UTAH BIG GAME RANGE TREND SUMMARIES 2019

WILDLIFE MANAGEMENT UNITS
13A, 14, 15, 16B & 16C,
&
SOUTHEASTERN REGION TREATED OR DISTURBED SUMMARY

PUBLICATION NUMBER 20-04
REPORT FOR FEDERAL AID PROJECT W-82-R-64

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE RESOURCES

UTAH BIG GAME RANGE TREND UNIT SUMMARIES
2019
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SOUTHEASTERN REGION TREATED OR DISTURBED SUMMARY

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Mountain Ball Cactus (*Pediocactus simpsonii*) by Jason Cox (2019)

Performance Report for Federal Aid Project W-82-R-64

Publication No. 20-04

UTAH DEPARTMENT OF NATURAL RESOURCES
Division of Wildlife 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-64

Grant Title: Wildlife Habitat Research and Monitoring

Project Title: Wildlife Habitat Monitoring/Range Trend Studies

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

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

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

REMARKS

The work completed during the 2019 field season and reported in this publication involves the reading of interagency range trend studies in the DWR Southeastern 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:

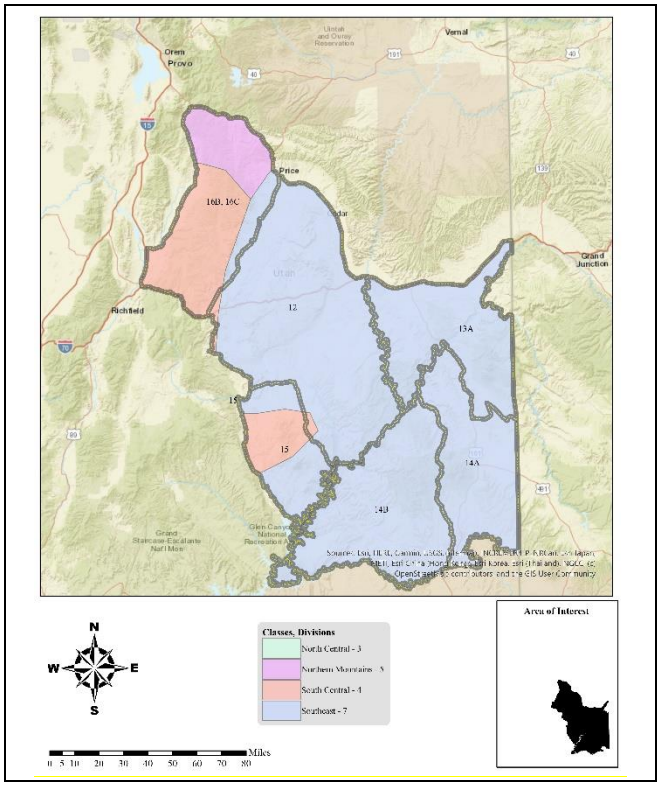
Bureau of Land Management
- Monticello Resource Area
- Moab Resource Area

Manti-La Sal National Forest
- Ferron Ranger District
- Moab Ranger District
- Monticello Ranger District
- Sanpete Ranger District

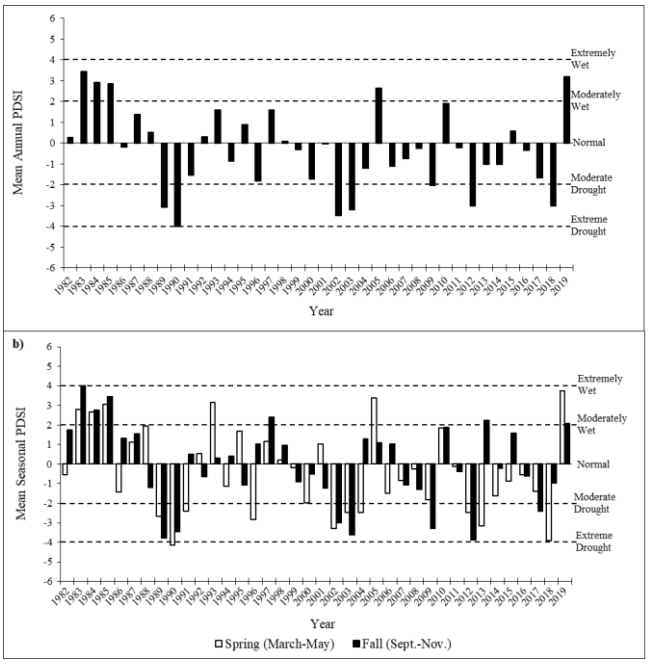
Private landowners were cooperative in allowing access to study sites located on their land.

RANGE TREND UNIT SUMMARY OVERVIEW

Boundary Description and Geography: Each unit summary includes the boundary description outlining the boundary of the unit. The geography section details the major features of the unit



Climate Data: The state of Utah is divided into seven climatic divisions for estimating the Palmer Drought Severity Index (PDSI) and the Southern region occurs within four of these divisions: Western (Division 1), Dixie (Division 2), South Central (Division 5), and Southeast (Division 7). The PDSI shows cumulative drought conditions based on precipitation and temperature. Long-term drought is cumulative, so the intensity of the current drought is based not only upon the prevailing conditions but also upon those of previous months (Climate Prediction Center Internet Team, 2005).
The PDSI is based on climate data gathered from 1895 to 2019. The data reported in this summary covers the years over which these sites have been sampled (1982-2019). The PDSI uses a scale where zero indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought (Time Series Data, 2020). In the figure below, graph "a" represents the mean annual PDSI for the Western division (Division 1) and graph "b" shows the mean PDSI by season, spring (March-May) and fall (Sept.-Nov.) for the Western division (Division 1) (Climate Prediction Center Internet Team, 2005).



Big Game Habitat: Big game habitat is discussed within each of the unit summaries. This section is a general description of the big game habitat within the unit. Habitat maps for big game animals show the seasonal ranges for year-long, winter, transitional, and summer habitat.

Land Ownership: Land ownership and big game seasonal range were overlaid within a Geographic Information System (GIS) program to create tables for big game animals to display estimated habitat acreage by season and ownership. If there was not habitat for a specific season (summer, winter, transitional, year-long) then that column was omitted.

LANDFIRE Existing Vegetation Coverage: The Existing Vegetation Cover (EVC) layer represents the vertically-projected percent cover of the live canopy layer for a 30-m grid cell. EVC is generated separately for tree, shrub, and herbaceous cover functional groups

using training data and other layers. Percentages of tree, shrub, and herbaceous canopy cover training data are generated using plot-level ground-based visual assessments. Once the training data is developed, relationships are then established separately for each functional group between the training data and a combination of Landsat, elevation, and ancillary data. Each of the derived data layers (tree, shrub, herbaceous) has a potential range from 0-100 percent, which are merged into a single composite EVC layer (LANDFIRE, n.d.).

The LANDFIRE data reported in this summary includes the major functional groups (shrubland, conifer, grassland, and other) and various subgroups of importance found within the unit boundaries. Acres and percent of total are reported for each individual vegetation type with the group percent of total for each of the major groups also reported. Agricultural, developed, riparian, and other groups are classified as "other."

Limiting Factors to Big Game Habitat: This section discusses some of the major limiting factors for big game habitat in the unit. Many of the limitations are determined from the range trend study site data, such as abundance of cheatgrass, pinyon and juniper, sagebrush, and other habitat types. Other known limitations such as wildfire, energy development, habitat fragmentation, etc. are determined from other sources.

Treatments/Restoration Work: There has been an active effort to address many of the limitations within each unit through the Watershed Restoration Initiative (WRI). This section outlines the work that has been done on the unit through WRI projects. A map of the projects that have occurred on the management unit through the WRI program and a map of the fire history from 2000-2019 is available for each unit. A total acreage amount for each type of treatment is provided in a table for each unit.

Range Trend Studies: Many of the range trend study sites were established in the 1980s and have many years of data associated with them. A table details the year an individual study was established, whether it is active or suspended, and the ecological site description (if available). Another table shows the disturbance history for those sites that have had a known disturbance that occurred on the site.

Study Trend Summary: Trends were reported by grouping sites into an ecological site based on soil characteristics, elevation, precipitation, and dominant vegetation type. Trends for each individual ecological site were evaluated by analyzing directional shifts in mean densities, covers, and utilizations for shrubs and trees. Not all sites had shrubs or trees present: when this was the case, these graphs were included with no data displayed. The implied trend for the herbaceous understory was evaluated by comparing mean values of nested frequencies and covers from sample year to sample year. Occupancy trends of big game species are also discussed and were evaluated by comparing mean pellet group counts of individual species from sample year to sample year.

Range trend study sites were summarized based on their ecological site descriptions (ESD). ESDs provide a consistent means for interpreting the landscape. Additionally, ESDs provide a way to identify similar ecological potentials and allow for predictable landscape responses to disturbances or management inputs based on repeating landscape patterns. Sites are classified based on abiotic and biotic features such as soil characteristics and plant community composition. The most common ESDs within big game seasonal ranges study sites are semidesert ESDs, which are lower in elevation, upland ESDs, which are mid-elevation, and mountain ESDs, which are higher elevation sites.

WRI and Range Trend Summary (Disturbed Sites): Study sites that have experienced a treatment or disturbance over the study years have been grouped together based on treatment or disturbance type. Treatments were further broken down into pre- and post-treatment categories. Only the latest pre-treatment year from each site was averaged into pre-treatment data while the post-treatment years were categorized into five-year increments that were averaged with their corresponding post-treatment years and are presented as 1-3 years post-treatment, 4-8 years-post-treatment, etc. Changes in shrubs, trees, herbaceous understory, and occupancy of wildlife and domestic animals were also described for each of the treatment types.

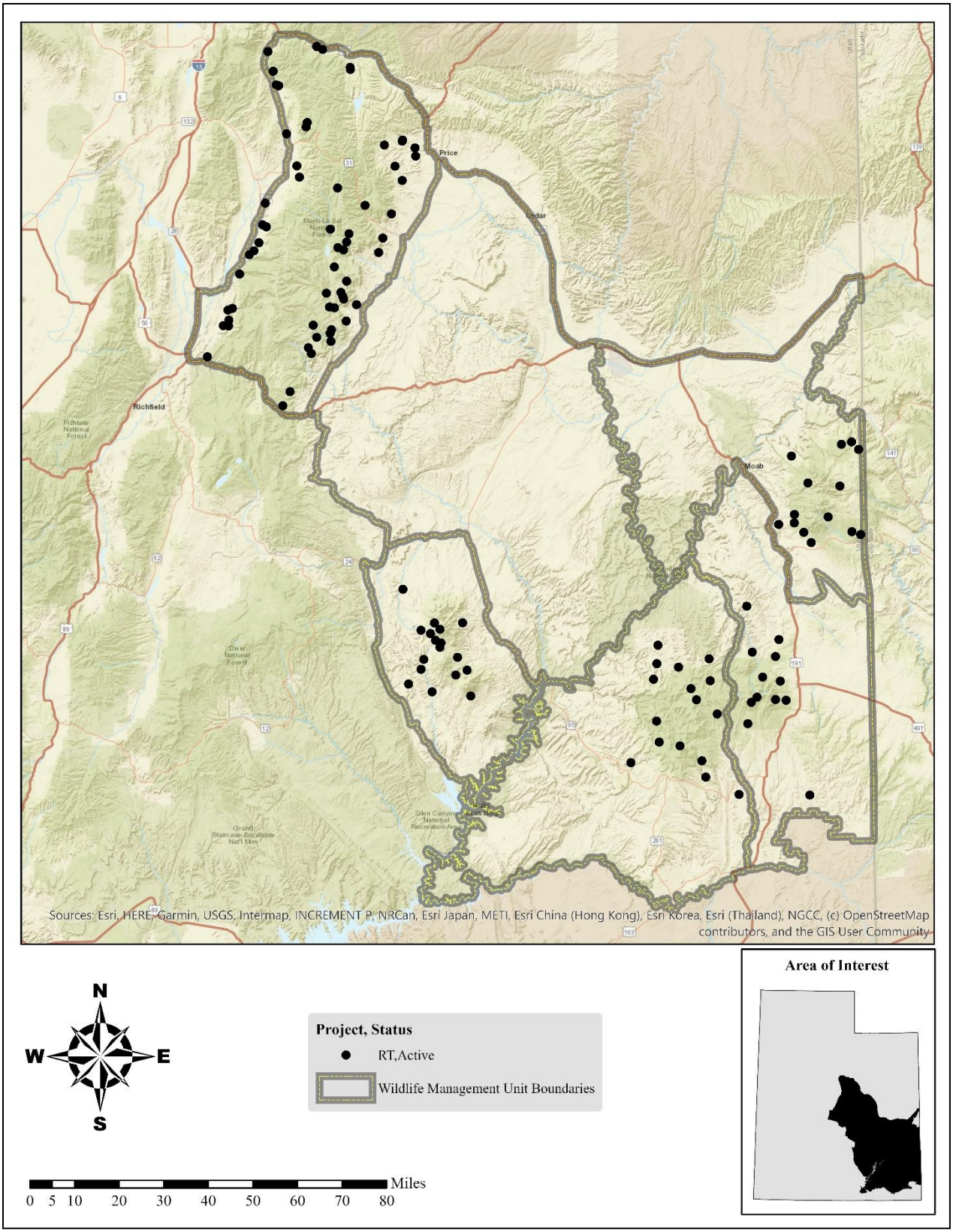
Deer Winter Range Condition Assessment: The desirable components index (DCI) for deer was created by Range Trend Program personnel as a tool to address condition and/or value of winter ranges for mule deer. This index is meant to be a companion to, and not a replacement for, the site-specific range trend 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, recruitment of young shrubs, 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 whether 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 soil stability, hydrologic function, and other environmental factors into account, this index should not be used to assess a sites function and/or condition as typically used by federal land management agencies.

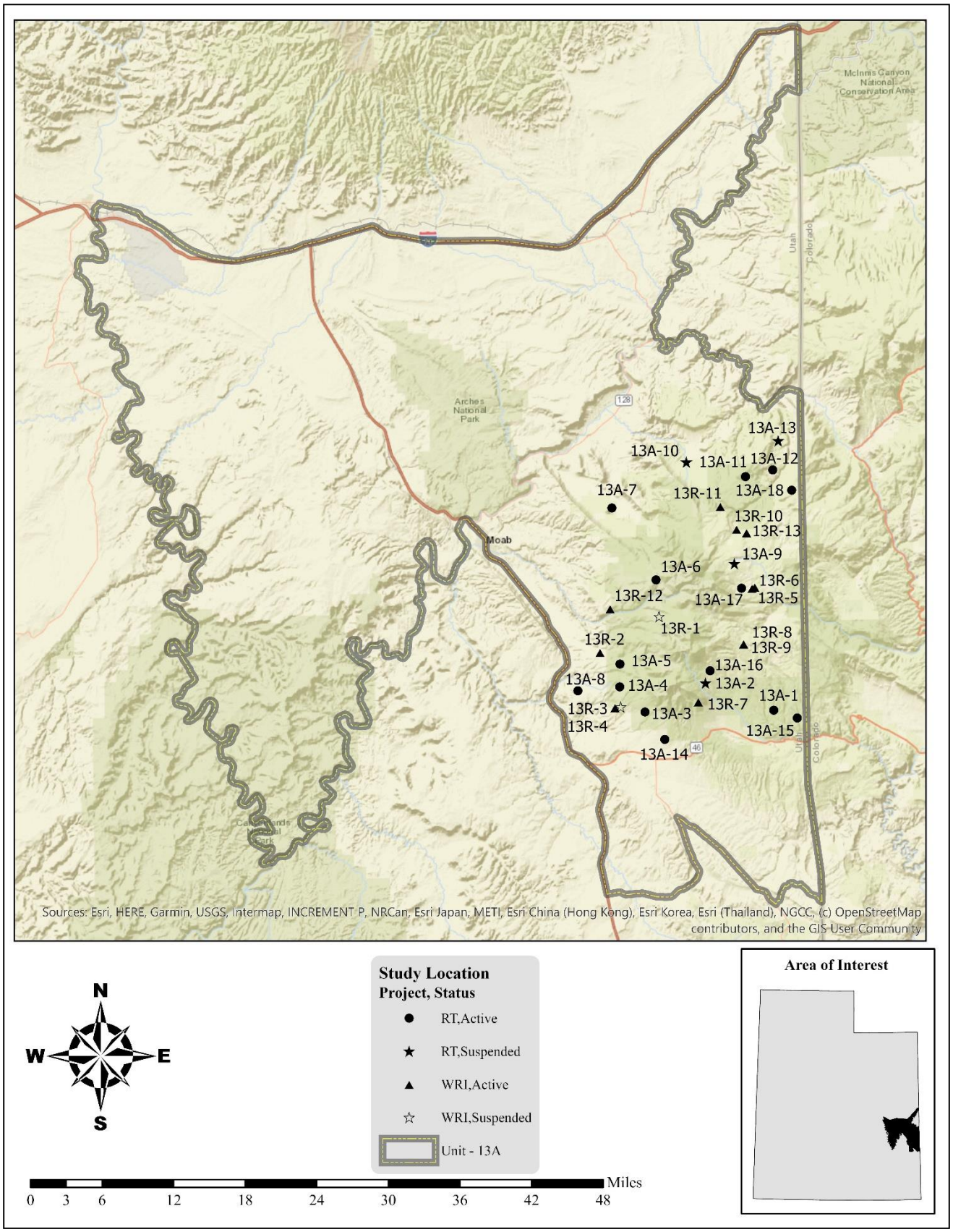
Changes in DCI over the sample years for both treated and untreated sites are included in the figures near the end of the summary. Care should be taken when interpreting these tables as the number of sites included in each year may vary. This could be misleading if the overall DCI seems to be improving, when really the very poor or poor sites may be excluded due to a lack of sampling in a certain year.

Discussion and Recommendations: Each of the ecological site descriptions were assessed for their overall threats based on species composition and cover. Common threats to these sites were pinyon-juniper encroachment and introduced perennial and/or annual grass species. Impacts of these threats include reduced vigor of understory species, a decrease in herbaceous diversity, and/or increased fire potential. Some sites did not have these issues and were classified as “none identified.”

UNIT SUMMARIES



1. WILDLIFE MANAGEMENT UNIT 13A – LA SAL MOUNTAINS



WILDLIFE MANAGEMENT UNIT 13A – LA SAL MOUNTAINS

Boundary Description

Ground and San Juan counties - Boundary begins at I-70 and the Green River; south along the Green River to the Colorado River; north along the Colorado River to Kane Springs Creek; southeast along Kane Springs Creek to Hatch Wash; southeast along Hatch Wash to US-191; south on US-191 to Big Indian Road; east on Big Indian Road to Lisbon Valley Road; east on Lisbon Valley Road to Island Mesa Road; east on Island Mesa Road to the Utah-Colorado state line; north on the state line to the Dolores River; northwest along the Dolores River to the Colorado River; northeast along the Colorado River to the Utah-Colorado state line; north on the state line to I-70; west on I-70 to the Green River.

Management Unit Description

Geography

The La Sal Mountains wildlife management unit covers a vast and varied area including the section of the Colorado Plateau that falls between the Utah/Colorado border and the Green River. This management unit also contains the Colorado River, La Sal mountain range, Arches National Park, and the north end of Canyonlands National Park. Mount Peale, the highest point of the La Sal Mountains and the management unit, reaches 12,721ft. The lowest point of the unit is just less than 4,000ft and along the Colorado River near Dead Horse Point State Park. Towns in this area include Moab, Castle Valley, La Sal, and Cisco.

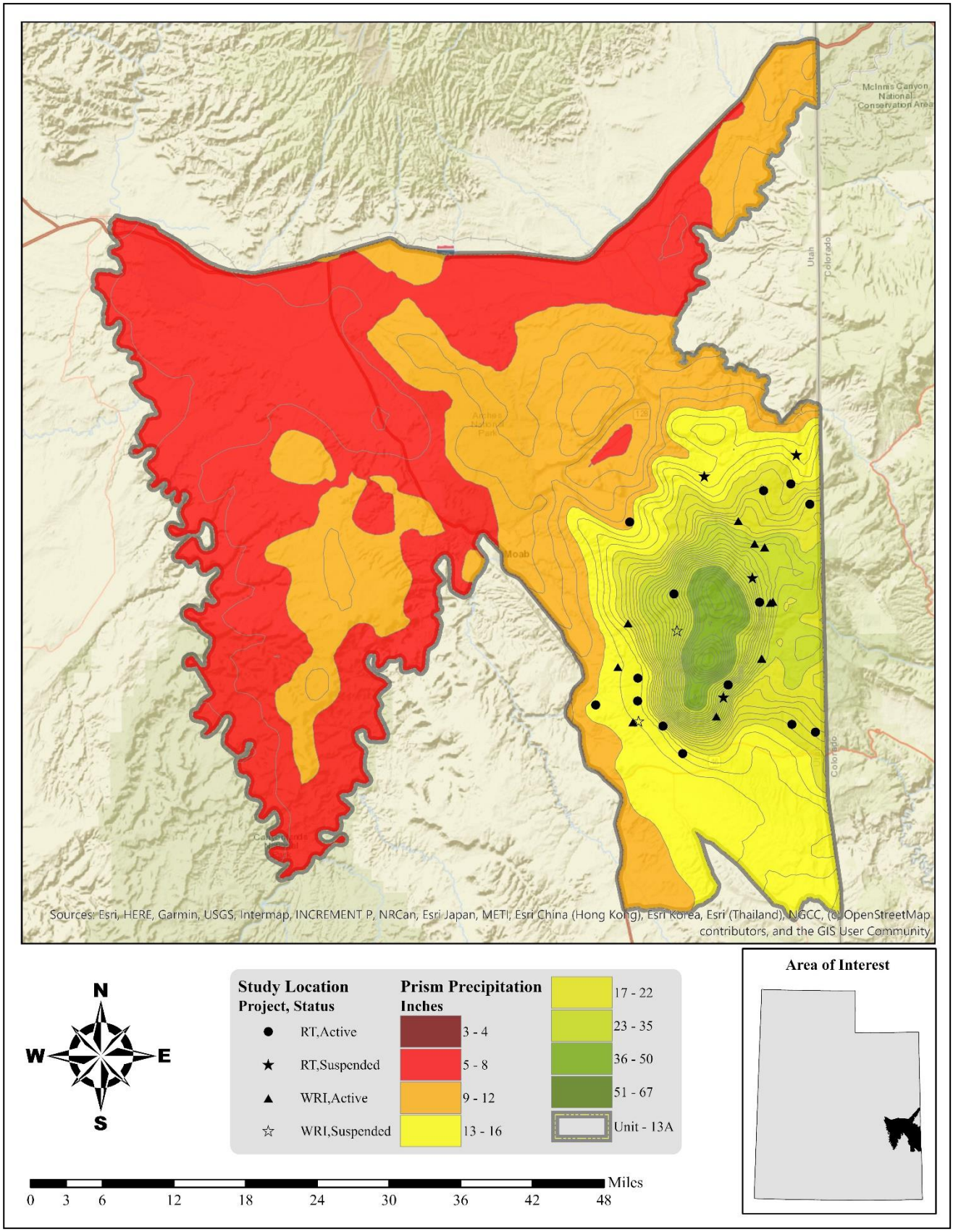
The Colorado and Green Rivers are carved into the Colorado Plateau: these rivers and their tributaries have shaped this region. The Green and Colorado rivers converge within Canyonlands National Park.

Climate Data

The 30-year (1981-2010) annual precipitation PRISM model shows precipitation ranges on the unit from 7 inches along the Green River to 45 inches on the peaks of the La Sal Mountains. All of the Range Trend and WRI monitoring studies on the unit occur between 12 and 31 inches of precipitation (**Map 1.1**) (PRISM Climate Group, Oregon State University, 2013).

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Palmer Drought Severity Index (PDSI) data for the unit was compiled from the National Oceanic and Atmospheric Administration (NOAA) Physical Sciences Division (PSD) as part of the Southeast division (Division 7).

The mean annual PDSI of the Southeast division displayed years of moderate to extreme drought from 1989-1990, 2002-2003, 2009, 2012, and 2018. The mean annual PDSI displayed moderately to extremely wet years from 1983-1985, 2005, and 2019 (**Figure 1.1a**). The mean spring (March-May) PDSI displayed years of moderate to extreme drought in 1989-1991, 1996, 2002-2004, 2012-2013, and 2018. Moderately to extremely wet years for this time period were displayed in 1983-1985, 1993, 2005, and 2019. The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1989-1990, 2002-2003, 2009, 2012, and 2017; moderately to extremely wet years were displayed in 1983-1985, 1997, 2013, and 2019 (**Figure 1.1b**) (Time Series Data, 2020).



Map 1.1: The 1981-2010 PRISM Precipitation Model for WMU 13A, La Sal Mountains (PRISM Climate Group, Oregon State University, 2013).

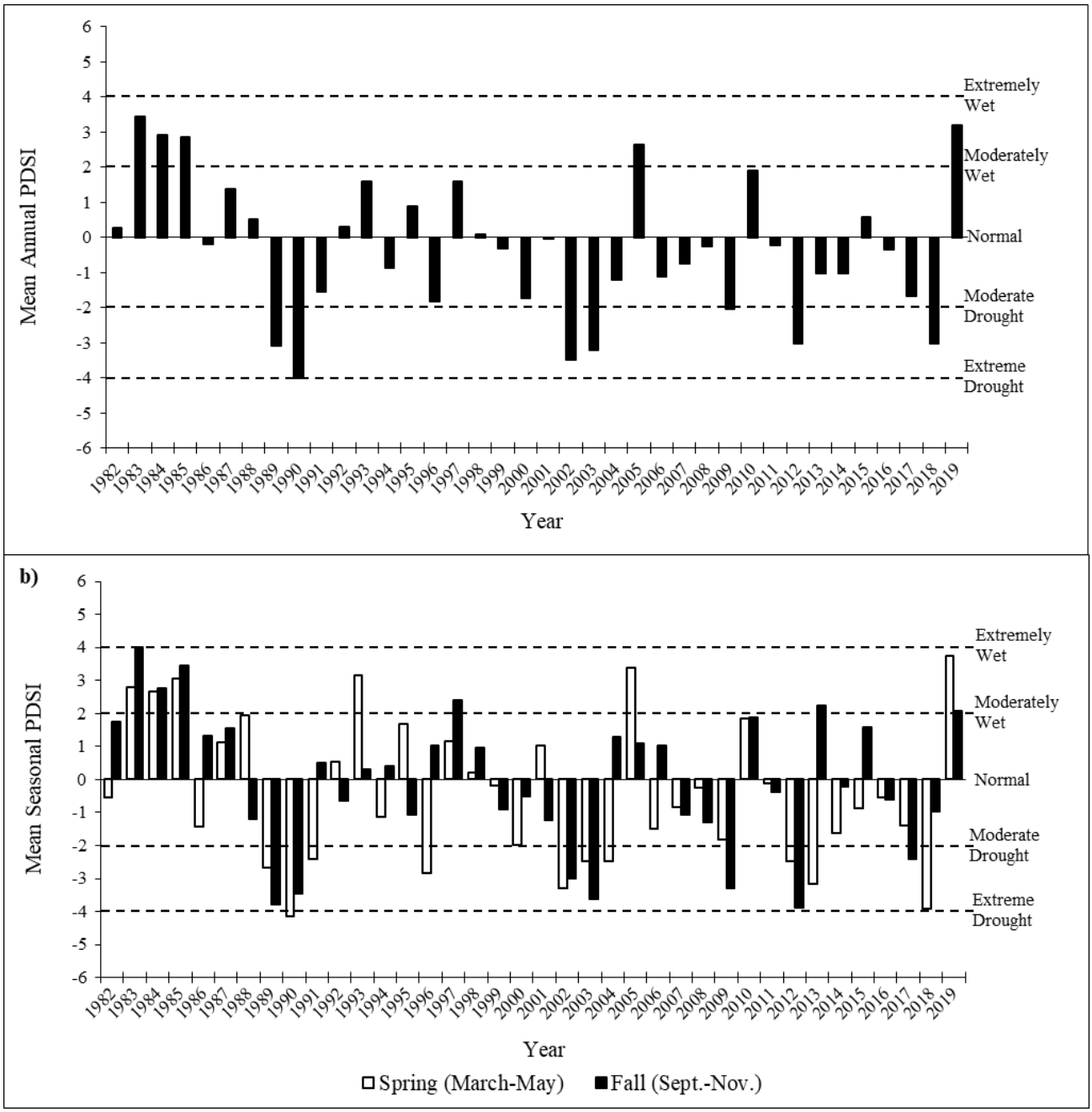


Figure 1.1: The 1982-2019 Palmer Drought Severity Index (PDSI) for the Southeast division (Division 7). The PDSI is based on climate data gathered from 1895 to 2019. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought. a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.) (Time Series Data, 2020).

Big Game Habitat

There are an estimated 507,156 acres classified as deer range on Unit 13A with 55% classified as winter range, 36% as summer range, and 9% considered to be year-long range (**Table 1.1**, **Map 1.2**).

Land managed by the Bureau of Land Management comprises 73% of the winter range, 13% is administered by the United States Forest Service (USFS), 8% is privately owned, 5% is managed by the Utah School and Institutional Trust Lands Administration (SITLA), and less than 1% each is managed by the Utah Department of Transportation (UDOT) and Utah Division of Natural Resources (UDNR) (**Table 1.2**, **Map 1.2**, **Map 1.7**). Of the elk winter range, 45% is administered by the USFS, 41% by the BLM, 10% is privately owned, 4% is managed by SITLA, and less than 1% is managed by UDOT (**Table 1.3**, **Map 1.3**, **Map 1.7**).

According to Landfire Existing Vegetation Coverage models, shrublands comprise just over 60% of the unit. Nearly half of the shrubland consists of blackbrush and Mormon tea according to the model (**Table 1.7**): blackbrush is a key browse species for mule deer, but much of this shrubland is not considered mule deer habitat.

The predominant vegetation in the northern and western portions of this unit is a desert shrub type which receives little use by deer or elk. This lower country is inhabited mostly by desert bighorn sheep and antelope, while the deer and elk range is centered on and around the La Sal Mountains. However, the 12,000 foot talus peaks of these mountains are bare. The mountains level off at about 8,000 feet to form a plateau, then slope gently down to the desert below at about 4,000 feet; deer generally winter on the mesas at 8,000 feet or lower. South-facing slopes in steep canyons and the low desert areas also provide some additional wintering areas.

Key big game areas include the Fisher Valley-Fisher Mesa area, lower Castle Valley severe winter range, Upper Castle Valley and Porcupine Draw, Bromley Ridge, Black Ridge, Pole Canyon-Slaughter Flats-Buck Hollow, and North Beaver Mesa.

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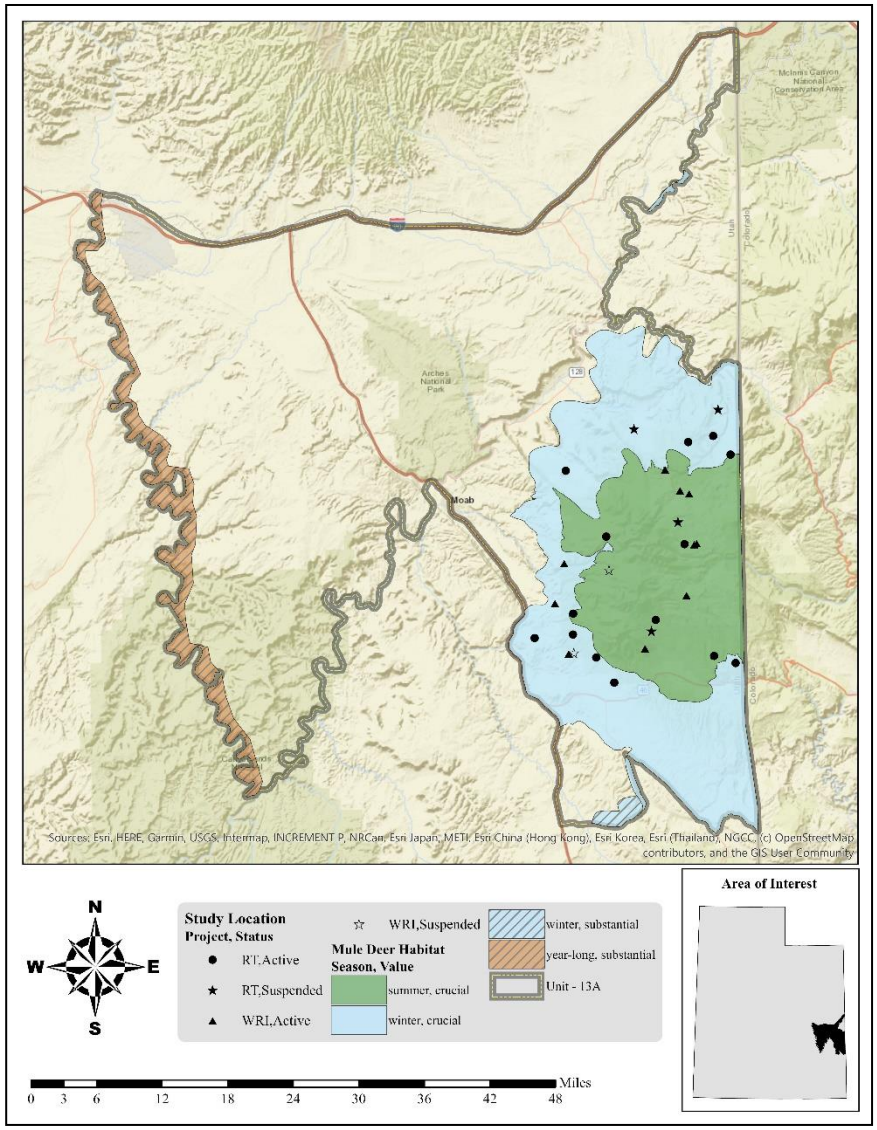
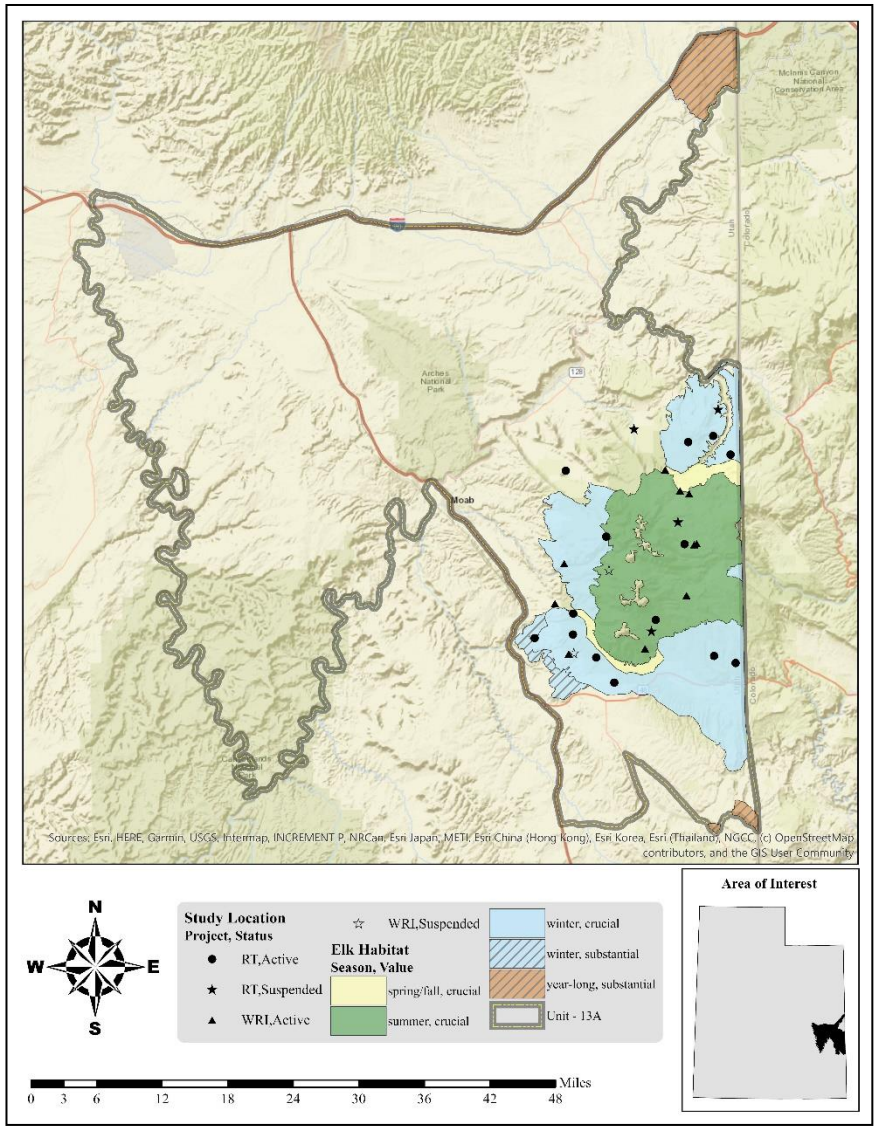
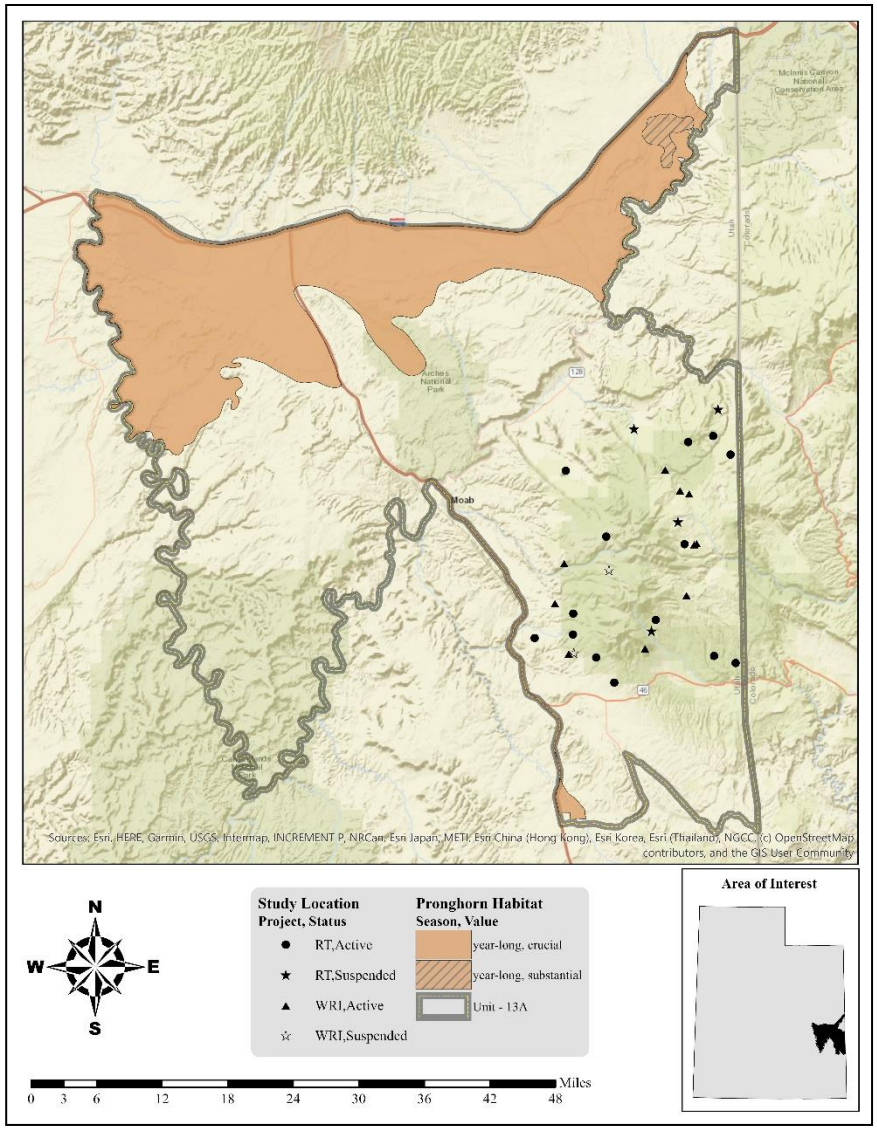


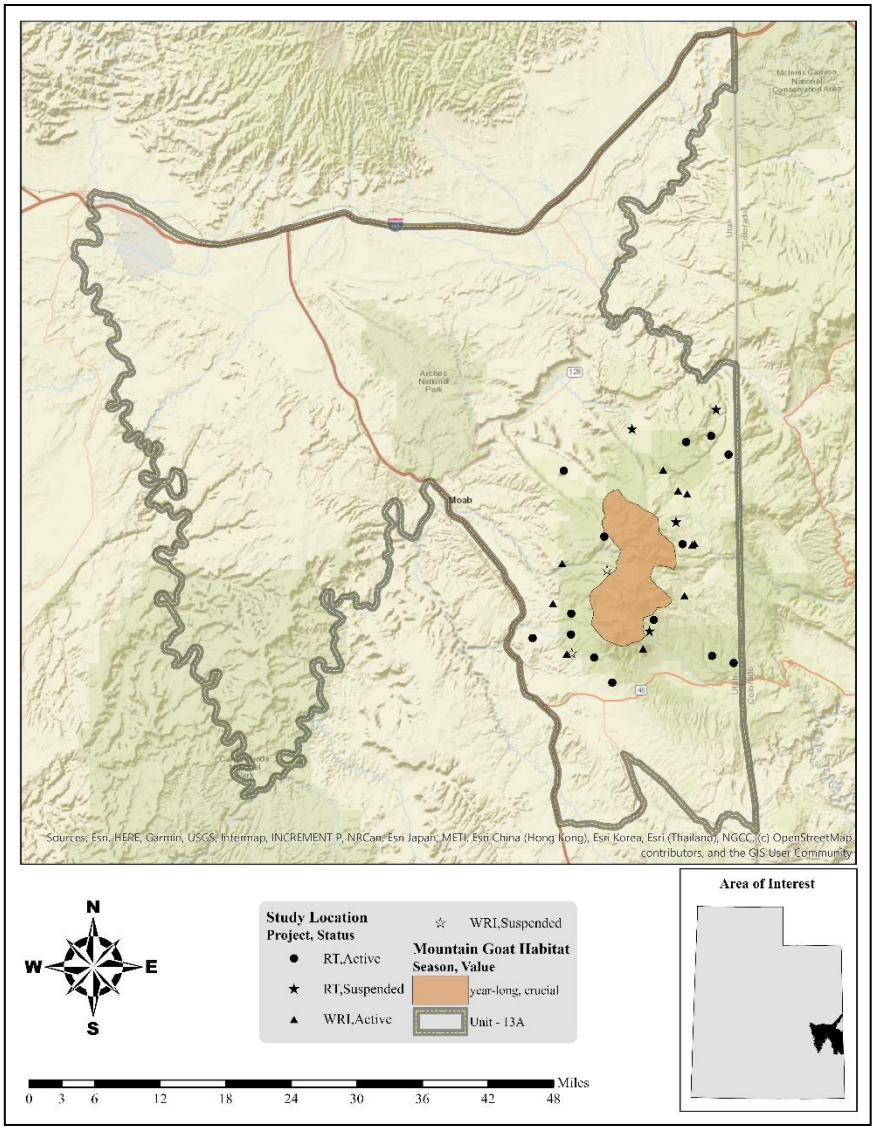
Map 1.2: Estimated mule deer habitat by season and value for WMU 13A, La Sal Mountains.



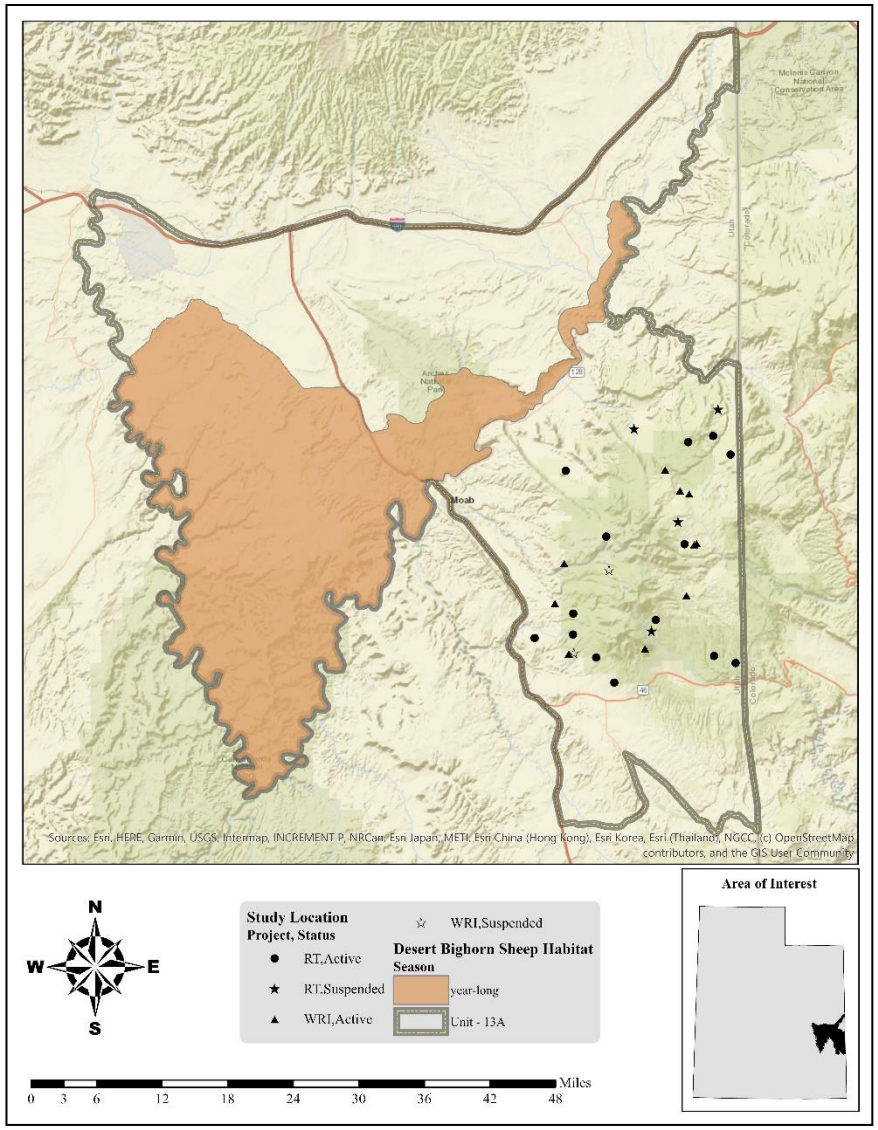
Map 1.3: Estimated elk habitat by season and value for WMU 13A, La Sal Mountains.



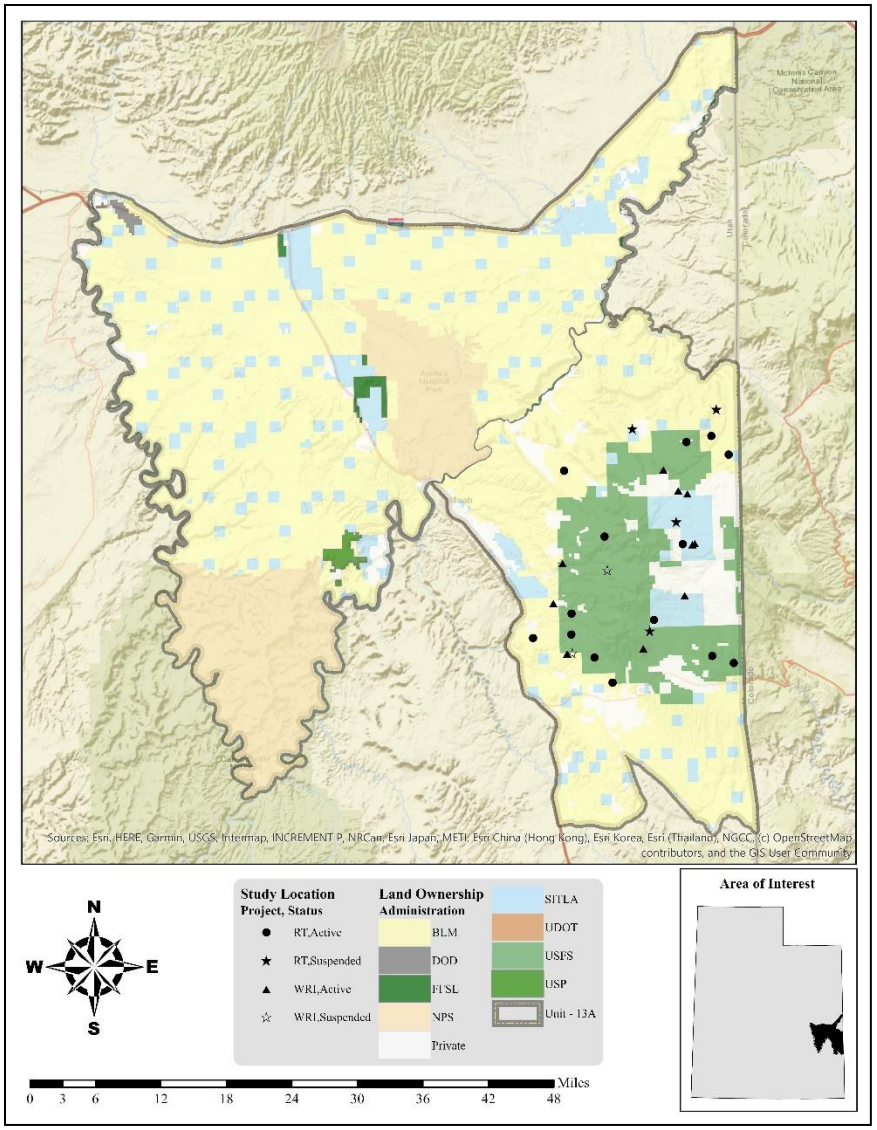
Map 1.4: Estimated pronghorn habitat by season and value for WMU 13A, La Sal Mountains.



Map 1.5: Estimated mountain goat habitat by season and value for WMU 13A, La Sal Mountains.



Map 1.6: Estimated desert bighorn sheep habitat by season and value for WMU 13A, La Sal Mountains.



Map 1.7: Land ownership for WMU 13A, La Sal Mountains.

	Year Long Range		Summer Range		Winter Range		Spring/Fall Range	
Species	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
Mule Deer	47,011	9%	182,027	36%	278,118	55%	0	0%
Elk	23,099	8%	113,382	39%	143,722	49%	11,714	4%
Pronghorn	383,567	100%	0	0%	0	0%	0	0%
Mountain Goat	42,207	100%	0	0%	0	0%	0	0%
Desert Bighorn Sheep	493,526	100%	0	0%	0	0%	0	0%

Table 1.1: Estimated mule deer, elk, pronghorn, mountain goat, and Desert Bighorn Sheep habitat acreage by season for WMU 13A, La Sal Mountains.

	Summer Range		Winter Range		Year Long Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	2,302	1%	203,179	73%	20,586	44%
Private	46,231	26%	23,502	8%	2,999	6%
SITLA	29,227	16%	14,841	5%	1,209	3%
USFS	104,267	57%	36,273	13%	0	0%
UDOT	0	0%	81	<1%	0	0%
UDNR	0	0%	243	<1%	4,008	8%
DOD	0	0%	0	0%	64	<1%
NPS	0	0%	0	0%	18,145	39%
Total	182,027	**100%**	278,118	**100%**	47,011	**100%**

Table 1.2: Estimated mule deer habitat acreage by season and ownership for WMU 13A, La Sal Mountains.

	Summer Range		Winter Range		Year Long Range		Spring/Fall Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	116	<1%	58,557	41%	19,905	86%	1,483	13%
Private	34,287	30%	15,014	10%	939	4%	1,880	16%
SITLA	27,949	25%	5,049	4%	1,889	8%	86	<1%
USFS	51,030	45%	65,049	45%	0	0%	8,265	71%
UDOT	0	0%	52	<1%	185	1%	0	0%
UDNR	0	0%	0	0%	180	1%	0	0%
Total	113,382	**100%**	143,722	**100%**	23,099	**100%**	11,714	**100%**

Table 1.3: Estimated elk habitat acreage by season and ownership for WMU 13A, La Sal Mountains.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	294,667	77%
Private	13,693	4%
SITLA	56,552	15%
UDOT	766	<1%
UDNR	2,680	<1%
DOD	2,536	<1%
NPS	12,672	3%
Total	383,567	**100%**

Table 1.4: Estimated pronghorn habitat acreage by season and ownership for WMU 13A, La Sal Mountains.

	Year Long Range	
Ownership	*Area (acres)*	*%*
Private	1,736	4%
SITLA	3,574	9%
USFS	36,897	87%
Total	42,207	**100%**

Table 1.5: Estimated mountain goat habitat acreage by season and ownership for WMU 13A, La Sal Mountains.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	276,669	56%
Private	9,890	2%
SITLA	31,368	6%
UDOT	69	<1%
UDNR	8,320	2%
NPS	167,211	34%
Total	493,526	**100%**

Table 1.6: Estimated desert bighorn sheep habitat acreage by season and ownership for WMU 13A, La Sal Mountains.

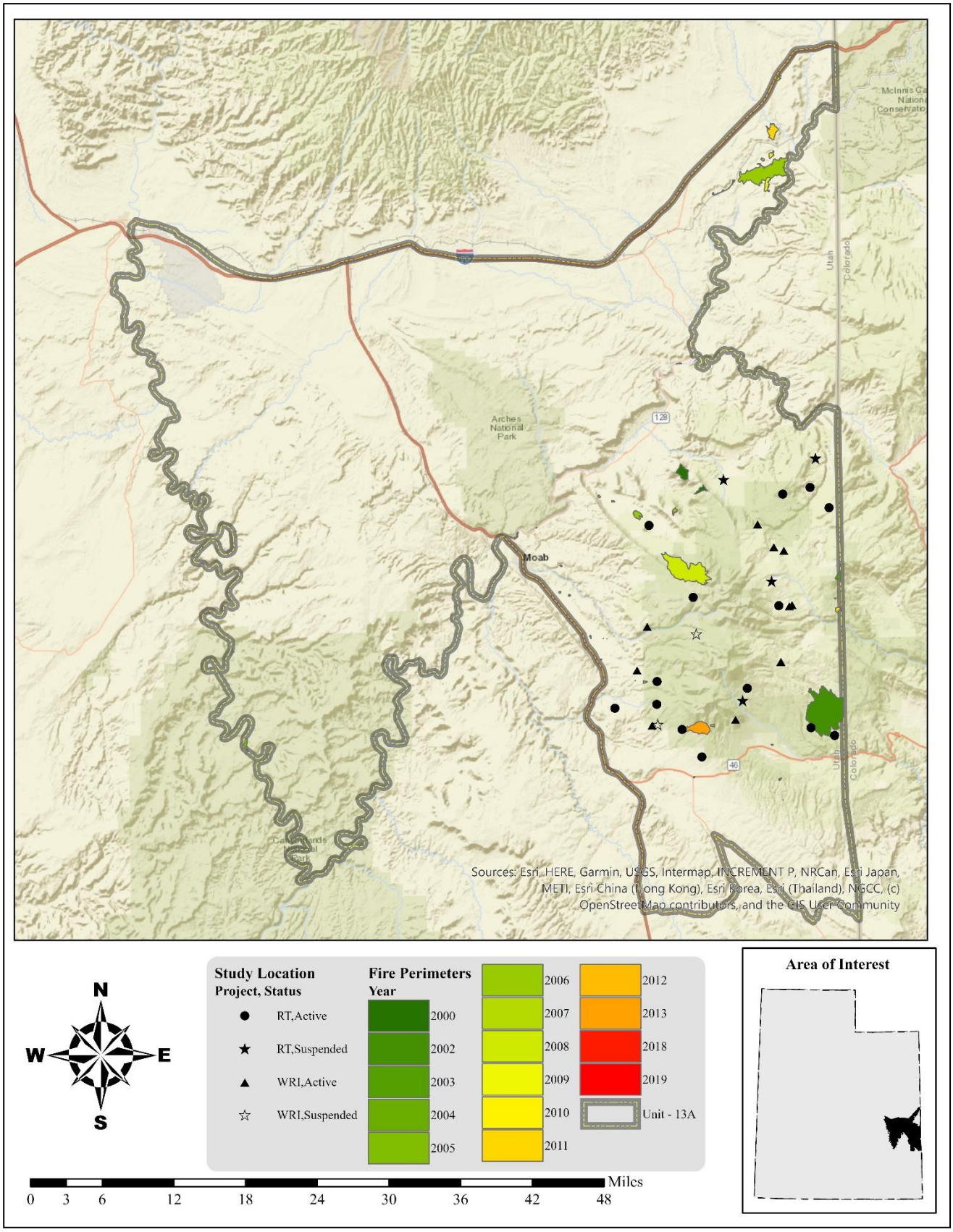
Group	Existing Vegetation Type	Acres	% of Total	Group % of Total
Shrubland	Colorado Plateau Blackbrush-Mormon-tea Shrubland	327,478	29.06%	
	Inter-Mountain Basins Mat Saltbush Shrubland	103,690	9.20%	
	Colorado Plateau Pinyon-Juniper Shrubland	66,634	5.91%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	47,094	4.18%	
	Inter-Mountain Basins Big Sagebrush Shrubland	46,661	4.14%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	26,438	2.35%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	20,834	1.85%	
	Inter-Mountain Basins Greasewood Flat	17,216	1.53%	
	Southern Colorado Plateau Sand Shrubland	15,373	1.36%	
	Rocky Mountain Lower Montane-Foothill Shrubland	3,067	0.27%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	2,370	0.21%	
	Inter-Mountain Basins Montane Sagebrush Steppe	1,903	0.17%	
	Other Shrubland	348	0.03%	60.25%
Conifer	Colorado Plateau Pinyon-Juniper Woodland	180,443	16.01%	
	Southern Rocky Mountain Ponderosa Pine	29,335	2.60%	
	Rocky Mountain Subalpine Forest and Woodland	10,353	0.92%	
	Southern Rocky Mountain Mixed Conifer Forest and Woodland	6,699	0.59%	
	Other Conifer	890	0.08%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	10	0.00%	20.21%
Other	Sparsely Vegetated	119,658	10.62%	
	Hardwood	26,334	2.34%	
	Developed	9,319	0.83%	
	Agricultural	8,514	0.76%	
	Open Water	7,121	0.63%	
	Riparian	4,181	0.37%	
	Conifer-Hardwood	2,639	0.23%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	1,091	0.10%	15.87%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	28,103	2.49%	
	Interior West Ruderal Riparian	1,518	0.13%	
	Interior Western North American Temperate Ruderal Shrubland	807	0.07%	2.70%
Exotic Herbaceous	Great Basin & Intermountain Introduced Annual Grassland	2,643	0.23%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	2,041	0.18%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	1,173	0.10%	
	Interior Western North American Temperate Ruderal Grassland	936	0.08%	0.60%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	1,587	0.14%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	1,176	0.10%	
	Southern Rocky Mountain Montane-Subalpine Grassland	913	0.08%	
	Other Grassland	467	0.04%	
	Rocky Mountain Alpine Grassland	5	0.00%	0.37%
Total		**1,127,062**	**100%**	**100%**

Table 1.7: LANDFIRE Existing Vegetation Coverage (LANDFIRE.US_140EVT, 2020) for WMU 13A, La Sal Mountains.

Limiting Factors to Big Game Habitat

Habitat quality and quantity are the main limiting factors on this subunit. Continual monitoring of range conditions and deer use will help to maintain and improve habitat. In addition, preserving and protecting existing crucial deer ranges may be possible by seeking cooperative projects with federal land management agencies and private landowners in carrying out habitat improvements such as reseedings, controlled burns, water developments, etc. It is also important to plan and evaluate resources uses and developments that could impact habitat quality, develop specific vegetation objectives to maintain the quality of important deer use areas, and work toward long-term habitat protection and preservation through the use of agreements with land management agencies and local governments, and through the use of conservation easements etc. on private lands. Deer fences and crossings limiting range are always a concern. However, cooperation with the Utah Department of Transportation in construction of highway fences, passage structures, warning signs, etc. will continue to ensure proper access to habitat as well as deer and human safety.

Encroachment by pinyon-juniper woodland communities may pose a threat to important rangelands. Pinyon-juniper woodlands comprise 16% of the unit according to the Landfire Existing Vegetation Coverage Model (**Table 1.7**). Encroachment and invasion of these woodlands into sagebrush communities has been shown to decrease the sagebrush and herbaceous components, therefore decreasing available forage for wildlife (Miller, Svejcar, & Rose, 2000).



Map 1.8: Land coverage of fires by year from 2000-2019 for WMU 13A, La Sal Mountains (Geosciences and Environmental Change Science Center (GECSC) Outgoing Datasets, 2020).

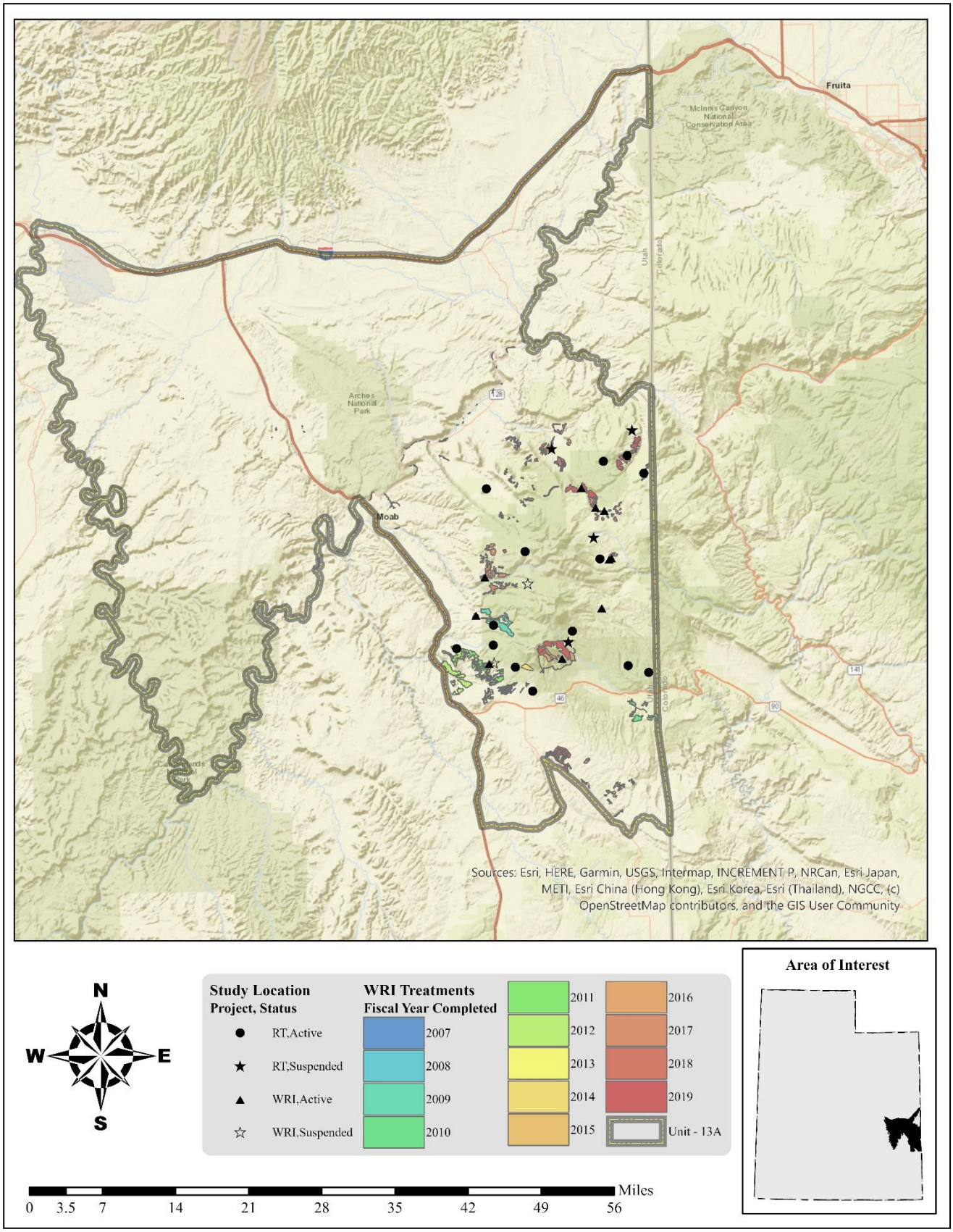
Treatments/Restoration Work

There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 17,371 acres of land have been treated within the La Sal Mountains unit since the WRI was implemented in 2004 (**Map 1.9**). An additional 4,004 acres are currently being treated and treatments have been proposed for 4,905 acres. Treatments frequently overlap one another bringing the total completed treatment acres to 19,894 acres for this unit (**Table 1.8**, **Map 1.9**). Other treatments have occurred outside of the WRI through independent agencies and landowners, but the WRI comprises the majority of work done on deer winter ranges throughout the state of Utah.

Vegetation removal/hand crew treatments such as lop and scatter to remove pinyon and juniper have treated the most acres in this unit followed by bullhog. Other management practices include (but are not limited to): prescribed fires to promote aspen regeneration and forest health, seeding to augment the herbaceous understory, and other similar vegetation removal techniques (**Table 1.8**).

Type	Completed Acreage	Current Acreage	Proposed Acreage	Total Acreage
Bullhog	**5,517**	**1,288**	**212**	**7,017**
Full Size	4,570	1,288	212	6,070
Skid Steer	947	0	0	947
Chain Harrow	**89**	**0**	**0**	**89**
>15 ft. (One-Way)	89	0	0	89
Forestry Practices	**124**	**57**	**0**	**181**
Ripping	124	0	0	124
Clearcutting	0	57	0	57
Harrow	**180**	**0**	**0**	**180**
≤15 ft. (One-Way)	180	0	0	180
Herbicide Application	**449**	**86**	**72**	**607**
Ground	308	0	18	326
Spot Treatment	141	86	54	281
Interseeding	**18**	**0**	**0**	**18**
Interseeding	18	0	0	18
Mowing	**5**	**34**	**0**	**39**
Brush Hog	0	34	0	34
Other	5	0	0	5
Planting/Transplanting	**93**	**60**	**18**	**171**
Container Stock	0	2	0	2
Bareroot Stock	56	0	18	74
Bareroot/Container Stock	15	0	0	15
Other	22	58	0	80
Prescribed Fire	**1,842**	**2,562**	**3,251**	**7,655**
Prescribed Fire	1,835	2,562	3,251	7,648
Pile Burn	7	0	0	7
Seeding (Primary)	**2,371**	**1**	**212**	**2,584**
Broadcast (Aerial-Fixed Wing)	246	0	212	458
Broadcast (Aerial-Helicopter)	1,559	0	0	1,559
Ground (Mechanical Application)	485	1	0	486
Drill (Rangeland)	18	0	0	18
Hand Seeding	63	0	0	63
Seeding (Secondary)	**89**	**2**	**0**	**91**
Ground (Mechanical Application)	89	0	0	89
Hand Seeding	0	2	0	2
Vegetation Removal/Hand Crew	**9,117**	**1,325**	**1,420**	**11,862**
Lop & Scatter	6,910	1,295	460	8,665
Lop-Pile-Burn	1,842	0	870	2,712
Lop & Chip	7	1	36	44
Cut Stump	358	29	54	441
Other	**0**	**57**	**4**	**61**
Road Decommissioning	0	57	4	61
Grand Total	**19,894**	**5,472**	**5,189**	**30,555**
*** Total Land Area Treated**	**17,371**	**4,044**	**4,905**	**26,320**

Table 1.8: WRI treatment action size (acres) for completed, current, and proposed projects for WMU 13A, La Sal Mountains. Data accessed on 02/19/2020. *Does not include overlapping treatments.



Map 1.9: WRI treatments by fiscal year completed for WMU 13A, La Sal Mountains.

Range Trend Studies

Range Trend studies have been sampled within WMU 13A on a regular basis since 1987, with studies being added or suspended as was deemed necessary (**Table 1.9**). Due to changes in sampling methodologies, only data collected following the 1992 sample year is included in this summary. Monitoring studies of WRI projects began in 2004; when possible WRI monitoring studies are established prior to treatment and sampled on a regular basis following treatment. Due to the long-term nature of the studies, many of the Range Trend and WRI studies have had some sort of disturbance or treatment prior to or since study establishment (**Table 1.10**).

Range Trend studies are summarized in this report by ecological site. Range Trend and WRI studies that have had a disturbance or treatment during the reported sample period are summarized in this report by the disturbance or treatment type and are summarized by region.

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
13A-1	Two Mile Chaining	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019	Mountain Loam (Mountain Big Sagebrush)
13A-2	East LaSal Pass	RT	Suspended	1987, 1994, 1999	Not Verified
13A-3	Buck Hollow	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019	Upland Stony Loam (Pinyon-Utah Juniper)
13A-4	Slaughter Flat	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019	Upland Loam (Mountain Big Sagebrush)
13A-5	Amasas Back	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019	Upland Stony Loam (Pinyon-Utah Juniper)
13A-6	Bald Mesa	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019	High Mountain Loam (Mountain Big Sagebrush)
13A-7	Round Mountain	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019	Semidesert Stony Loam (Blackbrush)
13A-8	Black Ridge	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019	Upland Loam (Mountain Big Sagebrush)
13A-9	Taylor Flat	RT	Suspended	1987, 1994, 1999	Not Verified
13A-10	Upper Fisher Valley	RT	Suspended	1987, 1994, 1999, 2004, 2009	Not Verified
13A-11	North Beaver Mesa	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019	Upland Loam (Mountain Big Sagebrush)
13A-12	Below Polar Rim	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019	Upland Loam (Mountain Big Sagebrush)
13A-13	Beaver Canyon	RT	Suspended	1987, 1994	Not Verified
13A-14	Lower Lackey Fan	RT	Active	1994, 1999, 2004, 2009, 2014, 2019	Upland Stony Loam (Wyoming Big Sagebrush)
13A-15	Hideout Mesa	RT	Active	1994, 1999, 2004, 2009, 2014, 2019	Mountain Loam (Mountain Big Sagebrush)
13A-16	Beaver Creek	RT	Active	2004, 2009, 2014, 2019	High Mountain Loam (Aspen)
13A-17	Bar -A	RT	Active	2004, 2009, 2014, 2019	High Mountain Loam (Thurber Fescue)
13A-18	Dolores Point	RT	Active	2019	Mountain Loam (Mountain Big Sagebrush)
13R-1	Horse Creek Burn	WRI	Suspended	2007	Not Verified
13R-2	Pack Creek	WRI	Active	2007, 2010, 2014, 2019	Semidesert Stony Loam (Blackbrush)
13R-3	Black Ridge Fuel Reduction	WRI	Active	2010, 2013, 2016	Upland Gravelly Loam (Pinyon-Utah Juniper)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
13R-4	Black Ridge Fuel Reduction Reference	WRI	Suspended	2010	Not Verified
13R-5	La Sal Aspen Exclosure	WRI	Active	2011, 2014, 2019	High Mountain Loam (Aspen)
13R-6	La Sal Aspen	WRI	Active	2011, 2014, 2019	High Mountain Loam (Aspen)
13R-7	Doe Canyon	WRI	Active	2013, 2018	High Mountain Loam (Aspen)
13R-8	Hop Creek Aspen	WRI	Active	2013, 2016	High Mountain Loam (Aspen)
13R-9	Hop Creek Aspen Exclosure	WRI	Active	2013, 2016	High Mountain Loam (Aspen)
13R-10	Brush Hole	WRI	Active	2016	Mountain Loam (Oak)
13R-11	Above Fisher Creek	WRI	Active	2018	Mountain Stony Loam (Browse)
13R-12	South Mesa	WRI	Active	2018	Mountain Shallow Loam (Black Sagebrush)
13R-13	Sids Draw	WRI	Active	2019	Mountain Loam (Oak)

Table 1.9: Range trend and WRI project studies monitoring history and ecological site potential for WMU 13A, La Sal Mountains.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
13A-1	Two Mile	Chain Unknown		1978	900	
	Chaining	Seed Unknown		1978	900	
13A-3	Buck Hollow	Chain Unknown	Buck Hollow	1982	700	
		Seed Unknown	Buck Hollow	1982	700	
13A-4	Slaughter Flat	Chain Unknown		1974	940	
		Seed Unknown		1974	940	
13A-5	Amasas Back	Chain Unknown		1978	750	
		Seed Unknown		1978	750	
13A-8	Black Ridge	Chain Unknown		Historic		
		Seed Unknown		Historic		
	Black Ridge	Lop and Scatter	Black Ridge Fuels Reduction and Vegetation Restoration - Phase II	2011	1,359	1730
13A-10	Upper Fisher Valley	Two-Way Chain Unknown		1960		
		Seed Unknown		1960		
		Lop and Scatter	Moab Mule Deer Winter Range Improvement Project-Fisher Mesa Phase 1	October-November 2016	431	3790
13A-11	North Beaver Mesa	Chain Unknown		1962	1,000	
		Seed Unknown		1962	1,000	
13A-12	Below Polar Rim	Two-Way Chain Unknown		1969	1,540	
		Seed Unknown		1969	1,540	
		Lop and Scatter	Moab Mule Deer Winter Range Habitat Improvement-Phase 3	November 2018	1,470	4514
13A-14	Lower Lackey Fan	Herbicide		Historic		
		Unknown				
		Seed Unknown		Historic		
13A-15	Hideout Mesa	Wildfire	Hideout Mesa Fire	1992		
13A-18	Dolores Point	Lop and Scatter	Moab Mule Deer Winter Range Habitat Improvement-Phase 3	November 2018	1,470	4514
13R-2	Pack Creek	Lop and Scatter	Pack Creek	2003		
		Bullhog	Pack Creek	April 2007	127	907
		Slash Pile	Pack Creek	October 2007	127	907
		Broadcast/Harrow	Pack Creek	October 2007	127	907
13R-3	Black Ridge Fuel Reduction	Aerial Before	Black Ridge Tree Chaining and Seeding	Fall 1966	3,043	LTDL
		Two-Way Ely	Black Ridge Tree Chaining and Seeding	Fall 1966	3,043	LTDL
		Bullhog	Black Ridge Fuels Reduction and Vegetation Restoration	Fall 2010	1,803	1408
		Aerial Unknown	Black Ridge Fuels Reduction and Vegetation Restoration	Fall 2010	1,471	1408
13R-5	La Sal Aspen Exclosure	Logging/Clear-Cut	La Sal Mountain Aspen Enhancement	September-November 2011	124	1990
13R-6	La Sal Aspen	Logging/Clear-Cut	La Sal Mountain Aspen Enhancement	September-November 2011	124	1990
13R-7	Doe Canyon	Prescribed Fire	Lackey Basin Aspen Restoration	June 2016	665	2620
13R-8	Hop Creek Aspen	Logging/Clear-Cut		2011-2012		

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
13R-9	Hop Creek Aspen Exclosure	Logging/Clear-Cut		2011-2012		
13R-10	Brush Hole	Bullhog	Brush Hole Shrub Treatment	April-May 2017	359	3630
13R-11	Above Fisher Creek	Bullhog	North End La Sal (Brush Hole Phase 3) (Proposed)	2018	747	4614
13R-12	South Mesa	Bullhog	West Slope WUI Phase 4 (Proposed)	2018	375	4491
13R-13	Sids Draw	Bullhog	North End La Sal (Brush Hole Phase 4)	Fall 2019	1,247	4837

Table 1.10: Range trend and WRI studies known disturbance history for WMU 13A, La Sal Mountains. PDB = Pre-Database; LTDL = Land Treatment Digital Library (Pilliod & Welty, 2019).

Study Trend Summary (Range Trend)

Mountain (Aspen)

There is one study [Beaver Creek (13A-16)] that is classified as a Mountain (Aspen) ecological site. The Beaver Creek study site is located on the lower southeastern-facing slopes of Mount Peale.

Shrubs/Trees: Preferred browse cover on this site has remained generally stable over time with minor fluctuations. Mountain snowberry (*Symphoricarpos oreophilus*) has provided a majority of the browse cover in all sample years. Other preferred browse species such as Gambel oak (*Quercus gambelii*), gooseberry currant (*Ribes montigenum*), and Woods' rose (*Rosa woodsii*) have contributed marginal amounts of cover throughout the study period (**Figure 1.2**). Preferred browse density has increased over time, with mature individuals being the dominant demographic of the population in all years (**Figure 1.9**). Browse utilization has fluctuated from year to year, but has increased overall; nearly 19% of mature plants were moderately browsed in the 2019 sample year (**Figure 1.11**).

Aspen (*Populus tremuloides*) has been the only tree observed on this study site with decreasing cover values over time (**Figure 1.5**). No density data is available for the 2004 or 2009 sample year, but a decrease was observed between 2014 and 2019 (**Figure 1.7**).

Herbaceous Understory: The herbaceous understory of this study site has increased over time and has been primarily comprised of perennial grasses and forbs. Annual forb cover and abundance has increased overall, but they have been a minor understory component in all sample years. Annual grasses are not present on this site (**Figure 1.13**, **Figure 1.16**).

Occupancy: Pellet transect data shows that overall abundance has decreased and that the primary occupants have varied over time. Cattle were the primary occupants from 2004-2014 with mean pellet group abundance ranging from 11 days use/acre in 2019 to 102 days use/acre in 2009. Deer were the primary occupants in 2019 with average pellet group abundance varying from 0 days use/acre in 2009 to 15 days use/acre in 2019. Mean abundance of elk pellet groups has fluctuated between 8 days use/acre in 2009 and 2019 and 42 days use/acre in 2004 (**Figure 1.19**).

Mountain (Thurber Fescue)

One study [Bar-A (13A-17)] is considered to be a Mountain (Thurber Fescue) ecological site: this study site is situated near Bar A Creek on the lower slopes of the eastern side of the La Sal Mountains.

Shrubs/Trees: Preferred browse cover on this site has marginally increased over time, but has remained low overall; all preferred browse cover has been contributed by silver sagebrush (*Artemisia cana*) throughout the study period (**Figure 1.2**). Density of preferred browse has increased overall, but has also remained low. Mature individuals have comprised a majority of the plant population in all sample years, and decadent plants were observed for the first time in 2019 (**Figure 1.9**). Utilization has fluctuated: 80% of plants displayed moderate use in 2004, 100% were lightly browsed in 2009 and 2014 and approximately 30% were moderately hedged in 2019 (**Figure 1.11**).

Trees have not been observed on this site in either point-quarter density or cover measurements and will therefore not be discussed in this section (**Figure 1.5**, **Figure 1.7**).

Herbaceous Understory: The herbaceous understory of this study site has remained robust with perennial grasses and forbs as the main components; Kentucky bluegrass (*Poa pratensis*) and Rocky Mountain Iris (*Iris missouriensis*) have been the primary grass and forb species. Cover of both perennial grasses and forbs has decreased each year since 2009, but was still significant in 2019 (**Figure 1.13**). The nested frequency of herbaceous species has exhibited far less fluctuation than cover and has remained mostly stable over time (**Figure 1.16**).

Occupancy: Pellet transect data shows that cattle were the primary occupants of this study site in 2004 and 2019; mean abundance of cattle pellet groups has ranged from 9 days use/acre in 2014 to 44 days use/acre in 2004. Elk were the primary occupants in 2009 and 2014, and mean pellet group abundance has fluctuated between 7 days use/acre in 2019 and 28 days use/acre in 2009. Finally, deer have also been present on this site, with a mean pellet group abundance ranging from 0 days use/acre in 2019 to 2 days use/acre in 2009 (**Figure 1.19**).

Mountain (Big Sagebrush)

There are four studies [Two Mile Chaining (13A-01), Bald Mesa (13A-06), Hideout Mesa (13A-15), and Dolores Point (13A-18)] that are classified as Mountain (Big Sagebrush) ecological sites. The Two Mile Chaining study site is located just west of Trough Draw near the Utah-Colorado state line, while Bald Mesa can be found on top of Bald Mesa near Warner Lake. Hideout Mesa is situated in Dry Draw below Hideout Mesa and is roughly three-quarters of a mile west of the Utah-Colorado state line. Finally, the Dolores Point study is located just south of Dolores Point near the Utah-Colorado border.

Shrubs/Trees: These study sites have generally been co-dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and other preferred browse species such as mountain snowberry (*Symphoricarpos oreophilus*). Total shrub cover has exhibited a slight overall increase (**Figure 1.3**). Preferred browse density has fluctuated from year to year, but has increased marginally over the study period; the decrease in plants/acre between 2014 and 2019 can largely be attributed to the Hideout Mesa study. Mature individuals have comprised a majority of the browse populations on these sites in all sample years (**Figure 1.9**). Utilization of preferred browse has remained largely stable since the 1999 sample year, with 18% of plants being moderately hedged and 7% being heavily hedged in 2019 (**Figure 1.11, Figure 1.9**).

Trees sampled on these sites include both Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*); trees are absent on the Bald Mesa site. Tree cover has increased marginally over time. Density has fluctuated from year to year, but has remained largely stable overall. Twoneedle pinyon has contributed a majority of the cover and density values, the trends of which are mainly driven by the Two Mile Chaining study (**Figure 1.6**, **Figure 1.8**).

Herbaceous Understory: The herbaceous understories on these sites are primarily composed of perennial grasses and forbs with minor fluctuations in cover and frequency values between sample years. However, native annual forbs increased and were co-dominant in 2019: this trend can be attributed to all study sites except Two Mile Chaining. Annual grass cover and frequency have remained relatively low with trends almost entirely driven by the Hideout Mesa study. The introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) has been present in fluctuating amounts, but has remained relatively rare overall. Site-level data shows that trends in bulbous bluegrass are entirely driven by the Two Mile Chaining study and that it was sampled for the first time on Hideout Mesa in 2019 (**Figure 1.13**, **Figure 1.16**).

Occupancy: Pellet transect data shows that the primary occupants of these sites have varied from year to year. Cattle were the primary occupants from 1999 to 2014, and average pellet group abundance has ranged from 4 days use/acre in 2014 to 46 days use/acre in 1999 and 2004. Hideout Mesa and Bald Mesa have been the study sites with the most pellet groups over the study period. In 2019, elk were the primary occupants of these sites; elk pellet groups have had a mean abundance as low as 3 days use/acre in 2014 and as high as 38 days use/acre in 1999. Deer have also been present on these sites with a mean abundance fluctuating between 2 days use/acre in 2014 and 15 days use/acre in 1999. Finally, mean abundance of horse pellet groups has ranged from 0 days use/acre in 2004, 2014, and 2019 to 1 days use/acre in 2009 (**Figure 1.19**).

Upland (Big Sagebrush)

Five study sites [Slaughter Flat (13A-04), Black Ridge (13A-08), North Beaver Mesa (13A-11), Below Polar Rim (13A-12), and Lower Lackey Fan (13A-14)] are considered to be Upland (Big Sagebrush) ecological sites. The Slaughter Flat study site can be found on Slaughter Flat southwest of the La Sal Mountains. Black

Ridge is situated on Black Ridge and is roughly two miles east of US-191. The North Beaver Mesa study is located on the southwestern portion of North Beaver Mesa, and Below Polar Rim is situated below Polar Mesa on North Beaver Mesa. Finally, Lower Lackey Fan can be found northwest of the town of La Sal and south of Lackey Basin.

Shrubs/Trees: The primary browse species on these sites is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), with lesser amounts of cover contributed by other species. Average preferred browse cover shows that overall shrub cover has slightly increased over time, mainly due to sagebrush (**Figure 1.3**). Density of preferred browse has fluctuated, but has decreased overall. Average demographic data indicates that mature individuals have comprised a majority of the plant populations on these sites in all sample years. Recruitment of young plants has varied from year to year, but decreased between 2014 and 2019 (**Figure 1.10**). Average utilization of preferred browse has decreased each year since 2004. However, utilization remained significant in 2019, with 38% of plants receiving moderate use and 23.5% with heavy use (**Figure 1.12**).

Trees sampled on these sites include both Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*). Average tree cover has remained low throughout the study period. However, average density has increased each year since 2004, with the increase between 2014 and 2019 largely driven by the Below Polar Rim and North Beaver Mesa studies (**Figure 1.6**, **Figure 1.8**).

Herbaceous Understory: The herbaceous understories on these sites are primarily composed of perennial grasses, the cover of which has fluctuated over time. The introduced species crested wheatgrass (*Agropyron cristatum*) is the most abundant species on most sites. Overall, herbaceous cover and abundance has varied from year to year. Both cover and frequency of the understories increased between 2014 and 2019, mainly due to annual forbs and grasses. Cheatgrass (*Bromus tectorum*) has been observed throughout the study period on all study sites in fluctuating amounts, but contributed little cover in 2019 (**Figure 1.14**, **Figure 1.17**).

Occupancy: Pellet transect data shows that overall presence has decreased significantly since 1999 and that the primary occupants have varied over time. Elk were the primary occupants on these sites from 1999 to 2014, with mean abundance of pellet groups ranging from 18 days use/acre in 2014 and 2019 to 72 days use/acre in 1999. Deer were the primary occupants in 2019, however, and mean pellet group abundance has ranged from 13 days use/acre in 2014 to 40 days use/acre in 1999. Mean abundance of cattle pellet groups has been as low as 6 days use/acre in 2014 and as high as 23 days use/acre in 1999 (**Figure 1.20**).

Upland (Pinyon-Juniper)

There are two studies [Buck Hollow (13A-03) and Amasas Back (13A-05)] that are classified as Upland (Pinyon-Juniper) ecological sites. The Buck Hollow study is found just south of Cottonwood Canyon and north of Buck Hollow, and the Amasas Back study is located on Amasas Back which is south of Pack Creek.

Shrubs/Trees: Sagebrush (*Artemisia sp.*) contributes a majority of the browse cover on these study sites. However, the entirety of this sagebrush cover is due to black sagebrush (*A. nova*) on the Amasas Back study; alderleaf mountain mahogany is the dominant browse species on the Buck Hollow site. Data indicates that average preferred browse cover has slightly decreased over time, a trend largely driven by Amasas Back (**Figure 1.3**). Average density of preferred browse has decreased overall. Mature individuals have been the largest demographic in these plant populations, and decadence has exhibited a slight increase due to the Amasas Back study (**Figure 1.10**). Utilization has fluctuated over time, with over 50% of plants displaying little or no signs of hedging in 1994, 1999, 2009, and 2019 (**Figure 1.12**).

Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) are present on both study sites with significant cover and density values. Average tree cover has displayed an increasing trend over time, while density has remained mostly stable throughout the study period (**Figure 1.6**, **Figure 1.8**).

Herbaceous Understory: The herbaceous understories on these sites have fluctuated over the study period. Perennial grasses and annual grasses and forbs have been the dominant herbaceous components in many

sample years. Overall frequency and cover decreased each year from 1994 to 2014: However, cover and abundance increased in 2019: this is almost entirely due to increases in the introduced annual grass species cheatgrass (*Bromus tectorum*) and annual forbs on the Amasas Back study (**Figure 1.14**, **Figure 1.17**).

Occupancy: Pellet transect data shows that animal presence has decreased over time and that deer have been the primary occupants in all sample years. Mean abundance of deer pellet groups has ranged from 13 days use/acre in 2014 to 50 days use/acre in 1999. Elk have also been present on these sites with mean pellet group abundance varying between 9 days use/acre in 2014 and 34 days use/acre in 1999. Finally, mean abundance of cattle pellet groups has been as low as 2 days use/acre in 2004 and as high as 10 days use/acre in 1999 (**Figure 1.20**).

Semidesert (Blackbrush)

One study [Round Mountain (13A-07)] is classified as a Semidesert (Blackbrush) ecological site: this study is found on the northeastern side of Round Mountain in Castle Valley.

Shrubs/Trees: Preferred browse cover has increased over time with blackbrush (*Coleogyne ramosissima*) as the dominant species. Other preferred browse species such as mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and mormon tea (*Ephedra viridis*) have also been present, but with much less cover (**Figure 1.4**). Density of preferred browse species has decreased over the sample period. However, demographic data indicates that this decrease is largely due to a decrease in the number of decadent individuals; mature plants have comprised most of the preferred browse population in all sample years (**Figure 1.10**). Utilization has fluctuated over the sample period. 50% or less of the browse population has displayed signs of moderate to heavy use in most years: the exception to this is 2004, when 47% of plants were moderately used and 31% were heavily used (**Figure 1.12**).

Both twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have been observed on this site, the latter of which has provided the entirety of the tree cover in all sample years. Cover and density both increased over time, but decreased in the 2019 sample year (**Figure 1.6**, **Figure 1.8**).

Herbaceous Understory: The herbaceous understory for this site has been mainly comprised of the introduced annual grass species cheatgrass (*Bromus tectorum*). However, native annual forbs increased and were the dominant component in 2019. Perennial grasses and forbs have never been particularly abundant. Cover of the herbaceous understory as a whole has increased each year. Nested frequency has fluctuated, exhibiting a decrease between 1994 and 2004 and increasing since that time (**Figure 1.15**, **Figure 1.18**).

Occupancy: Average pellet transect data is not available for the 2004 sample year and is therefore absent from the figure below and not considered in this discussion. Animal presence has decreased over time on this study site. Deer have been the primary occupants in all sample years, with a mean pellet group abundance ranging from 16 days use/acre in 2019 to 78 days use/acre in 1999. Elk have also been present, with mean abundance of pellet groups fluctuating between 1 days use/acre in 2009 and 2 days use/acre in 1999, 2014, and 2019 (**Figure 1.20**).

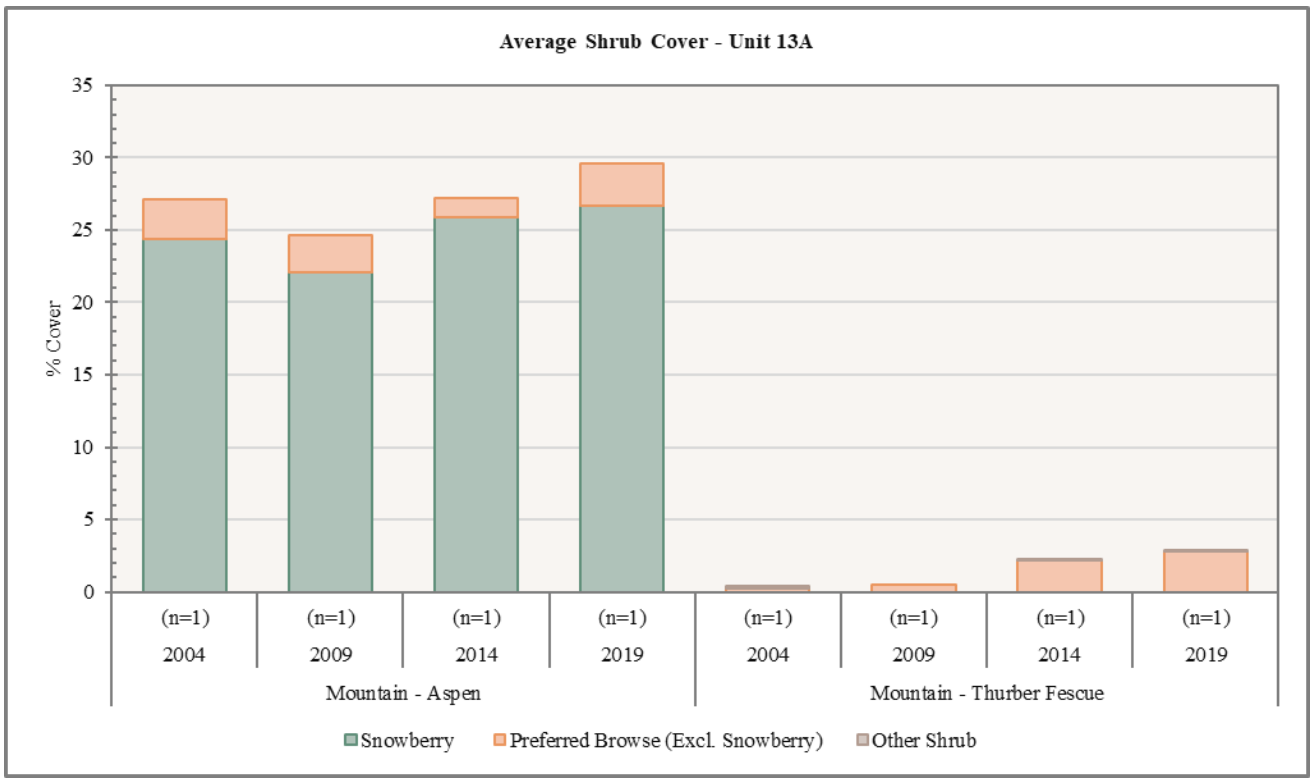


Figure 1.2: Average shrub cover for Mountain - Aspen and Mountain - Thurber Fescue study sites in WMU 13A, La Sal Mountains.

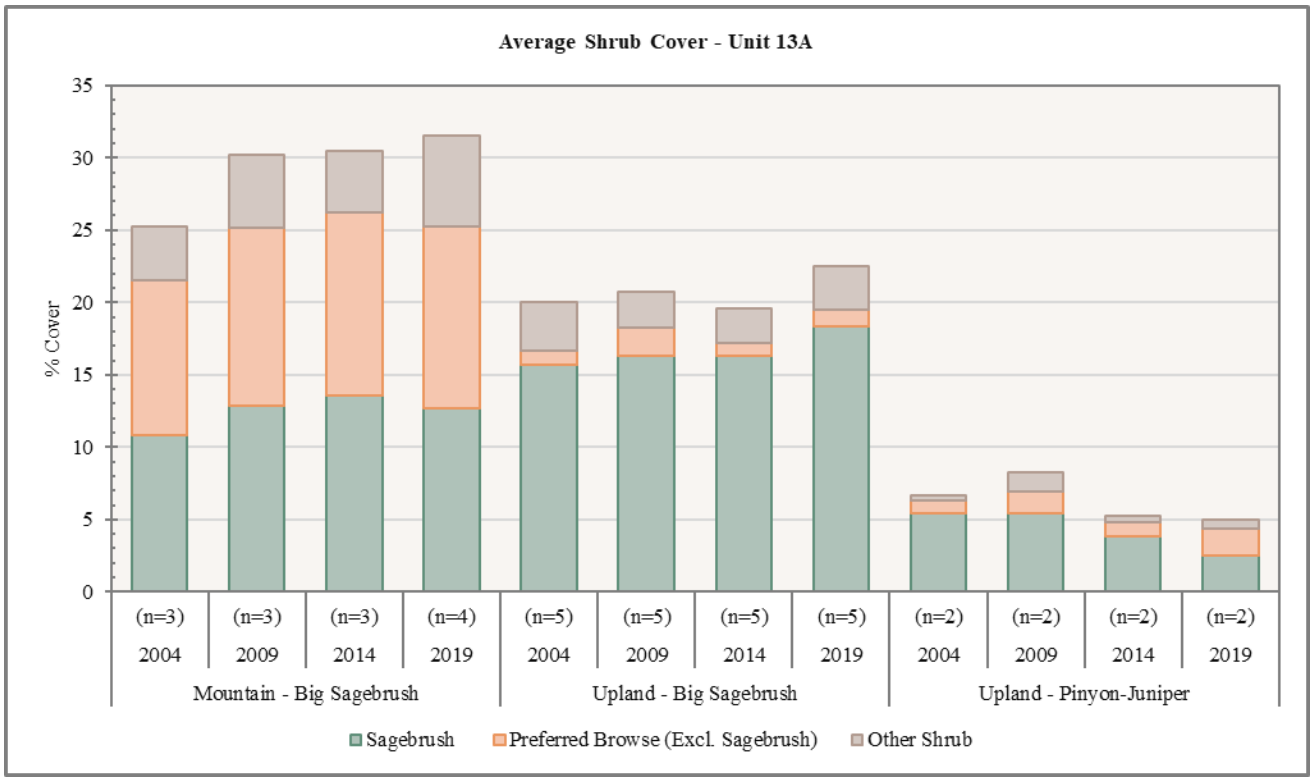


Figure 1.3: Average shrub cover for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Upland - Pinyon-Juniper study sites in WMU 13A, La Sal Mountains.

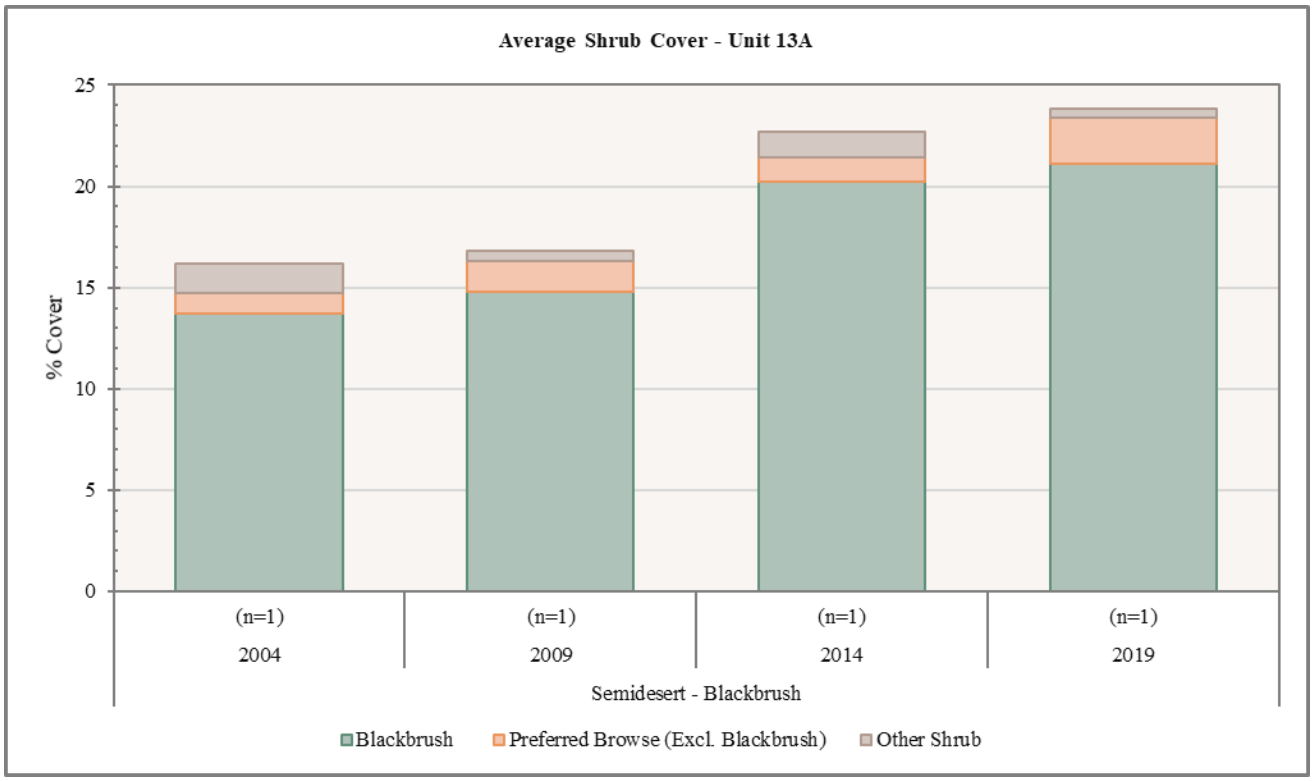


Figure 1.4: Average shrub cover for Semidesert - Blackbrush study sites in WMU 13A, La Sal Mountains.

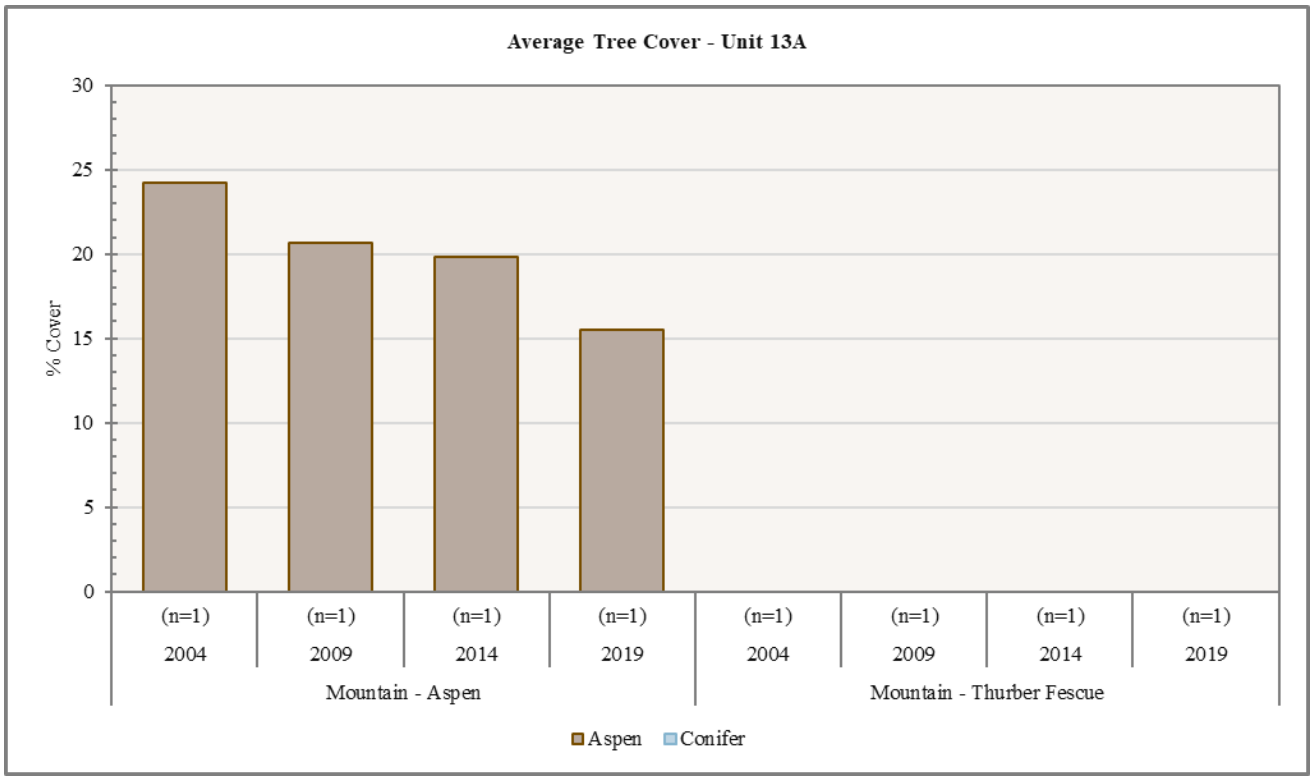


Figure 1.5: Average tree cover for Mountain - Aspen and Mountain - Thurber Fescue study sites in WMU 13A, La Sal Mountains.

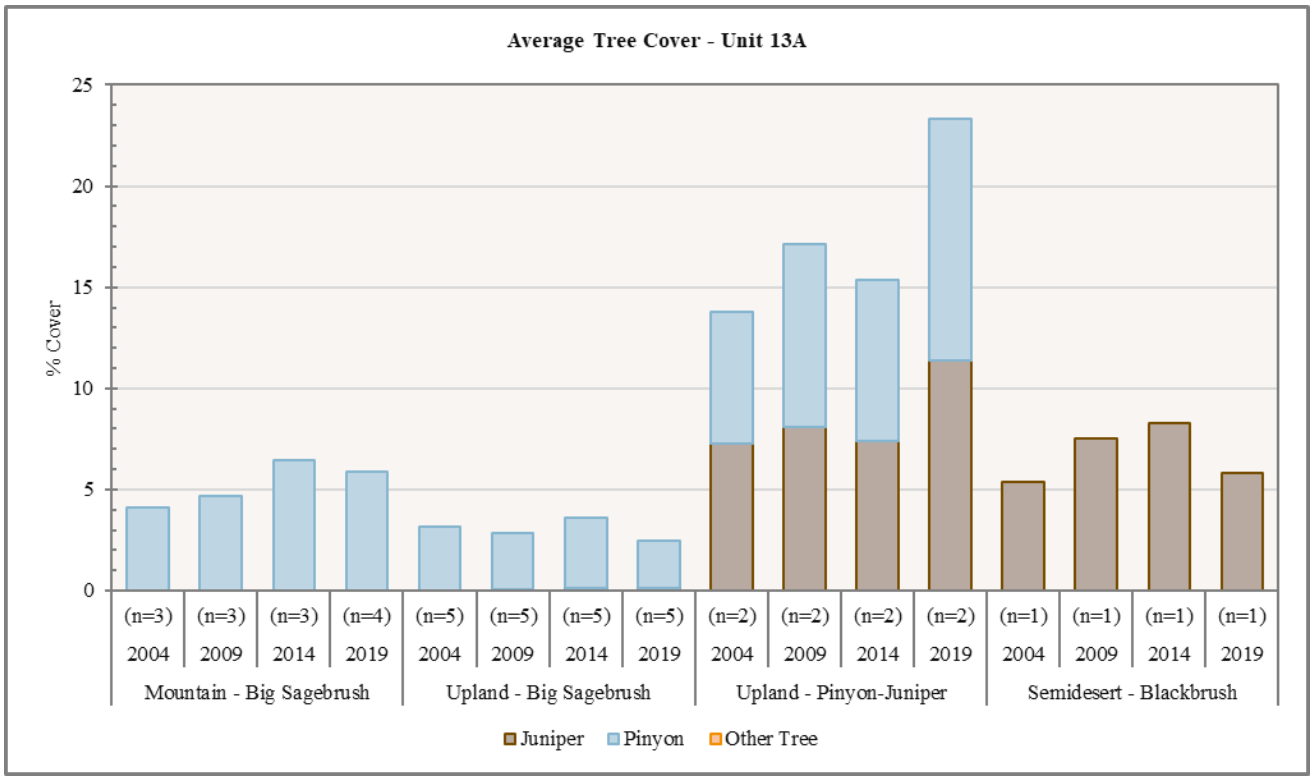


Figure 1.6: Average tree cover for Mountain - Big Sagebrush, Upland - Big Sagebrush, Upland - Pinyon-Juniper, and Semidesert - Blackbrush study sites in WMU 13A, La Sal Mountains.

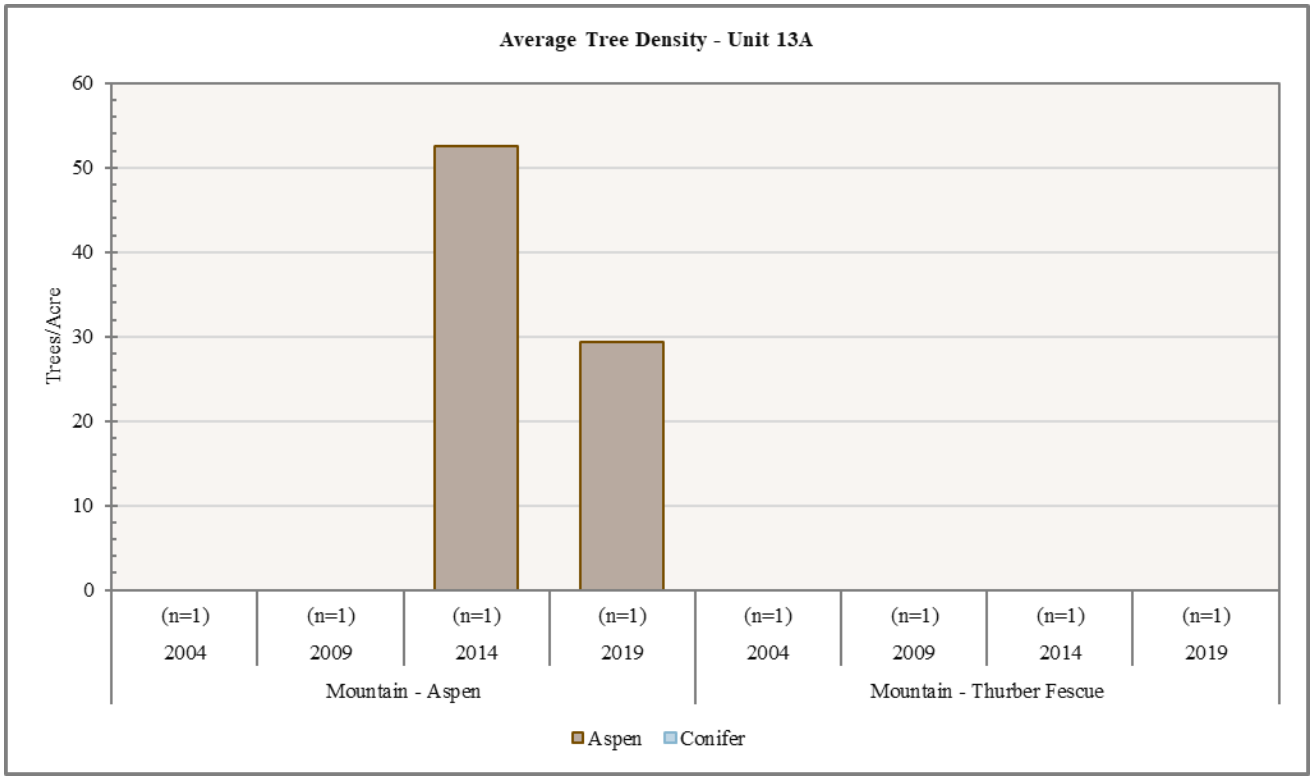


Figure 1.7: Average tree density for Mountain - Aspen and Mountain - Thurber Fescue study sites in WMU 13A, La Sal Mountains.

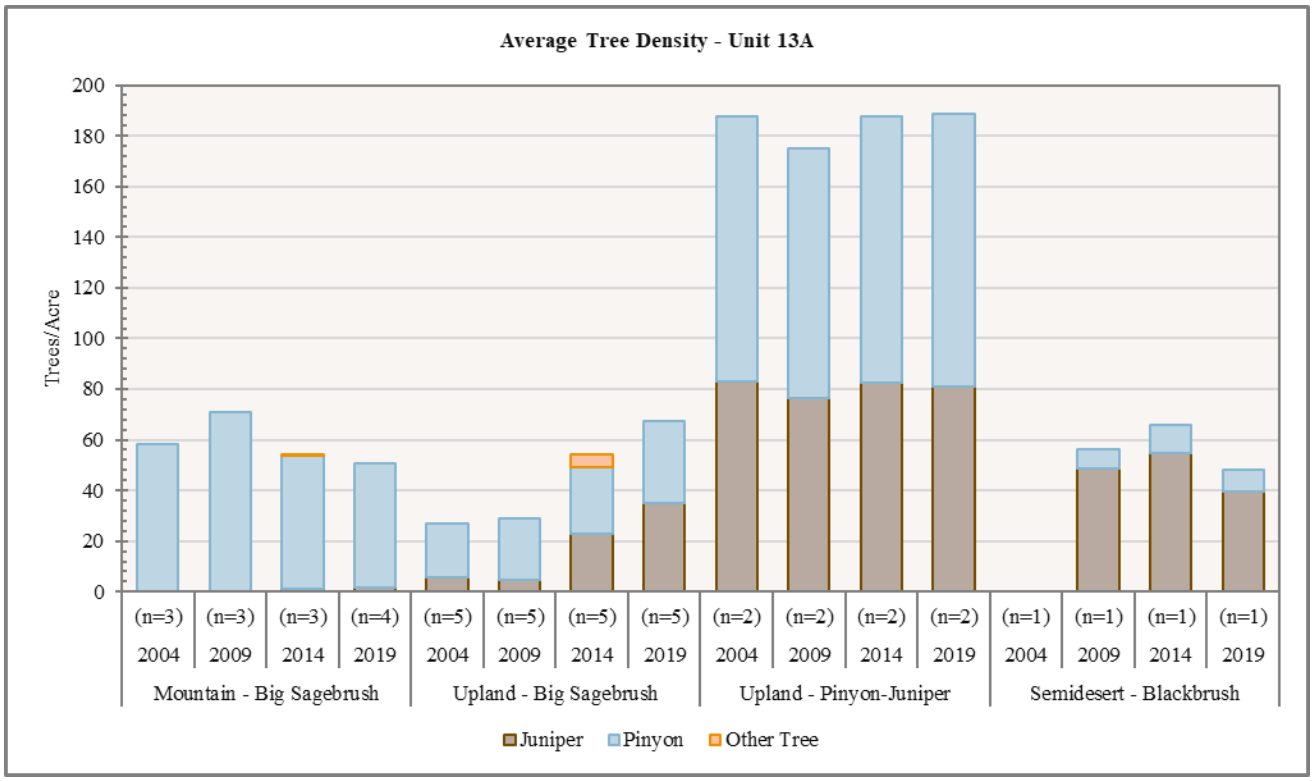


Figure 1.8: Average tree density for Mountain - Big Sagebrush, Upland - Big Sagebrush, Upland - Pinyon-Juniper, and Semidesert - Blackbrush study sites in WMU 13A, La Sal Mountains.

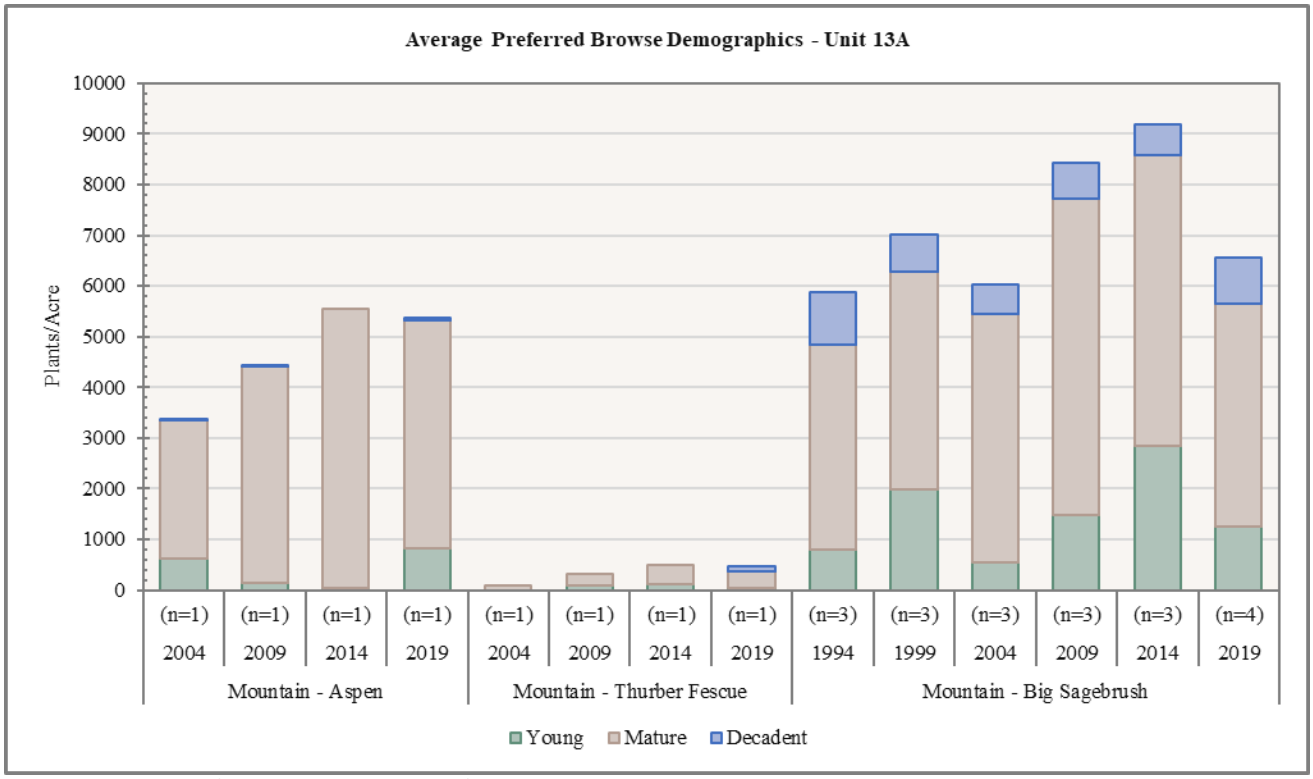


Figure 1.9: Average preferred browse demographics for Mountain - Aspen, Mountain - Thurber Fescue, and Mountain - Big Sagebrush study sites in WMU 13A, La Sal Mountains.

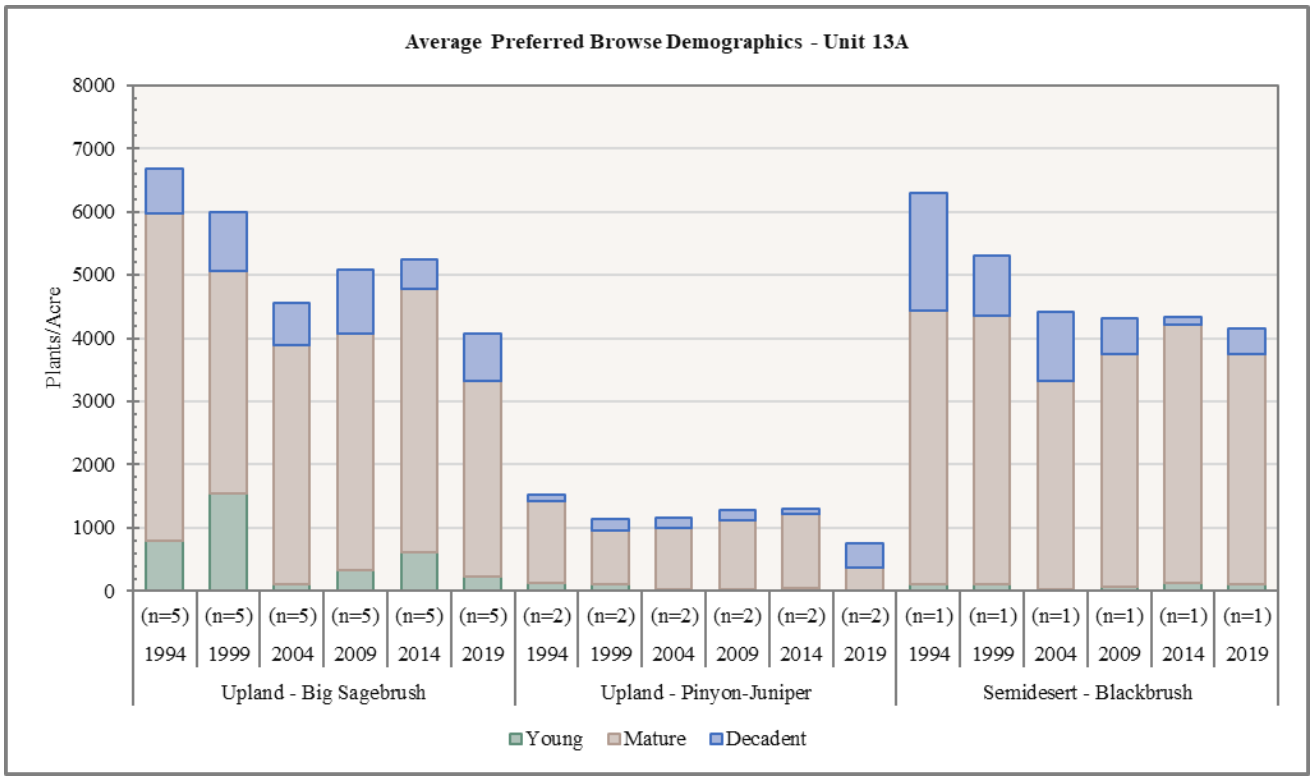


Figure 1.10: Average preferred browse demographics for Upland - Big Sagebrush, Upland - Pinyon-Juniper, and Semidesert - Blackbrush study sites in WMU 13A, La Sal Mountains.

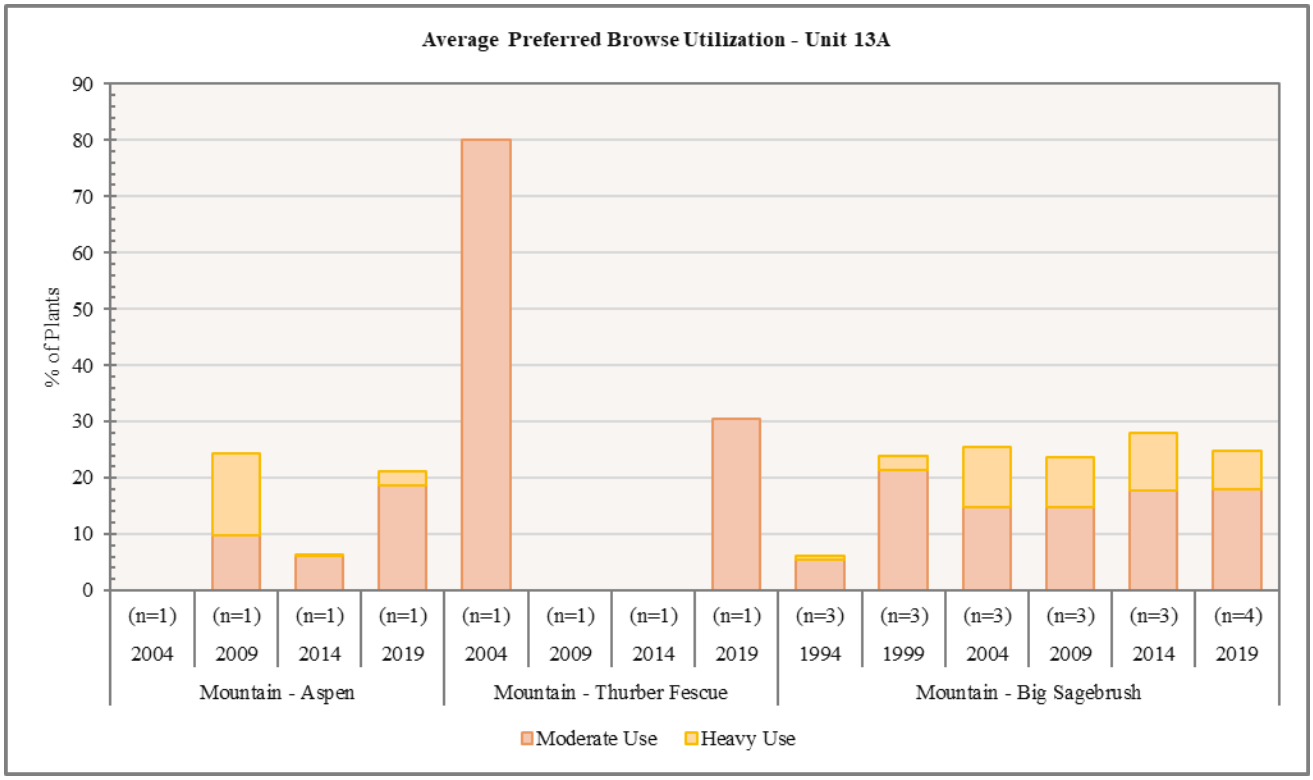


Figure 1.11: Average preferred browse utilization for Mountain - Aspen, Mountain - Thurber Fescue, and Mountain - Big Sagebrush study sites in WMU 13A, La Sal Mountains.

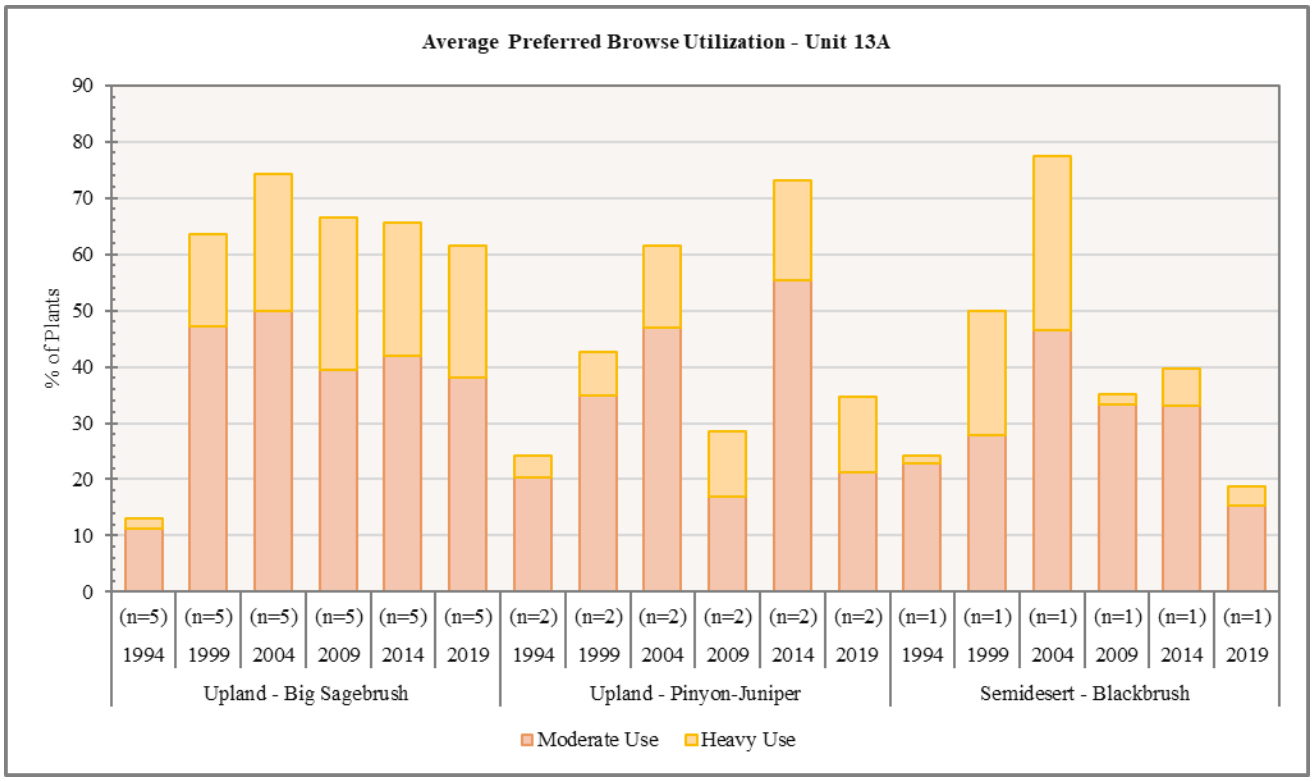


Figure 1.12: Average preferred browse utilization for Upland - Big Sagebrush, Upland - Pinyon-Juniper, and Semidesert - Blackbrush study sites in WMU 13A, La Sal Mountains.

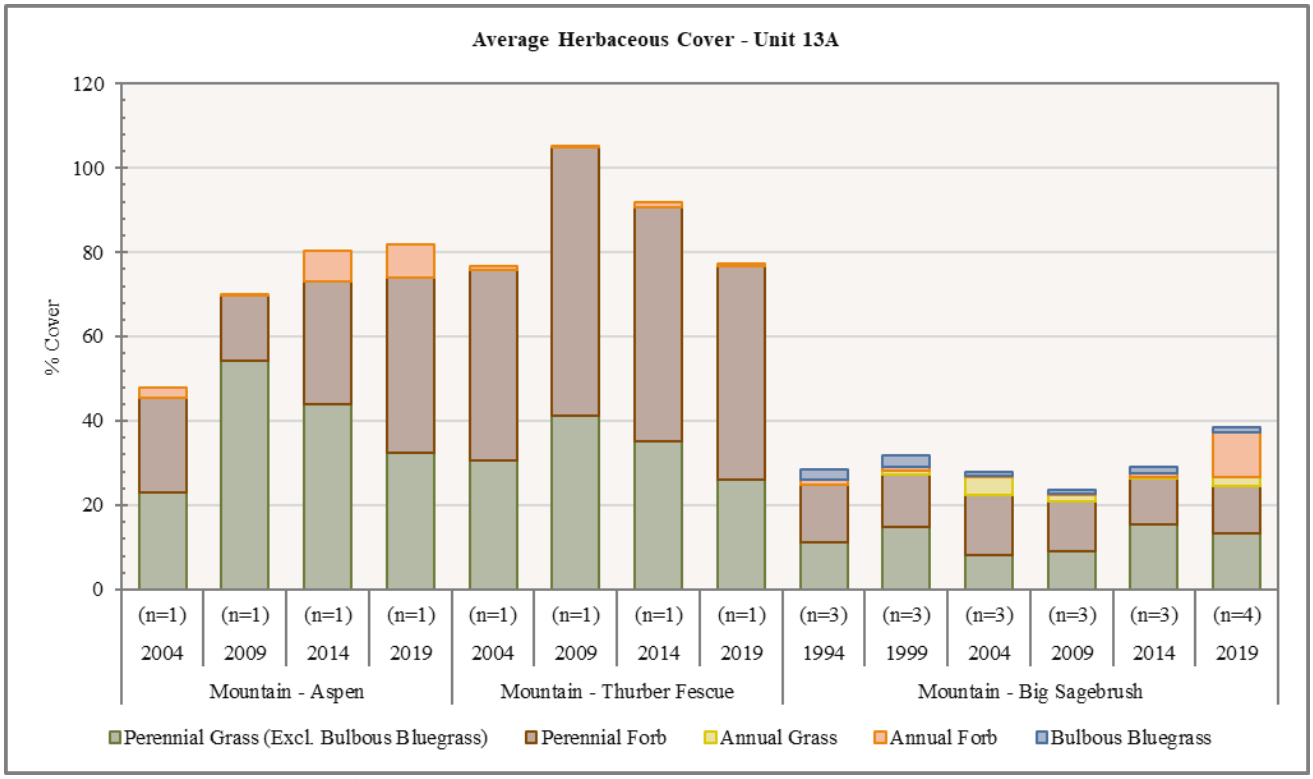


Figure 1.13: Average herbaceous cover for Mountain - Aspen, Mountain - Thurber Fescue, and Mountain - Big Sagebrush study sites in WMU 13A, La Sal Mountains.

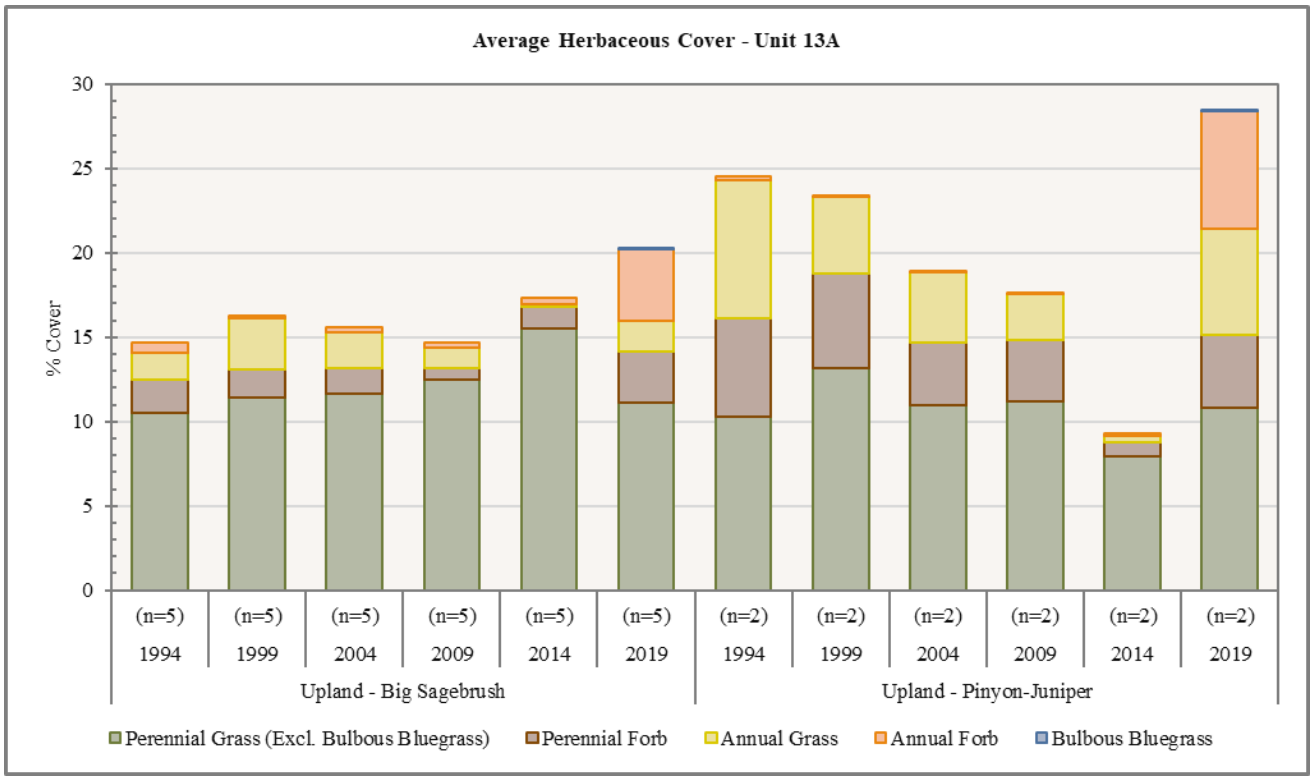


Figure 1.14: Average herbaceous cover for Upland - Big Sagebrush and Upland - Pinyon-Juniper study sites in WMU 13A, La Sal Mountains.

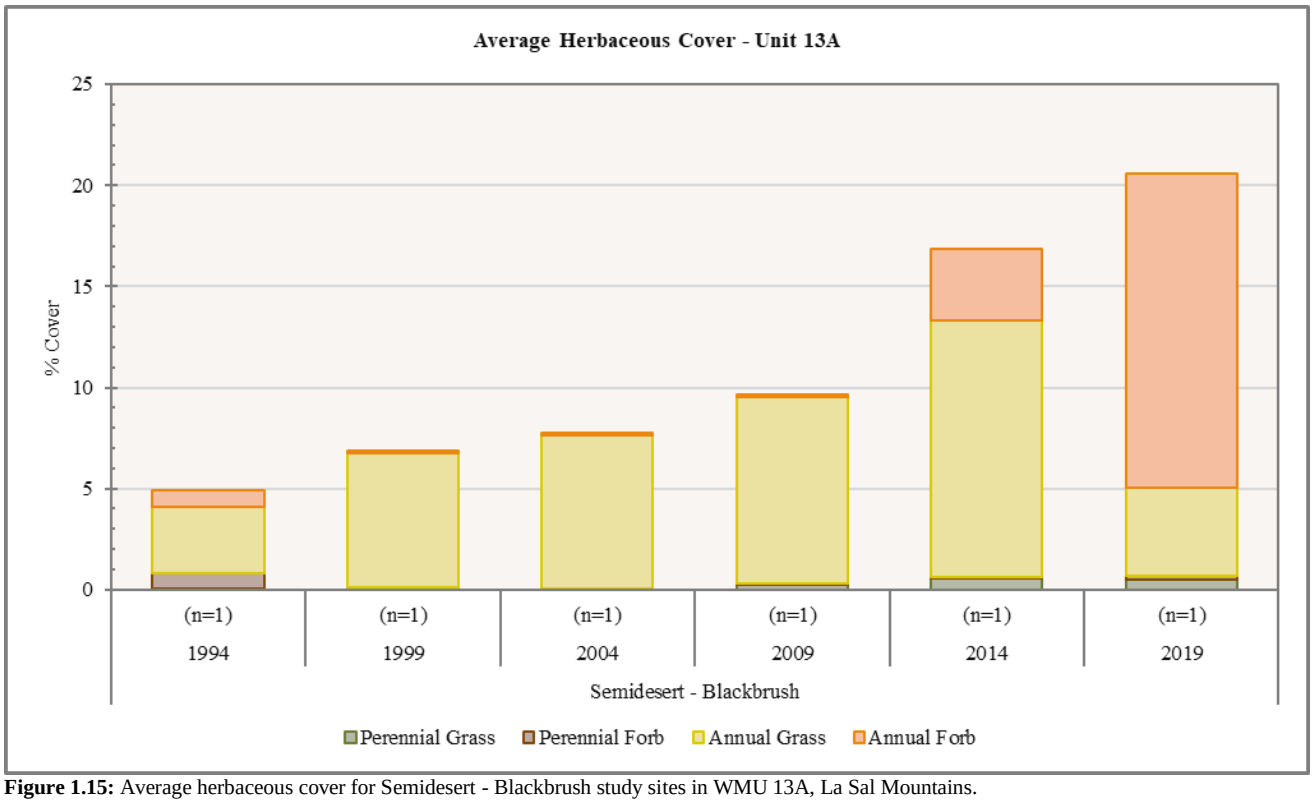


Figure 1.15: Average herbaceous cover for Semidesert - Blackbrush study sites in WMU 13A, La Sal Mountains.

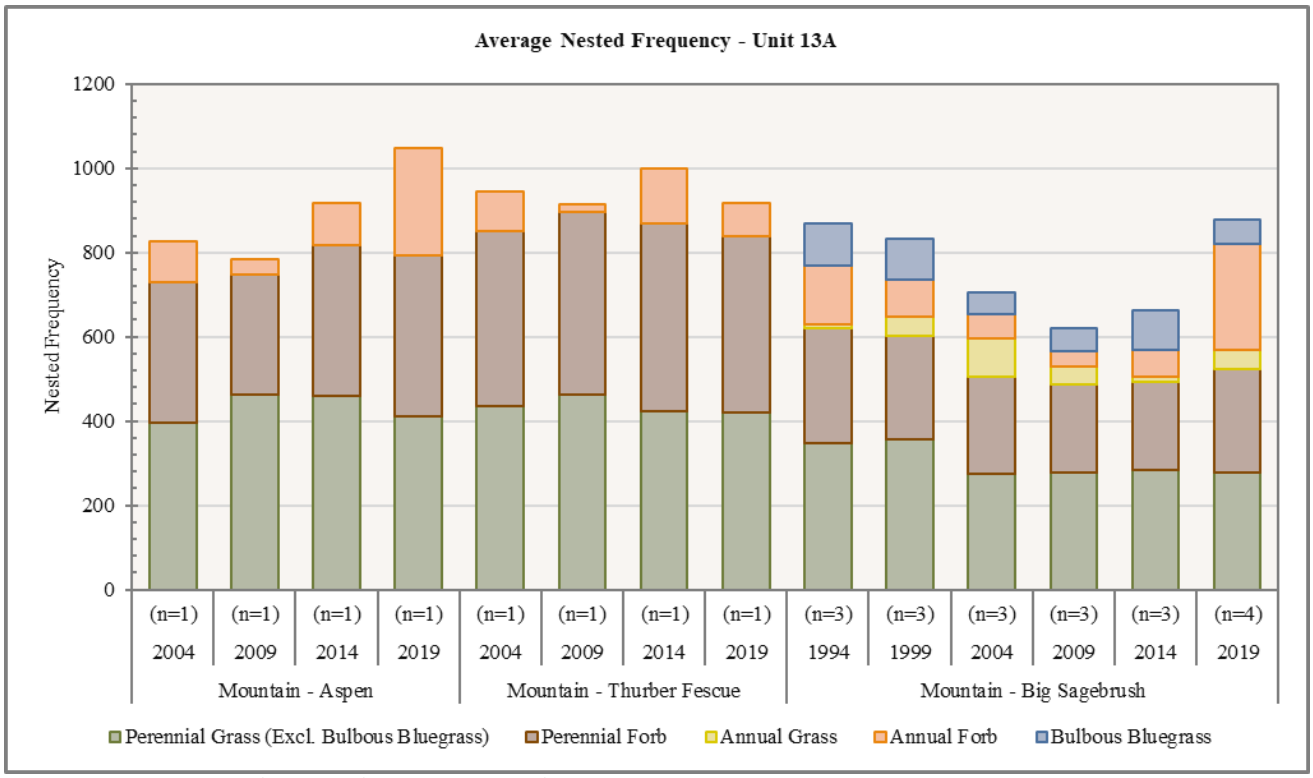


Figure 1.16: Average nested frequency of herbaceous species for Mountain - Aspen, Mountain - Thurber Fescue, and Mountain - Big Sagebrush study sites in WMU 13A, La Sal Mountains.

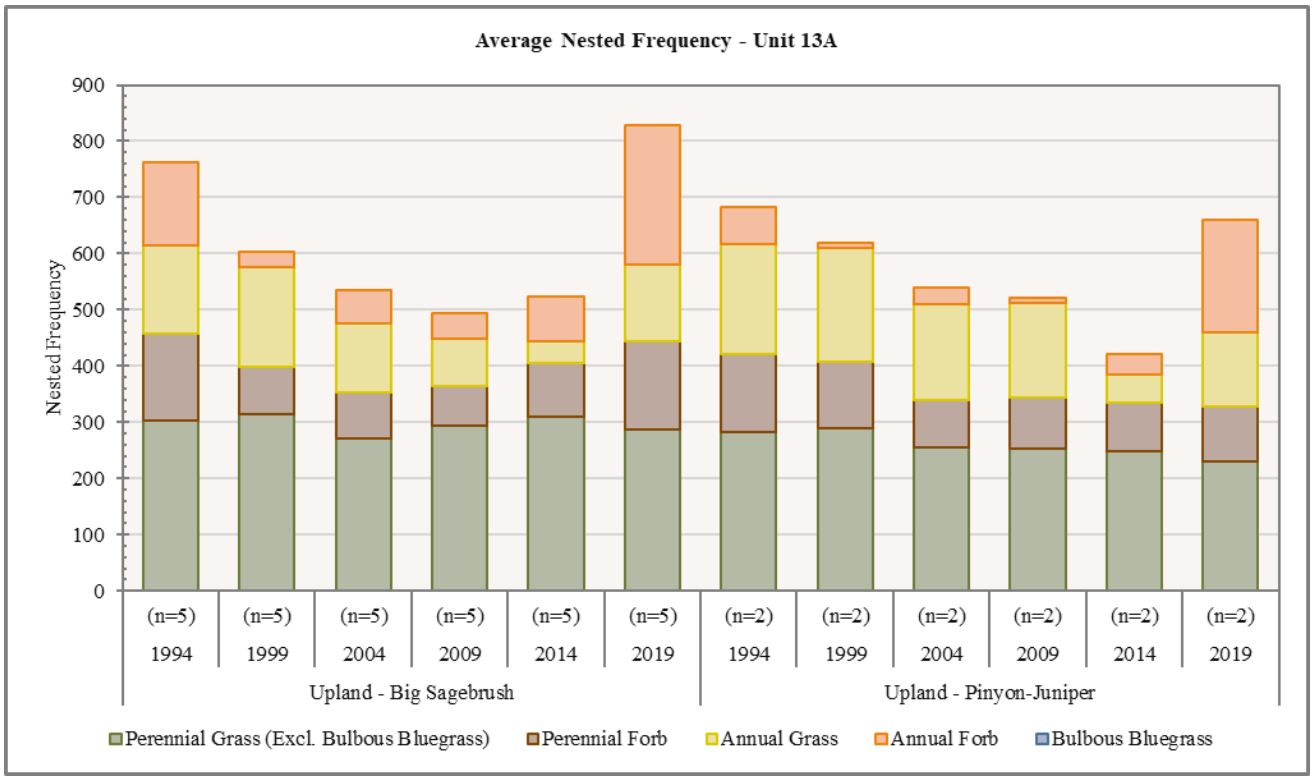


Figure 1.17: Average nested frequency of herbaceous species for Upland -Big Sagebrush and Upland - Pinyon-Juniper study sites in WMU 13A, La Sal Mountains.

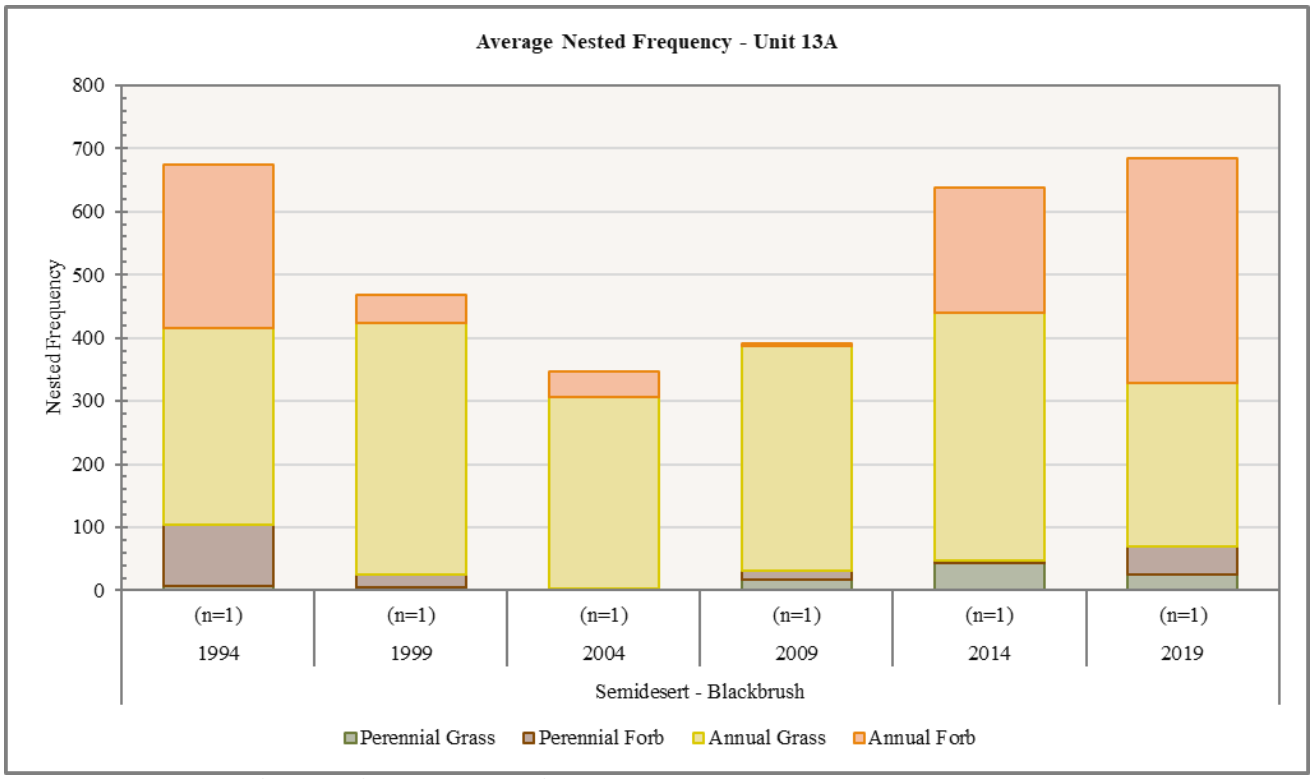


Figure 1.18: Average nested frequency of herbaceous species for Semidesert - Blackbrush study sites in WMU 13A, La Sal Mountains.

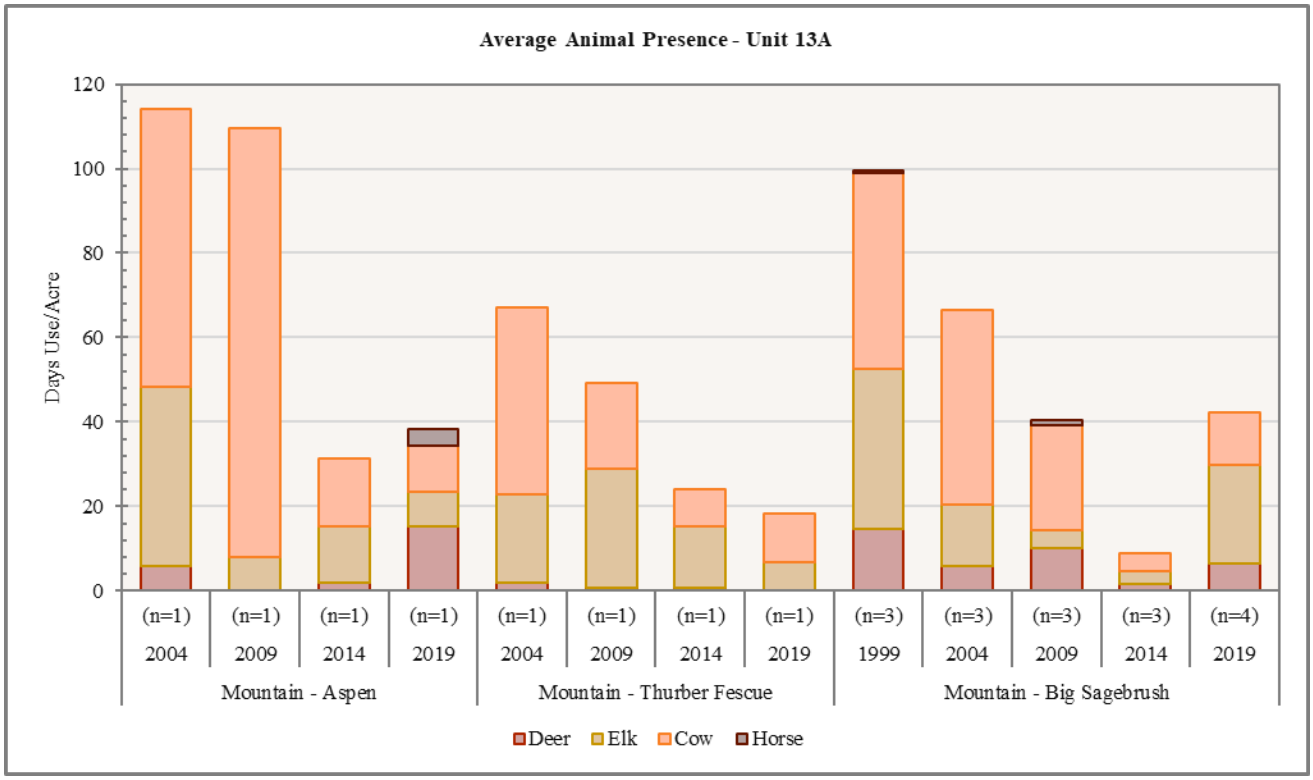


Figure 1.19: Average pellet transect data for Mountain - Aspen, Mountain - Thurber Fescue, and Mountain - Big Sagebrush study sites in WMU 13A, La Sal Mountains.

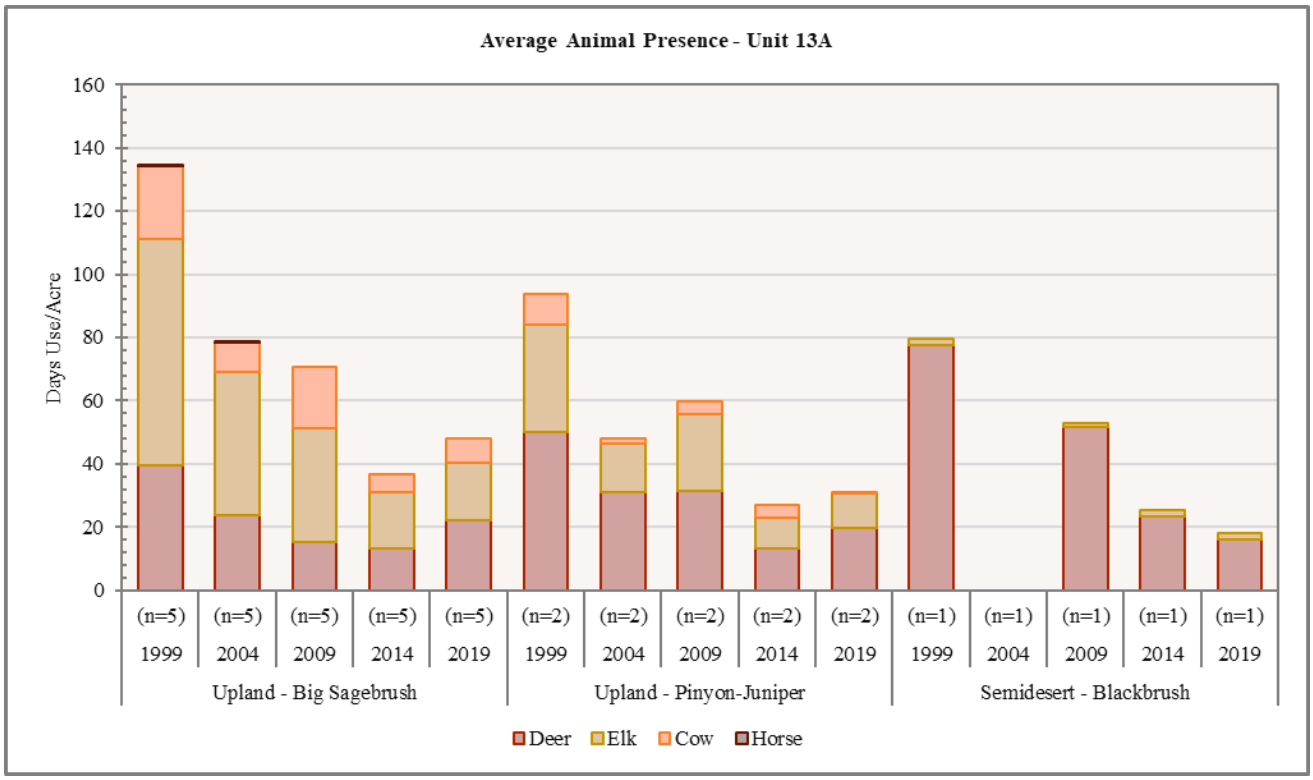
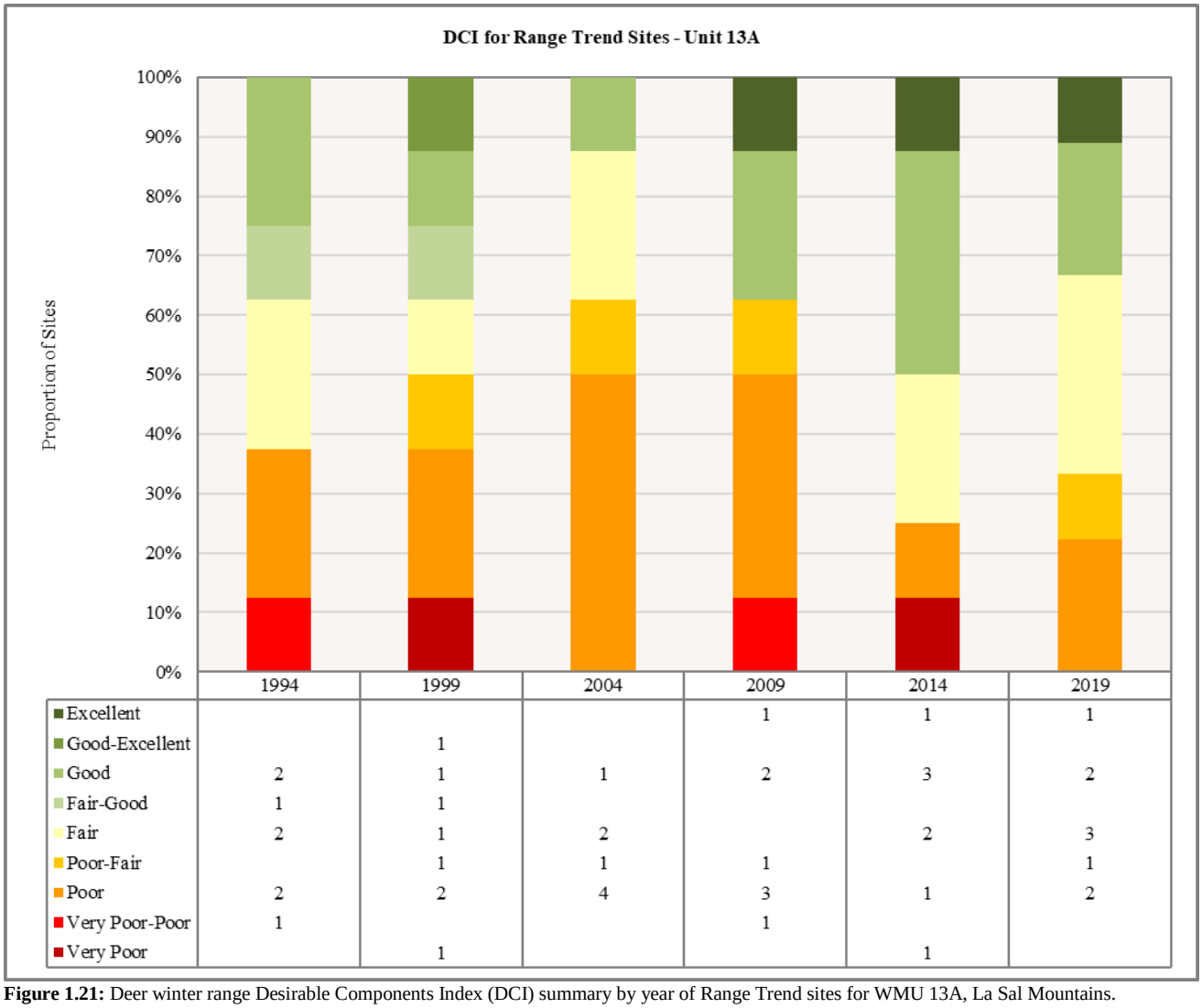


Figure 1.20: Average pellet transect data for Upland - Big Sagebrush, Upland - Pinyon-Juniper, and Semidesert - Blackbrush study sites in WMU 13A, La Sal Mountains.

Deer Winter Range Condition Assessment

The condition of deer winter range within the La Sal management unit has continually changed on the sites sampled since 1994; the active Range Tend sites within the unit are considered to be in poor to excellent condition as of the 2019 sample year (**Figure 1.21**, **Table 1.11**). The sites considered to be in excellent and good condition are North Beaver Mesa, Below Polar Rim, and Dolores Point: high amounts of preferred browse and significant perennial grass cover contribute to the high rankings of these sites. The Round Mountain and Lower Lackey Fan sites are considered to be in fair condition, and the Slaughter Flat study is classified as being in poor-fair condition. The Buck Hollow and Black Ridge studies were classified as being in poor condition: the decadence and recruitment of young preferred browse are the primary reasons that these sites were categorized as being in poor condition.

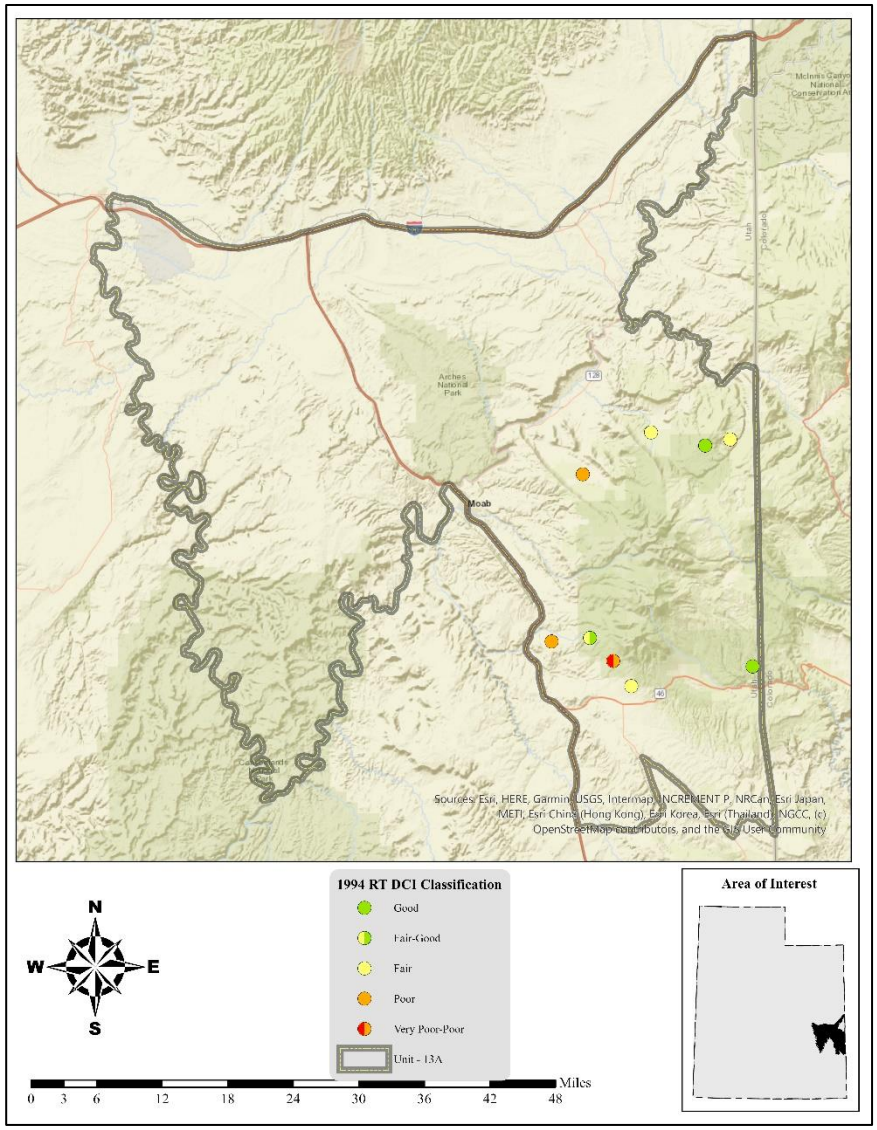


	1994	1999	2004	2009	2014	2019
Excellent				1	1	1
Good-Excellent		1				
Good	2	1	1	2	3	2
Fair-Good	1	1				
Fair	2	1	2		2	3
Poor-Fair		1	1	1		1
Poor	2	2	4	3	1	2
Very Poor-Poor	1			1		
Very Poor		1			1	

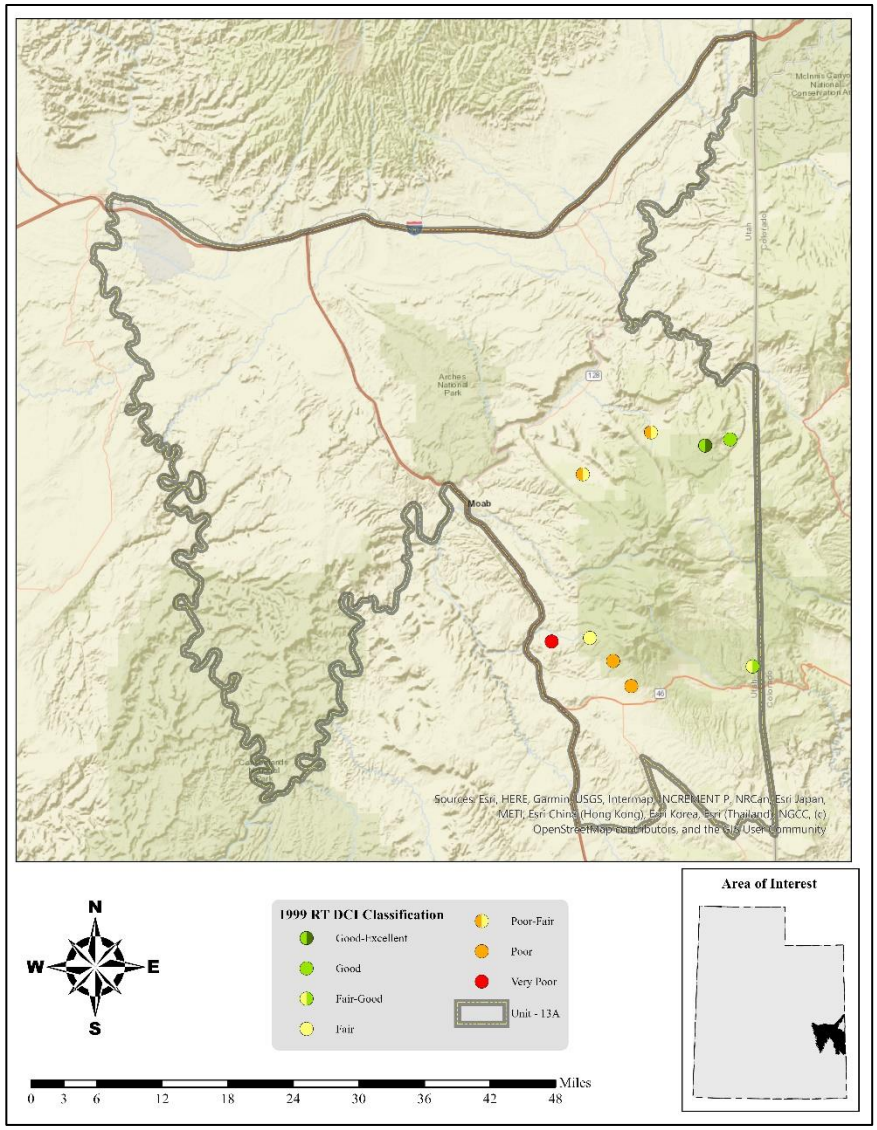
Figure 1.21: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 13A, La Sal Mountains.

Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
13A-03	1994	0	0	0	30	0	5.9	0	**35.9**	**VP-P**
13A-03	1999	0.2	0	0	30	0	10	0	**40.2**	**P**
13A-03	2004	1.4	0	0	30	0	9.9	0	**41.2**	**P**
13A-03	2009	3.6	0	0	30	0	9.2	0	**42.7**	**P**
13A-03	2014	1.2	0	0	18.2	0	1.6	0	**21**	**VP**
13A-03	2019	3.9	0	0	29.1	0	10	0	**43**	**P**
13A-04	1994	12.6	11.9	6.4	29.5	-0.2	5.5	0	**65.7**	**F-G**
13A-04	1999	13.1	9.2	8.2	26.7	-5.5	1.5	0	**53.1**	**F**
13A-04	2004	12.1	7.6	0.9	28.5	-4.1	6.1	0	**51**	**P-F**
13A-04	2009	14	8	0.4	19.8	-3.6	1.3	0	**39.9**	**P**
13A-04	2014	15.9	8.5	0	30	-0.1	1.4	0	**55.6**	**F**
13A-04	2019	16.5	5.8	0.5	20	-1.5	8.5	0	**49.8**	**P-F**
13A-07	1994	18.3	4.8	0.8	0.1	-2.5	1.5	0	**23**	**P**
13A-07	1999	15.6	11.5	0.9	0.1	-5	0.2	0	**23.3**	**P-F**
13A-07	2004	15	9.3	0.2	0.1	-5.7	0	0	**18.9**	**P**
13A-07	2009	16.7	11.8	0.7	0.5	-6.9	0.1	0	**22.8**	**P**
13A-07	2014	21.7	14.6	1.5	1.1	-9.5	0.1	0	**29.5**	**F**
13A-07	2019	24	12.4	1.2	0.9	-3.3	0.4	0	**35.7**	**F**
13A-08	1994	18.1	7.8	3.1	11.3	-1.3	0	0	**39.1**	**P**
13A-08	1999	14.7	11	1.8	6.4	-1.5	0	0	**32.4**	**VP**
13A-08	2004	23.1	8.3	0.7	10.2	-2.4	0	0	**40**	**P**
13A-08	2009	17.5	4.6	0.6	11.1	-0.3	0	0	**33.4**	**VP-P**
13A-08	2014	17.5	11.5	1.9	12.5	-0.1	0	0	**43.2**	**P**
13A-08	2019	21.1	6	0	12	-1.8	2.3	0	**39.6**	**P**
13A-11	1994	30	11.2	8.9	18.9	-1.2	9	0	**76.8**	**G**
13A-11	1999	24.5	9.5	11.4	27.9	-0.4	8.3	0	**81.2**	**G-E**
13A-11	2004	27.1	11.4	1.1	25.9	-0.2	5.7	0	**71**	**G**
13A-11	2009	30	12.4	6.1	30	-0.1	4.3	0	**82.6**	**E**
13A-11	2014	26.2	12.1	9.2	30	-0.1	9.1	0	**86.6**	**E**
13A-11	2019	27.3	10.5	5.2	30	0	10	0	**83**	**E**
13A-12	1994	13.8	14.1	0.7	30	-0.6	4.2	0	**62.2**	**F**
13A-12	1999	15.1	12.3	15	30	-1.4	6.2	0	**77.1**	**G**
13A-12	2004	23.6	11.4	0.1	19.6	-0.1	2.4	0	**57.1**	**F**
13A-12	2009	26.6	11.5	3.5	30	-0.4	0.9	0	**72.2**	**G**
13A-12	2014	25.5	13.6	3.7	30	-0.2	2	0	**74.6**	**G**
13A-12	2019	25.8	9.9	1.6	30	-1.5	4.8	0	**70.6**	**G**
13A-14	1994	15.2	8.9	15	15.1	-2.4	1.5	0	**53.3**	**F**
13A-14	1999	12.6	6.2	9	20.2	-2.6	0.1	0	**45.5**	**P**
13A-14	2004	17.3	8.1	2.6	30	-0.9	1.3	0	**58.4**	**F**
13A-14	2009	22.2	1.5	1.2	25	-0.3	0.4	0	**49.9**	**P-F**
13A-14	2014	21.5	12.1	8.6	28.4	-0.1	0.5	0	**71**	**G**
13A-14	2019	30	11	2.3	10.6	-2	1.9	0	**53.9**	**F**
13A-15	1994	15	10.7	12.1	25.4	0	9.9	0	**73**	**G**
13A-15	1999	13.7	11.5	15	25	-2.1	7.6	0	**70.7**	**F-G**
13A-15	2004	23.3	11.8	3.9	9.2	-9.2	7.6	0	**46.6**	**P**
13A-15	2009	28.7	12.1	13.5	12.2	-3.1	9.9	0	**73.2**	**G**
13A-15	2014	30	12.2	13.3	17.8	-0.4	10	0	**82.8**	**G**
13A-15	2019	23.6	6.9	6.4	21	-6.5	8.7	0	**60.1**	**F**
13A-18	2019	24.8	11.5	10.6	30	-0.2	10	0	**86.7**	**G**

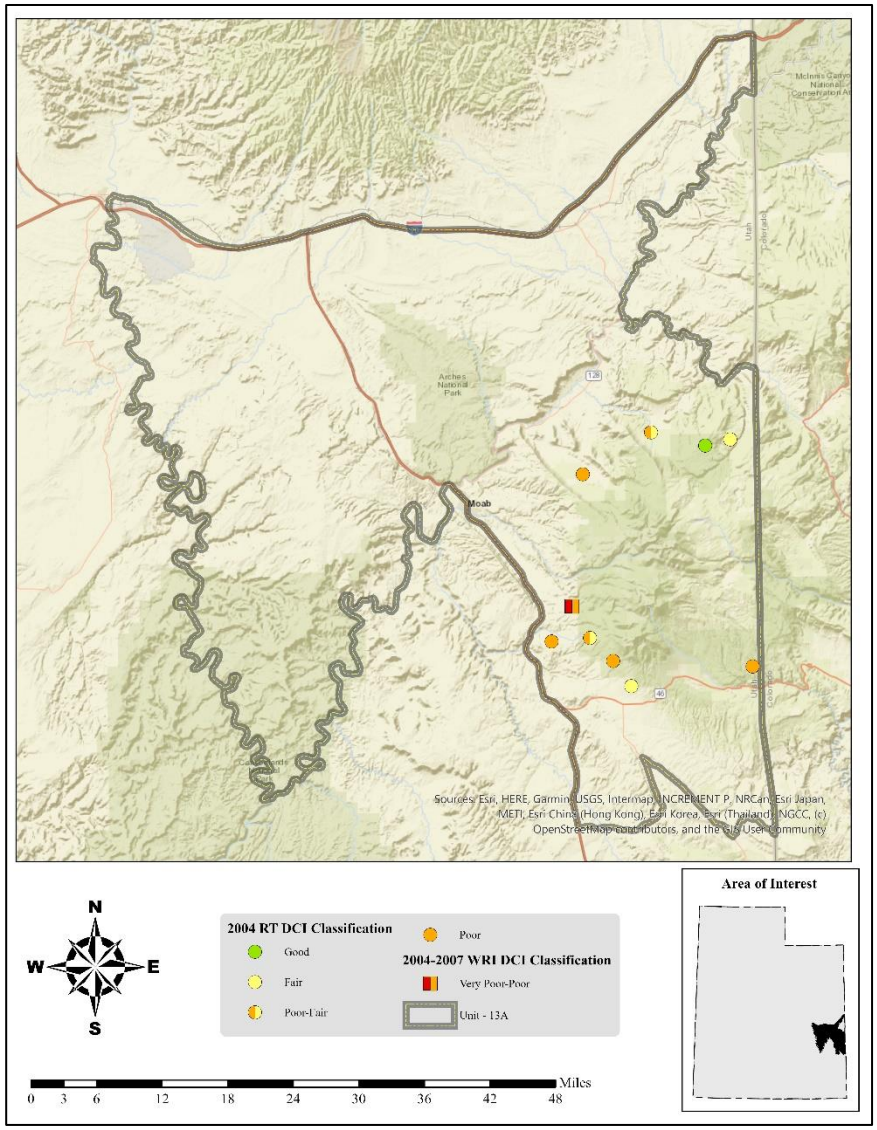
Table 1.11: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 13A, La Sal Mountains. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. *Studies with an asterisk have been suspended.



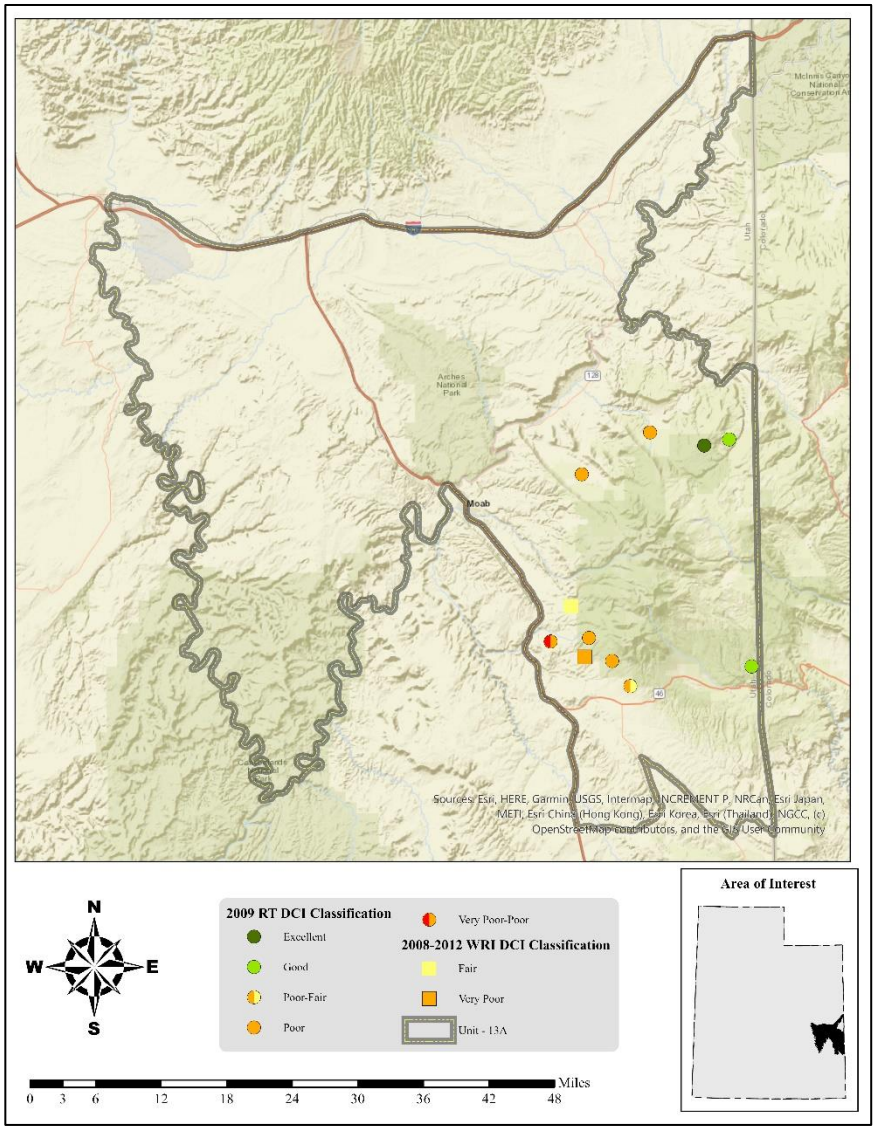
Map 1.10: 1994 Desirable Components Index (DCI) ranking distribution by study site for WMU 13A, La Sal Mountains.



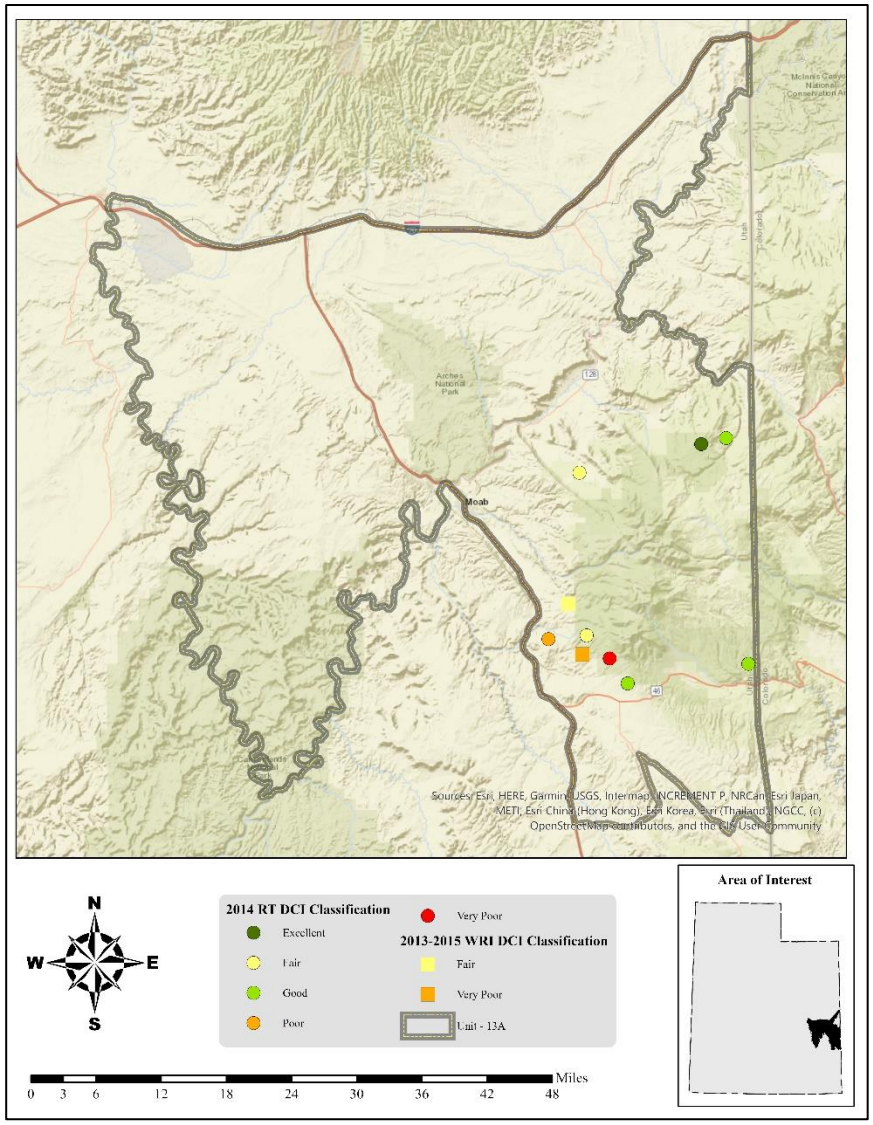
Map 1.11: 1999 Desirable Components Index (DCI) ranking distribution by study site for WMU 13A, La Sal Mountains.



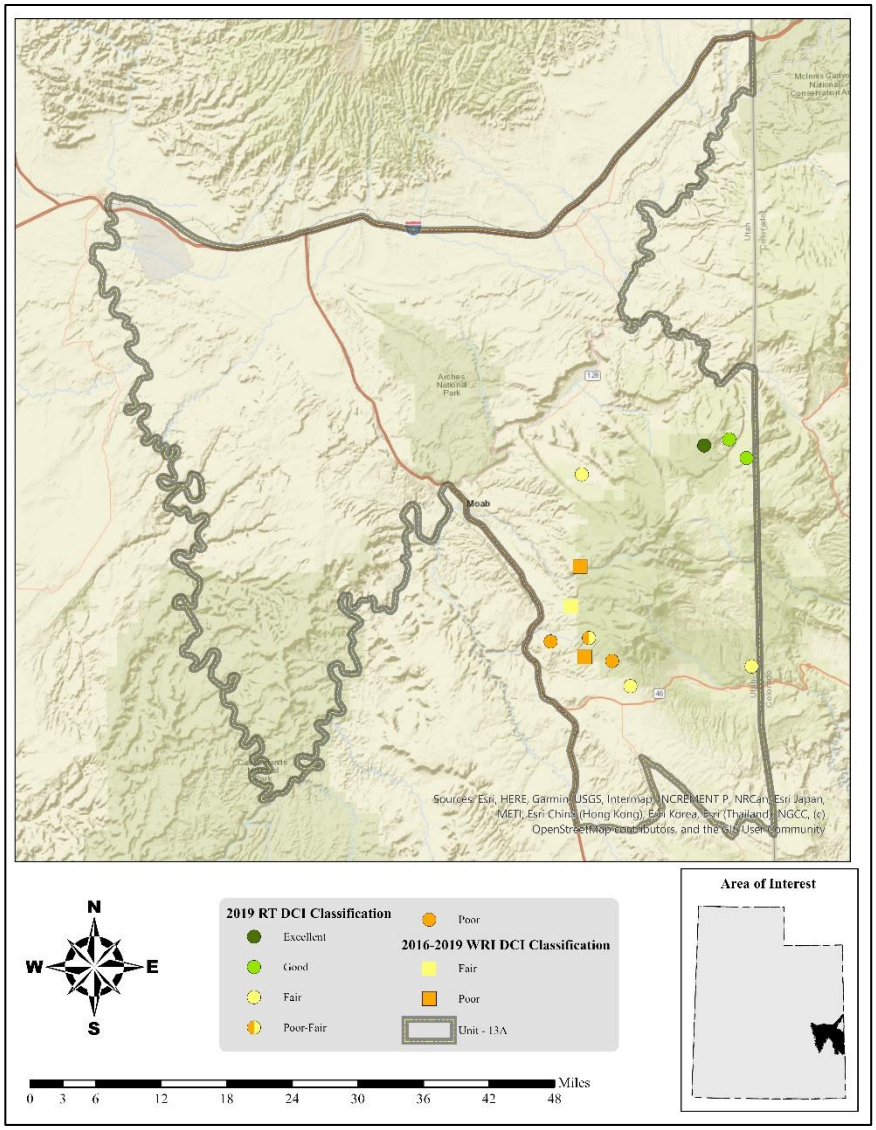
Map 1.12: 2004 Desirable Components Index (DCI) ranking distribution by study site for WMU 13A, La Sal Mountains.



Map 1.13: 2009 Desirable Components Index (DCI) ranking distribution by study site for WMU 13A, La Sal Mountains.



Map 1.14: 2014 Desirable Components Index (DCI) ranking distribution by study site for WMU 13A, La Sal Mountains.



Map 1.15: 2019 Desirable Components Index (DCI) ranking distribution by study site for WMU 13A, La Sal Mountains.

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
13A-1	Two Mile Chaining	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
13A-3	Buck Hollow	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Deer	High	Reduced/less vigorous browse component
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
13A-4	Slaughter Flat	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
13A-5	Amasas Back	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
13A-6	Bald Mesa	Tourism/Recreation	High	Loss of habitat, reduced understory shrub and herbaceous vigor
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
13A-7	Round Mountain	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
13A-8	Black Ridge	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
13A-11	North Beaver Mesa	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Elk	High	Reduced understory shrub and herbaceous vigor
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
13A-12	Below Polar Rim	Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
13A-14	Lower Lackey Fan	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
13A-15	Hideout Mesa	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
13A-16	Beaver Creek	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
13A-17	Bar -A	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
13A-18	Dolores Point	Animal Use – Elk	High	Reduced understory shrub and herbaceous vigor
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
13R-2	Pack Creek	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
13R-3	Black Ridge Fuel Reduction	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
13R-5	La Sal Aspen Exclosure	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
13R-6	La Sal Aspen	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
13R-7	Doe Canyon	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
13R-8	Hop Creek Aspen	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
13R-9	Hop Creek Aspen Exclosure	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
13R-10	Brush Hole	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
13R-11	Above Fisher Creek	PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
13R-12	South Mesa	PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
13R-13	Sids Draw	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor

Table 1.12: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 13A, La Sal Mountains. All assessments are based off of the most current sample date for each study site. Criteria for evaluating limiting factors is available in **APPENDIX A - THREAT ASSESSMENT**.

Discussion and Recommendations

Mountain (Aspen)

The study within the Mountain (Aspen) ecological type, Beaver Creek, is considered to be deer and elk summer range within the La Sal Mountains management unit. The plant community on this site supports grass, forb, and shrub populations that provide valuable summer forage for wildlife. Introduced perennial grass species are present on this study site in high amounts. These grasses can be aggressive at higher elevations and may have the potential to reduce the diversity and abundance of other more desirable native grass and forb species. If reseeding is necessary to restore herbaceous diversity, care should be taken in seed selection and preference should be given to native species when possible.

Mountain (Thurber Fescue)

The study that is considered to be a Mountain (Thurber Fescue) ecological site, Bar -A, is in generally good condition for deer and elk summer range within the La Sal Mountains unit. The grass and forb communities on this study site provide summer forage for wildlife. Introduced perennial grasses are present on this site and may pose a medium-level threat to the herbaceous understory.

If reseeding is necessary to restore herbaceous diversity, care should be taken in seed selection and preference should be given to native species when possible.

Mountain (Big Sagebrush)

Studies that are considered to be Mountain (Big Sagebrush) ecological sites vary in condition from fair to good for deer winter and summer range habitat on this unit. These communities support browse populations and herbaceous communities that provide good forage for wildlife. Introduced perennial grasses pose a medium to high-level threat on the Two Mile Chaining and Bald Mesa studies: these grasses can be aggressive at higher elevations and may outcompete more desirable native grasses and forbs. Some of these sites, particularly Hideout Mesa, have been prone to invasion by annual grasses, specifically cheatgrass (*Bromus tectorum*). Annual grasses can increase fuel loads and exacerbate the risk for wildfire. Except for the Bald Mesa study, the sites are in Phase I to Phase I transitioning to Phase II of conifer encroachment and are at risk for future encroachment. Recreation poses a threat on the Bald Mesa study, as a bicycle trail runs through the transect: this may possibly lead to a loss of habitat and/or the reduction of understory shrub and herbaceous vigor. The introduced noxious weed nodding plumeless thistle (*Carduus nutans*) has been observed in low amounts on the Bald Mesa study. Noxious weeds may have the potential to compete with native forbs and grasses for resources. Pellet transect data indicates that high use by elk and/or cattle may be occurring on the Hideout Mesa and Dolores Point studies. Overuse by these animals poses a medium to high-level threat to the vigor and diversity of the shrub and herbaceous component.

Treatments to reduce annual grass might be necessary if high levels of these grasses become an issue in the communities where they are present. It is recommended that areas with significant conifer encroachment undergo a tree-removing treatment (e.g. bullhog, chaining, lop and scatter, etc.) where and when feasible. If reseeding is necessary to restore herbaceous communities on these sites, care should be taken in seed selection and preference should be given to native species when possible. On the Hideout Mesa and Dolores Point study sites, closer examination of the site and surrounding area may be recommended to determine whether overuse by elk and/or cattle is occurring in the surrounding area.

Upland (Big Sagebrush)

The study sites within the Upland (Big Sagebrush) ecological type vary in condition from poor to excellent for deer winter range in the La Sal Mountains management unit. The sagebrush communities on these sites support plant populations that provide winter forage for wildlife. Introduced perennial grass species are present on all study sites, mostly in high amounts. Introduced annual grasses are also present on all sites in varying amounts. All of the sites are in Phase I of woodland succession and are at risk of further conifer encroachment. In addition, pellet transect data indicates that high use by elk and/or cattle may be occurring on the Slaughter Flat and North Beaver Mesa studies. Overuse by elk and cattle may lead to reduced vigor and diversity of the shrub component and herbaceous understory.

Areas with conifer encroachment should be treated (e.g. bullhog, chaining, lop and scatter, etc.) where and when feasible. Treatments to reduce undesirable grass species may be advisable on some locations to restore plant community diversity. If reseeding is necessary to restore herbaceous communities, care should be taken in seed selection and preference should be given to native species when possible. Finally, closer examination of the Slaughter Flat and North Beaver Mesa studies and surrounding areas is recommended to help determine if overuse by cattle and/or elk is occurring in the surrounding area.

Upland (Pinyon-Juniper)

The studies that are considered to be Upland (Big Sagebrush) ecological sites vary in condition. The Buck Hollow study is considered to be deer and elk winter range and is in poor condition. Amasas Back is deer summer range and elk winter range and is in generally poor to fair condition. The browse communities present on these sites provide cover and forage for wildlife. Introduced annual grasses are present on both sites, particularly so on the Amasas Back study: these grasses can increase fuel loads and pose a risk for wildfire. As could be expected from this ESD, conifer encroachment is occurring on both sites and poses a medium-level threat. Both sites have high amounts of introduced perennial grasses which can reduce understory diversity when present in significant amounts. In addition, pellet transect data suggests that high use by deer may be occurring on the Buck Hollow site. Sustained high use by deer may lead to reduced vigor and/or density of the browse component.

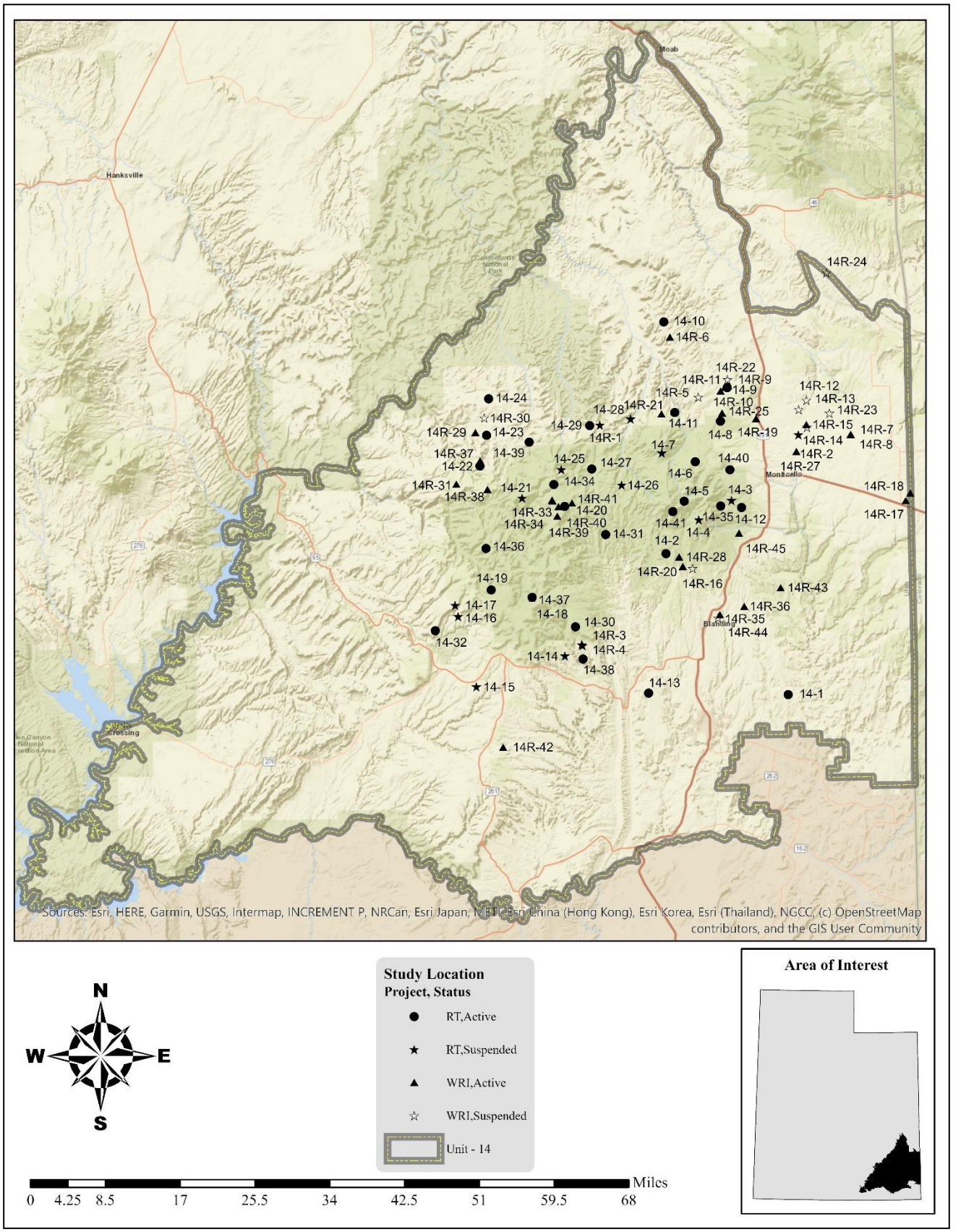
Treatments to reduce undesirable grasses may become necessary on some sites if high levels of these grasses persist. Areas with conifer encroachment should be treated (e.g. bullhog, chaining, lop and scatter, etc.) where and when appropriate. However, care should be taken to select methods that will not increase annual grass cover. If reseeding is necessary to restore herbaceous communities, care should be taken in seed selection and preference should be given to native species when possible. Finally, closer examination of the Buck Hollow site and surrounding area may be recommended to determine if high use by deer is occurring in the surrounding area.

Semidesert (Blackbrush)

The study that is considered to be a Semidesert (Blackbrush) ecological site, Round Mountain, is considered to be in fair condition for deer winter range within this unit. This blackbrush community supports browse populations that provide good winter forage for wildlife, particularly deer. The plant community on this site has significant potential for invasion by annual grasses. Annual grasses, specifically cheatgrass (*Bromus tectorum*), can increase fuel loads and exacerbate the risk for wildfire. In addition, this site is within Phase I of conifer encroachment and may be at risk for future encroachment.

Treatments to reduce annual grass might be necessary if high levels of these grasses become an issue. This site may also benefit from a tree -removing treatment (e.g. bullhog, chaining, lop and scatter, etc.) if it is deemed feasible, although care should be taken to select methods that will not increase annual grasses.

2. WILDLIFE MANAGEMENT UNIT 14 – SAN JUAN



WILDLIFE MANAGEMENT UNIT 14 – SAN JUAN

Boundary Description

Grand and San Juan counties - Boundary begins in Moab at the Junction of the Colorado River and Highway US-191; south on US-191 to Big Indian Road; east on Big Indian Road to Lisbon Valley Road; east on Lisbon Valley Road to Island Mesa Road; east on Island Mesa Road to the Utah-Colorado state line; south on the state line to the Navajo Nation Reservation boundary; west on the Navajo Nation Reservation boundary to Lake Powell; north along the eastern shore of Lake Powell to the Colorado River; north on the Colorado River to Moab.

Management Unit Description

Geography

Abajo Mountains

The Abajo Mountains subunit (14A) covers a large portion of the eastern side of San Juan county in southeastern Utah and is a climactically and topographically diverse area. The elevation ranges from 4,500 feet near the town of Bluff to 11,445 feet on Abajo Peak. The Abajo Mountains, located in the western-central part of the unit, contain the unit's summer range: these mountains typically have steep slopes and rugged canyons that have well-developed vegetation communities except for the rocky peaks above timberline. The highest meadow slopes have been terraced to slow destructive erosion caused by historic overgrazing. From the base of the mountain, gentle slopes extend out into the flat mesas and rough desert canyon lands that constitute the majority of the unit's land area. Major drainages include Indian Creek and Hatch Wash, which flow north to the Colorado River, and Cottonwood, Johnson, Recapture, Verdure, and Montezuma Creeks, which flow east and south to the San Juan River. Municipalities within this subunit include Monticello, Blanding, Bluff, and Montezuma Creek.

Elk Ridge

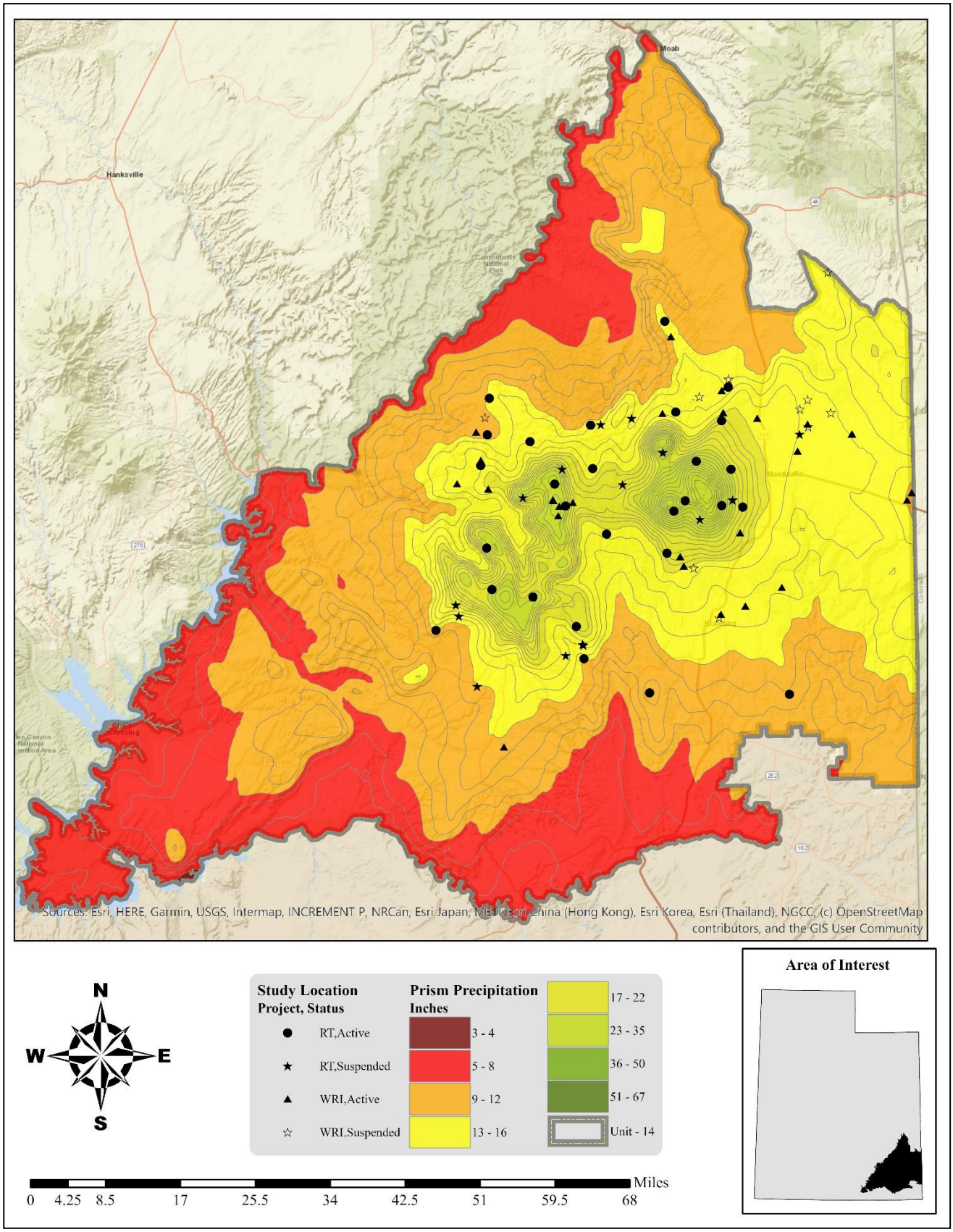
The Elk Ridge subunit (14B) is located in the western half of San Juan county west of the Abajo Mountains. The dominant topographic feature is Elk Ridge, a long, flat, sedimentary plateau. Horse Mountain, found at the north end of Elk Ridge, is the highest point in the subunit at approximately 9,200 feet of elevation. Elk Ridge itself is relatively level and ranges from 8,600 feet at the north end to 8,400 feet at the south end. Surrounding the steep slopes below Elk Ridge are numerous flats which provide most of the winter range in the unit. These flats have elevations of 5,000 to 6,000 feet and are dissected by numerous deep slickrock canyons which end at the San Juan and Colorado Rivers at about 4,000 feet of elevation. The most prominent drainages are South Cottonwood Wash, Butler Wash, and Comb Wash which drain into the San Juan River, and Beef Basin Wash, Dark Canyon, White Canyon, and North Cottonwood Wash which drain into the Colorado River. Two small communities, Bluff and Mexican Hat, are located near the unit's southern boundary. The unit boundaries encompass Natural Bridges National Monument and part of Canyonlands National Park.

Climate Data

The 30-year (1981-2010) annual precipitation PRISM model shows precipitation ranges on the unit from 5 inches on the southwestern side of the unit to 35 inches on the high-elevation peaks of the Abajo Mountains. All of the Range Trend and WRI monitoring studies on the unit occur within the 11-30 inch precipitation zone (**Map 2.1**) (PRISM Climate Group, Oregon State University, 2013).

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Palmer Drought Severity Index (PDSI) data for the unit was compiled from the National Oceanic and Atmospheric Administration (NOAA) Physical Sciences Division (PSD) as part of the Southeast division (Division 7).

The mean annual PDSI of the Southeast division displayed years of moderate to extreme drought from 1989-1990, 2002-2003, 2009, 2012, and 2018. The mean annual PDSI displayed moderately to extremely wet years from 1983-1985, 2005, and 2019 (**Figure 2.1a**). The mean spring (March-May) PDSI displayed years of moderate to extreme drought in 1989-1991, 1996, 2002-2004, 2012-2013, and 2018. Moderately to extremely wet years for this time period were displayed in 1983-1985, 1993, 2005, and 2019. The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1989-1990, 2002-2003, 2009, 2012, and 2017; moderately to extremely wet years were displayed in 1983-1985, 1997, 2013, and 2019 (**Figure 2.1b**) (Time Series Data, 2020).



Map 2.1: The 1981-2010 PRISM Precipitation Model for WMU 14, San Juan (PRISM Climate Group, Oregon State University, 2013).

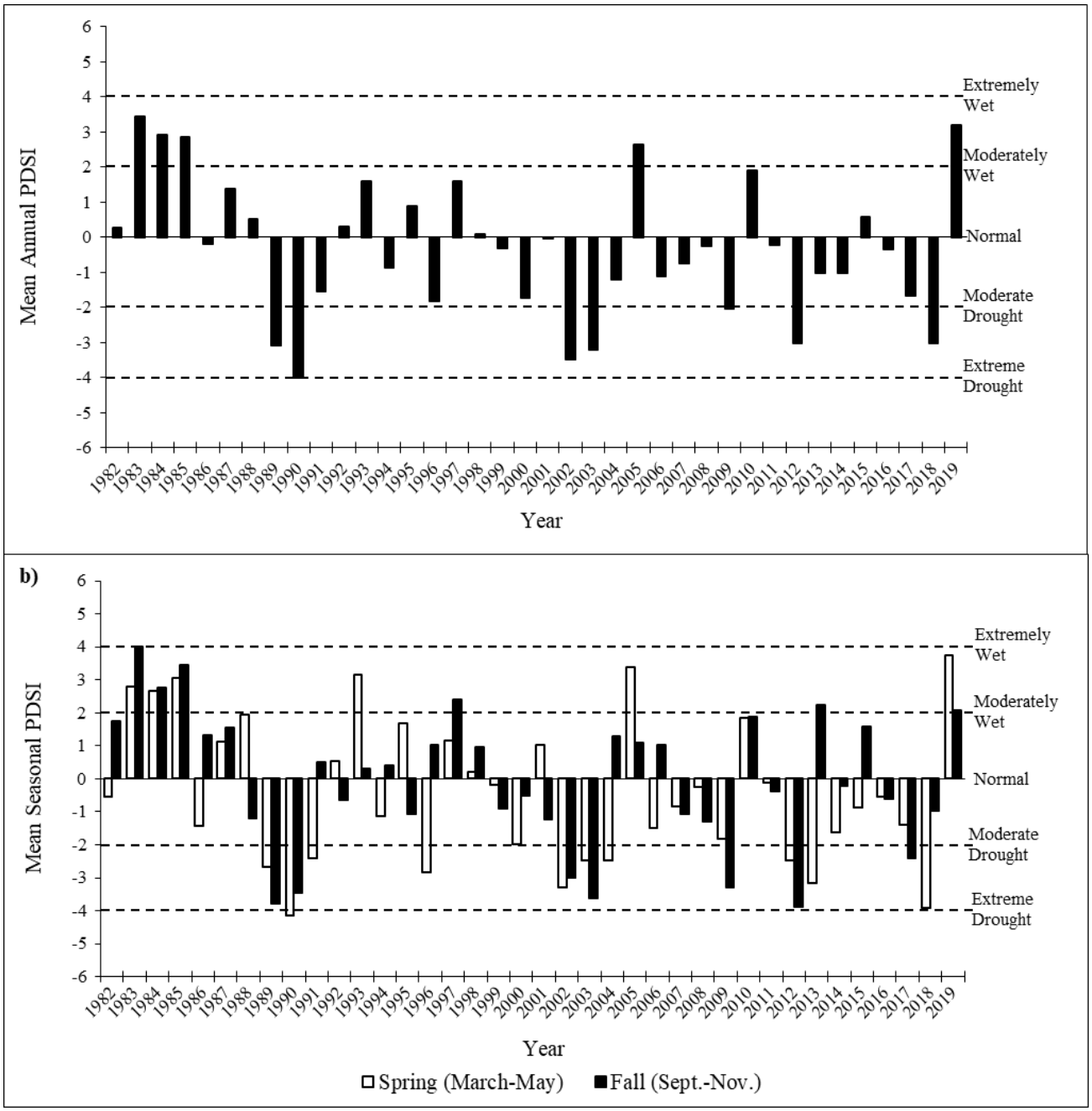


Figure 2.1: The 1982-2019 Palmer Drought Severity Index (PDSI) for the Southeast division (Division 7). The PDSI is based on climate data gathered from 1895 to 2019. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought. a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.) (Time Series Data, 2020).

Big Game Habitat

There are an estimated 1,034,810 acres classified as deer range on Unit 14 with 67% classified as winter range, 18% as summer range, and 15% as spring/fall range (**Table 2.1**, **Map 2.2**). Land managed by the Bureau of Land Management (BLM) comprises 60% of the deer winter range on the unit, 30% is privately owned, 9% is administered by the School and Institutional Trust Lands Administration (SITLA), 1% is owned by the Navajo Nation, and the United States Forest Service (USFS), Utah Department of Transportation (UDOT), Utah Division of Natural Resources (UDNR), and National Park Service (NPS) each manage less than 1% (**Table 2.2**, **Map 2.2**, **Map 2.6**). 41% of the elk winter range is administered by the USFS, 34% is managed by the BLM, 21% is privately owned, SITLA manages 4%, and UDOT manages less than 1% (**Table 2.3**, **Map 2.3**, **Map 2.6**).

Abajo Mountains

The normal deer winter range in the Abajo Mountains is found on various mesas at middle elevations. The upper elevation limit of most deer use during most winters is approximately 7,000 feet. However, during mild winters the range may remain open up to approximately 8,000 feet in elevation. The desert shrub community type (semidesert ecological sites) is found at low elevations along the northern boundary: deer use this community only in the most severe winters. The sagebrush-grass and pinyon-juniper vegetation communities (upland ecological sites) can be found side-by-side on the mesa tops of the normal winter range that are very important to wintering deer; the sagebrush-grass community type provides quality forage while pinyon-juniper communities provide important thermal cover. The pinyon-juniper-mountain brush community mountain ecological site is the most productive, but is usually excluded from use by deep snow during the more harsh winters.

The summer range is centered on and extends down the peaks of Blue Mountain to about 8,000 feet in elevation. Subalpine forest, aspen, and grass-shrub communities (high mountain ecological sites) are prevalent at higher elevations. Interspersed oak brush, sagebrush-grass, and forest communities (mountain ecological sites) provide the necessary cover and forage required for fawning and calving. The lower limits of the summer range on the north and east sides of the mountain are closer in elevation to approximately 7,500 feet and are dominated by mixed mountain brush communities (Guinta & Musclow, 1983). Oak brush is the dominant vegetation type at the lower reaches of the summer range.

Extensive areas of pinyon-juniper were chained and seeded in the 1960s. Although cover requirements for wildlife were not considered at the time (chained areas were large and usually square with no regard for cover or edge effect), they still provided many benefits (forage, for example) to the big game populations in the area.

The most crucial wintering areas for mule deer include Alkali Flat and Harts Draw. Other key areas are Shay Mesa, Indian Creek, from Deerneck Mesa to Step Hill, Cedar Point, Montezuma Canyon, and Recapture Wash.

Elk Ridge

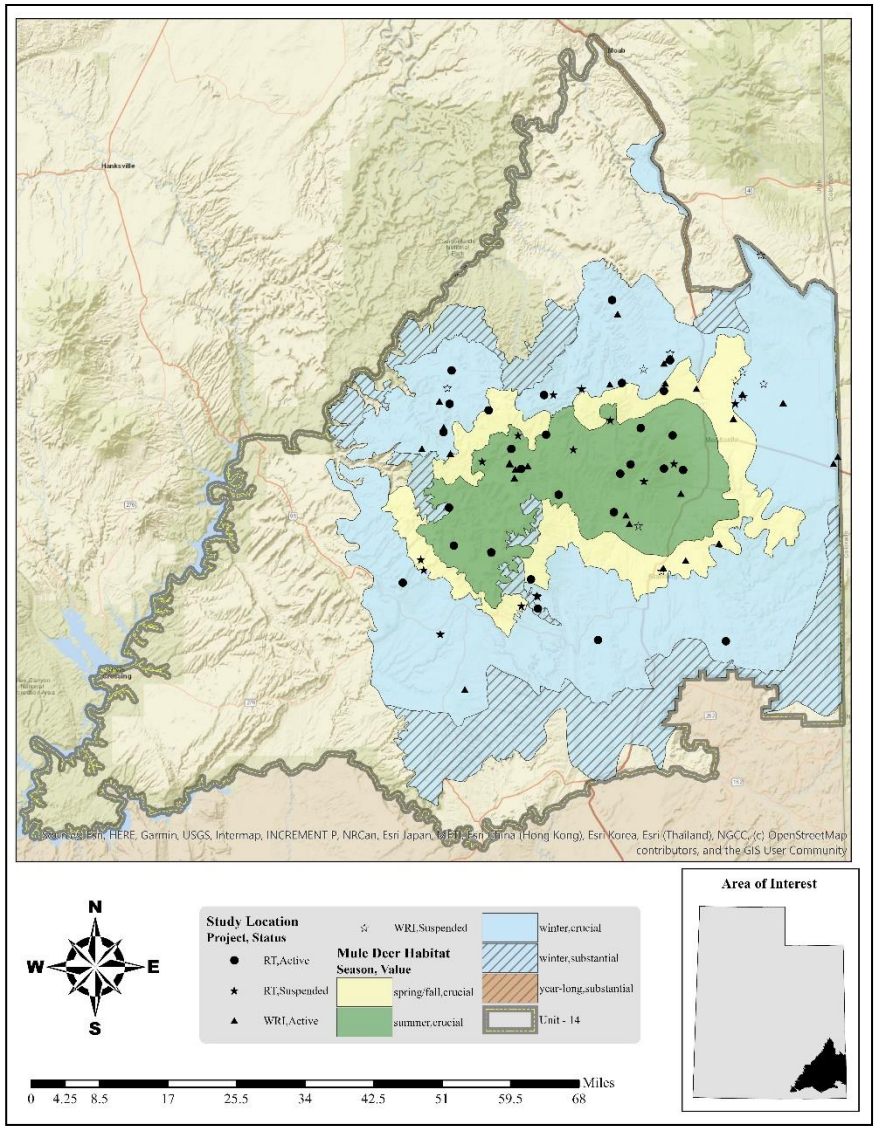
The primary winter range is found between 5,000 and 7,000 feet on the slopes and throughout the large flats surrounding Elk Ridge.

The sagebrush-grass vegetation community type (upland and semidesert ecological sites), dominated by *Artemisia sp.* shrubs, blue grama, and needle-and-thread grass, is found in Beef Basin and on Black Mesa, two important crucial winter ranges. The mountain brush-grass community type (mountain ecological sites) occupies the upper 1% of the winter range and has the highest rate of production: this type, however, is inaccessible during severe winters. The pinyon-juniper community (upland ecological sites) is the most prominent community type and occupies the majority of the deer winter range: this type is relatively unproductive, but provides good thermal and escape cover for deer that use the adjacent, more productive types. The pinyon-juniper with mountain brush community (upland and mountain ecological sites), like the

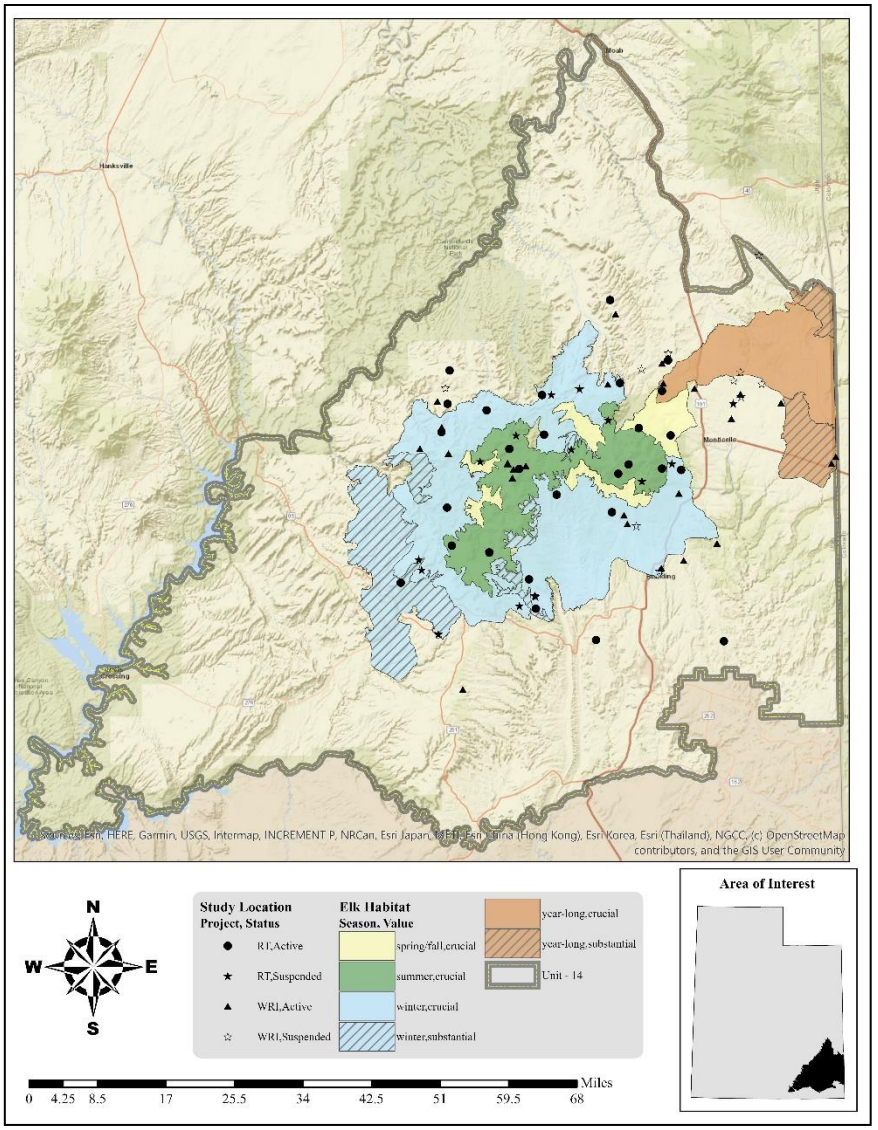
mountain brush community, can be found in the upper elevations of the winter range; this type provides quality deer forage in normal winters, but can be inaccessible to deer during severe winters. The pinyon-juniper-sagebrush community type (upland ecological sites) is fairly open, interspersed throughout larger tracts of pinyon-juniper woodland, and is important to wintering deer in both normal and severe winters.

Chaining projects are located throughout the unit and were mostly done in the 1960s to improve range for livestock, but have benefitted big game as well. Most of the treated and seeded areas are within pinyon-juniper communities. With trends on the most overused sagebrush communities decreasing, herbicide and seeding treatments have been done on several areas to open up the sagebrush, make them more productive, and increase their vigor.

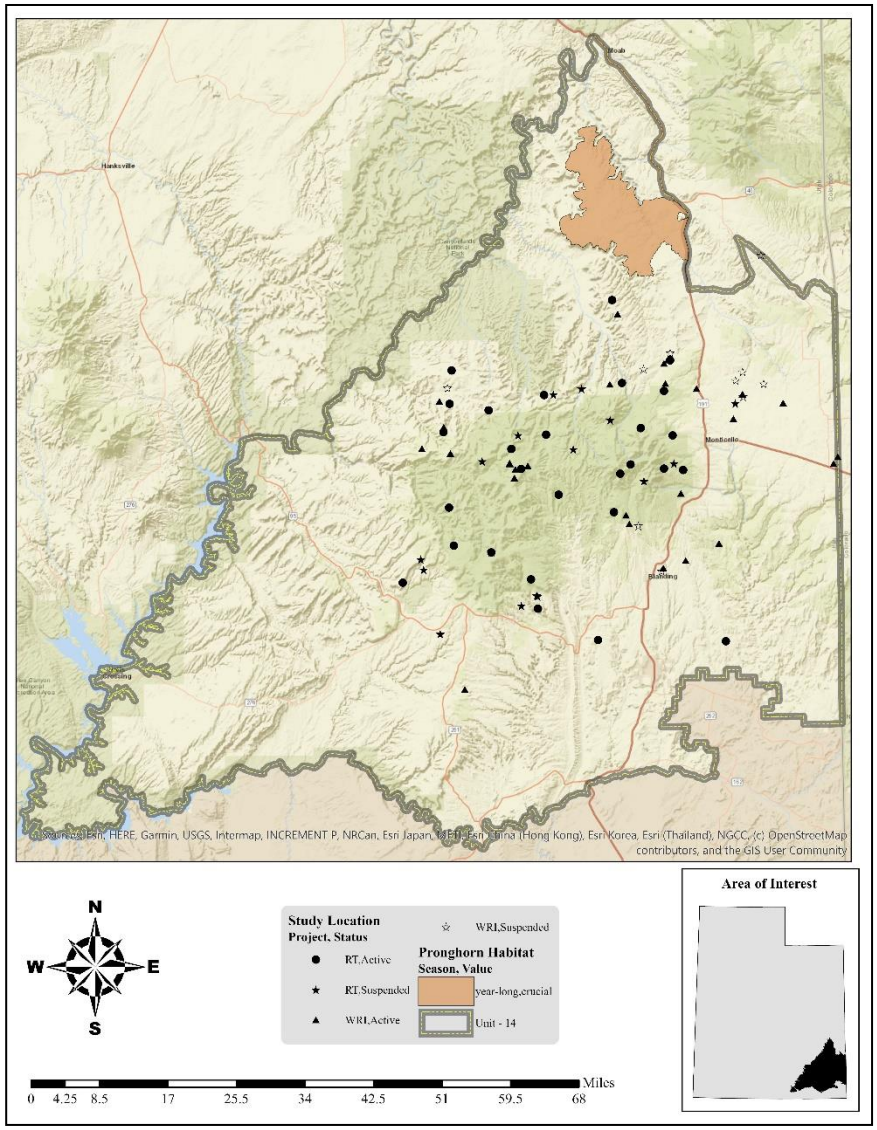
Key areas for mule deer winter range on Elk Ridge include Beef Basin, Salt Creek Mesa, Dark Canyon Plateau, and Black Mesa.



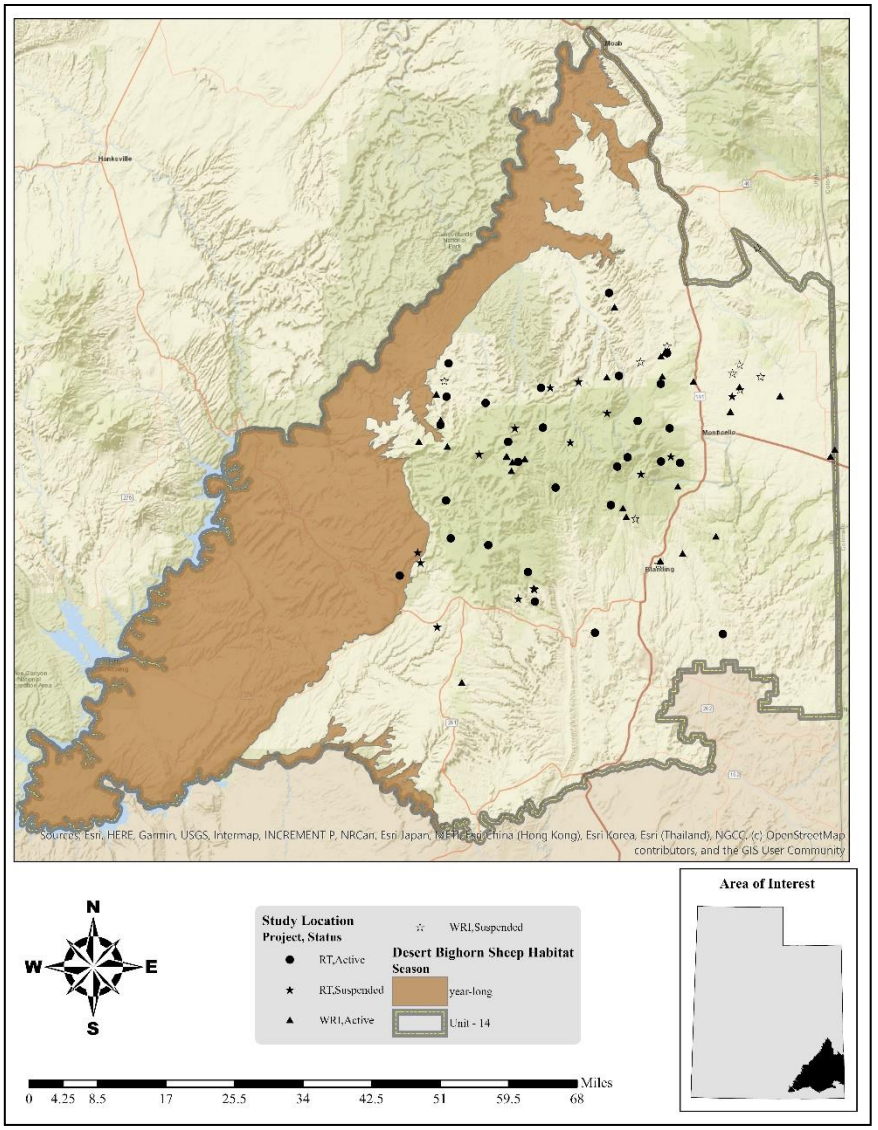
Map 2.2: Estimated mule deer habitat by season and value for WMU 14, San Juan.



Map 2.3: Estimated elk habitat by season and value for WMU 14, San Juan.



Map 2.4: Estimated pronghorn habitat by season and value for WMU 14, San Juan.



Map 2.5: Estimated desert bighorn sheep habitat by season and value for WMU 14, San Juan.

	Year Long Range		Summer Range		Winter Range		Spring/Fall Range	
Species	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
Mule Deer	0	0%	181,865	18%	693,585	67%	159,360	15%
Elk	153,460	44%	40,401	11%	118,348	34%	40,336	11%
Pronghorn	89,859	100%	0	0%	0	0%	0	0%
Desert Bighorn Sheep	122,797	100%	0	0%	0	0%	0	0%

Table 2.1: Estimated mule deer, elk, pronghorn, and desert bighorn sheep habitat acreage by season for WMU 14, San Juan.

	Summer Range		Winter Range		Spring/Fall Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	18,529	10%	419,720	60%	57,130	36%
Private	53,802	30%	205,053	30%	71,670	45%
SITLA	1,758	1%	59,355	9%	7,658	5%
USFS	107,733	59%	1,681	<1%	22,875	14%
UDOT	1	<1%	68	<1%	0	0%
UDNR	0	0%	40	<1%	27	<1%
DOE	42	<1%	0	0%	0	0%
NPS	0	0%	387	<1%	0	0%
Tribal	0	0%	7,281	1%	0	0%
Total	181,865	**100%**	693,585	**100%**	159,360	**100%**

Table 2.2: Estimated mule deer habitat acreage by season and ownership for WMU 14, San Juan.

	Year Long Range		Summer Range		Winter Range		Spring/Fall Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	46,744	31%	0	0%	40,417	34%	3,234	8%
Private	97,148	63%	256	1%	24,474	21%	6,097	15%
SITLA	6,744	4%	0	0%	4,808	4%	399	1%
USFS	2,824	2%	40,145	99%	48,649	41%	30,605	76%
UDOT	0	0%	0	0%	1	<1%	0	0%
Total	153,460	**100%**	40,401	**100%**	118,348	**100%**	40,336	**100%**

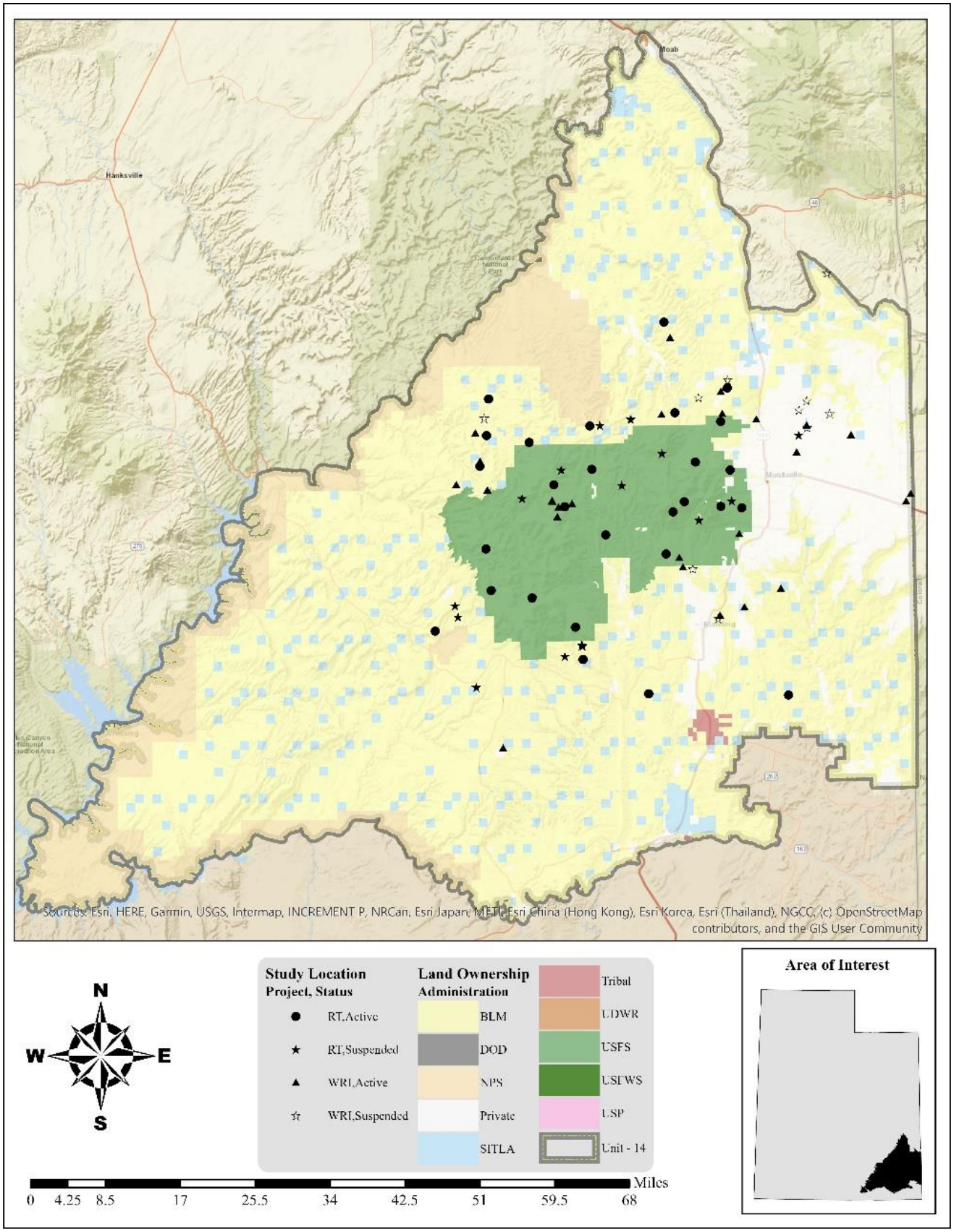
Table 2.3: Estimated elk habitat acreage by season and ownership for WMU 14, San Juan.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	76,704	85%
Private	2,802	3%
SITLA	10,351	12%
UDOT	3	<1%
Total	89,859	**100%**

Table 2.4: Estimated pronghorn habitat acreage by season and ownership for WMU 14, San Juan.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	96,013	78%
Private	853	<1%
SITLA	17,088	14%
UDNR	1,855	2%
NPS	6,988	6%
Total	122,797	**100%**

Table 2.5: Estimated desert bighorn sheep habitat acreage by season and ownership for WMU 14, San Juan.



Map 2.6: Land ownership for WMU 14, San Juan.

Group	Existing Vegetation Type	Acres	% of Total	Group % of Total
Shrubland	Inter-Mountain Basins Big Sagebrush Shrubland	139,975	14.19%	
	Colorado Plateau Pinyon-Juniper Shrubland	121,442	12.31%	
	Colorado Plateau Blackbrush-Mormon-tea Shrubland	104,487	10.59%	
	Herbaceous - Shrub-Steppe	30,082	3.05%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	26,092	2.64%	
	Great Basin & Intermountain Ruderal Shrubland	16,812	1.70%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	11,907	1.21%	
	Dwarf-shrubland	6,432	0.65%	
	Interior Western Ruderal Shrubland and Riparian Scrub	5,792	0.59%	
	Southern Colorado Plateau Sand Shrubland	5,538	0.56%	
	Inter-Mountain Basins Greasewood Flat	3,211	0.33%	
	Rocky Mountain Lower Montane-Foothill Shrubland	3,205	0.32%	
	Western Cool Temperate Shrubland	2,870	0.29%	
	Other Shrubland	363	0.04%	48.48%
Open Tree Canopy	Colorado Plateau Pinyon-Juniper Woodland	277,397	28.12%	
	Southern Rocky Mountain Ponderosa Pine Woodland	30,093	3.05%	
	Rocky Mountain Aspen Forest and Woodland	9,251	0.94%	
	Rocky Mountain Lower Montane-Foothill Riparian Woodland	3,781	0.38%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	1,431	0.15%	
	Western Cool Temperate Forest	1,119	0.11%	
	Rocky Mountain Lower Montane-Foothill Riparian Shrubland	754	0.08%	
	Interior West Ruderal Riparian Forest	666	0.07%	
	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	173	0.02%	
	Other Open Tree Canopy	118	0.01%	32.92%
Grassland	Western Cool Temperate Agriculture	97,284	9.86%	
	Inter-Mountain Basins Semi-Desert Grassland	3,328	0.34%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	3,168	0.32%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	2,857	0.29%	
	Great Basin & Intermountain Introduced Annual Grassland	2,780	0.28%	
	Southern Rocky Mountain Montane-Subalpine Grassland	1,666	0.17%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	1,318	0.13%	
	Interior Western North American Temperate Ruderal Grassland	1,257	0.13%	
	North American Arid West Emergent Marsh	823	0.08%	
	Other Grassland	204	0.02%	11.63%
Other	Sparsely Vegetated	46,870	4.75%	
	Developed	9,632	0.98%	
	Open Water	2,472	0.25%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	637	0.06%	
	Sparse Tree Canopy	20	0.00%	6.05%
Closed Tree Canopy	Southern Rocky Mountain Montane Mixed Conifer Forest and Woodland	5,651	0.57%	
	Rocky Mountain Subalpine Spruce-Fir Forest and Woodland	3,496	0.35%	0.93%
Total		**986,451**	**100%**	**100%**

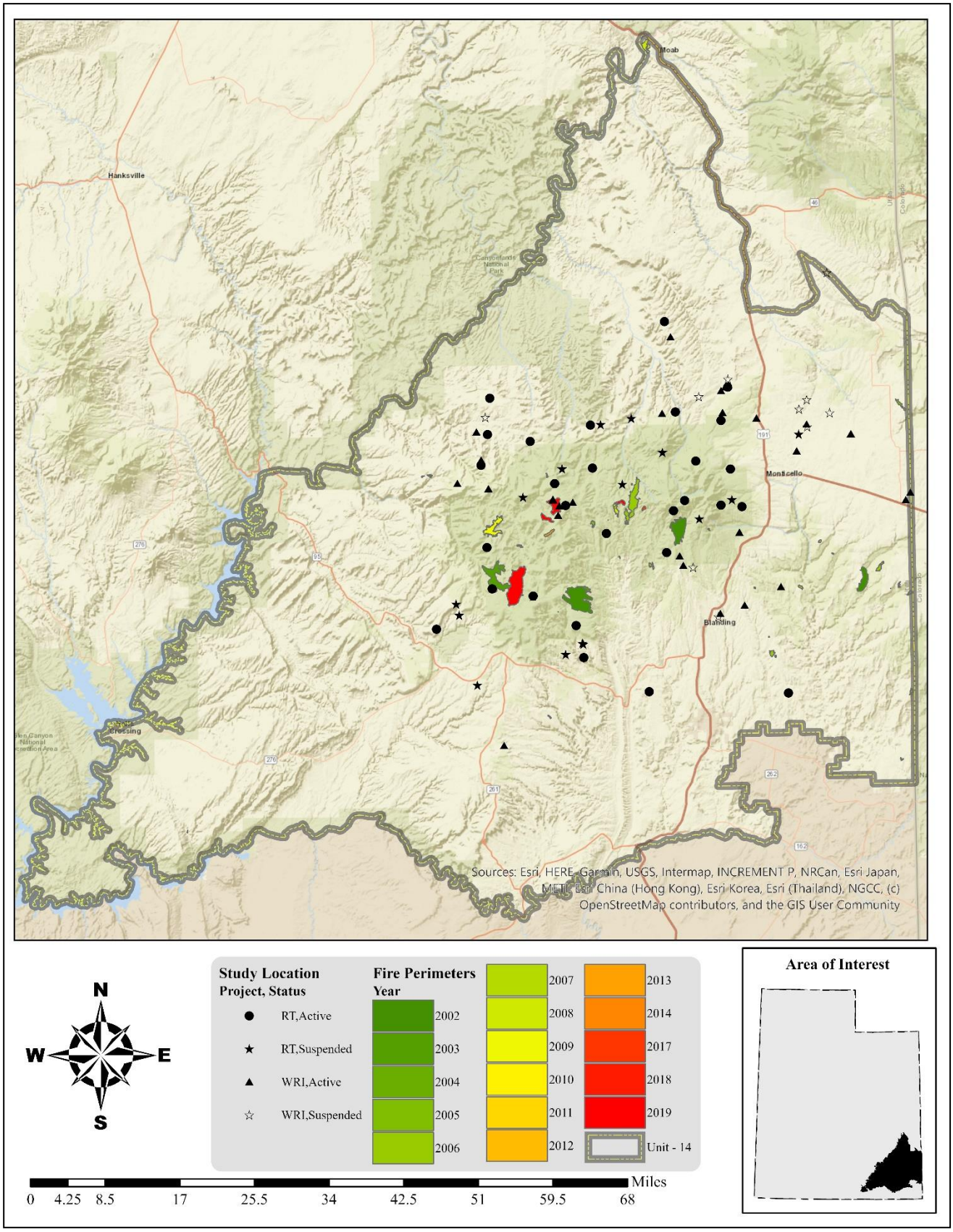
Table 2.6: LANDFIRE Existing Vegetation Coverage (LANDFIRE.US_140EVT, 2020) for WMU 14, San Juan.

Limiting Factors to Big Game Habitat

Livestock grazing is the primary land use for the San Juan herd unit. Other important land uses include logging, oil and gas exploration, hunting, farming, timber, mining, wood cutting, and recreation. Extensive areas of Elk Ridge are covered by ponderosa pine that provides large amounts of quality saw timber; most of the Elk Ridge area has once been logged. Oil and gas exploration has increased in recent years, while mining operations have been suspended due to low uranium prices. There has been recent development and increased activity on the crucially important Harts Point winter range. Activities associated with these land uses need to be closely monitored and steps should be taken to minimize and mitigate negative impacts on water quality and on the range and associated wildlife populations.

Extended drought poses a substantial threat to important sagebrush rangelands. Large drought-related die-offs of sagebrush in Ruin Park, Harts Draw, Alkali Point, Black Mesa and other key areas have reduced the quality of mule deer winter range. Future droughts could contribute to continued decreases of sagebrush, therefore inhibiting recovery. In addition, many of the range trend sites occurring in the upland and semidesert ecological sites had moderate to high cover of cheatgrass in the late 1990s and early 2000s. However, cheatgrass has since decreased in abundance. Moderate to high abundance of cheatgrass may limit effective recruitment of desirable species and may effect fire regimes.

According to the current LANDFIRE Existing Vegetation Coverage model, over 28% of the unit is comprised of pinyon and juniper woodlands. While these woodlands provide valuable escape and thermal cover for wildlife, encroachment and invasion into historic shrublands reduces available browse and decreases the carrying capacity of the unit. Encroachment and invasion of these woodlands into sagebrush communities has been shown to decrease the sagebrush and herbaceous components, therefore decreasing available forage for wildlife (Miller, Svejcar, & Rose, 2000).



Map 2.7: Land coverage of fires by year from 2000-2019 for WMU 14, San Juan (Geosciences and Environmental Change Science Center (GECSC) Outgoing Datasets, 2020).

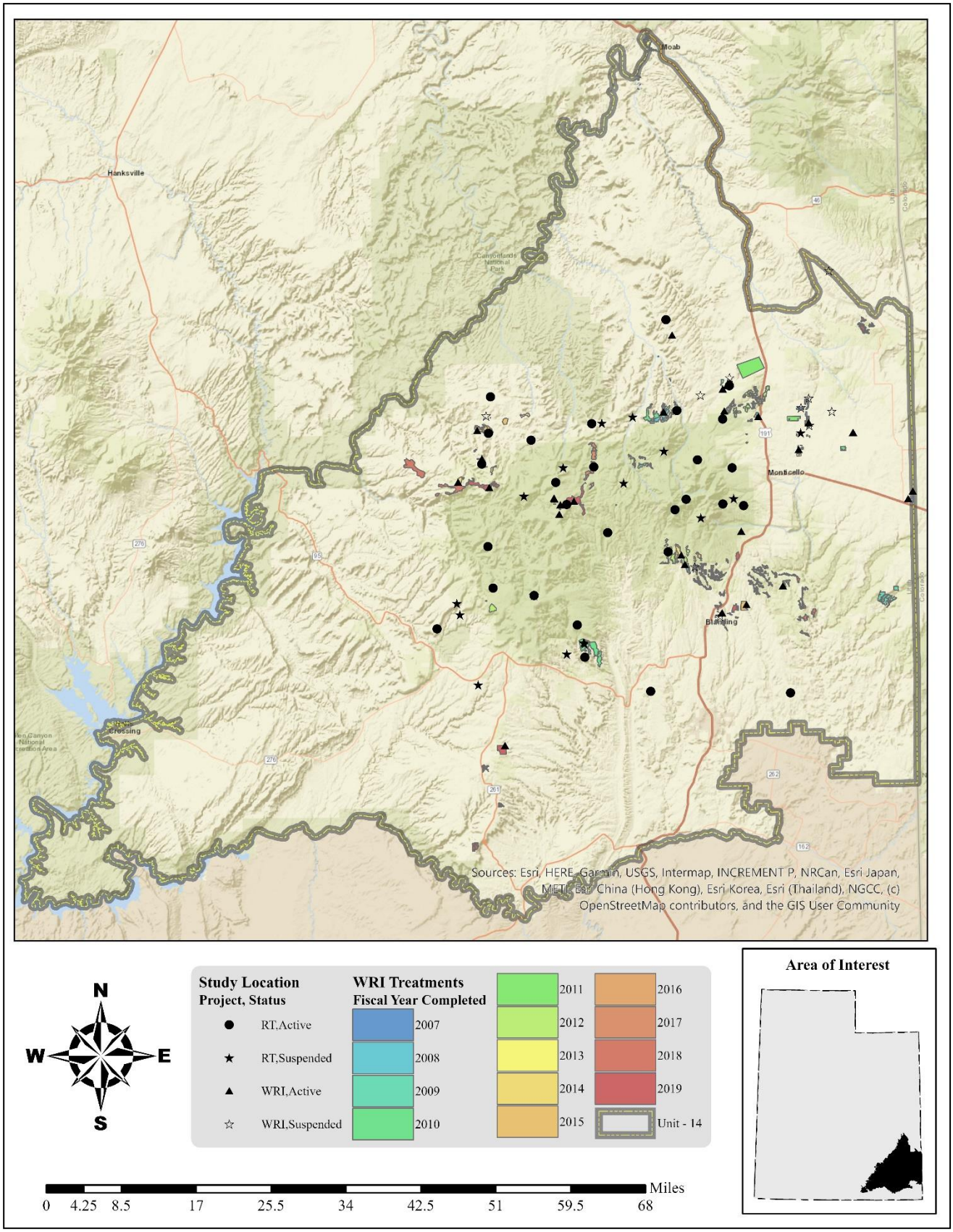
Treatments/Restoration Work

There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 28,861 acres of land have been treated within the San Juan unit since the WRI was implemented in 2004 (**Map 2.8**). In addition, 25,566 acres are currently being treated and treatments have been proposed for 28,007 acres. Treatments frequently overlap one another bringing the total completed treatment acres to 45,868 acres for this unit (**Table 2.7**). Other treatments have occurred outside of the WRI through independent agencies and landowners, but the WRI comprises the majority of work done on deer winter ranges throughout the state of Utah.

The treatment type that has treated the most acres in this unit is prescribed fire to promote aspen regeneration and increase forest health. Techniques to remove pinyon and juniper such as hand crew removal (e.g. lop and scatter, lop-pile-burn) and bullhog treatments are also very common. Seeding species to augment the herbaceous understory has also been an often-used treatment. Other management practices including (but not limited to) harrowing, chain harrowing, aerator treatments, and herbicide application have also been used across the unit (**Table 2.7**).

Type	Completed Acreage	Current Acreage	Proposed Acreage	Total Acreage
Aerator	**3,248**	**0**	**0**	**3,248**
Single Drum (One-Way)	629	0	0	629
Double Drum (Two-Way)	2,619	0	0	2,619
Anchor Chain	**156**	**0**	**0**	**156**
Ely (One-Way)	152	0	0	152
Ely (Two-Way)	4	0	0	4
Bullhog	**11,209**	**1,247**	**4,152**	**16,608**
Full Size	8,813	1,247	4,054	14,114
Skid Steer	2,396	0	98	2,494
Chain Harrow	**582**	**0**	**0**	**582**
≤15 ft. (One-Way)	362	0	0	362
>15ft. (One-Way)	220	0	0	220
Disc	**2,083**	**0**	**0**	**2,083**
Plow (One-Way)	220	0	0	220
Off-Set (One-Way)	1,863	0	0	1,863
Forestry Practices	**270**	**0**	**0**	**270**
Thinning (Non-Commercial)	270	0	0	270
Harrow	**2,398**	**0**	**0**	**2,398**
≤15 ft. (One-Way)	2,398	0	0	2,398
Herbicide Application	**2,214**	**14**	**213**	**2,441**
Ground	137	0	0	137
Aerial (Fixed-Wing)	1,105	0	199	1,304
Spot Treatment	972	14	14	1,000
Planting/Transplanting	**189**	**2**	**7**	**198**
Container Stock	0	2	0	2
Bareroot Stock	1	0	7	8
Other	188	0	0	188
Prescribed Fire	**1,518**	**21,528**	**22,572**	**45,618**
Prescribed Fire	1,518	21,528	22,572	45,618
Seeding (Primary)	**13,529**	**273**	**514**	**14,316**
Broadcast (Aerial-Fixed Wing)	2,875	258	0	3,133
Broadcast (Aerial-Helicopter)	682	0	0	682
Broadcast (Aerial-Helicopter)/Drill (Rangeland)	263	0	0	263
Ground (Mechanical Application)	7,427	0	388	7,815
Ground (Mechanical Application)/Drill (Rangeland/Truax)	56	0	0	56
Drill (Rangeland)	1,725	0	126	1,851
Drill (Rangeland/Truax)	414	0	0	414
Hand Seeding	87	15	0	102
Seeding (Secondary)	**921**	**258**	**98**	**1,277**
Broadcast (Aerial-Fixed Wing)	865	258	0	1,123
Ground (Mechanical Application)	56	0	98	154
Vegetation Removal/Hand Crew	**7,551**	**3,682**	**1,322**	**12,555**
Lop & Scatter	2,637	3,245	1,308	7,190
Lop-Pile-Burn	4,326	425	0	4,751
Lop (No Scatter)	450	0	0	450
Lop & Chip	1	0	14	15
Cut Stump	137	12	0	149
Other	**0**	**2**	**0**	**2**
Road Decommissioning	0	2	0	2
Grand Total	**45,868**	**27,006**	**28,878**	**101,752**
***Total Land Area Treated**	**28,861**	**25,566**	**28,007**	**82,434**

Table 2.7: WRI treatment action size (acres) for completed, current, and proposed projects for WMU 14, San Juan. Data accessed on 02/19/2020.
*Does not include overlapping treatments.



Map 2.8: WRI treatments by fiscal year completed for WMU 14, San Juan.

Range Trend Studies

Range Trend studies have been sampled within WMU 14 on a regular basis since 1986, with studies being added or suspended as was deemed necessary (**Table 2.8**). Due to changes in sampling methodologies, only data collected following the 1992 sample year is included in this summary. Monitoring studies of WRI projects began in 2004; when possible WRI monitoring studies are established prior to treatment and sampled on a regular basis following treatment. Due to the long-term nature of the studies, many of the Range Trend and WRI studies have had some sort of disturbance or treatment prior to or since study establishment (**Table 2.9**).

Range Trend studies are summarized in this report by ecological site. Range Trend and WRI studies that have had a disturbance or treatment during the reported sample period are summarized in this report by the disturbance or treatment type and are summarized by region.

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
14-1	Alkali Point	RT	Active	1986, 1994, 1999, 2004, 2009, 2012, 2014, 2019	Semidesert Loam (Wyoming Big Sagebrush)
14-2	Brushy Basin	RT	Active	1986, 1994, 1999, 2004, 2009, 2014, 2019	Mountain Stony Loam (Mountain Big Sagebrush)
14-3	Gold Queen Basin	RT	Suspended	1986, 1994, 1999, 2004	Not Verified
14-4	Camp Jackson Reservoir	RT	Suspended	1986, 1994, 1999	Not Verified
14-5	Jackson Ridge	RT	Active	1986, 1994, 1999, 2004, 2009, 2014, 2019	High Mountain Stony Loam (Aspen)
14-6	Harts Draw Reservoir	RT	Active	1986, 1994, 1999, 2004, 2009, 2014, 2019	Mountain Loam (Oak)
14-7	Shay Mountain	RT	Suspended	1986, 1994	Not Verified
14-8	Peters Point	RT	Active	1986, 1994, 1999, 2004, 2009, 2014, 2019	Upland Loam (Mountain Big Sagebrush)
14-9	Harts Draw	RT	Active	1986, 1994, 1999, 2004, 2009, 2014, 2019	Upland Loam (Mountain Big Sagebrush)
14-10	Harts Point	RT	Active	1986, 1994, 1999, 2004, 2009, 2014, 2019	Upland Loam (Mountain Big Sagebrush)
14-11	Shay Mesa	RT	Active	1986, 1994, 1999, 2004, 2009, 2011, 2014, 2019	Upland Loam (Mountain Big Sagebrush)
14-12	Shingle Mill	RT	Active	1994, 1999, 2004, 2009, 2014, 2019	Mountain Stony Loam (Browse)
14-13	Black Mesa	RT	Active	1986, 1992, 1994, 1999, 2004, 2009, 2014, 2019	Semidesert Sandy Loam (Wyoming Big Sagebrush)
14-14	Texas Flat	RT	Suspended	1986, 1992, 1994, 1999, 2004, 2009	Not Verified
14-15	Harmony Flat	RT	Suspended	1986, 1992, 1999, 2004	Not Verified
14-16	Lower Lost Park	RT	Suspended	1986, 1992, 1999, 2004, 2009	Not Verified
14-17	Deer Flat	RT	Suspended	1986, 1992, 1999	Not Verified
14-18	Kigalia Point	RT	Suspended	1986, 1992, 1999, 2004	Not Verified
14-19	Woodenshoe	RT	Active	1986, 1992, 1999, 2004, 2009, 2014, 2019	Mountain Loam (Ponderosa Pine)
14-20	Gooseberry	RT	Active	1986, 1992, 1999, 2004, 2009, 2014	Mountain Loam (Ponderosa Pine)
14-21	North Long Point	RT	Suspended	1986, 1992, 1999	Not Verified
14-22	Wild Cow Point	RT	Active	1986, 1992, 1999, 2004, 2009, 2014, 2019	Upland Loam (Mountain Big Sagebrush)
14-23	South Plain	RT	Active	1986, 1992, 1999, 2004, 2009, 2012, 2014, 2019	Upland Loam (Mountain Big Sagebrush)
14-24	Ruin Park	RT	Active	1986, 1992, 1999, 2004, 2009, 2014, 2019	Semidesert Sandy Loam (Wyoming Big Sagebrush)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
14-25	Davis Pocket	RT	Suspended	1986, 1992	Not Verified
14-26	The Wilderness	RT	Suspended	1986, 1992, 1999	Not Verified
14-27	Mormon Pasture Point	RT	Active	1986, 1992, 1999, 2004, 2009, 2014, 2019	Mountain Loam (Oak)
14-28	North Cottonwood	RT	Suspended	1986, 1999	Not Verified
14-29	Salt Creek Mesa	RT	Active	1992, 1999, 2004, 2009, 2014, 2019	Upland Shallow Loam (Pinyon-Utah Juniper)
14-30	Milk Ranch Point	RT	Active	1992, 1999, 2004, 2009, 2014, 2019	Mountain Loam (Oak)
14-31	Chippean Ridge	RT	Active	1992, 1999, 2004, 2009, 2014, 2019	Mountain Loam (Oak)
14-32	Lower Deer Flat	RT	Active	1994, 1999, 2004, 2009, 2014, 2019	Upland Loam (Mountain Big Sagebrush)
14-34	Big Flat	RT	Active	2004, 2009, 2014, 2019	Mountain Loam (Mountain Big Sagebrush)
14-35	Dickson Gulch	RT	Active	2009, 2014, 2019	High Mountain Loam (Aspen)
14-36	Dry Mesa	RT	Active	2009, 2014	Upland Loam (Mountain Big Sagebrush)
14-37	Kigalia Point II	RT	Active	2009, 2014, 2019	Mountain Loam (Ponderosa Pine)
14-38	Arch Canyon	RT	Active	2014, 2019	Upland Loam (Big Sagebrush)
14-39	Beef Basin Wash	RT	Active	2019	Upland Loam (Basin Big Sagebrush)
14-40	Clay Draw	RT	Active	2019	Mountain Stony Loam (Browse)
14-41	Duckett Ridge	RT	Active	2019	High Mountain Loam (Thurber Fescue)
14R-1	Cathedral Butte	RT	Suspended	2001, 2004	Not Verified
14R-2	Jerry Hines CRP	RT	Suspended	2001	Not Verified
14R-3	Little Baullies 1	RT	Suspended	1998	Not Verified
14R-4	Little Baullies 2	RT	Suspended	1998	Not Verified
14R-5	Turner Water Canyon (Hart Draw)	WRI	Suspended	2004	Not Verified
14R-6	Dugout (Hart Draw)	WRI	Active	2004, 2008, 2013, 2018	Upland Loam (Mountain Big Sagebrush)
14R-7	Adams CE Harrow	WRI	Active	2004, 2007, 2012, 2017	Upland Shallow Loam (Black Sagebrush)
14R-8	Adams CE Control	WRI	Active	2004, 2007, 2012, 2017	Upland Shallow Loam (Black Sagebrush)
14R-9	Hart Draw Flat 1	WRI	Active	2005, 2008, 2013, 2018	Upland Loam (Mountain Big Sagebrush)
14R-10	Hart Draw Flat 2	WRI	Active	2005, 2008, 2013, 2018	Upland Loam (Mountain Big Sagebrush)
14R-11	Harts Windmill	WRI	Active	2005, 2008, 2013, 2018	Upland Loam (Mountain Big Sagebrush)
14R-12	Bell Draw Drill	WRI	Suspended	2006	Not Verified
14R-13	Bell Draw Dixie	WRI	Suspended	2006, 2009, 2010	Not Verified
14R-14	SITLA Dixie	WRI	Suspended	2006, 2009, 2010	Not Verified
14R-15	SITLA Dixie 2	WRI	Active	2006, 2012, 2017	Upland Loam (Big Sagebrush)
14R-16	Harvey John Mesa	WRI	Suspended	2006, 2010, 2014	Not Verified
14R-17	Stateline South	WRI	Active	2006, 2012, 2017	Upland Shallow Loam (Black Sagebrush)
14R-18	Stateline North	WRI	Active	2006, 2009, 2013, 2017	Upland Loam (Big Sagebrush)
14R-19	Peter's Canyon	WRI	Active	2007, 2010, 2014, 2018	Upland Loam (Mountain Big Sagebrush)
14R-20	Johnson Creek	WRI	Active	2007, 2010, 2014, 2019	Upland Loam (Mountain Big Sagebrush)
14R-21	Shay Mesa Bullhog	WRI	Active	2008, 2011, 2014, 2018	Upland Loam (Mountain Big Sagebrush)
14R-22	Harts Draw Reference	WRI	Suspended	2009	Not Verified
14R-23	Gunnison Sage Grouse Reference	WRI	Suspended	2009	Not Verified
14R-24	Lisbon Valley GIP	WRI	Suspended	2008	Not Verified
14R-25	Peters Point BLM	WRI	Active	2011, 2014, 2018	Upland Loam (Mountain Big Sagebrush)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
14R-27	Seep Creek	WRI	Active	2012, 2015, 2019	Upland Loam (Mountain Big Sagebrush)
14R-28	Johnson Creek 2	WRI	Active	2012, 2015, 2019	Mountain Loam (Oak)
14R-29	South Plain 2	WRI	Active	2012, 2017	Upland Sand (Mountain Big Sagebrush)
14R-30	North Plain	WRI	Suspended	2012	Semidesert Sandy Loam (Wyoming Big Sagebrush)
14R-31	Dark Canyon	WRI	Active	2012, 2015, 2019	Upland Loam (Mountain Big Sagebrush)
14R-33	Sego Spring 1	WRI	Active	2014	High Mountain Loam (Aspen)
14R-34	Sego Spring 2	WRI	Active	2014	High Mountain Loam (Aspen)
14R-35	Blanding East	WRI	Suspended	2014	Upland Loam (Pinyon-Utah Juniper)
14R-36	Mustang Mesa	WRI	Active	2014, 2017	Upland Loam (Big Sagebrush)
14R-37	Lower Wild Cow Point	WRI	Active	2014, 2017	Upland Loam (Mountain Big Sagebrush)
14R-38	Sweet Alice Spring	WRI	Active	2017	Upland Sand (Mountain Big Sagebrush)
14R-39	Duck Lake	WRI	Active	2017	High Mountain Loam (Aspen)
14R-40	Gooseberry North	WRI	Active	2017	High Mountain Loam (Aspen)
14R-41	Round Mountain	WRI	Active	2017	High Mountain Loam (Aspen)
14R-42	Brushy Flat	WRI	Active	2018	Upland Loam (Mountain Big Sagebrush)
14R-43	Long Canyon Point	WRI	Active	2018	Upland Loam (Mountain Big Sagebrush)
14R-44	Lems Draw	WRI	Active	2018	Upland Shallow Loam (Black Sagebrush)
14R-45	Long Canyon	WRI	Active	2019	Mountain (Browse)

Table 2.8: Range trend and WRI project studies monitoring history and ecological site potential for WMU 14, San Juan.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
14-2	Brushy Basin	Chain Unknown		1971	1,400	
		Seed Unknown		1971	1,400	
		Bullhog	Brushy Basin Habitat Improvement Project Phase II	Fall 2012-Winter 2014	573	2275
14-6	Harts Draw Reservoir	Seed Unknown		Historic		
14-8	Peters Point	Chain Unknown		1962		
		Seed Unknown		1962		
14-9	Harts Draw	Single Drum/Seed	Hart Draw Sagebrush Restoration (year 1)	December 2005	629	246
14-11	Shay Mesa	Chain Unknown		Mid-1960s		
		Seed Unknown		Mid-1960s		
		Bullhog	Shay Mesa Phase II	May-June 2009	545	1091
14R-6	Dugout (Hart Draw)	Single Drum/Seed	Hart Draw Sagebrush Restoration (year 1)	December 2005	628	246
14R-7	Adams CE Harrow	Broadcast Before		August-December 2001	320	PDB
		Two-Way Dixie		August-December 2001	320	PDB
14R-9	Hart Draw Flat 1	Single Drum/Seed	Hart Draw Sagebrush Restoration (year 1)	December 2005	628	246
		Rangeland Drill	Hart Draw Phase 1 Cont.	September-October 2008	263	1231
		Aerial	Hart Draw Phase 1 Cont.	October 2008	263	1231
14R-10	Hart Draw Flat 2	Aerial	Hart Draw Phase 1 Cont.	October 2008	263	1231
		Single Drum/Seed	Hart Draw Sagebrush Restoration (year 1)	December 2005	628	246
14R-11	Harts Windmill	Single Drum/Seed	Hart Draw Sagebrush Restoration (year 1)	December 2005	628	246
		Rangeland Drill	Hart Draw Phase 1 Cont.	September-October 2008	263	1231
		Aerial	Hart Draw Phase 1 Cont.	October 2008	263	1231
14R-12	Bell Draw	Disc	Bell Draw	Fall 2006	219	295
	Drill	Rangeland Drill	Bell Draw	Fall 2006	219	295
14R-13	Bell Draw	One-Way Dixie	Bell Draw	Fall 2006	102	295
	Dixie	Broadcast Before	Bell Draw	Fall 2006	102	295

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
14R-14	SITLA Dixie	One-Way Dixie	Gunnison Sage-grouse Sagebrush Treatments phase 1	Fall 2006	275	334
		Broadcast Before	Gunnison Sage-grouse Sagebrush Treatments phase 1	Fall 2006	275	334
		One-Way Chain	Gunnison Sage-grouse Sagebrush Treatments Follow-up	September 2014	220	2855
		Broadcast	Gunnison Sage-grouse Sagebrush Treatments Follow-up	September 2014	220	2855
14R-15	SITLA Dixie 2	Broadcast Before	Gunnison Sage-grouse Sagebrush Treatments phase 1	Fall 2006	275	334
		One-Way Dixie	Gunnison Sage-grouse Sagebrush Treatments phase 1	Fall 2006	275	334
		One-Way Chain	Gunnison Sage-grouse Sagebrush Treatments Follow-up	September 2014	220	2855
		Broadcast	Gunnison Sage-grouse Sagebrush Treatments Follow-up	September 2014	220	2855
14R-16	Harvey John Mesa	Broadcast Before	Harvey John Kratcher Mesa	October-November 2006	270	526
		One-Way Dixie	Harvey John Kratcher Mesa	October-November 2006	270	526
14R-17	Stateline South	One-Way Dixie	Gunnison Sage-grouse Sagebrush Treatments phase 1	November-December 2006	240	334
		Broadcast Before	Gunnison Sage-grouse Sagebrush Treatments phase 1	November-December 2006	240	334
14R-18	Stateline North	Broadcast Before	Gunnison Sage-grouse Sagebrush Treatments phase 1	November-December 2006	240	334
		One-Way Dixie	Gunnison Sage-grouse Sagebrush Treatments phase 1	November-December 2006	240	334
14R-19	Peter's Canyon	Bullhog	Peter's Canyon	December 2006	151	906
		Broadcast/Harrow	Peter's Canyon	December 2007	151	906
		Prescribed Fire	Peter's Canyon	October 2007	151	906
14R-20	Johnson Creek	Slash Pile	Johnson Creek	October 2007-May 2008	261	905
		Lop and Scatter	Johnson Creek	October 2007-May 2008	300	905
		Broadcast/Harrow	Johnson Creek	October 2007-May 2008	300	905
14R-21	Shay Mesa Bullhog	Chain Unknown		1959		
		Seed Unknown		1959		
		Bullhog	Shay Mesa Phase II	April-September 2009	545	1091
		Aerial Before	Shay Mesa Phase II	December 2008-March 2009	212	1091
14R-24	Lisbon Valley GIP	Aerial Before	Lisbon Rim Seeding	October-November 1966	1,520	LTDL
		Two-Way Chain Unknown	Lisbon Rim Seeding	October-November 1966	1,520	LTDL
14R-25	Peters Point BLM	Bullhog	Peters Point - Phase I	October 2011-May 2012	1,253	1944
		Lop and Scatter	Peter's Point Maintenance	November 2019	2,097	4627
14R-27	Seep Creek	Plateau	Seep Creek Sagebrush and Wet Meadow Enhancement	November 2012	130	2325
		Disk	Seep Creek Sagebrush and Wet Meadow Enhancement	November 2012	130	2325
		Rangeland Drill	Seep Creek Sagebrush and Wet Meadow Enhancement	November 2012	130	2325
		Transplant	Seep Creek Sagebrush and Wet Meadow Enhancement	March 2013	130	2325
		Rangeland Drill	Seep Creek Sagebrush and Wet Meadow Enhancement	September 2013	130	2325
		Transplant	Seep Creek Sagebrush and Wet Meadow Enhancement	April 2014	130	2325
14R-28	Johnson Creek 2	Bullhog	Johnson Creek Hazard Fuel Project	October 2013-June 2014	266	2265
		Prescribed Fire	La Sal/Abajo Prescribed Fire FY20 (Proposed)	Fall 2019	1,000	4882
14R-36	Mustang Mesa	Aerial Before	Mustang Mesa Lop and Scatter	October 2014	418	3050
		Lop and Scatter	Mustang Mesa Lop and Scatter	October-November 2014	418	305

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
14R-43	Long Canyon Point	Chain Unknown		1972		
		Aerial Unknown		1972		
		Aerial Before	Devil's Canyon	October 2018	450	4476
		Bullhog	Devil's Canyon	November 2018-January 2019	258	4776
		Aerial After	Devil's Canyon	March 2019	450	4776
14R-44	Lems Draw	Lop and Scatter	Blanding East Phase III	November 2018	233	4323
14R-45	Long Canyon	Bullhog	Shingle Mill Phase 1 (Proposed)	August-December 2019	312	4860

Table 2.9: Range trend and WRI studies known disturbance history for WMU 14, San Juan. PDB = Pre-Database; LTDL = Land Treatment Digital Library (Pilliod & Welty, 2019)

Study Trend Summary (Range Trend)

Mountain (Aspen)

There are two studies [Jackson Ridge (14-05) and Dickson Gulch (14-35)] that are classified as Mountain (Aspen) ecological sites. The Jackson Ridge study site can be found on Jackson Ridge in the Abajo Mountains, while the Dickson Gulch study is situated just north of Dickson Gulch.

Shrubs/Trees: The dominant preferred browse species on these study sites has been a co-dominant mix of mountain snowberry (*Symphoricarpos oreophilus*) and Gambel oak (*Quercus gambelii*). Shrub cover has increased over time with a significant increase occurring between 2004 and 2009: this is due to the 2009 establishment of the Dickson Gulch study, which has contributed nearly all of the shrub cover since that time (**Figure 2.2**). Average demographic data shows that density has generally increased. In addition, mature individuals have been the dominant age group in the preferred browse populations in most sample years, these trends are mainly driven by the Dickson Gulch study (**Figure 2.15**). Preferred browse utilization has fluctuated, and less than 50% of plants were moderately or heavily used in all years except 2004 (**Figure 2.18**).

The dominant tree species on these sites is quaking aspen (*Populus tremuloides*). Average tree cover and density increased each sample year through 2014, but decreased in 2019 due to a die-off on the Dickson Gulch study. Other conifers such as Engelmann spruce (*Picea engelmannii*) and white fir (*Abies concolor*) are present on the Jackson Ridge site, but have remained relatively rare compared to aspen (**Figure 2.7**, **Figure 2.11**).

Herbaceous Understory: Total average cover of the herbaceous understory has shown a generally increasing trend; nested frequency has exhibited a slight decrease. Perennial grasses and forbs are co-dominant components on these sites, with Kentucky bluegrass (*Poa pratensis*), common dandelion (*Taraxacum officinale*), and Nevada pea (*Lathyrus lanszwertii*) as the most common species. Annual forbs are largely native and contribute relatively little cover. Annual grasses have remained absent on these sites throughout the study period (**Figure 2.21**, **Figure 2.25**).

Occupancy: Average occupancy has shown fluctuations over the sample period, with the primary occupants varying between elk, deer and cattle. Mean abundance of deer pellet groups has ranged from 1 days use/acre in 1999 to 7 days use/acre in 2019. Elk pellet groups have had a mean abundance fluctuating between 3 days use/acre in 2014 and 13 days use/acre in 2004. Finally, mean abundance of cattle pellet groups has been as low as 0 days use/acre in 1999 and as high as 15 days use/acre in 2019 (**Figure 2.29**).

Mountain (Thurber Fescue)

One study site [Duckett Ridge (14-41)] is considered to be a Mountain (Thurber Fescue) ecological site: this site is located on Duckett Ridge in the Abajo Mountains.

Shrubs/Trees: Trends over time are not yet available for this study site as it was established in 2019. As of study establishment, mountain snowberry (*Symphoricarpos oreophilus*) dominates the preferred browse component; Gambel oak (*Quercus gambelii*) also contributes significant (but less) cover (**Figure 2.2**). Average

demographic data shows that preferred browse is very abundant and that mature plants comprise most of the population; both decadence and recruitment of young are low (**Figure 2.15**). Utilization of preferred browse species is high: 29% of plants were moderately browsed and 65% were heavily browsed in 2019 (**Figure 2.18**).

Trees do not contribute any cover on this site (**Figure 2.7**). However, Engelmann spruce (*Picea engelmannii*), Douglas-fir (*Psuedotsuga menziesii*), and quaking aspen (*Populus tremuloides*) are present in point-quarter data with very low density (**Figure 2.11**).

Herbaceous Understory: The herbaceous understory of this site is robust, with the native perennial grass species Thurber's fescue (*Festuca thurberi*) as the dominant component. A number of diverse perennial grasses are also present, but contribute less cover. Perennial forbs are fairly abundant, and annual forbs are rare; annual grasses are absent on this site (**Figure 2.21**, **Figure 2.25**).

Occupancy: Average pellet transect data shows that animal occupancy is high on this site and that deer are the primary occupants with mean abundance of pellet groups of 50 days use/acre in 2019. Elk are also present with a mean pellet group abundance of 11 days use/acre. Finally, cattle pellet groups have a mean abundance of 2 days use/acre (**Figure 2.29**).

Mountain (Ponderosa Pine)

There are three studies [Woodenshoe (14-19), Gooseberry (14-20), and Kigalia Point II (14-37)] that are considered to be Mountain (Ponderosa Pine) ecological sites. The Woodenshoe study site is located just east of the Woodenshoe Buttes on South Elk Ridge, and the Gooseberry site is situated near the Gooseberry Guard Station on North Elk Ridge. Kigalia Point II can be found on the southern portion of Kigalia Point on South Elk Ridge.

Shrubs/Trees: The dominant shrub species on these sites have been a mixture of preferred browse species such as mountain snowberry (*Symphoricarpos oreophilus*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and/or Gambel oak (*Quercus gambelii*), among others. Total shrub cover has remained stable overall with minor fluctuations from year to year (**Figure 2.5**). Preferred browse demographics display a decreasing density trend. Young individuals were the most abundant demographic in 1992 mainly due to the Gooseberry study, but have since decreased. Mature plants have comprised a majority of the preferred browse populations in all other years (**Figure 2.15**). Utilization of preferred browse has varied between sample years, but has generally remained low (**Figure 2.18**).

Ponderosa pine (*Pinus ponderosa*) is the dominant tree species on these study sites, although quaking aspen (*Populus tremuloides*) is also present to a lesser extent. Tree cover and density have decreased since the 2009 sample year, although cover has increased overall (**Figure 2.9**, **Figure 2.13**).

Herbaceous Understory: The herbaceous understories of these sites are primarily composed of perennial grasses and forbs. Overall herbaceous cover has decreased since 2009, but the understories remain abundant as of 2019: average nested frequency has increased mainly due to annual forbs on the Woodenshoe study site. The introduced perennial grass species smooth brome (*Bromus inermis*) dominates the understory on Kigalia Point II, but Gooseberry and Woodenshoe are dominated by native species. However, the introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) has been observed on all three study sites in low amounts (**Figure 2.21**, **Figure 2.25**).

Occupancy: Cattle have been the primary occupants of these study sites in all sample years, with a mean pellet group abundance varying between 12 days use/acre in 2009 and 2014 and 21 days use/acre in 2019. Elk have also been present, and mean abundance of pellet groups has ranged from 2 days use/acre in 2014 to 11 days use/acre in 2019. Finally, deer pellet groups have had a mean abundance as low as 6 days use/acre in 2009 and 2014 and as high as 9 days use/acre in 1999 and 2019. (**Figure 2.29**)

Mountain (Big Sagebrush)

Two study sites [Brushy Basin (14-02) and Big Flat (14-34)] are classified as Mountain (Big Sagebrush) ecological sites. The Brushy Basin study is situated just south of the Abajo Mountains in Brushy Basin, and the Big Flat site is located southwest of Horse Mountain on North Elk Ridge.

Shrubs/Trees: Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) is the dominant preferred browse species on these sites, although other species are present in lesser amounts. Sagebrush and total shrub cover have shown an overall increase over the study period (**Figure 2.6**). Demographic data has shown a decrease in the numbers of sagebrush plants since 2004. Mature individuals have comprised a majority of the preferred browse populations in most sample years. However, young plants were the most abundant demographic in 2004: this is mainly due to the establishment of the Big Flat study site (**Figure 2.16**). Utilization increased dramatically through the 2014 sample year, when 45% of plants were moderately browsed and 26% were heavily browsed. The 2019 sample year showed a significant decrease in the amount of utilization from the previous sample year (**Figure 2.19**).

Twoneedle pinyon (*Pinus edulis*), Utah juniper (*Juniperus osteosperma*), and/or Rocky Mountain juniper (*Juniperus scopulorum*) are the tree species that have been observed on these study sites. Trees have not maintained a significant presence on the Big Flat site, with 2019 being the only year they were sampled in point-quarter. As such, the Brushy Basin study drives both the density and cover trends for this ecotype; twoneedle pinyon is the most abundant species on this site. Average tree cover and density displayed a decreasing trend from 2004 to 2014, with the decrease in 2014 likely due to a bullhog treatment which occurred between sample years. However, both cover and density increased between 2014 and 2019, suggesting that there may be a risk of infilling in the future (**Figure 2.8**, **Figure 2.12**).

Herbaceous Understory: The herbaceous understories of these sites are diverse and abundant. Perennial grasses including the introduced species smooth brome (*Bromus inermis*), intermediate wheatgrass (*Thinopyrum intermedium*), Kentucky bluegrass (*Poa pratensis*), and/or crested wheatgrass (*Agropyron cristatum*) have been the dominant herbaceous component in most sample years. Average cover and frequency of the understories as a whole have fluctuated from year to year. Both values increased between 2014 and 2019, mainly due to an increase in annual forbs on both study sites (**Figure 2.22**, **Figure 2.26**).

Occupancy: Average occupancy on these sites has exhibited fluctuations with decreases between 2004 and 2014, followed by an increase in 2019. The primary occupants have varied between deer, elk and cattle. Cattle were the primary occupants in 1999 and 2009, and mean abundance of pellet groups has fluctuated between 2 days use/acre in 2014 and 33 days use/acre in 1999. Elk were the primary occupants in 2004 and have had a mean abundance of pellet groups ranging from 4 days use/acre in 2014 to 26 days use/acre in 2004. Finally, the primary occupants were deer in 2014 and 2019: mean pellet group abundance has been as low as 7 days use/acre in 2014 and as high as 20 days use/acre in 2004 (**Figure 2.30**).

Mountain (Browse)

There are two study sites [Shingle Mill (14-12) and Clay Draw (14-40)] that are classified as Mountain (Browse) ecological sites. The Shingle Mill study is located south of Monticello and in the hills just above Shingle Mill Draw. The Clay Draw site is situated east of the city of Monticello and roughly one mile south of Clay Draw.

Shrubs/Trees: These study sites are dominated by a mixture of preferred browse species such as mountain snowberry (*Symphoricarpos oreophilus*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and/or wild crab apple (*Peraphyllum ramosissimum*), among others. Cover of preferred browse has generally increased overall, partially due to the establishment of the Clay Draw study in 2019 (**Figure 2.3**). Mature individuals have comprised a majority of the browse populations on these study sites in all sample years, and overall density has decreased each year since 2009 (**Figure 2.16**). Utilization has fluctuated, but less than 50% of plants have been moderately to heavily browsed in all sample years (**Figure 2.19**).

Tree cover on these sites is mainly provided by twoneedle pinyon (*Pinus edulis*), although Utah juniper (*Juniperus osteosperma*) has also been present. Cover has exhibited an increasing trend, but remains low as of 2019. Tree density also increased between 2014 and 2019, a trend which can again be mostly attributed to the establishment of Clay Draw (**Figure 2.8**, **Figure 2.12**).

Herbaceous Understory: The herbaceous understories of these study sites have been dominated by mostly native perennial grasses and forbs. Overall nested frequency and cover have fluctuated from year to year. Nested frequency has shown slight increases over time, but both frequency and cover values exhibited increases between 2014 and 2019. Annual forbs and grasses have remained relatively rare in all sample years (**Figure 2.22**, **Figure 2.26**).

Occupancy: Average pellet transect data shows that occupancy of these sites has increased overall, although fluctuations have occurred from year to year. Deer have been the primary occupants throughout the duration of the study period with a mean pellet group abundance ranging from 37 days use/acre in 2014 to 69 days use/acre in 2019. Elk pellet groups have had a mean abundance as low as 1 days use/acre in 2019 and as high as 19 days use/acre in 2004. Finally, cattle have also been present with a mean pellet group abundance varying between 0 days use/acre in 2014 and 9 days use/acre in 1999 (**Figure 2.30**).

Mountain (Oak)

Four study sites [Harts Draw Reservoir (14-06), Mormon Pasture Point (14-27), Milk Ranch Point (14-30), and Chippean Ridge (14-31)] are considered to be Mountain (Oak) ecological sites. The Harts Draw Reservoir site is located at the head of Harts Draw near Race Track Reservoir. Mormon Pasture Point can be found just north of Mormon Pasture Mountain on North Elk Ridge, while the Milk Ranch Point study is situated on Milk Ranch Point on South Elk Ridge. Finally, the Chippean Ridge study site is located on Chippean Ridge.

Shrubs/Trees: Preferred browse species other than Gambel oak (*Quercus gambelii*) dominate these study sites. This trend is mainly driven by Utah serviceberry (*Amelanchier utahensis*) and/or alderleaf mountain mahogany (*Cercocarpus montanus*) on the Milk Ranch Point and Chippean Ridge studies; Mormon Pasture Point and Harts Draw Reservoir have been dominated by Gambel oak. Total average shrub cover and density have exhibited minor fluctuations over time, but have largely remained stable overall (**Figure 2.4**). Mature individuals have comprised a majority of the plant populations on these study sites in all years except 1994, when young plants were the most abundant demographic (**Figure 2.16**). A majority of the plants were not used or lightly hedged in all years except 2014, when 41% were moderately used and 13% were heavily used (**Figure 2.19**).

Both tree cover and density have displayed increasing trends overall, with twoneedle pinyon (*Pinus edulis*) as the most abundant tree. These increases in cover and density are mainly driven by the Milk Ranch Point study. Utah juniper (*Juniperus osteosperma*) has also been present on these sites to a lesser extent (**Figure 2.8**, **Figure 2.12**).

Herbaceous Understory: The understories on these study sites have been mainly composed of perennial grasses in all sample years. However, most of these perennial grasses are introduced species such as smooth brome (*Bromus inermis*), crested wheatgrass (*Agropyron cristatum*), and intermediate wheatgrass (*Thinopyrum intermedium*). In addition, bulbous bluegrass (*Poa bulbosa*) is present on the Chippean Ridge, Milk Ranch Point, and Harts Draw Reservoir studies, with Chippean Ridge driving cover and frequency trends for this species. Overall herbaceous cover has increased over the study period. Nested frequency exhibited a mainly decreasing trend from 1994 through 2014. However, both cover and frequency increased in 2019, mainly due to perennial and annual forbs and bulbous bluegrass (**Figure 2.22**, **Figure 2.26**).

Occupancy: Average pellet transect data indicates that occupancy has fluctuated over time and exhibited an overall decrease. Cattle have been the primary occupants in most sample years, with a mean pellet group abundance ranging from 4 days use/acre in 2014 to 30 days use/acre in 1999. Elk were the primary occupants

in 2014, and mean abundance of pellet groups has been as low as 7 days use/acre in 2014 and as high as 13 days use/acre in 2009. Finally, deer have also been present on this site with mean pellet group abundance varying between 5 days use/acre in 2004 and 2014 and 10 days use/acre in 1999 (**Figure 2.30**).

Upland (Big Sagebrush)

There are ten study sites [Peters Point (14-08), Harts Draw (14-09), Harts Point (14-10), Shay Mesa (14-11), Wild Cow Point (14-22), South Plain (14-23), Lower Deer Flat (14-32), Dry Mesa (14-36), Arch Canyon (14-38), and Beef Basin Wash (14-39)] that are classified as Upland (Big Sagebrush) ecological sites. The Peters Point study site is located north of Monticello on Peters Point. The Harts Draw site is situated just south of SR-211 near the mouth of Hart Draw, while the Harts Point study can be found west of Harts Draw on Harts Point. The Shay Mesa site is located on Shay Mesa and roughly 0.8 miles southwest of Newspaper Rock. The Wild Cow Point study can be found between Fable Valley and Sweet Alice Canyon on Wild Cow Point. South Plain is situated in the southern portion of Beef Basin near the mouth of Sweet Alice Canyon, and the Lower Deer Flat study is located between Hideout Canyon and Deer Canyon on the lower portion of Deer Flat. The Dry Mesa site can be found on Dry Mesa above Dark Canyon. Arch Canyon is situated on the edge of Little Baullie Mesa above Arch Canyon. Finally, the Beef Basin Wash study site is located approximately two and a half miles southeast of House Park Butte in Beef Basin Wash.

Shrubs/Trees: These study sites are primarily dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with the Beef Basin Wash and Arch Canyon studies having basin big sagebrush (*A. tridentata* ssp. *tridentata*) and/or Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*) present. Other preferred browse species are also present on many sites. Cover of sagebrush has slightly decreased over time (**Figure 2.6**). Average preferred browse density has displayed a decreasing trend with the South Plain study exhibiting a particularly significant decrease. Mature individuals have comprised a majority of the plant populations on these sites (**Figure 2.17**). Utilization has generally increased, with 50% of plants being heavily used and 19% being moderately used (**Figure 2.20**).

Both Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) have been observed on these sites. Overall cover has remained low throughout the study period, and most cover has been contributed by the Peters Point and Wild Cow Point studies (**Figure 2.10**) Tree density has remained stable since 2009 (**Figure 2.14**).

Herbaceous Understory: These study sites have been dominated by perennial grasses in most sample years, although annual grasses co-dominated in 2019. Native perennial grass species are dominant on many sites. However, the Peters Point, Wild Cow Point, and Dry Mesa study sites have introduced species such as crested wheatgrass (*Agropyron cristatum*) and/or smooth brome (*Bromus inermis*) as the most abundant perennial grasses. Both overall nested frequency and cover values increased significantly between 2014 and 2019, largely due to the introduced annual grass cheatgrass (*Bromus tectorum*) on the South Plain study (**Figure 2.23**, **Figure 2.27**).

Occupancy: Pellet transect data shows that overall occupancy of these sites has decreased over time; the significant decrease between 2009 and 2014 is largely due to the Harts Draw and Lower Deer Flat studies. Deer have been the primary occupants of these sites in all sample years, with a mean pellet group abundance ranging from 8 days use/acre in 2014 to 55 days use/acre in 1999. Cattle have also been present, and mean abundance of pellet groups has been as low as 2 days use/acre in 2014 and as high as 20 days use/acre in 2009. Elk have had the least abundance of pellet groups, the mean of which has varied between 1 days use/acre in 1999 and 8 days use/acre in 2009 and 2019 (**Figure 2.31**).

Upland (Pinyon-Juniper)

One study [Salt Creek Mesa (14-29)] is considered to be an Upland (Pinyon-Juniper) ecological site. The Salt Creek Mesa study site is located north of Cathedral Butte on Salt Creek Mesa.

Shrubs/Trees: Overall shrub cover has increased over the study period, with preferred browse as the main component in 2004 and 2019; Utah serviceberry (*Amelanchier utahensis*) has been the most abundant preferred browse species. Other shrubs, namely Fremont's mahonia (*Mahonia fremontii*), contributed most of the shrub cover in 2009 and 2014 (**Figure 2.6**). Density of preferred browse has remained low throughout the study period (**Figure 2.17**). Preferred browse utilization was initially high, with 8% of plants being moderately used and 83% heavily used in 1994. However, utilization has since decreased: no plants were moderately or heavily hedged in 2019 (**Figure 2.20**).

Both twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have been present on this site. Tree cover has increased since 2004 (**Figure 2.10**). Data indicates that average density decreased between 2004 and 2009, but increased slightly between 2014 and 2019 (**Figure 2.14**).

Herbaceous Understory: This study site has been primarily dominated by perennial grasses, although perennial forbs have co-dominated in some years. The introduced species crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Thinopyrum intermedium*) have contributed most of the perennial grass cover over the study period. Cover and abundance of perennial grasses has decreased overall. However, nested frequency of the herbaceous understory as a whole increased between 2014 and 2019: this is mainly due to an increase in annual forbs. Annual grasses have not been observed in any sample year (**Figure 2.23**, **Figure 2.27**).

Occupancy: Pellet transect data shows that occupancy of this site has varied between sample years, but has decreased overall. In addition, primary occupancy has shifted between deer, elk, and cattle. Deer were the primary occupants in 2004, with a mean pellet group abundance ranging from 0 days use/acre in 2014 to 19 days use/acre in 1999. The primary occupants were elk in 2009 and 2019; mean abundance of elk pellet groups has been as low as 0 days use/acre in 2014 and as high as 38 days use/acre in 2009. Finally, cattle were the primary occupants in 1999 and 2009, and mean pellet group abundance has fluctuated between 1 days use/acre in 2014 and 33 days use/acre in 2009 (**Figure 2.31**).

Semidesert (Big Sagebrush)

There are three study sites [Alkali Point (14-01), Black Mesa (14-13), and Ruin Park (14-24)] that are classified as Semidesert (Big Sagebrush) ecological sites. The Alkali Point study is situated on Alkali Point between Bullpen Swale and Cave Canyon, and the Black Mesa site can be found east of Black Mesa Butte on Black Mesa. The Ruin Park study is located in the northern portion of Beef Basin in Ruin Park.

Shrubs/Trees: Composition of the shrub component on these sites has fluctuated over time between big sagebrush (*Artemisia tridentata*) and other shrubs excluding preferred browse. Preferred browse species other than sagebrush are not found in any abundance. Overall shrub cover has decreased over time: this is mainly due to decreases in Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and broom snakeweed (*Gutierrezia sarothrae*) on the Black Mesa and Alkali Point studies (**Figure 2.6**). Density of preferred browse has also exhibited a precipitous decrease over the study period, with sagebrush decreasing in abundance on all three sites. Decadent plants have comprised a majority of the plant populations on these sites in most sample years, and recruitment of young has decreased over time (**Figure 2.17**). However, utilization of preferred browse has consistently remained high: more than 80% of plants were moderately to heavily hedged in 1999, 2004, 2014, and 2019 (**Figure 2.20**).

Utah juniper (*Juniperus osteosperma*) has been observed on all three study sites; density and cover have consistently remained low (**Figure 2.10**, **Figure 2.14**).

Herbaceous Understory: Composition of the herbaceous understories on these sites has varied from year to year between perennial and annual grasses and annual forbs. Cover and frequency decreased from 1999 to 2014. However, both values increased in 2019, mainly due to increases in the introduced annual grass species cheatgrass (*Bromus tectorum*) on the Black Mesa study and annual forbs on all three sites (**Figure 2.24**, **Figure 2.28**).

Occupancy: Pellet transect data shows that overall occupancy of these sites has decreased over time and that deer have been the primary occupants. Mean abundance of deer pellet groups has fluctuated between 42 days use/acre in 2014 and 87 days use/acre in 1999. Cattle pellet groups have had a mean abundance as low as 3 days use/acre in 2014 and as high as 22 days use/acre in 1999. Finally, elk have had the least mean abundance of pellet groups, ranging from 0 days use/acre in 2014 to 4 days use/acre in 2009 (**Figure 2.31**).

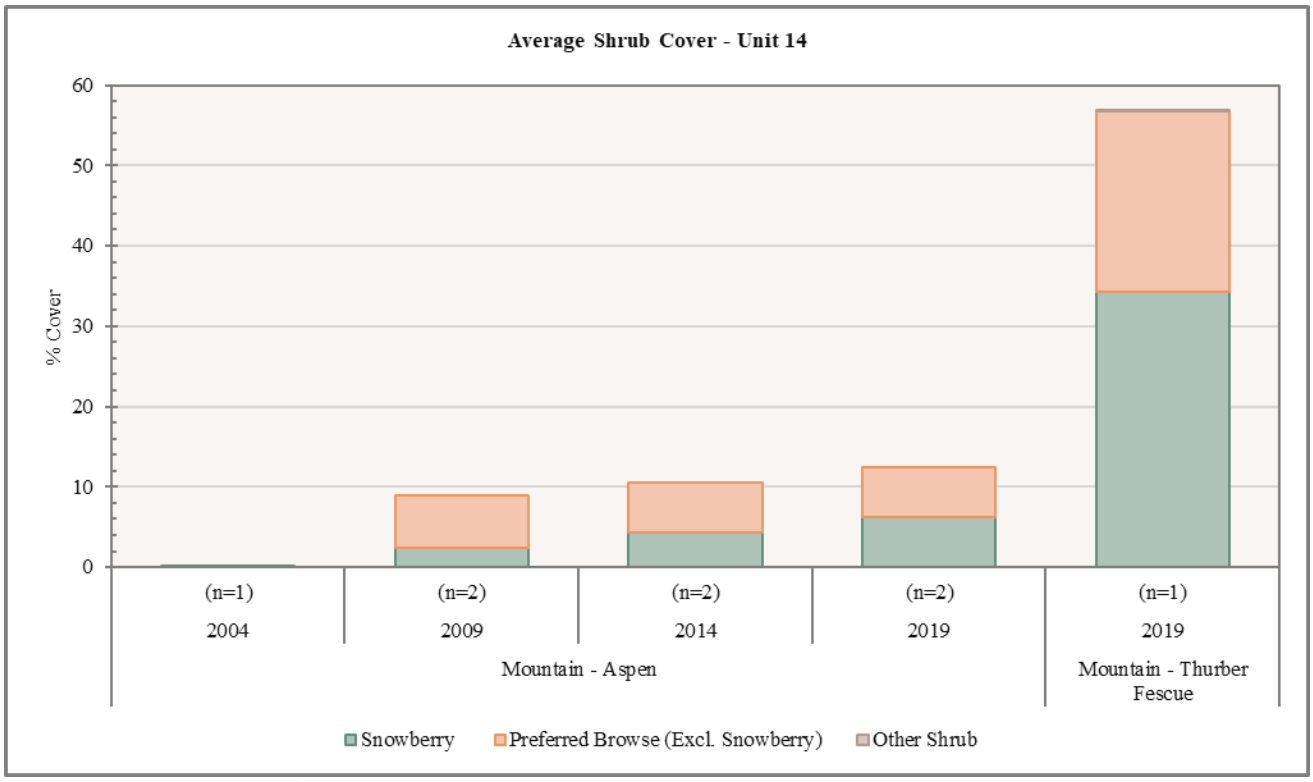


Figure 2.2: Average shrub cover for Mountain - Aspen and Mountain - Thurber Fescue study sites in WMU 14, San Juan.

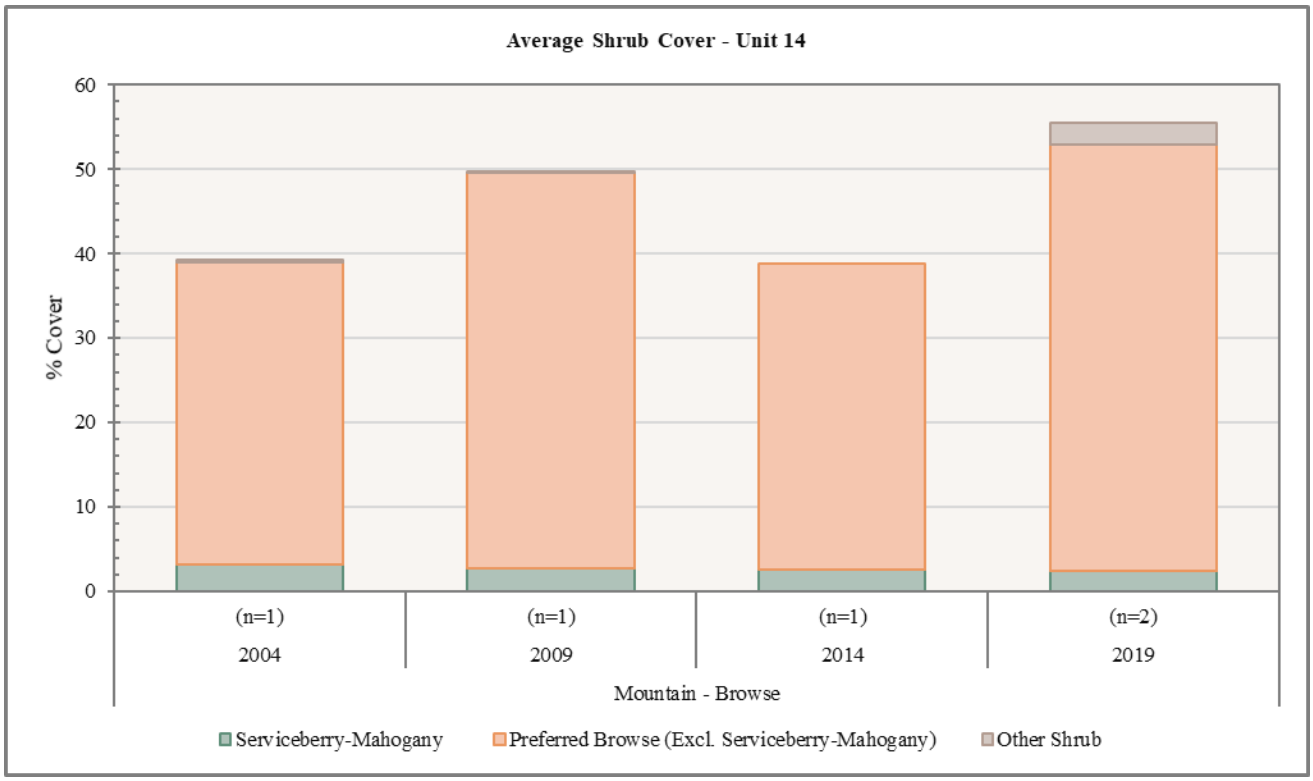


Figure 2.3: Average shrub cover for Mountain - Browse study sites in WMU 14, San Juan.

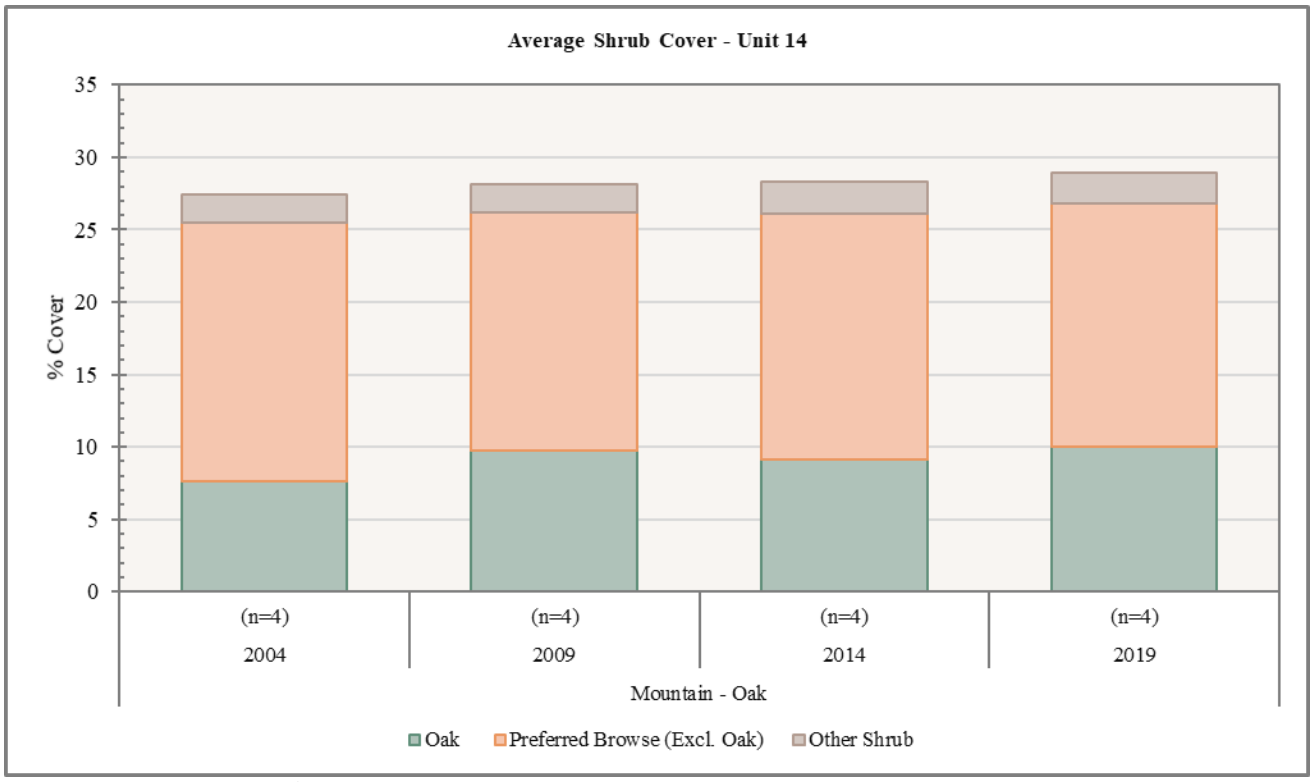


Figure 2.4: Average shrub cover for Mountain - Oak study sites in WMU 14, San Juan.

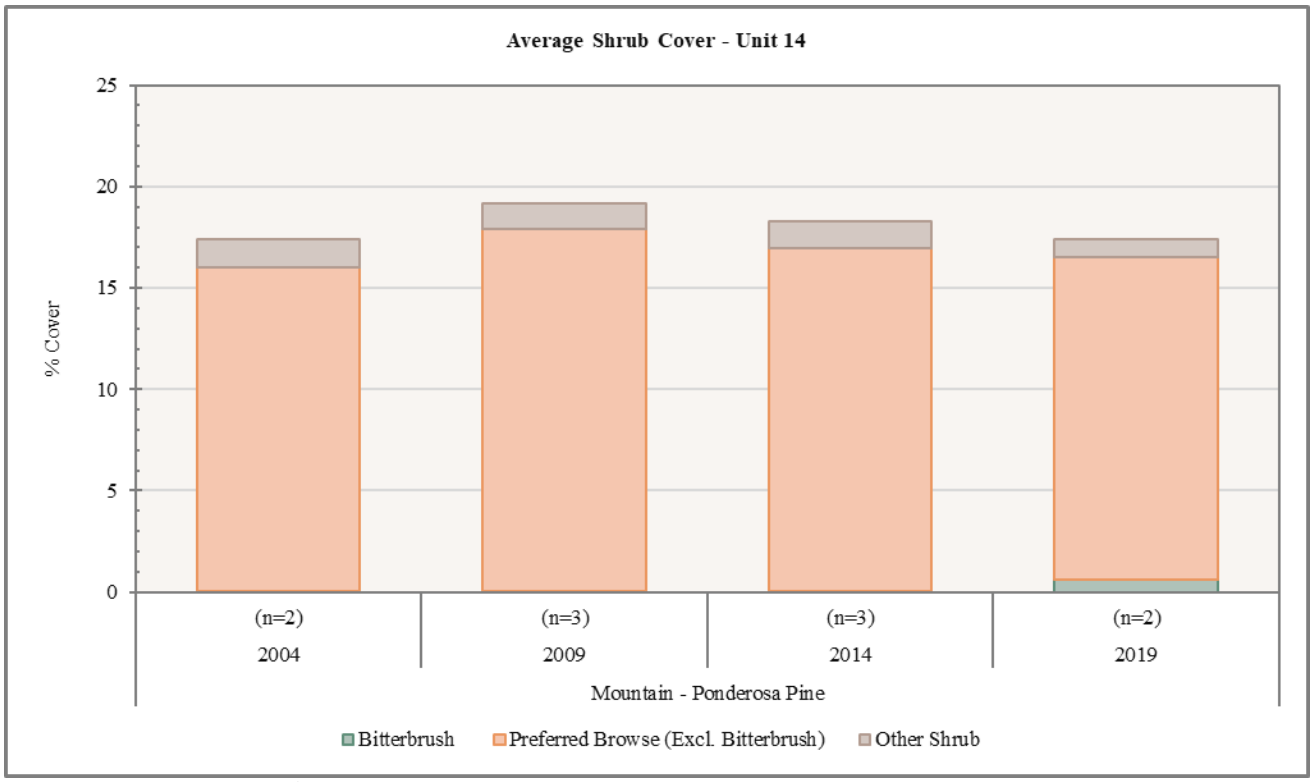


Figure 2.5: Average shrub cover for Mountain - Ponderosa Pine study sites in WMU 14, San Juan.

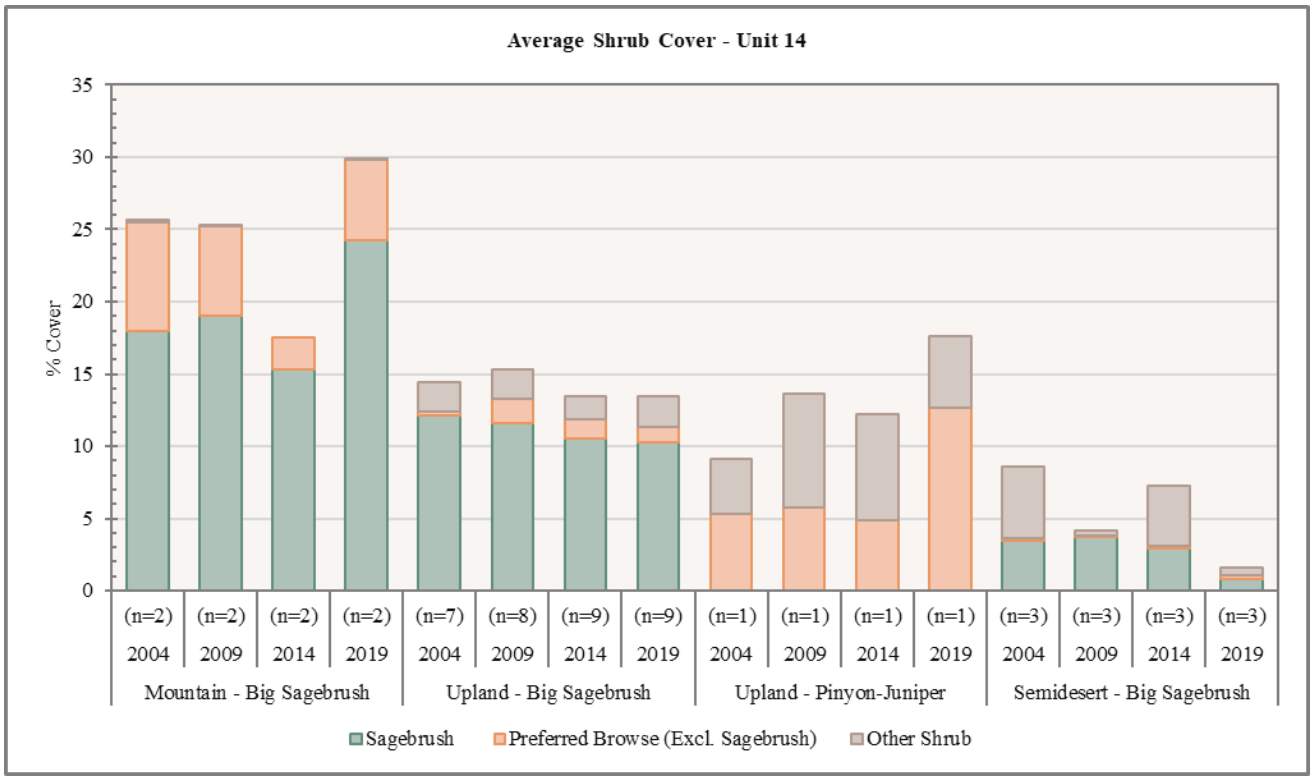


Figure 2.6: Average shrub cover for Mountain - Big Sagebrush, Upland - Big Sagebrush, Upland - Pinyon-Juniper, and Semidesert - Big Sagebrush study sites in WMU 14, San Juan.

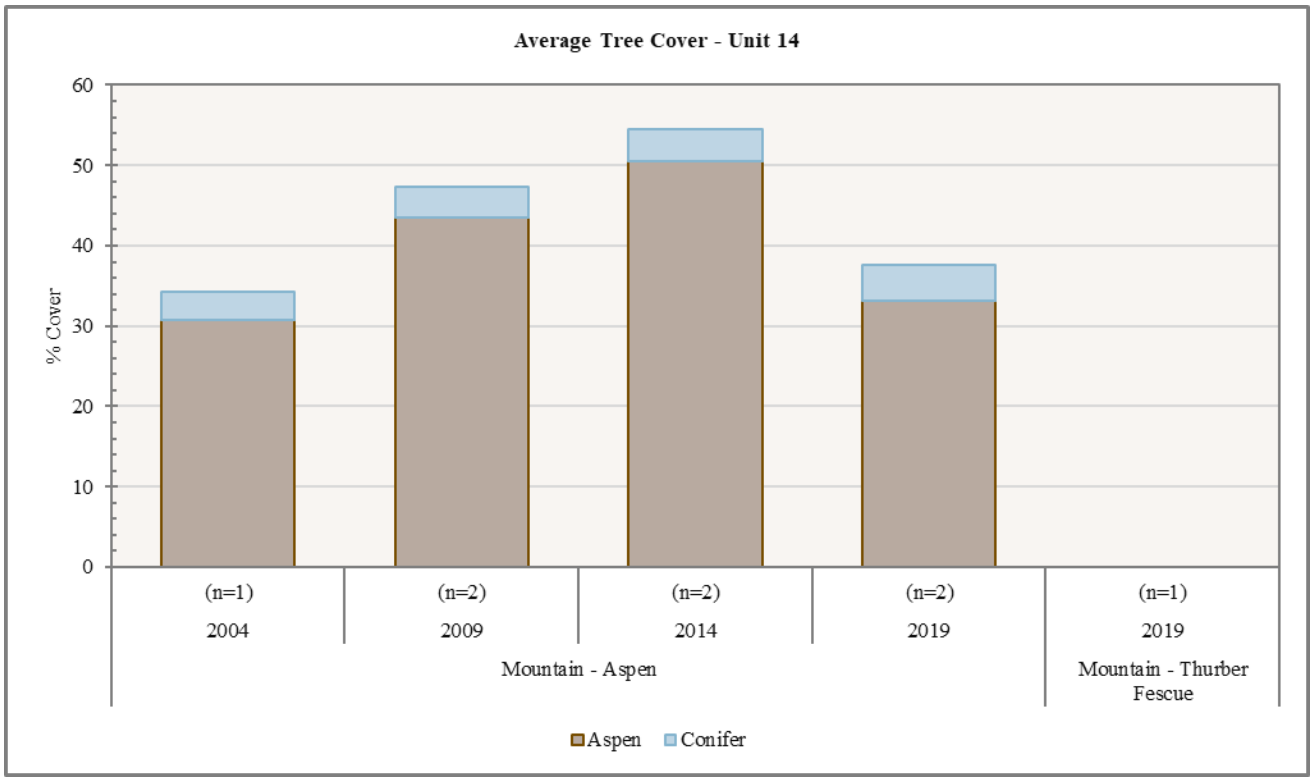


Figure 2.7: Average tree cover for Mountain - Aspen and Mountain - Thurber Fescue study sites in WMU 14, San Juan.

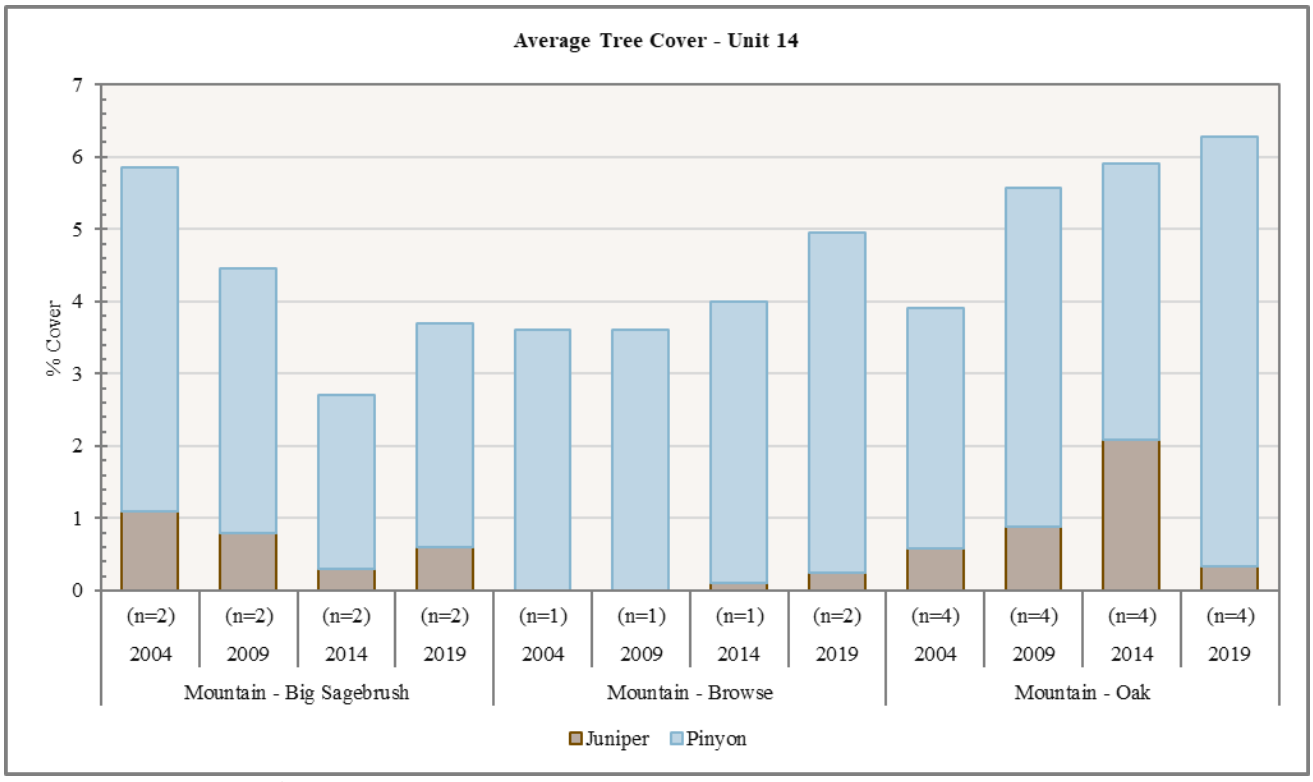


Figure 2.8: Average tree cover for Mountain - Big Sagebrush, Mountain - Browse, and Mountain - Oak study sites in WMU 14, San Juan.

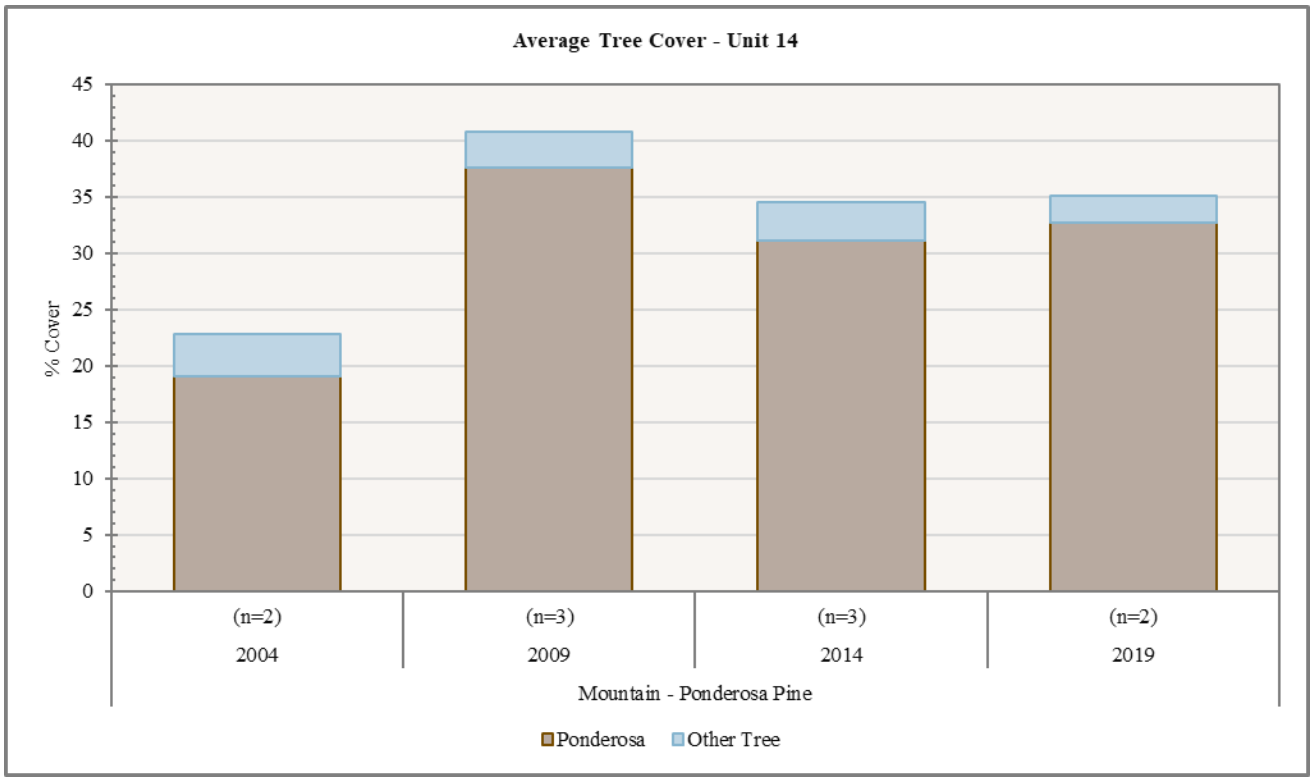


Figure 2.9: Average tree cover for Mountain - Ponderosa Pine study sites in WMU 14, San Juan.

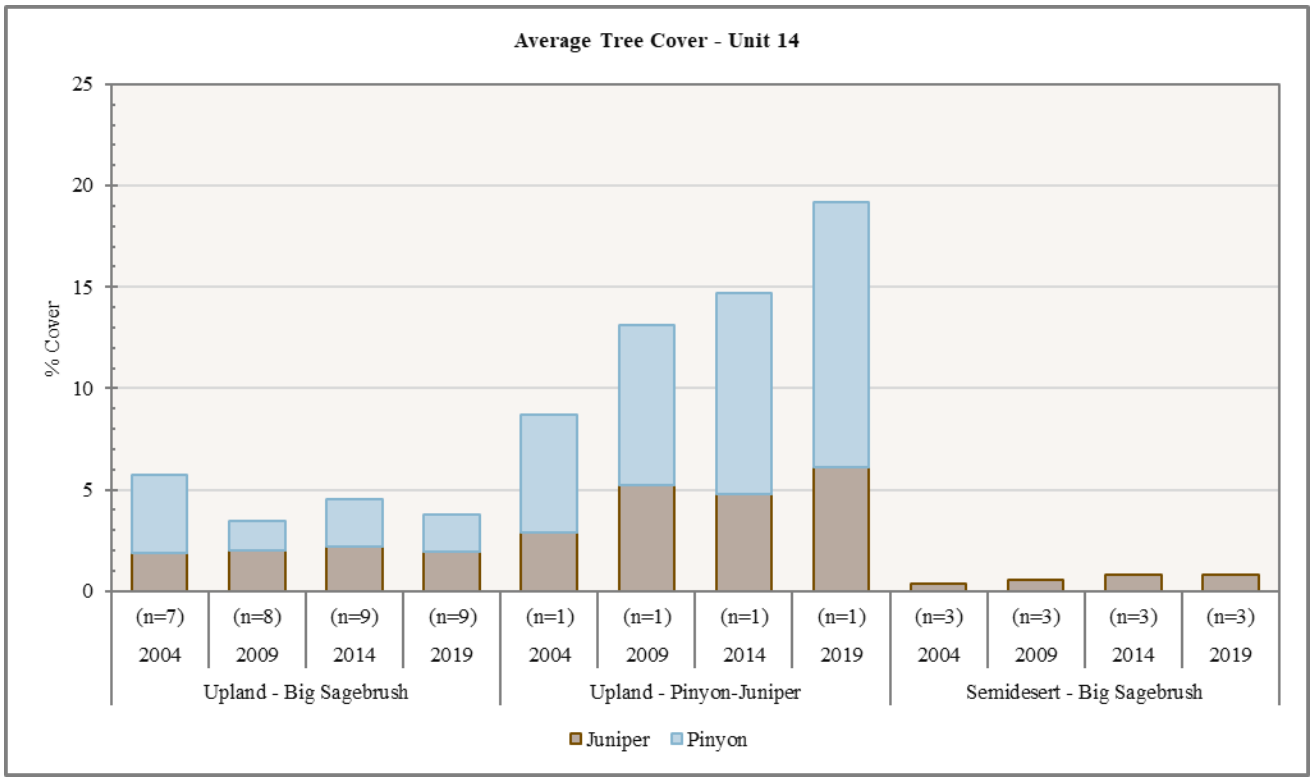


Figure 2.10: Average tree cover for Upland - Big Sagebrush, Upland - Pinyon-Juniper, and Semidesert - Big Sagebrush study sites in WMU 14, San Juan.

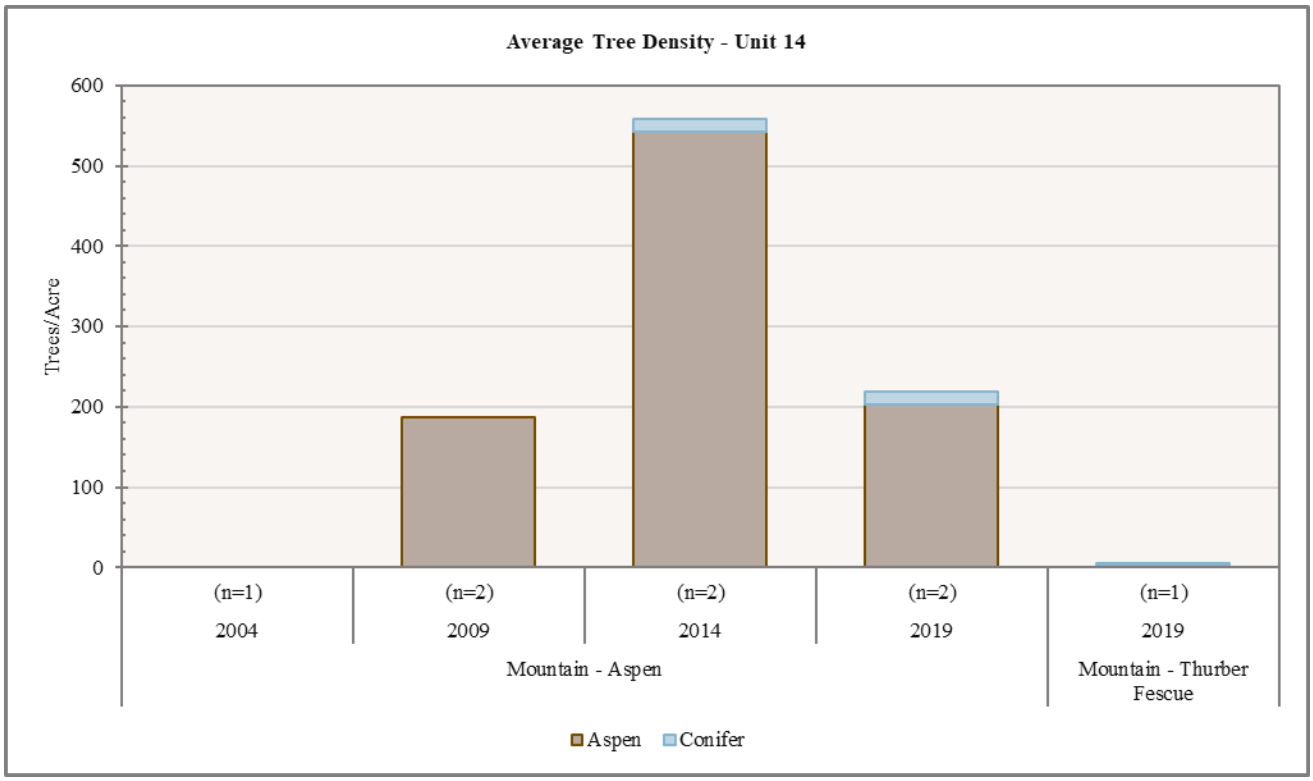


Figure 2.11: Average tree density for Mountain - Aspen and Mountain - Thurber Fescue study sites in WMU 14, San Juan.

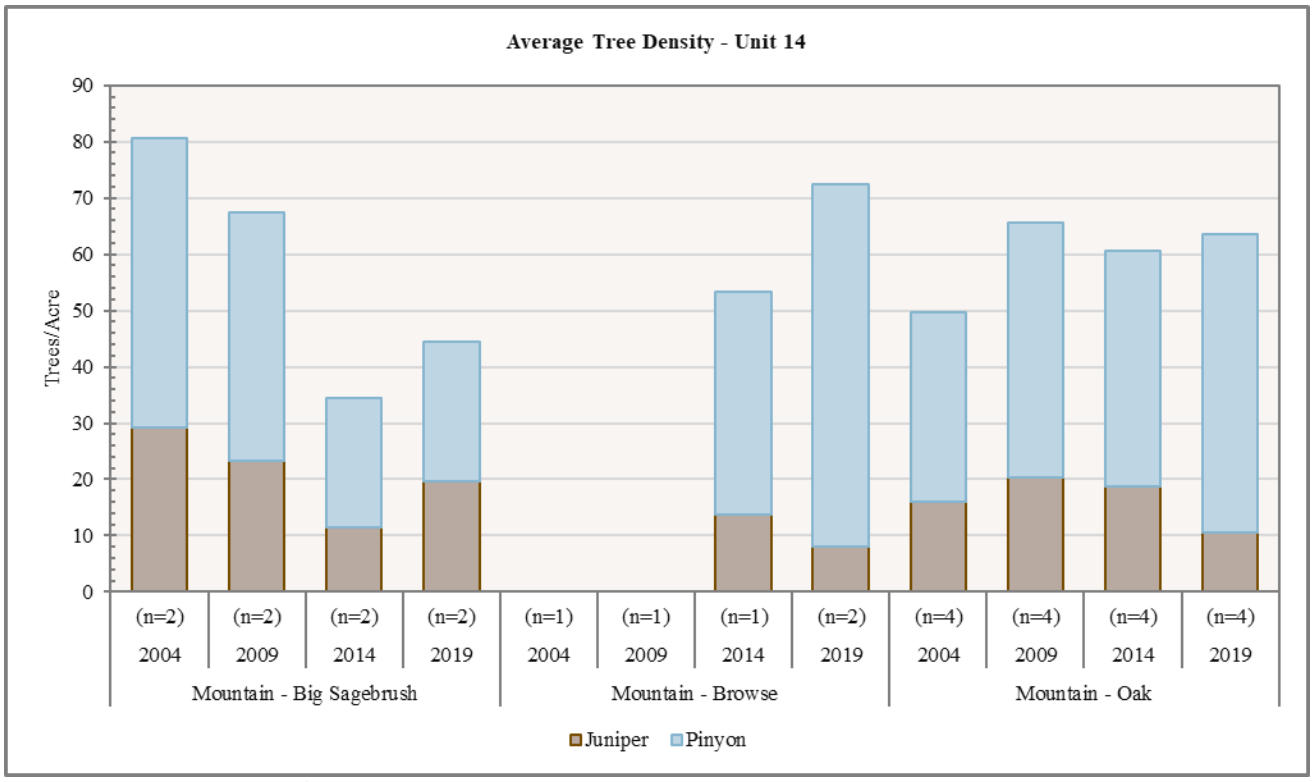


Figure 2.12: Average tree density for Mountain - Big Sagebrush, Mountain - Browse, and Mountain - Oak study sites in WMU 14, San Juan.

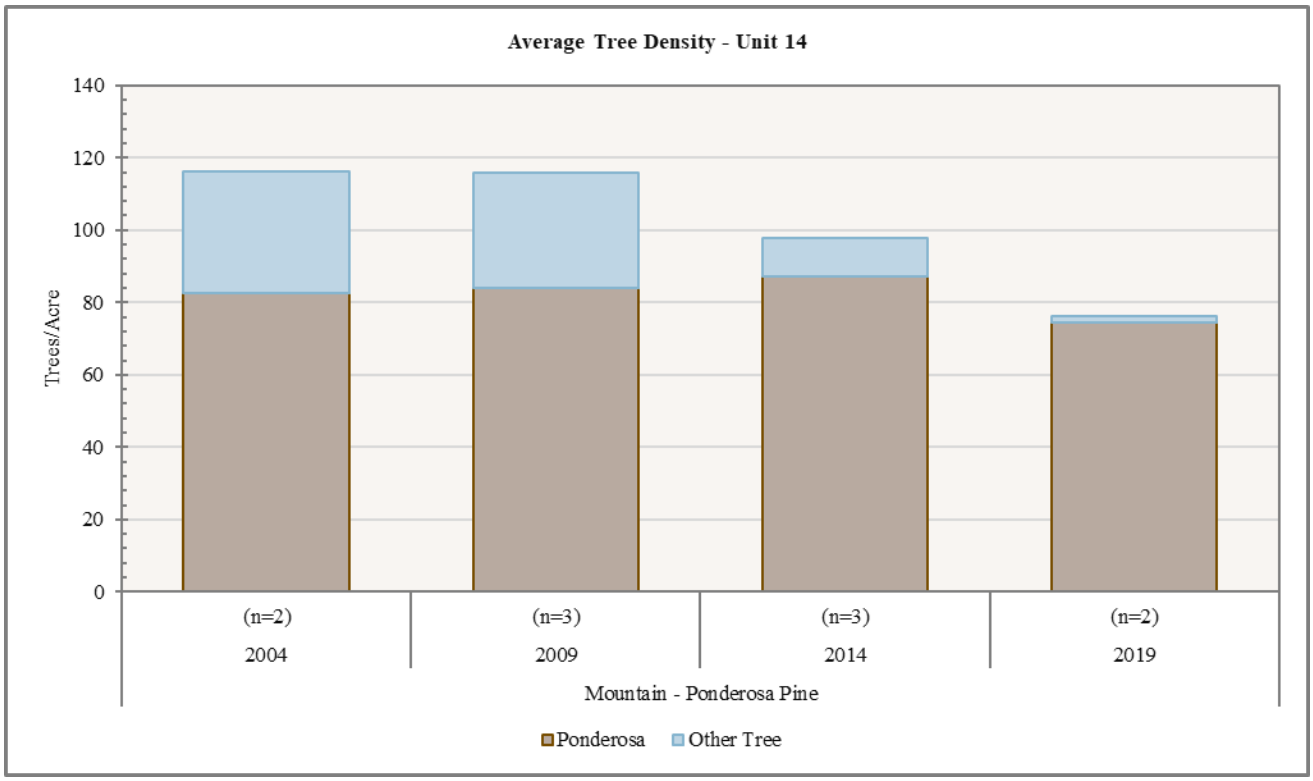


Figure 2.13: Average tree density for Mountain - Ponderosa Pine study sites in WMU 14, San Juan.

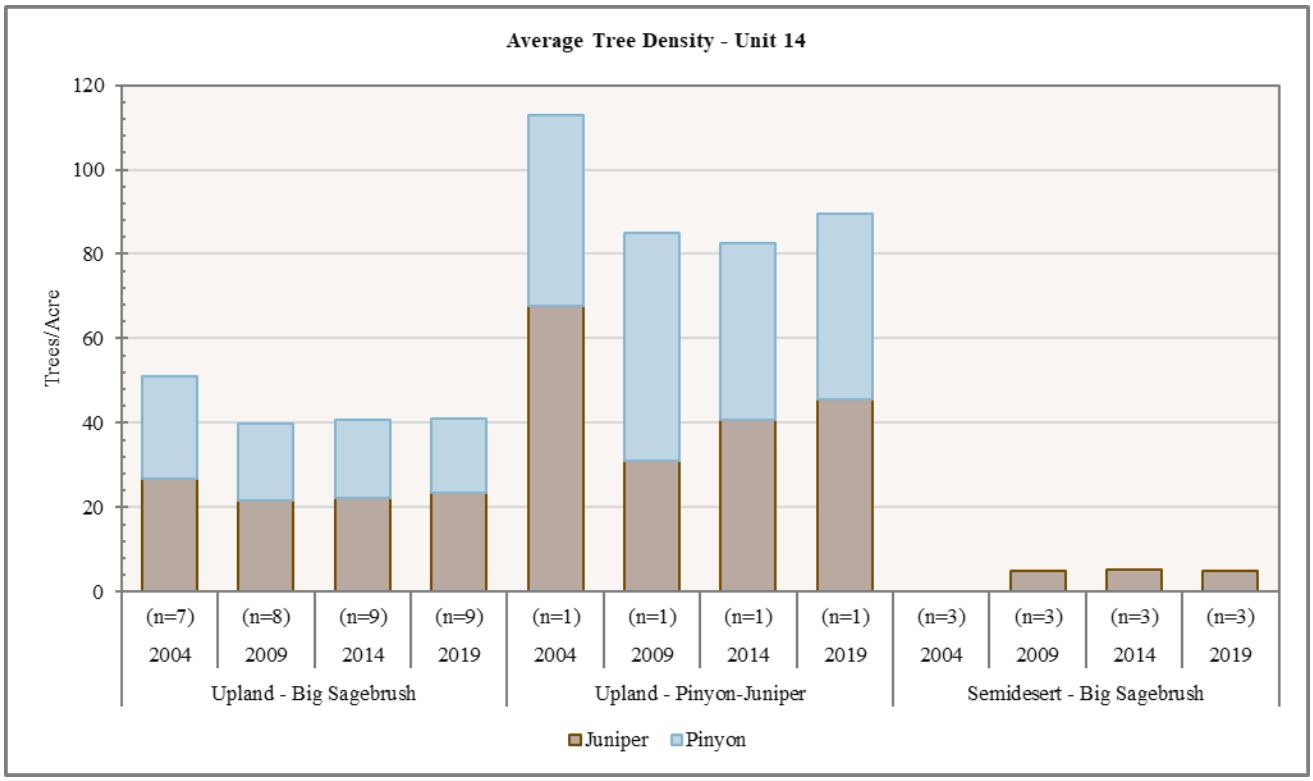


Figure 2.14: Average tree density for Upland - Big Sagebrush, Upland - Pinyon-Juniper, and Semidesert - Big Sagebrush study sites in WMU 14, San Juan.

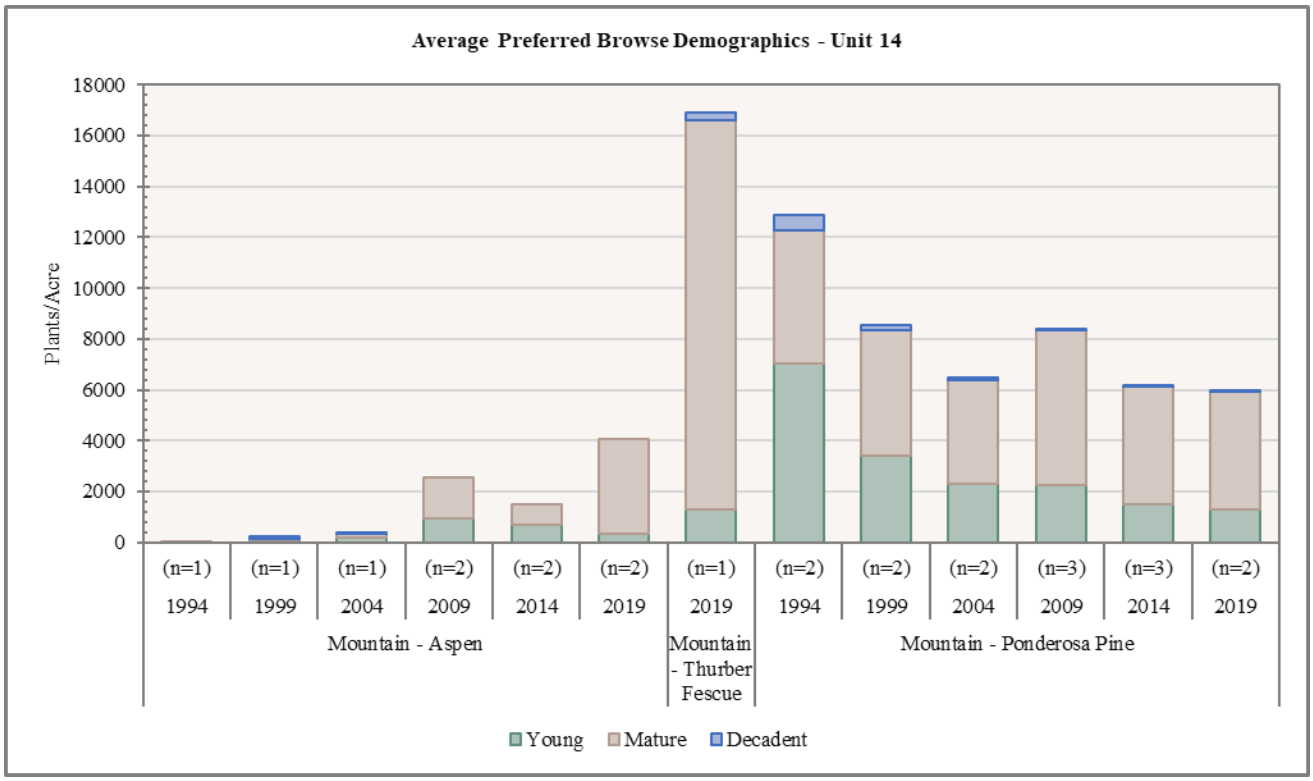


Figure 2.15: Average preferred browse demographics for Mountain - Aspen, Mountain - Thurber Fescue, and Mountain - Ponderosa Pine study sites in WMU 14, San Juan.

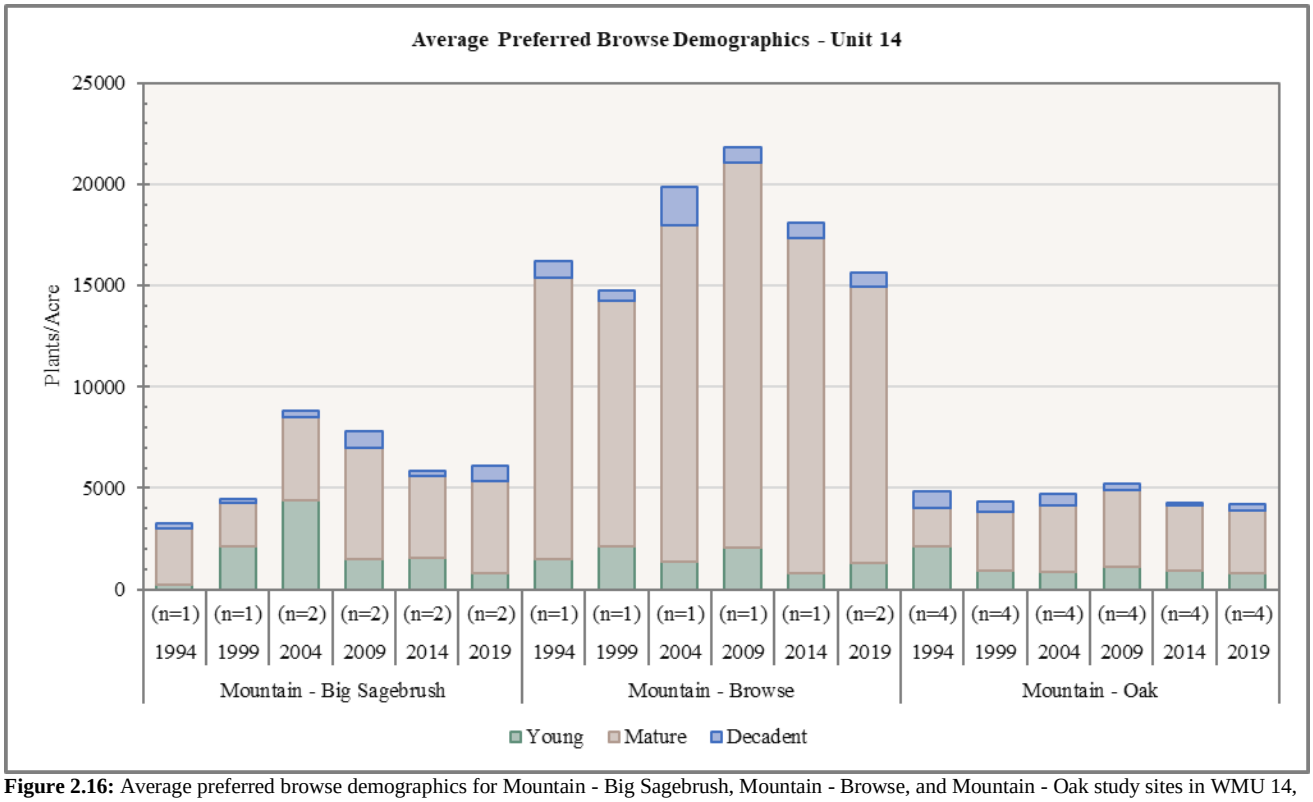


Figure 2.16: Average preferred browse demographics for Mountain - Big Sagebrush, Mountain - Browse, and Mountain - Oak study sites in WMU 14, San Juan.

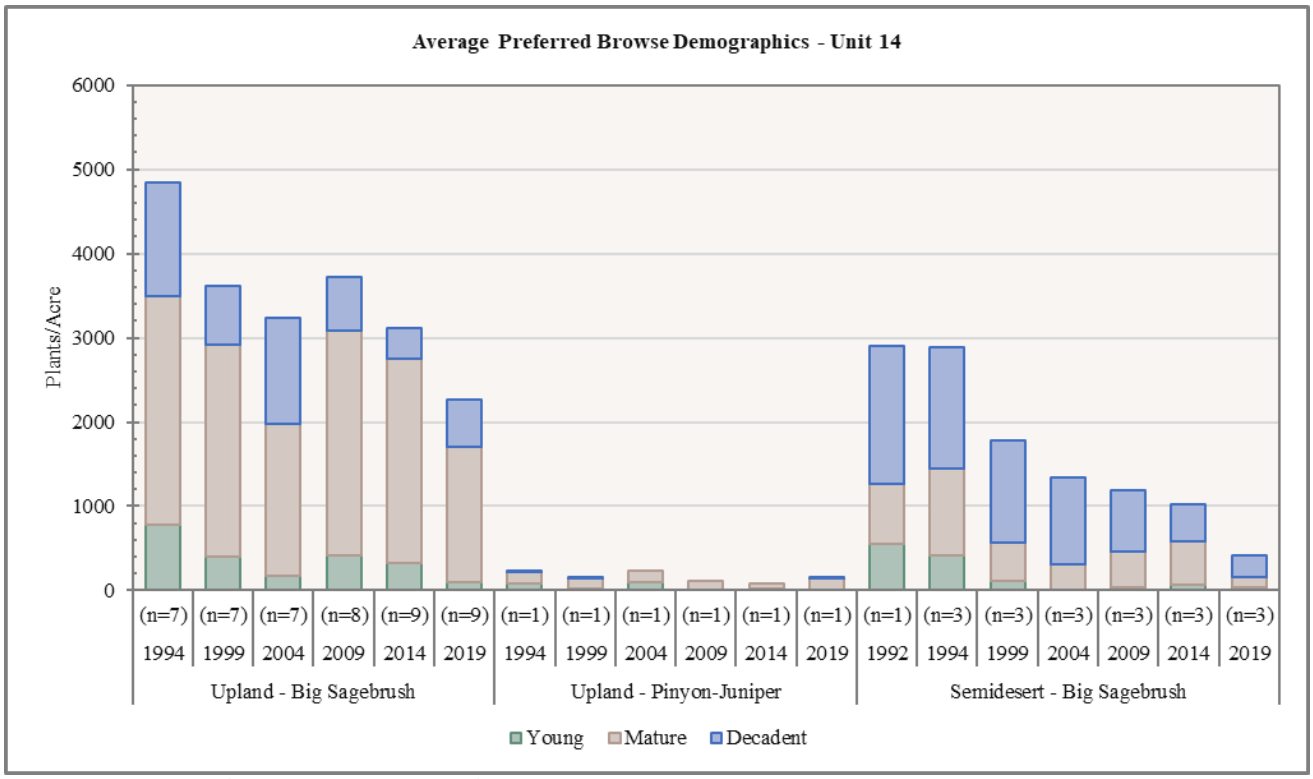


Figure 2.17: Average preferred browse demographics for Upland - Big Sagebrush, Upland - Pinyon-Juniper, and Semidesert - Big Sagebrush study sites in WMU 14, San Juan.

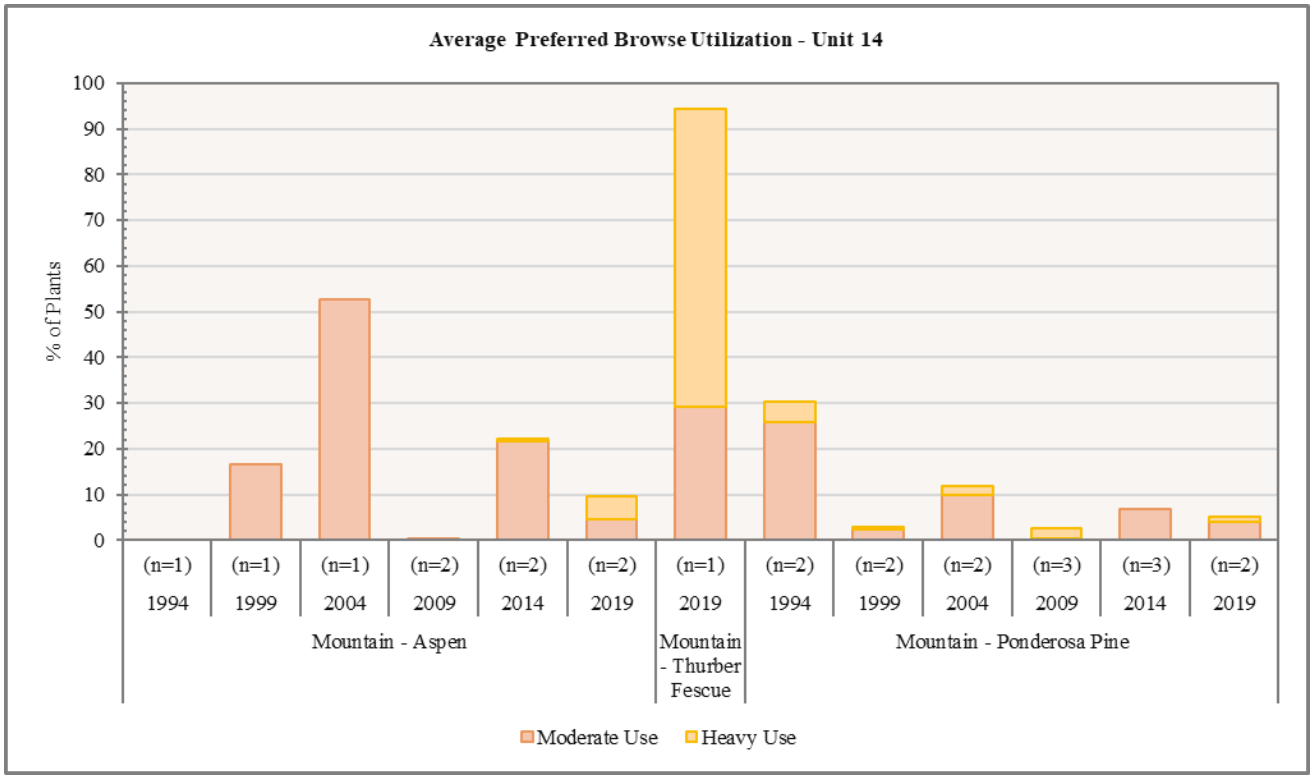


Figure 2.18: Average preferred browse utilization for Mountain - Aspen, Mountain - Thurber Fescue, and Mountain - Ponderosa Pine study sites in WMU 14, San Juan.

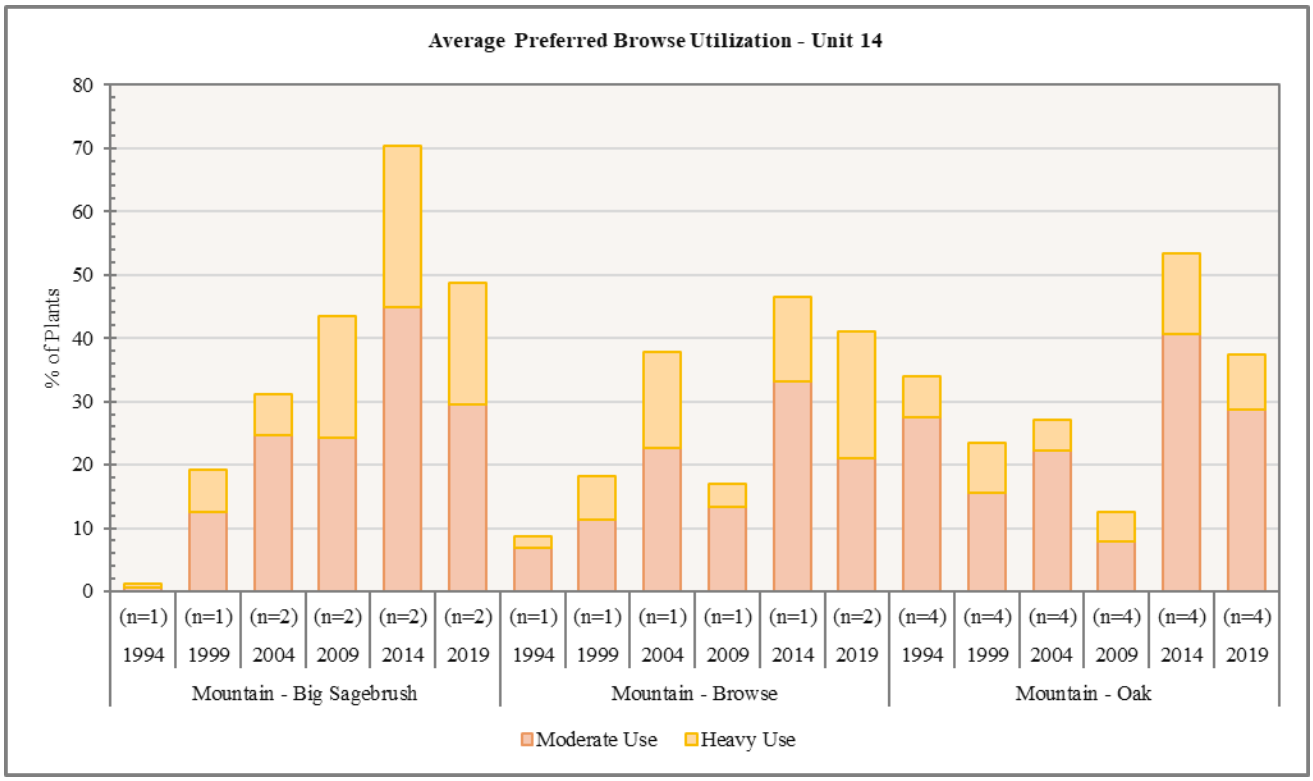


Figure 2.19: Average preferred browse utilization for Mountain - Big Sagebrush, Mountain - Browse, and Mountain - Oak study sites in WMU 14, San Juan.

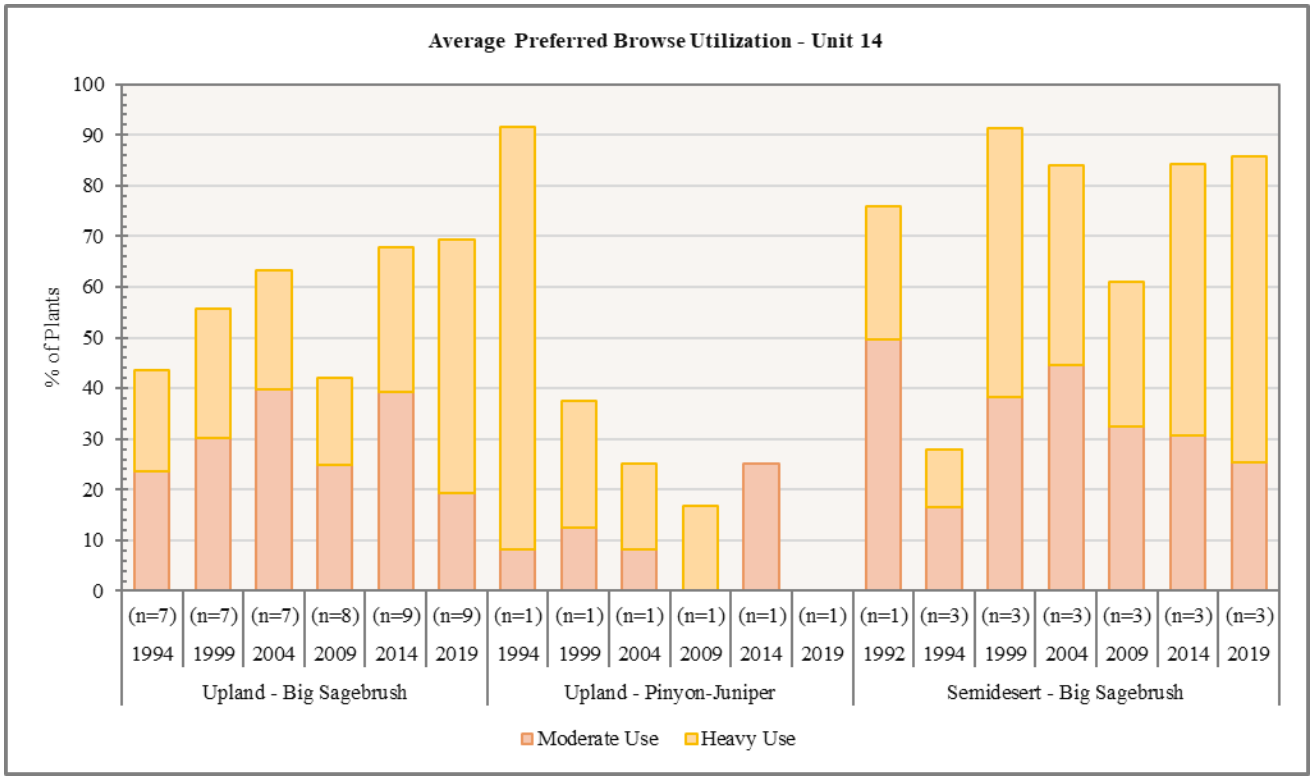


Figure 2.20: Average preferred browse utilization for Upland - Big Sagebrush, Upland - Pinyon-Juniper, and Semidesert - Big Sagebrush study sites in WMU 14, San Juan.

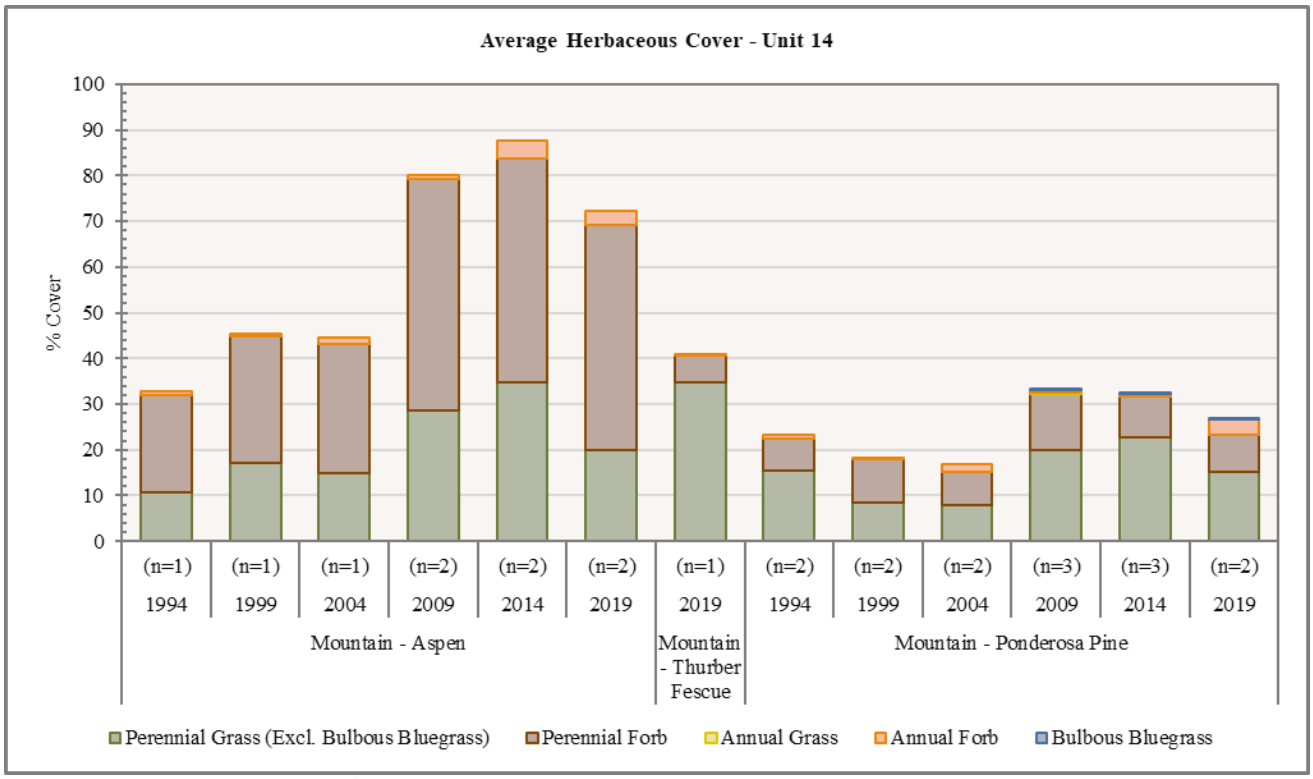


Figure 2.21: Average herbaceous cover for Mountain - Aspen, Mountain - Thurber Fescue, and Mountain - Ponderosa Pine study sites in WMU 14, San Juan.

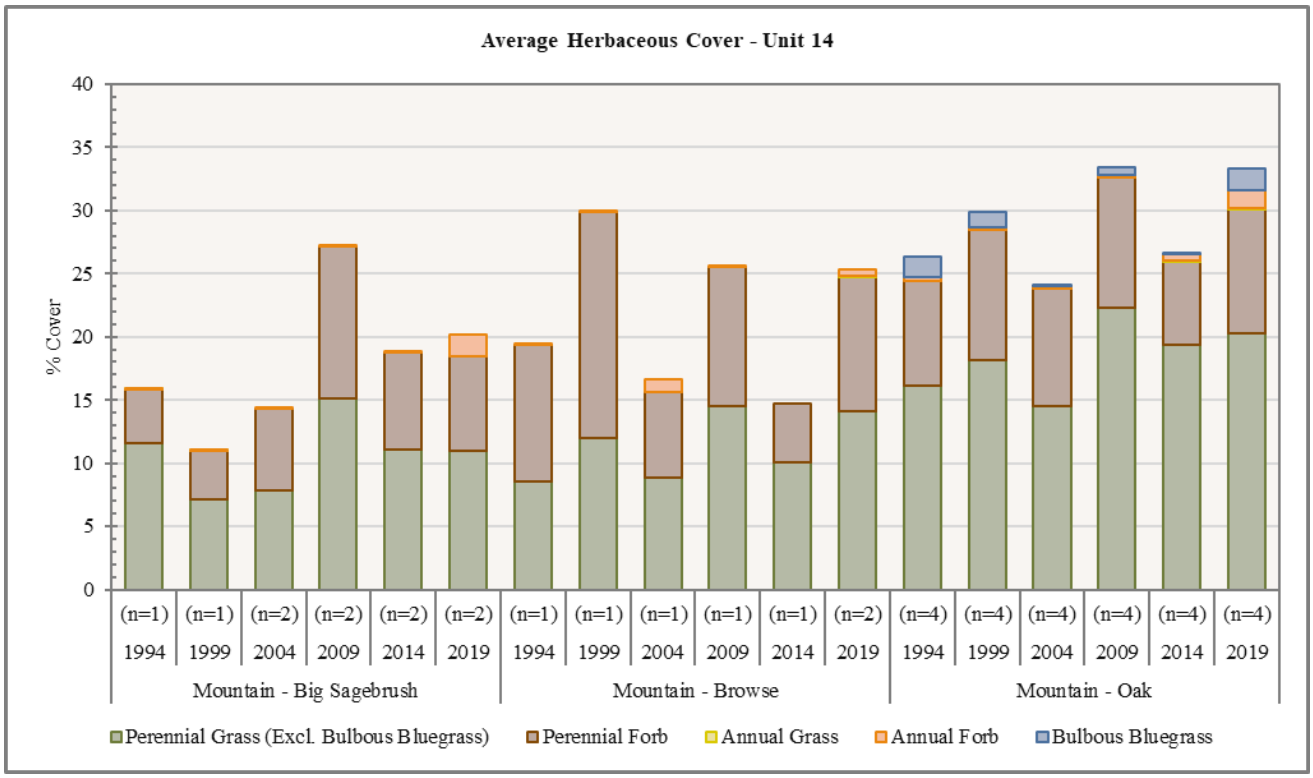


Figure 2.22: Average herbaceous cover for Mountain - Big Sagebrush, Mountain - Browse, and Mountain - Oak study sites in WMU 14, San Juan.

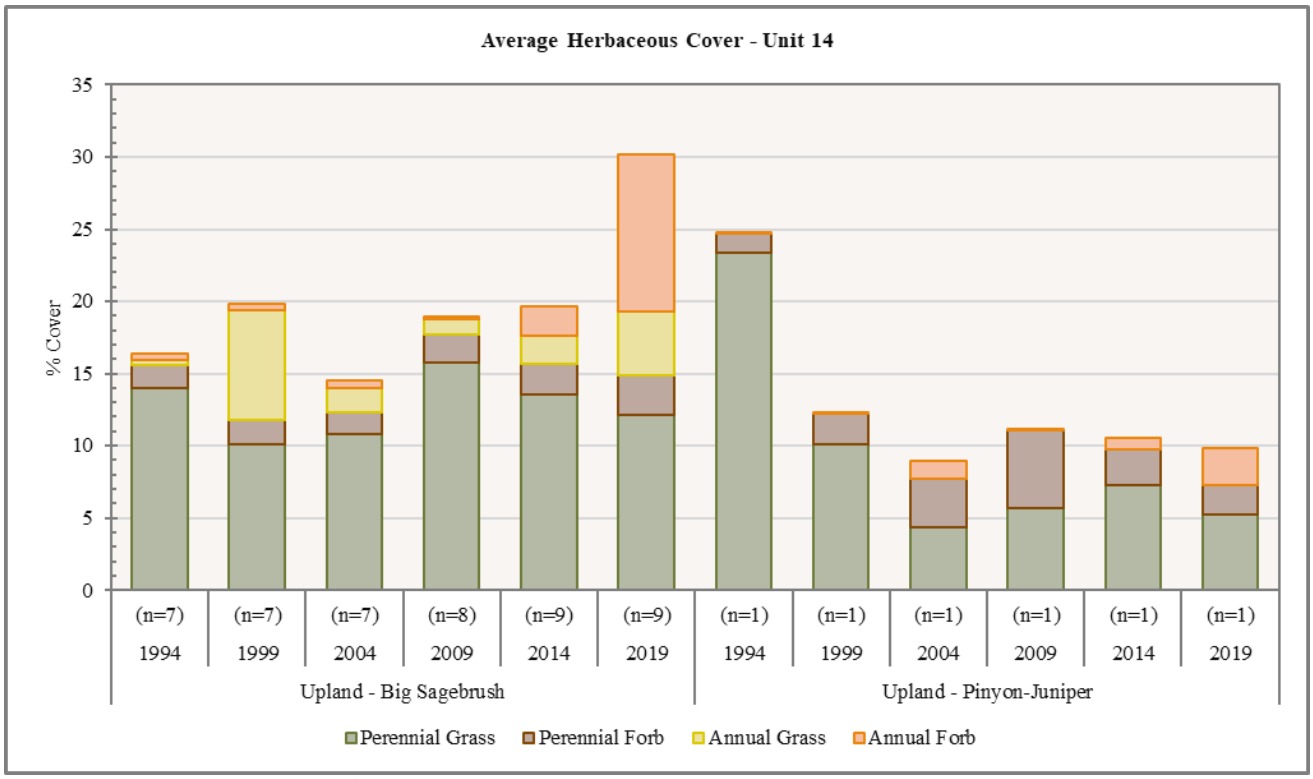


Figure 2.23: Average herbaceous cover for Upland - Big Sagebrush and Upland - Pinyon-Juniper study sites in WMU 14, San Juan.

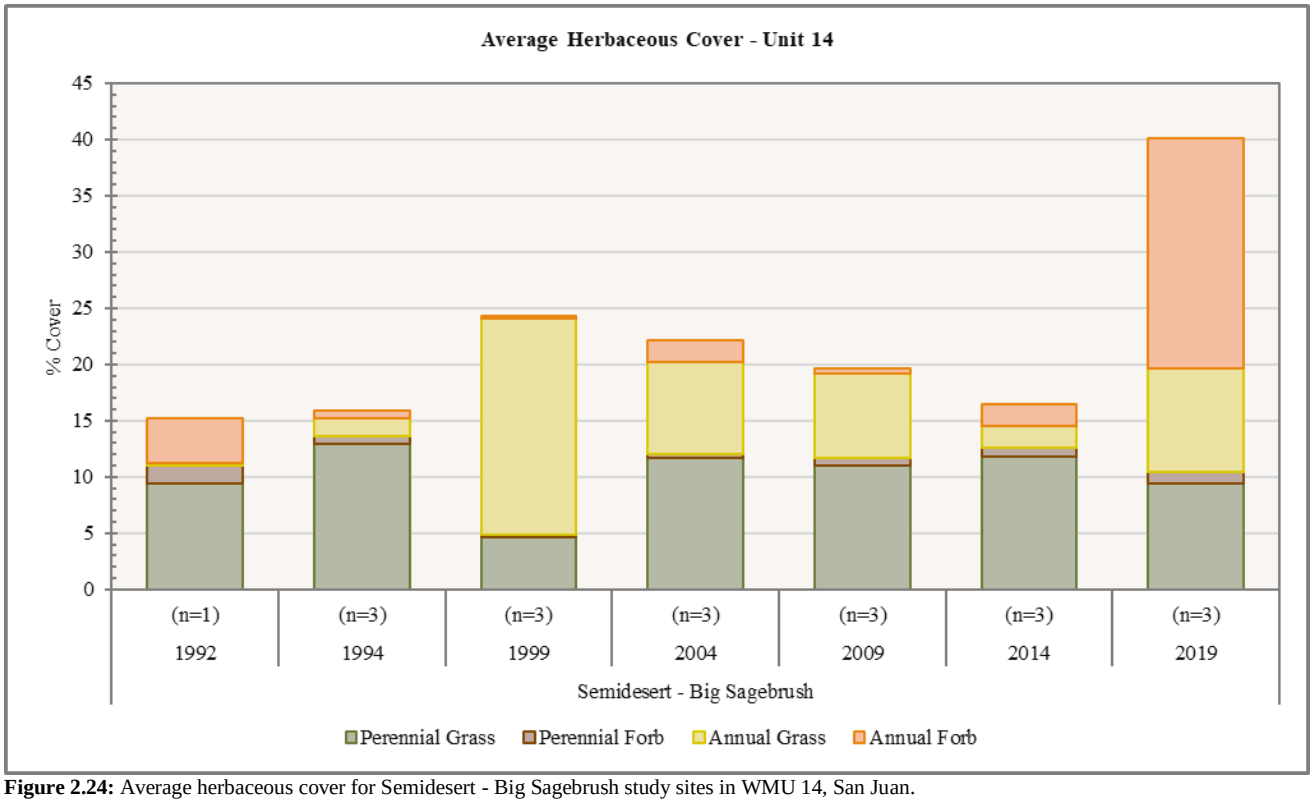


Figure 2.24: Average herbaceous cover for Semidesert - Big Sagebrush study sites in WMU 14, San Juan.

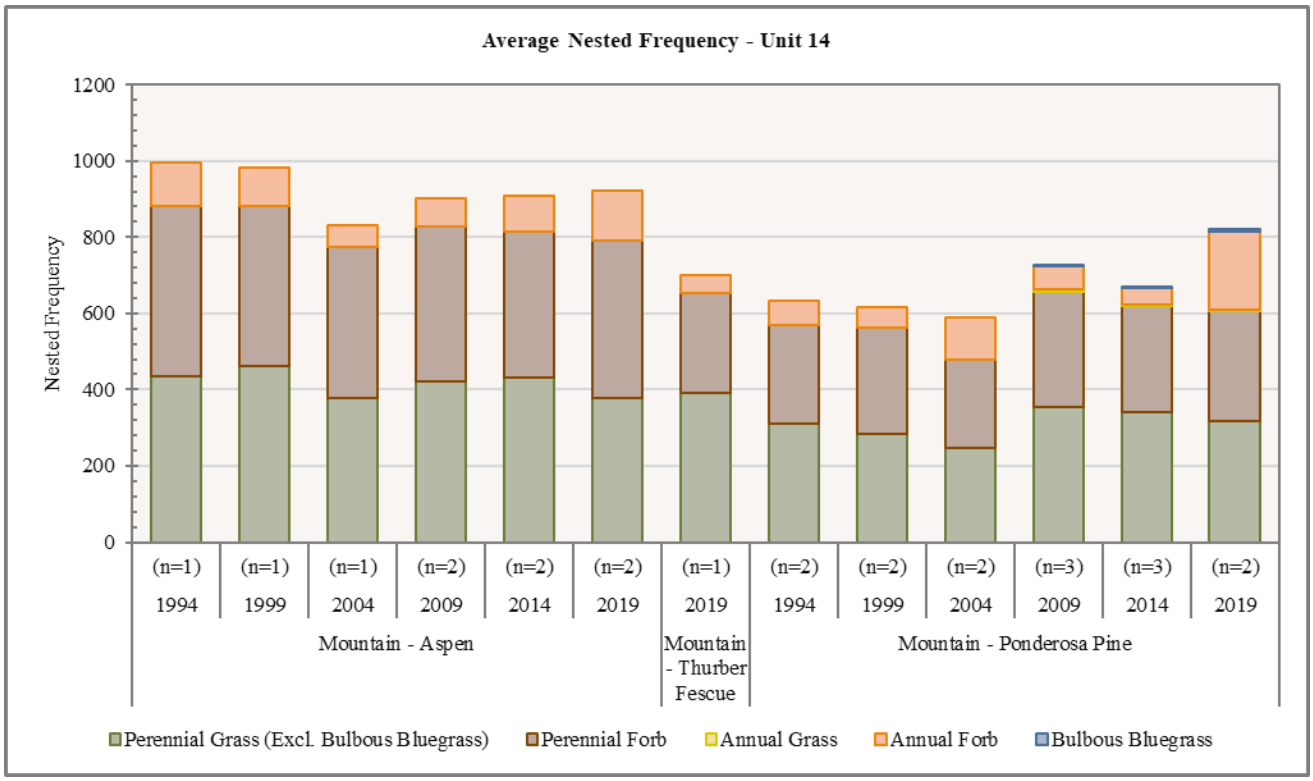


Figure 2.25: Average nested frequency of herbaceous species for Mountain - Aspen, Mountain - Thurber Fescue, and Mountain - Ponderosa Pine study sites in WMU 14, San Juan.

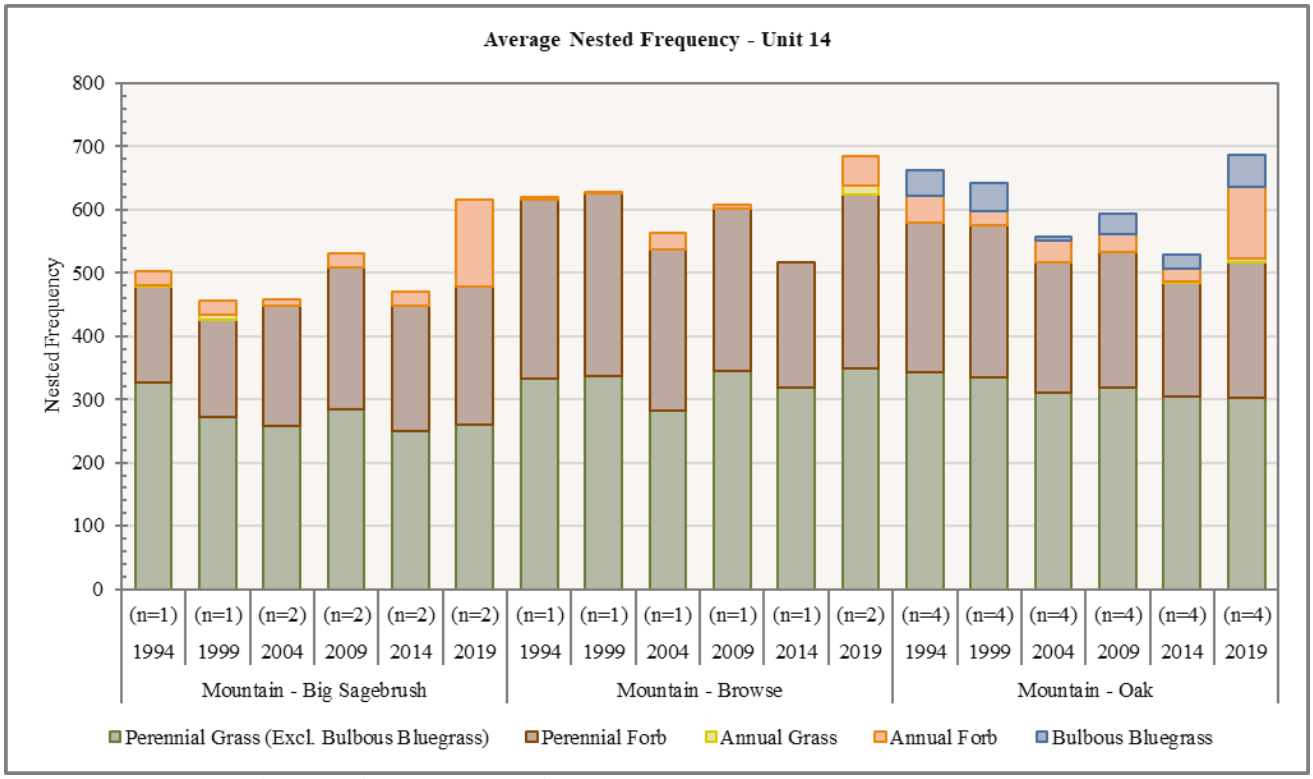


Figure 2.26: Average nested frequency of herbaceous species for Mountain - Big Sagebrush, Mountain - Browse, and Mountain - Oak study sites in WMU 14, San Juan.

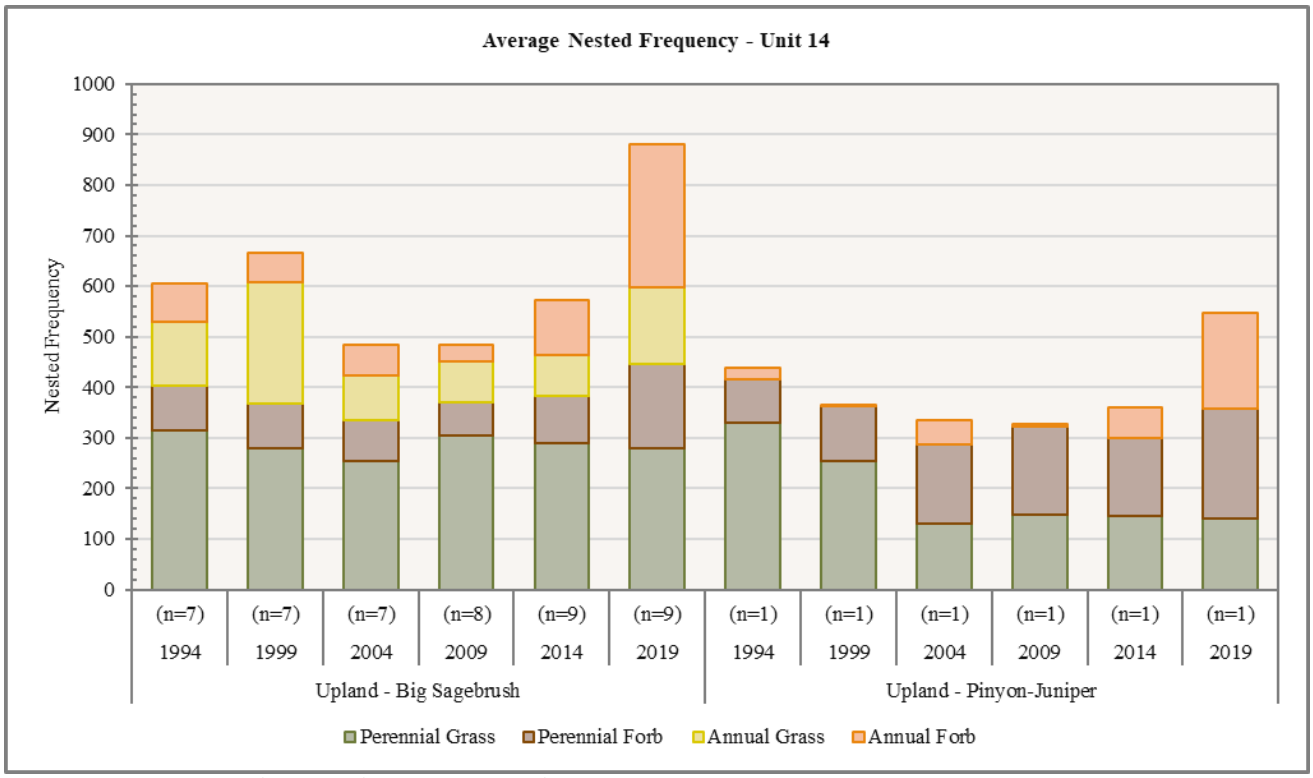


Figure 2.27: Average nested frequency of herbaceous species for Upland - Big Sagebrush and Upland - Pinyon-Juniper study sites in WMU 14, San Juan.

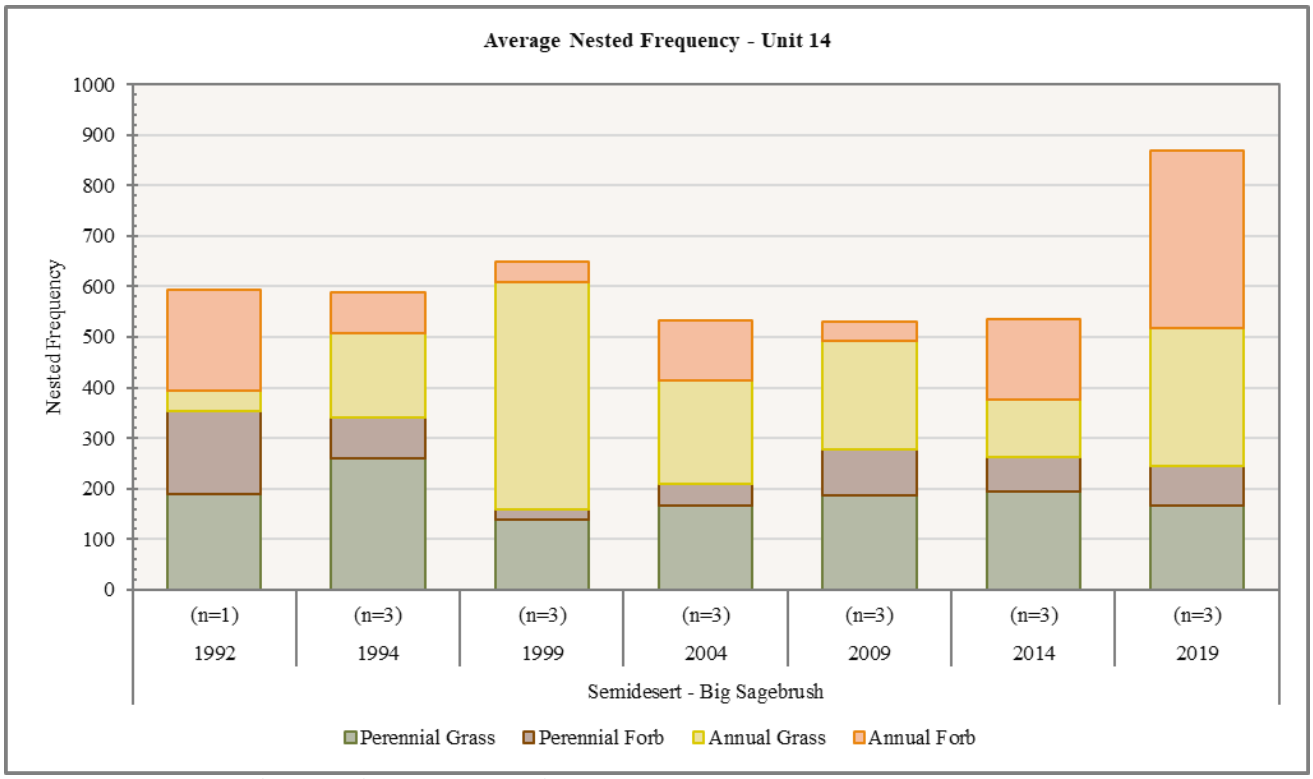


Figure 2.28: Average nested frequency of herbaceous species for Semidesert - Big Sagebrush study sites in WMU 14, San Juan.

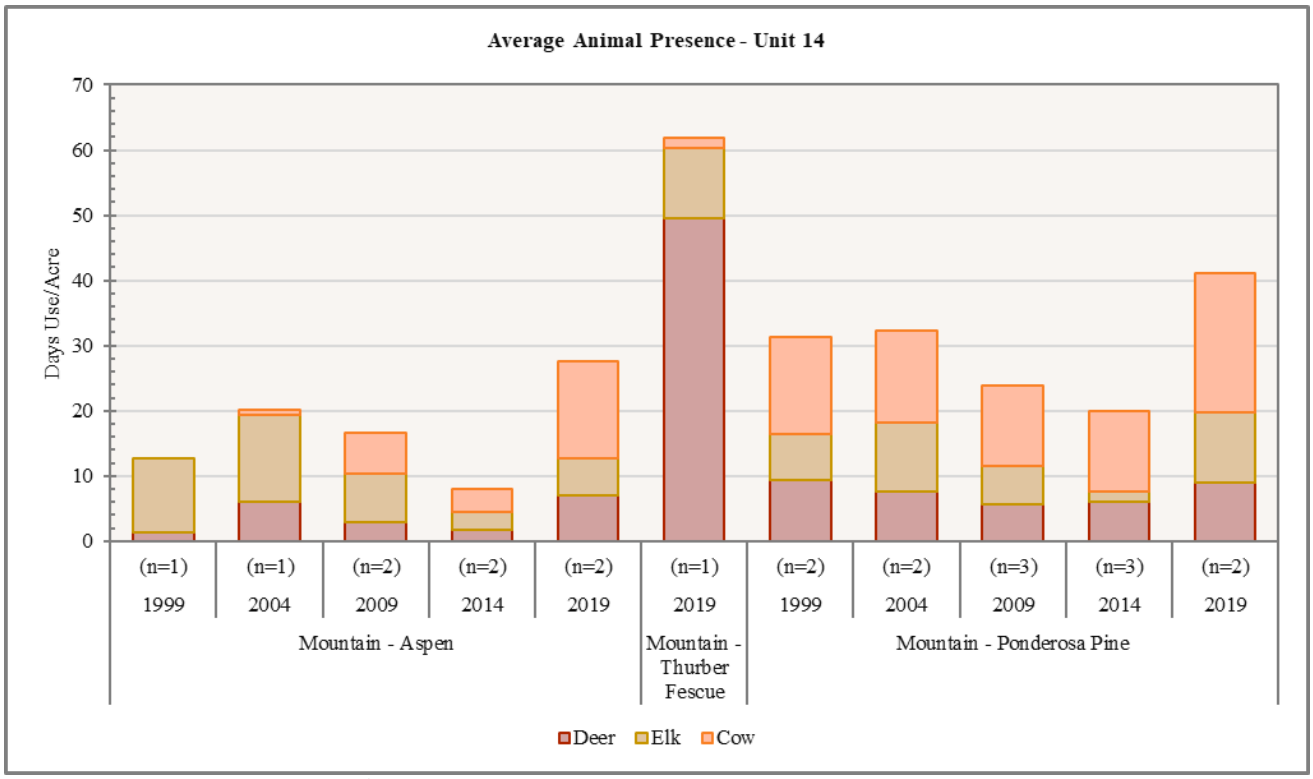


Figure 2.29: Average pellet transect data for Mountain - Aspen, Mountain - Thurber Fescue, and Mountain - Ponderosa Pine study sites in WMU 14, San Juan.

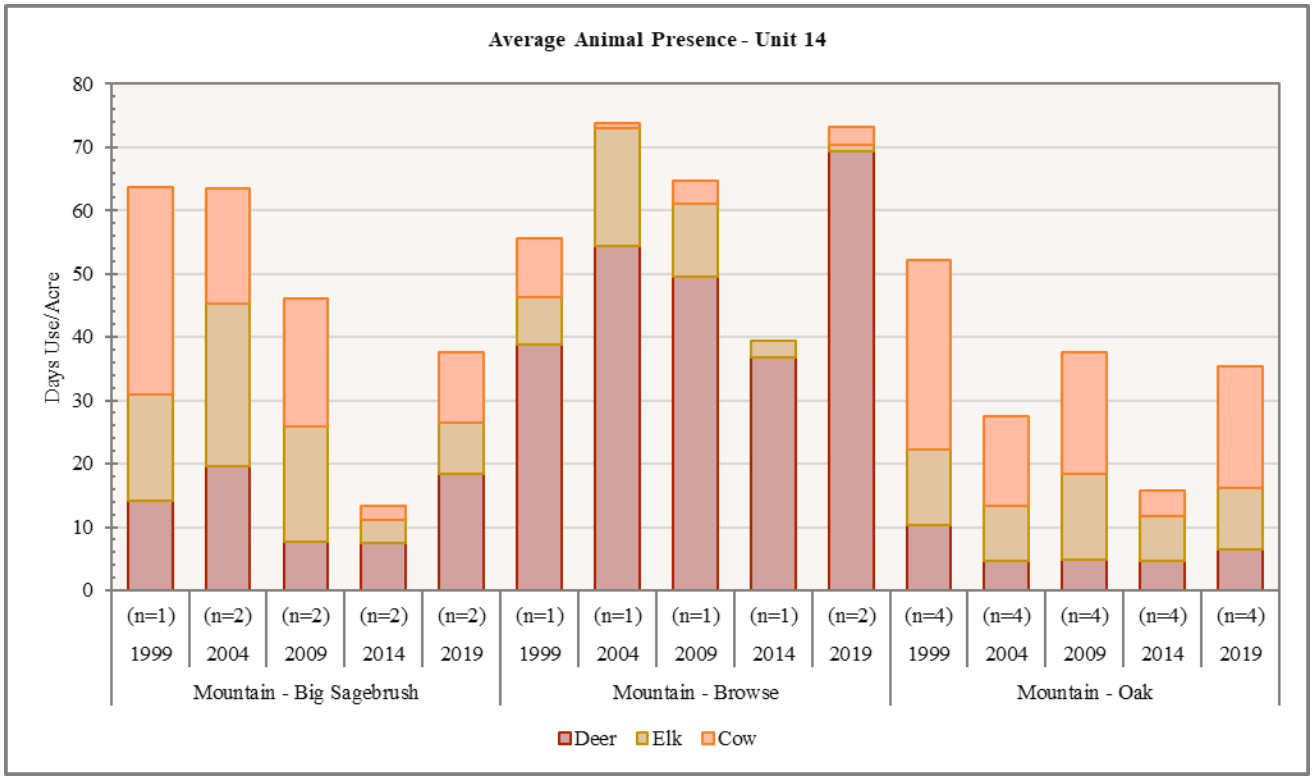


Figure 2.30: Average pellet transect data for Mountain - Big Sagebrush, Mountain - Browse, and Mountain - Oak study sites in WMU 14, San Juan.

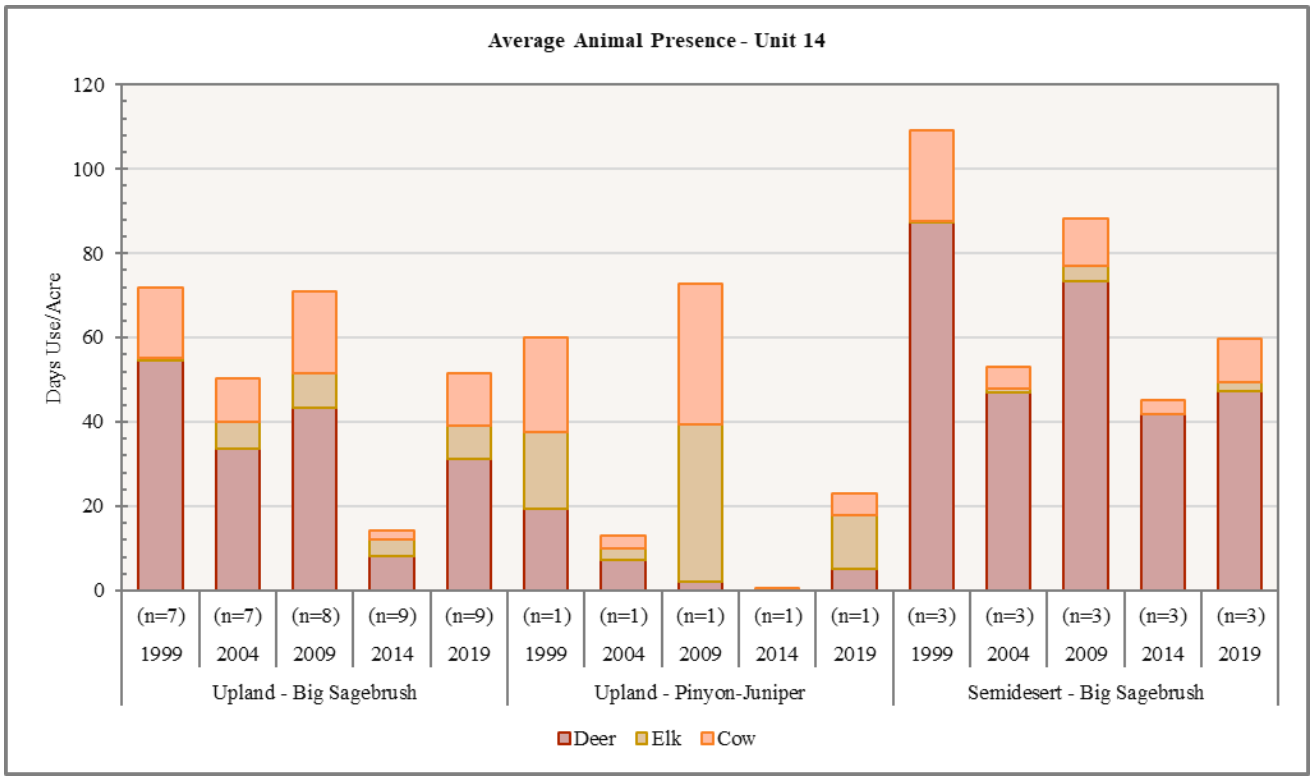
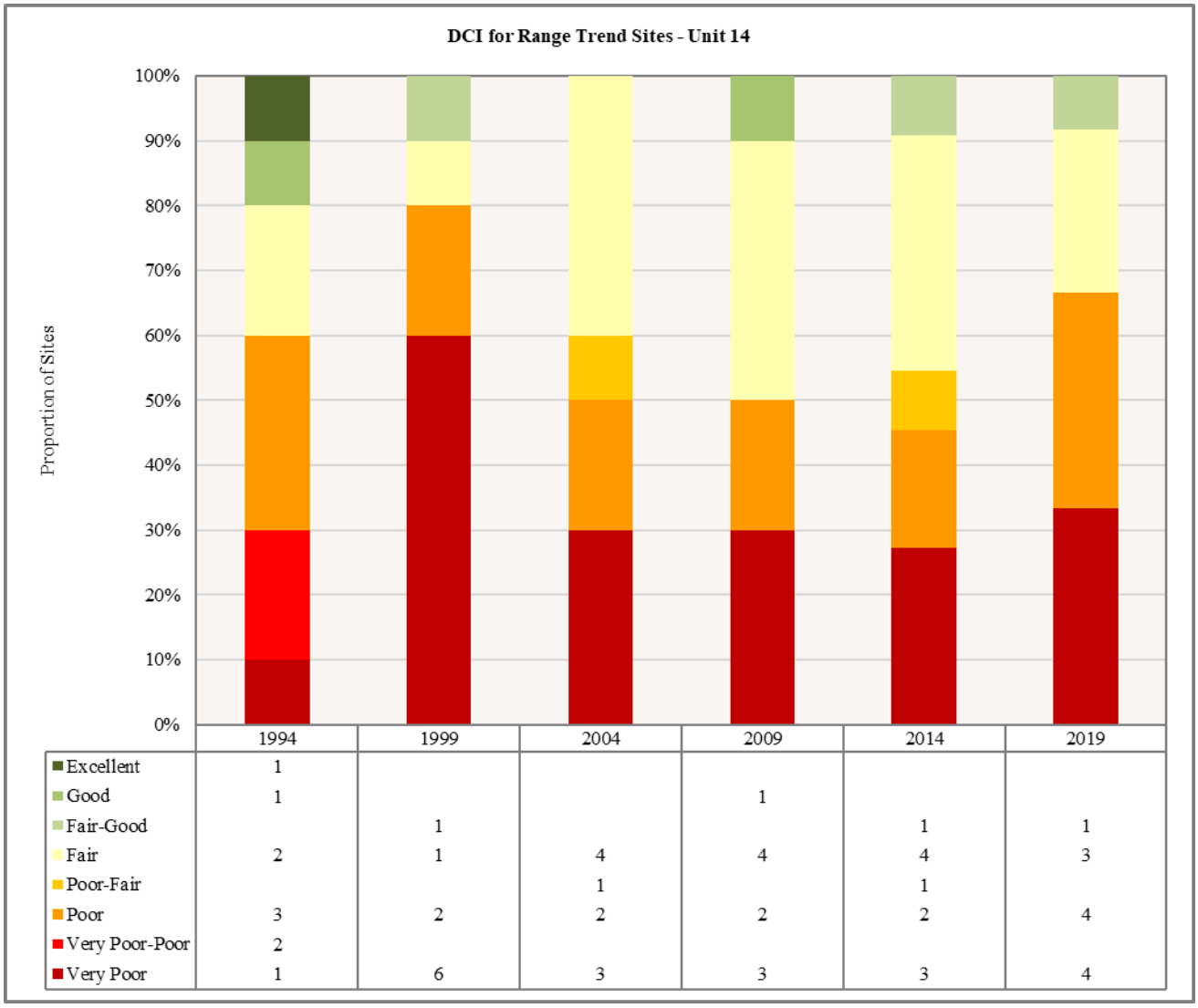


Figure 2.31: Average pellet transect data for Upland - Big Sagebrush, Upland - Pinyon-Juniper, and Semidesert - Big Sagebrush study sites in WMU 14, San Juan.

Deer Winter Range Condition Assessment

The condition of deer winter range within the San Juan management unit has fluctuated on the sites sampled since 1994. As of the 2019 sample year, the active Range Trend sites in the unit are considered to be in very poor to fair-good condition (**Figure 2.32**, **Table 2.10**). The Lower Deer Flat study is in fair-good condition: perennial grass cover and some preferred browse cover are the reason that this site is in this condition. The Wild Cow Point, Ruin Park, and Beef Basin Wash studies are considered to be in fair condition. There are four sites classified as being in poor condition: these sites are Harts Draw, Harts Point, Shay Mesa, and Salt Creek Mesa. Finally, there are four sites ranked as very poor which are the Alkali Point, Black Mesa, South Plain, and Arch Canyon studies. Lack of preferred browse and annual cover is the reason that these studies are classified as being in very poor condition. DCI scores on the unit have generally remained the same over time.



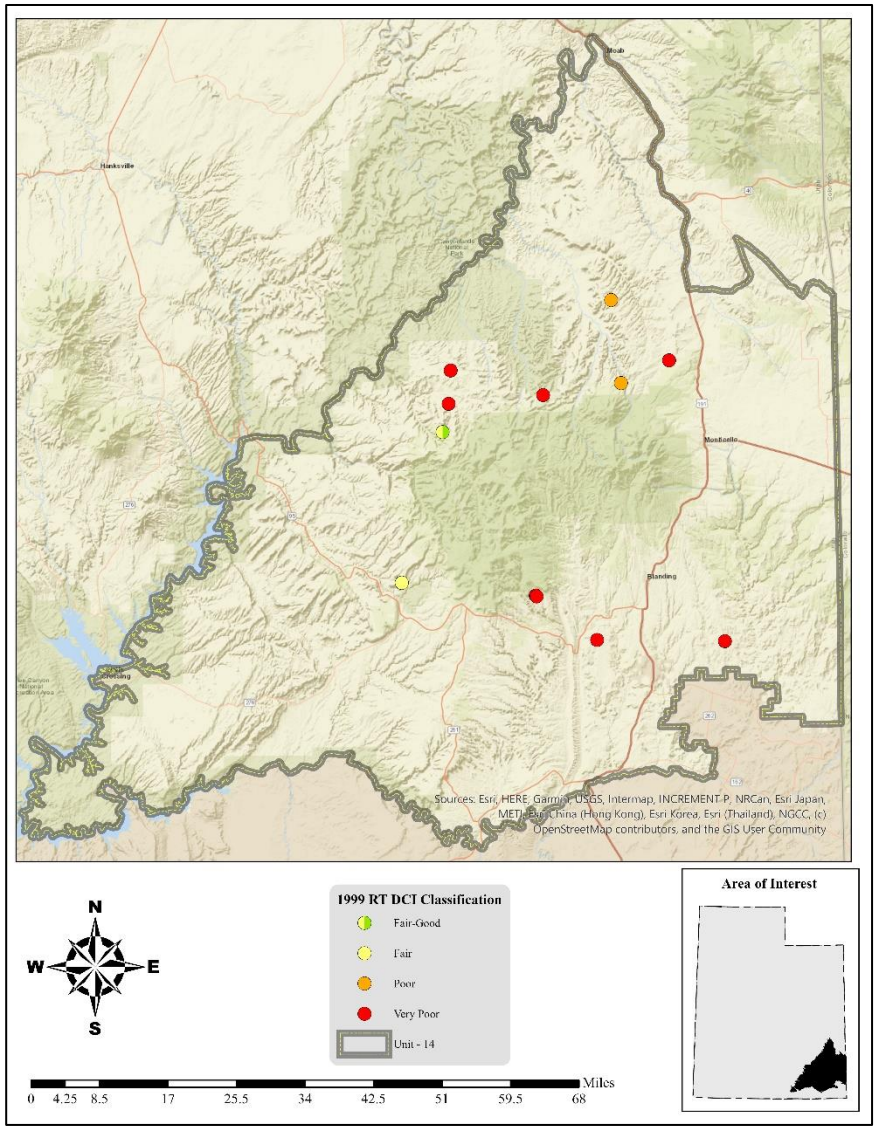
	1994	1999	2004	2009	2014	2019
Excellent	1					
Good	1			1		
Fair-Good		1			1	1
Fair	2	1	4	4	4	3
Poor-Fair			1		1	
Poor	3	2	2	2	2	4
Very Poor-Poor	2					
Very Poor	1	6	3	3	3	4

Figure 2.32: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 14, San Juan.

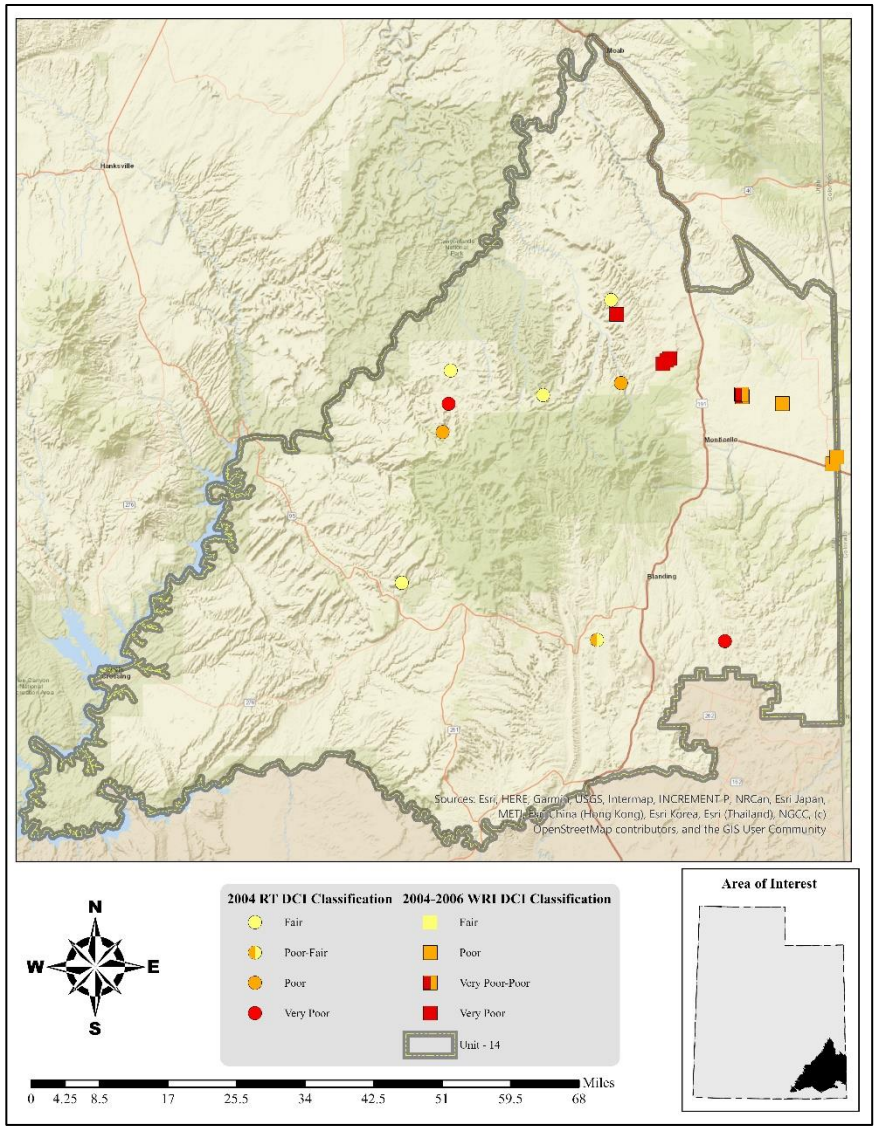
Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
14-01	1994	14	-4	0	3.5	-3	0.7	0	**11.1**	**VP-P**
14-01	1999	10.8	-8.9	0	0.8	-18	0	0	**-15.3**	**VP**
14-01	2004	6.9	-12.2	0	0.5	-10.8	0.3	0	**-15.2**	**VP**
14-01	2009	5.9	0	0	0.6	-14	2.8	0	**-4.7**	**VP**
14-01	2012	4.9	0	0	1.3	-12.3	0.8	0	**-5.3**	**VP**
14-01	2014	4.1	0	0	1	-3.8	1.8	0	**3.2**	**VP**
14-01	2019	0.6	0	0	1.4	-6.1	1.9	0	**-2.3**	**VP**
14-09	1994	14.6	1.1	1.1	21.1	-0.5	0.9	0	**38.3**	**P**
14-09	1999	11.8	5.2	0.3	15	-9.9	1.4	0	**23.7**	**VP**
14-09	2004	10.3	-12.5	1	29.3	-0.4	0.4	0	**28**	**VP**
14-09	2009	10.3	3.9	2.5	30	-2.4	0.7	0	**44.9**	**P**
14-09	2014	9.6	10.7	1.1	30	-0.3	5.7	0	**56.9**	**F**
14-09	2019	8.9	0	0.7	26.9	-0.3	9.5	0	**45.7**	**P**
14-10	1994	15.1	7.1	3.1	22.2	-0.8	0.7	0	**47.2**	**P**
14-10	1999	14.5	11.7	5.8	12.1	-5.6	4.9	0	**43.4**	**P**
14-10	2004	27.4	2.7	1.4	16	-0.9	10	0	**56.6**	**F**
14-10	2009	25.9	5.7	0	23.4	-1.3	0.1	0	**53.8**	**F**
14-10	2014	19.3	12.1	2.8	20.9	-9.6	2	0	**47.5**	**P**
14-10	2019	23.3	4.7	0.7	14.1	-8.1	3	0	**37.6**	**P**
14-11	1994	4.5	0	0	14.4	-0.4	2.1	0	**20.5**	**VP**
14-11	1999	7.1	13.2	4.1	16.5	-4.2	3.3	0	**39.9**	**P**
14-11	2004	17.4	7	2	14.7	0	1.4	0	**42.4**	**P**
14-11	2009	7.3	5.5	0.8	13.6	-1.4	1.5	0	**27.3**	**VP**
14-11	2011	10	12.4	8.3	30	-2.6	6.7	0	**64.8**	**F-G**
14-11	2014	8.9	14.3	8.4	30	-1.3	3.6	0	**63.9**	**F-G**
14-11	2019	12.5	10.8	2.1	15.2	-3.5	9.3	0	**46.3**	**P**
14-13	1992	9.8	-2.1	9.7	18.8	-0.1	3.3	0	**39.4**	**F**
14-13	1994	15.2	3.3	13.1	17.7	-0.5	0.6	0	**49.4**	**G**
14-13	1999	5.9	0	0	7.6	-9.2	0.3	0	**4.5**	**VP**
14-13	2004	6.3	0	0	24.1	-7.5	1.5	0	**24.4**	**P-F**
14-13	2009	8.1	-0.4	0.7	21.8	-2.4	1	0	**28.7**	**F**
14-13	2014	7	7.7	3.8	16.2	-0.7	0.8	0	**34.7**	**F**
14-13	2019	2.4	0	0	2.3	-14	1.7	0	**-7.6**	**VP**
14-22	1992	23.6	10.1	12.4	30	0	5.9	0	**82**	**E**
14-22	1999	17.8	10.5	4.2	30	0	3.8	0	**66.3**	**F-G**
14-22	2004	16.4	3.8	1.2	19.6	0	2.3	0	**43.3**	**P**
14-22	2009	19	9.6	1.9	30	0	1.3	0	**61.8**	**F**
14-22	2014	14.9	4.4	0.4	25.5	0	0.6	0	**45.7**	**P**
14-22	2019	13	7	1.9	28.9	-0.1	3.7	0	**54.3**	**F**
14-23	1992	6.8	-8.3	10.1	30	-0.1	0.5	0	**39**	**P**
14-23	1999	3.4	0	0	7.2	-19.7	0.4	0	**-8.7**	**VP**
14-23	2004	2.9	0	0	21.6	-7.2	0.4	0	**17.7**	**VP**
14-23	2009	2.3	0	0	30	-0.9	0.7	0	**32**	**VP**
14-23	2012	3.9	0	0	30	-0.9	0.6	0	**33.6**	**VP-P**
14-23	2014	2.1	0	0	30	-2.1	2.8	0	**32.9**	**VP**
14-23	2019	3.9	0	0	23.3	-15.7	1.7	0	**13.1**	**VP**
14-24	1992	5.8	0	0	30	0	3.2	0	**39**	**F**
14-24	1999	2.4	0	0	19.5	-15.8	1.1	0	**7.2**	**VP**
14-24	2004	0.4	0	0	30	0	0.4	0	**30.7**	**F**
14-24	2009	0.3	0	0	30	-0.5	0.2	0	**30**	**F**
14-24	2014	0.5	0	0	30	0	2.5	0	**33**	**F**
14-24	2019	0.9	0	0	30	-0.6	2.7	0	**33**	**F**
14-29	1992	2.2	0	0	30	0	2.6	0	**34.8**	**VP-P**
14-29	1999	4.5	0	0	20.2	0	4.3	0	**29**	**VP**
14-29	2004	7.4	15	15	8.7	0	6.7	0	**52.8**	**F**
14-29	2009	7.9	15	0	11.4	0	10	0	**44.3**	**P**
14-29	2014	7.4	0	0	14.6	0	4.8	0	**26.7**	**VP**
14-29	2019	18.7	14.6	0	10.4	0	4.1	0	**47.8**	**P**

Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
14-32	1994	15.9	9.5	4.1	25.4	-0.2	2	0	**56.7**	**F**
14-32	1999	15.1	8.7	10.7	26.9	-0.6	1.7	0	**62.5**	**F**
14-32	2004	17	3.2	3.5	30	-0.2	1.3	0	**54.7**	**F**
14-32	2009	23.3	11.3	2.6	30	0	2.6	0	**69.7**	**G**
14-32	2014	17.4	10.6	1.7	19.9	0	0.7	0	**50.3**	**P-F**
14-32	2019	19	10.3	0	30	0	5.6	0	**64.9**	**F-G**
14-38	2014	26.5	11.2	1.3	12.9	0	0.7	0	**52.5**	**F**
14-38	2019	18	3.4	0	3.9	-0.3	5.3	0	**30.3**	**VP**
14-39	2019	13.9	6.1	1.7	30	-2.2	5.9	0	**55.4**	**F**

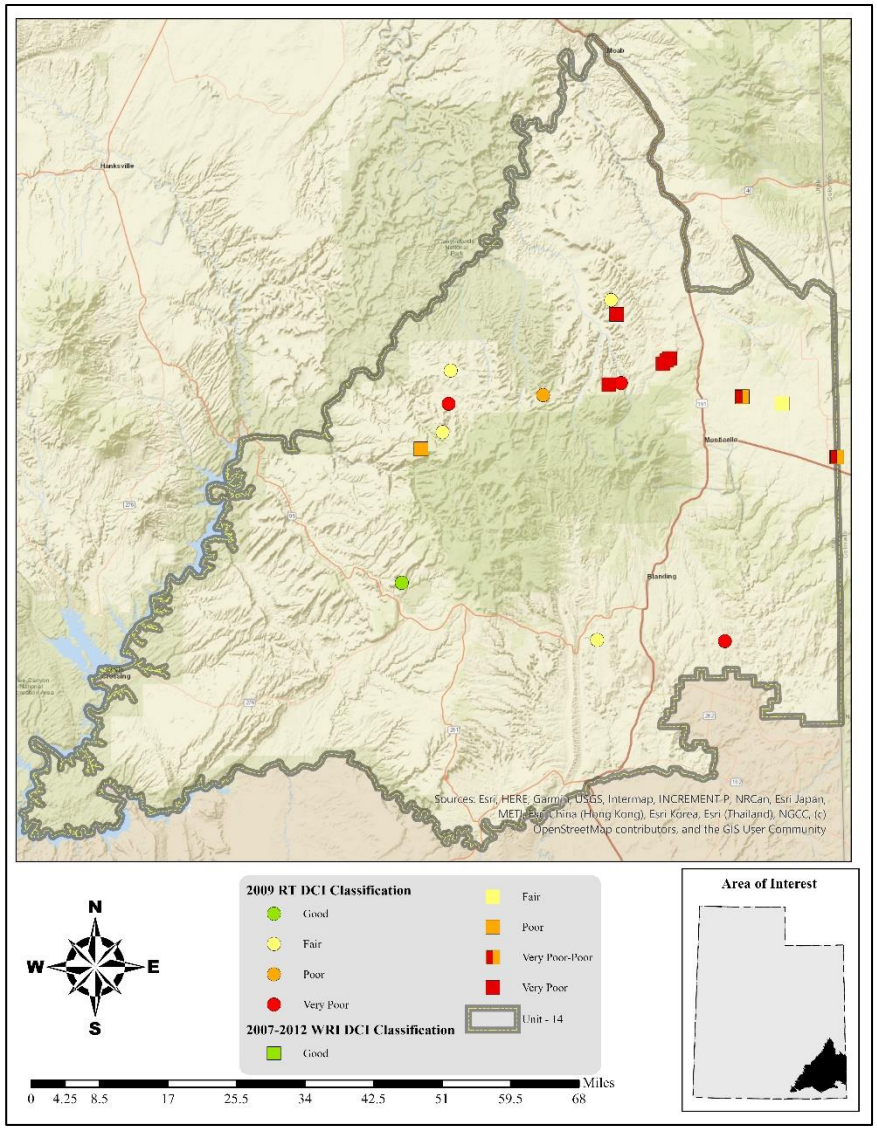
Table 2.10: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 14, San Juan. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. *Studies with an asterisk have been suspended.



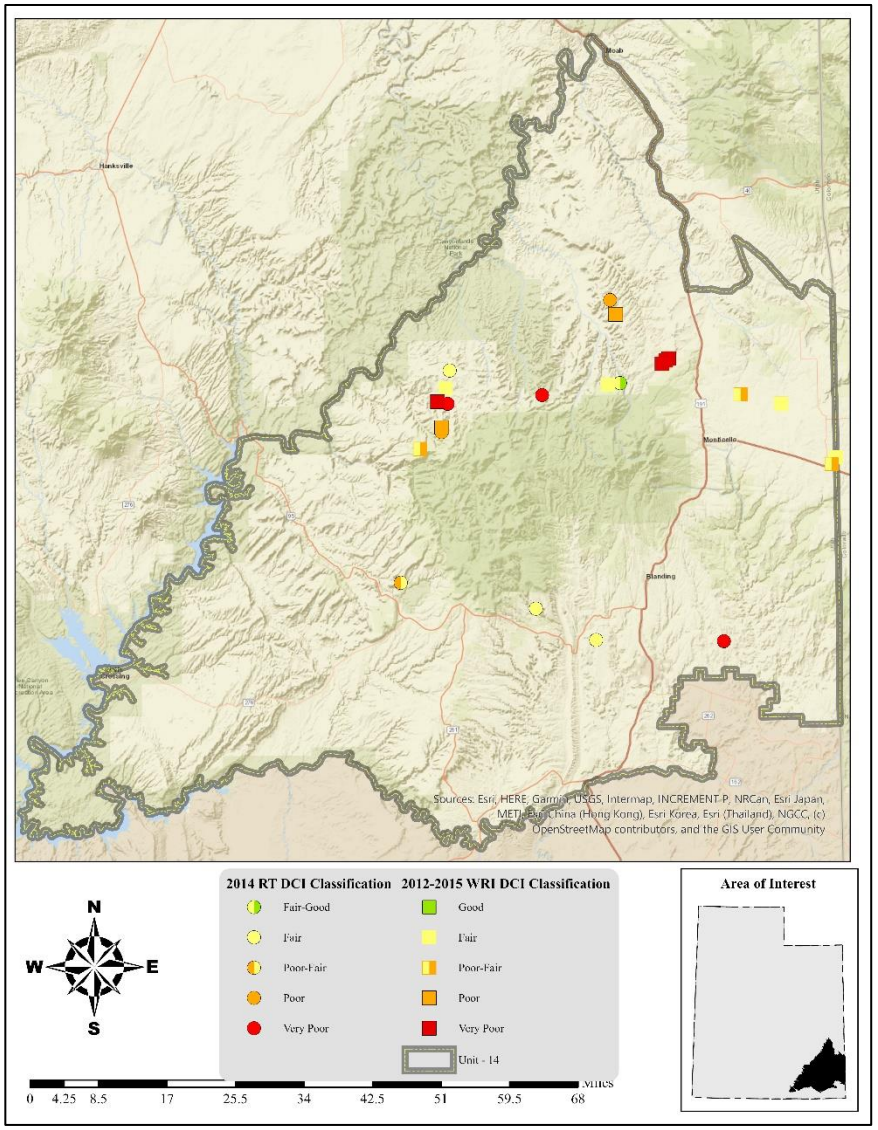
Map 2.9: 1999 Desirable Components Index (DCI) ranking distribution by study site for WMU 14, San Juan.



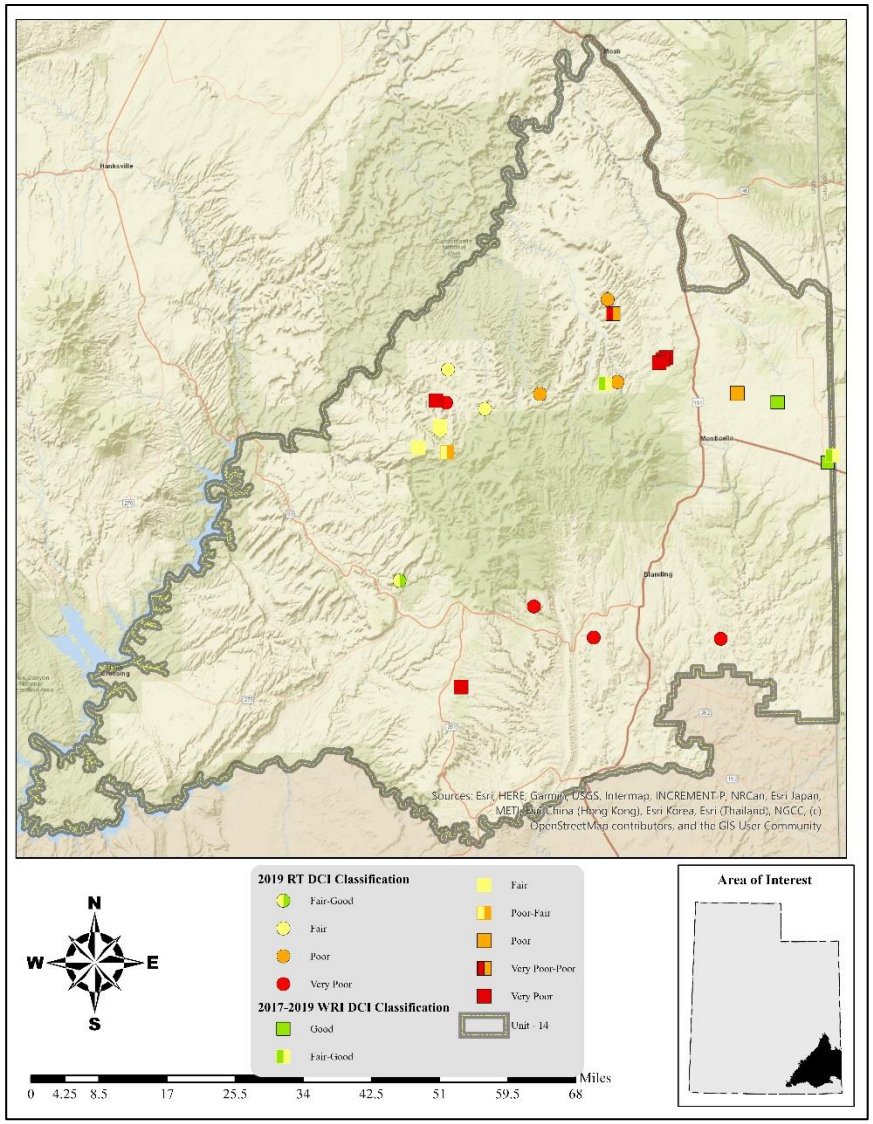
Map 2.10: 2004 Desirable Components Index (DCI) ranking distribution by study site for WMU 14, San Juan.



Map 2.11: 2009 Desirable Components Index (DCI) ranking distribution by study site for WMU 14, San Juan.



Map 2.12: 2014 Desirable Components Index (DCI) ranking distribution by study site for WMU 14, San Juan.



Map 2.13: 2019 Desirable Components Index (DCI) ranking distribution by study site for WMU 14, San Juan.

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
14-1	Alkali Point	Climate Change	High	Loss of habitat and shift in ecological community type
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Animal Use – Deer	High	Reduced/less vigorous browse component
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14-2	Brushy Basin	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14-5	Jackson Ridge	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
14-6	Harts Draw Reservoir	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
14-8	Peters Point	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14-9	Harts Draw	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Climate Change	Medium	Loss of habitat and shift in ecological community type
		Animal Use – Deer	Medium	Reduced/less vigorous browse component
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14-10	Harts Point	Animal Use – Deer	High	Reduced/less vigorous browse component
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14-11	Shay Mesa	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		Animal Use – Elk	Medium	Reduced understory shrub and herbaceous vigor
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14-12	Shingle Mill	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14-13	Black Mesa	Climate Change	High	Loss of habitat and shift in ecological community type
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14-19	Woodenshoe	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
14-20	Gooseberry	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
14-22	Wild Cow Point	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
14-23	South Plain	Climate Change	High	Loss of habitat and shift in ecological community type
		Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14-24	Ruin Park	Climate Change	High	Loss of habitat and shift in ecological community type
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14-27	Mormon Pasture Point	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14-29	Salt Creek Mesa	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Animal Use – Elk	High	Reduced understory shrub and herbaceous vigor
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
14-30	Milk Ranch Point	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14-31	Chippean Ridge	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14-32	Lower Deer Flat	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14-34	Big Flat	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
14-35	Dickson Gulch	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
14-36	Dry Mesa	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14-37	Kigalia Point II	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
14-38	Arch Canyon	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14-39	Beef Basin Wash	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14-40	Clay Draw	Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14-41	Duckett Ridge	None Identified		
14R-6	Dugout (Hart Draw)	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Climate Change	Medium	Loss of habitat and shift in ecological community type
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14R-7	Adams CE Harrow	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
14R-8	Adams CE Control	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
14R-9	Hart Draw Flat 1	Climate Change	High	Loss of habitat and shift in ecological community type
		Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
14R-10	Hart Draw Flat 2	Climate Change	High	Loss of habitat and shift in ecological community type
		Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
14R-11	Harts Windmill	Climate Change	High	Loss of habitat and shift in ecological community type
		Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
14R-15	SITLA Dixie 2	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
14R-17	Stateline South	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14R-18	Stateline North	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
14R-19	Peter's Canyon	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
14R-20	Johnson Creek	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14R-21	Shay Mesa Bullhog	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14R-25	Peters Point BLM	PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
14R-27	Seep Creek	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Noxious Weeds	High	Reduced diversity of desirable grass and forb species
		Agriculture	Low	Fragmentation and degradation/loss of habitat
14R-28	Johnson Creek 2	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14R-29	South Plain 2	Climate Change	High	Loss of habitat and shift in ecological community type
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
14R-31	Dark Canyon	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14R-33	Sego Spring 1	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Elk	Medium	Reduced understory shrub and herbaceous vigor

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
14R-34	Sego Spring 2	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
14R-36	Mustang Mesa	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14R-37	Lower Wild Cow Point	PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
14R-38	Sweet Alice Spring	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14R-39	Duck Lake	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14R-40	Gooseberry North	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14R-41	Round Mountain	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Elk	High	Reduced understory shrub and herbaceous vigor
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14R-42	Brushy Flat	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Agriculture	Low	Fragmentation and degradation/loss of habitat
14R-43	Long Canyon Point	PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
14R-44	Lems Draw	PJ Encroachment	High	Reduced understory shrub and herbaceous vigor
14R-45	Long Canyon	PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity

Table 2.11: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 14, San Juan. All assessments are based off of the most current sample date for each study site. Criteria for evaluating limiting factors is available in **Appendix A - Threat Assessment**.

Discussion and Recommendations

Mountain (Aspen)

The studies that are within the Mountain (Aspen) ecological type are considered to be deer and elk summer range within the San Juan management unit. These communities support grass and forb populations that provide valuable summer forage for wildlife. Introduced perennial grasses pose a moderate threat on the Jackson Ridge study and a high-level threat on the Dickson Gulch study. These grasses can be aggressive at higher elevation and are capable of reducing the diversity and abundance of other more desirable native grass and forb species. In addition, pellet transect data indicates that high cattle use may be occurring on the Dickson Gulch site. Heavy usage by cattle has the potential to lead to reduced diversity of native herbaceous species.

Treatments to reduce aggressive perennial grasses could eventually be needed in some areas if a lack of diversity in the plant community becomes a concern. If reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native grass species when possible. On the Dickson Gulch study, closer examination of the site and surrounding area may be recommended to determine if high use is occurring across the allotment.

Mountain (Thurber Fescue)

The study site that is considered to be of the Mountain (Thurber Fescue) ecological type, Duckett Ridge, is considered to be deer and elk summer range on this unit. This community type supports grass and forb populations that provide forage for wildlife. No threats were found on this study site.

Mountain (Ponderosa Pine)

The studies within the Mountain (Ponderosa Pine) community type are considered to be summer range for deer and elk. Study sites of this ecological type support herbaceous communities which provide valuable forage for wildlife in the summer months. All three studies are host to introduced perennial grasses. While they provide forage, introduced perennial grasses can be aggressive at higher elevations and reduce the

prevalence and abundance of other more desirable native grasses and forbs. In addition, low amounts of annual grasses have been observed on the Woodenshoe and Gooseberry studies.

Treatment to reduce annual grasses may be necessary in some areas if cover increases significantly. Treatments for aggressive introduced perennial grasses could be needed to restore diversity on these study sites. If reseeding is necessary to restore native species, care should be taken in species selection and preference given to native species when possible.

Mountain (Big Sagebrush)

The sites within the Mountain (Big Sagebrush) ecological type are considered to be summer range for deer. These communities support mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) populations that provide valuable browse for wildlife. Introduced perennial grasses pose a high-level threat on both study sites. These grasses can be aggressive at higher elevation and may have the potential to reduce the diversity and abundance of other more desirable native grass and forb species. Annual grasses have been present in low amounts on the Brushy Basin study, and may exacerbate the risk of wildfire should they increase in the future. Both sites are considered to be within Phase I of woodland succession; further tree encroachment is possible as time passes. In addition, pellet transect data indicates that high cattle usage may be occurring on the Big Flat study; overuse by cattle may lead to reduced herbaceous diversity.

Treatments to reduce aggressive perennial grasses could eventually be needed in some areas if a lack of diversity in the plant community becomes a concern. If reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native grass species when possible. Locations with conifer encroachment may benefit from tree-reducing treatments (e.g. lop and scatter, bullhog, chaining, etc.) if density and cover increase in the future. Finally, closer examination of the Big Flat site and surrounding area may be recommended to determine if high cattle usage is occurring across the allotment.

Mountain (Browse)

The study sites that are classified as being of the Mountain (Browse) ecological type range are considered to be deer summer range and elk spring/fall or winter range on this unit. Sites of this community type support shrub populations that provide valuable browse for wildlife. Annual grasses have been observed on both study sites in low amounts. Annual grasses may have the potential increase fuel loads and exacerbate risk of wildfire should they increase significantly in the future. In addition, both studies of this ecological type are classified as being within Phase I of woodland succession. Further encroachment may be possible in the future without tree-removing disturbances. Introduced perennial grasses pose a low-level threat on the Clay Draw study. At higher elevations, introduced grasses can be aggressive and may have the potential to outcompete more desirable native grass and forb species.

Treatments to reduce annual grasses may be beneficial should amounts significantly increase in the future. Management of aggressive perennial grasses could eventually be needed on the Clay Draw site. If reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference given to native species when possible. Finally, these sites may require conifer-removing disturbances (e.g. lop and scatter, chaining, bullhog, etc.) if density and cover increase in the future.

Mountain (Oak)

The studies that are within the Mountain (Big Sagebrush) ecological type are considered to be deer and elk summer, spring/fall, or winter range within the San Juan unit. These communities support grass, forb, and shrub populations that provide valuable forage for wildlife. Introduced perennial grasses pose a

medium to high-level threat on all studies within this ecological type. These grasses can be aggressive at higher elevation and are capable of reducing the diversity and abundance of other more desirable native grass and forb species. Annual grasses, particularly cheatgrass (*Bromus tectorum*), have been observed in low amounts on the Harts Draw Reservoir and Chippean Ridge studies. High amounts of annual grasses may increase fuel loads and can exacerbate the risk of wildfire. All sites except for the Harts Draw Reservoir study are considered to be within Phase I of woodland succession. Further tree encroachment may be possible in the future. Pellet transect data indicates that high cattle use may be occurring on the Harts Draw Reservoir site. Heavy cattle usage may have the potential to lead to reduced diversity of desirable grasses and forbs.

Treatments to reduce aggressive perennial grasses could eventually be needed in some areas if a lack of diversity in the plant community becomes a concern. Locations with conifer encroachment may require tree-removing treatments (e.g. bullhog, chaining, lop and scatter, etc.) if density and cover increase in the future. In addition, treatments to reduce annual grasses may be beneficial on some sites if cover increases in future sample years. If reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native grass and forb species when possible. Finally, further investigation on the Harts Draw Reservoir study and surrounding area is recommended to determine if high cattle use is occurring across the allotment.

Upland (Big Sagebrush)

Most of the studies that are classified as Upland (Big Sagebrush) ecological sites are considered to be deer winter habitat within the San Juan management unit. Peters Point and Dry Mesa, however, are classified as deer spring/fall and summer habitat (respectively). The plant communities on these sites support big sagebrush (*Artemisia tridentata*) populations that can provide browse for wildlife. Annual grasses, particularly the introduced species cheatgrass (*Bromus tectorum*), are present on all of these study sites in varying amounts. High amounts of annual grasses may have the potential to increase fuel loads and exacerbate the risk of wildfire. Introduced perennial grasses are also present on many sites, and may have the potential to reduce the diversity and abundance of other more desirable native grass and forb species. The Wild Cow Point study is considered to be within Phase I transitioning to Phase II of woodland succession, while all other sites are within Phase I. Further conifer encroachment may occur without treatment. In addition, high use by deer, cattle, and/or elk may be occurring on the Harts Draw, Harts Point, Shay Mesa, South Plain, Lower Deer Flat, Dry Mesa, and Beef Basin Wash studies. Heavy usage by animals may lead to reduced vigor or loss of browse and/or herbaceous components. Finally, climate change poses a high-level threat on the South Plain study and a medium-level threat on the Harts Draw site. Changes in climate can result in the loss of valuable big game habitat and/or shifts in the ecological community type.

Locations with significant tree encroachment may require conifer-reducing treatments in the future (e.g. bullhog, chaining, lop and scatter, etc.) if density and cover increase. However, caution should be used during method selection so that treatment will not increase annual grass abundance. If reseeding is needed to restore the herbaceous communities, care should be taken in seed selection and preference should be given to native species when possible. Closer examination of the applicable sites and surrounding areas may be recommended to determine if high animal use is occurring throughout the localized area.

Upland (Pinyon-Juniper)

The study that is classified as an Upland (Pinyon-Juniper) ecological site, Salt Creek Mesa, is considered to be in poor condition for deer winter habitat within the San Juan management unit. Introduced perennial grasses are present on this study site. Although these perennial species help provide competition against annual grasses, they may have the potential to reduce the abundance of more desirable native grass and forb species. In addition, pellet transect data suggests that high use by cattle and elk may be occurring on

this site. Heavy usage by these animals may lead to reduced shrub and herbaceous vigor and/or loss in diversity of the herbaceous component. Conifer encroachment is occurring on this study site. Although the study is considered to be in Phase I transitioning to Phase II of woodland succession, it is likely that tree encroachment will continue without treatment.

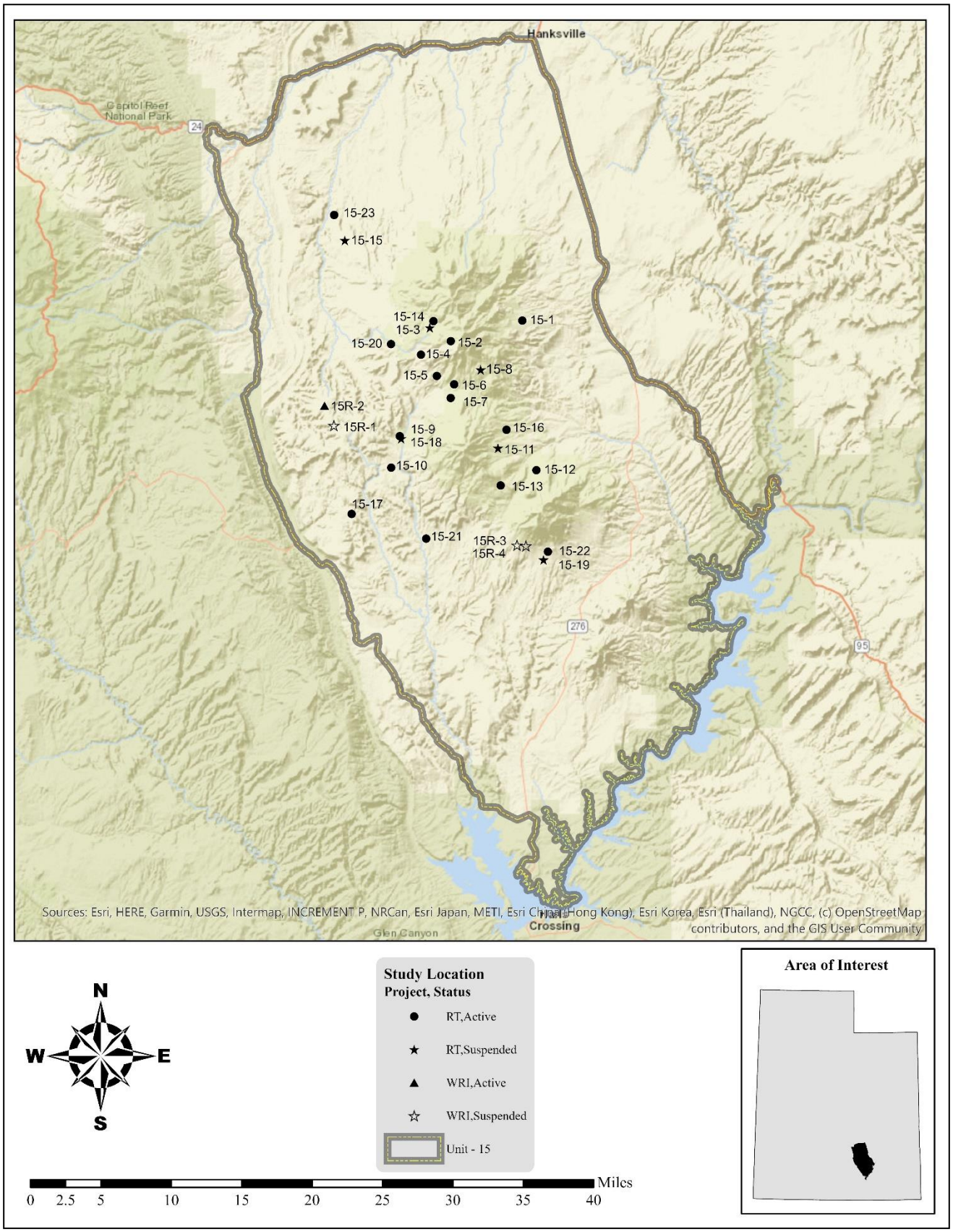
Locations with tree encroachment may require conifer-reducing treatments in the future (e.g. bullhog, chaining, lop and scatter, etc.) if density and cover increase. If reseeding is needed to restore the herbaceous community on this study site specifically, care should be taken in seed selection and preference should be given to native species when possible. Finally, closer examination of the site and surrounding area may be recommended to determine if high animal usage is occurring in the surrounding area.

Semidesert (Big Sagebrush)

The studies that are considered to be Semidesert (Big Sagebrush) ecological sites are classified as being in very poor to fair condition for deer winter range in this unit. The Black Mesa and Alkali Point sites support Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) communities which provide browse for wildlife; Ruin Park is dominated by perennial grasses. Annual grasses have been observed and are considered to be a high-level threat on all study sites. High amounts of annual grasses may have the potential to increase fuel loads. Climate change is also a high-level threat on all sites. Changes in climate have resulted or are beginning to result in a loss of the sagebrush population on these study sites and may cause a shift in ecological types. All studies are also in Phase I of woodland succession, and there may be potential for continued encroachment over time. In addition, pellet data suggests that high use by cattle may be occurring on the Alkali Point and Ruin Park studies. High cattle usage may lead to reduced herbaceous vigor and diversity.

Treatments to reduce amounts of annual grasses may be needed on these sites. If reseeding is necessary to restore native species, care should be taken in species selection and preference given to native species when possible. Tree-reducing treatments may be advisable in the future (e.g. lop and scatter, chaining, bullhog, etc.) if conifer cover and density increase. In addition, further investigation of the Alkali Point and Ruin Park sites and surrounding areas may be recommended to determine if high cattle usage is occurring across the allotments. Finally, it may be beneficial to review management strategies in response to ecological shifts caused by climate change.

3. WILDLIFE MANAGEMENT UNIT 15 – HENRY MOUNTAINS



WILDLIFE MANAGEMENT UNIT 15 – HENRY MOUNTAINS

Boundary Description

Garfield, Kane, and Wayne counties - Boundary begins on SR-95 at a point two miles south of Hanksville; south on SR-95 to Lake Powell; south along the western shore of Lake Powell to SR-276 at Bullfrog; north on SR-276 to Notom Road; north on Notom Road to a point two miles south of SR-24; east along a line that is two miles south of SR-24 to SR-95. Unit boundaries exclude Capitol Reef National Park.

Management Unit Description

Geography

The Henry Mountains lie between the Waterpocket Fold on the west, the canyon of the Colorado River and Lake Powell to the southeast, and the Fremont and Dirty Devil Rivers to the north and northeast. The mountain peaks are the result of vertical intrusions of igneous rocks that have penetrated from a broad basin into the sedimentary strata (Stokes, 1986). The majority of the mountain rises gently upwards to these peaks, which are (from north to south): Mt. Ellen (11,615 feet), Mt. Pennell (11,371 feet), Mt. Hillars (10,650 feet), Mt. Holmes (7,930 feet), and Mt. Ellsworth (8,235 feet). From the base of the peaks, gentle slopes extend out into the flat mesas and rough desert canyon lands that constitute the majority of the unit's land area. Towns in this area include Hanksville, Notom, and Ticaboo.

The Glen Canyon Dam on the Colorado River in Arizona created Lake Powell, which stretches northeast into Utah and makes up the southeastern border of the Henry Mountains unit. The south-flowing stream systems that drain the Henry Mountains run into Lake Powell while the streams to the north flow into the Fremont River and to the east into the Dirty Devil River.

Climate Data

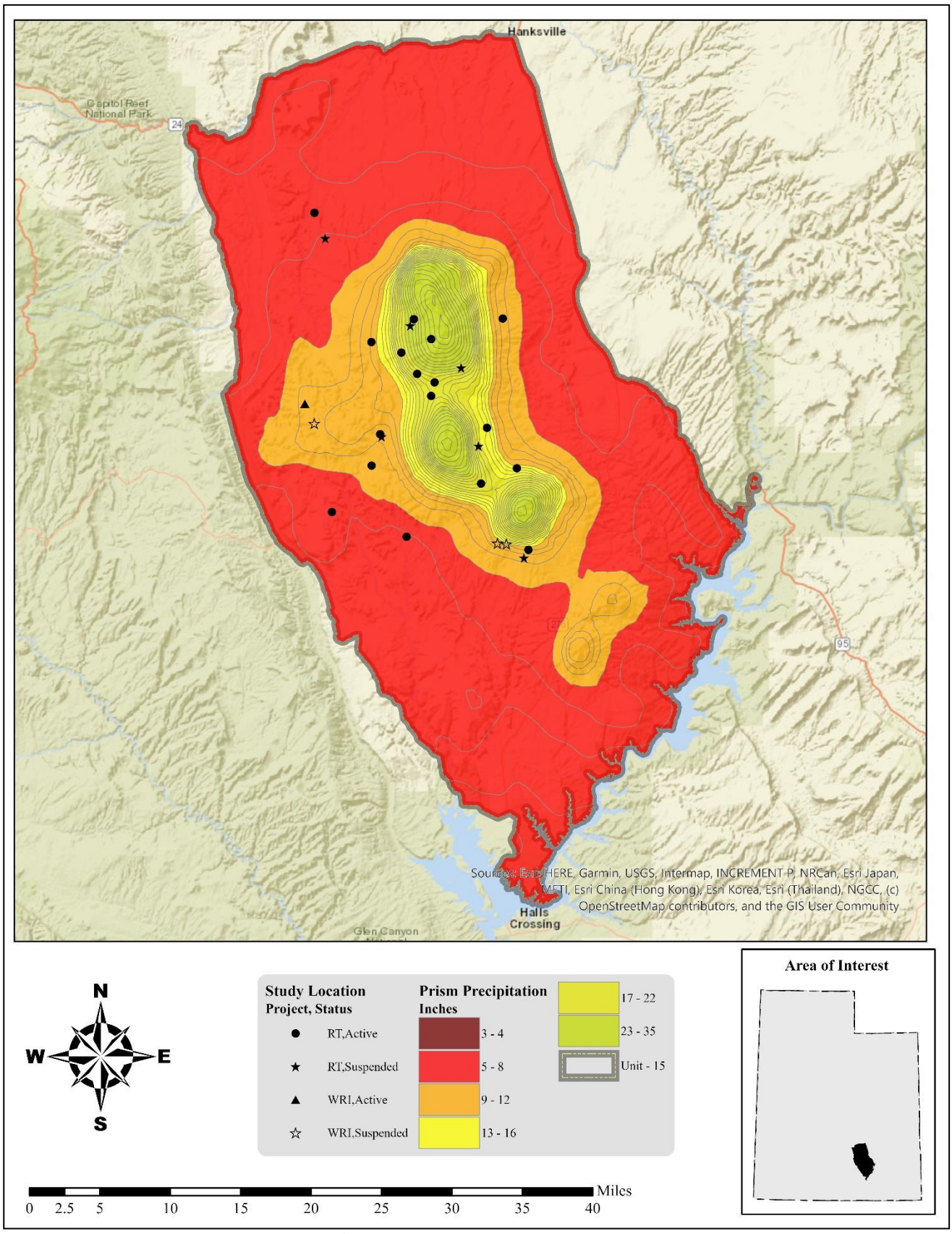
The 30-year (1981-2010) annual precipitation PRISM model shows precipitation ranges from 5 inches in the southern and northern portions of the unit to 32 inches on the peaks of Mt. Ellen. All of the Range Trend and WRI monitoring studies on the unit occur within 7-30 inches of precipitation (**Map 3.1**) (PRISM Climate Group, Oregon State University, 2013).

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Palmer Drought Severity Index (PDSI) data for the unit was compiled from the National Oceanic and Atmospheric Administration (NOAA) Physical Sciences Division (PSD) as part of the South Central division (Division 4) and Southeast division (Division 7).

The mean annual PDSI of the South Central division displayed years of moderate to extreme drought from 1989-1990. 2002-2003, 2012-2014, and 2018. The mean annual PDSI displayed moderately to extremely wet years from 1983-1985, 1997-1998, 2005, 2011, and 2019 (**Figure 3.1a**). The mean spring (March-May) PDSI displayed years of moderate to extreme drought in 1989-1990, 1996, 2000, 2002-2004, 2013-2014, and 2018. Moderately to extremely wet years for this time period were displayed in 1983-1986, 1995, 1998-1999, 2005, 2011, and 2019. The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1989-1990, 2002-2003, 2007, 2009, and 2012; moderately to extremely wet years were displayed in 1982-1985, 1997-1998, 2005, 2011, and 2019 (**Figure 3.1b**) (Time Series Data, 2020).

The mean annual PDSI of the Southeast division displayed years of moderate to extreme drought from 1989-1990, 2002-2003, 2009, 2012, and 2018. The mean annual PDSI displayed moderately to extremely wet years from 1983-1985, 2005, and 2019 (**Figure 3.2a**). The mean spring (March-May) PDSI displayed years of moderate to extreme drought in 1989-1991, 1996, 2002-2004, 2012-2013, and 2018. Moderately to extremely wet years for this time period were displayed in 1983-1985, 1993, 2005, and 2019. The mean fall (Sept.-Nov.)

PDSI displayed years of moderate to extreme drought in 1989-1990, 2002-2003, 2009, 2012, and 2017; moderately to extremely wet years were displayed in 1983-1985, 1997, 2013, and 2019 (**Figure 3.2b**) (Time Series Data, 2020).



Map 3.1: The 1981-2010 PRISM Precipitation Model for WMU 15, Henry Mountains (PRISM Climate Group, Oregon State University, 2013).

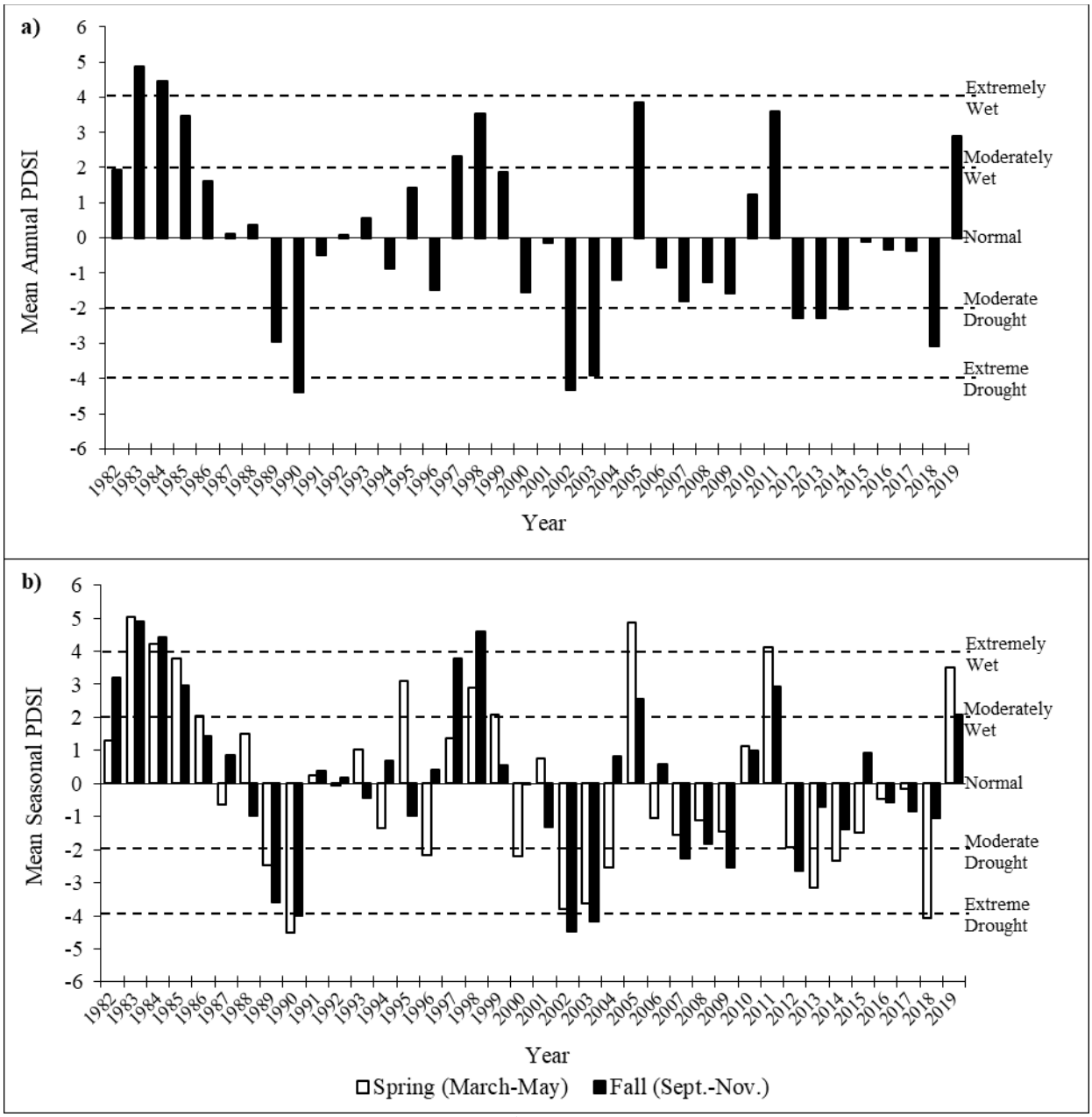


Figure 3.1: The 1982-2019 Palmer Drought Severity Index (PDSI) for the South Central division (Division 4). The PDSI is based on climate data gathered from 1895 to 2019. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought. a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.) (Time Series Data, 2020).

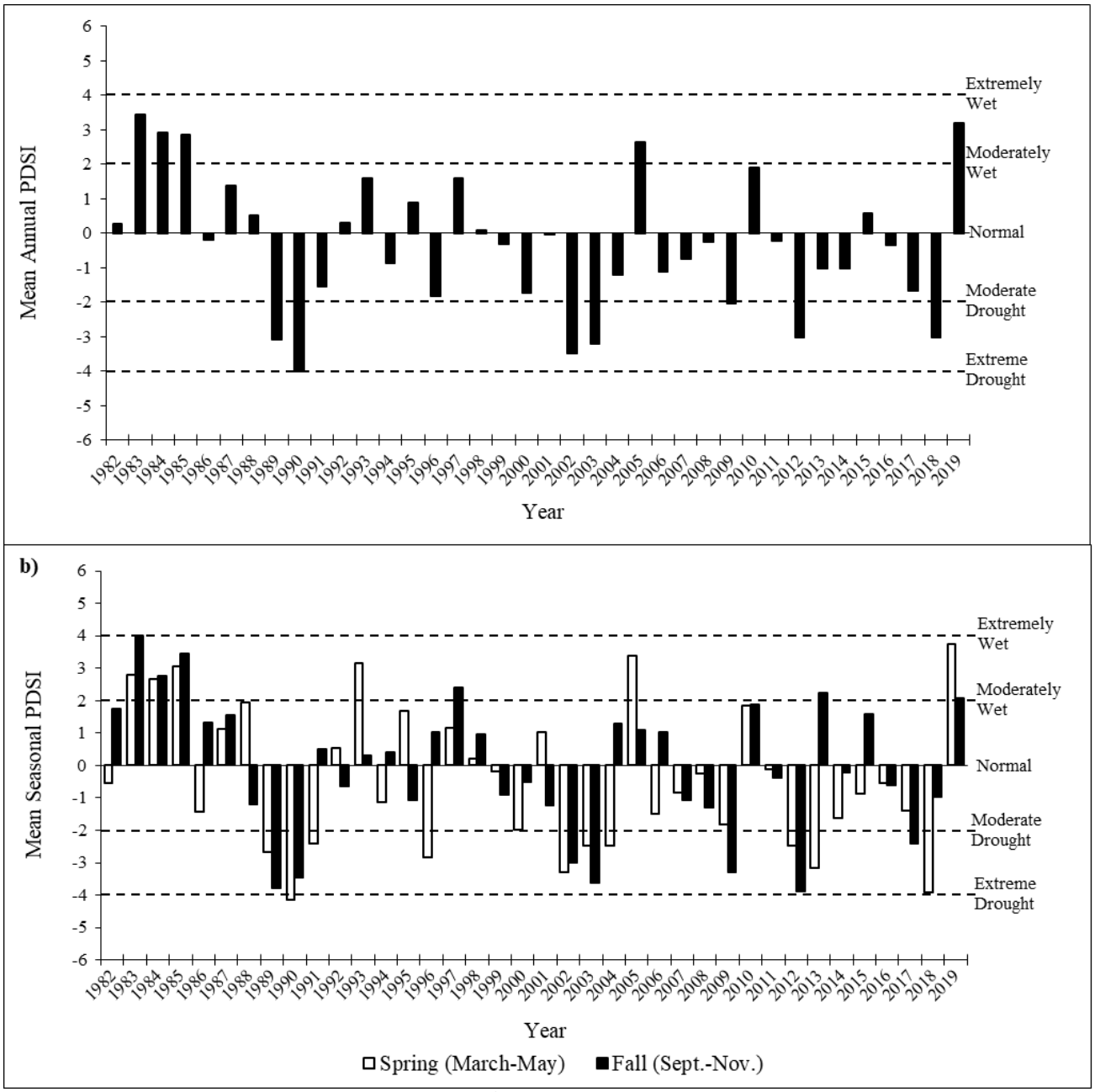
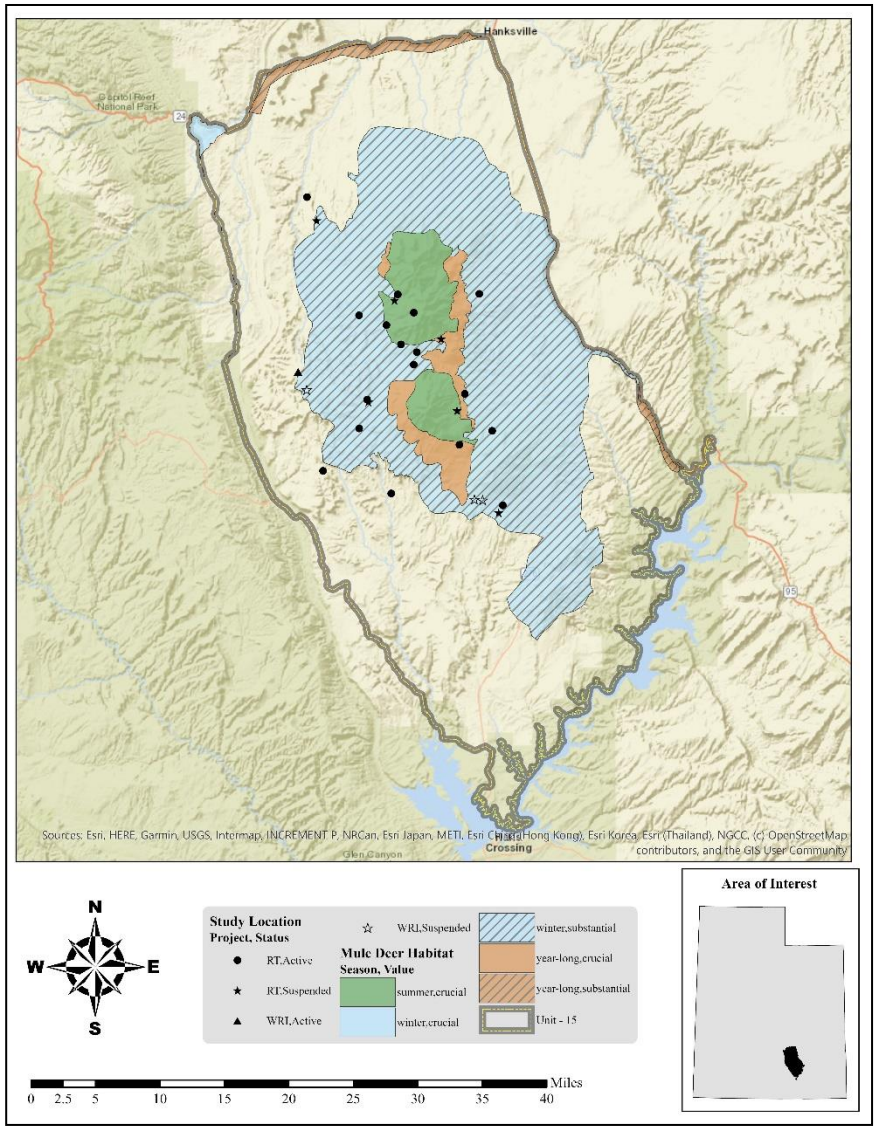


Figure 3.2: The 1982-2019 Palmer Drought Severity Index (PDSI) for the Southeast division (Division 7). The PDSI is based on climate data gathered from 1895 to 2019. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought. a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.) (Time Series Data, 2020).

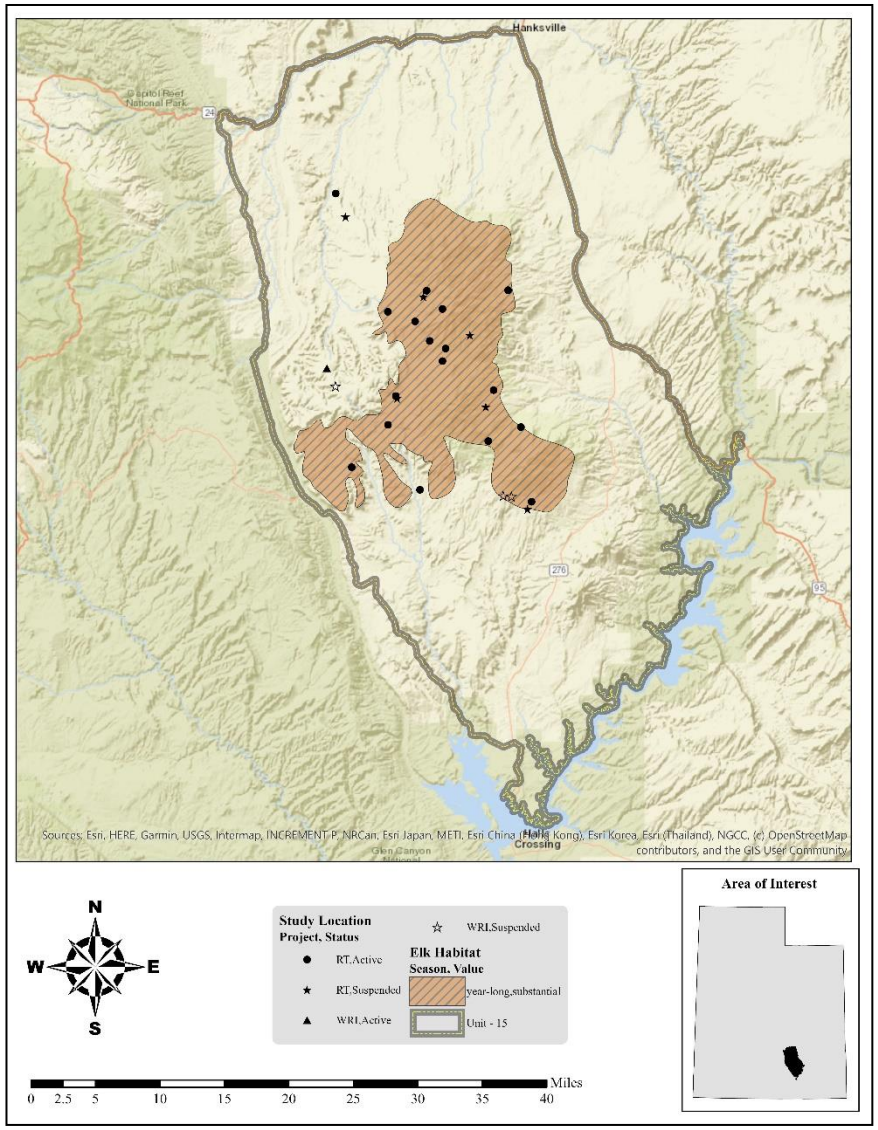
Big Game Habitat

An estimated 373,850 acres are classified as deer range in the Henry Mountains management unit with 81% classified as winter range, 10% as summer range, and 9% as year-long range (**Table 3.1**, **Map 3.2**). The Bureau of Land Management (BLM) administers 88% of the winter range, 10% is managed by the School and Institutional Trust Lands Administration (SITLA), approximately 2% is privately held, and the Utah Department of Transportation (UDOT) and the National Park Service (NPS) each administer less than 1%. The BLM administers 85% of the summer range, 11% is managed by SITLA, approximately 4% is privately held (**Table 3.2, Map 3.2, Map 3.7**).

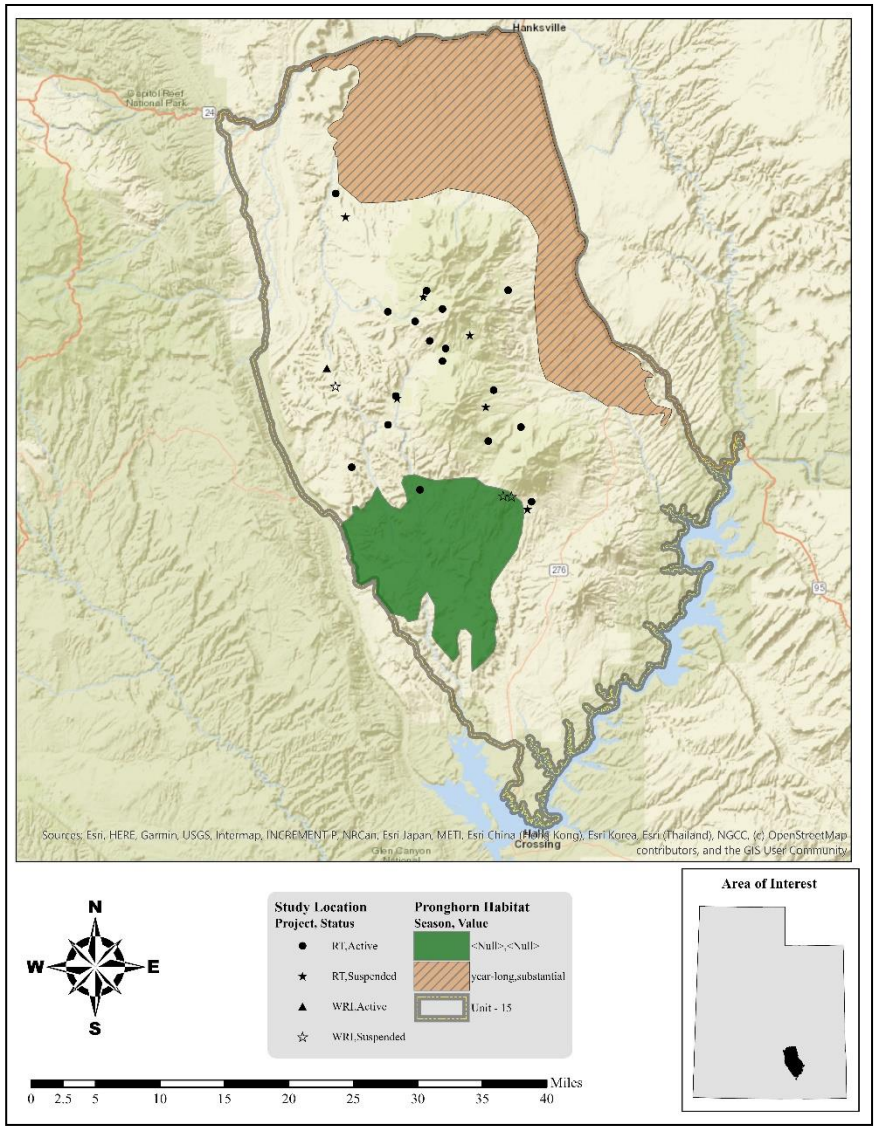
The key areas in this unit are associated primarily with pinyon-juniper chaining and revegetation treatments, but exceptions include other areas that are frequently used by bison and mule deer. The following areas are considered to be crucial deer winter habitat: Crescent Creek, Birch Spring, Cave Flat, Quaking Aspen Spring, Dugout Creek, and Coyote Creek. The Bullfrog Creek area is considered to be crucial deer spring/fall/summer habitat and Airplane Spring is considered crucial year-round deer habitat. The Mud Spring area is crucial year-round habitat for both bison and deer. The Steven's Mesa and Swap Mesa areas sample desert shrub communities that are considered to be crucial year-long habitat for bison and crucial winter habitat for deer. Finally, the Nasty Flat area is considered to be crucial year-long bison habitat and crucial deer summer habitat.



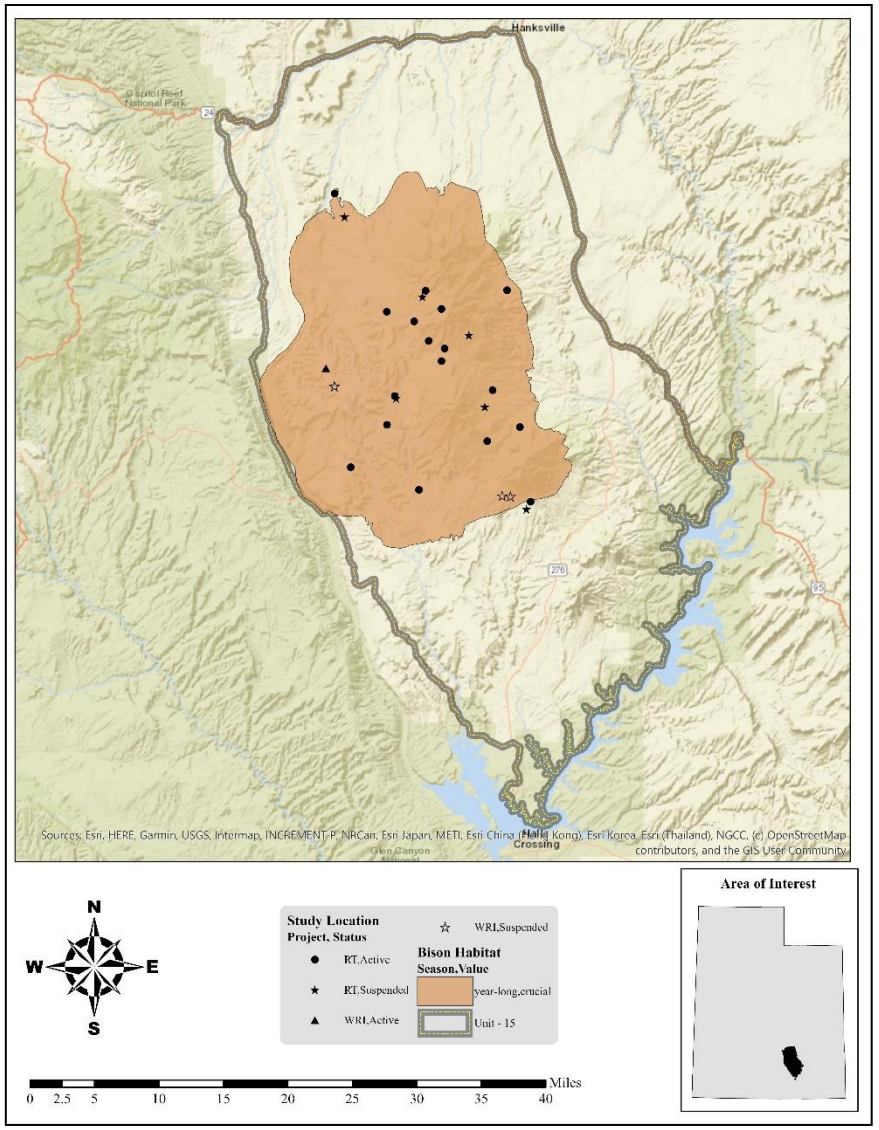
Map 3.2: Estimated mule deer habitat by season and value for WMU 15, Henry Mountains.



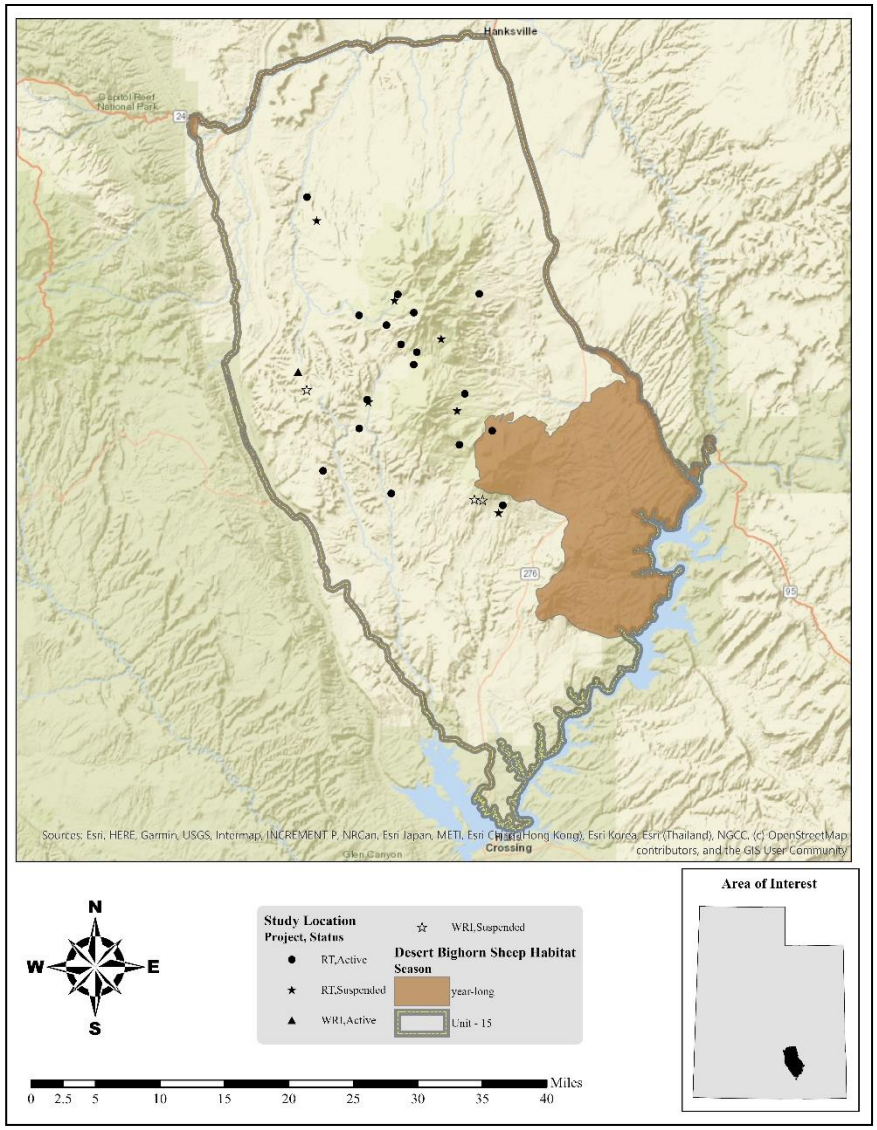
Map 3.3: Estimated elk habitat by season and value for WMU 15, Henry Mountains.



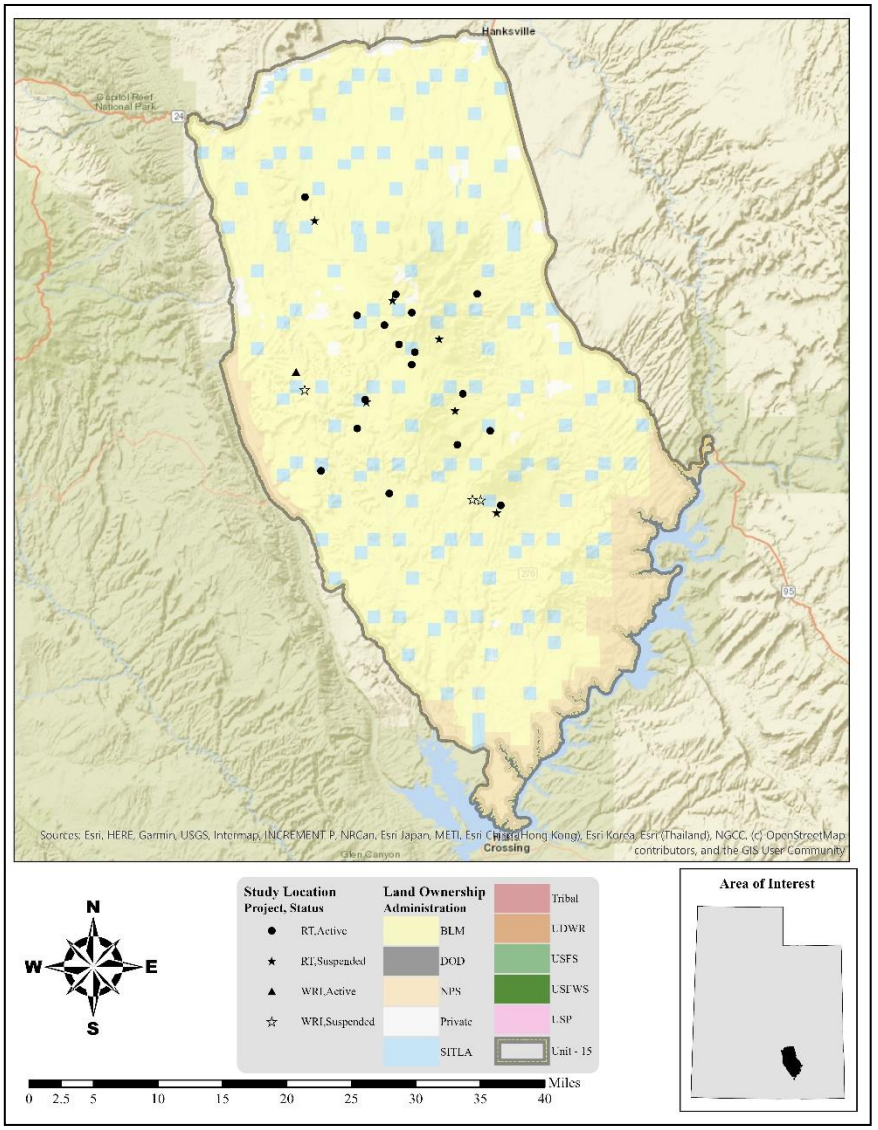
Map 3.4: Estimated pronghorn habitat by season and value for WMU 15, Henry Mountains.



Map 3.5: Estimated bison habitat by season and value for WMU 15, Henry Mountains.



Map 3.6: Estimated desert bighorn sheep habitat by season and value for WMU 15, Henry Mountains.



Map 3.7: Land ownership for WMU 15, Henry Mountains.

	Year Long Range		Summer Range		Winter Range	
Species	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
Mule Deer	34,734	9%	38,265	10%	300,851	81%
Elk	151,638	100%	0	0%	0	0%
Pronghorn	258,740	100%	0	0%	0	0%
Bison	301,484	100%	0	0%	0	0%
Desert Bighorn Sheep	123,403	100%	0	0%	0	0%

Table 3.1: Estimated mule deer, elk, pronghorn, bison, and desert bighorn sheep habitat acreage by season for WMU 15, Henry Mountains.

	Year Long Range		Summer Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	26,795	77%	32,508	85%	263,340	88%
Private	3,999	11%	1,362	4%	6,554	2%
SITLA	3,029	9%	4,396	11%	30,941	10%
UDOT	0	0%	0	0%	12	<1%
NPS	910	3%	0	0%	4	<1%
Total	34,734	**100%**	38,265	**100%**	300,851	**100%**

Table 3.2: Estimated mule deer habitat acreage by season and ownership for WMU 15, Henry Mountains.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	131,841	87%
Private	1,480	1%
SITLA	18,269	12%
NPS	48	<1%
Total	151,638	**100%**

Table 3.3: Estimated elk habitat acreage by season and ownership for WMU 15, Henry Mountains.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	222,224	86%
Private	8,345	3%
SITLA	28,169	11
NPS	2	<1%
Total	258,740	**100%**

Table 3.4: Estimated pronghorn habitat acreage by season and ownership for WMU 15, Henry Mountains.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	258,627	86%
Private	3,753	1%
SITLA	31,731	11%
NPS	7,373	2%
Total	301,484	**100%**

Table 3.5: Estimated bison habitat acreage by season and ownership for WMU 15, Henry Mountains.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	77,764	63%
Private	529	<1%
SITLA	9,982	8%
NPS	35,127	29%
Total	123,403	**100%**

Table 3.6: Estimated desert bighorn sheep habitat acreage by season and ownership for WMU 15, Henry Mountains.

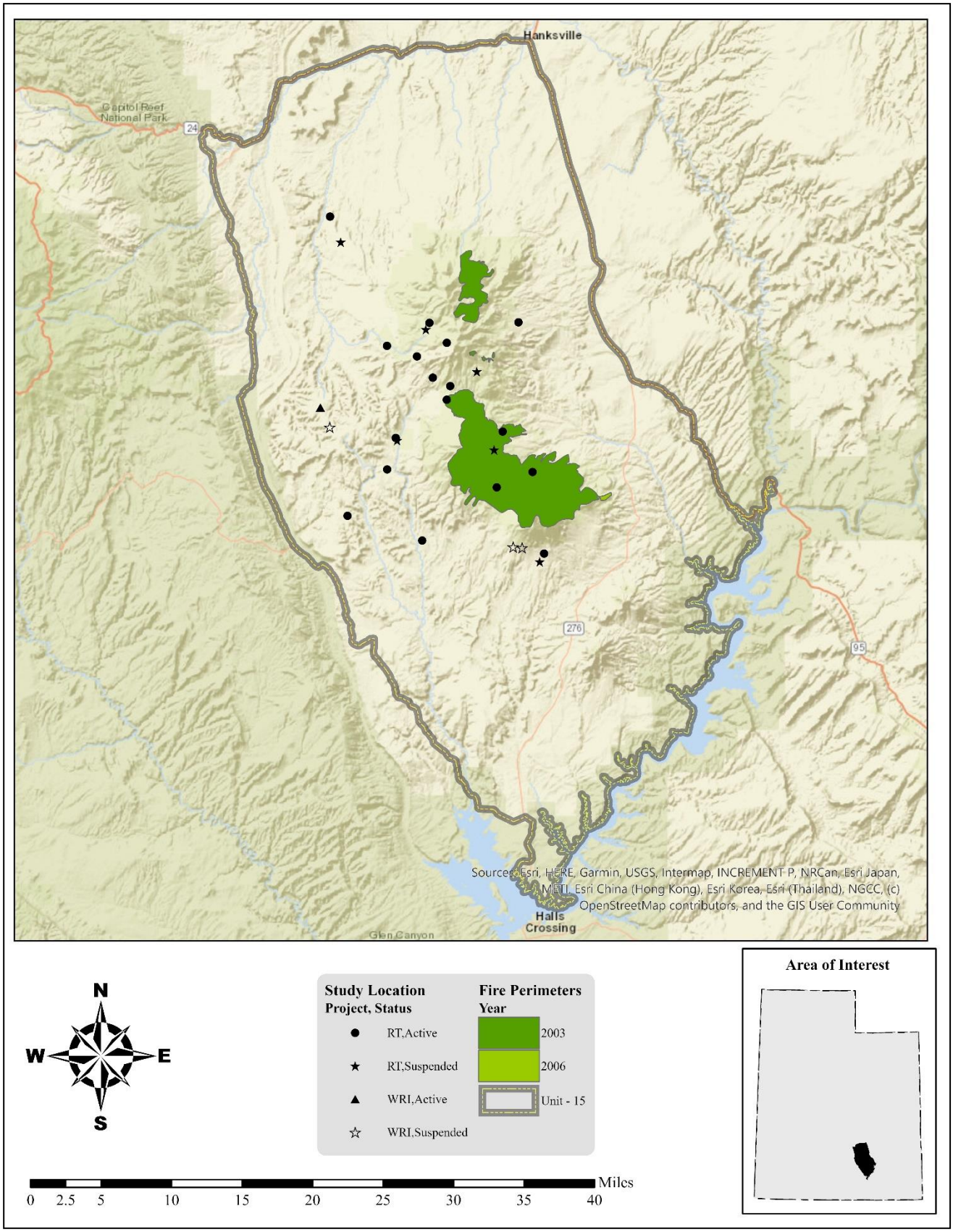
Group	Existing Vegetation Type	Acres	% of Total	Group % of Total
Shrubland	Colorado Plateau Blackbrush-Mormon-tea Shrubland	136,578	21.49%	
	Dwarf Shrubland	62,212	9.79%	
	Colorado Plateau Pinyon-Juniper Shrubland	47,402	7.46%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	26,101	4.11%	
	Great Basin & Intermountain Ruderal Shrubland	11,557	1.82%	
	Herbaceous - Shrub-Steppe	25,355	3.99%	
	Southern Colorado Plateau Sand Shrubland	9,563	1.50%	
	Inter-Mountain Basins Big Sagebrush Shrubland	9,334	1.47%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	4,137	0.65%	
	Inter-Mountain Basins Greasewood Flat	2,913	0.46%	
	Rocky Mountain Lower Montane-Foothill Shrubland	1,379	0.22%	
	Interior Western Ruderal Shrub	687	0.11%	
	Western Cool Temperature Shrub	262	0.04%	
	Rocky Mountain Subalpine-Montane Riparian Shrub	5	0.00%	
	Other Shrubland	4	0.00%	53.11%
Open Tree Canopy	Colorado Plateau Pinyon-Juniper Woodland	72,010	11.33%	
	Southern Rocky Mountain Ponderosa Pine Woodland	5,265	0.83%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	1,977	0.31%	
	Rocky Mountain Aspen Forest and Woodland	1,108	0.17%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	711	0.11%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	217	0.03%	
	Rocky Mountain Lower Montane-Foothill Riparian Shrubland or Woodland	178	0.03%	
	Interior West Ruderal Riparian Forest	57	0.01%	
	Western Cool Temperate Forest	12	0.00%	
	Other Open Tree Canopy	4	0.00%	12.83%
Other	Sparsely Vegetated	203,182	31.98%	
	Developed	1,458	0.23%	
	Open Water	322	0.05%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	2	0.00%	32.26%
Grassland	Western Cool Temperate Agriculture	2,911	0.46%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	1,108	0.17%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	775	0.12%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	644	0.10%	
	Inter-Mountain Basins Semi-Desert Grassland	586	0.09%	
	Great Basin & Intermountain Introduced Annual Grassland	402	0.06%	
	Southern Rocky Mountain Montane-Subalpine Grassland	396	0.06%	
	North American Arid West Emergent Marsh	48	0.01%	
	Rocky Mountain Alpine Grassland	26	0.00%	
	Other Grassland	13	0.00%	
	Interior Western North American Temperate Ruderal Grassland	8	0.00%	
	Western North American Ruderal Grassland	4	0.00%	1.09%
Closed Tree Canopy	Southern Rocky Mountain Montane Mixed Conifer Forest and Woodland	2,877	0.45%	
	Rocky Mountain Subalpine Spruce-Fir Forest and Woodland	1,638	0.26%	0.71%
Total		**635,432**	**100%**	**100%**

Table 3.7: LANDFIRE Existing Vegetation Coverage (LANDFIRE.US_140EVT, 2020) for WMU 15, Henry Mountains.

Limiting Factors to Big Game Habitat

Habitat quality and quantity are the main limiting factors of this subunit. According to the current LANDFIRE Existing Vegetation Coverage model, the majority of the unit is comprised blackbrush-mormon-tea shrubland (22%) and sparsely vegetated (32%) habitat types. In addition, just over 11% of the unit is comprised of pinyon-juniper woodlands (**Table 3.7**). While pinyon-juniper woodlands provide valuable escape and thermal cover for wildlife, encroachment and invasion into historic shrublands reduces available browse (Miller, Svejcar, & Rose, 2000) and may thereby decrease the carrying capacity of the unit. Continual monitoring of range conditions and big game use will help to maintain and improve habitat. Preserving and protecting existing big game ranges is also important, and may be accomplished by seeking cooperative projects with federal land management agencies and private landowners to carry out habitat improvements. Additional measures could include planning and evaluating resource use and developments that might affect habitat quality, developing specific vegetation objectives to maintain the quality of important deer use areas, working toward long-term habitat protection and preservation through the use of agreements with land management agencies and local governments, and through the use of conservation easements etc. on private lands.

Wildfire has had a moderate impact on the deer winter range in the Henry Mountains unit. While few fires have occurred, the ones that have burned have been large. The Bulldog fire of 2003 was the largest fire in the unit at 31,753 acres, followed by the Lonesome Beaver fire of 2003 at 4,555 acres. The Lonesome Beaver fire occurred mainly on deer summer range and bison year-long range while the Bulldog fire occurred on deer summer and winter range and bison year-long range (**Map 3.8**).



Map 3.8: Land coverage of fires by year from 2000-2019 for WMU 15, Henry Mountains (Geosciences and Environmental Change Science Center (GECSC) Outgoing Datasets, 2020).

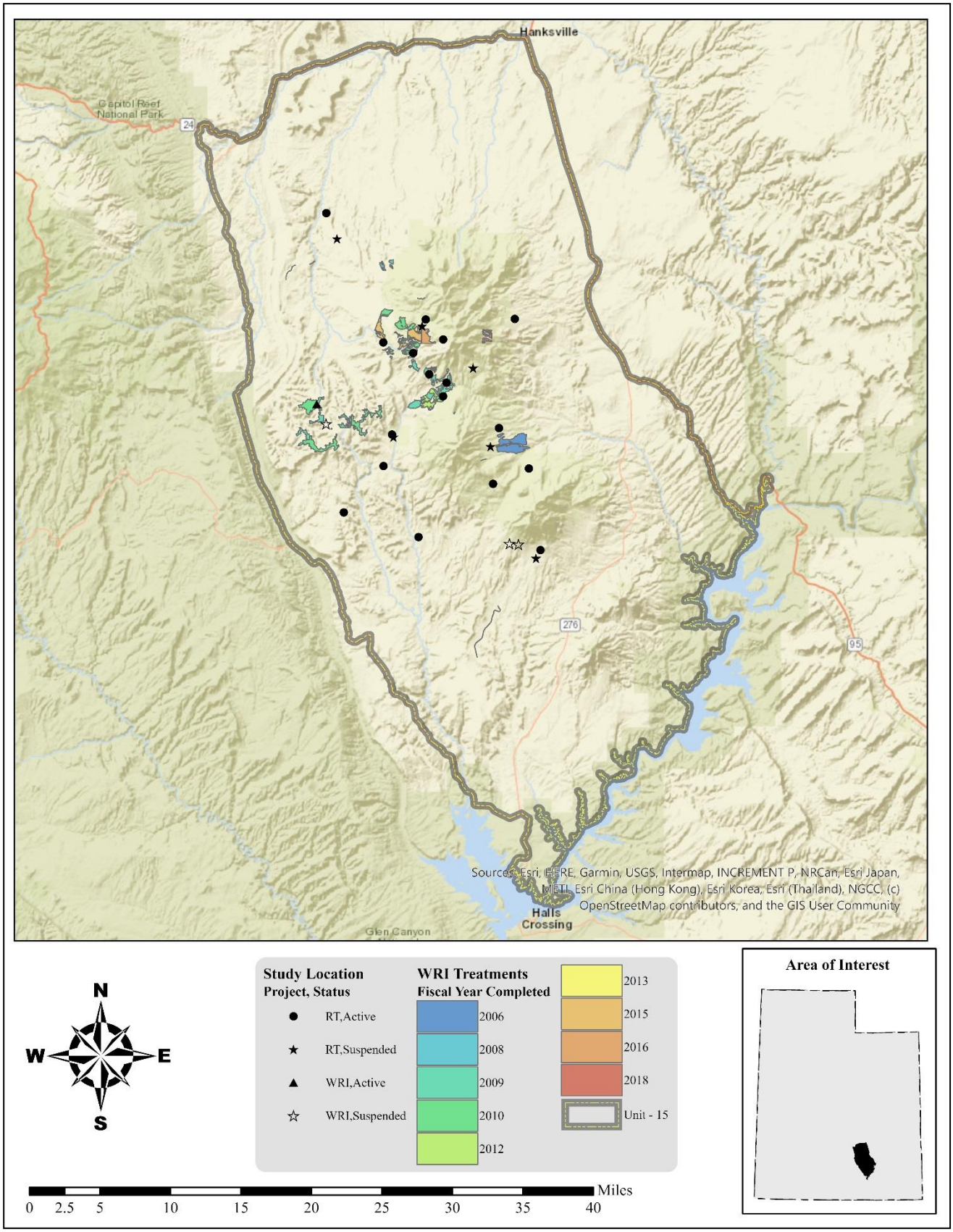
Treatments/Restoration Work

There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 8,258 acres of land have been treated within the Henry Mountain unit since the WRI was implemented in 2004 (**Map 3.9**). Treatments frequently overlap one another bringing the total completed treatment acres for this unit to 12,595 acres (**Table 3.8**). Other treatments have occurred outside of the WRI through independent agencies and landowners, but the WRI comprises the majority of work done on deer winter ranges throughout the state of Utah.

Manual vegetation removal (lop and scatter) to treat pinyon and juniper trees is the most common management practice by acreage. Harrow treatments, combined with seeding to augment the herbaceous and shrub components have occurred on the unit. Other management practices include (but are not limited to): anchor chaining and bullhog treatments to remove pinyon and juniper, and roller chopping (**Table 3.8**).

Type	Completed Acreage	Current Acreage	Proposed Acreage	Total Acreage
Anchor Chain	**72**	0	0	**72**
Ely (Two-Way)	72	0	0	72
Bullhog	**791**	0	0	**791**
Skid Steer	791	0	0	791
Chain Harrow	**841**	0	0	**841**
≤15 ft. (One-Way)	516	0	0	516
>15ft. (One-Way)	325	0	0	325
Harrow	**1,330**	0	0	**1,330**
≤15 ft. (One-Way)	5	0	0	5
≤15 ft. (Two-Way)	1,325	0	0	1,325
Roller Chopper	**325**	0	0	**325**
One-Way	325	0	0	325
Seeding (Primary)	**3,185**	0	0	**3,185**
Broadcast (Aerial-Fixed Wing)	1,027	0	0	1,027
Ground (Mechanical Application)	2,153	0	0	2,153
Hand Seeding	5	0	0	5
Seeding (Secondary/Shrub)	**325**	0	0	**325**
Broadcast (Aerial-Helicopter)	325	0	0	325
Vegetation Removal/Hand Crew	**5,721**	0	0	**5,721**
Lop & Scatter	5,716	0	0	5,716
Lop-Pile-Burn	5	0	0	5
Other	**5**	0	0	**5**
Road Decommissioning	5	0	0	5
Grand Total	**12,595**	**0**	**0**	**12,595**
*** Total Land Area Treated**	**8,258**	**0**	**0**	**8,258**

Table 3.8: WRI treatment action size (acres) for completed, current, and proposed projects for WMU 15, Henry Mountains. Data accessed on 02/19/2020. *Does not include overlapping treatments.



Map 3.9: WRI treatments by fiscal year completed for WMU 15, Henry Mountains.

Range Trend Studies

Range Trend studies have been sampled within WMU 15 on a regular basis since 1987, with studies being added or suspended as was deemed necessary (**Table 3.9**). Due to changes in sampling methodologies, only data collected following the 1992 sample year is included in this summary. Monitoring studies of WRI projects began in 2004; when possible WRI monitoring studies are established prior to treatment and sampled on a regular basis following treatment. Due to the long-term nature of the studies, many of the Range Trend and WRI studies have had some sort of disturbance or treatment prior to or since study establishment (**Table 3.10**).

Range Trend studies are summarized in this report by ecological site. Range Trend and WRI studies that have had a disturbance or treatment during the reported sample period are summarized in this report by the disturbance or treatment type and are summarized by region.

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
15-1	Eagle Bench	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019	Semidesert Gravelly Loam (Wyoming Big Sagebrush)
15-2	Nasty Flat	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019	High Mountain Stony Loam (Aspen)
15-3	Dugout	RT	Suspended	1987, 1994, 1999	Not Verified
15-4	South Creek Chaining	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019	Mountain Stony Loam (Mountain Big Sagebrush)
15-5	Bates Knob	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019	Mountain Loam (Mountain Big Sagebrush)
15-6	Box Springs Chaining	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019	Mountain Loam (Mountain Big Sagebrush)
15-7	Airplane Spring	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019	Upland Stony Loam (Black Sagebrush)
15-8	Garden Basin	RT	Suspended	1987, 1994, 1999	Not Verified
15-9	Cave Flat Chaining	RT	Suspended	1987, 1994, 1999, 2009	Not Verified
15-10	Cave Flat	RT	Active	1987, 1994, 1999, 2011, 2014, 2019	Semidesert Sandy Loam (Wyoming Big Sagebrush)
15-11	Above Coyote Bench	RT	Suspended	1987, 1994, 1999	Not Verified
15-12	Quaking Aspen Spring	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019	Upland Stony Loam (Black Sagebrush)
15-13	Sidehill Spring	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019	Mountain Loam (Mountain Big Sagebrush)
15-14	Dugout Creek	RT	Active	2004, 2009, 2014, 2019	Mountain Loam (Mountain Big Sagebrush)
15-15	Steven's Mesa	RT	Suspended	2004, 2009, 2014	Semidesert Sandy Loam (Fourwing Saltbush)
15-16	Coyote Spring	RT	Active	2009, 2014, 2019	Mountain Stony Loam (Mountain Big Sagebrush)
15-17	Swap Mesa	RT	Active	2009, 2014, 2019	Semidesert Sandy Loam (Fourwing Saltbush)
15-18	Cave Flat Chaining 2	RT	Active	2014, 2019	Semidesert Shallow Loam (Utah Juniper-Pinyon)
15-19	Copper Creek	RT	Suspended	2014	Semidesert Sandy Loam (Blackbrush)
15-20	Sage Flat	RT	Active	2019	Upland Stony Loam (Mountain Big Sagebrush)
15-21	Bullfrog Benches	RT	Active	2019	Desert Loam (Shadscale)
15-22	Johns Knoll	RT	Active	2019	Upland Stony Loam (Wyoming Big Sagebrush)
15-23	Steven's Mesa Point	RT	Active	2019	Desert Loam (Shadscale)
15R-1	Tarantula Mesa Reference	WRI	Suspended	2009	Not Verified
15R-2	Tarantula Mesa Lop and Scatter	WRI	Active	2009, 2012, 2019	Semidesert Sandy Loam (Wyoming Big Sagebrush)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
15R-3	Indian Springs	WRI	Suspended	2010	Not Verified
15R-4	Indian Springs Reference	WRI	Suspended	2010	Not Verified

Table 3.9: Range trend and WRI project studies monitoring history and ecological site potential for WMU 15, Henry Mountains.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
15-1	Eagle Bench	Two-Way Chain Unknown	Eagle Bench Seeding	August 1966- October 1966	1,500	LTDL
		Aerial After	Eagle Bench Seeding	August 1966-October 1966	1,500	LTDL
		Lop and Scatter	Henry Mountain Fuel Reduction	April-May 2002	1,011	LTDL
15-4	South Creek Chaining	Chain Unknown	South Creek Pinyon-Juniper Project	Fall 1968- Spring 1969	500	LTDL
		Dribbler	South Creek Pinyon-Juniper Project	Fall 1968-Spring 1969	500	LTDL
		Aerial After	South Creek Pinyon-Juniper Project	May 1969	500	LTDL
		Lop and Scatter	Henry Mountains PJ Thinning	Fall 2000-Fall 2002	500	LTDL
		Lop and Scatter	Dugout Flat Lop and Scatter Phase II	Fall 2009	1,396	1335
15-5	Bates Knob	Dribbler	South Creek Seeding	Fall 1968-Spring 1969	500	LTDL
		Chain Unknown	South Creek Seeding	Fall 1968-Spring 1969	500	LTDL
		Aerial After	South Creek Seeding	May 1969	500	LTDL
		Lop and Scatter	Airplane Springs Fuels Project	June-July 2008	1,464	1123
15-6	Box Springs Chaining	Chain Unknown	Box Springs Chain and Seed	August 1984-March 1985	2,200	LTDL
		Seed Unknown	Box Springs Chain and Seed	August 1984-March 1985	2,200	LTDL
		Dribbler	Box Springs Chain and Seed	August 1984-March 1985	2,200	LTDL
		Lop and Scatter	Bullfrog Creek Chaining Maint. Phase I	June-November 2008	164	339
15-7	Airplane Spring	Aerial Before	West Horn Seeding	October 1968-June 1969	700	LTDL
		Chain Unknown	Horn Chaining	October 1968-June 1969	3,100	LTDL
		Lop and Scatter	Airplane Springs Fuels Project	June-July 2008	1,464	1123
15-9	Cave Flat Chaining	Chain Unknown		Fall 1983		
		Seed Unknown		Fall 1983		
15-11	Above Coyote Bench	Wildfire	Bulldog Fire	July 2003	31,753	
		Aerial After	Bulldog Fire Rehabilitation-Non WSA	November 2003	8,527	LTDL
15-12	Quaking Aspen Spring	Chain Unknown		Historic		
		Seed Unknown		Historic		
		Wildfire	Bulldog	2003	31,754	
		Chain Unknown	Bulldog Fire Rehabilitation-Non WSA	2003	4,600	
		Aerial	Henry Mountains Low Elevation Seeding	2003	7,676	
		Dribbler	Henry Mountains Dribbler	2003	900	
15-13	Sidehill Spring	Wildfire	Bulldog	2003	31,754	
		Chain Unknown		November 2003	4,600	LTDL
		Seed Unknown	BLM Bulldog Fire (Non-WSA)	November 2003	7,676	LTDL
15-16	Coyote Spring	Wildfire	Bulldog	2003	31,754	
		Chain Unknown		November 2003	4,600	LTDL
		Seed Unknown	BLM Bulldog Fire (Non-WSA)	November 2003	7,676	LTDL
15-17	Swap Mesa	Wildfire		Historic		
15-18	Cave Flat Chaining 2	Chaining Unknown		Fall 1983		
		Seeding Unknown		Fall 1983		
15-20	Sage Flat	Aerial Before	Nasty Flat Chaining	March 1985	685	
		Two-Way Ely	Nasty Flat Chaining	August 1984-March 1985	685	
15R-2	Tarantula Mesa	Aerial Before	Tarantula Seeding #2	April 1966	1,500	
	Lop and Scatter	Two-Way Chain Unknown	Tarantula Seeding #2	October 1965-March 1966	1,500	
		Lop and Scatter	Tarantula Mesa Lop and Scatter Phase II	August-September 2009	1,784	1336

Table 3.10: Range trend and WRI studies known disturbance history for WMU 15, Henry Mountains. PDB = Pre-Database; LTDL = Land Treatment Digital Library (Pilliod & Welty, 2019).

Study Trend Summary (Range Trend)

Mountain (Aspen)

One study site [Nasty Flat (15-02)] is classified as a Mountain (Aspen) ecological site: this site is located south of Nasty Flat on the west-facing slopes of South Summit Ridge.

Shrubs/Trees: The dominant browse species on this study site are mountain snowberry (*Symphoricarpos oreophilus*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) as of 2019; mountain big sagebrush was the dominant species in 2004 and 2009. Total shrub cover exhibited a decrease between 2004 and 2009, but has increased in subsequent sample years (**Figure 3.3**). Average preferred browse demographics show that density has fluctuated over the study period, but has been decreasing since 1999. Mature individuals comprise a majority of the plant population on this study site (**Figure 3.14**). Preferred browse utilization displayed an increase between 2004 and 2009, but has decreased in each subsequent sample year. In 2019, 3% of plants were moderately browsed and 97% were lightly browsed to not browsed (**Figure 3.17**).

Trees on this site are a mixture of quaking aspen (*Populus tremuloides*), limber pine (*Pinus flexilis*), and Douglas-fir (*Pseudotsuga menziesii*); tree cover is significant and has increased over time. Density is also significant, but has decreased overall (**Figure 3.8**, **Figure 3.11**).

Herbaceous Understory: The herbaceous understory of this study site is rich and abundant and primarily composed of native species. Perennial grasses and forbs are the dominant components. The introduced grass species smooth brome (*Bromus inermis*) is present on this site, but in low amounts. Overall herbaceous cover decreased between 1994 and 1999, but an increasing trend has been observed in subsequent sample years (**Figure 3.20**, **Figure 3.20**). Frequency shows a generally decreasing trend (**Figure 3.23**).

Occupancy: Average pellet transect data indicates a fluctuating, but overall decreasing trend in animal presence. Cattle and/or bison were the primary occupants in 1999 and were co-dominant with deer in 2019. Mean abundance of cattle and/or bison pellet groups has ranged from 0 days use/acre in 2009 and 2014 to 18 days use/acre in 2004. Deer have been the primary occupants in 2004, 2009, and 2014 and were co-dominant with cattle and/or bison in 2019; mean abundance of deer pellet groups has been as low as 5 days use/acre in 2014 and as high as 39 days use/acre in 2009. Finally, elk have also been present with a mean pellet group abundance fluctuating between 0 days use/acre in 1999, 2004, 2014, and 2019 and 2 days use/acre in 2009 (**Figure 3.26**).

Mountain (Big Sagebrush)

There are six studies [South Creek Chaining (15-04), Bates Knob (15-05), Box Springs Chaining (15-06), Sidehill Spring (15-13), Dugout Creek (15-14), and Coyote Spring (15-16)] that are classified as Mountain (Big Sagebrush) ecological sites. The South Creek Chaining study can be found just south of South Creek on the lower slopes of South Creek Ridge. Bates Knob is situated on the lower southern-facing slopes of South Creek Ridge between Sweetwater Creek and North Fork Bullfrog Creek. The Box Springs Chaining study is located just north of Box Spring and Pennellen Pass. The Sidehill Spring study site is situated east of Sidehill Spring and just southwest of Bulldog Peak. The Dugout Creek study is south of Corral Point near Dugout Creek. Finally, Coyote Spring is located north of the Coyote Benches near Coyote Creek.

Shrubs/Trees: Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) is the dominant preferred browse species on most of these studies. Other preferred browse such as antelope bitterbrush (*Purshia tridentata*), mountain snowberry (*Symphoricarpos oreophilus*), and/or other species are present on some sites, but contribute less cover. Overall cover has increased through the sample years, mainly due to sagebrush; the Dugout Creek, Sidehill Spring, and Bates Knob studies in particular have shown significant increases in sagebrush cover over time (**Figure 3.4**). Preferred browse demographics have indicated a decrease in plants/acre since 2009, a trend that can mostly be attributed to reduced recruitment of young plants. Mature individuals have been the dominant demographic in most sample years. Young plants comprised a majority of the populations on these sites in 2009, largely due to the South Creek Chaining site. Decadence of preferred

browse has fluctuated, but has remained low overall (**Figure 3.14**). Utilization of preferred browse has increased over time: 36% of plants were heavily used and 27% were moderately used in 2019 (**Figure 3.17**).

Trees, particularly Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*), are present on all sites except for Coyote Spring. Both cover and density exhibited an initial decrease between 2004 and 2009, a trend which can partially be attributed to lop and scatter projects on the Box Springs Chaining and Bates Knob studies. Trees have increased since that time period, however, indicating that infilling and/or further encroachment is occurring on sites of this ecotype (**Figure 3.9**, **Figure 3.12**).

Herbaceous Understory: The herbaceous understories of these study sites have remained dominated by perennial grasses, many of which are introduced species such as crested wheatgrass (*Agropyron cristatum*), Russian wildrye (*Psathrostachys juncea*), and intermediate wheatgrass (*Thinopyrum intermedium*). Cover has fluctuated, but has increased overall. Nested frequency values have also fluctuated. Annual grasses provided moderate cover in 1999 due to the Sidehill Spring study, but have been relatively rare in other sample years (**Figure 3.20**, **Figure 3.23**).

Occupancy: Average pellet transect data indicates that the utilization of these sites has fluctuated, but has decreased overall. Primary occupancy has varied, with deer as the primary occupants in 2004, 2009, and 2014 and co-dominant with cattle in 2019. Cattle were the sole primary occupants in 1999. Mean abundance of deer pellet groups has ranged from 5 days use/acre in 2014 to 39 days use/acre in 2009. Elk have also been present, with a mean pellet group abundance fluctuating between 0 days use/acre in 1999, 2004, 2014, and 2019 and 2 days use/acre in 2009. Finally, mean abundance of cattle pellet groups has been as low as 0 days use/acre in 2009 and 2014 and as high as 18 days use/acre in 2004 (**Figure 3.26**).

Upland (Big Sagebrush)

There are two studies [Sage Flat (15-20) and Johns Knoll (15-22)] that are classified as Upland (Big Sagebrush) ecological sites. The Sage Flat study site is located in Sage Flat, just south of South Creek. The Johns Knoll study can be found west of Johns Knoll and Star Spring.

Shrubs/Trees: Trends over time are not available for these studies as they were established in 2019. Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) is the dominant preferred browse species on these studies. Other preferred browse species such as blackbrush (*Coleogyne ramosissima*) and mormon tea (*Ephedra viridis*) are also present on the Johns Knoll site, but in lesser amounts (**Figure 3.4**). Preferred browse demographics indicate that mature individuals comprise a majority of the plant populations on these study sites. However, more than one-third of plants are decadent, and recruitment of young is low (**Figure 3.15**). Utilization of preferred browse is high, with 50% of plants showing signs of heavy use and 30% being moderately used (**Figure 3.18**).

Utah juniper (*Juniperus osteosperma*) is present on these sites, but with low cover and density (**Figure 3.9**, **Figure 3.12**).

Herbaceous Understory: The herbaceous understories of these study sites are abundant and co-dominated by perennial grasses and annual grasses and forbs. Perennial grasses consist of mainly native species such as blue grama (*Bouteloua gracilis*) and sand dropseed (*Sporobolus cryptandrus*), but the introduced species crested wheatgrass (*Agropyron cristatum*) also contributes some cover on the Sage Flat study. The introduced annual grass species cheatgrass (*Bromus tectorum*) is present on both sites, but more significantly so on Sage Flat. Annual forbs are all native, with shy gilia (*Gilia inconspicua*) contributing the most cover of any forb species on both sites (**Figure 3.21**, **Figure 3.24**).

Occupancy: Average pellet transect data shows that utilization of these sites is high. Deer are the primary occupants of these studies, with a mean pellet group abundance of 33 days use/acre in 2019. Cattle and/or bison are also present, and mean abundance of pellet groups is 5 days use/acre as of 2019 (**Figure 3.27**).

Upland (Black/Low Sagebrush)

Two study sites [Airplane Spring (15-07) and Quaking Aspen Spring (15-12)] are considered to be Upland (Black/Low Sagebrush) ecological sites. The Airplane Spring study site is located northwest of The Horn and just northeast of Airplane Spring. The Quaking Aspen Spring site is situated north of Cass Creek Peak and Quaking Aspen Spring.

Shrubs/Trees: Sagebrush (*Artemisia sp.*) is the dominant preferred browse species on these sites. Black sagebrush (*A. nova*) dominates the Airplane Spring study, while mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) contributes most of the cover on Quaking Aspen Spring. Other preferred browse species such as alderleaf mountain mahogany (*Cercocarpus montanus*) and Utah serviceberry (*Amelanchier utahensis*) are also present on these sites, but contribute less cover. Average sagebrush cover has increased over time, driving the increasing preferred browse trend (**Figure 3.4**). Preferred browse demographic data shows that density has remained stable over the study period and that mature individuals have comprised a majority of the plant populations in all years (**Figure 3.15**). Utilization of preferred browse was initially low, but over 50% of plants were moderately to heavily hedged in 2014 and 2019 (**Figure 3.18**).

Tree cover and density have been observed on these sites in all years; a mixture of both twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) has been observed. Both cover and density decreased between 2004 and 2009 due to the fire on Quaking Aspen Spring site and the lop and scatter on Airplane Spring. Cover has remained low in subsequent sample years, but density has increased each year: this suggests that infilling may be possible in the future (**Figure 3.9**, **Figure 3.12**).

Herbaceous Understory: The herbaceous understories of these study sites are mostly composed of perennial grasses, particularly the introduced species crested wheatgrass (*Agropyron cristatum*). The introduced annual grass species cheatgrass (*Bromus tectorum*) has been present on both sites in fluctuating amounts, but cover has generally remained low (**Figure 3.21**, **Figure 3.24**).

Occupancy: Pellet transect data shows that the occupancy has increased over time. Primary occupancy has shifted, with cow and/or bison as the primary occupants in 1999 and 2004 and deer as primary occupants in all subsequent sample years. Mean abundance of deer pellet groups has ranged from 7 days use/acre in 2004 to 53 days use/acre in 2019. Elk have also been present, with a mean pellet group abundance fluctuating between 0 days use/acre in 1999, 2004, and 2019 to 1 days use/acre in 2009. Finally, mean abundance of cattle and/or bison pellet groups has varied between 4 days use/acre in 2019 and 19 days use/acre in 2009 (**Figure 3.27**).

Semidesert (Big Sagebrush)

There are two studies [Eagle Bench (15-01) and Cave Flat (15-10)] that are classified as Semidesert (Big Sagebrush) ecological sites. The Eagle Bench study is located on the east side of the Henry Mountains north of Crescent Creek and Lecleed Spring. The Cave Flat study is found on Cave Flat, approximately 0.8 miles south of Cave Flat Reservoir.

Shrubs/Trees: Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) is the dominant preferred browse species on these sites, although other species are present in lower amounts. The cover of sagebrush has displayed significant fluctuations between sample years, but has shown a slightly decreasing trend overall. Total shrub cover has mostly remained stable (**Figure 3.5**). Preferred browse demographic data indicates that density has decreased overall since 1999. Although mature plants have been the dominant demographic throughout the study period, moderate amounts of decadence have also been observed. Recruitment of young plants has decreased over time (**Figure 3.16, Figure 3.14**). Utilization of preferred browse fluctuated significantly from 1994 to 2009, but has decreased since 2009. However, utilization remains high with 36% of plants being moderately used and 31% being heavily used in 2019 (**Figure 3.19**).

Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) are the tree species present on these sites. Cover has remained low and stable since 2009, a trend entirely driven by the Cave Flat study; no

cover was observed in 2004 as Cave Flat was not sampled that year. Average density has increased over time, a trend that can largely be attributed to infilling on the Eagle Bench study (**Figure 3.10**, **Figure 3.13**).

Herbaceous Understory: The herbaceous understories of these sites are primarily composed of perennial grasses with a generally increasing trend observed for cover. The perennial grass component has been primarily composed of native species such as blue grama (*Bouteloua gracilis*), squirreltail (*Elymus elymoides*), and/or James' galleta (*Pleuraphis jamesii*), among others. Frequency displays only slight fluctuations in perennial grass abundance. Overall, herbaceous cover and frequency have increased between 2014 and 2019, primarily due to the native annual grass species, sixweeks fescue (*Vulpia octoflora*) and annual forbs. Cover of the introduced annual grass species cheatgrass (*Bromus tectorum*) has fluctuated, but has been low on both sites in recent sample years (**Figure 3.22**, **Figure 3.25**).

Occupancy: Average pellet transect data indicates that occupancy initially increased between 2004 and 2009, but has decreased in subsequent sample years. Cattle and/or bison were the primary occupants in 1999 and have had a mean pellet group abundance ranging from 1 days use/acre in 2009 and 2014 to 24 days use/acre in 1999. Deer have been the primary occupants in all other sample years; mean abundance of deer pellet groups has been as low as 2 days use/acre in 1999 and as high as 51 days use/acre in 2014. Finally, elk pellet groups have had a mean abundance fluctuating between 0 days use in 2004, 2009, 2014, and 2019 to 0.3 days use/acre in 1999 (**Figure 3.28**).

Semidesert (Fourwing Saltbush)

One study site [Swap Mesa (15-17)] is considered to be a Semidesert (Fourwing Saltbush) ecological site: this study is located on the eastern portion of Swap Mesa, southwest of the Henry Mountains.

Shrubs/Trees: Fourwing saltbush (*Atriplex canescens*) is the dominant preferred browse species on this site and contributes most of the total shrub cover as of 2019. Total shrub cover has decreased overall, but this is largely due to other shrubs excluding preferred browse. Other shrubs – namely broom snakeweed (*Gutierrezia sarothrae*) – provided most of the shrub cover in 2009, but that cover has since decreased (**Figure 3.6**). Shrub demographic data shows that density has remained low. A majority of individuals in the preferred browse community have been mature plants in all years except 2014, when young plants were the dominant demographic (**Figure 3.16**). 62% of preferred browse species were heavily used and 38% were moderately used in 2009. Utilization has decreased each subsequent sample year, however: moderately used and heavily used plants comprised only 18% of the population in 2019 (**Figure 3.19**).

Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) were observed in point-quarter density in 2014, but have not been present in any other year or in cover measurements (**Figure 3.10**, **Figure 3.13**). However, site photos reveal that trees are still present on this site in low amounts as of 2019.

Herbaceous Understory: The herbaceous understory of this study site has increased over time in both cover and frequency. In 2009 and 2014 the understory was primarily comprised of perennial grasses such as James' galleta (*Pleuraphis jamesii*). However, annual grasses and mainly native annual and perennial forbs increased and became co-dominant in 2019. The introduced annual grass species cheatgrass (*Bromus tectorum*) and introduced annual forb species prickly Russian thistle (*Salsola tragus*) have been observed throughout the duration of the study, but have provided little cover (**Figure 3.22**, **Figure 3.25**).

Occupancy: Pellet transect data shows that the occupancy of this site has slightly decreased over time. Bison have been the primary occupants of this study site in all years, with a mean abundance of pellet groups ranging from 29 days use/acre in 2019 to 34 days use/acre in 2009 and 2014. In addition, deer pellet groups were observed on this site for the first time in 2019 with a mean abundance of 4 days use/acre (**Figure 3.28**).

Semidesert (Utah Juniper-Pinyon)

There is one study site [Cave Flat Chaining 2 (15-18)] that is classified as a Semidesert (Utah Juniper-Pinyon) ecological site. The Cave Flat Chaining 2 site is located on the northern portion of Cave Flat and just west of Bullfrog Creek.

Shrubs/Trees: Stansbury cliffrose (*Purshia stansburiana*) has been the dominant preferred browse species on this site throughout the duration of the study period. Additional preferred browse species such as Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) have also been present, but to a lesser extent. Overall shrub cover has exhibited a marginal decrease over time. However, this decrease is due to shrub species excluding preferred browse, namely broom snakeweed (*Gutierrezia sarothrae*); preferred browse cover has increased over time (**Figure 3.5**). Average preferred browse demographics show that density has remained low and that mature individuals have been the dominant demographic in both sample years (**Figure 3.16**). Utilization has also decreased: only 17% of plants were moderately hedged in 2019 and the rest were lightly hedged or not used at all (**Figure 3.19**).

Both Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) have been observed on this study site, with cover and density increasing over time (**Figure 3.10**, **Figure 3.13**).

Herbaceous Understory: The herbaceous understory of this study site has increased over time in both cover and nested frequency. Annual forbs and/or grasses such as cheatgrass (*Bromus tectorum*), shy gilia (*Gilia inconspicua*), and annual cryptantha (*Cryptantha sp.*) have been the primary components of the understory. A mixture of native and introduced perennial grass species is present, but cover and frequency have decreased over the study period (**Figure 3.22**, **Figure 3.25**).

Occupancy: Pellet transect data shows that the occupancy has decreased and that the primary occupants have varied between sample years. Deer were the primary occupants in 2014 and mean pellet group abundance has ranged from 1 days use/acre in 2019 to 32 days use/acre in 2014. Cattle and/or bison were the primary occupants in 2019, and their mean pellet group abundance has fluctuated between 7 days use/acre in 2014 and 25 days use/acre in 2019 (**Figure 3.28**).

Desert (Shadscale)

There are two studies [Bullfrog Benches (15-21) and Steven's Mesa Point (15-23)] that are classified as Desert (Shadscale) ecological sites. The Bullfrog Benches study is located southwest of the Henry Mountains on the Bullfrog Benches. The Steven's Mesa Point study can be found north of the Henry Mountains on the northernmost portion of Stevens Mesa.

Shrubs/Trees: Trends over time are not available for these studies as they were established in 2019. Preferred browse cover is limited and is mainly provided by shadscale saltbush (*Atriplex confertifolia*) on both study sites. Other preferred browse species are absent from the Bullfrog Benches site and rare on the Steven's Mesa Point study. A majority of the shrub cover on these sites is provided by other shrub species excluding preferred browse (**Figure 3.7**). Shrub demographic data shows that the majority of individuals in these communities are mature plants, although nearly one-third of plants are decadent (**Figure 3.16**). Utilization of preferred browse is low, with 14% of plants being moderately browsed and 5% being heavily browsed as of 2019 (**Figure 3.19**).

Trees are absent from these study sites and will therefore not be discussed in this section (**Figure 3.10**, **Figure 3.13**).

Herbaceous Understory: The herbaceous understories of these study sites are abundant, but are mostly composed of annual forbs; the weedy introduced species redstem stork's bill (*Erodium cicutarium*) dominates the Bullfrog Benches site while the native species phacelia (*Phacelia sp.*) is most abundant on Steven's Mesa Point. Most perennial grass and forb cover is provided by the Steven's Mesa Point study. Annual grasses are rare on both sites (**Figure 3.22**, **Figure 3.25**).

Occupancy: Pellet transect data shows that the cattle and/or bison have been the sole occupants of these sites and that mean abundance of pellet groups was 32 days use/acre in 2019 (**Figure 3.28**).

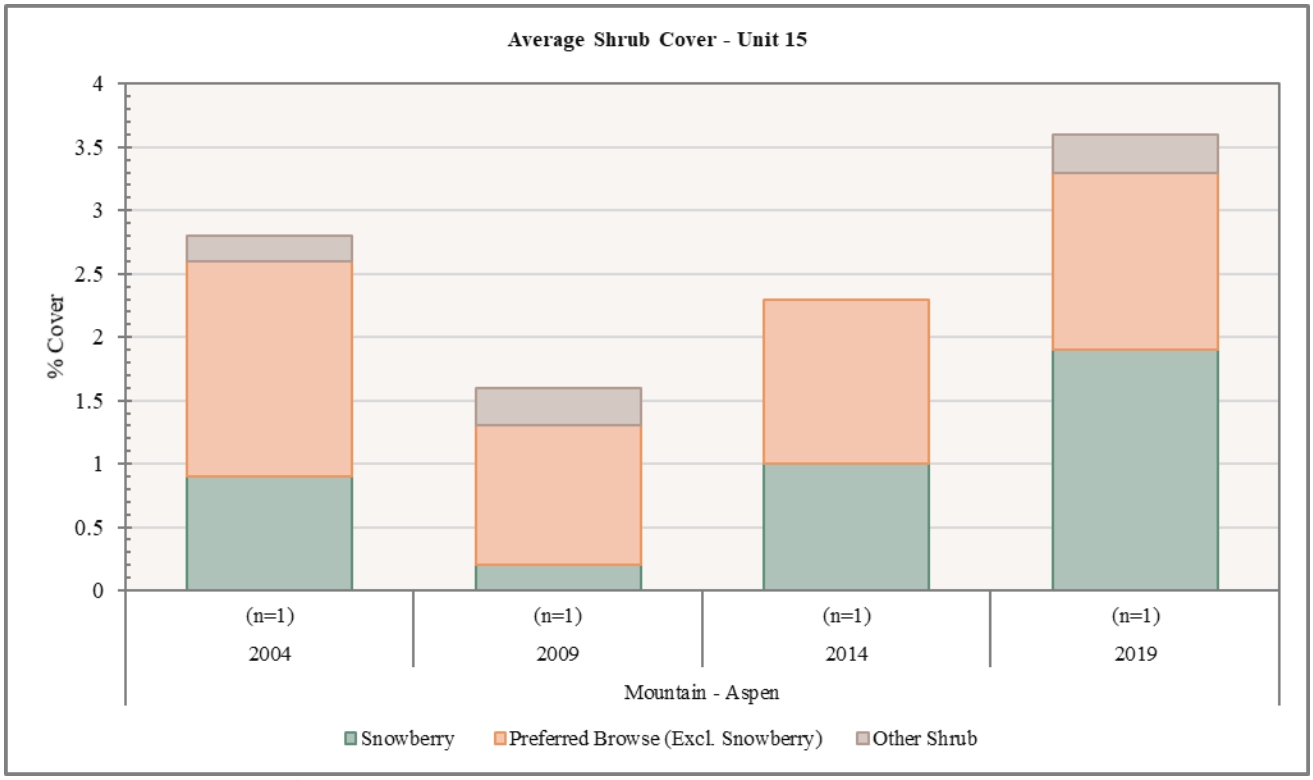


Figure 3.3: Average shrub cover for Mountain - Aspen study sites in WMU 15, Henry Mountains.

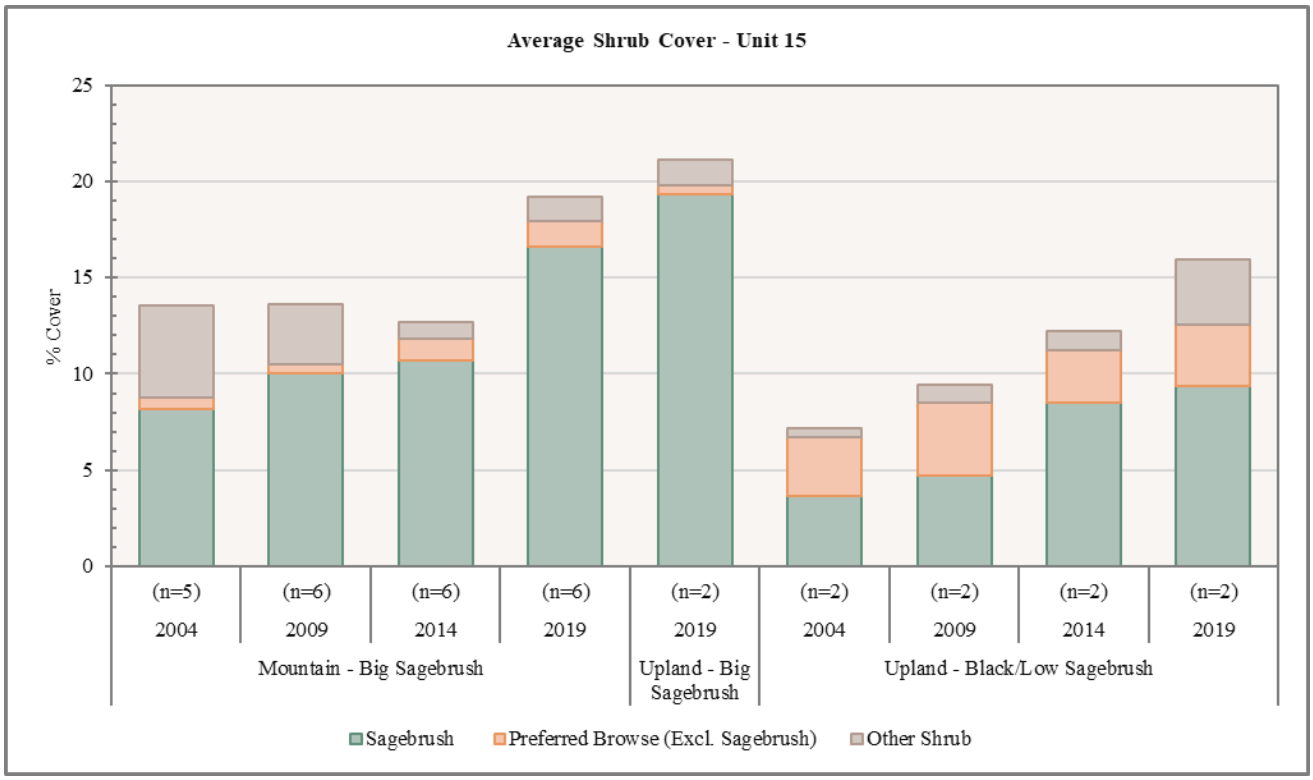


Figure 3.4: Average shrub cover for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Upland - Black/Low Sagebrush study sites in WMU 15, Henry Mountains.

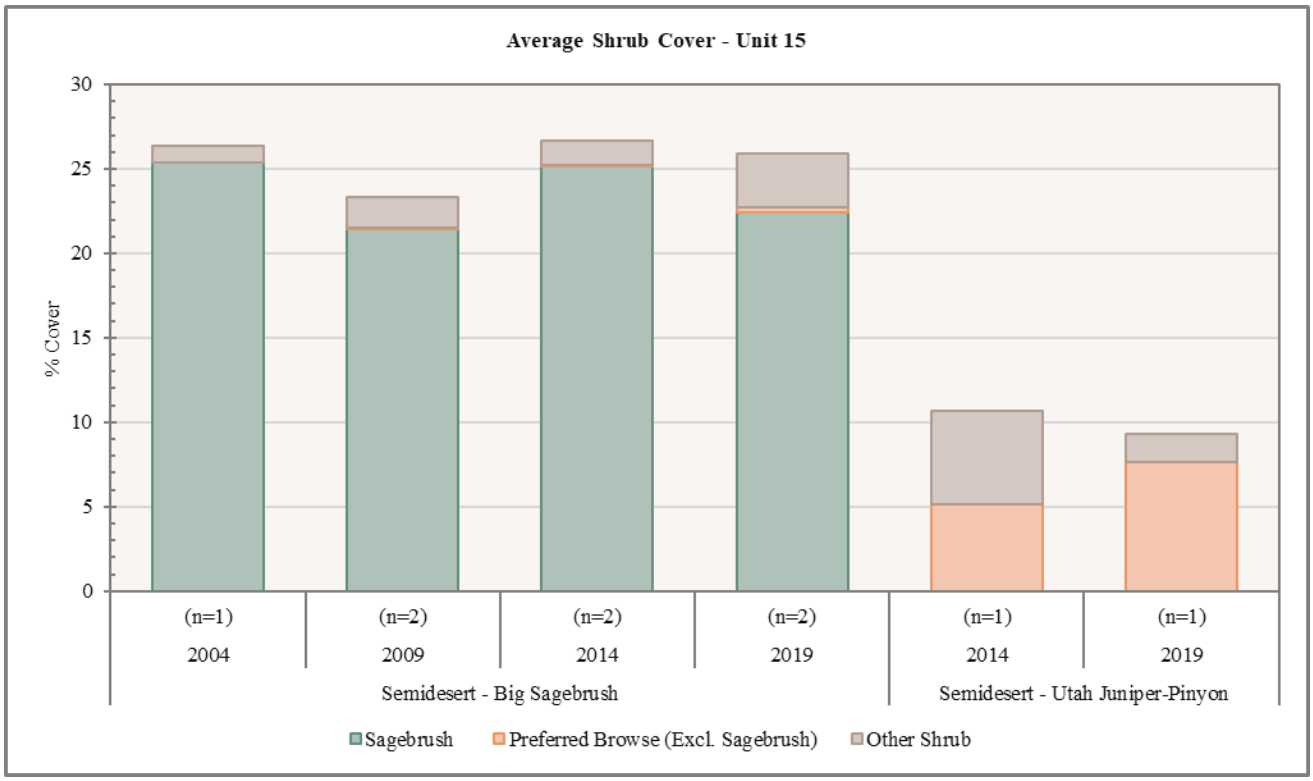


Figure 3.5: Average shrub cover for Semidesert - Big Sagebrush and Semidesert - Utah Juniper-Pinyon study sites in WMU 15, Henry Mountains.

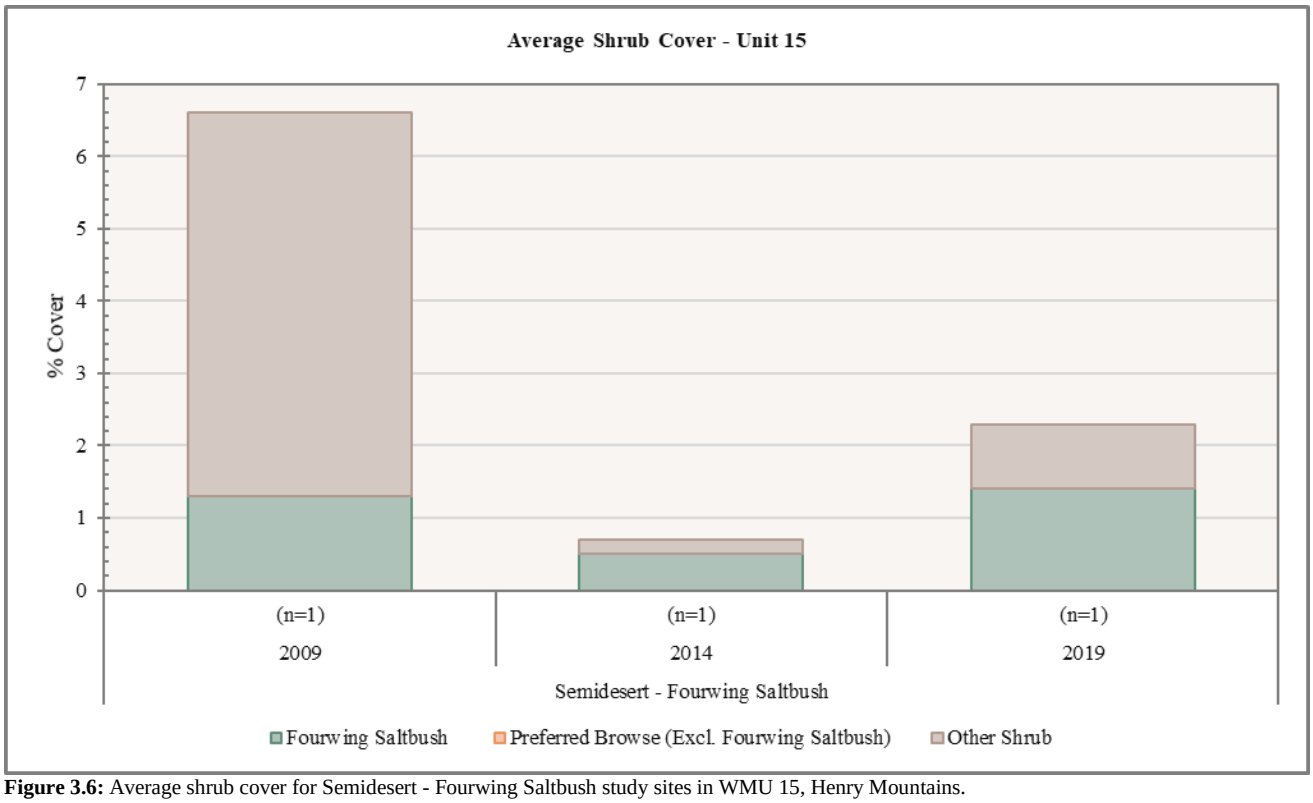


Figure 3.6: Average shrub cover for Semidesert - Fourwing Saltbush study sites in WMU 15, Henry Mountains.

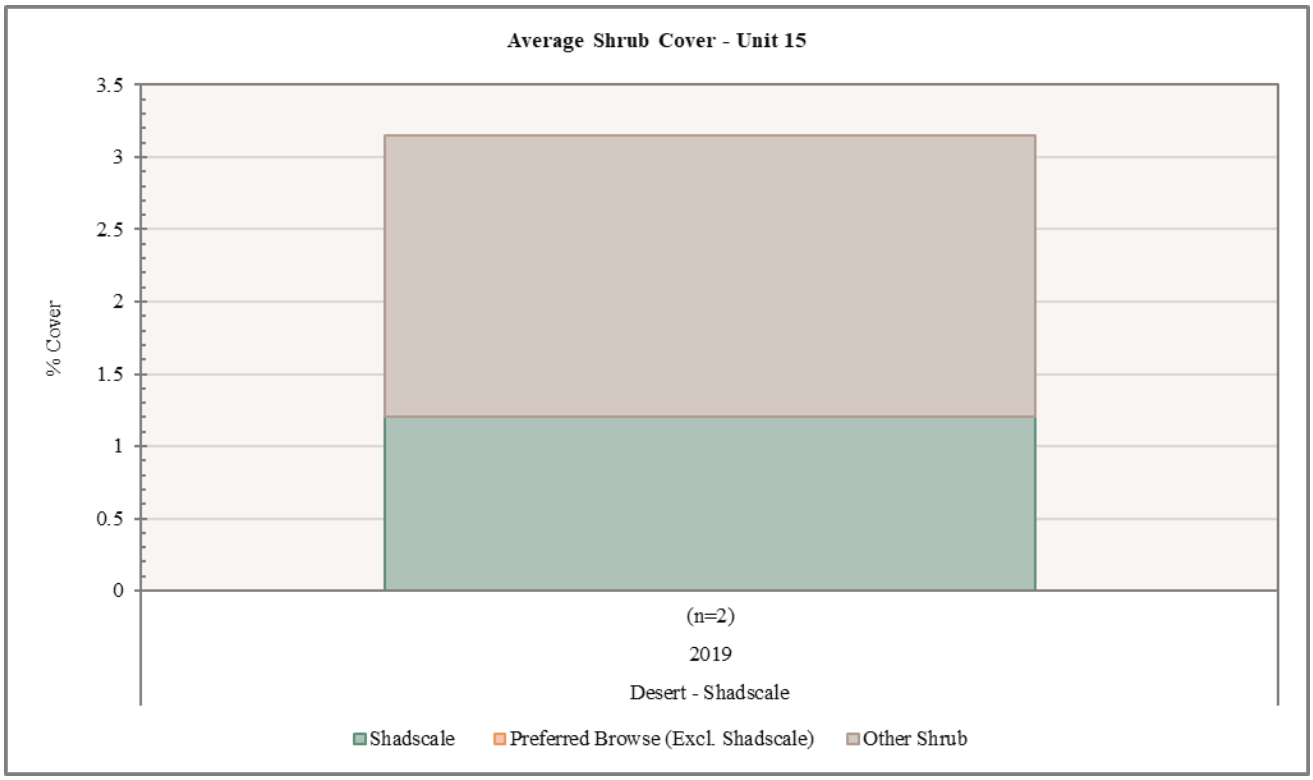


Figure 3.7: Average shrub cover for Desert - Shadscale study sites in WMU 15, Henry Mountains.

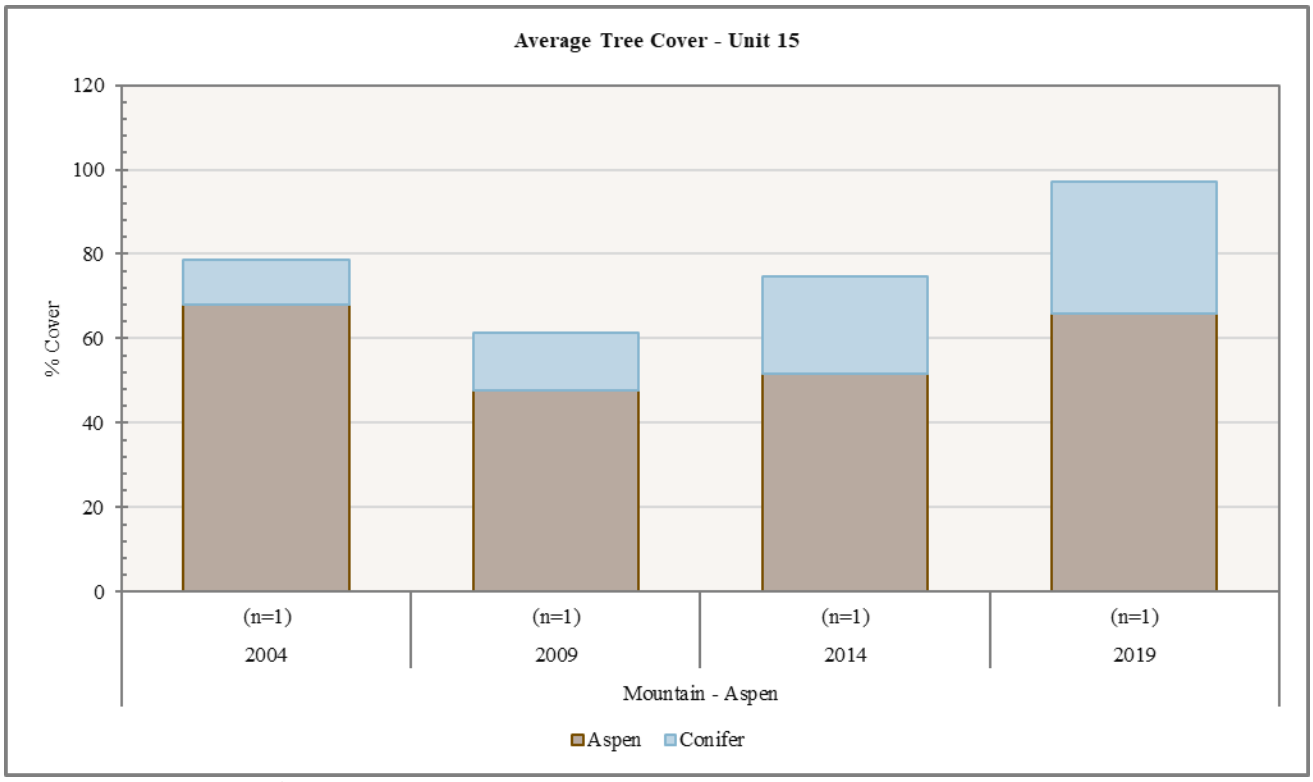


Figure 3.8: Average tree cover for Mountain - Aspen study sites in WMU 15, Henry Mountains.

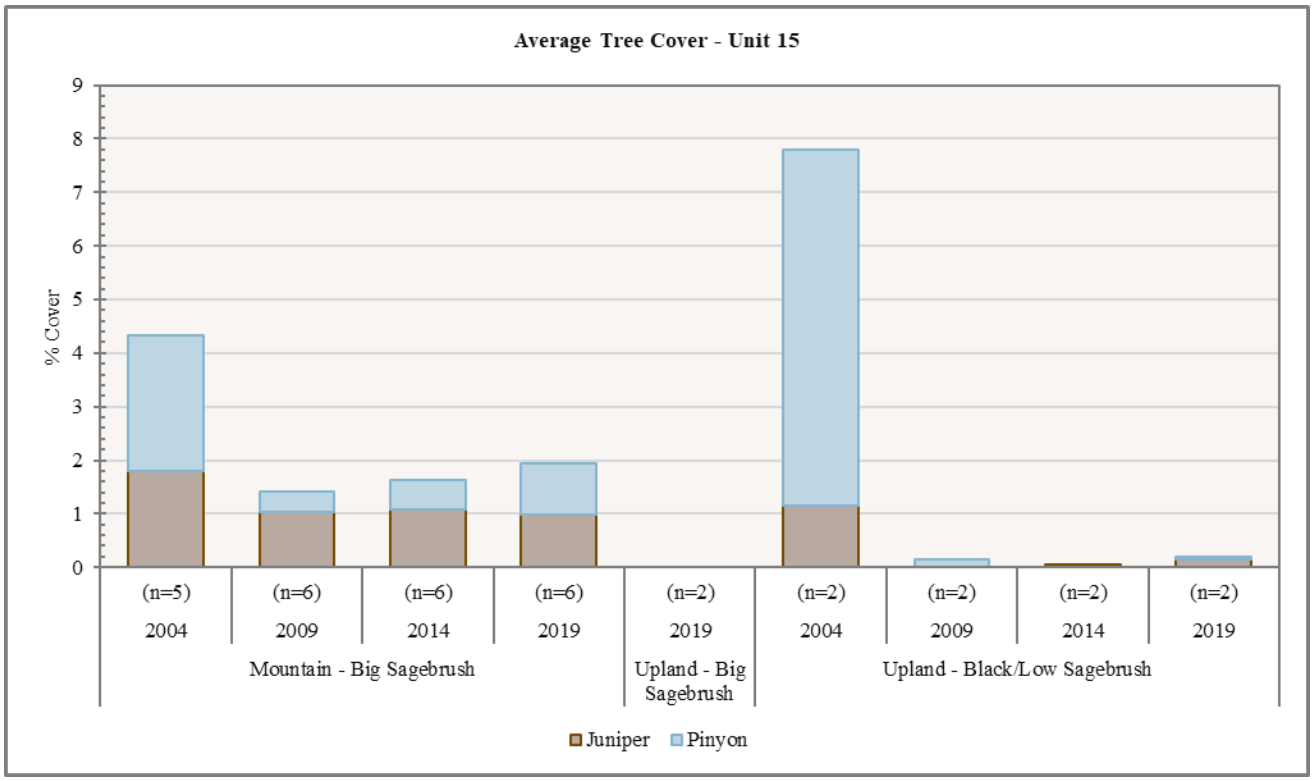


Figure 3.9: Average tree cover for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Upland - Black/Low Sagebrush study sites in WMU 15, Henry Mountains.

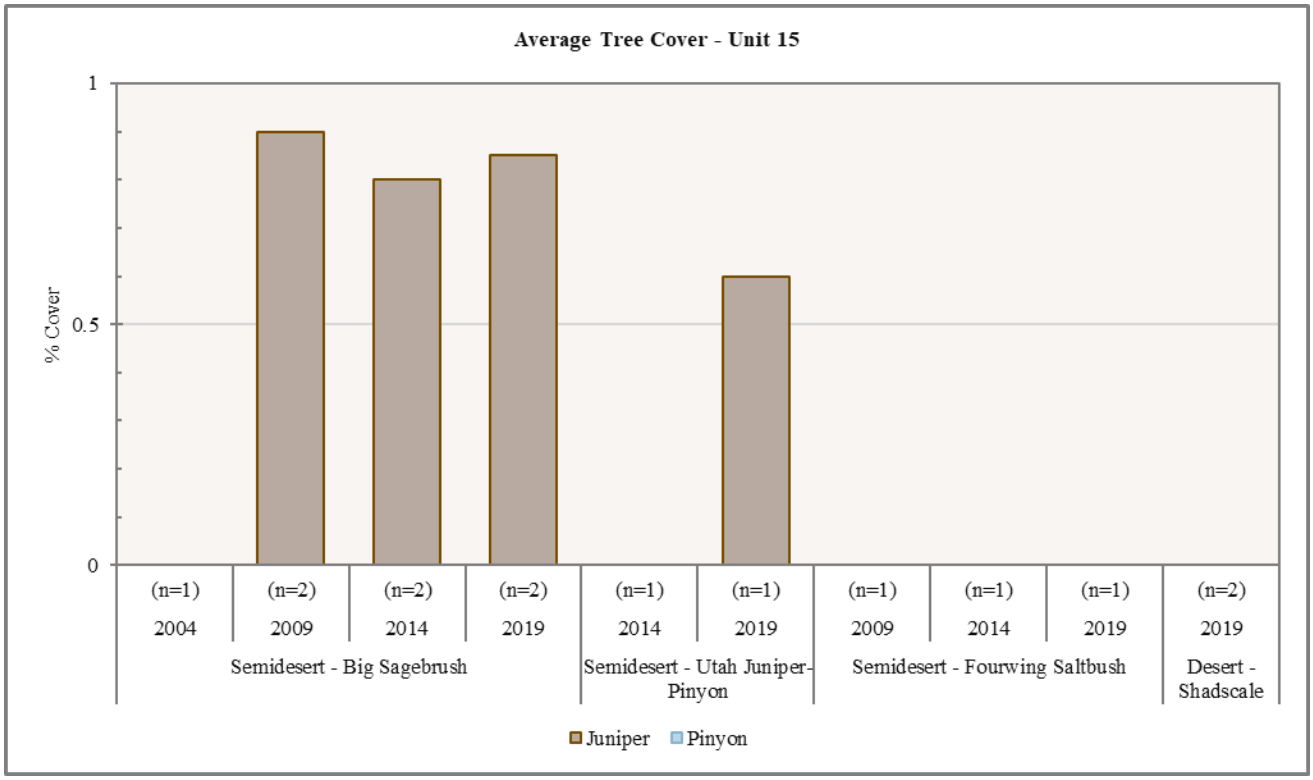


Figure 3.10: Average tree cover for Semidesert - Big Sagebrush, Semidesert - Utah Juniper-Pinyon, Semidesert - Fourwing Saltbush, and Desert - Shadscale study sites in WMU 15, Henry Mountains.

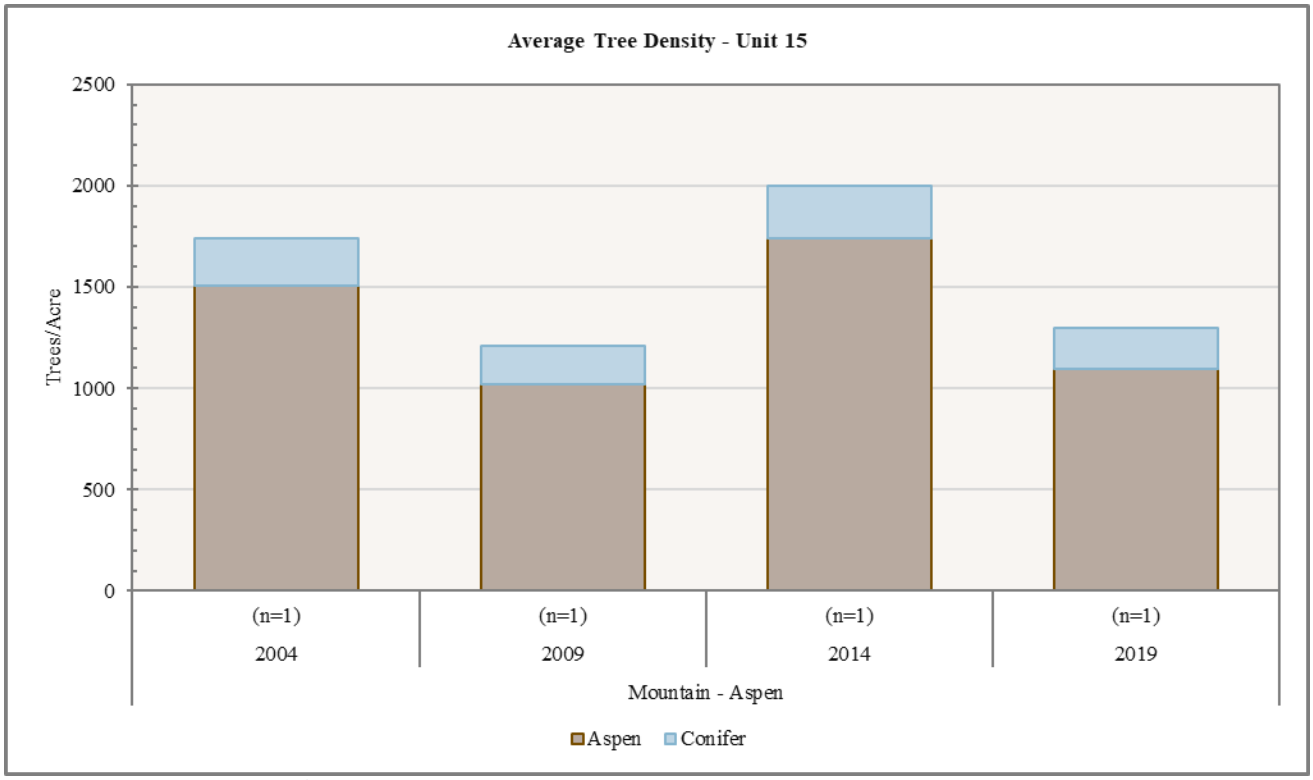


Figure 3.11: Average tree density for Mountain - Aspen study sites in WMU 15, Henry Mountains.

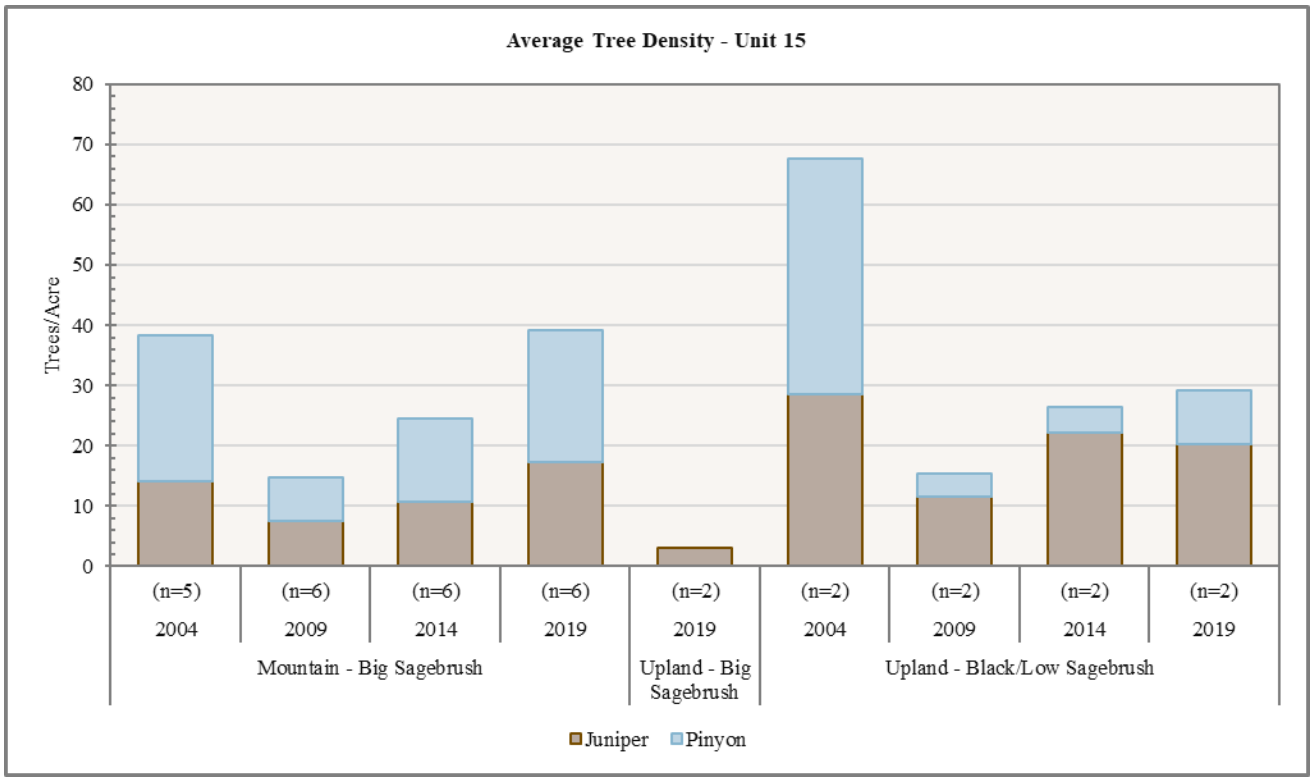


Figure 3.12: Average tree density for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Upland - Black/Low Sagebrush study sites in WMU 15, Henry Mountains.

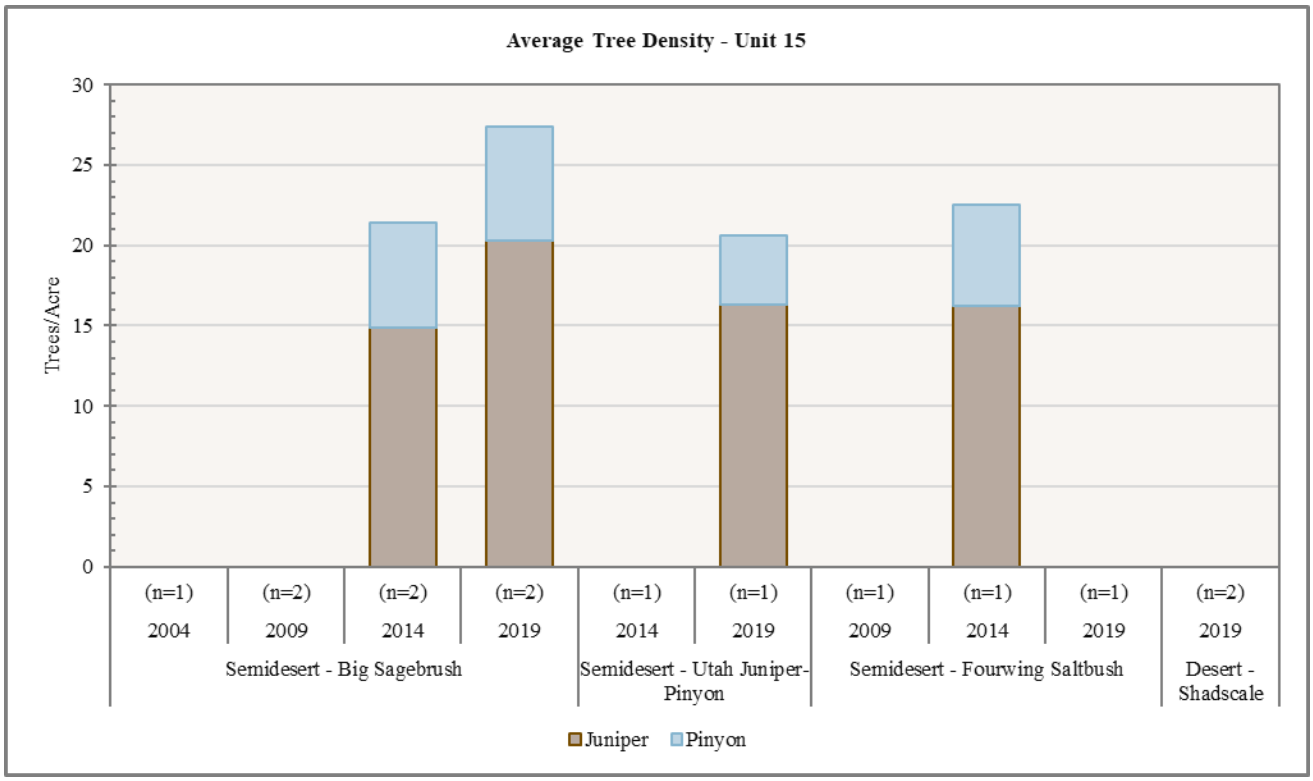


Figure 3.13: Average tree density for Semidesert - Big Sagebrush, Semidesert - Utah Juniper-Pinyon, Semidesert - Fourwing Saltbush, and Desert - Shadscale study sites in WMU 15, Henry Mountains.

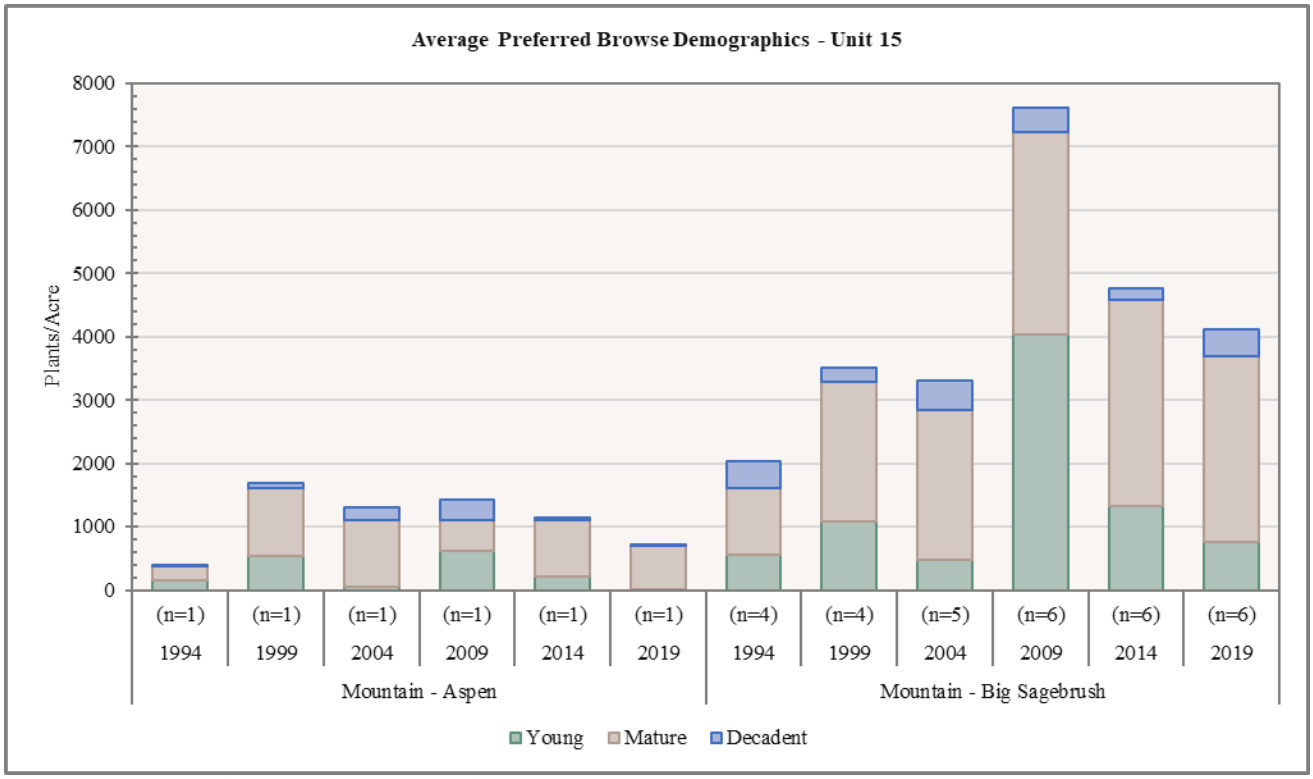


Figure 3.14: Average preferred browse demographics for Mountain - Aspen and Mountain - Big Sagebrush study sites in WMU 15, Henry Mountains.

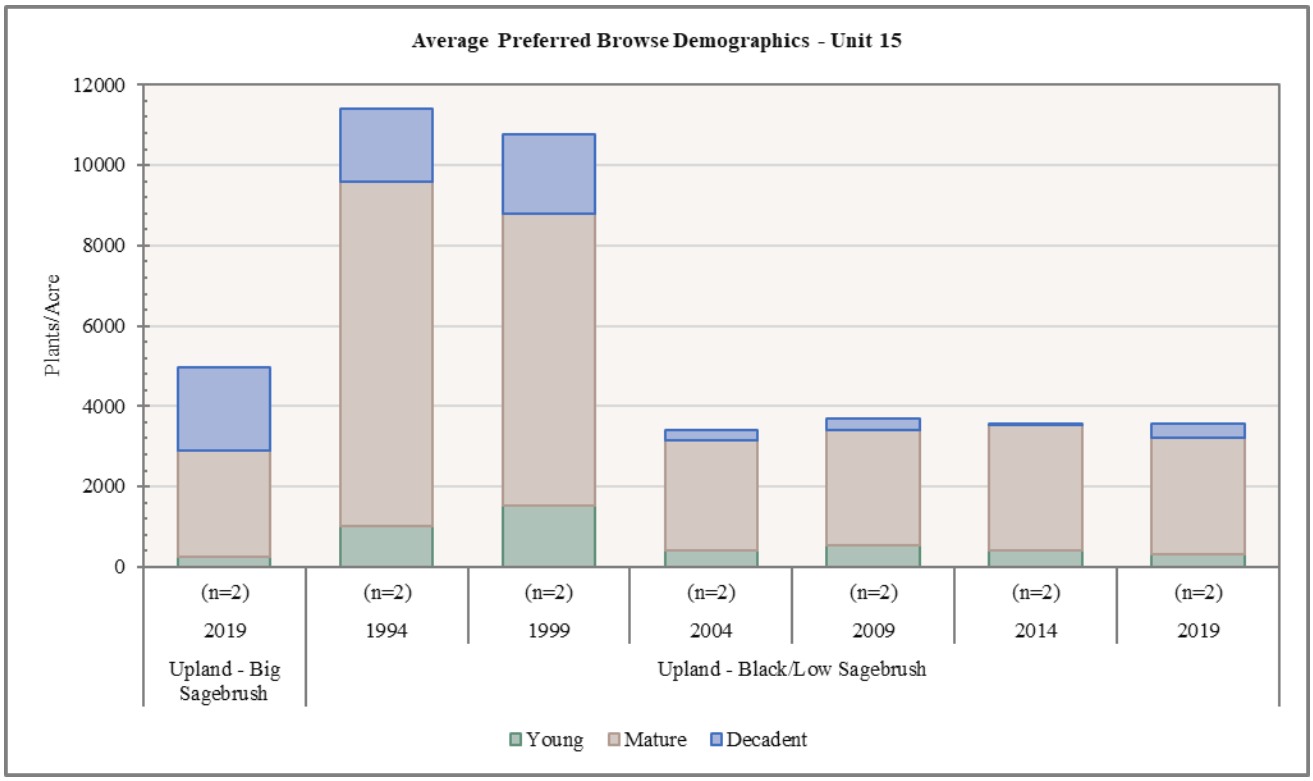


Figure 3.15: Average preferred browse demographics for Upland - Big Sagebrush and Upland - Black/Low Sagebrush study sites in WMU 15, Henry Mountains.

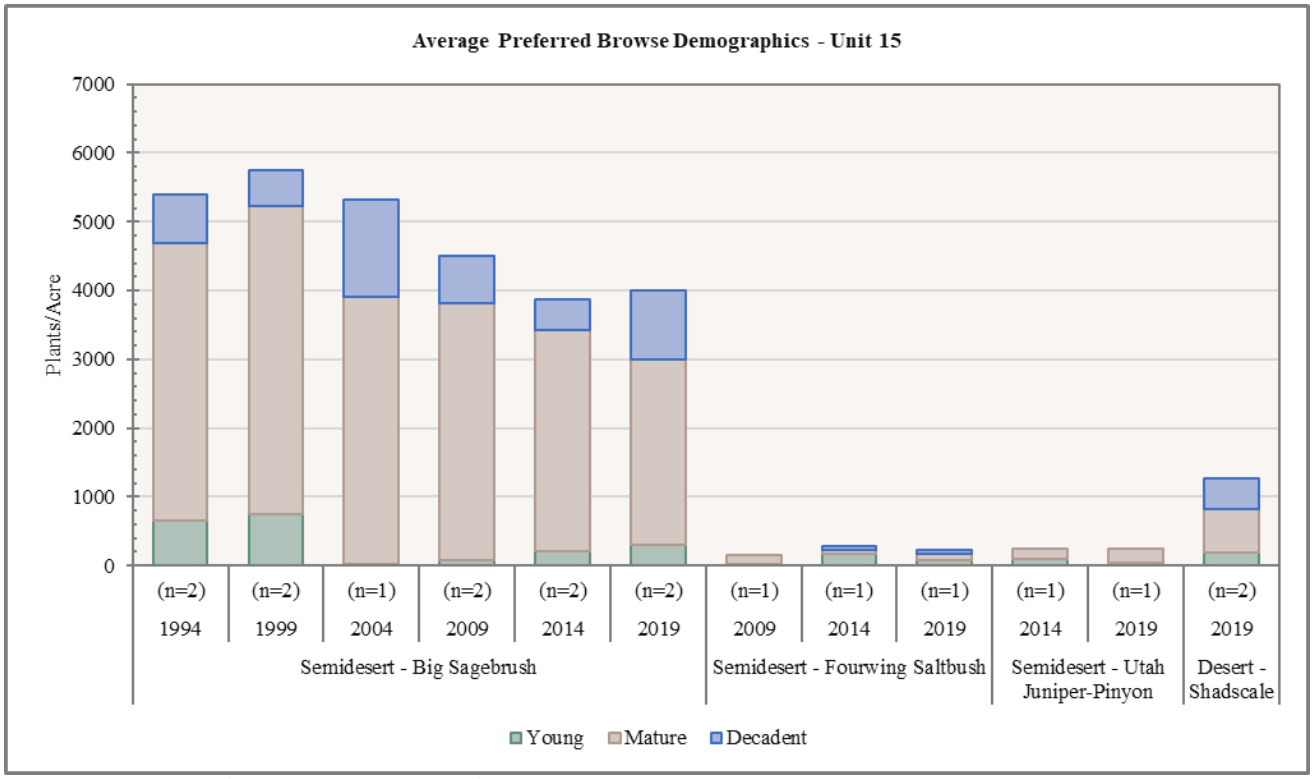


Figure 3.16: Average preferred browse demographics for Semidesert - Big Sagebrush, Semidesert - Fourwing Saltbush, Semidesert - Utah Juniper-Pinyon, and Desert - Shadscale study sites in WMU 15, Henry Mountains.

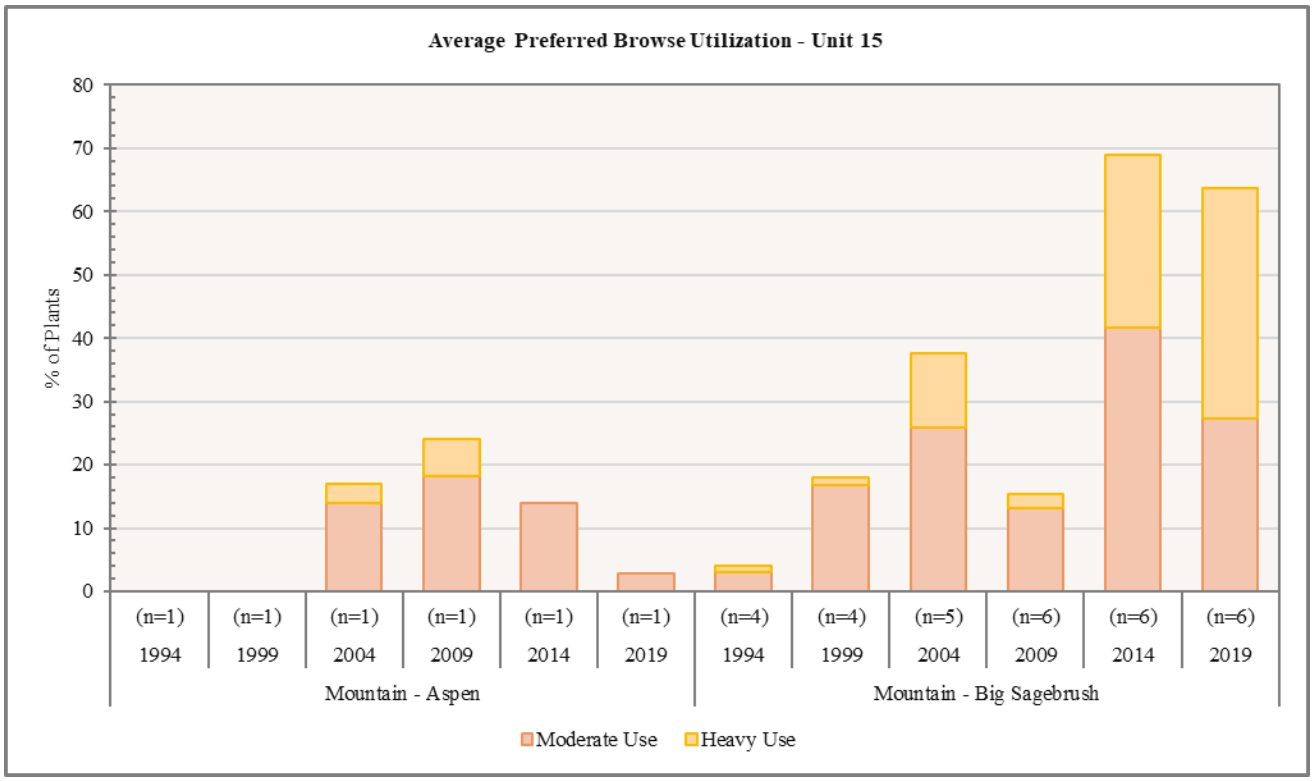


Figure 3.17: Average preferred browse utilization for Mountain - Aspen and Mountain - Big Sagebrush study sites in WMU 15, Henry Mountains.

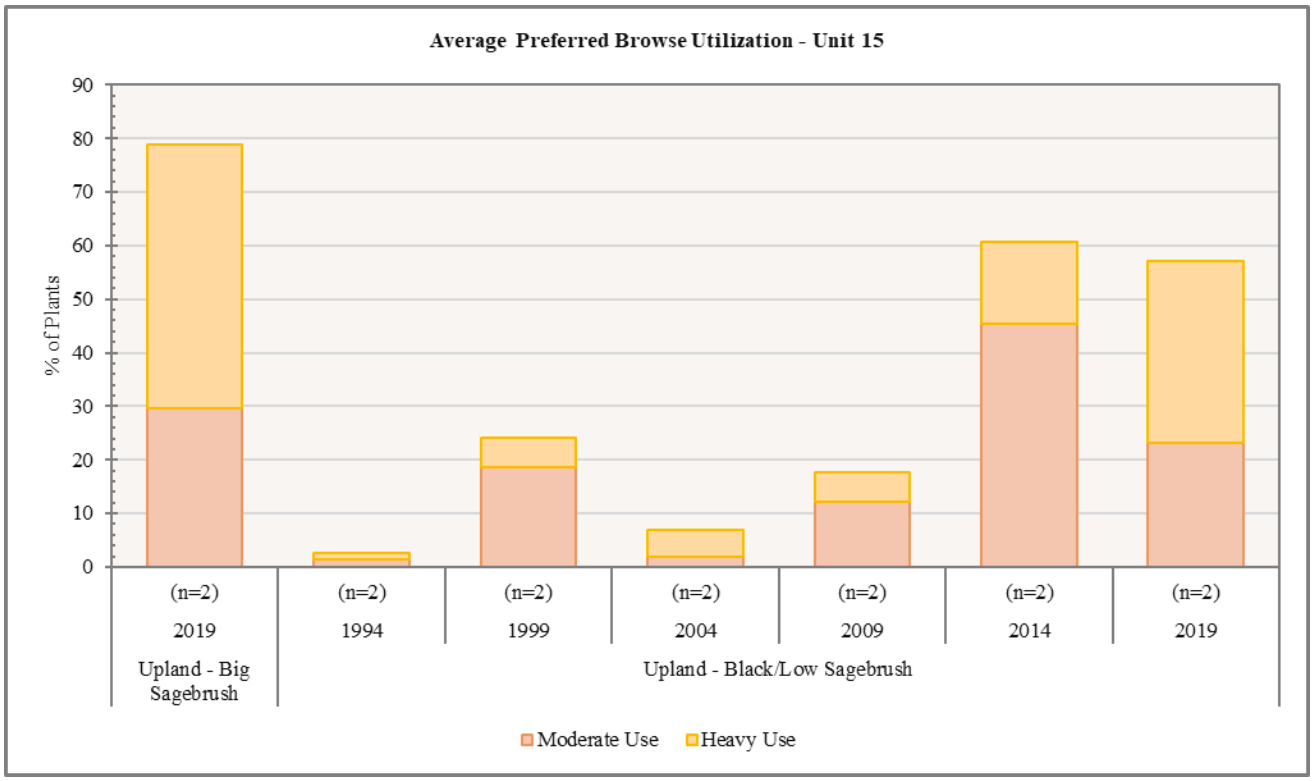


Figure 3.18: Average preferred browse utilization for Upland - Big Sagebrush and Upland - Black/Low Sagebrush study sites in WMU 15, Henry Mountains.

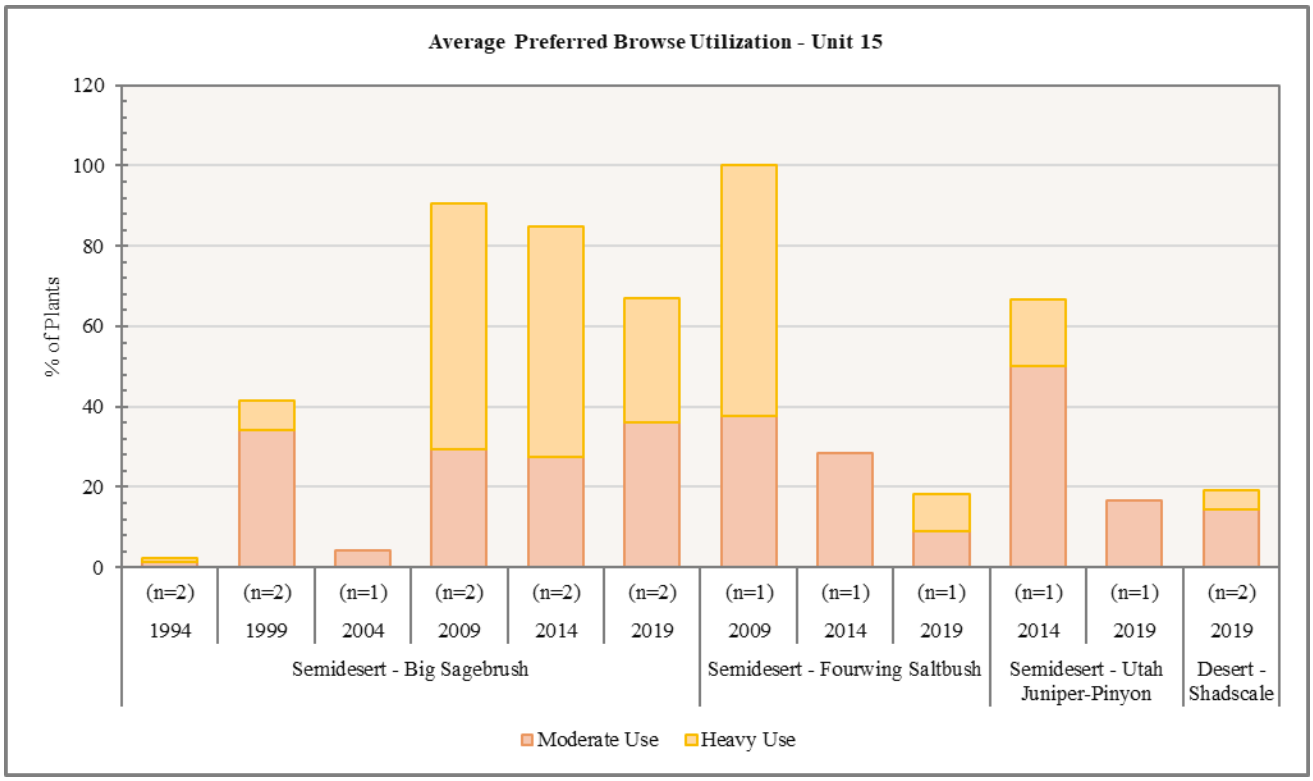


Figure 3.19: Average preferred browse utilization for Semidesert - Big Sagebrush, Semidesert - Fourwing Saltbush, Semidesert - Utah Juniper-Pinyon, and Desert - Shadscale study sites in WMU 15, Henry Mountains.

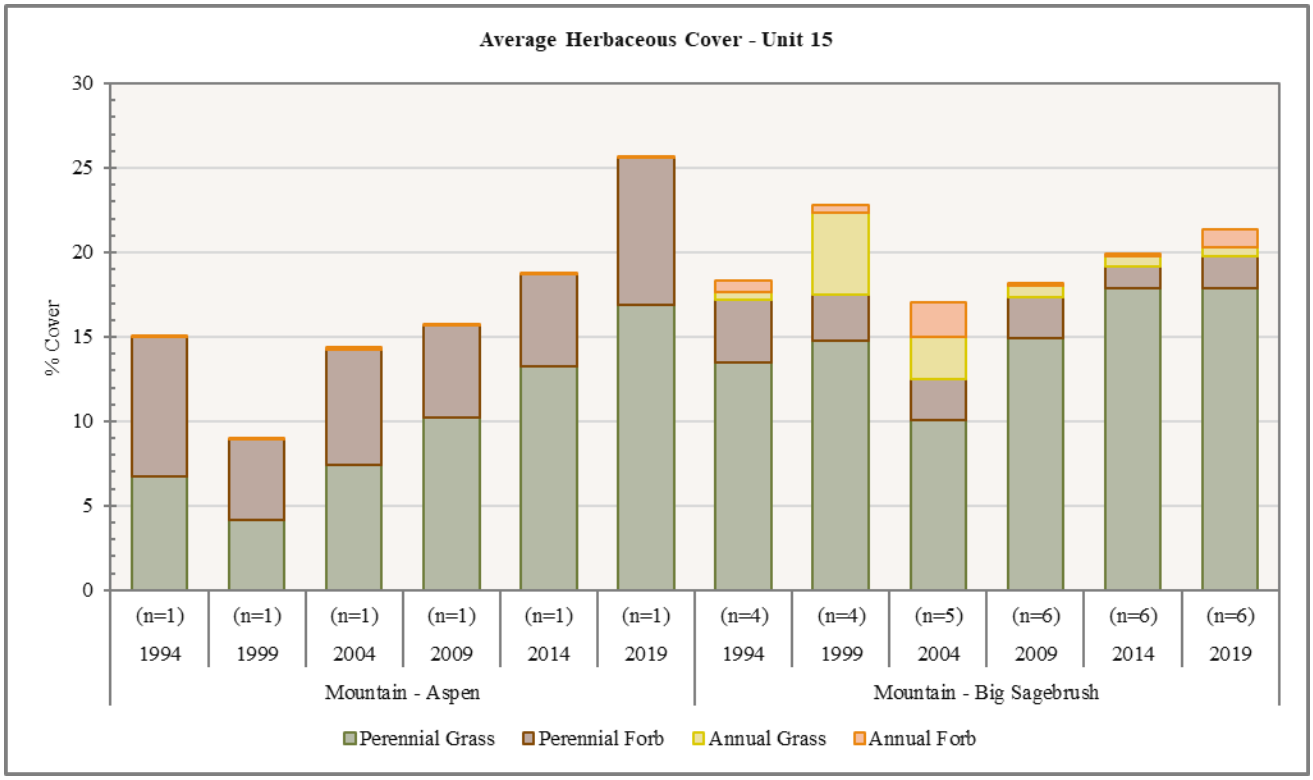


Figure 3.20: Average herbaceous cover for Mountain - Aspen and Mountain - Big Sagebrush study sites in WMU 15, Henry Mountains.

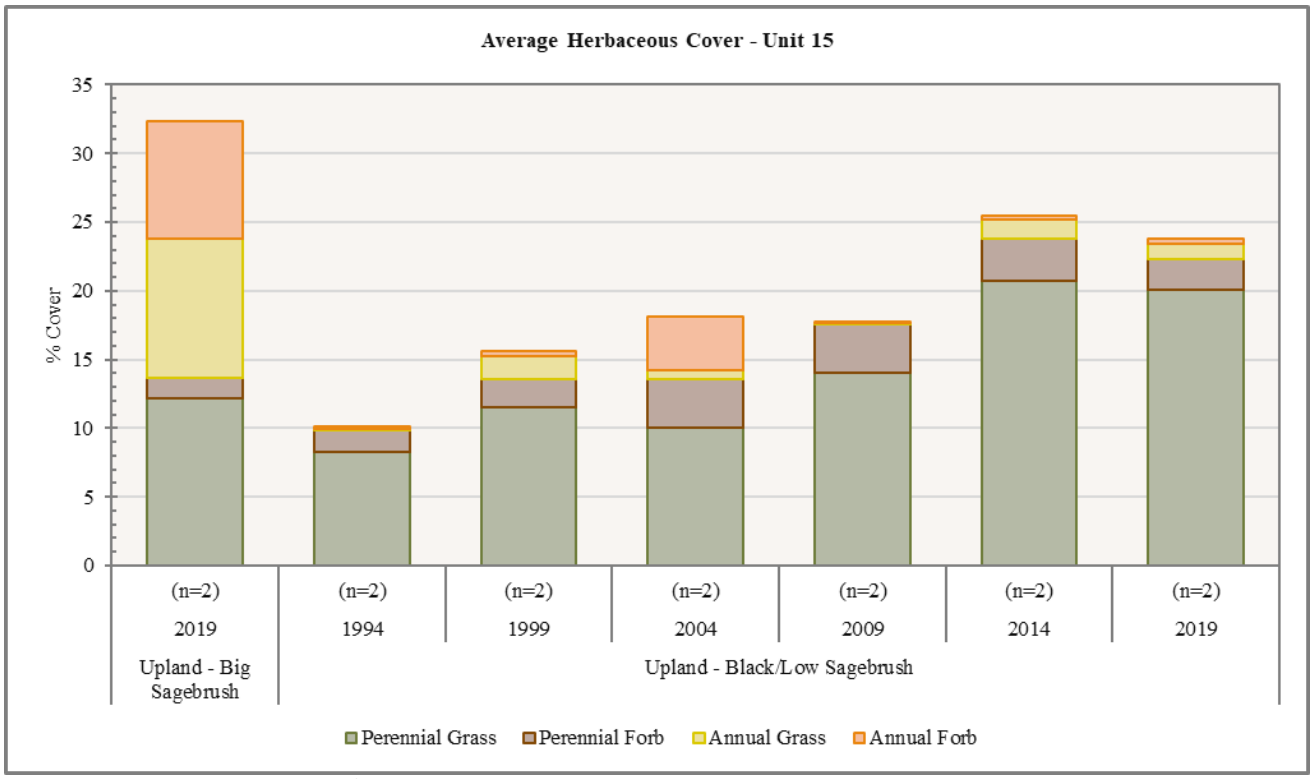


Figure 3.21: Average herbaceous cover for Upland - Big Sagebrush and Upland - Black/Low Sagebrush study sites in WMU 15, Henry Mountains.

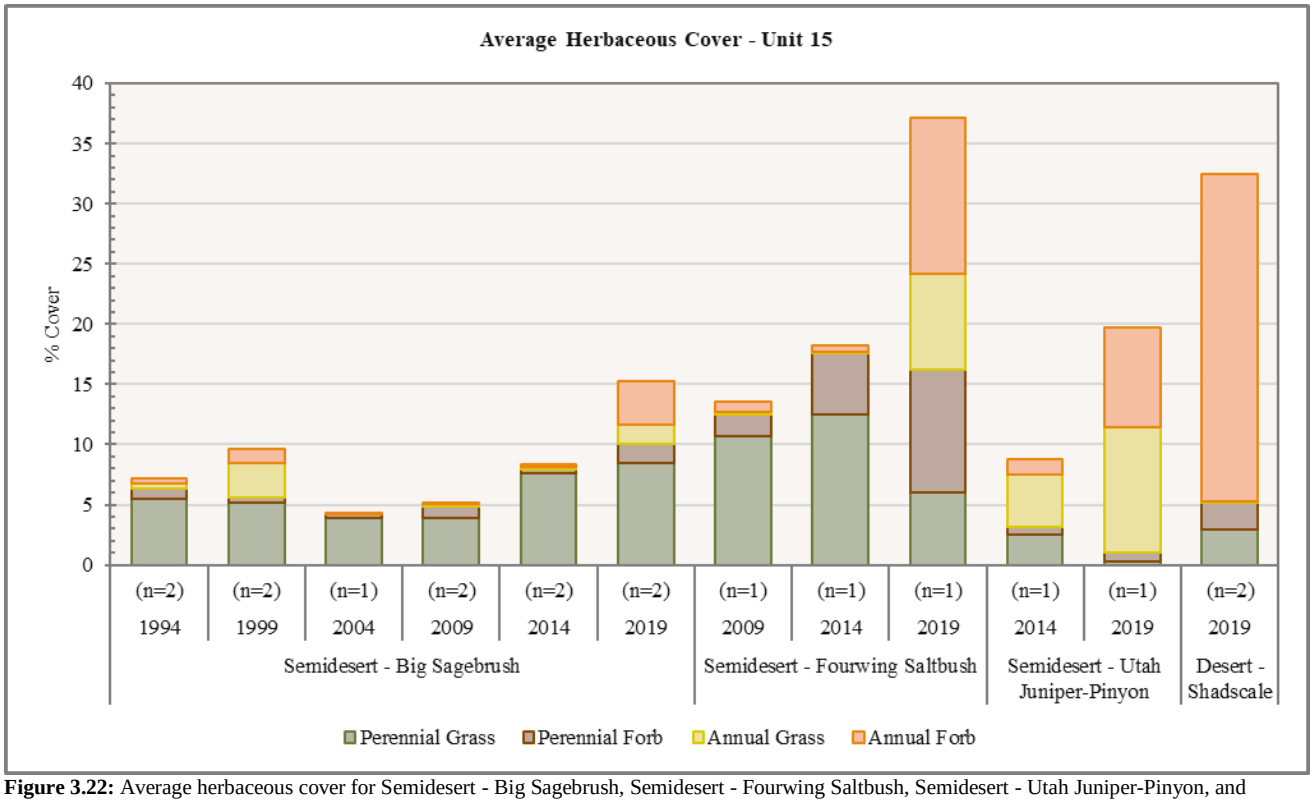


Figure 3.22: Average herbaceous cover for Semidesert - Big Sagebrush, Semidesert - Fourwing Saltbush, Semidesert - Utah Juniper-Pinyon, and Desert - Shadscale study sites in WMU 15, Henry Mountains.

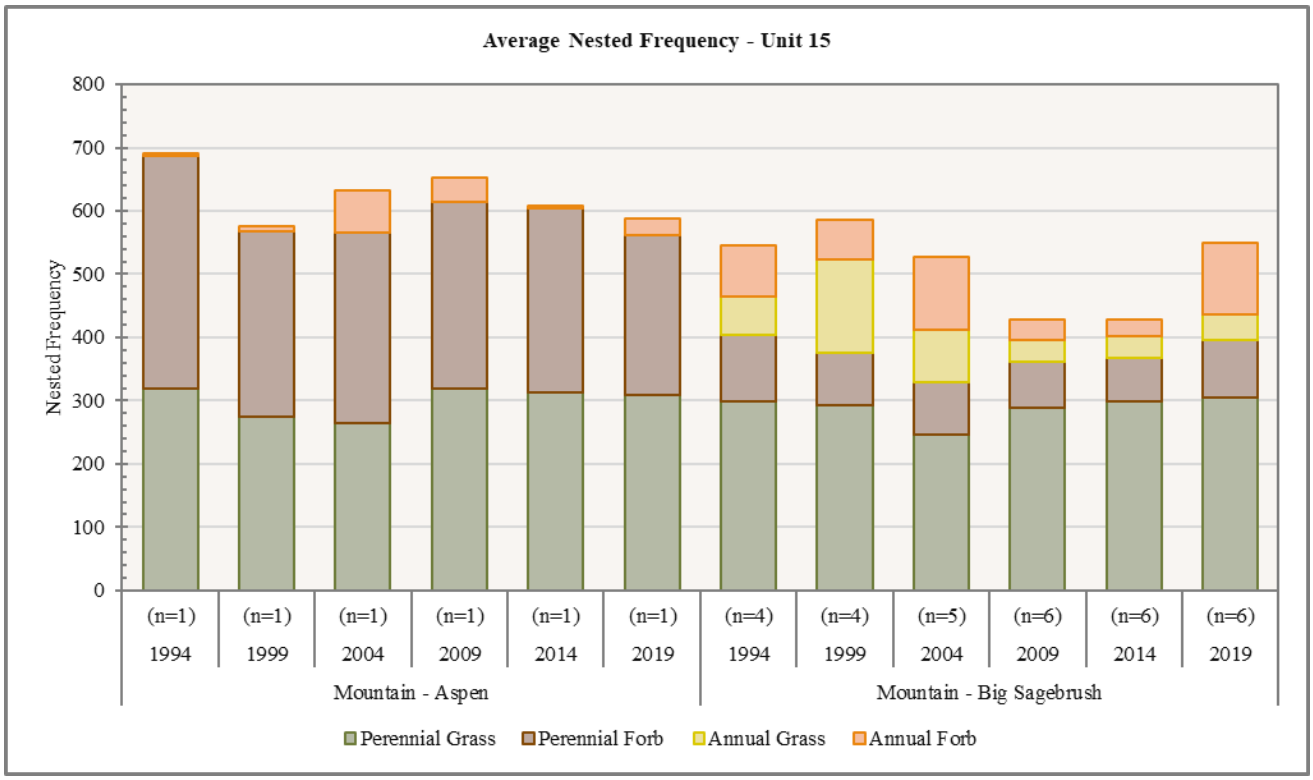


Figure 3.23: Average nested frequency of herbaceous species for Mountain - Aspen and Mountain - Big Sagebrush study sites in WMU 15, Henry Mountains.

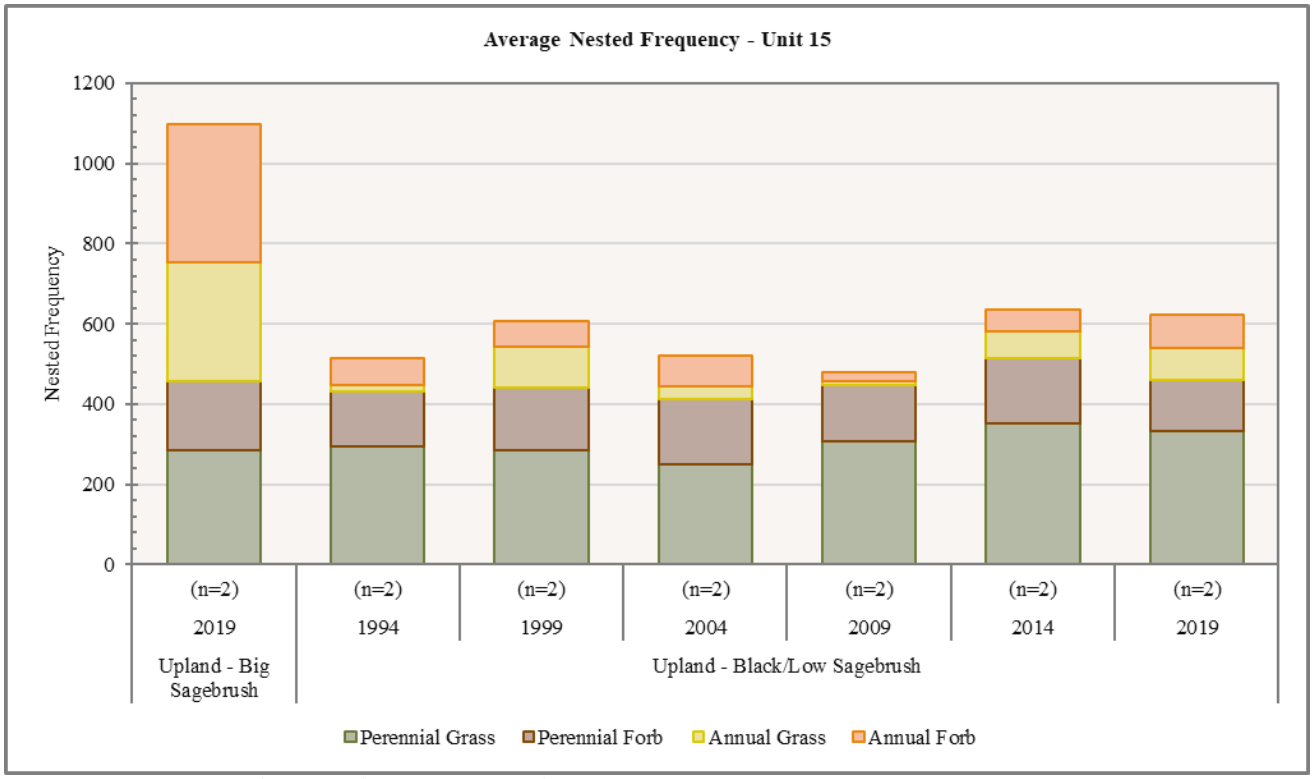


Figure 3.24: Average nested frequency of herbaceous species for Upland - Big Sagebrush and Upland - Black/Low Sagebrush study sites in WMU 15, Henry Mountains.

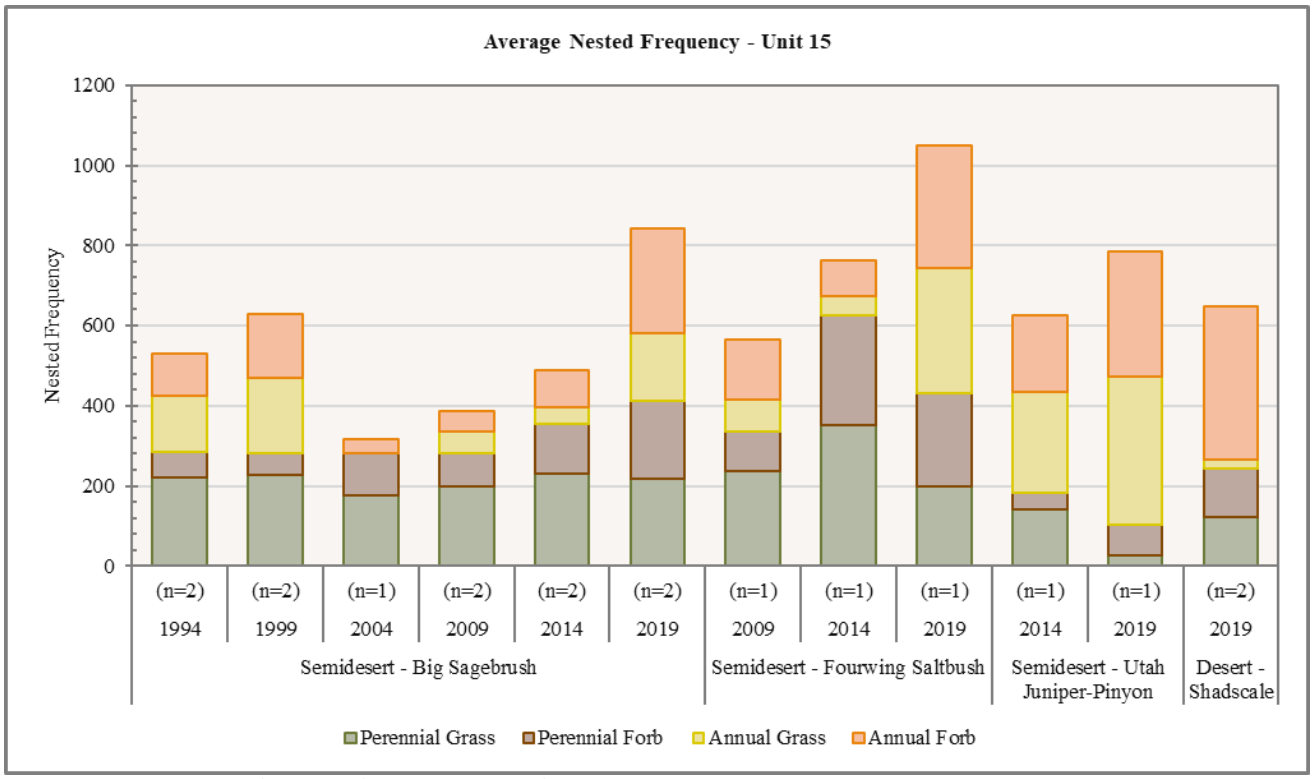


Figure 3.25: Average nested frequency of herbaceous species for Semidesert - Big Sagebrush, Semidesert - Fourwing Saltbush, Semidesert - Utah Juniper-Pinyon, and Desert - Shadscale study sites in WMU 15, Henry Mountains.

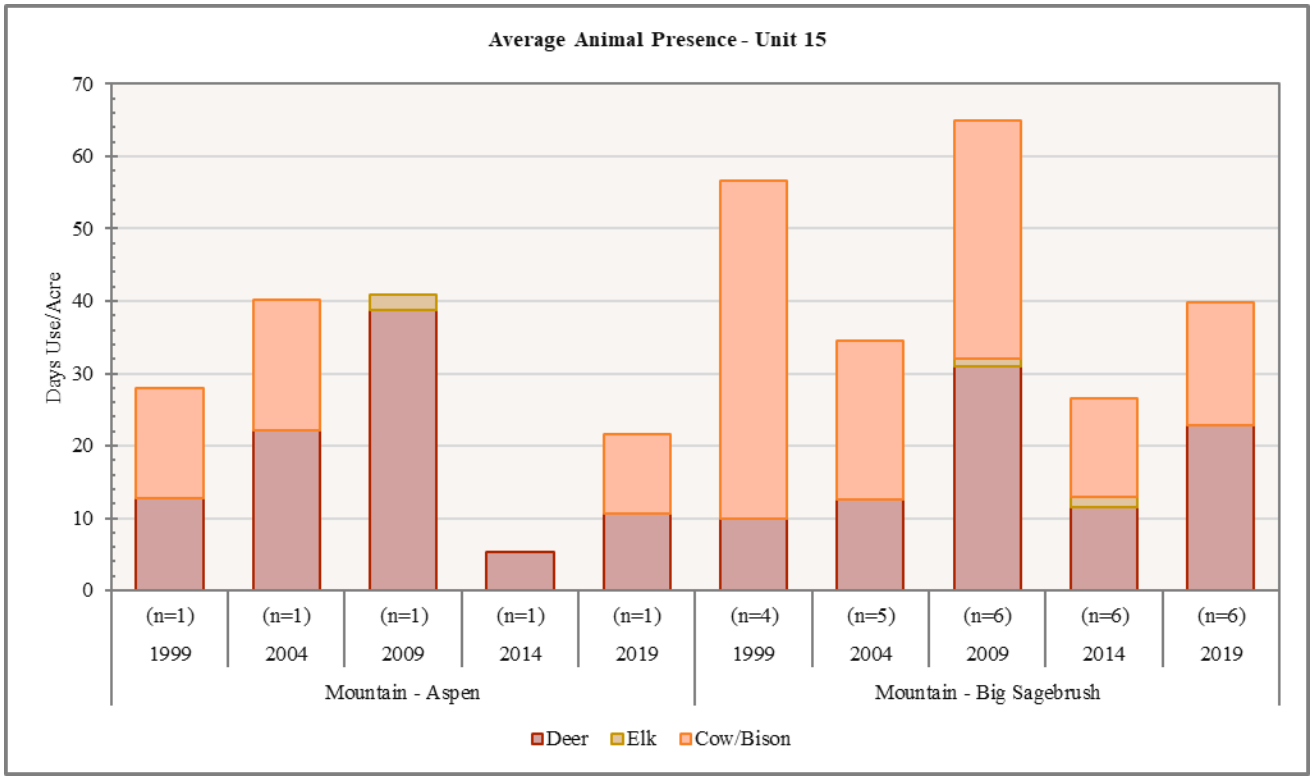


Figure 3.26: Average pellet transect data for Mountain - Aspen and Mountain - Big Sagebrush study sites in WMU 15, Henry Mountains.

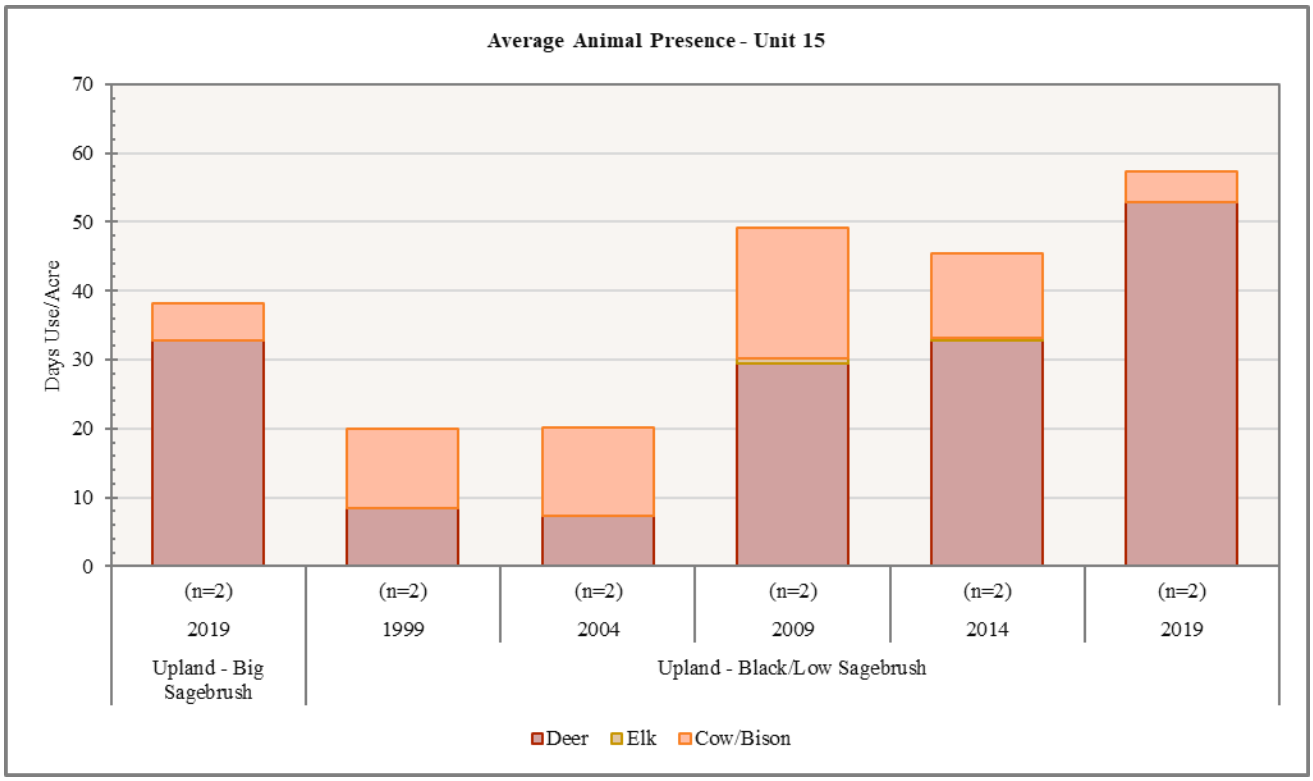


Figure 3.27: Average pellet transect data for Upland - Big Sagebrush and Upland - Black/Low Sagebrush study sites in WMU 15, Henry Mountains.

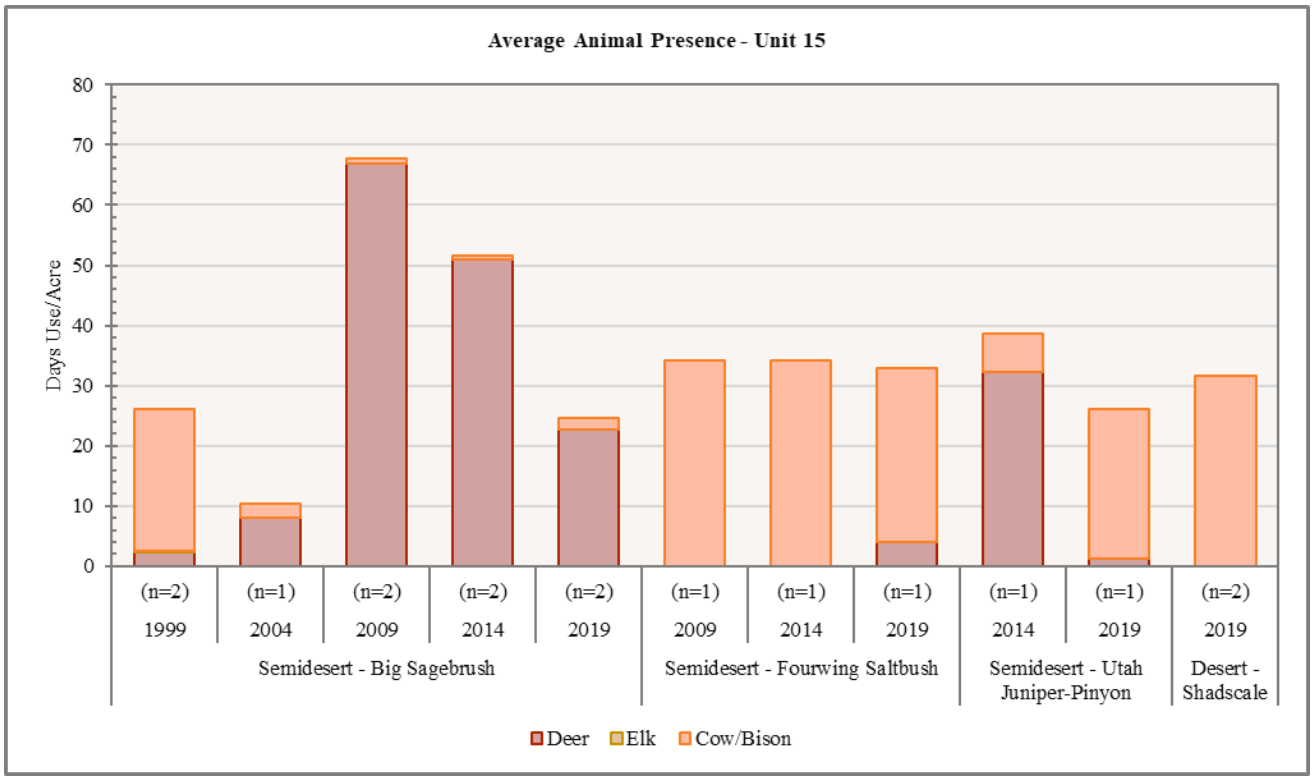
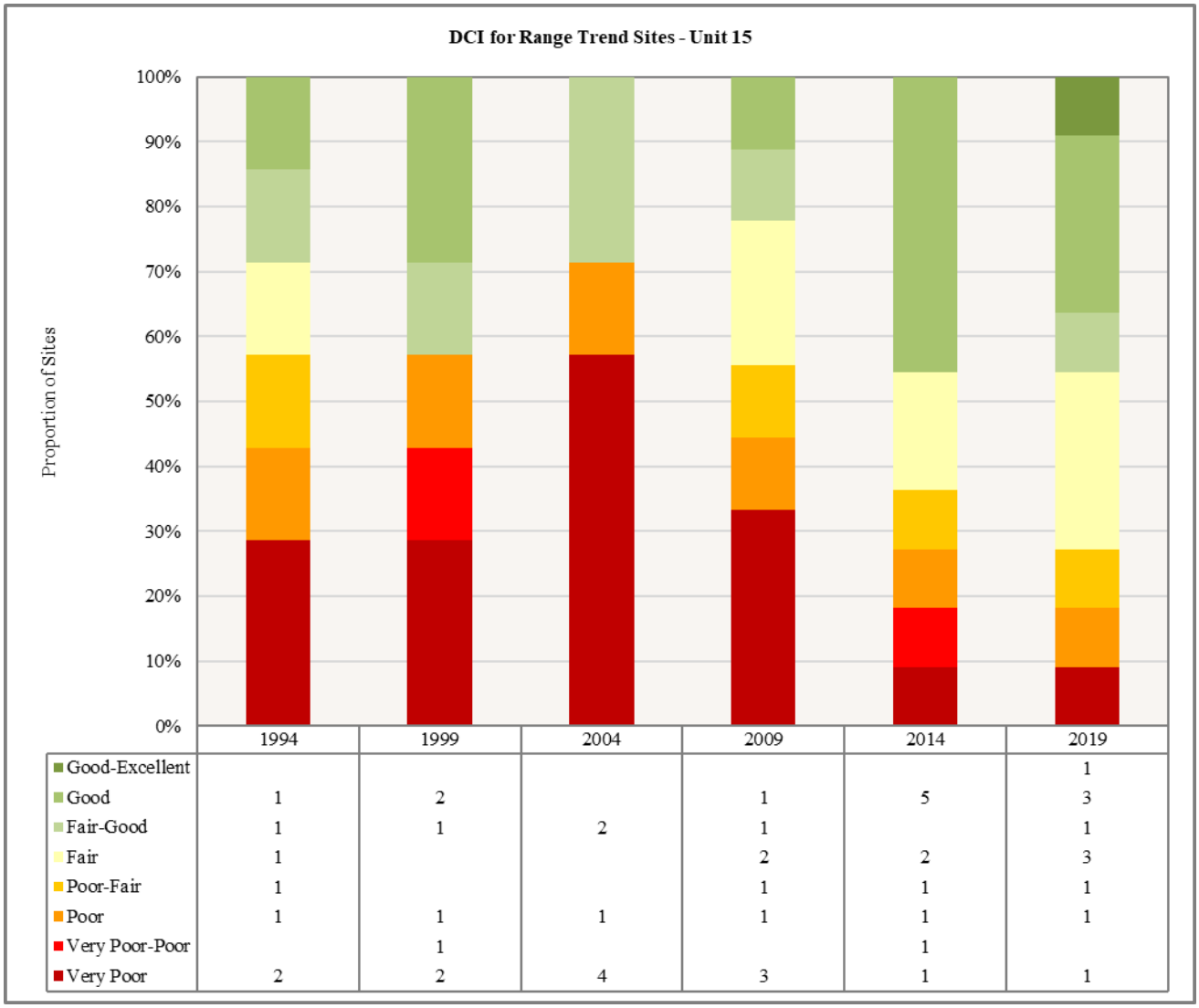


Figure 3.28: Average pellet transect data for Semidesert - Big Sagebrush, Semidesert - Fourwing Saltbush, Semidesert - Utah Juniper/Pinyon, and Desert - Shadscale study sites in WMU 15, Henry Mountains.

Deer Winter Range Condition Assessment

The condition of deer winter range within the Henry Mountain management unit has continually changed on the sites sampled since 1994. The active Range Trend sites sampled within the unit are considered to be in very poor to good-excellent condition as of the 2019 sample year (**Figure 3.29**, **Table 3.11**). The Sidehill Spring study is considered to be in good-excellent condition, with high cover of preferred browse and perennial grass contributing to this ranking. The three sites rated as being in good condition are Eagle Bench, Airplane Spring, and Cave Flat. The one site in fair-good condition is Quaking Aspen Spring. There are three studies in fair condition: Bates Knob, Box Springs Chaining, and Cave Flat Chaining 2. The Sage Flat study site is classified as being in poor condition. There is one study in very poor condition: Coyote Spring. Overall, the condition of the sites across the unit has improved since 2004.

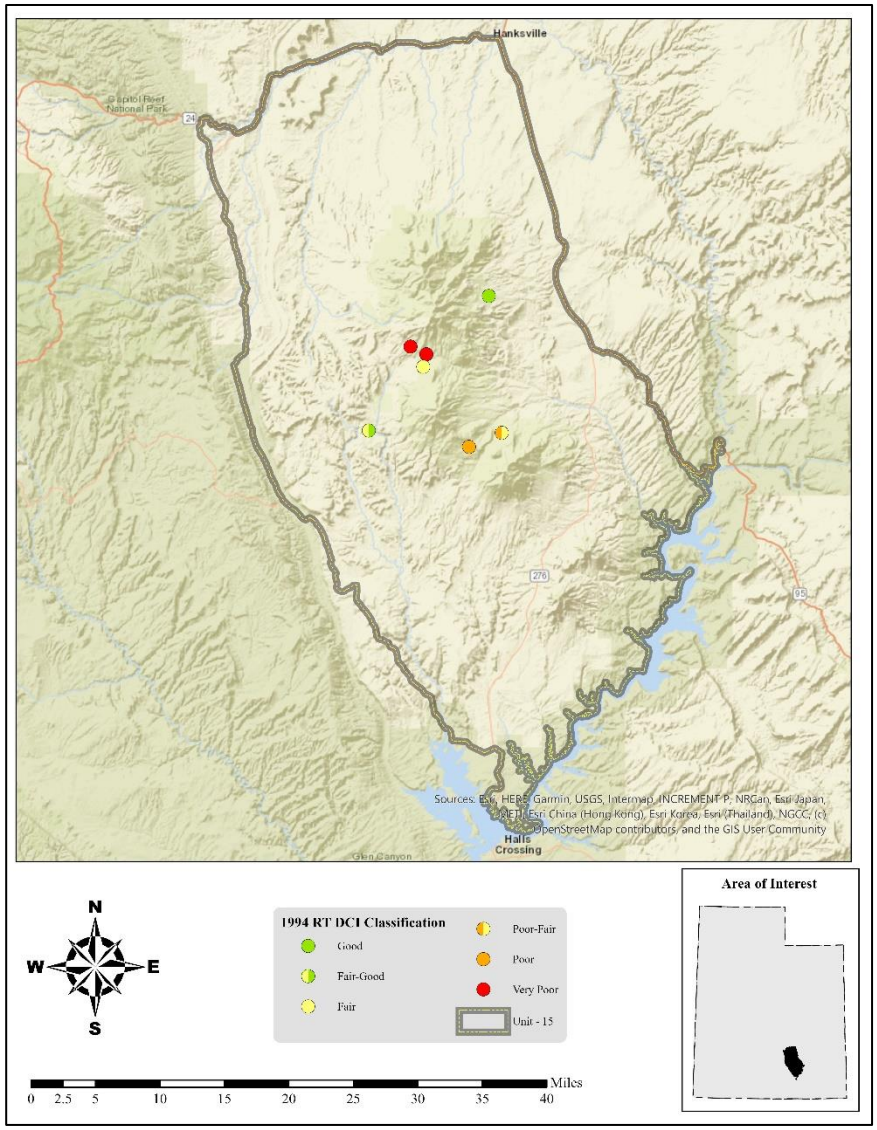


	1994	1999	2004	2009	2014	2019
Good-Excellent						1
Good	1	2		1	5	3
Fair-Good	1	1	2	1		1
Fair	1			2	2	3
Poor-Fair	1			1	1	1
Poor	1	1	1	1	1	1
Very Poor-Poor		1			1	
Very Poor	2	2	4	3	1	1

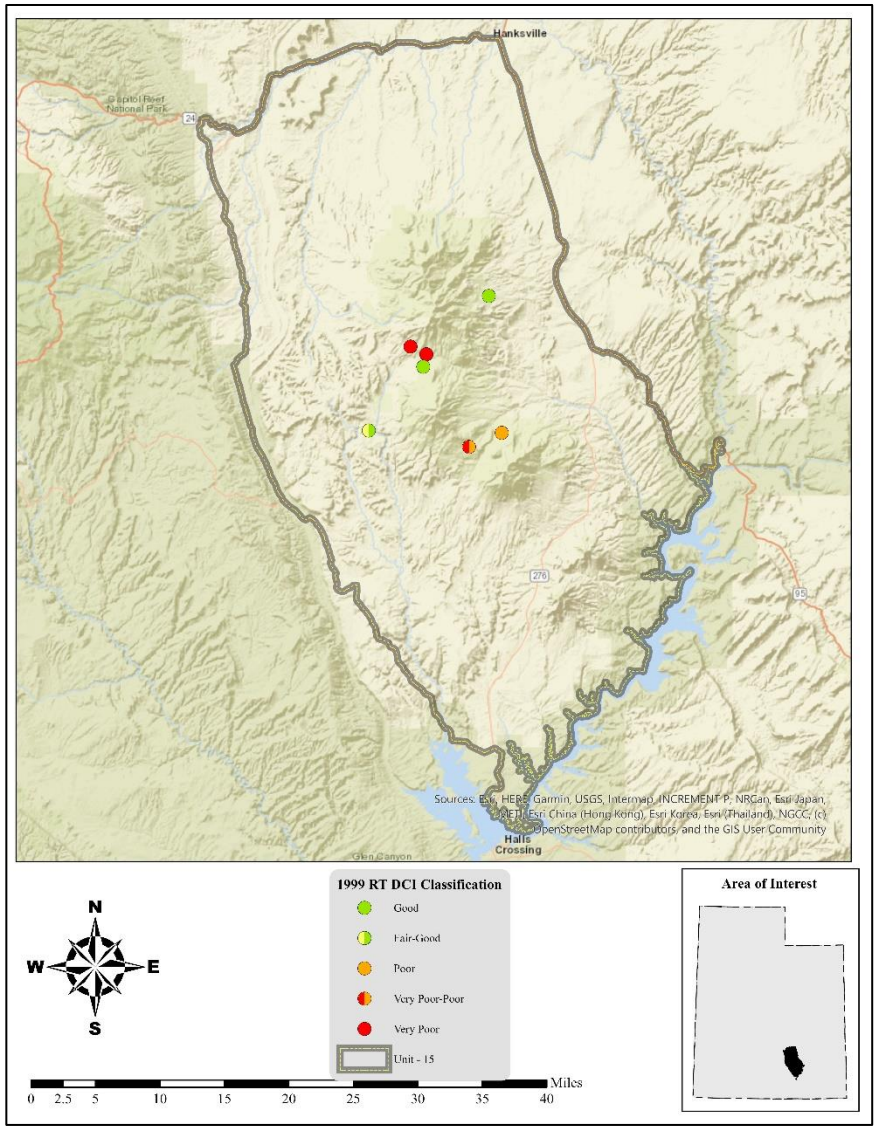
Figure 3.29: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 15, Henry Mountains.

Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
15-01	1994	20	14	3.5	6.9	0	3.2	0	**47.5**	**G**
15-01	1999	26.7	12.4	3.8	8.4	0	1.5	0	**52.7**	**G**
15-01	2004	30	7.1	0.2	7.7	0	0.8	0	**45.7**	**F-G**
15-01	2009	25.8	10.2	0.5	6.6	0	2.1	0	**45.2**	**F-G**
15-01	2014	28.2	10.9	2.9	18.7	-0.1	1.3	0	**61.9**	**G**
15-01	2019	27.6	5.8	1.8	21.5	-0.3	1.8	0	**58.3**	**G**
15-05	1994	2.2	0	0	20.8	-0.5	4.6	0	**27.1**	**VP**
15-05	1999	4.5	0	0	23.9	-1.7	3.4	0	**30.1**	**VP**
15-05	2004	10	13.7	5.4	11.8	0	5	0	**45.9**	**P**
15-05	2009	15.6	14.6	8	16.2	0	2.2	0	**56.5**	**P-F**
15-05	2014	17	14.2	10.9	22.2	0	0.7	0	**64.9**	**F**
15-05	2019	30	12.3	1.9	18.2	0	1.7	0	**64**	**F**
15-06	1994	0.5	0	0	30	0	0.9	0	**31.4**	**VP**
15-06	1999	2.4	0	0	30	0	0.5	0	**32.9**	**VP**
15-06	2004	4	0	0	30	0	0	0	**34**	**VP**
15-06	2009	4.7	0	0	30	0	0.1	0	**34.8**	**VP**
15-06	2014	8.8	15	0	30	0	0.1	0	**53.9**	**P-F**
15-06	2019	13.9	15	0	30	0	0.4	0	**59.2**	**F**
15-07	1994	9.5	12	7.1	26	0	3.4	0	**57.9**	**F**
15-07	1999	11.8	12.4	15	30	0	2.8	0	**72**	**G**
15-07	2004	17.5	13.3	3.5	29.9	0	1.6	0	**65.8**	**F-G**
15-07	2009	20.7	11.3	5.5	22.7	0	1.2	0	**61.4**	**F**
15-07	2014	23.4	14.6	5.1	30	-0.6	1.3	0	**73.8**	**G**
15-07	2019	22.6	11.1	4.9	30	-1.2	1.2	0	**68.5**	**G**
15-10	1994	15.8	5.9	8.4	15.2	-0.6	0.1	0	**44.8**	**F-G**
15-10	1999	16	12.1	9.6	12.3	-4.4	0	0	**45.6**	**F-G**
15-10	2011	28	10.3	1.2	8.9	-0.3	1.8	0	**49.8**	**G**
15-10	2014	30	11.9	1	11.6	-0.1	0.3	0	**54.7**	**G**
15-10	2019	29.3	9.8	6.2	12.4	-2.1	4.5	0	**60**	**G**
15-12	1994	25.8	9.2	3.1	7.1	-0.1	3	0	**48.2**	**P-F**
15-12	1999	25.2	9.1	3.7	6.3	-2.6	5.3	0	**47**	**P**
15-12	2004	0	0	0	10.2	-1	10	0	**19.2**	**VP**
15-12	2009	1.8	0	0	30	0	10	0	**41.8**	**P**
15-12	2014	5.8	0	0	30	-1.3	10	0	**44.5**	**P**
15-12	2019	10	12.9	5.4	30	-0.4	7.6	0	**65.5**	**F-G**
15-13	1994	24.3	6.3	7.5	3.1	-0.6	10	0	**50.7**	**P**
15-13	1999	24	11.5	6.8	4.3	-12.6	7.3	0	**41.3**	**VP-P**
15-13	2004	0.6	0	0	17.3	-1.6	9.6	0	**25.8**	**VP**
15-13	2009	7.3	15	4.9	25.2	-1.6	6.8	0	**57.5**	**F**
15-13	2014	14.3	14.8	15	30	-1.2	1.7	0	**74.6**	**G**
15-13	2019	26.3	14.6	15	30	-0.4	4.5	0	**89.9**	**G-E**
15-15*	2004	4.5	0	0	2.7	0	0.2	0	**7.3**	**VP**
15-15*	2009	0.1	0	0	5.1	0	0.4	0	**5.7**	**VP**
15-15*	2014	1	0	0	7.3	0	2.1	0	**10.4**	**VP-P**
15-16	2009	0.3	0	0	30	0	2.8	0	**33**	**VP**
15-16	2014	0.4	0	0	30	-0.2	3.6	0	**33.8**	**VP**
15-16	2019	1.2	0	0	30	-0.1	2.3	0	**33.4**	**VP**
15-18	2014	7.6	13.5	15	5.1	-3.2	1.2	0	**39.2**	**F**
15-18	2019	11.2	15	9.1	0.5	-7.8	1.5	0	**29.6**	**F**
15-19*	2014	30	13.5	7.8	3.7	-0.5	0.3	0	**54.8**	**G**
15-20	2019	21.3	4.5	1.9	26	-10.9	4	0	**46.7**	**P**
15-22	2019	28	0.3	2.4	22.9	-4.4	1.7	0	**50.9**	**P-F**

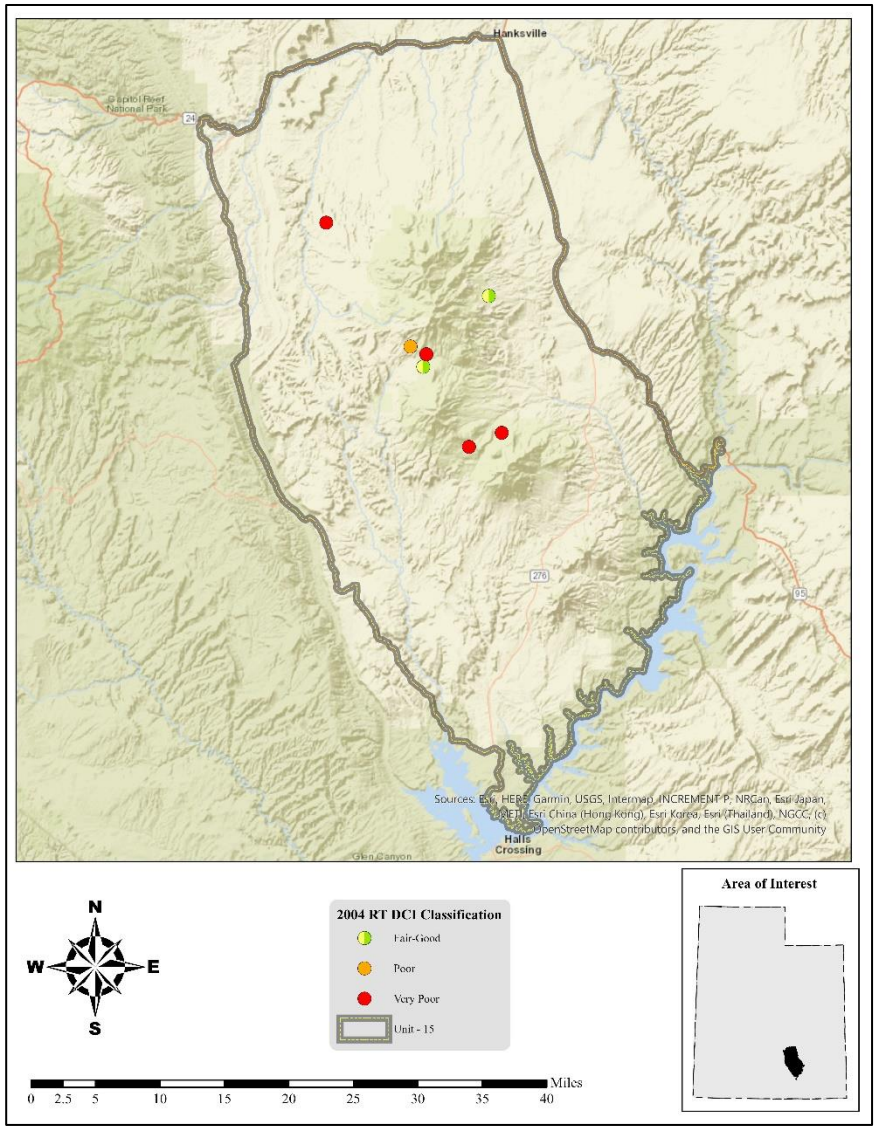
Table 3.11: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 15, Henry Mountains. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. *Studies with an asterisk have been suspended.



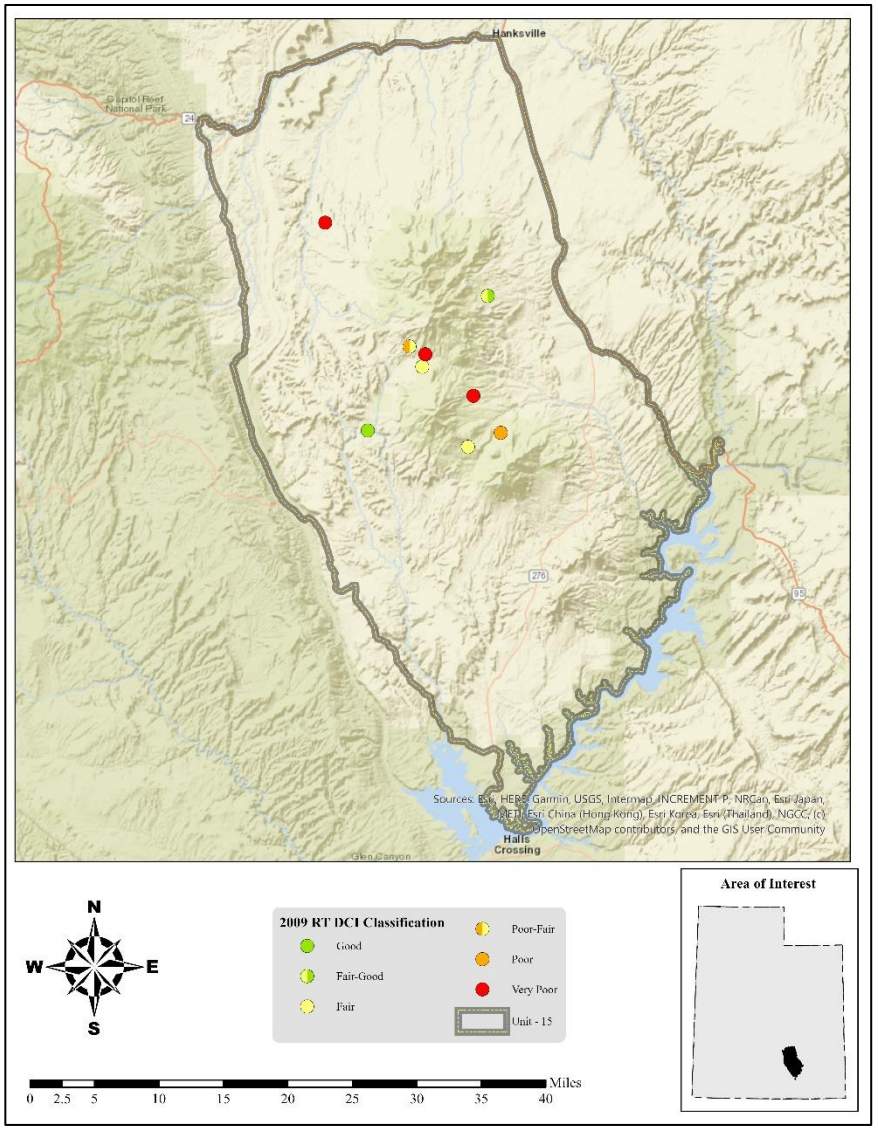
Map 3.10: 1994 Desirable Components Index (DCI) ranking distribution by study site for WMU 15, Henry Mountains.



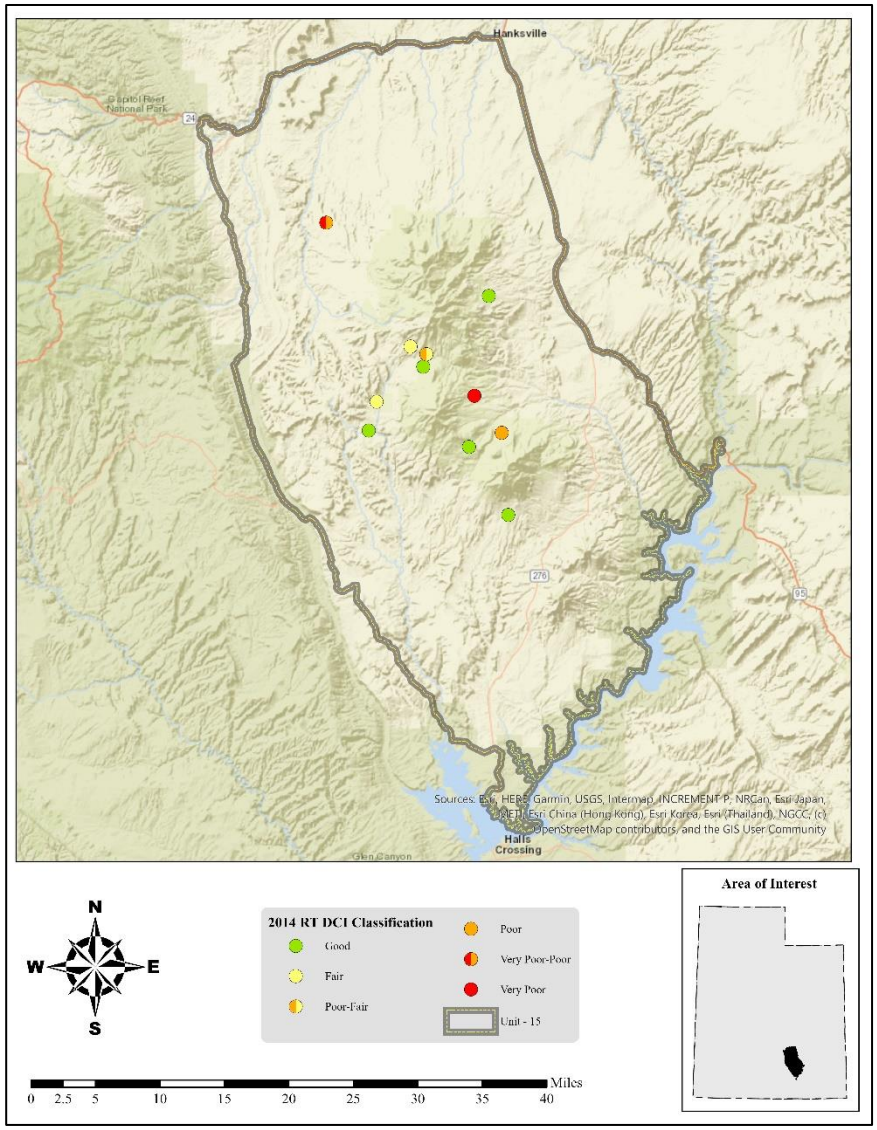
Map 3.11: 1999 Desirable Components Index (DCI) ranking distribution by study site for WMU 15, Henry Mountains.



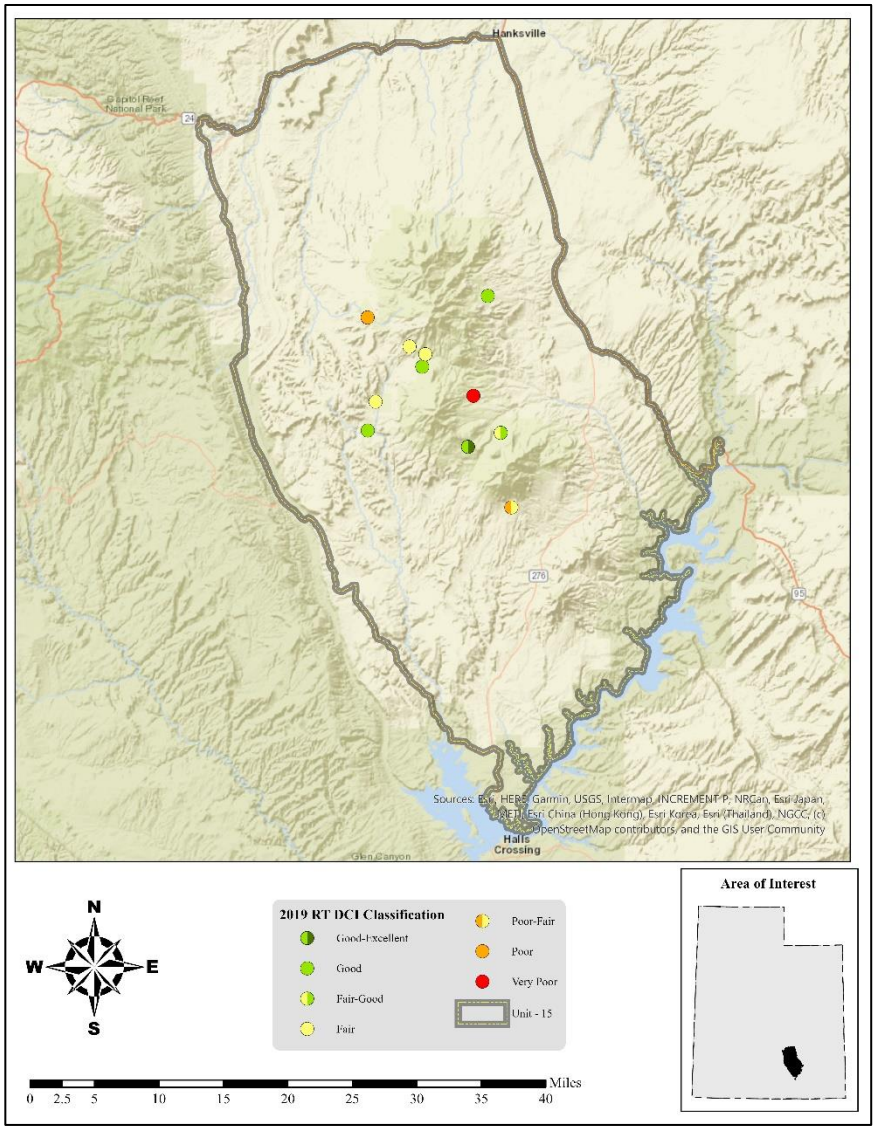
Map 3.12: 2004 Desirable Components Index (DCI) ranking distribution by study site for WMU 15, Henry Mountains.



Map 3.13: 2009 Desirable Components Index (DCI) ranking distribution by study site for WMU 15, Henry Mountains.



Map 3.14: 2014 Desirable Components Index (DCI) ranking distribution by study site for WMU 15, Henry Mountains.



Map 3.15: 2019 Desirable Components Index (DCI) ranking distribution by study site for WMU 15, Henry Mountains.

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
15-1	Eagle Bench	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
15-2	Nasty Flat	Animal Use – Cattle/Bison	Medium	Reduced diversity of desirable grass and forb species
15-4	South Creek Chaining	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
15-5	Bates Knob	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
15-6	Box Springs Chaining	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
15-7	Airplane Spring	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
15-10	Cave Flat	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
15-12	Quaking Aspen Spring	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle/Bison	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
15-13	Sidehill Spring	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Animal Use – Cattle/Bison	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
15-14	Dugout Creek	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
15-16	Coyote Spring	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle/Bison	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
15-17	Swap Mesa	Animal Use – Bison	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
15-18	Cave Flat Chaining 2	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Animal Use – Cattle/Bison	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
15-20	Sage Flat	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Animal Use – Cattle/Bison	Medium	Reduced diversity of desirable grass and forb species
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
15-21	Bullfrog Benches	Climate Change	High	Loss of habitat and shift in ecological community type
		Animal Use – Cattle/Bison	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
15-22	Johns Knoll	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
15-23	Steven's Mesa Point	Animal Use – Cattle/Bison	High	Reduced diversity of desirable grass and forb species
15R-2	Tarantula Mesa Lop and Scatter	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor

Table 3.12: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 15, Henry Mountains. All assessments are based off of the most current sample date for each study site. Criteria for evaluating limiting factors is available in **Appendix A - Threat Assessment**.

Discussion and Recommendations

Mountain (Aspen)

The study within the Mountain (Aspen) ecological type, Nasty Flat, is classified as deer summer range in the Henry Mountains unit. This community supports an aspen stand and an understory that may provide forage to wildlife. Pellet transect data indicates that this site may undergo high use by cattle and/or bison; high use by roughage eaters may result in decreased abundance and diversity in the herbaceous understory.

Closer examination of the Nasty Flat study site and surrounding area is recommended. This further investigation may aid in determining if high cattle and/or bison use is occurring throughout the surrounding area.

Mountain (Big Sagebrush)

The studies within the Mountain (Big Sagebrush) ecological type are considered to be in very poor to excellent condition for deer winter range on this unit; the South Creek Chaining study is considered to be deer summer range. These communities support sagebrush populations that provide browse to wildlife. Introduced perennial grasses pose a high-level threat on all study sites except for Dugout Creek: these grasses can contribute to a reduction in understory diversity. In addition, annual grasses have been observed in varying amounts on every site except the Box Springs Chaining study. Increased amounts of annual grasses can increase fuel loads and may exacerbate the risk of wildfire. Conifer encroachment has been observed on many sites, and every study except for Dugout Creek is considered to be within Phase I of woodland succession. These sites have the potential to progress through the phases of woodland succession over time. Pellet transect data suggests that high use by cattle and/or bison may be occurring on the Sidehill Spring and Coyote Spring studies. High use by roughage eaters may lead to reduced vigor and diversity of the herbaceous understory.

Treatments to reduce annual grasses or aggressive introduced perennial grasses would be advisable in areas where the ecological integrity is threatened. If reseeding is needed to restore herbaceous communities, care should be taken in seed selection and preference should be given to native species when possible. In addition, closer examination of the Sidehill Spring and Coyote Spring studies and surrounding areas may be recommended to determine if high cattle and/or bison usage is occurring throughout the surrounding area. Finally, conifer-removing treatments (e.g. bullhog, chaining, lop and scatter, etc.) may be beneficial when and where they are necessary and feasible.

Upland (Big Sagebrush)

The studies that are classified as Upland (Big Sagebrush) ecological sites are considered to be in poor to poor-fair condition for deer winter range within the Henry Mountains management unit. The plant communities on these sites support sagebrush populations that provide browse to wildlife. Annual grasses have been observed on both studies, and there may be potential for these annual grasses to increase and elevate the risk of wildfire. In addition, both sites are considered to be within Phase I of woodland succession, and encroachment may continue in the future. Introduced perennial grass species are present on the Sage Flat study. These grasses can increase and reduce understory diversity, particularly in higher elevation locations. Pellet group data indicates that high cattle and/or bison use may also be occurring on the Sage Flat site: this may result in reduced diversity and abundance in the herbaceous understory.

Treatment to reduce annual grasses and aggressive perennial grass monocultures may be advisable in areas where ecological integrity is threatened. If reseeding is needed to restore herbaceous communities, care should be taken in seed selection and preference should be given to native species when possible. Tree-removing disturbances (e.g. chaining, lop and scatter, bullhog, etc.) may be recommended if density and cover increase in the future. Further investigation on the Sage Flat site and surrounding area may be recommended to determine if high use is occurring across the surrounding area.

Upland (Black/Low Sagebrush)

The studies within the Upland (Black/Low Sagebrush) ecological type are considered to be in fair-good to good condition for deer winter range on this unit. The sagebrush communities on these sites support shrub populations that provide winter browse for wildlife. Introduced perennial grasses are present on both sites. Although these perennial species may help provide competition against annual grasses, they may have the

potential to reduce the abundance of more desirable native herbaceous species. Both studies are considered to be within Phase I of woodland succession, and encroachment may continue in the future. In addition, annual grasses have been observed on both sites. Should cover of these annual grasses increase in the future, they may have the potential to increase the risk of wildfire. Pellet transect data shows that the Quaking Aspen Spring study may be undergoing high cattle and/or bison use. High use by roughage eaters has the potential to lead to decreased abundance and diversity of the herbaceous understory. Treatments to reduce trees (e.g. bullhog, chaining, lop and scatter, etc.) may be recommended in future years if cover and density of conifers increase. Closer examination of the Quaking Aspen Spring site and the area around it may be recommended to help determine if high use is occurring throughout the surrounding area. Finally, treatments to reduce undesirable grasses may be advisable in areas where they contribute high cover. If reseeding is needed to restore herbaceous communities, care should be taken in seed selection and preference should be given to native species when possible.

Semidesert (Big Sagebrush)

The studies that are classified as Semidesert (Big Sagebrush) ecological sites are considered to be in good condition for deer winter range in the Henry Mountains management unit. Communities of this ecological type support sagebrush populations that provide browse for wildlife. Annual grasses have been observed in the understories of both sites. Although they are a low-level threat, annual grasses have the potential to increase fuel loads and affect wildfire regimes if they increase over time. While currently only in Phase I of pinyon-juniper encroachment, these studies may be at risk of further encroachment in the future. Continued encroachment in turn can reduce shrub and herbaceous health and productivity if not addressed.

While the conifer communities at these particular studies are currently small, it is suggested that work to prevent future pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) begin in areas when it is deemed necessary. Treatments to reduce annual grasses may be advisable in areas where the ecological integrity is threatened. If reseeding is needed to restore herbaceous communities, care should be taken in seed selection and preference should be given to native species when possible.

Semidesert (Fourwing Saltbush)

The study site that is considered to be a Semidesert (Fourwing Saltbush) ecological site, Swap Mesa, is classified as bison habitat within the unit. The herbaceous community on this site may provide forage for bison. Pellet group data suggests that high use by bison may be occurring on this site. High usage by roughage eaters may result in decreased herbaceous abundance and diversity. In addition, annual grasses have been observed on this study site. Although the threat level is low, these annual grasses could increase fuel loads and affect wildfire regimes if they increase in the future. This site is considered to be in Phase I of woodland succession, and may be at risk of further tree encroachment in the future.

Treatments to reduce trees (e.g. bullhog, chaining, lop and scatter, etc.) may be recommended in the future should cover and density increase. Treatments to reduce annual grasses may be advisable if they increase in the future. If reseeding is needed to restore herbaceous communities, care should be taken in seed selection and preference should be given to native species when possible. Finally, it may be beneficial to more closely examine the Swap Mesa site and surrounding area to help determine if high use by bison is occurring in the surrounding area.

Semidesert (Utah Juniper-Pinyon)

The single study that is classified as a Semidesert (Utah Juniper-Pinyon) ecological site, Cave Flat Chaining 2, is considered to be in fair condition for deer winter range. This study site supports a shrub community that provides browse for wildlife. High amounts of cheatgrass (*Bromus tectorum*) have been

observed on this site. Increased amounts of annual grasses may have the potential to elevate fuel loads and alter wildfire regimes. While currently only in Phase I of pinyon-juniper encroachment, this study could be at risk of further encroachment in the future. This continued conifer encroachment can in turn reduce shrub and herbaceous health and productivity if not addressed. In addition, pellet group data shows that high usage by cattle and/or bison may be occurring on this study site. Heavy use by cattle and/or bison may have the potential to result in reduced abundance and diversity of the herbaceous understory.

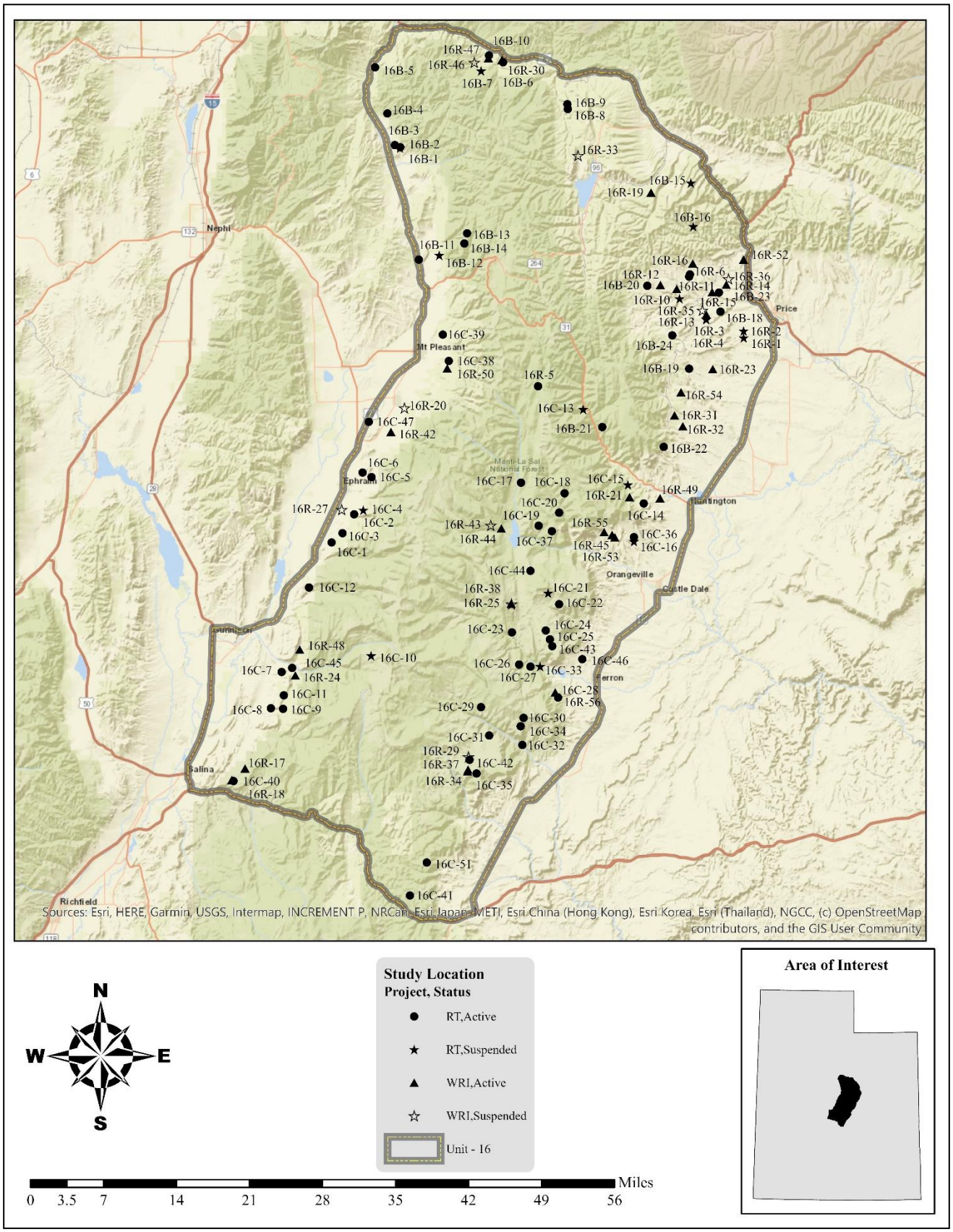
While the conifer community at this particular study is currently small, it is recommended that work to prevent future pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) begin in areas when it is deemed necessary. In addition, further investigation of the Cave Flat Chaining 2 study and adjacent areas may be recommended to help determine if high use by cattle and/or bison is occurring throughout the surrounding area. Treatments to reduce annual grasses may be advisable if the ecological integrity of this site is threatened. If reseeding is needed to restore herbaceous communities, care should be taken in seed selection and preference should be given to native species when possible.

Desert (Shadscale)

The studies within the Desert (Shadscale) ecological type are considered to be bison habitat. The desert shrub communities on these sites support herbaceous populations that are in poor condition and provide little forage for wildlife, particularly on the Bullfrog benches study. Pellet group data indicates that high cattle and/or bison use may be occurring on both sites. High use by roughage eaters may lead to reduced abundance and diversity of the herbaceous understory. Annual grasses have been observed in low amounts on the Bullfrog Benches site. In addition, climate change is a high-level concern on the Bullfrog Benches study, as it may result in the loss of habitat and/or shifts in the ecological community type.

Treatments to reduce amounts of annual grasses may be beneficial if they increase in the future. Further examination of these study sites and surrounding areas may be advisable to determine if high cattle and/or bison use is occurring throughout the surrounding area. Finally, it may be beneficial to review management strategies in response to potential ecological shifts caused by climate change.

4. WILDLIFE MANAGEMENT UNIT 16B, 16C – MANTI CENTRAL MOUNTAINS



WILDLIFE MANAGEMENT UNIT 16B, 16C – MANTI CENTRAL MOUNTAINS

Boundary Description

16B: Utah, Sanpete, Emery, and Carbon counties - Boundary begins at SR-10 and SR-31 in Huntington; north on SR-10 to Highway US-6; northwest on US-6 to Highway US-89; south on US-89 to SR-31; southeast on SR-31 to Huntington.

16C: Sanpete, Emery, and Sevier counties – Boundary begins at the junction of SR-10 and SR-31 at Huntington; south on SR-10 to Interstate 70; west on I-70 to Highway US-89 at Salina; north on US-89 to SR-31 at Fairview; southeast on SR-31 to SR-10 at Huntington.

Management Unit Description

Climate Data

The 30-year (1981-2010) annual precipitation PRISM model shows precipitation on unit 16B ranges from 9 inches on the eastern side of the unit to 32 inches on the central peaks of the unit. All of the Range Trend and WRI monitoring studies in unit 16B occur within 10-26 inches of precipitation. Precipitation on unit 16C varies between 7 inches near the town of Castle Dale and in the southeastern portion of the unit and 42 inches on the high-elevation peaks of the Central Mountains. All Range Trend and WRI monitoring studies in unit 16C occur within 10-28 inches of precipitation (**Map 4.1**) (PRISM Climate Group, Oregon State University, 2013).

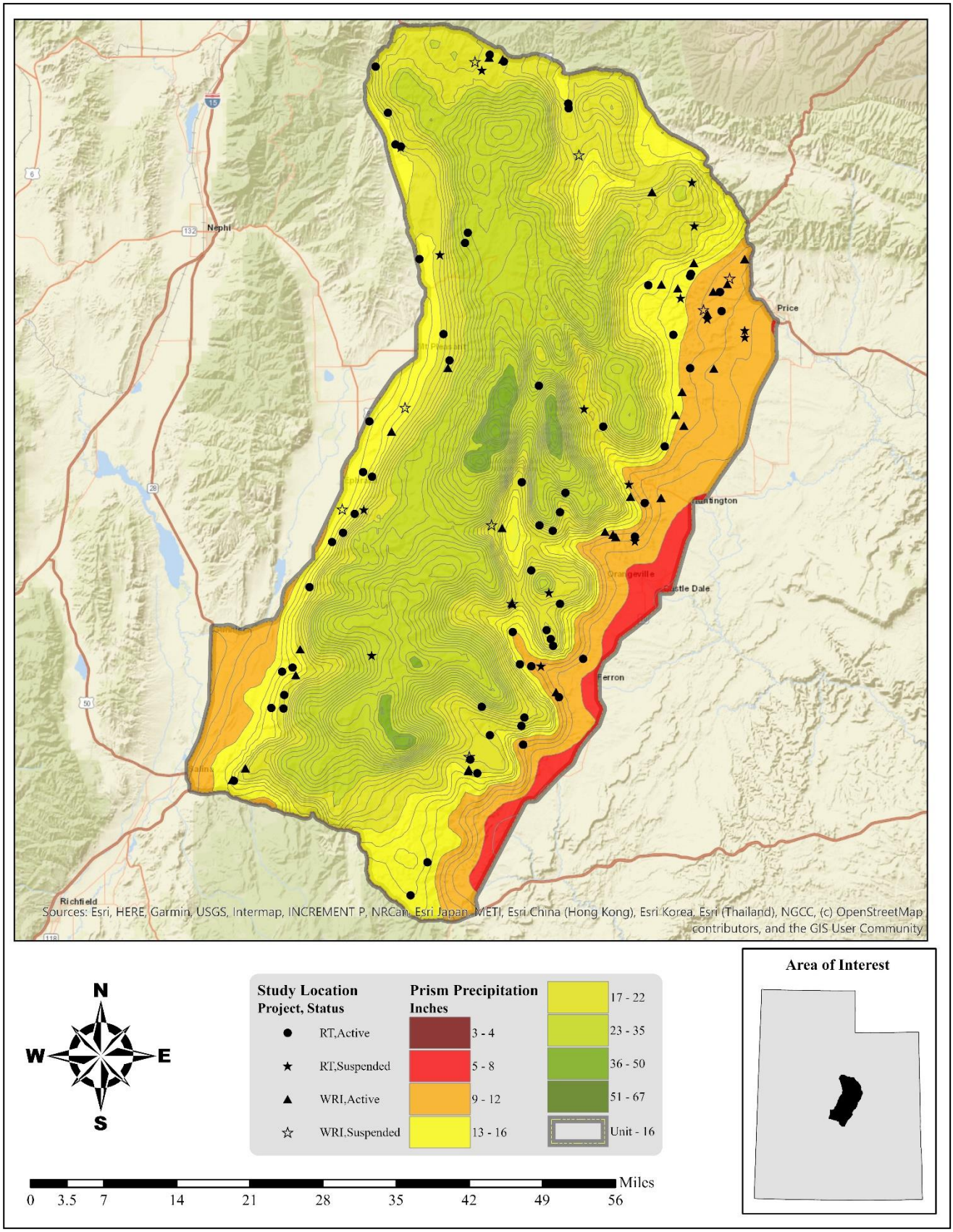
Vegetation trends are dependent upon annual and seasonal precipitation patterns. Palmer Drought Severity Index (PDSI) data for the unit was compiled from the National Oceanic and Atmospheric Administration (NOAA) Physical Sciences Division (PSD) as part of the South Central, Northern Mountains, and Southeast divisions (Division 4, 5, and 7).

The mean annual PDSI of the South Central division displayed years of moderate to extreme drought from 1989-1990. 2002-2003, 2012-2014, and 2018. The mean annual PDSI displayed moderately to extremely wet years from 1983-1985, 1997-1998, 2005, 2011, and 2019 (**Figure 4.1a**). The mean spring (March-May) PDSI displayed years of moderate to extreme drought in 1989-1990, 1996, 2000, 2002-2004, 2013-2014, and 2018. Moderately to extremely wet years for this time period were displayed in 1983-1986, 1995, 1998-1999, 2005, 2011, and 2019. The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1989-1990, 2002-2003, 2007, 2009, and 2012; moderately to extremely wet years were displayed in 1982-1985, 1997-1998, 2005, 2011, and 2019 (**Figure 4.1b**) (Time Series Data, 2020).

The mean annual PDSI of the Northern Mountains division displayed years of moderate to extreme drought from 1988-1990, 2000-2003, 2012-2013, and 2018. The mean annual PDSI displayed moderately to extremely wet years from 1982-1986, 1995, 1997-1998, 2005, 2011, and 2019 (**Figure 4.2a**). The mean spring (March-May) PDSI displayed years of moderate to extreme drought in 1989-1990, 1992, 2000-2004, 2012-2014, and 2018. Moderately to extremely wet years for this time period were displayed in 1982-1986, 1995-1996, 1998-1999, 2005, 2011, and 2019. The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1988-1990, 2000-2003, 2007, and 2012-2013; moderately to extremely wet years were displayed in 1982-1986, 1995, and 1997-1998 (**Figure 4.2b**) (Time Series Data, 2020).

Finally, the mean annual PDSI of the Southeast division displayed years of moderate to extreme drought from 1989-1990, 2002-2003, 2009, 2012, and 2018. The mean annual PDSI displayed moderately to extremely wet years from 1983-1985, 2005, and 2019 (**Figure 4.3a**). The mean spring (March-May) PDSI displayed years of moderate to extreme drought in 1989-1991, 1996, 2002-2004, 2012-2013, and 2018. Moderately to extremely wet years for this time period were displayed in 1983-1985, 1993, 2005, and 2019. The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1989-1990, 2002-2003, 2009, 2012, and 2017;

moderately to extremely wet years were displayed in 1983-1985, 1997, 2013, and 2019 (**Figure 4.3b**) (Time Series Data, 2020).



Map 4.1: The 1981-2010 PRISM Precipitation Model for WMU 16B, 16C, Manti Central Mountains (PRISM Climate Group, Oregon State University, 2013).

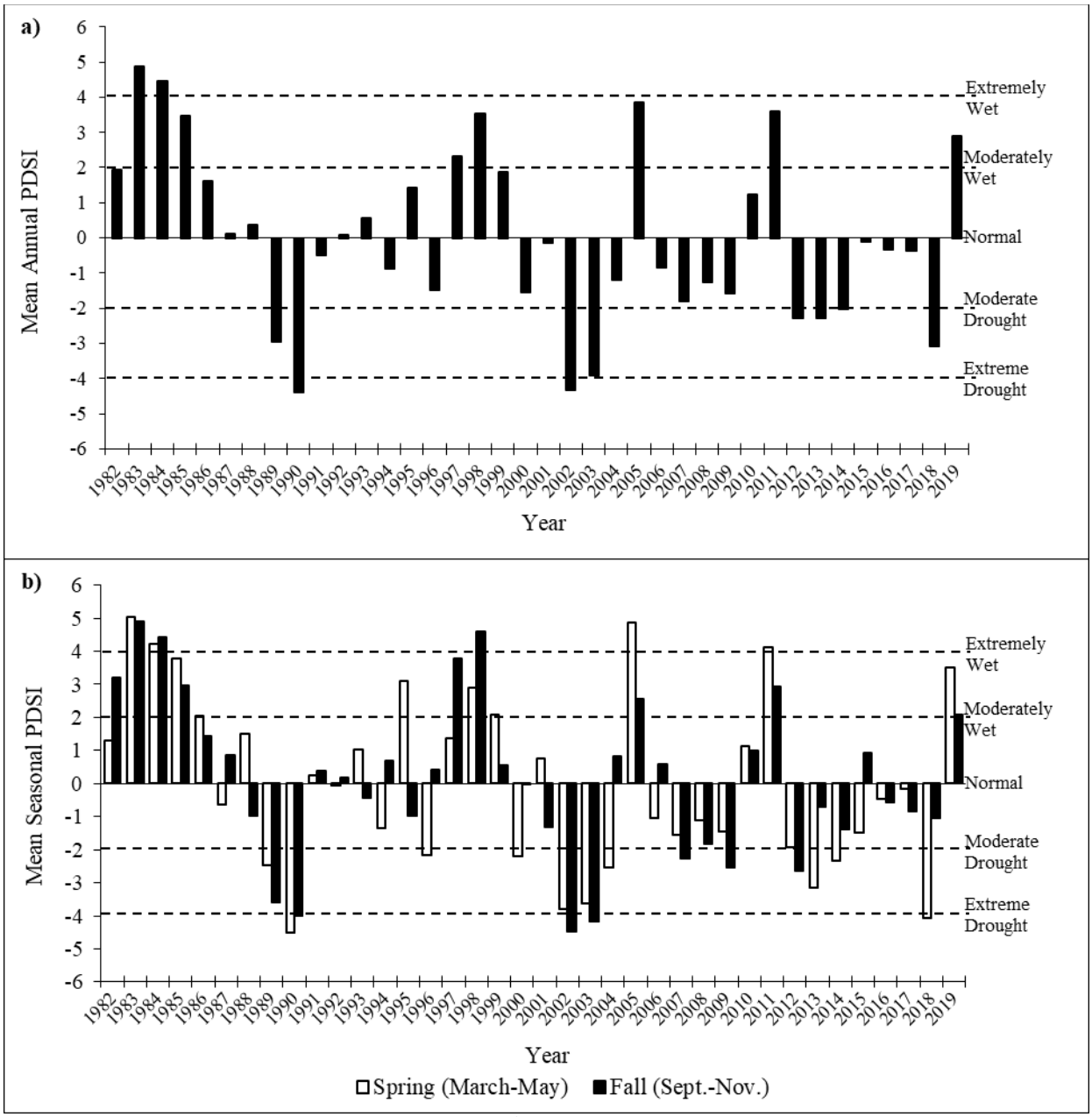


Figure 4.1: The 1982-2019 Palmer Drought Severity Index (PDSI) for the South Central division (Division 4). The PDSI is based on climate data gathered from 1895 to 2019. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought. a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.) (Time Series Data, 2020).

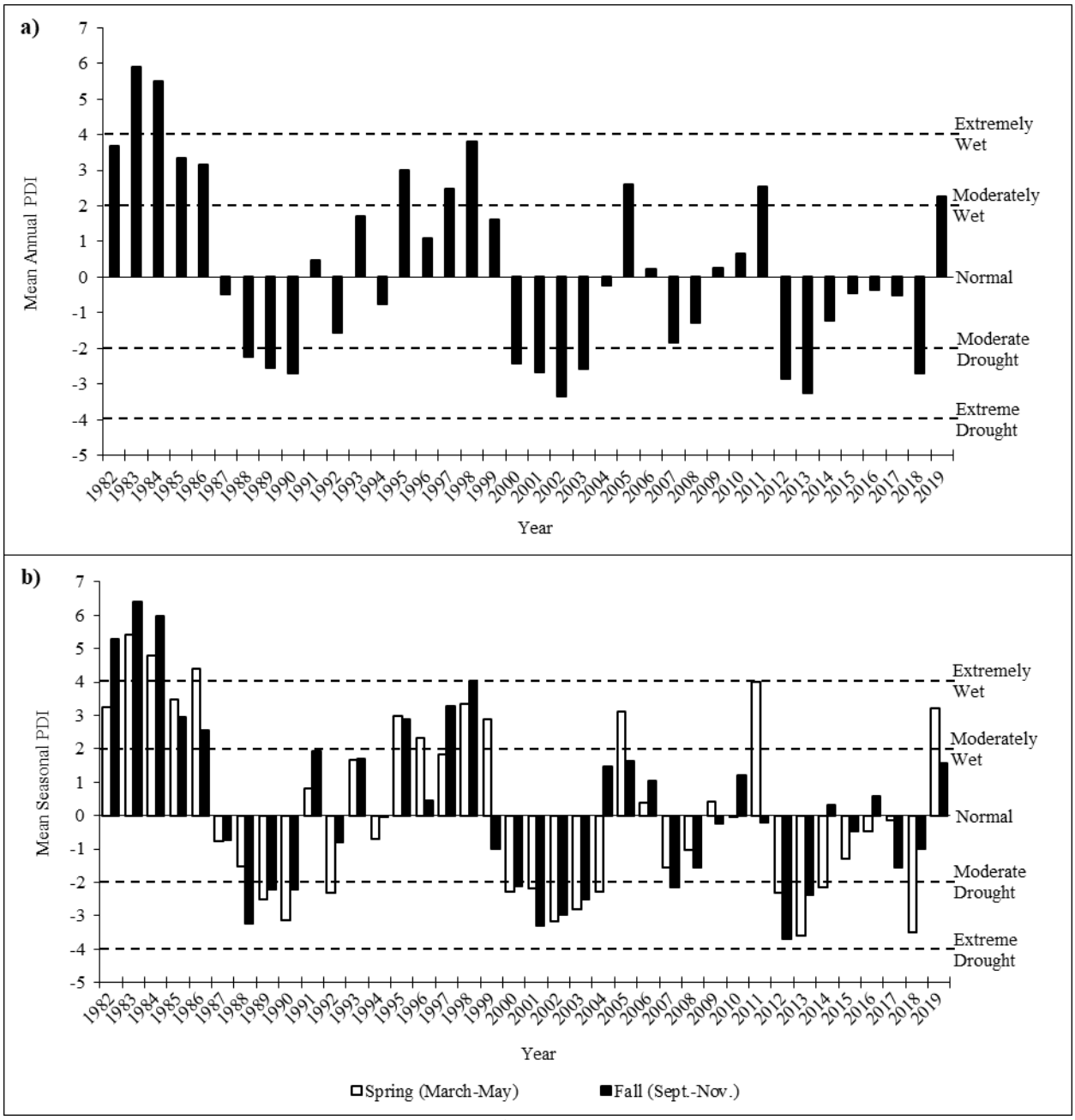


Figure 4.2: The 1982-2019 Palmer Drought Severity Index (PDSI) for the Northern Mountains division (Division 5). The PDSI is based on climate data gathered from 1895 to 2019. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought. a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.) (Time Series Data, 2020).

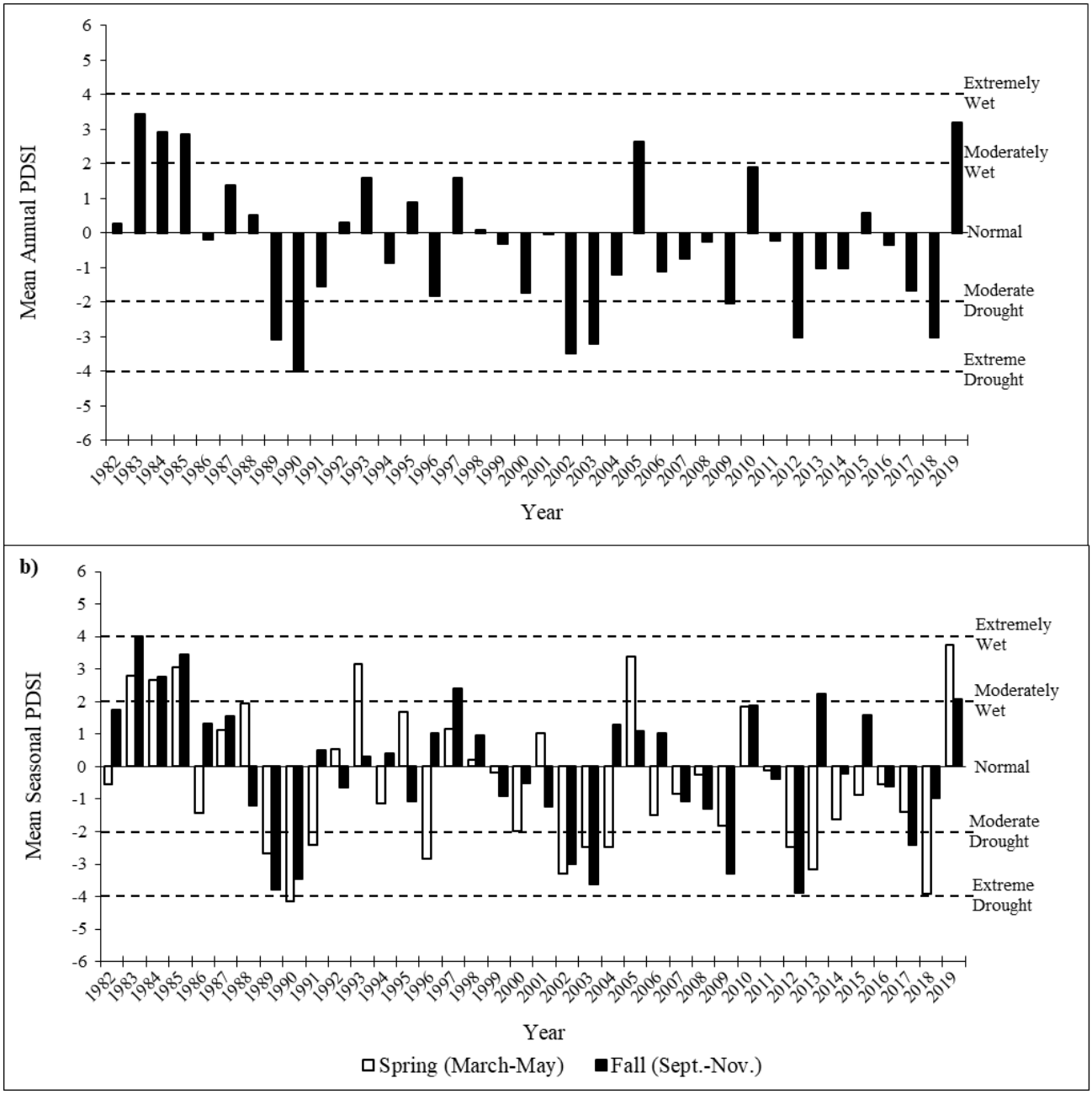


Figure 4.3: The 1982-2019 Palmer Drought Severity Index (PDSI) for the Southeast division (Division 7). The PDSI is based on climate data gathered from 1895 to 2019. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought. a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.) (Time Series Data, 2020).

Geography

Wasatch Plateau

Unit 16B covers the eastern and western sides of the Wasatch Plateau. Skyline Drive to Soldier Summit roughly divides the eastern and western halves of the unit. This unit was previously called the Northeast Manti Deer Herd Unit 30. In the spring of 1998, Deer Herd Unit 30 was incorporated into the much larger Wildlife Management Unit 16.

Unit 16C was previously called Deer Herd Unit 31 – South East Manti, but was enlarged in the spring of 1998 to include both the eastern and western sides of the Wasatch Plateau and renamed Wildlife Management Unit 16C. Unit 16C is a subunit of the very large WMU 16, which encompasses areas in Utah, Carbon, Juab, Sevier, and Sanpete counties.

Wildlife Management Unit 16C covers the southern portion of the Wasatch Plateau; as with unit 16B, this subunit's western and eastern halves are divided roughly by Skyline Drive. The upper limits of the winter range on 16C generally follow the rim of the plateau and the 9,000-foot contour of the south and west exposures of the large canyons and mountain slopes. Many of the plateaus drop steeply to the valley floor below the very lowest portion of the herd unit, which supports a low desert shrub type on unproductive shale hills: this acreage is not considered to be part of the winter range.

Big Game Habitat

There are an estimated 1,491,080 acres classified as deer range within Unit 16B, 16C with 44% classified as winter range, 35% as summer range, 14% as spring/fall range, 7% as winter/spring range, and less than 1% as year-long range (**Table 4.1**, **Map 4.2**). The United States Forest Service (USFS) administers 32% of the deer winter range, 30% is privately held, 19% is managed by the Bureau of Land Management (BLM), the School and Institutional Trust Lands Administration (SITLA) manages 12%, 7% is owned by the Utah Division of Natural Resources (UDNR), and the Utah Department of Transportation (UDOT) and Department of Defense (DOD) each administer less than 1% (**Table 4.2**, **Map 4.2**, **Map 4.6**). Of the elk winter range, 42% is managed by the USFS, 23% is privately owned, 16% is managed by the BLM, 16% is administered by SITLA, 8% is owned by UDNR, and UDOT and the DOD each administer less than 1% (**Table 4.3**, **Map 4.3**, **Map 4.6**).

Central Mountains Manti North

Most of the winter range in subunit 16B lies on the east side of the Wasatch Plateau, which rises straight up from the valley floor to ridges with heights of over 9,500 feet. The winter range is a narrow strip of land along the base of the plateau below the 8,000 foot contour: it runs from Price Canyon south to Huntington Canyon. Other important winter ranges include a large section of land along the Price River in the Colton area, below Scofield Reservoir, and in the mouths of several side canyons in Huntington Canyon. Elk winter ranges are found on south-facing grassy points at high elevations on the Wasatch Plateau.

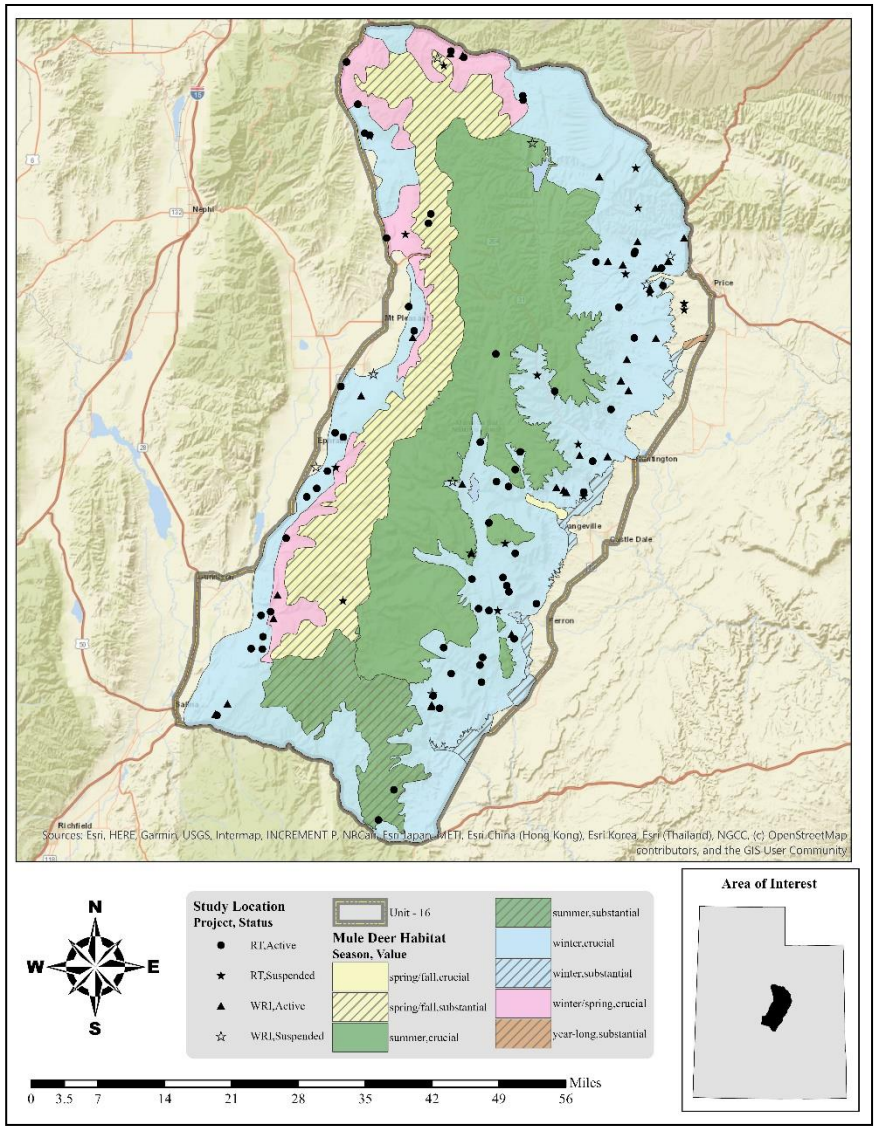
Key wintering areas for deer include Wildcat Canyon and the Gordon Creek basin, Consumers Bench, Porphyry Bench, North Spring, several areas in Huntington Canyon, Gentry Mountain, Spring Canyon drainages, and the foothills along US-89 and US-6. Preferred elk wintering areas include Miles Point, Reynolds Point on Trail Mountain, Telephone Bench, and Diamanti Bench. The winter range is made up of several habitat types, including pinyon-juniper, sagebrush-grass, mountain brush, grassland, seedings, and other miscellaneous vegetation types.

Central Mountains Manti South

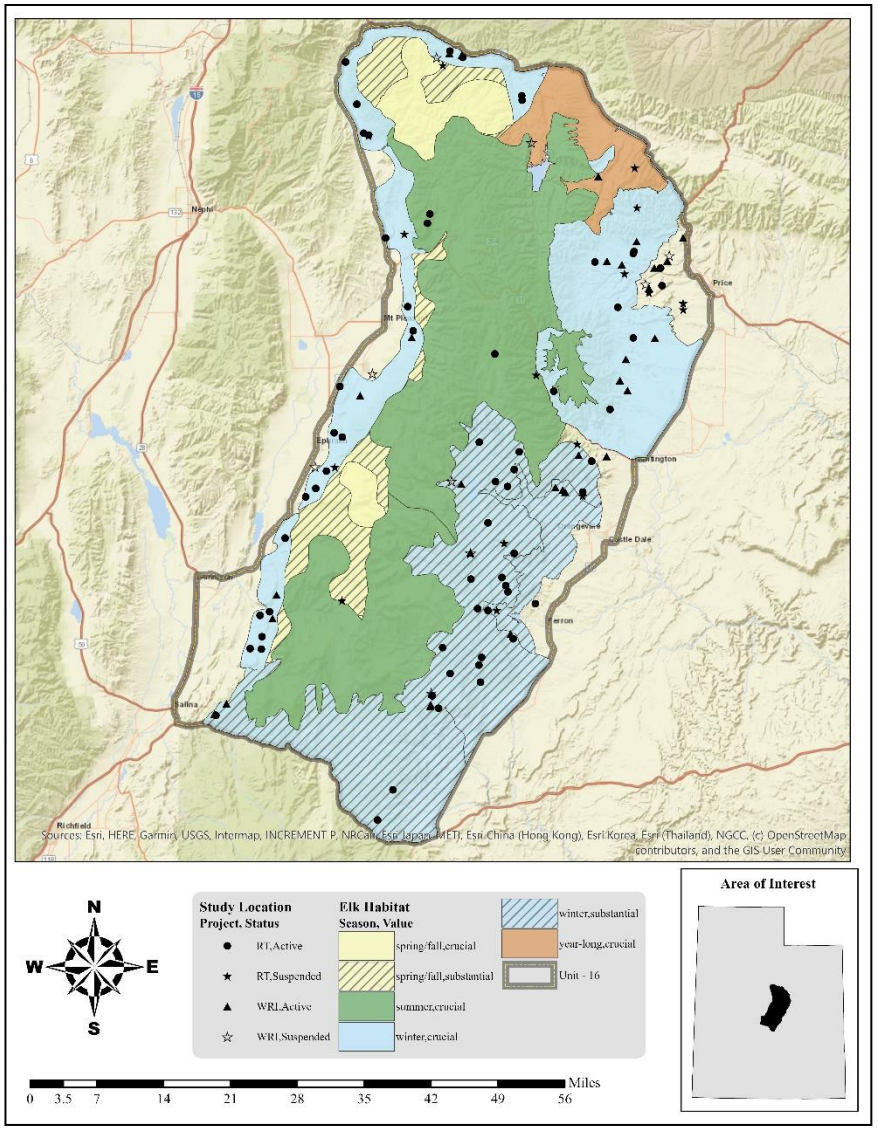
The key deer wintering areas in subunit 16C are the lower end of Muddy Creek and Ferron Creek, Black Dragon, Biddlecome Hollow, Cottonwood Canyon, and Huntington Canyon. Elk winter higher on Trail Mountain, North and South Horn Mountain, Sage Flat, and on the foothills along US-89 from Salina to Mount

Pleasant: deer also utilize these areas during mild winters. Elk utilize the mountain mahogany and sagebrush on the lower points of the plateau, such as North and South Horn Mountain and Trail Mountain. Much of this key winter range is located on Forest Service lands.

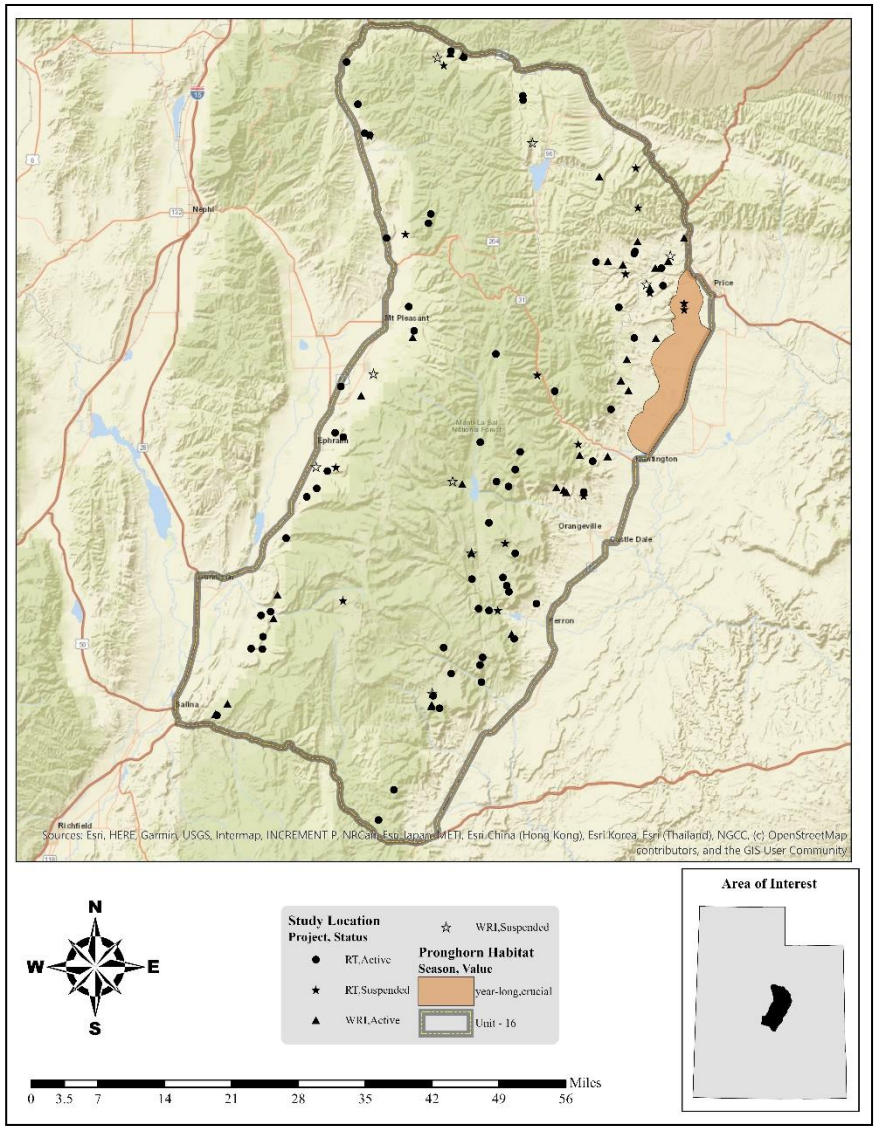
Pinyon-juniper benches become more limited in the southern portion of the unit and there are mostly low desert shrub foothills associated with Muddy Creek. Overall, the pinyon-juniper vegetation type comprises a fair amount of the winter range at low elevations, but is not considered to be critical to the trend monitoring program. However, chained and seeded portions of this type provide important wintering areas and are monitored for trends; chaining treatments are sampled in the foothills from Huntington Canyon to south of Dry Wash, and other key areas at Middle and Dry Mountains are also sampled. The big sagebrush-grass vegetation type is found on many key areas on the Northeast Manti Unit, but also on high-elevation elk winter range on Trail, East, and Horn Mountains. Big sagebrush-grass is limited on crucial deer winter range, but key areas are located on Black Dragon and Muddy Creek.



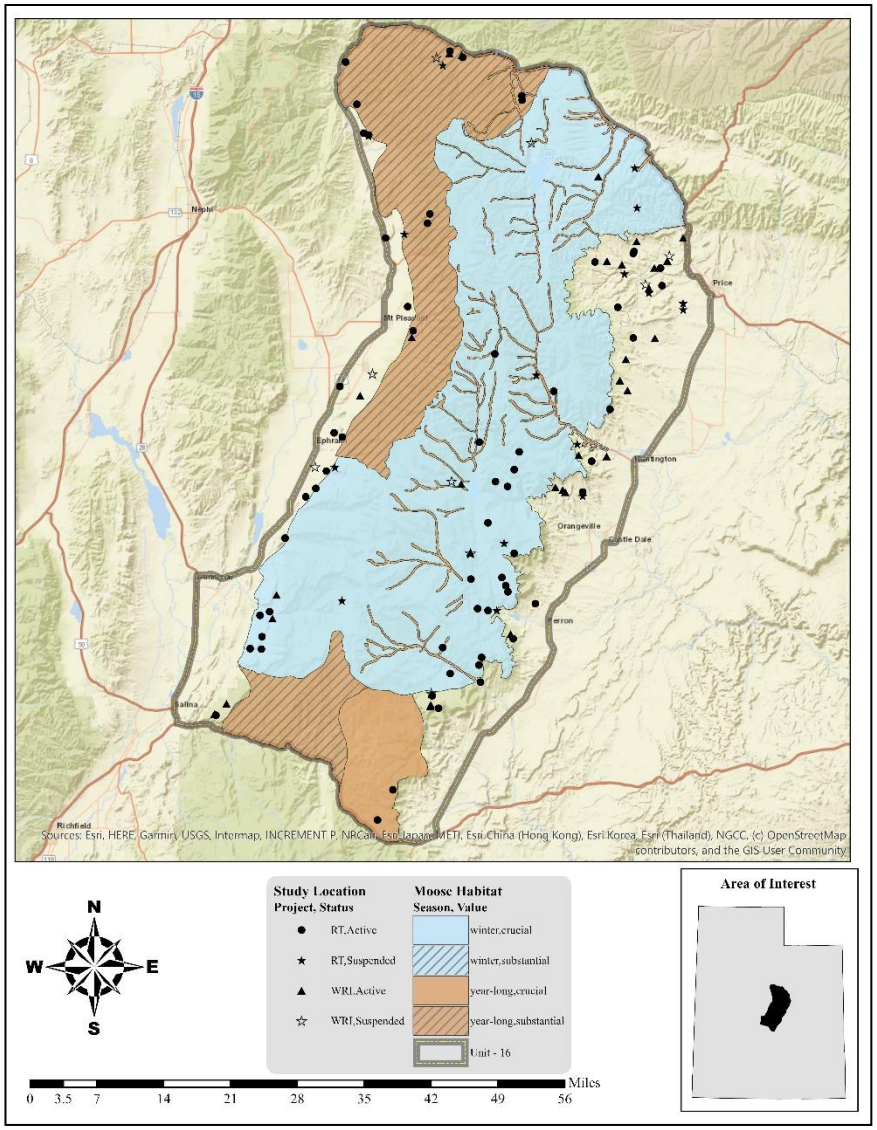
Map 4.2: Estimated mule deer habitat by season and value for WMU 16B, 16C, Manti Central Mountains.



Map 4.3: Estimated elk habitat by season and value for WMU 16B, 16C, Manti Central Mountains.



Map 4.4: Estimated pronghorn habitat by season and value for WMU 16B, 16C, Manti Central Mountains.



Map 4.5: Estimated moose habitat by season and value for WMU 16B, 16C, Manti Central Mountains.

	Year Long Range		Summer Range		Winter Range		Spring/Fall Range		Winter/Spring Range	
Species	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
Mule Deer	1,113	<1%	514,225	35%	660,075	44%	214,607	14%	101,060	7%
Elk	63,006	4%	538,234	37%	705,159	48%	151,899	11%	0	0%
Pronghorn	40,620	100%	0	0%	0	0%	0	0%	0	0%
Moose	423,095	36%	0	0%	768,569	64%	0	0%	0	0%

Table 4.1: Estimated mule deer, elk, pronghorn, and moose habitat acreage by season for WMU 16B, 16C, Manti Central Mountains.

	Year Long Range		Summer Range		Winter Range		Spring/Fall Range		Winter/Spring Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	25	2%	4,935	1%	122,496	19%	1,067	1%	2,169	2%
Private	51	5%	86,277	17%	194,785	30%	22,256	10%	33,366	33%
SITLA	1,037	93%	4,796	1%	81,013	12%	28	<1%	703	1%
USFS	0	0%	416,093	81%	211,667	32%	189,142	88%	46,697	46%
UDOT	0	0%	0	0%	92	<1%	0	0%	2	<1%
UDNR	0	0%	2,125	<1%	49,960	7%	2,115	1%	18,107	18%
DOD	0	0%	0	0%	62	<1%	0	0%	16	<1%
Total	1,113	**100%**	514,225	**100%**	660,075	**100%**	214,607	**100%**	101,060	**100%**

Table 4.2: Estimated mule deer habitat acreage by season and ownership for WMU 16B, 16C, Manti Central Mountains.

	Year Long Range		Summer Range		Winter Range		Spring/Fall Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	8,363	13%	935	<1%	111,240	16%	789	<1%
Private	47,611	76%	98,887	18%	163,171	23%	11,617	8%
SITLA	1,387	2%	3,121	1%	78,349	11%	10	<1%
USFS	929	2%	430,064	80%	297,134	42%	134,637	89%
UDOT	8	<1%	15	<1%	59	<1%	0	0%
UDNR	4,708	7%	5,211	1%	55,129	8%	4,845	3%
DOD	0	0%	0	0%	78	<1%	0	0%
Total	63,006	**100%**	538,234	**100%**	705,159	**100%**	151,899	**100%**

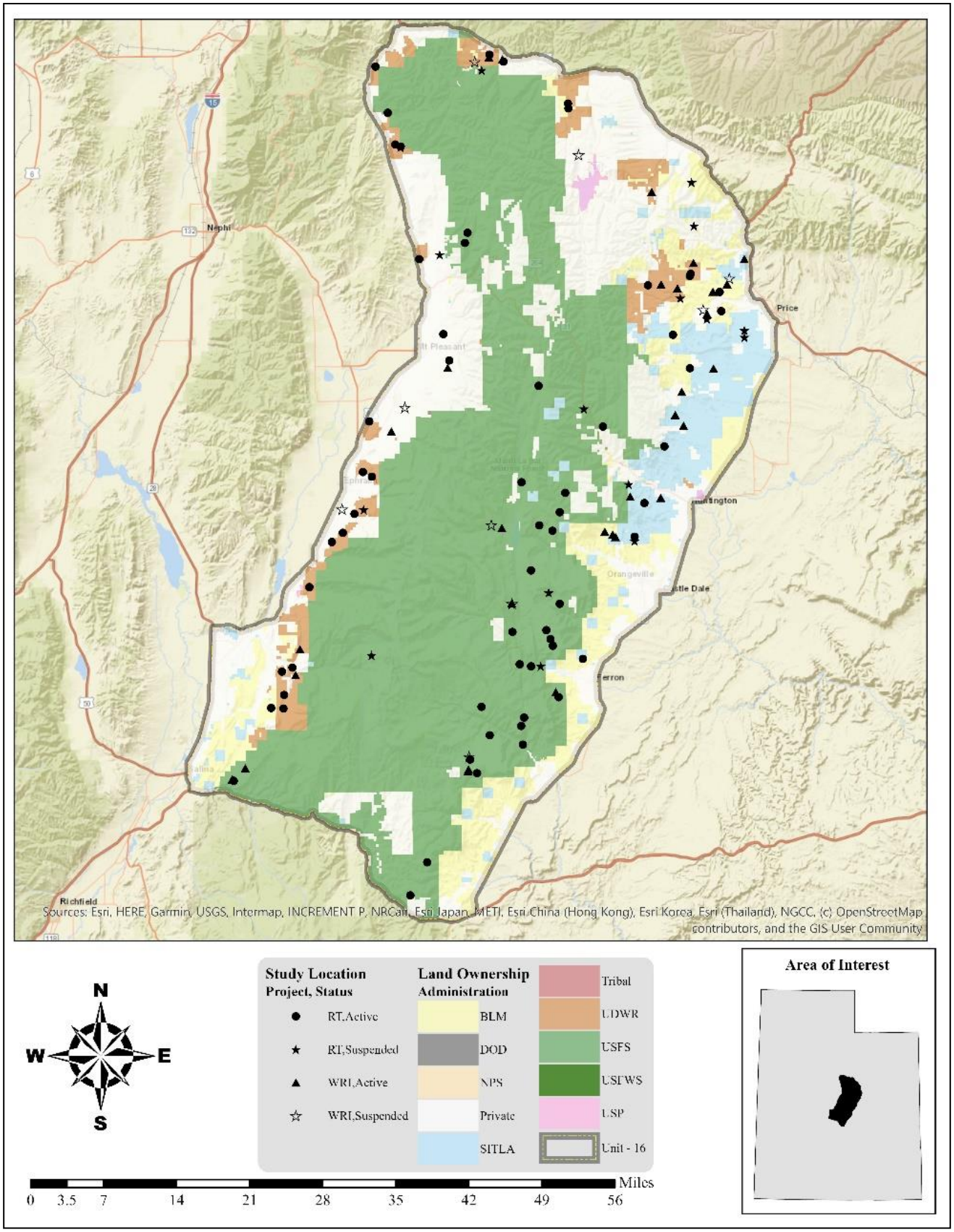
Table 4.3: Estimated elk habitat acreage by season and ownership for WMU 16B, 16C, Manti Central Mountains.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	9,361	23%
Private	5,229	13%
SITLA	25,685	63%
UDNR	329	1%
UDOT	15	<1%
Total	40,620	**100%**

Table 4.4: Estimated pronghorn habitat acreage by season and ownership for WMU 16B, 16C, Manti Central Mountains.

	Year Long Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	4,617	1%	31,456	4%
Private	106,633	25%	163,708	21%
SITLA	1,420	1%	14,551	2%
USFS	293,497	69%	526,450	69%
UDOT	31	<1%	28	<1%
UDNR	16,819	4%	32,375	4%
DOD	78	<1%	0	0%
Total	423,095	**100%**	768,569	**100%**

Table 4.5: Estimated moose habitat acreage by season and ownership for WMU 16B, 16C, Manti Central Mountains.



Map 4.6: Land ownership for WMU 16B, 16C, Manti Central Mountains.

Group	Existing Vegetation Type	Acres	% of Total	Group % of Total
Open Tree Canopy	Colorado Plateau Pinyon-Juniper Woodland	210,011	17.02%	
	Rocky Mountain Aspen Forest and Woodland	142,772	11.57%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	62,080	5.03%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	14,015	1.14%	
	Other Open Tree Canopy	10,392	0.84%	
	Southern Rocky Mountain Ponderosa Pine Woodland	8,880	0.72%	
	Rocky Mountain Bigtooth Maple Ravine Woodland	9,562	0.77%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	6,764	0.55%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	5,086	0.41%	
	Rocky Mountain Lower Montane-Foothill Riparian Woodland	2,898	0.23%	
	Western Cool Temperate Forest	2,476	0.20%	
	Great Basin Pinyon-Juniper Woodland	1,355	0.11%	
	Rocky Mountain Lower Montane-Foothill Riparian Shrubland	1,100	0.09%	
	Interior West Ruderal Riparian Forest	10	0.00%	
	Great Basin Foothill and Lower Montane Riparian	6	0.00%	38.69%
Shrubland	Herbaceous - Shrub-Steppe	179,749	14.57%	
	Dwarf-Shrubland	56,587	4.59%	
	Inter-Mountain Basins Big Sagebrush Shrubland	49,283	3.99%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	41,715	3.38%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	41,358	3.35%	
	Rocky Mountain Lower Montane-Foothill Shrubland	11,854	0.96%	
	Great Basin & Intermountain Ruderal Shrubland	11,389	0.92%	
	Other Shrubland	10,939	0.89%	
	Great Basin Xeric Mixed Sagebrush Shrubland	9,138	0.74%	
	Inter-Mountain Basins Greasewood Flat	3,748	0.30%	
	Western Cool Temperate Shrub	2,610	0.21%	
	Rocky Mountain Subalpine-Montane Riparian Shrubland or Woodland	2,018	0.16%	
	Interior Western Ruderal Shrub	1,861	0.15%	
	Colorado Plateau Pinyon-Juniper Shrubland	1,662	0.13%	
	Great Basin Semi-Desert Chaparral	61	0.00%	34.36%
Closed Tree Canopy	Southern Rocky Mountain Montane Mixed Conifer Forest and Woodland	68,210	5.53%	
	Rocky Mountain Subalpine Spruce-Fir Forest and Woodland	61,354	4.97%	10.50%
Grassland	Western Cool Temperate Agriculture	43,283	3.51%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	19,217	1.56%	
	Southern Rocky Mountain Montane-Subalpine Grassland	15,434	1.25%	
	Interior Western North American Temperate Ruderal Grassland	6,250	0.51%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	5,766	0.47%	
	Inter-Mountain Basins Semi-Desert Grassland	5,509	0.45%	
	Other Grassland	5,496	0.45%	
	Great Basin & Intermountain Introduced Annual Grassland	3,473	0.28%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	2,621	0.21%	
	Rocky Mountain Alpine Grassland	1,564	0.13%	
	Western North American Ruderal Grassland	415	0.03%	
	North American Arid West Emergent Marsh	162	0.01%	8.85%
Other	Sparsely Vegetated	74,177	6.01%	
	Developed	14,760	1.20%	
	Open Water	4,291	0.35%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	683	0.06%	7.61%
Total		**1,234,044**	**100%**	**100%**

Table 4.6: LANDFIRE Existing Vegetation Coverage (LANDFIRE.US_140EVT, 2020) for WMU 16B, 16C, Manti Central Mountains.

Limiting Factors to Big Game Habitat

Central Mountains Manti North

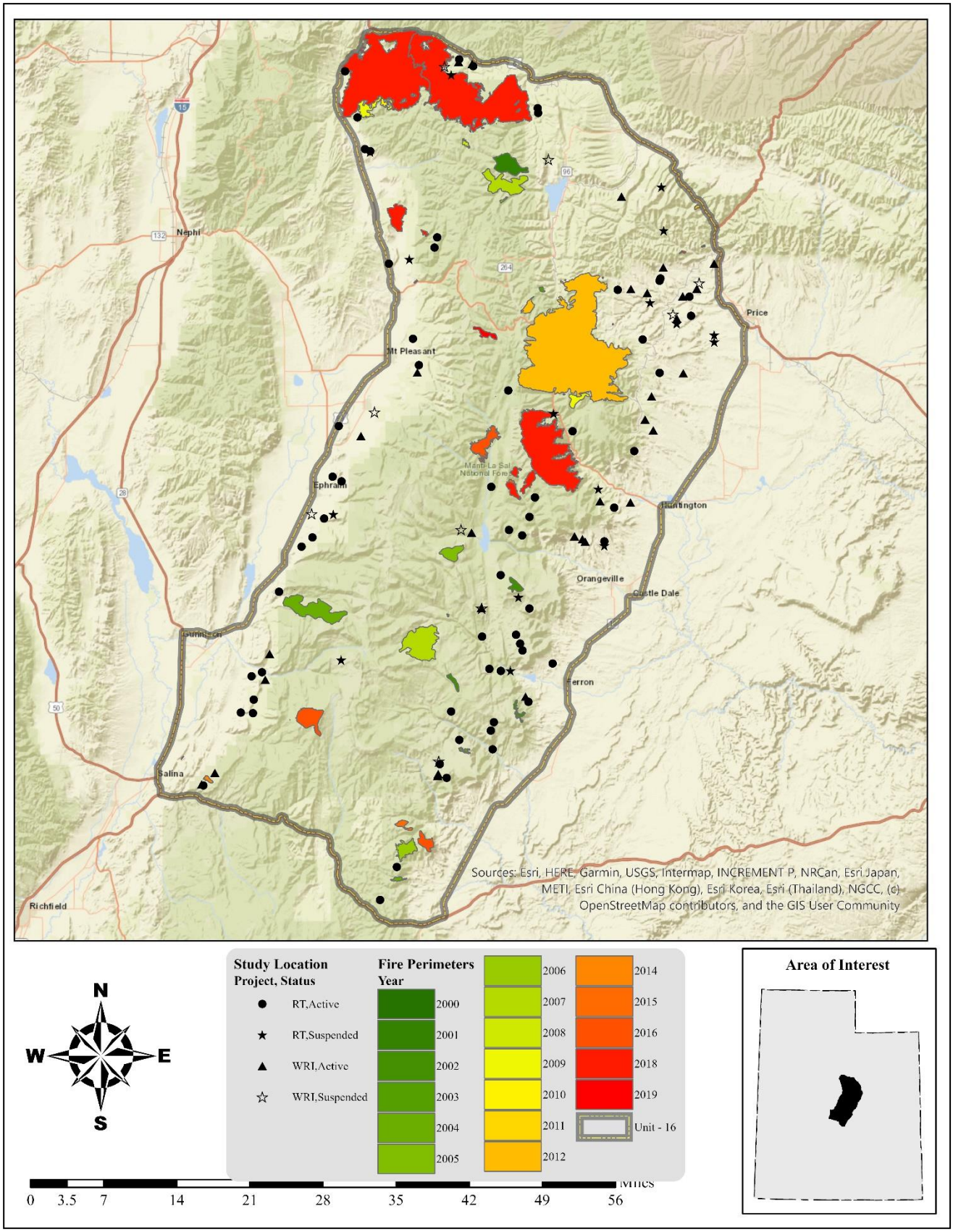
The Manti North area has historically supported a variety of wildlife and outdoor recreation, livestock grazing, ranches and farms, energy developments, and some forest industry. Industrial activities in the subunit are associated primarily with coal production, electrical power generation, and oil and gas development. Exploration and development activities for oil and gas have the potential for future increases and demands placed upon winter ranges in this area will likely increase. Power plants, pipelines, slack piles, coal load-out facilities, ghost towns, railroads, and agriculture all compete for valuable winter range land area: the Huntington Canyon Power Plant alone has removed over 400 acres of crucial winter range. An extensive road system provides year-round access to large portions of the winter range. Furthermore, heavily-used access roads to coal mines dissect important winter ranges all along the east side of the Wasatch Plateau and are accountable for a large number of the highway deer mortality.

Central Mountains Manti South

The upper portions of the winter range on Forest Service lands are managed primarily for livestock grazing. Widespread watershed rehabilitation through contour trenching and seeding was done on this rangeland in the 1960s. An extensive road system provides access to a large percentage of the winter range. Many roads in crucial areas are open or maintained and used winter-long in relation to various activities including mining, gas wells, the Horn Mountain TV towers, and for recreation. However, access is more restricted further south in the Ferron and Muddy Creek Drainages. The lowest foothill ranges are accessible year-round and are usually adjacent to agricultural areas. Coal mining and power plants are the major economic activities in the area. Other associated impacts include road improvements, truck traffic, and an increased human population. In addition, outdoor recreation is popular in the area: these activities include camping, hunting, fishing, four-wheeling, and snowmobiling and are facilitated by the extensive road system in the mountains and foothills.

Both

Encroachment of pinyon and juniper trees is an additional limiting factor in both subunits. According to the current LANDFIRE Existing Vegetation Coverage model, pinyon-juniper woodlands comprise just over 17% of the unit (**Table 4.6**). While these woodlands provide valuable escape and thermal cover for wildlife, encroachment and invasion into historic shrublands reduces available browse (Miller, Svejcar, & Rose, 2000), and may therefore influence the carrying capacity of the unit.



Map 4.7: Land coverage of fires by year from 2000-2019 for WMU 16B/C, Manti North/South (Geosciences and Environmental Change Science Center (GECSC) Outgoing Datasets, 2020).

Treatments/Restoration Work

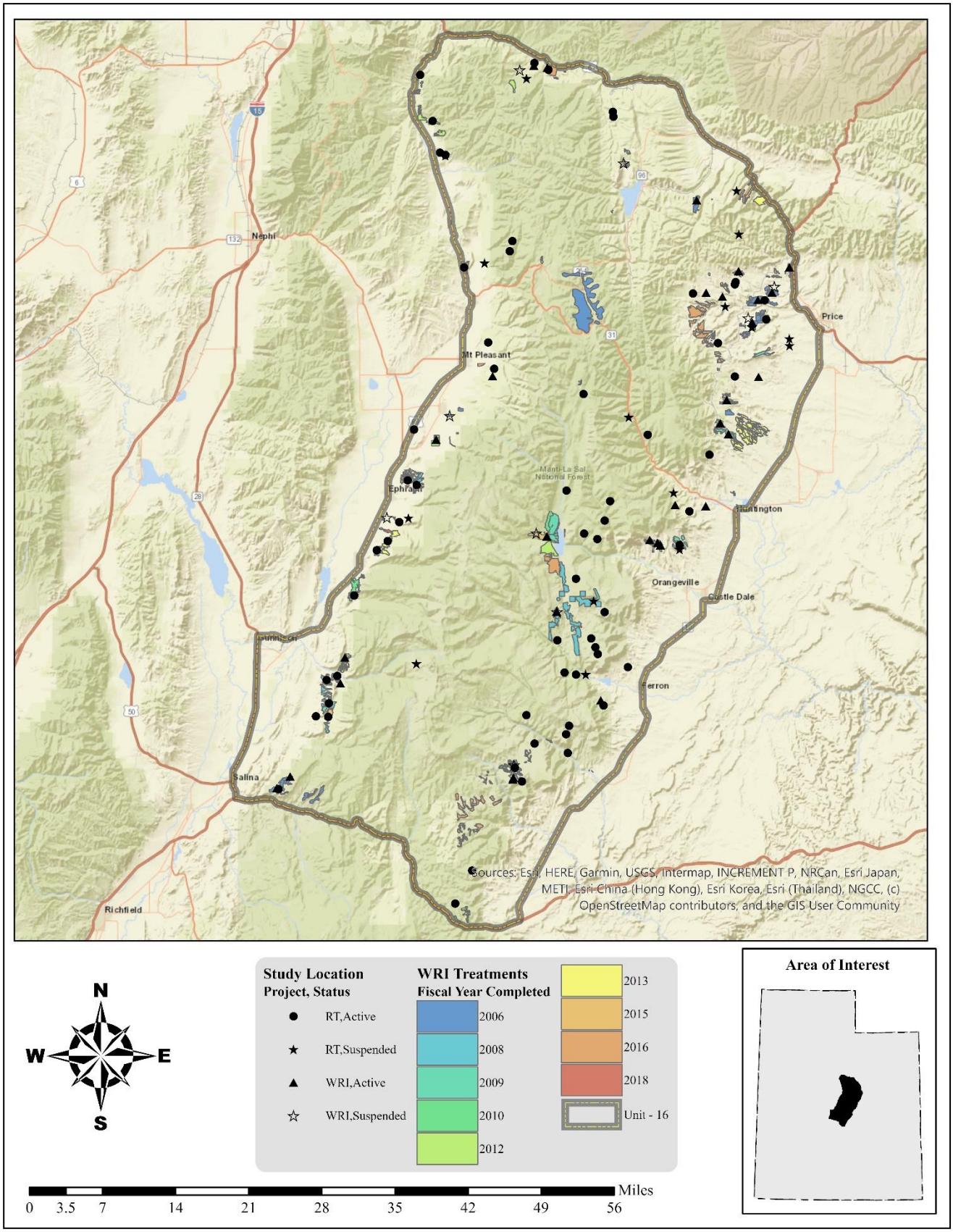
There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 62,609 acres of land have been treated within the Manti Central Mountains subunit since the WRI was implemented in 2004 (**Map 4.8**). An additional 8,854 acres are currently being treated and treatments have been proposed for 42,802 acres. Treatments frequently overlap one another bringing the total completed treatment acres to 91,559 acres for this unit (**Table 4.7**). Other treatments have occurred outside of the WRI through independent agencies and landowners, but the WRI comprises the majority of work done on deer winter ranges throughout the state of Utah.

Skid-steer mounted bullhog treatments and manual vegetation removal such as lop and scatter treatments are the most common treatment by acreage across the Manti Central Mountains unit. Seeding plants to supplement the herbaceous understory is also common. There is a significant amount of acreage proposed to undergo a prescribed fire treatment. Other treatments include anchor chaining, harrowing and herbicide treatments (**Table 4.7**).

Type	Completed Acreage	Current Acreage	Proposed Acreage	Total Acreage
Aerator	**2,320**	**0**	**0**	**2,320**
Double Drum (One-Way)	1,105	0	0	1,105
Double/Single Drum (One-Way)	1,215	0	0	1,215
Anchor Chain	**5,108**	**0**	**1,071**	**6,179**
Ely (One-Way)	2,450	0	0	2,450
Ely (Two-Way)	389	0	1,071	1,460
Ely/Smooth (Two-Way)	2,269	0	0	2,269
Bulldozing	**520**	**0**	**0**	**520**
Tree Push	469	0	0	469
Other	51	0	0	51
Bullhog	**16,236**	**3,104**	**3,832**	**23,172**
Full Size	2,173	2,038	2,236	6,447
Skid Steer	14,063	1,066	0	15,129
Full Size/Skid Steer	0	0	1,596	1,596
Chain Harrow	**2,222**	**0**	**0**	**2,222**
≤15 ft. (One-Way)	9	0	0	9
≤15 ft. (Two-Way)	235	0	0	235
>15 ft. (One-Way)	228	0	0	228
>15 ft. (Two-Way)	1,750	0	0	1,750
Disc	**1,591**	**0**	**0**	**1,591**
Plow (One-Way)	10	0	0	10
Plow (Two-Way)	1,398	0	0	1,398
Off-Set (One-Way)	183	0	0	183
Forestry Practices	**0**	**352**	**88**	**440**
Thinning (Non-Commercial)	0	352	0	352
Group Selection Cuts	0	0	88	88
Harrow	**5,079**	**0**	**0**	**5,079**
≤15 ft. (One-Way)	3,112	0	0	3,112
≤15 ft. (Two-Way)	693	0	0	693
>15 ft. (Two-Way)	1,274	0	0	1,274
Herbicide Application	**8,222**	**423**	**871**	**9,516**
Ground	6,175	0	200	6,375
Aerial (Fixed-Wing)	934	299	0	1,233
Aerial (Helicopter)	573	0	671	1,244
Spot Treatment	540	124	0	664
Interseeding	**324**	**0**	**0**	**324**
Interseeding	324	0	0	324
Mowing	**896**	**0**	**0**	**896**
Brush Hog	846	0	0	846
Other	50	0	0	50
Planting/Transplanting	**45**	**0**	**49**	**94**
Container Stock	9	0	49	58
Bareroot/Container Stock	10	0	0	10
Other	26	0	0	26
Prescribed Fire	**1,848**	**0**	**16,367**	**18,215**
Prescribed Fire	1,848	0	16,367	18,215
Roller Chopper	**1,150**	**0**	**0**	**1,150**
One-Way	1,150	0	0	1,150
Seeding (Primary)	**26,061**	**1,703**	**12,600**	**40,364**
Broadcast (Aerial-Fixed Wing)	12,264	1,379	11,732	25,375

Broadcast (Aerial-Helicopter)	6,423	0	0	6,423
Broadcast (Aerial-Fixed Wing)/Ground (Mechanical Application)	1,550	0	868	2,418
Ground (Mechanical Application)	3,470	0	0	3,470
Drill (Rangeland)	2,194	324	0	2,518
Drill (Truax)	93	0	0	93
Drill (Truax)/Ground (Mechanical Application)	40	0	0	40
Hand Seeding	27	0	0	27
Seeding (Secondary)	**4,248**	**1,066**	**0**	**5,314**
Broadcast (Aerial-Fixed Wing)	3,587	0	0	3,587
Broadcast (Aerial-Helicopter)	498	0	0	498
Ground (Mechanical Application)	163	1,066	0	1,229
Brush Saw	**388**	**0**	**0**	**388**
Hydraulic Brush Saw	388	0	0	388
Vegetation Removal/Hand Crew	**15,283**	**2,206**	**7,924**	**25,413**
Lop & Scatter	14,743	1,639	1,482	17,864
Lop-Pile-Burn	534	567	978	2,079
Lop & Scatter/Lop-Pile-Burn	0	0	1,596	1,596
Lop (No Scatter)	6	0	0	6
Cut Stump	0	0	3,868	3,868
Other	**18**	**0**	**0**	**18**
Road Decommissioning	18	0	0	18
Grand Total	**91,559**	**8,854**	**42,802**	**143,215**
*** Total Land Area Treated**	**62,609**	**6,115**	**37,195**	**105,919**

Table 4.7: WRI treatment action size (acres) for completed, current, and proposed projects for WMU 16B/C, Manti North/South. Data accessed on 02/19/2020. *Does not include overlapping treatments.



Map 4.8: WRI treatments by fiscal year completed for WMU 16B/C, Manti North/South.

Range Trend Studies

Range Trend studies have been sampled within WMU 16B, 16C on a regular basis since 1988, with studies being added or suspended as was deemed necessary (**Table 4.8**). Due to changes in sampling methodologies, only data collected following the 1992 sample year is included in this summary. Monitoring studies of WRI projects began in 2004; when possible, WRI monitoring studies are established prior to treatment and sampled on a regular basis following treatment. Due to the long-term nature of the studies, many of the Range Trend and WRI studies have had some sort of disturbance or treatment prior to or since study establishment (**Table 4.9**).

Range Trend studies are summarized in this report by ecological site. Range Trend and WRI studies that have had a disturbance or treatment during the reported sample period are summarized in this report by the disturbance or treatment type and are summarized by region.

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
16B-1	Long Ridge South	RT	Suspended	1989, 1997, 2002, 2007	Not Verified
16B-2	Long Ridge North	RT	Active	1989, 1997, 2002, 2007, 2014, 2019	Mountain Stony Loam (Mountain Big Sagebrush)
16B-3	Rocky Hollow	RT	Active	1989, 1997, 2002, 2007, 2014, 2019	Mountain Loam (Mountain Big Sagebrush)
16B-4	Dry Creek Chaining	RT	Active	1989, 1997, 2002, 2007, 2014, 2019	Mountain Stony Loam (Browse)
16B-5	Jackson Unit	RT	Active	1989, 1997, 2002, 2007, 2014, 2019	Mountain Gravelly Loam (Mountain Big Sagebrush)
16B-6	Mill Fork	RT	Active	1989, 1997, 2002, 2007, 2014, 2019	Mountain Stony Loam (Mountain Big Sagebrush)
16B-7	East Dairy Fork	RT	Suspended	1989, 1997, 2002	Not Verified
16B-8	Starvation Mahogany	RT	Active	1989, 1999, 2002, 2007, 2014, 2019	Mountain Shallow Loam (Curlleaf Mountain Mahogany)
16B-9	Starvation Mountain Brush	RT	Active	1989, 1999, 2002, 2007, 2014, 2019	Mountain Stony Loam (Browse)
16B-10	Dairy Fork Burn	RT	Active	1989, 1997, 2002, 2007, 2014, 2019	Mountain Loam (Mountain Big Sagebrush)
16B-11	Hilltop	RT	Active	1989, 1997, 2002, 2007, 2014, 2019	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16B-12	Oak Creek	RT	Suspended	1989, 1997, 2002	Not Verified
16B-13	Oak Creek Ridge Aspen	RT	Active	1989, 1997, 2002, 2007, 2014, 2019	High Mountain Loam (Aspen)
16B-14	Oak Creek Ridge Seeding	RT	Active	1989, 1997, 2002, 2007, 2014, 2019	High Mountain Clay (Slender Wheatgrass)
16B-15	Ford Ridge	RT	Suspended	1988, 1994, 1999	Not Verified
16B-16	Hardscrabble	RT	Suspended	1988, 1994, 1999	Not Verified
16B-17	Slackpile	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16B-18	Porphyry Bench	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019	Semidesert Loam (Wyoming Big Sagebrush)
16B-19	North Spring Bench	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16B-20	Telephone Bench	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019	Upland Shallow Loam (Black Sagebrush)
16B-21	Huntington Canyon	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019	Mountain Very Steep Stony Loam (Mountain Big Sagebrush)
16B-22	Poison Spring Bench	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019	Upland Stony Loam (Pinyon-Utah Juniper)
16B-23	Consumer Bench	RT	Active	1994, 1999, 2004, 2009, 2012, 2014, 2019	Semidesert Loam (Wyoming Big Sagebrush)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
16B-24	Wire Grass Bench	RT	Active	1994, 1999, 2004, 2009, 2014, 2019	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16C-1	Manti Face Chaining	RT	Active	1989, 1997, 2002, 2007, 2014, 2019	Upland Gravelly Loam (Black Sagebrush)
16C-2	Willow Creek	RT	Active	1989, 1997, 2002, 2007, 2014, 2019	Upland Stony Loam (Pinyon-Utah Juniper)
16C-3	North Manti Face	RT	Active	1989, 1997, 2002, 2007, 2014, 2019	Mountain Loam (Mountain Big Sagebrush)
16C-4	Bald Mountain	RT	Suspended	1989, 1997, 2002	Not Verified
16C-5	Cane Valley	RT	Active	1989, 1997, 2002, 2007, 2014, 2019	Upland Clay (Pinyon-Utah Juniper)
16C-6	Black Hill	RT	Active	1989, 1997, 2002, 2007, 2014, 2015, 2019	Upland Shallow Loam (Black Sagebrush)
16C-7	Mayfield Mountain Face	RT	Active	1989, 1997, 2002, 2007, 2014, 2019	Upland Loam (Black Sagebrush)
16C-8	Pole Canyon Chaining	RT	Active	1989, 1997, 2002, 2007, 2014, 2019	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16C-9	Pole Canyon Oak	RT	Active	1989, 1997, 2002, 2007, 2014, 2019	Mountain Stony Loam (Oak)
16C-10	Julius Pasture	RT	Suspended	1989, 1997	Not Verified
16C-11	Above South Hollow	RT	Active	1989, 1997, 2002, 2007, 2014, 2019	Mountain Loam (Browse)
16C-12	Manti Dump	RT	Active	1989, 1997, 2002, 2007, 2014, 2019	Upland Loam (Wyoming Big Sagebrush)
16C-13	West Huntington Canyon	RT	Suspended	1988, 1994, 1999, 2004, 2009, 2014	Mountain Loam (Black Sagebrush)
16C-14	Red Point	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019	Upland Stony Loam (Pinyon-Utah Juniper)
16C-15	Howard FS Chaining	RT	Suspended	1988, 1994, 1999, 2004, 2009, 2014	Upland Shallow Loam (Pinyon-Utah Juniper)
16C-16	Church Mine Road	RT	Suspended	1988	Not Verified
16C-17	Middle Mountain	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019	Mountain Shallow Loam (Mountain Big Sagebrush)
16C-18	East Mountain	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019	High Mountain Loam (Mountain Big Sagebrush)
16C-19	Trail Mountain Exclosure	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019	Mountain Loam (Browse)
16C-20	Miles Point	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019	Mountain Loam (Mountain Big Sagebrush)
16C-21	North Horn Cap	RT	Suspended	1988, 1994, 1999, 2004	Not Verified
16C-22	North Horn Rock Canyon	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019	Mountain Shallow Loam (Black Sagebrush)
16C-23	Black Dragon	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16C-24	South Horn Exclosure	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019	Mountain Loam (Browse)
16C-25	South Horn 1/4 Corner	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019	Mountain Loam (Mountain Big Sagebrush)
16C-26	Dry Mountain	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16C-27	Birch Creek Chaining	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16C-28	South of Dry Wash	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019	Upland Stony Loam (Pinyon-Utah Juniper)
16C-29	Scab Hollow	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019	Mountain Stony Loam (Curlleaf Mountain Mahogany)
16C-30	Upper Hole Trail	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019	Mountain Stony Loam (Curlleaf Mountain Mahogany)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
16C-31	Box Canyon Knolls	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019	Mountain Shallow Loam (Low Sagebrush)
16C-32	Muddy Creek	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019	Semidesert Clay (Shadscale)
16C-33	Little Nelson Mountain	RT	Suspended	1994, 1999, 2004, 2009	Not Verified
16C-34	South Sage Flat	RT	Active	1994, 1999, 2004, 2009, 2014, 2019	Mountain Shallow Loam (Low Sagebrush)
16C-35	Wildcat Knolls	RT	Active	1994, 1999, 2004, 2009, 2014, 2019	Mountain Shallow Loam (Low Sagebrush)
16C-36	Danish Bench	RT	Active	1994, 1999, 2004, 2009, 2014, 2019	Upland Stony Loam (Pinyon-Utah Juniper)
16C-37	Joes Valley Overlook	RT	Active	1994, 1999, 2004, 2009, 2014, 2019	Mountain Loam (Shrub)
16C-38	Pleasant Creek	RT	Active	1989, 1997, 2002, 2007, 2014, 2019	Mountain Loam (Mountain Big Sagebrush)
16C-39	Cove Creek	RT	Active	1989, 1997, 2002, 2007, 2014, 2019	Upland Loam (Shrub)
16C-40	Cedar Mountain	RT	Active	1985, 1999, 2004, 2009, 2014, 2019	Upland Stony Loam (Pinyon-Utah Juniper)
16C-41	Trough Hollow	RT	Active	1985, 1999, 2004, 2009, 2014, 2019	Mountain Loam (Mountain Big Sagebrush)
16C-42	Box Canyon Sage-Grouse	RT	Active	2004, 2009, 2014, 2019	Mountain Loam (Mountain Big Sagebrush)
16C-43	Olson Draw Sage-Grouse	RT	Active	2004, 2009, 2014, 2019	Mountain Loam (Mountain Big Sagebrush)
16C-44	North Horn	RT	Active	2005, 2009, 2014, 2019	Mountain Shallow Loam (Birchleaf Mountain Mahogany)
16C-45	Olsen Canyon	RT	Active	2007, 2014, 2019	Upland Gravelly Loam (Wyoming Big Sagebrush)
16C-46	Indian Hollow	RT	Active	2014, 2019	Semidesert Shallow Loam (Black Sagebrush)
16C-47	White Hill	RT	Active	2019	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16C-51	Old Woman Plateau	RT	Active	2019	Mountain Shallow Loam (Mountain Big Sagebrush)
16R-1	Price Pipeline South	RT	Suspended	1997, 2004	Not Verified
16R-2	Price Pipeline Native South	RT	Suspended	1997, 2004	Not Verified
16R-3	Price Pipeline Native North	RT	Suspended	1997, 2004	Not Verified
16R-4	Price Pipeline North	RT	Suspended	1997, 2004	Not Verified
16R-5	Scad Hollow	RT	Active	1998, 2004, 2009, 2014, 2019	High Mountain Loam (Silver Sagebrush)
16R-6	North Slackpile	RT	Active	1998, 2004, 2009, 2014, 2019	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16R-7	MORRIS COOK CE #1	RT	Suspended	1999	Not Verified
16R-8	SORENSEN CE	RT	Suspended	1999	Not Verified
16R-10	Gordon Creek Burn	RT	Suspended	1999, 2001, 2004, 2009	Not Verified
16R-11	Lower Cedar Bench	WRI	Active	2004, 2007, 2012, 2016	Upland Loam (Wyoming Big Sagebrush)
16R-12	Upper Cedar Bench	WRI	Active	2004, 2007, 2012, 2016	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16R-13	Upper Porphyry	WRI	Active	2004, 2007, 2009, 2010, 2012, 2017	Semidesert Loam (Wyoming Big Sagebrush)
16R-14	Consumer Bench North	WRI	Active	2005, 2008, 2012, 2017	Semidesert Loam (Wyoming Big Sagebrush)
16R-15	Consumer Bench 2	WRI	Active	2005, 2008, 2012, 2017	Semidesert Loam (Wyoming Big Sagebrush)
16R-16	Wildcat Push	WRI	Active	2005, 2010, 2014, 2018	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
16R-17	Cedar Mountain Brush Saw	WRI	Active	2005, 2008, 2013, 2018	Upland Stony Loam (Black Sagebrush)
16R-18	Cedar Mountain Dixie	WRI	Active	2005, 2008, 2013, 2018	Upland Loam (Black Sagebrush)
16R-19	Lower Fish Creek WMA	WRI	Active	2005, 2010, 2015, 2019	Mountain Loam (Mountain Big Sagebrush)
16R-20	Howerton's	WRI	Suspended	2005, 2007, 2013	Upland Loam (Mountain Big Sagebrush)
16R-21	Stump Flat	WRI	Active	2006, 2010, 2014, 2018	Upland Loam (Black Sagebrush)
16R-23	North Spring	WRI	Active	2006, 2010, 2014, 2018	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16R-24	12 Mile Dixie	WRI	Active	2006, 2010, 2013, 2017	Upland Loam (Wyoming Big Sagebrush)
16R-25	Black Dragon Bullhog	WRI	Active	2006, 2009, 2012, 2018	Mountain Loam (Browse)
16R-27	DC Plateau	WRI	Suspended	2007	Not Verified
16R-29	Wildcat Disking Reference	WRI	Suspended	2008	Not Verified
16R-30	Mill Fork Chaining	WRI	Active	2007, 2010, 2014, 2019	Mountain Loam (Mountain Big Sagebrush)
16R-31	Mohrland Roller Chopper 1	WRI	Active	2008, 2011, 2014, 2018	Upland Loam (Black Sagebrush)
16R-32	Mohrland Roller Chopper 2	WRI	Active	2008, 2011, 2014, 2018	Upland Loam (Black Sagebrush)
16R-33	Scofield Dixie	WRI	Suspended	2008, 2011, 2015	High Mountain Loam (Mountain Big Sagebrush)
16R-34	Wildcat Dixie Harrow	WRI	Active	2008, 2009, 2010, 2013, 2017	Mountain Loam (Mountain Big Sagebrush)
16R-35	Upper Porphyry Reference	WRI	Suspended	2009	Not Verified
16R-36	Consumer Bench Reference	WRI	Suspended	2009	Not Verified
16R-37	Wildcat Disking	WRI	Active	2009, 2010, 2013, 2017	Mountain Loam (Mountain Big Sagebrush)
16R-38	Black Dragon Reference	WRI	Suspended	2009	Not Verified
16R-42	Canal Canyon	WRI	Active	2011, 2014, 2018	Upland Loam (Mountain Big Sagebrush)
16R-43	Swasey Mountain Brush Bullhog	WRI	Suspended	2011	Not Verified
16R-44	Swasey Bullhog	WRI	Active	2011, 2015, 2019	Mountain Shallow Loam (Mountain Big Sagebrush)
16R-45	Grimes Wash	WRI	Active	2011, 2017	Semidesert Stony Loam (Wyoming Big Sagebrush)
16R-46	Dairy fork 1	WRI	Suspended	2012, 2015	Mountain Loam (Oak)
16R-47	Dairy Fork 2	WRI	Active	2012, 2015, 2019	Mountain Stony Loam (Mountain big sagebrush)
16R-48	North Hollow	WRI	Active	2012, 2015, 2018	Mountain Stony Loam (Oak)
16R-49	Stump Flat 2	WRI	Active	2013, 2016	Semidesert Shallow Loam (Black Sagebrush)
16R-50	Bear Ranch	WRI	Active	2013, 2017	Mountain Gravelly Loam (Oak)
16R-52	Helper Benches	WRI	Active	2014, 2017	Semidesert Stony Loam (Wyoming Big Sagebrush)
16R-53	Grimes Wash 2	WRI	Active	2014, 2017	Semidesert Stony Loam (Wyoming Big Sagebrush)
16R-54	Hiawatha Miller Creek	WRI	Active	2015, 2018	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16R-55	Grimes Wash 3	WRI	Active	2017	Semidesert Stony Loam (Wyoming Big Sagebrush)
16R-56	Dry Wash	WRI	Active	2019	Upland Stony Loam (Pinyon-Utah Juniper)

Table 4.8: Range trend and WRI project studies monitoring history and ecological site potential for WMU 16B/C, Manti North/South.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
16B-4	Dry Creek Chaining	Chain Unknown		Historic		
		Seed Unknown		Historic		
		Bullhog	Dry Canyon Wildlife Improvement and Fuels Reduction Project Phase I	Between July 2010 and June 2012	496	1701
16B-5	Jackson Unit	Chain Unknown		1972		
		Seed Unknown		1972		
		Bullhog	Birdseye WMA Bullhog Project	September 2016-December 2017	229	3605
16B-6	Mill Fork	Aerial Before	Mill Fork Wildlife Habitat Improvement Project	October 2007	462	716
		Two-Way Ely/Smooth	Mill Fork Wildlife Habitat Improvement Project	October-November 2007	350	716
		Dribbler	Mill Fork Wildlife Habitat Improvement Project	November 2007	350	716
		Lop and Scatter	Mill Fork Wildlife Habitat Improvement Project (Phase 2)	August-November 2015	553	3019
16B-9	Starvation Mountain Brush	Bullhog		2002		
16B-10	Dairy Fork Burn	Wildfire		1988		
		Chain Unknown		1988		
		Disc Unknown		1988		
		Seed Unknown		1988		
16B-11	Hilltop	Chain Unknown		1978	250	
		Seed Unknown		1978	250	
		Bulllhog	Hilltop Conservation Easement Bullhog Phase 2	July 2014-June 2015	269	3047
16B-14	Oak Creek Ridge Seeding	Herbicide Unknown		1988		
		Seed Unknown		1988		
16B-18	Porphyry Bench	Double Drum/Seed	Price West Benches Year 1--Porphyry Bench	November 2004, April-May 2005	1,104	229
		Aerial After	Price West Benches Year 1--Porphyry Bench	December 2004	1,104	229
		One-Way Disc	Porphyry Bench Sagebrush Planting	November 2016	20	3616
		Broadcast After	Porphyry Bench Sagebrush Planting	November 2016	20	3616
16B-20	Telephone Bench	Lop and Scatter	North Springs PJ Removal Phase II	March-October 2018	4,484	3583
16B-22	Poison Spring Bench	Chain Unknown		Late 1960s		
		Seed Unknown		Late 1960s		
		Lop and Scatter	Burma Rd. Pinyon/Juniper Removal	October-December 2013	1,312	2556
16B-23	Consumer Bench	Broadcast Before	Price West Benches Year 2	October-December 2005	2,658	228
		Double Drum/Seed	Price West Benches Year 2	October-December 2005	2,658	228
		Aerial After	Price West Benches Year 2	March 2006	2,658	228
		Lop and Scatter	Miller Creek Watershed Restoration	November 2018	242	4207
16C-1	Manti Face Chaining	Chain Unknown		Historic		
		Seed Unknown		Historic		
		Lop and Scatter	Manti Face Lop and Scatter	September-December 2012	853	1707
16C-2	Willow Creek	Chain Unknown	Bald Mountain	1969	700	
		Seed Unknown	Bald Mountain	1969	700	
		Lop and Scatter	Bald Mountain WMA Lop and Scatter	2014-2015	400	
16C-3	North Manti Face	Lop and Scatter	Manti Face Lop and Scatter	July 2010-June 2012	853	1707
16C-5	Cane Valley	Two-Way Chain Unknown		1982		
		Aerial Unknown		1982		
		Lop and Scatter	Black Hills WMA Lop and Scatter	October 2007	878	710
		Lop and Scatter	Dedicated Hunter Project	June 2018	5	
16C-6	Black Hill	Chain Unknown		1982		
		Seed Unknown		1982		
		Lop and Scatter	Black Hills WMA Lop and Scatter	October 2007	878	710
16C-7	Mayfield Mountain Face	Chain Unknown		Historic		
		Seed Unknown		Historic		
		Lop and Scatter	Twelve Mile WMA Habitat Improvement	July-October 2007	1,294	273
16C-8	Pole Canyon Chaining	Aerial After	Pole Canyon Seeding	September 1967	1,800	LTDL
		Two-Way Chain Unknown	Pole Canyon Seeding	September 1967	1,800	LTDL
		Lop and Scatter		Between 1997 and 2002		

16C-9	Pole Canyon Oak	Chain Unknown		1970s		
		Two-Way Ely/Smooth	Twelve Mile WMA Habitat Improvement - Year 2	October-November 2008	540	1059
		Aerial Before	Twelve Mile WMA Habitat Improvement - Year 2	October-November 2008	618	1059
		Dribbler	Twelve Mile WMA Habitat Improvement - Year 2	October-November 2008	540	1059
16C-11	Above South Hollow	Chain Unknown		Prior to 1960		
		Seed Unknown		Prior to 1960		
		Two-Way Ely/Smooth	Twelve Mile WMA Habitat Improvement - Year 2	October-November 2008	540	1059
		Aerial Before	Twelve Mile WMA Habitat Improvement - Year 2	October-November 2008	618	1059
		Dribbler	Twelve Mile WMA Habitat Improvement - Year 2	October-November 2008	540	1059
16C-12	Manti Dump	Chain Unknown	East Manti Dump	1961		
		Seed Unknown	East Manti Dump	1961		
		Lop and Scatter	6-Mile Habitat Improvement	June-August 2009	787	1051
		Bullhog	Six Mile WMA In-House Bullhog Project - Phase 1 (Proposed)	2019	1,065	4809
		Dribbler Unknown	Six Mile WMA In-House Bullhog Project - Phase 1 (Proposed)	2019	1,065	4809
16C-13	West Huntington Canyon	Wildfire		Historic		
16C-14	Red Point	Two-Way Chain Unknown	West Huntington Chain and Seed	September 1969-December	1,158	LTDL
		Aerial After	West Huntington Chain and Seed	December 1969	1,158	LTDL
		Aerial After	West Huntington Chain and Seed	March 1973	1,158	LTDL
		Lop and Scatter	Burma Rd. Pinyon/Juniper Removal	October-December 2013	1,312	2556
16C-15	Howard FS Chaining	Chain Unknown		September-December 1961	230	LTDL
		Aerial Before		September-December 1961	230	LTDL
16C-16	Church Mine Road	Chain Unknown		November-December 1969	1,319	LTDL
		Seed Unknown		November-December 1969	1,319	LTDL
		Lop and Scatter	Danish Bench Lop and Scatter	Spring 2009	589	1390
16C-17	Middle Mountain	Chain Unknown		Historic	200	
		Bullhog		Spring 2009		
16C-18	East Mountain	Herbicide Unknown		Late 1960s		
16C-19	Trail Mountain Exclosure	Contour Trench		1960s		
		Seed Unknown		1960s		
16C-21	North Horn Cap	Bullhog	Black Dragon	March 2006-June 2008	4,358	514
16C-22	North Horn Rock Canyon	Bullhog	Swasey Wildlife Habitat Improvement and Hazardous Fuels Reduction Project Phase VII	August 2016-June 2017	620	3638
16C-23	Black Dragon	Contour Trench		1965		
		Seed Unknown		1965		
16C-24	South Horn Exclosure	Bullhog	South Horn Wildlife Habitat Improvement Project	June 2017-April 2018	608	4036
16C-26	Dry Mountain	Chain Unknown		1967		
		Seed Unknown		1967		
		Lop and Scatter		1999		
		Bullhog		Between 2004 and 2009		
16C-27	Birch Creek Chaining	Chain Unknown		1972		
		Contour Trench		1972		
		Seed Unknown		1972		
		Lop and Scatter		Fall 2004		
16C-28	South of Dry Wash	Chain Unknown		1972	35	
		Seed Unknown		1972	35	
		Bullhog		2015-2018		
16C-32	Muddy Creek	Broadcast	Muddy Creek Seeding	February 2006	60	95
16C-34	South Sage Flat	Seed Unknown		Historic		
16C-36	Danish Bench	Chain Unknown		November-December 1969	1,319	LTDL
		Seed Unknown		November-December 1969	1,319	LTDL
		Lop and Scatter	Danish Bench Lop and Scatter	Spring 2009	586	1390
		Lop and Scatter		Between 2014 and 2019		
16C-37	Joes Valley Overlook	Seed Unknown		Historic		
		Contour Trench		Historic		

16C-38	Pleasant Creek	Two-Way Ely	Bear Mountain CWMU Habitat Enhancement	October-December 2013	232	2602
		Aerial Before	Bear Mountain CWMU Habitat Enhancement	October-December 2013	232	2602
		Dribbler	Bear Mountain CWMU Habitat Enhancement	October-December 2013	232	2602
		Aerial After	Bear Mountain CWMU Habitat Enhancement	February 2014	232	2602
16C-40	Cedar Mountain	Seed Unknown		1979-1980		
		Chain Unknown		1979-1980		
		One-Way Dixie	Fishlake NF PJ Maintenance-Sagebrush Enhancement - Year 1	June-December 2005	4,445	216
		Brush Saw		2005-2008		
		Bullhog		2009-2014		
16C-42	Box Canyon Sage-Grouse	Aerial Before	GH Olsen Chaining	September 1967	800	LTDL
		Two-Way Ely	GH Olsen Chaining	September 1967	800	LTDL
		Broadcast Before	Wildcat Knolls Habitat Improvement	September-November 2008	810	1161
		One-Way Dixie	Wildcat Knolls Habitat Improvement	September-November 2008	435	1161
		Rangeland Drill	Wildcat Sagebrush Restoration Project Phase II	August-September 2009	466	1392
16C-44	North Horn	Contour Trench		Historic		
16C-45	Olsen Canyon	Seed Unknown		Historic		
		Chain Unknown		Historic		
		Lop and Scatter	Twelve Mile Wma Habitat Improvement	July 2007-October 2008	1,254	273
16R-3	Price Pipeline Native North	Double Drum/Seed	Price West Benches (Year1) Porphyry Bench	November 2004, April-May 2005	1,104	229
		Aerial After	Price West Benches (Year1) Porphyry Bench	December 2004	1,104	229
16R-4	Price Pipeline North	Double Drum/Seed	Price West Benches (Year1) Porphyry Bench	November 2004, April-May 2005	1,104	229
		Aerial After	Price West Benches (Year1) Porphyry Bench	December 2004	1,104	229
16R-6	North Slackpile	Roller Chopper	Gordon Creek Roller Chopper	October 2006	199	513
16R-10	Gordon Creek Burn	Prescribed Fire		March 1999	160	
		Broadcast Before		March 1999	160	
		One-Way Dixie		March 1999	160	
16R-11	Lower Cedar Bench	Push	Cedar Bench	Spring 2005		PDB
		Broadcast Before	Cedar Bench	Spring 2005		PDB
		Lop and Scatter	North Springs PJ Removal Phase II	March-October 2018	4,484	3583
16R-12	Upper Cedar Bench	Broadcast Before	Cedar Bench	Spring 2005		PDB
		Push	Cedar Bench	Spring 2005		PDB
16R-13	Upper Porphyry	Double Drum/Seed	Price West Benches (Year1) Porphyry Bench	November 2004, April-May 2005	1,104	229
		Aerial After	Price West Benches (Year1) Porphyry Bench	December 2004	1,104	229
16R-14	Consumer Bench North	Double Drum/Seed	Price West Benches (Year2)(Consumers)(airport)	November 2004-March 2005	2,658	228
		Aerial After	Price West Benches (Year2)(Consumers)(airport)	March 2005	2,658	228
16R-15	Consumer Bench 2	Double Drum/Seed	Price West Benches (Year2)(Consumers)(airport)	November 2004-March 2005	2,658	228
		Aerial After	Price West Benches (Year2)(Consumers)(airport)	March 2005	2,658	228
16R-16	Wildcat Push	Aerial Before	Wildcat Canyon P-J Removal	October 2007	140	32
		Roller Chopper	Wildcat Canyon P-J Removal	October-November 2007	140	32
		Dribbler	Wildcat Canyon P-J Removal	October-November 2007	140	32
16R-17	Cedar Mountain	Chain Unknown		1970s		
		Brush Saw	Fishlake NF PJ Maintenance-Sagebrush Enhancement - Year 2	June-December 2005	2,469	465
		Bullhog or Lop and Scatter		Between 2008 and 2013		
16R-18	Cedar Mountain Dixie	Chain Unknown		1970s		
		Seed Unknown		1970s		
		One-Way Dixie	Fishlake NF PJ Maintenance-Sagebrush Enhancement - Year 1	June-December 2005	4,445	216
		Brush Saw		2011		

16R-20	Howerton's	Disc	Spring City Plateau Demonstration Project	October 2005	152	169
		Rangeland Drill	Spring City Plateau Demonstration Project	October 2005	152	169
		Plateau	Spring City Plateau Demonstration Project	November 2005	152	169
		Plateau	Spring City Plateau Project - Year 2	September 2008	50	1092
		Rangeland Drill	Spring City Plateau Project - Year 2	October 2008	25	1092
		Broadcast	Spring City Plateau Project - Year 2	January 2009	25	1092
16R-21	Stump Flat	Two-Way Chain Unknown	West Huntington Chain and Seed	September-December 1969	1,158	LTDL
		Aerial After	West Huntington Chain and Seed	December 1969	1,158	LTDL
		Aerial After	West Huntington Chain and Seed	March 1973	1,158	LTDL
		Roller Chopper	Stump Flat Pinyon/Juniper Habitat Restoration	September-October 2006	67	431
		Lop and Scatter	Burma Rd. Pinyon/Juniper Removal	October-December 2013	1,312	2556
16R-23	North Spring	Broadcast Before	Price West Benches Phase 3 - North Springs	October 2006	340	430
		One-Way Dixie	Price West Benches Phase 3 - North Springs	October 2006	680	430
16R-24	12 Mile	Agricultural Field		Historic		
	Dixie	Roundup, Paramount	Twelve Mile WMA Habitat Improvement	November 2006	40	273
		Roundup	Twelve Mile WMA Habitat Improvement	May 2007	40	273
		Roundup	Twelve Mile WMA Habitat Improvement	October 2007	40	273
		Truax Drill	Twelve Mile WMA Habitat Improvement	October 2007	45	273
		Broadcast	Twelve Mile WMA Habitat Improvement	January 2008	40	273
16R-25	Black Dragon Bullhog	Bullhog	Black Dragon	August 2006-June 2008	4,358	514
16R-30	Mill Fork Chaining	Aerial Before	Mill Fork Wildlife Habitat Improvement	October 2007	462	716
		Two-Way Ely	Mill Fork Wildlife Habitat Improvement	October-November 2007	350	716
		Dribbler	Mill Fork Wildlife Habitat Improvement	November 2007	350	716
		Lop and Scatter	Mill Fork Wildlife Habitat Improvement Project (Phase 2)	August-November 2015	553	3019
16R-31	Mohrland	Aerial Before	Poison Spring Bench Seeding	1970	4,995	LTDL
	Roller Chopper	Two-Way Chain Unknown	Poison Spring Bench Seeding	1970		LTDL
	1	Aerial Before	Mohrland PJ Removal	October 2008	743	1083
		Roller Chopper	Mohrland PJ Removal	October-December 2008		1083
		Dribbler	Mohrland PJ Removal	October-December 2008	743	1083
16R-32	Mohrland	Aerial Before	Poison Spring Bench Seeding	1970	4,995	LTDL
	Roller Chopper 2	Two-Way Chain Unknown	Poison Spring Bench Seeding	1970	4,995	LTDL
		Aerial Before	Mohrland PJ Removal	October 2008	743	1083
		Roller Chopper	Mohrland PJ Removal	October-December 2008	743	1083
		Dribbler	Mohrland PJ Removal	October-December 2008	743	1083
16R-33	Scofield Dixie	Two-Way Dixie	Scofield Sage Grouse Habitat Restoration	November 2008	150	1085
		Broadcast Before	Scofield Sage Grouse Habitat Restoration	November 2008	150	1085
		Sagebrush Removal		2014-2015		
16R-34	Wildcat Dixie Harrow	One-Way Dixie	Wildcat Knolls Habitat Improvement	September-November 2008	435	1161
		Broadcast	Wildcat Knolls Habitat Improvement	September-November 2008	810	1161
16R-37	Wildcat Disking	Broadcast Before	Wildcat Knolls Habitat Improvement	September-November 2008	810	1161
		Two-Way Disc	Wildcat Knolls Habitat Improvement	September-November 2008	375	1161
		Rangeland Drill	Wildcat Sagebrush Restoration Project Phase II	September 2009	466	1392
16R-42	Canal Canyon	Aerial Before	Canal Canyon Project	October 2011	314	1921
		Two-Way Ely	Canal Canyon Project	October 2011	314	1921
		Dribbler	Canal Canyon Project	October 2011	314	1921
		Aerial After	Canal Canyon Project	January 2012	314	1921
		Plateau	Canal Canyon Project	Fall 2012	314	1921

16R-43	Swasey Mountain Brush Bullhog	Bullhog	Swasey Wildlife Improvement and Hazardous Fuels Phase IV	August 2013-June 2015	519	2627
16R-44	Swasey Bullhog	Bullhog	Swasey Wildlife Improvement and Hazardous Fuels Phase IV	August 2013-June 2015	519	2627
16R-45	Grimes Wash	Aerial Before	Grimes Wash Phase 2	October 2017	111	4041
		Bullhog	Grimes Wash Phase 2	October-November 2017	111	4041
		Aerial After	Grimes Wash Phase 2	January 2018	111	4041
16R-46	Dairy fork 1	Bullhog	Dairy Fork Habitat Improvement Phase 2	July 2013-June 2014	447	2214
16R-47	Dairy Fork 2	Two-Way Ely	Dairy Fork Habitat Improvement Phase 2	November 2013	460	2214
		Aerial Before	Dairy Fork Habitat Improvement Phase 2	November 2013	460	2214
		Dribbler	Dairy Fork Habitat Improvement Phase 2	November 2013	460	2214
		Aerial After	Dairy Fork Habitat Improvement Phase 2	February 2014	460	2214
		Bitterbrush	Bitterbrush Hand Planting	July 2015		
16R-48	North Hollow	Chain Unknown	Mayfield Seeding	October-November 1966	957	LTDL
		Aerial After	Mayfield Seeding	October-November 1966	957	LTDL
		Two-Way Ely/Smooth	North Hollow WMA and LS Conservation Easement Habitat Improvement	November 2012	321	2276
		Aerial Before	North Hollow WMA and LS Conservation Easement Habitat Improvement	November 2012	447	2276
		Dribbler	North Hollow WMA and LS Conservation Easement Habitat Improvement	November 2012	447	2276
		Plateau	North Hollow WMA and LS Conservation Easement Habitat Improvement	December 2012-March 2013	447	2276
		Aerial After	North Hollow WMA and LS Conservation Easement Habitat Improvement	January 2013	447	2276
16R-49	Stump Flat 2	Aerial Before	Stump Flat Pinyon/Juniper Removal Project	October 2013	460	2693
		Bullhog	Stump Flat Pinyon/Juniper Removal Project	October 2013	460	2693
		Aerial After	Stump Flat Pinyon/Juniper Removal Project	December 2013	460	2693
16R-50	Bear Ranch	Aerial Before	Bear Mountain CWMU Habitat Enhancement	October 2013	232	2602
		Two-Way Ely	Bear Mountain CWMU Habitat Enhancement	October-December 2013	232	2602
		Dribbler	Bear Mountain CWMU Habitat Enhancement	October-December 2013	232	2602
		Aerial After	Bear Mountain CWMU Habitat Enhancement	February 2014	232	2602
16R-52	Helper Benches	Aerial Before	Helper Benches Pinyon/Juniper Removal	October 2014	241	3006
		Two-Way Ely	Helper Benches Pinyon/Juniper Removal	October 2014	241	3006
16R-53	Grimes Wash 2	Aerial Before	Grimes Wash PJ Removal	October 2011	272	1946
		Two-Way Ely	Grimes Wash PJ Removal	October 2011	148	1946
		Aerial After	Grimes Wash PJ Removal	December 2011	272	1946
16R-54	Hiawatha Miller Creek	Aerial Before	Hiawatha/Miller Creek Phase 2	December 2015-March 2016	486	3365
		Lop and Scatter	Hiawatha/Miller Creek Phase 2	December 2015-March 2016	486	3365
16R-55	Grimes Wash 3	Broadcast Before	Grimes Wash BLM Stewardship P/J Removal	October-November 2013	181	2866
		Aerial Before	Grimes Wash Phase 2	October 2017	111	4041
		Bullhog	Grimes Wash Phase 2	October-November 2017	111	4041
		Aerial After	Grimes Wash Phase 2	January 2018	111	4041
16R-56	Dry Wash	Lop and Scatter	Dry Wash Units 4, 5, 9 (Proposed)	Fall 2019	264	4907
		Aerial Before	Dry Wash Units 4, 5, 9 (Proposed)	Fall 2019	264	4907

Table 4.9: Range trend and WRI studies known disturbance history for WMU 16B/C, Manti North/South. PDB = Pre-Database; LTDL = Land Treatment Digital Library (Pilliod & Welty, 2019).

Study Trend Summary (Range Trend)

Mountain (Big Sagebrush)

There are sixteen study sites [Long Ridge North (16B-02), Rocky Hollow (16B-03), Jackson Unit (16B-05), Mill Fork (16B-06), Dairy Fork Burn (16B-10), Huntington Canyon (16B-21), North Manti Face (16C-03), Middle Mountain (16C-17), East Mountain (16C-18), Miles Point (16C-20), South Horn ¼ Corner (16C-25), Pleasant Creek (16C-38), Trough Hollow (16C-41), Box Canyon Sage-Grouse (16C-42), Olson Draw Sage-Grouse (16C-43), and Old Woman Plateau (16C-51)] that are classified as Mountain (Big Sagebrush) ecological sites. The Long Ridge North study is located north of the community of Indianola on Long Ridge, and the Rocky Hollow site is situated just north of the Long Ridge North study in Rocky Hollow. The Jackson Unit study can be found south of Birdseye and about 0.4 miles east of US-89. The Mill Fork study is south of US-6 on the north slopes of Davis Hill. Dairy Fork Burn is located south of US-6 between Sky High and Davis Hill.

The Huntington Canyon study is situated above Huntington Canyon on the southwestern-facing slopes of Gentry Mountain. The Manti Mountain Face study can be found on the northern portion of the face of Manti Mountain. The Middle Mountain site is located north of Joes Valley Reservoir on Middle Mountain, and the East Mountain site is situated on East Mountain above Cottonwood Creek. Miles Point is located on Trail Mountain above Cottonwood Creek. The South Horn ¼ Corner study can be found on South Horn Mountain between the South Horn Exclosure and Olson Draw Sage-Grouse study sites. The Pleasant Creek study site is situated on the east bench near the town of Mt. Pleasant, and the Trough Hollow site is located northeast of I-70 and Moroni Peak. The Box Canyon Sage-Grouse study is situated on a flat east of Duncan Mountain. Olson Draw Sage-Grouse can be found on the sagebrush flats of South Horn Mountain. Finally, the Old Woman Plateau study site is located on a flat west of the Saleratus Benches on Old Woman Plateau.

Shrubs/Trees: The dominant browse species on these study sites is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). Other preferred browse species are also present in varying amounts, with black sagebrush (*A. nova*), mountain snowberry (*Symphoricarpos oreophilus*), antelope bitterbrush (*Purshia tridentata*), and curl-leaf mountain mahogany (*Cercocarpus ledifolius*) displaying significant cover on different sites. The cover of preferred browse has exhibited a slight decrease over the sample years (**Figure 4.4**). Plant demographic data shows that the communities on these sites are primarily composed of mature individuals with low amounts of decadent plants (**Figure 4.22**). Utilization of preferred browse has shown a slightly increasing trend, with a mixture of moderate and heavy utilization being noted (**Figure 4.27**).

Trees on sites of the mountain big sagebrush ecological type have shown a slight decrease in both cover and density. An initial increase in cover and density occurred, but these changes are attributable to the addition of seven new sites. Most of the cover is provided by juniper (*Juniperus sp.*) trees (**Figure 4.12**, **Figure 4.17**).

Herbaceous Understory: The herbaceous understories of the sites within this ecological type are diverse, abundant, and mostly composed of native species. There has been a stable to increasing trend observed for the understories with perennial grasses being the dominant component and both perennial and annual forbs as significant contributors as well. Annual grasses are present, but sparse overall (**Figure 4.32**, **Figure 4.37**).

Occupancy: Average pellet transect data shows that both elk and deer are the primary occupants of these sites. Data also shows that occupancy has fluctuated with 2004 and 2009 showing high occupancy and then lower occupancy noted in the following sample years. The mean pellet group abundance for elk has ranged from 15 days use/acre in 2019 to nearly 45 days use/acre in 2004. Pellet group abundance for deer and/or sheep has varied from 7 days use/acre in 1999 to nearly 42 days use/acre in 2004. Cattle occupancy has varied from 1 days use/acre in 2014 to 13 days use/acre in 2019 (**Figure 4.42**).

Mountain (Black/Low Sagebrush)

Four studies [North Horn Rock Canyon (16C-22), Box Canyon Knolls (16C-31), South Sage Flat (16C-34), and Wildcat Knolls (16C-35)] are considered to be Mountain (Black/Low Sagebrush) ecological sites. The

North Horn Rock Canyon study site is located on a bench south of North Horn Mountain and north of Rock Canyon. The Box Canyon Knolls study can be found on a plateau top west of White Mountain and south of Flagstaff Peak. The South Sage Flat site is situated above Muddy Creek on South Sage Flat, and the Wildcat Knolls study is located just south of Wildcat Knolls.

Shrubs/Trees: The shrub components of these ecological sites are composed of a mixture of shrub species, with the dominant species being black sagebrush (*Artemisia nova*), little sagebrush (*A. arbuscula*), and yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*). Lesser amounts of mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) are also present on these sites. Shrub cover has displayed an increasing trend with most of this cover being contributed by sagebrush (**Figure 4.4**). In 2009, an increasing trend of young plants and a high proportion of young plants has been maintained since then (**Figure 4.22**). Utilization of preferred browse has generally been low, with the exception of 2014, which showed heavy utilization (**Figure 4.27**).

Tree cover on these sites is provided by Utah juniper (*Juniperus osteosperma*), Rocky Mountain juniper (*J. scopulorum*), twoneedle pinyon (*Pinus edulis*), ponderosa pine (*P. ponderosa*) and limber pine (*P. flexilis*). Cover and density have been sampled in low amounts only in the most recent years, and a trend is difficult to establish with such low cover (**Figure 4.12**, **Figure 4.17**).

Herbaceous Understory: The herbaceous understories on these sites are diverse and moderately abundant in cover. Perennial grasses are the dominant components on the studies with the majority of species being native. Herbaceous cover and frequency have remained stable with slight increases over time with the largest increase being noted in the 2014 and 2019 sample years (**Figure 4.32**, **Figure 4.37**).

Occupancy: Average pellet transect data shows that elk have been the primary occupants of these study sites and that a decreasing trend has been observed in recent years. Elk pellet data has typically been high and shows a mean abundance ranging from a high of 78 days use/acre in 1999 to a low of 34 days use/acre in 2014. The mean pellet abundance for cattle has varied between 5 days use/acre in 2014 and 20 days use/acre in 1999. Deer and/or sheep pellet groups have generally been sampled in low abundance with a low of 3 days use/acre in 2019 and a high of 13 days use/acre in 2004 (**Figure 4.42**).

Mountain (Curlleaf Mahogany)

Three study sites [Starvation Mahogany (16B-08), Scab Hollow (16C-29), and Upper Hole Trail (16C-30)] are considered to be Mountain (Curlleaf Mahogany) ecological sites. The Starvation Mahogany study is located on Starvation Mountain. The Scab Hollow site can be found above Muddy Creek in Scab Hollow. Finally, the Upper Hole Trail study site is situated between Sage Flat and South Sage Flat.

Shrubs/Trees: The shrub components on these sites are comprised of a mixture of shrub species with the dominant species being Utah serviceberry (*Amelanchier utahensis*), curl-leaf mountain mahogany (*Cercocarpus ledifolius*), alderleaf mountain mahogany (*C. montanus*), antelope bitterbrush (*Purshia tridentata*), and mountain snowberry (*Symphoricarpos oreophilus*). Preferred browse cover (including curl-leaf mountain mahogany) exhibited a decreasing trend until 2019, in which an increase in cover was observed (**Figure 4.9**). Browse demographic data shows that the numbers of plants have been stable with a moderate amount of young recruitment in all years (**Figure 4.24**). Utilization across the ecotype has remained stable and has been considered to be low overall (**Figure 4.29**).

Tree cover on these sites is provided by Utah juniper (*Juniperus osteosperma*), Rocky Mountain juniper (*J. scopulorum*), twoneedle pinyon (*Pinus edulis*), and limber pine (*P. flexilis*). Tree cover has slightly increased over time while density has shown more significant increases. Density is provided nearly equally by both twoneedle pinyon and Rocky Mountain juniper (**Figure 4.12**, **Figure 4.17**).

Herbaceous Understory: The herbaceous understories on these sites provide moderate cover with a mixture of perennial grasses and forbs as the dominant components. Perennial grasses have displayed a steady increase in cover, although nested frequency has remained stable. Perennial forb cover and nested frequency have remained stable as well, with little fluctuation noted between sample years (**Figure 4.34**, **Figure 4.39**).

Occupancy: Average pellet transect data shows that elk have been the primary occupants of these study sites in most years. Data also shows that significant decreases in occupancy were noted in the 2014 and 2019 study years. Days use/acre of elk pellet groups has fluctuated between a low of 23 days in 2019 and a high of 70 in 2009. Deer and/or sheep pellet groups show that occupancy has varied between 5 days use/acre in 2014 and 24 days use/acre in 2004. Finally, cattle have shown presence as low as 2 days use/acre in 2014 and as high as 12 days use/acre in 1999 (**Figure 4.44**).

Mountain (Browse)

There are six study sites [Dry Creek Chaining (16B-04), Starvation Mountain Brush (16B-09), Above South Hollow (16C-11), Trail Mountain Exclosure (16C-19), South Horn Exclosure (16C-24), and North Horn (16C-44)] that are considered to be Mountain (Browse) ecological sites. Dry Creek Chaining can be found north of Dry Creek and approximately one and one half miles east of US-89. The Starvation Mountain Brush study is located on Starvation Mountain, while the Above South Hollow site is situated on Mayfield Mountain above South Hollow. Trail Mountain Exclosure is located on Trail Mountain and roughly two miles east of Joes Valley Reservoir. The South Horn Exclosure study can be found on South Horn Mountain, and the North Horn site is situated on North Horn Mountain north of The Cap.

Shrubs/Trees: The shrub components on these sites are composed of a number of different shrub species with mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), alderleaf mountain mahogany (*Cercocarpus montanus*), mountain snowberry (*Symphoricarpos oreophilus*) and antelope bitterbrush (*Purshia tridentata*) as the most prevalent species. Shrub cover has shown a slight decrease over time, although this is attributable to the increase in total number of sites. Cover has remained stable in the years following the addition of study sites (**Figure 4.7**). Preferred browse demographics show that the plant communities are composed primarily of mature individuals with a moderate number of young and low amounts of decadent individuals being present (**Figure 4.23**). Preferred browse utilization has remained moderate overall with nearly 30 percent of plants showing heavy use in most years. In addition, utilization has shown slight fluctuations but has remained similar through the sample years (**Figure 4.28**).

Tree cover on sites of this ecological type is mostly provided by Utah juniper (*Juniperus osteosperma*), Rocky Mountain juniper (*J. scopulorum*), twoneedle pinyon (*Pinus edulis*) and limber pine (*P. flexilis*). Tree cover increased in 2009 with the addition of new studies but then decreased following fuels reduction projects that occurred on several sites (**Figure 4.13**). Tree density correlates with cover: density increased in 2009 with the addition of new sites and there is a corresponding decrease in density following the habitat treatments (**Figure 4.18**).

Herbaceous Understory: Sites of this ecological type have herbaceous understories that are diverse with moderate amounts of cover: this is typical of higher elevation browse sites. These understories are composed primarily of perennial grasses with a lesser component of both annual and perennial forbs. Cover of perennial grasses has shown significant increases through the sample years, although forbs have shown less of an increase. Nested frequency of all components has shown noticeable, but smaller increases. There was a slight decrease observed in the 2004 sample year due to additions in the number of studies sampled (**Figure 4.33**, **Figure 4.38**).

Occupancy: Pellet transect data shows that elk have been the dominant species on these site with the exception of the 2004 sample year, in which deer were the primary occupants. Mean pellet group abundance for elk has varied between a low of 22 days use/acre in 2019 and a high of 38 days use/acre in 2009. The use for deer has ranged from 8 days use/acre in 2014 to 31 days use/acre in 2004. Cattle presence on these sites has generally

been low with use being sampled at a low of 2 days use/acre in 1999 and 2019 and at a high of 11 days use/acre in 2009 (**Figure 4.43**).

Mountain (Oak)

One study site [Pole Canyon Oak (16C-09)] is classified as a Mountain (Oak) ecological site: this site is located near the mouth of Pole Canyon in South Hollow.

Shrubs/Trees: The main shrub component on this site is Gambel oak (*Quercus gambelii*) with lesser amounts of other species such as antelope bitterbrush (*Purshia tridentata*) and alderleaf mountain mahogany (*Cercocarpus montanus*) also present. Cover of oak decreased in the 2014 sample year, but recovered in 2019, showing a significant increase. Cover of other preferred browse has remained stable (**Figure 4.8**). Browse demographics indicate that there has been an increase in the number of mature individuals with little decadence observed. However, there has also been a decreasing trend in the number of young plants sampled (**Figure 4.23**). Utilization data shows that use has been increasing with low utilization until 2014 and then moderate overall utilization in 2014 and 2019 with roughly 40 percent of plants showing moderate or heavy utilization (**Figure 4.28**).

Tree cover on this site is provided by Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*); cover decreased significantly following the 2009 sample year due to a chaining treatment (**Figure 4.13**). Density of trees has similarly decreased following the treatment and trees have been sampled with relatively low density (**Figure 4.18**).

Herbaceous Understory: The herbaceous understory on this site has transitioned over time. Perennial grass cover increased significantly in the 2014 and 2019 study years along with perennial forbs: nested frequency of these species exhibited a corresponding increase. The majority of perennial grass cover is provided by introduced species that were seeded during a chaining treatment in 2008. Annual grasses have shown a generally increasing trend. Over time, the site has changed from having a sparse understory to a moderately robust and diverse understory (**Figure 4.33**, **Figure 4.38**).

Occupancy: Average pellet transect data shows that deer have been the main occupants on this study site with mean pellet group abundance varying from 87 days use/acre in 2002 to 18 days use/acre in 2014. Other species have typically had low abundance with elk presence varying between 0 days use/acre in 2002 and 9 days use/acre in 2014. Cattle presence has fluctuated from 0 days use/acre in 2002 and 2014 to 2 days use/acre in 2019 (**Figure 4.43**).

Mountain (Shrub)

There is one study site [Joes Valley Overlook (16C-37)] that is classified as a Mountain (Shrub) ecological site. The Joes Valley Overlook site is situated on the southern portion of Trail Mountain above Straight Canyon.

Shrubs/Trees: The shrub component on this site is comprised of a mix of shrubs with mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) being dominant. Mountain snowberry (*Symphoricarpos oreophilus*) and Utah serviceberry (*Amelanchier utahensis*) also provide significant cover, but are less common than sagebrush. Cover of mountain big sagebrush has shown steady increases (**Figure 4.5**). Shrub demographic data has shown steady increases in the number of young individuals. Decadent plants have remained fairly low in number over the study period (**Figure 4.23**). Utilization data shows that there has been an increasing trend over time. In 2014, nearly 70 percent of browse species were either moderately or heavily hedged (**Figure 4.28**).

Tree cover on this site was sampled in 1999 through 2009 and was provided by limber pine (*Pinus flexilis*); cover of any tree species has not been sampled since that time (**Figure 4.13**). Density of trees was first sampled in 2014 with Rocky Mountain juniper (*Juniperus scopulorum*), twoneedle pinyon (*P. edulis*), and

limber pine being the species observed. There have not been significant increases in density over time (**Figure 4.18**).

Herbaceous Understory: The herbaceous understory on this site is relatively diverse and provides moderate cover, which is typical of higher precipitation browse sites. Perennial grasses are the dominant component of this site with perennial forbs also being a significant component. There have been fluctuations in cover and nested frequency over the sample period. A slight decrease of both cover and nested frequency of perennial grasses and forbs occurred during the 2004 sampling, with increases observed in subsequent sample years (**Figure 4.33**, **Figure 4.38**).

Occupancy: Pellet transect data shows that there has been a decreasing trend in overall animal presence noted since the initial sample year. Elk have been the primary occupants of the study in all years, with a mean pellet group abundance varying between 83 days use/acre in 1999 and 27 days use/acre in 2019. Cattle have also been present on the site in all years with use as low as 5 days use/acre in 2019 and as high as 40 days use/acre in 2009. Finally, mean abundance of deer and/or sheep pellet groups has ranged from 0 days use/acre in 2014 to 9 days use/acre in 1999 (**Figure 4.43**).

Mountain (Aspen)

One study site [Oak Creek Ridge Aspen (16B-13)] is considered to be a Mountain (Aspen) ecological site: this study is located on Oak Creek Ridge above Sanpete Valley.

Shrubs/Trees: Shrubs are not a major component of this site. However, a small number of mountain snowberry (*Symphoricarpos oreophilus*) and red elderberry (*Sambucus racemosa*) have been sampled in both cover and density. A slightly increasing trend in cover has been noted, although cover has been under 1 percent in all years (**Figure 4.6**, **Figure 4.24**). Utilization of preferred browse has typically been moderate (**Figure 4.29**).

Tree cover has been high and mainly provided by quaking aspen (*Populus tremuloides*). Cover has remained stable with little change observed between sample years (**Figure 4.14**). Density data has also remained stable over time with conifer trees, namely white fir (*Abies concolor*) and Douglas fir (*Pseudotsuga menziesii*), being noted in density in addition to aspen (**Figure 4.19**).

Herbaceous Understory: The herbaceous understory on this site is diverse and provides significant cover as is typical of high-elevation aspen communities. Perennial forbs are the dominant component with perennial grasses also providing a significant amount of cover; most of the plants on this site are native species. There have been fluctuations in the understory over time, but trends have remained stable overall. There was a significant increase of perennial forbs in both cover and nested frequency in the 2019 sample year. Perennial grass cover showed a moderate increase in 2014, although nested frequency had a less noticeable increase (**Figure 4.34**, **Figure 4.39**).

Occupancy: Pellet transect data shows that the site has low animal occupancy. Cattle are the primary occupants of this site, with mean abundance of pellet groups having a low of 4 days use/acre in 2009 and 2019 and a high of 14.5 days use/acre in 2004. Deer presence has also been low with a high of 3 days use/acre being noted in 2002 through 2014 and no presence occurring in 1999 or 2019. Elk presence has been low as well with 3 days use/acre sampled in 2009 and 2014 and no presence in 1999 and 2019 (**Figure 4.44**).

Mountain (Silver Sagebrush)

There is one study site [Scad Hollow (16R-05)] that is classified as a Mountain (Silver Sagebrush) ecological site. The Scad Hollow study is situated in Scad Valley on the Wasatch Plateau.

Shrubs/Trees: This site has a shrub component that provides good amounts of cover; the dominant browse species is silver sagebrush (*Artemisia cana*) with a lesser component of mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) also present. Shrub cover has shown an increasing trend with most of this increase coming from

silver sagebrush (**Figure 4.4**). Demographic data shows that most of the community is comprised of mature individuals and that there is a low amount of decadence (**Figure 4.22**). Utilization of browse has typically been low with under 10 percent of plants showing moderate use in all years (**Figure 4.27**).

Trees are not present on this site and will therefore not be discussed in this section (**Figure 4.14**, **Figure 4.19**).

Herbaceous Understory: The herbaceous understory on this site is diverse and provides a significant amount of cover. The dominant components on this site are perennial grasses and forbs. Most of the understory is composed of native species with the exception of Kentucky bluegrass (*Poa pratensis*), which is quite common. Nested frequency has remained almost unchanged while herbaceous cover has shown slight increases. The majority of the increase in cover has been provided by perennial grasses (**Figure 4.32**, **Figure 4.37**).

Occupancy: Pellet transect data shows that deer and/or sheep have been the primary occupants of this study site. A stable to decreasing trend has been noted with the exception of 2014, which showed very high use. Sheep were seen on this site in 2014, and it is likely that much of this increased presence can be directly attributed to this band of sheep. Deer and/or sheep mean pellet abundance has varied from a low of 17 days use/acre in 2019 to a high of 142 days use/acre in 2014. Elk have only been sampled in the 2009 study year with 2 days use/acre being noted. Pellet group data for cattle shows that 2019 was the only year in which pellet groups were sampled with a mean abundance of 4 days use/acre (**Figure 4.42**).

Mountain (Slender Wheatgrass)

One study [Oak Creek Ridge Seeding (16B-14)] is considered to be a Mountain (Slender Wheatgrass) ecological site: this study site is located on the southern portion of Oak Creek Ridge.

Shrubs/Trees: Shrubs are not present on this site in any significant amount and therefore will not be discussed in this section (**Figure 4.5**, **Figure 4.24**, **Figure 4.29**). Trees are not present on this site either and will not be discussed in this section (**Figure 4.14**, **Figure 4.19**).

Herbaceous Understory: The herbaceous understory of this site provides significant cover but is mostly comprised of weedy annuals or introduced grasses. A decreasing trend has been observed for perennial grasses in both cover and nested frequency. Nested frequency and cover of perennial forbs showed a significant increase in the 2019 sample year: this is driven by the increase of lanceleaf springparsley (*Claytonia lanceolata*). Annual forbs have been present in moderate amounts throughout the study period with fluctuations between years being observed (**Figure 4.34**, **Figure 4.39**).

Occupancy: Average pellet transect data shows that cattle have been the primary occupants of this site in all years except for 2009, when elk were the primary occupants. There was a decreasing trend in overall animal presence until the 2019 sample year, in which cattle presence displayed a notable increase. The mean abundance of cattle pellet groups has varied from 9 days use/acre in 2009 to 42 days use/acre in 2004. Mean abundance of elk pellet groups has been as low as 0 days use/acre in 2014 and as high as 10 days use/acre in 2009. Deer and/or sheep have been present on the site in low amounts with use fluctuating between 0 days use/acre in 2014 and 2019 and 2 days use/acre in 2004 and 2009 (**Figure 4.44**).

Upland (Big Sagebrush)

There are 12 study sites [Hilltop (16B-11), Slackpile (16B-17), North Spring Bench (16B-19), Wire Grass Bench (16B-24), Pole Canyon Chaining (16C-08), Manti Dump (16C-12), Black Dragon (16C-23), Dry Mountain (16C-26), Birch Creek Chaining (16C-27), Olsen Canyon (16C-45), White Hill (16C-47), and North Slackpile (16R-06)] that are classified as Upland (Big Sagebrush) ecological sites. Hilltop can be found north of the town of Fairview and just east of US-89. The Slackpile study site is located south of Wildcat Canyon on the Gordon Creek WMA, while the North Spring Bench study is situated south of North Spring Canyon on North Spring Bench. The Wire Grass Bench site can be found west of the city of Price on Wiregrass Bench. Pole Canyon Chaining is just south of Mayfield Mountain.

The Manti Dump study site is located just north of Sixmile Canyon on the Six-Mile WMA, while Black Dragon is situated above Ferron Canyon and west of Black Dragon Creek. The Dry Mountain study is above Slide Hollow on Dry Mountain. Birch Creek Chaining can be found east of Millsite Reservoir on the lower slopes of Little Nelson Mountain. The Olsen Canyon study is located near the mouth of Olsen Canyon on the Twelve-Mile WMA, and the White Hill site is situated north of Pigeon Hollow on the White Hill WMA. Finally, the North Slackpile study can be found south of Wildcat Canyon and east of Cedar Bench.

Shrubs/Trees: The dominant browse species on these sites is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). Some sites have a smaller amount of other browse species present such as yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*), Gambel oak (*Quercus gambelii*), black sagebrush (*A. nova*), and antelope bitterbrush (*Purshia tridentata*), although cover varies by site (**Figure 4.4**). Preferred browse demographics show that the populations on these study sites are mostly composed of young and mature plants with a small amount of decadent individuals present. Density of plants has fluctuated over time, but this is likely attributable to the changes in numbers of sites (**Figure 4.25**). Preferred browse utilization has been considered to be high in all years except for the 1994 and 2009 sample years in which use was much lower (**Figure 4.30**).

Conifer trees are present on many studies, with twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) being the species sampled. Tree cover on these sites has shown a generally increasing trend; various treatments have occurred on the sites over the sample years, but cover has still increased (**Figure 4.15**). Tree density has displayed slight decreases over time (**Figure 4.20**).

Herbaceous Understory: The herbaceous understories on these sites are not extremely diverse, although they do provide moderate cover. Perennial grasses are the dominant component on these sites with an increasing trend noted for cover; nested frequency has not shown significant changes. Annual grasses have been present in small amounts during most sample years. Annual and perennial forbs have consistently provided a small amount of cover and frequency through the sample period (**Figure 4.35**, **Figure 4.40**).

Occupancy: Pellet transect data shows that deer have been the primary occupants on these sites in all years, with variations in presence being observed. Mean abundance of deer pellet groups has been as low as 18 days use/acre in 2014 and as high as 71 days use/acre in 2004. Elk have been present as well with low use being observed: 10 days use/acre was sampled in 2019 and 17 days use/acre was noted in 2014. The mean abundance of cattle pellet groups has varied between 4 days use/acre in 2014 and 9 days use/acre in 2009 (**Figure 4.45**).

Upland (Black/Low Sagebrush)

There are four study sites [Telephone Bench (16B-20), Manti Face Chaining (16C-01), Black Hill (16C-06), and Mayfield Mountain Face (16C-07)] that are considered to be Upland (Black/Low Sagebrush) ecological sites. The Telephone Bench study is found on the western portion of Telephone Bench, while Manti Face Chaining is situated on the lower slopes of Manti Mountain face. The Black Hill study is located just northeast of the city of Ephraim on Black Hill. The Mayfield Mountain Face study site is situated south of the town of Mayfield on the face of Mayfield Mountain.

Shrubs/Trees: The dominant browse species on these sites is black sagebrush (*Artemisia nova*), although lesser amounts of other species also present. Cover of preferred browse has displayed slight increases over time (**Figure 4.10**). Browse demographics show that density was high in 1994 and 2009 with decreases occurring after these sample years, but 2009 had a very high proportion of young plants. Decadence has been low in many years with the exception of 1994, when nearly 40 percent of plants were considered to be decadent (**Figure 4.25**). Preferred browse utilization has been low in most years, with the exception of the 2014 sample year; approximately 33 percent of plants were considered to be heavily used in 2014 and 37 percent were moderately used (**Figure 4.30**).

Conifer trees have been sampled on these sites in most years; Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) are the species that have been observed. Cover and density have decreased, likely due to lop and scatter treatments that occurred in 2007, 2012 and 2018 (**Figure 4.15**, **Figure 4.20**).

Herbaceous Understory: The herbaceous understories on these sites are abundant with relatively low diversity. Perennial grass cover has remained stable over time with only slight increases, and frequency has been stable. Perennial grasses are comprised of a mixture of both native and introduced species. Bulbous bluegrass (*Poa bulbosa*) was first sampled in 2009, and has shown small but steady increases since then. Perennial forb cover has displayed a decreasing trend over time. Annual forbs have fluctuated in cover and frequency. Finally, annual grasses have been present in most years with fluctuating cover and frequency, but overall cover has remained low (**Figure 4.35**, **Figure 4.40**).

Occupancy: Pellet transect data has shown that deer and/or sheep have been the primary occupants of these sites excluding in the 1999 sample year in which elk were the primary occupants. Animal presence has been relatively stable with the exception of 2009, in which occupancy was high. The mean pellet abundance of deer and/or sheep has changed with use varying from a low of 5 days use/acre in 1999 to a high of 102 days use/acre in 2009. The presence of elk has fluctuated over the sample period, with a low of 8 days use/acre in 2019 and a high of 28 days use/acre in 2009. Cattle have been on the site in all years, and use has ranged from less than 1 days use/acre in 1999 and 2019 to 8 days use/acre in 2009 (**Figure 4.45**).

Upland (Shrub)

One study [Cove Creek (16C-39)] is classified as an Upland (Shrub) ecological site: this site is located just north of Cove Creek in the Sanpete Valley.

Shrubs/Trees: The dominant browse species on this study site are mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*), although there is also a significant pricklypear (*Opuntia sp.*) component present. Total preferred browse cover has decreased with the bitterbrush component remaining stable in cover (**Figure 4.5**). Demographic data shows that the preferred browse population on this site is primarily composed of mature individuals with an increasing trend observed in decadent plants. Recruitment of young individuals has fluctuated depending on the year (**Figure 4.25**). Utilization of preferred browse has increased over time, although 2004 was an exception as low utilization was noted. In the 2014 and 2019 sample years, between 75 and 80 percent of plants were heavily browsed (**Figure 4.30**).

No trees are present on this site and will therefore not be discussed in this section (**Figure 4.15**, **Figure 4.20**).

Herbaceous Understory: The herbaceous understory of this site provides significant cover, although it is almost entirely comprised of weedy annual and perennial species. Annual grasses were the dominant component in 1999, bulbous bluegrass (*Poa bulbosa*) became the dominant component between 2004 and 2014, and in the 2019 study year annual grasses were again the dominant component. Annual grasses have shown an increasing trend over time while perennial grasses have decreased. Perennial forbs have displayed a decreasing trend through time in both cover and frequency. Bulbous bluegrass has been present in all sample years with cover and frequency remaining relatively stable over the sample period (**Figure 4.35**, **Figure 4.40**).

Occupancy: Pellet transect data has shown that deer and/or sheep and elk are the primary occupants of the study site with presence fluctuating. More specifically, deer and/or sheep were the primary occupants in the sample years between 2004 and 2014, and elk were the primary occupants in 2019. Deer and/or sheep presence has been as low as 22 days use/acre and as high as 92 days use/acre in 2009. Elk have been present in all years with use fluctuating between 8 days use/acre in 2004 and 49 days use/acre in 2019. Cattle use has shown low use overall with presence varying between 0 days use/acre in 2009 and 2014 and 6 days use/acre in 2019 (**Figure 4.45**).

Upland (Pinyon-Juniper)

Seven studies [Poison Spring Bench (16B-22), Willow Creek (16C-02), Cane Valley (16C-05), Red Point (16C-14), South of Dry Wash (16C-28), Danish Bench (16C-36), and Cedar Mountain (16C-40)] are considered to be Upland (Pinyon-Juniper) ecological sites. The Poison Spring Bench study is located south of Mohrland on Poison Spring Bench. The Willow Creek site can be found north of Willow Creek at the foot of Bald Mountain, while the Cane Valley study is situated east of Ephraim in Cane Valley. The Red Point study can be found west of the town of Huntington and north of Red Point. The South of Dry Wash study is located south of Dry Wash and northeast of Nelson Mountain. The Danish Bench site is north of the towns of Orangeville and Castle Dale on Danish Bench. Finally, the Cedar Mountain study can be found east of the town of Salina on Cedar Mountain.

Shrubs/Trees: The dominant shrub components on these sites are a mixture of many types of browse species with different sites being dominated by different species. Dominant browse species include, for example, black sagebrush (*Artemisia nova*), Mormon tea (*Ephedra viridis*), antelope bitterbrush (*Purshia tridentata*), alderleaf mountain mahogany (*Cercocarpus montanus*), and mountain big sagebrush (*A. tridentata* ssp. *vaseyana*). Shrub cover has remained fairly consistent throughout the sample period (**Figure 4.10**). Demographic data shows that most of the plant populations on these sites are comprised of mature adults with small numbers of decadent and young plants also present (**Figure 4.25**). Utilization of preferred browse has been moderate overall with fluctuations noted between sample years. The exception to this, however, is the 2014 sample year in which use was high (**Figure 4.30**).

Tree cover on these study sites is provided by Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) in nearly equal proportions. Tree-removing disturbances have occurred on all of the study sites in recent years, and they are the primary cause of the decrease in cover (**Figure 4.15**). Tree density has followed tree cover with a decreasing trend exhibited across the study sites (**Figure 4.20**).

Herbaceous Understory: The herbaceous understories of these sites have generally provided low to moderate cover of perennial grasses and low amounts of annual and perennial forbs. Annual grasses have been present in low amounts in most years. Cover of perennial grasses has shown an increasing trend through time, but nested frequency has not changed significantly. Annual forbs have not provided significant cover except for 2019 in which they supplied nearly 9 percent cover (**Figure 4.35**, **Figure 4.40**).

Occupancy: Pellet group data shows that across the sites, deer have been the primary occupants in all sample years. Deer use has varied from 19 days use/acre in 2019 to 50 days use/acre in 1999. Elk have also been present in significant amounts with a mean abundance ranging from 9 days use/acre in 2014 to 34 days use/acre in 1999. Cattle have also been occupants in all years, although typically in low abundance. Days use/acre for cattle has varied between less than 1 day in 2019 and nearly 10 days use/acre in 1999 (**Figure 4.45**).

Semidesert (Big Sagebrush)

There are two study sites [Porphyry Bench (16B-18) and Consumer Bench (16B-23)] that are classified as Semidesert (Big Sagebrush) ecological sites. The Porphyry Bench study is situated above Pinnacle Canyon on the eastern portion of Porphyry Bench, while the Consumer Bench study is located just south of Garley Canyon on Consumer Bench.

Shrubs/Trees: The browse components on these two sites are a mixture of species with Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), forage kochia (*Bassia prostrata*), and winterfat (*Krascheninnikovia lanata*) being the most common species. Cover of preferred browse has displayed a decreasing trend over time with sagebrush cover decreasing significantly. However, there was an increase in preferred browse cover noted in the 2019 sample year: most of this increase was due to species other than sagebrush (**Figure 4.10**). Preferred browse demographic data shows a significant decrease in the number of individuals in the 2004 sample year, likely due to the drought and subsequent die-off (**Figure 4.26**). Utilization

of browse species has steadily decreased following the 2004 sample year and again is likely partially attributable to the sagebrush die-off in this ecotype (**Figure 4.31**).

Conifer trees are present on the Consumer Bench study site with both Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) being observed. Trees have not been sampled in cover measurements, but they have been sampled in density. A lop and scatter treatment reduced density between the 2014 and 2019 sample years, and trees are currently sampled only in very low abundance (**Figure 4.16**, **Figure 4.21**).

Herbaceous Understory: The herbaceous understories of these two sites are moderately abundant and mostly composed of perennial grasses. Annual forbs have been present in varying amounts depending on the year while perennial forbs have consistently provided moderate cover. There is some diversity present in the forb layer, although cover is not high overall. Perennial grasses have shown fluctuations in cover and nested frequency, with decreases in both occurring in 2004 and 2013. The 2019 sample year showed a flush of annual grass cover and was the only year in which they provided significant cover (**Figure 4.36**, **Figure 4.41**).

Occupancy: The pellet group data for these sites shows that deer and/or sheep are the primary occupants of these areas. Elk and cattle are present, but to a much lesser extent than deer and/or sheep. Deer and/or sheep use has varied from a low of 38 days use/acre in 2014 to a high of 178 days use/acre in 2009. The mean abundance of elk pellet groups has fluctuated between 11 days use/acre in 2019 and 33 days use/acre in 1999. Cattle presence has been low during most samplings. The 2009 sample year was the year in which mean abundance of cattle pellet groups was the lowest with pellet data showing fewer than 1 days use/acre. The 2019 sample year was highest for cattle pellet groups with 10 days use/acre being noted (**Figure 4.46**).

Semidesert (Black/Low Sagebrush)

One study [Indian Hollow (16C-46)] is considered to be a Semidesert (Black/Low Sagebrush) ecological site. The Indian Hollow study can be found northwest of the town of Ferron in Indian Hollow.

Shrubs/Trees: The browse species that are dominant on this site are black sagebrush (*Artemisia nova*) and Bigelow sage (*A. bigelovii*). Other browse species are also present, but in smaller amounts. Cover of preferred browse has increased slightly over the sample years (**Figure 4.10**). Preferred browse demographics show that the plant population on this site is mostly composed of mature individuals with little decadence being observed (**Figure 4.26**). Utilization of preferred browse has been moderate to high in both sample years (**Figure 4.31**).

Conifer trees are present on this site, with Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) being the observed species. Tree cover is very minimal with less than one percent being sampled in both years (**Figure 4.16**). Density of trees has increased slightly over time (**Figure 4.21**).

Herbaceous Understory: The herbaceous understory of this site is sparse and provides little cover. Perennial grasses are the dominant component of the site. There has been a slight increase in perennial grass cover and frequency. Forbs are fairly sparse with a small amount of cover provided. However, perennial forbs have increased in cover and frequency (**Figure 4.36**, **Figure 4.41**).

Occupancy: Pellet transect data shows that deer are the sole occupants of this study site. Deer use has fluctuated with 0 days use/acre sampled in 2014 and 29 days use/acre sampled in 2019 (**Figure 4.46**).

Semidesert (Shadscale)

There is one study site [Muddy Creek (16C-32)] that is classified as a Semidesert (Shadscale) ecological site: this site is located north of Emery near Muddy Creek and the mouth of Wash Rock Canyon.

Shrubs/Trees: The dominant browse species on the Muddy Creek site is shadscale saltbush (*Atriplex confertifolia*; mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) showed a significant decrease between 1999 and 2004, but is still present in small amounts. Greasewood (*Sarcobatus vermiculatus*) has

displayed an increasing trend through time. Preferred browse demographic data indicates that the plant community is primarily composed of mature individuals with 1994 and 1999 showing higher levels of decadence. The 2009 sample year showed significant recruitment of young plants (**Figure 4.11**, **Figure 4.26**). Preferred browse utilization has been low with utilization being between 10 to 20 percent moderately or heavily hedged. The 1999 sample year was an exception and approximately 40 percent were either moderately or heavily hedged in that year (**Figure 4.31**).

Twoneedle pinyon (*Pinus edulis*) was sampled with very low density for the first time in the 2019 sample year (**Figure 4.21**). Trees have not been sampled in cover measurements in any year (**Figure 4.16**).

Herbaceous Understory: The herbaceous understory on this site provides moderate cover and is typical of dry, low-elevation sites. Perennial grasses are the dominant component of the understory with little cover contributed by other components in most years. Annual grasses have not been sampled in most years, although a flush of cheatgrass (*Bromus tectorum*) occurred in the 2019 sample year. Perennial forbs have been observed in low numbers while annual forbs have varied depending on the year (**Figure 4.36**, **Figure 4.41**).

Occupancy: Pellet transect data indicates that animal presence has decreased over time. Elk are the primary occupants of this site, although deer and cattle pellet groups have also been sampled to a lesser extent. The mean abundance of elk pellet groups has varied from 6 days use/acre in 2019 to 79 days use/acre in 2009. Mule deer have been found on the site in all years with use fluctuating between 6 days use/acre in 2019 and 18 days use/acre in 2004. Finally, cattle have been present in low amounts with no pellet groups sampled in 2014 and 2009 and 5 days use/acre being sampled in 2004 (**Figure 4.46**).

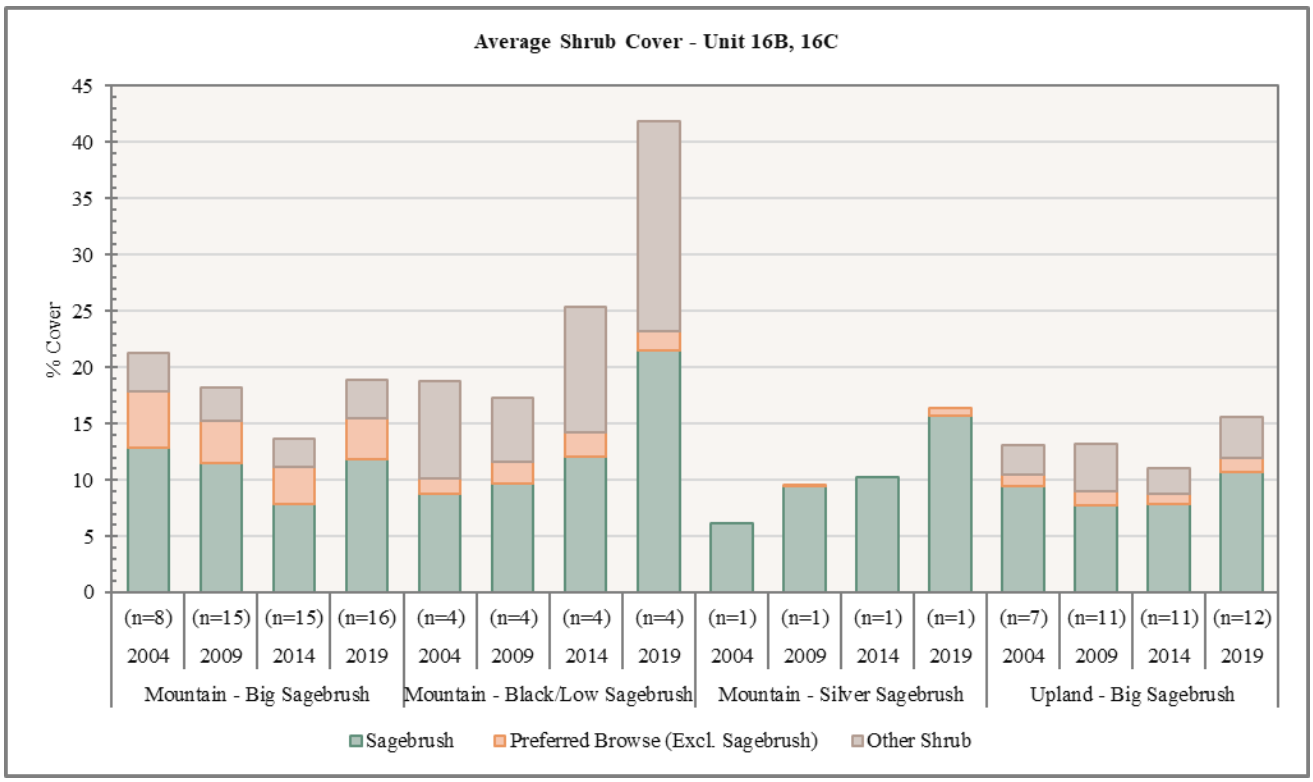


Figure 4.4: Average shrub cover for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, Mountain - Silver Sagebrush, and Upland - Big Sagebrush study sites in WMU 16B, 16C, Manti Central Mountains.

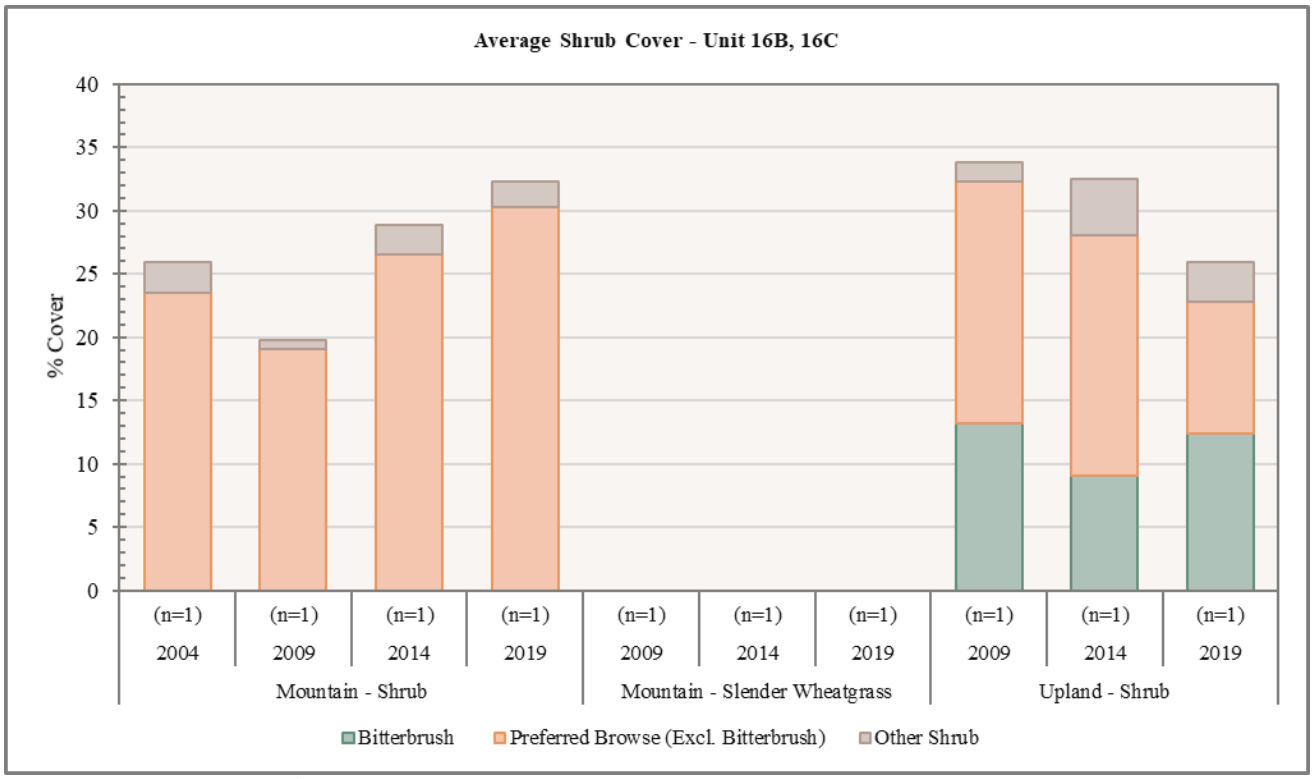


Figure 4.5: Average shrub cover for Mountain – Shrub, Mountain - Slender Wheatgrass, and Upland - Shrub study sites in WMU 16B, 16C, Manti Central Mountains.

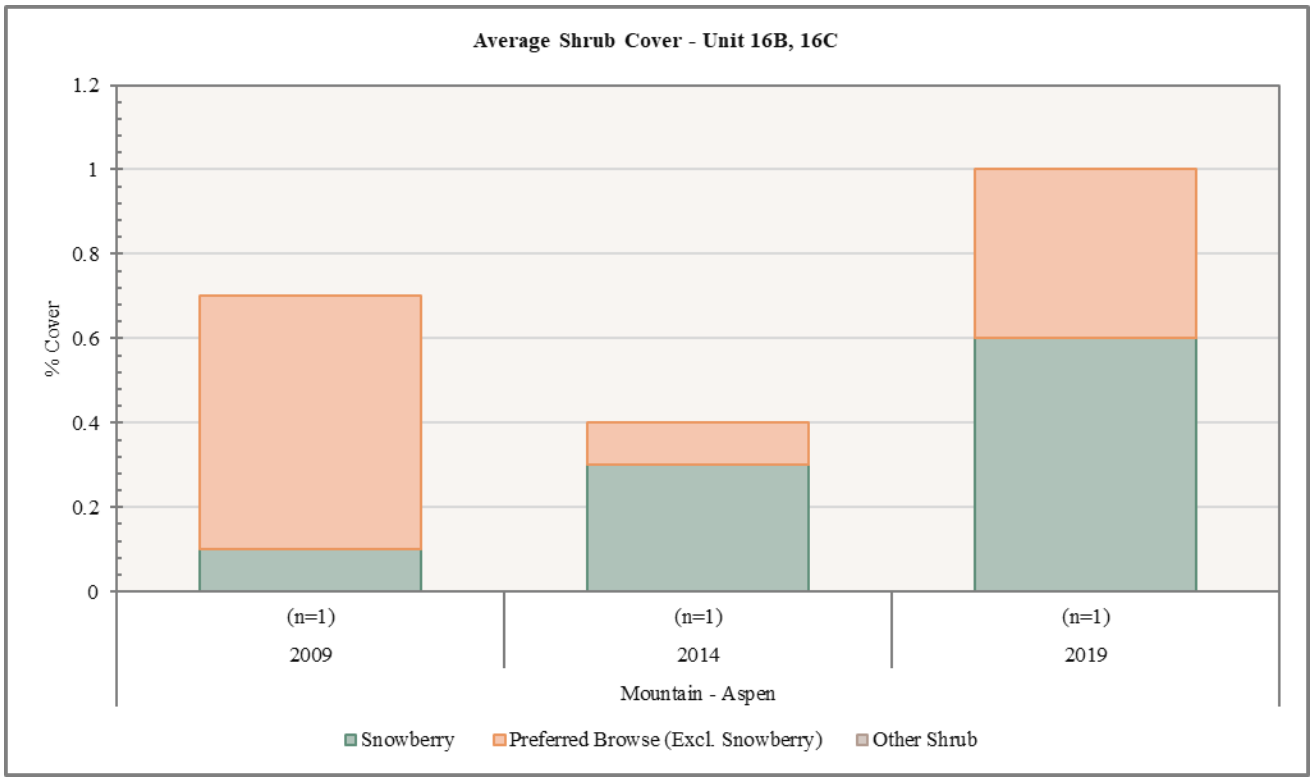


Figure 4.6: Average shrub cover for Mountain - Aspen study sites in WMU 16B, 16C, Manti Central Mountains.

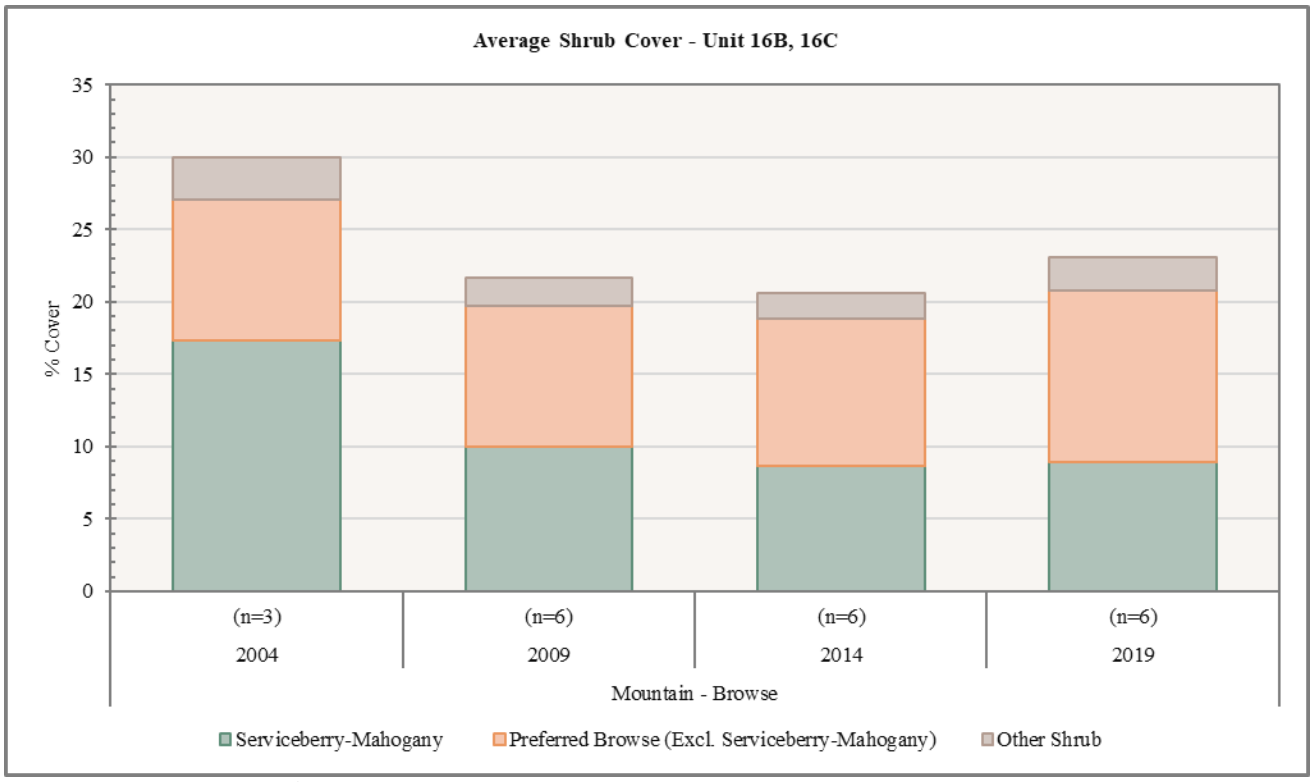


Figure 4.7: Average shrub cover for Mountain - Browse study sites in WMU 16B, 16C, Manti Central Mountains.

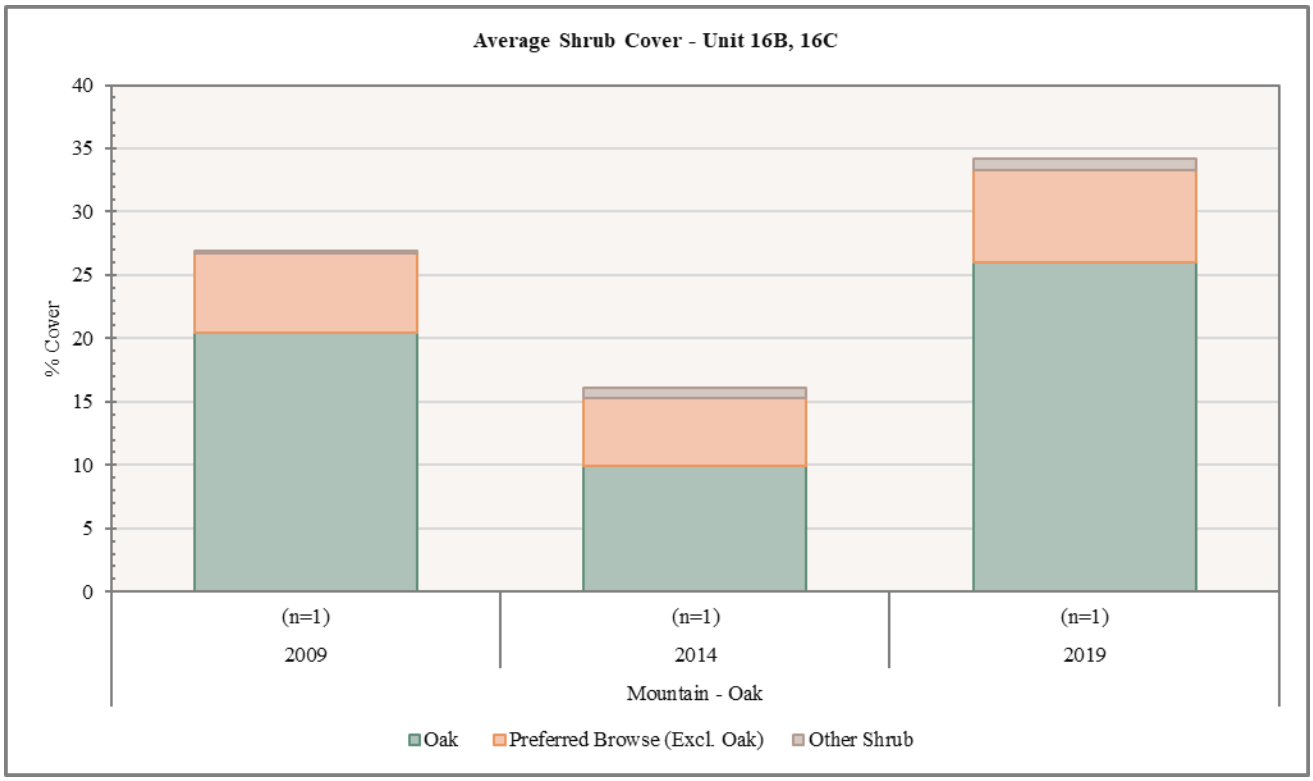


Figure 4.8: Average shrub cover for Mountain - Oak study sites in WMU 16B, 16C, Manti Central Mountains.

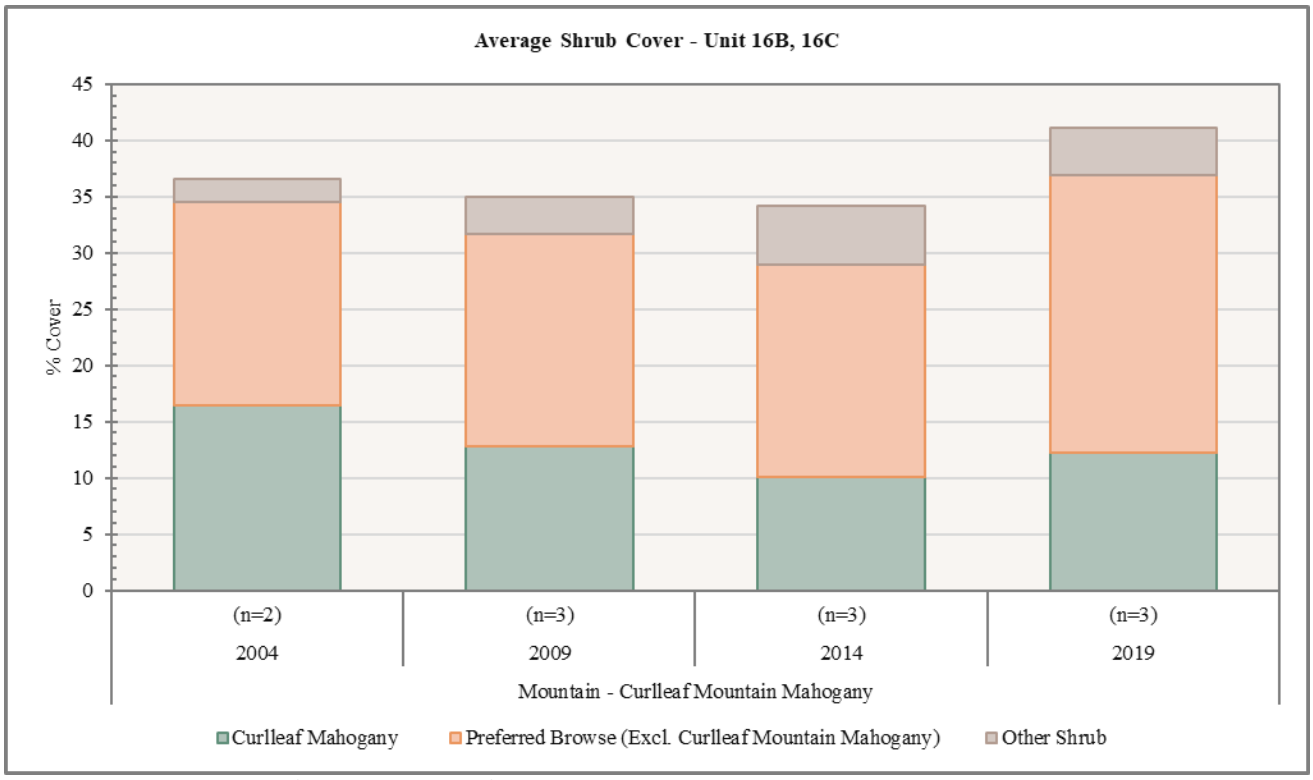


Figure 4.9: Average shrub cover for Mountain - Curlleaf Mountain Mahogany study sites in WMU 16B, 16C, Manti Central Mountains.

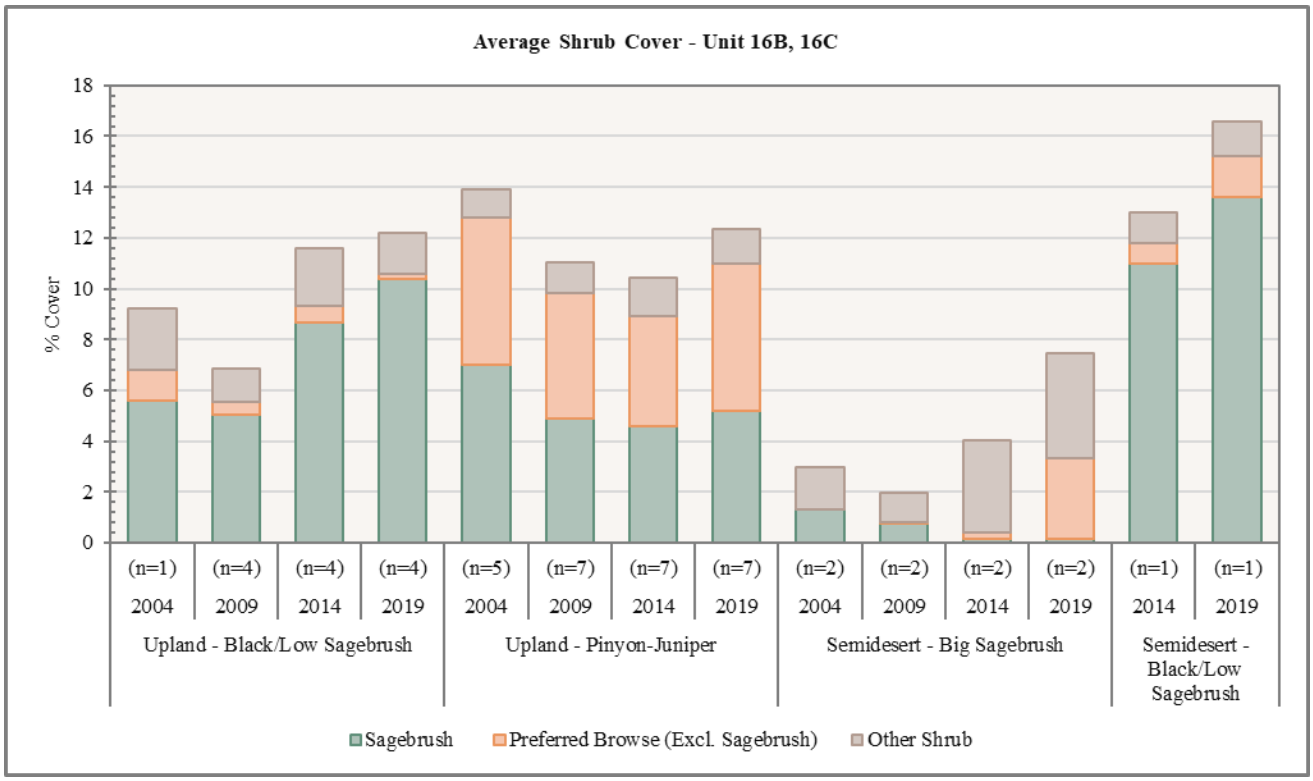


Figure 4.10: Average shrub cover for Upland - Black/Low Sagebrush, Upland - Pinyon-Juniper, Semidesert - Big Sagebrush, and Semidesert - Black/Low Sagebrush study sites in WMU 16B, 16C, Manti Central Mountains.

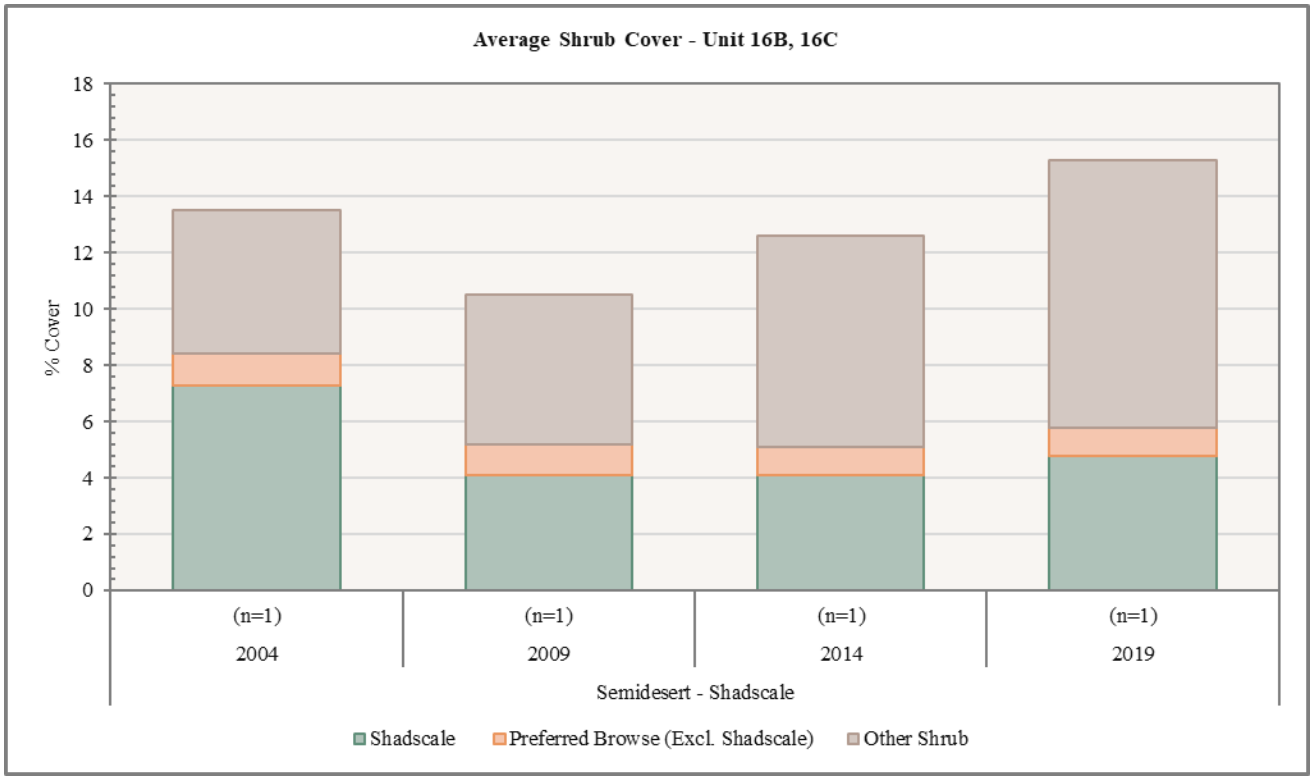


Figure 4.11: Average shrub cover for Semidesert - Shadscale study sites in WMU 16B, 16C, Manti Central Mountains.

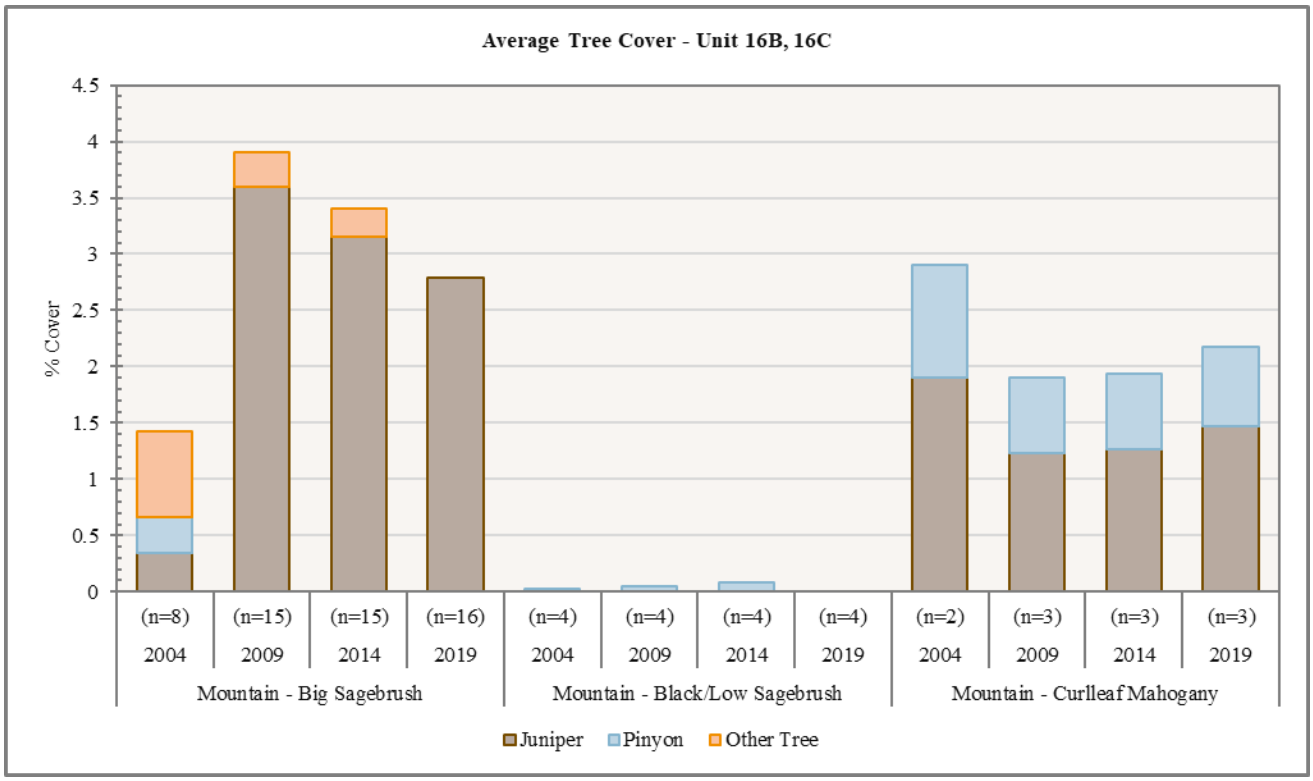


Figure 4.12: Average tree cover for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain - Curlleaf Mahogany study sites in WMU 16B, 16C, Manti Central Mountains.

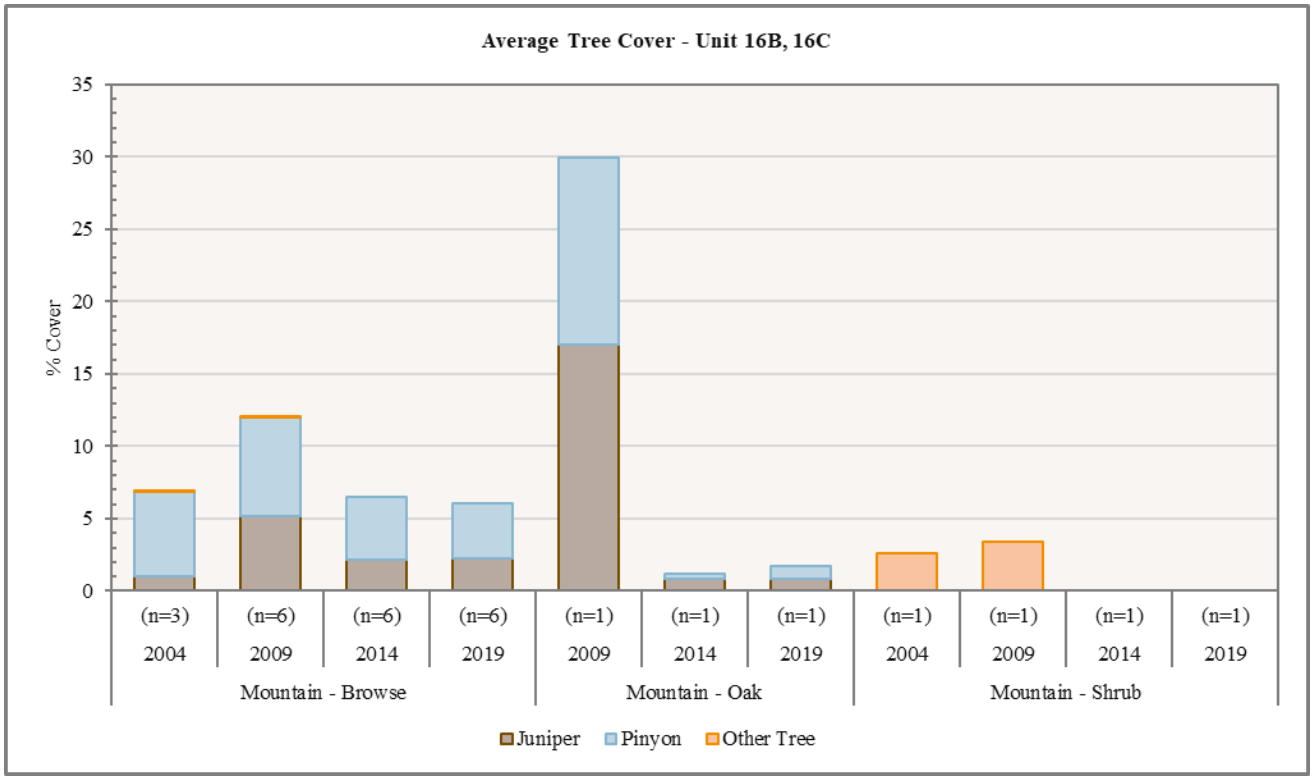


Figure 4.13: Average tree cover for Mountain - Browse, Mountain - Oak, and Mountain - Shrub study sites in WMU 16B, 16C, Manti Central Mountains.

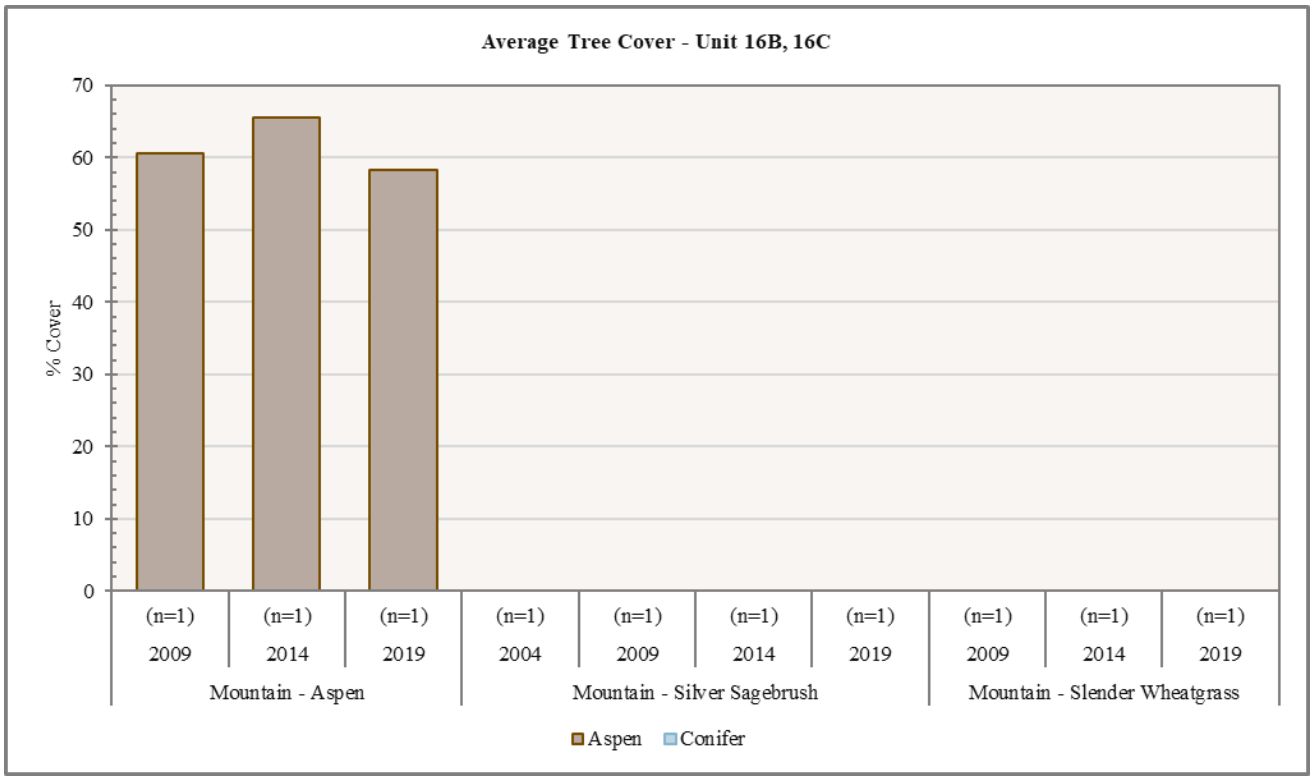


Figure 4.14: Average tree cover for Mountain - Aspen, Mountain - Silver Sagebrush, and Mountain - Slender Wheatgrass study sites in WMU 16B, 16C, Manti Central Mountains.

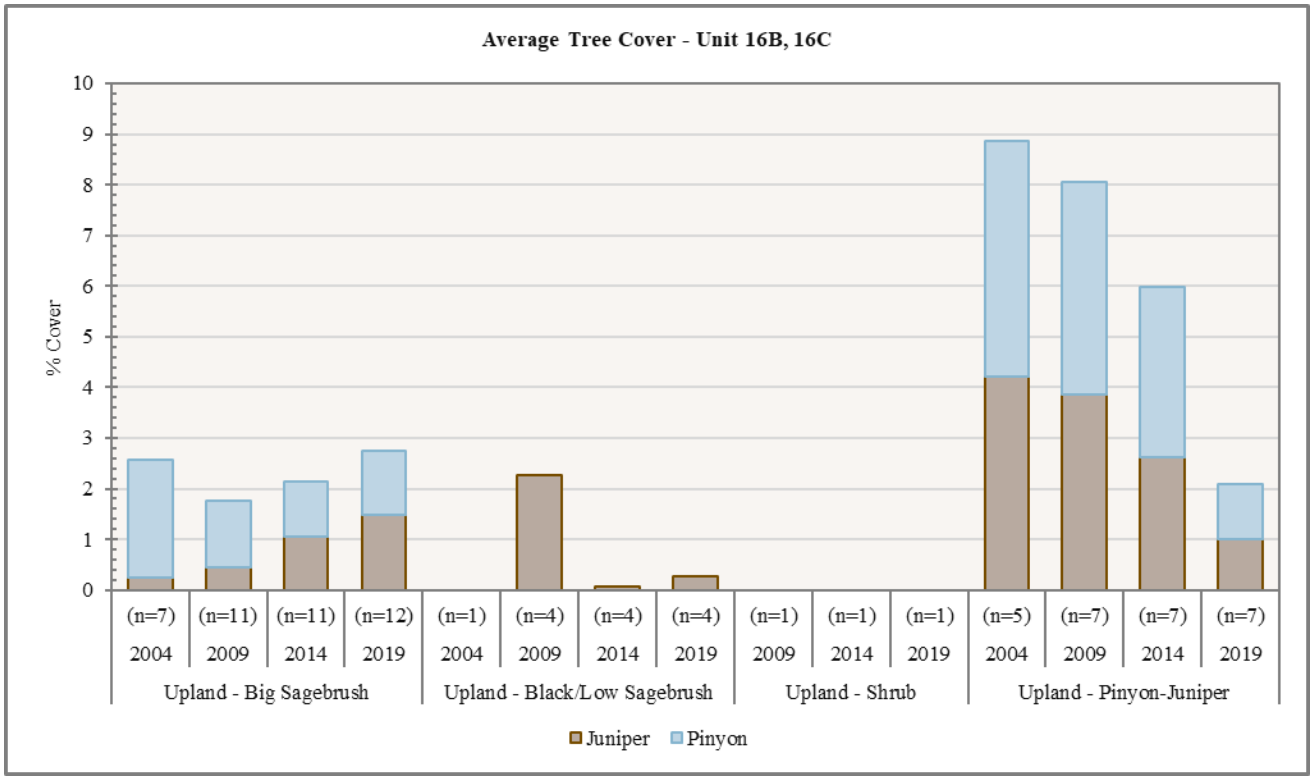


Figure 4.15: Average tree cover for Upland - Big Sagebrush, Upland - Black/Low Sagebrush, Upland - Shrub, and Upland - Pinyon-Juniper study sites in WMU 16B, 16C, Manti Central Mountains.

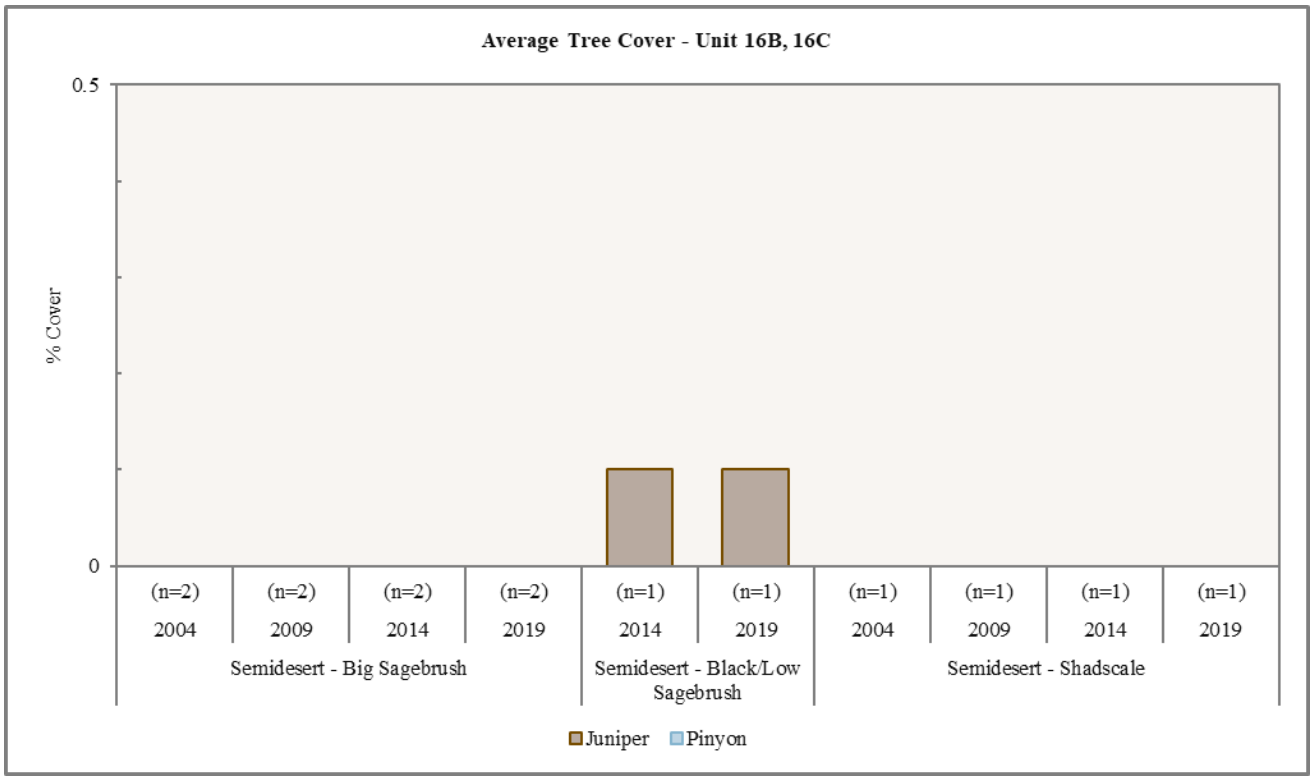


Figure 4.16: Average tree cover for Semidesert - Big Sagebrush, Semidesert - Black/Low Sagebrush, and Semidesert - Shadscale study sites in WMU 16B, 16C, Manti Central Mountains.

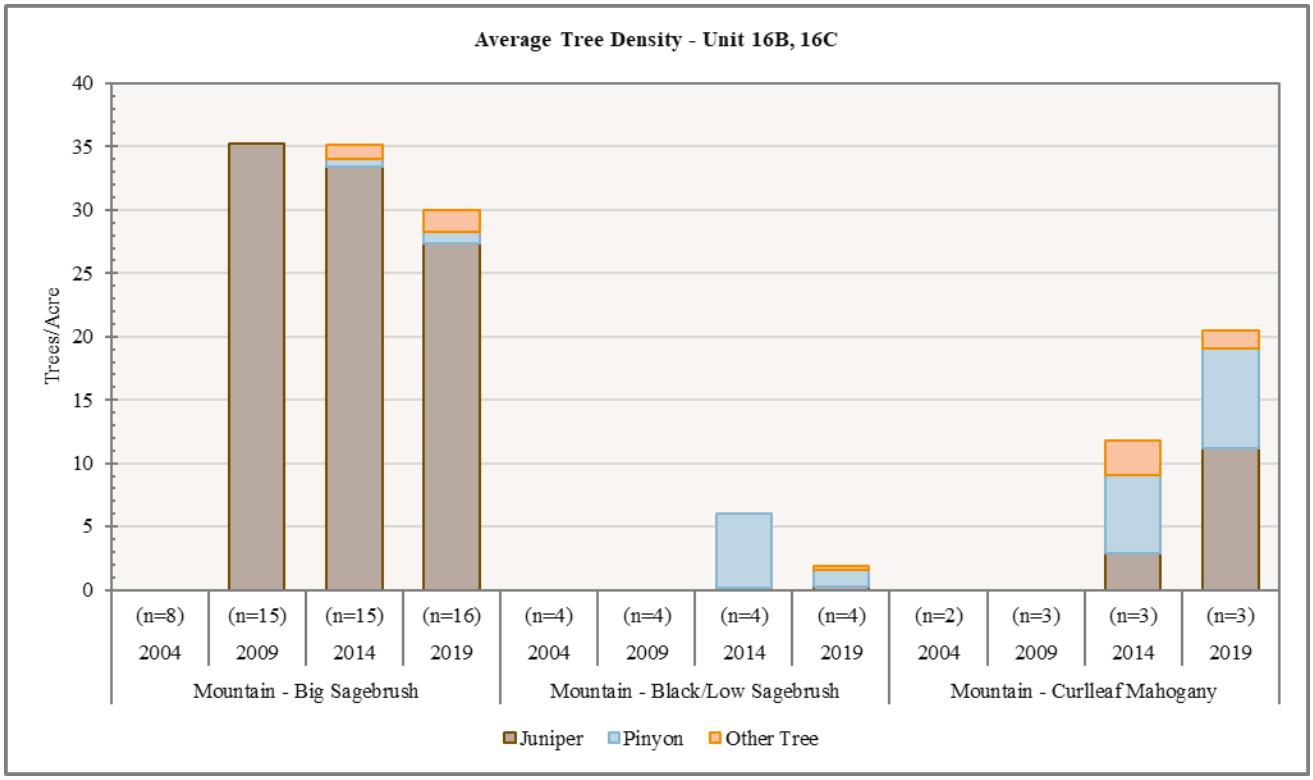


Figure 4.17: Average tree density for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain - Curlleaf Mahogany study sites in WMU 16B, 16C, Manti Central Mountains.

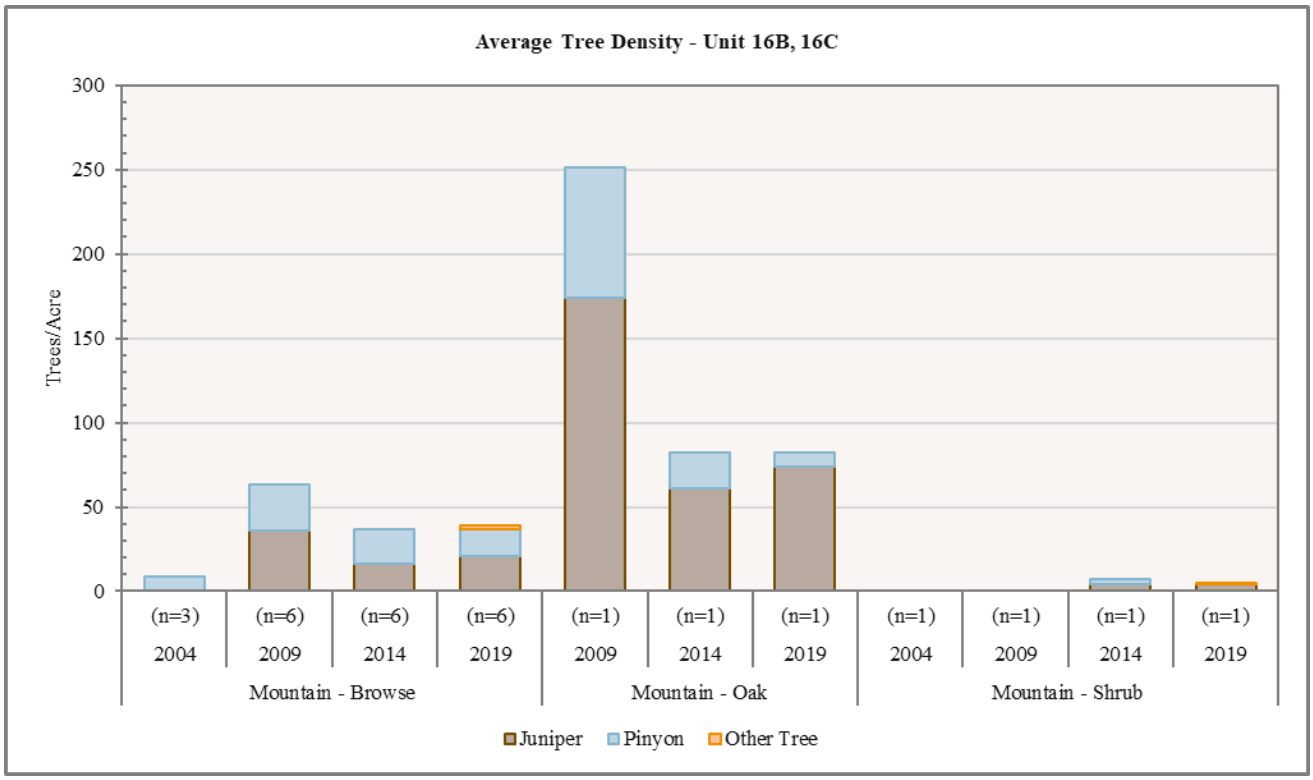


Figure 4.18: Average tree density for Mountain - Browse, Mountain - Oak, and Mountain - Shrub study sites in WMU 16B, 16C, Manti Central Mountains.

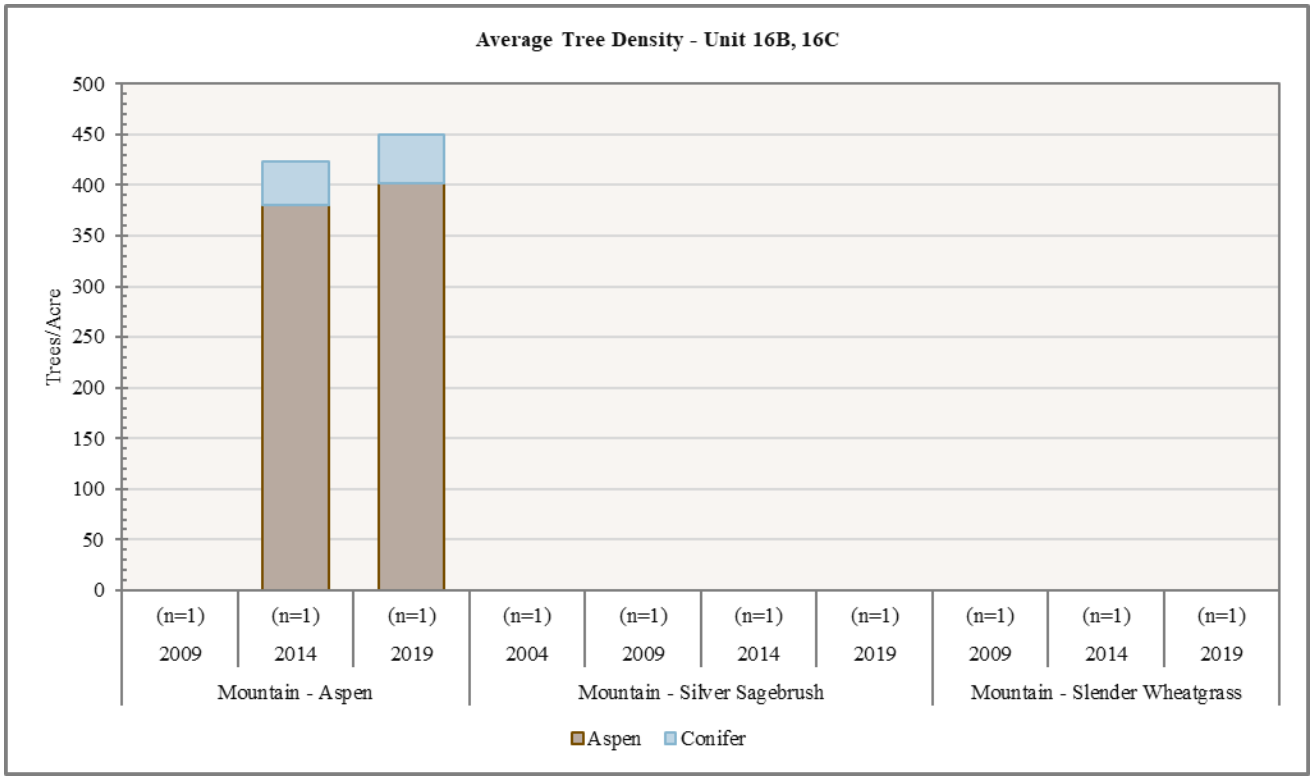


Figure 4.19: Average tree density for Mountain - Aspen, Mountain - Silver Sagebrush, and Mountain - Slender Wheatgrass study sites in WMU 16B, 16C, Manti Central Mountains.

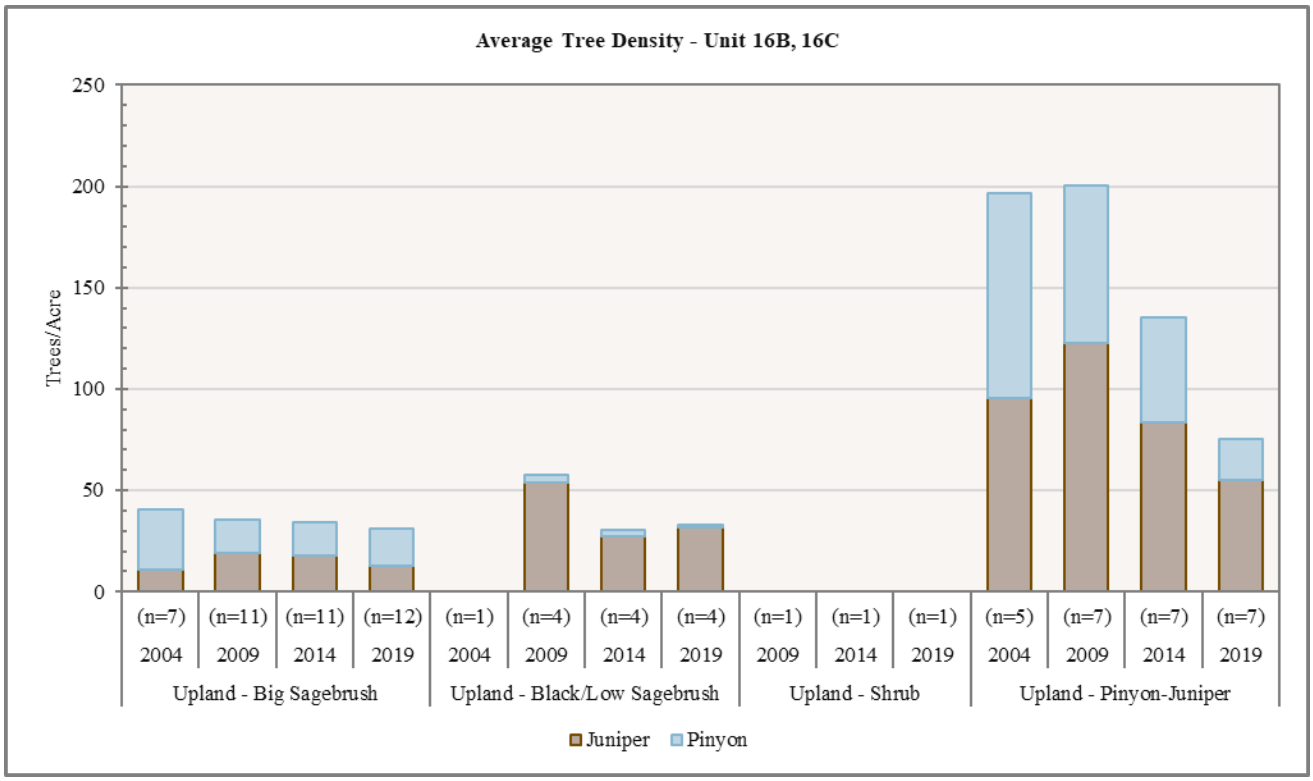


Figure 4.20: Average tree density for Upland - Big Sagebrush, Upland - Black/Low Sagebrush, Upland - Shrub, and Upland - Pinyon-Juniper study sites in WMU 16B, 16C, Manti Central Mountains.

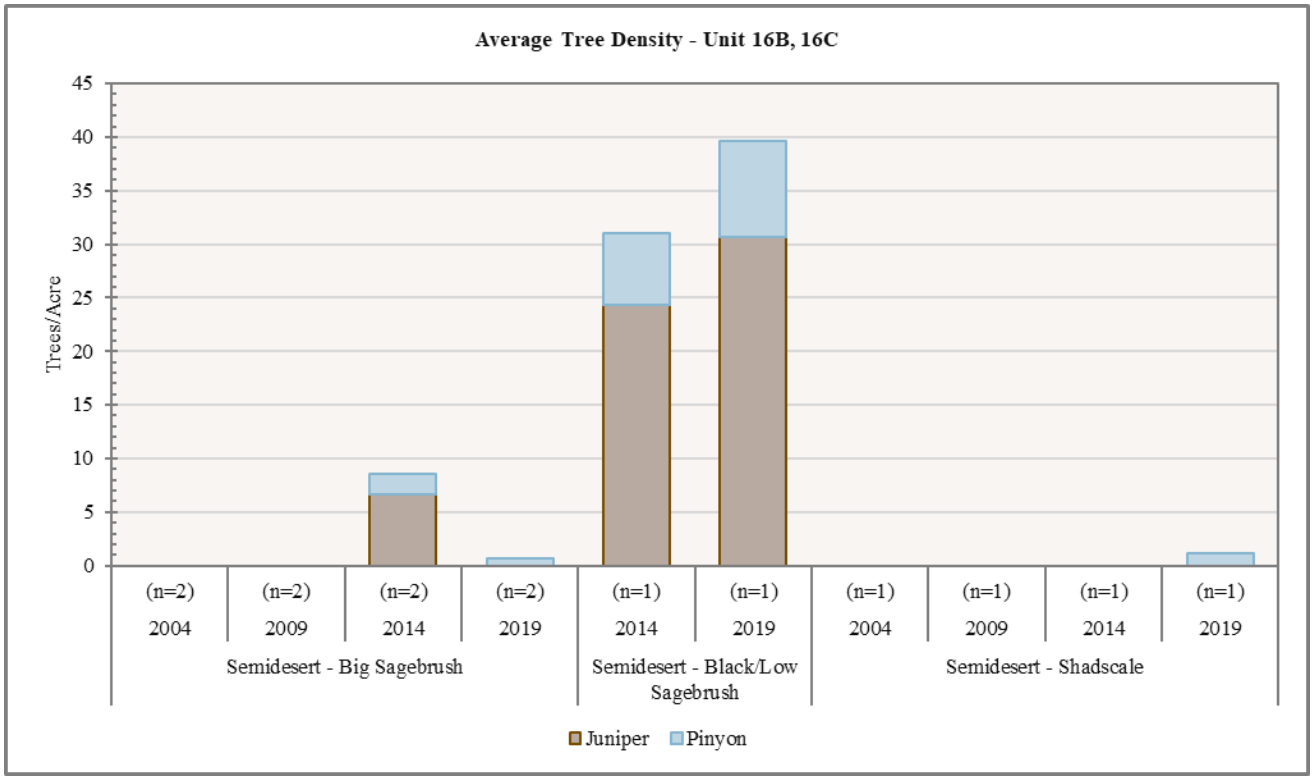


Figure 4.21: Average tree density for Semidesert - Big Sagebrush, Semidesert - Black/Low Sagebrush, and Semidesert - Shadscale study sites in WMU 16B, 16C, Manti Central Mountains.

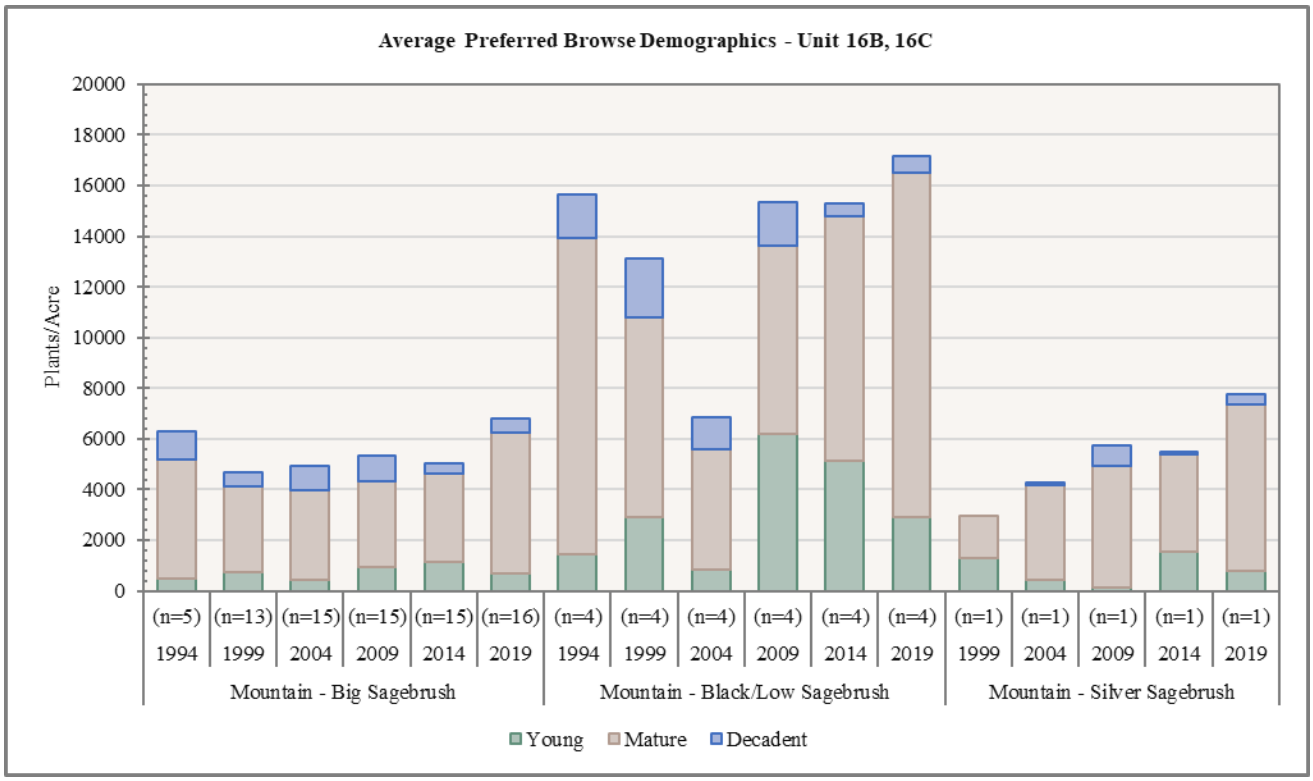


Figure 4.22: Average preferred browse demographics for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain - Silver Sagebrush study sites in WMU 16B, 16C, Manti Central Mountains.

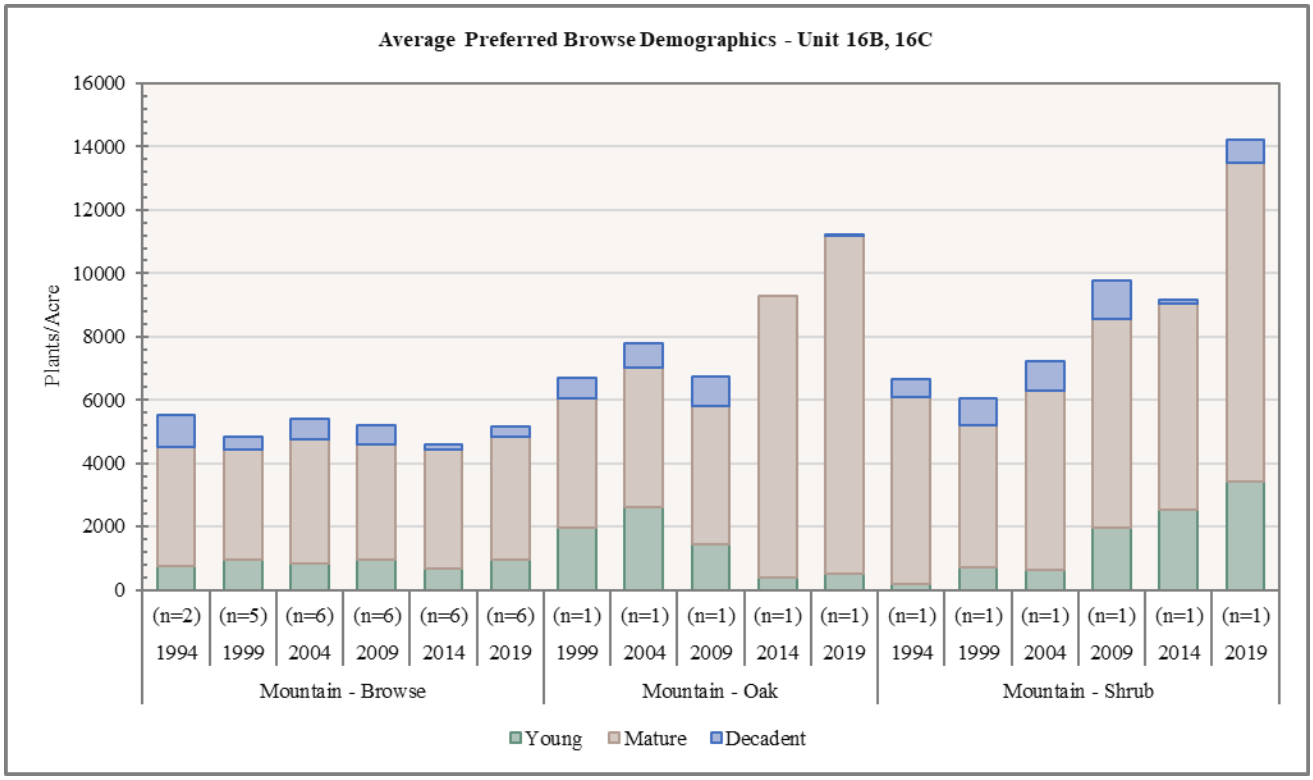


Figure 4.23: Average preferred browse demographics for Mountain - Browse, Mountain - Oak, and Mountain - Shrub study sites in WMU 16B, 16C, Manti Central Mountains.

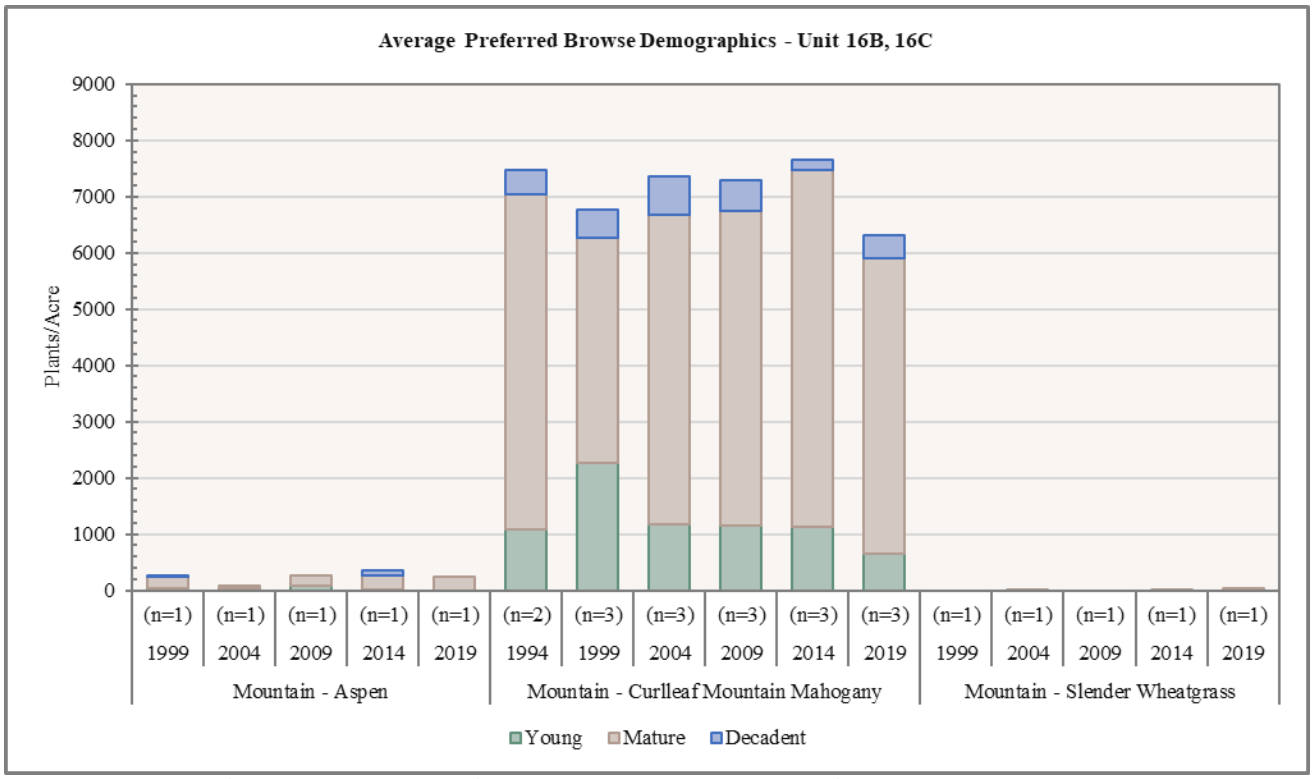


Figure 4.24: Average preferred browse demographics for Mountain - Aspen, Mountain - Curlleaf Mountain Mahogany, and Mountain - Slender Wheatgrass study sites in WMU 16B, 16C, Manti Central Mountains.

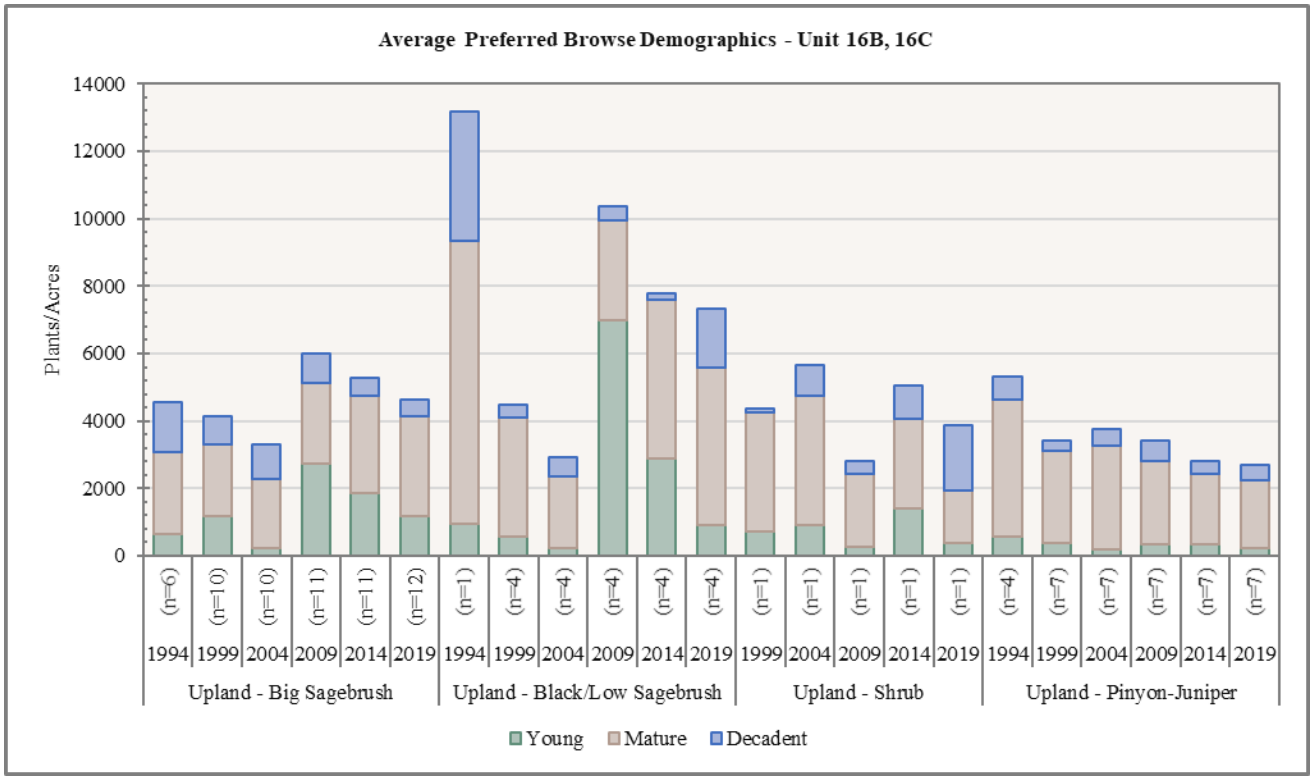


Figure 4.25: Average preferred browse demographics for Upland - Big Sagebrush, Upland - Black/Low Sagebrush, Upland - Shrub, and Upland - Pinyon-Juniper study sites in WMU 16B, 16C, Manti Central Mountains.

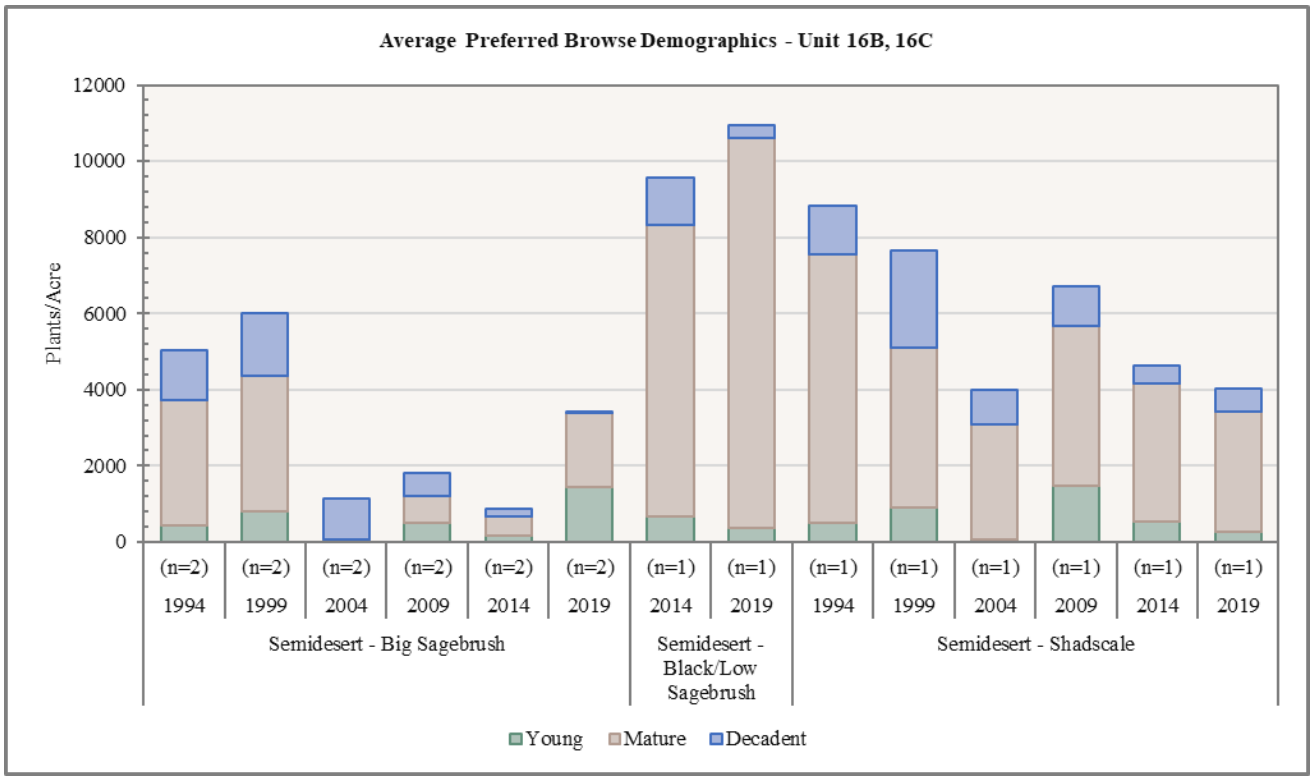


Figure 4.26: Average preferred browse demographics for Semidesert - Big Sagebrush, Semidesert - Black/Low Sagebrush, and Semidesert - Shadscale study sites in WMU 16B, 16C, Manti Central Mountains.

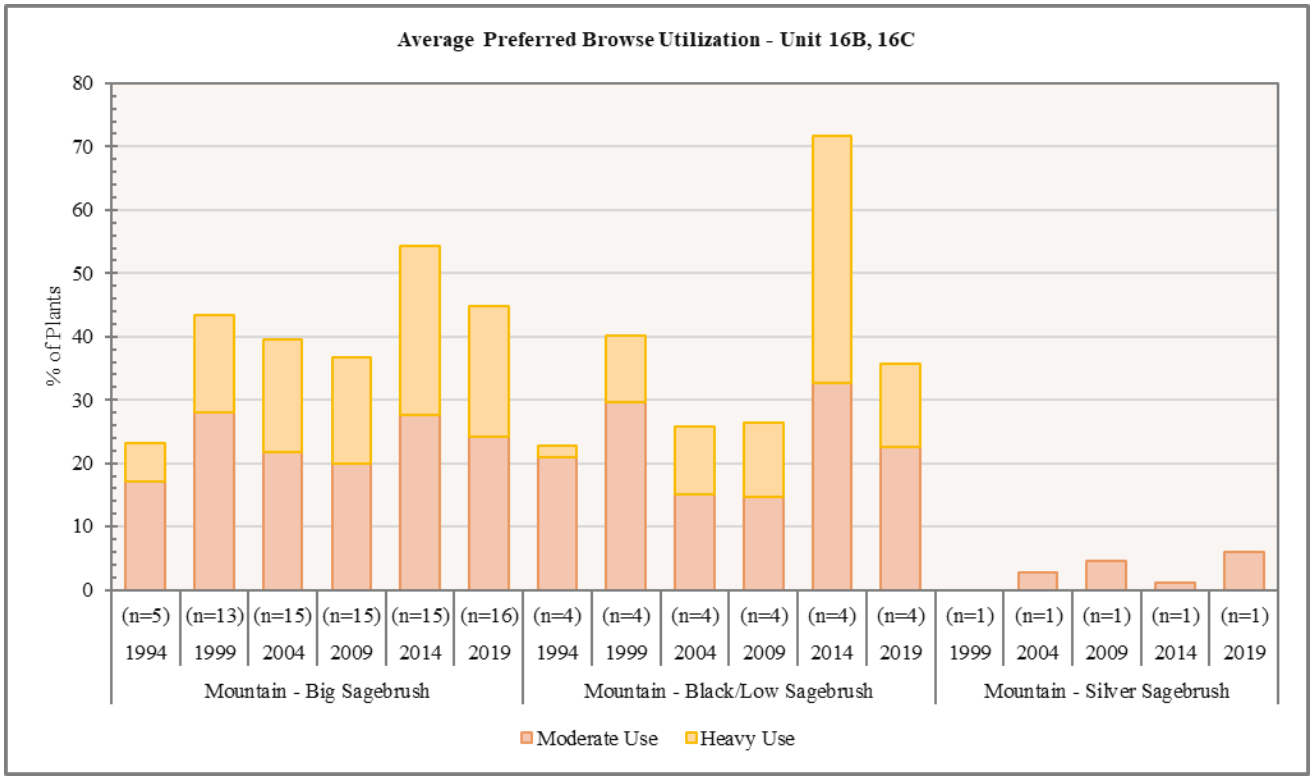


Figure 4.27: Average preferred browse utilization for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain - Silver Sagebrush study sites in WMU 16B, 16C, Manti Central Mountains.

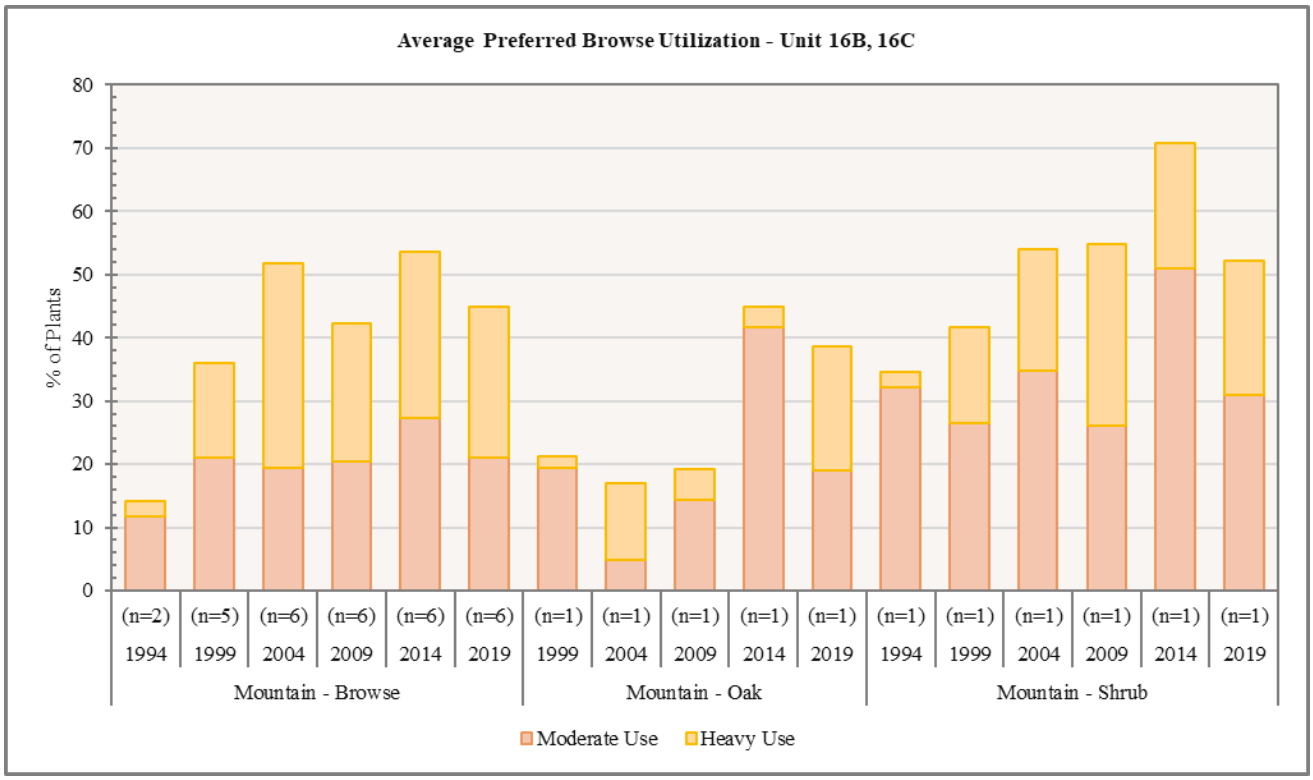


Figure 4.28: Average preferred browse utilization for Mountain - Browse, Mountain - Oak, and Mountain - Shrub study sites in WMU 16B, 16C, Manti Central Mountains.

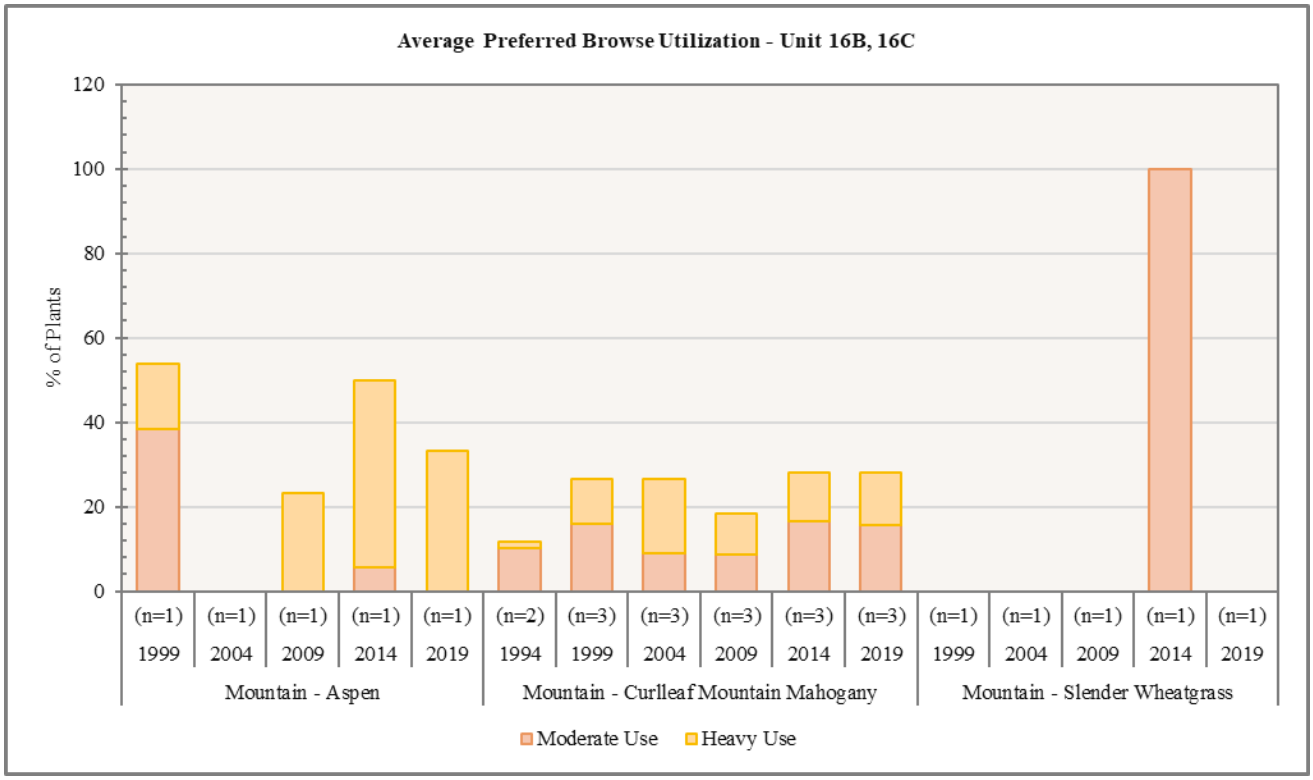


Figure 4.29: Average preferred browse utilization for Mountain - Aspen, Mountain - Curlleaf Mountain Mahogany, and Mountain - Slender Wheatgrass study sites in WMU 16B, 16C, Manti Central Mountains.

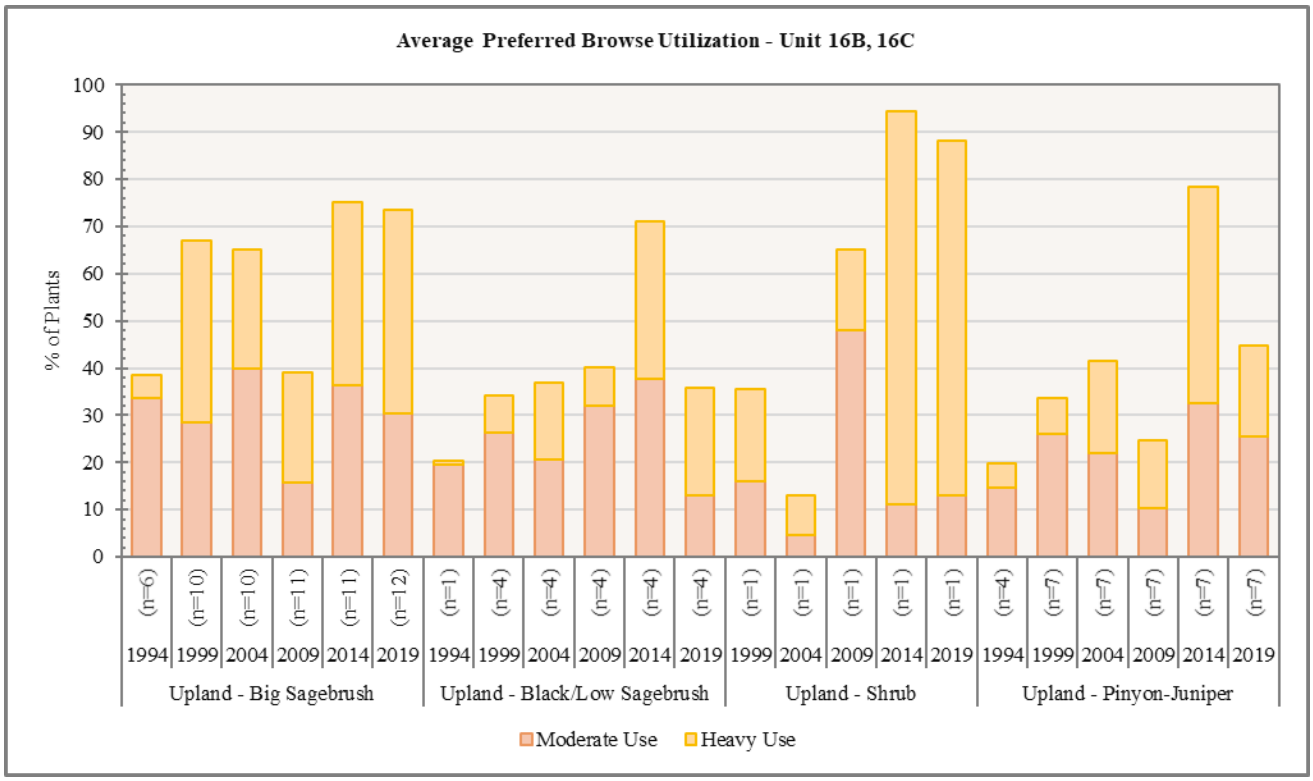


Figure 4.30: Average preferred browse utilization for Upland - Big Sagebrush, Upland - Black/Low Sagebrush, Upland - Shrub, and Upland - Pinyon-Juniper study sites in WMU 16B, 16C, Manti Central Mountains.

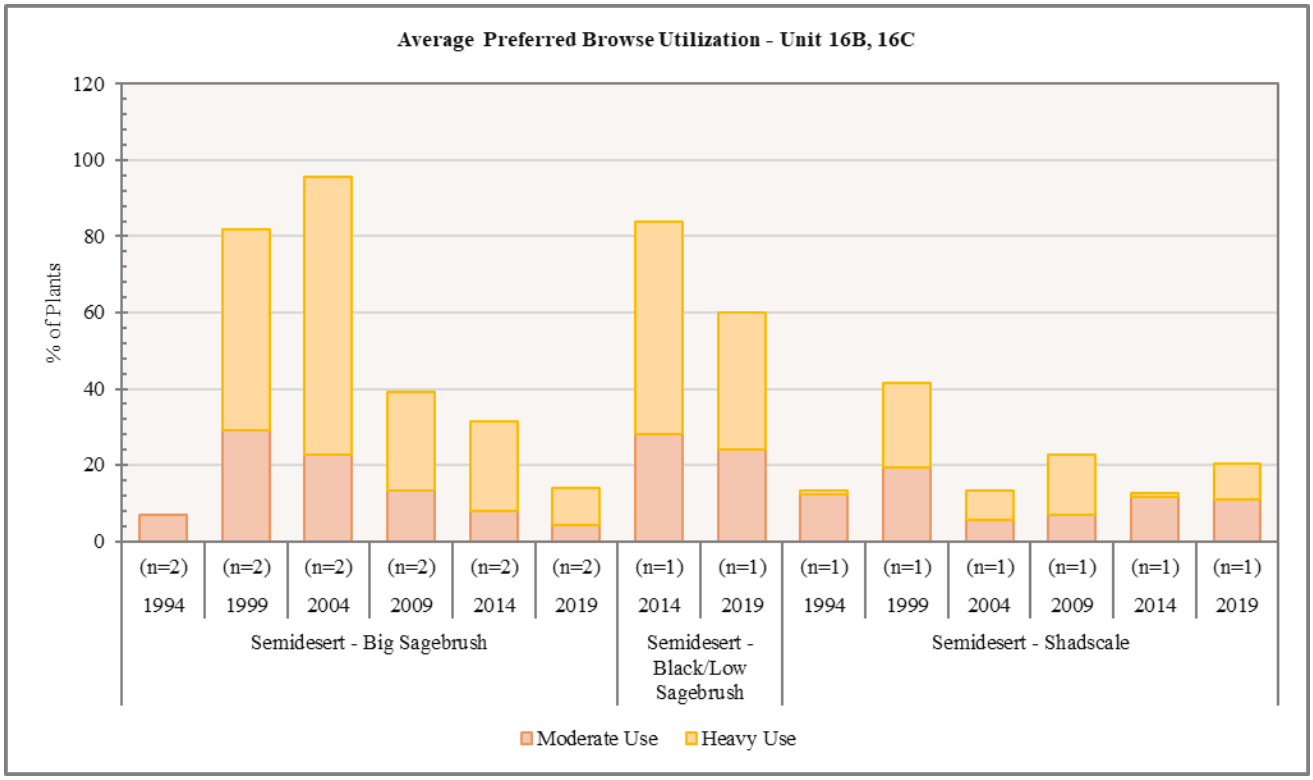


Figure 4.31: Average preferred browse utilization for Semidesert - Big Sagebrush, Semidesert - Black/Low Sagebrush, and Semidesert - Shadscale study sites in WMU 16B, 16C, Manti Central Mountains.

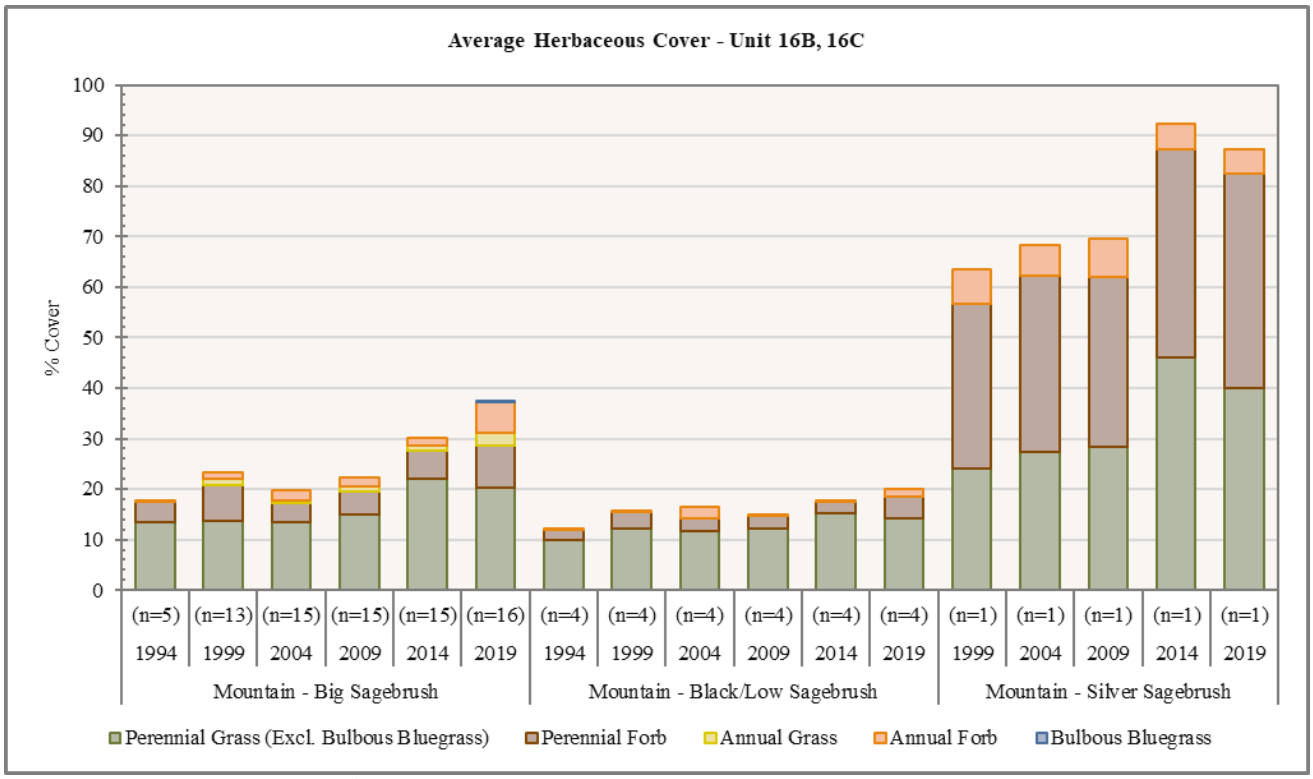


Figure 4.32: Average herbaceous cover for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain - Silver Sagebrush study sites in WMU 16B, 16C, Manti Central Mountains.

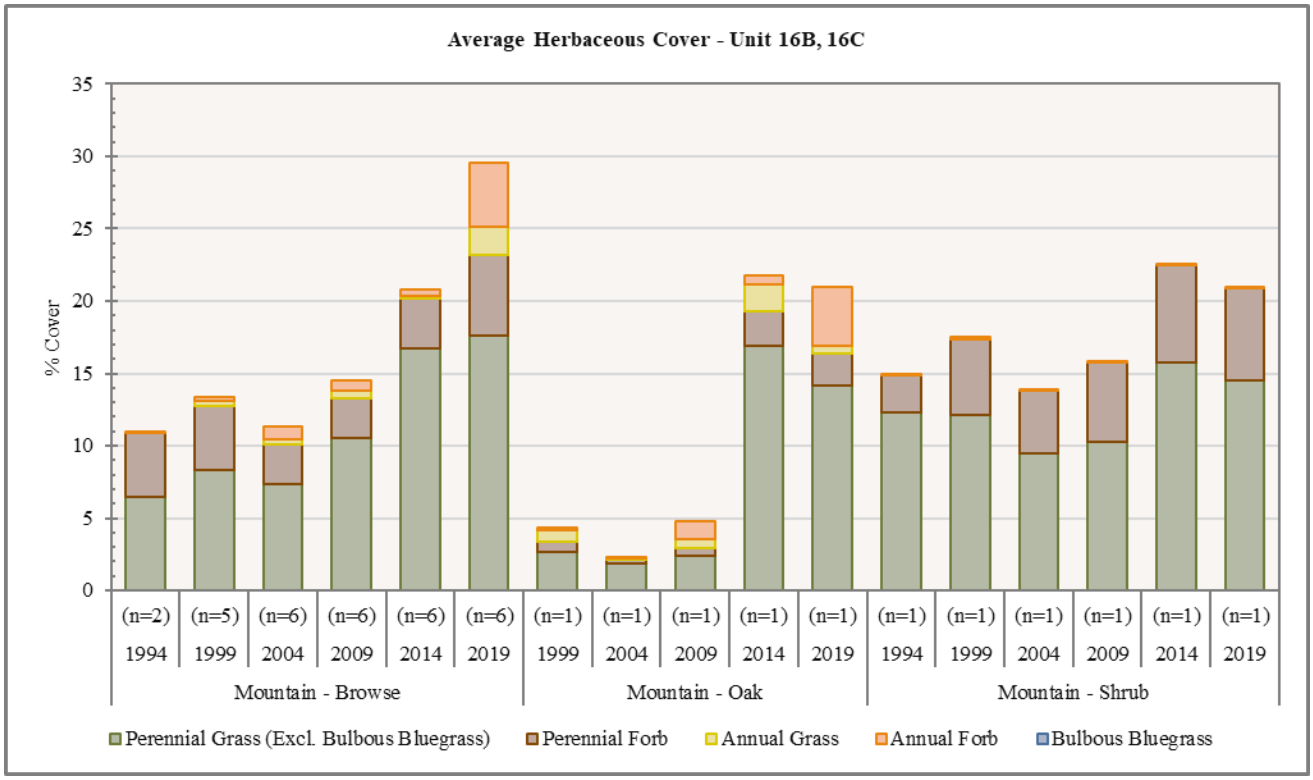


Figure 4.33: Average herbaceous cover for Mountain - Browse, Mountain - Oak, and Mountain - Shrub study sites in WMU 16B, 16C, Manti Central Mountains.

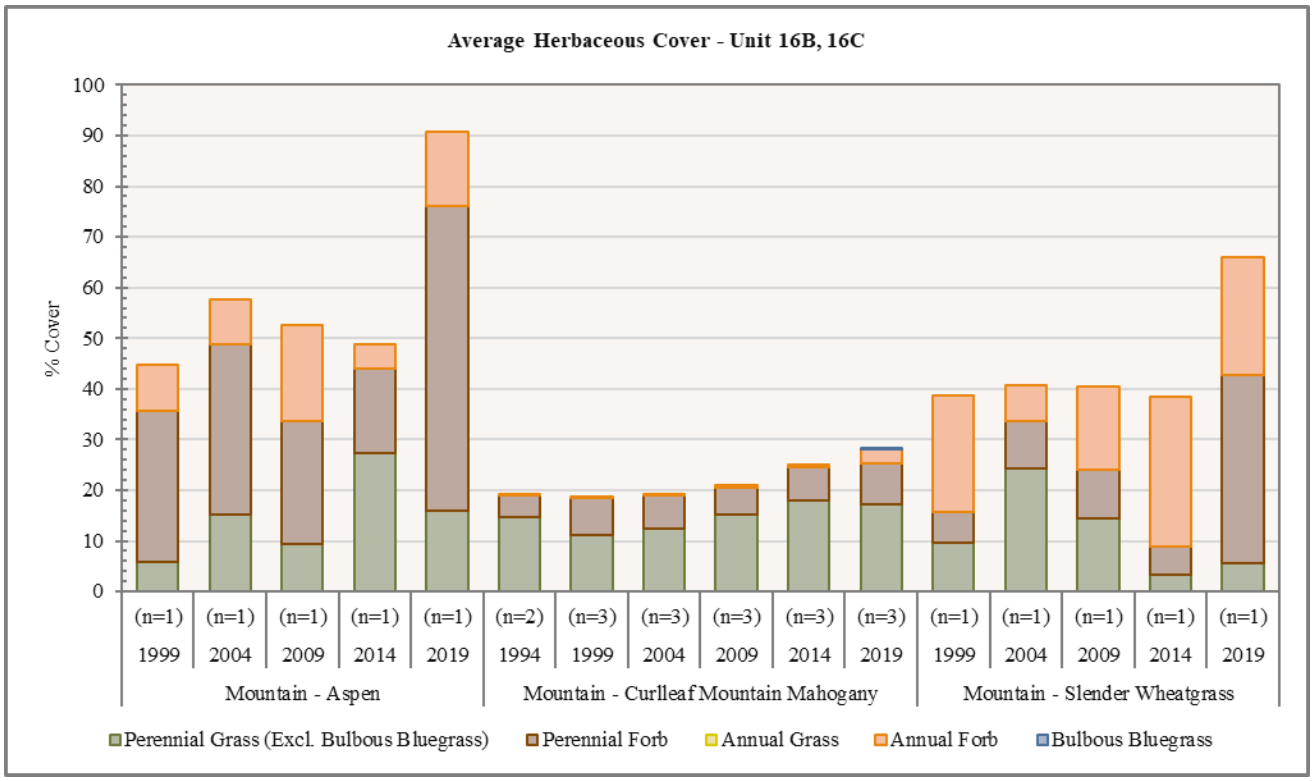


Figure 4.34: Average herbaceous cover for Mountain - Aspen, Mountain - Curlleaf Mountain Mahogany, and Mountain - Slender Wheatgrass study sites in WMU 16B, 16C, Manti Central Mountains.

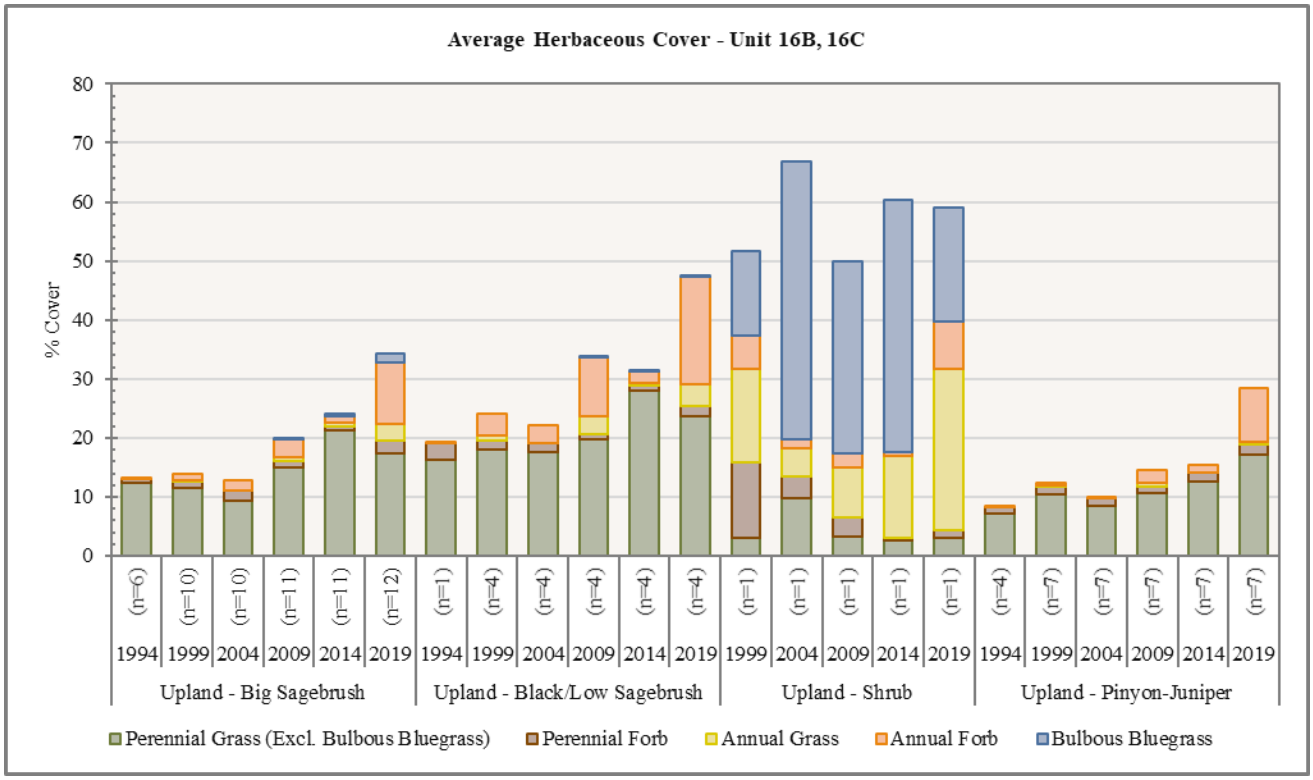


Figure 4.35: Average herbaceous cover for Upland - Big Sagebrush, Upland - Black/Low Sagebrush, Upland - Shrub, and Upland - Pinyon-Juniper study sites in WMU 16B, 16C, Manti Central Mountains.

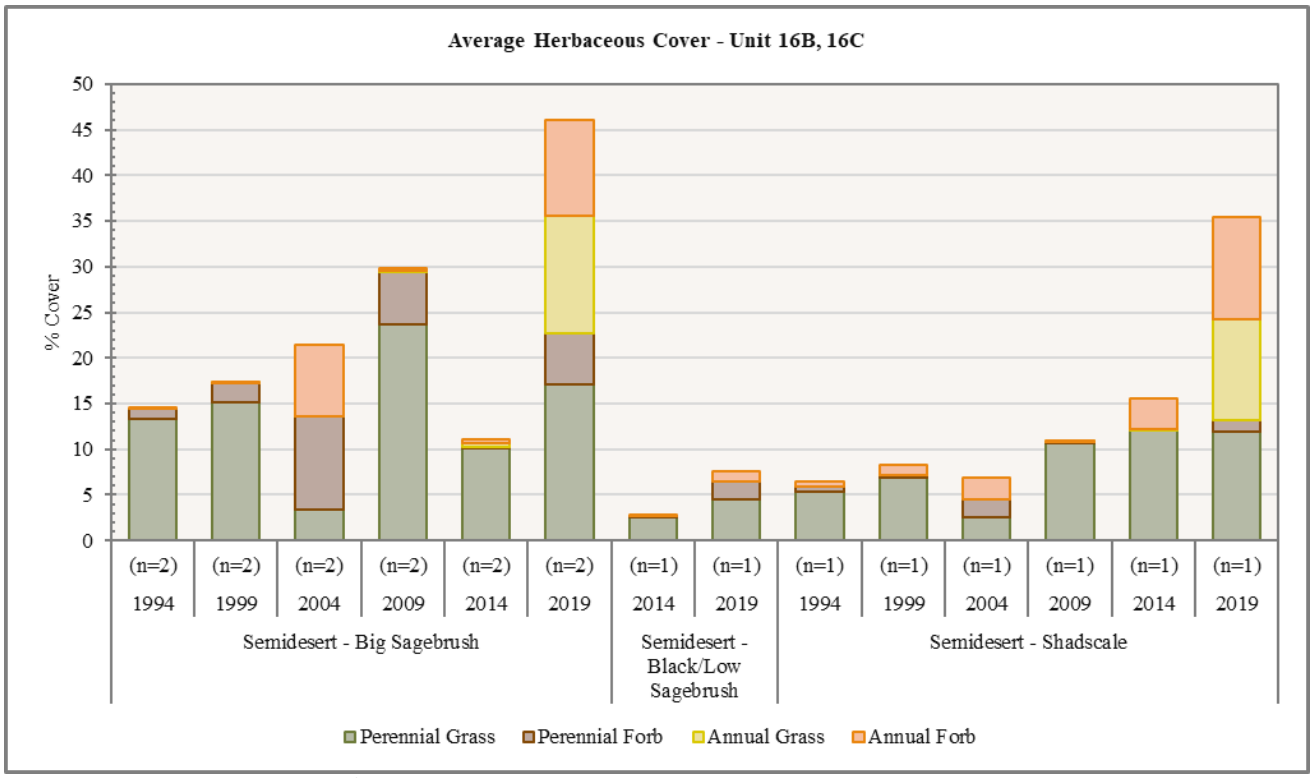


Figure 4.36: Average herbaceous cover for Semidesert - Big Sagebrush, Semidesert - Black/Low Sagebrush, and Semidesert - Shadscale study sites in WMU 16B, 16C, Manti Central Mountains.

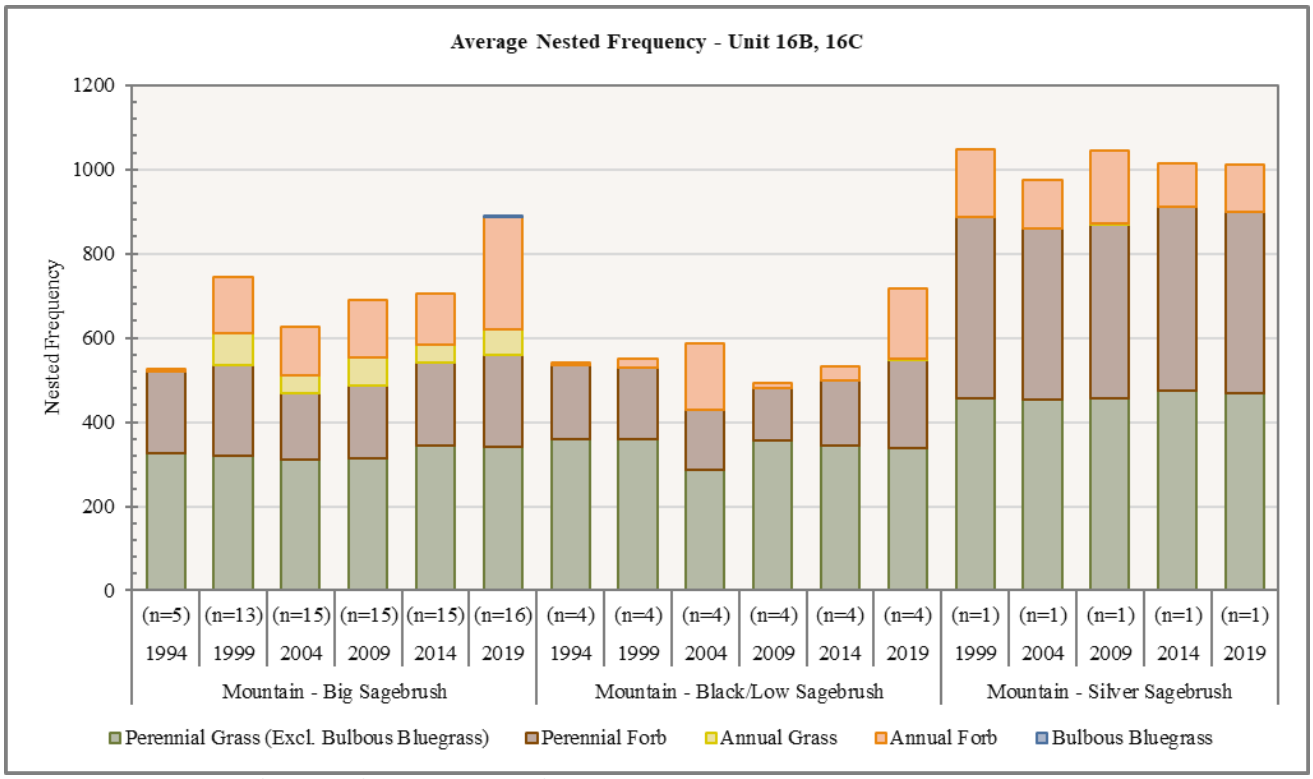


Figure 4.37: Average nested frequency of herbaceous species for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain - Silver Sagebrush study sites in WMU 16B, 16C, Manti Central Mountains.

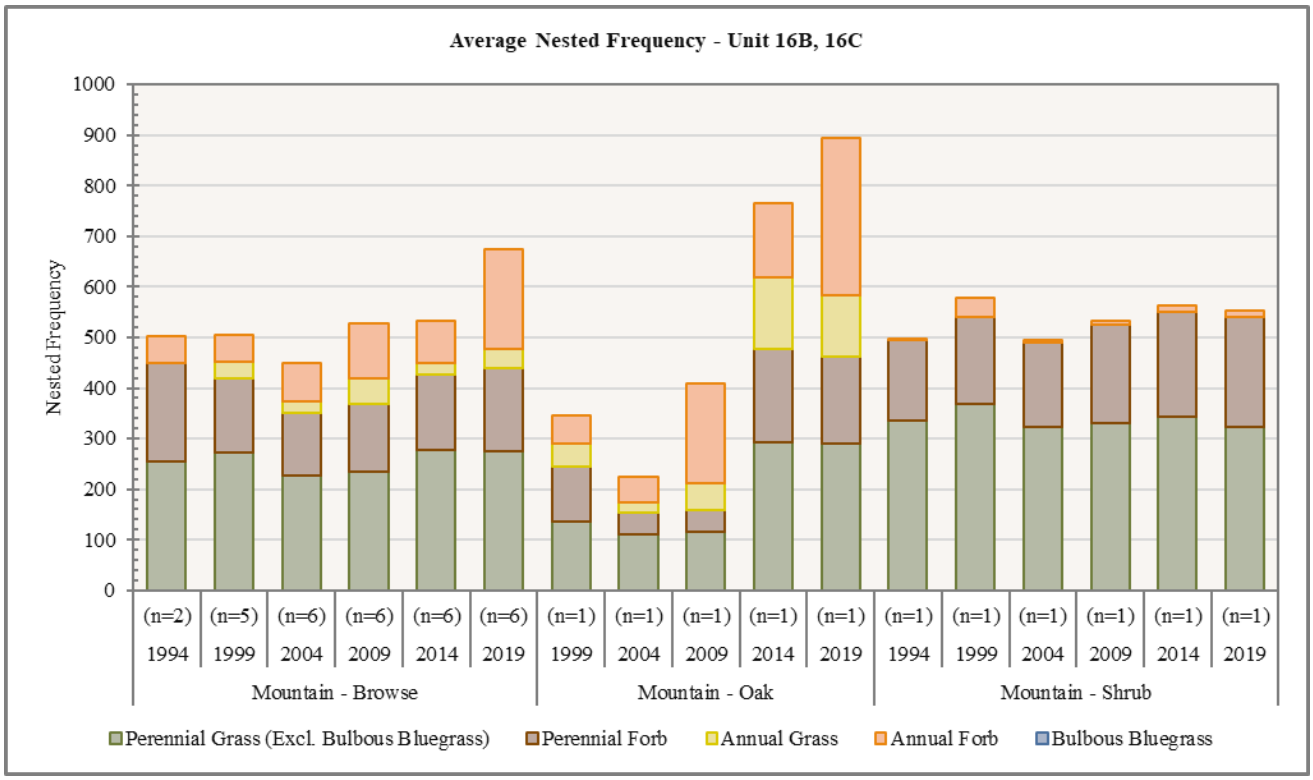


Figure 4.38: Average nested frequency of herbaceous species for Mountain - Browse, Mountain - Oak, and Mountain - Shrub study sites in WMU 16B, 16C, Manti Central Mountains.

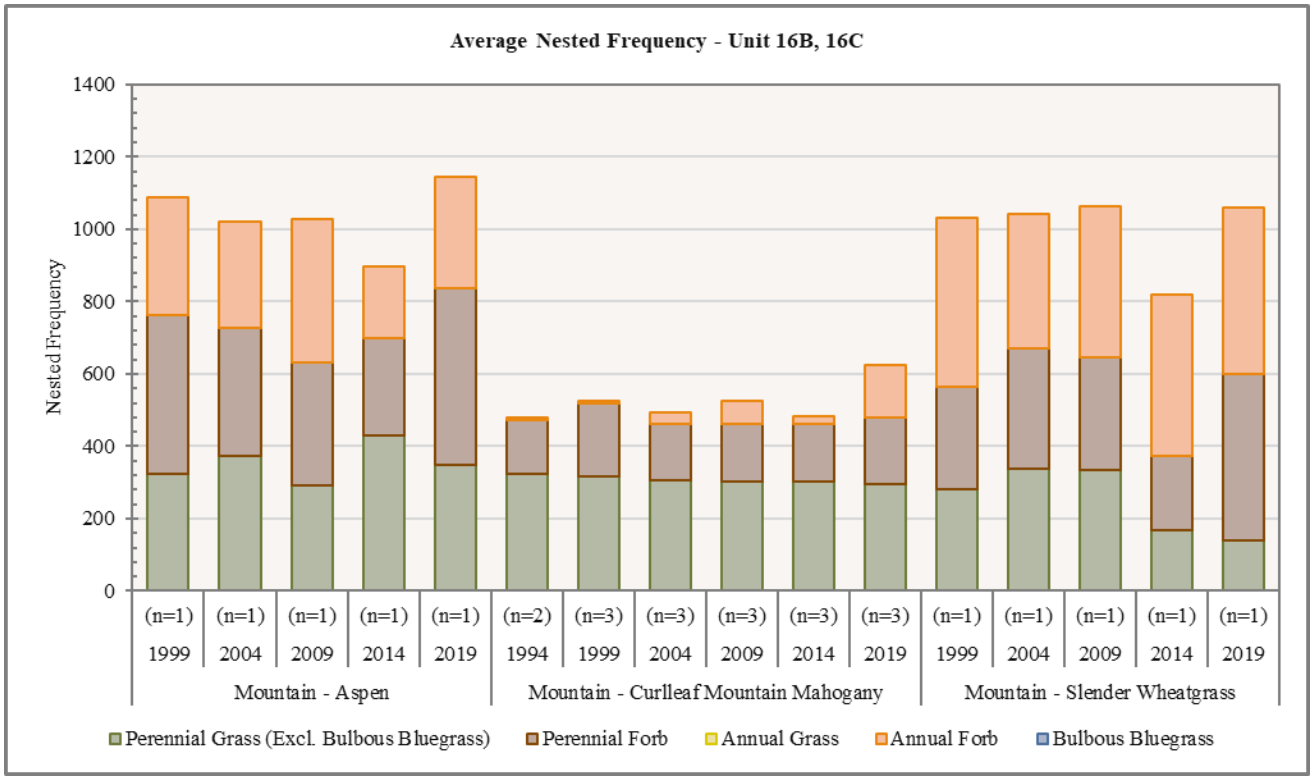


Figure 4.39: Average nested frequency of herbaceous species for Mountain - Aspen, Mountain - Curlleaf Mountain Mahogany, and Mountain - Slender Wheatgrass study sites in WMU 16B, 16C, Manti Central Mountains.

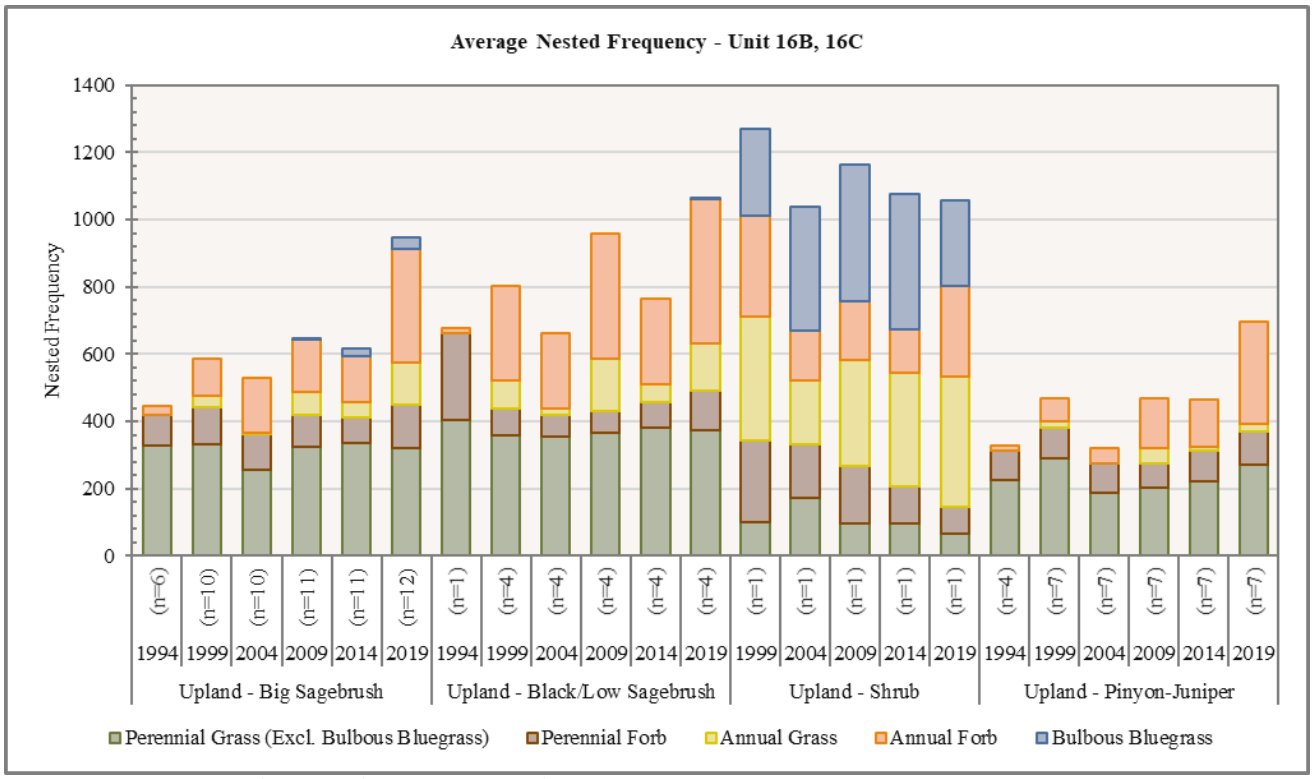


Figure 4.40: Average nested frequency of herbaceous species for Upland - Big Sagebrush, Upland - Black/Low Sagebrush, Upland - Shrub, and Upland - Pinyon-Juniper study sites in WMU 16B, 16C, Manti Central Mountains.

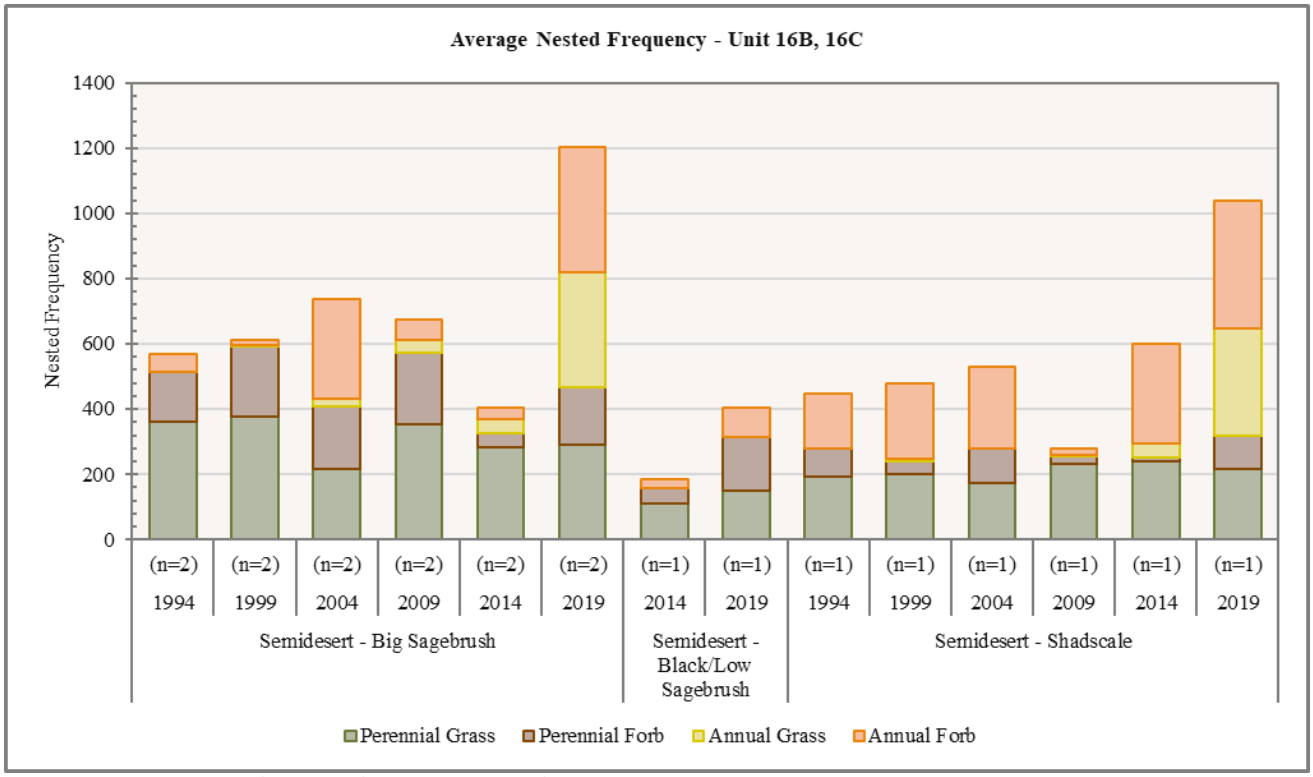


Figure 4.41: Average nested frequency of herbaceous species for Semidesert - Big Sagebrush, Semidesert - Black/Low Sagebrush, and Semidesert - Shadscale study sites in WMU 16B, 16C, Manti Central Mountains.

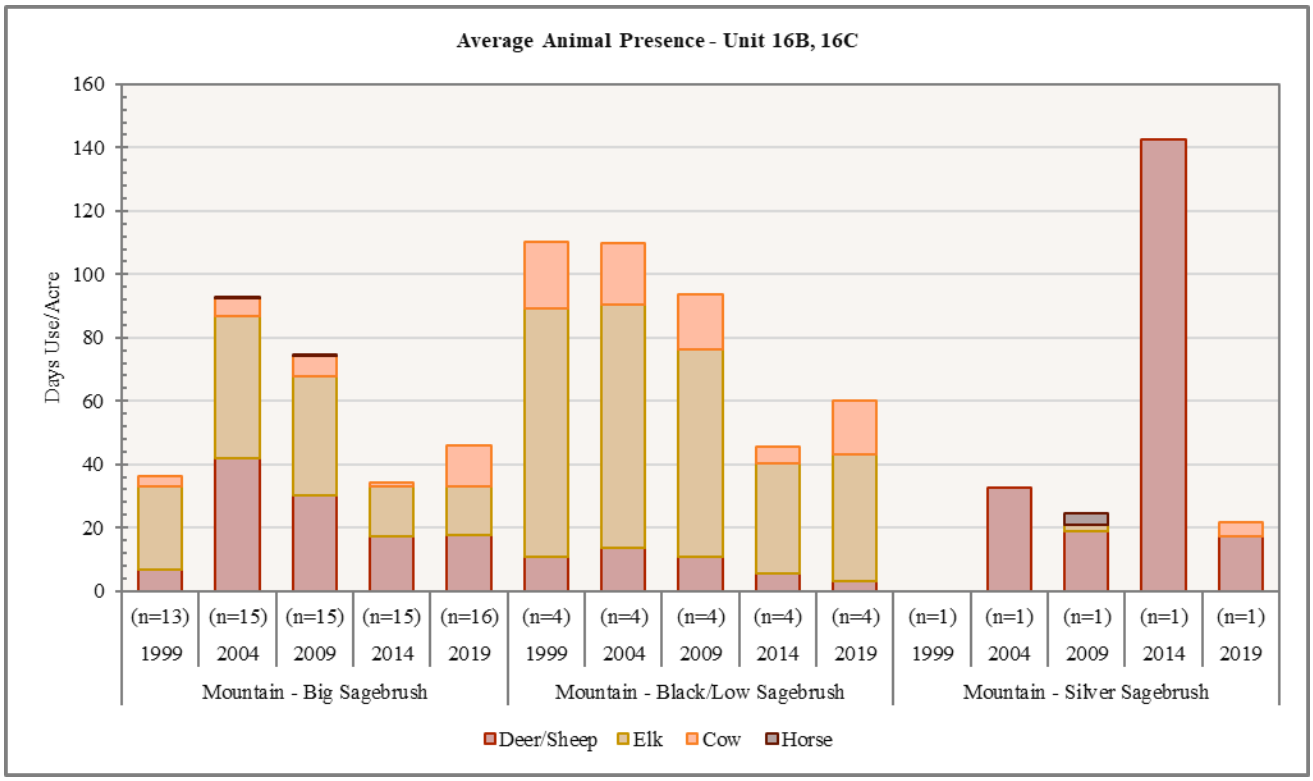


Figure 4.42: Average pellet transect data for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain - Silver Sagebrush study sites in WMU 16B, 16C, Manti Central Mountains.

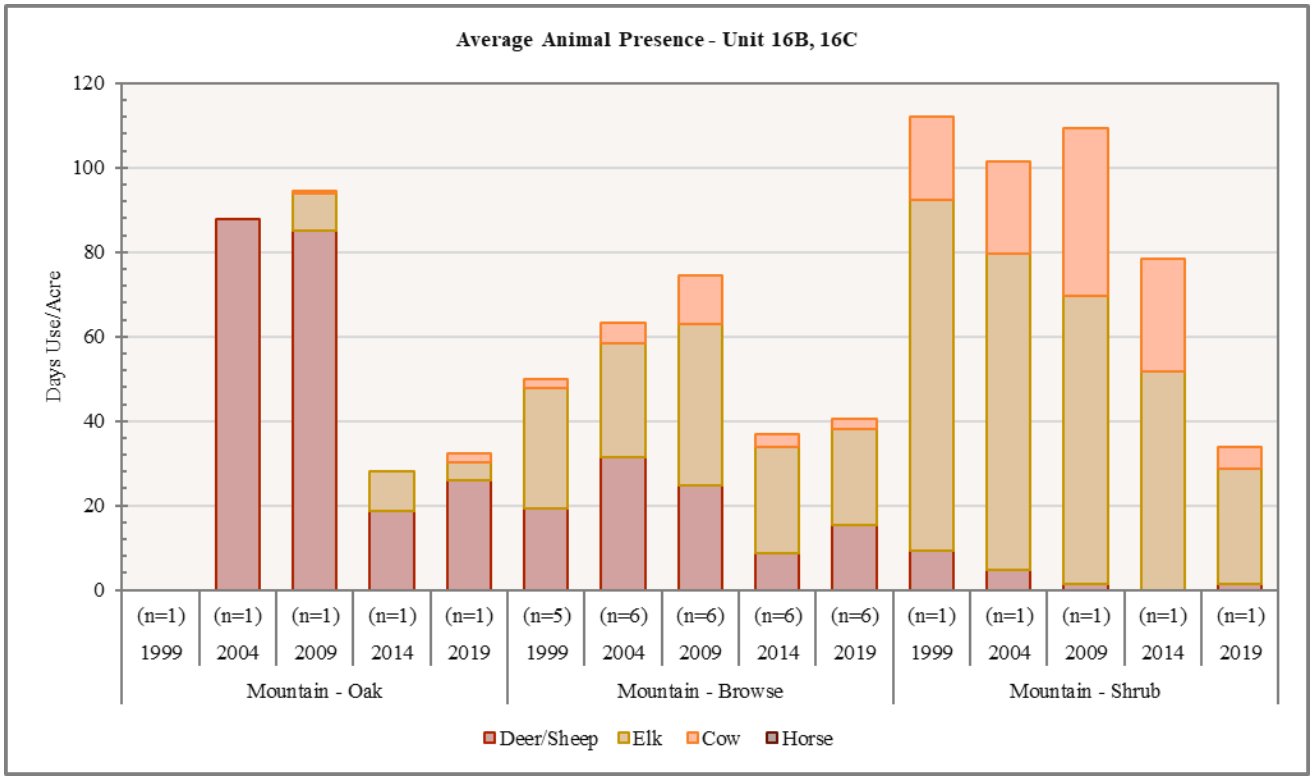


Figure 4.43: Average pellet transect data for Mountain - Oak, Mountain - Browse, and Mountain - Shrub study sites in WMU 16B, 16C, Manti Central Mountains.

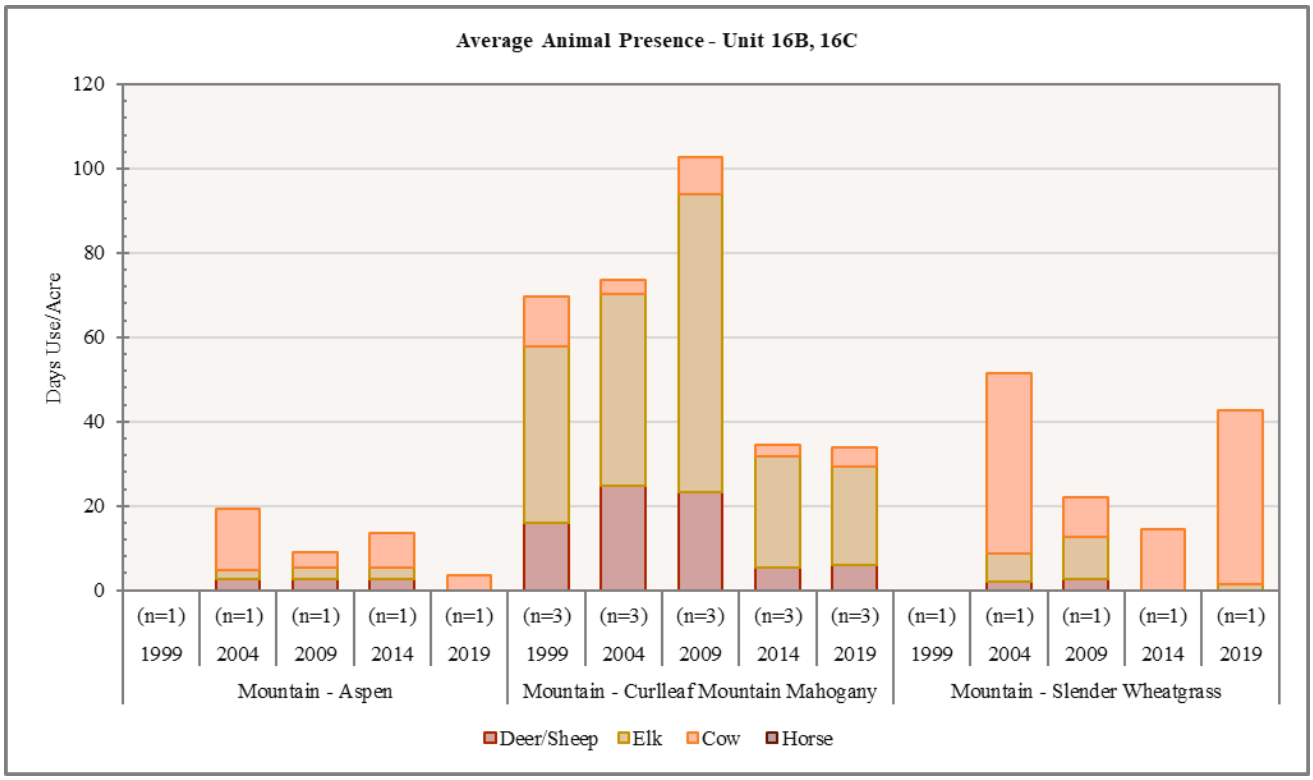


Figure 4.44: Average pellet transect data for Mountain - Aspen, Mountain - Curlleaf Mountain Mahogany, and Mountain - Slender Wheatgrass study sites in WMU 16B, 16C, Manti Central Mountains.

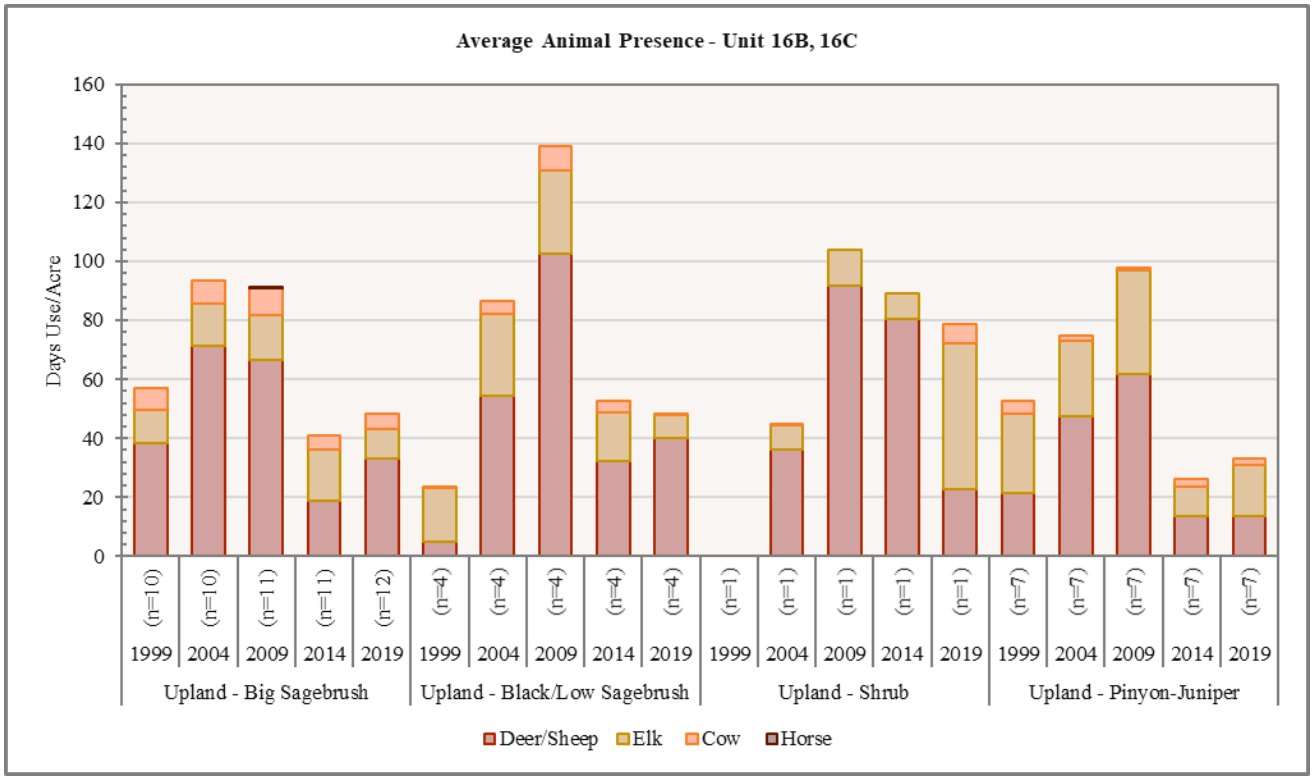


Figure 4.45: Average pellet transect data for Upland - Big Sagebrush, Upland - Black/Low Sagebrush, Upland - Shrub, and Upland - Pinyon-Juniper study sites in WMU 16B, 16C, Manti Central Mountains.

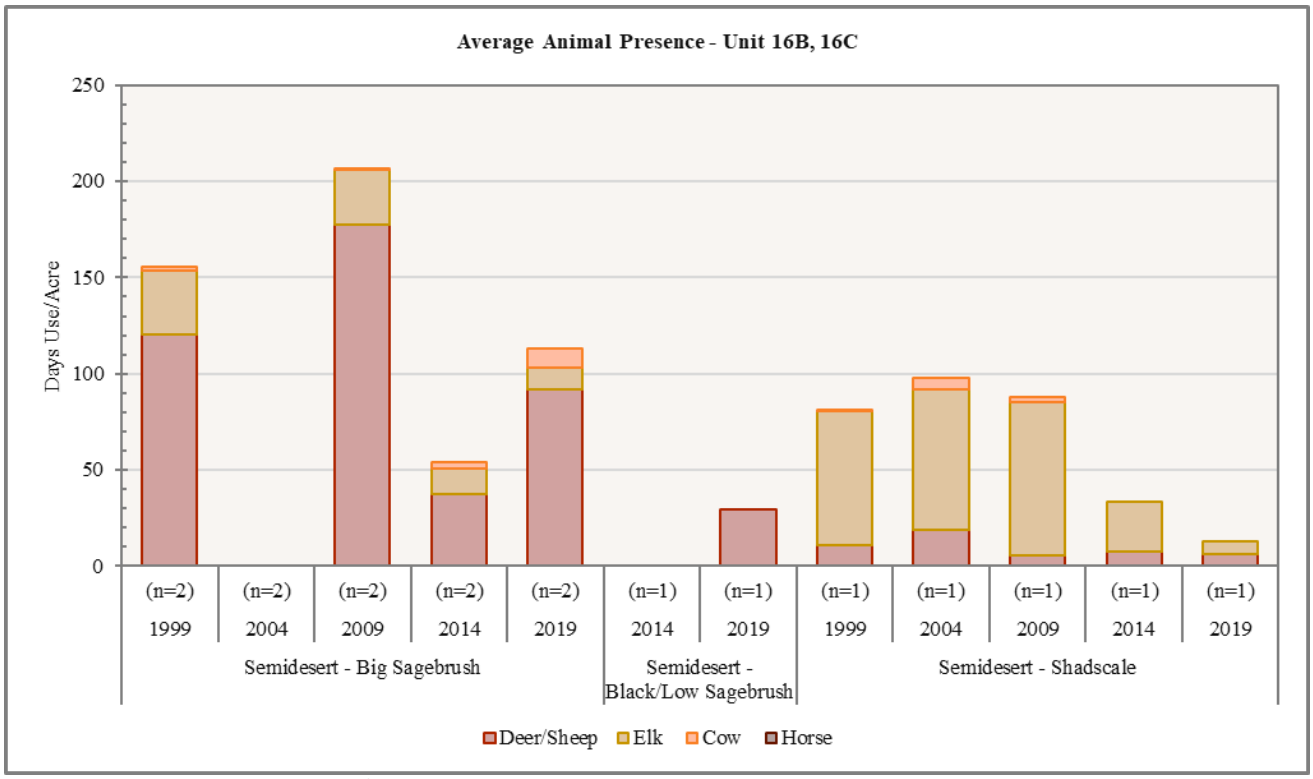
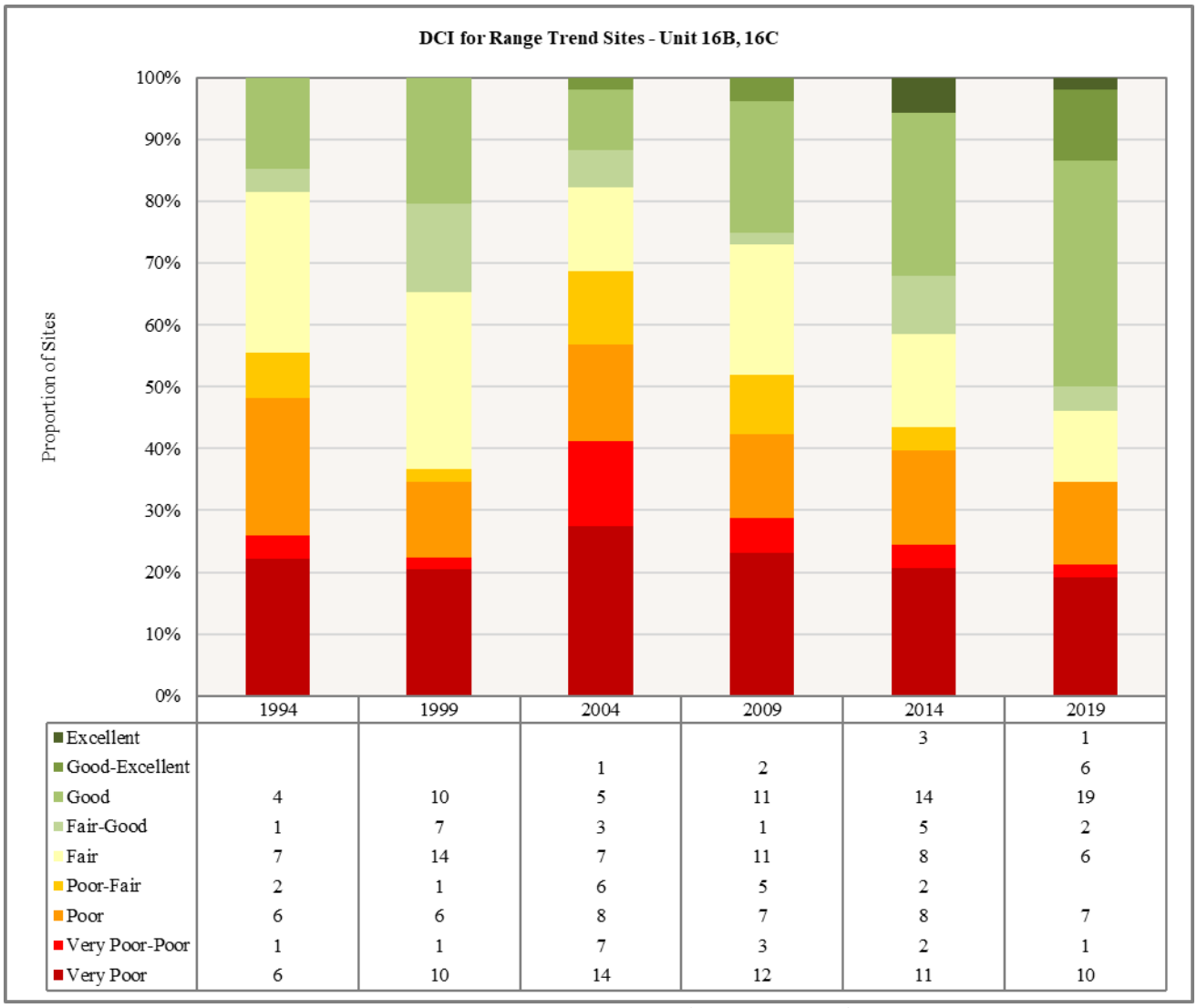


Figure 4.46: Average pellet transect data for Semidesert - Big Sagebrush, Semidesert - Black/Low Sagebrush, and Semidesert - Shadscale study sites in WMU 16B, 16C, Manti Central Mountains.

Deer Winter Range Condition Assessment

The condition of deer winter range within the Manti Central Mountains management unit has fluctuated on the sites sampled since 1994. The active Range Trend sites sampled within the unit are considered to be in very poor to excellent condition as of the 2019 sample year (**Figure 4.47**, **Table 4.10**). The Rocky Hollow, Jackson Unit, Dairy Fork Burn, Hilltop, Manti Face Chaining, Black Hill, Pole Canyon Chaining, Above South Hollow, and North Spring Bench sites remained in very poor condition. Willow Creek deteriorated slightly from poor to very poor-poor, while North Manti Face went from very poor-poor to poor. The Manti Dump and Poison Spring Bench studies stayed in poor condition. The White Hill study site was established and was considered to be in poor condition, and Olsen Canyon and South Horn Exclosure went from fair to poor. Consumer Bench and Danish Bench improved from poor to fair condition. The Pleasant Creek study remained in fair condition, and Long Ridge North and North Horn Rock Canyon deteriorated slightly from fair to good to fair condition. Dry Creek Chaining improved from poor-fair to fair-good.

The Slackpile study went from very poor-poor to good condition, and Porphyry Bench improved from poor to good condition. The Pole Canyon Oak, Red Point, Dry Mountain, Box Canyon Sage-Grouse, and Indian Hollow studies all improved from fair to good condition. Birch Creek Chaining, Scab Hollow, and Box Canyon Knolls went from fair-good to good, but Upper Hole Trail deteriorated slightly, going from good to fair-good condition. The South of Dry Wash study improved from poor-fair to good condition. The Muddy Creek site went from good to fair. Mill Fork, Starvation Mountain Brush, Mayfield Mountain Face, Wire Grass Bench, Middle Mountain, South Horn ¼ Corner, South Sage Flat, and Olson Draw Sage-Grouse all remained in good condition. Trail Mountain Exclosure, Black Dragon, Wildcat Knolls, and North Slackpile improved from good to good-excellent, but Starvation Mahogany and Telephone Bench went from excellent to good-excellent. Finally, the Joes Valley Overlook study remained in excellent condition.



	1994	1999	2004	2009	2014	2019
Excellent					3	1
Good-Excellent			1	2		6
Good	4	10	5	11	14	19
Fair-Good	1	7	3	1	5	2
Fair	7	14	7	11	8	6
Poor-Fair	2	1	6	5	2	
Poor	6	6	8	7	8	7
Very Poor-Poor	1	1	7	3	2	1
Very Poor	6	10	14	12	11	10

Figure 4.47: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 16B, 16C, Manti Central Mountains.

Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
16B-02	1997	13.1	4.2	2.6	28.9	-0.4	10	0	**58.5**	**F**
16B-02	2002	12.7	6.2	6.5	30	-0.1	7.7	0	**63**	**F**
16B-02	2007	16.2	2.1	4.4	30	-0.8	10	0	**61.8**	**F**
16B-02	2014	10.2	10.8	8.7	30	-0.5	9	0	**68.3**	**F-G**
16B-02	2019	9.3	8.5	14.2	30	-6.3	10	0	**65.8**	**F**
16B-03	1997	14.4	6.2	4.1	17.5	-9.8	10	0	**42.4**	**P**
16B-03	2002	18.6	6	2.5	13.6	-5.5	5.7	0	**40.9**	**VP-P**
16B-03	2007	19.7	3.7	1.4	17.5	-7.6	4.7	0	**39.4**	**VP-P**
16B-03	2014	8.8	4	3.4	21.5	-9.7	10	0	**37.9**	**VP**
16B-03	2019	14.1	4.5	3.3	18	-20	10	0	**29.9**	**VP**
16B-04	1997	13.7	14.6	5.4	10.7	-1.2	7.8	0	**50.9**	**P**
16B-04	2002	12.6	7.8	2	6.9	-1.4	5.2	0	**33.1**	**VP**
16B-04	2007	18.1	9.8	10.4	8	-1.4	5.9	0	**50.8**	**P**
16B-04	2014	16.5	14.7	8.3	9.7	-0.8	4.7	0	**53.1**	**P-F**
16B-04	2019	28.7	14.7	5.1	19.9	-8	10	0	**70.4**	**F-G**
16B-05	1997	0.2	0	0	29.1	-0.6	3.2	0	**31.9**	**VP**
16B-05	2002	0.2	0	0	28.2	-0.3	0.1	0	**28.2**	**VP**
16B-05	2007	0.5	0	0	30	-0.2	0.5	0	**30.8**	**VP**
16B-05	2014	0.1	0	0	30	-0.1	0.2	0	**30.3**	**VP**
16B-05	2019	0	0	0	30	0	0.6	0	**30.6**	**VP**
16B-06	1997	30	10.8	0.5	2	0	7.4	0	**50.6**	**P**
16B-06	2002	30	2.3	0.1	1.8	0	4.9	0	**39**	**VP-P**
16B-06	2007	30	-1.2	0.8	2.3	0	7.4	0	**39.3**	**VP-P**
16B-06	2014	15.2	13.3	15	30	0	10	-2	**81.5**	**G**
16B-06	2019	16	12.8	14.6	30	0	9.3	-2	**80.7**	**G**
16B-08	1999	23.2	13.2	15	15.7	0	10	0	**77.1**	**G**
16B-08	2002	24.7	11.5	6.8	22.3	0	10	0	**75.4**	**G**
16B-08	2007	30	12.5	11.1	27.8	0	10	0	**91.4**	**G-E**
16B-08	2014	30	14.7	8.2	30	0	10	0	**92.9**	**E**
16B-08	2019	30	14.3	5.6	30	0	10	0	**89.9**	**G-E**
16B-09	1999	30	12.1	9	11.7	-0.2	7.7	0	**70.3**	**F-G**
16B-09	2002	30	8.9	5.1	20.4	0	5	0	**69.4**	**F-G**
16B-09	2007	27.6	12.4	8.5	30	-0.6	4.8	0	**82.6**	**G**
16B-09	2014	30	13.9	2.9	30	0	3	0	**79.8**	**G**
16B-09	2019	30	11.7	3.6	30	-0.1	6.1	0	**81.3**	**G**
16B-10	1997	0.5	0	0	30	-0.7	5.7	-2	**33.5**	**VP**
16B-10	2002	2.3	0	0	30	-0.2	0.6	-2	**30.6**	**VP**
16B-10	2007	6	0	0	30	-0.1	8.4	-2	**42.3**	**P**
16B-10	2014	3.3	0	0	30	0	4.2	-2	**35.5**	**VP**
16B-10	2019	2.9	0	0	30	0	3.2	-4	**32**	**VP**
16B-11	1997	1.7	0	0	30	-0.3	0.9	-4	**28.4**	**VP**
16B-11	2002	0.9	0	0	30	0	0.4	0	**31.2**	**VP**
16B-11	2007	1.4	0	0	30	-1.3	1.4	-2	**29.5**	**VP**
16B-11	2014	0.9	0	0	30	-0.1	1.4	-2	**30.2**	**VP**
16B-11	2019	1.5	0	0	30	-2.6	3	-4	**27.9**	**VP**
16B-17	1994	7.2	-0.9	2.5	29.2	0	2.6	0	**40.7**	**P**
16B-17	1999	9.9	4.3	4.1	23.2	0	4.4	0	**45.9**	**P**
16B-17	2004	1	0	0	8.4	0	10	-2	**17.4**	**VP**
16B-17	2009	2.4	0	0	17.9	0	5.1	0	**25.3**	**VP**
16B-17	2014	3.9	0	0	30	0	1.2	0	**35.1**	**VP-P**
16B-17	2019	8.6	13.1	8.2	30	-0.1	10	0	**69.9**	**G**
16B-18	1994	13.4	7.4	1.7	24.4	0	2.4	0	**49.5**	**G**
16B-18	1999	14.8	6.6	5.2	28.6	0	4.1	0	**59.2**	**G**
16B-18	2004	1.8	0	0	2.7	0	10	0	**14.5**	**P**
16B-18	2009	0.6	0	0	30	0	10	0	**40.6**	**F**
16B-18	2014	0.3	0	0	19.8	0	0.1	0	**20.2**	**P**
16B-18	2019	7.7	15	15	24.5	-9.9	10	0	**62.3**	**G**

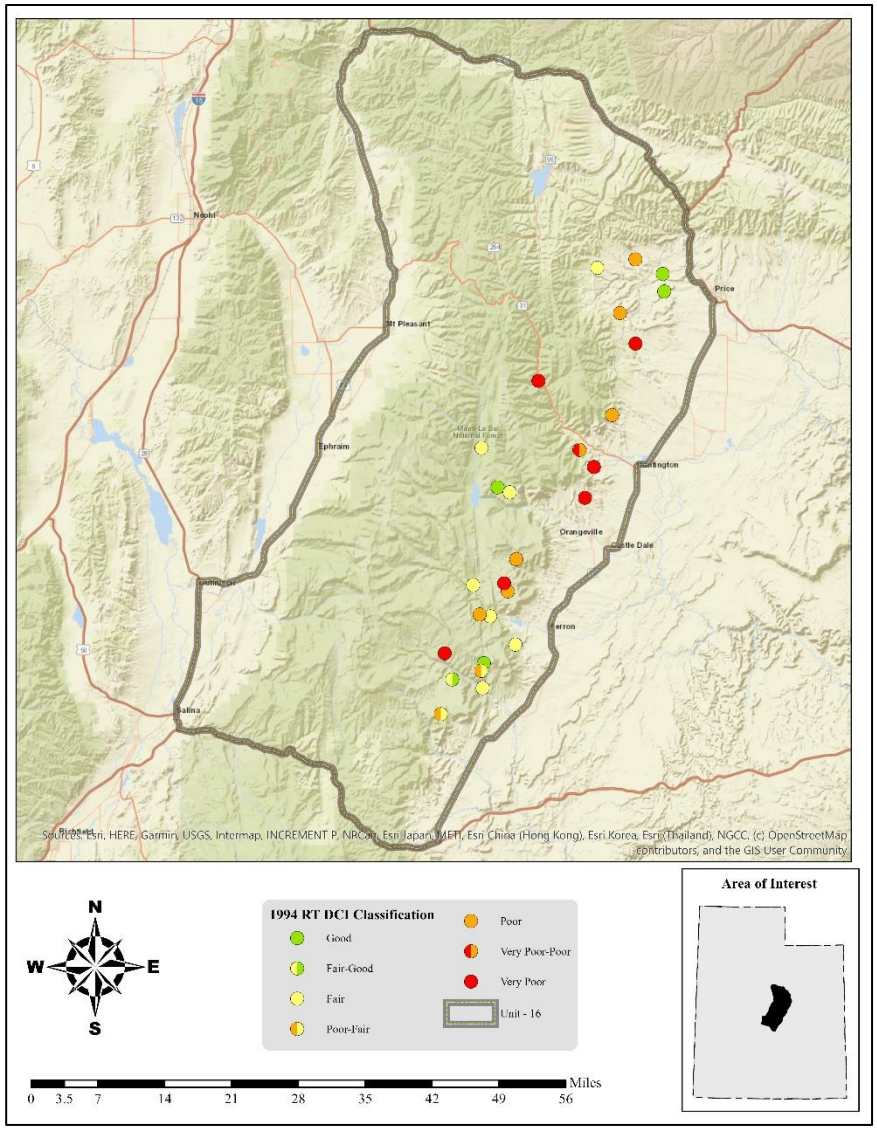
Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
16B-19	1994	15.8	-3.5	1.3	15.7	0	0.1	0	**29.5**	**VP**
16B-19	1999	17	5.8	11.7	23.3	-0.7	0.9	0	**57.9**	**F**
16B-19	2004	2.3	0	0	12.3	-0.1	3.7	0	**18.2**	**VP**
16B-19	2009	2.4	0	0	26	-0.9	3.5	0	**31**	**VP**
16B-19	2014	0.6	0	0	30	-0.7	0.8	0	**30.8**	**VP**
16B-19	2019	0	0	0	30	-10.3	8.1	0	**27.8**	**VP**
16B-20	1994	11.5	4.4	4	30	0	5.4	0	**55.3**	**F**
16B-20	1999	15.7	12.2	6.3	30	0	9	0	**73.1**	**G**
16B-20	2004	8.5	7.5	3.6	30	0	10	0	**59.6**	**F**
16B-20	2009	12.9	14.4	15	30	0	5.8	0	**78**	**G-E**
16B-20	2014	26.6	14.8	15	30	0	3.7	0	**90**	**E**
16B-20	2019	30	7	3.9	30	-0.6	10	0	**80.4**	**G-E**
16B-22	1994	26.6	10.7	4.2	4.7	0	1.5	0	**47.6**	**P**
16B-22	1999	28.9	12.8	2.3	6	0	1.1	0	**51.2**	**P-F**
16B-22	2004	30	10.3	1.2	0.3	0	0.7	0	**42.4**	**P**
16B-22	2009	30	9.5	1.8	1.1	0	0.9	0	**43.3**	**P**
16B-22	2014	30	8.6	2.4	0.5	0	2	0	**43.4**	**P**
16B-22	2019	30	7.6	2.4	2.1	0	5.3	0	**47.4**	**P**
16B-23	1994	11.4	6.5	8.7	28.6	0	2.2	0	**57.5**	**G**
16B-23	1999	12.8	6.8	8.7	30	0	4	0	**62.3**	**G**
16B-23	2004	1.5	0	0	10.9	-0.1	10	0	**22.3**	**P**
16B-23	2009	1.4	0	0	30	-0.2	8.9	0	**40.1**	**F**
16B-23	2012	1.7	0	0	27.7	0	1.6	0	**31**	**F**
16B-23	2014	0.8	0	0	20.7	-0.7	0.4	0	**21.1**	**P**
16B-23	2019	1.9	0	0	30	-9.5	6.2	0	**28.7**	**F**
16B-24	1994	6.8	0.3	4.8	30	0	4.1	0	**46.1**	**P**
16B-24	1999	12.1	6.4	8.8	30	-0.2	6.3	0	**63.5**	**F-G**
16B-24	2004	6.7	-3.2	6.4	30	0	7.5	0	**47.4**	**P**
16B-24	2009	8.6	8.7	15	30	0	5.3	0	**67.5**	**G**
16B-24	2014	9.7	10.9	15	30	0	4.5	0	**70.1**	**G**
16B-24	2019	11.8	10.8	15	30	-0.2	9.8	0	**77.1**	**G**
16C-01	1997	0.1	0	0	30	-0.7	1.2	-2	**28.6**	**VP**
16C-01	2002	0.2	0	0	30	0	0.1	-2	**28.2**	**VP**
16C-01	2007	0.5	0	0	30	-3	0.1	-2	**25.7**	**VP**
16C-01	2014	1	0	0	30	0	1	-2	**29.9**	**VP**
16C-01	2019	2.5	0	0	30	-0.9	2	-4	**29.6**	**VP**
16C-02	1997	11.2	15	5.4	29.2	-1	3.3	-2	**61.1**	**F**
16C-02	2002	6.9	0	0	30	0	0.8	-2	**35.7**	**VP-P**
16C-02	2007	7.6	10.6	0.9	28	-1.3	0.7	-2	**44.5**	**P**
16C-02	2014	6.3	0	0	30	-0.1	2.2	0	**38.4**	**P**
16C-02	2019	5.7	0	0	30	-2.2	1.7	-2	**33.2**	**VP-P**
16C-03	1997	6.2	6.3	5	23.9	-0.2	10	0	**51.3**	**P**
16C-03	2002	6.2	0	0	24.2	0	6.7	0	**37**	**VP**
16C-03	2007	3.9	0	0	16.2	-0.9	5.3	0	**24.4**	**VP**
16C-03	2014	4.3	0	0	24.4	-0.2	10	0	**38.4**	**VP-P**
16C-03	2019	4.6	0	0	30	-0.8	10	0	**43.8**	**P**
16C-05	1997	0.1	0	0	29.7	-0.1	8	-2	**35.6**	**VP-P**
16C-05	2002	0.1	0	0	30	0	6.9	0	**36.9**	**VP-P**
16C-05	2007	0	0	0	30	-1.8	7.9	0	**36.1**	**VP-P**
16C-05	2014	1.2	0	0	30	-0.2	6.9	0	**37.8**	**P**
16C-05	2019	2.2	0	0	30	-0.1	7.6	-2	**37.6**	**P**
16C-06	1997	1.1	0	0	30	-1.5	1	0	**30.6**	**VP**
16C-06	2002	1.2	0	0	30	-0.3	0	0	**31**	**VP**
16C-06	2007	1.5	0	0	30	-4.4	0.1	0	**27.2**	**VP**
16C-06	2014	1.8	0	0	30	-0.5	0.3	0	**31.5**	**VP**
16C-06	2015	1.9	0	0	30	-0.6	0.1	0	**31.4**	**VP**
16C-06	2019	1.3	0	0	30	-6.6	0.4	0	**25.1**	**VP**

Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
16C-07	1997	12.2	11.3	7.6	30	-0.3	0.6	0	**61.3**	**F**
16C-07	2002	11.4	10.8	0.4	22	0	0	0	**44.6**	**P**
16C-07	2007	12.8	9.1	13.7	25.8	-1.8	0.2	0	**59.7**	**F**
16C-07	2014	17.4	12.4	15	30	-1	0.5	0	**74.3**	**G**
16C-07	2019	17.5	11.4	13.6	30	-3	1.5	0	**70.9**	**G**
16C-08	1997	4.3	0	0	11.9	-0.4	1.3	0	**17.1**	**VP**
16C-08	2002	1.7	0	0	1.1	0	0.3	0	**3.1**	**VP**
16C-08	2007	3.8	0	0	21.5	-1.9	0.3	0	**23.8**	**VP**
16C-08	2014	1.4	0	0	30	-4.1	0.3	0	**27.6**	**VP**
16C-08	2019	1.3	0	0	30	-3.4	0.2	0	**28.2**	**VP**
16C-09	1997	25.7	12.6	14.1	5.4	-0.6	1.3	0	**58.4**	**F**
16C-09	2002	17.3	9.7	11.4	3.7	0	0.6	0	**42.8**	**P**
16C-09	2007	29.3	11	10.2	4.8	-0.5	1	0	**55.8**	**P-F**
16C-09	2014	17.9	15	1.6	30	-1.4	4.8	-2	**66**	**F**
16C-09	2019	30	14.9	2.4	28.3	-0.4	4.4	-2	**77.5**	**G**
16C-11	1997	4.7	0	0	30	0	1.9	0	**36.6**	**VP**
16C-11	2002	3.4	0	0	13.7	0	0.1	0	**17.2**	**VP**
16C-11	2007	4.3	0	0	25.5	-0.1	0.1	0	**29.8**	**VP**
16C-11	2014	0.8	0	0	30	0	2.5	-4	**29.2**	**VP**
16C-11	2019	2.3	0	0	30	-0.4	3	-2	**32.9**	**VP**
16C-12	1997	15.3	5.3	2.8	29.2	-0.3	0	0	**52.3**	**F**
16C-12	2002	11.4	-4.1	0.4	27.8	0	0	0	**35.5**	**VP-P**
16C-12	2007	11.3	-2.1	0.5	30	-0.5	0	0	**39.1**	**P**
16C-12	2014	7.6	8.7	1.1	30	-0.1	0.1	0	**47.5**	**P**
16C-12	2019	9.1	3.6	1.9	30	-0.6	0.7	0	**44.7**	**P**
16C-13*	1994	5.6	0	0	27.8	0	3.5	0	**36.9**	**VP**
16C-13*	1999	11.1	12.4	5.9	30	0	7.7	0	**67.2**	**F**
16C-13*	2004	9.6	10.4	1.6	30	0	1.8	0	**53.2**	**P-F**
16C-13*	2009	10.7	10.4	2.9	30	0	3	0	**57**	**P-F**
16C-13*	2014	7.6	11.2	0.7	30	0	2.3	0	**51.7**	**P**
16C-14	1994	2.3	0	0	19	0	2.4	0	**23.7**	**VP**
16C-14	1999	7.5	14.9	7.9	23.7	0	1	0	**55.1**	**F**
16C-14	2004	13.5	13.6	11.6	4.6	0	1.4	0	**44.7**	**P**
16C-14	2009	11.9	13.9	9.7	3.8	0	0.4	0	**39.8**	**P**
16C-14	2014	14.9	14.2	15	8.7	0	0.5	0	**53.4**	**F**
16C-14	2019	21.6	13.1	5.8	30	-0.2	2.1	0	**72.5**	**G**
16C-15*	1994	6.5	9.8	4.8	10.5	0	1.5	0	**33.1**	**VP-P**
16C-15*	1999	6.7	4.9	5.7	10.8	0	0.9	0	**28.9**	**VP**
16C-15*	2004	7	1.4	3.2	5.9	0	1.1	0	**18.5**	**VP**
16C-15*	2009	7.8	5.9	1	7.2	0	0.3	0	**22.2**	**VP**
16C-15*	2014	4	0	0	4.9	0	0.2	0	**9.1**	**VP**
16C-17	1994	12.9	10.6	5.8	28.8	0	8.2	0	**66.4**	**F**
16C-17	1999	23.9	12.7	8.4	29.5	0	10	0	**84.5**	**G**
16C-17	2004	30	12.4	9	29.7	0	10	0	**91.1**	**G-E**
16C-17	2009	27.1	12.1	8.5	23.8	0	10	0	**81.5**	**G**
16C-17	2014	29.5	14.5	6.2	25.3	0	10	0	**85.5**	**G**
16C-17	2019	30	13.6	5	27.6	0	10	0	**86.2**	**G**
16C-19	1994	26.3	10	10.6	19.2	0	10	0	**76.2**	**G**
16C-19	1999	29.1	12.3	11.2	20.4	0	10	0	**83.1**	**G**
16C-19	2004	30	11.8	9.7	20	0	10	0	**81.5**	**G**
16C-19	2009	28.4	11.4	12.2	17.1	0	10	0	**79.1**	**G**
16C-19	2014	30	13.6	6.4	22.6	0	10	0	**82.6**	**G**
16C-19	2019	30	11.9	7.2	30	0	10	0	**89.1**	**G-E**
16C-22	1994	18.7	7.8	0.7	14.4	0	1.1	0	**42.6**	**P**
16C-22	1999	17.3	6.4	1.4	22.7	0	3.4	0	**51.3**	**P**
16C-22	2004	22.3	5.2	2.1	22.1	0	2.8	0	**54.5**	**P-F**
16C-22	2009	22.8	6	6.2	19.5	0	1.3	0	**55.9**	**P-F**
16C-22	2014	19.9	12.6	15	19.2	0	3.2	0	**69.9**	**F-G**
16C-22	2019	30	9.8	2.6	18.5	0	3.7	0	**64.7**	**F**

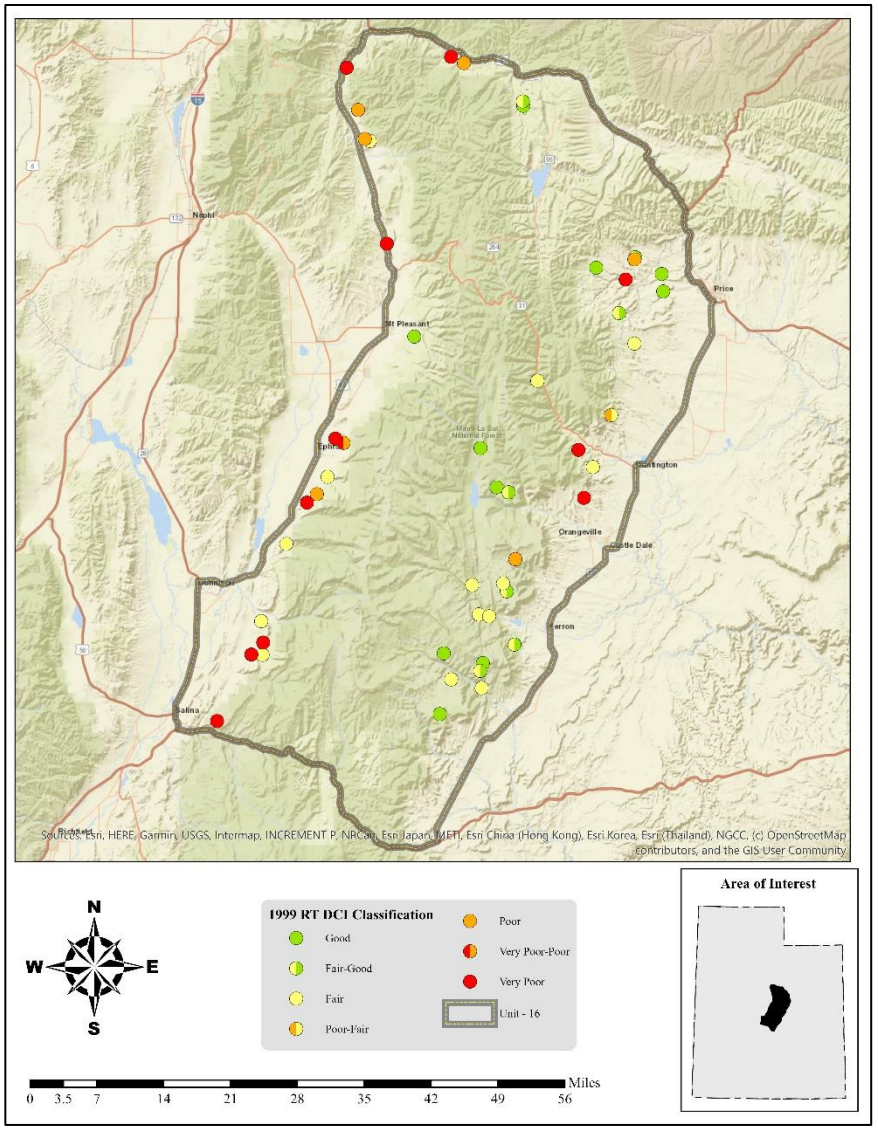
Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
16C-23	1994	7.4	10.3	14	25.9	0	0.8	0	**58.3**	**F**
16C-23	1999	9.8	10.4	15	19.8	0	0.9	0	**56**	**F**
16C-23	2004	15.9	12.9	1.7	21.4	0	3.2	0	**55.1**	**F**
16C-23	2009	15.9	9.9	15	14.9	0	1.1	0	**56.8**	**F**
16C-23	2014	18.5	11.9	15	30	0	0.7	0	**76.1**	**G**
16C-23	2019	20.6	11.4	15	30	0	4.6	0	**81.6**	**G-E**
16C-24	1994	16.8	6.3	0.6	6.7	0	4.2	0	**34.5**	**VP**
16C-24	1999	25.7	11.7	8.4	10	0	6.3	0	**62.1**	**F**
16C-24	2004	30	11	8.5	3.7	0	4	0	**57.1**	**F**
16C-24	2009	30	8.5	6.6	9.1	0	2.7	0	**56.9**	**P-F**
16C-24	2014	30	12.1	8.4	7.8	0	5.5	0	**63.8**	**F**
16C-24	2019	17.5	7	11.8	9	0	7.1	0	**52.5**	**P**
16C-25	1994	12.7	2.7	2.5	17	0	9.8	0	**44.7**	**P**
16C-25	1999	13.1	11.9	9.1	24.1	0	10	0	**68.1**	**F-G**
16C-25	2004	15.6	8.8	7.1	20.6	0	10	0	**62**	**F**
16C-25	2009	14.9	10.6	15	20.1	0	10	0	**70.6**	**F-G**
16C-25	2014	12.8	12.6	15	30	0	10	0	**80.4**	**G**
16C-25	2019	24	12.6	5.9	30	0	10	0	**82.6**	**G**
16C-26	1994	30	5.5	1.1	9.6	0	0.6	0	**46.7**	**P**
16C-26	1999	30	9.4	4.4	8.7	0	5.6	0	**58**	**F**
16C-26	2004	30	4.2	1.4	6.5	0	1.7	0	**43.7**	**P**
16C-26	2009	30	7.8	1.1	10.6	0	1.2	0	**50.8**	**P-F**
16C-26	2014	30	12.2	3.5	12.7	0	2.6	0	**61**	**F**
16C-26	2019	30	11.1	4.3	19.7	0	4.8	0	**69.9**	**G**
16C-27	1994	9.7	11.7	11.7	23.6	0	0.2	0	**56.9**	**F**
16C-27	1999	13.8	11.2	7.4	27.2	0	0	0	**59.6**	**F**
16C-27	2004	21.8	7.5	4.8	16.2	0	0.1	0	**50.3**	**P-F**
16C-27	2009	17.3	11.3	11	21.6	0	0	0	**61.1**	**F**
16C-27	2014	19.9	12.4	7	24.3	0	0	0	**63.5**	**F-G**
16C-27	2019	27.8	12.8	3.8	30	0	0.1	0	**74.4**	**G**
16C-28	1994	21	10.2	5.9	18.3	0	3.1	0	**58.5**	**F**
16C-28	1999	23.4	11.3	13.6	17.2	0	0.9	0	**66.3**	**F-G**
16C-28	2004	27.6	12.7	11.6	6.9	0	0.5	0	**59.2**	**F**
16C-28	2009	24.4	7.8	8.1	13.5	0	1.4	0	**55.2**	**F**
16C-28	2014	15.7	12.7	13	9.7	0	0.7	0	**51.7**	**P-F**
16C-28	2019	21.2	11.9	8.8	23.7	0	2.9	0	**68.5**	**G**
16C-29	1994	5	0	0	30	0	1.2	0	**36.2**	**VP**
16C-29	1999	8.5	14.9	15	30	0	10	0	**78.4**	**G**
16C-29	2004	23.7	12	15	30	0	1.7	0	**82.4**	**G**
16C-29	2009	24.8	14.9	6.6	30	0	1.6	0	**77.9**	**G**
16C-29	2014	19.5	13.1	3.4	30	0	3.7	0	**69.7**	**F-G**
16C-29	2019	20.7	13	5.6	30	0	5.3	0	**74.5**	**G**
16C-30	1994	29.7	13.6	5.9	17.1	0	10	0	**76.3**	**G**
16C-30	1999	30	13	12.8	14.5	0	10	0	**80.3**	**G**
16C-30	2004	30	13.5	7.1	17.4	0	10	0	**78**	**G**
16C-30	2009	30	14.3	5.8	16	0	10	0	**76.2**	**G**
16C-30	2014	30	13.5	9	16.3	0	10	0	**78.8**	**G**
16C-30	2019	30	12.6	6.8	9.6	0	10	0	**69**	**F-G**
16C-31	1994	9.4	13.2	14.7	28.9	0	3.5	0	**69.8**	**F-G**
16C-31	1999	14	10.3	13.4	21.8	0	6.1	0	**65.5**	**F**
16C-31	2004	6	0	0	12.9	0	8.3	0	**27.2**	**VP**
16C-31	2009	8.3	13	15	16.9	0	9.9	0	**63.2**	**F**
16C-31	2014	18	14.9	15	17.3	0	4.4	0	**69.6**	**F-G**
16C-31	2019	30	14.9	9.7	16.5	0	10	0	**81.1**	**G**
16C-32	1994	10.1	10.5	2.9	10.7	0	1.1	0	**35.2**	**F**
16C-32	1999	9.3	3.9	5.1	13.8	0	0.4	0	**32.5**	**F**
16C-32	2004	8.7	7.7	1	5.2	0	3.9	0	**26.5**	**P-F**
16C-32	2009	5.5	10.1	10.6	21.3	0	0.3	0	**47.7**	**G**
16C-32	2014	5.4	11.8	5.8	24.1	-0.1	0.1	0	**47**	**G**
16C-32	2019	6.1	10.5	3.4	24	-8.3	2.3	0	**37.9**	**F**

Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
16C-34	1994	16.1	11	5.1	14.8	0	6.4	0	**53.4**	**P-F**
16C-34	1999	20	9.9	9.9	20.7	0	8.2	0	**68.7**	**F-G**
16C-34	2004	8.5	7.9	3	30	0	4.2	0	**53.6**	**P-F**
16C-34	2009	9.3	8.5	7.5	21.6	0	4.1	0	**51**	**P**
16C-34	2014	14.5	13.7	15	30	0	5.3	0	**78.5**	**G**
16C-34	2019	22.6	14.4	11.2	27.1	0	8.9	0	**84.2**	**G**
16C-35	1994	17	11.7	0.3	22.1	0	4	0	**55.1**	**P-F**
16C-35	1999	20.6	11.1	13.1	30	0	7.8	0	**82.6**	**G**
16C-35	2004	14.6	13.1	4.2	26.5	0	5.1	0	**63.5**	**F**
16C-35	2009	18.8	13.5	15	30	0	3.2	0	**80.5**	**G**
16C-35	2014	19.6	13.8	6	30	0	5.3	0	**74.7**	**G**
16C-35	2019	30	14.2	7.2	30	0	9.4	0	**90.8**	**G-E**
16C-36	1994	5.7	0	0	14.7	0	2.9	0	**23.3**	**VP**
16C-36	1999	5.9	0	0	14.6	0	2.6	0	**23**	**VP**
16C-36	2004	7.7	6.8	6.8	7.6	0	7.5	0	**36.4**	**VP-P**
16C-36	2009	11.9	0.2	6.2	7.2	0	1.4	0	**26.9**	**VP**
16C-36	2014	11	13.7	2	9.4	0	2.7	0	**38.7**	**P**
16C-36	2019	17.2	13.1	0.5	18.2	0	3.2	0	**52.1**	**F**
16C-37	1994	15.3	10.8	1.6	24.6	0	5	0	**57.4**	**F**
16C-37	1999	18.4	10.8	6	24.3	0	10	0	**69.6**	**F-G**
16C-37	2004	27.8	9.8	5.6	19	0	8.6	0	**70.8**	**F-G**
16C-37	2009	22.6	11	11.4	20.5	0	10	0	**75.5**	**G**
16C-37	2014	30	14.6	13.4	30	0	10	0	**98**	**E**
16C-37	2019	30	13.2	13.4	29	0	10	0	**95.6**	**E**
16C-38	1997	22.1	12.5	8.8	28	-1.2	10	-6	**74.1**	**G**
16C-38	2002	24.1	13.3	4.9	24.2	0	10	-4	**72.5**	**G**
16C-38	2007	21.9	7.2	6.3	19.2	-2.4	10	-2	**60.2**	**F**
16C-38	2014	8.9	13.9	6.3	25.7	-0.5	10	-4	**60.2**	**F**
16C-38	2019	18.1	12.1	1.6	24	-0.4	10	-6	**59.4**	**F**
16C-40	1999	0	0	0	25	0	1.4	-2	**24.4**	**VP**
16C-40	2004	0	0	0	28.4	0	1	0	**29.4**	**VP**
16C-40	2009	0.3	0	0	30	0	2.2	0	**32.4**	**VP**
16C-40	2014	0	0	0	30	0	4.8	-4	**30.8**	**VP**
16C-40	2019	0	0	0	30	0	1.2	-2	**29.2**	**VP**
16C-42	2004	20.9	8.1	5	30	0	7.9	0	**71.9**	**F-G**
16C-42	2009	12.1	9.4	15	30	0	10	0	**76.6**	**G**
16C-42	2014	9.6	9.1	8.6	30	0	7.3	0	**64.6**	**F**
16C-42	2019	14.2	11.4	15	30	0	9.2	0	**79.8**	**G**
16C-43	2004	20.8	0.7	1.2	23.6	0	10	0	**56.2**	**P-F**
16C-43	2009	15.6	3.8	9.2	27.5	0	5.9	0	**62.1**	**F**
16C-43	2014	19.3	9.6	15	30	0	10	0	**83.9**	**G**
16C-43	2019	21.1	7	10.2	30	0	10	0	**78.3**	**G**
16C-45	2007	12.3	9.8	1.8	30	-0.6	1	0	**54.2**	**F**
16C-45	2014	11.6	7.9	4.1	30	-0.2	2.6	0	**56.1**	**F**
16C-45	2019	8.3	3.4	3.1	30	-1.9	2.1	0	**44.9**	**P**
16C-46	2014	14.6	10.6	2.2	5	0	0.4	0	**32.9**	**F**
16C-46	2019	18.8	13.5	2	8.9	0	3.9	0	**47.1**	**G**
16C-47	2019	18.9	8.2	11.4	7.8	-7.3	0.1	0	**39**	**P**
16R-06	1998	17.2	9.4	12.9	23.8	0	1.3	0	**64.5**	**F-G**
16R-06	2004	3.5	0	0	24.1	0	6	0	**33.6**	**VP-P**
16R-06	2009	7.3	13.7	15	30	0	5	0	**70.9**	**G**
16R-06	2014	7.4	13.9	15	30	0	1.4	0	**67.7**	**G**
16R-06	2019	21.9	14.7	15	25.9	0	3.5	0	**80.9**	**G-E**

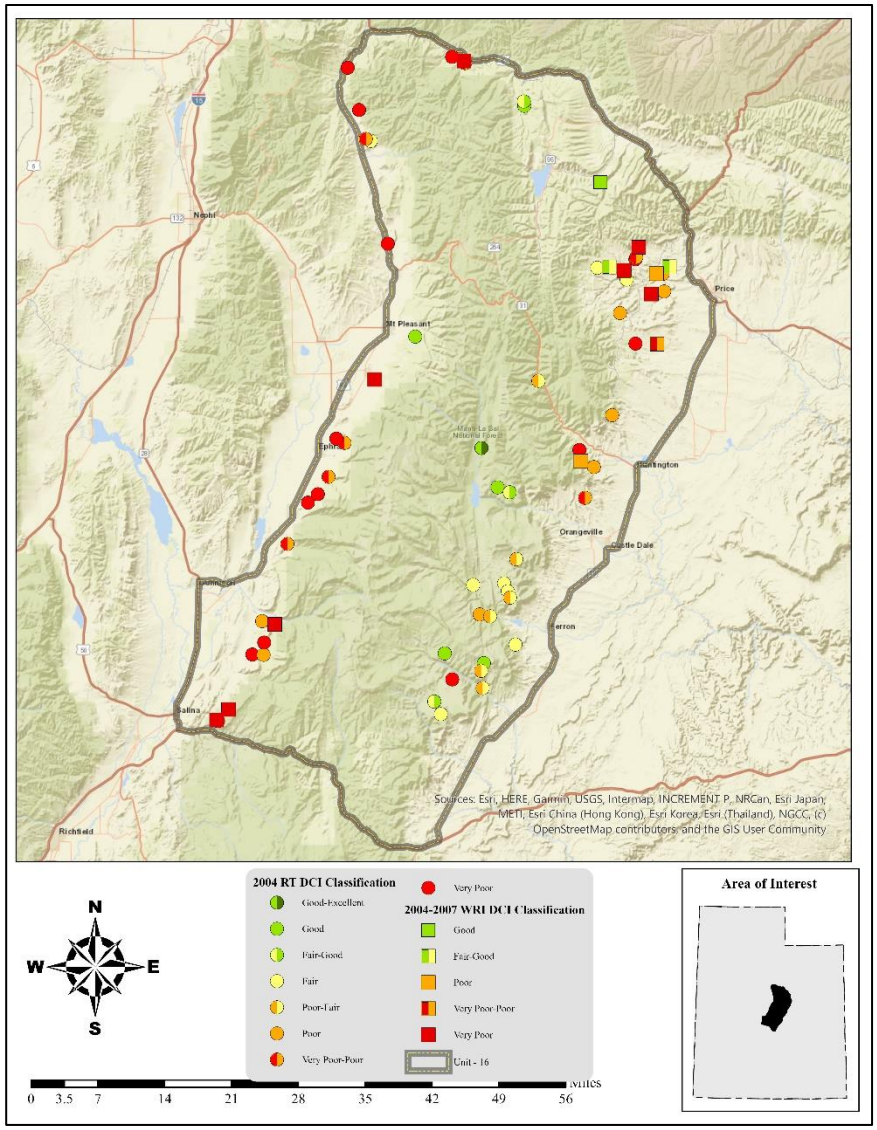
Table 4.10: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 16B, 16C, Manti Central Mountains. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. *Studies with an asterisk have been suspended.



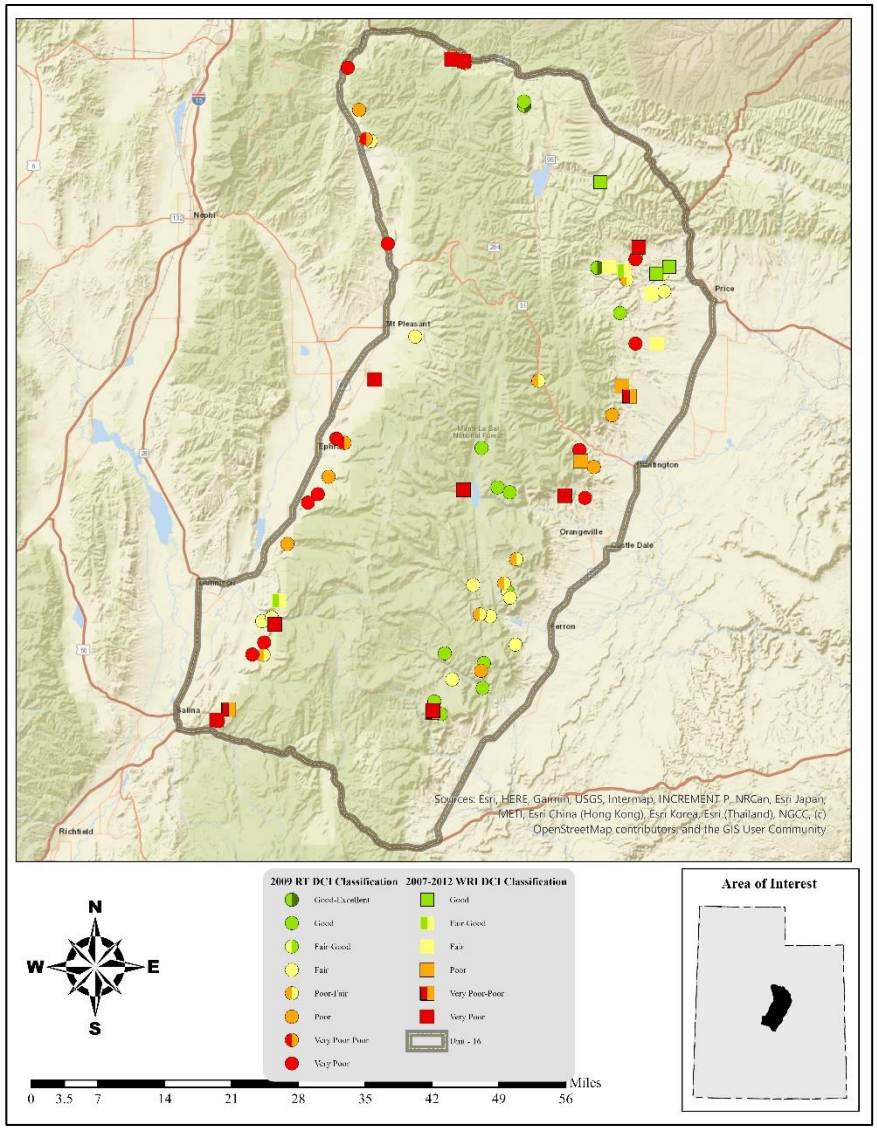
Map 4.9: 1994 Desirable Components Index (DCI) ranking distribution by study site for WMU 16B, 16C, Manti Central Mountains.



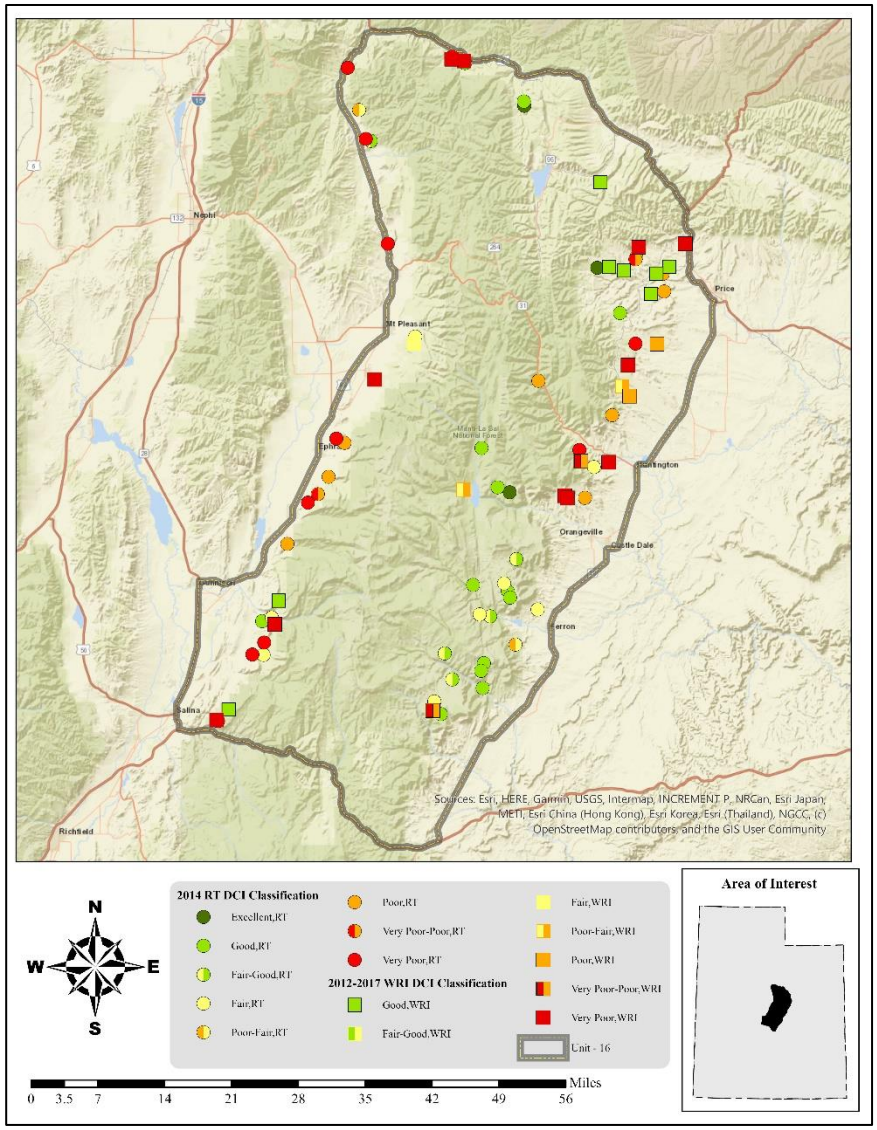
Map 4.10: 1999 Desirable Components Index (DCI) ranking distribution by study site for WMU 16B, 16C, Manti Central Mountains.



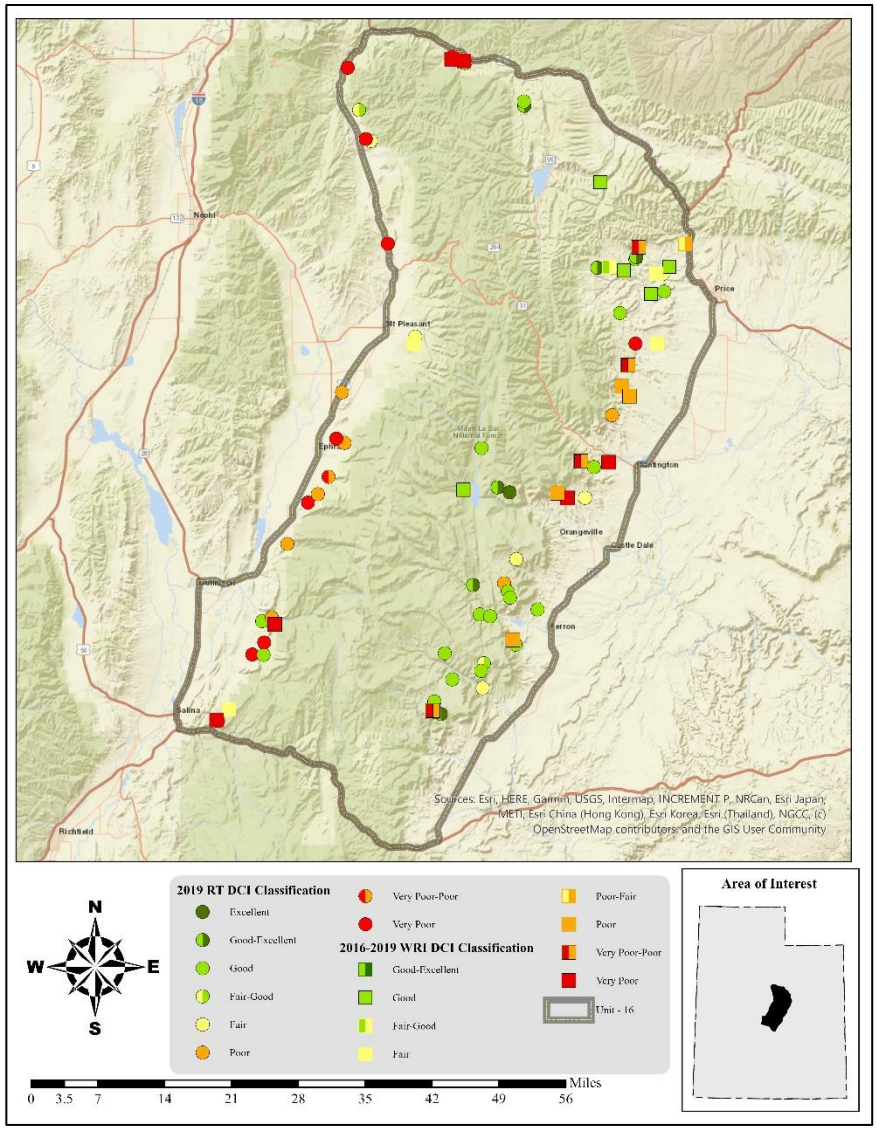
Map 4.11: 2004 Desirable Components Index (DCI) ranking distribution by study site for WMU 16B, 16C, Manti Central Mountains.



Map 4.12: 2009 Desirable Components Index (DCI) ranking distribution by study site for WMU 16B, 16C, Manti Central Mountains.



Map 4.13: 2014 Desirable Components Index (DCI) ranking distribution by study site for WMU 16B, 16C, Manti Central Mountains.



Map 4.14: 2019 Desirable Components Index (DCI) ranking distribution by study site for WMU16B, 16C, Manti Central Mountains.

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
16B-2	Long Ridge North	Energy Development	High	Fragmentation and degradation/loss of habitat
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-3	Rocky Hollow	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Animal Use – Deer	Medium	Reduced/less vigorous browse component
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-4	Dry Creek Chaining	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
16B-5	Jackson Unit	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
16B-6	Mill Fork	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-8	Starvation Mahogany	Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-9	Starvation Mountain Brush	Energy Development	High	Fragmentation and degradation/loss of habitat
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Elk	High	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-10	Dairy Fork Burn	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Noxious Weeds	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-11	Hilltop	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Elk	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-13	Oak Creek Ridge Aspen	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Noxious Weeds	Medium	Reduced diversity of desirable grass and forb species
16B-14	Oak Creek Ridge Seeding	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Noxious Weeds	Medium	Reduced diversity of desirable grass and forb species
16B-17	Slackpile	Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-18	Porphyry Bench	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Deer	High	Reduced/less vigorous browse component
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
16B-19	North Spring Bench	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
16B-20	Telephone Bench	Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-21	Huntington Canyon	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-22	Poison Spring Bench	Animal Use – Elk	High	Reduced understory shrub and herbaceous vigor
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-23	Consumer Bench	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-24	Wire Grass Bench	Animal Use – Deer	Medium	Reduced/less vigorous browse component
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-1	Manti Face Chaining	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-2	Willow Creek	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
16C-3	North Manti Face	PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
16C-5	Cane Valley	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-6	Black Hill	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Deer/Sheep	High	Reduced/less vigorous browse component
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-7	Mayfield Mountain Face	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Animal Use – Deer	Medium	Reduced/less vigorous browse component
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-8	Pole Canyon Chaining	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-9	Pole Canyon Oak	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-11	Above South Hollow	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-12	Manti Dump	Energy Development	High	Fragmentation and degradation/loss of habitat
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
16C-14	Red Point	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-17	Middle Mountain	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-18	East Mountain	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
16C-19	Trail Mountain Exclosure	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-20	Miles Point	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-22	North Horn- Rock Canyon	Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Animal Use – Elk	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-23	Black Dragon	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-24	South Horn Exclosure	PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
16C-25	South Horn ¼ Corner	None Identified		Reduced understory shrub and herbaceous vigor
16C-26	Dry Mountain	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-27	Birch Creek Chaining	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	Medium	
		Animal Use – Elk	Medium	
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-28	South of Dry Wash	Animal Use – Elk	High	Reduced understory shrub and herbaceous vigor
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
16C-29	Scab Hollow	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-30	Upper Hole Trail	Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-31	Box Canyon Knolls	Animal Use – Elk	High	Reduced understory shrub and herbaceous vigor
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
16C-32	Muddy Creek	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
16C-34	South Sage Flat	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Animal Use – Elk	Medium	Reduced understory shrub and herbaceous vigor
16C-35	Wildcat Knolls	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Animal Use – Elk	High	Reduced understory shrub and herbaceous vigor
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-36	Danish Bench	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-37	Joes Valley Overlook	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-38	Pleasant Creek	Energy Development	High	Fragmentation and degradation/loss of habitat
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-39	Cove Creek	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	High	Reduced diversity of desirable grass and forb species
16C-40	Cedar Mountain	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Elk	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-41	Trough Hollow	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-42	Box Canyon Sage-Grouse	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
16C-43	Olson Draw Sage-Grouse	None Identified		
16C-44	North Horn	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-45	Olsen Canyon	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-46	Indian Hollow	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-47	White Hill	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-51	Old Woman Plateau	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
16R-5	Scad Hollow	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
16R-6	North Slackpile	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-11	Lower Cedar Bench	Animal Use – Deer	Medium	Reduced/less vigorous browse component
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-12	Upper Cedar Bench	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-13	Upper Porphyry	Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Animal Use – Deer	Medium	Reduced/less vigorous browse component
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
16R-14	Consumer Bench North	Animal Use – Deer	Medium	Reduced/less vigorous browse component
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-15	Consumer Bench 2	Animal Use – Deer/Sheep	High	Reduced/less vigorous browse component
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
16R-16	Wildcat Push	Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-17	Cedar Mountain Brush Saw	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Elk	High	Reduced understory shrub and herbaceous diversity
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
16R-18	Cedar Mountain Dixie	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Elk	Medium	Reduced understory shrub and herbaceous diversity
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-19	Lower Fish Creek WMA	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
16R-21	Stump Flat	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-23	North Spring	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-24	12 Mile Dixie	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	High	Reduced diversity of desirable grass and forb species
		Agriculture	Low	Fragmentation and degradation/loss of habitat
16R-25	Black Dragon Bullhog	Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-30	Mill Fork Chaining	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Noxious Weeds	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-31	Mohrland Roller Chopper 1	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-32	Mohrland Roller Chopper 2	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-34	Wildcat Dixie Harrow	None Identified		
16R-37	Wildcat Disking	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
16R-42	Canal Canyon	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Animal Use – Deer	Medium	Reduced/less vigorous browse component
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-44	Swasey Bullhog	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-45	Grimes Wash	PJ Encroachment	High	Reduced understory shrub and herbaceous vigor
16R-47	Dairy Fork 2	Noxious Weeds	Medium	Reduced diversity of desirable grass and forb species
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-48	North Hollow	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous diversity
16R-49	Stump Flat 2	PJ Encroachment	Low	Reduced understory shrub and herbaceous diversity
16R-50	Bear Ranch	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Noxious Weeds	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous diversity
16R-52	Helper Benches	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous diversity
16R-53	Grimes Wash 2	PJ Encroachment	Low	Reduced understory shrub and herbaceous diversity
16R-54	Hiawatha Miller Creek	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous diversity
16R-55	Grimes Wash 3	PJ Encroachment	High	Reduced understory shrub and herbaceous diversity
16R-56	Dry Wash	PJ Encroachment	High	Reduced understory shrub and herbaceous diversity
		Animal Use – Deer	High	Reduced/less vigorous browse component
		Animal Use – Elk	Medium	Reduced understory shrub and herbaceous diversity
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity

Table 4.11: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 16B, 16C, Manti Central Mountains. All assessments are based off of the most current sample date for each study site. Criteria for evaluating limiting factors is available in **Appendix A - Threat Assessment**.

Discussion and Recommendations

Mountain (Big Sagebrush)

The studies considered to be of the Mountain (Big Sagebrush) ecological type are classified as being within very poor to good condition for deer winter range within the Manti Central Mountains management unit; the Huntington Canyon, East Mountain, Miles Point, Trough Hollow, and Old Woman Plateau studies are classified as deer summer range. These ecological sites generally support big sagebrush (*Artemisia tridentata*) communities and herbaceous understories that provide forage for deer and other big game. Introduced perennial grasses are present on many of these sites: at higher elevations these grasses can become aggressive and may outcompete native species. Annual grasses have also been observed on many sites in mostly low amounts. However, these annual grasses pose a high-level threat on the Long Ridge North and Rocky Hollow studies and a moderate threat on the Pleasant Creek study. High amounts of annual grasses have the potential to increase fuel loads and may exacerbate the risk of wildfire. Conifer encroachment is also occurring on many sites and will likely continue to occur in the future without disturbance. Pellet transect data indicates that high use by deer may be occurring on the Rocky Hollow site. In addition, high cattle use may be happening on the Box Canyon Sage-Grouse and Old Woman Plateau studies. Heavy animal use has the potential to lead to reduced vigor and diversity of shrubs and herbaceous species.

Energy development poses a threat to the Long Ridge North and Pleasant Creek studies. Maintenance work associated with energy sources such as powerlines and pipelines can lead to reduced vigor of shrubs and herbaceous species. Noxious weeds are present or have been observed in the past on the Mill Fork, Dairy Fork Burn, and Pleasant Creek sites. These noxious weed species have the potential to be aggressive and may outcompete native grasses and forbs.

Areas that show significant amounts of conifer encroachment may benefit from a tree-removing disturbance (e.g. bullhog, lop and scatter, etc). Treatments to reduce annual and introduced perennial grass cover may be advisable on sites where they threaten ecological integrity and diversity: the same may be recommended for sites with significant amounts of noxious weeds. If reseeding is needed to restore the herbaceous communities on these sites, care should be taken in seed selection and preference should be given to native species when possible. Finally, closer examination of the Rocky Hollow, Box Canyon Sage-Grouse, and Old Woman Plateau sites and surrounding areas may be recommended to determine if high animal use is occurring throughout the localized area.

Mountain (Black/Low Sagebrush)

The studies that are classified as Mountain (Black/Low Sagebrush) ecological sites generally support sagebrush (*Artemisia sp.*) communities, which provide feed for deer. These studies are in fair to good-excellent condition for deer winter range in the Manti Central Mountains management unit. Introduced perennial grasses are present on the South Sage Flat site. Although they may help provide competition against annual grasses, these introduced perennial species can be aggressive at higher elevations and have the potential to outcompete more desirable native grasses and forbs. Annual grasses have been observed on the North Horn Rock Canyon site. Although the threat level is currently low, high amounts of annual grasses can increase fuel loads and may exacerbate the risk of wildfire. In addition, the North Horn Rock Canyon and Wildcat Knolls studies are considered to be within Phase I of woodland succession, and conifer encroachment will likely continue in future years. Elk and cattle pellet groups indicate that high use may be occurring on all sites of this ecological type. Heavy use by these animals may lead to reduced shrub and herbaceous vigor and diversity.

Further investigation on all sites and the surrounding areas is recommended, as it may help determine if high elk and cattle use are occurring throughout the localized area. Treatments may be needed on the

North Horn Rock Canyon site if annual grass significantly increases in the future. Introduced perennial grasses may need to be managed on the South Sage Flat site if ecological integrity is deemed to be threatened. Care should be taken in seed selection if reseeding is needed and preference should be given to native species if and when possible. Finally, tree-removing treatments (e.g. lop and scatter, chaining, bullhog, etc.) may be advisable on the Wildcat Knolls and North Horn Rock Canyon studies if cover and density increase in the future.

Mountain (Curlleaf Mahogany)

The studies that are classified as Mountain (Curlleaf Mahogany) ecological sites support communities of curl-leaf mountain mahogany (*Cercocarpus ledifolius*) and a diverse number of other browse species which provide valuable browse for wintering deer. These sites range from being in fair-good to good-excellent condition for deer winter range within the Manti Central Mountains management unit. Introduced perennial grasses are present on the Starvation Mahogany site. Although the threat level on this particular site is low, these species have the potential to be aggressive (especially at higher elevations) and may lead to reduced abundance and diversity of native grasses and forbs. Annual grasses have also been observed on the Starvation Mahogany study, but currently pose a low-level threat. Conifer encroachment is occurring, and all three studies are considered to be within Phase I of woodland succession. Further tree encroachment could be possible over time. Finally, pellet group data indicates that high cattle use may be occurring on the Upper Hole Trail study. Heavy use by roughage eaters has the potential to be detrimental to the abundance and diversity of herbaceous species.

Areas with tree encroachment might be considered for treatments (e.g. bullhog, chaining, lop and scatter, etc.) in the future, if cover and density of conifers increase. Herbicide treatments and grazing management changes are possible treatments for undesirable understory species. If reseeding is needed to restore the herbaceous communities on these sites, care should be taken in seed selection and preference should be given to native species when possible. Further investigation of the Upper Hole Trail site and surrounding area is recommended to determine if high cattle use is occurring throughout the allotment.

Mountain (Browse)

The studies that are classified as Mountain (Browse) ecological sites generally support mixed browse communities, which provide feed for deer during the winter months. These mixed browse communities are in very poor to good-excellent condition for deer winter range; the North Horn site is considered to be deer summer range. Introduced perennial grass species are present on many studies in varying amounts. These introduced perennial grass species can be aggressive (particularly at higher elevations) and may have the potential to lead to reduced amounts of other more desirable native species. Annual grasses have been observed on the Dry Creek Chaining, Starvation Mountain Brush, Above South Hollow, and South Horn Exclosure studies. Although the threat these annual grasses pose is low, they may have the potential to exacerbate the risk of wildfire if they increase in the future. Conifer encroachment is occurring on all sites, and further encroachment is likely in the future without a tree-removing disturbance.

Threats associated with energy development are a concern on the Starvation Mountain Brush study. Maintenance work associated with energy development such as powerlines and pipelines may result in reduced shrub and understory vigor. Pellet transect data shows that high use by elk may be occurring on the Starvation Mountain Brush study. High elk use may also lead to decreased shrub and herbaceous vigor. Noxious weed species have been observed in the past on the Above South Hollow site. Although the threat level is currently low, noxious weeds have the potential to lead to reduce diversity and cover of other native species in the herbaceous understory.

When and where feasible, areas that have conifer encroachment might be considered for treatments (e.g. bullhog, chaining, lop and scatter, etc.). Undesirable grasses and forbs could be addressed through treatments such as herbicide and changes in grazing management. If reseeding is needed to help restore the herbaceous communities, care should be taken in seed selection and preference should be given to native species when possible. It may also be beneficial to closely examine the Starvation Mountain Brush site and surrounding area. Further investigation may help determine whether high elk use is occurring throughout the localized area.

Mountain (Oak)

The Pole Canyon Oak study is considered to be a Mountain (Oak) ecological site and is classified as being in good condition for deer winter range. This site supports Gambel oak (*Quercus gambelii*) and an abundant herbaceous understory that provides browse and forage for deer. Introduced perennial grasses are present on this site and pose a moderate threat: these grasses can reduce the diversity and abundance of other more preferred native herbaceous species. In addition, annual grasses have been observed on this site, albeit with low cover. Noxious weeds have also been present in low amounts. Noxious weed species can be aggressive, leading to less herbaceous diversity. There is conifer encroachment occurring on this site that could increase over time.

For threats in the herbaceous understories, treatments or management practices could be used to help manage these species. More specifically, herbicide treatments and grazing management changes are possible treatment options for undesirable understory species. If reseeding is needed to restore the herbaceous communities on these sites, care should be taken in seed selection and preference should be given to native species when possible. Although cover and density of trees only place this site in Phase I of woodland succession, conifer-removing treatments (lop and scatter, bullhog, chaining, etc.) may be advisable if trees increase in the future.

Mountain (Shrub)

The study that is classified as a Mountain (Shrub) ecological site, Joes Valley Overlook, is host to a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community and an abundant herbaceous understory: these provide feed for deer and elk during the winter months. This site is considered to be in excellent condition.

Introduced perennial grass species pose a medium-level threat to this site, as they can be aggressive and outcompete native grasses and forbs. If reseeding is deemed necessary to restore the herbaceous community, care should be taken in seed selection and preference should be given to native species when possible. Conifers are also present, placing this site in Phase I of woodland succession. This site may benefit from tree-removing treatments (e.g. bullhog, chaining, lop and scatter, etc.) in the future if cover and density increase.

Mountain (Aspen)

Oak Creek Ridge Aspen is classified as a Mountain (Aspen) ecological site and is considered to be spring/fall range for deer. This site is dominated by a quaking aspen (*Populus tremuloides*) stand and a diverse and abundant herbaceous understory that provides valuable forage for wildlife. Introduced perennial grasses are present on this site: these grasses can be aggressive (especially at higher elevations) and may have the potential to reduce diversity and abundance of more desirable native grasses and forbs. In addition, the noxious weed species gypsyflower (*Cynoglossum officinale*) poses a medium-level threat. Like introduced perennial grasses, noxious weeds can be aggressive and outcompete native grasses and forbs.

If the ecological integrity of the herbaceous understory is deemed to be threatened, treatments could include (but are not limited to) herbicide, grazing management changes, or reseeding. If reseeding is opted for, care should be taken in seed selection with native grasses and forbs as the preferred species to be included.

Mountain (Silver Sagebrush)

The study that is considered to be a Mountain (Silver Sagebrush) ecological site, Scad Hollow, is considered to be summer range for deer in the Manti North/South management unit. This site supports a silver sagebrush (*Artemisia cana*) stand and a diverse and abundant herbaceous understory. The introduced perennial grass species Kentucky bluegrass (*Poa pratensis*) is the most abundant grass on this site; introduced perennial grasses have the potential to be aggressive and may lead to reduced diversity of other native herbaceous species. In addition, the annual grass species cheatgrass (*Bromus tectorum*) has been observed on this site in the past, albeit in low abundance.

For these herbaceous threats, treatments or management practices could be used if deemed necessary. Herbicide treatments and grazing management changes, more specifically, could possibly be used for undesirable understory species. Reseeding could also be a strategy, although caution should be used in seed selection with preference given to native grass and forb species when possible.

Mountain (Slender Wheatgrass)

The Oak Creek Ridge Seeding study is classified within the Mountain (Slender Wheatgrass) ecological type and is considered to be spring/fall range for deer. The herbaceous component of this site is robust and mainly comprised of perennial and annual forbs. Although the grass component is small compared to that of forbs, much of the perennial grass cover is contributed by introduced species. These introduced perennial grasses can be especially aggressive at high elevations and may have the potential to outcompete native grasses and forbs. The noxious weed species gypsyflower (*Cynoglossum officinale*) is also present on this site: noxious weeds can also be aggressive and may threaten the ecological integrity of the herbaceous understory. In addition, pellet group data suggests that high use by cattle may be occurring on this site. Heavy use by roughage eaters has the potential to lead to reduced herbaceous abundance and diversity.

Grazing management changes, herbicide treatments, and reseeding are possible treatments for undesirable understory species. If reseeding is needed to restore the herbaceous communities on these sites, care should be taken in seed selection and preference should be given to native species when possible. Finally, closer examination of the Oak Creek Ridge Seeding site and surrounding area may be recommended to help determine whether high cattle use is occurring across the allotment.

Upland (Big Sagebrush)

The studies that are classified as Upland (Big Sagebrush) ecological sites are considered to be in very poor to good-excellent condition. Sites of this ecological type generally support big sagebrush (*Artemisia tridentata*) communities, which provide feed for deer during the winter months. Introduced perennial grasses are present in notable amounts on the Hilltop, Pole Canyon Chaining, Manti Dump, Black Dragon, Birch Creek Chaining, Olsen Canyon, and White Hill studies. Although these perennial species help provide competition against annual grasses, they may have the potential to lead to reduced abundance of other more desirable native grass and forb species. In addition, annual grasses are present in varying amounts on all study sites except Birch Creek Chaining. High amounts of annual grasses can increase fuel loads and may contribute to altering wildfire regimes. Encroachment of pinyon and juniper is considered to be a low to medium-level threat on many sites, and will likely continue in future sample years without a tree-removing disturbance.

Energy development poses a threat to the Manti Dump study. Maintenance work associated with energy sources such as powerlines can lead to reduced vigor of shrubs and herbaceous species. Noxious weeds are present or have been observed in the past on the Hilltop and Slackpile study sites. Although the threat level on these sites is low, noxious weeds have the potential to be aggressive and outcompete native herbaceous species. In addition, pellet group data indicates that the Hilltop, Slackpile, Wire Grass Bench, Pole Canyon Chaining, and Birch Creek Chaining sites may be undergoing high use by cattle, elk, and/or deer. High use by animals has the possibility to lead to reduced shrub and/or herbaceous vigor and diversity.

Treatments to reduce aggressive perennial grasses could be needed in some areas if a lack of diversity in the plant community becomes a concern. Locations with conifer encroachment may require tree-removing treatments (e.g. bullhog, chaining, lop and scatter, etc.) if density and cover increase in the future. In addition, treatments to reduce annual grasses may be beneficial on some sites where the ecological integrity may be threatened. Finally, it may be beneficial to see if high animal use is occurring by more closely examining the applicable sites and surrounding areas.

Upland (Black/Low Sagebrush)

The studies classified within the Upland (Black/Low Sagebrush) ecological type generally support black sagebrush (*Artemisia nova*) communities which provide browse for deer during the winter months. These sites range from being in very poor to good-excellent condition for deer winter range in the Manti Central Mountains unit. Annual and introduced perennial grasses are present on all four sites in varying amounts. High annual grass loads can raise the risk of wildfire while introduced perennial grasses can reduce the diversity of understory species. In addition, all sites are in Phase I of woodland succession, and tree encroachment may continue over time. The noxious weed species field bindweed (*Convolvulus arvensis*) has been observed on the Manti Face Chaining study. Although cover is low, noxious weeds do have the potential to be aggressive. In addition, deer and/or sheep use may be occurring on the Black Hill and Mayfield Mountain Face studies – high use by these animals may lead to a reduced or less vigorous browse component.

If conifer density and cover increase in the future, these sites might be considered for tree-removing treatments (e.g. bullhog, chaining, lop and scatter, etc.). For threats in the herbaceous understories, treatments or management practices could be used to help manage these species. For example, herbicide treatments and grazing management changes are possible treatment options for undesirable understory species. If reseeding is needed to restore the herbaceous communities on these sites, care should be taken in seed selection and preference should be given to native species when possible.

Further investigation of the Mayfield Mountain Face and Black Hill studies is also recommended. Closer examination of these sites and surrounding areas may help determine if high deer and/or sheep use is occurring. For example, data for the Black Hill site shows that use of black sagebrush has increased over time, as has the percentage of decadent plants in the population. Furthermore, density has displayed a decreasing trend as use has increased. This data may indicate that this study cannot support the amount of deer/sheep use that has been occurring.

Upland (Shrub)

The Cove Creek study is considered to be an Upland (Shrub) ecological site and is in poor condition. This study site is host to a shrub population that provides browse for deer. Annual and perennial grasses contribute high amounts of cover to the herbaceous understory of this site. Introduced perennial grass species can reduce the diversity of understory species while high annual grass loads can exacerbate the

risk of wildfire. In addition, the noxious weeds field bindweed (*Convolvulus arvensis*) and nodding plumeless thistle (*Carduus nutans*) are present or have been observed in the past. Although cover is currently low, noxious weeds do have the potential to be aggressive.

Treatments to manage undesirable herbaceous species are recommended for this site. Possible treatment options include (but are not limited to): reseeding, herbicide treatments, and changes in grazing management. If reseeding is selected to help restore the understory, caution should be used in seed selection with preference given to native grass and forb species when possible.

Upland (Pinyon-Juniper)

The studies classified within the Upland (Pinyon-Juniper) ecological type range from being in very poor to good condition for deer winter range. Many of these sites support shrub populations that provide valuable browse for wintering deer. Introduced perennial grasses pose a high-level threat on the Willow Creek, Cane Valley, Red Point, Danish Bench, and Cedar Mountain sites, and a low-level threat on the South of Dry Wash study. Although they can help provide competition against annual grasses, introduced perennial grasses may outcompete more desirable native grasses and forbs. Annual grasses have been present or observed in the past on the Willow Creek, Cane Valley, Red Point, South of Dry Wash, and Cedar Mountain sites. South of Dry Wash is considered to be in Phase I transitioning to Phase II of woodland encroachment, and the rest of the sites are in Phase I. Without a tree-removing disturbance, conifer encroachment is likely to continue in the future. Finally, pellet group data indicates that the Poison Spring Bench, South of Dry Wash, and Cedar Mountain studies may be highly used by elk. Heavy elk use may lead to reduced understory shrub and herbaceous abundance and vigor.

Areas that have conifer encroachment might be considered for treatments (e.g. bullhog, chaining, lop and scatter, etc.) when and where it would be beneficial. For threats in the herbaceous understories, treatments or management practices used to help manage these species may include (but are not limited to) herbicide treatments and grazing management changes. In addition, if reseeding is needed to restore the herbaceous communities on these sites, care should be taken in seed selection and preference should be given to native species when possible. Further investigation of the Poison Spring Bench, South of Dry Wash, and the Cedar Mountain sites is recommended. Closer examination of these sites and surrounding areas may help determine if high elk use is occurring throughout the localized area.

Semidesert (Big Sagebrush)

The studies that are considered to be Semidesert (Big Sagebrush) ecological sites are host to shrub communities which provide feed for wintering deer. These studies are considered to be in good to good-excellent condition for deer winter range. Annual grasses, particularly cheatgrass (*Bromus tectorum*), are present in high amounts on the Porphyry Bench study and in low amounts on the Consumer Bench site. High amounts of annual grasses can increase fuel loads and may contribute to altering wildfire regimes. Pellet transect data indicates that high deer use may be occurring on the Porphyry Bench study and that heavy cattle use may be a concern on the Consumer Bench site. Heavy use by these animals may lead to decreased vigor and abundance of shrubs and/or herbaceous species. Introduced perennial grasses are another concern on the Porphyry Bench study. These grasses can reduce the diversity and abundance of other more desirable native grasses and forbs. In addition, the Consumer Bench site is considered to be within Phase I of woodland succession, and further tree encroachment will likely occur over time.

Areas where trees are present may benefit from conifer-removing treatments (e.g. bullhog, chaining, lop and scatter, etc.) when and where needed. If reseeding is needed to restore the herbaceous communities in areas where ecological integrity may be threatened, care should be taken in seed selection and preference should be given to native species when possible. Finally, closer examination of the Porphyry Bench and

Consumer Bench studies and surrounding area may be beneficial. Further investigation may help determine whether high animal use is occurring throughout the localized area.

Semidesert (Black/Low Sagebrush)

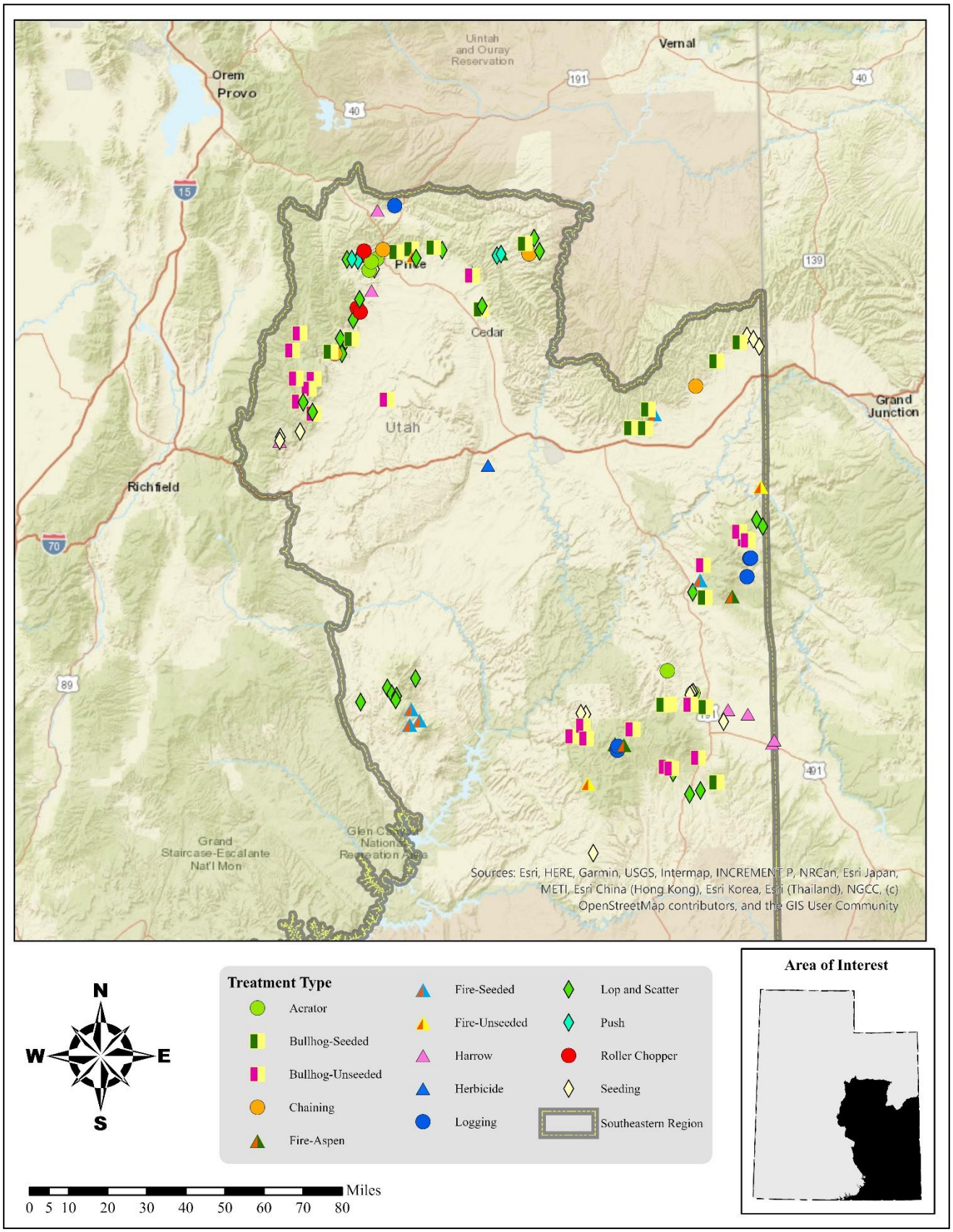
The study classified as a Semidesert (Black/Low Sagebrush) ecological site, Indian Hollow, is considered to be in good condition for deer winter range in the Manti Central Mountains management unit. This site is dominated by black sagebrush (*Artemisia nova*) which provides browse for deer during the winter months. This site is considered to be within Phase I of woodland succession. A tree-removing treatment (e.g. bullhog, chaining, lop and scatter, etc.) may be advisable if encroachment continues in the future.

Semidesert (Shadscale)

Muddy Creek is classified as a Semidesert (Shadscale) ecological site and is host to shrubs such as shadscale saltbush (*Atriplex confertifolia*) that provide browse for deer and elk during the winter. This site is considered to be in fair condition for deer winter range in this unit. Annual grasses are present on this site with high cover; high amounts of annual grasses have the possibility to exacerbate risk of wildfire. Introduced perennial grasses have also been observed. Although the threat they pose is currently low, they may lead to reduced diversity of more desirable native herbaceous species should they increase in the future. Finally, the Muddy Creek site is considered to be in Phase I of woodland succession, and further encroachment could be possible over time.

This site may benefit from tree-removing treatments (e.g. bullhog, lop and scatter, chaining) if conifer cover and density increase in the future. In addition, treatments such as herbicide and changes in grazing management may be advisable for herbaceous threats if ecological integrity is deemed to be negatively affected.

5. SOUTHEASTERN REGION – TREATED OR DISTURBED SUMMARY



Study Trend Summary (Treated/Disturbed Sites)

Bullhog (Seeded)

There are 16 study sites that were treated with a bullhog and subsequently seeded during the report period. Nine of these studies [Sagers Bench (10R-59), Deadman (11B-01), West Coal Creek Bullhog (11R-10), Horse Canyon (11R-13), Dugout (11R-17), Black Ridge Fuel Reduction (13R-03), Peter's Canyon (14R-19), Shay Mesa Bullhog (14R-21), and Long Canyon Point (14R-43)] are considered to be upland ecological sites and seven studies [East Thompson Bench (10B-15), South Book Cliffs (10R-55), Dry Canyon (10R-58), Hat Rock (10R-60), Bull Canyon (10R-64), Stump Flat 2 (16R-49), and Grimes Wash 3 (16R-55)] are classified as semidesert ecological sites.

The Sagers Bench study site is located northeast of the town of Thompson on a bench above Sagers Canyon. The Deadman site can be found just south of the mouth of Deadman Canyon north of Price. West Coal Creek Bullhog is situated southwest of Helper near the head of Warehouse Canyon: The Horse Canyon study can be found east of I-70 and roughly two miles west of the mouth of Horse Canyon. Dugout is located on the South Book Cliffs near Soldier Creek. The Black Ridge Fuel Reduction site is situated south of Moab and east of State Route 191, and Peter's Canyon can be found just west of SR-191 near the head of Peters Canyon. Shay Mesa Bullhog is situated on Shay Mesa just north of Shay Mountain. The Long Canyon Point study can be found on Long Canyon Point, northeast of Blanding.

The East Thompson Bench study is located on a bench above Thompson Canyon, and South Book Cliffs can be found just southwest of the East Thompson Bench site. The Dry Canyon study is situated between Potato Hill and the mouth of Dry Canyon. The Hat Rock site is located approximately one mile south of Hat Rock, and Bull Canyon is situated on a bench above Nash Wash. Stump Flat 2 is west of Huntington. Finally, the Grimes Wash 3 study is located north of Orangeville near Grimes Wash.

Shrubs/Trees: Average shrub cover on the upland ecological sites has increased over time with preferred browse as the dominant component. This trend is partially due to a variation in number of study sites (the 'n value') in each sample year. For example, many study sites prior to treatment and in the first year after treatment contributed little to no browse cover. In comparison, two of the three studies (West Coal Creek Bullhog and Shay Mesa Bullhog) with data for the third post-treatment sampling provided over 15% cover. Overall shrub cover has also increased on the semidesert study sites due to an increase in other shrub cover excluding preferred browse. In addition to 'n value' fluctuations, this increase in other shrub cover during the first post-treatment sample year can be largely attributed to an increase in broom snakeweed (*Gutierrezia sarothrae*) cover on the Dry Canyon study (**Figure 5.1**). Overall density of preferred browse on upland study sites exhibited an initial decrease during the first sampling following treatment, but has increased over time. Mature individuals have comprised a majority of the plant populations in all sample years, a trend partially driven by the West Coal Creek Bullhog site. Density of preferred browse has also increased on semidesert study sites with mature plants as the dominant demographic in all sample years (**Figure 5.4**). Utilization of preferred browse has generally decreased on upland sites. However, an increase was noted between the first and second post-treatment sample years: this is at least partially due to the West Coal Creek Bullhog study, which has no data for the first post-treatment sampling and is therefore not included in that average. Utilization has marginally increased on semidesert study sites (**Figure 5.5**).

As expected with a bullhog treatment, tree cover has exhibited a marked decrease over time on both upland and semidesert study sites. However, a slight increase was observed between the second and third post-treatment sample years on upland studies: this is in part due to differences in the number of studies sampled from year to year (**Figure 5.2**). Tree density has also decreased overall on sites of both ecotypes (**Figure 5.3**).

Herbaceous Understory: The herbaceous understories have increased overall in cover and frequency, although composition has fluctuated. On upland study sites, perennial grasses have dominated the understories during the second and third post-treatment samplings. Prior to treatment and in the first post-treatment sample year,

however, the understories of these studies were dominated by a mixture of perennial and annual forbs and grasses. The Peter's Canyon and Deadman studies are partially responsible for the amount of annual grasses and forbs prior to treatment and during the first post-treatment sample year, respectively. Again, it is also important to notice the difference in the numbers of studies from sample year to sample year when analyzing this data. The semidesert study sites have been primarily comprised of annual grasses and forbs in both sample years: this trend is in part driven by the South Book Cliffs, Dry Canyon, and Stump Flat 2 study sites (**Figure 5.6**, **Figure 5.7**).

Occupancy: Pellet group transect data indicates that overall average animal presence has decreased over time. Deer have been the primary occupants in all sample years, and cattle were co-dominant in the third sampling following treatment. Generally speaking, mean abundance of deer pellet groups has ranged from 10 days use/acre during the second sample year following treatment to 19 days use/acre prior to treatment. Elk pellet groups have had a mean abundance as low as 2 days use/acre during the second sample year following treatment to 7 days use/acre during the first post-treatment sampling. Cattle pellet groups have had a mean abundance fluctuating between 2 days use/acre prior to treatment and 14 days use/acre in the third sample year after treatment (**Figure 5.8**).

Deer Winter Range Condition Assessment: The condition of deer winter range on sites that have been bullhogged and seeded has continually changed over the sample period. These sites within the Southeastern Region are considered to be within very poor to fair-good condition, with most studies improving or remaining stable. The Cottonwood Ridge study (which was not discussed above) deteriorated from fair to very poor condition. Dry Canyon, Sagers Bench, Horse Canyon, Dugout, and Stump Flat 2 remained in very poor condition. The Hat Rock and Bull Canyon studies were established and were classified as being within very poor-poor condition. Grimes Wash 3 was also established and was considered to be in poor condition. East Thompson Bench improved from very poor-poor to poor. The Deadman and Black Ridge Fuel Reduction sites went from very poor to poor, and the South Book Cliffs study went from fair to poor. Finally, West Coal Creek Bullhog and Shay Mesa Bullhog went from fair to fair-good condition (**Figure 5.9**, **Table 5.1**).

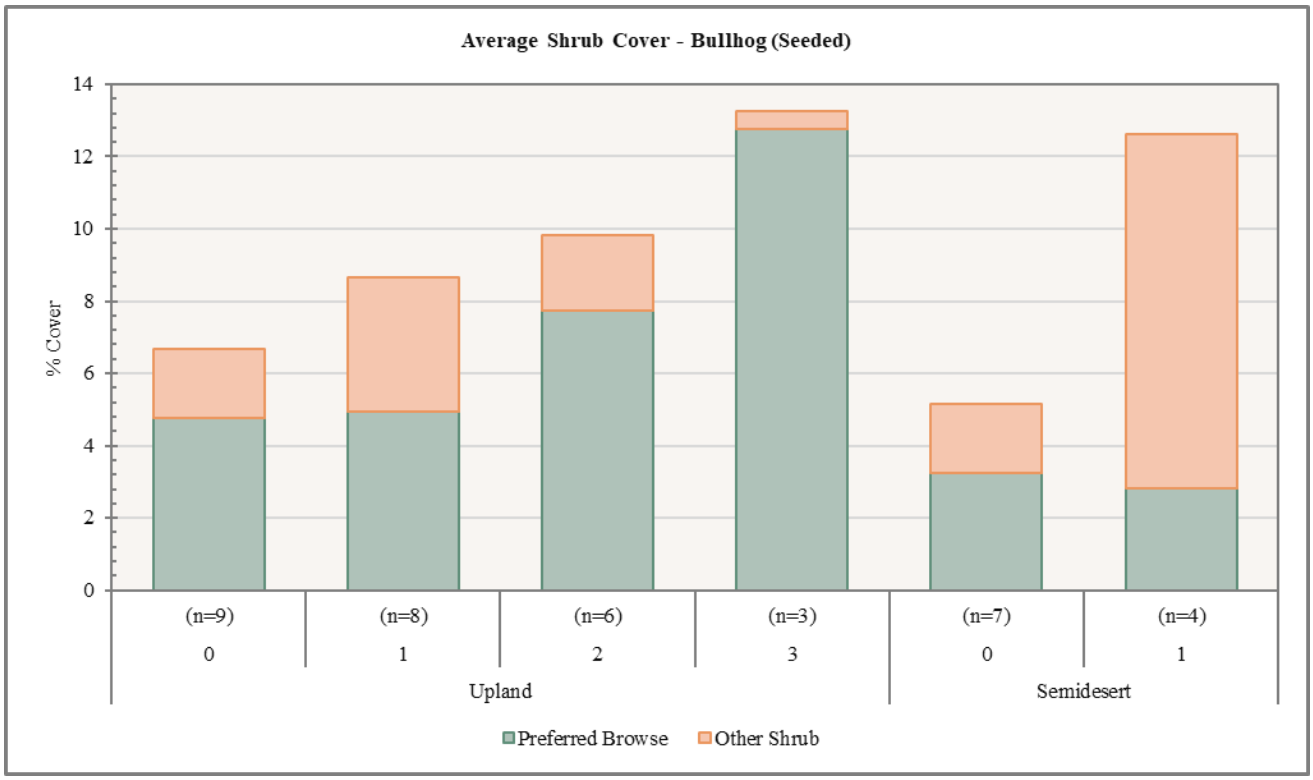


Figure 5.1: Average shrub cover on upland and semidesert study sites that have been treated with a bullhog and seeded. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

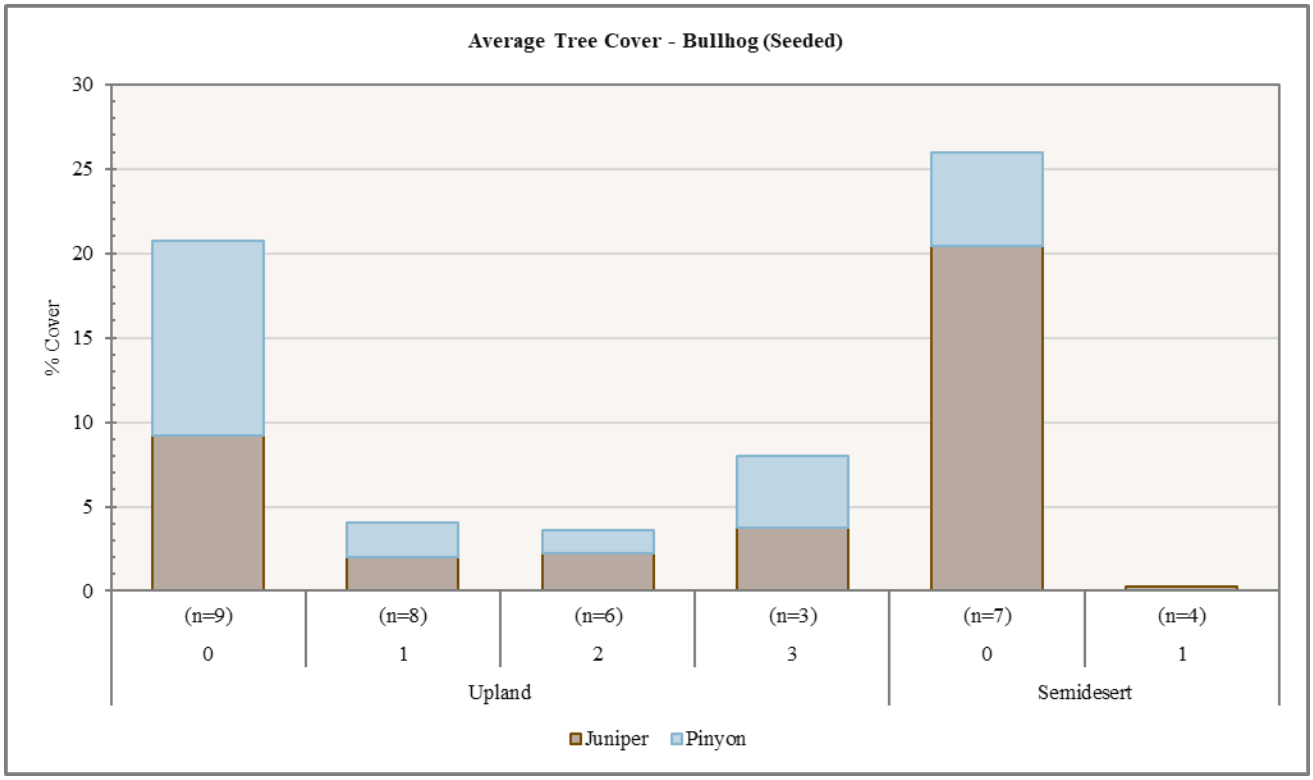


Figure 5.2: Average tree cover on upland and semidesert study sites that have been treated with a bullhog and seeded. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

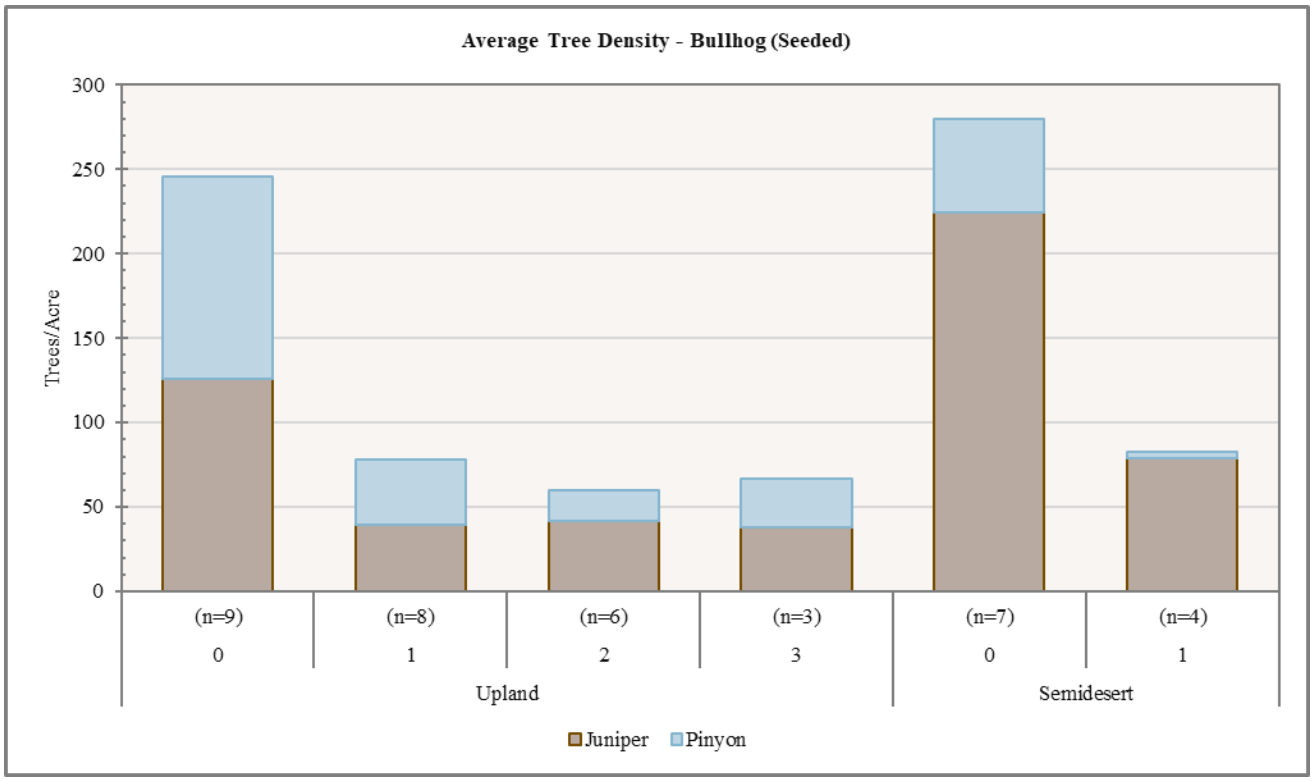


Figure 5.3: Average tree density on upland and semidesert study sites that have been treated with a bullhog and seeded. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

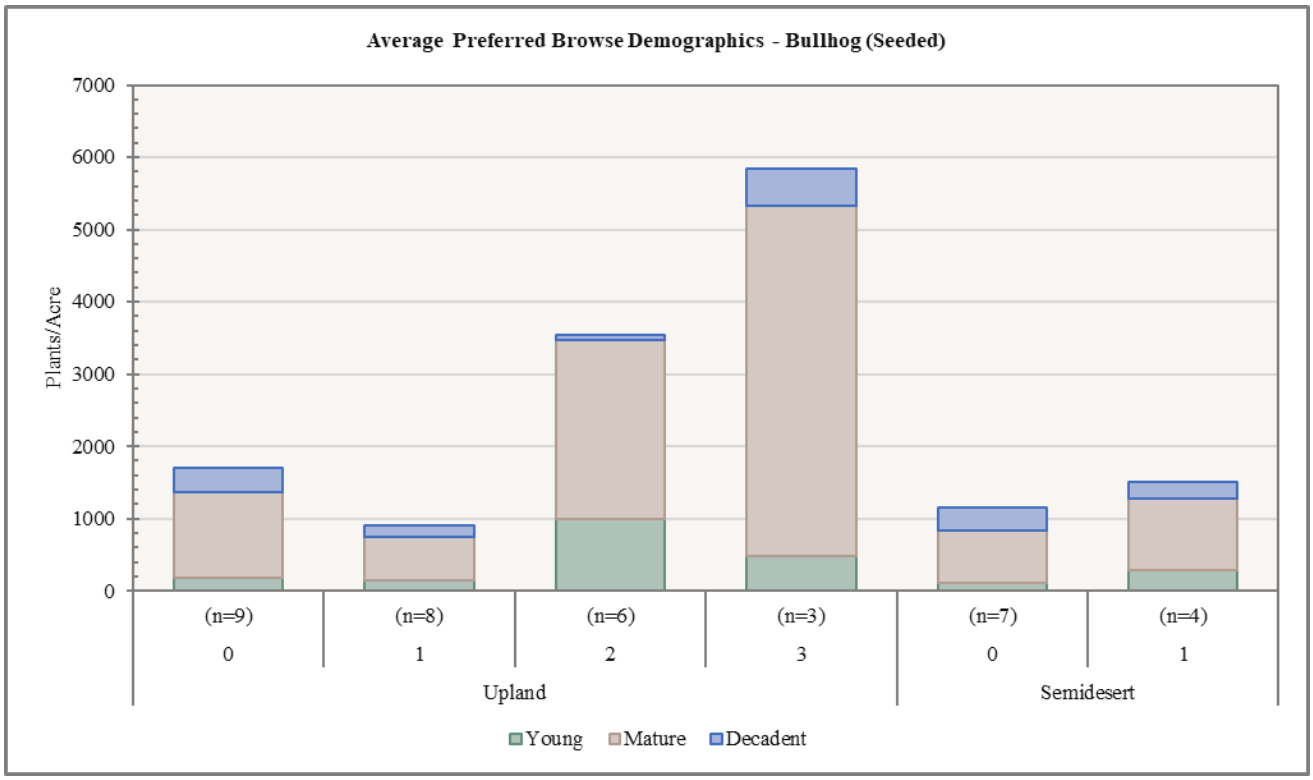


Figure 5.4: Average preferred browse demographics on upland and semidesert study sites that have been treated with a bullhog and seeded. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

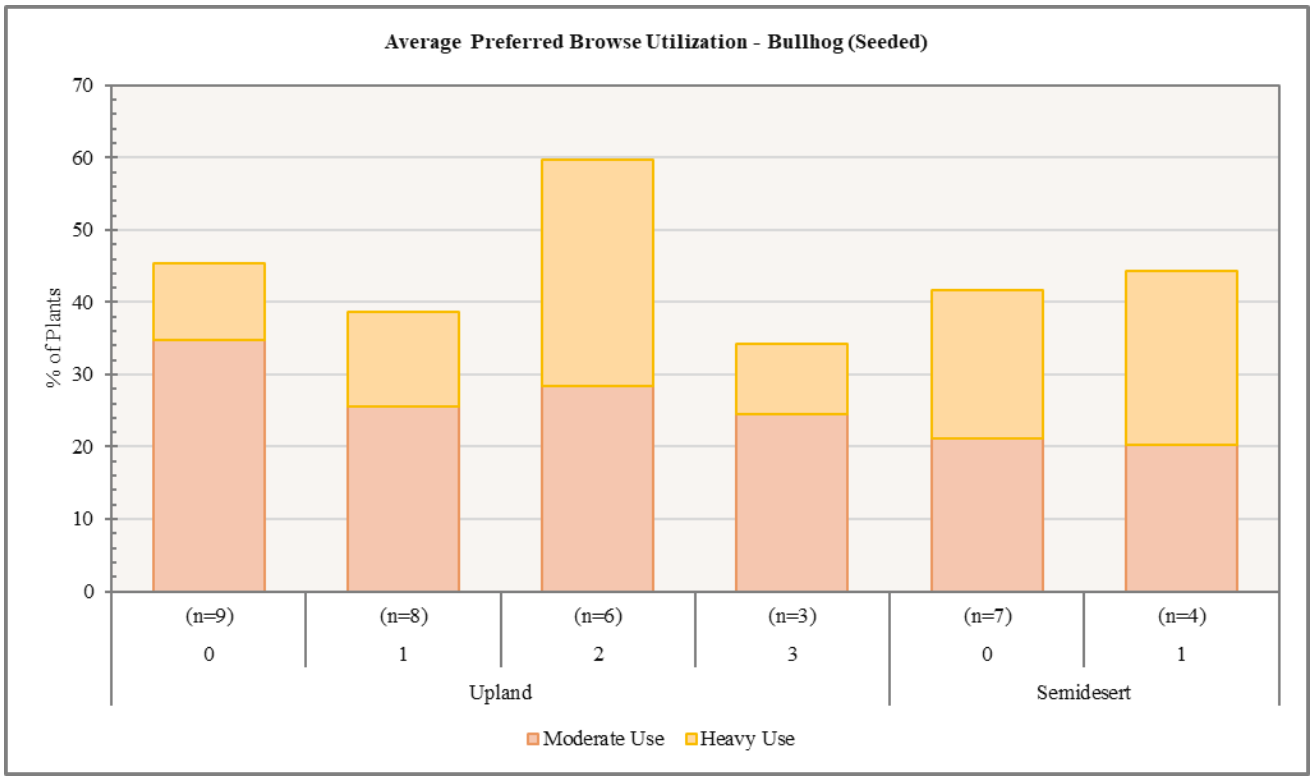


Figure 5.5: Average preferred browse utilization on upland and semidesert study sites that have been treated with a bullhog and seeded. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

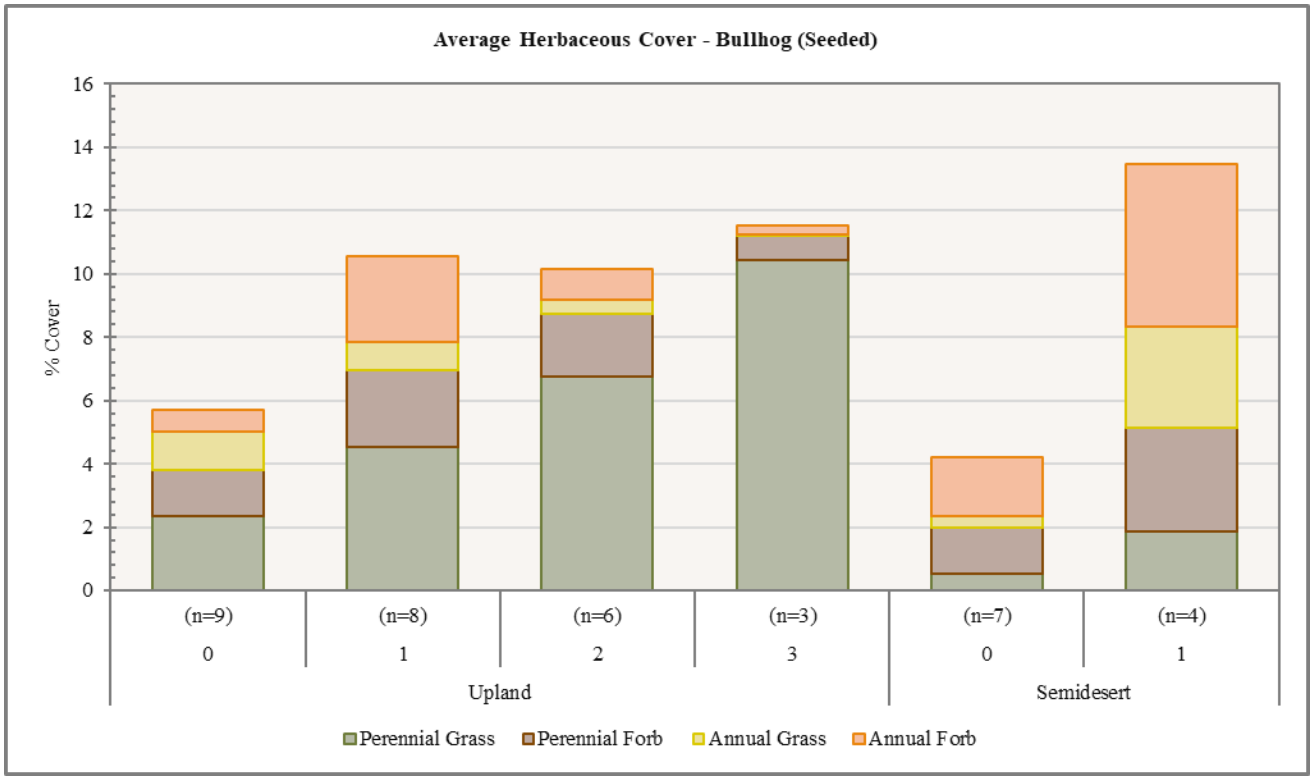


Figure 5.6: Average herbaceous cover on upland and semidesert study sites that have been treated with a bullhog and seeded. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

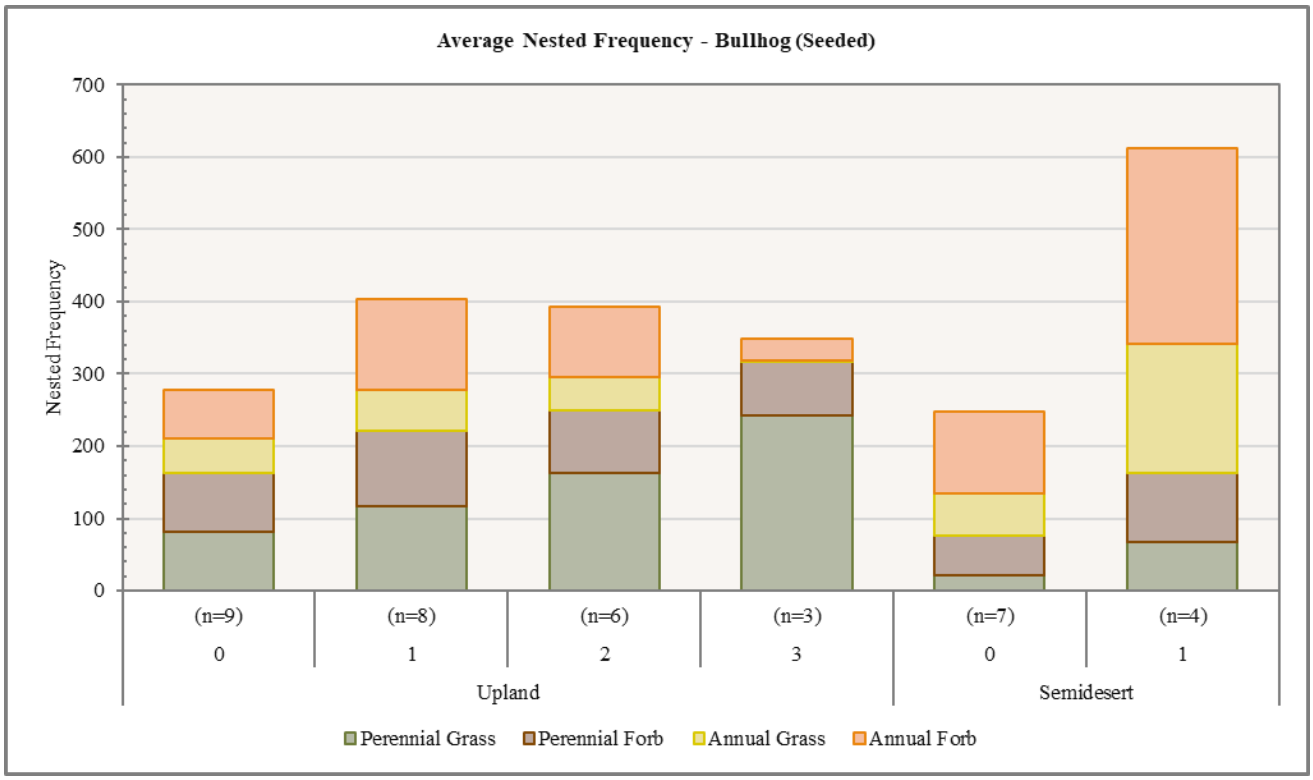


Figure 5.7: Average nested frequency of herbaceous species on upland and semidesert study sites that have been treated with a bullhog and seeded. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

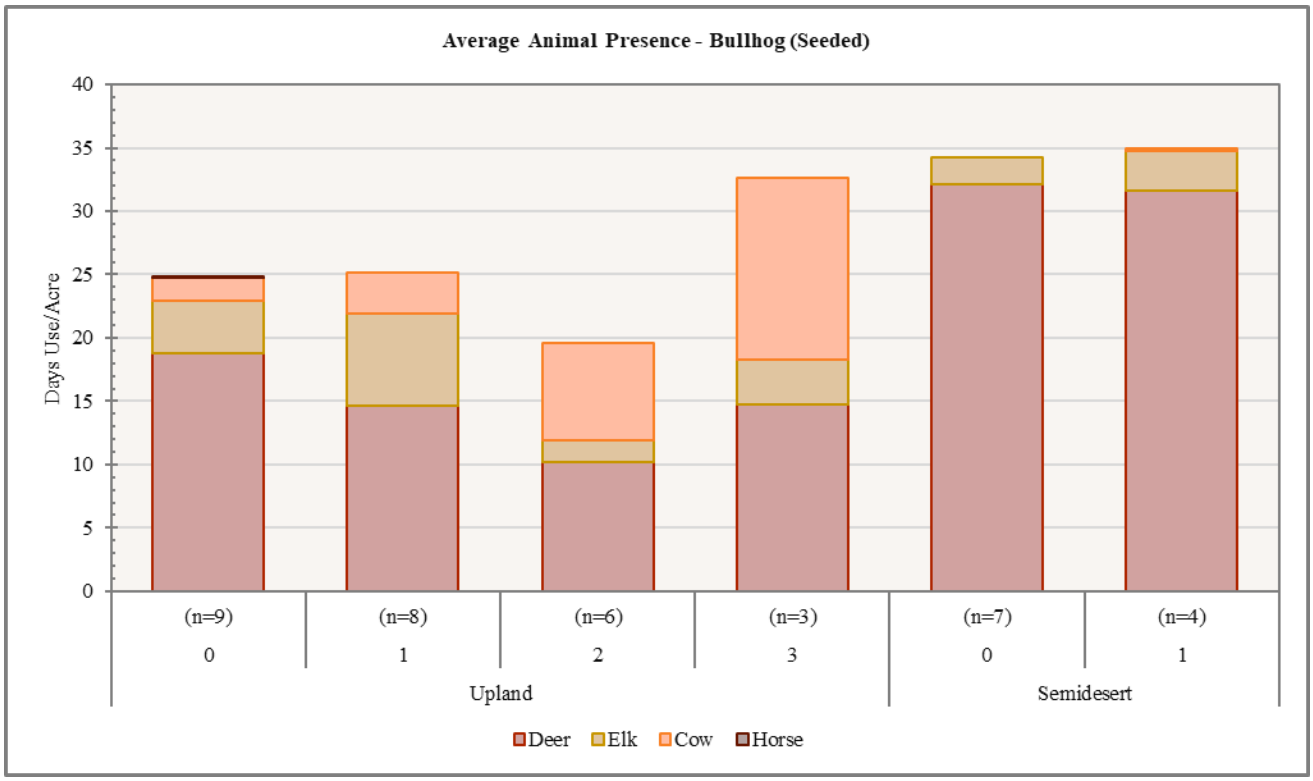


Figure 5.8: Average pellet transect data on upland and semidesert study sites that have been treated with a bullhog and seeded. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment. Upland deer pellets include deer/antelope.

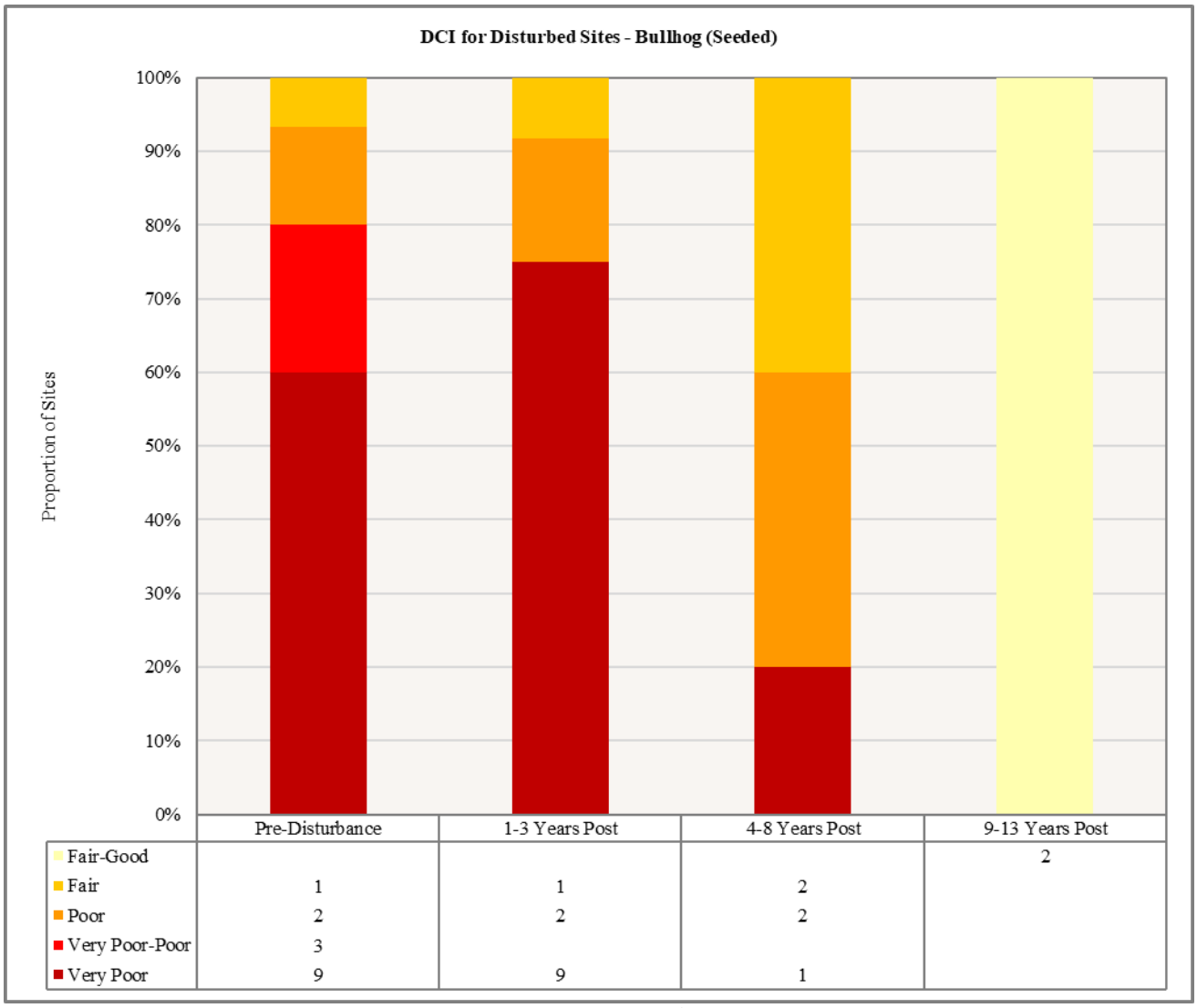


Figure 5.9: Deer winter range Desirable Components Index (DCI) summary by year of sites that have been treated with a bullhog and seeded.

Study Number	Post Category	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
10-15	0	1.8	0	0	6.4	-0.1	1.6	0	**9.6**	**VP-P**
10-15	1	2	0	0	10.6	-0.9	8.3	0	**19.9**	**P**
10R-55	0	15.3	3.2	0.6	0.6	-1.6	2.3	0	**20.3**	**P**
10R-55	1	8.9	8	15	1.8	-4.5	10	0	**39.2**	**F**
10R-58	0	4.9	0	0	0	-0.2	0.2	0	**5**	**VP**
10R-58	1	2.9	0	0	1.6	-4.2	5.9	0	**6.2**	**VP**
10R-59	0	6	0	0	0	0	3.6	0	**9.6**	**VP**
10R-59	1	1.4	0	0	3.5	-1.1	8	0	**11.8**	**VP**
10R-60	0	0	0	0	0	0	8.3	0	**8.3**	**VP-P**
10R-64	0	0	0	0	0.2	0	8	0	**8.2**	**VP-P**
11B-01	0	2.2	0	0	0.3	0	4.8	0	**7.3**	**VP**
11B-01	1	1.2	0	0	1.8	0	4	0	**6.9**	**VP**
11B-01	2	9.7	14.3	15	1.8	-1.1	3.1	0	**42.8**	**P**
11B-17*	0	13.3	3	8.2	20.5	-0.4	3.2	0	**47.7**	**P**
11R-10	0	13	6.1	1.1	2.2	0	0.6	0	**23**	**VP**
11R-10	1	13.5	0	0	9.4	0	7.3	0	**30.1**	**VP**
11R-10	2	18.6	14.5	15	5.6	0	1.7	0	**55.4**	**F**
11R-10	3	22.8	13	3.7	23.1	0	1.6	0	**64**	**F-G**
11R-13	0	2.3	0	0	1.1	0	7.7	0	**11.1**	**VP**

Study Number	Post Category	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
11R-13	1	2.3	0	0	1.4	0	5.5	0	**9.1**	**VP**
11R-13	2	2.5	0	0	1	-0.1	5.6	0	**9**	**VP**
11R-17	0	4.1	0	0	0	0	0.5	0	**4.6**	**VP**
11R-17	1	3.8	0	0	0	0	1.4	0	**5.2**	**VP**
11R-18	0	14.3	12.1	9.4	18.6	0	10	0	**64.4**	**F**
11R-18	1	5.7	0	0	16.6	0	10	0	**32.3**	**VP**
13R-03	0	5.9	0	0	22.2	-0.2	4.9	0	**32.8**	**VP**
13R-03	1	5.4	0	0	17.3	0	6.7	0	**29.4**	**VP**
13R-03	2	5.4	0	0	30	-0.3	10	0	**45.1**	**P**
14R-03*	0	0	0	0	0	0	0	0	**0**	**VP**
14R-04*	0	1.2	0	0	0.4	0	0.2	0	**1.7**	**VP**
14R-21	0	8.6	11.5	8.1	1.4	-1.7	0.3	0	**28.2**	**VP**
14R-21	1	22.3	5.5	2.2	12.3	-0.3	2.7	0	**44.7**	**P**
14R-21	2	20.8	14	5.8	18.6	-0.5	2.2	0	**60.8**	**F**
14R-21	3	23.3	10.7	7	21.6	0	2.3	0	**64.8**	**F-G**
16R-49	0	0.3	0	0	0	0	0.1	0	**0.4**	**VP**
16R-49	1	0.4	0	0	0.9	0	2	0	**3.3**	**VP**
16R-55	0	6.4	6.7	6	0	0	0.2	0	**19.4**	**P**

Table 5.1: Deer winter range Desirable Components Index (DCI) information by site number of study sites that have been treated with a bullhog and seeded. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.
*Studies with an asterisk have been suspended.

Bullhog (Unseeded)

There are 21 study sites that were treated with a bullhog and not seeded during the report period. Of these studies, 13 [Brush Hole (13R-10), Above Fisher Creek (13R-11), South Mesa (13R-12), Sids Draw (13R-13), Brushy Basin (14-02), Mormon Pasture Point (14-27), Johnson Creek 2 (14R-28), Long Canyon (14R-45), Middle Mountain (16C-17), North Horn- Rock Canyon (16C-22), South Horn Exclosure (16C-24), Black Dragon Bullhog (16R-25), and Swasey Bullhog (16R-44)] are considered to be mountain ecological sites. In addition, eight studies [East Carbon Bullhog (11R-09), Shay Mesa (14-11), Peters Point BLM (14R-25), Dark Canyon (14R-31), Lower Wild Cow Point (14R-37), Sweet Alice Spring (14R-38), Dry Mountain (16C-26), and South of Dry Wash (16C-28)] are classified as upland ecological sites.

The Brush Hole study site is located northeast of Mount Waas in the La Sal Mountains, while Above Fisher Creek is situated above Fisher Creek and just south of Fisher Valley. The South Mesa study can be found on the southern portion of South Mesa in the La Sal Mountains. The Sids Draw study is southeast of the Brush Hole Study in Sids Draw. The Brushy Basin study is situated just south of the Abajo Mountains in Brushy Basin, and the Mormon Pasture Point study is located north of Mormon Pasture Point on North Elk Ridge. Johnson Creek 2 can be found east of Brushy Basin, near Johnson Creek. The Long Canyon site is situated east of Long Canyon on the lower slopes of the Abajo Mountains. The Middle Mountain study site is north of Joes Valley Reservoir on Middle Mountain, and the North Horn- Rock Canyon study can be found on a bench south of North Horn Mountain and north of Rock Canyon. South Horn Exclosure is situated on South Horn Mountain. The Black Dragon Bullhog site is located south of Joes Valley Reservoir above North Dragon Creek. Swasey Mountain Bullhog is situated along The Switchbacks just west of Joes Valley Reservoir.

The East Carbon Bullhog study site can be found below the South Book Cliffs on the eastern edge of Clark Valley, and the Shay Mesa study is located on Shay Mesa and roughly 0.8 miles southwest of Newspaper Rock. Peters Point BLM is north of Monticello on Peters Point. The Dark Canyon study is situated on the Dark Canyon Plateau on North Elk Ridge. The Lower Wild Cow Point study is on Wild Cow Point between Fable Valley and Sweet Alice Canyon. The Sweet Alice Spring site can be found just west of the Sweet Alice Hills on the Dark Canyon Plateau, and the Dry Mountain study is above Slide Hollow on Dry Mountain. Finally, the South of Dry Wash study is located south of Dry Wash and northeast of Nelson Mountain.

Shrubs/Trees: Preferred browse species have provided most of the cover in all sample years on mountain ecological sites. Shrub cover has fluctuated, with an initial decrease in the first sample year following treatment and increases after that. Variation in number of study sites (the 'n value') in each sample year likely influences these trends; for example, data for the third post-treatment sample year is provided entirely by the Middle Mountain and Black Dragon Bullhog studies. Preferred browse species also provide most of the shrub cover on upland study sites. Total average cover on upland sites has remained fairly stable overall, but has fluctuated between sample years: again, this is at least in part due to the differing number of study sites from year to year. Other shrub species have been present in varying amounts throughout the study period, but are typically a minor part of the shrub component (**Figure 5.10**). Overall density of preferred browse on mountain study sites follows a similar trend to that of cover: an initial decrease followed by increases. Furthermore, overall density during the third post-treatment sample year surpassed pre-treatment levels. Density on upland study sites has fluctuated slightly from year to year, but has remained largely consistent overall. Mature plants have been the dominant demographic throughout the study periods on both mountain and upland ecological sites (**Figure 5.13**). Average utilization of preferred browse on mountain ecological sites decreased between the second and third sample years following treatment, but has increased overall; 28% of plants were moderately browsed and 20% were heavily browsed during the most recent sampling. Overall utilization on upland study sites has remained stable, albeit with fluctuations from year to year. Over 60% of plants on these sites have been moderately to heavily browsed before treatment and during the second and third post-treatment samplings (**Figure 5.14**).

As is expected on sites treated with a bullhog, tree cover has decreased following treatment on both mountain and upland ecological sites (**Figure 5.11**). Tree density has also decreased overall, although mountain and upland sites have exhibited marginal increases after the initial post-treatment sampling: this is in part due to the variation in number of studies sampled from year to year (**Figure 5.12**).

Herbaceous Understory: The herbaceous understories of both mountain and upland ecological sites have increased over time with perennial grasses contributing the most cover in all sample years. Primarily native perennial grasses dominate many of the mountain ecological sites. However, introduced species such as intermediate wheatgrass (*Thinopyrum intermedium*) and crested wheatgrass (*Agropyron cristatum*) are present on some sites and contribute much of the herbaceous cover on the Mormon Pasture Point and Brushy Basin studies. Nested frequency values have fluctuated. For example, abundance of perennial and annual forbs has increased on upland study sites, mainly due to the Dry Mountain and Shay Mesa studies (**Figure 5.15**, **Figure 5.16**).

Occupancy: Average animal presence has exhibited a marginal decrease overall on mountain study sites with fluctuations between sample years. Elk have been the primary occupants of these sites in all years except during the second post-treatment sample year, in which deer and/or sheep were the primary occupants. Mean abundance of deer and/or sheep pellet groups has ranged from 6 days use/acre in the third post-treatment sample year to 16 days use/acre during the second sampling after treatment. Elk pellet groups have had a mean abundance as low as 9 days use/acre prior to treatment and as high as 13 days use in the second post-treatment sample year. Mean abundance of cattle pellet groups has fluctuated between 0.4 days use/acre in the third sample year following treatment and 4 days use/acre before treatment.

Average animal presence on upland study sites decreased between the pre-treatment and second post-treatment sample years, but subsequently increased. Deer have been the primary occupants of these study sites in most sample years, with a mean pellet group abundance ranging from 4 days use/acre in the second post-treatment sample year to 27 days use/acre prior to treatment. Elk were co-dominant with deer and cattle in the second post-treatment sampling. Average abundance of elk pellet groups has been as low as 6 days use/acre before treatment and during the second post-treatment sample year and as high as 13 days use/acre in the first sample year following treatment. Finally, cattle pellet groups have had a mean abundance fluctuating between 2 days use/acre prior to treatment and 6 days use/acre during the third post-treatment sample year (**Figure 5.17**).

Deer Winter Range Condition Assessment: The condition of deer winter range on sites that have been treated with a bullhog and not seeded has continually changed over the sample period. These sites within the

Southeastern Region are considered to be within very poor to good condition, with most studies improving or remaining stable. The Fullers Bottom study (which was not discussed above) remained in very poor condition, while East Carbon Bullhog stayed in very poor-poor condition. The South Mesa and Sweet Alice Spring studies were established and were considered to be within poor and poor-fair condition (respectively). Shay Mesa deteriorated from fair-good to poor condition. Dark Canyon improved from poor-fair to fair, and Lower Wild Cow Point went from poor to fair. The South Horn Exclosure study deteriorated from fair to poor condition, and North Horn- Rock Canyon went from fair-good to fair. The South of Dry Wash and Swasey Bullhog studies improved from poor to fair-good condition. The Dry Mountain site went from fair to good condition. Finally, the Middle Mountain study remained in good condition (**Figure 5.18**, **Table 5.2**).

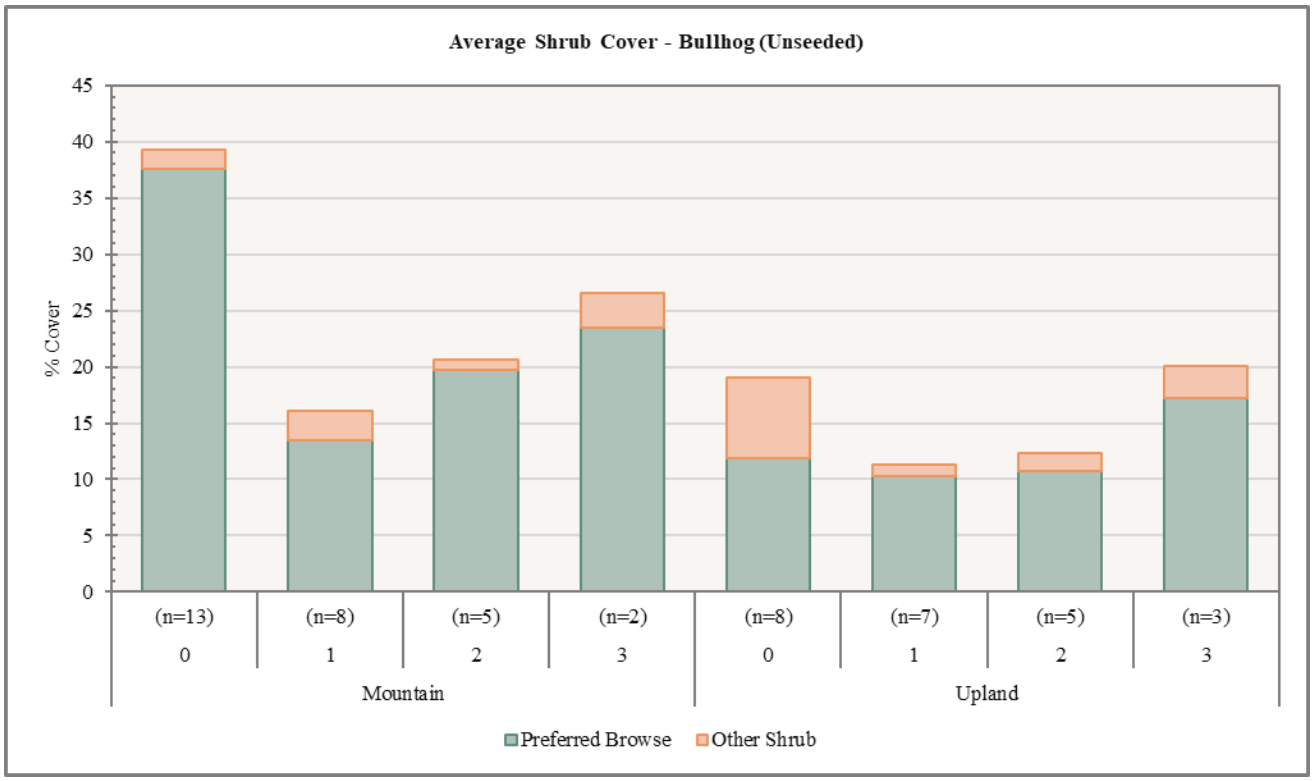


Figure 5.10: Average shrub cover on mountain and upland study sites that have been treated with a bullhog. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

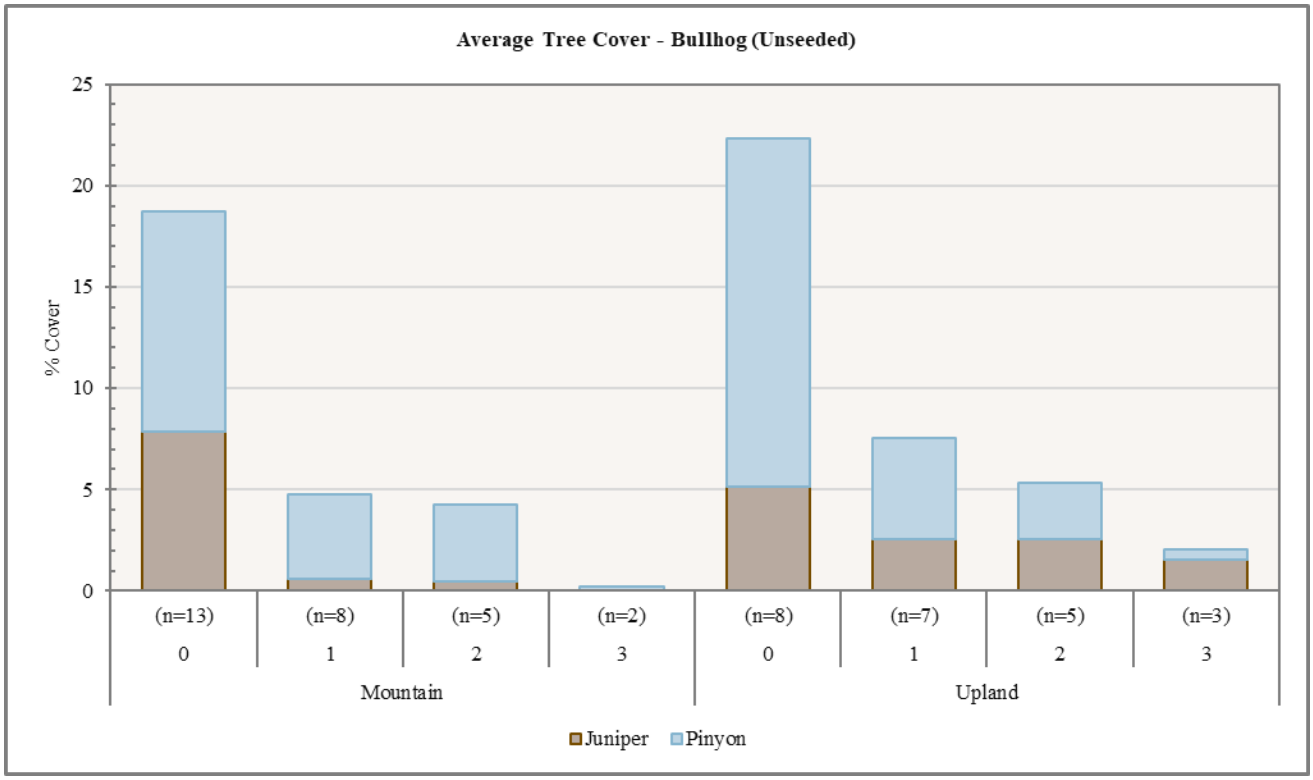


Figure 5.11: Average tree cover on mountain and upland study sites that have been treated with a bullhog. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

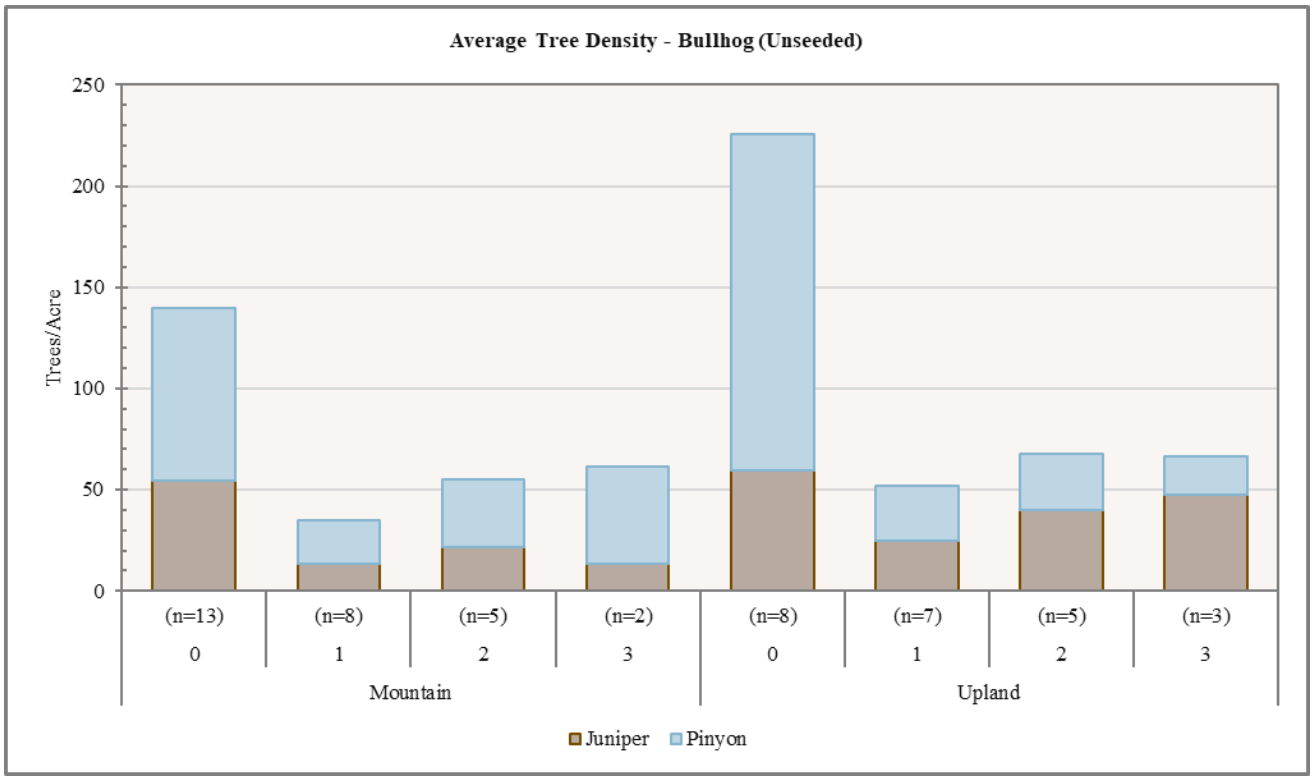


Figure 5.12: Average tree density on mountain and upland study sites that have been treated with a bullhog. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

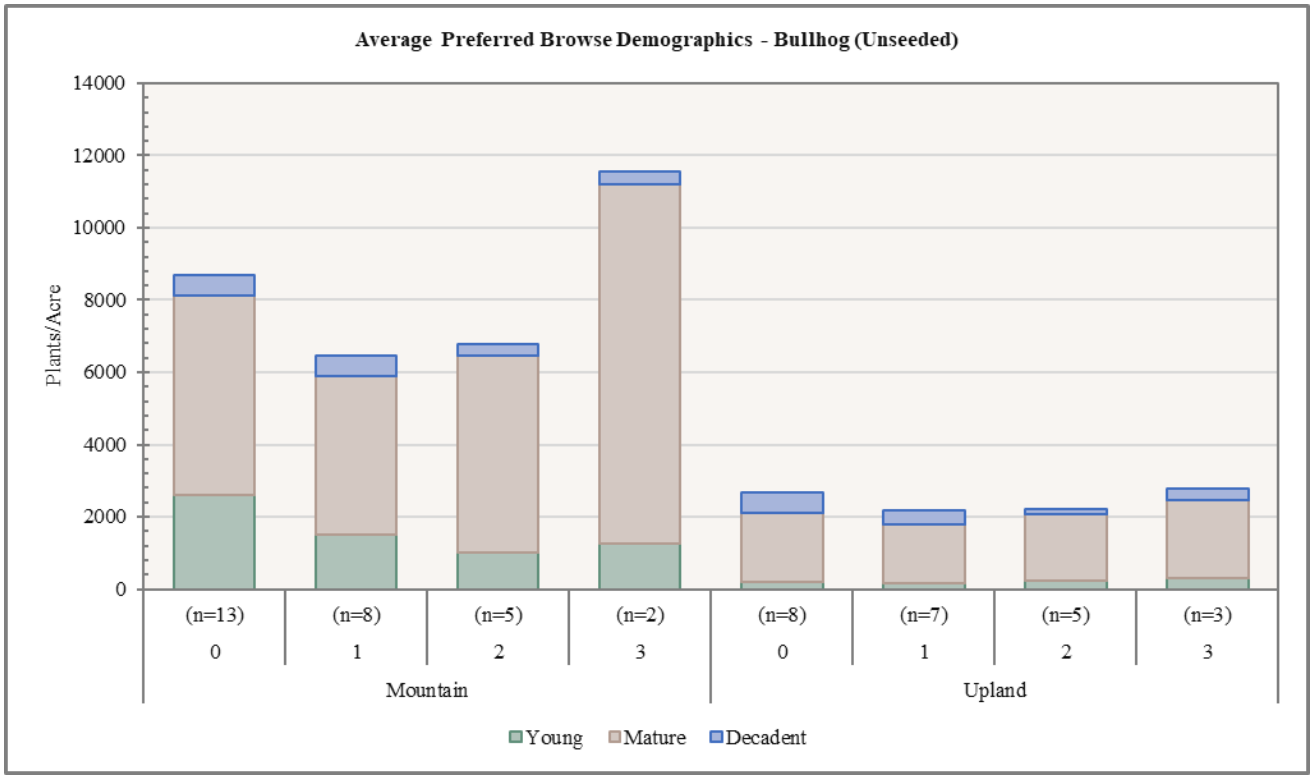


Figure 5.13: Average preferred browse demographics on mountain and upland study sites that have been treated with a bullhog. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

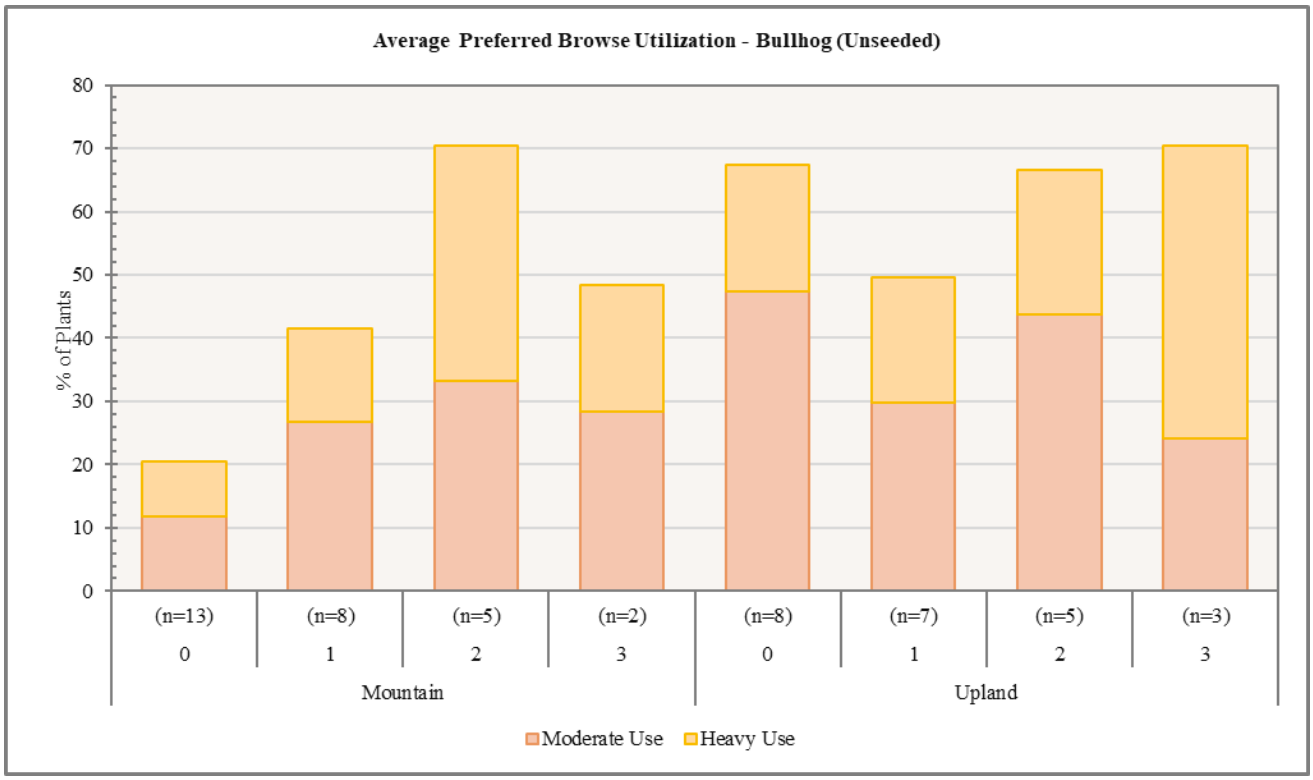


Figure 5.14: Average preferred browse utilization on mountain and upland study sites that have been treated with a bullhog. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

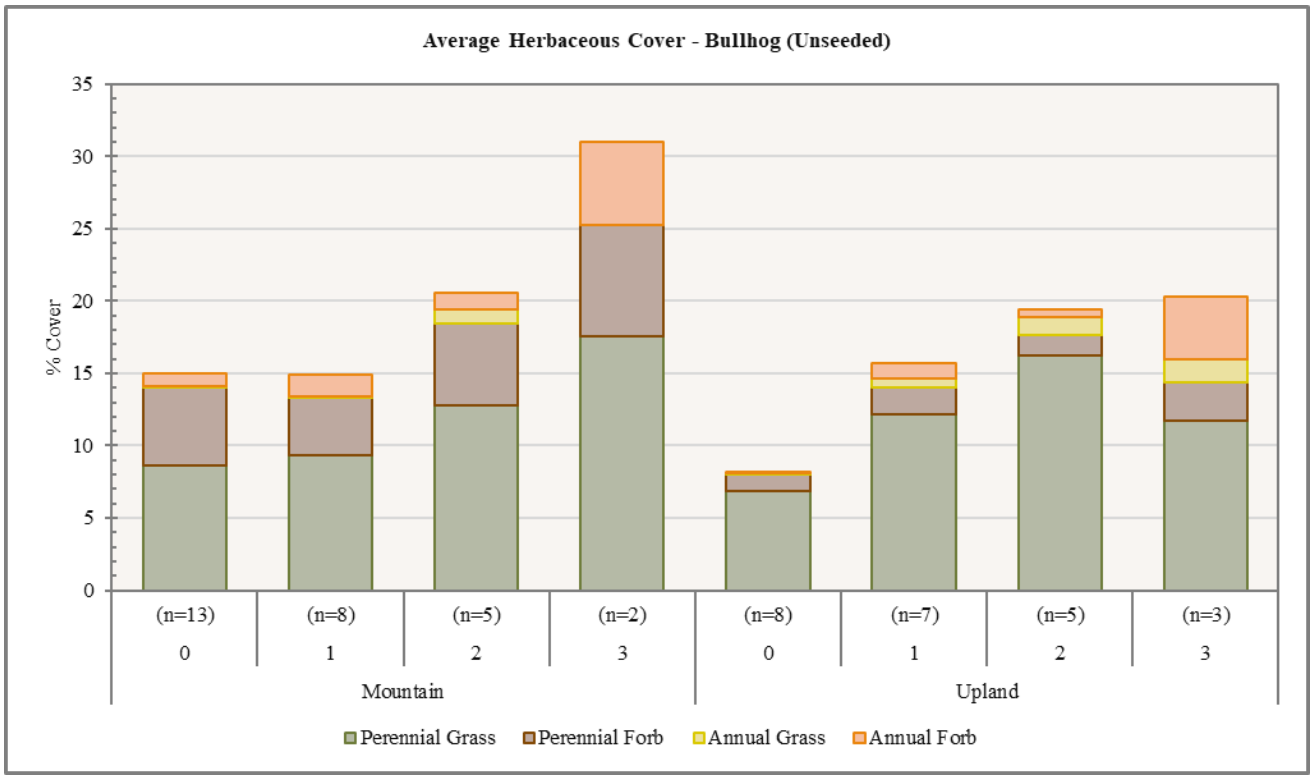


Figure 5.15: Average herbaceous cover on mountain and upland study sites that have been treated with a bullhog. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

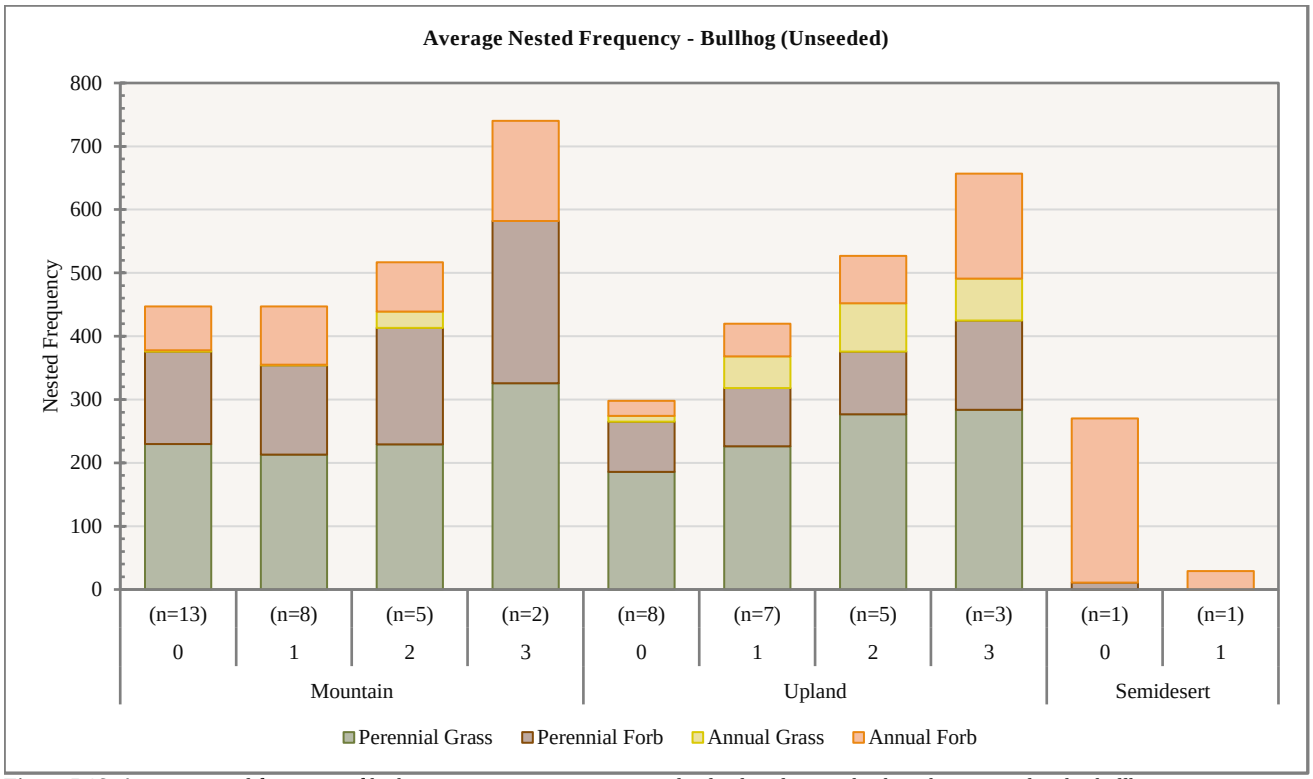


Figure 5.16: Average nested frequency of herbaceous species on mountain and upland study sites that have been treated with a bullhog. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

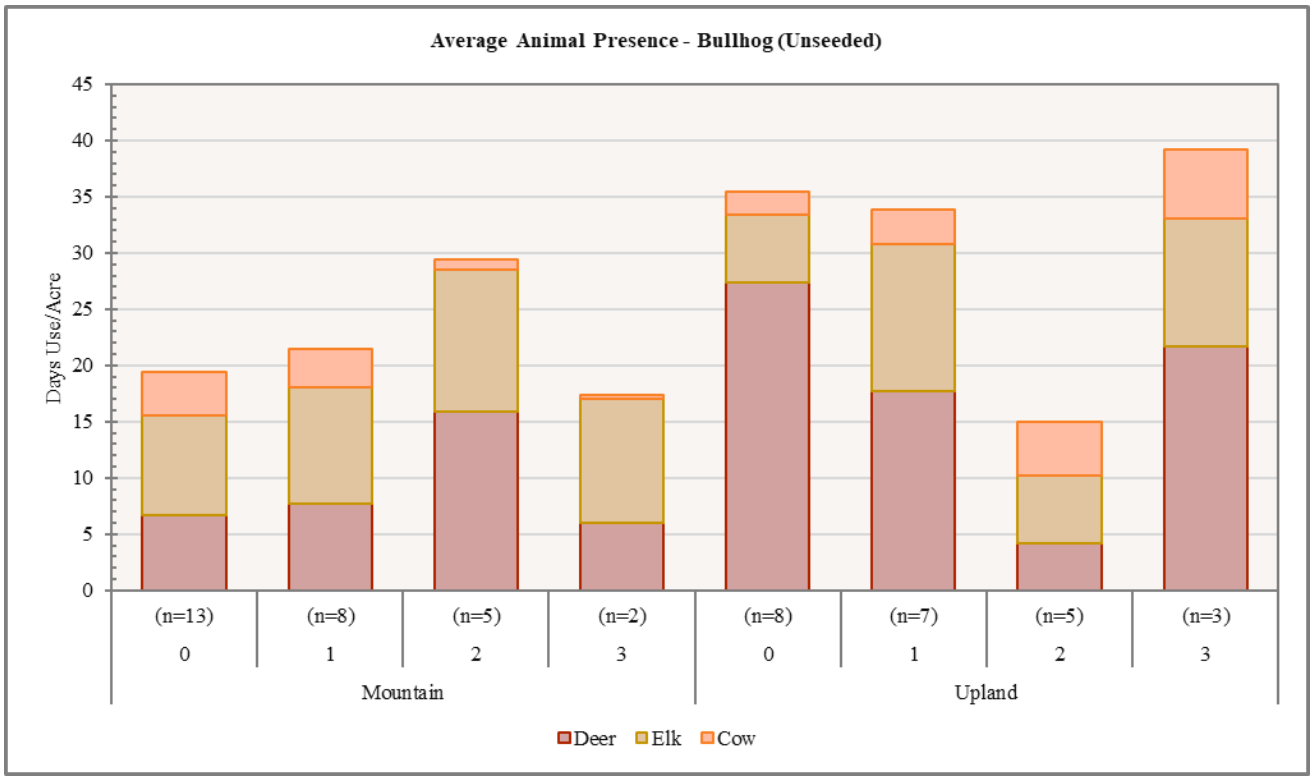


Figure 5.17: Average pellet transect data on mountain and upland study sites that have been treated with a bullhog, 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment. Mountain deer pellets include deer/sheep.

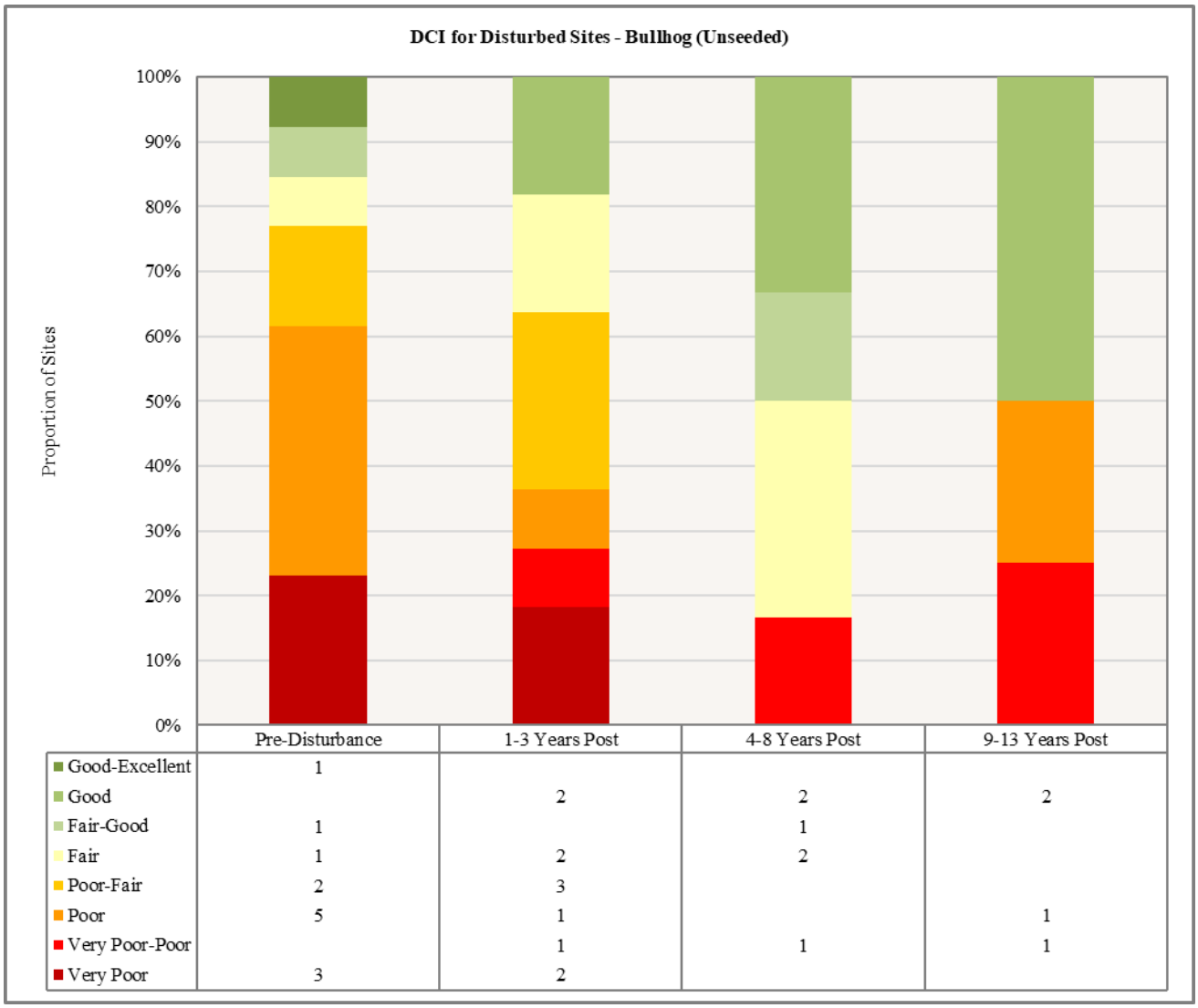


Figure 5.18: Deer winter range Desirable Components Index (DCI) summary by year of sites that have been treated with a bullhog.

Study Number	Post Category	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
11R-09	0	3.8	0	0	15.4	0	0.3	0	**19.5**	**VP**
11R-09	1	2.9	0	0	30	0	1.2	0	**34.1**	**VP-P**
11R-09	2	3	0	0	30	0	0.9	0	**33.8**	**VP-P**
11R-09	3	3.6	0	0	30	0	2.1	0	**35.7**	**VP-P**
12R-02	0	0.3	0	0	0	0	0.8	-2	**-0.9**	**VP**
12R-02	1	0	0	0	0	0	0	-2	**-2**	**VP**
13R-12	0	24.7	5.4	2.9	9.9	0	3.1	0	**46**	**P**
14-11	0	17.4	7	2	14.7	0	1.4	0	**42.4**	**P**
14-11	1	7.3	5.5	0.8	13.6	-1.4	1.5	0	**27.3**	**VP**
14-11	2	8.9	14.3	8.4	30	-1.3	3.6	0	**63.9**	**F-G**
14-11	3	12.5	10.8	2.1	15.2	-3.5	9.3	0	**46.3**	**P**
14R-31	0	14.1	2.6	4.8	18.8	-0.1	1.6	0	**41.9**	**P**
14R-31	1	10.3	8.3	1.8	28.8	-1.8	3	0	**50.4**	**P-F**
14R-31	2	17	11.3	2	30	-3.3	4.3	0	**61.2**	**F**
14R-37	0	8.4	10.1	6.1	18.6	-0.1	4.2	0	**47.4**	**P**
14R-37	1	10.4	9	2.2	30	0	10	0	**61.4**	**F**
14R-38	0	21.2	12.5	2.6	7.7	0	6.5	0	**50.5**	**P-F**

Study Number	Post Category	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
16C-17	0	30	12.4	9	29.7	0	10	0	**91.1**	**G-E**
16C-17	1	27.1	12.1	8.5	23.8	0	10	0	**81.5**	**G**
16C-17	2	29.5	14.5	6.2	25.3	0	10	0	**85.5**	**G**
16C-17	3	30	13.6	5	27.6	0	10	0	**86.2**	**G**
16C-22	0	19.9	12.6	15	19.2	0	3.2	0	**69.9**	**F-G**
16C-22	1	30	9.8	2.6	18.5	0	3.7	0	**64.7**	**F**
16C-24	0	30	12.1	8.4	7.8	0	5.5	0	**63.8**	**F**
16C-24	1	17.5	7	11.8	9	0	7.1	0	**52.5**	**P**
16C-26	0	30	4.2	1.4	6.5	0	1.7	0	**43.7**	**P**
16C-26	1	30	7.8	1.1	10.6	0	1.2	0	**50.8**	**P-F**
16C-26	2	30	12.2	3.5	12.7	0	2.6	0	**61**	**F**
16C-26	3	30	11.1	4.3	19.7	0	4.8	0	**69.9**	**G**
16C-28	0	15.7	12.7	13	9.7	0	0.7	0	**51.7**	**P-F**
16C-28	1	21.2	11.9	8.8	23.7	0	2.9	0	**68.5**	**G**
16R-44	0	5.2	0	0	9	0	10	0	**24.2**	**VP**
16R-44	1	7.8	15	3.9	19.6	0	6.9	0	**53.1**	**P-F**
16R-44	2	16.1	15	6.4	30	0	10	0	**77.5**	**G**

Table 5.2: Deer winter range Desirable Components Index (DCI) information by site number of study sites that have been treated with a bullhog. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.
*Studies with an asterisk have been suspended.

Fire (Seeded)

Six study sites have burned and have been seeded over the study period. Of these studies, two [Sidehill Spring (15-13) and Coyote Spring (15-16)] are considered to be mountain ecological sites, two ['B' Canyon (11B-05) and Quaking Aspen Spring (15-12)] are classified as upland ecological sites, and two [West Horse Pasture (10B-16) and Pack Creek (13R-02)] are considered to be semidesert ecological sites.

The Sidehill Spring study site is situated east of Sidehill Spring and southwest of Bulldog Peak, and Coyote Spring is located north of the Coyote Benches near Coyote Creek in the Henry Mountains. 'B' Canyon can be found below the South Book Cliffs on the eastern edge of Clark Valley. Quaking Aspen Spring is situated north of Cass Creek Peak and Quaking Aspen Spring in the Henry Mountains, and West Horse Pasture can be found southeast of the Cunningham Ranch at Nash Wash. Finally, the Pack Creek study is located just east of the La Sal Mountains near Pack Creek.

Shrubs/Trees: Average shrub cover has increased significantly over time on mountain study sites. A majority of this shrub cover is contributed by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) on the Sidehill Spring study, which drives the cover trend for this ecotype. On upland sites, average total shrub cover increased each year from the second post-treatment sampling through the fourth post-treatment sample year, but decreased during the fifth post-treatment year. This trend can be entirely attributed to the differing number of studies each sample year; Quaking Aspen Spring has contributed a majority of the shrub cover throughout the study period, but does not have data for the fifth post-treatment sampling available at this time. Total shrub cover and preferred browse cover has displayed an increasing trend on semidesert study sites, with all of the shrub cover during the second and third post-treatment sampling provided by the Pack Creek study (**Figure 5.19**). Average preferred browse demographics indicate that browse density on mountain sites exhibited an initial decrease following treatment, but has marginally increased since that time. Mature plants comprised a majority of the plant populations on these sites prior to treatment and during the second and fourth post-treatment sampling. During the first and third sample years following treatment, however, young plants were the dominant demographic: this trend is driven by the Sidehill Spring study. Preferred browse density on upland sites has decreased significantly following treatment and has remained comparatively low in subsequent sample years. Mature plants have comprised most of the populations on these sites throughout the study period. Browse density on semidesert study sites has increased after treatment, mainly due to differing 'n values.' Mature plants have also been the dominant demographic on semidesert sites in all study years, and

decadence has decreased over time (**Figure 5.22**). Browse utilization on mountain sites has increased overall. On upland study sites, average utilization has been decreasing since the third post-treatment sample year, but has marginally increased overall. Year to year fluctuations on these sites can largely be attributed to variation in number of studies sampled. Average utilization on semidesert sites decreased in the first sample year after treatment, but increased significantly afterwards (**Figure 5.23**).

Juniper (*Juniperus sp.*) and pinyon (*Pinus sp.*) have not provided cover on mountain and upland ecological sites in any sample year. Average tree density has increased after treatment on mountain and upland study sites, but has remained low. Density trends on mountain sites are driven by the Sidehill Spring site and upland density trends are driven by the Quaking Aspen Spring study. Average tree cover and density have increased on semidesert study sites. Furthermore, site-level data reveals that these trends are entirely driven by the Pack Creek study; no trees have been observed in cover or density on the West Horse Pasture site (**Figure 5.20**, **Figure 5.21**).

Herbaceous Understory: Average herbaceous cover has increased on mountain study sites, while frequency has fluctuated. Annual grasses were the dominant herbaceous component on these sites prior to treatment, a trend that is entirely due to the Sidehill Spring study. Following treatment, however, perennial grasses have provided most of the herbaceous cover and frequency. Perennial grasses have also been the dominant herbaceous component on upland study sites in most study years. The exception to this is the first post-treatment sampling, when perennial grasses and forbs and annual grasses were co-dominant on the Quaking Aspen Spring site. Cover exhibited a decreasing trend on semidesert sites through the second post-treatment sample year, but increased significantly during the third sampling after treatment; a similar trend is displayed by the frequency data. Composition of these understories has fluctuated. Annual grasses have dominated the understories prior to treatment and during the third sample year after treatment. The first and second post-treatment samplings, however, have suggested more heterogenous understories with a mixture of perennial and annual grasses and forbs being co-dominant (**Figure 5.24**, **Figure 5.25**).

Occupancy: Average animal presence has exhibited a marginal decrease on mountain study sites. Cattle and/or bison have been the primary occupants of these sites in most years, with a mean pellet group abundance ranging from 0 days use/acre in the first sample year after treatment to 67 days use/acre during the second post-treatment sample year. Deer were the primary occupants in the first post-treatment sample year, and average abundance of pellet groups has been as low as 1 days use/acre in the first sampling after treatment and as high as 13 days use/acre during the fourth post-treatment samplings. Elk were observed during the second sampling after treatment with an average abundance of 0.7 days use/acre, but have not been present in any other year.

On upland study sites, average animal presence increased between the first and third post-treatment samplings, but has since decreased. Primary occupancy has fluctuated over time. Deer were the primary occupants prior to treatment and during the first and fourth post-treatment sample years, while deer and cattle and/or bison were co-dominant in the second and fifth sample years after treatment. Cattle and/or bison were the primary occupants in the third post-treatment sample years. Mean abundance of deer pellet groups has ranged from 6 days use/acre prior to treatment to 27 days use/acre during the third post-treatment sample year. Elk have also been present on these sites with a mean pellet group abundance as low as 0 days use/acre prior to treatment and during the first post-treatment sample year and as high as 4 days use/acre in the third sampling after treatment. Cattle and/or bison have had an average pellet group abundance fluctuating between 0 days use/acre in the first post-treatment sample year and 32 days use/acre during the third sampling following treatment.

Animal presence on semidesert study sites exhibited an increase between the second and third post-treatment samplings, but has decreased overall. Deer have been the primary occupants in all study years, with a mean pellet group abundance fluctuating between 22 days use/acre in the second sample year after treatment and 89 days use prior to treatment. Elk have also been present with an average pellet group abundance as low as 0 days use/acre in the second sample year following treatment and as high as 44 days use/acre before treatment. Finally, mean abundance of cattle pellet groups has ranged from 0 days use/acre prior to treatment and during

the second post-treatment sample year to 3 days use/acre during the third post-treatment sampling (**Figure 5.26**).

Deer Winter Range Condition Assessment: Over the sample period, the condition of deer winter range on sites that have burned and have been subsequently seeded has continually changed. These sites within the Southeastern Region are considered to be within very poor to good-excellent condition, with most studies remaining stable or exhibiting minor fluctuations. The West Horse Pasture study improved from very poor to very poor-poor, and the 'B' Canyon and Coyote Spring sites remained in very poor condition. Pack Creek remained in fair condition, and Quaking Aspen Spring went from poor to fair-good. Finally, the Sidehill Spring study site improved from good to good-excellent condition (**Figure 5.27**, **Table 5.3**).

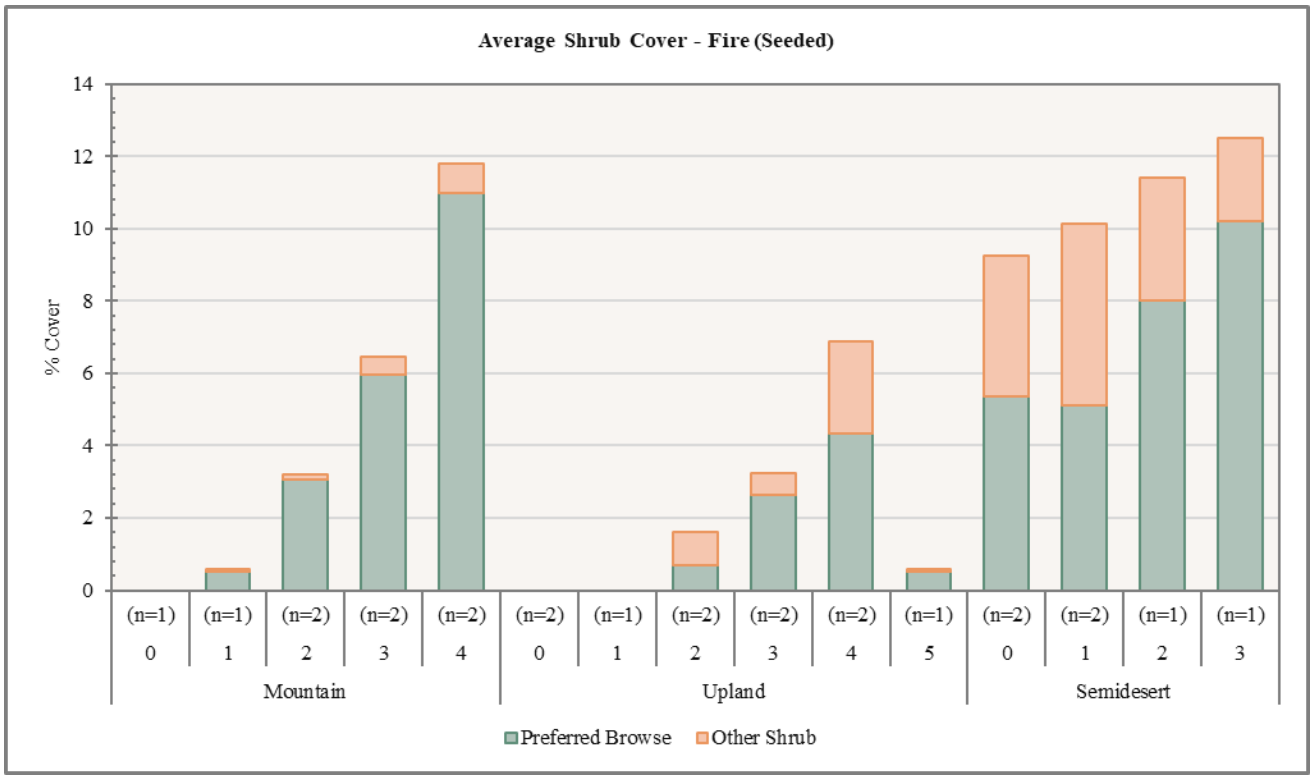


Figure 5.19: Average shrub cover on mountain, upland, and semidesert study sites that have burned and have been seeded. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment, 4 = 14 – 18 years post-treatment, 5 = 19 – 23 years post-treatment.

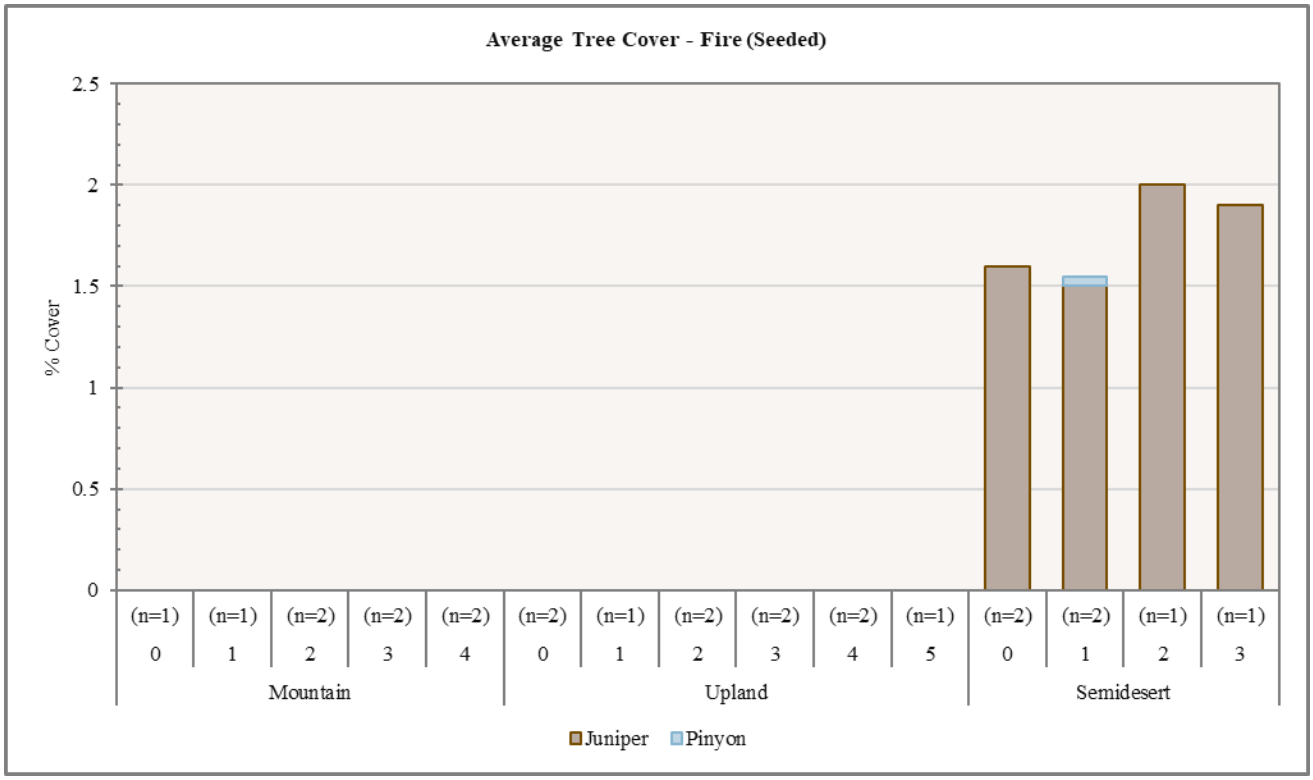


Figure 5.20: Average tree cover on mountain, upland, and semidesert study sites that have burned and have been seeded. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment, 4 = 14 – 18 years post-treatment, 5 = 19 – 23 years post-treatment.

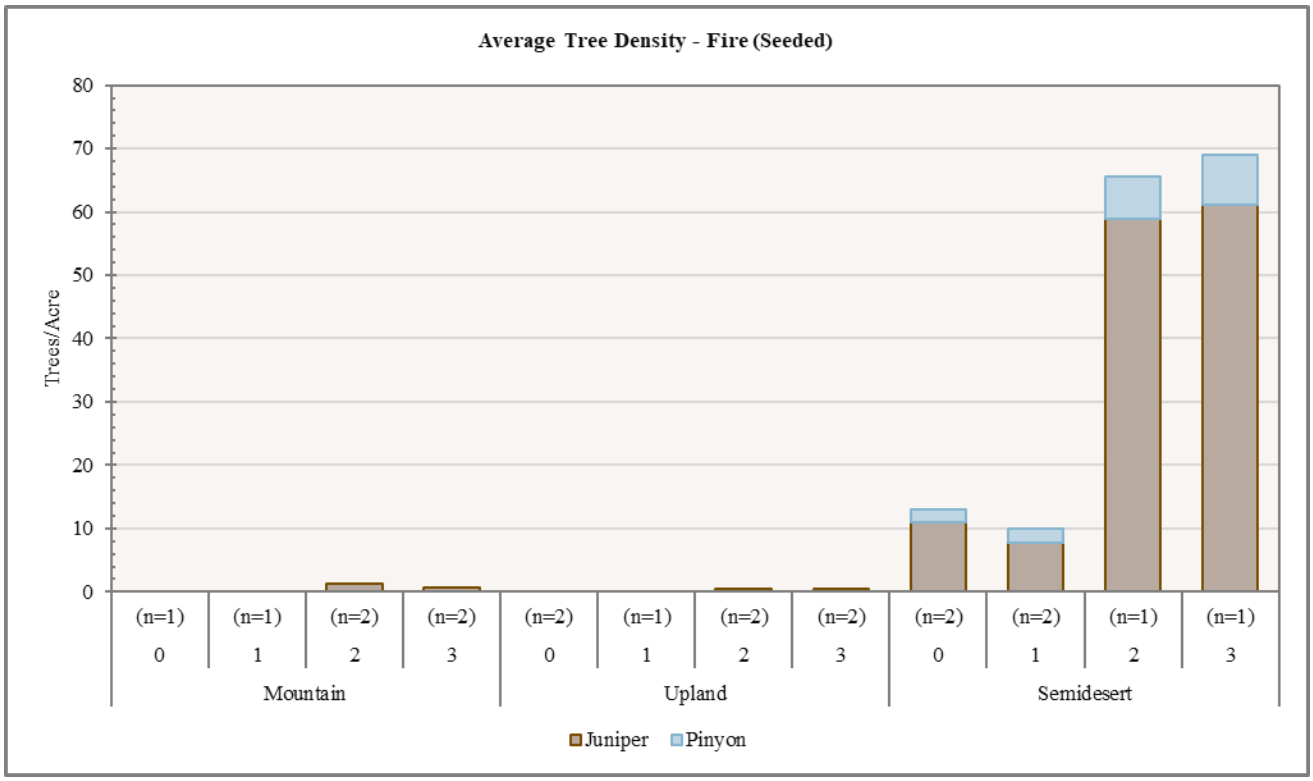


Figure 5.21: Average tree density on mountain, upland, and semidesert study sites that have been seeded. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment, 4 = 14 – 18 years post-treatment, 5 = 19 – 23 years post-treatment.

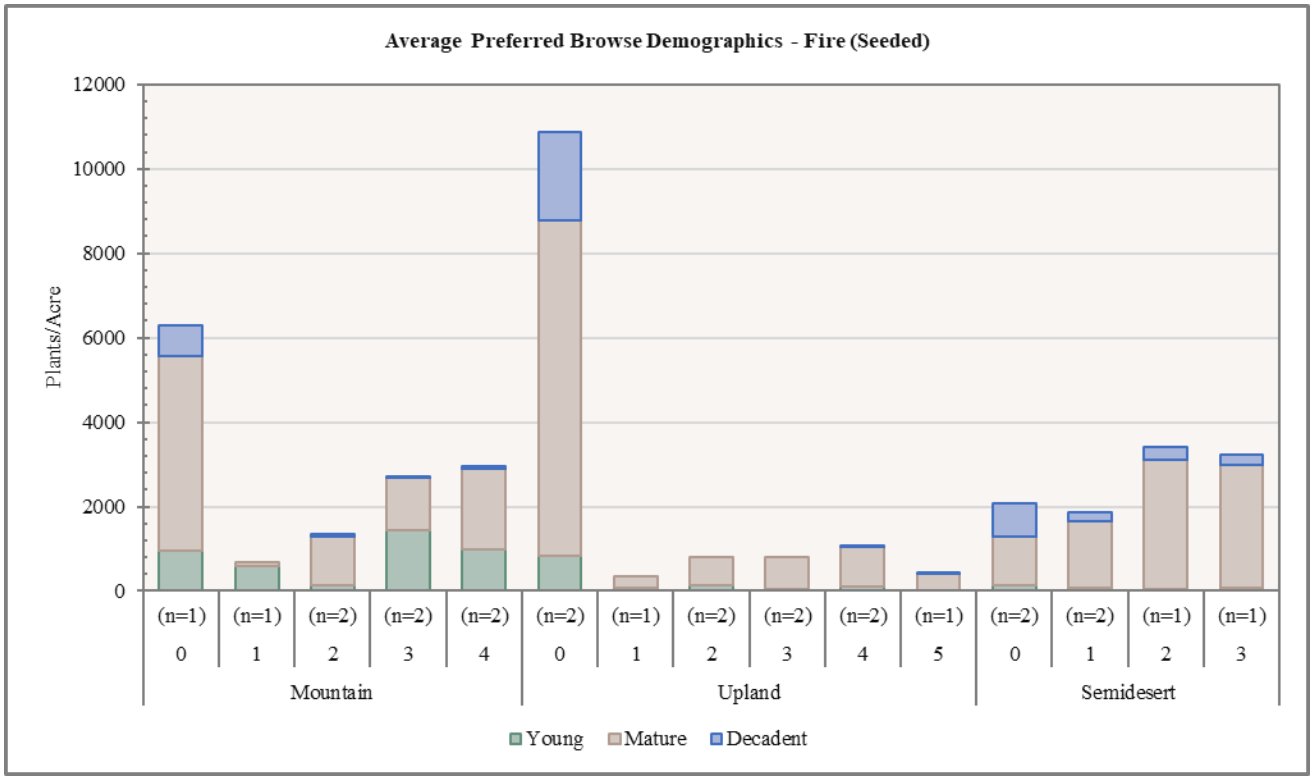


Figure 5.22: Average preferred browse demographics on mountain, upland, and semidesert study sites that have burned and have been seeded. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment, 4 = 14 – 18 years post-treatment, 5 = 19 – 23 years post-treatment.

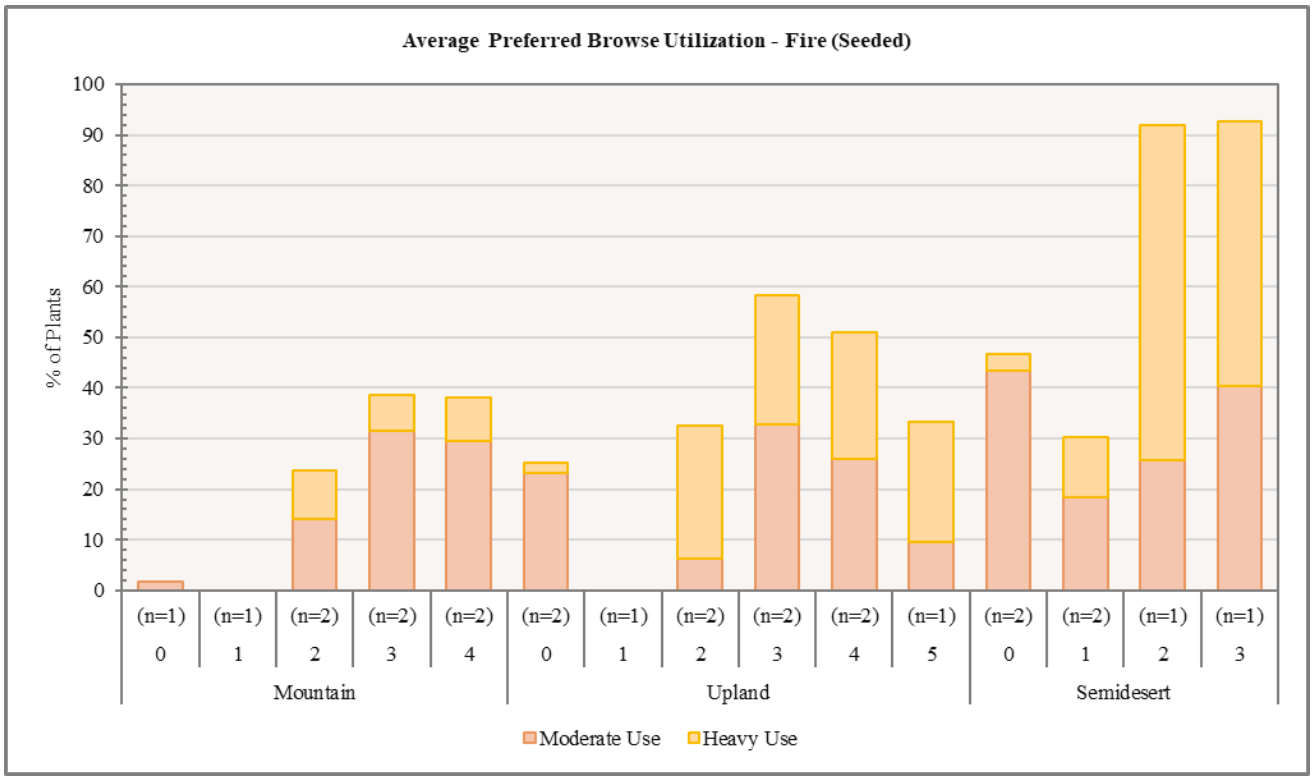


Figure 5.23: Average preferred browse utilization on mountain, upland, and semidesert study sites that have burned and have been seeded. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment, 4 = 14 – 18 years post-treatment, 5 = 19 – 23 years post-treatment.

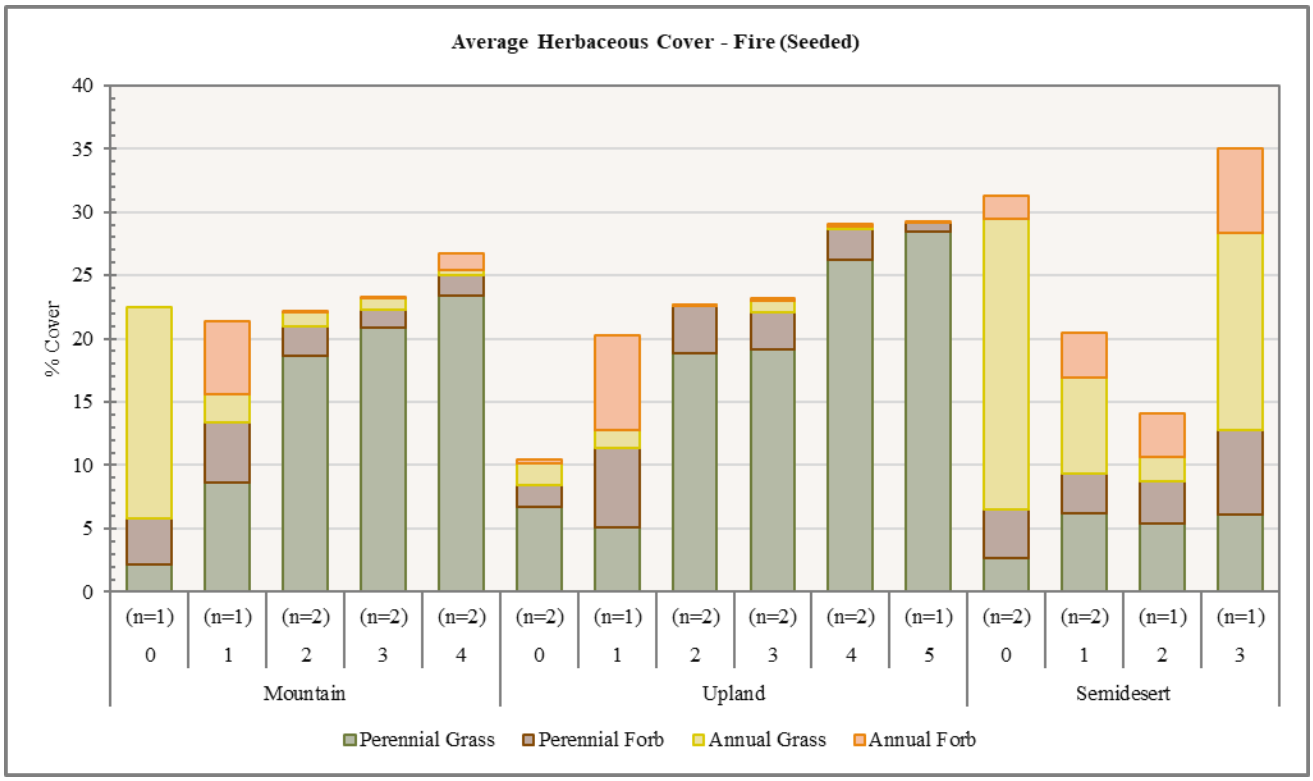


Figure 5.24: Average herbaceous cover on mountain, upland, and semidesert study sites that have burned and have been seeded. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment, 4 = 14 – 18 years post-treatment, 5 = 19 – 23 years post-treatment.

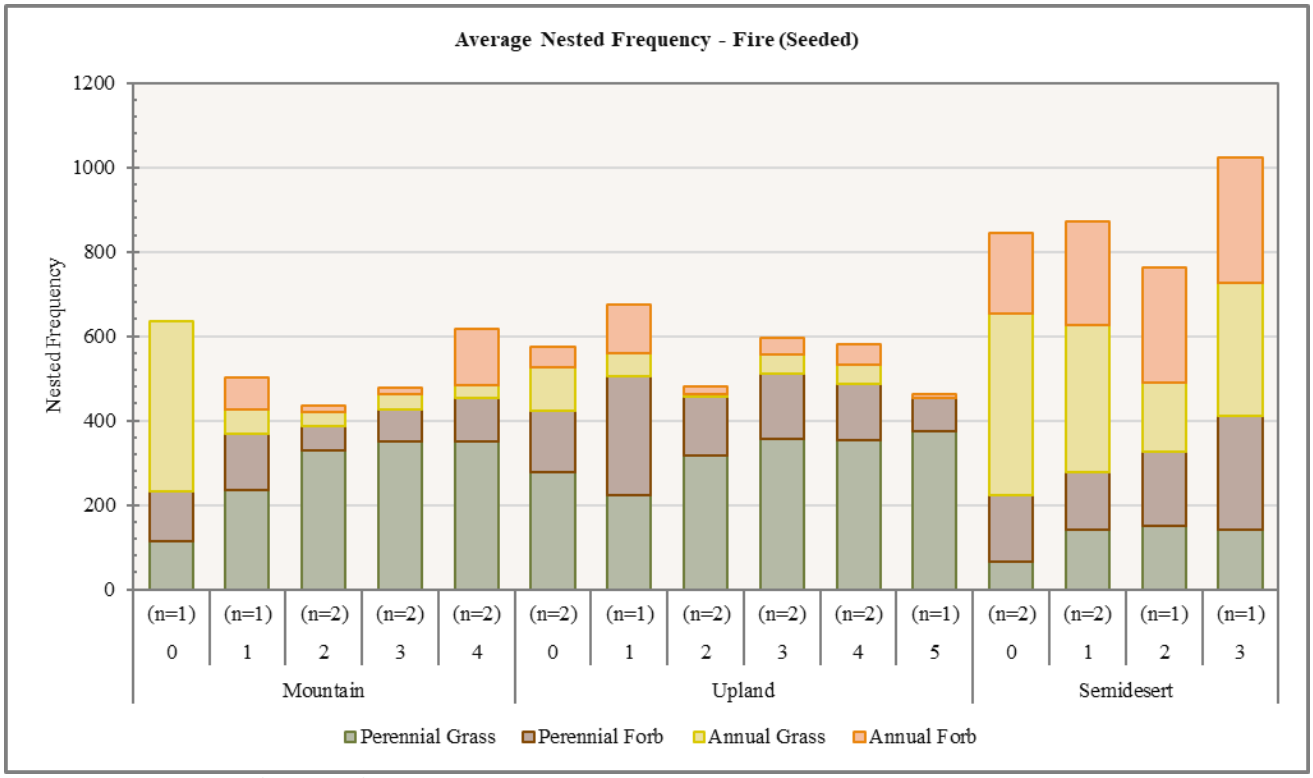


Figure 5.25: Average nested frequency of herbaceous species on mountain, upland, and semidesert study sites that have burned and have been seeded. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment, 4 = 14 – 18 years post-treatment, 5 = 19 – 23 years post-treatment.

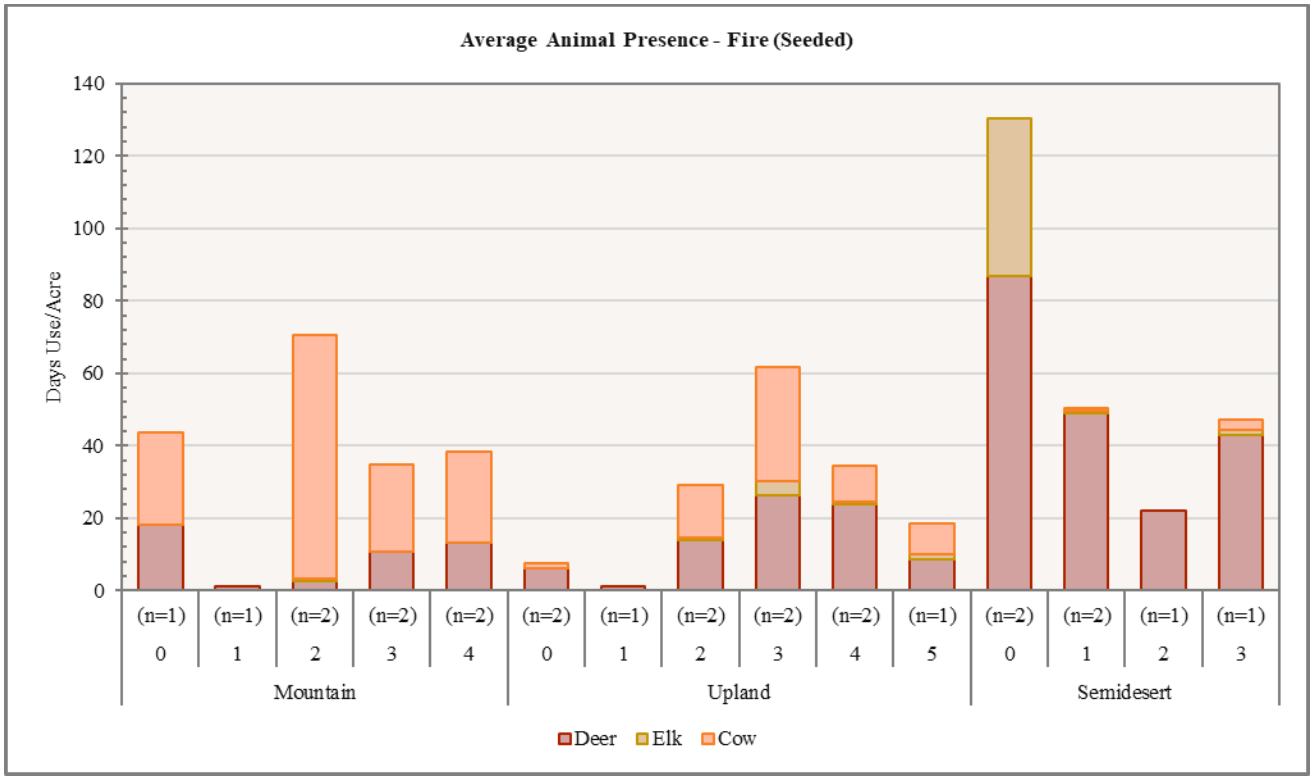


Figure 5.26: Average pellet transect data on mountain, upland, and semidesert study sites that have burned and have been seeded. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment, 4 = 14 – 18 years post-treatment, 5 = 19 – 23 years post-treatment. Mountain and upland cattle pellets include cattle/bison.

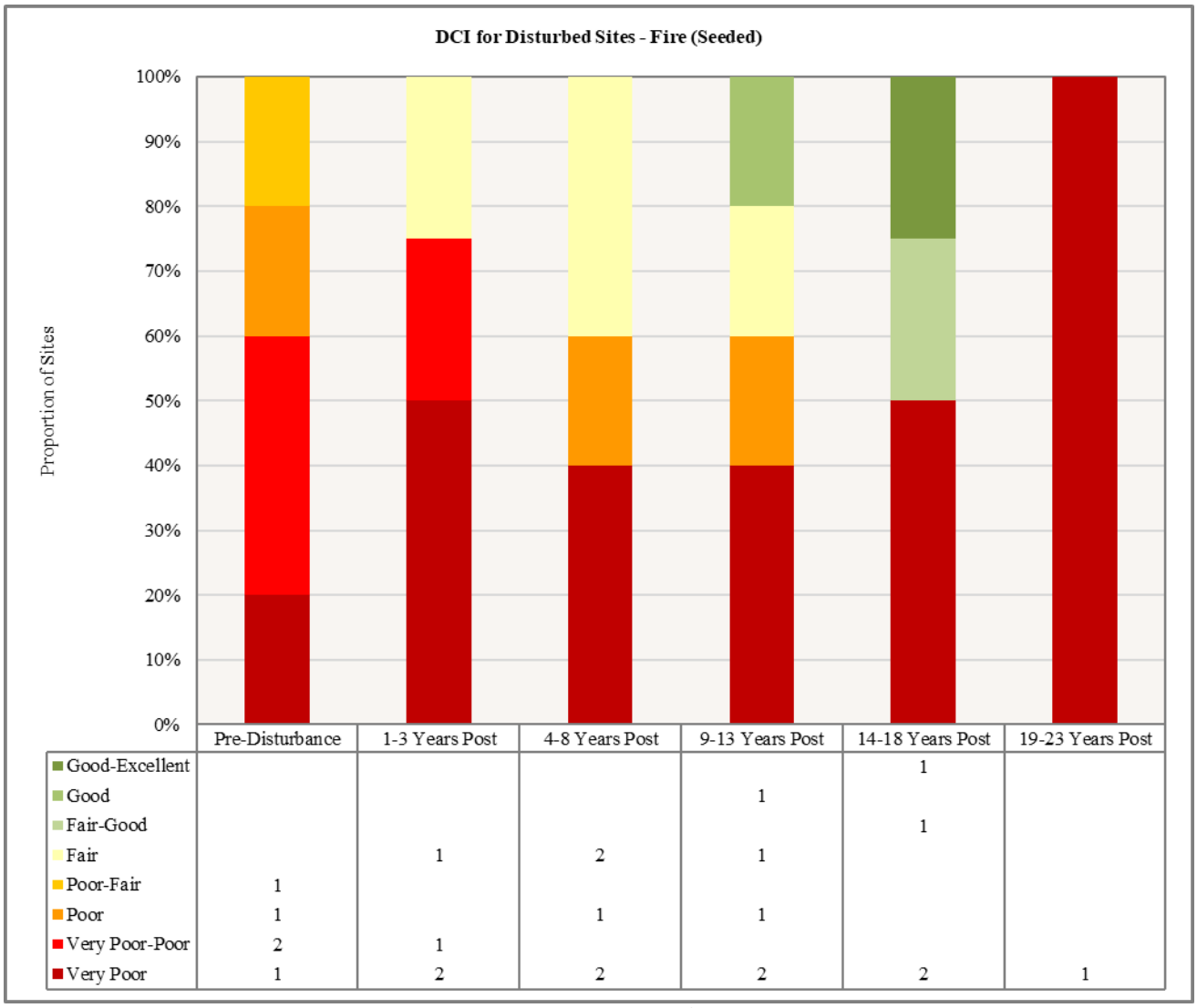


Figure 5.27: Deer winter range Desirable Components Index (DCI) summary by year of sites that have burned and have been seeded.

Study Number	Post Category	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
10-16	0	5.6	0	0	3.9	-14.7	7.8	0	**2.6**	**VP**
10-16	1	1.6	0	0	14.3	-8.9	2.9	0	**9.8**	**VP-P**
10R-25*	0	0	0	0	0	-20	0	0	**-20**	**VP**
11B-05	0	14	11.4	3.8	20.7	0	1.5	0	**51.5**	**P-F**
11B-05	2	0.5	0	0	30	0	1.9	0	**32.4**	**VP**
11B-05	3	0.9	0	0	30	0	0.8	0	**31.7**	**VP**
11B-05	4	1.1	0	0	30	0	1.7	0	**32.8**	**VP**
11B-05	5	0.7	0	0	30	0	1.4	0	**32.1**	**VP**
13R-02	0	6.6	5.4	2.9	6.9	-19.6	7.6	0	**9.9**	**VP-P**
13R-02	1	9.5	13.5	1.2	10.7	-2.6	9.5	0	**41.8**	**F**
13R-02	2	8.4	13.4	0.3	10.8	-1.4	6.7	0	**38.2**	**F**
13R-02	3	11	12.7	1.2	12.2	-11.7	10	0	**35.5**	**F**
15-12	0	25.2	9.1	3.7	6.3	-2.6	5.3	0	**47**	**P**
15-12	1	0	0	0	10.2	-1	10	0	**19.2**	**VP**
15-12	2	1.8	0	0	30	0	10	0	**41.8**	**P**
15-12	3	5.8	0	0	30	-1.3	10	0	**44.5**	**P**
15-12	4	10	12.9	5.4	30	-0.4	7.6	0	**65.5**	**F-G**

Study Number	Post Category	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
15-13	0	24	11.5	6.8	4.3	-12.6	7.3	0	**41.3**	**VP-P**
15-13	1	0.6	0	0	17.3	-1.6	9.6	0	**25.8**	**VP**
15-13	2	7.3	15	4.9	25.2	-1.6	6.8	0	**57.5**	**F**
15-13	3	14.3	14.8	15	30	-1.2	1.7	0	**74.6**	**G**
15-13	4	26.3	14.6	15	30	-0.4	4.5	0	**89.9**	**G-E**
15-16	2	0.3	0	0	30	0	2.8	0	**33**	**VP**
15-16	3	0.4	0	0	30	-0.2	3.6	0	**33.8**	**VP**
15-16	4	1.2	0	0	30	-0.1	2.3	0	**33.4**	**VP**

Table 5.3: Deer winter range Desirable Components Index (DCI) information by site number of study sites that have burned and have been seeded. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment, 4 = 14 – 18 years post-treatment, 5 = 19 – 23 years post-treatment.
*Studies with an asterisk have been suspended.

Harrow

Six study sites have been treated with a harrow over the study period. Of these six study sites, two [Wildcat Dixie Harrow (16R-34) and Emma Park Harrow Grazed (17R-07)] are classified as mountain ecological sites and four [Adams CE Harrow (14R-07), SITLA Dixie 2 (14R-15), Stateline South (14R-17), and North Spring (16R-23)] are considered to be upland ecological sites.

The Wildcat Dixie Harrow study is located just south of Wildcat Knolls, while Emma Park Harrow Grazed is north of US-6 in Emma Park. The Adams CE Harrow site is situated northeast of Monticello and roughly 6.6 miles west of the Utah-Colorado border. SITLA Dixie 2 can be found north of Monticello. The Stateline South study is north of US-491 near the Utah-Colorado Border. Finally, the North Spring study is located southwest of Price near North Spring Canyon.

Shrubs/Trees: A majority of the preferred browse cover on the mountain ecological sites is provided by sagebrush species (*Artemisia sp.*). Overall, average shrub cover initially decreased in the first sample year following treatment, but has since increased. Pre-treatment and fourth post-treatment sampling averages are based on one study site each (Wildcat Dixie Harrow and Emma Park Harrow Grazed, respectively). Sagebrush species also contribute a majority of the preferred browse cover on upland study sites. Average overall shrub cover has displayed a decreasing trend on these sites, but remains significant (**Figure 5.28**).

Average preferred browse demographics indicate that mountain study sites exhibited an initial decrease in preferred browse density post-treatment, but have recovered since that time; upland study sites have followed a generally increasing trend. Furthermore, the marked increase in recruitment of young on mountain study sites between the second and third post-treatment sample years can largely be attributed to the Emma Park Harrow Grazed study. Demographics also show that mature individuals have comprised a majority of the plant populations on sites of both ecotypes in all other sample years. In addition, decadence has decreased over time on mountain study sites. Although this trend may initially appear to be due to differences in 'n values,' site-level data reveals that decadence has exhibited a decreasing trend on both study sites regardless of post-treatment category (**Figure 5.30**). Average preferred browse utilization on mountain study sites remained low through the third post-treatment sampling. However, utilization increased significantly in the fourth post-treatment sample year, with 45% of plants being moderately hedged and 43% heavily hedged: this is entirely due to the Emma Park Harrow Grazed study. On upland study sites, utilization has exhibited a decrease between the third and fourth sample years after treatment. However, this trend is entirely driven by the Adams CE Harrow site as it is the only one with data for the fourth post-treatment sample year (**Figure 5.31**).

Trees have only been observed in density data for the third post-treatment sample year on upland study sites. Furthermore, the decrease between the third and fourth samplings after treatment is not indicative of an overall trend. Trees have never been present on the only site with data for the fourth post-treatment sample year on upland study sites, SITLA Dixie 2 (**Figure 5.29**).

Herbaceous Understory: The understories of these sites have fluctuated from year to year, but general trends can be deduced from the available data. The herbaceous understories on mountain study sites has displayed a decreasing overall trend in cover and frequency. Mainly native perennial grasses such as muttongrass (*Poa fendleriana*) and saline wildrye (*Leymus salinus*) have been the dominant herbaceous component on these sites in many years. Perennial forbs have been present in lesser, but still significant, amounts. Annual grasses have not been sampled on either site in any study year. On upland study sites, there has been an overall increase in the understory. Perennial grasses also comprise much of the understory on these studies. Annual grasses have been present on all sites in varying amounts in at least one sample year and particularly so on the Stateline South site. However, these grasses have generally provided little cover overall (**Figure 5.32**, **Figure 5.33**).

Occupancy: On mountain study sites, average pellet transect data indicates that animal presence has fluctuated from year to year, but has decreased overall. Primary occupancy has also changed over time. Elk were the primary occupants through the second post-treatment sample year. Mean abundance of elk pellet groups have ranged from 0.7 days use/acre in the fourth sample year to 63 days use/acre prior to treatment. In the third sample year after treatment, cattle were the primary occupants; average cattle pellet group abundance has been as low as 0.7 days use/acre in the fourth post-treatment sample year and as high as 32 days use/acre during the third sample year after treatment. Deer were the primary occupants in the fourth post-treatment sampling, and they have had a mean pellet group abundance fluctuating between 0 days use/acre before treatment and as high as 5 days use/acre during the first and second post-treatment samplings.

Overall animal presence has decreased on upland studies. Deer were the primary occupants prior to treatment and through the third post-treatment sampling; mean abundance of deer pellet groups has been as high as 41 days use/acre before treatment and as low as 0 days use/acre in the fourth post-treatment sample year. Cattle were the primary occupants during the fourth sampling after treatment, and they have had an average pellet group abundance ranging from 2 days use/acre before treatment to 9 days use/acre in the fourth post-treatment sample year. Finally, elk have been present on these sites with a mean pellet group abundance fluctuating between 0 days use/acre in the second and third sample years following treatment and 4 days use/acre during the third post-treatment sampling (**Figure 5.34**).

Deer Winter Range Condition Assessment: The condition of deer winter range on sites that have undergone a harrow treatment has continually changed over the sample period. These sites within the Southeastern Region are considered to be within poor to good-excellent condition, with most improving. The SITLA Dixie 2 site deteriorated slightly from poor-fair to poor condition. Stateline South improved from poor-fair to good condition, and the Adams CE Harrow and North Spring sites went from fair to good condition. Finally, the Wildcat Dixie Harrow improved from fair-good to good-excellent condition (**Figure 5.35**, **Table 5.4**).

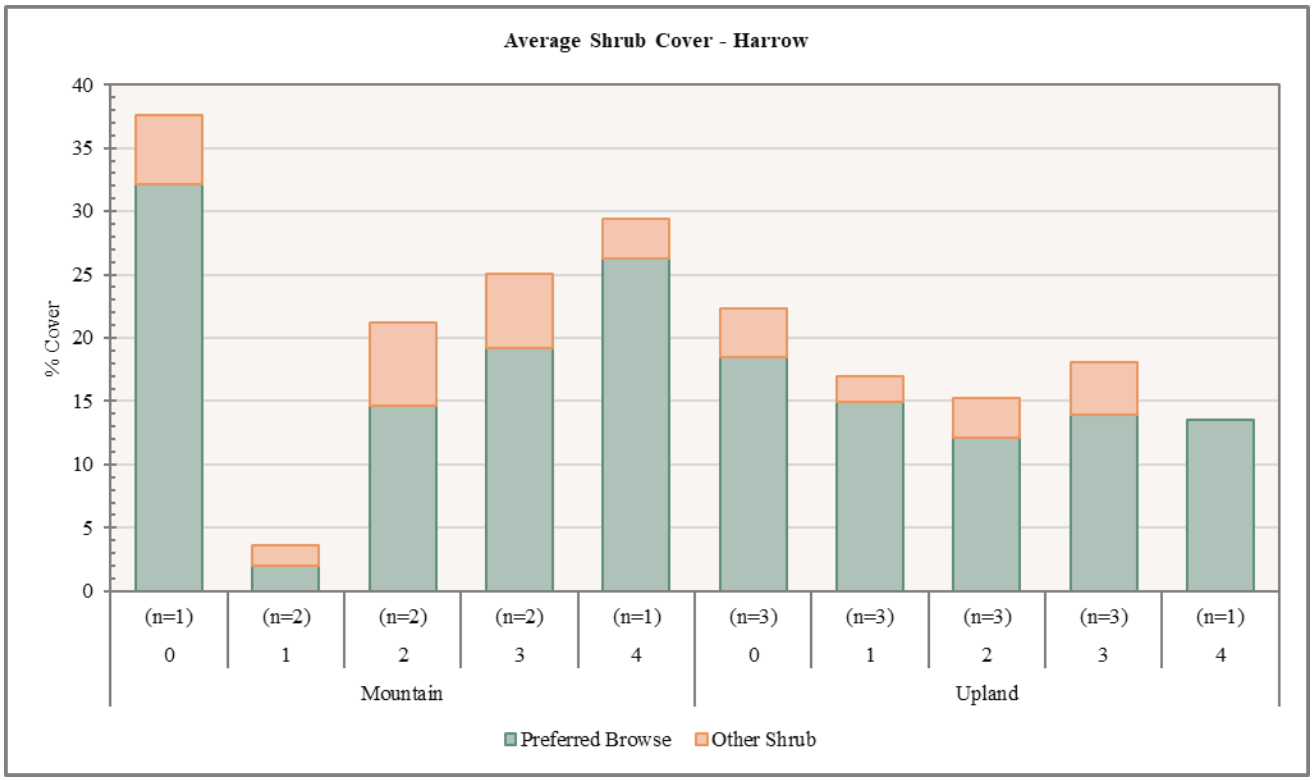


Figure 5.28: Average shrub cover on mountain and upland study sites that have undergone a harrow treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment., 4 = 14 – 18 years post-treatment.

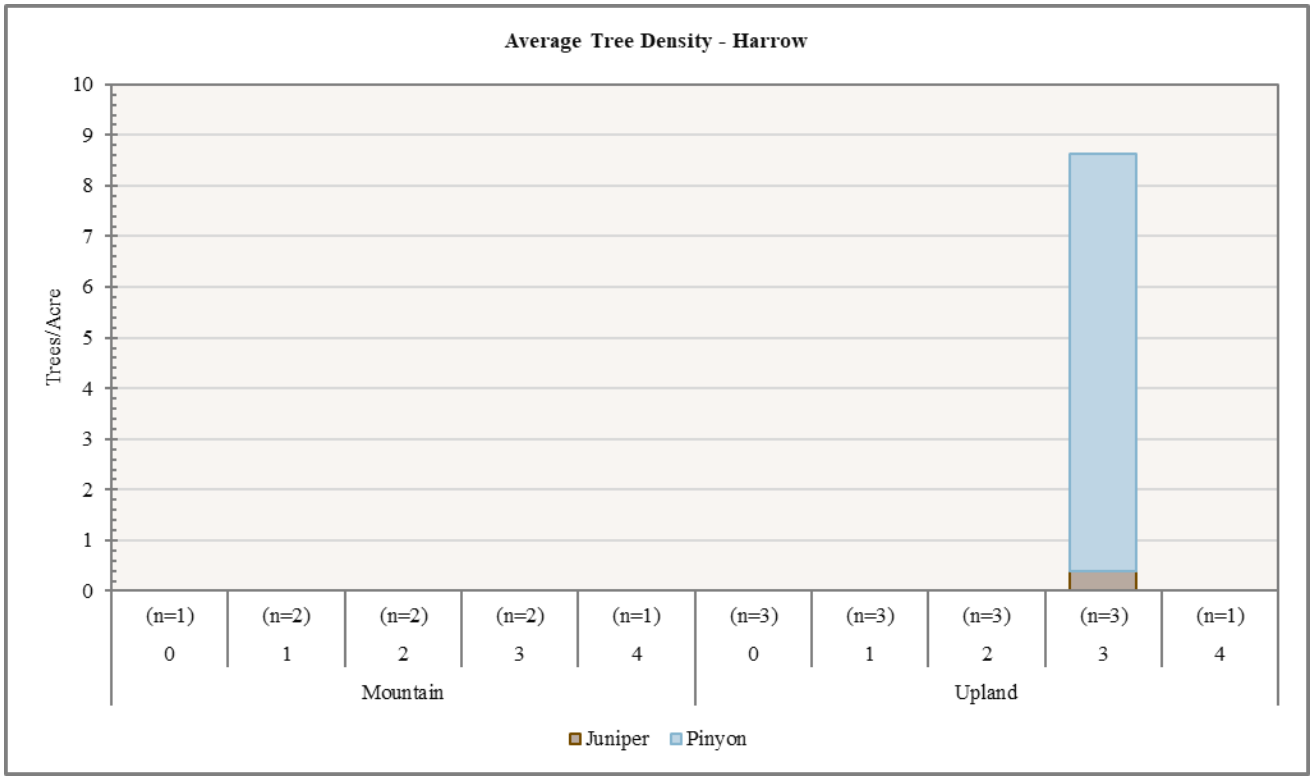


Figure 5.29: Average tree density on mountain and upland study sites that have undergone a harrow treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment, 4 = 14 – 18 years post-treatment.

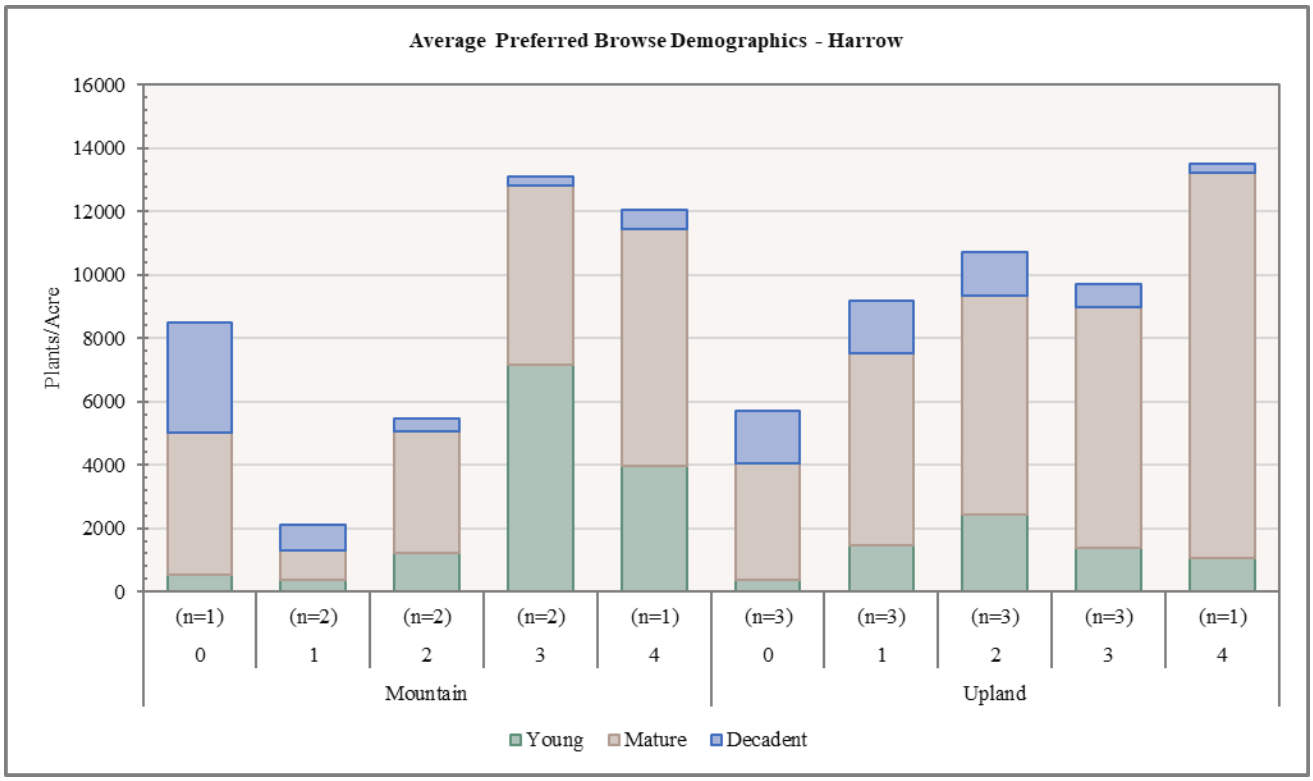


Figure 5.30: Average preferred browse demographics on mountain and upland study sites that have undergone a harrow treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment, 4 = 14 – 18 years post-treatment.

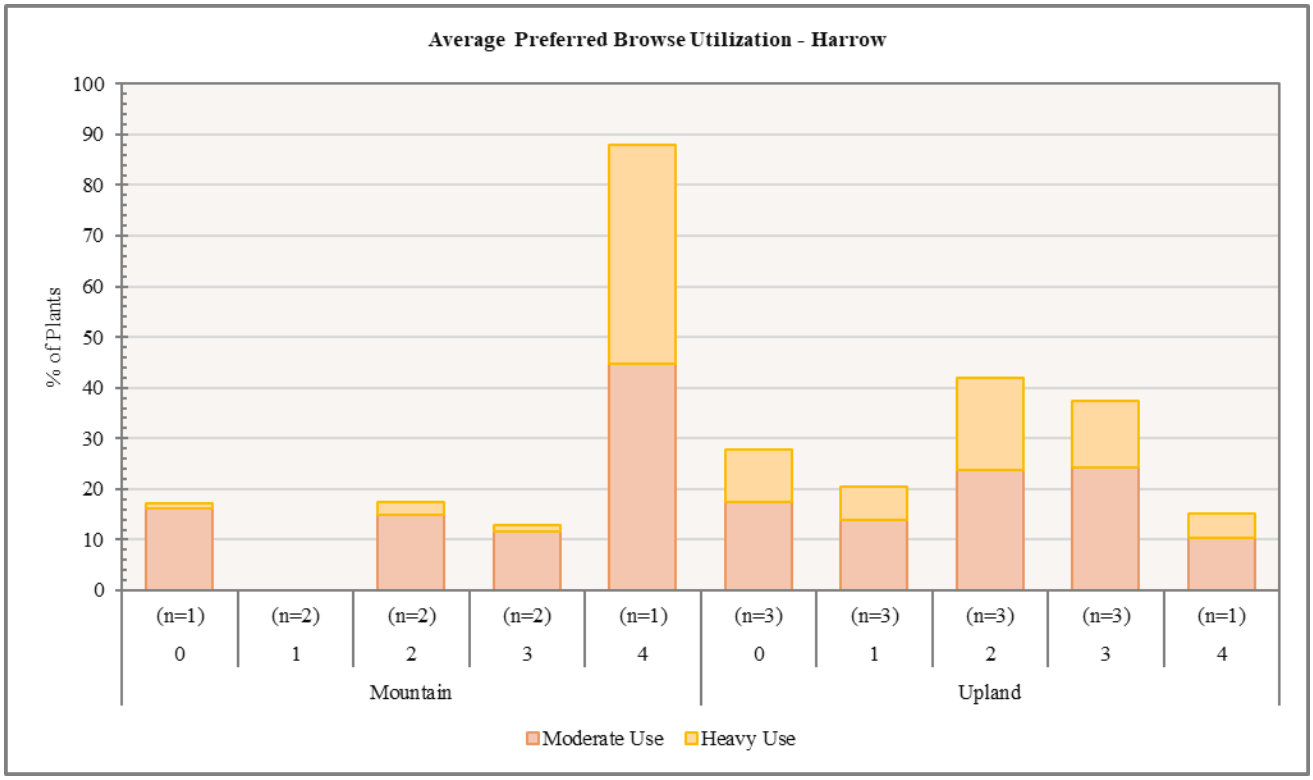


Figure 5.31: Average preferred browse utilization on mountain and upland study sites that have undergone a harrow treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment, 4 = 14 – 18 years post-treatment.

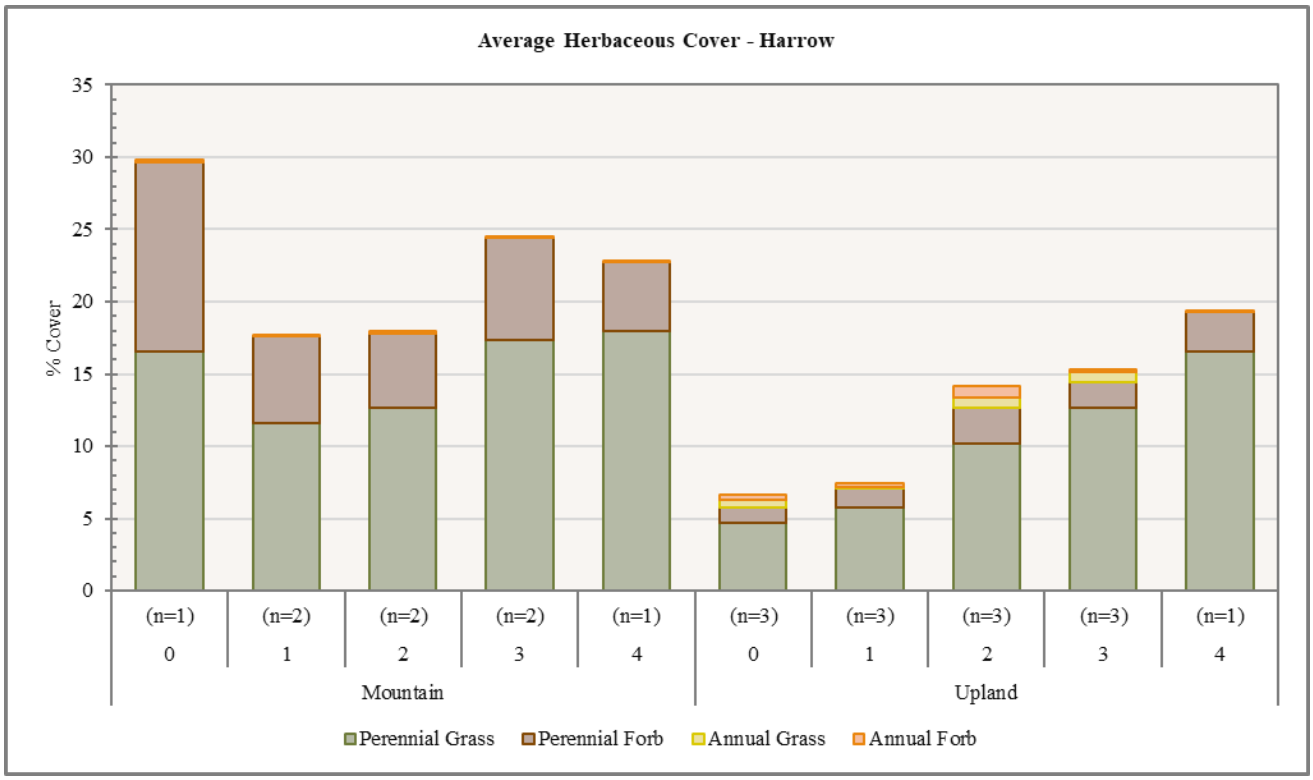


Figure 5.32: Average herbaceous cover on mountain and upland study sites that have undergone a harrow treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment, 4 = 14 – 18 years post-treatment.

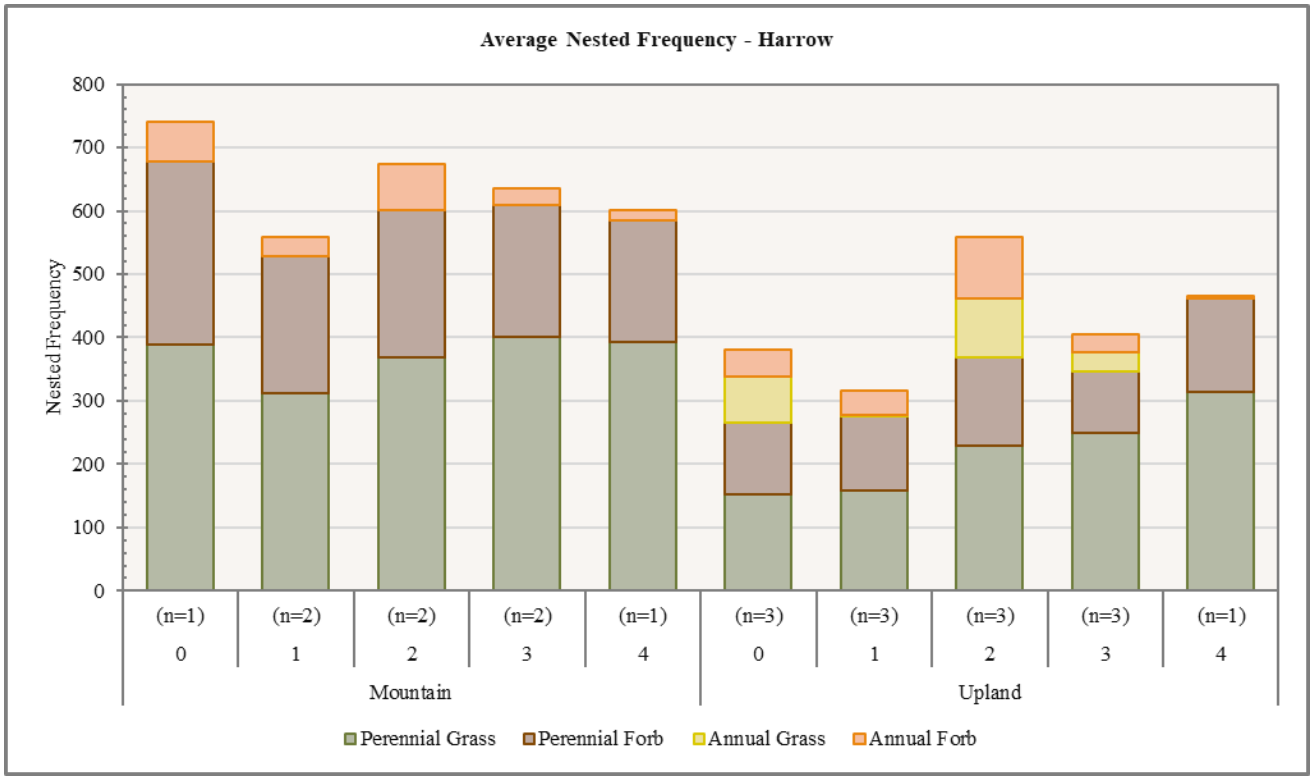


Figure 5.33: Average nested frequency of herbaceous species on mountain and upland study sites that have undergone a harrow treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment, 4 = 14 – 18 years post-treatment.

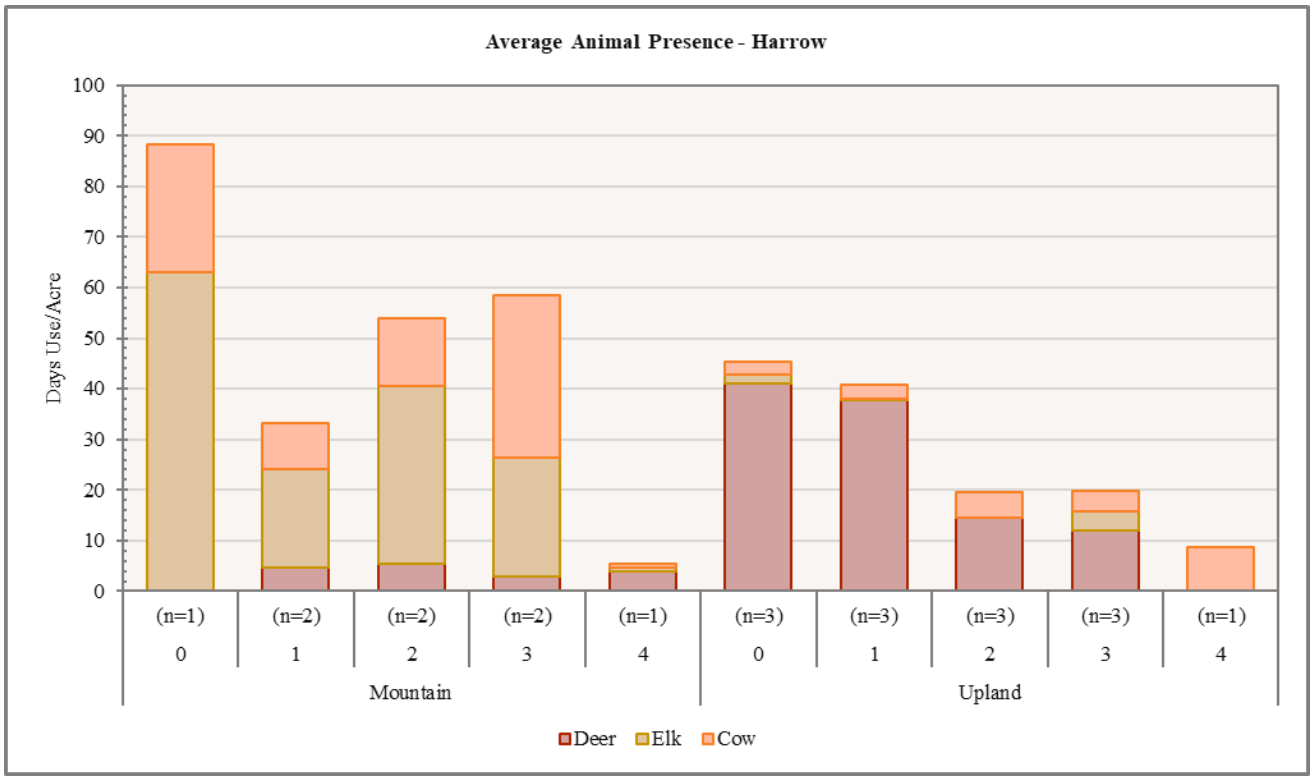


Figure 5.34: Average pellet transect data on mountain and upland study sites that have undergone a harrow treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment, 4 = 14 – 18 years.

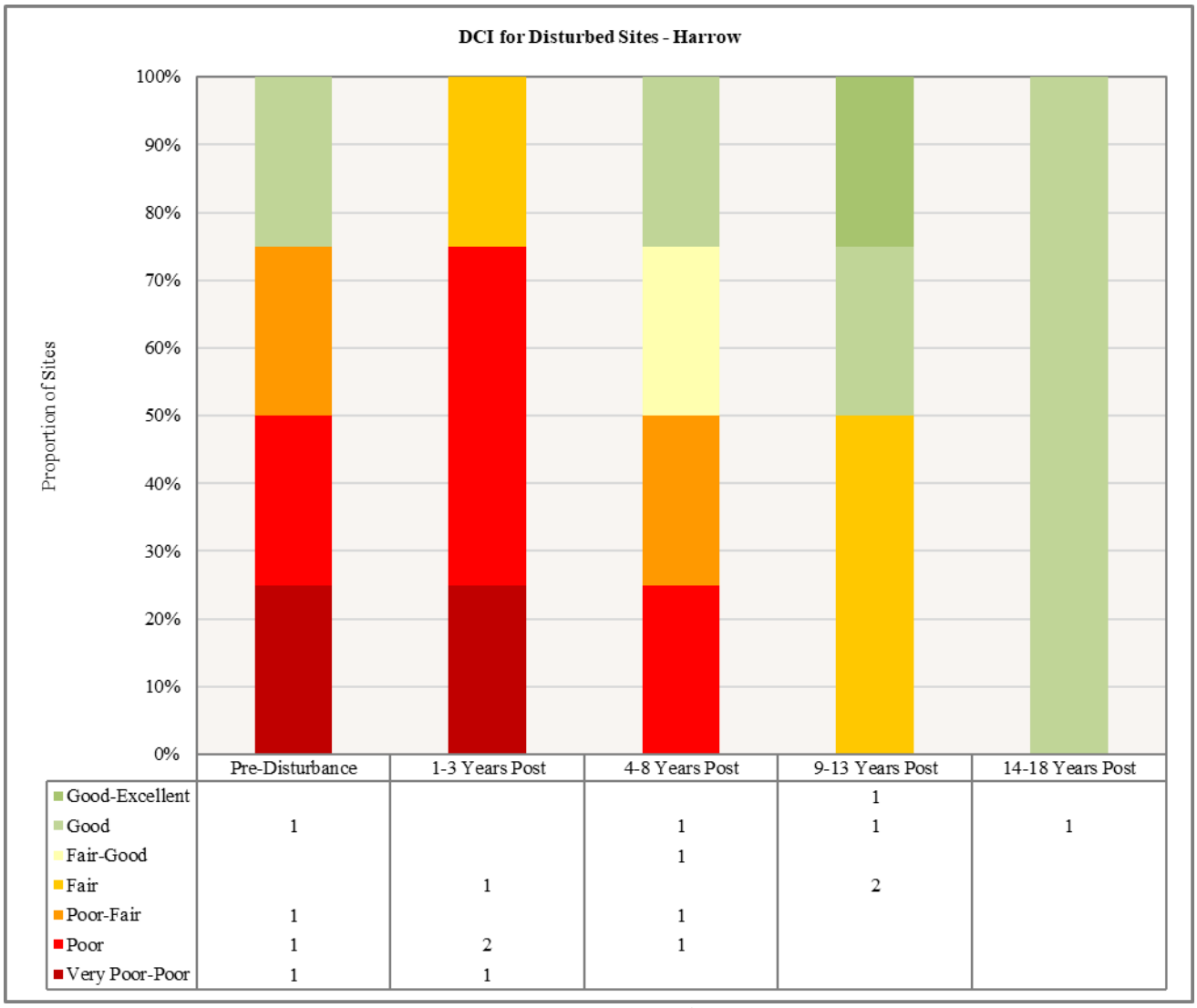


Figure 5.35: Deer winter range Desirable Components Index (DCI) summary by year of sites that have undergone a harrow treatment.

Study Number	Post Category	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
14R-07	1	16.3	5.7	0.6	14.3	0	4.6	0	**41.4**	**P**
14R-07	2	16.9	7.6	8	30	0	9.9	0	**72.4**	**G**
14R-07	3	12.1	12.8	2.8	30	0	4.3	0	**62**	**F**
14R-07	4	16.9	14.2	2.8	30	0	5.6	0	**69.5**	**G**
14R-14*	0	27.8	0	0	2.7	-2.9	5.8	0	**33.3**	**VP-P**
14R-15	0	26.2	13	4.2	3	0	3	0	**49.3**	**P-F**
14R-15	1	29.3	12.1	0.6	0.1	0	1.6	0	**43.7**	**P**
14R-17	0	28.2	5.7	2	5.9	-1.1	1.1	0	**41.9**	**P**
14R-17	2	18.6	13.3	5.5	11.3	-1.7	4.5	0	**51.6**	**P-F**
14R-17	3	26.5	13.6	1.6	23.3	-1.1	6.6	0	**70.5**	**G**
16R-10*	0	3.9	0	0	6.3	-0.4	10	0	**19.9**	**VP**
16R-10*	1	30	15	0.3	4.8	-0.8	10	0	**59.3**	**F**
16R-10*	2	30	15	0	7.4	-0.7	0.4	0	**52.2**	**F**
16R-10*	3	30	15	0	6.8	-0.6	0	0	**51.1**	**P-F**
16R-23	\	14.4	-4.6	4.7	19.4	-0.2	1.9	0	**35.7**	**VP-P**
16R-23	1	10.5	11.4	15	20	0	2.1	0	**59**	**F**
16R-23	2	9.9	12.3	12.6	7.8	0	0	0	**42.5**	**P**
16R-23	3	13.4	10.9	15	14.4	-0.3	0.1	0	**53.4**	**F**

Study Number	Post Category	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
16R-34	0	30	2.7	2.9	30	0	10	0	75.6	G
16R-34	1	4.9	0	0	23.6	0	10	0	38.5	VP-P
16R-34	2	13.9	12.7	9.4	24.9	0	10	0	70.8	F-G
16R-34	3	22	14	15	30	0	10	0	91	G-E

Table 5.4: Deer winter range Desirable Components Index (DCI) information by site number of study sites that have undergone a harrow treatment. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.
*Studies with an asterisk have been suspended.

Lop & Scatter

Twenty six study sites have undergone a lop and scatter treatment during the study period. Of these studies, five [Cedar Ridge (11B-09), Dolores Point (13A-18), South Creek Chaining (15-04), Bates Knob (15-05), and Box Springs Chaining (15-06)] are classified as mountain ecological sites, 18 [Cottonwood (11B-07), Dugout Creek PJ Chained (11B-19), Horse Canyon 2 (11R-14), Knap Bench (11R-19), Black Ridge (13A-08), Below Polar Rim (13A-12), Johnson Creek (14R-20), Mustang Mesa (14R-36), Lems Draw (14R-44), Airplane Spring (15-07), Telephone Bench (16B-20), Poison Spring Bench (16B-22), Red Point (16C-14), Birch Creek Chaining (16C-27), Danish Bench (16C-36), Stump Flat (16R-21), Hiawatha Miller Creek (16R-54), and Dry Wash (16R-56)] are considered to be upland ecological sites, and three [Eagle Bench (15-01), Tarantula Mesa Lop and Scatter (15R-02), and Consumer Bench (16B-23)] are classified as semidesert ecological sites.

The Cedar Ridge study is located on Cedar Ridge in Carbon county, and the Dolores Point site can be found on the southern portion of Dolores Point near the Utah-Colorado border. The South Creek Chaining study is just south of South Creek on the lower slopes of South Creek Ridge in the Henry Mountains. Bates Knob is also located in the Henry Mountains, specifically on the lower southern-facing slopes of South Creek Ridge between Sweetwater Creek and North Fork Bullfrog Creek. The Box Springs Chaining study is situated just north of Box Spring and Pennellen Pass in the Henry Mountains. Cottonwood can be found in Sage Brush Flat on the Tavaputs Plateau, and Dugout Creek PJ Chained is west of Dugout Creek on the South Book Cliffs. The Horse Canyon 2 study can be found east of I-70 and roughly 1.5 miles northwest of the mouth of Horse Canyon. The Knap Bench site is located northeast of Price on Knap Bench.

The Black Ridge study can be found roughly two miles east of US-191 on Black Ridge near the La Sal Mountains. Below Polar Rim is situated below Polar Mesa on North Beaver Mesa. The Johnson Creek site is north of Blanding and just west of Johnson Creek, and the Mustang Mesa site is found northeast of Blanding on the northern portion of Mustang Mesa. The Lems Draw study is located northeast of Blanding near Lems Draw. The Airplane spring study site is situated northwest of The Horn and just northeast of Airplane Spring in the Henry Mountains. The Telephone Bench study is found on the western portion of Telephone Bench, while the Poison Spring Bench site is located south of Mohrland on Poison Spring Bench. The Red Point study is west of Huntington and north of Red Point.

The Birch Creek Chaining study site is situated east of Millsite Reservoir on the lower slopes of Little Nelson Mountain. The Danish Bench site is north of Orangeville and Castle Dale on Danish Bench, and the Stump Flat study can be found west of Huntington on Stump Flat. Hiawatha Miller Creek is northeast of Hiawatha and just south of Miller Creek. The Dry Wash site is situated south of Dry Wash and northeast of Nelson Mountain. The Eagle Bench study is located on the east side of the Henry Mountains, north of Crescent Creek and Lecleed Spring. Tarantula Mesa Lop and Scatter can be found on Tarantula Mesa between Spring Canyon and Five Canyon. Finally, the Consumer Bench study site is located just south of Garley Canyon on Consumer Bench.

Shrubs/Trees: Overall shrub cover on mountain ecological sites displayed a decreasing trend between the pre-treatment and second post-treatment sample years. However, preferred browse cover increased between the second and third sample years following treatment, primarily due to the Bates Knob study. Upland ecological

sites have exhibited an overall increasing trend. However, when considering these analyses, it is important to note the differing number of studies from year to year and consider their effect on these vegetation trends. For example, closer review of the data indicates that all cover during the third sample year after treatment is contributed by only three studies: Airplane Spring, Johnson Creek, and Birch Creek Chaining. Average shrub cover on semidesert ecological sites has increased overall following treatment, a trend largely driven by big sagebrush (*Artemisia tridentata*) on the Tarantula Mesa Lop and Scatter and Eagle Bench sites (**Figure 5.36**).

Average preferred browse demographics for mountain ecological sites indicate that density of preferred browse has decreased over time and that mature individuals have comprised a majority of the population. Furthermore, the initial decrease between the pre-treatment and first-treatment samplings is due to the exclusion of the Cedar Ridge study, which only has pre-treatment data. Upland study site density has fluctuated, but has remained largely stable overall. In addition, mature plants have made up a majority of the populations on these sites. Preferred browse density on semidesert study sites has increased over the duration of the study period, with mature plants as the primary demographic. However, decadence also increased in the fourth sample year following treatment, a trend that can be entirely attributed to the Tarantula Mesa Lop and Scatter study (**Figure 5.39**). Mean utilization of preferred browse on mountain ecological sites has significantly increased over the study period. On upland sites, utilization remained fairly stable through the third post-treatment sampling, with approximately 50% of plants exhibiting moderate to heavy use. However, usage increased in the fourth post-treatment sample year, with 42% of plants being moderately browsed and 30% being heavily browsed: this is entirely due to the Birch Creek Chaining study. Usage on semidesert study sites initially decreased between the pre-treatment and first post-treatment sample years. Preferred browse utilization increased in the second and third sample years following treatment, a trend that can largely be attributed to the Eagle Bench study (**Figure 5.40**).

Average cover of pinyon (*Pinus sp.*) and juniper (*Juniperus sp.*) trees has decreased overall following treatment on mountain, upland, and semidesert sites. A slight increase was observed between the second and third post-treatment samplings on mountain sites due to the Box Springs Chaining site. On upland study sites, Johnson Creek has provided much of the cover in the sample years following treatment (**Figure 5.37**). Mean tree density has also decreased on mountain and upland sites. Density on semidesert study sites, however, has increased: this trend is entirely driven by the variation in study numbers from year to year, as Eagle Bench is the only study site to have data for the fourth post-treatment sample year (**Figure 5.38**).

Herbaceous Understory: Perennial grasses have contributed the most average herbaceous cover on mountain ecological sites in all sample years, although nested frequency has remained stable. Site-level data shows that the Cedar Ridge and Dolores Point studies have been primarily dominated by native perennial grasses, while the introduced grass species crested wheatgrass (*Agropyron cristatum*) has dominated the Box Springs Chaining, Bates Knob, and South Creek Chaining sites. Perennial grasses have also provided most of the cover on upland study sites in many sample years. However, annual and perennial grasses and forbs were co-dominant in the third post-treatment sampling: this trend can be attributed to the Johnson Creek study. The herbaceous understories of semidesert study sites have also exhibited variations from year to year, but have increased overall. Perennial grasses have also contributed a majority of the cover on semidesert study sites. Nested frequency data, however, suggests that perennial and annual grasses and forbs have been roughly equally abundant in many sample years (**Figure 5.41**, **Figure 5.42**).

Occupancy: According to average pellet group data, animal presence on mountain sites has fluctuated, but has slightly increased overall. Primary occupancy has varied. Deer were the primary occupants before treatment and in the second and third post-treatment sample years. Mean abundance of deer pellet groups has ranged from 14 days use/acre during the second post-treatment sampling. Cattle and/or bison were co-dominant with deer during the second post-treatment sampling, and average pellet group abundance has been as low as 11 days use/acre during the second sample year after treatment and as high as 21 days use/acre in the first post-treatment sample year. Elk have also been present, and they were the primary occupants in the first sample year after treatment; mean abundance of elk pellet groups has fluctuated between 0 days use/acre in the third sampling following treatment and 26 days use/acre during the first post-treatment sample year.

Average animal presence on upland study sites initially decreased, but has increased in each subsequent year. Deer have also been the primary occupants of these sites through the third post-treatment sample year, with mean pellet group abundance ranging from 1 days use/acre in the fourth sample year after treatment to 23 days use/acre in the first post-treatment year. Elk were the primary occupants in the fourth sampling after treatment with an average pellet group abundance of 40 days use/acre; average pellet group abundance of elk has been as low as 3 days use/acre in the first post-treatment sample year. Cattle and/or bison pellet groups have had a mean abundance ranging from 5 days use/acre in the first and second sample years following treatment to 14 days use/acre during the fourth post-treatment sampling.

Presence on semidesert sites increased through the second post-treatment sample year, but has since decreased. Deer have been the primary occupants in all years, with average pellet group abundance fluctuating between 11 days use/acre in the fourth sample year after treatment and 41 days use/acre during the second post-treatment sampling. Elk have also been present on these sites, and mean abundance of pellet groups has been as low as 0 days use/acre in the second and fourth post-treatment samplings and as high as 6 days use/acre during the first sample year following treatment. Finally, mean abundance of cattle and/or bison pellet groups has ranged from 2 days use/acre in the second, third, and fourth samplings after treatment to 8 days use/acre in the initial post-treatment sample year (**Figure 5.43**).

Deer Winter Range Condition Assessment: The condition of deer winter range on sites that have undergone a lop and scatter treatment has continually changed over the sample period. These sites within the Southeastern Region are considered to be within very poor to excellent condition, with most studies improving or remaining stable. The Horse Canyon 2 site deteriorated slightly from poor-fair to poor condition. The Hiawatha Miller Creek study improved from very poor to very poor-poor condition, and the Stump Flat site remained in very poor-poor condition. The Dry Wash site was established and was in poor condition. Poison Spring Bench and Black Ridge remained in poor condition, and Box Springs Chaining improved from poor-fair to fair. The Consumer Bench and Danish Bench study sites went from poor to fair condition and the Bates Knob study stayed in fair condition. The Knap Bench study was established and was considered to be in fair condition. Red Point improved from fair to good condition, and Birch Creek Chaining went from fair-good to good. The Dugout Creek PJ Chained, Below Polar Rim, Eagle Bench, and Airplane Spring studies stayed in good condition. The Dolores Point, Cottonwood, and Cedar Ridge studies were all established and were classified as being in good, fair-good, and good-excellent condition (respectively). Finally, the Telephone Bench study slightly deteriorated from excellent to good-excellent condition (**Figure 5.44**, **Table 5.5**).

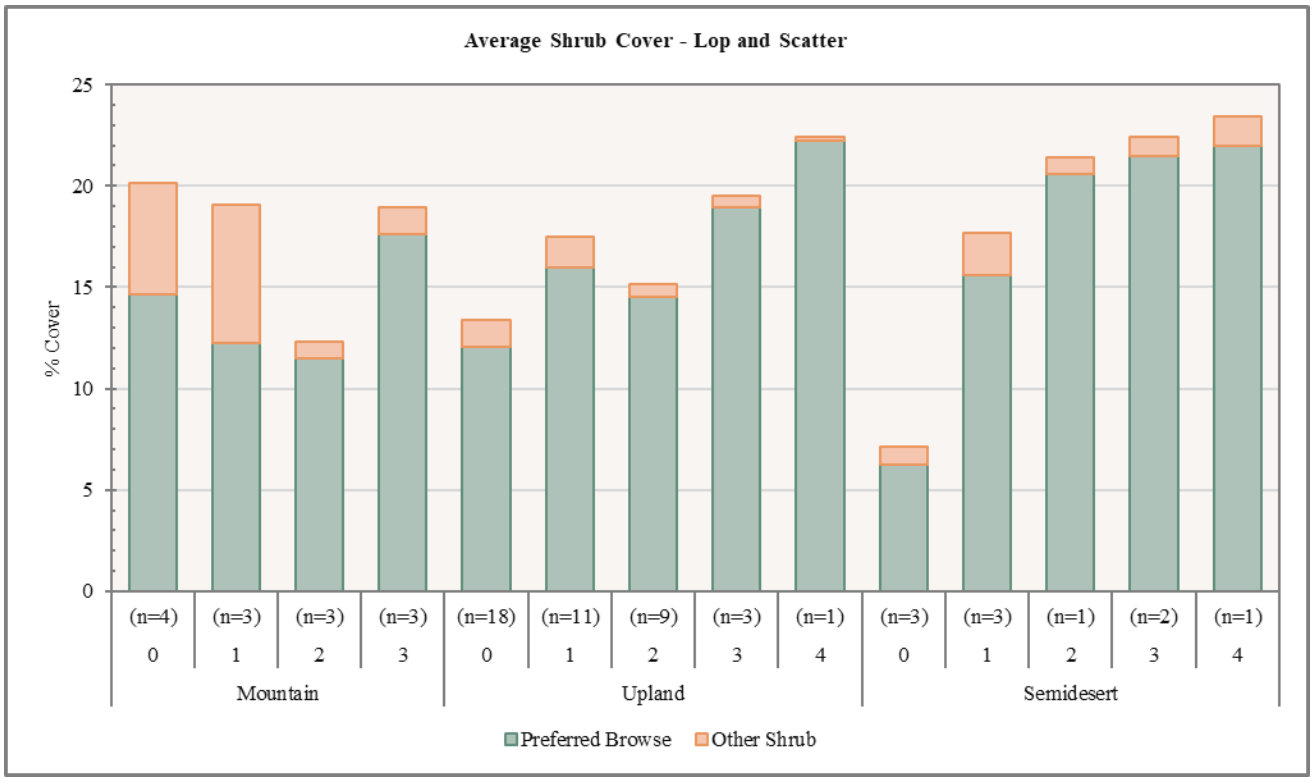


Figure 5.36: Average shrub cover on mountain, upland, and semidesert study sites that have undergone a lop and scatter treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment, 4 = 14 – 18 years post-treatment.

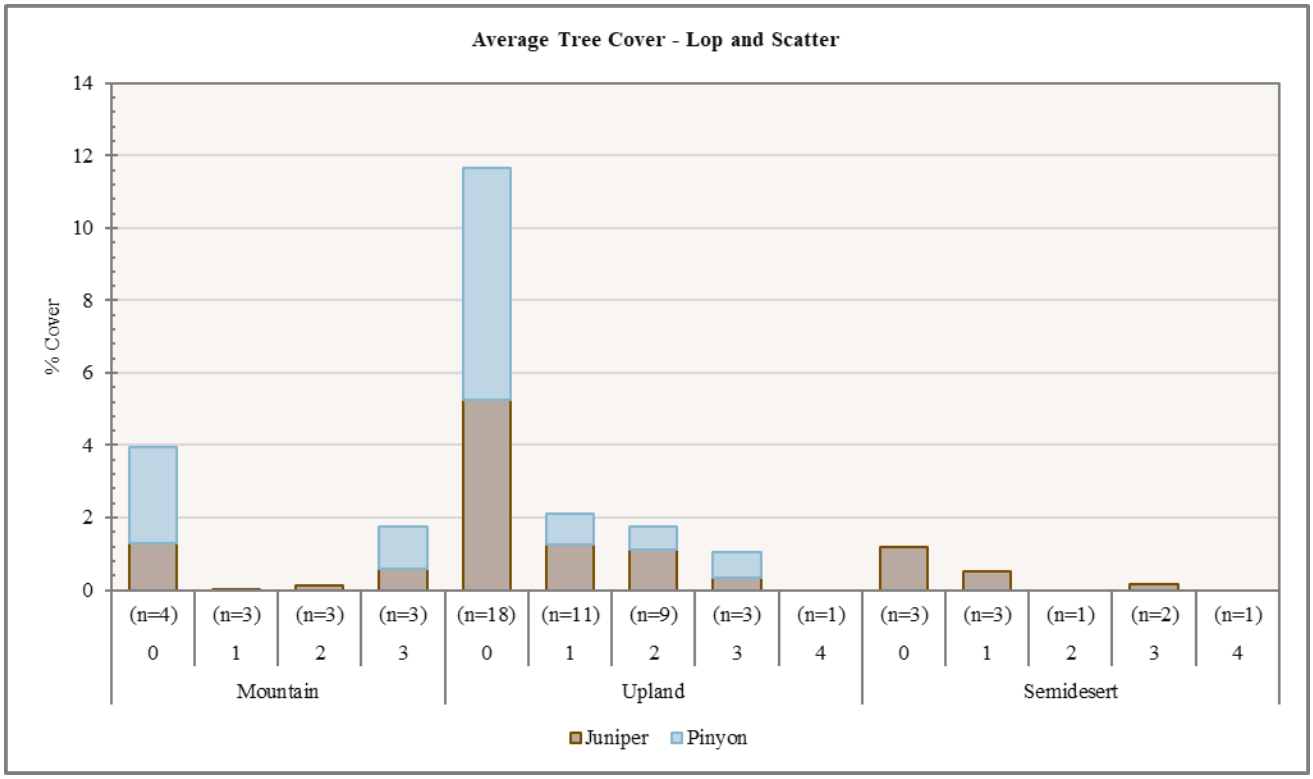


Figure 5.37: Average tree cover on mountain, upland, and semidesert study sites that have undergone a lop and scatter treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment, 4 = 14 – 18 years post-treatment.

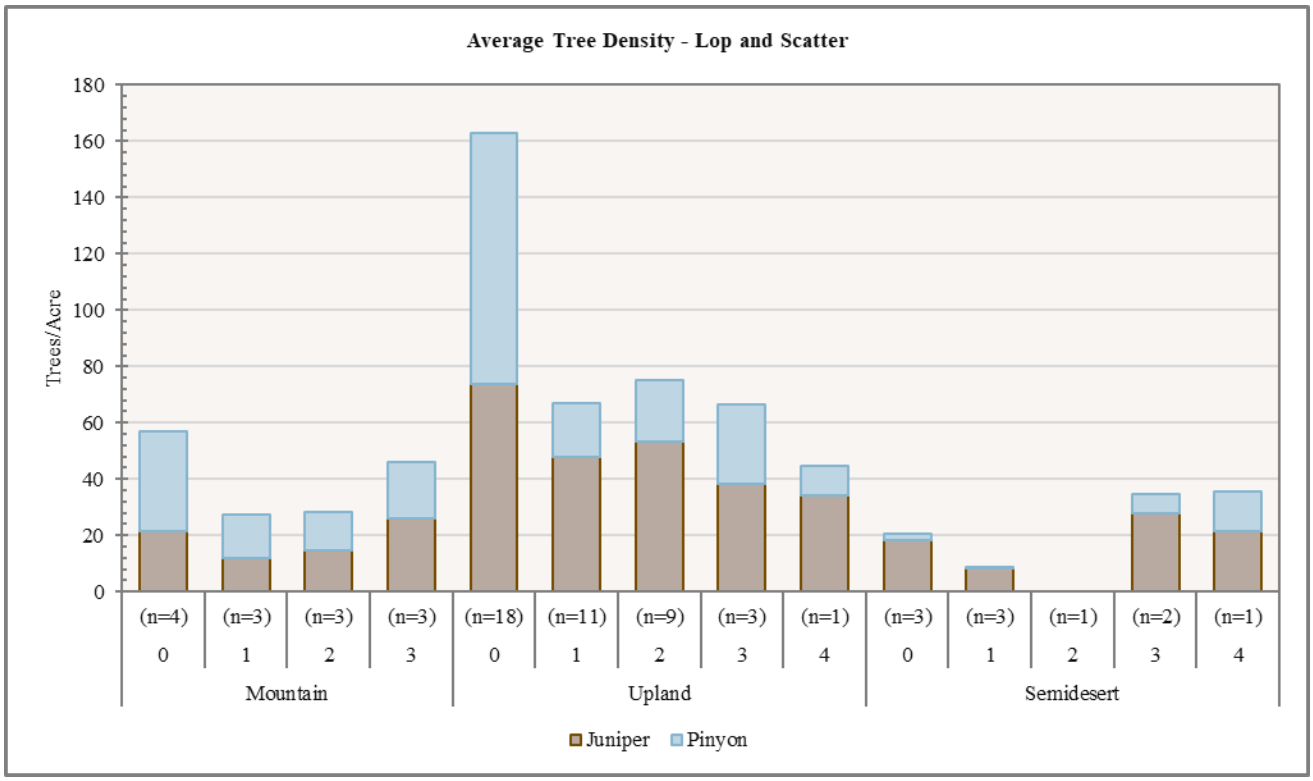


Figure 5.38: Average tree density on mountain, upland, and semidesert study sites that have undergone a lop and scatter treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment, 4 = 14 – 18 years post-treatment.

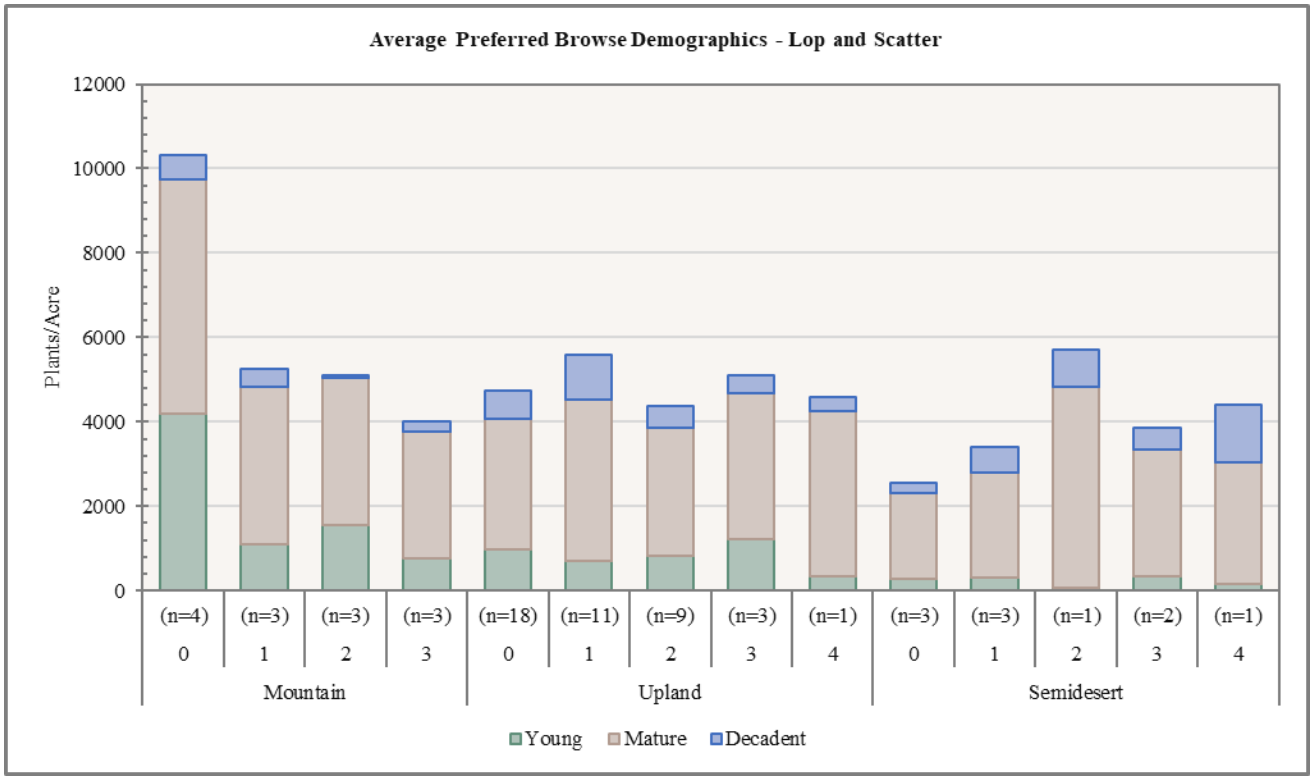


Figure 5.39: Average preferred browse demographics on mountain, upland, and semidesert study sites that have undergone a lop and scatter treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment, 4 = 14 – 18 years post-treatment.

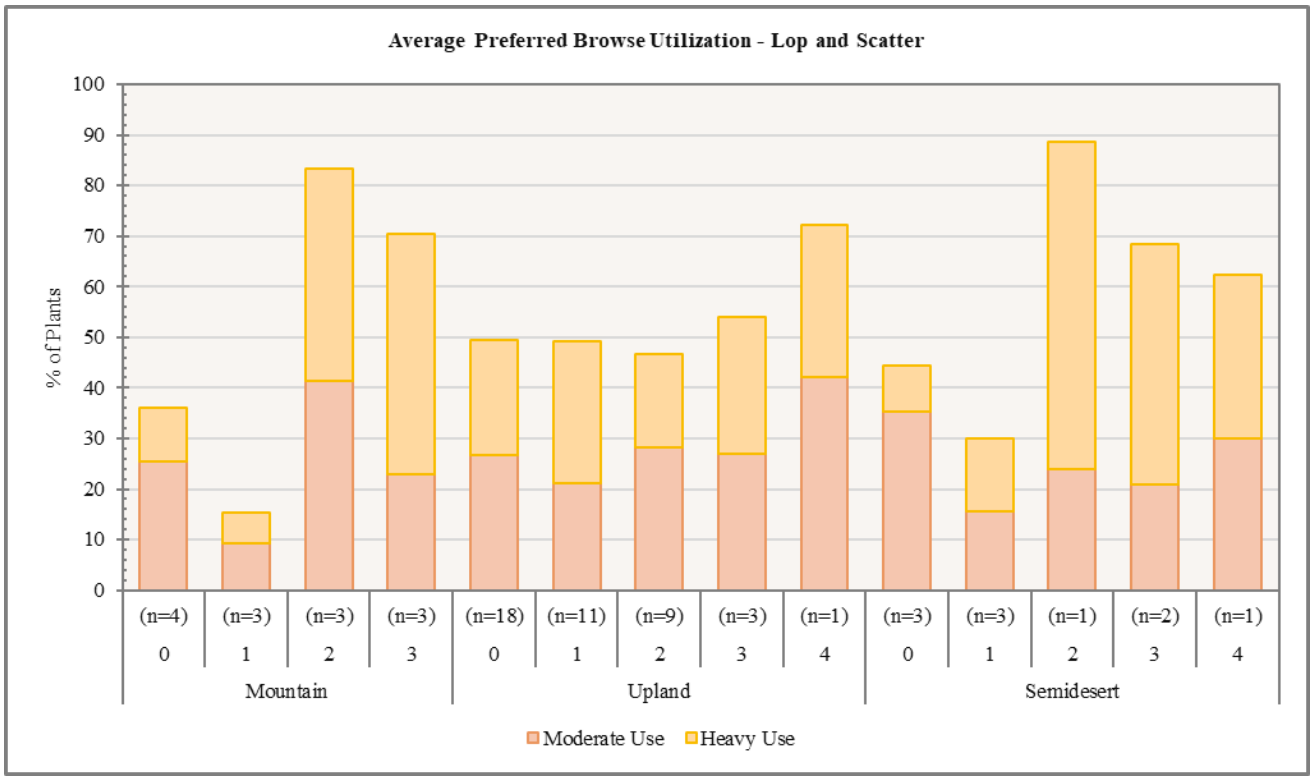


Figure 5.40: Average preferred browse utilization on mountain, upland, and semidesert study sites that have undergone a lop and scatter treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment, 4 = 14 – 18 years post-treatment.

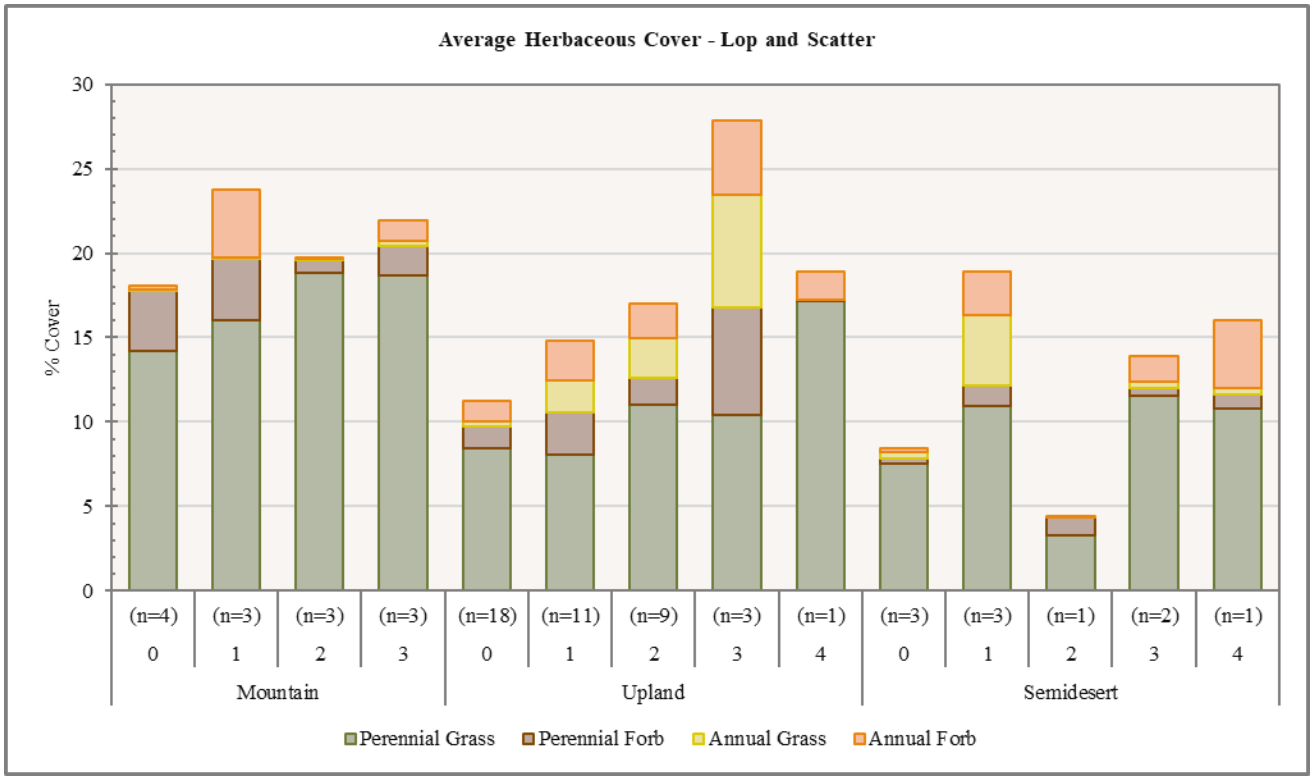


Figure 5.41: Average herbaceous cover on mountain, upland, and semidesert study sites that have undergone a lop and scatter treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment, 4 = 14 – 18 years post-treatment.

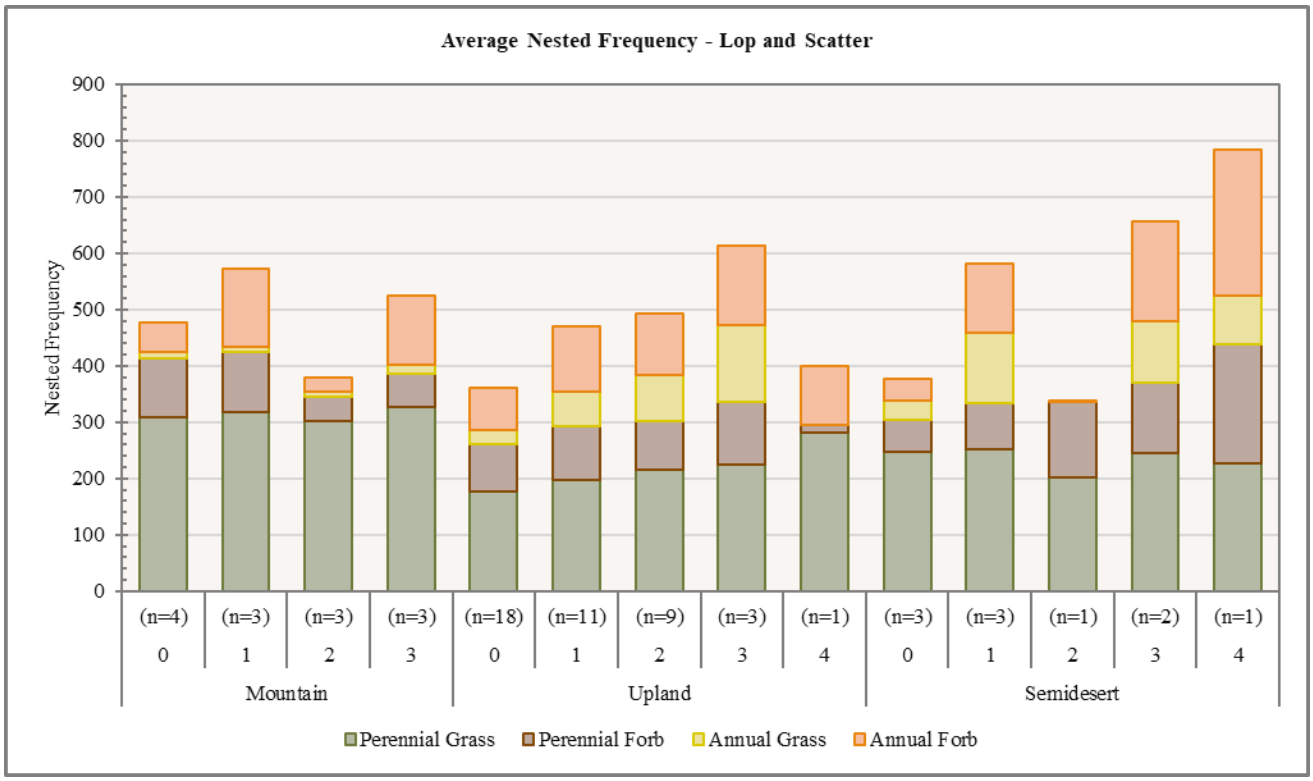


Figure 5.42: Average nested frequency of herbaceous species on mountain, upland, and semidesert study sites that have undergone a lop and scatter treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment, 4 = 14 – 18 years post-treatment.

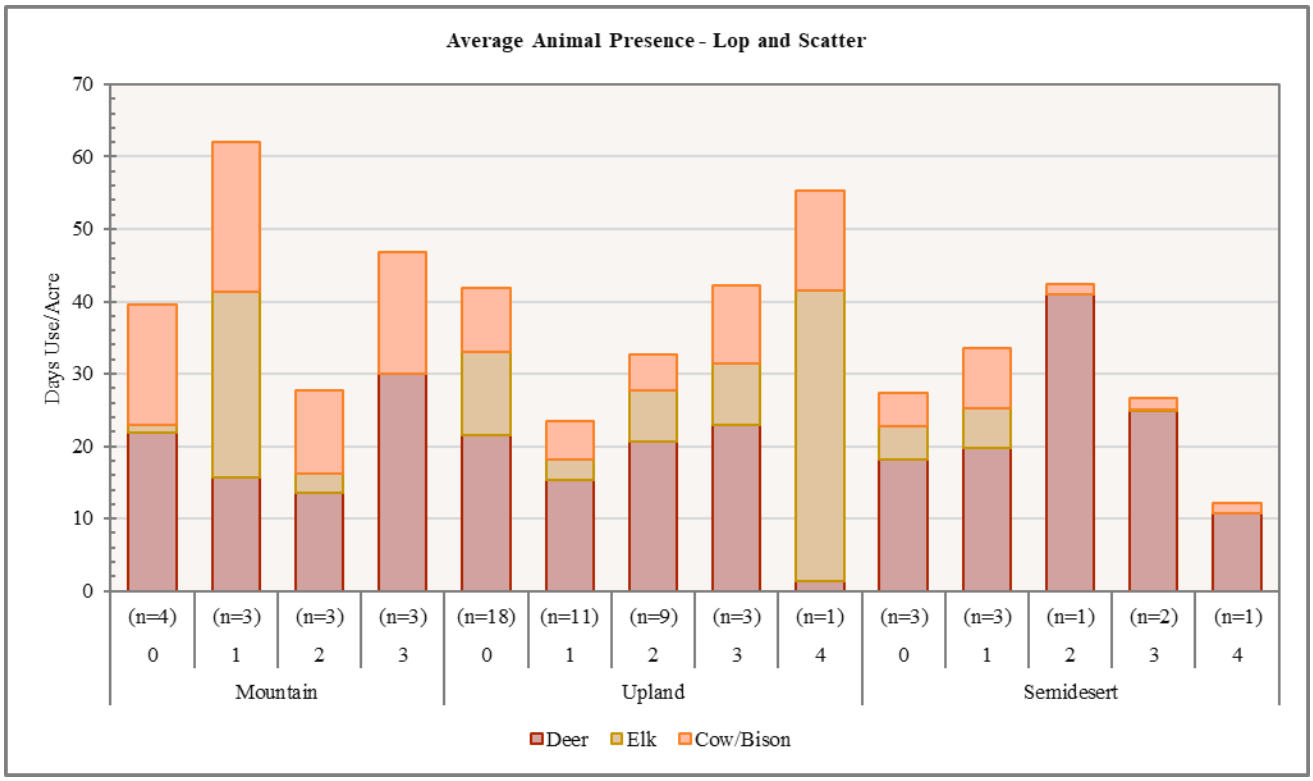


Figure 5.43: Average pellet transect data on mountain, upland, and semidesert study sites that have undergone a lop and scatter treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment, 4 = 14 – 18 years post-treatment. Upland and semidesert deer pellets include deer and sheep.

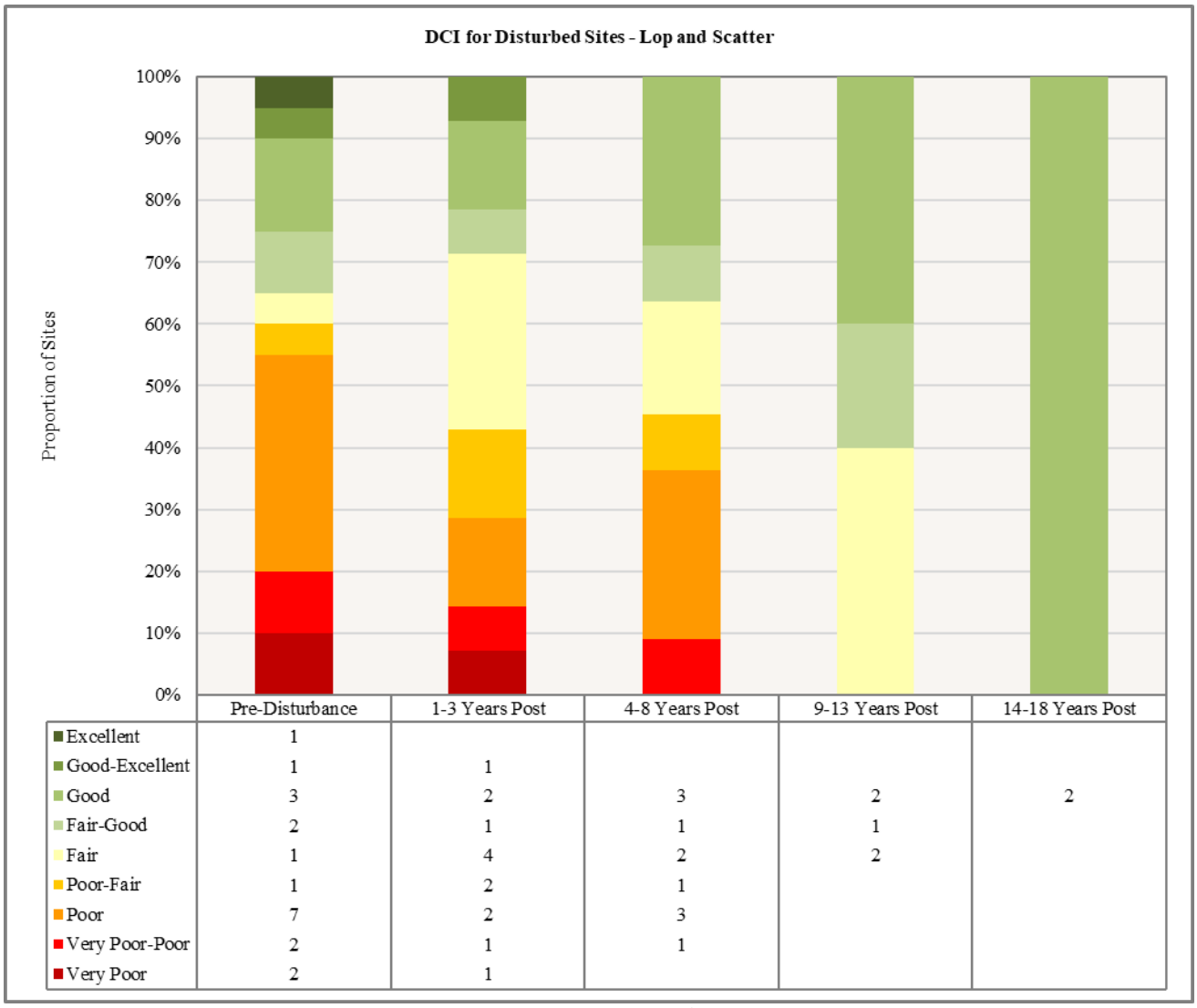


Figure 5.44: Deer winter range Desirable Components Index (DCI) summary by year of sites that have undergone a lop and scatter treatment.

Study Number	Post Category	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
11B-07	0	17.1	2.5	7.2	30	0	6.9	0	**63.6**	**F-G**
11B-09	0	30	11.3	9.8	28.6	0	10	0	**89.7**	**G-E**
11B-19	0	20.5	14.6	14.9	12.4	-0.3	5	0	**67**	**G**
11B-19	2	23.9	14.8	15	18	-7.8	3.6	0	**67.4**	**G**
11R-14	0	10.4	11.2	15	7.6	0	0.4	0	**44.6**	**P**
11R-14	1	19.4	10.3	15	7.1	0	0.2	0	**52**	**P-F**
11R-14	2	12.4	9.1	14.3	8.5	0	0.3	0	**44.5**	**P**
11R-19	0	15.3	9.9	9.1	16.8	-0.4	9.8	0	**60.5**	**F**
13A-08	0	17.5	4.6	0.6	11.1	-0.3	0	0	**33.4**	**VP-P**
13A-08	1	17.5	11.5	1.9	12.5	-0.1	0	0	**43.2**	**P**
13A-08	2	21.1	6	0	12	-1.8	2.3	0	**39.6**	**P**
13A-10*	0	23.4	6.6	0	16.1	-0.4	1.1	0	**46.8**	**P**
13A-12	0	25.5	13.6	3.7	30	-0.2	2	0	**74.6**	**G**
13A-12	1	25.8	9.9	1.6	30	-1.5	4.8	0	**70.6**	**G**
13A-18	1	24.8	11.5	10.6	30	-0.2	10	0	**86.7**	**G**

Study Number	Post Category	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
15-01	0	26.7	12.4	3.8	8.4	0	1.5	0	**52.7**	**G**
15-01	1	30	7.1	0.2	7.7	0	0.8	0	**45.7**	**F-G**
15-01	2	25.8	10.2	0.5	6.6	0	2.1	0	**45.2**	**F-G**
15-01	3	28.2	10.9	2.9	18.7	-0.1	1.3	0	**61.9**	**G**
15-01	4	27.6	5.8	1.8	21.5	-0.3	1.8	0	**58.3**	**G**
15-05	0	10	13.7	5.4	11.8	0	5	0	**45.9**	**P**
15-05	1	15.6	14.6	8	16.2	0	2.2	0	**56.5**	**P-F**
15-05	2	17	14.2	10.9	22.2	0	0.7	0	**64.9**	**F**
15-05	3	30	12.3	1.9	18.2	0	1.7	0	**64**	**F**
15-06	0	4	0	0	30	0	0	0	**34**	**VP**
15-06	1	4.7	0	0	30	0	0.1	0	**34.8**	**VP**
15-06	2	8.8	15	0	30	0	0.1	0	**53.9**	**P-F**
15-06	3	13.9	15	0	30	0	0.4	0	**59.2**	**F**
15-07	0	17.5	13.3	3.5	29.9	0	1.6	0	**65.8**	**F-G**
15-07	1	20.7	11.3	5.5	22.7	0	1.2	0	**61.4**	**F**
15-07	2	23.4	14.6	5.1	30	-0.6	1.3	0	**73.8**	**G**
15-07	3	22.6	11.1	4.9	30	-1.2	1.2	0	**68.5**	**G**
16B-20	0	26.6	14.8	15	30	0	3.7	0	**90**	**E**
16B-20	1	30	7	3.9	30	-0.6	10	0	**80.4**	**G-E**
16B-22	0	30	9.5	1.8	1.1	0	0.9	0	**43.3**	**P**
16B-22	1	30	8.6	2.4	0.5	0	2	0	**43.4**	**P**
16B-22	2	30	7.6	2.4	2.1	0	5.3	0	**47.4**	**P**
16B-23	0	0.8	0	0	20.7	-0.7	0.4	0	**21.1**	**P**
16B-23	1	1.9	0	0	30	-9.5	6.2	0	**28.7**	**F**
16C-14	0	11.9	13.9	9.7	3.8	0	0.4	0	**39.8**	**P**
16C-14	1	14.9	14.2	15	8.7	0	0.5	0	**53.4**	**F**
16C-14	2	21.6	13.1	5.8	30	-0.2	2.1	0	**72.5**	**G**
16C-27	0	21.8	7.5	4.8	16.2	0	0.1	0	**50.3**	**P-F**
16C-27	2	17.3	11.3	11	21.6	0	0	0	**61.1**	**F**
16C-27	3	19.9	12.4	7	24.3	0	0	0	**63.5**	**F-G**
16C-27	4	27.8	12.8	3.8	30	0	0.1	0	**74.4**	**G**
16C-36	0	11	13.7	2	9.4	0	2.7	0	**38.7**	**P**
16C-36	1	17.2	13.1	0.5	18.2	0	3.2	0	**52.1**	**F**
16R-21	0	1.5	0	0	30	0	1.6	0	**33.1**	**VP-P**
16R-21	2	4	0	0	30	0	1.7	0	**35.7**	**VP-P**
16R-54	0	6.3	0	0	13.2	0	0.4	0	**19.8**	**VP**
16R-54	1	7.1	3.5	12.2	11.1	0	0.9	0	**34.8**	**VP-P**
16R-56	0	11.4	13.5	13.3	0	0	1.5	0	**39.7**	**P**

Table 5.5: Deer winter range Desirable Components Index (DCI) information by site number of study sites that have undergone a lop and scatter treatment. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment., 4 = 14 – 18 years post-treatment.
*Studies with an asterisk have been suspended.

Roller Chopper

Four study sites have undergone a roller chopper treatment. All four studies [North Slackpile (16R-06), Wildcat Push (16R-16), Mohrland Roller Chopper 1 (16R-31), Mohrland Roller Chopper 2 (16R-32)] are considered to be upland ecological sites.

The North Slackpile study site is located south of Wildcat Canyon on the Gordon Creek WMA. Wildcat Push can be found approximately one mile north of the North Slackpile study. Mohrland Roller Chopper 1 is situated south of Hiawatha near the base of Gentry Mountain, and Mohrland Roller Chopper 2 is roughly 1.3 miles southeast of the Mohrland Roller Chopper 1 site.

Shrubs/Trees: Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) provides much of the cover on the North Slackpile and Wildcat Push site; Mohrland Roller Chopper 1 and 2 are dominated by black sagebrush (*A. nova*). Overall shrub cover decreased during the first sample year following the roller chopper treatment.

However, shrub cover increased between the second and third post-treatment samplings, surpassing pre-treatment levels: this is largely due to the North Slackpile study, which exhibited a nearly 12% increase in preferred browse cover over said time period (**Figure 5.45**). Density of preferred browse has increased from pre-treatment levels. Composition of the preferred browse on these sites has also changed over the study period. Mature plants comprised most of the populations on these sites before treatment and during the second and third samplings after treatment. Recruitment of young plants initially increased after treatment, but has since decreased; young individuals were the dominant demographic during the first post-treatment sample year. Decadence has decreased over the study period (**Figure 5.48**). Utilization of preferred browse decreased during the first post-treatment year, but has increased overall: 31% of plants were moderately hedged and 27% were heavily hedged in the third post-treatment sample year (**Figure 5.49**).

Both Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) have been observed on these study sites. Average tree cover decreased after treatment and has remained low during the following sample years – this trend is mainly driven by the Mohrland Roller Chopper 1 and 2 studies (**Figure 5.46**). Mean tree density also decreased initially, but has increased steadily in subsequent years (**Figure 5.47**): this indicates that there may be potential for infilling on these study sites in future sample years.

Herbaceous Understory: The herbaceous understories of these sites are mainly comprised of perennial grasses; the Mohrland Roller Chopper studies are dominated by the introduced perennial grass species crested wheatgrass (*Agropyron cristatum*), while mainly native species are dominant on the Wildcat Push and North Slackpile sites. Cover of the understory exhibited a significant increase between the pre-treatment and first post-treatment samplings. Overall cover has decreased in subsequent years, but still remains higher than that observed prior to treatment as of the third post-treatment year (**Figure 5.50**). Nested frequency has been less variable than cover: abundance initially increased following treatment and has remained largely stable since that time (**Figure 5.51**).

Occupancy: Average pellet transect data indicates that animal presence has increased over time. Deer have been the primary occupants of these sites in most years, but elk pellet groups were most abundant in the second post-treatment sample year. Average deer pellet group abundance has ranged from 12 days use/acre during the second post-treatment sampling to 29 days use/acre in the third sample year after treatment. Mean abundance of elk pellet groups has been as low as 5 days use/acre before treatment and as high as 23 days use/acre during the second sampling after treatment. Finally, cattle have been present with a mean pellet group abundance fluctuating between 2 days use/acre in the second sample year following treatment and 10 days use/acre during the second post-treatment sampling (**Figure 5.52**).

Deer Winter Range Condition Assessment: The condition of deer winter range on sites that have undergone a roller chopper treatment has continually changed over the sample period. These sites within the Southeastern Region are considered to be within very poor-poor to good-excellent condition, with most studies exhibiting minor fluctuations. The North Slackpile study improved from good to good-excellent condition. Wildcat Push went from very poor to very poor-poor condition, while Mohrland Roller Chopper 1 deteriorated from poor-fair to poor condition. Finally, the Mohrland Roller Chopper 2 study remained in poor condition (**Figure 5.53**, **Table 5.6**).

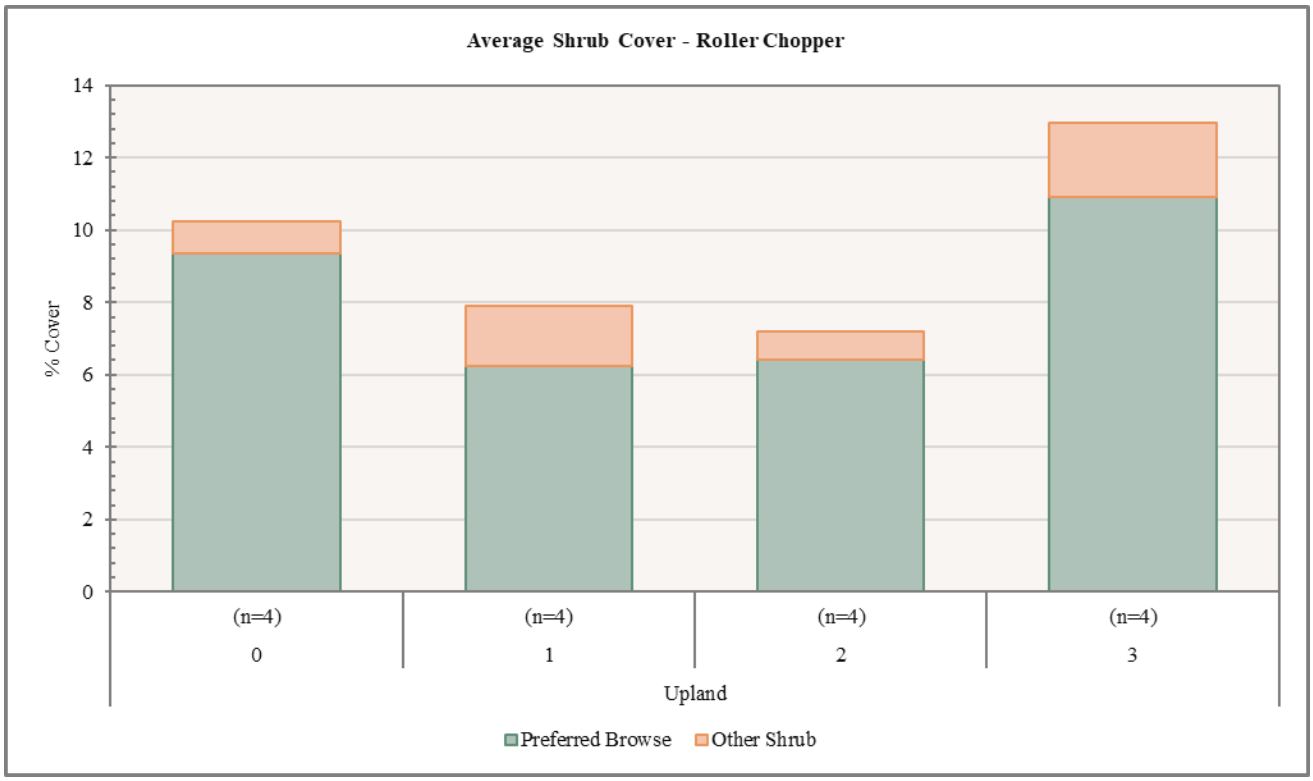


Figure 5.45: Average shrub cover on upland study sites that have undergone a roller chopper treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

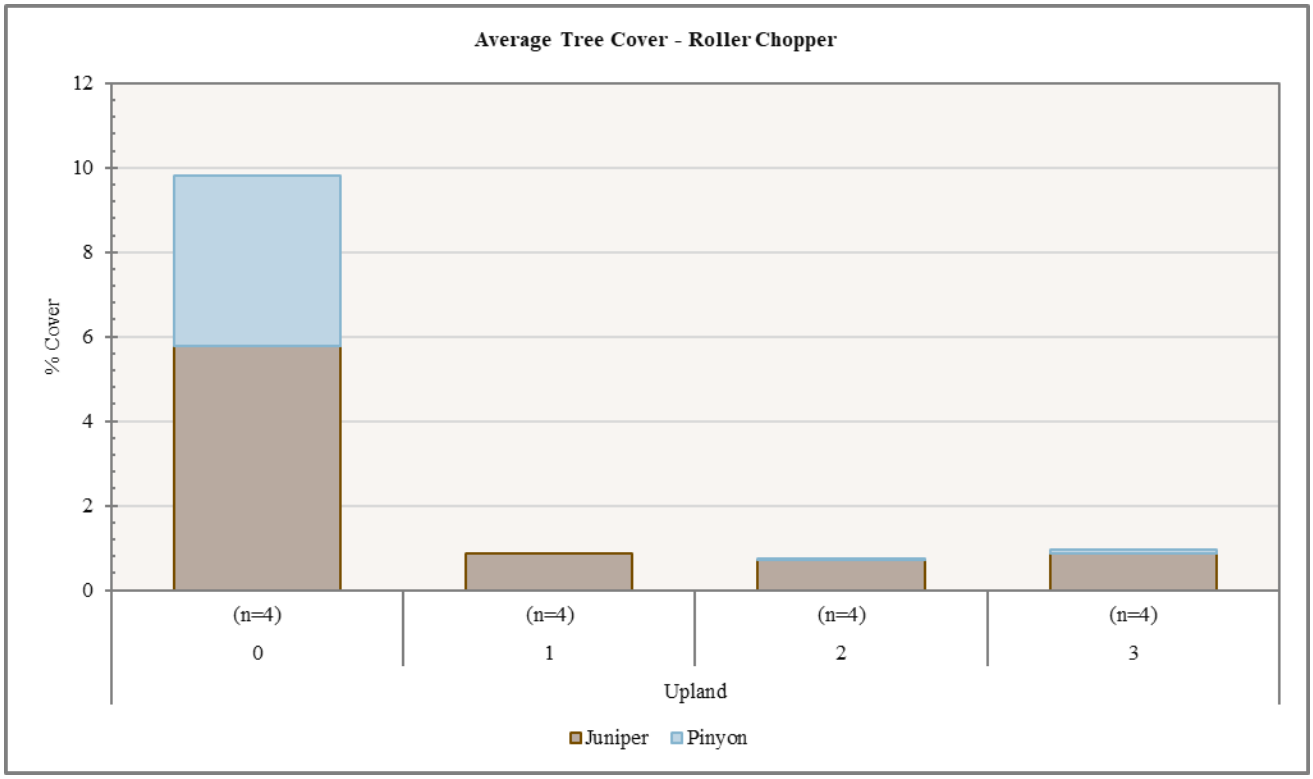


Figure 5.46: Average tree cover on upland study sites that have undergone a roller chopper treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

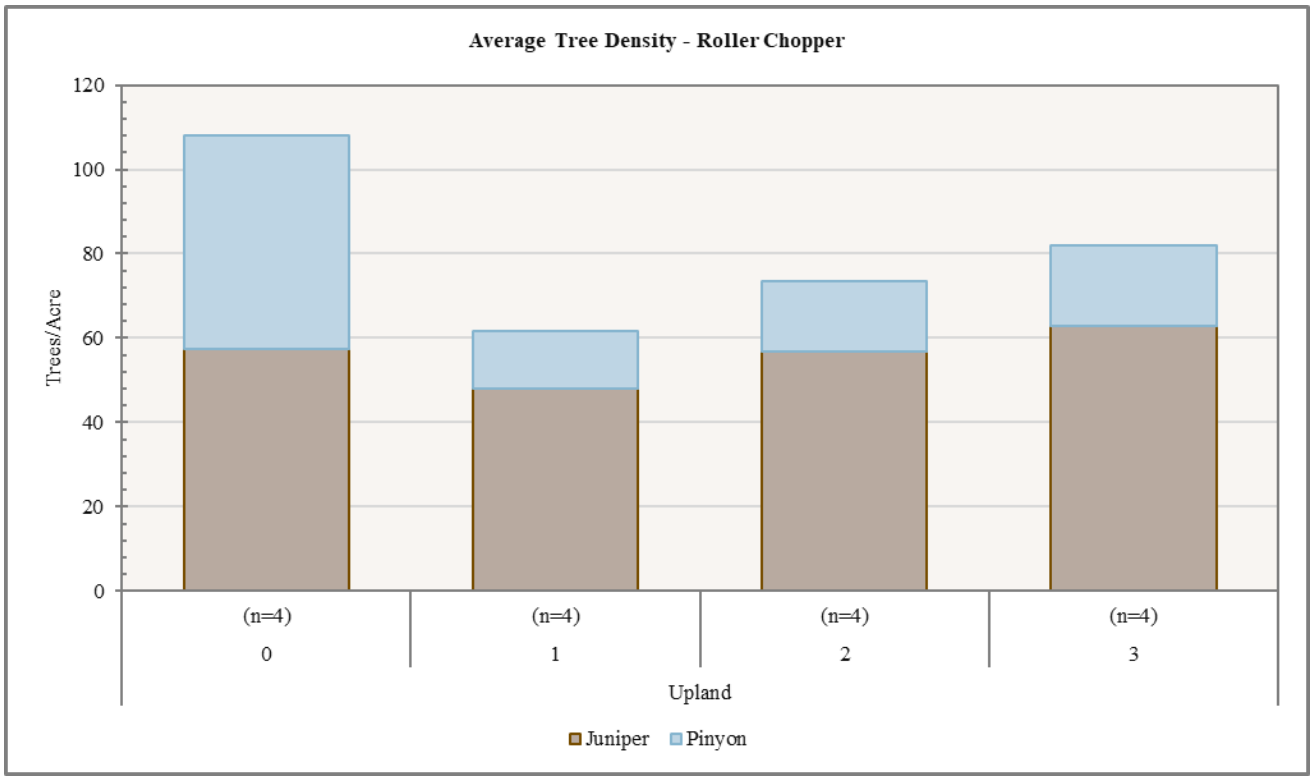


Figure 5.47: Average tree density on upland study sites that have undergone a roller chopper treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

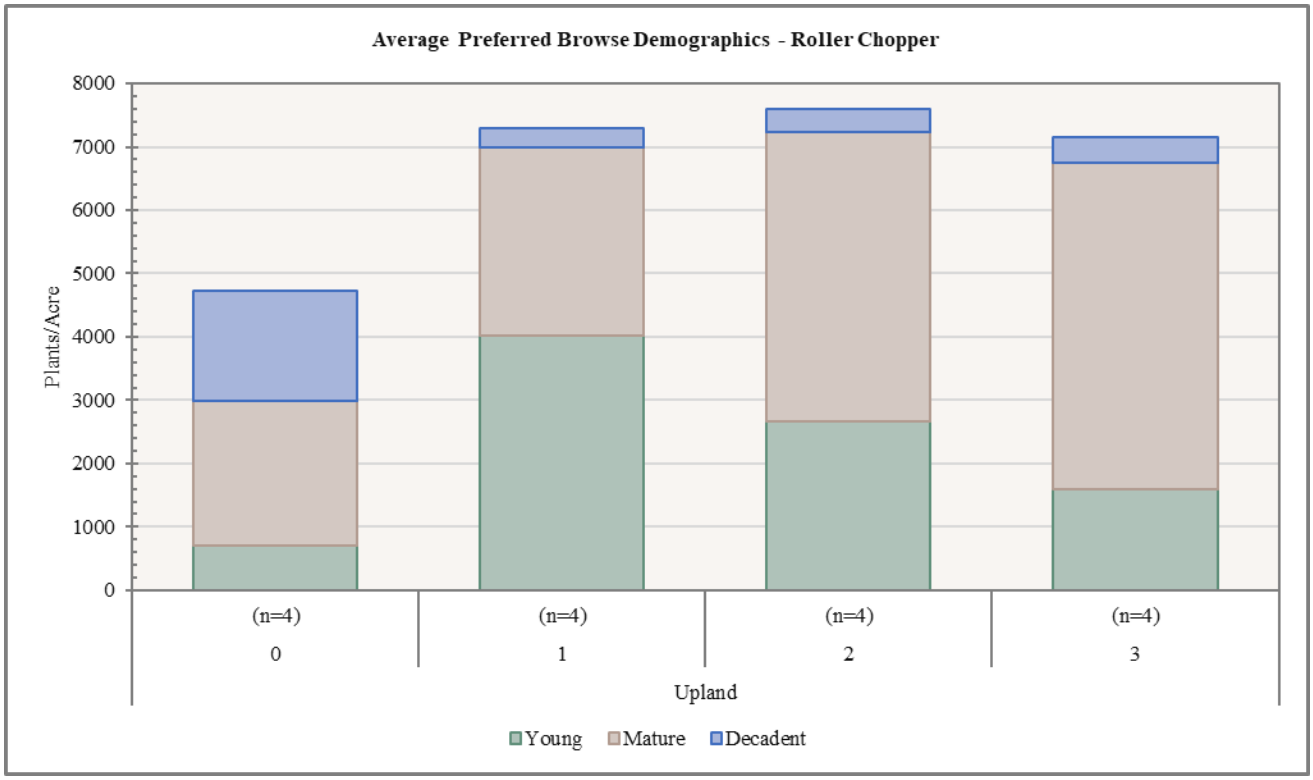


Figure 5.48: Average preferred browse demographics on upland study sites that have undergone a roller chopper treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

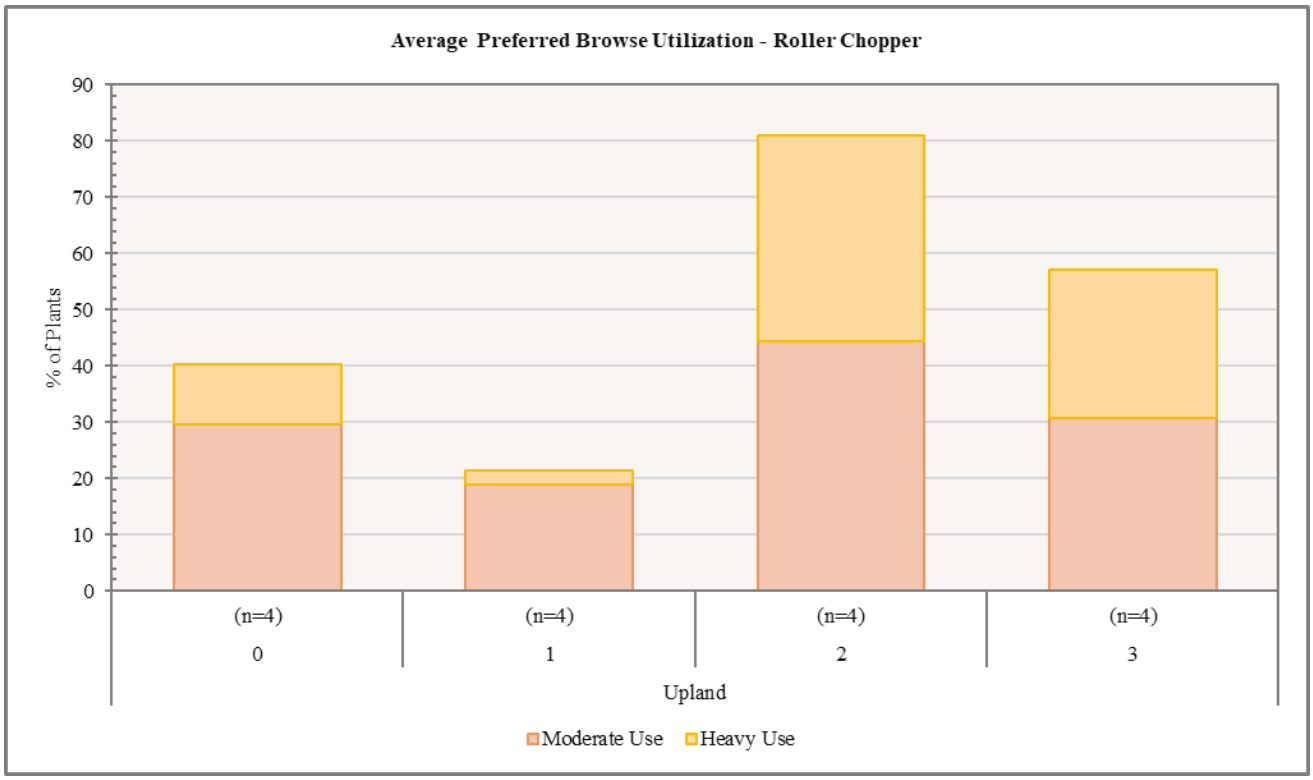


Figure 5.49: Average preferred browse utilization on upland study sites that have undergone a roller chopper treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

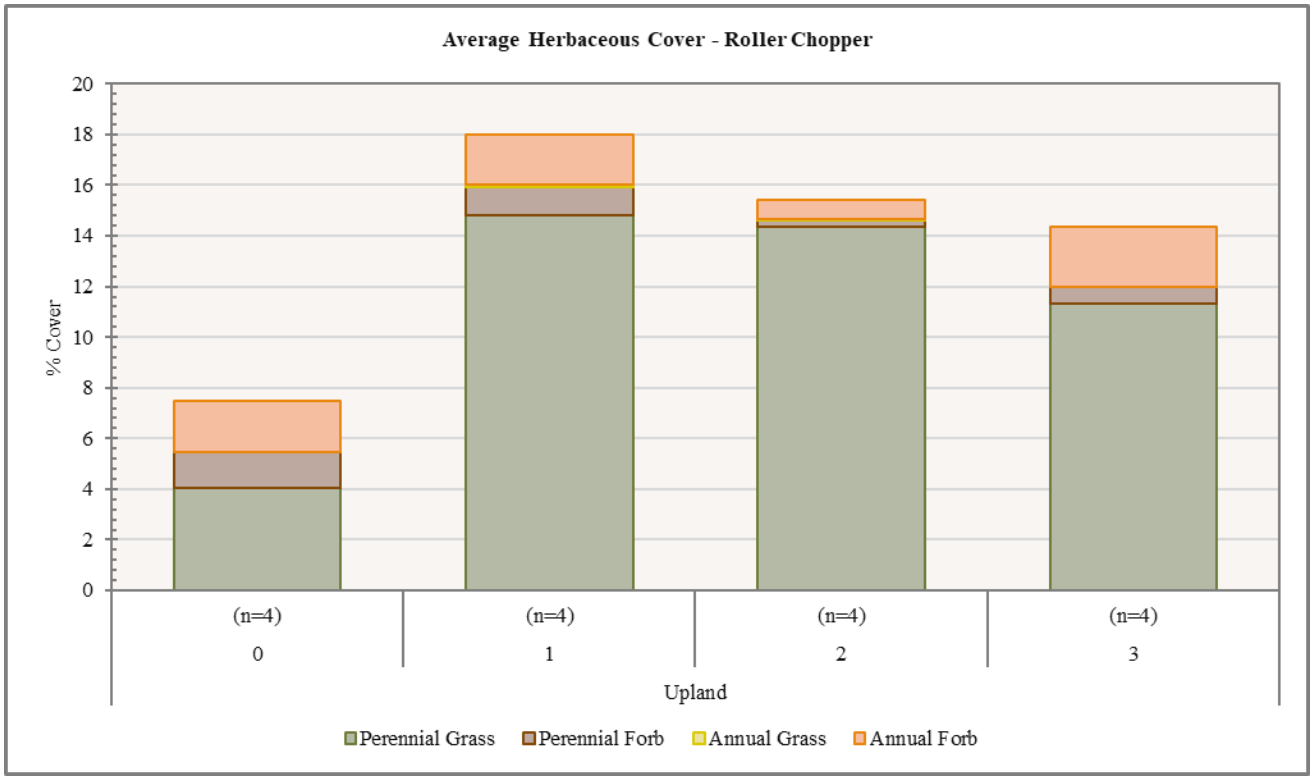


Figure 5.50: Average herbaceous cover on upland study sites that have undergone a roller chopper treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

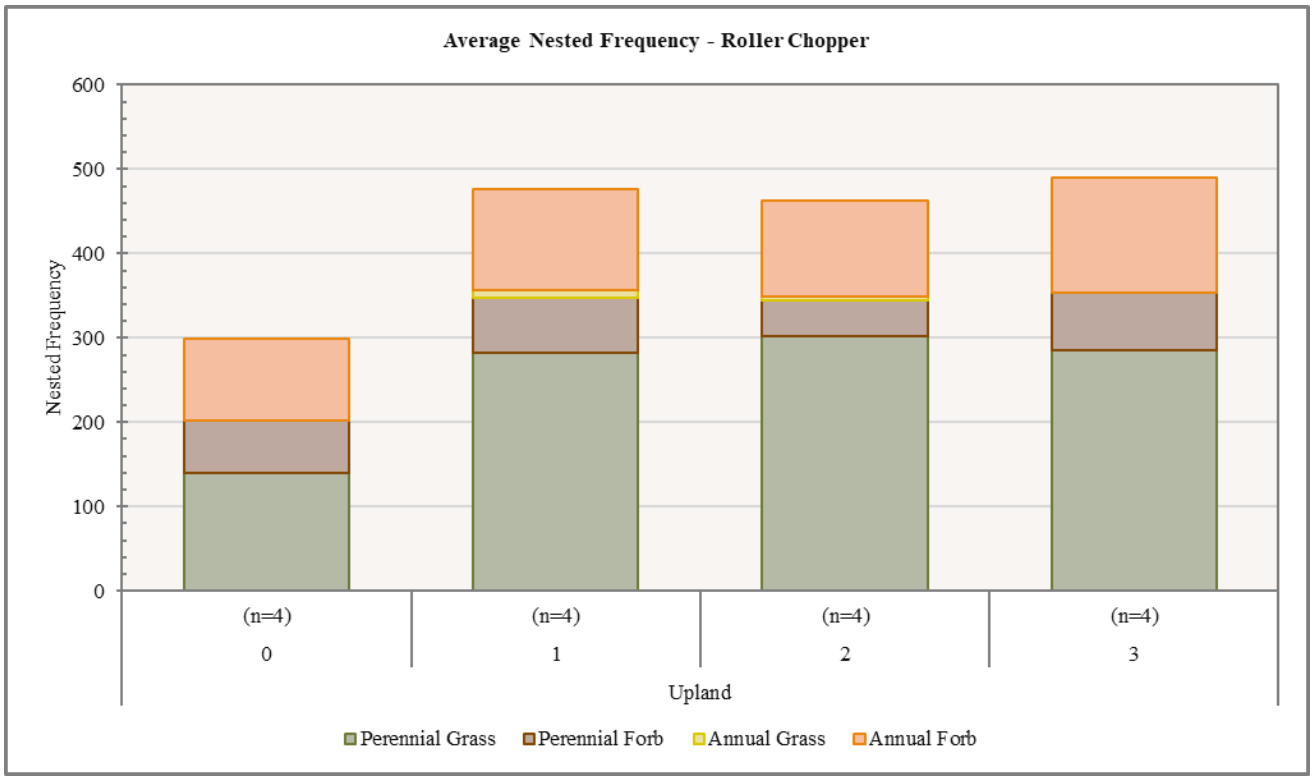


Figure 5.51: Average nested frequency of herbaceous species on upland study sites that have undergone a roller chopper treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

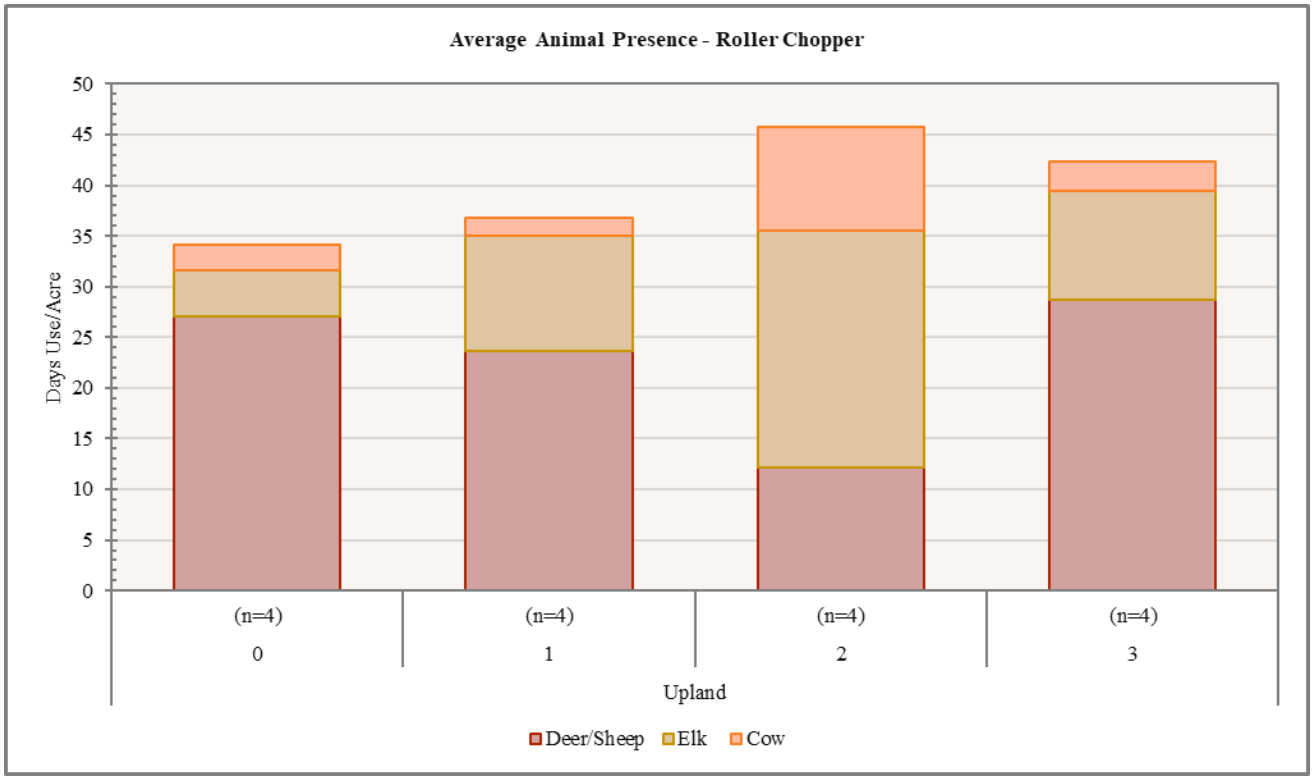


Figure 5.52: Average pellet transect data on upland study sites that have undergone a roller chopper treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

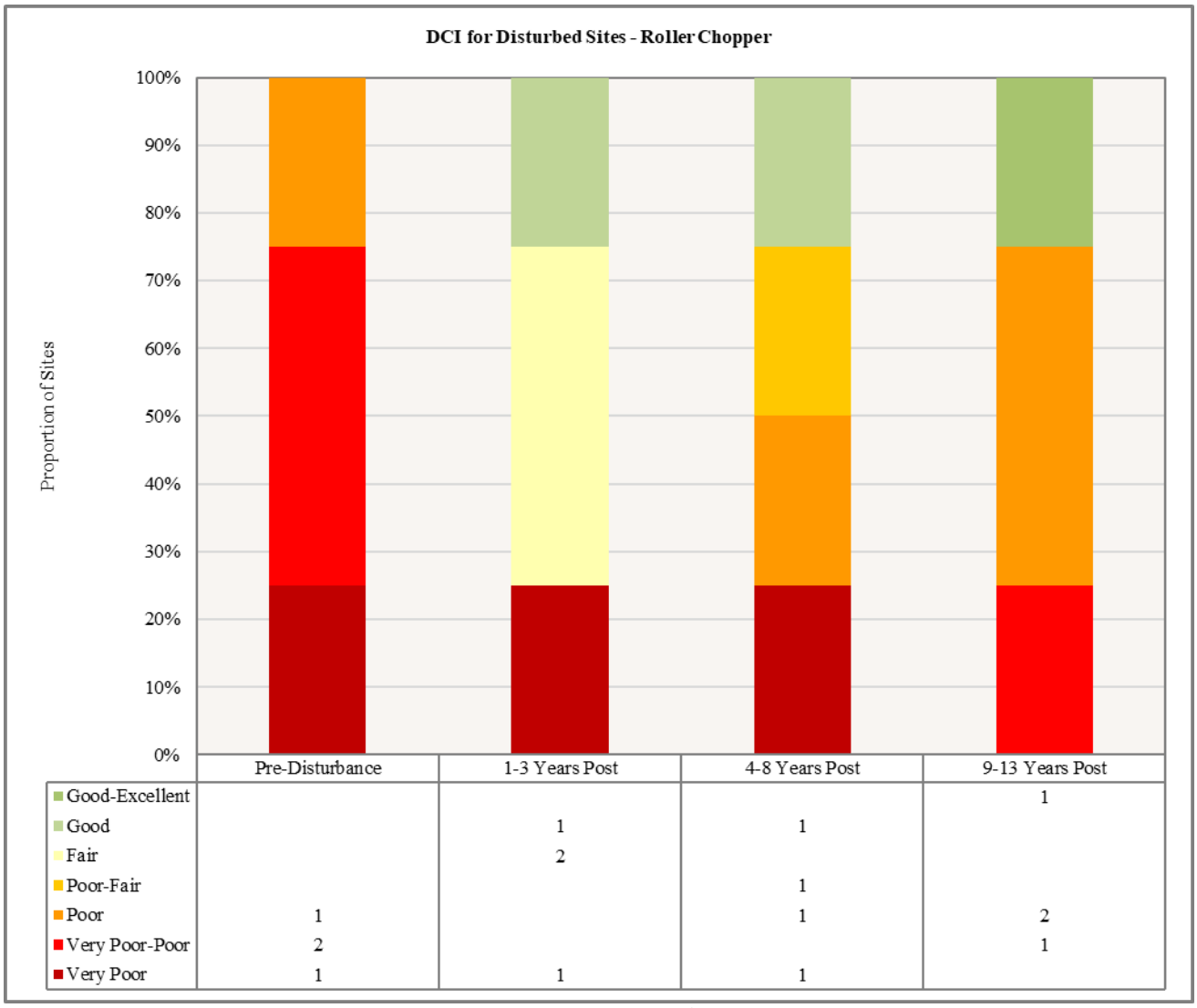


Figure 5.53: Deer winter range Desirable Components Index (DCI) summary by year of sites that have undergone a roller chopper treatment.

Study Number	Post Category	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
16R-06	0	3.5	0	0	24.1	0	6	0	**33.6**	**VP-P**
16R-06	1	7.3	13.7	15	30	0	5	0	**70.9**	**G**
16R-06	2	7.4	13.9	15	30	0	1.4	0	**67.7**	**G**
16R-06	3	21.9	14.7	15	25.9	0	3.5	0	**80.9**	**G-E**
16R-16	0	0.1	0	0	6.1	0	2.1	0	**8.3**	**VP**
16R-16	1	1.3	0	0	27.8	-0.1	1.1	0	**30**	**VP**
16R-16	2	1.9	0	0	30	0	0.2	0	**32**	**VP**
16R-16	3	3.3	0	0	30	0	0.8	0	**34.1**	**VP-P**
16R-31	0	18.2	4.9	11.1	0.5	0	2.9	0	**37.7**	**P**
16R-31	1	11.3	14.1	13.4	19.5	-0.1	1.8	0	**60**	**F**
16R-31	2	10.4	13.8	11.2	16.5	0	0.2	0	**52**	**P-F**
16R-31	3	14.4	11.7	8.7	9.9	0	0.4	0	**44.9**	**P**
16R-32	0	25.1	4.8	3.1	1.6	0	0.3	0	**34.8**	**VP-P**
16R-32	1	11.4	11.9	10.7	24.2	0	1.1	0	**59.2**	**F**
16R-32	2	12.4	12.1	6.8	14.5	0	0.2	0	**45.8**	**P**
16R-32	3	15	11.1	5.2	11.3	0	0.6	0	**43.2**	**P**

Table 5.6: Deer winter range Desirable Components Index (DCI) information by site number of study sites that have undergone a roller chopper treatment. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

Tree Push

There are four study sites that have undergone a tree push treatment. Two of these studies [Cold Springs WMA (11R-16) and Flat Iron Mesa (11R-20)] are considered to be mountain ecological sites and two [Lower Cedar Bench (16R-11) and Upper Cedar Bench (16R-12)] are classified as upland ecological sites.

Shrubs/Trees: Average shrub cover on mountain study sites has decreased significantly over time, with preferred browse species as the main component. The Flat Iron Mesa study provides much of the preferred browse cover on these sites and data is only available for the pre-treatment sample year. As such, Cold Springs WMA provides all of the cover for the first post-treatment sample year, and site-level data reveals that cover has remained stable between sample years. On upland study sites, sagebrush species (*Artemisia sp.*) dominate the preferred browse component and shrub cover has exhibited an overall increase following treatment (**Figure 5.54**).

Average preferred demographic data shows that density has decreased on mountain sites and that mature individuals have comprised a majority of the plant populations in both sample years. Density on upland sites has exhibited an overall increase and that composition of the populations has shifted. Decadent plants were the most abundant demographic before treatment, but have decreased over time. Recruitment of young plants on both sites increased significantly in the second post-treatment sample year, but decreased afterwards. Mature individuals have been the most abundant demographic in the plant populations during other samplings (**Figure 5.57**). Mean utilization of preferred browse has increased on mountain sites, with 40% of plants being moderately hedged in the first post-treatment sample year. Utilization has also increased on upland study sites: 16% of plants were moderately used and 50% heavily used during the third sample year after treatment (**Figure 5.58**).

Tree cover on mountain study sites has decreased from pre-treatment levels. Furthermore, conifer cover decreased and quaking aspen (*Populus tremuloides*) contributed all of the tree cover in the first post-treatment sample year. Average tree density has increased, with aspen being the only species sampled in the first study year after treatment. Again, trends for mountain study sites can primarily be attributed to differences in number of studies sampled from year to year. Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) have been the tree species sampled on upland study sites, and cover has decreased over time. In addition. All post-treatment cover has been contributed by the Lower Cedar Bench study. However, both studies have contributed density data in all sample years (**Figure 5.55**, **Figure 5.56**).

Herbaceous Understory: The herbaceous understories on mountain study sites have increased in both cover and frequency, although composition has varied. Perennial forbs contributed most of the frequency and cover prior to treatment. However, perennial grasses and annual forbs increased, becoming co-dominant with perennial forbs in the first post-treatment sampling: this shift in composition can be entirely attributed to the Cold Springs WMA study. Herbaceous cover has increased overall on upland study sites, with mainly native perennial grasses as the primary component. Average nested frequency has exhibited a slight decrease, but this is mainly due to a decrease in annual forbs; perennial grass abundance has slightly increased overall (**Figure 5.59**, **Figure 5.60**).

Occupancy: Pellet group transect data indicates that pellet group abundance has remained low on mountain study sites, but has increased overall. Deer and elk were the primary occupants prior to treatment, and deer were the sole primary occupants in the first post-treatment sample year. Mean abundance of deer pellet groups was 3 days use/acre before treatment and 6 days use/acre afterwards. Elk had an average pellet group abundance of 3 days use/acre prior to treatment and 2 days use/acre in the first post-treatment sample year. Mean abundance of cattle pellet groups was 0.7 days/acre prior to and 4 days use/acre after treatment.

Average pellet group abundance has decreased overall on upland sites. Deer have been the primary occupants in all study years. Mean abundance of deer pellet groups has ranged from 47 days use/acre in the third post-treatment sample year to 87 days use/acre before treatment. Elk have also been present, with an average pellet group abundance as low as 10 days use/acre in the third sample year after treatment and as high as 55 days

use/acre in the second post-treatment sampling. Finally, cattle were present in the third post-treatment sample year with a mean pellet group abundance of 2 days use/acre. However, cattle pellet groups have not been observed in any other sample year (**Figure 5.61**).

Deer Winter Range Condition Assessment: The condition of deer winter range on sites that have undergone a tree push treatment has continually changed over the sample period. These sites within the Southeastern Region are considered to be within fair-good and good condition. The Lower Cedar Bench study remained in good condition, while the Upper Cedar Bench site deteriorated slightly from good to fair-good condition (**Figure 5.62**, **Table 5.7**).

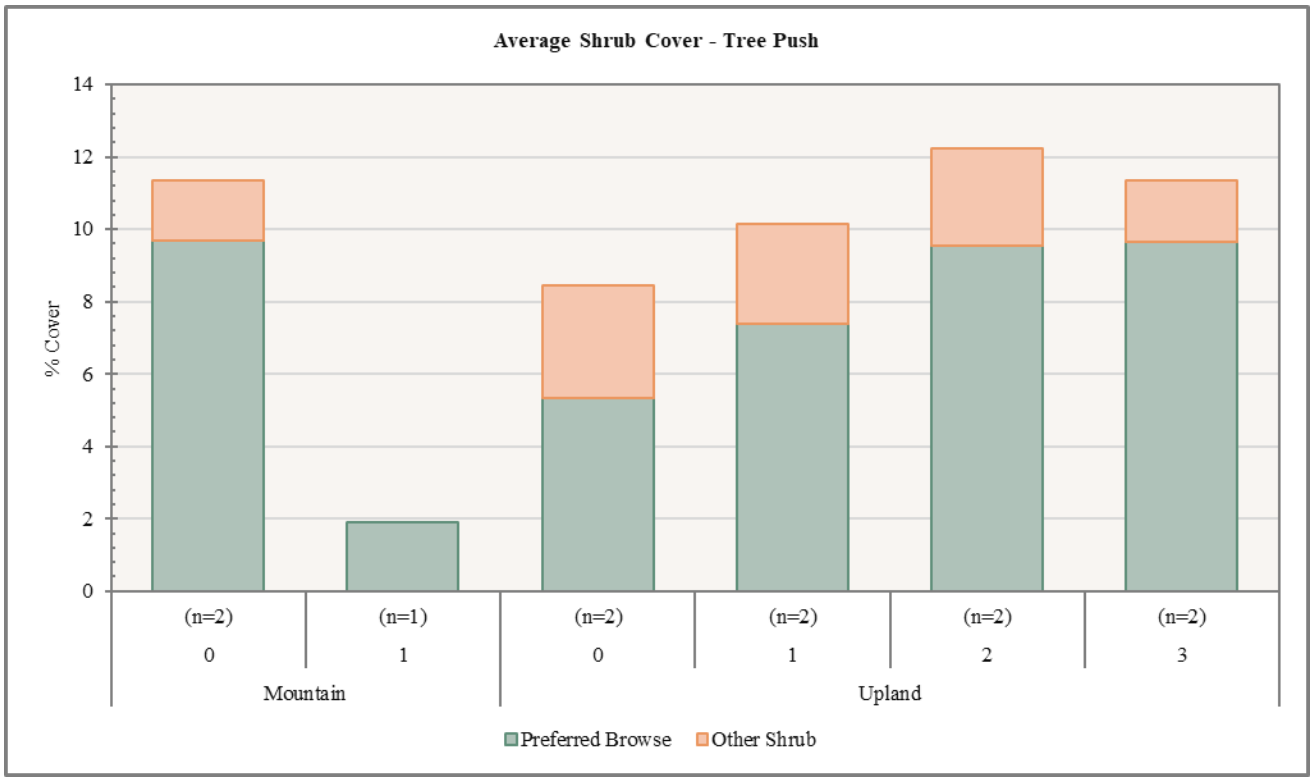


Figure 5.54: Average shrub cover on mountain and upland study sites that have undergone a tree push treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

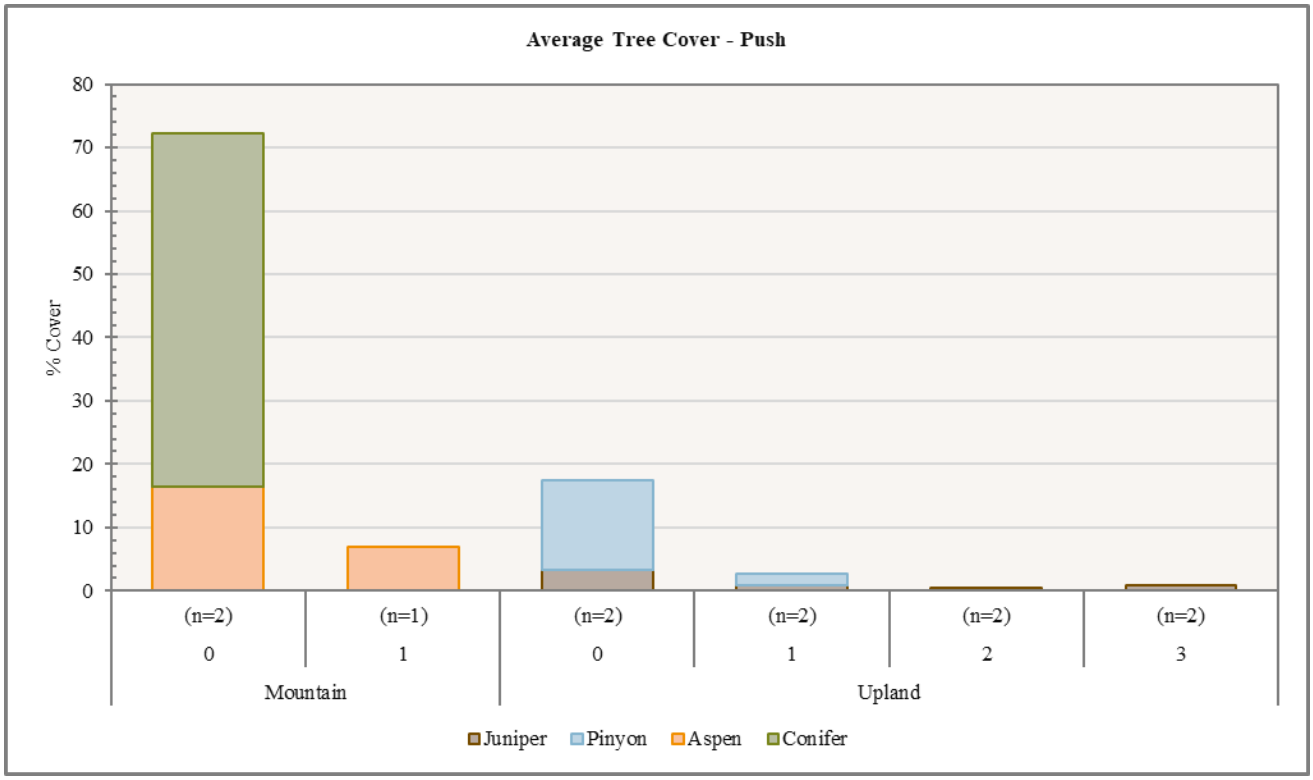


Figure 5.55: Average tree cover on mountain and upland study sites that have undergone a tree push treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

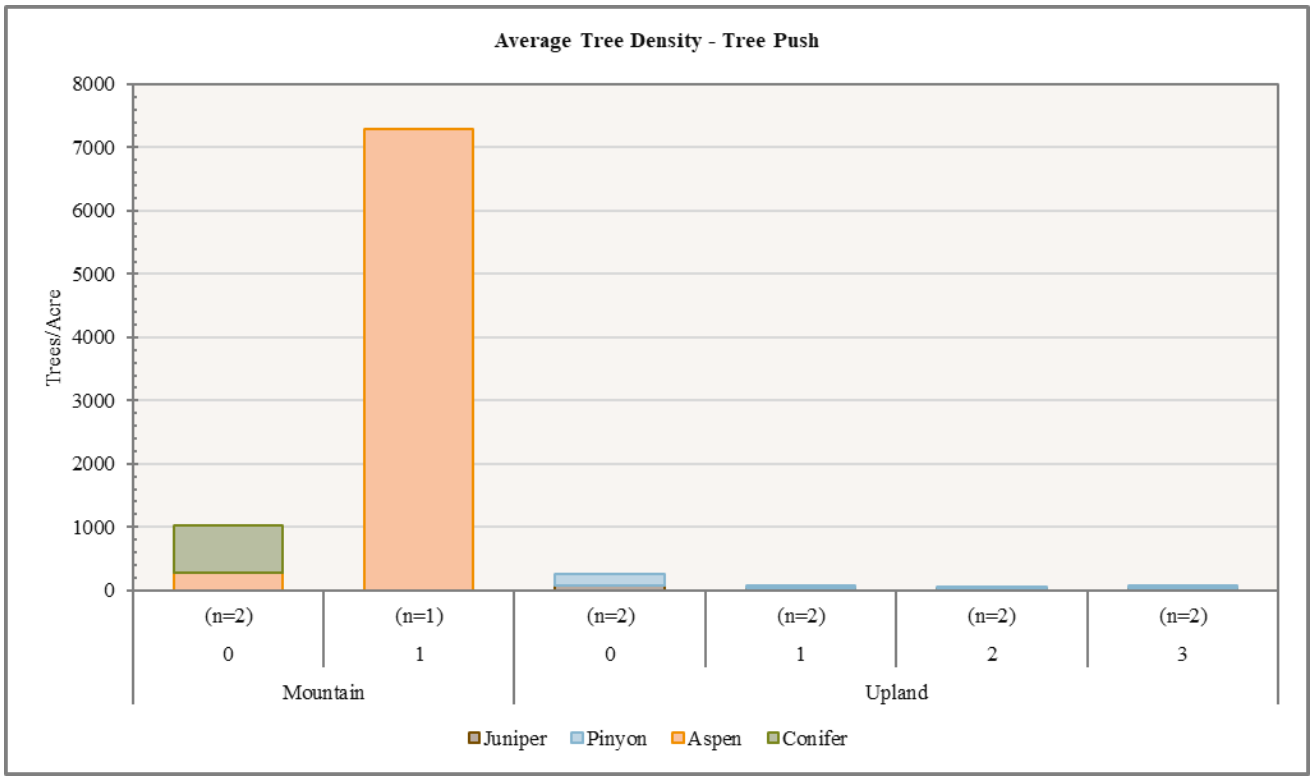


Figure 5.56: Average tree density on mountain and upland study sites that have undergone a tree push treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

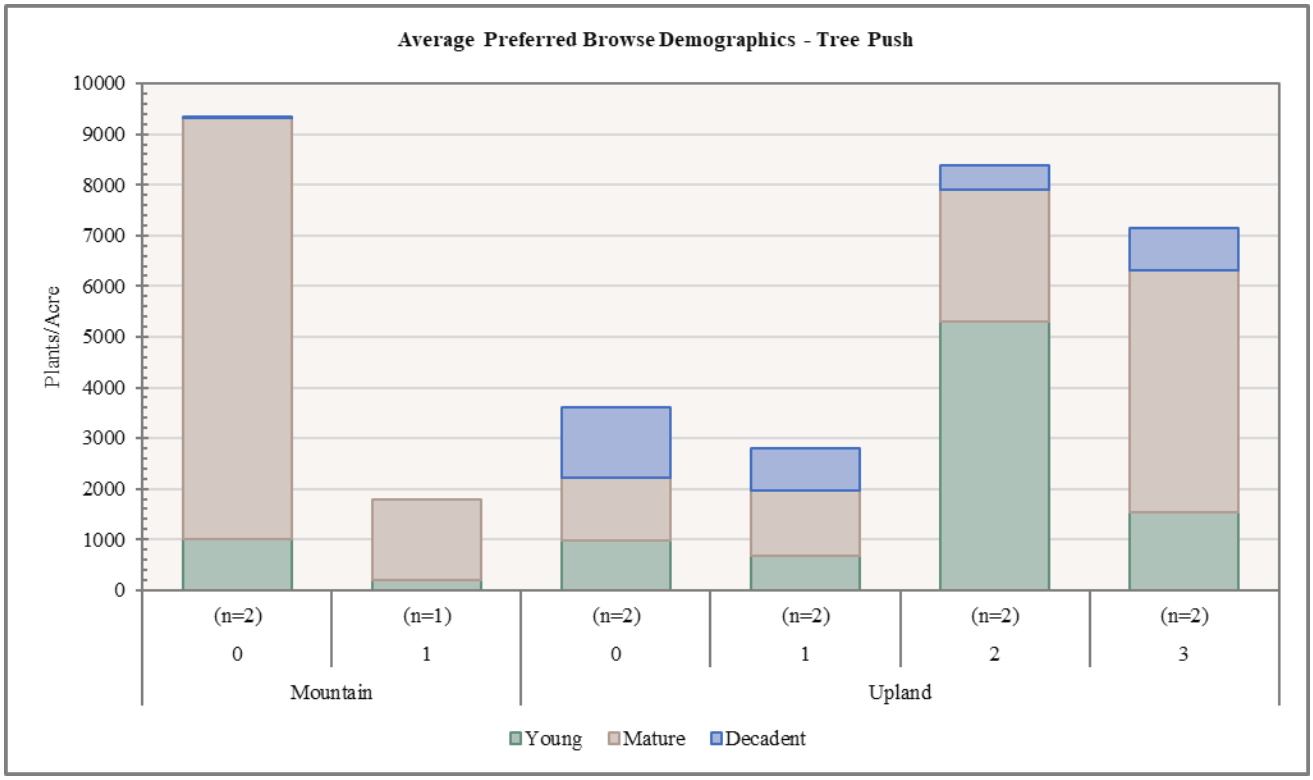


Figure 5.57: Average preferred browse demographics on mountain and upland study sites that have undergone a tree push treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

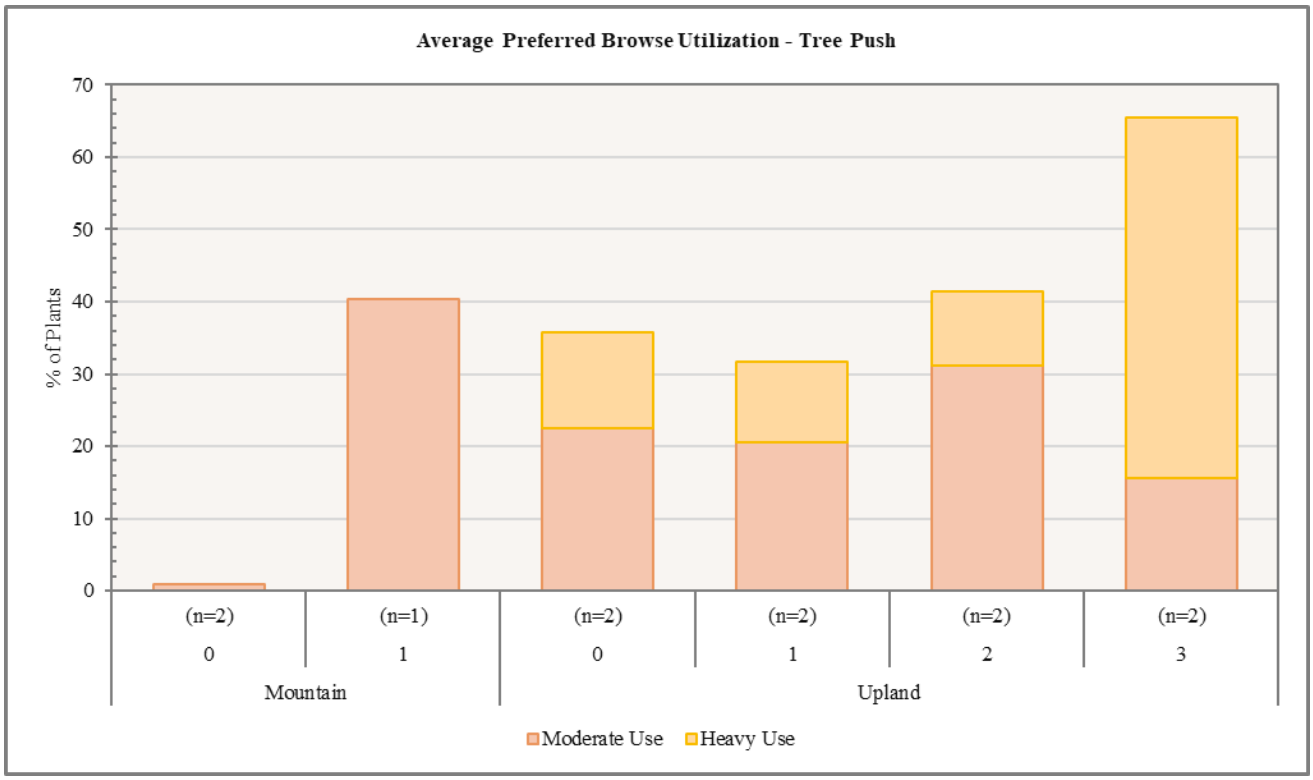


Figure 5.58: Average preferred browse utilization on mountain and upland study sites that have undergone a tree push treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

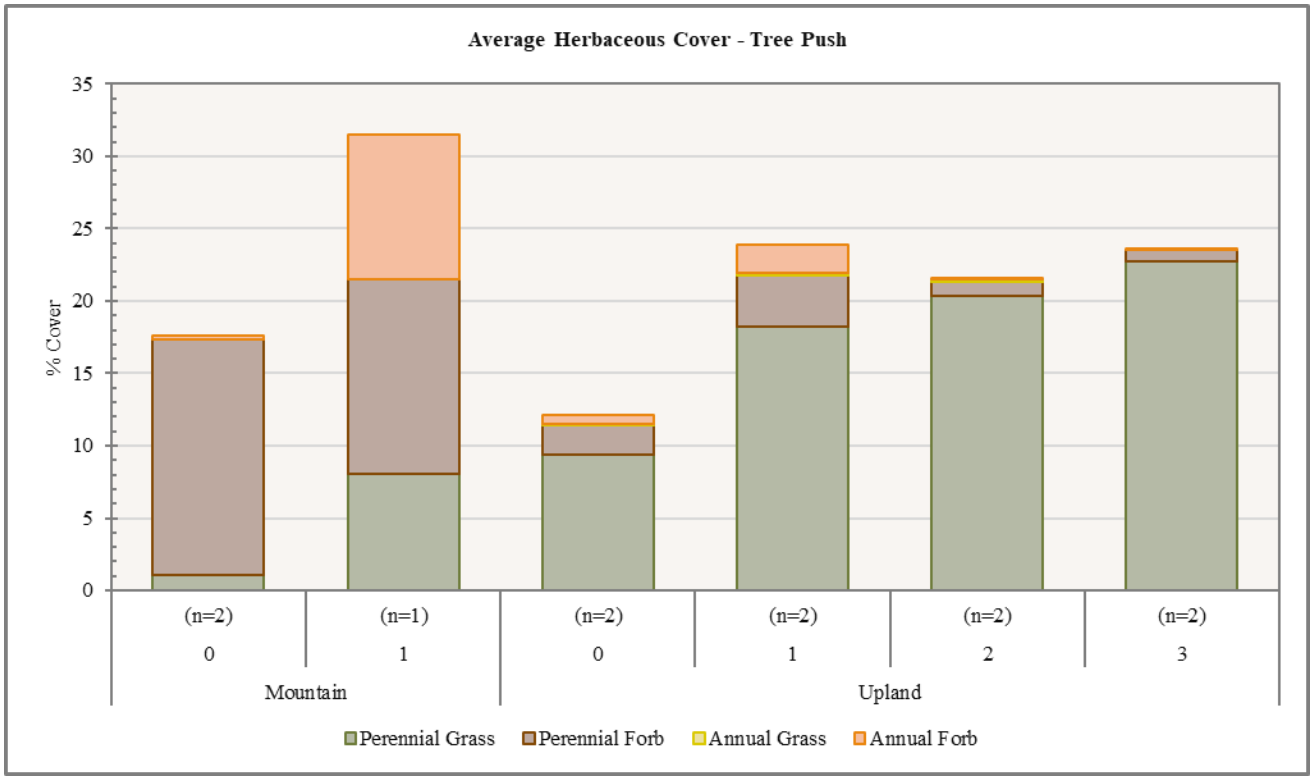


Figure 5.59: Average herbaceous cover on mountain and upland study sites that have undergone a tree push treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

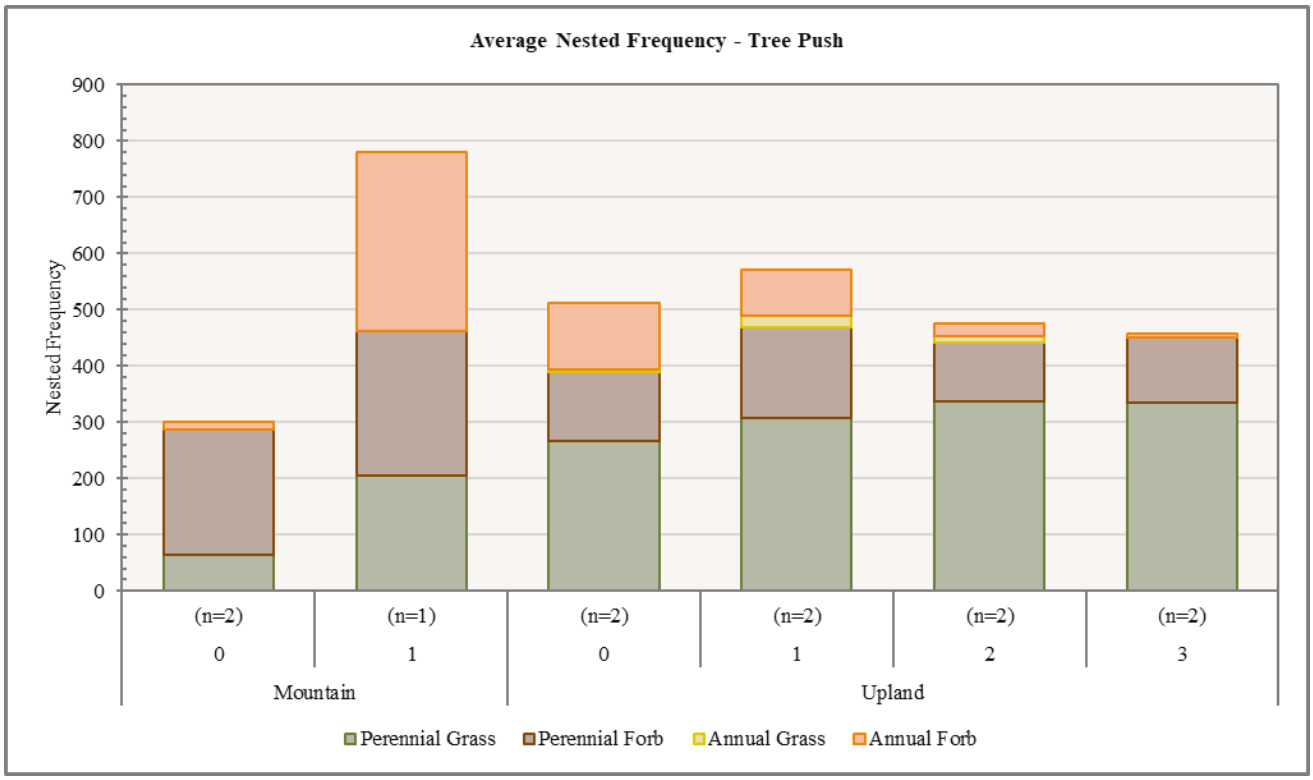


Figure 5.60: Average nested frequency of herbaceous species on mountain and upland study sites that have undergone a tree push treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

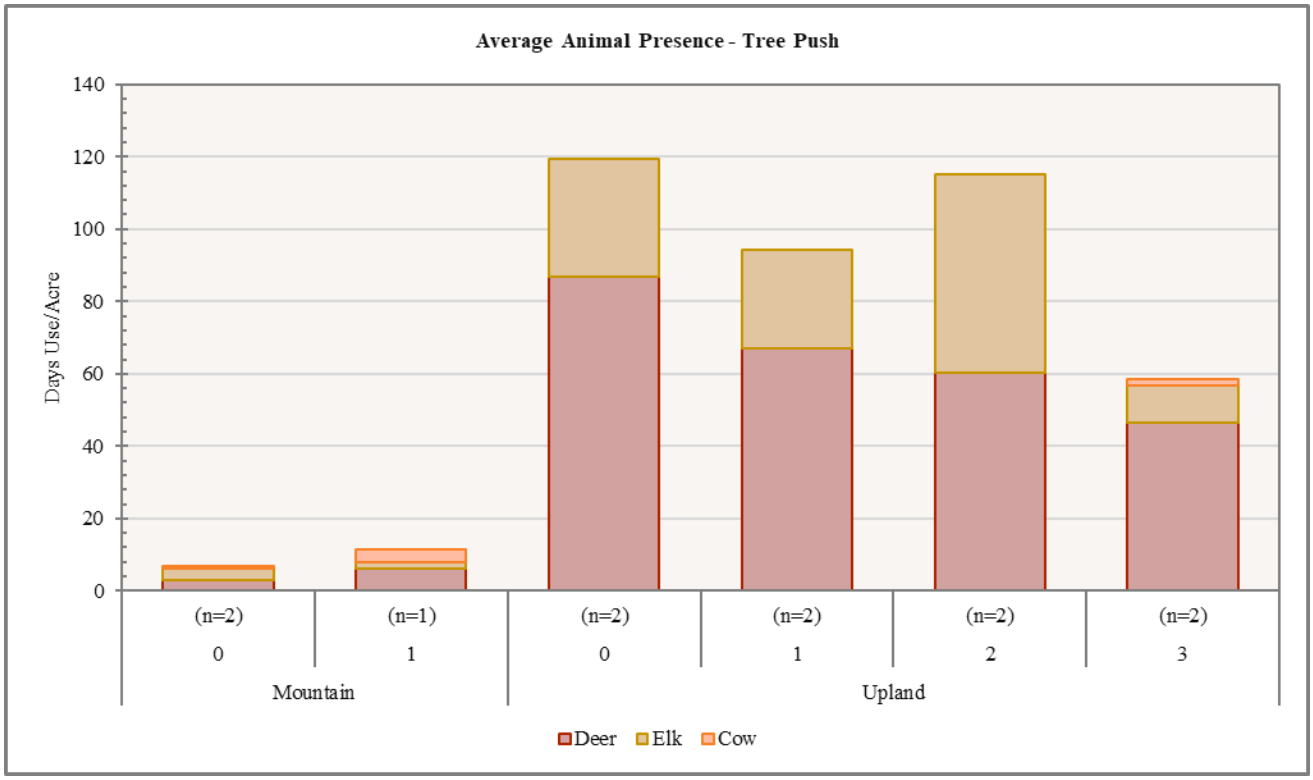


Figure 5.61: Average pellet transect data on mountain and upland study sites that have undergone a tree push treatment. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

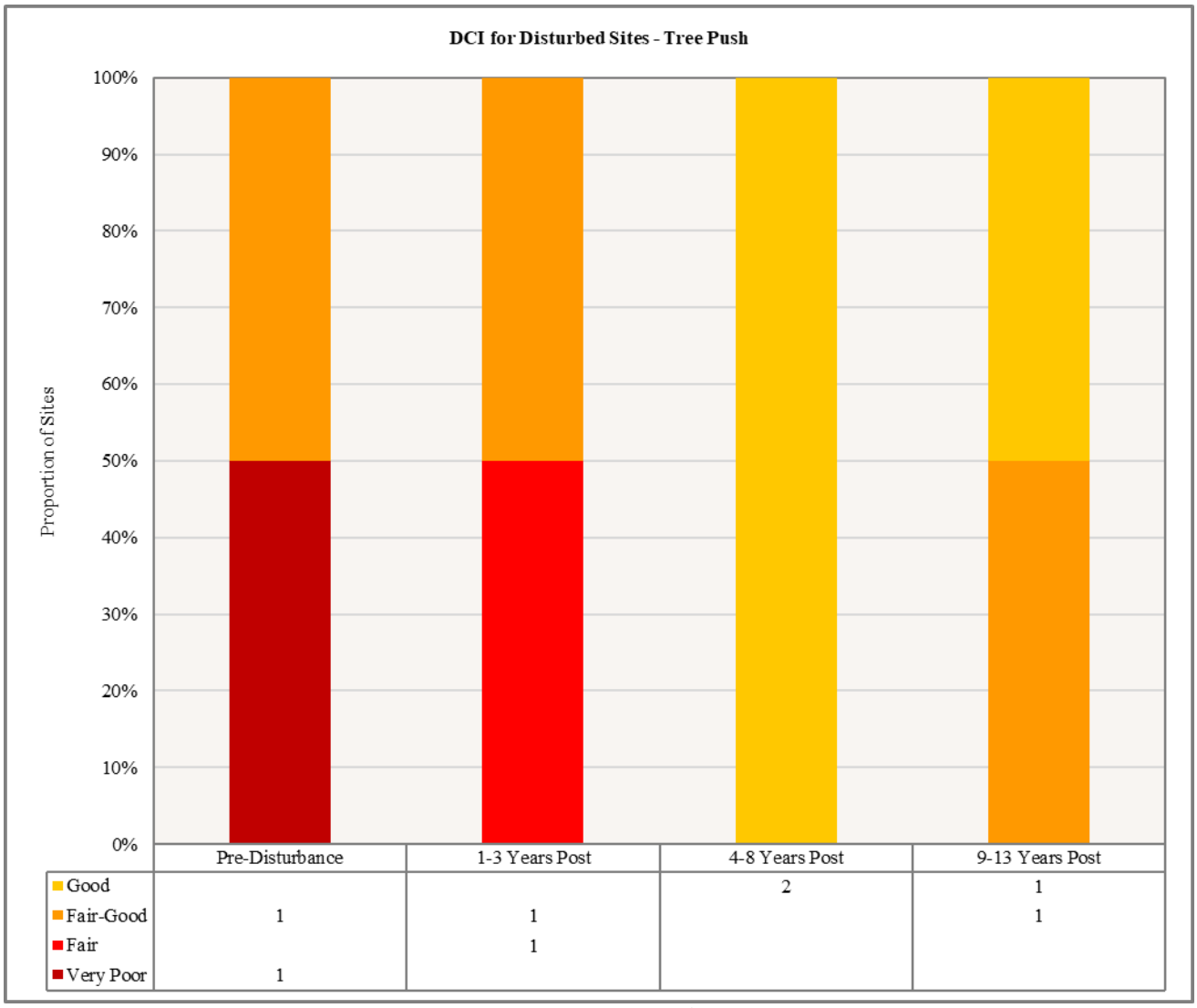


Figure 5.62: Deer winter range Desirable Components Index (DCI) summary by year of sites that have undergone a tree push treatment.

Study Number	Post Category	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
16R-11	0	5.3	0	0	10.2	-0.1	1.9	0	**17.2**	**VP**
16R-11	1	9.8	7.7	15	28.9	-0.2	5.8	0	**66.9**	**F-G**
16R-11	2	15	13.9	15	30	-0.2	2.4	0	**76**	**G**
16R-11	3	12.9	11.5	11.9	30	0	1.5	0	**67.7**	**G**
16R-12	0	8.1	7.1	15	27.3	0	6.4	0	**64**	**F-G**
16R-12	1	8.8	5.1	4.4	30	-0.1	8.4	0	**56.6**	**F**
16R-12	2	8.9	12.7	15	30	0	1.7	0	**68.3**	**G**
16R-12	3	11.3	11.8	9.8	30	0	1.8	0	**64.7**	**F-G**

Table 5.7: Deer winter range Desirable Components Index (DCI) information by site number of study sites that have undergone a tree push treatment. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

Seeding (Drill)

There are six study sites have been drill seeded. Of these study sites, two [Box Canyon Sage-Grouse (16C-42) and Wildcat Disking (16R-37)] are classified as mountain ecological sites and four [Hart Draw Flat 1 (14R-09), Harts Windmill (14R-11), South Plain 2 (14R-29), and Brushy Flat (14R-42)] are considered to be upland ecological sites.

Shrubs/Trees: Average shrub cover on mountain study sites has varied from year to year, but has increased overall; sagebrush species (*Artemisia sp.*) are the dominant preferred browse species on these sites. Examination of site-level data indicates that the Box Canyon Sage-Grouse study provides nearly all of the cover on mountain sites. As this study does not have data for the first sample year following treatment, the average cover value decreased significantly during that year. Shrub cover on upland study sites has also fluctuated, but has remained largely stable when comparing pre-treatment data to that of the third post-treatment sample year. Preferred browse species contributed most of the shrub cover prior to and initially following treatment. However, other shrubs excluding preferred browse have increased, and they became the dominant component in the second post-treatment year. Again, this can largely be attributed to variation in number of studies and differences in which studies were sampled from year to year (**Figure 5.63**).

Average preferred browse demographics indicate that density on study sites of both ecological types has followed the same trend as cover: density has decreased overall. On both mountain and upland ecological sites, mature individuals have comprised a majority of the plant populations in all sample years. In addition, decadence and recruitment of young has decreased overall on sites of these ecological types (**Figure 5.64**). Preferred browse utilization has also exhibited an overall decrease over the study period on sites of both ecological types (**Figure 5.65**). Again, these demographic and utilization trends are in part driven by variations in 'n values' between sample years.

Herbaceous Understory: The herbaceous understories of the mountain study sites have increased in both cover and frequency and are primarily composed of native and introduced perennial grasses. However, annual forbs were the most dominant component during the first post-treatment sample year: this is entirely due to the Wildcat Disking study. Annual grasses have been rare and only observed on the Wildcat Disking study. Overall nested frequency has decreased over time on this site, largely due to annual forbs. The upland understories initially increased in cover and nested frequency, but significantly decreased in subsequent years. These fluctuations can largely be attributed to differences in the number of studies sampled from year to year. South Plain 2 is the only study site with data for the first post-treatment sample year, and Hart Draw Flat 1 and Harts Windmill provide all data for the second and third post-treatment samplings. Composition of these understories has fluctuated. A mixture of annual grasses and forbs and perennial grasses were co-dominant before treatment and during the first sampling afterwards, whereas perennial grasses have been the main component in the second and third post-treatment sample years (**Figure 5.66**, **Figure 5.67**).

Occupancy: Average pellet transect data indicates that animal presence has increased on mountain ecological sites and that primary occupancy has varied. Elk were the primary occupants in the first and second sample years following treatment, and cattle have been the main occupants in all other years. Cattle pellet groups have had a mean abundance ranging from 0 days use/acre in the first post-treatment sample year to 42 days use/acre during the third sampling after treatment. Mean abundance of elk pellet groups has been as low as 7 days use/acre in the third post-treatment sample year and as high as 24 days use/acre in the second sample year after treatment. Deer have had a mean abundance of pellet groups fluctuating between 1 days use/acre prior to treatment and during the first and third post-treatment samplings and 2 days use/acre in the second sample year following treatment.

Animal presence has decreased overall on upland study sites, with cattle as the primary occupants in all sample years. Mean abundance of cattle pellet groups has been as low as 12 days use/acre in the first post-treatment sample year and as high as 29 days use/acre prior to treatment. Elk have also been present on these sites, with an average pellet group abundance ranging from 0 days use/acre in the second and third post-treatment sample years to 9 days use/acre during the first sampling after treatment. Finally, mean abundance of deer pellet

groups has fluctuated between 1 days use/acre in the first sample year after treatment and 5 days use/acre during the second post-treatment sample year (**Figure 5.68**).

Deer Winter Range Condition Assessment: The condition of deer winter range on sites that have been drill seeded has continually changed over the sample period. These sites within the Southern Region are considered to be within very poor to good condition, with most studies remaining stable or exhibiting minor fluctuations. The Bitter Creek, Bitter Creek Herbicide, and Bar X Wash - Bitter Creek sites (which were not discussed above) and the Brushy Flat study were in very poor condition when they were established prior to treatment. Hart Draw Flat 1, Harts Windmill, and South Plain 2 remained in very poor condition, while the Wildcat Disking study stayed in very poor-poor condition. Finally, the Box Canyon Sage-Grouse study improved from fair to good condition (**Figure 5.69**, **Table 5.8**).

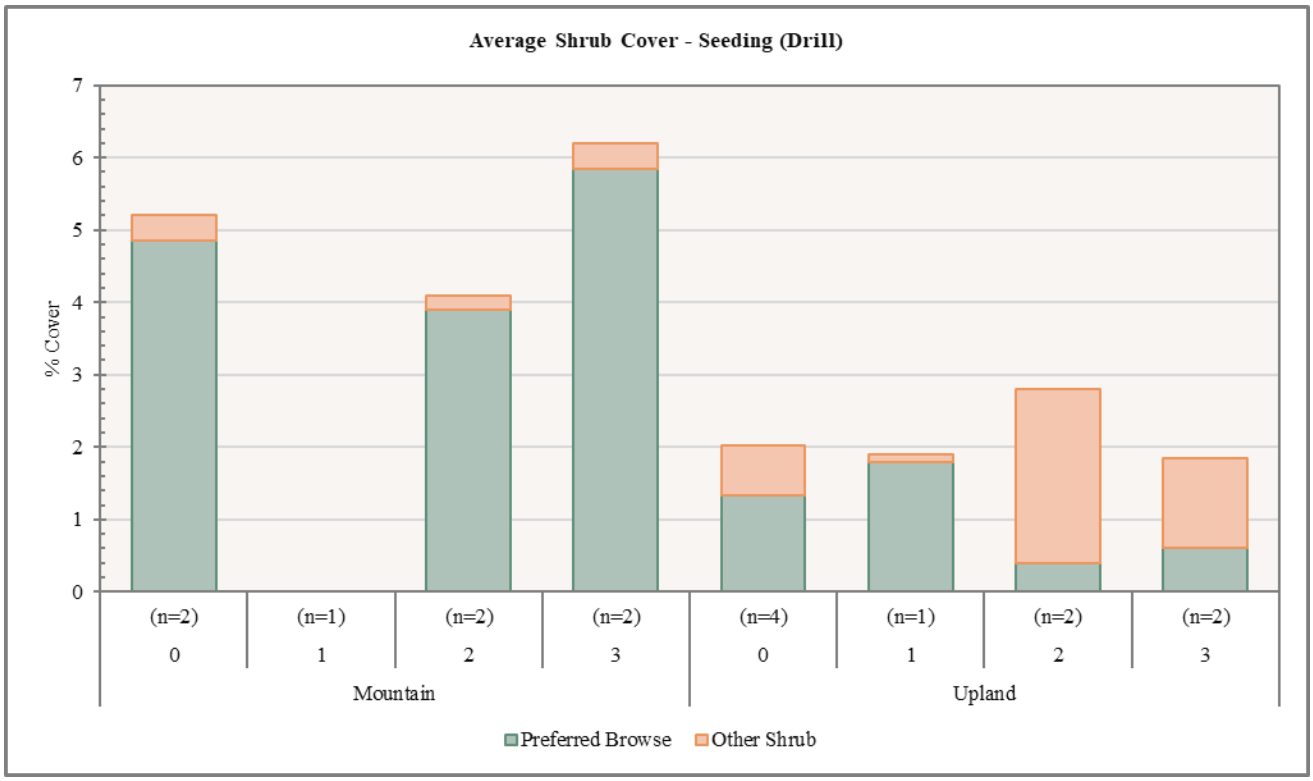


Figure 5.63: Average shrub cover on mountain and upland study sites that have been drill seeded. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

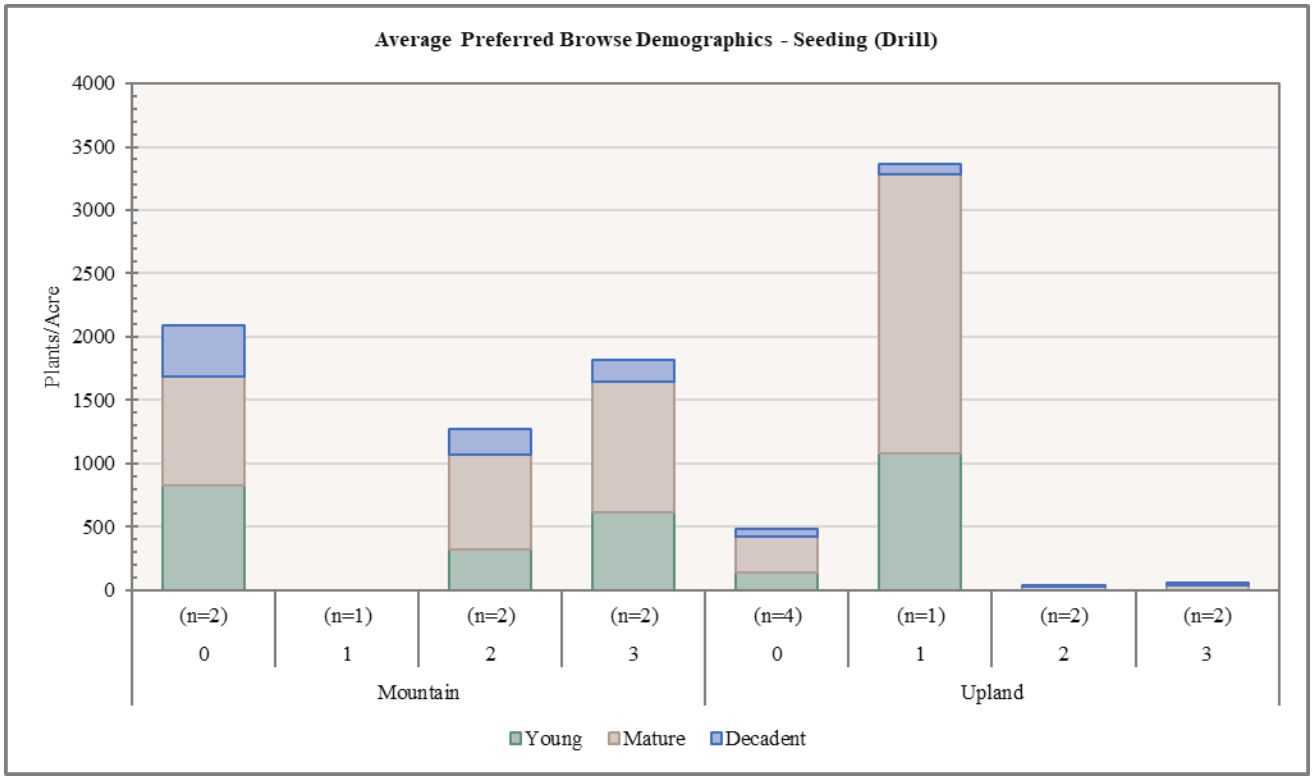


Figure 5.64: Average preferred browse demographics on mountain and upland study sites that have been drill seeded. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

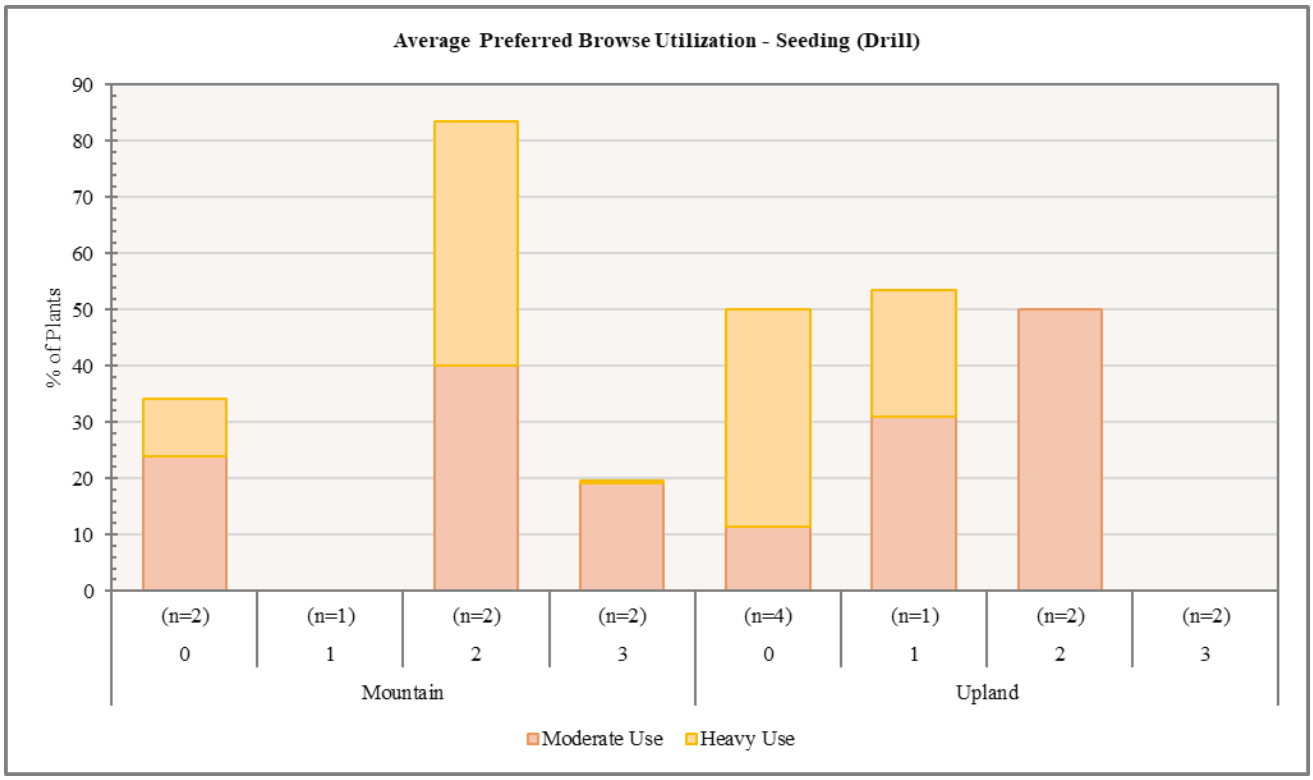


Figure 5.65: Average preferred browse utilization on mountain and upland study sites that have been drill seeded. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

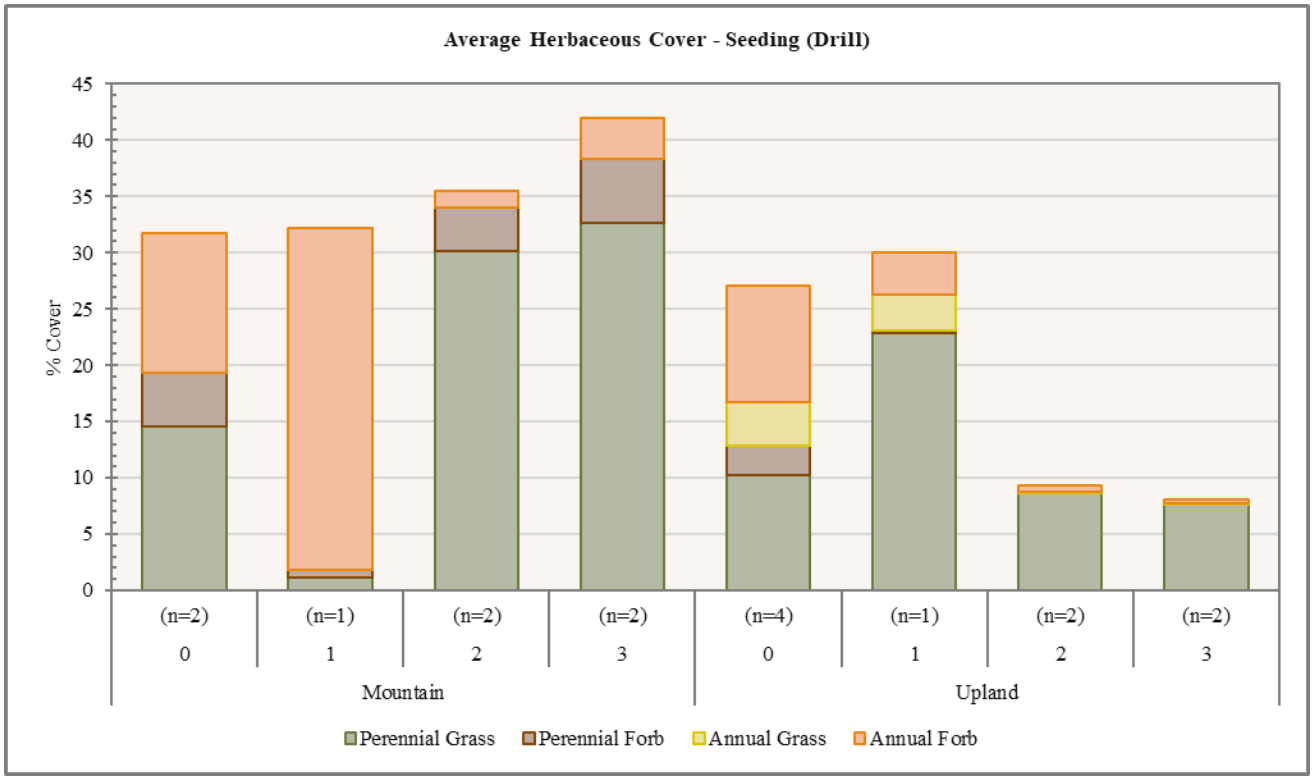


Figure 5.66: Average herbaceous cover on mountain and upland study sites that have been drill seeded. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

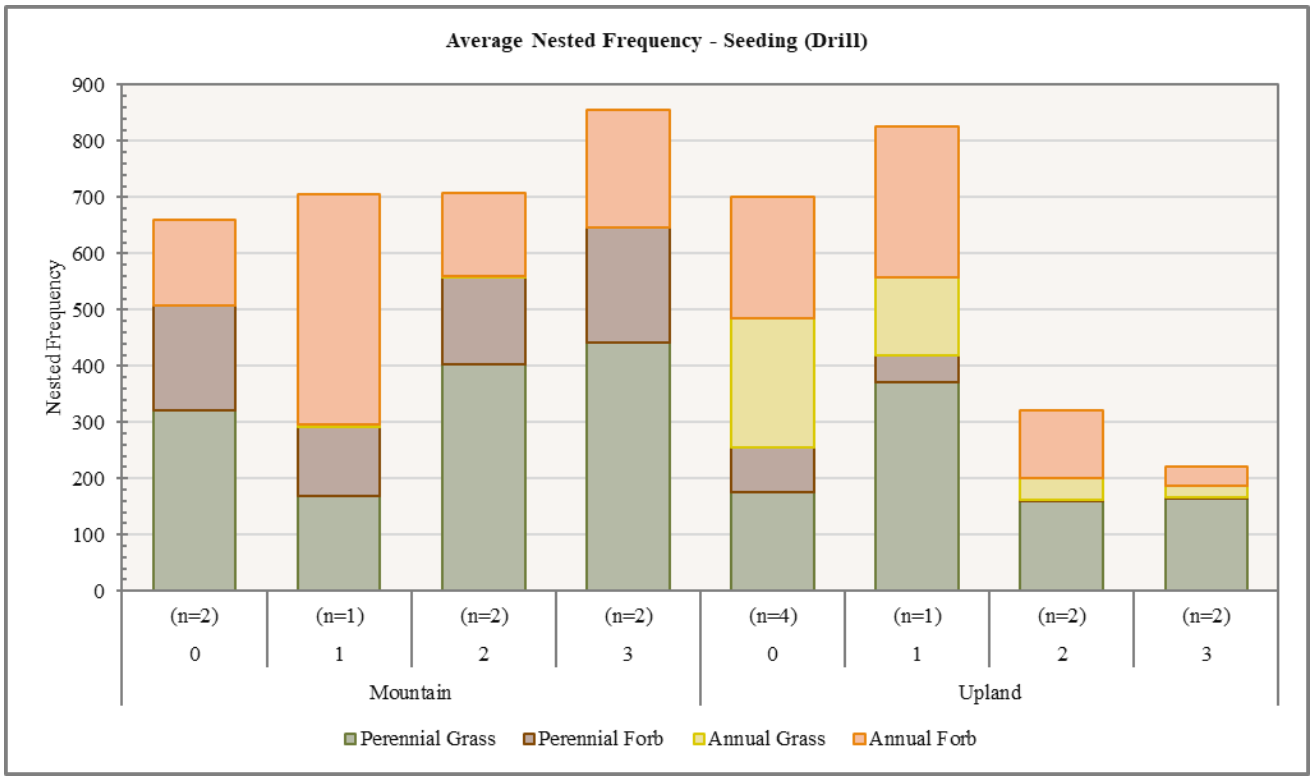


Figure 5.67: Average nested frequency of herbaceous species on mountain and upland study sites that have been drill seeded. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

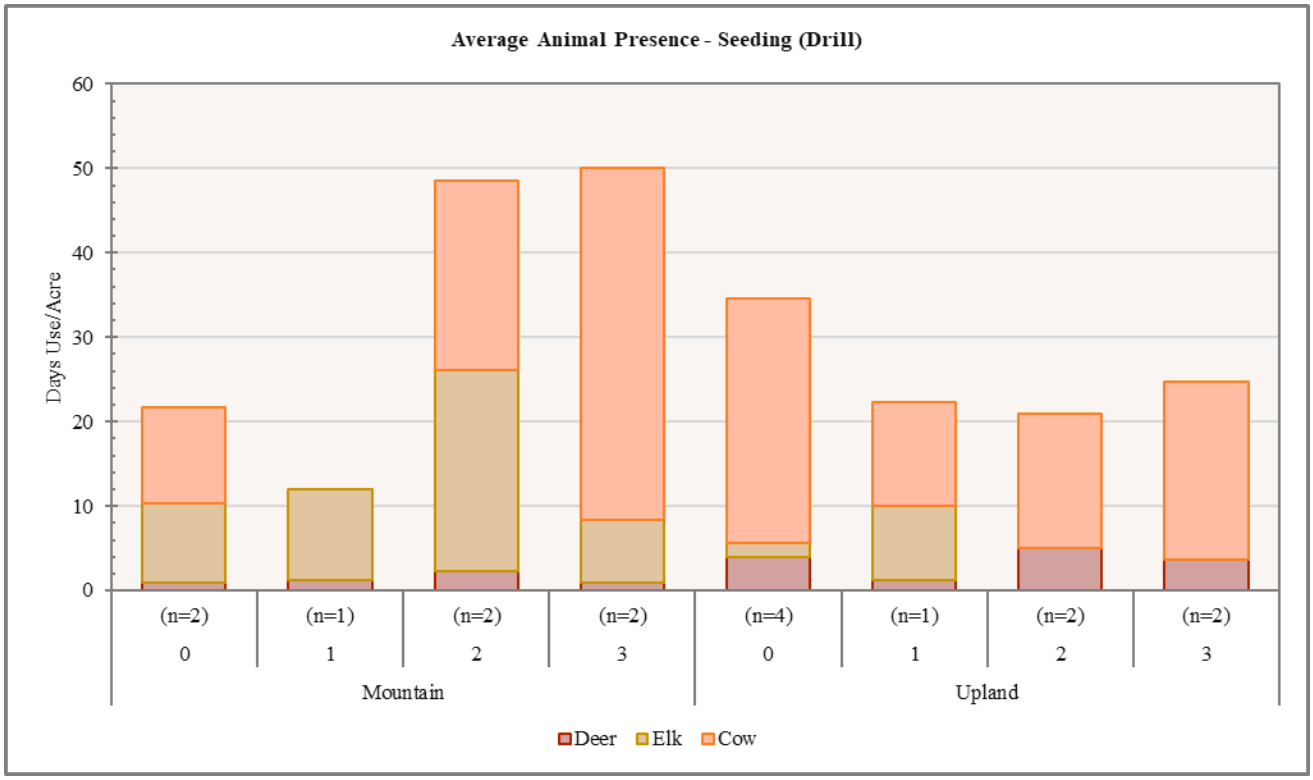


Figure 5.68: Average pellet transect data on mountain and upland study sites that have been drill seeded. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment. Upland deer pellets include deer/antelope.

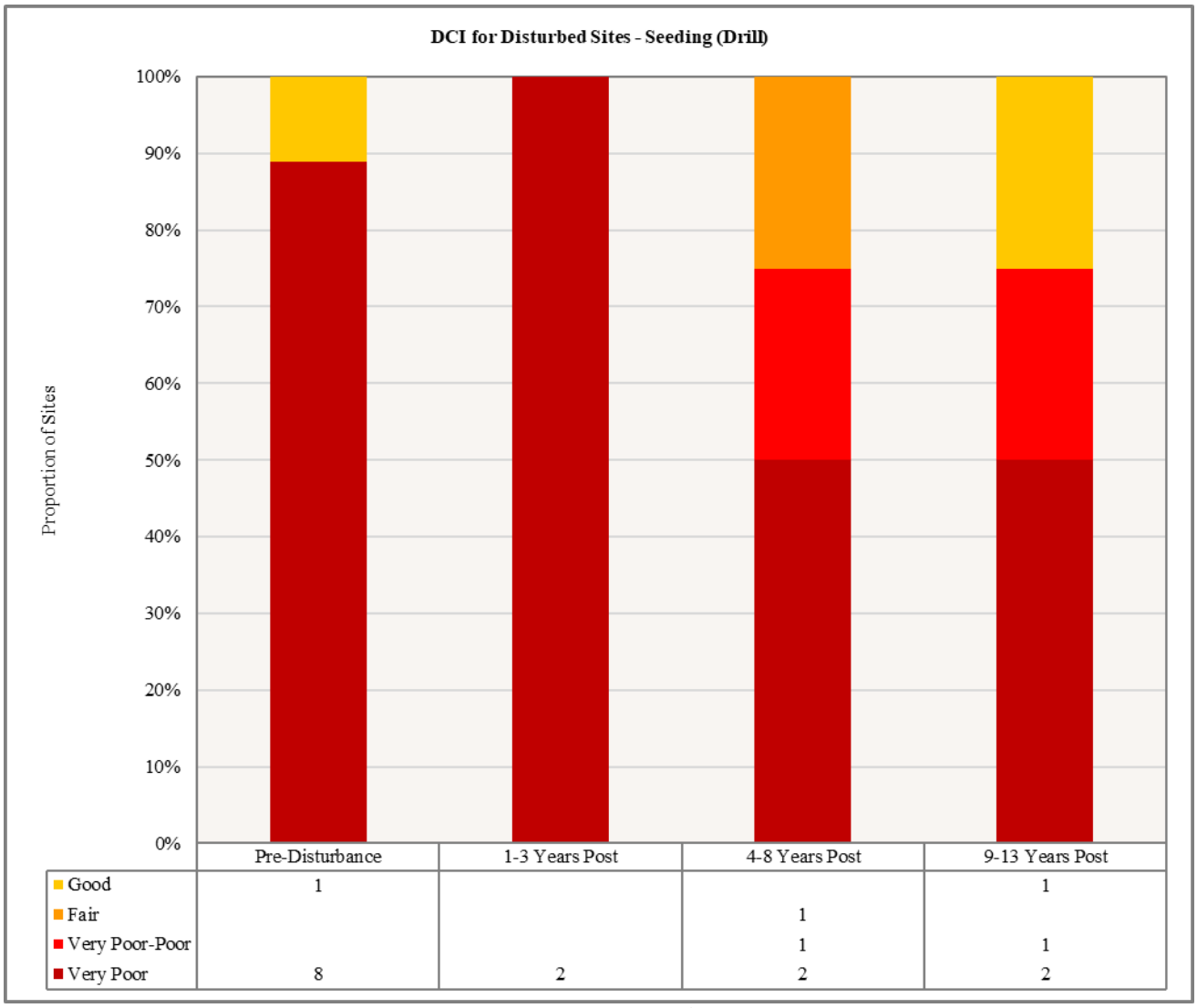


Figure 5.69: Deer winter range Desirable Components Index (DCI) summary by year of sites that have been drill seeded.

Study Number	Post Category	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
10R-50	0	5.3	0	0	14.9	-20	0.1	0	**0.3**	**VP**
10R-54	0	0.6	0	0	10.1	-20	2.2	0	**-7.1**	**VP**
10R-63	0	0	0	0	6.9	-7.9	1.8	0	**0.8**	**VP**
14R-09	0	0.6	0	0	23.6	-4.7	0.1	0	**19.6**	**VP**
14R-09	2	1	0	0	30	0	0	0	**31**	**VP**
14R-09	3	1.5	0	0	30	0	0.1	0	**31.6**	**VP**
14R-11	0	0	0	0	0.1	-6.4	0	0	**-6.2**	**VP**
14R-11	2	0	0	0	0.1	-0.2	0	0	**-0.1**	**VP**
14R-11	3	0	0	0	0.2	-0.1	0	0	**0.1**	**VP**
14R-29	0	1.9	0	0	30	-0.2	0.5	0	**32.2**	**VP**
14R-29	1	2.3	0	0	30	-2.4	0.4	0	**30.2**	**VP**
14R-42	0	4.1	0	0	0	-0.3	10	0	**13.8**	**VP**
16C-42	0	12.1	9.4	15	30	0	10	0	**76.6**	**G**
16C-42	2	9.6	9.1	8.6	30	0	7.3	0	**64.6**	**F**
16C-42	3	14.2	11.4	15	30	0	9.2	0	**79.8**	**G**

Study Number	Post Category	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
16R-37	0	0	0	0	9.4	0	3.5	0	**12.9**	**VP**
16R-37	1	0	0	0	2.4	0	1.3	0	**3.6**	**VP**
16R-37	2	0.1	0	0	30	0	8.2	0	**38.3**	**VP-P**
16R-37	3	0.4	0	0	30	0	10	0	**40.4**	**VP-P**

Table 5.8: Deer winter range Desirable Components Index (DCI) information by site number of study sites that have been drill seeded.
VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. 0 = pre-treatment, 1 = 1 – 3 years post-treatment, 2 = 4 – 8 years post-treatment, 3 = 9 – 13 years post-treatment.

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APPENDIX A - THREAT ASSESSMENT

Annual Grass:

Species: *Bromus tectorum, B. rubens, Taeniatherum caput-medusae, Eremopyrum triticeum*

Low: If present, automatically a threat. Present-3% in ANY sample year.*
Medium: 3-7% cover in ANY sample year.*
High: >7% cover in ANY sample year.*

Potential impact*:* Increased fire potential and reduced herbaceous diversity.
*The study sites are not monitored yearly, so it cannot be said with absolute confidence that the seedbank has been depleted even if cover was low in the most sample year. As such, one should err on the side of what has already occurred and what is therefore possible.

Introduced Perennial Grasses:

Species: *Thinopyrum intermedium, Bromus inermis, Agropyron cristatum, Poa pratensis, Psathrostachys juncea, Poa bulbosa*

Low: 1% of actual cover has to be contributed by a single species AND ratio to total perennial grass cover has to be up to 20%.
Medium: 20-50% of total perennial grass cover is contributed by introduced species.
High: >50% of total perennial grass cover is contributed by introduced species.

Potential Impact: Reduced diversity of desirable grass and forb species.

Noxious Weeds:

Low: If present, automatically a threat. Present-1% in ANY sample year.*
Medium: 1-5% cover in ANY sample year.*
High: >5% cover in ANY sample year. *

Potential Impact: Reduced diversity of desirable grass and forb species.
*The study sites are not monitored yearly, so it cannot be said with absolute confidence that the seedbank has been depleted even if cover was low in the most sample year. As such, one should err on the side of what has already occurred and what is therefore possible.

PJ Encroachment:

Species: *Juniperus osteosperma, J. scopulorum, Pinus edulis, P. monophylla*

Low: Phase I.
Medium: Phase I transitioning to Phase II or Phase II.
High: Phase II transitioning to Phase III or Phase III.

Potential Impact: Reduced understory shrub and herbaceous vigor.

Urban Development:

Low: On private or SITLA property that may be developed in the future AND near a community (ex: house or building nearby).
Medium: Development occurring nearby including road improvements and new roads.
High: Development occurring within one mile of the study site.

Potential Impact: Fragmentation and loss of habitat.

Tourism/Recreation:

Ski areas, golf courses, county parks, campgrounds, mountain bike trails, trailheads, ATV trails
Low: Minimal evidence of recreation occurring (ex: recent ATV or bike tracks, recent camping, general recreational activity, clay pigeon and bullet shells).
Moderate: In the process of becoming a high-activity area (ex: fire ring, beginnings of a trail).
High: High-activity area/area developed for recreation (ex: definite trails, tent pads).

Potential Impact: Loss of habitat, reduced shrub and herbaceous vigor.

Energy Development:

Low: Must meet one of the following:
a.) Site located in a known oil and/or gas reserve (ex: sites near Price, Book Cliffs, etc.).
b.) Site is in the vicinity of a wind or solar farm AND could reasonably be developed in the future (ex: Milford Flat).
c.) Site is adjacent to powerline.
d.) Site is adjacent to pipeline.
Medium: Site located in a known oil and/or gas reserve with road developments/improvements occurring in the area.
NOTE: No 'medium' option applicable for powerlines, pipelines, or wind or solar farms.
High: Must meet one of the following:
a.) Oil and gas developments are active within one mile of the study site.
b.) Site is in immediate vicinity of/adjacent to solar or wind farm.
c.) Powerline is actually on site.
d.) Pipeline is actually on site.

Potential Impact: Fragmentation and degradation/loss of habitat.

Agriculture:

Low: Site located in former agricultural field, has potential to revert back to agricultural land.
High: Site is converted back to agricultural land.

Potential Impact: Fragmentation and degradation/loss of habitat.

Animal use:

Categories determined using calculations based on pellet group data compared to ESD annual production values. Threat level is based on most recent sample year only.

NOTE: 'Low' risk can be assumed with any animal on site without being explicitly stated.
Medium: 50-75% of total production is used.
High: >75% of total production is used.

Potential Impact: Reduced diversity of desirable grass and forb species.

Woodcutting (excluding intentional habitat treatments):

Firewood, fenceposts

Low: Evidence that woodcutting is occurring in the vicinity.
NOTE: No 'medium' option applicable.
High: Off-road truck traffic for access, large amounts of tree debris, intensive woodcutting occurring.

Potential Impact: Fragmentation and degradation/loss of habitat.

Climate Change:

NOTE: 'Low' risk can be assumed for the whole state without being explicitly stated. Risk is only assessed when visible changes are occurring.
Moderate: Localized, patchy community shifts beginning compared to the reference/invaded state in the ESD description. One indicator may be high decadence in shrub communities and decreasing shrub density (ex: Black Mesa before 2019/Harts Draw studies).
High: A shift in the community has occurred that one could attribute to climate change (ex: shrub die-off, Ruin Park/Alkali Flat studies).

Potential Impact: Plant community shifts, loss of habitat.