0	-
2007	0.0	0.4	0.1	0.0	0.0	0.0	3.0	-	0.1	0.1	0.1	0.1	-	-	0.1	0.1	0.0
2012	0.0	0.7	0.0	-	-	-	0.1	-	0.3	-	0.0	0.4	-	-	0.5	-	-
2017	0.1	3.0	0.0	0.0	0.0	0.0	0.2	-	0.5	0.0	0.0	0.3	0.3	0.0	0.0	0.0	-

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

FORB SPECIES	Erigeron pumilus (shaggy fleabane)	Eriogonum brevicaulis (shortstem buckwheat)	Erysimum repandum <sup>ai</sup> (spreading wallflower)	Galium aparine <sup>a</sup> (stickywilly)	Gilia inconspicua <sup>a</sup> (shy gilia)	Hackelia patens (spotted stickseed)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Microsteris gracilis <sup>a</sup> (slender phlox)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Physalis hederifolia (ivyleaf groundcherry)	Physaria acutifolia var. acutifolia (sharpleaf twinpod)	Stenotus acaulis (stemless mock goldenweed)	unknown annual forb <sup>a</sup> (unknown forb)	Veronica biloba <sup>ai</sup> (two-lobe speedwell)
year	Nested Frequency																
1997	2	7	49	17	14	-	-	-	-	6	97	63	1	-	5	8	-
2002	-	7	-	6	32	10	2	-	-	-	111	42	-	-	-	-	-
2007	-	2	-	11	15	-	4	4	-	-	88	53	-	5	3	-	19
2012	-	-	-	6	-	-	1	-	6	-	97	71	-	2	-	-	29
2017	5	8	-	5	9	9	1	-	-	-	98	48	-	3	1	-	39
year	Average Cover (%)																
1997	0.0	0.0	0.1	0.2	0.0	-	-	-	-	0.0	1.9	0.2	0.0	-	0.1	0.1	-
2002	-	0.0	-	0.0	0.1	0.0	0.0	-	-	-	2.3	0.1	-	-	-	-	-
2007	-	0.0	-	0.1	0.0	-	0.0	0.0	-	-	2.1	0.2	-	0.0	0.1	-	0.1
2012	-	-	-	0.0	-	-	0.0	-	0.2	-	3.0	0.2	-	0.0	-	-	0.0
2017	0.0	0.0	-	0.0	0.0	0.1	0.0	-	-	-	3.1	0.4	-	0.0	0.0	-	0.1

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

FORB SPECIES	Zizadenus paniculatus (foothill deathcamas)
year	Nested Frequency
1997	1
2002	-
2007	-
2012	1
2017	5
year	Average Cover (%)
1997	0.0
2002	-
2007	-
2012	0.0
2017	0.0

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

**Table 16A-18.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)											
	year	1997	2002	2007	2012	2017	year	1997	2002	2007	2012	2017
Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	-	-	-	-	-	-	-	-	-	-	-	-
Cercocarpus montanus <sup>p</sup> (alderleaf mountain mahogany)	0.4	4	0.5	5.1	6	-	-	-	-	-	-	-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	0.8	10.3	0.2	2.4	12.5	0.2	-	-	-	-	-	-
Ephedra viridis <sup>p</sup> (mormon tea)	1.1	9.7	0.6	3.3	5	0.2	-	-	-	-	-	-
Juniperus osteosperma <sup>t</sup> (Utah juniper)												
Pinus edulis <sup>t</sup> (twoneedle pinyon)												
Purshia stansburiana <sup>p</sup> (Stansbury cliffrose)												
Quercus gambelii <sup>p</sup> (Gambel oak)												

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

**Table 16A-18.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
1997	300	-	7	60	33	13	0	13	67/74
2002	240	-	0	50	50	58	0	8	66/76
2007	160	-	0	75	25	38	13	13	59/82
2012	180	-	0	78	22	33	11	22	72/98
2017	160	-	0	88	13	0	0	13	74/78
<b>Bassia prostrata<sup>pi</sup> -- (forage kochia)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	130/195
2017	-	-	-	-	-	-	-	-	-/-
<b>Cercocarpus montanus<sup>p</sup> -- (alderleaf mountain mahogany)</b>									
1997	860	-	14	72	14	63	35	2	104/124
2002	1040	-	4	62	35	42	27	10	108/127
2007	740	80	0	32	68	14	73	60	122/158
2012	600	100	20	70	10	57	23	7	102/132
2017	780	2160	23	59	18	10	10	3	101/126
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1997	100	-	0	80	20	0	0	0	26/40
2002	200	-	0	70	30	20	20	0	25/50
2007	140	-	0	57	43	43	57	0	24/43
2012	200	20	20	80	0	10	0	10	41/61
2017	280	20	0	93	7	0	0	7	28/36
<b>Ephedra viridis<sup>p</sup> -- (mormon tea)</b>									
1997	440	-	0	86	14	27	0	5	106/144
2002	700	-	6	66	29	14	0	6	108/135
2007	460	-	17	52	30	13	13	9	110/169
2012	480	20	17	67	17	4	0	17	105/133
2017	460	-	4	83	13	44	0	9	95/112

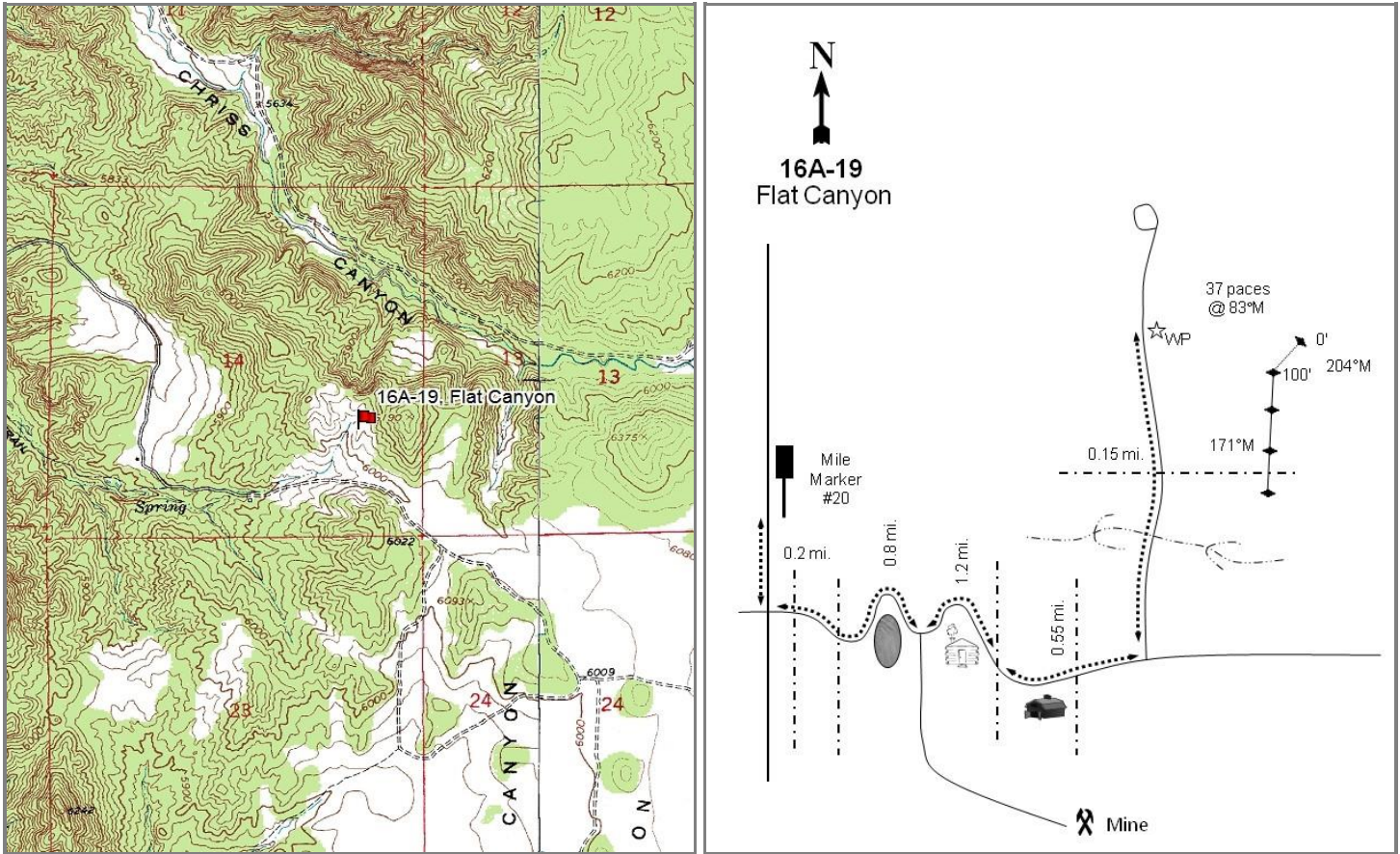
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Gutierrezia sarothrae</b> -- (broom snakeweed)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	18/26
2017	60	-	0	100	0	0	0	0	25/27
<b>Juniperus osteosperma</b> <sup>t</sup> -- (Utah juniper)									
1997	60	-	0	100	0	0	0	0	-/-
2002	60	-	0	100	0	0	0	0	-/-
2007	40	-	0	100	0	0	0	0	-/-
2012	80	-	0	100	0	0	0	0	-/-
2017	40	-	0	100	0	0	0	0	-/-
<b>Pinus edulis</b> <sup>t</sup> -- (twoneedle pinyon)									
1997	-	-	-	-	-	-	-	-	-/-
2002	40	-	0	100	0	0	0	0	-/-
2007	20	-	100	0	0	0	0	0	-/-
2012	20	-	100	0	0	0	0	0	-/-
2017	20	-	0	100	0	0	0	0	-/-
<b>Purshia stansburiana</b> <sup>p</sup> -- (Stansbury cliffrose)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	45/46
2007	-	-	-	-	-	-	-	-	142/115
2012	-	20	0	0	0	0	0	0	158/172
2017	-	-	-	-	-	-	-	-	151/88
<b>Quercus gambelii</b> <sup>p</sup> -- (Gambel oak)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	20	0	0	0	0	0	0	-/-
2012	20	-	100	0	0	0	0	0	-/-

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

**Table 16A-18.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
<b>Juniperus osteosperma</b> (Utah juniper)							
2002	63	-	-	-	-	-	27.9
2007	53	-	18	29	35	18	33.9
2012	51	-	11	11	22	56	25.3
2017	56	-	22	22	17	39	29.0
<b>Pinus edulis</b> (twoneedle pinyon)							
2002	2	-	-	-	-	-	11.3
2007	5	-	50	-	25	25	11.0
2012	7	-	50	-	-	50	12.5
2017	7	-	33	50	-	17	10.0

## FLAT CANYON - STUDY NO. 16A-19



### Location Information

USGS 7.5 min Map Info	Skinner Peaks SE; Township 16S, Range 1W, Section 14
GPS (0' Stake)	NAD 83 UTM ZONE 12, 423841 East 4363153 North

### Transect Information

Browse Tag # (0' Stake)	9084
Transect Bearing	204° 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 Levan, drive south on Highway 28 to 0.2 miles south of mile marker #20. Turn left (east) and go 0.8 miles to a fork. Keep left at the fork and continue for 1.2 miles to an old fence by an old cabin where the road makes a 90 degree turn to the east. Continue up the main road for 0.55 miles to a faint road, which turns off to the left and goes down into the sagebrush. Follow this road for 0.15 miles to a witness post on the right (east) side of the road. From here, walk up the hill for about 37 paces at a bearing of 83 degrees magnetic to the 0-foot baseline stake, which is marked with browse tag #9084.



**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	SALT CREEK
Elevation	6,040ft (1,841m)
Aspect	Southwest
Slope	20-30%
Sample Dates	05/21/1997, 10/25/2002, 05/30/2007, 05/30/2012, 05/25/2017

**Table 16A-19.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Aerial Before	Chriss Creek PJ Removal Phase 2	2223	October 2012	333
Mechanical - Bullhog	Chriss Creek PJ Removal Phase 2	2223	December 2012-March 2013	333

**Table 16A-19.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Chriss Creek PJ Removal - Phase II			Aerial	Oct 2012	500
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	1.00	0.94
G	Dactylis glomerata	Orchardgrass	Paiute	1.00	0.95
G	Elymus lanceolatus	Thickspike Wheatgrass	Critana	1.00	0.88
G	Leymus cinereus	Great Basin Wildrye	Trailhead	1.00	0.92
G	Psathyrostachys juncea	Russian Wildrye		1.00	0.75
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	P-7	2.00	1.79
F	Achillea millefolium	Western Yarrow	Eagle	0.05	0.04
F	Linum perenne	Blue Flax	Appar	0.15	0.13
F	Medicago sativa	Alfalfa	Ladak DL	0.85	0.79
F	Medicago sativa	Alfalfa	Ladak +	0.15	0.14
F	Onobrychis viciifolia	Sainfoin	Eski	1.00	0.78
F	Sanguisorba minor	Small Burnet	Delar	1.00	0.89

**Wildlife Habitat and Vegetation History**

**Table 16A-19.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter

**Table 16A-19.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Wyoming Big Sagebrush/Antelope Bitterbrush	Phase I
1997	Wyoming Big Sagebrush/Antelope Bitterbrush	Phase I
2002	Wyoming Big Sagebrush/Antelope Bitterbrush	Phase I transitioning to Phase II
2007	Wyoming Big Sagebrush/Antelope Bitterbrush/Annual Grass	Phase I transitioning to Phase II
2012	Wyoming Big Sagebrush/Antelope Bitterbrush	Phase I transitioning to Phase II
2017	Wyoming Big Sagebrush/Antelope Bitterbrush/Annual Grass	Phase I

**Site Notes**

Livestock use was noted in 2017.

**Soils**

**Table 16A-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 Loam	7.2	70.4	15.8	13.8	1.6	4.4	153.6	0.5	05/21/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Gravelly Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R047XA306UT
States and Transitions	No state and transition model is available for this ecological site.

Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and antelope bitterbrush (*Purshia tridentata*) have comprised a majority of the browse component since 1989. In addition, Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) are scattered throughout the site. Prior to a bullhog and seeding treatment in late 2012/early 2013 (Table 16A-19.1), the site was considered to be within Phase I transitioning to Phase II of woodland succession. The treatment removed much of the tree cover, and the site is currently in Phase I of encroachment (photos, Table 16A-19.4, Table 16A-19.12, Table 16A-19.13, Table 16A-19.14).

Perennial grasses, mainly bluebunch wheatgrass (*Pseudoroegneria spicata*), and the introduced annual grass species cheatgrass (*Bromus tectorum*) have contributed a majority of the herbaceous cover in most sample years since 1997; annual grasses were a co-dominant site component in 2007 and 2017 (Table 16A-19.7, Table 16A-19.10). Although diverse, annual and perennial forbs have remained rare (Table 16A-19.11).

**Trend Summary Tables**

**Table 16A-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	11.8	0.5	2.9	-	-	-
2002	15.0	0.4	6.5	-	-	-
2007	11.7	0.0	6.6	10.5	0.1	16.9
2012	13.1	0.2	5.0	16.9	0.2	18.3
2017	11.4	0.2	0.4	18.0	0.2	-

**Table 16A-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	319	213	82	110	5.8	6.2	0.3	1.0
2002	244	221	62	56	1.3	10.0	0.2	0.3
2007	428	214	224	47	12.3	9.2	1.5	0.5
2012	285	247	330	44	4.1	9.5	1.8	0.4
2017	393	206	345	63	13.6	8.9	5.2	1.4

**Table 16A-19.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	28.3	0.9	32.3	15.7	7.5	26.8
2002	30.1	0.8	35.2	11.8	9.2	31.7
2007	23.3	0.3	33.1	14.0	7.9	37.2
2012	24.7	1.5	33.2	8.8	6.7	38.5
2017	23.7	0.6	50.2	10.4	5.5	35.9

**Table 16A-19.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1997	-	28	1	-	2
2002	2	29	-	1	23
2007	2	13	1	-	59
2012	-	4	-	-	16
2017	2	9	-	-	14
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	2.2 (5.4)	44.2 (109.2)	-	-	-
2007	2.2 (5.4)	16.8 (41.4)	2.7 (6.6)	-	-
2012	-	6.0 (14.9)	-	-	-
2017	-	7.4 (18.2)	-	-	-

**Table 16A-19.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency								
1997	11	-	319	6	28	-	-	74	138
2002	0	21	241	-	44	-	-	62	167
2007	16	-	428	12	41	-	-	80	132
2012	2	-	285	-	59	-	2	131	119
2017	12	23	370	-	29	2	-	69	157
year	Average Cover (%)								
1997	0.1	-	5.8	0.2	1.3	-	-	1.2	3.4
2002	0.0	0.1	1.2	-	1.8	-	-	1.5	6.6
2007	0.5	-	12.3	0.1	1.8	-	-	1.3	5.5
2012	0.0	-	4.1	-	2.3	-	0.0	3.6	3.6
2017	0.5	0.8	12.8	-	0.8	0.0	-	1.1	6.4

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

**Table 16A-19.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Astragalus eurekaensis (Eureka milkvetch)	Astragalus lentiginosus (freckled milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littledod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chorispota tenella <sup>ai</sup> (crossflower)	Cirsium undulatum <sup>n</sup> (wavyleaf thistle)	Collinsia parviflora <sup>n</sup> (maiden blue eyed Mary)	Convolvulus arvensis <sup>ni</sup> (field bindweed)	Crepis acuminata (tapertip hawksbeard)
year	Nested Frequency																
1997	-	21	-	1	-	-	4	42	-	2	-	24	5	5	-	-	-
2002	-	13	2	29	1	6	5	18	-	-	-	2	3	-	3	-	0
2007	-	8	-	194	-	6	6	6	2	-	8	-	-	-	2	-	0
2012	-	-	-	324	-	9	6	-	-	1	3	9	-	3	1	-	4
2017	10	9	-	338	-	7	6	19	-	2	-	1	-	4	2	5	0
year	Average Cover (%)																
1997	-	0.3	-	0.0	-	-	0.1	0.2	-	0.1	-	0.1	0.0	0.0	-	-	-
2002	-	0.1	0.0	0.0	0.0	0.0	0.0	0.1	-	-	-	0.0	0.0	-	0.0	-	0.0
2007	-	0.0	-	1.2	-	0.0	0.2	0.0	0.0	-	0.0	-	-	-	0.0	-	0.0
2012	-	-	-	1.5	-	0.0	0.1	-	-	0.0	0.0	0.0	-	0.1	0.0	-	0.0
2017	0.2	0.2	-	4.8	-	0.1	0.2	0.1	-	0.1	-	0.0	-	0.0	0.0	0.0	0.0

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

FORB SPECIES	Cryptantha humilis (roundspike cryptantha)	Cymopterus longipes (longstalk springparsley)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Eriogonum racemosum (redroot buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Erysimum (wallflower)	Gaium aparine <sup>a</sup> (stickywilly)	Gilia inconspicua <sup>a</sup> (shy gilia)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	
year	Nested Frequency																	
1997	16	-	-	-	3	-	2	-	-	54	5	-	0	-	7	9	3	
2002	-	-	8	-	7	2	4	-	1	11	-	-	-	3	-	7	-	
2007	10	-	14	1	2	-	11	-	2	19	2	13	-	1	3	7	-	
2012	4	-	-	2	3	3	8	3	-	-	3	2	2	2	3	1	-	
2017	4	3	12	-	2	-	19	-	1	18	17	1	2	-	2	-	-	
year	Average Cover (%)																	
1997	0.1	-	-	-	0.0	-	0.0	-	-	0.1	0.0	-	0.0	-	0.2	0.0	0.0	
2002	-	-	0.0	-	0.0	0.0	0.0	-	0.0	0.0	-	-	-	0.0	-	0.0	-	
2007	0.0	-	0.0	0.0	0.0	-	0.1	-	0.0	0.1	0.0	0.1	-	0.0	0.2	0.0	-	
2012	0.0	-	-	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.2	0.0	-	
2017	0.2	0.0	0.0	-	0.0	-	0.3	-	0.0	0.1	0.0	0.0	0.0	-	0.1	-	-	

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

FORB SPECIES	Sanguisorba minor <sup>i</sup> (small burnet)	Streptanthus cordatus (heartleaf twistflower)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Veronica biloba <sup>ai</sup> (twolobe speedwell)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency				
1997	-	5	9	-	-
2002	-	1	-	2	3
2007	-	2	2	2	-
2012	-	-	1	1	-
2017	1	2	2	-	7
year	Average Cover (%)				
1997	-	0.0	0.1	-	-
2002	-	0.0	-	0.0	0.0
2007	-	0.0	0.1	0.0	-
2012	-	-	0.0	0.0	-
2017	0.0	0.0	0.0	-	0.1

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

**Table 16A-19.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ephedra viridis <sup>p</sup> (mormon tea)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>i</sup> (Utah juniper)	Opuntia polyacantha (plains pricklypear)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Quercus gambelii <sup>p</sup> (Gambel oak)
year	Line Intercept Cover (%)							
1997	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-
2007	6.1	0.1	-	-	16.9	-	4.4	-
2012	7.7	0.2	-	-	18.3	-	9	0.2
2017	7.2	-	-	0.2	-	-	10.8	-
year	Quadrat Cover (%)							
1997	8.8	0.1	-	0.3	2.9	0.0	3.0	-
2002	10.9	0.1	0.0	0.3	6.5	-	4.1	-
2007	7.2	0.0	0.0	0.0	6.6	-	4.5	0.0
2012	5.9	0.0	0.0	0.1	5.0	-	7.2	0.0
2017	3.8	0.0	0.0	0.2	0.4	-	7.2	0.4

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

**Table 16A-19.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
1997	1220	120	13	72	15	10	0	2	56/89
2002	1280	-	6	72	22	33	2	11	49/75
2007	1340	-	3	55	42	31	13	21	68/86
2012	1080	20	2	69	30	2	0	11	63/87
2017	1040	280	12	73	15	10	0	12	61/90
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	140	-	29	71	0	0	0	0	32/51
2002	120	-	17	50	33	0	0	0	24/34
2007	120	-	0	67	33	0	0	17	19/22
2012	120	-	50	50	0	0	0	0	33/37
2017	-	20	0	0	0	0	0	0	32/55
<b>Ephedra viridis<sup>p</sup> -- (mormon tea)</b>									
1997	-	-	-	-	-	-	-	-	45/34
2002	-	-	-	-	-	-	-	-	41/32
2007	-	-	-	-	-	-	-	-	109/138
2012	60	-	0	67	33	0	67	33	91/116
2017	-	-	-	-	-	-	-	-	47/68
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	71/84
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	59/43
2017	-	-	-	-	-	-	-	-	42/46
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	1400	180	83	17	0	0	0	0	25/36
2002	400	-	0	25	75	0	0	75	11/14
2007	80	20	50	50	0	0	0	0	30/28
2012	120	-	0	100	0	0	0	0	23/37
2017	200	-	20	80	0	0	0	0	29/40

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 (%)				
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1997	20	-	0	100	0	0	0	0	- / -
2002	80	-	0	100	0	0	0	0	- / -
2007	100	20	20	80	0	0	0	0	- / -
2012	100	20	0	100	0	0	0	0	- / -
2017	120	-	83	17	0	0	0	0	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1997	80	-	0	100	0	0	0	0	7/25
2002	-	-	-	-	-	-	-	-	- / -
2007	100	-	20	80	0	0	0	0	8/18
2012	60	-	0	100	0	0	0	0	10/14
2017	20	-	0	100	0	0	0	0	6/10
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1997	600	-	17	80	3	67	27	0	63/131
2002	620	-	3	84	13	23	45	10	57/150
2007	620	-	3	77	19	23	71	13	63/154
2012	940	-	0	98	2	34	0	0	76/144
2017	1180	-	0	97	3	46	24	0	60/122
<b>Quercus gambelii<sup>p</sup> -- (Gambel oak)</b>									
1997	-	-	-	-	-	-	-	-	- / -
2002	20	-	0	100	0	0	0	0	- / -
2007	20	-	100	0	0	0	0	0	- / -
2012	20	-	100	0	0	0	0	0	223/253
2017	40	-	0	100	0	0	0	0	42/37

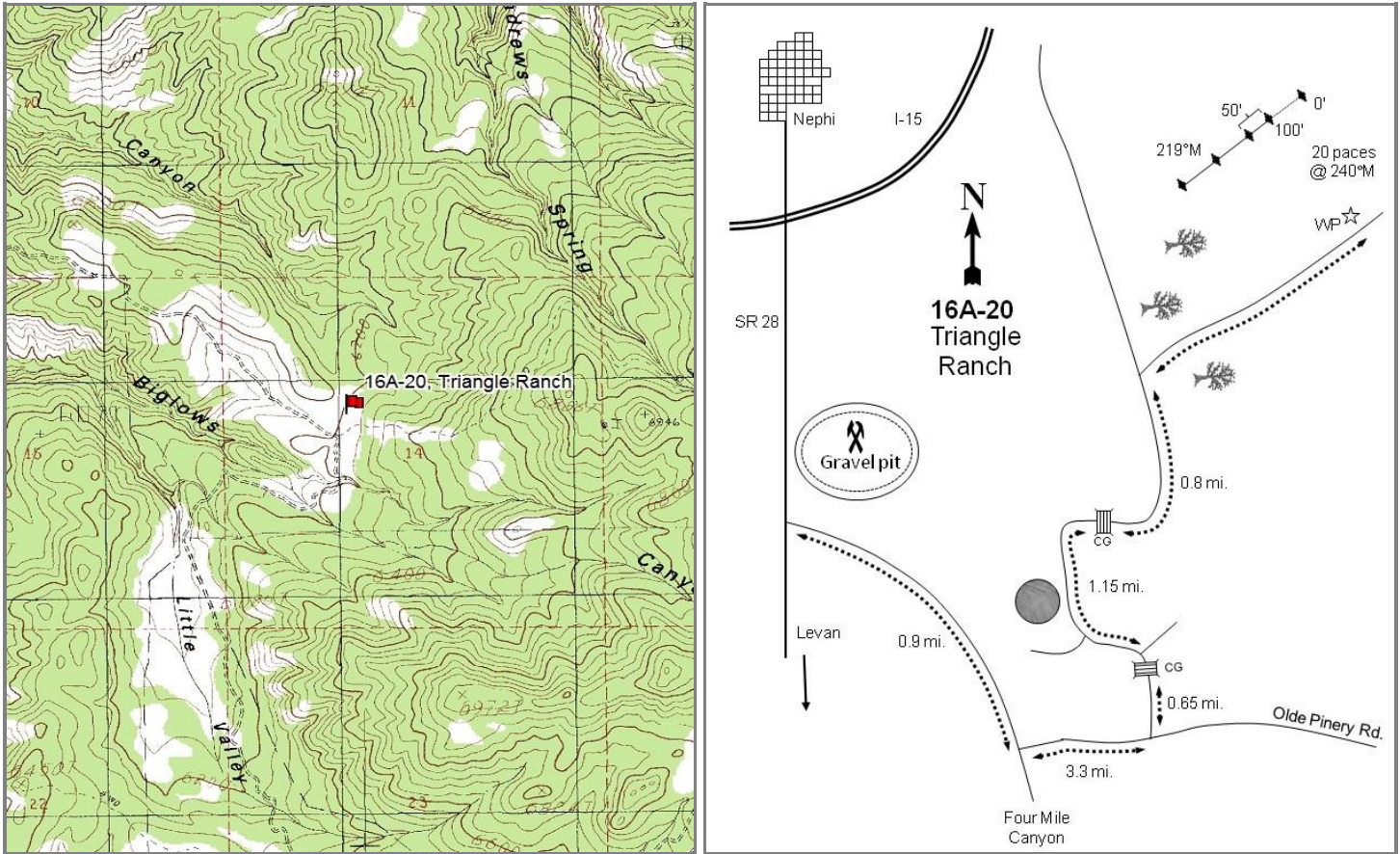
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 16A-19.14 - 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' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2002	43	-	-	-	-	-	17.6
2007	35	6	6	18	41	29	22.4
2012	41	-	17	28	17	39	17.7
2017	31	7	47	27	-	20	14.1
<b>Pinus edulis (twoneedle pinyon)</b>							
2002	14	-	-	-	-	-	13.0
2007	2	-	-	-	-	100	20.0



## TRIANGLE RANCH - STUDY NO. 16A-20



### Location Information

USGS 7.5 min Map Info	Nephi SE; Township 13S, Range 1E, Section 14
GPS (0' Stake)	NAD 83 UTM ZONE 12, 431970 East 4393043 North

### Transect Information

Browse Tag # (0' Stake)	N/A
Transect Bearing	256° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 2: No Rebar, Belt 5: 4ft, Line 2: 50ft Long

### Directions to Site

Just south of Nephi on Highway 28, turn south past the gravel pit onto a graded road. Drive for 0.9 miles to a fork. Bear left on the Old Pinery Road and proceed for 3.3 miles to an intersection. Turn left here and go 0.65 miles to a cattle guard at the top of the hill, then drive through Little Valley 1.1 miles to a gate at the north end of the valley. Continue for 0.05 more miles to a cattle guard. Proceed up the jeep trail 0.8 miles to a fork in a chained area. Take the right fork and proceed for 0.05 miles to the witness post on the left (north) side of the road. From the witness post, walk for 20 paces at 341 degrees magnetic to the 0-foot baseline stake.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,200ft (1,890m)
Aspect	West
Slope	15%
Sample Dates	05/27/1997, 12/13/2002, 05/31/2007, 05/29/2012, 05/18/2017

**Table 16A-20.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Dribbler	Triangle Ranch WMA Bullhog Project	3447	Spring 2016	302
Mechanical - Bullhog	Triangle Ranch WMA Bullhog Project	3447	July 2015-April 2016	302
Chaining - Chain Unknown	-	-	Early 1970s	-
Seeding - Seed Unknown	-	-	Early 1970s	-

**Wildlife Habitat and Vegetation History**

**Table 16A-20.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Moose	substantial	year-long

**Table 16A-20.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Mountain Big Sagebrush	Phase I
1997	Mountain Big Sagebrush	Phase I
2002	Mountain Big Sagebrush/Bulbous Bluegrass	Phase I
2007	Mountain Big Sagebrush/Bulbous Bluegrass	Phase I
2012	Mountain Big Sagebrush/Bulbous Bluegrass	Phase I
2017	Perennial Grass/Bulbous Bluegrass/Mountain Big Sagebrush	Phase I

**Site Notes**

No Notes

**Soils**

**Table 16A-20.5 - 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	6.2	42.0	31.4	26.6	1.9	17.6	185.6	0.4	05/27/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

From study establishment in 1989, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been the dominant browse species on this site. Utah juniper (*Juniperus osteosperma*) trees have also been present throughout the duration of the study, although both cover and density decreased in 2017 following a bullhog treatment (Table 16A-20.1); the study site has been considered to be in Phase I of woodland succession in all study years (photos, Table 16A-20.4, Table 16A-20.12, Table 16A-20.13, Table 16A-20.14). The herbaceous understory has remained very abundant and diverse, with perennial grasses, including the introduced species smooth brome (*Bromus inermis*), intermediate wheatgrass (*Thinopyrum intermedium*), and orchardgrass (*Dactylis glomerata*), as the most abundant component in all sample years. However, the introduced species bulbous bluegrass (*Poa bulbosa*) has contributed the most cover of any one perennial grass species since 2002, and has been a co-dominant site component since 2002. Forbs have remained rare in comparison (Table 16A-20.7, Table 16A-20.10, Table 16A-20.11).

**Trend Summary Tables**

**Table 16A-20.6 - 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	12.8	0.0	1.1	-	-	-
2002	15.0	0.3	3.0	-	-	-
2007	10.2	0.5	4.7	8.1	0.1	0.7
2012	9.6	0.0	4.3	12.6	0.1	6.9
2017	7.0	0.0	-	6.0	0.1	0.2

**Table 16A-20.7 - 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	78	448	304	164	0.4	26.0	2.4	3.3
2002	56	422	245	157	0.1	29.7	1.2	3.7
2007	76	453	161	139	0.8	45.3	1.4	4.1
2012	8	463	62	138	0.0	42.3	0.3	3.3
2017	30	441	254	192	0.2	51.6	3.8	7.2

**Table 16A-20.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	12.8	0.1	50.8	1.1	0.2	47.7
2002	19.0	0.2	42.6	1.8	0.2	55.0
2007	12.4	0.2	39.8	2.4	0.1	60.1
2012	9.6	0.1	45.0	1.5	0.1	60.3
2017	9.5	0.0	58.8	1.8	0.1	63.2

**Table 16A-20.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
1997	7	-	-	-	2
2002	5	9	-	-	8
2007	2	11	1	-	13
2012	4	2	-	-	16
2017	1	6	-	-	15
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	4.4 (10.8)	35.5 (87.7)	-	-	-
2007	4.4 (10.8)	40.2 (99.3)	-	-	-
2012	3.6 (9.0)	4.7 (11.6)	-	8.7 (21.5)*	-
2017	8.7 (21.5)	10.0 (24.8)	-	-	-

\*Pellets per acre (ha)

**Table 16A-20.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Dactylis glomerata <sup>i</sup> (orchardgrass)	Festuca idahoensis (Idaho fescue)	Leymus cinereus (basin wildrye)	Leymus salinus (saline wildrye)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency														
1997	18	-	43	78	91	102	1	6	164	77	1	218	66	-	127
2002	15	-	56	56	66	95	4	-	81	223	-	133	52	-	136
2007	13	26	61	58	82	128	6	2	81	304	-	52	37	1	113
2012	16	-	85	8	94	159	12	2	81	318	8	58	34	6	110
2017	7	-	91	30	80	96	25	-	55	362	5	30	62	1	153
year	Average Cover (%)														
1997	0.8	-	1.2	0.4	2.3	4.0	0.0	0.8	1.1	2.3	0.0	8.1	1.2	-	4.2
2002	0.4	-	2.7	0.1	3.1	6.1	0.8	-	0.8	7.9	-	3.6	0.8	-	3.5
2007	0.4	0.2	3.9	0.6	6.3	11.0	0.5	0.0	0.8	13.8	-	1.8	0.8	0.0	6.0
2012	0.5	-	3.6	0.0	4.9	8.5	1.1	0.1	1.2	14.9	0.1	0.7	0.5	0.2	5.9
2017	0.7	-	4.2	0.2	5.7	4.3	1.5	-	1.1	21.6	0.0	0.3	1.9	0.0	10.4

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

**Table 16A-20.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum alyssoides <sup>ai</sup> (pale madwort)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria parvifolia (small-leaf pussytoes)	Arabis (rockcress)	Astragalus cibirarius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Balsamorhiza sagittata (arrow/leaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littlepod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Crepis acuminata (tapertip hawksbeard)	Cymopterus (springparsley)
year	Nested Frequency																
1997	98	-	41	6	10	68	7	3	10	-	-	117	0	217	7	12	4
2002	61	-	98	-	2	86	2	4	15	-	-	51	-	190	9	34	8
2007	30	-	76	-	-	72	0	-	10	2	-	30	-	70	-	31	6
2012	24	-	14	-	-	83	2	0	-	-	3	1	1	10	-	44	6
2017	51	12	150	3	-	108	8	-	11	2	-	10	3	68	11	44	1
year	Average Cover (%)																
1997	0.8	-	0.1	0.0	0.0	1.8	0.1	0.0	0.0	-	-	0.3	0.0	0.6	0.1	0.1	0.0
2002	0.3	-	0.3	-	0.0	2.1	0.2	0.0	0.0	-	-	0.1	-	0.6	0.0	0.7	0.0
2007	0.2	-	0.2	-	-	2.4	0.0	-	0.0	0.0	-	0.1	-	0.2	-	0.8	0.0
2012	0.1	-	0.0	-	-	2.5	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	0.5	0.0
2017	0.3	0.0	2.1	0.0	-	4.3	0.2	-	0.1	0.0	-	0.0	0.2	0.4	0.0	1.4	0.0

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

FORB SPECIES	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium aparine <sup>a</sup> (stickywilly)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Linum perenne <sup>i</sup> (blue flax)	Medicago sativa <sup>i</sup> (alfalfa)	Microseris nutans (nodding microseris)	Microsteris gracilis <sup>a</sup> (slender phlox)	Penstemon (beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sphaeralcea coccinea (scarlet globemallow)
year	Nested Frequency																
1997	3	69	3	6	-	28	2	14	21	-	-	-	-	21	8	-	9
2002	-	21	1	6	-	-	-	-	6	-	-	22	2	21	4	-	3
2007	2	27	6	6	-	29	1	-	0	1	-	5	-	24	-	1	5
2012	-	6	2	3	-	10	3	-	7	-	-	-	-	7	-	2	3
2017	-	22	-	5	2	20	69	8	6	-	16	18	-	11	-	-	1
year	Average Cover (%)																
1997	0.0	0.2	0.0	0.1	-	0.5	0.0	0.0	0.1	-	-	-	-	0.0	0.0	-	0.0
2002	-	0.1	0.0	0.0	-	-	-	-	0.0	-	-	0.0	0.0	0.0	0.0	-	0.0
2007	0.0	0.1	0.0	0.1	-	0.8	0.0	-	0.1	0.0	-	0.0	-	0.1	-	0.0	0.0
2012	-	0.0	0.0	0.0	-	0.0	0.0	-	0.0	-	-	-	-	0.0	-	0.0	0.0
2017	-	0.1	-	0.0	0.0	0.3	0.3	0.1	0.1	-	0.1	0.0	-	0.1	-	-	0.0

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

FORB SPECIES	Symphoricarum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	unknown annual forb <sup>a</sup> (unknown forb)	Vicia americana (American vetch)	Viola (violet)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency						
1997	-	1	60	24	-	5	6
2002	4	-	14	-	-	1	7
2007	5	-	6	-	3	0	5
2012	-	-	18	-	2	8	6
2017	-	-	24	-	9	5	6
year	Average Cover (%)						
1997	-	0.0	0.6	0.1	-	0.0	0.0
2002	0.1	-	0.1	-	-	0.0	0.1
2007	0.2	-	0.0	-	0.1	0.0	0.1
2012	-	-	0.2	-	0.0	0.0	0.0
2017	-	-	0.2	-	0.5	0.0	0.1

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

**Table 16A-20.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)					
	year	1997	2002	2007	2012	2017
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	-	-	-	-	-	-
Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	-	-	-	-	-	-
Gutierrezia sarothrae (broom snakeweed)	7.8	0.3	0.1	0.7	-	-
Juniperus osteosperma <sup>i</sup> (Utah juniper)	9.5	-	0.1	6.9	-	3.1
Purshia tridentata <sup>p</sup> (antelope bitterbrush)	4.7	-	0.1	0.2	-	1.3
Quercus gambelii <sup>p</sup> (Gambel oak)	-	-	-	-	-	-

year	Quadrat Cover (%)					
	1997	2002	2007	2012	2017	
1997	12.0	0.1	0.0	1.1	0.1	0.6
2002	13.7	0.7	0.3	3.0	-	0.6
2007	9.2	0.2	0.5	4.7	-	0.8
2012	8.9	-	0.0	4.3	-	0.8
2017	6.0	-	0.0	0.0	-	1.0

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

**Table 16A-20.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1997	-	-	-	-	-	-	-	-	82/76
2002	-	-	-	-	-	-	-	-	98/104
2007	-	-	-	-	-	-	-	-	81/90
2012	-	-	-	-	-	-	-	-	88/74
2017	-	-	-	-	-	-	-	-	87/93
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1997	3180	140	28	65	8	16	3	5	67/96
2002	2900	20	10	61	29	26	0	11	64/93
2007	2320	-	6	59	35	27	28	28	67/98
2012	1940	-	14	63	23	17	1	18	64/83
2017	2380	1100	48	37	15	6	0	13	51/73
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	27/38
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	49/47
2017	20	-	0	100	0	0	0	0	21/34
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1997	140	-	29	57	14	0	0	14	83/72
2002	140	-	0	43	57	71	0	0	68/72
2007	80	-	0	0	100	50	25	75	76/78
2012	20	-	100	0	0	0	0	0	64/63
2017	-	-	-	-	-	-	-	-	34/40
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	240	20	42	58	0	0	0	0	11/9
2002	1320	-	21	73	6	0	0	5	11/16
2007	520	20	4	77	19	0	0	4	18/20
2012	80	-	50	50	0	0	0	0	15/18
2017	320	40	13	88	0	0	0	0	16/24

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1997	40	-	100	0	0	0	0	0	- / -
2002	160	-	0	100	0	0	0	0	- / -
2007	160	-	25	75	0	0	0	0	- / -
2012	120	-	50	50	0	0	0	0	- / -
2017	-	-	-	-	-	-	-	-	- / -
<b>Peraphyllum ramosissimum<sup>p</sup> -- (wild crab apple)</b>									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	130/163
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	163/161
2017	-	-	-	-	-	-	-	-	173/176
<b>Purshia stansburiana<sup>p</sup> -- (Stansbury cliffrose)</b>									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	20	-	100	0	0	0	0	0	101/131
2017	-	-	-	-	-	-	-	-	59/81
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1997	40	-	0	100	0	0	100	0	59/83
2002	20	-	0	100	0	0	0	0	49/129
2007	-	-	-	-	-	-	-	-	77/99
2012	-	-	-	-	-	-	-	-	76/238
2017	-	-	-	-	-	-	-	-	79/120
<b>Quercus gambelii<sup>p</sup> -- (Gambel oak)</b>									
1997	-	-	-	-	-	-	-	-	- / -
2002	300	-	0	100	0	53	0	0	137/91
2007	220	-	9	73	18	0	0	27	- / -
2012	160	-	25	75	0	0	0	25	109/90
2017	120	-	33	67	0	67	0	0	74/91
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	143/160
2017	-	-	-	-	-	-	-	-	54/61

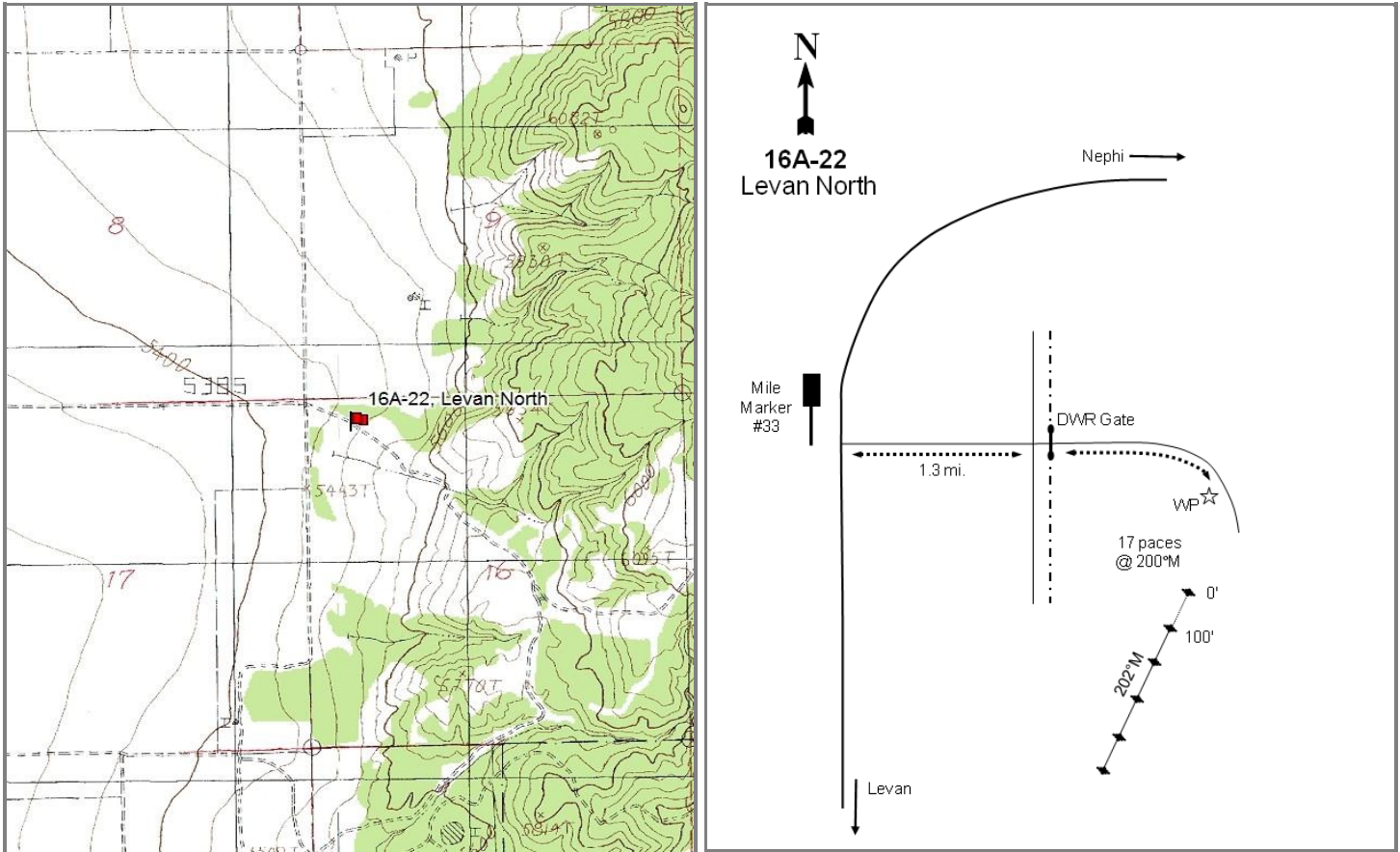
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 16A-20.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2002	110	-	-	-	-	-	10.7
2007	117	5	20	25	25	25	10.7
2012	131	-	20	10	30	40	12.7
2017	10	-	100	-	-	-	31.0



## LEVAN NORTH - STUDY NO. 16A-22



### Location Information

USGS 7.5 min Map Info	Levan NW; Township 14S, Range 1E, Section 16
GPS (0' Stake)	NAD 83 UTM ZONE 12, 428447 East 4383802 North

### Transect Information

Browse Tag # (0' Stake)	184
Transect Bearing	202° 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 Nephi, travel south on Highway 28 and turn left (east) at mile marker 33. Travel east for 1.3 miles; cross a road and a UDWR fence that is immediately after the road. Continue east for 0.15 miles to a witness post on the right (south). From the witness post, the 0-foot baseline stake is 17 paces away at 200 degrees magnetic and is marked by browse tag #184.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,460ft (1,664m)
Aspect	Northwest
Slope	5-10%
Sample Dates	06/18/2007, 05/24/2012, 05/24/2017

**Table 16A-22.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	Levan Wildlife Management Area Bullhog	3954	2017 or 2018?	808
Chaining - Chain Unknown	-	-	Early 1970s	-
Seeding - Seed Unknown	-	-	Early 1970s	-
Hand Crew - Lop and Scatter	Levan Farm WMA Habitat Improvement	271	Fall 2006	700

**Wildlife Habitat and Vegetation History**

**Table 16A-22.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter

**Table 16A-22.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2007	Perennial Grass/Mountain Big Sagebrush	Phase I
2012	Perennial Grass/Mountain Big Sagebrush	Phase I
2017	Bulbous Bluegrass/Mountain Big Sagebrush	Phase I

**Site Notes**

This study was established (in part) to replace the Levan Farm Chaining (16A-16) study.

**Soils**

**Table 16A-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
Sandy Loam	6.9	67.2	15.5	17.3	2.9	11.9	227.2	0.8	06/18/2007

**Site Potential**

1981 - 2010 Average Annual Precipitation	16 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 2007, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been the dominant browse species on this site with antelope bitterbrush (*Purshia tridentata*) as a minor component. Utah juniper (*Juniperus osteosperma*) trees are also present, placing the site in Phase I of encroachment (Table 16A-22.4, Table 16A- 22.12, Table 16A-22.13, Table 16A-22.14). The herbaceous understory has been abundant in all sample years, with a diverse mixture of perennial grasses including the introduced species crested wheatgrass (*Agropyron cristatum*) providing the most herbaceous cover; in 2017 the introduced species bulbous bluegrass (*Poa bulbosa*) was the most abundant species. In addition, the noxious and introduced perennial forb field bindweed (*Convolvulus arvensis*) has been observed in each sample year, albeit in low abundance. Forbs, although diverse, have remained rare (Table 16A- 22.7, Table 16A-22.10, Table 16A-22.11).

**Trend Summary Tables**

**Table 16A-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
2007	1.0	0.0	6.5	2.0	0.2	9.7
2012	1.2	0.1	5.1	2.9	-	8.3
2017	1.8	0.9	4.3	2.4	0.9	6.2

**Table 16A-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
2007	361	360	339	62	9.6	21.8	3.1	0.6
2012	182	432	240	77	3.1	31.2	1.4	1.1
2017	151	436	265	98	4.3	34.9	5.5	1.7

**Table 16A-22.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2007	9.2	2.7	46.9	4.2	3.7	45.7
2012	9.5	1.0	50.2	3.5	4.7	51.1
2017	16.3	4.1	37.5	8.1	4.3	52.2

**Table 16A-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	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2007	6	23	5	52
2012	3	6	-	9
2017	5	14	2	18
Year	Days Use Per Acre (ha)			
2007	12.3 (30.5)	37.5 (92.7)	1.3 (3.3)	-
2012	13.8 (34.1)	11.4 (28.1)	-	-
2017	11.6 (28.7)	20.8 (51.3)	-	-

**Table 16A-22.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Dactylis glomerata <sup>i</sup> (orchardgrass)	Festuca idahoensis (Idaho fescue)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency									
2007	276	45	1	352	5	-	54	109	80	14
2012	233	40	1	153	9	7	200	189	122	39
2017	281	66	8	100	8	-	323	61	46	71
year	Average Cover (%)									
2007	15.0	0.2	0.0	9.4	0.2	-	1.2	2.6	2.4	0.3
2012	10.5	0.2	0.0	2.9	0.9	0.3	7.6	6.5	4.3	1.0
2017	11.1	1.5	0.7	2.7	0.6	-	17.6	2.1	1.3	1.5

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

**Table 16A-22.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium acuminatum (tapertip onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Astragalus eurekaensis (Eureka milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littlepod false flax)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Chaetopappa ericoides (rose heath)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Convolvulus arvensis <sup>ni</sup> (field bindweed)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Eriogonum racemosum (redroot buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Microsteris gracilis <sup>a</sup> (slender phlox)	Phlox longifolia (longleaf phlox)	Silene antirrhina <sup>a</sup> (steepy silene)
year	Nested Frequency																
2007	-	302	7	-	4	64	9	37	29	-	14	1	58	6	13	2	140
2012	-	184	6	5	-	38	11	33	26	-	17	3	12	-	5	11	61
2017	1	237	5	17	-	-	21	20	32	1	-	1	61	19	-	8	5
year	Average Cover (%)																
2007	-	1.4	0.0	-	0.0	0.2	0.1	0.1	0.4	-	0.1	0.0	0.4	0.0	0.0	0.0	0.8
2012	-	0.6	0.1	0.0	-	0.1	0.3	0.1	0.2	-	0.0	0.1	0.0	-	0.0	0.0	0.3
2017	0.0	3.0	0.0	0.0	-	-	0.5	0.3	0.6	0.0	-	0.0	2.0	0.0	-	0.0	0.0

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

FORB SPECIES	Sisymbrium altissimum <sup>ai</sup> (tall tumbledmustard)	Sphaeralcea coccinea (scarlet globemallow)	Tragopogon dubius <sup>ai</sup> (yellow salsify)
year	Nested Frequency		
2007	1	17	6
2012	-	26	23
2017	-	26	7
year	Average Cover (%)		
2007	0.0	0.2	0.0
2012	-	0.4	0.2
2017	-	0.5	0.0

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

**Table 16A-22.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)			
	year	2007	2012	2017
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	1.8	0.2	9.7	0.2
Gutierrezia sarothrae (broom snakeweed)	1.6	0	8.3	1.3
Juniperus osteosperma <sup>t</sup> (Utah juniper)	2.4	0.9	6.2	0
SHRUB SPECIES	Quadrat Cover (%)			
	year	2007	2012	2017
Purshia tridentata <sup>p</sup> (antelope bitterbrush)	1.0	0.0	6.5	0.0
	1.2	0.1	5.1	0.0
	1.8	0.9	4.3	0.0

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

**Table 16A-22.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
2007	480	-	0	17	83	21	54	79	64/83
2012	380	1020	5	53	42	26	16	0	62/78
2017	780	-	31	51	18	26	3	8	63/91
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
2007	-	-	-	-	-	-	-	-	23/47
2012	20	-	0	100	0	100	0	0	20/46
2017	-	-	-	-	-	-	-	-	-/-
<b>Ephedra viridis<sup>p</sup> -- (mormon tea)</b>									
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	92/105
2017	-	-	-	-	-	-	-	-	-/-
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	33/34
2017	-	-	-	-	-	-	-	-	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
2007	80	-	50	50	0	0	0	0	21/29
2012	260	60	62	39	0	0	0	0	21/29
2017	1540	120	20	81	0	1	0	0	23/27
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
2007	80	-	25	75	0	0	0	0	-/-
2012	160	20	13	75	13	0	13	14	-/-
2017	80	-	0	100	0	0	0	0	-/-
<b>Pinus edulis<sup>t</sup> -- (twoneedle pinyon)</b>									
2007	-	-	-	-	-	-	-	-	-/-
2012	20	-	0	100	0	0	0	0	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Purshia stansburiana<sup>p</sup> -- (Stansbury cliffrose)</b>									
2007	-	-	-	-	-	-	-	-	161/117
2012	-	-	-	-	-	-	-	-	163/159
2017	-	-	-	-	-	-	-	-	184/186

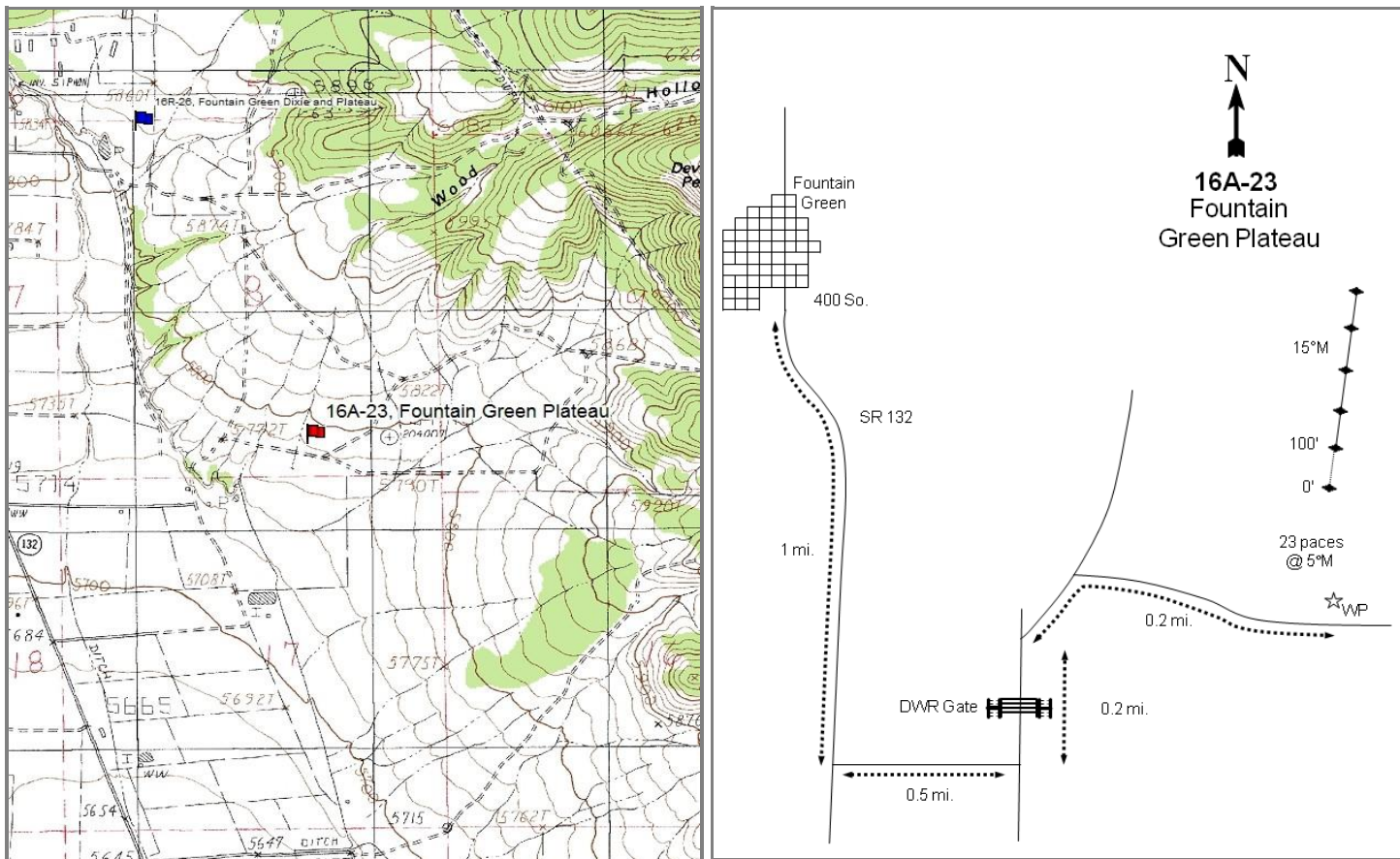
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Purshia tridentata <sup>P</sup> -- (antelope bitterbrush)									
2007	20	-	0	100	0	0	0	0	69/126
2012	180	-	0	100	0	11	89	0	62/105
2017	20	-	0	100	0	0	100	0	99/181

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

**Table 16A-22.14 - 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)							
2007	36	-	-	13	38	50	21.0
2012	28	8	8	25	25	33	16.7
2017	27	-	17	33	42	8	15.7

## FOUNTAIN GREEN PLATEAU - STUDY NO. 16A-23



### Location Information

USGS 7.5 min Map Info	Moroni NW; Township 14S, Range 3E, Section 08
GPS (0' Stake)	NAD 83 UTM ZONE 12, 447673 East 4384594 North

### Transect Information

Browse Tag # (0' Stake)	193
Transect Bearing	15° 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 curve in SR-132 on the south end of Fountain Green, travel south on SR-132 for 1 mile and turn left (east) onto a dirt road that goes toward the GBRC farm. Travel on this road for 0.5 miles to a "T"-intersection and turn left (north) towards a hill. Travel for 0.2 miles up the hill, passing through a gate to the DWR property to an intersection. Turn right (east) here and travel 0.2 miles to the witness post on the left (north) side of the road. From the witness post, the 0-foot baseline stake is 23 paces away at 5 degrees magnetic and is marked by browse tag #193.



**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,775ft (1,760m)
Aspect	Southwest
Slope	5%
Sample Dates	07/03/2007, 05/14/2012, 05/15/2017

**Table 16A-23.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Herbicide - Plateau	Fountain Green WMA Habitat Improvement	288	September 2007	275

**Table 16A-23.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
CRO WMA			Broadcast	Oct 2016	57
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
G	Leymus cinereus	Great Basin Wildrye	UDWR IntMtn Tetra	0.88	0.59
G	Pascopyrum smithii	Western Wheatgrass	Arriba	0.88	0.81
G	Poa secunda	Sandberg Bluegrass	Mountain Home	0.44	0.35
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Columbia	1.75	1.55
F	Linum perenne	Blue Flax	Appar	0.88	0.78
F	Medicago sativa	Alfalfa	Ladak +	0.88	0.84
F	Onobrychis viciifolia	Sainfoin	Eski	3.51	3.33
F	Sanguisorba minor	Small Burnet	Delar	1.75	1.65
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Sanpete UT	1.40	0.27

**Wildlife Habitat and Vegetation History**

**Table 16A-23.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Greater Sage Grouse	occupied	year-long

**Table 16A-23.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2007	Wyoming Big Sagebrush/Annual Grass	No Encroachment
2012	Wyoming Big Sagebrush/Annual Grass	No Encroachment
2017	Wyoming Big Sagebrush/Annual Grass	No Encroachment

**Site Notes**

Two deer carcasses were found on site in 2007, and sheep were on the site when it was read in May of 2012.

**Soils**

**Table 16A-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
Sandy Loam	7.0	56.2	24.0	19.8	1.6	12.3	486.4	0.6	07/03/2007

**Site Potential**

1981 - 2010 Average Annual Precipitation	13 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.

Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) has dominated the shrub component of this site since study establishment in 2007, although density decreased by more than half between 2012 and 2017 (Table 16A-23.12, Table 16A-23.13). The introduced annual grass cheatgrass (*Bromus tectorum*) is the most abundant species in the herbaceous understory. Cover and frequency of cheatgrass did decrease as of the first sampling after a herbicide treatment (Table 16A-23.1) while that of perennial grasses increased, but annual grasses were nearly at pre-treatment levels in 2017; as such, this study site may suffer the effects of an increased fuel load should a wildfire occur. Forbs have remained rare (Table 16A-23.7, Table 16A-23.10, Table 16A-23.11).

**Trend Summary Tables**

**Table 16A-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
2007	3.4	1.1	-	3.7	0.8	-
2012	8.2	1.0	-	8.2	1.6	-
2017	2.0	1.0	-	2.2	2.0	-

**Table 16A-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
2007	475	221	396	77	27.1	1.9	4.3	0.4
2012	312	350	295	42	9.8	15.2	1.9	0.1
2017	451	317	327	77	26.3	8.1	3.5	0.5

**Table 16A-23.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2007	19.5	1.8	44.5	0.5	2.2	41.6
2012	21.3	0.8	39.1	0.3	2.5	35.7
2017	33.5	1.7	34.0	1.8	2.8	42.9

**Table 16A-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/Domestic Sheep	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
2007	-	52	5	-	60
2012	-	23	-	-	42
2017	1	23	-	-	52
Days Use Per Acre (ha)					
2007	-	87.8 (216.8)	1.3 (3.3)	-	-
2012	-	46.2 (114.2)	0.7 (1.7)	8.7 (21.5)*	-
2017	-	22.1 (54.6)	-	-	-

\*Pellets per acre (ha)

**Table 16A-23.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Secale cereale <sup>ai</sup> (cereal rye)	Sporobolus cryptandrus (sand dropseed)	Vulpia octoflora <sup>a</sup> (sixweeks fescue)
year	Nested Frequency									
2007	475	8	10	202	-	4	10	11	-	3
2012	312	-	25	336	-	9	13	-	3	-
2017	451	10	28	302	4	3	6	-	5	-
year	Average Cover (%)									
2007	27.0	0.1	0.3	1.2	-	0.1	0.3	0.1	-	0.0
2012	9.8	-	0.1	14.1	-	0.1	0.9	-	0.0	-
2017	26.3	0.6	0.6	6.4	0.1	0.0	0.5	-	0.0	-

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

**Table 16A-23.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																
Alyssum desertorum <sup>ai</sup> (desert madwort)																
Calochortus nuttallii (sego lily)																
Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)																
Crepis acuminata (tapertip hawkbeard)																
Erigeron pumilus (shaggy fleabane)																
Eriogonum umbellatum (sulphur-flower buckwheat)																
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)																
Gilia inconspicua <sup>a</sup> (shy gilia)																
Lappula occidentalis <sup>a</sup> (flatspine stickseed)																
Lotus utahensis (Utah bird's-foot trefoil)																
Onobrychis vicifolia <sup>a</sup> (sainfoin)																
Phlox longifolia (longleaf phlox)																
Salsola tragus <sup>ai</sup> (prickly Russian thistle)																
Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)																
Sphaeralcea coccinea (scarlet globemallow)																
year	Nested Frequency															
2007	376	-	160	-	-	-	103	-	1	-	-	-	-	2	77	
2012	239	-	138	3	2	1	9	-	13	1	-	3	3	-	36	
2017	158	7	293	6	7	-	23	20	-	2	22	1	-	-	42	
year	Average Cover (%)															
2007	2.0	-	0.5	-	-	-	1.7	-	0.0	-	-	-	-	0.0	0.4	
2012	1.0	-	0.8	0.0	0.0	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-	0.1	
2017	0.3	0.1	3.0	0.0	0.0	-	0.1	0.1	-	0.0	0.1	0.0	-	-	0.3	

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

**Table 16A-23.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES			
Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)			
Chrysothamnus viscidiflorus sp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)			
Opuntia polyacantha (plains pricklypear)			
year	Line Intercept Cover (%)		
2007	3.7	-	0.8
2012	8.2	0	1.6
2017	2.2	-	2
year	Quadrat Cover (%)		
2007	3.4	-	1.1
2012	8.2	0.0	1.0
2017	2.0	-	1.0

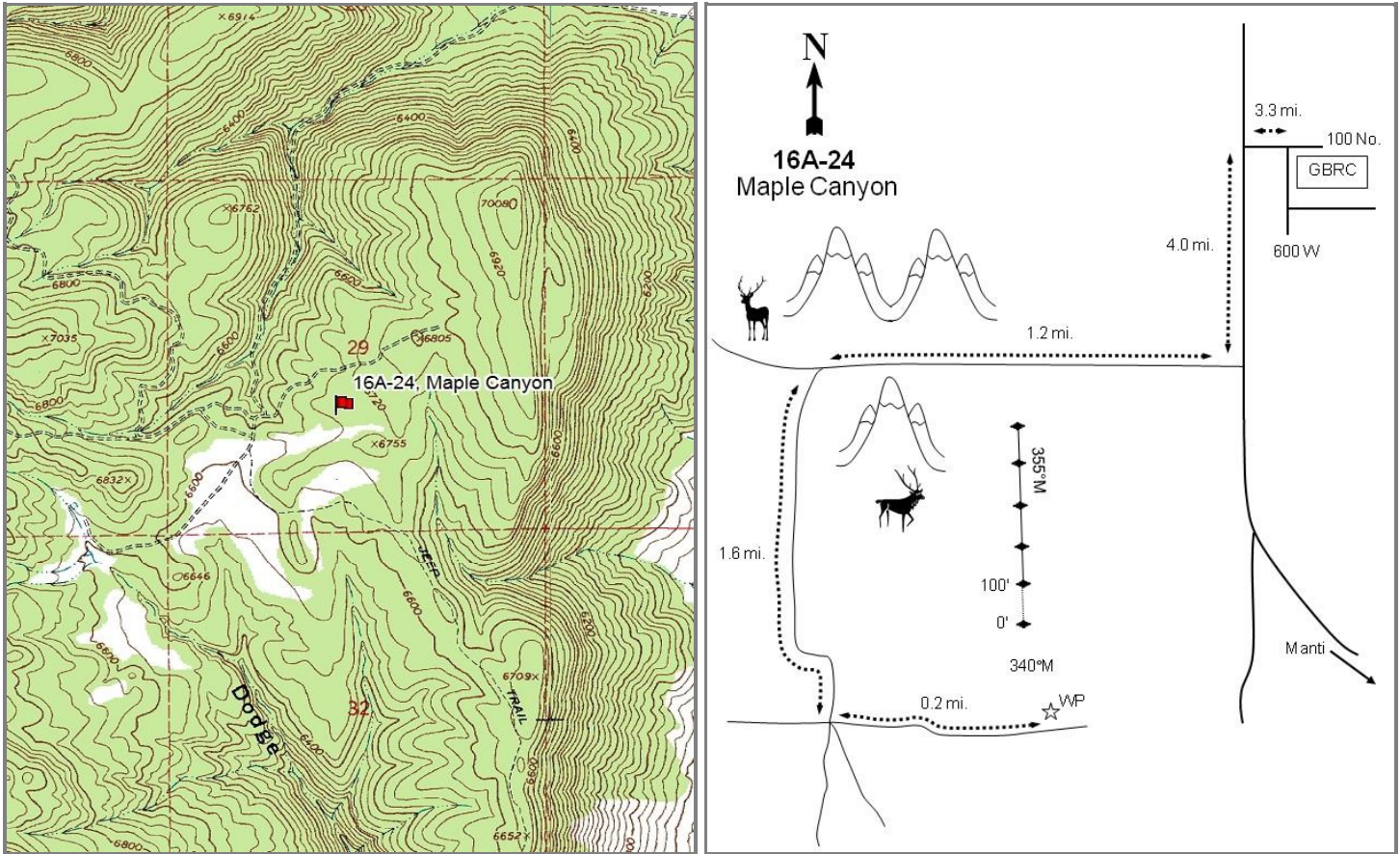
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 16A-23.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
2007	1200	-	0	32	68	12	87	55	73/101
2012	2460	760	47	38	15	26	9	9	76/100
2017	920	200	37	13	50	17	28	28	71/92
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
2007	-	-	-	-	-	-	-	-	53/124
2012	40	-	50	50	0	0	100	50	- / -
2017	-	-	-	-	-	-	-	-	18/20
<b>Echinocereus -- (hedgehog cactus)</b>									
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	31/60
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
2007	440	-	0	91	9	0	0	0	20/47
2012	520	-	4	85	12	4	8	8	17/74
2017	1060	-	13	85	2	0	2	2	17/62

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

## MAPLE CANYON - STUDY NO. 16A-24



### Location Information

USGS 7.5 min Map Info	Manti SW; Township 17S, Range 2E, Section 29
GPS (0' Stake)	NAD 83 UTM ZONE 12, 437954 East 4350784 North

### Transect Information

Browse Tag # (0' Stake)	179
Transect Bearing	355° magnetic (Line 5: 66° 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

Starting at the intersection of 100 North and 600 West in Ephraim, travel 3.3 miles west on 100 North. Turn left (south) at the intersection and travel 4.0 miles to another intersection. Turn right (west). Travel for 1.2 miles up the canyon to a "Y" intersection and turn left (south). Travel 1.6 miles to five-point intersection on top of the ridge. Take the furthest left (east) road and travel 0.2 miles to a witness post on the north side of the road. The 0-foot stake (browse tag #179) is found 340 degrees magnetic from the witness post.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,660ft (2,030m)
Aspect	West
Slope	5%
Sample Dates	05/30/2012, 05/31/2017

**Table 16A-24.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	Maple Canyon WMA Habitat Improvement	2352	September 2012-October 2013	514

**Wildlife Habitat and Vegetation History**

**Table 16A-24.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter/spring

**Table 16A-24.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2012	Pinyon-Juniper	Phase II transitioning to Phase III
2017	Perennial Grass/Mountain Big Sagebrush	Phase I

**Site Notes**

No Notes

**Soils**

**Table 16A-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
Clay Loam	7.0	32.4	33.1	34.5	3.5	4.1	92.0	1.0	05/30/2012

**Site Potential**

1981 - 2010 Average Annual Precipitation	16 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.

When established in 2012, this study site was dominated by Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) and was considered to be within Phase II transitioning to Phase III of woodland succession. Browse species such as mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) were present, but contributed much less cover. A bullhog treatment in 2012/2013 removed most of the trees (photos, Table 16A-24.4, Table 16A-24.12, Table 16A-24.13, Table 16A-24.14), and the site transitioned to one dominated by perennial grasses -- namely the introduced species crested wheatgrass (*Agropyron cristatum*) and the native species bluebunch wheatgrass (*Pseudoroegneria spicata*) -- and sagebrush (Table 16A-24.7, Table 16A-24.10); the densities and cover of both bitterbrush and sagebrush increased between 2012 and 2017 (Table 16A-24.12, Table 16A-24.13). Forbs have remained rare, and the noxious and introduced annual forb species nodding plumeless thistle (*Carduus nutans*) was observed in 2017 (Table 16A-24.11).



**Trend Summary Tables**

**Table 16A-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
2012	2.5	-	14.6	1.0	-	18.6
2017	3.0	-	0.2	2.8	-	0.1

**Table 16A-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
2012	-	246	102	118	-	10.8	0.3	0.9
2017	17	315	274	130	0.2	24.1	3.8	1.8

**Table 16A-24.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2012	21.6	2.5	38.4	14.5	4.5	30.4
2017	17.4	0.6	54.1	13.0	2.6	33.1

**Table 16A-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	Rabbit
	Quadrat Frequency		
2012	-	13	18
2017	6	14	41
Year	Days Use Per Acre (ha)		
2012	-	8.1 (19.9)	-
2017	8.7 (21.5)	20.1 (49.7)	-

**Table 16A-24.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ii</sup> (cheatgrass)	Festuca idahoensis (Idaho fescue)	Pascopyrum smithii (western wheatgrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea <sup>i</sup> (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency							
2012	130	-	32	4	104	12	36	3
2017	180	17	66	2	68	12	92	7
year	Average Cover (%)							
2012	5.5	-	1.2	0.0	2.7	0.4	1.1	0.0
2017	11.5	0.2	4.5	0.0	0.8	0.8	6.2	0.2

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



**Table 16A-24.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria dimorpha (low pussytoes)	Arenaria fendleri (Fendler's sandwort)	Astragalus eurekaensis (Eureka milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Carduus nutans <sup>ami</sup> (nodding plumeless thistle)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Chaenactis douglasii (Douglas' dusty maiden)	Cirsium undulatum <sup>a</sup> (wavy leaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Crepis acuminata (tapertip hawkbeard)	Cryptantha humilis (roundspike cryptantha)	Cymopterus (springparsley)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Eriogonum breviceale (shortstem buckwheat)
year	Nested Frequency																
2012	2	24	18	-	11	4	-	-	69	-	-	8	1	-	25	-	3
2017	37	170	9	4	11	2	8	0	135	6	7	11	-	3	46	34	-
year	Average Cover (%)																
2012	0.0	0.0	0.1	-	0.1	0.0	-	-	0.1	-	-	0.0	0.0	-	0.1	-	0.0
2017	0.2	3.1	0.2	0.0	0.2	0.0	0.0	0.0	0.4	0.2	0.0	0.1	-	0.0	0.4	0.1	-

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

FORB SPECIES	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lathyrus brachycalyx (Bonneville pea)	Microsteris gracilis <sup>a</sup> (slender phlox)	Phlox austromontana (mountain phlox)	Phlox longifolia (long leaf phlox)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Stenotus acaulis (stemless mock goldenweed)	Streptanthus cordatus (heart leaf twistflower)	Trifolium longipes (long stalk clover)
year	Nested Frequency								
2012	-	5	28	46	3	-	3	3	30
2017	5	8	55	18	-	1	7	4	10
year	Average Cover (%)								
2012	-	0.0	0.1	0.5	0.0	-	0.0	0.0	0.1
2017	0.0	0.3	0.1	0.1	-	0.0	0.1	0.0	0.0

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

**Table 16A-24.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)						
	year						
Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	2012	0.1	0.8	-	11	7.6	0.1
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	2017	-	1.4	-	0.1	-	1.4
Chrysothamnus depressus <sup>p</sup> (longflower rabbitbrush)	year	Quadrat Cover (%)					
Juniperus osteosperma <sup>t</sup> (Utah juniper)	2012	0.0	1.2	0.1	8.5	6.0	1.1
Pinus edulis <sup>t</sup> (twoneedle pinyon)	2017	-	1.8	0.0	0.2	-	1.2
Purshia tridentata <sup>p</sup> (antelope bitterbrush)							

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

**Table 16A-24.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

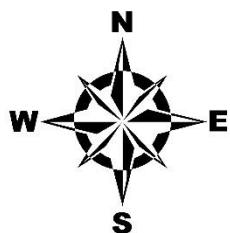
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
2012	60	-	0	100	0	0	0	0	47/133
2017	-	-	-	-	-	-	-	-	-/-
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
2012	400	40	10	60	30	39	11	6	47/60
2017	460	-	13	61	26	9	4	26	56/72
<b>Chrysothamnus depressus<sup>p</sup> -- (longflower rabbitbrush)</b>									
2012	140	-	0	100	0	0	0	0	9/14
2017	120	-	0	100	0	0	0	0	10/19
<b>Ephedra viridis<sup>p</sup> -- (mormon tea)</b>									
2012	-	-	-	-	-	-	-	-	106/85
2017	-	-	-	-	-	-	-	-	96/114
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
2012	-	-	-	-	-	-	-	-	94/45
2017	-	-	-	-	-	-	-	-	61/61
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
2012	80	-	0	100	0	25	0	0	18/27
2017	20	-	0	100	0	0	0	0	15/19
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
2012	160	20	38	50	13	0	0	0	-/-
2017	40	60	50	50	0	0	0	50	-/-
<b>Peraphyllum ramosissimum<sup>p</sup> -- (wild crab apple)</b>									
2012	-	-	-	-	-	-	-	-	47/59
2017	-	-	-	-	-	-	-	-	33/34
<b>Pinus edulis<sup>t</sup> -- (twoneedle pinyon)</b>									
2012	160	40	50	38	13	0	0	13	-/-
2017	20	-	0	100	0	0	0	0	-/-
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
2012	60	-	0	33	67	0	67	67	33/109
2017	320	-	0	100	0	75	25	0	27/73

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

**Table 16A-24.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution				Average Diameter (cm)	
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'		>12' (%)
<b>Juniperus osteosperma (Utah juniper)</b>							
2012	226	-	10	50	30	10	9.8
2017	38	10	90	-	-	-	6.8
<b>Pinus edulis (twoneedle pinyon)</b>							
2012	165	5	10	40	40	5	8.3
2017	10	38	63	-	-	-	4.0

# WILDLIFE MANAGEMENT UNIT 17A - WASATCH MOUNTAINS



### Study Location

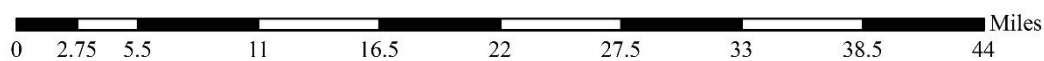
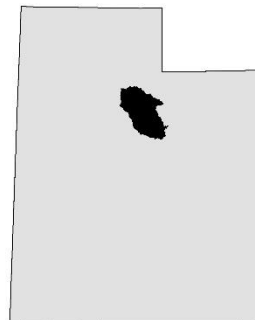
#### Project, Status

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



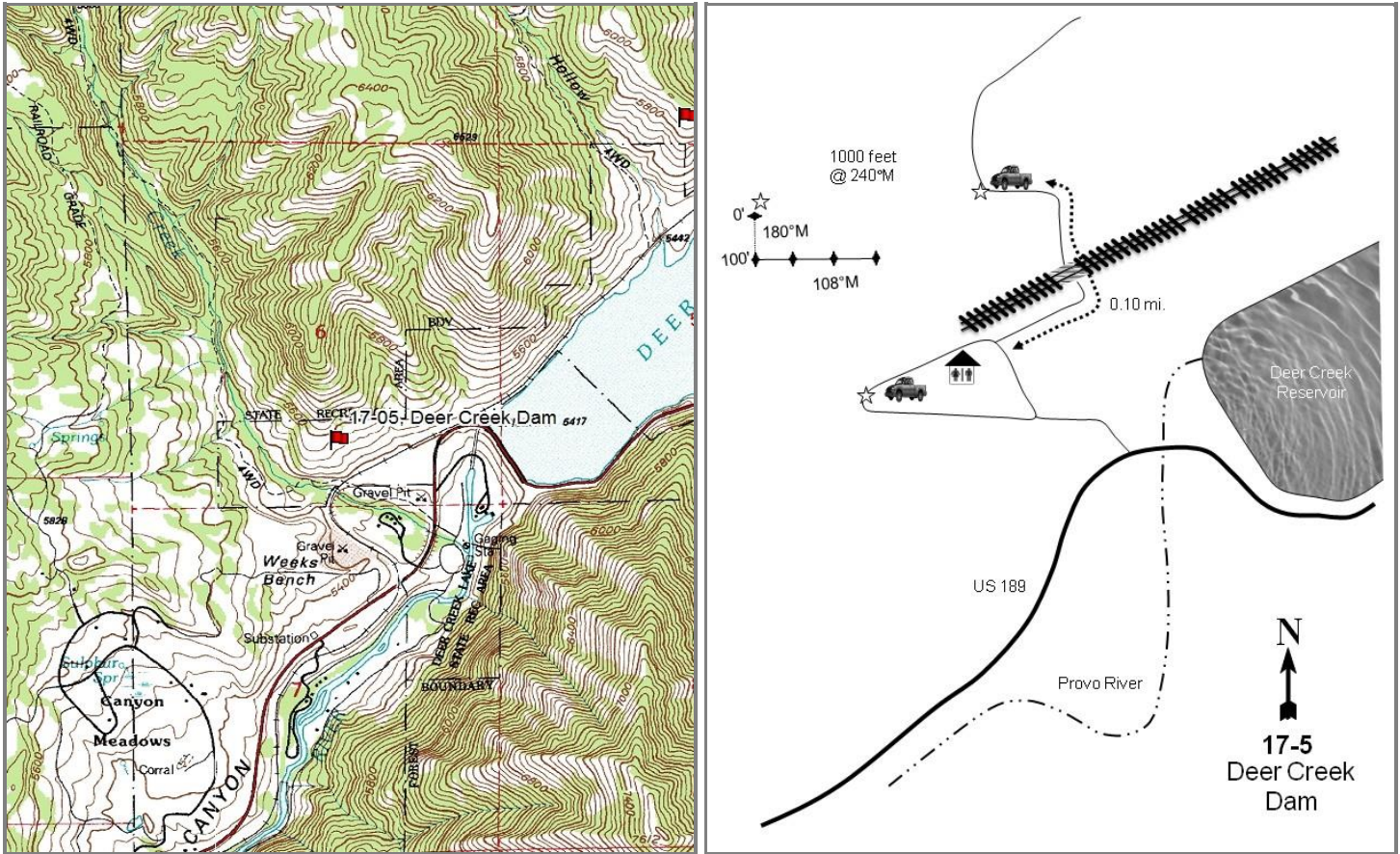
Unit - 17A

### Area of Interest





## DEER CREEK DAM - STUDY NO. 17-5

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Aspen Grove SE; Township 5S, Range 4E, Section 06  
NAD 83 UTM ZONE 12, 454471 East 4473070 North

**Transect Information**

Browse Tag # (0' Stake)	3914
Transect Bearing	180° magnetic (Lines 2-4: 275° magnetic)
Length	400ft
Belt Placement	Line 1 (11 & 95ft), line 2 (71ft), line 3 (34ft), line 4 (71ft)
Belt Marker Placement	Belts 2, 3, 4: No Rebar

**Directions to Site**

From the dam at the south end of Deer Creek Reservoir, proceed south on U.S. 189 for ~0.10 miles and turn right (north) onto a road that leads to a parking lot at a trailhead (there is an outhouse in the parking lot). Park here and walk ~1000 feet northwest (a GPS may be useful), crossing railroad tracks and proceeding up a small hill to a full-high witness post. The 0-foot baseline stake is 20 feet from the witness post. A red browse tag, numbered 3914, is attached to the 0-foot baseline stake.

NOTE: Line 4 belt 3 was mistakenly put at 71 feet, and in order to be consistent, belt 3 has not been moved to 59 feet.

**Site Information**

Land Ownership	State
Land Administrator	USP
Allotment	No data
Elevation	5,550ft (1,692m)
Aspect	Southeast
Slope	12-20%
Sample Dates	05/16/1996, 06/27/2002, 07/02/2007, 07/30/2012, 07/12/2017

**Table 17-05.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Other - Powerline	-	-	Prior to 1989	-

**Wildlife Habitat and Vegetation History****Table 17-05.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Moose	crucial	year-long

**Table 17-05.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mountain Big Sagebrush	No Encroachment
1989	Mountain Big Sagebrush	No Encroachment
1996	Mountain Big Sagebrush	No Encroachment
2002	Mountain Big Sagebrush	No Encroachment
2007	Mountain Big Sagebrush	No Encroachment
2012	Mountain Big Sagebrush	No Encroachment
2017	Mountain Big Sagebrush	No Encroachment

**Site Notes**

The study is located half of a mile west of Deer Creek Dam on a moderately-sloped bench.

**Soils****Table 17-05.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.3	29.3	42.7	28.0	3.3	12.9	150.4	0.7	11/12/2002
Clay Loam	7.4	28.6	37.1	34.4	4.9	10.7	99.2	0.8	05/16/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	24 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

This study site has remained dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) since 1983; other preferred browse species such as chokecherry (*Prunus virginiana*), antelope bitterbrush (*Purshia tridentata*), and Utah serviceberry (*Amelanchier utahensis*) are present in lesser amounts (Table 17-05.12, Table 17-05.13). The herbaceous understory is abundant and diverse overall. As of the 2017 sample year, dominant grasses on the site include the introduced annual species cheatgrass (*Bromus tectorum*) and the native perennial species bluebunch wheatgrass (*Pseudoroegneria spicata*). Perennial and annual forbs are abundant, but the noxious weed species field bindweed (*Convolvulus arvensis*), gypsyflower (*Cynoglossum officinale*) and Dalmatian toadflax (*Linaria dalmatica*) are present (Table 17-05.7, Table 17-05.10, Table 17-05.11).

**Trend Summary Tables****Table 17-05.6 - 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	22.1	7.1	-	-	-	-
2002	25.2	6.5	-	27.2	9.6	-
2007	16.0	3.0	-	18.9	4.9	-
2012	14.8	6.7	-	16.7	8.0	-
2017	20.2	13.1	-	28.7	16.0	-

**Table 17-05.7 - 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	444	173	318	223	19.1	3.5	5.1	4.9
2002	238	164	273	227	3.1	3.1	3.7	6.3
2007	347	106	350	232	9.7	4.3	8.0	7.0
2012	163	140	306	314	2.8	8.5	6.7	9.1
2017	136	138	312	252	5.3	4.0	8.2	9.3

**Table 17-05.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	6.7	-	56.9	5.7	5.4	56.0
2002	16.9	-	45.2	6.7	3.3	46.5
2007	9.7	-	46.2	5.4	3.4	51.5
2012	10.8	-	45.9	11.2	7.6	44.2
2017	10.3	-	53.9	11.1	4.1	52.8

**Table 17-05.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1996	15	1	-
2002	11	3	-
2007	5	-	2
2012	-	-	-
2017	5	-	1
Year	Days Use Per Acre (ha)		
1996	-	-	-
2002	32.2 (79.5)	6.0 (14.9)	-
2007	29.5 (72.8)	16.8 (41.4)	-
2012	7.4 (18.2)	-	-
2017	8.7 (21.5)	-	-



**Table 17-05.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Aegilops cylindrica <sup>ni</sup> (jointed goatgrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Leymus cinereus (basin wildrye)	Melica bulbosa (oniongrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea <sup>i</sup> (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency													
1996	-	-	-	-	444	-	5	3	-	-	104	-	-	82
2002	3	3	3	182	138	3	0	7	-	-	45	1	-	108
2007	-	2	2	123	329	-	5	3	-	1	28	-	-	69
2012	-	-	10	117	67	1	3	-	4	-	25	49	3	64
2017	-	-	3	56	107	4	-	1	1	-	-	1	-	129
year	Average Cover (%)													
1996	-	-	-	-	19.1	-	0.2	0.0	-	-	1.2	-	-	2.1
2002	0.1	0.0	0.0	1.4	1.6	0.0	0.0	0.2	-	-	0.5	0.0	-	2.2
2007	-	0.0	0.1	1.0	8.7	-	0.8	0.2	-	0.0	0.3	-	-	2.9
2012	-	-	0.9	1.6	1.2	0.0	0.4	-	0.0	-	0.8	2.4	0.0	4.0
2017	-	-	0.1	1.0	4.2	0.0	-	0.0	0.0	-	-	0.0	-	3.8

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

**Table 17-05.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcross)	Artemisia ludoviciana (white sagebrush)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus cibirius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littledod false flax)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Convolvulus arvensis <sup>ni</sup> (field bindweed)
year	Nested Frequency																
1996	-	18	111	-	7	-	-	24	-	-	-	12	48	-	-	2	-
2002	-	51	178	-	7	25	-	25	1	7	3	35	20	2	9	3	-
2007	3	22	261	-	5	7	5	47	-	2	51	147	13	2	6	25	-
2012	-	11	234	-	7	10	-	25	3	3	-	24	32	10	3	216	-
2017	-	70	132	1	13	1	2	41	1	16	9	108	14	-	57	29	1
year	Average Cover (%)																
1996	-	0.1	0.4	-	0.1	-	-	0.2	-	-	-	0.1	0.8	-	-	0.0	-
2002	-	0.4	0.8	-	0.2	0.8	-	0.5	0.0	0.0	0.0	0.1	0.4	0.0	0.0	0.0	-
2007	0.0	0.1	1.8	-	0.2	0.2	0.1	1.7	-	0.0	0.2	1.3	0.2	0.0	0.0	0.1	-
2012	-	0.0	1.0	-	0.2	0.1	-	0.5	0.0	0.0	-	0.1	2.0	0.2	0.0	3.6	-
2017	-	1.1	0.6	0.0	0.4	0.0	0.0	1.9	0.0	0.1	0.1	0.8	0.4	-	0.3	0.4	0.0

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

FORB SPECIES	Cynoglossum officinale <sup>ani</sup> (gypsyflower)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron (fleabane)	Eriogonum brevicaulle (shortstem buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium <sup>a</sup> (bedstraw)	Galium aparine <sup>a</sup> (stickywilly)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Hackelia patens (spotted stickseed)	Hedysarum boreale (Utah sweetvetch)	Helianthella uniflora (oneflower helianthella)	Helianthus annuus <sup>a</sup> (common sunflower)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Linaria dalmatica <sup>ai</sup> (Dalmatian toadflax)	Lithospermum ruderale (western stone seed)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	
year	Nested Frequency																	
1996	42	-	-	7	-	172	-	21	-	30	-	-	18	56	6	2	1	
2002	-	-	-	1	13	67	-	3	-	-	-	6	3	45	6	0	0	
2007	9	3	-	2	31	29	-	-	1	9	-	-	12	73	9	1	7	
2012	3	9	-	-	17	10	-	-	-	12	4	-	20	107	6	4	4	
2017	6	15	1	3	53	129	32	-	-	24	3	-	25	36	5	4	-	
year	Average Cover (%)																	
1996	2.3	-	-	0.2	-	1.1	-	0.0	-	0.6	-	-	0.0	0.8	0.4	0.2	0.0	
2002	-	-	-	0.0	0.1	1.1	-	0.0	-	-	-	0.0	0.0	1.4	0.2	0.2	0.0	
2007	0.4	0.0	-	0.0	0.6	1.5	-	-	0.0	0.0	-	-	0.1	2.0	0.5	0.1	0.0	
2012	0.2	0.0	-	-	0.1	0.1	-	-	-	0.6	0.0	-	1.1	2.4	0.2	0.2	0.0	
2017	0.2	0.1	0.0	0.0	1.3	3.3	0.2	-	-	1.8	0.0	-	0.1	1.0	0.2	0.0	-	

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

FORB SPECIES	Melilotus officinalis <sup>i</sup> (sweetclover)	Microsteris gracilis <sup>a</sup> (slender phlox)	Oenothera (evening primrose)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Sphaeralcea coccinea (scarlet globemallow)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Veronica biloba <sup>ai</sup> (twolobe speedwell)
year	Nested Frequency							
1996	9	-	3	127	-	-	65	-
2002	-	4	-	145	-	-	96	-
2007	-	8	1	128	-	-	148	-
2012	8	-	8	91	4	-	111	2
2017	-	3	3	139	-	1	24	17
year	Average Cover (%)							
1996	0.0	-	0.0	2.2	-	-	0.4	-
2002	-	0.0	-	2.6	-	-	1.1	-
2007	-	0.0	0.0	1.8	-	-	1.8	-
2012	0.3	-	0.2	0.7	0.0	-	2.0	0.0
2017	-	0.0	0.0	2.2	-	0.0	0.4	0.4

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

**Table 17-05.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Prunus virginiana <sup>p</sup> (chokecherry)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Symphoricarpos oreophilus (mountain snowberry)
year	Line Intercept Cover (%)								
1996	-	-	-	-	-	-	-	-	-
2002	0.2	24.8	1.5	1.3	2.6	0.6	0.9	-	4.9
2007	1	15.7	2.9	1.6	0.3	-	0.6	-	1.7
2012	1.1	12.3	3.2	2	0.7	-	1.3	-	4.1
2017	0.5	20.4	6.1	4	6.1	-	3.6	0.2	3.8
year	Quadrat Cover (%)								
1996	-	20.6	3.5	0.9	0.3	-	0.4	0.1	3.2
2002	0.5	23.4	1.6	0.6	1.2	0.4	0.6	-	3.3
2007	0.1	14.0	1.3	1.0	0.4	-	0.9	0.0	1.2
2012	0.1	12.2	2.6	1.1	0.9	-	1.0	0.4	3.2
2017	0.3	14.2	6.0	3.0	4.1	-	2.4	0.4	3.1

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

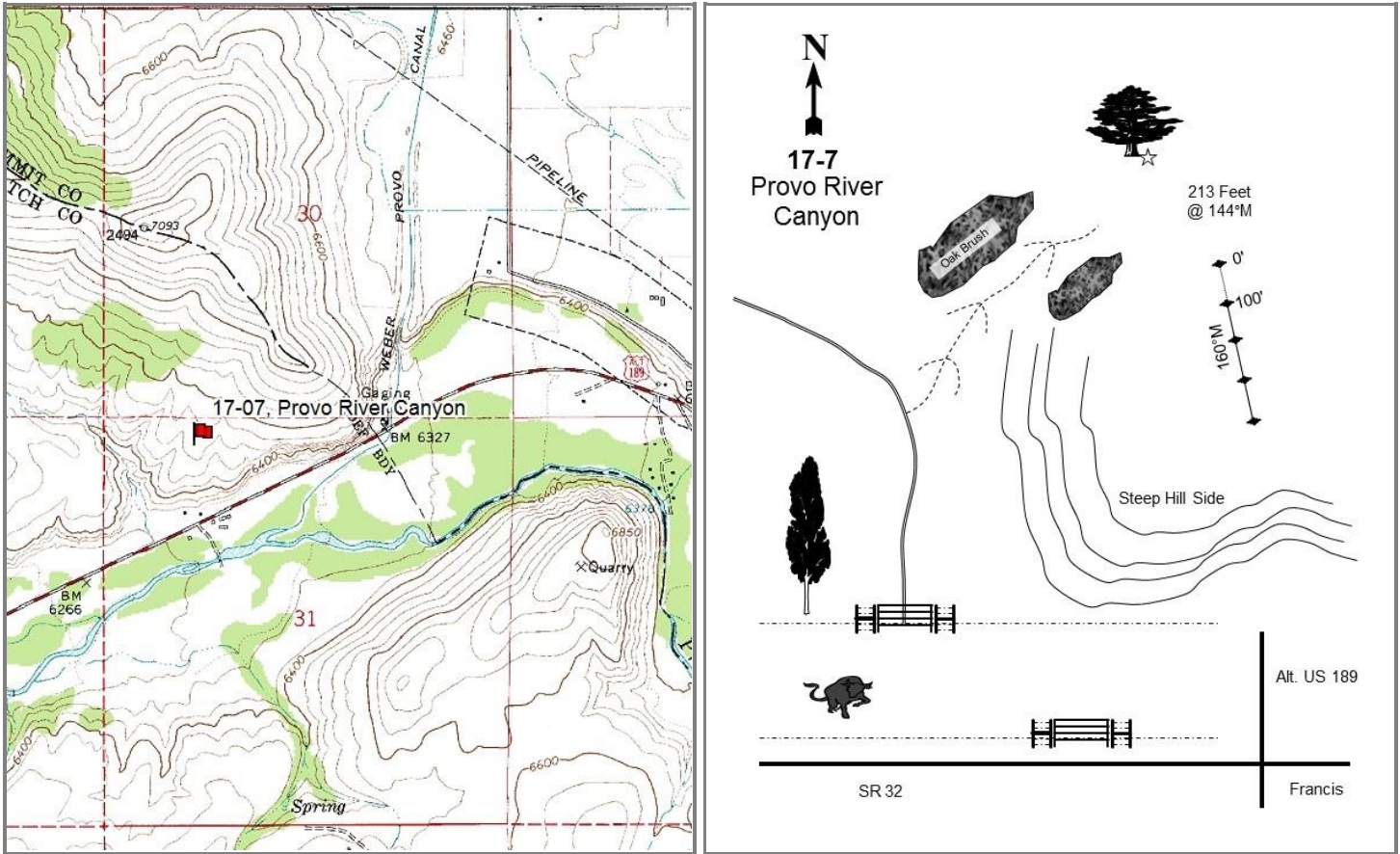
**Table 17-05.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Acer grandidentatum<sup>t</sup> -- (bigtooth maple)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2002	40	-	0	100	0	0	0	0	38/15
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	40	-	0	50	50	0	100	50	63/65
2002	60	-	0	67	33	0	33	0	175/144
2007	60	-	0	33	67	33	67	33	83/94
2012	40	-	0	100	0	50	0	50	128/141
2017	20	-	0	100	0	100	0	0	116/134
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	4120	2020	38	54	8	18	2	15	62/100
2002	5320	-	15	70	15	17	2	9	62/71
2007	2800	-	4	63	34	27	16	36	75/99
2012	2940	3280	30	45	25	11	0	18	66/91
2017	6140	280	27	67	6	2	0	3	52/76
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	2060	120	14	86	0	11	0	0	32/55
2002	1760	-	0	98	2	0	0	1	30/43
2007	1300	-	9	80	11	0	0	8	29/47
2012	1080	-	0	93	7	0	0	32	35/60
2017	1460	-	6	95	0	0	0	0	36/62
<b>Crataegus douglasii -- (black hawthorn)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2002	40	-	0	100	0	0	100	0	72/101
2007	-	-	-	-	-	-	-	-	79/84
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1996	580	-	14	69	17	3	21	24	57/62
2002	520	-	0	69	31	0	0	23	52/63
2007	320	-	0	56	44	0	0	25	76/75
2012	460	-	9	70	22	0	0	9	71/81
2017	580	-	0	83	17	7	0	10	75/82
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	1140	600	30	67	4	2	2	5	15/23
2002	2940	-	3	90	8	0	0	3	26/34
2007	600	20	7	93	0	0	0	0	26/22
2012	1420	80	76	24	0	0	0	4	27/42
2017	2540	-	0	100	0	0	0	0	36/51
<b>Mahonia repens -- (creeping barberry)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2002	5180	-	0	100	0	0	0	0	9/13
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	14/17
<b>Prunus virginiana<sup>P</sup> -- (chokecherry)</b>									
1996	320	420	88	13	0	13	0	0	138/58
2002	680	-	3	94	3	12	68	3	28/21
2007	700	-	100	0	0	0	0	0	-/-
2012	280	-	14	86	0	7	0	0	81/92
2017	1080	-	0	100	0	0	0	0	60/28
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1996	100	20	20	80	0	80	0	0	33/113
2002	20	-	0	100	0	100	0	0	47/83
2007	20	-	0	100	0	0	100	0	35/112
2012	40	-	0	100	0	100	0	0	53/192
2017	40	-	0	100	0	100	0	0	50/116
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	95/68
2007	20	-	0	100	0	0	0	100	47/81
2012	-	-	-	-	-	-	-	-	62/51
2017	-	-	-	-	-	-	-	-	61/85
<b>Rhus trilobata<sup>P</sup> -- (skunkbush sumac)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	208/239
<b>Ribes aureum<sup>P</sup> -- (golden currant)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	109/100
2017	-	-	-	-	-	-	-	-	110/109
<b>Rosa woodsii<sup>P</sup> -- (Woods' rose)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2002	40	-	100	0	0	0	0	0	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1996	540	-	11	89	0	7	11	0	66/87
2002	480	-	4	79	17	8	8	0	64/83
2007	300	-	7	80	13	27	7	7	61/102
2012	420	-	0	91	10	19	0	57	63/90
2017	720	-	0	92	8	0	0	11	53/72

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

## PROVO RIVER CANYON - STUDY NO. 17-7



### Location Information

USGS 7.5 min Map Info	Francis NW; Township 2S, Range 6E, Section 31
GPS (0' Stake)	NAD 83 UTM ZONE 12, 473378 East 4495437 North

### Transect Information

Browse Tag # (0' Stake)	7960
Transect Bearing	160° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 3: No Rebar

### Directions to Site

From the junction of SR-32 and Alt US-189 in Francis, proceed west on Highway 32 for 1.7 miles and stop at an old corral in a marshy pasture on the right (north), opposite Victory Ranch Club (6480 E. Hwy 32). Walk to the large, narrow-leaf cottonwood northwest of the corral; the tree is at the mouth of a small canyon. Walk up the canyon for approximately 500 feet until the first drainage on the right is reached. A drainage begins where the road crosses the creek for the second time. Walk up this drainage past the oak clumps to a point where the gully flattens out. Locate a three-trunked, high-lined juniper to the right. From the juniper, walk 213 feet at 144 degrees magnetic to the 0-foot stake of the baseline, marked with browse tag #7960. The baseline runs in a direction of 160 degrees magnetic.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,550ft (1,996m)
Aspect	South
Slope	5-12%
Sample Dates	09/12/1996, 07/02/2001, 08/07/2007, 07/31/2012, 07/10/2017

**Wildlife Habitat and Vegetation History**

**Table 17-07.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Deer	crucial	winter/spring	
Greater Sage Grouse	occupied	year-long & Winter	brood-rearing
Moose	crucial	winter	

**Table 17-07.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Mountain Big Sagebrush	NA
1990	Mountain Big Sagebrush	NA
1996	Mountain Big Sagebrush	NA
2001	Mountain Big Sagebrush	NA
2007	Mountain Big Sagebrush/Annual Grass	NA
2012	Mountain Big Sagebrush	NA
2017	Mountain Big Sagebrush	NA

**Site Notes**

The nearest perennial source of water is a spring that is 950 feet south of the site, near an abandoned house.

**Soils**

**Table 17-07.5 - 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
Clay Loam	6.6	41.8	27.4	30.7	3.5	23.1	275.2	0.4	09/12/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has dominated this site since study establishment in 1984; intercept cover has increased since 2007, but density has decreased overall since 1984. Antelope bitterbrush (*Purshia tridentata*) is also present, but contributes much less cover (photos, Table 17-07.12, Table 17-07.13). The herbaceous understory has fluctuated. The annual grass cheatgrass (*Bromus tectorum*) has been observed in moderate abundance in most sample years, and was a co-dominant vegetation component in 2007. Perennial grasses, in particular the native species Sandberg bluegrass (*Poa secunda*) and bluebunch wheatgrass (*Pseudoroegneria spicata*), have provided over 10% cover during the last two sample years (Table 17-07.10). Annual forb cover increased over 18% between 2012 and 2017, but most of the increase can be attributed to the introduced species desert madwort (*Alyssum desertorum*); both perennial and annual forbs have been rare in other sample years (Table 17-07.7, Table 17-07.11).



**Trend Summary Tables**

**Table 17-07.6 - 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	33.2	0.0	-	-	-	-
2001	32.7	0.1	-	-	-	-
2007	17.0	0.0	-	29.8	0.1	-
2012	17.6	0.1	-	26.7	0.1	-
2017	18.5	0.2	-	33.3	0.1	-

**Table 17-07.7 - 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	330	248	52	22	7.4	6.7	0.2	0.3
2001	173	294	211	156	1.5	9.0	2.3	3.8
2007	408	240	246	38	19.4	8.7	2.6	0.6
2012	244	326	254	30	6.5	15.3	1.9	0.1
2017	223	286	378	101	8.9	13.9	20.1	1.1

**Table 17-07.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	7.2	4.7	58.6	0.7	1.4	49.8
2001	17.9	7.4	50.1	1.1	1.8	49.8
2007	9.6	1.2	44.7	1.4	1.4	57.8
2012	5.9	3.2	50.7	1.6	2.8	49.9
2017	7.8	8.5	46.6	1.9	1.8	51.5

**Table 17-07.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
1996	-	30	2	-	9
2001	-	26	-	-	31
2007	5	27	-	-	38
2012	1	28	-	-	16
2017	-	26	7	1	18
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	1.5 (3.6)	34.9 (86.1)	2.7 (6.6)	-	-
2007	10.9 (26.9)	30.2 (74.5)	5.3 (13.2)	-	-
2012	2.9 (7.2)	28.8 (71.2)	6.0 (14.9)	52.3 (129.1)*	-
2017	1.5 (3.6)	50.9 (125.8)	40.9 (101.0)	-	-

\*Pellets per acre (ha)

**Table 17-07.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Leymus cinereus (basin wildrye)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency											
1996	-	11	-	330	34	4	9	-	-	90	145	-
2001	-	24	3	173	38	13	0	-	-	191	97	-
2007	-	23	12	406	12	17	4	-	4	159	84	-
2012	2	18	45	229	30	61	5	-	-	208	134	-
2017	-	20	15	209	49	33	5	2	12	188	75	10
year	Average Cover (%)											
1996	-	0.7	-	7.4	0.9	0.0	0.0	-	-	2.4	2.7	-
2001	-	0.5	0.0	1.5	0.6	0.1	0.0	-	-	5.5	2.3	-
2007	-	0.6	0.0	19.4	0.1	0.3	0.0	-	0.0	4.5	3.1	-
2012	0.0	1.1	1.6	4.8	0.5	1.6	0.0	-	-	6.3	5.7	-
2017	-	0.6	0.1	8.8	1.0	0.7	0.2	0.0	0.6	8.6	2.2	0.1

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

**Table 17-07.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Allium acuminatum (tapertip onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Astragalus (milkvech)	Astragalus cibirarius (browse milkvech)	Astragalus convallarius (lesser rushy milkvech)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Cordylanthus ramosus <sup>a</sup> (bushy bird's beak)	Crepis acuminata (tapertip hawksbeard)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)
year	Nested Frequency																
1996	2	-	-	21	-	5	-	3	-	-	16	20	-	7	-	-	1
2001	-	-	2	22	6	-	120	11	-	1	117	80	-	6	-	2	-
2007	1	3	-	192	5	-	18	1	-	-	87	37	-	2	11	1	-
2012	-	-	4	250	3	-	5	2	2	-	15	5	-	6	-	-	-
2017	9	-	5	340	-	-	58	15	3	-	82	40	5	-	5	-	-
year	Average Cover (%)																
1996	0.0	-	-	0.0	-	0.0	-	0.0	-	-	0.0	0.1	-	0.1	-	-	0.0
2001	-	-	0.0	0.1	0.0	-	3.4	0.0	-	0.0	1.2	0.4	-	0.1	-	0.0	-
2007	0.0	0.0	-	2.2	0.0	-	0.3	0.0	-	-	0.3	0.1	-	0.1	0.0	0.0	-
2012	-	-	0.0	1.9	0.0	-	0.0	0.0	0.0	-	0.0	0.0	-	0.0	-	-	-
2017	0.0	-	0.0	18.4	-	-	0.5	0.2	0.0	-	1.1	0.1	0.2	-	0.0	-	-

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

FORB SPECIES	Erigeron pumilus (shaggy fleabane)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lithospermum ruderale (western stone seed)	Lomatium triternatum (nineleaf biscuitroot)	Lupinus argenteus (silvery lupine)	Microsteris gracilis <sup>a</sup> (slender phlox)	Orthocarpus <sup>a</sup> (owl's-clover)	Phlox longifolia (longleaf phlox)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Silene antirrhina <sup>a</sup> (sleepy silene)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Vicia americana (American vetch)
year	Nested Frequency													
1996	-	-	-	-	3	2	-	4	2	-	-	-	-	-
2001	-	5	-	-	1	19	13	38	26	2	11	1	-	-
2007	-	-	4	-	-	1	13	-	6	-	3	-	-	6
2012	2	-	-	-	1	3	2	-	7	-	-	-	4	2
2017	-	21	-	3	-	0	7	-	11	-	15	5	-	4
year	Average Cover (%)													
1996	-	-	-	-	0.0	0.2	-	0.1	0.0	-	-	-	-	-
2001	-	0.0	-	-	0.0	0.1	0.0	0.4	0.1	0.0	0.1	0.0	-	-
2007	-	-	0.0	-	-	0.0	0.0	-	0.1	-	0.0	-	-	0.0
2012	0.0	-	-	-	0.0	0.0	0.0	-	0.0	-	-	-	0.0	0.0
2017	-	0.2	-	0.1	-	0.0	0.0	-	0.0	-	0.1	0.0	-	0.0

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

**Table 17-07.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Opuntia (pricklypear)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)
year	Line Intercept Cover (%)				
1996	-	-	-	-	-
2001	-	-	-	-	-
2007	-	27.4	-	0.1	2.4
2012	-	25.3	-	0.1	1.4
2017	-	31.7	-	0.1	1.6
year	Quadrat Cover (%)				
1996	-	32.1	0.0	0.0	1.1
2001	0.0	30.8	0.0	0.0	1.9
2007	-	16.5	-	0.0	0.5
2012	-	17.6	0.0	0.0	0.0
2017	-	17.9	0.1	0.0	0.7

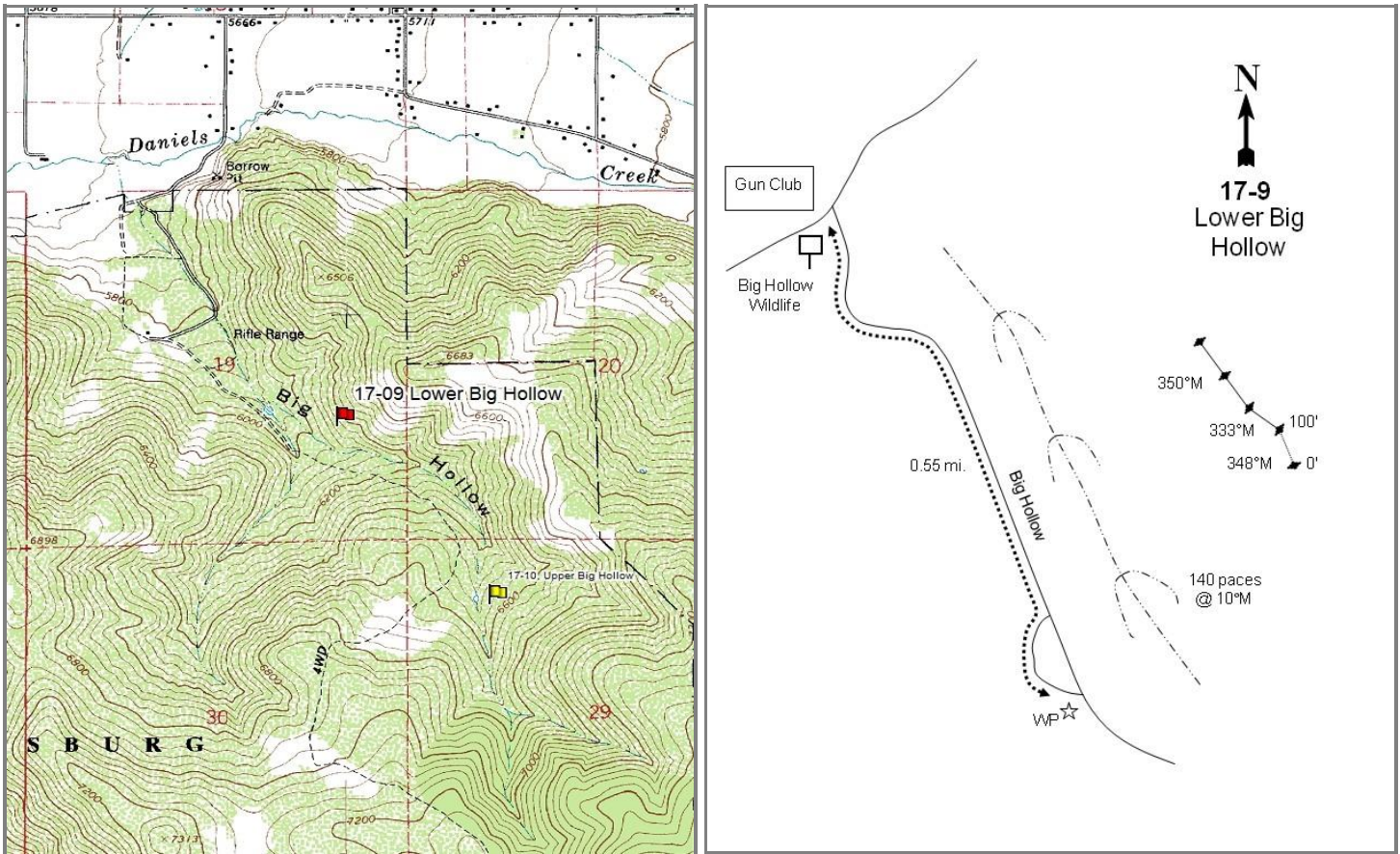
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 17-07.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2001	-	20	0	0	0	0	0	0	- / -
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	4120	20	3	77	20	37	5	3	87/129
2001	4280	-	2	61	37	32	8	23	92/109
2007	2920	20	1	49	50	33	11	34	94/116
2012	2600	20	0	60	40	54	10	50	92/111
2017	3140	1720	3	71	26	54	12	19	88/119
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	20	-	100	0	0	0	0	0	- / -
2001	20	-	0	100	0	0	0	0	- / -
2007	-	-	-	-	-	-	-	-	26/33
2012	-	20	0	0	0	0	0	0	22/23
2017	20	-	0	100	0	0	0	0	36/35
<b>Opuntia -- (pricklypear)</b>									
1996	200	-	0	100	0	10	0	0	14/52
2001	60	-	0	100	0	0	0	0	13/46
2007	120	-	17	83	0	0	0	0	12/24
2012	100	-	0	100	0	0	0	20	11/20
2017	140	-	0	100	0	0	0	0	14/21
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	180	-	0	89	11	11	67	0	60/114
2001	240	-	0	100	0	33	50	0	83/106
2007	200	-	0	60	40	10	80	10	76/94
2012	200	-	0	90	10	0	100	30	68/87
2017	180	-	0	33	67	0	89	67	70/91

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

## LOWER BIG HOLLOW - STUDY NO. 17-9



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Charleston NE; Township 4S, Range 5E, Section 19  
NAD 83 UTM ZONE 12, 464570 East 4478191 North

### Transect Information

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

67  
346° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (71ft), Line 3 (59ft), Line 4 (34ft)  
Belt 5: 3ft

### Directions to Site

Beginning at the gun club parking lot at the mouth of Big Hollow, proceed east for 0.10 miles to the road, which runs up Big Hollow. Turn right and proceed up Big Hollow for 0.55 miles to a turnoff to the south and a green steel "T" fencepost. From the fencepost, the 0-foot baseline stake is located 140 paces away across Big Hollow at an azimuth of 10 degrees magnetic. A red browse tag with number 67 is attached to the 0-foot stake of the frequency baseline.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,200ft (1,890m)
Aspect	Southwest
Slope	30-35%
Sample Dates	09/25/1996, 07/25/2002, 07/03/2007, 08/01/2012, 07/10/2017

**Table 17-09.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	1976	-
Seeding - Seed Unknown	-	-	Fall 1976	-

**Wildlife Habitat and Vegetation History****Table 17-09.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter/spring
Elk	crucial	winter
Moose	substantial	winter

**Table 17-09.4 - 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	No Encroachment
1989	Mountain Big Sagebrush	No Encroachment
1996	Mountain Big Sagebrush	No Encroachment
2002	Mountain Big Sagebrush	No Encroachment
2007	Mountain Big Sagebrush	No Encroachment
2012	Mountain Big Sagebrush	No Encroachment
2017	Mountain Big Sagebrush	No Encroachment

**Site Notes**

This study is located approximately 0.5 miles above the mouth of Big Hollow with an ephemeral stream 200 feet to the west. In management terms the area is likely significant as fawn-rearing habitat for deer and spring-fall range for elk. It was noted in 2017 that some oak (*Quercus gambelii*) plants had galls and that fungus affected some brome grass (*Bromus sp.*) seed heads.

**Soils****Table 17-09.5 - 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
Sandy Clay Loam	7.1	49.8	19.4	30.7	3.0	13.2	128.0	0.6	09/25/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Loam (Browse)
NRCS Ecological Site #	R047XA420UT
States and Transitions	No state and transition model is available for this ecological site.

This study site has existed in a stable state as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated plant community with other preferred browse such as Gambel oak (*Quercus gambelii*), Stansbury cliffrose (*Purshia stansburiana*), Utah serviceberry (*Amelanchier utahensis*), and alderleaf mountain mahogany (*Cercocarpus montanus*) scattered throughout (Table 17-09.12, Table 17-09.13). The herbaceous component is diverse in composition and abundant. Annual grasses -- namely the introduced species cheatgrass (*Bromus tectorum*) -- have contributed the most cover in most sample years since 1996, although a mixture of native and introduced perennial species are also present (Table 17-09.7, Table 17-09.10). Forbs are diverse, but have remained relatively rare throughout the study period (Table 17-09.11).



**Trend Summary Tables**

**Table 17-09.6 - 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	22.0	0.3	-	-	-	-
2002	22.1	0.6	-	27.7	0.4	-
2007	15.5	0.2	-	23.0	0.6	-
2012	21.8	1.6	-	33.5	1.2	-
2017	16.4	1.4	-	28.8	1.2	-

**Table 17-09.7 - 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	361	156	195	117	13.4	5.8	1.4	2.2
2002	283	140	164	44	7.3	7.0	1.5	1.6
2007	375	143	102	53	16.7	7.0	0.4	1.8
2012	227	181	200	103	3.7	9.4	0.7	3.4
2017	347	171	218	83	20.3	11.0	3.9	3.5

**Table 17-09.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	3.6	0.1	58.6	2.4	10.4	42.7
2002	12.0	0.6	54.6	5.5	13.8	38.0
2007	6.8	0.1	47.1	3.3	11.7	44.1
2012	10.5	0.1	41.9	4.5	16.9	41.9
2017	8.4	0.2	38.8	8.2	17.0	51.4

**Table 17-09.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1996	8	3	3
2002	8	2	-
2007	8	2	3
2012	7	1	-
2017	12	3	5
Year	Days Use Per Acre (ha)		
1996	-	-	-
2002	38.2 (94.4)	4.0 (9.9)	-
2007	29.5 (72.8)	2.0 (5.0)	-
2012	27.5 (67.9)	2.7 (6.6)	-
2017	22.1 (54.6)	8.7 (21.5)	-

**Table 17-09.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES											
Bromus arvensis <sup>ai</sup> (field brome)											
Bromus inermis <sup>i</sup> (smooth brome)											
Bromus tectorum <sup>ai</sup> (cheatgrass)											
Dactylis glomerata <sup>i</sup> (orchardgrass)											
Elymus elymoides (squirreltail)											
Poa bulbosa <sup>i</sup> (bulbous bluegrass)											
Poa fendleriana (muttongrass)											
Poa pratensis <sup>i</sup> (Kentucky bluegrass)											
Poa secunda (Sandberg bluegrass)											
Pseudoroegneria spicata (bluebunch wheatgrass)											
Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)											
year	Nested Frequency										
1996	2	4	361	1	1	1	10	28	37	74	20
2002	9	6	276	-	3	9	6	-	55	57	15
2007	7	20	375	1	-	24	2	-	49	60	10
2012	4	15	227	1	-	37	2	-	51	88	11
2017	54	11	312	6	-	55	3	-	6	87	28
year	Average Cover (%)										
1996	0.0	0.1	13.4	0.0	0.0	0.0	0.6	0.3	0.6	3.3	0.8
2002	0.2	0.3	7.1	-	0.1	0.5	0.2	-	1.1	3.9	0.8
2007	0.0	1.1	16.7	0.0	-	0.5	0.0	-	0.9	4.0	0.5
2012	0.0	0.8	3.7	0.0	-	0.9	0.0	-	0.8	5.8	1.0
2017	1.8	0.6	18.5	0.1	-	1.6	0.0	-	0.1	6.4	2.3

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

**Table 17-09.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																		
Agoseris glauca (pale agoseris)																		
Alyssum desertorum <sup>ai</sup> (desert madwort)																		
Arabis (rockcress)																		
Astragalus (milkvech)																		
Astragalus utahensis (Utah milkvech)																		
Balsamorhiza sagittata (arrow/leaf balsamroot)																		
Calochortus nuttallii (sego lily)																		
Camelina microcarpa <sup>ai</sup> (littledod false flax)																		
Castilleja angustifolia (northwestern Indian paintbrush)																		
Chaenactis douglasii (Douglas' dustymaiden)																		
Cirsium (thistle)																		
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																		
Collomia linearis <sup>a</sup> (tiny trumpet)																		
Comandra umbellata (bastard toadflax)																		
Crepis acuminata (tapertip hawksbeard)																		
Descurainia <sup>a</sup> (tansymustard)																		
Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)																		
year	Nested Frequency																	
1996	-	187	19	-	-	5	-	-	-	4	6	-	2	6	-	3	2	
2002	-	115	-	-	-	9	2	4	-	-	-	4	29	3	13	-	-	
2007	1	81	-	-	-	2	-	1	4	-	-	-	9	1	-	3	-	
2012	5	181	3	1	-	13	-	3	-	-	-	1	6	3	14	7	-	
2017	1	148	-	-	4	29	-	17	1	-	2	10	102	4	2	2	-	
year	Average Cover (%)																	
1996	-	1.1	0.0	-	-	0.7	-	-	-	0.1	0.2	-	0.0	0.0	-	0.0	0.0	
2002	-	0.8	-	-	-	1.1	0.0	0.1	-	-	-	0.0	0.1	0.0	0.3	-	-	
2007	0.0	0.2	-	-	-	1.1	-	0.0	0.0	-	-	-	0.0	0.0	-	0.0	-	
2012	0.0	0.6	0.0	0.0	-	1.9	-	0.0	-	-	-	0.0	0.0	0.0	0.1	0.1	-	
2017	0.0	2.1	-	-	0.0	2.8	-	0.1	0.0	-	0.0	0.0	0.7	0.0	0.0	0.0	-	

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

FORB SPECIES	Erigeron (fleabane)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium <sup>n</sup> (bedstraw)	Grindelia squarrosa (curlycup gumweed)	Hackelia patens (spotted stickseed)	Heliomeris multiflora var. multiflora (showy goldeneye)	Ipomopsis aggregata (scarlet gilia)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Orobanche (broomrape)	Orthocarpus tolmiei <sup>a</sup> (Tolmie's owl's-clover)	Packera multilobata (lobeleaf groundsel)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (sleepy silene)
year	Nested Frequency																
1996	28	-	-	4	37	3	3	1	-	21	-	-	3	3	-	2	-
2002	-	-	3	-	9	-	-	-	4	-	28	-	13	2	-	-	11
2007	-	-	7	-	29	-	3	-	-	-	-	10	-	-	5	-	9
2012	24	-	-	-	28	-	3	4	7	2	4	16	3	4	-	-	3
2017	1	6	7	-	38	-	6	2	16	-	8	1	-	1	-	-	-
year	Average Cover (%)																
1996	0.4	-	-	0.0	0.4	0.0	0.0	0.0	-	0.2	-	-	0.0	0.1	-	0.0	-
2002	-	-	0.2	-	0.1	-	-	-	0.0	-	0.3	-	0.0	0.0	-	-	0.1
2007	-	-	0.2	-	0.6	-	0.0	-	-	-	-	0.0	-	-	0.0	-	0.1
2012	0.3	-	-	-	0.2	-	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-	-	0.0
2017	0.0	0.4	0.4	-	0.5	-	0.0	0.0	0.1	-	0.0	0.0	-	0.0	-	-	-

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

FORB SPECIES	Sisymbrium altissimum <sup>ai</sup> (tall tumbled mustard)	Symphoricarichum (aster)	Tragopogon dubius <sup>ai</sup> (yellow salsify)
year	Nested Frequency		
1996	-	8	20
2002	-	7	-
2007	-	-	-
2012	1	13	4
2017	7	2	2
year	Average Cover (%)		
1996	-	0.0	0.2
2002	-	0.0	-
2007	-	-	-
2012	0.0	0.6	0.0
2017	0.0	0.1	0.0

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

**Table 17-09.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)										
	year	1996	2002	2007	2012	2017	1996	2002	2007	2012	2017
Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	-	-	-	-	-	-	1.9	2.3	0.0	0.0	0.0
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	-	16.5	-	15.5	21	21.2	11.5	12.9	10.4	13.7	11.1
Gutierrezia sarothrae (broom snakeweed)	-	-	-	-	0.3	0.1	0.1	-	-	0.4	0.6
Mahonia repens (creeping barberry)	-	-	-	-	-	0.1	-	-	-	-	0.0
Opuntia (pricklypear)	-	0.2	0.2	0.1	0.1	0.2	0.2	0.0	0.0	0.0	0.2
Purshia stansburiana <sup>p</sup> (Stansbury cliffrose)	-	1.7	1.7	1.2	1.6	2	1.8	0.7	0.0	0.4	1.3
Quercus gambelii <sup>p</sup> (Gambel oak)	-	8.6	8.6	6.3	10.8	5.6	6.8	6.2	5.1	7.7	4.1
Symphoricarpos oreophilus (mountain snowberry)	-	0.2	0.2	0.5	0.8	0.8	0.1	0.6	0.2	1.2	0.5

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

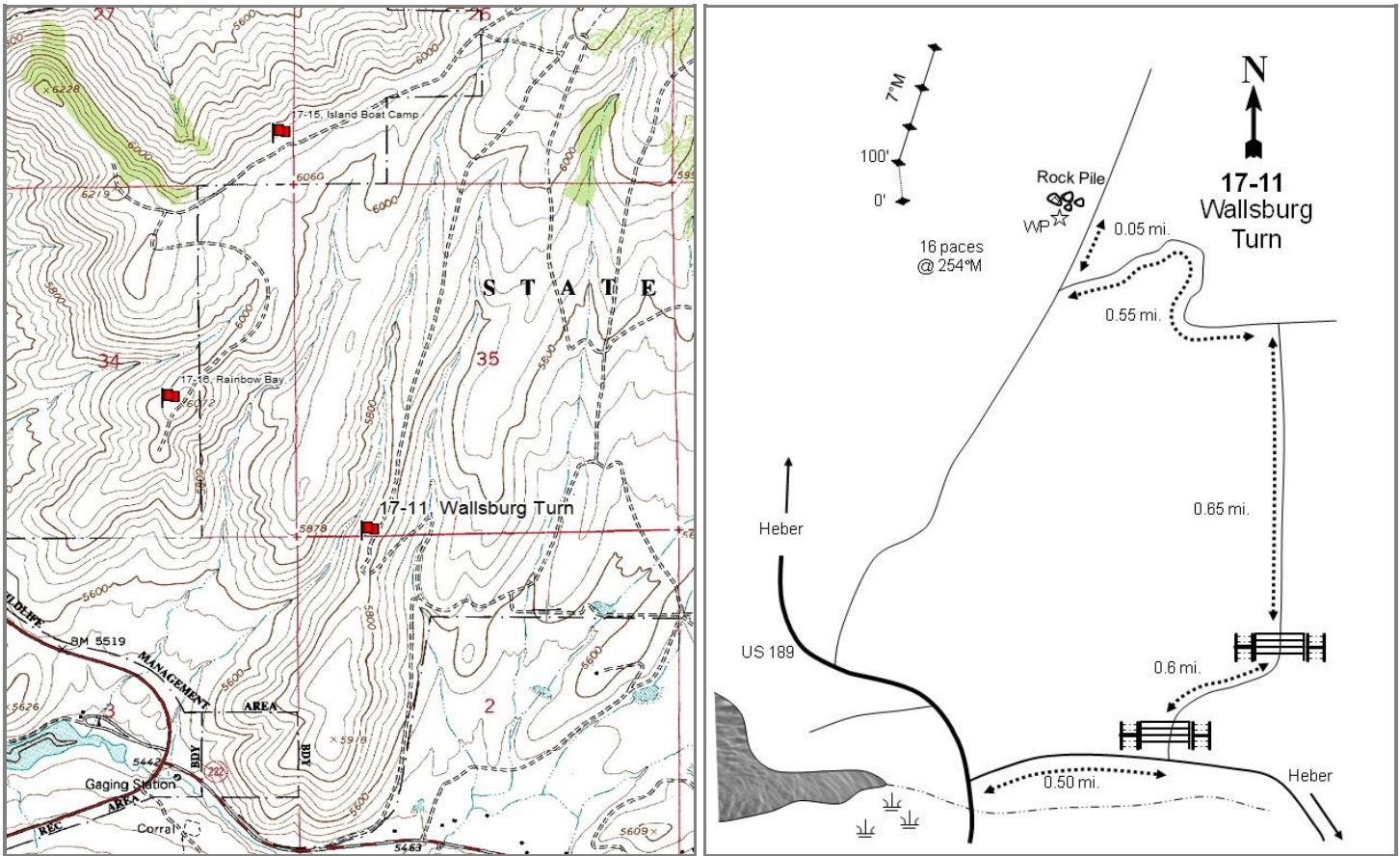
**Table 17-09.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	120	-	33	67	0	17	0	0	94/138
2002	400	-	65	20	15	65	15	45	63/51
2007	40	-	0	100	0	100	0	0	65/89
2012	20	-	0	100	0	0	0	0	76/80
2017	100	-	80	20	0	60	40	0	86/94
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	1540	140	22	60	18	22	0	1	65/128
2002	1920	-	3	73	24	15	1	10	73/111
2007	1500	-	0	84	16	29	5	88	82/118
2012	1360	80	4	81	15	13	2	3	88/131
2017	1460	-	0	85	15	41	16	23	85/131
<b>Cercocarpus montanus<sup>p</sup> -- (alderleaf mountain mahogany)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	176/209
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	181/142
2017	-	-	-	-	-	-	-	-	197/166
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	360	40	17	83	0	0	0	0	27/37
2002	-	-	-	-	-	-	-	-	23/25
2007	-	-	-	-	-	-	-	-	33/47
2012	20	-	0	100	0	0	0	0	36/50
2017	60	-	0	100	0	0	0	0	35/44
<b>Mahonia repens -- (creeping barberry)</b>									
1996	20	-	0	100	0	0	0	0	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	20	-	0	100	0	0	0	0	6/13
2017	440	-	0	100	0	0	0	0	11/6

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Opuntia -- (pricklypear)</b>									
1996	200	-	0	100	0	0	0	0	13/34
2002	160	-	0	50	50	0	0	38	12/28
2007	100	-	0	100	0	0	0	0	13/23
2012	140	-	0	100	0	0	0	0	17/30
2017	120	-	0	100	0	0	0	0	16/30
<b>Purshia stansburiana<sup>P</sup> -- (Stansbury cliffrose)</b>									
1996	140	-	0	86	14	71	29	0	64/177
2002	120	-	0	50	50	0	83	17	62/157
2007	20	-	0	100	0	0	100	0	69/154
2012	40	-	50	50	0	0	0	0	70/109
2017	20	-	0	100	0	0	100	0	69/112
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1996	1200	-	17	82	2	2	0	2	101/79
2002	2840	-	16	82	2	8	0	1	86/50
2007	1900	40	10	85	5	3	0	25	93/52
2012	2300	100	35	63	3	20	0	0	80/70
2017	2740	20	33	67	0	50	5	0	90/54
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1996	100	-	20	80	0	0	0	0	47/73
2002	160	-	0	100	0	0	13	0	64/65
2007	160	-	0	88	13	0	0	38	54/75
2012	480	-	0	88	13	4	0	17	53/52
2017	300	-	40	60	0	0	0	20	61/72

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

## WALLSBURG TURN - STUDY NO. 17-11

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Charleston SW; Township 5S, Range 4E, Section 02  
NAD 83 UTM ZONE 12, 460271 East 4474420 North

**Transect Information**

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

Not Available  
338° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Belt 4: 2ft, Belt 5: 1ft

**Directions to Site**

Beginning at the intersection of US-189 and the Wallsburg turnoff, proceed 0.50 miles towards Wallsburg to an intersection. Turn left at the intersection and proceed northerly for 0.8 miles, passing through two DWR gates. Continue on this road for 0.65 miles to another intersection. Turn left at the intersection and go 0.55 miles to another intersection. Turn right and continue for 0.05 miles to a small rock pile on the left (east) side of the road. From the rock monument, walk 16 paces at an azimuth of 264 degrees magnetic to the 0-foot baseline stake. The frequency baseline is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.



**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,800ft (1,768m)
Aspect	West
Slope	25%
Sample Dates	05/29/1996, 06/25/2002, 07/02/2007, 07/26/2012, 07/11/2017

**Table 17-11.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	August 1976	-
Seeding - Seed Unknown	-	-	Fall 1976	-

**Wildlife Habitat and Vegetation History****Table 17-11.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Greater Sage Grouse	occupied	year-long

**Table 17-11.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Perennial Grass	No Encroachment
1989	Mountain Big Sagebrush	No Encroachment
1996	Mountain Big Sagebrush	No Encroachment
2002	Mountain Big Sagebrush	No Encroachment
2007	Mountain Big Sagebrush	No Encroachment
2012	Mountain Big Sagebrush	No Encroachment
2017	Mountain Big Sagebrush	No Encroachment

**Site Notes**

No Notes

**Soils****Table 17-11.5 - 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
Silty Clay Loam	7.6	18.9	53.1	28.0	3.1	16.3	156.8	0.5	05/29/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Loam (Oak)
NRCS Ecological Site #	R047XA432UT
States and Transitions	No state and transition model is available for this ecological site.

When established in 1983, this study site was dominated by perennial grasses; mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and other browse species were also present. The site transitioned as sagebrush aged and increased, and has been dominated by sagebrush from the 1989 sample year onward (photos, Table 17-11.12, Table 17- 11.13). The herbaceous understory has continued to be abundant and diverse throughout the study years. The introduced perennial grass species crested wheatgrass (*Agropyron cristatum*) and intermediate wheat grass (*Thinopyrum intermedium*) and the native species Sandberg bluegrass (*Poa secunda*) have contributed the most cover over the sample period. In addition, the introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed on the site since 1996 and contributed 10.7% cover in 2017; the introduced perennial species bulbous bluegrass (*P. bulbosa*) is also present (Table 17-11.7, Table 17-11.10). Alfalfa (*Medicago sativa*) has been the most abundant forb in most study years (Table 17-11.11).

**Trend Summary Tables****Table 17-11.6 - 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	10.1	1.9	-	-	-	-
2002	12.6	1.0	-	13.7	1.0	-
2007	12.8	1.4	-	14.8	1.0	-
2012	14.0	1.8	-	15.7	2.4	-
2017	9.5	3.0	-	12.2	2.7	-

**Table 17-11.7 - 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	35	379	350	174	0.6	16.0	2.5	12.5
2002	43	375	332	167	0.6	21.4	8.9	9.6
2007	184	388	389	113	3.3	20.4	5.6	4.9
2012	44	417	258	101	0.3	25.4	0.9	3.5
2017	211	393	366	150	11.1	24.6	8.7	5.8

**Table 17-11.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	11.8	2.2	41.3	9.2	11.9	44.0
2002	8.9	1.7	44.0	7.7	8.7	48.5
2007	7.1	0.7	37.6	8.3	6.8	52.6
2012	6.8	1.0	43.8	8.5	7.8	50.0
2017	4.0	4.4	38.4	11.7	8.9	54.9

**Table 17-11.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	2	12	7	2
2002	-	21	6	5
2007	-	20	6	14
2012	-	8	4	-
2017	1	6	3	7
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2002	-	54.3 (134.1)	17.4 (43.0)	-
2007	5.8 (14.3)	52.3 (129.1)	34.9 (86.1)	-
2012	6.5 (16.1)	10.0 (24.8)	4.7 (11.6)	-
2017	5.1 (12.6)	7.4 (18.2)	0.7 (1.7)	-

**Table 17-11.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)	Vulpia octiflora <sup>a</sup> (sixweeks fescue)
year	Nested Frequency								
1996	255	-	-	35	-	140	8	159	-
2002	222	3	-	42	-	144	3	219	2
2007	229	11	-	181	6	207	18	178	-
2012	256	2	-	42	8	188	6	188	-
2017	246	4	2	209	69	183	32	117	10
year	Average Cover (%)								
1996	8.6	-	-	0.6	-	1.9	0.5	5.0	-
2002	11.3	0.0	-	0.6	-	2.1	0.4	7.6	0.0
2007	8.4	0.1	-	3.3	0.0	4.5	0.5	6.9	-
2012	17.0	0.0	-	0.3	0.1	3.3	0.2	4.9	-
2017	12.0	0.0	0.0	10.7	2.4	5.8	1.2	3.3	0.4

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

**Table 17-11.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Astragalus miser (timber milkvetch)	Calochortus nuttallii (sego lily)	Castilleja (Indian paintbrush)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cymopterus (springparsley)	Delphinium nuttallianum (two-lobed larkspur)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Erigeron divergens <sup>a</sup> (spreading fleabane)
year	Nested Frequency																
1996	12	1	140	43	-	8	9	31	3	163	88	-	18	1	-	32	48
2002	9	23	11	21	2	-	9	39	-	290	7	-	9	-	-	31	-
2007	7	3	103	27	5	-	1	62	-	303	1	-	10	-	3	144	-
2012	5	-	45	5	5	-	-	2	-	157	13	-	3	-	-	19	-
2017	-	11	89	31	11	2	7	30	-	221	10	2	21	-	5	49	-
year	Average Cover (%)																
1996	0.1	0.0	0.3	1.1	-	0.0	0.0	0.1	0.0	1.0	0.2	-	0.1	0.0	-	0.2	0.1
2002	0.0	0.2	0.0	0.2	0.0	-	0.2	0.1	-	8.1	0.0	-	0.1	-	-	0.1	-
2007	0.0	0.0	0.2	0.3	0.0	-	0.0	0.3	-	3.7	0.0	-	0.1	-	0.0	0.5	-
2012	0.0	-	0.1	0.1	0.0	-	-	0.0	-	0.5	0.1	-	0.0	-	-	0.0	-
2017	-	0.1	2.5	0.3	0.0	0.0	0.1	0.6	-	2.8	0.0	0.0	0.1	-	0.0	0.5	-

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

FORB SPECIES												
Eriogonum racemosum (redroot buckwheat)												
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)												
Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)												
Helianthus annuus <sup>a</sup> (common sunflower)												
Lactuca serriola <sup>ai</sup> (prickly lettuce)												
Medicago sativa <sup>i</sup> (alfalfa)												
Microsteris gracilis <sup>a</sup> (slender phlox)												
Polygonum douglasii <sup>a</sup> (Douglas' knotweed)												
Silene antirrhina <sup>a</sup> (sleepy silene)												
Sphaeralcea coccinea (scarlet globemallow)												
Symphotrichum ascendens (western aster)												
Tragopogon dubius <sup>ai</sup> (yellow salsify)												
year	Nested Frequency											
1996	23	-	3	-	6	90	-	2	230	2	-	2
2002	15	-	-	3	-	104	12	2	108	-	-	-
2007	13	-	-	-	-	67	10	2	188	-	-	-
2012	21	-	-	-	-	68	3	-	128	-	3	-
2017	16	9	-	-	3	81	79	-	62	-	2	-
year	Average Cover (%)											
1996	0.3	-	0.0	-	0.0	10.8	-	0.0	0.5	0.0	-	0.0
2002	0.2	-	-	0.0	-	8.7	0.0	0.0	0.6	-	-	-
2007	0.1	-	-	-	-	4.3	0.0	0.0	0.8	-	-	-
2012	0.3	-	-	-	-	3.1	0.0	-	0.3	-	0.0	-
2017	0.1	0.2	-	-	0.0	5.0	1.8	-	0.4	-	0.0	-

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

**Table 17-11.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES				
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)				
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)				
Gutierrezia sarothrae (broom snakeweed)				
Opuntia polyacantha (plains pricklypear)				
year	Line Intercept Cover (%)			
1996	-	-	-	-
2002	13.7	0.7	0.1	0.2
2007	14.8	0.9	-	0.1
2012	15.7	1.9	-	0.5
2017	12.2	2.4	-	0.3
year	Quadrat Cover (%)			
1996	10.1	0.5	1.2	0.2
2002	12.6	0.6	0.1	0.3
2007	12.8	1.3	0.0	0.1
2012	14.0	1.1	-	0.8
2017	9.5	2.7	0.0	0.3

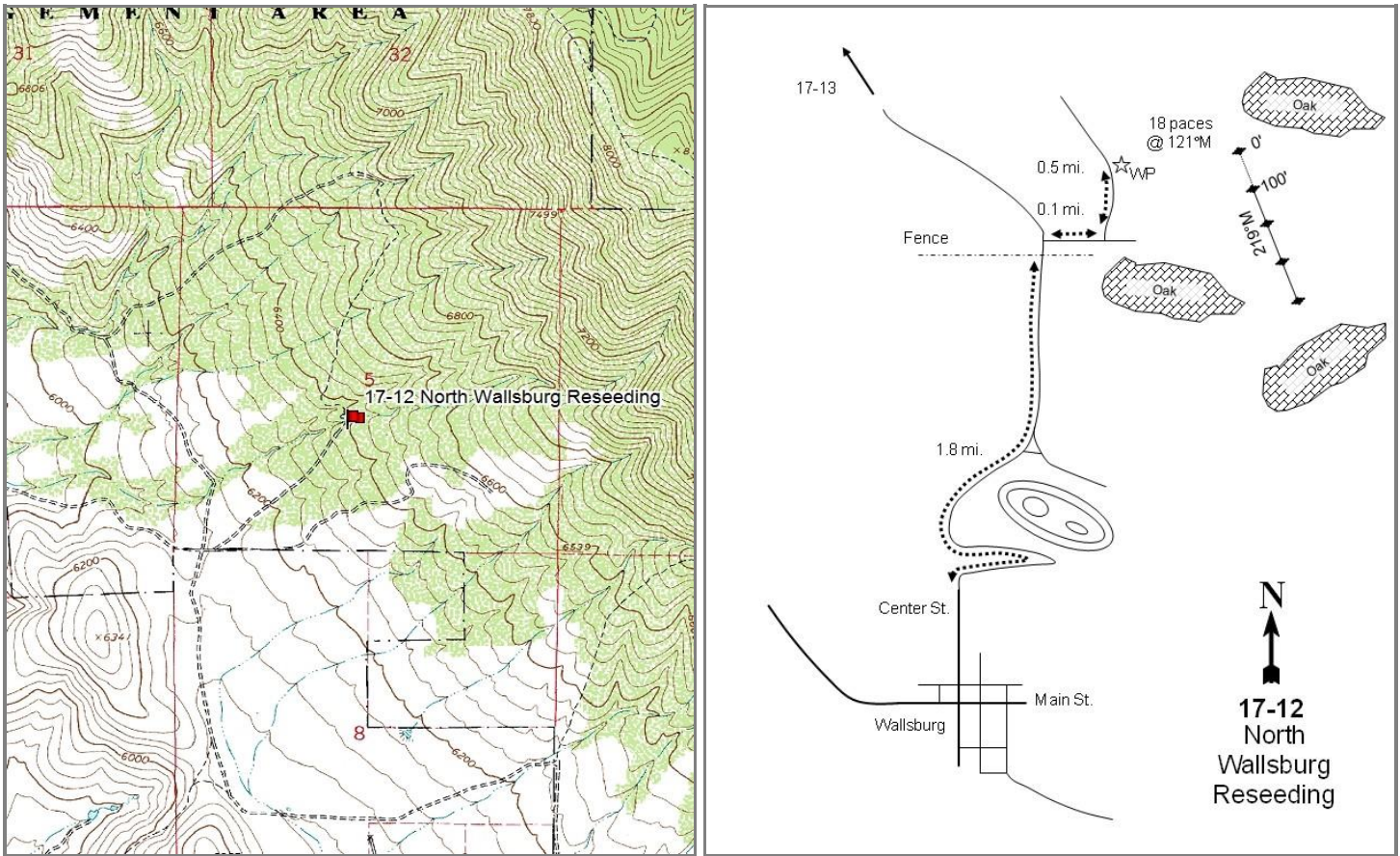
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 17-11.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1996	2320	40	8	91	1	66	17	5	52/91
2002	2160	-	2	72	26	41	44	14	63/89
2007	1780	20	0	47	53	29	1	67	78/109
2012	1700	-	6	71	24	37	13	29	71/99
2017	1800	-	2	71	27	36	0	14	72/109
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	200	80	40	60	0	0	0	0	23/34
2002	1360	-	2	90	9	0	0	0	18/26
2007	1200	-	0	98	2	0	0	13	26/31
2012	1200	-	0	100	0	0	0	8	25/37
2017	1280	-	3	97	0	3	0	0	33/49
<b>Ephedra viridis<sup>P</sup> -- (mormon tea)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	53/57
2017	-	-	-	-	-	-	-	-	55/59
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	2600	440	12	88	0	0	0	0	22/35
2002	400	-	0	80	20	0	0	0	18/13
2007	100	-	0	100	0	0	0	0	24/24
2012	-	-	-	-	-	-	-	-	28/49
2017	320	-	6	94	0	0	0	0	31/36
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	120	20	0	100	0	0	0	0	14/46
2002	140	-	0	100	0	0	0	0	15/67
2007	120	-	0	67	33	0	0	17	16/41
2012	320	-	0	100	0	0	0	6	12/26
2017	200	-	10	90	0	0	0	0	15/31
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1996	-	-	-	-	-	-	-	-	48/170
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	36/92
2012	-	-	-	-	-	-	-	-	48/100
2017	20	-	0	100	0	100	0	0	63/132

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

## NORTH WALLSBURG RESEEDING - STUDY NO. 17-12



### Location Information

USGS 7.5 min Map Info	Charleston SE; Township 5S, Range 5E, Section 05
GPS (0' Stake)	NAD 83 UTM ZONE 12, 465440 East 4473635 North

### Transect Information

Browse Tag # (0' Stake)	DWR73
Transect Bearing	172° 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 town of Wallsburg, take Center Street and continue north for 1.8 miles, staying on the main road until a gate is reached. Proceed through the gate and turn east immediately after passing through the gate. Proceed east, traveling along the fence line, for 0.10 miles to another intersection. Turn left at the intersection and proceed north for 0.50 miles to a green steel "T" fencepost on the right (east) side of the road. From the fencepost, the 0-foot baseline stake is 18 paces away at an azimuth of 121 degrees magnetic. A red browse tag, number DWR73, is attached to the 0-foot baseline stake.



**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,400ft (1,951m)
Aspect	Southwest
Slope	10-15%
Sample Dates	09/24/1996, 06/26/2002, 07/06/2007, 07/25/2012, 07/10/2017

**Table 17-12.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	August 1976	-
Seeding - Seed Unknown	-	-	Fall 1976	-

**Wildlife Habitat and Vegetation History****Table 17-12.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter/spring
Elk	crucial	winter

**Table 17-12.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Gambel Oak/Mixed Mountain Brush	No Encroachment
1989	Gambel Oak/Mixed Mountain Brush	No Encroachment
1996	Gambel Oak/Mixed Mountain Brush	No Encroachment
2002	Gambel Oak/Mixed Mountain Brush	No Encroachment
2007	Gambel Oak/Mixed Mountain Brush	No Encroachment
2012	Gambel Oak/Mixed Mountain Brush	No Encroachment
2017	Gambel Oak/Mixed Mountain Brush	No Encroachment

**Site Notes**

The study is within the boundaries of a 1976 wildfire between Main Canyon and Daniels Canyon. The fire varied in intensity, leaving patches of shrubs that survived. The area was seeded later that year.

**Soils****Table 17-12.5 - 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	7.1	40.2	29.1	30.7	3.5	21.1	163.2	0.7	09/24/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Mountain Stony Loam (Oak)
NRCS Ecological Site #	R047XA463UT
States and Transitions	No state and transition model is available for this ecological site.

This site has been co-dominated by Gambel oak (*Quercus gambelii*) and mixed mountain brush, mainly mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*), since study establishment in 1983; other shrubs are present in lesser amounts (Table 17-12.12, Table 17-12.13). Perennial grasses have dominated the herbaceous understory in each sample year (Table 17-12.7), with intermediate wheatgrass (*Thinopyrum intermedium*) and crested wheatgrass (*Agropyron cristatum*) being the dominant grasses in 1983 and 1989 and Idaho fescue (*Festuca idahoensis*) contributing the most cover since 1996. In addition, the introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) has been observed each sample year since 1996 (Table 17-12.10). Forbs, although diverse, have remained rare (Table 17-12.11).

**Trend Summary Tables****Table 17-12.6 - 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	8.4	1.4	-	-	-	-
2002	12.0	0.6	-	18.3	1.1	-
2007	9.0	0.6	-	14.3	1.8	-
2012	14.4	0.2	-	18.0	1.4	-
2017	11.6	0.7	-	15.3	1.0	-

**Table 17-12.7 - 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	18	371	161	76	0.1	21.1	0.4	1.5
2002	8	350	36	54	0.5	18.6	0.1	0.6
2007	38	396	125	71	0.6	29.9	0.6	1.1
2012	23	424	26	59	0.1	38.8	0.1	1.3
2017	19	386	69	64	0.6	33.4	0.5	1.7

**Table 17-12.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	12.0	0.8	40.0	10.1	6.8	34.8
2002	20.5	0.1	58.4	4.4	5.1	32.8
2007	14.8	0.1	42.6	2.8	3.7	47.9
2012	10.4	0.1	38.3	3.7	3.3	56.8
2017	14.4	0.1	57.9	4.5	4.2	47.3

**Table 17-12.9 - 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	Coyote	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
1996	5	-	27	5	8
2002	-	-	24	5	-
2007	-	-	30	6	17
2012	-	-	6	5	-
2017	-	-	24	3	14
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2002	-	-	69.0 (170.5)	10.0 (24.8)	-
2007	-	-	48.3 (119.2)	18.7 (46.3)	-
2012	-	-	17.4 (43.0)	2.7 (6.6)	-
2017	-	8.7 (21.5)*	40.2 (99.3)	7.4 (18.2)	-

\*Pellets per acre (ha)

**Table 17-12.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Dactylis glomerata <sup>i</sup> (orchardgrass)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Hesperostipa comata (needle and thread)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency											
1996	-	73	18	-	1	219	-	34	-	31	26	157
2002	4	61	8	0	1	188	2	102	-	8	7	179
2007	-	62	38	3	-	213	1	137	-	-	8	214
2012	5	46	23	10	-	273	2	154	2	-	5	198
2017	-	37	19	-	-	257	3	148	-	-	7	201
year	Average Cover (%)											
1996	-	2.4	0.1	-	0.0	14.3	-	0.6	-	0.4	0.1	3.3
2002	0.2	1.3	0.5	0.0	0.0	8.3	0.0	2.8	-	0.0	0.1	5.9
2007	-	2.2	0.6	0.0	-	16.2	0.0	4.2	-	-	0.1	7.2
2012	0.2	2.2	0.1	0.0	-	26.7	0.0	4.0	0.0	-	0.0	5.6
2017	-	1.6	0.6	-	-	21.3	0.0	4.0	-	-	0.0	6.5

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

**Table 17-12.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza sagittata (arrow/leaf balsamroot)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron divergens <sup>a</sup> (spreading fleabane)
year	Nested Frequency																
1996	2	-	158	1	-	11	-	-	-	3	6	-	-	-	-	3	1
2002	1	2	26	9	-	11	-	2	-	-	-	6	3	4	-	-	-
2007	1	1	99	8	9	5	1	3	4	-	4	1	-	9	21	-	-
2012	1	-	12	6	4	4	-	-	-	-	7	-	-	-	-	-	2
2017	-	-	44	7	4	7	1	9	-	-	2	22	-	-	-	-	4
year	Average Cover (%)																
1996	0.0	-	0.4	0.0	-	0.3	-	-	-	0.0	0.3	-	-	-	-	0.0	0.0
2002	0.0	0.0	0.1	0.1	-	0.1	-	0.0	-	-	-	0.0	0.0	0.0	-	-	-
2007	0.0	0.0	0.5	0.1	0.1	0.2	0.0	0.0	0.0	-	0.0	0.0	-	0.0	0.1	-	-
2012	0.0	-	0.0	0.1	0.2	0.0	-	-	-	-	0.0	-	-	-	-	-	0.0
2017	-	-	0.2	0.3	0.2	0.2	0.0	0.0	-	-	0.0	0.3	-	-	-	-	0.0

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

FORB SPECIES	Eriogonum racemosum (redroot buckwheat)	Euphorbia brachycera (horned spurge)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Grindelia squarrosa (curlycup gumweed)	Helianthus annuus <sup>a</sup> (common sunflower)	Heliomeris multiflora var. multiflora (showy goldeneye)	Lactuca serriola <sup>ii</sup> (prickly lettuce)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stone seed)	Medicago sativa <sup>i</sup> (alfalfa)	Orthocarpus <sup>a</sup> (owl's-clover)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sphaeralcea coccinea (scarlet globemallow)	Symphotrichum ascendens (western aster)	Tragopogon dubius <sup>ii</sup> (yellow salsify)
year	Nested Frequency																
1996	7	-	-	3	-	10	-	3	1	11	2	23	6	-	-	-	10
2002	3	-	-	6	-	-	-	1	12	5	-	11	-	-	1	-	2
2007	6	-	-	-	-	1	-	1	2	2	-	32	1	-	2	2	1
2012	4	3	5	-	3	-	1	-	8	3	-	25	-	3	-	5	1
2017	13	1	-	-	-	4	3	-	5	5	-	14	-	-	4	-	1
year	Average Cover (%)																
1996	0.1	-	-	0.1	-	0.2	-	0.0	0.1	0.3	0.0	0.1	0.0	-	-	-	0.0
2002	0.0	-	-	0.0	-	-	-	0.0	0.1	0.2	-	0.0	-	-	0.0	-	0.0
2007	0.0	-	-	-	-	0.0	-	0.0	0.2	0.3	-	0.1	0.0	-	0.0	0.0	0.0
2012	0.2	0.0	0.0	-	0.0	-	0.0	-	0.4	0.3	-	0.1	-	0.0	-	0.1	0.0
2017	0.1	0.0	-	-	-	0.0	0.0	-	0.4	0.4	-	0.1	-	-	0.0	-	0.0

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

FORB SPECIES	Zizadenus paniculatus (foothill deathcamas)
year	Nested Frequency
1996	-
2002	-
2007	-
2012	2
2017	2
year	Average Cover (%)
1996	-
2002	-
2007	-
2012	0.0
2017	0.0

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

**Table 17-12.12 - 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 <sup>p</sup> (Utah serviceberry)	1996	-	-	-	-	-	-	-	-	-	-
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	2002	0.3	4.6	-	0.3	-	0	2.1	11.3	-	0.8
Cercocarpus montanus <sup>p</sup> (alderleaf mountain mahogany)	2007	0.1	4.3	-	0.9	0.1	0	2	7.9	-	0.8
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	2012	0.2	2.5	-	0.9	-	0.1	4.2	11.1	-	0.4
Gutierrezia sarothrae (broom snakeweed)	2017	0.1	1.8	-	0.2	0.2	0	3.6	9.8	-	0.6
Opuntia polyacantha (plains pricklypear)	Quadrat Cover (%)										
Purshia tridentata <sup>p</sup> (antelope bitterbrush)	1996	-	1.6	0.0	0.7	0.5	0.0	1.6	5.1	0.1	0.1
Quercus gambelii <sup>p</sup> (Gambel oak)	2002	0.4	3.9	-	0.0	0.0	0.0	1.7	6.0	-	0.5
Symphoricarpos oreophilus (mountain snowberry)	2007	0.2	3.2	-	0.1	0.0	0.0	1.9	3.7	-	0.5
Tetradymia canescens (spineless horsebrush)	2012	0.1	3.5	-	0.2	-	0.0	3.5	7.3	-	0.1
	2017	0.1	2.1	-	0.2	0.2	0.0	3.1	6.3	-	0.3

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

**Table 17-12.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

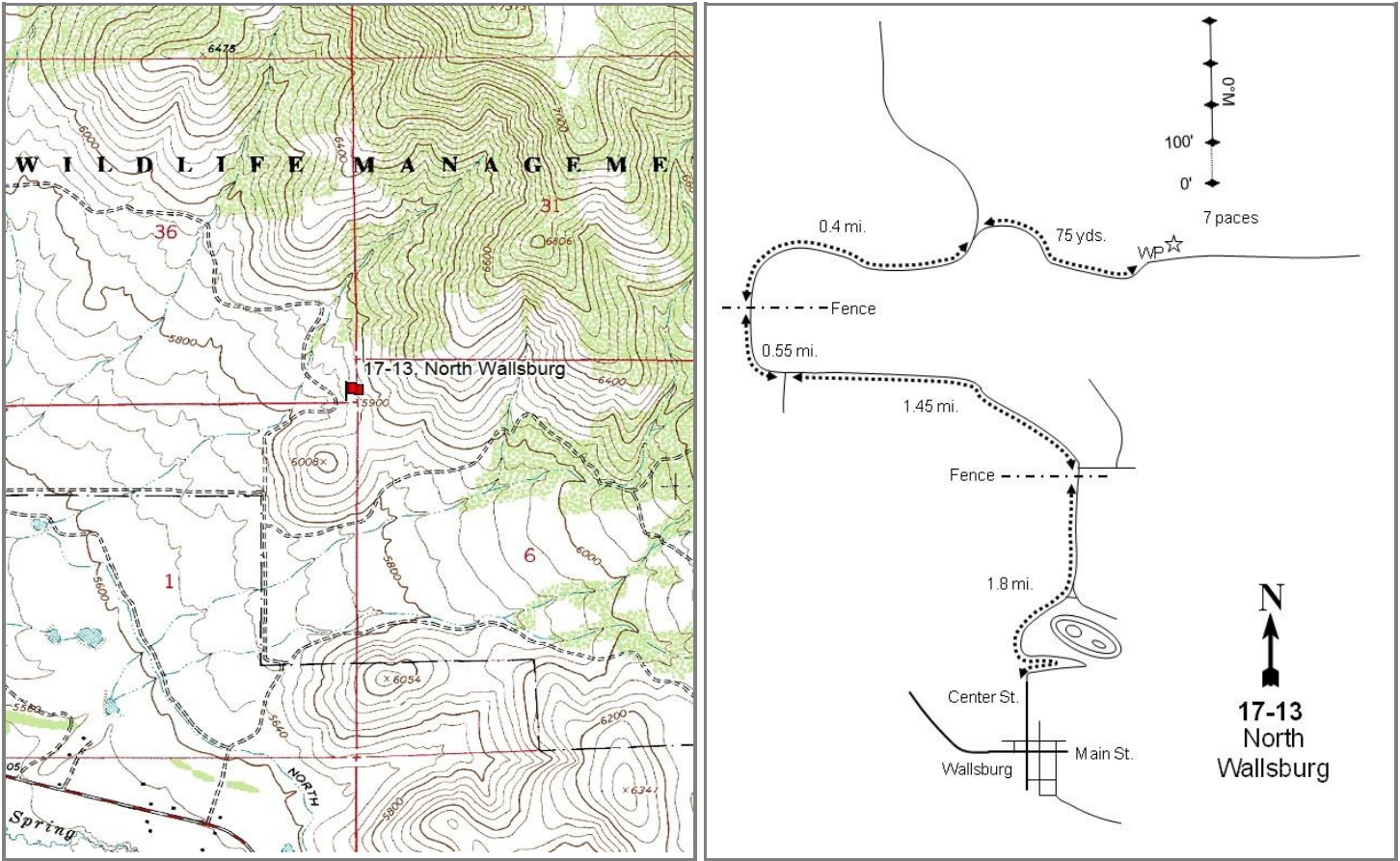
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2002	40	-	0	100	0	50	50	0	78/89
2007	40	-	0	100	0	50	0	0	69/91
2012	120	-	83	17	0	17	0	0	67/79
2017	180	-	0	100	0	0	0	0	57/60
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	340	-	18	77	6	53	6	0	72/119
2002	320	-	0	88	13	44	56	0	65/96
2007	360	-	0	56	44	39	6	78	75/125
2012	280	-	0	64	36	64	36	43	65/115
2017	280	-	7	50	43	36	43	36	68/121
<b>Cercocarpus montanus<sup>p</sup> -- (alderleaf mountain mahogany)</b>									
1996	20	-	0	100	0	0	100	0	80/96
2002	-	-	-	-	-	-	-	-	69/89
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	1300	60	15	79	6	0	0	2	25/49
2002	480	-	4	92	4	0	0	4	18/37
2007	340	-	0	77	24	0	0	6	24/37
2012	300	-	13	87	0	7	0	0	25/45
2017	280	-	7	86	7	21	0	0	28/47
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	840	20	33	67	0	0	0	0	21/27
2002	120	-	0	83	17	0	0	0	17/21
2007	80	-	0	75	25	0	0	25	25/31
2012	20	-	0	100	0	0	0	0	19/32
2017	260	-	8	92	0	0	0	8	33/38

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	160	-	0	100	0	0	13	0	12/51
2002	80	-	0	100	0	0	0	0	12/20
2007	80	-	0	75	25	0	0	0	12/24
2012	60	-	0	100	0	0	0	0	13/34
2017	40	-	50	50	0	0	0	0	15/32
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1996	100	-	0	100	0	40	0	0	78/196
2002	80	-	0	100	0	0	50	0	91/187
2007	80	-	0	100	0	75	0	0	104/186
2012	240	-	0	92	8	42	42	8	92/181
2017	300	-	0	100	0	40	40	0	91/154
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1996	2840	240	20	74	6	51	4	49	123/85
2002	4400	-	26	71	2	0	0	31	123/65
2007	5320	-	45	40	15	3	0	34	173/94
2012	3200	480	56	44	0	4	0	1	98/65
2017	6680	340	60	39	2	1	0	1	117/74
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1996	20	-	0	100	0	0	0	0	78/83
2002	-	-	-	-	-	-	-	-	62/121
2007	-	-	-	-	-	-	-	-	105/188
2012	-	-	-	-	-	-	-	-	89/97
2017	-	-	-	-	-	-	-	-	105/129
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	400	-	20	80	0	0	0	0	22/37
2002	640	-	16	84	0	0	0	0	23/57
2007	680	-	9	85	6	0	0	27	22/42
2012	560	-	0	100	0	0	0	0	16/32
2017	560	-	4	96	0	0	0	0	18/48

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



## NORTH WALLSBURG - STUDY NO. 17-13



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Charleston SE; Township 4S, Range 4E, Section 36  
NAD 83 UTM ZONE 12, 463193 East 4474482 North

### Transect Information

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

3955  
0° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Belt 2: 5ft

### Directions to Site

Beginning at the town of Wallsburg, proceed northerly for 1.80 miles, staying on the main road. At 1.80 miles the road will come to a fence line and a gate: proceed through the gate and turn left (west). Proceed west for 1.45 miles to where the road bends northward at the DWR fence line. Continue on the same road northward for 0.55 additional miles to a cattle guard. Cross the fence and take the immediate right fork, then proceed 0.40 miles to another fork in the road. Walk 75 yards up the old road to a red steel fencepost and a full-high witness post on the left (north) side of the road and stop. From the fencepost, the 0-foot stake of the baseline is 7 paces northeast.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,000ft (1,829m)
Aspect	West
Slope	20%
Sample Dates	09/24/1996, 06/26/2002, 07/06/2007, 07/25/2012, 07/10/2017

**Wildlife Habitat and Vegetation History****Table 17-13.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Greater Sage Grouse	occupied	year-long

**Table 17-13.4 - 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	NA
1989	Mountain Big Sagebrush	NA
1996	Mountain Big Sagebrush/Annual Grass	NA
2002	Mountain Big Sagebrush/Bulbous Bluegrass	NA
2007	Mountain Big Sagebrush/Bulbous Bluegrass	NA
2012	Mountain Big Sagebrush/Bulbous Bluegrass	NA
2017	Mountain Big Sagebrush/Bulbous Bluegrass	NA

**Site Notes**

There is an ephemeral stream 700 feet to the west and a group of stock ponds approximately 1 mile to the southwest.

**Soils****Table 17-13.5 - 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	7.1	50.9	23.7	25.4	2.4	16.2	172.8	0.6	09/24/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has dominated this site since study establishment in 1983 (Table 17-13.12, Table 17-13.13). The herbaceous understory has remained abundant throughout the study years (Table 17-13.7). However, the main herbaceous components are the introduced annual grass cheatgrass (*Bromus tectorum*) and the introduced perennial grass bulbous bluegrass (*Poa bulbosa*), although other perennial grasses are present in much lesser amounts (Table 17-13.10). Forbs, while somewhat diverse, have remained rare throughout the study years; the introduced annual forb redstem stork's bill (*Erodium cicutarium*) contributed the most cover of any one species in the 2017 sample year (Table 17-13.11). Encroachment by trees is not a concern on this study site.

**Trend Summary Tables****Table 17-13.6 - 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	10.9	2.3	-	-	-	-
2002	14.7	0.3	-	17.3	0.2	-
2007	11.9	0.3	-	19.5	0.9	-
2012	11.3	0.5	-	24.8	1.2	-
2017	14.4	3.7	-	19.5	4.4	-

**Table 17-13.7 - 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	370	324	211	11	16.0	11.8	1.2	0.1
2002	232	404	80	14	5.2	26.9	0.3	0.0
2007	358	422	118	23	9.1	27.9	1.4	0.1
2012	293	401	58	12	7.1	32.1	0.7	0.1
2017	428	384	231	10	20.6	27.3	4.9	0.1

**Table 17-13.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	4.3	1.0	44.3	3.8	12.0	43.9
2002	12.4	0.9	40.8	4.5	11.6	47.5
2007	6.5	0.2	38.9	2.5	11.0	54.4
2012	8.0	0.6	33.9	3.6	16.4	55.2
2017	6.9	0.5	53.2	2.6	10.8	62.3

**Table 17-13.9 - 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	Mule Deer	Rocky Mountain Elk	Rabbit	Domestic Sheep
	Quadrat Frequency			
1996	36	12	11	1
2002	47	4	6	-
2007	56	10	2	-
2012	45	10	-	1
2017	42	5	5	-
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2002	151.5 (374.1)	8.7 (21.5)	-	-
2007	147.4 (364.2)	37.5 (92.7)	-	-
2012	93.2 (230.1)	4.7 (11.6)	-	-
2017	102.6 (253.3)	4.0 (9.9)	-	-

**Table 17-13.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency								
1996	6	-	370	9	-	181	193	-	-
2002	18	2	232	3	4	348	156	-	11
2007	5	3	358	-	4	363	140	1	7
2012	10	8	293	2	9	384	79	16	-
2017	7	9	428	-	9	379	9	1	26
year	Average Cover (%)								
1996	0.4	-	16.0	0.2	-	7.5	3.7	-	-
2002	0.7	0.0	5.2	0.0	0.2	22.6	2.7	-	0.7
2007	0.2	0.3	9.1	-	0.0	23.8	3.5	0.0	0.2
2012	0.2	0.4	7.1	0.0	0.0	29.7	1.4	0.2	-
2017	0.2	0.2	20.6	-	0.2	25.9	0.1	0.0	0.7

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

**Table 17-13.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Astragalus eurekaensis (Eureka milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Cirsium (thistle)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron divergens <sup>a</sup> (spreading fleabane)	Eriogonum racemosum (redroot buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Helianthus annuus <sup>a</sup> (common sunflower)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (sleepy silene)
year	Nested Frequency																
1996	4	120	1	-	1	-	-	-	-	9	6	6	59	-	-	4	-
2002	-	14	-	0	4	1	-	-	-	-	-	3	32	2	6	-	38
2007	-	8	-	-	2	7	-	3	30	-	0	3	68	-	8	-	53
2012	2	1	-	-	5	-	-	-	-	-	25	3	8	-	2	-	9
2017	-	38	-	-	-	7	0	0	3	2	1	2	185	-	-	-	9
year	Average Cover (%)																
1996	0.0	0.7	0.0	-	0.0	-	-	-	-	0.0	0.0	0.0	0.2	-	-	0.0	-
2002	-	0.0	-	0.0	0.0	0.0	-	-	-	-	-	0.0	0.1	0.0	0.0	-	0.1
2007	-	0.0	-	-	0.0	0.0	-	0.0	0.1	-	0.0	0.0	0.9	-	0.0	-	0.4
2012	0.0	0.0	-	-	0.0	-	-	-	-	-	0.6	0.0	0.0	-	0.0	-	0.1
2017	-	0.2	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7	-	-	-	0.0

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

FORB SPECIES				
Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)				
Sphaeralcea coccinea (scarlet globemallow)				
Tragopogon dubius <sup>ai</sup> (yellow salsify)				
Zigadenus paniculatus (foothill deathcamas)				
year	Nested Frequency			
1996	-	-	32	-
2002	5	-	-	-
2007	0	-	1	3
2012	4	-	15	-
2017	-	0	-	1
year	Average Cover (%)			
1996	-	-	0.2	-
2002	0.0	-	-	-
2007	0.0	-	0.0	0.0
2012	0.0	-	0.0	-
2017	-	0.0	-	0.0

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

**Table 17-13.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES					
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)					
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)					
Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)					
Gutierrezia sarothrae (broom snakeweed)					
Opuntia polyacantha (plains pricklypear)					
year	Line Intercept Cover (%)				
1996	-	-	-	-	-
2002	16.1	-	1.2	0.2	-
2007	17.7	-	1.8	0.6	0.3
2012	22.4	-	2.4	1.2	-
2017	17.8	-	1.7	4.4	-
year	Quadrat Cover (%)				
1996	9.1	-	1.8	2.0	0.3
2002	13.5	-	1.2	0.1	0.2
2007	11.0	-	0.9	0.1	0.2
2012	10.5	-	0.8	0.3	0.2
2017	13.5	0.4	0.9	3.2	0.1

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

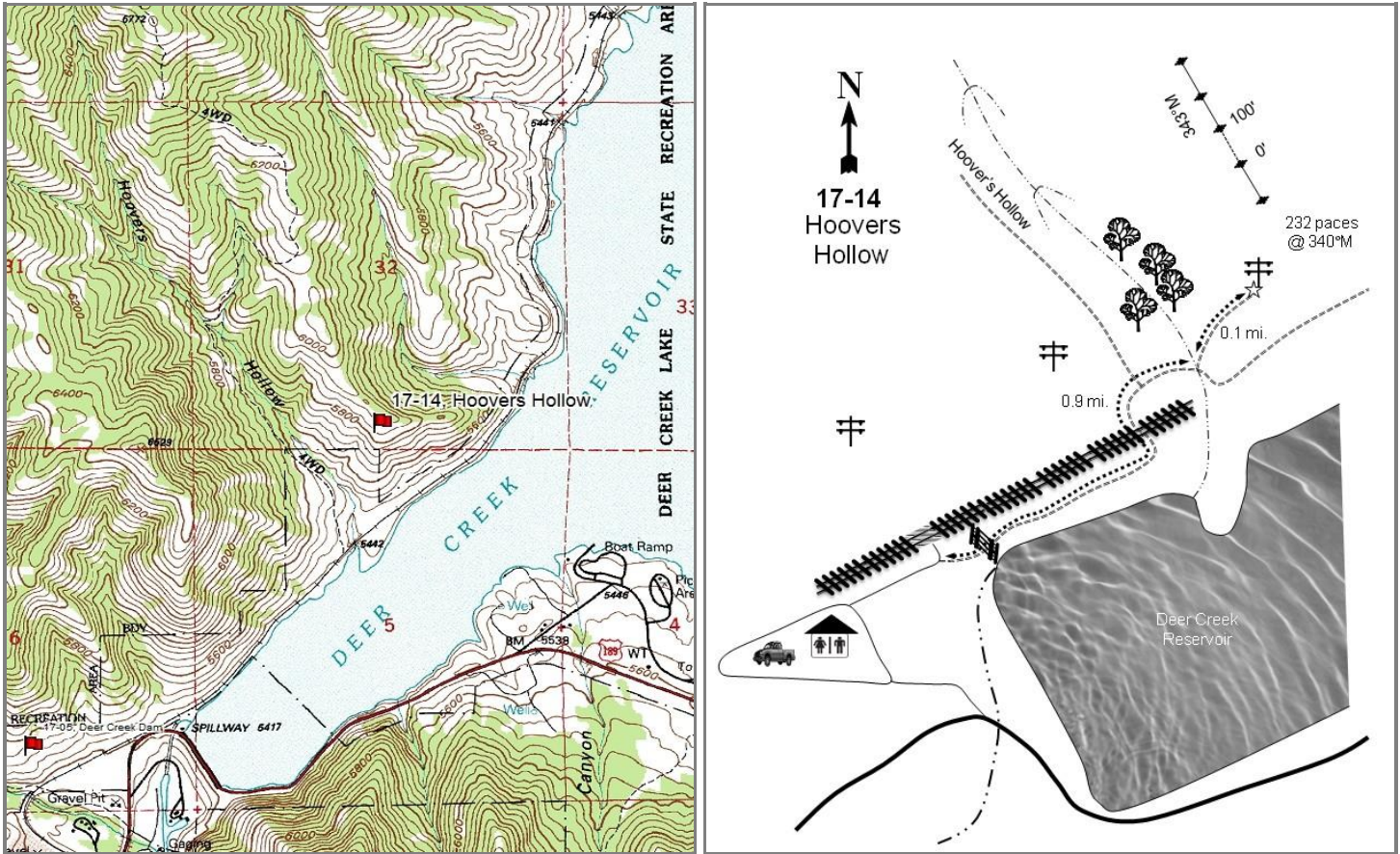
**Table 17-13.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1996	2240	380	16	53	31	38	8	8	59/112
2002	2540	-	5	62	33	32	30	11	53/76
2007	1800	-	2	56	42	39	13	71	68/100
2012	1620	100	1	82	17	33	20	12	71/110
2017	1640	-	2	73	24	48	38	21	66/106
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2002	20	-	0	100	0	0	0	0	21/28
2007	-	-	-	-	-	-	-	-	26/34
2012	20	-	0	100	0	0	0	0	13/16
2017	20	-	0	100	0	0	0	0	30/35
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1996	360	120	11	67	22	11	6	11	78/115
2002	280	-	0	21	79	0	0	29	52/57
2007	280	-	0	21	79	0	0	36	66/75
2012	140	-	0	71	29	0	0	0	67/89
2017	200	-	0	70	30	0	0	10	73/101
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	4500	100	12	88	0	0	0	0	24/34
2002	520	-	0	77	23	0	0	8	21/21
2007	660	20	12	82	6	0	0	0	21/24
2012	1880	80	52	48	0	0	0	0	25/31
2017	6420	20	7	94	0	0	0	0	25/29
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	420	-	10	81	10	0	0	0	12/43
2002	380	-	11	79	11	0	0	0	12/28
2007	260	-	0	92	8	0	0	8	15/32
2012	400	-	5	90	5	0	0	35	13/32
2017	300	-	7	87	7	0	0	7	16/40

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



## HOOVERS HOLLOW - STUDY NO. 17-14



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Aspen Grove SE; Township 4S, Range 4E, Section 32  
NAD 83 UTM ZONE 12, 455968 East 4474548 North

### Transect Information

Browse Tag # (0' Stake)	3949
Transect Bearing	343° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 5: 1ft

### Directions to Site

From the locked gate at the southwest corner of Deer Creek Reservoir, walk 0.9 miles on the maintenance road along the northern edge of the reservoir, crossing the railroad tracks. Stop where the road crosses Hoovers Hollow. Follow a faint road that leads through the brush across the hollow, and then to the first power pole northeast of the hollow. From the power pole, walk 232 paces at an azimuth of 340 degrees magnetic to the 0-foot baseline stake. A red browse tag, numbered 3949, is attached to the 0-foot baseline stake.



**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,820ft (1,774m)
Aspect	Southwest
Slope	30-40%
Sample Dates	05/24/1996, 06/28/2002, 07/05/2007, 07/30/2012, 07/10/2017

**Table 17-14.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Cascade	-	2003	-

**Wildlife Habitat and Vegetation History**

**Table 17-14.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Moose	substantial	winter

**Table 17-14.4 - 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	NA
1989	Mountain Big Sagebrush/Perennial Grass	NA
1996	Mountain Big Sagebrush	NA
2002	Mountain Big Sagebrush/Annual Grass	NA
2007	Annual Grass	NA
2012	Annual Grass/Perennial Grass	NA
2017	Annual Grass	NA

**Site Notes**

This study is located on a ridge top near the mouth of Hoovers Hollow, and on the west side of Deer Creek Reservoir.

**Soils**

**Table 17-14.5 - 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	7.3	34.9	35.1	30.0	2.6	25.6	92.8	0.5	05/24/1996

**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	No state and transition model is available for this ecological site.

This study site existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) (photos, Table 17-14.12, Table 17-14.13) and perennial grass, namely Sandberg bluegrass (*Poa secunda*) (Table 17-14.10, Table 17-14.11), plant community from establishment in 1983 to 1989. The perennial grass component decreased in 1996, leaving sagebrush as the sole dominant component (Table 17-14.7). In 2002, the introduced annual grass species cheatgrass (*Bromus tectorum*) increased in abundance, transitioning the study site to one co-dominated by annual grasses. Then, in 2003, the Cascade wildfire removed most of the browse component. Annual grasses have dominated the study site in the sample years following the burn, with perennial grasses co-dominating in 2012. In addition, the cover of cheatgrass more than tripled from 12.3% in 2012 to 41.6% in 2017, thereby increasing fuel loads and risk of future wildfire (Table 17-14.10).

**Trend Summary Tables****Table 17-14.6 - 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	2.0	4.5	-	-	-	-
2002	2.8	1.7	-	3.7	1.8	-
2007	0.8	0.9	-	0.4	0.9	-
2012	0.4	1.2	-	0.5	1.3	-
2017	1.0	1.7	-	0.4	2.8	-

**Table 17-14.7 - 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	426	220	456	242	5.8	7.3	13.1	3.5
2002	423	229	380	98	20.8	7.0	5.6	2.1
2007	437	261	442	147	14.6	7.0	13.8	3.8
2012	416	318	413	132	12.7	13.8	10.1	6.4
2017	489	212	446	111	41.7	4.7	16.7	3.7

**Table 17-14.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	12.4	2.8	28.1	7.7	18.4	35.8
2002	15.8	1.2	23.2	9.4	17.4	45.6
2007	10.8	0.3	28.6	6.3	16.8	50.5
2012	8.3	0.1	39.7	11.4	16.2	41.1
2017	5.4	0.4	28.6	15.3	15.3	58.4

**Table 17-14.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	-	28	11	1
2002	-	29	12	2
2007	-	32	36	-
2012	-	28	16	1
2017	-	7	8	1
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2002	1.5 (3.6)	68.3 (168.8)	21.5 (53.0)	-
2007	-	118.6 (293.0)	58.3 (144.0)	-
2012	-	40.2 (99.3)	33.5 (82.8)	-
2017	-	11.4 (28.1)	25.5 (62.9)	-

**Table 17-14.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency					
<i>Bromus arvensis</i> <sup>ai</sup> (field brome)	-	426	-	177	72	5
<i>Bromus tectorum</i> <sup>ai</sup> (cheatgrass)	97	422	2	171	110	-
<i>Poa bulbosa</i> <sup>i</sup> (bulbous bluegrass)	7	437	6	208	104	-
<i>Poa secunda</i> (Sandberg bluegrass)	37	402	14	228	160	-
<i>Pseudoroegneria spicata</i> (bluebunch wheatgrass)	14	489	18	143	97	-
<i>Sporobolus cryptandrus</i> (sand dropseed)						

year	Average Cover (%)					
1996	-	5.8	-	3.7	3.6	0.0
2002	0.6	20.2	0.0	2.5	4.5	-
2007	0.1	14.6	0.2	3.8	3.1	-
2012	0.4	12.3	0.6	4.5	8.8	-
2017	0.1	41.6	1.5	1.4	1.8	-

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

**Table 17-14.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
<i>Agoseris glauca</i> (pale agoseris)	33	18	371	-	4	15	12	8	67	70	211	21	33	59	-	12	372	
<i>Allium acuminatum</i> (tapertip onion)	1	32	225	4	-	6	13	1	74	2	167	3	33	-	5	1	89	
<i>Alyssum desertorum</i> <sup>ai</sup> (desert madwort)	-	-	331	-	-	10	-	-	116	7	22	-	44	19	-	4	409	
<i>Astragalus beekwithii</i> (Beekwith's milkvetch)	7	-	306	-	-	7	-	-	84	15	33	32	28	7	8	7	290	
<i>Astragalus tenellus</i> (looseflower milkvetch)	-	-	346	-	-	10	-	-	-	0	6	-	25	3	-	8	409	
<i>Astragalus utahensis</i> (Utah milkvetch)																		
<i>Calochortus nuttallii</i> (sego lily)																		
<i>Castilleja linariifolia</i> (Wyoming Indian paintbrush)																		
<i>Ceratocephala testiculata</i> <sup>ai</sup> (curveseed butterwort)																		
<i>Cirsium</i> (thistle)																		
<i>Collinsia parviflora</i> <sup>a</sup> (maiden blue eyed Mary)																		
<i>Collomia linearis</i> <sup>a</sup> (tiny trumpet)																		
<i>Cymopterus</i> (springparsley)																		
<i>Draba</i> <sup>a</sup> (draba)																		
<i>Epilobium brachycarpum</i> <sup>a</sup> (tall annual willowherb)																		
<i>Eriogonum racemosum</i> (redroot buckwheat)																		
<i>Erodium cicutarium</i> <sup>ai</sup> (redstem stork's bill)																		

year	Average Cover (%)																	
1996	0.2	0.1	1.6	-	0.0	0.1	0.0	0.1	0.2	1.1	1.1	0.1	0.1	0.1	-	0.0	6.4	
2002	0.0	0.1	2.1	0.2	-	0.2	0.0	0.1	0.2	0.0	1.2	0.0	0.4	-	0.0	0.0	0.8	
2007	-	-	1.6	-	-	0.1	-	-	0.4	0.1	0.0	-	0.1	0.1	-	0.2	10.4	
2012	0.0	-	1.7	-	-	0.2	-	-	0.4	0.3	0.0	0.1	0.4	0.0	0.0	0.1	6.2	
2017	-	-	2.7	-	-	0.2	-	-	-	0.0	0.0	-	0.1	0.0	-	0.1	13.8	

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

FORB SPECIES																
Galium aparine <sup>a</sup> (stickywilly)																
Gilia inconspicua <sup>a</sup> (shy gilia)																
Helianthella uniflora (oneflower helianthella)																
Helianthus annuus <sup>a</sup> (common sunflower)																
Heterotheca villosa (hairy false goldenaster)																
Lactuca serriola <sup>ai</sup> (prickly lettuce)																
Lappula occidentalis <sup>a</sup> (flatspine stickseed)																
Linaria dalmatica <sup>ai</sup> (Dalmatian toadflax)																
Machaeranthera (tansyaster)																
Oenothera pallida <sup>a</sup> (pale evening primrose)																
Polygonum douglasii <sup>a</sup> (Douglas' knotweed)																
Sanguisorba minor <sup>i</sup> (small burnet)																
Saxifraga (saxifrage)																
Silene antirrhina <sup>a</sup> (sleepy silene)																
Tragopogon dubius <sup>ai</sup> (yellow salsify)																
Verbascum thapsus <sup>ai</sup> (common mullein)																
year	Nested Frequency															
1996	1	-	-	-	95	2	-	4	46	26	3	-	-	225	77	4
2002	-	1	-	110	33	-	4	1	-	8	-	-	-	194	3	-
2007	-	-	2	-	62	-	3	13	-	-	-	10	32	251	40	-
2012	-	-	-	-	88	11	-	3	-	29	-	6	-	233	63	-
2017	-	-	5	1	66	2	-	13	15	-	-	4	-	-	15	-
year	Average Cover (%)															
1996	0.0	-	-	-	1.7	0.0	-	0.0	0.1	0.0	0.0	-	-	2.6	0.8	0.2
2002	-	0.0	-	0.3	0.9	-	0.0	0.0	-	0.0	-	-	-	0.9	0.0	-
2007	-	-	0.1	-	2.5	-	0.0	0.1	-	-	-	0.2	0.5	1.0	0.3	-
2012	-	-	-	-	5.1	0.1	-	0.1	-	0.2	-	0.2	-	0.7	0.6	-
2017	-	-	0.1	0.0	2.8	0.0	-	0.1	0.1	-	-	0.3	-	-	0.1	-

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

**Table 17-14.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES						
Amelanchier utahensis <sup>p</sup> (Utah serviceberry)						
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)						
Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)						
Gutierrezia sarothrae (broom snakeweed)						
Opuntia (pricklypear)						
Symphoricarpos oreophilus (mountain snowberry)						
year	Line Intercept Cover (%)					
1996	-	-	-	-	-	-
2002	-	2.3	1.4	-	1.8	-
2007	0.1	-	0.3	0.2	0.7	-
2012	0.2	-	0.3	0.1	1.2	-
2017	0.2	-	0.2	0.1	2.7	-
year	Quadrat Cover (%)					
1996	0.1	1.2	0.7	1.6	2.8	0.1
2002	0.4	1.3	1.2	-	1.5	0.1
2007	0.6	0.1	0.0	0.1	0.6	0.1
2012	0.4	-	0.0	0.3	0.9	-
2017	0.6	-	0.4	0.2	1.5	-

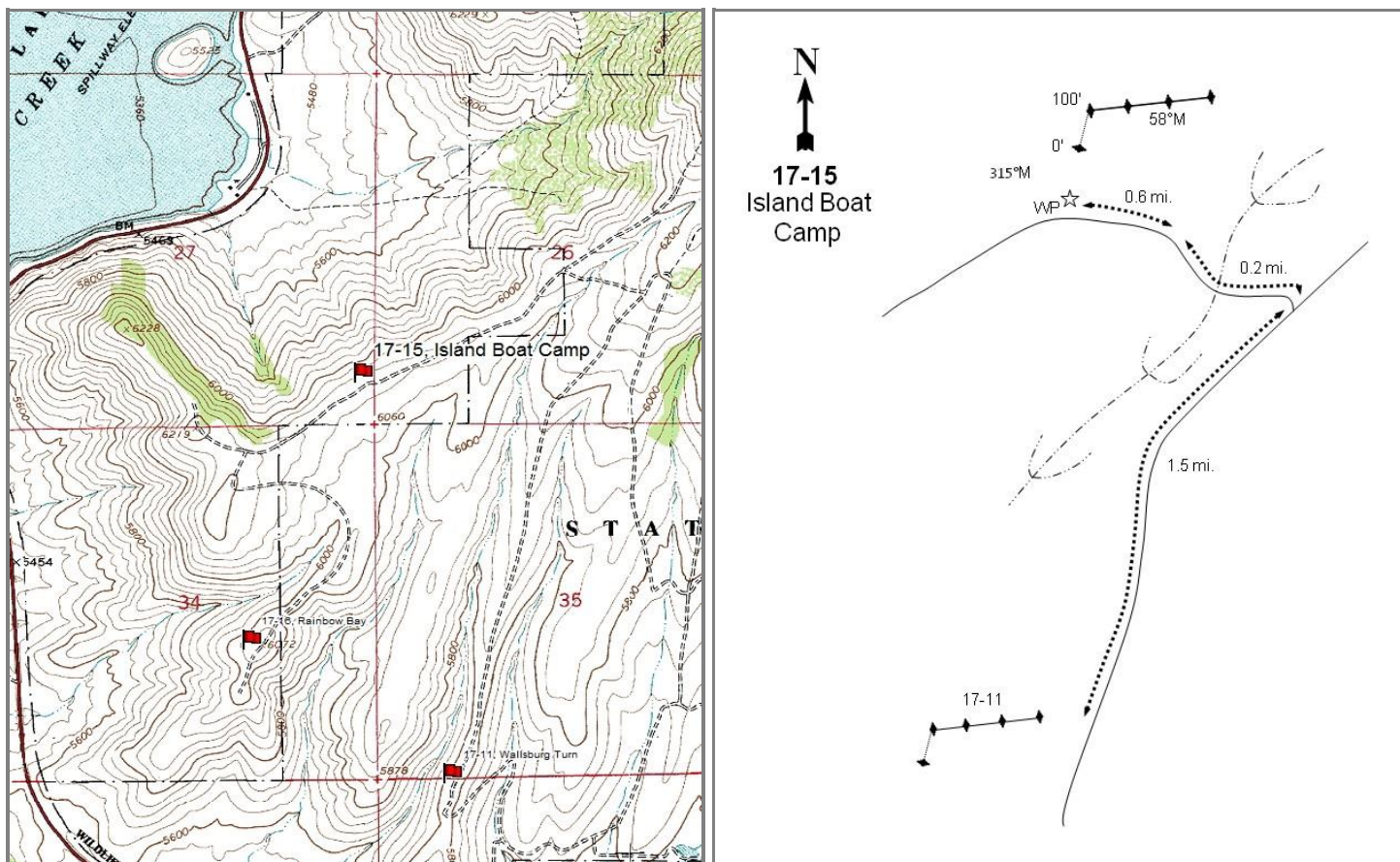
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 17-14.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	40	-	0	50	50	50	50	0	32/53
2002	20	-	0	100	0	0	100	0	44/63
2007	20	-	0	100	0	0	0	0	61/80
2012	20	-	0	100	0	100	0	0	73/96
2017	40	-	0	100	0	50	0	0	73/88
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	340	80	18	65	18	47	29	6	44/79
2002	340	-	0	88	12	65	12	0	49/82
2007	20	-	0	0	100	100	0	0	53/96
2012	-	-	-	-	-	-	-	-	51/87
2017	20	-	0	100	0	0	0	0	48/100
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	44/43
2017	-	-	-	-	-	-	-	-	41/100
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1996	480	40	8	67	25	33	21	17	59/99
2002	180	-	0	44	56	11	11	22	73/94
2007	20	-	0	100	0	0	0	0	58/71
2012	40	-	0	100	0	0	0	0	60/98
2017	20	-	0	100	0	0	0	0	59/110
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	11540	21280	59	41	0	0	0	0	13/20
2002	160	-	13	75	13	0	0	13	13/17
2007	80	-	0	100	0	0	0	0	21/31
2012	160	-	25	75	0	0	0	0	28/50
2017	560	-	11	89	0	4	0	0	24/33
<b>Opuntia -- (pricklypear)</b>									
1996	1000	20	4	56	40	0	0	18	15/85
2002	1400	-	11	61	27	0	1	13	13/39
2007	1000	-	6	92	2	0	0	0	13/28
2012	1660	-	1	99	0	1	0	31	14/40
2017	1700	-	4	95	1	0	0	29	15/50
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	-	-	-	-	-	-	-	-	17/71
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	21/96
2012	-	-	-	-	-	-	-	-	29/177
2017	-	-	-	-	-	-	-	-	45/166
<b>Quercus gambelii<sup>p</sup> -- (Gambel oak)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	122/198
2017	-	-	-	-	-	-	-	-	130/192
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1996	20	-	100	0	0	0	0	0	16/27
2002	20	-	0	100	0	0	0	0	19/35
2007	20	-	0	100	0	0	100	0	11/21
2012	-	-	-	-	-	-	-	-	43/85

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

## ISLAND BOAT CAMP - STUDY NO. 17-15

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Charleston SW; Township 4S, Range 4E, Section 27  
NAD 83 UTM ZONE 12, 459903 East 4476256 North

**Transect Information**

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

415  
355° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Standard

**Directions to Site**

Beginning at the intersection of US-189 and the Wallsburg turnoff, proceed 0.50 miles towards Wallsburg to an intersection. Turn left at the intersection and proceed northerly for just over 1 mile, passing through two DWR gates, to another intersection, and turn right. Proceed 0.05 miles to a small rock pile on the left (east) side of the road, which marks study 17-11, Wallsburg Turn. Continue down the road for 1.5 miles, traveling north and passing a left fork to another fork. Bear left and go 0.2 miles, passing through a drainage to another ridge top, and bear left. Drive along the ridge for 0.6 miles to a witness post on the north side of the road. The 0-foot stake is marked with a browse tag #415.



**Site Information**

Land Ownership	Federal
Land Administrator	UDWR
Allotment	No data
Elevation	6,100ft (1,859m)
Aspect	Northeast
Slope	5%
Sample Dates	05/30/1996, 06/25/2002, 07/03/2007, 08/02/2012, 07/12/2017

**Wildlife Habitat and Vegetation History****Table 17-15.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Greater Sage Grouse	occupied	year-long

**Table 17-15.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mixed Mountain Brush	NA
1989	Mixed Mountain Brush	NA
1996	Mixed Mountain Brush	NA
2002	Mixed Mountain Brush	NA
2007	Mixed Mountain Brush	NA
2012	Mixed Mountain Brush	NA
2017	Mixed Mountain Brush	NA

**Site Notes**

This winter range study is located on a ridge overlooking both Wallsburg and the Island Boat Camp.

**Soils****Table 17-15.5 - 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	7.6	32.9	33.1	34.0	4.8	12.8	160.0	0.7	05/30/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Loam (Browse)
NRCS Ecological Site #	R047XA420UT
States and Transitions	No state and transition model is available for this ecological site.

Since establishment in 1983, this study site has existed as a mixed mountain brush plant community with Utah serviceberry (*Amelanchier utahensis*), antelope bitterbrush (*Purshia tridentata*), and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) as the main browse species. Other subordinate shrub species such as yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*) and mountain snowberry (*Symphoricarpos oreophilus*) are also present (Table 17-15.12, Table 17-15.13). The herbaceous understory has remained dominated by a number of introduced and native perennial grasses in most study years. The introduced annual grass cheatgrass (*Bromus tectorum*) was observed in low amounts from 1996 to 2012, but increased and contributed 11% cover in 2017 (Table 17-15.7, Table 17-15.10). Both annual and perennial forbs are diverse and abundant; the noxious weed species gypsyflower (*Cynoglossum officinale*) was present in 1996 and was again observed in 2017 (Table 17-15.11).

**Trend Summary Tables****Table 17-15.6 - 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	19.2	9.7	-	-	-	-
2002	22.7	11.7	-	23.7	9.6	-
2007	6.4	13.1	-	11.6	17.5	-
2012	10.3	14.7	-	18.4	8.4	-
2017	10.0	12.4	-	18.0	18.5	-

**Table 17-15.7 - 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	77	384	267	383	0.7	13.7	1.2	15.6
2002	7	398	257	325	0.0	23.2	1.6	11.4
2007	199	348	361	242	2.4	18.2	5.0	8.7
2012	116	391	107	262	0.3	21.5	0.3	7.1
2017	253	326	373	228	11.1	18.3	10.3	8.9

**Table 17-15.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	8.5	0.6	61.4	2.7	1.5	54.4
2002	7.3	1.0	55.1	4.3	0.7	59.8
2007	7.3	0.4	39.2	3.4	0.7	61.1
2012	5.7	0.0	45.1	4.9	0.5	56.5
2017	7.0	0.1	41.1	4.5	1.5	62.0

**Table 17-15.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
1996	1	-	35	19	5
2002	-	-	52	17	1
2007	6	-	29	12	2
2012	1	-	20	4	-
2017	-	-	26	2	6
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2002	0.7 (1.8)	-	123.3 (304.6)	31.5 (77.8)	-
2007	18.9 (46.6)	-	66.4 (163.9)	8.7 (21.5)	-
2012	0.7 (1.8)	8.7 (21.5)*	61.7 (152.3)	4.0 (9.9)	-
2017	2.9 (7.2)	-	65.7 (162.2)	6.7 (16.6)	-

\*Pellets per acre (ha)

**Table 17-15.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus briziformis <sup>ai</sup> (rattlesnake brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Melica bulbosa (oniongrass)	Poa (bluegrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency															
1996	26	-	9	-	-	77	-	-	5	-	-	230	6	66	208	-
2002	34	-	28	-	-	7	0	-	7	19	-	197	8	140	239	-
2007	2	-	35	1	-	199	-	2	0	-	1	51	8	179	223	-
2012	5	2	106	3	-	116	-	-	-	-	-	78	14	132	216	-
2017	-	14	179	4	2	249	1	3	7	-	4	65	1	122	99	2
year	Average Cover (%)															
1996	0.9	-	0.1	-	-	0.7	-	-	0.1	-	-	5.0	0.1	1.3	6.3	-
2002	1.3	-	1.8	-	-	0.0	0.0	-	0.2	1.5	-	5.0	0.2	2.5	10.7	-
2007	0.0	-	1.7	0.0	-	2.4	-	0.0	0.0	-	0.0	0.8	0.3	2.9	12.3	-
2012	0.1	0.0	6.0	0.0	-	0.3	-	-	-	-	-	2.2	0.5	3.5	9.1	-
2017	-	0.3	10.2	0.0	0.0	11.0	0.0	0.1	0.1	-	0.1	0.6	0.0	3.9	2.9	0.1

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

**Table 17-15.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus cibirarius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Balsamorhiza sagittata (arrow/leaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littlepod false flax)	Castilleja (Indian paintbrush)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)
year	Nested Frequency																
1996	152	32	124	45	-	99	3	92	14	-	3	2	3	1	3	227	30
2002	38	102	20	36	-	54	11	58	3	-	-	4	-	-	1	247	3
2007	31	19	304	-	3	25	17	78	3	-	-	-	10	3	-	212	49
2012	34	3	86	2	3	1	11	69	-	-	-	4	2	7	3	30	2
2017	3	80	308	-	3	18	26	87	10	26	-	2	-	-	0	117	137
year	Average Cover (%)																
1996	0.9	0.1	0.2	0.5	-	2.7	0.0	4.4	0.0	-	0.0	0.0	0.0	0.0	0.0	0.7	0.1
2002	0.2	0.4	0.0	0.6	-	0.7	0.1	4.7	0.0	-	-	0.1	-	-	0.0	1.1	0.0
2007	0.2	0.1	3.6	-	0.0	0.1	0.3	5.3	0.0	-	-	-	0.0	0.0	-	1.0	0.1
2012	0.1	0.0	0.2	0.0	0.0	0.0	0.1	4.5	-	-	-	0.0	0.0	0.0	0.0	0.1	0.0
2017	0.0	0.6	6.6	-	0.0	0.2	0.3	6.1	0.0	0.2	-	0.0	-	-	0.0	1.4	1.3

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

FORB SPECIES	Comandra umbellata (bastard toadflax)	Cordylanthus <sup>a</sup> (bird's-beak)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Cymopterus longipes (longstalk springparsley)	Cynoglossum officinale <sup>ani</sup> (gypsyflower)	Delphinium nuttallianum (two-lobed larkspur)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Erigeron divergens <sup>a</sup> (spreading fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum ovalifolium (cushion buckwheat)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium <sup>a</sup> (bedstraw)	Hackelia patens (spotted stickseed)	Linum lewisii (Lewis flax)
year	Nested Frequency																
1996	24	-	99	-	74	3	45	-	-	26	-	15	157	-	3	20	21
2002	3	-	28	-	30	-	3	-	10	21	3	16	113	-	-	11	13
2007	6	-	25	3	3	-	-	25	6	27	-	7	56	-	-	-	3
2012	24	2	17	3	2	-	-	6	-	16	-	6	63	-	-	2	3
2017	24	6	7	-	5	2	-	9	-	7	-	2	32	2	-	5	-
year	Average Cover (%)																
1996	0.1	-	0.5	-	0.3	0.0	0.1	-	-	0.1	-	0.1	2.5	-	0.0	0.1	0.2
2002	0.0	-	0.6	-	0.1	-	0.0	-	0.2	0.1	0.0	0.2	2.0	-	-	0.1	0.1
2007	0.0	-	0.4	0.0	0.0	-	-	0.0	0.2	0.2	-	0.1	0.6	-	-	-	0.0
2012	0.1	0.0	0.2	0.1	0.0	-	-	0.0	-	0.2	-	0.1	0.6	-	-	0.0	0.0
2017	0.1	0.2	0.1	-	0.0	0.0	-	0.1	-	0.1	-	0.0	0.4	0.1	-	0.0	-

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

FORB SPECIES	Lomatium triternatum (nineleaf biscuitroot)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa <sup>i</sup> (alfalfa)	Mertensia (bluebells)	Microsteris gracilis <sup>a</sup> (slender phlox)	Orthocarpus <sup>a</sup> (owl's-clover)	Packera multilobata (lobeleaf groundsel)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Vicia americana (American vetch)	Viola (violet)
year	Nested Frequency															
1996	17	45	4	-	8	-	9	10	149	22	-	-	1	28	-	113
2002	-	20	-	-	-	7	-	9	156	3	-	-	4	30	-	-
2007	-	19	-	-	-	15	-	-	69	-	3	2	-	1	-	-
2012	3	15	1	-	-	11	-	-	125	4	4	1	-	2	7	-
2017	-	14	-	0	-	41	-	2	15	3	8	0	11	4	4	-
year	Average Cover (%)															
1996	0.0	1.0	0.0	-	0.1	-	0.1	0.0	0.3	0.0	-	-	0.0	0.1	-	1.4
2002	-	0.4	-	-	-	0.0	-	0.0	0.9	0.0	-	-	0.0	0.2	-	-
2007	-	1.1	-	-	-	0.0	-	-	0.3	-	0.0	0.0	-	0.0	-	-
2012	0.0	0.4	0.1	-	-	0.0	-	-	0.4	0.0	0.0	0.0	-	0.0	0.0	-
2017	-	0.7	-	0.0	-	0.3	-	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 17-15.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)						
	year						
Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	1996	-	-	-	-	-	-
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	2002	5.6	10.2	7.3	0.2	7.9	2.1
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	2007	4.8	3.1	13.2	0.5	3.7	3.7
Gutierrezia sarothrae (broom snakeweed)	2012	9	2.8	7.4	0.2	6.6	0.8
Purshia tridentata <sup>p</sup> (antelope bitterbrush)	2017	6.9	4.3	15.5	0.8	6.8	2
Symphoricarpos oreophilus (mountain snowberry)							
Tetradymia canescens (spineless horsebrush)							
year	Quadrat Cover (%)						
1996	3.9	10.2	7.4	0.3	5.1	1.9	0.0
2002	4.7	10.4	7.4	0.5	7.7	3.7	0.1
2007	3.0	0.9	9.3	0.2	2.5	3.4	0.2
2012	3.8	2.1	10.5	0.8	4.3	3.4	0.0
2017	4.6	2.1	10.0	0.8	3.3	1.4	0.2

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

**Table 17-15.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

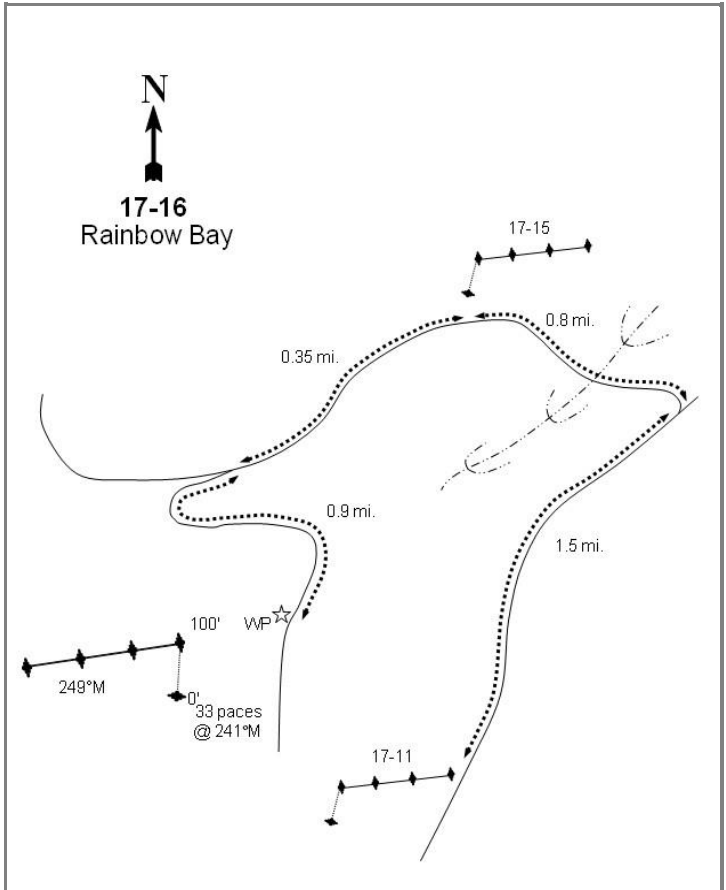
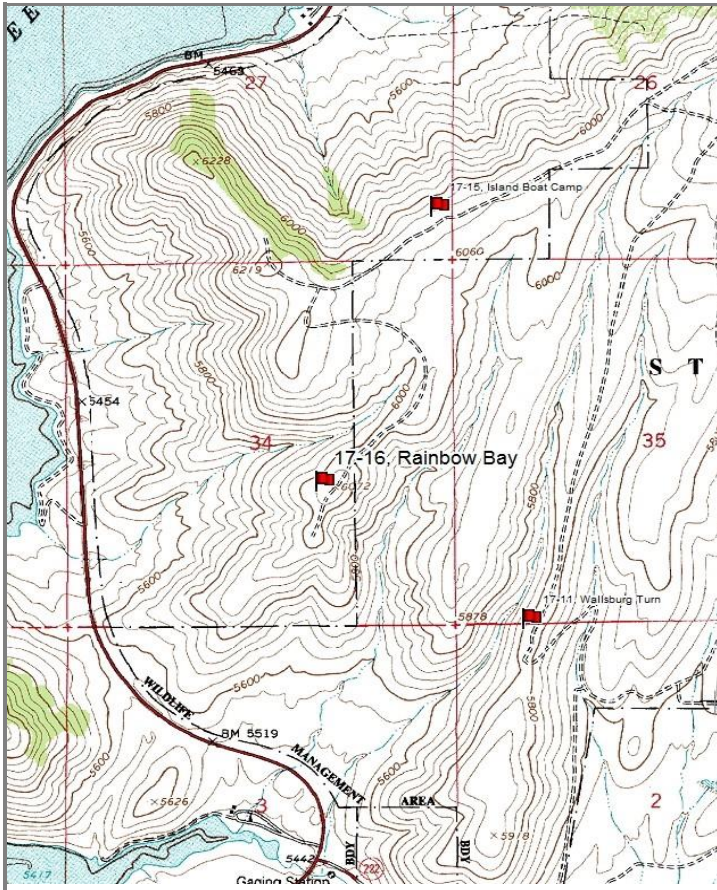
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	1220	60	33	61	7	26	12	0	79/102
2002	700	-	17	54	29	26	51	6	80/88
2007	780	-	5	90	5	36	10	0	89/93
2012	800	-	8	85	8	33	38	18	92/91
2017	1120	40	20	80	0	48	7	0	91/90
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	2080	-	2	71	27	56	12	10	69/108
2002	1740	-	6	56	38	35	17	13	72/89
2007	520	40	15	19	65	31	23	39	87/96
2012	560	60	7	54	39	18	25	25	69/76
2017	600	-	0	93	7	33	13	7	84/88
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	6060	60	11	89	0	1	0	0	30/53
2002	4760	-	4	95	1	0	0	0	27/43
2007	4140	-	1	90	9	0	0	1	35/57
2012	4480	280	1	96	3	0	0	23	30/47
2017	5680	-	3	97	1	3	0	1	35/56
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	920	100	28	61	11	0	0	0	18/23
2002	580	-	0	93	7	0	3	7	16/18
2007	820	-	0	98	2	0	0	0	21/22
2012	720	-	6	94	0	0	0	0	20/24
2017	820	-	22	78	0	0	0	0	27/35
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1996	600	-	0	87	13	20	77	13	100/176
2002	560	-	0	71	29	18	79	11	109/159
2007	400	-	0	65	35	40	55	5	103/120
2012	600	-	3	73	23	43	37	22	105/147
2017	540	-	0	100	0	70	26	0	107/136

Year	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	560	20	32	68	0	4	0	0	58/72
2002	540	-	0	96	4	0	0	4	69/81
2007	520	280	8	92	0	0	0	4	77/108
2012	960	-	0	98	2	4	0	60	66/76
2017	1320	20	2	99	0	33	0	0	62/67
Tetradymia canescens -- (spineless horsebrush)									
1996	160	-	63	38	0	13	0	0	23/32
2002	160	-	25	75	0	13	0	0	24/49
2007	120	-	0	83	17	17	0	0	23/47
2012	120	-	0	100	0	0	0	50	24/36
2017	160	-	0	100	0	0	0	0	30/49

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



## RAINBOW BAY - STUDY NO. 17-16

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Charleston SW; Township 4S, Range 4E, Section 34  
NAD 83 UTM ZONE 12, 459424 East 4475038 North

**Transect Information**

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

3947  
345° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)  
Standard

**Directions to Site**

Beginning at the intersection of US-189 and the Wallsburg turnoff, proceed 0.50 miles towards Wallsburg to an intersection. Turn left at the intersection and proceed northerly for just over 1 mile, passing through two DWR gates, to another intersection, and turn right. Proceed for 0.05 miles to a small rock pile on the left (east) side of the road, which marks study 17-11, Wallsburg Turn. Continue down the road 1.5 miles from study 17-11 to a fork. Bear left and go 0.2 miles through a drainage to another ridge top and bear left. Drive along the ridge for 0.6 miles to a witness post on the north side of the road, which marks study 17-15, Island Boat Camp. Continue down this road for 0.35 miles to an intersection with a short telephone post and a Mountain Bell wire warning sign. Turn left and stay left for 0.9 miles to a witness post on the north side of the road. From the witness post, the 0-foot stake is 33 paces away at an azimuth of 241 degrees magnetic, marked with browse tag #3947.

**Site Information**

Land Ownership	Federal
Land Administrator	UDWR
Allotment	No data
Elevation	6,040ft (1,841m)
Aspect	West
Slope	15-20%
Sample Dates	05/31/1996, 06/25/2002, 07/03/2007, 07/31/2012, 07/12/2017

**Table 17-16.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	Historic	-

**Wildlife Habitat and Vegetation History**

**Table 17-16.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Greater Sage Grouse	occupied	year-long

**Table 17-16.4 - 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/Bitterbrush	NA
1989	Mountain Big Sagebrush/Bitterbrush	NA
1996	Mountain Big Sagebrush/Bitterbrush	NA
2002	Mountain Big Sagebrush/Bitterbrush/Perennial Grass	NA
2007	Perennial Grass/Mountain Big Sagebrush/Bitterbrush	NA
2012	Perennial Grass/Mountain Big Sagebrush/Bitterbrush	NA
2017	Annual Grass/Mountain Big Sagebrush/Bitterbrush	NA

**Site Notes**

No Notes

**Soils**

**Table 17-16.5 - 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	7.2	42.6	27.4	30.0	3.6	27.5	285.6	0.7	05/31/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA461UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) have been the dominant browse species since the study was established in 1983 (photos, Table 17-16.12, Table 17-16.13). The herbaceous understory has remained abundant and diverse through the study years (Table 17-16.7). Perennial grasses, mainly bluebunch wheatgrass (*Pseudoroegneria spicata*), increased over time as browse cover decreased, and were a co-dominant site component from 2002 to 2012. The cover of the introduced annual grass cheatgrass (*Bromus tectorum*) increased by over 30% between 2012 and 2017, replacing perennial grass as co-dominant vegetation (Table 17-16.10). Both perennial and annual forbs are present on this study site, with the perennial forb arrowleaf balsamroot (*Balsamorhiza sagittata*) and the annual forbs desert madwort (*Alyssum desertorum*), maiden blue eyed Mary (*Collinsia parviflora*), and redstem stork's bill (*Erodium cicutarium*) as the most abundant forbs in 2017 (Table 17-16.11). It is predicted that this site will transition to one mainly dominated by grasses if the browse component continues to decrease.

**Trend Summary Tables**

**Table 17-16.6 - 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	13.0	4.9	-	-	-	-
2002	12.6	5.1	-	12.4	3.3	-
2007	7.4	4.4	-	8.0	2.7	-
2012	7.6	2.6	-	9.7	3.1	-
2017	6.6	3.3	-	12.0	4.7	-

**Table 17-16.7 - 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	329	309	448	282	3.0	13.2	5.8	11.7
2002	317	329	413	177	8.0	16.6	6.6	7.1
2007	374	316	391	134	9.0	15.7	4.2	6.6
2012	197	381	278	196	1.4	18.0	1.5	7.1
2017	419	299	379	137	32.0	15.9	13.2	7.8

**Table 17-16.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	7.2	1.4	49.6	6.5	6.0	49.3
2002	11.0	0.8	47.9	10.8	3.9	47.7
2007	6.5	0.1	41.1	7.2	2.3	53.4
2012	8.2	0.0	40.2	9.9	2.5	46.9
2017	4.8	0.4	39.0	9.3	4.3	61.0

**Table 17-16.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1996	1	40	21	-
2002	-	53	9	4
2007	-	45	9	1
2012	-	29	3	-
2017	-	32	2	8
Year	Days Use Per Acre (ha)			
1996	-	-	-	-
2002	-	100.5 (248.3)	26.2 (64.6)	-
2007	-	111.3 (274.8)	12.8 (31.5)	-
2012	-	22.1 (54.6)	3.4 (8.3)	-
2017	-	39.6 (97.7)	4.0 (9.9)	-

**Table 17-16.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency									
1996	11	20	-	329	-	-	6	48	257	12
2002	5	50	44	308	1	30	-	102	213	9
2007	0	29	41	369	2	22	-	122	230	-
2012	-	64	61	159	1	36	5	156	241	-
2017	-	93	12	419	4	99	5	125	127	3
year	Average Cover (%)									
1996	0.2	1.4	-	3.0	-	-	0.1	0.5	10.9	0.2
2002	0.2	3.5	0.2	7.8	0.0	0.6	-	1.9	10.3	0.0
2007	0.0	2.1	0.2	8.9	0.0	0.4	-	2.0	11.1	-
2012	-	4.0	0.4	1.1	0.0	0.8	0.1	2.6	10.5	-
2017	-	5.9	1.1	30.9	0.0	2.6	0.0	3.2	4.2	0.0

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

**Table 17-16.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcross)	Artemisia ludoviciana (white sagebrush)	Astragalus cibirius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza sagittata (arrow/leaf balsamroot)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curviseed butterwort)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastaard toadflax)	Crepis acuminata (tapertip hawkbeard)
year	Nested Frequency																
1996	91	13	349	3	-	130	2	6	77	13	43	5	8	297	107	-	14
2002	17	43	93	3	-	22	-	1	68	13	13	10	-	400	3	-	12
2007	12	-	296	1	-	17	-	-	80	0	3	5	3	233	2	7	6
2012	32	-	127	7	4	9	-	5	91	-	6	1	5	127	-	9	15
2017	6	1	316	-	4	18	-	1	83	-	9	-	2	134	22	7	-
year	Average Cover (%)																
1996	0.8	0.0	1.4	0.0	-	4.2	0.0	0.0	4.8	0.0	0.2	0.0	0.1	2.1	0.3	-	0.1
2002	0.1	0.2	0.3	0.0	-	0.1	-	0.0	5.3	0.0	0.4	0.0	-	5.6	0.0	-	0.2
2007	0.1	-	1.8	0.0	-	0.3	-	-	5.2	0.0	0.1	0.0	0.1	0.8	0.0	0.2	0.3
2012	0.2	-	0.3	0.0	0.0	0.0	-	0.0	5.7	-	0.2	0.0	0.1	0.5	-	0.0	0.1
2017	0.2	0.0	5.4	-	0.0	0.3	-	0.0	6.1	-	0.2	-	0.0	0.9	0.1	0.1	-

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

FORB SPECIES	Cryptantha (cryptantha)	Cymopterus longipes (longstalk springparsley)	Delphinium nuttallianum (two-lobed larkspur)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Erigeron pumilus (shaggy fleabane)	Eriogonum brevicaulis (shortstem buckwheat)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Hackelia patens (spotted stickseed)	Helianthus annuus <sup>a</sup> (common sunflower)	Helionis multiflora var. multiflora (showy goldeneye)	Lactuca scariola <sup>ai</sup> (prickly lettuce)	Linaria dalmatica <sup>ai</sup> (Dalmatian toadflax)	Lithospermum ruderale (western stone seed)
year	Nested Frequency																
1996	-	103	13	-	64	10	-	23	4	-	3	3	-	6	-	-	8
2002	-	27	5	1	39	-	2	31	-	-	-	8	25	-	-	4	10
2007	-	5	-	-	103	1	1	19	3	45	-	-	-	2	5	-	3
2012	-	5	1	5	23	6	1	26	7	20	6	-	-	-	4	38	2
2017	2	1	-	-	6	-	5	17	-	139	-	1	-	-	-	5	5
year	Average Cover (%)																
1996	-	0.8	0.1	-	0.2	0.0	-	0.2	0.0	-	0.0	0.0	-	0.0	-	-	0.1
2002	-	0.2	0.0	0.0	0.1	-	0.0	0.3	-	-	-	0.0	0.1	-	-	0.2	0.1
2007	-	0.0	-	-	0.4	0.0	0.0	0.1	0.0	0.2	-	-	-	0.0	0.0	-	0.0
2012	-	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1	0.0	-	-	-	0.0	0.3	0.1
2017	0.0	0.0	-	-	0.0	-	0.1	0.3	-	6.2	-	0.0	-	-	-	0.0	0.3

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

FORB SPECIES	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Orthocarpus <sup>a</sup> (owl's-clover)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>ai</sup> (tall tumbleweed)	Sphaeralcea coccinea (scarlet globemallow)	Sphaeralcea grossularifolia (gooseberry/leaf globemallow)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Vicia americana (American vetch)
year	Nested Frequency												
1996	5	2	-	4	9	117	212	-	-	-	4	82	-
2002	1	-	44	-	-	-	96	-	1	2	-	-	-
2007	-	-	19	-	5	7	175	15	-	1	-	3	10
2012	1	-	30	-	6	32	126	1	-	1	-	24	-
2017	-	2	43	-	-	1	17	7	5	2	-	5	3
year	Average Cover (%)												
1996	0.3	0.0	-	0.0	0.0	0.2	1.2	-	-	-	0.0	0.5	-
2002	0.1	-	0.2	-	-	-	0.3	-	0.0	0.0	-	-	-
2007	-	-	0.1	-	0.0	0.0	0.4	0.3	-	0.0	-	0.0	0.0
2012	0.0	-	0.1	-	0.0	0.1	0.3	0.0	-	0.0	-	0.1	-
2017	-	0.0	0.2	-	-	0.0	0.1	0.2	0.2	0.0	-	0.0	0.0

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

**Table 17-16.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)															
	year	1996	2002	2007	2012	2017	1996	2002	2007	2012	2017					
Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	-	-	-	-	-	-	-	-	-	-	-					
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	0.1	6	1.8	0.9	0.1	6.3	-	0.5	0.3	3.8	2	0.6	0	3.9	-	0.1
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	0.4	4.3	1.6	0.7	0.8	5	-	-	0.4	4.3	1.6	0.7	0.8	5	-	-
Gutierrezia sarothrae (broom snakeweed)	0.3	3.5	2.9	1.2	0.5	8.2	0.1	-	0.3	3.5	2.9	1.2	0.5	8.2	0.1	-
Opuntia polyacantha (plains pricklypear)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Purshia tridentata <sup>p</sup> (antelope bitterbrush)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Symphoricarpos oreophilus (mountain snowberry)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Tetradymia canescens (spineless horsebrush)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

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

**Table 17-16.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

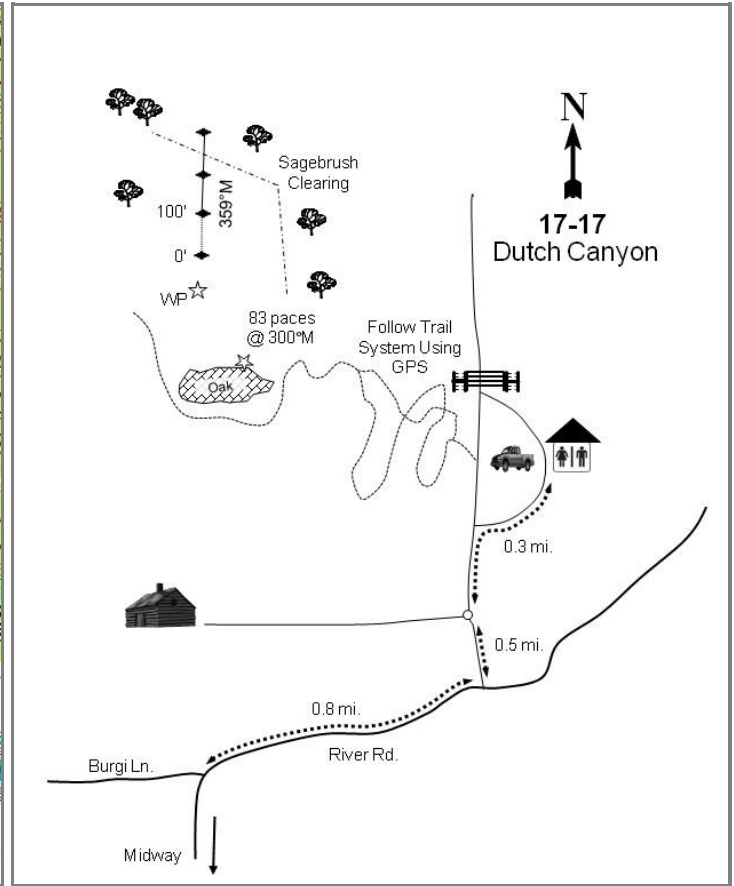
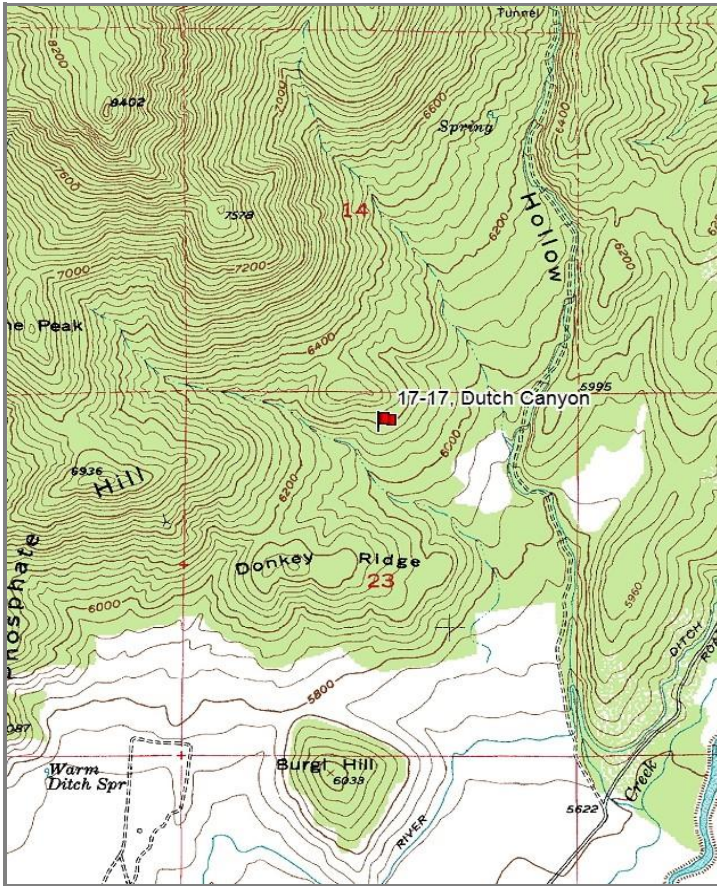
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	60	-	67	33	0	67	0	0	33/40
2002	60	-	67	33	0	33	67	0	27/29
2007	60	-	33	67	0	33	67	0	45/57
2012	60	-	0	100	0	67	33	33	51/54
2017	80	-	0	100	0	75	25	0	51/54
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	1520	20	1	47	51	59	1	12	57/108
2002	1060	-	6	45	49	38	11	26	68/105
2007	860	60	5	44	51	28	5	81	72/104
2012	620	60	7	74	19	26	19	26	57/88
2017	740	20	3	81	16	14	14	22	60/86
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	640	-	0	100	0	0	0	0	30/57
2002	820	-	0	98	2	0	0	2	28/45
2007	1200	-	3	88	8	0	0	3	33/56
2012	980	-	0	96	4	0	0	39	28/51
2017	1140	-	7	93	0	2	0	0	32/57
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	88/116
2012	-	-	-	-	-	-	-	-	82/57
2017	-	-	-	-	-	-	-	-	58/103
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1996	14580	17520	31	68	1	0	0	0	18/26
2002	3500	-	0	72	28	0	0	17	18/19
2007	1700	-	5	95	0	0	0	0	22/21
2012	1220	160	10	90	0	0	0	7	22/32
2017	2740	20	37	63	0	0	0	0	25/27

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	280	-	29	57	14	0	0	7	13/35
2002	300	-	13	67	20	0	0	7	12/30
2007	400	-	5	90	5	0	0	5	17/36
2012	620	-	7	94	0	0	3	16	14/38
2017	1180	-	0	93	7	5	0	10	15/37
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1996	480	-	17	79	4	21	50	0	61/141
2002	340	-	0	88	12	6	94	0	77/159
2007	360	-	0	89	11	33	11	0	76/140
2012	300	-	0	80	20	27	67	60	75/149
2017	480	-	0	100	0	38	0	0	83/161
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2002	20	-	100	0	0	0	0	0	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	0	100	0	0	0	0	42/25
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1996	-	-	-	-	-	-	-	-	37/59
2002	20	-	0	100	0	0	0	0	37/60
2007	-	20	0	0	0	0	0	0	29/56
2012	20	60	0	100	0	0	0	0	35/81
2017	20	-	0	100	0	0	0	0	36/85

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



## DUTCH CANYON - STUDY NO. 17-17

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Heber City SW; Township 3S, Range 4E, Section 23  
NAD 83 UTM ZONE 12, 460838 East 4488840 North

**Transect Information**

Browse Tag # (0' Stake)	3952
Transect Bearing	359° magnetic
Length	300ft
Belt Placement	Line 1 (11ft, 59ft, & 95ft), Line 2 (34ft), Line 3 (71ft)
Belt Marker Placement	Belt 3: No Rebar

**Directions to Site**

Beginning at the intersection of River Road and Burgi Lane (north of Midway), proceed northward on River Road for 0.80 miles to an intersection. Turn left and proceed 0.50 miles to a circular parking area. Take a dirt Forest Service road on the east side of the parking area for 0.3 miles to a dirt parking area with an outhouse. Across from the parking area is the Dutchman Way trailhead: park in the dirt lot and take this trail up to the site. Use the GPS to navigate up the hills to the site (0.44 miles). The frequency baseline is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. A red browse tag, number 3952, is attached to the 0-foot baseline stake.

**Site Information**

Land Ownership	State
Land Administrator	USP
Allotment	No data
Elevation	6,150ft (1,875m)
Aspect	South
Slope	15%
Sample Dates	09/30/1996, 06/24/2002, 07/27/2007, 07/31/2012, 07/11/2017

**Wildlife Habitat and Vegetation History****Table 17-17.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Moose	crucial	year-long

**Table 17-17.4 - 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	NA
1989	Mountain Big Sagebrush	NA
1996	Mountain Big Sagebrush	NA
2002	Mountain Big Sagebrush	NA
2007	Mountain Big Sagebrush	NA
2012	Mountain Big Sagebrush	NA
2017	Mountain Big Sagebrush/Annual Grass	NA

**Site Notes**

Several of the baseline posts were missing in 2002, so the baseline was reset and is now only 300 feet in length. The sample area has therefore changed twice: once in 1996 when the baseline was extended, and then again in 2002 when the baseline was contracted. Changes to the baseline and sample area are likely to have an impact on cover, frequency, and density data. The nearest perennial source of water is a stream flowing down Dutch Hollow located 0.35 miles to the east.

**Soils****Table 17-17.5 - 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
Sandy Clay Loam	6.9	48.2	25.4	26.4	2.5	23.9	160.0	0.5	09/30/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Loam (Oak)
NRCS Ecological Site #	R047XA432UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been the dominant browse species since 1983, although there are Gambel oak (*Quercus gambelii*) patches scattered throughout the study site; antelope bitterbrush (*Purshia tridentata*) is also present in lesser amounts (photos, Table 17-17.12, Table 17-17.13). The noxious perennial forb leafy spurge (*Euphorbia esula*) and the introduced annual grass cheatgrass (*Bromus tectorum*) have been the most abundant herbaceous species in most sample years. Cheatgrass has fluctuated from year to year, but cover increased and it became co-dominant with sagebrush in 2017. Perennial grass species are rare in comparison, and the introduced species bulbous bluegrass (*Poa bulbosa*) and Kentucky bluegrass (*P. pratensis*) have provided a majority of the perennial grass cover in most sample years since 2002 (Table 17-17.10, Table 17-17.11). Annual forbs have generally been abundant, but cover has fluctuated over the study years (Table 17-17.7).

**Trend Summary Tables****Table 17-17.6 - 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	16.4	2.3	-	-	-	-
2002	26.7	1.2	-	37.9	2.2	-
2007	22.0	0.3	-	39.4	0.4	-
2012	22.7	0.6	-	37.5	1.2	-
2017	22.0	0.4	-	35.6	0.3	-

**Table 17-17.7 - 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	407	48	328	77	8.1	1.4	6.2	1.3
2002	286	65	260	141	8.9	2.0	3.5	8.6
2007	355	57	347	168	5.6	2.1	7.3	6.6
2012	220	50	323	208	2.3	1.7	2.1	4.2
2017	383	70	143	138	22.7	3.2	2.2	4.2

**Table 17-17.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	2.2	0.1	70.9	2.7	2.6	34.6
2002	11.3	0.3	58.2	2.9	2.4	49.7
2007	6.5	0.2	65.5	3.3	2.1	43.8
2012	4.6	0.0	63.3	4.0	1.9	39.5
2017	7.4	1.0	51.0	5.4	2.1	52.6

**Table 17-17.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Moose	Rabbit
	Quadrat Frequency					
1996	-	25	-	-	-	6
2002	1	24	2	-	-	8
2007	-	28	8	1	-	7
2012	-	19	4	-	2	2
2017	-	13	8	-	-	7
Year	Days Use Per Acre (ha)					
1996	-	-	-	-	-	-
2002	-	64.3 (158.9)	9.4 (23.2)	-	-	-
2007	-	64.3 (158.9)	25.5 (62.9)	-	-	-
2012	-	13.4 (33.1)	1.3 (3.3)	-	-	-
2017	-	23.4 (57.9)	12.8 (31.5)	-	-	-

**Table 17-17.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus arvensis <sup>ai</sup> (field brome)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus marginatus (mountain brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency								
1996	-	11	2	407	-	35	-	-	-
2002	92	-	-	273	21	40	7	0	-
2007	79	-	-	333	25	23	5	4	-
2012	117	-	1	131	12	30	7	1	-
2017	31	-	4	380	17	31	15	4	1
year	Average Cover (%)								
1996	-	0.3	0.0	8.1	-	1.1	-	-	-
2002	0.7	-	-	8.2	0.9	0.6	0.6	0.0	-
2007	0.9	-	-	4.7	1.4	0.6	0.1	0.0	-
2012	1.2	-	0.0	1.1	0.2	0.7	0.8	0.0	-
2017	0.1	-	0.2	22.5	1.0	1.5	0.5	0.0	0.0

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

**Table 17-17.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum alyssoides <sup>ai</sup> (pale madwort)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvech)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littledod false flax)	Chenopodium fremontii <sup>a</sup> (Fremont's goosefoot)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron (fleabane)	Eriogonum brevicaulis (shortstem buckwheat)	Eriogonum racemosum (redroot buckwheat)
year	Nested Frequency																
1996	-	263	9	-	-	-	3	9	-	18	-	-	-	4	19	-	10
2002	-	227	1	1	4	3	5	2	3	38	-	-	2	5	-	1	3
2007	-	339	3	-	2	5	-	4	-	9	-	16	12	3	23	-	1
2012	-	321	4	-	-	-	-	5	2	-	-	4	3	-	36	-	3
2017	33	81	5	-	9	6	-	1	4	46	3	0	-	2	-	9	6
year	Average Cover (%)																
1996	-	2.0	0.3	-	-	-	0.0	0.0	-	0.0	-	-	-	0.0	0.2	-	0.0
2002	-	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-	-	0.0	0.0	-	0.0	0.1
2007	-	6.7	0.1	-	0.0	0.0	-	0.2	-	0.0	-	0.1	0.2	0.0	0.3	-	0.0
2012	-	2.0	0.2	-	-	-	-	0.2	0.0	-	-	0.0	0.0	-	0.4	-	0.0
2017	0.2	1.4	0.2	-	0.0	0.0	-	0.0	0.0	0.5	0.0	0.0	-	0.0	-	0.0	0.0

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

FORB SPECIES	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Euphorbia esula <sup>ni</sup> (leafy spurge)	Galium aparine <sup>a</sup> (stickywilly)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Heliomeris multiflora var. multiflora (showy goldeneye)	Heterotheca villosa (hairy false goldenaster)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Linaria dalmatica <sup>ni</sup> (Dalmatian toadflax)	Lupinus argenteus (silvery lupine)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Symphyotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	unknown annual forb <sup>a</sup> (unknown forb)	Verbascum thapsus <sup>ai</sup> (common mullein)
year	Nested Frequency																
1996	-	-	-	-	34	0	37	-	5	29	-	7	-	-	99	104	7
2002	-	129	-	2	3	-	-	-	7	9	22	3	-	1	31	-	-
2007	3	141	2	3	7	-	-	13	4	7	23	-	0	-	11	-	-
2012	6	170	-	2	0	0	-	43	9	2	9	6	-	-	10	-	-
2017	4	119	-	3	-	-	-	-	2	9	-	-	-	-	4	-	-
year	Average Cover (%)																
1996	-	-	-	-	0.4	0.1	0.2	-	0.2	0.1	-	0.1	-	-	0.8	2.6	0.4
2002	-	7.9	-	0.0	0.0	-	-	-	0.5	0.0	0.1	0.0	-	0.0	0.4	-	-
2007	0.0	5.7	0.0	0.0	0.1	-	-	0.1	0.2	0.0	0.1	-	0.0	-	0.1	-	-
2012	0.0	2.7	-	0.0	0.0	0.0	-	0.6	0.2	0.0	0.0	0.0	-	-	0.0	-	-
2017	0.0	3.9	-	0.0	-	-	-	-	0.0	0.0	-	-	-	-	0.0	-	-

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

FORB SPECIES	Vicia americana (American vetch)	Zizadenus paniculatus (foothill deathcamas)
year	Nested Frequency	
1996	-	0
2002	-	-
2007	3	1
2012	-	6
2017	-	-
year	Average Cover (%)	
1996	-	0.0
2002	-	-
2007	0.0	0.0
2012	-	0.0
2017	-	-

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

**Table 17-17.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)				
	year	1996	2002	2007	2012
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <sup>p</sup> (mountain big sagebrush)	-	-	-	-	-
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>viscidiflorus</i> (yellow rabbitbrush)	24.6	0.3	1.9	5.2	8.1
<i>Gutierrezia sarothrae</i> (broom snakeweed)	24.6	-	0.4	4.9	9.9
<i>Purshia tridentata</i> <sup>p</sup> (antelope bitterbrush)	23.6	0.4	0.8	4.1	9.8
<i>Quercus gambelii</i> <sup>p</sup> (Gambel oak)	27	0.3	0	2.2	6.4

SHRUB SPECIES	Quadrat Cover (%)				
	year	1996	2002	2007	2012
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <sup>p</sup> (mountain big sagebrush)	8.8	-	2.3	0.5	7.1
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>viscidiflorus</i> (yellow rabbitbrush)	18.8	0.0	1.2	2.6	5.4
<i>Gutierrezia sarothrae</i> (broom snakeweed)	15.1	0.0	0.3	2.1	4.8
<i>Purshia tridentata</i> <sup>p</sup> (antelope bitterbrush)	14.1	0.0	0.6	2.8	5.9
<i>Quercus gambelii</i> <sup>p</sup> (Gambel oak)	16.5	0.0	0.4	2.3	3.3

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

**Table 17-17.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

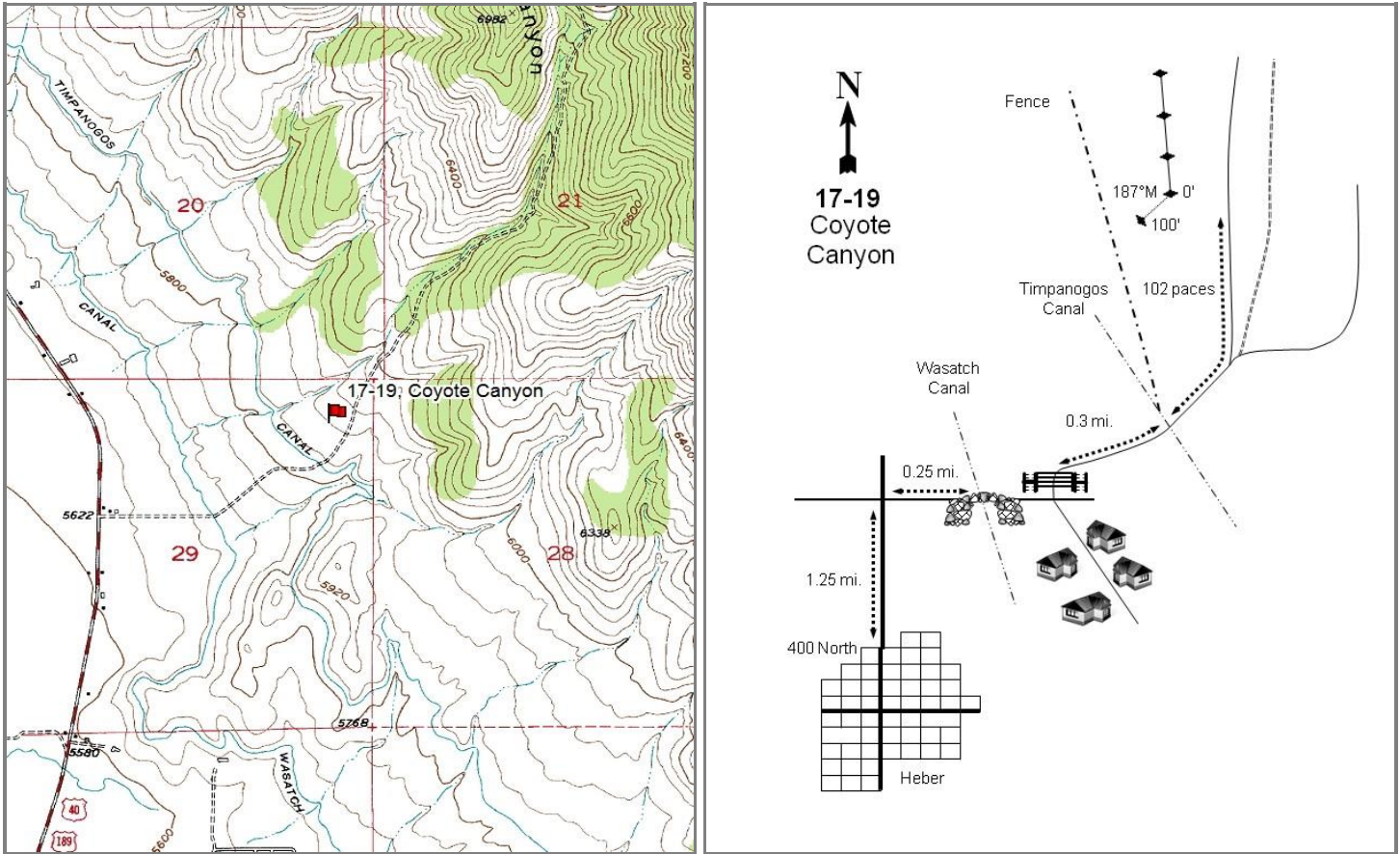
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	57/70
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1996	1380	60	16	68	16	0	0	10	59/110
2002	2380	-	3	82	15	15	2	13	71/116
2007	1660	20	0	77	23	62	12	74	77/119
2012	1460	-	1	69	30	19	21	26	75/130
2017	1920	-	1	84	15	29	5	10	74/136
<b>Cercocarpus ledifolius<sup>p</sup> -- (curl-leaf mountain mahogany)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	73/28
2017	-	-	-	-	-	-	-	-	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1996	20	-	0	100	0	0	0	0	51/111
2002	60	-	0	100	0	0	0	0	48/77
2007	60	-	0	100	0	0	0	0	52/95
2012	40	-	0	100	0	0	0	0	36/61
2017	60	-	0	100	0	0	0	0	41/79
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	84/70
2017	-	-	-	-	-	-	-	-	85/91

Year	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	2740	-	1	77	23	0	0	2	21/32
2002	1660	-	0	90	10	0	0	6	23/29
2007	300	-	0	93	7	0	0	7	23/28
2012	600	-	40	60	0	0	0	0	24/36
2017	40	-	0	100	0	0	0	0	24/38
Purshia tridentata <sup>P</sup> -- (antelope bitterbrush)									
1996	80	-	0	100	0	75	25	0	46/209
2002	220	-	9	91	0	9	73	9	52/198
2007	240	-	8	92	0	8	83	0	53/189
2012	420	-	10	91	0	14	71	14	46/134
2017	340	-	6	59	35	53	24	24	42/81
Quercus gambelii <sup>P</sup> -- (Gambel oak)									
1996	2200	240	38	58	4	2	0	10	134/122
2002	2600	-	28	59	13	28	9	21	77/60
2007	1800	140	20	69	11	17	6	31	138/89
2012	1900	120	44	54	2	30	0	8	74/65
2017	2260	-	15	77	8	21	4	5	120/91

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



## COYOTE CANYON - STUDY NO. 17-19



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Heber City SE; Township 3S, Range 5E, Section 29  
NAD 83 UTM ZONE 12, 466329 East 4487184 North

### Transect Information

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

7085  
187° magnetic (Lines 2-4: 345° magnetic)  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Belt 1: 5ft, Belt 3: No Rebar

### Directions to Site

From 400 North and Highway 40 (Main) in Heber, travel north for 1.25 miles and turn right onto a paved road. Proceed east for 0.25 miles to a left turn just past the Wasatch Canal (you will need a key or combination to pass through a locked gate). Follow this road for 0.3 miles to a fork immediately past Timpanogos Canal (there is a locked gate with two combo locks). From the canal, turn left and walk 102 paces up the road. From this point, walk 10 paces west from the edge of the road to the 100-foot baseline stake. The 0-foot baseline stake is marked by a red browse tag #7085, and the first line runs 187 degrees magnetic. The rest of the baseline runs off the 0-foot baseline stake in a direction of 345 degrees magnetic.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,900ft (1,798m)
Aspect	South
Slope	7%
Sample Dates	09/10/1996, 06/24/2002, 07/26/2007, 08/01/2012, 07/11/2017

**Wildlife Habitat and Vegetation History****Table 17-19.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Greater Sage Grouse	occupied	year-long & Winter

**Table 17-19.4 - 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
1996	Mountain Big Sagebrush/Annual Grass	No Encroachment
2002	Mountain Big Sagebrush	No Encroachment
2007	Mountain Big Sagebrush/Annual Grass	Phase I
2012	Mountain Big Sagebrush	Phase I
2017	Mountain Big Sagebrush/Annual Grass	Phase I

**Site Notes**

Prior to 2002, this study was known as "Northeast of Heber." The study is located on the northeast side of the Heber valley, and a new housing development was built approximately 1000 feet southwest in 1996. The 100-foot stake was moved approximately 25 feet to the west to avoid sampling on a newly built road; some seeded grasses and forbs that were planted along the road occur on several of the belts. The nearest source of perennial water is Timpanogos Canal, which is 600 feet southwest.

**Soils****Table 17-19.5 - 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	6.4	46.2	26.1	27.7	3.6	34.4	160.0	0.5	09/10/1996

**Site Potential**

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has dominated the shrub community on this site since its establishment in 1984, with antelope bitterbrush (*Purshia tridentata*) present in lower amounts (Table 17-19.12, Table 17-19.13). Although the herbaceous understory has remained abundant and fairly diverse throughout the study period, a majority of the herbaceous cover has been contributed by the introduced annual grass cheatgrass (*Bromus tectorum*), which was co-dominant with sagebrush in 1996, 2007, and 2017. Perennial grasses and forbs, while diverse, have generally remained rare. However, in 2017 annual forbs provided 10.2% cover: most of this cover was due to desert madwort (*Alyssum desertorum*) and redstem stork's bill (*Erodium cicutarium*) (Table 17-19.7, Table 17-19.10, 17- 19.11). Utah juniper (*Juniperus osteosperma*) trees are visible in site photos from 2007 onward (this is not reflected in the data), placing this site in Phase I of woodland succession and indicating that encroachment is possible in the future.

**Trend Summary Tables****Table 17-19.6 - 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	18.5	1.3	-	-	-	-
2002	20.1	0.5	-	21.6	0.6	-
2007	12.1	0.4	-	14.6	5.4	-
2012	19.0	0.9	-	26.1	0.8	-
2017	14.5	0.7	-	24.0	1.0	-

**Table 17-19.7 - 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	453	66	166	45	21.2	2.1	2.1	0.6
2002	268	85	171	14	2.8	2.2	0.8	0.0
2007	435	73	383	38	19.7	1.8	3.8	0.2
2012	294	23	309	22	6.9	0.6	1.2	0.1
2017	423	55	375	107	30.9	1.9	10.2	1.2

**Table 17-19.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1996	11.3	0.4	56.0	0.3	8.1	38.8
2002	32.8	0.5	47.7	0.5	8.5	25.4
2007	23.1	0.4	40.8	0.7	9.0	39.7
2012	37.0	0.4	35.4	0.3	9.6	29.0
2017	19.6	0.8	32.1	1.2	9.3	49.9

**Table 17-19.9 - 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/Domestic Sheep	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1996	-	47	5	-	11
2002	1	62	3	-	14
2007	2	44	17	2	21
2012	-	43	1	-	1
2017	-	38	-	-	23
Days Use Per Acre (ha)					
1996	-	-	-	-	-
2002	-	187.0 (461.8)	21.5 (53.0)	-	-
2007	-	46.9 (115.9)	54.9 (135.7)	1.2 (2.9)	-
2012	-	63.7 (157.3)	4.0 (9.9)	4.0 (10.0)	-
2017	-	52.3 (129.1)	12.8 (31.5)	-	-

**Table 17-19.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency								
1996	0	27	2	453	33	1	-	9	0
2002	-	45	9	265	32	4	-	-	6
2007	2	35	-	435	22	1	12	-	3
2012	1	10	8	293	3	-	9	-	0
2017	2	28	-	423	17	4	4	-	1
year	Average Cover (%)								
1996	0.0	1.3	0.0	21.2	0.7	0.0	-	0.1	0.1
2002	-	1.9	0.0	2.8	0.2	0.0	-	-	0.0
2007	0.0	1.2	-	19.7	0.5	0.0	0.1	-	0.0
2012	0.0	0.3	0.0	6.9	0.0	-	0.2	-	0.0
2017	0.1	1.2	-	30.9	0.4	0.0	0.1	-	0.0

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

**Table 17-19.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Cordylanthus ramosus <sup>a</sup> (bushy bird's beak)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Grindelia squarrosa (curlycup gumweed)	Hedysarum boreale (Utah sweetvetch)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Linum lewisii (Lewis flax)	Madia glomerata <sup>a</sup> (mountain tarweed)	
year	Nested Frequency																	
1996	6	11	103	-	-	2	13	-	23	-	-	-	2	0	-	26	9	
2002	-	6	147	-	1	3	-	-	-	-	30	-	-	-	-	-	-	
2007	-	18	375	4	16	22	39	-	2	20	5	11	-	5	1	-	-	
2012	-	2	309	-	2	4	-	-	3	-	-	3	-	-	-	-	-	
2017	-	89	352	6	-	4	50	8	-	69	25	1	4	-	-	-	-	
year	Average Cover (%)																	
1996	0.0	0.0	0.8	-	-	0.0	0.0	-	0.1	-	-	-	0.0	0.0	-	0.5	0.0	
2002	-	0.0	0.6	-	0.0	0.0	-	-	-	-	0.1	-	-	-	-	-	-	
2007	-	0.1	3.2	0.0	0.1	0.1	0.1	-	0.0	0.3	0.0	0.1	-	0.0	0.0	-	-	
2012	-	0.0	1.2	-	0.0	0.0	-	-	0.0	-	-	0.0	-	-	-	-	-	
2017	-	1.1	7.6	0.0	-	0.0	0.2	0.2	-	1.8	0.1	0.0	0.0	-	-	-	-	

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

FORB SPECIES	Medicago sativa <sup>i</sup> (alfalfa)	Microsteris gracilis <sup>a</sup> (slender phlox)	Orthocarpus <sup>a</sup> (owl's-clover)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Sphaeralcea coccinea (scarlet globemallow)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Trifolium (clover)
year	Nested Frequency										
1996	1	8	39	5	50	-	-	-	-	2	-
2002	1	7	-	4	5	3	-	4	-	3	-
2007	-	20	-	2	8	-	1	-	1	4	2
2012	-	3	-	14	5	-	-	1	-	-	3
2017	-	5	-	11	-	-	-	9	2	-	-
year	Average Cover (%)										
1996	0.0	0.0	1.1	0.0	0.1	-	-	-	-	0.0	-
2002	0.0	0.0	-	0.0	0.0	0.0	-	0.0	-	0.0	-
2007	-	0.1	-	0.0	0.0	-	0.0	-	0.0	0.0	0.0
2012	-	0.0	-	0.0	0.0	-	-	0.0	-	-	0.0
2017	-	0.0	-	0.0	-	-	-	0.2	0.0	-	-

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

**Table 17-19.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Ericameria nauseosa (rubber rabbitbrush)	Opuntia polyacantha (plains pricklypear)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)
year	Line Intercept Cover (%)			
1996	-	-	-	-
2002	21.5	-	0.6	0.1
2007	14.4	-	5.4	0.2
2012	25.5	0.2	0.6	0.6
2017	23.5	0.6	0.4	0.5
year	Quadrat Cover (%)			
1996	18.2	-	1.3	0.2
2002	19.8	-	0.5	0.3
2007	11.6	0.1	0.2	0.5
2012	18.7	0.1	0.7	0.3
2017	14.3	0.0	0.7	0.2

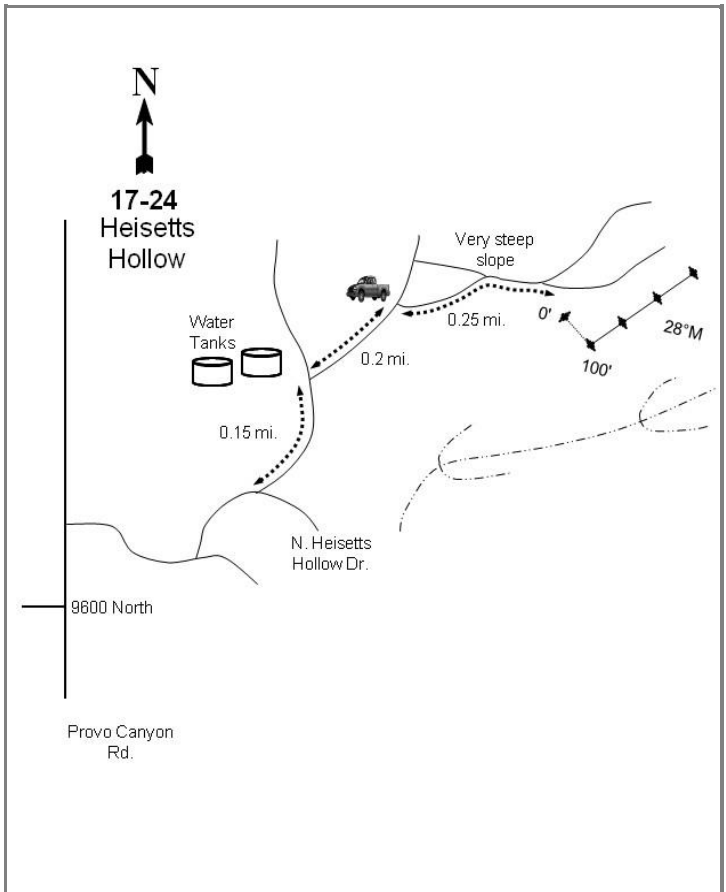
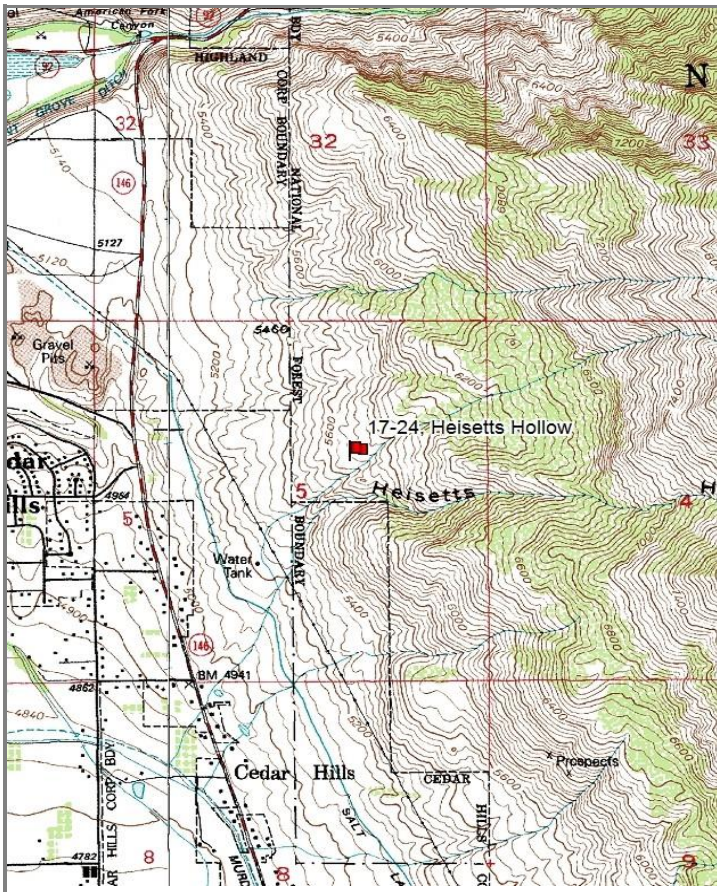
**Table 17-19.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1996	3820	400	18	60	22	35	2	2	59/104
2002	4180	-	8	54	38	20	48	23	51/78
2007	3240	400	8	61	32	29	16	59	66/91
2012	3180	260	8	72	20	32	11	6	66/98
2017	2920	160	3	77	20	25	1	10	71/104
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1996	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	120	-	50	50	0	0	0	0	29/17
2012	60	-	0	100	0	0	0	0	83/117
2017	40	-	0	100	0	0	0	0	82/137
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1996	1020	80	8	86	6	0	0	8	12/33
2002	560	-	4	86	11	0	4	11	14/30
2007	400	20	0	70	30	0	0	25	15/40
2012	540	-	7	78	15	0	0	19	14/40
2017	480	-	0	96	4	0	0	17	17/30
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1996	80	-	0	75	25	100	0	0	37/82
2002	80	-	0	75	25	0	100	0	46/95
2007	80	-	0	100	0	0	100	0	63/98
2012	80	20	0	100	0	25	50	0	62/97
2017	120	-	17	83	0	33	50	0	68/114

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



## HEISETTS HOLLOW - STUDY NO. 17-24

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Timpanogos Cave SW; Township 5S, Range 2E, Section 05  
NAD 83 UTM ZONE 12, 437050 East 4474124 North

**Transect Information**

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

Not Available  
136° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)  
Belts 1, 4, 5: No Rebar

**Directions to Site**

North of Pleasant Grove, turn east off Canyon Road (Route 146) onto West Box Elder Drive. Take the next left onto North Heissetts Hollow Drive. Follow this road to a couple of large water tanks (about 0.15 miles -- there may be a closed gate). Continue 0.2 miles to a level parking area; there will be signs indicating that vehicles are not permitted beyond this point. From here, walk up the road 0.25 miles to the 0-foot baseline stake, staying to the right. You will pass numerous forks and trails, and a GPS unit will help you navigate to the study. There is no 0-foot or 400-foot stake.



**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	5,630ft (1,716m)
Aspect	West
Slope	5-22%
Sample Dates	05/13/1997, 05/16/2002, 07/26/2007, 07/26/2012, 07/11/2017

**Table 17-24.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Cedar Hills	-	2013	5.8

**Wildlife Habitat and Vegetation History****Table 17-24.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Mountain Goat	substantial	year-long

**Table 17-24.4 - 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	Perennial Grass/Mountain Big Sagebrush	Phase I
2007	Perennial Grass/Mountain Big Sagebrush	Phase I
2012	Perennial Grass/Mountain Big Sagebrush	Phase I
2017	Perennial Grass	Phase I

**Site Notes**

This study is located on the upper Lake Bonneville terrace near the mouth of Heissetts Hollow and uphill from the Salt Lake Aqueduct. The nearest perennial source of water is Heissetts Hollow, which is approximately 550 feet south; some camping occurs in the area of the study.

**Soils****Table 17-24.5 - 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
Clay Loam	7.0	32.0	35.4	32.6	3.8	5.7	105.6	0.6	05/13/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

From study establishment in 1983 through the 2012 sample year, this study site was co-dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and perennial grasses -- mainly bluebunch wheatgrass (*Pseudoroegneria spicata*) and the introduced species bulbous bluegrass (*Poa bulbosa*). Sagebrush density exhibited a decrease from 1997 to 2012, and a wildfire in 2013 burned much of the sagebrush and other browse that remained, causing the study site to transition to one dominated by perennial grass. Although they provided less cover, sagebrush and other browse species were still present in the most recent sample year, indicating that the browse component of this study site may have the potential to recover. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed each sample year since 1997, but cover has remained low (Table 17-24.10, Table 17-24.12, Table 17-24.13). Forbs were diverse, but not abundant in most sample years. However, annual forbs provided 10% cover in 2017, much of which was contributed by the introduced species redstem stork's bill (*Erodium cicutarium*) (Table 17-24.7, Table 17-24.11).

**Trend Summary Tables****Table 17-24.6 - 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	8.5	3.6	-	-	-	-
2002	7.7	0.0	-	-	-	-
2007	6.6	0.3	-	6.0	1.0	-
2012	6.5	2.3	1.0	7.1	1.7	0.5
2017	1.3	4.7	-	1.9	7.2	2.2

**Table 17-24.7 - 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	151	450	192	108	1.5	37.0	1.2	1.6
2002	45	433	183	82	0.2	34.3	1.9	1.0
2007	165	438	195	78	1.6	38.3	1.1	2.6
2012	111	393	97	77	2.5	33.8	0.4	1.4
2017	105	363	323	73	3.1	26.2	10.1	1.7

**Table 17-24.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	7.4	0.6	38.9	6.8	5.0	53.5
2002	14.6	0.2	30.9	8.9	7.6	49.6
2007	11.4	0.1	37.3	7.5	3.5	52.3
2012	17.8	0.1	28.5	7.6	6.2	53.2
2017	23.5	0.0	31.5	9.0	7.1	46.1

**Table 17-24.9 - 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	Mule Deer	Rocky Mountain Elk	Horse	Rabbit	Rocky Mountain Bighorn Sheep
	Quadrat Frequency				
1997	43	1	-	1	-
2002	46	1	-	3	-
2007	14	41	-	13	-
2012	19	4	-	5	-
2017	16	-	-	12	-
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	65.0 (160.6)	3.4 (8.3)	0.6 (1.4)	-	-
2007	77.7 (192.0)	42.9 (105.9)	-	-	0.7 (1.7)
2012	22.1 (54.6)	5.3 (13.2)	-	-	-
2017	8.7 (21.5)	-	-	-	-

**Table 17-24.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES									
Aegilops cylindrica <sup>ni</sup> (jointed goatgrass)									
Agropyron cristatum <sup>i</sup> (crested wheatgrass)									
Bromus arvensis <sup>ni</sup> (field brome)									
Bromus tectorum <sup>ni</sup> (cheatgrass)									
Elymus lanceolatus (thickspike wheatgrass)									
Poa bulbosa <sup>i</sup> (bulbous bluegrass)									
Poa pratensis <sup>i</sup> (Kentucky bluegrass)									
Poa secunda (Sandberg bluegrass)									
Pseudoroegneria spicata (bluebunch wheatgrass)									
year	Nested Frequency								
1997	-	-	-	151	-	373	-	29	352
2002	-	-	-	45	2	367	46	36	295
2007	-	3	17	156	3	375	12	9	297
2012	2	9	-	109	6	263	-	25	310
2017	-	8	8	102	-	287	-	11	254
year	Average Cover (%)								
1997	-	-	-	1.5	-	16.6	-	0.2	20.2
2002	-	-	-	0.2	0.0	19.1	0.6	1.5	13.2
2007	-	0.0	0.1	1.5	0.1	19.3	0.1	0.1	18.7
2012	0.0	0.2	-	2.5	0.2	12.2	-	1.0	20.3
2017	-	0.2	0.0	3.1	-	12.1	-	0.2	13.6

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

**Table 17-24.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																	
Agoseris glauca (pale agoseris)																	
Allium (onion)																	
Alyssum desertorum <sup>ni</sup> (desert madwort)																	
Ambrosia psilostachya (Cuman ragweed)																	
Arabis perennans (perennial rockcress)																	
Astragalus (milkvech)																	
Astragalus utahensis (Utah milkvech)																	
Calochortus nuttallii (sego lily)																	
Castilleja angustifolia (northwestern Indian paintbrush)																	
Chaetopappa ericoides (rose heath)																	
Cirsium undulatum <sup>a</sup> (wavyleaf thistle)																	
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																	
Comandra umbellata (bastard toadflax)																	
Convolvulus arvensis <sup>ni</sup> (field bindweed)																	
Crepis acuminata (tapertip hawksbeard)																	
Descurainia pinnata <sup>a</sup> (western tansymustard)																	
Draba <sup>a</sup> (draba)																	
year	Nested Frequency																
1997	-	3	143	38	2	-	3	-	2	-	12	-	3	-	5	-	-
2002	-	-	97	4	-	18	6	4	5	-	12	-	-	-	7	6	-
2007	-	-	157	11	-	-	6	-	2	-	16	2	-	-	16	-	15
2012	-	-	57	35	-	3	2	1	-	-	15	14	6	10	1	-	-
2017	1	-	264	33	-	-	0	5	-	1	11	-	-	4	2	-	-
year	Average Cover (%)																
1997	-	0.0	0.5	0.2	0.0	-	0.1	-	0.0	-	0.2	-	0.0	-	0.0	-	-
2002	-	-	0.2	0.1	-	0.4	0.1	0.0	0.0	-	0.1	-	-	-	0.0	0.0	-
2007	-	-	0.6	0.1	-	-	0.2	-	0.0	-	0.2	0.0	-	-	0.1	-	0.0
2012	-	-	0.2	0.4	-	0.2	0.0	0.0	-	-	0.1	0.0	0.0	0.1	0.1	-	-
2017	0.0	-	1.5	0.5	-	-	0.0	0.0	-	0.0	0.0	-	-	0.0	0.0	-	-

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

FORB SPECIES												
<i>Erodium cicutarium</i> <sup>ai</sup> (redstem stork's bill)												
<i>Hedysarum boreale</i> (Utah sweetvetch)												
<i>Helianthus annuus</i> <sup>a</sup> (common sunflower)												
<i>Lactuca serriola</i> <sup>ai</sup> (prickly lettuce)												
<i>Lappula occidentalis</i> <sup>a</sup> (flatspine stickseed)												
<i>Lithospermum ruderale</i> (western stone seed)												
<i>Lygodesmia</i> (skeletonplant)												
<i>Oenothera</i> (evening primrose)												
<i>Phlox longifolia</i> (longleaf phlox)												
<i>Sedum lanceolatum</i> (spearleaf stonecrop)												
<i>Sphaeralcea coccinea</i> (scarlet globemallow)												
<i>Tragopogon dubius</i> <sup>ai</sup> (yellow salsify)												
year	Nested Frequency											
1997	48	27	-	1	-	3	-	5	31	-	7	33
2002	64	4	17	5	25	-	14	1	21	1	13	7
2007	38	17	-	-	-	-	9	-	8	-	10	17
2012	12	14	-	-	4	-	2	2	3	-	6	6
2017	236	28	1	-	-	-	-	-	1	-	-	3
year	Average Cover (%)											
1997	0.3	0.7	-	0.0	-	0.0	-	0.3	0.1	-	0.0	0.2
2002	1.4	0.2	0.0	0.0	0.1	-	0.1	0.0	0.1	0.0	0.0	0.1
2007	0.3	1.9	-	-	-	-	0.2	-	0.0	-	0.1	0.1
2012	0.1	0.5	-	-	0.0	-	0.0	0.0	0.0	-	0.0	0.0
2017	8.5	1.1	0.0	-	-	-	-	-	0.0	-	-	0.0

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

**Table 17-24.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES								
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <sup>p</sup> (mountain big sagebrush)								
<i>Atriplex confertifolia</i> <sup>p</sup> (shadscale saltbush)								
<i>Cercocarpus montanus</i> <sup>p</sup> (alderleaf mountain mahogany)								
<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>speciosa</i> <sup>p</sup> (rubber rabbitbrush)								
<i>Gutierrezia sarothrae</i> (broom snakeweed)								
<i>Juniperus osteosperma</i> <sup>t</sup> (Utah juniper)								
<i>Purshia stansburiana</i> <sup>p</sup> (Stansbury cliffrose)								
<i>Quercus gambelii</i> <sup>p</sup> (Gambel oak)								
year	Line Intercept Cover (%)							
1997	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-
2007	4.8	-	1.1	-	1	-	0.1	-
2012	6	-	1	0	1.7	0.5	0.1	-
2017	0.6	-	0.7	-	7.2	2.2	-	0.6
year	Quadrat Cover (%)							
1997	8.2	0.0	0.1	0.1	3.6	-	-	-
2002	7.0	0.1	0.4	0.0	0.0	-	0.1	-
2007	6.1	-	0.5	-	0.3	-	0.0	-
2012	5.7	-	0.8	0.0	2.3	1.0	0.0	-
2017	0.4	-	0.8	-	4.7	0.0	0.1	0.0

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

**Table 17-24.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

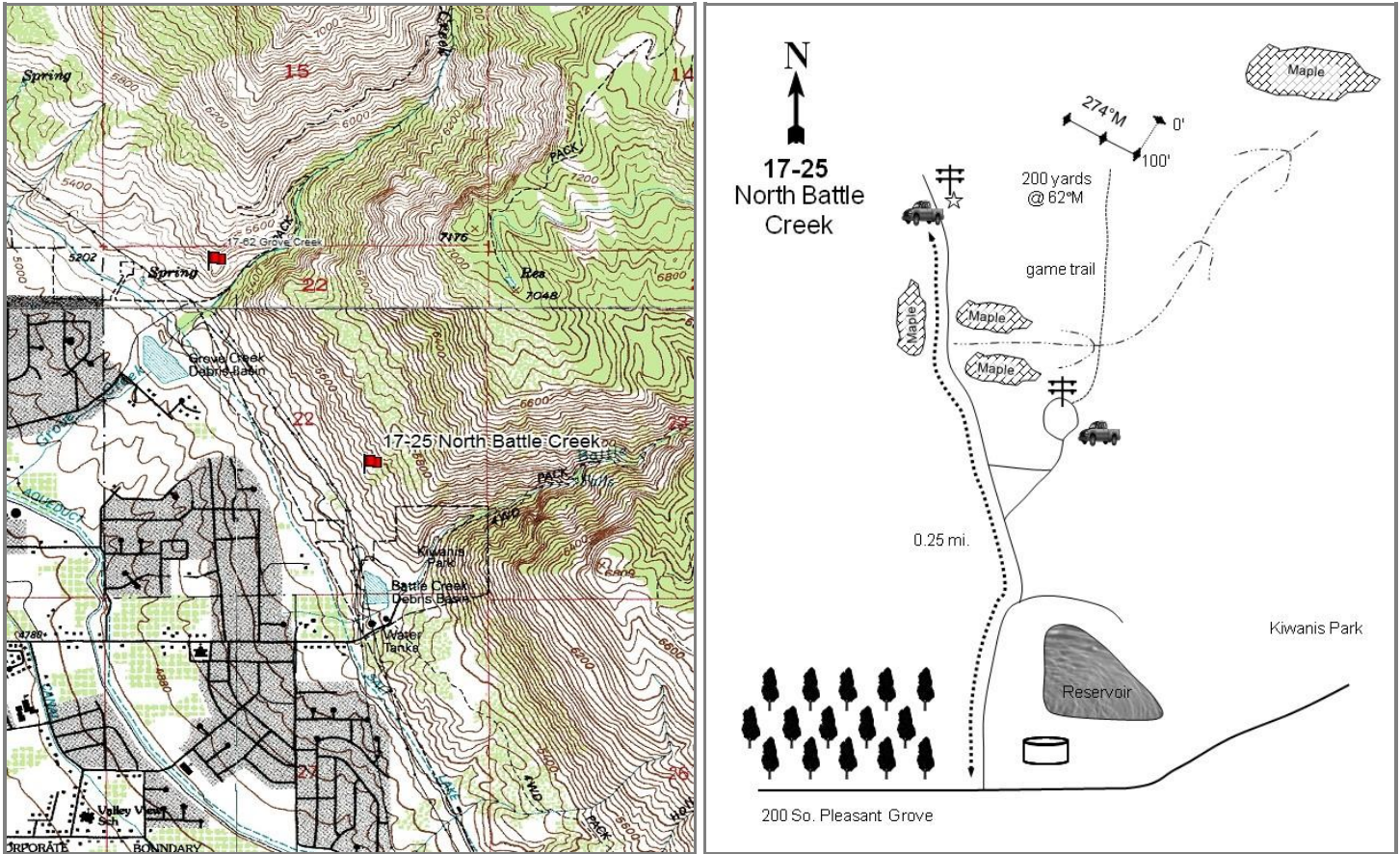
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1997	1120	60	7	70	23	54	30	14	63/120
2002	920	-	7	52	41	11	85	26	55/91
2007	860	-	0	63	37	26	58	30	61/99
2012	800	-	0	78	23	40	33	20	66/97
2017	40	-	0	50	50	0	50	50	69/125
<b>Atriplex confertifolia<sup>P</sup> -- (shadscale saltbush)</b>									
1997	20	-	0	100	0	100	0	0	32/59
2002	40	-	0	50	50	0	100	0	15/40
2007	40	-	0	100	0	0	0	0	22/41
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Cercocarpus montanus<sup>P</sup> -- (alderleaf mountain mahogany)</b>									
1997	20	20	0	100	0	0	100	0	178/323
2002	40	-	0	100	0	100	0	0	227/287
2007	60	-	33	67	0	67	33	0	211/227
2012	40	-	0	100	0	0	0	0	201/207
2017	60	-	33	0	67	0	67	0	114/145
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	20	-	0	100	0	0	0	0	60/96
2017	-	-	-	-	-	-	-	-	-/-
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1997	80	-	0	100	0	0	0	25	66/121
2002	40	-	0	50	50	50	50	0	71/116
2007	40	-	0	100	0	0	0	0	86/148
2012	20	-	0	100	0	0	0	0	103/179
2017	-	-	-	-	-	-	-	-	30/37
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	10300	8900	42	58	0	0	0	0	15/19
2002	120	-	33	67	0	0	0	17	18/17
2007	920	-	15	80	4	2	0	4	24/25
2012	1200	20	3	95	2	0	0	8	29/38
2017	4960	-	4	96	0	0	0	0	33/38
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	20	-	0	100	0	100	0	0	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Purshia stansburiana<sup>P</sup> -- (Stansbury cliffrose)</b>									
1997	-	-	-	-	-	-	-	-	97/121
2002	-	-	-	-	-	-	-	-	174/142
2007	-	-	-	-	-	-	-	-	146/176
2012	20	-	0	100	0	100	0	0	109/111
2017	-	-	-	-	-	-	-	-	163/159
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1997	-	-	-	-	-	-	-	-	133/110
2002	-	-	-	-	-	-	-	-	-/-
2007	40	-	0	100	0	0	0	0	96/61
2012	-	-	-	-	-	-	-	-	72/54
2017	200	-	0	100	0	0	100	90	99/90
<b>Rosa woodsii<sup>P</sup> -- (Woods' rose)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	240/260

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

**Table 17-24.14 - 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)							
2017	1	-	-	-	-	100	38.0

## NORTH BATTLE CREEK - STUDY NO. 17-25



### Location Information

USGS 7.5 min Map Info	Orem NW; Township 5S, Range 2E, Section 22
GPS (0' Stake)	NAD 83 UTM ZONE 12, 440346 East 4468842 North

### Transect Information

Browse Tag # (0' Stake)	3988
Transect Bearing	192 ° magnetic (Lines 2-3: 274° magnetic)
Length	300ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft & 71ft)
Belt Marker Placement	No Rebar

### Directions to Site

From Pleasant Grove, drive up 200 South towards Battle Creek Canyon; the paved road ends at a water tank. Follow one of the many dirt roads north along the base of the foothill under the powerlines. From the water tank, continue about 1/4 mile to a second reservoir: stop at the south end. From the powerline pole on the south end of the old reservoir, the 0-foot stake is about 200 yards away at 62 degrees magnetic. The study samples the first face or slope below the second terrace in a fairly dense cliffrose type, just north of a small drainage. A red browse tag, #3988, is attached to the 0-foot stake.



**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,500ft (1,676m)
Aspect	West
Slope	55-65%
Sample Dates	05/13/1997, 05/16/2002, 08/06/2007, 07/27/2012, 07/12/2017

**Wildlife Habitat and Vegetation History****Table 17-25.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter

**Table 17-25.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Stansbury Cliffrose	NA
1989	Stansbury Cliffrose	NA
1997	Stansbury Cliffrose	NA
2002	Stansbury Cliffrose	NA
2007	Stansbury Cliffrose	NA
2012	Stansbury Cliffrose/Annual Grass	NA
2017	Stansbury Cliffrose/Annual Grass	NA

**Site Notes**

The Battle Creek and Grove Creek debris basins, which act as small reservoirs in the spring, are located below the site to the north and south. Otherwise, the nearest perennial source of water is Grove Creek, which is located 0.7 miles (1.1km) to the northwest. Residential subdivisions have been constructed up to the base of the foothill just below the site.

**Soils****Table 17-25.5 - 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
Clay Loam	7.1	28.0	33.4	38.6	2.9	6.4	38.4	0.6	05/13/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Upland Very Steep Stony Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

Stansbury cliffrose (*Purshia stansburiana*) has been the dominant browse species on this site since study establishment in 1983. Other preferred browse species are also present and include Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), rubber rabbitbrush (*Ericameria nauseosa* ssp. *nauseosa* var. *speciosa*), and Woods' rose (*Rosa woodsii*) (photos, Table 17-25.12, Table 17-25.13). Grasses are abundant, but much of the cover is contributed by the introduced annual species cheatgrass (*Bromus tectorum*) and cereal rye (*Secale cereale*); annual grasses were co-dominant with cliffrose in 2012 and 2017. In addition, the introduced and noxious annual grass species jointed goatgrass (*Aegilops cylindrica*) was observed on this study site for the first time in 2017 (Table 17-25.7, Table 17-25.10). Forbs have also remained fairly common (annual more so than perennial) and diverse through the sample years, with the introduced annual species redstem stork's bill (*Erodium cicutarium*) being the most abundant species in most sample years since 1997. Noxious and introduced forbs have also present in nearly all sample years, including the perennial forb field bindweed (*Convolvulus arvensis*) and annual forb yellow star-thistle (*Centaurea solstitialis*) (Table 17-25.11).

**Trend Summary Tables****Table 17-25.6 - 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	9.0	0.6	-	-	-	-
2002	9.8	0.4	-	-	-	-
2007	7.3	-	-	14.1	0.2	-
2012	5.6	0.6	-	11.2	0.4	-
2017	6.0	0.8	-	8.4	0.5	-

**Table 17-25.7 - 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	182	85	366	185	2.5	3.7	9.7	5.4
2002	42	91	275	190	0.2	3.9	6.4	4.1
2007	266	46	306	59	8.3	1.4	6.1	0.7
2012	411	36	292	70	30.0	1.6	4.3	0.9
2017	350	24	346	60	23.6	0.8	14.7	1.5

**Table 17-25.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	16.8	0.0	19.8	11.9	28.2	30.6
2002	26.9	0.0	15.7	9.8	32.0	26.0
2007	19.9	-	25.1	19.0	22.7	26.5
2012	11.0	-	23.4	10.3	26.7	46.0
2017	14.7	-	29.7	17.3	24.0	42.0

**Table 17-25.9 - 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	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1997	47	-	-
2002	18	1	-
2007	22	3	2
2012	10	-	-
2017	7	-	1
Days Use Per Acre (ha)			
1997	-	-	-
2002	44.2 (109.2)	0.7 (1.7)	-
2007	82.4 (203.6)	-	-
2012	28.1 (69.5)	-	-
2017	17.4 (43.0)	-	-

**Table 17-25.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Aegilops cylindrica <sup>ani</sup> (jointed goatgrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus briziformis <sup>ai</sup> (rattlesnake brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Secale cereale <sup>ai</sup> (cereal rye)	unknown perennial grass (unknown grass)
year	Nested Frequency									
1997	-	1	-	-	182	-	7	74	2	4
2002	-	9	-	-	42	2	-	80	-	-
2007	-	-	3	-	259	-	-	46	39	-
2012	-	1	6	5	373	-	8	28	228	-
2017	20	-	-	8	208	-	-	24	282	-
year	Average Cover (%)									
1997	-	0.0	-	-	2.5	-	0.2	3.5	0.0	0.0
2002	-	0.2	-	-	0.2	0.0	-	3.7	-	-
2007	-	-	0.0	-	7.4	-	-	1.4	0.9	-
2012	-	0.0	0.2	0.0	18.5	-	0.1	1.5	11.4	-
2017	0.4	-	-	0.0	7.3	-	-	0.8	15.8	-

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

**Table 17-25.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Ambrosia psilostachya (Cuman ragweed)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvech)	Buglossoides arvensis <sup>ai</sup> (corn gromwell)	Camelina microcarpa <sup>ai</sup> (littledod false flax)	Centaurea solstitialis <sup>ani</sup> (yellow star-thistle)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Convolvulus arvensis <sup>ai</sup> (field bindweed)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium aparine <sup>a</sup> (stickywilly)	Grindelia squarrosa (curlycup gumweed)	
year	Nested Frequency																	
1997	17	88	15	5	-	-	-	1	190	1	-	12	-	4	250	65	-	
2002	131	61	1	-	1	-	-	48	138	2	-	15	-	7	99	113	-	
2007	2	154	4	-	-	-	8	13	99	-	-	20	2	-	221	33	0	
2012	-	265	19	1	-	-	2	-	3	-	4	23	-	3	153	2	-	
2017	-	71	16	5	-	27	1	15	60	-	-	15	-	-	319	4	-	
year	Average Cover (%)																	
1997	0.1	0.3	0.2	0.3	-	-	-	0.1	1.6	0.0	-	0.4	-	0.0	6.4	0.8	-	
2002	0.9	0.3	0.0	-	0.0	-	-	1.3	0.9	0.0	-	0.5	-	0.0	1.0	2.6	-	
2007	0.0	0.8	0.2	-	-	-	0.0	0.1	0.7	-	-	0.2	0.0	-	3.8	0.6	0.0	
2012	-	1.9	0.2	0.1	-	-	0.0	-	0.0	-	0.0	0.2	-	0.0	2.1	0.0	-	
2017	-	0.2	0.3	0.2	-	0.2	0.0	0.2	0.4	-	-	0.2	-	-	13.6	0.1	-	

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

FORB SPECIES	Hackelia patens (spotted stickseed)	Hedysarum boreale (Utah sweetvetch)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lathyrus brachycalyx (Bonneville pea)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa <sup>i</sup> (alfalfa)	Microsteris gracilis <sup>ai</sup> (slender phlox)	Phlox longifolia (longleaf phlox)	Salsola tragus <sup>ai</sup> (prickly Russian thistle)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Trifolium (clover)
year	Nested Frequency														
1997	15	-	18	-	126	-	4	-	11	-	-	3	6	20	-
2002	10	7	1	-	64	-	-	-	9	-	-	4	2	17	-
2007	7	3	8	-	30	0	-	-	-	-	-	1	-	11	-
2012	-	-	11	17	25	-	-	2	4	2	1	2	-	1	1
2017	2	-	0	3	23	-	-	6	-	-	-	-	-	-	-
year	Average Cover (%)														
1997	0.1	-	0.2	-	4.2	-	0.0	-	0.1	-	-	0.0	0.1	0.1	-
2002	0.1	0.0	0.0	-	2.5	-	-	-	0.1	-	-	0.0	0.0	0.1	-
2007	0.0	0.0	0.0	-	0.3	0.0	-	-	-	-	-	0.0	-	0.0	-
2012	-	-	0.1	0.1	0.4	-	-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0
2017	0.0	-	0.0	0.0	0.8	-	-	0.0	-	-	-	-	-	-	-

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

**Table 17-25.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Celtis laevigata var. reticulata (netleaf hackberry)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Purshia stansburiana <sup>p</sup> (Stansbury cliffrose)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)
year	Line Intercept Cover (%)					
1997	-	-	-	-	-	-
2002	-	-	-	-	-	-
2007	1.4	-	0	0.2	12.7	-
2012	0.6	0.4	-	0	10.6	-
2017	0.1	-	0.1	0.5	8.2	-
year	Quadrat Cover (%)					
1997	0.8	-	0.8	0.6	7.3	-
2002	0.4	-	0.4	0.4	8.7	0.3
2007	0.6	-	0.0	0.0	6.7	-
2012	0.3	0.0	0.0	0.6	5.3	-
2017	0.3	0.1	0.4	0.6	5.3	-

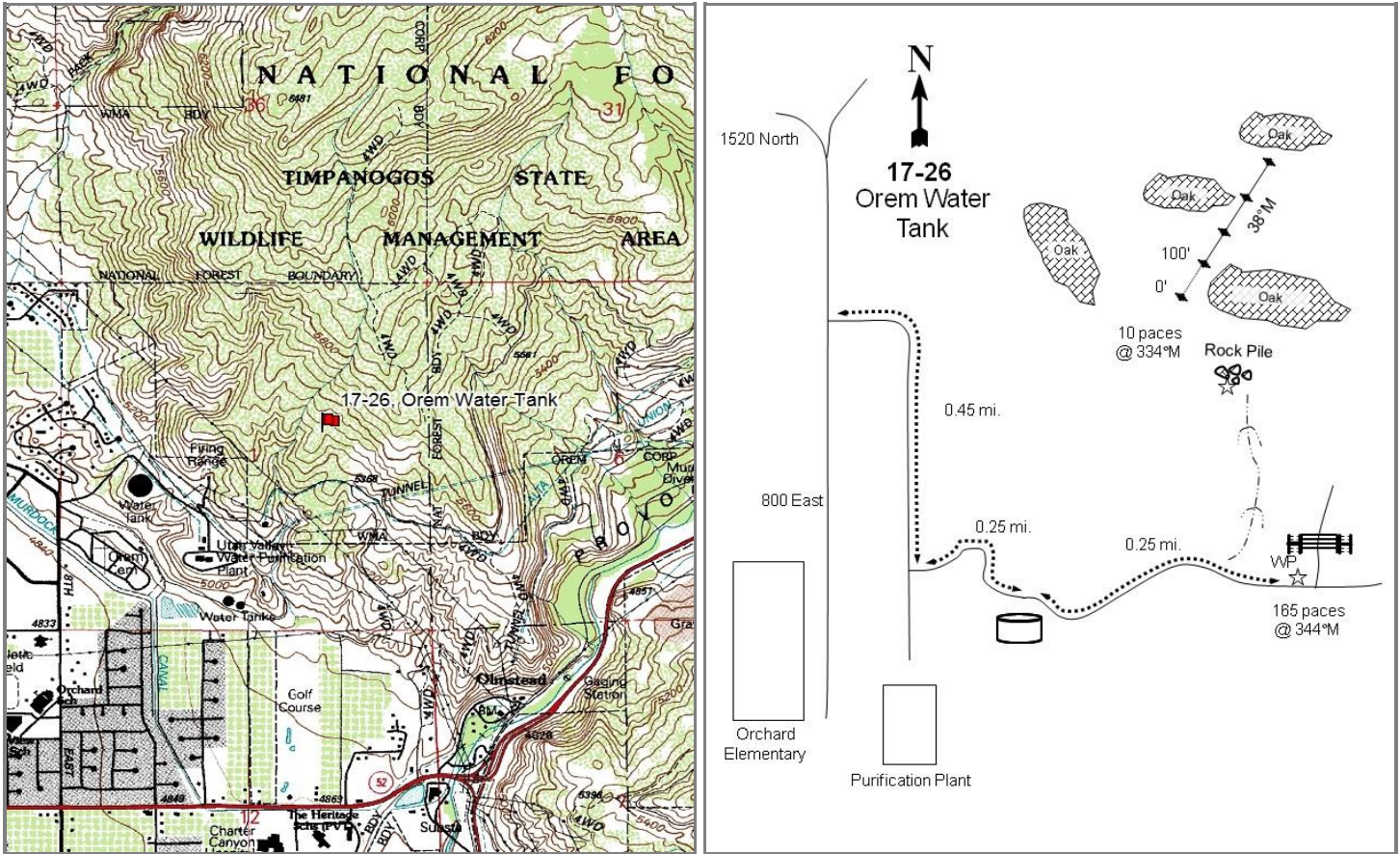
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 17-25.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. wyomingensis<sup>P</sup> -- (Wyoming big sagebrush)</b>									
1997	220	-	0	82	18	36	55	18	67/101
2002	120	-	0	83	17	100	0	0	77/122
2007	120	-	0	100	0	67	0	17	86/139
2012	140	-	0	57	43	43	57	71	73/126
2017	120	-	0	50	50	0	100	50	74/122
<b>Celtis laevigata var. reticulata -- (netleaf hackberry)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	20	-	100	0	0	0	0	0	- / -
2012	20	-	100	0	0	0	0	0	69/99
2017	-	-	-	-	-	-	-	-	11/142
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1997	60	-	0	33	67	0	0	67	55/91
2002	40	-	50	0	50	0	0	50	38/85
2007	20	-	0	0	100	0	0	100	64/93
2012	20	-	0	100	0	0	0	0	73/116
2017	20	-	0	100	0	0	0	0	79/128
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	860	-	14	86	0	0	0	0	23/28
2002	140	-	0	43	57	0	0	43	19/44
2007	80	-	0	100	0	0	0	0	37/37
2012	200	-	0	100	0	0	0	0	28/38
2017	100	-	0	100	0	0	0	0	41/60
<b>Purshia stansburiana<sup>P</sup> -- (Stansbury cliffrose)</b>									
1997	800	-	0	90	10	10	90	3	121/145
2002	720	20	0	69	31	11	58	11	134/157
2007	640	-	3	91	6	56	13	9	143/164
2012	580	-	0	83	17	24	28	28	138/151
2017	500	-	0	80	20	56	40	20	146/178
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	80	40	25	75	0	25	50	0	32/43
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Rhus trilobata var. trilobata<sup>P</sup> -- (skunkbush sumac)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	157/361
2017	-	-	-	-	-	-	-	-	169/295
<b>Rosa woodsii<sup>P</sup> -- (Woods' rose)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	117/210
2017	-	-	-	-	-	-	-	-	156/153

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

## OREM WATER TANK - STUDY NO. 17-26



### Location Information

USGS 7.5 min Map Info	Orem NE; Township 6S, Range 2E, Section 01
GPS (0' Stake)	NAD 83 UTM ZONE 12, 443623 East 4464321 North

### Transect Information

Browse Tag # (0' Stake)	3913
Transect Bearing	38° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 1: No Rebar

### Directions to Site

You may need a key from Orem City to access this site. On the north side of Orem, go east up 1600 North (which turns into 1520 North) to 800 East. Just south of this intersection on 800 East, turn up the road towards the water purification plant. Go 0.45 miles, turn left, and continue for 0.25 miles to a water tank. Travel on this road for 0.25 miles and park. The old road towards the study site is closed, but a witness post should mark the junction. From there, walk about 165 paces (275 yards) to a rock pile at the head of a small drainage or gully. From the rockpile, walk north 10 paces at 334 degrees magnetic to the 0-foot baseline stake at the edge of the oakbrush: it is marked by a red browse tag #3913.



**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,500ft (1,676m)
Aspect	West
Slope	8-30%
Sample Dates	06/05/1997, 07/25/2002, 05/14/2007, 08/02/2012, 07/10/2017

**Table 17-26.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Seed Unknown	-	-	Historic	-
Fire - Wildfire	-	-	Prior to 1983	-
Fire - Wildfire	-	-	1996	-
Seeding - Seed Unknown	-	-	1996	-

**Wildlife Habitat and Vegetation History**

**Table 17-26.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter

**Table 17-26.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Gambel Oak	NA
1989	Gambel Oak	NA
1997	Perennial Grass	NA
2002	Gambel Oak/Perennial Grass	NA
2007	Gambel Oak/Perennial-Annual Grass	NA
2012	Gambel Oak/Perennial Grass	NA
2017	Gambel Oak/Perennial Grass	NA

**Site Notes**

The nearest source of perennial water is found in the residential area located 0.5 miles to the southwest.

**Soils**

**Table 17-26.5 - 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
Clay Loam	6.7	33.8	38.4	27.8	2.9	15.9	198.4	0.7	06/05/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Mountain Loam (Oak)
NRCS Ecological Site #	R047XA432UT
States and Transitions	No state and transition model is available for this ecological site.

Gambel oak (*Quercus gambelii*) has been the dominant browse species on this site in most sample years since study establishment in 1983. A wildfire removed a large portion of the browse component in 1997, but it has since recovered (photos, Table 17-26.12, Table 17-26.13). Perennial grasses have been a dominant/co-dominant site component since 1997, with the introduced species smooth brome (*Bromus inermis*) contributing a majority of the cover; annual grasses -- namely the introduced species cheatgrass (*B. tectorum*) -- were also co-dominant in 2007. In addition, the noxious annual grass species jointed goatgrass (*Aegilops cylindrica*) was observed for the first time in the 2017 sample year in low abundance (Table 17-26.10). Forb cover has fluctuated from year to year, but in 2017 perennial forbs provided 19.9% cover; most of this was due to the introduced species alfalfa (*Medicago sativa*) (Table 17-26.7, Table 17-26.11). Barring a major disturbance, this study site is expected to remain in a similar state in future sample years.



**Trend Summary Tables**

**Table 17-26.6 - 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
1997	7.6	-	-	-	-	-
2002	16.5	-	-	24.9	-	-
2007	23.0	-	-	38.3	-	-
2012	19.7	-	-	32.5	-	-
2017	21.9	-	-	28.6	-	-

**Table 17-26.7 - 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
1997	132	370	149	130	3.3	20.1	1.3	12.2
2002	205	358	98	155	10.3	25.6	1.1	7.6
2007	316	374	147	142	16.2	17.7	2.5	5.9
2012	189	458	94	176	4.1	45.0	0.3	3.1
2017	188	379	248	191	6.3	24.6	8.8	19.9

**Table 17-26.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	23.4	0.0	34.2	2.0	3.9	42.5
2002	1.1	0.0	72.4	0.1	0.7	59.4
2007	0.5	0.0	60.6	0.1	0.9	65.0
2012	0.1	-	46.8	0.0	0.7	70.8
2017	0.8	-	91.4	0.3	0.8	70.1

**Table 17-26.9 - 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	Mule Deer	Rocky Mountain Elk
	Quadrat Frequency	
1997	36	7
2002	11	15
2007	5	14
2012	1	-
2017	4	2
Year	Days Use Per Acre (ha)	
1997	-	-
2002	48.9 (120.8)	59.6 (147.3)
2007	8.1 (19.9)	87.8 (216.8)
2012	12.1 (29.8)	-
2017	6.0 (14.9)	1.3 (3.3)

**Table 17-26.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Aegilops cylindrica <sup>mi</sup> (jointed goatgrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)	Vulpia octoflora <sup>a</sup> (sixweeks fescue)
year	Nested Frequency										
1997	-	46	44	274	121	-	-	12	-	120	2
2002	-	21	63	273	191	3	1	6	-	138	4
2007	-	21	-	251	316	19	-	18	-	134	13
2012	-	7	29	285	179	19	-	14	1	270	-
2017	1	14	70	248	164	26	-	1	-	180	-
year	Average Cover (%)										
1997	-	1.7	0.9	13.4	2.5	-	-	0.1	-	4.9	0.0
2002	-	0.5	1.0	18.0	9.3	0.2	0.0	0.0	-	7.0	0.0
2007	-	1.4	-	11.1	16.0	0.2	-	0.2	-	4.7	0.2
2012	-	0.2	0.2	22.9	3.9	0.7	-	0.1	0.0	21.1	-
2017	0.0	0.5	1.3	15.8	5.0	0.4	-	0.0	-	7.9	-

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

**Table 17-26.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum <sup>ai</sup> (desert madwort)	Calochortus nuttallii (sego lily)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Epipactis gigantea (stream orchid)	Eriogonum racemosum (redroot buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium aparine <sup>a</sup> (stickywilly)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Linaria dalmatica <sup>mi</sup> (Dalmatian toadflax)	Medicago sativa <sup>a</sup> (alfalfa)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)
year	Nested Frequency																
1997	109	14	-	-	-	10	-	2	6	31	6	2	7	3	111	-	2
2002	87	1	-	1	-	5	-	-	-	20	4	-	-	4	154	-	-
2007	61	-	-	-	4	11	7	-	-	36	46	-	-	14	125	1	-
2012	70	-	2	-	-	-	-	-	2	6	13	1	3	44	143	2	-
2017	144	3	-	16	5	2	-	-	-	99	53	2	10	21	167	5	-
year	Average Cover (%)																
1997	0.7	0.0	-	-	-	0.0	-	0.0	0.0	0.2	0.0	0.2	0.0	0.0	12.1	-	0.0
2002	0.5	0.0	-	0.0	-	0.0	-	-	-	0.5	0.0	-	-	0.0	7.6	-	-
2007	0.2	-	-	-	0.0	0.0	0.0	-	-	1.2	1.0	-	-	0.3	5.5	0.0	-
2012	0.2	-	0.0	-	-	-	-	-	0.0	0.0	0.1	0.0	0.0	0.4	2.7	0.0	-
2017	1.7	0.0	-	0.1	0.0	0.0	-	-	-	5.2	1.5	0.0	0.1	0.3	19.5	0.0	-

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

FORB SPECIES					
<i>Silene antirrhina</i> <sup>a</sup> (sleepy silene)					
<i>Sisymbrium altissimum</i> <sup>ai</sup> (tall tumblemustard)					
<i>Sphaeralcea coccinea</i> (scarlet globemallow)					
<i>Tragopogon dubius</i> <sup>ai</sup> (yellow salsify)					
<i>Zigadenus paniculatus</i> (foothill deathcamas)					
year	Nested Frequency				
1997	2	-	7	5	-
2002	14	-	0	-	-
2007	18	-	5	-	1
2012	5	-	2	4	-
2017	-	9	1	1	-
year	Average Cover (%)				
1997	0.0	-	0.0	0.1	-
2002	0.0	-	0.0	-	-
2007	0.0	-	0.0	-	0.0
2012	0.0	-	0.0	0.0	-
2017	-	0.1	0.0	0.0	-

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

**Table 17-26.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES		
<i>Bassia prostrata</i> <sup>pi</sup> (forage kochia)		
<i>Quercus gambelii</i> <sup>p</sup> (Gambel oak)		
year	Line Intercept Cover (%)	
1997	-	-
2002	-	24.9
2007	-	38.3
2012	-	32.5
2017	-	28.6
year	Quadrat Cover (%)	
1997	-	7.6
2002	-	16.5
2007	-	23.0
2012	0.0	19.6
2017	-	21.9

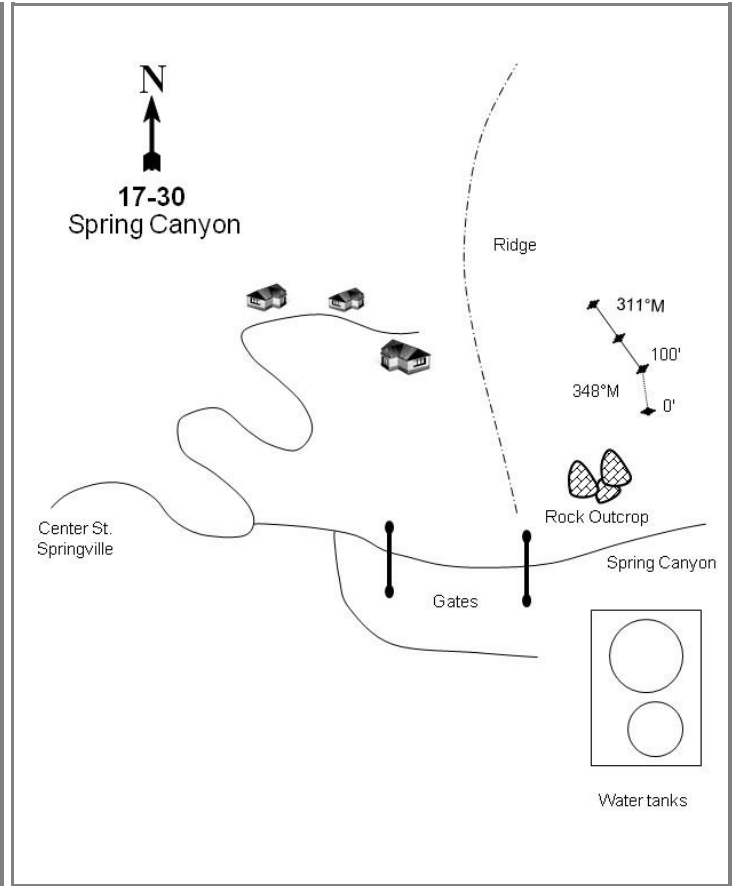
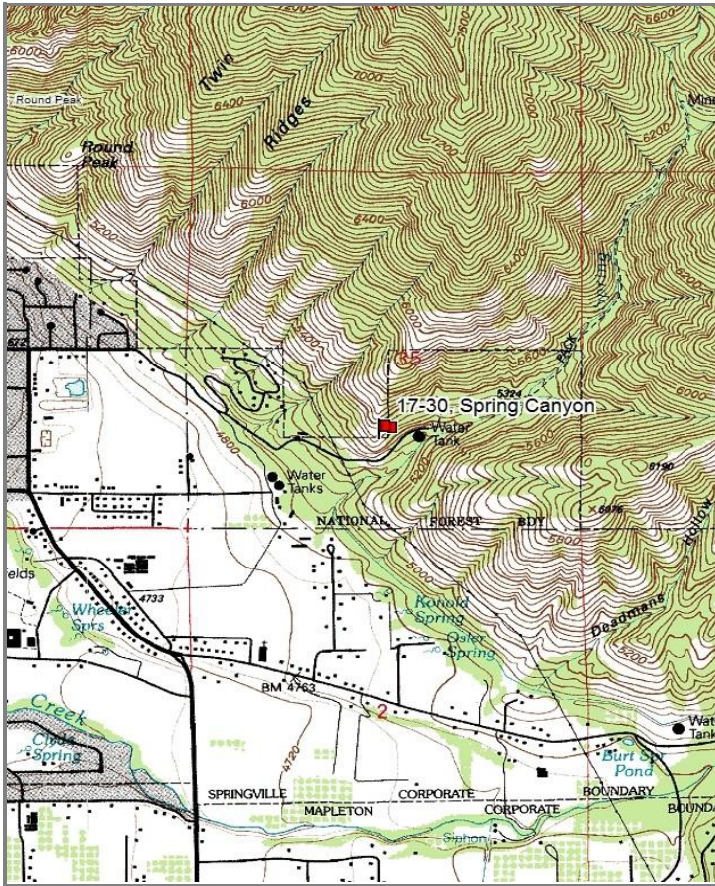
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 17-26.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Atriplex canescens<sup>P</sup> -- (fourwing saltbush)</b>									
1997	-	-	-	-	-	-	-	-	40/33
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Bassia prostrata<sup>Pi</sup> -- (forage kochia)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	20	-	0	0	100	0	0	100	33/25
2017	-	-	-	-	-	-	-	-	-/-
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1997	20	-	100	0	0	0	100	0	- / -
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	27/43
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	52/37
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1997	10560	4580	77	23	0	0	0	19	33/24
2002	18820	-	16	84	0	6	0	0	79/39
2007	19340	20	23	76	1	6	0	2	103/54
2012	16140	-	45	52	3	16	3	12	97/53
2017	17500	260	45	47	8	12	1	6	100/59

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

## SPRING CANYON - STUDY NO. 17-30



### Location Information

USGS 7.5 min Map Info                      Springville SW; Township 7S, Range 3E, Section 35  
 GPS (0' Stake)                                NAD 83 UTM ZONE 12, 451466 East 4446005 North

### Transect Information

Browse Tag # (0' Stake)                      177  
 Transect Bearing                                348° magnetic  
 Length    300ft  
 Belt Placement                                 Line 1 (11ft & 95ft), Line 2 (34ft & 71ft), Line 3 (59ft)  
 Belt Marker Placement                        Belts 1-4: No Rebar

### Directions to Site

Follow Center Street in Springville going east toward the mountain. From the first switchback (where the main road continues up to houses on the bench north of Spring Canyon), continue towards the canyon mouth to the first gate. Continued development may alter the approach to the canyon, but in 1989, it was possible to walk 1/2 mile from the first locked gate to another gate further in the canyon. From this gate, continue 119 paces east into Spring Canyon. Uphill to the northwest (azimuth of 271 degrees magnetic) there is a conspicuous group of rock outcroppings. Walk up the side hill to the uppermost rock near the top of the ridge. The 0-foot stake, marked with a red browse tag #177, is north of the rock.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,200ft (1,585m)
Aspect	Southeast
Slope	65%
Sample Dates	05/15/1997, 05/14/2002, 05/18/2007, 07/03/2012, 07/05/2017

**Wildlife Habitat and Vegetation History**

**Table 17-30.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter

**Table 17-30.4 - 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/Perennial Grass	NA
1989	Stansbury Cliffrose/Perennial Grass	NA
1997	Stansbury Cliffrose/Bulbous Bluegrass	NA
2002	Stansbury Cliffrose/Bulbous Bluegrass	NA
2007	Stansbury Cliffrose/Annual Grass/Bulbous Bluegrass	NA
2012	Stansbury Cliffrose/Annual Grass	NA
2017	Stansbury Cliffrose/Annual Grass	NA

**Site Notes**

A water tank is located below the study site; this area is a watershed for the city of Springville.

**Soils**

**Table 17-30.5 - 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
Sandy Loam	7.0	61.8	22.4	15.8	2.0	5.9	57.6	0.6	05/15/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	25 inches
NRCS Ecological Site	Upland Very Steep Stony Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

Stansbury cliffrose (*Purshia stansburiana*) has dominated the shrub overstory on this study site since 1983; other preferred browse includes rubber rabbitbrush (*Ericameria nauseosa* ssp. *nauseosa* var. *speciosa*) and Gambel oak (*Quercus gambelii*) (Table 17-30.12, Table 17-30.13). The herbaceous understory has remained fairly diverse and abundant through the study period. Perennial grasses, mainly bluebunch wheatgrass (*Pseudoroegneria spicata*) and the introduced species bulbous bluegrass (*Poa bulbosa*), were most abundant in the herbaceous understory and were co- dominant from 1983 through the 2007 sample year. The introduced annual grass cheatgrass (*Bromus tectorum*) has increased in abundance and cover since 1997, and became a co-dominant site component in 2007 (Table 17-30.10). Forbs have generally remained rare in most sample years. The exception to this is the 2017 sample year in which annual forbs provided nearly 12% cover, with nearly all of that being contributed by the introduced annual species desert madwort (*Alyssum desertorum*) and redstem stork's bill (*Erodium cicutarium*) (Table 17-30.7, Table 17-30.11).

**Trend Summary Tables**

**Table 17-30.6 - 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	3.7	1.9	-	-	-	-
2002	5.0	0.6	-	-	-	-
2007	4.3	0.6	-	8.9	1.1	-
2012	4.6	2.1	-	7.1	4.7	-
2017	2.6	1.8	-	7.6	2.7	-

**Table 17-30.7 - 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	344	450	76	90	3.5	28.5	0.8	2.4
2002	362	440	75	117	6.0	32.0	0.3	2.8
2007	427	408	199	108	14.1	23.2	3.1	4.1
2012	421	295	254	96	22.6	19.1	2.2	2.2
2017	431	306	353	60	25.1	13.8	11.7	2.0

**Table 17-30.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	10.9	0.4	16.9	28.5	13.1	38.7
2002	2.6	-	15.5	28.7	16.6	47.6
2007	9.0	0.3	22.7	18.3	17.4	47.7
2012	10.1	0.7	24.4	17.5	17.6	48.9
2017	17.8	0.1	10.4	36.4	13.9	45.8

**Table 17-30.9 - 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	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1997	38	22	-
2002	32	2	1
2007	47	17	-
2012	17	2	2
2017	15	10	-
Year	Days Use Per Acre (ha)		
1997	-	-	-
2002	42.2 (104.3)	3.4 (8.3)	-
2007	8.7 (21.5)	59.6 (147.3)	-
2012	20.8 (51.3)	0.7 (1.7)	-
2017	21.5 (53.0)	14.1 (34.8)	-



**Table 17-30.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency						
Aristida purpurea (purple threeawn)	-	344	434	7	177	-	-
Bromus tectorum <sup>ai</sup> (cheatgrass)	-	362	433	1	156	-	-
Poa bulbosa <sup>i</sup> (bulbous bluegrass)	2	427	386	9	150	-	-
Poa secunda (Sandberg bluegrass)	4	421	219	35	116	2	-
Pseudoroegneria spicata (bluebunch wheatgrass)	-	431	224	67	111	-	1
Secale cereale <sup>ai</sup> (cereal rye)	Average Cover (%)						
Sporobolus cryptandrus (sand dropseed)	-	3.5	24.5	0.2	3.9	-	-
year	-	6.0	26.3	0.0	5.7	-	-
1997	0.1	14.1	17.1	0.2	5.8	-	-
2002	0.2	22.5	13.3	0.6	5.1	0.1	-
2007	-	25.1	8.1	1.5	4.1	-	0.0
2012							
2017							

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

**Table 17-30.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Alyssum desertorum <sup>ai</sup> (desert madwort)	56	-	-	30	6	-	16	-	-	-	-	-	57	-	4	-	-
Ambrosia psilostachya (Cuman ragweed)	17	-	-	34	2	-	-	-	3	-	-	-	79	1	33	-	14
Amsinckia tessellata <sup>a</sup> (bristly fiddleneck)	138	19	2	38	4	-	4	-	1	8	5	0	37	-	96	0	-
Artemisia ludoviciana (white sagebrush)	166	41	-	44	-	-	2	-	-	-	-	-	10	-	148	-	-
Astragalus utahensis (Utah milkvetch)	218	2	-	50	0	4	5	1	-	1	-	-	11	-	283	-	-
Camelina microcarpa <sup>ai</sup> (littlupod false flax)	Average Cover (%)																
Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	0.1	-	-	0.3	0.1	-	0.6	-	-	-	-	-	1.9	-	0.0	-	-
Crepis acuminata (tapertip hawkbeard)	0.0	-	-	0.4	0.0	-	-	-	0.0	-	-	-	2.3	0.0	0.2	-	0.0
Cryptantha (cryptantha)	0.5	0.4	0.0	1.1	0.0	-	0.1	-	0.0	0.0	0.0	0.0	2.3	-	2.4	0.0	-
Descurainia pinnata <sup>a</sup> (western tansymustard)	0.6	0.7	-	1.1	-	-	0.0	-	-	-	-	-	0.2	-	1.6	-	-
Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	2.6	0.0	-	1.5	0.0	0.0	0.0	0.0	-	0.0	-	-	0.4	-	8.7	-	-
Erigeron pumilus (shaggy fleabane)																	
Eriogonum brevicaulis (shortstem buckwheat)																	
Eriogonum racemosum (redroot buckwheat)																	
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)																	
Galium aparine <sup>a</sup> (stickywilly)																	
Gilia in conspicua <sup>a</sup> (shy gilia)																	

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

FORB SPECIES												
Grindelia squarrosa (curlycup gumweed)												
Heterotheca villosa (hairy false goldenaster)												
Lactuca serriola <sup>ai</sup> (prickly lettuce)												
Lappula occidentalis <sup>a</sup> (flatspine stickseed)												
Lomatium (desertparsley)												
Machaeranthera canescens (hoary tansyaster)												
Oenothera caespitosa (tufted evening primrose)												
Penstemon (beardtongue)												
Phlox longifolia (longleaf phlox)												
Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)												
Symphotrichum (aster)												
Tragopogon dubius <sup>ai</sup> (yellow salsify)												
year	Nested Frequency											
1997	-	2	-	-	2	3	-	3	-	-	-	1
2002	-	0	-	17	-	-	-	-	-	-	3	2
2007	-	6	7	2	-	-	0	1	8	4	-	8
2012	5	-	3	-	-	-	-	1	-	2	-	1
2017	-	0	2	-	-	-	-	-	-	-	-	2
year	Average Cover (%)											
1997	-	0.0	-	-	0.0	0.0	-	0.0	-	-	-	0.0
2002	-	0.0	-	0.0	-	-	-	-	-	-	0.0	0.0
2007	-	0.0	0.0	0.0	-	-	0.0	0.1	0.0	0.0	-	0.0
2012	0.1	-	0.0	-	-	-	-	0.0	-	0.0	-	0.0
2017	-	0.0	0.0	-	-	-	-	-	-	-	-	0.3

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

**Table 17-30.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES					
Celtis laevigata var. reticulata (netleaf hackberry)					
Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)					
Gutierrezia sarothrae (broom snakeweed)					
Purshia stansburiana <sup>p</sup> (Stansbury cliffrose)					
Quercus gambelii <sup>p</sup> (Gambel oak)					
year	Line Intercept Cover (%)				
1997	-	-	-	-	-
2002	-	-	-	-	-
2007	0.3	-	0.8	6.4	2.5
2012	3.7	-	1	3.8	3.3
2017	1.4	-	1.3	4.8	2.8
year	Quadrat Cover (%)				
1997	0.0	0.0	1.9	2.6	1.0
2002	0.5	0.4	0.1	3.4	1.2
2007	0.4	-	0.2	3.6	0.8
2012	1.7	-	0.5	1.6	2.9
2017	1.3	-	0.5	1.6	1.0

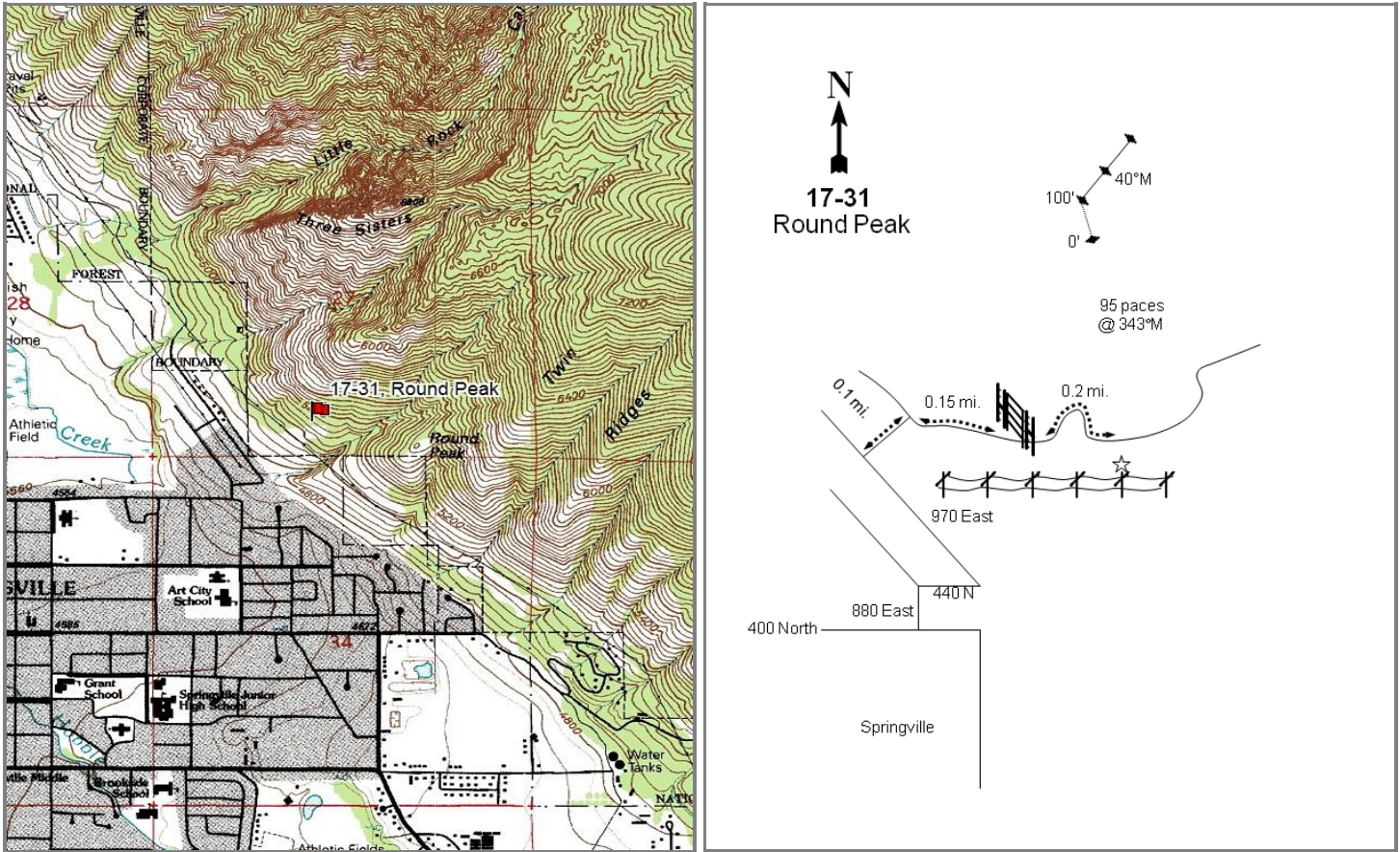
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 17-30.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Celtis laevigata var. reticulata -- (netleaf hackberry)</b>									
1997	-	-	-	-	-	-	-	-	60/264
2002	-	-	-	-	-	-	-	-	66/262
2007	-	-	-	-	-	-	-	-	116/256
2012	-	-	-	-	-	-	-	-	137/308
2017	80	-	0	100	0	100	0	0	- / -
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1997	20	-	0	100	0	0	100	0	42/103
2002	20	-	0	0	100	100	0	100	32/79
2007	-	-	-	-	-	-	-	-	71/77
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	77/119
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	2760	300	29	71	0	0	0	0	20/27
2002	580	20	28	41	31	3	0	14	13/19
2007	1140	-	12	86	2	2	4	2	21/27
2012	580	20	24	72	3	0	0	39	25/45
2017	460	-	4	96	0	0	0	0	29/45
<b>Purshia stansburiana<sup>P</sup> -- (Stansbury cliffrose)</b>									
1997	180	80	0	78	22	0	100	0	184/203
2002	340	-	12	82	6	18	59	0	158/192
2007	400	-	0	80	20	0	90	15	149/187
2012	140	20	14	86	0	14	57	0	174/205
2017	420	-	38	57	5	24	57	19	180/215
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1997	20	-	0	100	0	0	0	0	240/290
2002	60	20	0	100	0	0	0	0	166/193
2007	40	140	0	100	0	0	0	0	302/376
2012	20	-	0	100	0	0	0	0	- / -
2017	-	-	-	-	-	-	-	-	325/468

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

## ROUND PEAK - STUDY NO. 17-31



### Location Information

USGS 7.5 min Map Info                      Springville SW; Township 7S, Range 3E, Section 27  
 GPS (0' Stake)                                NAD 83 UTM ZONE 12, 449748 East 4447392 North

### Transect Information

Browse Tag # (0' Stake)                      419  
 Transect Bearing                              349° magnetic  
 Length    300ft  
 Belt Placement                                Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft & 71ft)  
 Belt Marker Placement                      Standard

### Directions to Site

From the town of Springville, proceed on 440 North and 970 East to an intersection at the end of the paved road. Turn right and continue for 0.1 miles to an intersection. Turn right and proceed southeast along the foothills for 0.15 miles to a locked gate: park here. Walk 0.2 miles along the road and stop when parallel to two power poles which are 50 yards south of the road. From the power poles, the 0-foot baseline stake is 95 paces north at 343 degrees magnetic and marked with browse tag #419.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,100ft (1,554m)
Aspect	South
Slope	25-45%
Sample Dates	05/14/1997, 05/14/2002, 07/05/2007, 07/03/2012, 07/05/2017

**Wildlife Habitat and Vegetation History**

**Table 17-31.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter

**Table 17-31.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Netleaf Hackberry/Smooth Sumac	NA
1989	Netleaf Hackberry/Smooth Sumac/Bulbous Bluegrass	NA
1997	Netleaf Hackberry/Smooth Sumac/Bulbous Bluegrass	NA
2002	Netleaf Hackberry/Smooth Sumac/Bulbous Bluegrass	NA
2007	Netleaf Hackberry/Smooth Sumac/Bulbous Bluegrass	NA
2012	Netleaf Hackberry/Smooth Sumac/Bulbous Bluegrass	NA
2017	Netleaf Hackberry/Smooth Sumac/Bulbous Bluegrass	NA

**Site Notes**

The nearest source of perennial water is the Spring Creek wetland 0.8 miles to the northwest. In the summer of 1989, several fawn carcasses were found which were most likely winter-killed by the deep snows of the 1988-89 winter. In 2007, a deer skeleton was found on the baseline and there were several game trails traversing the study.

**Soils**

**Table 17-31.5 - 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
Clay Loam	7.2	39.4	30.7	29.8	4.3	6.3	160.0	0.6	05/14/1997
Loam	7.3	36.9	38.4	24.7	1.9	14.2	256.0	1.0	05/14/2002

**Site Potential**

1981 - 2010 Average Annual Precipitation	24 inches
NRCS Ecological Site	Mountain Stony Loam (Hackberry)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

This study site has remained in a stable state as a netleaf hackberry (*Celtis laevigata* var. *reticulata*) and smooth sumac (*Rhus glabra*) plant community type since 1983. Additional preferred browse species, such as skunkbush sumac (*R. trilobata*) and Gambel oak (*Quercus gambelii*), are also present (photos, Table 17-31.12, Table 17-31.13). The native perennial grass species bluebunch wheatgrass (*Pseudoroegneria spicata*) is common in the herbaceous understory, but the introduced species bulbous bluegrass (*Poa bulbosa*) has been the most abundant grass and a co-dominant site component in every study year since 1989. Annual grasses -- all introduced species -- are also present and have increased in cover since 1997. In addition, the noxious and introduced annual species jointed goatgrass (*Aegilops cylindrica*) was observed in 2012 and 2017 (Table 17-31.7, Table 17-31.10). Cover of forbs has fluctuated from sample year to sample year, but the introduced annual species redstem stork's bill (*Erodium cicutarium*) and native perennial species Bonneville pea (*Lathyrus brachycalyx*) contributed the most forb cover in 2017 (Table 17-31.11).

**Trend Summary Tables****Table 17-31.6 - 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
1997	2.2	3.5	-	-	-	-
2002	1.8	3.9	-	-	-	-
2007	2.3	4.1	-	6.1	7.4	-
2012	3.9	10.6	-	4.4	12.6	-
2017	2.4	10.8	-	5.6	17.5	-

**Table 17-31.7 - 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
1997	151	392	194	213	0.8	24.3	1.3	7.6
2002	209	423	151	126	1.6	31.6	0.8	6.2
2007	272	330	188	211	4.4	19.4	1.3	6.2
2012	295	348	101	156	9.3	20.1	0.9	5.1
2017	253	326	281	129	9.3	21.2	10.3	6.3

**Table 17-31.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	3.4	0.4	28.9	12.7	21.9	38.9
2002	0.7	0.0	24.8	12.2	24.7	47.9
2007	3.3	0.0	28.8	16.4	20.7	43.0
2012	3.1	-	29.9	10.3	27.0	46.5
2017	2.6	0.0	16.1	24.8	28.7	49.7

**Table 17-31.9 - 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	Coyote	Mule Deer	Rocky Mountain Elk	Greater Sage- Grouse	Other	Rabbit
	Quadrat Frequency					
1997	-	19	22	-	-	3
2002	-	24	11	-	-	-
2007	-	11	24	-	-	-
2012	-	11	1	1	-	2
2017	-	19	16	-	-	5
Year	Days Use Per Acre (ha)					
1997	-	-	-	-	-	-
2002	-	44.2 (109.2)	9.4 (23.2)	-	-	-
2007	-	74.4 (183.7)	36.2 (89.4)	-	17.4 (43.0)*	-
2012	-	30.2 (74.5)	7.4 (18.2)	-	-	-
2017	8.7 (21.5)*	38.9 (96.0)	22.1 (54.6)	-	-	-

\*Pellets per acre (ha)

**Table 17-31.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Aegilops cylindrica <sup>ni</sup> (jointed goatgrass)	Avena fatua <sup>ni</sup> (wild oat)	Bromus arvensis <sup>ni</sup> (field brome)	Bromus briziformis <sup>ni</sup> (rattlesnake brome)	Bromus tectorum <sup>ni</sup> (cheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency						
1997	-	-	21	26	137	306	279
2002	-	111	9	-	157	373	216
2007	-	81	6	0	249	265	171
2012	4	40	14	-	287	260	174
2017	5	109	7	1	185	290	143
year	Average Cover (%)						
1997	-	-	0.1	0.1	0.6	12.7	11.6
2002	-	0.6	0.0	-	1.0	19.0	12.6
2007	-	0.7	0.0	0.0	3.7	10.8	8.7
2012	0.1	0.2	0.0	-	9.0	10.8	9.3
2017	0.0	2.6	0.1	0.0	6.6	13.1	8.1

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

**Table 17-31.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum desertorum <sup>ni</sup> (desert madwort)	Ambrosia psilostachya (Cuman ragweed)	Artemisia ludoviciana (white sagebrush)	Astragalus beckwithii (Beckwith's milkvetch)	Calochortus nuttallii (sego lily)	Carduus nutans <sup>ni</sup> (nodding plumeless thistle)	Cirsium undulatum <sup>a</sup> (wavyleaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Cryptantha (cryptantha)	Cymopterus longipes (longstalk springparsley)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron divergens <sup>a</sup> (spreading fleabane)	Eriogonum brevicaulis (shortstem buckwheat)	Eriogonum racemosum (redroot buckwheat)	Erodium cicutarium <sup>ni</sup> (redstem stork's bill)
year	Nested Frequency																
1997	5	146	134	20	2	-	-	29	-	-	18	-	5	0	-	-	14
2002	1	48	1	13	2	1	1	5	-	-	9	-	-	-	-	2	68
2007	-	124	114	41	39	-	-	-	-	6	2	1	-	2	2	-	72
2012	-	73	105	16	-	-	-	-	3	-	2	-	-	8	-	-	24
2017	-	131	23	35	-	-	-	7	13	-	-	2	-	2	-	-	224
year	Average Cover (%)																
1997	0.0	0.4	3.0	0.2	0.1	-	-	0.6	-	-	0.5	-	0.0	0.0	-	-	0.1
2002	0.0	0.1	0.0	0.1	0.4	0.0	0.0	0.0	-	-	0.4	-	-	-	-	0.0	0.4
2007	-	0.5	3.4	0.5	0.7	-	-	-	-	0.2	0.0	0.0	-	0.0	0.0	-	0.4
2012	-	0.2	2.7	0.3	-	-	-	-	0.0	-	0.0	-	-	0.2	-	-	0.5
2017	-	2.0	0.6	0.9	-	-	-	0.0	0.1	-	-	0.0	-	0.0	-	-	7.2

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



FORB SPECIES	Galium aparine <sup>a</sup> (stickywilly)	Grindelia squarrosa (curlycup gumweed)	Helianthus annuus <sup>a</sup> (common sunflower)	Heterotheca villosa (hairy false goldenaster)	Lactuca scariola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lathyrus brachycalyx (Bonneville pea)	Lithospermum incisum (narrowleaf stone seed)	Lithospermum ruderale (western stone seed)	Phlox longifolia (longleaf phlox)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Symphyotrichum (aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ai</sup> (yellow salsify)
year	Nested Frequency														
1997	39	-	3	-	-	1	68	8	13	13	33	-	3	-	5
2002	23	13	-	-	-	24	84	10	-	3	22	-	4	4	5
2007	16	-	-	3	-	-	25	31	7	8	-	-	-	-	19
2012	-	12	5	2	-	-	51	-	3	1	15	-	-	-	1
2017	4	7	13	3	7	-	87	1	-	-	-	5	-	-	4
year	Average Cover (%)														
1997	0.2	-	0.0	-	-	0.0	3.2	0.2	0.0	0.0	0.1	-	0.4	-	0.0
2002	0.1	0.4	-	-	-	0.0	4.8	0.0	-	0.1	0.0	-	0.0	0.0	0.0
2007	0.1	-	-	0.0	-	-	0.3	0.2	0.9	0.0	-	-	-	-	0.2
2012	-	0.2	0.0	0.0	-	-	1.8	-	0.0	0.0	0.0	-	-	-	0.0
2017	0.0	0.2	0.2	0.1	0.0	-	4.5	0.0	-	-	-	0.5	-	-	0.0

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

**Table 17-31.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Celtis laevigata var. reticulata (netleaf hackberry)	Gutierrezia sarothrae (broom snakeweed)	Quercus gambelii <sup>p</sup> (Gambel oak)	Rhus glabra <sup>p</sup> (smooth sumac)	Rhus trilobata <sup>p</sup> (skunkbush sumac)
year	Line Intercept Cover (%)				
1997	-	-	-	-	-
2002	-	-	-	-	-
2007	6.6	0.8	-	6.1	-
2012	6.8	5.8	0.2	4.2	-
2017	6.9	10.6	0.3	5.3	-
year	Quadrat Cover (%)				
1997	1.9	1.6	-	2.2	-
2002	2.4	1.6	-	1.8	-
2007	3.4	0.8	-	2.3	-
2012	5.4	5.2	0.0	3.9	-
2017	5.0	5.8	0.0	2.3	0.0

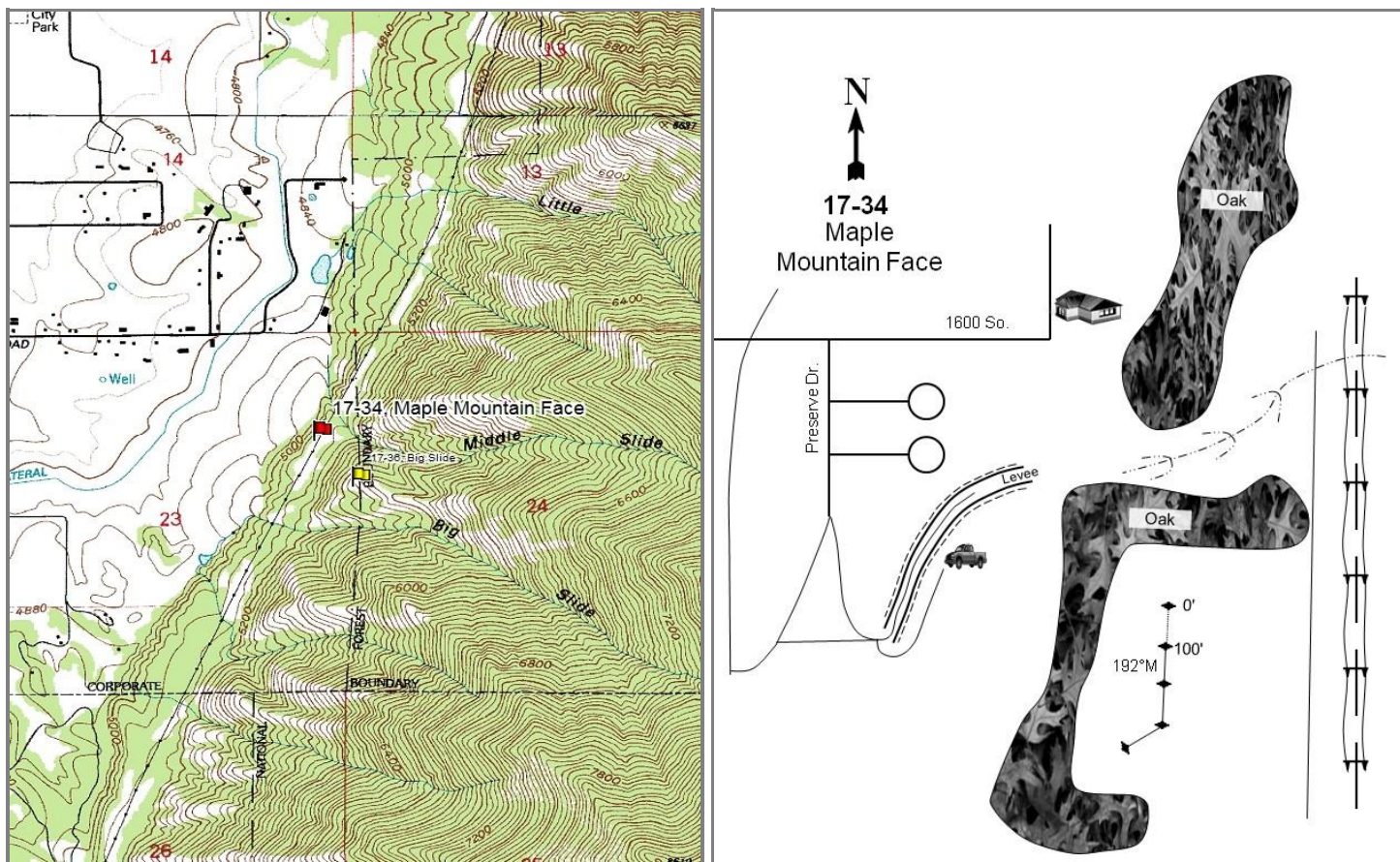
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 17-31.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Celtis laevigata var. reticulata -- (netleaf hackberry)</b>									
1997	60	140	33	67	0	0	0	33	190/447
2002	40	40	0	50	50	0	0	50	89/149
2007	300	-	0	93	7	0	0	60	91/96
2012	180	-	0	100	0	0	0	22	193/315
2017	80	-	0	100	0	25	0	25	152/226
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	63/138
2017	-	-	-	-	-	-	-	-	48/128
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	3280	880	41	59	0	0	0	8	21/33
2002	1100	-	2	93	6	0	0	0	21/27
2007	3820	-	5	95	0	0	0	1	20/21
2012	4020	640	41	57	3	2	0	55	29/48
2017	3640	20	5	92	3	0	0	4	35/50
<b>Mahonia repens -- (creeping barberry)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	8/10
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	10/17
2017	-	-	-	-	-	-	-	-	-/-
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	40	0	0	0	0	0	0	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	20	-	100	0	0	0	0	0	37/42
2017	20	-	100	0	0	0	100	0	61/74
<b>Rhus glabra<sup>P</sup> -- (smooth sumac)</b>									
1997	1100	-	14	62	24	60	29	4	122/90
2002	1320	-	12	64	24	9	49	14	80/55
2007	740	20	22	73	5	3	11	0	116/104
2012	740	-	3	97	0	5	0	0	69/65
2017	460	-	22	74	4	52	17	0	69/66
<b>Rhus trilobata<sup>P</sup> -- (skunkbush sumac)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	20	-	0	100	0	0	0	0	97/186
2012	-	-	-	-	-	-	-	-	75/109
2017	60	-	0	100	0	0	0	0	78/99

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

## MAPLE MOUNTAIN FACE - STUDY NO. 17-34



### Location Information

USGS 7.5 min Map Info Spanish Fork Peak NE; Township 8S, Range 3E, Section 23  
 GPS (0' Stake) NAD 83 UTM ZONE 12, 452136 East 4440286 North

### Transect Information

Browse Tag # (0' Stake) 442  
 Transect Bearing 198° magnetic  
 Length 400ft  
 Belt Placement Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (87ft)  
 Belt Marker Placement Belts 1, 3-5: No Rebar

### Directions to Site

Drive on 1600 South in Mapleton to the end of road. Park and hike east for 0.4 miles to an old road that runs parallel to power lines. A small sagebrush clearing west of the road is where the site is located. The 0-foot baseline stake is in the north end of the clearing, 33 paces from power pole #349 at an azimuth of 342 degrees magnetic. The 0-foot stake has browse tag #442 attached, and the study stakes are 12-18" tall green fenceposts.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,100ft (1,554m)
Aspect	Northwest
Slope	2-10%
Sample Dates	05/15/1997, 06/07/2002, 07/25/2007, 05/31/2012, 06/01/2017

**Table 17-34.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	Between 1989 and 1997	-
Seeding - Seed Unknown	-	-	Between 1989 and 1997	-

**Wildlife Habitat and Vegetation History**

**Table 17-34.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter

**Table 17-34.4 - 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/Bulbous Bluegrass	NA
1989	Mountain Big Sagebrush/Bulbous Bluegrass	NA
1997	Bulbous Bluegrass/Perennial Forb	NA
2002	Bulbous Bluegrass/Perennial Forb	NA
2007	Bulbous Bluegrass/Mountain Big Sagebrush	NA
2012	Mountain Big Sagebrush/Bulbous Bluegrass	NA
2017	Mountain Big Sagebrush/Bulbous Bluegrass	NA

**Site Notes**

This study is located on one of the few remaining crucial winter ranges on the Lake Bonneville terrace southeast of Mapleton. An old road north of the trail was used by ATVs and horses in 2007, and there was a housing development being constructed 0.5 miles west of the study in the same year. The nearest source of perennial water is a canal located 0.4 miles to the west.

**Soils**

**Table 17-34.5 - 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	6.3	45.8	30.4	23.8	2.2	13.6	188.8	0.5	05/15/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	24 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

From study establishment in 1983 to 1989, this site existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and bulbous bluegrass (*Poa bulbosa*) plant community. A wildfire sometime between 1989 and 1997 removed much of the shrub overstory; bulbous bluegrass and perennial forbs -- namely arrowleaf balsamroot (*Balsamorhiza sagittata*) -- were dominant in 1997 and 2002. Mountain big sagebrush exhibited an increase in cover and the site returned to and has remained as a mountain big sagebrush and bulbous bluegrass community type since the 2007 sample year. Other perennial grasses are very diverse, but not as abundant as bulbous bluegrass. Annual grasses are also present, and the noxious and introduced species jointed goatgrass (*Aegilops cylindrica*) was observed in 2012 and 2017. Annual forbs have remained relatively rare, but contributed 20% cover in 2017, with a majority being provided by the introduced species redstem stork's bill (*Erodium cicutarium*) (Photos, Table 17-34.7, Table 17-34.10, Table 17-34.11, Table 17-34.12, Table 17-34.13). This study site is expected to remain in similar state in the future unless a major disturbance occurs.

**Trend Summary Tables**

**Table 17-34.6 - 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
1997	1.7	-	-	-	-	-
2002	4.2	-	-	-	-	-
2007	7.3	0.0	-	14.4	-	-
2012	18.1	0.3	-	19.3	0.4	-
2017	12.8	0.4	-	18.5	0.4	-

**Table 17-34.7 - 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
1997	93	485	93	314	0.6	45.7	1.9	37.5
2002	61	489	36	200	0.2	59.9	0.2	29.6
2007	131	488	179	224	1.4	48.7	9.5	9.8
2012	247	426	174	179	3.8	44.0	2.7	15.6
2017	291	451	322	190	9.1	57.1	20.1	17.8

**Table 17-34.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	9.9	3.2	18.7	6.5	1.3	67.8
2002	2.8	1.6	24.0	2.9	0.6	80.1
2007	3.3	0.6	29.3	1.9	0.5	73.8
2012	0.7	0.0	50.2	0.1	0.2	77.6
2017	8.5	2.2	49.5	2.1	0.6	77.9

**Table 17-34.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1997	9	1	4	-	-
2002	12	2	-	-	-
2007	-	16	10	3	-
2012	-	17	-	-	-
2017	3	1	-	-	1
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	18.9 (46.6)	4.0 (9.9)	2.0 (5.0)	-	-
2007	0.7 (1.8)	40.9 (101.0)	28.1 (69.5)	9.9 (24.4)	-
2012	-	57.7 (142.4)	-	-	-
2017	-	3.4 (8.3)	0.7 (1.7)	-	-

**Table 17-34.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Aegilops cylindrica <sup>ni</sup> (jointed goatgrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bromus arvensis <sup>ni</sup> (field brome)	Bromus briziformis <sup>ni</sup> (rattlesnake brome)	Bromus tectorum <sup>ni</sup> (cheatgrass)	Dactylis glomerata <sup>i</sup> (orchardgrass)	Elymus glaucus (blue wildrye)	Eremopyrum triticeum <sup>ni</sup> (annual wheatgrass)	Melica bulbosa (oniongrass)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)
year	Nested Frequency																
1997	-	-	-	-	-	93	68	-	-	-	-	463	-	-	143	-	-
2002	-	16	0	12	3	48	24	2	-	20	-	484	-	5	66	23	14
2007	-	12	5	36	55	66	25	-	-	22	-	472	1	1	130	1	16
2012	35	14	9	201	-	88	15	-	14	-	-	386	4	3	65	9	10
2017	30	22	20	229	76	107	12	-	-	-	10	397	-	1	204	10	45
year	Average Cover (%)																
1997	-	-	-	-	-	0.6	0.8	-	-	-	-	41.3	-	-	3.7	-	-
2002	-	0.1	0.0	0.1	0.0	0.2	0.6	0.0	-	0.1	-	57.8	-	0.0	0.8	0.2	0.2
2007	-	0.6	0.1	0.2	0.3	0.9	1.0	-	-	0.4	-	43.8	0.0	0.0	1.5	0.0	0.4
2012	0.5	0.5	0.4	0.9	-	2.4	1.7	-	0.0	-	-	35.6	0.0	0.0	1.6	0.6	0.8
2017	0.5	1.9	0.8	5.6	1.1	1.8	0.2	-	-	-	0.6	39.6	-	0.0	8.6	0.9	1.6

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

GRASS SPECIES	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency
1997	5
2002	-
2007	9
2012	26
2017	37
year	Average Cover (%)
1997	0.0
2002	-
2007	0.8
2012	2.9
2017	3.1

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

**Table 17-34.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Astragalus (milkvech)	Balsamorhiza sagittata (arrowleaf balsamroot)	Brassicaceae <sup>a</sup> (mustard family)	Calochortus nuttallii (sego lily)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Convolvulus arvensis <sup>ni</sup> (field bindweed)	Crepis acuminata (tapertip hawkbeard)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron divergens <sup>a</sup> (spreading fleabane)	Erodium cicutarium <sup>ni</sup> (redstem stork's bill)	Galium aparine <sup>a</sup> (stickeywilly)	Grindelia squarrosa (curlycup gumweed)	Helianthus annuus <sup>a</sup> (common sunflower)
year	Nested Frequency																
1997	-	1	5	271	3	15	4	3	-	3	-	3	66	3	3	-	-
2002	-	-	0	167	-	2	2	-	-	7	-	1	-	9	5	-	7
2007	-	1	-	85	-	4	1	-	-	3	-	3	129	51	1	106	-
2012	-	-	-	108	-	-	-	-	-	22	1	-	94	52	-	27	3
2017	3	-	-	103	-	43	-	-	4	23	0	-	32	218	25	1	32
year	Average Cover (%)																
1997	-	0.0	0.0	34.1	0.0	0.0	0.0	0.0	-	0.2	-	0.0	1.5	0.0	0.0	-	-
2002	-	-	0.0	28.3	-	0.0	0.0	-	-	0.1	-	0.0	-	0.0	0.0	-	0.0
2007	-	0.0	-	4.3	-	0.0	0.2	-	-	0.0	-	0.0	8.2	1.2	0.0	3.3	-
2012	-	-	-	13.7	-	-	-	-	-	0.2	0.0	-	1.9	0.2	-	0.3	0.0
2017	0.0	-	-	14.2	-	0.4	-	-	0.0	1.5	0.0	-	0.3	17.2	0.6	0.0	0.1

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

FORB SPECIES	Heterotheca villosa (hairy false goldenaster)	Lactuca serriola <sup>ni</sup> (prickly lettuce)	Lathyrus brachycalyx (Bonneville pea)	Linum lewisii (Lewis flax)	Medicago sativa <sup>i</sup> (alfalfa)	Phlox longifolia (longleaf phlox)	Plantago patagonica <sup>a</sup> (woolly plantain)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Sanguisorba minor <sup>i</sup> (small burnet)	Sisymbrium altissimum <sup>ni</sup> (tall tumbledmustard)	Sphaeralcea coccinea (scarlet globemallow)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ni</sup> (yellow salsify)	Verbascum thapsus <sup>ni</sup> (common mullein)	Veronica biloba <sup>ni</sup> (two-lobed speedwell)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency															
1997	-	10	9	9	30	9	-	-	107	15	-	3	4	1	-	-
2002	-	0	1	-	29	14	-	4	22	-	0	-	12	-	-	-
2007	-	-	4	-	38	27	12	-	30	-	-	-	12	-	-	1
2012	0	6	7	-	20	27	16	-	7	-	-	1	49	-	-	-
2017	2	21	5	-	20	30	34	-	-	15	-	-	10	-	2	1
year	Average Cover (%)															
1997	-	0.0	0.1	0.0	0.7	0.0	-	-	2.2	0.1	-	0.0	0.1	0.1	-	-
2002	-	0.0	0.0	-	0.6	0.1	-	0.0	0.5	-	0.0	-	0.1	-	-	-
2007	-	-	0.0	-	1.4	0.2	0.0	-	0.5	-	-	-	0.1	-	-	0.0
2012	0.0	0.0	0.1	-	1.2	0.1	0.4	-	0.1	-	-	0.0	0.2	-	-	-
2017	0.0	0.1	0.3	-	1.0	0.4	1.5	-	-	0.1	-	-	0.2	-	0.0	0.0

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



**Table 17-34.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)				
	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)				
Gutierrezia sarothrae (broom snakeweed)					
Purshia tridentata <sup>p</sup> (antelope bitterbrush)					
Quercus gambelii <sup>p</sup> (Gambel oak)					
Rhus trilobata <sup>p</sup> (skunkbush sumac)					
year	Line Intercept Cover (%)				
1997	-	-	-	-	-
2002	-	-	-	-	-
2007	9	-	3.6	1.8	-
2012	12.8	0.4	4.1	2.4	-
2017	9.8	0.4	6.1	2.6	-
year	Quadrat Cover (%)				
1997	0.2	-	0.0	1.5	0.1
2002	1.7	-	0.9	1.5	0.1
2007	5.4	0.0	1.1	0.9	0.0
2012	12.1	0.3	3.0	2.9	-
2017	10.1	0.4	2.7	0.0	-

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

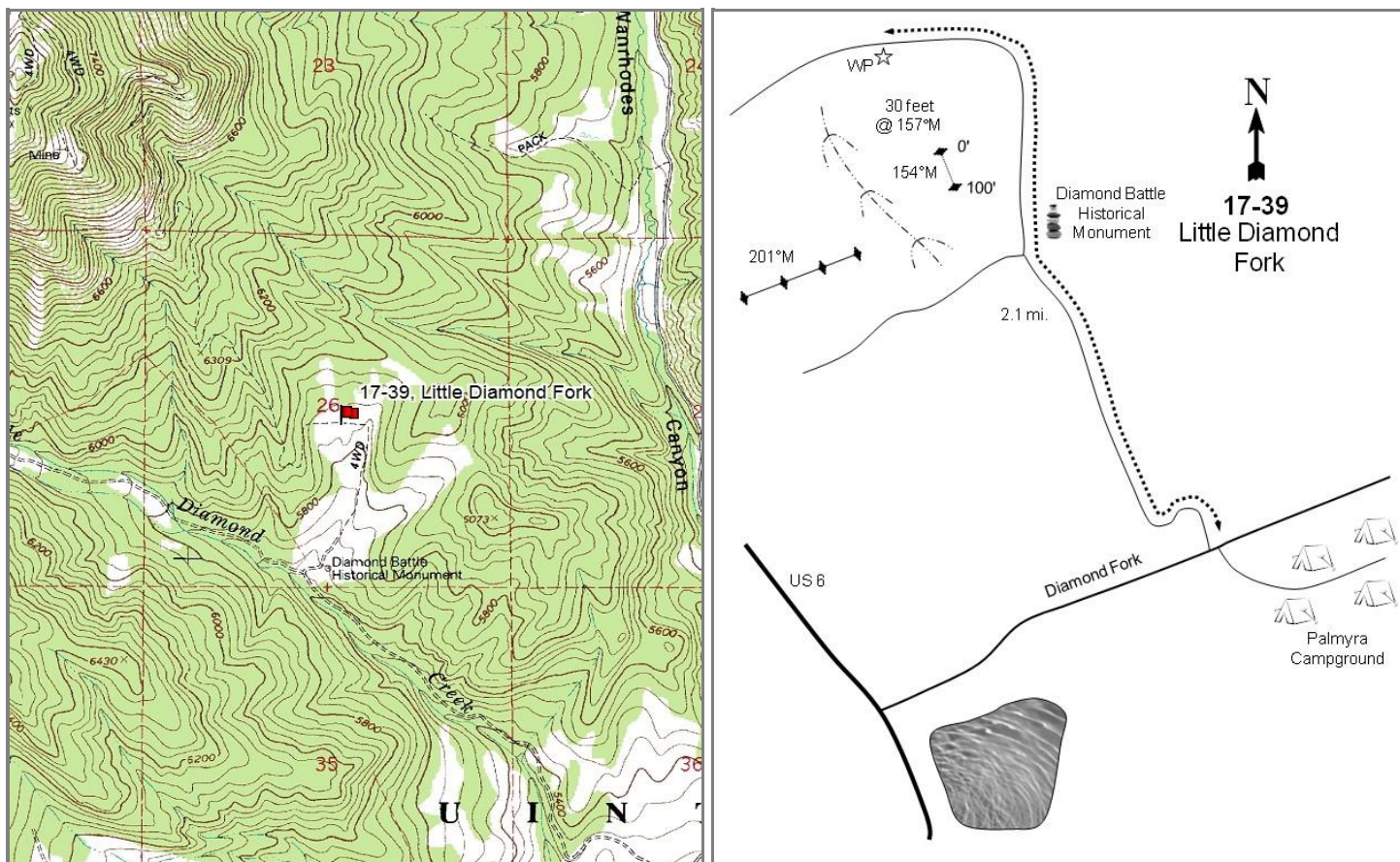
**Table 17-34.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1997	220	200	100	0	0	0	0	0	32/46
2002	440	20	0	100	0	5	0	0	52/72
2007	580	1600	24	72	3	0	0	0	77/134
2012	2000	1620	13	86	1	1	0	1	61/91
2017	2940	-	22	69	8	2	0	8	55/79
<b>Cercocarpus ledifolius<sup>p</sup> -- (curl-leaf mountain mahogany)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	26/41
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	35/58
2017	-	-	-	-	-	-	-	-	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	34/48
2007	40	20	50	50	0	0	0	0	29/35
2012	200	-	0	100	0	0	0	0	23/39
2017	320	120	25	75	0	0	0	0	29/31
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1997	120	-	83	17	0	83	0	0	25/29
2002	140	-	0	100	0	57	43	0	42/98
2007	140	-	0	86	14	29	29	14	96/178
2012	160	-	13	88	0	0	0	13	83/160
2017	520	-	8	92	0	35	35	0	77/141
<b>Quercus gambelii<sup>p</sup> -- (Gambel oak)</b>									
1997	280	-	100	0	0	0	0	0	- / -
2002	360	-	33	67	0	0	0	0	118/97
2007	180	340	0	100	0	56	0	0	130/93
2012	260	-	46	54	0	0	0	0	172/145
2017	80	-	0	100	0	0	0	0	158/140

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Rhus trilobata <sup>P</sup> -- (skunkbush sumac)									
1997	40	-	0	100	0	0	0	0	- / -
2002	40	-	50	50	0	50	50	0	37/77
2007	20	-	0	100	0	0	100	0	74/172
2012	-	-	-	-	-	-	-	-	106/270
2017	20	-	0	100	0	0	0	0	75/96

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

## LITTLE DIAMOND FORK - STUDY NO. 17-39

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Billies Mountain NW; Township 8S, Range 4E, Section 26  
NAD 83 UTM ZONE 12, 461517 East 4437712 North

**Transect Information**

Browse Tag # (0' Stake)	3923
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**

From the intersection of Highway 6 and Diamond Fork Canyon, proceed northeasterly up Diamond Fork to Palmyra Campground. From Palmyra Campground, continue on the road to the northwest for 2.10 miles up Little Diamond Creek to a distinct sagebrush-grass plateau and a witness post. From the witness post, walk 30 feet at 157 degrees magnetic to the 0-foot baseline stake. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height, and a red browse tag, number 3923, is attached to the 0-foot baseline stake.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	DIAMOND FORK
Elevation	5,850ft (1,783m)
Aspect	South
Slope	5-10%
Sample Dates	06/06/1997, 07/03/2002, 06/28/2007, 05/31/2012, 07/07/2017

**Table 17-39.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	Lower Diamond Revegetation Project	-	1969	1500
Seeding - Aerial Unknown	Lower Diamond Revegetation Project	-	1969	1500

**Wildlife Habitat and Vegetation History****Table 17-39.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Moose	substantial	winter

**Table 17-39.4 - 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/Bulbous Bluegrass	NA
1989	Mountain Big Sagebrush/Bulbous Bluegrass	NA
1997	Mountain Big Sagebrush/Bulbous Bluegrass	NA
2002	Mountain Big Sagebrush/Bulbous Bluegrass	NA
2007	Mountain Big Sagebrush/Bulbous Bluegrass	NA
2012	Mountain Big Sagebrush/Bulbous Bluegrass	NA
2017	Mountain Big Sagebrush/Bulbous Bluegrass	NA

**Site Notes**

The nearest source of perennial water is Little Diamond Creek, located 0.5 miles south of the study site.

**Soils****Table 17-39.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	5.9	55.4	24.7	19.8	2.4	25.7	579.2	0.4	06/06/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	26 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has dominated this study site since its establishment in 1983. Utah serviceberry (*Amelanchier utahensis*), Woods' rose (*Rosa woodsii*), Gambel oak (*Quercus gambelii*), and rubber rabbitbrush (*Ericameria nauseosa* ssp. *nauseosa* var. *speciosa*) are also present as subordinate preferred browse species (photos, Table 17-39.12, Table 17-39.13). The herbaceous understory is diverse and very abundant. The introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) has been co-dominant with sagebrush since 1983, with the introduced species smooth brome (*Bromus inermis*) as the next most common perennial grass (Table 17- 39.10). Perennial forbs were somewhat abundant in most sample years, but rare in 2017. In addition, the noxious and introduced annual forb species nodding plumeless thistle (*Carduus nutans*) and gypsyflower (*Cynoglossum officinale*) have been observed in past sample years, but were not present in 2017 (Table 17-39.7, Table 17-39.11).

**Trend Summary Tables****Table 17-39.6 - 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
1997	6.3	1.0	-	-	-	-
2002	9.2	0.7	-	8.2	1.0	-
2007	9.2	0.7	-	14.2	0.7	-
2012	13.9	0.4	-	11.0	0.3	-
2017	13.0	0.5	-	19.9	0.3	-

**Table 17-39.7 - 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
1997	-	448	237	285	-	38.4	4.3	17.0
2002	-	465	94	262	-	48.6	1.3	16.1
2007	2	481	67	219	0.0	54.2	1.0	11.0
2012	1	467	36	231	0.0	51.8	0.9	10.9
2017	2	469	13	162	0.0	52.1	0.1	4.1

**Table 17-39.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	8.6	0.8	36.0	0.8	0.3	56.4
2002	11.3	0.2	37.0	1.2	0.5	69.4
2007	7.3	0.3	21.8	0.3	0.4	75.5
2012	5.7	0.0	45.0	0.2	0.1	71.5
2017	11.0	0.0	42.8	0.5	0.2	62.3

**Table 17-39.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit	Domestic Sheep
	Quadrat Frequency				
1997	2	3	3	-	-
2002	14	12	-	-	1
2007	12	3	2	1	-
2012	1	2	-	1	-
2017	6	-	-	-	-
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	40.6 (100.4)	28.1 (69.5)	16.1 (39.7)	-	-
2007	39.9 (98.6)	15.4 (38.1)	1.3 (3.3)	-	-
2012	14.5 (35.9)	2.7 (6.6)	2.7 (6.6)	-	-
2017	20.3 (50.2)	1.3 (3.3)	-	-	-

**Table 17-39.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES									
Agropyron <sup>i</sup> (wheatgrass)									
Bromus inermis <sup>i</sup> (smooth brome)									
Bromus tectorum <sup>ai</sup> (cheatgrass)									
Pascopyrum smithii (western wheatgrass)									
Poa bulbosa <sup>i</sup> (bulbous bluegrass)									
Poa fendleriana (muttongrass)									
Poa pratensis <sup>i</sup> (Kentucky bluegrass)									
Poa secunda (Sandberg bluegrass)									
Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)									
year	Nested Frequency								
1997	9	107	-	120	392	2	68	13	70
2002	-	154	-	109	435	8	16	26	74
2007	-	183	2	36	461	-	-	-	73
2012	-	264	1	71	386	-	-	22	28
2017	-	291	2	62	417	-	-	18	49
year	Average Cover (%)								
1997	0.4	5.5	-	0.9	27.8	0.0	1.0	0.5	2.3
2002	-	8.0	-	1.5	34.5	0.0	0.2	0.3	4.2
2007	-	12.5	0.0	1.1	37.2	-	-	-	3.5
2012	-	19.2	0.0	1.1	30.5	-	-	0.1	0.9
2017	-	17.4	0.0	2.2	29.3	-	-	0.8	2.3

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

**Table 17-39.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																	
Agoseris grandiflora (bigflower agoseris)																	
Arabis (rockcress)																	
Artemisia ludoviciana (white sagebrush)																	
Astragalus (milkvetch)																	
Astragalus cibirius (browse milkvetch)																	
Astragalus convallarius (lesser rushy milkvetch)																	
Carduus nutans <sup>ani</sup> (nodding plumeless thistle)																	
Cirsium undulatum <sup>a</sup> (wavyleaf thistle)																	
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																	
Collomia linearis <sup>a</sup> (tiny trumpet)																	
Crepis acuminata (tapertip hawkbeard)																	
Cynoglossum officinale <sup>ani</sup> (gypsoflower)																	
Descurainia pinnata <sup>a</sup> (western tansymustard)																	
Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)																	
Erigeron divergens <sup>a</sup> (spreading fleabane)																	
Erigeron eatonii (Eaton's fleabane)																	
Eriogonum racemosum (redroot buckwheat)																	
year	Nested Frequency																
1997	25	3	4	1	-	16	-	32	17	10	-	27	3	3	162	-	3
2002	23	-	10	2	-	40	5	13	5	14	1	-	-	14	1	-	-
2007	3	3	11	-	-	22	-	-	5	9	3	-	-	8	10	6	-
2012	3	-	9	-	19	53	-	2	-	-	3	2	-	-	4	-	5
2017	2	-	4	-	-	17	-	0	-	-	1	-	-	-	-	5	-
year	Average Cover (%)																
1997	0.2	0.0	0.8	0.0	-	0.8	-	0.9	0.0	0.0	-	0.3	0.0	0.0	2.1	-	0.0
2002	0.1	-	0.3	0.0	-	0.6	0.4	0.3	0.0	0.0	0.0	-	-	0.0	0.0	-	-
2007	0.0	0.0	0.6	-	-	0.6	-	-	0.0	0.0	0.0	-	-	0.0	0.2	0.2	-
2012	0.0	-	0.3	-	0.9	1.7	-	0.0	-	-	0.2	0.4	-	-	0.0	-	0.0
2017	0.0	-	0.1	-	-	0.5	-	0.0	-	-	0.0	-	-	-	-	0.0	-

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

FORB SPECIES	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium <sup>ii</sup> (redstem stork's bill)	Galium aparine <sup>a</sup> (stickywilly)	Gilia inconspicua <sup>a</sup> (shy gilia)	Lactuca serriola <sup>ii</sup> (prickly lettuce)	Lupinus argenteus (silvery lupine)	Medicago sativa <sup>i</sup> (alfalfa)	Microsteris gracilis <sup>a</sup> (slender phlox)	Oenothera (evening primrose)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (sleepy silene)	Symphyotrichum (aster)	Symphyotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ii</sup> (yellow salsify)	unknown annual forb <sup>a</sup> (unknown forb)	Verbascum thapsus <sup>ii</sup> (common mullein)
year	Nested Frequency																
1997	5	1	2	-	7	124	3	-	17	44	-	-	198	28	84	1	-
2002	4	-	-	2	3	66	-	1	23	5	3	-	197	8	64	-	4
2007	-	-	-	-	3	34	-	-	-	-	-	3	187	-	39	-	2
2012	10	-	-	-	-	48	5	-	-	-	-	-	165	12	33	-	-
2017	3	5	-	-	4	3	-	-	-	-	-	6	136	-	4	-	-
year	Average Cover (%)																
1997	0.0	0.0	0.0	-	0.1	5.4	0.0	-	0.1	0.1	-	-	9.2	0.3	0.7	0.0	-
2002	0.0	-	-	0.0	0.0	3.8	-	0.0	0.1	0.0	0.0	-	10.7	0.1	0.5	-	0.0
2007	-	-	-	-	0.0	1.4	-	-	-	-	-	0.0	8.1	-	0.7	-	0.0
2012	0.0	-	-	-	-	1.1	0.0	-	-	-	-	-	6.3	0.1	0.5	-	-
2017	0.0	0.0	-	-	0.0	0.3	-	-	-	-	-	0.2	2.8	-	0.0	-	-

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

FORB SPECIES	Vicia americana (American vetch)	Zizadenus paniculatus (foothill deathcamas)
year	Nested Frequency	
1997	20	6
2002	24	-
2007	12	-
2012	21	-
2017	11	-
year	Average Cover (%)	
1997	0.2	0.0
2002	0.3	-
2007	0.1	-
2012	0.3	-
2017	0.1	-

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



**Table 17-39.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)						
	year	1997	2002	2007	2012	2017	
Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	-	-	-	-	-	-	-
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	-	8.2	-	-	0.9	0.1	-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	0.1	13.4	0	0.3	0.7	-	0.4
Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	0.1	10.7	-	0.2	0.3	-	-
Gutierrezia sarothrae (broom snakeweed)	0.4	18.8	-	0.1	0.3	-	0.6
Opuntia (pricklypear)							
Rosa woodsii <sup>p</sup> (Woods' rose)							

year	Quadrat Cover (%)						
	1997	2002	2007	2012	2017		
1997	-	6.2	0.0	0.0	1.0	-	0.2
2002	-	8.7	-	0.0	0.5	0.2	0.4
2007	0.0	8.5	0.0	0.1	0.7	0.0	0.6
2012	0.0	13.3	0.1	0.4	0.3	0.0	0.2
2017	0.0	12.3	-	0.1	0.5	-	0.5

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

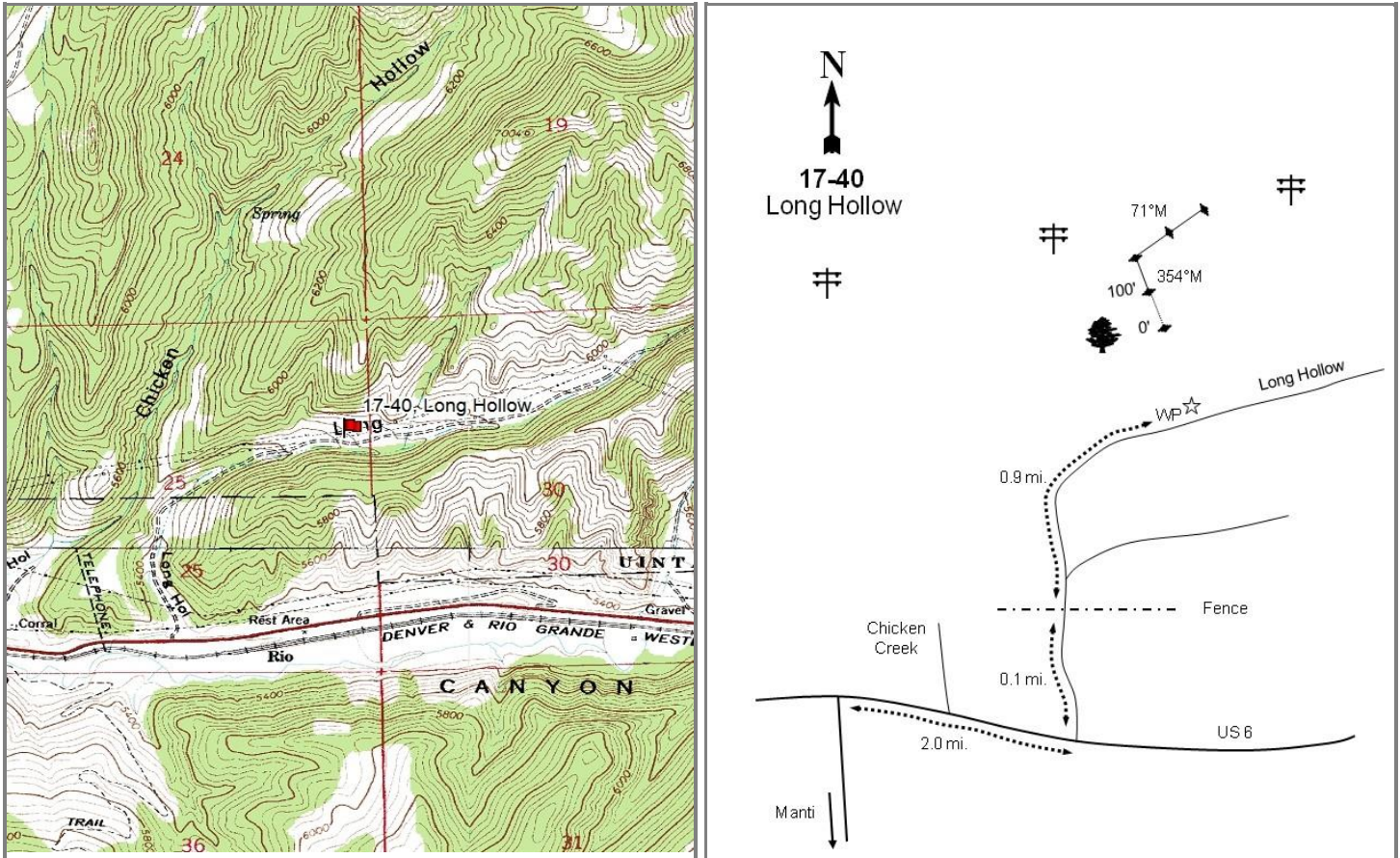
**Table 17-39.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1997	-	-	-	-	-	-	-	-	55/69
2002	20	-	0	100	0	100	0	0	61/59
2007	40	-	0	100	0	100	0	0	64/60
2012	20	-	0	100	0	100	0	0	75/70
2017	40	-	0	100	0	100	0	0	76/73
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1997	1200	80	15	42	43	7	0	25	63/93
2002	1520	20	7	78	16	18	0	4	56/80
2007	1400	220	13	76	11	10	3	7	74/105
2012	1520	260	9	84	7	9	1	4	68/102
2017	1800	-	8	81	11	7	0	10	76/119
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	60	-	0	100	0	0	0	0	34/44
2002	60	-	0	100	0	0	0	0	37/67
2007	60	-	0	100	0	0	0	0	37/48
2012	80	-	0	100	0	0	0	0	34/62
2017	20	-	0	100	0	0	0	0	52/67
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1997	20	-	0	100	0	100	0	0	107/150
2002	20	-	0	100	0	0	100	0	67/91
2007	20	-	0	100	0	0	0	0	55/85
2012	40	-	0	100	0	100	0	0	69/76
2017	40	-	0	100	0	0	0	0	57/53
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	1580	180	32	68	0	0	0	0	27/31
2002	1820	-	0	99	1	0	0	0	20/27
2007	900	-	2	96	2	0	0	2	20/20
2012	380	20	0	100	0	0	0	0	17/22
2017	540	-	0	100	0	0	0	0	29/30

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 (%)				
Opuntia -- (pricklypear)									
1997	440	-	0	100	0	0	0	0	20/40
2002	300	-	0	13	87	0	0	80	15/45
2007	40	-	0	100	0	0	0	0	16/49
2012	40	-	0	100	0	0	0	50	22/40
2017	-	-	-	-	-	-	-	-	14/33
Quercus gambelii <sup>P</sup> -- (Gambel oak)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	94/35
2007	-	-	-	-	-	-	-	-	140/113
2012	-	-	-	-	-	-	-	-	186/162
2017	-	-	-	-	-	-	-	-	138/81
Rosa woodsii <sup>P</sup> -- (Woods' rose)									
1997	280	20	93	7	0	0	0	0	60/53
2002	280	-	0	100	0	0	0	0	23/35
2007	420	-	52	48	0	0	0	0	28/23
2012	520	-	4	85	12	4	96	8	28/21
2017	340	-	100	0	0	0	0	0	29/29
Symphoricarpos oreophilus -- (mountain snowberry)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	46/47

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

## LONG HOLLOW - STUDY NO. 17-40

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Billies Mountain SE; Township 9S, Range 4E, Section 25  
NAD 83 UTM ZONE 12, 463842 East 4428341 North

**Transect Information**

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

3946  
354° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Standard

**Directions to Site**

Beginning at the intersection of Highway 6 and Long Hollow Road, proceed northerly up Long Hollow for 0.10 miles to a fork. At the fork, stay to the left and proceed an additional 0.90 miles up Long Hollow to a green steel "T" fencepost on the left (north) side of the road. From the stake, the 0-foot marker of the baseline is 15 feet to the north, near a juniper. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. A red browse tag, number 3946, is attached to the 0-foot baseline stake. High tension power lines run above the study site.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	DIAMOND FORK
Elevation	5,700ft (1,737m)
Aspect	South
Slope	5-15%
Sample Dates	06/09/1997, 06/05/2002, 06/26/2007, 07/12/2012, 07/07/2017

**Table 17-40.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Other - Powerline	-	-	Prior to 1997	-

**Wildlife Habitat and Vegetation History****Table 17-40.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Moose	substantial	winter

**Table 17-40.4 - 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	Phase I
1989	Mountain Big Sagebrush	Phase I
1997	Mountain Big Sagebrush/Bulbous Bluegrass	Phase I
2002	Mountain Big Sagebrush/Bulbous Bluegrass	Phase I
2007	Mountain Big Sagebrush/Bulbous Bluegrass	Phase I
2012	Mountain Big Sagebrush/Bulbous Bluegrass	Phase I
2017	Mountain Big Sagebrush/Bulbous Bluegrass/Annual Grass	No Encroachment

**Site Notes**

Long Hollow is a narrow canyon that drains directly into the Spanish Fork River; the nearest perennial source of water is Soldier Creek and is approximately one mile south of the study site. A portion of the baseline passes beneath a high- tension powerline.

**Soils****Table 17-40.5 - 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
Sandy Clay Loam	7.2	51.4	26.7	21.8	2.8	10.6	166.4	0.7	06/09/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Mountain Gravelly Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA406UT
States and Transitions	No state and transition model is available for this ecological site.

This study site has been dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) since establishment in 1983 (Table 17-40.12, Table 17-40.13). The introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) is the most abundant herbaceous species in the understory and has been a co-dominant vegetation component since 1997; other perennial species are diverse, but not as common. The introduced annual grass cheatgrass (*Bromus tectorum*) has been observed in fluctuating amounts, and became another co-dominant component in the 2017 sample year (Table 17- 40.10). Although diverse, forbs have generally not been very abundant (Table 17-40.7). The noxious and introduced annual forb species gypsyflower (*Cynoglossum officinale*) and perennial species whitetop (*Cardaria draba*) were present in the past, but were not observed in 2017 (Table 17-40.11). Although previously in Phase I of woodland succession, no Utah juniper (*Juniperus osteosperma*) trees were seen on site in 2017. However, photos show that trees are still prevalent in the immediate surrounding area, indicating that this site may become infilled in the future (photos, Table 17-40.4).

**Trend Summary Tables****Table 17-40.6 - 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
1997	11.3	1.0	1.0	-	-	-
2002	10.6	2.0	2.7	-	-	-
2007	8.0	3.4	-	8.7	1.7	-
2012	9.9	3.0	-	12.0	3.7	-
2017	6.6	5.6	-	8.5	8.1	-

**Table 17-40.7 - 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
1997	340	376	191	273	7.9	22.7	1.9	12.1
2002	110	440	16	246	0.7	32.0	0.2	8.3
2007	152	454	38	221	0.8	36.2	0.5	8.2
2012	91	461	47	241	0.5	41.2	0.7	6.2
2017	287	408	191	161	12.1	29.7	9.9	6.4

**Table 17-40.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	1.5	3.5	49.6	2.4	17.0	48.4
2002	2.1	2.2	37.4	1.4	17.5	57.3
2007	2.7	0.5	30.9	1.6	19.3	54.9
2012	0.2	0.2	49.2	0.8	18.5	64.2
2017	2.6	0.1	54.3	1.0	17.8	59.2

**Table 17-40.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1997	-	32	63	-	-
2002	2	51	15	-	-
2007	10	38	15	-	1
2012	2	6	-	11	-
2017	11	17	21	-	-
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	10.2 (25.1)	87.1 (215.2)	23.4 (57.9)	-	-
2007	5.8 (14.3)	30.8 (76.1)	48.9 (120.8)	-	-
2012	-	-	-	13.4 (33.0)	-
2017	-	17.4 (43.0)	12.8 (31.5)	-	-

**Table 17-40.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ni</sup> (field brome)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus tectorum <sup>ni</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Festuca (fescue)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency												
1997	-	31	-	-	340	-	13	280	19	6	38	73	42
2002	-	41	7	-	108	3	-	375	22	39	41	89	60
2007	1	55	11	-	143	6	-	362	-	21	74	56	88
2012	-	57	6	22	87	1	-	448	-	5	67	65	74
2017	-	38	3	4	284	3	-	379	-	9	51	23	68
year	Average Cover (%)												
1997	-	2.0	-	-	7.9	-	0.0	14.1	0.3	0.0	1.7	1.9	2.8
2002	-	1.4	0.0	-	0.7	0.1	-	23.2	0.1	0.4	2.2	0.9	3.6
2007	0.0	3.1	0.0	-	0.8	0.1	-	19.0	-	0.5	2.7	1.0	9.7
2012	-	1.6	0.0	0.4	0.5	0.0	-	33.8	-	0.1	1.9	1.2	2.1
2017	-	0.9	0.0	0.4	12.1	0.4	-	22.8	-	0.2	2.0	0.2	2.8

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

**Table 17-40.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum desertorum <sup>ni</sup> (desert madwort)	Arabis (rockcress)	Artemisia dracunculus (tarragon)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvech)	Astragalus utahensis (Utah milkvech)	Calochortus nuttallii (sego lily)	Cardaria draba <sup>ni</sup> (whitetop)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ni</sup> (curveseed butterwort)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Cymopterus (springparsley)	Cynoglossum officinale <sup>ni</sup> (gypsyflower)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)
year	Nested Frequency																
1997	11	75	-	3	93	4	3	19	30	1	6	10	-	2	1	-	2
2002	-	-	2	4	84	-	-	1	37	1	3	15	-	2	-	-	-
2007	3	1	1	3	140	-	1	8	10	-	-	5	5	2	0	2	-
2012	-	-	-	-	153	-	4	-	16	-	-	12	-	1	-	-	-
2017	-	-	-	4	109	-	-	6	-	-	-	2	-	5	-	-	-
year	Average Cover (%)																
1997	0.0	0.2	-	0.0	2.8	0.0	0.1	0.1	2.3	0.0	0.0	0.5	-	0.0	0.1	-	0.0
2002	-	-	0.0	0.0	2.4	-	-	0.0	1.0	0.0	0.0	0.5	-	0.0	-	-	-
2007	0.0	0.0	0.0	0.1	4.4	-	0.0	0.6	0.0	-	-	0.1	0.0	0.0	0.0	0.0	-
2012	-	-	-	-	3.5	-	0.1	-	0.3	-	-	0.3	-	0.0	-	-	-
2017	-	-	-	0.1	3.3	-	-	0.0	-	-	-	0.0	-	0.0	-	-	-

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

FORB SPECIES	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron (fleabane)	Erigeron divergens <sup>a</sup> (spreading fleabane)	Eriogonum racemosum (redroot buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Grindelia squarrosa (curlycup gumweed)	Hackelia patens (spotted stickseed)	Helianthus annuus <sup>a</sup> (common sunflower)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lactuca tatarica var. pulchella <sup>a</sup> (blue lettuce)	Lithospermum incisum (narrowleaf stone seed)	Lithospermum ruderale (western stone seed)	Medicago sativa <sup>i</sup> (alfalfa)	Oenothera (evening primrose)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Sisymbrium altissimum <sup>ai</sup> (tall tumbleweed)	
year	Nested Frequency																	
1997	1	-	19	2	74	-	116	2	-	21	0	-	2	0	10	10	3	
2002	-	-	2	3	7	-	45	1	-	-	0	-	6	-	8	-	-	
2007	-	3	11	4	16	-	29	-	-	-	-	0	5	-	1	-	-	
2012	-	-	27	5	12	-	11	-	-	5	3	-	18	1	7	-	-	
2017	-	-	-	3	188	2	7	-	1	-	8	-	12	-	10	-	7	
year	Average Cover (%)																	
1997	0.0	-	0.4	0.0	0.6	-	2.5	0.0	-	0.1	0.0	-	0.5	0.0	0.0	0.0	0.0	
2002	-	-	0.0	0.0	0.0	-	0.8	0.0	-	-	0.0	-	0.8	-	0.0	-	-	
2007	-	0.0	0.4	0.2	0.1	-	1.3	-	-	-	-	0.1	0.4	-	0.0	-	-	
2012	-	-	0.5	0.2	0.1	-	0.4	-	-	0.0	0.0	-	0.5	0.0	0.0	-	-	
2017	-	-	-	0.2	9.4	0.0	0.1	-	0.0	-	0.0	-	1.7	-	0.0	-	0.4	

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

FORB SPECIES	Sphaeralcea coccinea (scarlet globemallow)	Symphyotrichum (aster)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Vicia americana (American vetch)
year	Nested Frequency			
1997	118	-	44	-
2002	122	-	3	1
2007	96	1	3	1
2012	84	-	5	-
2017	43	-	4	-
year	Average Cover (%)			
1997	3.1	-	0.4	-
2002	2.7	-	0.2	0.0
2007	0.7	0.0	0.0	0.0
2012	1.0	-	0.0	-
2017	0.8	-	0.0	-

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



**Table 17-40.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. tridentata <sup>P</sup> (basin big sagebrush)	Artemisia tridentata ssp. vaseyana <sup>P</sup> (mountain big sagebrush)	Atriplex canescens <sup>P</sup> (fourwing saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>P</sup> (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Opuntia (pricklypear)
year	Line Intercept Cover (%)							
1997	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-
2007	-	4.9	0.7	-	3.1	1.7	-	-
2012	-	6.5	0.8	0.2	4.7	3.4	-	0.1
2017	-	5	0.9	0.3	2.6	7.7	-	0.1
year	Quadrat Cover (%)							
1997	3.1	4.1	0.2	-	3.8	1.0	1.0	0.0
2002	1.2	7.3	0.2	-	1.9	1.9	2.7	0.1
2007	1.0	3.9	0.1	-	3.0	3.4	-	-
2012	0.0	7.4	0.7	0.0	1.8	3.0	-	0.0
2017	-	4.7	0.2	0.0	1.6	5.5	-	0.1

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

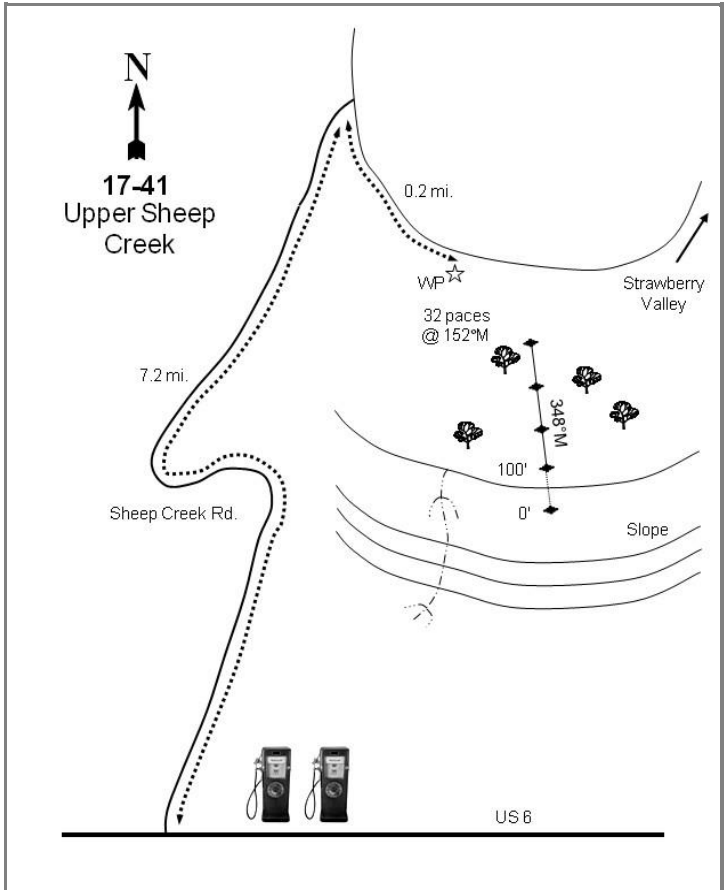
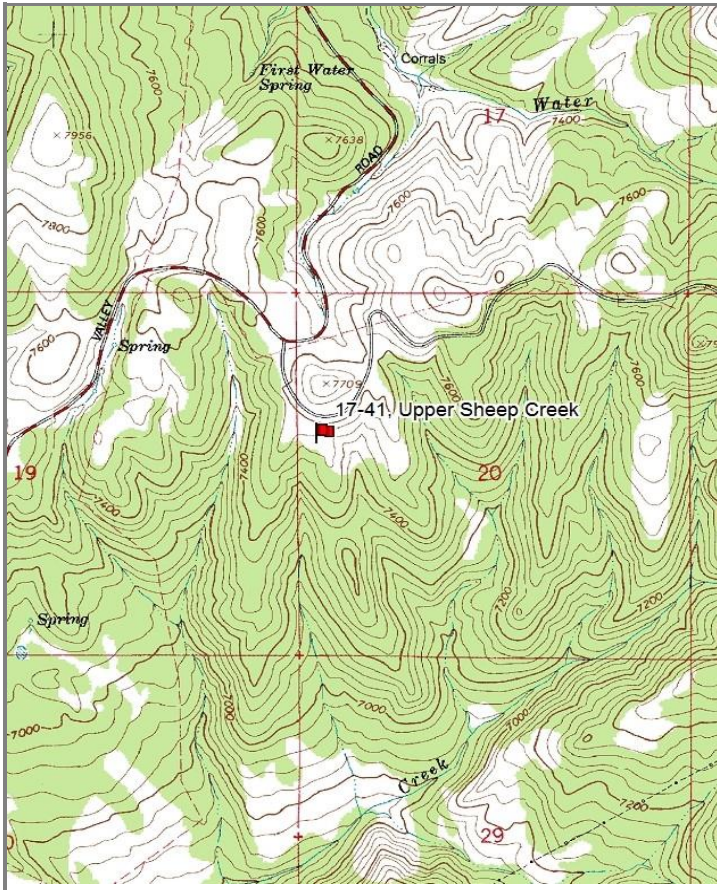
**Table 17-40.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

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 (%)				
Artemisia tridentata ssp. tridentata <sup>P</sup> -- (basin big sagebrush)									
1997	460	-	9	74	17	13	0	9	84/106
2002	180	-	0	0	100	44	0	89	151/115
2007	40	-	0	100	0	50	0	50	158/169
2012	60	-	0	100	0	0	0	0	73/109
2017	20	-	0	0	100	0	100	0	118/142
Artemisia tridentata ssp. vaseyana <sup>P</sup> -- (mountain big sagebrush)									
1997	880	80	9	84	7	59	0	0	68/105
2002	1240	-	13	40	47	34	16	14	66/82
2007	940	20	2	70	28	30	6	35	70/98
2012	800	20	8	68	25	18	0	18	83/108
2017	740	-	3	70	27	32	24	27	63/88
Atriplex canescens <sup>P</sup> -- (fourwing saltbush)									
1997	200	-	10	90	0	0	90	0	76/81
2002	280	-	0	50	50	29	7	21	46/57
2007	140	-	0	86	14	43	0	0	77/110
2012	180	-	11	67	22	67	0	22	59/70
2017	140	-	0	100	0	0	14	0	68/72
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	20	-	0	100	0	0	0	0	35/47
2002	40	-	0	50	50	0	0	50	35/46
2007	20	-	0	100	0	0	0	100	40/54
2012	60	-	0	100	0	0	0	0	47/70
2017	40	-	0	100	0	0	0	0	48/70
Ericameria nauseosa ssp. nauseosa var. speciosa <sup>P</sup> -- (rubber rabbitbrush)									
1997	1060	-	9	77	13	36	17	11	84/91
2002	900	-	9	36	56	38	2	33	53/58
2007	680	-	3	79	18	3	0	12	65/78
2012	640	-	3	94	3	0	0	25	77/107
2017	480	-	0	83	17	0	0	13	65/79

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	3840	200	54	43	3	0	0	1	27/26
2002	4620	-	2	81	17	0	0	8	21/23
2007	4720	-	10	86	3	0	0	4	26/31
2012	5000	700	46	53	2	0	0	0	28/38
2017	4000	-	2	98	0	0	0	0	32/39
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	40	-	50	50	0	50	0	0	- / -
2007	20	-	100	0	0	0	0	0	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	-/-
<b>Opuntia -- (pricklypear)</b>									
1997	180	-	22	78	0	0	0	0	16/21
2002	240	-	8	92	0	0	0	0	12/26
2007	180	20	22	78	0	0	0	22	16/33
2012	240	-	0	100	0	0	0	0	16/39
2017	340	-	0	94	6	0	0	24	13/29
<b>Rhus trilobata<sup>p</sup> -- (skunkbush sumac)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	128/194
2012	-	-	-	-	-	-	-	-	167/249
2017	-	-	-	-	-	-	-	-	100/141

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

## UPPER SHEEP CREEK - STUDY NO. 17-41

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Rays Valley SE; Township 9S, Range 6E, Section 20  
NAD 83 UTM ZONE 12, 476139 East 4430595 North

**Transect Information**

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

178  
168° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Standard

**Directions to Site**

Beginning at the intersection of Sheep Creek Road and Rays Valley Road, proceed northerly up Rays Valley Road for 7.2 miles to an intersection (0.20 miles past a cattle guard). Turn right at the intersection and proceed easterly for 0.60 miles to another intersection. Turn right at the intersection and proceed for 0.10 miles to a "Y" in the road. Take the left side of the "Y" and proceed another 0.10 miles to a faint road to the right. Turn right onto the faint road and proceed 0.10 miles to a green steel "T" fencepost to the left-hand (south) side. From the stake, the 0-foot stake of the baseline is 32 paces away at an azimuth of 152 degrees magnetic. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	DIAMOND FORK
Elevation	7,550ft (2,301m)
Aspect	South
Slope	12-40%
Sample Dates	06/11/1997, 06/17/2002, 06/28/2007, 07/11/2012, 07/05/2017

**Wildlife Habitat and Vegetation History****Table 17-41.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter/spring
Elk	substantial	spring/fall
Moose	substantial	winter

**Table 17-41.4 - 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/Bitterbrush	Phase I
1997	Mountain Big Sagebrush/Bitterbrush	Phase I
2002	Mountain Big Sagebrush/Bitterbrush	Phase I
2007	Mountain Big Sagebrush/Bitterbrush	Phase I
2012	Mountain Big Sagebrush/Bitterbrush	Phase I
2017	Mountain Big Sagebrush/Bitterbrush	Phase I

**Site Notes**

The study area drains into Sheep Creek, but is near the divide with First Water Creek; both creeks are located within 1.1 miles of the study.

**Soils****Table 17-41.5 - 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	6.6	31.4	22.7	45.8	4.3	17.6	384.0	0.5	06/11/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Mountain Clay (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA403UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1983, this site has remained in a stable state as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) plant community type. Other preferred browse is present in lesser amounts and includes Utah serviceberry (*Amelanchier utahensis*), longflower rabbitbrush (*Chrysothamnus depressus*), and Woods' rose (*Rosa woodsii*). Utah juniper (*Juniperus osteosperma*) is also present (mainly on line 1), placing the site in Phase I of woodland succession (photos, Table 17-41.4, Table 17-41.12, Table 17-41.13, Table 17-41.14). The herbaceous understory is diverse and abundant, with perennial grasses and forbs contributing the most cover (Table 17-41.7, Table 17-41.10, Table 17-41.11).

**Trend Summary Tables****Table 17-41.6 - 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	26.5	16.2	0.0	-	-	-
2002	33.9	18.0	1.6	39.1	19.2	2.3
2007	23.1	16.3	1.3	20.1	25.3	3.9
2012	21.2	13.8	2.1	36.1	22.9	4.1
2017	24.9	12.3	2.8	34.7	15.0	3.8

**Table 17-41.7 - 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	7	306	207	283	0.0	11.8	2.3	9.2
2002	3	301	170	242	0.0	10.2	1.1	7.6
2007	10	319	145	250	0.1	10.6	0.8	8.2
2012	-	302	38	174	-	12.1	0.2	4.1
2017	-	335	148	248	-	9.3	3.1	6.9

**Table 17-41.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	10.1	0.2	54.5	4.9	2.8	54.8
2002	13.5	0.0	47.2	2.0	4.4	59.2
2007	16.7	0.0	36.1	3.3	3.2	54.1
2012	17.0	-	54.5	0.8	5.2	48.9
2017	13.3	0.1	56.9	5.9	4.5	53.1

**Table 17-41.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	6	33	5	-
2002	2	23	3	2
2007	1	23	2	6
2012	2	12	7	-
2017	1	32	3	4
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	13.1 (32.3)	46.2 (114.2)	2.7 (6.6)	-
2007	11.6 (28.7)	65.7 (162.2)	11.4 (28.1)	-
2012	3.6 (9.0)	40.9 (101.0)	10.7 (26.5)	-
2017	9.4 (23.3)	14.1 (34.8)	-	-

**Table 17-41.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Melica bulbosa (oniongrass)	Phleum pratense <sup>i</sup> (timothy)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency													
1997	4	16	57	7	1	-	10	2	14	10	119	14	1	186
2002	4	27	63	3	-	-	-	5	-	-	56	30	3	207
2007	17	15	62	10	5	0	1	19	3	-	71	30	14	172
2012	7	8	69	-	7	-	-	-	1	-	20	-	20	229
2017	20	59	70	-	5	4	-	12	2	-	71	48	28	173
year	Average Cover (%)													
1997	0.2	0.2	1.7	0.0	0.0	-	0.4	0.0	0.2	0.2	3.5	0.4	0.0	5.0
2002	0.1	0.6	2.3	0.0	-	-	-	0.0	-	-	0.9	0.8	0.0	5.6
2007	0.5	0.1	2.2	0.1	0.0	0.0	0.0	0.4	0.0	-	2.1	1.0	0.8	3.5
2012	0.3	0.1	2.1	-	0.2	-	-	-	0.0	-	0.4	-	0.8	8.3
2017	0.2	0.9	1.6	-	0.1	0.0	-	0.3	0.0	-	1.3	1.3	0.4	3.2

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

**Table 17-41.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Androsace septentrionalis <sup>a</sup> (pygmyflower rockjasmine)	Arabis (rockcross)	Astragalus beekwithii (Beekwith's milkvetch)	Astragalus cibaricus (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Balsamorhiza sagittata (arrow/leaf balsamroot)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)
year	Nested Frequency																
1997	5	36	117	-	2	-	-	61	-	15	20	2	-	9	94	40	-
2002	3	6	57	11	-	3	-	32	1	8	-	-	4	4	106	16	-
2007	3	15	121	-	-	-	5	22	2	18	-	1	-	2	137	52	-
2012	-	2	-	-	-	-	-	-	-	20	1	-	-	3	13	41	-
2017	-	-	60	1	-	5	-	23	3	13	8	-	3	2	25	65	2
year	Average Cover (%)																
1997	0.0	0.2	1.1	-	0.0	-	-	1.6	-	1.1	0.1	0.1	-	0.2	0.3	0.2	-
2002	0.0	0.0	0.1	0.0	-	0.1	-	0.6	0.0	1.1	-	-	0.0	0.0	0.4	0.1	-
2007	0.0	0.2	0.5	-	-	-	0.0	0.7	0.0	1.5	-	0.0	-	0.0	0.7	0.8	-
2012	-	0.0	-	-	-	-	-	-	-	1.4	0.0	-	-	0.0	0.0	0.5	-
2017	-	-	0.3	0.0	-	0.1	-	0.3	0.1	0.8	0.0	-	0.0	0.0	0.1	1.0	0.0

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

FORB SPECIES	Cynoglossum officinale <sup>ani</sup> (gypsyflower)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Eriogonum heracleoides (parsnipflower buckwheat)	Eriogonum ovalifolium (cushion buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Galium aparine <sup>a</sup> (stickywilly)	Hackelia patens (spotted stickseed)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lygodesmia (skeletonplant)	Machaeranthera canescens (hoary tansyaster)	Orobanche fasciculata (clustered broomrape)	Orthocarpus tolimiei <sup>a</sup> (Tolmie's owl's-clover)	Penstemon (beardtongue)	Penstemon humilis (low beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)
year	Nested Frequency																
1997	-	-	28	-	3	18	14	-	-	4	34	60	45	7	43	56	62
2002	1	-	40	8	1	7	6	6	4	2	-	57	68	28	64	-	23
2007	-	-	19	2	8	2	5	3	-	14	-	4	57	26	36	-	8
2012	2	4	12	-	26	-	4	16	-	1	-	4	12	34	32	-	-
2017	2	-	49	-	2	1	12	-	-	1	3	94	52	18	50	7	44
year	Average Cover (%)																
1997	-	-	1.2	-	0.1	0.1	0.4	-	-	0.0	0.6	1.3	1.0	0.1	0.2	0.2	0.5
2002	0.0	-	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.4	1.8	0.6	0.3	-	0.3
2007	-	-	0.9	0.0	0.1	0.0	0.0	0.0	-	0.1	-	0.0	1.9	0.4	0.3	-	0.1
2012	0.0	0.1	0.4	-	0.4	-	0.0	0.1	-	0.0	-	0.0	0.2	0.5	0.2	-	-
2017	0.0	-	1.9	-	0.0	0.0	0.1	-	-	0.0	0.0	2.4	1.3	0.1	0.3	0.0	0.5

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

FORB SPECIES	Sphaeralcea coccinea (scarlet globemallow)	Stanleya pinnata (desert princesplume)	Streptanthus cordatus (heartleaf twistflower)	Symphoricarum ascendens (western aster)	Viola (violet)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency					
1997	-	1	-	29	46	15
2002	4	-	4	40	7	2
2007	-	2	1	36	-	-
2012	-	-	2	30	-	-
2017	-	-	5	44	-	-
year	Average Cover (%)					
1997	-	0.0	-	0.7	0.1	0.1
2002	0.1	-	0.1	1.2	0.0	0.0
2007	-	0.0	0.0	0.6	-	-
2012	-	-	0.0	0.4	-	-
2017	-	-	0.0	0.4	-	-

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



**Table 17-41.12 - 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 <sup>p</sup> (Utah serviceberry)	-	-	-	-	-	-	-	-	-	-	-
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	2.4	17.3	-	9.5	0.6	2.3	1.7	18.8	0.6	7.4	
Chrysothamnus depressus <sup>p</sup> (longflower rabbitbrush)	0.8	11	-	10.2	1	3.9	1.3	7.2	1.1	12.8	
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	1.6	15.2	-	8.9	0.1	4.1	0.9	18.2	1.1	13	
Eriogonum heracleoides (parsnipflower buckwheat)	2.5	12.6	-	8.2	-	3.8	0.6	18.2	1.4	6.2	
Juniperus osteosperma <sup>i</sup> (Utah juniper)	Quadrat Cover (%)										
Mahonia repens (creeping barberry)	1.7	12.1	-	7.7	-	0.0	1.9	11.7	1.0	6.6	
Purshia tridentata <sup>p</sup> (antelope bitterbrush)	2.0	17.1	-	9.2	0.0	1.6	1.4	14.1	0.7	7.4	
Rosa woodsii <sup>p</sup> (Woods' rose)	1.1	11.1	-	7.0	0.0	1.3	0.9	10.1	0.8	8.4	
Symphoricarpos oreophilus (mountain snowberry)	1.2	8.2	-	6.8	0.0	2.1	0.6	11.2	0.6	6.4	
	2017	1.4	9.6	0.0	5.9	-	2.8	0.9	13.0	1.0	5.5

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

**Table 17-41.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1997	540	140	15	85	0	30	4	0	77/91
2002	800	-	35	55	10	43	13	5	84/83
2007	600	40	7	90	3	37	23	0	80/69
2012	640	-	25	75	0	34	0	6	75/72
2017	700	-	17	83	0	29	14	0	78/72
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1997	2160	-	10	77	13	22	5	7	78/105
2002	2200	20	3	67	30	21	4	10	80/94
2007	1940	20	2	66	32	40	12	25	77/96
2012	1920	-	4	69	27	47	32	52	98/102
2017	2120	-	3	74	24	31	7	18	80/98
<b>Chrysothamnus depressus<sup>p</sup> -- (longflower rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	0	100	0	0	0	0	16/39
2007	20	-	0	100	0	0	0	0	13/33
2012	-	-	-	-	-	-	-	-	21/39
2017	60	-	0	100	0	0	0	0	15/35
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	5000	-	2	98	0	0	0	0	32/47
2002	8720	20	2	93	5	1	0	2	29/38
2007	7220	-	3	97	0	0	0	0	27/42
2012	4720	-	0	97	3	0	0	35	27/40
2017	7260	-	3	97	0	0	0	0	27/38
<b>Eriogonum heracleoides -- (parsnipflower buckwheat)</b>									
1997	840	20	7	93	0	0	0	0	16/24
2002	1620	-	5	95	0	0	0	0	22/27
2007	1020	-	0	100	0	28	0	0	15/30
2012	260	-	8	92	0	85	0	8	8/27
2017	-	-	-	-	-	-	-	-	-/-

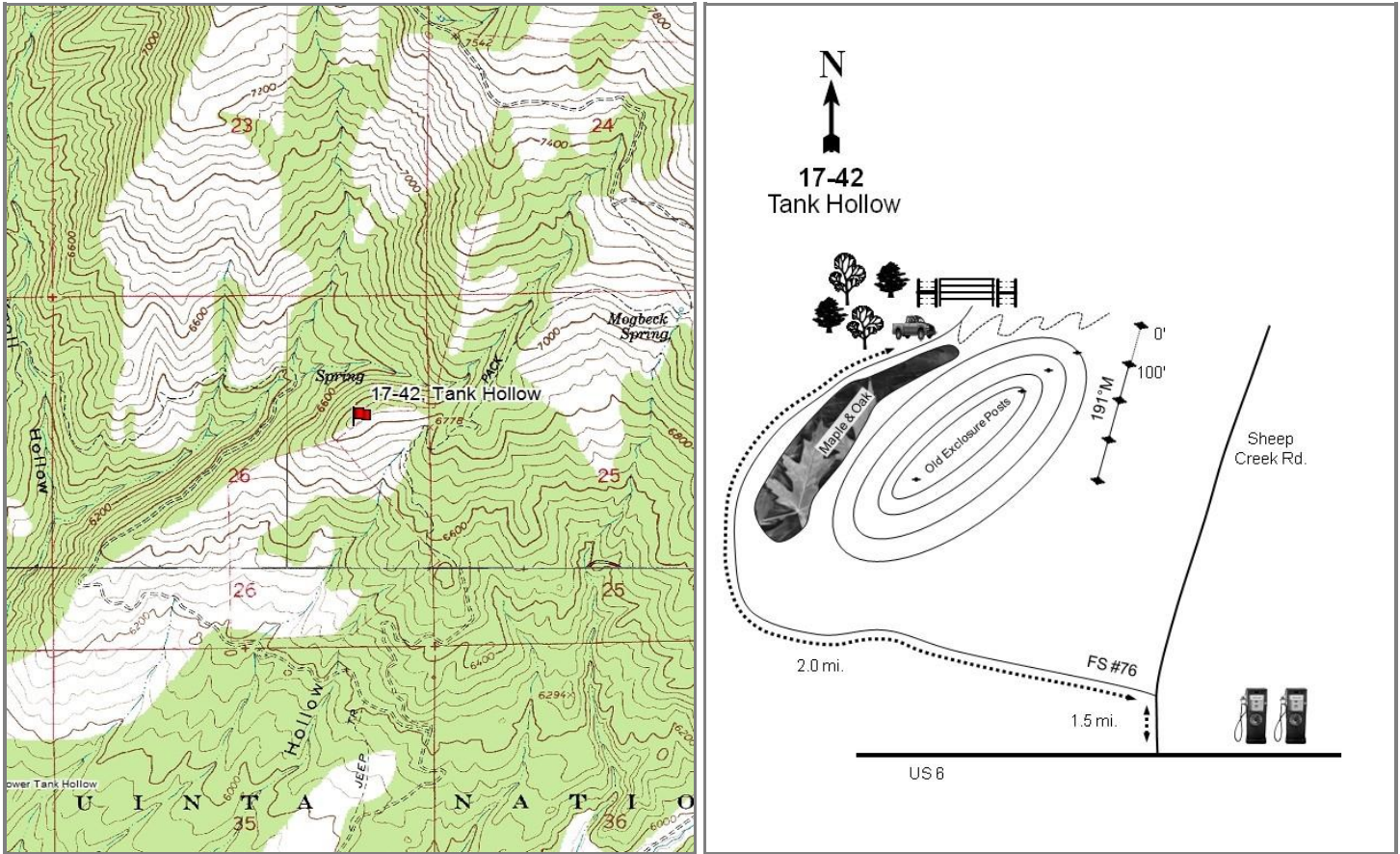
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1997	20	-	100	0	0	0	0	0	291/266
2002	60	-	33	67	0	0	0	0	- / -
2007	40	-	50	50	0	0	0	0	- / -
2012	80	-	25	75	0	0	0	0	- / -
2017	60	-	33	67	0	0	0	0	- / -
<b>Mahonia repens -- (creeping barberry)</b>									
1997	3640	20	16	84	0	0	0	0	10/14
2002	5480	-	2	97	2	0	0	10	7/11
2007	4640	-	9	91	1	0	0	1	8/9
2012	3940	-	5	95	0	0	0	4	8/12
2017	4520	-	2	98	0	0	0	0	8/10
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1997	1600	100	4	94	3	34	30	3	52/110
2002	1640	-	11	89	0	55	28	0	58/133
2007	1700	20	0	92	8	38	55	5	54/103
2012	2020	-	13	74	13	40	43	21	51/99
2017	1700	-	4	97	0	49	24	2	49/106
<b>Rosa woodsii<sup>p</sup> -- (Woods' rose)</b>									
1997	840	20	33	64	2	0	0	5	31/34
2002	700	-	17	83	0	0	0	0	33/34
2007	1180	-	0	100	0	0	0	0	24/22
2012	540	40	19	82	0	4	0	0	39/19
2017	1660	-	4	96	0	0	0	0	23/23
<b>Sambucus nigra ssp. cerulea<sup>p</sup> -- (blue elderberry)</b>									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	179/66
2017	-	-	-	-	-	-	-	-	149/121
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1997	4380	60	13	87	1	0	1	1	39/58
2002	5420	-	13	86	2	1	0	0	36/51
2007	4280	-	11	89	0	1	0	0	40/62
2012	8660	20	11	89	0	2	0	54	37/45
2017	8080	-	13	87	0	0	0	0	28/35

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

**Table 17-41.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2017	17	-	-	20	30	50	21.8

## TANK HOLLOW - STUDY NO. 17-42

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Rays Valley SW; Township 9S, Range 5E, Section 26  
NAD 83 UTM ZONE 12, 471773 East 4428457 North

**Transect Information**

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

719  
191° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Belt 5: 3ft

**Directions to Site**

Turn north off Highway US-6 (near milepost 195) onto the new Sheep Creek Road. Continue 1.5 miles on the paved road to an intersection with Forest Service road #076. From the intersection with the FS road, drive approximately 2 miles to a large gate. Park near the gate and hike up the steep hill for about 900 feet to the site location. The 0-foot stake is marked with browse tag #719.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	DIAMOND FORK
Elevation	6,840ft (2,085m)
Aspect	South
Slope	20%
Sample Dates	06/12/1997, 06/21/2002, 06/25/2007, 07/12/2012, 07/06/2017

**Table 17-42.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Tank Hollow Habitat Improvement Project	658	July 2007-December 2008	1117

**Wildlife Habitat and Vegetation History****Table 17-42.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter/spring
Elk	crucial	winter
Moose	substantial	winter

**Table 17-42.4 - 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/Bitterbrush	Phase I
1989	Mountain Big Sagebrush/Bitterbrush	Phase I
1997	Mountain Big Sagebrush/Bitterbrush	Phase I
2002	Mountain Big Sagebrush/Bitterbrush	Phase I
2007	Mountain Big Sagebrush/Bitterbrush	Phase I
2012	Mountain Big Sagebrush/Bitterbrush/Perennial Grass	Phase I
2017	Mountain Big Sagebrush/Bitterbrush/Perennial Grass	Phase I

**Site Notes**

The nearest perennial water source is a spring located 1000 feet northwest on the opposite side of the ridge.

**Soils****Table 17-42.5 - 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
Clay Loam	7.1	25.4	34.7	39.8	3.4	6.9	64.0	0.7	06/12/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Mountain Loam (Browse)
NRCS Ecological Site #	R047XA420UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) have been the dominant shrub species on this site since 1983, although a number of other species are also present. Utah juniper (*Juniperus osteosperma*) has been observed in all sample years, and increased in cover from study establishment through 2007; a lop and scatter treatment then removed many of the trees and cover decreased in 2012 (photos, Table 17-42.1, Table 17-42.12, Table 17-42.13, Table 17-42.14). This site has been considered to be in Phase I of woodland succession throughout the study period (Table 17-42.4). Herbaceous species are diverse and the understory is abundant overall (Table 17-42.7). Perennial grasses, particularly crested wheatgrass (*Agropyron cristatum*), contribute the most herbaceous cover and became a co-dominant site component in 2012 (Table 17-42.10). Forbs have remained rare since 2002 (Table 17-42.11).

**Trend Summary Tables****Table 17-42.6 - 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
1997	25.1	6.1	2.5	-	-	-
2002	15.3	5.5	3.0	9.7	4.4	0.8
2007	7.6	5.3	3.6	10.3	4.5	3.6
2012	11.7	4.6	0.1	16.8	4.4	0.8
2017	11.6	4.8	0.4	17.3	4.8	-

**Table 17-42.7 - 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
1997	79	211	234	320	0.9	11.0	1.7	16.1
2002	41	247	61	175	0.2	11.9	0.5	2.7
2007	94	355	102	130	1.5	15.8	0.4	3.1
2012	24	378	55	72	0.3	33.9	0.2	1.1
2017	10	397	165	119	0.4	28.9	1.3	2.1

**Table 17-42.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	11.9	0.3	53.1	1.7	4.2	52.6
2002	23.2	0.7	49.6	0.9	3.3	37.9
2007	24.4	0.3	41.0	1.6	3.5	42.4
2012	11.9	0.5	59.3	0.9	3.7	56.1
2017	13.5	0.9	63.4	3.1	4.6	50.5

**Table 17-42.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	-	38	36	1
2002	4	52	20	6
2007	3	31	33	4
2012	1	23	4	3
2017	-	36	1	12
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	5.1 (12.6)	155.5 (384.0)	48.9 (120.8)	-
2007	2.2 (5.4)	21.5 (53.0)	46.2 (114.2)	-
2012	6.5 (16.1)	45.6 (112.6)	14.1 (34.8)	-
2017	2.2 (5.4)	43.6 (107.6)	5.3 (13.2)	-

**Table 17-42.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES																						
Achnatherum hymenoides (Indian ricegrass)																						
Agropyron cristatum <sup>i</sup> (crested wheatgrass)																						
Bromus inermis <sup>i</sup> (smooth brome)																						
Bromus marginatus (mountain brome)																						
Bromus tectorum <sup>ai</sup> (cheatgrass)																						
Poa bulbosa <sup>i</sup> (bulbous bluegrass)																						
Poa fendleriana (muttongrass)																						
Poa pratensis <sup>i</sup> (Kentucky bluegrass)																						
Poa secunda (Sandberg bluegrass)																						
Pseudoroegneria spicata (bluebunch wheatgrass)																						
Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)																						
year	Nested Frequency																					
1997	6	95	-	6	79	-	3	6	52	28	61											
2002	9	148	-	6	41	12	11	13	32	25	52											
2007	3	241	8	-	94	6	15	7	65	104	41											
2012	8	275	-	8	24	2	1	-	50	77	87											
2017	1	328	8	-	10	46	-	-	30	46	108											
year	Average Cover (%)																					
1997	0.1	5.4	-	0.1	0.9	-	0.0	0.7	1.4	1.0	2.5											
2002	0.2	7.1	-	0.5	0.2	0.1	0.1	0.1	0.6	1.7	1.4											
2007	0.1	9.6	0.5	-	1.5	0.0	0.1	0.3	1.4	2.8	0.9											
2012	0.2	22.9	-	0.8	0.3	0.0	0.0	-	1.9	4.0	4.0											
2017	0.0	20.7	0.3	-	0.4	0.9	-	-	0.4	2.1	4.4											

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

**Table 17-42.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																							
Agoseris glauca (pale agoseris)																							
Allium (onion)																							
Alyssum desertorum <sup>ai</sup> (desert madwort)																							
Arabis (rockcress)																							
Astragalus (milkvetch)																							
Astragalus beekwithii (Beekwith's milkvetch)																							
Astragalus convallarius (lesser rushy milkvetch)																							
Balsamorhiza sagittata (arrow/leaf balsamroot)																							
Camelina microcarpa <sup>ai</sup> (littledod false flax)																							
Castilleja linariifolia (Wyoming Indian paintbrush)																							
Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)																							
Chenopodium album <sup>a</sup> (lambquarters)																							
Cirsium (thistle)																							
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																							
Collomia linearis <sup>a</sup> (tiny trumpet)																							
Comandra umbellata (bastaard toadflax)																							
Crepis acuminata (tapertip hawksbeard)																							
year	Nested Frequency																						
1997	0	19	-	8	2	4	11	1	15	4	-	2	53	27	9	3	58						
2002	13	19	3	3	-	-	-	4	18	-	-	-	2	12	-	-	11						
2007	2	3	35	-	-	-	-	3	55	-	7	-	2	1	-	-	1						
2012	-	-	47	-	-	-	-	2	-	-	3	-	4	6	1	2	-						
2017	3	11	140	-	-	-	-	3	5	1	9	-	1	7	-	1	2						
year	Average Cover (%)																						
1997	0.0	0.1	-	0.0	0.0	0.2	0.0	0.1	0.1	0.0	-	0.0	1.8	0.0	0.0	0.0	0.6						
2002	0.0	0.1	0.0	0.0	-	-	-	0.1	0.3	-	-	-	0.0	0.0	-	-	0.2						
2007	0.0	0.0	0.1	-	-	-	-	0.1	0.2	-	0.0	-	0.4	0.0	-	-	0.0						
2012	-	-	0.1	-	-	-	-	0.0	-	-	0.0	-	0.0	0.1	0.0	0.0	-						
2017	0.0	0.1	1.0	-	-	-	-	0.1	0.0	0.0	0.1	-	0.2	0.0	-	0.0	0.0						

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

FORB SPECIES	Cymopterus (springparsley)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Erigeron pumilus (shaggy fleabane)	Eriogonum brevicaulis (shortstem buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Hackelia patens (spotted stickseed)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stone seed)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Packera multilobata (lobeleaf groundsel)	Penstemon humilis (low beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)
year	Nested Frequency																
1997	35	7	1	-	-	87	5	182	5	-	7	5	7	9	49	1	-
2002	-	9	0	3	-	59	-	-	6	-	1	41	-	3	45	-	-
2007	21	7	-	4	-	53	-	12	7	3	1	14	-	-	28	-	-
2012	9	-	-	0	-	15	-	12	2	-	-	-	-	-	9	-	-
2017	12	15	-	-	3	9	1	5	7	-	-	-	2	3	32	-	3
year	Average Cover (%)																
1997	0.2	0.0	0.0	-	-	3.0	0.0	6.3	0.3	-	0.1	0.0	0.1	0.1	0.3	0.0	-
2002	-	0.1	0.0	0.1	-	0.8	-	-	0.6	-	0.0	0.1	-	0.0	0.1	-	-
2007	0.1	0.0	-	0.1	-	1.1	-	0.2	0.2	0.0	0.0	0.0	-	-	0.3	-	-
2012	0.0	-	-	0.0	-	0.3	-	0.1	0.2	-	-	-	-	-	0.0	-	-
2017	0.0	0.1	-	-	0.0	0.2	0.0	0.0	0.6	-	-	-	0.0	0.0	0.1	-	0.0

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

FORB SPECIES	Streptanthus cordatus (heartleaf twistflower)	Symphoricarum ascendens (western aster)	Thalictrum (meadow-rue)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Trifolium (clover)	Veronica biloba <sup>ai</sup> (twolobe speedwell)	Vicia americana (American vetch)	Viola (violet)
year	Nested Frequency							
1997	9	28	-	18	-	189	78	3
2002	9	14	-	-	2	-	58	-
2007	2	10	1	12	-	9	30	-
2012	5	14	-	-	-	-	13	-
2017	3	17	-	1	-	36	41	-
year	Average Cover (%)							
1997	0.2	0.9	-	0.1	-	1.4	1.6	0.0
2002	0.0	0.1	-	-	0.0	-	0.4	-
2007	0.0	0.1	0.1	0.1	-	0.0	0.2	-
2012	0.0	0.3	-	-	-	-	0.2	-
2017	0.0	0.2	-	0.0	-	0.1	0.4	-

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



**Table 17-42.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Cercocarpus montanus <sup>p</sup> (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Mahonia repens (creeping barberry)	Opuntia (pricklypear)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Quercus gambelii <sup>p</sup> (Gambel oak)	Symphoricarpos oreophilus (mountain snowberry)
year	Line Intercept Cover (%)										
1997	-	-	-	-	-	-	-	-	-	-	-
2002	0.2	5.9	0.8	1.9	0.6	0.8	-	-	2.6	0.2	1.9
2007	0.1	5.6	1.2	2	1.2	3.6	-	0.1	3.2	0.2	1.2
2012	-	5.7	2.9	2.4	0.5	0.8	-	0	7.5	0.7	1.5
2017	0	5.3	2.3	3.2	0.6	-	-	0.1	8.6	1.1	0.9
year	Quadrat Cover (%)										
1997	0.6	13.2	1.1	2.0	2.0	2.5	0.0	-	9.8	0.4	2.1
2002	0.6	8.4	1.6	2.0	1.9	3.0	-	0.0	4.6	0.2	1.6
2007	0.2	4.2	0.5	1.9	2.2	3.6	0.0	0.1	2.7	0.1	1.1
2012	0.2	4.2	2.1	2.6	0.3	0.1	-	0.1	5.0	0.3	1.6
2017	0.3	4.5	2.3	2.6	1.0	0.4	-	0.1	4.4	0.1	1.1

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

**Table 17-42.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1997	200	40	40	60	0	20	20	0	88/89
2002	180	-	44	0	56	11	78	22	53/47
2007	160	-	25	50	25	50	0	13	69/66
2012	100	40	0	100	0	80	20	0	83/73
2017	100	-	20	80	0	20	40	0	71/70
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1997	1720	-	5	64	31	57	13	23	76/118
2002	1780	-	2	33	65	16	80	44	66/84
2007	1080	60	2	48	50	37	46	37	70/92
2012	900	-	2	56	42	47	27	40	63/73
2017	840	-	2	62	36	50	31	26	61/74
<b>Cercocarpus montanus<sup>p</sup> -- (alderleaf mountain mahogany)</b>									
1997	320	-	6	94	0	19	75	6	83/103
2002	380	-	11	21	68	0	95	58	97/88
2007	180	20	0	89	11	44	56	11	72/74
2012	220	-	0	100	0	46	55	9	90/89
2017	300	-	20	73	7	27	53	7	100/98
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	1460	20	7	93	0	0	0	0	30/43
2002	1700	-	4	95	1	4	1	0	22/37
2007	1340	-	2	97	2	0	0	0	22/42
2012	1360	-	2	96	3	0	0	3	27/47
2017	1980	20	4	95	1	0	0	1	29/40
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	5420	400	22	78	0	0	0	0	25/26
2002	3840	20	1	73	27	0	0	10	19/20
2007	3460	20	3	92	5	0	0	2	21/25
2012	600	20	3	97	0	0	0	3	21/29
2017	1120	-	0	100	0	0	0	0	26/27

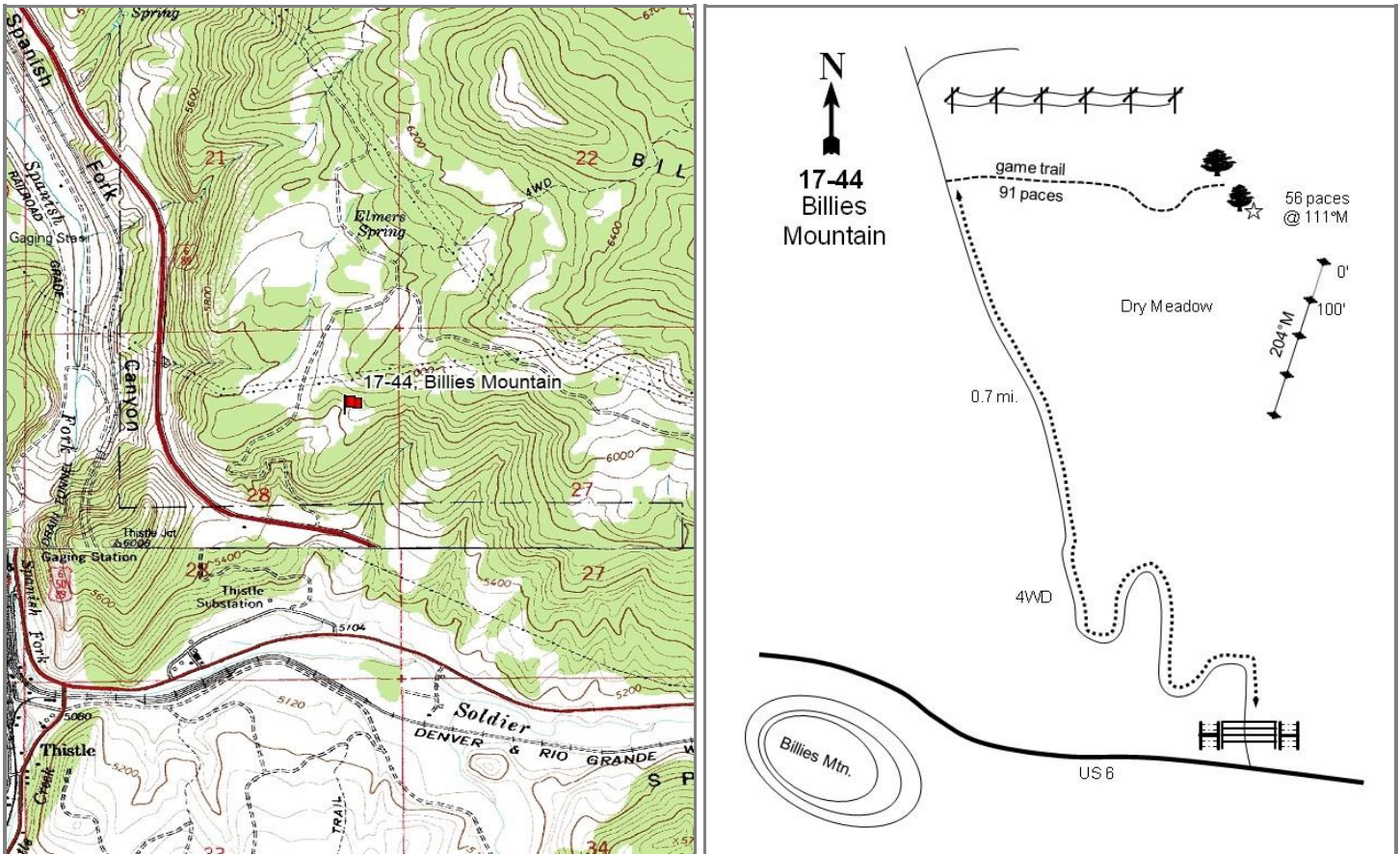
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1997	80	-	0	100	0	0	0	0	179/157
2002	60	-	0	100	0	0	33	33	- / -
2007	40	-	50	50	0	0	0	0	- / -
2012	20	-	100	0	0	0	0	0	- / -
2017	20	-	100	0	0	0	0	0	- / -
<b>Mahonia repens -- (creeping barberry)</b>									
1997	80	-	25	75	0	0	0	0	8/14
2002	-	-	-	-	-	-	-	-	- / -
2007	120	-	0	100	0	0	0	0	- / -
2012	20	-	0	100	0	0	0	0	7/11
2017	-	-	-	-	-	-	-	-	11/12
<b>Opuntia -- (pricklypear)</b>									
1997	20	-	0	100	0	0	0	0	9/14
2002	60	-	33	33	33	0	0	67	7/18
2007	100	-	20	80	0	0	0	0	16/21
2012	20	-	0	100	0	0	0	0	15/18
2017	300	-	0	100	0	0	0	0	13/15
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1997	1960	20	14	86	0	52	36	0	68/123
2002	2140	-	1	14	85	8	88	48	35/73
2007	1020	-	16	67	18	43	33	6	40/84
2012	1040	-	2	98	0	69	27	0	53/88
2017	1180	-	0	97	3	39	15	0	53/94
<b>Quercus gambelii<sup>p</sup> -- (Gambel oak)</b>									
1997	140	20	71	29	0	0	0	0	138/86
2002	160	-	50	0	50	0	38	50	66/68
2007	120	-	33	67	0	0	0	50	229/144
2012	180	-	89	11	0	0	0	0	86/82
2017	180	-	0	100	0	0	0	0	103/95
<b>Ribes<sup>p</sup> -- (currant)</b>									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	48/179
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1997	1000	-	10	90	0	0	0	0	46/92
2002	960	-	21	65	15	21	8	2	33/68
2007	900	-	69	31	0	0	0	7	33/47
2012	840	-	26	74	0	21	0	2	41/48
2017	940	-	21	79	0	0	0	0	41/54

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

**Table 17-42.14 - 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'	
<b>Juniperus osteosperma (Utah juniper)</b>						
2002	44	-	-	-	-	13.1
2007	63	-	31	6	44	12.3
2012	32	-	45	45	-	8.6
2017	21	-	11	67	11	11.3
<b>Pinus edulis (twoneedle pinyon)</b>						
2002	2	-	-	-	-	6.0

## BILLIES MOUNTAIN - STUDY NO. 17-44



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Billies Mountain SW; Township 9S, Range 4E, Section 28  
NAD 83 UTM ZONE 12, 458809 East 4428475 North

### Transect Information

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

Not Available  
204° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Standard

### Directions to Site

On Highways 6 and 89 in Spanish Fork Canyon, east of the new road cut through Billies Mountain and 0.9 miles west of the junction of Route 89 south to Manti and US-6, turn north onto a dirt road. Cross a cattle guard and follow the road for 0.7 miles to where it breaks out into a sagebrush/grass flat. On the right-hand (west) side of the road at the head of a small drainage, a game trail leads east towards a small meadow. Follow this trail approximately 150 yards to two large junipers at the edge of the meadow. From the junipers, walk up the near slope for 56 paces at a bearing of 111 degrees to the 0-foot baseline stake.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	BILLIES MOUNTAIN
Elevation	5,800ft (1,768m)
Aspect	Southwest
Slope	5-20%
Sample Dates	06/12/1997, 06/05/2002, 06/21/2007, 07/04/2012, 07/06/2017

**Wildlife Habitat and Vegetation History****Table 17-44.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Moose	substantial	winter

**Table 17-44.4 - 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	No Encroachment
1989	Mountain Big Sagebrush	No Encroachment
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/Mountain Big Sagebrush	Phase I
2017	Perennial Grass/Mountain Big Sagebrush	Phase I

**Site Notes**

The nearest perennial source of water is the Spanish Fork River located 0.7 miles west on the far side of US-6.

**Soils****Table 17-44.5 - 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	23.4	20.7	55.8	2.2	4.6	323.2	0.7	06/12/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Clay (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA403UT
States and Transitions	No state and transition model is available for this ecological site.

A number of browse species have been present on this study site since its establishment in 1983, but mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been the dominant species in all sample years. However, both cover and density of sagebrush have decreased overall since the 1997 sample year. Utah juniper trees (*Juniperus osteosperma*) were first observed on site in 1997, and cover has increased since 2002: this study site is therefore considered to be within Phase I of woodland succession (photos, Table 17-44.4, Table 17-44.12, Table 17-44.13, Table 17-44.14). The herbaceous understory is abundant and particularly diverse (Table 17-44.7), with a mixture of native and introduced perennial grasses being co-dominant with sagebrush from 1997 on. One should note the nearly seven-fold increase in cover of the introduced species bulbous bluegrass (*Poa bulbosa*) between 2012 and 2017 (Table 17-44.10). This increase implies that this study site has the potential to transition into one dominated by introduced perennial grasses if sagebrush cover continues to decrease. A majority of the cover contributed by forbs can be attributed to perennial species, particularly western aster (*Symphotrichum ascendens*) (Table 17-44.11).

**Trend Summary Tables****Table 17-44.6 - 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	7.4	3.4	1.8	-	-	-
2002	7.5	3.3	1.8	-	-	-
2007	6.2	3.3	2.1	8.7	4.5	7.2
2012	5.7	2.0	6.6	5.9	3.3	7.2
2017	5.4	3.9	0.6	6.7	4.7	9.6

**Table 17-44.7 - 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	70	415	173	367	0.9	23.5	1.6	18.6
2002	4	400	66	361	0.0	19.1	0.3	17.6
2007	84	397	87	378	0.6	23.3	0.5	17.8
2012	39	437	39	359	0.3	25.4	0.3	11.2
2017	50	425	68	326	0.9	38.1	0.8	16.2

**Table 17-44.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	14.8	1.7	54.5	1.1	0.7	46.4
2002	19.6	0.4	38.4	1.3	0.4	54.1
2007	16.5	0.2	38.6	2.7	0.3	56.2
2012	17.2	0.2	32.4	0.8	0.8	61.1
2017	24.4	0.0	29.5	3.2	0.4	54.3

**Table 17-44.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1997	2	37	25	-	-
2002	9	16	18	-	1
2007	7	33	12	-	2
2012	7	7	2	2	-
2017	13	11	2	1	3
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	15.3 (37.7)	36.2 (89.4)	11.4 (28.1)	-	-
2007	1.5 (3.6)	29.5 (72.8)	50.9 (125.8)	-	-
2012	11.6 (28.7)	7.4 (18.2)	0.7 (1.7)	3.5 (8.6)	-
2017	18.9 (46.6)	36.2 (89.4)	2.0 (5.0)	4.0 (10.0)	-

**Table 17-44.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Elymus glaucus (blue wildrye)	Elymus trachycaulus (slender wheatgrass)	Koeleria macrantha (prairie Junegrass)	Leymus cinereus (basin wildrye)	Melica bulbosa (oniongrass)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)
year	Nested Frequency																
1997	-	10	12	-	9	70	-	8	4	-	31	-	45	14	66	15	151
2002	-	9	64	-	13	4	-	-	-	14	8	-	15	24	94	35	112
2007	2	5	55	66	15	22	2	4	-	32	35	-	3	58	100	18	74
2012	15	4	56	1	23	36	14	5	-	5	12	3	3	98	97	24	60
2017	-	5	114	33	15	19	-	3	-	5	7	-	9	76	274	21	18
year	Average Cover (%)																
1997	-	0.3	0.5	-	0.3	0.9	-	0.1	0.6	-	0.7	-	1.5	0.1	1.6	0.7	6.7
2002	-	0.1	2.0	-	0.8	0.0	-	-	-	0.2	0.1	-	0.1	0.6	2.8	0.7	1.5
2007	0.0	0.0	2.6	0.2	1.1	0.4	0.0	0.0	-	0.8	1.2	-	0.0	1.0	2.1	0.5	1.8
2012	0.2	0.0	2.7	0.0	0.8	0.3	0.1	0.0	-	0.0	0.0	0.4	0.0	2.6	2.5	0.3	2.1
2017	-	0.1	6.8	0.5	0.9	0.4	-	0.0	-	0.1	0.0	-	0.1	3.3	15.2	0.1	0.4

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

GRASS SPECIES	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea <sup>i</sup> (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Secale cereale <sup>ai</sup> (cereal rye)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency				
1997	75	-	238	-	-
2002	37	5	212	-	-
2007	79	5	190	-	26
2012	136	4	192	2	9
2017	15	5	173	-	33
year	Average Cover (%)				
1997	1.6	-	8.9	-	-
2002	0.4	0.6	9.4	-	-
2007	1.9	0.4	8.4	-	1.3
2012	6.6	0.0	6.8	0.0	0.0
2017	0.1	0.8	8.0	-	2.2

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

**Table 17-44.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Allium (onion)	Alyssum desertorum <sup>ni</sup> (desert madwort)	Antennaria (pussytoes)	Artemisia ludoviciana (white sagebrush)	Astragalus cibirius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ni</sup> (littletop false flax)	Cardaria draba <sup>ni</sup> (whitetop)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Cymopterus (springparsley)
year	Nested Frequency																
1997	38	24	2	-	46	-	61	15	21	16	-	47	-	7	11	6	9
2002	44	13	-	-	49	-	25	10	19	1	-	36	-	-	1	9	14
2007	53	6	1	-	64	-	42	14	17	14	-	32	-	1	-	12	16
2012	61	1	-	1	33	-	33	5	-	-	-	40	-	3	-	13	16
2017	44	26	-	4	28	1	39	6	61	7	13	23	3	1	-	10	9
year	Average Cover (%)																
1997	1.1	0.1	0.0	-	1.5	-	0.8	0.3	0.1	0.1	-	1.5	-	0.0	0.0	0.0	0.1
2002	0.9	0.4	-	-	1.1	-	0.3	0.3	0.1	0.0	-	0.4	-	-	0.0	0.1	0.4
2007	1.4	0.0	0.0	-	1.9	-	0.6	0.2	0.1	0.1	-	0.6	-	0.0	-	0.3	0.1
2012	0.9	0.0	-	0.0	0.3	-	0.1	0.0	-	-	-	0.2	-	0.0	-	0.0	0.0
2017	1.4	0.1	-	0.1	0.8	0.1	0.7	0.2	0.2	0.0	0.3	0.4	0.0	0.0	-	0.1	0.0

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

FORB SPECIES	Cynoglossum officinale <sup>ni</sup> (gypsoflower)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Eriogonum brevicaulis (shortstem buckwheat)	Eriogonum heracleoides (parsnipflower buckwheat)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Galium aparine <sup>a</sup> (stickywilly)	Hackelia patens (spotted stickseed)	Heliomeris multiflora var. multiflora (showy goldeneye)	Lactuca serriola <sup>ni</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lithospermum ruderale (western stoneseed)	Medicago sativa <sup>i</sup> (alfalfa)	Melilotus officinalis <sup>i</sup> (sweetclover)	Microsteris gracilis <sup>a</sup> (slender phlox)
year	Nested Frequency																
1997	5	-	-	88	11	-	-	5	33	12	31	36	-	1	21	-	-
2002	2	-	-	35	3	1	1	3	24	5	10	-	-	1	-	-	-
2007	-	24	-	7	7	-	-	6	6	0	-	-	3	14	-	13	-
2012	0	-	-	2	-	-	-	2	2	2	11	-	-	3	32	3	-
2017	-	-	3	1	8	-	-	6	14	-	16	15	-	-	3	1	1
year	Average Cover (%)																
1997	0.0	-	-	0.5	0.1	-	-	0.0	0.6	0.0	0.6	0.2	-	0.0	0.3	-	-
2002	0.0	-	-	0.1	0.0	0.0	0.0	0.0	0.2	0.0	0.0	-	-	0.1	-	-	-
2007	-	0.1	-	0.0	0.1	-	-	0.1	0.0	0.0	-	-	0.0	0.3	-	0.2	-
2012	0.0	-	-	0.0	-	-	-	0.0	0.0	0.0	0.2	-	-	0.0	0.3	0.0	-
2017	-	-	0.0	0.0	0.2	-	-	0.1	0.4	-	0.2	0.0	-	-	0.0	0.0	0.0

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



FORB SPECIES									
Petradoria pumila (rock goldenrod)									
Phlox longifolia (longleaf phlox)									
Polygonum douglasii <sup>a</sup> (Douglas' knotweed)									
Sphaeralcea coccinea (scarlet globemallow)									
Symphotrichum ascendens (western aster)									
Taraxacum officinale (common dandelion)									
Tragopogon dubius <sup>ai</sup> (yellow salsify)									
Veronica biloba <sup>ai</sup> (two-lobed speedwell)									
Vicia americana (American vetch)									
year	Nested Frequency								
1997	27	73	2	-	263	-	31	-	150
2002	34	94	1	3	295	-	10	4	100
2007	42	18	-	3	291	-	36	-	111
2012	29	40	1	7	301	-	31	-	86
2017	40	41	-	7	221	1	36	-	84
year	Average Cover (%)								
1997	1.1	0.2	0.0	-	8.2	-	0.2	-	2.7
2002	1.8	0.7	0.0	0.0	10.0	-	0.1	0.0	0.9
2007	2.5	0.1	-	0.0	8.7	-	0.3	-	0.7
2012	0.8	0.1	0.0	0.0	7.6	-	0.3	-	0.4
2017	2.1	0.2	-	0.2	7.6	0.0	0.3	-	1.0

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

**Table 17-44.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES												
Amelanchier utahensis <sup>p</sup> (Utah serviceberry)												
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)												
Chrysothamnus depressus <sup>p</sup> (longflower rabbitbrush)												
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)												
Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)												
Gutierrezia sarothrae (broom snakeweed)												
Juniperus osteosperma <sup>t</sup> (Utah juniper)												
Prunus virginiana <sup>p</sup> (chokecherry)												
Purshia tridentata <sup>p</sup> (antelope bitterbrush)												
Rosa woodsii <sup>p</sup> (Woods' rose)												
Symphoricarpos oreophilus (mountain snowberry)												
Tetradymia canescens (spineless horsebrush)												
year	Line Intercept Cover (%)											
1997	-	-	-	-	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-	-	-	-	-
2007	-	4.3	0.2	1.2	1.2	0.1	7.2	0.4	2.6	0	2.8	0.4
2012	-	2.2	0.1	1	1.5	-	7.2	0.2	1.9	-	1.7	0.6
2017	0.2	2.2	0.5	0.6	1.4	0.5	9.6	-	2.4	-	3	0.6
year	Quadrat Cover (%)											
1997	0.0	4.7	0.0	1.7	0.5	0.3	1.8	0.1	1.9	0.1	1.1	0.3
2002	-	4.3	0.0	1.2	0.5	0.2	1.8	-	2.5	0.1	1.8	0.1
2007	-	3.8	0.1	1.3	0.5	0.0	2.1	0.1	1.5	0.1	1.6	0.4
2012	-	3.2	0.0	0.4	0.7	0.0	6.6	0.0	1.8	0.0	1.5	0.1
2017	0.0	2.4	0.2	1.0	0.4	0.6	0.6	-	2.4	0.0	1.8	0.5

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

**Table 17-44.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1997	40	-	0	100	0	50	0	0	55/70
2002	60	-	33	67	0	33	33	0	63/92
2007	20	-	0	100	0	100	0	0	90/89
2012	-	-	-	-	-	-	-	-	67/87
2017	60	-	33	67	0	33	67	33	53/62
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1997	1260	20	5	41	54	52	2	40	67/93
2002	1160	-	10	33	57	26	55	29	67/77
2007	980	-	10	37	53	55	10	41	64/87
2012	600	20	7	70	23	23	27	20	58/80
2017	960	-	40	46	15	4	4	15	53/68
<b>Chrysothamnus depressus<sup>P</sup> -- (longflower rabbitbrush)</b>									
1997	460	-	4	96	0	0	0	0	19/27
2002	180	-	0	89	11	11	0	0	18/29
2007	220	-	0	100	0	0	0	0	18/31
2012	200	20	10	90	0	10	0	0	13/20
2017	720	-	36	64	0	94	0	0	19/31
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	700	-	3	94	3	0	0	0	37/46
2002	720	-	8	92	0	0	0	3	28/43
2007	680	-	0	94	6	0	0	0	36/56
2012	520	-	15	85	0	0	0	12	35/39
2017	580	-	3	97	0	3	0	0	36/50
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1997	660	-	9	91	0	3	0	0	54/54
2002	420	-	0	67	33	19	5	0	57/75
2007	320	-	0	88	13	13	0	6	73/62
2012	420	-	5	95	0	0	0	10	61/69
2017	460	-	13	83	4	44	9	4	52/53
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	920	-	30	65	4	0	0	0	22/24
2002	940	-	0	98	2	0	0	0	17/16
2007	320	20	0	81	19	0	0	6	22/21
2012	80	-	25	75	0	0	0	0	19/23
2017	700	-	3	97	0	0	0	0	24/24
<b>Juniperus osteosperma<sup>I</sup> -- (Utah juniper)</b>									
1997	40	20	0	100	0	0	0	0	- / -
2002	60	-	0	100	0	0	0	0	- / -
2007	120	-	67	17	17	0	0	0	- / -
2012	60	-	67	33	0	0	0	33	- / -
2017	100	-	40	60	0	0	0	20	- / -
<b>Prunus virginiana<sup>P</sup> -- (chokecherry)</b>									
1997	60	-	0	100	0	0	0	0	40/40
2002	40	-	0	50	50	0	50	0	70/59
2007	20	-	0	100	0	0	0	0	75/90
2012	40	-	0	100	0	0	100	0	45/53
2017	-	-	-	-	-	-	-	-	28/20
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1997	540	-	4	89	7	37	56	7	56/94
2002	380	-	0	79	21	16	79	5	41/84
2007	400	20	10	90	0	60	15	0	64/120
2012	520	-	35	62	4	0	100	50	66/128
2017	500	-	24	72	4	28	72	4	55/108
<b>Rosa woodsii<sup>P</sup> -- (Woods' rose)</b>									
1997	100	-	40	60	0	0	0	0	- / -
2002	160	-	63	38	0	0	0	0	18/26
2007	180	-	67	33	0	0	0	0	22/24
2012	20	-	100	0	0	0	0	0	17/14
2017	20	20	100	0	0	0	0	0	- / -

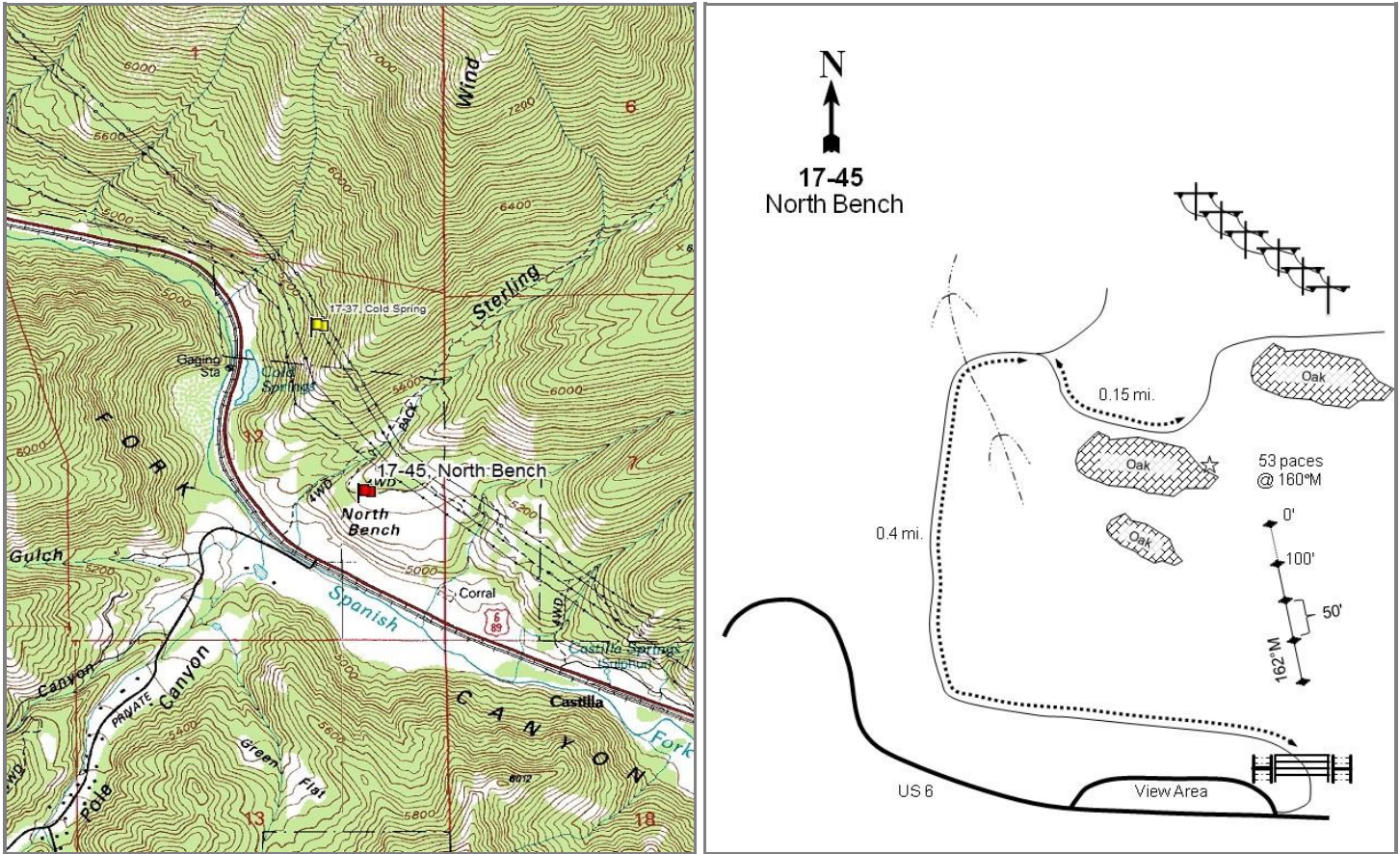
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1997	320	20	69	31	0	0	0	0	49/102
2002	680	-	27	74	0	6	0	12	39/88
2007	520	-	8	89	4	31	27	0	46/96
2012	500	200	0	100	0	0	0	4	44/63
2017	1120	-	5	95	0	5	0	11	40/68
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1997	520	-	23	77	0	0	0	0	25/35
2002	560	60	14	86	0	4	0	4	20/38
2007	640	-	9	66	25	3	0	0	23/41
2012	360	-	17	83	0	0	0	0	25/29
2017	660	-	9	91	0	0	0	12	23/29

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

**Table 17-44.14 - 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' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2017	10	-	22	33	22	22	19.2

## NORTH BENCH - STUDY NO. 17-45

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Spanish Fork Peak SE; Township 9S, Range 3E, Section 12  
NAD 83 UTM ZONE 12, 453800 East 4432784 North

**Transect Information**

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

Not Available  
162° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
No Rebar

**Directions to Site**

From the west side of the viewing area in lower Spanish Fork Canyon (about 3.5 miles east of the mouth), look for a dirt road that goes through a gate and by an old corral. Take this rough road for 0.4 miles to an intersection. At the intersection, turn right and continue for 0.15 miles to the top of the bench and an old fence line. From the wooden post near the left-hand (north) side of the road, walk 53 paces at a bearing of 160 degrees magnetic into the sagebrush flat. The first stake marks the 0-foot end of the baseline, and the remainder of the study stakes are south at 100 foot intervals.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,150ft (1,570m)
Aspect	South
Slope	3-10%
Sample Dates	05/28/1997, 06/05/2002, 07/23/2007, 07/02/2012, 06/01/2017

**Table 17-45.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Herbicide - Milestone	Utah County CWMA Priority Weeds Treatment and Restoration-Phase I	1116	2009	50

**Wildlife Habitat and Vegetation History****Table 17-45.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Moose	substantial	winter

**Table 17-45.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Sagebrush/Perennial Grass	No Encroachment
1997	Sagebrush/Perennial Grass	No Encroachment
2002	Sagebrush/Perennial Grass	No Encroachment
2007	Sagebrush/Perennial Grass	No Encroachment
2012	Sagebrush/Perennial Grass	No Encroachment
2017	Sagebrush/Perennial Grass	No Encroachment

**Site Notes**

The nearest perennial sources of water are Spanish Fork River 0.2 miles southwest and Cold Springs 0.4 miles northwest of the study. Spanish Fork River is on the opposite side of US-6, but Cold Springs is on the same side as the study site, which may make it the primary water source. The slope west of the study was being developed during the 2007 sample year.

**Soils****Table 17-45.5 - 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	6.1	36.7	36.4	26.8	1.7	27.3	227.2	0.3	05/28/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	23 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

From the time of establishment in 1989 through the most recent sample year, the site has remained dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and perennial grasses. The forb community on this site is abundant and diverse, with hairy false goldenaster (*Heterotheca villosa*) and silvery lupine (*Lupinus argenteus*) being the co-dominant species (Table 17-45.11). The grasses on the site are mostly introduced perennial grasses, with crested wheatgrass (*Agropyron cristatum*), bulbous bluegrass (*Poa bulbosa*), and Kentucky bluegrass (*P. pratensis*) being co-dominant (Table 17-45.10). Mountain big sagebrush is the dominant browse species, while broom snakeweed (*Gutierrezia sarothrae*) is a lesser component of the shrub layer (Table 17-45.12, Table 17-45.13). The presence of high levels of introduced perennial grasses, in particular bulbous bluegrass, could lead to an ecological shift away from the rich forb component currently found on the site to a more depleted forb community.

**Trend Summary Tables****Table 17-45.6 - 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	8.8	1.2	-	-	-	-
2002	13.1	2.4	-	-	-	-
2007	12.1	1.6	-	18.8	0.7	-
2012	11.4	1.2	-	10.8	1.1	-
2017	21.8	2.6	-	19.7	0.9	-

**Table 17-45.7 - 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	17	490	296	238	0.1	45.8	3.9	8.8
2002	-	489	171	257	-	50.7	3.1	12.9
2007	-	455	96	303	-	27.1	0.5	14.1
2012	5	453	146	282	0.0	30.5	1.2	10.9
2017	13	475	173	279	0.7	68.4	2.8	18.6

**Table 17-45.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	10.4	1.0	39.0	0.3	0.1	58.8
2002	5.0	0.8	37.4	0.1	0.0	71.5
2007	13.9	0.0	42.4	0.0	-	56.2
2012	3.7	0.0	51.9	0.0	0.7	54.9
2017	14.3	2.0	46.7	0.2	0.0	73.9

**Table 17-45.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk
	Quadrat Frequency		
1997	2	1	-
2002	5	7	1
2007	3	4	4
2012	1	1	-
2017	6	1	1
Year	Days Use Per Acre (ha)		
1997	-	-	-
2002	5.8 (14.3)	8.1 (19.9)	-
2007	31.2 (77.1)	4.0 (9.9)	4.0 (9.9)
2012	8.7 (21.5)	0.7 (1.7)	0.7 (1.7)
2017	28.3 (69.9)	18.7 (46.3)	-



**Table 17-45.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Dactylis glomerata <sup>i</sup> (orchardgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency									
1997	229	-	-	17	14	443	157	14	-	-
2002	262	-	-	-	19	456	166	9	-	-
2007	194	-	-	-	12	314	213	11	3	-
2012	322	-	-	5	34	216	88	43	-	-
2017	234	1	3	12	41	401	261	-	4	19
year	Average Cover (%)									
1997	9.3	-	-	0.1	0.7	31.3	4.0	0.5	-	-
2002	12.3	-	-	-	0.7	32.9	4.8	0.0	-	-
2007	6.3	-	-	-	0.3	12.3	8.1	0.0	0.0	-
2012	15.4	-	-	0.0	0.5	9.6	1.1	3.9	-	-
2017	18.5	0.0	0.1	0.7	1.8	30.6	16.6	-	0.1	0.6

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

**Table 17-45.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Antennaria parvifolia (small-leaf pussytoes)	Artemisia ludoviciana (white sagebrush)	Astragalus cibirarius (browse milkvetch)	Cardaria draba <sup>ai</sup> (whitewort)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cynoglossum officinale <sup>ai</sup> (gypsoflower)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron divergens <sup>a</sup> (spreading fleabane)	Erigeron pumilus (shaggy fleabane)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium aparine <sup>a</sup> (stickywilly)
year	Nested Frequency																
1997	-	-	4	-	-	27	2	-	-	70	-	-	164	-	32	-	-
2002	-	-	2	-	31	10	-	2	9	20	-	-	57	-	-	-	-
2007	1	1	5	-	-	4	-	-	-	1	-	-	36	-	2	-	-
2012	20	47	8	3	-	-	5	-	-	2	-	-	12	-	3	-	-
2017	6	31	4	-	-	-	9	-	-	17	5	5	45	1	2	17	3
year	Average Cover (%)																
1997	-	-	0.1	-	-	0.7	0.0	-	-	0.7	-	-	0.4	-	0.1	-	-
2002	-	-	0.1	-	0.4	0.0	-	0.0	0.0	0.4	-	-	0.2	-	-	-	-
2007	0.0	0.0	0.0	-	-	0.0	-	-	-	0.0	-	-	0.1	-	0.0	-	-
2012	0.1	1.2	0.2	0.0	-	-	0.0	-	-	0.0	-	-	0.0	-	0.0	-	-
2017	0.0	2.0	0.2	-	-	-	0.1	-	-	0.3	0.1	0.0	0.2	0.0	0.0	0.1	0.0

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



FORB SPECIES																
Grindelia squarrosa (curlycup gumweed)																
Helianthus annuus <sup>a</sup> (common sunflower)																
Heterotheca villosa (hairy false goldenaster)																
Iva axillaris (povertyweed)																
Lactuca serriola <sup>ai</sup> (prickly lettuce)																
Lupinus argenteus (silvery lupine)																
Machaeranthera canescens (hoary fansyaster)																
Medicago sativa <sup>i</sup> (alfalfa)																
Melilotus officinalis <sup>i</sup> (sweetclover)																
Phlox longifolia (longleaf phlox)																
Polygonum douglasii <sup>ai</sup> (Douglas' knotweed)																
Symphotrichum ascendens (western aster)																
Taraxacum officinale (common dandelion)																
Tragopogon dubius <sup>ai</sup> (yellow salsify)																
Verbascum thapsus <sup>ai</sup> (common mullein)																
Wyethia amplexicaulis (mule-ears)																
year	Nested Frequency															
1997	83	29	139	-	6	20	-	14	4	-	3	4	55	225	-	-
2002	8	6	214	-	-	29	-	22	1	-	-	6	16	139	-	-
2007	43	2	272	-	3	49	8	12	9	5	-	14	5	64	-	-
2012	71	8	150	-	11	66	-	21	52	13	-	8	17	117	6	-
2017	42	2	157	19	31	118	-	51	1	3	-	27	71	93	11	1
year	Average Cover (%)															
1997	1.1	0.3	3.5	-	0.0	0.9	-	0.9	0.2	-	0.0	0.2	1.1	2.5	-	-
2002	0.1	0.0	9.0	-	-	1.3	-	1.5	0.0	-	-	0.2	0.3	2.5	-	-
2007	0.7	0.0	9.9	-	0.0	2.6	0.0	0.3	0.1	0.0	-	0.3	0.0	0.4	-	-
2012	0.8	0.0	4.3	-	0.2	1.9	-	1.0	1.0	0.3	-	0.0	0.0	0.8	0.0	-
2017	0.3	0.0	6.2	0.2	0.3	4.4	-	2.8	0.0	0.0	-	1.1	1.4	1.7	0.1	0.0

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

**Table 17-45.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES			
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)			
Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)			
Gutierrezia sarothrae (broom snakeweed)			
year	Line Intercept Cover (%)		
1997	-	-	-
2002	-	-	-
2007	18.7	0.1	0.7
2012	10.7	0.1	1.1
2017	19.6	0.1	0.9
year	Quadrat Cover (%)		
1997	8.8	-	1.2
2002	13.1	-	2.4
2007	12.1	0.0	1.6
2012	11.4	0.0	1.2
2017	21.6	0.1	2.6

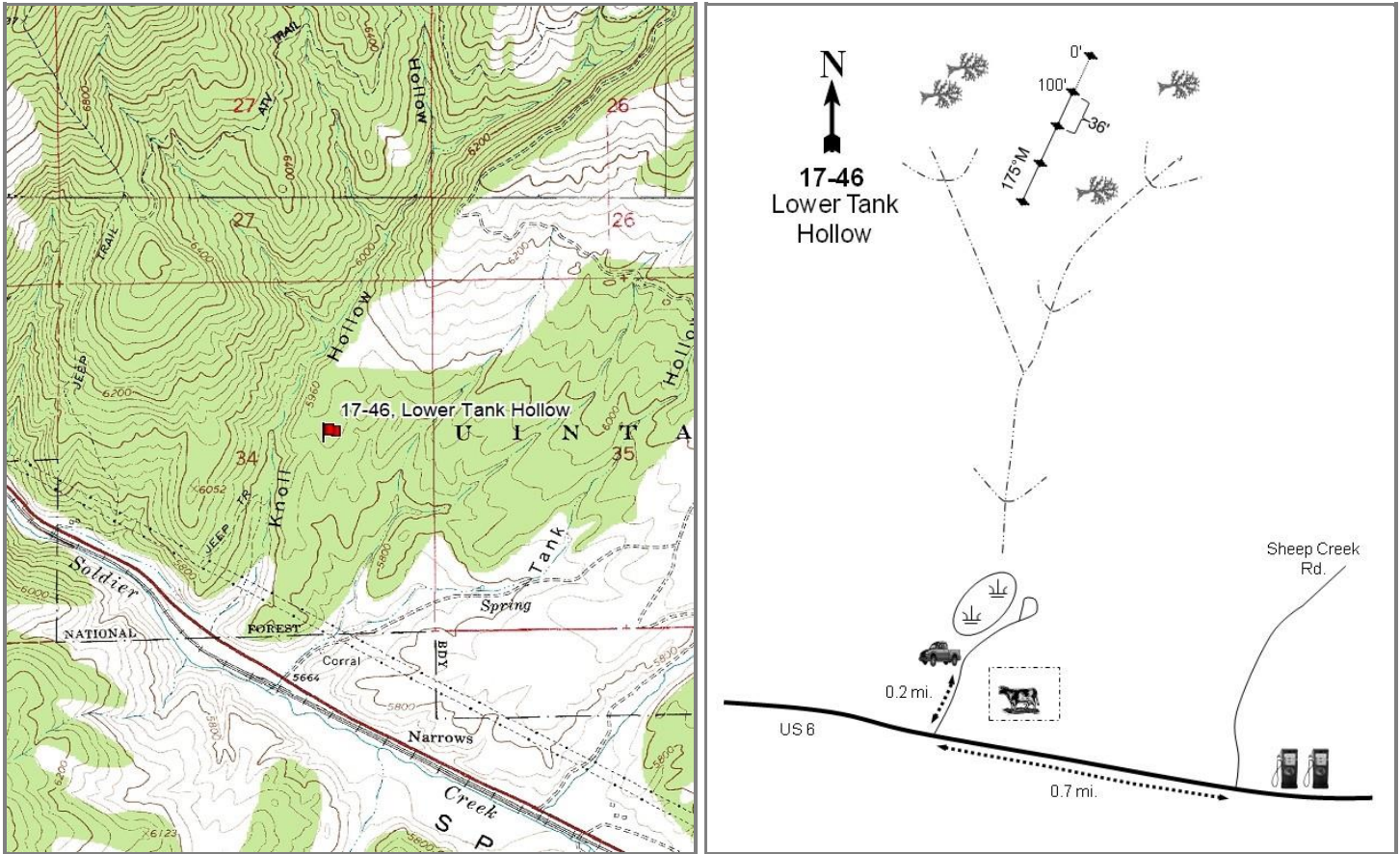
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 17-45.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Acer grandidentatum<sup>t</sup> -- (bigtooth maple)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	40	-	100	0	0	0	0	0	37/19
2017	-	-	-	-	-	-	-	-	-/-
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1997	5500	1480	56	35	9	3	0	5	93/108
2002	5000	40	11	68	21	10	2	6	49/59
2007	3380	380	2	85	14	24	7	9	53/73
2012	3200	60	16	59	24	9	1	30	52/67
2017	3680	2240	13	82	5	0	0	5	51/78
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1997	20	-	0	100	0	0	0	0	72/122
2002	-	-	-	-	-	-	-	-	47/71
2007	40	-	0	100	0	0	0	0	69/62
2012	20	-	0	100	0	0	0	0	63/42
2017	20	-	0	100	0	0	0	0	53/80
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	3400	1100	39	59	2	0	0	0	16/20
2002	4800	20	4	88	8	0	0	1	20/22
2007	2180	20	5	95	1	7	2	1	24/24
2012	1440	-	3	96	1	0	1	25	21/21
2017	1200	1280	7	93	0	0	0	0	25/29
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	20	-	0	100	0	0	0	0	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Quercus gambelii<sup>p</sup> -- (Gambel oak)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	20	-	100	0	0	0	0	0	83/71
2012	20	-	100	0	0	100	0	0	60/26
2017	-	-	-	-	-	-	-	-	-/-
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	35/41
2012	-	-	-	-	-	-	-	-	93/68

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

## LOWER TANK HOLLOW - STUDY NO. 17-46



### Location Information

USGS 7.5 min Map Info GPS (0' Stake)	Mill Fork NW; Township 9S, Range 5E, Section 34 NAD 83 UTM ZONE 12, 470018 East 4426679 North
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### Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	175° 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

In Spanish Fork Canyon, turn north up Tank Hollow, which is 0.7 miles west of the Sheep Creek Road and cafe on Highway 6. Drive for about 0.2 miles and stop by a small stock pond in the forks of the drainage. From there, walk north about 1/2 mile up the left fork, and keep left at two other major forks. Where the wash starts to flatten out at the head, there is a chained ridge to the right. The study site is on the ridge, about 20 paces from the center of the drainage, and the 0-foot baseline stake is near the highest point on the ridge.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	DIAMOND FORK
Elevation	5,900ft (1,798m)
Aspect	Southwest
Slope	10%
Sample Dates	06/11/1997, 06/17/2002, 06/25/2007, 07/11/2012, 08/16/2017

**Table 17-46.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	1971	-
Seeding - Seed Unknown	-	-	1971	-
Hand Crew - Lop and Scatter	Tank Hollow Habitat Improvement Project	658	July 2007-December 2008	1116

**Wildlife Habitat and Vegetation History**

**Table 17-46.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Moose	substantial	winter

**Table 17-46.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Yellow Rabbitbrush/Perennial Grass	Phase I
1997	Perennial Grass/Bitterbrush	Phase I
2002	Perennial Grass/Bitterbrush	Phase I transitioning to Phase II
2007	Perennial Grass/Bitterbrush	Phase I transitioning to Phase II
2012	Perennial Grass/Bitterbrush/Mountain Big Sagebrush	Phase I
2017	Perennial Grass/Bitterbrush/Mountain Big Sagebrush	Phase I

**Site Notes**

The nearest perennial source of water is Soldier Creek, which is 0.7 miles south of the study site, and a stock pond that is 0.5 miles south. A deer carcass was observed on the hike to the study site in 2017.

**Soils**

**Table 17-46.5 - 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	40.7	21.4	37.8	3.2	6.8	275.2	0.5	06/11/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

This study site has existed as a mixed shrub plant community since establishment in 1989 through the most recent sample year: basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*), and antelope bitterbrush (*Purshia tridentata*) are the main browse species (Table 17-46.12). The dominant grass species on the site is crested wheatgrass (*Agropyron cristatum*) (Table 17- 46.10). The forb community is diverse and contributes moderate cover; the most dominant species are spiny phlox (*Phlox hoodii*) and western stoneseed (*Lithospermum ruderae*) (Table 17-46.11). Utah juniper (*Juniperus osteosperma*) is present on the site, although there was a lop and scatter treatment in 2007 and 2008 that significantly reduced density and cover (Table 17-46.12, Table 17-46.14). However, there were still trees on the site following treatment, which leaves possibility for infilling the future.

**Trend Summary Tables**

**Table 17-46.6 - 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	3.7	2.6	6.3	-	-	-
2002	5.4	2.3	10.6	5.1	2.1	5.8
2007	3.0	1.5	7.4	4.1	1.7	13.2
2012	4.0	2.1	1.4	6.4	3.5	3.7
2017	6.5	3.4	1.5	8.2	4.6	6.8

**Table 17-46.7 - 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	30	323	130	233	0.5	19.1	1.9	5.1
2002	6	320	6	104	0.0	15.9	0.1	1.8
2007	22	309	146	110	0.1	18.5	0.6	1.9
2012	1	306	72	108	0.0	19.5	0.5	1.7
2017	-	348	201	94	-	29.5	0.9	3.7

**Table 17-46.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	24.1	1.4	41.1	5.8	0.7	36.6
2002	35.6	2.5	40.2	3.6	2.0	34.6
2007	40.5	2.6	28.0	4.6	0.9	33.7
2012	25.3	0.9	50.5	4.1	1.3	28.7
2017	33.0	0.1	46.2	6.0	1.6	38.5

**Table 17-46.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	1	30	11	3
2002	2	36	14	8
2007	5	42	4	7
2012	4	18	1	5
2017	3	31	-	7
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	6.5 (16.1)	46.9 (115.9)	5.3 (13.2)	-
2007	8.0 (19.7)	24.1 (59.6)	12.1 (29.8)	-
2012	12.3 (30.5)	20.1 (49.7)	1.3 (3.3)	-
2017	-	29.5 (72.8)	0.7 (1.7)	-

**Table 17-46.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Dactylis glomerata <sup>i</sup> (orchardgrass)	Elymus elymoides (squirreltail)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency												
1997	33	16	196	-	8	30	1	-	1	70	22	42	20
2002	40	4	259	-	-	6	3	1	1	18	3	5	25
2007	26	-	283	15	-	9	-	-	-	3	16	3	14
2012	1	-	300	-	-	1	-	-	2	-	10	1	3
2017	57	-	274	-	9	-	-	4	5	18	1	-	15
year	Average Cover (%)												
1997	0.7	0.7	12.5	-	0.2	0.5	0.0	-	0.0	1.4	0.6	2.8	0.2
2002	0.8	0.1	14.4	-	-	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.2
2007	0.5	-	17.4	0.1	-	0.0	-	-	-	0.0	0.4	0.1	0.2
2012	0.0	-	19.4	-	-	0.0	-	-	0.0	-	0.0	0.0	0.0
2017	4.7	-	23.5	-	0.1	-	-	0.2	0.1	0.6	0.0	-	0.3

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

**Table 17-46.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Astragalus cibirarius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littledod false flax)	Cardaria draba <sup>ni</sup> (whitetop)	Carduus nutans <sup>ai</sup> (nodding plumeless thistle)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)
year	Nested Frequency																
1997	1	5	11	74	-	27	4	2	13	-	22	9	4	19	22	-	32
2002	-	-	2	2	-	3	-	-	1	12	-	-	-	-	4	-	-
2007	-	2	6	131	3	30	3	1	3	-	4	-	9	4	3	-	-
2012	-	-	-	68	7	4	8	4	-	-	-	3	-	-	9	2	1
2017	-	1	-	198	-	19	4	-	-	-	-	-	-	-	2	-	-
year	Average Cover (%)																
1997	0.0	0.0	0.0	1.2	-	0.4	0.1	0.0	0.0	-	0.4	0.0	0.0	0.1	0.5	-	0.4
2002	-	-	0.0	0.0	-	0.0	-	-	0.0	0.0	-	-	-	-	0.1	-	-
2007	-	0.0	0.0	0.6	0.0	0.3	0.0	0.0	0.0	-	0.0	-	0.0	0.0	0.0	-	-
2012	-	-	-	0.2	0.0	0.0	0.1	0.1	-	-	-	0.0	-	-	0.1	0.0	0.0
2017	-	0.0	-	0.9	-	0.5	0.1	-	-	-	-	-	-	-	0.0	-	-

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

FORB SPECIES	Crepis acuminata (tapertip hawkbeard)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Eriogonum brevicaulle (shortstem buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Hackelia patens (spotted stickseed)	Hedysarum boreale (Utah sweetvetch)	Iva axillaris (povertyweed)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lithospermum ruderale (western stoneseed)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Penstemon caespitosus (mat penstemon)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	
year	Nested Frequency																	
1997	1	4	1	-	11	-	4	4	-	-	10	20	3	-	9	18	12	
2002	-	-	-	2	9	-	-	-	-	-	-	13	-	-	12	19	19	
2007	-	3	-	-	2	-	3	-	18	3	-	4	-	2	5	20	16	
2012	-	4	5	-	26	-	-	-	-	-	-	7	2	-	12	25	17	
2017	-	7	1	-	2	3	-	0	15	-	-	13	-	-	6	19	1	
year	Average Cover (%)																	
1997	0.0	0.0	0.0	-	0.3	-	0.0	0.2	-	-	0.2	0.5	0.0	-	0.3	0.4	0.0	
2002	-	-	-	0.0	0.5	-	-	-	-	-	-	0.3	-	-	0.0	0.4	0.1	
2007	-	0.0	-	-	0.1	-	0.0	-	0.3	0.0	-	0.0	-	0.0	0.0	0.6	0.1	
2012	-	0.0	0.3	-	0.4	-	-	-	-	-	-	0.0	0.0	-	0.2	0.8	0.0	
2017	-	0.0	0.0	-	0.0	0.0	-	0.0	0.4	-	-	0.9	-	-	0.3	0.8	0.0	

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

FORB SPECIES	Sphaeralcea coccinea (scarlet globemallow)	Symphyotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Verbascum thapsus <sup>ai</sup> (common mullein)	Vicia americana (American vetch)	Viola (violet)
year	Nested Frequency						
1997	3	100	2	17	5	36	4
2002	6	24	1	4	-	11	-
2007	2	7	-	2	-	24	-
2012	1	5	-	3	-	-	-
2017	3	26	-	-	-	5	-
year	Average Cover (%)						
1997	0.1	1.2	0.0	0.1	0.0	0.3	0.1
2002	0.0	0.3	0.0	0.0	-	0.1	-
2007	0.0	0.1	-	0.0	-	0.2	-
2012	0.0	0.0	-	0.0	-	-	-
2017	0.0	0.6	-	-	-	0.0	-

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



**Table 17-46.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. tridentata <sup>p</sup> (basin big sagebrush)	Chrysothamnus depressus <sup>p</sup> (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	Ericameria parryi var. parryi (Parry's rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Opuntia (pricklypear)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Rosa woodsii <sup>p</sup> (Woods' rose)	Symphoricarpos oreophilus (mountain snowberry)
year	Line Intercept Cover (%)											
1997	-	-	-	-	-	-	-	-	-	-	-	-
2002	1.3	1.3	0.1	1.4	-	0.5	0	5.8	-	2.4	-	0.2
2007	0.8	0.8	0.1	0.6	-	0.6	-	13.2	0.1	2.4	-	0.4
2012	1.1	1.2	0.3	1.4	0.3	0.8	0.2	3.7	-	3.5	-	1.1
2017	0.5	1	0.3	1.9	0.9	0.9	0.7	6.8	0.4	5.5	-	0.7
year	Quadrat Cover (%)											
1997	0.8	1.0	0.4	1.9	0.0	-	0.4	6.3	0.2	1.5	-	0.1
2002	0.5	1.7	0.0	1.7	-	0.4	0.1	10.6	0.0	3.2	-	0.1
2007	0.4	0.4	0.1	0.8	-	0.4	0.0	7.4	0.2	2.0	0.0	0.0
2012	0.6	0.6	0.0	1.1	0.1	0.2	0.0	1.4	0.1	2.7	0.0	0.6
2017	0.2	1.1	0.0	1.7	0.8	0.4	0.5	1.5	0.2	4.4	-	0.6

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

**Table 17-46.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1997	100	-	40	60	0	0	60	0	63/90
2002	60	-	0	67	33	0	100	33	78/96
2007	40	-	0	100	0	50	50	0	91/100
2012	40	-	0	100	0	100	0	50	78/83
2017	20	-	0	100	0	0	100	0	75/91
<b>Artemisia tridentata ssp. tridentata<sup>p</sup> -- (basin big sagebrush)</b>									
1997	420	-	24	62	14	10	5	10	102/96
2002	380	-	11	53	37	16	68	21	83/84
2007	220	-	9	36	55	46	18	64	80/71
2012	280	200	7	64	29	36	7	21	91/96
2017	440	-	32	50	18	23	9	14	77/81
<b>Chrysothamnus depressus<sup>p</sup> -- (longflower rabbitbrush)</b>									
1997	860	80	9	91	0	0	0	0	15/39
2002	120	-	0	83	17	0	0	0	9/22
2007	180	-	0	100	0	0	0	0	19/30
2012	120	-	17	67	17	50	17	17	15/43
2017	120	-	0	100	0	0	0	0	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	1300	-	11	80	9	0	2	2	30/42
2002	2020	-	3	66	31	16	5	18	20/30
2007	1280	-	13	64	23	6	3	14	22/33
2012	1000	240	10	84	6	12	0	54	29/49
2017	1220	-	8	92	0	13	0	0	31/49
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1997	60	-	67	33	0	33	0	33	66/68
2002	20	-	0	0	100	0	0	100	67/101
2007	40	-	0	100	0	0	0	0	56/39
2012	40	-	0	100	0	100	0	0	61/64
2017	80	-	50	50	0	0	0	0	66/68

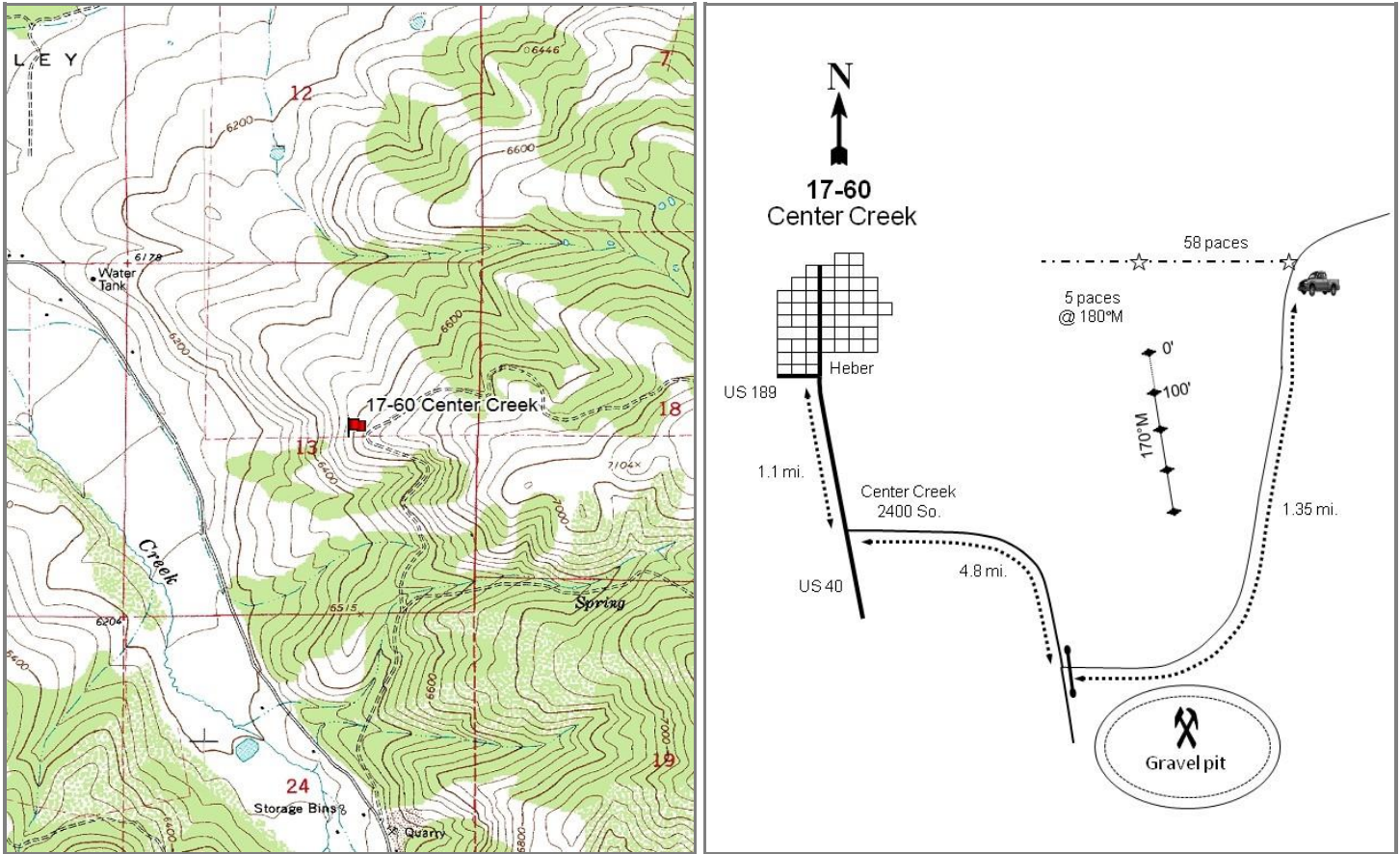
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Ericameria parryi var. parryi -- (Parry's rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	900	-	0	82	18	60	16	11	13/29
2007	520	-	23	77	0	23	0	0	20/28
2012	1160	20	21	79	0	35	28	0	29/47
2017	1260	-	3	97	0	0	0	0	16/34
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	480	60	21	75	4	0	0	0	30/29
2002	680	-	3	53	44	3	3	41	21/26
2007	160	-	0	88	13	0	0	0	23/22
2012	320	-	25	75	0	0	0	0	25/33
2017	1040	-	0	100	0	0	0	0	21/25
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1997	220	40	36	64	0	0	9	0	-/-
2002	160	20	13	88	0	0	0	13	-/-
2007	200	-	20	80	0	0	0	0	-/-
2012	80	-	100	0	0	0	0	0	-/-
2017	20	20	100	0	0	0	0	0	-/-
<b>Opuntia -- (pricklypear)</b>									
1997	140	80	29	71	0	0	0	0	5/35
2002	160	-	13	88	0	0	0	0	10/28
2007	120	-	17	83	0	0	0	0	11/27
2012	120	-	17	83	0	0	0	0	8/25
2017	60	-	0	100	0	0	0	33	10/22
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1997	120	-	17	83	0	17	67	0	40/138
2002	260	-	0	31	69	0	92	39	39/143
2007	400	-	0	95	5	0	100	0	41/95
2012	620	-	0	100	0	23	77	13	44/98
2017	560	-	0	100	0	46	54	0	50/104
<b>Rhus trilobata<sup>p</sup> -- (skunkbush sumac)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	0	0	100	0	0	0	-/-
2007	-	-	-	-	-	-	-	-	31/16
2012	-	-	-	-	-	-	-	-	170/255
2017	-	-	-	-	-	-	-	-	44/98
<b>Rosa woodsii<sup>p</sup> -- (Woods' rose)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	100	0	0	0	0	0	-/-
2007	-	-	-	-	-	-	-	-	11/18
2012	-	20	0	0	0	0	0	0	4/5
2017	-	-	-	-	-	-	-	-	21/14
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1997	80	-	0	100	0	0	0	0	46/79
2002	100	-	0	80	20	20	0	0	40/65
2007	100	-	20	80	0	40	0	0	31/43
2012	180	-	0	100	0	0	0	0	49/79
2017	80	-	0	100	0	0	0	0	44/70

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

**Table 17-46.14 - 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'	
<b>Juniperus osteosperma (Utah juniper)</b>						
2002	74	-	-	-	-	16.1
2007	76	-	11	11	37	18.3
2012	25	-	33	20	13	14.7
2017	23	15	38	15	15	14.8

## CENTER CREEK - STUDY NO. 17-60



### Location Information

USGS 7.5 min Map Info	Center Creek NW; Township 4S, Range 5E, Section 13
GPS (0' Stake)	NAD 83 UTM ZONE 12, 472300 East 4480073 North

### Transect Information

Browse Tag # (0' Stake)	174
Transect Bearing	170° magnetic
Length	500ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

### Directions to Site

From Heber City, proceed on Highway 40 towards Daniel's Canyon for 1.1 miles to Center Creek Road (2400 South). Continue for 3.0 miles until the road changes to a gravel road. Proceed for another 1.8 miles to a gravel pit, where there is a locked gate: contact Heber Valley Camp for permission and for the lock combo. Turn left and proceed 1.35 miles to a fence line; park here and walk 58 paces down the fence line. The 0-foot stake is 25 feet south of the fence line and is marked by browse tag #174.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,600ft (2,012m)
Aspect	West
Slope	22-25%
Sample Dates	06/27/2002, 08/07/2007, 08/01/2012, 07/25/2017

**Wildlife Habitat and Vegetation History**

**Table 17-60.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter

**Table 17-60.4 - 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	Phase I
2007	Mountain Big Sagebrush/Annual Grass	Phase I
2012	Mountain Big Sagebrush	Phase I
2017	Mountain Big Sagebrush/Annual Grass	Phase I

**Site Notes**

The nearest perennial source of water is Center Creek 0.6 miles to the west. A quarry is located one mile south of the study site; in 2007 the quarry was active and gravel was being transported on the road that is adjacent to the study. A dead deer carcass was found near the study site baseline in 2002, and another was found in 2007. Deer bedding areas and bones were found on the study site in 2017, and deer were observed nearby.

**Soils**

**Table 17-60.5 - 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	41.3	24.7	34.0	4.3	16.4	278.4	0.7	06/27/2002

**Site Potential**

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Gravelly Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA406UT
States and Transitions	No state and transition model is available for this ecological site.

This study site has remained in a stable state as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) plant community type since establishment in 2002; other preferred browse is rare in comparison (Table 17-60.12, Table 17-60.13). The herbaceous understory is diverse. However, most of the cover is provided by the introduced annual grass species cheatgrass (*Bromus tectorum*), which was a co-dominant site component in 2007 and 2017 (Table 17-60.10). Forbs have generally remained rare, with the exception of the 2017 sample year: annual forbs provided nearly 10% cover, most of which was attributed to the introduced species desert madwort (*Alyssum desertorum*) and redstem stork's bill (*Erodium cicutarium*) (Table 17-60.7, Table 17-60.11).

**Trend Summary Tables**

**Table 17-60.6 - 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	22.1	3.4	-	21.2	3.7	-
2007	16.2	2.0	-	18.7	2.4	-
2012	20.7	2.6	-	24.5	5.5	-
2017	19.4	7.2	-	24.2	8.1	-

**Table 17-60.7 - 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	266	153	197	145	4.4	3.8	1.1	1.9
2007	389	106	361	66	10.2	3.0	3.1	0.8
2012	295	176	113	99	7.8	5.5	0.4	1.7
2017	322	207	361	149	14.3	7.3	9.7	3.6

**Table 17-60.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2002	15.6	0.2	33.7	12.6	18.3	36.0
2007	7.4	-	39.1	10.1	12.6	42.6
2012	9.8	0.0	31.3	10.3	21.6	41.0
2017	3.7	0.6	36.1	15.0	18.0	55.7

**Table 17-60.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
2002	1	27	1	-	7
2007	1	45	5	-	29
2012	-	33	8	-	1
2017	-	29	6	-	4
Year	Days Use Per Acre (ha)				
2002	-	117.3 (289.7)	5.3 (13.2)	-	-
2007	-	53.0 (130.8)	38.9 (96.0)	-	-
2012	-	69.0 (170.5)	15.4 (38.1)	0.6 (1.4)	-
2017	-	69.0 (170.5)	2.7 (6.6)	-	-

**Table 17-60.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency										
2002	39	185	217	32	5	2	1	23	10	42	37
2007	30	93	382	12	1	9	3	4	-	17	45
2012	43	56	273	3	14	1	3	7	10	43	94
2017	32	176	218	65	2	18	21	11	-	33	62
year	Average Cover (%)										
2002	1.7	1.3	3.1	0.3	0.2	0.1	0.0	0.1	0.1	0.4	1.0
2007	1.0	0.3	9.9	0.2	0.0	0.1	0.0	0.0	-	0.2	1.6
2012	0.9	0.3	7.4	0.0	0.1	0.0	0.0	0.0	0.1	0.4	3.8
2017	2.0	3.8	10.4	1.5	0.0	1.1	0.2	0.1	-	0.5	1.8

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

**Table 17-60.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littledod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curviseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chaetopappa ericoides (rose heath)	Chenopodium <sup>a</sup> (goosefoot)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)
year	Nested Frequency																
2002	6	47	175	6	1	3	3	13	5	3	-	4	19	3	7	-	5
2007	-	14	353	-	-	1	4	-	-	-	1	-	17	-	7	15	4
2012	-	5	104	-	2	-	6	-	-	-	2	-	23	-	26	1	-
2017	-	57	331	-	-	1	10	17	-	-	-	-	12	-	15	-	10
year	Average Cover (%)																
2002	0.0	0.1	0.8	0.2	0.0	0.0	0.0	0.0	0.0	0.1	-	0.0	0.5	0.0	0.1	-	0.0
2007	-	0.0	1.9	-	-	0.0	0.0	-	-	-	0.0	-	0.2	-	0.2	0.0	0.0
2012	-	0.0	0.3	-	0.0	-	0.0	-	-	-	0.0	-	0.3	-	0.2	0.0	-
2017	-	0.2	4.5	-	-	0.0	0.9	0.1	-	-	-	-	0.2	-	0.6	-	0.0

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

FORB SPECIES																		
Cymopterus (springparsley)																		
Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)																		
Eriogonum brevicaulis (shortstem buckwheat)																		
Eriogonum racemosum (redroot buckwheat)																		
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)																		
Gilia inconspicua <sup>a</sup> (shy gilia)																		
Helianthus annuus <sup>a</sup> (common sunflower)																		
Heliomeris multiflora var. multiflora (showy goldeneye)																		
Heterotheca villosa (hairy false goldenaster)																		
Lactuca serriola <sup>ai</sup> (prickly lettuce)																		
Mentzelia <sup>a</sup> (blazingstar)																		
Microsteris gracilis <sup>a</sup> (slender phlox)																		
Mirabilis linearis (narrowleaf four o'clock)																		
Phlox longifolia (longleaf phlox)																		
Polygonum douglasii <sup>a</sup> (Douglas' knotweed)																		
Silene antirrhina <sup>a</sup> (sleepy silene)																		
Sphaeralcea coccinea (scarlet globemallow)																		
year	Nested Frequency																	
2002	15	20	1	4	20	1	2	3	32	-	-	27	-	18	-	-	20	
2007	4	-	-	1	113	2	-	-	10	-	2	3	-	1	-	-	17	
2012	4	2	-	2	5	-	-	15	26	3	4	-	-	7	-	3	15	
2017	6	11	-	6	183	1	-	10	15	-	0	-	15	-	2	-	29	
year	Average Cover (%)																	
2002	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.4	-	-	0.1	-	0.1	-	-	0.3	
2007	0.0	-	-	0.0	1.2	0.0	-	-	0.2	-	0.0	0.0	-	0.0	-	-	0.1	
2012	0.0	0.0	-	0.0	0.0	-	-	0.3	0.6	0.0	0.0	-	-	0.0	-	0.0	0.2	
2017	0.0	0.1	-	0.0	4.9	0.0	-	0.1	0.7	-	0.0	-	0.1	-	0.0	-	0.6	

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

FORB SPECIES			
Taraxacum officinale (common dandelion)			
Tragopogon dubius <sup>ai</sup> (yellow salsify)			
Viola (violet)			
year	Nested Frequency		
2002	-	-	-
2007	-	-	2
2012	-	4	-
2017	5	10	-
year	Average Cover (%)		
2002	-	-	-
2007	-	-	0.0
2012	-	0.0	-
2017	0.0	0.1	-

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



**Table 17-60.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Opuntia (pricklypear)	Prunus virginiana <sup>p</sup> (chokecherry)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)								
2002	0	20.7	0.1	2.2	0.3	0.2	-	0.5	0.9
2007	0	18.6	0.1	0.3	0.6	0.2	-	0.1	1.2
2012	-	24.5	0.2	2.9	0.5	0.2	-	-	1.7
2017	-	24.1	0.2	5.1	0.5	0.6	-	0.1	1.7
year	Quadrat Cover (%)								
2002	0.4	21.4	0.1	2.0	0.5	0.3	-	0.3	0.6
2007	0.1	15.6	0.0	0.3	0.3	0.4	-	0.4	1.1
2012	1.0	19.3	0.0	1.3	0.5	0.1	-	0.4	0.8
2017	0.4	19.0	0.2	4.4	0.8	0.6	0.0	0.0	1.1

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

**Table 17-60.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
2002	160	-	25	75	0	13	88	0	37/54
2007	140	-	14	71	14	0	86	0	34/44
2012	80	20	25	75	0	0	50	0	44/60
2017	60	-	33	67	0	0	67	0	38/42
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
2002	3020	-	2	70	28	32	23	21	70/97
2007	2120	-	1	67	32	30	27	16	70/98
2012	2040	380	1	82	17	30	14	5	66/96
2017	2140	20	4	64	33	22	26	24	71/123
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
2002	60	-	0	100	0	0	0	33	24/38
2007	20	-	0	100	0	0	0	0	18/26
2012	40	-	0	100	0	0	0	0	22/27
2017	100	-	0	100	0	0	0	0	31/46
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
2002	3620	-	0	95	6	0	0	4	21/25
2007	1160	360	9	90	2	3	5	7	20/19
2012	1520	200	7	93	0	0	0	0	26/36
2017	6340	20	1	99	0	0	0	0	27/27
<b>Linanthus pungens -- (granite prickly phlox)</b>									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	40	-	0	100	0	0	0	0	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Mahonia repens -- (creeping barberry)</b>									
2002	2260	-	0	100	0	0	0	0	7/10
2007	4400	-	1	99	0	0	0	1	9/11
2012	2040	-	0	100	0	0	0	0	9/13
2017	2360	-	0	100	0	0	0	0	7/11

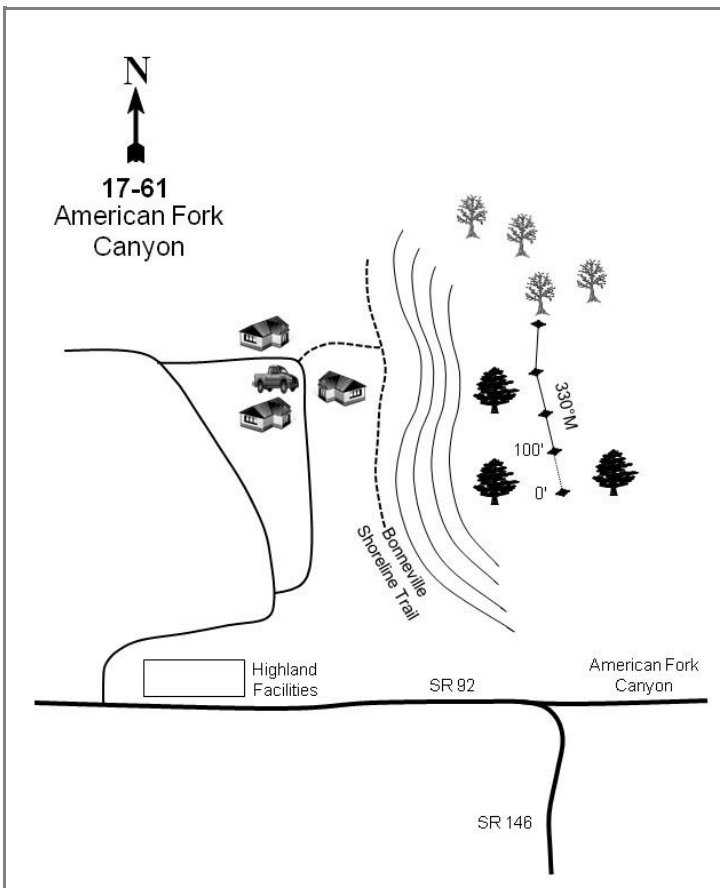
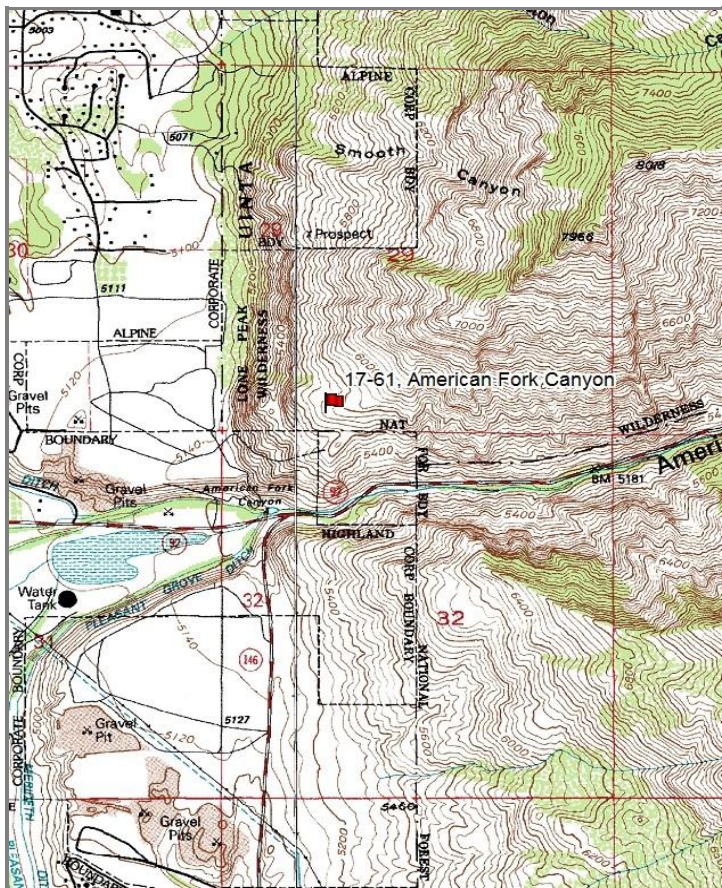
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Opuntia -- (pricklypear)</b>									
2002	1080	-	11	87	2	0	0	4	11/22
2007	1000	20	8	88	4	0	0	6	10/21
2012	940	-	4	96	0	0	2	4	12/24
2017	1000	-	4	92	4	4	0	8	12/30
<b>Prunus virginiana<sup>P</sup> -- (chokecherry)</b>									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	100	0	0	0	0	0	-/-
<b>Purshia stansburiana<sup>P</sup> -- (Stansbury cliffrose)</b>									
2002	-	-	-	-	-	-	-	-	215/170
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	0	0	100	0	100	100	-/-
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
2002	160	-	0	88	13	0	88	0	26/67
2007	220	-	9	82	9	0	64	9	21/61
2012	140	-	0	100	0	0	71	0	23/46
2017	80	-	25	50	25	0	75	25	30/45
<b>Rhus trilobata<sup>P</sup> -- (skunkbush sumac)</b>									
2002	-	-	-	-	-	-	-	-	69/130
2007	-	-	-	-	-	-	-	-	63/142
2012	-	-	-	-	-	-	-	-	83/164
2017	-	-	-	-	-	-	-	-	64/125
<b>Ribes<sup>P</sup> -- (currant)</b>									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	84/187
2017	-	-	-	-	-	-	-	-	-/-
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
2002	360	-	0	94	6	6	6	0	26/42
2007	320	-	0	94	6	6	0	6	28/52
2012	480	-	0	88	13	0	0	4	32/54
2017	900	-	0	96	4	0	0	2	29/56

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

**Table 17-60.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density		Size Class Distribution				Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2017	2	-	50	-	-	50	18.0

## AMERICAN FORK CANYON - STUDY NO. 17-61



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Timpanogos Cave SW; Township 4S, Range 2E, Section 29  
NAD 83 UTM ZONE 12, 436450 East 4476459 North

### Transect Information

Browse Tag # (0' Stake)  
Transect Bearing  
Length  
Belt Placement 74ft long  
Belt Marker Placement

Not Available  
330° magnetic (Line 4: 350° magnetic)  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Lines 2-3: 48ft and  
Belt 1: No Rebar, Belt 2: 1ft

### Directions to Site

Travel to American Fork Canyon on Highway 92. Toward the mouth of the canyon, there is a gravel pit on the north side of the road along with the Highland Facilities building. Turn left on the road and continue north just before the buildings. Continue up this road until a very steep, burned slope is encountered: the site lies on the first bench of this slope. Park here. Walk east up the slope about 1/4 of a mile to another bench; the study site is on this bench. GPS coordinates will be helpful on this site, and trail access is found in the neighborhood at the base of the slope.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	5,700ft (1,737m)
Aspect	West
Slope	20-25%
Sample Dates	08/08/2002, 07/26/2007, 07/26/2012, 07/11/2017

**Table 17-61.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Alpine Fire	-	June 2017	99

**Wildlife Habitat and Vegetation History**

**Table 17-61.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
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**Table 17-61.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2002	Annual Grass/Mountain Big Sagebrush	Phase I
2007	Annual Grass/Mountain Big Sagebrush	Phase I
2012	Annual Grass/Mountain Big Sagebrush	Phase I
2017	Juniper	Phase I

**Site Notes**

This study site was established to monitor Rocky Mountain bighorn sheep use; the sheep were transplanted to the area towards the end of 1999, but the study was not established until 2002. The nearest perennial source of water is American Fork River 0.25 miles south of the study. There is no 100-foot stake on this study site.

**Soils**

**Table 17-61.5 - 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	7.4	29.3	46.7	24.0	6.3	105.6	313.6	0.9	08/08/2002

**Site Potential**

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Shallow Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA446UT
States and Transitions	No state and transition model is available for this ecological site.

From study site establishment in 2002 through the 2012 sample year, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) was the most dominant browse species; Utah juniper trees (*Juniperus osteosperma*) were also scattered throughout the site (Table 17-61.12, Table 17-61.13). The herbaceous understory was abundant, but almost entirely composed of the introduced annual grass cheatgrass (*Bromus tectorum*). A fire in June of 2017 removed nearly all of the shrubs and herbaceous species -- the only herbaceous species observed in 2017 were cheatgrass and the introduced annual forbs desert madwort (*Alyssum desertorum*), redstem stork's bill (*Erodium cicutarium*), and tall tumbled mustard (*Sisymbrium altissimum*) (Table 17-61.10, Table 17-61.11). Many partially-burned trees survived, however, transitioning the site into one dominated by juniper (photos, Table 17-61.12, Table 17-61.13, Table 17-61.14).

**Trend Summary Tables**

**Table 17-61.6 - 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	3.9	-	7.8	7.0	-	14.8
2007	3.9	0.1	4.6	8.3	0.4	15.9
2012	6.2	0.4	12.0	11.5	0.4	19.2
2017	0.1	-	2.0	0.5	-	10.0

**Table 17-61.7 - 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	425	9	100	1	40.9	0.0	1.2	0.0
2007	457	112	263	3	37.4	2.7	3.8	0.0
2012	412	119	231	8	32.4	6.1	2.0	0.1
2017	11	-	16	-	0.2	-	0.2	-

**Table 17-61.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2002	4.7	0.1	40.7	1.5	21.6	52.3
2007	1.5	0.3	43.1	0.3	17.3	51.2
2012	3.9	0.5	34.4	0.7	21.9	59.7
2017	41.2	0.1	28.1	3.3	26.9	2.4

**Table 17-61.9 - 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/Big Horn Sheep	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency			
2002	43	7	-	18
2007	36	3	-	8
2012	26	-	1	12
2017	5	-	-	-
Days Use Per Acre (ha)				
2002	84.5 (208.6)	18.1 (44.7)	-	-
2007	55.6 (137.4)	6.7 (16.6)	-	-
2012	71.7 (177.1)	4.7 (11.6)	-	-
2017	8.7 (21.5)	-	-	-

**Table 17-61.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency					
2002	3	425	-	6	1	2
2007	-	457	2	14	46	66
2012	-	412	-	29	14	83
2017	-	11	-	-	-	-
year	Average Cover (%)					
2002	0.0	40.9	-	0.0	0.0	0.0
2007	-	37.4	0.0	0.4	0.4	1.9
2012	-	32.4	-	1.2	0.4	4.4
2017	-	0.2	-	-	-	-

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

**Table 17-61.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum <sup>ai</sup> (desert madwort)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Cryptantha (cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Erigeron (fleabane)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Heterotheca villosa (hairy false goldenaster)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Salsola tragus <sup>ai</sup> (prickly Russian thistle)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sisymbrium altissimum <sup>ai</sup> (tall tumbled mustard)	Tragopogon dubius <sup>ai</sup> (yellow salsify)
year	Nested Frequency													
2002	63	5	-	-	4	4	-	30	1	-	1	3	5	-
2007	54	2	2	3	7	38	-	134	-	16	-	199	7	1
2012	128	-	32	1	3	7	7	8	-	10	-	123	14	2
2017	13	-	-	-	-	-	-	7	-	-	-	-	0	-
year	Average Cover (%)													
2002	0.2	0.2	-	-	0.0	0.0	-	0.6	0.0	-	0.0	0.0	0.3	-
2007	0.2	0.0	0.0	0.0	0.0	0.1	-	2.0	-	0.0	-	1.5	0.1	0.0
2012	1.3	-	0.1	0.0	0.0	0.0	0.1	0.0	-	0.0	-	0.5	0.1	0.0
2017	0.2	-	-	-	-	-	-	0.0	-	-	-	-	0.0	-

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

**Table 17-61.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES						
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)						
Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)						
Gutierrezia sarothrae (broom snakeweed)						
Juniperus osteosperma <sup>i</sup> (Utah juniper)						
Opuntia (pricklypear)						
Purshia stansburiana <sup>p</sup> (Stansbury cliffrose)						
year	Line Intercept Cover (%)					
2002	4.4	-	-	14.8	-	2.6
2007	7.2	-	0.2	15.9	0.2	1.1
2012	10.4	0	-	19.2	0.4	1.1
2017	0.5	-	-	10	-	-
year	Quadrat Cover (%)					
2002	3.5	-	-	7.8	-	0.5
2007	3.4	-	0.1	4.6	0.0	0.5
2012	6.0	0.0	0.4	12.0	0.1	0.2
2017	0.1	-	-	2.0	-	-

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



**Table 17-61.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

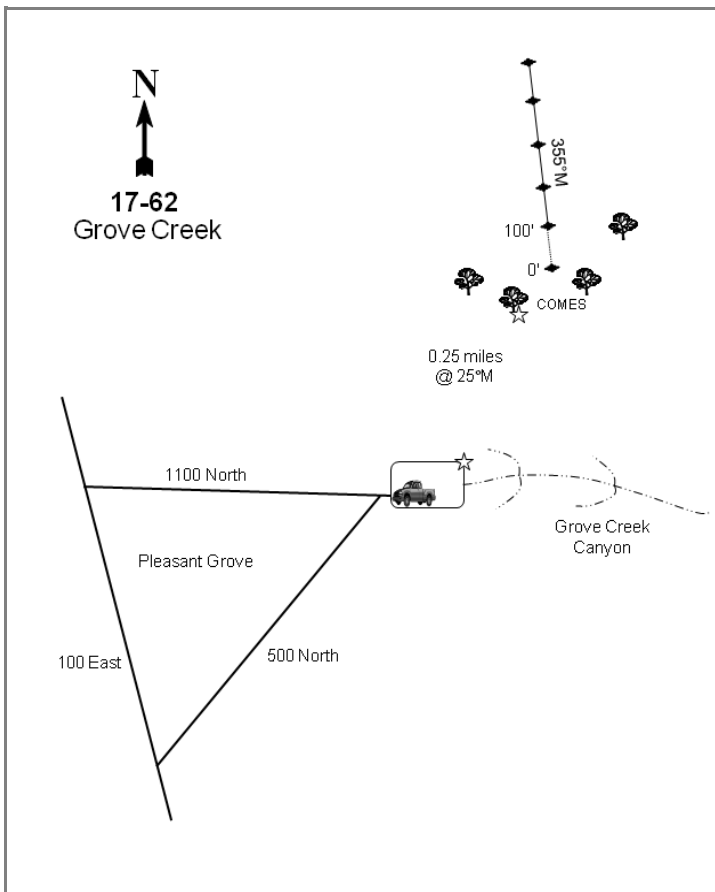
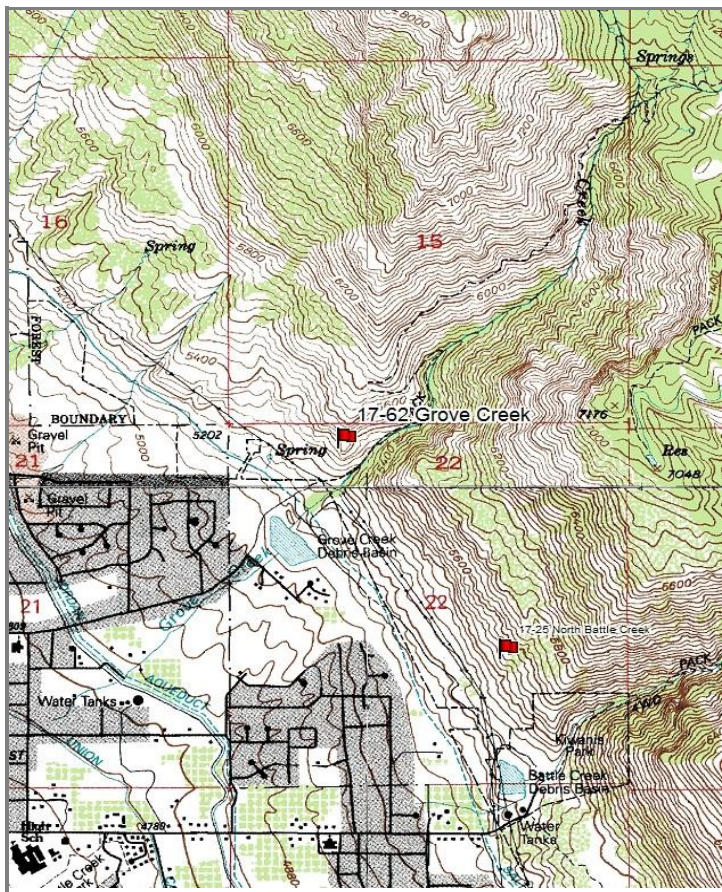
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
2002	1500	-	3	72	25	19	20	17	57/80
2007	1000	80	2	86	12	30	52	4	61/92
2012	980	60	2	84	14	20	57	69	63/90
2017	20	-	0	100	0	100	0	100	53/83
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
2002	20	-	0	0	100	0	0	0	58/112
2007	20	-	0	0	100	0	0	0	65/97
2012	40	-	0	50	50	0	0	50	66/90
2017	-	-	-	-	-	-	-	-	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
2002	-	-	-	-	-	-	-	-	-/-
2007	100	-	0	100	0	0	0	0	23/28
2012	80	20	0	100	0	0	0	0	30/43
2017	-	-	-	-	-	-	-	-	20/38
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
2002	100	-	0	100	0	0	0	0	-/-
2007	100	-	0	100	0	0	0	0	-/-
2012	100	-	0	100	0	0	0	0	-/-
2017	60	-	0	67	33	0	0	100	-/-
<b>Opuntia -- (pricklypear)</b>									
2002	80	-	25	75	0	0	0	0	8/13
2007	120	-	17	83	0	0	0	0	9/33
2012	160	-	0	88	13	0	0	13	9/30
2017	-	-	-	-	-	-	-	-	-/-
<b>Purshia stansburiana<sup>P</sup> -- (Stansbury cliffrose)</b>									
2002	120	-	0	33	67	50	50	17	108/110
2007	120	-	0	17	83	33	67	17	129/123
2012	100	-	40	0	60	20	0	0	120/111

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

**Table 17-61.14 - 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' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2002	38	-	-	-	-	-	20.4
2007	36	-	-	17	22	61	30.7
2012	40	-	6	-	18	76	33.6
2017	29	-	-	6	19	75	35.6

## GROVE CREEK - STUDY NO. 17-62



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Timpanogos Cave SW; Township 5S, Range 2E, Section 22  
NAD 83 UTM ZONE 12, 439692 East 4469781 North

### Transect Information

Browse Tag # (0' Stake)	266
Transect Bearing	355° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Belt 1: No Rebar, Belt 2: 3ft, Belt 3: 2ft, Belt 4: 4ft

### Directions to Site

From the junction of Highways 89 (State St.) and 146 in Pleasant Grove, continue on Highway 146 to 500 North, just before the school. Continue on this road until it comes to the parking lot at the mouth of Grove Creek Canyon. From the parking lot, follow the ridge for 0.25 miles at 25 degrees magnetic to the 0-foot stake in the cliffrose. The 300-foot stake is missing.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	5,350ft (1,631m)
Aspect	Southwest
Slope	40%
Sample Dates	08/08/2002, 08/06/2007, 07/27/2012, 07/11/2017

**Wildlife Habitat and Vegetation History****Table 17-62.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter

**Table 17-62.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2002	Stansbury Cliffrose/Mountain Big Sagebrush/Annual Grass	NA
2007	Stansbury Cliffrose/Mountain Big Sagebrush/Annual Grass	NA
2012	Stansbury Cliffrose/Mountain Big Sagebrush/Annual Grass	NA
2017	Stansbury Cliffrose/Mountain Big Sagebrush	NA

**Site Notes**

This study was established to monitor deer and bighorn sheep winter range; bighorn sheep were transplanted into the area in the late 1990s. This study has become increasingly important winter range as a result of the expansion of residential development. Big game bedding areas were seen on the site in 2012. The nearest perennial source of water is Grove Creek, which is 400 feet south of the study site.

**Soils****Table 17-62.5 - 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	33.3	34.7	32.0	3.4	11.4	198.4	0.7	08/07/2002

**Site Potential**

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Upland Stony Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

Stansbury cliffrose (*Purshia stansburiana*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) have been the dominant browse species on this study site since establishment in 2002; although other shrubs are, also present (Table 17-62.12, Table 17-62.13). The herbaceous understory was dominated by the introduced annual grass cheatgrass (*Bromus tectorum*) from 2002 through 2012. In 2017, however, most herbaceous cover was provided by the introduced annual forb redstem stork's bill (*Erodium cicutarium*). In addition, the noxious and introduced annual grass species jointed goatgrass (*Aegilops cylindrica*) was present in 2012, and the noxious and introduced annual forb yellow star- thistle (*Centaurea solstitialis*) was observed in most study years (Table 17-62.7, Table 17-62.10, Table 17-62.11). Without a major disturbance, this site is expected to remain in a similar state in future sample years, though annual grass may increase.

**Trend Summary Tables****Table 17-62.6 - 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	5.9	-	-	4.7	-	-
2007	2.5	0.3	-	6.1	-	-
2012	5.8	0.2	-	8.7	0.2	-
2017	3.8	0.1	-	9.2	0.6	-

**Table 17-62.7 - 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	398	138	280	40	19.2	4.3	3.9	0.5
2007	432	110	321	30	20.0	4.2	6.1	0.4
2012	406	148	311	57	20.6	8.8	6.5	1.7
2017	250	128	372	75	7.8	6.1	18.1	1.7

**Table 17-62.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2002	22.7	0.2	31.4	15.9	9.6	35.3
2007	10.9	0.2	51.1	12.3	6.4	35.1
2012	10.9	-	34.3	10.5	8.8	46.8
2017	22.5	-	29.9	18.0	8.5	36.6

**Table 17-62.9 - 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	Coyote	Mule Deer/Big Horn Sheep	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2002	-	36	1	-
2007	-	36	14	8
2012	-	26	1	-
2017	-	32	-	3
Year	Days Use Per Acre (ha)			
2002	-	71.7 (177.1)	4.7 (11.6)	-
2007	-	120.0 (296.3)	4.0 (9.9)	-
2012	8.7 (21.5)*	37.5 (92.7)	-	-
2017	-	108.6 (268.2)	-	-

\*Pellets per acre (ha)

**Table 17-62.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency						
Aegilops cylindrica <sup>mi</sup> (jointed goatgrass)	-	60	396	6	1	37	114
Bromus arvensis <sup>ai</sup> (field brome)	-	9	432	2	-	10	106
Bromus tectorum <sup>ai</sup> (cheatgrass)	2	-	406	4	-	4	143
Poa bulbosa <sup>i</sup> (bulbous bluegrass)	-	3	250	9	-	1	123
Poa fendleriana (muttongrass)							
Poa secunda (Sandberg bluegrass)							
Pseudoroegneria spicata (bluebunch wheatgrass)							
year	Average Cover (%)						
2002	-	0.3	18.9	0.1	0.0	0.4	3.8
2007	-	0.0	20.0	0.0	-	0.1	4.1
2012	0.0	-	20.6	0.2	-	0.1	8.6
2017	-	0.0	7.8	0.1	-	0.0	6.0

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

**Table 17-62.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Alyssum desertorum <sup>ai</sup> (desert madwort)	135	6	1	5	0	3	-	154	-	-	-	-	-	145	-	-	4
Ambrosia psilostachya (Cuman ragweed)	174	5	-	2	-	-	6	16	1	-	2	1	-	281	-	3	1
Antennaria (pussytoes)	273	44	-	2	-	12	5	10	-	2	4	-	1	195	2	-	9
Artemisia ludoviciana (white sagebrush)	244	39	-	3	-	3	1	100	-	-	-	1	4	327	5	-	6
Astragalus utahensis (Utah milkvetch)																	
Camelina microcarpa <sup>ai</sup> (littlerpod false flax)																	
Centaurea solstitialis <sup>mi</sup> (yellow star-thistle)																	
Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)																	
Cirsium (thistle)																	
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																	
Convolvulus arvensis <sup>mi</sup> (field bindweed)																	
Cryptantha (cryptantha)																	
Descurainia pinnata <sup>a</sup> (western tansymustard)																	
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)																	
Galium aparine <sup>a</sup> (stickywilly)																	
Lactuca serriola <sup>ai</sup> (prickly lettuce)																	
Lappula occidentalis <sup>a</sup> (flatspine stickseed)																	
year	Average Cover (%)																
2002	0.4	0.2	0.0	0.0	0.0	0.0	-	0.8	-	-	-	-	-	2.3	-	-	0.2
2007	0.6	0.0	-	0.0	-	-	0.0	0.0	0.0	-	0.0	0.0	-	5.3	-	0.0	0.0
2012	1.8	1.5	-	0.1	-	0.0	0.0	0.0	-	0.0	0.0	-	0.0	4.5	0.0	-	0.0
2017	1.6	0.5	-	0.0	-	0.1	0.0	0.5	-	-	-	0.1	0.0	15.5	0.2	-	0.2

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

FORB SPECIES				
Lathyrus brachycalyx (Bonneville pea)				
Silene antirrhina <sup>a</sup> (sleepy silene)				
Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)				
Tragopogon dubius <sup>ai</sup> (yellow salsify)				
year	Nested Frequency			
2002	28	5	7	4
2007	19	43	4	-
2012	9	9	21	-
2017	32	-	4	-
year	Average Cover (%)			
2002	0.3	0.0	0.1	0.0
2007	0.3	0.1	0.0	-
2012	0.1	0.0	0.1	-
2017	1.0	-	0.0	-

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

**Table 17-62.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES						
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)						
Celtis laevigata var. reticulata (netleaf hackberry)						
Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)						
Gutierrezia sarothrae (broom snakeweed)						
Purshia stansburiana <sup>p</sup> (Stansbury cliffrose)						
Rhus trilobata <sup>p</sup> (skunkbush sumac)						
year	Line Intercept Cover (%)					
2002	0.8	-	1.2	-	2.7	-
2007	0.3	0	0.8	-	5	-
2012	1.4	-	1.7	0.2	5.4	0.2
2017	1.9	-	1.6	0.6	5.7	-
year	Quadrat Cover (%)					
2002	1.6	-	1.5	-	2.7	0.0
2007	0.2	0.0	1.0	0.3	1.1	0.1
2012	1.1	-	0.9	0.2	3.8	0.0
2017	1.2	0.0	1.2	0.1	1.5	-

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

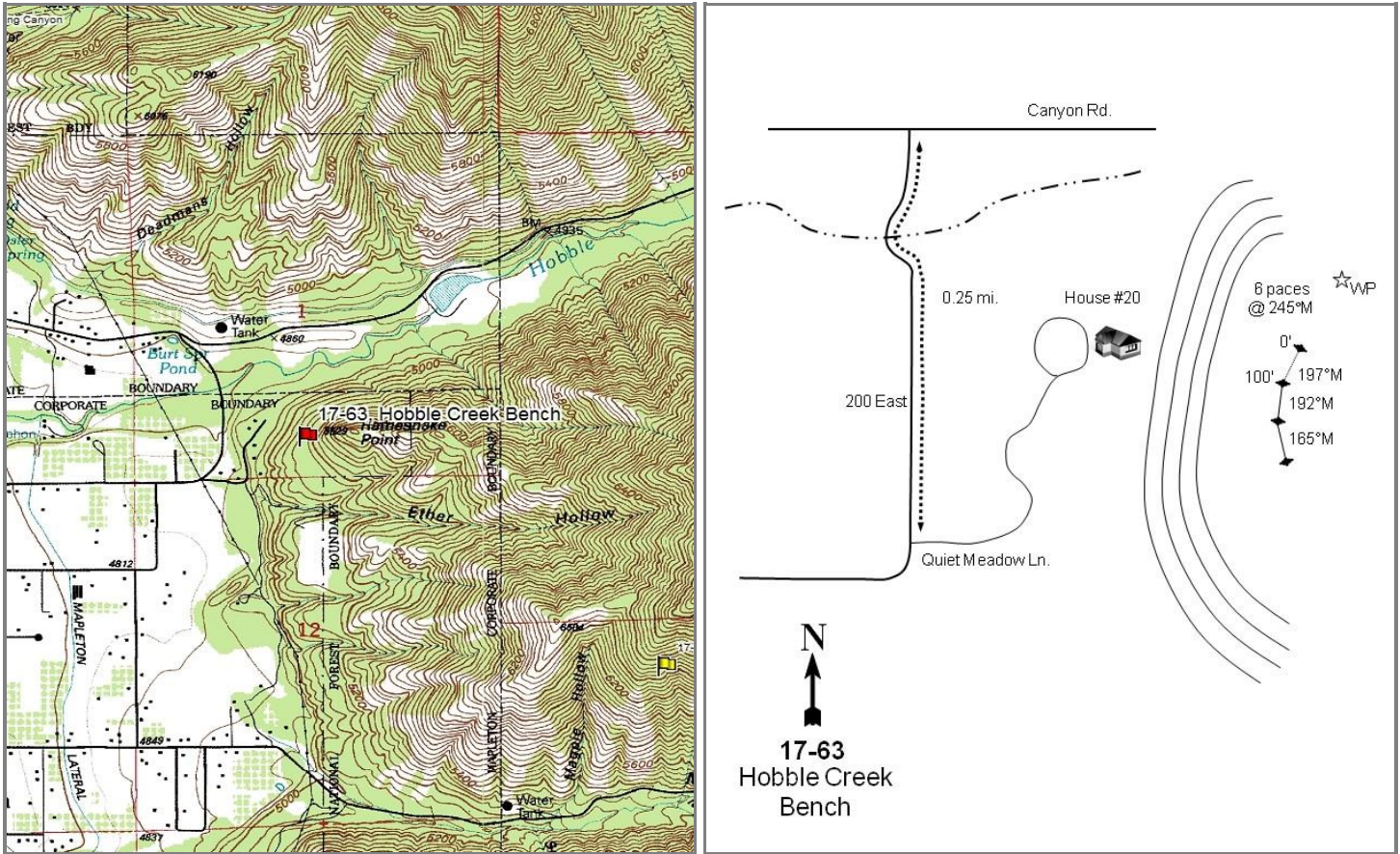
**Table 17-62.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
2002	380	-	0	47	53	26	37	37	60/87
2007	240	-	0	58	42	17	58	42	64/103
2012	160	-	0	88	13	38	13	25	78/109
2017	180	-	11	78	11	33	33	0	68/115
<b>Celtis laevigata var. reticulata -- (netleaf hackberry)</b>									
2002	-	-	-	-	-	-	-	-	-/-
2007	20	-	100	0	0	0	0	0	107/273
2012	-	-	-	-	-	-	-	-	44/86
2017	-	-	-	-	-	-	-	-	28/80
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
2002	180	-	0	56	44	11	0	22	65/105
2007	140	-	0	71	29	0	0	14	92/133
2012	100	-	0	100	0	0	0	60	87/147
2017	60	-	0	100	0	33	67	0	88/164
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
2002	40	-	0	100	0	0	0	0	20/30
2007	100	-	0	100	0	20	0	0	26/33
2012	180	60	0	89	11	0	0	22	30/50
2017	200	-	0	70	30	0	0	20	22/30
<b>Purshia stansburiana<sup>P</sup> -- (Stansbury cliffrose)</b>									
2002	120	-	50	50	0	17	17	0	174/210
2007	80	-	0	75	25	50	25	25	180/218
2012	140	-	29	71	0	29	0	0	183/259
2017	120	-	17	83	0	33	17	0	203/256
<b>Rhus trilobata<sup>P</sup> -- (skunkbush sumac)</b>									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	126/307
2017	-	-	-	-	-	-	-	-	125/249

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



## HOBBLE CREEK BENCH - STUDY NO. 17-63



### Location Information

USGS 7.5 min Map Info                      Springville SE; Township 8S, Range 3E, Section 01  
 GPS (0' Stake)                                NAD 83 UTM ZONE 12, 453021 East 4444162 North

### Transect Information

Browse Tag # (0' Stake)                      183  
 Transect Bearing                                197° magnetic  
 Length    (The study curves; use GPS to find stakes) 300ft  
 Belt Placement                                  Line 1 (97ft), Line 2 (11ft, 37ft & 95ft), Line 3 (34ft)  
 Belt Marker Placement                        No Rebar

### Directions to Site

On Highway 89 in Mapleton, take 1650 South, which will change into 1600 North. Follow 1600 North until it junctions with Quiet Meadow Lane (1600 North ends at this point). Park in front of house #20: it has a pond in the front yard. Ask owner, Mark Petersen (ownership may have changed), for permission to walk into his backyard. Go up his driveway to a steep footpath up the hill. Hike up the steep hill until a bench is reached; a half-high witness post is located in a clearing. The 0-foot stake is 6 paces at 245 degrees magnetic from the witness post and is marked by browse tag #183. All line stakes are rebar.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,120ft (1,561m)
Aspect	West
Slope	7-15%
Sample Dates	07/26/2002, 09/19/2012, 07/06/2017

**Wildlife Habitat and Vegetation History**

**Table 17-63.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter

**Table 17-63.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2002	Bitterbrush/Mountain Big Sagebrush/Bulbous Bluegrass	NA
2012	Bitterbrush/Mountain Big Sagebrush/Bulbous Bluegrass	NA
2017	Bitterbrush/Mountain Big Sagebrush/Bulbous Bluegrass	NA

**Site Notes**

The study is situated on a lake terrace left by ancient Lake Bonneville. Houses are located at the base of the slope, though future development may be unlikely due to the terrain. A geocache was found in 2017.

**Site Potential**

1981 - 2010 Average Annual Precipitation	23 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

This study site has remained dominated by antelope bitterbrush (*Purshia tridentata*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with Gambel oak (*Quercus gambelii*) patches scattered throughout the area; cover and health of bitterbrush and sagebrush have exhibited an overall decrease over the study period (photos, Table 17- 63.12, Table 17-63.13). The herbaceous understory has remained fairly diverse and very abundant, but has been dominated by the introduced perennial grass bulbous bluegrass (*Poa bulbosa*) in all sample years. The introduced annual grass cheatgrass (*Bromus tectorum*) is also present in increasing amounts, and the introduced annual forb redstem stork's bill (*Erodium cicutarium*) contributed nearly 24% cover in 2017 (Table 17-63.7, Table 17-63.10, Table 17-63.11). If shrub health and cover continue to decrease, this study site risks transitioning into one dominated by introduced perennial grasses and/or cheatgrass in future sample years.

**Trend Summary Tables**

**Table 17-63.6 - 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	16.2	0.3	-	22.5	-	-
2012	12.6	0.3	-	25.9	0.6	-
2017	14.8	0.0	-	20.9	0.1	-

**Table 17-63.7 - 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	65	466	19	57	0.6	56.4	0.2	2.6
2012	348	405	221	78	16.7	43.8	3.8	3.6
2017	381	422	334	56	17.4	35.7	25.4	2.5

**Table 17-63.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2002	3.1	8.0	26.4	0.5	0.1	75.6
2012	0.9	2.0	37.8	0.1	0.1	79.2
2017	1.6	1.0	67.2	1.4	0.1	79.4

**Table 17-63.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
2002	28	13	2
2012	45	6	5
2017	16	5	3
Year	Days Use Per Acre (ha)		
	2002	58.3 (144.0)	22.8 (56.3)
2012	62.3 (153.9)	11.4 (28.1)	-
2017	20.8 (51.3)	3.4 (8.3)	-

**Table 17-63.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Aristida purpurea (purple threeawn)	Bromus briziformis <sup>ai</sup> (rattlesnake brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus glaucus ssp. glaucus (blue wildrye)	Hesperostipa comata (needle and thread)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Secale cereale <sup>ai</sup> (cereal rye)	Sporobolus cryptandrus (sand dropseed)
year	Nested Frequency									
2002	44	-	65	-	29	460	5	29	-	32
2012	82	-	348	0	36	343	9	8	-	54
2017	34	4	381	10	42	402	31	19	2	86
year	Average Cover (%)									
2002	1.1	-	0.6	-	1.2	52.1	0.0	0.5	-	1.5
2012	5.6	-	16.7	0.0	3.6	31.5	0.3	0.5	-	2.2
2017	0.9	0.0	17.4	0.1	3.9	27.1	1.0	0.5	0.0	2.2

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

**Table 17-63.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Artemisia ludoviciana (white sagebrush)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Chamaesyce (sandmat)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cymopterus (springparsley)	Erigeron divergens <sup>a</sup> (spreading fleabane)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium aparine <sup>a</sup> (stickywilly)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Heterotheca villosa (hairy false goldenaster)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Linum lewisii (Lewis flax)
year	Nested Frequency																
2002	2	3	-	0	14	2	-	4	2	1	-	5	4	-	6	-	-
2012	7	-	4	3	11	-	3	3	-	5	91	39	2	1	14	7	3
2017	1	13	-	5	5	17	-	1	-	-	17	295	10	-	14	4	-
year	Average Cover (%)																
2002	0.0	0.0	-	0.0	0.8	0.0	-	0.0	0.0	0.0	-	0.0	0.0	-	0.6	-	-
2012	0.0	-	0.2	0.0	1.6	-	0.0	0.0	-	0.0	2.1	0.2	0.1	0.0	1.0	0.3	0.0
2017	0.0	0.1	-	0.2	0.8	0.1	-	0.0	-	-	0.7	23.7	0.2	-	0.6	0.0	-

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

FORB SPECIES	Lithospermum ruderale (western stoneseed)	Microsteris gracilis <sup>a</sup> (slender phlox)	Oenothera caespitosa (tufted evening primrose)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sphaeralcea coccinea (scarlet globemallow)	Tragopogon dubius <sup>ai</sup> (yellow salsify)
year	Nested Frequency							
2002	12	2	-	16	-	-	0	6
2012	23	-	4	2	-	2	-	143
2017	13	-	-	2	10	-	3	59
year	Average Cover (%)							
2002	0.9	0.0	-	0.1	-	-	0.0	0.1
2012	0.8	-	0.0	0.0	-	0.0	-	1.1
2017	0.7	-	-	0.0	0.1	-	0.0	0.6

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

**Table 17-63.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)					
	year	Line Intercept Cover (%)				
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	2002	2.1	-	-	17.9	2.5
	2012	2	0.6	0	21.5	2.4
	2017	1.5	0.1	-	17	2.4
Gutierrezia sarothrae (broom snakeweed)	2002	2.1	0.2	0.1	13.5	0.6
	2012	1.8	0.1	0.2	10.2	0.6
	2017	1.5	0.0	0.0	11.7	1.6
Opuntia fragilis (brittle pricklypear)	2002	2.1	0.2	0.1	13.5	0.6
	2012	1.8	0.1	0.2	10.2	0.6
	2017	1.5	0.0	0.0	11.7	1.6
Purshia tridentata <sup>p</sup> (antelope bitterbrush)	2002	2.1	0.2	0.1	13.5	0.6
	2012	1.8	0.1	0.2	10.2	0.6
	2017	1.5	0.0	0.0	11.7	1.6
Quercus gambelii <sup>p</sup> (Gambel oak)	2002	2.1	0.2	0.1	13.5	0.6
	2012	1.8	0.1	0.2	10.2	0.6
	2017	1.5	0.0	0.0	11.7	1.6

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

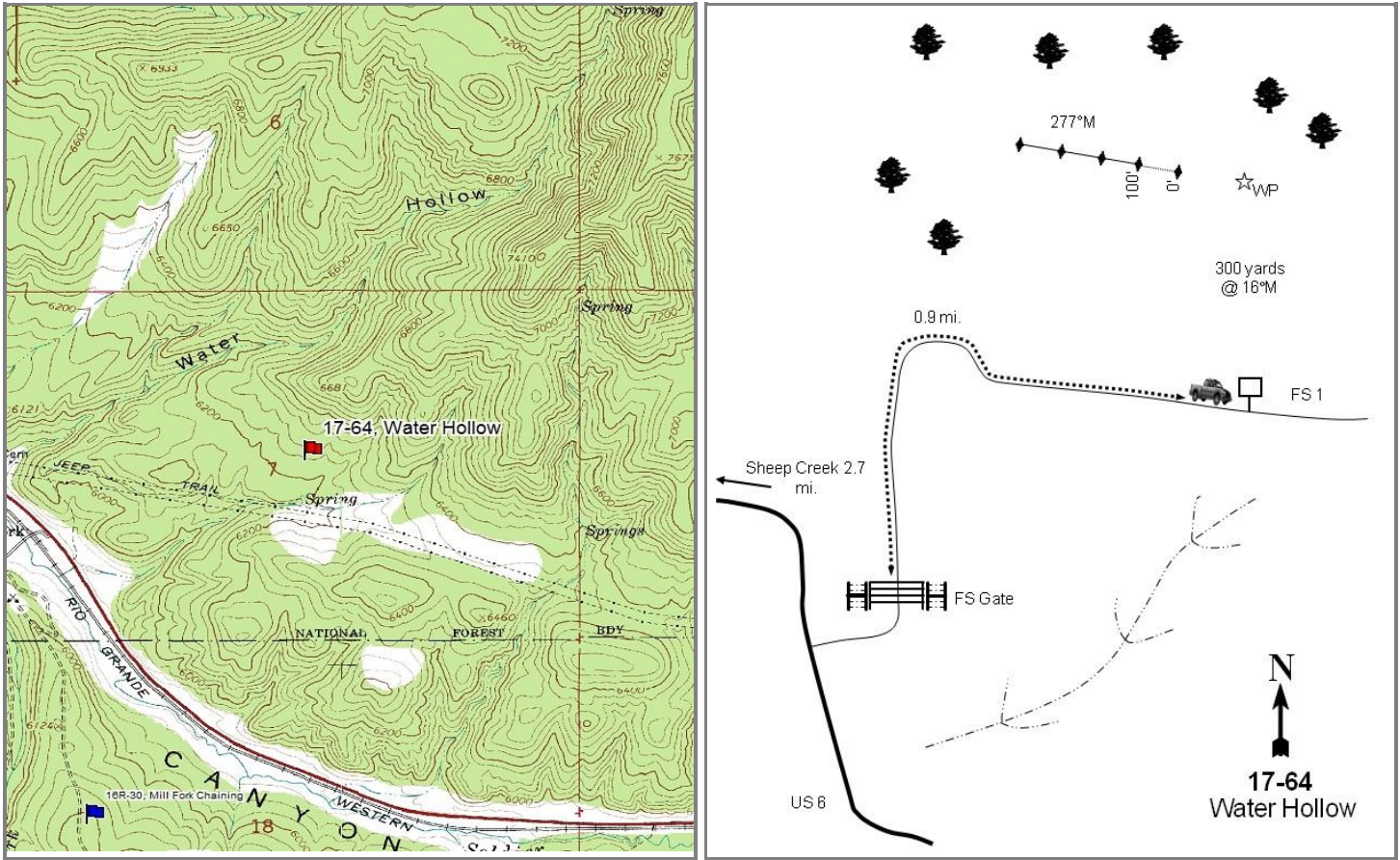
**Table 17-63.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
2002	640	-	3	66	31	13	0	25	55/86
2012	440	-	0	82	18	50	14	11	50/96
2017	300	-	7	80	13	27	20	13	48/79
<b>Cercocarpus montanus<sup>p</sup> -- (alderleaf mountain mahogany)</b>									
2002	-	-	-	-	-	-	-	-	245/310
2012	-	-	-	-	-	-	-	-	221/251
2017	-	-	-	-	-	-	-	-	182/275
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
2002	-	-	-	-	-	-	-	-	61/153
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	63/95
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
2002	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	83/177
2017	-	-	-	-	-	-	-	-	121/242
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
2002	80	-	0	50	50	0	0	25	37/37
2012	80	-	0	100	0	0	0	25	37/60
2017	80	-	0	100	0	0	0	0	33/41
<b>Opuntia fragilis -- (brittle pricklypear)</b>									
2002	80	-	0	100	0	0	0	0	8/18
2012	60	-	0	100	0	0	0	0	10/29
2017	100	-	0	100	0	0	0	20	20/37
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
2002	1040	-	4	85	12	8	79	4	71/199
2012	1960	-	10	84	6	16	82	44	53/140
2017	1740	-	1	92	7	23	70	5	53/132
<b>Quercus gambelii<sup>p</sup> -- (Gambel oak)</b>									
2002	180	-	0	100	0	0	0	0	96/74
2012	320	-	50	50	0	6	0	0	94/97
2017	340	-	47	53	0	6	0	0	109/102

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



## WATER HOLLOW - STUDY NO. 17-64



### Location Information

USGS 7.5 min Map Info	Mill Fork NE; Township 10S, Range 6E, Section 07
GPS (0' Stake)	NAD 83 UTM ZONE 12, 474878 East 4424104 North

### Transect Information

Browse Tag # (0' Stake)	132
Transect Bearing	265° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

### Directions to Site

From Spanish Fork Canyon, take Highway 6 to the Sheep Creek turnoff. Continue on Highway 6 for 2.2 miles to a road on the north side of the road (left). Turn left again just after exiting Highway 6, and then follow this road to a Forest Service gate. From the gate, go 0.9 miles to a Forest Service sign. Park here and walk 300 yards at 16 degrees magnetic to the witness post; a large clump of chained PJ is in front of the post. The 0-foot stake is just west of the witness post and is marked with browse tag #132. Extra rebar and T-posts are present on the site from another unrelated study.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	WATERSHED CLOSURE
Elevation	6,240ft (1,902m)
Aspect	South
Slope	11-12%
Sample Dates	08/26/2002, 06/28/2007, 07/10/2012, 07/05/2017

**Table 17-64.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Two-Way Smooth	-	-	1990s	60
Seeding - Seed Unknown	-	-	1990s	-

**Wildlife Habitat and Vegetation History****Table 17-64.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Moose	substantial	winter

**Table 17-64.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2002	Perennial Grass	Phase I
2007	Perennial Grass	Phase I
2012	Perennial Grass	Phase I
2017	Perennial Grass	Phase I

**Site Notes**

The nearest perennial source of water is Soldier Creek, which is located on the opposite side of US-6, 0.75 miles southwest of the study site. A rattlesnake was observed on site in 2017.

**Soils****Table 17-64.5 - 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	48.7	20.0	31.3	3.4	4.5	236.8	0.7	08/06/2002

**Site Potential**

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

A diverse number of perennial grasses dominate this study site, with the introduced species crested wheatgrass (*Agropyron cristatum*), smooth brome (*Bromus inermis*), and basin wildrye (*Leymus cinerius*) contributing the most cover in 2017 (Table 17-64.10). Forbs have remained rare throughout the study period (Table 17-64.7, Table 17-64.11). Shrubs are uncommon on this site, but the most prevalent preferred species are fourwing saltbush (*Atriplex canescens*) and antelope bitterbrush (*Purshia tridentata*) (Table 17-64.12, Table 17-64.13). Point-quarter data and photos reveal that Utah juniper trees (*Juniperus osteosperma*) are present with low density, placing this study site in Phase I of woodland succession (Table 17-64.4, Table 17-64.13, Table 17-64.14).



**Trend Summary Tables****Table 17-64.6 - 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	0.6	-	1.9	0.8	-	1.2
2007	0.6	-	1.9	1.7	-	1.5
2012	1.9	-	1.2	2.1	-	2.6
2017	1.2	-	-	2.1	-	-

**Table 17-64.7 - 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	8	315	18	22	0.0	20.4	0.1	0.3
2007	95	367	77	37	0.7	23.9	0.3	0.4
2012	11	369	79	16	0.2	32.4	0.2	0.1
2017	49	369	205	8	0.6	27.7	3.7	0.3

**Table 17-64.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2002	29.9	0.2	55.8	3.7	1.9	25.1
2007	23.0	0.6	44.6	3.7	0.7	36.6
2012	16.4	0.0	65.8	2.1	1.8	39.7
2017	16.7	1.6	59.9	4.2	0.6	37.0

**Table 17-64.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
2002	14	36	27
2007	11	31	9
2012	1	10	-
2017	28	3	14
Days Use Per Acre (ha)			
2002	25.5 (62.9)	115.3 (284.7)	-
2007	25.5 (62.9)	109.9 (271.5)	-
2012	18.7 (46.3)	9.4 (23.2)	-
2017	119.3 (294.6)	12.1 (29.8)	-

**Table 17-64.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus briziformis <sup>ai</sup> (rattlesnake brome)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus marginatus (mountain brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Dactylis glomerata <sup>i</sup> (orchardgrass)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Leymus cinereus (basin wildrye)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency																
2002	13	156	3	-	103	6	5	0	19	7	-	24	42	-	-	12	9
2007	6	196	40	-	111	28	66	-	5	7	-	36	52	5	4	24	16
2012	2	200	1	-	94	1	10	1	5	-	-	44	66	7	-	47	17
2017	-	171	1	3	190	6	49	-	6	0	1	28	20	-	-	2	8
year	Average Cover (%)																
2002	0.9	6.6	0.0	-	2.7	0.2	0.0	0.0	0.6	0.2	-	3.7	2.0	-	-	0.0	0.4
2007	0.2	7.3	0.1	-	3.4	1.0	0.4	-	0.2	0.2	-	2.9	1.4	0.1	0.2	0.6	1.2
2012	0.1	13.0	0.0	-	2.4	0.0	0.2	0.0	0.0	-	-	7.5	1.3	0.1	-	1.4	0.8
2017	-	8.3	0.0	0.0	7.8	0.1	0.6	-	0.2	0.2	0.0	4.0	0.2	-	-	0.0	0.6

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

GRASS SPECIES	Secale cereale <sup>ai</sup> (cereal rye)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency	
2002	0	128
2007	7	106
2012	-	140
2017	-	176
year	Average Cover (%)	
2002	0.0	3.1
2007	0.2	5.4
2012	-	5.8
2017	-	6.5

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

**Table 17-64.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Astragalus (milkvetch)	Camelina microcarpa <sup>ai</sup> (littletop false flax)	Carduus nutans <sup>aiii</sup> (nodding plumeless thistle)	Chaenactis douglasii (Douglas' dusty maiden)	Cirsium (thistle)	Cryptantha (cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Gilia inconspicua <sup>a</sup> (shy gilia)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stoneseed)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa <sup>i</sup> (alfalfa)
year	Nested Frequency																
2002	-	-	2	-	5	-	0	-	-	-	4	1	-	18	0	-	0
2007	21	-	-	15	-	3	1	1	9	-	10	3	18	26	0	-	-
2012	77	-	3	-	-	4	-	3	-	2	-	-	-	3	-	-	-
2017	164	0	3	13	1	-	-	-	32	14	2	3	22	5	-	1	-
year	Average Cover (%)																
2002	-	-	0.0	-	0.0	-	0.0	-	-	-	0.0	0.0	-	0.3	0.0	-	0.0
2007	0.1	-	-	0.1	-	0.0	0.0	0.1	0.0	-	0.1	0.0	0.1	0.2	0.0	-	-
2012	0.2	-	0.0	-	-	0.0	-	0.0	-	0.0	-	-	-	0.0	-	-	-
2017	3.2	0.0	0.1	0.1	0.1	-	-	-	0.2	0.0	0.0	0.0	0.1	0.2	-	0.0	-

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

FORB SPECIES	Penstemon caespitosus (mat penstemon)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Streptanthus cordatus (heartleaf twistflower)	Tragopogon dubius <sup>ai</sup> (yellow salsify)
year	Nested Frequency			
2002	1	-	1	9
2007	7	-	-	8
2012	1	-	4	-
2017	-	2	-	-
year	Average Cover (%)			
2002	0.0	-	0.0	0.0
2007	0.0	-	-	0.0
2012	0.0	-	0.0	-
2017	-	0.0	-	-

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

**Table 17-64.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)				
	year	2002	2007	2012	2017
<i>Atriplex canescens</i> <sup>p</sup> (fourwing saltbush)	0.5	1.2	0.3		
<i>Juniperus osteosperma</i> <sup>i</sup> (Utah juniper)	0.8	1.5	0.9		
<i>Purshia tridentata</i> <sup>p</sup> (antelope bitterbrush)	0.8	2.6	1.3		
	0.9	-	1.2		
SHRUB SPECIES	Quadrat Cover (%)				
	year	2002	2007	2012	2017
<i>Atriplex canescens</i> <sup>p</sup>	0.6	1.9	0.0		
<i>Juniperus osteosperma</i> <sup>i</sup>	0.4	1.9	0.1		
<i>Purshia tridentata</i> <sup>p</sup>	0.8	1.2	1.0		
	0.8	-	0.4		

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

**Table 17-64.13 - 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>Artemisia tridentata</i> ssp. <i>vaseyana</i> <sup>p</sup> -- (mountain big sagebrush)									
2002	-	-	-	-	-	-	-	-	54/73
2007	-	-	-	-	-	-	-	-	61/94
2012	-	-	-	-	-	-	-	-	84/125
2017	20	-	0	100	0	0	0	0	61/98
<i>Atriplex canescens</i> <sup>p</sup> -- (fourwing saltbush)									
2002	40	-	0	100	0	50	0	0	113/124
2007	60	-	0	100	0	33	0	0	140/192
2012	60	-	33	0	67	100	0	0	125/154
2017	40	-	0	100	0	0	0	0	134/167
<i>Cercocarpus ledifolius</i> <sup>p</sup> -- (curl-leaf mountain mahogany)									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	58/67
2017	-	-	-	-	-	-	-	-	-/-
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>viscidiflorus</i> -- (yellow rabbitbrush)									
2002	-	-	-	-	-	-	-	-	36/60
2007	-	-	-	-	-	-	-	-	56/86
2012	-	-	-	-	-	-	-	-	58/97
2017	-	-	-	-	-	-	-	-	89/137
<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>speciosa</i> <sup>p</sup> -- (rubber rabbitbrush)									
2002	-	-	-	-	-	-	-	-	74/110
2007	-	-	-	-	-	-	-	-	97/133
2012	-	-	-	-	-	-	-	-	132/222
2017	-	-	-	-	-	-	-	-	100/171
<i>Gutierrezia sarothrae</i> -- (broom snakeweed)									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	51/63
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-

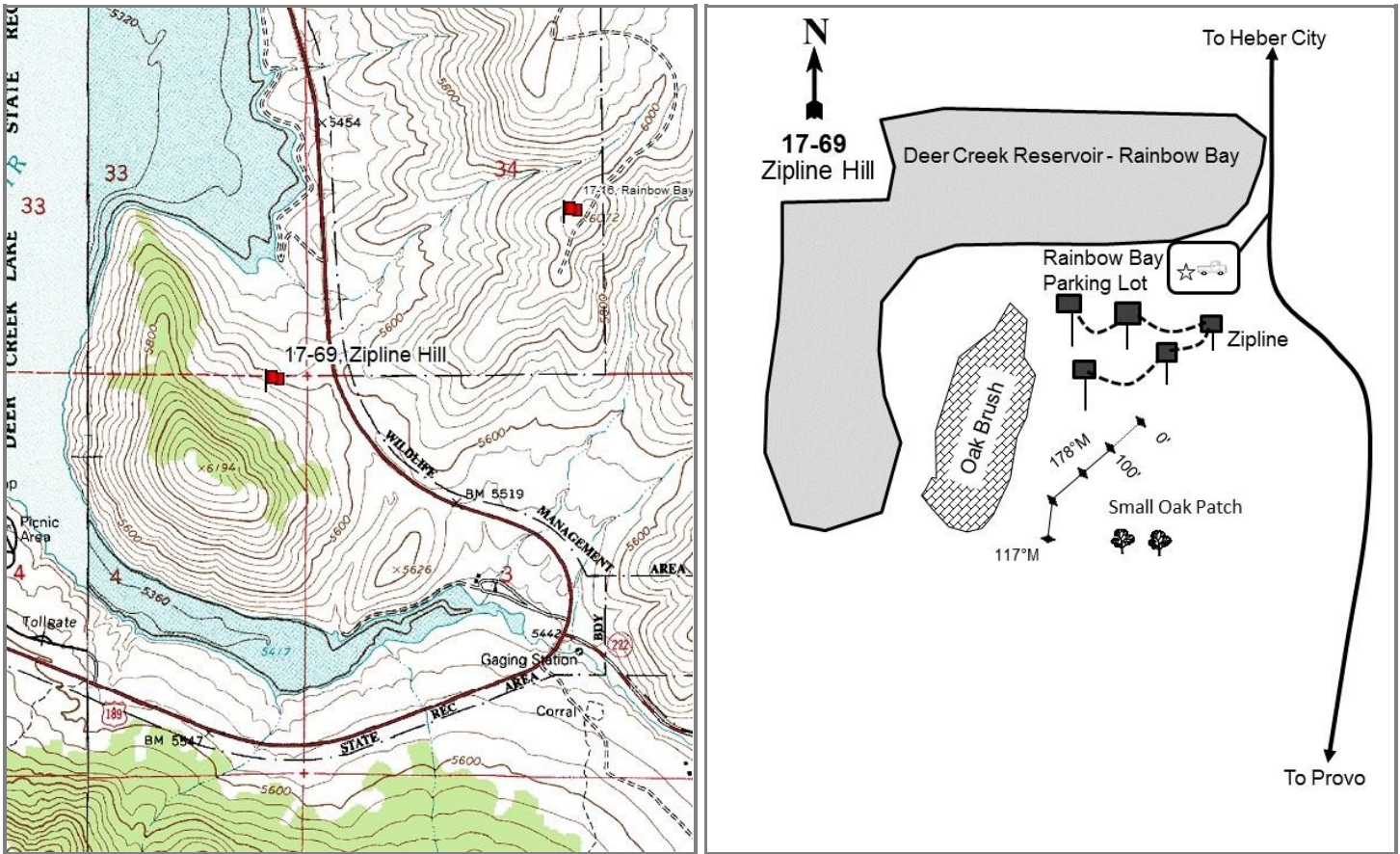
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
2002	20	-	100	0	0	0	0	0	- / -
2007	60	-	0	100	0	0	0	0	- / -
2012	80	-	25	75	0	0	0	0	- / -
2017	20	-	100	0	0	0	0	0	- / -
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
2002	60	-	67	33	0	0	100	0	43/70
2007	80	-	0	100	0	25	75	0	70/105
2012	60	-	0	100	0	33	33	0	99/139
2017	80	-	25	75	0	50	25	0	114/153
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
2002	-	-	-	-	-	-	-	-	32/45
2007	-	-	-	-	-	-	-	-	36/42
2012	-	-	-	-	-	-	-	-	65/90
2017	20	-	0	100	0	0	0	0	49/89

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

**Table 17-64.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2002	36	-	-	-	-	-	10.3
2007	39	-	8	77	15	-	14.5
2012	54	-	14	71	14	-	7.6
2017	8	-	100	-	-	-	3.3
<b>Pinus edulis (twoneedle pinyon)</b>							
2002	5	-	-	-	-	-	5.0
2007	7	-	-	100	-	-	8.2
2012	4	-	-	100	-	-	10.3

## ZIPLINE HILL - STUDY NO. 17-69



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Charleston SW; Township 5S, Range 4E, Section 04  
NAD 83 UTM ZONE 12, 458224 East 4474350 North

### Transect Information

Browse Tag # (0' Stake)	537
Transect Bearing	178° magnetic (Line 4: 117° 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 Highway 189 to Heber City, turn into the Rainbow Bay parking lot. Hike 600 paces at 175 degrees magnetic past the zip lines. The site is located on the hillside overlooking the bay and parking lot.

**Site Information**

Land Ownership	State
Land Administrator	USP
Allotment	No data
Elevation	No data
Aspect	East-Northeast
Slope	15-25%
Sample Dates	07/12/2017

**Table 17-69.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	Historic	-

**Wildlife Habitat and Vegetation History**

**Table 17-69.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Greater Sage Grouse	occupied	year-long

**Table 17-69.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Bitterbrush/Perennial Grass	NA

**Site Notes**

No Notes

**Soils**

**Table 17-69.5 - 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	28.2	35.1	36.8	3.8	9.5	215.0	0.4	07/12/2017

**Site Potential**

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

Antelope bitterbrush (*Purshia tridentata*) is the dominant browse species on this study site, with lesser amounts of preferred browse such as Utah serviceberry (*Amelanchier utahensis*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and chokecherry (*Prunus virginiana*), also present (Table 17-69.12, Table 17-69.13). The herbaceous understory is abundant (Table 17-69.7). Native perennial grasses, including Sandberg bluegrass (*Poa secunda*) and bluebunch wheatgrass (*Pseudoroegneria spicata*), are co-dominant site components. In addition, the introduced annual grasses field brome (*Bromus arvensis*) and cheatgrass (*B. tectorum*) are present and contributed 18.5% cover in 2017 (Table 17-69.10). The forb component is diverse, and perennial forbs are more common than annual forbs (Table 17- 69.11).



**Trend Summary Tables**

**Table 17-69.6 - 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
2017	13.6	8.1	-	17.6	10.3	-

**Table 17-69.7 - 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
2017	368	430	323	257	18.5	33.5	3.3	11.6

**Table 17-69.8 - 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
2017	3.4	1.1	44.9	0.9	2.7	69.9

**Table 17-69.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer		Rocky Mountain Elk	
	Quadrat Frequency		Days Use Per Acre (ha)	
2017	13		-	
2017	69.0 (170.5)		6.0 (14.9)	

**Table 17-69.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Melica bulbosa (oniongrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency									
2017	314	54	3	7	22	115	54	279	312	1
year	Average Cover (%)									
2017	17.0	1.5	0.1	0.1	0.4	3.3	0.9	13.7	15.0	0.0

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

**Table 17-69.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum <sup>ni</sup> (desert madwort)	Astragalus (milkvetch)	Astragalus convallarius (lesser rusby milkvetch)	Balsamorhiza hookeri (Hooker's balsamroot)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)
year	Nested Frequency																
2017	24	8	39	208	20	19	2	1	44	2	40	153	28	2	10	10	28
year	Average Cover (%)																
2017	0.3	0.0	0.3	1.4	0.8	0.3	0.0	0.1	0.2	0.0	0.2	0.8	0.2	0.0	0.0	0.0	0.2

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

FORB SPECIES	Erigeron divergens <sup>a</sup> (spreading fleabane)	Gayophytum racemosum <sup>a</sup> (blackfoot groundsmoke)	Helianthella uniflora (oneflower helianthella)	Helionis multiflora var. multiflora (showy goldeneye)	Lactuca serriola <sup>ni</sup> (prickly lettuce)	Linaria dalmatica <sup>ni</sup> (Dalmatian toadflax)	Lupinus argenteus (silvery lupine)	Microsteris gracilis <sup>a</sup> (slender phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Symphoricarum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ni</sup> (yellow salsify)	Viola (violet)	Wyethia amplexicaulis (mule-ears)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency															
2017	2	4	59	17	6	10	44	15	5	5	42	4	56	1	3	46
year	Average Cover (%)															
2017	0.0	0.1	3.9	0.1	0.0	0.1	3.3	0.0	0.0	0.0	1.0	0.0	0.6	0.0	0.1	0.8

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

**Table 17-69.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Prunus virginiana <sup>p</sup> (chokecherry)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)
year	Line Intercept Cover (%)						
2017	2.9	-	9.3	-	1	0.1	14.6
year	Quadrat Cover (%)						
2017	1.4	0.5	7.1	0.1	0.8	0.1	11.7

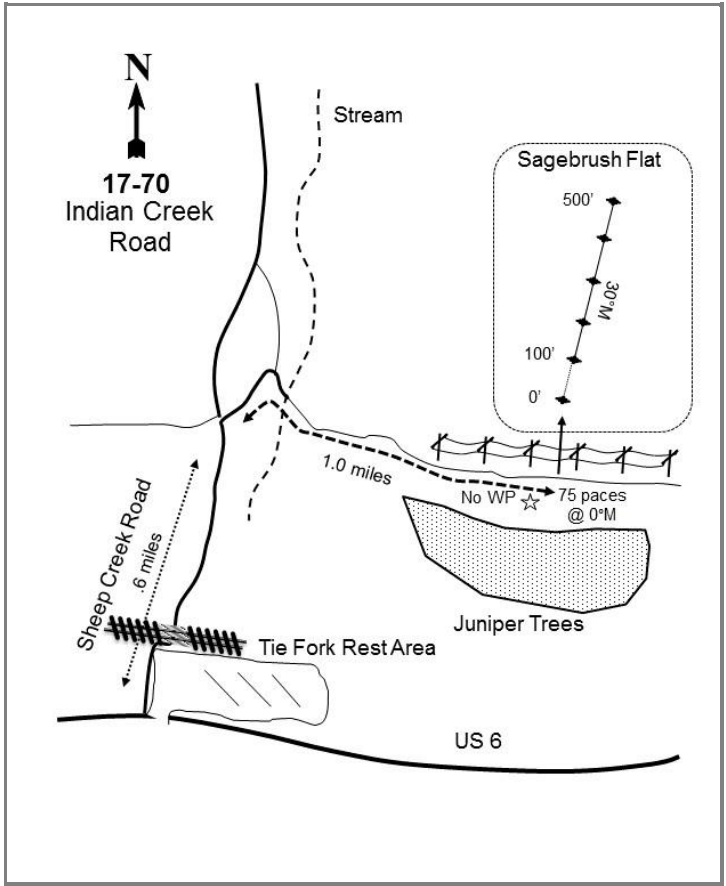
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 17-69.13 - 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 <sup>p</sup> -- (Utah serviceberry)									
2017	700	-	37	63	0	37	40	0	68/74
Artemisia tridentata ssp. vaseyana <sup>p</sup> -- (mountain big sagebrush)									
2017	80	-	0	100	0	50	0	0	61/65
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2017	4740	-	2	98	1	0	0	1	35/50
Gutierrezia sarothrae -- (broom snakeweed)									
2017	220	-	0	100	0	0	0	0	25/24
Mahonia repens -- (creeping barberry)									
2017	4440	-	0	100	0	1	0	0	11/9
Prunus virginiana <sup>p</sup> -- (chokecherry)									
2017	240	40	100	0	0	0	0	0	20/21
Purshia tridentata <sup>p</sup> -- (antelope bitterbrush)									
2017	1160	-	9	88	3	53	22	17	73/129
Quercus gambelii <sup>p</sup> -- (Gambel oak)									
2017	-	-	-	-	-	-	-	-	146/92

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

## INDIAN CREEK ROAD - STUDY NO. 17-70



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Tucker NW; Township 10S, Range 6E, Section 13  
NAD 83 UTM ZONE 12, 483031 East 4422573 North

### Transect Information

Browse Tag # (0' Stake)	705
Transect Bearing	30° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

### Directions to Site

At the rest area at Tie Fork road, turn left and proceed up the road for 0.75 miles, then turn right at the road that crosses the creek. Proceed across the creek and drive down the powerline road for 1.0 mile. The site is in a sagebrush flat on the left side of the road. Park and walk 50 paces to the 0-foot stake, which is marked by browse tag #705.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	WATERSHED CLOSURE
Elevation	6550
Aspect	South
Slope	12%
Sample Dates	07/05/2017

**Table 17-70.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	Sheep Creek phase 1	2629	May 2014	552

**Wildlife Habitat and Vegetation History**

**Table 17-70.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter
Moose	substantial	winter

**Table 17-70.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Mixed Shrub/Perennial Grass	Phase I

**Site Notes**

No Notes

**Soils**

**Table 17-70.5 - 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	44.2	28.1	27.8	2.8	8.1	242.0	0.4	07/05/2017

**Site Potential**

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Upland Shallow Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R047XA320UT
States and Transitions	No state and transition model is available for this ecological site.

As of study establishment in 2017, mixed shrubs -- mainly yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*) and spineless horsebrush (*Tetradymia canescens*) -- dominate this study site. The preferred browse species Utah serviceberry (*Amelanchier utahensis*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and antelope bitterbrush (*Purshia tridentata*) were also observed in lower abundance (Table 17-70.12, Table 17-70.13). A diverse number of native and introduced perennial grasses co-dominate the site (Table 17-70.7, Table 17- 70.10). Annual forbs are more abundant than perennial forbs, with desert madwort (*Alyssum desertorum*) contributing the most cover of any single species (Table 17-70.11). The presence of Utah juniper (*Juniperus osteosperma*) (Table 17- 70.14), which places this site in Phase I of woodland succession (Table 17-70.4), indicates that there is potential for this area to be infilled in the future.

**Trend Summary Tables**

**Table 17-70.6 - 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
2017	3.6	15.2	-	4.6	19.2	-

**Table 17-70.7 - 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
2017	96	377	416	81	1.2	19.3	8.6	1.2

**Table 17-70.8 - 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
2017	29.6	0.8	35.9	3.2	1.4	47.0

**Table 17-70.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
Year	Days Use Per Acre (ha)			
	2017	-	48	4
2017	4.4 (10.8)	168.2 (415.5)	6.0 (14.9)	-

**Table 17-70.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus marginatus (mountain brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Hesperosipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency										
2017	17	51	5	84	96	1	79	5	39	201	104
year	Average Cover (%)										
2017	0.5	1.6	0.0	1.7	1.2	0.1	2.4	0.0	0.8	9.0	3.3

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

**Table 17-70.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum alyssoides <sup>ai</sup> (pale madwort)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Astragalus calycosus (Torrey's milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littlepod false flax)	Castilleja (Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Cirsium undulatum <sup>a</sup> (wavy/leaf thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Cryptantha (cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Linum lewisii (Lewis flax)
year	Nested Frequency																
2017	6	32	410	2	12	3	1	1	20	1	11	2	1	4	16	5	6
year	Average Cover (%)																
2017	0.0	0.6	7.6	0.0	0.2	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.5	0.0	0.0

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

FORB SPECIES	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Penstemon (beardtongue)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Schoenocrambe limifolia (flaxleaf plainsmustard)
year	Nested Frequency					
2017	6	39	1	3	27	7
year	Average Cover (%)					
2017	0.1	0.2	0.0	0.0	0.1	0.1

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

**Table 17-70.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa (rubber rabbitbrush)	Opuntia (pricklypear)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Symphoricarpos oreophilus (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)							
2017	0.3	4	9.9	0.1	0.1	0.3	0.8	8.3
year	Quadrat Cover (%)							
2017	0.0	3.5	7.8	0.0	0.1	0.2	0.6	6.7

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



**Table 17-70.13 - 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.

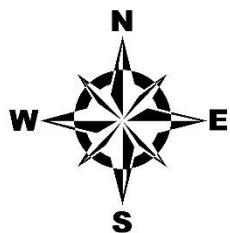
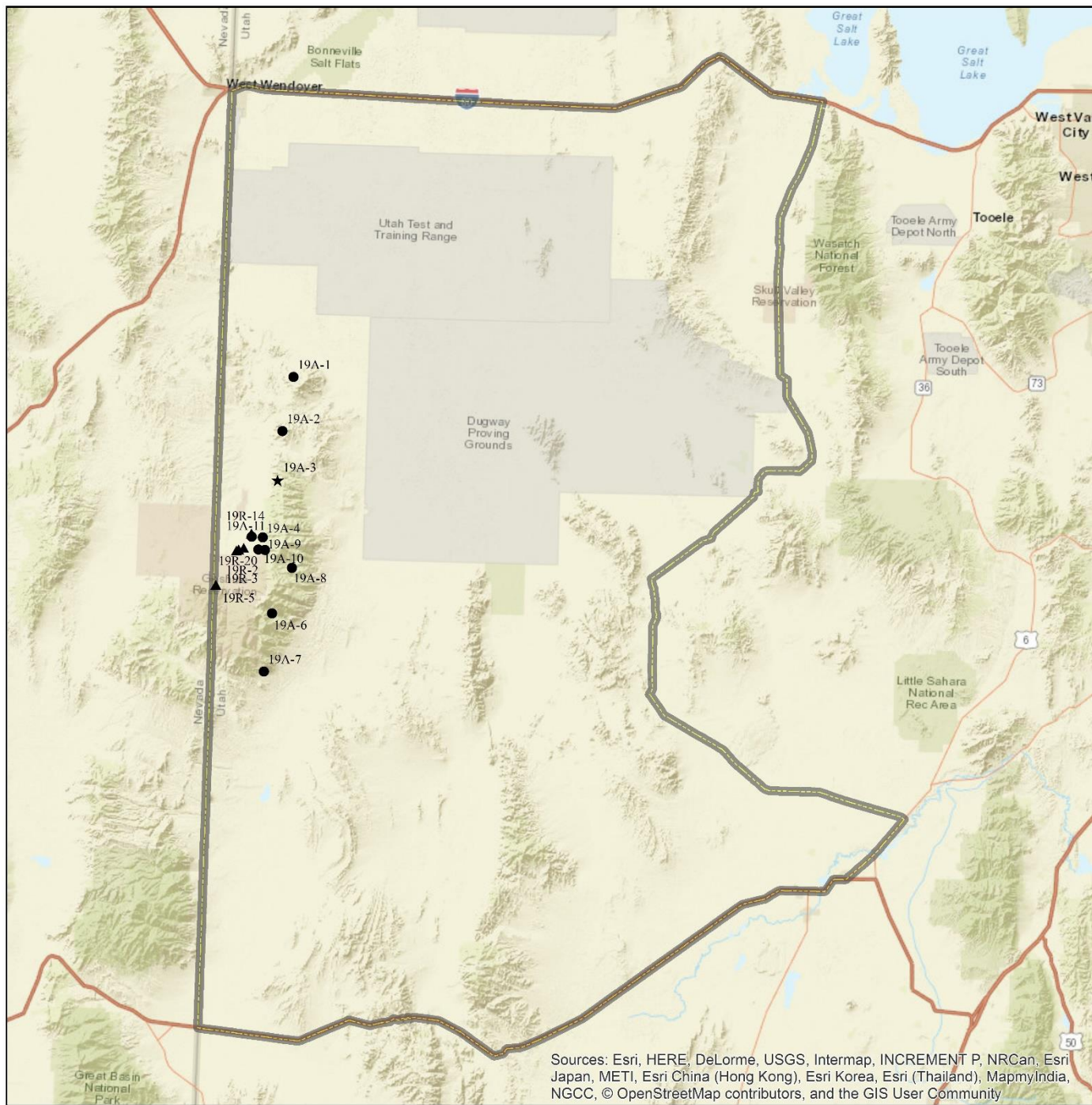
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis <sup>p</sup> -- (Utah serviceberry)									
2017	40	-	0	100	0	50	0	0	37/39
Artemisia tridentata ssp. vaseyana <sup>p</sup> -- (mountain big sagebrush)									
2017	640	-	6	88	6	31	59	3	61/77
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2017	9300	-	4	96	0	0	0	0	25/35
Ericameria nauseosa -- (rubber rabbitbrush)									
2017	80	-	0	50	50	50	0	0	43/39
Opuntia -- (pricklypear)									
2017	20	-	0	100	0	0	0	0	- / -
Purshia tridentata <sup>p</sup> -- (antelope bitterbrush)									
2017	160	-	0	100	0	38	63	0	40/77
Symphoricarpos oreophilus -- (mountain snowberry)									
2017	260	-	0	92	8	0	0	8	41/63
Tetradymia canescens -- (spineless horsebrush)									
2017	3340	-	4	95	1	0	0	1	28/48

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

**Table 17-70.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

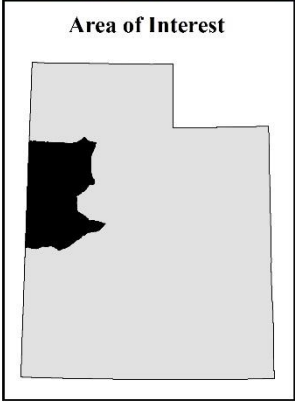
Year	Density	Seedling (%)	Size Class Distribution				Average Diameter (cm)
	Trees per Acre		1-4'	4-8'	8-12'	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2017	44	8	85	8	-	-	4.2

# WILDLIFE MANAGEMENT UNIT 19A - DEEP CREEK WEST DESERT

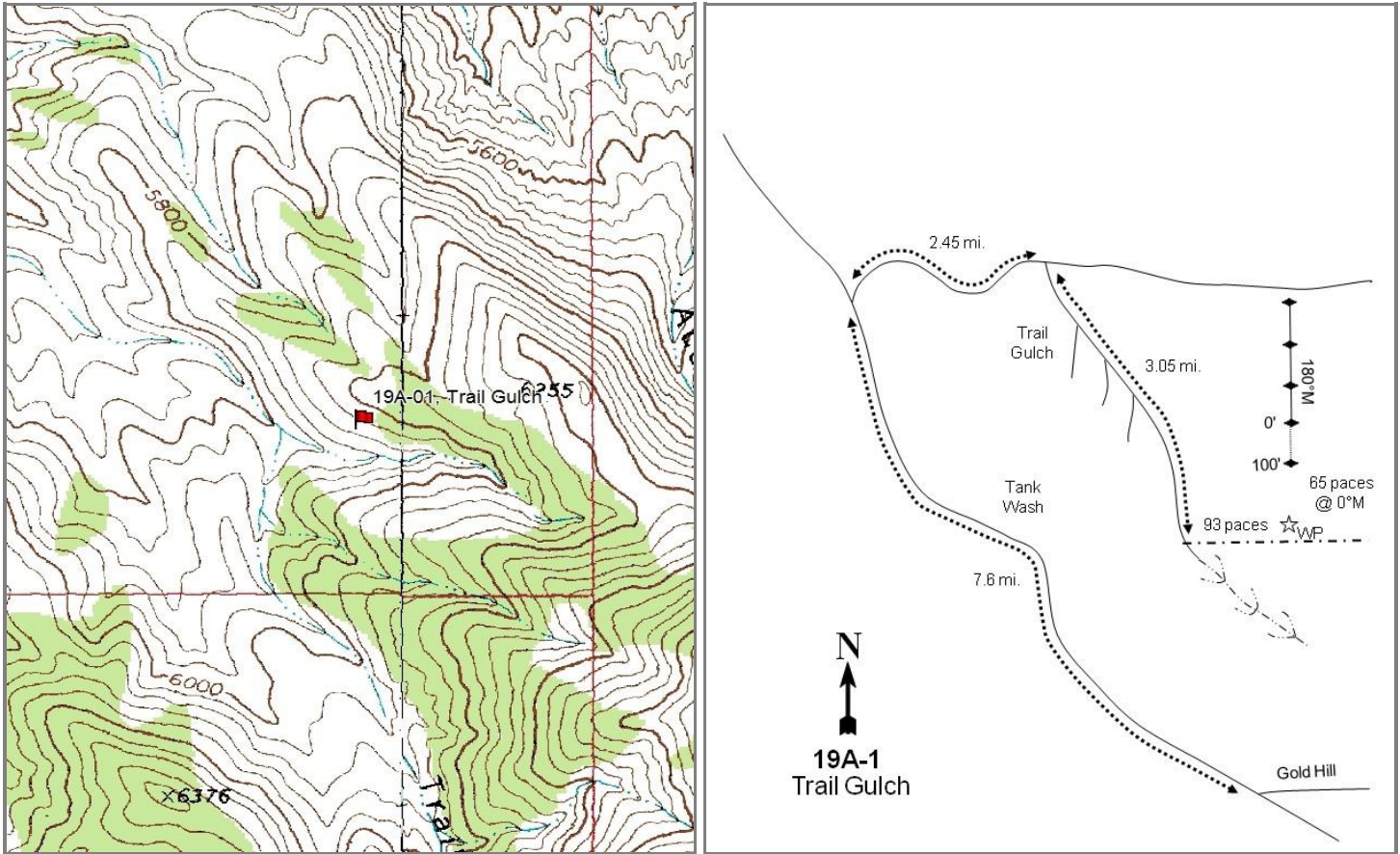


**Study Location Project, Status**

- RT, Active
- ★ RT, Suspended
- ▲ WRI, Active
- ▭ Unit - 19A



## TRAIL GULCH - STUDY NO. 19A-1



### Location Information

USGS 7.5 min Map Info Ochre Mountain NE; Township 7S, Range 18W, Section 09  
 GPS (0' Stake) NAD 83 UTM ZONE 12, 255222 East 4457093 North

### Transect Information

Browse Tag # (0' Stake) 3970  
 Transect Bearing 180° 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

Beginning at Gold Hill, proceed northwesterly toward Gold Hill Pass and Tank Wash for 7.6 miles to a road to the north. Turn right and continue northerly for 2.45 miles to a dirt road to the southeast up Trail Gulch. Proceed up Trail Gulch for 3.05 miles, staying to the left (straight) at all intersections. Stop where the road ends and two drainages come together. From the intersection of the streambeds, walk 93 paces to the east, along the left drainage to a green "T" fencepost on the north side of the streambed. From the fencepost, walk 65 paces north to the 0-foot baseline stake. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height. The 0-foot baseline stake has a red browse tag #3970.



**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	DUTCH MOUNTAIN
Elevation	5,800ft (1,768m)
Aspect	South
Slope	30-45%
Sample Dates	07/16/1997, 07/16/2002, 07/09/2007, 07/16/2012, 06/27/2017

**Wildlife Habitat and Vegetation History****Table 19A-01.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter

**Table 19A-01.4 - 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	Phase I
1989	Stansbury Cliffrose	Phase I
1997	Stansbury Cliffrose	Phase I
2002	Stansbury Cliffrose	Phase I
2007	Stansbury Cliffrose	Phase I
2012	Stansbury Cliffrose	Phase I
2017	Stansbury Cliffrose	Phase I

**Site Notes**

Several broods of chukars were observed in the area in 1983. A bedding area with a high number of sheep pellets was noted in 2012, just at the top of the ridge near the 400-foot stake. A dead sheep was also found on the site in 2012.

**Soils****Table 19A-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	7.1	38.0	32.4	29.6	2.4	7.7	76.8	0.7	07/16/1997

**Site Potential**

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

Stansbury cliffrose (*Purshia stansburiana*) has been the dominant browse species on this study site since establishment in 1983, and density has exhibited an overall increase over the study period. Other preferred browse species, including black sagebrush (*Artemisia nova*) and Nevada jointfir (*Ephedra nevadensis*) are also present as minor components (Table 19A-01.12, Table 19A-01.13). Singleleaf pinyon (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) have been observed since site establishment and this study has remained in Phase I of woodland succession in all sample years (photos, Table 19A-01.4, Table 19A-01.13, Table 19A-01.14). Although moderately diverse, the herbaceous understory has remained sparse (Table 19A-01.7). The introduced annual grass species cheatgrass (*Bromus tectorum*) and perennial grasses such as bluebunch wheatgrass (*Pseudoroegneria spicata*) have generally provided the most herbaceous cover from sample year to sample year (Table 19A-01.10). Forbs have remained rare (Table 19A-01.11). Unless a major disturbance occurs, this study site is expected to remain in this or a similar state in future sample years.

**Trend Summary Tables****Table 19A-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
1997	10.2	1.9	11.4	-	-	-
2002	8.6	0.4	10.1	13.9	0.9	15.2
2007	8.0	0.7	8.7	11.7	1.1	17.3
2012	8.6	0.7	13.1	11.3	1.1	18.5
2017	7.8	2.0	11.7	13.7	2.1	16.7

**Table 19A-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
1997	292	140	1	25	7.1	4.1	0.0	0.1
2002	231	113	6	18	5.4	4.9	0.0	0.0
2007	228	127	31	16	3.7	4.1	0.3	0.1
2012	193	117	6	4	3.4	3.8	0.0	0.0
2017	186	107	53	7	8.5	3.1	1.5	0.1

**Table 19A-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
1997	3.3	1.7	30.2	16.4	27.4	35.1
2002	13.3	2.1	27.3	18.4	32.2	28.5
2007	6.9	0.7	30.0	19.1	31.6	25.5
2012	16.8	0.8	28.6	22.8	32.5	28.2
2017	6.9	0.8	22.4	26.8	30.3	31.1

**Table 19A-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	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency			
1997	-	-	-	8
2002	2	-	-	9
2007	6	-	-	25
2012	2	-	-	1
2017	-	-	-	3
Days Use Per Acre (ha)				
1997	-	-	-	-
2002	22.1 (54.6)	-	-	-
2007	5.3 (13.2)	1.3 (3.3)	-	-
2012	5.3 (13.2)	2.0 (5.0)	-	-
2017	0.7 (1.7)	-	1.2 (2.9)	-

**Table 19A-01.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Pleuraphis jamesii (James' galleta)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)
year	Nested Frequency						
1997	6	292	7	14	16	112	-
2002	1	231	7	5	20	89	5
2007	2	228	-	2	13	121	-
2012	8	193	-	9	32	79	1
2017	22	186	4	4	28	60	-
year	Average Cover (%)						
1997	0.2	7.1	0.0	0.4	0.4	3.1	-
2002	0.2	5.4	0.1	0.1	0.3	4.3	0.0
2007	0.1	3.7	-	0.1	0.1	3.9	-
2012	0.0	3.4	-	0.1	0.4	3.2	0.0
2017	0.3	8.5	0.0	0.1	0.5	2.2	-

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

**Table 19A-01.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Astragalus utahensis (Utah milkvetch)	Cirsium neomexicanum <sup>n</sup> (New Mexico thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lomatium (desertparsley)	Phlox longifolia (longleaf phlox)	Sphaeralcea coccinea (scarlet globemallow)	Streptanthus cordatus (heartleaf twistflower)	unknown perennial forb (unknown forb)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency												
1997	4	1	-	-	-	-	-	1	12	-	-	8	-
2002	-	1	-	5	1	4	1	3	6	3	2	-	4
2007	-	2	4	5	-	19	3	1	7	5	-	3	-
2012	2	2	-	-	-	-	4	-	-	2	-	-	-
2017	2	7	-	2	2	45	-	-	-	5	-	-	-
year	Average Cover (%)												
1997	0.0	0.0	-	-	-	-	-	0.0	0.0	-	-	0.1	-
2002	-	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0
2007	-	0.1	0.0	0.0	-	0.2	0.0	0.0	0.0	0.1	-	0.0	-
2012	0.0	0.0	-	-	-	-	0.0	-	-	0.0	-	-	-
2017	0.0	0.2	-	0.0	0.0	1.3	-	-	-	0.1	-	-	-

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

**Table 19A-01.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)										
	year										
Artemisia nova <sup>p</sup> (black sagebrush)	-	-	-	-	-	-	-	-	-	-	-
Atriplex confertifolia <sup>p</sup> (shadscale saltbush)	4.2	-	0.1	0.7	2.3	-	13.1	-	2.1	7.4	0.1
Brickellia californica (California brickellbush)	3.3	-	0.2	0.1	0.6	-	15.2	-	2.1	7.8	0.8
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	4.6	-	0.1	0.4	0.3	-	14	0.1	4.5	6.4	0.5
Ephedra nevadensis <sup>p</sup> (Nevada jointfir)	5	-	0.3	1	0.7	-	14.3	-	2.4	8	0.8
Gutierrezia sarothrae (broom snakeweed)											
Juniperus osteosperma <sup>t</sup> (Utah juniper)											
Opuntia polyacantha (plains pricklypear)											
Pinus monophylla <sup>t</sup> (singleleaf pinyon)											
Purshia stansburiana <sup>p</sup> (Stansbury cliffrose)											
Tetradymia glabrata (littleleaf horsebrush)											
year	Quadrat Cover (%)										
1997	5.4	0.5	0.0	0.1	1.8	0.6	11.4	-	-	2.5	1.1
2002	3.6	0.0	0.0	0.4	1.0	0.0	10.0	0.0	0.1	4.0	0.0
2007	3.6	0.2	0.0	0.4	0.6	-	8.2	-	0.6	3.6	0.3
2012	4.8	0.3	0.0	0.3	0.7	-	11.3	0.0	1.9	2.7	0.4
2017	2.8	-	0.4	0.7	0.6	-	10.1	-	1.7	4.4	0.9

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

**Table 19A-01.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia nova<sup>p</sup> -- (black sagebrush)</b>									
1997	840	-	2	79	19	19	0	7	33/67
2002	1400	-	1	70	29	51	13	6	26/62
2007	980	-	2	69	29	29	57	22	38/73
2012	1580	-	0	80	20	43	0	20	30/64
2017	1220	-	0	100	0	67	0	7	34/72
<b>Atriplex confertifolia<sup>p</sup> -- (shadscale saltbush)</b>									
1997	120	20	0	67	33	0	0	0	21/31
2002	60	-	0	33	67	0	0	33	14/30
2007	80	-	0	75	25	0	25	25	22/41
2012	100	-	0	100	0	0	0	0	13/23
2017	-	-	-	-	-	-	-	-	30/60
<b>Brickellia californica -- (California brickellbush)</b>									
1997	160	60	13	88	0	0	0	0	31/36
2002	40	-	0	100	0	0	0	0	26/38
2007	160	-	0	100	0	38	0	0	24/50
2012	200	-	0	100	0	0	0	0	18/29
2017	60	-	0	100	0	0	0	0	26/48
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1997	220	-	0	82	18	0	0	9	24/40
2002	100	-	0	80	20	0	0	0	29/59
2007	120	-	0	100	0	0	0	0	28/49
2012	160	-	0	38	63	13	13	75	23/45
2017	120	-	0	83	17	0	0	33	27/64
<b>Echinocereus engelmannii -- (Engelmann's hedgehog cactus)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	0	100	0	0	0	0	9/12
2007	-	-	-	-	-	-	-	-	8/21
2012	20	-	0	100	0	0	0	0	13/19
2017	20	-	0	100	0	0	0	0	7/11



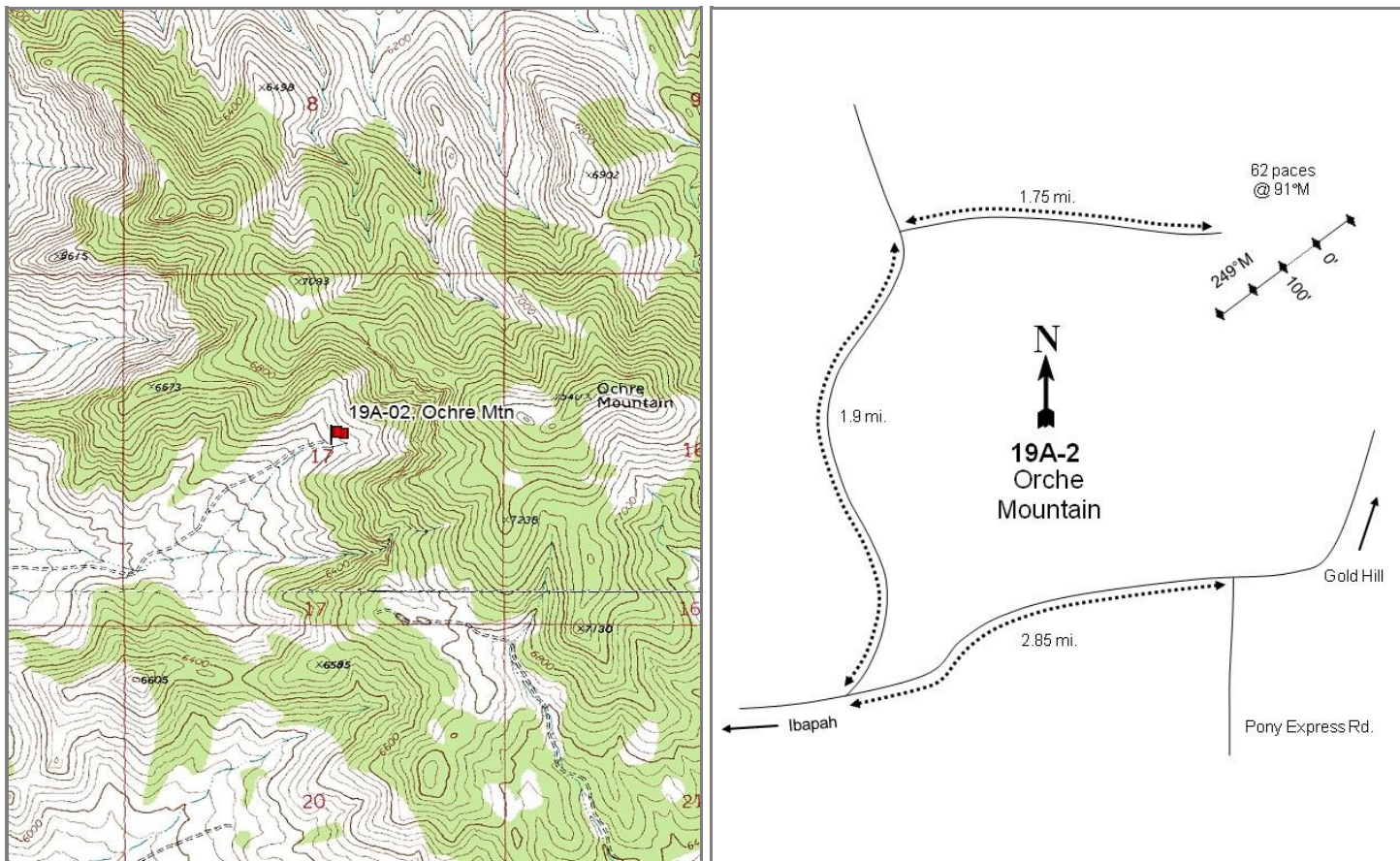
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Ephedra nevadensis<sup>p</sup> -- (Nevada jointfir)</b>									
1997	820	-	20	73	7	34	0	0	47/72
2002	660	-	3	55	42	27	39	46	45/82
2007	720	-	0	31	69	11	75	39	44/80
2012	700	-	11	40	49	6	77	54	34/59
2017	600	-	0	70	30	23	50	50	40/78
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	640	20	6	94	0	0	0	0	19/32
2002	180	-	0	22	78	0	0	67	17/29
2007	20	-	0	100	0	0	0	0	16/31
2012	-	-	-	-	-	-	-	-	15/18
2017	100	-	0	100	0	0	0	0	19/32
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1997	160	-	25	63	13	0	0	0	- / -
2002	100	-	0	100	0	0	0	0	- / -
2007	160	20	38	50	13	0	0	0	- / -
2012	140	-	29	71	0	0	0	0	- / -
2017	160	-	25	63	13	0	0	0	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1997	40	-	0	100	0	0	0	0	17/33
2002	80	-	0	100	0	0	0	0	11/30
2007	20	-	0	0	100	0	0	100	11/21
2012	20	-	0	100	0	0	0	0	11/20
2017	20	-	0	100	0	0	0	0	10/34
<b>Pinus monophylla<sup>t</sup> -- (singleleaf pinyon)</b>									
1997	20	-	0	100	0	0	0	0	- / -
2002	60	20	67	33	0	0	0	0	- / -
2007	40	20	50	50	0	0	0	0	- / -
2012	100	20	80	20	0	0	0	0	- / -
2017	60	-	67	33	0	0	0	0	- / -
<b>Purshia stansburiana<sup>p</sup> -- (Stansbury cliffrose)</b>									
1997	340	20	18	65	18	12	0	6	96/149
2002	380	-	5	79	16	42	37	11	112/161
2007	360	-	0	67	33	17	28	17	116/168
2012	280	-	14	43	43	64	0	21	107/163
2017	320	-	0	88	13	19	0	0	108/160
<b>Sclerocactus pubispinus -- (Great Basin fishhook cactus)</b>									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	20	-	0	100	0	0	0	0	8/21
<b>Tetradymia glabrata -- (littleleaf horsebrush)</b>									
1997	340	-	6	53	41	0	0	12	45/58
2002	120	-	0	0	100	0	0	100	57/35
2007	220	-	0	27	73	18	9	73	32/55
2012	180	-	0	56	44	0	0	100	42/62
2017	180	-	0	33	67	11	0	33	43/76

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

**Table 19A-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' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2007	75	7	20	47	20	7	19.6
2012	59	5	5	42	32	16	23.3
2017	52	6	-	56	17	22	25.9
<b>Pinus monophylla (singleleaf pinyon)</b>							
2007	59	10	50	20	20	-	7.6
2012	62	23	15	38	8	15	9.5
2017	54	7	21	29	21	21	10.5

## OCHRE MOUNTAIN - STUDY NO. 19A-2



### Location Information

USGS 7.5 min Map Info	Ochre Mountain SE; Township 8S, Range 18W, Section 17
GPS (0' Stake)	NAD 83 UTM ZONE 12, 253041 East 4446319 North

### Transect Information

Browse Tag # (0' Stake)	3931
Transect Bearing	249° 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 Gold Hill, proceed southwest toward Pony Express Road. From the intersection at Pony Express Road, continue on the main road (east) towards Ibapah for another 2.85 miles to an intersection going north (right). Take the road going north for 1.91 miles to a road going east (right). Turn right and continue for 1.75 miles to a small box canyon. Stop and walk 62 paces at 91 degrees magnetic to a green steel "T" fencepost with a red browse tag, numbered 3931, attached. This marks the 0-foot stake of the baseline. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	OCHRE
Elevation	6,400ft (1,951m)
Aspect	West
Slope	15-20%
Sample Dates	07/16/1997, 07/16/2002, 07/10/2007, 07/16/2012, 06/28/2017

**Wildlife Habitat and Vegetation History****Table 19A-02.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter

**Table 19A-02.4 - 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	Phase I
1989	Mountain Big Sagebrush	Phase I
1997	Mountain Big Sagebrush/Annual Grass	Phase I
2002	Mountain Big Sagebrush	Phase I
2007	Mountain Big Sagebrush/Annual Grass	Phase I
2012	Mountain Big Sagebrush/Annual Grass	Phase I
2017	Mountain Big Sagebrush/Annual Grass	Phase I

**Site Notes**

It was noted in 2017 that many shrubs were host to spider mites.

**Soils****Table 19A-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	7.1	50.0	32.4	17.6	3.4	7.6	150.4	1.0	07/16/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	13 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 existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated plant community type since study establishment in 1983; other shrubs such as black sagebrush (*A. nova*) and yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *stenophyllus* or *viscidiflorus*) have also been present throughout the years to a lesser extent. In addition, site photos and cover data reveal that singleleaf pinyon (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) have been on site and the site has remained in Phase I of woodland succession since study establishment (photos, Table 19A-02.4, Table 19A-02.12, Table 19A-02.13, Table 19A-02.14). The herbaceous understory has been diverse and abundant in all sample years. However, much of the herbaceous cover has been contributed by the introduced annual grass species cheatgrass (*Bromus tectorum*), and annual grasses were co-dominant with sagebrush in most sample years since 1997. Perennial grasses and forbs, mainly the native species bluebunch wheatgrass (*Pseudoroegneria spicata*) and Bonneville pea (*Lathyrus brachycalyx*) have also remained abundant (Table 19A-02.7, Table 19A-02.10, Table 19A-02.11) (State 2, USDA-NRCS, 2006).

**Trend Summary Tables**

**Table 19A-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
1997	16.6	0.3	-	-	-	-
2002	16.6	0.7	-	13.6	0.3	-
2007	14.4	1.3	-	18.0	1.4	-
2012	13.9	1.2	-	19.9	1.2	0.2
2017	13.1	1.6	0.0	16.8	1.1	1.3

**Table 19A-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
1997	394	290	20	213	10.8	9.4	0.1	6.0
2002	322	236	61	247	7.6	12.2	1.2	8.3
2007	375	252	89	257	12.5	13.7	1.2	12.1
2012	383	262	17	136	23.5	13.7	0.3	3.0
2017	430	246	55	236	38.5	11.8	1.6	11.6

**Table 19A-02.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	2.6	1.4	53.2	8.3	5.1	39.3
2002	4.9	1.8	49.6	12.6	8.2	45.1
2007	2.3	0.1	40.5	6.2	3.8	50.9
2012	4.7	0.7	41.0	7.5	6.7	56.5
2017	2.4	0.3	43.3	7.8	4.3	68.8

**Table 19A-02.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1997	5	5	-	1	1
2002	3	18	5	1	2
2007	1	5	10	1	5
2012	5	2	6	1	-
2017	2	4	-	-	2
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	3.6 (9.0)	43.6 (107.6)	14.7 (36.4)	5.2 (12.9)	-
2007	4.4 (10.8)	1.3 (3.3)	29.5 (72.8)	4.7 (11.5)	-
2012	32.7 (80.7)	7.4 (18.2)	12.1 (29.8)	-	-
2017	19.6 (48.4)	10.7 (26.5)	-	3.5 (8.6)	-

**Table 19A-02.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency				
1997	4	394	-	137	214
2002	-	322	3	104	177
2007	-	375	10	93	198
2012	-	383	5	131	199
2017	-	430	12	58	214
year	Average Cover (%)				
1997	0.2	10.8	-	1.6	7.6
2002	-	7.6	0.0	0.9	11.3
2007	-	12.5	0.2	1.3	12.2
2012	-	23.5	0.2	3.0	10.5
2017	-	38.5	0.1	0.7	11.1

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

**Table 19A-02.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Arabis (rockcress)	Astragalus (milkvetch)	Castilleja angustifolia (northwestern Indian paintbrush)	Cirsium (thistle)	Crepis acuminata (tapertip hawkbeard)	Delphinium nuttallianum (two-lobed larkspur)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Erigeron pumilus (shaggy fleabane)	Hackelia patens (spotted stickseed)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lathyrus brachycalyx (Bonneville pea)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Oenothera caespitosa (tufted evening primrose)	Phlox longifolia (longleaf phlox)
year	Nested Frequency																
1997	-	5	-	1	0	3	-	7	4	2	-	-	199	-	1	-	13
2002	21	1	-	-	-	2	3	5	-	-	4	45	221	3	-	-	29
2007	7	3	3	-	-	8	-	10	-	-	-	60	235	-	-	-	15
2012	8	-	-	-	-	-	-	1	-	-	-	4	126	2	-	-	6
2017	9	0	-	-	-	2	3	3	-	-	-	-	226	-	2	1	-
year	Average Cover (%)																
1997	-	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	-	5.7	-	0.0	-	0.1
2002	0.1	0.0	-	-	-	0.0	0.0	0.0	-	-	0.0	0.8	8.0	0.0	-	-	0.1
2007	0.0	0.0	0.0	-	-	0.4	-	0.1	-	-	-	0.3	11.5	-	-	-	0.1
2012	0.1	-	-	-	-	-	-	0.0	-	-	-	0.0	2.9	0.0	-	-	0.0
2017	0.2	0.0	-	-	-	0.0	0.0	0.3	-	-	-	-	11.3	-	0.0	0.0	-

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

FORB SPECIES		
	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Tragopogon dubius <sup>ai</sup> (yellow salsify)
year	Nested Frequency	
1997	13	-
2002	15	-
2007	35	-
2012	14	-
2017	48	5
year	Average Cover (%)	
1997	0.1	-
2002	0.3	-
2007	0.9	-
2012	0.2	-
2017	1.1	0.1

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

**Table 19A-02.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES					
	Artemisia nova <sup>p</sup> (black sagebrush)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Juniperus osteosperma <sup>t</sup> (Utah juniper)
year	Line Intercept Cover (%)				
1997	-	-	-	-	-
2002	0.3	13.3	0.3	-	-
2007	0.4	17.6	1.4	-	-
2012	0.5	19.4	1.2	-	0.2
2017	0.1	16.7	0.2	0.9	1.3
year	Quadrat Cover (%)				
1997	0.3	16.3	0.3	-	-
2002	0.4	16.2	0.7	-	-
2007	0.5	13.9	1.3	-	-
2012	0.6	13.4	1.2	-	0.0
2017	0.0	13.1	1.1	0.5	0.0

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

**Table 19A-02.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia nova<sup>P</sup> -- (black sagebrush)</b>									
1997	220	-	0	82	18	0	0	18	24/44
2002	260	-	0	54	46	54	15	92	36/59
2007	360	-	11	33	56	0	0	22	31/63
2012	280	-	0	64	36	0	0	0	31/49
2017	20	-	0	0	100	0	0	100	22/55
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1997	2720	20	6	61	33	15	4	21	89/124
2002	1820	-	0	50	51	15	12	79	91/116
2007	1100	20	9	49	42	16	0	40	101/152
2012	1120	-	4	61	36	25	0	36	87/137
2017	1440	-	1	78	21	32	0	13	81/116
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1997	460	-	0	91	9	0	0	9	45/56
2002	340	-	0	94	6	0	0	0	38/57
2007	300	-	13	80	7	0	0	0	39/72
2012	380	-	5	90	5	0	0	37	37/81
2017	240	-	8	92	0	0	0	0	37/68
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	20	-	0	100	0	0	0	0	38/86
2012	-	-	-	-	-	-	-	-	-/-
2017	140	-	0	100	0	14	0	0	46/81

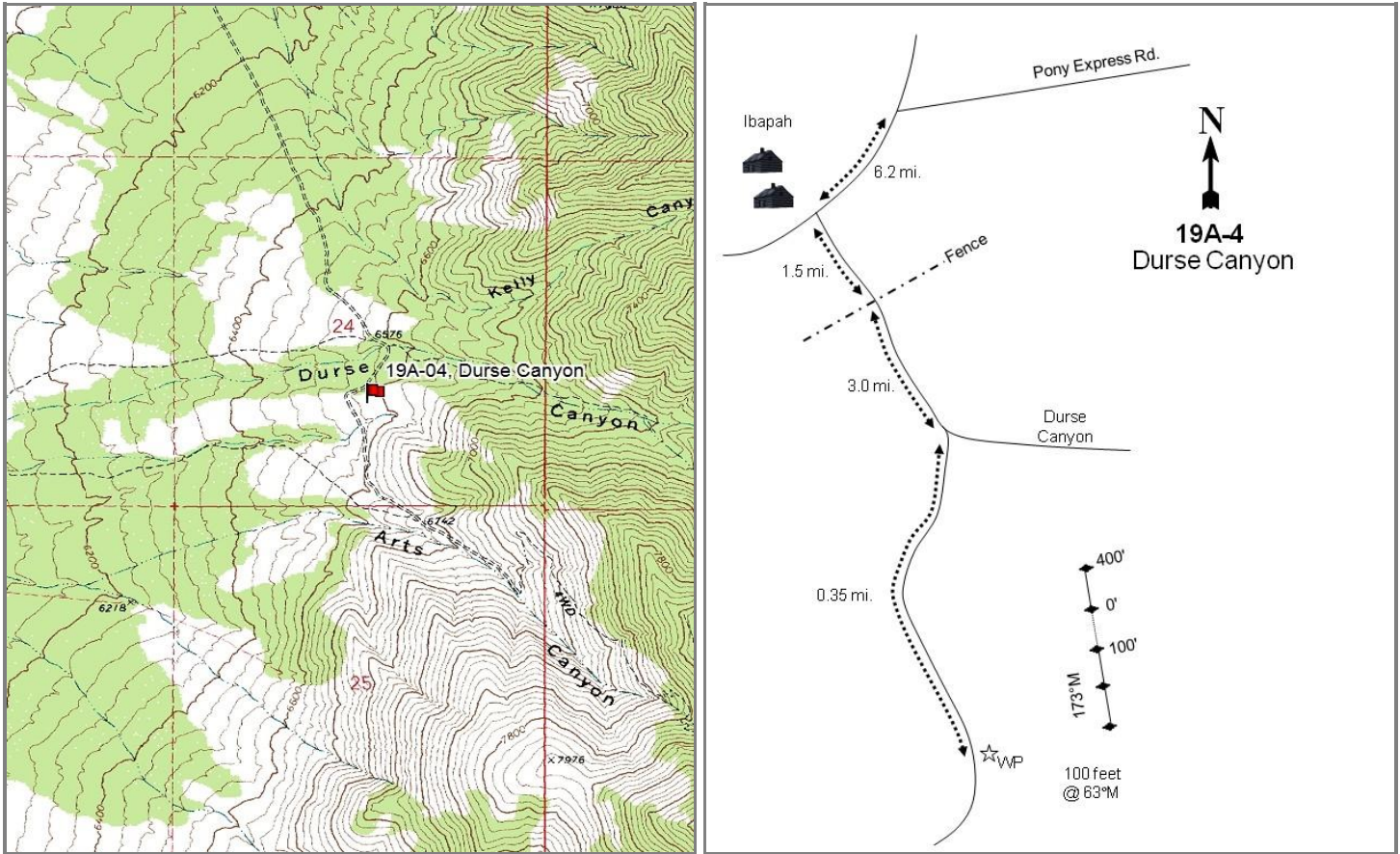
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 19A-02.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2017	1	-	-	100	-	-	9.0
<b>Pinus monophylla (singleleaf pinyon)</b>							
2017	1	-	100	-	-	-	4.0



## DURSE CANYON - STUDY NO. 19A-4



### Location Information

USGS 7.5 min Map Info Goshute NE; Township 10S, Range 19W, Section 24  
 GPS (0' Stake) NAD 83 UTM ZONE 12, 249133 East 4425145 North

### Transect Information

Browse Tag # (0' Stake) 3971  
 Transect Bearing 173° magnetic  
 Length 400ft  
 Belt Placement Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (71ft), Line 4 (59ft)  
 Belt Marker Placement Standard

### Directions to Site

From the intersection of the Pony Express Road to Gold Hill and the oiled road to Ibapah and Goshute, proceed southwest towards Goshute for 6.2 miles to a dirt road to the east. Turn left and proceed southeast for 4.55 miles, then turn right and continue 0.15 miles to another fork. Proceed for another 0.2 miles to a red steel "T" fencepost on the left (east) side of the road. From the fencepost, the 0-foot baseline stake is located 100 feet away at 63 degrees magnetic. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height, and a red browse tag #3971 is attached to the 0-foot baseline stake.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	IBAPAH
Elevation	6,560ft (1,999m)
Aspect	West
Slope	10%
Sample Dates	07/15/1997, 07/16/2002, 07/17/2012, 06/27/2017

**Wildlife Habitat and Vegetation History****Table 19A-04.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

**Table 19A-04.4 - 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	Phase I
1989	Stansbury Cliffrose	Phase I
1997	Stansbury Cliffrose/Pinyon-Juniper	Phase I transitioning to Phase II
2002	Pinyon-Juniper/Stansbury Cliffrose	Phase II
2012	Pinyon-Juniper/Stansbury Cliffrose	Phase II transitioning to Phase III
2017	Pinyon-Juniper/Stansbury Cliffrose	Phase II transitioning to Phase III

**Site Notes**

No Notes

**Soils****Table 19A-04.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.2	38.0	37.4	24.6	4.0	15.9	150.4	0.7	07/15/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	12 inches
NRCS Ecological Site	Upland Stony Loam (Cliffrose)
NRCS Ecological Site #	Undefined
States and Transitions	No state and transition model is available for this ecological site.

Stansbury cliffrose (*Purshia stansburiana*) has been the dominant browse species on this site since study establishment in 1983. Singleleaf pinyon (*Pinus monophyllus*) and Utah juniper (*Juniperus osteosperma*) have also been present in all sample years, and from 1983 to 1989, the site was considered to be within Phase I of woodland succession. As cover has increased and pinyon-juniper have become co-dominant with cliffrose, however, the study has progressed through phases of succession and has been in Phase II transitioning to Phase III since the 2012 sample year (photos, Table 19A- 04.4, Table 19A-04.12, Table 19A-04.13, Table 19A-04.14). The herbaceous understory has remained diverse in composition, but has never been particularly abundant (Table 19A-04.7, Table 19A-04.10, Table 19A-04.11). Without a tree-removing disturbance, this study site will likely advance in phases of woodland succession and eventually lose the shrub and herbaceous components that are currently present.

**Trend Summary Tables****Table 19A-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
1997	13.8	1.3	8.8	-	-	-
2002	20.3	1.4	12.2	18.3	1.5	21.3
2012	14.9	0.4	13.6	22.3	0.7	29.4
2017	15.0	0.5	9.6	25.4	-	34.9

**Table 19A-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
1997	270	254	66	160	3.7	5.4	0.5	3.9
2002	30	257	-	75	0.2	5.8	-	0.9
2012	70	227	5	105	0.6	6.7	0.0	1.0
2017	65	224	80	126	0.7	4.5	0.2	1.7

**Table 19A-04.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	8.6	1.7	39.0	19.2	5.1	35.3
2002	13.9	3.4	41.2	24.4	7.7	37.8
2012	11.8	0.5	51.5	11.9	11.3	35.8
2017	12.8	2.7	53.9	25.2	5.3	32.9

**Table 19A-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	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1997	10	-	11
2002	10	-	9
2012	1	1	10
2017	-	1	3
Days Use Per Acre (ha)			
1997	-	-	-
2002	34.2 (84.4)	6.0 (14.9)	-
2012	11.4 (28.1)	0.7 (1.7)	-
2017	-	-	-

**Table 19A-04.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency					
Bromus tectorum <sup>ai</sup> (cheatgrass)	270	39	-	1	219	27
Elymus elymoides (squirreltail)	30	26	-	-	241	17
Poa bulbosa <sup>i</sup> (bulbous bluegrass)	70	3	-	-	225	5
Poa fendleriana (muttongrass)	65	23	0	0	218	5
Poa secunda (Sandberg bluegrass)						
Pseudoroegneria spicata (bluebunch wheatgrass)						
year	Average Cover (%)					
1997	3.7	0.9	-	0.0	4.2	0.2
2002	0.2	0.2	-	-	5.5	0.1
2012	0.6	0.0	-	-	6.7	0.0
2017	0.7	0.6	0.0	0.0	3.8	0.1

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

**Table 19A-04.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Alyssum desertorum <sup>ai</sup> (desert madwort)	13	6	5	1	62	17	4	16	17	-	20	2	-	4	9	-	-
Arabis (rockcress)	-	-	-	-	9	-	-	-	-	-	6	-	-	-	-	6	-
Asclepias labriformis (Utah milkweed)	3	0	-	-	34	-	-	-	5	-	26	-	-	-	-	1	-
Astragalus (milkvetch)	-	-	1	18	24	6	-	20	47	2	23	2	4	2	-	15	3
Astragalus utahensis (Utah milkvetch)																	
Camelina microcarpa <sup>ai</sup> (littlerpod false flax)																	
Castilleja (Indian paintbrush)																	
Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)																	
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																	
Crepis acuminata (tapertip hawkbeard)																	
Cryptantha (cryptantha)																	
Descurainia pinnata <sup>a</sup> (western tansymustard)																	
Draba <sup>a</sup> (draba)																	
Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)																	
Ipomopsis aggregata (scarlet gilia)																	
Lathyrus brachycalyx (Bonneville pea)																	
Linum perenne <sup>i</sup> (blue flax)																	
year	Average Cover (%)																
1997	0.1	0.4	0.1	0.0	1.6	0.3	0.0	0.1	0.1	-	0.1	0.0	-	0.0	0.0	-	-
2002	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	0.0	-
2012	0.0	0.0	-	-	0.6	-	-	-	0.0	-	0.1	-	-	-	-	0.0	-
2017	-	-	0.0	0.4	0.1	0.0	-	0.0	0.1	0.0	0.3	0.0	0.0	0.0	-	0.1	0.0

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

FORB SPECIES	Lupinus (lupine)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Packera multilobata (lobeleaf groundsel)	Petradoria pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Pleiacanthus spinosus (thorn skeletonweed)	Streptanthus cordatus (heartleaf twistflower)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency								
1997	-	12	2	3	23	68	-	33	0
2002	-	2	-	10	20	24	4	-	2
2012	-	-	-	1	13	40	1	-	5
2017	1	-	2	4	18	54	1	1	2
year	Average Cover (%)								
1997	-	0.1	0.0	0.0	0.7	0.2	-	0.7	0.0
2002	-	0.0	-	0.0	0.7	0.1	0.0	-	0.0
2012	-	-	-	0.0	0.2	0.1	0.0	-	0.0
2017	0.0	-	0.0	0.0	0.6	0.2	0.0	0.0	0.0

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

**Table 19A-04.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova <sup>p</sup> (black sagebrush)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Grayia spinosa (spiny hopsage)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>i</sup> (Utah juniper)	Opuntia polyacantha (plains pricklypear)	Pinus monophylla <sup>i</sup> (singleleaf pinyon)	Purshia stansburiana <sup>p</sup> (Stansbury cliffrose)
year	Line Intercept Cover (%)								
1997	-	-	-	-	-	-	-	-	-
2002	2.1	3.4	0.1	0.4	1	6.4	-	14.9	12.8
2012	1.7	2	-	0.5	0.1	13	0.1	16.4	18.6
2017	1.5	0.8	-	-	-	17.1	-	17.8	23.1
year	Quadrat Cover (%)								
1997	1.9	3.8	0.5	-	0.7	6.0	0.1	2.8	8.1
2002	1.5	6.9	0.6	0.3	0.3	4.0	0.1	8.2	11.9
2012	1.8	1.4	-	0.4	0.0	7.8	0.0	5.8	11.7
2017	2.5	0.3	0.0	0.3	0.0	4.2	0.2	5.4	12.1

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

**Table 19A-04.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia nova<sup>P</sup> -- (black sagebrush)</b>									
1997	1100	100	38	46	16	2	0	6	33/58
2002	2120	-	26	45	28	3	0	21	25/43
2012	840	20	17	74	10	0	0	33	28/55
2017	1160	20	5	62	33	0	0	38	33/47
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1997	1100	80	22	36	42	9	0	44	53/74
2002	1400	20	10	40	50	3	0	29	42/64
2012	1180	20	12	59	29	2	0	42	35/55
2017	600	-	10	60	30	0	0	40	40/53
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	520	20	35	62	4	0	0	4	25/35
2002	580	-	0	86	14	0	0	7	21/48
2012	60	-	0	100	0	0	0	67	22/40
2017	-	-	-	-	-	-	-	-	22/32
<b>Grayia spinosa -- (spiny hopsage)</b>									
1997	560	40	75	25	0	0	0	0	35/68
2002	240	-	8	58	33	0	0	8	43/77
2012	120	-	0	83	17	0	0	17	39/60
2017	180	-	22	67	11	0	0	22	31/44
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	1520	100	47	51	1	0	0	1	21/26
2002	1180	-	2	88	10	0	0	3	15/16
2012	40	-	0	100	0	0	0	0	25/29
2017	180	-	33	56	11	0	0	11	23/23
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1997	200	100	70	30	0	0	0	0	- / -
2002	180	60	44	56	0	0	0	0	- / -
2012	160	100	50	50	0	0	0	0	- / -
2017	220	60	55	46	0	0	0	0	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1997	220	-	18	82	0	0	0	0	14/32
2002	240	-	8	92	0	0	0	0	14/25
2012	200	-	10	90	0	0	0	10	13/30
2017	320	-	0	100	0	0	0	0	13/35
<b>Pinus monophylla<sup>t</sup> -- (singleleaf pinyon)</b>									
1997	180	60	67	33	0	0	0	0	- / -
2002	280	120	43	50	7	0	0	21	- / -
2012	200	100	40	60	0	0	0	10	- / -
2017	160	-	38	63	0	0	0	13	- / -
<b>Purshia stansburiana<sup>P</sup> -- (Stansbury cliffrose)</b>									
1997	840	160	33	64	2	2	0	2	158/144
2002	820	-	15	68	17	17	2	5	173/164
2012	660	-	15	76	9	0	0	24	168/182
2017	780	40	8	77	15	0	0	8	164/158
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1997	-	-	-	-	-	-	-	-	- / -
2002	20	-	0	0	100	0	0	100	16/27

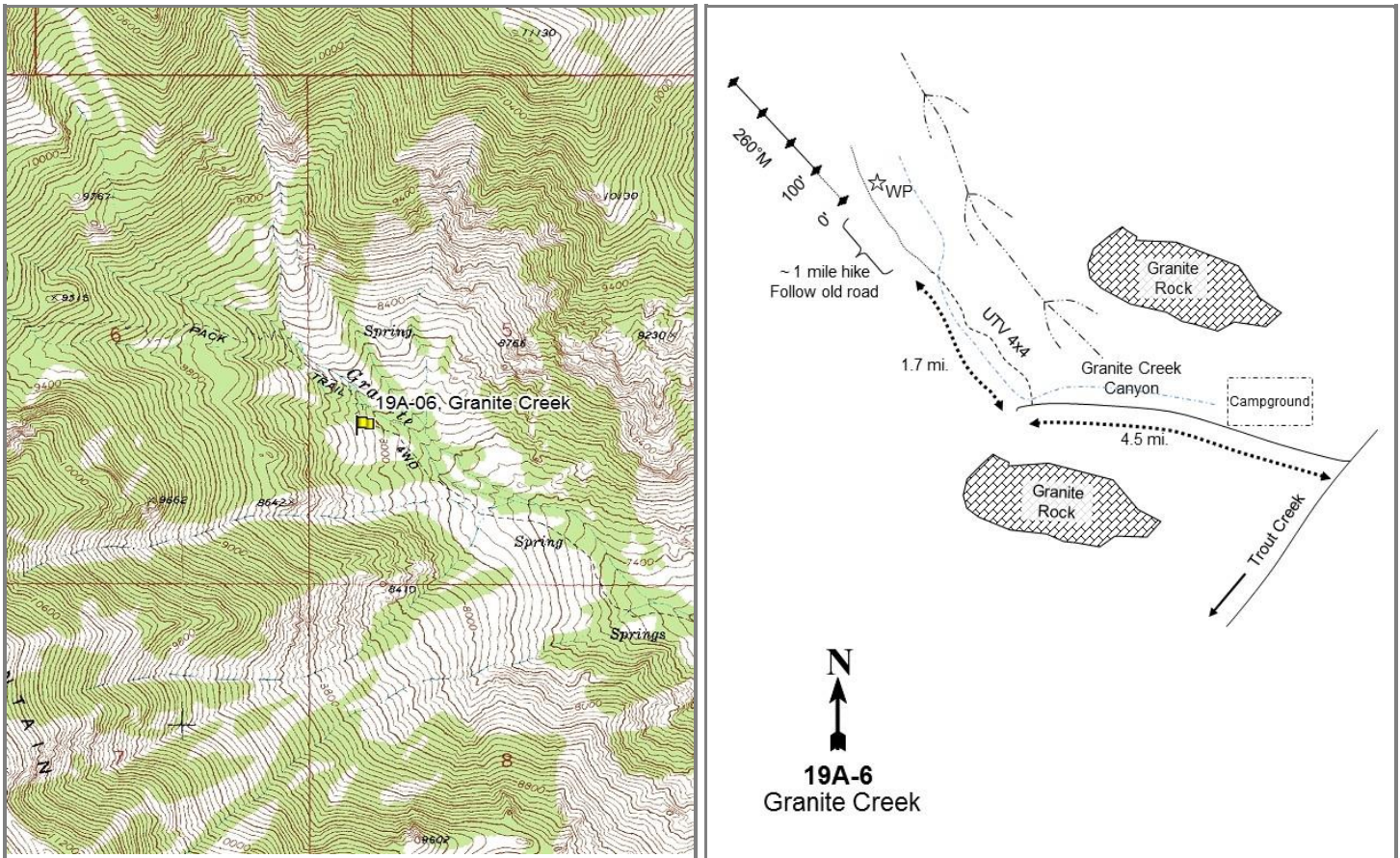
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 19A-04.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2002	442	-	-	-	-	-	6.8
2012	351	15	10	40	25	10	10.7
2017	417	15	5	45	20	15	10.3
<b>Pinus monophylla (singleleaf pinyon)</b>							
2002	355	-	-	-	-	-	6.4
2012	351	40	-	25	20	15	9.8
2017	329	25	25	10	20	20	11.1



## GRANITE CREEK - STUDY NO. 19A-6

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Ibapah Peak SE; Township 12S, Range 18W, Section 05  
NAD 83 UTM ZONE 12, 250978 East 4410010 North

**Transect Information**

Browse Tag # (0' Stake)	3921
Transect Bearing	260° 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 junction of Snake Valley Road and the road which runs west towards Granite Creek, proceed west up Granite Creek Canyon for 4.5 miles to an intersection. Turn right, crossing Granite Creek, and proceed 2.7 miles up the canyon to the end of the road. From the end of the road, the 0-foot baseline stake is 59 paces away at an azimuth of 194 degrees and near a single pine tree. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.



**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	THOUSAND PEAKS
Elevation	8,100ft (2,469m)
Aspect	Northeast
Slope	45%
Sample Dates	07/17/1997, 06/28/2017

**Wildlife Habitat and Vegetation History****Table 19A-06.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	spring/fall
Elk	substantial	spring/fall
Rocky Mountain Bighorn	crucial	spring/summer

**Table 19A-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	Phase I
1989	Mountain Big Sagebrush	Phase I
1997	Mountain Big Sagebrush	Phase I
2017	Mountain Big Sagebrush/Perennial Forb	Phase I

**Site Notes**

Evidence of past mining activity exists in the lower part of the canyon, but does not interfere with the study site.

**Soils****Table 19A-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	6.1	39.6	45.8	14.6	4.3	13.1	230.4	0.9	07/17/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

Although a number of shrub species are present as minor components, this study site has been dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) since 1983; density of sagebrush has exhibited an overall decreasing trend over time (Table 19A-06.12, Table 19A-06.13). Singleleaf pinyon (*Pinus monophylla*) has also been observed on this site since study establishment, and the site has remained in Phase I of woodland succession for the duration of the study (photos, Table 19A-06.4, Table 19A-06.14). The herbaceous understory has been abundant and very diverse in all sample years. Perennial grasses -- namely Idaho fescue (*Festuca idahoensis*) -- and perennial forbs have contributed the most herbaceous cover over the study period, and perennial forbs were a co-dominant site component in 2017 (Table 19A-06.7, Table 19A-06.10, Table 19A-06.11).

**Trend Summary Tables**

**Table 19A-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	12.9	9.4	3.1	-	-	-
2017	9.3	14.2	3.7	10.3	16.7	4.4

**Table 19A-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	-	369	185	338	-	13.9	0.7	11.9
2017	-	339	245	395	-	18.1	3.2	30.1

**Table 19A-06.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	5.8	1.7	51.7	3.3	10.6	50.6
2017	8.0	0.6	51.7	5.9	9.1	63.9

**Table 19A-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	Mule Deer	Rocky Mountain Elk
	Quadrat Frequency	
1997	21	-
2017	6	-
Year	Days Use Per Acre (ha)	
1997	-	-
2017	13.4 (33.1)	0.7 (1.7)

**Table 19A-06.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bromus ciliatus (fringed brome)	Elymus trachycaulus (slender wheatgrass)	Festuca idahoensis (Idaho fescue)	Hesperostipa comata (needle and thread)	Poa fendleriana (muttongrass)	Poa pratensis (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency									
1997	50	18	22	40	241	5	50	109	11	16
2017	-	14	31	69	237	-	34	102	15	17
year	Average Cover (%)									
1997	0.7	0.2	0.3	0.2	9.9	0.0	0.7	1.7	0.1	0.2
2017	-	0.3	1.0	1.2	10.8	-	0.9	2.9	0.3	0.8

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

**Table 19A-06.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Delphinium × occidentale (western larkspur)	Erigeron jonesii (Jones' fleabane)	Hackelia patens (spotted stickseed)	Heuchera parvifolia (litleleaf alumroot)
year	Nested Frequency																
1997	6	79	4	1	-	13	-	34	108	87	61	29	1	14	3	62	1
2017	11	186	-	1	2	20	2	9	25	175	158	30	6	7	10	25	7
year	Average Cover (%)																
1997	0.0	0.2	0.0	0.0	-	0.1	-	0.1	2.0	0.2	0.2	0.3	0.0	0.4	0.0	0.4	0.0
2017	0.0	1.3	-	0.0	0.1	0.3	0.6	0.0	0.6	1.7	1.2	0.4	0.0	0.4	0.1	0.7	0.2

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

FORB SPECIES	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Linum lewisii (Lewis flax)	Lomatium (desertparsley)	Lupinus caudatus (tailcup lupine)	Machaeranthera canescens (hoary tansyaster)	Mertensia (bluebells)	Microsteris gracilis <sup>a</sup> (slender phlox)	Penstemon watsonii (Watson's penstemon)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Potentilla (cinquefoil)	Pseudostellaria jamesiana (tuber starwort)	Sedum lanceolatum (spearleaf stonecrop)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Silene drummondii (Drummond's campion)	Symphyotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	unknown annual forb <sup>a</sup> (unknown forb)
year	Nested Frequency																
1997	17	3	3	119	2	6	11	49	81	4	202	6	19	1	-	17	4
2017	1	-	9	108	2	70	4	56	24	10	329	1	3	0	3	10	-
year	Average Cover (%)																
1997	0.0	0.0	0.0	4.1	0.0	0.2	0.0	0.9	0.2	0.0	2.9	0.0	0.1	0.0	-	0.1	0.0
2017	0.0	-	0.1	5.9	0.0	1.1	0.1	3.5	0.0	0.1	14.2	0.0	0.2	0.0	0.0	0.1	-

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

FORB SPECIES		
	Viola (violet)	
		Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency	
1997	16	-
2017	-	15
year	Average Cover (%)	
1997	0.1	-
2017	-	0.3

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

**Table 19A-06.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Abies concolor <sup>r</sup> (white fir)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum microthecum <sup>p</sup> (slender buckwheat)	Mahonia repens (creeping barberry)	Opuntia polyacantha (plains pricklypear)	Pinus monophylla <sup>i</sup> (singleleaf pinyon)	Symphoricarpos oreophilus (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)								
1997	-	-	-	-	-	-	-	-	-
2017	0.1	10.3	0.5	-	13.9	-	4.3	2.3	-
year	Quadrat Cover (%)								
1997	-	12.9	0.1	0.0	7.7	-	3.1	1.5	0.2
2017	1.6	9.2	0.2	0.1	12.0	0.0	2.1	2.0	-

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

**Table 19A-06.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

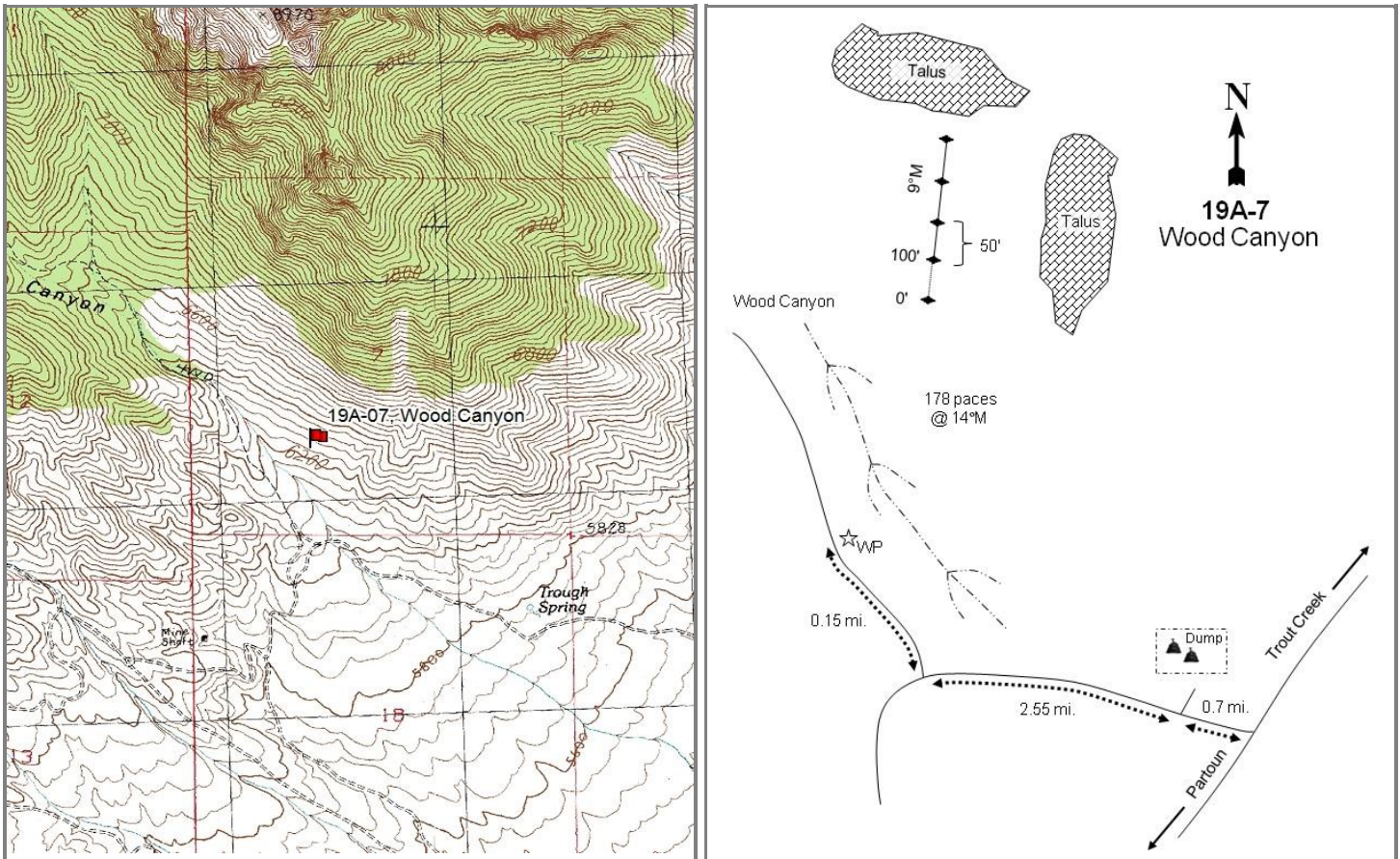
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Abies concolor<sup>t</sup> -- (white fir)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2017	140	-	100	0	0	0	0	0	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1997	2440	100	7	66	28	14	4	24	75/106
2017	1860	-	3	74	23	4	0	20	55/78
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	180	-	0	100	0	0	0	0	45/58
2017	420	-	0	100	0	0	0	0	32/43
<b>Eriogonum microthecum<sup>p</sup> -- (slender buckwheat)</b>									
1997	180	-	11	89	0	0	0	0	21/20
2017	60	-	0	100	0	33	0	0	16/30
<b>Mahonia repens -- (creeping barberry)</b>									
1997	31480	120	9	92	0	0	0	1	11/13
2017	68000	-	0	100	0	0	0	0	11/12
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1997	40	-	0	100	0	0	0	0	- / -
2017	20	-	0	100	0	0	0	0	15/52
<b>Pinus monophylla<sup>t</sup> -- (singleleaf pinyon)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2017	100	-	100	0	0	0	0	20	- / -
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1997	80	-	25	75	0	0	0	0	84/121
2017	180	-	11	89	0	0	0	11	85/164
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1997	60	-	0	33	67	0	0	0	33/62
2017	40	-	0	100	0	0	0	0	40/48

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

**Table 19A-06.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
<b>Abies concolor (white fir)</b>							
2017	36	-	29	50	-	21	9.0
<b>Pinus monophylla (singleleaf pinyon)</b>							
2017	18	-	27	9	-	64	22.5

## WOOD CANYON - STUDY NO. 19A-7

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Partoun NE; Township 13S, Range 18W, Section 07  
NAD 83 UTM ZONE 12, 249327 East 4398447 North

**Transect Information**

Browse Tag # (0' Stake)	9082
Transect Bearing	9° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 1: 2ft, Belt 2: 1ft, Line 2: 50ft Long

**Directions to Site**

From Trout Creek on Gandy Road through Snake Valley, go south to the old Partoun dump (which is now covered over). Turn west and continue for 0.7 miles to the Trough Springs turnoff. Take this road west for 3.25 miles to the turnoff to Wood Canyon. Turn right and proceed for 0.15 miles to a witness post on the right (northeast) side of the road. From the witness post, walk 178 paces north (14 degrees magnetic) to the 0-foot baseline stake which is behind a large rock. The baseline runs uphill at 9 degrees magnetic.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	PARTOUN
Elevation	6,250ft (1,905m)
Aspect	South
Slope	30-35%
Sample Dates	07/17/1997, 07/15/2002, 07/12/2007, 07/18/2012, 06/28/2017

**Wildlife Habitat and Vegetation History****Table 19A-07.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter/spring
Rocky Mountain Bighorn	substantial	year-long

**Table 19A-07.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Perennial Grass/Mixed Shrub	Phase I
1989	Perennial Grass/Mixed Shrub	Phase I
1997	Perennial Grass/Mixed Shrub	Phase I
2002	Perennial Grass/Mixed Shrub	Phase I
2007	Perennial Grass/Mixed Shrub	Phase I
2012	Perennial Grass/Mixed Shrub	Phase I
2017	Perennial Grass/Mixed Shrub	Phase I

**Site Notes**

Rugged cliffs cap the ridge north of the study, and it is surrounded by miles of vast open desert to the south and east. The study was established in 1989 to monitor bighorn sheep habitat, but it mainly receives winter use by deer. Chukars were heard on the nearby ledges in 1989, 1997, and 2012. In addition, pronghorn were spotted half of a mile east of the study in 2007. A stock pond one mile to the east is the closest apparent water source.

**Soils****Table 19A-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
Loam	7.4	50.0	31.4	18.6	1.5	9.2	233.6	0.8	07/17/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Semidesert Stony Loam (Black Sagebrush)
NRCS Ecological Site #	R028AY252UT
States and Transitions	No state and transition model is available for this ecological site.

At the time of study establishment in 1983, this site was a semi-desert ecological site dominated by perennial grasses and mixed shrubs. It has remained in this state in subsequent studies. The most prevalent shrub species are shadscale saltbush (*Atriplex confertifolia*), broom snakeweed (*Gutierrezia sarothrae*) and Nevada jointfir (*Ephedra nevadensis*) (Table 19A-07.12). Perennial grasses compose a significant portion of the understory; with James' galleta (*Pleuraphis jamesii*), sand dropseed (*Sporobolus cryptandrus*), and Indian ricegrass (*Achnatherum hymenoides*) being the most prevalent grasses in the understory (Table 19A-07.10). Annual grasses have fluctuated in cover through time (Table 19A-07.10). Forbs are rather sparse and diversity is low (Table 19A-07.11). It is likely that this site will continue to remain in this state in the future barring disturbance on the site.



**Trend Summary Tables****Table 19A-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
1997	3.1	7.8	-	-	-	-
2002	2.0	3.6	-	3.0	3.3	-
2007	2.5	5.0	-	2.0	6.0	-
2012	1.7	3.5	-	1.5	2.9	-
2017	1.7	3.6	-	3.1	3.3	-

**Table 19A-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
1997	439	207	105	11	6.2	7.8	1.2	0.1
2002	344	162	271	-	2.0	3.0	1.9	-
2007	422	208	361	2	8.6	4.7	5.2	0.0
2012	368	204	53	17	10.3	9.0	0.4	0.1
2017	321	277	318	8	3.2	14.1	6.7	0.0

**Table 19A-07.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	6.8	0.3	21.3	22.9	29.7	29.6
2002	13.9	0.4	18.4	26.9	33.7	13.7
2007	4.0	0.0	23.6	23.5	31.3	26.9
2012	14.0	0.0	18.8	19.4	35.5	25.9
2017	19.4	0.0	20.1	24.9	29.9	28.4

**Table 19A-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	Chukar Partridge	Cattle	Mule Deer/Pronghorn	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency					
1997	-	-	9	2	-	4
2002	-	-	10	-	1	4
2007	-	1	6	-	1	8
2012	-	-	4	-	1	4
2017	-	-	1	7	-	5
Year	Days Use Per Acre (ha)					
1997	-	-	-	-	-	-
2002	17.4 (43.0)*	8.0 (19.7)	14.1 (34.8)	0.7 (1.7)	1.7 (4.3)	-
2007	-	5.8 (14.3)	13.4 (33.1)	3.4 (8.3)	0.6 (1.4)	-
2012	-	2.9 (7.2)	5.3 (13.2)	3.4 (8.3)	1.7 (4.3)	-
2017	-	-	2.0 (5.0)	6.0 (14.9)	-	-

\*Pellets per acre (ha)

**Table 19A-07.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pleuraphis jamesii (James' galleta)	Poa secunda (Sandberg bluegrass)	Sporobolus cryptandrus (sand dropseed)
year	Nested Frequency						
1997	51	439	18	56	132	5	4
2002	29	344	2	51	83	6	26
2007	25	422	31	39	90	24	38
2012	30	368	3	18	176	18	1
2017	62	321	33	8	177	32	57
year	Average Cover (%)						
1997	1.8	6.2	0.3	1.5	4.0	0.1	0.1
2002	0.6	2.0	0.0	1.2	1.0	0.0	0.2
2007	0.4	8.6	1.1	0.9	1.5	0.2	0.7
2012	1.1	10.3	0.1	0.6	7.0	0.2	0.0
2017	3.3	3.2	0.9	0.2	6.2	0.2	3.1

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

**Table 19A-07.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum <sup>ai</sup> (desert madwort)	Astragalus (milkvetch)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Cryptantha (cryptantha)	Draba <sup>a</sup> (draba)	Erigeron (fleabane)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Gilia inconspicua <sup>a</sup> (shy gilia)	Halogeton glomeratus <sup>ai</sup> (saltlover)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lepidium <sup>a</sup> (pepperweed)	Phlox longifolia (longleaf phlox)	Sphaeralcea grossularifolia (gooseberry/leaf globemallow)
year	Nested Frequency												
1997	12	1	-	-	-	8	96	-	3	-	-	-	2
2002	6	-	-	-	-	-	271	-	-	-	-	-	-
2007	74	-	-	-	-	-	355	3	1	7	-	2	-
2012	-	7	-	-	-	-	53	-	-	-	-	3	7
2017	9	-	7	4	11	-	312	20	2	3	54	1	3
year	Average Cover (%)												
1997	0.0	0.0	-	-	-	0.0	1.2	-	0.0	-	-	-	0.0
2002	0.0	-	-	-	-	-	1.9	-	-	-	-	-	-
2007	0.3	-	-	-	-	-	4.8	0.0	0.0	0.0	-	0.0	-
2012	-	0.1	-	-	-	-	0.4	-	-	-	-	0.0	0.0
2017	0.1	-	0.0	0.0	0.0	-	6.3	0.1	0.0	0.0	0.2	0.0	0.0

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

**Table 19A-07.12 - 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 <sup>p</sup> (black sagebrush)	-	-	-	-	-	-	-	-	-	-	-
Atriplex confertifolia <sup>p</sup> (shadscale saltbush)	-	0.8	0.4	0.2	-	1.8	2.3	-	0.8	-	
Bassia americana <sup>p</sup> (green molly)	-	0.7	-	0.3	-	1.3	4.2	0	0.3	1.2	
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	-	0.5	-	0.2	-	1	2.1	0	-	0.6	
Echinocereus (hedgheg cactus)	-	0.2	0.1	0.3	-	2.8	2.3	0	-	0.7	
Ephedra nevadensis <sup>p</sup> (Nevada jointfir)	-	-	-	-	-	-	-	-	-	-	
Gutierrezia sarothrae (broom snakeweed)	-	-	-	-	-	-	-	-	-	-	
Krascheninnikovia lanata <sup>p</sup> (winterfat)	-	-	-	-	-	-	-	-	-	-	
Opuntia polyacantha (plains pricklypear)	-	-	-	-	-	-	-	-	-	-	
Tetradymia spinosa (shortspine horsebrush)	-	-	-	-	-	-	-	-	-	-	
year	Quadrat Cover (%)										
1997	-	2.3	0.0	0.5	-	0.8	5.0	-	1.0	1.3	
2002	-	0.7	0.0	0.3	0.0	1.3	2.2	-	0.8	0.2	
2007	-	0.5	-	0.3	0.0	1.9	3.5	0.1	0.7	0.4	
2012	0.1	0.1	-	0.4	0.0	1.2	2.1	0.1	0.3	0.8	
2017	-	0.2	0.0	0.4	0.0	1.5	2.0	0.0	0.2	1.0	

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

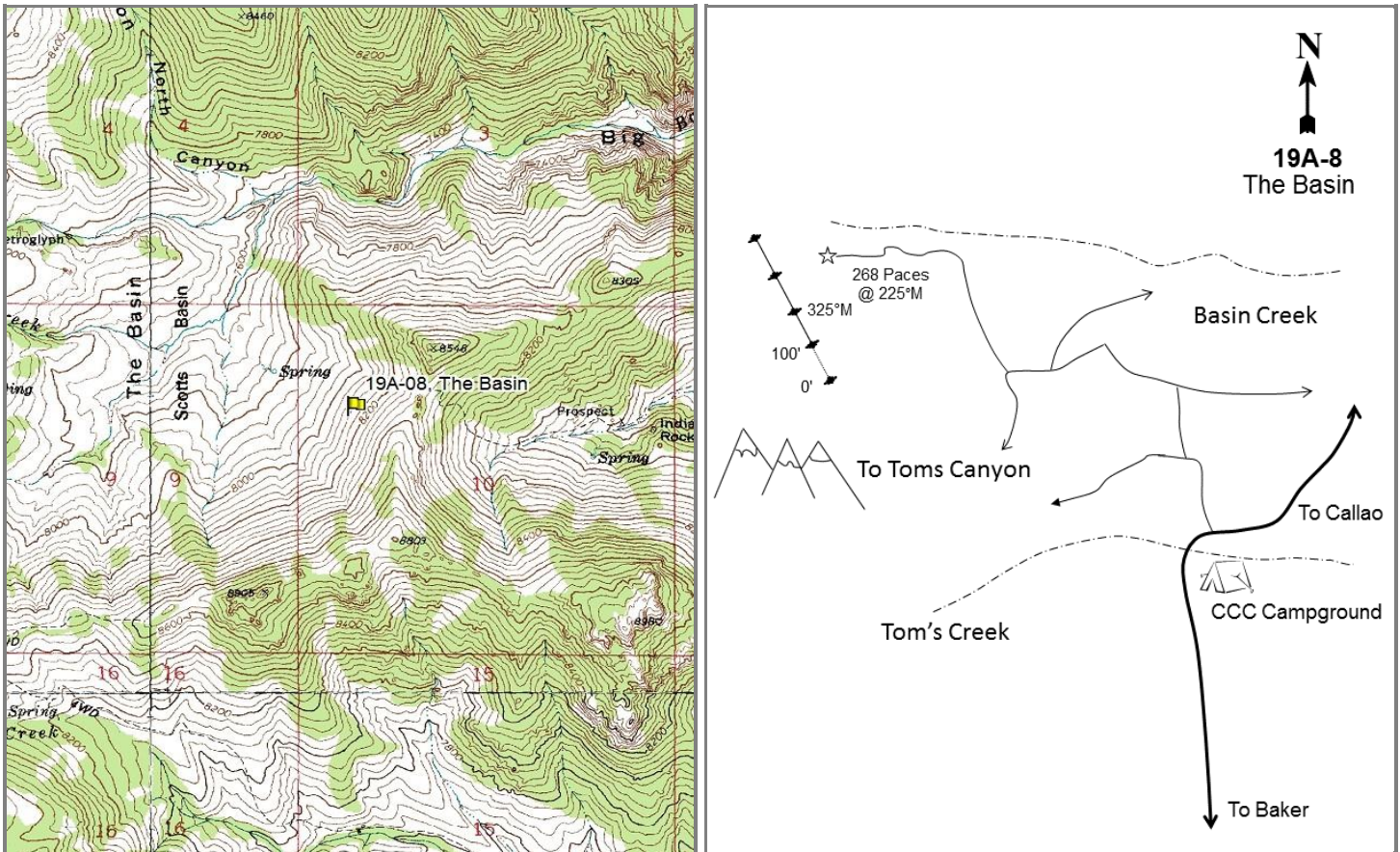
**Table 19A-07.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia nova<sup>p</sup> -- (black sagebrush)</b>									
1997	-	-	-	-	-	-	-	-	34/50
2002	-	-	-	-	-	-	-	-	21/42
2007	-	-	-	-	-	-	-	-	29/76
2012	140	-	0	100	0	0	0	0	23/64
2017	-	-	-	-	-	-	-	-	31/69
<b>Atriplex confertifolia<sup>p</sup> -- (shadscale saltbush)</b>									
1997	1400	20	10	67	23	14	7	20	24/59
2002	1140	-	30	26	44	4	4	35	16/39
2007	800	-	0	63	38	3	0	48	19/49
2012	500	-	4	96	0	4	0	4	15/38
2017	500	-	4	80	16	0	0	8	18/48
<b>Bassia americana<sup>p</sup> -- (green molly)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	240	-	58	42	0	0	8	0	12/20
2007	40	-	0	100	0	100	0	0	24/37
2012	60	-	0	100	0	0	0	0	26/41
2017	440	-	23	36	41	0	0	27	8/12
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1997	100	-	0	80	20	0	0	20	22/41
2002	80	-	0	50	50	0	25	25	18/42
2007	120	-	0	83	17	17	0	17	22/48
2012	40	-	0	50	50	0	0	100	26/50
2017	40	-	0	50	50	0	0	100	32/65
<b>Echinocereus -- (hedgheg cactus)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	200	-	20	80	0	0	0	0	8/15
2007	160	20	13	88	0	0	0	0	9/16
2012	200	-	0	100	0	0	0	0	11/14
2017	280	-	0	100	0	0	0	0	9/16

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Ephedra nevadensis<sup>P</sup> -- (Nevada jointfir)</b>									
1997	160	-	0	100	0	13	0	0	42/88
2002	320	-	25	63	13	56	6	75	47/118
2007	320	-	31	50	19	13	19	50	47/119
2012	360	-	28	67	6	22	33	50	48/99
2017	1000	20	12	48	40	0	0	40	39/79
<b>Escobaria vivipara var. arizonica -- (Arizona spinystar)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	20	-	0	100	0	0	0	0	9/14
2017	-	-	-	-	-	-	-	-	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	5200	60	7	80	13	0	0	11	19/31
2002	3320	-	4	68	28	0	1	33	14/23
2007	4040	-	3	83	14	1	0	5	21/34
2012	2180	20	4	95	1	0	0	3	19/32
2017	5720	-	6	88	6	0	0	13	19/27
<b>Krascheninnikovia lanata<sup>P</sup> -- (winterfat)</b>									
1997	60	-	0	100	0	33	0	0	22/26
2002	40	-	0	50	50	0	100	50	14/28
2007	260	-	0	100	0	0	8	0	15/29
2012	380	-	63	37	0	0	0	0	18/30
2017	120	-	0	100	0	83	0	50	19/34
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1997	460	-	9	87	4	0	0	4	29/46
2002	500	-	16	68	16	0	0	24	10/33
2007	520	-	0	85	15	4	0	12	12/39
2012	220	-	27	73	0	0	0	9	9/20
2017	220	-	18	73	9	0	0	9	10/22
<b>Tetradymia spinosa -- (shortspine horsebrush)</b>									
1997	100	-	0	60	40	20	0	20	44/73
2002	100	-	0	0	100	0	0	100	48/89
2007	120	-	0	0	100	0	0	100	46/140
2012	80	-	0	50	50	0	0	75	43/73
2017	100	-	0	0	100	0	0	100	42/74
<b>Yucca -- (yucca)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	53/59
2012	-	-	-	-	-	-	-	-	38/62
2017	-	-	-	-	-	-	-	-	48/78

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

## THE BASIN - STUDY NO. 19A-8



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Goshute Canyon SW; Township 11S, Range 18W, Section 10  
NAD 83 UTM ZONE 12, 254944 East 4419083 North

### Transect Information

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

N/A  
325° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
No Rebar

### Directions to Site

From the bridge outside of the CCC camp near Callao, take the fork off the main Snake Valley Road. Continue northwest for 0.85 miles to a fork: keep right and proceed 0.8 miles to an intersection. Turn left (toward the mountains), and after 0.1 miles keep right at the fork. Continue for 1.65 miles and keep right at the fork to Tom's Canyon. Proceed up Middle Canyon for 3.35 miles to the top, and stop where the road ends (in a saddle overlooking The Basin). Follow the lowest trail and hike southwest for 268 paces to a spot just past a small gully and the last clump of mahogany. The baseline is above the trail; walk 7 paces to the red fencepost marking the 100-foot baseline stake.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	MOUNTAIN
Elevation	8,200ft (2,499m)
Aspect	West
Slope	45%
Sample Dates	07/16/1997, 06/27/2017

**Wildlife Habitat and Vegetation History****Table 19A-08.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	summer/fall
Rocky Mountain Bighorn	crucial	spring/summer

**Table 19A-08.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Low Sagebrush	Phase I
1997	Low Sagebrush	Phase I
2017	Low Sagebrush	Phase I

**Site Notes**

Nearby mahogany and pinyon stands provide good cover and springs in the bottom of the basin (about 1/4 mile away) provide a perennial water source.

**Soils****Table 19A-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 Loam	6.4	61.3	22.2	16.6	3.2	10.1	176.0	0.7	07/16/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush), Mountain Shallow Loam (Low Sagebrush)
NRCS Ecological Site #	R047XA430 (442) UT
States and Transitions	No state and transition model is available for this ecological site.

Low sagebrush (*Artemisia arbuscula*) has dominated this site since the study was initiated in 1989. Mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) is also present toward the bottom of the transect, but is less abundant and provides less cover. Singleleaf pinyon (*Pinus monophylla*) has been observed on site since 1989, placing it in Phase I of encroachment (photos, Table 19A-08.4, Table 19A-08.12, Table 19A-08.13, Table 19A-08.14). The understory of this study site is diverse and quite abundant (Table 19A-08.7). Perennial grasses, mainly Idaho fescue (*Festuca idahoensis*), provided a majority of the herbaceous cover in 1997 and 2017; perennial forbs are also abundant. The introduced annual grass species cheatgrass (*Bromus tectorum*) was present on site for the first time in 2017, but with little cover (Table 19A-08.10, Table 19A-08.11).

**Trend Summary Tables****Table 19A-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
1997	14.4	0.3	1.7	-	-	-
2017	17.3	2.5	2.2	18.3	2.7	2.8

**Table 19A-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
1997	-	365	137	310	-	14.4	0.6	9.3
2017	12	363	205	290	0.2	21.0	4.1	11.2

**Table 19A-08.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	4.0	0.1	28.9	38.9	1.9	42.1
2017	8.9	0.1	38.2	34.0	1.6	52.2

**Table 19A-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	Rabbit
	Quadrat Frequency		
1997	4	13	-
2017	3	2	6
Year	Days Use Per Acre (ha)		
1997	-	-	-
2017	13.1 (32.3)	22.1 (54.6)	-

**Table 19A-08.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum nelsonii (Columbia needlegrass)	Bromus marginatus (mountain brome)	Bromus tectorum <sup>ii</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Festuca idahoensis (Idaho fescue)	Leymus cinereus (basin wildrye)	Melica bulbosa (oniongrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency										
1997	17	-	-	2	-	241	-	-	87	120	65
2017	1	1	12	4	16	292	13	5	22	183	25
year	Average Cover (%)										
1997	0.3	-	-	0.0	-	9.5	-	-	1.4	2.5	0.7
2017	0.0	0.0	0.2	0.0	0.5	15.7	0.2	0.1	0.3	3.4	0.8

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



**Table 19A-08.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Arabis (rockcress)	Arenaria fendleri (Fendler's sandwort)	Astragalus (milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ii</sup> (littlepod false flax)	Castilleja angustifolia (northwestern Indian paintbrush)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Delphinium nuttallianum (two-lobed larkspur)	Erigeron jonesii (Jones' fleabane)	Hackelia patens (spotted stickseed)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Linum lewisii (Lewis flax)	Lomatium (desertparsley)
year	Nested Frequency																
1997	-	17	137	8	11	-	20	113	8	-	71	67	45	17	-	8	2
2017	3	2	125	6	9	4	24	200	24	2	90	18	26	3	5	-	6
year	Average Cover (%)																
1997	-	0.0	1.7	0.1	0.0	-	0.1	0.3	0.0	-	0.9	0.4	0.3	0.1	-	0.1	0.0
2017	0.0	0.0	1.4	0.1	0.1	0.0	0.3	3.2	0.3	0.0	1.4	1.4	0.3	0.1	0.0	-	0.0

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

FORB SPECIES	Lupinus arbustus ssp. calcaratus (longspur lupine)	Mertensia (bluebells)	Microsteris gracilis <sup>a</sup> (slender phlox)	Penstemon humilis (low beardtongue)	Petradonia pumila (rock goldenrod)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Potentilla diversifolia (varileaf cinquefoil)	Sedum lanceolatum (spearleaf stonecrop)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Symphotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)
year	Nested Frequency												
1997	108	-	34	63	-	6	100	14	-	17	1	4	23
2017	62	19	19	12	6	1	63	1	40	29	32	3	26
year	Average Cover (%)												
1997	4.2	-	0.2	0.8	-	0.0	0.3	0.0	-	0.1	0.0	0.0	0.2
2017	4.3	0.1	0.1	0.2	0.1	0.0	0.3	0.0	0.2	0.2	0.5	0.0	0.7

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

**Table 19A-08.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)						
	year	Line Intercept Cover (%)					
Artemisia arbuscula <sup>p</sup> (little sagebrush)	1997	-	-	-	-	-	-
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	2017	11.4	5.5	0.9	1.5	0.5	1.2
Cercocarpus ledifolius <sup>p</sup> (curl-leaf mountain mahogany)	year	Quadrat Cover (%)					
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	1997	7.6	6.3	0.0	0.3	0.5	1.7
Eriogonum microthecum <sup>p</sup> (slender buckwheat)	2017	11.6	5.1	0.0	1.1	0.6	1.4
Pinus monophylla <sup>t</sup> (singleleaf pinyon)							
Symphoricarpos oreophilus (mountain snowberry)							

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

**Table 19A-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.

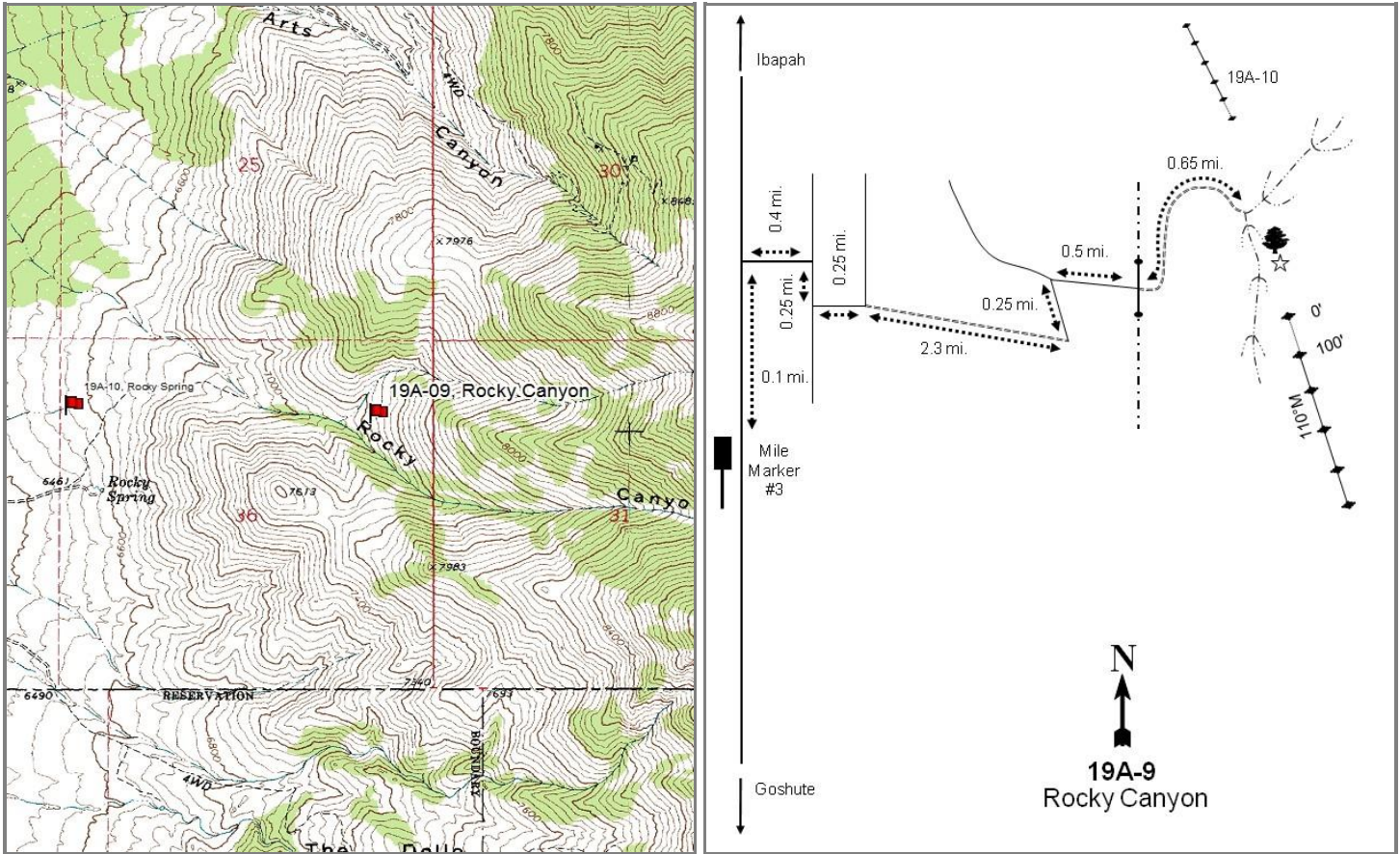
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia arbuscula <sup>p</sup> -- (little sagebrush)									
1997	6460	140	12	68	20	25	3	6	20/46
2017	7960	120	5	89	7	23	0	4	19/44
Artemisia tridentata ssp. vaseyana <sup>p</sup> -- (mountain big sagebrush)									
1997	2360	320	12	81	7	30	0	4	59/84
2017	1980	-	5	84	11	4	0	7	46/65
Cercocarpus ledifolius <sup>p</sup> -- (curl-leaf mountain mahogany)									
1997	-	20	0	0	0	0	0	0	- / -
2017	-	-	-	-	-	-	-	-	139/169
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	340	-	0	100	0	0	0	0	37/48
2017	520	-	4	96	0	0	0	0	34/51
Eriogonum microthecum <sup>p</sup> -- (slender buckwheat)									
1997	480	20	17	83	0	0	0	0	17/24
2017	540	-	0	100	0	0	0	0	26/37
Gutierrezia sarothrae -- (broom snakeweed)									
1997	20	-	0	100	0	0	0	0	- / -
2017	-	-	-	-	-	-	-	-	18/17
Pinus monophylla <sup>t</sup> -- (singleleaf pinyon)									
1997	20	20	0	100	0	0	0	0	- / -
2017	100	-	80	20	0	0	0	20	- / -
Symphoricarpos oreophilus -- (mountain snowberry)									
1997	60	-	0	100	0	0	0	0	67/172
2017	120	-	33	67	0	0	0	0	67/108

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

**Table 19A-08.14 - 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' (%)	
Pinus monophylla (singleleaf pinyon)							
2017	15	-	63	25	13	-	8.3

## ROCKY CANYON - STUDY NO. 19A-9

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Goshute SE; Township 10S, Range 19W, Section 36  
NAD 83 UTM ZONE 12, 249541 East 4422645 North

**Transect Information**

Browse Tag # (0' Stake)	413
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	Belt 3: 1ft

**Directions to Site**

From the main road between Ibapah and Goshute, turn east onto a road that is 0.1 miles north of mile marker 3. Drive for 0.4 miles to an intersection. Turn right and proceed for 0.25 miles to another intersection. Turn left and continue for 2.3 miles on a 4WD road that is faint in places to another intersection. Turn right and go 0.25 miles to another intersection. Turn right again and proceed for 0.5 miles to a gate. Drive through the gate and follow the road to the left for 0.65 miles, passing a witness post on the left side of the road (the witness post is for 19A-10, Rocky Spring). After 0.65 miles (0.4 miles after the witness post), the road ends. Park here and walk easterly in the drainage. The drainage will split: from here, walk 200 feet eastward out of the drainage toward a lone juniper. The 0-foot stake is 20 feet east of the juniper and is marked by browse tag #413.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	IBAPAH
Elevation	7,225ft (2,202m)
Aspect	Southwest
Slope	34%
Sample Dates	07/17/2002, 07/11/2007, 07/18/2012, 06/27/2017

**Wildlife Habitat and Vegetation History****Table 19A-09.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	summer/fall
Greater Sage Grouse	occupied	year-long
Rocky Mountain Bighorn	crucial	spring/summer

**Table 19A-09.4 - 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	Phase I
2007	Mountain Big Sagebrush	Phase I
2012	Mountain Big Sagebrush	Phase I
2017	Mountain Big Sagebrush	Phase I

**Site Notes**

This study site is located within a natural travel corridor for elk that move down onto the lower flats during winter months. An elk carcass was seen in 2007, and a deer carcass was noted in 2012. Cattle were seen downhill from the study in 2017.

**Soils****Table 19A-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
Loam	6.4	41.3	34.7	24.0	4.7	19.0	361.6	0.7	07/17/2002

**Site Potential**

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Mountain Shallow Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA446UT
States and Transitions	No state and transition model is available for this ecological site.

This study site has remained dominated by a mainly mature stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) since establishment in 2002. Other preferred browse species including (but not limited to) black sagebrush (*A. nova*) and rubber rabbitbrush (*Ericameria nauseosa* ssp. *nauseosa* var. *hololeuca*) are also present, but are not as abundant. This site has remained in Phase I of woodland succession throughout the study period with Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon (*Pinus monophylla*) scattered throughout the area (photos, Table 19A-09.4, Table 19A-09.12, Table 19A-09.13, Table 19A-09.14). Perennial grasses, namely bluebunch wheatgrass (*Pseudoroegneria spicata*), contribute a majority of the cover in the herbaceous understory, which has been abundant and diverse for the duration of the study period. Although abundance is low, the introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) has been observed in all study years with increasing cover values (Table 19A-09.7, Table 19A-09.10). Perennial forbs, in particular silvery lupine (*Lupinus argenteus*), have contributed more cover than annual forb species throughout the study period (Table 19A-09.11).

## Trend Summary Tables

**Table 19A-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
2002	21.6	2.9	-	24.4	3.3	-
2007	14.5	2.1	0.2	19.2	2.9	1.2
2012	16.9	2.8	0.4	20.2	2.3	0.1
2017	15.4	3.2	1.1	23.7	2.4	1.1

**Table 19A-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
2002	84	318	95	140	1.3	14.1	0.4	4.8
2007	10	344	177	214	0.1	17.6	0.5	6.3
2012	37	340	130	157	0.5	16.6	0.4	3.3
2017	80	322	169	203	2.5	19.9	2.5	9.4

**Table 19A-09.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2002	9.7	0.3	33.2	4.0	26.9	41.7
2007	11.0	0.2	24.6	4.0	32.8	36.8
2012	9.7	1.1	39.1	2.7	32.4	42.3
2017	10.0	0.0	33.8	2.7	25.4	48.9

**Table 19A-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	Coyote	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
2002	-	-	6	15	3
2007	2	-	4	12	3
2012	1	-	1	6	-
2017	4	-	-	3	-
Year	Days Use Per Acre (ha)				
2002	3.6 (9.0)	8.7 (21.5)*	16.1 (39.7)	25.5 (62.9)	-
2007	0.7 (1.8)	-	20.8 (51.3)	28.1 (69.5)	-
2012	1.5 (3.6)	-	-	20.8 (51.3)	-
2017	8.0 (19.7)	-	2.7 (6.6)	12.8 (31.5)	-

\*Pellets per acre (ha)

**Table 19A-09.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency						
2002	84	-	-	9	99	214	108
2007	10	-	-	17	115	261	124
2012	37	-	-	31	95	246	159
2017	80	4	2	61	86	159	161
year	Average Cover (%)						
2002	1.3	-	-	0.2	2.8	4.7	6.4
2007	0.1	-	-	0.4	2.8	7.2	7.2
2012	0.5	-	-	0.5	2.2	5.9	8.1
2017	2.5	0.2	0.0	4.0	2.6	4.2	8.9

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

**Table 19A-09.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Astragalus (milkvetch)	Balsamorhiza hookeri (Hooker's balsamroot)	Calochortus nuttallii (sego lily)	Chaenactis douglasii (Douglas' dustymaiden)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cystopteris fragilis (brittle bladderfern)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Eriogonum brevicaulle (shortstem buckwheat)	Hackelia patens (spotted stickseed)	Heterotheca villosa (hairy false goldenaster)	Ipomopsis aggregata (scarlet gilia)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Linum lewisii (Lewis flax)	Lupinus argenteus (silvery lupine)
year	Nested Frequency																
2002	3	-	0	-	3	91	12	-	-	4	2	7	-	-	-	-	94
2007	20	-	-	3	1	166	34	-	16	9	-	2	2	4	5	-	137
2012	10	1	1	-	-	110	34	-	17	12	4	4	-	4	-	-	85
2017	17	1	-	-	6	157	24	6	11	6	4	4	-	-	-	1	151
year	Average Cover (%)																
2002	0.0	-	0.0	-	0.0	0.4	0.1	-	-	0.0	0.0	0.1	-	-	-	-	4.0
2007	0.1	-	-	0.0	0.0	0.4	0.6	-	0.2	0.0	-	0.0	0.0	0.0	0.1	-	4.7
2012	0.0	0.0	0.0	-	-	0.3	0.7	-	0.3	0.0	0.0	0.0	-	0.0	-	-	2.0
2017	0.1	0.0	-	-	0.0	2.3	0.4	0.0	0.2	0.0	0.0	0.0	-	-	-	0.0	8.6

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

FORB SPECIES							
Machaeranthera canescens (hoary tansyaster)							
Microsteris gracilis <sup>a</sup> (slender phlox)							
Packera multilobata (lobeleaf groundsel)							
Petradoria pumila (rock goldenrod)							
Phlox longifolia (longleaf phlox)							
Silene antirrhina <sup>a</sup> (sleepy silene)							
unknown perennial forb (unknown forb)							
year	Nested Frequency						
2002	3	2	-	3	15	-	15
2007	9	3	8	5	29	13	-
2012	-	11	-	4	29	6	-
2017	-	2	1	-	9	11	-
year	Average Cover (%)						
2002	0.1	0.0	-	0.4	0.1	-	0.1
2007	0.0	0.0	0.2	0.2	0.2	0.0	-
2012	-	0.0	-	0.1	0.1	0.0	-
2017	-	0.0	0.0	-	0.0	0.1	-

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

**Table 19A-09.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES											
Artemisia nova <sup>p</sup> (black sagebrush)											
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)											
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)											
Ericameria nauseosa ssp. nauseosa var. hololeuca <sup>p</sup> (rubber rabbitbrush)											
Eriogonum microthecum <sup>p</sup> (slender buckwheat)											
Gutierrezia sarothrae (broom snakeweed)											
Juniperus osteosperma <sup>t</sup> (Utah juniper)											
Mahonia repens (creeping barberry)											
Paxistima myrsinites (Oregon boxleaf)											
Pediocactus simpsonii (mountain ball cactus)											
Pinus monophylla <sup>t</sup> (singleleaf pinyon)											
year	Line Intercept Cover (%)										
2002	1.4	23	-	-	-	0.9	-	0.7	1.7	-	-
2007	1.9	16.9	-	0.1	0.3	0.6	1.2	1.6	0.7	-	-
2012	2.5	17.5	-	-	0.2	0.3	-	1	1	-	0.1
2017	2.4	21.3	-	-	-	-	-	0.4	2	-	1.1
year	Quadrat Cover (%)										
2002	0.7	20.8	-	0.0	0.0	0.6	-	0.9	1.4	0.0	-
2007	1.6	12.9	-	0.0	0.1	0.3	0.2	1.1	0.6	0.0	0.0
2012	2.8	13.9	-	-	0.1	0.0	0.4	1.1	1.8	-	0.0
2017	0.2	15.2	0.0	-	-	0.4	0.4	1.1	1.7	-	0.7

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



**Table 19A-09.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia nova<sup>P</sup> -- (black sagebrush)</b>									
2002	440	-	5	77	18	0	0	5	21/45
2007	1260	220	5	68	27	0	0	21	27/46
2012	880	-	5	91	5	0	0	2	19/50
2017	400	-	0	100	0	0	5	0	22/37
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
2002	5340	-	6	72	21	8	3	13	55/80
2007	3100	940	8	57	35	34	9	31	57/96
2012	4160	-	7	82	11	22	1	6	47/78
2017	4540	460	0	86	14	14	4	12	50/75
<b>Cercocarpus montanus<sup>P</sup> -- (alderleaf mountain mahogany)</b>									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	82/130
2012	-	-	-	-	-	-	-	-	129/165
2017	-	-	-	-	-	-	-	-	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
2002	-	-	-	-	-	-	-	-	40/40
2007	-	-	-	-	-	-	-	-	35/47
2012	-	-	-	-	-	-	-	-	31/39
2017	380	-	0	100	0	0	0	0	17/28
<b>Eriogonum microthecum<sup>P</sup> -- (slender buckwheat)</b>									
2002	120	-	17	83	0	0	0	17	19/37
2007	80	-	0	100	0	0	0	0	22/35
2012	80	-	25	50	25	25	0	25	21/28
2017	-	-	-	-	-	-	-	-	-/-
<b>Ericameria nauseosa ssp. nauseosa var. hololeuca<sup>P</sup> -- (rubber rabbitbrush)</b>									
2002	20	-	0	100	0	0	0	0	43/10
2007	20	-	0	100	0	0	0	100	64/69
2012	-	-	-	-	-	-	-	-	48/56
2017	20	-	100	0	0	0	0	0	36/46
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
2002	640	-	0	94	6	0	0	9	20/32
2007	600	20	3	93	3	0	0	0	18/25
2012	280	-	0	100	0	0	0	0	17/24
2017	360	-	0	100	0	0	0	0	24/32
<b>Holodiscus dumosus -- (rockspirea)</b>									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	44/156
<b>Juniperus osteosperma<sup>f</sup> -- (Utah juniper)</b>									
2002	40	-	50	50	0	0	0	0	-/-
2007	20	-	100	0	0	0	0	0	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Mahonia repens -- (creeping barberry)</b>									
2002	6000	-	3	90	7	0	0	25	7/10
2007	6300	-	1	98	2	0	0	2	8/10
2012	4960	-	1	99	0	4	0	14	8/10
2017	3600	-	0	100	0	0	0	0	9/12
<b>Paxistima myrsinites -- (Oregon boxleaf)</b>									
2002	2400	20	2	96	3	0	0	2	8/20
2007	1440	-	0	100	0	0	0	0	15/22
2012	2180	-	0	100	0	0	0	0	8/14
2017	1280	-	0	100	0	0	0	0	13/19
<b>Pediocactus simpsonii -- (mountain ball cactus)</b>									
2002	20	-	0	100	0	0	0	0	4/6
2007	-	-	-	-	-	-	-	-	6/8
2012	-	-	-	-	-	-	-	-	11/10
2017	-	-	-	-	-	-	-	-	11/9

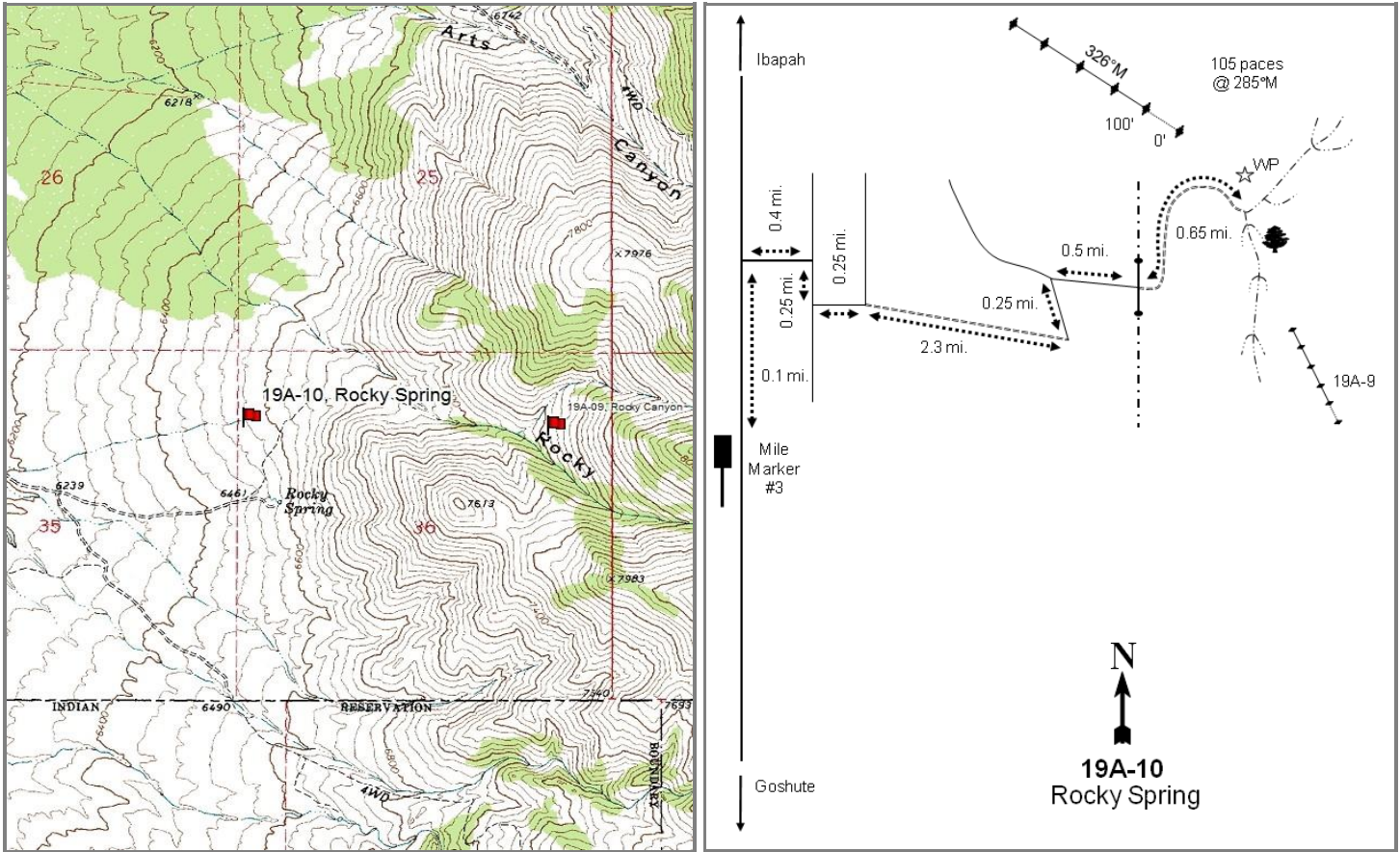
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Pinus monophylla<sup>t</sup> -- (singleleaf pinyon)</b>									
2002	20	40	100	0	0	0	0	0	- / -
2007	40	-	100	0	0	0	0	0	- / -
2012	60	-	100	0	0	0	0	0	- / -
2017	40	-	100	0	0	0	0	0	- / -
<b>Prunus virginiana var. melanocarpa<sup>p</sup> -- (black chokecherry)</b>									
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	29/21
2017	-	-	-	-	-	-	-	-	22/36
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
2002	-	-	-	-	-	-	-	-	73/228
2007	-	-	-	-	-	-	-	-	74/199
2012	-	-	-	-	-	-	-	-	102/200
2017	-	-	-	-	-	-	-	-	- / -
<b>Rosa woodsii<sup>p</sup> -- (Woods' rose)</b>									
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	36/59
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	30/31
<b>Sambucus racemosa<sup>p</sup> -- (red elderberry)</b>									
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	120/150
2012	-	-	-	-	-	-	-	-	151/105
2017	40	-	100	0	0	0	0	0	105/109

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

**Table 19A-09.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution				Average Diameter (cm)	
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'		>12' (%)
<b>Juniperus osteosperma (Utah juniper)</b>							
2017	27	-	25	63	-	13	9.1
<b>Pinus monophylla (singleleaf pinyon)</b>							
2017	49	-	50	19	13	19	9.1

## ROCKY SPRING - STUDY NO. 19A-10



### Location Information

USGS 7.5 min Map Info Goshute SW; Township 10S, Range 19W, Section 36  
 GPS (0' Stake) NAD 83 UTM ZONE 12, 248241 East 4422725 North

### Transect Information

Browse Tag # (0' Stake) 111  
 Transect Bearing 326° magnetic  
 Length 500ft  
 Belt Placement Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)  
 Belt Marker Placement Belt 3: 1ft

### Directions to Site

From the main road between Ibapah and Goshute, turn east onto a road that is 0.1 miles north of mile marker 3. Drive for 0.4 miles to an intersection. Turn right and proceed for 0.25 miles to another intersection. Turn left and continue for 2.3 miles on a 4WD road that is faint in places to another intersection. Turn right and drive 0.25 miles to another intersection. Turn right again and go 0.5 miles to a gate. Drive through the gate and follow the road to the left for 0.65 miles to the witness post on the left (north) side of the road. The 0-foot stake is 105 paces away at 285 degrees magnetic and is marked with browse tag #111.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	IBAPAH
Elevation	6,550ft (1,996m)
Aspect	Southwest
Slope	11%
Sample Dates	07/17/2002, 07/11/2007, 07/18/2012, 06/26/2017

**Wildlife Habitat and Vegetation History****Table 19A-10.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

**Table 19A-10.4 - 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	Phase I
2007	Mountain Big Sagebrush	Phase I
2012	Mountain Big Sagebrush/Annual Grass	Phase I
2017	Mountain Big Sagebrush/Annual Grass	Phase I

**Site Notes**

This study lies on an alluvial fan at the mouth of Rocky Canyon. A deer carcass was found on the site in 2012, and chukars were heard on the hillside to the east of the study in the same year. In 2017, it was noted that there may have been horses in the area.

**Soils****Table 19A-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	6.5	45.3	36.7	18.0	4.6	20.4	233.6	0.8	07/17/2002

**Site Potential**

1981 - 2010 Average Annual Precipitation	12 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.

Although a number of preferred browse species are present on this site, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has dominated the browse component since study establishment in 2002 (Table 19A-10.12, Table 19A-10.13). Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon (*Pinus monophylla*) have been observed each sample year, and the site has been considered to be within Phase I of woodland succession throughout the duration of the study (photos, Table 19A-10.4, Table 19A-10.14). Annual grasses and perennial grasses and forbs were present in similar amounts in 2002 and 2007 (Table 19A-10.7). However, the introduced annual grass species cheatgrass (*Bromus tectorum*) exhibited a significant increase in 2012, and annual grasses have been a co-dominant site component with sagebrush since that sample year (Table 19A-10.10, Table 19A-10.11).

**Trend Summary Tables****Table 19A-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
2002	20.2	0.7	-	19.8	0.3	0.5
2007	16.3	0.2	0.0	20.4	0.2	0.9
2012	16.9	0.4	0.6	19.5	0.1	0.9
2017	13.6	0.8	1.1	19.2	0.4	1.2

**Table 19A-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
2002	250	230	-	117	5.0	6.4	-	4.6
2007	181	277	1	121	3.8	10.1	0.0	5.8
2012	314	208	3	121	29.1	8.1	0.0	3.1
2017	408	184	16	108	27.9	6.3	0.2	5.2

**Table 19A-10.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2002	10.9	0.3	51.7	2.9	16.2	34.3
2007	17.8	0.0	35.3	4.0	21.6	33.7
2012	5.4	0.2	37.1	6.1	15.9	54.7
2017	8.8	0.7	39.8	3.7	20.5	50.5

**Table 19A-10.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Greater Sage- Grouse	Horse	Rabbit
	Quadrat Frequency					
2002	2	15	26	-	-	6
2007	-	13	19	-	-	26
2012	2	2	3	1	-	3
2017	2	-	2	-	-	1
Year	Days Use Per Acre (ha)					
2002	3.6 (9.0)	67.0 (165.5)	33.5 (82.8)	-	-	-
2007	2.2 (5.4)	58.3 (144.0)	34.9 (86.1)	-	-	-
2012	6.5 (16.1)	4.7 (11.6)	4.0 (9.9)	-	-	-
2017	17.4 (43.0)	5.3 (13.2)	8.1 (19.9)	-	0.6 (1.4)	-

**Table 19A-10.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES									
Bromus tectorum <sup>ai</sup> (cheatgrass)									
Elymus elymoides (squirreltail)									
Festuca idahoensis (Idaho fescue)									
Poa bulbosa <sup>i</sup> (bulbous bluegrass)									
Poa fendleriana (muttongrass)									
Poa pratensis <sup>i</sup> (Kentucky bluegrass)									
Poa secunda (Sandberg bluegrass)									
Pseudoroegneria spicata (bluebunch wheatgrass)									
Vulpia octoflora <sup>a</sup> (sixweeks fescue)									
year	Nested Frequency								
2002	250	1	-	-	28	-	162	83	3
2007	173	19	-	8	26	26	173	90	20
2012	314	3	2	-	16	21	147	59	10
2017	407	30	3	18	17	-	112	56	10
year	Average Cover (%)								
2002	5.0	0.1	-	-	0.3	-	2.8	3.1	0.0
2007	3.8	0.4	-	0.2	0.6	1.0	4.0	3.9	0.0
2012	29.1	0.0	0.0	-	0.2	0.2	5.5	2.2	0.0
2017	27.9	0.6	0.1	0.7	0.2	-	2.1	2.6	0.0

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

**Table 19A-10.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES															
Agoseris glauca (pale agoseris)															
Arabis (rockcress)															
Asclepias asperula (spider milkweed)															
Comandra umbellata (bastard toadflax)															
Cryptantha (cryptantha)															
Eriogonum brevicaulis (shortstem buckwheat)															
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)															
Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)															
Lupinus argenteus (silvery lupine)															
Packera multilobata (lobeleaf groundsel)															
Pleiocanthus spinosus (thorn skeletonweed)															
Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)															
Symphotrichum ascendens (western aster)															
Tragopogon dubius <sup>ai</sup> (yellow salsify)															
Zigadenus paniculatus (foothill deathcamas)															
year	Nested Frequency														
2002	-	-	8	18	-	3	-	-	59	-	20	-	21	-	-
2007	2	-	4	15	1	2	-	1	68	5	13	-	20	-	3
2012	2	-	10	38	-	-	-	3	53	4	19	-	13	-	5
2017	8	3	6	24	-	4	5	7	39	0	11	2	17	4	3
year	Average Cover (%)														
2002	-	-	0.2	0.3	-	0.0	-	-	2.9	-	0.7	-	0.5	-	-
2007	0.0	-	0.1	0.3	0.0	0.0	-	0.0	3.9	0.1	0.7	-	0.5	-	0.1
2012	0.0	-	0.1	0.8	-	-	-	0.0	1.7	0.0	0.2	-	0.1	-	0.1
2017	0.2	0.0	0.2	0.5	-	0.0	0.0	0.0	3.3	0.0	0.6	0.0	0.4	0.1	0.0

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

**Table 19A-10.12 - 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 <sup>p</sup> (black sagebrush)	2002	1	18.6	-	0.3	-	-	-	0.5	0.2
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	2007	0.1	18.8	0.8	0.2	-	0	-	0.9	0.7
Cercocarpus ledifolius <sup>p</sup> (curl-leaf mountain mahogany)	2012	-	18.2	-	0.1	-	-	-	0.9	1.3
Gutierrezia sarothrae (broom snakeweed)	2017	-	17.8	-	0.4	0.2	-	-	1	1.4
Juniperus osteosperma <sup>i</sup> (Utah juniper)	year	Quadrat Cover (%)								
Opuntia polyacantha (plains pricklypear)	2002	0.0	20.1	-	0.5	-	0.1	0.1	0.0	0.1
Pediocactus simpsonii (mountain ball cactus)	2007	0.1	15.8	0.0	0.1	-	0.1	0.0	0.0	0.5
Pinus monophylla <sup>i</sup> (singleleaf pinyon)	2012	-	16.6	-	0.2	-	0.2	0.0	0.6	0.3
Rosa woodsii <sup>p</sup> (Woods' rose)	2017	-	12.8	-	0.5	0.4	0.3	0.0	0.7	0.8

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

**Table 19A-10.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia nova<sup>p</sup> -- (black sagebrush)</b>									
2002	120	-	0	83	17	0	0	0	- / -
2007	80	-	0	100	0	0	0	0	22/39
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
2002	2840	20	2	56	42	18	3	20	56/96
2007	2220	1300	13	51	36	33	3	28	59/113
2012	2880	80	10	63	27	26	22	39	53/101
2017	2820	-	4	73	23	23	8	18	52/85
<b>Atriplex confertifolia<sup>p</sup> -- (shadscale saltbush)</b>									
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	25/36
2017	-	-	-	-	-	-	-	-	- / -
<b>Cercocarpus ledifolius<sup>p</sup> -- (curl-leaf mountain mahogany)</b>									
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	395/390
2017	-	-	-	-	-	-	-	-	206/235
<b>Cercocarpus montanus<sup>p</sup> -- (alderleaf mountain mahogany)</b>									
2002	20	-	0	100	0	100	0	0	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	21/49
2012	-	-	-	-	-	-	-	-	26/48
2017	-	-	-	-	-	-	-	-	- / -



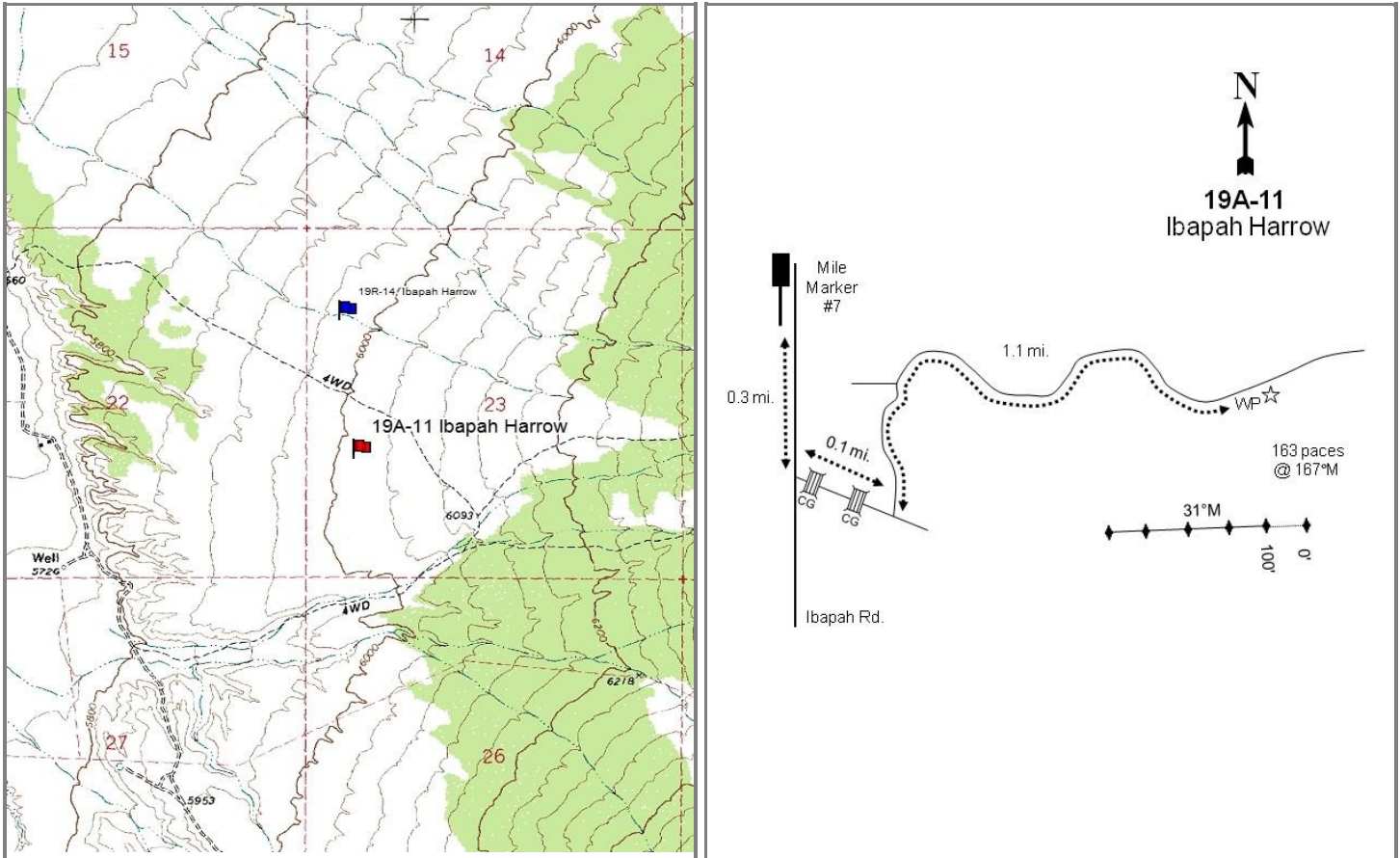
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	44/44
2017	-	-	-	-	-	-	-	-	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
2002	640	-	0	88	13	16	0	6	19/28
2007	200	-	0	100	0	0	0	0	17/22
2012	140	-	0	100	0	0	0	0	15/23
2017	300	-	0	100	0	0	0	0	16/23
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
2002	20	-	100	0	0	0	0	0	-/-
2007	20	-	100	0	0	0	0	0	-/-
2012	20	-	100	0	0	0	0	0	-/-
2017	40	-	50	50	0	0	0	0	-/-
<b>Krascheninnikovia lanata<sup>P</sup> -- (winterfat)</b>									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	10/59
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Linanthus pungens -- (granite prickly phlox)</b>									
2002	120	-	0	100	0	0	0	0	17/27
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	10/36
2017	-	-	-	-	-	-	-	-	-/-
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
2002	260	-	15	85	0	0	0	0	11/23
2007	220	-	9	91	0	18	0	18	11/29
2012	160	-	0	100	0	0	0	13	10/19
2017	100	-	0	100	0	0	0	20	10/21
<b>Pediocactus simpsonii -- (mountain ball cactus)</b>									
2002	40	-	0	100	0	0	0	0	6/11
2007	100	-	0	100	0	0	0	0	5/15
2012	20	-	100	0	0	0	0	0	6/9
2017	20	-	0	100	0	0	0	0	-/-
<b>Pinus monophylla<sup>t</sup> -- (singleleaf pinyon)</b>									
2002	60	-	100	0	0	0	0	0	-/-
2007	40	-	50	50	0	0	0	0	-/-
2012	20	-	100	0	0	0	0	0	-/-
2017	40	-	0	100	0	0	0	0	-/-
<b>Rosa woodsii<sup>P</sup> -- (Woods' rose)</b>									
2002	640	-	0	100	0	0	0	0	26/30
2007	360	-	11	83	6	0	0	0	31/44
2012	560	-	86	14	0	0	0	0	51/41
2017	1780	-	0	100	0	0	0	0	25/22

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

**Table 19A-10.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2002	24	-	-	-	-	-	5.8
2007	20	18	36	27	9	9	15.3
2012	20	17	25	33	8	17	10.6
2017	22	8	17	50	8	17	14.4
<b>Pinus monophylla (singleleaf pinyon)</b>							
2002	41	-	-	-	-	-	5.6
2007	24	9	45	36	-	9	8.1
2012	26	-	31	38	15	15	8.8
2017	38	9	45	18	18	9	10.2

## IBAPAH HARROW - STUDY NO. 19A-11



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Goshute NW; Township 10S, Range 19W, Section 23  
NAD 83 UTM ZONE 12, 246912 East 4425299 North

### Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	269° 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 Ibapah, proceed south just past mile marker 6; turn right onto a road 0.3 miles south of mile marker 7. Drive east for 1.3 miles, crossing two cattle guards along the way. Turn left and continue for 0.1 miles. Turn right and proceed for 1.1 miles to the witness post on the right (south) side of the road. From the witness post, walk approximately 163 paces at 167 degrees magnetic to the 0-foot stake.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	IBAPAH
Elevation	6,020ft (1,835m)
Aspect	West
Slope	4%
Sample Dates	07/10/2007, 07/17/2012, 06/26/2017

**Table 19A-11.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Ibapah Sagebrush Improvement - Year 2	1104	October 2008-April 2009	1540
Harrow - Two-Way Dixie	Ibapah Sagebrush Improvement - Year 1	730	October-November 2007	166
Seeding - Broadcast Before	Ibapah Sagebrush Improvement - Year 1	730	October-November 2007	166

**Table 19A-11.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name		Application Type	Application Date	Acres	
Ibapah Harrow		Broadcast	Oct 2007	200	
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	1.00	0.98
G	Agropyron cristatum	Crested Wheatgrass	Douglas	1.00	0.84
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	0.70	0.64
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	0.25	0.23
G	Elymus wawawaiensis	Snake River Wheatgrass	Secar	1.00	0.94
G	Pascopyrum smithii	Western Wheatgrass	Arriba	1.00	0.81
G	Poa secunda	Sandberg Bluegrass	Mountain Home ID	0.50	0.46
G	Psathyrostachys juncea	Russian Wildrye		1.00	0.83
G	Thinopyrum intermedium	Pubescent Wheatgrass		1.00	0.88
F	Achillea millefolium	Western Yarrow		0.10	0.10
F	Linum perenne	Blue Flax	Appar	1.00	0.92
F	Medicago sativa	Alfalfa	Ladak	1.00	0.92
F	Medicago sativa	Alfalfa	Spredor 4	1.00	0.96
F	Onobrychis viciifolia	Sainfoin	Eski	2.00	1.84
F	Sanguisorba minor	Small Burnet	Delar	2.00	1.87

**Wildlife Habitat and Vegetation History****Table 19A-11.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

**Table 19A-11.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2007	Wyoming Big Sagebrush	Phase I
2012	Wyoming Big Sagebrush/Perennial-Annual Grass	No Encroachment
2017	Wyoming Big Sagebrush/Perennial-Annual Grass	No Encroachment

**Site Notes**

A herd of elk was seen and an elk carcass found on site in 2012.

**Soils****Table 19A-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
Loam	7.5	27.4	46.0	26.6	1.5	9.2	249.6	0.5	07/10/2007

**Site Potential**

1981 - 2010 Average Annual Precipitation	11 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.

Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) has been the dominant browse species on this site throughout the duration of the study. Cover of sagebrush had decreased as of the first post-treatment sampling, but it exhibited an increase between 2012 and 2017 (Table 19A-11.13, Table 19A-11.14). Although not represented by the data, site photos reveal that Utah juniper (*Juniperus osteosperma*) trees were present in 2007, but had been removed by 2012; the study site is not currently being encroached by trees (photos, Table 19A-11.4). The herbaceous understory was not particularly abundant prior to treatment (Table 19A-11.7). However, perennial grasses -- namely the introduced species crested wheatgrass (*Agropyron cristatum*) and the native species Sandberg bluegrass (*Poa secunda*) -- and the introduced annual grass cheatgrass (*Bromus tectorum*) increased and have been co-dominant site components in 2012 and 2017. In addition, the introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) was observed for the first time in 2017 (Table 19A-11.10). Forbs have remained rare (Table 19A-11.11). This study site is expected to remain in a similar state in future sample years, although sagebrush cover may continue to increase.

**Trend Summary Tables****Table 19A-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
2007	19.8	2.0	-	22.9	2.2	-
2012	5.8	0.5	-	4.8	0.5	-
2017	6.9	0.6	-	7.0	0.5	-

**Table 19A-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
2007	267	308	28	79	1.3	7.4	0.1	0.6
2012	357	289	-	85	20.0	14.5	-	0.7
2017	338	318	319	72	16.3	22.1	3.7	1.1

**Table 19A-11.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2007	40.1	6.7	25.8	2.5	0.9	32.0
2012	28.6	0.2	46.3	0.8	0.3	43.7
2017	36.2	1.5	44.6	1.6	1.0	48.5

**Table 19A-11.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
2007	-	4	5	-	18
2012	-	1	6	-	1
2017	-	2	6	1	4
Year	Days Use Per Acre (ha)				
2007	-	0.7 (1.7)	16.1 (39.7)	-	-
2012	0.7 (1.8)	4.7 (11.6)	4.0 (9.9)	43.6 (107.6)*	-
2017	5.8 (14.3)	-	14.1 (34.8)	17.4 (43.0)*	-

\*Pellets per acre (ha)

**Table 19A-11.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea <sup>i</sup> (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency									
2007	3	8	267	-	-	5	303	-	5	-
2012	15	152	357	1	-	3	226	-	6	2
2017	2	181	338	2	16	7	244	0	30	6
year	Average Cover (%)									
2007	0.0	0.4	1.3	-	-	0.0	6.9	-	0.0	-
2012	1.1	6.7	20.0	0.0	-	0.0	6.3	-	0.4	0.0
2017	0.1	12.5	16.3	0.0	0.5	0.1	6.7	0.0	2.1	0.0

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

**Table 19A-11.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Arabis (rockcress)	Astragalus beckwithii (Beckwith's milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littledod false flax)	Castilleja flava (yellow Indian paintbrush)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Erigeron pumilus (shaggy fleabane)	Lesquerella (bladderpod)	Linum perenne <sup>i</sup> (blue flax)	Medicago sativa <sup>i</sup> (alfalfa)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Sanguisorba minor <sup>i</sup> (small burnet)	Tragopogon dubius <sup>ai</sup> (yellow salsify)
year	Nested Frequency																
2007	3	-	4	-	16	1	27	-	2	6	-	-	-	21	34	-	1
2012	-	-	-	-	2	-	-	3	-	4	-	10	7	12	51	3	-
2017	1	10	6	5	14	2	319	-	-	0	1	-	8	15	28	-	-
year	Average Cover (%)																
2007	0.0	-	0.0	-	0.2	0.0	0.1	-	0.0	0.1	-	-	-	0.2	0.1	-	0.0
2012	-	-	-	-	0.0	-	-	0.0	-	0.2	-	0.1	0.0	0.2	0.2	0.0	-
2017	0.0	0.5	0.0	0.0	0.1	0.1	3.7	-	-	0.0	0.0	-	0.1	0.2	0.1	-	-

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

FORB SPECIES	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency
2007	1
2012	-
2017	0
year	Average Cover (%)
2007	0.0
2012	-
2017	0.0

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

**Table 19A-11.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)
year	Line Intercept Cover (%)		
2007	22.9	2.2	-
2012	4.8	0.5	-
2017	7	0.5	-
year	Quadrat Cover (%)		
2007	19.8	1.9	0.0
2012	5.8	0.4	0.1
2017	6.9	0.6	0.0

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

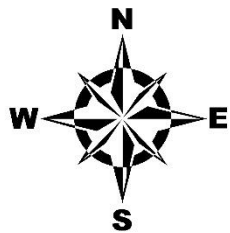
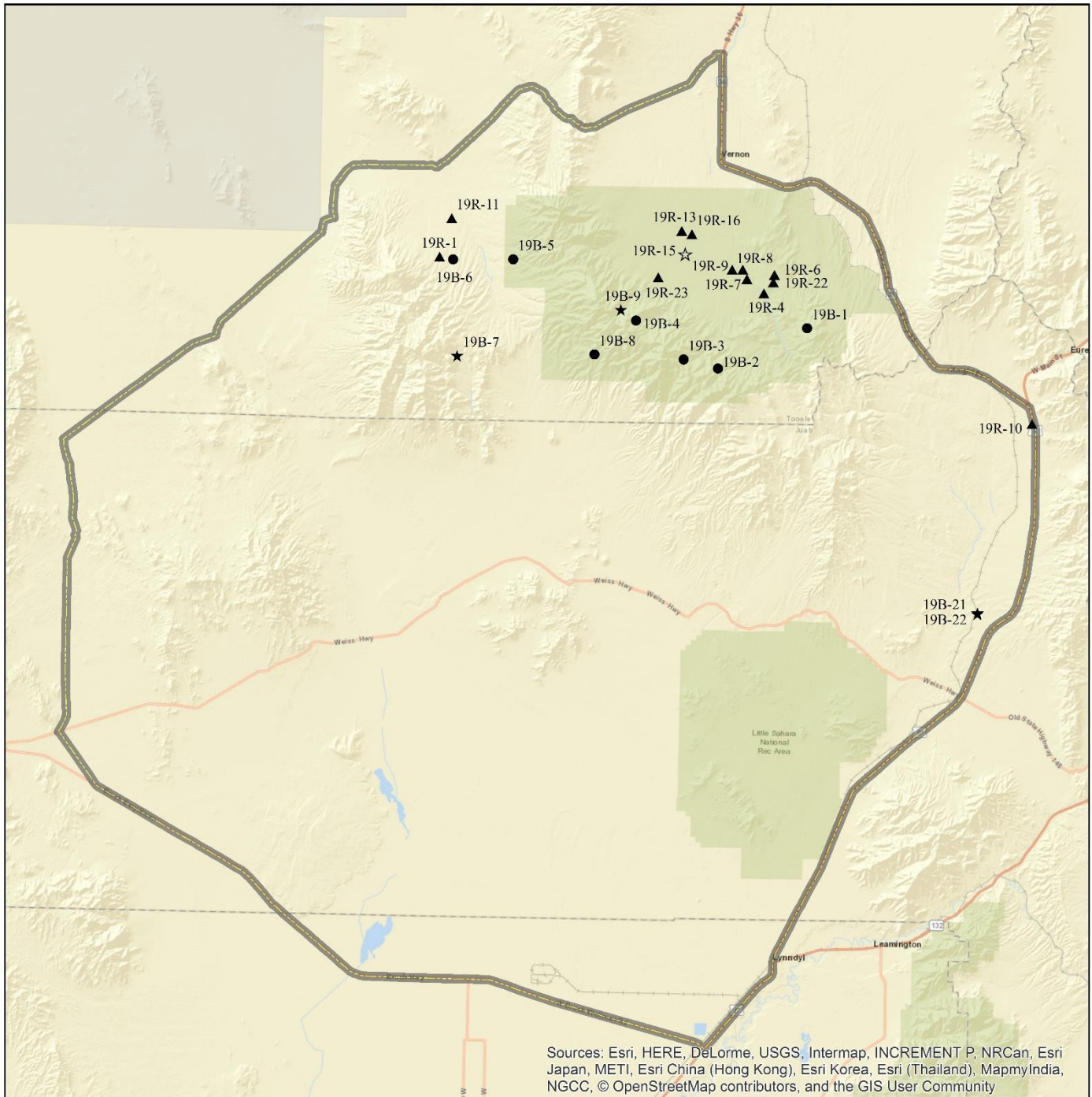
**Table 19A-11.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
2007	6220	380	4	41	55	36	0	28	49/78
2012	4040	100	29	64	7	7	3	6	34/49
2017	3940	-	12	78	10	0	0	20	37/52
<b>Cercocarpus ledifolius<sup>p</sup> -- (curl-leaf mountain mahogany)</b>									
2007	-	-	-	-	-	-	-	-	99/136
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
2007	1160	-	2	53	45	2	0	19	27/42
2012	540	20	7	78	15	0	0	59	28/46
2017	960	-	0	85	15	0	0	23	27/44
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
2007	-	-	-	-	-	-	-	-	19/14
2012	-	-	-	-	-	-	-	-	21/31
2017	60	-	0	33	67	0	0	67	19/20

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



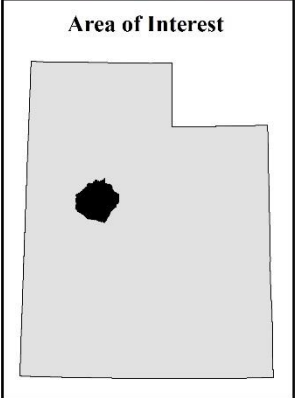
# WILDLIFE MANAGEMENT UNIT 19B - VERNON WEST DESERT



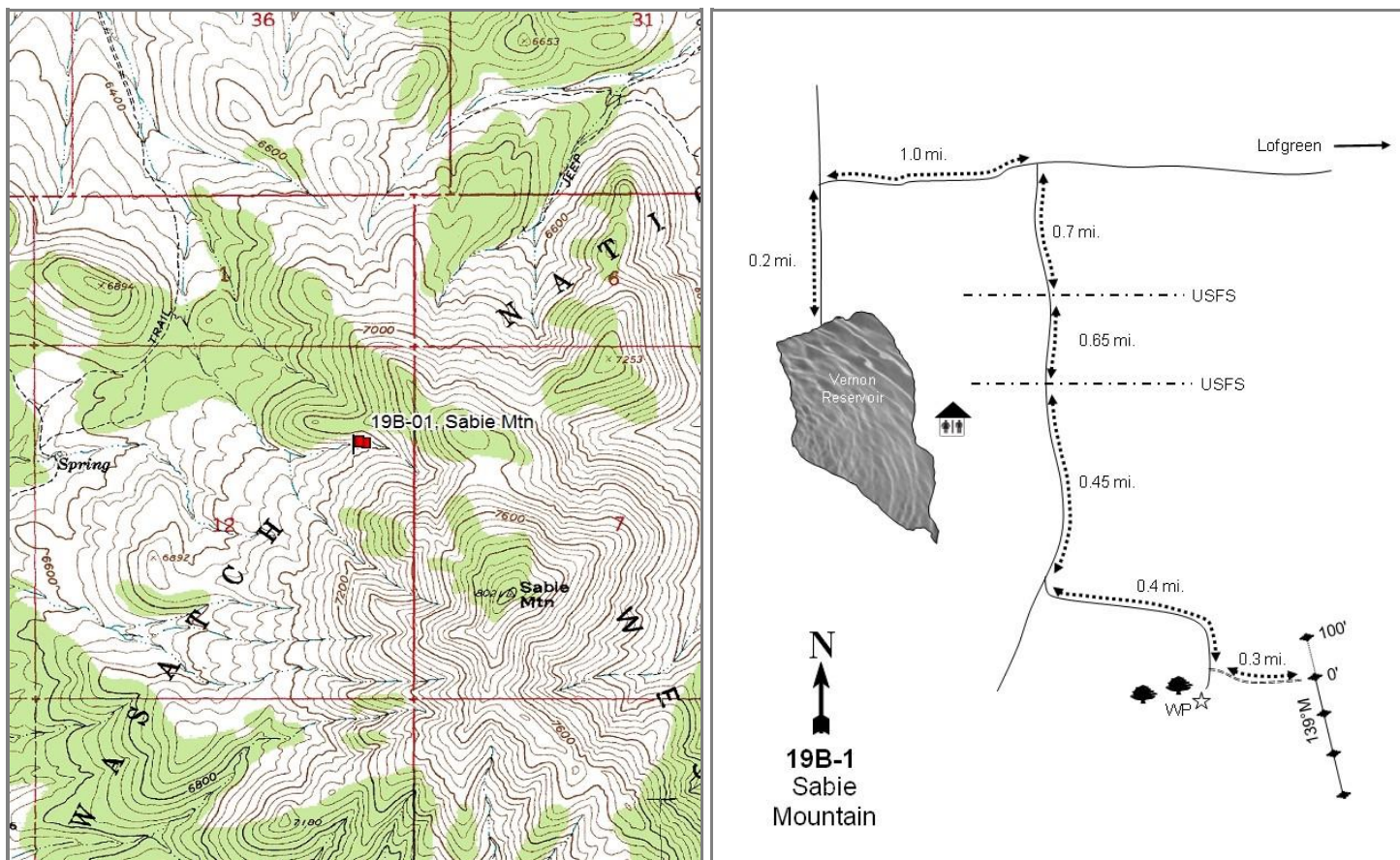
**Study Location Project, Status**

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

Unit - 19B



### SABIE MOUNTAIN - STUDY NO. 19B-1



#### Location Information

USGS 7.5 min Map Info	Sabie Mountain NW; Township 10S, Range 5W, Section 12
GPS (0' Stake)	NAD 83 UTM ZONE 12, 384771 East 4425572 North

#### Transect Information

Browse Tag # (0' Stake)	418
Transect Bearing	319° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 3: 2ft, Belt 5: No Rebar

#### Directions to Site

From the north end of Vernon Reservoir, go 0.2 miles north to an intersection. Turn right and proceed 1 mile on an eastbound road (road eventually goes to Lofgreen), then turn right onto a southbound road. Continue for 0.7 miles and cross a USFS fence, then proceed 0.65 miles and cross another USFS fence. Go 0.45 miles to a “Y” intersection; take the left fork and drive 0.4 miles to an intersection of a 4WD footpath going off to the left. The witness post is on the right side of the road between some PIMOs and is ~12” tall. Walk 0.3 miles on the footpath to the 0-foot stake.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	LITTLE VALLEY-VERNON
Elevation	6,980ft (2,128m)
Aspect	Northwest
Slope	35%
Sample Dates	08/25/1997, 07/29/2002, 07/30/2007, 06/21/2012, 06/07/2017

**Table 19B-01.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name		Application Type	Application Date	Acres	
James Seeding		Aerial	Sep 1970	1500	
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
G	Agropyron desertorum	Desert Wheatgrass		10.00	0.00
S	Atriplex canescens	Fourwing Saltbush		0.20	0.00
S	Medicago sativa	Alfalfa	Ladak	0.10	0.00

**Wildlife Habitat and Vegetation History****Table 19B-01.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	spring/fall
Greater Sage Grouse	occupied	year-long

**Table 19B-01.4 - 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-Snowberry	Phase I
1989	Mountain Big Sagebrush-Snowberry	Phase I
1997	Mountain Big Sagebrush	Phase I
2002	Mountain Big Sagebrush	Phase I
2007	Mountain Big Sagebrush-Snowberry	Phase I
2012	Mountain Big Sagebrush-Snowberry	Phase I
2017	Mountain Big Sagebrush-Snowberry	Phase I

**Site Notes**

No Notes

**Soils****Table 19B-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	6.3	30.6	41.8	27.6	4.7	10.1	275.2	1.0	08/25/1997

**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.

This study site has been co-dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and mountain snowberry (*Symphoricarpos oreophilus*) in most sample years since study establishment in 1983; other shrubs are present in lesser amounts (Table 19B-01.12). The herbaceous understory has remained plentiful and diverse with native perennial grasses and forbs contributing a majority of the cover in most sample years (Table 19B-01.10, Table 19B- 01.11). Singleleaf pinyon (*Pinus monophylla*) and (*Juniperus osteosperma*) have been observed on or near the study site (Photos, Table 19B-01.12, Table 19B-01.13, Table 19B-01.14), which has remained in Phase I of woodland succession since 1983 (Table 19B-01.4).



**Trend Summary Tables****Table 19B-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
1997	23.5	12.2	0.5	-	-	-
2002	26.7	12.1	2.1	23.6	11.9	1.6
2007	16.9	13.9	2.6	27.0	26.6	2.8
2012	24.4	20.6	2.1	31.5	29.4	1.6
2017	21.2	22.0	2.6	28.6	31.7	1.9

**Table 19B-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
1997	-	348	44	279	-	11.1	0.3	12.6
2002	-	256	-	119	-	5.3	-	3.0
2007	3	249	200	214	0.0	5.7	1.4	4.8
2012	-	297	88	279	-	15.3	0.3	18.2
2017	-	335	296	327	-	12.7	4.0	20.5

**Table 19B-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
1997	5.3	0.0	56.9	5.6	5.7	51.9
2002	16.2	0.1	44.5	6.3	7.8	47.5
2007	17.3	0.0	31.7	8.3	6.1	45.4
2012	12.7	0.0	49.0	4.5	11.8	60.0
2017	10.3	0.1	49.4	9.1	7.0	67.2

**Table 19B-01.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	-	8	1	6
2002	1	8	-	1
2007	4	17	2	31
2012	-	-	-	-
2017	-	6	-	4
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	5.1 (12.6)	18.7 (46.3)	-	-
2007	10.9 (26.9)	22.1 (54.6)	14.1 (34.8)	-
2012	2.2 (5.4)	4.7 (11.6)	-	-
2017	8.0 (19.7)	11.4 (28.1)	6.0 (14.9)	-

**Table 19B-01.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency									
	year									
Bromus marginatus (mountain brome)	-	-	5	7	3	9	3	279	62	60
Bromus tectorum <sup>ai</sup> (cheatgrass)	-	-	-	4	0	-	-	214	51	40
Elymus elymoides (squirreltail)	4	3	1	16	-	12	-	196	52	33
Leucopoa kingii (spike fescue)	-	-	-	4	2	7	1	77	230	23
Leymus cinereus (basin wildrye)	-	-	-	4	2	87	5	131	198	46
Melica bulbosa (oniongrass)										
Poa bulbosa <sup>i</sup> (bulbous bluegrass)										
Poa fendleriana (muttongrass)										
Poa secunda (Sandberg bluegrass)										
Pseudoroegneria spicata (bluebunch wheatgrass)										
year	Average Cover (%)									
1997	-	-	0.0	0.2	0.4	0.1	0.0	7.6	1.1	1.6
2002	-	-	-	0.2	0.0	-	-	4.2	0.4	0.5
2007	0.1	0.0	0.0	0.2	-	0.0	-	3.7	1.2	0.5
2012	-	-	-	0.7	0.2	0.2	0.0	4.6	8.4	1.2
2017	-	-	-	0.2	0.3	1.9	0.0	3.8	5.3	1.1

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

**Table 19B-01.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
	year																
Agoseris glauca (pale agoseris)	12	5	6	2	74	19	12	2	23	-	69	60	9	5	22	10	1
Allium (onion)	-	-	-	-	-	16	13	-	-	-	54	-	-	-	6	4	-
Arabis (rockcress)	7	109	-	-	6	6	36	-	198	-	76	12	2	3	2	-	-
Astragalus cibirarius (browse milkvetch)	3	8	-	22	14	12	36	-	85	2	132	50	-	-	27	3	-
Astragalus convallarius (lesser rushy milkvetch)	11	126	-	45	16	14	44	-	262	45	85	71	19	4	13	3	-
Balsamorhiza hookeri (Hooker's balsamroot)																	
Balsamorhiza sagittata (arrow/leaf balsamroot)																	
Cirsium neomexicanum <sup>a</sup> (New Mexico thistle)																	
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																	
Collomia linearis <sup>a</sup> (tiny trumpet)																	
Comandra umbellata (bastard toadflax)																	
Crepis acuminata (tapertip hawkbeard)																	
Delphinium nuttalianum (two-lobed larkspur)																	
Erigeron eatonii (Eaton's fleabane)																	
Eriogonum racemosum (redroot buckwheat)																	
Eriogonum umbellatum (sulphur-flower buckwheat)																	
Fritillaria atropurpurea (spotted fritillary)																	
year	Average Cover (%)																
1997	0.1	0.0	0.0	0.0	2.3	0.7	0.7	0.0	0.1	-	0.9	0.7	0.0	0.0	0.3	0.3	0.0
2002	-	-	-	-	-	0.4	0.5	-	-	-	1.0	-	-	-	0.0	0.0	-
2007	0.1	0.6	-	-	0.0	0.2	1.3	-	0.8	-	0.7	0.2	0.0	0.0	0.0	-	-
2012	0.0	0.0	-	0.2	0.4	0.8	3.7	-	0.3	0.0	2.5	1.1	-	-	0.2	0.0	-
2017	0.1	0.8	-	0.9	0.4	0.8	4.4	-	2.8	0.2	0.8	1.1	0.1	0.1	0.1	0.0	-

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

FORB SPECIES	Galium aparine <sup>a</sup> (stickywilly)	Helianthella uniflora (oneflower helianthella)	Hydrophyllum occidentale (western waterleaf)	Lithospermum ruderale (western stoneseed)	Lomatium grayi (Gray's biscuitroot)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Mertensia oblongifolia (oblongleaf bluebells)	Microseris nutans (nodding microseris)	Microsteris gracilis <sup>a</sup> (slender phlox)	Packera multilobata (lobeleaf groundsel)	Penstemon subglaber (smooth penstemon)	Phlox longifolia (longleaf phlox)	Platanthera aquilonis (northern green orchid)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Silene antirrhina <sup>a</sup> (sleepy silene)
year	Nested Frequency																
1997	-	67	-	5	4	71	7	-	-	3	6	6	74	-	7	14	-
2002	-	40	-	10	-	-	-	-	-	-	-	-	2	-	-	-	-
2007	-	41	9	3	4	5	-	12	-	4	-	4	3	-	-	37	-
2012	-	51	-	1	42	31	-	14	-	3	2	-	29	-	2	3	1
2017	3	36	36	-	6	85	-	59	65	6	-	-	49	3	-	53	10
year	Average Cover (%)																
1997	-	2.5	-	0.0	0.0	2.4	0.0	-	-	0.0	0.1	0.0	0.4	-	0.0	0.2	-
2002	-	0.6	-	0.2	-	-	-	-	-	-	-	-	0.0	-	-	-	-
2007	-	0.3	0.1	0.0	0.0	0.1	-	0.2	-	0.0	-	0.0	0.1	-	-	0.5	-
2012	-	3.3	-	0.0	0.9	1.0	-	0.1	-	0.0	0.1	-	0.2	-	0.0	0.0	0.0
2017	0.0	1.5	0.7	-	0.1	3.4	-	0.8	0.4	0.1	-	-	0.5	0.0	-	0.5	0.3

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

FORB SPECIES	Taraxacum officinale (common dandelion)	Vicia americana (American vetch)	Viola (violet)	Wyethia amplexicaulis (mule-ears)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency				
1997	1	19	-	24	-
2002	1	-	-	5	-
2007	-	1	-	22	-
2012	-	46	-	12	-
2017	-	75	2	17	16
year	Average Cover (%)				
1997	0.0	0.1	-	1.1	-
2002	0.0	-	-	0.2	-
2007	-	0.0	-	0.9	-
2012	-	1.2	-	2.2	-
2017	-	2.1	0.0	1.3	0.1

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

**Table 19B-01.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Mahonia repens (creeping barberry)	Pinus monophylla <sup>t</sup> (singleleaf pinyon)	Rosa woodsii <sup>p</sup> (Woods' rose)	Symphoricarpos oreophilus (mountain snowberry)
year	Line Intercept Cover (%)							
1997	-	-	-	-	-	-	-	-
2002	0.2	23.1	0.4	0.6	0.1	1	0.3	11.4
2007	-	26	0.5	1.2	0.2	1.6	1	25.9
2012	0.1	29.6	0.3	0.6	0.3	1	1.8	28.8
2017	0.6	26.8	0.5	0.8	0.7	1.1	1.2	30.5
year	Quadrat Cover (%)							
1997	0.2	22.3	1.5	0.5	1.1	-	1.0	9.6
2002	0.1	25.3	0.4	0.6	0.1	1.5	1.4	11.7
2007	0.2	16.1	0.4	0.8	0.2	1.8	0.7	13.3
2012	0.3	22.2	0.6	0.8	0.4	1.2	1.8	19.5
2017	0.7	19.2	0.6	1.0	0.5	1.6	1.3	21.0

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

**Table 19B-01.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1997	280	-	43	43	14	29	7	7	49/45
2002	240	-	8	33	58	33	58	0	43/72
2007	80	-	0	75	25	0	75	0	50/56
2012	300	-	27	60	13	60	20	13	64/53
2017	340	-	12	82	6	24	24	6	55/61
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1997	4220	80	1	74	25	20	1	14	67/86
2002	4580	-	1	73	26	4	25	3	62/89
2007	3220	-	0	71	29	37	17	13	67/101
2012	3500	-	2	76	22	10	2	23	68/103
2017	3660	-	1	77	22	18	1	9	69/103
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	2640	-	8	87	5	0	0	5	36/32
2002	800	-	3	25	73	5	13	25	14/19
2007	820	60	2	71	27	5	5	22	26/36
2012	620	-	0	100	0	0	0	7	28/33
2017	780	-	8	92	0	10	0	0	28/36
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1997	60	-	100	0	0	0	0	0	- / -
2002	80	-	50	50	0	0	0	0	- / -
2007	80	-	50	50	0	0	0	0	- / -
2012	40	-	0	100	0	0	0	0	- / -
2017	20	-	0	100	0	0	0	0	- / -
<b>Mahonia repens -- (creeping barberry)</b>									
1997	2820	-	8	92	0	0	0	0	9/13
2002	420	-	0	91	10	0	0	0	10/14
2007	2400	-	7	93	0	0	0	0	6/8
2012	1980	-	2	98	0	0	0	0	8/11
2017	2000	-	0	100	0	0	0	0	9/10



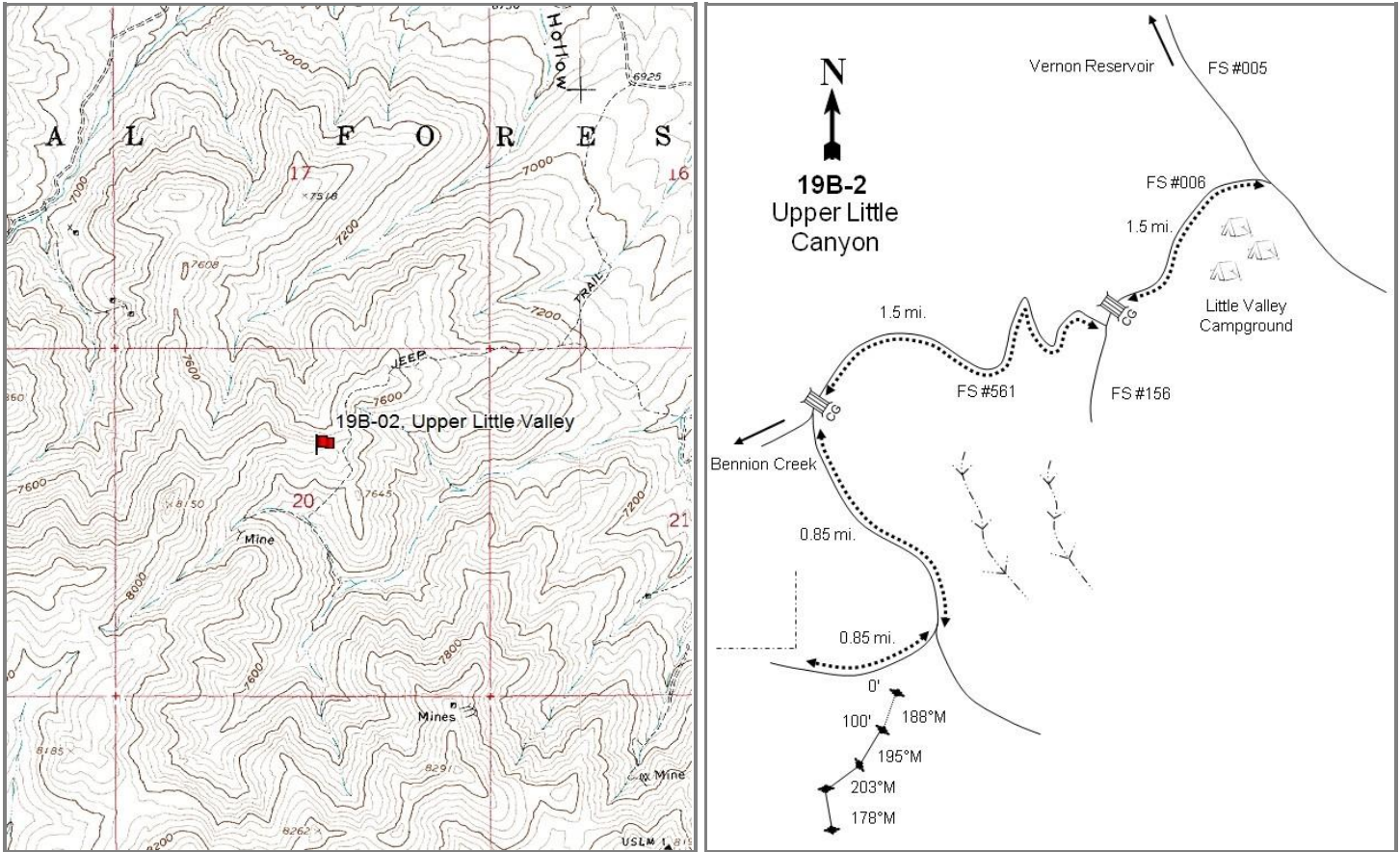
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Pinus monophylla<sup>t</sup> -- (singleleaf pinyon)</b>									
1997	20	20	100	0	0	0	0	0	- / -
2002	20	20	0	100	0	0	0	0	- / -
2007	20	-	0	100	0	0	0	0	- / -
2012	20	-	100	0	0	0	0	0	- / -
2017	40	20	0	100	0	0	0	0	- / -
<b>Rosa woodsii<sup>p</sup> -- (Woods' rose)</b>									
1997	1820	-	46	54	0	0	0	0	22/23
2002	1540	-	21	69	10	0	0	1	23/21
2007	1500	-	13	87	0	7	0	0	25/21
2012	2960	-	11	88	1	0	0	3	20/19
2017	1840	-	10	90	0	23	3	0	20/16
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1997	5060	40	5	93	2	0	0	0	34/51
2002	8360	-	1	88	12	0	1	1	31/42
2007	6600	-	3	96	2	3	0	2	34/66
2012	9620	80	17	82	1	1	0	2	34/44
2017	11000	80	12	88	1	0	0	0	33/42

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

**Table 19B-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' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2002	8	-	-	-	-	-	3.3
2007	10	-	75	25	-	-	6.0
2012	16	-	45	55	-	-	7.6
2017	10	-	50	50	-	-	7.3
<b>Pinus monophylla (singleleaf pinyon)</b>							
2002	61	-	-	-	-	-	4.1
2007	44	-	15	77	8	-	8.0
2012	45	8	15	69	8	-	6.2
2017	44	-	21	71	7	-	9.7

## UPPER LITTLE VALLEY - STUDY NO. 19B-2



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Dutch Peak NE; Township 10S, Range 5W, Section 20  
NAD 83 UTM ZONE 12, 377780 East 4422416 North

### Transect Information

Browse Tag # (0' Stake)	3928
Transect Bearing	188° magnetic (Line 2: 195° magnetic, Line 3: 203° magnetic, Line 4: 178° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 4: 4ft

### Directions to Site

The steep, rocky road leading to this study site can be reached on Little Valley Road either by traveling east for 2.5 miles from Bennion Creek or west for 2.6 miles from the Little Valley Campground. Turn south and proceed 0.85 miles to an intersection. Bear right and continue southerly up the ridge for 0.85 miles to a fence corner on the ridgeline. Continue up along the fence to the 19th fencepost. From this fencepost, the 0-foot baseline stake is 33 paces away at 169 degrees magnetic and is marked with a red browse tag #3928.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	LITTLE VALLEY-VERNON
Elevation	7,720ft (2,353m)
Aspect	South
Slope	25-30%
Sample Dates	07/31/1997, 08/05/2002, 07/30/2007, 06/07/2012, 06/05/2017

**Wildlife Habitat and Vegetation History****Table 19B-02.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

**Table 19B-02.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mixed Mountain Brush	No Encroachment
1989	Mixed Mountain Brush	No Encroachment
1997	Mixed Mountain Brush	No Encroachment
2002	Mixed Mountain Brush	No Encroachment
2007	Mixed Mountain Brush	No Encroachment
2012	Mixed Mountain Brush	No Encroachment
2017	Mixed Mountain Brush	No Encroachment

**Site Notes**

Numerous intermittent and perennial streams in the area provide good distribution of water. However, thermal and escape cover is rare as most of the surrounding area is occupied by low-growing shrubs. Vegetation tall enough to provide thermal escape can only be found in nearby canyon bottoms. In 2017, there were many caterpillars observed on site.

**Soils****Table 19B-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	6.2	49.3	27.2	23.6	4.6	23.7	211.2	0.6	07/30/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	26 inches
NRCS Ecological Site	Mountain Loam (Browse)
NRCS Ecological Site #	R047XA420UT
States and Transitions	No state and transition model is available for this ecological site.

Since establishment in 1983, this study site has remained dominated by mixed mountain brush species such as Utah serviceberry (*Amelanchier utahensis*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and mountain snowberry (*Symphoricarpos oreophilus*). A number of other shrub species are also present, but contribute less cover (Table 19B-02.12). The herbaceous understory has been plentiful and diverse with native perennial forbs contributing a majority of the cover in most sample years. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been present since 1997 with fluctuations in cover in subsequent sample years (Table 19B-02.10, Table 19B-02.11). Encroachment by pinyon (*Pinus sp.*) and juniper (*Juniperus sp.*) is not occurring on this study site (Table 19B-02.4).

**Trend Summary Tables****Table 19B-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
1997	8.1	19.6	-	-	-	-
2002	7.7	15.9	-	11.3	19.8	-
2007	8.2	12.5	-	16.0	19.8	-
2012	13.1	18.3	-	21.6	19.9	-
2017	19.8	14.4	-	27.5	18.4	-

**Table 19B-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
1997	208	188	329	255	1.7	7.6	5.5	13.0
2002	5	209	28	50	0.0	6.2	0.2	1.0
2007	292	141	365	184	13.7	3.9	10.1	8.2
2012	326	215	369	228	5.5	7.7	9.8	15.9
2017	353	185	380	275	10.6	10.2	13.0	21.8

**Table 19B-02.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	8.9	0.0	52.8	1.9	6.7	50.6
2002	31.9	-	38.5	10.7	10.1	27.6
2007	13.4	-	18.7	9.1	9.1	57.6
2012	11.8	-	33.8	2.7	9.6	58.8
2017	11.2	-	51.7	3.4	8.5	61.9

**Table 19B-02.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	-	26	2	3
2002	1	21	-	-
2007	-	18	10	1
2012	-	11	-	1
2017	-	12	1	-
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	8.7 (21.5)	42.2 (104.3)	2.0 (5.0)	-
2007	1.5 (3.6)	37.5 (92.7)	14.7 (36.4)	-
2012	1.5 (3.6)	7.4 (18.2)	-	-
2017	1.5 (3.6)	9.4 (23.2)	-	-

**Table 19B-02.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Bromus marginatus (mountain brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Melica bulbosa (oniongrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency									
1997	4	55	208	28	-	8	-	55	28	69
2002	0	33	5	7	-	-	-	18	5	160
2007	-	24	292	3	1	2	-	44	17	62
2012	13	71	326	18	21	17	5	32	36	55
2017	2	30	353	13	7	45	28	61	24	57
year	Average Cover (%)									
1997	0.0	1.2	1.7	0.7	-	0.3	-	3.0	0.7	1.9
2002	0.0	0.7	0.0	0.0	-	-	-	0.5	0.0	5.0
2007	-	0.2	13.7	0.0	0.1	0.0	-	1.3	0.2	2.0
2012	0.5	1.8	5.5	0.1	0.3	0.7	0.0	1.1	0.8	2.6
2017	0.1	0.7	10.6	0.4	0.1	1.0	1.3	2.7	0.8	3.1

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

**Table 19B-02.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arenaria fendleri (Fendler's sandwort)	Astragalus cibaricus (browse milkvetch)	Balsamorhiza sagittata (arrow/leaf balsamroot)	Camelina microcarpa <sup>ai</sup> (littlepod false flax)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Cirsium neomexicanum <sup>a</sup> (New Mexico thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Delphinium nuttallianum (twolobe larkspur)	Descurainia pinnata <sup>a</sup> (western tansymustard)
year	Nested Frequency																
1997	26	106	296	-	7	11	13	-	3	35	98	31	52	-	-	21	-
2002	5	-	3	-	-	13	-	-	2	1	-	25	4	-	-	-	-
2007	3	4	263	-	-	8	-	2	3	254	8	14	5	-	-	-	26
2012	20	47	316	4	1	12	28	2	9	205	33	16	44	-	12	21	-
2017	39	98	169	-	15	11	9	6	11	296	174	26	16	2	8	25	5
year	Average Cover (%)																
1997	0.5	0.5	4.3	-	0.1	0.8	0.0	-	0.2	0.1	0.4	0.4	1.2	-	-	0.1	-
2002	0.0	-	0.0	-	-	0.5	-	-	0.0	0.0	-	0.2	0.0	-	-	-	-
2007	0.0	0.0	2.9	-	-	0.4	-	0.0	0.0	3.0	0.0	0.1	0.1	-	-	-	0.7
2012	0.3	0.2	5.3	0.1	0.0	2.6	0.1	0.0	0.5	1.9	0.4	0.1	0.9	-	0.5	0.7	-
2017	0.6	0.7	1.4	-	0.2	1.3	0.0	0.0	0.3	6.7	2.5	0.4	0.3	0.0	0.3	0.5	0.0

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

FORB SPECIES	Epilobium (willowherb)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron (fleabane)	Eriogonum racemosum (redroot buckwheat)	Galium aparine <sup>a</sup> (stickywilly)	Hackelia patens (spotted stickseed)	Hydrophyllum capitatum (ballhead waterleaf)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lathyrus brachycalyx (Bonneville pea)	Ligusticum porteri (Porter's licorice-root)	Lithospermum ruderale (western stone seed)	Lomatium grayi (Gray's biscuitroot)	Lupinus caudatus (tailcup lupine)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Penstemon humilis (low beardtongue)
year	Nested Frequency																
1997	-	16	-	3	-	-	-	-	-	-	-	3	51	47	1	26	5
2002	-	23	-	-	-	-	-	-	-	3	-	4	-	-	-	-	-
2007	7	5	-	-	-	10	94	1	16	-	-	6	7	39	-	195	-
2012	-	48	-	-	-	4	70	53	54	-	-	7	26	66	1	6	-
2017	-	23	1	-	9	-	114	9	28	-	19	4	12	69	5	77	-
year	Average Cover (%)																
1997	-	0.1	-	0.1	-	-	-	-	-	-	-	0.1	1.5	1.7	0.0	0.1	0.0
2002	-	0.1	-	-	-	-	-	-	-	0.0	-	0.2	-	-	-	-	-
2007	0.2	0.0	-	-	-	0.1	5.1	0.0	0.1	-	-	0.7	0.1	0.9	-	3.2	-
2012	-	0.1	-	-	-	0.0	4.8	0.3	0.6	-	-	0.7	1.4	3.3	0.0	0.0	-
2017	-	0.1	0.0	-	0.1	-	9.1	0.1	0.1	-	1.2	0.4	0.5	5.2	0.0	0.7	-

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

FORB SPECIES	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Silene antirrhina <sup>a</sup> (sleepy silene)	Symphotrichum (aster)	Taraxacum officinale (common dandelion)	Tetranneuris acaulis (stemless four-nerve daisy)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	unknown perennial forb (unknown forb)	Viola (violet)	Wyethia amplexicaulis (mule-ears)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency											
1997	62	22	5	-	4	5	50	18	-	-	5	8
2002	-	-	-	-	-	-	-	-	1	-	-	-
2007	30	2	1	-	-	5	-	1	-	-	-	-
2012	-	-	4	1	-	10	-	9	-	2	-	-
2017	13	-	3	3	-	24	-	19	-	18	1	0
year	Average Cover (%)											
1997	0.6	0.1	0.2	-	0.4	0.1	4.6	0.1	-	-	0.2	0.0
2002	-	-	-	-	-	-	-	-	0.0	-	-	-
2007	0.4	0.0	0.0	-	-	0.1	-	0.0	-	-	-	-
2012	-	-	0.0	0.1	-	0.2	-	0.3	-	0.0	-	-
2017	0.1	-	0.1	0.6	-	0.6	-	0.3	-	0.3	0.0	0.0

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

**Table 19B-02.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Ceanothus martinii (Martin's ceanothus)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	Mahonia repens (creeping barberry)	Opuntia polyacantha (plains pricklypear)	Symphoricarpos oreophilus (mountain snowberry)
year	Line Intercept Cover (%)							
1997	-	-	-	-	-	-	-	-
2002	8	3.3	0.4	0.3	-	0.7	-	18.4
2007	10.8	5.2	-	0.4	-	1.2	-	18.2
2012	10.9	10.7	0.6	0.5	-	1.3	0.1	17.4
2017	13.5	14	1.2	1.3	-	0.5	-	15.4
year	Quadrat Cover (%)							
1997	5.5	2.6	0.3	0.9	-	2.7	0.1	15.6
2002	4.5	3.1	0.6	0.3	-	0.5	0.1	14.3
2007	4.5	3.7	-	0.2	-	1.5	-	10.8
2012	7.0	6.2	0.4	1.1	-	2.0	0.0	14.7
2017	7.4	11.5	0.4	0.6	0.9	1.6	-	11.8

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

**Table 19B-02.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

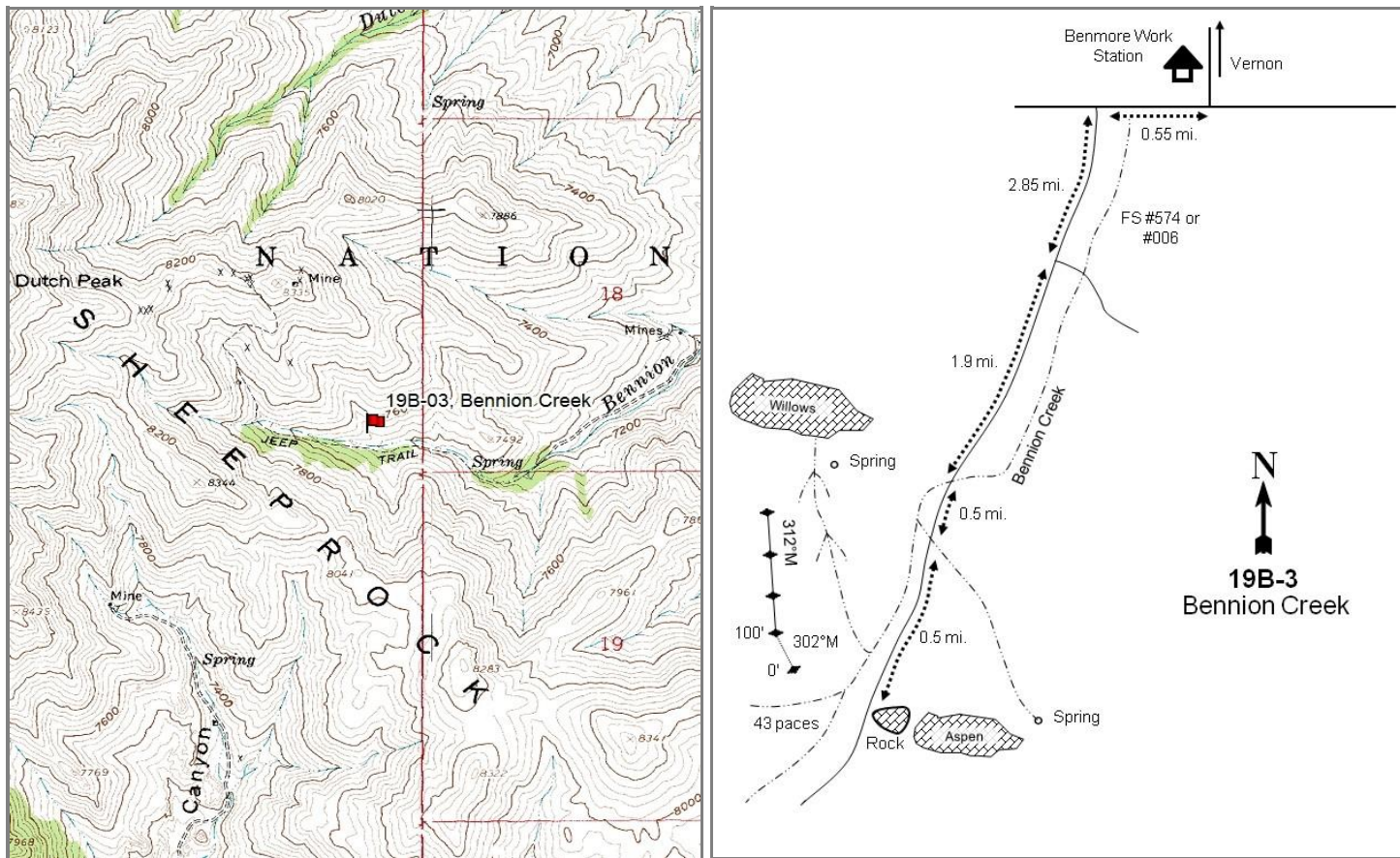
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1997	640	-	6	91	3	50	13	6	124/136
2002	700	-	0	100	0	0	97	49	107/108
2007	480	-	0	100	0	46	50	0	129/150
2012	440	-	0	96	5	18	0	9	127/151
2017	600	-	0	93	7	23	0	10	136/148
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1997	340	-	0	88	12	0	0	6	68/119
2002	520	-	0	81	19	15	8	4	55/101
2007	620	140	36	55	10	13	13	10	58/113
2012	860	-	2	93	5	12	0	0	71/114
2017	1080	-	0	100	0	4	0	0	62/113
<b>Ceanothus martinii -- (Martin's ceanothus)</b>									
1997	300	40	27	73	0	33	0	0	21/68
2002	340	-	6	94	0	0	88	0	13/30
2007	40	-	0	100	0	0	100	0	12/19
2012	160	-	0	100	0	38	0	0	20/60
2017	180	20	0	100	0	0	0	0	19/78
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	180	-	0	100	0	0	0	0	37/72
2002	180	-	0	11	89	0	11	44	23/47
2007	180	-	0	89	11	0	0	11	29/50
2012	200	-	0	100	0	0	0	0	28/53
2017	60	-	0	100	0	0	0	0	32/60
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	61/100
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	87/131
2017	120	-	0	100	0	0	0	0	27/64



Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Mahonia repens -- (creeping barberry)</b>									
1997	7560	-	22	78	0	0	0	0	11/17
2002	1560	-	0	54	46	0	0	46	8/10
2007	8700	-	0	100	0	0	0	0	9/11
2012	6160	-	11	89	0	0	0	0	9/13
2017	7700	-	0	100	0	0	0	0	7/9
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1997	180	-	22	78	0	0	0	22	15/31
2002	100	-	0	100	0	0	0	0	13/30
2007	20	-	0	100	0	0	0	0	14/31
2012	20	-	0	100	0	0	0	0	13/48
2017	20	-	0	100	0	0	0	0	17/46
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1997	3040	40	23	62	15	24	7	13	64/111
2002	2880	-	0	86	14	0	1	37	54/92
2007	2200	-	3	74	24	21	3	8	47/84
2012	2640	60	17	81	2	11	0	2	59/110
2017	2600	-	2	88	11	2	1	12	51/85
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1997	-	-	-	-	-	-	-	-	49/96

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

## BENNION CREEK - STUDY NO. 19B-3



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Dutch Peak NW; Township 10S, Range 6W, Section 48  
NAD 83 UTM ZONE 12, 375083 East 4423119 North

### Transect Information

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

3979  
302° magnetic (Lines 2-4: 312° magnetic)  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Belt 5: 4ft

### Directions to Site

From the Benmore Work Station south of Vernon, travel west for 0.55 miles to the intersection with the USFS road 574 (may have been changed to road 006). Turn left and travel south for 2.85 miles to a fork. Bear right and drive for 1.7 miles to where Bennion Creek crosses the road. Proceed 0.5 miles to where a small drainage from a spring crosses the road. Continue up Bennion Creek for 0.5 miles to the study site (vehicle travel may be restricted in this last 0.5 mile). The site is located on a ridge above the point where two springs come together. From the road, the 0-foot baseline stake is 43 paces northwest. A red browse tag with the number 3979 is attached to the 0-foot baseline stake.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	BENMORE
Elevation	7,500ft (2,286m)
Aspect	Southeast
Slope	25%
Sample Dates	07/31/1997, 08/05/2002, 07/31/2007, 06/20/2012, 06/05/2017

**Wildlife Habitat and Vegetation History****Table 19B-03.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

**Table 19B-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	Mixed Mountain Brush	No Encroachment
1989	Mixed Mountain Brush	No Encroachment
1997	Mixed Mountain Brush	No Encroachment
2002	Mixed Mountain Brush	No Encroachment
2007	Mixed Mountain Brush	No Encroachment
2012	Mixed Mountain Brush	No Encroachment
2017	Mixed Mountain Brush	No Encroachment

**Site Notes**

In 2017, it was noted that defoliator moths were present on a small number of Utah serviceberry (*Amelanchier utahensis*) plants.

**Soils****Table 19B-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	6.5	43.3	30.7	26.0	4.5	12.3	307.2	0.6	08/05/2002

**Site Potential**

1981 - 2010 Average Annual Precipitation	28 inches
NRCS Ecological Site	Mountain Stony Loam (Browse)
NRCS Ecological Site #	R047XA460UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1983, this site has remained in a stable state as a mixed mountain brush plant community with mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), Utah serviceberry (*Amelanchier utahensis*), and mountain snowberry (*Symphoricarpos oreophilus*) as the dominant shrub species, although a number of other species are present in lesser amounts (Table 19B-03.12, Table 19B-03.13). The herbaceous understory has remained diverse and abundant with perennial grasses and forbs contributing a majority of the cover in most sample years. However, the introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) has been observed on the study site since 2007 and was the most abundant perennial grass species in 2017 (Table 19B-03.7, Table 19B-03.10, Table 19B-03.11). Barring a major disturbance, it is likely that this site will remain in a similar state in the future.

**Trend Summary Tables****Table 19B-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	10.4	11.8	-	-	-	-
2002	6.9	7.7	-	10.5	9.9	-
2007	6.9	10.9	-	15.8	13.0	-
2012	15.2	8.6	-	20.9	13.1	-
2017	18.7	7.3	-	26.6	6.2	-

**Table 19B-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	4	340	256	301	0.0	15.8	1.6	9.4
2002	-	304	14	113	-	9.2	0.1	3.0
2007	9	229	372	208	0.1	5.4	10.1	9.3
2012	132	322	339	280	1.4	13.5	2.4	17.8
2017	185	348	346	332	3.6	19.4	10.0	17.1

**Table 19B-03.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	7.0	0.2	50.1	5.5	12.0	48.8
2002	27.6	-	31.7	15.2	15.6	26.6
2007	20.4	0.0	18.0	13.2	12.1	43.6
2012	19.6	0.0	45.0	1.8	13.6	49.9
2017	8.8	0.0	41.7	13.2	11.9	63.4

**Table 19B-03.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	5	8	1	1
2002	10	5	-	-
2007	5	1	-	-
2012	1	-	-	-
2017	1	4	-	2
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	21.1 (52.0)	11.4 (28.1)	0.7 (1.7)	-
2007	8.7 (21.5)	13.4 (33.1)	4.7 (11.6)	-
2012	1.5 (3.6)	4.7 (11.6)	0.7 (1.7)	-
2017	2.9 (7.2)	21.5 (53.0)	0.7 (1.7)	-

**Table 19B-03.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Bromus marginatus (mountain brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Leucopoa kingii (spike fescue)	Melica bulbosa (ontongrass)	Phleum pratense <sup>i</sup> (timothy)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea <sup>i</sup> (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency														
1997	5	36	4	-	-	1	154	116	3	-	129	15	34	-	74
2002	1	3	-	7	-	-	139	22	-	-	117	-	6	-	159
2007	3	93	9	4	-	-	33	57	-	11	38	1	22	3	54
2012	5	75	132	9	3	38	92	52	-	62	18	-	75	-	58
2017	6	64	185	-	3	-	31	157	3	155	30	10	20	-	66
year	Average Cover (%)														
1997	0.1	0.4	0.0	-	-	0.0	6.8	2.3	0.0	-	3.5	0.4	0.6	-	1.9
2002	0.0	0.0	-	0.2	-	-	4.7	0.3	-	-	1.4	-	0.0	-	2.6
2007	0.0	1.9	0.1	0.0	-	-	0.8	0.6	-	0.2	0.4	0.0	0.3	0.2	1.0
2012	0.0	1.5	1.4	0.1	0.0	0.7	4.6	0.7	-	1.4	0.2	-	1.6	-	2.6
2017	0.1	2.0	3.6	-	0.0	-	1.6	4.4	0.0	6.7	1.1	0.6	0.3	-	2.5

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

**Table 19B-03.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus cibirius (browse milkvetch)	Balsamorhiza sagittata (arrow/leaf balsamroot)	Brassicaceae <sup>a</sup> (mustard family)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littledod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)
year	Nested Frequency																
1997	3	24	167	86	1	10	18	5	-	8	-	10	1	7	91	82	-
2002	-	10	-	-	-	9	-	3	-	-	-	-	-	-	-	-	20
2007	1	3	55	81	-	5	-	8	4	-	2	2	-	10	352	112	11
2012	1	5	7	292	3	5	17	4	-	-	5	-	3	3	117	86	24
2017	3	42	106	182	-	12	23	19	-	2	16	-	1	10	136	270	12
year	Average Cover (%)																
1997	0.0	0.1	0.8	0.1	0.0	0.6	0.3	0.7	-	0.0	-	0.1	0.0	0.3	0.2	0.2	-
2002	-	0.0	-	-	-	0.2	-	0.3	-	-	-	-	-	-	-	-	0.2
2007	0.0	0.0	0.3	1.1	-	0.2	-	1.9	0.0	-	0.0	0.0	-	0.1	7.3	0.5	0.2
2012	0.0	0.0	0.0	1.3	0.0	0.2	0.4	2.6	-	-	0.0	-	0.0	0.0	0.3	0.2	0.8
2017	0.0	0.4	0.6	1.2	-	0.6	0.4	2.9	-	0.0	0.1	-	0.0	0.1	1.1	5.0	0.3

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

FORB SPECIES	Crepis acuminata (tapertip hawkbeard)	Cymopterus (springparsley)	Cynoglossum officinale <sup>ani</sup> (gypsyflower)	Delphinium nuttallianum (two-lobed larkspur)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron divergens <sup>a</sup> (spreading fleabane)	Eriogonum brevicaulis (shortstem buckwheat)	Eriogonum heracleoides (parsnipflower buckwheat)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erythronium grandiflorum (yellow avalanche-lily)	Galium aparine <sup>a</sup> (stickywilly)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Hackelia patens (spotted stickseed)	Hydrophyllum occidentale (western waterleaf)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)
year	Nested Frequency																
1997	90	-	-	13	28	9	-	9	6	13	-	-	-	2	-	2	-
2002	1	-	3	-	8	-	-	19	13	3	-	-	-	-	-	-	-
2007	63	-	-	2	40	3	3	11	7	-	-	-	8	-	61	31	6
2012	100	3	-	-	18	-	4	17	13	16	-	-	-	0	109	15	-
2017	83	41	-	10	44	-	6	14	11	3	1	15	1	3	97	7	-
year	Average Cover (%)																
1997	2.5	-	-	0.0	0.1	0.1	-	0.3	0.0	0.2	-	-	-	0.0	-	0.0	-
2002	0.0	-	0.0	-	0.0	-	-	1.3	0.3	0.0	-	-	-	-	-	-	-
2007	1.8	-	-	0.0	0.3	0.0	0.0	0.5	0.1	-	-	-	0.0	-	1.7	0.3	0.0
2012	3.5	0.1	-	-	0.1	-	0.0	1.2	0.3	0.1	-	-	-	0.0	5.6	0.0	-
2017	1.6	0.4	-	0.1	0.3	-	0.0	0.8	0.1	0.2	0.0	0.1	0.0	0.0	4.2	0.1	-

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

FORB SPECIES	Linum lewisii (Lewis flax)	Lithophragma tenellum (slender woodland-star)	Lithospermum (stoneseed)	Lomatium (desertparsley)	Lupinus caudatus (tailcup lupine)	Lupinus sericeus (silky lupine)	Machaeranthera canescens (hoary tansyaster)	Microseris nutans (nodding microseris)	Microsteris gracilis <sup>a</sup> (slender phlox)	Orobanche uniflora <sup>a</sup> (oneflowered broomrape)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Silene antirrhina <sup>a</sup> (sleepy silene)	Streptanthus cordatus (heartleaf twistflower)	Symphoricarum (aster)	Taraxacum officinale (common dandelion)
year	Nested Frequency																
1997	-	-	0	61	-	11	12	-	22	-	19	75	46	6	-	84	-
2002	-	-	2	-	-	2	-	-	-	-	-	-	3	-	-	42	-
2007	-	-	-	24	6	0	3	-	18	7	20	50	6	2	-	39	-
2012	-	-	2	58	6	-	19	-	23	-	3	30	10	23	1	20	-
2017	2	0	-	30	12	-	4	35	5	-	6	11	31	-	-	45	0
year	Average Cover (%)																
1997	-	-	0.0	0.9	-	0.3	0.0	-	0.1	-	0.2	0.2	0.5	0.0	-	1.1	-
2002	-	-	0.0	-	-	0.1	-	-	-	-	-	-	0.0	-	-	0.4	-
2007	-	-	-	1.1	0.2	0.0	0.1	-	0.1	0.0	0.2	0.3	0.1	0.0	-	0.8	-
2012	-	-	0.2	1.9	0.0	-	0.1	-	0.0	-	0.0	0.1	0.1	0.1	0.0	0.5	-
2017	0.0	0.0	-	1.6	0.5	-	0.1	0.3	0.1	-	0.0	0.0	1.1	-	-	0.6	0.0

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

FORB SPECIES	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Veronica biloba <sup>ai</sup> (two-lobed speedwell)	Viola (violet)	Wyethia amplexicaulis (mule-ears)
year	Nested Frequency			
1997	1	9	-	24
2002	-	-	-	1
2007	-	4	-	0
2012	1	5	3	-
2017	25	34	84	1
year	Average Cover (%)			
1997	0.0	0.0	-	0.9
2002	-	-	-	0.1
2007	-	0.0	-	0.0
2012	0.1	0.0	0.0	-
2017	0.6	0.4	1.1	0.1

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

**Table 19B-03.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia nova <sup>p</sup> (black sagebrush)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum heracleoides (parsnipflower buckwheat)	Mahonia repens (creeping barberry)	Opuntia polyacantha (plains pricklypear)	Paxistima myrsinites (Oregon boxleaf)	Rosa woodsii <sup>p</sup> (Woods' rose)	Salix bebbiana (Bebb willow)	Symphoricarpos oreophilus (mountain snowberry)
year	Line Intercept Cover (%)										
1997	-	-	-	-	-	-	-	-	-	-	-
2002	5.2	-	5.1	0.1	1	0	0.5	0.3	0.2	-	8
2007	6.9	-	7.9	0.5	1.2	0.2	0.8	0.4	1	0.2	9.7
2012	8.2	0.8	11.4	-	1.2	0.3	0.1	0.5	0.5	-	11
2017	8	2.2	16.4	1	-	-	0.3	0.3	-	0.1	4.5
year	Quadrat Cover (%)										
1997	3.6	0.4	4.5	0.4	-	0.8	0.1	0.7	1.9	-	9.8
2002	3.2	-	3.6	0.0	0.0	0.0	0.5	0.9	0.2	-	6.2
2007	3.1	0.0	3.4	1.0	0.0	0.4	0.4	0.2	0.4	0.8	8.0
2012	4.3	0.3	9.9	0.4	0.0	0.3	0.2	0.1	0.7	-	7.7
2017	4.7	2.3	11.4	0.5	-	0.2	0.4	0.2	0.3	0.1	5.7

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



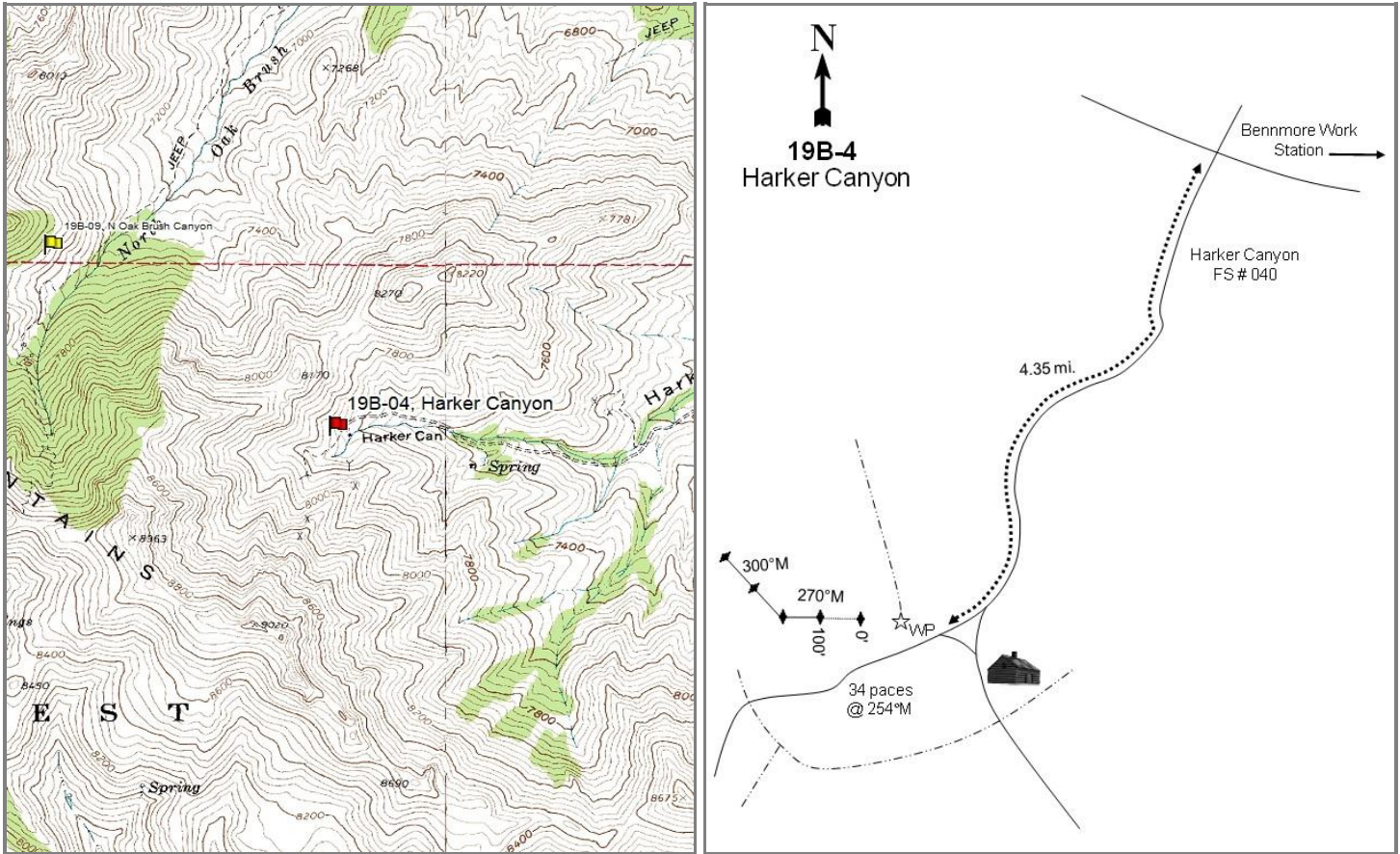
**Table 19B-03.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1997	700	-	9	54	37	49	43	34	87/96
2002	620	-	7	77	16	32	65	10	83/87
2007	460	-	4	96	0	26	52	4	107/106
2012	600	-	10	83	7	30	0	7	109/122
2017	820	-	15	83	2	10	12	5	119/134
<b>Artemisia nova<sup>P</sup> -- (black sagebrush)</b>									
1997	240	-	0	75	25	17	0	25	32/56
2002	60	-	0	100	0	0	0	0	21/66
2007	100	-	0	100	0	0	0	0	26/66
2012	100	-	20	80	0	60	0	0	18/62
2017	480	-	0	96	4	29	0	17	24/63
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1997	940	-	2	68	30	21	0	23	63/97
2002	860	-	9	63	28	28	14	21	50/90
2007	1080	800	30	61	9	41	6	7	55/96
2012	2060	40	1	91	8	8	4	13	46/83
2017	2140	-	4	91	6	22	0	6	56/96
<b>Cercocarpus ledifolius<sup>P</sup> -- (curl-leaf mountain mahogany)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	253/246
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	80	-	0	75	25	0	0	25	47/77
2002	60	-	0	100	0	0	0	33	26/39
2007	100	-	0	100	0	0	0	0	31/47
2012	80	-	0	100	0	0	0	0	27/47
2017	100	-	0	80	20	20	0	0	37/55
<b>Echinocereus -- (hedgehog cactus)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	8/9
<b>Eriogonum heracleoides -- (parsnipflower buckwheat)</b>									
1997	680	60	21	77	3	0	0	3	30/34
2002	980	-	0	94	6	12	8	2	14/31
2007	660	20	6	94	0	18	3	0	14/34
2012	1360	-	3	96	2	0	0	2	13/29
2017	-	-	-	-	-	-	-	-	-/-
<b>Mahonia repens -- (creeping barberry)</b>									
1997	1920	-	33	67	0	0	0	0	10/13
2002	120	-	0	100	0	0	0	0	6/8
2007	1900	-	4	96	0	11	0	0	10/12
2012	920	-	0	100	0	0	0	2	5/12
2017	2180	-	0	100	0	0	0	0	8/9
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1997	140	-	0	100	0	0	0	0	20/83
2002	120	-	0	100	0	0	0	0	16/86
2007	160	-	0	100	0	0	0	0	14/54
2012	280	-	0	100	0	0	0	0	14/32
2017	340	-	0	100	0	0	0	0	16/41
<b>Paxistima myrsinites -- (Oregon boxleaf)</b>									
1997	1560	40	24	76	0	0	0	0	12/32
2002	1740	-	0	100	0	14	10	0	11/19
2007	600	60	10	90	0	13	3	0	11/27
2012	720	-	6	94	0	0	0	0	9/22
2017	620	-	10	90	0	0	3	0	10/19

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Rosa woodsii<sup>P</sup> -- (Woods' rose)</b>									
1997	1140	260	65	30	5	0	0	2	28/39
2002	820	-	12	88	0	27	0	0	13/14
2007	660	-	0	100	0	9	0	0	37/27
2012	1240	-	7	86	8	0	0	0	31/22
2017	1000	-	86	14	0	0	0	0	19/18
<b>Salix bebbiana -- (Bebb willow)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	98/86
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1997	3660	20	21	72	8	16	1	11	44/80
2002	2980	-	2	91	7	0	0	20	35/57
2007	1980	-	2	97	1	5	1	10	38/82
2012	2860	20	4	94	2	1	0	3	36/67
2017	3480	-	20	77	3	0	0	2	37/62
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	0	100	0	0	0	0	-/-

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

## HARKER CANYON - STUDY NO. 19B-4



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Erickson Knoll NE; Township 10S, Range 6W, Section 10  
NAD 83 UTM ZONE 12, 371357 East 4426185 North

### Transect Information

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

577  
282° magnetic  
(Lines 3-4: 300) 400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Belt 3: 7ft, Belt 4: 1ft, Belt 5: 1ft

### Directions to Site

From the USFS Benmore Work Station, proceed south for 0.10 miles to a "T" intersection. Turn right at the intersection (west) and continue for 2.0 miles to an intersection and a sign for "Harker Canyon." Turn left, heading southwest towards Harker Canyon for 4.35 miles. Just after passing an old cabin on the left-hand side of the road, look for a half-high green steel "T" fencepost with a white top on the right side of the road (northeast). From the fencepost, the 0-foot stake of the baseline is 34 paces away at 245 degrees magnetic.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	VERNON
Elevation	7,700ft (2,347m)
Aspect	East
Slope	35%
Sample Dates	07/29/1997, 08/07/2002, 07/31/2007, 06/14/2012, 06/07/2017

**Wildlife Habitat and Vegetation History****Table 19B-04.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

**Table 19B-04.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mixed Mountain Brush	No Encroachment
1989	Mixed Mountain Brush	No Encroachment
1997	Mixed Mountain Brush	No Encroachment
2002	Mixed Mountain Brush	No Encroachment
2007	Mixed Mountain Brush	No Encroachment
2012	Mixed Mountain Brush	No Encroachment
2017	Mixed Mountain Brush	No Encroachment

**Site Notes**

A rattlesnake was observed on site in 2017.

**Soils****Table 19B-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	6.0	46.4	31.1	22.6	5.4	21.2	342.4	0.6	07/28/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	28 inches
NRCS Ecological Site	Mountain Loam (Browse)
NRCS Ecological Site #	R047XA420UT
States and Transitions	No state and transition model is available for this ecological site.

Mixed mountain brush species -- namely mountain snowberry (*Symphoricarpos oreophilus*), Utah serviceberry (*Amelanchier utahensis*), curl-leaf mountain mahogany (*Cercocarpus montanus*), and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) - - have dominated this site since study establishment in 1984 (Table 19B-04.12, Table 19B-04.13). A number of other shrub species are also present, but contribute less cover. The herbaceous understory has remained very abundant and diverse throughout the study years. Perennial grasses, mainly oniongrass (*Melica bulbosa*), and perennial forbs such as ballhead waterleaf (*Hydrophyllum capitatum*) and silky lupine (*Lupinus sericeus*) have been the main components of the understory in most sample years. In addition, the introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) was observed for the first time in 2017 (Table 19B-04.7, Table 19B- 04.10, Table 19B-04.11).

## Trend Summary Tables

**Table 19B-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
1997	6.0	25.4	-	-	-	-
2002	7.8	20.2	-	16.6	29.6	-
2007	6.4	21.0	-	18.3	34.9	-
2012	14.6	27.7	-	20.0	41.0	-
2017	10.2	22.2	-	24.2	33.9	-

**Table 19B-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
1997	2	364	148	221	0.0	17.2	0.7	8.2
2002	-	341	5	60	-	14.0	0.0	2.6
2007	5	258	231	233	0.1	7.2	2.6	14.6
2012	7	291	242	308	0.0	11.0	2.3	23.2
2017	79	343	296	360	1.0	23.7	4.5	42.6

**Table 19B-04.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	2.9	0.0	64.7	2.7	4.6	61.1
2002	23.4	0.4	35.8	9.9	9.0	41.7
2007	17.1	-	27.6	7.6	6.5	49.5
2012	10.7	-	56.7	1.4	8.4	63.7
2017	7.3	-	62.2	3.8	7.0	69.8

**Table 19B-04.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	-	6	2	-
2002	5	11	-	-
2007	3	4	3	-
2012	-	3	-	1
2017	1	5	-	-
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	8.7 (21.5)	40.2 (99.3)	1.3 (3.3)	-
2007	5.1 (12.6)	25.5 (62.9)	0.7 (1.7)	-
2012	2.2 (5.4)	22.8 (56.3)	-	-
2017	1.5 (3.6)	8.1 (19.9)	-	-

**Table 19B-04.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bromus marginatus (mountain brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Elymus trachycaulus (slender wheatgrass)	Festuca idahoensis (Idaho fescue)	Leucopoa kingii (spike fescue)	Melica bulbosa (oniongrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency													
1997	1	1	113	2	-	6	4	131	206	-	49	22	14	18
2002	-	-	64	-	5	-	-	120	220	-	81	2	-	13
2007	8	-	77	5	-	-	-	37	129	-	30	-	7	30
2012	-	14	109	7	5	12	-	91	180	-	15	9	4	-
2017	3	1	51	79	27	5	2	112	261	35	49	7	1	8
year	Average Cover (%)													
1997	0.0	0.0	3.8	0.0	-	0.1	0.0	5.0	6.0	-	1.3	0.3	0.2	0.5
2002	-	-	1.2	-	0.4	-	-	4.9	5.8	-	1.3	0.0	-	0.4
2007	0.0	-	3.0	0.1	-	-	-	0.9	2.1	-	0.7	-	0.1	0.4
2012	-	0.4	2.2	0.0	0.0	0.2	-	4.4	3.6	-	0.1	0.0	0.0	-
2017	0.0	0.0	1.3	1.0	0.5	0.1	0.2	5.5	12.6	1.7	1.6	0.1	0.0	0.2

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

**Table 19B-04.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Astragalus cibirarius (browse milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Castilleja linearifolia (Wyoming Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cymopterus longipes (longstalk springparsley)	Delphinium nuttallianum (twolobe larkspur)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)
year	Nested Frequency																
1997	-	124	20	2	1	-	7	-	1	1	33	40	-	47	-	4	-
2002	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	3	-
2007	5	123	21	-	-	4	4	1	-	-	182	56	-	3	-	-	20
2012	25	36	135	7	7	2	4	-	-	-	50	134	8	47	-	-	34
2017	45	171	127	2	32	7	2	-	-	-	171	130	1	57	5	75	7
year	Average Cover (%)																
1997	-	0.5	0.1	0.0	0.0	-	0.0	-	0.0	0.2	0.1	0.1	-	0.6	-	0.0	-
2002	-	-	-	-	-	0.2	-	-	-	-	-	-	-	-	-	0.0	-
2007	0.0	1.2	0.2	-	-	0.5	0.0	0.0	-	-	1.2	0.5	-	0.0	-	-	0.2
2012	0.2	0.1	0.9	0.0	0.0	0.6	0.0	-	-	-	0.1	0.9	0.3	0.9	-	-	0.1
2017	0.4	0.9	0.5	0.0	0.8	1.0	0.0	-	-	-	0.8	0.8	0.0	2.0	0.2	0.7	0.0

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

FORB SPECIES	Erigeron eatonii (Eatons fleabane)	Eriogonum heracleoides (parsnipflower buckwheat)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erythronium grandiflorum (yellow avalanche-lily)	Fritillaria atropurpurea (spotted fritillary)	Galium aparine <sup>a</sup> (stickywilly)	Hackelia patens (spotted stickseed)	Helianthella uniflora (oneflower helianthella)	Hydrophyllum capitatum (ballhead waterleaf)	Ipomopsis aggregata (scarlet gilia)	Ligusticum porteri (Porter's licorice-root)	Lomatium grayi (Gray's biscuitroot)	Lupinus sericeus (silky lupine)	Machaeranthera canescens (hoary tansyaster)	Mertensia (bluebells)	Microseris nutans (nodding microseris)
year	Nested Frequency																
1997	-	28	21	3	-	-	-	2	-	-	-	-	29	69	4	-	-
2002	-	19	3	2	-	-	-	-	2	-	-	-	-	-	-	-	-
2007	4	26	6	2	-	-	-	3	-	104	-	-	14	26	3	-	-
2012	6	7	17	7	-	-	4	-	6	157	1	-	25	107	3	-	-
2017	-	34	-	8	14	5	83	3	5	192	-	28	11	131	8	82	45
year	Average Cover (%)																
1997	-	1.5	0.6	0.0	-	-	-	0.0	-	-	-	-	0.2	1.4	0.0	-	-
2002	-	1.1	0.1	0.0	-	-	-	-	0.1	-	-	-	-	-	-	-	-
2007	0.0	1.5	0.1	0.0	-	-	-	0.0	-	5.0	-	-	0.2	0.8	0.0	-	-
2012	0.0	0.4	0.2	0.0	-	-	0.0	-	0.3	7.4	0.1	-	0.5	4.5	0.0	-	-
2017	-	1.5	-	0.1	0.0	0.0	0.8	0.0	0.1	12.1	-	0.8	0.3	11.1	0.2	2.6	0.4

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

FORB SPECIES	Microsteris gracilis <sup>a</sup> (slender phlox)	Penstemon humilis (low beardtongue)	Petroradia pumila (rock goldenrod)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Silene antirrhina <sup>a</sup> (sleepy silene)	Symphyotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Veronica biloba <sup>ai</sup> (twolobe speedwell)	Viola (violet)	Wyethia amplexicaulis (mule-ears)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency														
1997	11	3	-	-	38	96	-	-	8	3	-	1	-	39	2
2002	-	-	0	-	-	2	3	-	-	-	-	-	1	31	-
2007	6	10	-	-	26	66	4	-	5	-	-	3	3	37	-
2012	14	20	-	3	53	59	11	2	-	-	-	7	57	34	5
2017	21	2	2	4	91	13	39	-	6	-	8	24	72	45	-
year	Average Cover (%)														
1997	0.1	0.0	-	-	0.2	0.4	-	-	0.0	0.0	-	0.0	-	2.8	0.0
2002	-	-	0.0	-	-	0.0	0.0	-	-	-	-	-	0.0	1.1	-
2007	0.0	0.1	-	-	0.2	0.4	0.1	-	0.1	-	-	0.0	0.0	4.8	-
2012	0.0	0.9	-	0.0	1.2	0.1	0.0	0.0	-	-	-	0.0	0.2	5.0	0.0
2017	0.1	0.0	0.0	0.0	0.8	0.1	0.8	-	0.2	-	0.0	0.4	0.6	5.7	-

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



**Table 19B-04.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Ceanothus martinii (Martin's ceanothus)	Cercocarpus ledifolius <sup>p</sup> (curl-leaf mountain mahogany)	Cercocarpus montanus <sup>p</sup> (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum heracleoides (parsnipflower buckwheat)	Mahonia repens (creeping barberry)	Paxistima myrsinites (Oregon boxleaf)	Rosa woodsii <sup>p</sup> (Woods' rose)	Symphoricarpos oreophilus (mountain snowberry)
year	Line Intercept Cover (%)										
1997	-	-	-	-	-	-	-	-	-	-	-
2002	6.3	3.5	-	6.4	-	0.2	2.6	0.4	0.8	0.4	25.6
2007	7.9	2	-	7.3	0.2	0.1	0.6	0.6	0.4	0.9	33.2
2012	10.9	3.4	0.2	5.2	-	0.2	0.5	0.6	-	0.5	39.5
2017	12.5	4.4	-	7.2	-	0.4	-	0.7	0.3	0.1	32.5
year	Quadrat Cover (%)										
1997	3.6	1.9	0.6	0.5	-	1.2	-	0.8	-	0.1	22.8
2002	4.1	3.6	-	0.0	-	0.1	0.0	0.5	0.6	0.1	18.9
2007	3.5	2.0	-	0.5	0.0	0.1	0.0	0.3	0.4	0.4	20.2
2012	5.3	2.9	0.3	5.8	-	0.4	0.0	0.9	0.3	0.5	25.7
2017	7.3	2.3	0.0	0.4	-	0.5	-	1.1	0.1	0.2	20.5

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

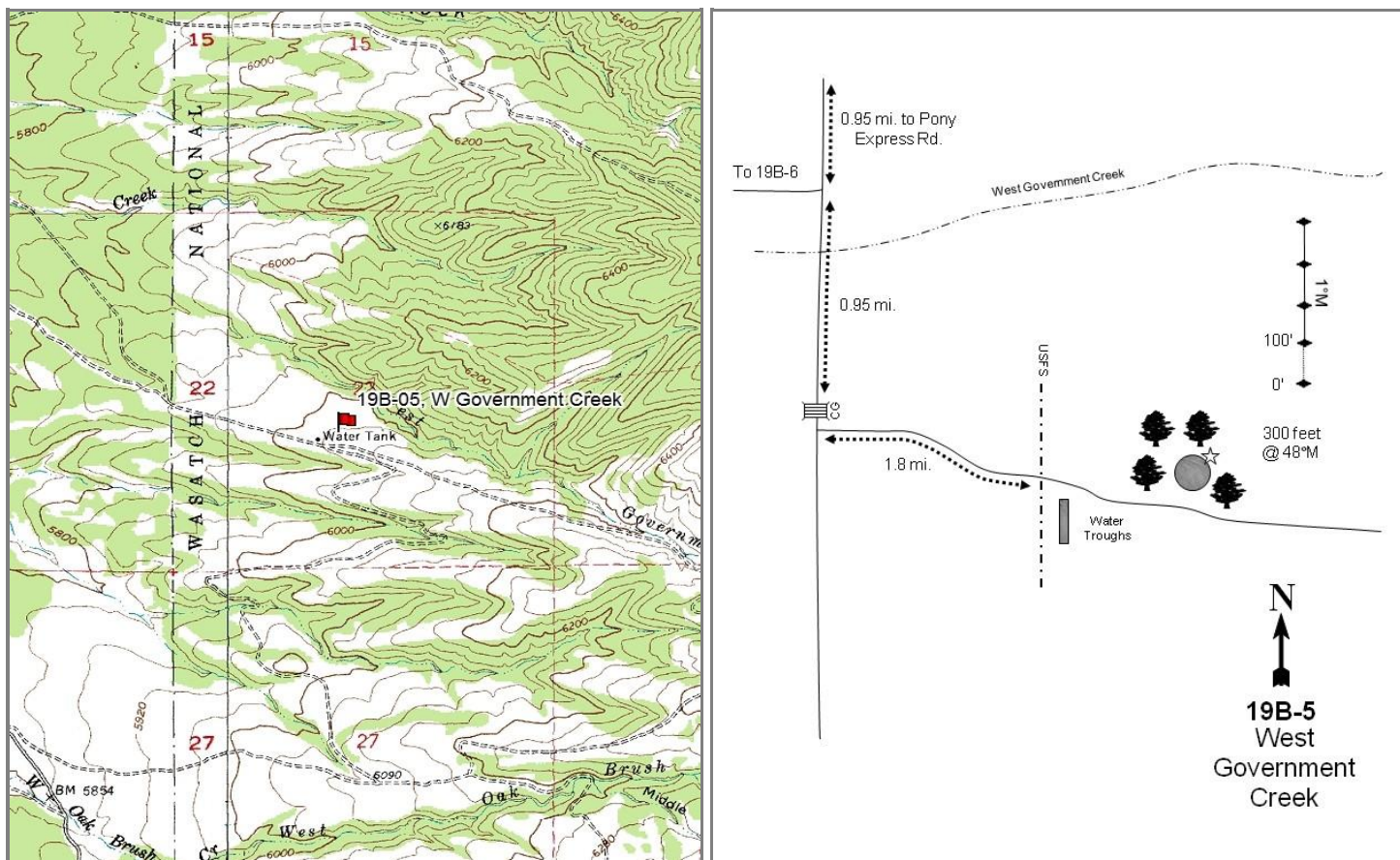
**Table 19B-04.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1997	560	-	11	86	4	25	4	0	132/119
2002	800	-	5	95	0	25	45	40	117/109
2007	500	-	16	72	12	8	44	4	126/121
2012	540	60	0	100	0	26	0	0	140/151
2017	800	-	0	100	0	28	0	0	127/129
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1997	1540	-	57	35	8	3	1	14	69/90
2002	560	-	0	79	21	0	0	11	59/90
2007	580	160	35	55	10	17	3	3	56/103
2012	700	20	11	89	0	0	0	0	47/74
2017	740	-	0	76	24	19	0	11	54/82
<b>Cercocarpus ledifolius<sup>p</sup> -- (curl-leaf mountain mahogany)</b>									
1997	-	-	-	-	-	-	-	-	400/450
2002	20	-	0	100	0	0	0	0	410/599
2007	20	-	0	100	0	0	0	0	363/567
2012	20	-	0	100	0	100	0	0	- / -
2017	20	580	0	100	0	0	0	0	- / -
<b>Ceanothus martinii -- (Martin's ceanothus)</b>									
1997	580	-	45	55	0	3	0	0	24/54
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	340	-	6	94	0	0	0	0	17/37
2017	-	60	0	0	0	0	0	0	- / -
<b>Cercocarpus montanus<sup>p</sup> -- (alderleaf mountain mahogany)</b>									
1997	-	-	-	-	-	-	-	-	- / -
2002	20	-	0	100	0	0	0	100	130/178
2007	20	-	0	100	0	0	0	0	156/192
2012	-	-	-	-	-	-	-	-	155/198
2017	-	-	-	-	-	-	-	-	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	760	-	21	79	0	0	0	0	39/44
2002	260	-	0	46	54	0	0	39	28/33
2007	160	-	0	100	0	50	0	0	30/45
2012	500	-	0	100	0	0	0	0	29/40
2017	360	-	6	94	0	0	0	0	29/42
<b>Eriogonum heracleoides -- (parsnipflower buckwheat)</b>									
1997	920	-	0	100	0	0	0	0	39/36
2002	1560	-	0	89	12	21	5	12	17/34
2007	780	80	0	97	3	0	21	3	13/32
2012	520	-	0	100	0	0	0	0	14/32
2017	-	-	-	-	-	-	-	-	-/-
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1997	80	-	100	0	0	25	50	25	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Mahonia repens -- (creeping barberry)</b>									
1997	2180	-	14	86	0	0	0	0	9/15
2002	1040	-	0	100	0	0	0	0	7/9
2007	3600	-	4	96	0	0	0	0	7/13
2012	3340	-	0	100	0	0	0	0	10/16
2017	3560	-	0	100	0	0	0	0	9/10
<b>Opuntia -- (pricklypear)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	11/46
2012	-	-	-	-	-	-	-	-	18/36
2017	-	-	-	-	-	-	-	-	17/53
<b>Paxistima myrsinites -- (Oregon boxleaf)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	880	-	21	80	0	7	0	0	9/20
2007	880	-	27	73	0	23	14	0	11/21
2012	1120	-	2	98	0	0	0	0	11/19
2017	860	40	26	74	0	0	0	0	9/20
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	58/166
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Ribes<sup>P</sup> -- (currant)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	0	100	0	0	0	0	140/164
<b>Rosa woodsii<sup>P</sup> -- (Woods' rose)</b>									
1997	880	20	55	46	0	0	0	0	24/24
2002	420	20	24	76	0	0	0	0	25/17
2007	880	-	0	98	2	0	7	2	26/26
2012	540	20	22	74	4	0	0	0	47/13
2017	600	-	7	93	0	0	0	0	20/13
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1997	2620	-	8	90	2	0	0	2	85/148
2002	3000	-	1	91	9	1	0	24	70/117
2007	2480	-	1	87	12	3	0	16	76/133
2012	2960	20	6	93	1	0	0	1	81/139
2017	5760	-	24	75	1	1	0	1	68/119

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

## WEST GOVERNMENT CREEK - STUDY NO. 19B-5



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Lookout Pass SW; Township 9S, Range 7W, Section 22  
NAD 83 UTM ZONE 12, 361722 East 4430994 North

### Transect Information

Browse Tag # (0' Stake)	3975
Transect Bearing	4° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (95ft)
Belt Marker Placement	Standard

### Directions to Site

Turn south off Pony Express Road onto Erickson Pass Road. Go 4.6 miles to the turnoff to study 19B-6. Continue for 0.95 miles to a cattle guard, and then turn left 60 yards past the cattle guard. Continue for 1.8 miles to a water trough. From the northeast side of the circular trough, the 0-foot baseline stake is 300 feet away at 48 degrees magnetic and is marked with browse tag #3975.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	ONAQUI
Elevation	6,000ft (1,829m)
Aspect	Northwest
Slope	7-10%
Sample Dates	07/31/1997, 08/01/2002, 08/01/2007, 06/19/2012, 06/06/2017

**Table 19B-05.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	Late 1960s	-
Seeding - Seed Unknown	-	-	Late 1960s	-
Hand Crew - Lop and Scatter	West Government	2024	July 2011-May 2012	1613

**Wildlife Habitat and Vegetation History****Table 19B-05.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

**Table 19B-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	Mountain Big Sagebrush	Phase I
1989	Mountain Big Sagebrush	Phase I
1997	Mountain Big Sagebrush	Phase I
2002	Mountain Big Sagebrush	Phase I
2007	Mountain Big Sagebrush	Phase I
2012	Mountain Big Sagebrush	Phase I
2017	Mountain Big Sagebrush	Phase I

**Site Notes**

This winter range study is located in the lower portion of the Lee's Creek drainage in an old juniper chaining area.

**Soils****Table 19B-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	7.6	40.4	35.1	24.6	3.4	23.8	336.0	0.2	07/31/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	15 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.

This study site has existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated plant community since 1983, with other shrub species such as antelope bitterbrush (*Purshia tridentata*) as subordinate community members (Table 19B-05.12). The herbaceous understory has remained abundant and moderately diverse throughout the study years; much of the herbaceous cover is contributed by the introduced perennial grass species crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Thinopyrum intermedium*) and the native species Sandberg bluegrass (*Poa secunda*). Perennial forb cover has fluctuated from year to year, but increased by nearly nine percent between 2012 and 2017 -- much of this increase is due to American vetch (*Vicia americana*) (Table 19B-05.7, Table 19B-05.10, Table 19B-05.11). Utah juniper (*Juniperus osteosperma*) trees are scattered across the site, placing it in Phase I of woodland succession (Photos, Table 19B-05.4, Table 19B-05.12, Table 19B-05.13, Table 19B-05.14).

**Trend Summary Tables****Table 19B-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	18.3	0.0	0.8	-	-	-
2002	21.3	0.1	1.4	31.5	0.1	2.2
2007	16.6	0.0	1.5	29.0	-	3.2
2012	20.4	-	0.3	30.1	-	-
2017	17.9	-	0.5	28.2	0.1	0.1

**Table 19B-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	13	367	356	222	0.0	16.2	1.8	5.4
2002	3	370	-	24	0.0	11.9	-	0.3
2007	11	385	225	185	0.1	21.2	1.0	3.0
2012	-	417	170	219	-	27.6	0.5	3.8
2017	-	434	255	288	-	39.9	1.2	12.6

**Table 19B-05.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	16.2	4.6	42.0	6.0	0.8	41.8
2002	40.2	1.1	36.9	5.1	1.1	35.4
2007	25.9	0.5	39.3	5.7	0.4	42.6
2012	15.3	0.0	49.7	2.6	1.7	55.4
2017	19.8	0.1	53.1	6.3	0.8	57.1

**Table 19B-05.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1997	10	3	-	-	21
2002	10	3	-	-	12
2007	6	8	1	-	54
2012	-	6	-	-	2
2017	2	8	-	-	2
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	33.4 (82.5)	14.1 (34.8)	-	0.6 (1.4)	-
2007	4.4 (10.8)	25.5 (62.9)	1.3 (3.3)	-	-
2012	-	4.0 (9.9)	-	-	-
2017	16.7 (41.2)	22.8 (56.3)	-	-	-

**Table 19B-05.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES								
Agropyron cristatum <sup>i</sup> (crested wheatgrass)								
Bromus tectorum <sup>ai</sup> (cheatgrass)								
Elymus elymoides (squirreltail)								
Poa bulbosa <sup>i</sup> (bulbous bluegrass)								
Poa fendleriana (muttongrass)								
Poa secunda (Sandberg bluegrass)								
Pseudoroegneria spicata (bluebunch wheatgrass)								
Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)								
year	Nested Frequency							
1997	260	13	-	-	-	186	8	153
2002	195	3	4	-	-	197	10	154
2007	220	11	-	-	-	245	13	126
2012	233	-	-	-	-	290	9	159
2017	307	-	-	42	7	279	27	188
year	Average Cover (%)							
1997	8.5	0.0	-	-	-	3.9	0.2	3.6
2002	5.7	0.0	0.0	-	-	2.7	0.4	3.0
2007	8.0	0.1	-	-	-	9.1	0.5	3.6
2012	11.9	-	-	-	-	9.4	0.4	5.9
2017	18.6	-	-	1.2	0.3	12.0	1.3	6.6

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

**Table 19B-05.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																	
Agoseris glauca (pale agoseris)																	
Alyssum desertorum <sup>ai</sup> (desert madwort)																	
Antennaria dimorpha (low pussytoes)																	
Arabis (rockcress)																	
Astragalus cibirius (browse milkvetch)																	
Astragalus convallarius (lesser rushy milkvetch)																	
Calochortus nuttallii (sego lily)																	
Castilleja angustifolia (northwestern Indian paintbrush)																	
Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)																	
Chaenactis douglasii (Douglas' dustymaiden)																	
Cirsium neomexicanum <sup>a</sup> (New Mexico thistle)																	
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																	
Comandra umbellata (bastard toadflax)																	
Crepis acuminata (tapertip hawksbeard)																	
Cymopterus longipes (longstalk springparsley)																	
Draba <sup>a</sup> (draba)																	
Erigeron pumilus (shaggy fleabane)																	
year	Nested Frequency																
1997	2	282	3	6	26	3	1	1	232	3	2	49	3	15	10	-	9
2002	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2007	4	77	-	-	49	2	7	-	171	-	-	68	2	15	3	5	-
2012	25	132	-	-	51	4	-	-	76	-	2	16	5	6	6	-	-
2017	35	236	-	-	72	7	28	3	41	4	1	34	10	19	32	-	3
year	Average Cover (%)																
1997	0.0	0.6	0.0	0.0	1.1	0.0	0.0	0.0	1.0	0.0	0.0	0.1	0.0	0.2	0.0	-	0.0
2002	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2007	0.1	0.2	-	-	1.7	0.0	0.0	-	0.6	-	-	0.2	0.0	0.1	0.0	0.0	-
2012	0.3	0.3	-	-	0.7	0.2	-	-	0.1	-	0.0	0.1	0.1	0.1	0.0	-	-
2017	0.5	0.9	-	-	3.6	0.1	0.1	0.0	0.1	0.0	0.0	0.2	0.1	0.4	0.3	-	0.0

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

FORB SPECIES	Eriogonum (buckwheat)	Galium boreale (northern bedstraw)	Medicago sativa <sup>i</sup> (alfalfa)	Microsteris gracilis <sup>a</sup> (slender phlox)	Petradoria pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Silene antirrhina <sup>a</sup> (sleepy silene)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Vicia americana (American vetch)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency									
1997	1	4	13	25	19	73	-	-	128	-
2002	-	-	-	-	12	-	-	-	11	-
2007	-	5	-	11	10	58	5	2	84	1
2012	-	-	-	2	13	69	1	-	125	-
2017	-	-	3	5	25	33	-	-	168	-
year	Average Cover (%)									
1997	0.0	0.2	1.7	0.0	0.3	0.7	-	-	0.9	-
2002	-	-	-	-	0.3	-	-	-	0.0	-
2007	-	0.0	-	0.0	0.2	0.4	0.0	0.0	0.4	0.0
2012	-	-	-	0.0	0.5	0.4	0.0	-	1.4	-
2017	-	-	0.6	0.0	0.7	0.2	-	-	6.0	-

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

**Table 19B-05.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Atriplex canescens <sup>p</sup> (fourwing saltbush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>i</sup> (Utah juniper)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)
year	Line Intercept Cover (%)				
1997	-	-	-	-	-
2002	31.4	-	0.1	2.2	0.1
2007	28.7	-	-	3.2	0.3
2012	28.5	-	-	-	1.6
2017	25.1	-	0.1	0.1	3.1
year	Quadrat Cover (%)				
1997	17.5	-	0.0	0.8	0.7
2002	20.5	0.4	0.1	1.4	0.4
2007	16.3	-	0.0	1.5	0.3
2012	18.7	-	-	0.3	1.7
2017	15.5	-	0.0	0.5	2.4

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



**Table 19B-05.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

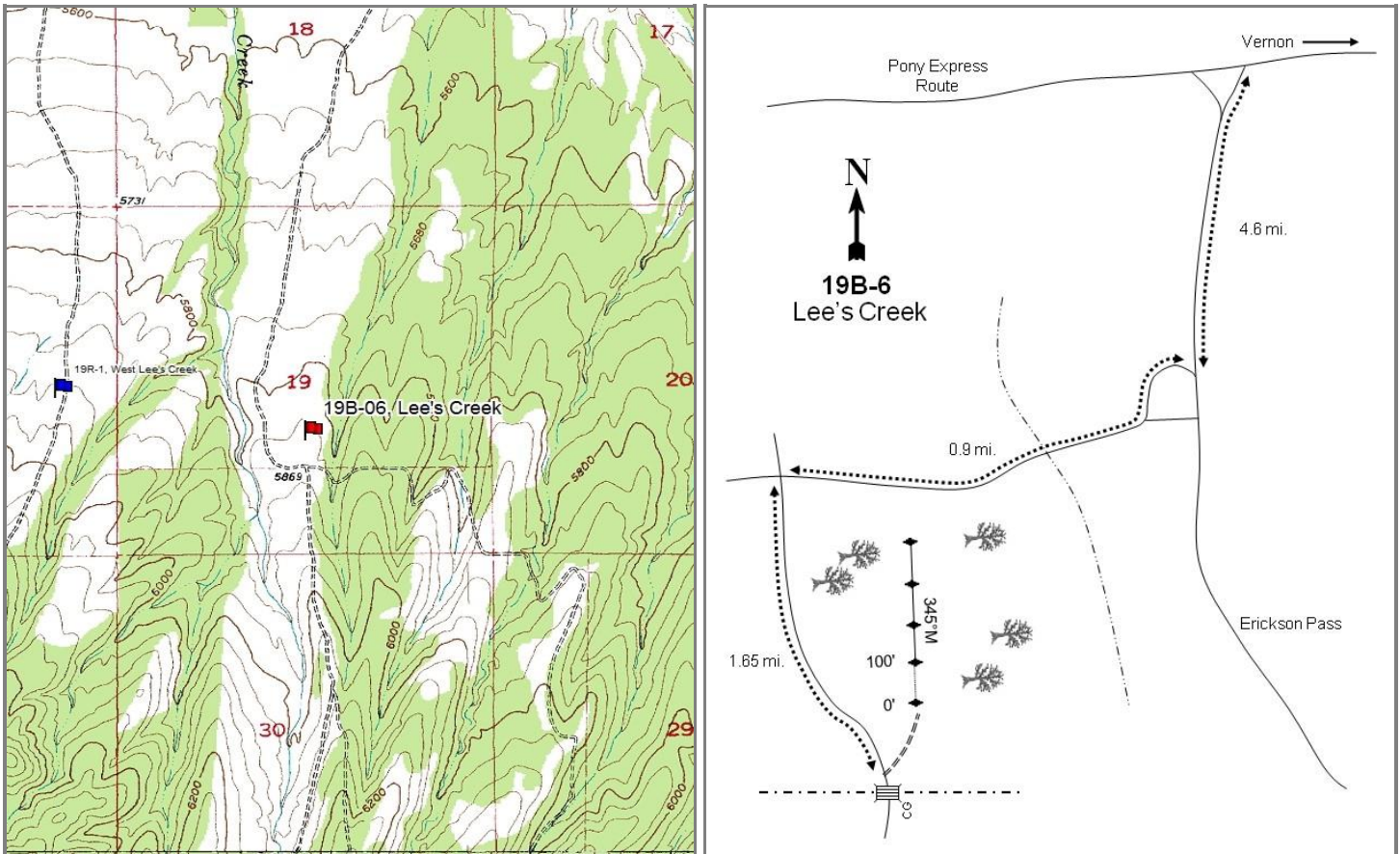
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1997	2300	20	16	76	9	40	0	12	84/136
2002	3160	-	3	73	24	30	3	6	75/119
2007	2320	-	1	60	39	30	21	29	79/124
2012	2420	-	0	76	24	37	2	27	92/116
2017	2380	-	0	66	34	25	9	37	80/119
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	240	20	25	75	0	0	0	0	34/27
2002	440	-	5	91	5	0	0	0	18/23
2007	140	-	0	57	43	0	0	43	13/12
2012	-	-	-	-	-	-	-	-	20/21
2017	40	-	0	100	0	0	0	0	23/20
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1997	20	-	100	0	0	0	0	0	- / -
2002	60	-	33	67	0	0	0	0	- / -
2007	40	-	0	100	0	0	0	0	- / -
2012	60	-	0	33	67	0	0	0	- / -
2017	20	-	100	0	0	0	0	0	- / -
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1997	100	-	20	80	0	20	40	0	35/106
2002	120	-	17	83	0	0	83	0	48/132
2007	80	-	0	100	0	0	75	0	60/135
2012	120	20	0	100	0	50	50	0	81/145
2017	260	-	0	100	0	39	39	8	86/137

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

**Table 19B-05.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2002	20	-	-	-	-	-	9.5
2007	21	-	10	60	20	10	9.8
2012	6	-	100	-	-	-	14.6
2017	14	13	75	13	-	-	5.4

## LEE'S CREEK - STUDY NO. 19B-6

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Indian Peaks SE; Township 9S, Range 7W, Section 19  
NAD 83 UTM ZONE 12, 357007 East 4430989 North

**Transect Information**

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

121  
345° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Standard

**Directions to Site**

Starting at the intersection of the Erickson Pass and Pony Express Roads, proceed south on Erickson Pass Road for 4.6 miles to an intersection. Turn right at the intersection and proceed west for 0.9 miles to another intersection. Turn left at the intersection and continue south for 1.65 miles to a cattle guard and gate. From the cattle guard, the 0-foot stake is 70 paces away at 12 degrees magnetic. The study is located just inside the chaining area that is adjacent to the burned area. The 0-foot stake is marked with a red browse tag numbered 121.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	GOVERNMENT CREEK
Elevation	5,850ft (1,783m)
Aspect	North
Slope	5%
Sample Dates	07/30/1997, 08/06/2002, 06/05/2007, 06/19/2012, 06/05/2017

**Table 19B-06.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Two-Way Chain Unknown	James Seeding	-	Summer/Fall 1970	1500
Seeding - Aerial Before	James Seeding	-	Summer/Fall 1970	1500

**Wildlife Habitat and Vegetation History****Table 19B-06.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

**Table 19B-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	Phase I
1989	Mountain Big Sagebrush	Phase I
1997	Mountain Big Sagebrush	Phase I transitioning to Phase II
2002	Mountain Big Sagebrush	Phase I transitioning to Phase II
2007	Mountain Big Sagebrush	Phase I transitioning to Phase II
2012	Mountain Big Sagebrush	Phase I transitioning to Phase II
2017	Mountain Big Sagebrush	Phase I transitioning to Phase II

**Site Notes**

This winter range study samples an old Utah juniper (*Juniperus osteosperma*) chaining that is located in the lower portion of the Lee's Creek drainage; it is situated on a ridge that runs north-south, and the perennial stream Lee's Creek is located 900 feet to the west.

**Soils****Table 19B-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	7.0	38.0	36.1	25.9	3.0	6.3	182.4	0.7	07/30/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	15 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, this site has existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated plant community with other shrub species scattered throughout. The herbaceous understory is abundant, with a majority of the cover is provided by the introduced perennial grass species crested wheatgrass (*Agropyron cristatum*) and the native perennial grass species Sandberg bluegrass (*Poa secunda*) (Table 19B-06.7, Table 19B-06.10). Forbs are moderately diverse with the native perennial species browse milkvetch (*Astragalus cibarius*) contributing the most cover of any one species. In addition, introduced annual species such as desert madwort (*Alyssum desertorum*) and curvseed butterwort (*Ceratocephala testiculata*) are abundant (Table 19B-06.11). This site is considered to be within Phase I transitioning to Phase II of woodland succession, with line intercept cover of Utah juniper (*Juniperus osteosperma*) increasing each sample year since 2002 (Table 19B-06.4, Table 19B-06.12). Without a tree-removing disturbance, this site is expected to continue to progress in phases of woodland succession.

**Trend Summary Tables****Table 19B-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	4.6	0.3	9.6	-	-	-
2002	5.1	1.2	9.3	7.1	0.5	14.4
2007	4.6	0.0	12.6	10.6	0.1	16.8
2012	8.8	-	12.9	8.7	-	18.5
2017	6.6	0.0	9.1	9.4	-	19.8

**Table 19B-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	23	368	206	67	0.2	14.5	0.6	1.9
2002	-	352	-	52	-	12.1	-	0.9
2007	12	363	261	41	0.0	14.2	1.0	0.6
2012	9	371	259	80	0.0	18.4	1.0	1.0
2017	6	368	315	151	0.0	19.2	2.2	4.5

**Table 19B-06.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	24.0	5.2	31.9	11.5	1.9	26.2
2002	24.9	0.6	31.7	23.3	2.6	27.6
2007	33.8	0.3	33.4	14.4	1.4	32.9
2012	24.2	0.4	39.2	10.4	2.5	41.9
2017	30.2	2.0	36.2	23.1	1.1	33.2

**Table 19B-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	Coyote	Mule Deer/Pronghorn	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
1997	22	-	14	-	27
2002	14	-	3	-	8
2007	7	-	10	1	60
2012	2	-	2	-	8
2017	3	-	2	-	18
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	21.1 (52.0)	-	0.7 (1.7)	-	-
2007	15.3 (37.7)	-	8.7 (21.5)	1.3 (3.3)	-
2012	-	8.7 (21.5)*	-	-	-
2017	53.7 (132.7)	-	5.3 (13.2)	-	-

\*Pellets per acre (ha)

**Table 19B-06.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency						
1997	0	1	325	23	2	239	-
2002	-	-	270	-	5	238	3
2007	-	-	278	12	0	278	5
2012	-	-	193	9	-	345	6
2017	-	-	246	6	4	319	7
year	Average Cover (%)						
1997	0.0	0.0	10.0	0.2	0.0	4.4	-
2002	-	-	8.9	-	0.2	3.0	0.0
2007	-	-	8.0	0.0	0.0	6.1	0.1
2012	-	-	4.8	0.0	-	13.5	0.0
2017	-	-	8.3	0.0	0.0	10.7	0.2

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

**Table 19B-06.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria dimorpha (low pussytoes)	Astragalus cibaricus (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus eurekaensis (Eureka milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Microsteris gracilis <sup>a</sup> (slender phlox)	Petradoria pumila (rock goldenrod)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency																
1997	131	-	8	-	0	-	110	6	4	-	-	-	1	29	25	2	0
2002	-	1	-	-	-	-	-	2	-	-	-	-	-	33	17	-	-
2007	45	10	9	-	-	-	251	-	-	-	1	5	-	16	8	6	1
2012	151	20	12	7	3	-	219	3	3	-	-	-	2	28	13	10	3
2017	245	30	74	1	3	13	246	-	0	7	-	-	3	38	33	1	-
year	Average Cover (%)																
1997	0.3	-	0.2	-	0.0	-	0.3	0.0	0.0	-	-	-	0.0	1.3	0.3	0.0	0.0
2002	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.8	0.1	-	-
2007	0.1	0.0	0.1	-	-	-	0.8	-	-	-	0.0	0.0	-	0.4	0.0	0.0	0.0
2012	0.3	0.1	0.1	0.1	0.1	-	0.7	0.0	0.0	-	-	-	0.0	0.5	0.1	0.0	0.0
2017	1.1	0.3	2.6	0.0	0.0	0.0	1.1	-	0.0	0.1	-	-	0.0	1.1	0.4	0.0	-

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

**Table 19B-06.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)					
	year	1997	2002	2007	2012	2017
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <sup>p</sup> (mountain big sagebrush)	-	-	-	-	-	-
<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>speciosa</i> <sup>p</sup> (rubber rabbitbrush)	7	0.1	0.5	14.4	-	-
<i>Gutierrezia sarothrae</i> (broom snakeweed)	10.6	-	0.1	16.8	-	-
<i>Juniperus osteosperma</i> <sup>t</sup> (Utah juniper)	8.7	-	-	18.5	-	-
<i>Purshia tridentata</i> <sup>p</sup> (antelope bitterbrush)	9.4	-	-	19.8	-	-
SHRUB SPECIES	Quadrat Cover (%)					
	year	1997	2002	2007	2012	2017
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <sup>p</sup> (mountain big sagebrush)	4.6	0.0	0.3	9.6	-	-
<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>speciosa</i> <sup>p</sup> (rubber rabbitbrush)	5.1	0.0	1.2	9.3	-	-
<i>Gutierrezia sarothrae</i> (broom snakeweed)	4.6	-	0.0	12.6	-	-
<i>Juniperus osteosperma</i> <sup>t</sup> (Utah juniper)	8.8	-	-	12.9	-	-
<i>Purshia tridentata</i> <sup>p</sup> (antelope bitterbrush)	6.4	-	0.0	9.1	0.1	-

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

**Table 19B-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 (%)				
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <sup>p</sup> -- (mountain big sagebrush)									
1997	2260	1760	72	28	0	6	1	5	58/88
2002	3260	20	23	69	7	7	0	7	53/77
2007	2200	20	19	62	19	46	6	56	61/81
2012	1660	100	5	88	7	31	0	22	62/91
2017	1660	-	10	78	12	7	0	6	64/101
<i>Atriplex canescens</i> <sup>p</sup> -- (fourwing saltbush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	40	-	0	100	0	0	0	0	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>speciosa</i> <sup>p</sup> -- (rubber rabbitbrush)									
1997	140	60	100	0	0	14	29	14	-/-
2002	20	-	0	0	100	0	100	0	28/42
2007	-	-	-	-	-	-	-	-	24/36
2012	-	-	-	-	-	-	-	-	29/60
2017	-	-	-	-	-	-	-	-	31/35
<i>Gutierrezia sarothrae</i> -- (broom snakeweed)									
1997	240	-	17	83	0	0	0	0	19/26
2002	480	-	4	58	38	0	0	13	19/28
2007	140	-	0	43	57	0	0	29	19/21
2012	-	-	-	-	-	-	-	-	-/-
2017	40	-	0	100	0	0	0	0	19/35
<i>Juniperus osteosperma</i> <sup>t</sup> -- (Utah juniper)									
1997	120	-	0	100	0	0	0	0	-/-
2002	160	-	0	100	0	0	0	0	-/-
2007	180	-	0	100	0	0	0	0	-/-
2012	140	20	0	100	0	0	0	14	-/-
2017	200	-	10	90	0	0	0	0	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Opuntia -- (pricklypear)</b>									
1997	-	-	-	-	-	-	-	-	15/54
2002	-	-	-	-	-	-	-	-	12/45
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	18/36
2017	-	-	-	-	-	-	-	-	-/-
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1997	20	-	100	0	0	0	100	0	22/61
2002	40	-	100	0	0	0	0	0	30/131
2007	20	-	100	0	0	100	0	0	42/127
2012	20	20	0	100	0	100	0	0	49/111
2017	60	-	0	100	0	0	67	0	58/123

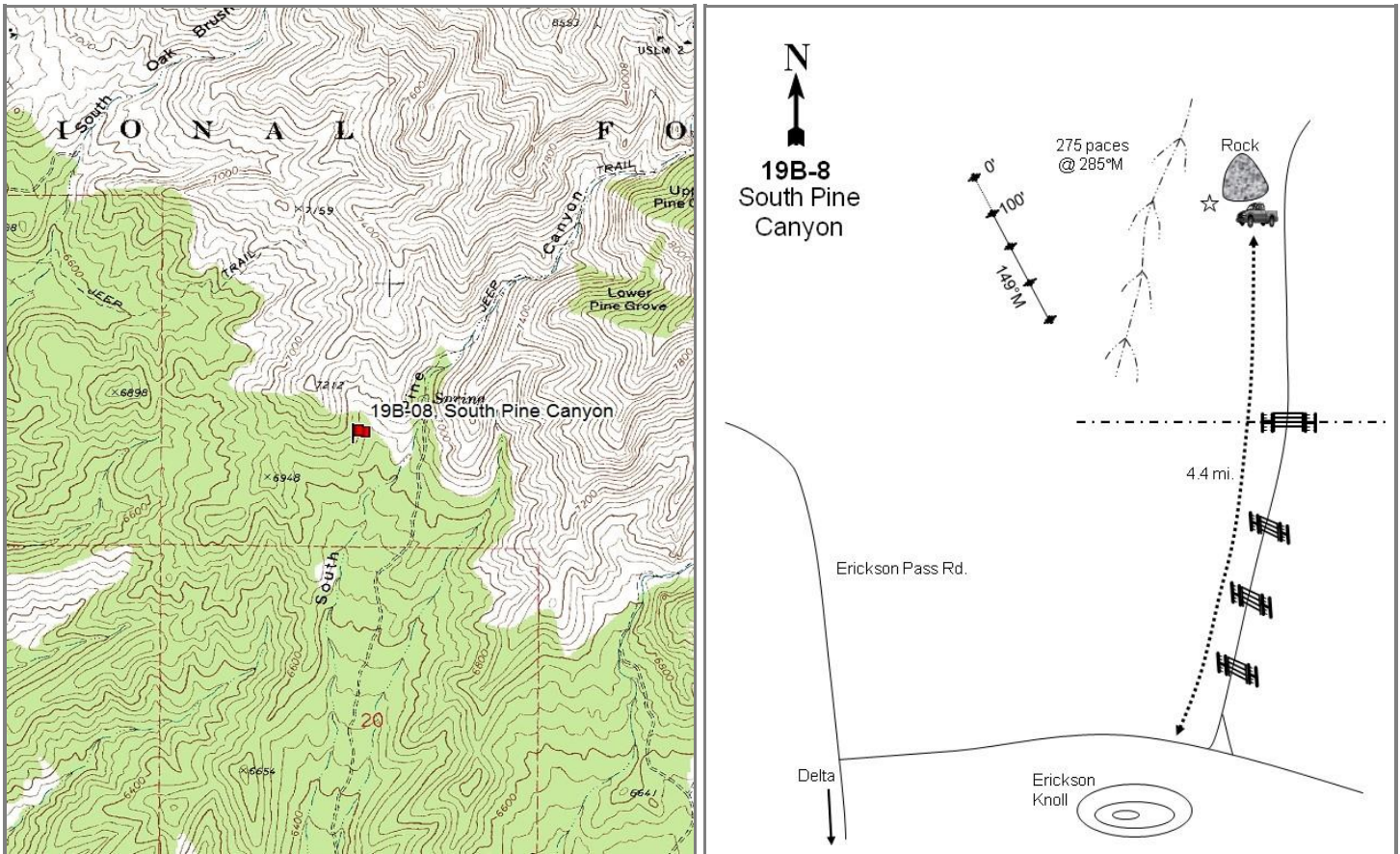
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 19B-06.14 - 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' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2002	97	-	-	-	-	-	12.8
2007	91	-	-	42	53	5	20.1
2012	81	-	11	32	42	16	26.5
2017	69	-	-	24	71	6	27.9



## SOUTH PINE CANYON - STUDY NO. 19B-8

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Erickson Knoll NE; Township 10S, Range 6W, Section 51  
NAD 83 UTM ZONE 12, 368086 East 4423524 North

**Transect Information**

Browse Tag # (0' Stake)	3976
Transect Bearing	149° 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**

Starting on the road north of Erickson Knoll (road 564), take South Pine Canyon Road north for 4.4 miles. Pass through a series of four gates and the National USFS boundary line. Stop next to a huge rock on the west side of the road. From the west side of the road, the 0-foot baseline stake is 250 paces away at 285 degrees magnetic (across South Pine wash). The 0-foot baseline stake is marked by browse tag #3976.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	WEST COTTONWOOD
Elevation	6,930ft (2,112m)
Aspect	South
Slope	20-22%
Sample Dates	08/06/2002, 08/02/2007, 06/20/2012, 06/07/2017

**Table 19B-08.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	1990	5338

**Wildlife Habitat and Vegetation History****Table 19B-08.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter/spring
Greater Sage Grouse	occupied	year-long

**Table 19B-08.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Mixed Mountain Brush	Phase I
1989	Mixed Mountain Brush	Phase I
2002	Annual Grass/Utah Serviceberry/Mountain Big Sagebrush	No Encroachment
2007	Mountain Big Sagebrush	No Encroachment
2012	Mountain Big Sagebrush	No Encroachment
2017	Mountain Big Sagebrush	No Encroachment

**Site Notes**

This study is located on a small ridgeline that samples important winter range for mule deer; an ephemeral stream is located 750 feet to the east.

**Soils****Table 19B-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 Loam	7.1	69.3	16.7	14.0	2.5	13.8	227.2	0.6	08/06/2002

**Site Potential**

1981 - 2010 Average Annual Precipitation	23 inches
NRCS Ecological Site	Mountain Shallow Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA446UT
States and Transitions	No state and transition model is available for this ecological site.

This study site was in a stable state as a mixed mountain brush plant community when established in 1983. A fire sometime between 1989 and 1997 removed a majority of the browse component, and when the site was sampled in 2002 it had transitioned into a community dominated by the introduced annual grass cheatgrass (*Bromus tectorum*) with a small component of Utah serviceberry (*Amelanchier utahensis*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) in the overstory. Mountain big sagebrush has continued to recover and has been the dominant vegetation component since the 2007 sample year (photos, Table 19B-08.12, Table 19B-08.13). The herbaceous understory was dominated by the perennial grass species bluebunch wheatgrass (*Pseudoroegneria spicata*) prior to the wildfire, but has been mainly comprised of cheatgrass in subsequent sample years (Table 19B-08.10). Annual forbs such as desert madwort (*Alyssum desertorum*) and redstem stork's bill (*Erodium cicutarium*) have been more abundant than perennial forbs following the fire (Table 19B-08.11). Finally, Utah juniper (*Juniperus osteosperma*) trees were present during the 1987 and 1989 samplings (Photos), but burned in the wildfire; infilling has not occurred as of the 2017 sample year (Table 19B-08.12, Table 19B-08.13).

## Trend Summary Tables

**Table 19B-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
2002	2.1	0.6	-	4.2	0.9	-
2007	16.8	4.5	-	20.2	5.3	-
2012	31.5	6.6	-	33.8	8.4	-
2017	36.2	3.3	-	39.4	3.4	-

**Table 19B-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
2002	340	42	34	13	9.8	1.8	0.8	0.3
2007	374	16	288	113	10.1	0.9	3.4	1.4
2012	372	34	269	67	11.2	0.8	3.1	1.3
2017	293	60	324	92	6.0	2.0	6.0	1.6

**Table 19B-08.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2002	26.7	-	27.0	24.7	13.5	15.0
2007	21.9	0.0	15.9	21.0	13.4	34.9
2012	16.7	0.1	44.9	8.5	12.8	51.4
2017	27.4	0.2	39.9	16.0	12.0	47.8

**Table 19B-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	Coyote	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency					
2002	5	-	20	-	-	1
2007	1	-	17	5	-	6
2012	-	-	6	-	-	1
2017	-	-	11	-	-	-
Year	Days Use Per Acre (ha)					
2002	7.2 (17.9)	-	54.9 (135.7)	-	-	-
2007	-	-	27.5 (67.9)	2.7 (6.6)	-	-
2012	0.7 (1.8)	-	10.0 (24.8)	-	-	-
2017	-	8.7 (21.5)*	20.1 (49.7)	0.7 (1.7)	0.6 (1.4)	-

\*Pellets per acre (ha)

**Table 19B-08.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency					
Bromus tectorum <sup>ai</sup> (cheatgrass)						
Elymus elymoides (squirreltail)						
Poa fendleriana (muttongrass)						
Poa secunda (Sandberg bluegrass)						
Pseudoroegneria spicata (bluebunch wheatgrass)						
Sporobolus cryptandrus (sand dropseed)						
year	Average Cover (%)					
2002	9.8	-	0.0	0.0	1.7	0.0
2007	10.1	-	-	0.0	0.8	0.1
2012	11.2	-	-	0.2	0.6	-
2017	6.0	0.0	0.1	0.7	1.3	0.0

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

**Table 19B-08.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Allium (onion)																	
Alyssum desertorum <sup>ai</sup> (desert madwort)																	
Artemisia ludoviciana (white sagebrush)																	
Astragalus cibarius (browse milkvetch)																	
Balsamorhiza sagittata (arrow/leaf balsamroot)																	
Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)																	
Chaenactis douglasii (Douglas' dustymaiden)																	
Cirsium neomexicanum <sup>a</sup> (New Mexico thistle)																	
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																	
Collomia linearis <sup>a</sup> (tiny trumpet)																	
Comandra umbellata (bastard toadflax)																	
Crepis acuminata (tapertip hawkbeard)																	
Cryptantha (cryptantha)																	
Cymopterus longipes (longstalk springparsley)																	
Descurainia pinnata <sup>a</sup> (western tansymustard)																	
Epilobium brachycapum <sup>a</sup> (tall annual willowherb)																	
Eriogonum racemosum (redroot buckwheat)																	
year	Average Cover (%)																
2002	-	-	-	-	-	-	0.0	0.5	-	-	-	-	0.0	-	-	-	-
2007	-	0.9	0.0	-	-	0.0	0.2	0.3	0.3	0.0	-	-	0.0	0.0	0.7	0.0	0.2
2012	-	2.7	-	0.0	-	-	0.4	0.1	0.1	-	-	-	-	0.1	0.0	-	0.2
2017	0.0	4.9	0.0	0.2	0.0	-	0.1	0.3	0.0	0.0	0.0	0.0	0.2	-	0.0	0.0	0.2

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

FORB SPECIES											
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)											
Hackelia patens (spotted stickseed)											
Lactuca serriola <sup>ai</sup> (prickly lettuce)											
Lappula occidentalis <sup>a</sup> (flatspine stickseed)											
Lithospermum ruderale (western stoneseed)											
Lomatium grayi (Gray's biscuitroot)											
Machaeranthera canescens (hoary tansyaster)											
Microsteris gracilis <sup>a</sup> (slender phlox)											
Phlox longifolia (longleaf phlox)											
Sanguisorba minor <sup>i</sup> (small burnet)											
Vicia americana (American vetch)											
year	Nested Frequency										
2002	14	-	11	-	5	-	-	-	3	2	-
2007	77	3	2	55	9	7	8	4	47	-	2
2012	35	-	4	-	4	2	2	-	10	-	8
2017	75	-	4	-	9	-	-	1	31	-	11
year	Average Cover (%)										
2002	0.2	-	0.1	-	0.2	-	-	-	0.0	0.0	-
2007	0.8	0.0	0.0	0.3	0.5	0.0	0.1	0.0	0.3	-	0.0
2012	0.2	-	0.0	-	0.5	0.0	0.0	-	0.0	-	0.1
2017	0.7	-	0.0	-	0.4	-	-	0.0	0.1	-	0.2

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

**Table 19B-08.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES							
Amelanchier utahensis <sup>p</sup> (Utah serviceberry)							
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)							
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)							
Ericameria nauseosa (rubber rabbitbrush)							
Gutierrezia sarothrae (broom snakeweed)							
Mahonia repens (creeping barberry)							
Purshia tridentata <sup>p</sup> (antelope bitterbrush)							
year	Line Intercept Cover (%)						
2002	2.7	1.1	0.9	-	-	-	0.4
2007	5.1	12.9	4	1	-	0.3	2.2
2012	6.4	24.7	7	1.3	-	0.1	2.7
2017	6.8	30.2	2.7	0.6	-	0.1	2.4
year	Quadrat Cover (%)						
2002	1.4	0.3	0.6	-	-	0.1	0.4
2007	3.5	11.9	3.4	0.8	-	0.3	1.3
2012	4.1	25.3	4.9	1.4	-	0.3	2.1
2017	6.0	28.0	2.3	0.7	0.1	0.2	2.2

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

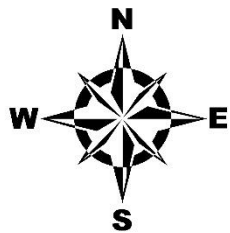
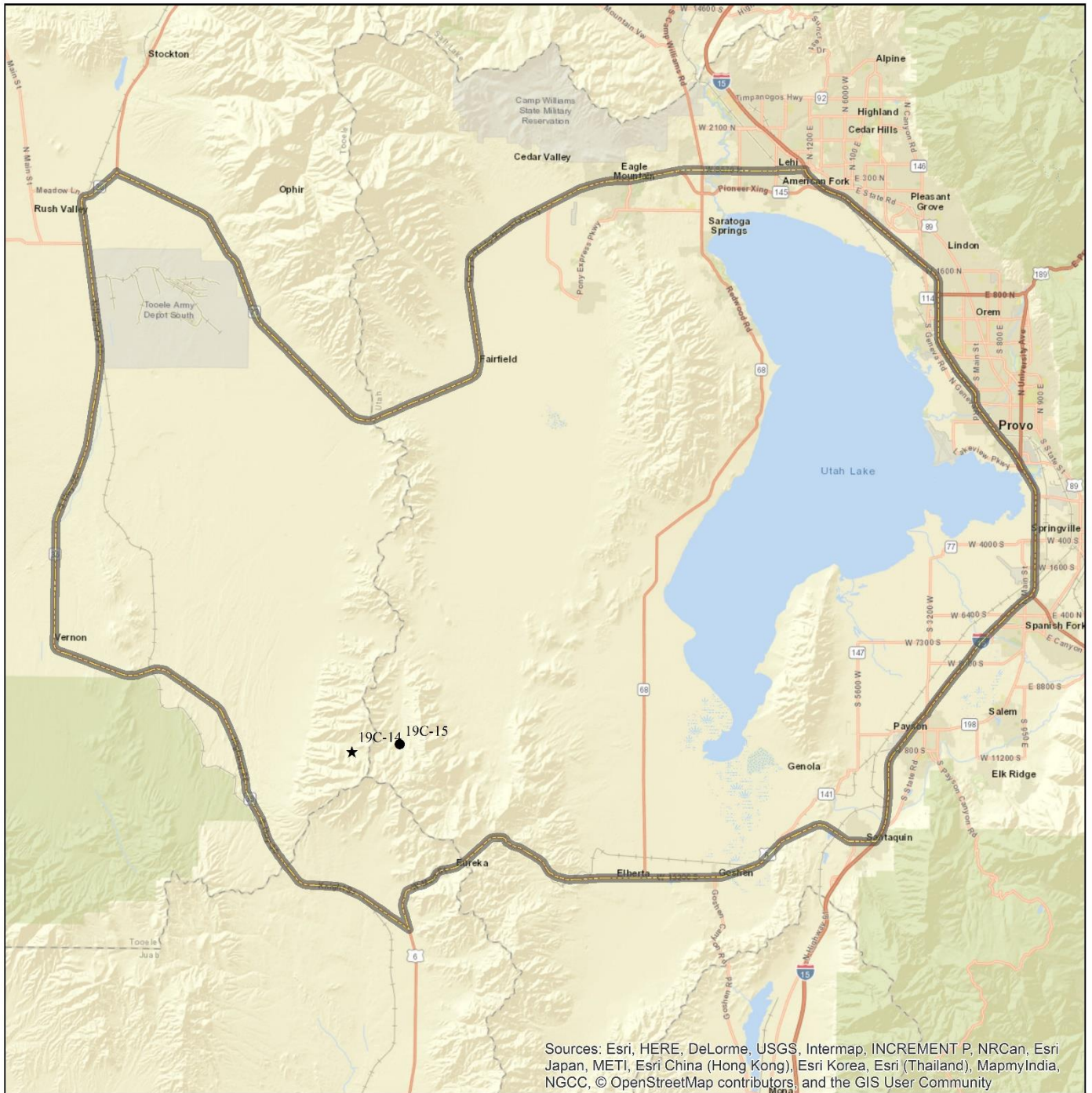
**Table 19B-08.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
2002	320	-	0	69	31	0	63	38	50/107
2007	200	-	0	100	0	70	10	10	79/144
2012	280	-	0	100	0	14	0	0	87/144
2017	320	300	0	81	19	19	6	0	88/144
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
2002	100	-	40	60	0	40	0	0	50/85
2007	10620	4060	56	44	0	9	2	1	39/64
2012	10480	20	3	86	12	13	2	25	26/57
2017	9720	20	9	76	15	29	20	7	35/66
<b>Atriplex canescens<sup>P</sup> -- (fourwing saltbush)</b>									
2002	-	-	-	-	-	-	-	-	26/56
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
2002	220	-	0	100	0	9	0	0	38/79
2007	4980	240	29	64	7	16	0	11	33/69
2012	4800	-	4	95	1	0	0	1	25/48
2017	4860	240	15	79	6	0	0	2	22/39
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
2002	-	-	-	-	-	-	-	-	-/-
2007	540	-	7	93	0	26	4	4	40/51
2012	680	-	0	88	12	3	0	6	57/62
2017	380	-	0	53	47	0	5	58	59/64
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	60	-	0	100	0	0	0	0	-/-
<b>Juniperus osteosperma<sup>I</sup> -- (Utah juniper)</b>									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Mahonia repens -- (creeping barberry)</b>									
2002	200	-	10	90	0	0	0	80	6/14
2007	960	-	0	77	23	0	0	88	13/19
2012	520	-	0	100	0	0	0	0	8/13
2017	1340	-	0	100	0	0	0	0	7/8
<b>Opuntia -- (pricklypear)</b>									
2002	20	-	0	100	0	0	0	0	16/50
2007	60	-	0	100	0	0	0	33	14/69
2012	40	-	0	100	0	0	0	0	10/32
2017	20	-	0	100	0	0	0	0	13/29
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
2002	60	-	0	100	0	0	100	0	23/65
2007	60	-	0	67	33	0	100	0	38/159
2012	60	-	0	100	0	67	33	0	55/178
2017	100	20	0	100	0	20	60	0	55/158
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	54/103
2012	-	-	-	-	-	-	-	-	34/96
2017	-	-	-	-	-	-	-	-	-/-
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
2002	20	-	100	0	0	100	0	0	-/-
2007	-	-	-	-	-	-	-	-	43/175

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

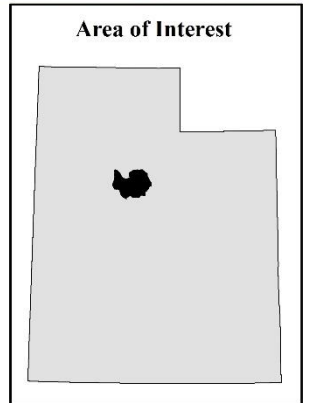


# WILDLIFE MANAGEMENT UNIT 19C - NORTH TINTIC WEST DESERT



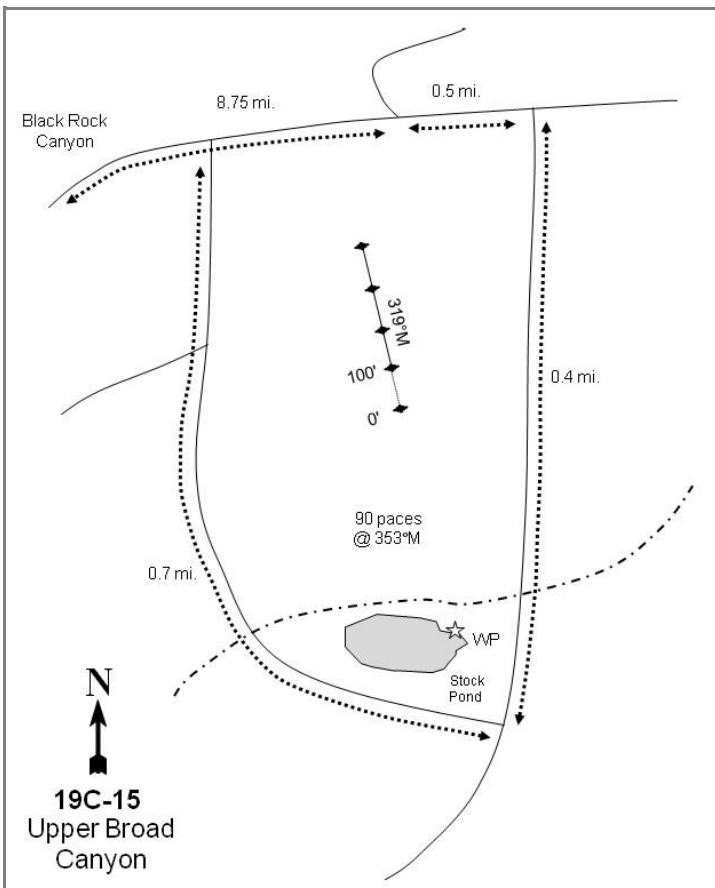
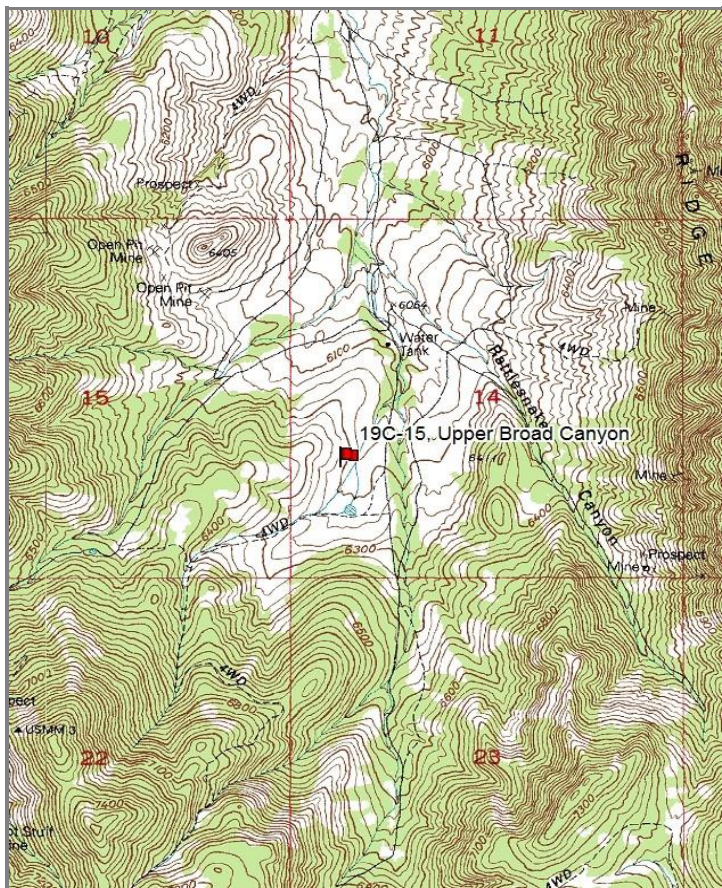
**Study Location  
Project, Status**

- RT, Active
- ★ RT, Suspended
- Unit -19C





## UPPER BROAD CANYON - STUDY NO. 19C-15



### Location Information

USGS 7.5 min Map Info	Boulder Peak SE; Township 9S, Range 3W, Section 14
GPS (0' Stake)	NAD 83 UTM ZONE 12, 401601 East 4431968 North

### Transect Information

Browse Tag # (0' Stake)	3935
Transect Bearing	319° magnetic
Length	500ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belts 1, 2: 1ft, Belt 3: 2ft, Belt 5: 5ft

### Directions to Site

From Highway U-36 between Vernon and Tintic Junction, proceed east on the Black Rock Canyon Road for 9.2 miles to the road junction in Broad Canyon within Utah County. At this point, take the right fork (east) and travel an additional 0.5 miles to another fork. Turn right and travel 0.4 miles to another fork. Turn left and travel approximately 0.1 miles to where there is a stock pond surrounded by a fence on the west side of the road. From the northwest corner of the stock pond, walk 90 paces at 353 degrees magnetic toward a large juniper at the base of the hill. At that point, there will be a green steel fencepost, 15 inches high with a red browse tag #3935 attached, which marks the 0-foot end of the frequency baseline.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	BROAD CANYON
Elevation	6,220ft (1,896m)
Aspect	Southeast
Slope	15-20%
Sample Dates	07/07/1997, 08/02/2002, 08/02/2007, 06/07/2012, 06/07/2017

**Wildlife Habitat and Vegetation History****Table 19C-15.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	spring/fall

**Table 19C-15.4 - 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
2017	Mountain Big Sagebrush/Perennial Grass	Phase I

**Site Notes**

There are obvious signs of sheep trailing to a stock pond located 600 feet to the south. Two antler sheds were found within the transect in 1983, and in 2002 four bucks and a few does were seen just north of the study. A very large band of sheep came through the site in 2017.

**Soils****Table 19C-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	7.1	42.4	29.1	28.6	3.0	7.1	166.4	0.6	07/07/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Shallow Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA446UT
States and Transitions	No state and transition model is available for this ecological site.

From study establishment in 1983, this site has been a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and perennial grass ecological site. Sagebrush cover has remained stable, although there were some areas near the study that burned in 2001. Perennial grass has not fluctuated during any of the study years, with the dominant species being bluebunch wheatgrass (*Pseudoroegneria spicata*) (Table 19C-15.10). The introduced species bulbous bluegrass (*Poa bulbosa*) was sampled for the first time in 2012 and annual grass cover increased significantly in 2017. Perennial forb species are sparse and rather non-diverse. However, annual forbs do contribute significant cover, mostly provided by the introduced species desert madwort (*Alyssum desertorum*) (Table 19C-15.11). There is some singleleaf pinyon (*Pinus monophylla*) and Utah juniper (*Juniperus utahensis*) encroachment occurring on the site, and it is likely that this will continue to occur without a tree-removing disturbance (Table 19C-15.14). Overall, this site has not changed greatly during the study period, although increased annual grass cover and the introduction of bulbous bluegrass may pose a threat to the future ecological stability of the site.

## Trend Summary Tables

**Table 19C-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
1997	10.5	1.2	0.9	-	-	-
2002	9.1	0.7	0.0	8.8	0.8	0.8
2007	7.5	0.8	0.0	10.5	0.9	0.9
2012	9.0	1.3	0.8	11.5	1.0	1.3
2017	7.9	4.1	1.9	8.7	5.3	1.9

**Table 19C-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
1997	237	358	409	40	1.2	19.9	2.2	0.2
2002	17	381	21	33	0.1	18.1	0.1	0.4
2007	103	376	298	57	0.5	26.7	1.3	0.4
2012	179	376	366	58	0.8	18.2	2.2	0.7
2017	264	326	433	44	5.6	17.0	5.5	0.6

**Table 19C-15.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	14.5	3.0	28.3	12.0	19.2	34.1
2002	16.7	4.1	27.9	13.5	19.5	27.5
2007	16.4	4.9	20.9	13.7	17.3	35.1
2012	12.1	1.5	26.1	9.8	23.9	34.2
2017	21.2	2.1	33.7	9.9	24.7	35.9

**Table 19C-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	Rabbit	Domestic Sheep
	Quadrat Frequency				
1997	-	-	17	7	12
2002	3	-	15	3	6
2007	-	-	7	9	-
2012	-	-	2	1	8
2017	-	-	6	1	31
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	-	-	22.1 (54.6)	-	19.4 (48.0)
2007	-	-	30.2 (74.5)	-	4.0 (9.9)
2012	-	8.7 (21.5)*	3.4 (8.3)	-	12.1 (29.8)
2017	-	-	1.3 (3.3)	-	62.3 (153.9)

\*Pellets per acre (ha)

**Table 19C-15.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency								
1997	1	44	237	3	-	-	4	298	224
2002	-	16	17	3	-	-	-	327	226
2007	2	14	103	3	-	-	-	330	218
2012	3	10	179	-	-	44	-	313	218
2017	3	3	264	-	3	85	2	146	222
year	Average Cover (%)								
1997	0.0	0.8	1.2	0.0	-	-	0.0	5.1	13.9
2002	-	1.1	0.1	0.0	-	-	-	4.1	12.9
2007	0.3	0.7	0.5	0.0	-	-	-	10.0	15.6
2012	0.1	0.3	0.8	-	-	1.1	-	6.5	10.3
2017	0.1	0.1	5.6	-	0.0	3.1	0.0	2.7	11.0

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

**Table 19C-15.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria dimorpha (low pussytoes)	Arabis (rockcross)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Chaenactis douglasii (Douglas' dusty maiden)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Helianthus annuus <sup>a</sup> (common sunflower)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lomatium (desertparsley)	
year	Nested Frequency																	
1997	2	401	19	5	-	154	-	1	17	-	-	-	15	-	-	-	-	12
2002	1	11	30	-	-	13	-	-	-	-	-	-	-	-	-	-	-	-
2007	3	263	18	-	12	126	-	-	27	-	10	11	-	-	-	-	-	30
2012	2	362	32	-	-	67	4	4	9	3	-	20	3	-	-	-	-	9
2017	-	430	34	-	2	115	-	4	8	-	1	34	-	10	4	3	-	-
year	Average Cover (%)																	
1997	0.0	1.3	0.1	0.0	-	0.7	-	0.0	0.0	-	-	-	0.0	-	-	-	-	0.0
2002	0.0	0.0	0.3	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-
2007	0.0	0.8	0.1	-	0.0	0.3	-	-	0.1	-	0.1	0.1	-	-	-	-	-	0.2
2012	0.0	1.8	0.6	-	-	0.1	0.0	0.0	0.0	0.0	-	0.0	0.0	-	-	-	-	0.0
2017	-	4.1	0.5	-	0.0	0.9	-	0.0	0.0	-	0.0	0.1	-	0.3	0.0	0.0	-	-

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

FORB SPECIES	Microsteris gracilis <sup>a</sup> (slender phlox)	Phlox longifolia (longleaf phlox)	Silene antirrhina <sup>a</sup> (sleepy silene)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency			
1997	61	-	-	6
2002	-	1	1	1
2007	9	-	5	2
2012	6	1	27	3
2017	-	-	33	4
year	Average Cover (%)			
1997	0.1	-	-	0.0
2002	-	0.0	0.0	0.0
2007	0.0	-	0.0	0.0
2012	0.0	0.0	0.1	0.0
2017	-	-	0.1	0.1

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

**Table 19C-15.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Eriogonum microthecum <sup>p</sup> (slender buckwheat)	Grayia spinosa (spiny hopsage)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Pinus monophylla <sup>t</sup> (singleleaf pinyon)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)
year	Line Intercept Cover (%)						
1997	-	-	-	-	-	-	-
2002	6.2	-	-	0.8	-	0.8	2.6
2007	7.9	0.1	-	0.9	-	0.9	2.5
2012	8.7	-	-	1	-	1.3	2.8
2017	6.9	-	-	5.3	-	1.9	1.8
year	Quadrat Cover (%)						
1997	8.6	-	-	1.2	0.0	0.8	1.9
2002	7.2	-	-	0.7	-	0.0	1.9
2007	5.5	0.0	-	0.8	-	0.0	2.0
2012	6.2	-	0.0	1.3	-	0.8	2.7
2017	5.5	-	-	4.1	0.0	1.9	2.4

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

**Table 19C-15.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1997	40	-	0	100	0	50	0	0	31/32
2002	40	-	0	100	0	100	0	0	29/40
2007	40	-	0	100	0	50	0	0	52/58
2012	40	-	0	100	0	0	50	0	65/68
2017	20	-	0	0	100	100	0	100	10/20
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1997	2060	20	8	63	29	42	9	37	56/89
2002	2100	-	3	51	47	17	0	18	54/87
2007	1560	-	3	50	47	35	24	45	56/99
2012	1540	400	8	65	27	42	8	35	48/89
2017	1680	40	11	52	37	32	24	36	46/85
<b>Cercocarpus ledifolius<sup>P</sup> -- (curl-leaf mountain mahogany)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	19/20
2017	-	-	-	-	-	-	-	-	-/-
<b>Eriogonum microthecum<sup>P</sup> -- (slender buckwheat)</b>									
1997	20	-	0	100	0	0	0	0	12/20
2002	20	-	0	100	0	0	0	0	9/13
2007	20	-	0	0	100	0	0	100	18/23
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Grayia spinosa -- (spiny hopsage)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	40	-	0	0	100	0	0	100	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	6760	20	20	80	1	0	0	0	19/17
2002	2500	-	2	74	24	1	0	13	14/20
2007	1360	40	4	96	0	0	0	0	19/25
2012	3420	3980	46	54	1	0	0	1	16/21
2017	7460	960	6	93	1	0	0	1	18/25
<b>Juniperus osteosperma<sup>T</sup> -- (Utah juniper)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	0	100	0	0	0	0	-/-
2007	20	-	100	0	0	0	0	0	-/-
2012	20	-	100	0	0	0	0	0	-/-
2017	20	-	0	100	0	0	0	0	-/-
<b>Pinus monophylla<sup>T</sup> -- (singleleaf pinyon)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	80	0	0	0	0	0	0	-/-
2007	-	40	0	0	0	0	0	0	-/-
2012	40	20	100	0	0	0	0	0	-/-
2017	60	20	100	0	0	0	0	0	-/-
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1997	380	-	5	84	11	16	63	0	57/93
2002	360	-	0	78	22	28	39	11	50/117
2007	220	-	0	100	0	36	46	0	61/135
2012	240	-	0	83	17	42	25	25	70/129
2017	240	-	0	42	58	58	25	58	55/124
<b>Ribes<sup>P</sup> -- (currant)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	36/83
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-

Year	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)									
1997	-	-	-	-	-	-	-	-	36/165

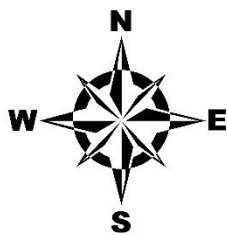
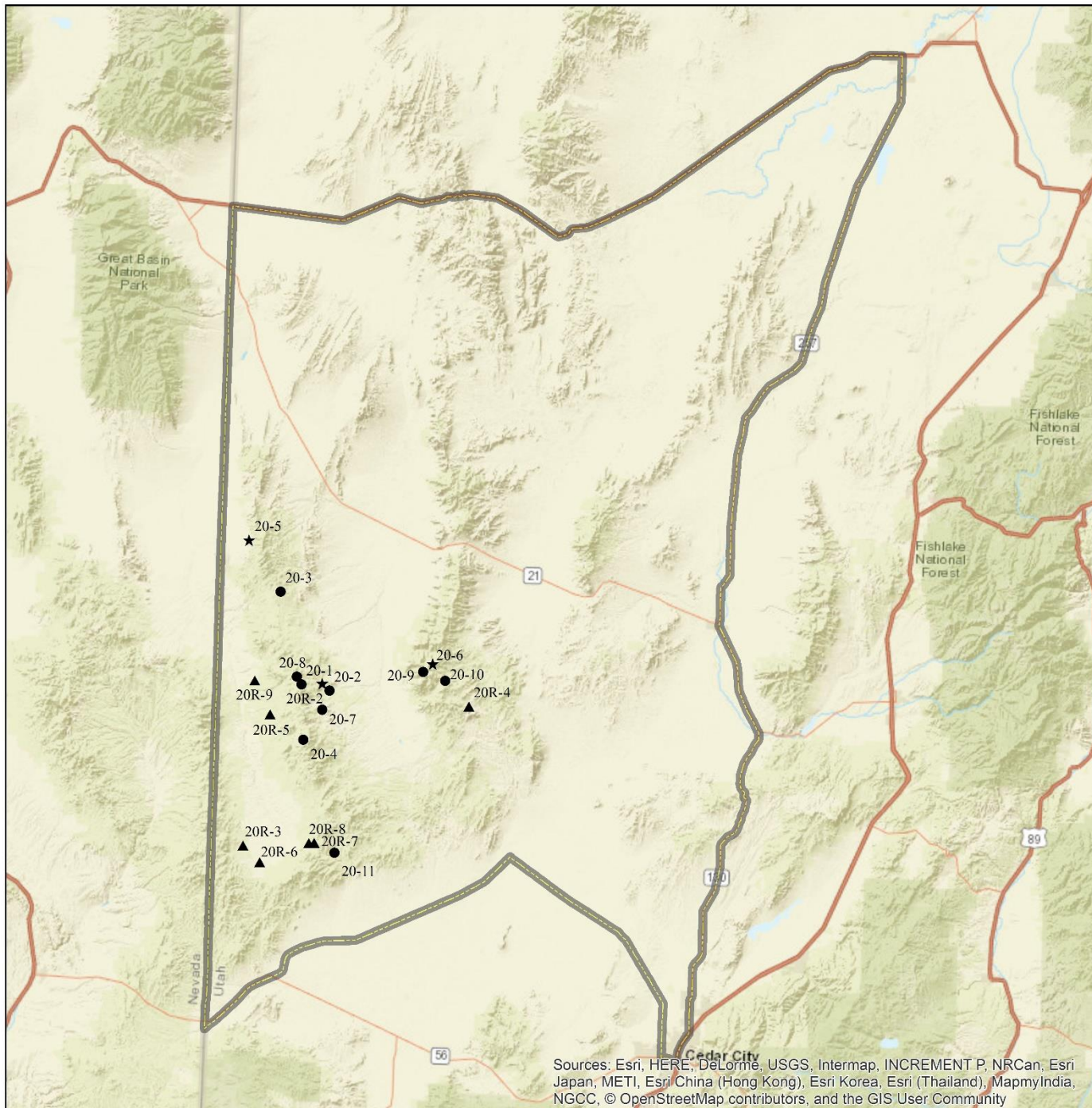
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 19C-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)							
2002	18	-	-	-	-	-	4.5
2007	18	-	30	60	10	-	8.2
2012	17	-	27	36	27	9	8.4
2017	20	-	9	82	9	-	10.8
Pinus monophylla (singleleaf pinyon)							
2002	70	-	-	-	-	-	4.5
2007	50	13	56	25	-	6	7.1
2012	46	-	14	50	21	14	9.2
2017	76	-	42	32	16	11	9.3

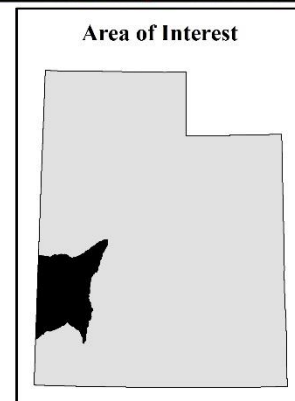
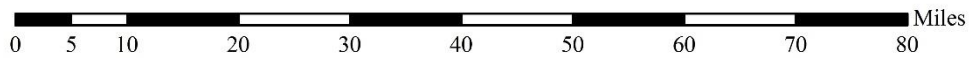


# WILDLIFE MANAGEMENT UNIT 20 - SOUTHWEST DESERT

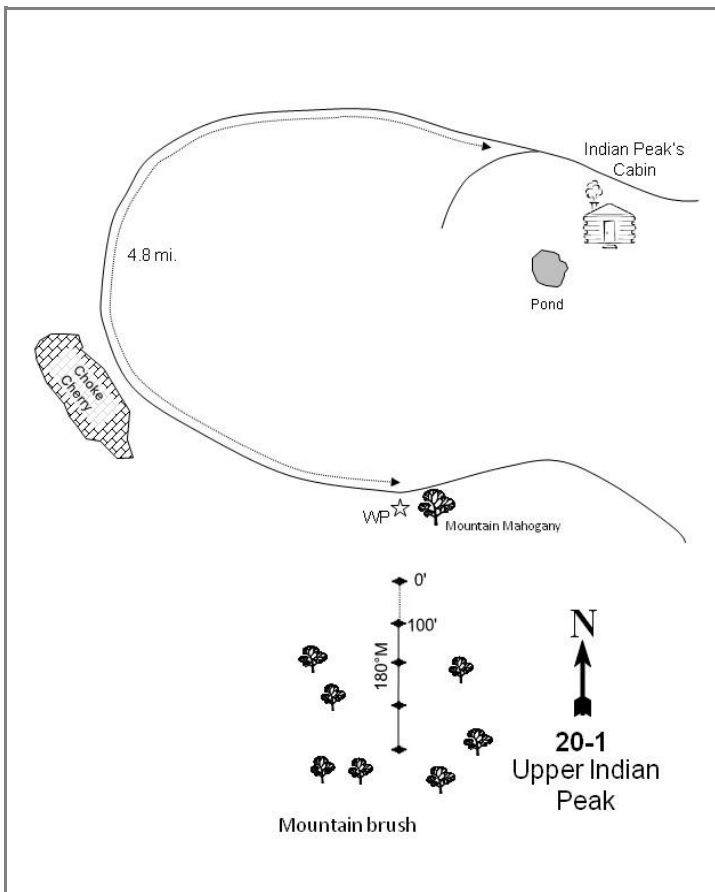
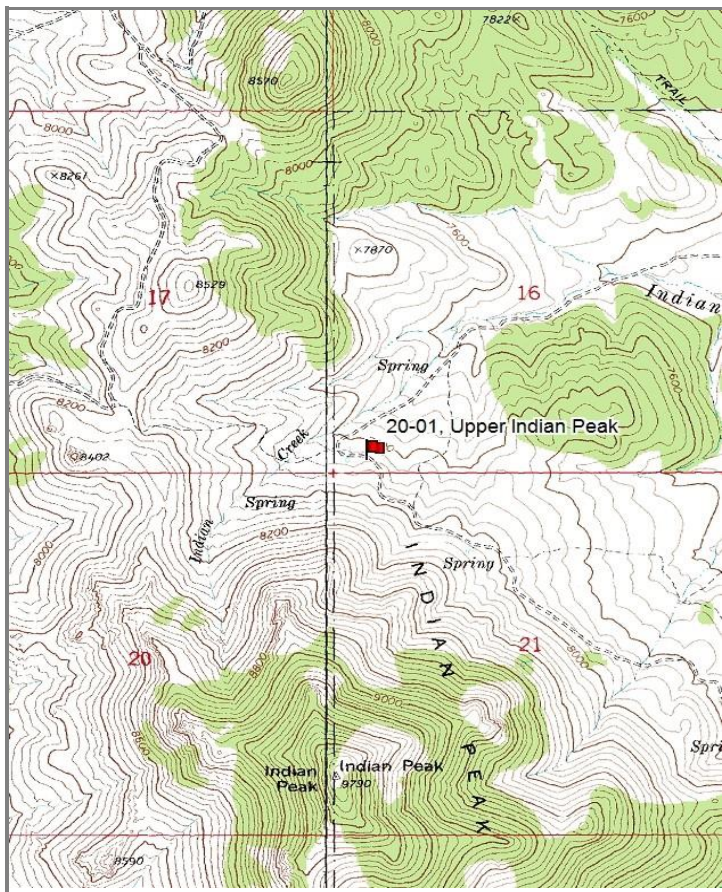


**Study Location**  
Project, Status

- RT, Active
- ★ RT, Suspended
- ▲ WRI, Active
- ▭ Unit - 20



## UPPER INDIAN PEAK - STUDY NO. 20-1



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Buckhorn Spring SW; Township 29S, Range 18W, Section 16  
NAD 83 UTM ZONE 12, 248615 East 4240757 North

### Transect Information

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

Not Available  
180° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Belt 1: No Rebar

### Directions to Site

From the Indian Peaks state cabin, travel west for 0.4 miles to a fork, then turn left and cross the stream. Turn right at the fork on the other side of the stream at 0.1 miles. Stay right at all other forks and drive 4.8 miles to a curl-leaf mountain mahogany on the west side of the road and the witness post; it is 2.4 miles from the last fork to the witness post. The 0-foot baseline stake is 15 feet south of the mahogany, and the study is marked by 2-to-3-foot-tall steel rebar.



**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	7,875ft (2,400m)
Aspect	North
Slope	20-30%
Sample Dates	06/18/1998, 07/01/2003, 06/18/2008, 06/25/2012, 06/13/2017

**Wildlife Habitat and Vegetation History****Table 20-01.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

**Table 20-01.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mixed Mountain Brush	Phase I
1991	Mixed Mountain Brush	Phase I
1998	Mixed Mountain Brush	Phase I
2003	Mixed Mountain Brush	Phase I
2008	Mixed Mountain Brush	Phase I
2012	Mixed Mountain Brush	Phase I
2017	Mixed Mountain Brush	Phase I

**Site Notes**

There are several springs and a small perennial stream within 0.25 miles of this study.

**Soils****Table 20-01.5 - 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	6.0	62.0	21.1	16.9	2.2	9.3	112.0	0.4	06/18/1998

**Site Potential**

1981 - 2010 Average Annual Precipitation	22 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.

From study establishment in 1985 through the 2017 sample year, the site has existed as a mixed mountain brush plant community. The dominant browse species are mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), Utah serviceberry (*Amelanchier utahensis*), and alderleaf mountain mahogany (*Cercocarpus montanus*), and lesser species include antelope bitterbrush (*Purshia tridentata*), curl-leaf mountain mahogany (*C. ledifolius*) and mountain snowberry (*Symphoricarpos oreophilus*) (Table 20-01.12). The grass component of the understory is dominated by the perennial species muttongrass (*Poa fendleriana*), but overall cover is relatively low (Table 20-01.7, Table 20-01.10). Forbs are diverse and relatively abundant with no introduced species sampled; mountain phlox (*Phlox austromontana*) is the most dominant forb on this site (Table 20-01.11). Tree cover on and around the site has increased since study establishment (Table 20-01.12), and in time tree cover may begin to affect understory and shrub production.

**Trend Summary Tables****Table 20-01.6 - 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
1998	31.2	3.2	-	-	-	-
2003	29.9	4.5	-	33.9	6.0	-
2008	30.9	7.5	-	37.5	8.8	-
2012	28.6	5.0	0.0	40.7	7.3	-
2017	35.7	6.7	0.5	41.4	7.4	0.8

**Table 20-01.7 - 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
1998	-	326	40	301	-	12.8	0.2	14.3
2003	-	265	14	246	-	4.7	0.1	6.4
2008	-	290	11	275	-	8.1	0.1	7.7
2012	-	266	39	204	-	6.6	0.3	7.7
2017	-	267	26	264	-	5.5	0.1	6.1

**Table 20-01.8 - 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
1998	8.1	0.1	33.9	33.4	4.5	49.4
2003	21.9	-	25.7	22.3	2.7	42.0
2008	13.3	0.0	24.4	26.9	3.4	45.7
2012	28.7	-	25.9	17.8	2.9	42.0
2017	25.1	0.0	33.5	21.3	3.1	48.4

**Table 20-01.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1998	3	14	19	-	19
2003	-	3	24	-	-
2008	-	6	27	-	25
2012	-	11	25	-	1
2017	-	8	21	6	8
Year	Days Use Per Acre (ha)				
1998	3.6 (9.0)	8.1 (19.9)	26.2 (64.6)	-	-
2003	-	2.0 (5.0)	60.3 (149.0)	-	-
2008	-	16.1 (39.7)	38.2 (94.4)	0.6 (1.4)	-
2012	-	16.1 (39.7)	49.6 (122.5)	-	-
2017	-	12.1 (29.8)	25.5 (62.9)	4.7 (11.5)	-

**Table 20-01.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Leucopoa kingii (spike fescue)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency											
1998	-	-	-	-	1	4	6	2	-	303	18	25
2003	-	-	-	6	-	-	-	-	-	152	69	55
2008	-	-	-	-	-	-	1	-	1	236	47	55
2012	1	-	-	0	-	-	1	-	-	163	27	109
2017	9	2	6	-	-	-	11	-	2	223	33	18
year	Average Cover (%)											
1998	-	-	-	-	0.1	0.1	0.1	0.0	-	11.7	0.6	0.3
2003	-	-	-	0.0	-	-	-	-	-	2.6	1.3	0.9
2008	-	-	-	-	-	-	0.0	-	0.0	6.3	0.8	1.1
2012	0.1	-	-	0.0	-	-	0.0	-	-	2.6	0.3	3.5
2017	0.1	0.0	0.0	-	-	-	0.1	-	0.0	4.2	0.7	0.4

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

**Table 20-01.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Androsace septentrionalis <sup>a</sup> (pygmyflower rockjasmine)	Antennaria (pussytoes)	Arabis drummondii (Drummond's rockcress)	Astragalus mollissimus (woolly locoweed)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza hookeri (Hooker's balsamroot)	Balsamorhiza sagittata (arrow/leaf balsamroot)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	
year	Nested Frequency																	
1998	3	14	20	5	-	2	21	7	37	1	5	70	14	-	39	-	28	
2003	-	6	3	-	1	2	-	-	-	4	1	28	-	-	17	-	12	
2008	-	13	3	-	16	-	-	15	2	-	-	9	-	-	66	6	27	
2012	8	6	3	-	8	4	-	6	-	2	-	-	1	-	17	-	2	
2017	-	5	3	-	1	15	-	3	-	-	-	7	4	4	66	25	1	
year	Average Cover (%)																	
1998	0.0	0.0	0.1	0.0	-	0.0	0.1	0.3	0.6	0.0	0.0	1.4	0.1	-	0.3	-	0.3	
2003	-	0.0	0.0	-	0.0	0.0	-	-	-	0.1	0.0	0.1	-	-	0.0	-	0.1	
2008	-	0.1	0.0	-	0.1	-	-	0.1	0.0	-	-	0.1	-	-	0.4	0.0	0.1	
2012	0.0	0.0	0.0	-	0.0	0.0	-	0.0	-	0.0	-	-	0.0	-	0.0	-	0.0	
2017	-	0.0	0.0	-	0.0	0.0	-	0.0	-	-	-	0.2	0.0	0.0	0.5	0.1	0.0	

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

FORB SPECIES	Delphinium nuttallianum (two-lobed larkspur)	Erigeron eatonii (Eaton's fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Fritillaria atropurpurea (spotted fritillary)	Galium multiflorum (shrubby bedstraw)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Linum lewisii (Lewis flax)	Lomatium (desertparsley)	Lupinus argenteus (silvery lupine)	Microsteris gracilis <sup>a</sup> (slender phlox)	Penstemon eatonii (firecracker penstemon)	Penstemon watsonii (Watson's penstemon)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)
year	Nested Frequency																
1998	2	121	3	25	48	14	6	3	-	41	21	3	4	20	104	34	17
2003	-	115	-	18	30	-	5	-	-	7	13	-	6	2	90	33	14
2008	-	116	2	25	43	-	5	-	-	-	16	-	6	16	96	63	11
2012	3	27	18	20	30	-	8	-	-	-	27	-	3	12	97	39	38
2017	-	17	1	20	30	-	9	-	10	17	22	5	-	27	92	79	17
year	Average Cover (%)																
1998	0.0	2.0	0.0	0.2	0.9	0.1	0.2	0.0	-	0.5	0.9	0.0	0.2	1.2	4.6	0.2	0.1
2003	-	0.9	-	0.2	0.2	-	0.0	-	-	0.0	0.7	-	0.0	0.4	3.4	0.1	0.1
2008	-	0.8	0.0	0.1	0.6	-	0.0	-	-	-	1.1	-	0.1	1.0	2.9	0.2	0.1
2012	0.0	0.2	0.1	0.4	0.3	-	0.1	-	-	-	0.5	-	0.0	1.5	4.1	0.2	0.3
2017	-	0.1	0.0	0.1	0.3	-	0.2	-	0.0	0.1	0.6	0.0	-	0.5	2.9	0.4	0.1

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

FORB SPECIES	Streptanthus cordatus (heartleaf twistflower)
year	Nested Frequency
1998	7
2003	7
2008	4
2012	1
2017	5
year	Average Cover (%)
1998	0.0
2003	0.1
2008	0.0
2012	0.0
2017	0.0

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

**Table 20-01.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Cercocarpus ledifolius <sup>p</sup> (curl-leaf mountain mahogany)	Cercocarpus montanus <sup>p</sup> (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria parryi var. parryi (Parry's rabbitbrush)	Eriogonum microthecum <sup>p</sup> (slender buckwheat)	Opuntia polyacantha var. erinacea (grizzlybear pricklypear)	Pinus monophylla <sup>t</sup> (singleleaf pinyon)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Symphoricarpos oreophilus (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)											
1998	-	-	-	-	-	-	-	-	-	-	-	-
2003	11.2	11.9	1.3	7.8	0.5	0.4	0.4	0	-	1.3	5	0.1
2008	12.5	12.4	2	7.6	1.1	0.2	1.5	0.1	-	1.5	7.3	0.1
2012	12.2	12.9	2.7	10	1.7	0.1	1.5	-	-	1.4	5.3	0.2
2017	15.4	13.4	3.4	6.5	1.2	-	1	0.1	0.8	1.7	5.9	0.2
year	Quadrat Cover (%)											
1998	8.3	15.8	0.4	5.2	0.9	-	0.8	0.2	-	0.7	1.9	0.2
2003	5.8	13.2	1.6	7.6	1.1	0.0	1.1	0.1	-	0.7	3.3	0.0
2008	9.6	11.4	1.9	5.7	1.5	0.0	1.2	0.2	-	1.1	5.8	0.0
2012	7.6	9.8	1.8	6.2	1.1	0.2	1.6	0.0	0.0	1.7	3.6	0.2
2017	11.3	12.6	0.9	7.7	1.5	0.0	1.4	0.0	0.5	1.8	4.9	0.2

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

**Table 20-01.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1998	900	60	36	62	2	27	9	0	109/122
2003	920	20	9	89	2	15	78	0	104/129
2008	960	100	17	71	13	33	17	0	105/126
2012	840	100	17	76	7	24	57	5	82/109
2017	940	20	15	85	0	4	72	0	110/135
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1998	6840	840	15	72	13	34	13	3	26/48
2003	7100	-	3	80	18	25	0	3	24/45
2008	6900	40	7	69	24	23	10	6	21/50
2012	4720	60	3	84	13	32	10	28	20/54
2017	5720	60	3	84	13	59	0	12	20/53
<b>Cercocarpus ledifolius<sup>p</sup> -- (curl-leaf mountain mahogany)</b>									
1998	100	-	40	60	0	40	20	0	175/150
2003	100	-	20	80	0	20	60	0	159/187
2008	80	-	0	100	0	25	0	0	120/101
2012	200	-	80	20	0	0	0	20	85/112
2017	120	-	0	100	0	67	0	0	150/150
<b>Cercocarpus montanus<sup>p</sup> -- (alderleaf mountain mahogany)</b>									
1998	740	20	19	73	8	46	24	3	120/141
2003	1040	-	14	87	0	12	81	0	99/135
2008	800	80	18	83	0	33	28	0	95/114
2012	780	20	5	92	3	33	49	10	93/131
2017	780	160	28	72	0	33	62	0	101/134
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1998	720	20	11	72	17	11	0	0	27/39
2003	960	-	0	94	6	19	4	0	25/32
2008	1100	-	6	82	13	2	0	4	20/30
2012	900	20	7	91	2	0	0	7	22/33
2017	880	-	2	96	2	2	11	2	23/37



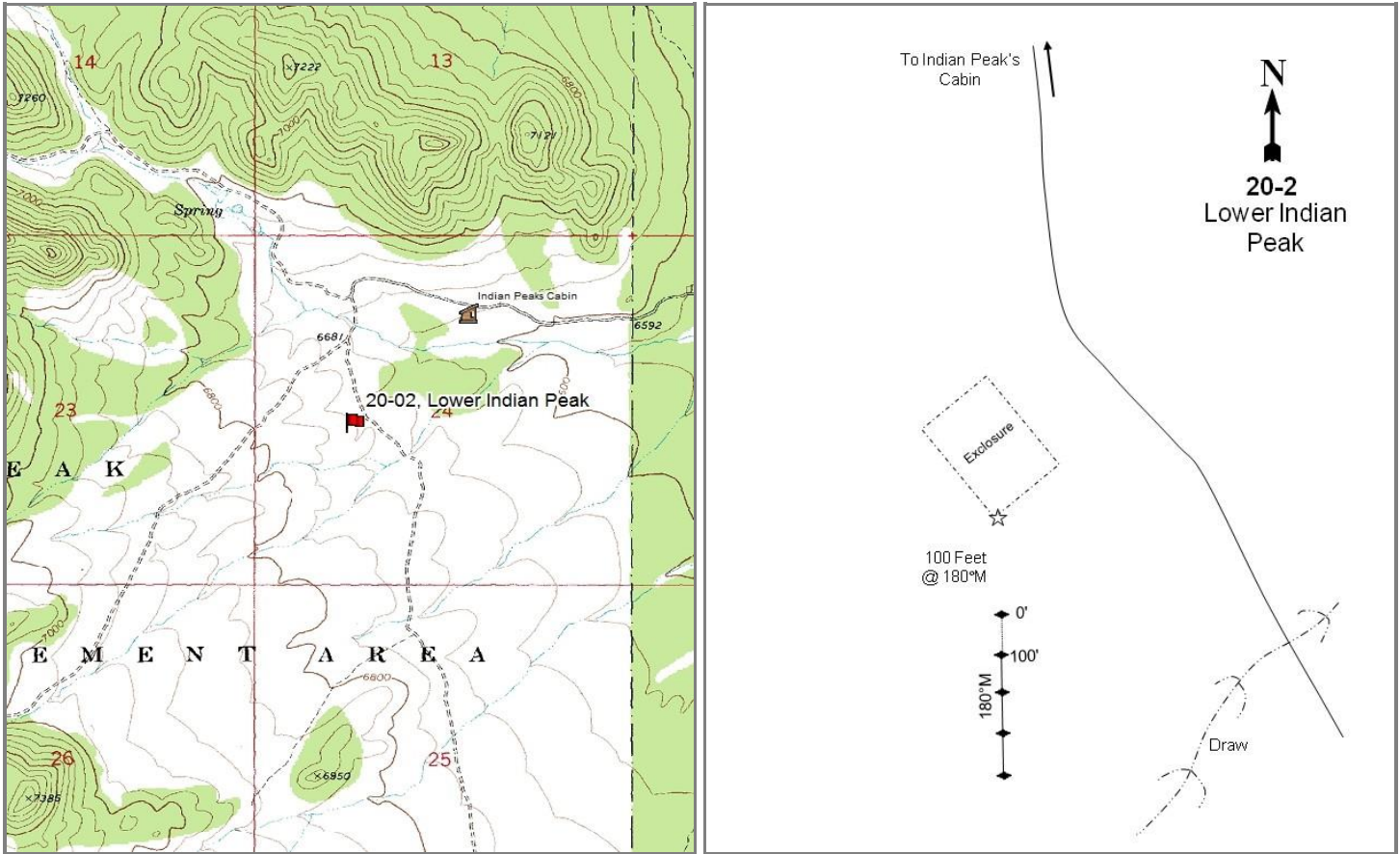
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Eriogonum microthecum<sup>P</sup> -- (slender buckwheat)</b>									
1998	1000	120	6	90	4	0	2	0	16/23
2003	2240	-	1	97	2	5	2	0	18/21
2008	2600	100	13	82	5	2	0	2	17/25
2012	1780	-	3	94	2	7	3	6	16/26
2017	2040	20	1	99	0	24	0	4	15/20
<b>Ericameria parryi var. parryi -- (Parry's rabbitbrush)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	340	-	0	94	6	6	24	0	20/26
2008	20	-	0	100	0	0	100	0	35/36
2012	140	-	0	71	29	0	0	29	21/26
2017	200	-	30	70	0	0	20	0	27/35
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	20	-	0	100	0	0	0	0	15/23
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Opuntia polyacantha var. erinacea -- (grizzlybear pricklypear)</b>									
1998	440	-	36	46	18	0	0	18	11/26
2003	420	-	14	81	5	0	0	10	12/27
2008	200	80	0	90	10	0	0	30	12/26
2012	60	-	0	100	0	0	0	67	10/20
2017	100	-	0	100	0	0	0	0	10/20
<b>Pinus monophylla<sup>t</sup> -- (singleleaf pinyon)</b>									
1998	60	-	100	0	0	0	0	0	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	20	-	0	0	100	0	0	100	-/-
2012	60	-	100	0	0	0	0	0	-/-
2017	60	-	33	67	0	0	0	0	-/-
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1998	60	-	0	100	0	0	33	0	28/135
2003	80	-	0	100	0	25	75	0	35/180
2008	140	-	0	100	0	0	86	43	32/84
2012	100	-	0	100	0	0	100	0	26/125
2017	60	-	0	100	0	67	33	0	43/145
<b>Rhus trilobata var. trilobata<sup>P</sup> -- (skunkbush sumac)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	20	0	0	0	0	0	0	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1998	1420	60	28	72	0	3	0	1	27/53
2003	1900	-	12	85	3	8	0	2	27/56
2008	1900	440	36	63	1	2	2	0	32/65
2012	1460	60	15	85	0	23	0	3	25/56
2017	1980	-	5	95	0	5	0	0	28/55
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1998	100	-	0	80	20	0	0	0	28/32
2003	320	-	13	75	13	19	0	0	26/34
2008	340	-	12	41	47	6	0	41	15/20
2012	100	-	20	80	0	20	40	20	24/38
2017	300	-	20	80	0	7	0	0	22/28

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

**Table 20-01.14 - 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' (%)	
<b>Pinus monophylla (singleleaf pinyon)</b>							
2017	43	15	54	8	23	-	6.1

## LOWER INDIAN PEAK - STUDY NO. 20-2



### Location Information

USGS 7.5 min Map Info GPS (0' Stake)	Buckhorn Spring SW; Township 29S, Range 18W, Section 24 NAD 83 UTM ZONE 12, 253679 East 4239627 North
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### Transect Information

Browse Tag # (0' Stake) Transect Bearing Length Belt Placement Belt Marker Placement	7076 180° magnetic 400ft Line 1 (11ft & 95ft), Line 2 (71ft), Line 3 (59ft), Line 4 (59ft) Belt 1: 6ft, Belt 3: 8ft, Belt 5: 1ft
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### Directions to Site

From the Indian Peaks state cabin, travel 0.4 miles west to a fork, then turn left and cross the stream. Continue for 0.1 miles and turn left at the fork, then go 0.3 miles to an enclosure, which is about 180 feet off the right side of the road. The 0-foot stake is 100 feet south and in line with the fence of the southwest corner of the enclosure. The 0-foot stake is a rebar with browse tag #7076.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,710ft (2,045m)
Aspect	East
Slope	8-10%
Sample Dates	06/10/1998, 07/02/2003, 06/16/2008, 06/28/2012, 06/12/2017

**Table 20-02.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	1959	100
Seeding - Rangeland Drill	-	-	1959	100
Hand Crew - Lop and Scatter	Indian Peaks WMA Lop and Scatter	1784	May-June 2011	930

**Wildlife Habitat and Vegetation History****Table 20-02.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	substantial	year-long
Elk	substantial	year-long

**Table 20-02.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Sagebrush/Perennial Grass	Phase I
1991	Sagebrush/Perennial Grass	Phase I
1998	Sagebrush/Perennial Grass	Phase I
2003	Sagebrush/Perennial Grass	Phase I
2008	Sagebrush/Perennial Grass	Phase I
2012	Sagebrush/Perennial Grass	Phase I
2017	Sagebrush/Perennial Grass	Phase I

**Site Notes**

There is an ephemeral stream approximately 0.25 miles from the study site.

**Soils****Table 20-02.5 - 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 Loam	6.4	64.0	17.4	18.6	2.1	12.7	99.2	0.6	06/10/1998

**Site Potential**

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Shallow Loam (Black Sagebrush)
NRCS Ecological Site #	R028AY325UT
States and Transitions	No state and transition model is available for this ecological site.

When this site was established in 1985, it was a sagebrush and perennial grass plant community. Black sagebrush (*Artemisia nova*) is the dominant browse species on the site with mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) and broom snakeweed (*Gutierrezia sarothrae*) as lesser components (Table 20-02.12). Black sagebrush cover has increased in the two sample years following the lop and scatter treatment (Table 20-02.1, Table 20-02.12). Perennial grasses are diverse and abundant, with crested wheatgrass (*Agropyron cristatum*) being the dominant species (Table 20-02.10). The forb community for this site is not diverse and is fairly sparse (Table 20-02.11). Post-treatment tree cover and density of Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon (*Pinus monophylla*) have decreased from pre-treatment levels (Table 20-02.12, Table 20-02.14). The site is considered to be in Phase I of woodland succession as of the 2017 sample year (Table 20-02.4), although there may be potential for infilling in future years.

**Trend Summary Tables**

**Table 20-02.6 - 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
1998	6.6	0.4	3.9	-	-	-
2003	8.3	0.2	4.8	5.4	0.4	6.3
2008	6.9	0.5	6.9	6.8	0.5	10.4
2012	6.7	0.4	2.3	6.1	0.3	2.6
2017	7.6	1.3	2.3	7.9	1.2	3.3

**Table 20-02.7 - 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
1998	202	328	55	20	2.9	16.9	0.2	0.4
2003	37	220	52	10	0.3	5.6	0.2	0.2
2008	190	243	11	10	1.3	11.6	0.0	0.2
2012	223	255	10	16	2.6	15.9	0.0	0.1
2017	247	289	39	23	5.3	16.3	0.1	0.3

**Table 20-02.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	21.4	1.2	36.9	10.7	13.1	34.1
2003	27.5	0.6	34.2	14.8	13.3	19.4
2008	15.8	0.2	38.2	14.6	13.7	27.8
2012	25.6	0.1	38.7	3.8	11.9	26.8
2017	25.3	0.1	37.7	7.5	13.5	34.7

**Table 20-02.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1998	-	3	8	-	23
2003	-	4	36	-	57
2008	-	8	16	-	87
2012	-	8	14	-	31
2017	-	14	12	-	53
Year	Days Use Per Acre (ha)				
1998	5.8 (14.3)	6.7 (16.6)	16.1 (39.7)	0.6 (1.4)	-
2003	-	10.7 (26.5)	44.2 (109.2)	-	-
2008	-	10.7 (26.5)	26.8 (66.2)	-	-
2012	1.5 (3.6)	10.0 (24.8)	9.4 (23.2)	-	-
2017	-	22.1 (54.6)	6.7 (16.6)	1.7 (4.3)	-

**Table 20-02.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bouteloua gracilis (blue grama)	Bromus inermis <sup>s</sup> (smooth brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea <sup>i</sup> (Russian wildrye)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency															
1998	-	262	8	1	50	202	12	1	3	-	27	8	23	9	-	32
2003	1	174	15	-	6	37	-	1	7	-	44	-	4	5	-	18
2008	1	216	9	-	14	190	11	-	-	-	15	16	8	11	1	18
2012	-	174	-	7	13	223	1	-	-	-	16	3	74	3	-	74
2017	-	223	28	4	33	247	4	-	10	5	43	-	12	12	-	42
year	Average Cover (%)															
1998	-	12.7	0.1	0.0	1.3	2.9	0.7	0.0	0.0	-	0.3	0.2	0.3	0.1	-	1.3
2003	0.0	3.9	0.1	-	0.0	0.3	-	0.0	0.2	-	1.0	-	0.0	0.0	-	0.3
2008	0.0	9.4	0.3	-	0.2	1.3	0.1	-	-	-	0.2	0.1	0.1	0.8	0.0	0.4
2012	-	9.5	-	0.2	0.2	2.6	0.0	-	-	-	1.1	0.1	1.4	0.0	-	3.4
2017	-	9.6	1.1	0.1	0.9	5.3	0.0	-	0.1	0.1	1.9	-	0.1	0.3	-	2.1

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

**Table 20-02.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Astragalus (milkvech)	Astragalus cibarius (browse milkvech)	Calochortus nuttallii (sego lily)	Chaetopappa ericoides (rose heath)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Cymopterus (springparsley)	Draba <sup>a</sup> (draba)	Erigeron pumilus (shaggy fleabane)	Gilia inconspicua <sup>a</sup> (shy gilia)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Navarretia intertexta <sup>a</sup> (needleleaf navarretia)	Orobanche fasciculata (clustered broomrape)	Packera multilobata (lobeleaf groundsel)	Penstemon linarioides ssp. sileri (Siler's penstemon)	Phlox austromontana (mountain phlox)	Sphaeralcea coccinea (scarlet globemallow)	Streptanthus cordatus (heartleaf twistflower)
year	Nested Frequency																
1998	-	-	-	2	-	2	39	3	19	1	-	-	1	-	10	2	-
2003	-	2	-	-	-	-	-	-	50	-	2	-	-	-	4	1	3
2008	3	-	-	-	-	-	1	-	3	7	-	-	-	-	5	2	-
2012	4	-	-	-	-	4	-	-	-	10	-	-	-	-	6	2	-
2017	-	-	2	-	6	-	6	3	21	6	2	1	1	1	11	6	-
year	Average Cover (%)																
1998	-	-	-	0.0	-	0.0	0.1	0.0	0.1	0.0	-	-	0.0	-	0.4	0.0	-
2003	-	0.1	-	-	-	-	-	-	0.2	-	0.0	-	-	-	0.0	0.0	0.0
2008	0.0	-	-	-	-	-	0.0	-	0.0	0.0	-	-	-	-	0.2	0.0	-
2012	0.0	-	-	-	-	0.0	-	-	-	0.0	-	-	-	-	0.1	0.0	-
2017	-	-	0.0	-	0.0	-	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-

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

**Table 20-02.12 - 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 <sup>p</sup> (black sagebrush)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	3.5	1	0.2	-	-	0.4	-	-	0.2	5.9	-	0.4	0.5	-	
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	4.2	1.5	-	-	-	0.4	0.4	-	0.5	6.9	-	3.5	0.3	0	
Cylindropuntia whipplei (Whipple cholla)	4.6	1.1	-	-	-	0.2	0.1	-	0.3	2.6	-	-	0.1	-	
Echinocereus (hedgehog cactus)	7.1	0.2	-	-	-	0.4	-	0.8	0.4	3.3	-	-	0.2	-	
Ephedra viridis <sup>p</sup> (mormon tea)	Quadrat Cover (%)														
Ericameria nauseosa ssp. nauseosa var. hololeuca <sup>p</sup> (rubber rabbitbrush)	1.9	3.9	0.4	0.0	-	0.1	0.1	-	0.0	3.9	-	0.0	0.5	0.0	
Ericameria parryi var. parryi (Parry's rabbitbrush)	4.8	1.9	0.0	-	-	0.7	0.0	0.0	0.1	4.2	0.0	0.6	1.0	-	
Gutierrezia sarothrae (broom snakeweed)	5.0	1.1	0.0	-	-	0.4	0.0	-	0.4	4.5	0.0	2.4	0.4	0.0	
Juniperus osteosperma <sup>t</sup> (Utah juniper)	5.3	0.8	-	-	-	0.1	0.0	0.0	0.4	2.3	-	-	0.4	-	
Pediocactus simpsonii (mountain ball cactus)	6.9	0.3	-	-	0.1	0.0	-	0.0	1.2	2.3	-	-	0.4	-	
Pinus monophylla <sup>t</sup> (singleleaf pinyon)	Quadrat Cover (%)														
Purshia tridentata <sup>p</sup> (antelope bitterbrush)	1.9	3.9	0.4	0.0	-	0.1	0.1	-	0.0	3.9	-	0.0	0.5	0.0	
Sclerocactus (fishhook cactus)	4.8	1.9	0.0	-	-	0.7	0.0	0.0	0.1	4.2	0.0	0.6	1.0	-	
	5.0	1.1	0.0	-	-	0.4	0.0	-	0.4	4.5	0.0	2.4	0.4	0.0	
	5.3	0.8	-	-	-	0.1	0.0	0.0	0.4	2.3	-	-	0.4	-	
	6.9	0.3	-	-	0.1	0.0	-	0.0	1.2	2.3	-	-	0.4	-	

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

**Table 20-02.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia frigida<sup>p</sup> -- (prairie sagewort)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	12/28
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	0	100	0	0	0	0	-/-
<b>Artemisia nova<sup>p</sup> -- (black sagebrush)</b>									
1998	1320	220	21	74	5	20	2	0	22/54
2003	1420	-	7	51	42	32	1	7	26/50
2008	1420	20	11	72	17	28	17	9	32/65
2012	1080	20	4	74	22	33	13	9	23/62
2017	2340	20	8	86	6	21	8	9	30/65
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1998	500	40	4	72	24	16	4	4	51/86
2003	240	-	25	58	17	50	0	8	57/96
2008	440	80	23	55	23	14	23	14	40/59
2012	540	120	11	70	19	11	37	30	38/70
2017	80	-	25	75	0	50	0	0	67/100
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1998	40	-	0	100	0	0	0	0	34/64
2003	60	-	0	67	33	0	0	33	30/54
2008	120	-	17	50	33	33	17	33	17/24
2012	20	-	0	0	100	0	0	100	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Cylindropuntia whipplei -- (Whipple cholla)</b>									
1998	20	-	0	100	0	0	0	0	11/29
2003	-	-	-	-	-	-	-	-	10/29
2008	-	-	-	-	-	-	-	-	8/12
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	15/53

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 (%)				
<b>Echinocereus -- (hedgehog cactus)</b>									
1998	20	-	0	100	0	0	0	0	10/31
2003	60	-	0	100	0	0	0	0	9/19
2008	-	-	-	-	-	-	-	-	-/-
2012	20	-	0	100	0	0	0	0	8/20
2017	60	-	0	100	0	0	0	0	10/25
<b>Ephedra viridis<sup>P</sup> -- (mormon tea)</b>									
1998	40	-	50	50	0	50	0	50	69/99
2003	20	-	0	0	100	100	0	100	65/96
2008	40	-	0	50	50	100	0	50	58/78
2012	20	-	0	0	100	0	0	0	54/94
2017	20	-	0	100	0	0	100	0	60/90
<b>Eriogonum -- (buckwheat)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	5/11
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Ericameria nauseosa ssp. nauseosa var. hololeuca<sup>P</sup> -- (rubber rabbitbrush)</b>									
1998	100	-	0	60	40	40	0	40	50/58
2003	20	-	0	0	100	0	0	0	49/72
2008	120	-	0	83	17	0	50	17	35/51
2012	60	-	0	67	33	0	33	33	30/45
2017	20	-	0	0	100	0	100	100	56/77
<b>Ericameria parryi var. parryi -- (Parry's rabbitbrush)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	20	-	100	0	0	0	0	0	-/-
2008	-	-	-	-	-	-	-	-	12/33
2012	20	20	0	100	0	0	0	0	13/25
2017	20	-	0	100	0	0	0	0	32/60
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1998	180	40	0	56	44	0	0	44	14/19
2003	420	-	0	71	29	0	0	0	19/25
2008	980	40	4	84	12	2	2	8	16/19
2012	1260	60	24	68	8	0	0	19	16/24
2017	1640	-	1	88	11	0	0	15	14/19
<b>Juniperus osteosperma<sup>1</sup> -- (Utah juniper)</b>									
1998	80	-	0	100	0	0	0	0	-/-
2003	80	-	25	75	0	0	0	0	-/-
2008	40	-	0	100	0	0	0	0	-/-
2012	20	-	0	100	0	0	0	0	-/-
2017	40	20	0	100	0	0	0	0	-/-
<b>Krascheninnikovia lanata<sup>P</sup> -- (winterfat)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	8/28
2017	-	-	-	-	-	-	-	-	-/-
<b>Opuntia -- (pricklypear)</b>									
1998	20	-	0	100	0	0	0	0	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	12/18
2012	-	-	-	-	-	-	-	-	-/-
2017	40	-	0	100	0	0	0	0	9/15
<b>Pediocactus simpsonii -- (mountain ball cactus)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	60	-	0	100	0	0	0	0	4/6
2008	20	-	0	100	0	0	0	0	4/7
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-



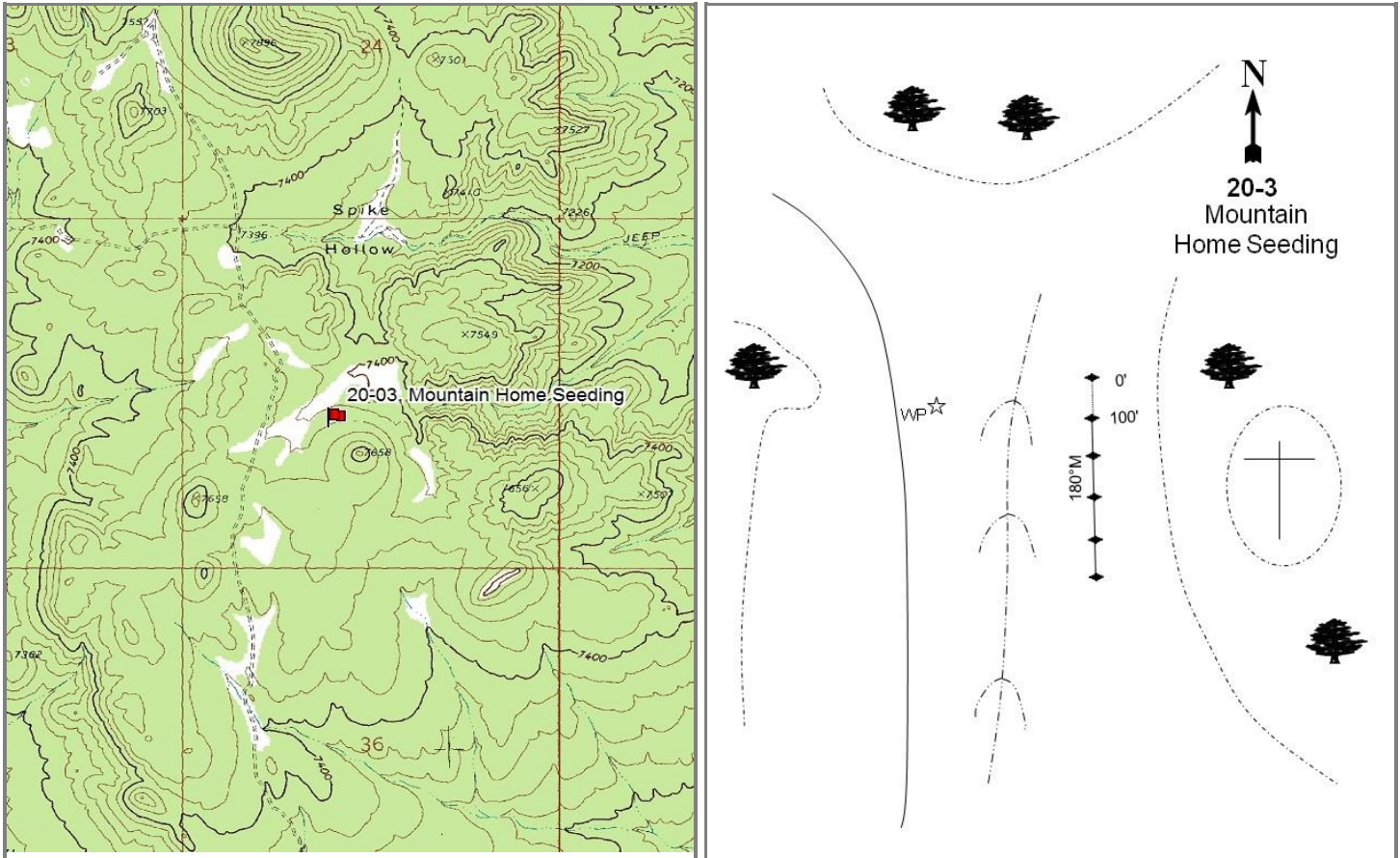
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Pinus monophylla<sup>t</sup> -- (singleleaf pinyon)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	20	-	100	0	0	0	0	0	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	20	0	0	0	0	0	0	-/-
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1998	40	-	0	50	50	0	100	50	55/155
2003	60	-	0	0	100	0	100	0	52/182
2008	60	-	0	33	67	100	0	0	47/125
2012	20	-	0	100	0	100	0	0	45/124
2017	40	-	0	100	0	0	100	0	51/141
<b>Rhus trilobata var. trilobata<sup>p</sup> -- (skunkbush sumac)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	63/178
2008	-	-	-	-	-	-	-	-	64/199
2012	-	-	-	-	-	-	-	-	90/97
2017	-	-	-	-	-	-	-	-	-/-
<b>Sclerocactus -- (fishhook cactus)</b>									
1998	20	-	0	100	0	0	0	0	5/7
2003	-	-	-	-	-	-	-	-	-/-
2008	60	-	0	100	0	0	0	0	13/26

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

**Table 20-02.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
1998	24	-	-	-	-	-	10.9
2003	22	-	-	30	40	30	22.6
2008	26	-	8	23	46	23	21.6
2012	17	55	-	-	45	-	12.0
2017	14	10	20	10	20	40	14.6
<b>Pinus monophylla (singleleaf pinyon)</b>							
1998	78	-	-	-	-	-	10.7
2003	80	5	11	16	47	21	14.4
2008	45	-	18	18	47	18	16.6
2012	21	30	10	20	40	-	11.1
2017	22	10	40	10	10	30	10.4

## MOUNTAIN HOME SEEDING - STUDY NO. 20-3



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Lopers Spring SE; Township 27S, Range 19W, Section 25  
NAD 83 UTM ZONE 12, 244818 East 4257569 North

### Transect Information

Browse Tag # (0' Stake)	143
Transect Bearing	180° 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 Indian Peaks cabin, drive to the main Pine Valley Road. Turn left (north) and drive about 2.0 miles to a fork, which is labeled with a sign saying "Hamblin Valley Road 15 miles". Drive west on this road (avoiding side roads) for about 12.0 miles to a four-way intersection, where a sign to the north reads "Lopers Spring 6.0 miles." Turn right (north) and drive for 6.2 miles to a witness post on the right side of the road (you will pass another four-way intersection at about 3.7 miles). The 0-foot stake is 170 paces from the witness post at 113 degrees magnetic and is marked with browse tag #143.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	No data
Elevation	7,500ft (2,286m)
Aspect	Northwest
Slope	5%
Sample Dates	06/09/1998, 07/01/2003, 07/06/2005, 06/17/2008, 06/27/2012, 06/14/2017

**Table 20-03.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Prescribed	Mountain Home Habitat Improvement 1988	-	1989	1066
Chaining - Two-Way Chain Unknown	Mountain Home Habitat Improvement 1988	-	1989	1066
Seeding - Aerial Before	Mountain Home Habitat Improvement 1988	-	1989	1066
Harrow - One-Way Dixie	Mountain Home Habitat Improvement	226	Fall 2005	746
Seeding - Broadcast Before	Mountain Home Habitat Improvement	226	Fall 2005	746

**Table 20-03.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name		Application Type	Application Date	Acres	
Mountain Home		Broadcast	Sep 2005	1200	
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		0.05	0.00
G	Agropyron cristatum	Crested Wheatgrass	Nordan	2.79	0.00
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	1.31	0.00
G	Agropyron cristatum	Crested Wheatgrass	Ephraim	1.22	0.00
G	Agropyron cristatum	Crested Wheatgrass	Douglas	0.50	0.40
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	0.50	0.47
G	Bromus inermis	Smooth Brome	Lincoln	2.02	0.00
G	Dactylis glomerata	Orchardgrass	Paiute	1.00	0.00
G	Elymus wawawaiensis	Snake River Wheatgrass	Secar	1.00	0.93
G	Festuca brevipila	Hard Fescue	Durar	0.50	0.47
G	Poa secunda	Canby Bluegrass	Canbar	0.50	0.40
G	Poa secunda	Sandberg Bluegrass	SID OR	0.50	0.40
G	Thinopyrum intermedium	Pubescent Wheatgrass		0.52	0.49
G	Thinopyrum intermedium	Pubescent Wheatgrass		0.50	0.42
G	Thinopyrum intermedium	Intermediate Wheatgrass		1.13	0.00
G	Thinopyrum ponticum	Tall Wheatgrass		0.47	0.00
F	Astragalus cicer	Cicer Milkvetch	Lutana	0.12	0.10
F	Astragalus cicer	Cicer Milkvetch	Lutana	0.88	0.83
F	Linum perenne	Blue Flax	Appar	0.05	0.05
F	Medicago sativa	Alfalfa	Ladak+	0.33	0.32
F	Medicago sativa	Alfalfa	Nomad	0.33	0.31
F	Medicago sativa	Alfalfa	Spredor 4	0.33	0.31
F	Medicago sativa	Alfalfa	Ladak	1.55	0.00
F	Melilotus officinalis	Yellow Sweetclover		0.47	0.00
F	Melilotus officinalis	Yellow Sweetclover		0.33	0.24
F	Onobrychis viciifolia	Sainfoin	Eski	1.50	1.41
F	Sanguisorba minor	Small Burnet	Delar	1.00	0.94
Mix Name		Application Type	Application Date	Acres	
Mountain Home Chaining		Broadcast	Sep 1989	1066	
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
G	Leymus cinereus	Great Basin Wildrye		0.05	0.00

**Wildlife Habitat and Vegetation History****Table 20-03.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	substantial	year-long
Elk	substantial	year-long

**Table 20-03.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1998	Perennial Grass	No Encroachment
2003	Perennial Grass	No Encroachment
2005	Perennial Grass/Rubber Rabbitbrush	No Encroachment
2008	Perennial Grass/Rubber Rabbitbrush	No Encroachment
2012	Perennial Grass/Rubber Rabbitbrush	No Encroachment
2017	Mountain Big Sagebrush	No Encroachment

**Site Notes**

The area is occupied by deer, elk and wild horses throughout most of the year. Escape and thermal cover are available at the edge of the treatment about 200 feet east of the study site. In 2017, it was noted that most of the rubber rabbitbrush (*Ericameria nauseosa*) was defoliated.

**Soils****Table 20-03.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	6.2	70.0	15.1	14.9	2.0	21.5	163.2	0.6	06/09/1998

**Site Potential**

1981 - 2010 Average Annual Precipitation      19 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.

At the time of study establishment in 1998, the site was a perennial grass plant community. It transitioned to a rubber rabbitbrush (*Ericameria nauseosa*) encroached site and was mechanically treated in 2005. Following this treatment, however, rabbitbrush maintained a presence. Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) began establishing on the site in 2003, and in 2017 it was the dominant shrub in the community (Table 20-03.12, Table 20- 03.13). Perennial grass cover and frequency have fluctuated, but the general trend has been a decreasing one, with crested wheatgrass (*Agropyron cristatum*) expressing dominance (Table 20-03.10). Forbs are modestly diverse, but cover is low; the dominant forb is perennial cryptantha (*Cryptantha* sp.) (Table 20-03.11). No tree cover has been observed since study establishment (Table 20-03.12), but the surrounding tree community (photos) and tree presence prior to site establishment indicate potential for future encroachment on this site.

**Trend Summary Tables****Table 20-03.6 - 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
1998	0.4	-	-	-	-	-
2003	1.0	0.0	-	0.3	0.5	-
2005	1.9	0.2	-	2.1	0.2	-
2008	2.7	1.0	-	3.4	1.4	-
2012	6.1	1.7	-	8.5	2.6	-
2017	12.2	2.9	-	12.5	3.9	-

**Table 20-03.7 - 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
1998	84	382	61	43	0.7	29.4	0.2	0.4
2003	29	330	2	14	0.1	9.3	0.0	0.2
2005	10	364	16	12	0.0	20.3	0.1	0.3
2008	6	363	5	37	0.0	13.1	0.0	0.4
2012	15	354	12	44	0.0	12.3	0.0	0.3
2017	152	260	145	61	1.8	4.7	0.8	1.1

**Table 20-03.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	15.5	0.0	42.2	23.4	13.6	35.3
2003	41.4	-	18.8	24.4	11.8	10.6
2005	21.0	-	15.5	38.8	13.4	22.8
2008	13.8	0.1	25.1	35.8	16.7	17.1
2012	36.6	-	18.0	8.6	16.2	23.1
2017	44.8	-	24.3	5.9	14.8	24.1

**Table 20-03.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1998	-	14	27	26	4
2003	1	7	16	27	-
2005	-	9	29	21	23
2008	-	9	31	20	53
2012	1	3	38	5	6
2017	1	13	20	6	8
Year	Days Use Per Acre (ha)				
1998	-	6.7 (16.6)	26.8 (66.2)	44.1 (109.0)	-
2003	0.7 (1.8)	2.7 (6.6)	39.6 (97.7)	38.3 (94.7)	-
2005	-	0.7 (1.7)	28.1 (69.5)	33.1 (81.8)	-
2008	-	4.7 (11.6)	51.6 (127.5)	43.6 (107.6)	-
2012	-	1.3 (3.3)	42.9 (105.9)	14.5 (35.9)	-
2017	-	16.8 (41.4)	10.7 (26.5)	13.9 (34.4)	-

**Table 20-03.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus rubens <sup>ai</sup> (red brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency							
1998	-	352	5	115	-	84	3	34
2003	-	318	-	82	-	29	-	18
2005	-	334	-	130	-	10	-	43
2008	-	337	4	92	-	6	7	57
2012	8	312	3	105	-	15	8	16
2017	-	235	-	62	86	76	-	6
year	Average Cover (%)							
1998	-	25.1	0.1	3.2	-	0.7	0.0	0.9
2003	-	8.6	-	0.7	-	0.1	-	0.1
2005	-	17.4	-	2.6	-	0.0	-	0.2
2008	-	10.9	0.0	1.8	-	0.0	0.0	0.4
2012	0.1	9.5	0.0	2.1	-	0.0	0.0	0.5
2017	-	3.9	-	0.8	1.0	0.8	-	0.0

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

**Table 20-03.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Astragalus (milkvech)	Chaenactis douglasii (Douglas' dusty maiden)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Dalea (prairie clover)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Gilia inconspicua <sup>a</sup> (shy gilia)	Grindelia squarrosa (curlycup gumweed)	Halogeton glomeratus <sup>ai</sup> (saltlover)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Linum lewisii (Lewis flax)	Lupinus argenteus (silvery lupine)	Medicago sativa <sup>i</sup> (alfalfa)	Microsteris gracilis <sup>a</sup> (slender phlox)	Packera multilobata (lobeleaf groundsel)
year	Nested Frequency																
1998	1	-	11	-	34	-	2	-	25	-	-	5	-	3	7	24	-
2003	-	-	-	-	2	-	-	-	-	-	2	-	-	-	1	-	-
2005	-	1	3	-	-	-	-	7	-	-	-	1	-	0	-	5	-
2008	3	-	1	-	6	3	-	3	-	1	-	-	1	4	-	1	2
2012	6	-	6	5	1	-	-	-	-	-	-	1	-	9	-	5	-
2017	3	-	30	34	6	-	-	106	15	-	-	3	-	6	-	27	-
year	Average Cover (%)																
1998	0.0	-	0.0	-	0.1	-	0.0	-	0.1	-	-	0.0	-	0.0	0.2	0.1	-
2003	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	0.0	-	-
2005	-	0.0	0.0	-	-	-	-	0.0	-	-	-	0.0	-	0.0	-	0.1	-
2008	0.0	-	0.0	-	0.0	0.0	-	0.0	-	0.0	-	-	0.0	0.0	-	0.0	0.0
2012	0.1	-	0.0	0.0	0.0	-	-	-	-	-	-	0.0	-	0.1	-	0.0	-
2017	0.0	-	0.1	0.6	0.0	-	-	0.5	0.1	-	-	0.0	-	0.3	-	0.1	-

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

FORB SPECIES	Phlox longifolia (longleaf phlox)	Pleiacanthus spinosus (thorn skeletonweed)	Sanguisorba minor <sup>i</sup> (small burnet)	Sphaeralcea coccinea (scarlet globemallow)
year	Nested Frequency			
1998	1	1	-	2
2003	7	5	-	0
2005	7	3	-	1
2008	12	3	3	3
2012	22	2	-	1
2017	17	0	-	6
year	Average Cover (%)			
1998	0.0	0.0	-	0.0
2003	0.0	0.1	-	0.0
2005	0.0	0.1	-	0.1
2008	0.0	0.1	0.0	0.1
2012	0.1	0.0	-	0.0
2017	0.1	0.0	-	0.0

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

**Table 20-03.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa (rubber rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. hololeuca <sup>p</sup> (rubber rabbitbrush)	Ericameria parryi var. parryi (Parry's rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)
year	Line Intercept Cover (%)					
1998	-	-	-	-	-	-
2003	0.3	-	0.5	-	-	-
2005	0.5	-	0.2	1.6	-	-
2008	1	-	1.4	2.4	-	-
2012	4	-	2.6	4.5	-	-
2017	10.7	-	3.9	1.8	0	-
year	Quadrat Cover (%)					
1998	-	-	-	0.4	-	-
2003	0.0	-	0.0	1.0	-	0.0
2005	0.4	-	0.2	1.5	-	-
2008	0.3	-	1.0	2.4	-	-
2012	1.9	0.0	1.7	4.2	-	-
2017	8.7	0.0	2.8	3.5	0.0	-

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



**Table 20-03.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	24/53
2005	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1998	-	-	-	-	-	-	-	-	76/101
2003	20	-	0	100	0	0	100	0	74/112
2005	920	580	96	4	0	0	2	0	67/103
2008	1340	80	70	30	0	3	3	6	27/34
2012	4900	440	74	24	2	2	8	78	38/53
2017	7020	200	33	67	1	28	1	1	43/55
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	30/54
2005	20	-	0	100	0	0	0	0	24/45
2008	40	-	0	100	0	0	0	0	21/26
2012	60	20	67	33	0	0	0	33	24/40
2017	60	-	0	100	0	0	0	33	26/39
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	40	0	0	0	0	0	0	107/161
2005	1020	1040	94	6	0	0	0	0	80/112
2008	1760	20	9	82	9	22	0	33	37/42
2012	2680	1360	32	59	9	2	0	37	49/54
2017	1720	-	31	64	5	7	0	71	56/63
<b>Ericameria nauseosa ssp. nauseosa var. hololeuca<sup>P</sup> -- (rubber rabbitbrush)</b>									
1998	-	-	-	-	-	-	-	-	88/129
2003	40	-	0	100	0	50	0	0	81/123
2005	2220	1180	95	5	0	0	0	0	67/113
2008	3500	20	15	75	9	21	2	19	30/44
2012	2360	460	22	64	14	7	0	34	45/55
2017	1860	-	5	93	2	1	0	82	48/57
<b>Ericameria parryi var. parryi -- (Parry's rabbitbrush)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	20	-	0	100	0	0	0	0	27/26
2005	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	24/50
2012	-	-	-	-	-	-	-	-	-/-
2017	100	-	20	20	60	20	0	80	16/30
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	20	-	100	0	0	0	0	0	16/12
2005	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	31/69
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	100	0	0	0	0	0	-/-
<b>Linanthus pungens -- (granite prickly phlox)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2005	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	22/89
2017	-	-	-	-	-	-	-	-	-/-

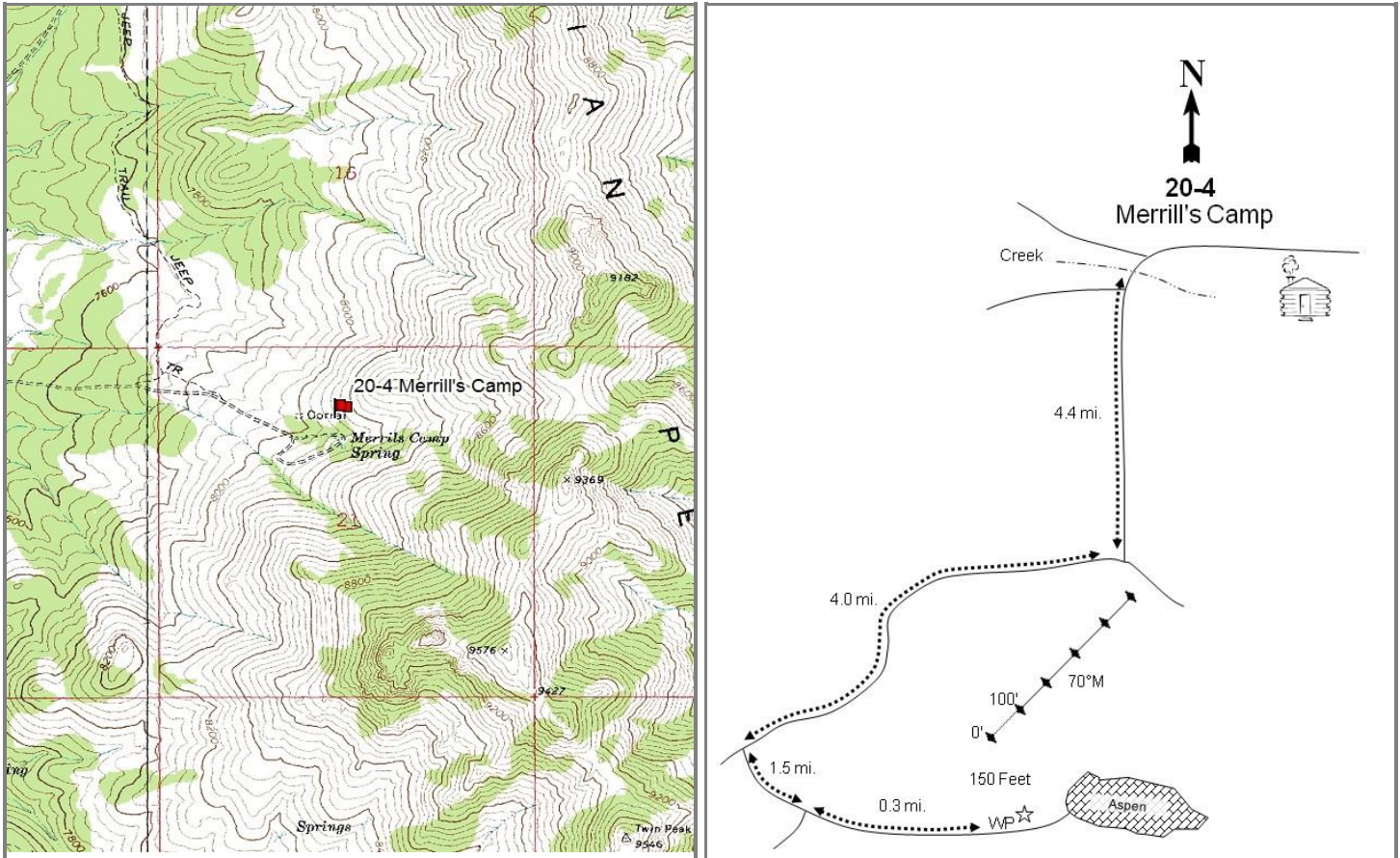
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Opuntia -- (pricklypear)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2005	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	11/27
Ribes <sup>p</sup> -- (currant)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	71/57
2005	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	83/92

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

**Table 20-03.14 - 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 osteosperma (Utah juniper)							
2017	1	-	100	-	-	-	6.0
Pinus monophylla (singleleaf pinyon)							
2017	1	-	100	-	-	-	2.0

## MERRILL'S CAMP - STUDY NO. 20-4

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Pinto Spring NW; Township 30S, Range 18W, Section 21  
NAD 83 UTM ZONE 12, 248942 East 4230696 North

**Transect Information**

Browse Tag # (0' Stake)	112
Transect Bearing	70° 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 Indian Peaks Cabin, drive for 0.3 miles to an intersection west of the cabin. At the intersection, turn left and drive for 4.4 miles to a "T" intersection, then turn right. Drive 4.0 miles and turn left. Proceed for another 1.5 miles and turn left, and then drive for 0.3 miles to the witness post on the left (north) side of the road. The 0-foot stake is 50 paces up the hill at approximately 0 degrees magnetic. The 0-foot stake is marked with browse tag #112.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	ATCHISON CREEK
Elevation	8,150ft (2,484m)
Aspect	Southwest
Slope	25-30%
Sample Dates	06/27/2012, 06/12/2017

**Wildlife Habitat and Vegetation History****Table 20-04.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

**Table 20-04.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2012	Mixed Mountain Brush	Phase I
2017	Mixed Mountain Brush	Phase I

**Site Notes**

Merrill's Camp Spring is the nearest source of water available to wildlife, and is located approximately 500 feet from the site in an old grove of aspen (*Populus tremuloides*) trees and shrubs that may provide escape and thermal cover for wildlife. Common Poorwills (*Phalaenoptilus nuttallii*) were found brooding under Utah serviceberry plants in 2012.

**Soils****Table 20-04.5 - 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
Sandy Loam	5.5	67.4	17.5	15.1	2.2	6.7	232.0	0.5	06/27/2012

**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.

At the time of study establishment in 2012, this site was a mountain brush community dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), black sagebrush (*A. nova*), and Utah serviceberry (*Amelanchier utahensis*) and has remained so through the 2017 sample year (Table 20-04.12). The introduced annual species cheatgrass (*Bromus tectorum*) is the dominant grass species on the site and may be detrimental to biodiversity. The forb component is moderately diverse, but cover is low; the perennial species silvery lupine (*Lupinus argentus*) and annual species slender phlox (*Microsteris gracilis*) are the dominant species (Table 20-04.11). Singleleaf pinyon (*Pinus monophylla*) is present on the site, placing it in Phase I of woodland succession (photos, Table 20-04.4, Table 20-04.13, Table 20-04.14); it is possible that this study site may progress in phases of encroachment.

**Trend Summary Tables****Table 20-04.6 - 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
2012	28.7	7.5	0.7	33.6	9.5	-
2017	29.8	5.4	0.8	35.7	6.2	-

**Table 20-04.7 - 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
2012	390	132	99	131	8.3	1.6	0.8	2.4
2017	399	146	227	164	10.5	1.7	1.6	5.1

**Table 20-04.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2012	20.0	-	32.5	3.3	11.3	47.6
2017	15.4	0.0	46.2	12.0	14.5	49.4

**Table 20-04.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
2012	1	4	3	5	1
2017	5	8	-	11	1
Year	Days Use Per Acre (ha)				
2012	-	12.8 (31.5)	14.1 (34.8)	5.8 (14.3)	-
2017	-	13.4 (33.1)	2.7 (6.6)	9.9 (24.4)	-

**Table 20-04.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum <sup>ii</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency					
2012	-	390	59	4	11	63
2017	1	399	65	12	9	66
year	Average Cover (%)					
2012	-	8.3	0.4	0.1	0.2	0.9
2017	0.0	10.5	0.6	0.4	0.1	0.6

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

**Table 20-04.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvetch)	Astragalus argophyllus (silverleaf milkvetch)	Calochortus nuttallii (sego lily)	Castilleja (Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Chaetopappa ericoides (rose heath)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Erigeron eatonii (Eaton's fleabane)	Gilia inconspicua <sup>a</sup> (shy gilia)	Lupinus argenteus (silvery lupine)
year	Nested Frequency																
2012	15	3	4	1	1	1	-	6	3	67	1	1	1	3	3	3	59
2017	17	2	6	4	3	3	1	5	-	83	5	9	-	8	3	-	72
year	Average Cover (%)																
2012	0.0	0.0	0.0	0.0	0.0	0.0	-	0.4	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	1.6
2017	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	-	0.5	0.0	0.1	-	0.1	0.0	-	4.0

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

FORB SPECIES	Microsteris gracilis <sup>a</sup> (slender phlox)	Oenothera (evening primrose)	Penstemon eatonii (firecracker penstemon)	Penstemon watsonii (Watson's penstemon)	Phlox longifolia (longleaf phlox)	Tragopogon dubius <sup>ai</sup> (yellow salsify)
year	Nested Frequency					
2012	48	4	1	5	67	-
2017	196	1	3	8	73	1
year	Average Cover (%)					
2012	0.1	0.0	0.0	0.1	0.3	-
2017	1.0	0.0	0.0	0.2	0.3	0.0

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

**Table 20-04.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia nova <sup>p</sup> (black sagebrush)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	Ericameria parryi var. parryi (Parry's rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Pinus monophylla <sup>t</sup> (singleleaf pinyon)	Symphoricarpos oreophilus (mountain snowberry)
year	Line Intercept Cover (%)									
2012	8.2	2.6	22.8	0.2	-	1.4	0.1	0.1	0	7.7
2017	7.9	13.9	13.8	0.3	0.1	1.7	-	0	-	4.2
year	Quadrat Cover (%)									
2012	7.9	1.2	19.6	0.3	-	1.1	0.0	0.2	0.7	5.9
2017	7.2	8.8	13.6	0.1	0.2	1.6	0.1	0.1	0.8	3.5

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

**Table 20-04.13 - 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 utahensis <sup>p</sup> -- (Utah serviceberry)									
2012	660	-	0	97	3	36	64	15	105/119
2017	900	80	22	76	2	29	53	4	106/104
Artemisia nova <sup>p</sup> -- (black sagebrush)									
2012	180	20	0	100	0	0	100	22	22/85
2017	3340	20	1	92	7	22	0	11	26/68
Artemisia tridentata ssp. vaseyana <sup>p</sup> -- (mountain big sagebrush)									
2012	4940	140	4	83	13	37	30	45	36/70
2017	2280	40	5	75	19	26	2	12	54/80
Cercocarpus ledifolius <sup>p</sup> -- (curl-leaf mountain mahogany)									
2012	-	-	-	-	-	-	-	-	173/192
2017	-	-	-	-	-	-	-	-	192/179
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2012	100	-	0	100	0	0	0	0	24/33
2017	220	-	0	100	0	0	0	0	23/24
Eriogonum microthecum <sup>p</sup> -- (slender buckwheat)									
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	25/27
Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> -- (rubber rabbitbrush)									
2012	20	-	0	100	0	0	0	0	73/84
2017	280	-	0	100	0	21	0	0	33/51
Ericameria parryi var. parryi -- (Parry's rabbitbrush)									
2012	1260	-	3	97	0	2	0	5	19/29
2017	860	-	0	98	2	28	19	2	25/36
Gutierrezia sarothrae -- (broom snakeweed)									
2012	100	-	0	100	0	0	0	0	17/28
2017	240	-	8	92	0	0	0	0	16/19
Mahonia repens -- (creeping barberry)									
2012	1180	-	9	92	0	0	0	10	8/11
2017	860	-	0	100	0	0	0	0	9/8
Opuntia polyacantha -- (plains pricklypear)									
2012	20	-	0	100	0	0	0	100	9/24
2017	40	-	0	100	0	0	0	0	12/21



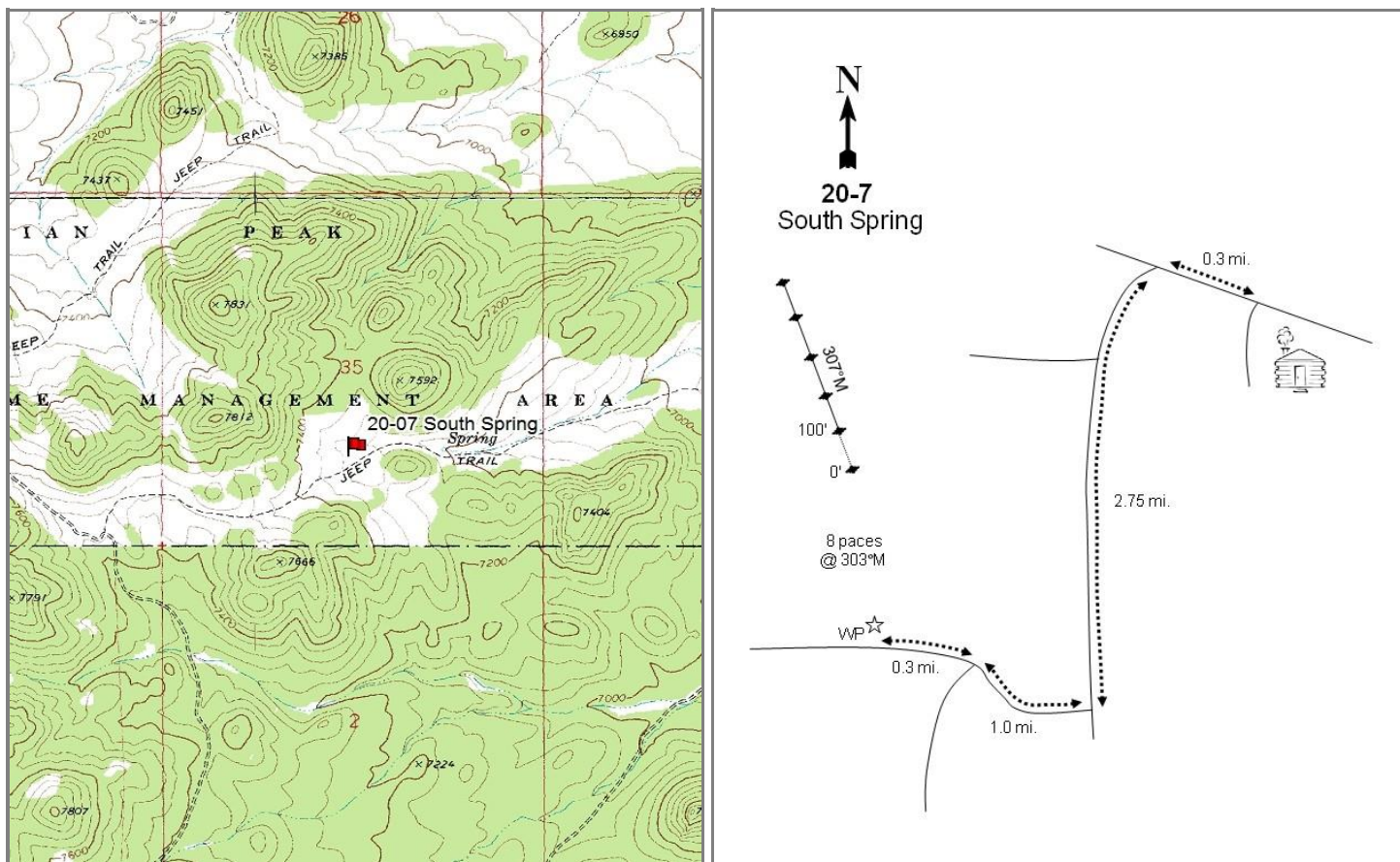
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Pinus monophylla <sup>t</sup> -- (singleleaf pinyon)									
2012	40	40	100	0	0	0	0	0	- / -
2017	120	-	67	33	0	0	0	0	- / -
Purshia tridentata <sup>p</sup> -- (antelope bitterbrush)									
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	54/106
Rosa woodsii <sup>p</sup> -- (Woods' rose)									
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	55/14
Symphoricarpos oreophilus -- (mountain snowberry)									
2012	4200	340	17	83	0	18	7	9	22/39
2017	3200	40	4	96	0	22	33	0	22/36
Tetradymia canescens -- (spineless horsebrush)									
2012	-	-	-	-	-	-	-	-	- / -
2017	20	-	0	100	0	100	0	0	16/42

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

**Table 20-04.14 - 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' (%)	
Pinus monophylla (singleleaf pinyon)							
2017	34	-	25	42	33	-	10.2

## SOUTH SPRING - STUDY NO. 20-7

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Pinto Spring NW; Township 29S, Range 18W, Section 35  
NAD 83 UTM ZONE 12, 252367 East 4236143 North

**Transect Information**

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

Not Available  
307° magnetic  
500ft  
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)  
Standard

**Directions to Site**

From the Indian Peaks Cabin, go 0.3 miles to an intersection west of the cabin. At the intersection, turn left and drive 2.75 miles to another right (closed road): follow this for 1.0 miles to a fork near a spring with a trough. Stay to the right and drive for 0.3 miles into a sagebrush/grass flat and to the witness post on the right (north) side of the road. The 0-foot stake is 8 paces at 303 degrees magnetic from the witness post.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	7,300ft (2,225m)
Aspect	Northeast
Slope	10%
Sample Dates	07/28/1999, 07/02/2003, 06/18/2008, 06/26/2012, 08/10/2017

**Table 20-07.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	1960s	-
Seeding - Seed Unknown	-	-	1960s	-
Fire - Prescribed Fire	Indian Peak Prescribed Fire	-	1999	-

**Wildlife Habitat and Vegetation History****Table 20-07.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	substantial	year-long
Elk	substantial	year-long

**Table 20-07.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1999	Mountain Big Sagebrush	Phase I
2003	Perennial Grass/Rubber Rabbitbrush	No Encroachment
2008	Rubber Rabbitbrush/Perennial Grass	No Encroachment
2012	Rubber Rabbitbrush/Mountain Big Sagebrush/Annual Grass	No Encroachment
2017	Mountain Big Sagebrush/Rubber Rabbitbrush/Annual Grass	No Encroachment

**Site Notes**

A deer skeleton was found on the site in 2017.

**Soils****Table 20-07.5 - 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 Loam	6.4	72.0	15.4	12.6	2.5	12.3	256.0	0.5	07/28/1999

**Site Potential**

1981 - 2010 Average Annual Precipitation	18 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.

When this study site was established in 1999, it was a sagebrush plant community in Phase I of woodland succession, being encroached by Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon (*Pinus monophylla*). Following the fire later that year (Table 20-07.1), it transitioned to a perennial grass and rubber rabbitbrush (*Ericameria nauseosa* ssp. *nauseosa* var. *hololeuca*) community without tree encroachment. As of the most recent sampling in 2017, this site is a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and rubber rabbitbrush plant community (Table 20-07.12, Table 20-07.13). Most grass cover is contributed by annual species, specifically cheatgrass (*Bromus tectorum*) (20-07.10). The forb community is sparse and lacking in diversity, with the dominant species being silvery lupine (*Lupinus argentus*) (Table 20-07.11). Although tree encroachment has not been a concern in the post-treatment sample years, there are trees present in areas surrounding the site (photos), indicating that there may be potential for future infilling.

**Trend Summary Tables****Table 20-07.6 - 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
1999	13.7	1.0	0.0	-	-	-
2003	0.2	2.8	-	0.3	4.1	-
2008	11.1	5.9	-	11.6	7.2	-
2012	15.6	6.6	-	11.9	5.3	-
2017	17.3	4.5	-	20.0	4.2	-

**Table 20-07.7 - 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
1999	117	374	-	85	1.2	16.7	-	2.6
2003	59	157	0	139	1.8	6.5	0.3	12.3
2008	359	281	42	159	6.8	9.0	0.3	5.2
2012	422	273	18	64	20.7	9.2	0.0	1.7
2017	407	341	37	69	14.3	14.5	0.1	3.8

**Table 20-07.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1999	8.8	0.2	58.3	8.4	0.1	36.3
2003	15.1	-	17.2	52.9	0.1	22.5
2008	16.4	-	35.8	16.6	0.3	41.6
2012	18.1	-	40.7	0.7	0.0	57.6
2017	21.2	0.0	47.1	16.1	0.2	45.6

**Table 20-07.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1999	2	8	28	-	8
2003	-	9	83	-	46
2008	1	8	59	12	85
2012	-	7	4	1	7
2017	-	6	5	16	33
Year	Days Use Per Acre (ha)				
1999	-	-	-	-	-
2003	2.2 (5.4)	12.8 (31.5)	89.1 (220.2)	-	-
2008	-	20.1 (49.7)	28.1 (69.5)	15.1 (37.3)	-
2012	1.5 (3.6)	1.3 (3.3)	19.4 (48.0)	4.0 (10.0)	-
2017	-	2.7 (6.6)	6.0 (14.9)	15.7 (38.7)	-

**Table 20-07.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum nelsonii (Columbia needlegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Leymus cinereus (basin wildrye)	Psathyrostachys juncea <sup>i</sup> (Russian wildrye)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency												
1999	15	-	297	2	118	117	6	-	2	-	-	-	52
2003	5	-	9	2	10	59	-	61	9	0	-	-	70
2008	23	3	40	4	42	359	7	69	36	2	0	-	124
2012	8	-	48	-	73	422	4	37	16	-	-	-	138
2017	33	2	86	6	80	407	6	25	28	-	-	1	161
year	Average Cover (%)												
1999	0.6	-	11.2	0.0	2.8	1.2	0.0	-	0.0	-	-	-	2.2
2003	0.2	-	0.2	0.0	0.1	1.8	-	1.6	0.2	0.0	-	-	4.2
2008	0.3	0.1	0.6	0.0	0.9	6.8	0.1	1.0	0.4	0.1	0.0	-	5.5
2012	0.1	-	0.8	-	1.1	20.7	0.1	0.5	0.2	-	-	-	6.5
2017	0.6	0.0	2.6	0.0	3.8	14.3	0.1	0.2	0.5	-	-	0.0	6.7

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

**Table 20-07.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Astragalus (milkvech)	Chamaesyce (sandmat)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Cymopterus (springparsley)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Eriogonum racemosum (redroot buckwheat)	Gilia inconspicua <sup>a</sup> (shy gilia)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Lithospermum ruderate (western stoneseed)	Lupinus argenteus (silvery lupine)	Navarretia intertexta <sup>a</sup> (needleleaf navarretia)	Phlox longifolia (longleaf phlox)	Pleiacanthus spinosus (thorn skeletonweed)	Portulaca oleracea <sup>ai</sup> (little hogweed)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Sphaeralcea coccinea (scarlet globemallow)
year	Nested Frequency															
1999	2	-	-	-	-	0	-	-	-	83	-	-	-	-	-	-
2003	1	-	-	-	-	-	-	-	0	118	0	23	0	0	-	2
2008	6	-	5	2	21	-	18	-	-	131	-	32	2	-	2	-
2012	3	-	4	2	-	-	-	5	-	51	-	2	6	-	10	1
2017	-	4	-	-	0	-	10	-	-	51	-	8	7	29	2	1
year	Average Cover (%)															
1999	0.0	-	-	-	-	0.0	-	-	-	2.5	-	-	-	-	-	-
2003	0.0	-	-	-	-	-	-	-	0.0	12.2	0.3	0.1	0.0	0.0	-	0.0
2008	0.0	-	0.0	0.0	0.2	-	0.0	-	-	4.9	-	0.2	0.0	-	0.0	-
2012	0.0	-	0.0	0.0	-	-	-	0.0	-	1.6	-	0.0	0.1	-	0.0	0.0
2017	-	0.0	-	-	0.0	-	0.0	-	-	3.7	-	0.1	0.0	0.1	0.0	0.0

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

**Table 20-07.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)					
	year	1999	2003	2008	2012	2017
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <sup>p</sup> (mountain big sagebrush)	-	-	-	-	-	-
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>viscidiflorus</i> (yellow rabbitbrush)	3.4	0.3	-	-	-	0.7
<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>hololeuca</i> <sup>p</sup> (rubber rabbitbrush)	6.8	11	-	-	-	0.4
<i>Juniperus osteosperma</i> <sup>t</sup> (Utah juniper)	2.5	5	9.4	-	-	0.3
<i>Purshia tridentata</i> <sup>p</sup> (antelope bitterbrush)	11.2	3.9	8.8	-	-	0.3
<i>Tetradymia canescens</i> (spineless horsebrush)	-	-	-	-	-	-
year	Quadrat Cover (%)					
1999	13.6	0.5	-	0.0	0.0	0.5
2003	0.1	2.5	0.0	-	-	0.3
2008	0.8	5.2	10.2	-	-	0.7
2012	4.8	5.3	10.8	-	-	1.3
2017	9.4	4.0	8.0	-	-	0.5

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

**Table 20-07.13 - 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.

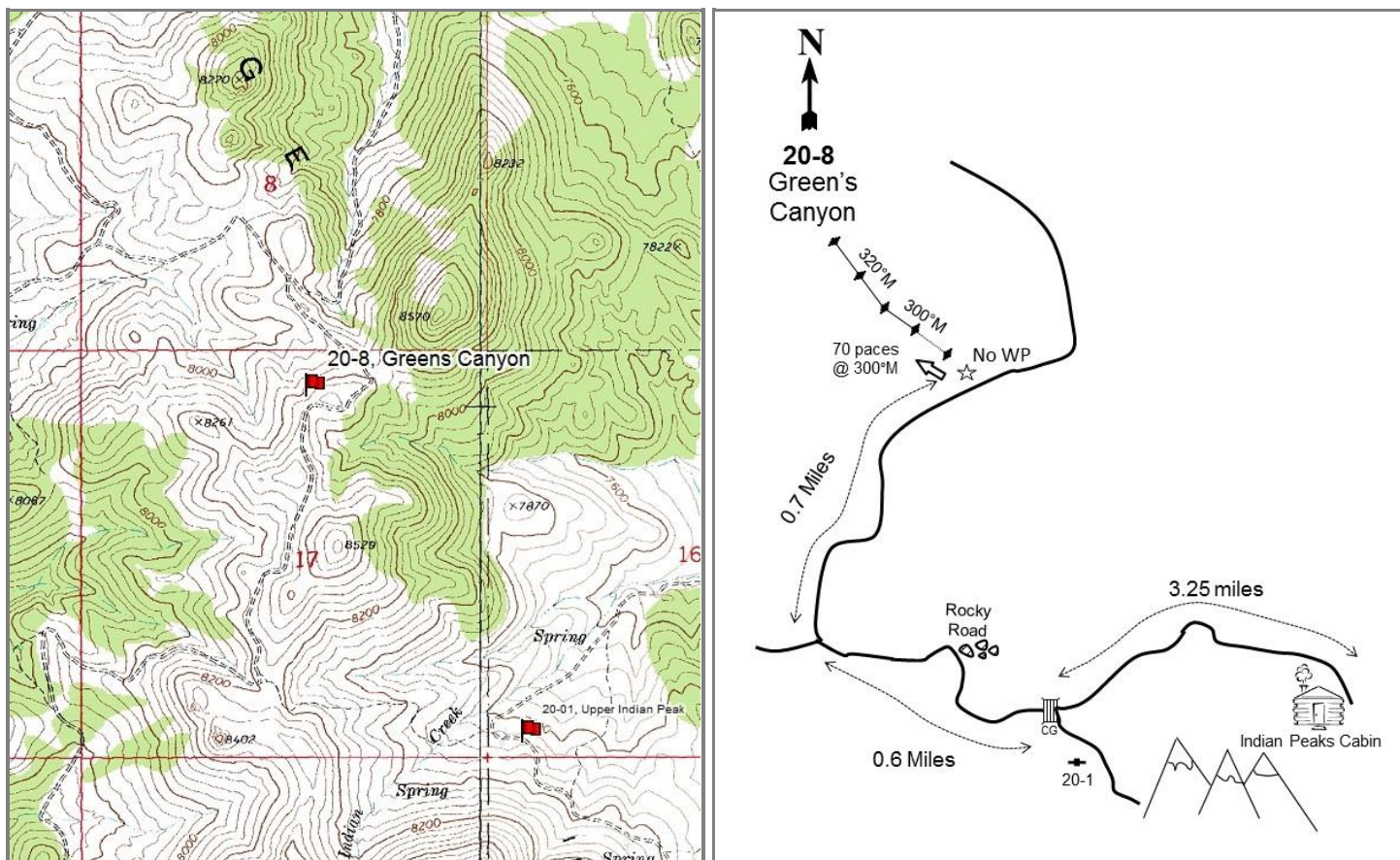
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <sup>p</sup> -- (mountain big sagebrush)									
1999	4100	-	1	70	29	38	2	15	72/85
2003	40	-	50	50	0	50	0	0	28/31
2008	620	-	10	90	0	3	0	0	33/44
2012	3200	220	76	24	0	0	0	37	41/60
2017	3000	40	13	85	2	7	0	1	55/86
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>viscidiflorus</i> -- (yellow rabbitbrush)									
1999	580	-	17	76	7	0	3	3	39/38
2003	1200	20	3	97	0	5	0	0	35/52
2008	8000	820	56	38	7	0	0	1	35/54
2012	4020	-	13	87	1	0	0	2	29/52
2017	2760	700	54	44	1	12	2	1	37/62
<i>Ericameria nauseosa</i> -- (rubber rabbitbrush)									
1999	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	50/78
2008	-	-	-	-	-	-	-	-	57/78
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	0	100	0	0	0	0	66/78
<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>hololeuca</i> <sup>p</sup> -- (rubber rabbitbrush)									
1999	-	-	-	-	-	-	-	-	-/-
2003	120	-	50	50	0	0	0	0	44/60
2008	5780	-	6	92	2	2	1	16	39/54
2012	2660	20	2	94	4	2	0	34	53/76
2017	2520	-	14	70	16	16	5	10	59/71
<i>Gutierrezia sarothrae</i> -- (broom snakeweed)									
1999	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	25/27

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1999	20	-	100	0	0	0	0	0	- / -
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
<b>Pinus monophylla<sup>t</sup> -- (singleleaf pinyon)</b>									
1999	40	-	100	0	0	0	0	0	- / -
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1999	140	-	14	57	29	14	71	29	38/69
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	18/32
2012	-	-	-	-	-	-	-	-	15/33
2017	-	-	-	-	-	-	-	-	10/29
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1999	280	-	0	100	0	0	0	0	38/44
2003	340	100	0	100	0	0	6	0	25/41
2008	360	-	0	39	61	33	50	11	21/52
2012	340	-	18	82	0	6	0	6	25/47
2017	500	-	80	20	0	0	0	0	18/25

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



## GREENS CANYON - STUDY NO. 20-8

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Miners Cabin Wash SE; Township 29S, Range 18W, Section 17  
NAD 83 UTM ZONE 12, 247783 East 4242154 North

**Transect Information**

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

Not Available  
300° magnetic (Lines 3-4: 320° magnetic)  
350ft  
Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (71ft), Line 4 (34ft)  
Standard

**Directions to Site**

From the Indian Peaks DWR Cabin, continue up the road 3.25 miles to a gate and fork in the road. Continue straight and drive up the mountain for about 0.6 miles to a road, then turn right and continue for another 0.7 miles. There is no witness post; the site will be on the left side of the road and down the hill. A UTV may be useful on some of the roads in the area.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	INDIAN PEAK
Elevation	8,250ft (2,515m)
Aspect	Northwest
Slope	25-40%
Sample Dates	06/14/2017

**Wildlife Habitat and Vegetation History**

**Table 20-08.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

**Table 20-08.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Mixed Mountain Brush	Phase I

**Site Notes**

Numerous game and feral horse trails cross the site.

**Soils**

**Table 20-08.5 - 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	6.5	48.2	30.1	21.8	3.8	8.1	328.0	0.7	06/14/2017

**Site Potential**

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Mountain Loam (Browse)
NRCS Ecological Site #	R047XB420UT
States and Transitions	No state and transition model is available for this ecological site.

At the time of study establishment in 2017, this site was dominated by mixed mountain brush species -- namely mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), Utah serviceberry (*Amelanchier utahensis*), and mountain snowberry (*Symphoricarpos oreophilus*) (Table 20-08.12). Perennial grasses and graminoids are moderately diverse with sedges (*Carex* sp.) as the most abundant species, although they provide low amounts of cover in general (Table 20- 08.10). Perennial and annual forbs are diverse and robust in quantity, with most cover contributed by the perennial species Watson's penstemon (*Penstemon watsonii*) as well as the annual species lambstongue ragwort (*Senecio integerrimus*) (Table 20-08.11). There is singleleaf pinyon (*Pinus monophylla*) present on the site in low amounts, indicating the potential for further tree encroachment which could reduce understory and shrub production in future sample years (Table 20-08.14).

**Trend Summary Tables**

**Table 20-08.6 - 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
2017	23.0	17.2	-	30.0	19.9	-

**Table 20-08.7 - 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
2017	1	315	250	345	0.0	6.9	5.2	16.4

**Table 20-08.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2017	17.4	0.0	40.6	9.7	2.4	60.9

**Table 20-08.9 - 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	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
Year	Days Use Per Acre (ha)				
	2017	-	30	25	11
2017	0.7 (1.8)	61.7 (152.3)	47.6 (117.5)	30.2 (74.6)	-

**Table 20-08.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency							
2017	131	104	1	167	10	1	8	5
year	Average Cover (%)							
2017	1.8	1.2	0.0	3.6	0.1	0.0	0.2	0.0

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

**Table 20-08.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Antennaria (pussytoes)	Calochortus nuttallii (sego lily)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cryptantha <sup>a</sup> (annual cryptantha)	Erigeron eatonii (Eaton's fleabane)	Eriogonum racemosum (redroot buckwheat)	Hackelia patens (spotted stickseed)	Heuchera (alumroot)	Lomatium (desertparsley)	Lupinus argenteus (silvery lupine)	Melilotus officinalis <sup>i</sup> (sweetclover)	Mertensia (bluebells)	Penstemon watsonii (Watson's penstemon)	Phlox austromontana (mountain phlox)
year	Nested Frequency																
2017	3	3	23	50	2	6	2	69	75	3	28	1	73	4	4	181	100
year	Average Cover (%)																
2017	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.6	0.4	0.0	0.4	0.0	2.7	0.0	0.0	6.6	1.3

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

FORB SPECIES	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Potentilla gracilis var. fastigiata (slender cinquefoil)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Taraxacum officinale (common dandelion)
year	Nested Frequency				
2017	40	33	143	207	38
year	Average Cover (%)				
2017	0.5	0.1	2.0	4.9	1.6

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

**Table 20-08.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Cercocarpus montanus <sup>p</sup> (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria parryi (Parry's rabbitbrush)	Eriogonum microthecum <sup>p</sup> (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Opuntia (pricklypear)	Rosa woodsii <sup>p</sup> (Woods' rose)	Symphoricarpos oreophilus (mountain snowberry)
year	Line Intercept Cover (%)										
2017	5.7	22.1	0.2	0.5	-	0.4	-	2.8	0	1.6	16.6
year	Quadrat Cover (%)										
2017	4.2	17.5	0.0	0.1	0.1	0.4	0.0	5.5	0.0	0.9	11.3

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

**Table 20-08.13 - 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 utahensis <sup>p</sup> -- (Utah serviceberry)									
2017	1640	40	42	56	2	9	54	5	71/83
Artemisia tridentata ssp. vaseyana <sup>p</sup> -- (mountain big sagebrush)									
2017	6140	60	9	89	2	22	0	2	41/67
Cercocarpus montanus <sup>p</sup> -- (alderleaf mountain mahogany)									
2017	120	-	33	67	0	33	67	0	112/107
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2017	40	-	0	100	0	0	0	0	23/27
Eriogonum microthecum <sup>p</sup> -- (slender buckwheat)									
2017	900	-	9	91	0	24	33	0	11/14
Ericameria parryi -- (Parry's rabbitbrush)									
2017	400	-	0	95	5	5	5	0	17/23
Gutierrezia sarothrae -- (broom snakeweed)									
2017	60	-	0	100	0	0	0	0	11/16
Mahonia repens -- (creeping barberry)									
2017	19520	-	0	100	0	4	0	0	8/10
Opuntia -- (pricklypear)									
2017	20	-	0	100	0	0	0	0	9/12
Ribes <sup>p</sup> -- (currant)									
2017	-	-	-	-	-	-	-	-	173/268
Rosa woodsii <sup>p</sup> -- (Woods' rose)									
2017	1880	-	26	75	0	21	25	0	29/19
Symphoricarpos oreophilus -- (mountain snowberry)									
2017	5380	-	7	93	0	29	3	0	35/66
Tetradymia canescens -- (spineless horsebrush)									
2017	-	-	-	-	-	-	-	-	33/36

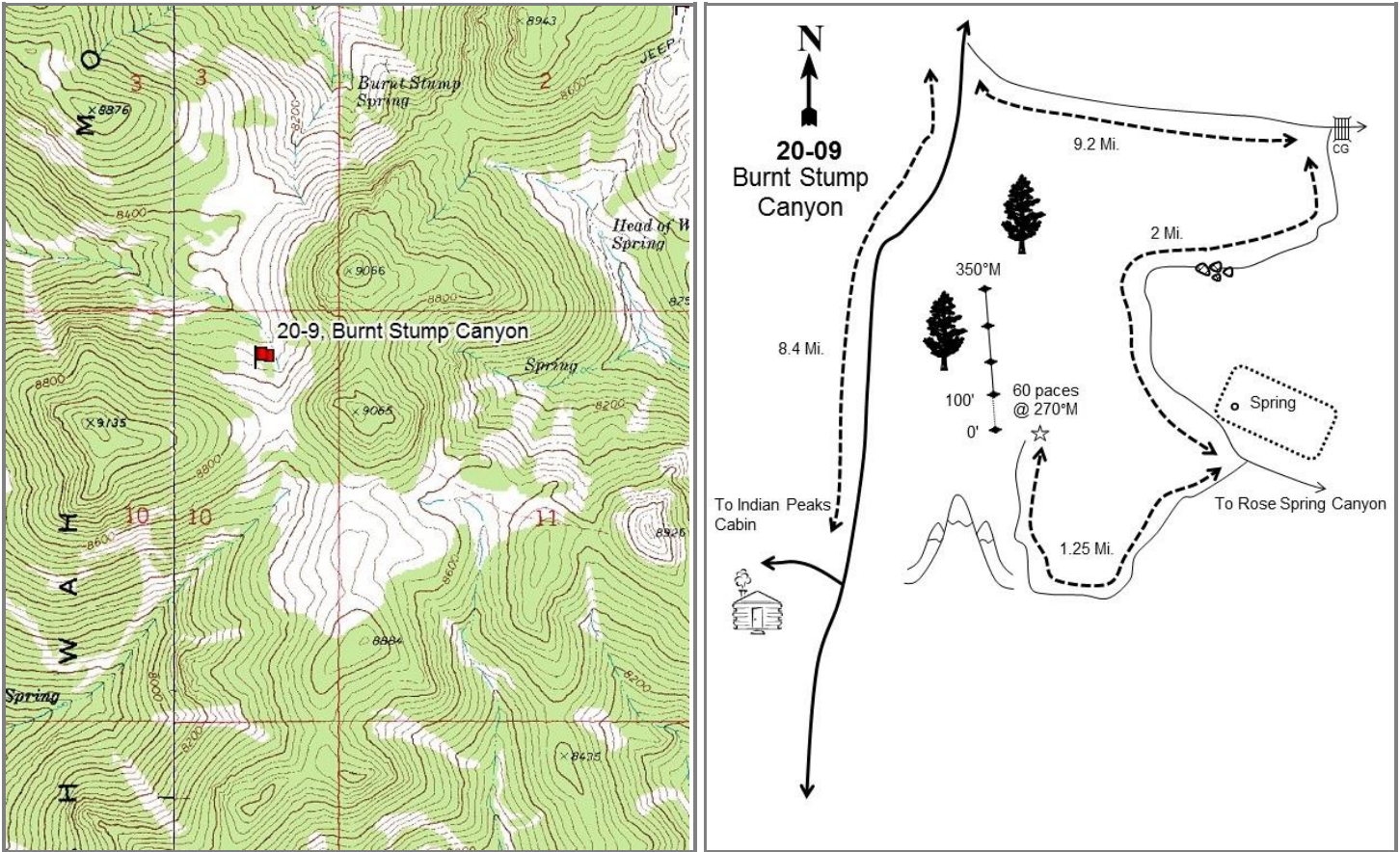
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 20-08.14 - 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' (%)
Pinus monophylla (singleleaf pinyon)							
2017	3	-	100	-	-	-	3.5



## BURNT STUMP CANYON - STUDY NO. 20-9



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Lamerdorf Peak SW; Township 29S, Range 16W, Section 10  
NAD 83 UTM ZONE 12, 270690 East 4242996 North

### Transect Information

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

Not Available  
350° magnetic  
500ft  
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)  
No Rebar or Stakes

### Directions to Site

From Pine Valley Road, turn onto Pine Grove Road and follow the road for 9.2 miles to a cattle guard. Before this cattle guard, turn right and drive 2 miles to a "T", right at the end of the enclosure for a spring. Take this road (1.25 miles) as far as possible: the road was washed out in 2017. Park and hike the road to the site.

NOTE: A UTV is advised when accessing this site as the road(s) may be washed out and rocky.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	WATER HOLLOW
Elevation	8,250ft (2,515m)
Aspect	North
Slope	20-30%
Sample Dates	08/08/2017

**Wildlife Habitat and Vegetation History****Table 20-09.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	summer
Elk	substantial	year-long

**Table 20-09.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Little Sagebrush	NA

**Site Notes**

Baseline stakes are marked by rock cairns.

**Site Potential**

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Mountain Shallow Loam (Low Sagebrush)
NRCS Ecological Site #	R047XB442UT
States and Transitions	No state and transition model is available for this ecological site.

This study site exists as a little sagebrush (*Artemisia arbuscula*) plant community as of study establishment in 2017; other browse species are present, but contribute much less cover (Table 20-09.12, Table 20-09.13). Grasses are lacking in diversity but provide good cover, with the native perennial species muttongrass (*Poa fendleriana*) as the dominant species (Table 20-09.10). Perennial forbs are plentiful, but also low in diversity; most forb cover is contributed by littleleaf pussytoes (*Antennaria microphylla*), silvery lupine (*Lupinus argentus*), and Watson's penstemon (*Penstemon watsonii*) (Table 20-09.11). A mixture of trees are present, including white fir (*Abies concolor*), Rocky Mountain juniper (*Juniperus scopulorum*), and quaking aspen (*Populus tremuloides*) (Table 20-09.14). Barring a major disturbance, this site will likely remain in this state in future sample years.



**Trend Summary Tables**

**Table 20-09.6 - 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
2017	27.8	5.2	0.2	33.8	5.8	-

**Table 20-09.7 - 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
2017	-	378	40	284	-	13.7	0.1	15.0

**Table 20-09.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2017	12.8	0.1	38.5	12.6	11.8	50.8

**Table 20-09.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency			
2017	8	18	6	3
Year	Days Use Per Acre (ha)			
	2017	4.0 (9.9)	4.7 (11.6)	5.8 (14.3)

**Table 20-09.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Poa fendleriana (muttongrass)	Poa pratensis' (Kentucky bluegrass)
year	Nested Frequency				
2017	105	8	15	333	16
year	Average Cover (%)				
2017	2.2	0.3	0.0	10.8	0.4

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

**Table 20-09.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Antennaria microphylla (littleleaf pussytoes)	Arabis (rockcress)	Astragalus (milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Erigeron eatonii (Eaton's fleabane)	Eriogonum racemosum (redroot buckwheat)	Lupinus argenteus (silvery lupine)	Penstemon watsonii (Watson's penstemon)	Petradonia pumila (rock goldenrod)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Taraxacum officinale (common dandelion)	Trifolium (clover)
year	Nested Frequency												
2017	88	3	2	13	4	68	125	113	133	15	40	1	48
year	Average Cover (%)												
2017	4.2	0.0	0.0	0.0	0.0	0.6	1.1	4.2	4.4	0.3	0.1	0.0	0.3

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

**Table 20-09.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia arbuscula <sup>p</sup> (little sagebrush)	Cercocarpus ledifolius <sup>p</sup> (curl-leaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria parryi (Parry's rabbitbrush)	Eriogonum microthecum <sup>p</sup> (slender buckwheat)	Juniperus scopulorum <sup>i</sup> (Rocky Mountain juniper)	Mahonia repens (creeping barberry)	Populus tremuloides <sup>i</sup> (quaking aspen)	Symphoricarpos oreophilus (mountain snowberry)
year	Line Intercept Cover (%)								
2017	30.5	0.1	1.2	2.5	3.2	-	0.1	-	2
year	Quadrat Cover (%)								
2017	22.3	0.4	2.1	2.4	5.1	0.1	0.1	0.0	0.7

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

**Table 20-09.13 - 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 (%)				
Abies concolor <sup>t</sup> -- (white fir)									
2017	20	-	0	100	0	0	0	0	- / -
Artemisia arbuscula <sup>p</sup> -- (little sagebrush)									
2017	10820	320	14	85	1	21	2	0	28/55
Cercocarpus ledifolius <sup>p</sup> -- (curl-leaf mountain mahogany)									
2017	360	20	33	67	0	0	0	0	21/26
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2017	520	-	0	100	0	0	0	4	33/53
Eriogonum microthecum <sup>p</sup> -- (slender buckwheat)									
2017	4400	-	2	98	0	1	1	1	13/23
Ericameria parryi -- (Parry's rabbitbrush)									
2017	2480	-	4	96	0	0	0	0	25/36
Juniperus scopulorum <sup>t</sup> -- (Rocky Mountain juniper)									
2017	20	-	100	0	0	0	0	0	- / -
Mahonia repens -- (creeping barberry)									
2017	1000	-	0	100	0	0	0	0	8/10
Symphoricarpos oreophilus -- (mountain snowberry)									
2017	1540	-	1	99	0	5	0	0	31/55

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

**Table 20-09.13a - Aspen Characteristics.** Characteristics of aspen populations including density, size class distribution, and vigor of plants.

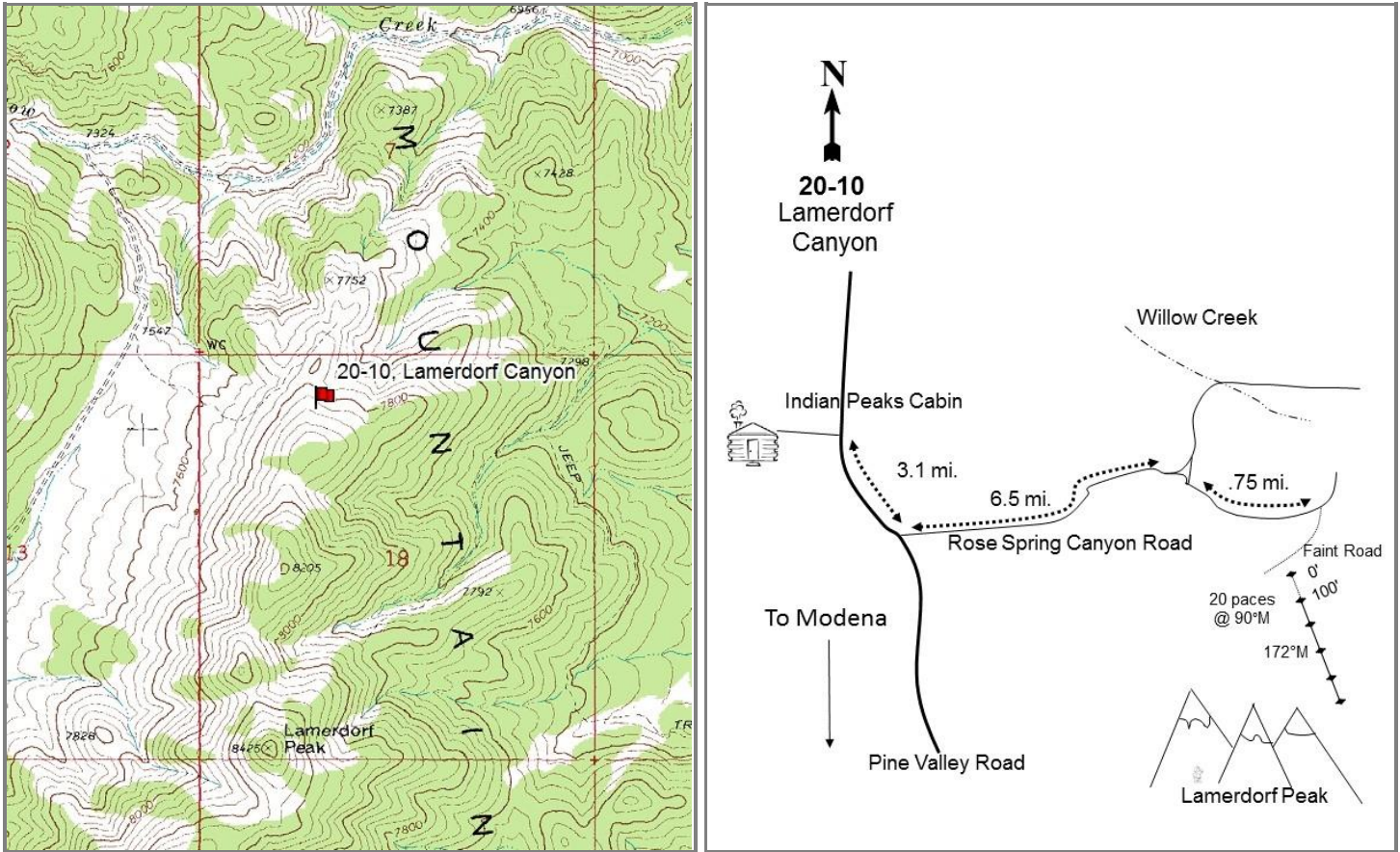
Year	Density	Size Class Distribution				Utilization		Poor Vigor (%)
	Plants per Acre	Class I (%)	Class II (%)	Class III (%)	Class IV (%)	Moderate (%)	Heavy (%)	
Populus tremuloides (quaking aspen)								
2017	60	100	-	-	-	0	0	0

Class I - ? 1.5 feet; Class II - > 1.5 Feet to 5 feet; Class III - > 5 Feet and up to 1 inch diameter at breast height (dbh); Class IV - > 1 inch diameter at breast height (dbh)

**Table 20-09.14 - 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' (%)	
Abies concolor (white fir)							
2017	4	25	50	25	-	-	4.3
Juniperus scopulorum (Rocky Mountain juniper)							
2017	14	50	50	-	-	-	2.5
Populus tremuloides (quaking aspen)							
2017	3	-	100	-	-	-	2.5

## LAMERDORF CANYON - STUDY NO. 20-10

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Lamerdorf Peak SW; Township 29S, Range 15W, Section 18  
NAD 83 UTM ZONE 12, 274679 East 4241381 North

**Transect Information**

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

267  
175° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
No Rebar

**Directions to Site**

From Pine Valley Road, turn onto Rose Spring Canyon Road. Follow this road for 7 miles, at which point there will be a road on the right-hand side of the main canyon road. Turn onto this road and drive for almost 1.0 miles up to the ridgetop (or the nearest flat parking area); the site is on the left and down the hill.

NOTE: A UTV is advisable for the rough and narrow road leading up-slope to the site.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	BUCKET RANCH
Elevation	7,900ft (2,408m)
Aspect	North
Slope	26%
Sample Dates	06/13/2017

**Wildlife Habitat and Vegetation History****Table 20-10.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	substantial	year-long
Elk	substantial	year-long

**Table 20-10.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Mixed Mountain Brush	Phase I

**Site Notes**

No Notes

**Soils****Table 20-10.5 - 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
Clay Loam	7.0	38.2	33.1	28.8	5.7	18.0	306.0	0.5	06/13/2017

**Site Potential**

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Mountain Stony Loam (Browse)
NRCS Ecological Site #	R047XB460UT
States and Transitions	No state and transition model is available for this ecological site.

At the time of study establishment in 2017, the site was a mixed mountain brush plant community with mountain snowberry (*Symphoricarpos oreophilus*) contributing the most cover, other major components include Utah serviceberry (*Amelanchier utahensis*) and black sagebrush (*Artemisia nova*) (Table 20-10.12). The forb species on the site are not diverse, with cover provided mostly by the annual species desert madwort (*Alyssum desertorum*) and perennial forbs being sparse (Table 20-10.11). Grasses are also not diverse, but cover is typical for this ecological type, with muttongrass (*Poa fendleriana*) being the dominant species. There are multiple tree species on the site, namely Utah juniper (*Juniperus osteosperma*), twoneedle pinyon (*Pinus edulis*), and singleleaf pinyon (*P. monophylla*) (Table 20-10.14). The site is currently considered to be within Phase I of woodland succession and it is likely that encroachment will continue to occur. A transition into Phase II of succession would likely repress the understory and shrub communities of this site.

**Trend Summary Tables**

**Table 20-10.6 - 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
2017	15.8	19.5	3.3	16.3	28.7	5.6

**Table 20-10.7 - 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
2017	13	200	40	249	0.1	2.9	0.7	8.2

**Table 20-10.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2017	18.4	-	36.9	18.0	10.5	46.3

**Table 20-10.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency			
2017	6	14	7	3
Year	Days Use Per Acre (ha)			
	2017	4.0 (9.9)	12.1 (29.8)	8.1 (20.1)

**Table 20-10.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency					
2017	40	18	13	88	40	56
year	Average Cover (%)					
2017	0.5	0.1	0.1	1.4	0.2	0.8

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

**Table 20-10.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arenaria macradenia ssp. ferrisiae (Ferris' sandwort)	Astragalus cibirius (browse milkvetch)	Astragalus drummondii (Drummond's milkvetch)	Astragalus utahensis (Utah milkvetch)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Erigeron eatonii (Eaton's fleabane)	Eriogonum racemosum (redroot buckwheat)	Galium aparine <sup>a</sup> (stickywilly)	Hackelia patens (spotted stickseed)	Lupinus argenteus (silvery lupine)
year	Nested Frequency																
2017	15	3	55	44	4	4	2	2	7	6	16	5	27	7	34	2	20
year	Average Cover (%)																
2017	0.1	0.0	0.4	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.1	0.6	0.0	0.3

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

FORB SPECIES	Penstemon watsonii (Watson's penstemon)	Petroradia pumila (rock goldenrod)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Physaria (twinpod)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Trifolium (clover)
year	Nested Frequency						
2017	72	67	92	65	2	3	32
year	Average Cover (%)						
2017	1.9	2.6	1.1	0.6	0.0	0.0	0.1

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

**Table 20-10.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia nova <sup>p</sup> (black sagebrush)	Cercocarpus ledifolius <sup>p</sup> (curl-leaf mountain mahogany)	Cercocarpus montanus <sup>p</sup> (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ephedra viridis <sup>p</sup> (mormon tea)	Ericameria parryi (Parry's rabbitbrush)	Eriogonum microthecum <sup>p</sup> (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Pinus edulis <sup>t</sup> (twoneedle pinyon)	Pinus monophylla <sup>t</sup> (singleleaf pinyon)	Symphoricarpos oreophilus (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)													
2017	6.3	8.5	-	1.2	3.2	0.3	0.1	-	0	0.1	1.9	3.7	25.3	0
year	Quadrat Cover (%)													
2017	6.2	8.0	0.4	0.7	1.9	0.5	0.1	0.0	0.3	0.2	2.0	1.3	17.1	0.0

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



**Table 20-10.13 - 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.

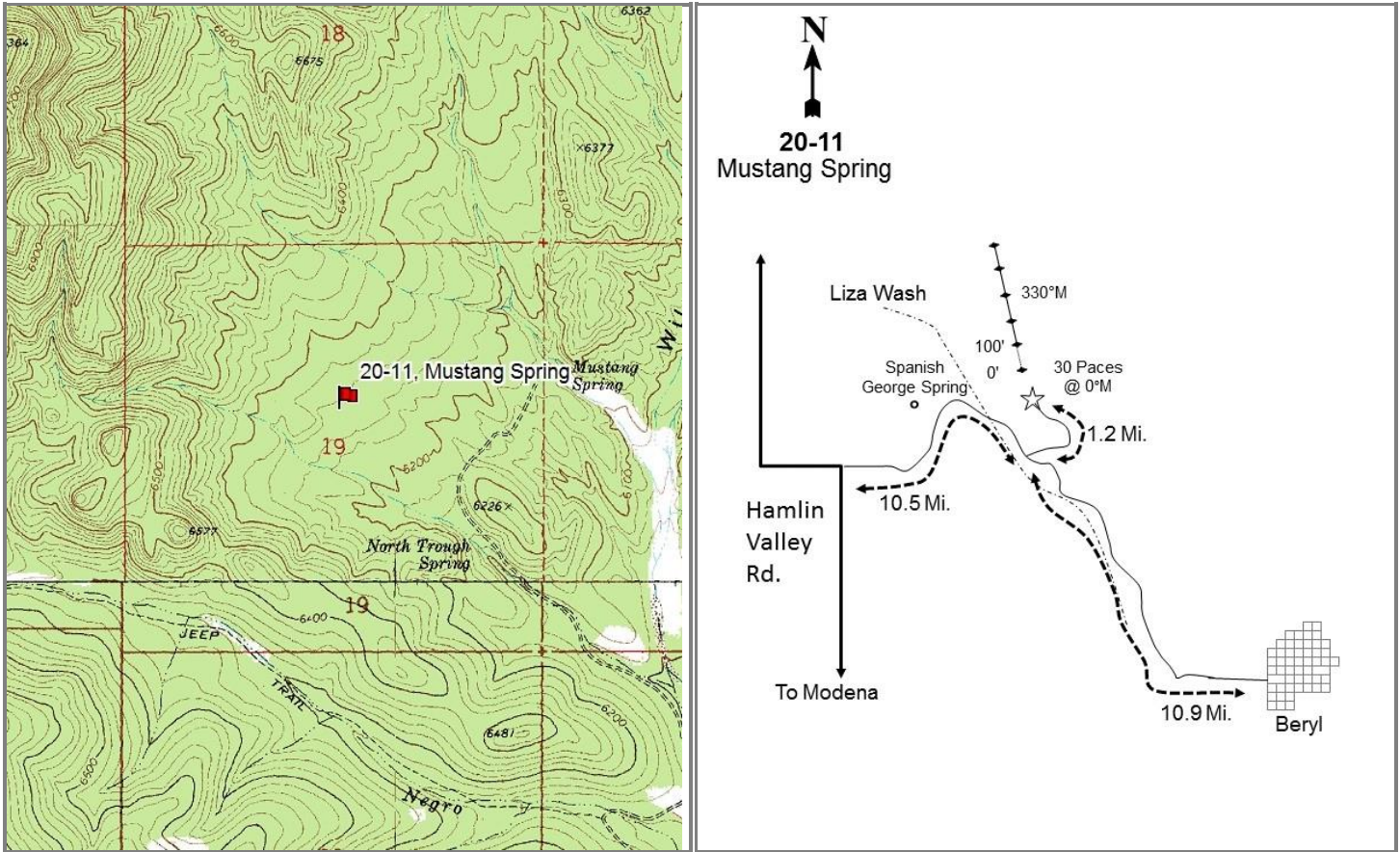
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis <sup>P</sup> -- (Utah serviceberry)									
2017	1200	-	53	43	3	18	57	3	69/99
Artemisia nova <sup>P</sup> -- (black sagebrush)									
2017	3520	360	22	69	10	37	1	7	32/61
Cercocarpus ledifolius <sup>P</sup> -- (curl-leaf mountain mahogany)									
2017	40	-	50	50	0	0	0	0	93/79
Cercocarpus montanus <sup>P</sup> -- (alderleaf mountain mahogany)									
2017	140	-	14	86	0	0	100	0	60/117
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2017	1820	20	3	97	0	1	0	0	30/42
Ephedra viridis <sup>P</sup> -- (mormon tea)									
2017	60	-	0	100	0	33	33	0	58/88
Eriogonum microthecum <sup>P</sup> -- (slender buckwheat)									
2017	60	-	0	67	33	33	67	0	10/22
Ericameria parryi -- (Parry's rabbitbrush)									
2017	340	-	59	41	0	0	77	0	20/20
Gutierrezia sarothrae -- (broom snakeweed)									
2017	380	-	0	100	0	0	0	5	17/25
Juniperus osteosperma <sup>t</sup> -- (Utah juniper)									
2017	20	-	100	0	0	0	0	0	- / -
Mahonia repens -- (creeping barberry)									
2017	700	-	0	100	0	0	0	0	10/10
Opuntia -- (pricklypear)									
2017	-	-	-	-	-	-	-	-	11/10
Pinus edulis <sup>t</sup> -- (twoneedle pinyon)									
2017	100	20	40	60	0	0	0	0	- / -
Pinus monophylla <sup>t</sup> -- (singleleaf pinyon)									
2017	200	20	60	40	0	0	0	0	- / -
Ribes <sup>P</sup> -- (currant)									
2017	-	-	-	-	-	-	-	-	82/78
Symphoricarpos oreophilus -- (mountain snowberry)									
2017	11840	-	8	92	0	44	18	0	23/58
Tetradymia canescens -- (spineless horsebrush)									
2017	40	-	100	0	0	0	50	0	- / -

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

**Table 20-10.14 - 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)							
2017	15	-	9	91	-	-	8.4
Pinus edulis (twoneedle pinyon)							
2017	55	6	50	31	13	-	6.3
Pinus monophylla (singleleaf pinyon)							
2017	84	-	47	32	21	-	8.3

## MUSTANG SPRING - STUDY NO. 20-11



### Location Information

USGS 7.5 min Map Info Steamboat Mountain S; Township 32S, Range 17W, Section 19  
 GPS (0' Stake) NAD 83 UTM ZONE 12, 254580 East 4210210 North

### Transect Information

Browse Tag # (0' Stake) 588  
 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

From the corner of Hamlin Valley Road and Modena Canyon Road, turn onto Spanish George Road. Follow this for 6 miles, and then bear right onto Liza Road. Continue through a small canyon for 4.4 miles until you reach Wilson Canyon Road. Drive on this road for 0.5 miles to a "Y", bear left onto West Fork Wilson Canyon, and drive 1.0 miles to the site.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	SHEEP SPRING
Elevation	6,260ft (1,908m)
Aspect	Southeast
Slope	5-10%
Sample Dates	08/09/2017

**Table 20-11.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	Mustang Spring Bullhog	-	2005	-

**Wildlife Habitat and Vegetation History****Table 20-11.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	substantial	year-long

**Table 20-11.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Rubber Rabbitbrush	Phase I

**Site Notes**

An elk shed was found on the site in 2017. A group of feral horses was also seen on site in the same sample year.

**Soils****Table 20-11.5 - 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
Loam	6.8	42.2	34.1	23.8	6.4	48.0	349.0	0.6	08/09/2017

**Site Potential**

1981 - 2010 Average Annual Precipitation	14 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.

The site was treated with a bullhog in 2005 to reduce tree cover and increase herbaceous production (Table 20-11.1). As of study establishment in 2017, shrubs -- primarily rubber rabbitbrush (*Ericameria nauseosa*) -- are a co-dominant vegetation component along with with annual forbs (Table 20-11.6, Table 20-11.7). Grasses are primarily composed of introduced species, with the perennials crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Thinopyrum intermedium*) being co-dominant with the annual species cheatgrass (*Bromus tectorum*) (Table 20-11.10). The weedy annual forbs common mullein (*Verbascum thapsus*) and prickly Russian thistle (*Salsola tragus*) contribute most of the forb cover (Table 20-11.11). Utah juniper (*Juniperus osteosperma*) has remained on the site (albeit with low density values) as well as in the general vicinity following the treatment (photos, Table 20-11.14). The site experiences heavy utilization by feral horses (Table 20-11.9), which will likely continue the degradation of the system into a rabbitbrush and annual weed state.

**Trend Summary Tables**

**Table 20-11.6 - 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
2017	0.1	6.4	-	-	8.2	-

**Table 20-11.7 - 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
2017	235	217	264	89	2.5	6.1	8.1	2.3

**Table 20-11.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2017	5.6	0.0	67.6	18.2	2.7	20.2

**Table 20-11.9 - 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	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency			
2017	5	1	23	12
Year	Days Use Per Acre (ha)			
	2017	4.7 (11.6)	1.3 (3.3)	42.4 (104.7)

**Table 20-11.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bouteloua gracilis (blue grama)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency							
2017	100	10	35	15	235	24	8	58
year	Average Cover (%)							
2017	2.8	0.3	0.9	0.4	2.5	0.4	0.1	1.4

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

**Table 20-11.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Amaranthus <sup>ai</sup> (pigweed)	Arabis (rockcress)	Chaenactis douglasii (Douglas' dustymaiden)	Cryptantha (cryptantha)	Dalea searlsiae (Searls' prairie clover)	Eriogonum caespitosum (matted buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum racemosum <sup>a</sup> (blackfoot groundsmoke)	Lotus utahensis (Utah bird's-foot trefoil)	Melilotus officinalis <sup>i</sup> (sweetclover)	Physalis (groundcherry)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Salsola tragus <sup>ai</sup> (prickly Russian thistle)	Sanguisorba minor <sup>i</sup> (small burnet)	Sisymbrium altissimum <sup>ai</sup> (tall tumbledustard)	Taraxacum officinale (common dandelion)	Verbascum thapsus <sup>ai</sup> (common mullein)
year	Nested Frequency																
2017	64	7	30	10	19	28	4	12	12	6	1	80	172	1	54	4	63
year	Average Cover (%)																
2017	0.4	0.0	0.8	0.0	0.3	0.8	0.0	0.1	0.2	0.0	0.0	0.6	3.9	0.0	0.7	0.2	2.4

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

**Table 20-11.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Ericameria nauseosa (rubber rabbitbrush)	Polygala subspinososa (spiny milkwort)
year	Line Intercept Cover		
2017	-	8.2	-
year	Quadrat Cover (%)		
2017	0.1	6.3	0.1

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

**Table 20-11.13 - 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 tridentata ssp. wyomingensis <sup>p</sup> -- (Wyoming big sagebrush)									
2017	380	-	0	100	0	0	0	0	59/109
Ericameria nauseosa -- (rubber rabbitbrush)									
2017	9800	260	85	15	0	0	0	0	53/80
Juniperus osteosperma <sup>t</sup> -- (Utah juniper)									
2017	20	-	100	0	0	0	0	0	- / -
Polygala subspinososa -- (spiny milkwort)									
2017	160	-	0	100	0	0	0	0	3/7
Purshia tridentata <sup>p</sup> -- (antelope bitterbrush)									
2017	-	-	-	-	-	-	-	-	29/66

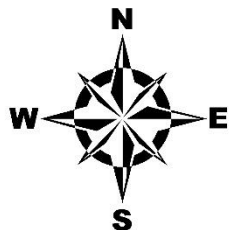
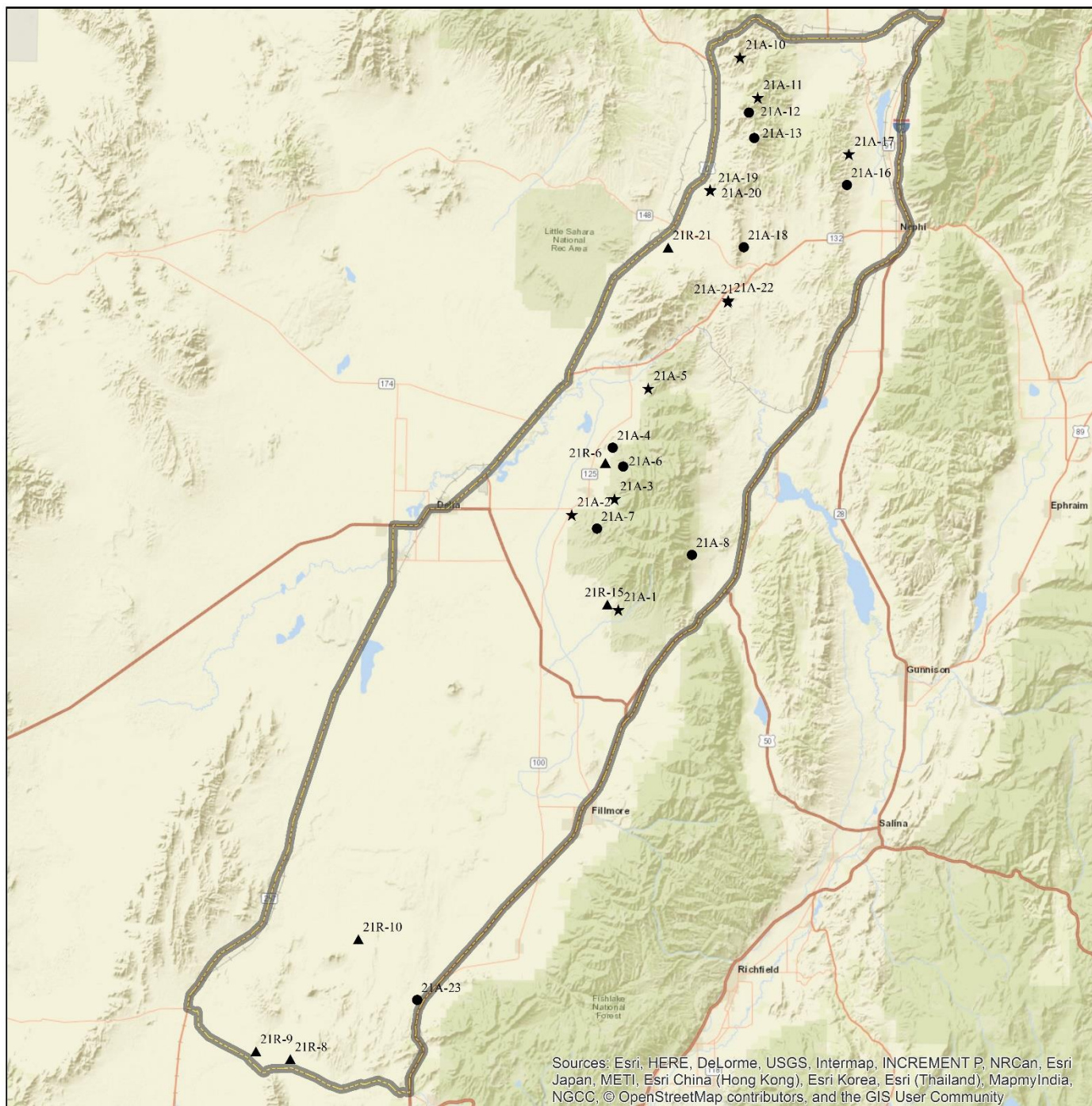
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 20-11.14 - 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)							
2017	8	-	13	50	25	13	20.1



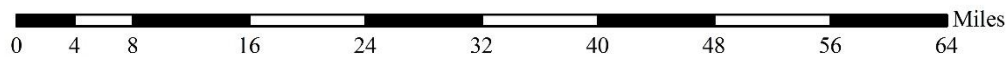
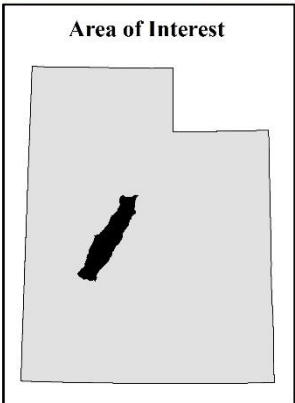
# WILDLIFE MANAGEMENT UNIT 21A - OAK CREEK FILLMORE



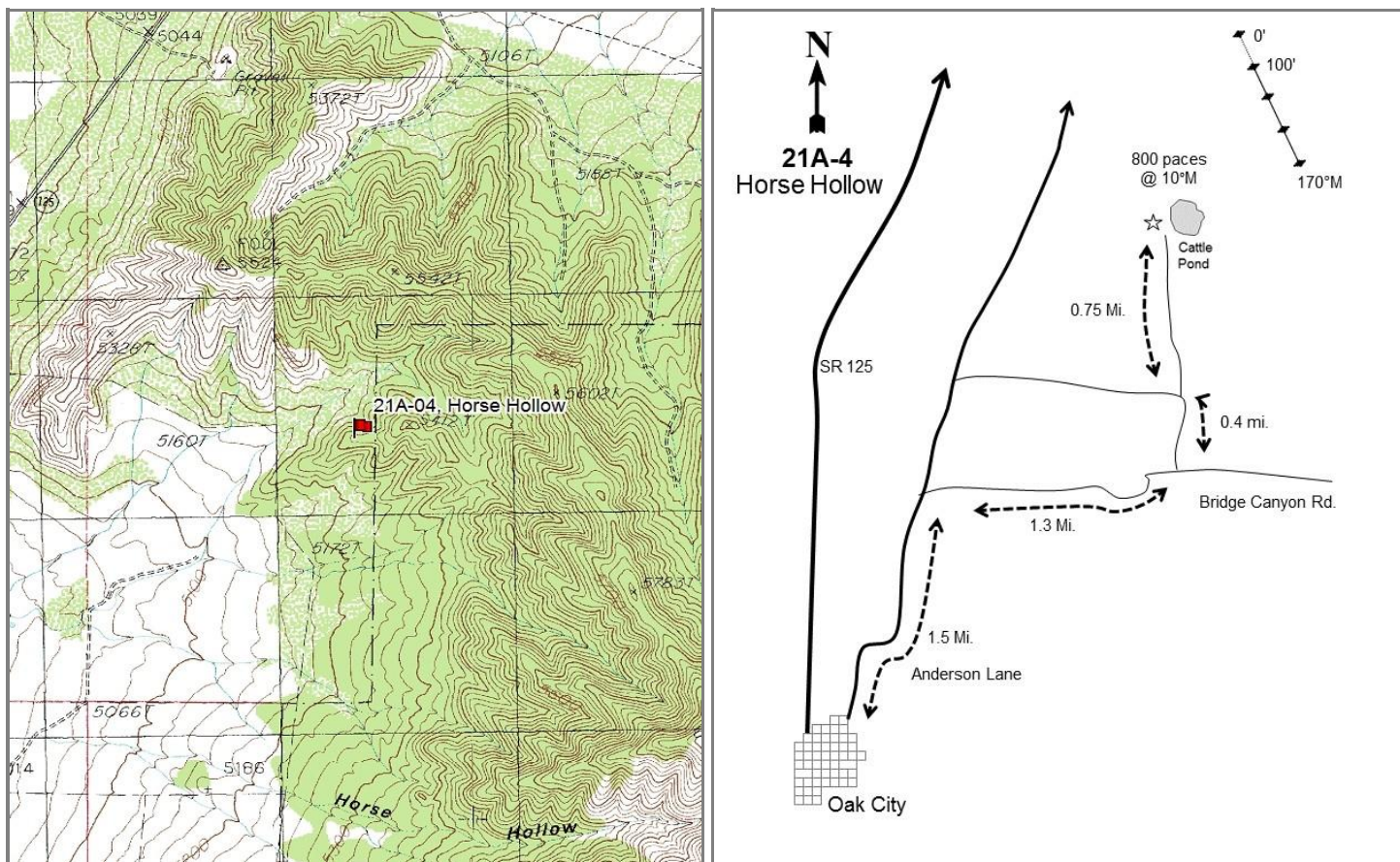
**Study Location  
Project, Status**

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

Unit - 21A



## HORSE HOLLOW - STUDY NO. 21A-4

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Oak City North SE; Township 16S, Range 4W, Section 16  
NAD 83 UTM ZONE 12, 388269 East 436557 North

**Transect Information**

Browse Tag # (0' Stake)	7067
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**

Proceed north from Oak City on Anderson Lane. Drive north for 1.5 miles to Bridge Canyon Road and turn right. Proceed on this road for 1.30 miles, then cross a wash and turn left at a fork. Proceed 0.4 miles to a cattle watering hole and follow a faint road right (north) for 0.75 miles to a water pond. Park here and hike north for 0.6 miles to the site; the 0-foot stake is located at the top of the hill.



**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	Fool Creek Allotment
Elevation	5,300ft (1,615m)
Aspect	South
Slope	25-30%
Sample Dates	08/26/1998, 05/13/2003, 05/22/2007, 06/14/2017

**Table 21A-04.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Clay Springs Fire	-	June-August 2012	107847
Fire - Wildfire	Devils Den Fire	-	August 2006	14371
Seeding - Aerial After	Devils Den	660	December 2006	7852

**Table 21A-04.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Devil's Den			Aerial	Dec 2006	3976
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
G	Agropyron cristatum	Crested Wheatgrass	CDII	1.01	0.88
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	0.99	0.81
G	Dactylis glomerata	Orchardgrass	Paiute	0.12	0.11
G	Dactylis glomerata	Orchardgrass	Paiute	0.13	0.11
G	Poa secunda	Canby Bluegrass	Canbar	0.25	0.22
G	Poa secunda	Sandberg Bluegrass	Toole MT	0.25	0.21
F	Achillea millefolium	Western Yarrow		0.10	0.10
F	Medicago sativa	Alfalfa	Ladak	0.38	0.36
F	Medicago sativa	Alfalfa	Ladak	0.28	0.25
F	Medicago sativa	Alfalfa	Ranger	0.67	0.58
F	Medicago sativa	Alfalfa	Spredor 4	0.65	0.62
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Sanpete UT	0.44	0.10
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Beaver UT	0.55	0.15
Mix Name			Application Type	Application Date	Acres
Devil's Den Sagebrush			Aerial	Dec 2006	3876
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
		Rice Hulls		0.10	0.00
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Beaver UT	0.55	0.15
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Beaver UT	0.45	0.10

**Wildlife Habitat and Vegetation History****Table 21A-04.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	substantial	winter

**Table 21A-04.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Wyoming Big Sagebrush/Juniper	Phase I transitioning to Phase II
1991	Wyoming Big Sagebrush/Juniper	Phase I transitioning to Phase II
1998	Wyoming Big Sagebrush/Juniper	Phase I transitioning to Phase II
2003	Wyoming Big Sagebrush/Juniper	Phase I transitioning to Phase II
2007	Annual Grass/Juniper	Phase I
2012	Perennial Grass/Juniper	Phase I
2017	Annual-Perennial Grass/Juniper	Phase I

**Site Notes**

No Notes

**Soils****Table 21A-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
Sandy Loam	7.1	54.9	25.8	19.3	1.3	3.3	105.6	0.5	08/26/1998

**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.

When this site was established in 1985, it was a Utah juniper (*Juniperus osteosperma*) and Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) mixed community. In 2006, the site burned and when it was read in 2007, it had transitioned to a juniper and annual grass community (Community State 3, Table 2-39.6, NRCS-2017). The site burned again in 2012 during the Clay Springs Fire and was treated with anchor chaining and seed. The perennial grass community is presently co-dominant with annual grasses (Table 21A-4.10). Forbs are relatively diverse, but sparse in distribution (Table 21A-4.11). Juniper is still present on the site and was diminished in the fires, although tree cover has increased since the last fire in 2012 (21A-4.6).

**Trend Summary Tables****Table 21A-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
1998	3.0	1.7	6.2	-	-	1.2
2003	5.0	0.9	8.5	5.4	1.0	8.0
2007	0.4	0.2	4.7	1.0	-	1.4
2017	1.2	1.8	4.5	2.0	1.0	7.7

**Table 21A-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
1998	418	123	-	15	12.6	3.0	-	0.1
2003	274	156	12	21	3.5	5.2	0.0	0.1
2007	388	91	58	11	13.8	1.8	1.1	0.0
2017	348	169	221	36	10.4	9.6	3.4	0.5

**Table 21A-04.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	14.6	3.9	34.3	30.2	12.6	25.1
2003	20.0	6.8	28.1	25.9	14.6	22.6
2007	21.8	3.9	24.0	25.1	17.1	21.2
2017	30.2	2.2	28.2	20.9	18.9	30.1

**Table 21A-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		
1998	-	19	23
2003	-	6	34
2007	-	8	43
2017	1	1	8
Year	Days Use Per Acre (ha)		
1998	2.2 (5.4)	7.4 (18.2)	-
2003	-	2.7 (6.6)	-
2007	-	4.0 (9.9)	-
2017	5.1 (12.6)	4.7 (11.6)	-

**Table 21A-04.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Pleuraphis jamesii (James' galleta)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Secale cereale <sup>ai</sup> (cereal rye)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency									
1998	14	-	417	2	6	85	19	5	-	-
2003	21	-	274	-	9	113	40	-	-	-
2007	11	-	388	-	10	43	33	-	-	-
2017	15	24	348	3	23	17	54	-	17	43
year	Average Cover (%)									
1998	0.1	-	12.6	0.1	0.1	2.1	0.7	0.0	-	-
2003	0.6	-	3.5	-	0.0	3.4	1.2	-	-	-
2007	0.1	-	13.8	-	0.3	0.3	1.1	-	-	-
2017	0.5	0.9	10.4	0.0	1.2	0.2	3.0	-	0.7	3.1

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

**Table 21A-04.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis drummondii (Drummond's rockcress)	Astragalus (milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Cryptantha (cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Eriogonum cernuum <sup>a</sup> (nodding buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Gilia inconspicua <sup>a</sup> (shy gilia)	Hymenopappus filifolius (fineleaf hymenopappus)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lomatium (desertparsley)
year	Nested Frequency																
1998	-	-	-	5	-	-	7	-	-	-	-	-	-	-	-	-	-
2003	-	-	2	-	3	4	1	-	-	2	-	6	-	5	5	-	1
2007	-	3	-	-	-	3	5	-	-	2	14	31	4	2	-	-	-
2017	4	1	2	-	-	-	17	2	2	6	3	64	144	-	-	23	-
year	Average Cover (%)																
1998	-	-	-	0.0	-	-	0.0	-	-	-	-	-	-	-	-	-	-
2003	-	-	0.0	-	0.0	0.0	0.0	-	-	0.0	-	0.0	-	0.0	0.0	-	0.0
2007	-	0.0	-	-	-	0.0	0.0	-	-	0.4	0.6	0.1	0.0	0.0	-	-	-
2017	0.0	0.0	0.0	-	-	-	0.1	0.0	0.0	0.0	0.0	0.6	2.0	-	-	0.1	-

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

FORB SPECIES						
Oenothera caespitosa (tufted evening primrose)						
Phlox longifolia (longleaf phlox)						
Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)						
Sphaeralcea munroana (Munro's globemallow)						
Tragopogon dubius <sup>ai</sup> (yellow salsify)						
Zigadenus paniculatus (foothill deathcamas)						
year	Nested Frequency					
1998	-	3	-	-	-	-
2003	-	4	-	-	-	1
2007	-	2	3	-	-	1
2017	4	-	22	7	3	2
year	Average Cover (%)					
1998	-	0.0	-	-	-	-
2003	-	0.0	-	-	-	0.0
2007	-	0.0	0.0	-	-	0.0
2017	0.0	-	0.7	0.3	0.0	0.0

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

**Table 21A-04.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES						
Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)						
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)						
Ephedra nevadensis <sup>p</sup> (Nevada jointfir)						
Gutierrezia sarothrae (broom snakeweed)						
Juniperus osteosperma <sup>t</sup> (Utah juniper)						
Purshia stansburiana <sup>p</sup> (Stansbury cliffrose)						
year	Line Intercept Cover (%)					
1998	-	-	-	-	-	-
2003	3.9	0.2	0.7	0.8	8	0.8
2007	-	0	1	0	1.4	-
2017	-	-	2	1	7.7	-
year	Quadrat Cover (%)					
1998	2.1	0.2	0.9	1.5	6.2	-
2003	3.8	0.3	0.7	0.6	8.5	0.5
2007	-	0.0	0.4	0.2	4.7	-
2017	-	-	1.2	1.8	4.5	-

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

**Table 21A-04.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

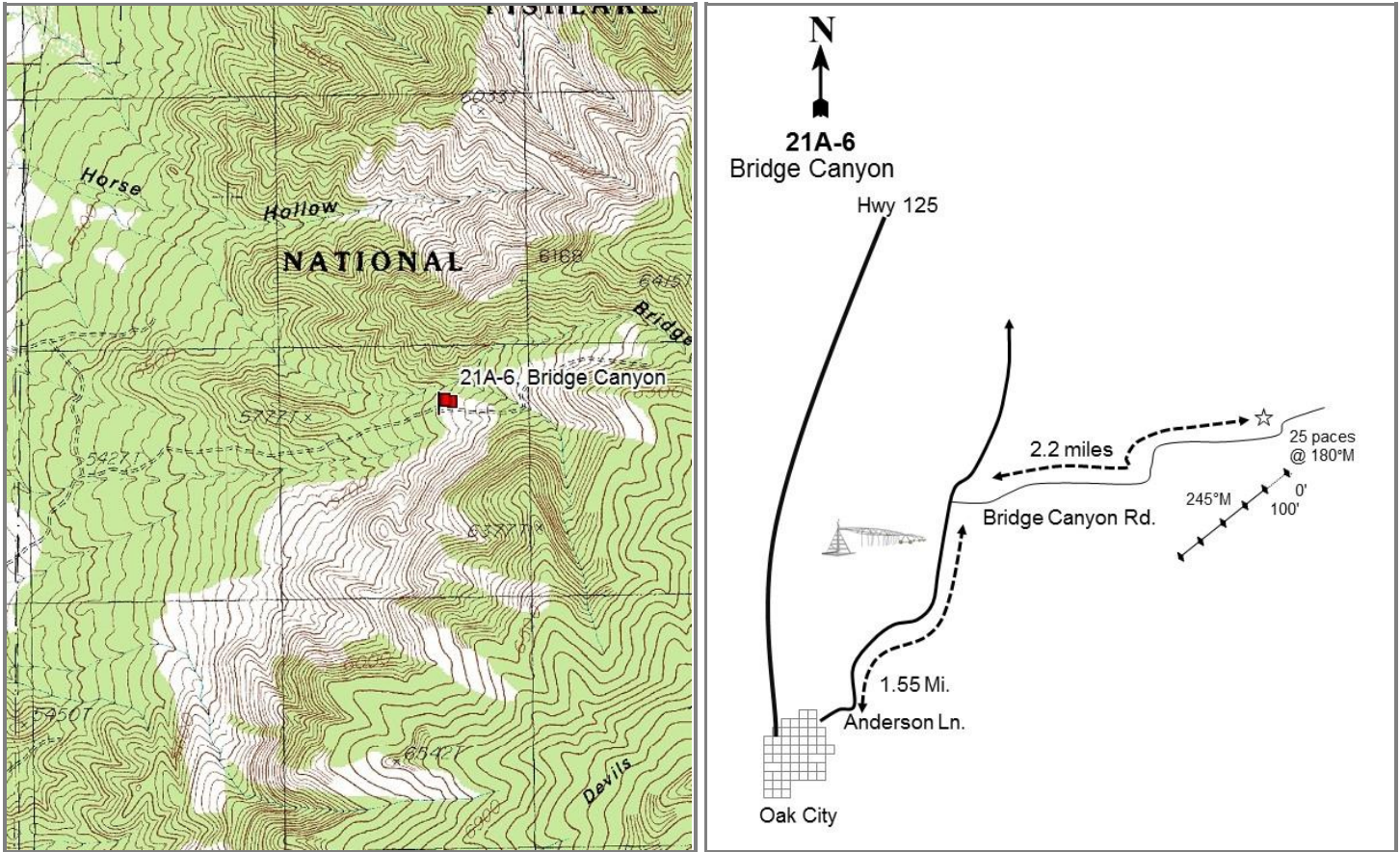
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. wyomingensis<sup>p</sup> -- (Wyoming big sagebrush)</b>									
1998	920	-	4	56	39	44	4	48	53/84
2003	640	-	0	53	47	3	3	19	60/94
2007	-	-	-	-	-	-	-	-	59/67
2017	-	-	-	-	-	-	-	-	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1998	560	-	0	89	11	25	18	100	25/45
2003	280	-	0	57	43	0	0	14	18/30
2007	40	-	0	0	100	0	0	100	11/17
2017	20	-	100	0	0	0	0	0	42/47
<b>Ephedra nevadensis<sup>p</sup> -- (Nevada jointfir)</b>									
1998	100	-	0	100	0	100	0	0	41/89
2003	420	-	0	29	71	29	19	19	38/50
2007	40	-	100	0	0	0	0	0	31/123
2017	620	-	3	94	3	45	55	3	39/62
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1998	-	-	-	-	-	-	-	-	46/83
2003	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1998	2500	-	3	93	4	7	3	98	19/27
2003	600	-	3	90	7	0	0	7	15/24
2007	100	700	40	60	0	0	0	20	14/17
2017	1020	-	14	86	0	0	0	0	26/41
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1998	80	40	50	50	0	0	0	0	- / -
2003	120	-	17	83	0	0	0	0	- / -
2007	40	-	0	50	50	0	0	50	- / -
2017	20	-	0	100	0	0	0	0	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1998	20	-	0	100	0	0	0	0	25/56
2003	20	-	0	100	0	0	0	0	11/41
2007	-	-	-	-	-	-	-	-	4/9
2017	-	-	-	-	-	-	-	-	18/60
<b>Purshia stansburiana<sup>p</sup> -- (Stansbury cliffrose)</b>									
1998	20	-	0	100	0	0	0	0	44/50
2003	40	-	0	50	50	50	50	0	57/50
2007	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Tetradymia spinosa -- (shortspine horsebrush)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	46/94

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

**Table 21A-04.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
1998	85	-	-	-	-	-	21.1
2003	81	5	21	26	5	42	20.2
2007	23	-	18	27	36	18	32.3
2017	13	-	11	11	33	44	32.0

## BRIDGE CANYON - STUDY NO. 21A-6

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Oak City North SE; Township 16S, Range 4W, Section 22  
NAD 83 UTM ZONE 12, 389709 East 4362923 North

**Transect Information**

Browse Tag # (0' Stake)	139
Transect Bearing	245° 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 Highway 125 to Oak City. From W 100 N, proceed east for 1 block to N 100 E. Follow this road out of town until it turns into N Anderson Lane. From the north edge of town, drive for 2.2 miles to Bridge Canyon Road. Turn right and drive for 1.6 miles up to the site, which is approximately 75 feet away on the south side of the road.



**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	Oak Creek Allotment
Elevation	5,826ft (1,776m)
Aspect	Southwest
Slope	10%
Sample Dates	06/20/2017

**Table 21A-06.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Clay Springs Fire	-	June-August 2012	107847
Fire - Wildfire	Devils Den Fire	-	August 2006	14371
Fire - Wildfire	Clay Springs Fire	-	1981	15840
Seeding - Aerial After	Devils Den Fire Rehab	660	December 2006	3976

**Table 21A-06.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name		Application Type	Application Date	Acres	
Devil's Den		Aerial	Dec 2006	3976	
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
G	Agropyron cristatum	Crested Wheatgrass	CDII	1.01	0.88
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	0.99	0.81
G	Dactylis glomerata	Orchardgrass	Paiute	0.12	0.11
G	Dactylis glomerata	Orchardgrass	Paiute	0.13	0.11
G	Poa secunda	Canby Bluegrass	Canbar	0.25	0.22
G	Poa secunda	Sandberg Bluegrass	Toole MT	0.25	0.21
F	Achillea millefolium	Western Yarrow		0.10	0.10
F	Medicago sativa	Alfalfa	Ladak	0.38	0.36
F	Medicago sativa	Alfalfa	Ladak	0.28	0.25
F	Medicago sativa	Alfalfa	Ranger	0.67	0.58
F	Medicago sativa	Alfalfa	Spredor 4	0.65	0.62
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Sanpete UT	0.44	0.10
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Beaver UT	0.55	0.15
Mix Name		Application Type	Application Date	Acres	
Devil's Den Sagebrush		Aerial	Dec 2006	3876	
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
		Rice Hulls		0.10	0.00
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Beaver UT	0.55	0.15
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Beaver UT	0.45	0.10

**Wildlife Habitat and Vegetation History****Table 21A-06.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
California Bighorn	substantial	year-long
Deer	substantial	winter

**Table 21A-06.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Perennial Grass	No Encroachment

**Site Notes**

No Notes

**Soils****Table 21A-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	6.8	46.2	33.1	20.8	3.3	24.0	392.0	0.5	06/20/2017

**Site Potential**

1981 - 2010 Average Annual Precipitation	14 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.

Established in 2017, this site is an Upland Gravelly Loam (Wyoming Big Sagebrush) ecological site. It is currently in a perennial grass/broom snakeweed (*Gutierrezia sarothrae*) ecological state. Wildfires have occurred on the site in 1981, 2006 and 2012, all prior to establishment. It is likely that the site existed in Community Phase 2 prior to the wildfires, which is a sagebrush/perennial grass state. The site is currently in Community Phase 2.1 (Shrubs/Invasive Plants/Native Perennials), which is likely to continue unless there is an event to move the site back to Community State 2 (USDA- NRCS, 2017). The site is now dominated by both native and introduced perennial grasses. Most of the perennial grass cover is provided by bluebunch wheatgrass (*Pseudoroegneria spicata*), bulbous bluegrass (*Poa bulbosa*), and purple threeawn (*Aristida purpurea*) (Table 21A-06.10). Forbs are not diverse, but the cover is high and primarily driven by redstem storksbill (*Erodium cicutarium*) (Table 21A-06.11).

**Trend Summary Tables****Table 21A-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
2017	-	1.4	-	-	3.6	-

**Table 21A-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
2017	183	385	418	10	2.9	28.8	15.5	0.1

**Table 21A-06.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2017	15.8	0.4	27.1	23.3	10.3	50.3

**Table 21A-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
	2017	12	4
Year	Days Use Per Acre (ha)		
2017	15.3 (37.7)	-	-

**Table 21A-06.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bromus tectorum <sup>ni</sup> (cheatgrass)	Pleuraphis jamesii (James' galleta)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency							
2017	66	163	183	40	196	12	174	44
year	Average Cover (%)							
2017	1.8	6.5	2.9	1.6	4.3	0.1	13.1	1.5

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

**Table 21A-06.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Draba <sup>a</sup> (draba)	Eriogonum racemosum (redroot buckwheat)	Erodium cicutarium <sup>ii</sup> (redstem stork's bill)	Helianthus annuus <sup>a</sup> (common sunflower)	Lactuca serriola <sup>ii</sup> (prickly lettuce)	Lomatium (desertparsley)	Phlox longifolia (longleaf phlox)	Tragopogon dubius <sup>ii</sup> (yellow salsify)
year	Nested Frequency								
2017	11	34	2	415	1	10	7	1	24
year	Average Cover (%)								
2017	0.1	0.1	0.0	15.2	0.0	0.0	0.0	0.0	0.1

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

**Table 21A-06.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Gutierrezia sarothrae (broom snakeweed)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept Cover (%)	
2017	3.6	-
year	Quadrat Cover (%)	
2017	1.4	0.0

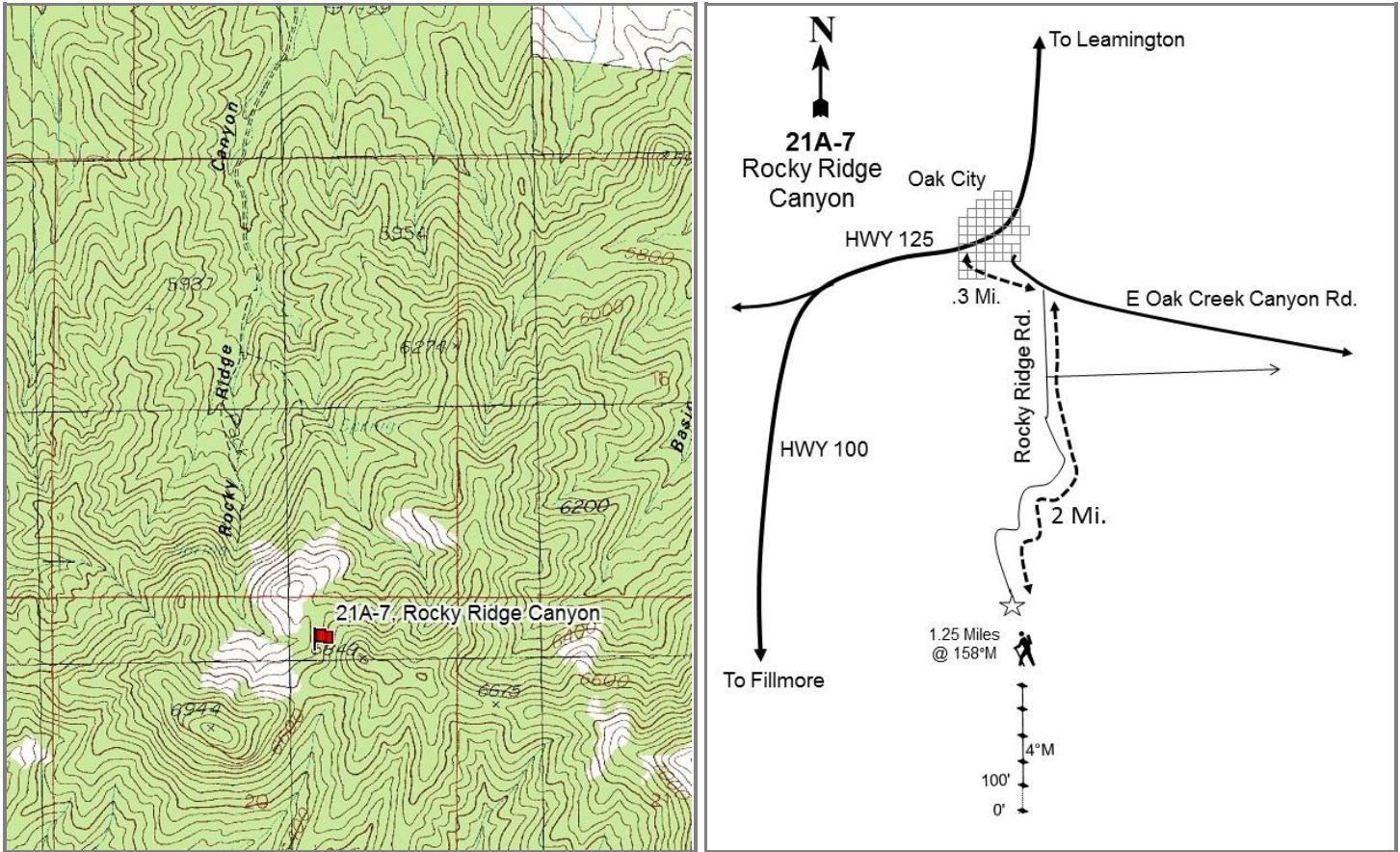
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 21A-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 (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
2017	1320	80	15	85	0	0	0	0	26/48
Opuntia polyacantha -- (plains pricklypear)									
2017	20	-	0	100	0	0	0	0	21/72

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

## ROCKY RIDGE CANYON - STUDY NO. 21A-7



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Oak City South NW; Township 17S, Range 4W, Section 20  
NAD 83 UTM ZONE 12, 386046 East 4354267 North

### Transect Information

Browse Tag # (0' Stake)	579
Transect Bearing	4° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

### Directions to Site

From Oak City, take E. Oak Creek Canyon road for 1/4 mile to the Rocky Ridge Road, and then drive 2 miles south to the end of the road near the base of the hill. Park here and hike 3/4 of a mile to a small bowl at the top of the ridge; the site is located on the east side of this small bowl.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	Oak Creek Allotment
Elevation	6,578ft (2,005m)
Aspect	West
Slope	25%
Sample Dates	06/14/2017

**Table 21A-07.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Clay Springs Fire	-	June-August 2012	107847
Fire - Wildfire	Clay Springs Fire	-	1981	15840

**Wildlife Habitat and Vegetation History****Table 21A-07.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
California Bighorn	substantial	year-long
Deer	substantial	summer

**Table 21A-07.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Mixed Mountain Brush	Phase I

**Site Notes**

Two bucks were noted on the site in 2017.

**Soils****Table 21A-07.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.1	50.2	25.1	24.8	3.5	7.0	209.0	0.5	06/14/2017

**Site Potential**

1981 - 2010 Average Annual Precipitation	14 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.

At the time of establishment in 2017, this site was a mountain brush community type. Much of the mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) component of this ecological type is no longer present on the site due to multiple fires that have burned in this area, with the most recent occurring in 2012. The browse species on this site are shrubs that are resilient to fire, with alderleaf mountain mahogany (*Cercocarpus montanus*) supplying the most cover (Table 21A-7.12). Perennial forbs are diverse and plentiful, with the most cover provided by arrowleaf balsamroot (*Balsamorhiza sagittata*) (Table 21A-7.11). There is good cover provided by perennial grasses, with cover predominantly contributed by bluebunch wheatgrass (*Pseudoroegneria spicata*) (Table 21A-7.10). This community will likely remain in this state without further disturbance, and in time sagebrush cover could return to the site if there are no further vegetation-removing disturbances.

**Trend Summary Tables**

**Table 21A-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
2017	9.2	3.2	-	13.0	3.0	-

**Table 21A-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
2017	267	340	110	210	7.6	23.1	0.7	12.4

**Table 21A-07.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2017	16.4	0.2	41.7	8.4	24.3	49.8

**Table 21A-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	Mule Deer		Rocky Mountain Elk	
	Quadrat Frequency			
2017	9		-	
Year	Days Use Per Acre (ha)			
	2017		2.0 (5.0)	

**Table 21A-07.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achmatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ni</sup> (field brome)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus tectorum <sup>ni</sup> (cheatgrass)	Hesperosipa comata (needle and thread)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency									
2017	10	1	208	51	210	4	95	80	248	13
year	Average Cover (%)									
2017	0.2	0.0	2.3	2.6	5.3	0.1	4.2	1.6	14.0	0.3

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



**Table 21A-07.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Arabis (rockcress)	Arenaria (sandwort)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Crepis acuminata (tapertip hawkbeard)	Cryptantha <sup>a</sup> (annual cryptantha)	Cryptantha (cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Erigeron pumilus (shaggy fleabane)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Gilia inconspicua <sup>a</sup> (shy gilia)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Linum perenne <sup>i</sup> (blue flax)	Lomatium (desertparsley)
year	Nested Frequency																
2017	38	7	7	85	21	81	31	3	3	16	1	4	13	3	3	4	52
year	Average Cover (%)																
2017	0.2	0.0	0.7	9.1	0.0	0.4	1.1	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.1	0.3

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

FORB SPECIES	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Phlox longifolia (longleaf phlox)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency					
2017	6	5	1	74	5	5
year	Average Cover (%)					
2017	0.2	0.2	0.0	0.5	0.1	0.0

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

**Table 21A-07.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Cercocarpus montanus <sup>p</sup> (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Quercus gambelii <sup>p</sup> (Gambel oak)
year	Line Intercept Cover (%)			
2017	9.9	2.8	0.2	3.1
year	Quadrat Cover (%)			
2017	6.2	3.1	0.0	3.0

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

**Table 21A-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.

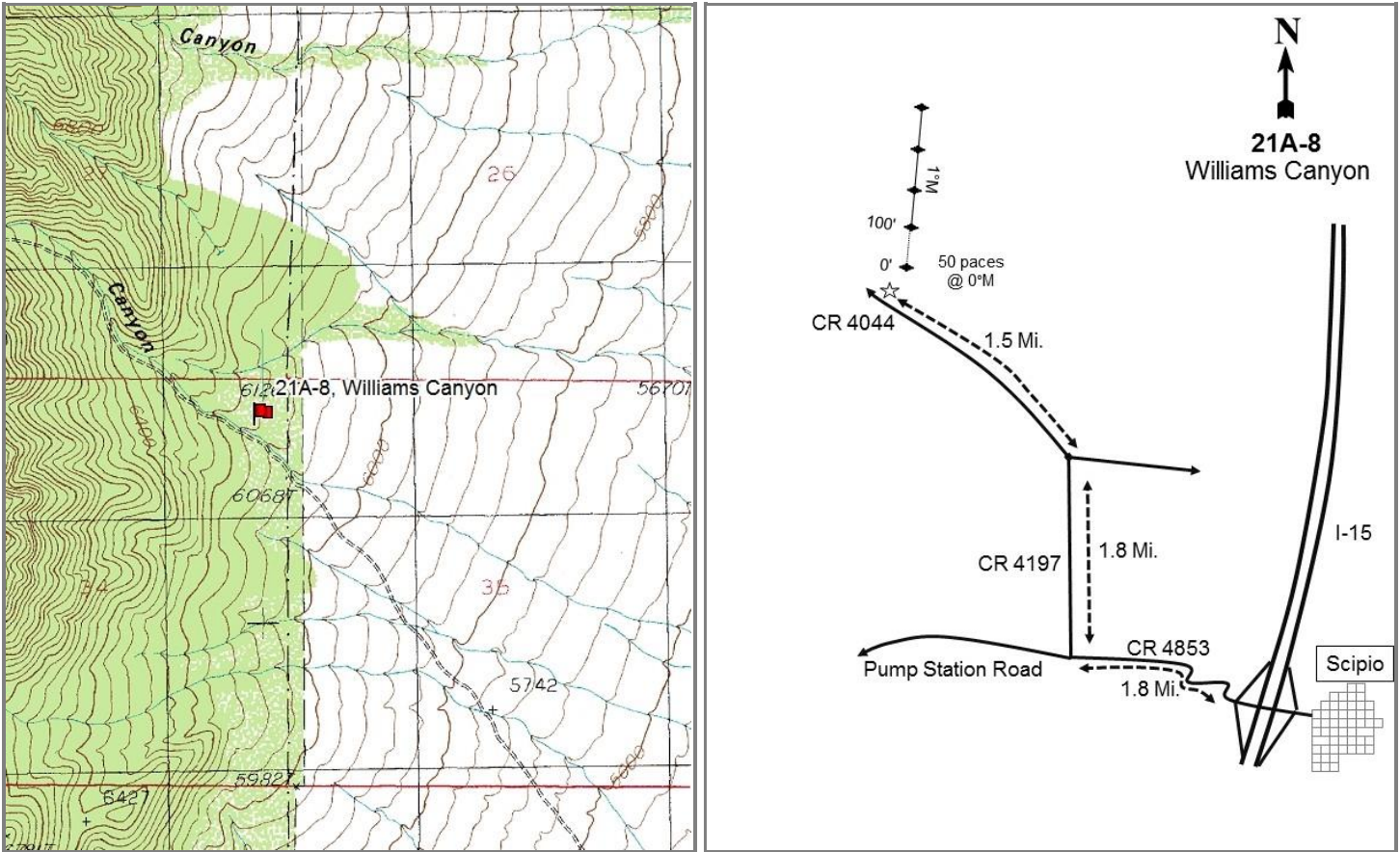
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana <sup>P</sup> -- (mountain big sagebrush)									
2017	60	-	67	33	0	33	0	33	15/12
Cercocarpus montanus <sup>P</sup> -- (alderleaf mountain mahogany)									
2017	1880	-	0	97	3	22	14	2	61/81
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2017	900	-	0	100	0	0	0	0	39/63
Gutierrezia sarothrae -- (broom snakeweed)									
2017	200	-	0	100	0	80	0	80	19/27
Quercus gambelii <sup>P</sup> -- (Gambel oak)									
2017	800	-	0	100	0	0	0	25	59/63

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

**Table 21A-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)							
2017	1	-	-	-	-	100	33.0

## WILLIAMS CANYON - STUDY NO. 21A-8



### Location Information

USGS 7.5 min Map Info	Williams Peak SE; Township 17S, Range 3W, Section 34
GPS (0' Stake)	NAD 83 UTM ZONE 12, 399306 East 4350578 North

### Transect Information

Browse Tag # (0' Stake)	125
Transect Bearing	1° 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 the Scipio exit (exit 188) off I-15, turn west onto County Road 4558, and continue for 2.5 miles through several right-angle turns. At County Road 4044, turn left and proceed for approximately 2.8 miles to the site. The site is 200 feet to the north of the road.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	Dry Creek Allotment
Elevation	6,167ft (1,880m)
Aspect	East
Slope	10%
Sample Dates	06/20/2017

**Table 21A-08.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Aerial Before	Clay Springs Fire Rehab	2454	Fall 2012	13505

**Table 21A-08.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Clay Springs Chaining			Aerial	Oct 2012	1522
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
G	Agropyron cristatum	Crested Wheatgrass		2.04	1.92
G	Dactylis glomerata	Orchardgrass		1.31	1.15
G	Elymus lanceolatus	Thickspike wheatgrass		3.02	2.85
G	Elymus wawawaiensis	Snake River wheatgrass		0.99	0.92
G	Poa secunda	Sandberg bluegrass		1.18	1.12
G	Poa secunda	Big bluegrass		0.72	0.63
G	Pseudoroegneria spicata	Bluebunch Wheatgrass		2.00	1.86
F	Linum perenne	Blue Flax	Appar	0.49	0.47
F	Medicago sativa	Alfalfa	Ladak NC	2.00	1.88
F	Penstemon strictus	Rocky Mountain Penstemon	Bandera	0.13	0.11
F	Sanguisorba minor	Small Burnet	Delar	1.51	1.46
Mix Name			Application Type	Application Date	Acres
Clay Springs - Shrub Mix			Aerial	Feb 2013	8273
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
F	Medicago sativa	Alfalfa	Ladak DL	0.12	0.11
F	Medicago sativa	Alfalfa	Ladak NC	0.39	0.33
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Sevier UT	0.15	0.03
S	Bassia prostrata	Forage Kochia	Beaver UT	0.05	0.04
S	Bassia prostrata	Forage Kochia	Beaver/Millard UT	0.27	0.17
S	Bassia prostrata	Forage Kochia	Beaver UT	0.16	0.09
S	Bassia prostrata	Forage Kochia	Beaver UT	0.17	0.12

**Wildlife Habitat and Vegetation History****Table 21A-08.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
California Bighorn	substantial	year-long
Deer	substantial	winter

**Table 21A-08.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Annual Grass/Mountain Big Sagebrush	Phase I

**Site Notes**

No Notes

**Soils****Table 21A-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	6.5	48.2	29.7	22.1	4.6	11.0	154.0	0.4	06/20/2017

**Site Potential**

1981 - 2010 Average Annual Precipitation 16 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 this site was established in 2017, it was in an annual grass and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community state. The site was treated as part of a fire rehabilitation project, but did not actually burn: this treatment potentially introduced crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Thinopyrum intermedium*) through aerial seeding. Introduced annual and perennial grasses, namely cheatgrass (*Bromus tectorum*) and bulbous bluegrass (*Poa bulbosa*), dominate the herbaceous understory; forbs are sparse (Table 21A-08.7, Table 21A-08.10, Table 21A-08.11). Mountain big sagebrush and antelope bitterbrush (*Purshia tridentata*) provide a majority of the browse species cover. The presence of Utah juniper (*Juniperus osteosperma*), while low, indicates that there is potential for future encroachment (Table 21A-8.14).

**Trend Summary Tables**

**Table 21A-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
2017	19.5	-	-	32.4	-	0.8

**Table 21A-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
2017	375	355	290	63	22.8	19.7	5.2	1.0

**Table 21A-08.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2017	3.5	0.1	52.9	4.7	11.3	62.4

**Table 21A-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	Rocky Mountain Elk	Rabbit
	2017	7	6	1
Year	Days Use Per Acre (ha)			
2017	3.6 (9.0)	11.4 (28.1)	-	-

**Table 21A-08.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus tectorum <sup>ni</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency							
2017	91	109	375	4	112	123	53	113
year	Average Cover (%)							
2017	1.5	3.2	22.8	0.1	5.8	4.0	1.9	3.3

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

**Table 21A-08.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Crepis acuminata (tapertip hawksbeard)	Draba <sup>a</sup> (draba)	Eriogonum racemosum (redroot buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Lathyrus brachycalyx (Bonneville pea)	Lomatium (desertparsley)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (steepy silene)	Sphaeralcea coccinea (scarlet globemallow)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	unknown annual forb <sup>a</sup> (unknown forb)
year	Nested Frequency																
2017	5	46	4	1	159	1	20	5	149	22	12	7	7	47	11	4	9
year	Average Cover (%)																
2017	0.0	0.2	0.0	0.0	0.6	0.0	0.0	0.1	3.7	0.4	0.3	0.0	0.0	0.7	0.2	0.0	0.0

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

**Table 21A-08.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Juniperus osteosperma <sup>a</sup> (Utah juniper)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)
year	Line Intercept Cover		
2017	21.2	0.8	11.2
year	Quadrat Cover (%)		
2017	15.1	0.0	4.3

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

**Table 21A-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 tridentata ssp. vaseyana <sup>p</sup> -- (mountain big sagebrush)									
2017	1560	40	3	80	18	13	0	35	93/132
Bassia prostrata <sup>pi</sup> -- (forage kochia)									
2017	20	-	0	100	0	0	0	0	13/22
Echinocereus -- (hedgehog cactus)									
2017	-	-	-	-	-	-	-	-	9/37
Gutierrezia sarothrae -- (broom snakeweed)									
2017	-	-	-	-	-	-	-	-	24/35
Juniperus osteosperma <sup>t</sup> -- (Utah juniper)									
2017	20	-	0	100	0	0	0	0	- / -
Opuntia polyacantha -- (plains pricklypear)									
2017	-	-	-	-	-	-	-	-	17/47
Purshia tridentata <sup>p</sup> -- (antelope bitterbrush)									
2017	440	-	0	100	0	77	0	0	124/223
Quercus gambelii <sup>p</sup> -- (Gambel oak)									
2017	-	-	-	-	-	-	-	-	81/152

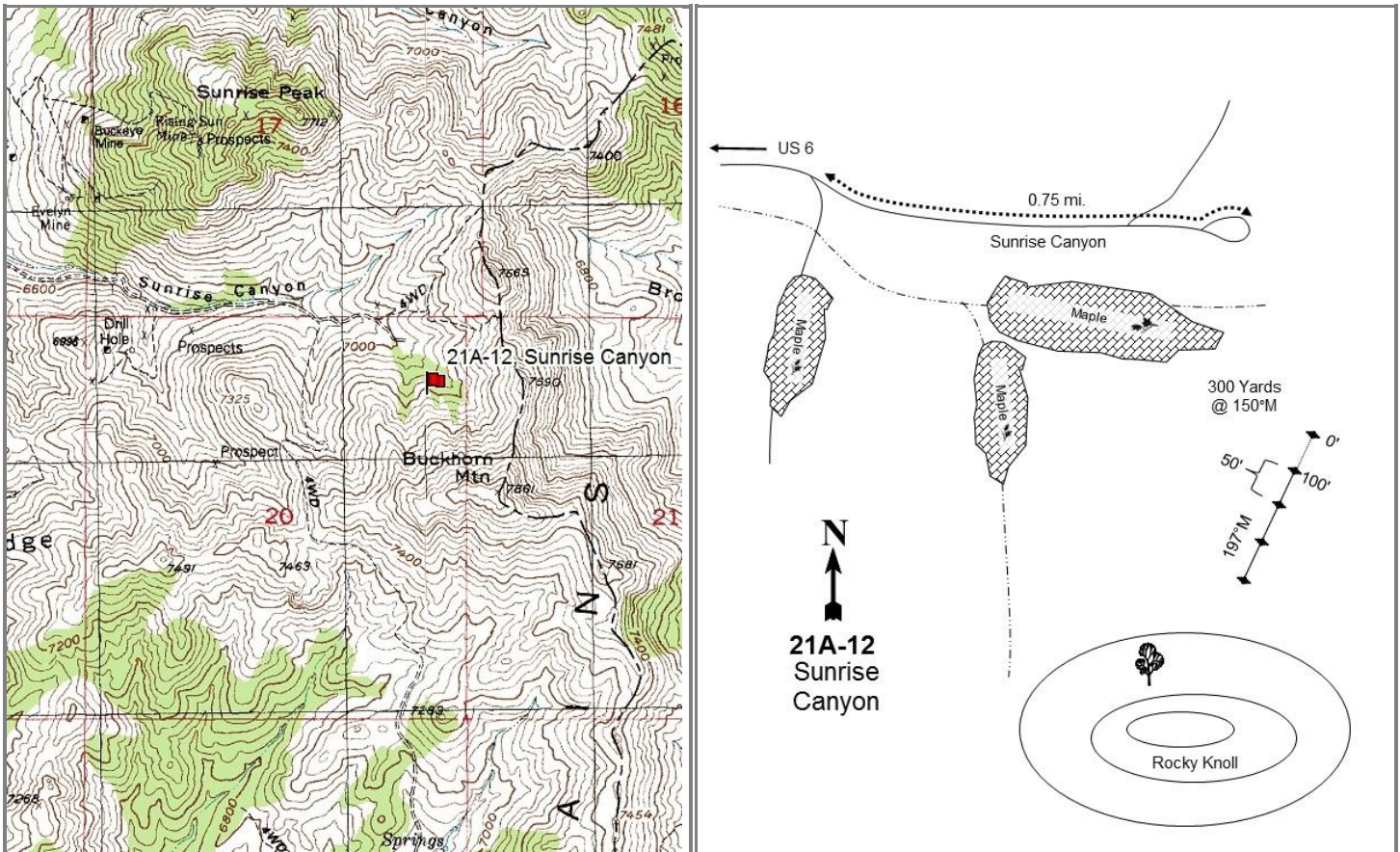
t - Tree Species; p - Preferred Browse; i - Introduced Species



**Table 21A-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)							
2017	7	-	-	17	50	33	25.3

## SUNRISE CANYON - STUDY NO. 21A-12

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Tintic Mountain NW; Township 11S, Range 2W, Section 20  
NAD 83 UTM ZONE 12, 407276 East 4412453 North

**Transect Information**

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

437  
197° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Belt 3: 3ft, Belt 5: 1ft

**Directions to Site**

From the junction of Highway US-6 and U-36, proceed south on US-6 for 6.3 miles to where the Sunrise Seeding road leads off to the east at mile marker 132. Proceed east on this road for 0.7 miles to a fork. Keep left for an additional 0.9 miles to an intersection. Turn right (east) up Sunrise Canyon for 0.85 miles to another fork. Stay left and go 0.75 miles to the end of the road in the bottom of Sunrise Canyon. From this point, the 0-foot mark of the baseline is located on a small ridge at 171 degrees magnetic on the opposite side of a maple-clogged draw. Walk on the designated azimuth through the draw to the sagebrush grass ridge. The 0-foot mark, marked by a green fencepost with a red browse tag number 437, is located approximately midway up the slope and in the middle of the ridge.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	DIAMOND SPRING
Elevation	7,250ft (2,210m)
Aspect	Northwest
Slope	44%
Sample Dates	07/10/1997, 06/12/2002, 08/08/2007, 06/18/2012, 06/06/2017

**Wildlife Habitat and Vegetation History****Table 21A-12.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	substantial	winter/spring
Greater Sage Grouse	occupied	year-long

**Table 21A-12.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1983	Sagebrush	NA
1989	Sagebrush	NA
1997	Sagebrush	NA
2002	Sagebrush	NA
2007	Sagebrush	NA
2012	Sagebrush	NA
2017	Sagebrush/Perennial Grass	NA

**Site Notes**

In 1983, numerous does with fawns, as well as a sage grouse brood were flushed from the draw below the study. In 2007, 3 deer were seen and a deer carcass was found near the study. A 3-foot rattlesnake was found on the site in 2017.

**Soils****Table 21A-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	6.1	54.4	23.1	22.6	4.7	23.1	358.4	0.6	07/10/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site Big Sagebrush)	Mountain Shallow Loam (Low Sagebrush) and Mountain Loam (Mountain
NRCS Ecological Site #	R047XA442 (430) UT
States and Transitions	No state and transition model is available for this ecological site.

This site has been a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and little sagebrush (*A. arbuscula*) dominated plant community in all sample years (Table 21A-12.12). The grass and grass-like community is robust and mostly native, with bluebunch wheatgrass (*Pseudoroegneria spicata*) and oniongrass (*Melica bulbosa*) being co-dominant species (Table 21A-12.10). The forb community is robust and diverse, being composed of mostly native species. The perennial silvery lupine (*Lupinus argentus*) is the dominant forb on the site, with ballhead waterleaf (*Hydrophyllum capitatum*) and spiny phlox (*Phlox hoodii*) expressing less dominance but still contributing significant cover (Table 21A-12.11). There are smaller amounts of other shrubs such as Utah serviceberry (*Amelanchier utahensis*), yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*), and mountain snowberry (*Symphoricarpos oreophilus*) present (Table 21A-12.12, Table 21A-12.13).

**Trend Summary Tables****Table 21A-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
1997	24.7	2.3	-	-	-	-
2002	28.3	4.6	0.2	44.1	6.5	-
2007	15.3	3.8	0.0	24.5	4.6	0.1
2012	23.5	5.0	0.4	24.0	4.4	0.2
2017	20.4	7.2	0.2	25.9	7.1	-

**Table 21A-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
1997	15	297	80	224	0.0	5.9	1.9	9.1
2002	8	256	82	246	0.0	7.2	0.4	19.4
2007	5	185	40	152	0.0	2.7	0.3	4.6
2012	117	246	81	252	1.8	9.5	0.5	13.9
2017	111	308	167	312	1.6	16.9	2.3	22.0

**Table 21A-12.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	13.4	0.2	39.1	7.7	20.0	39.5
2002	14.2	0.2	23.9	7.1	20.9	52.3
2007	15.1	0.0	34.9	7.2	21.2	29.2
2012	15.3	0.1	39.0	2.7	23.6	48.1
2017	9.0	-	41.5	5.4	17.2	66.6

**Table 21A-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	Mule Deer	Rocky Mountain Elk	Horse	Rabbit	Domestic Sheep
	Quadrat Frequency				
1997	10	-	-	-	6
2002	4	-	-	-	13
2007	2	7	-	-	13
2012	2	3	-	1	8
2017	3	-	-	2	2
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	6.7 (16.6)	-	-	-	-
2007	10.7 (26.5)	-	4.7 (11.5)	-	72.4 (178.8)
2012	11.4 (28.1)	2.0 (5.0)	-	-	31.5 (77.8)
2017	6.7 (16.6)	-	-	-	7.4 (18.2)

**Table 21A-12.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Koeleria macrantha (prairie Junegrass)	Melica bulbosa (oniongrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency								
1997	-	9	15	-	-	-	183	31	154
2002	-	-	8	4	-	3	150	16	126
2007	3	3	5	-	20	-	72	25	98
2012	-	10	117	-	-	-	44	105	143
2017	1	2	111	2	-	76	101	65	163
year	Average Cover (%)								
1997	-	0.4	0.0	-	-	-	3.3	0.2	2.0
2002	-	-	0.0	0.1	-	0.1	4.3	0.1	2.6
2007	0.0	0.0	0.0	-	0.1	-	0.9	0.2	1.5
2012	-	0.1	1.8	-	-	-	1.7	2.4	5.4
2017	0.1	0.0	1.6	0.0	-	2.8	4.1	1.4	8.3

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

**Table 21A-12.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Arenaria fendleri (Fendler's sandwort)	Astragalus cibirarius (browse milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chenopodium <sup>a</sup> (goosefoot)	Chenopodium album <sup>a</sup> (lambquarters)	Chenopodium leptophyllum <sup>a</sup> (narrowleaf goosefoot)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cymopterus (springparsley)	Cynoglossum officinale <sup>ai</sup> (gypsyflower)
year	Nested Frequency																
1997	-	11	3	98	3	-	-	-	1	-	-	-	29	2	-	-	40
2002	-	3	-	75	4	-	-	-	-	-	-	-	24	2	4	-	37
2007	-	1	-	34	-	-	-	-	-	9	8	-	12	3	-	-	-
2012	1	3	1	35	2	2	4	-	-	3	9	1	16	12	3	-	4
2017	21	11	2	38	8	8	1	8	-	-	-	-	79	39	2	7	-
year	Average Cover (%)																
1997	-	0.0	0.0	1.9	0.0	-	-	-	0.0	-	-	-	0.1	0.0	-	-	1.8
2002	-	0.0	-	1.7	0.0	-	-	-	-	-	-	-	0.1	0.0	0.0	-	0.2
2007	-	0.0	-	0.3	-	-	-	-	-	0.0	0.0	-	0.0	0.0	-	-	-
2012	0.0	0.0	0.0	0.4	0.0	0.0	0.0	-	-	0.0	0.1	0.0	0.0	0.0	0.0	-	0.0
2017	0.3	0.2	0.0	0.6	0.1	0.1	0.0	0.0	-	-	-	-	0.5	0.1	0.1	0.1	-

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

FORB SPECIES	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron (fleabane)	Eriogonum brevicaulle (shortstem buckwheat)	Eriogonum racemosum (redroot buckwheat)	Galium <sup>a</sup> (bedstraw)	Hackelia patens (spotted stickseed)	Hydrophyllum capitatum (ballhead waterleaf)	Lactuca serriola <sup>ii</sup> (prickly lettuce)	Lithospermum ruderale (western stoneseed)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Orobanche (broomrape)	Packera multilobata (lobeleaf groundsel)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)
year	Nested Frequency																
1997	-	-	-	-	-	-	-	7	1	132	3	-	-	2	49	-	21
2002	22	3	-	-	3	-	-	-	-	164	3	-	-	-	59	4	4
2007	2	-	-	1	-	-	-	2	-	110	1	-	-	6	20	6	10
2012	15	-	-	1	13	-	-	20	-	178	-	-	1	1	78	12	17
2017	-	3	3	2	40	5	39	1	3	223	8	10	-	1	70	-	3
year	Average Cover (%)																
1997	-	-	-	-	-	-	-	0.0	0.0	6.3	0.0	-	-	0.0	0.8	-	0.1
2002	0.0	0.0	-	-	0.0	-	-	-	-	16.1	0.0	-	-	-	1.2	0.0	0.0
2007	0.0	-	-	0.0	-	-	-	0.0	-	4.0	0.0	-	-	0.0	0.2	0.0	0.0
2012	0.1	-	-	0.0	0.1	-	-	0.1	-	11.3	-	-	0.0	0.0	2.0	0.1	0.0
2017	-	0.0	0.0	0.0	0.6	0.1	1.8	0.0	0.0	15.8	0.0	0.0	-	0.0	2.9	-	0.0

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

FORB SPECIES	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Taraxacum officinale (common dandelion)	unknown perennial forb (unknown forb)	Viola (violet)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency				
1997	-	-	-	-	5
2002	5	3	10	-	-
2007	3	-	-	-	-
2012	2	5	-	-	-
2017	33	-	-	16	-
year	Average Cover (%)				
1997	-	-	-	-	0.0
2002	0.0	0.0	0.2	-	-
2007	0.0	-	-	-	-
2012	0.0	0.0	-	-	-
2017	0.6	-	-	0.1	-

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



**Table 21A-12.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)													
	year													
Acer grandidentatum <sup>t</sup> (bigtooth maple)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	-	-	22	21.4	3.5	-	0.7	0	2	0.6	-	0.4	-	-
Artemisia arbuscula <sup>p</sup> (little sagebrush)	0.1	-	11.1	12.8	1.9	-	0.4	0.2	0.4	-	2.3	0	-	-
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	0.2	-	11	11.9	3	-	0.6	0.5	0.7	0.1	-	0.6	0	0
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	-	0.9	13.1	10.7	5.3	-	0.6	0.6	0.3	0.8	-	0.4	0.3	0.3
Ephedra nevadensis <sup>p</sup> (Nevada jointfir)	Quadrat Cover (%)													
Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	1997	-	-	14.2	10.0	1.1	-	-	0.5	0.5	0.6	-	0.1	0.0
Eriogonum microthecum <sup>p</sup> (slender buckwheat)	2002	0.2	-	12.9	14.9	2.6	-	0.0	0.5	0.7	0.6	-	0.5	0.1
Mahonia repens (creeping barberry)	2007	0.0	-	7.0	7.3	1.6	0.4	0.1	0.4	0.3	0.1	1.3	0.5	0.0
Opuntia polyacantha (plains pricklypear)	2012	0.4	-	11.2	11.7	2.8	-	0.1	0.5	1.0	0.1	-	0.6	0.4
Paxistima myrsinites (Oregon boxleaf)	2017	0.2	0.0	9.7	9.4	5.1	-	0.4	0.9	0.8	0.4	-	0.9	0.0
Symphoricarpos oreophilus (mountain snowberry)														
Tetradymia canescens (spineless horsebrush)														

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

**Table 21A-12.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Acer grandidentatum<sup>t</sup> -- (bigtooth maple)</b>									
1997	20	-	100	0	0	0	0	0	- / -
2002	120	20	83	17	0	0	0	0	- / -
2007	140	-	14	86	0	86	0	14	51/43
2012	80	-	50	50	0	25	0	0	38/42
2017	20	-	100	0	0	0	0	0	- / -
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1997	20	-	0	100	0	0	0	0	64/29
2002	-	-	-	-	-	-	-	-	- / -
2007	20	-	100	0	0	0	0	0	- / -
2012	-	-	-	-	-	-	-	-	17/32
2017	100	-	80	20	0	80	0	0	- / -
<b>Artemisia arbuscula<sup>p</sup> -- (little sagebrush)</b>									
1997	6700	200	5	82	13	20	1	11	32/61
2002	6440	40	3	81	17	4	9	8	26/52
2007	3580	280	2	67	31	45	13	8	27/55
2012	5140	120	17	76	7	28	54	18	23/55
2017	4560	40	4	84	13	36	21	39	29/49
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1997	1720	220	7	63	30	8	5	20	62/95
2002	3020	120	15	60	25	5	13	17	65/98
2007	2140	860	14	65	22	46	9	18	65/100
2012	3820	120	20	72	7	26	7	4	51/77
2017	2820	60	9	85	6	16	0	10	56/75
<b>Cercocarpus montanus<sup>p</sup> -- (alderleaf mountain mahogany)</b>									
1997	20	-	100	0	0	0	0	0	36/6
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	200/220
2012	-	-	-	-	-	-	-	-	53/58
2017	-	-	-	-	-	-	-	-	81/101

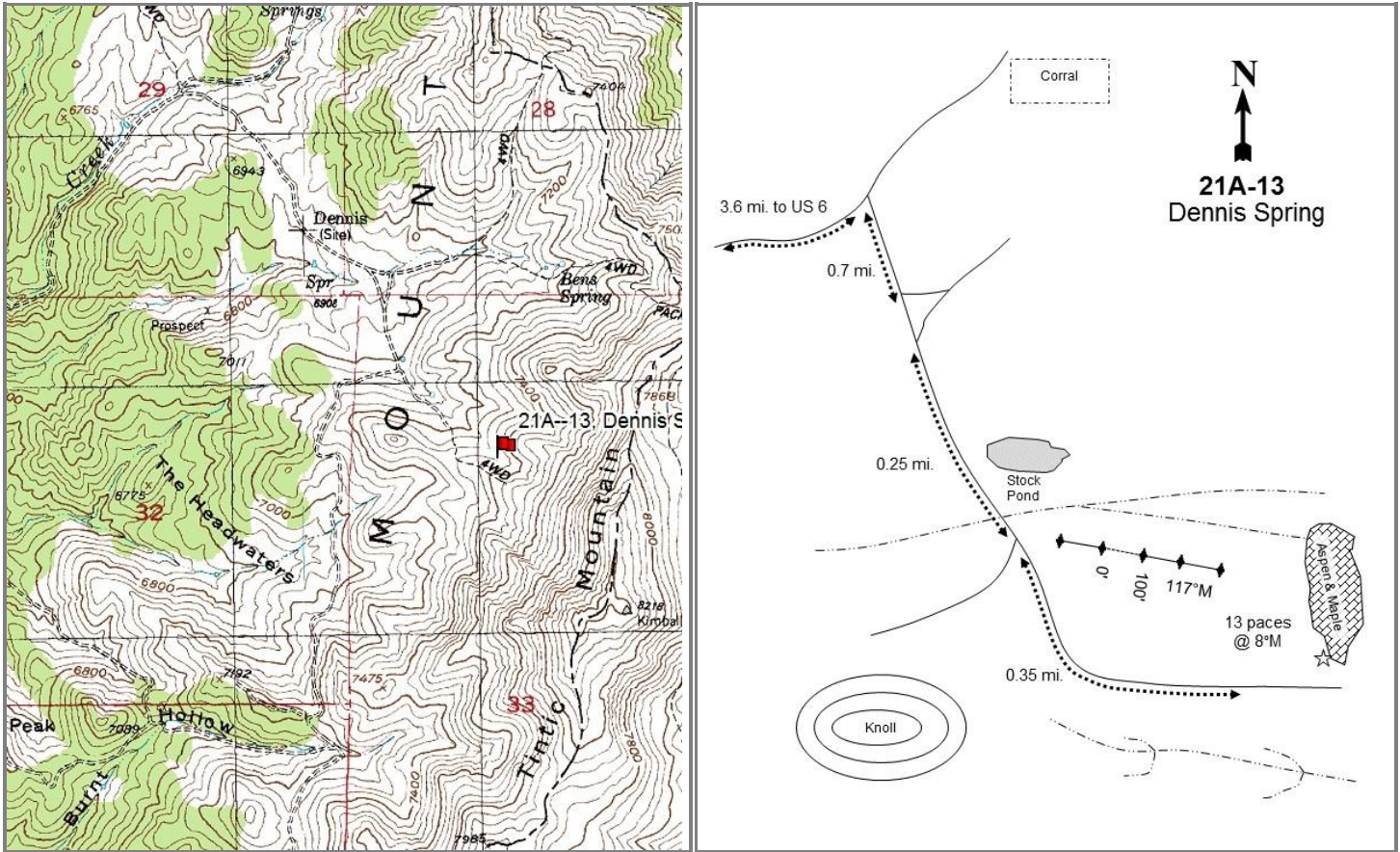
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	2900	-	16	83	1	10	3	0	27/27
2002	2040	20	2	95	3	7	0	1	28/37
2007	1620	20	9	91	0	48	12	4	30/39
2012	1440	20	4	93	3	1	0	1	29/36
2017	2140	-	3	97	0	3	0	0	36/47
<b>Ephedra nevadensis<sup>P</sup> -- (Nevada jointfir)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	0	0	100	100	0	0	-/-
<b>Eriogonum microthecum<sup>P</sup> -- (slender buckwheat)</b>									
1997	1020	40	10	90	0	2	0	0	12/18
2002	460	-	13	87	0	4	13	0	12/23
2007	500	40	20	76	4	20	8	0	17/24
2012	480	-	4	96	0	8	0	0	15/25
2017	660	-	24	76	0	58	9	0	19/24
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1997	20	-	0	100	0	0	0	0	96/66
2002	60	-	0	100	0	0	0	0	53/51
2007	20	-	0	0	100	0	0	100	143/158
2012	60	-	0	67	33	0	33	0	50/55
2017	40	-	0	100	0	50	0	0	50/39
<b>Mahonia repens -- (creeping barberry)</b>									
1997	660	-	9	91	0	0	0	0	16/20
2002	780	-	0	100	0	0	0	0	14/20
2007	1720	20	15	85	0	0	0	1	9/12
2012	1220	-	2	98	0	7	0	0	17/19
2017	2080	-	0	100	0	0	0	0	15/15
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1997	60	-	67	33	0	0	0	0	24/133
2002	680	-	0	100	0	0	0	0	15/48
2007	100	-	20	60	20	0	0	20	19/29
2012	20	-	0	100	0	0	0	0	17/44
2017	120	-	0	100	0	0	0	0	17/54
<b>Paxistima myrsinites -- (Oregon boxleaf)</b>									
1997	20	-	0	100	0	0	0	0	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	680	140	0	82	18	18	0	15	24/56
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1997	280	40	0	100	0	7	7	7	28/29
2002	200	40	20	70	10	0	0	10	45/67
2007	140	-	14	86	0	14	14	29	33/96
2012	360	-	33	67	0	11	0	0	22/34
2017	160	-	0	100	0	0	0	0	39/64
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1997	60	-	0	100	0	0	0	0	22/22
2002	60	-	0	67	33	0	0	33	26/29
2007	60	20	0	0	100	0	0	0	36/26
2012	180	-	0	100	0	0	0	0	31/35
2017	60	-	0	100	0	0	0	0	44/59

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

**Table 21A-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'	
<b>Acer grandidentatum (bigtooth maple)</b>						
2017	12	13	88	-	-	2.0

## DENNIS SPRING - STUDY NO. 21A-13

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Tintic Mountain NW; Township 11S, Range 2W, Section 33  
NAD 83 UTM ZONE 12, 408018 East 4408893 North

**Transect Information**

Browse Tag # (0' Stake)	3945
Transect Bearing	300° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 2: 1ft, Belt 5: 1ft

**Directions to Site**

From mile marker 130 on Highway US-6, proceed east for 1.6 miles to a fork and go left. Proceed 2 miles on the "Dennis Road" up Copperpolis Creek to a fork. Turn right (to the southeast) and travel uphill for 0.7 miles to another fork. Turn right again and drive for 0.25 miles to where there is a fork turning off sharply to the right and a stock pond on the left. Continue straight ahead (on the left fork) for an additional 0.35 miles to where the road ends on top of a small ridge. At the point, there will be an aspen-maple stand to your immediate left, front at the head of a small drainage. Just behind you, there should be a knoll. From the front-rightmost maple tree of the clump to your front, walk 13 paces at 8 degrees magnetic to the 300-foot stake. The 0-foot stake, marked with a red browse tag #3945, is located in the approximate middle of a triangle formed by three boulders. All plot markers consists of consists of steel fenceposts 15" to 20" in height.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	DIAMOND SPRING
Elevation	7,350ft (2,240m)
Aspect	Northwest
Slope	25%
Sample Dates	07/07/1997, 06/12/2002, 08/08/2007, 06/18/2012, 06/07/2017

**Table 21A-13.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Mona West	-	July 2001	33852

**Wildlife Habitat and Vegetation History****Table 21A-13.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	spring/fall
Greater Sage Grouse	occupied	year-long

**Table 21A-13.4 - 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	No Encroachment
1989	Mountain Big Sagebrush	No Encroachment
1997	Mountain Big Sagebrush	No Encroachment
2002	Perennial Forb/Perennial Grass	No Encroachment
2007	Mountain Big Sagebrush	No Encroachment
2012	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2017	Mountain Big Sagebrush/Perennial Grass	No Encroachment

**Site Notes**

Mormon crickets (*Anabrus simplex*) were abundant in 2002 and appear to have utilized many of the herbaceous plants.

**Soils****Table 21A-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	5.9	48.4	27.1	24.6	5.2	52.0	553.6	0.5	07/07/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

At the time of establishment in 1983 through the most recent sample year, this study site has existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated ecological site. A fire in 2001 reduced the sagebrush cover, but it has since recovered (Table 21A-13.12). Grass cover has historically been low, but the 2012 and 2017 studies showed that grass increased into a co-dominant component with sagebrush (Table 21A-13.6, Table 21A-13.7). The most common species are bluebunch wheatgrass (*Pseudoroegneria spicata*) and Letterman's needlegrass (*Achnatherum lettermanii*) (Table 21A-13.10). The forb species on the site are rich and abundant with ballhead waterleaf (*Hydrophyllum capitatum*) and longleaf phlox (*Phlox longifolia*) being the dominant species (Table 21A-13.11). It is likely that this site will continue to exist in the current ecological state without a disturbance.

**Trend Summary Tables****Table 21A-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
1997	32.8	6.4	1.1	-	-	-
2002	1.5	4.6	-	1.4	4.3	-
2007	22.8	6.4	-	36.1	9.9	-
2012	36.0	7.9	-	47.0	7.1	-
2017	38.5	6.2	0.0	65.6	6.1	-

**Table 21A-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
1997	28	212	265	239	0.4	2.7	2.4	8.8
2002	142	117	299	233	0.7	3.9	4.4	8.6
2007	168	181	181	133	3.8	3.7	0.7	2.2
2012	31	278	133	237	0.1	13.9	0.9	3.8
2017	68	263	185	293	0.6	10.3	2.5	7.7

**Table 21A-13.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	17.0	0.0	53.8	1.3	3.4	47.6
2002	49.7	0.8	22.7	3.9	6.4	27.8
2007	28.3	-	32.2	2.8	5.0	43.6
2012	22.5	-	52.6	1.0	6.5	54.7
2017	17.4	-	53.5	5.0	5.3	58.7

**Table 21A-13.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit	Domestic Sheep
	Quadrat Frequency					
1997	1	14	4	-	3	8
2002	-	4	-	-	1	6
2007	-	4	8	1	1	8
2012	1	1	-	-	-	2
2017	1	4	-	-	10	2
Year	Days Use Per Acre (ha)					
1997	-	-	-	-	-	-
2002	-	7.4 (18.2)	-	-	-	13.4 (33.1)
2007	-	1.3 (3.3)	6.7 (16.6)	-	-	20.1 (49.7)
2012	-	2.0 (5.0)	-	-	-	8.7 (21.5)
2017	-	0.7 (1.7)	-	-	-	10.0 (24.8)

**Table 21A-13.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Hesperostipa comata (needle and thread)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency												
1997	-	-	115	5	0	4	28	48	-	-	10	6	51
2002	-	2	67	1	-	2	142	3	9	-	8	1	32
2007	1	6	34	17	-	15	168	56	13	20	9	-	48
2012	1	8	120	37	-	20	31	42	8	6	6	7	78
2017	-	25	74	41	-	40	68	17	-	16	12	-	82
year	Average Cover (%)												
1997	-	-	1.5	0.0	0.0	0.0	0.4	0.6	-	-	0.2	0.0	0.3
2002	-	0.0	2.4	0.2	-	0.1	0.7	0.2	0.2	-	0.3	0.0	0.6
2007	0.0	0.0	0.5	0.2	-	0.1	3.8	0.8	0.3	0.5	0.2	-	1.1
2012	0.0	0.5	5.1	0.9	-	0.9	0.1	2.4	0.3	0.2	0.1	0.2	3.2
2017	-	2.2	1.9	1.7	-	0.8	0.6	0.4	-	0.2	0.6	-	2.5

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

**Table 21A-13.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arenaria fendleri (Fendler's sandwort)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Chenopodium album <sup>a</sup> (lambquarters)	Chenopodium leptophyllum <sup>a</sup> (narrowleaf goosefoot)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Cymopterus (springparsley)	Cynoglossum officinale <sup>ai</sup> (gypsyflower)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)
year	Nested Frequency																
1997	2	-	-	-	4	3	1	91	-	2	209	5	2	31	2	39	-
2002	3	-	-	-	-	13	1	161	-	2	21	-	-	0	-	10	3
2007	4	-	-	1	-	6	-	7	6	-	44	1	-	1	-	-	-
2012	17	-	1	3	-	5	2	2	-	-	49	-	1	16	-	2	7
2017	12	2	-	4	-	12	3	-	-	3	99	10	7	5	-	-	-
year	Average Cover (%)																
1997	0.0	-	-	-	0.0	0.0	0.0	0.4	-	0.0	1.1	0.0	0.0	0.3	0.0	0.8	-
2002	0.0	-	-	-	-	0.3	0.0	1.4	-	0.0	0.1	-	-	0.0	-	0.2	0.0
2007	0.0	-	-	0.0	-	0.0	-	0.0	0.0	-	0.1	0.0	-	0.0	-	-	-
2012	0.1	-	0.0	0.1	-	0.1	0.0	0.0	-	-	0.1	-	0.0	0.1	-	0.0	0.0
2017	0.2	0.0	-	0.1	-	0.2	0.0	-	-	0.0	0.6	0.1	0.2	0.1	-	-	-

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



FORB SPECIES	Erigeron (fleabane)	Eriogonum racemosum (redroot buckwheat)	Galium aparine <sup>a</sup> (stickywilly)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Hackelia patens (spotted stickseed)	Heliomeris multiflora var. multiflora (showy goldeneye)	Hydrophyllum capitatum (ballhead waterleaf)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lathyrus brachycalyx (Bonneville pea)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Mertensia (bluebells)	Microsteris gracilis <sup>a</sup> (slender phlox)	Orobanche (broomrape)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Phlox longifolia (longleaf phlox)
year	Nested Frequency																
1997	3	-	-	-	-	1	-	4	19	148	2	-	36	-	45	-	82
2002	3	2	-	32	-	-	64	131	18	49	-	-	14	-	-	3	142
2007	-	-	-	7	-	-	42	-	2	8	9	3	21	-	1	3	84
2012	-	14	-	3	3	14	18	2	5	10	4	1	31	2	-	3	161
2017	8	-	33	-	-	1	60	8	19	18	6	88	16	-	-	-	173
year	Average Cover (%)																
1997	0.0	-	-	-	-	0.0	-	0.0	0.3	7.3	0.0	-	0.1	-	0.5	-	0.2
2002	0.0	0.0	-	0.3	-	-	3.7	1.1	0.5	1.3	-	-	0.2	-	-	0.0	2.5
2007	-	-	-	0.0	-	-	1.2	-	0.1	0.1	0.0	0.0	0.0	-	0.0	0.0	0.5
2012	-	0.1	-	0.0	0.1	0.1	0.4	0.0	0.1	0.2	0.0	0.0	0.1	0.1	-	0.0	2.0
2017	0.0	-	0.1	-	-	0.0	1.5	0.4	0.9	0.7	0.0	0.7	0.0	-	-	-	1.7

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

FORB SPECIES	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Schoenocrambe limifolia (flaxleaf plainsmustard)	Senecio integerrimus <sup>a</sup> (lambstongue ragwort)	Streptanthus cordatus (heartleaf twistflower)	Symphotrichum (aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Trifolium (clover)	Veronica biloba <sup>ai</sup> (twolobe speedwell)	Vicia americana (American vetch)	Viola (violet)
year	Nested Frequency										
1997	21	-	-	5	-	15	-	39	-	-	-
2002	92	-	30	-	1	2	-	23	-	-	-
2007	131	-	17	-	1	-	-	3	-	-	-
2012	48	-	9	-	-	-	-	21	17	-	30
2017	46	1	71	-	-	5	2	92	3	19	19
year	Average Cover (%)										
1997	0.1	-	-	0.0	-	0.1	-	0.1	-	-	-
2002	0.8	-	0.3	-	0.0	0.0	-	0.2	-	-	-
2007	0.4	-	0.1	-	0.0	-	-	0.0	-	-	-
2012	0.2	-	0.2	-	-	-	-	0.1	0.2	-	0.2
2017	0.1	0.0	1.1	-	-	0.0	0.0	0.9	0.0	0.3	0.1

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

**Table 21A-13.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)												
	year												
Acer grandidentatum <sup>t</sup> (bigtooth maple)	1997	-	-	-	-	-	-	-	-	-	-	-	-
Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	2002	-	-	1.4	2.5	-	-	0.5	-	-	0	1.1	0.2
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	2007	-	-	36	5.3	-	-	2.6	0.1	-	0.1	1.6	0.3
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	2012	-	-	46.8	2.1	-	-	2.5	-	-	0.2	2.2	0.3
Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	2017	-	-	65.6	1.7	-	-	1.9	-	-	-	2.5	-
Juniperus osteosperma <sup>t</sup> (Utah juniper)	year	Quadrat Cover (%)											
Mahonia repens (creeping barberry)	1997	-	-	32.0	2.7	0.7	1.1	1.3	-	0.0	0.1	2.2	0.2
Paxistima myrsinites (Oregon boxleaf)	2002	-	-	1.4	2.7	-	-	0.9	0.0	-	0.1	0.4	0.5
Purshia tridentata <sup>p</sup> (antelope bitterbrush)	2007	-	-	22.4	3.4	-	-	1.4	0.1	-	0.3	1.2	0.2
Rosa woodsii <sup>p</sup> (Woods' rose)	2012	-	0.0	36.0	2.8	-	-	2.5	0.4	-	0.1	2.2	0.0
Symphoricarpos oreophilus (mountain snowberry)	2017	0.0	-	38.5	2.1	-	-	1.8	0.1	-	0.0	2.1	-
Tetradymia canescens (spineless horsebrush)	year												

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

**Table 21A-13.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Acer grandidentatum<sup>t</sup> -- (bigtooth maple)</b>									
1997	20	-	100	0	0	0	0	0	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	20	0	0	0	0	0	0	- / -
<b>Amelanchier utahensis<sup>p</sup> -- (Utah serviceberry)</b>									
1997	40	-	100	0	0	0	0	0	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	20	-	0	100	0	0	0	0	24/33
2017	-	-	-	-	-	-	-	-	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1997	4920	40	1	88	11	1	0	8	84/93
2002	7120	1020	100	0	0	0	0	0	20/29
2007	9500	26420	51	48	0	4	0	1	64/84
2012	12020	-	9	91	1	1	0	0	66/80
2017	10860	100	1	96	3	14	0	1	67/89
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	5560	100	15	85	1	12	1	2	26/27
2002	4700	-	20	79	0	6	1	1	21/26
2007	2700	500	10	82	8	25	3	13	35/47
2012	3100	80	3	97	1	0	0	0	25/30
2017	2700	20	17	82	1	0	0	0	26/32
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>p</sup> -- (rubber rabbitbrush)</b>									
1997	200	-	10	50	40	70	0	30	99/89
2002	20	-	100	0	0	0	100	100	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	92/72
2017	-	-	-	-	-	-	-	-	- / -

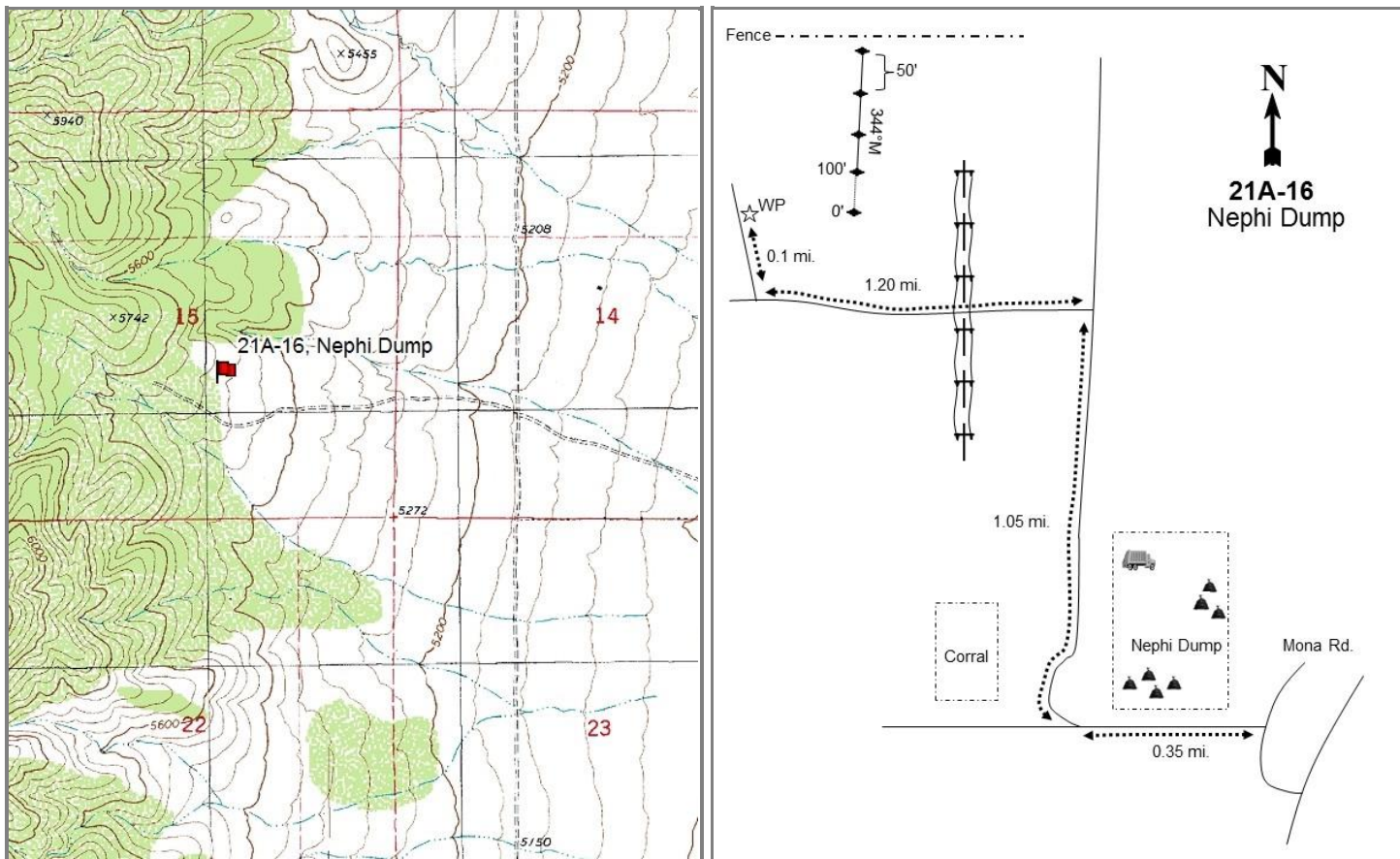
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1997	40	-	100	0	0	0	0	0	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
<b>Mahonia repens -- (creeping barberry)</b>									
1997	4540	20	8	93	0	0	0	0	12/14
2002	6340	-	0	98	1	0	0	5	9/14
2007	8320	-	0	100	0	0	0	0	12/17
2012	6320	-	0	100	0	0	0	0	12/14
2017	9420	-	2	98	0	0	0	0	10/11
<b>Paxistima myrsinites -- (Oregon boxleaf)</b>									
1997	-	-	-	-	-	-	-	-	- / -
2002	-	-	-	-	-	-	-	-	- / -
2007	60	-	33	67	0	33	0	33	12/24
2012	40	-	0	100	0	0	0	0	18/36
2017	240	-	0	100	0	0	0	0	9/12
<b>Rosa woodsii<sup>p</sup> -- (Woods' rose)</b>									
1997	180	20	78	22	0	0	0	0	- / -
2002	260	-	100	0	0	0	0	8	- / -
2007	240	-	25	75	0	8	0	0	28/33
2012	480	-	83	17	0	0	0	0	17/21
2017	180	-	44	56	0	0	0	0	26/21
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1997	2540	20	13	87	1	5	1	1	31/55
2002	1160	20	69	31	0	2	2	2	30/60
2007	420	-	10	91	0	24	0	14	35/75
2012	700	-	6	94	0	0	0	0	25/49
2017	780	20	8	92	0	0	0	0	37/63
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1997	220	-	18	82	0	0	0	0	36/44
2002	400	-	25	75	0	0	0	0	24/36
2007	240	-	33	67	0	8	0	0	32/66
2012	100	-	0	100	0	0	0	0	26/49
2017	20	-	0	100	0	0	0	0	43/54

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

**Table 21A-13.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution				Average Diameter (cm)	
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'		>12' (%)
<b>Acer grandidentatum (bigtooth maple)</b>							
2017	9	-	75	25	-	-	2.5

## NEPHI DUMP - STUDY NO. 21A-16



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Slate Jack Canyon SE; Township 12S, Range 1W, Section 15  
NAD 83 UTM ZONE 12, 420978 East 4402322 North

### Transect Information

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

Not Available  
344° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (29ft)  
Belt 2: No Rebar

### Directions to Site

From the Nephi City Dump, travel north on a gravel road for 1.05 miles and then turn left (west) just after passing over a cattle guard. Travel west for 1.25 miles and turn right (north) onto a faint road and proceed for 0.1 miles. At this point, there is a small stockpile and a short red steel stake. From here, walk east for a short distance to the 0-foot mark of the frequency baseline, marked by a steel fencepost.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	NEPHI BENCH
Elevation	5,500ft (1,676m)
Aspect	East
Slope	5-10%
Sample Dates	07/10/1997, 05/21/2002, 06/01/2007, 05/17/2012, 05/17/2017

**Wildlife Habitat and Vegetation History****Table 21A-16.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	substantial	winter/spring

**Table 21A-16.4 - 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
2017	Mountain Big Sagebrush/Perennial Grass	Phase I

**Site Notes**

This site is located within 40 acre area that was not burned in 1996, though much of the surrounding vegetation burned in both 1986 and 1996.

**Soils****Table 21A-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	6.9	42.0	27.4	30.6	2.9	7.7	284.8	0.7	07/09/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	16 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.

When this site was established in 1983, it was a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) plant community in Phase I of encroachment by Utah juniper (*Juniperus osteosperma*) (photos, Table 21A-16.4, Table 21A- 16.12, Table 21A-16.13). Perennial grasses are co-dominant with sagebrush, with crested wheatgrass (*Agropyron cristatum*) and Sandberg bluegrass (*Poa secunda*) being the dominant species (Table 21A-16.10). The forb community is varied, but much of the forb cover is provided by the introduced annual species curvseed butterwort (*Ceratocephala testiculata*) and desert madwort (*Alyssum desertorum*) (Table 21A-16.11). Mountain big sagebrush is the primary browse component of the site, with cover having remained stable throughout the duration of the study (Table 21A- 16.12). Juniper cover has been similar, with density having decreased over time. However, average tree diameter has increased, indicating that the tree community is becoming more mature (Table 21A-16.14).

**Trend Summary Tables****Table 21A-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
1997	11.6	6.9	3.4	-	-	-
2002	8.9	5.2	0.7	-	-	-
2007	6.3	4.2	2.2	7.6	5.8	6.6
2012	8.9	2.6	5.9	9.7	3.8	9.6
2017	6.9	2.9	1.6	8.5	4.9	11.3

**Table 21A-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
1997	236	287	396	40	4.6	14.7	4.4	0.2
2002	192	308	301	43	2.8	16.0	3.7	1.3
2007	375	318	376	37	10.5	17.6	5.8	1.1
2012	235	346	301	58	2.4	20.9	1.6	0.9
2017	91	325	376	91	1.3	17.0	6.6	1.8

**Table 21A-16.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	7.7	3.9	39.2	18.1	9.5	38.5
2002	16.6	14.7	29.8	12.1	10.6	40.8
2007	11.0	4.3	31.0	12.3	8.0	47.3
2012	9.9	2.8	42.5	11.6	7.8	41.8
2017	20.2	3.1	36.5	21.9	11.3	33.5

**Table 21A-16.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	8	17	-	22
2002	1	12	-	5
2007	9	8	1	51
2012	8	3	-	8
2017	2	2	-	51
Days Use Per Acre (ha)				
1997	-	-	-	-
2002	5.1 (12.6)	30.8 (76.1)	-	-
2007	24.0 (59.2)	18.7 (46.3)	-	-
2012	16.7 (41.2)	0.7 (1.7)	-	-
2017	3.6 (9.0)	1.3 (3.3)	-	-



**Table 21A-16.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency								
1997	-	163	24	212	8	-	187	35	-
2002	4	155	17	181	4	-	213	43	2
2007	0	130	34	368	12	6	236	89	-
2012	2	150	-	235	8	-	265	63	-
2017	2	185	-	91	2	4	201	57	4
year	Average Cover (%)								
1997	-	9.0	0.1	4.5	0.1	-	4.2	1.4	-
2002	0.0	8.8	0.1	2.8	0.2	-	5.1	1.9	0.0
2007	0.0	5.1	0.2	10.3	0.2	0.0	8.7	3.5	-
2012	0.2	7.9	-	2.4	0.1	-	8.6	4.1	-
2017	0.2	8.3	-	1.3	0.1	0.2	4.7	3.3	0.1

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

**Table 21A-16.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Astragalus beekwithii (Beekwith's milkvetch)	Astragalus cibirius (browse milkvetch)	Astragalus eurekaensis (Eureka milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa <sup>ai</sup> (littledod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chorispota tenella <sup>ai</sup> (crossflower)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)
year	Nested Frequency																
1997	-	-	308	-	-	11	18	10	1	223	5	-	-	-	-	-	-
2002	1	-	167	-	-	32	1	-	1	227	7	-	7	-	6	-	-
2007	-	-	238	-	11	7	4	8	-	331	-	-	4	-	2	-	-
2012	3	1	248	-	7	17	1	-	10	110	-	4	2	-	1	-	-
2017	-	-	161	2	26	4	26	9	29	307	8	-	10	1	4	3	9
year	Average Cover (%)																
1997	-	-	3.0	-	-	0.1	0.1	0.0	0.0	1.2	0.0	-	-	-	-	-	-
2002	0.0	-	0.4	-	-	1.2	0.0	-	0.0	2.7	0.3	-	0.0	-	0.0	-	-
2007	-	-	0.9	-	0.7	0.0	0.0	0.0	-	4.4	-	-	0.0	-	0.0	-	-
2012	0.0	0.0	0.7	-	0.2	0.2	0.0	-	0.1	0.3	-	0.1	0.0	-	0.0	-	-
2017	-	-	2.2	0.0	0.9	0.0	0.1	0.0	0.5	2.8	0.4	-	0.1	0.0	0.2	0.0	0.1

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

FORB SPECIES														
<i>Gilia inconspicua</i> <sup>a</sup> (shy gilia)														
<i>Lactuca serriola</i> <sup>ai</sup> (prickly lettuce)														
<i>Microsteris gracilis</i> <sup>a</sup> (slender phlox)														
<i>Packera multilobata</i> (lobeleaf groundsel)														
<i>Phacelia austromontana</i> <sup>a</sup> (Southern Sierra phacelia)														
<i>Phlox austromontana</i> (mountain phlox)														
<i>Silene antirrhina</i> <sup>a</sup> (sleepy silene)														
<i>Sisymbrium altissimum</i> <sup>ai</sup> (tall tumblemustard)														
<i>Sphaeralcea coccinea</i> (scarlet globemallow)														
<i>Tragopogon dubius</i> <sup>ai</sup> (yellow salsify)														
unknown annual forb <sup>a</sup> (unknown forb)														
<i>Vicia americana</i> (American vetch)														
<i>Zigadenus paniculatus</i> (foothill deathcamas)														
year	Nested Frequency													
1997	-	10	3	5	17	1	-	-	1	2	4	2	4	
2002	-	-	2	1	44	1	-	1	-	-	-	-	-	-
2007	-	-	6	-	63	2	45	2	-	-	-	13	-	-
2012	-	-	12	-	62	1	44	-	-	-	-	19	-	-
2017	6	8	7	-	56	-	20	15	-	-	-	10	-	-
year	Average Cover (%)													
1997	-	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	0.0
2002	-	-	0.0	0.0	0.3	0.0	-	0.0	-	-	-	-	-	-
2007	-	-	0.0	-	0.3	0.0	0.1	0.0	-	-	-	0.3	-	-
2012	-	-	0.0	-	0.4	0.0	0.1	-	-	-	-	0.4	-	-
2017	0.0	0.0	0.2	-	0.4	-	0.1	0.2	-	-	-	0.1	-	-

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

**Table 21A-16.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES						
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <sup>p</sup> (mountain big sagebrush)						
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>stenophyllus</i> (yellow rabbitbrush)						
<i>Ericameria nauseosa</i> (rubber rabbitbrush)						
<i>Gutierrezia sarothrae</i> (broom snakeweed)						
<i>Juniperus osteosperma</i> <sup>t</sup> (Utah juniper)						
<i>Purshia stansburiana</i> <sup>p</sup> (Stansbury cliffrose)						
year	Line Intercept Cover (%)					
1997	-	-	-	-	-	-
2002	-	-	-	-	-	-
2007	7.6	5.5	0.3	-	6.6	-
2012	9.7	3.8	-	-	9.6	-
2017	8.5	4.9	-	-	11.3	-
year	Quadrat Cover (%)					
1997	10.9	5.4	0.8	0.7	3.4	0.8
2002	8.9	4.1	1.0	0.1	0.7	-
2007	6.3	3.5	0.6	0.0	2.2	-
2012	8.9	2.6	-	0.0	5.9	-
2017	6.9	2.9	-	0.0	1.6	-

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

**Table 21A-16.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

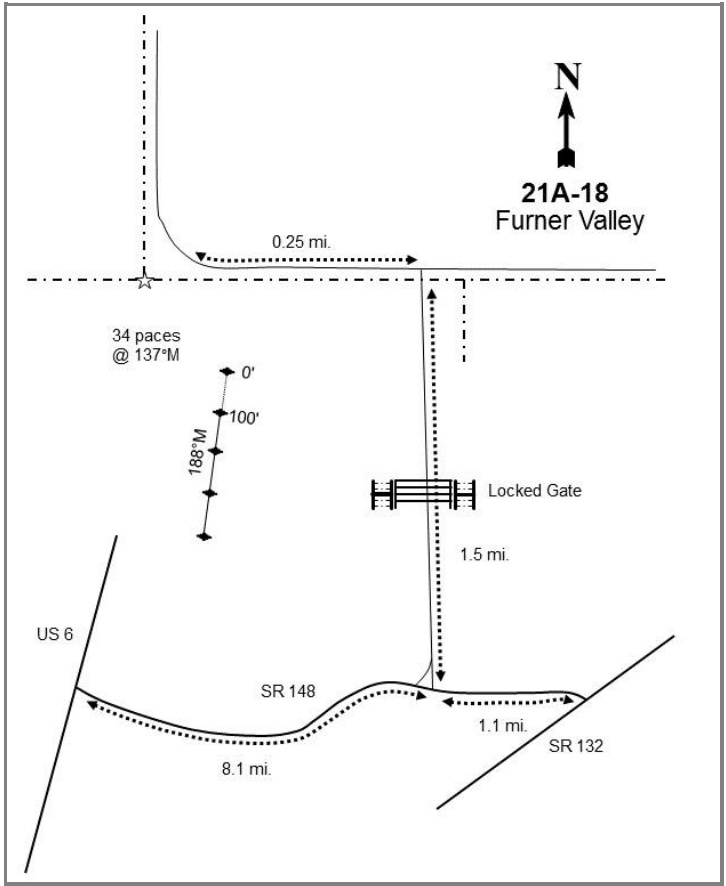
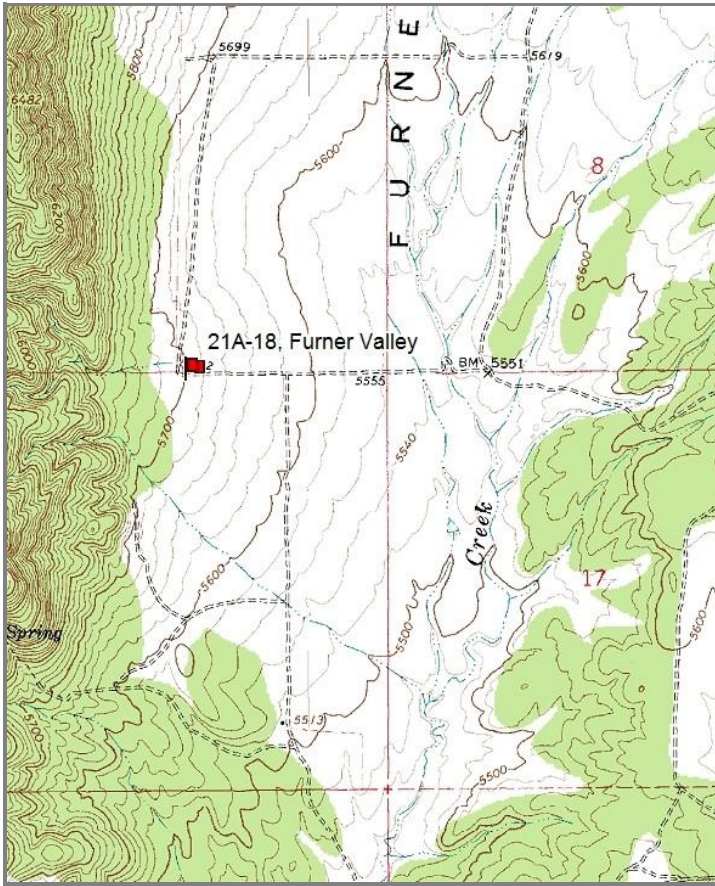
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1997	1920	60	5	75	20	38	0	28	61/83
2002	2220	-	1	55	44	32	9	15	63/83
2007	1740	20	0	53	47	24	14	28	75/92
2012	1580	-	0	70	30	8	0	9	73/98
2017	1480	40	8	76	16	0	0	14	74/103
<b>Cercocarpus montanus<sup>P</sup> -- (alderleaf mountain mahogany)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	0	0	100	0	0	100	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1997	1780	-	2	89	9	0	0	2	43/49
2002	2380	-	3	75	23	0	0	7	40/61
2007	1820	20	0	44	56	2	0	14	40/62
2012	1600	260	1	75	24	3	0	1	31/50
2017	1420	-	3	93	4	0	0	4	38/62
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1997	40	-	0	0	100	0	0	0	-/-
2002	20	-	0	0	100	0	0	0	107/187
2007	20	-	0	0	100	0	0	100	58/168
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	1920	120	21	78	1	0	0	1	27/28
2002	680	-	3	59	38	0	0	41	17/23
2007	140	20	0	100	0	0	0	0	19/23
2012	60	-	0	100	0	0	0	0	20/25
2017	20	-	0	100	0	0	0	0	28/41
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1997	20	-	0	100	0	0	0	0	-/-
2002	20	-	0	100	0	0	0	0	-/-
2007	20	-	0	100	0	0	0	0	-/-
2012	20	-	0	100	0	0	0	0	-/-
2017	20	-	0	100	0	0	0	0	-/-
<b>Linanthus pungens -- (granite prickly phlox)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	25/46
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Purshia stansburiana<sup>P</sup> -- (Stansbury cliffrose)</b>									
1997	40	-	0	50	50	0	100	0	103/119
2002	-	-	-	-	-	-	-	-	94/80
2007	-	-	-	-	-	-	-	-	119/133
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1997	-	-	-	-	-	-	-	-	28/41

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

**Table 21A-16.14 - 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' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2002	62	-	-	-	-	11.7	
2007	45	-	8	33	25	19.1	
2012	45	-	8	25	33	23.4	
2017	39	-	-	33	42	22.2	

## FURNER VALLEY - STUDY NO. 21A-18



### Location Information

USGS 7.5 min Map Info	Furner Ridge SW; Township 13S, Range 2W, Section 18
GPS (0' Stake)	NAD 83 UTM ZONE 12, 406570 East 4393604 North

### Transect Information

Browse Tag # (0' Stake)	3936
Transect Bearing	188° magnetic
Length	400ft
Belt Placement	Belt 1 (11ft & 95ft), Belt 2 (34ft), Belt 3 (59ft), Belt 4 (71ft)
Belt Marker Placement	Standard

### Directions to Site

From a point on Highway U-148 located 8.1 miles east of the junction of Highway U-148 and US-6, proceed north on the dirt road to Furner Valley for 1.5 miles. At this point, there is a "T" intersection with cropland immediately to the north. Turn left (west) and travel for 0.25 miles, then drive to where the road turns north again at a right angle. Stop! From the corner of the fence, walk 34 paces at 137 degrees magnetic to the 0-foot marker of the frequency baseline, a green steel fencepost 15" high with a red browse tag #3936 attached.

**Site Information**

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,700ft (1,737m)
Aspect	East
Slope	8%
Sample Dates	07/08/1997, 06/03/2002, 08/28/2007, 07/09/2012, 06/01/2017

**Table 21A-18.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical or Aerator - Mower or Aerator Unknown	-	-	Between 2002 and 2007	-

**Wildlife Habitat and Vegetation History**

**Table 21A-18.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

**Table 21A-18.4 - 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/Antelope Bitterbrush	Phase I
1989	Mountain Big Sagebrush/Antelope Bitterbrush	Phase I
1997	Mountain Big Sagebrush/Antelope Bitterbrush	Phase I
2002	Mountain Big Sagebrush/Antelope Bitterbrush	Phase I
2007	Perennial Grass/Mountain Big Sagebrush/Antelope Bitterbrush	Phase I
2012	Mountain Big Sagebrush/Antelope Bitterbrush	Phase I
2017	Mountain Big Sagebrush/Antelope Bitterbrush	Phase I

**Site Notes**

The study was mowed or aerated between the 2002 and 2007 readings, thinning the the browse cover substantially. The area is in close proximity to a large dryland farm, which may attract deer in the spring. Cattle were seen adjacent to the study in 2017.

**Soils**

**Table 21A-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
Sandy Clay Loam	7.0	54.4	23.1	22.6	2.4	10.5	160.0	0.6	07/08/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	15 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.

At the time of study establishment in 1983, this site existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) dominated plant community (Table 21A-18.12, Table 21A- 18.13). Perennial grasses have provided significant cover, with needle and thread (*Hesperostipa comata*) being the most dominant species. There have also been significant amounts of cover contributed by annual grasses, namely cheatgrass (*Bromus tectorum*) (Table 21A-18.10). Perennial forbs are sparse. Annual forb cover is high, with the cover predominantly coming from desert madwort (*Alyssum desertorum*) (Table 21A-18.11). Tree cover is provided by Utah juniper (*Juniperus osteosperma*), and the study site is currently in Phase I of woodland succession (Table 21A-18.4, Table 21A-18.14). It is likely that this site will continue to exist in this state without a future disturbance. Encroachment from Utah juniper will likely continue, as this site was not part of the Furner and Dog Valley Juniper Removal treatment.

**Trend Summary Tables**

**Table 21A-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	15.8	1.3	2.7	-	-	-
2002	18.2	1.0	4.6	-	-	-
2007	5.1	1.0	4.9	9.0	0.9	7.6
2012	10.4	0.1	4.6	15.4	0.2	9.3
2017	9.3	0.1	7.4	16.1	0.2	16.5

**Table 21A-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	257	258	372	157	5.3	9.0	2.4	1.8
2002	281	266	410	71	2.4	13.8	5.9	0.8
2007	365	311	440	46	10.3	11.6	7.7	0.3
2012	317	343	304	45	6.4	17.0	2.6	0.4
2017	294	313	411	108	8.6	7.2	11.1	0.7

**Table 21A-18.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	22.6	1.3	40.1	8.7	1.5	34.3
2002	20.5	11.3	36.1	7.6	2.0	46.4
2007	15.1	1.1	44.6	9.6	1.0	37.3
2012	20.2	0.4	47.9	7.0	1.7	39.2
2017	20.9	0.9	42.9	11.4	1.1	46.5

**Table 21A-18.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit	Domestic Sheep
	Quadrat Frequency					
1997	2	11	1	-	12	2
2002	2	12	-	2	21	2
2007	5	1	1	10	85	-
2012	5	1	-	2	8	-
2017	11	8	-	-	66	-
Year	Days Use Per Acre (ha)					
1997	-	-	-	-	-	-
2002	5.8 (14.3)	36.2 (89.4)	-	4.7 (11.5)	-	4.0 (9.9)
2007	10.2 (25.1)	1.3 (3.3)	-	20.3 (50.2)	-	-
2012	39.2 (96.8)	4.0 (9.9)	-	22.1 (54.5)	-	-
2017	-	8.7 (21.5)	0.7 (1.7)	-	-	-



**Table 21A-18.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)	unknown perennial grass (unknown grass)
year	Nested Frequency										
1997	22	2	-	257	87	190	-	41	4	5	3
2002	39	1	4	281	26	196	9	46	21	2	-
2007	26	-	-	365	80	212	7	67	11	3	-
2012	15	3	-	317	7	259	8	128	22	-	-
2017	9	-	-	294	46	201	36	87	12	-	-
year	Average Cover (%)										
1997	0.8	0.2	-	5.3	1.3	6.0	-	0.5	0.1	0.1	0.1
2002	1.8	0.0	0.0	2.4	0.5	9.3	0.0	1.1	1.0	0.0	-
2007	0.7	-	-	10.3	2.2	6.4	0.1	1.6	0.5	0.0	-
2012	0.6	0.2	-	6.4	0.1	11.6	0.0	3.3	1.2	-	-
2017	0.6	-	-	8.6	0.6	4.3	0.4	0.8	0.4	-	-

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

**Table 21A-18.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria (pussytoes)	Astragalus (milkvetch)	Astragalus calycosus (Torrey's milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Carduus nutans <sup>ai</sup> (nodding plumeless thistle)	Castilleja angustifolia var. dubia (northwestern Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Crepis acuminata (tapertip hawksbeard)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Gilia inconspicua <sup>a</sup> (shy gilia)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Linum lewisii (Lewis flax)	Lithospermum incisum (narrowleaf stone seed)	Lygodesmia grandiflora (largeflower skeletonplant)
year	Nested Frequency																
1997	372	2	7	30	-	3	2	9	-	12	2	-	-	-	33	1	-
2002	410	-	4	23	-	3	-	1	-	-	-	-	-	-	3	2	8
2007	440	-	-	14	0	-	-	-	3	-	-	12	-	-	11	-	2
2012	304	-	-	14	-	2	-	-	2	-	1	-	-	-	-	-	3
2017	408	-	-	11	4	17	3	2	7	-	-	20	8	2	8	4	8
year	Average Cover (%)																
1997	2.3	0.0	0.1	0.4	-	0.0	0.0	0.2	-	0.0	0.0	-	-	-	0.2	0.0	-
2002	5.8	-	0.0	0.3	-	0.0	-	0.0	-	-	-	-	-	-	0.0	0.0	0.0
2007	7.4	-	-	0.1	0.0	-	-	-	0.0	-	-	0.2	-	-	0.1	-	0.0
2012	2.6	-	-	0.2	-	0.0	-	-	0.0	-	0.0	-	-	-	-	-	0.0
2017	10.6	-	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.4	0.1	0.0	0.0	0.0	0.1

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

FORB SPECIES									
Microsteris gracilis <sup>a</sup> (slender phlox)									
Oenothera (evening primrose)									
Packera multilobata (lobeleaf groundsel)									
Phlox austromontana (mountain phlox)									
Phlox longifolia (longleaf phlox)									
Sphaeralcea coccinea (scarlet globemallow)									
Streptanthus cordatus (heartleaf twistflower)									
Tragopogon dubius <sup>ai</sup> (yellow salsify)									
Zigadenus paniculatus (foothill deathcamas)									
year	Nested Frequency								
1997	-	7	47	7	37	-	15	7	3
2002	-	4	1	6	26	3	1	6	2
2007	3	-	2	3	7	6	1	4	1
2012	-	-	1	2	25	1	-	-	-
2017	-	-	6	5	45	8	3	4	14
year	Average Cover (%)								
1997	-	0.0	0.4	0.2	0.1	-	0.1	0.1	0.0
2002	-	0.0	0.0	0.2	0.1	0.0	0.0	0.1	0.0
2007	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2012	-	-	0.0	0.0	0.1	0.0	-	-	-
2017	-	-	0.0	0.0	0.3	0.1	0.0	0.0	0.0

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

**Table 21A-18.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES						
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)						
Gutierrezia sarothrae (broom snakeweed)						
Juniperus osteosperma <sup>t</sup> (Utah juniper)						
Linanthus pungens (granite prickly phlox)						
Opuntia polyacantha (plains pricklypear)						
Purshia tridentata <sup>p</sup> (antelope bitterbrush)						
year	Line Intercept Cover (%)					
1997	-	-	-	-	-	-
2002	-	-	-	-	-	-
2007	2.6	0.9	7.6	-	-	6.4
2012	5.1	-	9.3	0.2	-	10.3
2017	5.9	0.1	16.5	0.1	-	10.2
year	Quadrat Cover (%)					
1997	11.0	1.3	2.7	-	0.0	4.8
2002	9.3	1.0	4.6	0.0	0.0	8.8
2007	1.4	1.0	4.9	0.0	-	3.7
2012	3.1	-	4.6	0.1	-	7.3
2017	2.3	0.1	7.4	0.0	-	7.0

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

**Table 21A-18.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

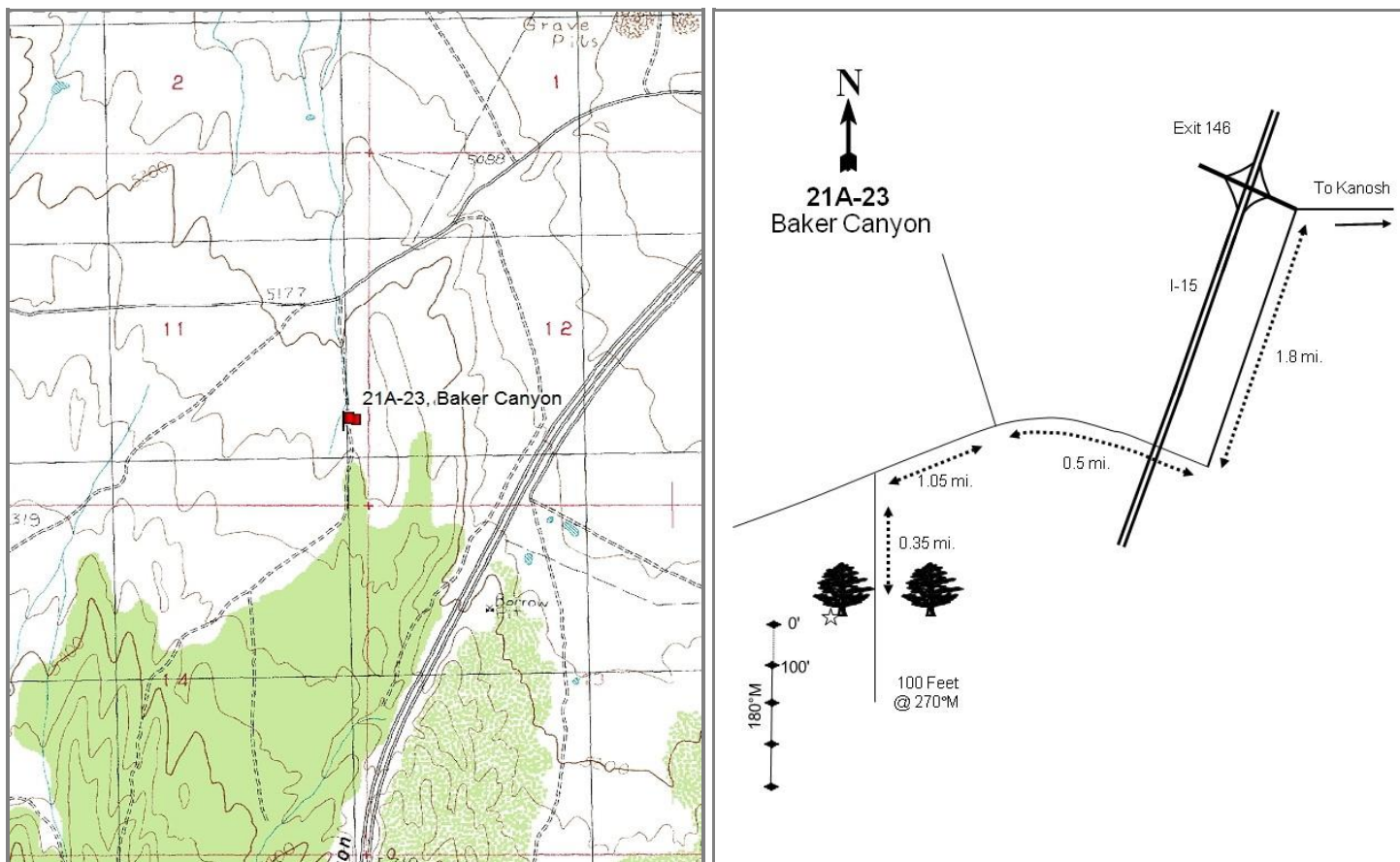
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1997	2100	60	16	57	27	10	0	24	81/116
2002	1980	120	24	51	25	14	4	10	79/109
2007	900	100	11	40	49	9	11	53	48/68
2012	900	-	4	80	16	36	2	47	56/92
2017	900	60	9	71	20	49	4	7	55/84
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1997	20	-	0	100	0	0	0	0	41/67
2002	40	-	0	100	0	0	0	0	18/31
2007	40	-	50	50	0	0	0	0	23/54
2012	20	-	0	100	0	0	0	0	18/51
2017	20	-	0	100	0	0	100	0	21/39
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1997	5000	40	24	76	0	0	0	0	24/25
2002	3820	-	3	84	14	0	0	9	18/26
2007	2160	400	13	82	6	0	0	6	21/32
2012	-	-	-	-	-	-	-	-	-/-
2017	160	-	38	63	0	0	0	0	18/23
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1997	80	-	25	75	0	0	0	0	-/-
2002	100	20	0	100	0	0	0	0	-/-
2007	100	-	0	100	0	0	0	0	-/-
2012	80	-	25	75	0	0	0	25	-/-
2017	80	-	0	100	0	0	0	0	-/-
<b>Linanthus pungens -- (granite prickly phlox)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	0	100	0	0	0	0	24/41
2007	60	-	33	67	0	0	0	0	9/31
2012	20	-	0	100	0	0	0	100	29/67
2017	80	-	0	100	0	0	0	0	14/24
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1997	20	-	0	100	0	0	0	0	7/8
2002	20	-	0	100	0	0	0	0	12/19
2007	20	-	0	100	0	0	0	0	10/25
2012	40	-	0	100	0	0	0	0	13/32
2017	20	-	0	100	0	0	0	100	3/7
<b>Purshia stansburiana<sup>P</sup> -- (Stansbury cliffrose)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	86/53
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1997	580	-	3	86	10	59	17	3	84/145
2002	520	-	0	92	8	58	15	4	117/206
2007	460	-	0	96	4	13	17	30	83/159
2012	460	-	4	91	4	35	52	17	84/168
2017	480	20	0	79	21	71	25	4	82/164

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

**Table 21A-18.14 - 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' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2002	37	-	-	-	-	-	8.4
2007	31	-	38	23	23	15	10.7
2012	33	-	13	50	25	13	9.8
2017	33	-	7	33	53	7	15.3

## BAKER CANYON - STUDY NO. 21A-23

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Dog Valley Peak NW; Township 24S, Range 7W, Section 11  
NAD 83 UTM ZONE 12, 360922 East 4288321 North

**Transect Information**

Browse Tag # (0' Stake)	7071
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**

Proceed south from Kanosh on the main road and turn left just before the I-15 interchange. Travel on the frontage road for 1.8 miles (paralleling the freeway on the east side) to an overpass. Proceed over the interstate and continue 0.5 miles west to a fork. Take the left fork and travel for about 1.05 miles. Just beyond the point of a small hill, turn left on a two-tire track road. Go 0.35 miles to the first point where the road squeezes between two junipers. From the south side of the large juniper to the right, walk 100 feet due west to the start of the frequency baseline. The 0-foot baseline stake is a rebar, tagged #7071.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	TWIN PEAKS
Elevation	5,220ft (1,591m)
Aspect	Northwest
Slope	3%
Sample Dates	06/16/1998, 06/12/2003, 07/23/2008, 08/14/2012, 06/22/2017

**Table 21A-23.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Plow	Horse Hollow Seeding	-	1967	2200
Seeding - Rangeland Drill	Horse Hollow Seeding	-	1967	2200
Fire - Prescribed	-	-	Prior to 1991	-

**Table 21A-23.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Horse Hollow			Drill	Nov 1967	2200
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
G	Psathyrostachys juncea	Russian Wildrye		6.00	0.00

**Wildlife Habitat and Vegetation History****Table 21A-23.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing

**Table 21A-23.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Wyoming Big Sagebrush/Perennial Grass	Phase I
1991	Wyoming Big Sagebrush/Perennial Grass	Phase I
1998	Wyoming Big Sagebrush/Perennial Grass	Phase I
2003	Wyoming Big Sagebrush/Perennial Grass	Phase I
2008	Wyoming Big Sagebrush/Perennial Grass	Phase I
2012	Wyoming Big Sagebrush/Perennial Grass	Phase I
2017	Wyoming Big Sagebrush/Annual grass	Phase I

**Site Notes**

No Notes

**Soils****Table 21A-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
Sandy Clay Loam	7.1	48.0	27.4	24.6	1.0	16.8	140.8	0.6	06/16/1998

**Site Potential**

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Upland Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R028AY309UT
States and Transitions	No state and transition model is available for this ecological site.

From the time this site was established in 1985 to the most recent sampling in 2017, it has been a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) dominated site. Prior to 2017, the site consisted of a perennial grass understory, while in 2017 the understory transitioned to an annual grass dominated state (21A-23.10). It is worthy to note that cattle usage was particularly high in 2017, which could have been a contributing factor to the decrease of perennial grasses (21A-23.7). The forb component of the site is primarily comprised of introduced annual forbs, and cover of these undesirable forbs is high (21A-23.11). Utah juniper (*Juniperus osteosperma*) is present on the site, with cover having increased steadily through time (Table 21A-23.12, Table 21A-23.13); it appears that the site is nearing the transition to Phase II encroachment.

**Trend Summary Tables****Table 21A-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
1998	5.4	1.0	2.9	-	-	0.2
2003	7.4	1.2	3.1	5.1	0.5	6.4
2008	4.8	1.2	0.1	4.1	0.9	6.9
2012	6.3	1.5	2.9	6.9	0.7	8.3
2017	6.9	1.7	1.4	5.7	1.1	15.8

**Table 21A-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
1998	276	213	379	158	6.5	10.2	5.5	5.2
2003	110	233	98	79	1.4	13.2	2.5	2.7
2008	234	242	284	95	2.5	11.6	3.7	2.2
2012	250	282	317	133	5.5	12.2	2.3	2.2
2017	306	242	416	128	16.2	6.5	11.7	2.5

**Table 21A-23.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	40.5	1.5	28.4	23.4	4.1	33.1
2003	19.7	1.4	23.2	34.2	3.0	29.8
2008	9.2	3.0	34.3	30.9	2.2	27.9
2012	20.9	3.8	39.8	18.0	1.4	36.3
2017	24.8	1.0	28.9	20.3	1.4	46.6

**Table 21A-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	Rabbit
	Quadrat Frequency		
1998	4	12	7
2003	-	9	32
2008	-	15	86
2012	4	-	32
2017	12	12	42
Year	Days Use Per Acre (ha)		
1998	7.2 (17.9)	19.4 (48.0)	-
2003	12.3 (30.5)	0.7 (1.7)	-
2008	12.3 (30.5)	9.4 (23.2)	-
2012	0.7 (1.8)	2.0 (5.0)	-
2017	30.5 (75.3)	0.7 (1.7)	-



**Table 21A-23.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea <sup>i</sup> (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency											
1998	9	-	-	276	25	-	-	-	1	68	1	148
2003	16	-	-	110	24	-	-	-	-	117	-	151
2008	6	-	-	234	1	-	-	-	2	75	-	205
2012	4	-	-	250	4	-	-	-	-	210	-	158
2017	24	4	35	306	5	1	5	4	28	117	-	127
year	Average Cover (%)											
1998	0.4	-	-	6.5	0.5	-	-	-	0.1	1.7	0.0	7.4
2003	0.4	-	-	1.4	0.7	-	-	-	-	2.2	-	9.9
2008	0.0	-	-	2.5	0.0	-	-	-	0.0	0.8	-	10.7
2012	0.0	-	-	5.5	0.2	-	-	-	-	4.4	-	7.5
2017	0.2	0.0	0.3	16.2	0.3	0.0	0.0	0.0	0.4	2.5	-	2.6

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

**Table 21A-23.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum <sup>ai</sup> (desert madwort)	Antennaria dimorpha (low pussytoes)	Astragalus calycosus (Torrey's milkvetch)	Astragalus piutensis (Sevier milkvetch)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Comandra umbellata (bastard toadflax)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Gilia inconspicua <sup>a</sup> (shy gilia)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Linum lewisii (Lewis flax)	Machaeranthera canescens (hoary tansyaster)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Sphaeralcea coccinea (scarlet globemallow)	Tragopogon dubius <sup>ai</sup> (yellow salsify)
year	Nested Frequency																
1998	364	-	68	3	150	5	-	4	69	-	1	-	15	72	-	37	-
2003	21	-	12	-	-	7	-	-	78	2	-	-	-	32	4	31	-
2008	241	6	23	-	136	5	-	3	107	-	-	-	-	22	19	29	-
2012	294	1	49	-	141	11	-	-	85	-	-	-	2	52	1	34	-
2017	403	3	35	2	61	9	1	11	168	-	-	1	6	44	6	41	7
year	Average Cover (%)																
1998	3.3	-	0.9	0.0	1.0	0.0	-	0.0	1.2	-	0.0	-	0.2	2.6	-	1.4	-
2003	0.1	-	0.1	-	-	0.2	-	-	2.4	0.0	-	-	-	1.1	0.0	1.3	-
2008	0.8	0.0	0.3	-	0.7	0.1	-	0.0	2.1	-	-	-	-	0.4	0.4	0.9	-
2012	1.4	0.0	0.5	-	0.4	0.1	-	-	0.5	-	-	-	0.0	1.0	0.0	0.6	-
2017	5.4	0.0	0.3	0.1	0.5	0.0	0.0	0.2	5.7	-	-	0.0	0.0	1.0	0.0	1.0	0.0

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

**Table 21A-23.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Ephedra nevadensis <sup>p</sup> (Nevada jointfir)	Ericameria nauseosa ssp. nauseosa var. hololeuca <sup>p</sup> (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)						
1998	-	-	-	-	-	-	-
2003	3.2	0.5	1	0.9	-	6.4	-
2008	2.7	0.1	1	0.4	-	6.9	0.8
2012	4.3	0.7	1.3	1.3	-	8.3	-
2017	3.7	0.9	0.4	1.6	0.1	15.8	0.1
year	Quadrat Cover (%)						
1998	3.1	1.0	1.2	1.0	-	2.9	-
2003	4.8	1.2	1.9	0.7	-	3.1	-
2008	3.6	1.2	1.2	0.0	-	0.1	0.0
2012	3.8	1.5	1.7	0.8	-	2.9	-
2017	5.1	1.1	1.0	0.7	0.4	1.4	0.2

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

**Table 21A-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 <sup>p</sup> -- (Wyoming big sagebrush)									
1998	780	-	5	80	15	51	3	3	53/74
2003	560	-	0	71	29	7	0	21	58/87
2008	580	20	3	55	41	31	31	28	72/99
2012	500	-	0	68	32	12	20	76	54/86
2017	600	760	7	77	17	7	0	17	58/90
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1998	260	-	0	100	0	0	0	0	25/33
2003	360	-	0	89	11	0	0	0	28/53
2008	420	20	5	81	14	5	0	10	28/42
2012	520	-	15	85	0	4	0	85	28/54
2017	520	-	15	85	0	35	23	0	27/59
Ephedra nevadensis <sup>p</sup> -- (Nevada jointfir)									
1998	100	-	40	60	0	20	20	0	60/115
2003	320	-	69	25	6	6	13	6	60/105
2008	480	-	50	33	17	25	17	4	60/116
2012	220	-	0	100	0	73	9	46	60/119
2017	500	-	48	44	8	64	24	8	49/107
Ericameria nauseosa ssp. nauseosa var. hololeuca <sup>p</sup> -- (rubber rabbitbrush)									
1998	20	-	0	100	0	0	0	0	110/203
2003	40	-	100	0	0	0	0	0	76/124
2008	20	-	0	100	0	0	0	0	74/104
2012	60	-	0	67	33	33	0	33	63/96
2017	280	-	14	64	21	0	0	14	53/78
Gutierrezia sarothrae -- (broom snakeweed)									
1998	-	-	-	-	-	-	-	-	35/48
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	17/12
2017	140	-	0	100	0	0	0	29	24/38

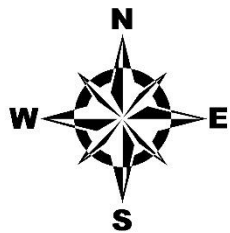
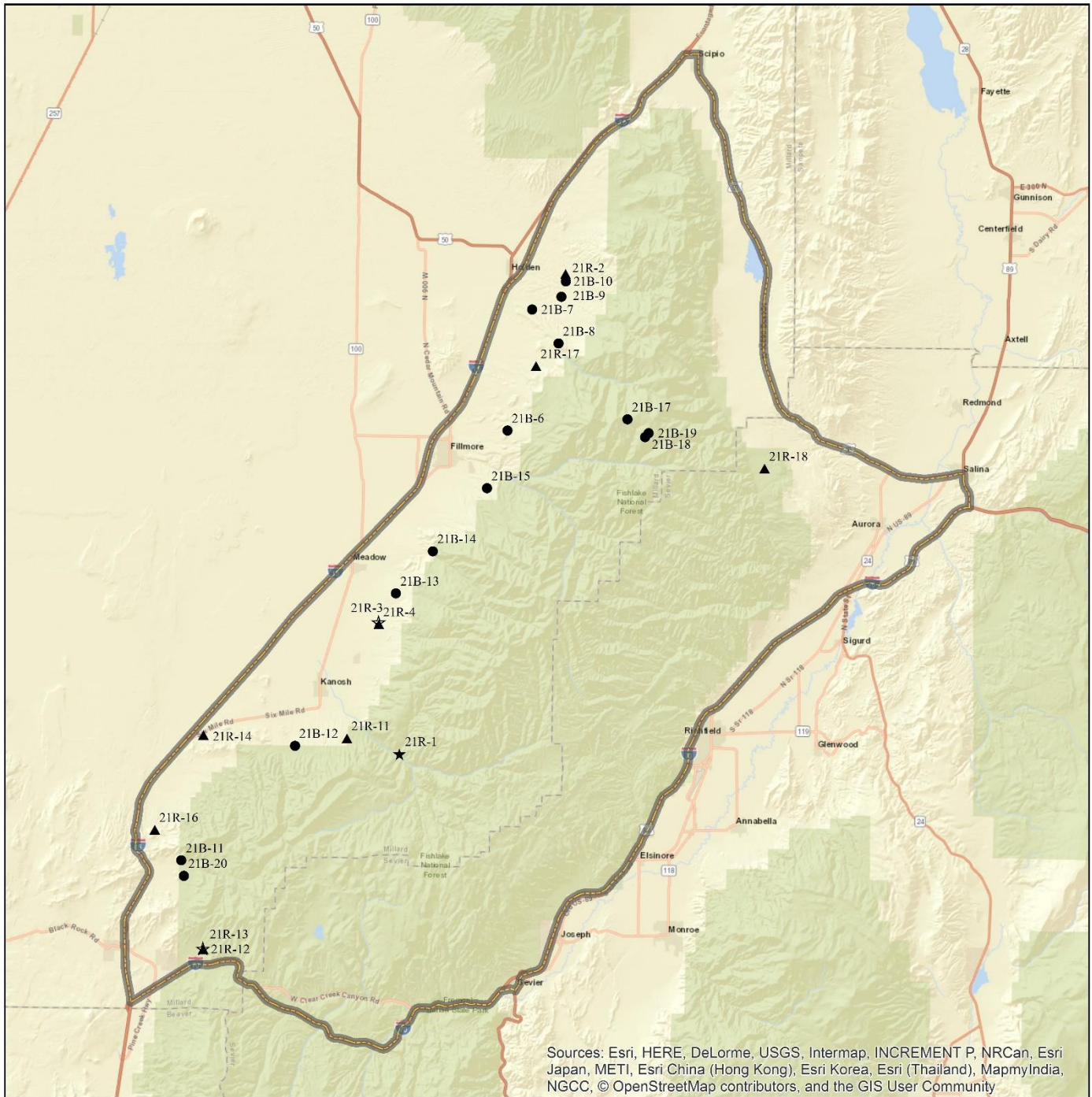
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1998	40	-	50	50	0	0	0	0	- / -
2003	40	-	50	50	0	0	0	0	- / -
2008	60	20	33	67	0	0	0	0	- / -
2012	180	20	0	100	0	0	0	89	- / -
2017	80	40	75	25	0	0	0	0	- / -
<b>Opuntia -- (pricklypear)</b>									
1998	-	-	-	-	-	-	-	-	- / -
2003	-	-	-	-	-	-	-	-	29/63
2008	-	-	-	-	-	-	-	-	5/21
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	6/9
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1998	-	-	-	-	-	-	-	-	- / -
2003	-	-	-	-	-	-	-	-	- / -
2008	40	-	0	100	0	0	0	0	65/86
2012	-	-	-	-	-	-	-	-	- / -
2017	160	-	25	75	0	0	0	0	32/32

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

**Table 21A-23.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.


Year	Density		Size Class Distribution				Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
2003	40	9	45	27	18	-	8.0
2008	44	8	38	38	8	8	10.5
2012	47	13	40	33	13	-	6.3
2017	55	12	47	24	-	18	9.6

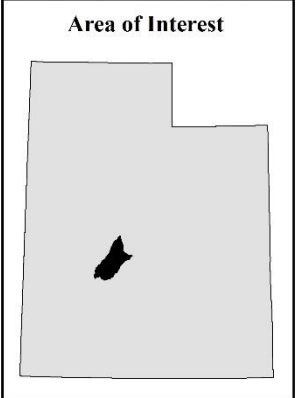
# WILDLIFE MANAGEMENT UNIT 21B - PAHVANT FILLMORE



**Study Location Project, Status**

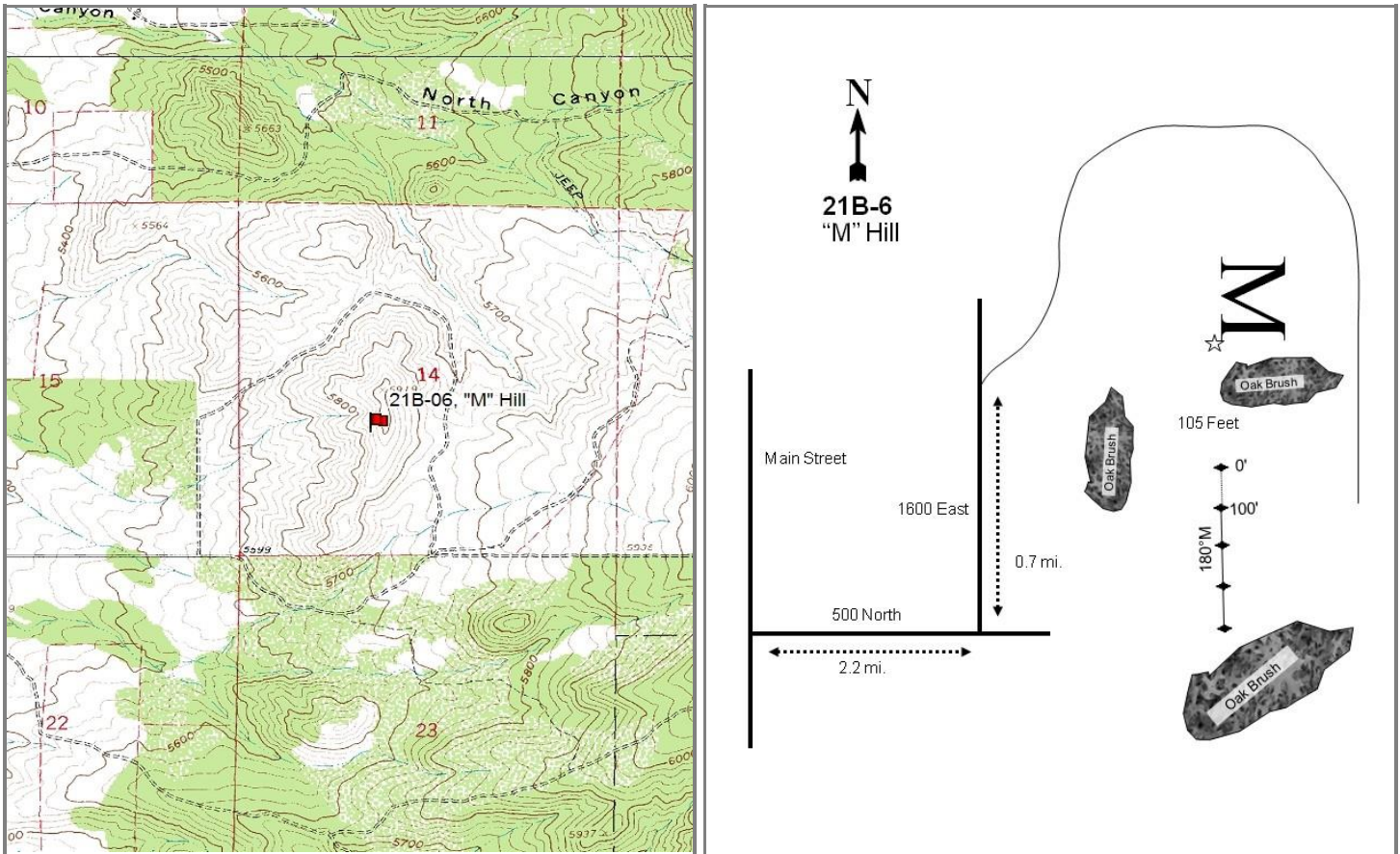
- RT, Active
- ★ RT, Suspended
- ▲ WRI, Active
- ☆ WRI, Suspended

 Unit - 21B





## M HILL - STUDY NO. 21B-6

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Fillmore NE; Township 21S, Range 4W, Section 14  
NAD 83 UTM ZONE 12, 389814 East 4315807 North

**Transect Information**

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

7112  
180° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
No Rebar

**Directions to Site**

This transect is located near the 'M' on the hill northeast of Fillmore. Starting at the junction of 500 North and Main Street in Fillmore, go east 2.2 miles to the base of 'M' Hill; the road that goes to the top of 'M' Hill has been closed. Turn left (north) at the gun range and drive for 0.7 miles to the closed road, park, and hike to the 'M'. The frequency baseline starts 105 feet due south of the bottom of the south leg of the concrete 'M'. The baseline is marked by 2 ½-foot-tall steel rebar. The 0-foot baseline stake is marked with browse tag #7112.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,850ft (1,783m)
Aspect	West
Slope	30-35%
Sample Dates	06/24/1998, 06/09/2003, 07/22/2008, 08/09/2012, 06/20/2017

**Table 21B-06.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	Historic	-

**Wildlife Habitat and Vegetation History****Table 21B-06.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	substantial	winter

**Table 21B-06.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mixed Mountain Brush	Phase I
1991	Mixed Mountain Brush	Phase I
1998	Mixed Mountain Brush	Phase I
2003	Mixed Mountain Brush	Phase I transitioning to Phase II
2008	Mixed Mountain Brush	Phase I transitioning to Phase II
2012	Mixed Mountain Brush	Phase I transitioning to Phase II
2017	Mixed Mountain Brush	Phase I transitioning to Phase II

**Site Notes**

No Notes

**Soils****Table 21B-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
Sandy Clay Loam	6.9	51.3	27.4	21.3	4.0	8.4	89.6	0.7	06/24/1998

**Site Potential**

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Loam (Oak)
NRCS Ecological Site #	R047XA432UT
States and Transitions	No state and transition model is available for this ecological site.

From study establishment in 1985 through the most recent sample year, the primary shrubs on the site have been Gambel oak (*Quercus gambelii*) and alderleaf mountain mahogany (*Cercocarpus montanus*). The browse species Stansbury cliffrose (*Purshia stansburiana*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) were also observed on the site in lesser amounts (21B-06.12). Grasses provide good cover, with bluebunch wheatgrass (*Pseudoroegneria spicata*) as the dominant species (21B-06.10). Forbs are diverse, although overall cover is not high and the introduced annual species desert madwort (*Alyssum desertorum*) provides the most cover (21B-06.11). Utah juniper (*Juniperus osteosperma*) has been present on the site since the initial sampling and cover has increased in subsequent sample years (Table 21B-06.14). It is probable that without a tree-removing disturbance, the tree cover will increase in the future and potentially reduce understory productivity.



**Trend Summary Tables****Table 21B-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
1998	14.8	2.6	6.0	0.5	-	0.9
2003	11.9	0.3	3.2	20.0	0.5	8.3
2008	10.8	0.5	3.4	20.2	0.6	10.0
2012	14.9	0.1	5.4	27.0	0.6	14.3
2017	10.9	0.1	1.4	21.0	0.2	11.0

**Table 21B-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
1998	201	243	296	201	2.2	9.3	2.1	6.2
2003	31	230	19	107	0.1	12.0	0.1	2.3
2008	66	245	247	90	0.3	13.2	1.7	2.8
2012	84	281	293	73	0.3	21.6	1.8	2.2
2017	95	283	402	145	2.1	17.3	10.0	2.8

**Table 21B-06.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	9.0	0.1	52.8	22.4	11.1	40.9
2003	18.3	0.3	46.0	9.5	12.2	27.5
2008	4.7	0.5	45.4	17.0	13.3	32.0
2012	9.0	0.4	51.1	11.3	11.1	46.0
2017	13.1	1.0	50.0	20.1	11.7	42.1

**Table 21B-06.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1998	-	16	3	16
2003	-	24	1	15
2008	-	27	2	39
2012	-	6	2	3
2017	-	6	1	14
Year	Days Use Per Acre (ha)			
1998	5.8 (14.3)	22.8 (56.3)	4.0 (9.9)	-
2003	0.7 (1.8)	48.9 (120.8)	6.7 (16.6)	-
2008	-	22.8 (56.3)	3.4 (8.3)	-
2012	-	11.4 (28.1)	5.3 (13.2)	-
2017	-	15.4 (38.1)	2.0 (5.0)	-

**Table 21B-06.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency							
1998	2	14	199	7	-	0	39	232
2003	2	-	31	1	8	-	77	206
2008	1	10	57	4	2	-	63	235
2012	0	-	84	4	59	-	72	247
2017	3	5	92	5	70	-	50	252
year	Average Cover (%)							
1998	0.4	0.2	2.0	0.1	-	0.0	0.5	8.3
2003	0.2	-	0.1	0.0	0.0	-	1.0	10.8
2008	0.2	0.0	0.2	0.1	0.0	-	0.4	12.5
2012	0.0	-	0.3	0.2	2.4	-	1.9	17.1
2017	0.2	0.0	2.1	0.0	1.7	-	0.8	14.6

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

**Table 21B-06.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum alyssoides <sup>ai</sup> (pale madwort)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Astragalus eurekaensis (Eureka milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Cryptantha (cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium multiflorum (shrubby bedstraw)	Gilia inconspicua <sup>a</sup> (shy gilia)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)
year	Nested Frequency																
1998	7	-	279	1	19	-	8	3	-	6	24	3	1	49	-	12	-
2003	-	-	3	-	2	-	-	1	4	3	12	-	-	12	3	-	-
2008	-	-	242	1	2	2	-	5	5	3	3	-	3	8	-	-	-
2012	-	-	293	-	-	-	9	-	7	2	-	3	-	-	-	-	-
2017	-	156	365	-	14	1	22	-	6	-	-	12	-	40	-	4	1
year	Average Cover (%)																
1998	0.0	-	1.8	0.0	0.2	-	0.0	0.1	-	0.1	0.1	0.0	0.0	0.5	-	0.1	-
2003	-	-	0.0	-	0.0	-	-	0.0	0.0	0.0	0.1	-	-	0.2	0.0	-	-
2008	-	-	1.7	0.0	0.1	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.2	-	-	-
2012	-	-	1.7	-	-	-	0.0	-	0.0	0.0	-	0.0	-	-	-	-	-
2017	-	0.7	9.2	-	0.1	0.0	0.0	-	0.0	-	-	0.1	-	0.4	-	0.0	0.0

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

FORB SPECIES	Linum lewisii (Lewis flax)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Petradoria pumila (rock goldenrod)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Phy sara chambersii (Chambers' twinpod)	Silene antirrhina <sup>a</sup> (sleepy silene)	Streptanthus cordatus (heartleaf twistflower)	Tragopogon dubius <sup>ai</sup> (yellow salsify)
year	Nested Frequency											
1998	4	0	29	-	9	80	44	25	4	-	18	0
2003	-	-	-	5	4	42	33	16	-	-	3	3
2008	-	-	-	3	-	32	28	5	-	3	14	-
2012	-	-	-	-	-	35	29	18	-	-	1	-
2017	-	10	17	-	-	28	41	28	5	3	7	3
year	Average Cover (%)											
1998	0.1	0.0	0.1	-	0.1	2.9	1.9	0.1	0.0	-	0.2	0.0
2003	-	-	-	0.0	0.0	1.2	0.6	0.2	-	-	0.0	0.0
2008	-	-	-	0.0	-	1.7	0.7	0.0	-	0.0	0.1	-
2012	-	-	-	-	-	1.3	0.6	0.2	-	-	0.0	-
2017	-	0.0	0.1	-	-	1.2	0.9	0.1	0.0	0.0	0.0	0.0

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

**Table 21B-06.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Cercocarpus montanus <sup>p</sup> (alderleaf mountain mahogany)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>i</sup> (Utah juniper)	Linanthus pungens (granite prickly phlox)	Purshia stansburiana <sup>p</sup> (Stansbury cliffrose)	Quercus gambelii <sup>p</sup> (Gambel oak)
year	Line Intercept Cover (%)							
1998	-	-	-	-	-	-	-	-
2003	-	0.2	6.1	0.5	8.3	0	1.7	12
2008	-	0.7	5.4	0.6	10	-	0.9	13.2
2012	-	1	7.5	0.6	14.3	-	1.7	16.8
2017	-	1	5.1	0.2	11	-	1.2	13.7
year	Quadrat Cover (%)							
1998	-	1.0	3.5	1.3	6.0	1.3	1.6	8.8
2003	0.4	0.0	3.9	0.1	3.2	0.2	1.1	6.5
2008	-	0.8	2.9	0.5	3.4	0.0	0.1	6.9
2012	-	0.9	6.3	0.1	5.4	-	0.4	7.4
2017	-	0.4	2.8	0.1	1.4	-	0.4	7.3

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

**Table 21B-06.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	244/265
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1998	220	-	0	82	18	9	0	0	73/92
2003	80	-	0	75	25	0	0	0	63/102
2008	60	-	0	100	0	0	0	0	78/115
2012	100	-	20	80	0	0	0	20	71/109
2017	100	20	0	100	0	0	0	20	61/100
<b>Cercocarpus montanus<sup>P</sup> -- (alderleaf mountain mahogany)</b>									
1998	260	80	54	39	8	0	0	0	177/179
2003	300	-	20	73	7	27	27	0	190/221
2008	200	-	10	60	30	60	0	10	196/212
2012	120	20	17	83	0	0	17	50	199/230
2017	120	2520	17	83	0	0	17	0	179/202
<b>Ericameria nauseosa ssp. nauseosa var. hololeuca<sup>P</sup> -- (rubber rabbitbrush)</b>									
1998	-	-	-	-	-	-	-	-	30/37
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	19/10
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1998	1740	80	13	87	0	0	0	0	28/31
2003	400	-	0	95	5	0	0	5	23/29
2008	1000	20	0	96	4	0	0	0	26/36
2012	420	-	10	43	48	0	0	48	18/29
2017	620	40	29	68	3	0	0	3	26/29
<b>Juniperus osteosperma<sup>L</sup> -- (Utah juniper)</b>									
1998	160	-	25	63	13	0	0	0	-/-
2003	260	20	39	62	0	0	0	0	-/-
2008	200	40	30	70	0	0	0	0	-/-
2012	320	20	25	75	0	0	0	0	-/-
2017	220	-	46	55	0	0	0	0	-/-
<b>Linanthus pungens -- (granite prickly phlox)</b>									
1998	3400	20	8	79	12	0	0	0	5/15
2003	380	-	5	84	11	0	0	11	5/14
2008	20	-	0	0	100	0	0	100	-/-
2012	-	-	-	-	-	-	-	-	24/35
2017	-	-	-	-	-	-	-	-	14/33
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1998	-	-	-	-	-	-	-	-	18/39
2003	-	-	-	-	-	-	-	-	16/50
2008	20	-	0	100	0	0	0	0	12/15
2012	-	-	-	-	-	-	-	-	15/40
2017	-	-	-	-	-	-	-	-	16/30
<b>Purshia stansburiana<sup>P</sup> -- (Stansbury cliffrose)</b>									
1998	160	20	0	63	38	75	0	0	125/118
2003	120	-	0	17	83	17	83	17	166/175
2008	80	-	25	50	25	25	0	0	118/103
2012	140	20	0	71	29	29	14	29	110/111
2017	120	-	0	67	33	50	33	33	104/112
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1998	3020	60	46	53	1	19	0	0	138/111
2003	3080	100	38	52	10	0	0	6	93/66
2008	4700	260	13	83	4	1	0	0	98/106
2012	2740	60	64	34	2	4	1	2	94/100
2017	4420	260	69	29	2	2	0	1	90/88

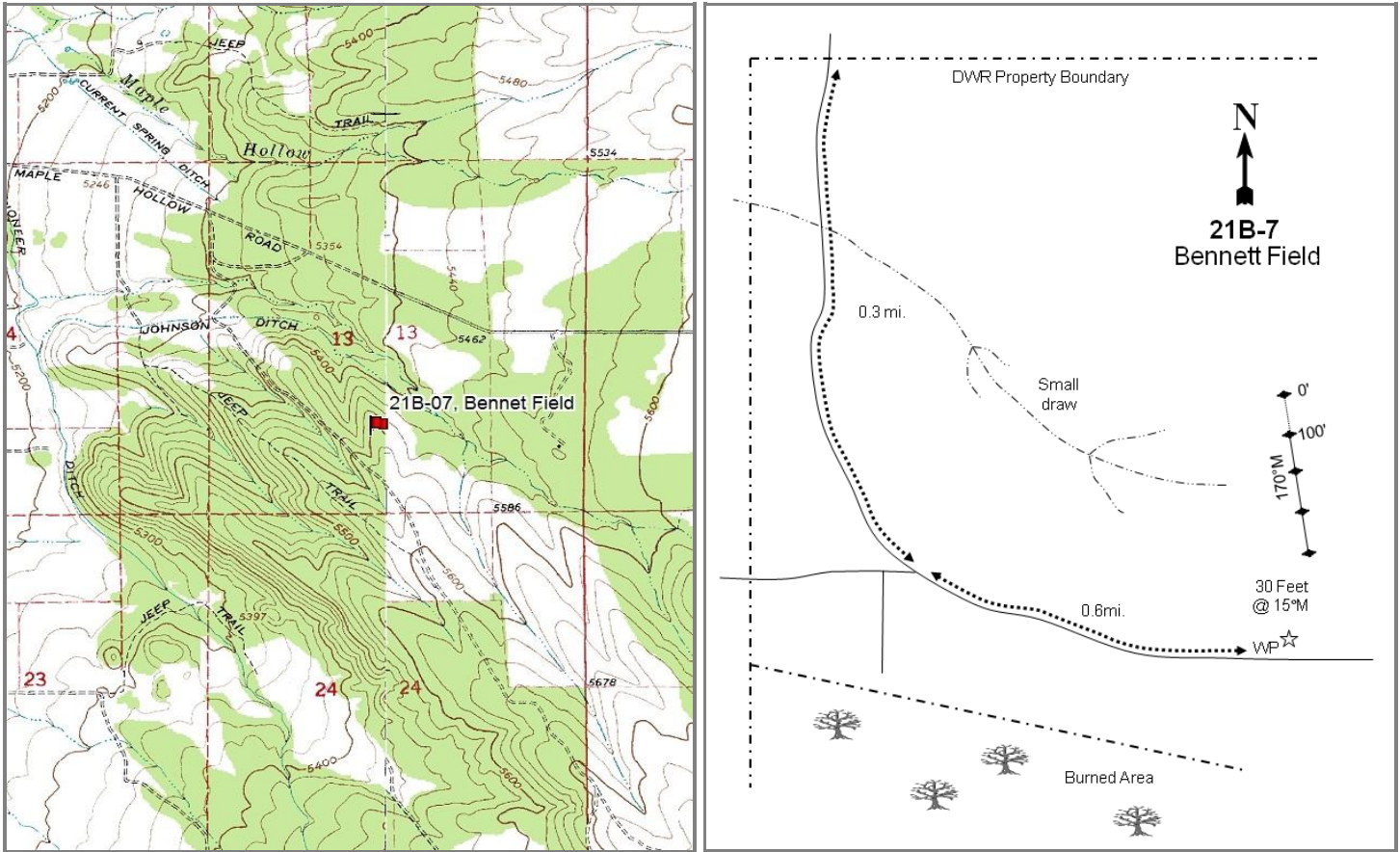
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Rhus trilobata var. trilobata <sup>P</sup> -- (skunkbush sumac)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	140/316

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

**Table 21B-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)							
1998	132	-	-	-	-	-	17.2
2003	140	-	32	16	37	16	14.6
2008	144	11	-	21	32	37	13.4
2012	149	11	5	16	53	16	14.3
2017	161	5	11	16	32	37	19.3

## BENNETT FIELD - STUDY NO. 21B-7



### Location Information

USGS 7.5 min Map Info	Holden NE; Township 20S, Range 4W, Section 13
GPS (0' Stake)	NAD 83 UTM ZONE 12, 391734 East 4325279 North

### Transect Information

Browse Tag # (0' Stake)	7184
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

Take I-15 exit 174 south of Holden. From the interchange, proceed 0.9 miles straight east on a dirt road (towards Maple Canyon). Just after the cattle guard, turn right. Continue for 0.1 miles to a gate to DWR property. Proceed 0.3 miles down across a wash and over to a three-way split. Follow the main road, which bends to the left, and continue for 0.6 miles near the top of a small ridge. There is a witness post (steel rebar 3 feet tall) on the left (north) side of the road. The 400-foot stake is 30 feet away from the witness post at a bearing of 15 degrees magnetic. The frequency baseline starts 400 feet further north and the 0-foot stake is marked with browse tag #7184.



**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,500ft (1,676m)
Aspect	West
Slope	10%
Sample Dates	06/24/1998, 05/15/2003, 07/25/2008, 08/13/2012, 06/21/2017

**Table 21B-07.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	1958	-

**Wildlife Habitat and Vegetation History****Table 21B-07.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	substantial	winter

**Table 21B-07.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I
1991	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I
1998	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I
2003	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I
2008	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I
2012	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I transitioning to Phase II
2017	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I transitioning to Phase II

**Site Notes**

A deer carcass was found on the site in 2012.

**Soils****Table 21B-07.5 - Soil Analysis Data.** List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	6.9	48.7	27.7	23.6	3.2	7.5	140.8	0.8	06/23/1998

**Site Potential**

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XB336UT
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 mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Stansbury cliffrose (*Purshia stansburiana*) (Table 21B-07.6, Table 21B-07.12, Table 21B-07.13). The herbaceous understory has maintained high amounts of cheatgrass (*Bromus tectorum*), which can reduce the resiliency of the site through the loss of diversity and increased fire regimes. Perennial grasses contribute little cover, and forb diversity and cover is low overall (Table 21B-07.10, Table 21B-07.11). The site was chained in 1958 and since that treatment, infilling by Utah juniper (*Juniperus osteosperma*) has been steady (photos, Table 21B-07.14). Barring a tree-removing disturbance, this site will likely continue to transition into a Phase II woodland community.

**Trend Summary Tables****Table 21B-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
1998	14.4	0.8	0.2	0.3	-	0.1
2003	18.0	0.1	0.7	27.4	-	1.8
2008	10.9	0.5	1.0	20.6	0.7	5.4
2012	10.1	0.1	3.3	21.9	-	3.7
2017	11.1	0.1	2.5	20.8	-	8.6

**Table 21B-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
1998	392	211	422	16	27.4	4.6	13.2	0.7
2003	371	331	390	68	13.0	12.6	12.2	0.6
2008	391	244	303	13	14.7	9.5	2.9	0.0
2012	382	361	379	13	22.0	28.0	5.8	0.3
2017	291	398	422	24	19.2	31.6	13.6	0.2

**Table 21B-07.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	5.7	2.0	70.1	5.2	2.9	54.1
2003	14.6	5.8	39.1	1.3	3.2	53.9
2008	3.1	0.7	54.8	2.3	3.9	47.6
2012	2.2	0.3	58.5	1.1	2.4	70.0
2017	3.5	2.0	55.9	4.9	4.0	66.6

**Table 21B-07.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1998	3	55	1	20
2003	-	55	2	16
2008	-	55	-	49
2012	-	34	-	21
2017	-	35	2	21
Year	Days Use Per Acre (ha)			
1998	-	131.3 (324.4)	2.0 (5.0)	-
2003	-	160.9 (397.3)	-	-
2008	1.5 (3.6)	145.4 (359.2)	0.7 (1.7)	-
2012	-	89.1 (220.2)	3.4 (8.3)	-
2017	0.7 (1.8)	60.3 (149.0)	10.0 (24.8)	-

**Table 21B-07.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Aristida purpurea (purple threeawn)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Secale cereale <sup>ai</sup> (cereal rye)
year	Nested Frequency								
1998	-	3	392	9	4	-	179	44	2
2003	-	-	371	-	89	-	304	38	-
2008	0	10	391	3	77	28	167	38	-
2012	-	7	377	-	221	13	188	40	-
2017	-	17	290	4	348	27	142	53	-
year	Average Cover (%)								
1998	-	0.0	27.4	0.1	0.0	-	3.5	1.0	0.0
2003	-	-	13.0	-	2.9	-	7.9	1.8	-
2008	0.0	0.0	14.7	0.0	3.0	0.7	3.0	2.8	-
2012	-	0.0	22.0	-	11.7	0.8	11.9	3.5	-
2017	-	0.1	19.1	0.1	23.5	0.5	3.9	3.7	-

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

**Table 21B-07.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Astragalus (milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chamaesyce (sandmat)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Crepis acuminata (tapertip hawkbeard)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium <sup>a</sup> (bedstraw)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Linum lewisii (Lewis flax)	Lomatium (desertparsley)	Petroradia pumila (rock goldenrod)	Phlox austromontana (mountain phlox)
year	Nested Frequency																
1998	5	422	-	-	2	-	-	-	-	-	53	-	2	6	-	4	-
2003	7	367	0	18	-	83	-	2	10	2	135	3	-	3	28	3	-
2008	4	266	-	-	3	12	4	-	6	-	98	-	-	-	-	-	-
2012	-	379	-	-	-	-	-	-	4	5	3	-	-	1	-	4	-
2017	-	403	-	10	-	4	-	2	8	-	133	-	-	-	4	5	1
year	Average Cover (%)																
1998	0.1	12.9	-	-	0.0	-	-	-	-	-	0.1	-	0.0	0.1	-	0.4	-
2003	0.1	8.2	0.0	0.1	-	0.2	-	0.0	0.0	0.0	3.8	0.0	-	0.0	0.2	0.1	-
2008	0.0	1.5	-	-	0.0	0.0	0.0	-	0.0	-	1.4	-	-	-	-	-	-
2012	-	5.7	-	-	-	-	-	-	0.0	0.0	0.0	-	-	0.0	-	0.3	-
2017	-	10.6	-	0.0	-	0.0	-	0.0	0.0	-	3.0	-	-	-	0.0	0.1	0.0

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

FORB SPECIES	Phlox longifolia (longleaf phlox)	Silene antirrhina <sup>a</sup> (sleepy silene)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency			
1998	1	-	7	-
2003	12	10	5	4
2008	2	-	-	0
2012	1	6	3	2
2017	3	3	3	-
year	Average Cover (%)			
1998	0.0	-	0.2	-
2003	0.1	0.0	0.0	0.0
2008	0.0	-	-	0.0
2012	0.0	0.0	0.0	0.0
2017	0.0	0.0	0.0	-

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

**Table 21B-07.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Purshia stansburiana <sup>p</sup> (Stansbury cliffrose)
year	Line Intercept Cover (%)			
1998	-	-	-	-
2003	17.4	-	1.8	10
2008	12.6	0.7	5.4	8
2012	15.2	-	3.7	6.7
2017	14.4	-	8.6	6.4
year	Quadrat Cover (%)			
1998	10.3	0.8	0.2	4.1
2003	15.4	0.1	0.7	2.6
2008	9.3	0.5	1.0	1.6
2012	8.5	0.1	3.3	1.6
2017	10.3	0.1	2.5	0.8

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

**Table 21B-07.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

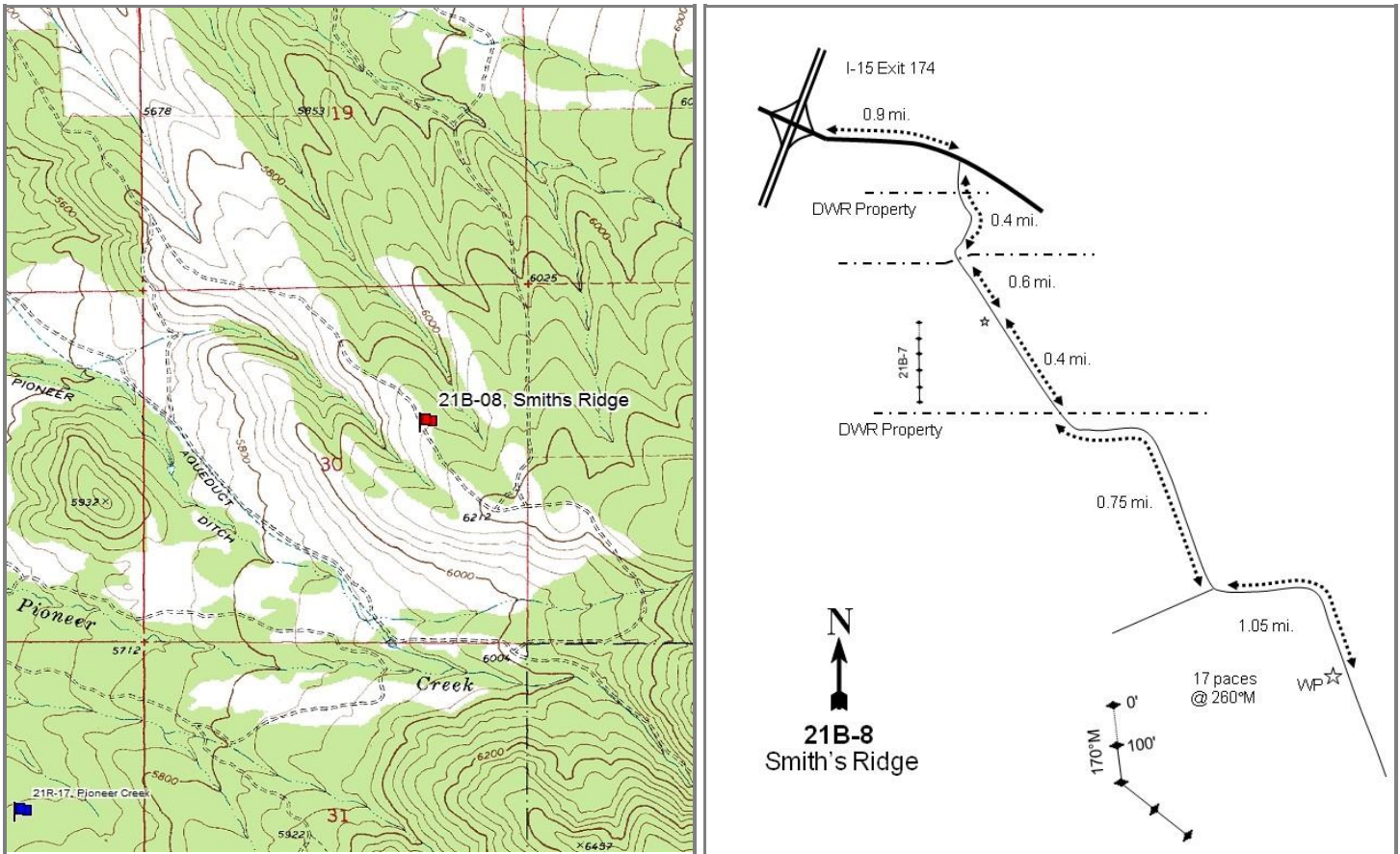
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1998	1960	-	3	56	41	26	3	14	89/107
2003	1800	-	1	54	44	24	6	20	90/108
2008	1360	-	3	40	57	32	4	38	98/124
2012	1440	-	1	63	36	38	40	40	94/124
2017	1300	-	0	60	40	32	15	45	85/110
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1998	60	-	33	67	0	0	0	0	21/25
2003	-	-	-	-	-	-	-	-	33/41
2008	-	-	-	-	-	-	-	-	34/62
2012	-	-	-	-	-	-	-	-	46/62
2017	-	-	-	-	-	-	-	-	42/68
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	62/98
2017	-	-	-	-	-	-	-	-	48/67
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1998	1080	40	22	76	2	0	0	2	26/28
2003	220	-	9	82	9	0	0	9	14/20
2008	260	-	0	92	8	0	0	8	26/35
2012	120	-	0	100	0	0	0	0	30/44
2017	120	-	0	100	0	0	0	0	25/23
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1998	40	-	0	50	50	0	0	0	-/-
2003	20	-	0	0	100	0	0	100	-/-
2008	20	-	0	0	100	0	0	0	-/-
2012	40	-	0	100	0	0	0	0	-/-
2017	20	20	0	0	100	0	0	0	-/-
<b>Purshia stansburiana<sup>P</sup> -- (Stansbury cliffrose)</b>									
1998	480	20	13	75	13	21	0	0	198/164
2003	360	-	0	56	44	11	61	17	211/188
2008	400	-	20	20	60	20	35	25	197/170
2012	280	-	0	79	21	50	14	29	172/162
2017	320	40	13	50	38	44	19	13	194/148
<b>Rhus trilobata var. trilobata<sup>P</sup> -- (skunkbush sumac)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	133/270

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

**Table 21B-07.14 - 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' (%)	
<b>Purshia stansburiana (Stansbury cliffrose)</b>							
2003	169	-	-	-	-	-	22.1
<b>Juniperus osteosperma (Utah juniper)</b>							
1998	13	-	-	-	-	-	10.3
2003	18	-	-	-	-	-	16.4
2008	32	-	30	20	30	20	13.7
2012	29	9	18	9	27	36	12.7
2017	26	-	10	-	50	40	23.5

## SMITHS RIDGE - STUDY NO. 21B-8

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Coffee Peak SW; Township 20S, Range 3W, Section 30  
NAD 83 UTM ZONE 12, 393805 East 4322630 North

**Transect Information**

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

511  
170° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Standard

**Directions to Site**

From exit 174 on I-15 south of Holden, proceed to the east side of the freeway, then east on the Maple Canyon Road for 0.9 miles to a cattle guard. Just beyond the cattle guard, turn right and go 0.1 miles to DWR property. Proceed for 0.3 miles across a wash and to a three-way split in the road. Stay left and continue for 0.6 miles to the Bennett Field transect (21-7). From there, continue for 0.4 miles to a gate at the eastern boundary of DWR property. Go another 0.75 miles through two more gates to a two-track road. Turn left and drive for 1.05 miles to the witness post. From the witness post, walk 17 paces at 260 degrees magnetic. The frequency baseline starts 100 feet due west of the cliffrose. The 0-foot stake is a 3-foot rebar with browse tag #511 attached.

NOTE: If the road is closed, the hike to the site is 0.7 miles from the main gravel road.



**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,110ft (1,862m)
Aspect	West
Slope	8-10%
Sample Dates	08/10/1998, 06/13/2003, 07/25/2008, 08/13/2012, 06/21/2017

**Table 21B-08.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	Late 1950s or early 1960s	-
Fire - Wildfire	Swains Fire	-	August 2000	7898
Seeding - Aerial	Fire Rehabilitation-Swains Fire Q-619	-	2001	1000

**Table 21B-08.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name		Application Type	Application Date	Acres	
Swain Aerial		Aerial	Oct 2000	1000	
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	3.00	0.00
G	Bromus inermis	Smooth Brome		3.00	0.00
G	Pascopyrum smithii	Western Wheatgrass		2.00	0.00
G	Pseudoroegneria spicata	Bluebunch Wheatgrass		2.00	0.00
G	Thinopyrum ponticum	Tall Wheatgrass		3.00	0.00
F	Medicago sativa	Alfalfa	Ladak	0.50	0.00
S	Purshia tridentata	Bitterbrush		0.50	0.00

**Wildlife Habitat and Vegetation History****Table 21B-08.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	substantial	winter

**Table 21B-08.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mountain Big Sagebrush/Stansbury Cliffrose	Phase I transitioning to Phase II
1991	Mountain Big Sagebrush/Stansbury Cliffrose	Phase I transitioning to Phase II
1998	Mountain Big Sagebrush/Stansbury Cliffrose	Phase I transitioning to Phase II
2003	Mountain Big Sagebrush	Phase I
2008	Mountain Big Sagebrush	Phase I
2012	Bulbous Bluegrass/Mountain Big Sagebrush	Phase I transitioning to Phase II
2017	Bulbous Bluegrass/Mountain Big Sagebrush	Phase I transitioning to Phase II

**Site Notes**

No Notes

**Soils****Table 21B-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 Loam	5.7	62.0	19.4	18.6	3.5	12.0	76.8	0.4	08/10/1998

**Site Potential**

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Upland Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XB336UT
States and Transitions	No state and transition model is available for this ecological site.

This site is currently a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated ecological site. Prior to the fire in 2000, the dominant browse species were both mountain big sagebrush and Stansbury cliffrose (*Purshia stansburiana*); the fire reduced the other browse species while sagebrush recovered well (Table 21B-08.12, Table 21B-08.13). The composition of the understory has shifted through the years. Prior to 2012, the herbaceous component was dominated by perennial grasses in moderate amounts. In 2012, the introduced perennial species bulbous bluegrass (*Poa bulbosa*) exhibited significantly increased cover values and established dominance in the understory: this grass will likely maintain or increase in cover and reduce the overall species diversity on the site (Table 21B-08.10). Introduced annual forbs have also established dominance in 2012 and 2017. Prior to the 2012 sample year, forbs were diverse, but generally not abundant (Table 21B-08.7, Table 21B-08.11). Utah juniper (*Juniperus osteosperma*) is present in significant numbers, and the site is currently in transition to Phase II of woodland succession (Table 21B-08.4, Table 21B-08.14). Encroachment will likely continue without a tree-removing disturbance.

**Trend Summary Tables****Table 21B-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
1998	20.4	1.7	5.9	0.1	-	1.3
2003	5.5	1.6	5.3	5.2	3.2	8.5
2008	5.7	0.6	5.2	7.0	0.3	11.9
2012	6.1	1.4	4.2	9.3	1.5	10.5
2017	7.2	1.1	1.9	13.5	0.6	17.0

**Table 21B-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
1998	354	270	83	19	9.3	9.0	0.4	0.1
2003	308	205	193	46	11.9	10.1	9.4	1.7
2008	324	258	287	-	6.4	9.3	3.4	-
2012	163	408	367	42	2.7	31.7	4.3	0.4
2017	117	416	433	54	1.2	30.8	13.5	0.5

**Table 21B-08.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	11.8	4.1	52.7	7.6	5.5	45.6
2003	17.3	0.1	35.5	6.8	9.8	47.0
2008	11.7	0.2	49.5	4.4	8.6	35.5
2012	9.9	0.1	41.0	4.6	9.7	53.6
2017	14.2	0.4	47.6	9.5	9.4	50.2

**Table 21B-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	Coyote	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
1998	-	-	13	11	8
2003	3	-	41	3	10
2008	3	-	66	5	44
2012	1	-	31	5	20
2017	6	-	36	1	33
Year	Days Use Per Acre (ha)				
1998	-	-	70.4 (173.8)	28.1 (69.5)	-
2003	1.5 (3.6)	-	89.8 (221.8)	12.1 (29.8)	-
2008	11.6 (28.7)	8.7 (21.5)*	140.1 (346.0)	3.4 (8.3)	-
2012	1.5 (3.6)	-	26.8 (66.2)	2.7 (6.6)	-
2017	13.8 (34.1)	-	37.5 (92.7)	4.0 (9.9)	-

\*Pellets per acre (ha)

**Table 21B-08.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES										
Aristida purpurea (purple threeawn)										
Bromus arvensis <sup>ai</sup> (field brome)										
Bromus tectorum <sup>ai</sup> (cheatgrass)										
Elymus elymoides (squirreltail)										
Festuca idahoensis (Idaho fescue)										
Poa bulbosa <sup>i</sup> (bulbous bluegrass)										
Poa fendleriana (muttongrass)										
Poa secunda (Sandberg bluegrass)										
Pseudoroegneria spicata (bluebunch wheatgrass)										
Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)										
year	Nested Frequency									
1998	-	-	354	60	-	17	-	152	113	-
2003	-	3	308	61	2	57	-	112	63	6
2008	-	5	324	41	1	16	25	139	89	32
2012	-	5	158	19	8	251	7	182	89	74
2017	2	7	110	32	5	319	2	108	167	68
year	Average Cover (%)									
1998	-	-	9.3	1.2	-	0.5	-	2.6	4.7	-
2003	-	0.6	11.3	1.8	0.0	2.4	-	1.8	3.8	0.2
2008	-	0.0	6.4	1.0	0.0	0.3	0.2	2.5	3.7	1.6
2012	-	0.0	2.7	0.2	0.2	17.3	0.3	6.2	4.0	3.4
2017	0.0	0.0	1.2	1.0	0.2	17.3	0.0	2.4	8.1	1.8

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

**Table 21B-08.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																	
Achillea millefolium (Common yarrow)																	
Agoseris glauca (pale agoseris)																	
Alyssum alyssoides <sup>ai</sup> (pale madwort)																	
Alyssum desertorum <sup>ai</sup> (desert madwort)																	
Arabis (rockcress)																	
Astragalus (milkvech)																	
Astragalus eurekaensis (Eureka milkvech)																	
Calochortus nuttallii (sego lily)																	
Castilleja (Indian paintbrush)																	
Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)																	
Cirsium (thistle)																	
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																	
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)																	
Galium aparine <sup>a</sup> (stickywilly)																	
Hedysarum boreale (Utah sweetvech)																	
Helianthus annuus <sup>a</sup> (common sunflower)																	
Lactuca serriola <sup>ai</sup> (prickly lettuce)																	
year	Nested Frequency																
1998	-	-	-	68	7	4	-	2	-	14	-	-	4	-	-	-	-
2003	3	6	-	1	-	-	-	1	-	-	0	-	191	-	2	1	3
2008	-	-	-	213	-	-	-	-	-	5	-	3	126	-	-	-	-
2012	-	6	-	350	-	-	-	1	-	-	0	21	49	-	3	-	6
2017	-	3	320	285	3	-	8	6	3	13	-	19	169	8	-	-	-
year	Average Cover (%)																
1998	-	-	-	0.3	0.1	0.0	-	0.0	-	0.0	-	-	0.1	-	-	-	-
2003	0.1	0.0	-	0.0	-	-	-	0.0	-	-	0.0	-	9.4	-	0.0	0.0	0.0
2008	-	-	-	0.9	-	-	-	-	-	0.0	-	0.0	2.3	-	-	-	-
2012	-	0.0	-	3.2	-	-	-	0.0	-	-	0.0	0.0	0.8	-	0.0	-	0.0
2017	-	0.0	4.3	3.2	0.0	-	0.0	0.0	0.0	0.0	-	0.0	5.8	0.2	-	-	-

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

FORB SPECIES	Linum lewisii (Lewis flax)	Lomatium (desertparsley)	Medicago sativa <sup>i</sup> (alfalfa)	Microsteris gracilis <sup>a</sup> (slender phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Sanguisorba minor <sup>i</sup> (small burnet)	Silene antirrhina <sup>a</sup> (sleepy silene)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Veronica biloba <sup>ai</sup> (two-lobed speedwell)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency										
1998	8	-	-	-	-	-	-	-	3	-	-
2003	3	15	15	1	-	-	3	-	-	-	0
2008	-	-	-	-	-	-	-	-	2	-	-
2012	3	17	11	2	1	-	-	38	7	-	1
2017	3	20	5	-	9	3	-	3	15	1	1
year	Average Cover (%)										
1998	0.0	-	-	-	-	-	-	-	0.0	-	-
2003	0.0	0.1	1.4	0.0	-	-	0.1	-	-	-	0.0
2008	-	-	-	-	-	-	-	-	0.1	-	-
2012	0.0	0.1	0.3	0.0	0.0	-	-	0.1	0.1	-	0.0
2017	0.0	0.1	0.2	-	0.1	0.0	-	0.0	0.1	0.0	0.0

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

**Table 21B-08.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Bassia prostrata <sup>pt</sup> (forage kochia)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>i</sup> (Utah juniper)	Opuntia polyacantha (plains pricklypear)	Purshia stansburiana <sup>p</sup> (Stansbury cliffrose)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Quercus gambelii <sup>p</sup> (Gambel oak)
year	Line Intercept Cover (%)							
1998	-	-	-	-	-	-	-	-
2003	0.8	1.8	3.2	8.5	0	1.4	1.1	0.1
2008	3.2	1.6	0.2	11.9	0.1	1.8	0.3	0.1
2012	7.1	0.9	1.5	10.5	-	0.8	0.5	-
2017	9.9	0.3	0.6	17	0	2.8	0.5	-
year	Quadrat Cover (%)							
1998	6.1	-	1.7	5.9	-	5.2	8.6	0.5
2003	1.0	2.0	1.5	5.3	0.0	1.1	1.3	0.0
2008	2.3	1.8	0.5	5.2	0.1	1.4	0.2	0.0
2012	4.0	1.4	1.3	4.2	0.0	0.4	0.3	-
2017	5.8	0.5	0.6	1.9	0.5	0.8	0.1	-

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

**Table 21B-08.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1998	2040	-	14	73	14	48	1	12	52/72
2003	1440	40	61	31	8	31	8	3	31/38
2008	1400	20	27	70	3	20	0	1	40/54
2012	1320	80	6	94	0	44	38	6	47/74
2017	1280	-	5	88	8	31	30	6	53/95
<b>Bassia prostrata<sup>Pi</sup> -- (forage kochia)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	4020	100	46	54	0	57	2	0	22/33
2008	6000	780	35	62	3	36	22	2	16/26
2012	3540	1920	23	77	1	24	33	4	12/24
2017	1580	-	11	89	0	25	0	0	8/12
<b>Ericameria nauseosa ssp. nauseosa var. hololeuca<sup>P</sup> -- (rubber rabbitbrush)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	80	-	0	100	0	0	0	0	27/27
2008	-	-	-	-	-	-	-	-	62/78
2012	20	-	0	0	100	100	0	100	78/130
2017	-	-	-	-	-	-	-	-	58/73
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1998	3160	-	20	80	0	0	0	0	24/31
2003	2740	-	2	92	6	3	0	5	27/32
2008	1500	300	13	60	27	0	1	21	19/29
2012	2060	-	2	98	0	0	0	25	19/31
2017	2420	20	19	77	4	0	0	3	20/26
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1998	100	20	0	100	0	0	0	0	-/-
2003	80	-	0	100	0	0	0	0	-/-
2008	40	-	0	100	0	0	0	0	-/-
2012	60	-	0	100	0	0	0	0	-/-
2017	100	60	0	100	0	0	0	0	-/-
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1998	20	-	0	0	100	0	0	100	21/42
2003	80	-	50	50	0	0	0	0	16/23
2008	80	-	0	100	0	0	0	0	14/38
2012	140	-	29	71	0	0	0	43	13/48
2017	140	-	0	100	0	0	0	0	13/42
<b>Purshia stansburiana<sup>P</sup> -- (Stansbury cliffrose)</b>									
1998	220	-	18	82	0	64	0	0	152/273
2003	60	-	0	67	33	67	33	0	135/171
2008	80	-	25	25	50	0	0	25	147/156
2012	40	-	0	100	0	100	0	0	103/132
2017	160	-	63	38	0	13	25	0	104/113
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1998	600	-	3	97	0	67	20	0	118/208
2003	60	-	0	100	0	67	33	0	117/223
2008	240	-	67	0	33	0	33	8	75/141
2012	100	20	0	20	80	0	100	0	48/92
2017	80	-	0	25	75	0	100	0	51/135
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1998	-	-	-	-	-	-	-	-	211/174
2003	20	-	0	100	0	0	0	0	41/31
2008	40	-	50	50	0	0	0	0	-/-
2012	-	40	0	0	0	0	0	0	35/52
2017	-	-	-	-	-	-	-	-	121/80
<b>Rhus glabra<sup>P</sup> -- (smooth sumac)</b>									
1998	60	-	0	0	100	100	0	67	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	46/88
2012	-	-	-	-	-	-	-	-	35/30
2017	-	-	-	-	-	-	-	-	32/33

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Rhus trilobata <sup>P</sup> -- (skunkbush sumac)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	163/82
Ribes <sup>P</sup> -- (currant)									
1998	200	-	0	100	0	0	0	0	28/35

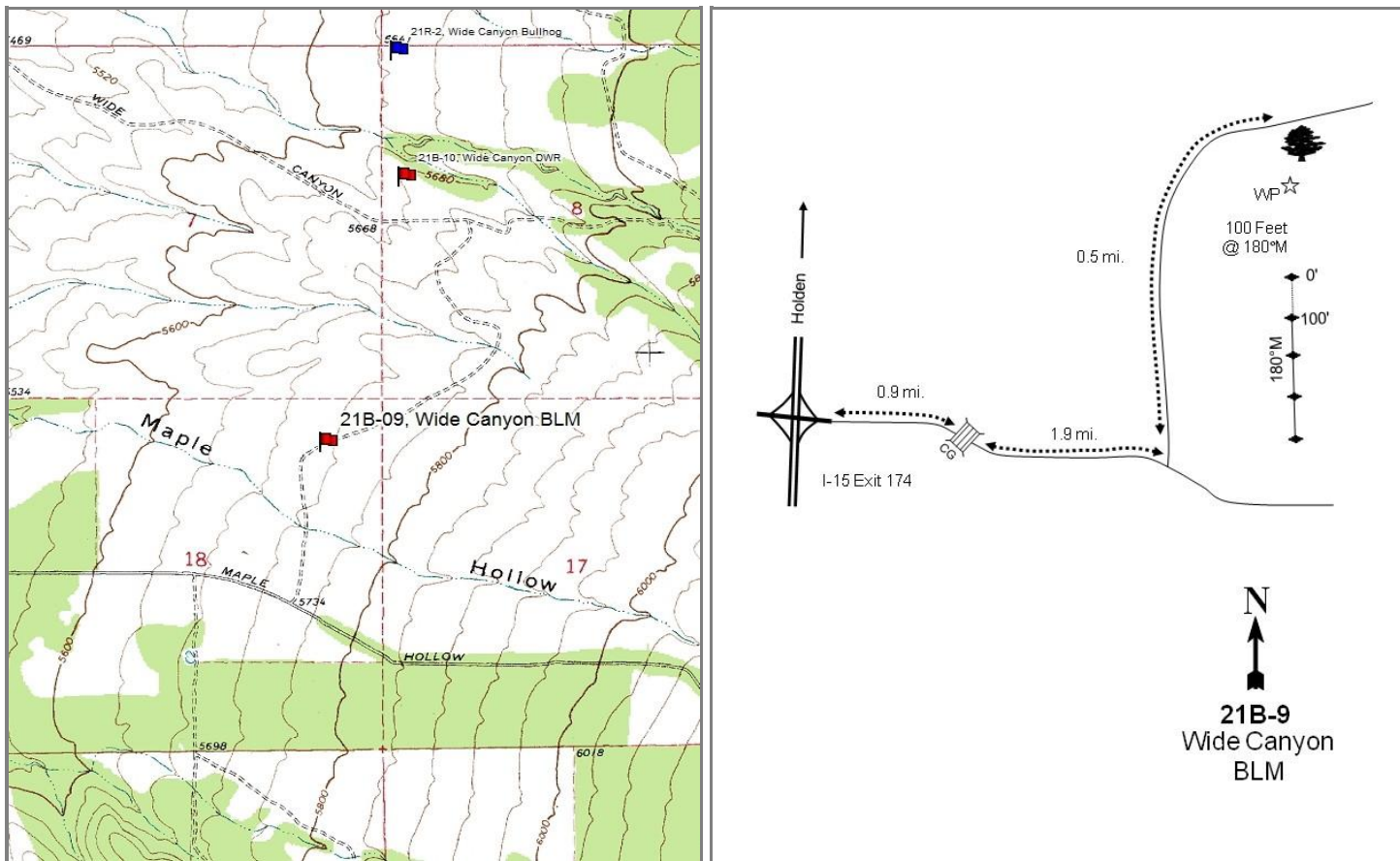
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 21B-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)							
1998	47	-	-	-	-	-	17.1
2003	24	-	8	8	42	42	30.2
2008	24	-	8	8	31	54	34.2
2012	25	-	-	15	-	85	26.4
2017	25	-	-	23	31	46	29.5



## WIDE CANYON BLM - STUDY NO. 21B-9



### Location Information

USGS 7.5 min Map Info                      Coffee Peak NW; Township 20S, Range 3W, Section 18  
 GPS (0' Stake)                                NAD 83 UTM ZONE 12, 394027 East 4326278 North

### Transect Information

Browse Tag # (0' Stake)                      7107  
 Transect Bearing                                180° magnetic  
 Length    400ft  
 Belt Placement                                  Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
 Belt Marker Placement                        Belt 4: 4ft

### Directions to Site

From exit 174 on I-15 south of Holden, go 0.9 miles east to a cattle guard. Continue for 1.9 miles to a dirt road turning off to the left. Follow this dirt road for 0.5 miles to a witness post (rebar) three feet off the right (south) side of the road, about 10 feet beyond a juniper. The frequency baseline starts 100 feet south of the witness post. The 0-foot stake is rebar with browse tag #7107 attached.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	HOLDEN SPRING
Elevation	5,710ft (1,740m)
Aspect	Southwest
Slope	2-5%
Sample Dates	08/24/1998, 05/15/2003, 07/21/2008, 08/06/2012, 06/19/2017

**Table 21B-09.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Two-Way Unknown	Holden Seeding	-	1965	2668
Seeding - Aerial Before	Holden Seeding	-	1965	2668
Mechanical - Bullhog	BLM Project	-	2006	1500

**Table 21B-09.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name		Application Type	Application Date	Acres	
Holden Seeding		Aerial	Aug 1965	2668	
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
G	Agropyron cristatum	Crested Wheatgrass		7.87	5.84

**Wildlife Habitat and Vegetation History****Table 21B-09.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	substantial	winter

**Table 21B-09.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Stansbury Cliffrose/Mountain Big Sagebrush/Annual Grass	Phase I
1991	Stansbury Cliffrose/Mountain Big Sagebrush/Annual Grass	Phase I
1998	Stansbury Cliffrose/Mountain Big Sagebrush/Annual Grass	Phase I
2003	Stansbury Cliffrose/Mountain Big Sagebrush/Annual Grass	Phase I transitioning to Phase II
2008	Stansbury Cliffrose/Mountain Big Sagebrush/Annual Grass	Phase I
2012	Mountain Big Sagebrush/Annual Grass/Stansbury Cliffrose	Phase I
2017	Mountain Big Sagebrush/Annual Grass/Stansbury Cliffrose	Phase I

**Site Notes**

No Notes

**Soils****Table 21B-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
Sandy Loam	6.9	56.7	25.7	17.6	2.9	18.4	163.2	0.7	08/24/1998

**Site Potential**

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Stony Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R047XB336UT
States and Transitions	No state and transition model is available for this ecological site.

When this study was established in 1985, the browse species Stansbury cliffrose (*Purshia stansburiana*) was the dominant species on the site. After 2008, Stansbury cliffrose (*Purshia stansburiana*) exhibited decreases in cover and increased mortality, resulting in mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) becoming the dominant browse species (Table 21B-09.12, Table 21B-09.13). The understory is dominated by the introduced annual and perennial grasses cheatgrass (*Bromus tectorum*) and bulbous bluegrass (*Poa bulbosa*) (Table 21B-09.10). Forbs are depleted and dominated by introduced annuals -- primarily redstem stork's bill (*Erodium cicutarium*) (Table 21B-09.7, Table 21B-09.11). Utah juniper (*Juniperus osteosperma*) is present on the site, although cover and density have decreased following a bullhog treatment in 2006 (Table 21B-09.12, Table 21B-09.14); it is probable that tree cover will increase in future samplings barring a disturbance event. In addition, the high cover of annual grass puts the site at risk for wildfire, which could affect the species composition and resiliency of the site.

**Trend Summary Tables**

**Table 21B-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
1998	13.8	6.0	1.5	-	-	0.5
2003	20.5	0.1	2.3	21.9	0.1	5.9
2008	13.1	0.2	-	21.6	0.5	-
2012	10.6	0.2	0.1	17.8	0.3	0.6
2017	13.0	0.2	0.0	22.8	-	-

**Table 21B-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
1998	456	156	301	4	15.1	2.6	1.6	0.2
2003	399	256	285	15	18.9	8.3	11.9	0.1
2008	411	212	251	-	17.5	5.0	7.5	-
2012	409	300	234	11	21.8	15.2	3.1	0.0
2017	454	304	373	13	39.4	15.4	14.4	0.2

**Table 21B-09.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	9.0	2.2	56.2	1.1	10.5	47.8
2003	16.0	1.5	34.4	0.2	10.4	57.8
2008	4.8	0.0	48.7	0.4	8.2	49.4
2012	4.5	0.3	63.9	0.1	9.2	56.4
2017	4.5	0.6	57.1	0.6	9.3	67.8

**Table 21B-09.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
1998	1	57	-	-	22
2003	5	58	1	-	22
2008	1	73	6	1	40
2012	-	45	-	-	10
2017	2	37	2	-	35
Year	Days Use Per Acre (ha)				
1998	12.3 (30.5)	155.5 (384.0)	-	-	-
2003	2.2 (5.4)	167.5 (413.8)	-	-	-
2008	10.9 (26.9)	140.1 (346.0)	13.4 (33.1)	-	-
2012	15.3 (37.7)	54.3 (134.1)	0.7 (1.7)	-	-
2017	0.7 (1.8)	39.6 (97.7)	-	-	-

**Table 21B-09.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency						
1998	27	456	-	37	3	109	-
2003	8	399	3	-	33	227	-
2008	27	411	-	12	27	188	-
2012	26	409	-	10	50	260	-
2017	37	454	-	6	178	200	3
year	Average Cover (%)						
1998	0.9	15.1	-	0.4	0.0	1.3	-
2003	0.3	18.9	0.1	-	0.8	7.1	-
2008	0.5	17.5	-	0.1	1.0	3.4	-
2012	1.3	21.8	-	0.0	3.4	10.4	-
2017	1.5	39.4	-	0.1	7.9	5.9	0.0

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

**Table 21B-09.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum alyssoides <sup>ai</sup> (pale madwort)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Astragalus (milkvech)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chenopodium <sup>n</sup> (goosefoot)	Collinsia parviflora <sup>n</sup> (maiden blue eyed Mary)	Descurainia pinnata <sup>n</sup> (western tansymustard)	Draba <sup>n</sup> (draba)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lepidium <sup>n</sup> (pepperweed)	Microsteris gracilis <sup>n</sup> (slender phlox)	Phacelia <sup>n</sup> (phacelia)	Phlox longifolia (longleaf phlox)	Silene antirrhina <sup>n</sup> (sleepy silene)
year	Nested Frequency																
1998	-	-	-	4	-	28	2	40	-	-	28	-	255	18	-	-	-
2003	5	-	5	-	6	9	-	34	1	-	261	3	-	5	8	3	-
2008	-	-	44	-	-	12	-	15	-	-	219	24	5	2	-	-	-
2012	1	-	130	-	3	1	-	99	4	47	104	10	4	28	-	5	61
2017	6	40	236	-	6	3	-	87	3	16	326	1	-	4	-	-	10
year	Average Cover (%)																
1998	-	-	-	0.1	-	0.1	0.0	0.2	-	-	0.1	-	1.1	0.1	-	-	-
2003	0.0	-	0.2	-	0.0	0.0	-	0.1	0.0	-	11.5	0.0	-	0.0	0.0	0.0	-
2008	-	-	0.8	-	-	0.0	-	0.1	-	-	6.4	0.3	0.0	0.0	-	-	-
2012	0.0	-	0.3	-	0.0	0.0	-	0.3	0.0	0.1	2.1	0.0	0.0	0.1	-	0.0	0.1
2017	0.2	0.8	3.3	-	0.0	0.0	-	0.3	0.0	0.1	9.8	0.0	-	0.0	-	-	0.0

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

FORB SPECIES		
Tragopogon dubius <sup>ai</sup> (yellow salsify)		
Zizadenus paniculatus (foothill deathcamas)		
year	Nested Frequency	
1998	2	0
2003	-	1
2008	-	-
2012	2	2
2017	8	2
year	Average Cover (%)	
1998	0.0	0.0
2003	-	0.0
2008	-	-
2012	0.0	0.0
2017	0.1	0.0

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

**Table 21B-09.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES						
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)						
Ericameria nauseosa ssp. nauseosa var. hololeuca <sup>p</sup> (rubber rabbitbrush)						
Gutierrezia sarothrae (broom snakeweed)						
Juniperus osteosperma <sup>t</sup> (Utah juniper)						
Opuntia polyacantha (plains pricklypear)						
Purshia stansburiana <sup>p</sup> (Stansbury cliffrose)						
year	Line Intercept Cover (%)					
1998	-	-	-	-	-	-
2003	10	0.4	-	5.9	0.1	11.5
2008	7.8	0.8	0.5	-	-	13
2012	12.2	1.5	0.3	0.6	-	4.1
2017	16.3	0.7	-	-	-	5.8
year	Quadrat Cover (%)					
1998	9.5	0.6	6.0	1.5	0.0	3.7
2003	13.7	0.0	0.1	2.3	0.0	6.8
2008	7.3	1.0	0.2	-	-	4.8
2012	8.1	1.4	0.2	0.1	-	1.1
2017	11.2	0.7	0.2	0.0	-	1.2

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

**Table 21B-09.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1998	2400	60	26	52	23	23	0	6	78/98
2003	1900	-	3	72	25	35	25	13	72/92
2008	1440	-	3	54	43	18	3	18	80/93
2012	1340	40	15	63	22	45	12	25	68/103
2017	1560	2540	5	81	14	54	9	27	81/118
<b>Ericameria nauseosa ssp. nauseosa var. hololeuca<sup>P</sup> -- (rubber rabbitbrush)</b>									
1998	140	-	0	86	14	14	0	0	72/103
2003	80	-	0	75	25	0	50	0	52/69
2008	60	-	0	100	0	0	0	0	66/95
2012	60	-	0	100	0	0	0	0	74/150
2017	80	-	0	50	50	0	0	25	72/108
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1998	5720	-	2	98	0	0	0	0	34/43
2003	220	-	9	91	0	0	0	0	12/13
2008	300	20	7	93	0	0	0	0	29/44
2012	340	-	24	77	0	0	0	0	25/46
2017	220	-	36	64	0	0	0	0	23/30
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1998	60	-	0	100	0	0	0	0	- / -
2003	60	-	0	100	0	0	0	0	- / -
2008	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1998	20	20	0	100	0	0	0	0	17/30
2003	20	-	0	100	0	0	0	0	15/36
2008	-	-	-	-	-	-	-	-	18/46
2012	20	-	0	100	0	0	0	0	15/45
2017	-	-	-	-	-	-	-	-	18/39
<b>Purshia stansburiana<sup>P</sup> -- (Stansbury cliffrose)</b>									
1998	180	-	0	100	0	33	0	0	214/236
2003	160	-	0	100	0	25	50	0	209/228
2008	480	-	50	33	17	13	17	4	226/242
2012	40	-	0	100	0	50	0	50	231/327
2017	100	-	0	80	20	60	20	20	248/199

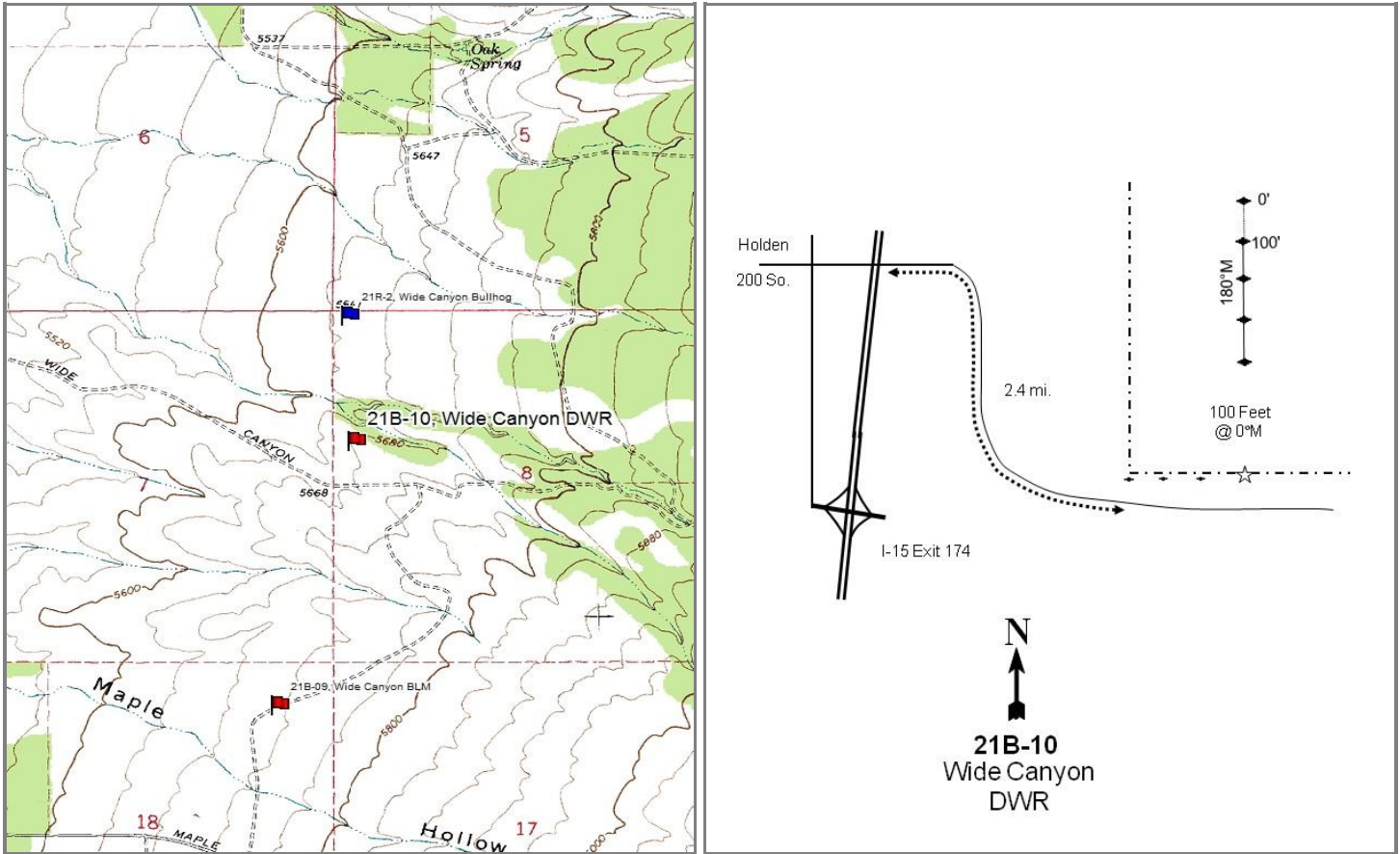
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 21B-09.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
<b>Purshia stansburiana (Stansbury cliffrose)</b>							
2003	152	-	-	-	-	-	10.4
<b>Juniperus osteosperma (Utah juniper)</b>							
1998	25	-	-	-	-	-	18.5
2003	22	-	-	-	-	-	16.5
2008	9	-	33	17	17	33	14.5
2012	9	-	33	17	17	33	16.3
2017	14	-	25	25	38	13	11.9



## WIDE CANYON DWR - STUDY NO. 21B-10



### Location Information

USGS 7.5 min Map Info	Coffee Peak NW; Township 20S, Range 3W, Section 08
GPS (0' Stake)	NAD 83 UTM ZONE 12, 394374 East 4327487 North

### Transect Information

Browse Tag # (0' Stake)	7070
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 south Holden exit off I-15, go north into town and turn right at 200 South. Follow the road for one block east, then north a few yards, then immediately east again up the hill to an overpass. From the overpass, go 2.4 miles east to the fence corner of DWR property. Not including the corner posts, count to the third wooden post to the east. Measure 100 feet due north of the fence to the 400-foot stake. The 0-foot stake is a 2-foot-tall fencepost marked with browse tag #7070. The other stakes are rebar.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,640ft (1,719m)
Aspect	Southwest
Slope	5-10%
Sample Dates	08/24/1998, 06/19/2003, 07/21/2008, 08/06/2012, 06/19/2017

**Table 21B-10.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	1998-2003	-
Chaining - Chain Unknown	-	-	1950s	-
Seeding - Seed Unknown	-	-	1950s	-

**Wildlife Habitat and Vegetation History****Table 21B-10.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	substantial	winter

**Table 21B-10.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mountain Big Sagebrush/Stansbury Cliffrose/Bitterbrush	Phase I
1991	Mountain Big Sagebrush/Stansbury Cliffrose/Bitterbrush	Phase I
1998	Mountain Big Sagebrush	Phase I transitioning to Phase II
2003	Bulbous Bluegrass/Mountain Big Sagebrush	Phase I
2008	Bulbous Bluegrass/Mountain Big Sagebrush	Phase I
2012	Bulbous Bluegrass/Mountain Big Sagebrush	Phase I
2017	Bulbous Bluegrass/Mountain Big Sagebrush	Phase I

**Site Notes**

No Notes

**Soils****Table 21B-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
Clay Loam	7.0	36.7	34.7	28.6	2.6	9.7	92.8	1.0	08/24/1998

**Site Potential**

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XB336UT
States and Transitions	No state and transition model is available for this ecological site.

This site is currently in a degraded Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) ecological state, with the high cover of the introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) threatening the plant community. The community was previously a mixed Wyoming big sagebrush, antelope bitterbrush (*Purshia tridentata*), and Stansbury cliffrose (*P. stansburiana*) community which has since transitioned to a system primarily dominated by sagebrush (Table 21B-10.12, Table 21B-10.13). The herbaceous understory is robust, but the dominant species are introduced perennial grasses (Table 21B-10.10). Forbs are not diverse and cover is scant (Table 21B-10.11). A chaining between 1998 and 2003 reduced the cover of Utah juniper (*Juniperus osteosperma*), but cover has increased in recent sample years.

**Trend Summary Tables****Table 21B-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
1998	10.4	1.2	3.9	-	-	0.2
2003	10.2	0.0	2.0	11.2	-	3.3
2008	7.5	0.2	3.1	11.0	0.4	5.5
2012	6.0	0.1	0.7	10.3	0.4	7.8
2017	10.5	0.4	1.9	11.4	0.6	6.8

**Table 21B-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
1998	45	450	64	9	0.2	20.7	0.3	0.2
2003	58	436	78	14	0.8	30.2	0.4	0.2
2008	89	450	47	5	1.1	34.1	0.2	0.1
2012	31	472	55	7	0.1	59.9	0.3	0.0
2017	9	459	159	9	0.7	55.1	1.9	0.2

**Table 21B-10.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	10.8	1.2	56.8	2.5	2.7	42.8
2003	11.6	1.2	47.9	4.4	3.0	48.3
2008	6.9	1.1	48.9	1.1	1.3	52.7
2012	3.5	1.5	65.8	1.0	1.8	67.4
2017	10.1	2.6	44.0	0.9	1.3	63.5

**Table 21B-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	Coyote	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
1998	4	-	51	1	51
2003	1	-	45	1	23
2008	3	-	71	-	32
2012	-	-	28	3	7
2017	1	-	31	2	9
Year	Days Use Per Acre (ha)				
1998	8.7 (21.5)	-	122.6 (302.9)	3.4 (8.3)	-
2003	2.9 (7.2)	26.2 (64.6)*	164.9 (407.2)	-	-
2008	8.7 (21.5)	-	297.5 (734.9)	-	-
2012	8.0 (19.7)	-	41.5 (102.6)	-	-
2017	-	-	20.8 (51.3)	2.0 (5.0)	-

\*Pellets per acre (ha)

**Table 21B-10.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency							
1998	19	-	45	11	183	150	198	173
2003	1	-	58	5	319	120	215	105
2008	7	-	89	5	353	36	252	146
2012	2	-	31	1	392	32	118	272
2017	1	2	7	-	372	27	122	237
year	Average Cover (%)							
1998	0.3	-	0.2	0.0	5.0	4.0	6.1	5.3
2003	0.1	-	0.8	0.0	13.5	2.4	9.5	4.6
2008	0.2	-	1.1	0.1	15.6	0.3	12.0	5.9
2012	0.0	-	0.1	0.0	38.9	0.5	5.7	14.8
2017	0.1	0.0	0.7	-	31.9	1.1	8.5	13.5

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

**Table 21B-10.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum alyssoides <sup>ai</sup> (pale madwort)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Astragalus (milkvetch)	Astragalus calycosus (Torrey's milkvetch)	Astragalus lentiginosus (freckled milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Crepis acuminata (tapertip hawkbeard)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Microsteris gracilis <sup>a</sup> (slender phlox)	Petradoria pumila (rock goldenrod)	Silene antirrhina <sup>a</sup> (sleepy silene)	Streptanthus cordatus (heartleaf twistflower)	Townsendia (Townsend daisy)	Tragopogon dubius <sup>ai</sup> (yellow salsify)
year	Nested Frequency																
1998	-	50	-	3	-	-	9	11	-	-	-	3	6	-	-	-	0
2003	-	25	2	2	-	0	29	24	-	5	-	11	3	3	3	-	-
2008	-	42	1	-	-	3	-	2	-	-	-	7	1	-	-	-	-
2012	-	46	-	3	-	-	-	-	-	2	1	-	1	4	-	-	3
2017	81	54	-	-	1	0	-	35	3	4	-	5	2	25	-	1	-
year	Average Cover (%)																
1998	-	0.2	-	0.0	-	-	0.0	0.0	-	-	-	0.0	0.2	-	-	-	0.0
2003	-	0.1	0.0	0.0	-	0.0	0.1	0.2	-	0.0	-	0.0	0.1	0.0	0.0	-	-
2008	-	0.2	0.0	-	-	0.0	-	0.0	-	-	-	0.0	0.0	-	-	-	-
2012	-	0.2	-	0.0	-	-	-	-	-	0.0	0.0	-	0.0	0.0	-	-	0.0
2017	0.8	0.1	-	-	0.0	0.0	-	0.3	0.0	0.0	-	0.0	0.0	0.6	-	0.0	-

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

FORB SPECIES	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency
1998	-
2003	4
2008	-
2012	3
2017	3
year	Average Cover (%)
1998	-
2003	0.0
2008	-
2012	0.0
2017	0.1

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

**Table 21B-10.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Linanthus pungens (granite prickly phlox)	Opuntia polyacantha (plains pricklypear)	Purshia stansburiana <sup>p</sup> (Stansbury cliffrose)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)
year	Line Intercept Cover (%)						
1998	-	-	-	-	-	-	-
2003	6.2	-	3.3	-	-	2.7	2.3
2008	6.5	0.4	5.5	0	-	2.4	2.1
2012	7.3	0.4	7.8	-	-	2.8	0.2
2017	7.9	0.6	6.8	-	-	1.5	2
year	Quadrat Cover (%)						
1998	8.9	1.2	3.9	0.0	-	1.5	-
2003	5.0	0.0	2.0	-	0.0	2.7	2.5
2008	4.0	0.2	3.1	0.0	-	1.9	1.6
2012	4.5	0.1	0.7	-	-	1.0	0.6
2017	7.3	0.3	1.9	-	0.0	0.4	2.8

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

**Table 21B-10.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1998	-	-	-	-	-	-	-	-	- / -
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1998	2180	-	1	42	57	40	5	20	72/89
2003	1080	-	0	48	52	41	15	20	80/87
2008	920	-	2	44	54	33	9	46	81/99
2012	760	-	3	63	34	53	40	42	81/127
2017	660	80	6	46	49	24	15	42	76/120
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1998	-	-	-	-	-	-	-	-	- / -
2003	-	-	-	-	-	-	-	-	58/56
2008	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	40/85
2017	-	-	-	-	-	-	-	-	63/92
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1998	20	-	0	0	100	0	100	0	42/120
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	35/55
2012	-	-	-	-	-	-	-	-	59/78
2017	-	-	-	-	-	-	-	-	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1998	1960	20	6	93	1	0	0	0	28/29
2003	100	-	20	60	20	0	0	0	24/17
2008	360	60	0	100	0	0	0	0	21/30
2012	200	-	10	90	0	0	0	80	21/33
2017	320	-	56	44	0	0	0	0	25/36
<b>Juniperus osteosperma<sup>L</sup> -- (Utah juniper)</b>									
1998	100	20	20	60	20	0	0	0	- / -
2003	60	20	100	0	0	0	0	0	- / -
2008	80	-	75	25	0	0	0	0	- / -
2012	40	-	50	50	0	0	0	0	- / -
2017	40	-	0	100	0	0	0	0	- / -
<b>Linanthus pungens -- (granite prickly phlox)</b>									
1998	140	-	0	0	100	0	0	86	20/24
2003	80	-	0	100	0	0	0	0	5/9
2008	120	-	17	67	17	0	0	100	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1998	20	-	0	100	0	0	0	0	14/23
2003	20	-	0	100	0	0	0	0	22/33
2008	20	-	0	0	100	0	0	0	15/35
2012	20	-	0	100	0	0	0	0	15/39
2017	40	-	0	100	0	0	0	100	16/39
<b>Purshia stansburiana<sup>P</sup> -- (Stansbury cliffrose)</b>									
1998	260	20	8	62	31	39	15	0	143/164
2003	200	-	0	90	10	20	60	10	124/128
2008	240	-	17	42	42	0	8	8	154/153
2012	140	-	29	71	0	57	14	14	180/187
2017	60	20	33	0	67	67	0	33	167/162
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1998	40	-	0	0	100	50	50	0	76/104
2003	140	-	14	86	0	29	43	0	100/163
2008	100	-	0	100	0	20	40	0	88/127
2012	120	-	0	100	0	33	67	50	83/129
2017	80	-	25	75	0	0	100	0	98/167



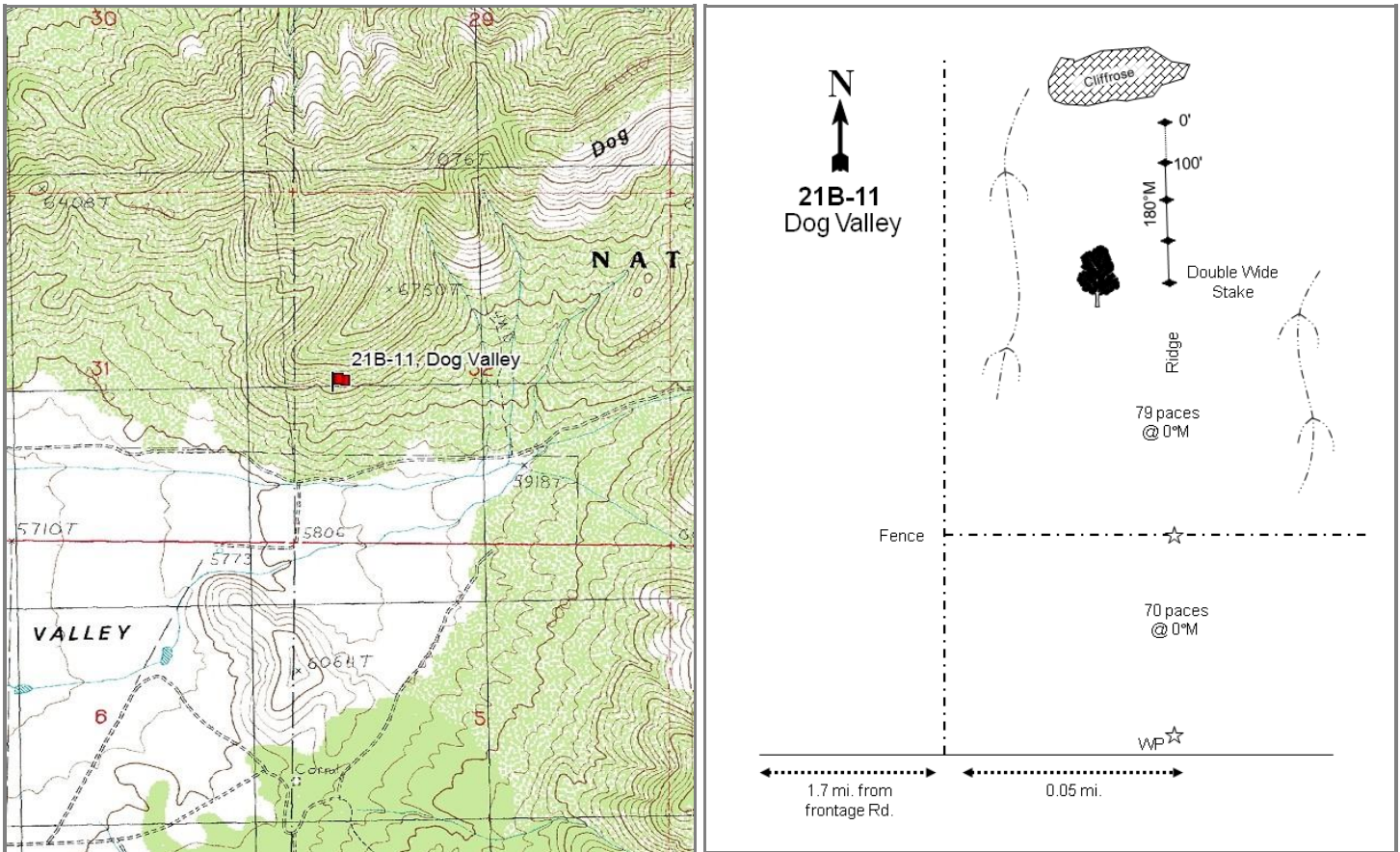
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Ribes <sup>p</sup> -- (currant)									
1998	20	-	0	100	0	0	0	0	- / -

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

**Table 21B-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)							
1998	74	-	-	-	-	-	11.9
2003	51	-	42	26	16	16	10.0
2008	50	-	31	31	13	25	11.9
2012	66	-	37	37	11	16	8.6
2017	60	-	5	42	47	5	16.3

## DOG VALLEY - STUDY NO. 21B-11

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Dog Valley Peak SE; Township 24S, Range 6W, Section 32  
NAD 83 UTM ZONE 12, 364297 East 4282178 North

**Transect Information**

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

Not Available  
180° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Belt 3: 5ft, Belt 5: 2ft

**Directions to Site**

Travel south on I-15 out of Kanosh. Take the first ranch exit south of Kanosh (exit 138) and drive under the freeway to the east side. Turn and drive north on the frontage road parallel to the interstate for 1.2 miles to a cattle guard. Just past the cattle guard, turn right and proceed east for 1.7 miles to a fence. From the fence, continue 0.05 miles east to a witness post on the north side of the road by a large juniper. The witness post is a steel full-high stake approximately 3 feet tall and 8 feet off the road. From the witness post, walk 852 feet due north. A tape should be used to measure the 852 feet north to the 400-foot stake.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	Grass Creek Allotment
Elevation	6,200ft (1,890m)
Aspect	South
Slope	30-35%
Sample Dates	06/16/1998, 06/12/2003, 07/23/2008, 08/14/2012, 07/31/2017

**Table 21B-11.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Dog Valley Peak	-	July 1996	217
Fire - Wildfire	Dog Valley	-	July-August 2006	28664

**Wildlife Habitat and Vegetation History****Table 21B-11.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	substantial	winter

**Table 21B-11.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Stansbury Cliffrose/Annual Grass	Phase I
1991	Stansbury Cliffrose/Annual Grass	Phase I
1998	Annual Grass	Phase I
2003	Annual Grass	Phase I
2008	Annual Grass	Phase I
2012	Annual Grass	Phase I
2017	Annual Grass	Phase I

**Site Notes**

No Notes

**Soils****Table 21B-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	6.8	40.7	29.7	29.6	2.6	20.7	121.6	0.8	06/16/1998

**Site Potential**

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XB336UT
States and Transitions	No state and transition model is available for this ecological site.

At the time of establishment in 1985, this site was a Stansbury cliffrose (*Purshia stansburiana*) dominated site. A fire in 1996 removed many of the browse species on the site, and another fire in 2006 removed surviving browse species (Table 21B-11.1, Table 21B-11.13). The site has consistently maintained a high level of annual grass cover, with cheatgrass (*Bromus tectorum*) cover near 50% in many sample years (Table 21B-11.10). Forb species on the site are depleted, with the introduced annual species redstem stork's bill (*Erodium cicutarium*) providing significant cover and being the dominant forb species (Table 21B-11.11). Maintaining a high fine fuel load often leads to a consistently short fire return interval. It is therefore likely that without a reduction in fuel loads that this site will continue to stay in a low resiliency state marked by frequent wildfire.

**Trend Summary Tables****Table 21B-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
1998	0.0	0.1	-	-	-	0.2
2003	0.5	-	3.4	0.8	-	4.0
2008	-	-	-	-	-	2.3
2012	-	0.1	-	-	0.8	4.0
2017	0.2	0.2	0.1	0.9	0.3	-

**Table 21B-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
1998	483	38	350	37	46.5	1.4	8.7	0.6
2003	337	19	410	7	8.7	0.5	35.8	0.0
2008	452	20	306	26	20.6	0.6	8.7	0.2
2012	476	25	254	57	54.4	2.2	8.1	1.6
2017	486	84	394	15	49.5	4.1	17.8	0.5

**Table 21B-11.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	2.3	0.0	66.2	6.0	18.8	54.0
2003	4.9	-	36.5	7.1	15.2	49.9
2008	1.8	-	44.1	6.2	18.0	36.6
2012	0.2	0.4	48.8	1.4	14.0	66.6
2017	2.9	-	32.5	10.0	19.9	64.1

**Table 21B-11.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1998	-	35	1	12
2003	1	43	2	2
2008	-	69	14	13
2012	1	12	1	3
2017	8	10	-	10
Year	Days Use Per Acre (ha)			
1998	-	46.9 (115.9)	4.0 (9.9)	-
2003	5.8 (14.3)	116.0 (286.4)	-	-
2008	-	95.1 (235.0)	6.0 (14.9)	-
2012	3.6 (9.0)	15.4 (38.1)	2.0 (5.0)	-
2017	2.9 (7.2)	19.4 (48.0)	-	-

**Table 21B-11.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Aristida purpurea (purple threeawn)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Pleuraphis jamesii (James' galleta)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency					
1998	-	483	4	5	6	23
2003	3	337	2	-	4	10
2008	9	452	-	-	1	10
2012	16	476	-	1	-	10
2017	60	486	11	7	3	12
year	Average Cover (%)					
1998	-	46.5	0.0	0.8	0.1	0.4
2003	0.1	8.7	0.0	-	0.0	0.2
2008	0.4	20.6	-	-	0.0	0.2
2012	1.7	54.4	-	0.0	-	0.4
2017	3.0	49.5	0.4	0.2	0.0	0.4

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

**Table 21B-11.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum <sup>ai</sup> (desert madwort)	Ambrosia psilostachya (Cuman ragweed)	Antennaria (pussytoes)	Artemisia ludoviciana (white sagebrush)	Astragalus calycosus (Torrey's milkvetch)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Chamaesyce (sandmat)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Convolvulus arvensis <sup>ni</sup> (field bindweed)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Gayophytum racemosum <sup>a</sup> (blackfoot groundsmoke)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Machaeranthera canescens (hoary tansyaster)	Onopordium acanthium <sup>ni</sup> (Scotch cottonthistle)
year	Nested Frequency																
1998	298	-	5	-	11	-	-	2	-	-	13	3	188	-	80	-	-
2003	1	2	-	-	-	-	-	-	2	6	5	-	409	-	7	-	-
2008	102	-	-	-	-	-	-	-	-	16	44	-	280	-	25	7	-
2012	104	-	-	-	-	1	2	3	9	52	47	3	214	-	22	-	-
2017	307	-	-	3	-	2	-	-	-	11	-	-	324	2	21	-	3
year	Average Cover (%)																
1998	2.6	-	0.0	-	0.1	-	-	0.2	-	-	0.0	0.0	5.6	-	0.5	-	-
2003	0.0	0.0	-	-	-	-	-	-	0.0	0.0	0.0	-	35.8	-	0.0	-	-
2008	0.3	-	-	-	-	-	-	-	-	0.1	0.1	-	6.9	-	1.3	0.0	-
2012	0.3	-	-	-	-	0.0	0.0	0.1	0.0	1.5	0.1	0.0	7.5	-	0.2	-	-
2017	5.0	-	-	0.2	-	0.0	-	-	-	0.3	-	-	12.5	0.0	0.3	-	0.0

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

FORB SPECIES							
Phlox longifolia (longleaf phlox)							
Physalis crassifolia (yellow nightshade groundcherry)							
Polygonum douglasii <sup>a</sup> (Douglas' knotweed)							
Silene antirrhina <sup>a</sup> (sleepy silene)							
Tragopogon dubius <sup>ai</sup> (yellow salsify)							
unknown perennial forb (unknown forb)							
Verbascum thapsus <sup>ai</sup> (common mullein)							
year	Nested Frequency						
1998	-	-	-	-	-	20	-
2003	-	-	-	-	-	-	-
2008	2	8	1	-	3	-	-
2012	-	0	-	2	2	-	-
2017	-	3	-	3	-	-	2
year	Average Cover (%)						
1998	-	-	-	-	-	0.3	-
2003	-	-	-	-	-	-	-
2008	0.0	0.0	0.0	-	0.0	-	-
2012	-	0.0	-	0.0	0.0	-	-
2017	-	0.0	-	0.0	-	-	0.0

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

**Table 21B-11.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES				
Gutierrezia sarothrae (broom snakeweed)				
Juniperus osteosperma <sup>t</sup> (Utah juniper)				
Purshia stansburiana <sup>p</sup> (Stansbury cliffrose)				
Tetradymia canescens (spineless horsebrush)				
year	Line Intercept Cover (%)			
1998	-	-	-	-
2003	-	4	0.8	-
2008	-	2.3	-	-
2012	-	4	0	0.8
2017	0	-	0.9	0.3
year	Quadrat Cover (%)			
1998	-	0.0	0.0	0.1
2003	-	3.4	0.5	-
2008	-	0.0	-	-
2012	0.0	0.0	0.0	0.1
2017	0.0	0.1	0.2	0.1

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

**Table 21B-11.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1998	-	-	-	-	-	-	-	-	- / -
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
<b>Cercocarpus montanus<sup>P</sup> -- (alderleaf mountain mahogany)</b>									
1998	-	-	-	-	-	-	-	-	- / -
2003	-	-	-	-	-	-	-	-	20/47
2008	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
<b>Echinocereus -- (hedgehog cactus)</b>									
1998	-	-	-	-	-	-	-	-	- / -
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	15/32
2012	-	-	-	-	-	-	-	-	17/42
2017	-	-	-	-	-	-	-	-	16/30
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1998	20	-	100	0	0	0	0	0	- / -
2003	-	-	-	-	-	-	-	-	29/65
2008	-	-	-	-	-	-	-	-	24/31
2012	20	-	0	100	0	0	0	0	29/48
2017	40	-	0	100	0	0	0	0	16/19
<b>Purshia stansburiana<sup>P</sup> -- (Stansbury cliffrose)</b>									
1998	-	40	0	0	0	0	0	0	- / -
2003	260	-	8	92	0	23	69	0	54/57
2008	40	-	50	0	50	0	0	50	41/55
2012	40	-	0	100	0	100	0	50	78/86
2017	40	-	0	100	0	0	0	0	92/103
<b>Rhus glabra<sup>P</sup> -- (smooth sumac)</b>									
1998	-	-	-	-	-	-	-	-	- / -
2003	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	84/102
2012	-	-	-	-	-	-	-	-	73/115
2017	-	-	-	-	-	-	-	-	59/97
<b>Sambucus nigra ssp. cerulea<sup>P</sup> -- (blue elderberry)</b>									
1998	-	-	-	-	-	-	-	-	66/32
2003	-	-	-	-	-	-	-	-	46/56
2008	-	-	-	-	-	-	-	-	146/212
2012	-	-	-	-	-	-	-	-	189/229
2017	-	-	-	-	-	-	-	-	- / -
<b>Tetradymia canescens -- (spineless horsebrush)</b>									
1998	120	-	17	83	0	0	0	0	26/50
2003	80	-	25	75	0	0	0	25	26/59
2008	40	-	50	50	0	0	0	100	25/47
2012	200	-	0	90	10	0	0	20	33/77
2017	100	-	0	100	0	20	20	0	40/78

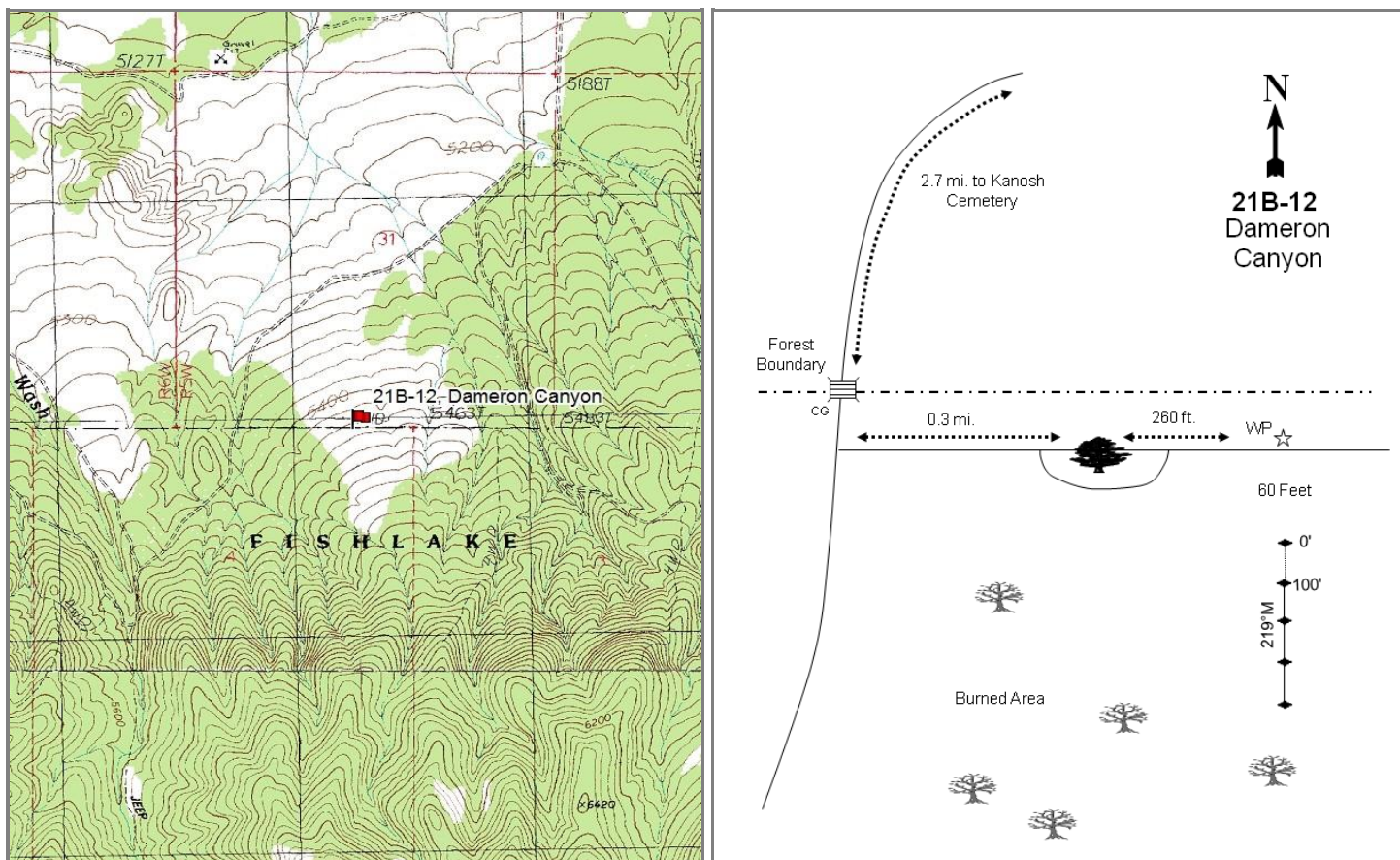
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 21B-11.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution				Average Diameter (cm)	
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'		>12' (%)
<b>Juniperus osteosperma (Utah juniper)</b>							
2017	2	-	50	-	-	50	28.0



## DAMERON CANYON - STUDY NO. 21B-12

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Kanosh SW; Township 24S, Range 5W, Section 04  
NAD 83 UTM ZONE 12, 373188 East 4291142 North

**Transect Information**

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

137  
170° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Belt 1: No Rebar, Belt 4: 1ft, Line 1: 98ft Long

**Directions to Site**

Travel south on the main road from Kanosh. Continue south on a dirt road towards the cemetery when the main road turns west towards the interstate. From the northeast corner of the Kanosh cemetery (1/2 mile south of town), follow the main road south for 2.7 miles to a cattle guard. Just past the cattle guard, turn left and go 0.3 miles along the fence to a faint road. Where the road rejoins, continue for 260 feet to a witness post on the left side of the road by the fence. The witness post is a steel rebar stake 2 1/2 feet tall. From the witness post, walk 60 feet due south to the start of the frequency baseline. The 0-foot baseline stake is tagged with browse tag #7109. The 100-foot end of the baseline is marked by a stake that is actually only 98 feet south, so the tape must be adjusted at that end.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	Kanosh Allotment
Elevation	5,450ft (1,661m)
Aspect	West-Northwest
Slope	3-5%
Sample Dates	06/16/1998, 06/12/2003, 08/27/2008, 08/14/2012, 06/22/2017

**Table 21B-12.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Dry Wash	-	July 2008	324
Chaining - Chain Unknown	-	-	1985	-

**Wildlife Habitat and Vegetation History****Table 21B-12.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	substantial	winter

**Table 21B-12.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mountain Big Sagebrush/Bitterbrush	Phase I
1991	Mountain Big Sagebrush/Bitterbrush	Phase I
1998	Mountain Big Sagebrush/Bitterbrush	Phase I
2003	Mountain Big Sagebrush/Bitterbrush	Phase I
2008	Barren/Fire	No Encroachment
2012	Smooth Sumac	No Encroachment
2017	Smooth Sumac	No Encroachment

**Site Notes**

No Notes

**Soils****Table 21B-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
Loam	6.8	44.7	30.7	24.6	3.7	11.9	163.2	0.9	06/16/1998

**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.

This site was a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) dominated plant community upon study establishment in 1985. After the Dry Wash Fire in 2008, the site transitioned to a smooth sumac (*Rhus glabra*) dominated site (Table 21B-12.12, Table 21B-12.13). The study site has produced copious amounts of cheatgrass (*Bromus tectorum*) following the burn that threatens the integrity of the ecosystem and can cause a dramatic shift in the fire regime (Table 21B-12.10). The forb component is sparse and not diverse, with most cover being contributed by introduced annual forbs, namely desert madwort (*Alyssum desertorum*) and redstem stork's bill (*Erodium cicutarium*) (Table 21B-12.7, Table 21B-12.11). Without a disturbance to shift the trajectory of the site, it is unlikely that this site will change from the current degraded ecological state.

**Trend Summary Tables****Table 21B-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
1998	19.4	9.7	1.6	-	-	-
2003	23.6	1.7	0.8	29.6	1.1	2.4
2008	-	-	-	-	-	-
2012	3.0	0.1	-	3.8	0.4	-
2017	22.0	2.6	-	29.3	3.6	-

**Table 21B-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
1998	439	198	306	34	19.9	5.0	3.5	0.1
2003	304	367	80	-	8.3	14.6	0.6	-
2008	3	48	-	-	0.0	0.5	-	-
2012	464	41	399	28	35.9	0.5	21.2	2.2
2017	495	83	323	14	63.6	3.0	9.5	0.0

**Table 21B-12.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	9.6	1.3	60.8	6.5	5.4	49.5
2003	15.5	0.0	40.1	6.2	4.4	51.5
2008	45.8	0.0	10.9	41.9	9.5	0.5
2012	4.6	0.6	40.0	14.5	6.8	58.9
2017	5.6	0.3	53.2	6.4	6.1	75.7

**Table 21B-12.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1998	1	47	2	8
2003	1	37	-	1
2008	-	5	-	-
2012	1	3	-	8
2017	-	7	1	8
Year	Days Use Per Acre (ha)			
1998	-	150.1 (370.8)	0.7 (1.7)	-
2003	5.1 (12.6)	191.0 (471.8)	-	-
2008	-	-	-	-
2012	4.4 (10.8)	-	-	-
2017	2.9 (7.2)	14.7 (36.4)	0.7 (1.7)	-

**Table 21B-12.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus briziformis <sup>ai</sup> (rattlesnake brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Secale cereale <sup>ai</sup> (cereal rye)
year	Nested Frequency									
1998	3	-	14	-	432	14	-	185	12	2
2003	-	-	6	-	304	28	9	358	14	-
2008	-	-	-	-	3	-	-	48	-	-
2012	-	-	-	12	463	-	10	22	10	-
2017	-	3	37	6	489	-	73	5	7	-
year	Average Cover (%)									
1998	0.0	-	0.2	-	19.7	0.3	-	4.4	0.2	0.0
2003	-	-	0.1	-	8.2	0.6	0.2	13.5	0.4	-
2008	-	-	-	-	0.0	-	-	0.5	-	-
2012	-	-	-	0.1	35.8	-	0.1	0.2	0.2	-
2017	-	0.0	0.4	0.4	62.8	-	2.4	0.1	0.6	-

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

**Table 21B-12.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum alyssoides <sup>ai</sup> (pale madwort)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Argemone munita (flatbud pricklypoppy)	Astragalus calycosus (Torrey's milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Chamaesyce (sandmat)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis <sup>a</sup> (slender phlox)
year	Nested Frequency																
1998	1	-	54	8	-	3	8	43	-	-	62	7	-	1	3	10	17
2003	-	-	23	-	-	-	-	19	-	5	10	-	8	-	-	-	7
2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2012	-	-	169	-	2	-	-	3	5	-	-	2	379	5	-	-	-
2017	-	31	190	-	-	-	5	-	6	4	3	1	261	2	-	-	-
year	Average Cover (%)																
1998	0.0	-	0.5	0.0	-	0.0	0.0	0.1	-	-	0.2	0.0	-	0.0	0.0	0.0	0.0
2003	-	-	0.1	-	-	-	-	0.1	-	0.0	0.0	-	0.2	-	-	-	0.0
2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2012	-	-	1.0	-	0.0	-	-	0.0	0.0	-	-	0.0	20.1	0.0	-	-	-
2017	-	0.2	1.5	-	-	-	0.0	-	0.0	0.0	0.0	0.0	7.7	0.0	-	-	-

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

FORB SPECIES	Nested Frequency					
Phlox longifolia (longleaf phlox)	5	3	259	15	-	-
Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	-	-	34	-	-	-
Silene antirrhina <sup>a</sup> (sleepy silene)	-	-	-	-	-	-
Tragopogon dubius <sup>ai</sup> (yellow salsify)	-	-	1	1	21	-
Verbena bracteata (bigbract verbena)	-	-	3	2	-	3
Zigadenus paniculatus (foothill deathcamas)	-	-	0.0	0.0	-	0.0
year	Average Cover (%)					
1998	0.0	0.0	2.4	0.2	-	-
2003	-	-	0.2	-	-	-
2008	-	-	-	-	-	-
2012	-	-	0.0	0.0	2.2	-
2017	-	-	0.0	0.0	-	0.0

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

**Table 21B-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 <sup>p</sup> (mountain big sagebrush)	-	-	-	-	-	-	-	-	-	-
Ericameria nauseosa (rubber rabbitbrush)	19.4	-	1.1	2.4	-	10.2	-	-	-	-
Gutierrezia sarothrae (broom snakeweed)	-	-	-	-	-	-	-	-	-	-
Juniperus osteosperma <sup>i</sup> (Utah juniper)	-	-	0.4	-	0.1	-	3.7	-	-	-
Purshia stansburiana <sup>p</sup> (Stansbury cliffrose)	-	-	3.6	-	-	0.7	22.4	6.2	-	-
Purshia tridentata <sup>p</sup> (antelope bitterbrush)	-	-	-	-	-	-	-	-	-	-
Rhus glabra <sup>p</sup> (smooth sumac)	-	-	-	-	-	-	-	-	-	-
Rhus trilobata var. trilobata <sup>p</sup> (skunkbush sumac)	-	-	-	-	-	-	-	-	-	-
Ribes cereum var. cereum <sup>p</sup> (wax currant)	-	-	-	-	-	-	-	-	-	-
year	Quadrat Cover (%)									
1998	13.4	1.0	8.7	1.6	0.3	5.5	-	-	0.1	-
2003	16.5	-	1.7	0.8	0.1	7.0	-	-	-	-
2008	-	-	-	-	-	-	-	-	-	-
2012	-	-	0.1	-	0.0	-	3.0	-	-	-
2017	-	-	2.6	-	-	0.9	21.1	0.0	-	-

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

**Table 21B-12.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1998	2840	60	12	70	18	17	1	2	65/79
2003	2560	-	2	74	24	31	9	9	75/92
2012	-	-	-	-	-	-	-	-	22/29
2017	-	-	-	-	-	-	-	-	54/44
<b>Ericameria nauseosa -- (rubber rabbitbrush)</b>									
1998	80	-	75	25	0	0	0	0	86/122
2003	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	58/90
2017	160	-	0	100	0	0	0	0	82/122
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1998	10540	320	9	90	1	0	0	0	22/27
2003	1320	80	2	88	11	0	0	8	22/23
2012	220	160	9	73	18	0	0	9	24/39
2017	1860	60	8	93	0	0	0	0	23/34
<b>Juniperus osteosperma<sup>I</sup> -- (Utah juniper)</b>									
1998	20	-	100	0	0	0	0	0	-/-
2003	40	-	0	100	0	0	0	0	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Purshia stansburiana<sup>P</sup> -- (Stansbury cliffrose)</b>									
1998	80	-	25	75	0	100	0	0	215/246
2003	20	-	100	0	0	0	0	0	159/208
2012	20	-	100	0	0	0	100	0	32/89
2017	-	-	-	-	-	-	-	-	-/-
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1998	400	40	0	95	5	50	25	0	128/163
2003	360	-	0	83	17	11	67	6	143/179
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	0	100	0	100	0	0	35/81
<b>Rhus glabra<sup>P</sup> -- (smooth sumac)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2012	440	20	27	73	0	5	0	0	79/102
2017	3140	-	6	94	0	0	0	1	74/89
<b>Rhus trilobata var. trilobata<sup>P</sup> -- (skunkbush sumac)</b>									
1998	-	-	-	-	-	-	-	-	183/244
2003	-	-	-	-	-	-	-	-	147/152
2012	-	-	-	-	-	-	-	-	-/-
2017	60	-	0	100	0	0	0	0	72/69
<b>Ribes cereum var. cereum<sup>P</sup> -- (wax currant)</b>									
1998	20	-	0	0	100	0	0	0	-/-
2003	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Sambucus nigra ssp. cerulea<sup>P</sup> -- (blue elderberry)</b>									
1998	40	-	0	100	0	100	0	0	-/-
2003	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	175/383

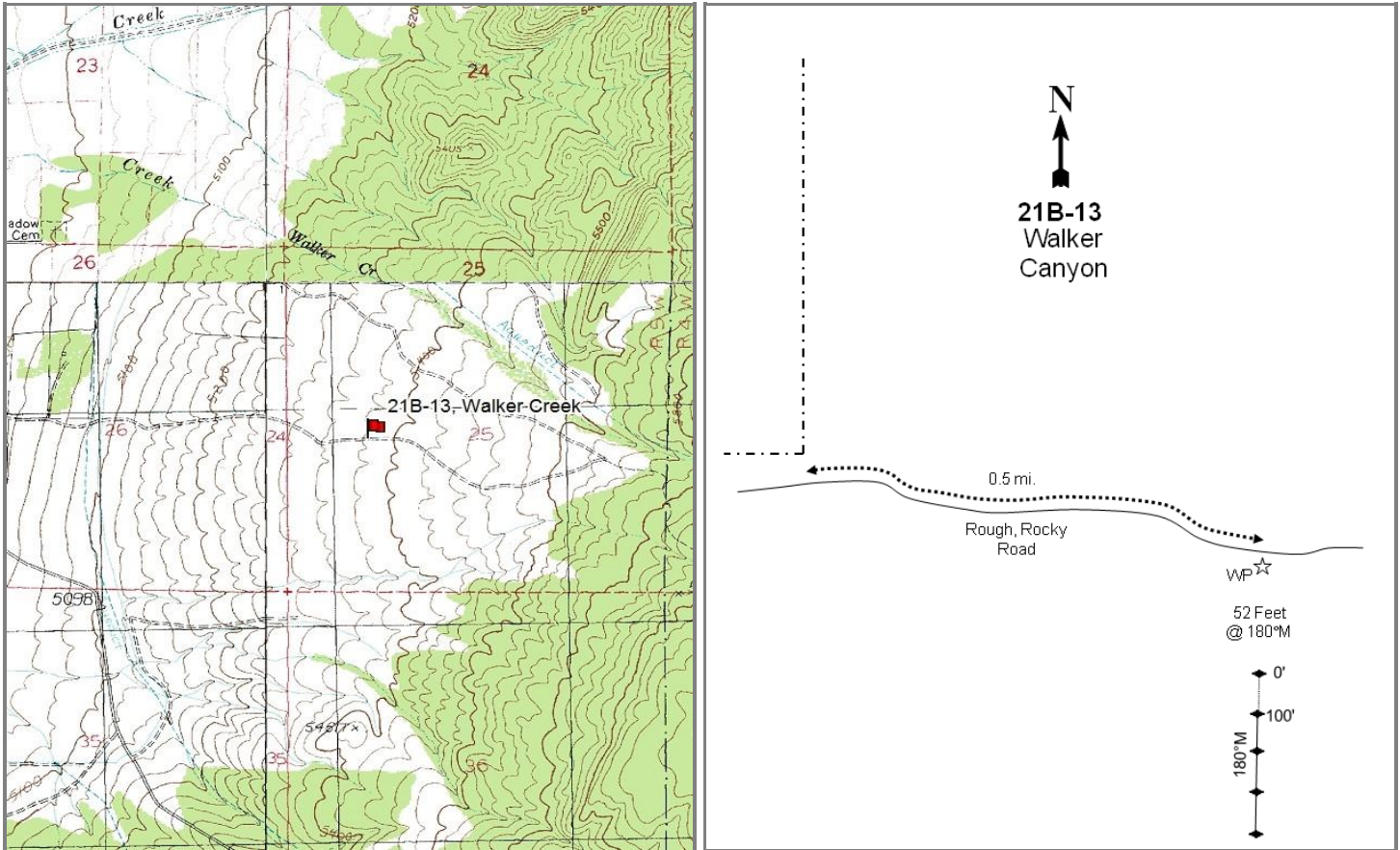
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 21B-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'	
<b>Juniperus osteosperma (Utah juniper)</b>						
2017	1	100	-	-	-	3.0



## WALKER CREEK - STUDY NO. 21B-13

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Sunset Peak NW; Township 22S, Range 5W, Section 25  
NAD 83 UTM ZONE 12, 381088 East 4303068 North

**Transect Information**

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

7074  
180° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Belt 2: 3ft, Belt 3: 6ft, Belt 4: 1ft, Belt 5: 6ft

**Directions to Site**

Travel south from Meadow (southwest of Fillmore) on SR-133 to mile marker 6. Go approximately 0.05 miles further south on SR-133 and turn east onto a gravel road (4400 S). Continue east for 0.8 miles to a junction. Turn right and follow this road (2600 W) for 1 mile around several bends until the main road turns back to the south. Instead of turning south, continue straight east for 0.1 miles to a fork. Keep right at the fork and go 0.15 miles to a concrete aqueduct. Continue on the road 0.25 miles to a fence corner on the left, then travel another 0.5 miles to a cairn on the right side of the road. The 0-foot baseline stake is 51.5 feet south of the rebar and rock cairn. The 0-foot stake is a 2 ½ foot tall rebar tagged #7074.

NOTE: A 4X4 vehicle is advisable for the rough roads.



**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	MEADOW SPRING
Elevation	5,370ft (1,637m)
Aspect	West
Slope	2-5%
Sample Dates	06/23/1998, 06/19/2003, 08/25/2008, 08/15/2012, 06/21/2017

**Table 21B-13.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	-	-	1991-1998	-
Mechanical - Push	Meadow Creek Seeding	-	1966	270

**Wildlife Habitat and Vegetation History****Table 21B-13.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	substantial	winter

**Table 21B-13.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mountain Big Sagebrush/Annual Grass	Phase I
1991	Mountain Big Sagebrush/Annual Grass	Phase I
1998	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I
2003	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I
2008	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I
2012	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I
2017	Mountain Big Sagebrush/Stansbury Cliffrose/Annual Grass	Phase I

**Site Notes**

A deer carcass was found on the site in 2008.

**Soils****Table 21B-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	6.4	60.0	17.4	22.6	2.5	9.0	108.8	0.9	06/23/1998

**Site Potential**

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XB336UT
States and Transitions	No state and transition model is available for this ecological site.

Since this study site was established in 1985, it has been dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), with Stansbury cliffrose (*Purshia stansburiana*) being a significant but lesser component of the community (Table 21B-13.12). Annual grass cover has been high, with very high annual grass cover in recent sample years (Table 21B-13.10). Annual forbs are plentiful, but the diversity and cover of perennial forbs is low (Table 21B- 13.11). The site was treated to remove trees in 1966 and again in the 1990s. However, this site is likely to be further infilled by Utah juniper (*Juniperus osteosperma*) in future years without treatment or disturbance to remove trees (Table 21B-13.1, Table 21B-13.14).

**Trend Summary Tables****Table 21B-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
1998	23.2	1.7	4.1	-	-	0.4
2003	22.2	0.3	6.7	25.7	0.7	8.5
2008	15.5	0.3	2.6	26.5	0.8	7.0
2012	18.1	0.4	6.3	32.4	0.4	7.6
2017	20.3	0.0	3.3	25.5	0.3	9.8

**Table 21B-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
1998	464	157	104	15	32.4	3.7	0.4	0.1
2003	335	298	126	5	10.0	10.4	2.7	0.0
2008	442	236	81	5	13.4	6.4	0.4	0.3
2012	402	278	260	10	19.7	16.1	3.0	0.1
2017	426	216	339	16	38.9	8.8	11.5	0.4

**Table 21B-13.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	3.5	0.7	70.5	3.8	13.3	58.0
2003	5.8	0.0	46.0	2.1	15.5	54.0
2008	0.5	0.1	64.7	0.6	11.0	43.1
2012	1.6	0.1	62.4	0.4	13.2	64.5
2017	7.8	1.0	56.2	1.1	15.0	64.3

**Table 21B-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	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1998	41	-	19
2003	39	-	7
2008	43	-	21
2012	21	4	12
2017	22	3	5
Days Use Per Acre (ha)			
1998	93.8 (231.7)	-	-
2003	124.0 (306.2)	-	-
2008	113.9 (281.4)	-	-
2012	36.2 (89.4)	12.8 (31.5)	-
2017	42.2 (104.3)	4.0 (9.9)	-

**Table 21B-13.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia octoflora <sup>a</sup> (sixweeks fescue)
year	Nested Frequency								
1998	18	1	-	459	45	-	118	1	34
2003	11	12	-	335	42	-	269	5	1
2008	13	5	-	442	31	-	210	4	-
2012	11	13	-	402	14	4	257	7	-
2017	27	38	2	422	22	10	141	5	4
year	Average Cover (%)								
1998	0.8	0.1	-	31.9	0.7	-	2.0	0.0	0.5
2003	0.2	0.8	-	10.0	0.9	-	8.3	0.1	0.0
2008	0.5	0.6	-	13.4	0.7	-	4.7	0.1	-
2012	0.5	1.1	-	19.7	0.2	0.1	13.7	0.5	-
2017	0.7	1.2	0.0	38.9	0.7	0.2	5.6	0.4	0.0

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

**Table 21B-13.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum <sup>ai</sup> (desert madwort)	Ceratocephala testiculata <sup>ai</sup> (curvseed butterwort)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Convolvulus arvensis <sup>ai</sup> (field bindweed)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Eriogonum cernuum <sup>a</sup> (nodding buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Galium boreale (northern bedstraw)	Helianthus annuus <sup>a</sup> (common sunflower)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Microsteris gracilis <sup>a</sup> (slender phlox)	Phlox longifolia (longleaf phlox)	Silene antirrhina <sup>a</sup> (sleepy silene)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency															
1998	2	19	26	-	15	-	-	1	-	-	2	41	8	20	-	7
2003	2	10	50	-	-	-	3	37	-	-	-	5	-	32	-	5
2008	27	-	5	-	-	-	-	52	-	-	-	-	-	-	-	5
2012	137	-	71	-	3	-	-	-	-	-	-	15	1	155	5	9
2017	302	3	89	1	-	4	9	78	10	3	2	6	-	11	2	5
year	Average Cover (%)															
1998	0.0	0.1	0.1	-	0.0	-	-	0.0	-	-	0.0	0.1	0.1	0.1	-	0.1
2003	0.0	0.0	1.5	-	-	-	0.1	0.9	-	-	-	0.0	-	0.1	-	0.0
2008	0.1	-	0.0	-	-	-	-	0.3	-	-	-	-	-	-	-	0.3
2012	1.3	-	0.2	-	0.0	-	-	-	-	-	-	0.0	0.0	1.4	0.0	0.1
2017	8.5	0.0	0.6	0.0	-	0.0	0.1	2.3	0.2	0.0	0.0	0.0	-	0.1	0.0	0.1

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

**Table 21B-13.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)					
	year	1998	2003	2008	2012	2017
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	-	-	-	-	-	-
Ephedra nevadensis <sup>p</sup> (Nevada jointfir)	19.6	-	0.7	8.5	-	6.1
Gutierrezia sarothrae (broom snakeweed)	20.1	-	0.8	7	-	6.4
Juniperus osteosperma <sup>t</sup> (Utah juniper)	19.8	-	0.4	7.6	-	12.6
Opuntia polyacantha (plains pricklypear)	16.8	-	0.3	9.8	-	8.7
Purshia stansburiana <sup>p</sup> (Stansbury cliffrose)	15.9	-	1.4	4.1	0.3	7.3
Quadrat Cover (%)						
year	1998	2003	2008	2012	2017	
1998	15.9	-	1.4	4.1	0.3	7.3
2003	18.8	-	0.3	6.7	-	3.4
2008	12.0	-	0.3	2.6	-	3.5
2012	9.8	0.4	0.4	6.3	-	7.9
2017	12.5	-	0.0	3.3	-	7.8

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

**Table 21B-13.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>p</sup> -- (mountain big sagebrush)</b>									
1998	2560	-	2	77	22	2	0	7	74/96
2003	2060	-	0	68	32	36	4	11	78/103
2008	2060	20	2	50	49	17	24	13	76/112
2012	1820	20	11	71	18	21	22	18	83/121
2017	1860	60	4	68	28	32	10	33	71/117
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1998	2080	80	16	82	2	0	0	2	20/27
2003	260	-	0	100	0	0	0	0	24/29
2008	500	-	0	92	8	0	0	4	26/36
2012	240	80	33	67	0	0	0	92	26/39
2017	120	-	0	100	0	0	0	0	24/30
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1998	80	-	50	50	0	0	0	0	- / -
2003	100	-	40	60	0	0	0	0	- / -
2008	100	-	20	80	0	0	0	20	- / -
2012	80	20	50	50	0	0	0	0	- / -
2017	60	-	0	100	0	0	0	0	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1998	40	-	0	100	0	0	0	0	19/44
2003	-	-	-	-	-	-	-	-	16/47
2008	20	-	0	100	0	0	0	0	15/54
2012	-	-	-	-	-	-	-	-	4/11
2017	-	-	-	-	-	-	-	-	16/13
<b>Purshia stansburiana<sup>p</sup> -- (Stansbury cliffrose)</b>									
1998	580	40	7	90	3	69	0	0	157/163
2003	540	20	7	48	44	19	52	4	151/177
2008	540	-	4	74	22	52	26	7	165/159
2012	600	-	10	73	17	50	17	23	179/168
2017	540	-	4	63	33	37	15	26	178/158

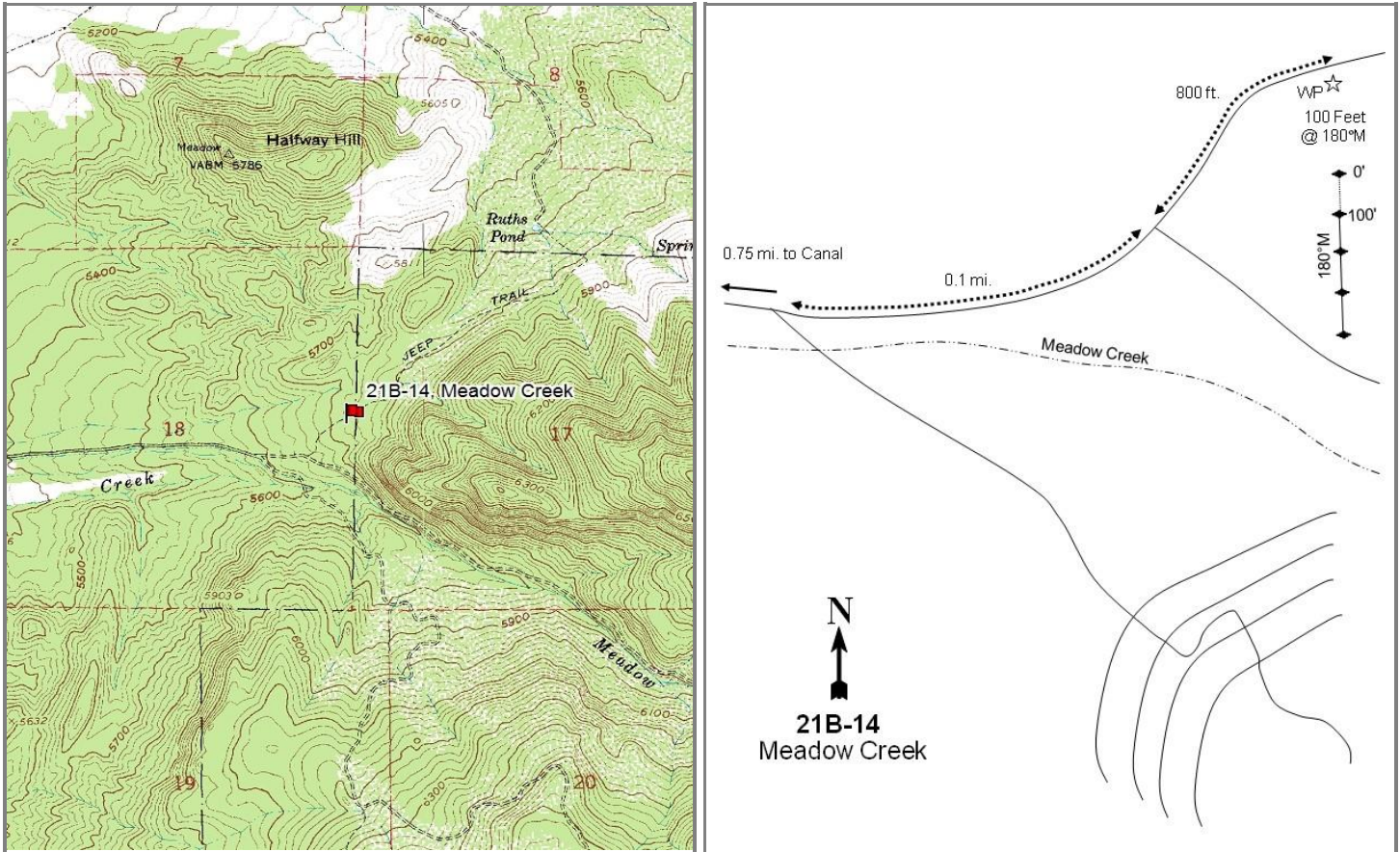
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Rhus trilobata var. trilobata <sup>P</sup> -- (skunkbush sumac)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	140/249
2008	-	-	-	-	-	-	-	-	147/155
2012	-	-	-	-	-	-	-	-	125/279
2017	-	-	-	-	-	-	-	-	145/224

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

**Table 21B-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)							
1998	104	-	-	-	-	-	9.6
2003	102	-	22	39	6	33	11.0
2008	83	-	39	44	17	-	19.4
2012	98	6	-	53	18	24	11.1
2017	24	22	11	-	56	11	23.2

## MEADOW CREEK - STUDY NO. 21B-14

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Fillmore SW; Township 22S, Range 4W, Section 18  
NAD 83 UTM ZONE 12, 383982 East 4306364 North

**Transect Information**

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

7110  
180° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
Standard

**Directions to Site**

From the corner of 100 North and 200 East in Meadow, travel 0.5 miles north to Meadow Creek Road. Turn right and go 2.75 miles east. Drive across the canal and continue for 0.75 miles to a fork in the road. Turn left and go 0.1 miles to another fork. Turn left and drive for about 0.15 miles (800 feet) to a rebar witness post on the right (south) side of the road; the baseline starts 100 feet south of the witness post. The 0-foot baseline stake is a rebar with browse tag #7110 attached.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	MEADOW SPRING
Elevation	5,720ft (1,743m)
Aspect	Southwest
Slope	8-10%
Sample Dates	06/23/1998, 06/19/2003, 08/25/2008, 08/15/2012, 06/21/2017

**Table 21B-14.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Two-Way Unknown	Meadow Creek Seeding	-	1966	1770
Seeding - Aerial Before	Meadow Creek Seeding	-	1966	1770
Seeding - Dribbler/Broadcast Before	Meadow Creek Seeding	-	1966	1770

**Table 21B-14.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Meadow Seeding			Aerial	Sep 1966	1770
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
G	Agropyron cristatum	Crested Wheatgrass		5.08	4.27
F	Astragalus cicer	Cicer Milkvetch		0.06	0.00
F	Balsamorhiza sagittata	Arrowleaf Balsamroot		0.03	0.00
F	Hedysarum boreale ssp. boreale var. boreale	Utah Sweetvetch		0.03	0.00
F	Medicago sativa	Alfalfa	Nomad	0.48	0.00
F	Melilotus officinalis	Yellow Sweetclover		1.27	0.00
F	Sanguisorba minor	Small Burnet		0.06	0.00
S	Artemisia tridentata	Big Sagebrush		0.06	0.00
Mix Name			Application Type	Application Date	Acres
Meadow Seeding			Dribbler	Sep 1966	1770
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
S	Amelanchier utahensis	Utah Serviceberry		0.06	0.00
S	Atriplex canescens	Fourwing Saltbush		0.11	0.00
S	Cercocarpus ledifolius	Curleaf Mountain Mahogany		0.06	0.00
S	Ephedra viridis	Green Ephedra		0.06	0.00
S	Purshia stansburiana	Cliffrose		0.06	0.00
S	Purshia tridentata	Bitterbrush		0.17	0.00

**Wildlife Habitat and Vegetation History****Table 21B-14.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	substantial	winter

**Table 21B-14.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mountain Big Sagebrush	Phase I
1991	Mountain Big Sagebrush	Phase I
1998	Mountain Big Sagebrush/Juniper	Phase I transitioning to Phase II
2003	Mountain Big Sagebrush/Juniper	Phase I transitioning to Phase II
2008	Juniper/Mountain Big Sagebrush	Phase II
2012	Juniper/Mountain Big Sagebrush	Phase II
2017	Juniper	Phase II

**Site Notes**

No Notes

**Soils****Table 21B-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 Clay Loam	6.3	58.0	17.4	24.6	2.4	7.6	118.4	0.8	06/23/1998



**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.

When this site was established in 1985, it was a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) plant community in Phase I of encroachment by Utah juniper (*Juniperus osteosperma*). Over the study years, this site has transitioned into a juniper-dominated ecosystem with sagebrush cover decreasing significantly; in 2008 the site was determined to be in Phase II of encroachment (Table 21B-14.4, Table 21B-14.12). The herbaceous understory is fairly sparse, with a majority of the cover coming from perennial grasses (Table 21B-14.7, Table 21B-14.10). Forbs are moderately diverse, but limited in total cover (Table 21B-14.11). It is likely that this site will continue to transition into a Phase III woodland, with the shrub and herbaceous components fading from the system and tree dominance becoming complete.

**Trend Summary Tables****Table 21B-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
1998	14.6	0.0	12.0	-	-	1.4
2003	9.5	-	14.8	10.8	-	24.3
2008	5.1	0.3	17.5	8.0	0.2	32.3
2012	4.8	0.1	22.0	8.7	-	35.6
2017	5.3	0.1	22.4	7.2	-	34.3

**Table 21B-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
1998	225	233	292	4	2.7	10.9	2.5	0.2
2003	155	237	200	17	1.4	5.7	1.2	0.0
2008	227	211	289	25	1.9	6.0	1.1	0.1
2012	212	260	313	16	3.1	11.8	4.1	0.1
2017	126	246	389	35	1.0	9.9	6.5	0.1

**Table 21B-14.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	18.1	3.3	55.2	6.0	5.4	42.4
2003	26.8	0.8	49.3	2.2	4.3	35.4
2008	16.8	1.8	61.1	3.7	5.3	32.9
2012	13.6	3.0	59.8	3.4	3.7	43.8
2017	20.5	6.2	53.4	4.1	4.6	39.9

**Table 21B-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	Rabbit
	Quadrat Frequency			
1998	1	-	21	43
2003	3	-	16	11
2008	3	-	34	31
2012	1	-	15	21
2017	1	-	8	15
Year	Days Use Per Acre (ha)			
1998	8.0 (19.7)	-	55.6 (137.4)	-
2003	3.6 (9.0)	-	71.1 (175.5)	-
2008	-	8.7 (21.5)*	119.3 (294.6)	-
2012	-	-	45.6 (112.6)	-
2017	-	-	61.7 (152.3)	-

\*Pellets per acre (ha)

**Table 21B-14.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES										
Agropyron cristatum <sup>i</sup> (crested wheatgrass)										
Bromus arvensis <sup>ai</sup> (field brome)										
Bromus tectorum <sup>ai</sup> (cheatgrass)										
Elymus elymoides (squirreltail)										
Pascopyrum smithii (western wheatgrass)										
Poa bulbosa <sup>i</sup> (bulbous bluegrass)										
Poa fendleriana (muttongrass)										
Poa secunda (Sandberg bluegrass)										
Pseudoroegneria spicata (bluebunch wheatgrass)										
Vulpia octoflora <sup>a</sup> (sixweeks fescue)										
year	Nested Frequency									
1998	170	7	220	5	-	-	1	32	72	13
2003	101	5	152	7	3	4	2	95	65	-
2008	122	18	216	1	0	-	-	69	59	-
2012	116	13	211	-	-	8	-	135	83	-
2017	133	10	124	6	-	74	-	48	45	-
year	Average Cover (%)									
1998	7.9	0.0	2.6	0.2	-	-	0.0	0.4	2.4	0.1
2003	2.7	0.0	1.3	0.0	0.1	0.1	0.0	1.1	1.7	-
2008	4.0	0.5	1.4	0.0	0.0	-	-	0.4	1.6	-
2012	5.8	0.1	3.0	-	-	0.2	-	3.7	2.1	-
2017	4.9	0.0	0.9	0.0	-	2.4	-	0.6	1.9	-

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

**Table 21B-14.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																	
Allium (onion)																	
Alyssum alyssoides <sup>ai</sup> (pale madwort)																	
Alyssum desertorum <sup>ai</sup> (desert madwort)																	
Arabis (rockcress)																	
Astragalus (milkvech)																	
Calochortus nuttallii (sego lily)																	
Castilleja (Indian paintbrush)																	
Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)																	
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																	
Cryptantha (cryptantha)																	
Descurainia pinnata <sup>a</sup> (western tansymustard)																	
Draba <sup>a</sup> (draba)																	
Galium <sup>a</sup> (bedstraw)																	
Microsteris gracilis <sup>a</sup> (slender phlox)																	
Phlox longifolia (longleaf phlox)																	
Plantago patagonica <sup>a</sup> (woolly plantain)																	
Polygonum douglasii <sup>a</sup> (Douglas' knotweed)																	
year	Nested Frequency																
1998	-	-	266	2	0	-	-	2	-	3	5	15	-	24	-	3	-
2003	11	-	173	1	-	2	-	34	22	-	3	15	7	5	3	-	-
2008	-	-	282	14	-	-	-	24	3	-	-	-	-	16	9	1	3
2012	-	-	304	5	2	3	-	16	7	3	-	-	-	14	3	-	-
2017	-	6	378	6	0	7	2	46	48	1	-	13	7	9	19	-	5
year	Average Cover (%)																
1998	-	-	2.4	0.0	0.0	-	-	0.0	-	0.2	0.0	0.0	-	0.0	-	0.0	-
2003	0.0	-	0.8	0.0	-	0.0	-	0.1	0.0	-	0.0	0.0	0.0	0.0	0.0	-	-
2008	-	-	1.0	0.1	-	-	-	0.0	0.0	-	-	-	-	0.0	0.1	0.0	0.0
2012	-	-	3.7	0.1	0.0	0.0	-	0.0	0.0	0.0	-	-	-	0.0	0.0	-	-
2017	-	0.1	5.6	0.1	0.0	0.0	0.0	0.3	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	Nested Frequency			
<i>Silene antirrhina</i> <sup>a</sup> (sleepy silene)	13	-	-	-
<i>Streptanthus cordatus</i> (heartleaf twistflower)	31	-	-	-
unknown annual forb <sup>a</sup> (unknown forb)	-	-	-	2
<i>Zigadenus paniculatus</i> (foothill deathcamas)	70	1	-	-
	55	-	2	0
year	Average Cover (%)			
1998	0.0	-	-	-
2003	0.1	-	-	-
2008	-	-	-	0.0
2012	0.3	0.0	-	-
2017	0.4	-	0.0	0.0

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

**Table 21B-14.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)									
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <sup>p</sup> (mountain big sagebrush)	-	-	-	-	-	-	-	-	-	-
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>stenophyllus</i> (yellow rabbitbrush)	5.1	0	0.1	-	24.3	0	-	2.7	0.2	2.7
<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>hololeuca</i> <sup>p</sup> (rubber rabbitbrush)	3.6	0.2	-	-	32.3	0	-	1.1	0.9	2.4
<i>Gutierrezia sarothrae</i> (broom snakeweed)	3.7	-	-	-	35.6	-	-	1.4	1.3	2.3
<i>Juniperus osteosperma</i> <sup>t</sup> (Utah juniper)	2.2	-	-	-	34.3	-	-	0.9	0.9	3.2
<i>Opuntia</i> (pricklypear)										
<i>Pinus edulis</i> <sup>t</sup> (twoneedle pinyon)										
<i>Purshia stansburiana</i> <sup>p</sup> (Stansbury cliffrose)										
<i>Purshia tridentata</i> <sup>p</sup> (antelope bitterbrush)										
<i>Quercus gambelii</i> <sup>p</sup> (Gambel oak)										
year	Quadrat Cover (%)									
1998	8.8	-	1.7	0.0	12.0	-	-	1.6	0.1	2.4
2003	7.1	0.0	0.0	-	14.8	0.0	-	0.6	0.6	1.1
2008	3.0	0.1	-	0.2	17.4	0.0	0.1	0.4	0.5	1.2
2012	2.5	0.1	-	-	22.0	-	-	0.4	0.4	1.5
2017	1.9	0.1	-	-	22.4	-	0.0	0.6	0.4	2.5

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

**Table 21B-14.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	173/137
2012	-	-	-	-	-	-	-	-	94/79
2017	-	-	-	-	-	-	-	-	-/-
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1998	1640	20	5	77	18	15	2	16	62/95
2003	1300	-	0	43	57	14	2	28	56/81
2008	980	20	2	51	47	27	0	35	54/83
2012	1340	-	0	48	52	46	8	42	62/90
2017	920	-	2	20	78	17	4	74	57/76
<b>Cercocarpus montanus<sup>P</sup> -- (alderleaf mountain mahogany)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	224/210
2008	-	-	-	-	-	-	-	-	172/204
2012	-	-	-	-	-	-	-	-	144/146
2017	-	-	-	-	-	-	-	-	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	25/30
2008	20	-	0	0	100	0	0	100	-/-
2012	20	-	0	0	100	0	0	100	31/56
2017	20	-	0	100	0	0	0	0	45/38
<b>Ephedra viridis<sup>P</sup> -- (mormon tea)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	66/181
2008	-	-	-	-	-	-	-	-	107/201
2012	-	-	-	-	-	-	-	-	95/156
2017	-	-	-	-	-	-	-	-	-/-
<b>Ericameria nauseosa ssp. nauseosa var. hololeuca<sup>P</sup> -- (rubber rabbitbrush)</b>									
1998	160	-	13	13	75	0	0	38	69/88
2003	20	-	0	0	100	0	0	100	57/34
2008	-	-	-	-	-	-	-	-	40/61
2012	-	-	-	-	-	-	-	-	24/19
2017	-	-	-	-	-	-	-	-	-/-
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1998	260	20	8	92	0	0	0	0	15/16
2003	20	-	0	100	0	0	0	0	19/27
2008	80	-	0	75	25	0	0	25	21/31
2012	-	-	-	-	-	-	-	-	15/15
2017	-	-	-	-	-	-	-	-	26/36
<b>Juniperus osteosperma<sup>t</sup> -- (Utah juniper)</b>									
1998	380	-	21	79	0	0	0	0	-/-
2003	500	-	0	100	0	0	0	0	-/-
2008	500	-	16	84	0	0	0	0	-/-
2012	500	-	20	76	4	0	0	16	-/-
2017	380	-	5	95	0	0	0	0	-/-
<b>Opuntia -- (pricklypear)</b>									
1998	20	-	0	100	0	0	0	0	20/33
2003	20	-	0	100	0	0	0	0	19/36
2008	20	-	0	100	0	0	0	0	18/40
2012	20	-	0	100	0	0	0	100	14/33
2017	40	-	0	100	0	0	0	0	18/41
<b>Pinus edulis<sup>t</sup> -- (twoneedle pinyon)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	20	0	0	0	0	0	0	-/-

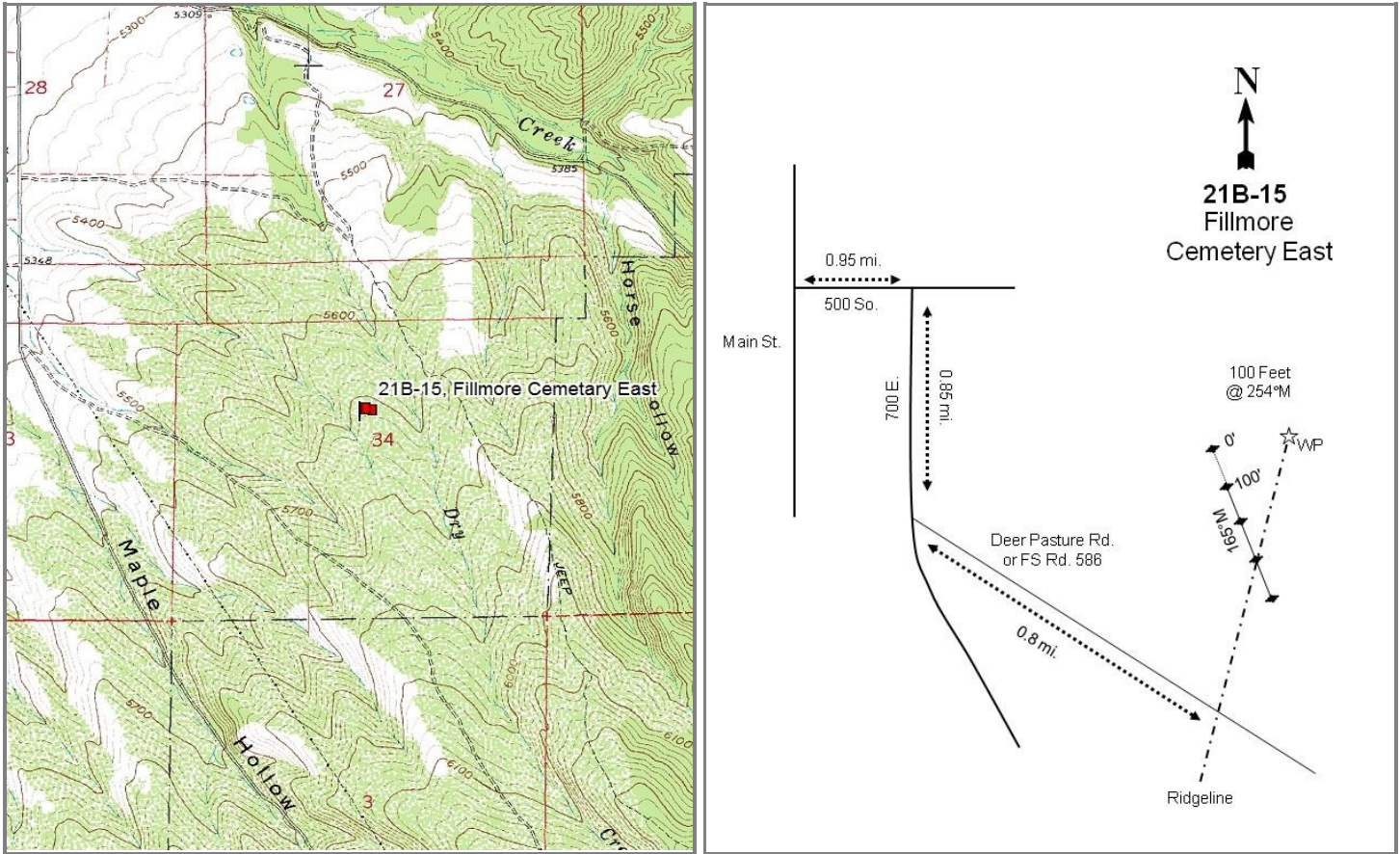
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Purshia stansburiana<sup>P</sup> -- (Stansbury cliffrose)</b>									
1998	40	-	50	50	0	0	0	0	148/169
2003	120	-	0	17	83	17	0	17	158/145
2008	20	-	0	0	100	100	0	0	163/151
2012	60	-	0	67	33	33	0	33	134/151
2017	40	-	0	50	50	100	0	50	171/180
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1998	60	-	0	100	0	100	0	0	88/147
2003	100	-	0	100	0	0	0	0	83/107
2008	40	-	0	100	0	0	100	0	84/158
2012	40	-	0	100	0	100	0	0	82/174
2017	60	-	0	100	0	100	0	0	95/139
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1998	780	-	46	54	0	0	0	0	108/74
2003	800	-	23	73	5	0	0	0	89/65
2008	1040	-	56	29	15	14	0	2	103/86
2012	640	80	53	47	0	0	0	9	69/69
2017	880	-	0	100	0	0	0	0	84/59

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

**Table 21B-14.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
1998	367	-	-	-	-	-	9.2
2003	354	-	5	50	35	10	16.3
2008	369	-	5	25	30	40	16.1
2012	358	-	-	15	35	50	14.8
2017	304	-	-	30	55	15	17.3

## FILLMORE CEMETERY EAST - STUDY NO. 21B-15



### Location Information

USGS 7.5 min Map Info GPS (0' Stake)	Fillmore NE; Township 21S, Range 4W, Section 34 NAD 83 UTM ZONE 12, 388216 East 4311293 North
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### Transect Information

Browse Tag # (0' Stake) Transect Bearing Length Belt Placement Belt Marker Placement	7073 165° magnetic 400ft Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft) No Rebar
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### Directions to Site

From 500 South and Main in Fillmore (the bend in the road), go east for 0.95 miles past the LDS Church and the cemetery to an intersection. Turn right (south) and go 0.85 miles to F.S. Road #386. Turn left and follow this road for 0.8 miles to the ridgeline. From the ridgeline, walk north about 1/3 of a mile to a witness post (full-high rebar). The frequency baseline starts 100 feet west (254 degrees magnetic) of the cairn. The 0-foot stake is a rebar tagged #7073.

**Site Information**

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,720ft (1,743m)
Aspect	Northwest
Slope	5-10%
Sample Dates	06/23/1998, 06/09/2003, 07/22/2008, 08/15/2012, 06/20/2017

**Table 21B-15.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Herbicide - Plateau	Fillmore WMA Juniper Thinning	408	November-December 2008	156
Chaining - Chain Unknown	-	-	1973	-
Seeding - Seed Unknown	-	-	1973	-
Harrow - One-Way Dixie	Fillmore WMA Juniper Thinning	408	November 2008	156
Seeding - Broadcast Before	Fillmore WMA Juniper Thinning	408	November 2008	156

**Table 21B-15.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name		Application Type	Application Date	Acres	
Fillmore WMA		Broadcast	Nov 2008	315	
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
G	Agropyron cristatum	Crested Wheatgrass	Douglas	0.48	0.40
G	Agropyron fragile	Siberian Wheatgrass	Vavilov	0.48	0.42
G	Dactylis glomerata	Orchardgrass	Paiute	0.10	0.09
G	Elymus wawawaiensis	Snake River Wheatgrass	Secar	0.48	0.36
G	Pascopyrum smithii	Western Wheatgrass	Arriba	0.48	0.39
G	Poa secunda	Canby Bluegrass	Canbar	0.10	0.09
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Anatone	0.79	0.68
F	Achillea millefolium	Western Yarrow		0.05	0.05
F	Linum lewisii	Lewis Flax	Maple Grove	0.24	0.22
F	Medicago sativa	Alfalfa	Ladak	0.32	0.29
F	Medicago sativa	Alfalfa	Ranger	0.32	0.28
F	Medicago sativa	Alfalfa	Spredor 4	0.32	0.30
F	Onobrychis viciifolia	Sainfoin	Eski	1.90	1.75
F	Sanguisorba minor	Small Burnet	Delar	1.90	1.77
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Beaver UT	0.48	0.11
S	Purshia stansburiana	Stansbury Cliffrose		0.10	0.06

**Wildlife Habitat and Vegetation History**

**Table 21B-15.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	substantial	winter

**Table 21B-15.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mountain Big Sagebrush/Gambel Oak	Phase I
1991	Mountain Big Sagebrush/Gambel Oak	Phase I
1998	Mountain Big Sagebrush/Gambel Oak	Phase I
2003	Mountain Big Sagebrush/Gambel Oak	Phase I
2008	Mountain Big Sagebrush/Gambel Oak	Phase I
2012	Gambel Oak/Mountain Big Sagebrush	Phase I
2017	Gambel Oak/Mountain Big Sagebrush	Phase I

**Site Notes**

No Notes

**Soils**

**Table 21B-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	6.5	46.0	27.4	26.6	2.8	23.4	169.6	0.8	06/23/1998



**Site Potential**

1981 - 2010 Average Annual Precipitation 17 inches  
 NRCS Ecological Site Mountain Loam (Oak)  
 NRCS Ecological Site # R047XA432UT  
 States and Transitions No state and transition model is available for this ecological site.

When the site was established in 1985, it was a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Gambel oak (*Quercus gambelii*) dominated plant community. Following a harrow treatment in the fall of 2008, sagebrush cover decreased significantly and oak cover increased (Table 21B-15.1, Table 21B-15.12). As for the herbaceous understory, the forbs are diverse but cover is low (Table 21B-15.11). The graminoid component of the understory mainly consists of undesirable introduced species, with the perennial species bulbous bluegrass (*Poa bulbosa*) and annual species cheatgrass (*Bromus tectorum*) being the primary grasses: their presence detracts from the overall ecological health of the site (Table 21B-15.10). There has been some encroachment by Utah juniper (*Juniperus osteosperma*) and the site is considered to be within Phase I of woodland succession (Table 21B-15.4, Table 21B-15.14).

**Trend Summary Tables**

**Table 21B-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
1998	25.3	2.4	-	-	-	-
2003	26.7	0.5	1.2	27.2	0.5	2.7
2008	18.5	0.4	1.6	31.5	0.8	3.7
2012	13.3	0.6	0.8	20.8	1.6	3.1
2017	16.3	5.0	1.9	26.5	7.6	3.3

**Table 21B-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
1998	374	159	257	38	6.8	4.5	2.5	0.4
2003	367	214	107	34	10.6	6.9	0.7	0.6
2008	384	214	174	31	9.9	5.7	0.8	0.7
2012	348	302	291	57	7.9	20.1	3.2	0.5
2017	286	329	373	73	10.8	20.2	9.7	1.5

**Table 21B-15.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	15.6	1.1	54.0	16.2	6.2	39.4
2003	16.6	0.6	43.2	9.5	5.7	44.4
2008	4.3	1.3	50.7	9.2	5.8	41.6
2012	8.0	0.0	54.8	8.9	5.4	50.4
2017	15.1	0.3	44.0	6.2	4.8	54.5

**Table 21B-15.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1998	-	49	-	1	14
2003	-	35	-	-	6
2008	-	51	3	-	21
2012	-	28	-	-	18
2017	1	24	2	-	27
Days Use Per Acre (ha)					
1998	0.7 (1.8)	79.8 (197.0)	-	0.6 (1.4)	-
2003	-	61.7 (152.3)	1.3 (3.3)	-	-
2008	-	111.3 (274.8)	0.7 (1.7)	-	-
2012	-	44.2 (109.2)	-	-	-
2017	-	22.1 (54.6)	-	-	-

**Table 21B-15.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus arvensis <sup>ai</sup> (field brome)	Bromus briziformis <sup>ai</sup> (rattlesnake brome)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia octoflora <sup>a</sup> (sixweeks fescue)
year	Nested Frequency											
1998	-	32	183	-	313	52	32	3	-	61	5	8
2003	-	26	145	-	350	84	77	-	-	58	12	-
2008	-	28	172	-	359	80	83	3	-	85	0	-
2012	3	22	232	-	229	41	238	-	1	45	33	-
2017	-	38	118	72	202	55	278	-	-	5	47	7
year	Average Cover (%)											
1998	-	1.0	3.0	-	3.8	1.4	1.2	0.0	-	0.9	0.0	0.0
2003	-	1.0	1.0	-	9.6	2.0	2.1	-	-	0.9	0.9	-
2008	-	1.7	2.3	-	7.6	1.1	1.2	0.0	-	1.7	0.0	-
2012	0.2	1.6	3.4	-	4.6	0.6	15.0	-	0.0	1.0	1.5	-
2017	-	2.1	0.8	2.5	7.3	1.0	14.7	-	-	0.0	2.4	0.2

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

**Table 21B-15.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum alyssoides <sup>ai</sup> (pale madwort)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Asclepias (milkweed)	Astragalus argophyllus (silverleaf milkvetch)	Astragalus cibirarius (browse milkvetch)	Astragalus lentiginosus (freckled milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Cirsium calceareum <sup>a</sup> (Cainville thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Collomia linearis <sup>a</sup> (tiny trumpet)	Crepis acuminata (tapertip hawkbeard)	Cymopterus (springparsley)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Draba <sup>a</sup> (draba)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)
year	Nested Frequency																
1998	-	175	3	8	3	3	-	-	56	16	9	-	1	-	14	46	3
2003	-	95	-	-	-	-	-	-	11	5	6	-	-	-	1	-	-
2008	-	162	-	-	-	2	1	4	3	8	3	1	-	-	3	-	-
2012	-	253	-	-	-	1	-	1	-	84	14	-	2	-	6	4	19
2017	4	335	-	-	0	3	-	11	5	101	25	4	-	2	-	-	19
year	Average Cover (%)																
1998	-	1.0	0.0	0.2	0.0	0.0	-	-	0.1	0.7	0.0	-	0.0	-	0.0	0.4	0.0
2003	-	0.5	-	-	-	-	-	-	0.0	0.2	0.0	-	-	-	0.0	-	-
2008	-	0.6	-	-	-	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-	-	0.0	-	-
2012	-	1.5	-	-	-	0.0	-	0.0	-	1.5	0.0	-	0.0	-	0.0	0.0	0.0
2017	0.0	6.0	-	-	0.0	0.1	-	0.1	0.0	3.4	0.1	0.0	-	0.0	-	-	0.0

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

FORB SPECIES	Eriogonum racemosum (redroot buckwheat)	Galium boreale (northern bedstraw)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stoneseed)	Lotus utahensis (Utah bird's-foot trefoil)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis <sup>ai</sup> (slender phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>ai</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (sleepy silene)	Sphaeralcea coccinea (scarlet globemallow)	Streptanthus cordatus (heartleaf twistflower)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency														
1998	-	4	-	6	0	-	4	6	2	-	29	2	1	-	6
2003	-	8	-	6	6	-	-	-	1	-	3	-	3	-	10
2008	4	-	1	1	5	2	-	-	-	16	-	3	-	-	12
2012	-	29	10	9	3	-	-	1	4	14	10	4	-	3	6
2017	3	29	-	2	2	4	-	2	3	10	-	5	-	23	11
year	Average Cover (%)														
1998	-	0.0	-	0.0	0.0	-	0.0	0.0	0.0	-	0.1	0.0	0.0	-	0.1
2003	-	0.3	-	0.0	0.2	-	-	-	0.0	-	0.0	-	0.0	-	0.1
2008	0.0	-	0.0	0.1	0.2	0.0	-	-	-	0.0	-	0.1	-	-	0.3
2012	-	0.1	0.0	0.0	0.1	-	-	0.0	0.0	0.1	0.0	0.2	-	0.0	0.0
2017	0.0	0.3	-	0.0	0.3	0.3	-	0.0	0.0	0.0	-	0.1	-	0.2	0.4

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

**Table 21B-15.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Opuntia (pricklypear)	Purshia stansburiana <sup>p</sup> (Stansbury cliffrose)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Quercus gambelii <sup>p</sup> (Gambel oak)
year	Line Intercept Cover (%)						
1998	-	-	-	-	-	-	-
2003	13.7	0.5	2.7	-	-	6.6	6.9
2008	12.9	0.8	3.7	-	-	8.5	10.1
2012	4.7	1.6	3.1	0	-	4.2	11.9
2017	7.2	7.5	3.3	0.1	-	7.8	11.5
year	Quadrat Cover (%)						
1998	16.7	2.2	-	0.1	-	6.0	2.7
2003	17.2	0.5	1.2	-	-	5.6	3.8
2008	7.8	0.3	1.6	0.1	-	5.8	4.8
2012	3.5	0.5	0.8	0.0	-	3.1	6.7
2017	4.0	4.9	1.9	0.0	0.4	4.9	7.1

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

**Table 21B-15.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1998	2680	80	7	60	33	15	0	7	66/93
2003	2440	-	0	59	41	16	7	19	66/87
2008	2420	-	6	34	60	41	5	28	71/93
2012	3120	400	64	30	6	10	4	6	46/72
2017	2940	-	21	71	8	24	12	10	37/52
<b>Ceanothus fendleri -- (Fendler's ceanothus)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	42/141
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Cercocarpus ledifolius<sup>P</sup> -- (curl-leaf mountain mahogany)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	66/58
2017	-	-	-	-	-	-	-	-	51/72
<b>Cercocarpus montanus<sup>P</sup> -- (alderleaf mountain mahogany)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	66/113
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	0	100	0	0	0	0	- / -
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1998	5100	60	13	88	0	0	0	0	18/23
2003	980	-	6	90	4	0	0	2	18/22
2008	1000	80	12	78	10	2	0	8	20/34
2012	1440	380	21	74	6	0	0	3	21/36
2017	5100	-	11	88	2	0	0	2	25/37
<b>Juniperus osteosperma<sup>I</sup> -- (Utah juniper)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	20	0	0	0	0	0	0	- / -
2008	-	-	-	-	-	-	-	-	-/-
2012	20	-	0	100	0	0	0	0	- / -
2017	60	-	67	0	33	0	0	33	- / -
<b>Opuntia -- (pricklypear)</b>									
1998	40	-	0	100	0	0	0	0	18/41
2003	40	-	0	100	0	0	0	0	16/48
2008	60	-	0	100	0	0	0	33	16/58
2012	80	-	25	75	0	0	0	0	13/45
2017	100	-	0	100	0	0	0	20	13/25
<b>Purshia stansburiana<sup>P</sup> -- (Stansbury cliffrose)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	80	-	0	100	0	100	0	0	136/164
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1998	360	-	17	83	0	67	17	0	53/132
2003	340	-	0	100	0	0	100	0	60/206
2008	360	-	0	100	0	67	6	6	61/166
2012	460	-	0	91	9	78	0	9	46/135
2017	320	-	6	94	0	75	19	0	50/159
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1998	1500	180	47	53	0	0	0	0	144/94
2003	2280	60	34	54	11	10	1	5	91/73
2008	3780	80	26	69	5	5	0	5	113/120
2012	2500	20	36	63	1	8	0	1	74/66
2017	3360	-	5	89	7	23	10	7	87/84

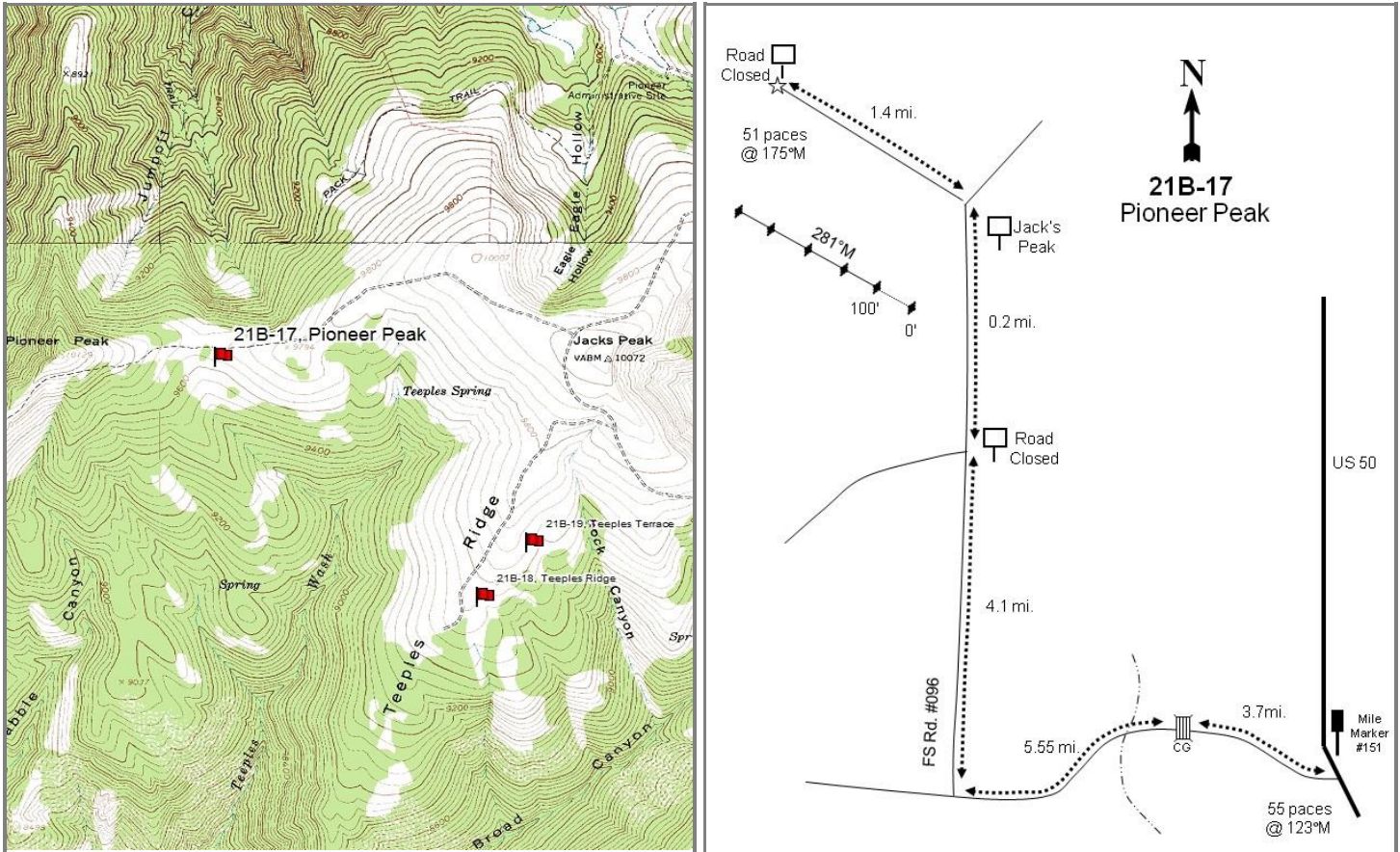
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Rhus trilobata <sup>P</sup> -- (skunkbush sumac)									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	173/479

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

**Table 21B-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)							
1998	2	-	-	-	-	-	23.0
2008	5	-	-	20	-	80	17.6
2012	6	-	-	20	20	60	32.8
2017	6	-	-	40	60	-	23.6

## PIONEER PEAK - STUDY NO. 21B-17



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Mount Catherine NE; Township 21S, Range 3W, Section 11  
NAD 83 UTM ZONE 12, 399200 East 4316684 North

### Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	281° 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 Highway 50 at mile marker 151, drive west for 3.7 miles to a cattle guard. Go another 0.75 miles across a stream to a gate. Go through the gate and drive 5.55 miles past the weather gauging station to a right turn. Turn right onto road #096 and go 4.1 miles to a "road closed" sign on the left, just before Jack's Peak. Drive 0.2 miles to Jack's Peak. From here, turn left and drive for 1.4 miles to the end of the road and a "road closed" sign. From this sign, walk 51 paces at 175 degrees magnetic to the 500-foot stake. The 0-foot stake is 500 feet away at 101 degrees magnetic, next to a big fir tree.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	Pioneer Allotment
Elevation	9,600ft (2,926m)
Aspect	South
Slope	15-20%
Sample Dates	08/21/1997, 09/04/2003, 08/23/2012, 07/05/2017

**Table 21B-17.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Terrace - Contour Trench	-	-	Historic	-
Seeding - Seed Unknown	-	-	Historic	-

**Wildlife Habitat and Vegetation History****Table 21B-17.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	summer
Elk	crucial	summer

**Table 21B-17.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1997	Subalpine Meadow	No Encroachment
2003	Subalpine Meadow	No Encroachment
2012	Subalpine Meadow	No Encroachment
2017	Subalpine Meadow	No Encroachment

**Site Notes**

No Notes

**Soils****Table 21B-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	6.0	42.7	26.7	30.6	3.3	18.4	188.8	0.2	08/21/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	32 inches
NRCS Ecological Site	High Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA516UT
States and Transitions	No state and transition model is available for this ecological site.

When the site was established in 1997, it was a subalpine meadow vegetation type and has remained so through the subsequent sample years. The herbaceous understory is rich and robust with copious amounts of perennial forbs and grasses. The co-dominant grass species are mountain brome (*Bromus marginatus*), intermediate wheatgrass (*Thinopyrum intermedium*), and Letterman's needlegrass (*Achnatherum lettermanii*) (Table 21B-17.7, 21B-17.10). The dominant forbs are western larkspur (*Delphinium occidentale*), bluebells (*Mertensia sp.*), and tuber starwort (*Pseudostellaria jamesiana*) (Table 21B-17.11). Shrubs are not a major vegetation component on this site. It is likely that this site will remain in this state in future years unless there is a disturbance that modifies the system.



**Trend Summary Tables****Table 21B-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
1997	-	-	-	-	-	-
2003	-	-	-	-	-	-
2012	-	0.0	-	-	-	-
2017	-	-	-	-	-	-

**Table 21B-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
1997	-	385	318	310	-	19.6	5.9	12.7
2003	-	358	162	305	-	17.3	2.9	16.6
2012	-	343	245	300	-	15.8	2.9	13.5
2017	-	378	155	365	-	25.7	1.7	31.2

**Table 21B-17.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	29.7	1.0	29.4	0.4	3.2	50.1
2003	45.4	-	23.3	0.3	3.0	34.9
2012	42.3	0.6	37.3	0.2	2.2	35.2
2017	43.4	0.0	16.2	0.1	1.8	48.5

**Table 21B-17.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk
	Quadrat Frequency		
1997	9	-	5
2003	6	-	1
2012	3	-	3
2017	3	1	-
Year	Days Use Per Acre (ha)		
1997	-	-	-
2003	18.9 (46.6)	-	2.0 (5.0)
2012	22.5 (55.6)	0.7 (1.7)	19.4 (48.0)
2017	4.4 (10.8)	-	4.7 (11.6)

**Table 21B-17.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus marginatus (mountain brome)	Dactylis glomerata <sup>i</sup> (orchardgrass)	Elymus trachycaulus (slender wheatgrass)	Melica bulbosa (oniongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency								
1997	125	1	63	173	72	7	2	-	201
2003	66	104	39	135	5	35	3	6	169
2012	131	3	57	178	-	42	-	4	127
2017	128	-	29	272	8	62	8	8	89
year	Average Cover (%)								
1997	3.0	0.0	2.2	5.1	0.9	0.0	0.0	-	8.4
2003	0.8	4.0	1.7	2.9	0.0	1.0	0.0	0.0	6.8
2012	3.8	0.0	1.6	3.7	-	0.7	-	0.4	5.6
2017	3.5	-	0.9	11.5	0.1	2.5	0.2	0.5	6.5

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

**Table 21B-17.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris aurantiaca (orange agoseris)	Arabis drummondii (Drummond's rockcress)	Artemisia dracunculus (tarragon)	Claytonia lanceolata (lanceleaf springbeauty)	Collomia linearis <sup>a</sup> (tiny trumpet)	Delphinium × occidentale (western larkspur)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron eatonii (Eaton's fleabane)	Galium bifolium <sup>a</sup> (twinleaf bedstraw)	Geranium richardsonii (Richardson's geranium)	Helianthella uniflora (oneflower helianthella)	Heliomeris multiflora var. multiflora (showy goldeneye)	Hydrophyllum capitatum (ballhead waterleaf)	Lathyrus lanszwertii (Nevada pea)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)
year	Nested Frequency																
1997	1	23	16	2	-	225	30	25	4	-	5	-	121	-	-	46	150
2003	13	3	24	2	-	84	20	-	1	-	5	-	117	-	-	49	107
2012	11	12	15	12	-	81	35	-	16	-	8	2	74	-	-	63	70
2017	14	18	12	11	4	141	58	9	19	6	12	-	3	140	16	82	182
year	Average Cover (%)																
1997	0.0	0.2	0.1	0.0	-	2.3	3.7	0.2	0.0	-	0.4	-	1.4	-	-	2.0	2.5
2003	0.1	0.0	0.1	0.7	-	0.3	3.5	-	0.0	-	0.5	-	3.4	-	-	3.1	2.1
2012	0.1	0.3	0.1	0.6	-	0.3	4.0	-	0.0	-	0.4	0.1	0.8	-	-	3.1	0.6
2017	0.5	0.1	0.1	1.1	0.0	1.3	6.7	0.0	0.6	0.0	0.5	-	0.0	5.3	0.8	1.7	3.5

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

FORB SPECIES														
<i>Madia glomerata</i> <sup>a</sup> (mountain tarweed)														
<i>Mertensia</i> (bluebells)														
<i>Orthocarpus tolmiei</i> <sup>a</sup> (Tolmie's owl's-clover)														
<i>Penstemon</i> (beardtongue)														
<i>Phlox longifolia</i> (longleaf phlox)														
<i>Polygonum douglasii</i> <sup>a</sup> (Douglas' knotweed)														
<i>Pseudostellaria jamesiana</i> (tuber starwort)														
<i>Ranunculus</i> (buttercup)														
<i>Senecio</i> (ragwort)														
<i>Symphotrichum ascendens</i> (western aster)														
<i>Taraxacum officinale</i> (common dandelion)														
<i>Tragopogon dubius</i> <sup>ai</sup> (yellow salsify)														
<i>Vicia americana</i> (American vetch)														
<i>Viola</i> (violet)														
year	Nested Frequency													
1997	79	18	5	-	-	184	121	13	-	6	12	2	50	8
2003	72	10	3	4	-	108	38	-	4	102	19	6	46	-
2012	138	16	14	1	-	118	58	-	-	129	8	2	60	-
2017	6	30	15	-	1	-	191	6	-	15	27	1	57	9
year	Average Cover (%)													
1997	2.2	0.4	0.2	-	-	1.0	1.0	0.2	-	0.0	0.1	0.0	0.6	0.1
2003	1.3	0.3	0.0	0.0	-	1.3	0.1	-	0.1	1.6	0.3	0.1	0.7	-
2012	2.0	0.6	0.1	0.0	-	0.5	0.5	-	-	1.7	0.0	0.0	0.7	-
2017	0.0	4.2	0.3	-	0.0	-	4.5	0.0	-	0.1	0.4	0.0	1.0	0.0

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

**Table 21B-17.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	
<i>Chrysothamnus viscidiflorus</i> ssp. <i>lanceolatus</i> (yellow rabbitbrush)	
year	Line Intercept Cover (%)
1997	-
2003	-
2012	-
2017	-
year	Quadrat Cover (%)
1997	-
2003	-
2012	0.0
2017	-

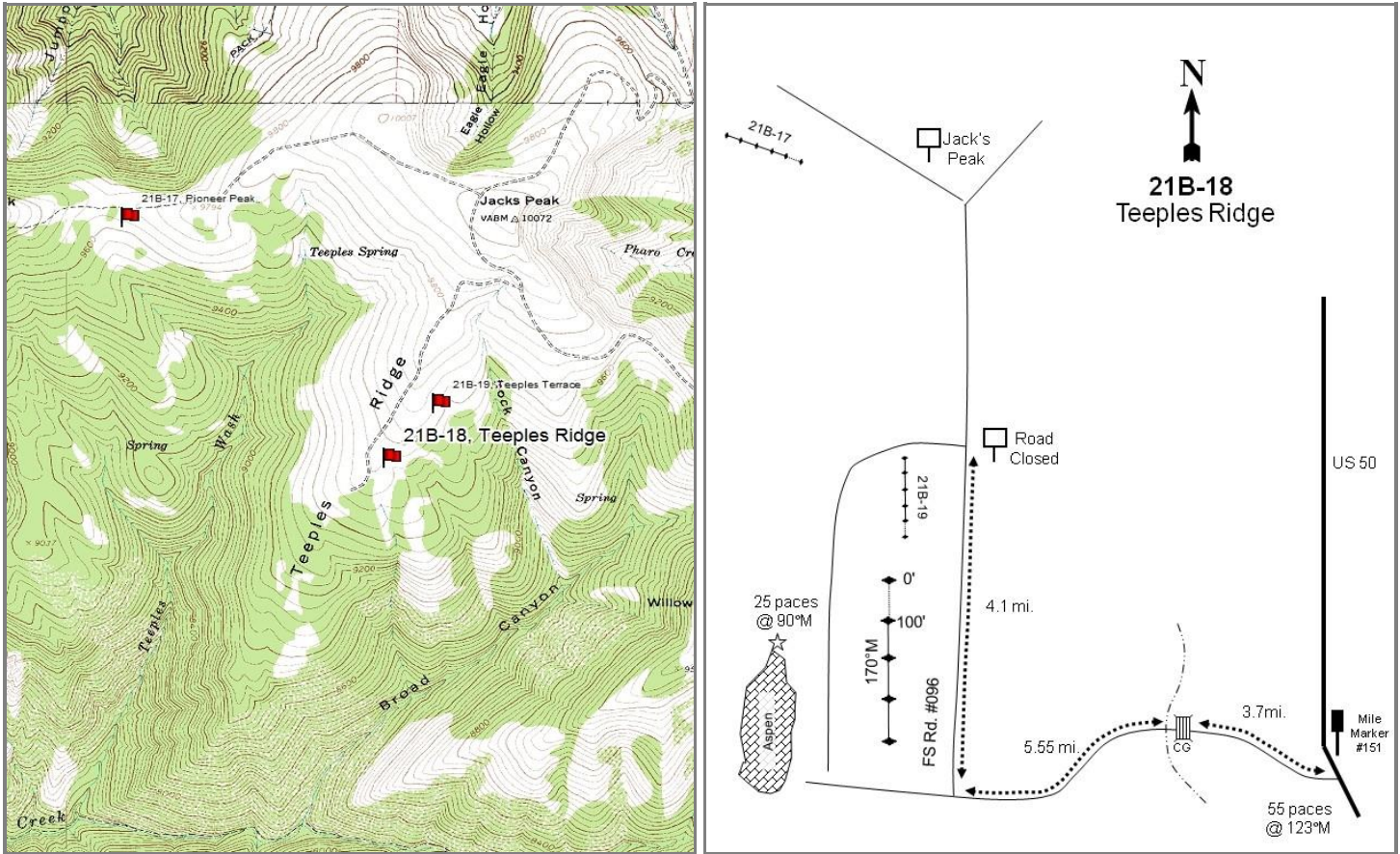
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 21B-17.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Chrysothamnus viscidiflorus ssp. lanceolatus -- (yellow rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	35/64
<b>Rhus trilobata<sup>P</sup> -- (skunkbush sumac)</b>									
1997	-	-	-	-	-	-	-	-	15/24
2003	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Ribes cereum<sup>P</sup> -- (wax currant)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	123/152
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	47/124
2017	-	-	-	-	-	-	-	-	79/108

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

## TEEPLES RIDGE - STUDY NO. 21B-18

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Mount Catherine NE; Township 21S, Range 3W, Section 13  
NAD 83 UTM ZONE 12, 400573 East 4315298 North

**Transect Information**

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

Not Available  
170° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
No Rebar

**Directions to Site**

From Highway 50 at mile marker 151, drive west for 3.7 miles to a cattle guard. Go another 0.75 miles across a stream to a gate. Go through the gate and drive 5.55 miles past the weather gauging station to a right turn. Turn right onto road #096 and go 4.1 miles to a "road closed" sign on the left, just before Jack's Peak. Walk down the old road on the left (which is basically a trail now) for about 0.75 miles to the edge of an aspen clone and a clearing on the left: the study is in the clearing. From the north end of the aspen clone, walk 25 paces at 90 degrees magnetic to the 200-foot stake. The 0-foot stake is 200 feet north.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	Chalk Creek North Fork A
Elevation	9,550ft (2,911m)
Aspect	Southeast
Slope	8-15%
Sample Dates	08/21/1997, 09/04/2003, 08/23/2012, 07/06/2017

**Table 21B-18.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Seed Unknown	-	-	Historic	-

**Wildlife Habitat and Vegetation History****Table 21B-18.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	summer
Elk	crucial	summer

**Table 21B-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	Subalpine Meadow	No Encroachment
2003	Subalpine Meadow	No Encroachment
2012	Subalpine Meadow	No Encroachment
2017	Subalpine Meadow	No Encroachment

**Site Notes**

No Notes

**Soils****Table 21B-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	6.4	32.7	28.7	38.6	3.8	18.2	252.8	0.6	08/21/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	32 inches
NRCS Ecological Site	High Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA516UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1997, the vegetation component has remained composed of a diverse mix of perennial forbs and grasses. The grasses on the site are primarily perennial introduced species -- namely smooth brome (*Bromus inermis*) and intermediate wheatgrass (*Thinopyrum intermedium*): these provide the majority of the cover (Table 21B- 18.7, Table 21B-18.10). The primary forbs are silky lupine (*Lupinus sericeus*), western larkspur (*Delphinium occidentale*) and tuber starwort (*Pseudostellaria jamesiana*) (Table 21B-18.11). There is some mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) present on the site, and therefore there may be some potential for sagebrush to increase in future sample years (Table 21B-18.12, Table 21B-18.13).

**Trend Summary Tables****Table 21B-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	0.0	-	-	-	-	-
2003	0.2	-	-	-	-	-
2012	0.0	-	-	0.1	-	-
2017	0.3	0.0	-	0.3	-	-

**Table 21B-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	-	358	171	322	-	16.4	0.8	13.2
2003	-	404	80	307	-	20.9	0.5	12.3
2012	-	363	184	231	-	29.0	1.0	7.2
2017	-	469	27	362	-	42.9	0.1	18.5

**Table 21B-18.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	37.9	-	31.4	0.7	0.1	34.0
2003	39.5	-	34.7	0.0	0.6	33.1
2012	25.8	-	37.4	0.2	0.2	40.8
2017	34.8	0.1	13.9	0.1	0.3	57.5

**Table 21B-18.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk
	Quadrat Frequency		
1997	11	2	9
2003	16	2	10
2012	5	1	13
2017	5	-	9
Year	Days Use Per Acre (ha)		
1997	-	-	-
2003	23.2 (57.4)	1.3 (3.3)	18.1 (44.7)
2012	34.1 (84.3)	4.7 (11.6)	23.4 (57.9)
2017	4.4 (10.8)	-	20.8 (51.3)



**Table 21B-18.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus marginatus (mountain brome)	Dactylis glomerata <sup>i</sup> (orchardgrass)	Elymus trachycaulus (slender wheatgrass)	Melica bulbosa (oniongrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency								
1997	11	-	235	1	20	2	-	2	166
2003	18	8	277	16	6	-	4	8	199
2012	18	-	254	1	20	3	-	14	223
2017	42	3	351	32	29	8	4	33	185
year	Average Cover (%)								
1997	0.1	-	11.6	0.0	0.3	0.0	-	0.0	4.4
2003	0.3	0.1	12.7	0.1	0.2	-	0.1	0.0	7.6
2012	0.9	-	14.4	0.0	0.9	0.0	-	0.6	12.2
2017	1.0	0.0	25.3	1.4	1.1	0.4	0.1	1.2	12.4

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

**Table 21B-18.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris aurantiaca (orange agoseris)	Arabis (rockcress)	Artemisia dracunculus (tarragon)	Astragalus (milkvetch)	Astragalus utahensis (Utah milkvetch)	Cirsium (thistle)	Collomia linearis <sup>a</sup> (tiny trumpet)	Cymopterus (springparsley)	Delphinium × occidentale (western larkspur)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron eatonii (Eaton's fleabane)	Erigeron flagellaris (trailing fleabane)	Galium bifolium <sup>a</sup> (twinleaf bedstraw)	Heliomeris multiflora var. multiflora (showy goldeneye)	Hydrophyllum capitatum (ballhead waterleaf)	Lupinus sericeus (silky lupine)
year	Nested Frequency																
1997	37	56	12	4	-	-	1	52	4	67	8	-	-	-	30	-	-
2003	29	18	5	-	3	-	2	-	-	42	-	7	15	-	40	-	-
2012	34	-	-	-	-	2	6	17	-	48	-	15	18	21	40	-	3
2017	69	14	-	-	-	-	3	5	43	40	2	85	6	-	5	96	24
year	Average Cover (%)																
1997	1.1	0.5	0.1	0.1	-	-	0.0	0.1	0.0	6.0	0.1	-	-	-	0.4	-	-
2003	0.5	0.1	0.0	-	0.0	-	0.0	-	-	4.1	-	0.1	0.3	-	0.5	-	-
2012	1.1	-	-	-	-	0.0	0.0	0.1	-	2.5	-	0.1	0.1	0.2	1.1	-	0.0
2017	2.7	0.0	-	-	-	-	0.0	0.0	0.3	2.5	0.0	1.2	0.1	-	0.1	1.4	2.2

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

FORB SPECIES										
<i>Machaeranthera canescens</i> (hoary tansyaster)										
<i>Mertensia</i> (bluebells)										
<i>Penstemon</i> (beardtongue)										
<i>Polygonum douglasii</i> <sup>a</sup> (Douglas' knotweed)										
<i>Pseudostellaria jamesiana</i> (tuber starwort)										
<i>Rumex crispus</i> <sup>i</sup> (curly dock)										
<i>Symphotrichum ascendens</i> (western aster)										
<i>Taraxacum officinale</i> (common dandelion)										
<i>Tragopogon dubius</i> <sup>ai</sup> (yellow salsify)										
<i>Vicia americana</i> (American vetch)										
year	Nested Frequency									
1997	166	64	-	139	177	3	2	25	-	32
2003	245	60	-	80	17	-	8	10	-	-
2012	33	33	2	164	7	-	116	10	-	9
2017	114	58	-	9	239	-	1	33	11	10
year	Average Cover (%)									
1997	2.8	0.8	-	0.6	1.0	0.2	0.0	0.2	-	0.1
2003	5.0	1.2	-	0.5	0.1	-	0.1	0.4	-	-
2012	0.3	0.6	0.0	0.7	0.0	-	1.1	0.1	-	0.0
2017	1.0	1.7	-	0.1	4.8	-	0.0	0.5	0.0	0.1

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

**Table 21B-18.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES		
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> <sup>p</sup> (mountain big sagebrush)		
<i>Symphoricarpos oreophilus</i> (mountain snowberry)		
year	Line Intercept Cover (%)	
1997	-	-
2003	-	-
2012	0.1	-
2017	0.3	-
year	Quadrat Cover (%)	
1997	0.0	-
2003	0.2	-
2012	0.0	-
2017	0.3	0.0

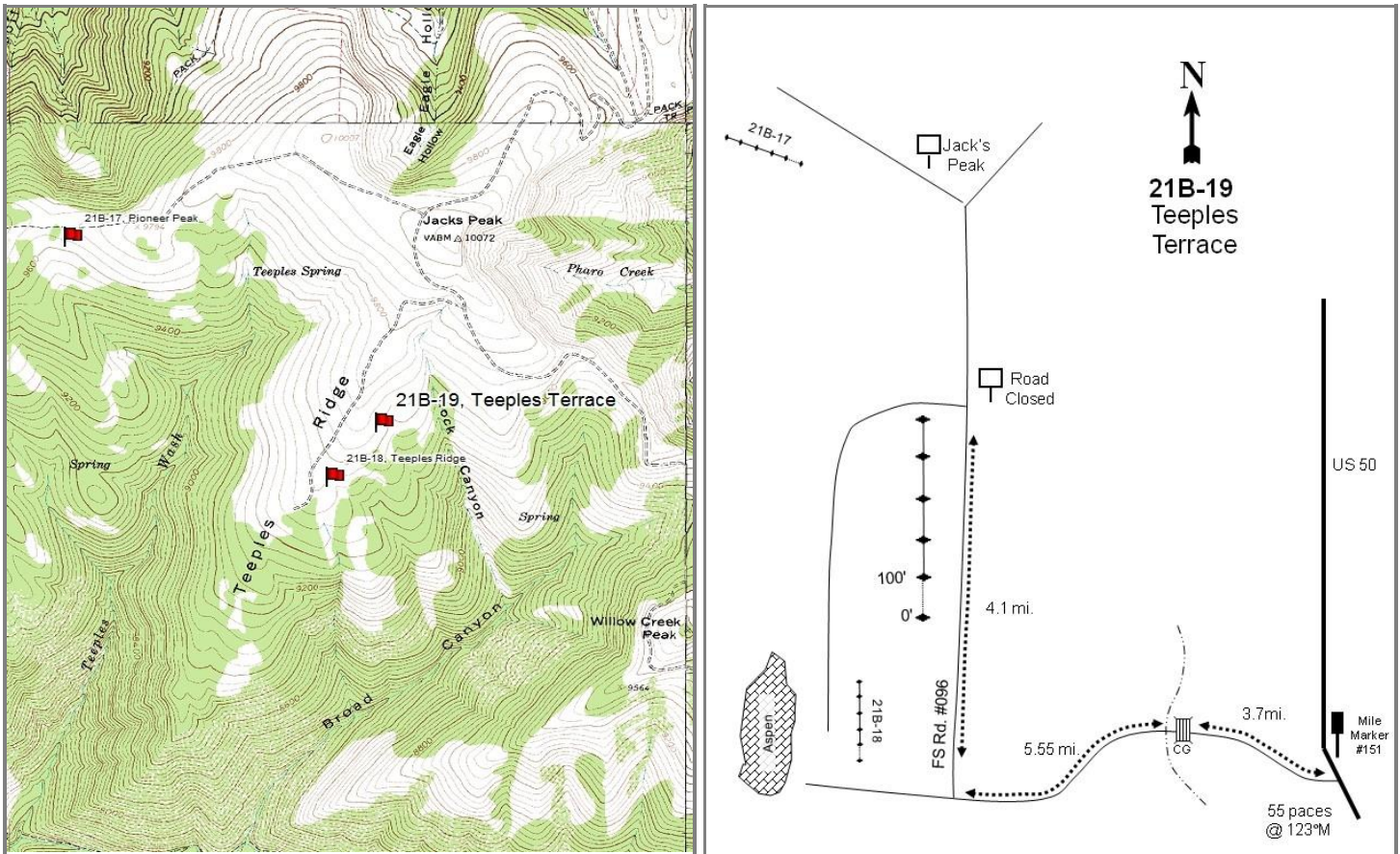
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 21B-18.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1997	100	-	60	40	0	0	0	0	25/22
2003	120	-	17	83	0	0	0	0	32/35
2012	40	40	0	50	50	0	0	100	39/50
2017	380	-	74	26	0	5	0	0	33/35
<b>Chrysothamnus viscidiflorus ssp. lanceolatus -- (yellow rabbitbrush)</b>									
1997	-	-	-	-	-	-	-	-	22/18
2003	-	-	-	-	-	-	-	-	19/32
2012	-	-	-	-	-	-	-	-	24/31
2017	-	-	-	-	-	-	-	-	-/-
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	100	0	0	0	0	0	13/7

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

## TEEPLES TERRACE - STUDY NO. 21B-19

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Mount Catherine NE; Township 21S, Range 3W, Section 13  
NAD 83 UTM ZONE 12, 400844 East 4315611 North

**Transect Information**

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

Not Available  
10° magnetic  
500ft  
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)  
Standard

**Directions to Site**

From Highway 50 at mile marker 151, drive west for 3.7 miles to a cattle guard. Go another 0.75 miles across a stream to a gate. Go through the gate and drive 5.55 miles past the weather gauging station to a right turn. Turn right onto road #096 and go 4.1 miles to a "road closed" sign on the left, just before Jack's Peak. Walk down the closed road about 2/3 mile to a cluster of *Ribes*. Walk down eight terraces to a witness post; the 0-foot stake is just north of the witness post. The baseline runs along the terrace.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	Chalk Creek North Fork A
Elevation	9,660ft (2,944m)
Aspect	Southeast
Slope	15-30%
Sample Dates	08/21/1997, 09/04/2003, 08/23/2012, 07/06/2017

**Table 21B-19.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Terrace - Contour Trench	-	-	Historic	-
Seeding - Seed Unknown	-	-	Historic	-

**Wildlife Habitat and Vegetation History****Table 21B-19.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	summer
Elk	crucial	summer

**Table 21B-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	Subalpine Meadow	No Encroachment
2003	Subalpine Meadow	No Encroachment
2012	Subalpine Meadow	No Encroachment
2017	Subalpine Meadow	No Encroachment

**Site Notes**

No Notes

**Soils****Table 21B-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	5.0	48.0	26.7	25.3	2.5	52.0	227.2	0.2	08/21/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	32 inches
NRCS Ecological Site	High Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA516UT
States and Transitions	No state and transition model is available for this ecological site.

When this site was established in 1997, it was a subalpine meadow vegetative community and remains so as of the most recent sampling in 2017. The herbaceous understory is robust and diverse in the forb community, with the perennial forbs silky lupine (*Lupinus sericeus*), tuber starwort (*Pseudostellaria jamesiana*), and American vetch (*Vicia americana*) as the most dominant species (Table 21B-19.11). The grass community has good cover of perennial species, with the native and introduced species Letterman's needlegrass (*Letterman's needlegrass*), smooth brome (*Bromus inermis*), and intermediate wheatgrass (*Thinopyrum intermedium*) being the most dominant grasses (Table 21B-19.11). Browse species do not contribute high amounts of cover. Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) provides most of the browse cover, so it is possible that sagebrush cover will continue to increase in the future unless a major disturbance occurs (Table 21B-19.12).

## Trend Summary Tables

**Table 21B-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	-	-	-	-	-
2003	0.0	0.0	-	-	-	-
2012	1.2	0.0	-	1.7	-	-
2017	2.0	0.0	-	3.1	-	-

**Table 21B-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	-	375	187	266	-	20.8	1.8	14.6
2003	-	420	64	296	-	26.0	0.4	15.1
2012	-	444	231	329	-	31.8	1.5	16.0
2017	-	431	102	338	-	29.5	0.7	20.8

**Table 21B-19.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	44.8	3.3	14.2	0.5	2.3	38.2
2003	43.1	-	22.1	0.5	4.5	39.3
2012	36.0	0.0	35.7	1.6	7.0	50.0
2017	44.4	-	13.6	0.9	6.5	43.9

**Table 21B-19.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	7	1	4	-
2003	18	1	6	1
2012	3	3	8	-
2017	1	-	1	-
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2003	22.5 (55.6)	0.7 (1.7)	8.1 (19.9)	-
2012	7.2 (17.9)	1.3 (3.3)	28.1 (69.5)	-
2017	3.6 (9.0)	-	4.0 (9.9)	-

**Table 21B-19.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Bromus inermis <sup>i</sup> (smooth brome)	Bromus marginatus (mountain brome)	Carex utriculata (Northwest Territory sedge)	Dactylis glomerata <sup>i</sup> (orchardgrass)	Poa pratensis <sup>i</sup> (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency							
1997	87	292	55	3	9	14	-	20
2003	115	390	9	-	28	47	-	7
2012	275	332	47	6	18	17	2	129
2017	198	270	64	5	57	64	-	64
year	Average Cover (%)							
1997	1.7	15.0	2.7	0.0	0.2	0.6	-	0.5
2003	2.2	21.6	0.1	-	0.6	1.3	-	0.2
2012	9.1	16.5	0.7	0.1	0.2	0.4	0.0	4.8
2017	6.0	13.6	3.7	0.0	1.6	1.8	-	2.7

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

**Table 21B-19.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris aurantiaca (orange agoseris)	Androsace septentrionalis <sup>a</sup> (pygmyflower rockjasmine)	Arabis (rockcress)	Artemisia dracunculus (tarragon)	Cirsium undulatum <sup>a</sup> (wavy/leaf thistle)	Claytonia (springbeauty)	Collomia linearis <sup>a</sup> (tiny trumpet)	Delphinium nuttallianum (two-lobed larkspur)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Erigeron eatonii (Eaton's fleabane)	Erigeron flagellaris (trailing fleabane)	Galium bifolium <sup>a</sup> (twinleaf bedstraw)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Helianthella uniflora (oneflower helianthella)	Heliomeris multiflora var. multiflora (showy goldeneye)	Hydrophyllum capitatum (ballhead waterleaf)
year	Nested Frequency																
1997	62	32	-	7	1	-	-	108	-	17	7	5	-	15	-	3	-
2003	107	43	4	17	-	-	-	7	-	-	26	4	-	-	5	6	-
2012	51	17	-	37	7	0	-	5	-	1	20	40	14	4	10	3	-
2017	30	39	-	35	4	-	32	97	37	-	71	2	-	-	-	25	38
year	Average Cover (%)																
1997	1.3	0.3	-	0.0	0.0	-	-	0.6	-	0.1	0.0	0.1	-	0.1	-	0.0	-
2003	2.1	0.3	0.0	0.1	-	-	-	0.0	-	-	0.3	0.0	-	-	0.0	0.0	-
2012	0.5	0.3	-	0.3	0.3	0.0	-	0.0	-	0.0	0.2	0.2	0.2	0.0	0.2	0.0	-
2017	0.7	0.4	-	0.2	0.2	-	0.1	0.7	0.3	-	1.1	0.1	-	-	-	0.8	0.6

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



FORB SPECIES																
Lathyrus lanszwertii (Nevada pea)																
Lupinus sericeus (silky lupine)																
Machaeranthera canescens (hoary tansyaster)																
Microsteris gracilis <sup>a</sup> (slender phlox)																
Orthocarpus tolimiei <sup>a</sup> (Tolmie's owl's-clover)																
Penstemon (beardtongue)																
Polygonum douglasii <sup>a</sup> (Douglas' knotweed)																
Potentilla hippiana (woolly cinquefoil)																
Pseudostellaria jamesiana (tuber starwort)																
Ranunculus (buttercup)																
Rumex salicifolius (willow dock)																
Symphotrichum ascendens (western aster)																
Taraxacum officinale (common dandelion)																
Tragopogon dubius <sup>ai</sup> (yellow salsify)																
Vicia americana (American vetch)																
Viola (violet)																
year	Nested Frequency															
1997	-	94	53	3	-	1	127	-	44	3	60	-	112	-	20	-
2003	-	95	72	-	3	-	52	2	28	-	18	7	156	3	13	-
2012	-	189	82	2	15	2	204	7	71	-	-	95	39	-	45	-
2017	12	204	58	-	-	-	6	4	98	-	-	6	54	-	35	23
year	Average Cover (%)															
1997	-	5.4	0.7	0.0	-	0.0	1.0	-	0.3	0.1	3.6	-	2.6	-	0.1	-
2003	-	5.5	0.9	-	0.0	-	0.3	0.0	0.1	-	0.9	0.0	4.5	0.0	0.2	-
2012	-	10.7	0.9	0.0	0.4	0.0	0.8	0.1	0.7	-	-	1.1	0.3	-	0.3	-
2017	0.4	11.1	0.7	-	-	-	0.0	0.0	2.1	-	-	0.0	0.7	-	1.1	0.1

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

**Table 21B-19.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES			
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)			
Chrysothamnus viscidiflorus ssp. lanceolatus (yellow rabbitbrush)			
Symphoricarpos oreophilus (mountain snowberry)			
year	Line Intercept Cover (%)		
1997	-	-	-
2003	-	-	-
2012	1.7	-	-
2017	3.1	-	-
year	Quadrat Cover (%)		
1997	0.0	-	-
2003	0.0	-	0.0
2012	1.2	0.0	-
2017	2.0	0.0	-

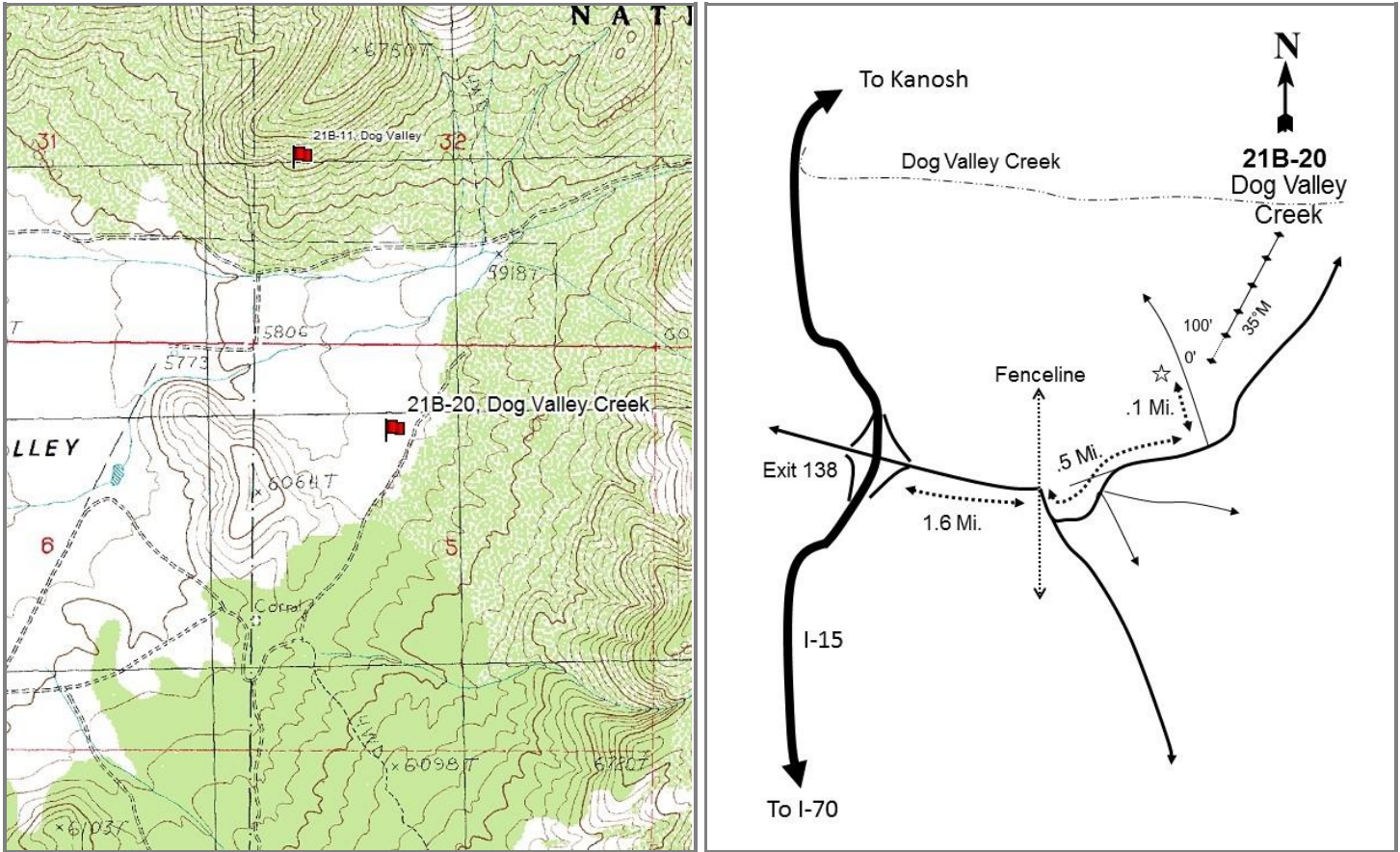
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 21B-19.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1997	40	-	50	0	50	0	0	0	44/96
2003	40	-	50	50	0	0	0	0	43/33
2012	380	1640	16	84	0	0	0	0	51/76
2017	1180	-	54	42	3	0	0	0	44/65
<b>Chrysothamnus viscidiflorus ssp. lanceolatus -- (yellow rabbitbrush)</b>									
1997	40	-	0	100	0	0	0	0	22/37
2003	-	-	-	-	-	-	-	-	25/43
2012	40	-	0	100	0	0	0	0	43/52
2017	20	-	100	0	0	0	0	0	26/48
<b>Sambucus racemosa<sup>P</sup> -- (red elderberry)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	70/128
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1997	-	-	-	-	-	-	-	-	-/-
2003	20	-	100	0	0	0	0	0	- / -
2012	20	-	0	100	0	0	100	0	44/101
2017	20	-	0	100	0	0	0	0	53/104

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

## DOG VALLEY CREEK - STUDY NO. 21B-20



### Location Information

USGS 7.5 min Map Info	Dog Valley Peak SE; Township 25S, Range 6W, Section 05
GPS (0' Stake)	NAD 83 UTM ZONE 12, 364501 East 4280964 North

### Transect Information

Browse Tag # (0' Stake)	555
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	Standard

### Directions to Site

Traveling north on I-15, take exit 138 off I-15. Follow County Road 4603 to a fork at 1.6 miles, then follow the main road right for 0.2 miles to a fenceline. At the fenceline, turn left and follow the road for 0.15 miles to a small gap in the trees. Turn left again and continue for 0.4 miles to a faint trail: the site is on the right (east) side of this trail.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	Grass Creek Allotment
Elevation	5,879ft (1,792m)
Aspect	Northwest
Slope	2%
Sample Dates	06/21/2017

**Table 21B-20.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Dog Valley Peak	-	July 1996	217
Fire - Wildfire	Dog Valley	-	July-August 2006	28664

**Wildlife Habitat and Vegetation History****Table 21B-20.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	substantial	winter

**Table 21B-20.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Mountain Big Sagebrush/Annual Grass	No Encroachment

**Site Notes**

No Notes

**Soils****Table 21B-20.5 - 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	34.2	34.7	31.1	2.7	28.0	262.0	0.4	06/21/2017

**Site Potential**

1981 - 2010 Average Annual Precipitation	15 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.

At time of study establishment in 2017, this site was dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and cheatgrass (*Bromus tectorum*) in the herbaceous understory; broom snakeweed (*Gutierrezia sarothrae*) is also present in the shrub layer to a lesser extent (Table 21B-20.10, Table 21B-20.12). The perennial introduced grass species bulbous bluegrass (*Poa bulbosa*) and the native species western wheatgrass (*Pascopyrum smithii*) are also present in significant amounts in the herbaceous understory (Table 21B-20.10). Native forb species are not diverse and are mostly depleted, but the introduced annual forb species desert madwort (*Alyssum desertorum*) is very common (Table 21B-20.11). There is Utah juniper (*Juniperus osteosperma*) present near the site, but all of the trees on the site have burned in recent fires. However, there is potential for future infill leading from nearby seed sources (photos). The heavy cover of annual grass is a threat to the system as it has the potential for increased wildfire regimes and the associated changes in plant communities associated with frequent wildfire.

**Trend Summary Tables**

**Table 21B-20.6 - 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
2017	12.7	3.6	-	17.1	2.2	-

**Table 21B-20.7 - 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
2017	429	374	399	86	25.9	24.7	11.7	1.3

**Table 21B-20.8 - 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
2017	6.2	0.1	41.8	9.7	0.3	67.5

**Table 21B-20.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2017	14	4	1	7
Year	Days Use Per Acre (ha)			
2017	63.2 (156.0)	0.7 (1.7)	1.3 (3.3)	-

**Table 21B-20.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)	Vulpia octoflora <sup>a</sup> (sixweeks fescue)
year	Nested Frequency									
2017	31	429	6	214	211	16	111	4	3	14
year	Average Cover (%)									
2017	1.2	25.8	0.1	7.8	10.0	0.5	4.9	0.1	0.0	0.1

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

**Table 21B-20.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)	Cirsium (thistle)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Convolvulus arvensis <sup>ni</sup> (field bindweed)	Cryptantha (cryptantha)	Draba <sup>a</sup> (draba)	Erigeron divergens <sup>a</sup> (spreading fleabane)	Eriogonum racemosum (redroot buckwheat)	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Lotus utahensis (Utah bird's-foot trefoil)	Microsteris gracilis <sup>a</sup> (slender phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>ai</sup> (Douglas' knotweed)	Silene antirrhina <sup>a</sup> (steepy silene)
year	Nested Frequency																
2017	1	385	9	14	8	71	6	1	8	2	35	16	14	3	9	20	60
year	Average Cover (%)																
2017	0.0	10.3	0.0	0.0	0.1	0.4	0.1	0.0	0.0	0.1	0.4	0.1	0.5	0.0	0.1	0.1	0.3

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

FORB SPECIES	Sphaeralcea coccinea (scarlet globemallow)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency		
2017	17	46	3
year	Average Cover (%)		
2017	0.1	0.3	0.1

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

**Table 21B-20.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Gutierrezia sarothrae (broom snakeweed)
year	Line Intercept	
2017	17.1	2.2
year	Quadrat Cover (%)	
2017	12.7	3.6

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

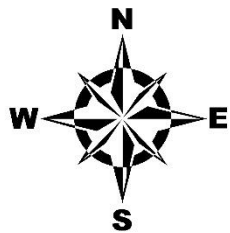
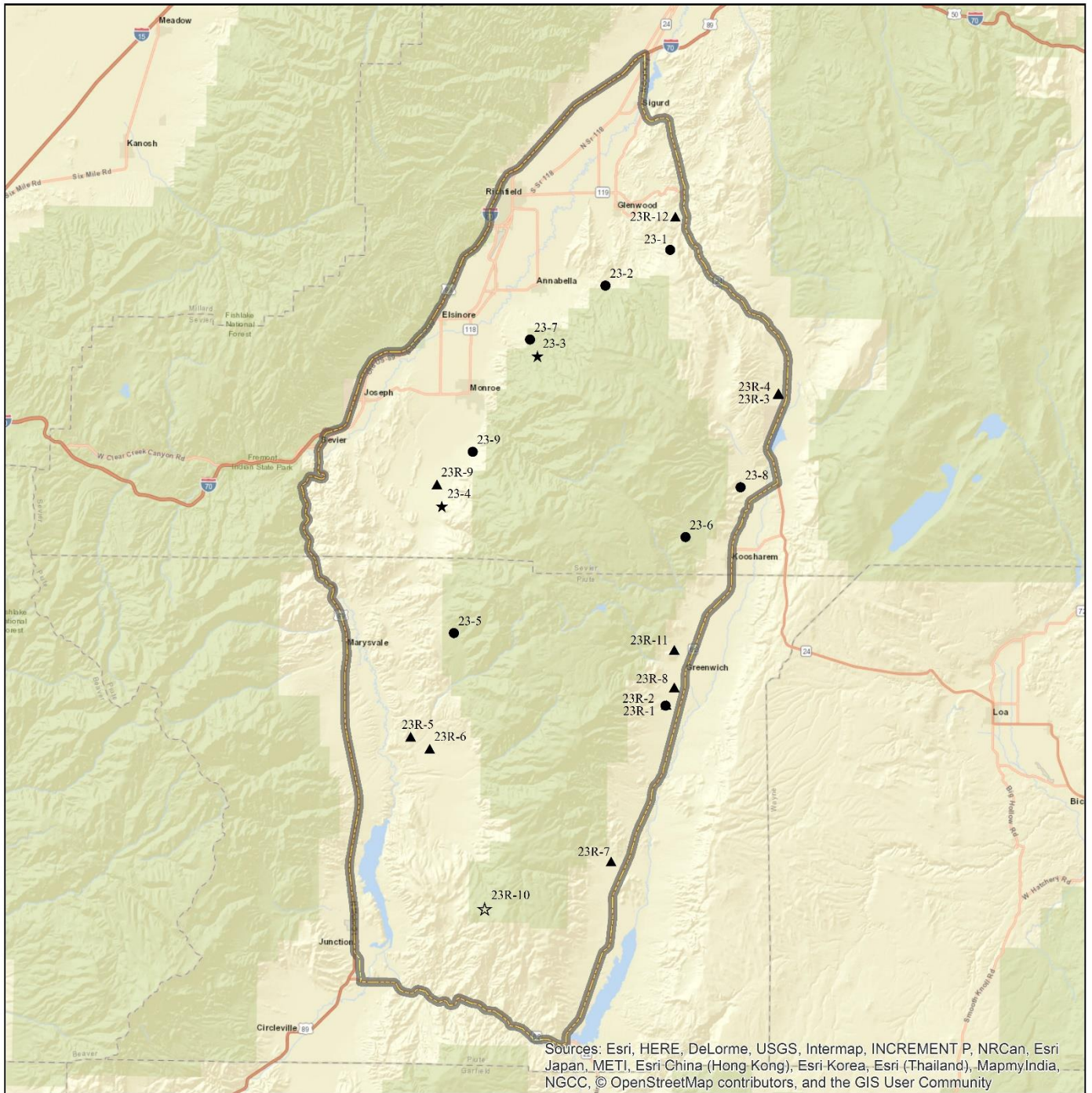
**Table 21B-20.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

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 <sup>P</sup> -- (mountain big sagebrush)									
2017	10640	-	81	18	0	0	0	0	53/90
Gutierrezia sarothrae -- (broom snakeweed)									
2017	7940	440	45	55	0	0	0	0	18/25
Juniperus osteosperma <sup>t</sup> -- (Utah juniper)									
2017	-	-	-	-	-	-	-	-	- / -
Quercus gambelii <sup>P</sup> -- (Gambel oak)									
2017	-	-	-	-	-	-	-	-	86/77

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



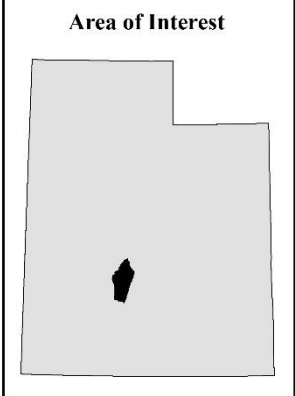
# WILDLIFE MANAGEMENT UNIT 23 - MONROE



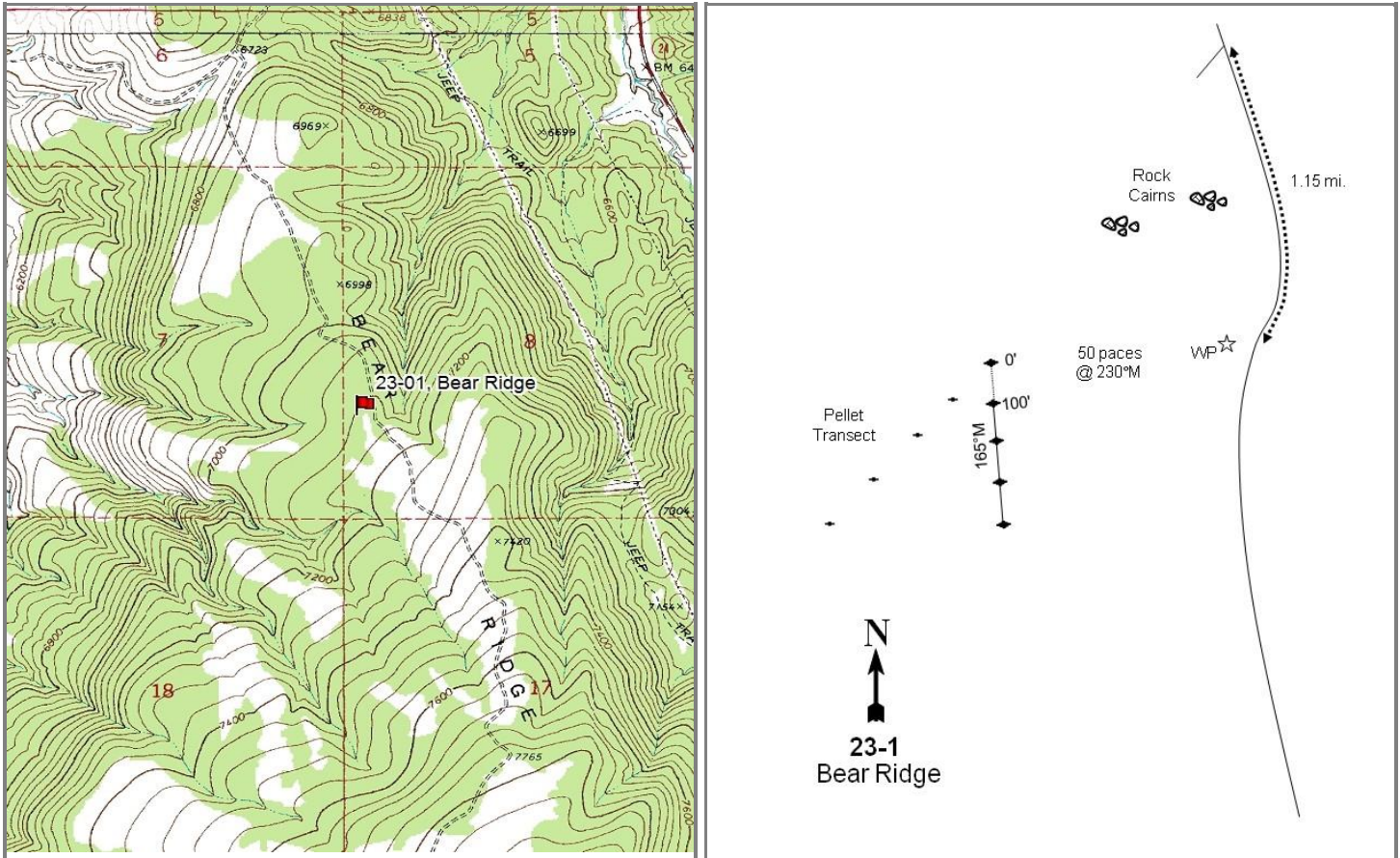
**Study Location Project, Status**

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

Unit - 23



## BEAR RIDGE - STUDY NO. 23-1



### Location Information

USGS 7.5 min Map Info Water Creek Canyon N; Township 24S, Range 1W, Section 08  
 GPS (0' Stake) NAD 83 UTM ZONE 12, 418271 East 4287692 North

### Transect Information

Browse Tag # (0' Stake) 7038  
 Transect Bearing 165° magnetic  
 Length 400ft  
 Belt Placement Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
 Belt Marker Placement Belt 1: 1ft, Belt 2: 7ft, Belt 5: No Rebar

### Directions to Site

From Richfield, go east on Highway 119 to the junction of U-24. One hundred yards before the intersection of Highway 119 and U-24, turn south onto a dirt road. Follow this road for 1.5 miles to a hairpin turn and keep right. Go 0.55 miles to a fork, bear left and continue for 1.15 miles more to a witness post on the west side of the road. Walk 50 paces at 230 degrees magnetic to the 0-foot baseline stake. The trend study stakes are rebar 2-1/2 feet tall, and the 0-foot stake is marked by browse tag #7038.



**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	NORTH COVE MOUNTAIN
Elevation	7,140ft (2,176m)
Aspect	Southwest
Slope	10%
Sample Dates	07/20/1998, 08/22/2003, 08/19/2008, 08/06/2012, 06/15/2017

**Table 23-01.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	North Cove Maintenance and Guzzlers	3150	October 2016	1500
Chaining - Two-Way Ely	North Cove Vegetation Treatment	1880	October-November 2010	3000
Seeding - Aerial Before	North Cove Vegetation Treatment	1880	October-November 2010	1500

**Table 23-01.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
North Cove Vegetation Treatment			Aerial	Oct 2010	1500
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
G	Festuca ovina	Sheep Fescue	Covar	0.50	0.40
G	Leymus cinereus	Great Basin Wildrye	Trailhead	1.50	1.47
G	Poa fendleriana	Muttongrass		0.20	0.18
G	Poa secunda	Sandberg Bluegrass	Mountain Home	0.50	0.45
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky	2.00	1.62
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Anatone	1.00	0.91
G	Thinopyrum intermedium	Pubescent Wheatgrass	Luna	1.00	0.92
F	Helianthus annuus	Annual Sunflower	Sunflower	1.00	0.97
F	Linum perenne	Blue Flax	Appar	1.00	0.89
F	Medicago sativa	Alfalfa	Ranger	1.00	0.94
F	Melilotus officinalis	Yellow Sweetclover		1.00	0.88
F	Penstemon palmeri	Palmer Penstemon	Elko NV	0.00	0.00
F	Penstemon palmeri	Palmer Penstemon	Iron UT	0.19	0.18
F	Penstemon palmeri	Palmer Penstemon	Pine NV	0.30	0.28
F	Sanguisorba minor	Small Burnet	Delar	4.00	3.80

**Wildlife Habitat and Vegetation History****Table 23-01.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	substantial	winter

**Table 23-01.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
1991	Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
1998	Sagebrush/Pinyon-Juniper	Phase II
2003	Sagebrush/Pinyon-Juniper	Phase II
2008	Pinyon-Juniper/Sagebrush	Phase II transitioning to Phase III
2012	Perennial Grass	Phase I
2017	Perennial Grass/Antelope Bitterbrush	Phase I

**Site Notes**

No Notes

**Soils****Table 23-01.5 - 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
Loam	7.4	40.0	33.4	26.6	3.3	9.0	124.8	0.7	07/20/1998

**Site Potential**

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Upland Shallow Loam (Black Sagebrush)
NRCS Ecological Site #	R028AY325UT
States and Transitions	No state and transition model is available for this ecological site.

This site existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and black sagebrush (*A. nova*) plant community with twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) trees co-dominant from study establishment in 1985 through 2008. The cover of pinyon and juniper continued to increase through the sample years and the study site progressed through phases of woodland succession: the study was considered to be in Phase II transitioning to Phase III in 2008 (photos, Table 23-01.4, Table 23-01.12, Table 23-01.13, Table 23-01.14). The herbaceous understory was somewhat abundant between 1985 and 2008 (Table 23-01.7), but was not considered a dominant vegetation component of the site. However, a chaining and seeding treatment in 2010 removed much of the pinyon-juniper and amplified the understory (Table 23-01.1). As a result, the site transitioned to one dominated by perennial grasses -- primarily the native species bluebunch wheatgrass (*Pseudoroegneria spicata*) -- in 2012 (Table 23-01.10). Cover of browse species also increased following the treatment, and antelope bitterbrush (*Purshia tridentata*) became a co-dominant component in 2017 (Table 23-01.12, Table 23-01.13). Forbs have remained rare throughout the study years, although they have increased in diversity after treatment (Table 23-01.11).

**Trend Summary Tables****Table 23-01.6 - 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
1998	7.9	0.3	11.4	-	-	-
2003	7.4	-	18.0	6.4	-	32.3
2008	4.2	0.0	7.9	7.7	-	31.8
2012	2.7	0.0	0.4	5.6	-	0.7
2017	9.3	0.1	0.2	11.1	0.3	-

**Table 23-01.7 - 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
1998	49	276	4	53	0.4	10.9	0.0	0.8
2003	15	229	-	24	0.0	7.0	-	0.4
2008	25	248	-	42	0.1	6.7	-	0.5
2012	25	258	47	154	0.1	9.8	0.4	3.8
2017	61	319	25	130	0.8	27.4	0.1	3.1

**Table 23-01.8 - 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
1998	21.2	0.9	42.3	26.1	11.1	29.9
2003	13.0	3.4	37.3	19.6	13.1	32.3
2008	12.4	2.7	43.8	29.8	10.0	21.0
2012	32.5	0.5	44.9	8.2	7.3	18.9
2017	28.8	-	49.2	6.7	5.9	38.4

**Table 23-01.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
1998	-	-	35	4	24
2003	-	-	20	-	32
2008	-	-	20	1	64
2012	-	-	4	1	5
2017	-	-	20	13	36
Year	Days Use Per Acre (ha)				
1998	-	-	50.9 (125.8)	7.4 (18.2)	-
2003	0.7 (1.8)	-	54.3 (134.1)	1.3 (3.3)	-
2008	0.7 (1.8)	8.7 (21.5)*	33.5 (82.8)	1.3 (3.3)	-
2012	-	-	21.5 (53.0)	4.0 (9.9)	-
2017	-	-	16.1 (39.7)	6.7 (16.6)	-

\*Pellets per acre (ha)

**Table 23-01.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Dactylis glomerata <sup>i</sup> (orchardgrass)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Leymus cinereus (basin wildrye)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea <sup>i</sup> (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency										
1998	13	49	-	7	-	-	54	103	-	207	-
2003	5	15	-	2	-	-	28	88	-	177	-
2008	-	25	-	2	-	-	9	122	-	194	-
2012	6	25	-	4	28	12	7	70	5	182	50
2017	12	61	2	5	89	19	7	48	5	240	45
year	Average Cover (%)										
1998	0.2	0.4	-	0.0	-	-	1.0	2.0	-	7.7	-
2003	0.0	0.0	-	0.0	-	-	0.5	0.9	-	5.6	-
2008	-	0.1	-	0.0	-	-	0.1	0.7	-	6.0	-
2012	0.2	0.1	-	0.0	0.1	0.3	0.2	0.9	0.1	6.3	1.7
2017	0.5	0.8	0.0	0.1	5.9	2.3	0.7	0.6	0.6	15.7	1.2

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

**Table 23-01.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum <sup>ai</sup> (desert madwort)	Arabis (rockcress)	Astragalus cicer <sup>i</sup> (chickpea milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Castilleja (Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawkbeard)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Helianthus annuus <sup>a</sup> (common sunflower)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Linum perenne <sup>i</sup> (blue flax)
year	Nested Frequency																
1998	1	-	1	-	6	-	-	1	4	3	8	5	9	-	-	-	-
2003	-	-	1	-	6	-	-	-	-	-	-	-	6	-	-	-	-
2008	-	-	4	-	9	-	-	-	-	-	-	1	7	-	-	-	-
2012	7	-	4	-	4	-	-	3	-	-	-	4	19	5	36	10	80
2017	24	6	2	1	5	2	0	6	1	-	11	4	3	6	2	8	41
year	Average Cover (%)																
1998	0.0	-	0.0	-	0.1	-	-	0.0	0.0	0.0	0.1	0.0	0.2	-	-	-	-
2003	-	-	0.0	-	0.1	-	-	-	-	-	-	-	0.1	-	-	-	-
2008	-	-	0.0	-	0.1	-	-	-	-	-	-	0.0	0.2	-	-	-	-
2012	0.1	-	0.0	-	0.0	-	-	0.0	-	-	-	0.0	0.4	0.0	0.3	0.1	2.3
2017	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	-	0.4	0.0	0.0	0.0	0.0	0.0	0.7

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

FORB SPECIES	Lithospermum incisum (narrowleaf stoneseed)	Lomatium (desertparsley)	Medicago sativa <sup>i</sup> (alfalfa)	Melilotus officinalis <sup>i</sup> (sweetclover)	Penstemon palmeri (Palmer's penstemon)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Sanguisorba minor <sup>i</sup> (small burnet)	Tragopogon dubius <sup>ai</sup> (yellow salsify)
year	Nested Frequency								
1998	-	1	-	-	-	4	17	-	-
2003	-	-	-	-	-	7	7	-	-
2008	-	-	-	-	-	7	20	-	-
2012	0	-	0	1	23	8	5	38	-
2017	-	3	-	-	13	15	2	25	4
year	Average Cover (%)								
1998	-	0.0	-	-	-	0.2	0.2	-	-
2003	-	-	-	-	-	0.2	0.0	-	-
2008	-	-	-	-	-	0.0	0.1	-	-
2012	0.0	-	0.0	0.0	0.3	0.1	0.0	0.5	-
2017	-	0.0	-	-	0.9	0.2	0.0	0.6	0.0

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

**Table 23-01.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova <sup>p</sup> (black sagebrush)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa (rubber rabbitbrush)	Eriogonum microthecum <sup>p</sup> (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma <sup>i</sup> (Utah juniper)	Mahonia repens (creeping barberry)	Opuntia (pricklypear)	Pinus edulis <sup>i</sup> (twoneedle pinyon)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)
year	Line Intercept Cover (%)										
1998	-	-	-	-	-	-	-	-	-	-	-
2003	1.9	0.6	-	-	-	-	23.3	-	-	9	3.9
2008	2.2	0.3	-	-	-	-	21.4	-	-	10.4	5.2
2012	0.9	0.3	-	-	-	-	0.5	-	-	0.2	4.4
2017	2.1	0.6	-	0.3	0.1	-	-	-	-	-	8.3
year	Quadrat Cover (%)										
1998	2.2	2.5	0.1	-	-	-	5.5	-	0.1	6.0	3.2
2003	2.4	0.8	-	-	-	-	9.2	-	-	8.8	4.3
2008	1.4	0.1	-	-	-	-	3.1	0.0	0.0	4.8	2.7
2012	1.1	0.2	-	-	-	-	0.4	-	0.0	0.0	1.4
2017	2.8	0.7	-	0.0	0.1	0.0	0.2	-	-	-	5.6

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

**Table 23-01.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	54/59
2017	-	-	-	-	-	-	-	-	39/67
<b>Artemisia nova<sup>P</sup> -- (black sagebrush)</b>									
1998	1300	-	6	60	34	49	0	9	40/58
2003	1140	-	2	46	53	9	0	18	37/61
2008	740	-	0	51	49	8	19	30	36/56
2012	680	-	29	65	6	12	3	3	25/44
2017	1260	-	0	100	0	19	0	10	27/46
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1998	1100	-	9	24	67	56	2	40	38/56
2003	840	-	14	17	69	29	0	41	37/54
2008	520	-	0	0	100	23	54	81	32/49
2012	340	-	29	65	6	18	0	0	32/51
2017	580	900	41	59	0	17	14	0	38/60
<b>Cercocarpus ledifolius<sup>P</sup> -- (curl-leaf mountain mahogany)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	23/42
2017	-	-	-	-	-	-	-	-	-/-
<b>Chrysothamnus depressus<sup>P</sup> -- (longflower rabbitbrush)</b>									
1998	20	-	0	100	0	0	0	0	- / -
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	20	-	0	100	0	0	0	0	28/35
2017	-	-	-	-	-	-	-	-	-/-
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1998	20	-	0	100	0	0	0	0	25/30
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Eriogonum microthecum<sup>P</sup> -- (slender buckwheat)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	21/57
2017	320	-	0	100	0	13	0	0	15/10
<b>Ericameria nauseosa ssp. nauseosa -- (rubber rabbitbrush)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	20	-	0	100	0	0	0	0	66/74
<b>Gutierrezia sarothrae -- (broom snakeweed)</b>									
1998	40	-	0	100	0	0	0	0	24/24
2003	-	-	-	-	-	-	-	-	16/13
2008	-	-	-	-	-	-	-	-	17/26
2012	-	-	-	-	-	-	-	-	21/30
2017	80	-	0	100	0	0	0	0	32/45
<b>Juniperus osteosperma<sup>1</sup> -- (Utah juniper)</b>									
1998	80	40	50	50	0	0	0	0	- / -
2003	100	-	60	40	0	0	0	0	- / -
2008	140	-	43	57	0	0	14	14	- / -
2012	80	20	75	25	0	0	0	0	- / -
2017	60	-	100	0	0	0	0	0	- / -



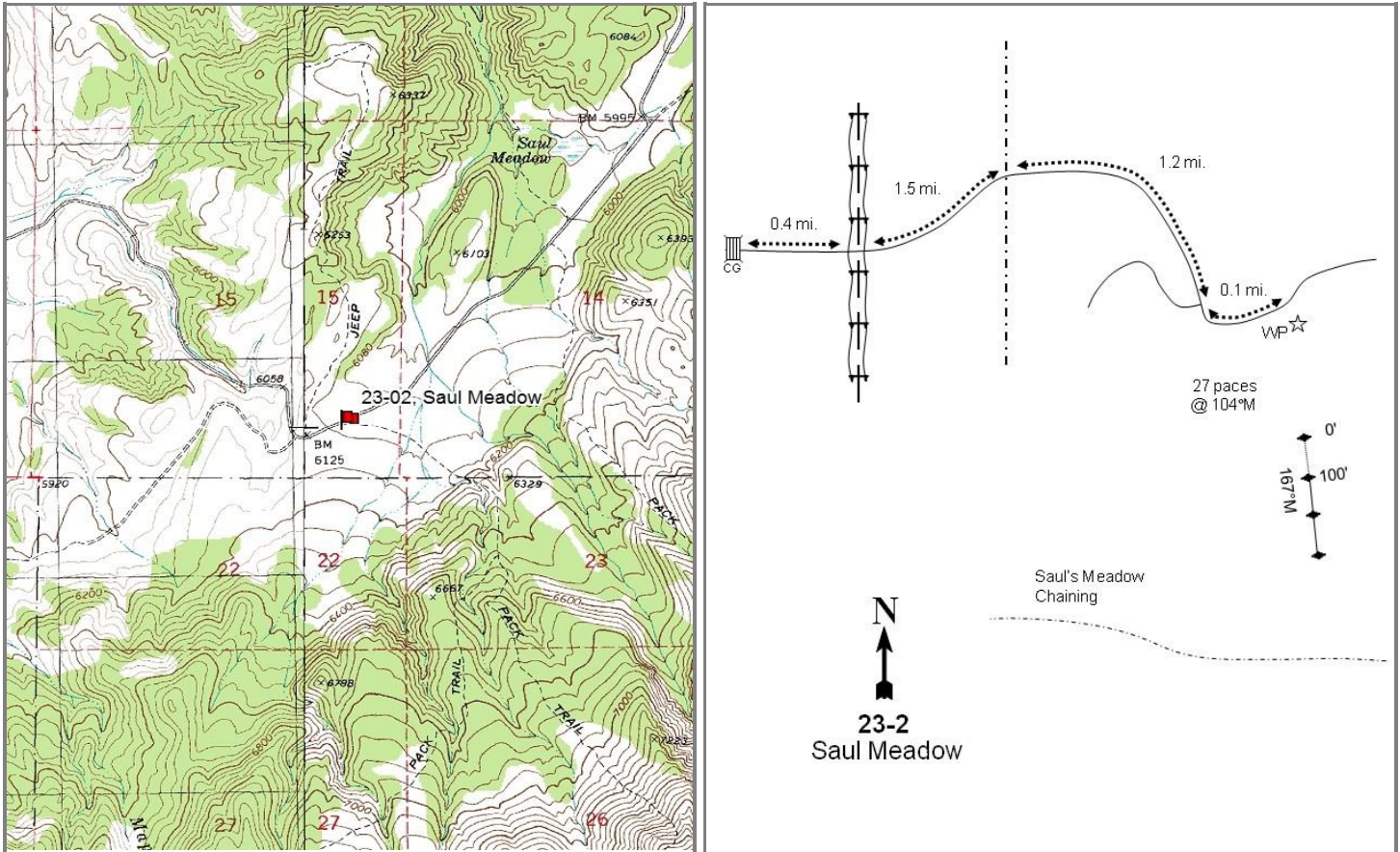
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Opuntia -- (pricklypear)									
1998	60	20	67	33	0	0	0	0	20/30
2003	40	-	0	100	0	0	0	0	14/36
2008	60	-	0	100	0	0	0	0	16/68
2012	40	-	0	100	0	0	0	0	12/25
2017	40	-	0	100	0	0	0	0	11/19
Pinus edulis <sup>t</sup> -- (twoneedle pinyon)									
1998	80	20	0	100	0	0	0	0	- / -
2003	120	20	33	67	0	0	0	0	- / -
2008	160	40	38	63	0	0	0	0	- / -
2012	60	-	67	33	0	0	0	33	- / -
2017	-	-	-	-	-	-	-	-	- / -
Purshia tridentata <sup>p</sup> -- (antelope bitterbrush)									
1998	760	40	5	87	8	37	0	5	56/110
2003	420	-	5	71	24	43	48	0	67/151
2008	420	-	0	76	24	24	76	57	63/129
2012	580	20	17	83	0	62	14	0	44/83
2017	1040	-	4	96	0	14	56	0	50/87

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

**Table 23-01.14 - 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 osteosperma (Utah juniper)							
1998	213	-	-	-	-	-	22.4
2003	197	-	15	20	20	45	17.8
2008	165	10	5	25	30	30	30.9
2012	86	30	50	20	-	-	12.3
2017	36	53	47	-	-	-	3.0
Pinus edulis (twoneedle pinyon)							
1998	144	-	-	-	-	-	12.1
2003	119	5	15	35	25	20	13.6
2008	124	6	11	39	22	22	18.4
2012	41	50	36	14	-	-	3.0
2017	11	50	50	-	-	-	1.8

## SAUL MEADOW - STUDY NO. 23-2

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Water Creek Canyon N; Township 24S, Range 2W, Section 15  
NAD 83 UTM ZONE 12, 413149 East 4284873 North

**Transect Information**

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

Not Available  
167° magnetic  
300ft  
Line 1 (11ft & 71ft), Line 2 (34ft & 95ft), Line 3 (59ft)  
Standard

**Directions to Site**

Starting from the Annabella Cemetery, drive northeast for 0.1 miles to a cattle guard. Bear left and continue 0.4 miles, crossing under a powerline. Proceed for 1.5 miles to the BLM boundary sign, then 1.2 miles more to a fork in the road. Continue straight for 0.1 miles on the main road to a green and yellow fencepost on the right (south) side of the road. The rebar marking the 0-foot end of the frequency baseline is 27 paces at 104 degrees magnetic from the green and yellow fencepost, which marks the start of a pellet transect.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	SALLS MEADOW
Elevation	6,110ft (1,862m)
Aspect	Northeast
Slope	3-6%
Sample Dates	07/27/1998, 07/14/2003, 08/19/2008, 08/06/2012, 06/15/2017

**Table 23-02.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Broadcast Before	Maple Creek Seeding	-	May 1965	540
Hand Crew - Lop and Scatter	Sauls Meadow Thinning	-	April 2003	331
Chaining - Two-Way Unknown	Maple Creek Seeding	-	May 1965	540
Seeding - Aerial Before	Maple Creek Seeding	-	May 1965	540

**Table 23-02.2 Seed Mix.** List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Maple Creek Seeding			Aerial	May 1965	540
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
G	Agropyron cristatum	Crested Wheatgrass		7.04	0.00
Mix Name			Application Type	Application Date	Acres
Maple Creek Seeding			Broadcast	May 1965	200
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acre
F	Sanguisorba minor	Small Burnet		0.50	0.00
S	Atriplex canescens	Fourwing Saltbush		0.50	0.00
S	Cercocarpus ledifolius	Curleaf Mountain Mahogany		0.13	0.00
S	Cercocarpus montanus	True Mountain Mahogany		0.13	0.00
S	Ephedra viridis	Greenleaf Ephedra		0.13	0.00
S	Krascheninnikovia lanata	Winterfat		0.13	0.00
S	Purshia tridentata	Bitterbrush		0.50	0.00

**Wildlife Habitat and Vegetation History****Table 23-02.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	substantial	winter

**Table 23-02.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mountain Big Sagebrush	Phase I
1991	Mountain Big Sagebrush	Phase I
1998	Mountain Big Sagebrush/Annual Grass	Phase I
2003	Mountain Big Sagebrush	Phase I
2008	Mountain Big Sagebrush	Phase I
2012	Mountain Big Sagebrush/Annual Grass	Phase I
2017	Mountain Big Sagebrush/Annual Grass	Phase I

**Site Notes**

No Notes

**Soils****Table 23-02.5 - 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 Loam	6.6	62.0	19.4	18.6	1.2	8.6	115.2	0.5	07/27/1998

**Site Potential**

1981 - 2010 Average Annual Precipitation	10 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.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been the dominant shrub species on this study site since the study began in 1985, although density and recruitment of young has exhibited an overall decrease through the study years. Utah juniper (*Juniperus osteosperma*) trees have been scattered throughout the site in each study year, but woodland succession has never exceeded Phase I: this is likely due (in part) to a lop and scatter treatment between 1998 and 2003 (Table 23-02.1, Table 23-02.4, Table 23-02.12, Table 23-02.13, Table 23-02.14). The herbaceous understory is depauperate in species diversity. The introduced annual grass cheatgrass (*Bromus tectorum*) has been the most abundant herbaceous species in many sample years and was a co-dominant site component in 1998, 2012, and 2017; the abundance of cheatgrass increases fuel loads on this study site (Table 23-02.10). Forbs have remained rare, with the introduced annual species desert madwort (*Alyssum desertorum*) and redstem stork's bill (*Erodium cicutarium*) contributing the most cover in 2017 (Table 23-02.7, Table 23-02.11). This site will likely remain in this ecological state moving forward without a disturbance event.

**Trend Summary Tables****Table 23-02.6 - 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
1998	12.7	-	2.0	-	-	-
2003	14.7	-	-	12.0	0.1	-
2008	8.6	0.0	-	12.0	0.1	-
2012	11.7	-	-	16.6	-	-
2017	13.4	0.0	-	13.4	-	-

**Table 23-02.7 - 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
1998	298	159	5	2	11.6	7.4	0.0	0.0
2003	257	161	42	-	5.9	7.2	0.7	-
2008	341	149	86	-	5.6	8.0	0.2	-
2012	352	189	247	-	10.3	8.4	0.6	-
2017	455	117	388	-	31.9	3.0	3.9	-

**Table 23-02.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	21.8	1.9	45.3	7.9	4.0	31.3
2003	34.3	1.6	36.5	8.4	4.6	27.2
2008	21.6	0.5	56.5	12.2	3.1	22.8
2012	28.3	1.4	35.0	12.1	4.0	33.3
2017	25.8	0.2	55.1	6.6	2.8	48.8

**Table 23-02.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1998	1	50	10	55
2003	2	36	3	68
2008	1	47	11	80
2012	1	20	22	51
2017	-	28	-	50
Year	Days Use Per Acre (ha)			
1998	3.6 (9.0)	99.2 (245.0)	18.1 (44.7)	-
2003	1.5 (3.6)	59.0 (145.7)	10.0 (24.8)	-
2008	-	85.1 (210.2)	15.4 (38.1)	-
2012	-	47.6 (117.5)	39.6 (97.7)	-
2017	1.5 (3.6)	23.4 (57.9)	5.3 (13.2)	-

**Table 23-02.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES				
Agropyron cristatum <sup>i</sup> (crested wheatgrass)				
Bromus tectorum <sup>ai</sup> (cheatgrass)				
Elymus elymoides (squirreltail)				
Vulpia octoflora <sup>a</sup> (sixweeks fescue)				
year	Nested Frequency			
1998	148	298	11	-
2003	152	257	12	7
2008	136	341	13	-
2012	180	352	11	-
2017	103	455	17	-
year	Average Cover (%)			
1998	7.0	11.6	0.5	-
2003	6.9	5.9	0.3	0.0
2008	7.5	5.6	0.5	-
2012	8.2	10.3	0.2	-
2017	2.6	31.9	0.5	-

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

**Table 23-02.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES							
Alyssum desertorum <sup>ai</sup> (desert madwort)							
Ceratocephala testiculata <sup>ai</sup> (curveseed butterwort)							
Chamaesyce (sandmat)							
Draba <sup>ai</sup> (draba)							
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)							
Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)							
Sisymbrium altissimum <sup>ai</sup> (tall tumbledmustard)							
year	Nested Frequency						
1998	2	-	2	-	-	3	-
2003	5	14	-	-	-	3	21
2008	75	9	-	-	-	2	2
2012	247	15	-	3	-	-	14
2017	388	5	-	-	13	-	-
year	Average Cover (%)						
1998	0.0	-	0.0	-	-	0.0	-
2003	0.0	0.1	-	-	-	0.0	0.6
2008	0.2	0.0	-	-	-	0.0	0.0
2012	0.6	0.0	-	0.0	-	-	0.0
2017	3.6	0.0	-	-	0.3	-	-

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

**Table 23-02.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)			
	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Atriplex confertifolia <sup>p</sup> (shadscale saltbush)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Opuntia (pricklypear)
year	Line Intercept Cover (%)			
1998	-	-	-	-
2003	12	-	-	0.1
2008	12	-	-	0.1
2012	16.6	-	-	-
2017	13.4	-	-	0
year	Quadrat Cover (%)			
1998	12.7	-	2.0	-
2003	14.7	-	-	0.0
2008	8.4	0.1	-	0.0
2012	11.7	-	-	-
2017	13.4	-	-	0.0

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

**Table 23-02.13 - 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 <sup>p</sup> -- (mountain big sagebrush)									
1998	2840	40	9	47	44	45	4	15	61/80
2003	3060	40	31	41	28	12	1	13	61/80
2008	2740	-	10	54	37	19	46	26	58/82
2012	2620	-	4	78	18	24	48	14	64/86
2017	2420	-	2	73	26	36	39	20	63/89
Atriplex canescens <sup>p</sup> -- (fourwing saltbush)									
1998	-	-	-	-	-	-	-	-	-/-
2003	40	-	0	100	0	0	0	0	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1998	40	-	0	100	0	0	0	0	14/21
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	46/67
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
Juniperus osteosperma <sup>t</sup> -- (Utah juniper)									
1998	60	-	0	100	0	0	0	0	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
1998	80	-	0	75	25	0	0	25	11/15
2003	40	-	0	100	0	0	0	0	14/36
2008	60	-	0	67	33	0	0	33	15/50
2012	40	-	0	100	0	0	0	0	13/31
2017	80	-	0	100	0	0	0	0	13/32

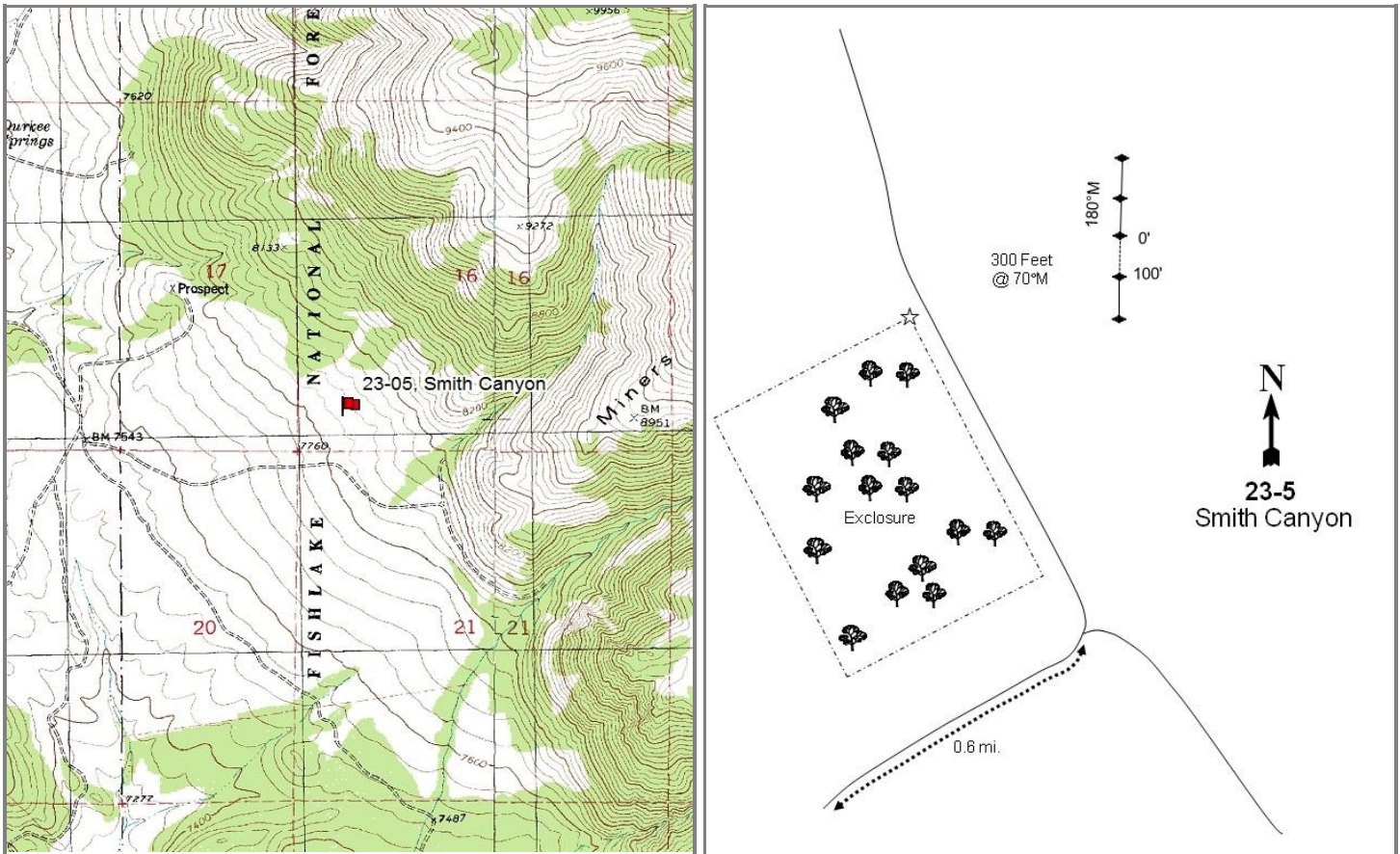
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 23-02.14 - 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)							
1998	12	-	-	-	-	-	11.6
2008	4	-	100	-	-	-	5.7
2017	5	-	33	67	-	-	7.3



## SMITH CANYON - STUDY NO. 23-5

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Marysville NE; Township 27S, Range 2W, Section 16  
NAD 83 UTM ZONE 12, 401130 East 4257287 North

**Transect Information**

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

7043  
180° magnetic  
400ft  
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)  
No Rebar

**Directions to Site**

From the intersection of Main Street (SR-89) and Center Street in Marysville, turn east and proceed for 0.7 miles, crossing a bridge. At a three-way split in the road, stay left and continue for 1.9 miles. Keep right and drive for 0.8 miles. Keep right at the split, and then go immediately right again. Proceed for another 0.8 miles and make a left turn: continue for 2.75 miles up this road to a "T" intersection. Turn right and go 1.0 miles to a cattle guard. Make a hard left turn here and drive 0.1 miles, then turn right and continue for 0.6 miles to an enclosure. Turn north (left) and go along the east side of a cattle enclosure. From the northeast corner of the enclosure, walk 300 feet at 70 degrees (in line with the north side fence) to the start of the baseline. The 0-foot end is marked by a fencepost with browse tag #7043 attached.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	Marysville Peak Allotment
Elevation	7,850ft (2,393m)
Aspect	Southwest
Slope	5-10%
Sample Dates	07/13/1998, 07/21/2003, 08/15/2008, 08/07/2012, 06/12/2017

**Table 23-05.1 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	Blackbird Mine WFU	-	June 2006	1464
Seeding - Aerial Unknown	Monroe Mountain Burn Stabilization	598	July 2006	1468

**Wildlife Habitat and Vegetation History****Table 23-05.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter

**Table 23-05.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mountain Big Sagebrush	Phase I
1991	Mountain Big Sagebrush	Phase I
1998	Mountain Big Sagebrush/Annual Grass	Phase I
2003	Mountain Big Sagebrush/Annual Grass	Phase I
2008	Annual Grass	No Encroachment
2012	Mountain Big Sagebrush/Annual Grass	No Encroachment
2017	Mountain Big Sagebrush/Annual Grass	No Encroachment

**Site Notes**

Wildlife use the area in the winter, but tracks and sightings indicate that use is common year-round.

**Soils****Table 23-05.5 - 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	5.9	54.0	29.4	16.6	3.5	21.9	281.6	0.4	07/13/1998

**Site Potential**

1981 - 2010 Average Annual Precipitation	18 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.

From 1985 through the 2003 sample year, this site was dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with a minor component of other shrub species. Twoneedle pinyon (*Pinus edulis*) trees, although rare, were present during this time period, placing the site in Phase I of woodland succession (Table 23-05.4, Table 23-05.12, Table 23-05.13). A wildfire in 2006 removed the trees and nearly all of the browse. The introduced annual grass cheatgrass (*Bromus tectorum*) was a co-dominant site component prior to the burn, and was the dominant vegetation in the 2008 sample year. Sagebrush began to recover following rehabilitation efforts (Table 23-05.12), and in both 2012 and 2017 it was co-dominant with cheatgrass. Although diverse, herbaceous species other than cheatgrass have generally remained rare (Table 23-05.7, Table 23-05.10, Table 23-05.11). The high cover of annual grasses puts the resiliency of the site at risk and has potential to increase the fire regime of the site.

**Trend Summary Tables****Table 23-05.6 - 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	31.0	-	-	-	-	-
2003	28.1	-	-	34.4	0.1	-
2008	0.8	0.0	-	1.1	-	-
2012	11.5	-	-	15.8	-	-
2017	36.9	0.1	-	37.2	-	-

**Table 23-05.7 - 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	372	252	16	94	10.5	5.0	0.0	2.5
2003	417	132	270	59	17.2	1.5	3.4	1.2
2008	370	40	159	63	18.0	1.2	3.8	5.1
2012	458	45	250	64	30.5	0.7	4.3	0.8
2017	417	59	127	90	27.0	1.2	0.6	1.9

**Table 23-05.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	13.6	0.1	53.9	12.9	2.7	40.5
2003	10.3	0.0	45.4	16.2	2.2	48.9
2008	7.8	-	29.7	36.6	4.0	35.6
2012	5.1	0.0	39.5	18.0	1.0	49.6
2017	18.0	-	56.6	12.7	1.4	59.5

**Table 23-05.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit	Domestic Sheep
	Quadrat Frequency				
1998	3	34	-	24	-
2003	-	27	-	3	-
2008	3	25	4	16	-
2012	5	12	3	1	-
2017	4	10	-	47	-
Year	Days Use Per Acre (ha)				
1998	13.8 (34.1)	105.9 (261.5)	0.7 (1.7)	-	1.3 (3.3)
2003	2.9 (7.2)	139.4 (344.3)	6.7 (16.6)	-	-
2008	12.3 (30.5)	24.8 (61.2)	8.7 (21.5)	-	-
2012	18.1 (44.8)	23.4 (57.9)	8.1 (19.9)	-	-
2017	-	10.7 (26.5)	4.7 (11.6)	-	-

**Table 23-05.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency						
Bromus tectorum <sup>ai</sup> (cheatgrass)	372	29	5	4	30	7	223
Elymus elymoides (squirreltail)	417	38	1	-	34	8	78
Hesperostipa comata (needle and thread)	370	6	-	-	5	-	31
Pleuraphis jamesii (James' galleta)	458	1	-	-	6	-	39
Poa fendleriana (muttongrass)	417	29	-	-	3	-	27
Poa secunda (Sandberg bluegrass)							
Pseudoroegneria spicata (bluebunch wheatgrass)							
year	Average Cover (%)						
1998	10.5	0.2	0.2	0.1	0.3	0.0	4.2
2003	17.2	0.4	0.0	-	0.3	0.2	0.6
2008	18.0	0.2	-	-	0.1	-	0.9
2012	30.5	0.0	-	-	0.0	-	0.6
2017	27.0	0.7	-	-	0.0	-	0.5

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

**Table 23-05.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Agoseris glauca (pale agoseris)	0	3	3	3	-	9	-	-	2	1	5	-	2	1	-	-	-
Alyssum desertorum <sup>ai</sup> (desert madwort)	7	11	-	2	-	11	-	-	-	-	-	-	96	5	-	-	-
Arabis (rockcress)	-	43	-	4	-	1	-	-	0	5	-	-	57	-	-	-	7
Astragalus (milkvetch)	-	193	-	3	-	12	-	-	1	-	-	-	7	-	-	1	17
Astragalus cibaricus (browse milkvetch)	13	100	-	-	7	11	6	1	1	12	-	2	2	-	4	-	-
Astragalus convallarius (lesser rushy milkvetch)																	
Astragalus lentiginosus (freckled milkvetch)																	
Astragalus purshii (woollypod milkvetch)																	
Balsamorhiza sagittata (arrow/leaf balsamroot)																	
Calochortus nuttallii (sego lily)																	
Chaenactis douglasii (Douglas' dustymaiden)																	
Cirsium (thistle)																	
Collinsia parviflora <sup>a</sup> (maiden blue eyed Mary)																	
Comandra umbellata (bastard toadflax)																	
Crepis acuminata (tapertip hawksbeard)																	
Cryptantha humilis (roundspike cryptantha)																	
Descurainia pinnata <sup>a</sup> (western tansymustard)																	
year	Average Cover (%)																
1998	0.0	0.0	0.0	0.0	-	0.2	-	-	0.0	0.0	0.0	-	0.0	0.0	-	-	-
2003	0.0	0.1	-	0.0	-	0.2	-	-	-	-	-	-	0.7	0.0	-	-	-
2008	-	0.4	-	0.0	-	0.0	-	-	0.0	0.0	-	-	0.1	-	-	-	0.3
2012	-	4.1	-	0.0	-	0.1	-	-	0.0	-	-	-	0.0	-	-	0.0	0.0
2017	0.1	0.4	-	-	0.2	0.4	0.0	0.0	0.2	0.0	-	0.0	0.0	-	0.1	-	-

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

FORB SPECIES	Erigeron eatonii (Eatons fleabane)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stone seed)	Lotus utahensis (Utah bird's-foot trefoil)	Lupinus argenteus (silvery lupine)	Microsteris gracilis <sup>a</sup> (slender phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Streptanthus cordatus (heartleaf twistflower)	Tragopogon dubius <sup>ai</sup> (yellow salsify)
year	Nested Frequency															
1998	-	22	4	-	-	-	-	-	17	19	11	22	-	-	1	-
2003	-	9	13	-	-	-	-	-	1	6	202	3	-	-	2	-
2008	-	45	-	3	-	74	0	4	0	8	-	-	-	14	1	-
2012	1	46	2	3	1	46	-	4	-	0	-	2	1	19	-	1
2017	-	35	-	3	-	25	5	4	2	-	14	11	4	5	-	-
year	Average Cover (%)															
1998	-	0.3	0.0	-	-	-	-	-	0.3	1.5	0.0	0.1	-	-	0.0	-
2003	-	0.1	0.1	-	-	-	-	-	0.0	0.8	2.6	0.0	-	-	0.0	-
2008	-	1.9	-	0.0	-	1.1	0.0	0.3	0.0	2.8	-	-	-	1.9	0.0	-
2012	0.0	0.5	0.0	0.0	0.0	0.1	-	0.0	-	0.0	-	0.0	0.0	0.1	-	0.0
2017	-	0.6	-	0.0	-	0.1	0.0	0.2	0.0	-	0.0	0.0	0.0	0.0	-	-

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

**Table 23-05.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> (rubber rabbitbrush)	Eriogonum microthecum <sup>p</sup> (slender buckwheat)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Symphoricarpos oreophilus (mountain snowberry)
year	Line Intercept Cover (%)				
1998	-	-	-	-	-
2003	28.9	-	-	5.5	0.1
2008	1	0.1	-	0	-
2012	14.8	0.4	-	0.6	-
2017	36.4	0.4	-	0.4	-
year	Quadrat Cover (%)				
1998	24.4	-	-	6.6	-
2003	24.4	-	-	3.7	0.0
2008	0.8	0.0	-	0.0	0.0
2012	11.4	0.0	0.0	0.1	-
2017	36.4	0.1	-	0.4	0.1

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

**Table 23-05.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

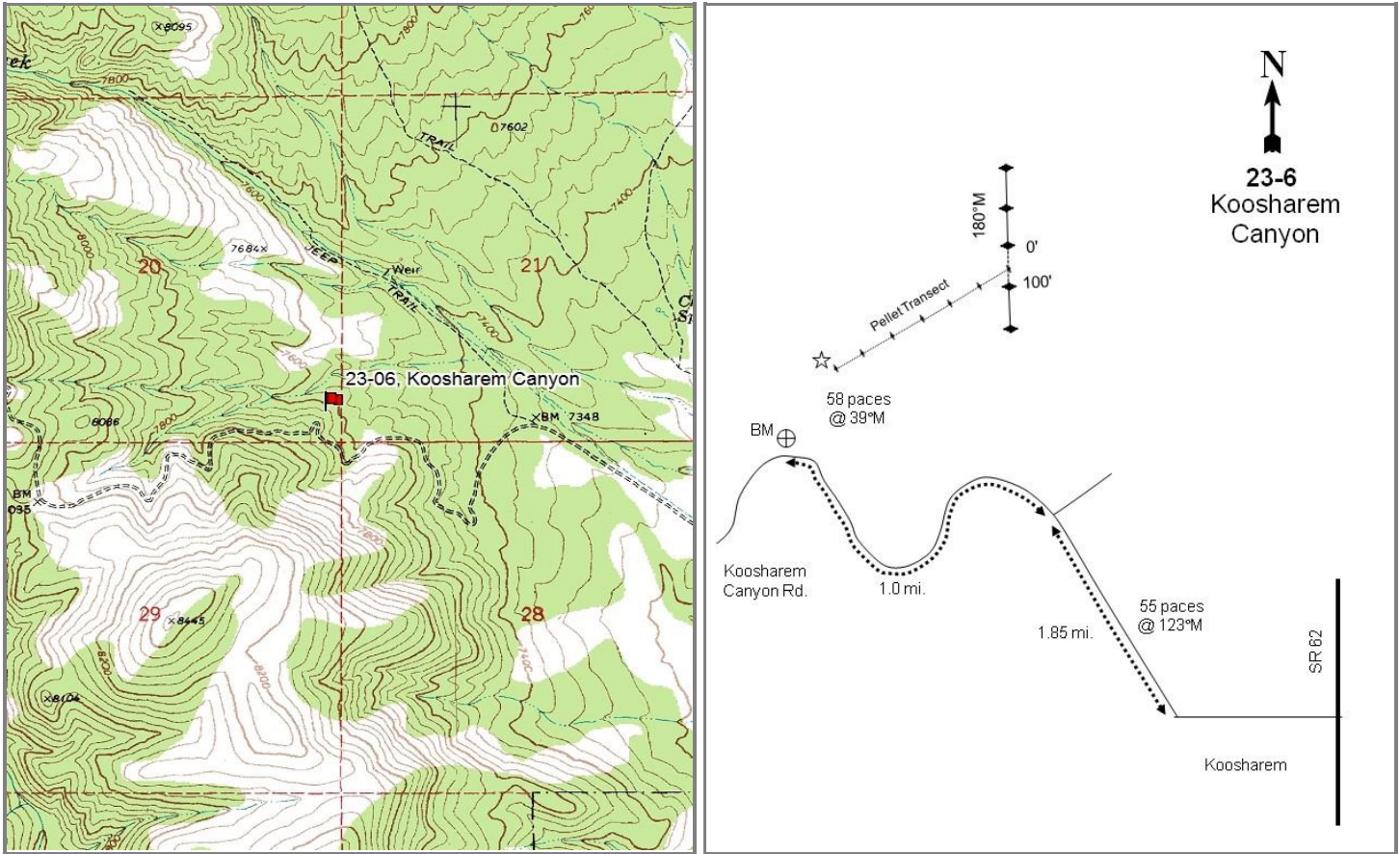
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1998	-	-	-	-	-	-	-	-	60/44
2003	-	-	-	-	-	-	-	-	22/23
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	18/33
2017	-	-	-	-	-	-	-	-	-/-
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1998	3860	-	4	79	18	46	7	6	83/112
2003	3400	-	1	58	41	27	5	7	78/99
2008	1100	-	33	67	0	0	0	0	33/38
2012	17240	5260	91	9	0	0	0	0	49/82
2017	16360	-	27	73	0	6	0	0	54/86
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1998	40	-	0	100	0	0	50	0	- / -
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	41/60
2012	-	-	-	-	-	-	-	-	34/67
2017	20	-	0	100	0	0	0	0	24/14
<b>Eriogonum microthecum<sup>P</sup> -- (slender buckwheat)</b>									
1998	60	-	67	33	0	0	33	0	- / -
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	100	20	60	40	0	60	20	0	10/30
2017	-	-	-	-	-	-	-	-	60/54
<b>Ericameria nauseosa ssp. nauseosa var. speciosa<sup>P</sup> -- (rubber rabbitbrush)</b>									
1998	20	-	0	0	100	0	0	0	- / -
2003	-	-	-	-	-	-	-	-	-/-
2008	20	-	0	100	0	0	0	0	38/53
2012	60	-	33	67	0	0	0	0	48/69
2017	100	-	0	100	0	0	0	0	80/82
<b>Opuntia -- (pricklypear)</b>									
1998	-	-	-	-	-	-	-	-	12/29
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	12/29
2017	-	-	-	-	-	-	-	-	8/60
<b>Pinus edulis<sup>t</sup> -- (twoneedle pinyon)</b>									
1998	20	-	100	0	0	0	0	0	- / -
2003	20	-	0	100	0	0	0	0	- / -
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Purshia tridentata<sup>P</sup> -- (antelope bitterbrush)</b>									
1998	1220	-	15	77	8	26	67	0	55/103
2003	1040	-	0	42	58	15	79	37	47/96
2008	120	-	17	83	0	33	17	0	24/63
2012	120	-	0	100	0	0	100	0	25/76
2017	120	-	0	100	0	0	50	0	30/89
<b>Quercus gambelii<sup>P</sup> -- (Gambel oak)</b>									
1998	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	71/66
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
<b>Sclerocactus -- (fishhook cactus)</b>									
1998	80	-	0	25	75	0	75	0	- / -
2003	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-

Year	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)									
1998	20	-	0	100	0	0	0	0	32/71
2003	60	-	0	67	33	0	0	33	21/40
2008	20	-	0	100	0	0	0	0	34/64
2012	20	-	0	100	0	100	0	0	32/76
2017	40	-	0	100	0	0	0	50	26/72
Tetradymia canescens -- (spineless horsebrush)									
1998	-	-	-	-	-	-	-	-	-/-
2003	20	-	0	100	0	0	0	0	27/33
2008	20	-	0	100	0	0	0	0	34/42
2012	20	-	0	100	0	0	100	0	20/77
2017	20	-	0	0	100	0	0	100	30/72

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



## KOOSHAREM CANYON - STUDY NO. 23-6



### Location Information

USGS 7.5 min Map Info Koosharem SE; Township 26S, Range 1W, Section 20  
 GPS (0' Stake) NAD 83 UTM ZONE 12, 419491 East 4264909 North

### Transect Information

Browse Tag # (0' Stake) 7042  
 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 intersection next to the Koosharem LDS Ward Building, go west for 0.35 miles on Koosharem Mountain Road. Bear right and go 0.05 miles to a fork. Take the left fork over a small bridge and proceed for 1.85 miles to another fork. Turn left and go just over 1.0 mile to a hairpin turn that curves to the left. Stop at the apex of the curve: there is a benchmark here on the north side of the road. Take a bearing of 39 degrees and walk 58 feet from the benchmark to find a short yellow rebar that marks a pellet group transect. From the first stake, the pellet group transect runs northeast (62-67 degrees) with stakes at intervals of about 50-60 feet. Count down 7 stakes, then walk due north 50 feet to the baseline starting point. The 0-foot end of the baseline is marked by a steel rebar with browse tag #7042 attached. The baseline runs due south, crossing the pellet group transect.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	Koosharem Allotment
Elevation	7,650ft (2,332m)
Aspect	North
Slope	25-30%
Sample Dates	08/03/1998, 08/08/2003, 08/14/2008, 08/08/2012, 06/13/2017

**Wildlife Habitat and Vegetation History**

**Table 23-06.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter

**Table 23-06.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mixed Mountain Brush	Phase I
1991	Mixed Mountain Brush	Phase I
1998	Mixed Mountain Brush	Phase I
2003	Mixed Mountain Brush	Phase I
2008	Mixed Mountain Brush	Phase I transitioning to Phase II
2012	Mixed Mountain Brush	Phase I transitioning to Phase II
2017	Mixed Mountain Brush	Phase I transitioning to Phase II

**Site Notes**

Wildlife use appears to be year-round.

**Soils**

**Table 23-06.5 - 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	6.5	40.0	25.4	34.6	4.2	26.8	243.2	0.6	08/02/1998

**Site Potential**

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Mountain Loam (Browse)
NRCS Ecological Site #	R047XB420UT
States and Transitions	No state and transition model is available for this ecological site.

Mixed mountain brush, including mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and alderleaf mountain mahogany (*Cercocarpus montanus*), has dominated this site since establishment in 1985; the overall shrub component has remained very diverse throughout the study period (Table 23-06.12, Table 23-06.13). Native perennial grasses have been the most abundant herbaceous component in all years. The introduced annual grass cheatgrass (*Bromus tectorum*) has been observed in small amounts in 2003 and 2017, and although forbs were diverse in 2017, they have never been common (Table 23-06.7, Table 23-06.10, Table 23-06.11). Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) trees are present on this study site, and it has progressed from Phase I to Phase I transitioning to Phase II of woodland succession (photos, Table 23-06.4, Table 23-06.14). Without a tree-removing disturbance, it is likely that encroachment will continue to occur.

**Trend Summary Tables**

**Table 23-06.6 - 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
1998	26.4	2.1	0.2	-	-	-
2003	27.2	2.5	1.1	24.8	1.8	3.0
2008	20.4	4.0	1.6	33.3	4.8	3.9
2012	27.0	5.2	2.0	33.0	5.5	4.2
2017	24.3	4.5	2.4	26.4	3.3	6.7

**Table 23-06.7 - 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
1998	-	304	18	37	-	12.5	0.1	0.3
2003	1	252	13	18	0.0	6.9	0.0	0.1
2008	-	290	3	56	-	8.7	0.0	0.6
2012	-	305	9	17	-	9.8	0.1	0.1
2017	23	280	100	94	0.2	13.3	0.8	1.3

**Table 23-06.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	23.5	0.0	46.9	14.5	9.5	37.1
2003	19.6	0.2	42.9	7.2	12.1	36.9
2008	21.2	0.0	39.1	6.9	11.8	40.0
2012	16.4	0.1	53.3	5.9	9.3	41.8
2017	34.9	0.0	43.9	3.1	9.7	37.0

**Table 23-06.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1998	1	44	8	47
2003	-	42	-	34
2008	-	71	11	76
2012	-	33	1	11
2017	-	37	4	38
Year	Days Use Per Acre (ha)			
1998	5.1 (12.6)	63.0 (155.6)	30.8 (76.1)	-
2003	0.7 (1.8)	113.2 (279.7)	2.0 (5.0)	-
2008	3.6 (9.0)	162.8 (402.2)	12.8 (31.5)	-
2012	0.7 (1.8)	63.7 (157.3)	7.4 (18.2)	-
2017	-	231.2 (571.1)	0.7 (1.7)	-

**Table 23-06.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bouteloua gracilis (blue grama)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency											
1998	20	-	-	2	-	127	61	-	5	156	-	35
2003	16	8	-	-	1	65	34	-	5	153	-	23
2008	10	15	-	-	-	131	55	-	23	163	-	26
2012	17	28	-	2	-	132	53	-	21	120	-	28
2017	48	-	2	1	23	116	42	3	3	139	5	53
year	Average Cover (%)											
1998	0.7	-	-	0.0	-	2.0	1.0	-	0.0	8.0	-	0.8
2003	0.2	0.2	-	-	0.0	1.4	0.3	-	0.0	3.9	-	0.8
2008	0.8	0.2	-	-	-	2.0	0.8	-	0.0	4.0	-	0.9
2012	0.6	1.2	-	0.0	-	1.4	0.8	-	0.1	4.8	-	0.8
2017	1.9	-	0.0	0.0	0.2	2.2	0.4	0.3	0.0	5.7	0.1	2.7

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

**Table 23-06.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Androsace septentrionalis <sup>a</sup> (pygmyflower rockjasmine)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus lentiginosus (freckled milkvetch)	Calochortus nuttallii (sego lily)	Chaenactis douglasii (Douglas' dustymaiden)	Cryptantha humilis (roundspike cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Gilia inconspicua <sup>a</sup> (shy gilia)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Machaeranthera canescens (hoary tansyaster)	Orogenia linearifolia (Great Basin Indian potato)
year	Nested Frequency																
1998	15	-	3	-	5	-	-	1	2	-	4	3	-	-	-	-	-
2003	-	6	-	-	-	-	-	-	3	-	-	-	-	-	11	-	-
2008	2	-	11	6	-	7	-	-	1	-	3	2	-	-	-	2	-
2012	7	-	-	-	-	-	-	-	0	-	-	-	-	-	-	3	-
2017	6	1	2	-	-	7	1	8	4	3	3	10	51	4	44	4	1
year	Average Cover (%)																
1998	0.1	-	0.0	-	0.0	-	-	0.0	0.0	-	0.0	0.0	-	-	-	-	-
2003	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
2008	0.0	-	0.0	0.1	-	0.0	-	-	0.0	-	0.1	0.0	-	-	-	0.0	-
2012	0.1	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-
2017	0.0	0.0	0.0	-	-	0.0	0.0	0.1	0.0	0.0	0.1	0.3	0.2	0.0	0.5	0.0	0.0

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

FORB SPECIES	Packera multilobata (lobeleaf groundsel)	Penstemon comarthenus (dusty beardtongue)	Penstemon watsonii (Watson's penstemon)	Phlox longifolia (longleaf phlox)	Polygonum douglasii <sup>a</sup> (Douglas' knotweed)	Potentilla gracilis (slender cinquefoil)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Sphaeralcea coccinea (scarlet globemallow)	Symphotrichum ascendens (western aster)	Tragopogon dubius <sup>ai</sup> (yellow salsify)	Trifolium gymnocarpon (hollyleaf clover)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency											
1998	-	-	8	7	-	1	-	5	-	1	2	-
2003	-	5	-	4	-	-	-	-	-	-	3	-
2008	-	-	10	16	-	1	-	1	-	-	11	-
2012	-	1	-	6	-	5	-	2	-	2	-	-
2017	4	3	13	31	3	1	1	4	4	-	27	1
year	Average Cover (%)											
1998	-	-	0.0	0.0	-	0.0	-	0.0	-	0.0	0.0	-
2003	-	0.1	-	0.0	-	-	-	-	-	-	0.0	-
2008	-	-	0.2	0.1	-	0.0	-	0.0	-	-	0.1	-
2012	-	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	-
2017	0.1	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	-	0.2	0.1

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

**Table 23-06.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis <sup>p</sup> (Utah serviceberry)	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Cercocarpus montanus <sup>p</sup> (alderleaf mountain mahogany)	Chrysothamnus depressus <sup>p</sup> (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum microthecum <sup>p</sup> (slender buckwheat)	Juniperus osteosperma <sup>t</sup> (Utah juniper)	Opuntia polyacantha (plains pricklypear)	Pediocactus simpsonii (mountain ball cactus)	Pinus edulis <sup>t</sup> (twoneedle pinyon)	Purshia tridentata <sup>p</sup> (antelope bitterbrush)	Quercus gambelii <sup>p</sup> (Gambel oak)	Sclerocactus (fishhook cactus)	Symphoricarpos oreophilus (mountain snowberry)
year	Line Intercept Cover (%)													
1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2003	0.1	12.4	8.1	-	0.3	0.3	1.7	0.3	-	1.3	1.1	2.8	-	1.2
2008	0.1	16.3	12.8	-	0.8	0.3	2.4	1.3	-	1.5	1.2	2.6	-	2.7
2012	0.7	16.2	11.3	-	1	1.1	2.5	1.8	-	1.7	0.9	2.8	-	2.7
2017	0.2	14.4	9.3	0	-	-	3.9	1.2	-	2.8	0.7	1.8	-	2.1
year	Quadrat Cover (%)													
1998	0.4	16.9	6.7	0.3	0.0	0.4	0.0	0.2	0.0	0.2	0.2	1.5	-	1.8
2003	0.2	15.6	8.1	0.0	0.2	0.3	0.8	0.6	0.0	0.3	0.3	2.7	-	1.7
2008	0.0	12.8	5.9	0.0	0.0	0.4	0.7	1.4	0.0	1.0	0.2	1.0	0.0	2.5
2012	0.2	14.0	8.8	0.0	0.4	0.9	1.4	2.6	-	0.7	1.4	1.7	-	2.2
2017	0.0	13.2	8.6	0.2	0.4	0.2	1.0	1.6	-	1.4	0.7	1.4	-	2.5

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

**Table 23-06.13 - Shrub/Tree Characteristics.** Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Amelanchier utahensis<sup>P</sup> -- (Utah serviceberry)</b>									
1998	240	-	33	67	0	25	0	0	64/54
2003	140	-	0	71	29	14	71	29	67/47
2008	40	-	100	0	0	0	0	0	37/41
2012	120	-	33	50	17	33	50	17	64/54
2017	120	-	33	67	0	17	67	33	43/46
<b>Artemisia tridentata ssp. vaseyana<sup>P</sup> -- (mountain big sagebrush)</b>									
1998	3420	60	9	64	26	33	6	3	74/80
2003	4400	-	3	64	33	32	11	7	62/69
2008	4440	60	9	38	54	28	5	49	57/80
2012	4180	320	5	71	24	35	21	20	65/86
2017	3780	140	5	74	21	38	44	20	65/73
<b>Cercocarpus montanus<sup>P</sup> -- (alderleaf mountain mahogany)</b>									
1998	1380	-	13	78	9	49	23	3	91/101
2003	1520	-	4	88	8	18	72	8	83/89
2008	1980	-	22	50	28	39	27	10	76/92
2012	1640	40	11	83	6	35	45	22	82/93
2017	1680	-	2	94	4	19	63	2	62/71
<b>Chrysothamnus depressus<sup>P</sup> -- (longflower rabbitbrush)</b>									
1998	160	-	0	100	0	63	0	0	8/25
2003	260	-	0	100	0	39	54	0	16/23
2008	400	-	20	75	5	20	15	5	11/19
2012	160	-	13	88	0	0	63	0	10/19
2017	200	-	20	80	0	0	80	0	7/10
<b>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)</b>									
1998	140	-	0	86	14	0	0	14	40/34
2003	60	-	0	33	67	0	0	33	35/26
2008	200	-	10	50	40	10	10	10	33/43
2012	260	-	8	85	8	8	0	15	35/36
2017	120	-	0	100	0	0	0	0	35/32
<b>Eriogonum microthecum<sup>P</sup> -- (slender buckwheat)</b>									
1998	780	-	21	80	0	3	0	0	22/25
2003	860	-	2	91	7	0	2	5	15/14
2008	1060	-	15	81	4	23	0	0	18/20
2012	680	20	9	91	0	9	3	15	18/27
2017	320	-	6	94	0	6	0	0	13/15
<b>Juniperus osteosperma<sup>f</sup> -- (Utah juniper)</b>									
1998	60	20	33	67	0	0	0	0	- / -
2003	100	-	40	60	0	0	0	0	- / -
2008	100	-	60	40	0	0	0	0	- / -
2012	160	20	63	38	0	0	0	13	- / -
2017	120	-	50	50	0	0	0	0	- / -
<b>Mahonia repens -- (creeping barberry)</b>									
1998	60	-	0	100	0	0	0	0	11/17
2003	-	-	-	-	-	-	-	-	- / -
2008	20	-	0	100	0	0	0	0	6/9
2012	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
<b>Opuntia polyacantha -- (plains pricklypear)</b>									
1998	620	20	16	84	0	0	0	13	17/34
2003	940	-	2	98	0	0	0	0	10/24
2008	740	-	3	92	5	0	0	14	15/39
2012	1260	20	2	98	0	5	0	21	15/34
2017	2080	-	0	99	1	4	0	1	12/24
<b>Pediocactus simpsonii -- (mountain ball cactus)</b>									
1998	40	-	50	50	0	0	0	0	- / -
2003	20	-	0	100	0	0	0	0	6/8
2008	40	-	0	100	0	0	0	0	- / -
2012	-	-	-	-	-	-	-	-	5/7
2017	-	-	-	-	-	-	-	-	4/7

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<b>Pinus edulis<sup>t</sup> -- (twoneedle pinyon)</b>									
1998	60	-	33	67	0	0	0	0	- / -
2003	60	-	67	33	0	0	0	0	- / -
2008	40	20	50	50	0	0	0	0	- / -
2012	60	20	33	67	0	0	0	0	- / -
2017	60	-	33	67	0	0	0	0	- / -
<b>Purshia tridentata<sup>p</sup> -- (antelope bitterbrush)</b>									
1998	180	-	22	78	0	33	22	0	59/88
2003	200	-	0	100	0	30	70	0	47/99
2008	200	-	20	20	60	20	70	40	43/87
2012	180	60	0	89	11	11	89	33	38/70
2017	280	-	0	100	0	7	93	0	36/62
<b>Quercus gambelii<sup>p</sup> -- (Gambel oak)</b>									
1998	960	80	56	38	6	52	8	0	83/61
2003	940	-	45	53	2	30	28	0	119/80
2008	1840	-	17	63	20	47	16	9	126/111
2012	600	-	20	77	3	13	57	27	94/80
2017	600	-	0	97	3	47	33	3	70/58
<b>Symphoricarpos oreophilus -- (mountain snowberry)</b>									
1998	1540	20	38	61	1	17	0	1	33/53
2003	2240	-	7	91	2	0	2	2	27/39
2008	2320	360	23	50	27	22	1	4	25/43
2012	2220	20	16	83	1	20	3	7	25/34
2017	2560	-	6	94	0	6	6	0	22/31

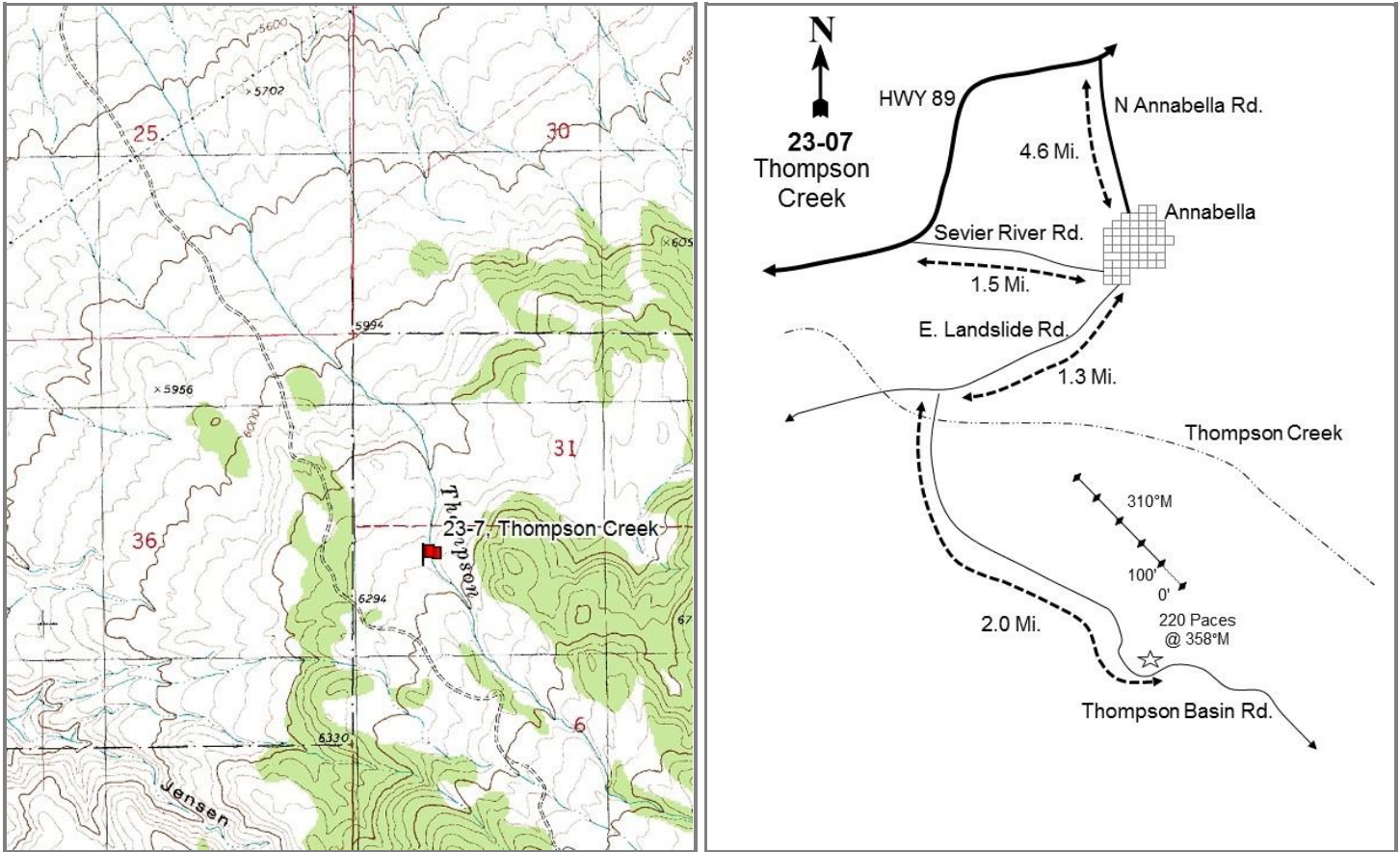
t - Tree Species; p - Preferred Browse; i - Introduced Species

**Table 23-06.14 - Tree Characteristics.** Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4'	4-8'	8-12'	>12' (%)	
<b>Juniperus osteosperma (Utah juniper)</b>							
1998	36	-	-	-	-	-	6.0
2003	32	8	8	62	-	23	14.2
2008	39	-	29	29	24	18	12.8
2012	63	12	35	18	29	6	10.4
2017	57	-	33	11	33	22	16.6
<b>Pinus edulis (twoneedle pinyon)</b>							
1998	31	-	-	-	-	-	6.7
2003	51	8	25	25	25	17	7.6
2008	37	13	13	40	13	20	8.5
2012	64	23	8	15	54	-	6.8
2017	34	-	7	36	14	43	12.5



## THOMPSON CREEK - STUDY NO. 23-7

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Annabella SW; Township 25S, Range 2W, Section 06  
NAD 83 UTM ZONE 12, 407159 East 4280581 North

**Transect Information**

Browse Tag # (0' Stake)	514
Transect Bearing	310° 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 town of Annabella, continue for 1.3 miles on East Landslide (may be named Omni Point) Road. Turn left (south) onto Thompson Basin Road and continue for 2.0 miles, passing Thompson Creek, then park. The study site is on the right-hand (north) side of the road, and the 0-foot stake is approximately 220 paces away at 358 degrees magnetic.

**Site Information**

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	No data
Aspect	West
Slope	8-12%
Sample Dates	06/12/2017

**Table 23-07.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Harrow - Dixie	Fishlake NF PJ Maintenance-Sagebrush Enhancement - Year 1	216	2005	1115
Chaining - Chain Unknown	-	-	Historic	-

**Wildlife Habitat and Vegetation History****Table 23-07.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	substantial	winter

**Table 23-07.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Mountain Big Sagebrush/Annual Grass	Phase I

**Site Notes**

A white spike shed was found on site in 2017.

**Soils****Table 23-07.5 - 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 Loam	7.1	60.2	20.7	19.1	2.9	8.3	427.0	0.5	06/12/2017

**Site Potential**

1981 - 2010 Average Annual Precipitation	10 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.

The dominant browse species on this study site is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and few other shrub species are present (Table 23-07.12, Table 23-07.13). Utah juniper (*Juniperus osteosperma*) trees were observed with low density, and the study is considered to be within Phase I of woodland succession (Table 23-07.4, Table 23-07.14). A majority of the herbaceous cover is provided by the introduced annual species cheatgrass (*Bromus tectorum*), which is a co-dominant site vegetation component. Although a number of other grass species are present, they are rare in comparison. Forbs are depauperate in both species composition and quantity (Table 23-07.7, Table 23-07.10, Table 23-07.11).

**Trend Summary Tables**

**Table 23-07.6 - 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
2017	10.5	1.9	-	13.5	0.9	-

**Table 23-07.7 - 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
2017	457	289	70	1	41.0	14.9	1.9	0.1

**Table 23-07.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2017	2.2	-	60.2	8.3	14.2	65.0

**Table 23-07.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
Year	Days Use Per Acre (ha)			
	2017	3	18	22
2017	-	16.8 (41.4)	21.5 (53.0)	-

**Table 23-07.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achmatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Poa bulbosa <sup>i</sup> (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency									
2017	9	9	6	457	25	61	1	3	57	199
year	Average Cover (%)									
2017	0.0	0.1	0.2	41.0	0.9	2.4	0.0	0.0	1.5	9.9

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

**Table 23-07.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Erodium cicutarium <sup>ai</sup> (redstem stork's bill)	Hymenopappus (hymenopappus)	Lactuca serriola <sup>ai</sup> (prickly lettuce)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)
year	Nested Frequency			
2017	64	1	2	6
year	Average Cover (%)			
2017	1.8	0.1	0.0	0.0

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

**Table 23-07.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept	
2017	13.5	0.9
year	Quadrat Cover (%)	
2017	10.5	1.9

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

**Table 23-07.13 - 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.

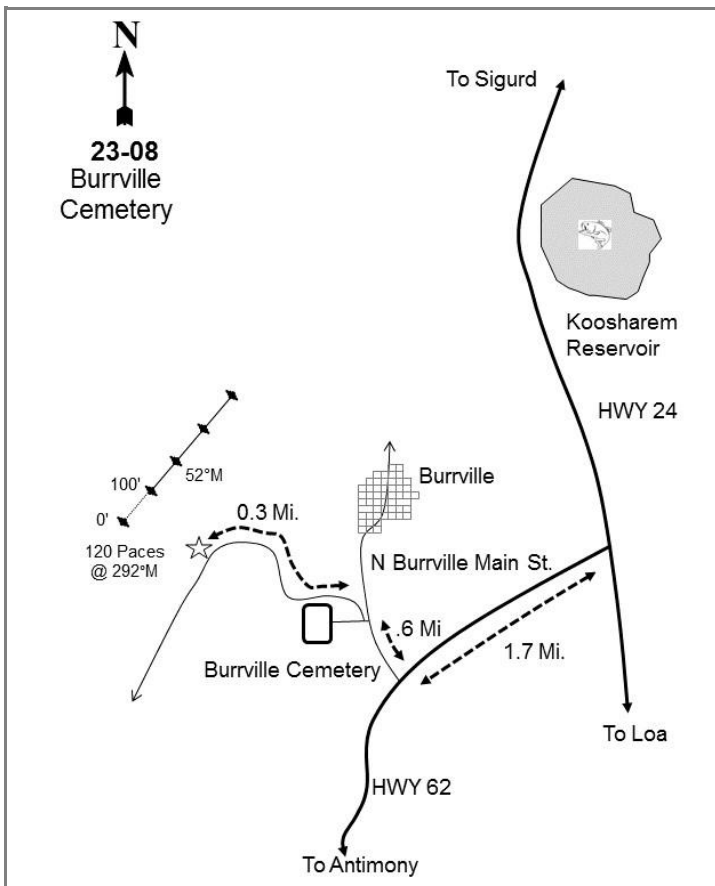
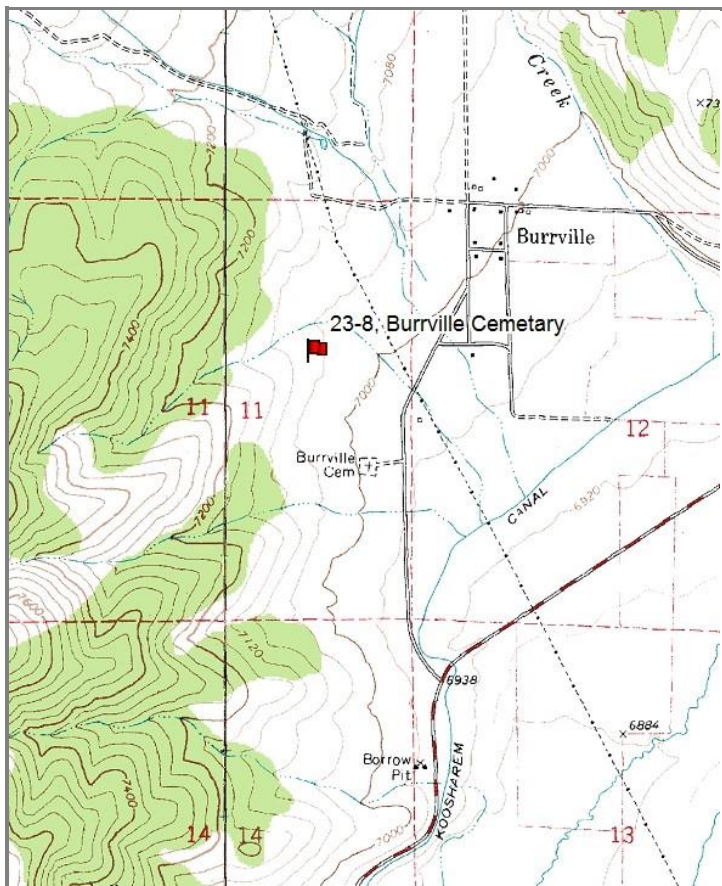
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana <sup>p</sup> -- (mountain big sagebrush)									
2017	1740	200	1	75	24	31	23	16	55/91
Ericameria nauseosa ssp. nauseosa var. speciosa <sup>p</sup> -- (rubber rabbitbrush)									
2017	-	-	-	-	-	-	-	-	96/155
Opuntia polyacantha -- (plains pricklypear)									
2017	1380	-	0	99	1	0	0	1	12/27

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

**Table 23-07.14 - 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'	
Juniperus osteosperma (Utah juniper)						
2017	8	-	67	33	-	14.7

## BURRVILLE CEMETERY - STUDY NO. 23-8



### Location Information

USGS 7.5 min Map Info Burrville NW; Township 26S, Range 1W, Section 11  
 GPS (0' Stake) NAD 83 UTM ZONE 12, 423868 East 4268863 North

### Transect Information

Browse Tag # (0' Stake) 575  
 Transect Bearing 52° 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

Traveling south on Highway 24, turn right (west) onto Highway 62 and continue for 1.7 miles. Turn right onto East 300 South and proceed for 0.6 miles to a road on the left leading to Burrville Cemetery. Turn right onto a dirt road before reaching the cemetery; continue for 0.3 miles, and park. The study site is 120 paces away from the right (north) side of the road at a bearing of 292 degrees magnetic.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	BURRVILLE
Elevation	7,056ft (2,151m)
Aspect	Northeast
Slope	12%
Sample Dates	06/13/2017

**Table 23-08.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Harrow - Dixie	-	-	Between 2006 and 2009	-
Seeding - Seed Unknown	-	-	Between 2006 and 2009	-

**Wildlife Habitat and Vegetation History**

**Table 23-08.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

**Table 23-08.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Perennial Grass/Mountain Big Sagebrush	Phase I

**Site Notes**

No Notes

**Soils**

**Table 23-08.5 - 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	6.9	38.2	36.7	25.1	1.6	3.4	139.0	0.4	06/13/2017

**Site Potential**

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R034XY308UT
States and Transitions	No state and transition model is available for this ecological site.

This site was established in 2017 and is co-dominated by perennial grasses -- mainly bluebunch wheatgrass (*Pseudoroegneria spicata*) -- and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). The introduced annual grass cheatgrass (*Bromus tectorum*) was also observed, but in low amounts (Table 23-08.10, Table 23-08.12, Table 23-08.13). Forbs on this site are somewhat diverse, but rare (Table 23-08.7, Table 23-08.11). Utah juniper (*Juniperus osteosperma*) trees are present with low density, placing this site in Phase I of woodland succession (Table 23-08.4, Table 23-08.14); further encroachment could possibly occur in the future.



**Trend Summary Tables**

**Table 23-08.6 - 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
2017	6.7	0.0	-	8.1	0.2	-

**Table 23-08.7 - 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
2017	281	297	289	33	4.2	20.5	2.7	0.4

**Table 23-08.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2017	28.3	-	34.7	21.5	5.2	32.5

**Table 23-08.9 - 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	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
2017	8	5	54
Year	Days Use Per Acre (ha)		
	2017	10.0 (24.8)	22.1 (54.6)

**Table 23-08.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Hesperostipa comata (needle and thread)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea <sup>i</sup> (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium <sup>i</sup> (intermediate wheatgrass)
year	Nested Frequency										
2017	48	64	281	20	6	62	8	30	3	179	64
year	Average Cover (%)										
2017	2.6	2.9	4.2	0.2	0.4	1.6	0.1	0.3	0.1	11.6	0.6

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



**Table 23-08.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency														
Alyssum desertorum <sup>ni</sup> (desert madwort)	250	4	7	40	8	5	2	2	3	53	1	1	1	3	9
Astragalus lentiginosus (freckled milkvetch)															
Astragalus piutensis (Sevier milkvetch)															
Ceratocephala testiculata <sup>ni</sup> (curvseed butterwort)															
Cryptantha (cryptantha)															
Descurainia pinnata <sup>a</sup> (western tansymustard)															
Eriogonum ovalifolium (cushion buckwheat)															
Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)															
Gilia inconspicua <sup>a</sup> (shy gilia)															
Lappula occidentalis <sup>a</sup> (flatspine stickseed)															
Lesquerella (bladderpod)															
Linum perenne <sup>i</sup> (blue flax)															
Polygonum douglasii <sup>a</sup> (Douglas' knotweed)															
Schoenocrambe linifolia (flaxleaf plainsmustard)															
Trifolium gymnocarpon (hollyleaf clover)															
year	Average Cover (%)														
2017	2.4	0.0	0.1	0.1	0.2	0.0	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

**Table 23-08.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover		
Artemisia tridentata ssp. vaseyana <sup>p</sup> (mountain big sagebrush)	8	0.1	0.2
Bassia prostrata <sup>ni</sup> (forage kochia)			
Opuntia polyacantha (plains pricklypear)			
year	Quadrat Cover (%)		
2017	5.9	0.8	0.0

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

**Table 23-08.13 - 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.

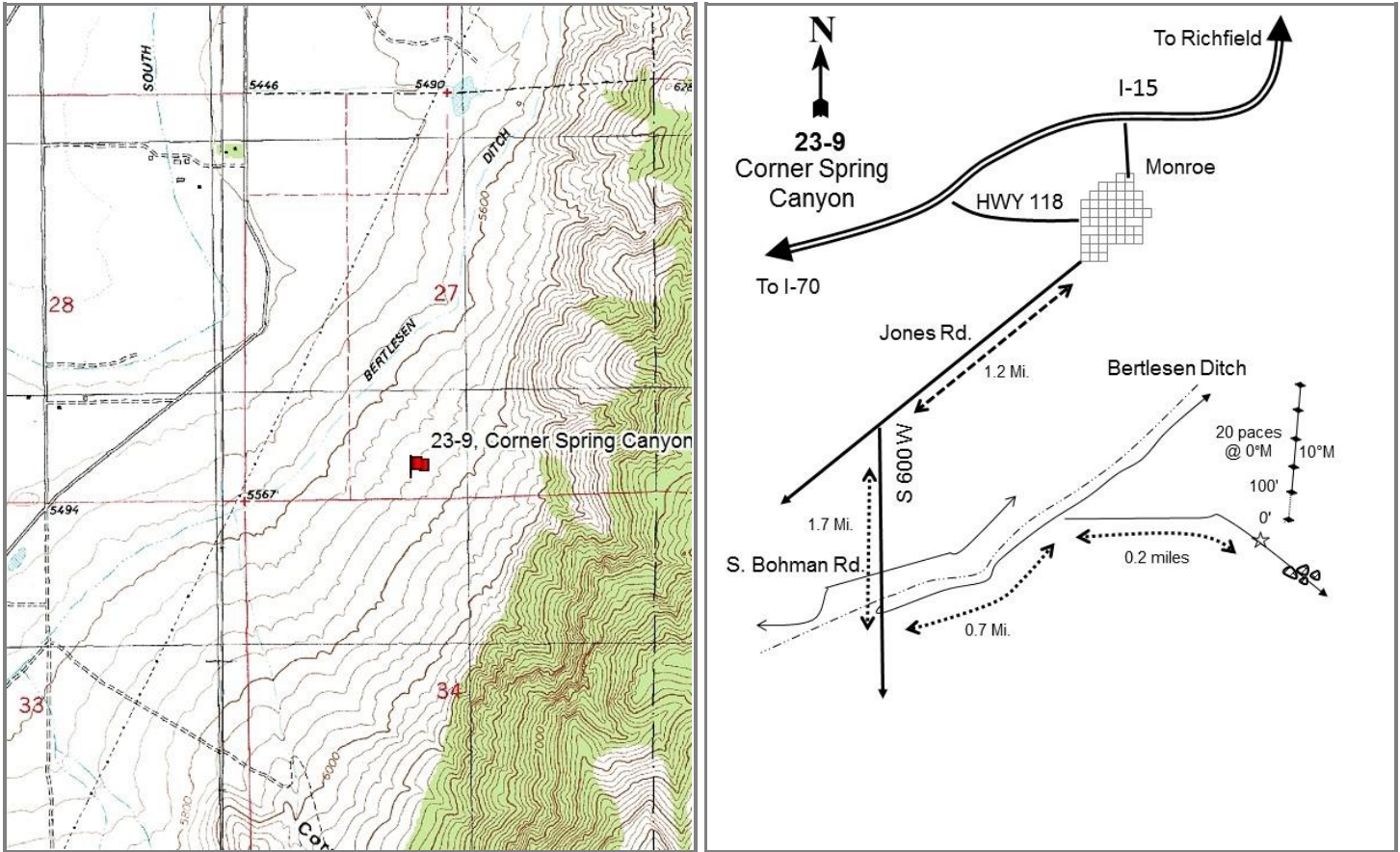
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana <sup>p</sup> -- (mountain big sagebrush)									
2017	3360	-	10	88	2	45	35	2	34/46
Bassia prostrata <sup>ni</sup> -- (forage kochia)									
2017	600	-	7	93	0	7	3	0	10/16
Juniperus osteosperma <sup>i</sup> -- (Utah juniper)									
2017	20	-	100	0	0	0	0	0	- / -
Opuntia polyacantha -- (plains pricklypear)									
2017	280	-	14	86	0	0	0	0	11/23

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

**Table 23-08.14 - 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'	
Juniperus osteosperma (Utah juniper)						
2017	13	-	100	-	-	6.6

## CORNER SPRING CANYON - STUDY NO. 23-9

**Location Information**

USGS 7.5 min Map Info  
GPS (0' Stake)

Monroe Peak NW; Township 25S, Range 3W, Section 34  
NAD 83 UTM ZONE 12, 402615 East 4271680 North

**Transect Information**

Browse Tag # (0' Stake)	574
Transect Bearing	10° 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 town of Monroe, go southeast on Jones road for 1.2 miles to S 600 W and turn left. Travel on this road for 1.7 miles, crossing Bertlesen ditch. Turn left on the service road for the ditch and go for 0.7 miles, crossing through a gate: after the 0.7 miles, you will turn right at a fenceline. Drive for 0.2 miles and the site will be on the left-hand (north) side of the road.

**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	HUNT
Elevation	5,728ft (1,746m)
Aspect	West
Slope	5-10%
Sample Dates	06/15/2017

**Wildlife Habitat and Vegetation History****Table 23-09.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
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**Table 23-09.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Annual Grass	Phase I

**Site Notes**

No Notes

**Soils****Table 23-09.5 - 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
Sandy Loam	7.4	60.2	24.7	15.1	1.3	7.7	203.0	0.4	06/15/2017

**Site Potential**

1981 - 2010 Average Annual Precipitation	9 inches
NRCS Ecological Site	Semidesert Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R028AY220UT
States and Transitions	No state and transition model is available for this ecological site.

The main browse on this site is Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), which provides little cover. In addition, a majority of the sagebrush plants on this site are decadent (Table 23-09.12, Table 23-09.13). The site is dominated by the introduced annual grass species cheatgrass (*Bromus tectorum*), which had nearly 70% cover in 2017; this study may therefore be subject to consequences of a high fuel load if a wildfire should occur. Forbs and perennial grasses are low in quantity and species diversity (Table 23-09.7, Table 23-09.10, Table 23-09.11). Utah juniper (*Juniperus osteosperma*) trees were also observed with low density, and although the site is only in Phase I of woodland succession, it may have the potential for further encroachment in the future (Table 23-09.4, Table 23-09.14).

**Trend Summary Tables****Table 23-09.6 - 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
2017	2.2	0.1	-	2.4	0.1	-

**Table 23-09.7 - 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
2017	482	63	83	-	68.8	1.0	1.5	-

**Table 23-09.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2017	1.9	0.0	44.7	5.1	15.4	74.0

**Table 23-09.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
2017	28	1	20
Year	Days Use Per Acre (ha)		
	2017	81.7 (201.9)	-

**Table 23-09.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES				
Aristida purpurea (purple threeawn)				
Bromus tectorum <sup>ai</sup> (cheatgrass)				
Elymus elymoides (squirreltail)				
Sporobolus cryptandrus (sand dropseed)				
year	Nested Frequency			
2017	2	482	20	42
year	Average Cover (%)			
2017	0.0	68.8	0.2	0.8

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

**Table 23-09.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES			
Alyssum desertorum <sup>ai</sup> (desert madwort)			
Erodium cicutarium <sup>ai</sup> (redstem stork's bill)			
Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)			
year	Nested Frequency		
2017	4	73	7
year	Average Cover (%)		
2017	0.0	1.3	0.1

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

**Table 23-09.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES		
Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)		
Opuntia polyacantha (plains pricklypear)		
year	Line Intercept	
2017	2.4	0.1
year	Quadrat Cover (%)	
2017	2.2	0.1

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

**Table 23-09.13 - 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.

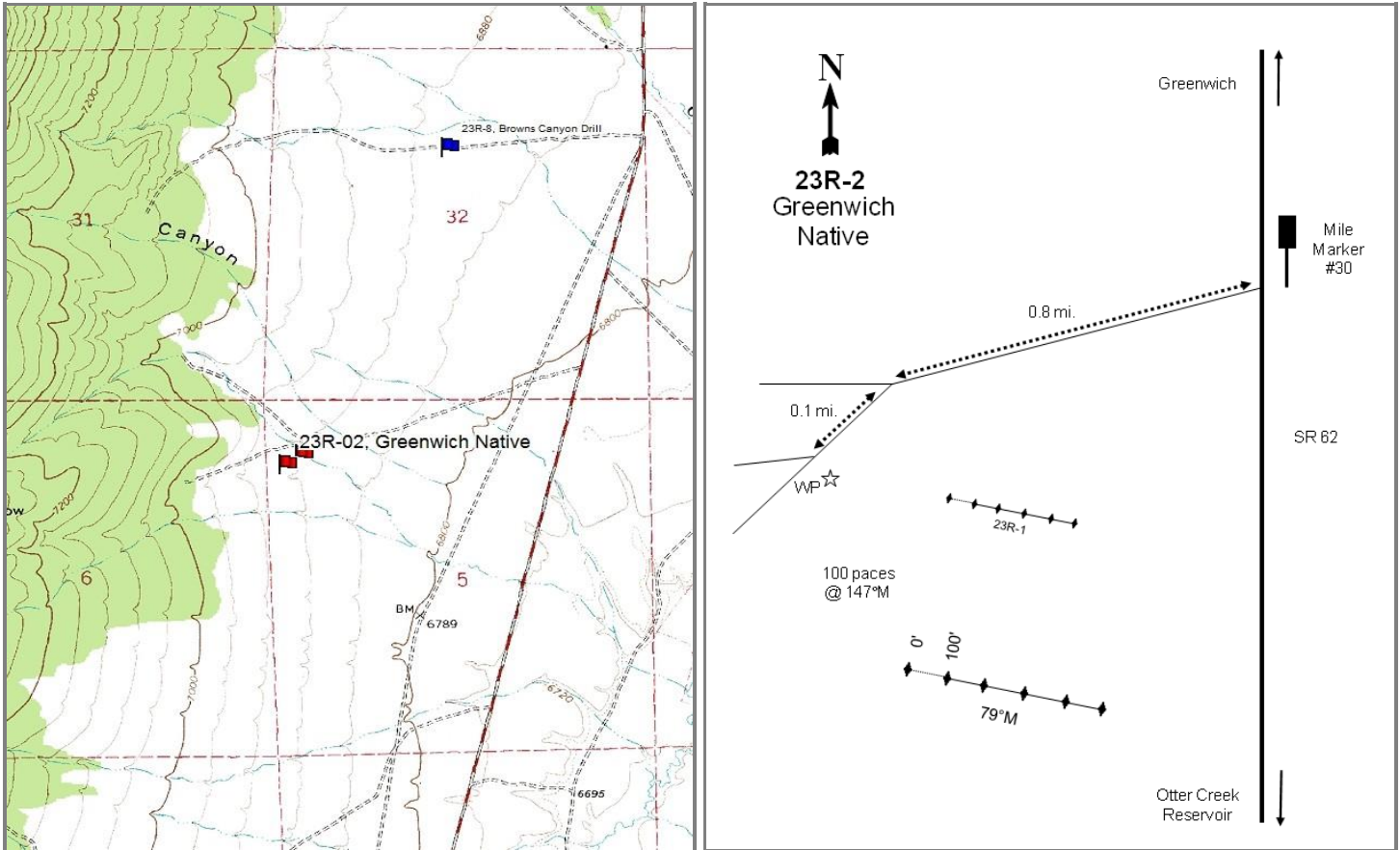
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. wyomingensis <sup>P</sup> -- (Wyoming big sagebrush)									
2017	580	-	3	31	66	7	72	55	46/74
Ericameria nauseosa ssp. nauseosa var. speciosa <sup>P</sup> -- (rubber rabbitbrush)									
2017	-	-	-	-	-	-	-	-	57/103
Opuntia polyacantha -- (plains pricklypear)									
2017	60	-	0	100	0	0	0	33	16/45

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

**Table 23-09.14 - 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 osteosperma (Utah juniper)							
2017	4	-	50	50	-	-	8.5

## GREENWICH NATIVE - STUDY NO. 23R-2



### Location Information

USGS 7.5 min Map Info  
GPS (0' Stake)

Greenwich SW; Township 28S, Range 1W, Section 05  
NAD 83 UTM ZONE 12, 417908 East 4251535 North

### Transect Information

Browse Tag # (0' Stake)	102
Transect Bearing	79° 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

Start on Highway 62 between Greenwich and Otter Creek Reservoir. At mile marker 30 there is a road going west: take this road for 0.8 miles to a fork. Stay right and continue for 0.1 mile to a witness post on the left (south) side of the road. From the witness post, walk 100 paces at 147 degrees magnetic to the 0-foot stake, which is marked with, browse tag #102. The study is marked with green, steel fenceposts approximately 12-18 inches in height.



**Site Information**

Land Ownership	Federal
Land Administrator	BLM
Allotment	NORTH NARROWS
Elevation	6,870ft (2,094m)
Aspect	Northeast
Slope	6-7%
Sample Dates	08/13/1997, 08/21/2003, 08/10/2004, 06/19/2008, 08/07/2012, 06/12/2017

**Table 23R-02.1 Disturbance History.** Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Harrow - Two-Way Dixie	Narrows Project	PDB	November 2004	3600
Seeding - Broadcast Before	Narrows Project	PDB	November 2004	3600

**Wildlife Habitat and Vegetation History****Table 23R-02.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

**Table 23R-02.4 - Vegetation History.** The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1997	Wyoming Big Sagebrush	No Encroachment
2003	Wyoming Big Sagebrush	No Encroachment
2004	Wyoming Big Sagebrush	No Encroachment
2008	Wyoming Big Sagebrush	No Encroachment
2012	Wyoming Big Sagebrush	No Encroachment
2017	Wyoming Big Sagebrush	No Encroachment

**Site Notes**

This study was established as a reference site to the Greenwich Disking trend study (23R-1) in 1997.

**Soils****Table 23R-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 Loam	6.3	55.3	26.2	18.6	1.2	17.7	147.2	0.4	08/13/1997

**Site Potential**

1981 - 2010 Average Annual Precipitation	9 inches
NRCS Ecological Site	Semidesert Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R047XB222UT
States and Transitions	No state and transition model is available for this ecological site.

This study site has remained in a stable state as a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) plant community type since establishment in 1997, and other shrubs are rare (Table 23R-02.12, Table 23R-02.13). The herbaceous understory, while somewhat diverse, has never been abundant; the introduced perennial grass species Russian wildrye (*Psathrostachys juncea*) and annual forb western tansymustard (*Descurainia pinnata*) provided the most cover in 2017. In addition, the introduced annual grass cheatgrass (*Bromus tectorum*) was observed for the first time in 2017, but in very low abundance (Table 23R-02.7, Table 23R-02.10, Table 23R-02.11). Finally, pinyon (*Pinus* sp.) and Utah juniper (*Juniperus osteosperma*) trees have been visible near the transect in site photos in all sample years, but encroachment is not actively occurring.



**Trend Summary Tables****Table 23R-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
1997	17.9	0.0	-	-	-	-
2003	20.9	-	-	16.6	-	-
2004	19.7	-	-	21.4	0.1	-
2008	14.3	0.0	-	11.9	-	-
2012	17.5	-	-	21.0	-	-
2017	16.3	-	-	16.8	0.1	-

**Table 23R-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
1997	-	44	-	2	-	0.6	-	0.0
2003	-	20	1	-	-	0.1	0.0	-
2004	-	10	14	0	-	0.0	0.1	0.0
2008	-	86	25	42	-	1.6	0.1	3.3
2012	-	85	71	9	-	2.5	0.3	0.0
2017	2	102	143	20	0.0	2.7	2.0	0.4

**Table 23R-02.8 - Basic Ground Cover.** Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	21.4	9.6	19.6	31.3	19.0	19.0
2003	21.7	7.3	22.1	18.0	19.8	21.1
2004	26.9	2.5	27.5	30.8	9.3	19.7
2008	30.0	2.5	39.2	14.9	10.7	18.9
2012	27.0	1.4	39.7	16.7	6.0	19.6
2017	41.6	1.5	33.0	16.6	10.4	19.7

**Table 23R-02.9 - Pellet Group Data.** Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	-	3	-	1
2003	-	-	-	64
2004	-	1	-	42
2008	-	-	1	87
2012	1	3	-	22
2017	4	4	1	68
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2003	-	-	1.3 (3.3)	-
2004	-	0.7 (1.7)	4.7 (11.6)	-
2008	0.7 (1.8)	-	3.4 (8.3)	-
2012	4.4 (10.8)	0.7 (1.7)	4.7 (11.6)	-
2017	3.6 (9.0)	1.3 (3.3)	3.4 (8.3)	-

**Table 23R-02.10 - Grass Species.** Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum <sup>i</sup> (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus tectorum <sup>ai</sup> (cheatgrass)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea <sup>i</sup> (Russian wildrye)
year	Nested Frequency							
1997	-	-	17	-	27	-	-	-
2003	-	-	9	-	11	-	-	-
2004	-	-	10	-	-	-	-	-
2008	1	-	3	-	38	24	-	41
2012	7	23	2	-	29	15	7	20
2017	-	7	2	2	46	17	11	45
year	Average Cover (%)							
1997	-	-	0.3	-	0.3	-	-	-
2003	-	-	0.1	-	0.1	-	-	-
2004	-	-	0.0	-	-	-	-	-
2008	0.0	-	0.0	-	0.5	0.1	-	0.9
2012	0.0	0.7	0.0	-	0.3	0.6	0.1	0.8
2017	-	0.0	0.0	0.0	0.6	0.1	0.1	1.8

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

**Table 23R-02.11 - Forb Species.** Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Astragalus lentiginosus (freckled milkvetch)	Cryptantha (cryptantha)	Descurainia pinnata <sup>a</sup> (western tansymustard)	Epilobium brachycarpum <sup>a</sup> (tall annual willowherb)	Gayophytum ramosissimum <sup>a</sup> (pinyon groundsmoke)	Ipomopsis aggregata (scarlet gilia)	Lappula occidentalis <sup>a</sup> (flatspine stickseed)	Linum perenne <sup>i</sup> (blue flax)	Oenothera caespitosa (tufted evening primrose)	Orobanche fasciculata (clustered broomrape)	Phlox longifolia (longleaf phlox)	Salsola tragus <sup>ai</sup> (prickly Russian thistle)	Sisymbrium altissimum <sup>ai</sup> (tall tumblemustard)	Solanum triflorum <sup>a</sup> (cutleaf nightshade)	unknown perennial forb (unknown forb)	
year	Nested Frequency															
1997	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2003	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
2004	-	0	14	-	-	-	-	-	-	-	-	-	-	-	0	-
2008	-	-	1	-	-	-	6	41	-	-	1	19	-	-	-	-
2012	2	2	50	2	-	-	17	2	-	3	-	3	6	2	-	-
2017	7	7	127	-	10	2	46	-	4	-	-	-	2	-	-	-
year	Average Cover (%)															
1997	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2003	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
2004	-	0.0	0.1	-	-	-	-	-	-	-	-	-	-	-	0.0	-
2008	-	-	0.0	-	-	-	0.0	3.3	-	-	0.0	0.0	-	-	-	-
2012	0.0	0.0	0.2	0.0	-	-	0.0	0.0	-	0.0	-	0.0	0.0	0.0	-	-
2017	0.3	0.2	1.6	-	0.0	0.0	0.3	-	0.0	-	-	-	0.0	-	-	-

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

**Table 23R-02.12 - Shrub and Tree Species.** Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)	
	Artemisia tridentata ssp. wyomingensis <sup>p</sup> (Wyoming big sagebrush)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept Cover (%)	
1997	-	-
2003	16.6	-
2004	21.4	0.1
2008	11.9	-
2012	21	-
2017	16.8	0.1
year	Quadrat Cover (%)	
1997	17.9	0.0
2003	20.9	-
2004	19.7	0.0
2008	14.3	0.0
2012	17.5	-
2017	16.3	0.0

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

**Table 23R-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. wyomingensis <sup>p</sup> -- (Wyoming big sagebrush)									
1997	3800	160	6	76	18	45	1	8	67/102
2003	4220	-	4	14	82	11	1	40	61/78
2004	4280	5500	4	40	56	2	1	29	62/86
2008	6160	4940	31	40	30	17	17	16	50/67
2012	5400	2400	24	55	21	23	29	34	61/88
2017	5200	160	14	67	19	17	12	20	55/73
Gutierrezia sarothrae -- (broom snakeweed)									
1997	-	-	-	-	-	-	-	-	-/-
2003	-	-	-	-	-	-	-	-	20/17
2004	-	-	-	-	-	-	-	-	25/16
2008	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
Opuntia polyacantha -- (plains pricklypear)									
1997	20	-	0	100	0	0	0	0	-/-
2003	-	-	-	-	-	-	-	-	13/33
2004	20	-	0	100	0	0	0	0	13/39
2008	20	20	0	0	100	0	0	100	12/32
2012	20	-	0	100	0	0	0	0	10/34
2017	60	-	0	100	0	0	0	0	11/19

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

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## APPENDIX A - VEGETATION TYPE

## VEGETATION COMMUNITY TYPE CLASSIFICATION--

Vegetation Type Code	Vegetation Community Type Name*	Description
ANN GRASS	Annual Grass	Annual grasses provide the dominant vegetation cover.
PER GRASS	Perennial Grass	Perennial grasses provide the dominant vegetation cover.
ANN-PER GRASS	Annual-Perennial Grass	Mixture of Annual and Perennial grass species provide the dominant vegetation cover.
ANN GRASS-FORB	Annual Grass-Forb	Mixture of Annual grass and forb species provide the dominant vegetation cover.
PER GRASS-FORB	Perennial Grass-Forb	Mixture of Perennial grass and forb species provide the dominant vegetation cover.
ANN FORB	Annual Forb	Annual forbs provide the dominant vegetation cover
PER FORB	Perennial Forb	Perennial forbs provide the dominant vegetation cover
ANN-PER FORB	Annual-Perennial Forb	Mixture of Annual and Perennial forb species provide the dominant vegetation cover.
WEED	Annual-Perennial Weed	Annual and/or Perennial weedy species provide the dominant vegetation cover.
WET MEADOW	Wet Meadow	Riparian vegetation species provide the dominant vegetation cover
DRY MEADOW	Dry Meadow	High elevation subalpine meadow
RIPAR	Riparian	Riparian vegetation species provide the dominant vegetation cover.
ALP GRASS	Alpine Grass	Grass or grass-like species provide the dominant vegetation cover
ALP FORB	Alpine Forb	Forb species provide the dominant vegetation cover
ALP SHRUB	Alpine Shrub	Alpine shrub species provide the dominant vegetation cover
ALP MIX	Alpine-Mixed	Mixture of grass, forb, or shrub species provide the dominant vegetation cover
ARTRT	Basin Big Sagebrush	Major component of the site (typically >5% cover).
ARTRV	Mountain Big Sagebrush	Major component of the site (typically > 5% cover).
ARTRW	Wyoming Big Sagebrush	Major component of the site (typically >5% cover).
ARAR	Low Sagebrush	Major component of the site (typically >5% cover).
ARCA	Silver Sagebrush	Major component of the site (typically >5% cover).
ARNO	Black Sagebrush	Major component of the site (typically >5% cover).
ARSP	Bud Sagebrush	Major component of the site (typically >5% cover).
ARFR	Fringed Sagebrush	Major component of the site (typically >5% cover).
CHNA	Rubber Rabbitbrush	Major component of the site (typically >5% cover).
CHPA	Parry Rabbitbrush	Major component of the site (typically >5% cover).
CHVI	Low Rabbitbrush	Major component of the site (typically >5% cover).
GUSA	Broom Snakeweed	Major component of the site (typically >5% cover).
SAVE	Black Greasewood	Major component of the site (typically >5% cover).
CELA	Winterfat	Major component of the site (typically >5% cover).
ATCO	Shadscale	Major component of the site (typically >5% cover).
ATCA	Fourwing Saltbush	Major component of the site (typically >5% cover).
GRSP	Spiny Hopsage	Major component of the site (typically >5% cover).
MSDS	Mixed Salt Desert Shrub	Mixture of one or more Salt Desert species (ATCO, ATCA, GRSP, etc.) with no one species expressing dominance.
LARRE	Creosote Bush	Major component of the site (typically >5% cover).
CORA	Blackbrush	Major component of the site (typically >5% cover).
PRFA	Desert Almond	Major component of the site (typically >5% cover).
EPHED	Ephedra	Major component of the site (typically >5% cover).
QUGA	Gambel Oak	Major component of the site (typically >5% cover).

Vegetation Type Code	Vegetation Community Type Name*	Description
QUTU	Live Oak	Major component of the site (typically >5% cover).
SYOR	Snowberry	Major component of the site (typically >5% cover).
AMAL	Serviceberry	Major component of the site (typically >5% cover).
PUTR	Bitterbrush	Major component of the site (typically >5% cover).
PUGL	Desert Bitterbrush	Major component of the site (typically >5% cover).
ARCT2	Manzanita	Major component of the site (typically >5% cover).
CEMOM	True Mountain Mahogany	Major component of the site (typically >5% cover).
CELEL	Curlleaf Mountain Mahogany	Major component of the site (typically >5% cover).
COMES	Stansbury Cliffrose	Major component of the site (typically >5% cover).
KOPR	Forage Kochia	Major component of the site (typically >5% cover).
TAMARIX	Tamarix	Major component of the site (typically >5% cover).
MMB	Mixed Mountain Brush	Mixture of one or more Mountain brush species (ARTRV, AMAL, CEMOM, etc.) with no one species expressing dominance.
MB	Mixed Shrub	Mixture of various shrub species with none expressing dominance.
CHAPARRAL	Chaparral	Mixture of fire tolerant shrub species.
JUNIPER	Juniper	Major component of the site (Phase III <sup>1</sup> ). No pinyon present.
PINYON	Pinyon	Major component of the site (Phase III <sup>1</sup> ). No juniper present.
PJ	Pinyon-Juniper	Major components of the site (Phase III <sup>1</sup> ). Pinyon and Juniper present.
POTR	Quaking Aspen	POTR provides the dominant overstory (typically >5% cover).
POTR-CE	Quaking Aspen-Conifer Encroached	Mixture of QUGA and Conifers (conifers typically provide >5% cover).
PIPO	Ponderosa Pine	PIPO provides the dominant overstory (typically >5% cover).
PSMEM	Douglas Fir	Major component of the site (typically >5% cover).
ABCO	White Fir	Major component of the site (typically >5% cover).
PIFL	Limber Pine	Major component of the site (typically >5% cover).
PICO	Lodgepole Pine	Major component of the site (typically >5% cover).
PILO	Bristlecone Pine	Major component of the site (typically >5% cover).
PIEN	Engelmann Spruce	Major component of the site (typically >5% cover).
ABLA	Subalpine Fir	Major component of the site (typically >5% cover).
SUBALP	Subalpine Forest	Mixture of PIEN and ABLA provide the dominant vegetation cover
MIX CON	Mixed Conifer Forest	Mixture of conifer tree species provide the dominant vegetation cover
AG-PAST	Agricultural-Pasture	Active or abandoned agricultural pasture
AG-CL	Agricultural-Cropland	Active or abandoned agricultural cropland
*Vegetation types can be co-dominant on the study site and when more than one vegetation community types are co-dominant and are major components of the site a (/) is used to separate vegetation community types.		
<sup>1</sup> Phase of woodland succession		