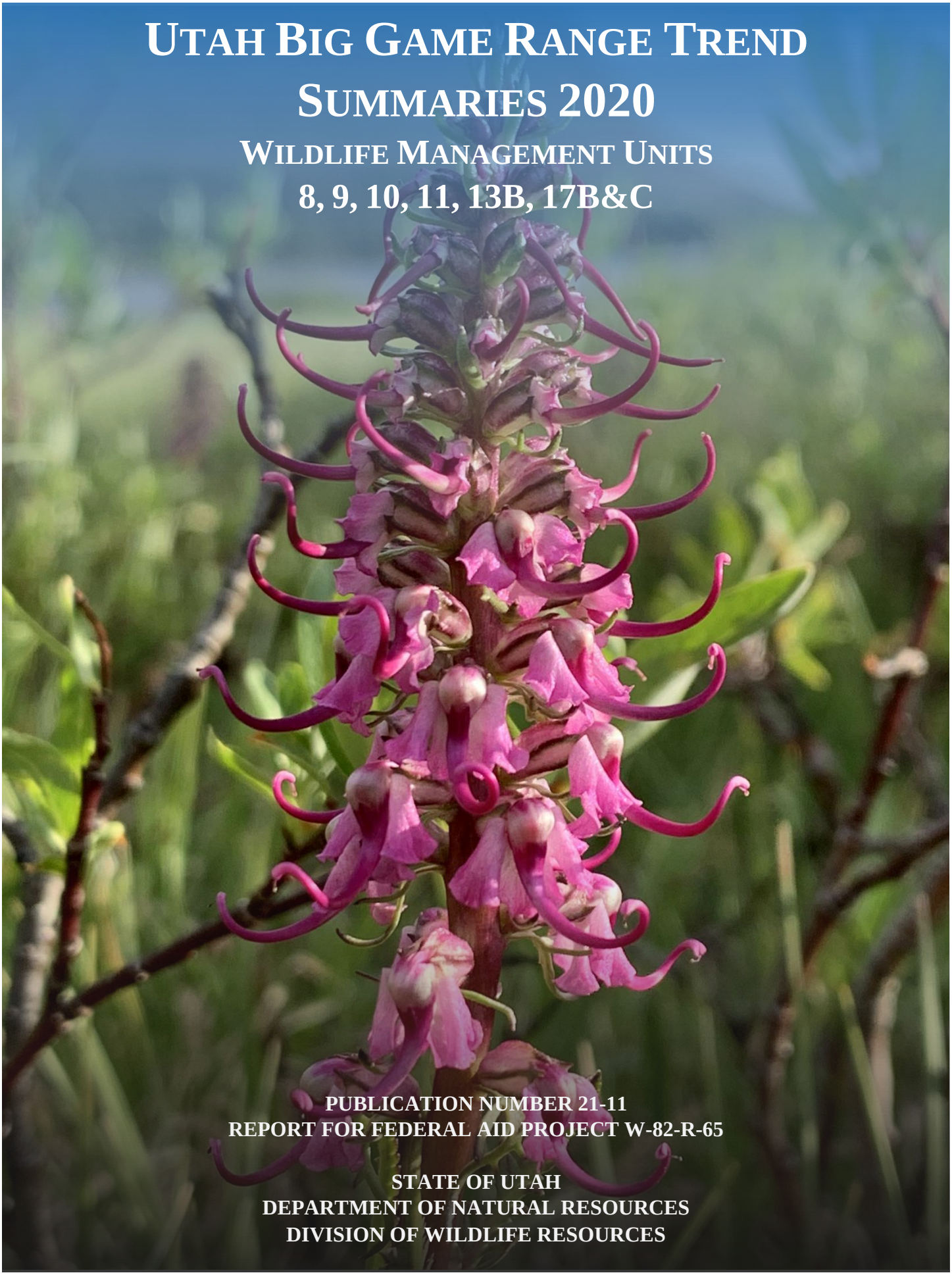
UTAH BIG GAME RANGE TREND SUMMARIES 2020

WILDLIFE MANAGEMENT UNITS
8, 9, 10, 11, 13B, 17B&C



PUBLICATION NUMBER 21-11
REPORT FOR FEDERAL AID PROJECT W-82-R-65

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE RESOURCES

UTAH BIG GAME RANGE TREND UNIT SUMMARIES
2020
WILDLIFE MANAGEMENT UNITS
8, 9, 10, 11, 13B, 17B&C

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Elephanthead Lousewort (*Pedicularis groenlandica*) by Jason Cox (2020)

Performance Report for Federal Aid Project W-82-R-65

Publication No. 21-11

UTAH DEPARTMENT OF NATURAL RESOURCES
Division of Wildlife Resources
1594 West North Temple
Salt Lake City, Utah 84114

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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-65

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.

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 (https://wildlife.utah.gov/range-trends-archives.html), on USBs, and in hard copies located in UDWR regional offices, BLM and USFS offices, and public libraries. 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 2020 field season and reported in this publication involves the reading of interagency range trend studies in the DWR Northeastern Region. Most trend studies surveyed in these management units were established in the 1980s and reread at 5-year intervals.

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

Bureau of Land Management
- Price Resource Area
- Vernal Resource Area
- Moab Resource Area

Ashley National Forest
- Vernal Ranger District
- Roosevelt Ranger District
- Duchesne Ranger District
- Flaming Gorge National Recreation Area

Uinta Wasatch Cache National Forest
- Mountain View Ranger District

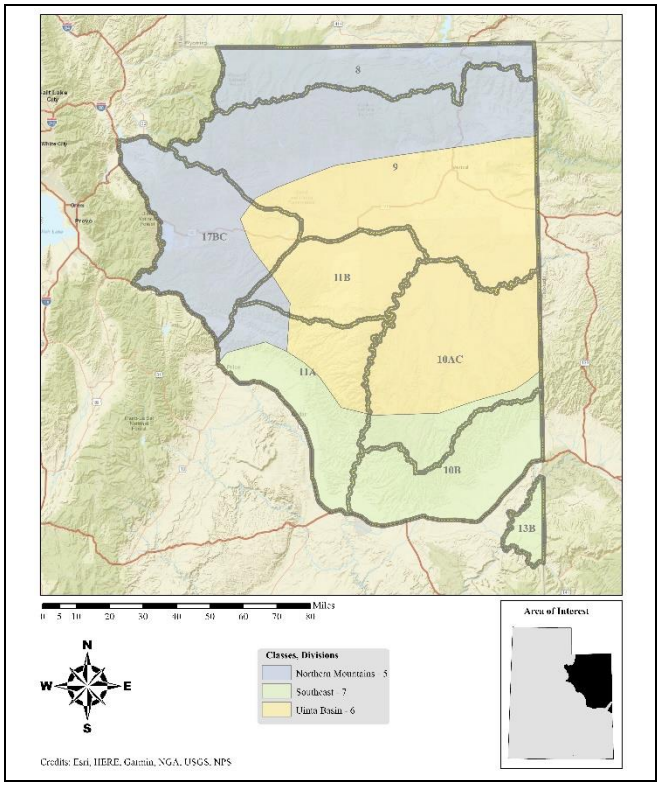
US National Park Service
- Dinosaur National Monument

Ute Indian Tribe Natural Resources
- Fort Duchesne, Utah

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

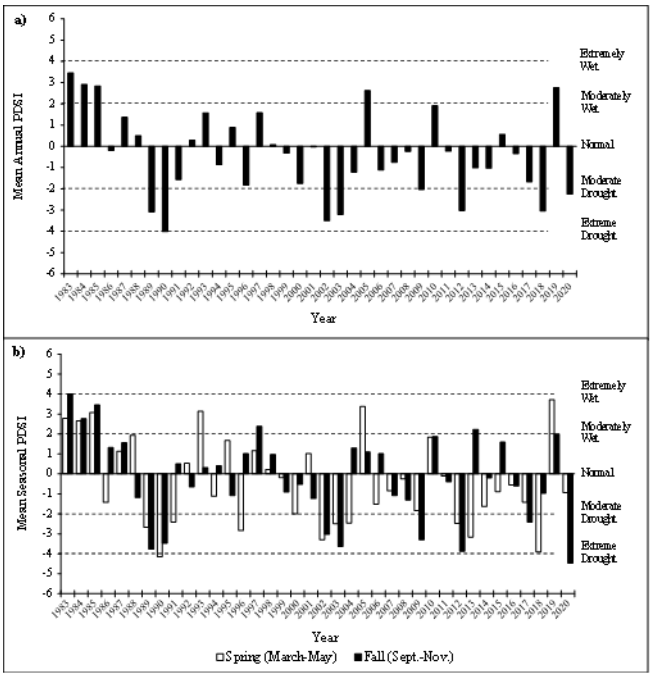
RANGE TREND UNIT SUMMARY OVERVIEW

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 northeastern region occurs within three of these divisions: Northern Mountains (Division 5), Uinta (Division 6) 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 2020. The data reported in this summary covers the years over which these sites have been sampled (1982-2020). 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 south central region and graph "b" shows the mean PDSI by season, spring (March-May) and fall (Sept.-Nov.) for the south central region (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 2000-2020 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.

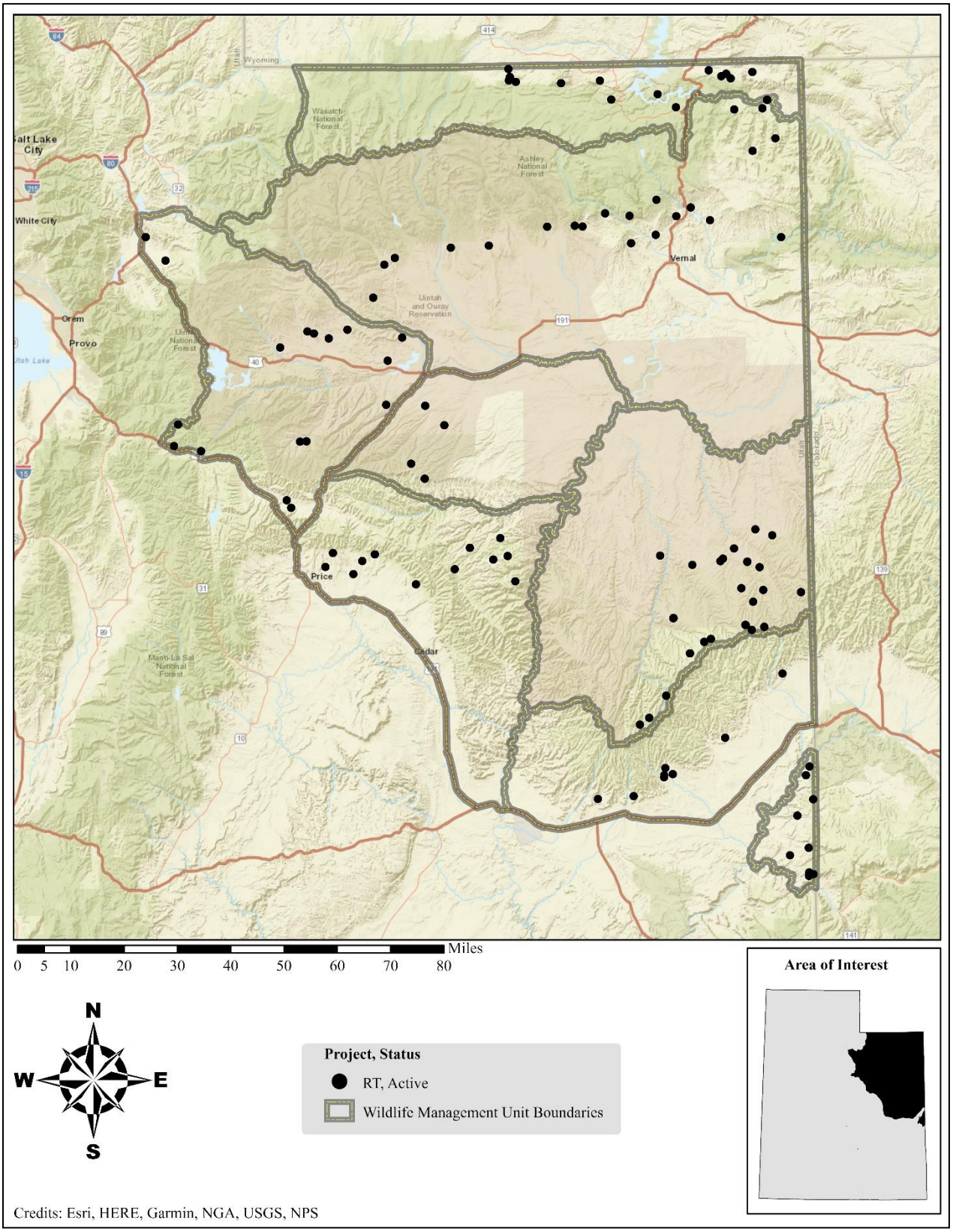
Deer Winter Range Condition Assessment: The desirable components index (DCI) for deer was created by Range Trend Program personnel as a tool to address condition and/or value of winter ranges for mule deer. This index is meant to be a companion to, and not a replacement for, the site-specific range trend 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.

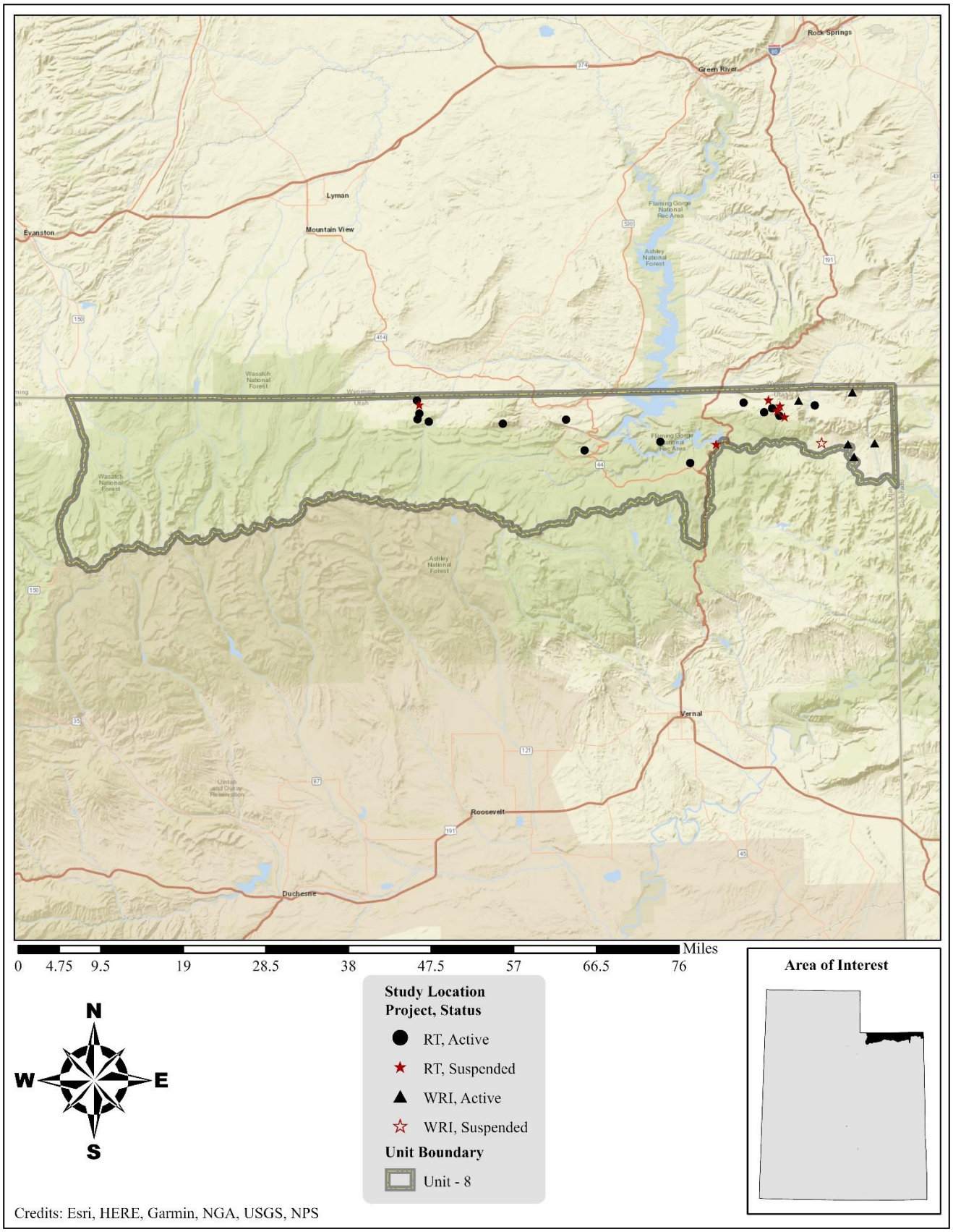
Changes in DCI over the sample years for both treated and untreated sites are included in the figures near the end of the summary. Care should be taken when interpreting these tables as the number of sites included in each year may vary. This could be misleading if the overall DCI seems to be improving, 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 8 – NORTH SLOPE



WILDLIFE MANAGEMENT UNIT 8 – NORTH SLOPE

Boundary Description

Summit and Daggett counties - Boundary begins at the junction of State Route (SR) 150 and the Summit-Duchesne county line (summit of the Uinta Mountains); north along SR-150 to the Utah-Wyoming state line; east along this state line to the Utah-Wyoming-Colorado state lines (Three Corners); south along the Utah-Colorado state line to the Green River; west along the Green River to Flaming Gorge Reservoir; west along the south shore of Flaming Gorge Reservoir to Cart Creek; south along Cart Creek to SR-191; south on SR-191 to the Uintah-Daggett County line (summit ridgeline of the Uinta Mountains); west along the summit ridgeline of the Uinta mountains to SR-150 and the beginning point.

Management Unit Description

Geography

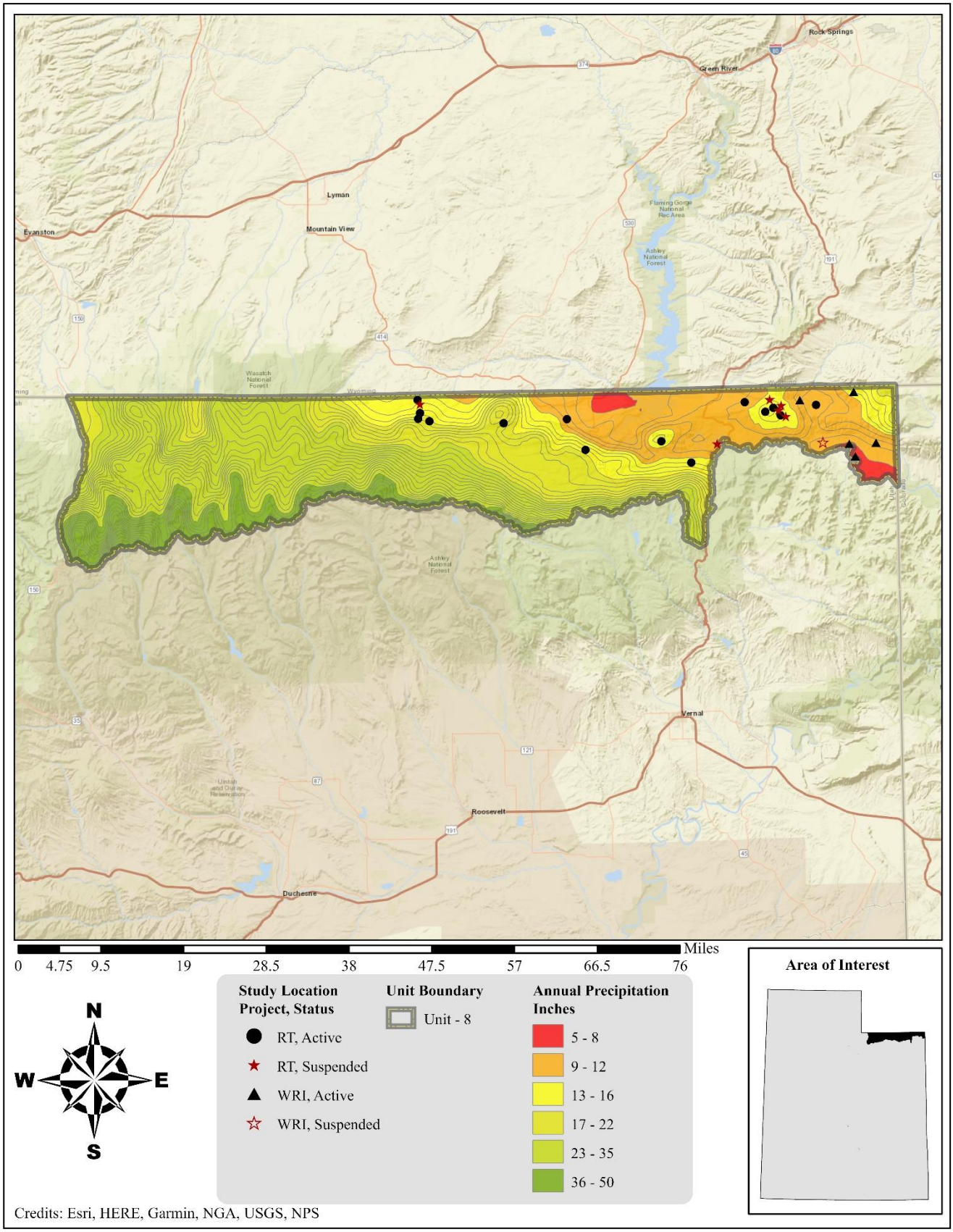
The North Slope Wildlife Management Unit is located along the north slope of the Uinta Mountains in Summit and Daggett Counties. This unit contains Flaming Gorge National Recreation Area, portions of Wasatch-Cache and Ashley National Forests, and a portion of the High Uintas Wilderness Area. Elevation of Unit 8 ranges from 5,400 feet in the bottomlands of the Green River to over 13,000 feet in the Uinta Mountains. Several major drainages are located within the unit including Green River, Bear River, Black's Fork, Smith's Fork, Henry's Fork, and Burnt Fork. Towns in this area include Manila and Dutch John.

Climate Data

The 30 year (1981-2010) annual precipitation PRISM model shows precipitation ranges on the unit from 8 inches along the Green River near the Utah-Colorado border to 41 inches on the peaks of the Uinta Mountains. All of the Range Trend and WRI monitoring studies on the unit occur within 8-17 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 Northern Mountains division (Division 5).

The mean annual PDSI of the Northern Mountains division displayed years of moderate to extreme drought from 1988-1990, 2000-2003, 2012-2013, 2018, and 2020. The mean annual PDSI displayed moderately to extremely wet years from 1983-1986, 1995, 1997-1998, 2005, and 2011 (**Figure 1.1a**). 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 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, 2012-2013, and 2020; moderately to extremely wet years were displayed in 1983-1986, 1995, and 1997-1998 (**Figure 1.1b**) (Time Series Data, 2020)**.**



Map 1.1: The 1981-2010 PRISM Precipitation Model for WMU 8, North Slope (PRISM Climate Group, Oregon State University, 2013).

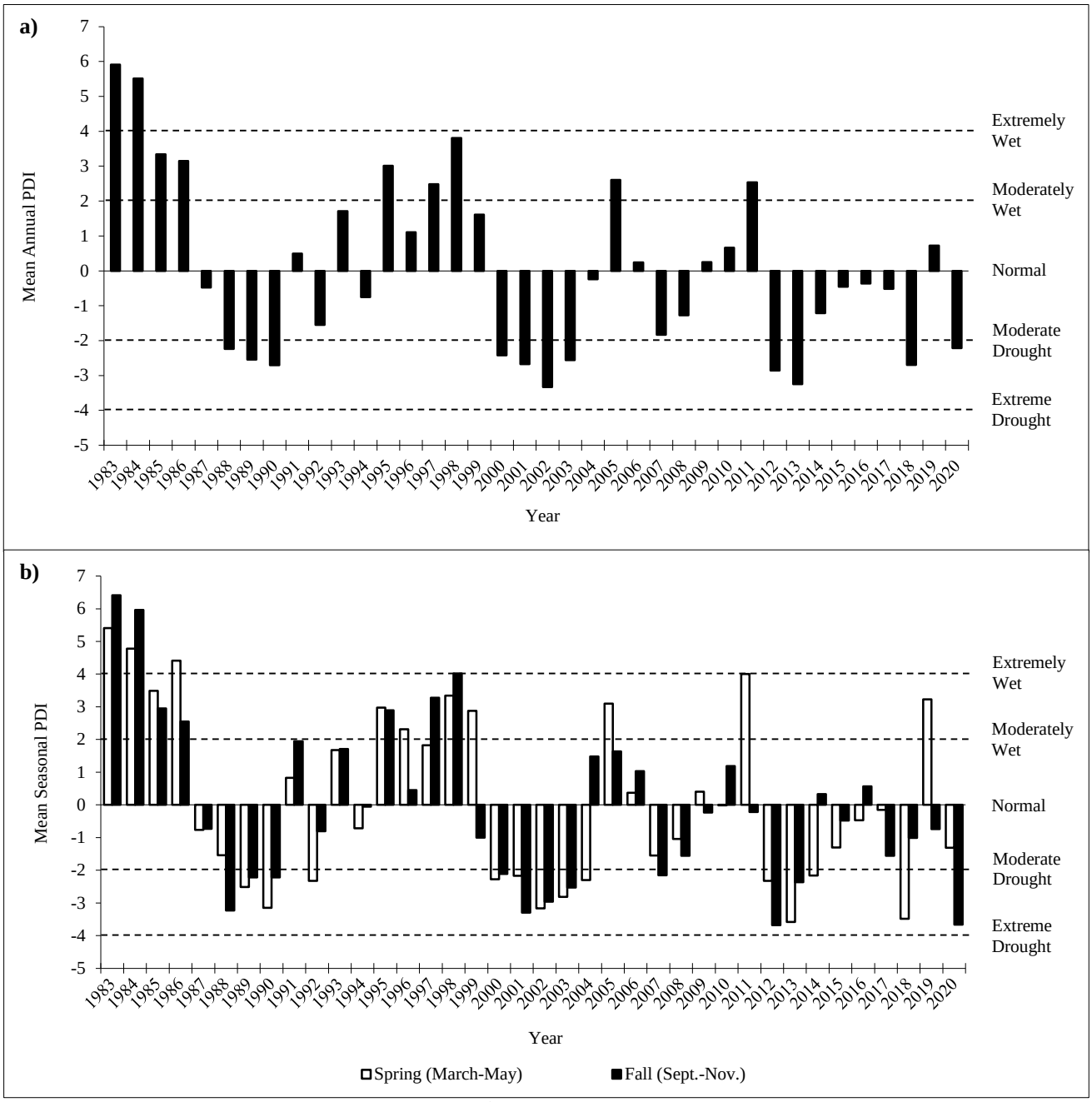


Figure 1.1: The 1983-2020 Palmer Drought Severity Index (PDSI) for the Northern Mountains division (Division 5). The PDSI is based on climate data gathered from 1895 to 2020. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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)

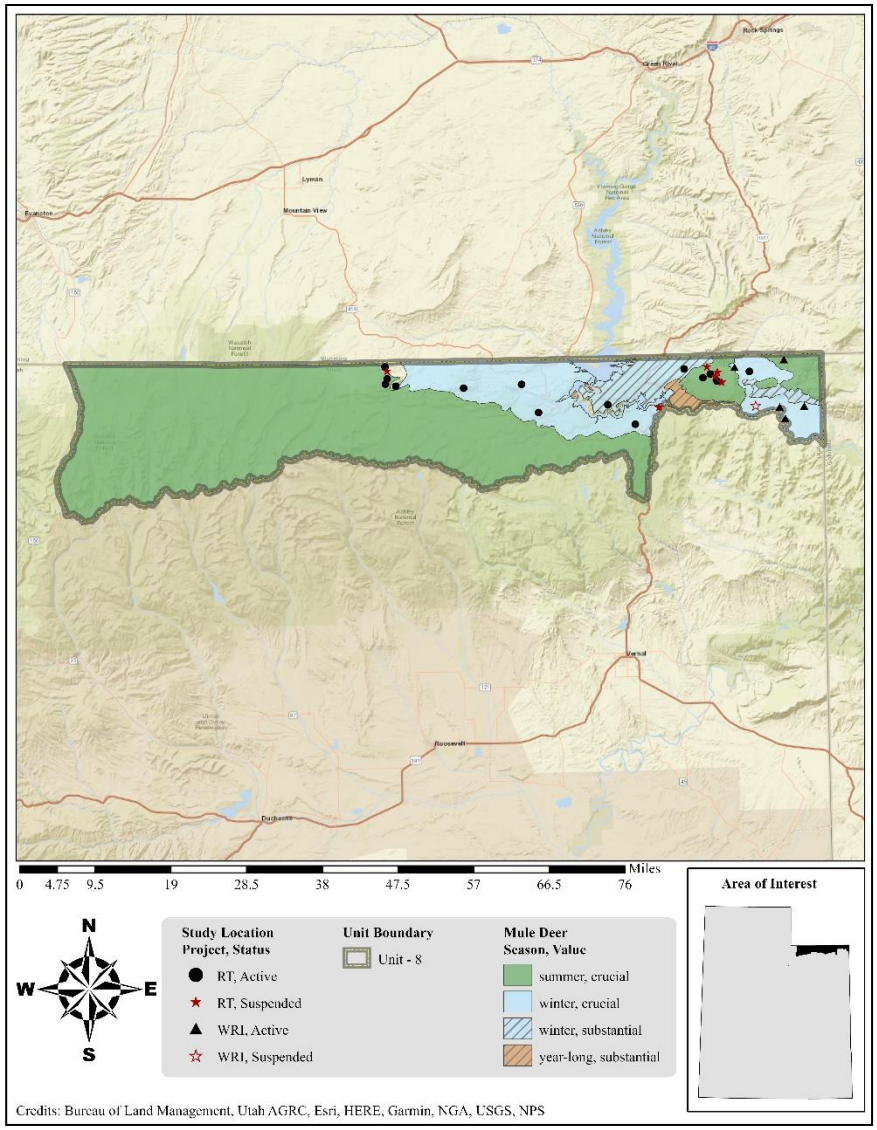
Big Game Habitat

There are approximately 760,000 acres in Unit 8 (Subunits 8A, 8B, and 8C) that are classified as deer habitat with 24% considered to be deer winter range. In addition, approximately 720,000 acres in this unit are classified as elk range with 27% comprising elk winter range (**Table 1.1**, **Map 1.2**).

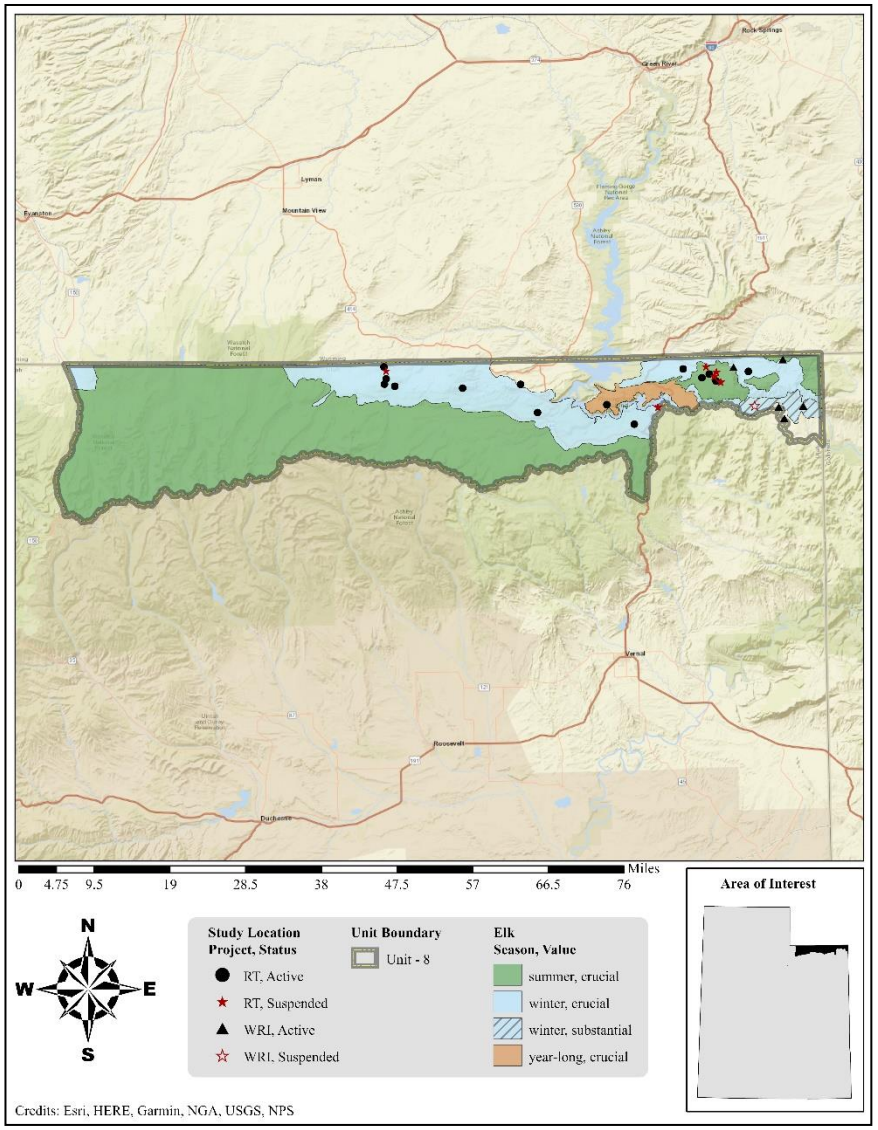
The U.S. Forest Service (USFS) administers approximately 42% of the unit's deer winter range, 24% is managed by the Bureau of Land Management (BLM), 21% is privately owned, 11% is administered by the Utah School and Institutional Trust Lands Administration (SITLA), 2% is managed by the Utah Division of Wildlife Resources (DWR), and less than 1% is owned by both the Utah Department of Transportation (UDOT) and Forestry, Fire and State Lands (FFSL). A majority of the summer range is on USFS land at 87%, while an additional 8% is privately owned. The remaining 5% is managed by the BLM, SITLA, and UDWR. Much of the year long range is also managed by the USFS at 65%, while 31% is privately owned. Four percent is administered by SITLA, and less than 1% of the year-long range is managed by UDWR (**Table 1.2**, **Map 1.2**, **Map 4.7**).

Landfire Existing Vegetation Coverage modeling shows that shrublands make up approximately 15% of the North Slope unit with sagebrush shrubland and steppe contributing up to 11% percent of the unit's land coverage. Habitat in the North Slope unit is variable and ranges from mountain brush communities to alpine tundra above the timberline: this tundra includes vast expanses of subalpine fir (*Abies lasiocarpa*), Engelmann spruce (*Picea engelmannii*), and lodgepole pine (*Pinus contorta*) (**Table 1.8**).

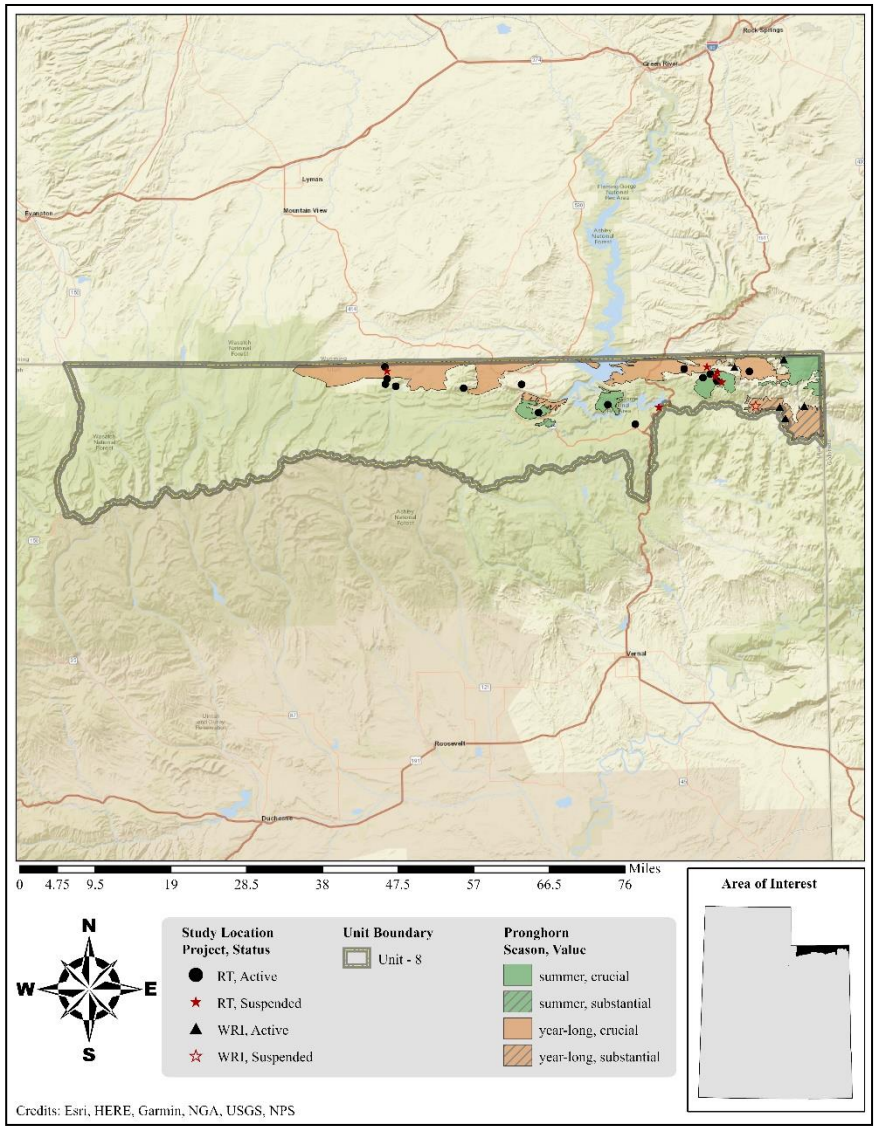
Several important deer winter concentration areas were identified within the unit in the 1974 range inventory. They include the Dowd Mountains, Bear Mountains, Goslin Mountains, Dutch John Flat, Little Hole, Red Creek Flat, Taylor Flat, Death Valley, and Digger Basin (Olson, 1975). The key areas for elk winter range are found on the alderleaf mountain mahogany (*Cercocarpus montanus*) slopes of Phil Pico Mountain, Bald Range, Widdop Mountain, and Jessen Butte.



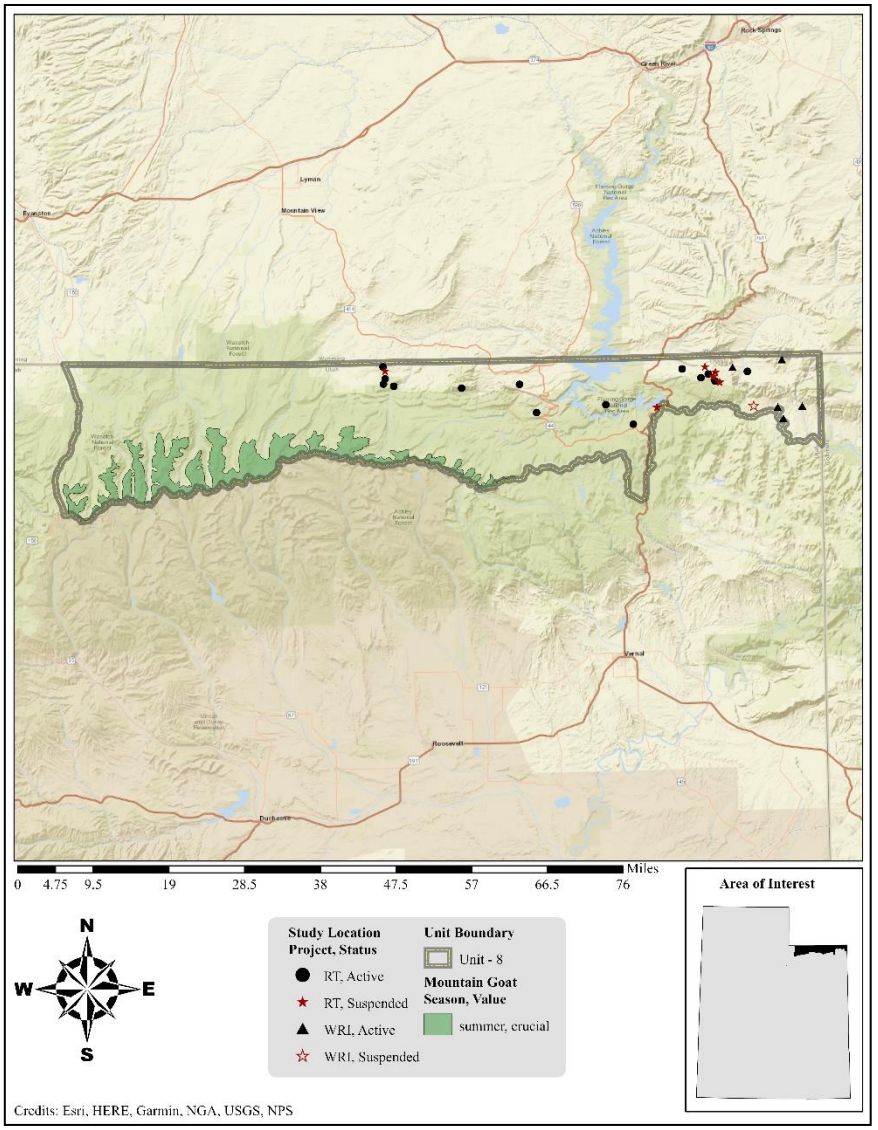
Map 1.2: Estimated mule deer habitat by season and value for WMU 8, North Slope.



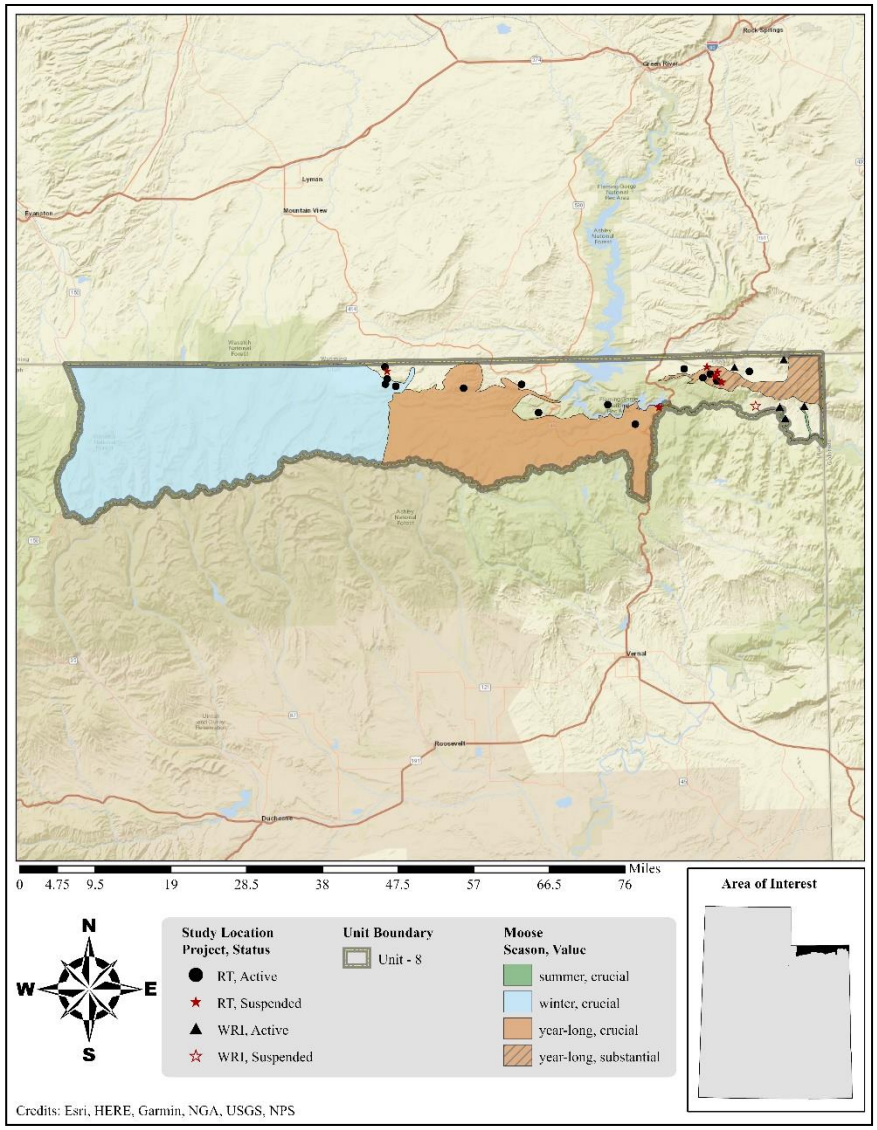
Map 1.3: Estimated elk habitat by season and value for WMU 8, North Slope.



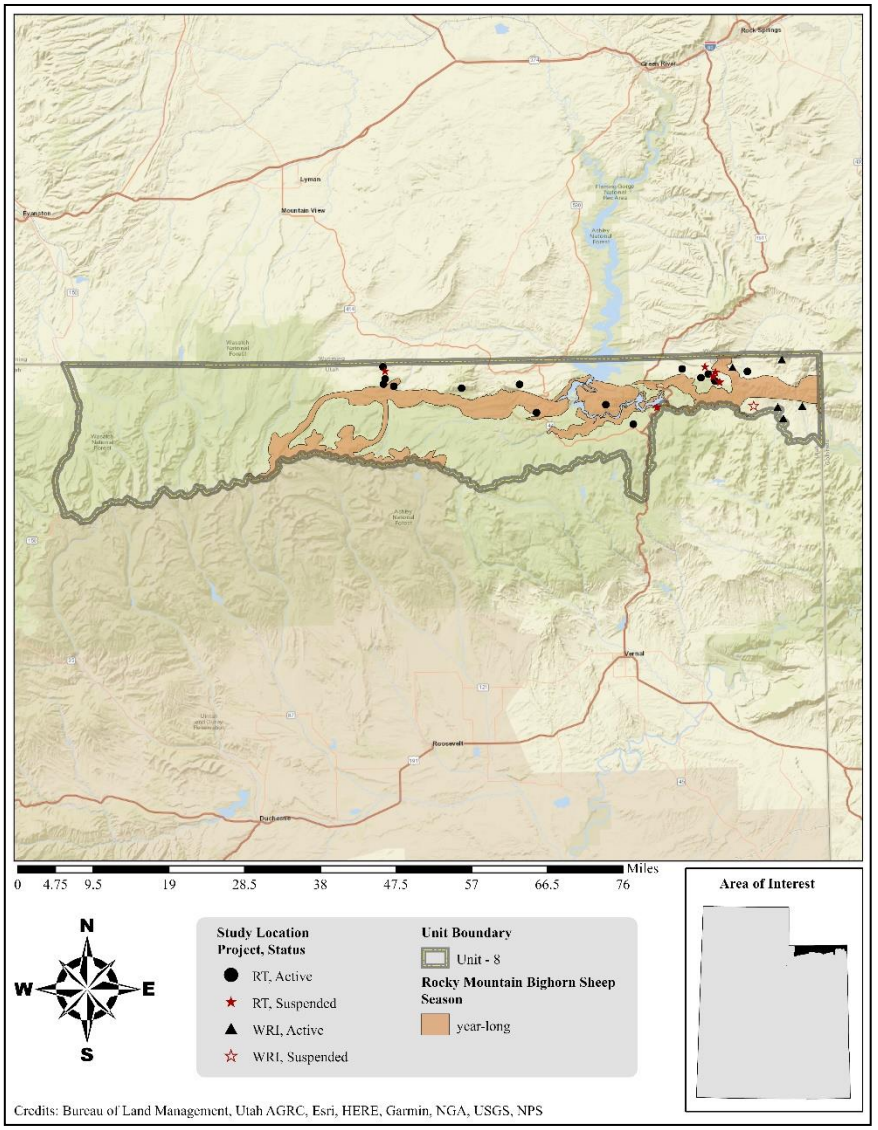
Map 1.4: Estimated pronghorn habitat by season and value for WMU 8, North Slope.



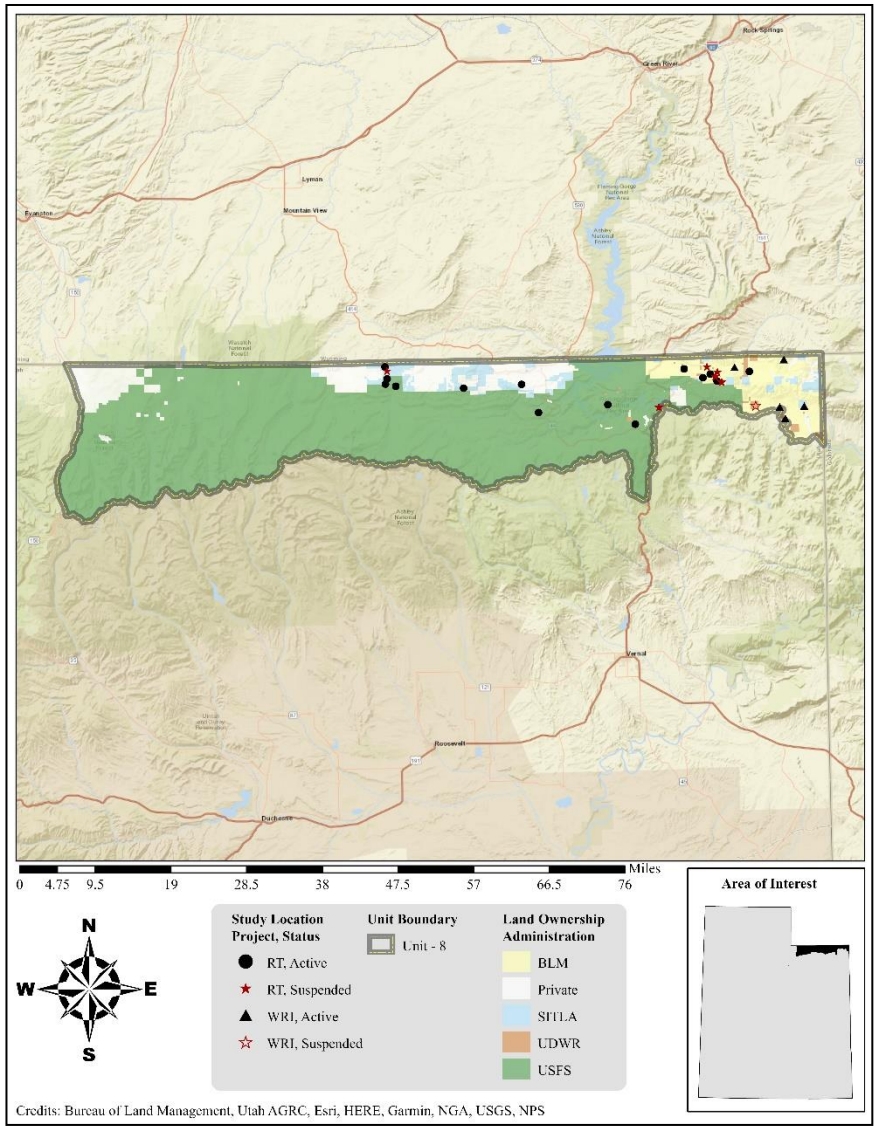
Map 1.5: Estimated mountain goat habitat by season and value for WMU 8, North Slope.



Map 1.6: Estimated moose habitat by season and value for WMU 8, North Slope.



Map 1.7: Estimated Rocky Mountain bighorn sheep habitat by season and value for WMU 8, North Slope.



Map 1.8: Land ownership for WMU 8, North Slope.

	Year Long Range		Summer Range		Winter Range	
Species	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
Mule Deer	7,338	1%	570,752	75%	180,363	24%
Elk	18,655	3%	503,296	70%	196,190	27%
Moose	228,536	37%	2,134	<1%	380,185	62%
Pronghorn	85,123	75%	27,714	25%	0	0%
Mountain Goat	0	0%	88,009	100%	0	0%
Bighorn Sheep	138,952	100%	0	0%	0	0%

Table 1.1: Estimated mule deer, elk, moose, pronghorn, mountain goat, and Rocky Mountain bighorn sheep habitat acreage by season for WMU 8, North Slope.

	Year Long Range		Summer Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	0	0%	20,034	4%	43,200	24%
Private	2,249	31%	45,487	8%	37,194	21%
SITLA	302	4%	7,820	1%	19,277	11%
UDOT	0	0%	0	0%	9	<1%
FFSL	0	0%	0	0%	2	<1%
USFS	4,780	65%	496,423	87%	76,055	42%
UDWR	7	<1%	989	<1%	4,626	2%
Total	7,338	**100%**	570,752	**100%**	180,363	**100%**

Table 1.2: Estimated mule deer habitat acreage by season and ownership for WMU 8, North Slope.

	Year Long Range		Summer Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	0	0%	13,935	3%	40,608	21%
Private	2,268	12%	23,569	5%	41,722	21%
SITLA	314	2%	4,310	1%	21,906	11%
UDOT	0	0%	0	0%	9	<1%
USFS	15,946	85%	460,407	91%	89,410	46%
UDWR	127	1%	1,075	<1%	2,535	1%
Total	18,655	**100%**	503,296	**100%**	196,190	**100%**

Table 1.3: Estimated elk habitat acreage by season and ownership for WMU 8, North Slope.

	Year Long Range		Summer Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	19,189	8%	895	42%	0	0%
Private	9,989	4%	533	25%	41,610	11%
SITLA	13,815	6%	27	1%	1,599	<1%
FFSL	0	0%	17	1%	0	0%
USFS	184,493	81%	0	0%	336,977	89%
UDWR	1,050	<1%	661	31%	0	0%
Total	228,536	**100%**	2,134	**100%**	380,185	**100%**

Table 1.4: Estimated moose habitat acreage by season and ownership for WMU 8, North Slope.

	Year Long Range		Summer Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	28,167	33%	9,061	33%
Private	28,635	34%	2,609	10%
SITLA	12,147	14%	3,421	12%
UDOT	9	<1%	0	0%
USFS	12,549	15%	11,977	43%
UDWR	3,615	4%	646	2%
Total	85,123	**100%**	27,714	**100%**

Table 1.5: Estimated pronghorn habitat acreage by season and ownership for WMU 8, North Slope.

	Summer Range	
Ownership	*Area (acres)*	*%*
USFS	88,009	100%
Total	88,009	**100%**

Table 1.6: Estimated mountain goat habitat acreage by season and ownership for WMU 8, North Slope.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	16,933	12%
Private	2,316	2%
SITLA	4,837	3%
USFS	114,489	82%
UDWR	376	<1%
Total	138,952	**100%**

Table 1.7: Estimated Rocky Mountain bighorn sheep habitat acreage by season and ownership for WMU 8, North Slope.

Group	Existing Vegetation Type	Acres	% of Total	Group % of Total
Conifer	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	152,500	19.45%	
	Rocky Mountain Lodgepole Pine Forest	136,818	17.45%	
	Colorado Plateau Pinyon-Juniper Woodland	79,441	10.13%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	23,597	3.01%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	14,199	1.81%	
	Southern Rocky Mountain Ponderosa Pine Woodland	12,724	1.62%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	10,636	1.36%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	5,313	0.68%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	4,521	0.58%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	4,469	0.57%	
	Other Conifer	930	0.12%	
	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	17	0.00%	56.78%
Other	Sparsely Vegetated	76,014	9.70%	
	Conifer-Hardwood	34,426	4.39%	
	Hardwood	28,667	3.66%	
	Riparian	20,125	2.57%	
	Open Water	17,948	2.29%	
	Agricultural	10,902	1.39%	
	Developed	7,527	0.96%	
	Snow-Ice	55	0.01%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	18	0.00%	24.96%
Shrubland	Inter-Mountain Basins Montane Sagebrush Steppe	55,561	7.09%	
	Inter-Mountain Basins Big Sagebrush Shrubland	26,041	3.32%	
	Inter-Mountain Basins Big Sagebrush Steppe	11,462	1.46%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	7,562	0.96%	
	Wyoming Basins Dwarf Sagebrush Shrubland and Steppe	6,423	0.82%	
	Rocky Mountain Lower Montane-Foothill Shrubland	3,981	0.51%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	2,903	0.37%	
	Rocky Mountain Alpine Dwarf-Shrubland	1,743	0.22%	
	Inter-Mountain Basins Mat Saltbush Shrubland	1,263	0.16%	
	Inter-Mountain Basins Greasewood Flat	674	0.09%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Shrubland	496	0.06%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	470	0.06%	
	Other Shrubland	418	0.05%	15.18%
Grassland	Southern Rocky Mountain Montane-Subalpine Grassland	6,798	0.87%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	5,148	0.66%	
	Inter-Mountain Basins Semi-Desert Grassland	4,165	0.53%	
	Rocky Mountain Alpine Turf	1,549	0.20%	
	Rocky Mountain Alpine Fell-Field	714	0.09%	
	Other Grassland	500	0.06%	2.41%
Exotic Herbaceous	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	915	0.12%	
	Great Basin & Intermountain Introduced Annual Grassland	719	0.09%	
	Interior Western North American Temperate Ruderal Grassland	692	0.09%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	393	0.05%	0.35%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	2,167	0.28%	
	Interior Western North American Temperate Ruderal Shrubland	265	0.03%	
	Interior West Ruderal Riparian Scrub	117	0.01%	
	Interior West Ruderal Riparian Forest	11	0.00%	0.33%
Total		**784,000**	**100%**	**100%**

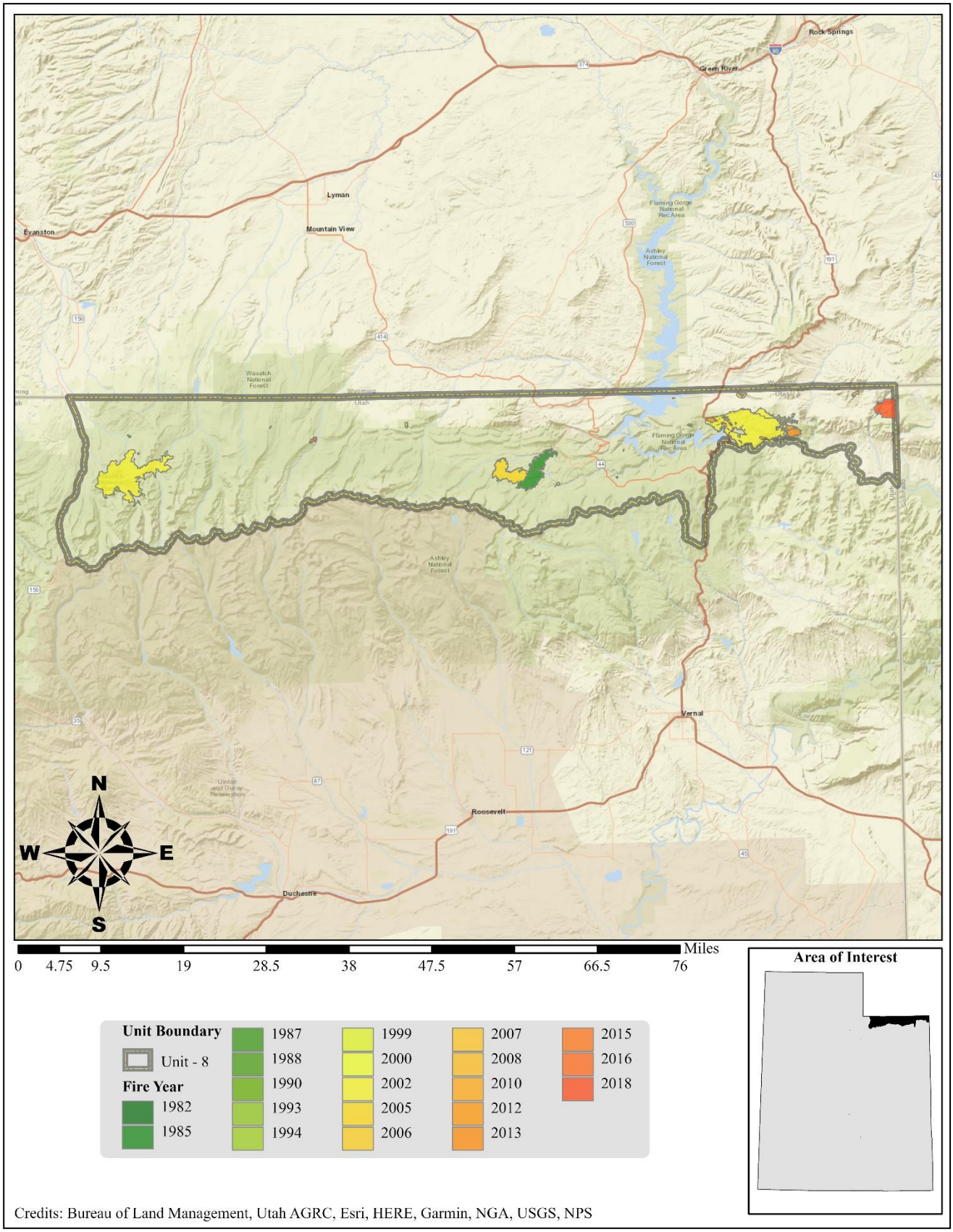
Table 1.8: LANDFIRE Existing Vegetation Coverage (LANDFIRE.US_140EVT, 2019) for WMU 8, North Slope.

Limiting Factors to Big Game Habitat

Deer winter range on the Utah side of the border is a major limiting factor on the unit, with many deer wintering in Wyoming. Following construction of the Flaming Gorge Reservoir, approximately 14,000 acres of deer winter range was lost, but the reservoir does not appear to be a serious barrier to migration (Warren, 1973). Most livestock grazing was concurrently eliminated within the Green River corridor. The area supports a variety of wildlife and outdoor recreation, livestock grazing, ranches and farms, and recreation and electrical power generation associated with the reservoir.

Although not an immediate threat, encroachment of twoneedle pinyon (*Pinus edulis*) and juniper (*Juniperus sp.*) is a potential limiting factor; approximately 10% of the unit is classified as pinyon-juniper woodland (**Table 1.8**). Encroachment of these woodlands into sagebrush communities has been shown to limit browse and herbaceous cover, therefore decreasing available forage for wildlife (Miller, Svejcar, & Rose, 2000).

Finally, availability of deer fences and crossings may be a concern for range limitation, but cooperation with the Utah Department of Transportation in constructing highway fences, passage structures, warning signs, etc. will continue in order to ensure proper access to habitat as well as deer and human safety.



Map 1.9: Land coverage of fires by year from 2000-2020 for WMU 8, North Slope (Geosciences and Environmental Change Science Center (GECSC) Outgoing Datasets, 2021).

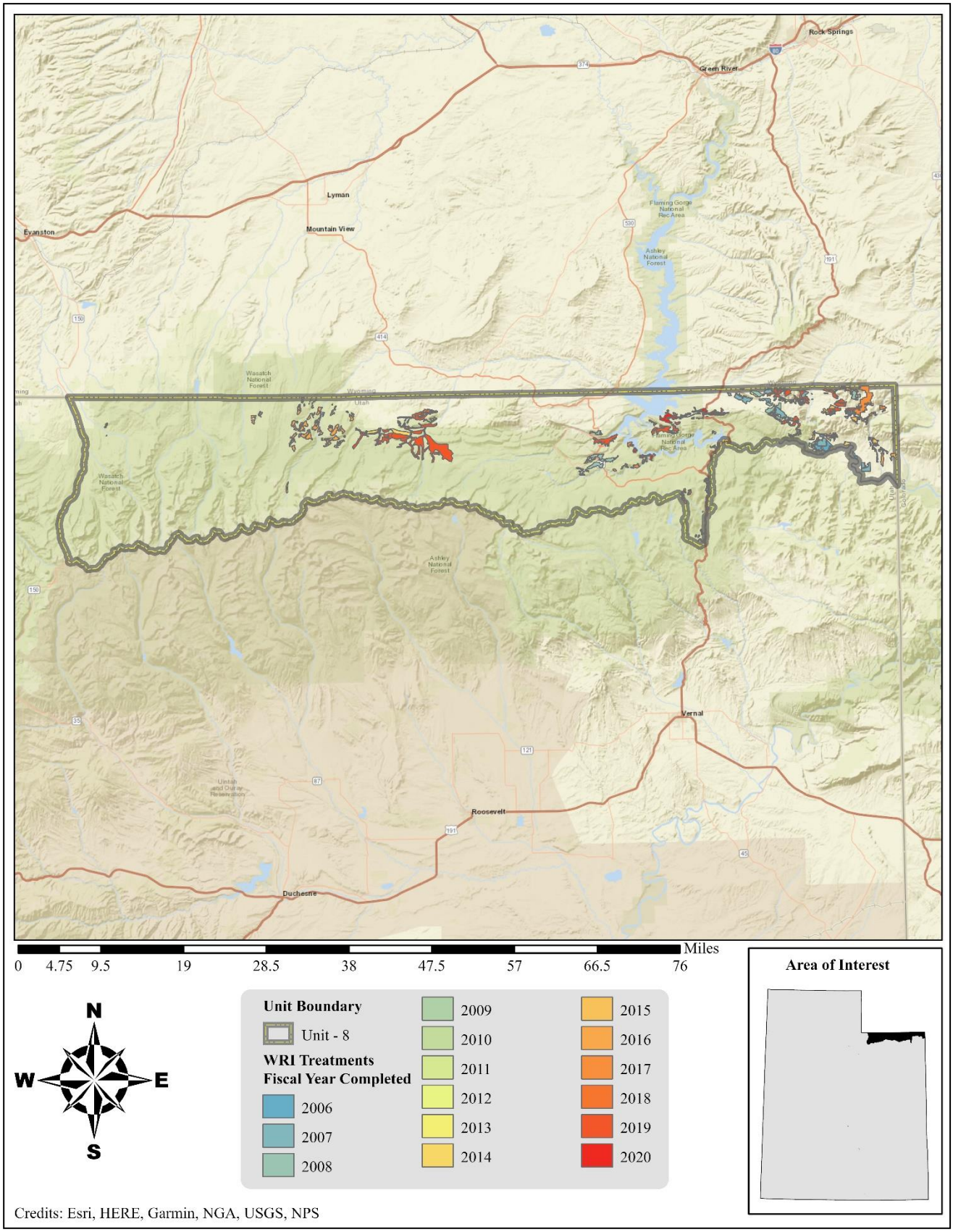
Treatments/Restoration Work

There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 25,145 net acres of land have been treated within the North Slope unit since the WRI was implemented in 2004 (**Map 1.10**). However, land treatments frequently overlap one another bringing the total treatment acres to 53,867 acres for this unit. In addition, 34,945 acres are currently being treated and treatments are proposed for another 5,305 acres (**Table 1.9**). Other treatments may 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 via hand crew is the most common management practice on the North Slope management unit. Herbicide application is also very common. Other management practices include seeding of desired grass, forb, and shrub species, prescribed burns, aerator treatments, and harrow and bullhog projects to remove pinyon and juniper. Current actions along the North Slope affecting the most acreage are commercial tree thinning treatments intended for forest maintenance and rejuvenation (**Table 1.9**).

Type	Completed Acreage	Current Acreage	Proposed Acreage	Total Acreage
Aerator	**132**	**0**	**0**	**132**
Double Drum (One-Way)	132	0	0	132
Bullhog	**1,937**	**0**	**0**	**1,937**
Full Size	1,670	0	0	1,670
Skid Steer	267	0	0	267
Forestry Practices	**855**	**11,629**	**481**	**12,965**
Thinning (Non-Commercial)	246	0	141	387
Thinning (Commercial)	610	11,629	339	12,579
Harrow	**146**	**0**	**0**	**146**
≤15 ft. (One-Way)	146	0	0	146
Herbicide Application	**2,176**	**2,983**	**0**	**5,159**
Aerial (Fixed-Wing)	129	0	0	129
Aerial (Helicopter)	2,047	2,983	0	5,029
Prescribed Fire	**623**	**0**	**821**	**1,444**
Prescribed Fire	623	0	0	623
Pile Burn	0	0	821	821
Seeding (Primary)	**0**	**8**	**1,318**	**1,326**
Broadcast (Aerial-Fixed Wing)	0	0	679	679
Drill (Rangeland)	0	8	639	647
Seeding (Secondary)	**178**	**0**	**0**	**178**
Broadcast (Aerial-Helicopter)	178	0	0	178
Vegetation Removal/Hand Crew	**20,883**	**2,853**	**33**	**23,769**
Lop & Scatter	20,611	747	33	21,391
Lop-Pile-Burn	222	2,106	0	2,327
Lop (No Scatter)	50	0	0	50
Other	**3**	**0**	**0**	**3**
Excavating/Extraction	3	0	0	3
Grand Total	**53,867**	**34,945**	**5,305**	**94,117**
***Total Land Area Treated**	**25,145**	**17,456**	**2,652**	**45,253**

Table 1.9: WRI treatment action size (acres) for completed, current, and proposed projects for WMU 8, North Slope. Data accessed on 02/09/2021.
*Does not include overlapping treatments.



Map 1.10: WRI treatments by fiscal year completed for WMU 8, North Slope.

Range Trend Studies

Range Trend studies have been sampled on a regular basis within subunit 8A since 1988 and within subunits 8B and 8C since 1982; studies have been added or suspended as has been deemed necessary (**Table 1.10**). Due to changes in sampling methodologies, only data sampled 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 and sampled on a regular basis following treatment. Due to the long-term nature of the studies, many of the Range Trend or WRI study sites have had some sort of disturbance or treatment prior to or since study establishment (**Table 1.11**). Range Trend studies are summarized in this report by ecological site.

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
08A-1	Widdop Mtn. South Slope	RT	Active	1988, 1995, 2000, 2005, 2010, 2015	Mountain Stony Loam (Browse)
08A-2	Widdop Mtn. North Slope	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2020	Mountain Stony Loam (Browse)
08A-3	Bald Range South	RT	Suspended	1988, 1995, 2000	Not Verified
08A-4	Bald Range	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2020	Mountain Stony Loam (Browse)
08A-5	Telephone Hollow	RT	Active	1988, 1995, 2000, 2005, 2010, 2015	Mountain Stony Loam (Browse)
08B-1	Cedar Springs	RT	Suspended	1982, 1988, 1995, 2000	Not Verified
08B-4	Greendale	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020	Mountain Loam (Mountain Big Sagebrush)
08B-5	Bennett Ranch	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020	Upland Loam (Mountain Big Sagebrush)
08B-6	Death Valley	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020	Mountain Shallow Loam (Birchleaf Mountain Mahogany)
08B-8	Phil Pico Mountain	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2020	Mountain Very Steep Stony Loam (Browse)
08C-2	Goslin Mountain	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020	Mountain Loam (Mountain Big Sagebrush)
08C-3	Bear Top Mountain	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020	Mountain Loam (Mountain Big Sagebrush)
08C-7	Antelope Flat	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2020	Upland Loam (Wyoming Big Sagebrush)
08C-9	West Goslin	RT	Active	1995, 2000, 2005, 2010, 2015, 2020	Mountain Loam (Mountain Big Sagebrush)
08C-10	Sagebrush Ridge	RT	Suspended	1995, 2000	Not Verified
08C-11	Triangle Meadow	RT	Suspended	1995, 2000	Not Verified
08C-12	Big Meadow	RT	Active	1995, 2000, 2010, 2015, 2020	Semiwet (Fresh Meadow)
08C-13	Lower Big Meadow	RT	Suspended	1995, 2000	Not Verified
08C-14	Clay Basin Bench	RT	Active	2000, 2005, 2010, 2015, 2020	Semidesert Loam (Wyoming Big Sagebrush)
08C-15	Ford Spring	RT	Suspended	1996	Not Verified
08R-1	Brown's Park db Drum	WRI	Active	2005, 2008, 2012, 2016	Semidesert - Alkali Flat (Black Greasewood)
08R-2	Teepee Mountain Bullhog	WRI	Active	2007, 2010, 2013, 2018	Upland Stony Loam (Bonneville Big Sagebrush)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
08R-3	Goslin Mountain Bullhog	WRI	Active	2008, 2010, 2013, 2017	Upland Loam (Mountain Big Sagebrush)
08R-4	Bake Oven	WRI	Active	2012, 2016	Semidesert - Alkali Flat (Black Greasewood)
08R-5	Birch Creek	WRI	Active	2014, 2017	Upland Loam (Mountain Big Sagebrush)
08R-6	Red Creek	WRI	Suspended	2016, 2019	Semidesert Loam (Wyoming Big Sagebrush)

Table 1.10: Range trend and WRI project studies monitoring history and ecological site potential for WMU 8, North Slope.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
08A-2	Widdop Mtn. North Slope	Lop and Scatter	Telephone Hollow Lop and Scatter	September 2014	303	2536
08A-5	Telephone Hollow	Lop and Scatter	Telephone Hollow Lop and Scatter	September 2014	303	2536
08C-2	Goslin Mountain	Lop and Scatter	Goslin Mountain Phase 2 Lop and Scatter	May 2008	1,221	691
08C-3	Bear Top Mountain	Prescribed Fire		1998		
08C-7	Antelope Flat	Lop and Scatter	Goslin Mountain P/J Encroachment Removal	August 2006	1,677	297
08C-9	West Goslin	Wildfire Seed Unknown	Mustang	2002 After 2002	21,638	
08R-1	Brown's Park db Drum	2,4-D/Tordon Double Drum/Seed	Brown's Park Brown's Park	June 2005 2005	141 141	26 26
08R-2	Teepee Mountain Bullhog	Bullhog	Teepee Mountain Bullhog Project	June-August 2007	535	692
08R-3	Goslin Mountain Bullhog	Bullhog Aerial Before	Goslin Bullhog Phase II Goslin Bullhog Phase II	March-May 2009 October 2008	2,595 2,595	1090 1090
08R-4	Bake Oven	Arsenal Truax Drill Two-Way Chain Aerial After	Bake Oven Sagebrush Restoration Bake Oven Sagebrush Restoration Bake Oven Sagebrush Restoration Bake Oven Sagebrush Restoration	September 2013 September 2013 January 2014 January 2014	150 150 150 150	2268 2268 2268 2268
08R-5	Birch Creek	Aerial Before Bullhog Aerial After	Birch Creek Pinyon and Juniper Removal Birch Creek Pinyon and Juniper Removal Birch Creek Pinyon and Juniper Removal	November 2014 December 2014 January 2015	276 276 276	2913 2913 2913
08R-6	Red Creek	Lop and Scatter	Red Creek Flat Phase 2 Lop and Scatter	May 2007	503	359

Table 1.11: Range trend and WRI studies known disturbance history for WMU 8, North Slope. PDB = Pre-Database; LTDL = Land Treatment Digital Library (Pilliod & Welty, 2019).

Study Trend Summary (Range Trend)

Mountain (Big Sagebrush)

There are four study sites [Greendale (08B-4), Goslin Mountain (08C-2), Bear Top Mountain (08C-3), and West Goslin (08C-9)] that are classified as Mountain (Big Sagebrush) ecological sites. The Bear Top Mountain and Greendale studies are located within the Flaming Gorge National Recreation Area, north and south (respectively) of the Green River. The Goslin Mountain and West Goslin study sites are both found on the south face of Goslin Mountain (**Table 1.10**).

Shrubs/Trees: The primary browse species on these sites is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), although other browse species are present in smaller amounts. Line-intercept cover of sagebrush has increased from year to year and is good overall with 17% cover in 2020 (**Figure 1.2**). However, density of sagebrush has decreased overall since 1995. The recruitment of young plants has varied, but has remained low overall, as has the density of decadent plants. With some variability in density, mature plants have been the most dominant age group throughout the study years (**Figure 1.8**). Browse utilization has fluctuated from year to year, but has slightly decreased overall; nearly 27% of mature plants were moderately browsed in the 2020 sample year (**Figure 1.10**).

The increase in average cover and density of conifers is mostly due to the Greendale study site and driven by a population of ponderosa pine (*Pinus ponderosa*). Most of the sites do have some woodland encroachment occurring, but not in any considerable amount (**Figure 1.6**).

Herbaceous Understory: The herbaceous understories on these sites have generally increased over the sample years and are mainly dominated by perennial grasses; the exception to this is the Bear Top Mountain study, which was dominated by the introduced annual grass cheatgrass (*Bromus tectorum*) from 2010 to 2020. Overall cover of annual grasses has generally increased over time from less than 1% in 2005 to 5% in 2010 and 6% in 2015, but decreased to over 2% in 2020. Cover for bulbous bluegrass (*Poa bulbosa*) on the Goslin Mountain study has generally exhibited a slight, steady increase, but there was a marked increase in 2020. Cover of perennial and annual forbs has fluctuated, but has shown an overall decreasing trend (**Figure 1.12**, **Figure 1.14**).

Occupancy: Pellet transect data indicates that elk presence has generally decreased on these sites while deer presence has varied from year to year; cattle pellet groups have generally increased since 2000. Deer pellet groups have had a mean abundance ranging from 13 days use/acre in 2000 to 46 days use/acre in 2005. Average abundance of elk pellet groups has been as low as 6 days use/acre in 2015 and 2020 and as high as 25 days use/acre in 2000. Mean abundance of cattle pellet groups has fluctuated between 0 days use/acre in 2015 and 15 days use/acre in 2020. Finally, horse pellet groups were present in 2010 with an average abundance of 0.1 days use/acre, but have not been observed in any other sample year (**Figure 1.16**).

Mountain (Browse)

There are six study sites [Widdop Mountain South Slope (08A-1), Widdop Mountain North Slope (08A-2), Bald Range (08A-4), Telephone Hollow (08A-5), Death Valley (08B-6), and Phil Pico Mountain (08B-8)] classified as Mountain (Browse) ecological sites. Widdop Mountain South Slope is located on the south slope of Widdop Mountain, and the Widdop Mountain North Slope and Telephone Hollow studies are located on the northern slope. The Bald Range study site is found on Bald Range, north of Widdop Mountain. Death Valley occurs southwest of Flaming Gorge Reservoir on the north slope of Windy Ridge. The Phil Pico Mountain study is found on the south slope of Phil Pico Mountain (**Table 1.10**).

Shrubs/Trees: These sites are dominated by a mixture of browse species, namely alderleaf mountain mahogany (*Cercocarpus montanus*), mountain snowberry (*Symphoricarpos oreophilus*), and Utah serviceberry (*Amelanchier utahensis*); other preferred browse species are present, but contribute much less cover. Overall, the mean cover of combined serviceberry and mahogany has slightly increased over the study years, from 23% in 2005, 28% in 2010, 29% in 2015, and 28% in 2020. Other preferred browse has been present in much lower

amounts. Average combined cover of preferred browse excluding serviceberry and mahogany has ranged from 7% in 2005 to 9% in both 2010 and 2015, and 12% in 2020 (**Figure 1.2**). The density of preferred browse has exhibited an overall upward trend over the study years. Recruitment of young plants has remained steady with a moderate number of plants being recruited. The number of decadent plants has remained low. Mature plants make up a majority of the preferred browse populations (**Figure 1.8**). Overall utilization has remained stable. However, the difference between heavy and moderate use has had large fluctuations: 42% of plants displayed heavy use in 2005 and 13% in 2010, but 2015 and 2020 sample years were similar at 27% and 32%, respectively (**Figure 1.10**).

Overall tree encroachment is minimal. However, twoneedle pinyon (*Pinus edulis*) was recorded in 2015 with density measurements on the Telephone Hollow and Death Valley study sites; the populations on these studies are comprised mainly of young trees. Although overall encroachment may vary from site to site, it is likely that over time these young trees will increase in size (**Figure 1.4**, **Figure 1.6**).

Herbaceous Understory: In general, herbaceous cover has displayed a slight increase over the sample years with the dominant component being perennial grasses. Perennial forbs have also exhibited a slight increase overall and contributed 8% cover in 2020. The cover provided by annual grasses and forbs has remained consistent over time, but has been less than 1% in all sample years (**Figure 1.12, Figure 1.14**).

Occupancy: Pellet transect data indicates that these sites have largely been occupied by elk, and to a lesser extent, deer. Cattle presence appears to be low across these sites. Animal presence in general has fluctuated, but has shown an overall increasing trend over the study years. The mean abundance of elk pellet groups has ranged from 26 days use/acre in 2015 to 48 days use/acre in 2020. Deer pellet groups have had a mean abundance fluctuating between 7 days use/acre in 2005 and 34 days use/acre in 2020.Finally, the mean abundance of cattle pellet groups has ranged from 3 to 4 days use/acre for all sample years (**Figure 1.16**).

Upland (Big Sagebrush)

There are two study sites [Bennett Ranch (08B-5) and Antelope Flat (08C-7)] that are classified as Upland (Big Sagebrush) ecological sites. Bennett Ranch is located southwest of Manila on the low northern slope of Jessen Butte. The Antelope Flat study site is found in the eastern portion of Antelope Flat near Goslin Mountain (**Table 1.10**).

Shrubs/Trees: The shrub understory of Bennett Ranch is dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), while that of Antelope Flat is dominated by Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*). Except for black sagebrush (*A. nova*) on Bennett Ranch, other preferred browse species are lacking on both sites. Average sagebrush cover has increased slightly from 24% in 2005 to 28% in 2020 (**Figure 1.3**). A majority of the preferred browse populations have been classified as mature for all sample years, although decadent individuals have remained moderately abundant. Recruitment of young plants has varied, but has generally remained low **(Figure 1.9**). Moderate utilization of preferred browse has remained stable or has had a slight decrease since the 2000 sample year. In the 2020 sample year, 20% of plants were moderately hedged and 23% were heavily hedged (**Figure 1.10**).

Bennett Ranch is the only site with measurable woodland presence for this ecological type, but encroachment is not considered active. Tree covers and densities for twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have been minimal since 2000. Although density values are low, this site is considered to be within Phase I of woodland succession (**Figure 1.5**, **Figure 1.7**).

Herbaceous Understory: These study sites have moderately abundant herbaceous understories. The Bennett Ranch site has been dominated by perennial grasses in all sample years. The herbaceous understory of Antelope Flat was also dominated by perennial grasses through the 2005 study year, but annual grasses – primarily cheatgrass (*Bromus tectorum*) – became dominant in 2010, placing the site at an increased risk for fire. Cover of perennial forbs has ranged from 3% in 2010 to just over 5% in 2000, while that of annual forbs has remained low **(Figure 1.13**, **Figure 1.15**).

Occupancy: Pellet transect data indicates that deer/antelope currently occupy these studies along with elk sharing similar occupancy estimations between the 2000 and 2010 sample years. However, average elk pellet group abundance has been low since 2015. The mean abundance of deer/antelope pellet groups has ranged from 8 days use/acre in 2000 to 65 days use/acre in 2020. The mean abundance of elk pellet groups has been as low as 2 days use/acre in 2020 and as high as 20 days use/acre in 2005. Cattle have consistently been the most infrequent occupants of these sites, with pellet groups ranging from 6 days use/acre in 2015 to 13 days use/acre in 2005 (**Figure 1.17**).

Semidesert (Big Sagebrush)

One study site [Clay Basin Bench (8C-14)] is classified as a Semidesert (Sagebrush) ecological site. The Clay Basin Bench study is located south of the Utah-Wyoming border in central Clay Basin (**Table 1.10**).

Shrubs/Trees: Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) is the primary browse species on the Clay Basin Bench study. Although sagebrush cover has displayed a generalized increasing trend between 2000 and 2015, it has remained low throughout the study years. Other preferred browse species are present on the site, but provide little cover. Other shrubs, mainly broom snakeweed (*Gutierrezia sarothrae*) and pricklypear cactus (*Opuntia sp*.), contribute the most cover in the shrub understory, ranging from 2% in 2005 to 15% in 2020 (**Figure 1.2**). The overall preferred browse populations have gradually decreased in density while the individual demographics of the population have fluctuated over the study years. However, these populations have mainly been a mixture of mature and decadent individuals. Recruitment of young plants has remained low while decadent sagebrush have decreased overall since 1995 (**Figure 1.9**). The average amount of preferred browse receiving moderate use has exhibited an overall decreased since 2000. However, utilization remained noteworthy in 2020, with 24% of plants receiving moderate use and 38% with heavy use. Heavy use of preferred browse has fluctuated greatly over the sample period (**Figure 1.11**).

Pinyon-juniper encroachment it is not occurring at this time on this representative site (**Figure 1.5**, **Figure 1.7**).

Herbaceous Understory: The herbaceous understory of the Clay Basin Bench study is plentiful and is dominated by perennial grasses, mainly needle and thread (*Hesperostipa comata*). Although cover has fluctuated slightly in recent sample years, perennial grasses have shown an overall increasing trend. Cover of both annual grasses and annual forbs has fluctuated over time, with each contributing about 10% cover in 2015, but decreasing to less than 1% in 2020. Perennial forbs have remained rare, with cover ranging from 0.2% in 2005 and 2010 to 2% in 2000 (**Figure 1.13**, **Figure 1.15**).

Occupancy: The mean abundance of elk pellet groups has ranged from 0 days use/acre from 2010 to 2020 to 6 days use/acre in 2000. The mean abundance of deer/antelope pellet groups has been as low as 7 days use/acre in 2015 and as high as 77 days use/acre in 2020. Finally, the mean abundance of cattle pellet groups has ranged from 12 days use/acre in 2005 to 20 days use/acre in 2000 (**Figure 1.17**).

Semiwet (Fresh Meadow)

One study site [Big Meadow (8C-12)] is classified as a Semiwet (Fresh Meadow) ecological site. Big Meadow is located on the lower southern slope of Goslin Mountain, southeast of the Goslin Mountain (8C-2) and West Goslin (8C-9) study sites (**Table 1.10**).

Shrubs/Trees: Shrubs and trees are absent from this representative site (**Figure 1.8**, **Figure 1.10**, **Figure 1.4**, **Figure 1.6**).

Herbaceous Understory: This site is dominated by perennial grasses, which have exhibited an increasing trend over the study years. Although arctic rush (*Juncus arcticus*) has been the most abundant perennial graminoid in the past, cover has decreased from 34% in 2010 to just 6% in 2015. Kentucky bluegrass (*Poa pratensis*) has become the most dominant perennial grass species, with cover ranging from 9% in 2000 to 49% in 2015: this

substantial increase could possibly be in response to heavy grazing. Perennial forbs are also quite abundant, with cover ranging from 11% in 2010 to 26% in 2020. Annual grasses do not and have not occurred on this study site, and annual forbs contribute a very low amount of cover (**Figure 1.12**, **Figure 1.14**).

Occupancy: Pellet transect data shows occasional occupancy of this site although animals were absent in 2015. Elk appear to not occupy this site. Mean abundance of pellet groups for deer/antelope has ranged from 0 days use/acre in 2000 and 2015 to 21 days use/acre in 2010. Mean abundance of pellet groups for cattle has ranged from 0 days use/acre in 2015 to 164 days use/acre in 2010 (**Figure 1.16**).

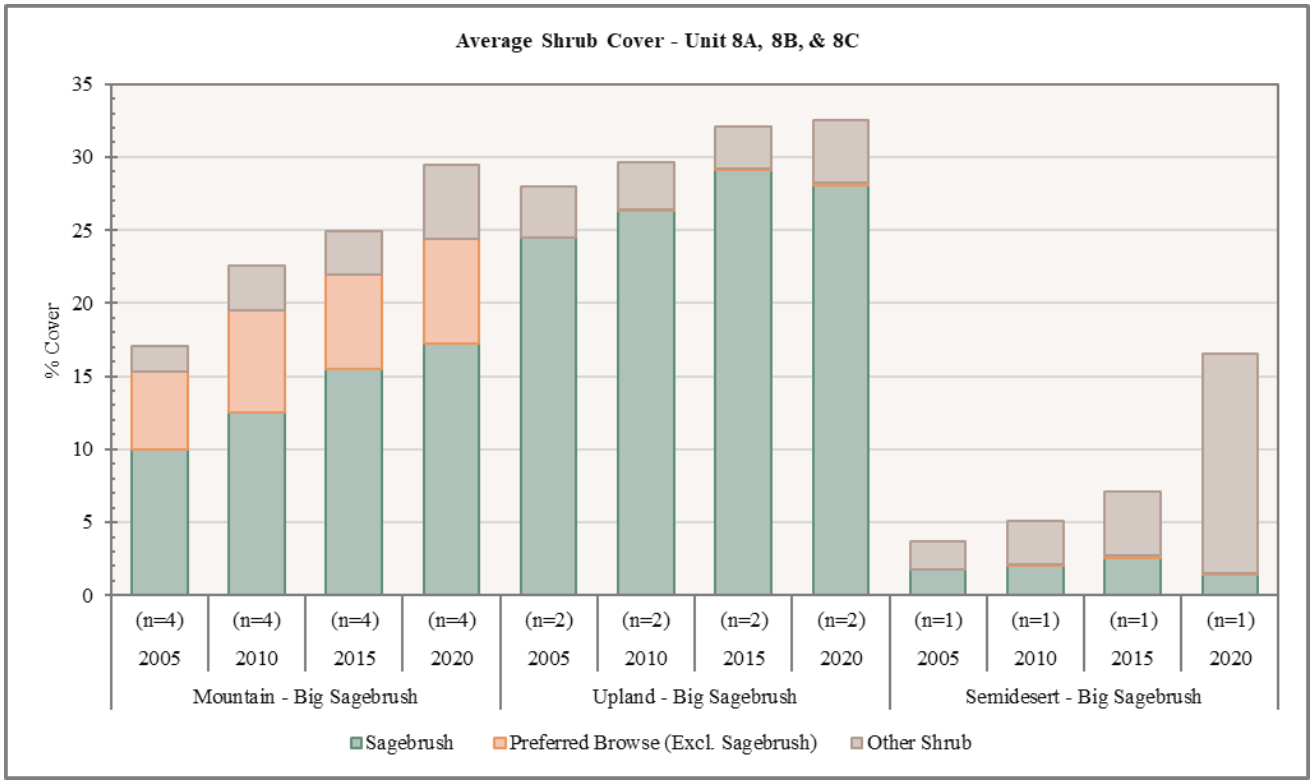


Figure 1.2: Average shrub cover for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 8, North Slope.

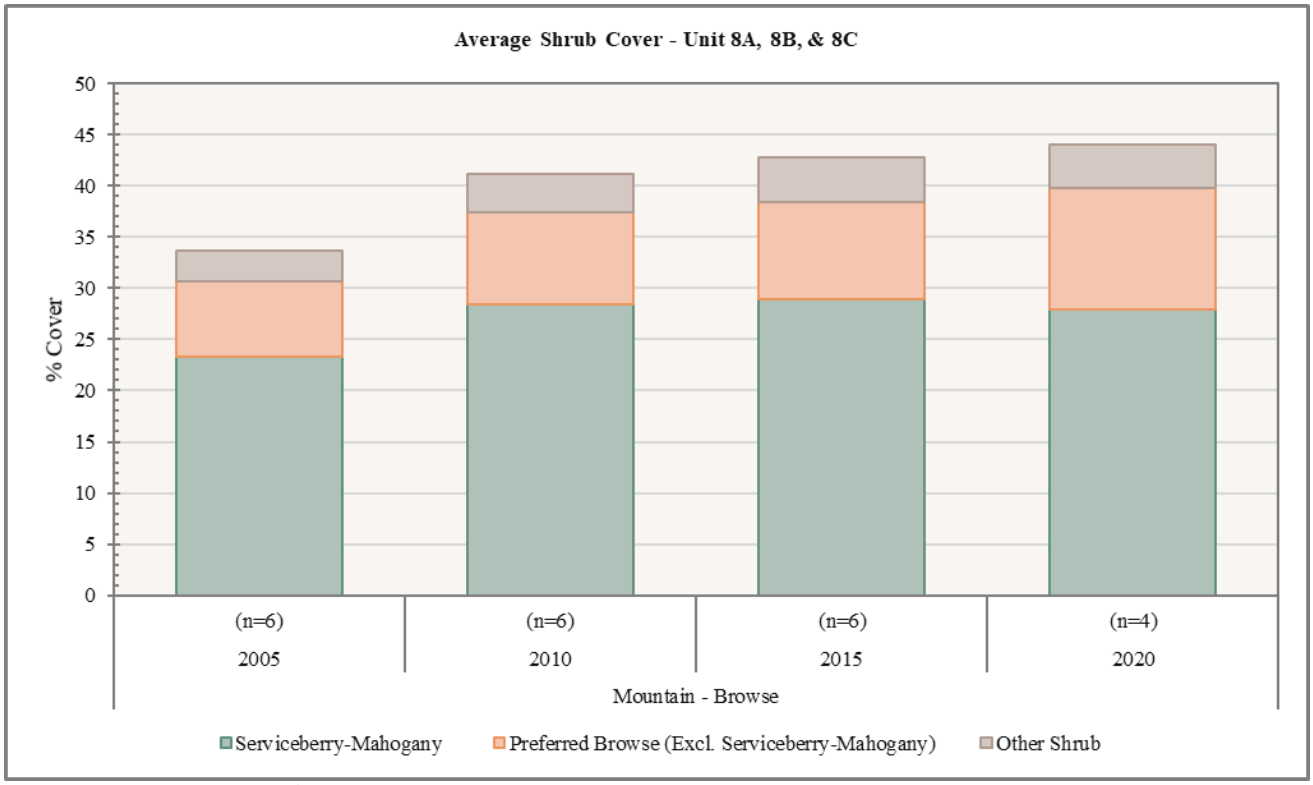


Figure 1.3: Average shrub cover for Mountain - Browse study sites in WMU 8, North Slope.

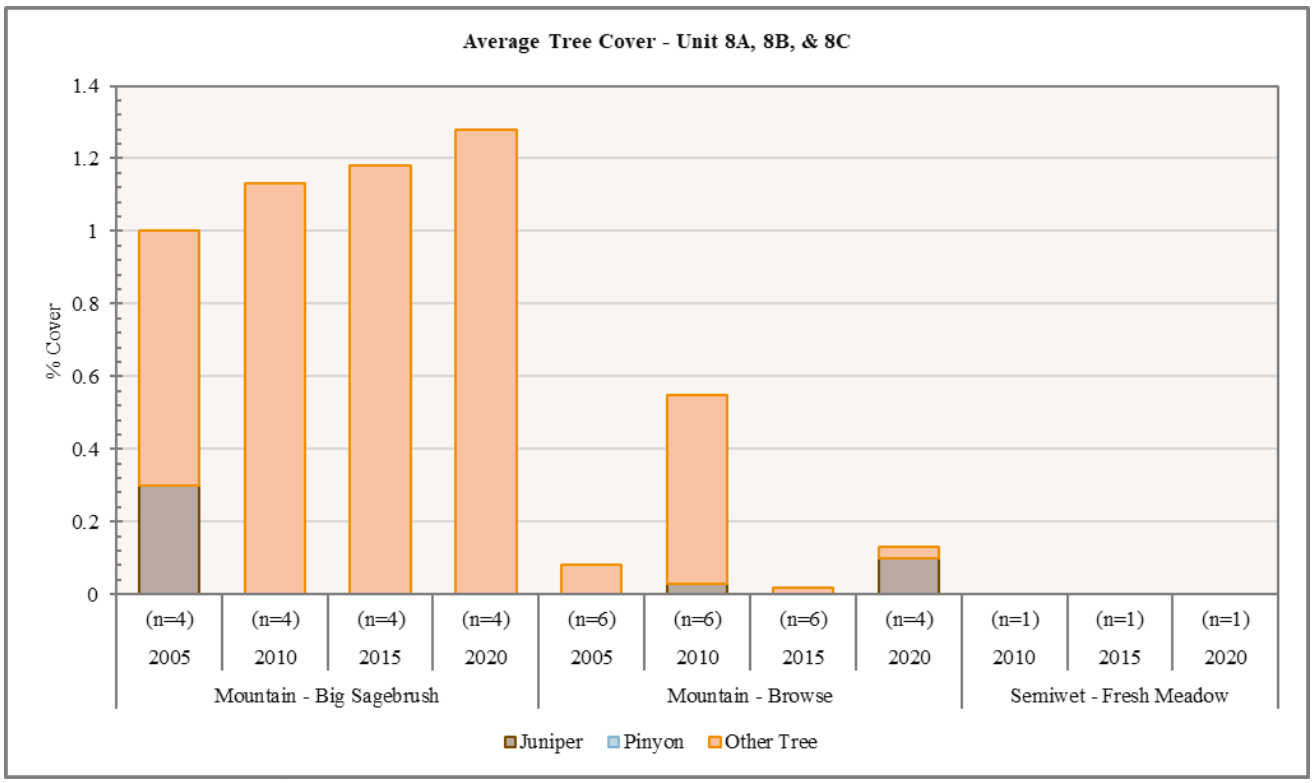


Figure 1.4: Average tree cover for Mountain - Big Sagebrush, Mountain - Browse, and Semiwet - Fresh Meadow study sites in WMU 8, North Slope.

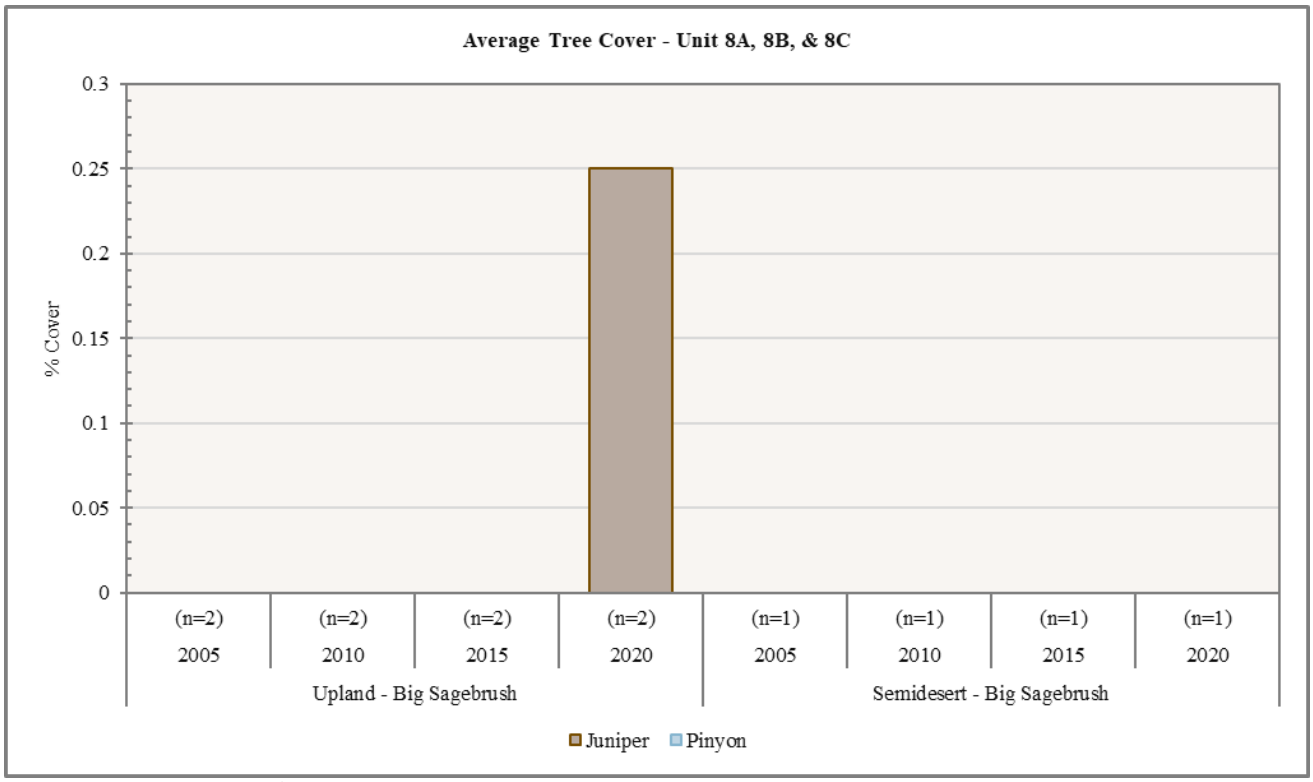


Figure 1.5: Average tree cover for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 8, North Slope.

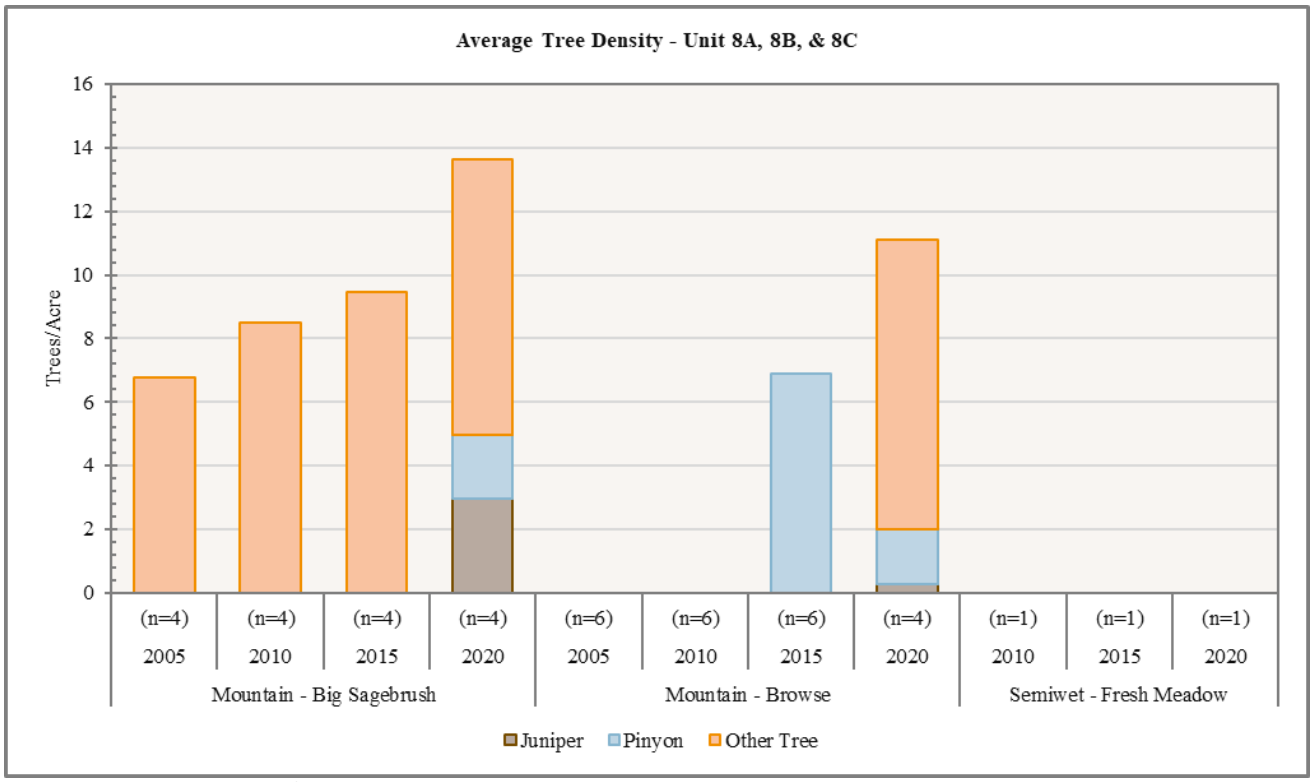


Figure 1.6: Average tree density for Mountain - Big Sagebrush, Mountain - Browse, and Semiwet - Fresh Meadow study sites in WMU 8, North Slope.

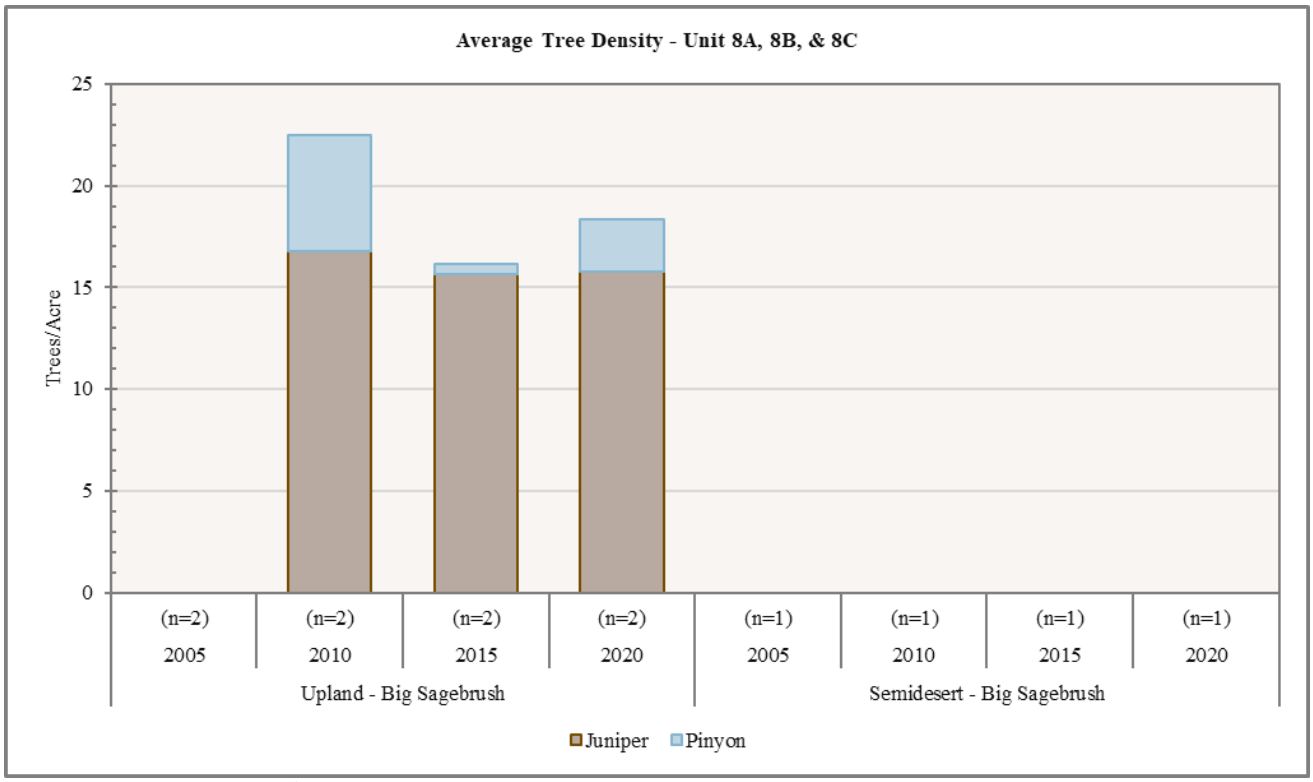


Figure 1.7: Average tree density for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 8, North Slope.

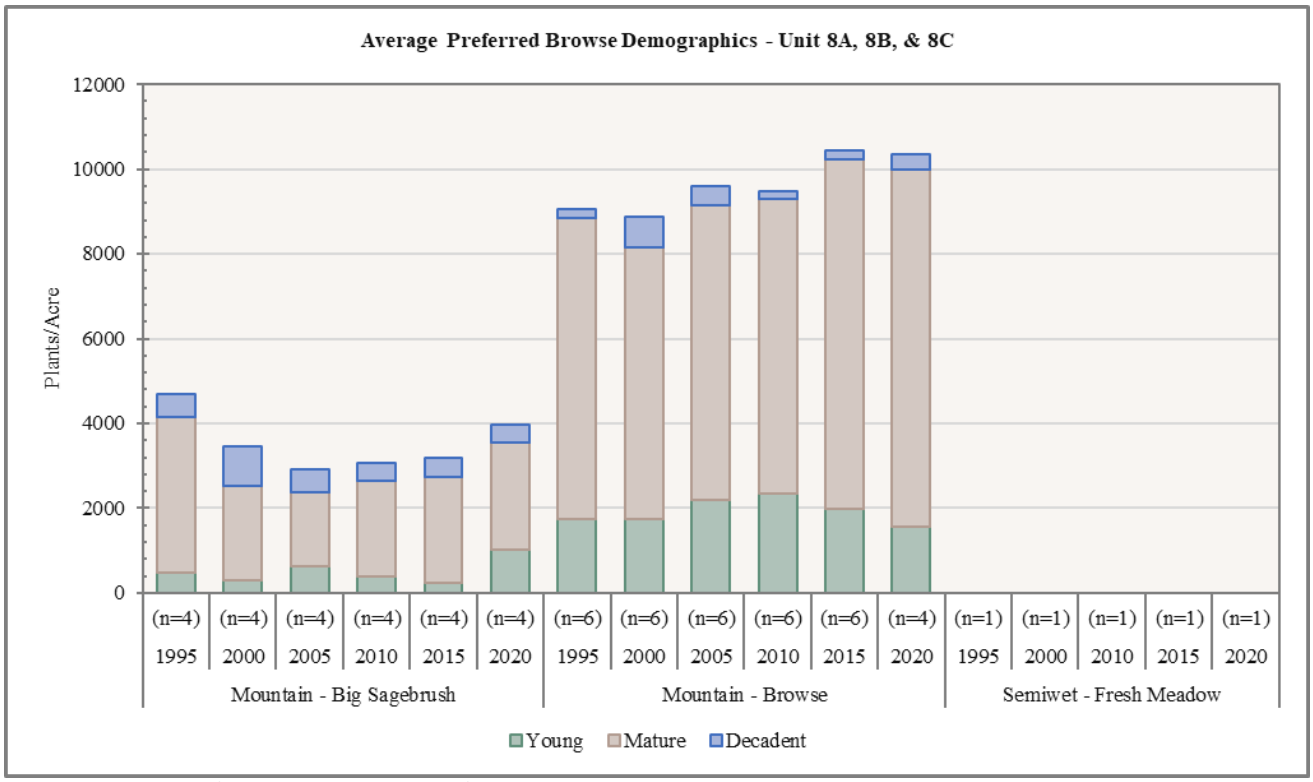


Figure 1.8: Average preferred browse demographics for Mountain - Big Sagebrush, Mountain - Browse, and Semiwet - Fresh Meadow study sites in WMU 8, North Slope.

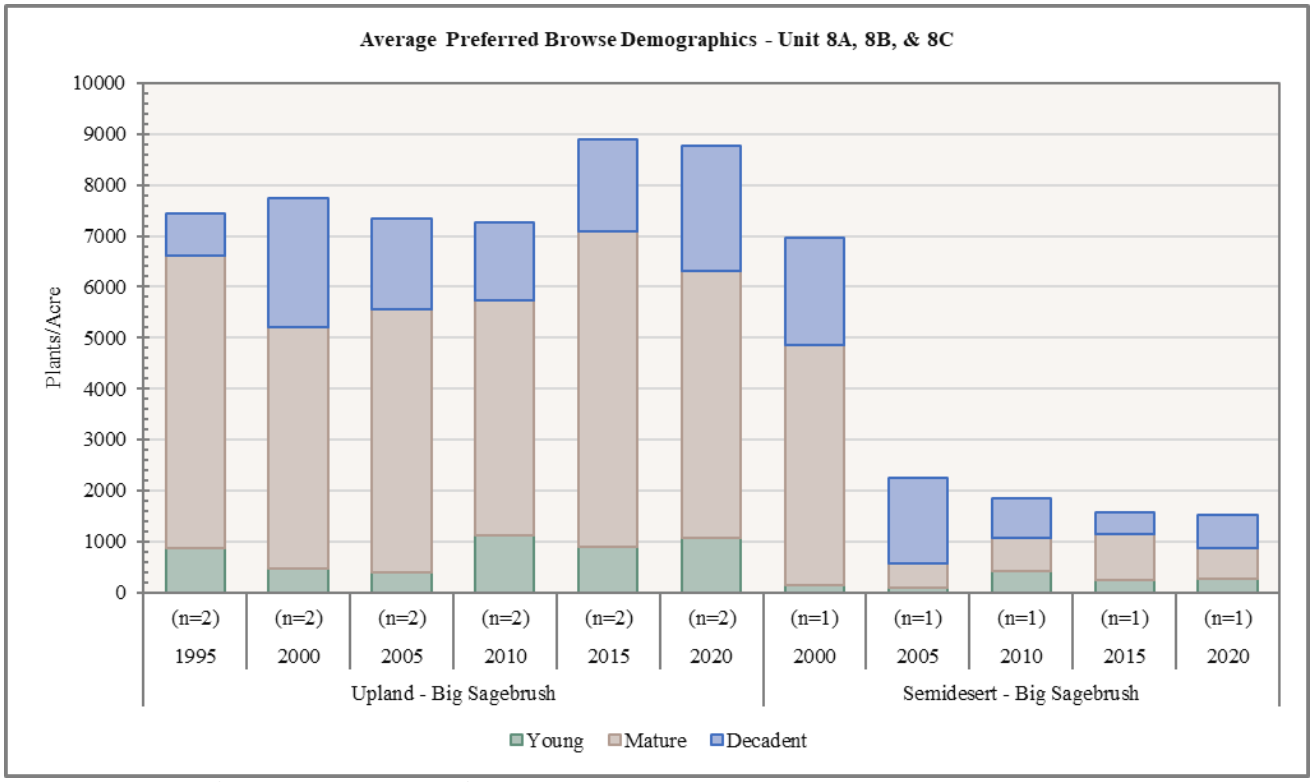


Figure 1.9: Average preferred browse demographics for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 8, North Slope.

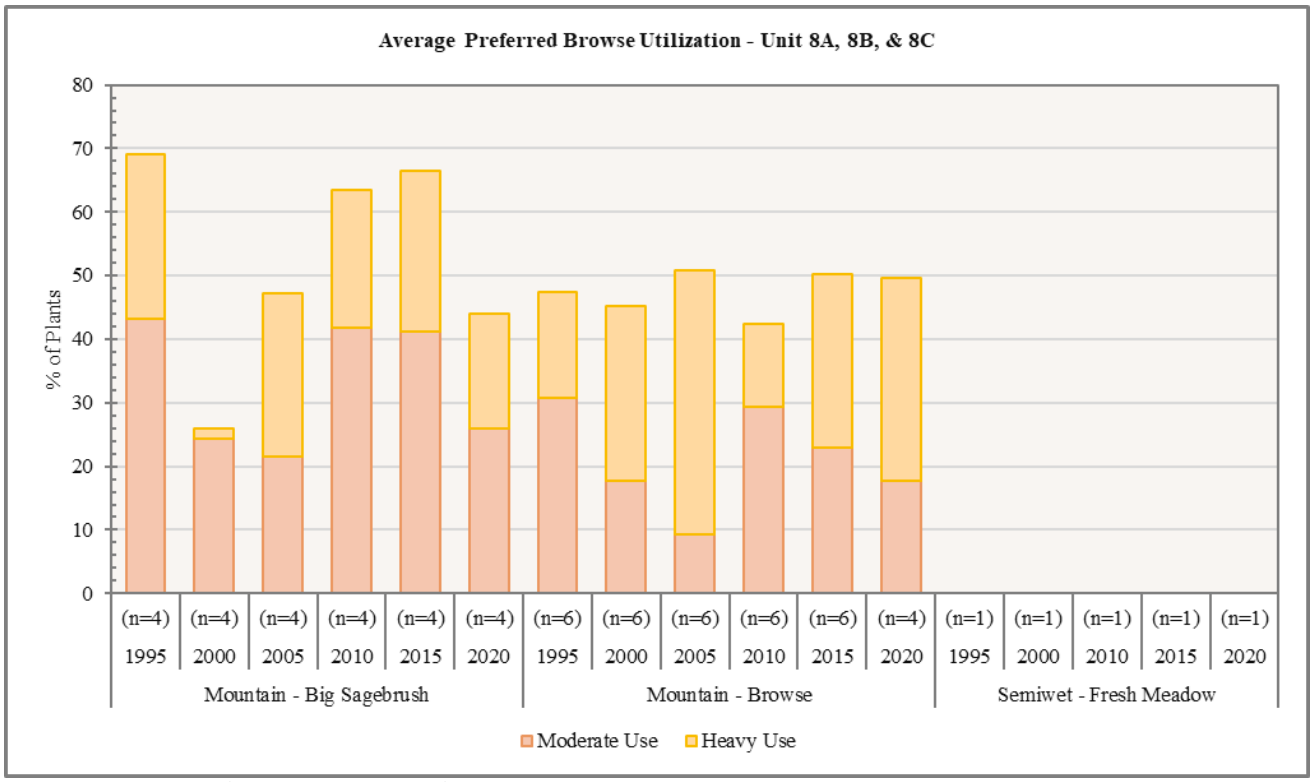


Figure 1.10: Average preferred browse utilization for Mountain - Big Sagebrush, Mountain - Browse, and Semiwet - Fresh Meadow study sites in WMU 8, North Slope.

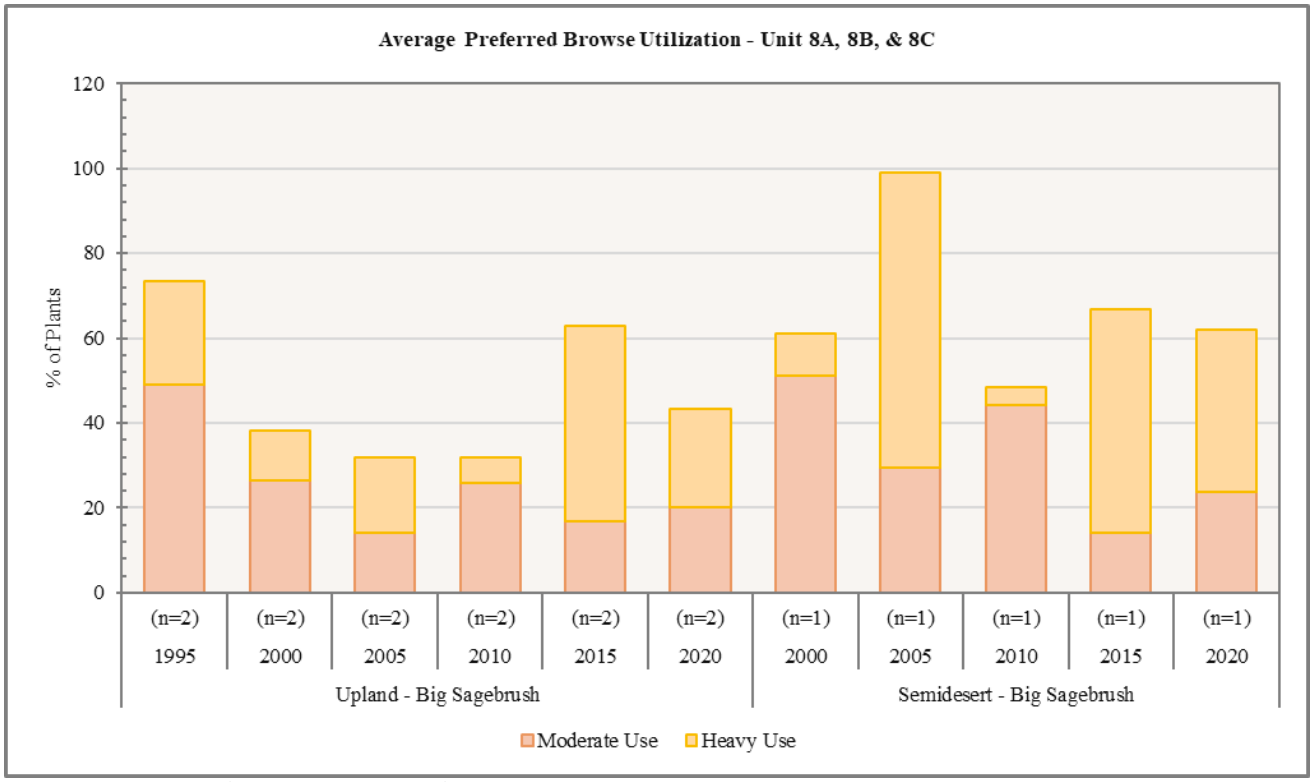


Figure 1.11: Average preferred browse utilization for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 8, North Slope.

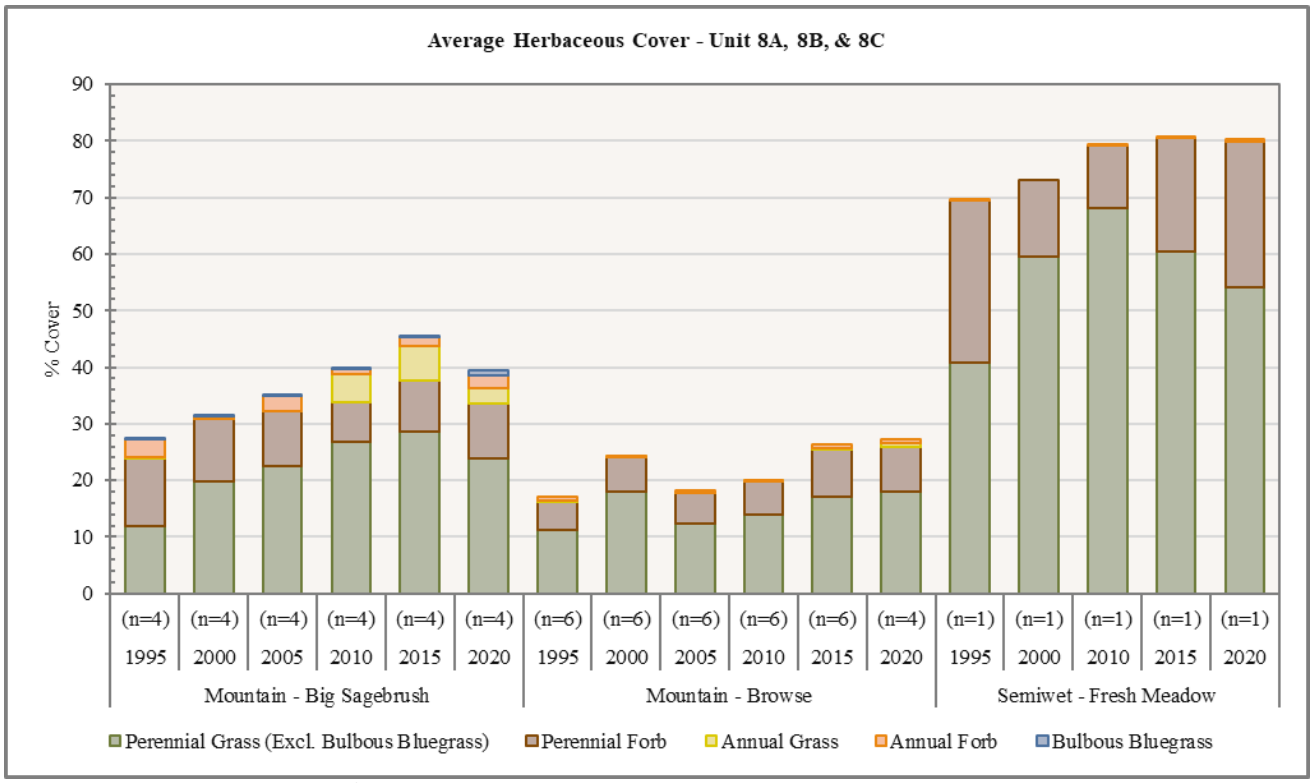


Figure 1.12: Average herbaceous cover for Mountain - Big Sagebrush, Mountain - Browse, and Semiwet - Fresh Meadow study sites in WMU 8, North Slope.

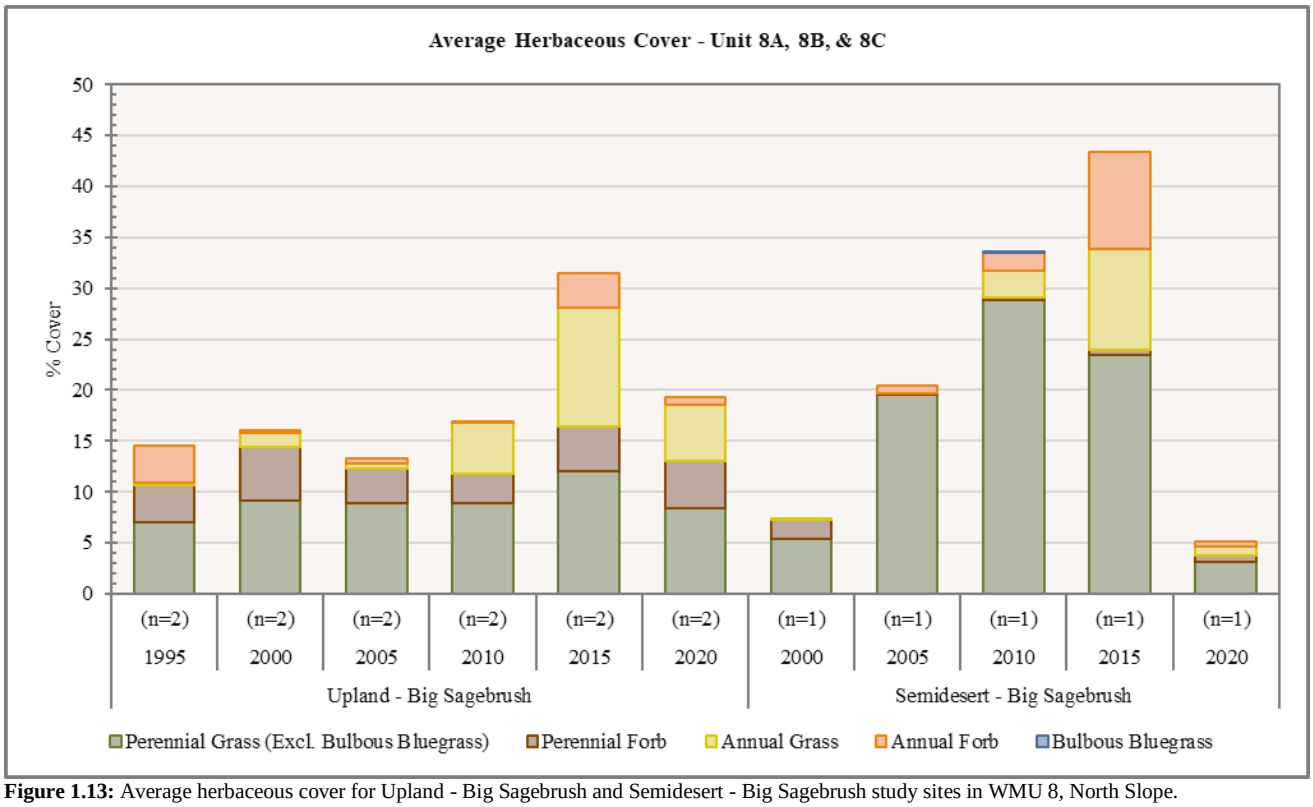


Figure 1.13: Average herbaceous cover for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 8, North Slope.

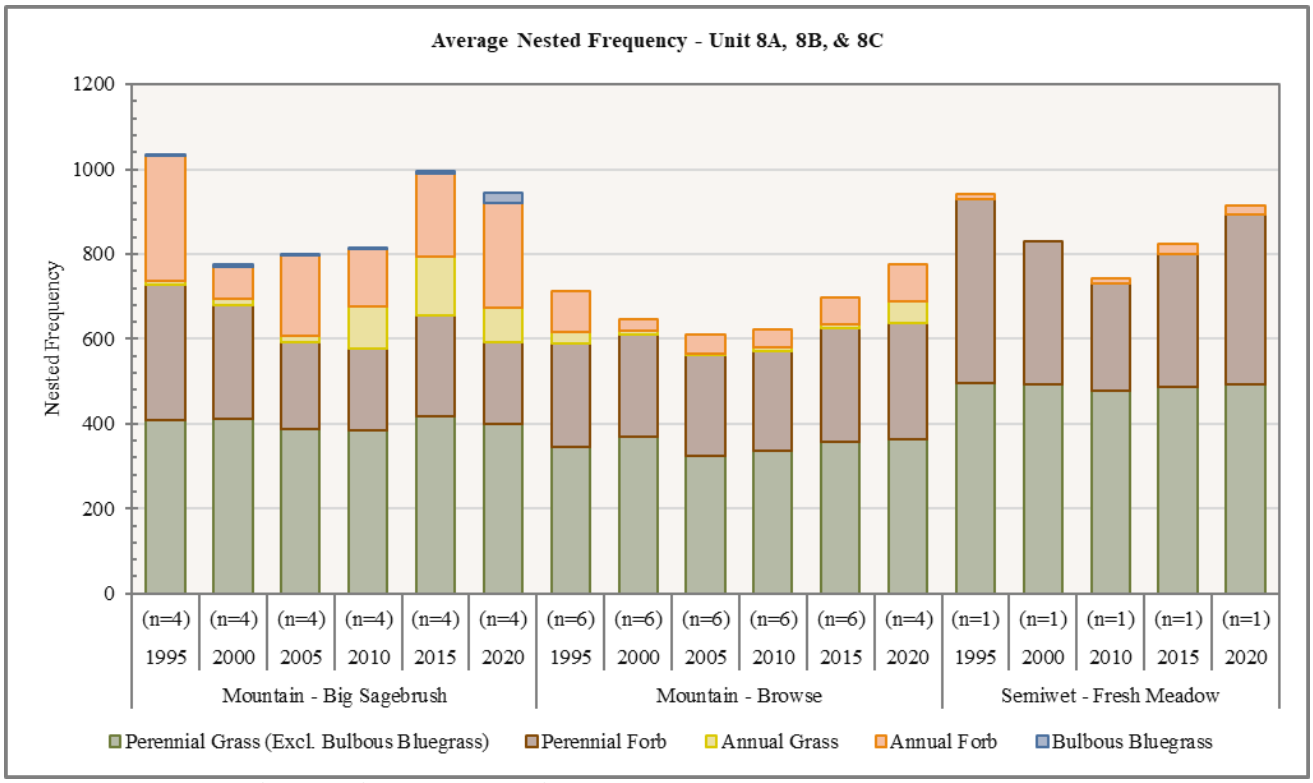


Figure 1.14: Average nested frequency of herbaceous species for Mountain - Big Sagebrush, Mountain - Browse, and Semiwet - Fresh Meadow study sites in WMU 8, North Slope.

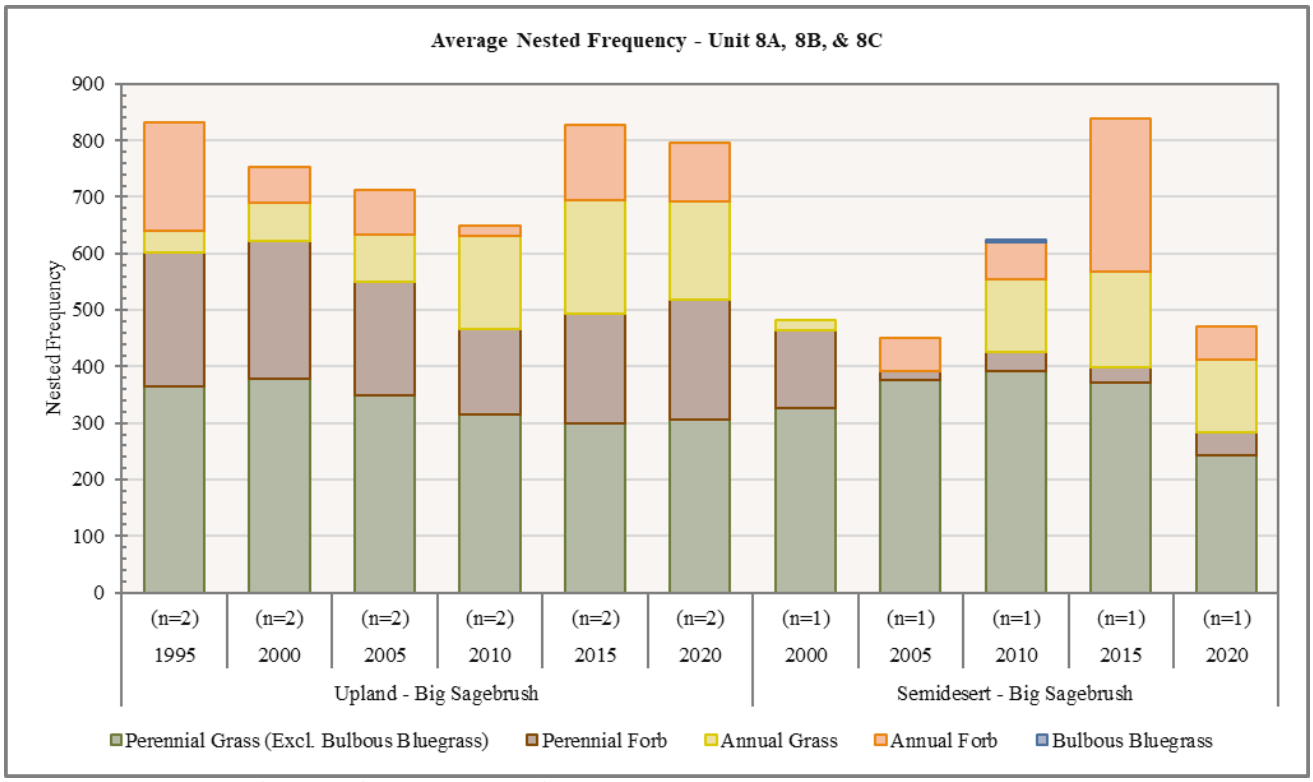


Figure 1.15: Average nested frequency of herbaceous species for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 8, North Slope.

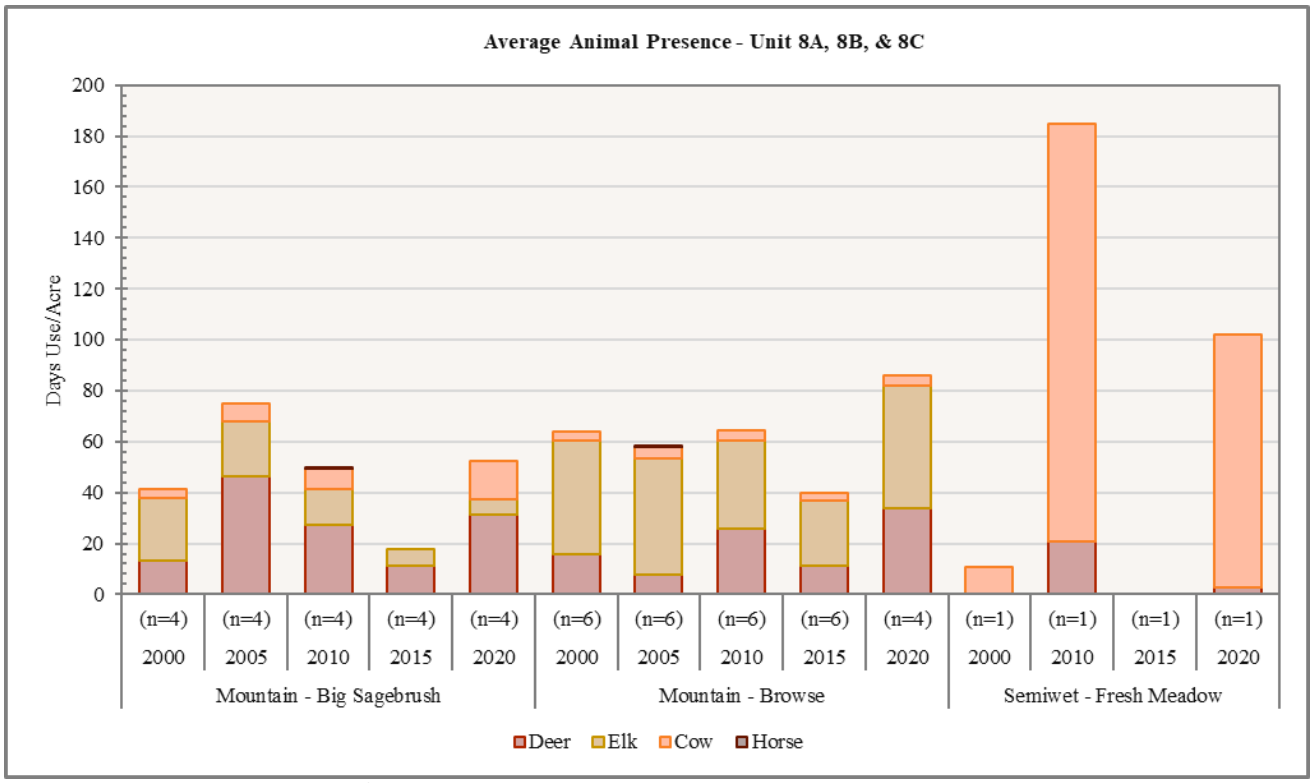


Figure 1.16: Average pellet transect data for Mountain - Big Sagebrush, Mountain - Browse, and Semiwet - Fresh Meadow study sites in WMU 8, North Slope. *Mountain - Big Sagebrush and Mountain - Browse deer pellet groups include deer/antelope.

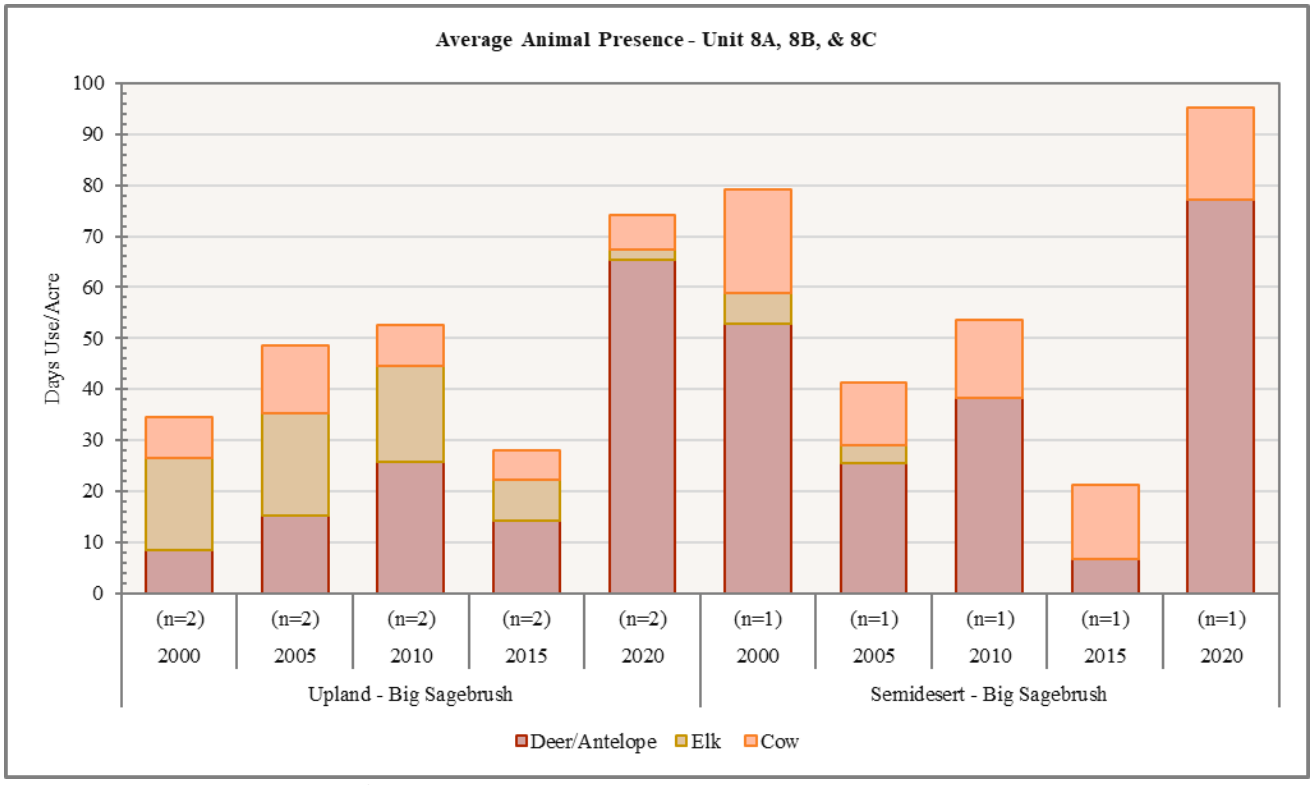
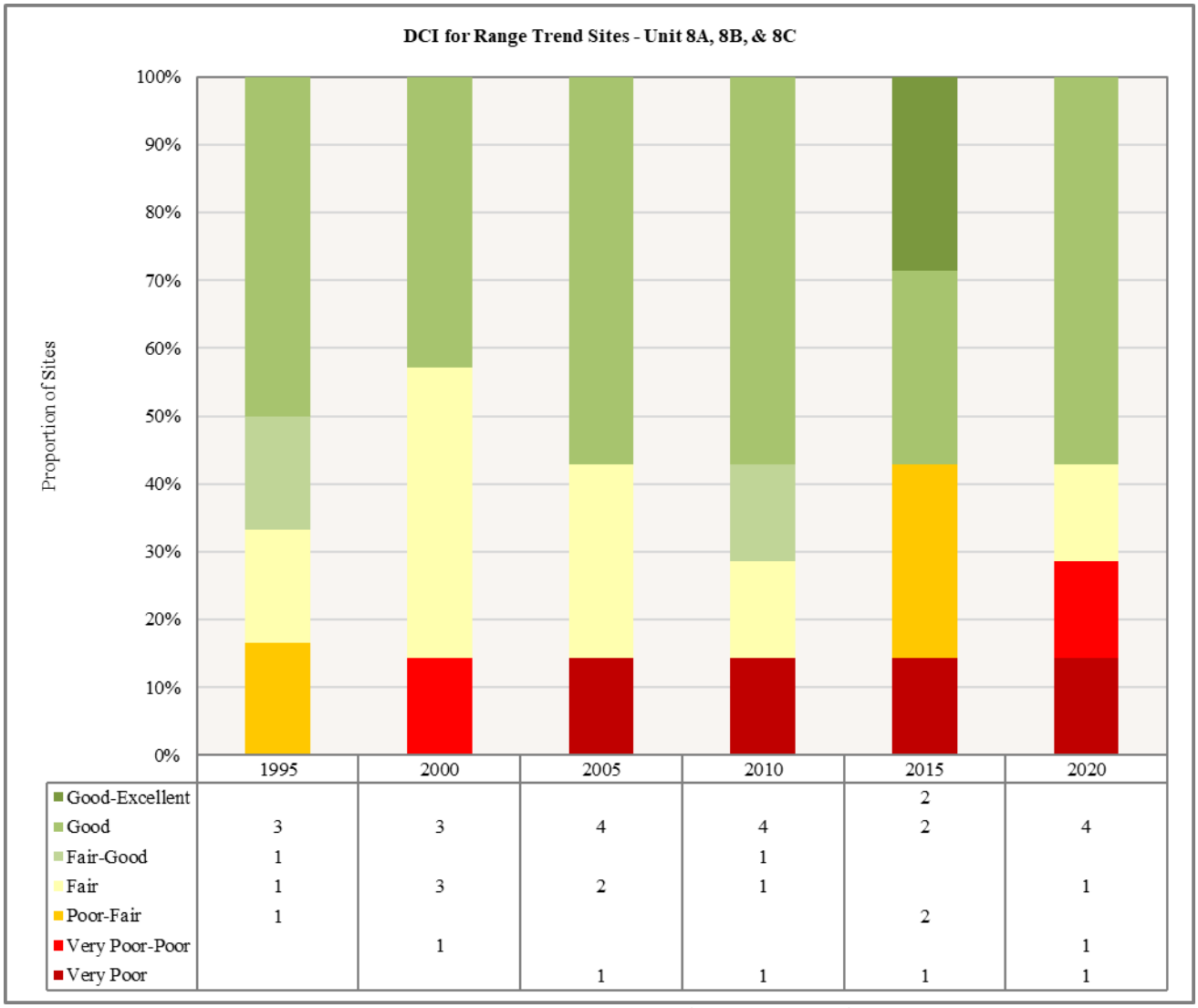


Figure 1.17: Average pellet transect data for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 8, North Slope.

Deer Winter Range Condition Assessment

The condition of deer winter range within the North Slope management unit has generally remained stable since the 1995 sampling. The Range Trend sites in WMU 8B have remained in good condition from 1995 to 2020, and are the main drivers for the unit's stability as good deer winter range. Range Trend sites in WMU 8C tend to be much more variable with Bear Top Mountain (08C-03) having a proclivity to remain as very poor deer winter range and Clay Basin Bench (08C-14) tending to remain as fair deer winter range.

The overall deer winter range assessment in 2020 for WMU 8 remains good. However, Bear Top Mountain remains in very poor condition due to an abundance of annual grass and a lack of perennial forb and browse cover, while Clay Basin Bench has recently lost perennial grass and browse cover and is currently rated as very poor to poor winter range. Of the sites in WMU 8C, Antelope Flat (08C-07) has the least amount of variance in habitat desirability and is considered to be fair winter range. Greendale (08B-04), Bennett Ranch (08B-05), Death Valley (08B-06), and Phil Pico Mountain (08B-08) are all considered to be in good condition (**Figure 1.18**, **Table 1.12**).

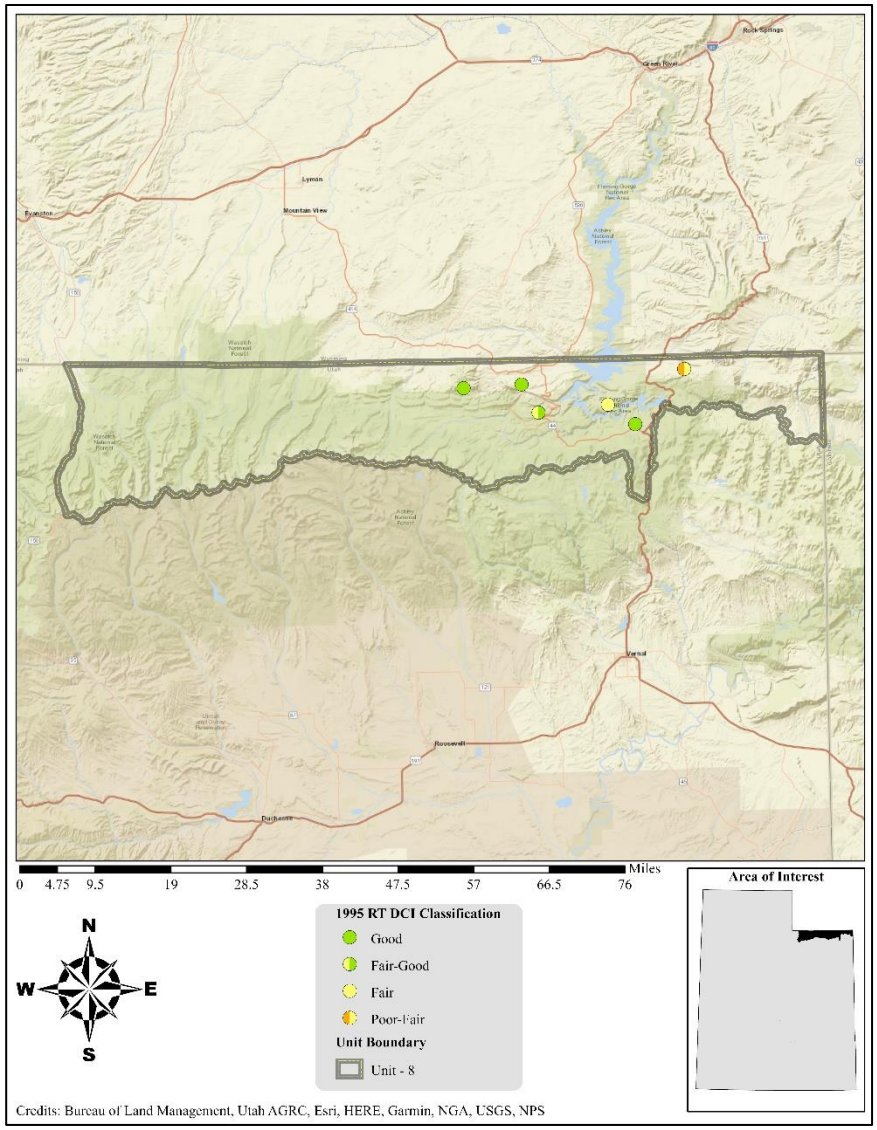


	1995	2000	2005	2010	2015	2020
Good-Excellent					2	
Good	3	3	4	4	2	4
Fair-Good	1			1		
Fair	1	3	2	1		1
Poor-Fair	1				2	
Very Poor-Poor		1				1
Very Poor			1	1	1	1

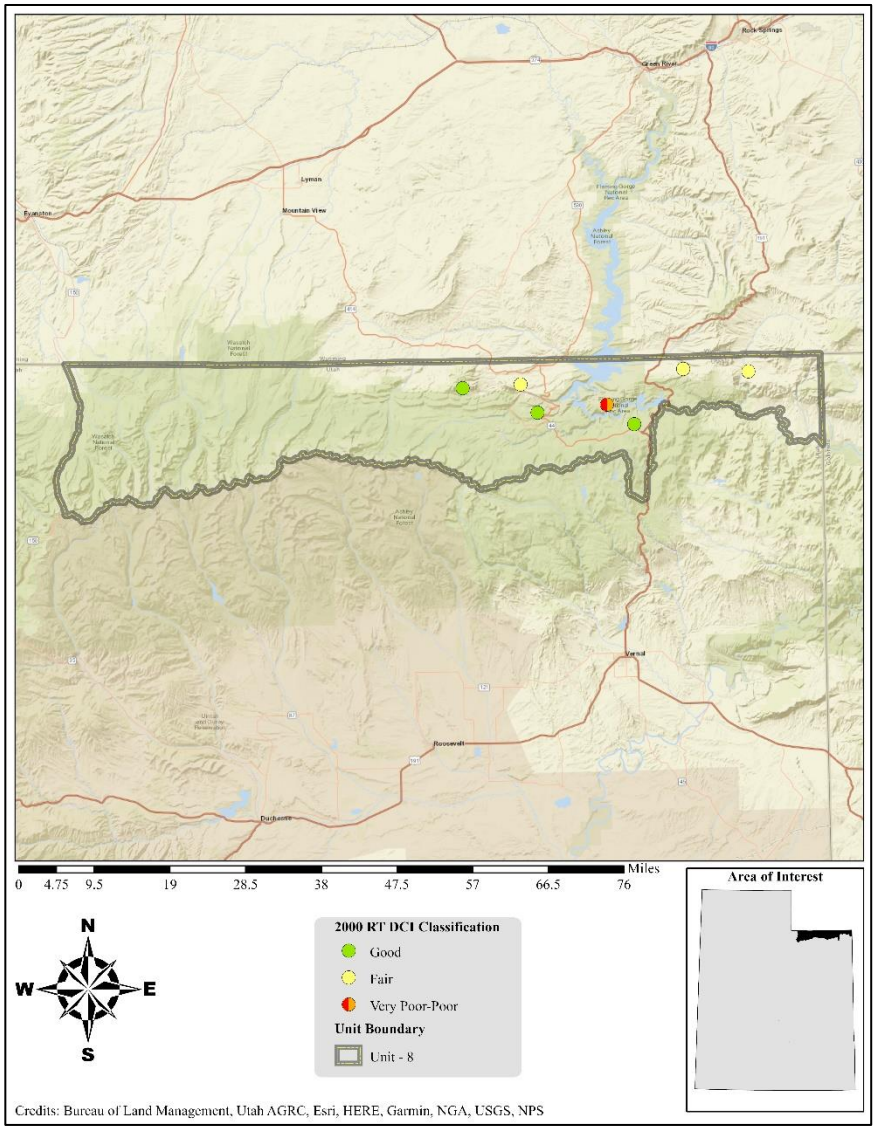
Figure 1.18: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 8, North Slope.

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
08B-04	1995	24.3	13.7	5.2	26.5	-0.1	10	0	**79.7**	**G**
08B-04	2000	26.4	8.2	5.2	30	0	10	0	**79.8**	**G**
08B-04	2005	30	7.7	6.6	30	0	10	0	**84.3**	**G**
08B-04	2010	30	9	7.1	30	-0.4	10	0	**85.7**	**G**
08B-04	2015	30	9.5	2.1	30	-1	10	-2	**78.5**	**G**
08B-04	2020	30	11.2	4.8	30	0	10	-2	**84**	**G**
08B-05	1995	28	13.4	6.1	16.6	0	9.2	0	**73.2**	**G**
08B-05	2000	25.8	5.4	1.4	17.1	0	10	0	**59.6**	**F**
08B-05	2005	30	6.9	1.9	11.8	0	8.2	0	**58.8**	**F**
08B-05	2010	30	8.5	2.5	18.4	0	7.7	0	**67.1**	**G**
08B-05	2015	30	8.6	1.2	30	0	10	0	**79.8**	**G-E**
08B-05	2020	30	7	1.1	23.6	0	10	0	**71.6**	**G**
08B-06	1995	30	13.3	4	12.6	0	9.7	0	**69.5**	**F-G**
08B-06	2000	27.5	6.9	0.9	30	0	10	0	**75.3**	**G**
08B-06	2005	30	10	5.3	30	0	8.8	0	**84.1**	**G**
08B-06	2010	30	11.6	7.8	28.3	0	10	0	**87.7**	**G**
08B-06	2015	30	6.4	2.8	23.4	-0.1	10	0	**72.6**	**G**
08B-06	2020	30	9.9	3.9	24	-0.2	10	0	**77.6**	**G**
08B-08	1995	30	13.9	8	27.9	-1.9	5.8	0	**83.6**	**G**
08B-08	2000	30	10.8	6.1	30	-0.1	7.8	0	**84.5**	**G**
08B-08	2005	30	13.1	6.8	30	0	6.9	0	**86.7**	**G**
08B-08	2010	30	14.7	5.6	30	-0.1	7.2	0	**87.4**	**G**
08B-08	2015	30	13.9	7	30	-0.9	10	0	**90.1**	**G-E**
08B-08	2020	30	13.7	4.8	30	-1.8	9.2	0	**85.8**	**G**
08C-03	1995	22	12.3	5.2	16.3	-0.2	10	0	**65.7**	**F**
08C-03	2000	1.6	0	0	27	-0.5	10	0	**38.1**	**VP-P**
08C-03	2005	0.7	0	0	30	-0.1	2.1	0	**32.7**	**VP**
08C-03	2010	0.7	0	0	30	-12.2	5.1	0	**23.6**	**VP**
08C-03	2015	2	0	0	30	-16.5	4.7	0	**20.2**	**VP**
08C-03	2020	3.1	0	0	30	-7.6	3.1	-2	**26.6**	**VP**
08C-07	1995	20	8.5	5.2	11.3	-0.4	5.6	0	**50.2**	**P-F**
08C-07	2000	24.3	1.2	3.9	19.3	-2.1	10	0	**56.6**	**F**
08C-07	2005	27.4	7.3	4.0	23.9	-0.6	5.4	0	**67.3**	**G**
08C-07	2010	30	6.8	14.6	17.2	-7.5	4	0	**65**	**F-G**
08C-07	2015	28	7.8	10.1	14.6	-17.5	5.6	0	**48.5**	**P-F**
08C-07	2020	30	6	13.0	10.1	-8.3	6.3	0	**57.2**	**F**
08C-14	2000	19.7	5.5	1.1	10.7	-0.1	3.9	0	**40.8**	**F**
08C-14	2005	2.3	0	0	30	0	0.4	0	**32.6**	**F**
08C-14	2010	2.6	0	0	30	-2.0	0.5	0	**31.1**	**F**
08C-14	2015	3.4	0	0	30	-7.5	0.8	0	**26.8**	**P-F**
08C-14	2020	1.9	0	0	6.1	-0.6	1.5	0	**8.9**	**VP-P**

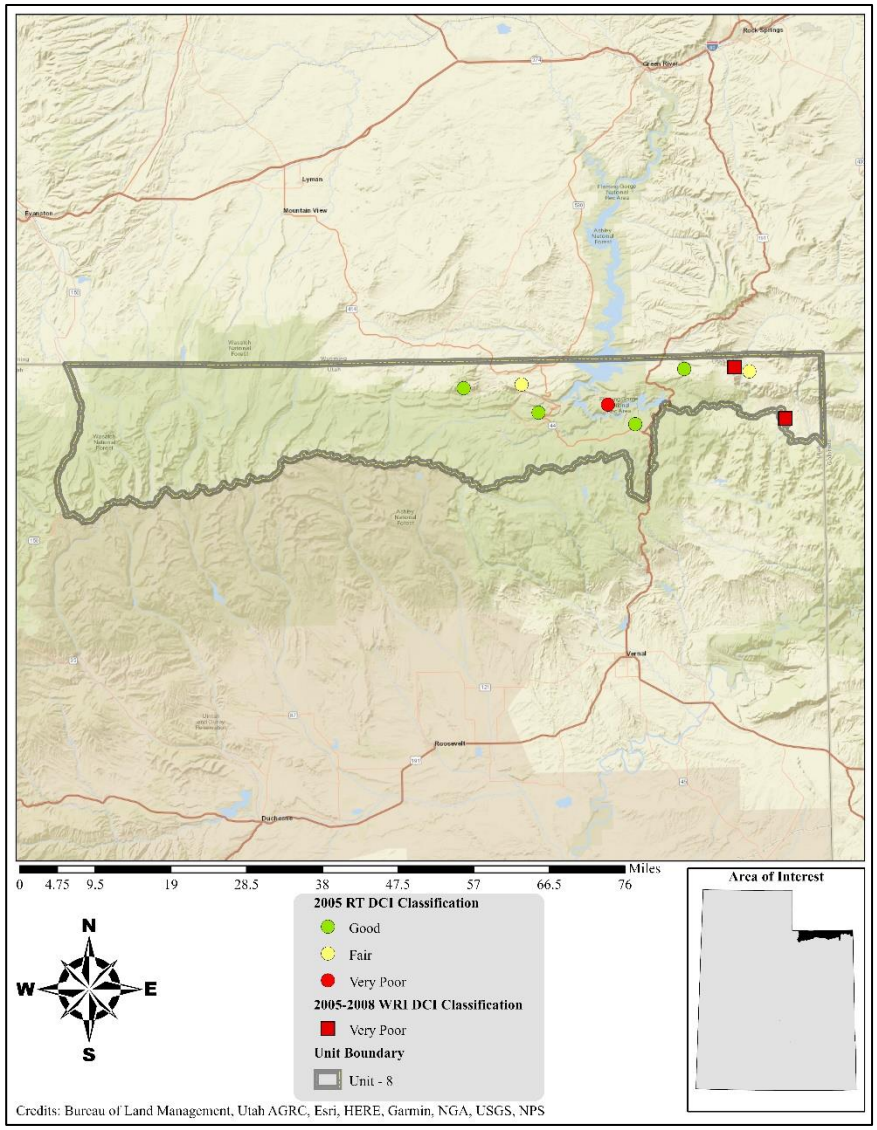
Table 1.12: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 8, North Slope. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. *Studies with an asterisk have been suspended.



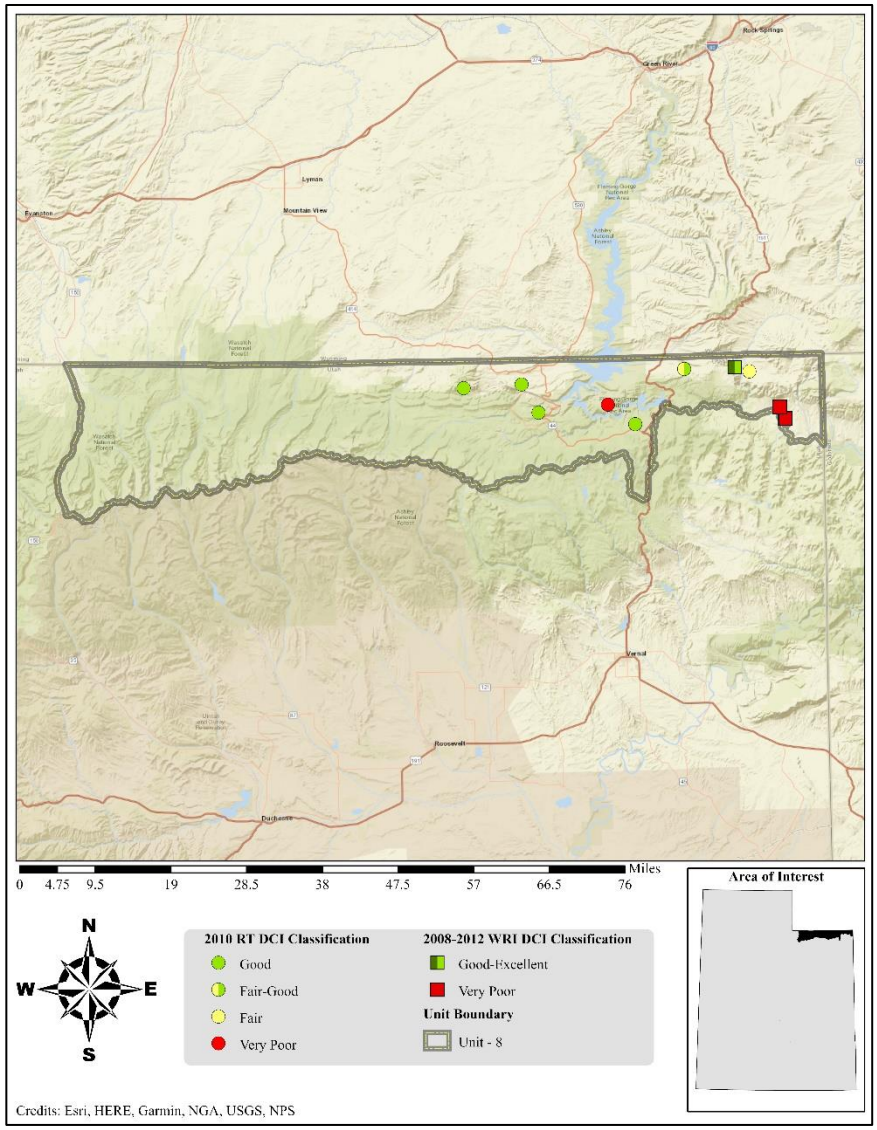
Map 1.11: 1995 Desirable Components Index (DCI) ranking distribution by study site for WMU 8, North Slope.



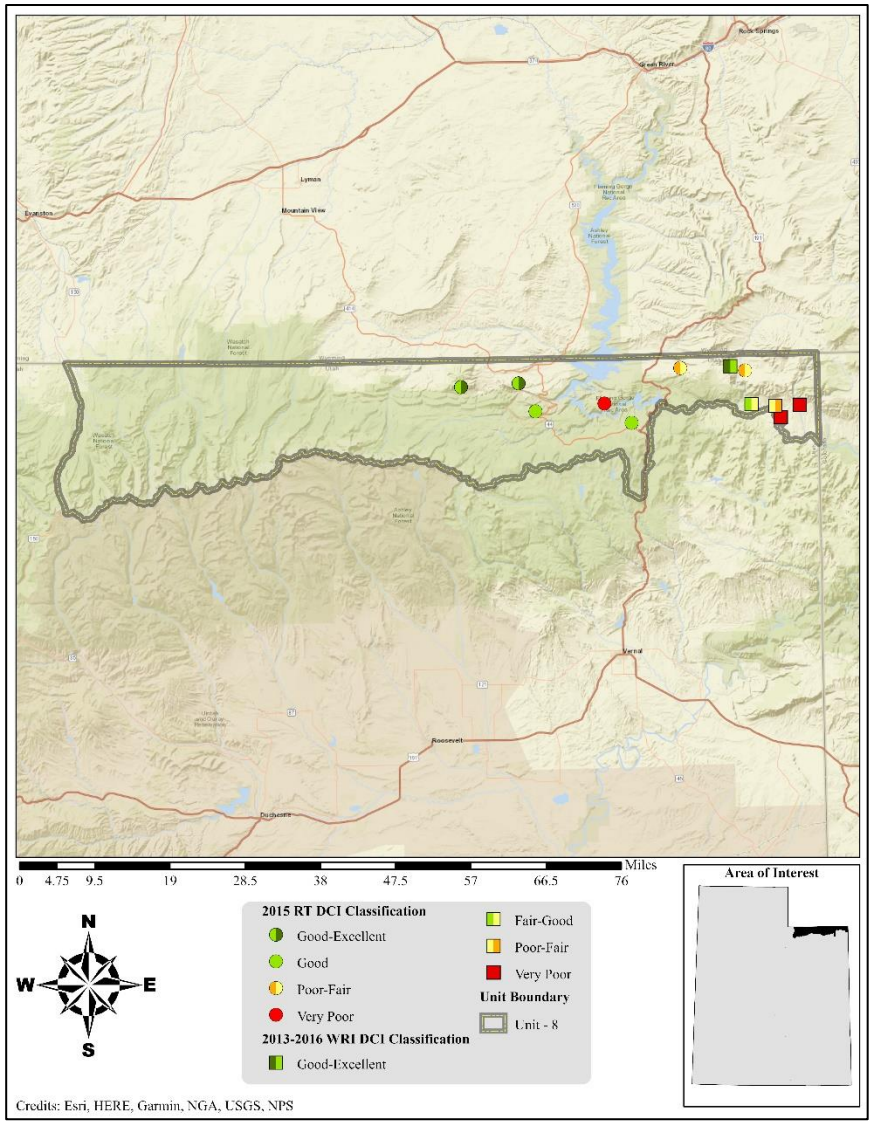
Map 1.12: 2000 Desirable Components Index (DCI) ranking distribution by study site for WMU 8, North Slope.



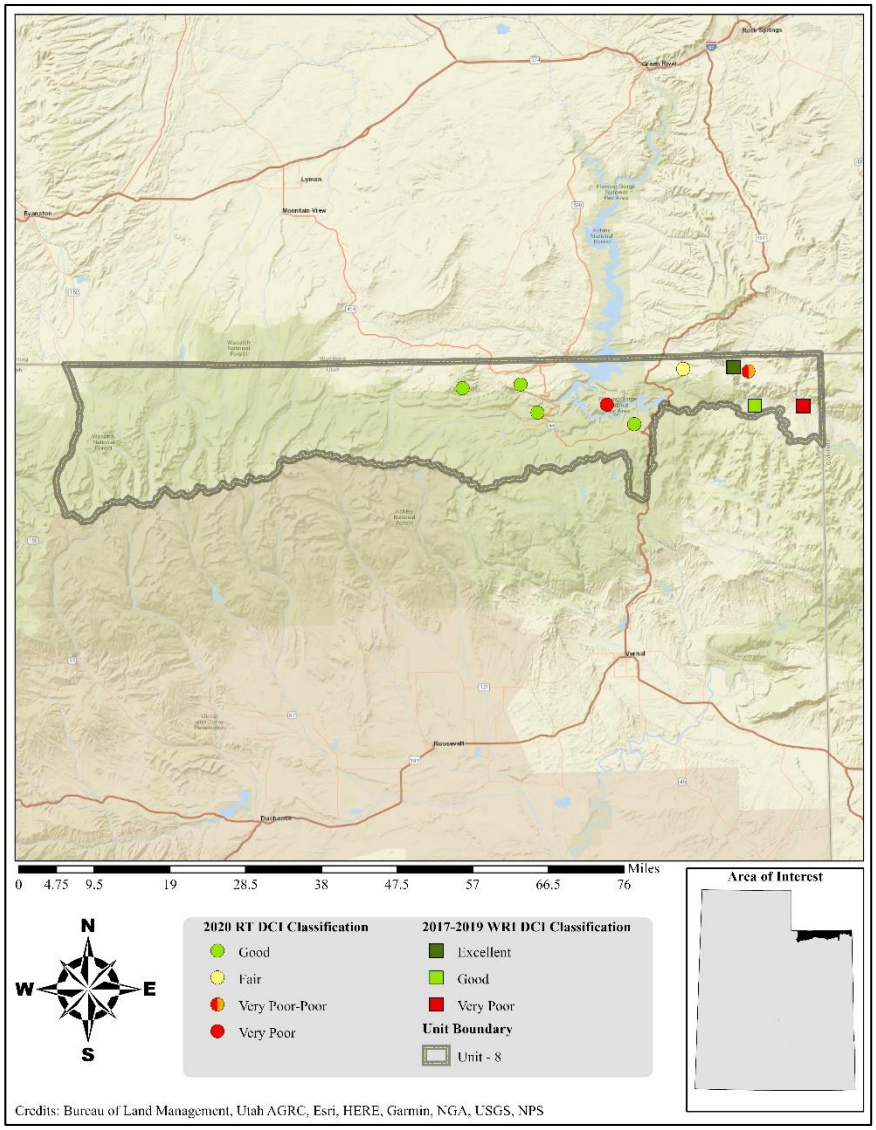
Map 1.13: 2005 Desirable Components Index (DCI) ranking distribution by study site for WMU 8, North Slope.



Map 1.14: 2010 Desirable Components Index (DCI) ranking distribution by study site for WMU 8, North Slope.



Map 1.15: 2015 Desirable Components Index (DCI) ranking distribution by study site for WMU 8, North Slope.



Map 1.16: 2020 Desirable Components Index (DCI) ranking distribution by study site for WMU 8, North Slope.

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
08A-1	Widdop Mtn. South Slope	None Identified		
08A-2	Widdop Mtn. North Slope	Animal Use – Moose	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
08A-4	Bald Range	Animal Use – Elk	High	Reduced understory shrub and herbaceous vigor
08A-5	Telephone Hollow	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
08B-4	Greendale	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
		Tourism/Recreation	Low	Loss of habitat, reduced understory shrub and herbaceous vigor
08B-5	Bennett Ranch	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
08B-6	Death Valley	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
08B-8	Phil Pico Mountain	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
08C-2	Goslin Mountain	Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
08C-3	Bear Top Mountain	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
08C-7	Antelope Flat	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Animal Use – Deer/Antelope	Medium	Reduced/less vigorous browse component
08C-9	West Goslin	Energy Development	High	Fragmentation and degradation/loss of habitat
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
08C-12	Big Meadow	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
08C-14	Clay Basin Bench	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Energy Development	High	Fragmentation and degradation/loss of habitat
08R-1	Brown's Park db Drum	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
08R-2	Teepee Mountain Bullhog	Animal Use – Cattle	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
08R-3	Goslin Mountain Bullhog	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
08R-4	Bake Oven	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Noxious Weeds	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
08R-5	Birch Creek	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor

Table 1.13: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 8, North Slope. 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)

Excluding the Bear Top Mountain study site (which burned), these high elevation mountain ecological sites support sagebrush communities and are generally considered to be in good condition for deer and elk winter range habitat on the North Slope management unit. Also excluding the Bear Top Mountain study, these communities support robust shrub populations that provide valuable browse in mild and moderate winters. While generally in good condition, introduced perennial grasses are present in the herbaceous understories and pose a low to medium-level threat. Although providing valuable forage, these grass species can often be aggressive at higher elevations and can reduce the prevalence and abundance of other more desirable native grass and forb species. Two of these sites, Goslin Mountain and Bear Top Mountain, appear to be vulnerable to encroachment from conifer trees. Encroachment by pinyon and juniper can lead to reduced understory shrub

and herbaceous health if not addressed and is considered to be a low-level threat on these study sites. An additional threat from annual grasses, specifically cheatgrass (*Bromus tectorum*), appears to be low on most sites. However, the threat of invasion by cheatgrass is high on Bear Top Mountain. Higher amounts of cheatgrass can increase fuel loads and exacerbate the risk of fire. The introduced noxious weeds nodding plumeless thistle (*Carduus nutans*) and gypsyflower (*Cynoglossum officinale*) have been observed in low amounts on the respective Bear Top Mountain and Greendale studies. Noxious weeds, like non-native perennial and annual grasses have the potential to compete with native forbs and grasses for resources. Finally, energy development is a high-level threat on the West Goslin site. Energy development leads to the direct loss of habitat and habitat fragmentation due to infrastructure development that may lead to physiological stress and displacement of wildlife.

It is recommended that monitoring and work to reduce conifer encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should continue in these communities. If reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native species when possible. Despite being a higher potential ecotype, care should still be taken when implementing mechanical disturbances in areas where cheatgrass is a threat so as to not encourage increases in annual grass and noxious weed cover. Monitoring may be needed to determine what energy development factors (noise, traffic, pollutants, fugitive dust, etc.) could be influencing wildlife in the area, and if mitigation measures are needed to support wildlife. Attention should be given to observing contractual obligations in reclamation projects.

Mountain (Browse)

These high elevation mountain ecological sites support mixed mountain brush communities and are generally considered to be in good condition for deer and elk summer range habitat on the North Slope management unit. These communities support robust shrub populations that provide valuable browse in mild and moderate winters. Threat from annual grasses, specifically cheatgrass (*Bromus tectorum*), appears to be low on most sites which include Widdop Mountain North Slope, Death Valley, and Phil Pico Mountain. High amounts of cheatgrass can increase fuel loads and exacerbate the risk of fire. Although the threat is low, the Telephone Hollow and Death Valley studies appear to be vulnerable to encroachment from conifer trees, which can lead to reduced understory shrub and herbaceous health if not addressed. Pellet transect data indicates that high use by moose and elk may be occurring on the Widdop Mountain North Slope and Bald Range studies, posing medium and high-level threats, respectively. Overuse by these animals may affect the vigor and diversity of the shrub and herbaceous components on these sites.

It is recommended that monitoring continue in communities where active conifer encroachment is occurring, and trees should be treated (e.g. bullhog, chaining, lop and scatter, etc.) where and when feasible. Due to the higher potential of these sites and the low cover, treatments to reduce cheatgrass is likely not needed. However, care should always be taken to avoid increases in annual grass when working in these areas with mechanical treatments. Finally, closer examination of the Widdop Mountain North Slope and Bald Range studies and surrounding areas is recommended to help determine if overuse by moose and elk is occurring in their respective areas.

Upland (Big Sagebrush)

These low to mid-elevation ecological sites are considered to be in fair to good condition for deer and elk winter range habitat on the North Slope management unit. These sites support robust sagebrush populations that provide valuable browse in mild and moderate winters. Although in generally good condition, the Bennett Ranch study site appears to be prone to encroachment from pinyon and juniper trees and is considered to be in Phase I of woodland succession. Although it poses a low-level threat, future tree encroachment may eventually reduce understory shrub and herbaceous health if not addressed. While the herbaceous understories of these communities are also in generally good condition, the introduced annual grass cheatgrass (*Bromus tectorum*) is the dominant grass species on the Antelope Flat site; increased amounts of cheatgrass can lead to higher fuel loads that increase the threat of wildfire. Cheatgrass also competes aggressively with native forbs and grasses, which may lead to reduced availability of wildlife forage. In addition, pellet transect data indicates that high

deer and/or antelope usage may be occurring on the Antelope Flat study; overuse by deer and/or antelope may lead to reduced herbaceous diversity.

It is recommended that when necessary, work to reduce pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should begin or continue in these communities; care should be taken in order to select treatment methods that will not increase annual grass cover. Treatments to reduce annual grass cover may be necessary on the Antelope Flat study. When reseeding is necessary to restore herbaceous species, care should also be taken in species selection, and preference should be given to native species when possible. The Antelope Flat site and surrounding area may need closer examination to determine if high deer and/or antelope usage is occurring in the area.

Semidesert (Big Sagebrush)

This semidesert sagebrush ecological site is generally considered to be in poor condition for deer winter range habitat on this unit. Sites of this community type generally support shrub populations that potentially provide valuable browse in moderate to severe winters. This community is susceptible to invasion from annual grasses, primarily cheatgrass (*Bromus tectorum*); increased amounts of cheatgrass can increase fuel loads and heighten the potential for wildfire. In addition, pellet transect data indicates that high cattle usage may be occurring on the Clay Basin Bench study; overuse by cattle may lead to reduced herbaceous diversity.

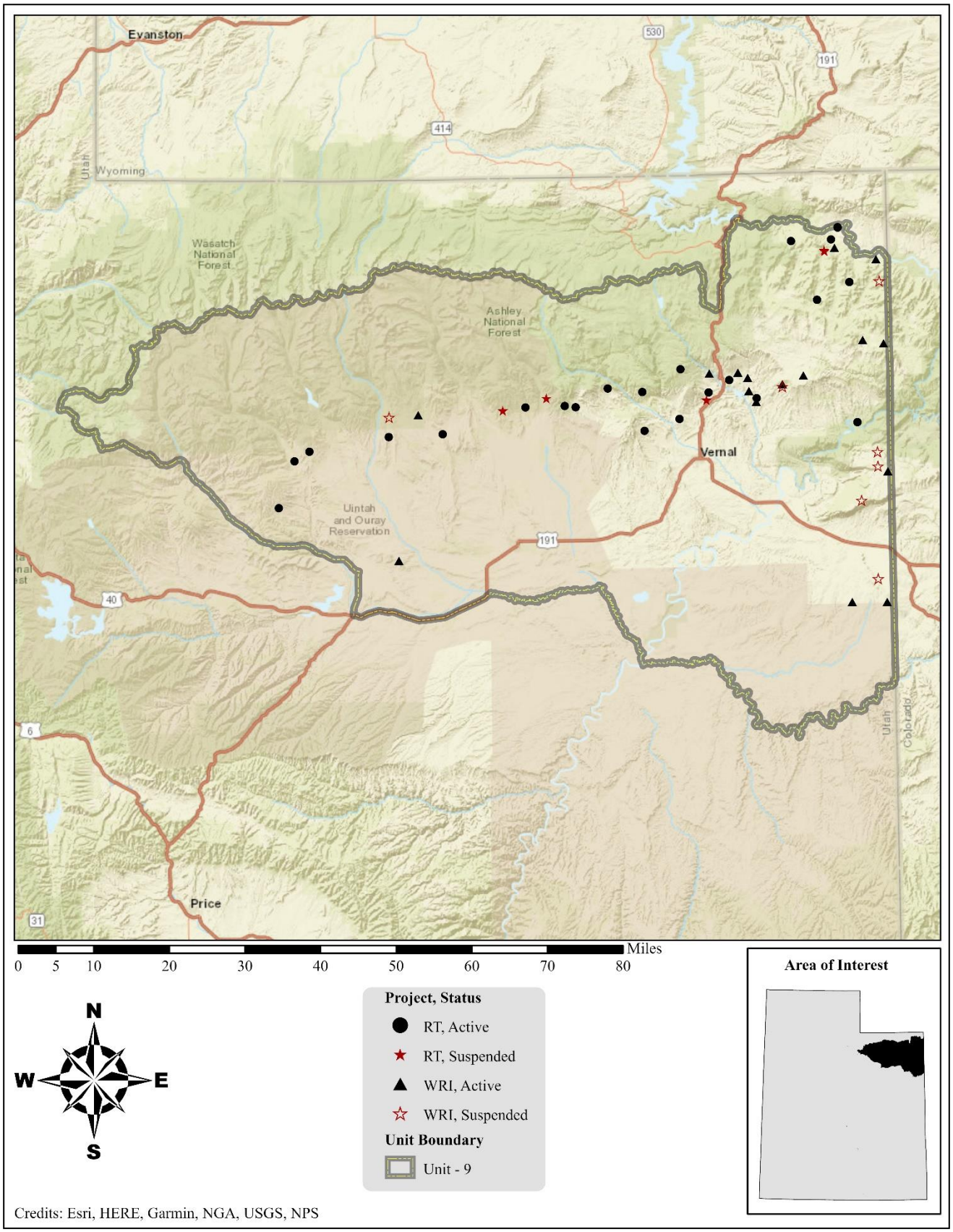
Should treatment to rejuvenate sagebrush be deemed necessary, care should be taken in selecting treatment methods that will not increase annual grass loads. Treatments to reduce annual grass and work to diminish fuel loads and create fire breaks may eventually be necessary on this site if cheatgrass continues to increase. Closer examination of the Clay Basin Bench site and surrounding area may be recommended to determine if high cattle usage is occurring across the allotment.

Semiwet (Fresh Meadow)

This semiwet fresh meadow ecological site supports a vigorous herbaceous community dominated by perennial grasses and is generally considered to be in fair condition for deer and elk summer range habitat on the North Slope management unit. Although plentiful, the herbaceous understory is dominated by the introduced perennial grass species Kentucky bluegrass (*Poa pratensis*) which appears to be reducing the prevalence of other more desirable native grass and forb species; this is likely a response to the high levels of grazing that have occurred on this site in the past. Pellet transect data indicates that high cattle usage may be occurring on the Big Meadow study; as mentioned above, overuse by cattle may lead to reduced herbaceous diversity.

Treatment to reduce introduced perennial grass may be necessary, or changes in grazing management to decrease grazing pressure within this semiwet ecosystem. If reseeding is required to restore herbaceous species, care should be taken in species selection and preference should be given to native species when possible. Closer examination of the Big Meadow site and surrounding area may be needed to determine if high cattle usage is occurring across the allotment.

2. WILDLIFE MANAGEMENT UNIT 9 – SOUTH SLOPE



WILDLIFE MANAGEMENT UNIT 9 – SOUTH SLOPE

Boundary Description

Wasatch, Summit, Daggett, Uintah, Duchesne counties - Boundary begins at the junction of Highway US-40 and State Route (SR)-87 in Duchesne; north on SR-87 to SR-35; northwest on SR-35 to the Provo River; north along the Provo River to the North Fork Provo River; north along the North Fork Provo River to SR-150; north along SR-150 to the Summit/Duchesne county line (summit ridgeline of the Uinta Mountains); east along the summit ridgeline of the Uinta Mountains to SR-191; north along SR-191 to Cart Creek; northeast along Cart Creek to Flaming Gorge Reservoir; east along Flaming Gorge Reservoir to the Green River; east along the Green River to the Utah-Colorado state line, south along the Utah-Colorado state line to the White River; west along the White River to the Green River; north along the Green River to the Duchesne River; northwest along the Duchesne River to US-40 at Myton; west along US-40 to SR-87 in Duchesne and beginning point.

Management Unit Description

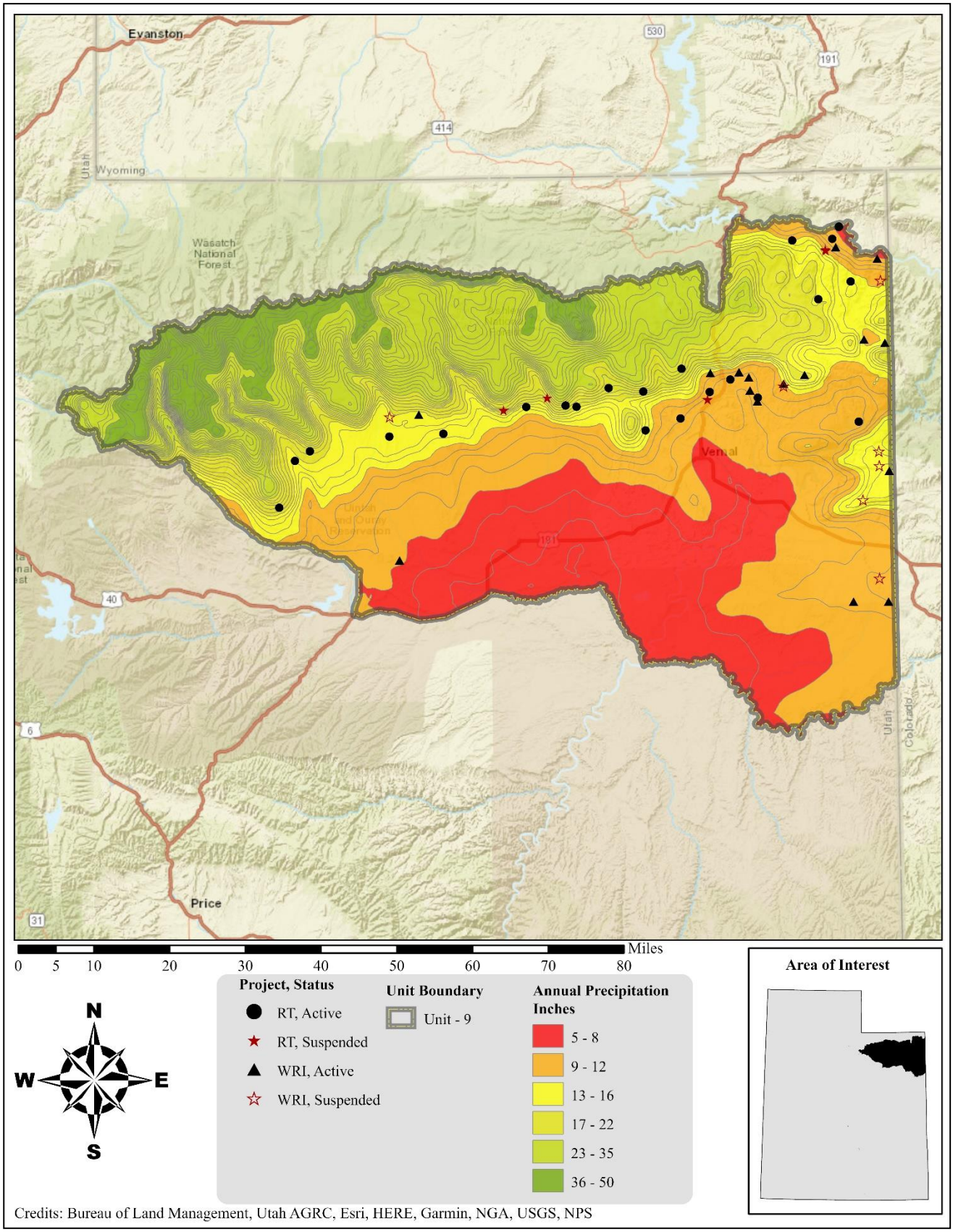
Climate Data

The 30-year (1981-2010) annual precipitation PRISM model shows that precipitation within the South Slope unit ranges from 5 inches near the town of Ft. Duchesne to 50 inches in the Uinta Mountains. All of the Range Trend and WRI monitoring studies in the unit occur within the 8-20 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 Northern Mountains and Uinta Basin division (Divisions 5 and 6).

The mean annual PDSI of the Northern Mountains division displayed years of moderate to extreme drought from 1988-1990, 2000-2003, 2012-2013, 2018, and 2020. The mean annual PDSI displayed moderately to extremely wet years from 1983-1986, 1995, 1997-1998, 2005, and 2011 (**Figure 2.1a**). 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 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, 2012-2013, and 2020; moderately to extremely wet years were displayed in 1983-1986, 1995, and 1997-1998 (**Figure 2.1b**) (Time Series Data, 2020)

The mean annual PDSI of the Uinta Basin division displayed years of moderate to extreme drought from 1989-1991, 2000, 2002-2003, 2012-2014, 2018, and 2020. The mean annual PDSI displayed moderate to extreme wet years from 1983-1985, 1993, 1997-1998, and 2005. The mean spring (March-May) PDSI displayed years of moderate to extreme drought in 1989-1992, 2002-2004, 2012-2014, and 2018. Moderate to extremely wet years for this time period were displayed in 1983-1985, 1993, 1995, 1998, 2005, 2011, and 2019 (**Figure 2.2a**). The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1989-1990, 2001-2003, 2007, 2012, 2017-2018, and 2020; moderately to extremely wet years were displayed in 1983-1986, 1993, and 1997-1998 (**Figure 2.2b**) (Time Series Data, 2020).



Map 2.1: The 1981-2010 PRISM Precipitation Model for WMU 9, South Slope (PRISM Climate Group, Oregon State University, 2013).

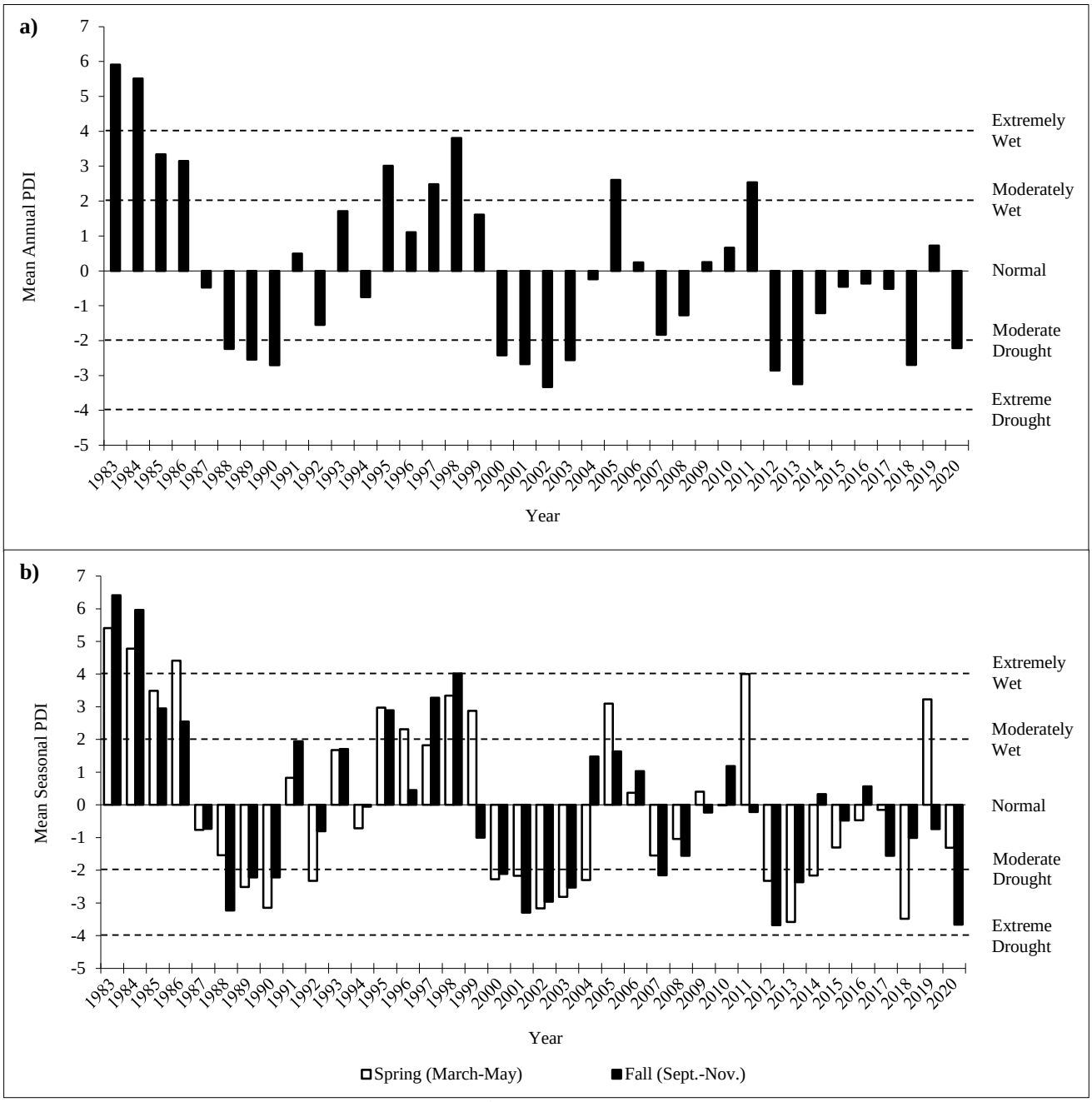


Figure 2.1: The 1983-2020 Palmer Drought Severity Index (PDSI) for the Northern Mountains division (Division 5). The PDSI is based on climate data gathered from 1895 to 2020. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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).

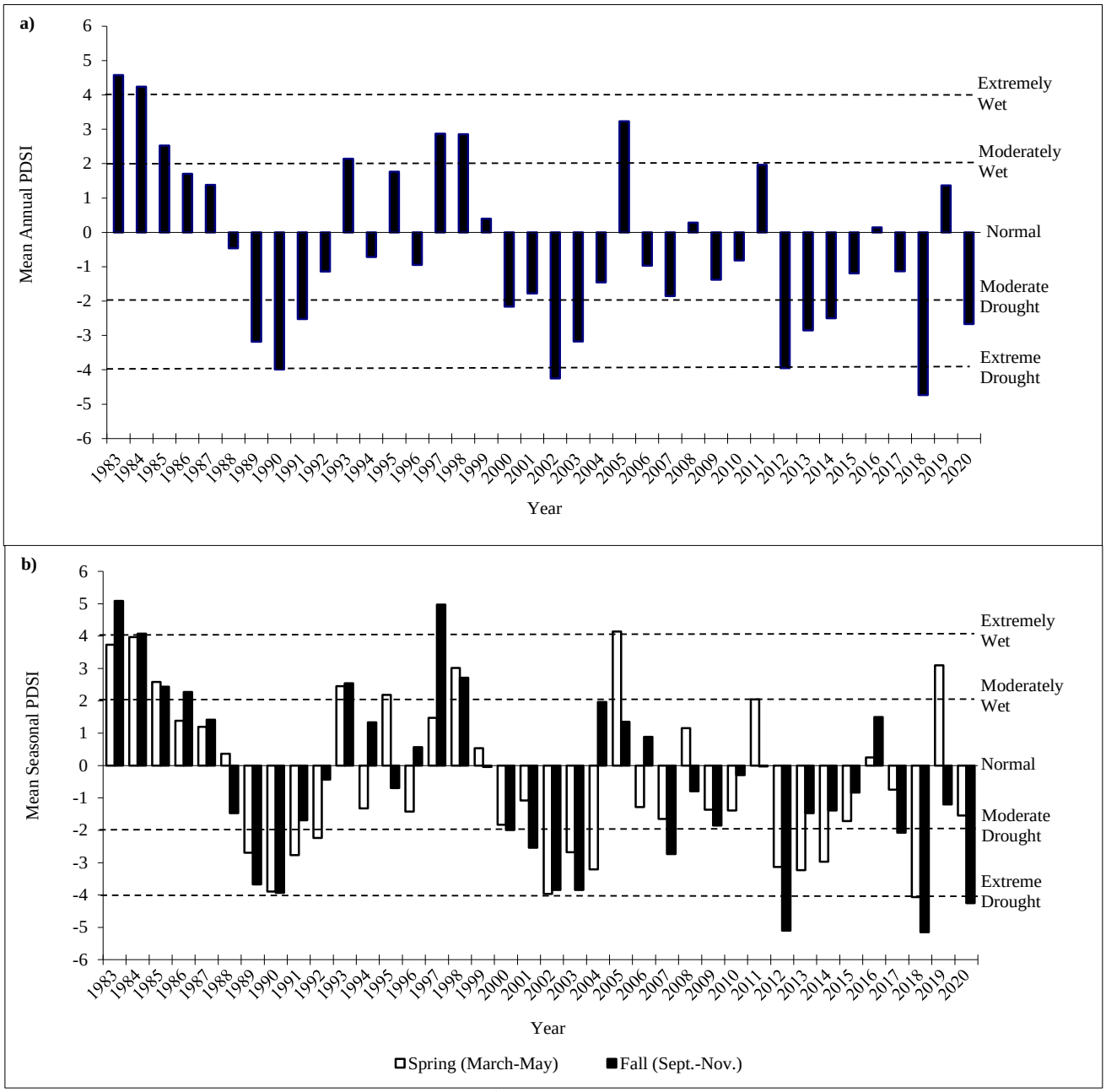


Figure 2.2: The 1983-2020 Palmer Drought Severity Index (PDSI) for the Uintah Basin division (Division 6). The PDSI is based on climate data gathered from 1895 to 2020. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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

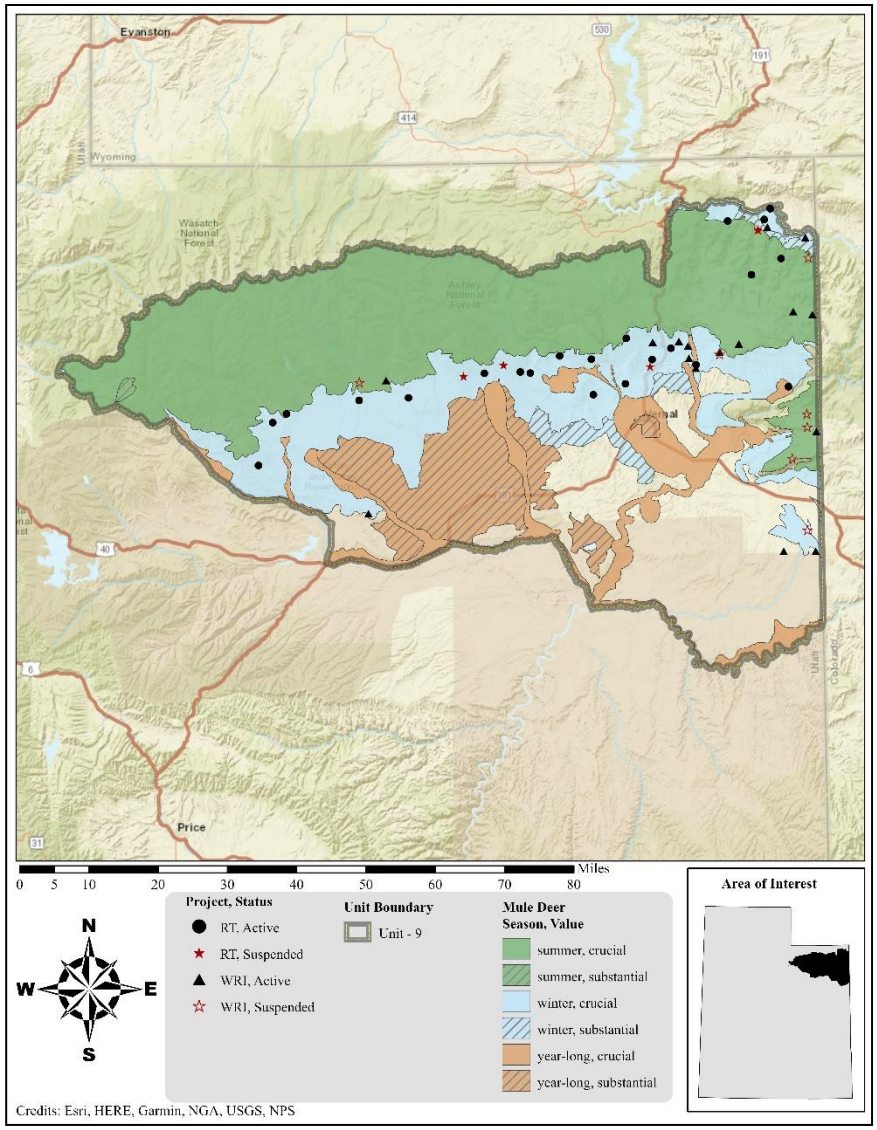
The South Slope Wildlife Management Unit is located along the south slope of the Uinta Mountains and extends south into the Uintah Basin in Duchesne and Uintah counties. The unit encompasses the land area of two former deer herd units: the Vernal Unit (11) and the South Slope Unit (12). Elevation ranges from 13,528 feet at Kings Peak (the highest point in Utah) to 4,650 feet at the confluence of the White and Green Rivers. This unit covers a varied area containing the High Uintas Wilderness Area, portions of Ashley National Forest, and desert habitats below Vernal and Roosevelt. Numerous towns fall within the boundaries of this management unit, as do many rivers and drainages.

Big Game Habitat

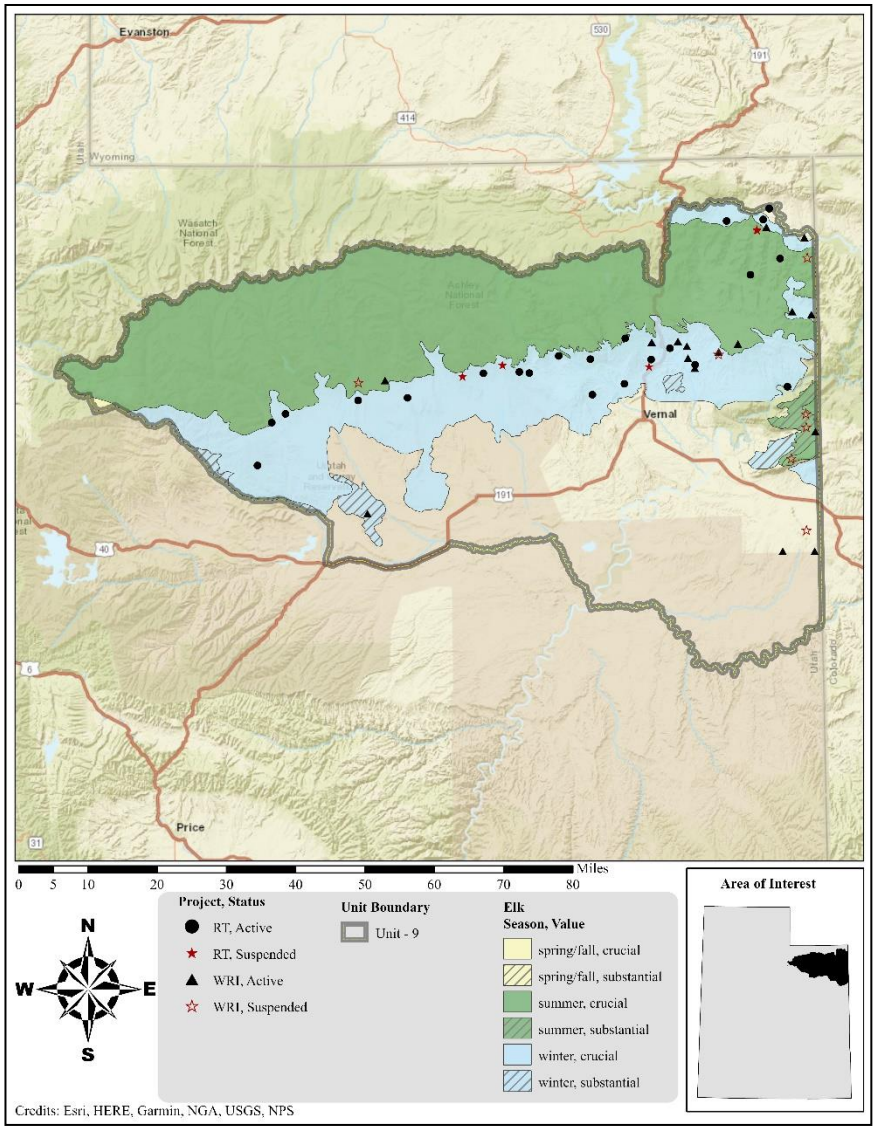
The South Slope unit contains over 2.2 million acres of deer range with summer, year-long, and winter ranges making up 51%, 23%, and 26% of this area, respectively (**Table 2.1**, **Map 2.2**). Most of the year-long range in this unit occurs on land owned by private landowners and the Ute Tribe at 66% and 20%, respectively. A minor portion of the year-long range is owned by the Bureau of Land Management (BLM), the Utah School and Institutional Trust Lands Administration (SITLA), and the National Park Service (NPS). Finally, the Utah Division of Wildlife Resources (UDWR), Forestry, Fire and State Lands (FFSL), the U.S. Forest Service (USFS), Utah State Parks (USP), the U.S. Fish and Wildlife Service (USFWS), and the U.S Bureau of Reclamation (BR) each manage 1% or less of the unit (**Table 2.2**, **Map 2.2**). The USFS manages 75% of elk year-long range, while one-third of elk winter range is administered by the Ute Tribe (**Map 2.8**, **Table 2.3**, **Map 2.3**, **Map 2.8**).

Winter range within the old Vernal deer herd unit (11) is comprised mainly of closely associated areas of pinyon-juniper woodlands on the south-facing slopes and foothill benches of the Diamond, Blue, and Taylor Mountains. The upper limits generally follow the 8,500 foot contour, while the lower limits are defined by agricultural lands and the desert below Vernal. Winter ranges within the old South Slope (12) unit are more limited. In addition, management is diplomatic, as a large portion of these lands are part of the Uintah and Ouray Indian Reservation. Summer range within the new South Slope unit is plentiful, ranging from aspen and conifer communities to mountain big sagebrush and mountain brush communities.

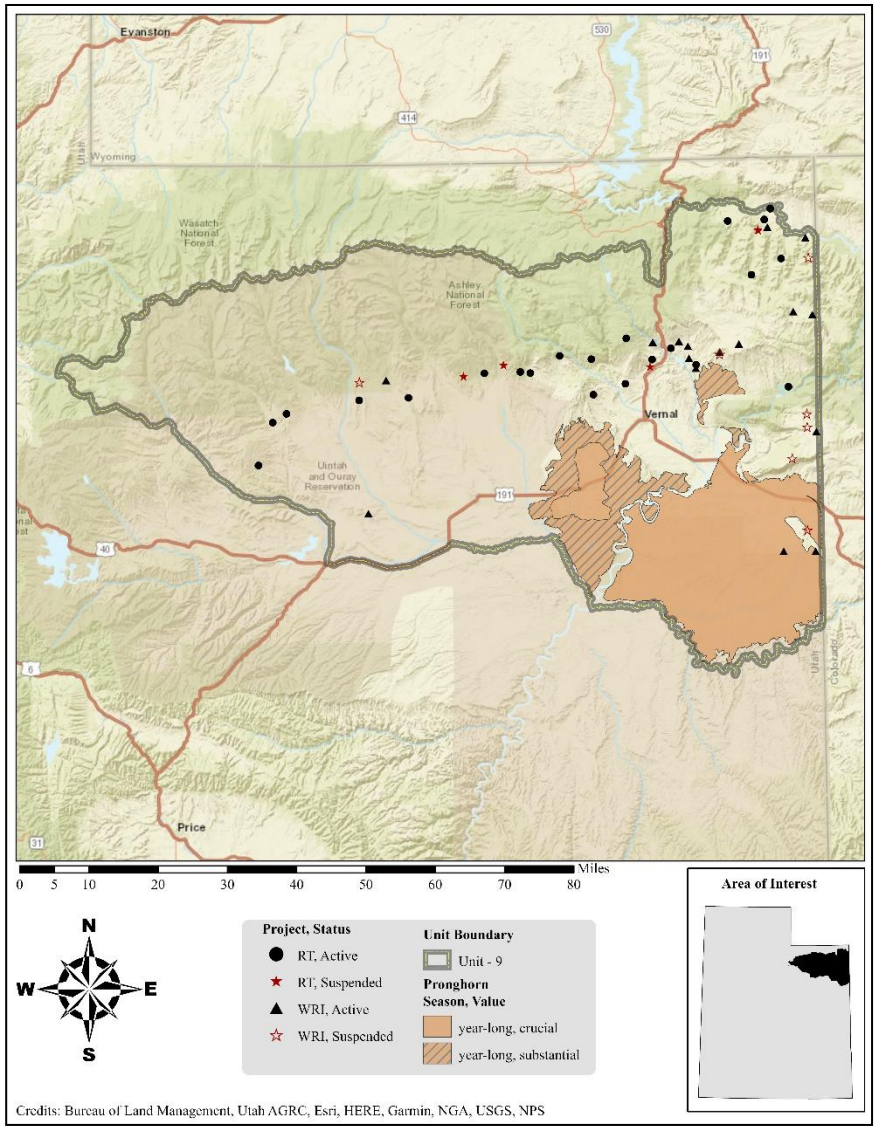
Key areas for winter range consist of the small sagebrush/grass parks found throughout the pinyon and juniper woodlands, especially on the Vernal side of the unit. Sparse pinyon and juniper communities dominate the foothills where diversity and productivity of desirable browse is usually relatively low. Areas with a sagebrush understory or sagebrush/grass associations are more productive: these areas normally receive more use by big game and livestock. Representing these key areas are Red Mountain, Dry Fork Mountain, Island Park, and Brown's Park. Key areas at Toliver Creek and Brown's Park represent winter range in pinyon and juniper communities, including areas that have either been chained or burned. Higher winter ranges in the mountain brush and mountain big sagebrush zones also provide important winter range for big game in this unit, especially along the south slope of the Uinta Mountains. Key areas within these vegetation types include Little Hole, John Starr Flat, Mosby Mountain, Gooseberry Spring, and Seep Hollow. Key areas in transitional and summer ranges are sampled on the Taylor, Mosby, and Diamond Mountains. Landfire Existing Vegetation Coverage models suggest that shrublands comprise just over 35% of the unit, with approximately 23% of the land coverage consisting of sagebrush shrubland and steppe that is considered to be key habitat for mule deer (**Table 2.7**).



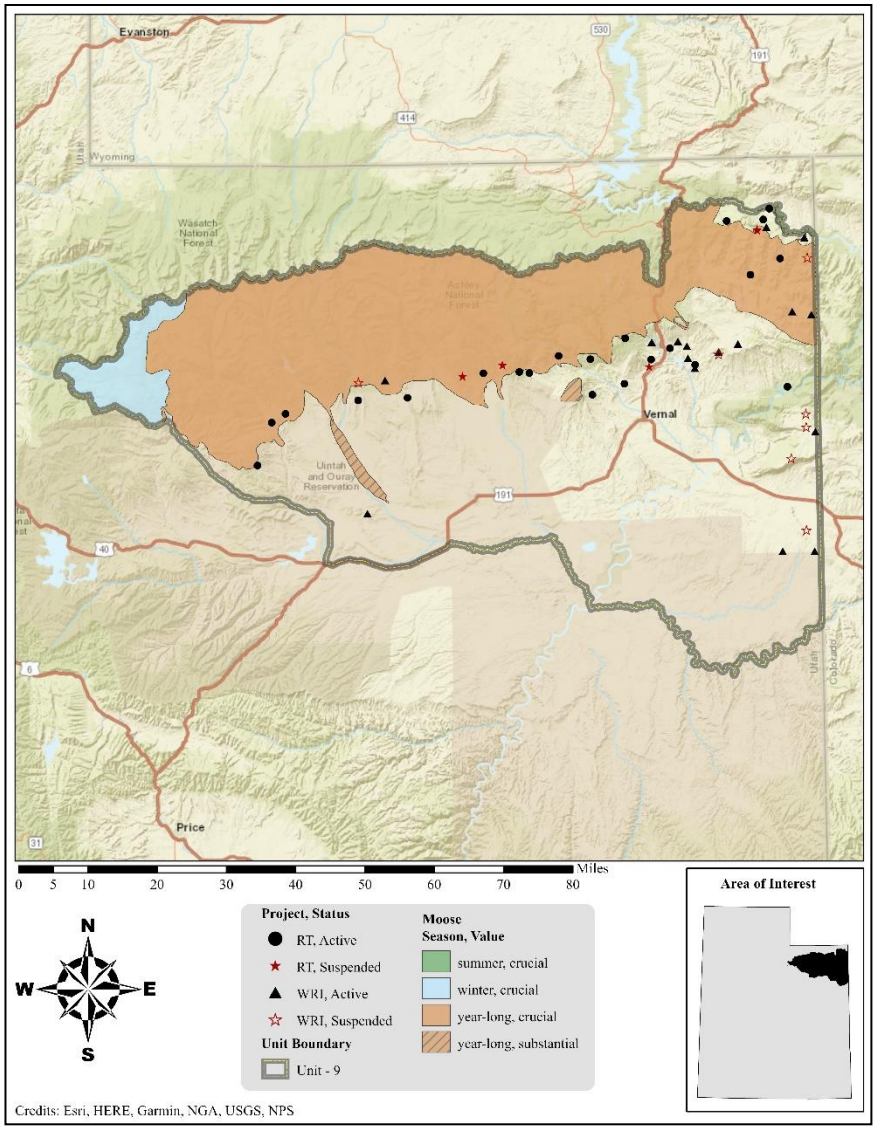
Map 2.2: Estimated mule deer habitat by season and value for WMU 9, South Slope.



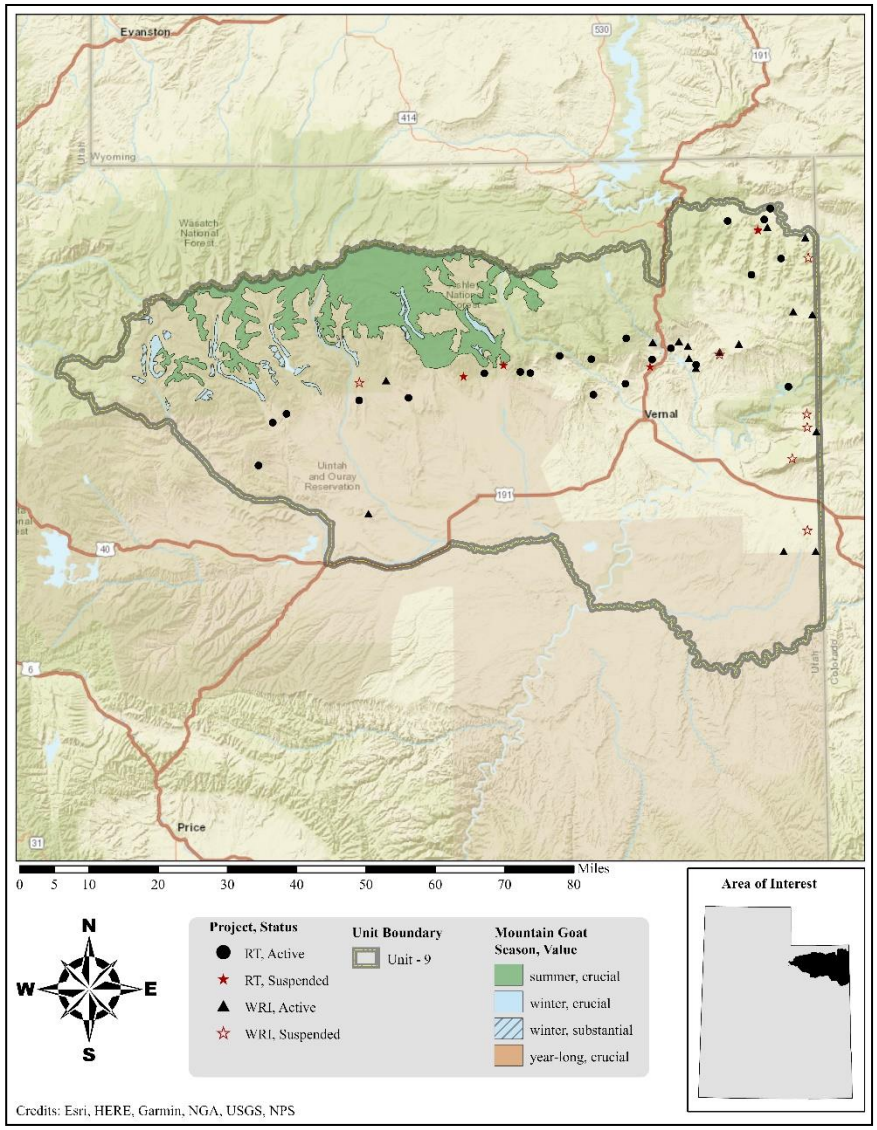
Map 2.3: Estimated elk habitat by season and value for WMU 9, South Slope.



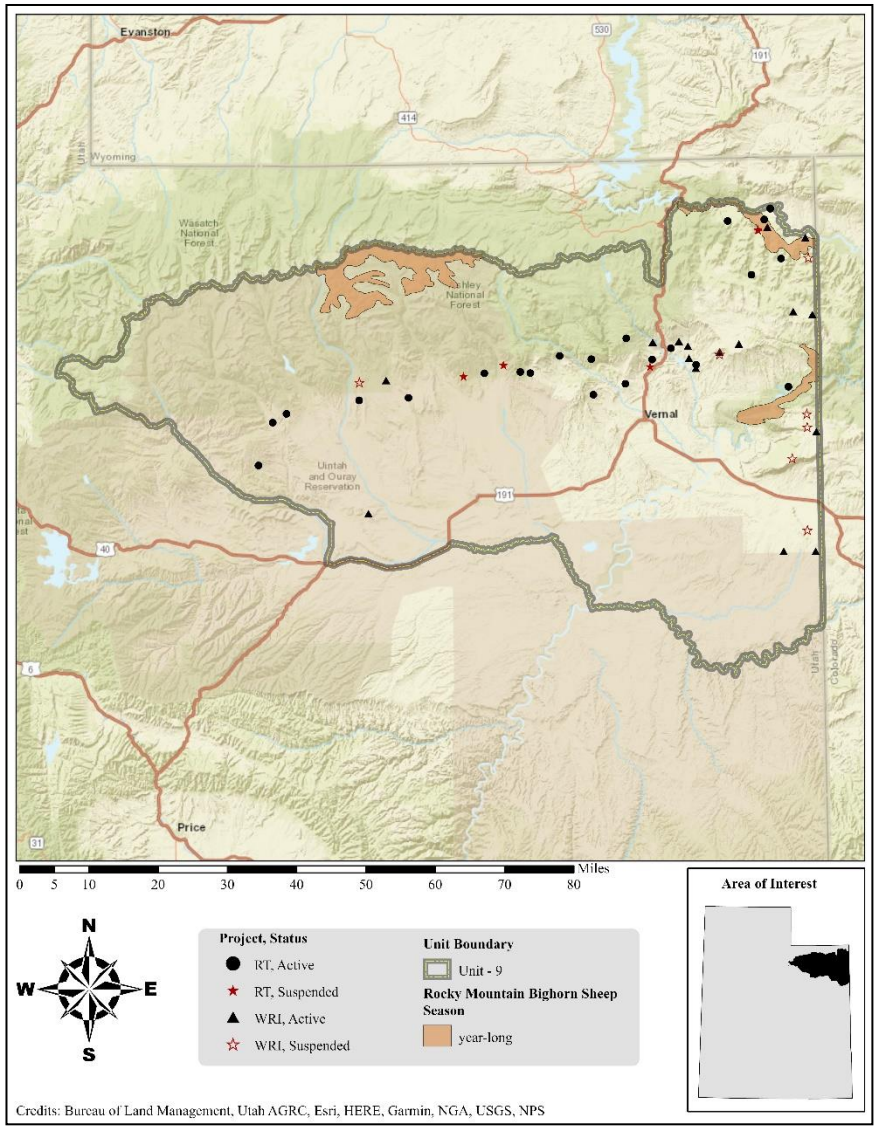
Map 2.4: Estimated pronghorn habitat by season and value for WMU 9, South Slope.



Map 2.5: Estimated moose habitat by season and value for WMU 9, South Slope.



Map 2.6: Estimated mountain goat habitat by season and value for WMU 9, South Slope.



Map 2.7: Estimated moose habitat by season and value for WMU 9, South Slope.

	Year Long Range		Summer Range		Winter Range		Spring/Fall Range	
Species	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
Mule Deer	518,287	23%	1,139,993	51%	587,028	26%	0	0%
Elk	0	0%	1,075,745	61%	677,712	39%	3,470	<1%
Moose	1,062,755	92%	2,484	<1%	93,252	8%	0	0%
Pronghorn	557,108	100%	0	0%	0	0%	0	0%
Bighorn Sheep	101,389	100%	0	0%	0	0%	0	0%

Table 2.1: Estimated mule deer, elk, pronghorn, and moose habitat acreage by season for WMU 9, South Slope.

	Year Long Range		Summer Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	33,211	6%	94,871	8%	183,518	31%
Private	342,080	66%	109,233	10%	107,732	18%
SITLA	16,187	3%	7,604	1%	36,536	6%
FFSL	6,829	1%	0	0%	4	<1%
USFS	60	<1%	871,359	76%	39,946	7%
USFWS	5,738	1%	0	0%	0	0%
USP	347	<1%	0	0%	4,049	1%
UDWR	897	<1%	13,716	1%	2,995	1%
Tribal	102,625	20%	35,282	3%	200,461	34%
NPS	9,577	2%	7,929	1%	11,787	2%
BR	738	<1%	0	0%	0	0%
Total	518,287	**100%**	1,139,993	**100%**	587,028	**100%**

Table 2.2: Estimated mule deer habitat acreage by season and ownership for WMU 9, South Slope.

	Summer Range		Winter Range		Spring/Fall Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	77,641	7%	173,206	26%	0	0%
Private	89,180	8%	180,643	27%	360	10%
SITLA	5,661	1%	25,147	4%	0	0%
USFS	852,511	79%	55,858	8%	3,110	90%
USFWS	0	0%	125	<1%	0	0%
USP	0	0%	2,933	<1%	0	0%
UDWR	13,429	1%	1,609	<1%	0	0%
Tribal	30,111	3%	228,550	34%	0	0%
NPS	7,213	1%	9,641	1%	0	0%
Total	1,075,745	**100%**	677,712	**100%**	3,470	**100%**

Table 2.3: Estimated elk habitat acreage by season and ownership for WMU 9, South Slope.

	Year Long Range		Summer Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	69,608	7%	1,552	62%	0	0%
Private	83,716	8%	2	<1%	3,724	4%
SITLA	5,513	1%	16	1%	0	0%
FFSL	0	0%	22	1%	0	0%
USFS	801,998	75%	0	0%	89,527	96%
UDWR	14,192	1%	893	36%	0	0%
Tribal	87,728	8%	0	0%	0	0%
Total	1,062,755	**100%**	2,484	**100%**	93,252	**100%**

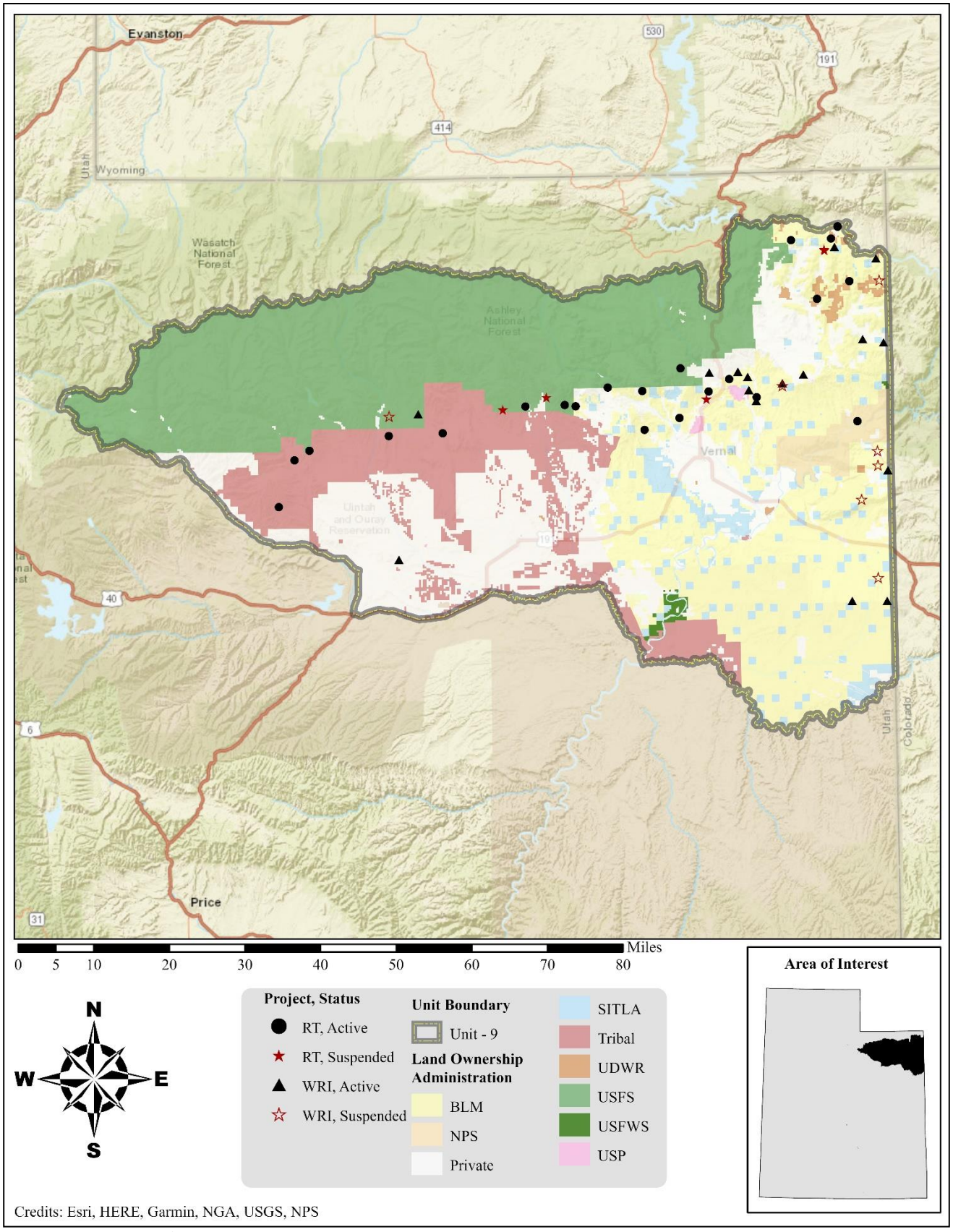
Table 2.4: Estimated moose habitat acreage by season and ownership for WMU 9, South Slope.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	402,258	72%
Private	48,824	9%
SITLA	64,681	12%
UDOT	30	<1%
FFSL	152	<1%
USFWS	2,418	<1%
Tribal	36,067	6%
NPS	2,678	<1%
Total	557,108	**100%**

Table 2.5: Estimated pronghorn habitat acreage by season and ownership for WMU 9, South Slope.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	15,321	15%
Private	40	<1%
SITLA	1,833	2%
USFS	66,564	66%
USFWS	378	<1%
UDWR	1,005	1%
NPS	16,247	16%
Total	101,389	**100%**

Table 2.6: Estimated Rocky Mountain bighorn sheep habitat acreage by season and ownership for WMU 9, South Slope.



Map 2.8: Land ownership for WMU 9, South Slope.

Group	Existing Vegetation Type	Acres	% of Total	Group % of Total
Shrubland	Inter-Mountain Basins Big Sagebrush Shrubland	383,162	13.52%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	215,381	7.60%	
	Inter-Mountain Basins Montane Sagebrush Steppe	199,733	7.05%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	62,625	2.21%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	59,592	2.10%	
	Inter-Mountain Basins Greasewood Flat	20,070	0.71%	
	Rocky Mountain Lower Montane-Foothill Shrubland	19,575	0.69%	
	Inter-Mountain Basins Mat Saltbush Shrubland	16,410	0.58%	
	Colorado Plateau Pinyon-Juniper Shrubland	4,912	0.17%	
	Rocky Mountain Alpine Dwarf-Shrubland	4,581	0.16%	
	Other Shrub	3,797	0.13%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	3,255	0.11%	
	Inter-Mountain Basins Big Sagebrush Steppe	1,351	0.05%	
	Colorado Plateau Blackbrush-Mormon-tea Shrubland	12	0.00%	
	Wyoming Basins Dwarf Sagebrush Shrubland and Steppe	4	0.00%	
	Southern Colorado Plateau Sand Shrubland	4	0.00%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Shrubland	<1	0.00%	35.10%
Conifer	Colorado Plateau Pinyon-Juniper Woodland	382,988	13.52%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	259,807	9.17%	
	Rocky Mountain Lodgepole Pine Forest	132,851	4.69%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	50,651	1.79%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	38,794	1.37%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	24,707	0.87%	
	Southern Rocky Mountain Ponderosa Pine Woodland	22,406	0.79%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	14,260	0.50%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	5,998	0.21%	
	Other Conifer	3,601	0.13%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	1,125	0.04%	
	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	4	0.00%	33.07%
Other	Sparsely Vegetated	244,390	8.62%	
	Agricultural	242,466	8.56%	
	Hardwood	71,607	2.53%	
	Conifer-Hardwood	68,306	2.41%	
	Developed	46,551	1.64%	
	Riparian	39,012	1.38%	
	Open Water	30,212	1.07%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	4,196	0.15%	
	Snow-Ice	20	0.00%	26.35%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	84,196	2.97%	
	Interior West Ruderal Riparian Scrub	10,048	0.35%	
	Interior West Ruderal Riparian Forest	2,861	0.10%	
	Interior Western North American Temperate Ruderal Shrubland	1,861	0.07%	3.49%
Exotic Herbaceous	Great Basin & Intermountain Introduced Annual Grassland	19,119	0.67%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	5,024	0.18%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	3,093	0.11%	
	Interior Western North American Temperate Ruderal Grassland	2,561	0.09%	1.05%
Grassland	Southern Rocky Mountain Montane-Subalpine Grassland	11,590	0.41%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	5,622	0.20%	
	Inter-Mountain Basins Semi-Desert Grassland	5,172	0.18%	
	Rocky Mountain Alpine Turf	2,033	0.07%	
	Rocky Mountain Alpine Fell-Field	1,026	0.04%	
	Other Grassland	950	0.03%	0.93%
Total		**2,833,574**	**100%**	**100%**

Table 2.7: LANDFIRE Existing Vegetation Coverage (LANDFIRE.US_140EVT, 2019) for WMU 9, South Slope.

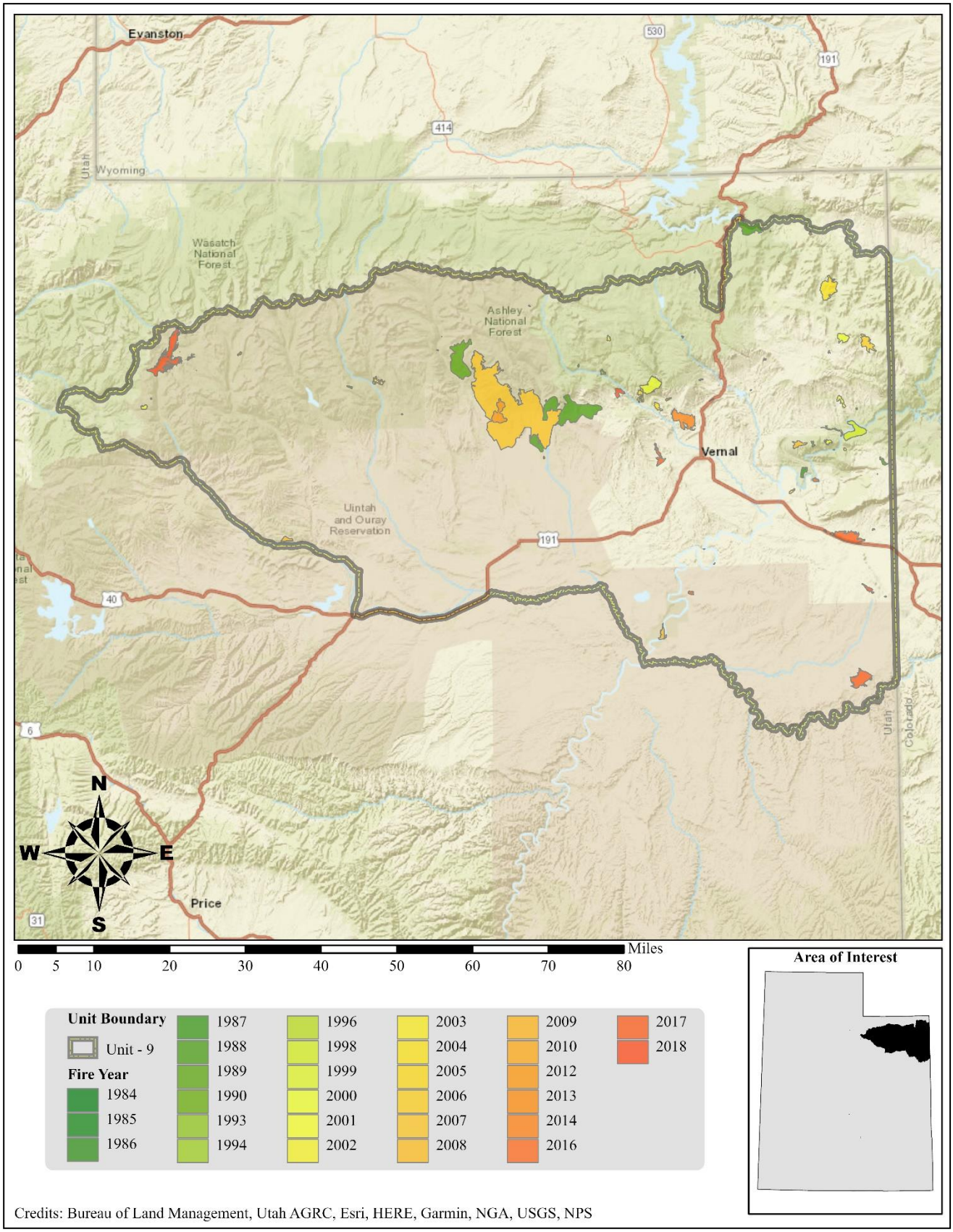
Limiting Factors to Big Game Habitat

One of the major limiting factors in this management unit is limited winter range availability: many of these areas are located on Uintah and Ouray Indian Reservation, making management multifaceted. Additional factors include habitat degradation and loss, winter range forage condition, and landowner acceptance. Continued range monitoring could maintain and protect ranges from further habitat loss and deterioration. Cooperation between federal, state, local, tribal governments, and private landowners could assist in maintaining and preserving crucial habitat through agreements with land management agencies, the use of conservation easements and the like on private lands, planning and evaluating resource use and developments that might affect habitat quality, and developing specific vegetation objectives to maintain the quality of

important deer use areas. In addition, forage production could be maintained or improved through direct range improvements such as reseedings, controlled burns, water developments, tree removal, etc.

At an estimated 13% land coverage, pinyon and juniper woodland communities may pose a threat by encroaching on crucial sagebrush shrublands. The presence of cheatgrass on many study sites in this unit may limit effective recruitment of desirable species and increase fire frequency (**Table 2.7**) (Miller, Svejcar, & Rose, 2000).

Finally, deer fences and crossings limiting range are a concern, but cooperation with the Utah Department of Transportation in constructing highway fences, passage structures, warning signs, etc. will continue in order to ensure proper access to habitat as well as deer and human safety.



Map 2.9: Land coverage of fires by year from 2000-2020 for WMU 9, South Slope (Geosciences and Environmental Change Science Center (GECSC) Outgoing Datasets, 2021).

Treatments/Restoration Work

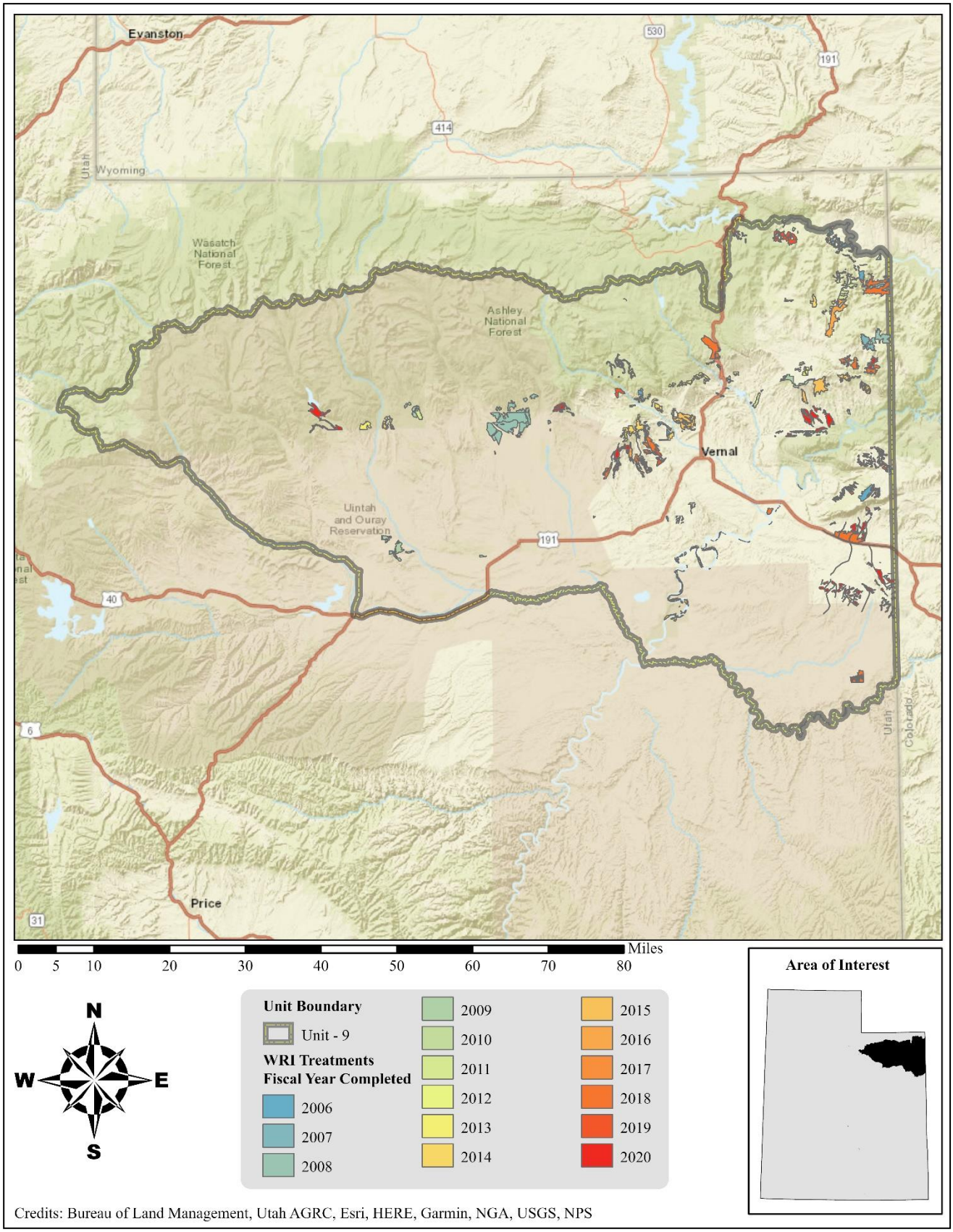
There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 73,729 net acres of land have been treated within the South Slope unit since the WRI was implemented in 2004 (**Map 2.10**). Treatments frequently overlap one another bringing the total treatment acres to 94,526 acres for this unit. An additional 95,607 acres are currently being treated and future treatments are proposed for 11,612 acres (**Table 2.8**). Other treatments may 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 via hand crew is the most common management practice. The use of seeding to supplement the herbaceous understory is also very common. Other management practices include seeding of desired shrub species, herbicide application to control weeds, prescribed burns, and harrow and bullhog projects to remove pinyon and juniper trees (**Table 2.8**).

Type	Completed Acreage	Current Acreage	Proposed Acreage	Total Acreage
Aerator	**1,710**	**0**	**0**	**1,710**
Double Drum (One-Way)	30	0	0	30
Double Drum (Two-Way)	1,680	0	0	1,680
Anchor Chain	**2,315**	**0**	**0**	**2,315**
Ely (One-Way)	1,455	0	0	1,455
Ely (Two-Way)	860	0	0	860
Bullhog	**6,702**	**66**	**28**	**6,796**
Full Size	6,613	46	28	6,687
Skid Steer	89	20	0	109
Chain Harrow	**3,853**	**0**	**0**	**3,853**
>15 ft. (One-Way)	2,192	0	0	2,192
>15 ft. (Two-Way)	1,481	0	0	1,481
≤15 ft. (Two-Way)	180	0	0	180
Disc	**54**	**0**	**0**	**54**
Off-Set (Two-Way)	54	0	0	54
Forestry Practices	**830**	**80,098**	**651**	**81,579**
Thinning (Commercial)	264	78,998	81	79,343
Thinning (Non-Commercial)	91	1,028	571	1,690
Group Selection Cuts	474	0	0	474
Clearcutting	0	72	0	72
Grazing Management/Changes	**41**	**0**	**0**	**41**
Harrow	**2,187**	**0**	**0**	**2,187**
>15 ft. (One-Way)	1,127	0	0	1,127
>15 ft. (Two-Way)	59	0	0	59
≤15 ft. (One-Way)	566	0	0	566
≤15 ft. (Two-Way)	435	0	0	435
Herbicide Application	**22,418**	**1,972**	**7,701**	**32,091**
Aerial (Fixed-Wing)	13,693	0	7,701	21,395
Aerial (Helicopter)	8,239	1,972	0	10,211
Spot Treatment	214	0	0	214
Ground	271	0	0	271
Mowing	**573**	**0**	**0**	**573**
Brush Hog	573	0	0	573
Planting/Transplanting	**4**	**0**	**0**	**4**
Bareroot Stock	4	0	0	4
Prescribed Fire	**3,419**	**305**	**0**	**3,724**
Prescribed Fire	3,028	305	0	3,333
Pile Burn	391	0	0	391
Seeding (Primary)	**17,223**	**9,271**	**730**	**27,224**
Broadcast (Aerial-Fixed Wing)	15,057	9,049	730	24,836
Drill (Rangeland)	1,129	222	0	1,351
Drill (Truax)	200	0	0	200
Ground (Mechanical Application)	793	0	0	793
Hand Seeding	44	0	0	44
Seeding (Secondary)	**2,099**	**0**	**0**	**2,099**
Broadcast (Aerial-Fixed Wing)	2,099	0	0	2,099

Vegetation Removal/Hand Crew	**30,750**	**3,895**	**2,502**	**37,147**
Lop & Scatter	29,746	3,568	2,281	35,596
Lop-Pile-Burn	545	327	220	1,093
Lop (No Scatter)	458	0	0	458
Other	**346**	**0**	**0**	**346**
Road/Parking Area Improvements	346	0	0	346
Grand Total	**94,526**	**95,607**	**11,612**	**201,745**
***Total Land Area Treated**	**73,729**	**94,943**	**11,612**	**180,284**

Table 2.8: WRI treatment action size (acres) for completed, current, and proposed projects for WMU 9, South Slope. Data accessed on 02/09/2021.
*Does not include overlapping treatments.



Map 2.10: WRI treatments by fiscal year completed for WMU 9, South Slope.

Range Trend Studies

Range Trend studies have been sampled on a regular basis within Unit 9 since 1982; studies have been added or suspended as has been deemed necessary (**Table 2.9**). Due to changes in sampling methodologies, only data collected following the 1992 sample year is included in this study. Monitoring studies of WRI projects began in 2004; when possible, WRI monitoring studies are established prior to and sampled on a regular basis following treatment. Due to the long-term nature of the studies, many of the Range Trend or WRI study sites have had some sort of disturbance or treatment prior to or since study establishment (**Table 2.10**). Range Trend studies are summarized in this report by ecological site.

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
09-1	Red Mountain Allotment	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020	Semidesert Loam (Wyoming Big Sagebrush)
09-2	Taylor Mountain	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020	Mountain Loam (Mountain Big Sagebrush)
09-3	Dry Fork Mountain	RT	Active	1982, 1988, 1995, 2000, 2010, 2015, 2020	Mountain Stony Loam (Mountain Big Sagebrush)
09-4	Sawtooth-Flat Spring	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020	Mountain Gravelly Loam (Mountain Big Sagebrush)
09-5	Island Park	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020	Semidesert Loam (Wyoming Big Sagebrush)
09-6	Above Steinaker Draw	RT	Active	1988, 1995, 2000, 2005, 2015, 2020	Semidesert Shallow Loam (Wyoming Big Sagebrush)
09-7	Warren Draw	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020	Mountain Loam (Mountain Big Sagebrush)
09-8	Rye Grass	RT	Active	1988, 1995, 2000, 2015, 2020	Mountain Loam (Mountain Big Sagebrush)
09-9	Little Hole	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020	Mountain Loam (Mountain Big Sagebrush)
09-10	Toliver Creek Chaining	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2020	Semidesert Stony Loam (Wyoming Big Sagebrush)
09-11	Toliver Creek PJ	RT	Suspended	1988, 1995, 2000	Not Verified
09-12	Browns Park Burn & PJ	RT	Suspended	1988, 1995, 2000	Not Verified
09-13	John Star Flat	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2020	Mountain Stony Loam (Browse)
09-14	Red Pine Canyon	RT	Suspended	1982, 1988, 1995, 2000	Not Verified
09-15	Mud Springs Draw	RT	Active	1982, 1988, 1995, 2005, 2010, 2015, 2020	Mountain Stony Loam (Browse)
09-16	Mosby Mountain	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020	Mountain Stony Loam (Browse)
09-17	Farm Creek	RT	Active	1995, 2000, 2005, 2010, 2015, 2020	Mountain Stony Loam (Mountain Big Sagebrush)
09-18	Gooseberry Spring	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015	Mountain Stony Loam (Browse)
09-19	Mosby Mountain South	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2020	Mountain Stony Loam (Browse)
09-20	Seep Hollow	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015	Mountain Stony Loam (Browse)
09-21	Browns Park River Corridor-Livestock	RT	Active	2000, 2005, 2010, 2015, 2020	Semidesert Loam (Wyoming Big Sagebrush)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
09-22	Browns Park River Corridor-Wildlife	RT	Active	2000, 2005, 2010, 2015, 2020	Semidesert Loam (Wyoming Big Sagebrush)
09-23	Rock Creek	RT	Active	2005, 2010, 2015, 2020	Mountain Loam (Mountain Big Sagebrush)
09-24	Brush Creek Substation	RT	Active	1997, 2005, 2010, 2015	Semidesert Loam (Wyoming Big Sagebrush)
09-25	Buckhorn Canyon	RT	Active	2001, 2005, 2009, 2010, 2015, 2020	Semidesert Loam (Wyoming Big Sagebrush)
09-27	Little Mountain	RT	Active	2015, 2020	Upland Shallow Loam (Black Sagebrush)
09R-3	Deadman Greenstrip	WRI	Active	2004, 2007, 2011, 2015, 2019	Semidesert Loam (Wyoming Big Sagebrush)
09R-4	Diamond Mountain Bullhog	WRI	Active	2004, 2007, 2009, 2010, 2012, 2016, 2020	Upland Shallow Loam (Black Sagebrush)
09R-5	Little Donkey	WRI	Active	2004, 2007, 2012, 2016, 2020	Semidesert Loam (Wyoming Big Sagebrush)
09R-6	North Little Donkey	WRI	Active	2004, 2007, 2012, 2016, 2020	Semidesert Loam (Wyoming Big Sagebrush)
09R-7	Red Fleet Lop and Scatter	WRI	Active	2004, 2007, 2012, 2016, 2020	Upland Shallow Loam (Black Sagebrush)
09R-8	Marshall Draw	WRI	Suspended	2005	Not Verified
09R-9	Snake John Lop and Scatter	WRI	Suspended	2005, 2008	Not Verified
09R-10	Ruple Cabin	WRI	Active	2005, 2008, 2013, 2018	Mountain Loam (Mountain Big Sagebrush)
09R-11	Blue Mtn Burn	WRI	Suspended	2006	Not Verified
09R-12	West Stuntz	WRI	Active	2006, 2010, 2013, 2017	Mountain Loam (Mountain Big Sagebrush)
09R-13	Chew Dixie	WRI	Suspended	2006, 2009, 2010	Not Verified
09R-14	Pot Creek Chaining	WRI	Active	2007, 2011, 2014, 2017, 2020	Mountain Loam (Mountain Big Sagebrush)
09R-15	Brush Creek Dixie	WRI	Active	2007, 2009, 2010, 2012, 2016, 2020	Semidesert Loam (Wyoming Big Sagebrush)
09R-16	Brown's Field	WRI	Active	2008, 2011, 2014, 2018	Upland Loam (Mountain Big Sagebrush)
09R-17	Toliver Creek Bullhog	WRI	Active	2008, 2011, 2014, 2018	Upland Loam (Mountain Big Sagebrush)
09R-18	Brotherson Chaining	WRI	Active	2008, 2011, 2015, 2018	Upland Loam (Wyoming Big Sagebrush)
09R-19	Diamond Rim Reference	WRI	Suspended	2009	Not Verified
09R-21	Chew Reference	WRI	Suspended	2009	Not Verified
09R-22	North Dry Gulch Ponderosa Thinning	WRI	Active	2009, 2013, 2017	Mountain Gravelly Loam (Ponderosa Pine)
09R-23	North Dry Gulch Reference	WRI	Suspended	2009	Not Verified
09R-24	Raven Ridge	WRI	Active	2011, 2014, 2019	Semidesert Loam (Wyoming Big Sagebrush)
09R-25	Davis Draw Sagebrush	WRI	Active	2012, 2015, 2019	Mountain Loam (Mountain Big Sagebrush)
09R-26	Simplot	WRI	Active	2013, 2017	Upland Shallow Loam (Black Sagebrush)

Table 2.9: Range trend and WRI project studies monitoring history and ecological site potential for WMU 9, South Slope.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
09-1	Red Mountain Allotment	Lop and Scatter	Steinaker Draw PJ (CCI)	September 2005	266	28
		Wildfire	Taylor Mountain Road	July 2014	3,147	
		Herbicide Unknown	Taylor Mountain Fire Rehabilitation	Fall 2014	2,200	3182
		One-Way Smooth	Taylor Mountain Fire Rehabilitation	Fall 2014	1,100	3182
		Rangeland Drill	Taylor Mountain Fire Rehabilitation	October 2014	2,000	3182
		Aerial After	Taylor Mountain Fire--BLM ESR Supplement	December 2014	2,019	3207
09-3	Dry Fork Mountain	Wildfire	Dry Fork	July 2005	517	
09-5	Island Park	Wildfire	Island Park	2010	20	
09-9	Little Hole	Lop and Scatter	Little Hole II Slashing Project	Summer-Fall 2007	333	LTDL
		Lop and Scatter	Little Davenport Slashing/Lop and Scatter	Fall 2017	946	3782
09-10	Toliver Creek Chaining	Two-Way Chain Unknown	Browns Park Trial Reseeding	Fall 1962-Winter 1963	300	
		Aerial After	Browns Park Trial Reseeding	Fall 1962-Winter 1963	300	
		Two-Way Chain Unknown		Fall 1986		
		Seed Unknown		Fall 1986		
		Lop and Scatter	Taylor Flat P/J Removal	August 2005	1,040	10
		Lop and Scatter	Diamond Mountain Maintenance Project (Proposed)	Fall 2020	2,916	5105
09-12	Browns Park Burn & PJ	Prescribed Fire	Spitzenberg Prescribed Burn	Fall 1986	420	LTDL
		Aerial After	Spitzenberg Prescribed Burn	Fall 1986	420	LTDL
09-16	Mosby Mountain	Wildfire	Lil Water	1988	600	
		Aerial Broadcast	South Slope Vegetation Restoration Phase 2	October 2019	667	4856
09-17	Farm Creek	Wildfire	Neola North	Summer 2007	43,806	
09-19	Mosby Mountain South	Wildfire	Whiterocks	September 1988	16,600	
		One-Way Chain Unknown	Whiterocks Fire Rehabilitation	Fall 1988-Spring 1989	1,160	
		Aerial After	Whiterocks Fire Rehabilitation	Fall 1988-Spring 1989	1,160	
09-24	Brush Creek Substation	Plateau	Brush Creek Bench Sage Restoration	September 2008	279	315
		Broadcast Before	Brush Creek Bench Sage Restoration	December 2008	279	315
		One-Way Dixie	Brush Creek Bench Sage Restoration	December 2008	279	315
		Aerial After	Brush Creek Bench Sage Restoration	March 2009	279	315
		Rangeland Drill	Brush Creek Bench Seeding	October 2010	408	1659
09-25	Buckhorn Canyon	Lop and Scatter	Brush Creek Juniper Removal	November 2004	1,100	
		Lop and Scatter	Red Fleet Maintenance	September-October 2012	317	2273
09-27	Little Mountain	Two-Way Chain Unknown	Coalmine Basin Seeding	Fall 1965-Winter 1966	1,700	LTDL
		Aerial After	Coalmine Basin Seeding	Fall 1965-Winter 1966	1,700	LTDL
		Hand Planter	Coalmine Basin Seeding	Fall 1965-Winter 1966	1,700	LTDL
		Lop and Scatter	Dry Fork Hazardous Fuel Project Phase II	August-September 2013	1,842	2789
09R-3	Deadman Greenstrip	Single Drum/Seed	Deadman Greenstrip	Fall 2004	680	PDB
		Plateau	Deadman Bench Range Improvement	September 2008	523	1081
		Rangeland Drill	Deadman Bench Range Improvement	November-December 2008	523	1081
		Plateau	Deadman Bench follow-up herbicide	September 2012	1,003	2202
		Plateau	Green River District Herbicide Treatments 2019	August 2019	7,101	5000
09R-4	Diamond Mountain Bullhog	Aerial Before	Diamond Rim	September 2004	320	PDB
		Bullhog	Diamond Rim	September 2004	320	PDB
		Aerial After	Diamond Rim	November 2004	320	PDB
		Lop and Scatter	Diamond Mountain Maintenance Project (Proposed)	Fall 2020	3,000	5105
09R-5	Little Donkey	Roundup	Red Fleet	October 2004		PDB
09R-5	Little Donkey	Truax Drill	Red Fleet	November 2004	470	PDB
09R-6	North Little Donkey	Truax Drill	Red Fleet	Fall 2004	470	PDB

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
09R-7	Red Fleet Lop and Scatter	Chain Unknown		1960s or 70s		
		Lop and Scatter	Red Fleet Lop and Scatter	Fall 2004		PDB
		Lop and Scatter	Red Fleet Phase II/Maintenance	Fall 2012	300	2273
		Lop and Scatter	Diamond Mountain Maintenance Project (Proposed)	Fall 2020	2,916	5105
09R-10	Ruple Cabin	Aerial Before	Ruple Vegetation Treatment	Fall 2005	1,680	178
		Double Drum Spike	Ruple Vegetation Treatment	Fall 2005 Between 2008 and 2013	1,680	178
09R-12	West Stuntz	Broadcast Before	West Stuntz	Fall 2006	199	357
		Two-Way Dixie	West Stuntz	Fall 2006	199	357
09R-13	Chew Dixie	Broadcast Before	Chew - Blue Mountain Sage Grouse Enhancement	October 2006	236	316
		Two-Way Dixie	Chew - Blue Mountain Sage Grouse Enhancement	October 2006	236	316
09R-14	Pot Creek Chaining	Wildfire	Pot Hole	June-July 2006	1,396	
		Aerial Before	Ruple Cabin Wildfire Rehabilitation	September 2006	1,208	608
		Dribbler	Ruple Cabin Wildfire Rehabilitation	September 2006	1,208	608
		Aerial After	Ruple Cabin Wildfire Rehabilitation	December 2006	1,208	608
09R-15	Brush Creek Dixie	Plateau	Brush Creek Bench Sage Restoration	September 2008	280	315
		One-Way Dixie	Brush Creek Bench Sage Restoration	September 2008	280	315
		Aerial After	Brush Creek Bench Sage Restoration	March 2009	280	315
		Rangeland Drill	Brush Creek Bench Seeding	October 2010	400	1659
		Aerial After	Brush Creek Bench Seeding	November 2010	400	1659
09R-16	Brown's Field	Truax Drill	Browns Park Ag Field Rehabilitation	December 2006	200	26
		Plateau	Brown's Park Fields	Fall 2008	143	1152
		Rangeland Drill	Brown's Park Fields	January 2009	143	1152
09R-17	Toliver Creek Bullhog	Aerial Before	Toliver's Creek Bullhog	October 2008	195	1084
		Bullhog	Toliver's Creek Bullhog	Fall 2008	195	1084
		Lop and Scatter	Diamond Mountain Maintenance Project (Proposed)	Fall 2020	2,916	5105
09R-18	Brotherson Chaining	Aerial Before	Brotherson Chaining	November 2008	347	1150
		Two-Way Ely	Brotherson Chaining	November 2008	347	1150
		Aerial After	Brotherson Chaining	December 2008	237	1150
09R-22	North Dry Gulch Ponderosa Thinning	Lop (No Scatter)	North Dry Gulch Ponderosa Pine Thinning Project	September 2010	448	1495
09R-23	North Dry Gulch Reference	Lop (No Scatter)	Burnt Mill Spring Ponderosa Pine Thinning Project	September 2013	590	2282
09R-24	Raven Ridge	Plateau	Raven Ridge Harrow Project	September 2011	500	1989
		Broadcast Before	Raven Ridge Harrow Project	September-October 2011	500	1989
		One-Way Chain	Raven Ridge Harrow Project	September-October 2011	500	1989
		Plateau	Green River District Herbicide Treatments 2019	August 2019	7,102	5000
09R-25	Davis Draw Sagebrush	Two-Way Chain	Davis Draw Sagebrush	September 2012	424	2266
09R-26	Simplot	Strip Mine		Historic		

Table 2.10: Range trend and WRI studies known disturbance history for WMU 9, South Slope. PDB = Pre-Database; LTDL = Land Treatment Digital Library (Pilliod & Welty, 2019).

Study Trend Summary (Range Trend)

Mountain (Big Sagebrush)

There are eight study sites [Taylor Mountain (09-2), Dry Fork Mountain (09-3), Sawtooth-Flat Spring (09-4), Warren Draw (09-7), Rye Grass (09-8), Little Hole (09-9), Farm Creek (09-17), and Rock Creek (09-23)] that are classified as Mountain (Big Sagebrush) ecological sites. The Taylor Mountain site is situated on the South Slope of the Uinta Mountains. The Dry Fork Mountain study is also located on the south slope of the Uinta Mountains, west of Ashley Gorge and the Taylor Mountain study. The Sawtooth Flat Spring study is found on a flat on the south side of Sawtooth Ridge. The Warren Draw study is located in the southern portion of Warren Draw. Rye Grass is nestled in a valley at the Head of Rye Grass, which is due east of Mail Draw and Sears Creek. The Little Hole study is situated on the northern slope of the Uinta Mountains, northwest of Jackson Draw. The Farm Creek site is found on the southern slope of the Uinta Mountains adjacent to Farm

Creek. Finally, the Rock Creek study site is located near Rock Creek and across from Dick Hollow (**Table 2.9**).

Shrubs/Trees: The primary browse species on these sites is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*); the exceptions to this are the Farm Creek and Little Hole studies, where antelope bitterbrush (*Purshia tridentata*) contributes more cover than mountain big sagebrush. Other browse species are also present to a lesser extent. Line intercept cover of shrubs has remained stable between 2010 and 2020. Overall, however, shrub cover has decreased: the initial decrease between 2005 and 2010 is likely in part driven by the Farm Creek study site, which burned in 2007 (**Figure 2.3**). Density of preferred browse species has exhibited a general decrease over time, again partially due to the Farm Creek study. Mature individuals have been the dominant demographic in the preferred browse populations in all years, while decadence has fluctuated. Recruitment of young plants has remained low throughout the study period (**Figure 2.9**). Utilization of preferred browse has varied from sample year to sample year, with 16% of plants being moderately hedged and 28% heavily hedged in 2020 (**Figure 2.11**).

Conifer encroachment is a concern on these study sites. However, tree cover and density decreased significantly between 2015 and 2020: this trend can be almost entirely attributed to the removal of twoneedle pinyon (*Pinus edulis*) on the Little Hole site by a 2017 lop and scatter treatment (**Figure 2.5**, **Figure 2.7**).

Herbaceous Understory: The herbaceous understories of these study sites are plentiful, diverse, and overall in good condition. Perennial grasses have been the largest component in the understories throughout the study years. As of 2020, a majority of the perennial grass cover on these sites is provided by native species. However, the introduced species crested wheatgrass (*Agropyron cristatum*) and bulbous bluegrass (*Poa bulbosa*) contribute most of the herbaceous cover on the Farm Creek study: competition with these introduced grass species may limit other desirable herbaceous species. In most sample years, the cover and frequency of annual grasses – namely the introduced species cheatgrass (*Bromus tectorum*) – have generally remained low on these sites. A diverse number of perennial forbs provide substantial cover, but annual forb cover has remained low and has never exceeded 3% (**Figure 2.13**, **Figure 2.15**).

Occupancy: Pellet group transect data indicates that animal occupancy on these study sites has fluctuated from year to year. Deer pellet groups have consistently remained present in the highest amounts, with a mean abundance ranging from 23 days use/acre in 2015 to 53 days use/acre in 2005. The mean abundance of elk pellet groups has been as low as 6 days use/acre in 2010 and as high as 12 days use/acre in 2000. Finally, the mean abundance of cattle pellet groups has fluctuated between 7 days use/acre in 2000 and 2010 and 16 days use/acre in 2005 (**Figure 2.17**).

Mountain (Browse)

Six study sites [John Star Flat (09-13), Mud Springs Draw (09-15), Mosby Mountain (09-16), Gooseberry Spring (09-18), Mosby Mountain South (09-19), and Seep Hollow (09-20)] are classified as Mountain (Browse) ecological sites. The John Star Flat site is located in an alcove just below Tower Ridge on John Star Flat. The Mud Springs Draw site is found in the northern portion of Mud Springs Draw. Both the Mosby Mountain and Mosby Mountain South studies are situated on the south slope of Mosby Mountain. The Gooseberry Spring study is located on the southern slope of Dry Ridge near the Gooseberry and Pigeon Water Springs. Finally, the Seep Hollow study site is found on the southern slope of Dry Mountain in Dry Mountain Hollow (**Table 2.9**).

Shrubs/Trees: The dominant shrub species on these sites is generally a mixture of preferred browse including alderleaf mountain mahogany (*Cercocarpus montanus*), Utah serviceberry (*Amelanchier utahensis*), mountain snowberry (*Symphoricarpos oreophilus*), and antelope bitterbrush (*Purshia tridentata*). Total preferred browse cover has fluctuated on these sites, but overall shrub cover is good and has exhibited a slight increase over the study period. However, one should note the differing number of studies (the 'n value') from year to year and consider the implications this variation may have on vegetation trends (**Figure 2.4**). Overall preferred browse density has fluctuated from year to year; the decrease between 2015 and 2020 is partially due to the

Gooseberry Spring study, which was not sampled in 2020. A majority of the plants in these preferred browse populations are mature, and recruitment of young plants has decreased over time (**Figure 2.9**). Utilization of preferred browse has also fluctuated, but at least 50% of plants were moderately to heavily hedged in 1995, 2015, and 2020 (**Figure 2.11**).

Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) encroachment is occurring on these study sites. Tree cover and density have increased overall, trends which are driven by the John Star Flat and Seep Hollow studies. Furthermore, the increase in juniper between 2015 and 2020 can be entirely attributed to John Star Flat, which was not sampled in 2015 (**Figure 2.5**, **Figure 2.7**).

Herbaceous Understory: The herbaceous understories on these sites have generally remained abundant and diverse. Perennial grasses have consistently contributed the most herbaceous cover. Although introduced perennial grasses such as crested wheatgrass (*Agropyron cristatum*) and Kentucky bluegrass (*Poa pratensis*) are often present, native grasses dominate a majority of these sites. Perennial forb cover has fluctuated, but has remained moderate ranging from 6% cover in 1995 to 11% cover in 2005. The introduced annual grass species cheatgrass (*Bromus tectorum*) is present on a majority of these sites, but in generally low abundance. In addition, another introduced annual brome species, field brome (*B. arvensis*), has been observed in small amounts on the Mosby Mountain South study site. Annual forbs have contributed slightly more cover than annual grasses, but still remain a minor component of the herbaceous understory. The noxious weed and introduced annual forb gypsyflower (*Cynoglossum officinale*) has been observed on the Gooseberry Spring site, but in low amounts (**Figure 2.13**, **Figure 2.15**).

Occupancy: Pellet transect data indicates that the identity of the primary occupants of these study sites has varied over the sample years, but mean abundance has exhibited an overall increase. Elk were the primary occupants in 2000, 2010, and 2015 and have had a mean pellet group abundance ranging from 23 days use/acre in 2000 and 2020 to 36 days use/acre in 2005. Deer were the primary occupants in 2005 and 2020 with average pellet group abundance as low as 23 days use/acre in 2000 and 2010 and as high as 39 days use/acre in 2020. Mean abundance of cattle pellet groups has varied between 4 days use/acre in 2015 and 16 days use/acre in 2005. Finally, horse pellet groups were present in 2020 with an average abundance of 1 days use/acre, but were absent in all other sample years (**Figure 2.17**).

Upland (Black/Low Sagebrush)

There is one site [Little Mountain (9-27)] classified as an Upland (Black Sagebrush) ecological site. Little Mountain is found northwest of Coal Mine Basin and the city of Vernal (**Table 2.9**).

Shrubs/Trees: The Little Mountain study site is dominated by black sagebrush (*Artemisia nova*), the cover of which has remained generally stable over the study period; mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) is also present to a lesser extent. Other shrub and preferred browse species provided minimal cover in both sample years (**Figure 2.3**). Average preferred browse demographics indicate that the population has been comprised of mainly mature individuals. Recruitment of young plants has increased from 342 plants/acre in 2015 to 3,321 plants/acre in 2020 (**Figure 2.10**). Utilization of preferred browse decreased significantly between 2015 and 2020 (**Figure 2.12**).

Encroachment by Utah juniper (*Juniperus osteosperma*) is occurring on this study site. Juniper cover has increased over time, but density decreased between 2015 and 2020 (**Figure 2.6**, **Figure 2.8**).

Herbaceous Understory: The herbaceous understory on this site has exhibited an increase in cover over the study period with frequency remaining stable. Perennial grasses have been the dominant component in both sample years, although the introduced species crested wheatgrass (*Agropyron cristatum*) has contributed a majority of the cover and frequency. Perennial forbs have also been present, but have provided little cover in comparison with perennial grasses. The introduced annual grass cheatgrass (*Bromus tectorum*) has been observed in the understory in very low amounts. Finally, annual forbs have consistently remained rare (**Figure 2.14**, **Figure 2.16**).

Occupancy: Average pellet transect data shows that animal occupancy increased slightly between 2015 and 2020. Cattle have been the primary occupants in both sample years, with a mean pellet group abundance of 4 days use/acre in 2015 and 5 days use/acre in 2020. Mean abundance of deer pellet groups has been 1 days use/acre in both 2015 and 2020 (**Figure 2.18**).

Semidesert (Big Sagebrush)

There are eight sites [Red Mountain Allotment (09-1), Island Park (09-5), Above Steinaker Draw (09-6), Toliver Creek Chaining (09-10), Browns Park River Corridor – Livestock (09-21), Browns Park River Corridor – Wildlife (09-22), Brush Creek Substation (09-24), and Buckhorn Canyon (09-25)] classified as Semidesert (Sagebrush) ecological sites. The Red Mountain Allotment study is found just west of Steinaker Reservoir. The Island Park study is located just north of Big Island in Island Park. Above Steinaker Draw is aptly situated on a southern slope above the northern portion of Steinaker Draw. The Toliver Creek Chaining study is found east of Toliver Creek on the lower slopes of the Uinta Mountains near Browns Park. Both the Browns Park River Corridor – Livestock and Browns Park River Corridor – Wildlife studies are located just south of the Green River in Browns Park. Brush Creek Substation is situated on a flat above Brush Creek and opposite Donkey Flat. Finally, the Buckhorn Canyon study is found just east of Buckhorn Canyon (**Table 2.9**).

Shrubs/Trees: It is important to note that the number of sites sampled fluctuates from year to year and consider the potential implications of these differing 'n values' on vegetation trends over time. The dominant browse species varies from site to site. The Red Mountain Allotment and Island Park study sites, both of which burned, had little or no preferred browse cover recorded in 2020. Shadscale saltbush (*Atriplex confertifolia*) is the main browse species on the Browns Park River Corridor – Wildlife study site. Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) is the dominant or co-dominant browse species on the Above Steinaker Draw, Toliver Creek Chaining, Browns Park River Corridor – Livestock, Brush Creek Substation, and Buckhorn Canyon studies. Sagebrush cover and overall shrub cover in general vary from site to site, but have generally decreased over the study period (**Figure 2.3**). The exception to this is the Buckhorn Canyon study site, on which Wyoming big sagebrush increased from 10% cover in 2010 to 16% cover in 2020. Average preferred browse demographics indicate that the browse populations on these study sites are largely composed of mature and decadent individuals and that overall density has decreased through the sample years. Recruitment of young plants has fluctuated, but has generally exhibited a decreasing trend since 2010. However, decadence within these populations has also decreased over the study period (**Figure 2.10**). Preferred browse utilization has generally remained moderate overall, with 35% of plants being moderately browsed and 16% heavily browsed in 2020 (**Figure 2.12**).

Encroachment of Utah juniper (*Juniperus osteosperma*) is a concern on these sites, with cover and density remaining fairly stable overall. These trends and specifically the decrease in tree cover and density in 2010 can largely be attributed to the Above Steinaker Draw study, which was not sampled that year (**Figure 2.6**, **Figure 2.8**).

Herbaceous Understory: While the herbaceous understories of these sites are generally abundant, composition has varied throughout the years. The understories of these sites have been dominated by perennial and/or annual grasses in each sample year. The introduced annual grass species cheatgrass (*Bromus tectorum*) is present on many sites in significant amounts, increasing the risk for catastrophic fire; the Island Park study had nearly 58% cover of cheatgrass in 2020. Perennial grasses are largely native, but the introduced species crested wheatgrass (*Agropyron cristatum*) has been observed on select sites, particularly Toliver Creek Chaining and Red Mountain Allotment. Cover of both perennial forbs and annual forbs has fluctuated over time, but both have remained relatively rare in comparison of grasses (**Figure 2.14**, **Figure 2.16**).

Occupancy: Average pellet transect data indicates that occupancy has fluctuated over time. Overall use has generally increased; the increase between 2015 and 2020 can in part be attributed to deer and/or cattle pellet groups on the Toliver Creek Chaining and Red Mountain Allotment studies. Deer have been the primary occupants in all sample years, with a mean pellet group abundance ranging from 20 days use/acre in 2015 to 55 days use/acre in 2020. Mean abundance of elk pellet groups has varied between 3 days use/acre in 2015 and

24 days use/acre in 2005. Cattle have also been present, with an average abundance of pellet groups as low as 4 days use/acre in 2000 and as high as 16 days use/acre in 2020. Finally, horse pellet groups were observed in 2010 with a mean abundance of under 1 days use/acre, but were absent in all other years (**Figure 2.18**).

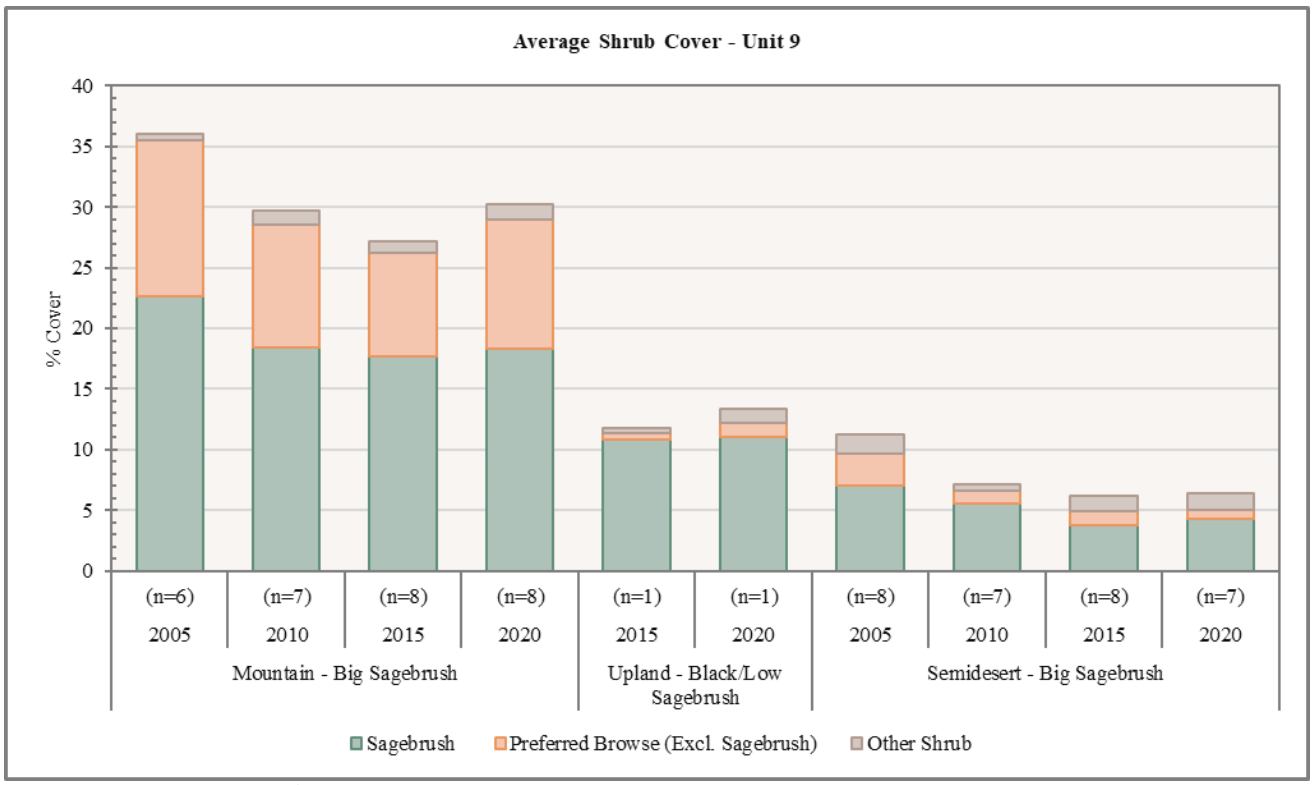


Figure 2.3: Average shrub cover for Mountain - Big Sagebrush, Upland - Black/Low Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 9, South Slope.

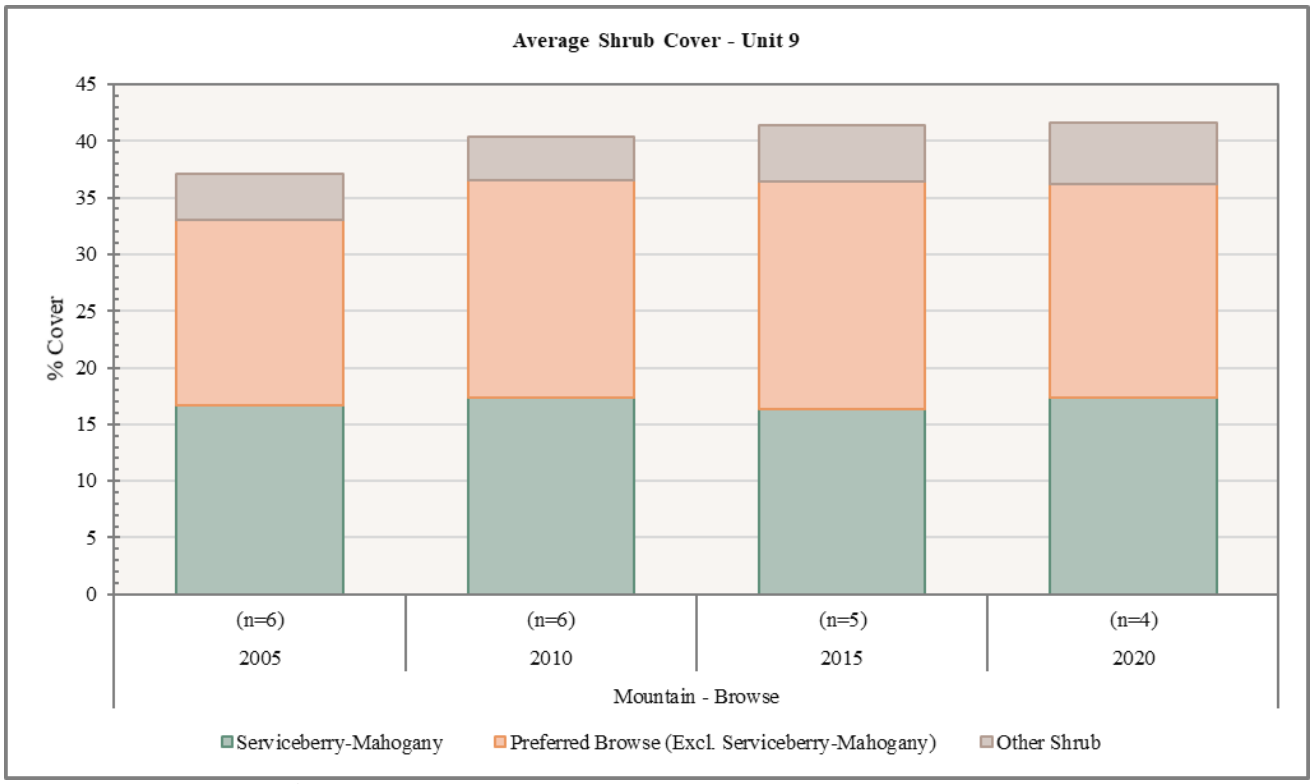


Figure 2.4: Average shrub cover for Mountain - Browse study sites in WMU 9, South Slope.

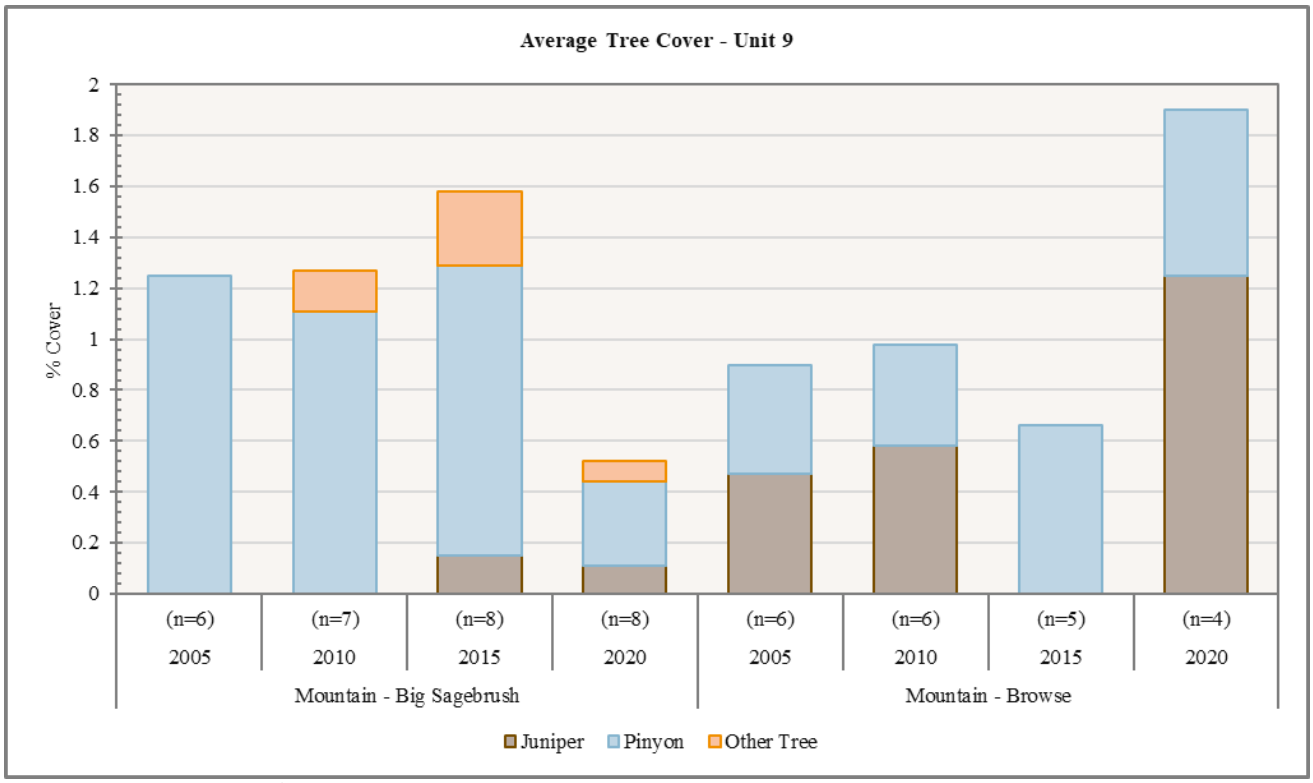


Figure 2.5: Average tree cover for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 9, South Slope.

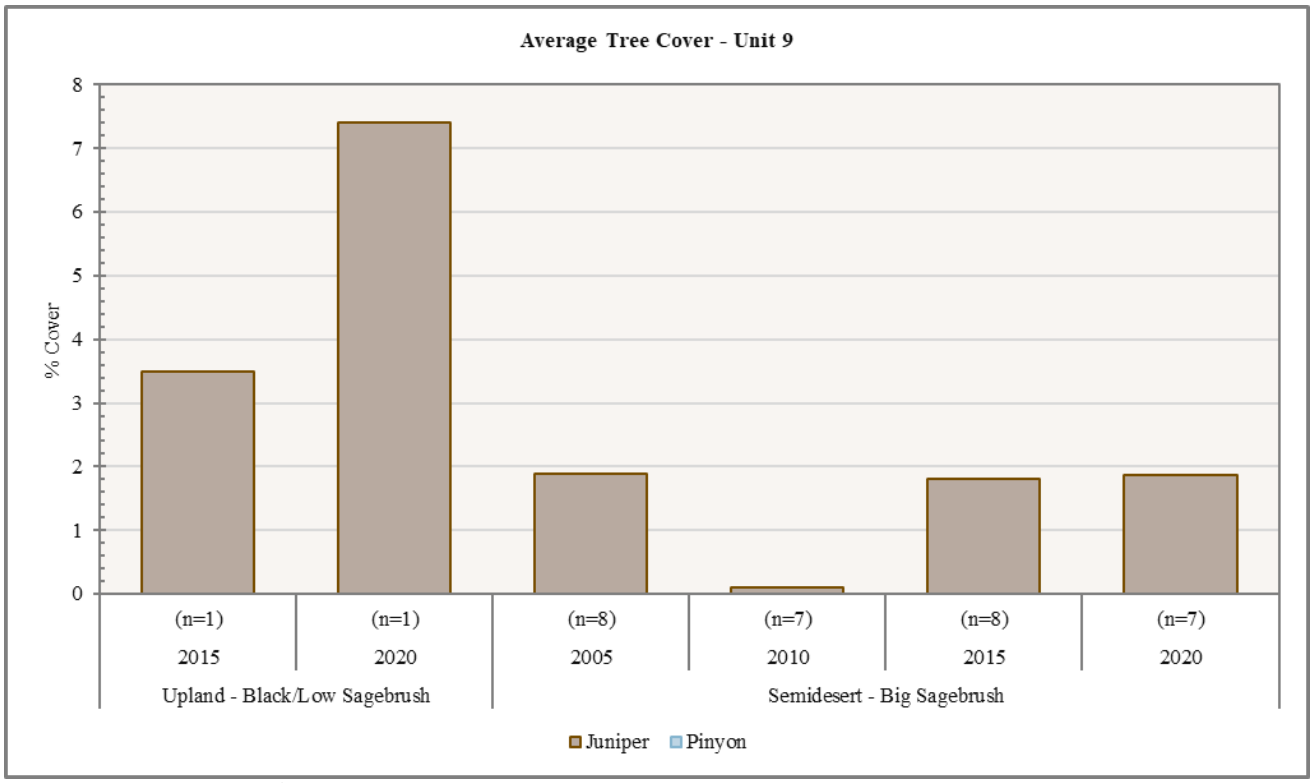


Figure 2.6: Average tree cover for Upland - Black/Low Sagebrush and Semidesert - Big Sagebrush study sites in WMU 9, South Slope.

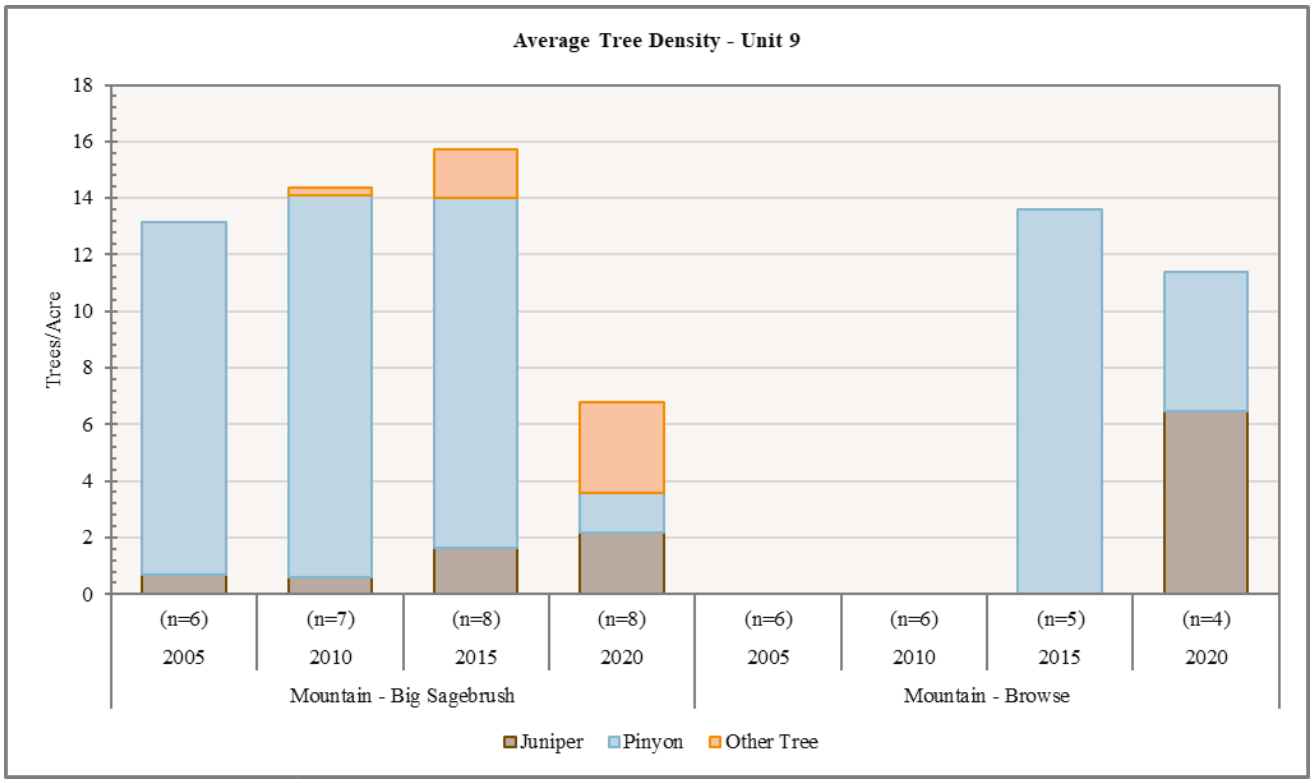


Figure 2.7: Average tree density for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 9, South Slope.

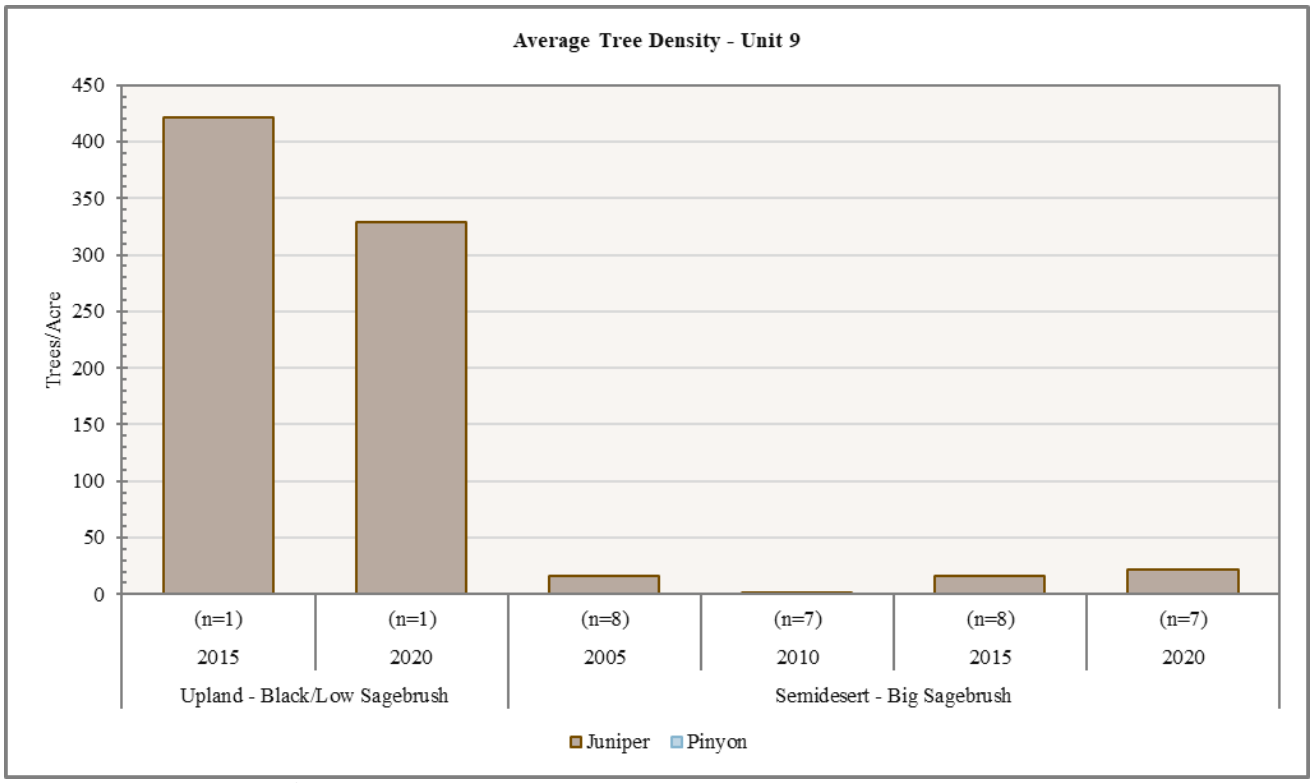


Figure 2.8: Average tree density for Upland - Black/Low Sagebrush and Semidesert - Big Sagebrush study sites in WMU 9, South Slope.

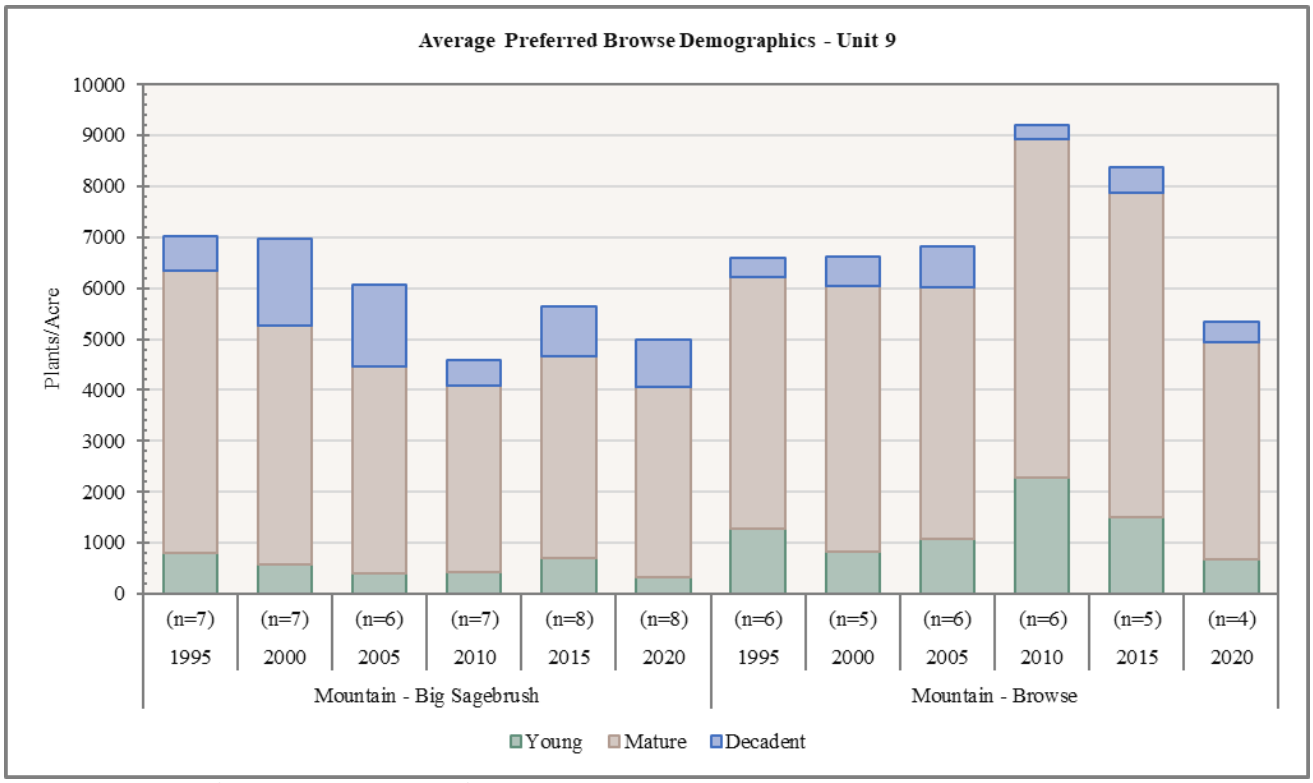


Figure 2.9: Average preferred browse demographics for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 9, South Slope.

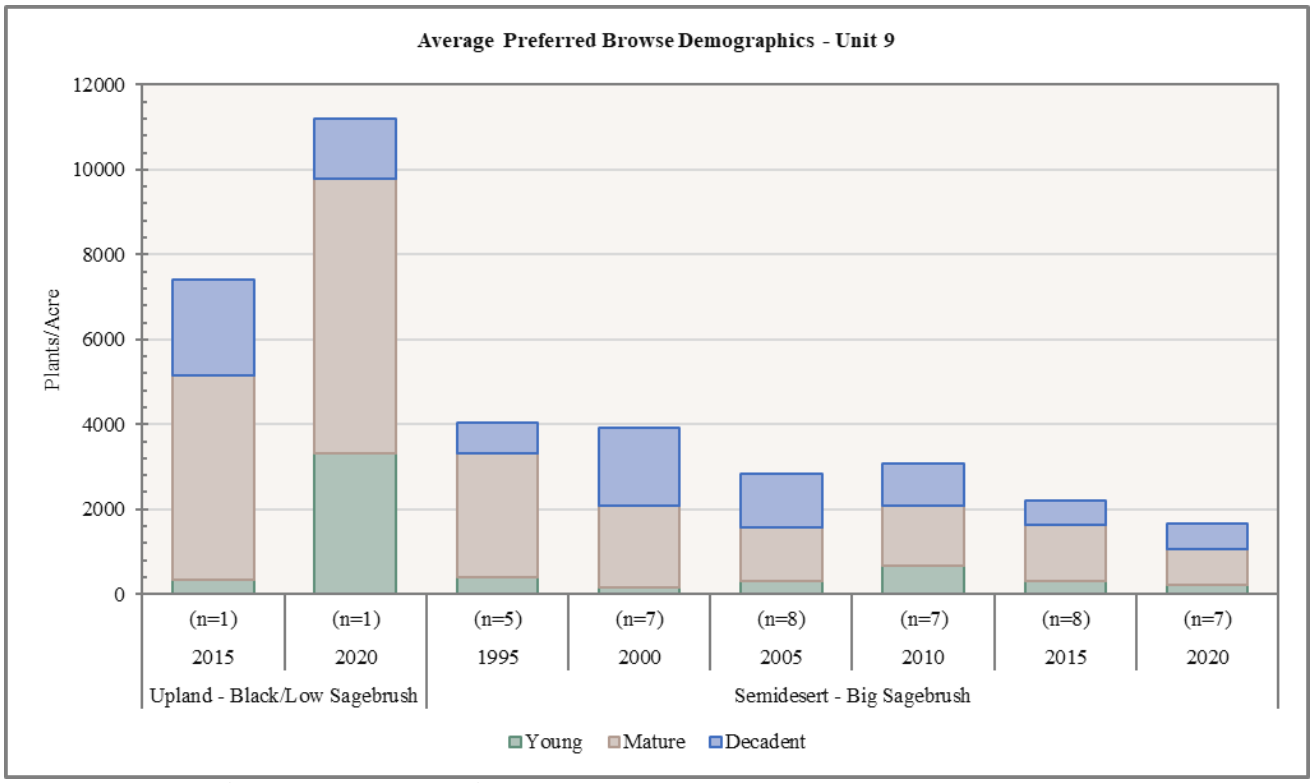


Figure 2.10: Average preferred browse demographics for Upland - Black/Low Sagebrush and Semidesert - Big Sagebrush study sites in WMU 9, South Slope.

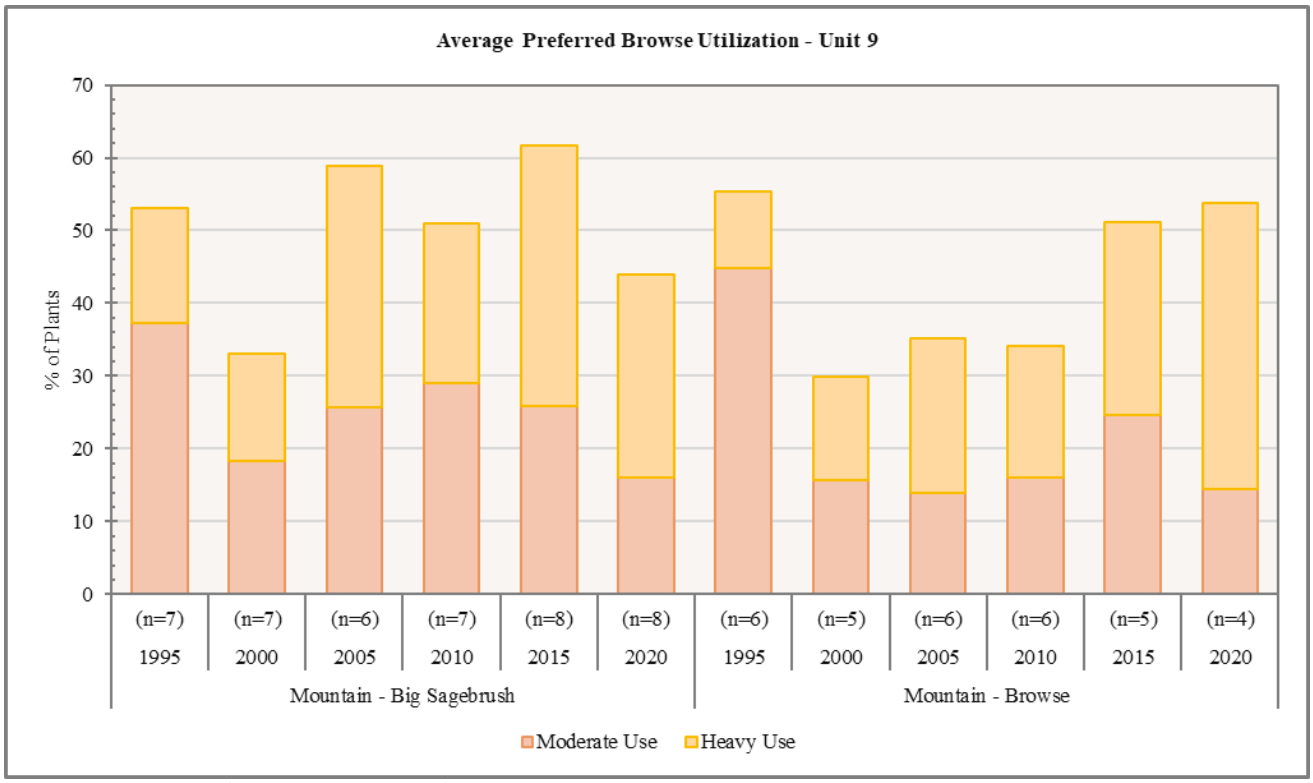


Figure 2.11: Average preferred browse utilization for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 9, South Slope.

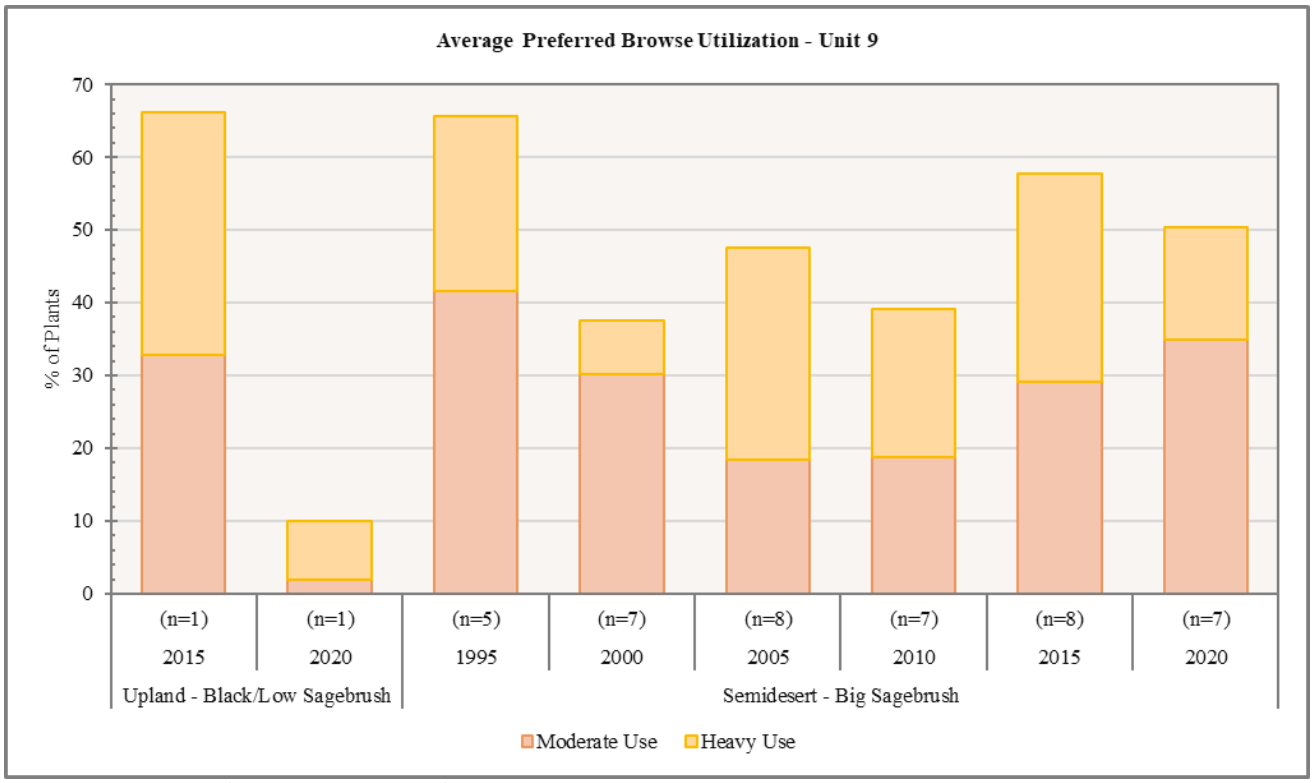


Figure 2.12: Average preferred browse utilization for Upland - Black/Low Sagebrush and Semidesert - Big Sagebrush study sites in WMU 9, South Slope.

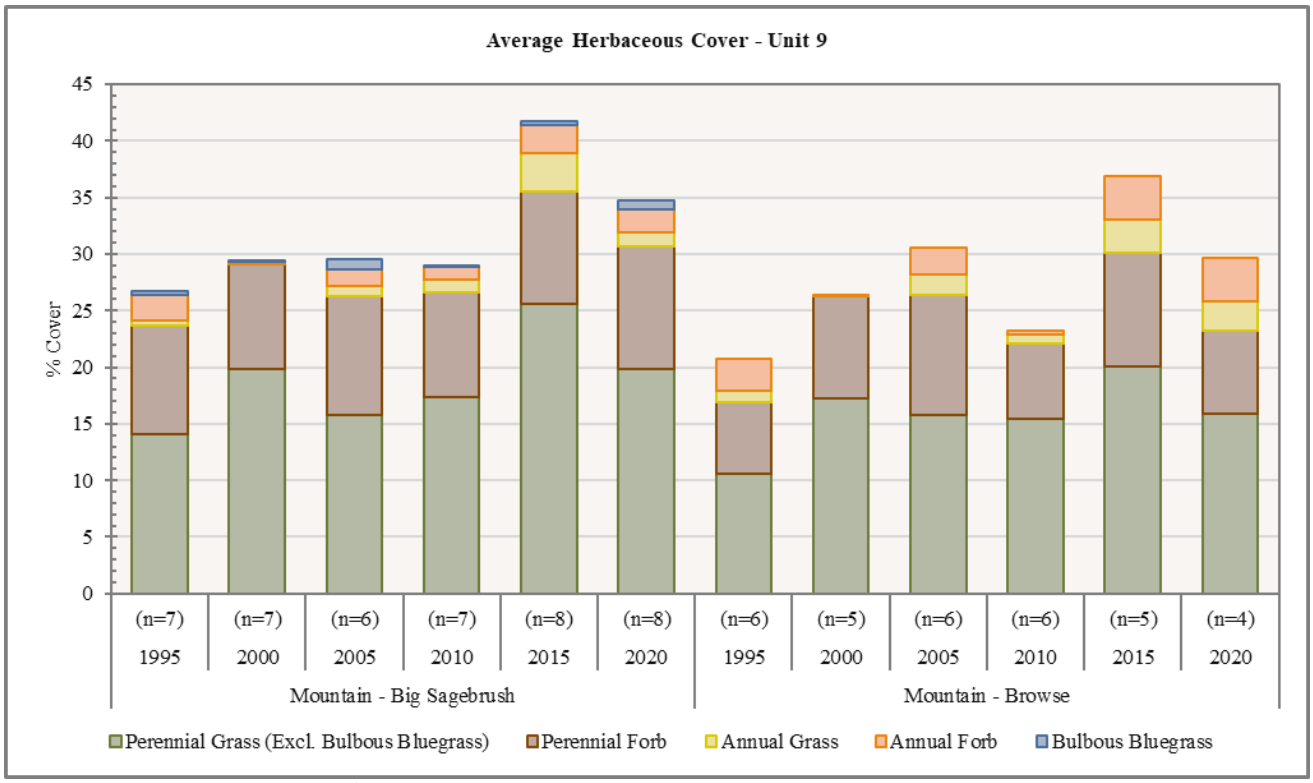


Figure 2.13: Average herbaceous cover for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 9, South Slope.

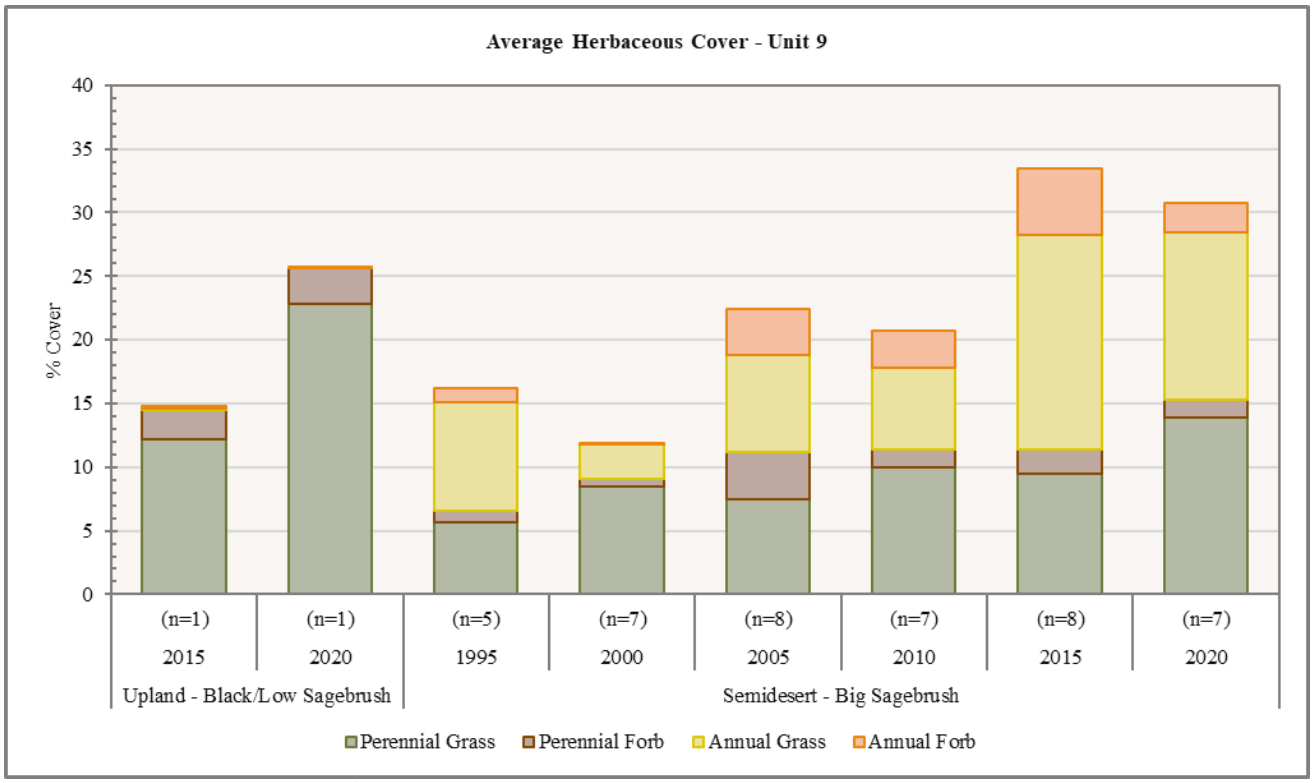


Figure 2.14: Average herbaceous cover for Upland - Black/Low Sagebrush and Semidesert - Big Sagebrush study sites in WMU 9, South Slope.

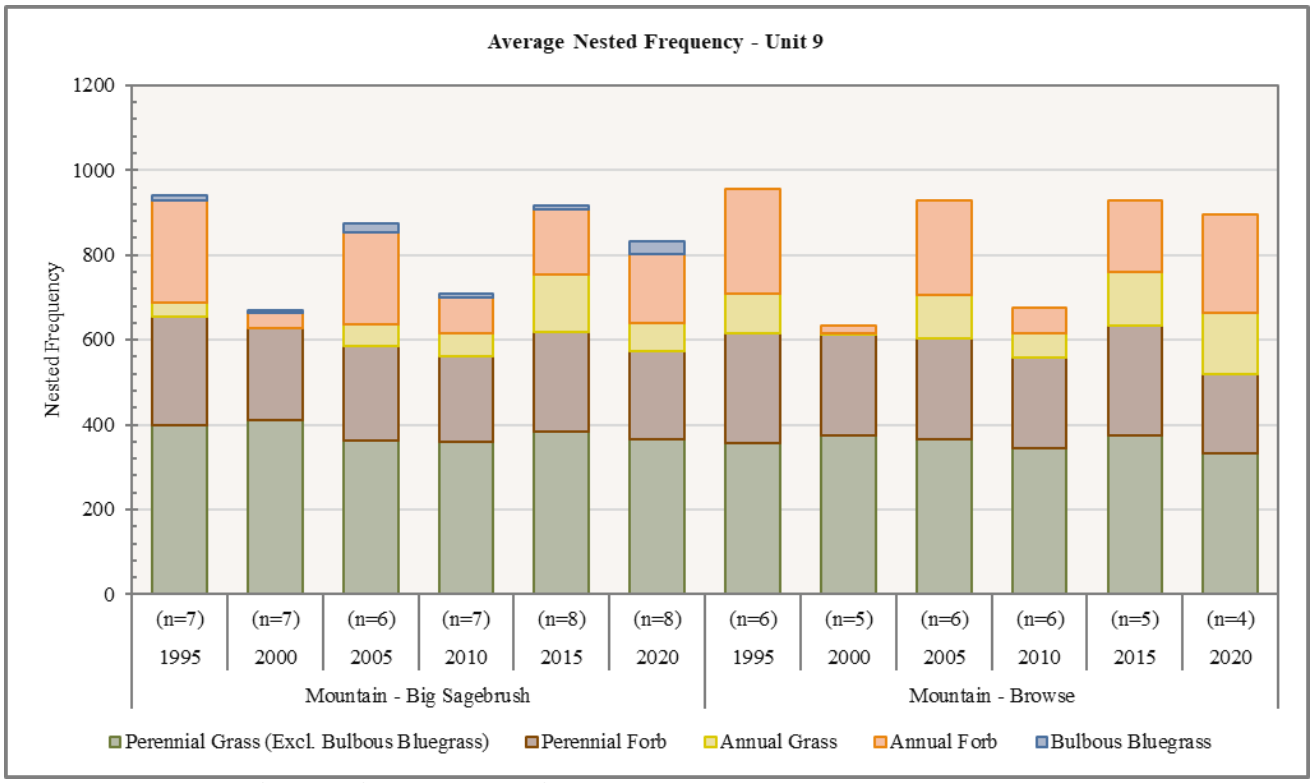


Figure 2.15: Average nested frequency of herbaceous species for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 9, South Slope.

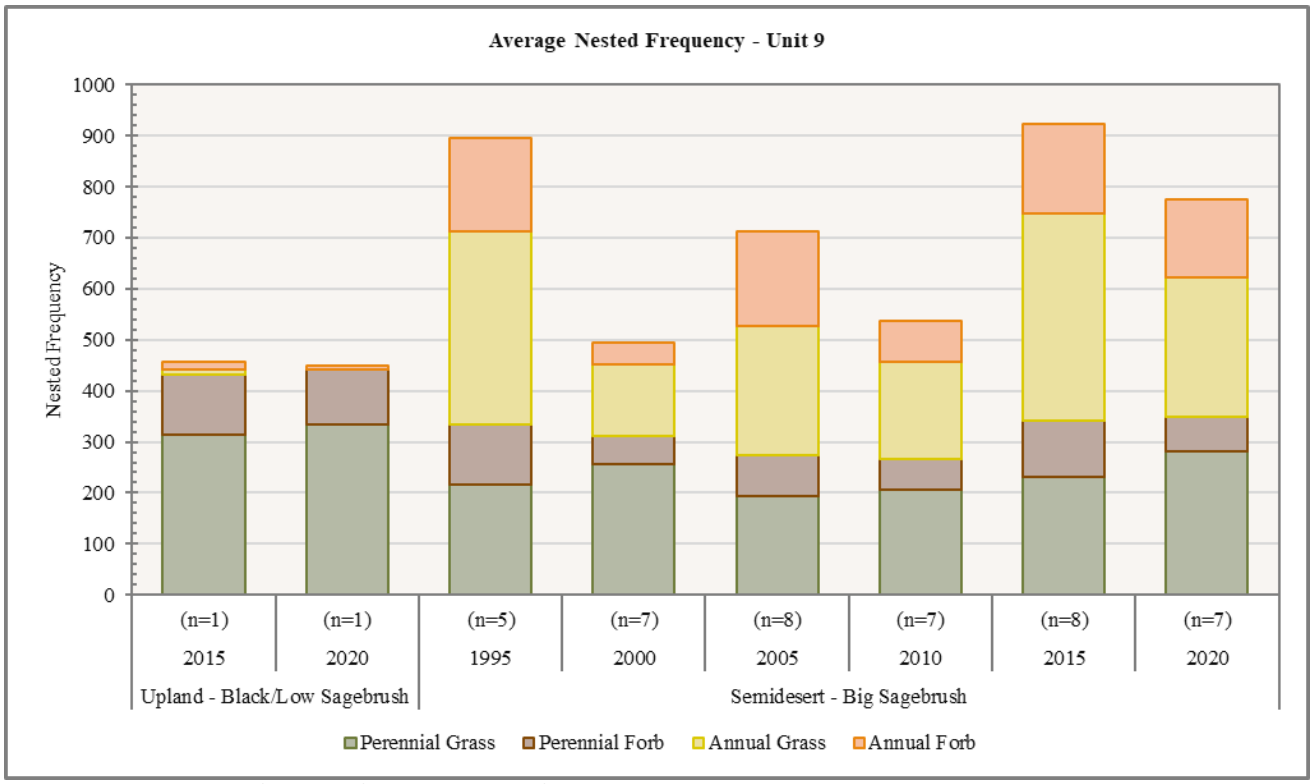


Figure 2.16: Average nested frequency of herbaceous species for Upland - Black/Low Sagebrush and Semidesert - Big Sagebrush study sites in WMU 9, South Slope.

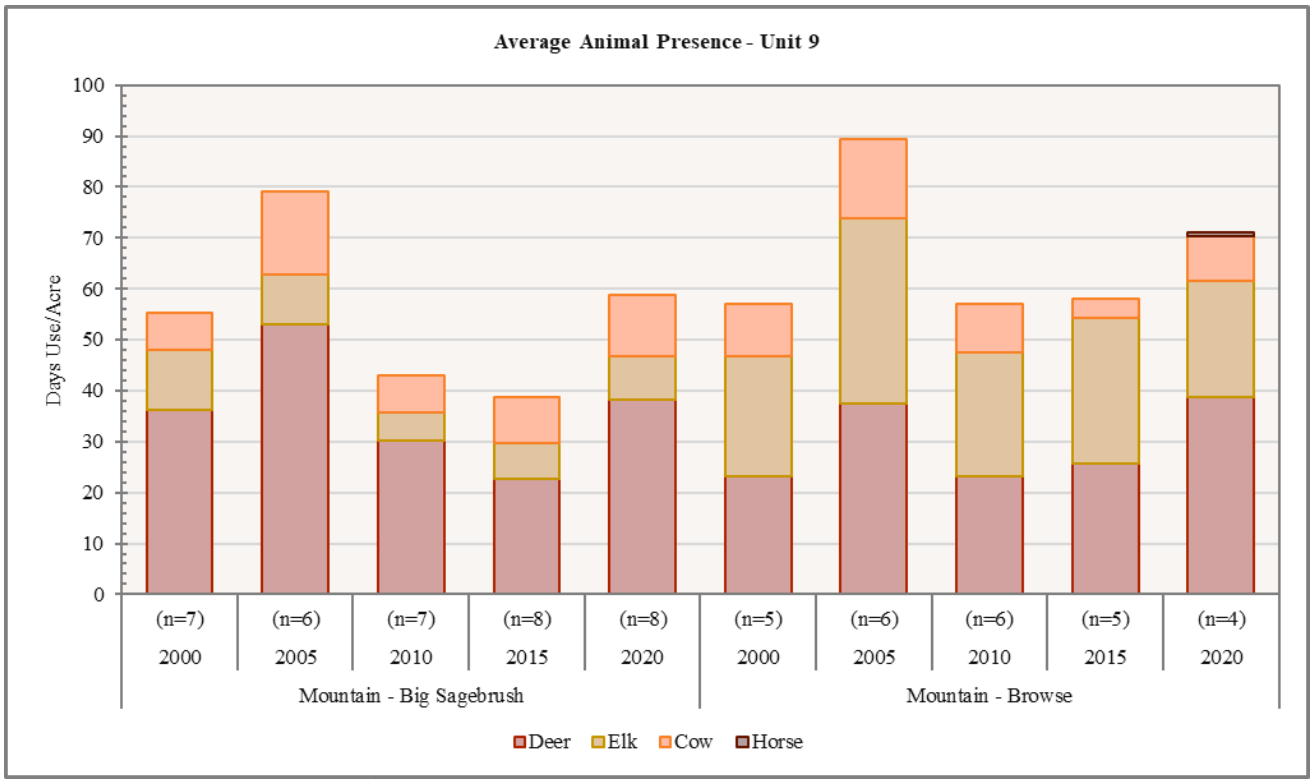


Figure 2.17: Average pellet transect data for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 9, South Slope.

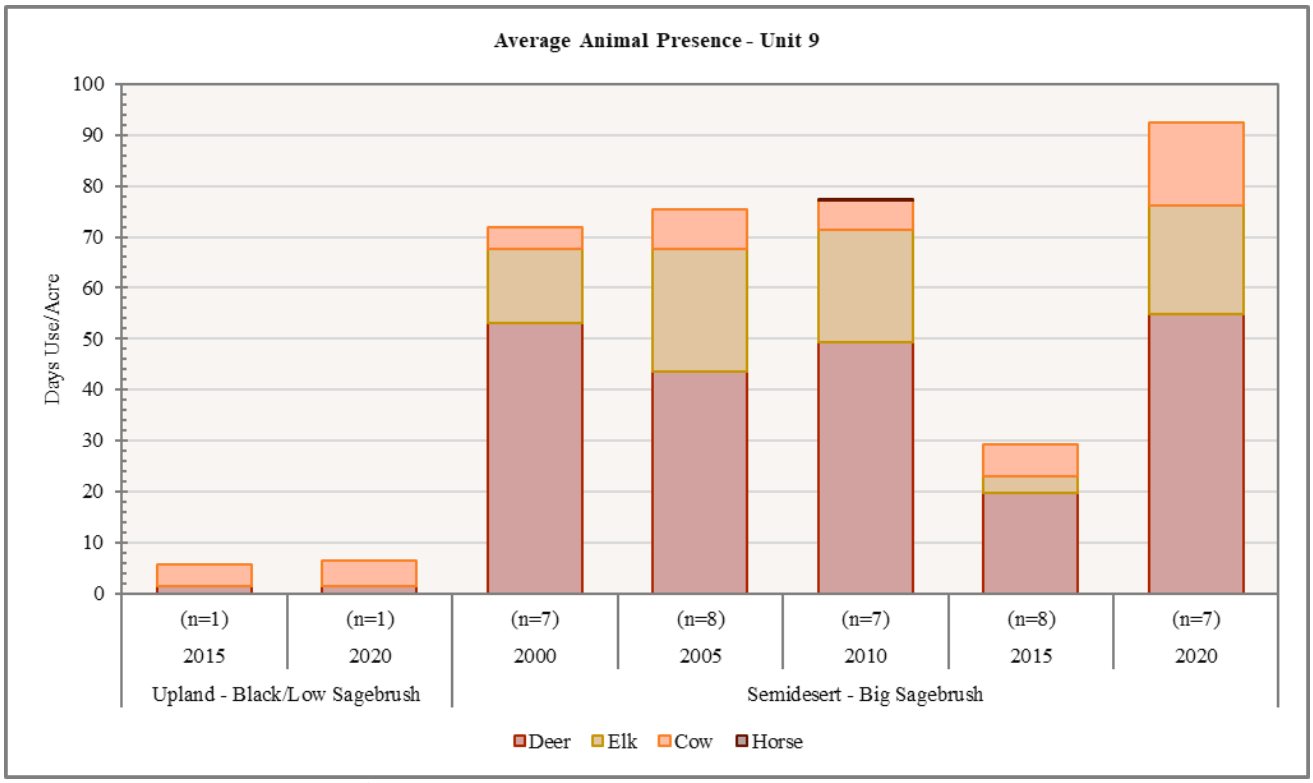
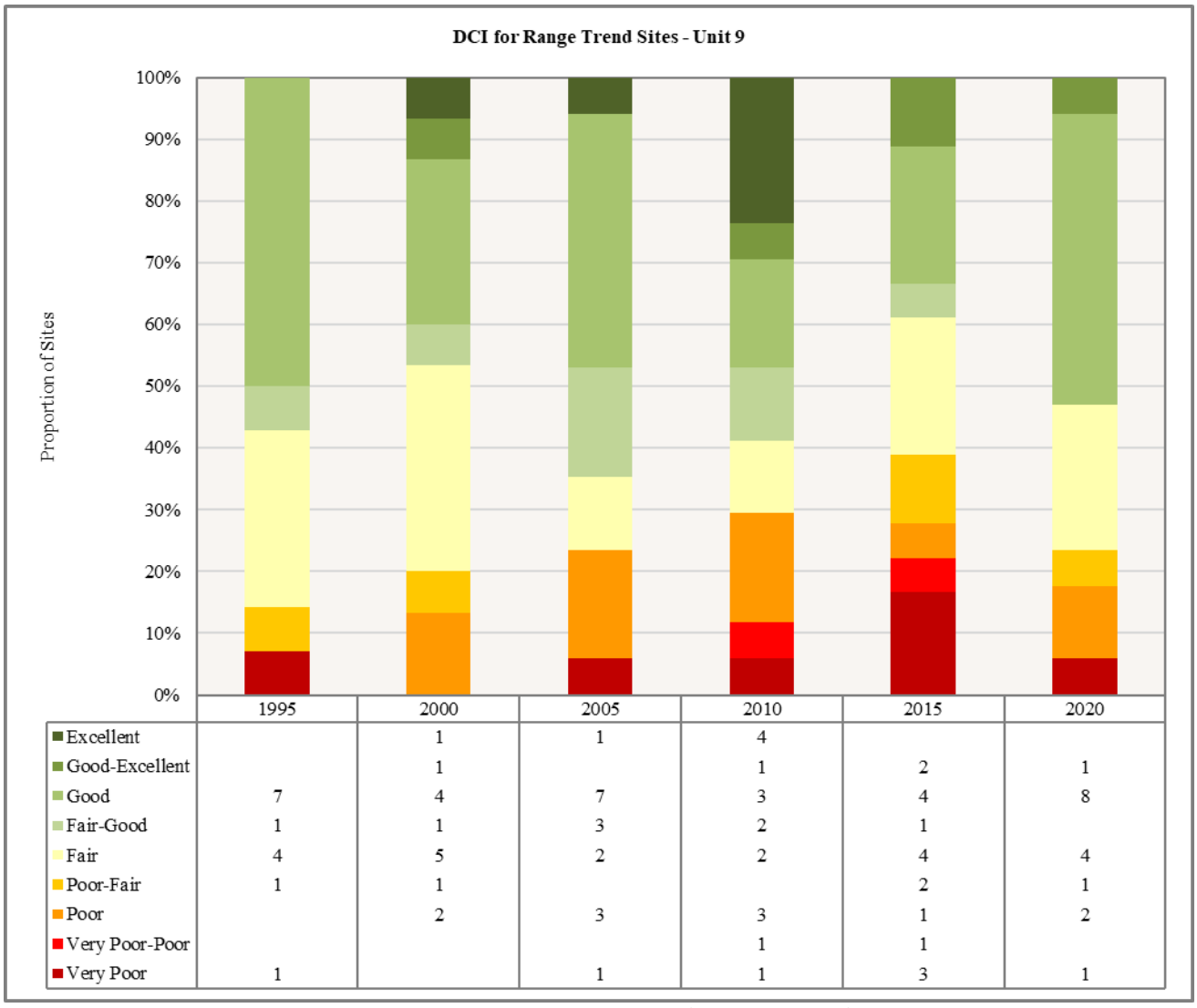


Figure 2.18: Average pellet transect data for Upland - Black/Low Sagebrush and Semidesert - Big Sagebrush study sites in WMU 9, South Slope.

Deer Winter Range Condition Assessment

The condition of deer winter range within the South Slope management unit has generally remained stable and fair since the 1995 sampling. Unit stability can be attributed to the Dry Fork Mountain (09-3), Sawtooth Flat Springs (09-4), Little Hole (09-9), John Star Flat (09-13), Mud Springs Draw (09-15), and Mosby Mountain South (09-19) studies, which are consistently considered to be good condition. Range Trend sites that lower the overall deer winter range quality of the unit and have higher variability in quality from year to year include Red Mountain Allotment (09-1), Island Park (09-5), Above Steinaker Draw (09-6), Toliver Creek Chaining (09-10), and Brush Creek Substation (09-2); these sites are considered to be in generally poor condition due to the amount of annual grass present, having few perennial forbs, a lack of diversity within the sagebrush demographics, and a lack of browse cover. Farm Creek (09-17), Browns Park River Corridor – Livestock (09-21), Browns Park River Corridor – Wildlife (09-22), Rock Creek (09-23), Buckhorn Canyon (09-25), and Little Mountain (09-27) average a fair ranking and experience moderate variations in quality from year to year. Finally, Mosby Mountain (09-16) and Seep Hollow (09-20) are consistently considered to be in good-excellent conditions.

The overall deer winter range assessment in 2020 for WMU 9 remains fair to good. However, Island Park and Farm Creek are currently considered to be in very poor and poor conditions, respectively. Both studies burned in wildfires that removed much of the browse and allowed for increases in annual grass already present on these sites. However, annual grass remains rare on the Farm Creek site. Nine out of the 17 studies sampled in 2020 were considered to have good or good-excellent winter conditions (**Figure 2.19**, **Table 2.11**)



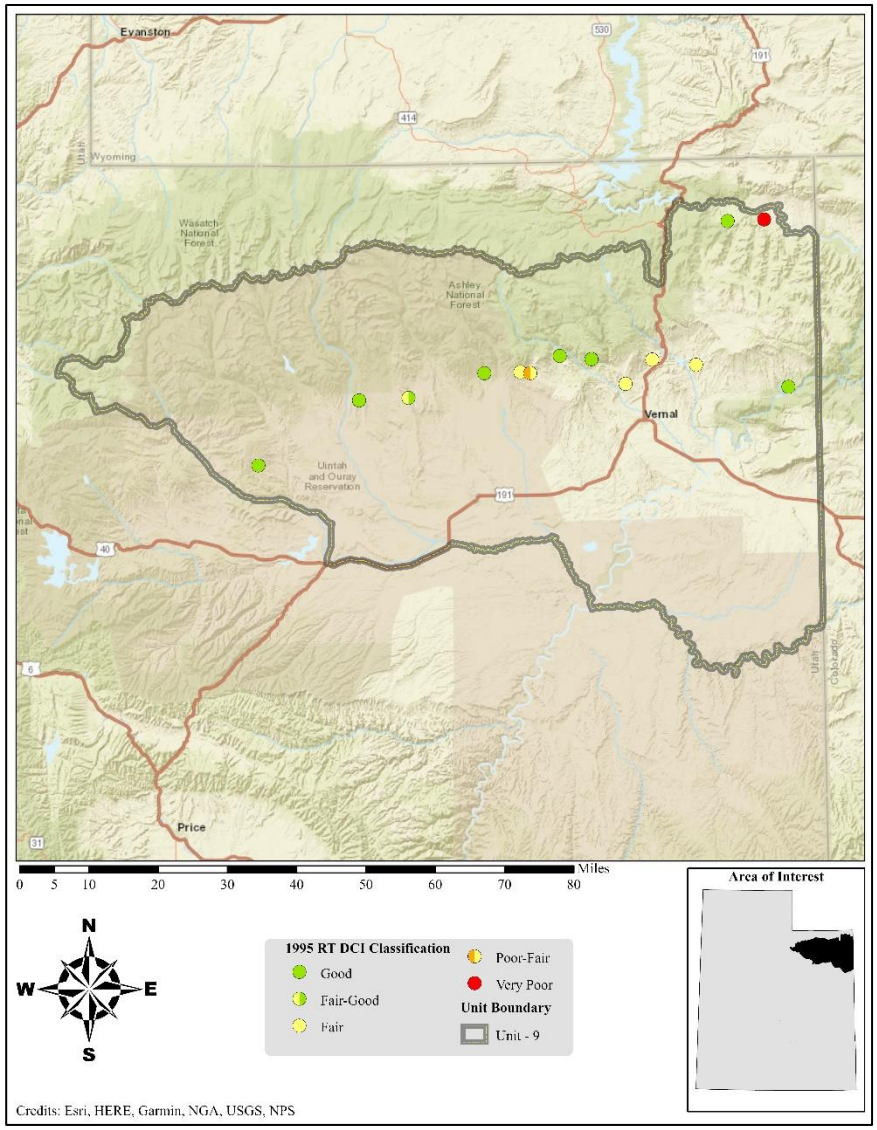
	1995	2000	2005	2010	2015	2020
Excellent		1	1	4		
Good-Excellent		1		1	2	1
Good	7	4	7	3	4	8
Fair-Good	1	1	3	2	1	
Fair	4	5	2	2	4	4
Poor-Fair	1	1			2	1
Poor		2	3	3	1	2
Very Poor-Poor				1	1	
Very Poor	1		1	1	3	1

Figure 2.19: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 9, South Slope.

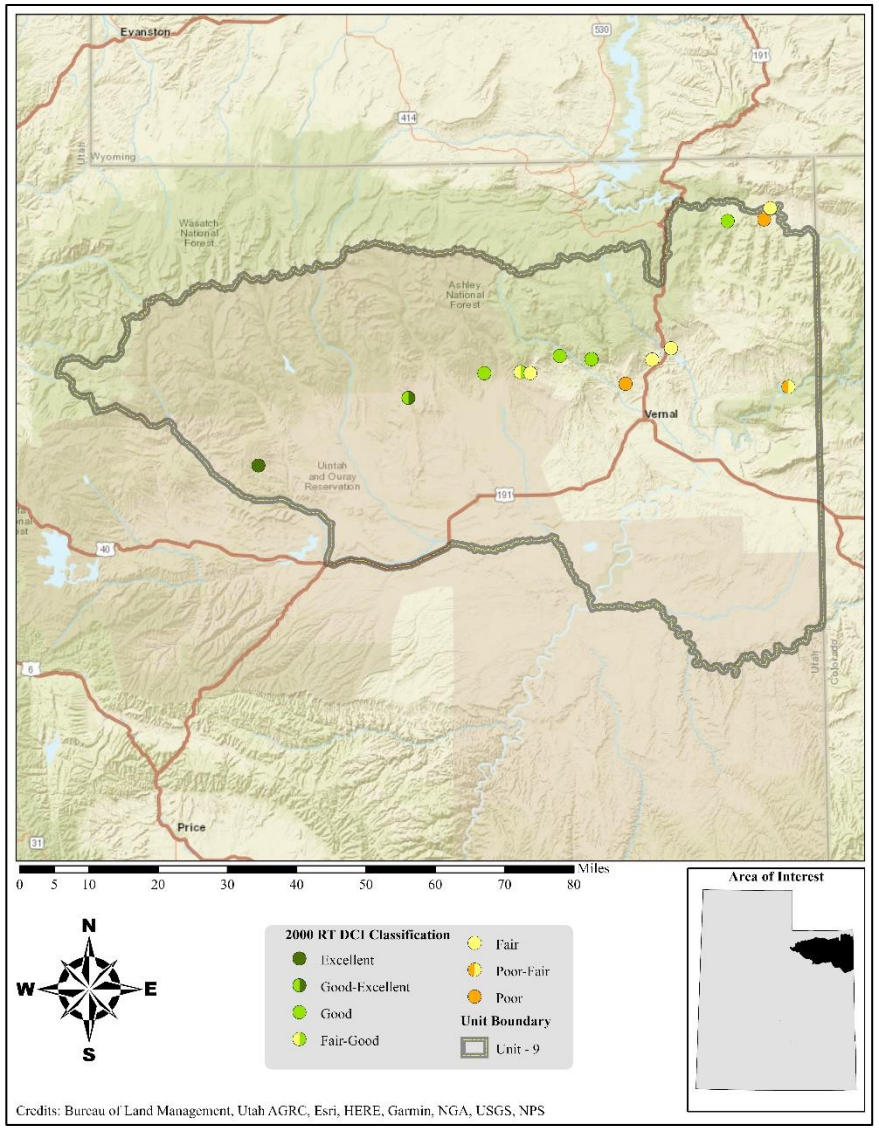
Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
09-01	1995	26.4	10.6	4.1	3.4	-5.6	0.5	0	**39.5**	**F**
09-01	2000	25	-4.5	0.6	2.3	-5.2	0	0	**18.2**	**P**
09-01	2005	25.1	-3.7	5.8	1.7	-16.1	0.1	0	**12.9**	**P**
09-01	2010	22	5.5	1.6	3.2	-13.2	0.3	0	**19.3**	**P**
09-01	2015	0	0	0	8.4	-12.8	6.2	0	**1.7**	**VP**
09-01	2020	0.1	0	0	30	-0.3	10	0	**39.9**	**F**
09-03	1995	30	12.4	4.4	30	-2.2	2	0	**76.6**	**G**
09-03	2000	30	10.1	4.7	30	0	2.3	0	**77.1**	**G**
09-03	2010	18.3	15	1.9	30	-4.5	10	0	**70.7**	**F-G**
09-03	2015	28.6	14.9	3.8	19.8	-5.9	10	0	**71.1**	**F-G**
09-03	2020	30	14.4	3.7	23.3	-3.2	10	0	**78.1**	**G**
09-04	1995	21.4	10.4	5.1	30	0	10	0	**76.9**	**G**
09-04	2000	24.3	8.7	5.1	30	0	10	0	**78.2**	**G**
09-04	2005	30	9.4	7.3	23.9	0	10	0	**80.7**	**G**
09-04	2010	30	11.3	4.1	30	0	10	0	**85.3**	**G**
09-04	2015	30	5.6	7.6	30	-2.1	10	0	**81.2**	**G**
09-04	2020	28.7	8.7	2.5	30	-0.1	10	0	**79.8**	**G**
09-05	1995	9.9	3.4	8.4	27.4	-2.3	1.7	0	**48.5**	**G**
09-05	2000	7.3	-9	1.4	24.3	-1.2	0.5	0	**23.3**	**P-F**
09-05	2005	3	0	0	26.7	-11.6	2	0	**20.1**	**P**
09-05	2010	0	0	0	6.9	-0.8	0.6	0	**6.7**	**VP**
09-05	2015	0	0	0	20.9	-14.7	3.3	0	**9.5**	**VP-P**
09-05	2020	0	0	0	23	-20	1.4	0	**4.4**	**VP**
09-06	1995	15	11.4	8	12	-4.6	1.2	0	**43**	**F**
09-06	2000	13.9	5.5	1.7	6	-4.1	4.8	0	**27.8**	**F**
09-06	2005	11.4	-1.4	0.6	8.2	-13.8	2.1	0	**7**	**VP**
09-06	2015	11.3	-0.1	4	0.9	-17.5	1.2	0	**-0.2**	**VP**
09-06	2020	12.8	3.6	3.9	6.2	-5.8	0.6	0	**21.2**	**P**
09-09	1995	30	11.7	5.6	22.7	-0.3	6.5	0	**76.2**	**G**
09-09	2000	30	6.4	3.4	30	0	5.6	0	**75.5**	**G**
09-09	2005	30	9.8	3.1	30	-0.1	10	0	**82.8**	**G**
09-09	2010	30	13.7	5.7	30	-0.4	5.8	0	**84.8**	**G**
09-09	2015	30	12.3	4.8	30	-4.8	10	0	**82.3**	**G**
09-09	2020	30	12.7	2.9	30	-1.5	6.1	0	**80.1**	**G**
09-10	1995	1.1	0	0	11.6	-17	4.5	0	**0.2**	**VP**
09-10	2000	2.2	0	0	22.4	-3.6	0.5	0	**21.6**	**P**
09-10	2005	5.5	0	0	30	-0.4	0.7	0	**35.8**	**F**
09-10	2010	2.6	0	0	30	-14.4	0.2	0	**18.4**	**P**
09-10	2015	3.6	0	0	30	-10.5	0.7	0	**23.8**	**P-F**
09-10	2020	3.8	0	0	30	-10.9	0.6	0	**23.4**	**P-F**
09-13	1995	29.3	13.2	10.8	7.6	-1	10	0	**69.8**	**F-G**
09-13	2000	30	11.6	8.3	29.1	0	10	0	**88.9**	**G-E**
09-13	2005	30	8.9	6.3	22.7	-2.7	10	0	**75.1**	**G**
09-13	2010	30	13.5	10	21.1	-0.4	10	0	**84.2**	**G**
09-13	2020	30	13.5	4.7	24	-3.5	10	0	**78.7**	**G**
09-15	1995	30	13.1	7.2	18.4	0	7.5	0	**76.2**	**G**
09-15	2005	30	11.6	9.4	29	-1.2	7.4	0	**86.3**	**G**
09-15	2010	30	14.5	8.2	30	-0.3	7	0	**89.3**	**G-E**
09-15	2015	30	11	8.3	23	-1.2	9.3	0	**80.5**	**G**
09-15	2020	30	13.1	5.6	30	-2.3	10	0	**86.4**	**G**
09-16	1995	7	13.1	3.4	30	-1	10	0	**62.6**	**F**
09-16	2000	11.4	12.8	6.4	30	0	10	0	**70.5**	**F-G**
09-16	2005	21.6	11.8	4.7	29.9	-1.6	10	0	**76.4**	**G**
09-16	2010	30	14.9	11.9	30	-1.9	10	0	**94.9**	**E**
09-16	2015	30	13.2	9.8	30	-4.9	10	0	**88**	**G-E**
09-16	2020	30	10.9	10.7	30	-0.8	10	0	**90.8**	**G-E**

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
09-17	1995	26.2	13.5	5.5	30	0	2.6	0	**77.8**	**G**
09-17	2000	30	8.6	4.9	30	0	3	0	**76.5**	**G**
09-17	2005	30	7.9	3.4	30	-0.6	3.2	0	**73.9**	**G**
09-17	2010	1.2	0	0	30	-0.7	10	0	**40.5**	**VP-P**
09-17	2015	4.5	0	0	30	-0.8	10	0	**43.7**	**P**
09-17	2020	7.2	0	0	30	0	9.7	0	**46.9**	**P**
09-19	1995	7.7	11.2	3	26.4	-2.7	10	0	**55.6**	**P-F**
09-19	2000	10.8	14.4	2.8	30	0	10	0	**67.9**	**F**
09-19	2005	19.5	12.9	4.4	30	-2.5	10	0	**74.2**	**G**
09-19	2010	28.9	14.2	13.1	30	-0.5	9.6	0	**95.3**	**E**
09-19	2015	30	12.4	6.1	28.3	-3.6	10	0	**83.2**	**G**
09-19	2020	30	14.1	4.9	30	-1.3	10	0	**87.7**	**G**
09-20	1995	30	13.8	8.6	24	-0.1	10	0	**86.3**	**G**
09-20	2000	30	13.1	9.4	30	0	10	0	**92.4**	**E**
09-20	2005	30	11.9	14	30	-0.3	10	0	**95.5**	**E**
09-20	2010	30	14.4	13.8	30	-0.1	10	0	**98.2**	**E**
09-20	2015	30	14	6.5	30	-1.2	10	0	**89.3**	**G-E**
09-21	2000	12.8	5.9	3.4	14.3	0	0.1	0	**36.4**	**F**
09-21	2005	16.9	7.5	4.2	16.6	-0.3	0.3	0	**45.1**	**F-G**
09-21	2010	6.8	-1.4	3.3	30	0	0.6	0	**39.2**	**F**
09-21	2015	7.2	5.8	3.4	30	-6.8	1.3	0	**40.9**	**F**
09-21	2020	5.5	0	0	22.4	-0.4	0.2	0	**27.7**	**F**
09-22	2000	6.5	2.4	0.6	30	-0.1	0	0	**39.4**	**F**
09-22	2005	17.1	10	0.4	16.3	-0.4	0	0	**43.4**	**F-G**
09-22	2010	6.6	-0.9	1.6	30	-0.2	0	0	**37.1**	**F**
09-22	2015	4.2	0	0	30	-6.3	0.1	0	**28**	**F**
09-22	2020	1	0	0	30	-1.3	0	0	**29.7**	**F**
09-23	2005	30	5.4	1.7	24.1	-3	3.1	0	**61.2**	**F**
09-23	2010	30	7.6	5.9	25.3	-0.1	1.4	0	**70**	**F-G**
09-23	2015	30	6.4	3.1	30	-5.6	1.5	0	**65.4**	**F**
09-23	2020	30	4.6	1.2	30	-2.7	0.3	0	**63.4**	**F**
09-24	1997	20	10.3	1.2	1.9	-2.6	1.1	0	**31.9**	**F**
09-24	2005	4.3	0	0	1	-2.7	10	0	**12.6**	**P**
09-24	2010	5.5	0	0	0.6	-3.9	10	0	**12.2**	**P**
09-24	2015	2.6	0	0	6.1	-12.4	10	0	**6.3**	**VP**
09-25	2001	26.4	0.2	0.8	10.8	-0.1	2.2	0	**40.3**	**F**
09-25	2005	9.3	-2.2	15	15.3	-0.4	10	0	**46.9**	**F-G**
09-25	2009	16.4	0	0	28.1	-11.6	10	0	**42.9**	**F**
09-25	2010	12.8	8.8	15	25.7	-1.5	6.5	0	**67.2**	**E**
09-25	2015	18.6	10.2	8	13.9	-20	3.7	0	**34.5**	**F**
09-25	2020	20	6.5	8.5	24.5	-5.3	2.4	0	**56.6**	**G**
09-27	2015	14.3	4.8	2.5	24.3	0	4.8	0	**50.6**	**P-F**
09-27	2020	15.3	11.2	14.9	30	0	5.6	0	**76.9**	**G**

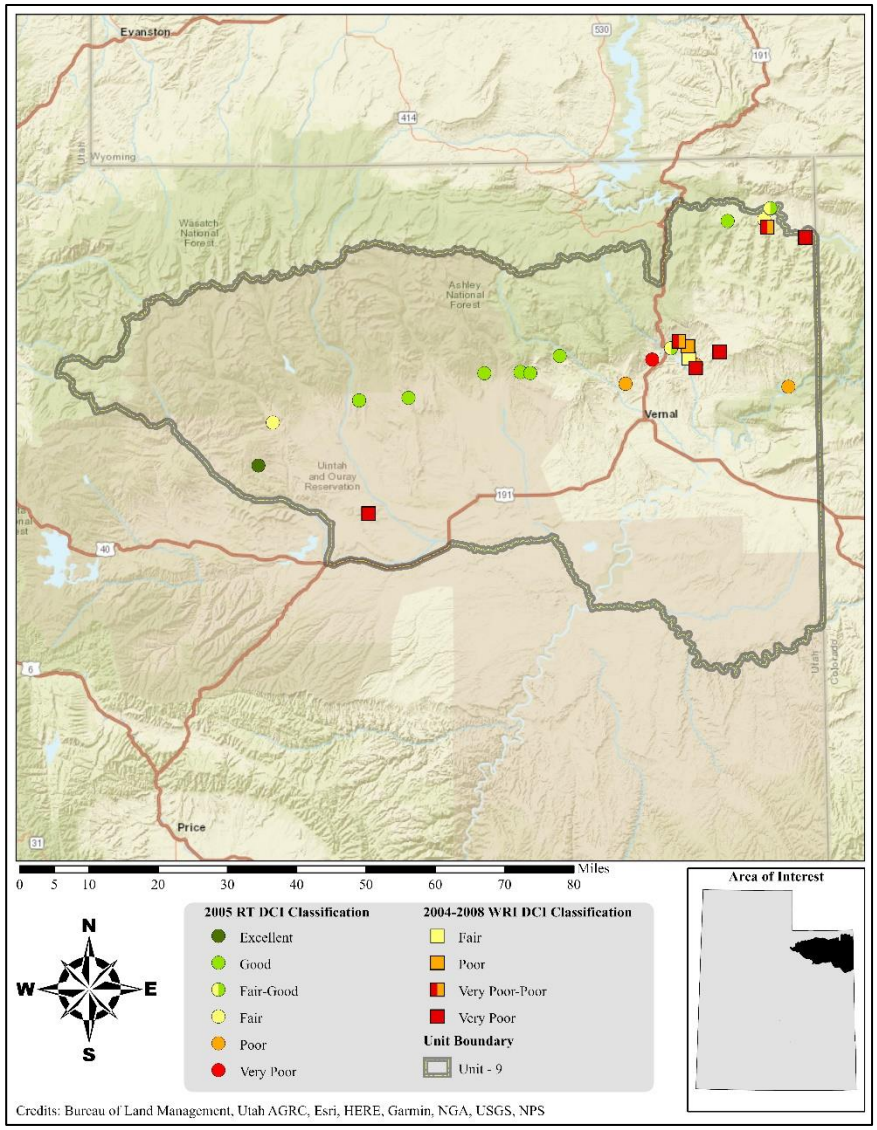
Table 2.11: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 9, South Slope. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. *Studies with an asterisk have been suspended.



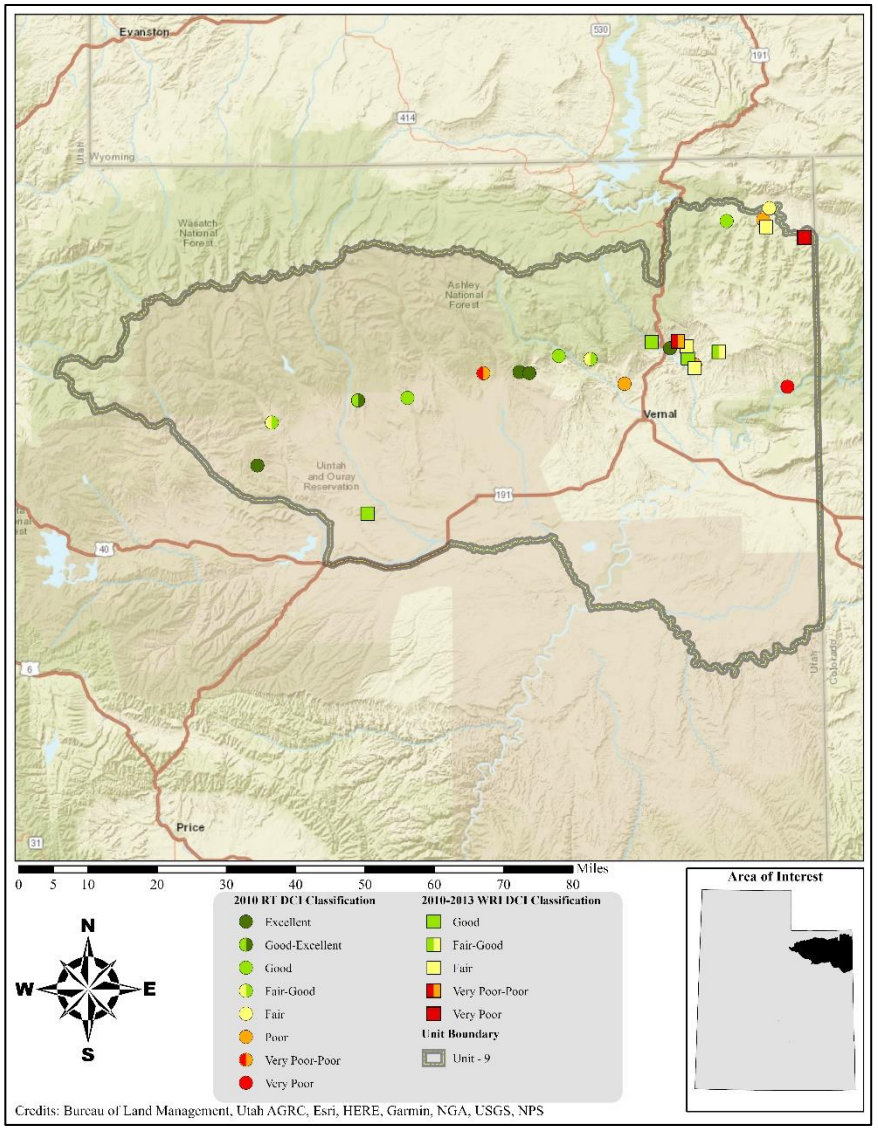
Map 2.11: 1995 Desirable Components Index (DCI) ranking distribution by study site for WMU 9, South Slope.



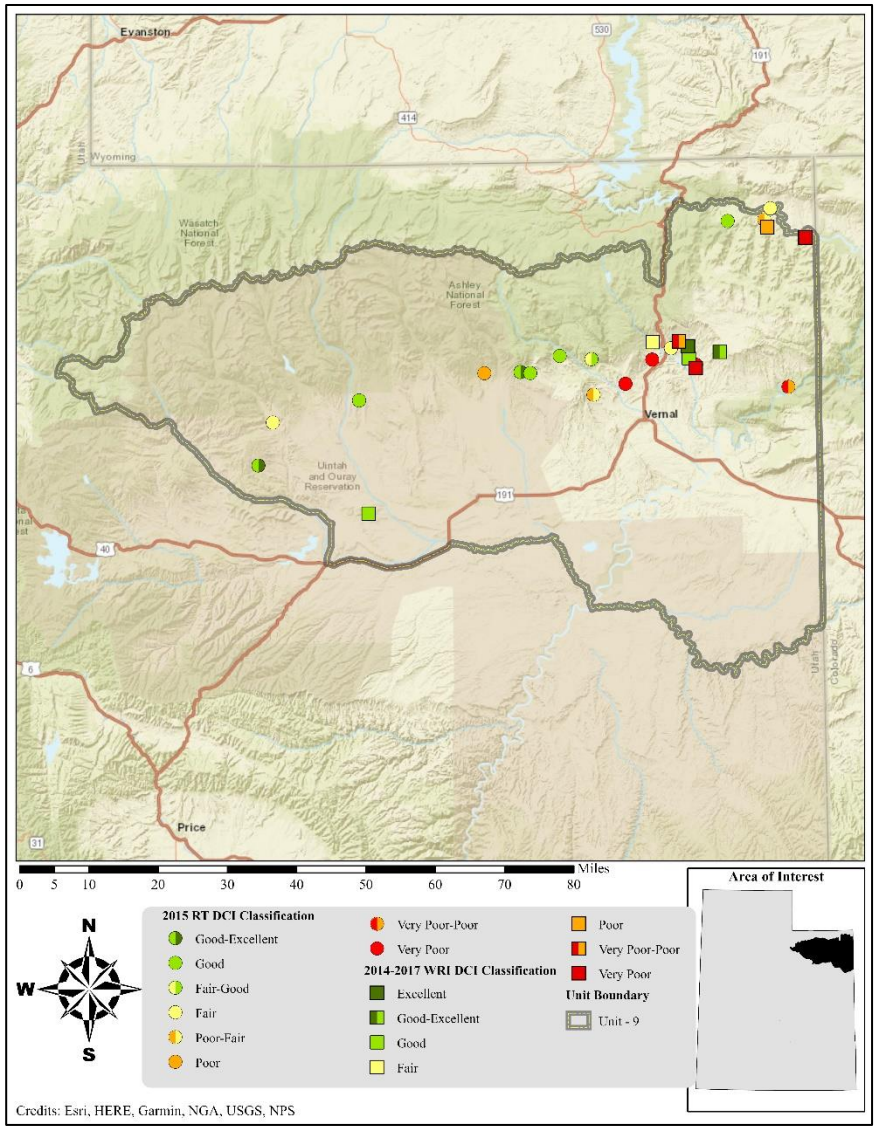
Map 2.12: 2000 Desirable Components Index (DCI) ranking distribution by study site for WMU 9, South Slope.



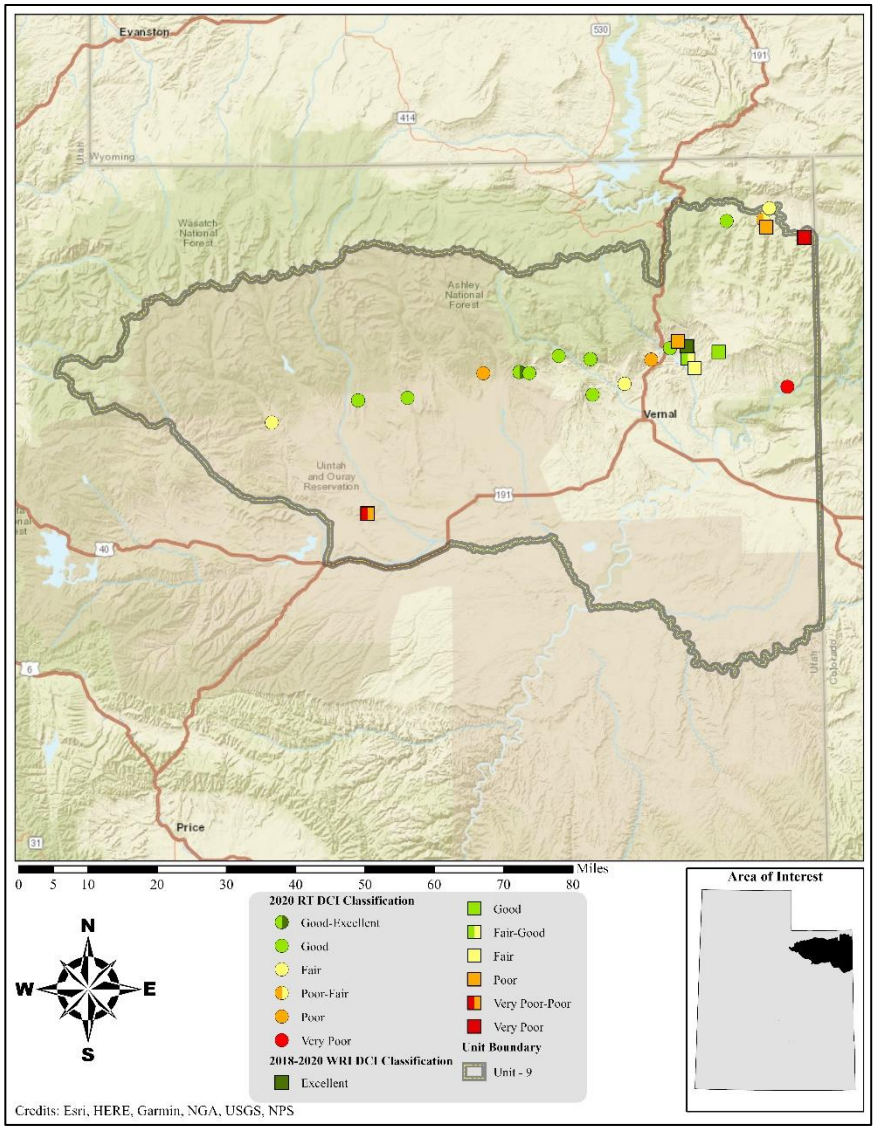
Map 2.13: 2005 Desirable Components Index (DCI) ranking distribution by study site for WMU 9, South Slope.



Map 2.14: 2010 Desirable Components Index (DCI) ranking distribution by study site for WMU 9, South Slope.



Map 2.15: 2015 Desirable Components Index (DCI) ranking distribution by study site for WMU 9, South Slope.



Map 2.16: 2020 Desirable Components Index (DCI) ranking distribution by study site for WMU 9, South Slope.

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
09-1	Red Mountain Allotment	Anumal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
09-2	Taylor Mountain	Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
09-3	Dry Fork Mountain	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
09-4	Sawtooth Flat Spring	Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
09-5	Island Park	Animal Use – Elk	High	Reduced understory shrub and herbaceous vigor
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
09-6	Above Steinaker Draw	Animal Use – Deer	High	Reduced/less vigorous browse component
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Animal Use – Elk	Medium	Reduced understory shrub and herbaceous vigor
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
09-7	Warren Draw	Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
09-8	Rye Grass	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
09-9	Little Hole	Annual Grass	Medium	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
09-10	Toliver 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	Low	Reduced understory shrub and herbaceous vigor
09-13	John Star Flat	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
09-15	Mud Springs Draw	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
09-16	Mosby Mountain	Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
09-17	Farm Creek	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
09-18	Gooseberry Spring	Animal Use – Elk	Medium	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
09-19	Mosby Mountain South	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
09-20	Seep Hollow	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
09-21	Browns Park River Corridor-Livestock	Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
09-22	Browns Park River Corridor-Wildlife	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
09-23	Rock Creek	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
09-24	Brush Creek Substation	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
09-25	Buckhorn Canyon	Animal Use – Cattle	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
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
09-27	Little Mountain	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
09R-3	Deadman Greenstrip	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
09R-4	Diamond Mountain Bullhog	Annual Grass	High	Reduced diversity of desirable grass and forb species
		Introduced Perennial Grass	Medium	Increased fire potential and reduced herbaceous diversity
.		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
09R-5	Little Donkey	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	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
09R-6	North Little Donkey	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		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
09R-7	Red Fleet Lop and Scatter	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		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
09R-10	Ruple Cabin	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
09R-12	West Stuntz	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
09R-14	Pot Creek Chaining	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
09R-15	Brush Creek Dixie	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
09R-16	Brown's Field	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
09R-17	Toliver Creek Bullhog	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
09R-18	Brotherson Chaining	Energy Development	High	Fragmentation and degradation/loss of habitat
		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
09R-22	North Dry Gulch Ponderosa Thinning	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
09R-24	Raven Ridge	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
09R-25	Davis Draw Sagebrush	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
09R-26	Simplot	Energy Development	High	Fragmentation and degradation/loss of habitat
		Animal Use – Elk	High	Reduced understory shrub and herbaceous vigor
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species

Table 2.12: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 9, South Slope. 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)

These high elevation mountain ecological sites support sagebrush communities and are generally considered to be in fair to good condition for deer winter and summer habitats on the South Slope management unit. These communities support shrub populations that provide valuable browse in mild winters. Introduced perennial grasses pose a low-level threat on most sites, but they are a high-level concern on the Farm Creek site. While introduced perennial grasses can be present in the herbaceous understories and provide valuable forage, these grass species are often aggressive at higher elevations and can lead to reduced prevalence and abundance of other more desirable native grass and forb species. Invasion from annual grasses, namely cheatgrass, is an issue on most of these sites, but they are at a low to medium-level risk of increased invasion. High amounts of cheatgrass can increase fuel loads and may exacerbate the risk of wildfire. Some of these sites appear to be prone to encroachment from pinyon-juniper trees, but encroachment poses a low-level threat with most sites in Phase I of woodland succession. Increased amounts of pinyon and juniper trees can lead to reduced understory shrub and herbaceous health if not addressed. Pellet transect data indicates that high use by cattle may be occurring on the Farm Creek study. Overuse by cattle poses a medium-level threat to the vigor and diversity of the shrub and herbaceous component.

If reseeding is necessary to restore herbaceous species on these sites, care should be taken in species selection, and preference should be given to native species when possible. 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 when necessary and appropriate, work to reduce pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should begin or continue in these communities. However, care should be taken in selecting treatment methods that will not increase annual grass cover. Closer examination of the

Farm Creek study and surrounding area may be needed to determine if high cattle usage is occurring throughout the localized area.

Mountain (Browse)

These high elevation mountain ecological sites support mixed mountain brush communities and are generally considered to be in good condition for deer winter and summer habitats on the South Slope management unit. These communities support robust shrub populations that provide valuable browse in mild and moderate winters. While these studies are in generally good condition, introduced perennial grasses are present on a few sites and pose medium and high-level threats on the Gooseberry Spring and Mosby Mountain South studies, respectively. Although they provide valuable forage, these introduced grass species can often be aggressive at higher elevations and can lead to reduced prevalence and abundance of other more desirable native grass and forb species. Cheatgrass is present in the understories of most of these communities. High amounts of cheatgrass can increase fuel loads thereby increasing the threat of wildfire. Seep Hollow, Mosby Mountain South, and John Star Flat appear to be prone to encroachment from pinyon-juniper trees, but encroachment poses a low-level threat with most sites in Phase I and Phase I transitioning to Phase II of woodland succession. Increases in pinyon and juniper trees can reduce understory shrub and herbaceous health if not addressed. The noxious weed gypsyflower (*Cynoglossum officinale*) was recorded on the Gooseberry Spring site, but in small amounts. Noxious weeds are often aggressive and can reduce the amount of desirable grass and forb species. Pellet transect data suggests that high use by cattle and elk may be occurring on the Mosby Mountain and Gooseberry Spring studies. High use by ruminants may lead to reduced vigor and diversity of the herbaceous understory.

There are several recommendations to improve habitat in these communities. If reseeding is deemed necessary to restore herbaceous species, care should be taken in species selection, and preference should be given to native species when possible. Treatments to reduce annual grass may be necessary on sites with a medium-level threat. Furthermore, work to reduce pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should begin or continue in these communities when and where appropriate, but care should be taken to select treatment methods that will not increase annual grass loads. Treatment for the noxious weed gypsyflower starts with spread prevention that include measures of containment by insuring livestock, treatment equipment, and seeding materials are certified to be weed-free. Areas of infestation may need to be treated by repeated, targeted chemical means when the plant is in the early rosette stage. Closer examination of cattle and elk presence on the respective Mosby Mountain and Gooseberry Spring studies may need to occur to determine if high usage is occurring throughout the surrounding areas.

Upland (Black Sagebrush)

The Little Mountain study is representative of the mid-elevation upland ecological type that supports sagebrush communities, and is considered to be in good condition for deer winter range habitat on this management unit. Sites of this ecological type generally support robust shrub populations that provide valuable browse in mild and moderate winters. The herbaceous understories are in generally good condition, but introduced perennial grasses dominate the Little Mountain site. Although they provide valuable forage, these grass species can be aggressive and can reduce the prevalence and abundance of other more desirable native grass and forb species. The annual grass species cheatgrass poses a low-level threat on the Little Mountain site. High amounts of cheatgrass can increase fuel loads and exacerbate the risk of wildfire. The additional threat of encroaching Utah juniper is low on the Little Mountain study site. However, juniper and pinyon trees have a tendency to lead to reduced understory shrub and herbaceous health as trees age and fill in the understory.

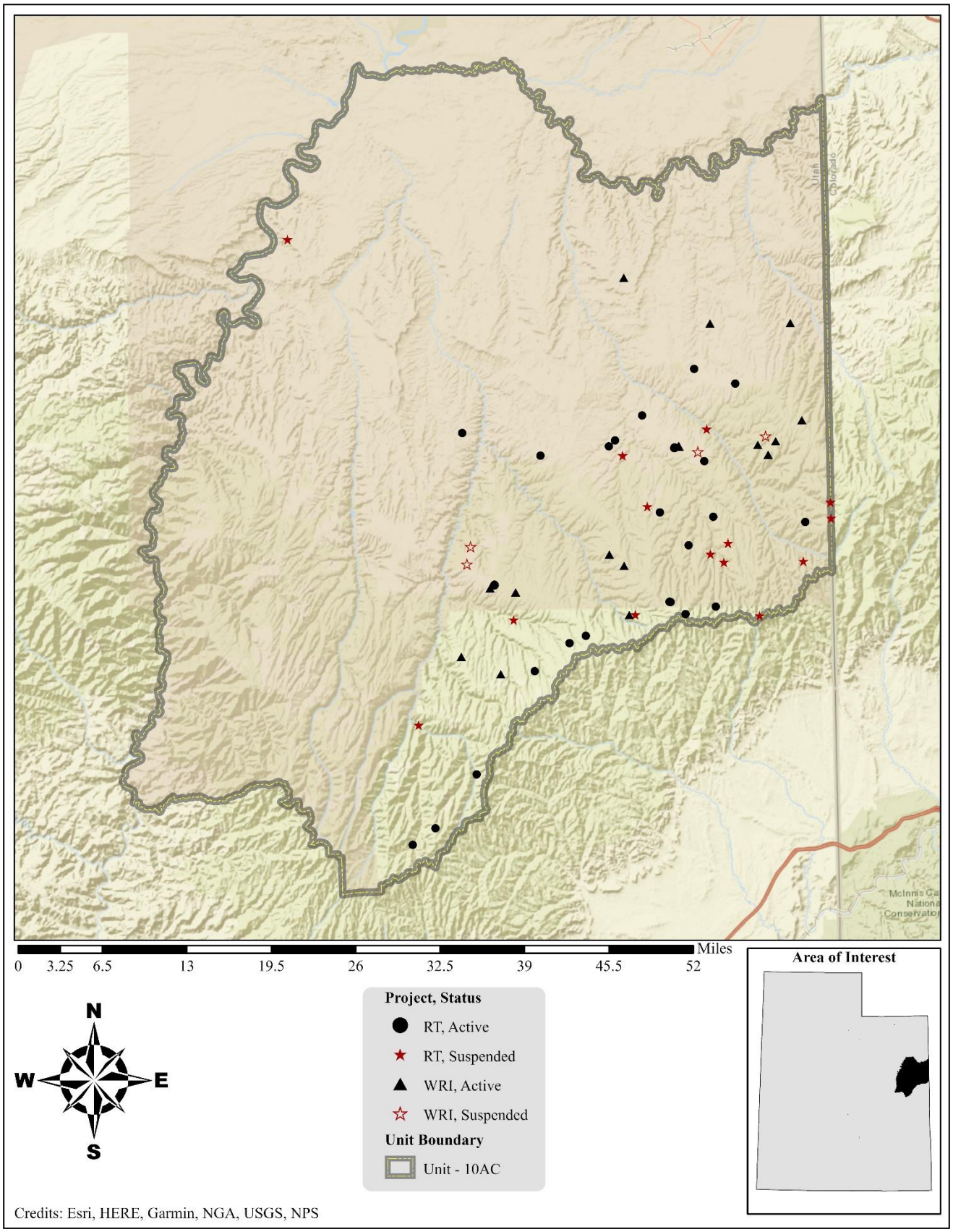
With any work involving reseeding to restore herbaceous species, care should be taken in species selection, and preference should be given to native grass species. It is also recommended that work to reduce juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should continue in this community type. Moreover, care should be taken in selecting treatment methods that will not increase annual grass cover.

Semidesert (Big Sagebrush)

These lower elevation semidesert ecological sites that support sagebrush communities are generally considered to be in very poor to fair condition for deer winter range habitat on the South Slope management unit. These communities support shrub populations that provide valuable browse in moderate to severe winters. Sites of this potential all share susceptibility to invasion from annual grasses, primarily cheatgrass, and all sites are considered to be highly threatened by cheatgrass invasion. High amounts of cheatgrass can increase fuel loads and exacerbate the threat of wildfire within these communities. The Red Mountain Allotment, Toliver Creek Chaining, and Brush Creek studies are susceptible to a high-level threat from introduced perennial grasses. Again, these species provide valuable forage for wildlife and livestock, but they can be aggressive and can reduce the prevalence and abundance of other more desirable native grass and forb species. In addition, these communities have the potential to experience encroachment from juniper and/or twoneedle pinyon trees, which can lead to reduced understory shrub and herbaceous cover if not addressed. Above Steinaker Draw is considered to be in Phase II of woodland succession, and is at the highest risk out of all the sites of herbaceous understory loss. Finally, a number of sites have a high-level threat from use by either wildlife and/or livestock. The Red Mountain Allotment and Buckhorn Canyon studies may be experiencing high use from cattle, while high wildlife use has been identified on the Island Park and Above Steinaker Draw studies through pellet group data. High use by ruminants may lead to reduced vigor and diversity of the herbaceous understory.

Several treatment types and considerations may be appropriate when working in semidesert community types. When performing any land treatments within this ecological potential, care should be taken in selecting treatment methods that will not increase annual grass cover. Treatments to reduce annual grass directly through chemical means may be necessary on some sites. It is also recommended that work to reduce juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should continue in these communities, again while taking care not to increase annual grass loads. If reseeding is deemed necessary to restore herbaceous species on these sites, care should be taken in species selection, and preference should be given to native species when possible. Closer examination of cattle, deer, and elk presence on the Island Park and Above Steinaker Draw studies may needed to determine if high usage is occurring throughout the surrounding areas.

3. WILDLIFE MANAGEMENT UNIT 10A, 10C – NORTH BOOK CLIFFS



WILDLIFE MANAGEMENT UNIT 10A AND 10C – NORTH BOOK CLIFFS

Boundary Description

Uintah and Grand counties - Boundary begins at the Utah-Colorado state line and the White River; south along this state line to the summit and drainage divide of the Book Cliffs; west along this summit and drainage divide to the Uintah and Ouray Indian Reservation boundary (Hells Hole/head of Sego Canyon); west along this boundary to the Green River; north along the Green River to the White River; east along this river to the Utah-Colorado state line.

Management Unit Description

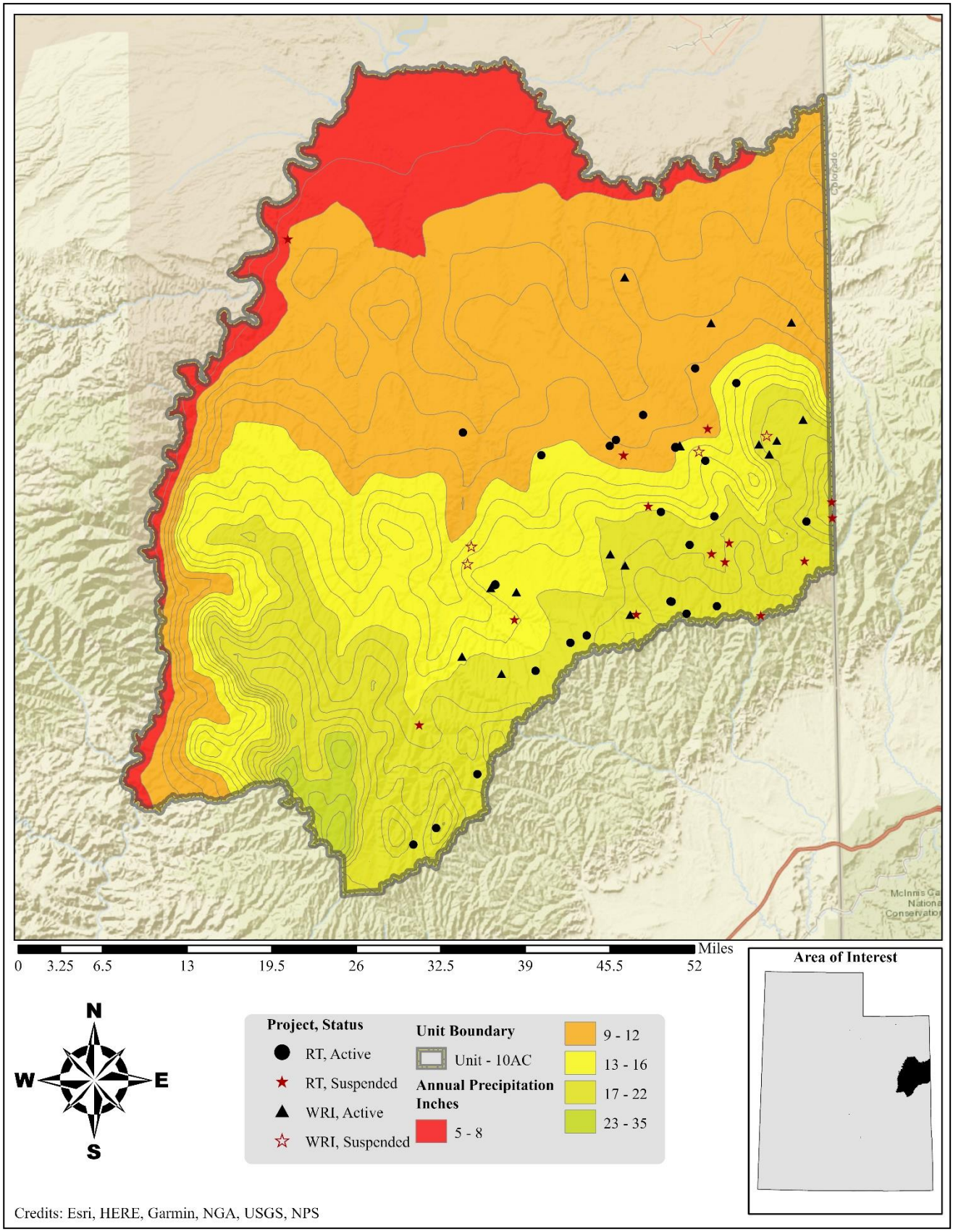
Climate Data

The 30 year (1981-2010) annual precipitation PRISM model shows precipitation ranges on the unit from 7 inches along portions of the bottomlands of the Green River to 25 inches along the 10AC-10B unit boundary line near Hill Creek and Roan Peaks. All of the Range Trend and WRI monitoring studies on the unit occur within 8-22 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 Uinta Basin and Southeast divisions (Divisions 6 and 7).

The mean annual PDSI of the Uinta Basin division displayed years of moderate to extreme drought from 1989-1991, 2000, 2002-2003, 2012-2014, 2018, and 2020. The mean annual PDSI displayed moderately to extremely wet years from 1983-1985, 1993, 1997-1998, and 2005. The mean spring (March-May) PDSI displayed years of moderate to extreme drought in 1989-1992, 2002-2004, 2012-2014, and 2018. Moderately to extremely wet years for this time period were displayed in 1983-1985, 1993, 1995, 1998, 2005, 2011, and 2019 (**Figure 3.1a**). The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1989-1990, 2001-2003, 2007, 2012, 2017-2018, and 2020; moderately to extremely wet years were displayed in 1983-1986, 1993, and 1997-1998 (**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, 2018, and 2020. 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 moderate to extreme drought in 1989-1991, 1996, 2002-2004, 2012-2013, and 2018; moderately to extremely wet years 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, 2017, and 2020; 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 10A, 10C, North Book Cliffs (PRISM Climate Group, Oregon State University, 2013).

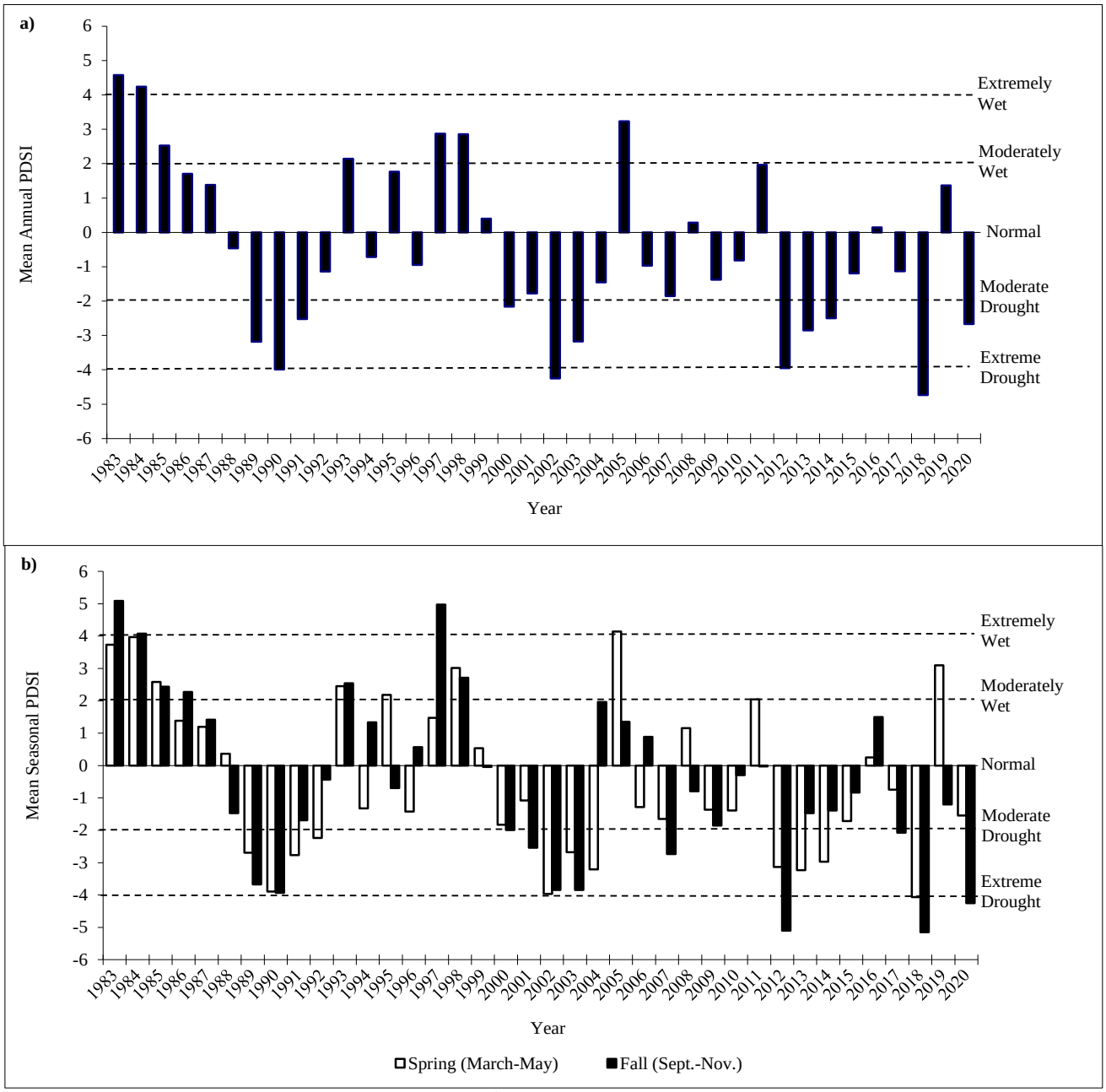


Figure 3.1: The 1983-2020 Palmer Drought Severity Index (PDSI) for the Uintah Basin division (Division 6). The PDSI is based on climate data gathered from 1895 to 2020. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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).

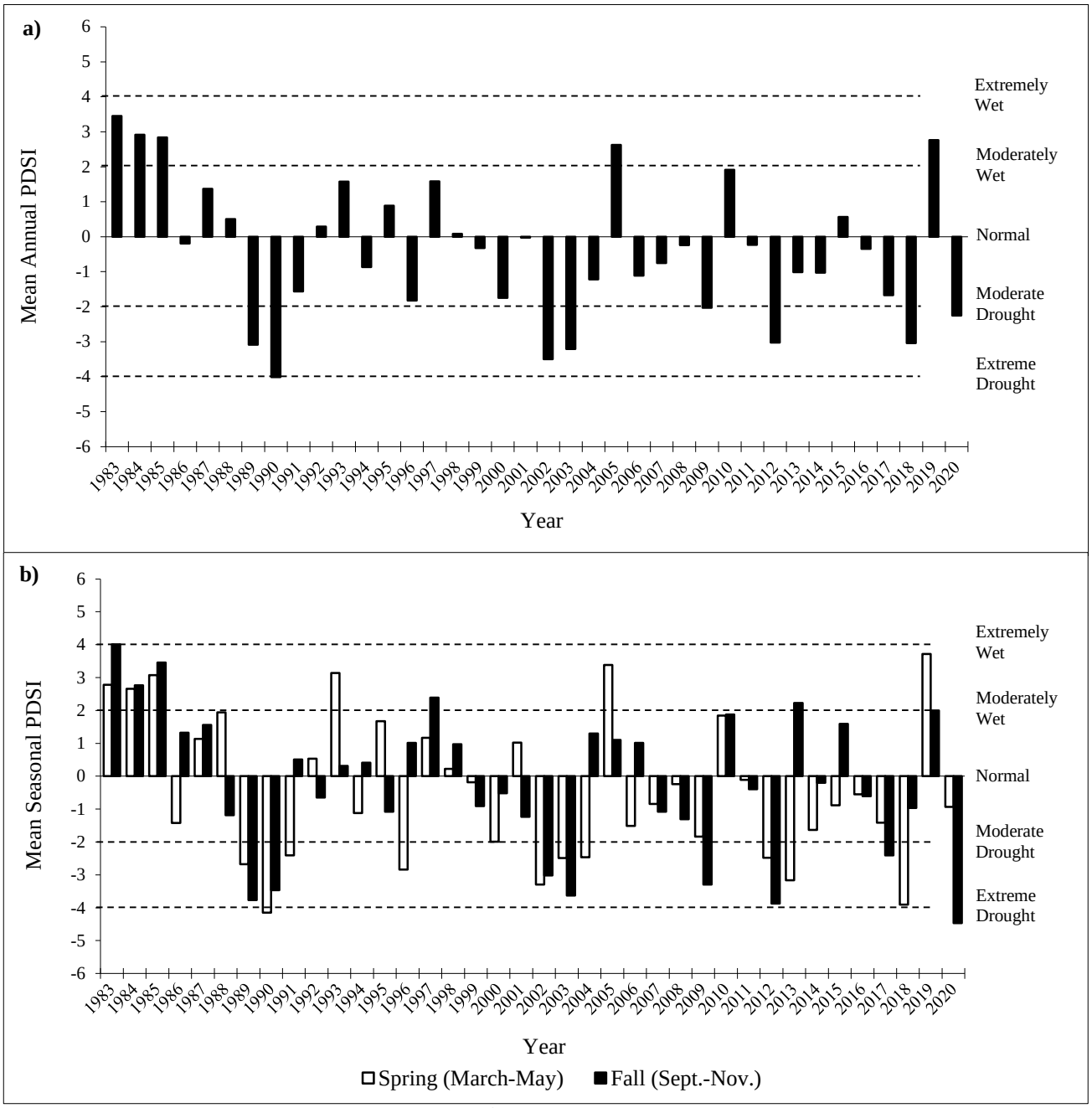


Figure 3.2: The 1983-2020 Palmer Drought Severity Index (PDSI) for the Southeast division (Division 7). The PDSI is based on climate data gathered from 1895 to 2020. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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

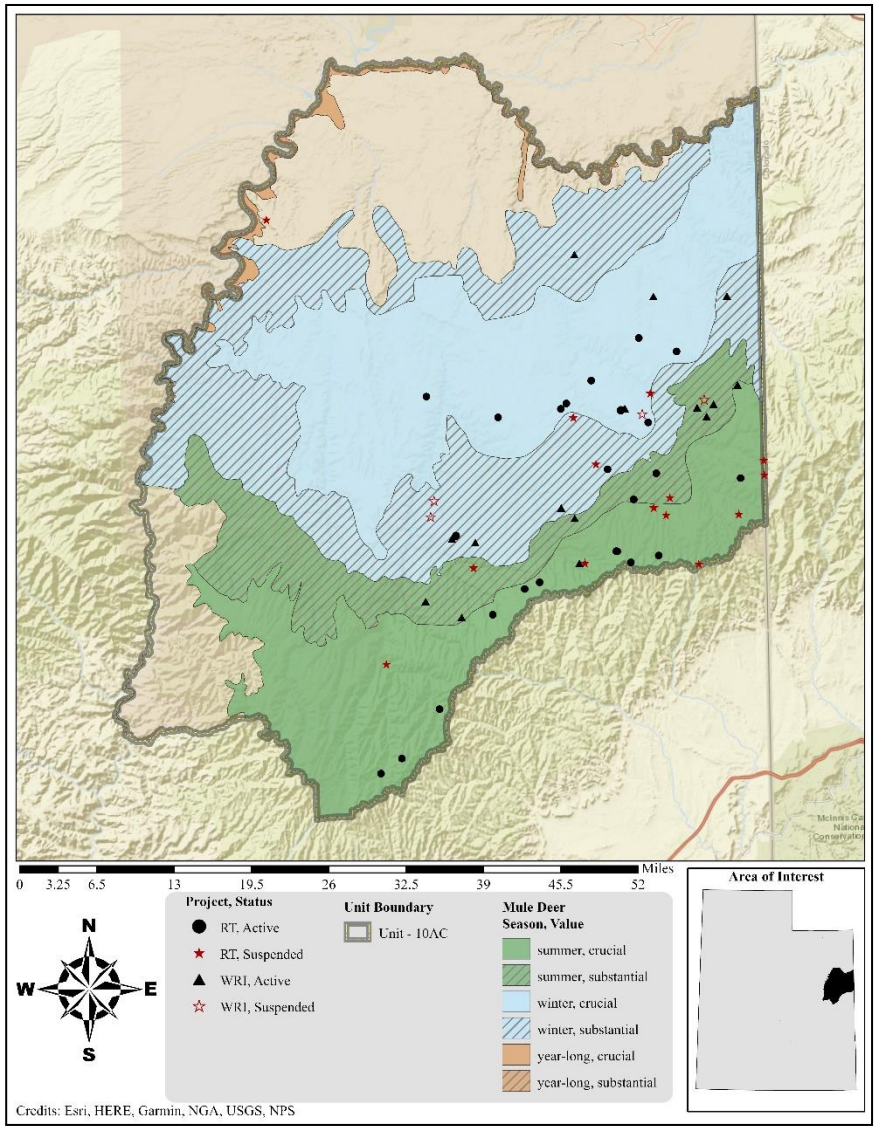
The maximum elevation in the North Book Cliffs unit is just less than 9,500 feet at Roan Peaks. The unit is bordered by Desolation Canyon and the Green River to the west and the White River to the north. Major drainages include Hill Creek, Willow Creek, and Bitter Creek. The southern and western portions of the management unit contain many canyons. The communities of Ouray and Bonanza are located just outside of the northern unit boundary.

Big Game Habitat

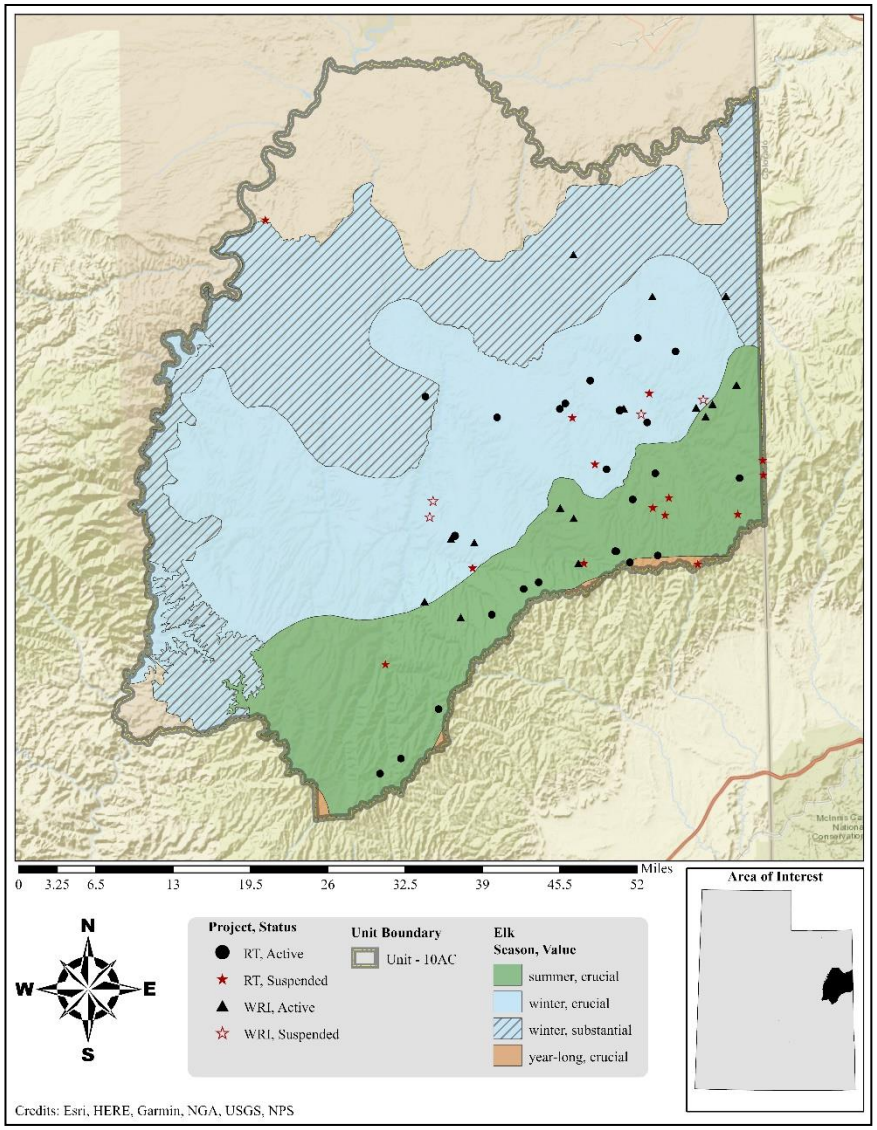
Total mule deer range in this wildlife management unit is estimated at almost 1.2 million acres with 32,851 acres classified as year-long range, 736,386 acres classified as winter range, and 406,492 acres of this total classified as summer range (**Table 3.1**, **Map 3.2**) Total elk range is estimated at over 1.1 million acres with 7,581 acres classified as year-long range, 916,146 as winter range, and 199,925 acres is considered to be summer range (**Table 3.1**, **Map 3.3**). Fifty five percent of mule deer year-long range is managed by the Bureau of Land Management (BLM) while 31% is tribal land, and private landowners own 6%. The Utah School and Institutional Trust Lands Administration (SITLA) governs 4% of year-long mule deer habitat. Much of the summer range (40%) is located on tribal land, 31% is managed by SITLA, and 26% is administrated by the BLM. The Utah Division of Wildlife Resources (UDWR) administers 2% of the mule deer summer range. Half (50%) of the winter range is on land administrated by the BLM, tribal land comprises 29%, SITLA administers 11%, private landowners own 8%, and 2% is managed by the UDWR (**Table 3.2**, **Map 3.2**, **Map 3.7**).

According to Landfire Existing Vegetation Coverage models, shrublands comprise almost 47% of the unit. Nearly 24% of the unit consists of sagebrush shrubland and steppe, and is considered key habitat for mule deer (**Table 3.6**).

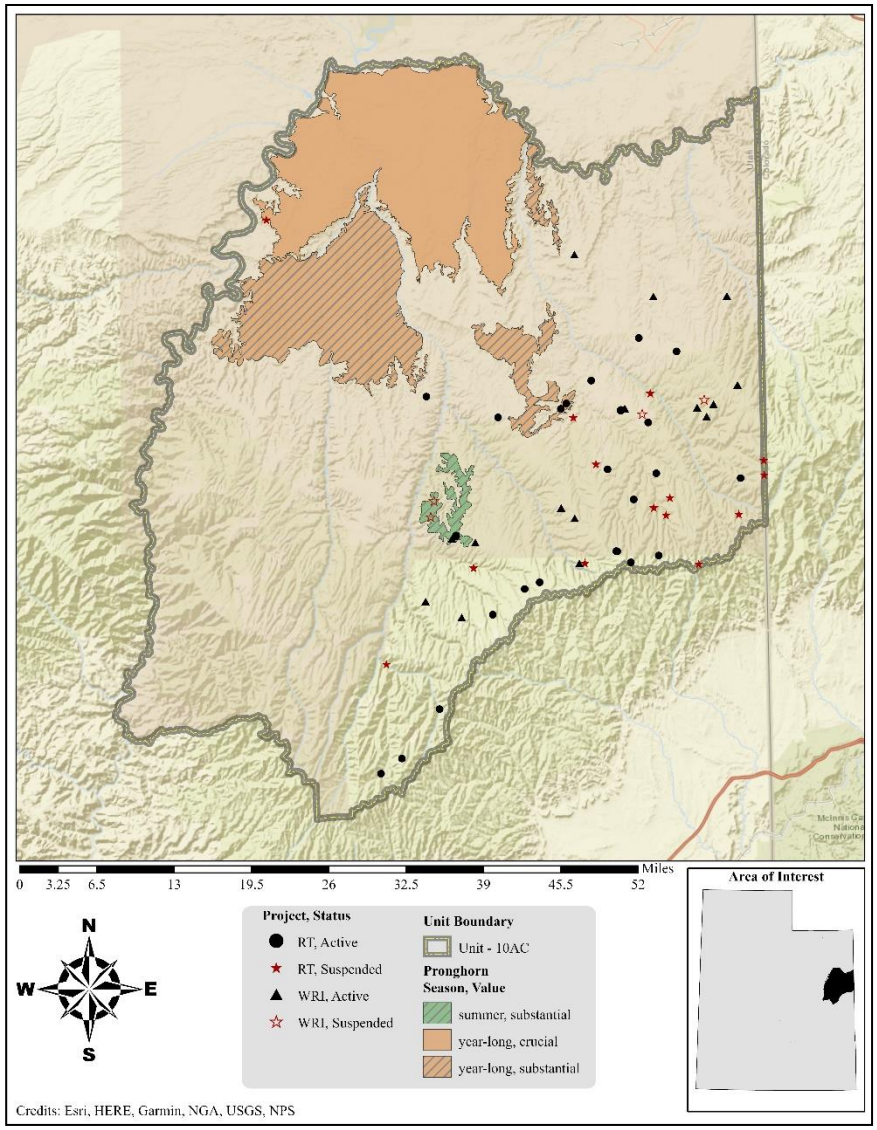
Areas such as Lower McCook Ridge, Big Park, the Crows Roost, Sunday School Canyon, Indian Ridge, and Atchee Ridge all support concentrations of wintering deer. Elk utilize many of the same areas, especially McCook Ridge. The winter range is composed of several main vegetation types including pinyon-juniper, salt desert shrub, and Wyoming big sagebrush. Vegetation composition on the summer range is principally sagebrush/grass and mountain brush, with isolated patches of conifer and aspen.



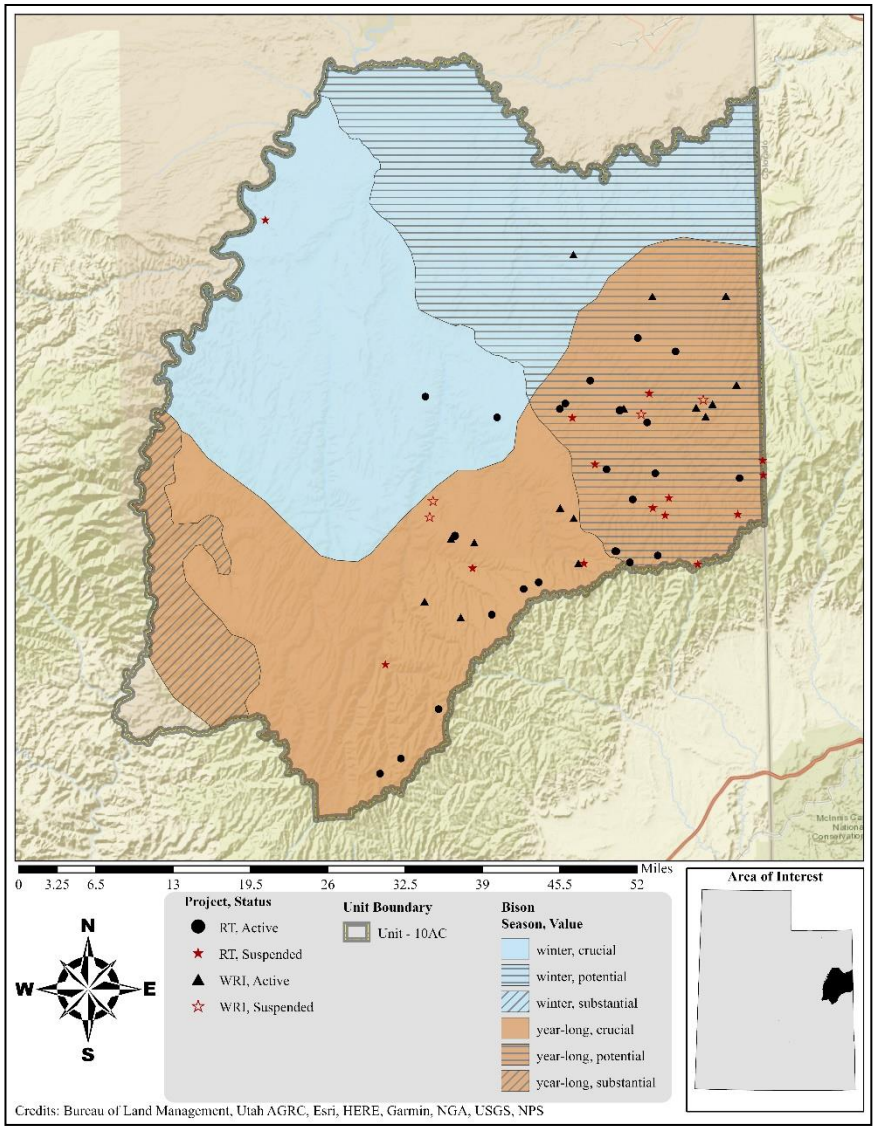
Map 3.2: Estimated mule deer habitat by season and value for WMU 10A, 10C, North Book Cliffs.



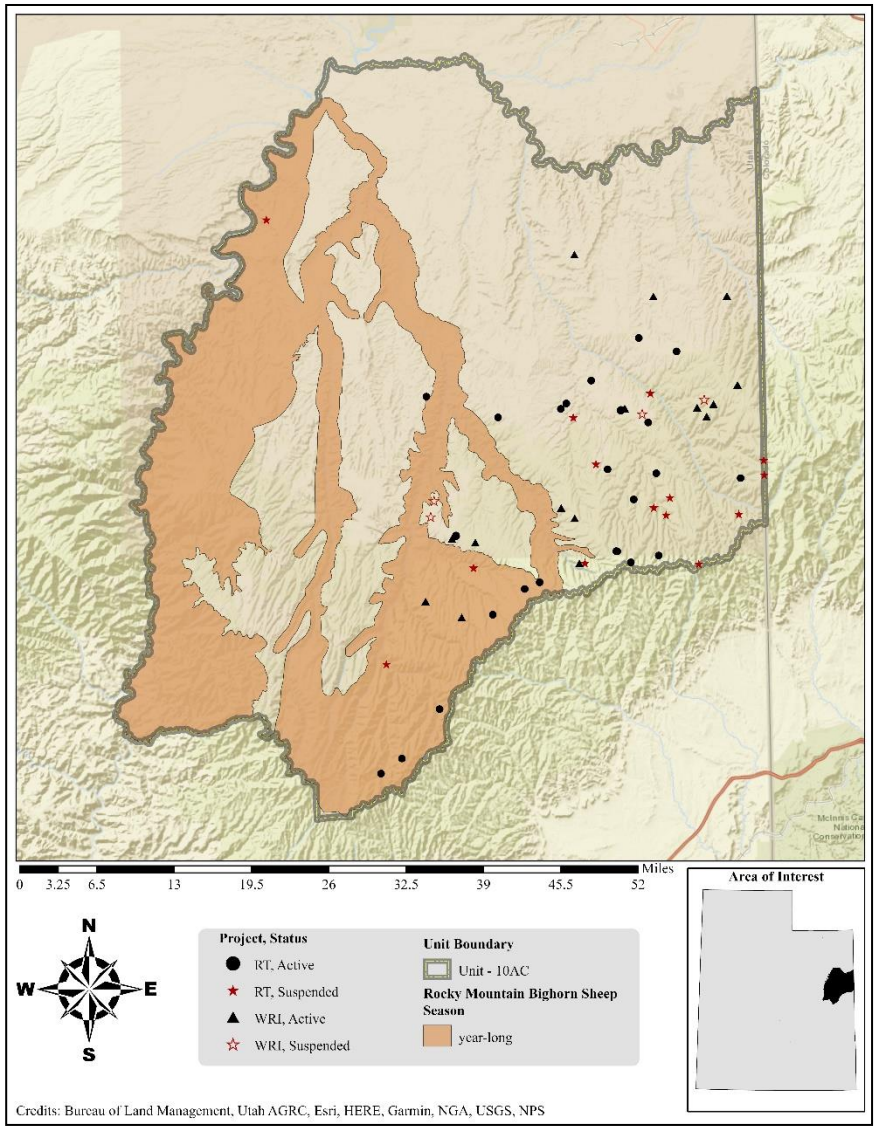
Map 3.3: Estimated elk habitat by season and value for WMU 10A, 10C, North Book Cliffs.



Map 3.4: Estimated pronghorn habitat by season and value for WMU 10A, 10C, North Book Cliffs.



Map 3.5: Estimated bison habitat by season and value for WMU 10A, 10C, North Book Cliffs.



Map 3.6: Estimated Rocky Mountain bighorn sheep habitat by season and value for WMU 10A, 10C, North Book Cliffs.

	Year Long Range		Summer Range		Winter Range	
Species	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
Mule Deer	30,851	2%	406,492	35%	736,386	63%
Elk	7,581	1%	199,925	18%	916,146	81%
Bison	722,611	50%	0	0%	721,188	50%
Bighorn Sheep	551,684	100%	0	0%	0	0%

Table 3.1: Estimated mule deer, elk, bison, and Rocky Mountain bighorn sheep habitat acreage by season for WMU 10A, 10C, North Book Cliffs.

	Year Long Range		Summer Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	17,415	56%	106,243	26%	365,879	50%
Private	1,689	6%	4,101	1%	57,055	8%
SITLA	1,241	4%	126,331	31%	82,034	11%
FFSL	1,007	3%	0	0%	0	0%
UDWR	0	0%	8,751	2%	14,875	2%
Tribal	9,498	31%	161,065	40%	216,543	29%
Total	30,851	**100%**	406,492	**100%**	736,386	**100%**

Table 3.2: Estimated mule deer habitat acreage by season and ownership for WMU 10A, 10C, North Book Cliffs.

	Year Long Range		Summer Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	3,867	51%	0	0%	375,627	41%
Private	406	5%	3,904	2%	50,532	5%
SITLA	1,785	24%	118,076	59%	88,585	10%
UDWR	0	0%	8,343	4%	15,284	2%
Tribal	1,523	20%	69,602	35%	386,120	42%
Total	7,581	**100%**	199,925	**100%**	916,146	**100%**

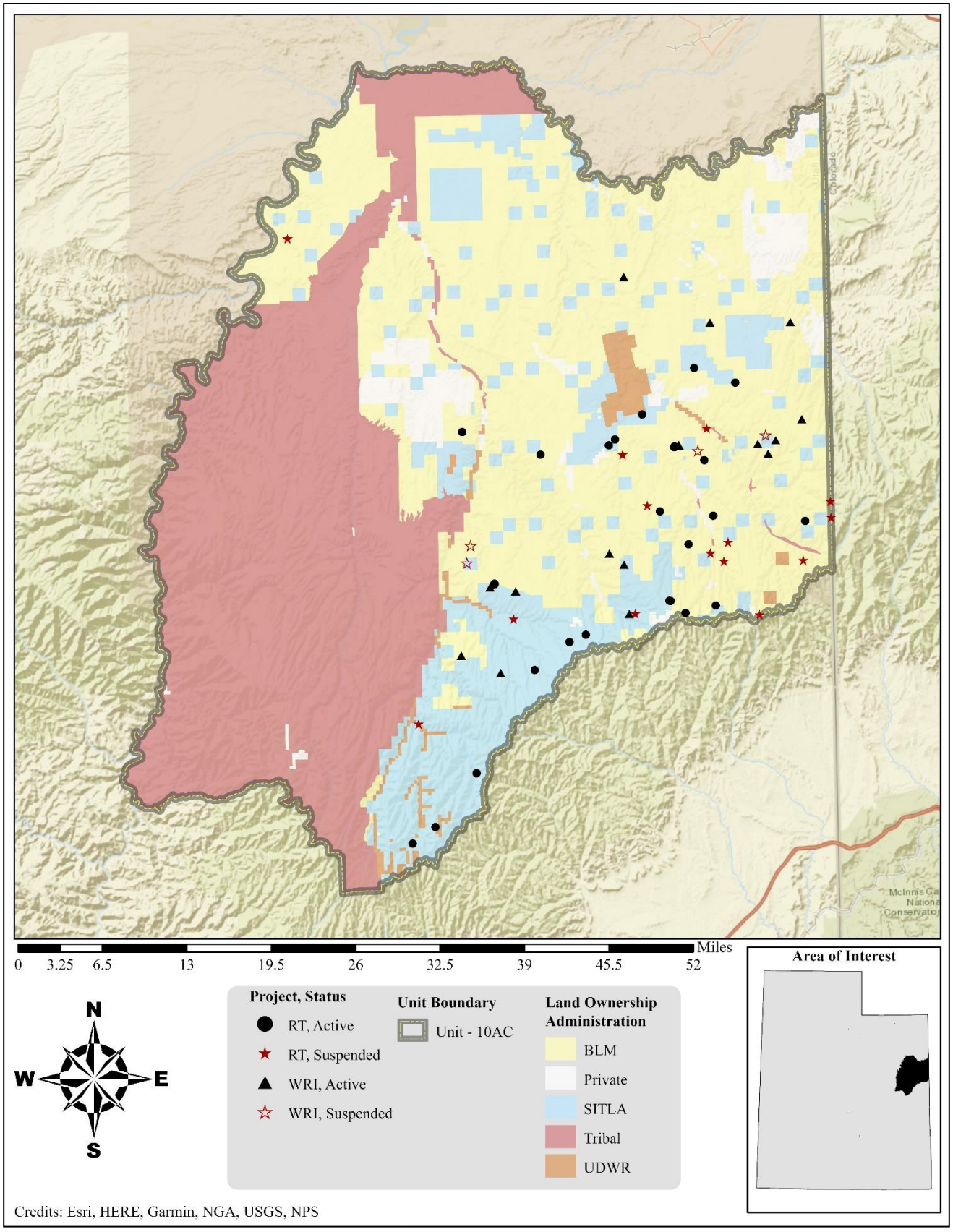
Table 3.3: Estimated elk habitat acreage by season and ownership for WMU 10A, 10C, North Book Cliffs.

	Year Long Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	264,068	36%	350,236	49%
Private	15,623	2%	48,218	7%
SITLA	173,060	24%	69,085	10%
FFSL	0	0%	706	<1%
UDWR	18,731	3%	4,896	<1%
Tribal	251,130	35%	248,046	34%
Total	722,611	**100%**	721,188	**100%**

Table 3.4: Estimated bison habitat acreage by season and ownership for WMU 10A, 10C, North Book Cliffs.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	102,000	18%
Private	6,505	1%
SITLA	116,178	21%
FFSL	755	<1%
UDWR	10,084	2%
Tribal	316,162	57%
Total	551,684	**100%**

Table 3.5: Estimated Rocky Mountain bighorn sheep habitat acreage by season and ownership for WMU 10A, 10C, North Book Cliffs.



Map 3.7: Land ownership for WMU 10A, 10C, North Book Cliffs.

Group	Existing Vegetation Type	Acres	% of Total	Group % of Total
Shrubland	Inter-Mountain Basins Mixed Salt Desert Scrub	214,289	14.63%	
	Inter-Mountain Basins Big Sagebrush Shrubland	192,818	13.16%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	81,274	5.55%	
	Inter-Mountain Basins Montane Sagebrush Steppe	70,462	4.81%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	35,715	2.44%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	33,882	2.31%	
	Rocky Mountain Lower Montane-Foothill Shrubland	19,452	1.33%	
	Inter-Mountain Basins Mat Saltbush Shrubland	14,877	1.02%	
	Colorado Plateau Pinyon-Juniper Shrubland	7,523	0.51%	
	Inter-Mountain Basins Greasewood Flat	5,570	0.38%	
	Other Shrubland	5,402	0.37%	
	Colorado Plateau Blackbrush-Mormon-tea Shrubland	707	0.05%	
	Southern Colorado Plateau Sand Shrubland	245	0.02%	46.56%
Conifer	Colorado Plateau Pinyon-Juniper Woodland	465,274	31.75%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	61,426	4.19%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	14,866	1.01%	
	Southern Rocky Mountain Ponderosa Pine Woodland	13,953	0.95%	
	Other Conifer	1,613	0.11%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	887	0.06%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	683	0.05%	
	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	116	0.01%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	23	0.00%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	2	0.00%	
	Inter-Mountain Basins Juniper Savanna	<1	0.00%	
	Southern Rocky Mountain Ponderosa Pine Savanna	<1	0.00%	38.14%
Other	Sparsely Vegetated	130,165	8.88%	
	Hardwood	26,265	1.79%	
	Agricultural	6,000	0.41%	
	Riparian	5,961	0.41%	
	Open Water	4,144	0.28%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	2,163	0.15%	
	Conifer-Hardwood	1,060	0.07%	
	Developed	623	0.04%	12.04%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	23,353	1.59%	
	Interior West Ruderal Riparian Scrub	3,801	0.26%	
	Interior Western North American Temperate Ruderal Shrubland	719	0.05%	
	Interior West Ruderal Riparian Forest	611	0.04%	1.94%
Exotic Herbaceous	Great Basin & Intermountain Introduced Annual Grassland	6,426	0.44%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	2,387	0.16%	
	Interior Western North American Temperate Ruderal Grassland	953	0.07%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	314	0.02%	0.69%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	3,660	0.25%	
	Southern Rocky Mountain Montane-Subalpine Grassland	3,418	0.23%	
	Other Grassland	1,401	0.10%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	729	0.05%	0.63%
Total		**1,465,213**	**100%**	**100%**

Table 3.6: LANDFIRE Existing Vegetation Coverage (LANDFIRE.US_140EVT, 2019) for WMU 10A, 10C, North Book Cliffs.

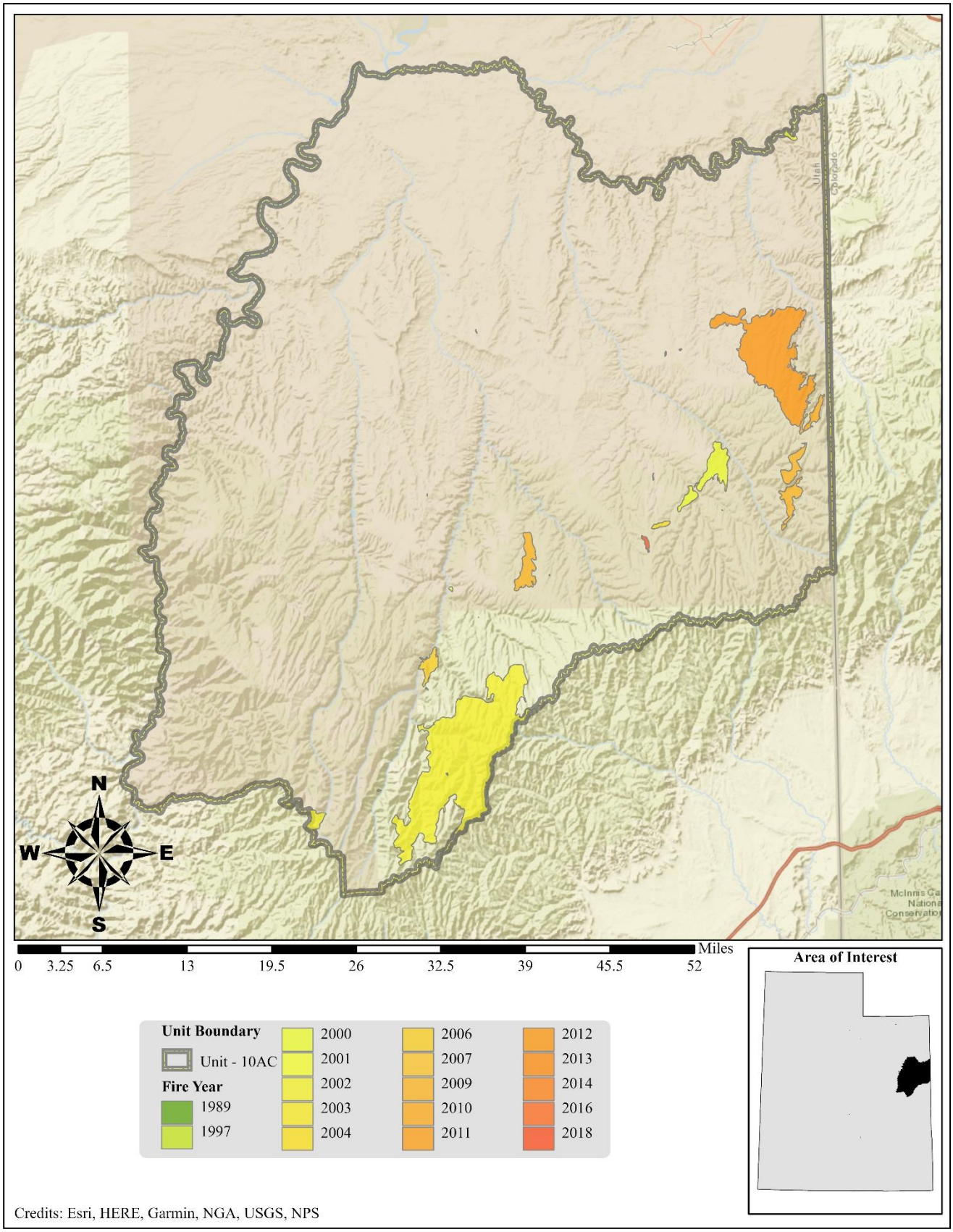
Limiting Factors to Big Game Habitat

The consensus is that the quantity and quality of the summer range are the most important limiting factors on this unit. Cooperation between federal, state, local, tribal governments, and private landowners could help maintain and protect ranges from further loss and degradation through agreements with land management agencies, the use of conservation easements and the like on private lands, planning and evaluating resource use and developments that might affect habitat quality, and developing specific vegetation objectives to maintain the quality of important deer use areas. In addition, forage production could be maintained or improved through range improvements such as reseedings, controlled burns, water developments, tree removal, etc.

Other management concerns for Unit 10A and 10C principally revolve around drought impacts on winter range browse species, cattle grazing outside of recognized grazing plan utilization levels and seasons, and the increasing demands for oil and gas development with its associated habitat fragmentation. There is also the possibility that at some later date oil shale and tar sands will be developed.

Encroachment by pinyon-juniper woodland communities also poses a substantial threat to important sagebrush rangelands. According to the Landfire Existing Vegetation Coverage models, nearly 32% of the North Book Cliffs unit is constituted of pinyon and juniper woodlands (**Table 3.6**). Encroachment of these woodlands into sagebrush communities has been shown to decrease browse and herbaceous cover, which in turn decreases available forage for wildlife (Miller, Svejcar, & Rose, 2000).

Finally, deer fences and crossings limiting range are a concern, but cooperation with the Utah Department of Transportation in construction of highway fences, passage structures, warning signs, etc. will continue in order to ensure proper access to habitat as well as deer and human safety.



Map 3.8: Land coverage of fires by year from 2000-2020 for WMU 10A, 10C, North Book Cliffs (Geosciences and Environmental Change Science Center (GECSC) Outgoing Datasets, 2021).

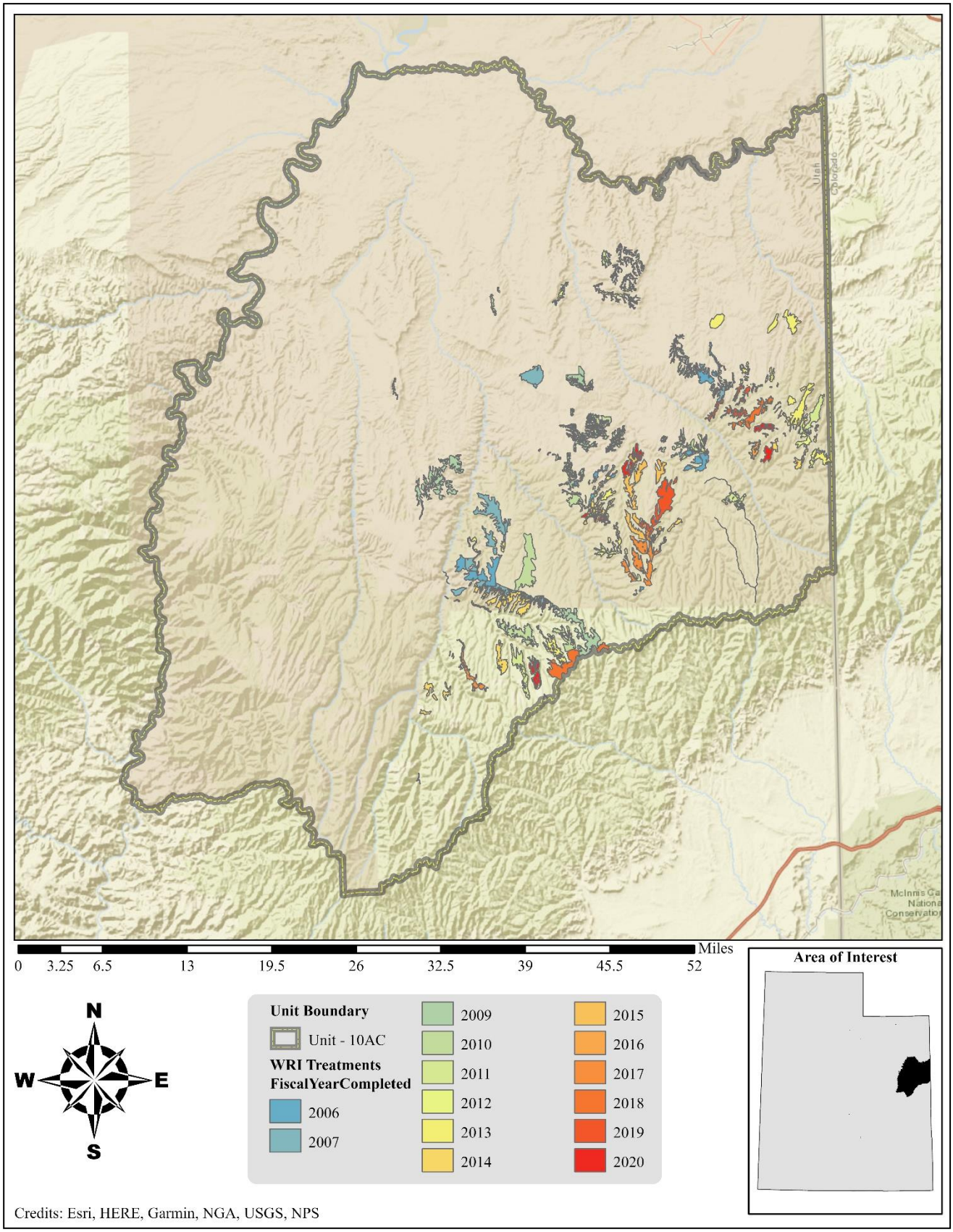
Treatments/Restoration Work

There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 52,655 net acres of land have been treated within the North Book Cliffs unit since the WRI was implemented in 2004 (**Map 3.9**). Treatments frequently overlap one another bringing the total treatment acres to 59,236 acres for this unit (**Table 3.7**). An additional 20,874 acres are currently being treated and treatments are planned for 839 acres. 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 via hand crew is the most common management practice in this unit. Bullhog work to reduce pinyon-juniper cover is also very common. Active projects include ground and aerial herbicide treatments with continued removal of pinyon-juniper by hand crew. Other management practices include seeding of grasses, forbs, and shrubs to augment desirable plant species, use of harrows and mechanical tree-cutters for pinyon-juniper reduction, and herbicide application to manage weeds (**Table 3.7**).

Type	Completed Acreage	Current Acreage	Proposed Acreage	Total Acreage
Anchor Chain	**945**	**0**	**0**	**945**
Ely (One-Way)	403	0	0	403
Ely (Two-Way)	541	0	0	541
Brush Saw	**182**	**0**	**0**	**182**
Hydraulic Brush Saw	182	0	0	182
Bullhog	**14,992**	**0**	**502**	**15,494**
Full Size	13,768	0	502	14,270
Skid Steer	1,224	0	0	1,224
Herbicide	**3,297**	**12,567**	**338**	**16,202**
Aerial (Fixed-Wing)	2,038	461	0	2,499
Spot Treatment	1,259	0	0	1,259
Ground	0	12,106	338	12,444
Mowing	**35**	**0**	**0**	**35**
Brush Hog	35	0	0	35
Planting/Transplanting	**4**	**0**	**0**	**4**
Container Stock	4	0	0	4
Seeding (Primary)	**6,934**	**0**	**0**	**6,934**
Broadcast (Aerial-Fixed Wing)	5,843	0	0	5,843
Broadcast (Aerial-Helicopter)	1,091	0	0	1,091
Drill (Rangeland)	<1	0	0	0
Vegetation Removal/Hand Crew	**32,847**	**8,307**	**0**	**41,154**
Lop & Scatter	32,635	8,307	0	40,942
Lop-Pile-Burn	212	0	0	212
Grand Total	**59,236**	**20,874**	**839**	**80,949**
***Total Land Area Treated**	**52,655**	**18,657**	**839**	**72,152**

Table 3.7: WRI treatment action size (acres) for completed, current, and proposed projects for WMU 10A, 10C, North Book Cliffs. Data accessed on 02/09/2021. *Does not include overlapping treatments.



Map 3.9: WRI treatments by fiscal year completed for WMU 10A, 10C, North Book Cliffs.

Range Trend Studies

Range Trend studies have been sampled within WMU 10A and 10C on a regular basis since 1982, with studies being added or suspended as was deemed necessary (**Table 3.8**). Due to changes in sampling methodologies, only data gathered 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 and are sampled on a regular basis following treatment. Due to the long-term nature of the studies, many of the Range Trend and WRI study sites have had some sort of disturbance or treatment prior to or since study establishment (**Table 3.9**). Range Trend studies are summarized in this report by ecological site.

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
10-1	Indian Ridge	RT	Active	1982, 1988. 1995, 2000, 2005, 2010, 2015, 2020	Upland Silt Loam (Fourwing Saltbush-Winterfat)
10-2	McCook Ridge Exclosure	RT	Active	1982, 1988, 1995, 1997, 2000, 2005, 2010, 2015, 2020	Upland Loam (Wyoming Big Sagebrush)
10-3	McCook Ridge Chaining	RT	Active	1982, 1988, 1995, 2000, 2005, 2007, 2009, 2010, 2015, 2020	Mountain Loam (Mountain Big Sagebrush)
10-4	Wirefence Point	RT	Active	1982, 1988, 1995, 1997, 2000, 2005, 2010, 2015, 2020	Mountain Loam (Mountain Big Sagebrush)
10-5	Willow Flat	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020	Mountain Loam (Mountain Big Sagebrush)
10-6	Little Jim Canyon	WRI	Active	1988, 1995, 2000, 2012, 2015, 2017	Mountain Stony Loam (Browse)
10-7	Cherry Mesa	RT	Active	1988, 1995, 1997, 2000, 2005, 2010, 2015, 2020	Mountain Loam (Mountain Big Sagebrush)
10-8	Black Horse	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2020	Mountain Stony Loam (Browse)
10-9	Agency Draw	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2020	Semidesert Loam (Wyoming Big Sagebrush)
10-10	Sunday School	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2020	Upland Silt Loam (Fourwing Saltbush-Winterfat)
10-11	Park Ridge	RT	Suspended	1988, 1995, 2000	Upland Silt Loam (Fourwing Saltbush-Winterfat)
10-12	Wolf Den	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2020	Upland Loam (Bonneville Big Sagebrush)
10-13	Moon Ridge Burn	RT	Suspended	1995, 1997, 2000	Semidesert Alkali Loam (Black Greasewood/Wyoming Big Sagebrush)
10-23	Bogart- She	RT	Active	1995, 2015, 2020	Mountain Loamy Bottom (Basin Wildrye)
10-24	Turner Canyon	RT	Active	1990, 1995, 2000, 2015, 2020	Mountain Loamy Bottom (Basin Wildrye)
10-25	Little Ridge	RT	Active	1990, 1995, 2015, 2020	High Mountain Loam (Aspen)
10-28	Wild Horse Bench	RT	Suspended	2010, 2015	Desert Shallow Loam (Black Sagebrush)
10R-1	Upper Meadow Creek	RT	Suspended	1997	Upland Loam (Wyoming Big Sagebrush)
10R-2	Lone Spring	RT	Suspended	1997, 2000	Mountain Stony Loam (Mountain Big Sagebrush)
10R-3	Burnt Timber	RT	Suspended	1997, 2000	Semidesert Alkali Loam (Black Greasewood/Wyoming Big Sagebrush)
10R-4	Two Water WMA	RT	Active	1997, 2000, 2005, 2010, 2015, 2020	Upland Shallow Loam (Black Sagebrush)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
10R-5	Lower Tom Patterson Point	RT	Active	1997, 2000, 2005, 2010, 2015, 2020	Mountain Loam (Mountain Big Sagebrush)
10R-6	Sweet Water Canyon	RT	Suspended	1997, 2000	Mountain Loamy Bottom (Basin Wildrye)
10R-7	Monument Ridge	RT	Active	1997, 2000, 2005, 2010, 2015, 2020	Mountain Stony Loam (Mountain Big Sagebrush)
10R-8	Upper Tom Patterson Point	RT	Suspended	1997, 2000	Mountain Stony Loam (Browse)
10R-9	Winter Ridge Exclosure Out	RT	Active	1997, 2000, 2005, 2010, 2015, 2020	Mountain Loam (Mountain Big Sagebrush)
10R-10	Winter Ridge Livestock Exclosure	RT	Active	1997, 2000, 2005, 2015, 2020	Mountain Loam (Mountain Big Sagebrush)
10R-11	Winter Ridge Total Exclosure	RT	Active	1997, 2000, 2005, 2015, 2020	Mountain Loam (Mountain Big Sagebrush)
10R-12	Horse Ridge	RT	Suspended	1997, 2000, 2005	Mountain Stony Loam (Browse)
10R-13	McCook Ridge Livestock Exclosure	RT	Active	1997, 2000, 2005, 2010, 2020	Upland Loam (Wyoming Big Sagebrush)
10R-14	McCook Ridge Total Exclosure	RT	Active	1997, 2000, 2005, 2010, 2020	Upland Loam (Wyoming Big Sagebrush)
10R-15	Saddle Horse	RT	Active	1998, 2000, 2005, 2010, 2015, 2020	Mountain Stony Loam (Browse)
10R-16	Monument Ridge #2	RT	Suspended	1998, 2000	Mountain Stony Loam (Browse)
10R-17	Railroad Canyon	RT	Active	1998, 2000, 2010, 2015, 2020	Mountain Loam (Mountain Big Sagebrush)
10R-18	Chipeta Canyon	RT	Suspended	1998	Mountain Loam (Mountain Big Sagebrush)
10R-19	Lower South Canyon	RT	Suspended	1998, 2000	Mountain Loamy Bottom (Basin Wildrye)
10R-20	Dick Canyon	RT	Suspended	1998, 2000	Mountain Loamy Bottom (Basin Wildrye)
10R-21	Rathole Canyon	RT	Suspended	1998, 2000	Mountain Loam (Mountain Big Sagebrush)
10R-22	Rathole Ridge	RT	Active	1998, 2000, 2005, 2010, 2015, 2020	Mountain Loam (Mountain Big Sagebrush)
10R-23	South Rathole	RT	Suspended	1998, 2000	Mountain Loam (Mountain Big Sagebrush)
10R-24	Upper Tent Canyon	RT	Suspended	1998, 2000	Mountain Loam (Mountain Big Sagebrush)
10R-28	Indian Ridge 2	RT	Active	1999, 2011, 2015, 2020	Upland Silt Loam (Fourwing Saltbush-Winterfat)
10R-29	Massey Junction	RT	Active	1999, 2005, 2010, 2015, 2020	Upland Silt Loam (Fourwing Saltbush-Winterfat)
10R-32	PR Spring Total Exclosure	RT	Active	2002, 2005, 2010, 2015, 2020	Mountain Loam (Browse)
10R-33	PR Spring Livestock Exclosure	RT	Active	2002, 2005, 2010, 2015, 2020	Mountain Loam (Browse)
10R-34	PR Spring Exclosure Outside	RT	Active	2002, 2005, 2010, 2015, 2020	Mountain Loam (Browse)
10R-35	Winter Ridge Dixie	WRI	Suspended	2005	Upland Loam (Bonneville Big Sagebrush)
10R-36	Indian Springs Bullhog	WRI	Active	2006, 2009, 2010, 2014, 2018	Mountain Shallow Loam (Black Sagebrush)
10R-37	Winter Ridge Dixie 2	WRI	Suspended	2006	Upland Loam (Bonneville Big Sagebrush)
10R-39	Indian Springs Bullhog 2	WRI	Active	2007, 2011, 2014, 2018	Mountain Stony Loam (Browse)
10R-40	Indian Springs Bullhog 3	WRI	Active	2007, 2011, 2014, 2018	Mountain Stony Loam (Browse)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
10R-41	Winter Ridge Bullhog	WRI	Active	2007, 2010, 2013, 2017	Mountain Loam (Mountain Big Sagebrush)
10R-42	Winter Ridge Bullhog 2	WRI	Active	2007, 2010, 2013, 2017	Mountain Loam (Mountain Big Sagebrush)
10R-43	McCook Ridge Plateau Exclosure North	WRI	Active	2008, 2010, 2013, 2018	Upland Silt Loam (Fourwing Saltbush-Winterfat)
10R-44	McCook Ridge Plateau Exclosure South	WRI	Active	2008, 2010, 2013, 2018	Upland Silt Loam (Fourwing Saltbush-Winterfat)
10R-45	McCook Ridge Plateau Exclosure Outside	WRI	Active	2008, 2010, 2013, 2018	Upland Silt Loam (Fourwing Saltbush-Winterfat)
10R-46	Seep Ridge Chaining	WRI	Active	2008, 2014, 2017	Mountain Loam (Mountain Big Sagebrush)
10R-47	McCook Ridge Reference	WRI	Suspended	2009	Upland Loam (Wyoming Big Sagebrush)
10R-48	Indian Springs Reference	WRI	Suspended	2009	Mountain Stony Loam (Browse)
10R-51	Archy Bench	WRI	Active	2011, 2014, 2019	Semidesert Loam (Wyoming Big Sagebrush)
10R-52	Seep Ridge Bullhog	WRI	Active	2011, 2014, 2017, 2020	Mountain Loam (Mountain Big Sagebrush)
10R-53	Moon Ridge	WRI	Active	2011, 2014, 2017	Mountain Loam (Mountain Big Sagebrush)
10R-57	Rector Ridge	WRI	Active	2015, 2018	Upland Loam (Bonneville Big Sagebrush)
10R-61	Augusi Ridge	WRI	Active	2018	Mountain Shallow Loam (Black Sagebrush)
10R-65	Horse Ridge 2	WRI	Active	2020	Mountain Loam (Browse)

Table 3.8: Range trend and WRI project studies monitoring history and ecological site potential for WMU 10A, 10C, North Book Cliffs.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
10-1	Indian Ridge	Lop and Scatter	Indian Ridge Lop and Scatter	June 2009	1,001	1079
		Rangeland Drill	Indian Ridge Sagebrush	September 2011	218	1952
		Plateau	Indian Ridge Sagebrush	October 2011	218	1952
		Lop and Scatter	Seep Ridge Maintenance Lop & Scatter (Proposed)	Fall 2020	3,814	5517
10-2	McCook Ridge Exclosure	Exclosure		1960s		
		Exclosure	Book Cliffs Three-Way Exclosure Reconstruction	August 2010-June 2011		1734
		Lop and Scatter	Seep Ridge Maintenance Lop & Scatter (Proposed)	Fall 2020	3,814	5517
10-3	McCook Ridge Chaining	Seed Unknown	McCook Ridge Pinyon Juniper Chaining	Fall 1962	2,000	
		One-Way Chain Unknown	McCook Ridge Pinyon Juniper Chaining	Fall 1962	2,000	
		Bullhog	McCook Ridge P/J Removal	April 2005	520	260
		Lop and Scatter	Seep Ridge Maintenance Lop & Scatter (Proposed)	Fall 2020	3,814	5517
10-4	Wirefence Point	Herbicide Unknown		1980s		
		Lop and Scatter	Three Pines L and S	September 2008-March 2009	1,943	1078
10-5	Willow Flat	Herbicide Unknown		Prior to 1982		
		Tebuthiuron		2005	225	
		Lop and Scatter	Cedar Camp Lop and Scatter	May-June 2010	2,042	1337
10-6	Little Jim Canyon	Bullhog	Little Jim Bullhog	April-July 2013	669	2219
10-7	Cherry Mesa	Chain Unknown		Historic		
		Bullhog	Cherry Mesa Bullhog	July 2009	576	1106
10-24	Turner Canyon	Wildfire	Diamond Creek	2002	88,421	
10R-5	Lower Tom Patterson Point	Chain Unknown		1960s		
		Seed Unknown		1960s		
		Wildfire		1980s		
10R-7	Monument Ridge	Chain Unknown		1960s		
		Seed Unknown		1960s		
		Wildfire		1980s		
		Lop and Scatter	Monument Ridge PJ Removal	August 2005	1,004	22
		Bullhog	Monument Ridge Bullhog II	October-November 2019	2,081	4381
		Lop and Scatter	Seep Ridge Maintenance Lop & Scatter (Proposed)	Fall 2020	4,491	5517
10R-9	Winter Ridge Exclosure Out	Lop and Scatter	Wolf Point Lop and Scatter	April 2006	811	259
10R-10	Winter Ridge Livestock Exclosure	Lop and Scatter	Wolf Point Lop and Scatter	April 2006	811	259
10R-11	Winter Ridge Total Exclosure	Lop and Scatter	Wolf Point Lop and Scatter	April 2006	811	259
10R-13	McCook Ridge Livestock Exclosure	Exclosure		1960s		
		Exclosure	Fencing - Book Cliffs Three-Way Exclosure Reconstruction	August 2010-June 2011		1734
10R-14	McCook Ridge Total Exclosure	Exclosure		1960s		
		Exclosure	Fencing - Book Cliffs Three-Way Exclosure Reconstruction	August 2010-June 2011		1734
10R-15	Saddle Horse	Chain Unknown		1960s		
		Seed Unknown		1960s		
		Wildfire		2001		
10R-17	Railroad Canyon	Prescribed Fire		Fall 1998		
10R-22	Rathole Ridge	Prescribed Fire		Fall 1998		
10R-28	Indian Ridge 2	Wildfire		Prior to 1999		
		Lop and Scatter	Indian Ridge Lop and Scatter	June 2009	1,001	1079
		Rangeland Drill	Indian Ridge Sagebrush	September 2011	224	1952
		Plateau	Indian Ridge Sagebrush	October 2011	224	1952
10R-29	Massey Junction	Wildfire		1980s		
10R-35	Winter Ridge Dixie	Lop and Scatter	Wolf Point Phase II P/J Removal	May-June 2007	1,323	298
10R-36	Indian Springs Bullhog	Aerial Before	Indian Springs Ridge Bullhog	December 2006	320	362
		Bullhog	Indian Springs Ridge Bullhog	January-February 2007	320	362
		Lop and Scatter	Indian Springs Phase I Maintenance	May 2016	319	3304

10R-39	Indian Springs Bullhog 2	Bullhog	Indian Spring Ridge Bullhog	2009		
		Wildfire	Augusi Fire	September 2010	955	
		Aerial After	Augusi Canyon Fire Rehabiltation	November 2010	955	1885
10R-40	Indian Springs Bullhog 3	Bullhog	Indian Springs Bullhog Phase 2	June-July 2009	350	677
		Lop and Scatter	Indian Springs Bullhog Maintenance	May 2014	610	2640
10R-41	Winter Ridge Bullhog	Bullhog	Winter Ridge Bullhog	January-February 2009	474	685
10R-42	Winter Ridge Bullhog 2	Bullhog	Winter Ridge Bullhog	January-February 2009	474	685
10R-43	McCook Ridge Plateau	Rangeland Drill	McCook Ridge Cheatgrass Control	September-October 2008	400	1109
	Exclosure North	Plateau	McCook Ridge Cheatgrass Control	October 2008	400	1109
10R-44	McCook Ridge Plateau	Rangeland Drill	McCook Ridge Cheatgrass Control	September-October 2008	400	1109
	Exclosure South	Plateau	McCook Ridge Cheatgrass Control	October 2008	400	1109
10R-45	McCook Ridge Plateau	Rangeland Drill	McCook Ridge Cheatgrass Control	September-October 2009	384	1109
	Exclosure Outside	Plateau	McCook Ridge Cheatgrass Control	October 2008	384	1109
10R-46	Seep Ridge Chaining	Aerial Before	Seep Ridge Chaining	September-October 2011	322	1951
		Two-Way Ely	Seep Ridge Chaining	September-October 2011	322	1951
		Dribbler	Seep Ridge Chaining	September-October 2011	322	1951
		Aerial After	Seep Ridge Chaining	December 2011	322	1951
		Lop (No Scatter)	Seep Ridge Chaining Maintenance	September-November 2016	332	3567
		Lop and Scatter	Seep Ridge Maintenance Lop & Scatter (Proposed)	Fall 2020	4491	5517
10R-47	McCook Ridge Reference	Bullhog	McCook Ridge Phase II PJ Removal	July 2006-June 2007	337	313
10R-51	Archy Bench	Lop and Scatter	Archy Bench Slashing	Summer 2010	1,339	
		Aerial Before	Archy Bench Sagebrush Restoration	October 2011	607	2050
		One-Way Ely	Archy Bench Sagebrush Restoration	October 2011	607	2050
		Plateau	Archy Bench Sagebrush Restoration	October 2011	607	2050
10R-52	Seep Ridge Bullhog	Aerial Before	Seep Ridge Bullhog Phase II	October 2011	390	1950
		Bullhog	Seep Ridge Bullhog Phase II	November 2011-February 2012	390	1950
		Aerial After	Seep Ridge Bullhog Phase II	December 2011	390	1950
10R-53	Moon Ridge	Two-Way Ely	Moon Ridge Chaining	October-November 2013	540	2218
		Dribbler	Moon Ridge Chaining	October-November 2013	540	2218
		Aerial After	Moon Ridge Chaining	November 2013	540	2218
		Aerial After	Moon Ridge Chaining	December 2013	540	2218
		Lop and Scatter	Moon Ridge Chaining Maintenance	September-November 2016	692	3568
10R-57	Rector Ridge	Wildfire	Wolf Den	July 2012	19,865	
		Aerial	Wolf Den - Rector Ridge Fire Rehabilitation	December 2012	2,229	2453
10R-65	Horse Ridge 2	Spike	Book Cliffs West Water Developments and Spike Treatment (Proposed)	Fall 2020	461	5376

Table 3.9: Range trend and WRI studies known disturbance history for WMU 10A, 10C, North Book Cliffs. PDB = Pre-Database; LTDL = Land Treatment Digital Library (Pilliod & Welty, 2019).

Study Trend Summary (Range Trend)

Mountain (Aspen)

There is one study [Little Ridge (10-25)] classified as a Mountain (Aspen) ecological site. This site is located adjacent to Little Creek on the southern portion of Little Creek Ridge (**Table 3.8**).

Shrubs/Trees: The primary browse species on this study site is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), although mountain snowberry (*Symphoricarpos oreophilus*) is also present to a lesser extent. Line intercept cover of both snowberry and other preferred browse (sagebrush) has increased between 2015 and 2020 (**Figure 3.3**). Average preferred browse demographics indicate that young individuals were the

primary demographic in 1995, but have since decreased; mature plants comprised a majority of the population in 2015 and 2020. Decadence remains low as of 2020, but has increased over the study period (**Figure 3.15**). Utilization of preferred browse has exhibited an overall decrease, and no plants were moderately or heavily browsed in 2020 (**Figure 3.19**).

Quaking aspen (*Populus tremuloides*) is the only tree recorded on this site. Cover of aspen decreased between 2015 and 2020, but density increased during the same time period (**Figure 3.7, Figure 3.11**).

Herbaceous Understory: This study site has an abundant herbaceous component dominated by perennial grasses; cover has fluctuated, but frequency has remained stable. A variety of native perennial grass species are present with needle-and-thread (*Hesperostipa comata*) as the dominant species in 2020, but the introduced species Kentucky bluegrass (*Poa pratensis*) also contributes substantial cover. Annual grasses have not been observed on this study site. In addition, a diverse number of perennial forbs provide a good amount of cover. Annual forbs are also present, but contribute little cover in comparison with perennial species (**Figure 3.23**, **Figure 3.26**).

Occupancy: Pellet group transect data indicates that elk primarily use this site, and mean abundance of pellet groups has ranged from 19 days use/acre in 2020 to 21 days use/acre in 2015. Average abundance of cattle/bison pellet groups has varied between 1 days use/acre in 2015 and 17 days use/acre in 2020. Finally, deer pellet groups were first observed in 2020 with a mean abundance of 1 days use/acre (**Figure 3.29**).

Mountain (Big Sagebrush)

There are eleven studies [McCook Ridge Chaining (10-3), Wirefence Point (10-4), Willow Flat (10-5), Cherry Mesa (10-7), Lower Tom Patterson Point (10R-5), Winter Ridge Exclosure Out (10R-9), Winter Ridge Livestock Exclosure (10R-10), Winter Ridge Total Exclosure (10R-11), Monument Ridge (10R-7), Railroad Canyon (10R-17), and Rathole Ridge (10R-22)] that are classified as Mountain (Big Sagebrush) ecological sites. The McCook Ridge Chaining site is located on top of McCook Ridge, just north of Box Elder Canyon. Wirefence Point is found on the southern portion of Winter Ridge near Wire Fence Canyon. The Willow Flat study is situated on Willow Flats, west of the Wirefence Point study. Cherry Mesa is found on top of Cherry Mesa. The Lower Tom Patterson Point study site is located on top of Tom Patterson Point in the northern portion of the area. The Winter Ridge Exclosure complex study sites are found at the junction of Bull Canyon and Winter Ridge, and northeast of the Winter Ridge Bullhog (10R-41) study site. The Monument Ridge study is found on Monument Ridge near Trap Canyon. The Railroad Canyon site is located in Railroad Canyon just south of the Uintah-Grand County border. Finally, the Rathole Ridge study is situated on top of the southeast portion of Rat Hole Ridge (**Table 3.8**).

Shrubs/Trees: The primary browse on these studies is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). Other browse species are present in many of these communities, but contribute less cover. Sagebrush cover increased from under 8% in 2010 to just under 14% in 2015, but has exhibited a largely stable trend overall. The initial decrease in sagebrush cover between 2005 and 2010 is likely due in part to a decrease on the Willow Flat study following a post-sampling herbicide treatment in 2005. Furthermore, this decrease could also be partially attributed to the difference in the number of studies sampled each year (the 'n value'). The covers of other preferred browse and other shrubs have generally remained stable since 2010 (**Figure 3.4**). Average preferred browse demographics indicate that mature plants comprise most of the populations on these study sites. Overall density has decreased over time, again likely in part due to the difference in 'n values.' Although overall recruitment of young individuals has decreased from 2,760 plants/acre in 1995, it has remained generally stable since the 2010 sample year (**Figure 3.16**). Utilization of preferred browse has fluctuated over time. In general, however, less than 50% of plants have been moderately to heavily utilized in all sample years except 2015, when 33% of plants were moderately browsed and 27% were heavily browsed (**Figure 3.20**).

Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) cover on these sites has decreased overall. Although cover remains low as of 2020, it has been increasing steadily each sample year since 2010.

Average tree density has exhibited an overall increase, a trend which can partially be attributed to the Wirefence Point, Willow Flat, Winter Ridge Exclosure Out, and Winter Ridge Total Exclosure studies. Although not currently at risk, these sites may have the potential for a decrease in valuable browse and forage species should tree cover and density increase in the future (**Figure 3.8**, **Figure 2.8**).

Herbaceous Understory: The herbaceous understories of these study sites have, on average, increased in cover over the study years and are mainly dominated by perennial grasses. Although native grasses are generally plentiful, introduced species such as crested wheatgrass (*Agropyron cristatum*) dominate the understories of the McCook Ridge Chaining, Lower Tom Patterson Point, and Monument Ridge studies. Annual grasses such as cheatgrass (*Bromus tectorum*) have been present on many of these sites since 2010, but contribute very little cover. Forbs on these study sites are generally very diverse. Perennial forbs have exhibited fluctuating but slightly decreasing overall trends for both cover and frequency. Annual forbs have remained rare throughout the study years (**Figure 3.23**, **Figure 3.26**).

Occupancy: Average pellet transect data indicates that elk have been the primary occupants of these study sites in most sample years and that occupancy fluctuates over time. Mean abundance of elk pellet groups has ranged from 21 days use/acre in 2010 to 45 days use/acre in 2005. Mean abundance of cattle pellet groups has been as low as just under 5 days use/acre in 2005 and as high as 15 days use/acre in 2020. Average abundance of horse pellet groups has been as low as 0 days use/acre in 1997 and 2000, and as high as 2 days use/acre in 2020. Finally, mean abundance of deer pellet groups has varied between under 5 days use/acre in 2015 and 27 days use/acre in 2010 (**Figure 3.29**).

Mountain (Browse)

There are five studies [Black Horse (10-8), Saddle Horse (10R-15), PR Spring Total Exclosure (10R-32), PR Spring Livestock Exclosure (10R-33), and PR Spring Exclosure Outside (10R-34)] which are classified as Mountain (Browse) ecological sites. The Black Horse study is found on top of Black Horse Ridge south of the Uintah-Grand County border. Saddle Horse is situated south of Saddle Horse Point. Finally, the PR Spring Total Exclosure, PR Spring Livestock Exclosure, and PR Spring Exclosure Outside studies are located near the southern portion of PR Canyon, just north of PR Spring (**Table 3.8**).

Shrubs/Trees: The dominant browse component of these sites is generally composed of a mixture of preferred browse species including mountain snowberry (*Symphoricarpos oreophilus*), alderleaf mountain mahogany (*Cercocarpus montanus*), Utah serviceberry (*Amalanchier utahensis*), and Gambel oak (*Quercus gambellii*); other shrub species are often present in lower amounts. However, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) provides the most cover on the Saddle Horse, PR Spring Livestock Exclosure, and PR Spring Exclosure Outside study sites as of 2020. Overall shrub cover has increased each sample year, a trend that is primarily driven by preferred browse other than mountain mahogany and serviceberry (**Figure 3.5**). Preferred browse density has fluctuated from year to year, but has exhibited an overall increase; it is important to note the differing 'n values' between sample years and consider the potential effects that this variation may have on vegetation trends. Average preferred browse demographics indicate that mature plants have consistently constituted the largest portion of the populations, and decadence has remained comparatively low. Recruitment of young plants has fluctuated, but has generally decreased (**Figure 3.16**). Utilization across the ecotype has remained fairly stable with less than 30% of plants being moderately and/or heavily hedged in each sample year (**Figure 3.20**).

Utah juniper (*Juniperus osteosperma*), twoneedle pinyon (*Pinus edulis*), and other conifers are present on some study sites. However, the Saddle Horse study is driving the average cover and density trends, both of which have increased since the 2005 sample year (**Figure 3.8**, **Figure 3.12**).

Herbaceous Understory: Herbaceous cover and abundance on these sites has exhibited slight fluctuations from year to year, but has generally remained stable overall. Perennial grasses have consistently been the dominant herbaceous component. Introduced species such as Kentucky bluegrass (*Poa pratensis*) and intermediate wheatgrass (*Thinopyrum intermedium*) contribute some cover on many sites, but many native species are often

present as well. The introduced annual grass species cheatgrass (*Bromus tectorum*) is present on the Saddle Horse study as of 2020, but in small amounts. These sites are host to a variety of perennial forbs, the amount of which has fluctuated but stable overall. Annual forbs have remained rare over time (**Figure 3.23**, **Figure 3.26**).

Occupancy: Average pellet transect data indicates that these sites are mainly used by elk and deer and that presence has decreased over time. Mean abundance of elk pellet groups has ranged from 14 days use/acre in 2020 to 27 days use/acre in 2000. Deer have had a mean pellet group abundance as low as 14 days use/acre in 2020 and as high as 48 days use/acre in 2000 (**Figure 3.29**).

Mountain (Basin Wildrye)

There are two studies [Bogart-She (10-23) and Turner Canyon (10-24)] that are classified as Mountain (Basin Wildrye) ecological sites. Bogart-She is located west of Little Creek Ridge just north of the intersection of the Bogart and She Canyons. Turner Canyon is found west of Diamond Ridge, adjacent to East Willow Creek (**Table 3.8**).

Shrubs/Trees: Browse species and shrubs in general on these sites are limited, with trends largely driven by the Turner Canyon study; all line intercept cover in 2020 is contributed by prairie sagewort (*Artemisia frigida*) (**Figure 3.3**). Average preferred browse demographics show that the population has been primarily composed of mature individuals and that density has decreased over time. Recruitment of young has fluctuated, but has similarly decreased overall (**Figure 3.16**). Preferred browse utilization has remained very low throughout the sample period (**Figure 3.20**).

Quaking aspen (*Populus tremuloides*) contributed a small amount of line intercept cover for the first time in 2020 on the Bogart-She study. Tree density has remained low and has also been provided by aspen on the Bogart-She site (**Figure 3.8**, **Figure 3.12**).

Herbaceous Understory: Both study sites have plentiful herbaceous understories that are largely composed of perennial grasses. Although the introduced perennial grass species Kentucky bluegrass (*Poa pratensis*) provides the most cover of any species on the Bogart-She study, native grasses do contribute a considerable amount of cover on both sites as of 2020. The introduced annual grass species cheatgrass (*Bromus tectorum*) is present on the Turner Canyon site, but in very low amounts. Perennial forbs are rich in diversity and although they have fluctuated in cover and frequency from year to year, they have remained largely stable overall. Annual forbs have remained rare over the sample period (**Figure 3.24**, **Figure 3.27**).

Occupancy: According to average pellet transect data, occupancy has increased over time. Elk were the primary occupants in 2000 and have had a mean pellet group abundance ranging from 6 days use/acre in 2020 to 11 days use/acre in 2015. Cattle and/or bison were the main occupants in 2015 and 2020 and have had an average abundance of pellet groups fluctuating between 2 days use/acre in 2000 and 48 days use/acre in 2020. Average abundance of horse pellet groups has been as low as 0 days use/acre in 2000 and as high as 6 days use/acre in 2020. Mean abundance of deer pellet groups has been as low as 0 days use/acre in 2000 and as high as just over 1 days use/acre in 2015 and 2020 (**Figure 3.29**).

Upland (Big Sagebrush)

There are four studies [McCook Ridge Exclosure (10-2), Wolf Den (10-12), McCook Ridge Livestock Exclosure (10R-13), and McCook Ridge Total Exclosure (10R-14)] classified as Upland (Sagebrush) ecological sites. The McCook Ridge Exclosure study is located on McCook Ridge near Slick Rock Canyon. Wolf Den is situated in Big Park, north of Nelson Canyon. The McCook Ridge Livestock and Total Exclosure study complex is located immediately east of the McCook Ridge Exclosure (**Table 3.8**).

Shrubs/Trees: The primary browse species on these sites is Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), save for Wolf Den, which is dominated by mountain big sagebrush (*A. tridentata* ssp.

vaseyana). Other browse species are often present, but generally contribute less cover. Average shrub cover has remained stable overall, but decreased significantly between 2015 and 2020. However, further examination of site-level data indicates that this decrease can largely be attributed to the difference in 'n values' between years and a decrease in sagebrush cover on the Wolf Den study (**Figure 3.4**). Average preferred browse demographics indicate that density has exhibited an overall decrease. Again, the decrease in density between 2015 and 2020 is largely due to differing 'n values' and a decrease in density across the ecotype. Mature plants have consistently been the primary demographic within the browse populations, although decadent individuals are also present. Recruitment of young plants has varied from year to year, but has decreased in general over the study period (**Figure 3.17**). Utilization data indicates that less than 50% of plants have been moderately or heavily hedged in most years. The exception to this is the 2005 sample year, when 25% of plants were moderately used and 42% were heavily used (**Figure 3.21**).

Encroachment by Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) is occurring on these study sites, but not in any significant amount. Furthermore, tree cover and density trends are entirely driven by the McCook Ridge Exclosure and Wolf Den studies (**Figure 3.9**, **Figure 3.13**).

Herbaceous Understory: Except for the Wolf Den study, which has little herbaceous cover, these studies have moderately abundant herbaceous understories which have remained largely stable since the studies began. Annual grasses, namely the introduced annual species cheatgrass (*Bromus tectorum*), contribute a majority of the herbaceous cover on all of the McCook Ridge Exclosure complex studies. Cheatgrass is also present on the Wolf Den study, but in low amounts. Perennial grasses have been observed in these understories with low to moderate cover. Annual and perennial forbs have remained comparatively rare (**Figure 3.24**, **Figure 3.27**).

Occupancy: Average pellet transect data shows that although use fluctuates from year to year, it has decreased overall. Deer are the primary occupants of these study sites and have had a mean pellet group abundance ranging from 36 days use/acre in 2015 to 123 days use/acre in 2005. Elk pellet groups have had an average abundance as low as 9 days use/acre in 2010 and as high as 14 days use/acre in 2015. Mean abundance of cattle pellet groups has fluctuated between 0 days use/acre in 2010 and 2015 and 2 days use/acre in 2005 (**Figure 3.30**).

Upland (Black Sagebrush)

There is one study [Two Water WMA (10R-4)] that is classified as an Upland (Black Sagebrush) ecological site. The Two Water WMA study is found on the northern slopes of McCook Ridge above Reservoir Canyon (**Table 3.8**).

Shrubs/Trees: Black sagebrush (*Artemisia nova*) has been the dominant browse species on this site throughout the study period. Other shrub species are present, but contribute limited cover. Total shrub cover increased between 2010 and 2015, but decreased by half between 2015 and 2020: this trend is almost entirely driven by black sagebrush (**Figure 3.4**). Density of preferred browse species has decreased each sample year since 2000. A majority of the population is comprised of mature individuals. Decadence has increased over time; the number of decadent plants was nearly equal to that of mature plants in 2020. Recruitment of young individuals has remained low throughout the duration of the study (**Figure 3.17**). Utilization of preferred browse has fluctuated from year to year. In general, however, between 40-70% of plants have been moderately or heavily browsed in each sample year since 2000 (**Figure 3.21**).

Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) were observed for the first time in point-quarter density in 2020, but in low amounts. Trees have not provided line intercept cover on this site in any sample year (**Figure 3.9**, **Figure 3.13**).

Herbaceous Understory: The herbaceous understory on this study site has remained moderately abundant and diverse throughout the study period. Native perennial grasses such as James' galleta (*Pleuraphis jamesii*) and blue grama (*Bouteloua gracilis*) have consistently been the dominant herbaceous component, although cover has fluctuated. The introduced annual grass species cheatgrass (*Bromus tectorum*) is present on this site, but

has provided low cover since the 1997 sample year. Both perennial and annual forbs have remained rare (**Figure 3.24**, **Figure 3.27**).

Occupancy: Average pellet transect data for this site shows that occupancy has generally decreased. In addition, deer have been the primary occupants in all sample years except 2005, when elk pellet groups were the most abundant. Deer have had a mean pellet group abundance ranging from 21 days use/acre in 2015 to 60 days use/acre in 2000. Mean abundance of elk pellet groups has fluctuated between 0 days use/acre in 2010 and 44 days use/acre in 2005. Average abundance of horse pellet groups has been as low as 0 days use/acre prior to 2015 sample year and as high as 8 days use/acre in 2020. Finally, cattle have also been present with average pellet group abundance as low as 0 days use/acre in 2000 and 2020 and as high as 2 days use/acre in 2005 (**Figure 3.30**).

Upland (Fourwing Saltbush)

Four sites [Indian Ridge (10-1), Sunday School (10-10), Indian Ridge 2 (10R-28), and Massey Junction (10R-29)] are classified as Upland (Fourwing Saltbush) ecological sites. The Indian Ridge and Indian Ridge 2 studies are located on top of Indian Ridge. Sunday School is found between Seep Ridge and Main Canyon. Finally, the Massey Junction study is located adjacent to the road that runs west past Atchee Ridge Cabin (**Table 3.8**).

Shrubs/Trees: The primary browse component on these study sites is fourwing saltbush (*Atriplex canescens*) as of 2020; other browse species provided most of the cover in previous sample years. Total average shrub cover has exhibited an overall increase over the sample period (**Figure 3.6**). Average preferred browse density has fluctuated; the significant decrease between 2015 and 2020 is largely due to prairie sagewort (*Artemisia frigida*) on the Sunday School study. Mature plants have generally comprised most of the preferred browse populations on these sites. Recruitment of young plants has varied from year to year (**Figure 3.17**). In 2005, 19% of preferred browse was moderately used and 58% was heavily used. However, average utilization of preferred browse has remained low in all other sample years (**Figure 3.21**).

Trees have not contributed line intercept cover at any time during the study period. Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) were observed in low amounts in density measurements for the first time in 2020: this trend is entirely driven by the Indian Ridge study (**Figure 3.9**, **Figure 3.13**).

Herbaceous Understory: Although the herbaceous understories of these sites are plentiful, they have been mainly comprised of the introduced annual grass species cheatgrass (*Bromus tectorum*) in all study years. Native perennial grasses have contribute relatively little cover and have exhibited a slightly decreasing trend since 2010. Perennial forbs have remained rare since the beginning of the study period, and although annual forb cover has fluctuated from year to year, it has generally decreased over time (**Figure 3.25**, **Figure 3.28**).

Occupancy: Average pellet transect data indicates that occupancy has increased overall. Deer have been the primary occupants in all sample years except 2000, and mean pellet group abundance has ranged from 8 days use/acre in 2000 to 48 days use/acre in 2020. Elk were the primary occupants of these study sites in 2000, and mean abundance of pellet groups has fluctuated between 8 days use/acre in 2020 and 23 days use/acre in 2005. Average abundance of cattle pellet groups has been as low as 9 days use/acre in 2015 and as high as 18 days use/acre in 2010. Average abundance of horse pellet groups has been as low as 0 days use/acre in 2005 and as high as 7 days use/acre in 2020 (**Figure 3.30**).

Semidesert (Big Sagebrush)

There is one study [Agency Draw (10-9)] that is classified as a Semidesert (Sagebrush) ecological site. Agency Draw is located southeast of Agency Draw Oil Field and west of Willow Creek (**Table 3.8**).

Shrubs/Trees: Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and black greasewood (*Sarcobatus vermiculatus*) are the dominant shrub species on this study site, although black sagebrush (*A. nova*) also provides moderate cover as of 2020. Average sagebrush cover has increased throughout the study years and that of other preferred browse has slightly decreased. Other shrub cover has remained fairly stable (**Figure 3.4**). Mature plants constituted a major portion of the preferred browse populations from 1995 to

2015, while decadence has decreased overall. Recruitment of young plants has fluctuated from year to year, but has generally increased; young individuals were the primary demographic in 2020. Average preferred browse density has exhibited minor variations between sample years, but has remained generally stable overall (**Figure 3.18**). Utilization of preferred browse has fluctuated from sample year to sample year. Over 60% of plants were moderately or heavily browsed in 2005 and 2015, but that percentage was less than 40% in 1995, 2000, 2010, and 2020 (**Figure 3.22**).

Encroachment of twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) is occurring on this site. Although cover and density are low as of 2020, they have slightly increased each sample year: this indicates that there may be potential for further encroachment over time (**Figure 3.10**, **Figure 3.14**).

Herbaceous Understory: The herbaceous understory of this study site has generally remained abundant over the sample period. Cover and composition, however, have fluctuated from year to year. Dominance in the understory has varied between native perennial grasses and the introduced annual grass species cheatgrass (*Bromus tectorum*). Perennial forbs are diverse in composition, but are not abundant. Annual forb cover has fluctuated, but has remained low on average (**Figure 3.25**, **Figure 3.28**).

Occupancy: Average pellet transect data indicates that deer primarily use this site and that overall occupancy has fluctuated, but has generally decreased. Deer pellet groups have had a mean abundance ranging from 19 days use/acre in 2015 to 49 days use/acre in 2000. Elk have also been present with an average pellet group abundance ranging from less than 1 days use/acre in 2010 and 2020 to as high as 13 days use/acre in 2005. Average abundance of horse pellet groups has been as low as 10 days use/acre in 2015 and as high as 23 days use/acre in 2005 and 2020. Finally, cattle were present in 2005 with a mean pellet group abundance of less than 1 days use/acre, but have been absent in all other sample years (**Figure 3.31**).

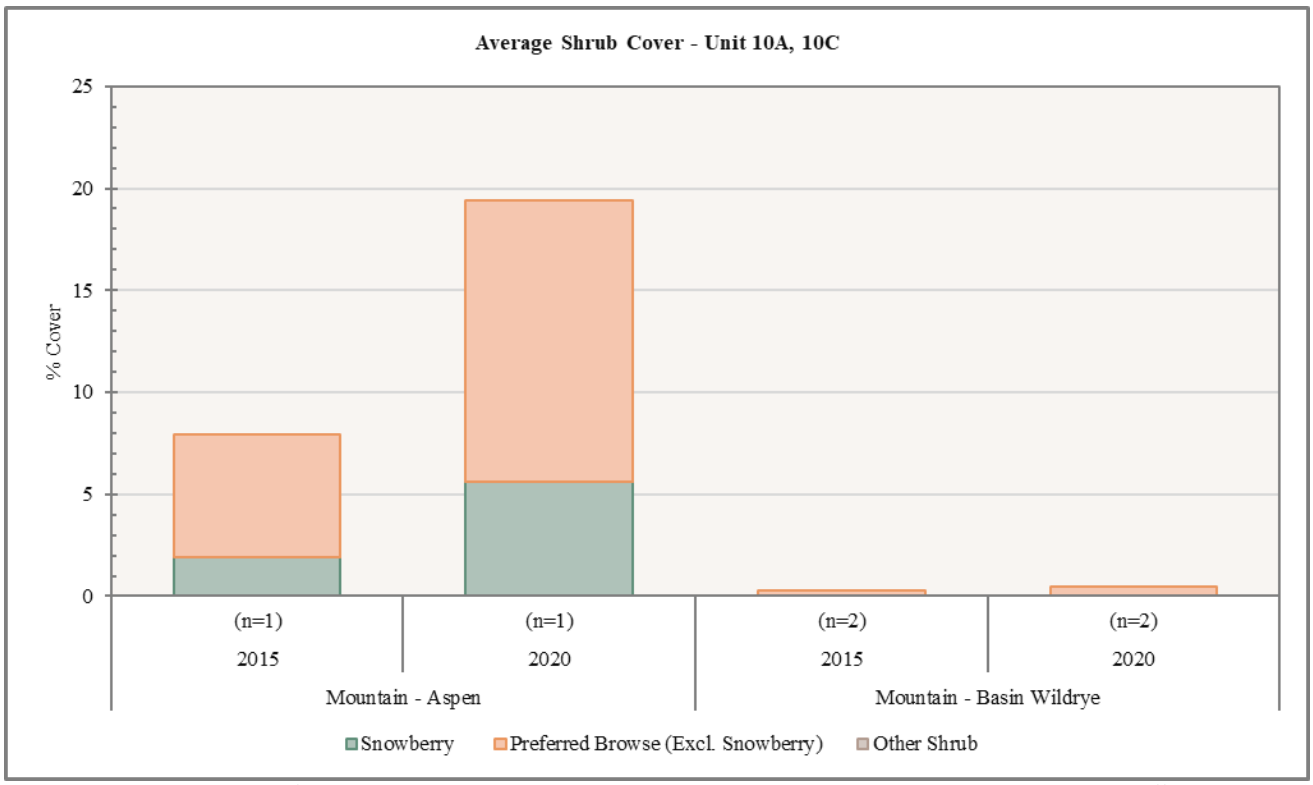


Figure 3.3: Average shrub cover for Mountain - Aspen and Mountain - Basin Wildrye study sites in WMU 10A, 10C, North Book Cliffs.

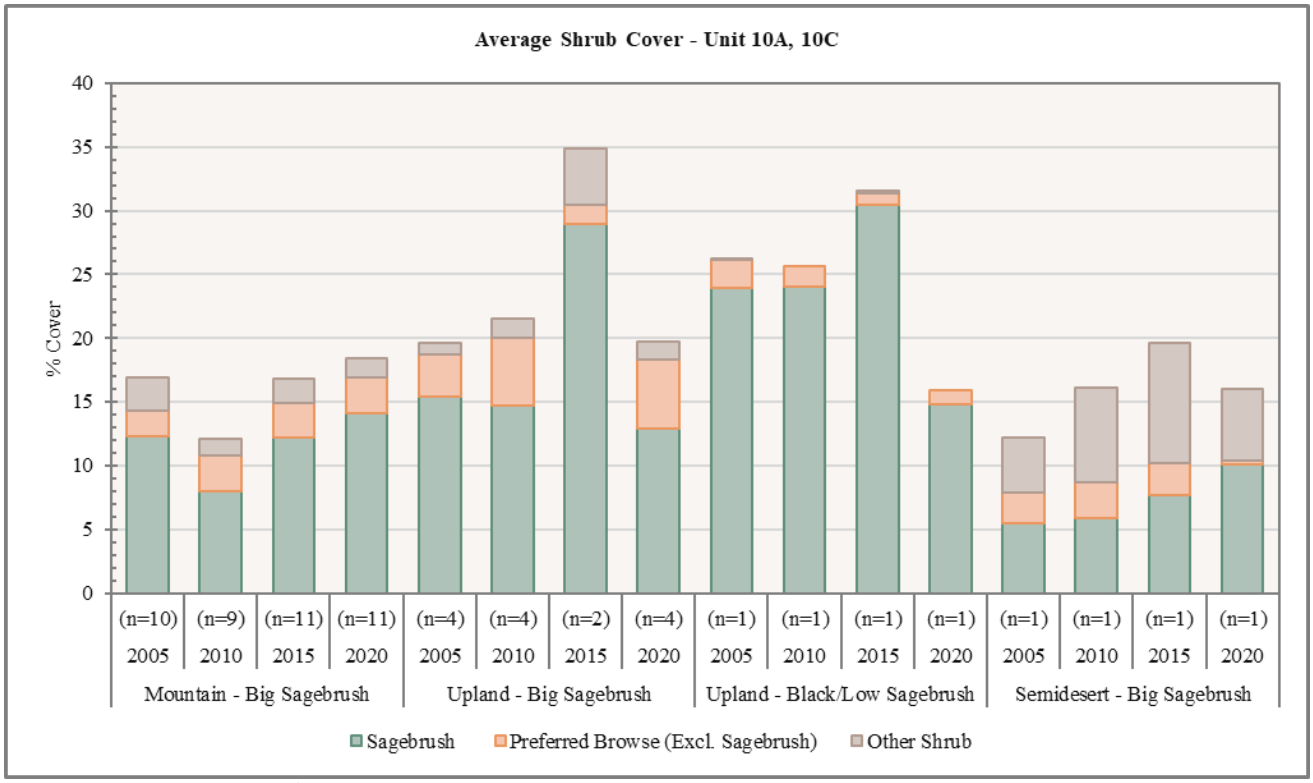


Figure 3.4: Average shrub cover for Mountain - Big Sagebrush, Upland - Big Sagebrush, Upland - Black/Low Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 10A, 10C, North Book Cliffs.

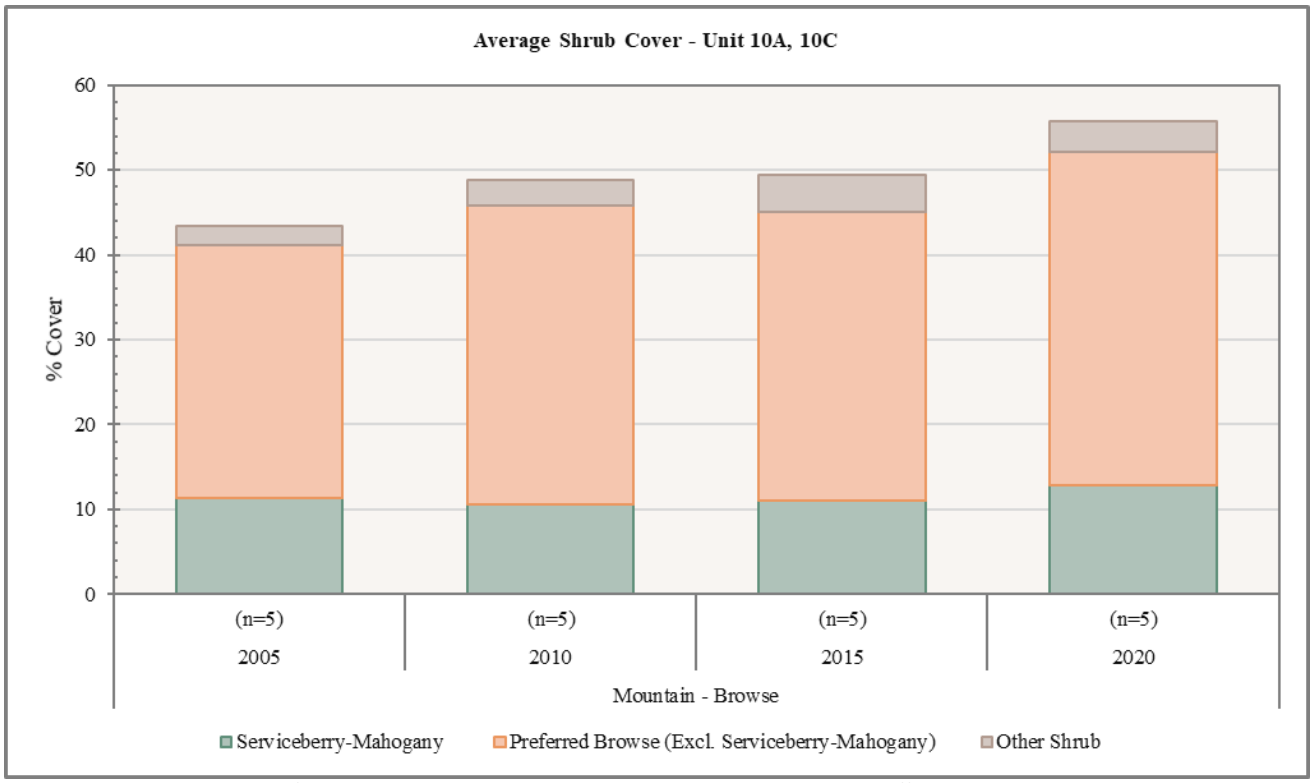


Figure 3.5: Average shrub cover for Mountain - Browse study sites in WMU 10A, 10C, North Book Cliffs.

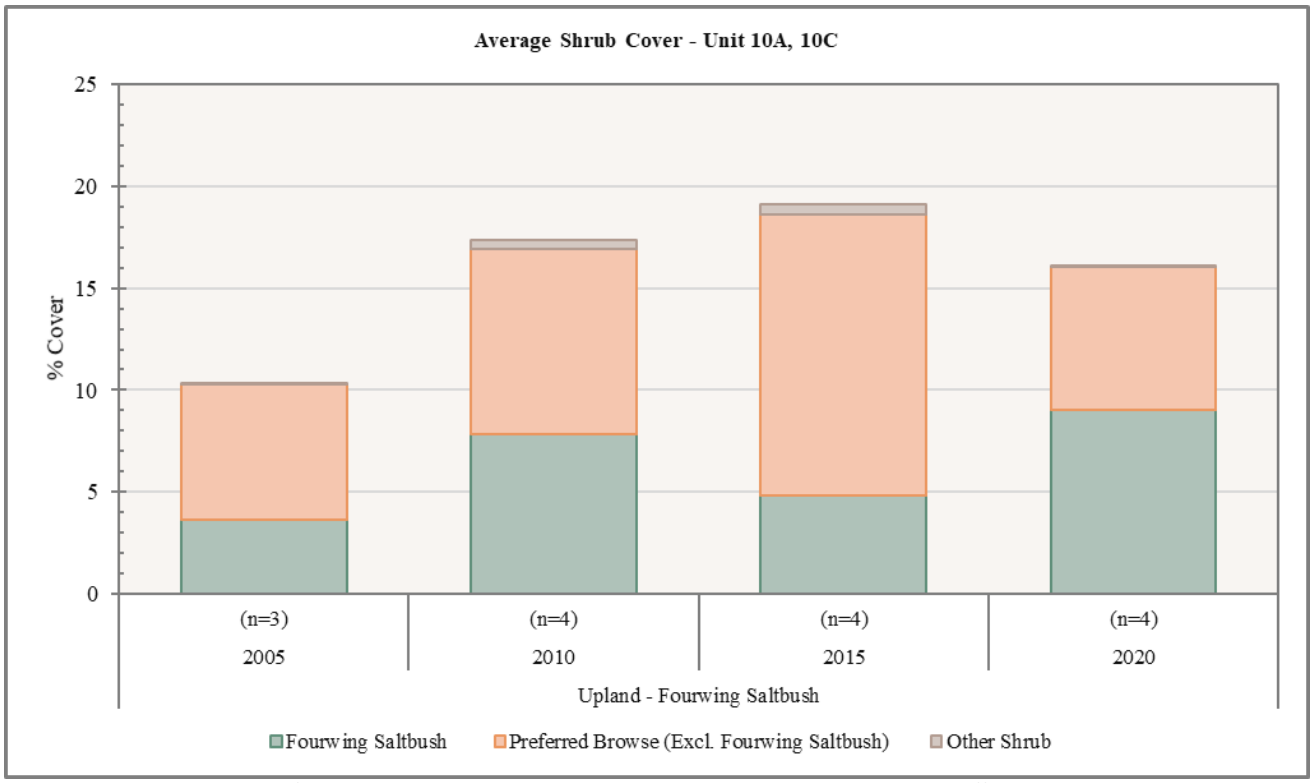


Figure 3.6: Average shrub cover for Upland - Fourwing Saltbush study sites in WMU 10A, 10C, North Book Cliffs.

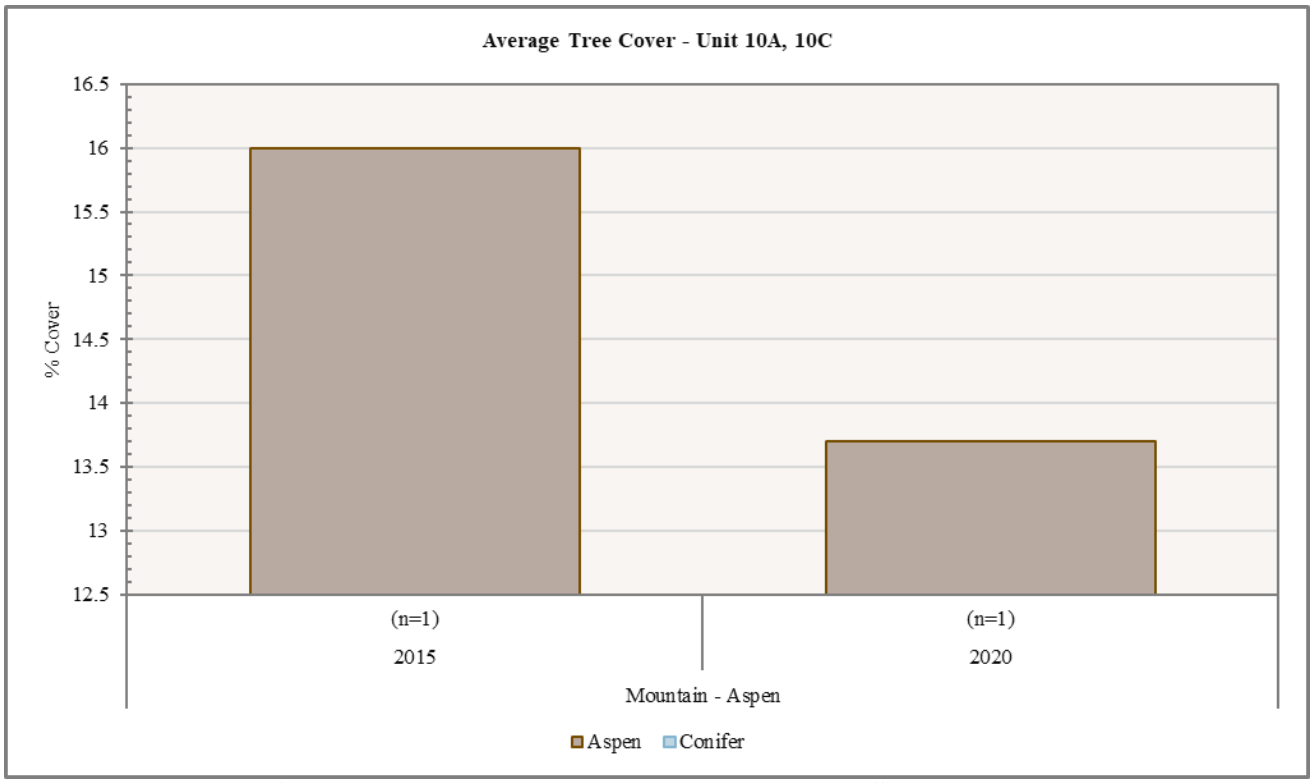


Figure 3.7: Average tree cover for Mountain - Aspen study sites in WMU 10A, 10C, North Book Cliffs.

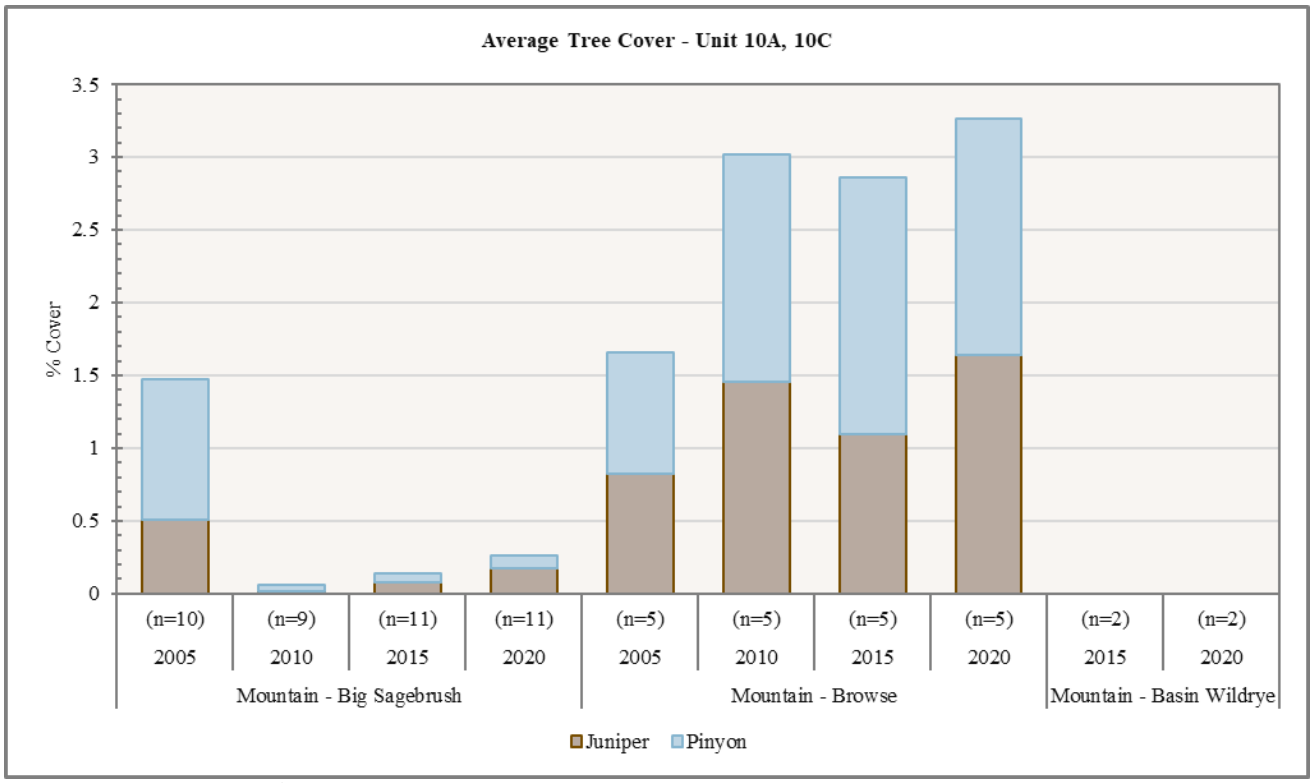


Figure 3.8: Average tree cover for Mountain - Big Sagebrush, Mountain - Browse, and Mountain - Basin Wildrye study sites in WMU 10A, 10C, North Book Cliffs.

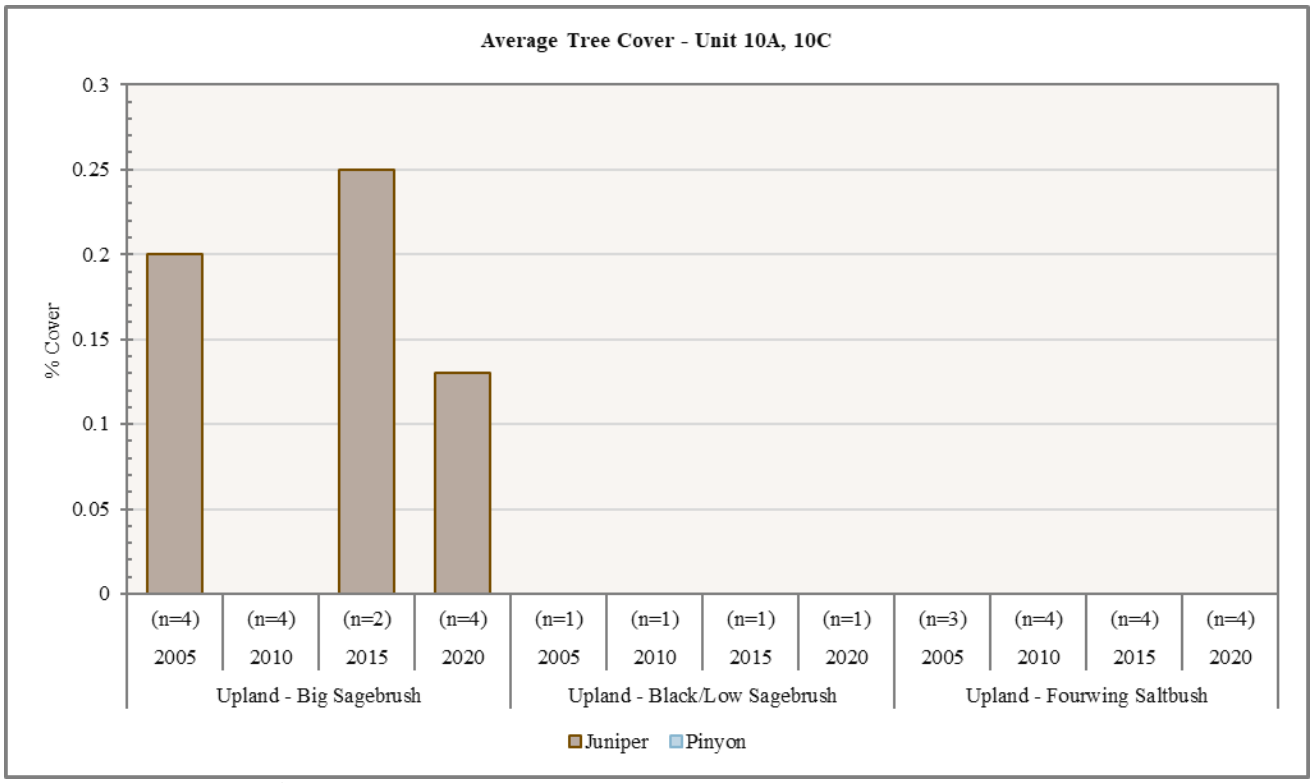


Figure 3.9: Average tree cover for Upland - Big Sagebrush, Upland - Black/Low Sagebrush, and Upland - Fourwing Saltbush study sites in WMU 10A, 10C, North Book Cliffs.

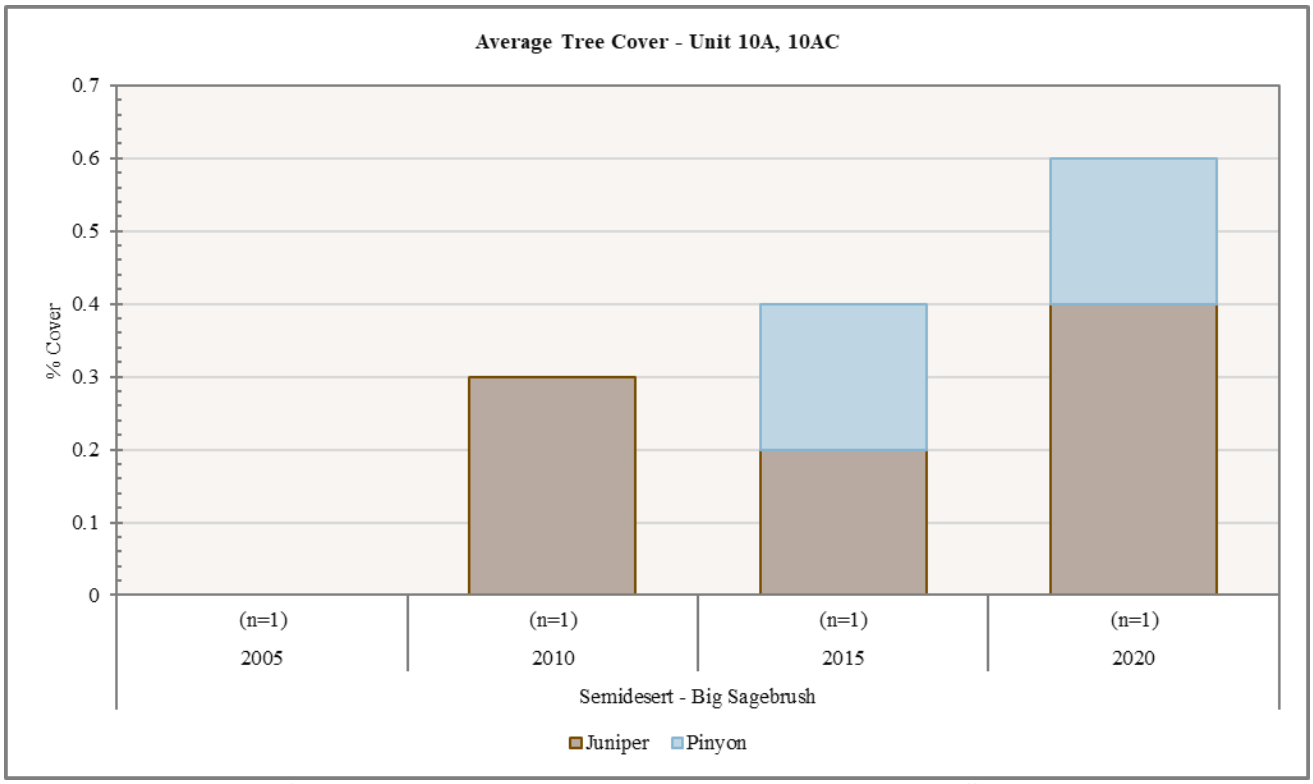


Figure 3.10: Average tree cover for Semidesert - Big Sagebrush study sites in WMU 10A, 10C, North Book Cliffs.

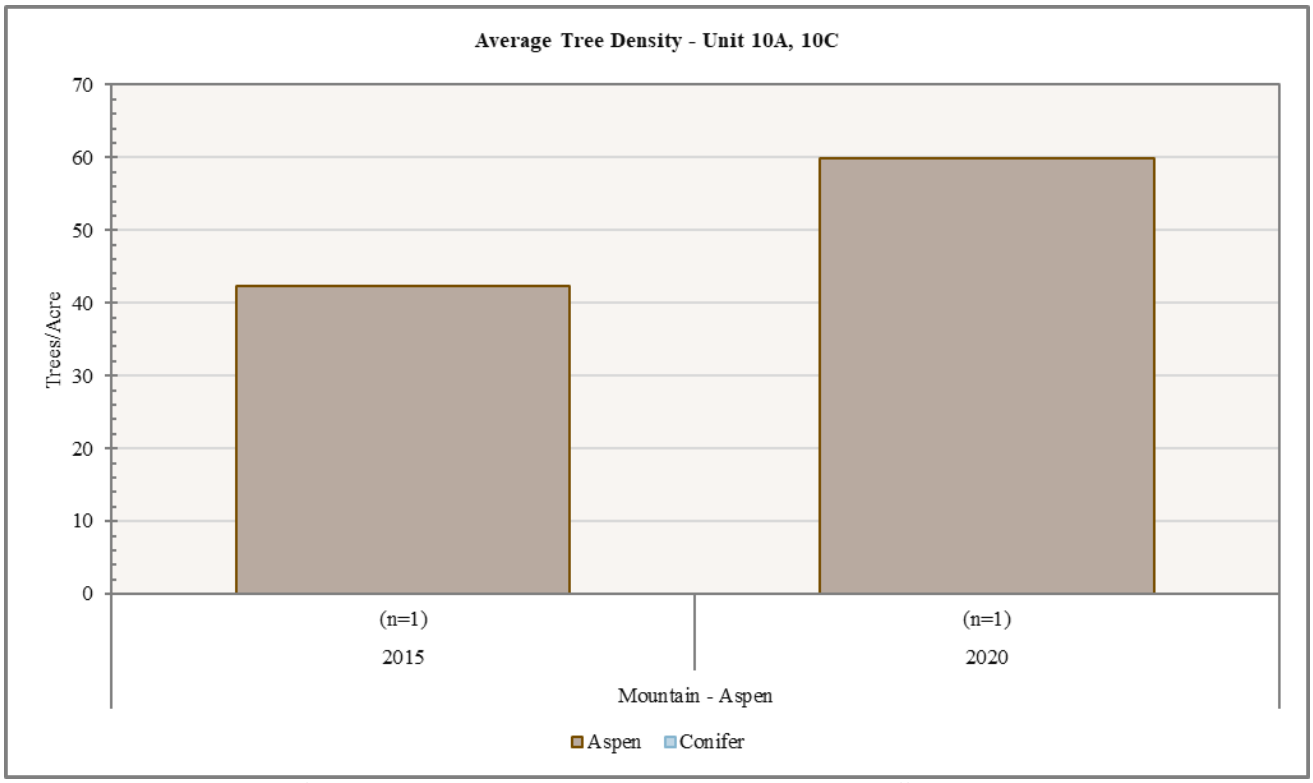


Figure 3.11: Average tree density for Mountain - Aspen study sites in WMU 10A, 10C, North Book Cliffs.

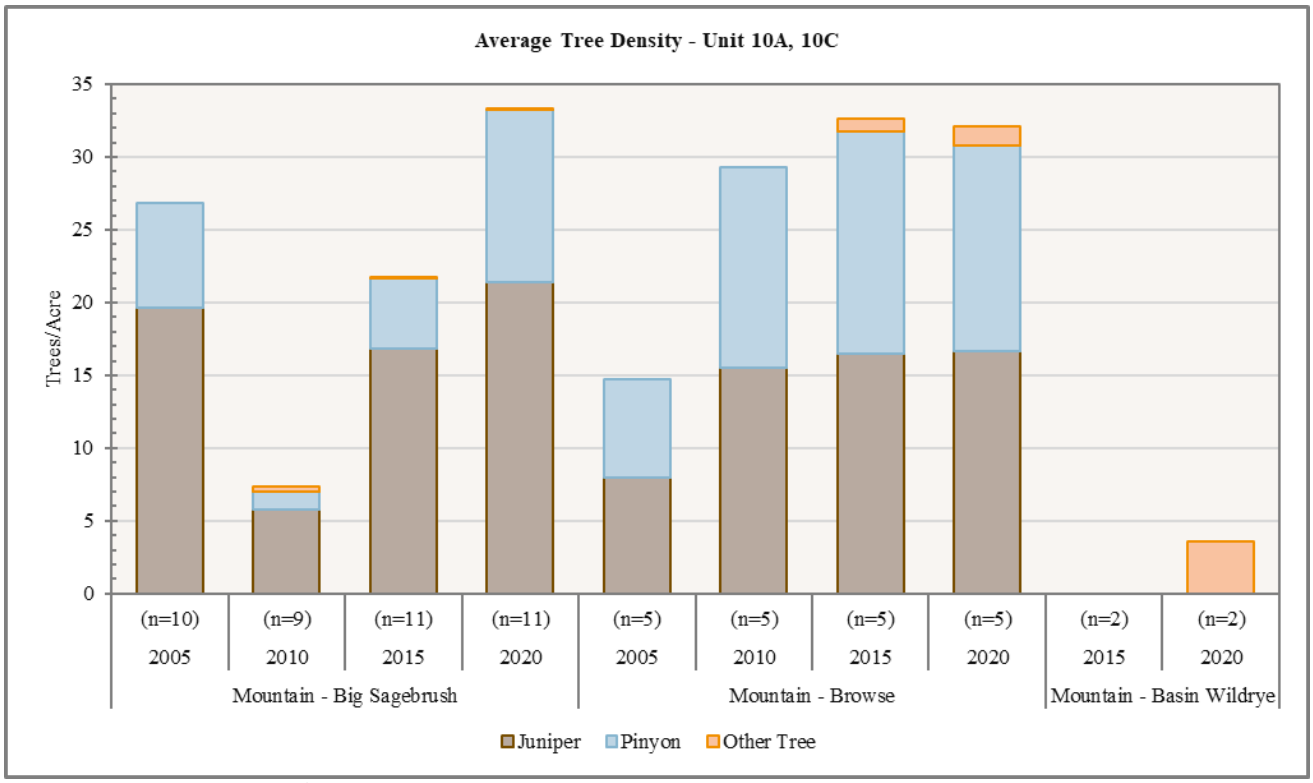


Figure 3.12: Average tree density for Mountain - Big Sagebrush, Mountain - Browse, and Mountain - Basin Wildrye study sites in WMU 10A, 10C, North Book Cliffs.

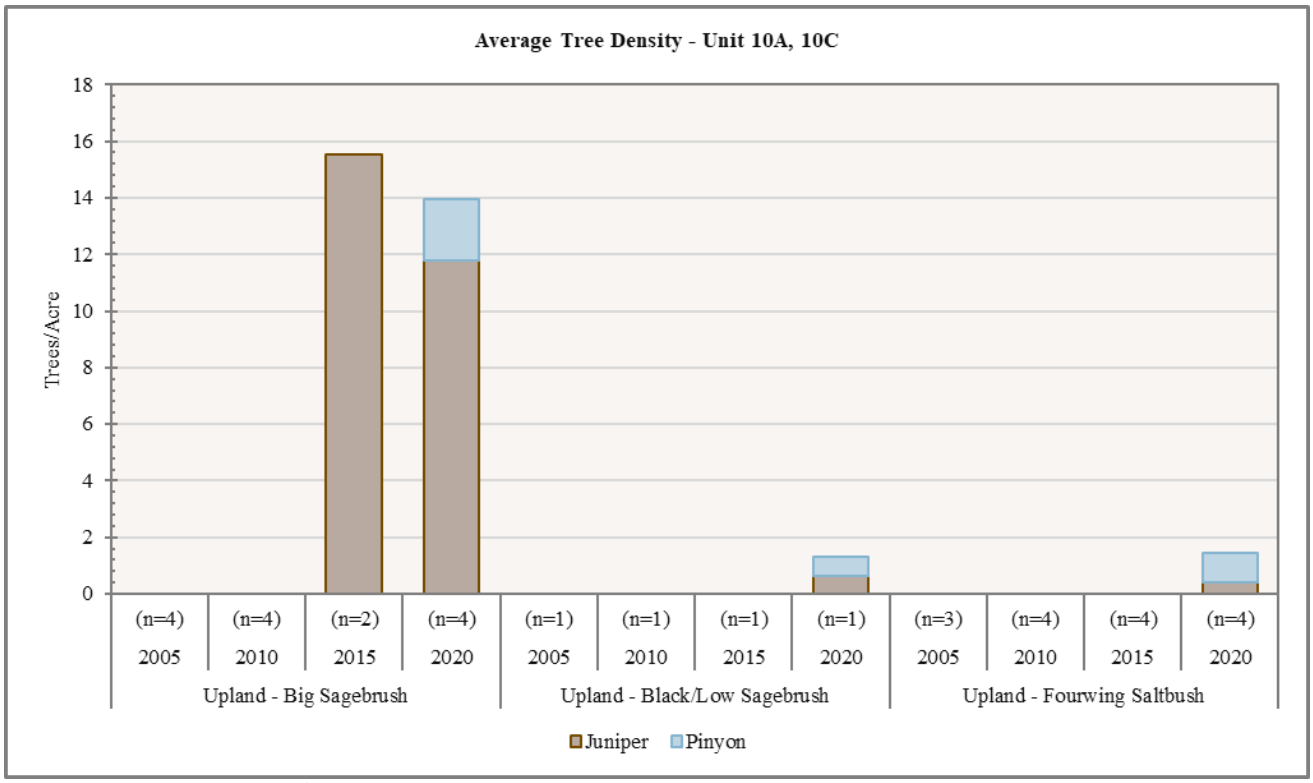


Figure 3.13: Average tree density for Upland - Big Sagebrush, Upland - Black/Low Sagebrush, and Upland - Fourwing Saltbush study sites in WMU 10A, 10C, North Book Cliffs.

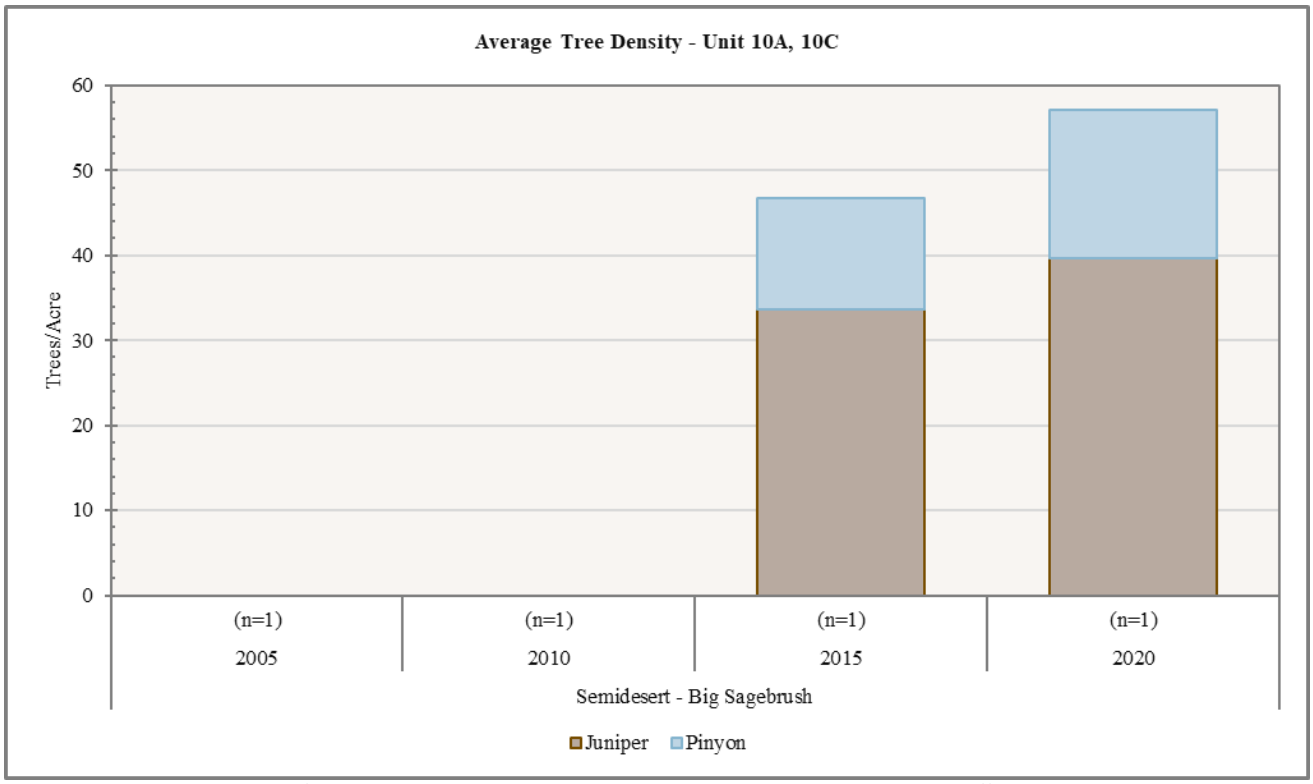


Figure 3.14: Average tree density for Semidesert - Big Sagebrush study sites in WMU 10A, 10C, North Book Cliffs.

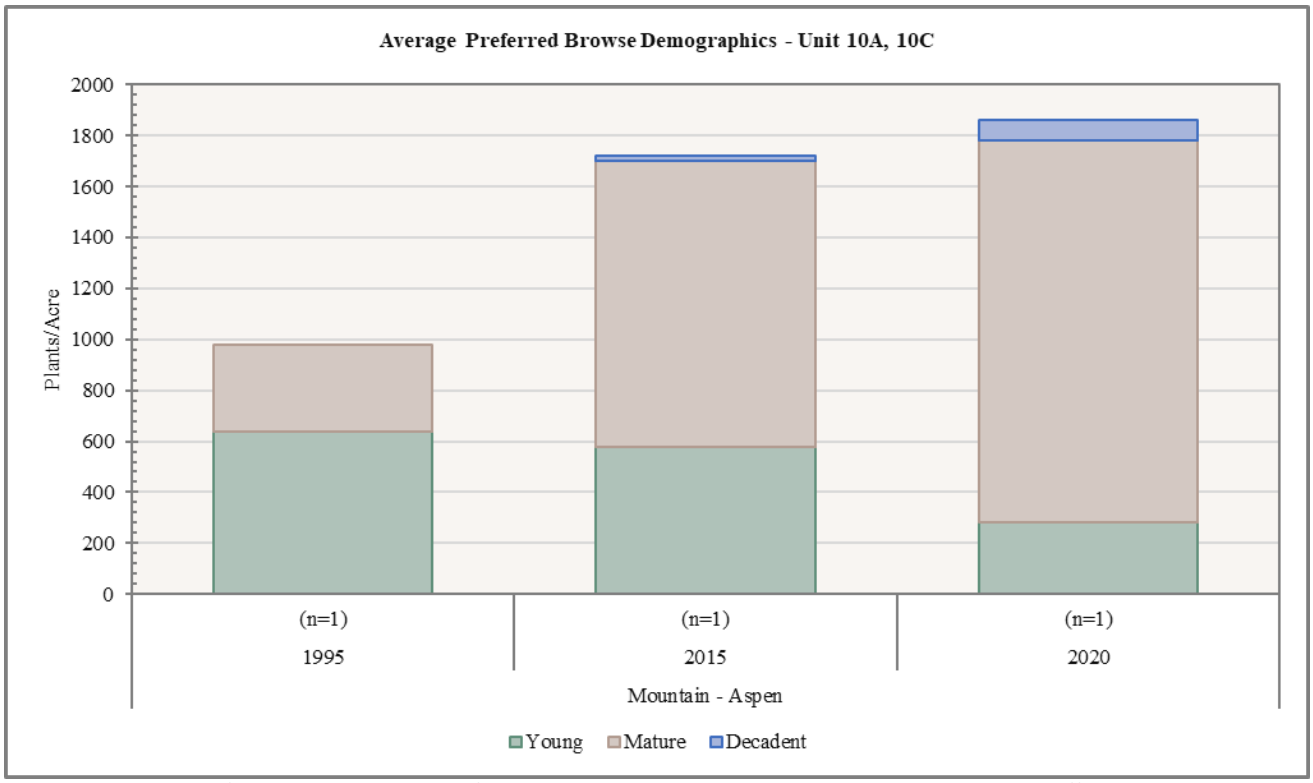


Figure 3.15: Average preferred browse demographics for Mountain - Aspen study sites in WMU 10A, 10C, North Book Cliffs.

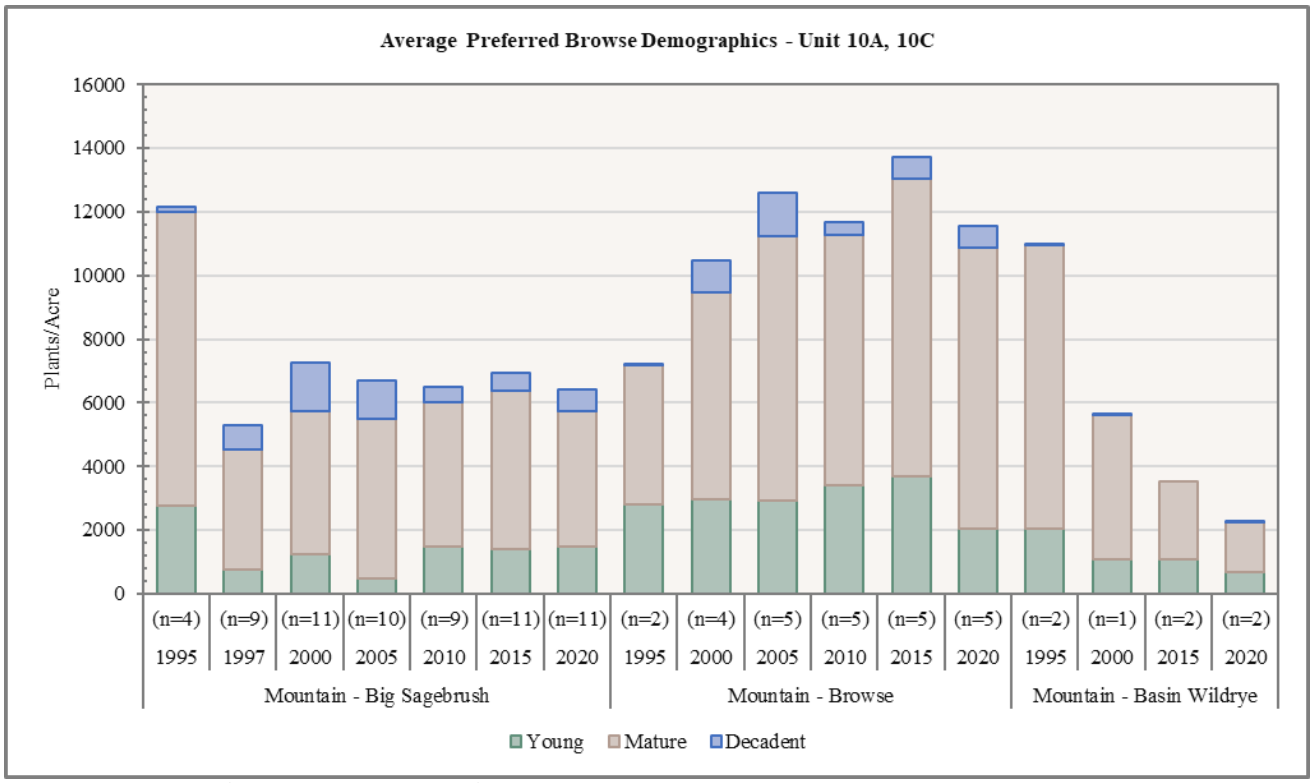


Figure 3.16: Average preferred browse demographics for Mountain - Big Sagebrush, Mountain - Browse, and Mountain - Basin Wildrye study sites in WMU 10A, 10C, North Book Cliffs.

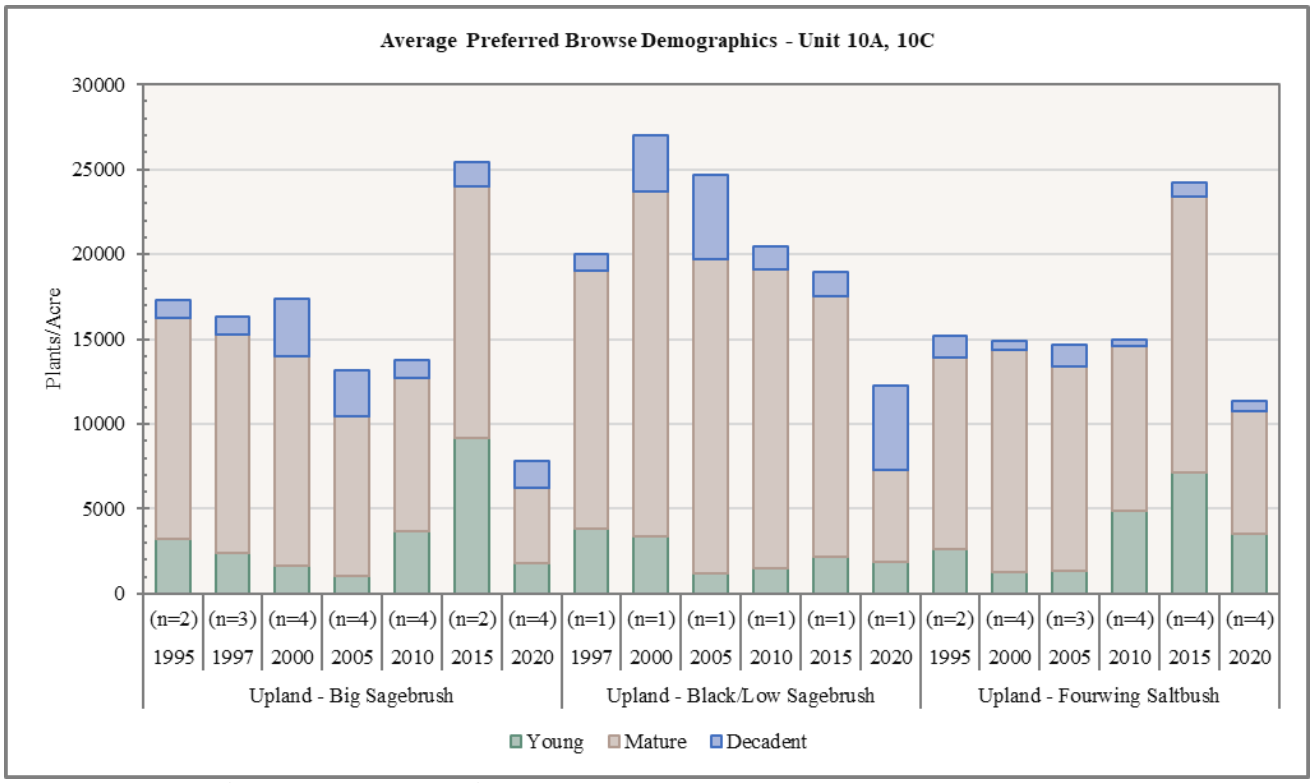


Figure 3.17: Average preferred browse demographics for Upland - Big Sagebrush, Upland - Black/Low Sagebrush, and Upland - Fourwing Saltbush study sites in WMU 10A, 10C, North Book Cliffs.

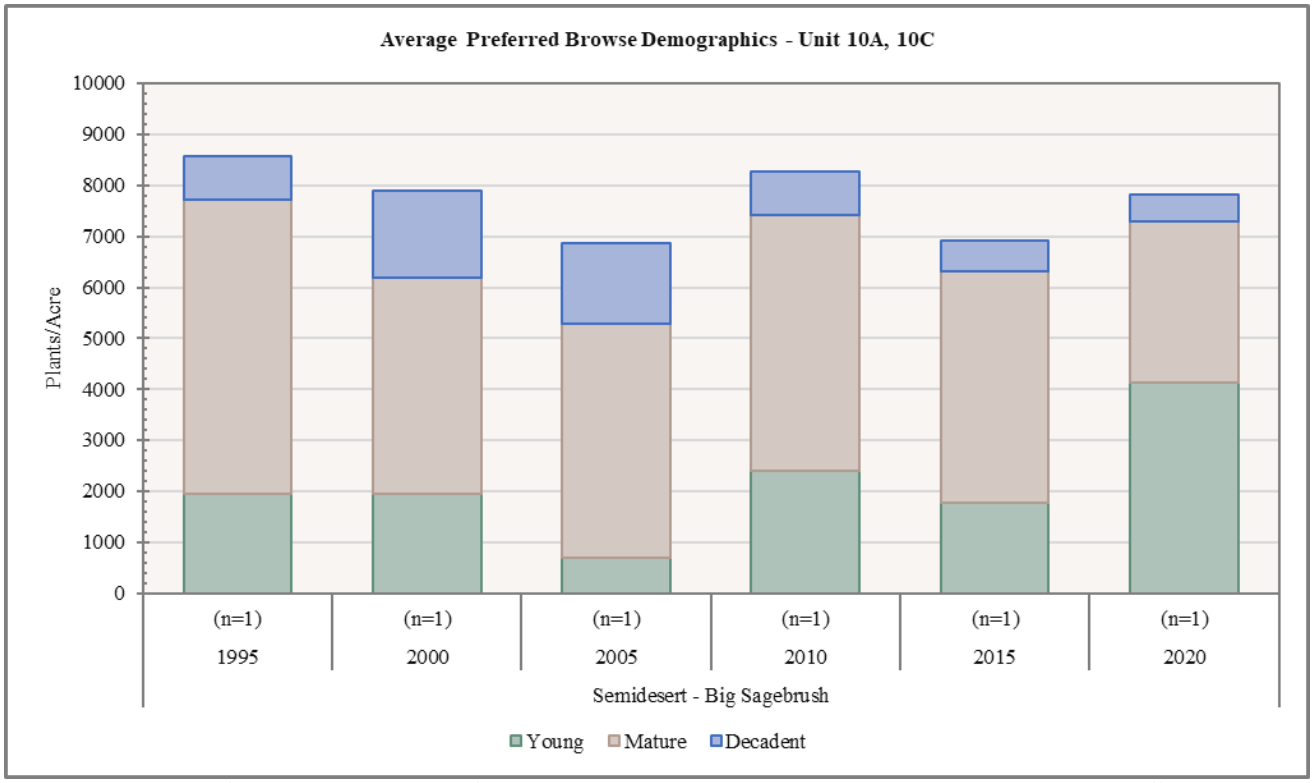


Figure 3.18: Average preferred browse demographics for Semidesert - Big Sagebrush study sites in WMU 10A, 10C, North Book Cliffs.

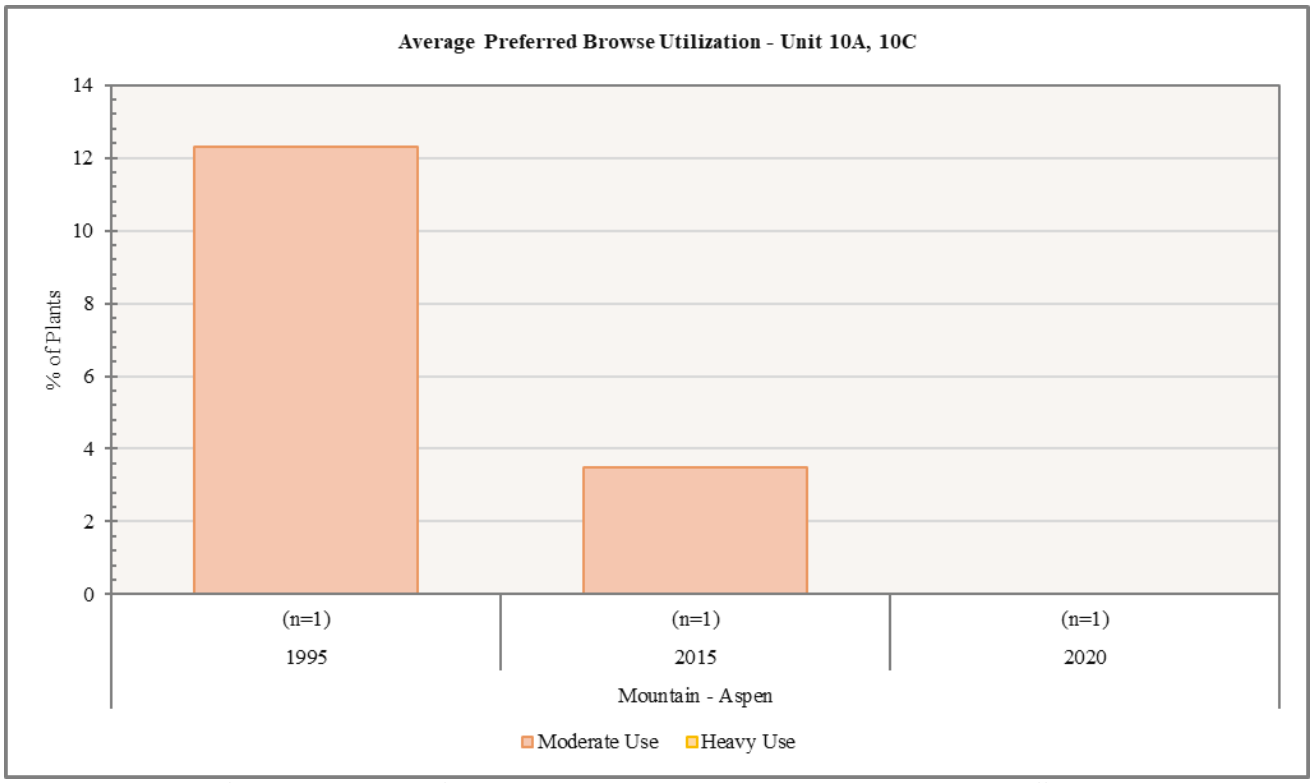


Figure 3.19: Average preferred browse utilization for Mountain - Aspen study sites in WMU 10A, 10C, North Book Cliffs.

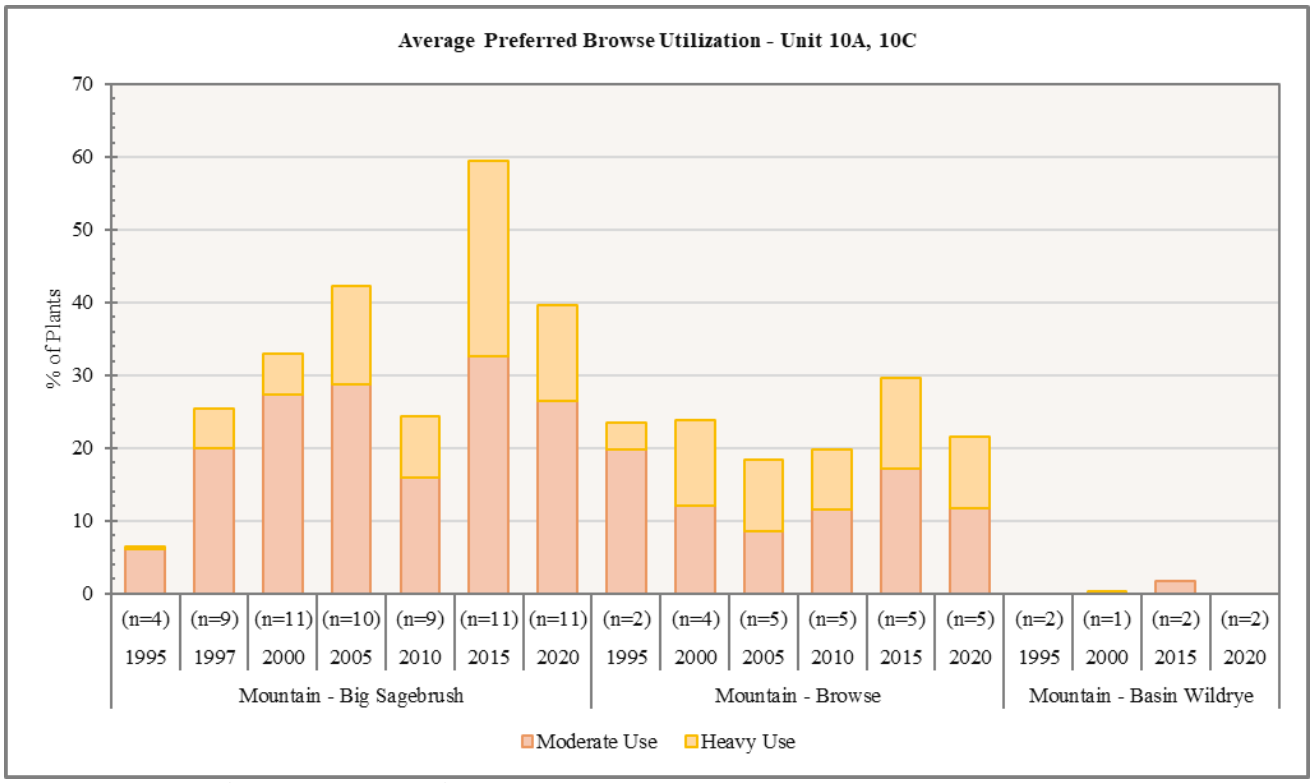


Figure 3.20: Average preferred browse utilization for Mountain - Big Sagebrush, Mountain - Browse, and Mountain - Basin Wildrye study sites in WMU 10A, 10C, North Book Cliffs.

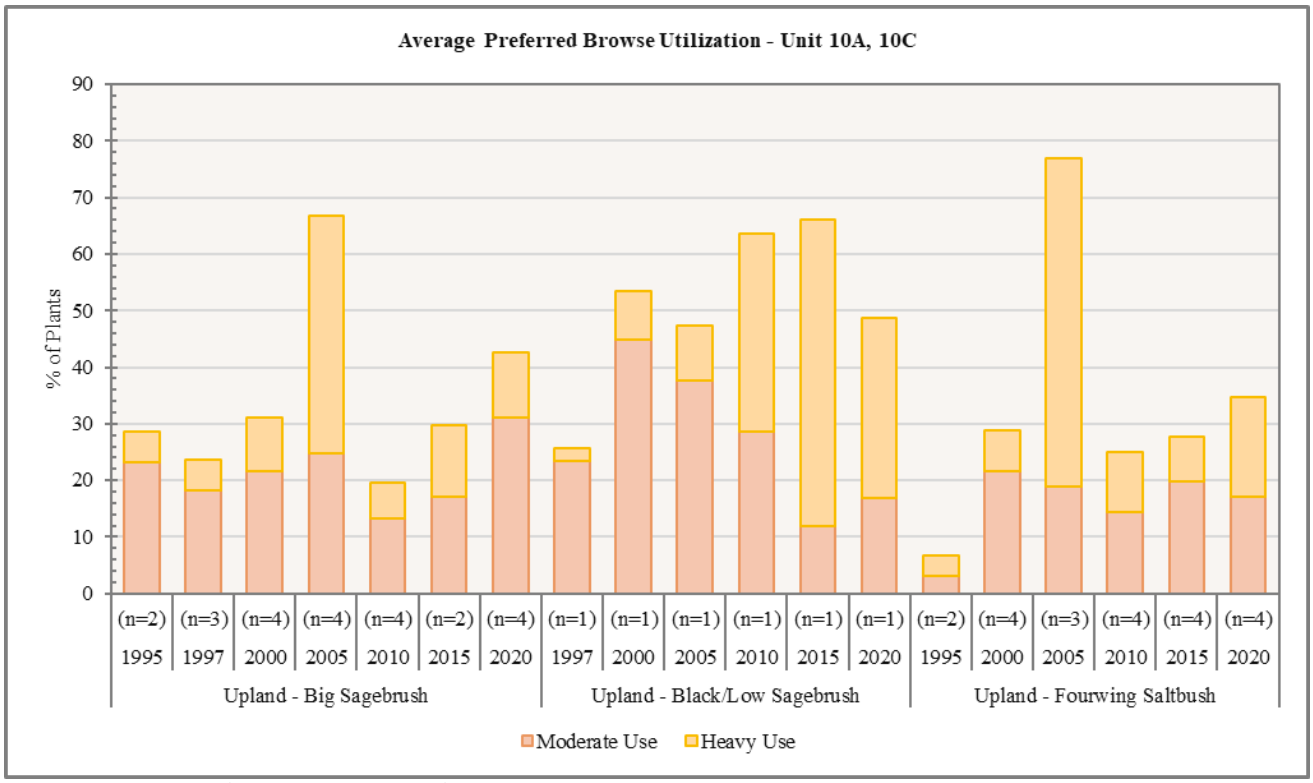


Figure 3.21: Average preferred browse utilization for Upland - Big Sagebrush, Upland - Black/Low Sagebrush, and Upland - Fourwing Saltbush study sites in WMU 10A, 10C, North Book Cliffs.

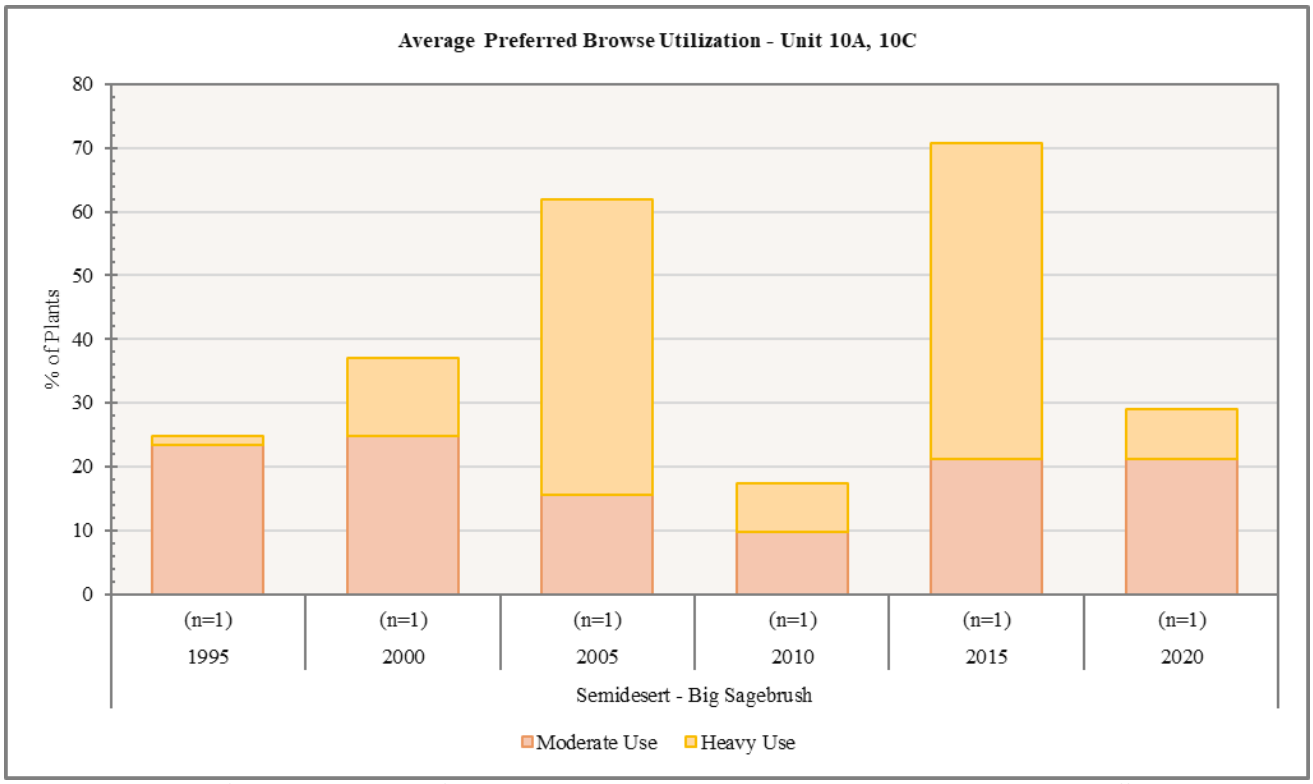


Figure 3.22: Average preferred browse utilization for Semidesert - Big Sagebrush study sites in WMU 10A, 10C, North Book Cliffs.

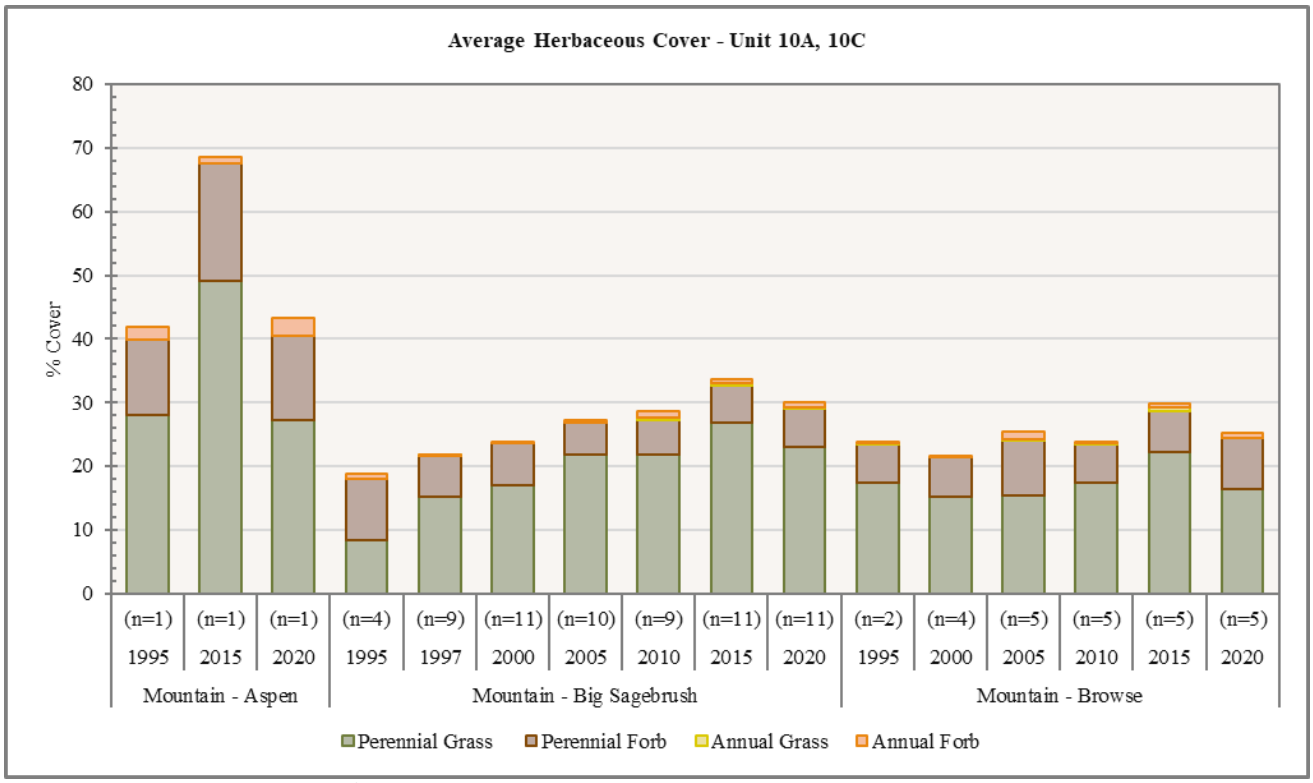


Figure 3.23: Average herbaceous cover for Mountain - Aspen, Mountain - Big Sagebrush, and Mountain - Browse study sites in WMU 10A, 10C, North Book Cliffs.

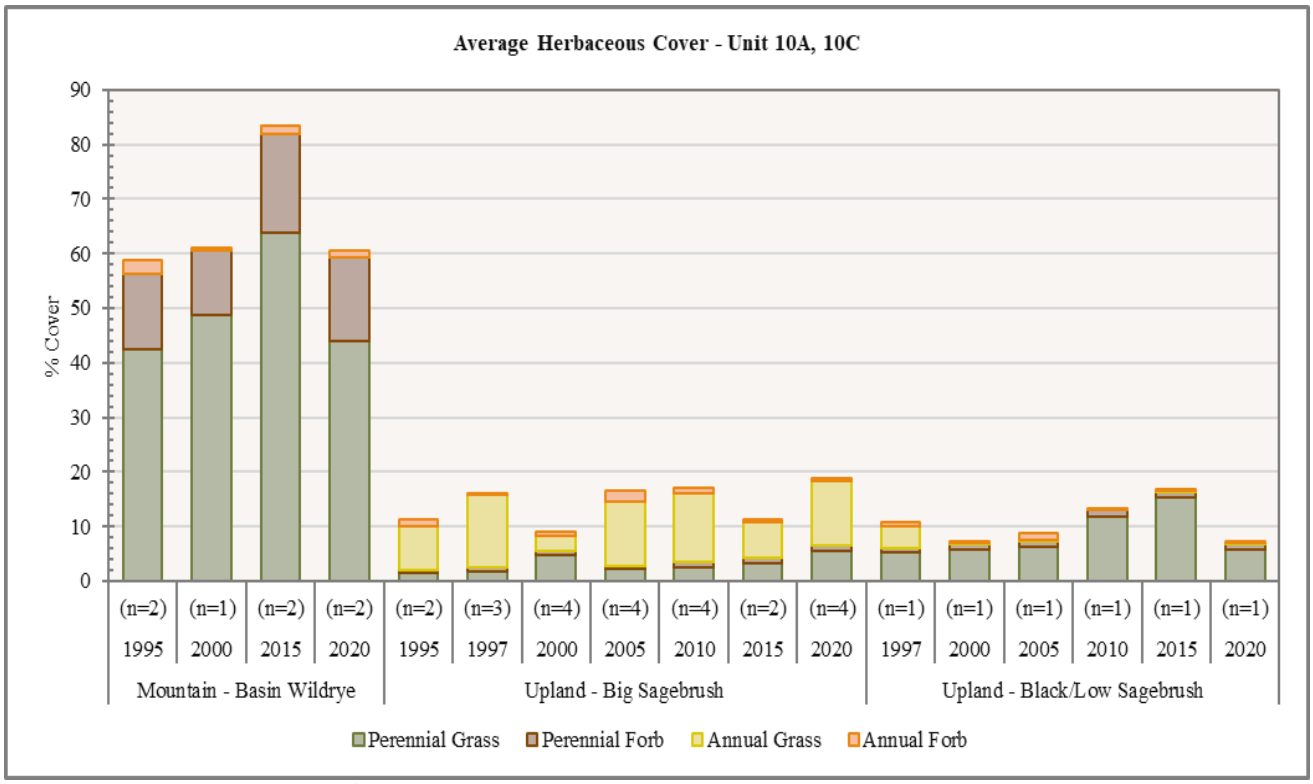


Figure 3.24: Average herbaceous cover for Mountain - Basin Wildrye, Upland - Big Sagebrush, and Upland - Black/Low Sagebrush study sites in WMU 10A, 10C, North Book Cliffs.

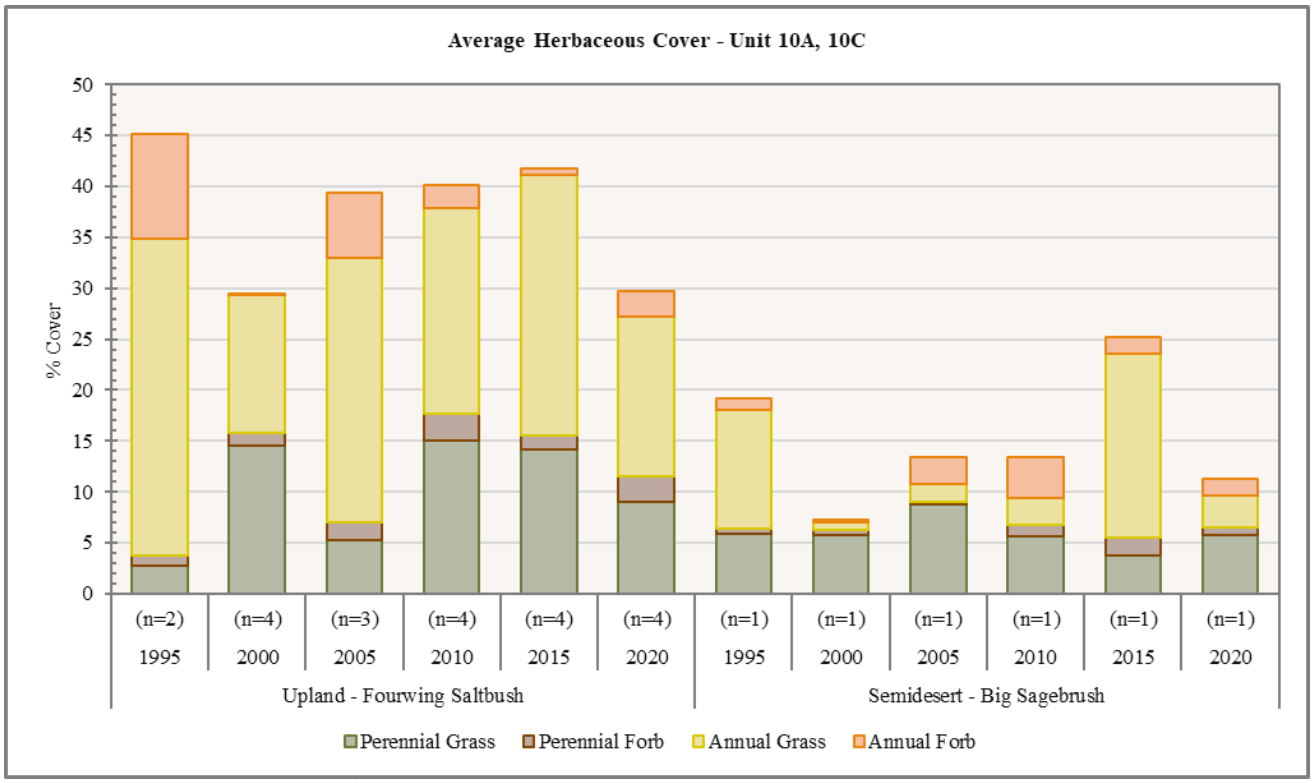


Figure 3.25: Average herbaceous cover for Upland - Fourwing Saltbush and Semidesert - Big Sagebrush study sites in WMU 10A, 10C, North Book Cliffs.

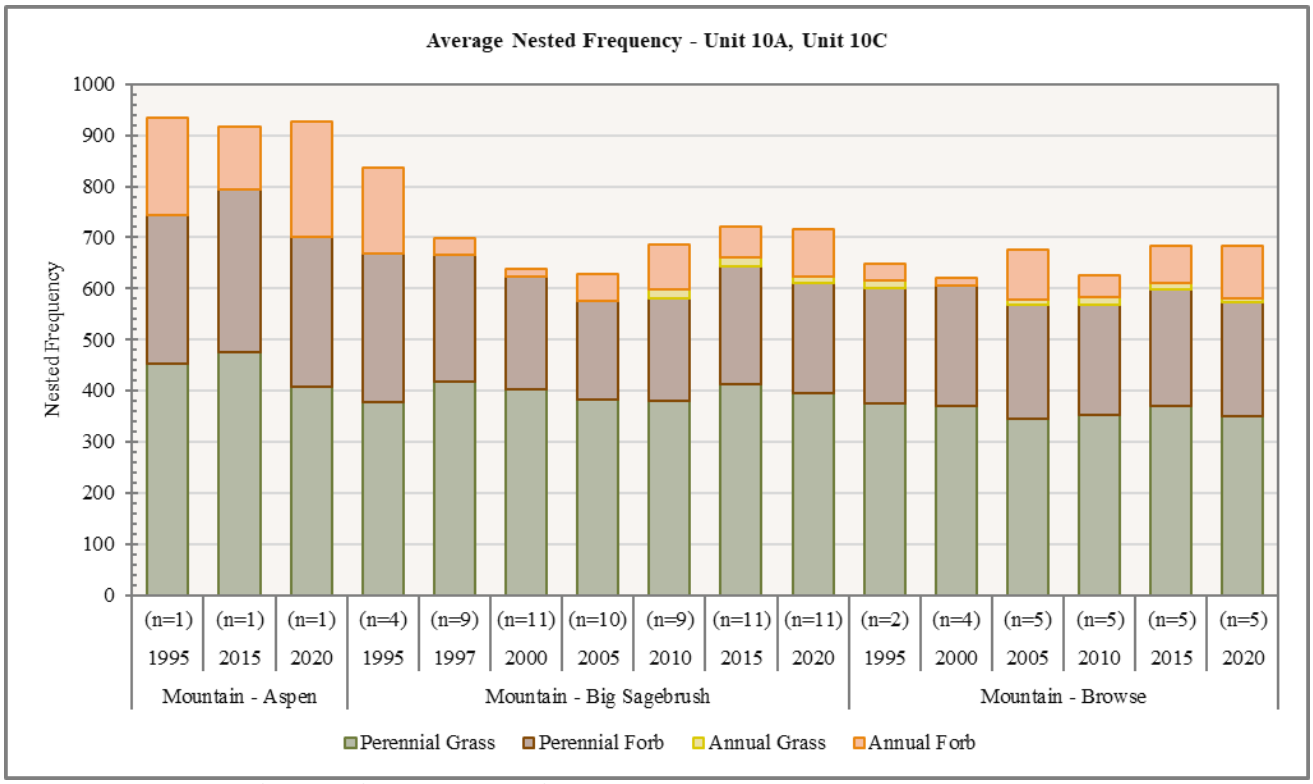


Figure 3.26: Average nested frequency of herbaceous species for Mountain - Aspen, Mountain - Big Sagebrush, and Mountain - Browse study sites in WMU 10A, 10C, North Book Cliffs.

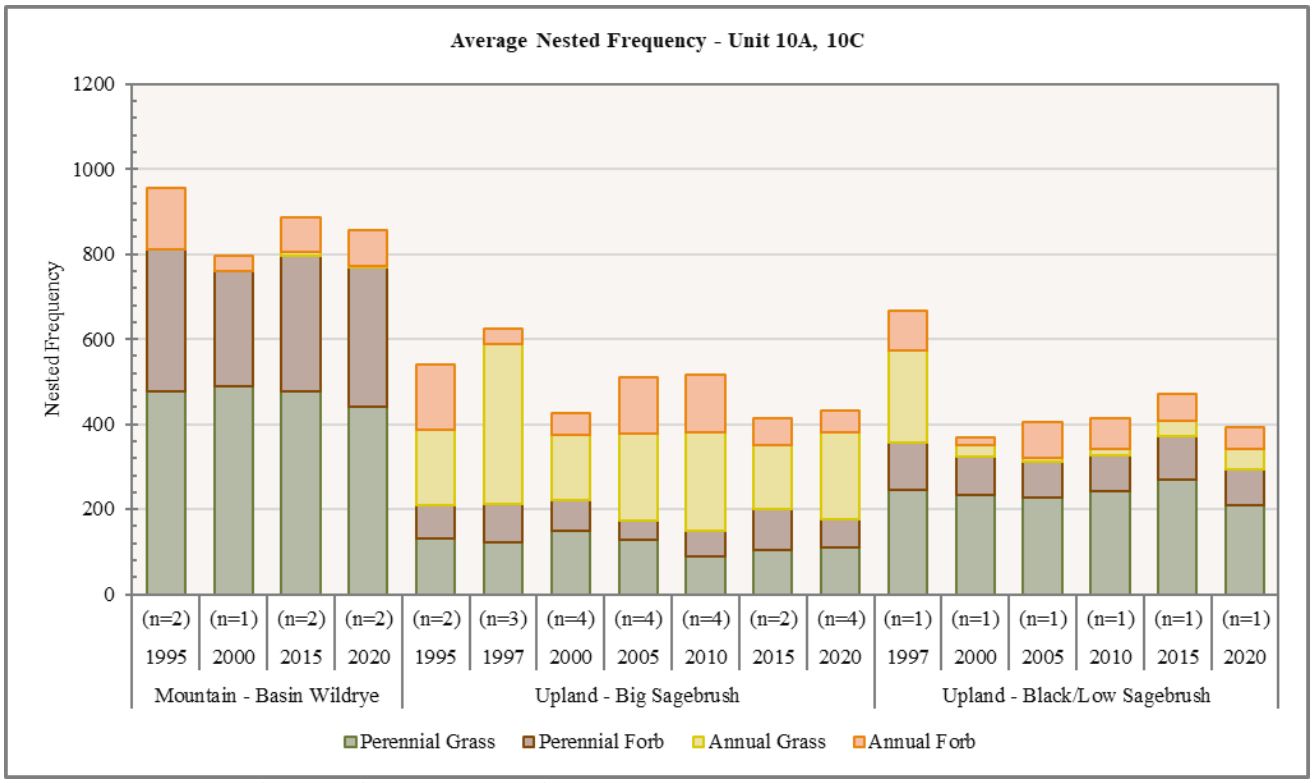


Figure 3.27: Average nested frequency of herbaceous species for Mountain - Basin Wildrye, Upland - Big Sagebrush, and Upland - Black/Low Sagebrush study sites in WMU 10A, 10C, North Book Cliffs.

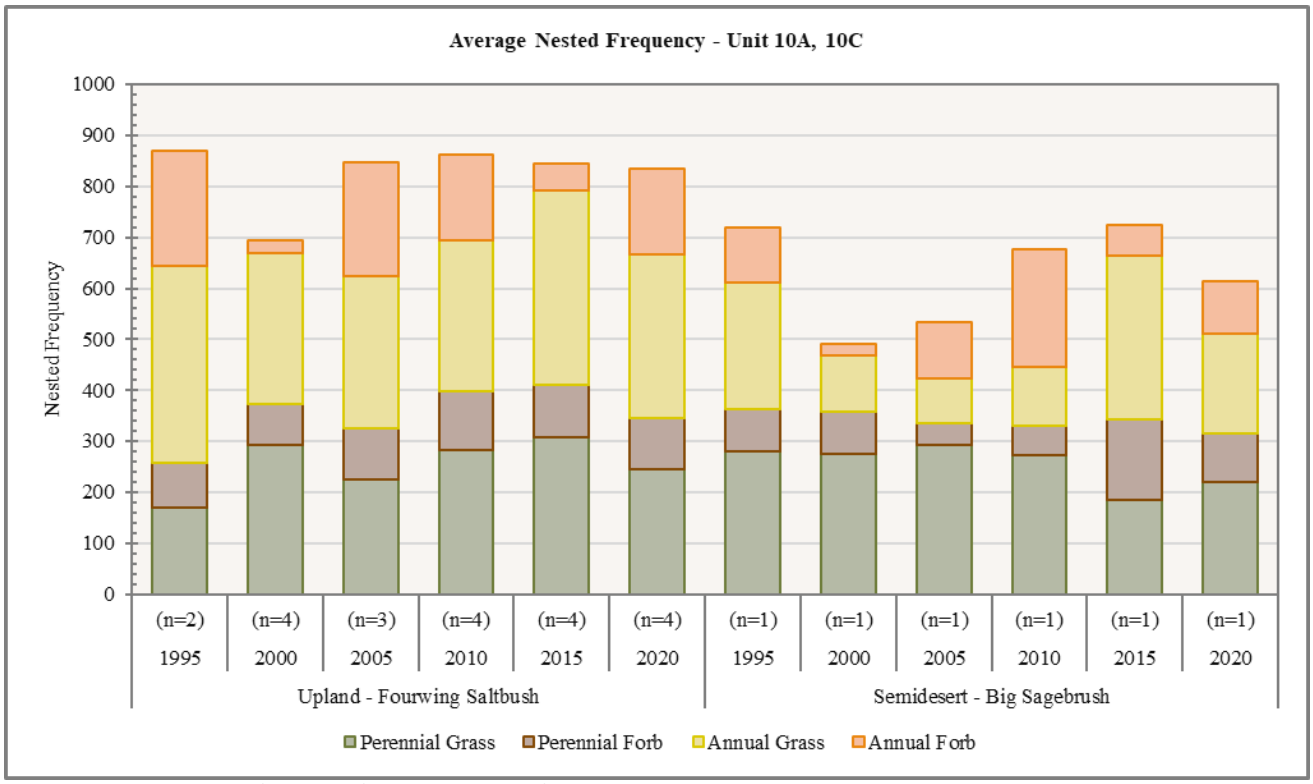


Figure 3.28: Average nested frequency of herbaceous species for Upland - Fourwing Saltbush and Semidesert - Big Sagebrush study sites in WMU 10A, 10C, North Book Cliffs.

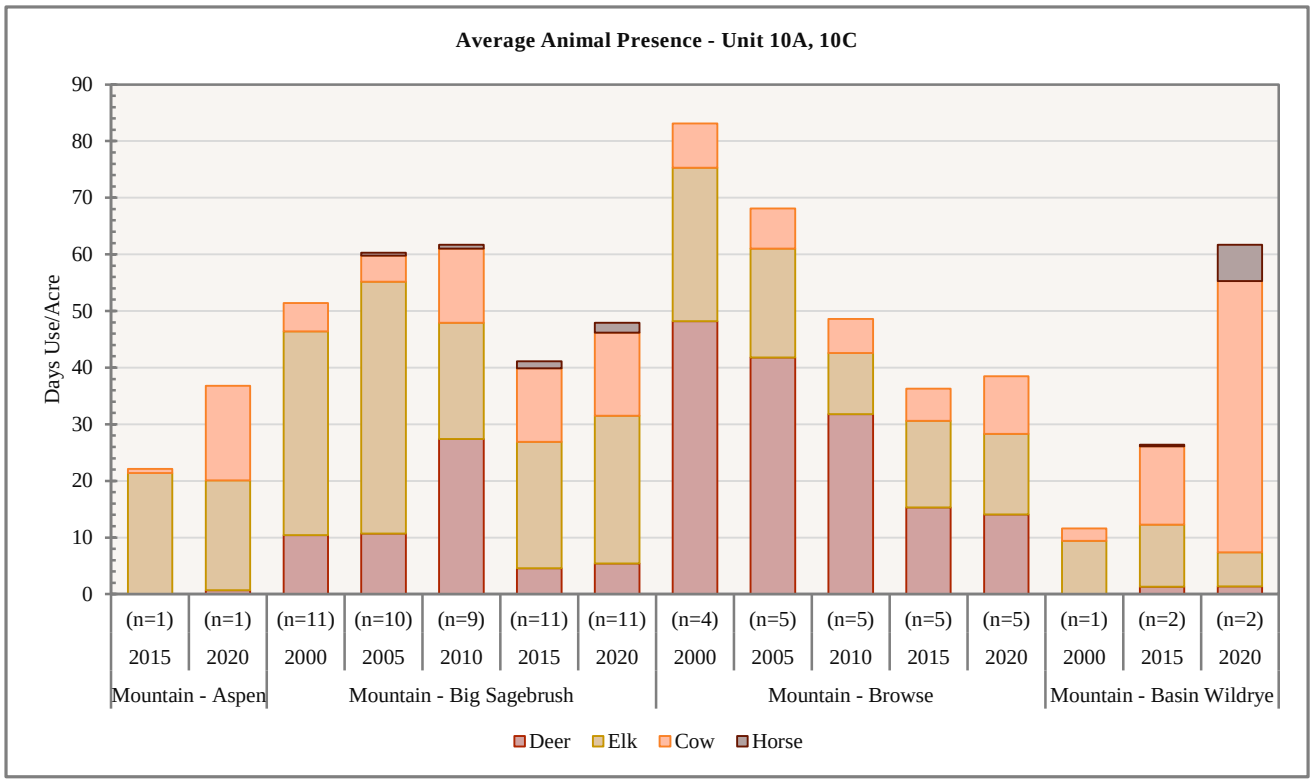


Figure 3.29: Average pellet transect data for Mountain - Aspen, Mountain - Big Sagebrush, Mountain - Browse, and Mountain - Basin Wildrye study sites in WMU 10A, 10C, North Book Cliffs. *Mountain - Aspen and Mountain - Basin Wildrye cattle pellets include cattle/bison.

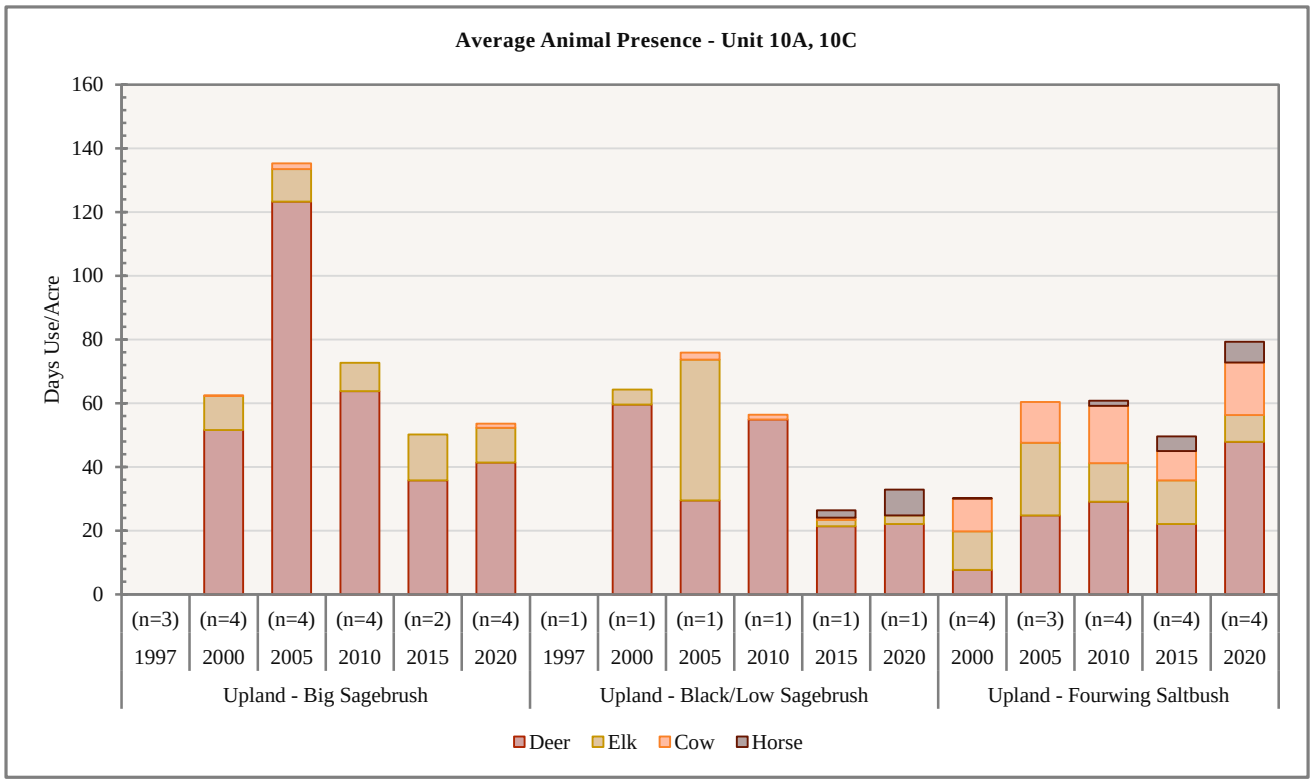


Figure 3.30: Average pellet transect data for Upland - Big Sagebrush, Upland - Black/Low Sagebrush, and Upland - Fourwing Saltbush study sites in WMU 10A, 10C, North Book Cliffs.

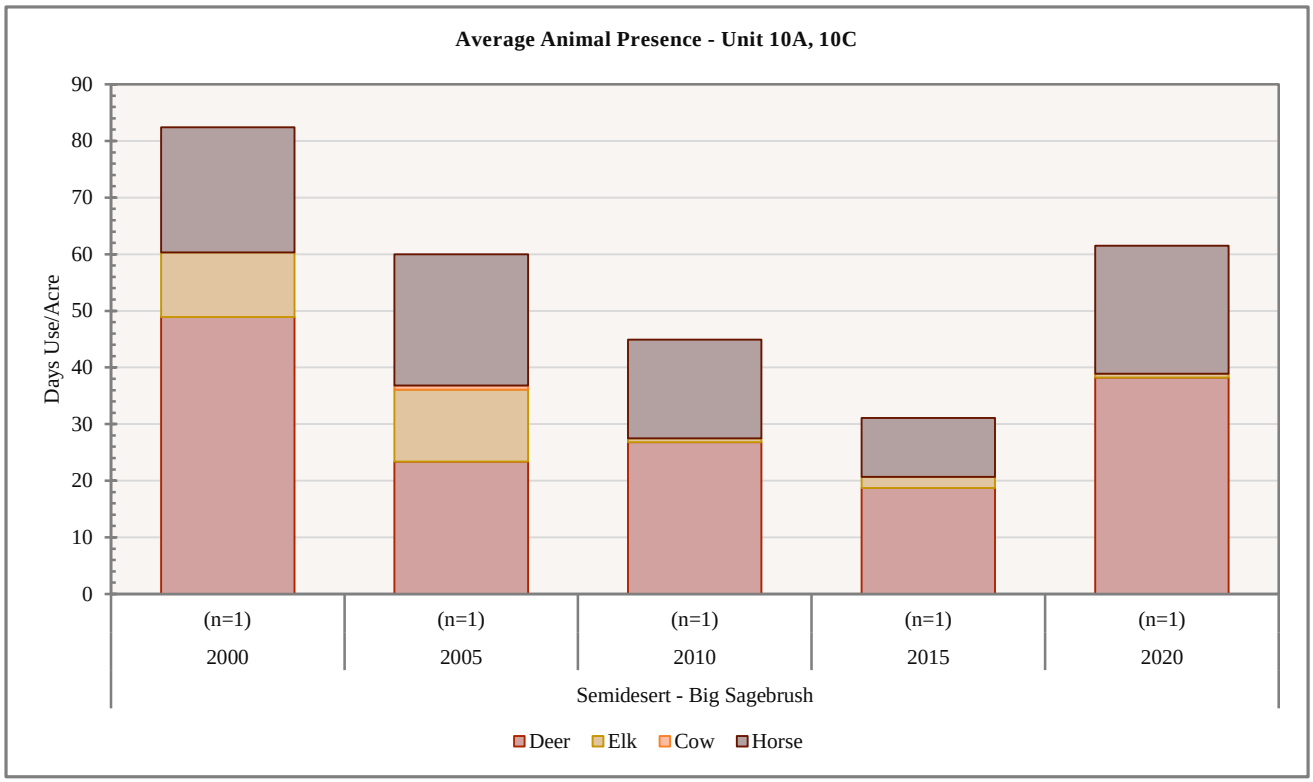
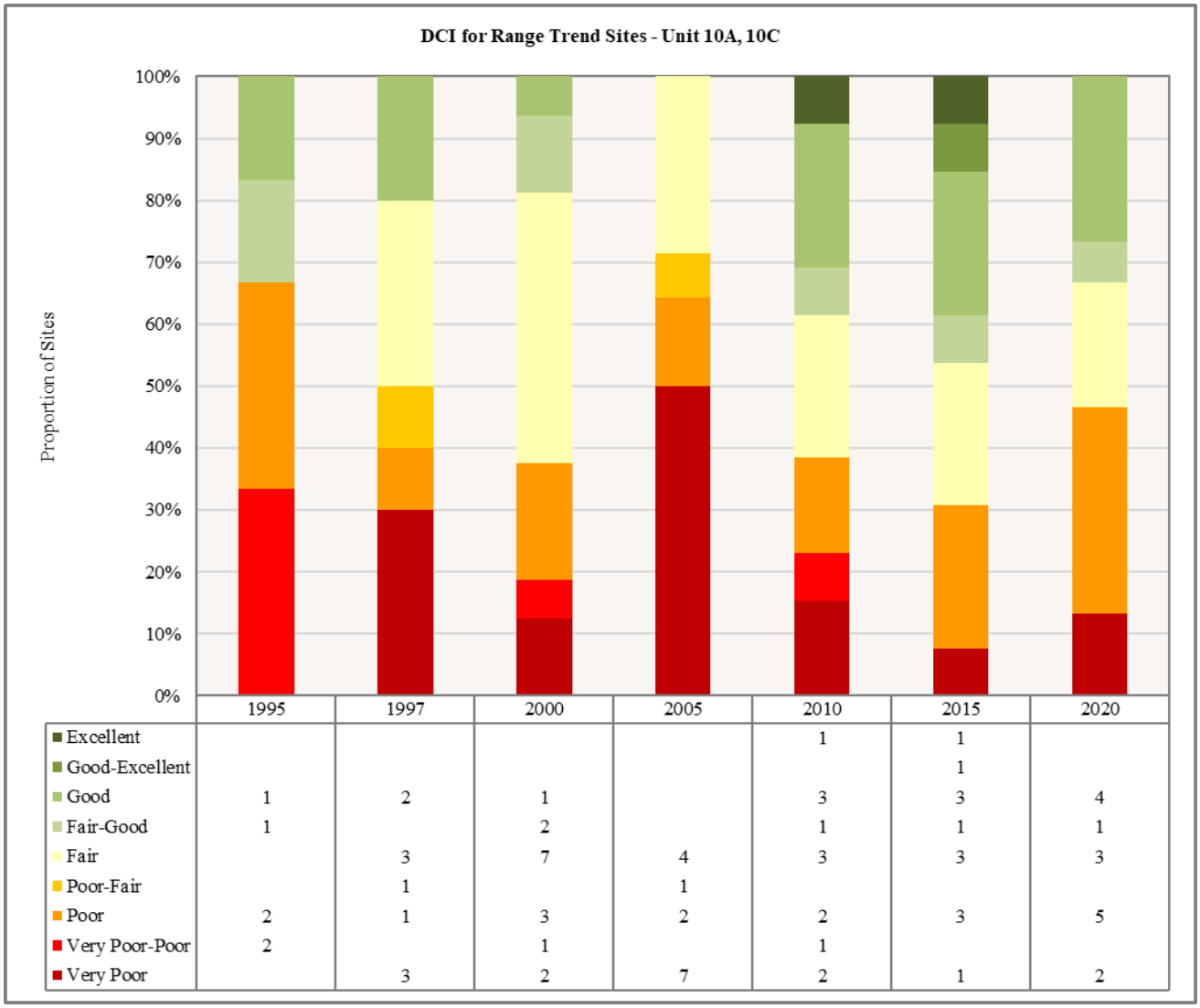


Figure 3.31: Average pellet transect data for Semidesert - Big Sagebrush study sites in WMU 10A, 10C, North Book Cliffs.

Deer Winter Range Condition Assessment

The condition of deer winter range within the North Book Cliffs management unit has a high amount of conditional disparities between sites. However, the unit as a whole has exhibited a slight improvement in averaged site conditions that have trended from poor in 1995 to poor-fair in 2020. Range Trend sites sampled within the unit that are consistently considered to be in very poor to poor condition include Indian Ridge (10-1), Monument Ridge (10R-7), and the McCook Ridge Livestock and Total Exclosures (10R-13 and 10R-14) but for differing reasons. Indian Ridge has remained in very poor condition due to a large amount of annual grass, while Monument Ridge has a lack of browse cover and sagebrush age class diversity. The McCook Ridge Exclosure studies' poor wintering conditions are due to both high annual grass cover and lack of sagebrush age class diversity. McCook Ridge Exclosure (10-2), Wolf Den (10-12), Indian Ridge 2 (10R-28), and Massey Junction (10R-29) all have average deer wintering conditions that are generally considered to be poor to poor-fair. McCook Ridge Chaining (10-3), Agency Draw (10-9), Sunday School (10-10), Two Water WMA (10R-4), Winter Ridge Exclosure Out (10R-9), Winter Ridge Livestock Exclosure (10R-10), and Winter Ridge Total Exclosure (10R-11) sites are all regularly found to be in fair condition for wintering deer, and are the drivers for improvement in wintering conditions across the unit. Sunday School has the highest degree of positive conditional change that ranges from very poor-poor to excellent wintering conditions: changes on this site are considered to be positive due to increases in preferred browse and perennial grass cover. However, annual grass is present on the Sunday School study and is increasing (**Figure 3.32**, **Table 3.10**).



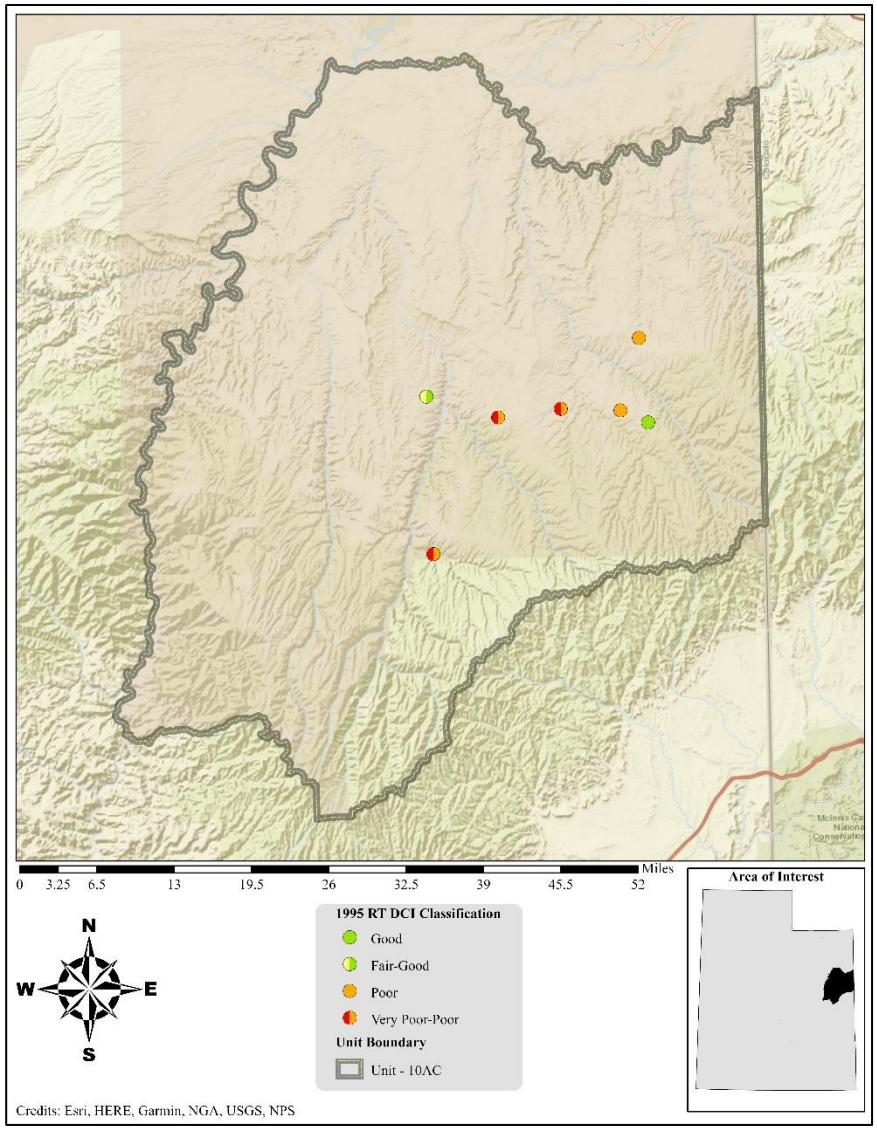
	1995	1997	2000	2005	2010	2015	2020
Excellent					1	1	
Good-Excellent						1	
Good	1	2	1		3	3	4
Fair-Good	1		2		1	1	1
Fair		3	7	4	3	3	3
Poor-Fair		1		1			
Poor	2	1	3	2	2	3	5
Very Poor-Poor	2		1		1		
Very Poor		3	2	7	2	1	2

Figure 3.32: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 10A, 10C, North Book Cliffs.

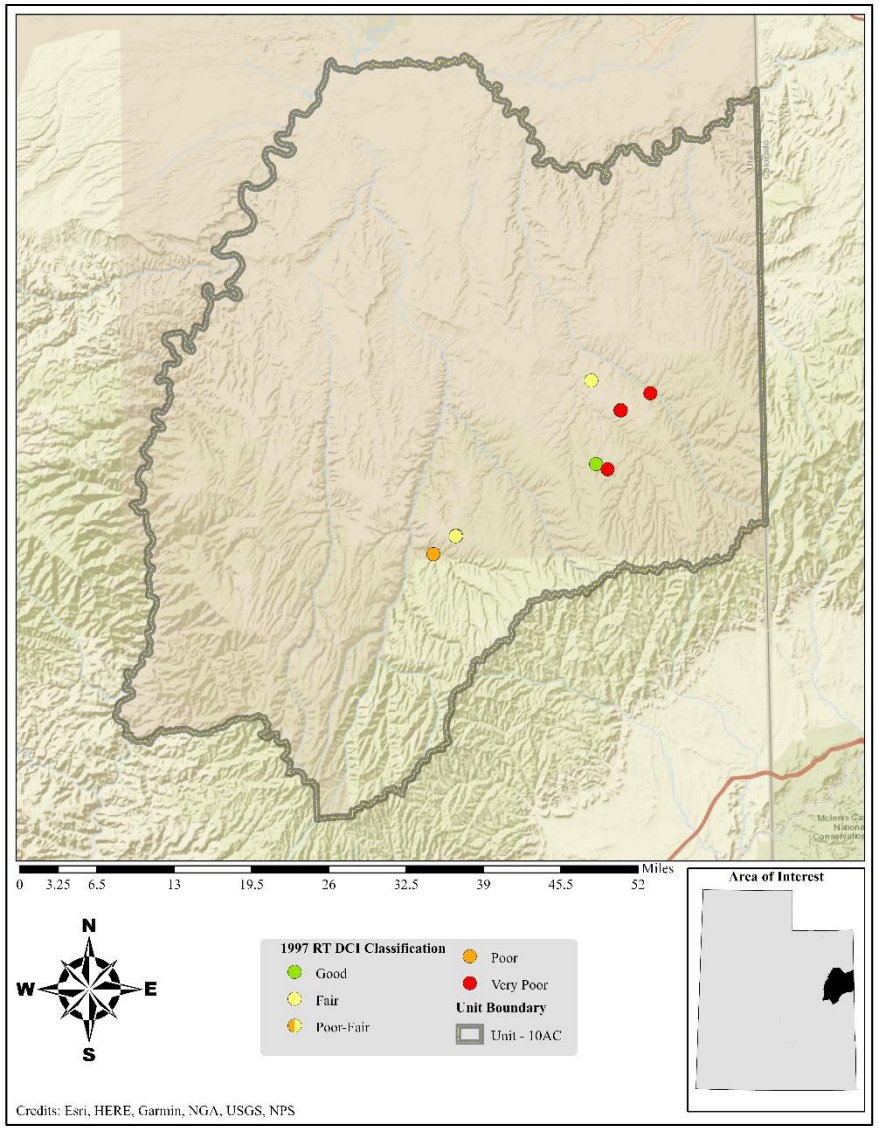
Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
10-01	1995	17.8	13.7	15	7.5	-20	1.3	0	**35.3**	**VP-P**
10-01	2000	15	9.9	7	16	-16.4	0.5	0	**31.9**	**VP**
10-01	2005	12	5.7	6	7.5	-20	1.7	0	**12.9**	**VP**
10-01	2010	16.8	9.1	6.1	9.6	-20	0.9	0	**22.5**	**VP**
10-01	2015	16.6	11.3	5	10.9	-20	2.1	0	**26**	**VP**
10-01	2020	23.5	8.1	2.3	7	-20	4.2	0	**25.1**	**VP**
10-02	1995	23.8	12.8	12.9	5.5	-11.8	2.2	0	**45.4**	**P**
10-02	1997	17.8	10.8	6.5	4.6	-4.1	2.8	0	**38.4**	**P**
10-02	2000	27.2	9.2	9.7	15.8	-3.1	5.1	0	**63.9**	**F-G**
10-02	2005	17.7	5.7	2.7	7	-10.2	2.1	0	**24.9**	**VP**
10-02	2010	19	10	15	8	-3.7	4.2	0	**52.4**	**F**
10-02	2015	22	9.7	14	12.5	-9.8	4.2	0	**52.5**	**F**
10-02	2020	18.6	8.4	9.2	10.7	-7.8	2.6	0	**41.7**	**P**
10-03	1995	15.1	14.5	15	24.3	0	6.4	0	**75.2**	**G**
10-03	2000	15.9	6.9	3.6	28.9	0	2.7	0	**58**	**F**
10-03	2005	10.4	9.6	1.4	24.7	0	1.8	0	**47.9**	**P**
10-03	2007	13.9	10.2	3.6	30	0	1.5	0	**59.2**	**F**
10-03	2009	15.5	0	0	30	0	2.9	0	**48.4**	**P**
10-03	2010	15.4	12.4	8.7	30	0	3.6	0	**70**	**F-G**
10-03	2015	18	12.1	1.6	30	0	6.8	0	**68.4**	**F-G**
10-03	2020	13.5	13.1	8.5	30	0	3.4	0	**68.5**	**F-G**
10-09	1995	14.2	11.1	13.9	11.9	-8.8	0.8	0	**43**	**F-G**
10-09	2000	12.7	6.6	11.7	11.6	-0.6	1	0	**43**	**F**
10-09	2005	9.5	3.2	5.8	17.6	-1.3	0.5	0	**35.4**	**F**
10-09	2010	10.7	10.2	15	11.2	-2	2.3	0	**47.4**	**G**
10-09	2015	12.6	11.5	15	7.4	-13.6	3.6	0	**36.5**	**F**
10-09	2020	13	12.7	15	11.6	-2.4	1.5	0	**51.3**	**G**
10-10	1995	15	8.7	11.5	3.6	-8	2.6	0	**33.4**	**VP-P**
10-10	2000	23.6	12.4	4.4	25	-0.4	6.4	0	**71.3**	**G**
10-10	2005	15.7	7.4	3.8	19.1	-0.2	3.6	0	**49.5**	**P-F**
10-10	2010	25.7	13.6	15	26.5	-0.6	2	0	**82.2**	**E**
10-10	2015	30	13.7	15	30	-3.5	1.1	0	**86.4**	**E**
10-10	2020	20.6	9.7	8.5	28	-6.6	1.1	0	**61.2**	**F**
10-12	1995	30	9.7	2.2	0.9	0	0	0	**42.8**	**P**
10-12	2000	30	3.7	3.4	4.2	0	0	0	**41.4**	**P**
10-12	2005	30	1.5	0.5	0.4	0	0.1	0	**32.5**	**VP**
10-12	2010	30	8.8	15	0.3	0	0.5	0	**54.6**	**F**
10-12	2015	30	11.6	15	0.3	0	0.3	0	**57.1**	**F**
10-12	2020	30	6.6	15	1.2	0	0.1	0	**52.8**	**F**
10-13*	1995	1.6	0	0	9.4	0	1.2	-2	**10.3**	**VP-P**
10-13*	1997	1.6	0	0	21.4	-0.3	0.2	-2	**20.8**	**P**
10-13*	2000	1.1	0	0	23.5	-0.7	0	0	**24**	**P-F**
10R-03*	1997	0	0	0	0	-20	0	0	**-20**	**VP**
10R-03*	2000	0	0	0	0.5	-17.7	0	0	**-17.2**	**VP**
10R-04	1997	28.5	13.4	10.6	10.7	-3	1.6	0	**61.8**	**F**
10R-04	2000	29.7	11.3	6.4	11.8	-0.1	1.8	0	**60.9**	**F**
10R-04	2005	30	8.7	2.7	12.8	0	2.1	0	**56.1**	**F**
10R-04	2010	30	12.8	3.5	23.8	0	2.5	0	**72.5**	**G**
10R-04	2015	30	12.6	4.5	30	-0.2	1.7	0	**78.6**	**G-E**
10R-04	2020	19.8	1.5	7.2	11.7	-0.2	2	0	**42**	**P**
10R-07	1997	0.8	0	0	25.4	0	8.4	0	**34.5**	**VP**
10R-07	2000	1.1	0	0	30	0	10	0	**41.1**	**VP-P**
10R-07	2005	1.6	0	0	30	0	4.7	0	**36.3**	**VP**
10R-07	2010	2.4	0	0	30	0	4.7	0	**37**	**VP**
10R-07	2015	3.4	0	0	30	0	8.7	0	**42.1**	**P**
10R-07	2020	5.1	0	0	30	0	9.1	0	**44.2**	**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
10R-09	1997	16.3	8	1.7	21.7	0	10	0	**57.6**	**F**
10R-09	2000	19.6	-0.3	4.2	30	0	10	0	**63.6**	**F**
10R-09	2005	11.8	2.6	1.3	30	0	7.3	0	**52.9**	**P**
10R-09	2010	12.1	4.9	12.1	28.6	0	8.6	0	**66.4**	**F**
10R-09	2015	13.9	10.2	8.1	30	0	10	0	**72.2**	**G**
10R-09	2020	18.1	8.5	15	30	0	10	0	**81.6**	**G**
10R-10	1997	17.8	6.4	2.8	29.5	0	9.2	0	**65.8**	**F**
10R-10	2000	20	8.7	5.3	30	0	4.3	0	**68.2**	**F-G**
10R-10	2005	19.9	4.3	1.9	30	0	6.3	0	**62.4**	**F**
10R-10	2015	19.8	11.5	3	30	0	10	0	**74.3**	**G**
10R-10	2020	21.3	9.3	5.6	30	0	10	0	**76.1**	**G**
10R-11	1997	24.3	7.9	2.9	30	0	7.7	0	**72.8**	**G**
10R-11	2000	25	-0.4	3.1	30	0	8.3	0	**66**	**F**
10R-11	2005	25.8	3.9	1.1	30	0	7	0	**67.7**	**F**
10R-11	2015	29.6	0.4	4.9	30	0	10	0	**75**	**G**
10R-11	2020	23.9	-1.8	2.9	30	0	10	0	**65**	**F**
10R-13	1997	27.7	10	11.1	4.8	-4.3	1.3	0	**50.5**	**P-F**
10R-13	2000	30.0	5.2	5.1	15.5	-3.6	1.5	0	**53.6**	**F**
10R-13	2005	20.0	2.9	2.2	9.6	-7.6	0.9	0	**28**	**VP**
10R-13	2010	18.5	11.2	13.7	2.5	-13.4	2	0	**34.5**	**VP-P**
10R-13	2020	21.0	6	5.3	3.5	-12.9	1.8	0	**24.6**	**VP**
10R-14	1997	29.8	10	6.2	1.1	-20	0.6	0	**27.8**	**VP**
10R-14	2000	30.0	5.9	4.2	2.3	-1.6	0.7	0	**41.5**	**P**
10R-14	2005	14.5	5.5	2.8	1	-17.7	0.2	0	**6.2**	**VP**
10R-14	2010	26.6	12.1	11.2	9.4	-20	1.9	0	**41.3**	**P**
10R-14	2020	20.0	2.1	4	29.1	-15	3.5	0	**43.7**	**P**
10R-16*	1998	11.2	13.9	15	30	-0.2	10	0	**79.9**	**G**
10R-28	1999	11.9	14	10.9	21.5	-18.4	1.2	0	**41**	**P**
10R-28	2011	29.1	14.4	10.6	30	-18.8	7.8	0	**73.1**	**G**
10R-28	2015	9.5	11.9	11.7	30	-20	1.5	0	**44.5**	**P**
10R-28	2020	8.6	6.1	10.5	23.9	-14	2.9	0	**37.9**	**P**
10R-29	1999	18.1	11.1	3.1	30	-5.4	2	0	**58.9**	**F**
10R-29	2005	10.1	7.9	3.9	4.7	-20	5.2	0	**11.8**	**VP**
10R-29	2010	10.7	12.1	9	9.7	-8.1	10	0	**43.4**	**P**
10R-29	2015	13.9	9.1	10.7	24.3	-17	6.5	0	**47.4**	**P**
10R-29	2020	25.4	14.1	15	12.9	-2.7	10	0	**74.7**	**G**

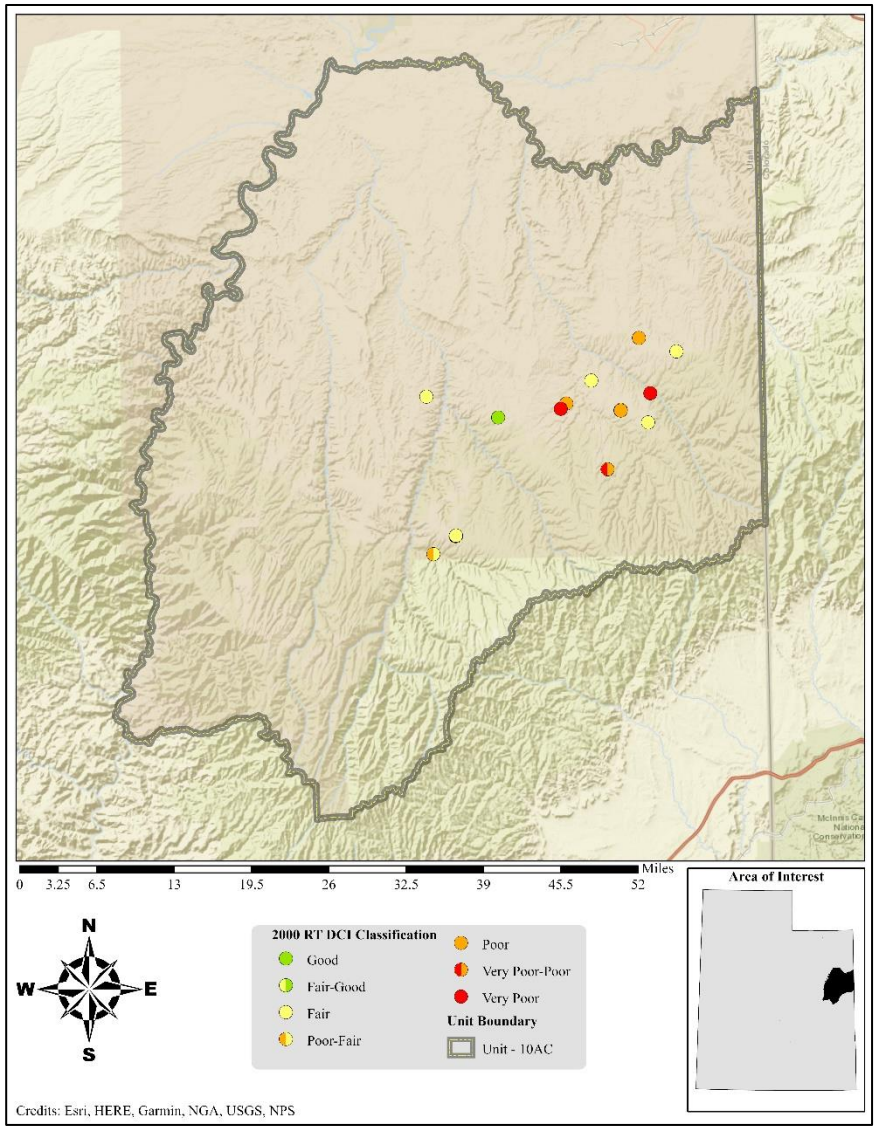
Table 3.10: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 10A, 10C, North Book Cliffs. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. *Studies with an asterisk have been suspended.



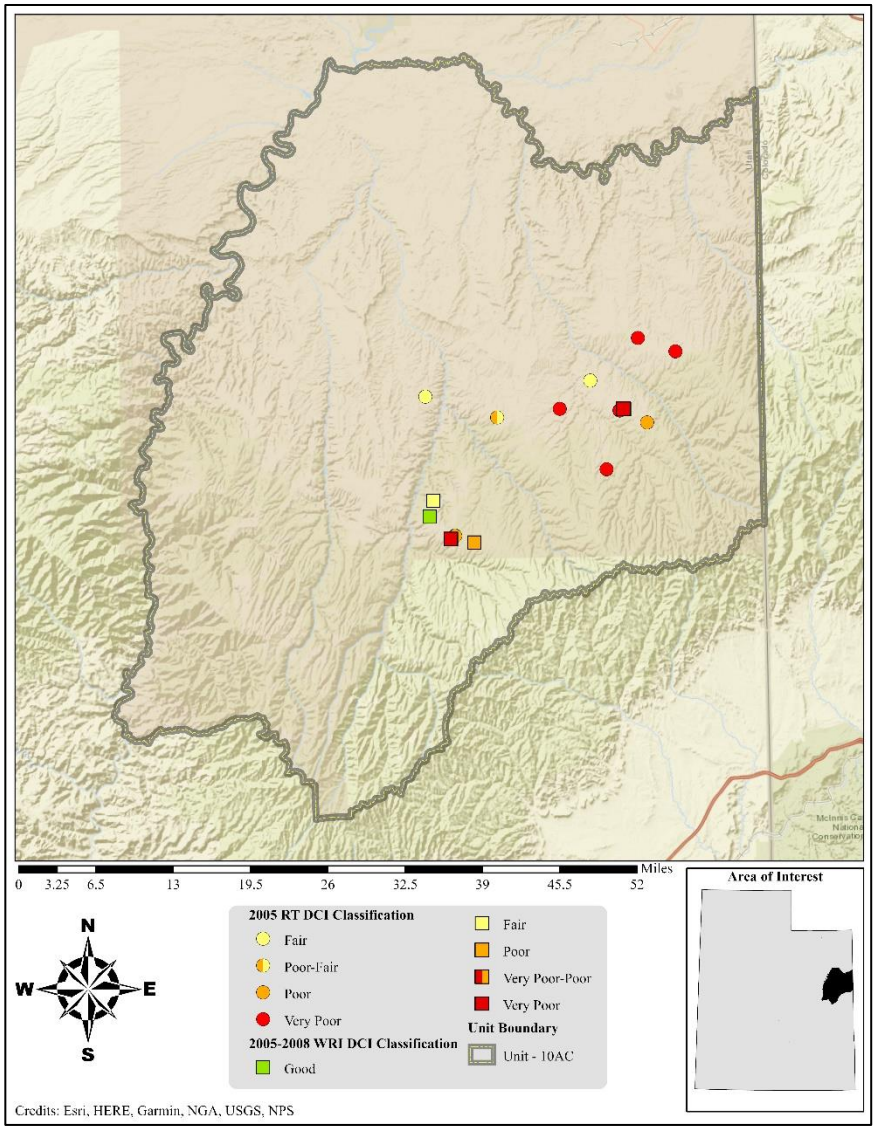
Map 3.10: 1995 Desirable Components Index (DCI) ranking distribution by study site for WMU 10A, 10C, North Book Cliffs.



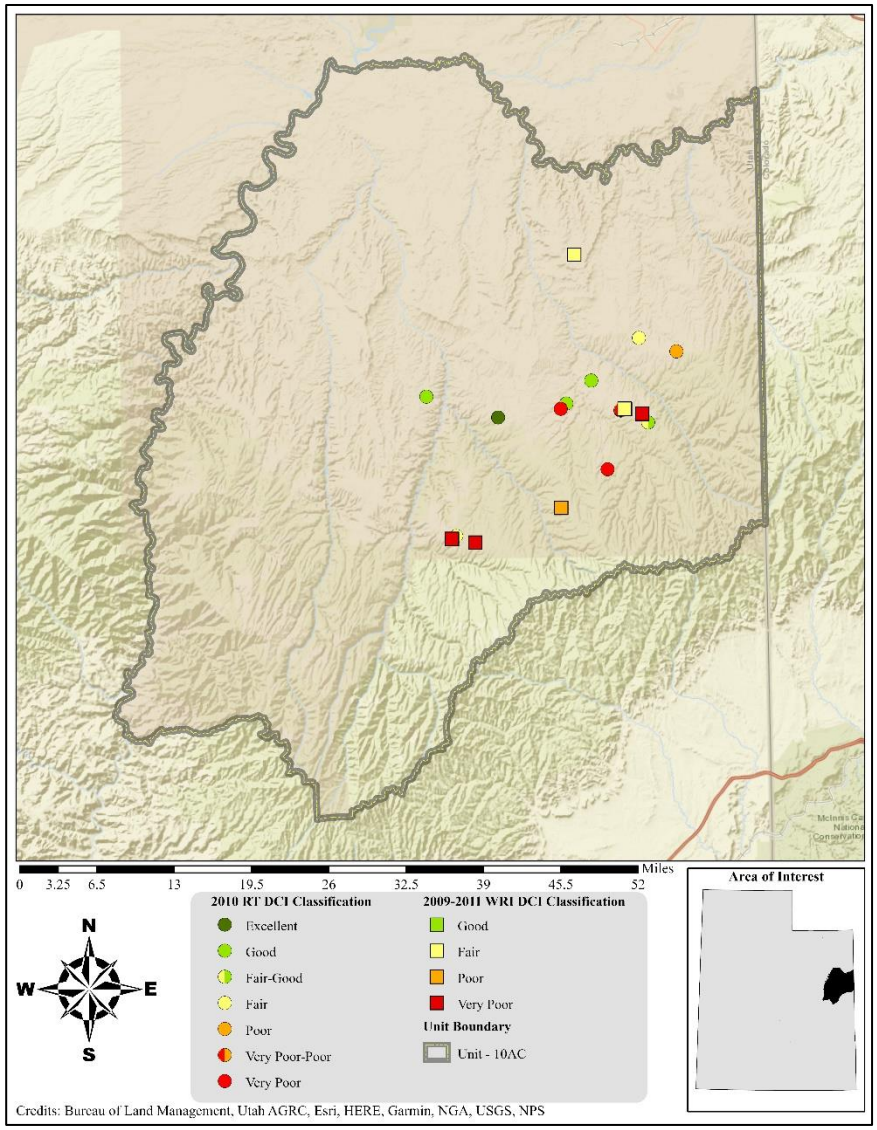
Map 3.11: 1997 Desirable Components Index (DCI) ranking distribution by study site for WMU 10A, 10C, North Book Cliffs.



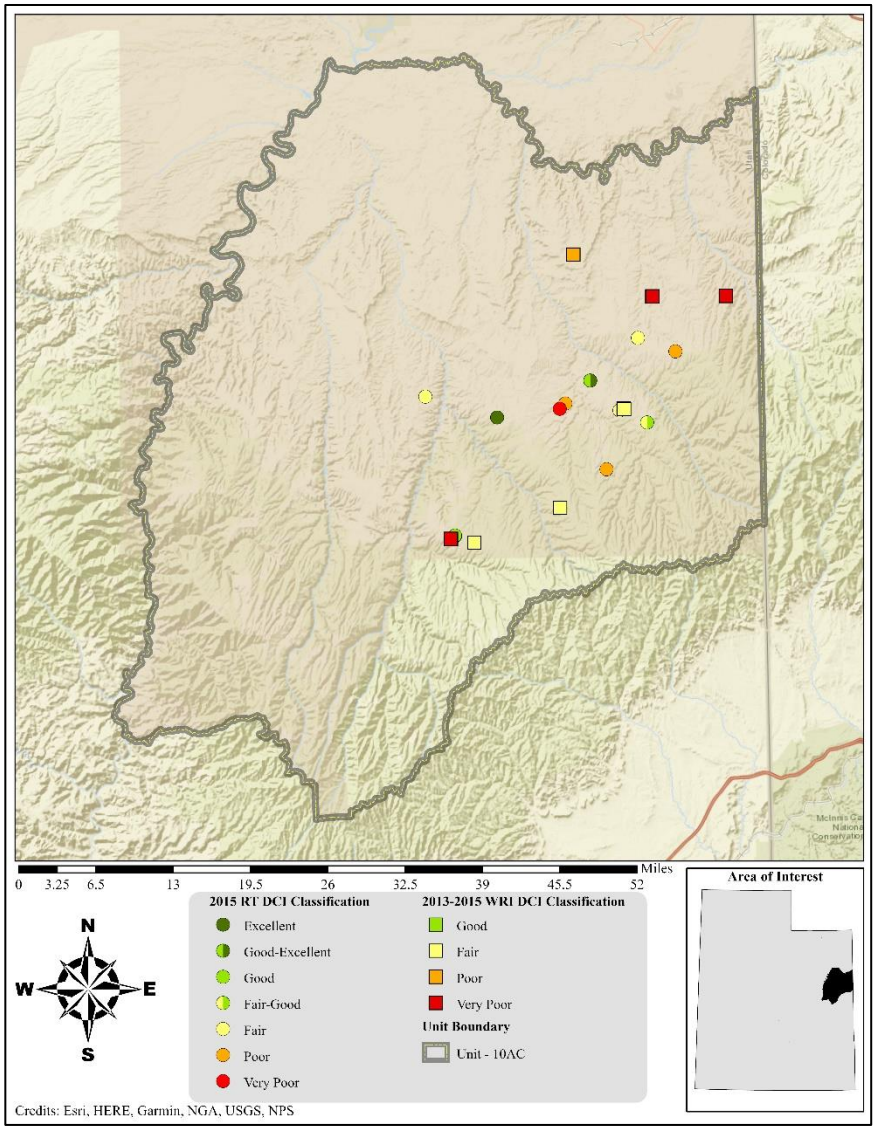
Map 3.12: 2000 Desirable Components Index (DCI) ranking distribution by study site for WMU 10A, 10C, North Book Cliffs.



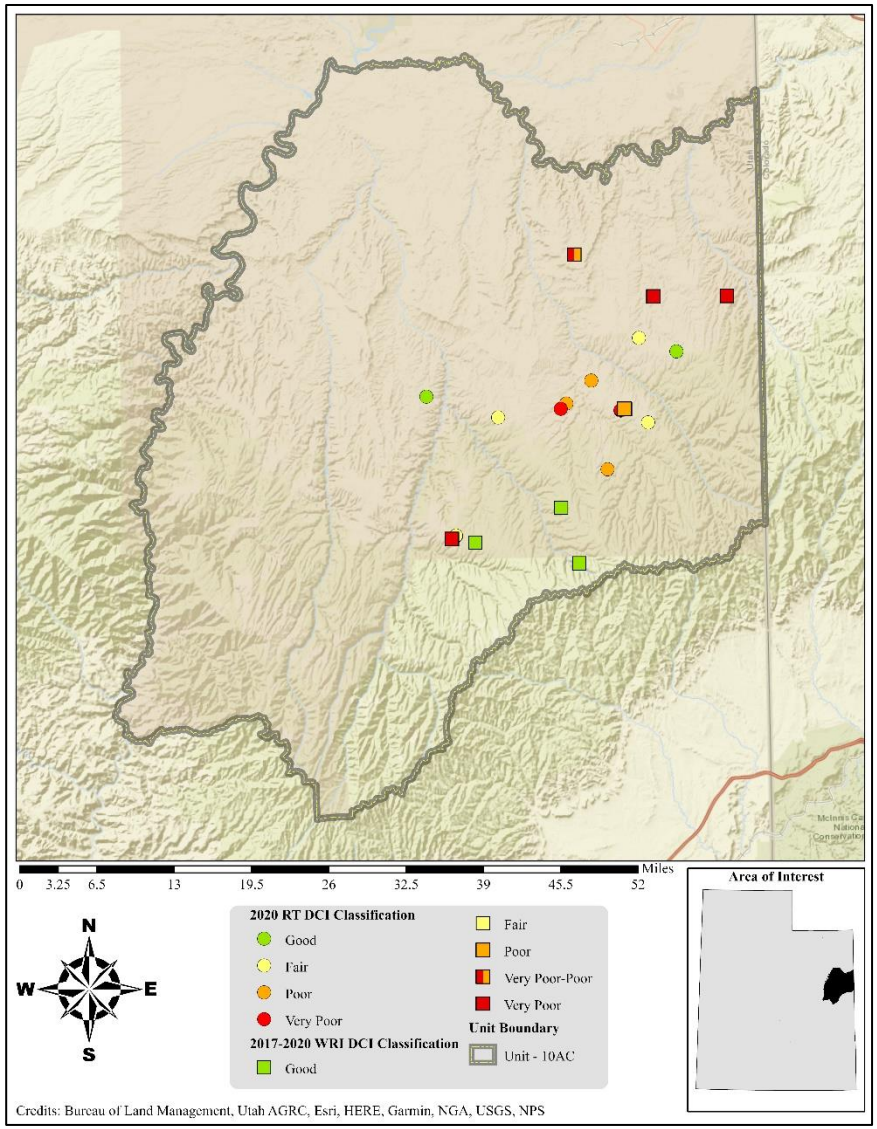
Map 3.13: 2005 Desirable Components Index (DCI) ranking distribution by study site for WMU 10A, 10C, North Book Cliffs.



Map 3.14: 2010 Desirable Components Index (DCI) ranking distribution by study site for WMU 10A, 10C, North Book Cliffs.



Map 3.15: 2015 Desirable Components Index (DCI) ranking distribution by study site for WMU 10A, 10C, North Book Cliffs.



Map 3.16: 2020 Desirable Components Index (DCI) ranking distribution by study site for WMU 10A, 10C, North Book Cliffs.

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
10-1	Indian Ridge	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
10-2	McCook Ridge Exclosure	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
10-3	McCook Ridge Chaining	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10-4	Wirefence Point	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10-5	Willow Flat	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
10-6	Little Jim Canyon	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10-7	Cherry Mesa	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10-8	Black Horse	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
10-9	Agency Draw	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Animal Use – Horse	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10-10	Sunday School	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
10-12	Wolf Den	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10-23	Bogart-She	Animal Use – Bison	High	Reduced diversity of desirable grass and forb species
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
10-24	Turner Canyon	Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
10-25	Little Ridge	Animal Use – Bison	High	Reduced diversity of desirable grass and forb species
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
10R-4	Two Water WMA	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-5	Lower Tom Patterson Point	Animal Use – Elk	High	Reduced understory shrub and herbaceous vigor
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-7	Monument Ridge	Energy Development	High	Fragmentation and degradation/loss of habitat
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-9	Winter Ridge Exclosure Out	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-10	Winter Ridge Livestock Exclosure	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-11	Winter Ridge Total Exclosure	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-13	McCook Ridge Livestock Exclosure	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
10R-14	McCook Ridge Total Exclosure	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
10R-15	Saddle Horse	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
10R-17	Railroad Canyon	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	Medium	Increased fire potential and reduced herbaceous diversity
10R-22	Rathole Ridge	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		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
10R-28	Indian Ridge 2	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Animal Use – Horse	Medium	Reduced diversity of desirable grass and forb species

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
10R-29	Massey Junction	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-32	PR Spring Total Exclosure	Energy Development	High	Fragmentation and degradation/loss of habitat
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
10R-33	PR Spring Livestock Exclosure	Energy Development	High	Fragmentation and degradation/loss of habitat
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
10R-34	PR Spring Exclosure Outside	Energy Development	High	Fragmentation and degradation/loss of habitat
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-36	Indian Springs Bullhog	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-39	Indian Springs Bullhog 2	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		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
10R-40	Indian Springs Bullhog 3	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-41	Winter Ridge Bullhog	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-42	Winter Ridge Bullhog 2	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-43	McCook Ridge Plateau Exclosure North	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-44	McCook Ridge Plateau Exclosure South	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
10R-45	McCook Ridge Plateau Exclosure Outside	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
10R-46	Seep Ridge Chaining	Energy Development	High	Fragmentation and degradation/loss of habitat
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-51	Archy Bench	Energy Development	High	Fragmentation and degradation/loss of habitat
		Annual Grass	High	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
10R-52	Seep Ridge Bullhog	Energy Development	High	Fragmentation and degradation/loss of habitat
		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
10R-53	Moon Ridge	Energy Development	High	Fragmentation and degradation/loss of habitat
		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
10R-57	Rector Ridge	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
10R-61	Augusi Ridge	PJ Encroachment	High	Reduced understory shrub and herbaceous vigor
10R-65	Horse Ridge 2	Energy Development	High	Fragmentation and degradation/loss of habitat
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor

Table 3.11: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 10A, 10C, North Book Cliffs. 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

High Mountain (Aspen)

This high-elevation mountain ecological site supports an aspen community and is considered to be in generally good condition for deer and elk summer range habitat on the North Book Cliffs management unit. This study site, Little Ridge, supports a diverse herbaceous understory that provides valuable forage during the summer months. Although the herbaceous understory is generally good, introduced perennial grass species are present in moderate amounts. These grass species provide valuable forage, but can be aggressive at higher elevations and may have the potential to lead to a reduction in prevalence and abundance of other more desirable native grass and forb species. Finally, pellet transect data shows that high bison use could possibly be occurring on

this site. Bison use above what areas of this ecological type can support may have the potential to lead to reduced diversity and abundance of the herbaceous understory.

Continued monitoring of this community is recommended. Closer examination of the study site and surrounding area is also recommended, as it may help determine whether or not high bison use is occurring throughout the localized area. If the ecological integrity of the herbaceous understory is deemed to be threatened, reseeding might be advisable. However, care should be taken in species selection and preference should be given to native grass and forb species when possible.

Mountain (Big Sagebrush)

These higher elevation mountain ecological sites which support sagebrush are considered to range from being in poor to good condition for deer summer and winter range habitat on this unit. These communities support robust shrub populations that provide valuable browse for wildlife. Varying amounts of introduced perennial grasses are present on all sites except those that are part of the Winter Ridge Exclosure complex. These grass species provide valuable forage, but can often be aggressive at higher elevations and can reduce the prevalence and abundance of other more desirable native grass and forb species. In addition, encroachment of pinyon and juniper poses a low-level threat on all studies except for the Railroad Canyon site. Annual grasses, namely cheatgrass, are also present on the Willow Flat, Cherry Mesa, Railroad Canyon, and Rathole Ridge studies. Although the threat is currently low, cheatgrass could increase fuel loads and exacerbate the risk of wildfire should it increase in future sample years.

Energy development may pose a threat to the Monument Ridge study, which is located within one mile of oil/gas developments. This development can lead to reduced vigor of shrubs and herbaceous species as well as potential fragmentation and degradation of habitat.

Pellet transect data indicates that high use by elk may be occurring on the Lower Tom Patterson Point site. In addition, high cattle use may be happening on the Railroad Canyon and Rathole Ridge studies. Heavy animal use has the potential to lead to reduced vigor and diversity of shrubs and herbaceous species.

Further investigation on the Lower Tom Patterson Point, Railroad Canyon, and Rathole Ridge sites and the surrounding areas is recommended, as it may help determine if high elk and cattle use are occurring throughout the localized area. In addition, introduced perennial grasses may need to be managed on the sites where they are present if ecological integrity is deemed to be threatened. 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. Pinyon and juniper encroachment does not pose an immediate threat on any of these sites. However, tree-removing treatments (e.g. lop and scatter, chaining, bullhog, etc.) may be advisable if cover and density increase in the future. Finally, treatments to manage annual grass on the Willow Flat, Cherry Mesa, Railroad Canyon, and Rathole Ridge studies may be beneficial should there be future increases in cover and abundance.

Mountain (Browse)

These high elevation mountain browse communities are generally considered to be in good condition for deer summer range habitat on the unit. These communities support shrub populations that provide valuable browse for wildlife. Although conditions are generally good, introduced perennial grasses pose a low to high-level threat to the understories of all studies except for the Black Horse site. These grass species provide valuable forage, but can often be aggressive at higher elevations and may lead to reduced prevalence and abundance of other more desirable native grass and forb species. The studies within the PR Springs Exclosure complex are also located within one mile of oil/gas developments. This development can lead to reduced vigor of shrubs and herbaceous species as well as potential fragmentation and degradation of habitat. In addition, annual grasses, namely cheatgrass, have been observed within the herbaceous understories on the Black Horse and Saddle Horse sites. Increased amounts of annual grasses may lead to increased fuel loads, altered wildfire regime, and reduced resiliency of the vegetation within the ecotype. Pinyon and juniper encroachment pose a

low-level threat on the Black Horse and PR Spring Exclosure Outside studies and a medium-level threat on the Saddle Horse site. Higher amounts of encroachment of pinyon and juniper trees may have the potential to reduce understory shrub and herbaceous health if not addressed. Finally, pellet transect data suggests that high cattle usage may be occurring on the Black Horse study. Cattle use above what sites of this ecotype can support may lead to reduced diversity of desirable grass and forb species within the herbaceous understory.

Closer examination of the Black Horse study and the surrounding area is recommended as it may help determine if high cattle use is occurring throughout the localized area. When and if necessary, work to prevent and/or reduce pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should begin in some of these communities. If reseeding is deemed necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native grass species when possible. Treatments to reduce annual grasses may be prudent in some areas if abundance and/or cover increases in the future.

Mountain (Basin Wildrye)

These high-elevation basin wildrye communities are generally considered to be in good condition for deer summer range habitat on the North Book Cliffs unit. These communities support plentiful herbaceous understories that provide valuable forage during the summer months. Introduced perennial grasses are present in the herbaceous understories of both study sites. While providing valuable forage, these grass species can often be aggressive at higher elevations and may reduce the prevalence and abundance of other more desirable native grass and forb species. The introduced annual grass species cheatgrass has also been observed on the Turner Canyon study. Although abundance is currently very low, annual grasses can increase fuel loads and may exacerbate the risk of wildfire if they increase in the future. According to pellet transect data, high bison usage may be occurring on the Bogart-She study site. When bison utilization occurs above the levels that sites of this ecotype can support, the result could possibly be a reduction in the diversity and abundance of desirable grass and forb species.

Further investigation on the Bogart-She study site and surrounding areas is advised, as it may aid in determining if high bison usage is occurring throughout the localized area. It is recommended that monitoring of these communities continue. If reseeding is necessary to restore herbaceous species and ecological integrity, care should be taken in species selection and preference should be given to native grass and forb species when possible. Monitoring of annual grasses on the Turner Canyon site should continue in the future.

Upland (Big Sagebrush)

These mid-elevation upland sagebrush communities range from very poor to fair condition for deer winter range habitat on the unit. These communities support robust shrub populations that provide valuable browse in mild and moderate winters. Annual grasses, primarily cheatgrass, are an issue on all four study sites. High amounts of cheatgrass can increase fuel loads and may exacerbate the threat of wildfire in the affected communities. Although the threat posed is currently low, pinyon-juniper encroachment is occurring on the McCook Ridge Exclosure and Wolf Den studies. Continued tree encroachment may lead to deteriorations in understory shrub and herbaceous health in the future if not addressed. In addition, introduced perennial grasses present a medium-level threat on the McCook Ridge Exclosure site. These grasses provide important forage, but can be aggressive at higher elevations, leading to reduced abundance and diversity of other more desirable native forbs and grasses.

Although pinyon and juniper populations are small in these communities, it is recommended that work to prevent further pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should begin when and where deemed appropriate. Treatments to reduce annual grasses such as herbicide or changes in grazing management may be necessary on studies where they pose a high-level threat. If reseeding is implemented on sites where it is considered to be appropriate, species selection should be performed with care with preference given to native species whenever possible.

Upland (Black Sagebrush)

The mid-elevation study site Two Water WMA supports a black sagebrush community and is considered to be in poor condition for deer winter range habitat on this unit. In general, communities of this ecotype support robust shrub populations that provide valuable browse in mild and moderate winters. Annual grass, primarily cheatgrass, is an issue on this study site. Although cheatgrass is rare as of 2020, abundance and cover have been moderate in the past. Higher amounts of cheatgrass can increase fuel loads and exacerbate the threat of wildfire in the affected communities. Threat of pinyon-juniper encroachment is currently low, but continued encroachment may lead to reduced understory shrub and herbaceous health in the future if not addressed.

Treatments to reduce annual grass may be necessary should it increase in the future. Although pinyon and juniper populations are small in these communities, commencement of work to prevent further pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) may be advisable. However, care should be taken so as to select a treatment type that will not increase annual grass loads.

Upland (Fourwing Saltbush)

The mid-elevation upland study sites that are classified as fourwing saltbush communities range from very poor to good condition for deer winter range within the North Book Cliffs management unit. These communities often support shrub populations that include fourwing saltbush, prairie sagewort, and winterfat (among others): these species provide valuable browse in mild and moderate winters. Annual grasses, primarily cheatgrass, are a significant component of the herbaceous understories of these study sites. Increased amounts of cheatgrass can increase fuel loads and have the potential to alter wildfire regime. If wildfire occurs within these communities, they lose most of their value as deer winter range and reestablishment of valuable browse species is typically slow. Pinyon and juniper encroachment currently present a minor threat on the Indian Ridge and Massey Junction studies. Continued tree encroachment may lead to reduced understory shrub and herbaceous health over time if not addressed. Finally, pellet transect data indicates that high use by cattle may be occurring on the Indian Ridge and Indian Ridge 2 studies. Furthermore, moderate horse use may also be happening on the Indian Ridge 2 site. Higher levels of utilization by these animals may lead to reduced abundance and diversity of desirable grass and forb species.

Further investigation on the Indian Ridge and Indian Ridge 2 studies and the surrounding areas is recommended, as it may help determine if high cattle and horse usage are occurring throughout the localized area. Treatments to reduce annual grass may be beneficial on these sites: work to diminish fuel loads and create fire breaks can help reduce the risk of catastrophic wildfire. Although pinyon and juniper populations are small in the communities where they are present, it is recommended that monitoring continue. Work to prevent further pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) may be appropriate in the future when and where it is deemed necessary.

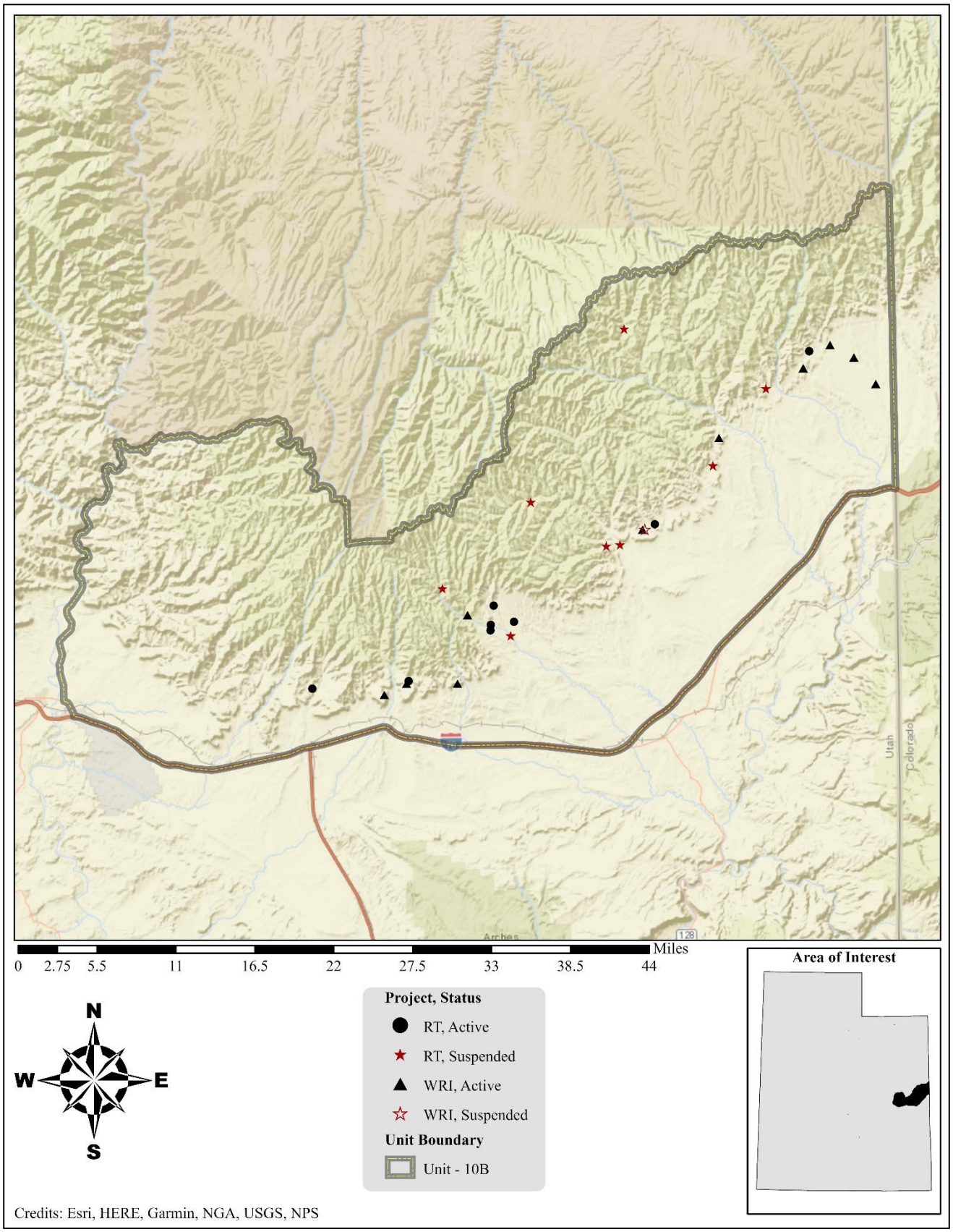
Semidesert (Big Sagebrush)

This lower elevation semidesert sagebrush community is considered to be in good condition for deer winter range on the North Book Cliffs unit. The vegetation community on this site supports a sagebrush population that provides valuable browse in mild to moderate winters. Annual grasses, primarily cheatgrass, have been present in previous sample years in high amounts. Higher amounts of annual grasses increase fuel loads and may exacerbate the risk of wildfire. If wildfire occurs within communities of this ecotype, they lose much of their value as deer winter range and valuable browse species are typically slow to reestablish. In addition, pellet data suggests that high use by horses could be occurring, presenting a medium-level threat to the diversity and abundance of the herbaceous understory. Although the threat posed is currently low, pinyon and juniper encroachment is also occurring on this site. Over time, increases in pinyon and juniper can lead to reduced understory shrub and herbaceous health.

As the pinyon and juniper population on this site is small, further monitoring is recommended; work to prevent and/or reduce tree encroachment may be beneficial in the future if deemed necessary. Treatments to reduce annual grass may be advisable if abundance and/or cover increase in future years. Finally, closer examination

of the Agency Draw study site is recommended, as it may help determine if high horse usage is occurring throughout the localized area.

4. WILDLIFE MANAGEMENT UNIT 10B – SOUTH BOOK CLIFFS



WILDLIFE MANAGEMENT UNIT 10B – SOUTH BOOK CLIFFS

Boundary Description

Grand County - Boundary begins at the Utah-Colorado state line and the summit and drainage divide of the Book Cliffs; west along this summit and drainage divide to Diamond Ridge; southwest along Diamond Ridge and the Book Cliffs summit (north-south drainage divide) to the Uintah and Ouray Indian Reservation boundary (Hells Hole/head of Sego Canyon); west along this boundary to the Green River; south along the Green River to Swasey boat ramp and Hastings Road; south along Hastings Road to State Route (SR)-19; south and east along SR-19 to exit 164 of I-70; east along I-70 to the Utah Colorado state line; north along this state line to the summit and drainage divide of the Book Cliffs.

Management Unit Description

Geography

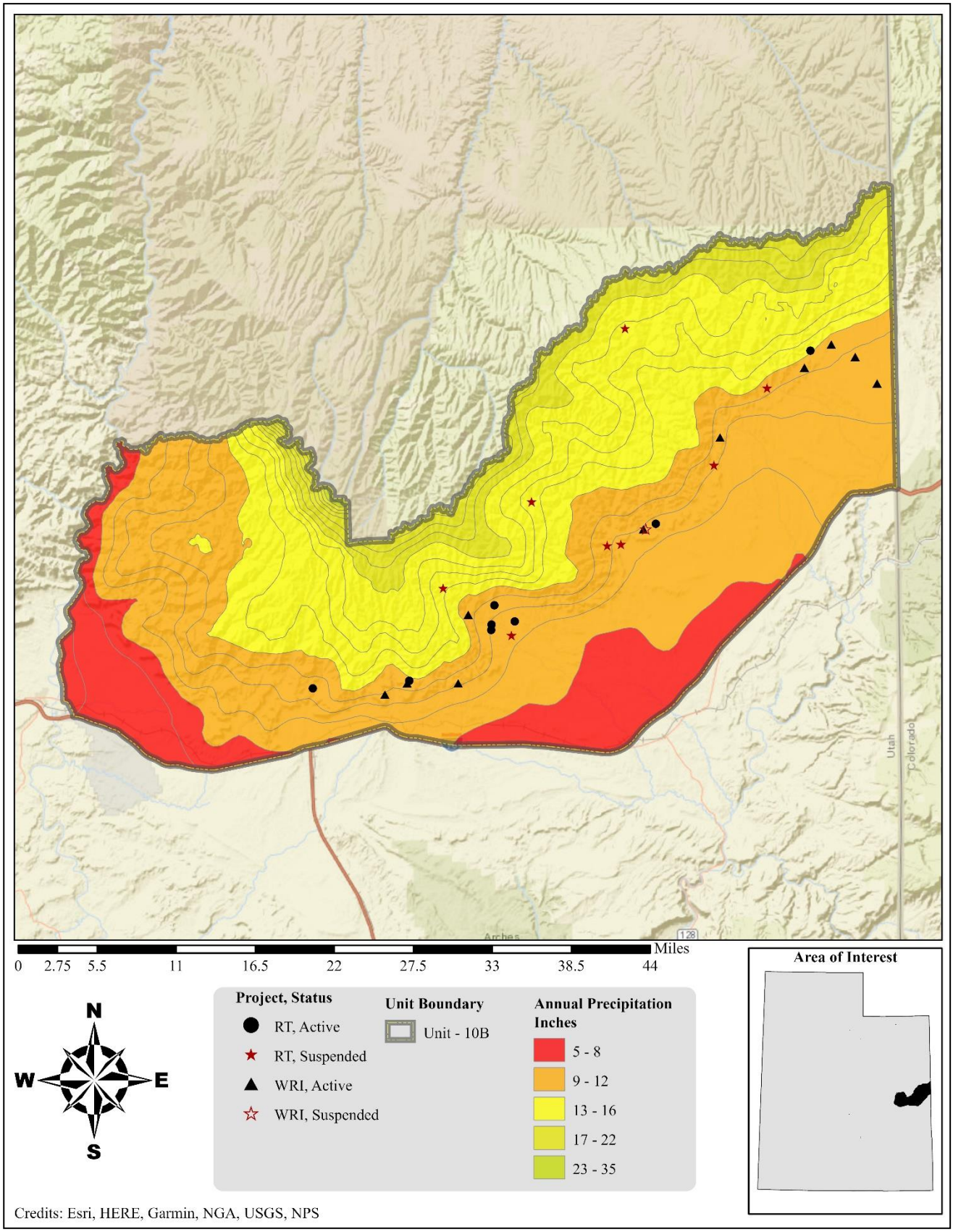
The maximum elevation in the South Book Cliffs unit is just over 9,000 feet. Terrain in higher elevations is typically steep and rough. Desolation and Gray Canyons fall partially within the westernmost portions of unit 10B, and numerous other canyons are located throughout. Parts of the city of Green River and the small town of Thompson Springs are within the boundaries of this unit. Pictographs and petroglyphs can also be found in this management unit.

Climate Data

The 30-year (1981-2010) annual precipitation PRISM model shows precipitation ranges from 6 inches in the most western portion of the unit to 22 inches along the unit 10AC-10B boundary line near Hill Creek and Roan Peaks. All of the Range Trend and WRI monitoring studies on the unit occur within the 10-15 inch precipitation zone (**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 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, 2018, and 2020. The mean annual PDSI displayed moderately to extremely wet years from 1983-1985, 2005, and 2019 (**Figure 4.1a**). The mean spring (March-May) PDSI displayed moderate to extreme drought in 1989-1991, 1996, 2002-2004, 2012-2013, and 2018; moderately to extremely wet years 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, 2017, and 2020; moderately to extremely wet years were displayed in 1983-1985, 1997, 2013, and 2019 (**Figure 4.1b**) (Time Series Data, 2020).



Map 4.1: The 1981-2010 PRISM Precipitation Model for WMU 10B, South Book Cliffs (PRISM Climate Group, Oregon State University, 2013).

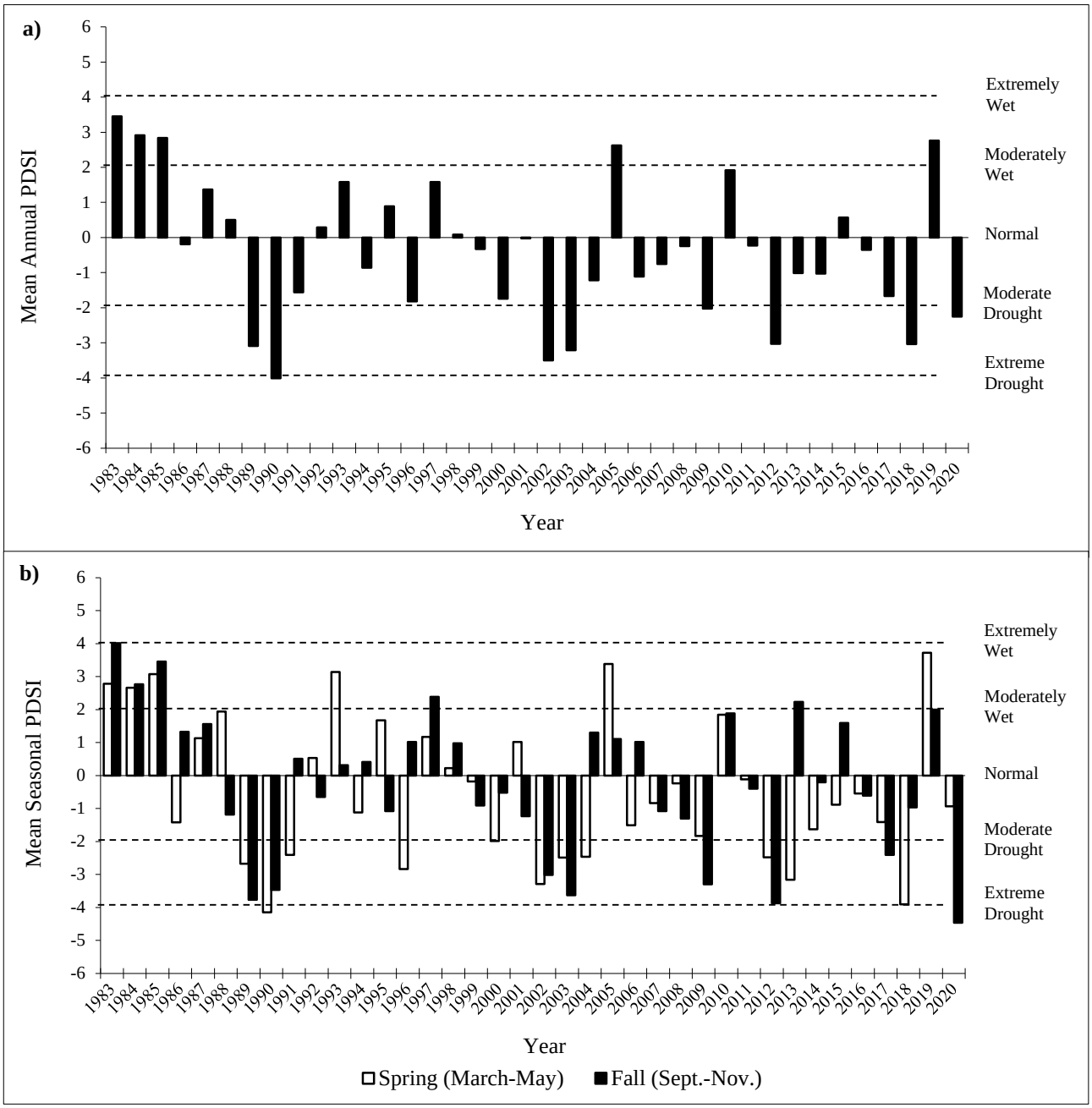


Figure 4.1: The 1983-2020 Palmer Drought Severity Index (PDSI) for the Southeast division (Division 7). The PDSI is based on climate data gathered from 1895 to 2020. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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

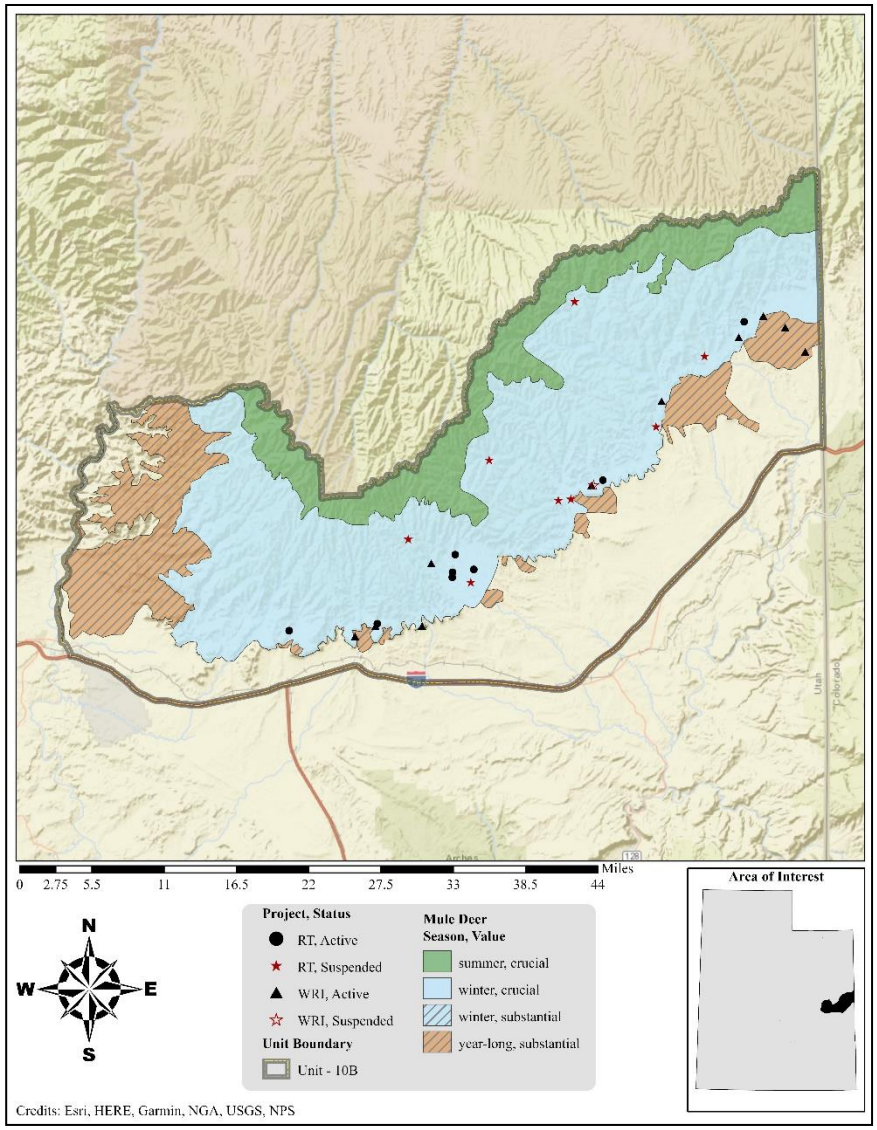
In total, mule deer range in the South Book Cliffs management unit is estimated at nearly 570,000 acres with 102,401 acres classified as year-long range, 364,342 acres of this classified as winter range, and 103,342 acres classified as summer range (**Table 4.1**, **Map 4.2**).

A majority of year-long mule deer range is managed by the Bureau of Land Management (BLM) at 77%. Private landownership comprises 13% of year-long range, and 9% is administrated by the Utah School and Institutional Trust Lands Administration (SITLA). The BLM also owns a majority (82%) of the summer range, 16% is managed by SITLA, and 1% belongs to private landowners while the remainder is tribal or Utah Division of Wildlife Resources (UDWR)-managed land. Finally, the BLM also manages 86% of the winter range, SITLA owns 10%, 3% is privately owned, and less than 1% is managed by the UDWR (**Table 4.2**, **Map 4.2**, **Map 4.7)**. Of the elk winter range, 86% is administered by the BLM, 11% is managed by SITLA, 3% is privately owned, and less than 1% is tribal land (**Table 4.3**, **Map 4.3**, **Map 4.7**).

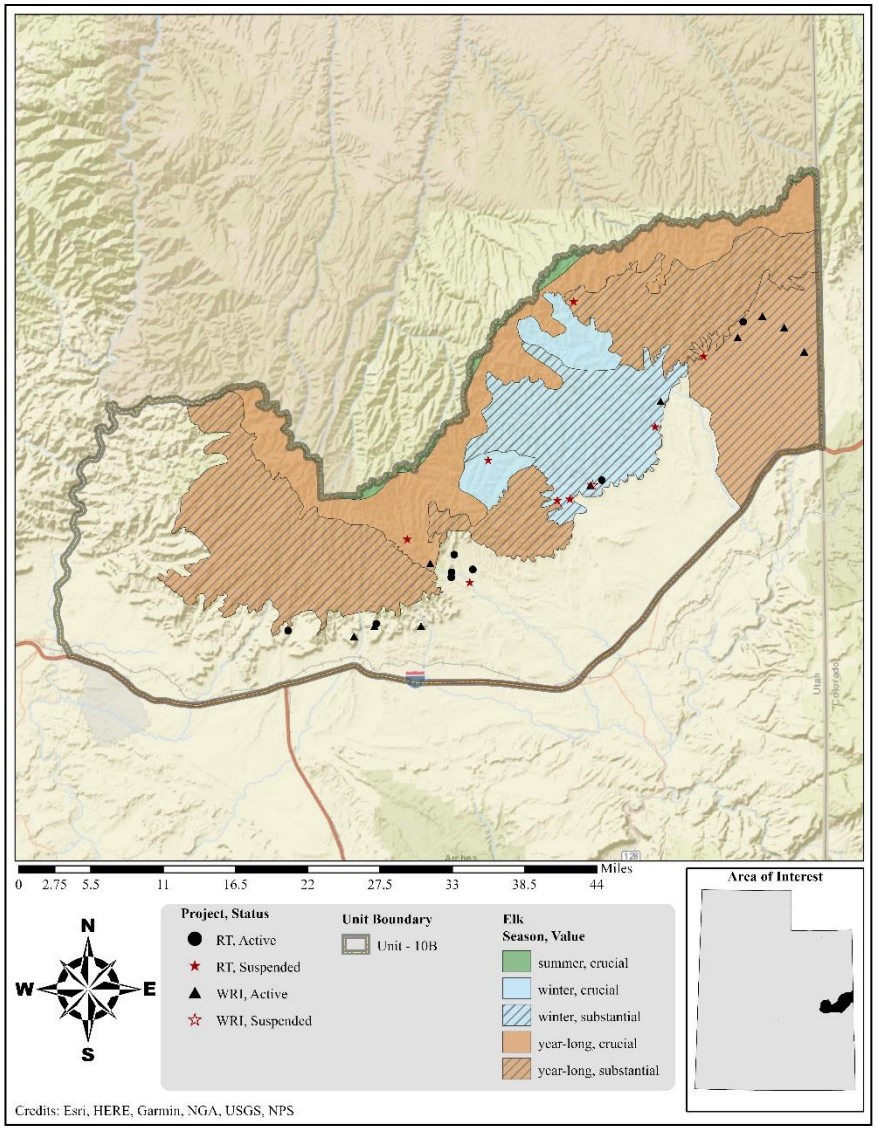
According to Landfire Existing Vegetation Coverage models, shrublands comprise nearly 50% of the unit. The unit consists of just over 5% of combined sagebrush shrublands and steppe type habitats that are key to mule deer, while combined saltbush and mixed salt desert scrub type habitat comprises 28% of the unit's land coverage (**Table 4.7**).

With a maximum elevation of just over 9,000 feet, the unit contains only small amounts of fawning areas and summer range, with few deer residing in the unit year-round. However, many deer that spend the summer on higher ranges in the northern portion (Unit 10AC) migrate annually to winter ranges in the southern portion (Unit 10B) of the unit. Terrain between the higher summer ranges and lower winter ranges to the south is steep and rugged, and is used primarily as a travel corridor with limited migration occurring over a short period of time.

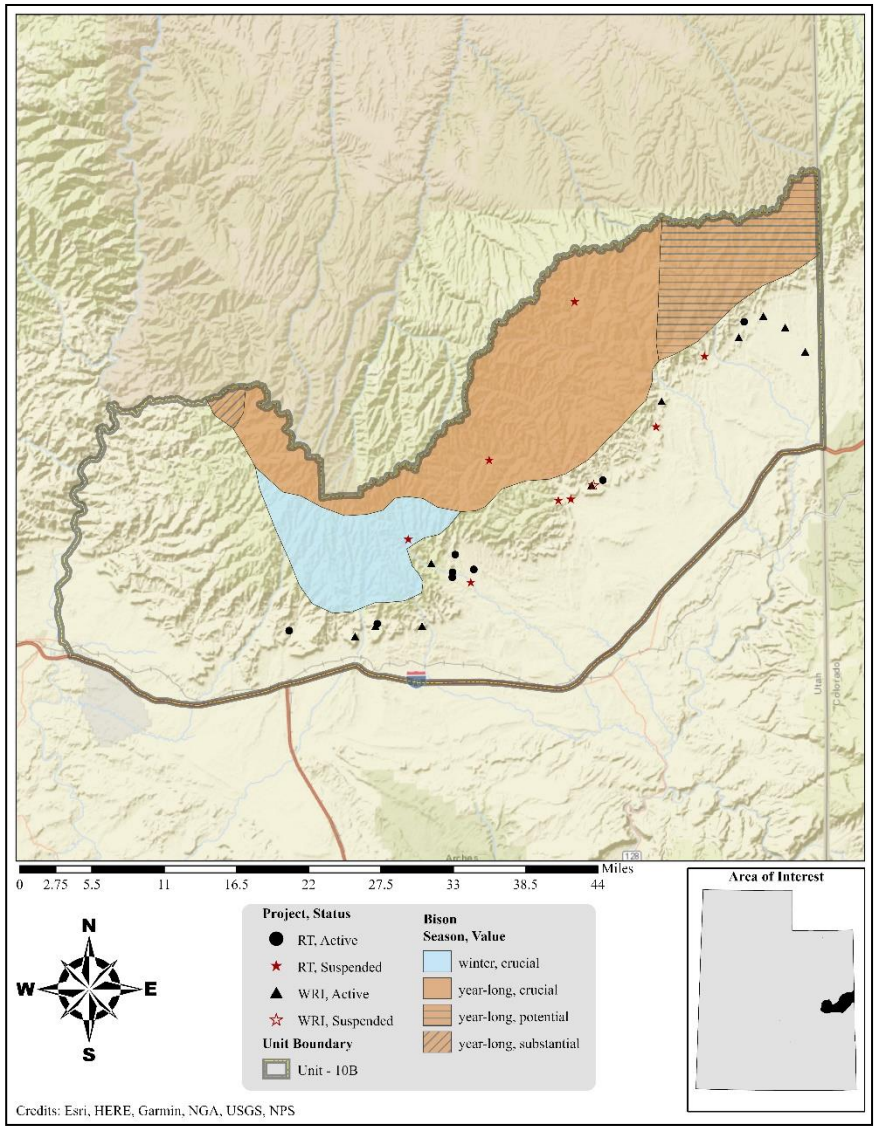
The upper limits of the normal winter range are found normally between 8,000 and 8,500 feet, depending on the slope and exposure. During severe winters the upper limits are usually lowered to about 7,000 feet. The lower limits of the winter range are bordered by the salt desert communities at approximately 5,000 feet. There are concentrations of wintering deer at Horse Pasture, Nash Wash, Cottonwood Ranch, and the Pear Park area.



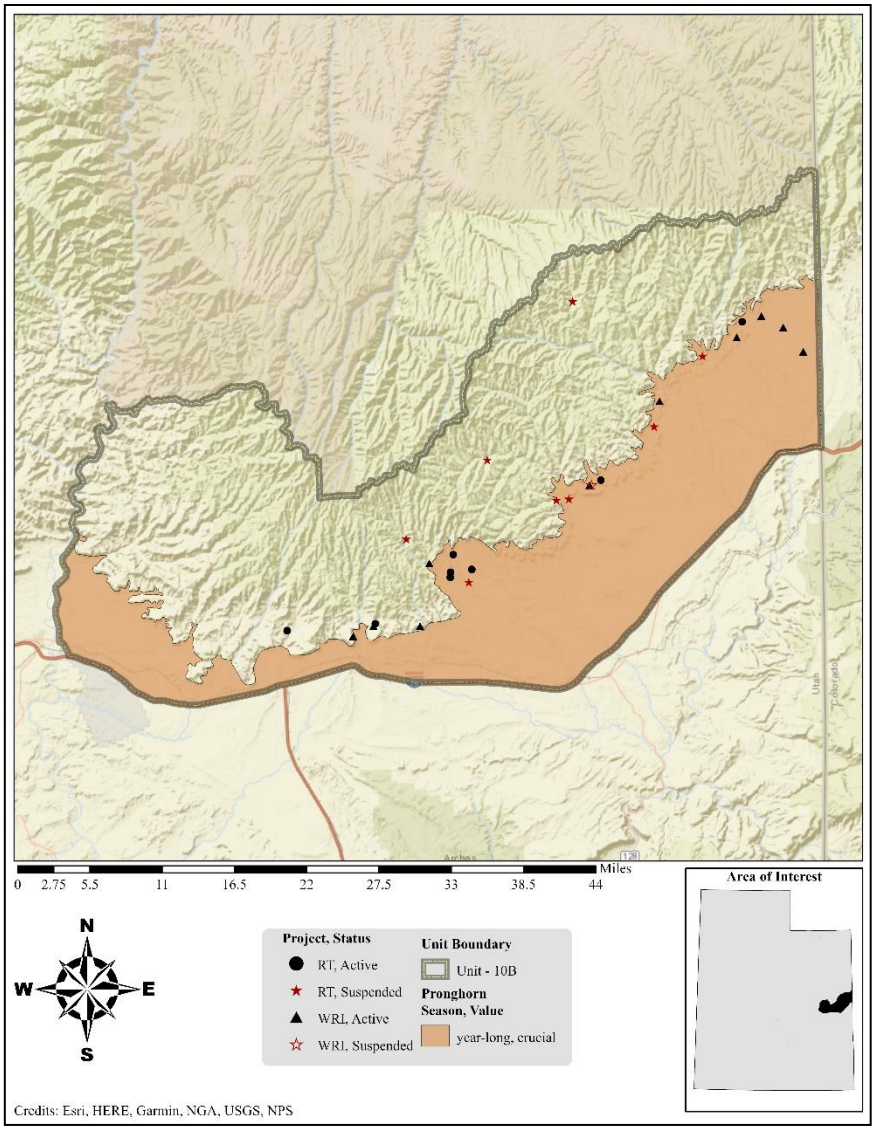
Map 4.2: Estimated mule deer habitat by season and value for WMU 10B, South Book Cliffs.



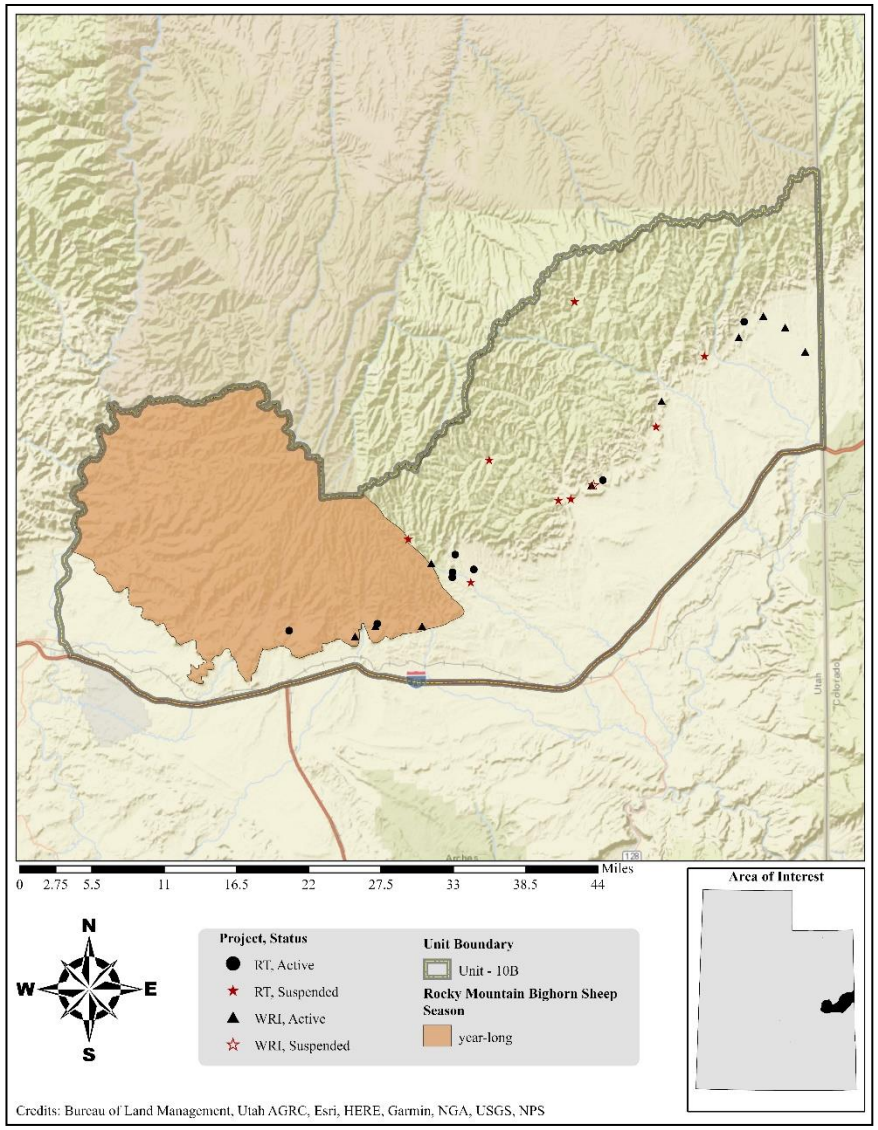
Map 4.3: Estimated elk habitat by season and value for WMU 10B, South Book Cliffs.



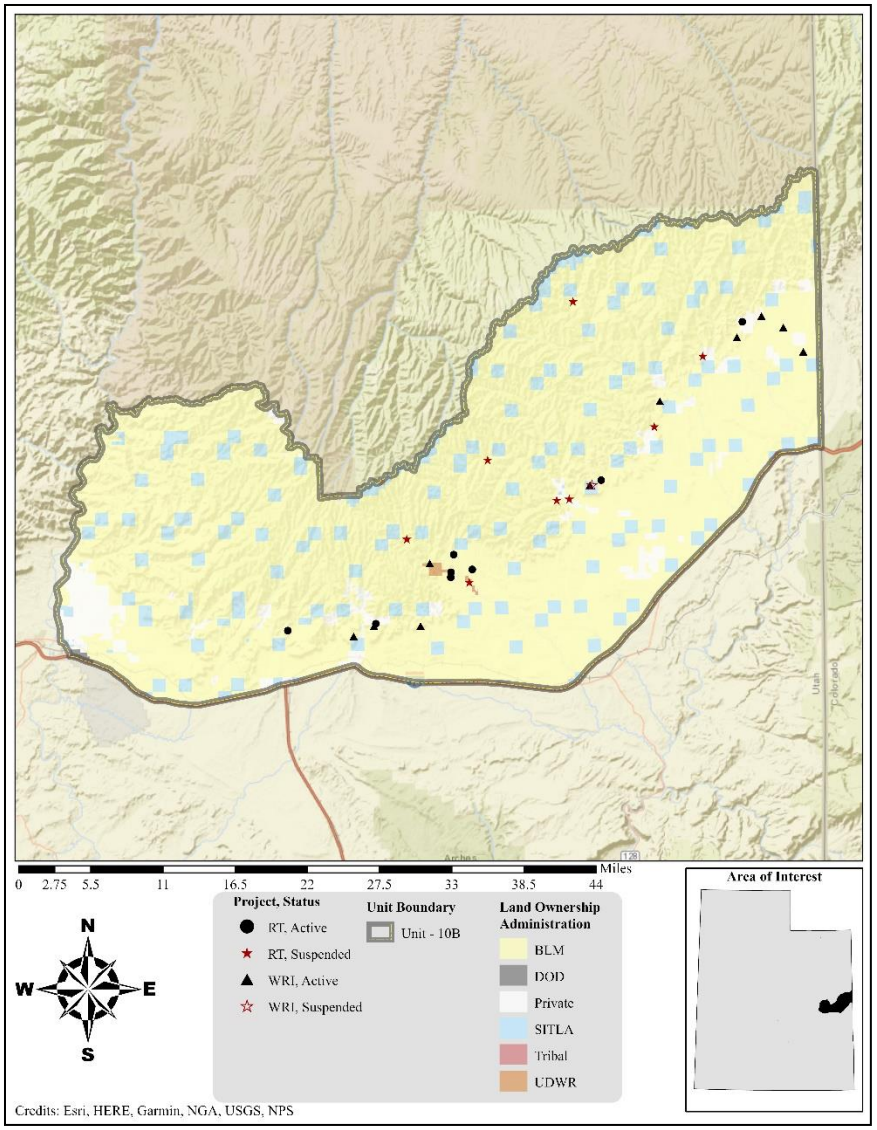
Map 4.4: Estimated bison habitat by season and value for WMU 10B, South Book Cliffs



Map 4.5: Estimated pronghorn habitat by season and value for WMU 10B, South Book Cliffs.



Map 4.6: Estimated Rocky Mountain bighorn sheep habitat by season and value for WMU 10B, South Book Cliffs.



Map 4.7: Land ownership for WMU 10B, South Book Cliffs.

	Year Long Range		Summer Range		Winter Range	
Species	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
Mule Deer	102,481	18%	103,366	18%	364,342	64%
Elk	373,977	78%	7,074	1%	98,579	21%
Pronghorn	322,646	100%	0	0%	0	0%
Bison	234,288	81%	0	0%	54,046	19%
Bighorn Sheep	251,085	100%	0	0%	0	0%

Table 4.1: Estimated mule deer, elk, pronghorn, bison, and Rocky Mountain bighorn sheep habitat acreage by season for WMU 10B, South Book Cliffs.

	Year Long Range		Summer Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	78,864	77%	85,183	82%	313,303	86%
Private	13,842	14%	1,230	1%	11,769	3%
SITLA	9,754	9%	16,743	16%	38,094	10%
FFSL	21	<1%	0	0%	0	0%
UDWR	0	0%	116	<1%	1,176	<1%
Tribal	<1	<1%	94	<1%	<1	<1%
Total	102,481	**100**	103,366	**100%**	364,342	**100%**

Table 4.2: Estimated mule deer habitat acreage by season and ownership for WMU 10B, South Book Cliffs.

	Year Long Range		Summer Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	323,420	86%	2,173	31%	84,650	86%
Private	8,789	2%	25	<1%	2,992	3%
SITLA	41,095	11%	4,728	67%	10,936	11%
UDOT	253	<1%	0	0%	0	0%
UDWR	360	<1%	114	2%	0	0%
Tribal	62	<1%	33	<1%	1	<1%
Total	373,977	**100%**	7,074	**100%**	98,579	**100%**

Table 4.3: Estimated elk habitat acreage by season and ownership for WMU 10B, South Book Cliffs.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	259,539	80%
Private	29,038	9%
SITLA	31,889	10%
UDOT	626	<1%
FFSL	1	<1%
UDWR	990	<1%
DOD	564	<1%
Total	322,646	**100%**

Table 4.4: Estimated pronghorn habitat acreage by season and ownership for WMU 10B, South Book Cliffs.

	Year Long Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	20,2223	86%	46,937	87%
Private	1,236	1%	1,579	3%
SITLA	30,618	13%	5,530	10%
UDWR	116	<1%	0	0%
Tribal	95	<1%	0	0%
Total	234,288	**100%**	54,046	**100%**

Table 4.5: Estimated bison habitat acreage by season and ownership for WMU 10B, South Book Cliffs.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	217,448	87%
Private	6,647	3%
SITLA	26,646	10%
FFSL	9	<1%
UDWR	257	<1%
Tribal	79	<1%
Total	251,085	**100%**

Table 4.6: Estimated Rocky Mountain bighorn sheep habitat acreage by season and ownership for WMU 10B, South Book Cliffs.

Group	Existing Vegetation Type	Acres	% of Total	Group % of Total
Shrubland	Inter-Mountain Basins Mat Saltbush Shrubland	126,015	15.25%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	107,588	13.02%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	44,020	5.33%	
	Colorado Plateau Pinyon-Juniper Shrubland	40,228	4.87%	
	Inter-Mountain Basins Big Sagebrush Shrubland	28,439	3.44%	
	Inter-Mountain Basins Greasewood Flat	16,818	2.04%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	15,602	1.89%	
	Colorado Plateau Blackbrush-Mormon-tea Shrubland	7,374	0.89%	
	Rocky Mountain Lower Montane-Foothill Shrubland	7,213	0.87%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	6,601	0.80%	
	Inter-Mountain Basins Montane Sagebrush Steppe	6,361	0.77%	
	Southern Colorado Plateau Sand Shrubland	3,762	0.46%	
	Other Shrubland	62	0.01%	49.63%
Conifer	Colorado Plateau Pinyon-Juniper Woodland	262,323	31.75%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	20,539	2.49%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	3,019	0.37%	
	Southern Rocky Mountain Ponderosa Pine Woodland	2,588	0.31%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	89	0.01%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	89	0.01%	
	Other Conifer	37	0.00%	
	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	28	0.00%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	<1	0.00%	34.94%
Other	Sparsely Vegetated	80,487	9.74%	
	Agricultural	5,678	0.69%	
	Hardwood	4,046	0.49%	
	Developed	3,820	0.46%	
	Riparian	1,510	0.18%	
	Open Water	376	0.05%	
	Conifer-Hardwood	64	0.01%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	11	0.00%	11.62%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	18,922	2.29%	
	Interior West Ruderal Riparian Scrub	552	0.07%	
	Interior West Ruderal Riparian Forest	132	0.02%	
	Interior Western North American Temperate Ruderal Shrubland	121	0.01%	2.39%
Exotic Herbaceous	Great Basin & Intermountain Introduced Annual Grassland	6,396	0.77%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	1,800	0.22%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	446	0.05%	
	Interior Western North American Temperate Ruderal Grassland	373	0.05%	1.09%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	1,371	0.17%	
	Southern Rocky Mountain Montane-Subalpine Grassland	1,140	0.14%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	202	0.02%	
	Other Grassland	85	0.01%	0.34%
Total		**826,328**	**100%**	**100%**

Table 4.7: LANDFIRE Existing Vegetation Coverage (LANDFIRE.US_140EVT, 2019) for WMU 10B, South Book Cliffs.

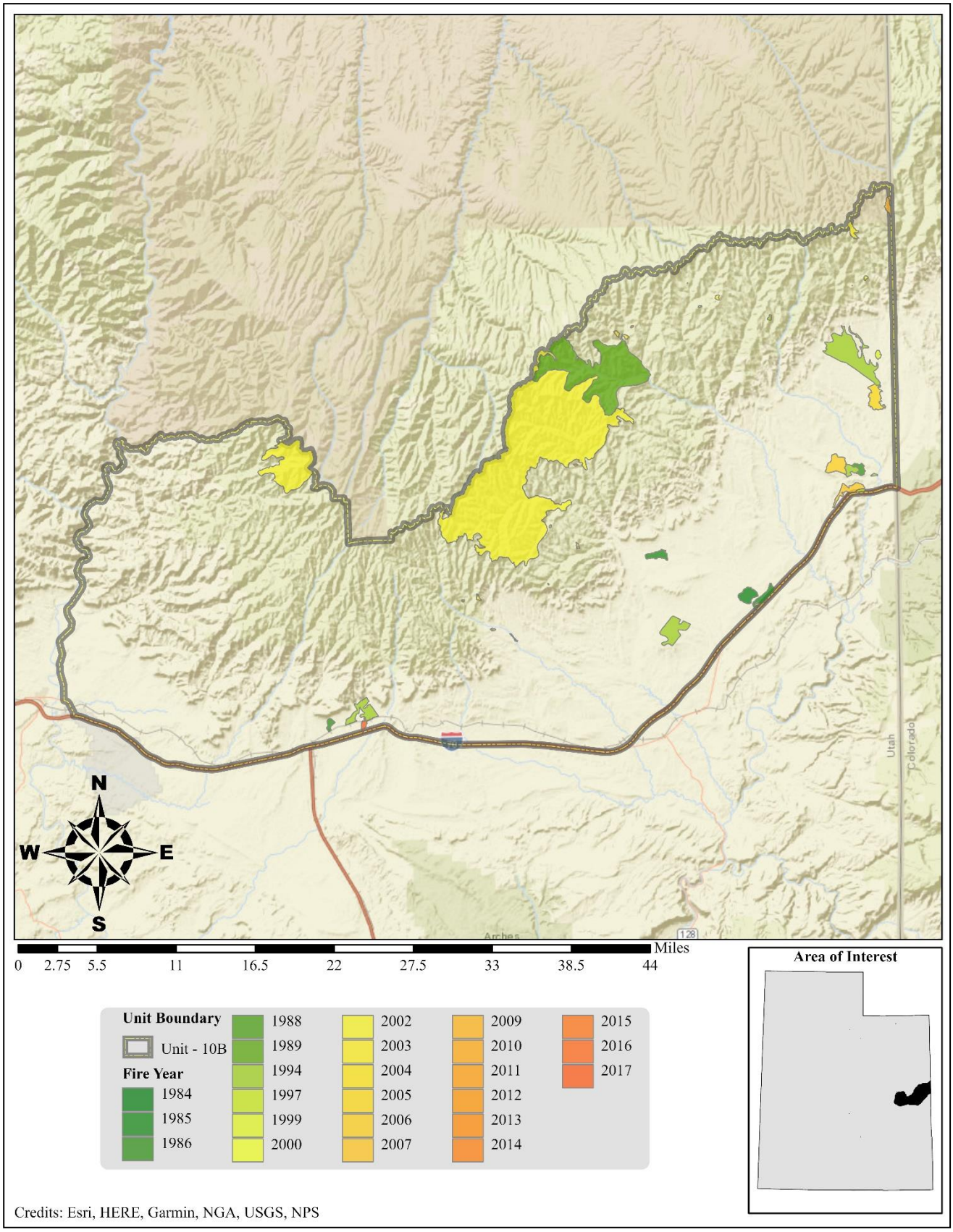
Limiting Factors to Big Game Habitat

Due to the steep, rough terrain at the upper elevations of the winter range, lower areas have been historically overused by livestock and game for long periods of time. Pictographs and petroglyphs found in the unit indicate the historical presence of bighorn sheep, deer, bison, and elk in the area before European settlement. Large herds of cattle and sheep were brought into the area around Moab in the mid-1870s and 1890s. During this time, livestock use on the South Book Cliffs was limited to the stock of local settlers. This changed in the 1920s when Colorado sheepherders began wintering large herds on the South Book Cliffs. During this period, as many as 200,000 sheep were using the range each winter. Since this time, local ranchers and the BLM have worked in cooperation to improve fencing, water developments, and other needs to encourage more uniform use of the range by livestock (Carter, 1983). Feral horses are also found in the Winter Ridge and Hill Creek areas.

The quantity and quality of the summer range are also major limiting factors on this unit. Cooperation between federal, state, local, tribal governments, and private landowners could help maintain and protect ranges from further loss and degradation through agreements with land management agencies. The use of conservation easements and the like on private lands, planning and evaluating resource use and developments that might affect habitat quality, and developing specific vegetation objectives to maintain the quality of important deer use areas will further help maintain and protect range degradation and loss. In addition, forage production

could be maintained or improved through direct range improvements such as reseedings, controlled burns, water developments, tree removal, etc.

According to the current Landfire Existing Vegetation Coverage models, nearly 32% of this unit is comprised of pinyon-juniper woodlands. Encroachment of these woodlands into sagebrush communities has been shown to decrease browse and herbaceous cover, decreasing available forage for wildlife (**Table 4.7**) (Miller, Svejcar, & Rose, 2000).



Map 4.8: Land coverage of fires by year from 2000-2020 for WMU 10B, South Book Cliffs (Geosciences and Environmental Change Science Center (GECSC) Outgoing Datasets, 2021).

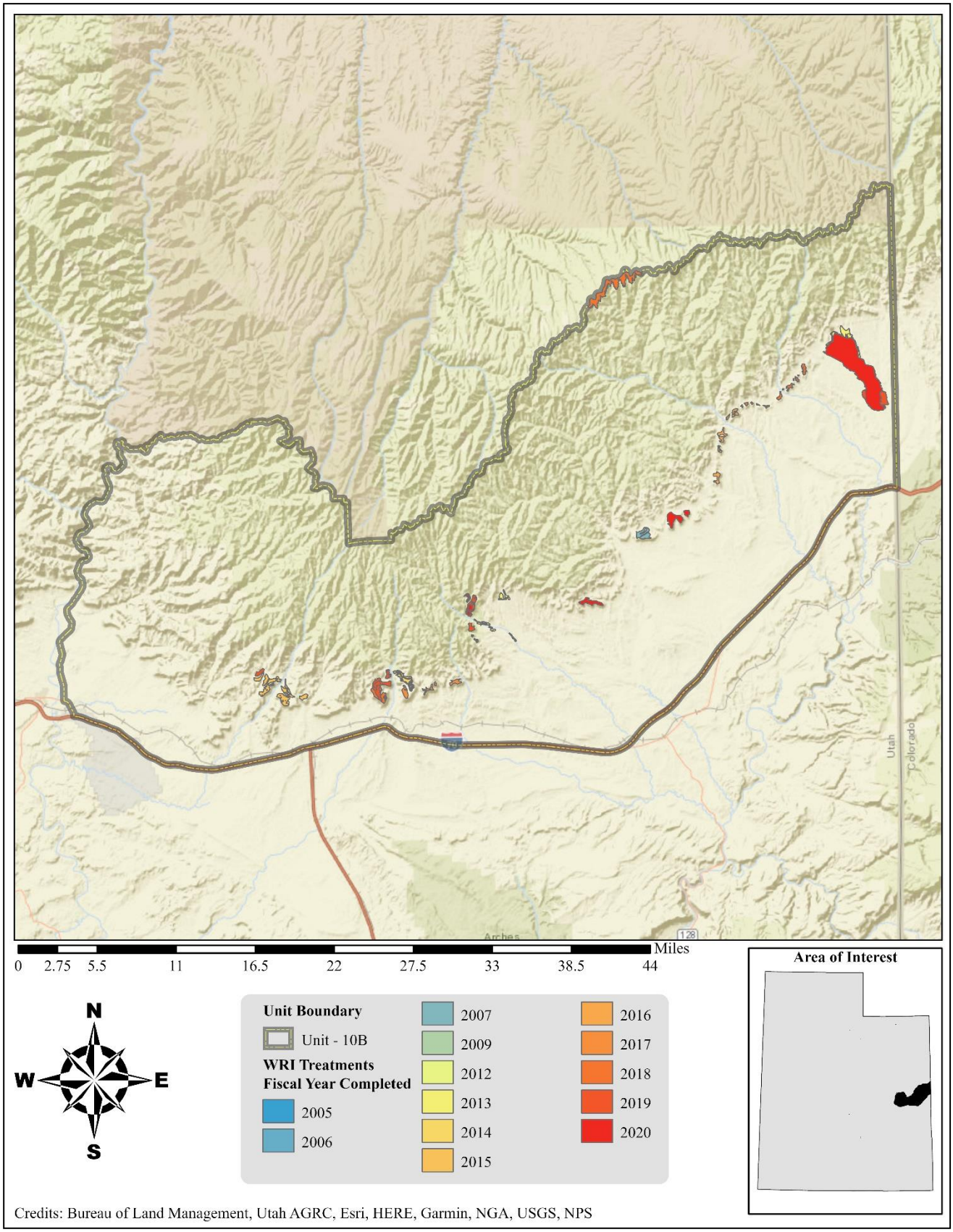
Treatments/Restoration Work

There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 10,610 net acres of land have been treated within the South Book Cliffs unit since the WRI was implemented in 2004 (**Map 4.9**). Treatments frequently overlap one another bringing the total treatment acres to 14,984 acres for this unit (**Table 4.8**, **Map 4.9**). 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.

Herbicide application to improve herbaceous understory is the most common management practice. Vegetation removal via hand crew and mastication to remove pinyon-juniper is also common. Other management practices include seeding to amplify the shrub understory, prescribed fires, and bullhog use to remove pinyon and Utah juniper (**Table 4.8**).

Type	Completed Acreage	Current Acreage	Proposed Acreage	Total Acreage
Anchor Chain	**306**	**0**	**0**	**306**
Smooth (Two-Way)	306	0	0	306
Bullhog	**2,277**	**890**	**2,154**	**5,321**
Full Size	2,277	890	2,154	5,321
Harrow	**37**	**0**	**0**	**37**
≤15 ft. (One-Way)	32	0	0	32
>15 ft. (One-Way)	5	0	0	5
Herbicide Application	**10,115**	**0**	**2,712**	**12,827**
Aerial (Fixed-Wing)	9,991	0	0	9,991
Aerial (Helicopter)	0	0	2,712	2,712
Ground	124	0	0	124
Planting/Transplanting	**<1**	**0**	**0**	**<1**
Container Stock	<1	0	0	<1
Prescribed Fire	**12**	**0**	**0**	**12**
Seeding (Primary)	**113**	**0**	**0**	**113**
Broadcast (Aerial-Fixed Wing)	45	0	0	45
Drill (Rangeland)	65	0	0	65
Ground (Mechanical Application)	2	0	0	2
Vegetation Removal/Hand Crew	**2,125**	**844**	**0**	**2,969**
Lop & Scatter	2,125	844	0	2,969
Grand Total	**14,984**	**1,734**	**4,866**	**21,584**
***Total Land Area Treated**	**10,610**	**1,734**	**4,866**	**17,210**

Table 4.8: WRI treatment action size (acres) for completed, current, and proposed projects for WMU 10B, South Book Cliffs. Data accessed on 02/09/2021. *Does not include overlapping treatments.



Map 4.9: WRI treatments by fiscal year completed for WMU 10B, South Book Cliffs.

Range Trend Studies

Range Trend studies have been sampled within WMU 10B on a regular basis since 1986, with studies being added or suspended as was deemed necessary (**Table 4.9**). Due to changes in sampling methodologies, only data sampled 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 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 4.10**). Range Trend studies are summarized in this report by ecological site.

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
10-14	East Floy Bench	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020	Semidesert Loam (Wyoming Big Sagebrush)
10-15	East Thompson Bench	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020	Semidesert Loam (Wyoming Big Sagebrush)
10-16	West Horse Pasture	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020	Semidesert Loam (Wyoming Big Sagebrush)
10-17	East Calf Canyon	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020	Semidesert Loam (Wyoming Big Sagebrush)
10-18	East Horse Pasture	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020	Semidesert Loam (Wyoming Big Sagebrush)
10-19	Lower Cottonwood	RT	Suspended	1986, 1995	Semidesert Loam (Wyoming Big Sagebrush)
10-20	Upper Cottonwood	RT	Suspended	1986, 1995, 2000	Semidesert Alkali Loam (Black Greasewood/Wyoming Big Sagebrush)
10-21	East Sulfur Bench	RT	Suspended	1986, 1995	Semidesert Loam (Wyoming Big Sagebrush)
10-22	Bryson Draw	RT	Suspended	1986, 1995	Semidesert Loam (Wyoming Big Sagebrush)
10-26	Bitter Creek	RT	Active	2000, 2005, 2010, 2015, 2020	Semidesert Loam (Wyoming Big Sagebrush)
10-27	Long Canyon	RT	Active	2005, 2010, 2015, 2020	Semidesert Loam (Wyoming Big Sagebrush)
10R-25	Nash Wash #1	RT	Suspended	1998	Semidesert Sandy loam (Fourwing Saltbush)
10R-26	Nash Wash #2	RT	Active	1998, 2015, 2020	Semidesert Sandy loam (Fourwing Saltbush)
10R-27	Nash Wash Burn	RT	Suspended	1999	Upland Loamy Bottom (Basin Big Sagebrush)
10R-30	Cottonwood Burn	RT	Suspended	1999	Upland Loamy Bottom (Basin Big Sagebrush)
10R-31	Hay Canyon Burn	RT	Suspended	1999, 2001	Upland Loamy Bottom (Basin Big Sagebrush)
10R-38	Long Canyon Chaining (Reference)	WRI	Suspended	2006	Semidesert Loam (Wyoming Big Sagebrush)
10R-49	Long Canyon Bench Chaining	WRI	Active	2010, 2013, 2018	Semidesert Loam (Wyoming Big Sagebrush)
10R-50	Bitter Creek	WRI	Active	2011, 2015, 2019	Semidesert Loam (Wyoming Big Sagebrush)
10R-54	Bitter Creek Herbicide	WRI	Active	2012, 2015, 2019	Semidesert Loam (Wyoming Big Sagebrush)
10R-55	South Book Cliffs	WRI	Active	2013, 2016, 2020	Semidesert Loam (Wyoming Big Sagebrush)
10R-58	Dry Canyon	WRI	Active	2015, 2019	Semidesert Shallow Loam (Wyoming Big Sagebrush)
10R-59	Sagers Bench	WRI	Active	2016, 2019	Upland Shallow Loam (Cliffrose)
10R-60	Hat Rock	WRI	Active	2017, 2020	Semidesert Shallow Loam (Wyoming Big Sagebrush)
10R-62	West Thompson Bench	WRI	Active	2018	Upland Shallow Loam (Cliffrose)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
10R-63	Bar X Wash - Bitter Creek	WRI	Active	2018	Semidesert Loam (Wyoming Big Sagebrush)
10R-64	Bull Canyon	WRI	Active	2019	Semidesert Stony Loam (Utah Juniper-Pinyon)

Table 4.9: Range trend and WRI project studies monitoring history and ecological site potential for WMU 10B, South Book Cliffs.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
10-15	East Thompson Bench	Aerial Before	South Book Cliffs Vegetation Improvement Phase 1	October 2013	500	2593
		Bullhog	South Book Cliffs Vegetation Improvement Phase 1	November-December 2013	500	2593
		Aerial After	South Book Cliffs Vegetation Improvement Phase 1	January 2014	500	2593
10-16	West Horse Pasture	Wildfire	22-2	2009	4	
		Wildfire	Nash Wash	June 2010	22	
		Rangeland Drill	Nash Wash WMA Wildfire Rehab	October-November 2012	81	2480
		Plateau	Nash Wash WMA Wildfire Rehab	October-November 2012	115	2480
10-17	East Calf Canyon	One-Way Smooth Chain		Fall 1987	330	
10R-25	Nash Wash #1	Wildfire	Nash Wash	2012	26	
		Plateau	Nash Wash WMA Phase II	October-November 2012	117	2258
		Rangeland Drill	Nash Wash Phase II	October-November 2012	87	2258
10R-30	Cottonwood Burn	Wildfire	Diamond Creek	2002	88,421	
10R-49	Long Canyon Bench Chaining	Two-Way Smooth	Long Canyon Bench Pinyon-Juniper Chaining	October 2006	305	29
		Aerial After	Long Canyon Bench Pinyon-Juniper Chaining	October 2006	305	29
		Plateau	Long Canyon Bench Pinyon-Juniper Chaining	November 2006	305	29
		Lop and Scatter	South Bookcliffs Phase 8 (Cottonwood) (Proposed)	Fall 2020	844	5290
10R-50	Bitter Creek	Plateau	Bitter Creek Restoration Phase 2	September 2012	2,250	2161
		Rangeland Drill	Bitter Creek Restoration Phase 2	October 2012	1,580	2161
		Plateau	Bitter Creek Phase 3 Seeding	November 2019	4,739	4673
10R-54	Bitter Creek Herbicide	Plateau	Bitter Creek Restoration Phase 2	September 2012	2,250	2161
		Rangeland Drill	Bitter Creek Restoration Phase 2	October 2012	1,580	2161
		Plateau	Bitter Creek Phase 3 Seeding	November 2019	4,739	4673
10R-55	South Book Cliffs	Aerial Before	South Book Cliffs Vegetation Phase 1	October 2013	512	2593
		Bullhog	South Book Cliffs Vegetation Phase 1	November 2013	512	2593
		Aerial After	South Book Cliffs Vegetation Phase 1	January 2014	512	2593
10R-56	Center Fork	Wildfire	Wolf Den	2012	19,865	
		Aerial	Wolf Den Fire-Rainbow	November-December 2012	526	2517
10R-58	Dry Canyon	Aerial Before	South Bookcliffs Vegetation Improvement (Hay) Phase III	March 2016	322	3330
		Bullhog	South Bookcliffs Vegetation Improvement (Hay) Phase III	March-May 2016	322	3330
10R-59	Sagers Bench	Aerial Before	South Bookcliffs Phase 4 (Sagers)	October 2016	360	3673
		Bullhog	South Bookcliffs Phase 4 (Sagers)	October-November 2016	360	3673
		Aerial After	South Bookcliffs Phase 4 (Sagers)	December 2016	360	3673
10R-60	Hat Rock	Aerial Before	South Bookcliffs Phase 5 (Bryson)	Fall 2017	324	3961
		Bullhog	South Bookcliffs Phase 5 (Bryson)	Fall 2017	324	3961
10R-63	Bar X Wash - Bitter Creek	Plateau	Bitter Creek Restoration Phase 3	October 2018	1,869	4465
		Plateau	Bitter Creek Phase 3 Seeding	November 2019	4,739	4673
10R-64	Bull Canyon	Lop and Scatter	South Bookcliffs Phase 7 (Nash)	January-February 2020	174	4836

Table 4.10: Range trend and WRI studies known disturbance history for WMU 10B, South Book Cliffs. PDB = Pre-Database; LTDL = Land Treatment Digital Library (Pilliod & Welty, 2019).

Study Trend Summary (Range Trend)

Semidesert (Big Sagebrush)

There are seven study sites [East Floy Bench (10-14), East Thompson Bench (10-15), West Horse Pasture (10-16), East Calf Canyon (10-17), East Horse Pasture (10-18), Bitter Creek (10-26), and Long Canyon (10-27)] classified as Semidesert (Sagebrush) ecological sites. East Floy Bench is found due west of Crescent Canyon, and between Crescent Flat to the south and Crescent Butte to the north. The East Thompson Bench study is located east of Thompson Canyon on Thompson Bench. West Horse Pasture is situated southeast of Cunningham Ranch, adjacent to Nash Wash. East Calf Canyon is found just east of Calf Canyon near the Cisco Dome Oil and Gas Field. East Horse Pasture is located almost due east of Cunningham Ranch adjacent to Cisco Dome Oil and Gas Field. Bitter Creek is found at the base of the Book Cliffs just north of the Stateline Gas Field. Finally, Long Canyon is situated at the base of the Book Cliffs, just east of Long Canyon (**Table 4.9**).

Shrubs/Trees: The most dominant browse species within these communities is Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*); additional browse species are rare, but can be found on some sites. Average sagebrush cover is generally good, but the West Horse Pasture study had much less (< 1%) cover than other studies in 2020 (**Figure 4.2**). Average preferred browse demographics indicate that mature plants have comprised a majority of the population in all sample years except 2005, when decadent plants were the majority. Recruitment of young plants has varied slightly from year to year, but there has been an overall general increase. The population appears to be stable overall (**Figure 4.6**). Browse utilization has fluctuated from year to year, but appears to have generally decreased; nearly 36% of mature plants were moderately browsed in the 2020 sample year (**Figure 4.7**).

All average tree cover and most of the average density on these study sites can be attributed to Utah juniper (*Juniperus osteosperma*). Average density and cover have exhibited overall decreasing trends: this could be attributed to tree-reducing projects that have taken place on select sites (**Figure 4.4, Figure 4.5**). It is important to note, however, that the average tree cover and density for the 2015 and 2020 sample years may be slightly higher than the relevant graphs depict: the site report states that the East Horse Pasture, West Horse Pasture, and Long Canyon studies were being encroached by juniper, but no trees were sampled in line intercept and strip density measurements in the 2015 and 2020 sample years.

Herbaceous Understory: The amount of overall herbaceous cover has varied from year to year on these sites. The composition has remained consistent, however, with the annual grass species cheatgrass (*Bromus tectorum*) contributing a majority of the herbaceous cover; cheatgrass may increase the risk of fire and threaten the resiliency of these sites. Native perennial grass species have been present in lesser amounts over the years, except in 2000 when they were the dominant herbaceous component. Although low, perennial grass cover has exhibited an overall (but only slightly) increasing trend over time. Perennial forbs remain rare on these sites, and cover of annual forbs has fluctuated over the sample years (**Figure 4.8**, **Figure 4.9**).

Occupancy: Pellet group transect data indicates that animal occupancy fluctuates from year to year and that deer have primarily used these sites. Deer pellet groups have had a mean abundance ranging from 30 days use/acre in 2000 to 58 days use/acre in 2005. Elk use has fluctuated over time and has been as low as 3 days use/acre in 2015 and as high as 16 days use/acre in 2000. Finally, mean abundance of cattle pellet groups has ranged from 3 days use/acre in 2000 to 11 days use/acre in 2010 (**Figure 4.10**).

Semidesert (Fourwing Saltbush)

One site [Nash Wash #2 (10R-26)] has been classified as a Semidesert (Fourwing Saltbush) ecological site. Nash Wash #2 is located just west of Cunningham Ranch and north of the West Horse Pasture study (**Table 4.9**).

Shrubs/Trees: The primary browse species on this site is fourwing saltbush (*Atriplex canescens*) which provides good cover, but cover has decreased since 2015. Other preferred browse species are present in low

amounts (**Figure 4.3**). The saltbush population and its age classes has had large variations from year to year. One reliable trend to note is that increases of decadent saltbush plants have been measured each sample year, indicating that the population is unstable (**Figure 4.6**). Since 2015, utilization has decreased with 35% of plants displaying moderate use and 23% being heavily used in 2015; moderate and heavy use were equal in 2020 at nearly 25% each (**Figure 4.7**).

Trees have not been observed on this representative site in either point-quarter density or cover measurements and will therefore not be discussed in this section (**Figure 4.4**, **Figure 4.5**).

Herbaceous Understory: This site has remained dominated by annual grass, primarily cheatgrass (*Bromus tectorum*), although the introduced species annual wheatgrass (*Eremopyrum triticeum*) does contribute notable cover. Perennial grasses are extremely limited on this site, with only foxtail barley (*Hordeum jubatum*) being sampled in 2015 and 2020. Perennial forbs are not present, and annual forb cover has fluctuated with a low of 1% in 2015 and a high of 10% in 1998 (**Figure 4.8**, **Figure 4.9**).

Occupancy: Pellet transect data indicates that this representative site is mainly utilized by deer and that use has decreased over time. Deer pellet groups had a mean abundance of 23 days use/acre in 2020 and 55 days use/acre in 1998. The mean abundance of elk pellet groups was 0 days use/acre in 1998 and 4 days use/acre in 2015, and the mean abundance of cattle/bison pellet groups was 0 days use/acre in both 1998 and 2020, and 4.4 days use/acre in 2015 (**Figure 4.10**).

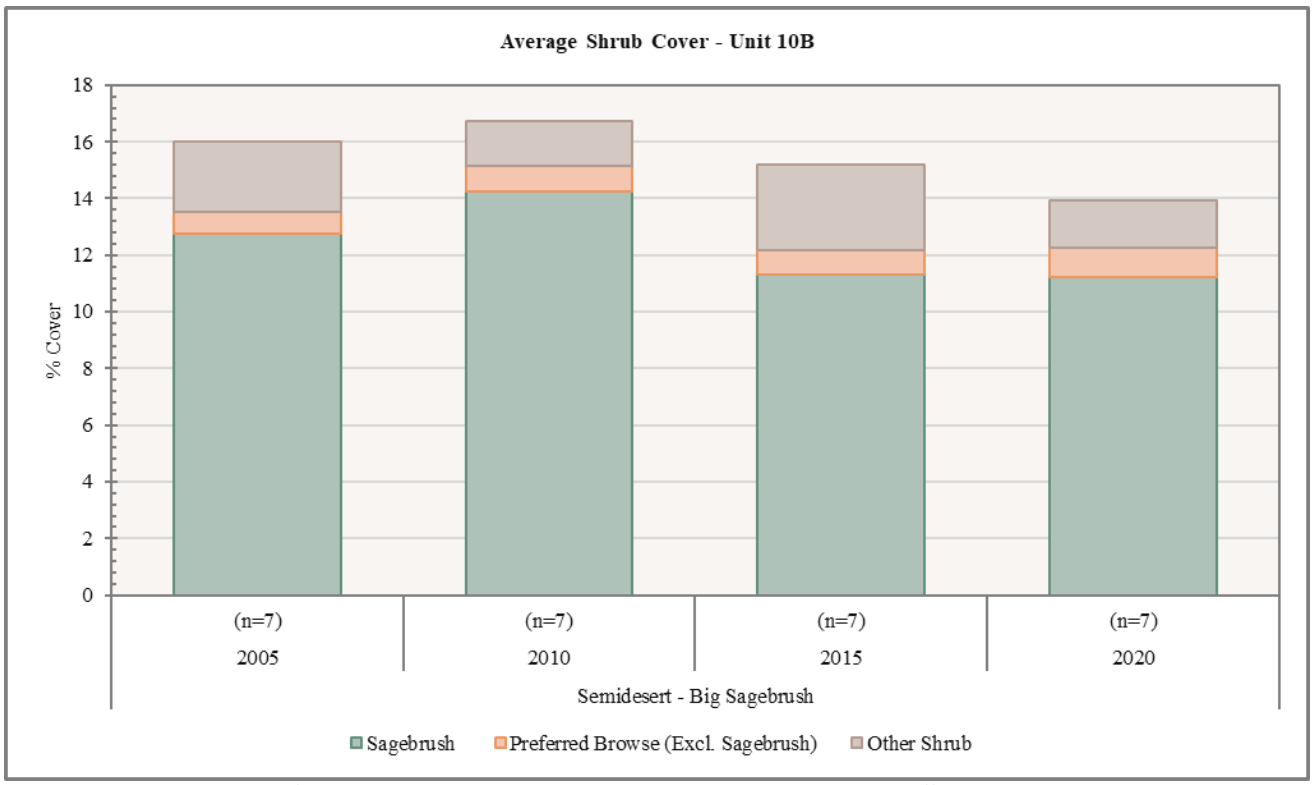


Figure 4.2: Average shrub cover for Semidesert - Big Sagebrush study sites in WMU 10B, South Book Cliffs.

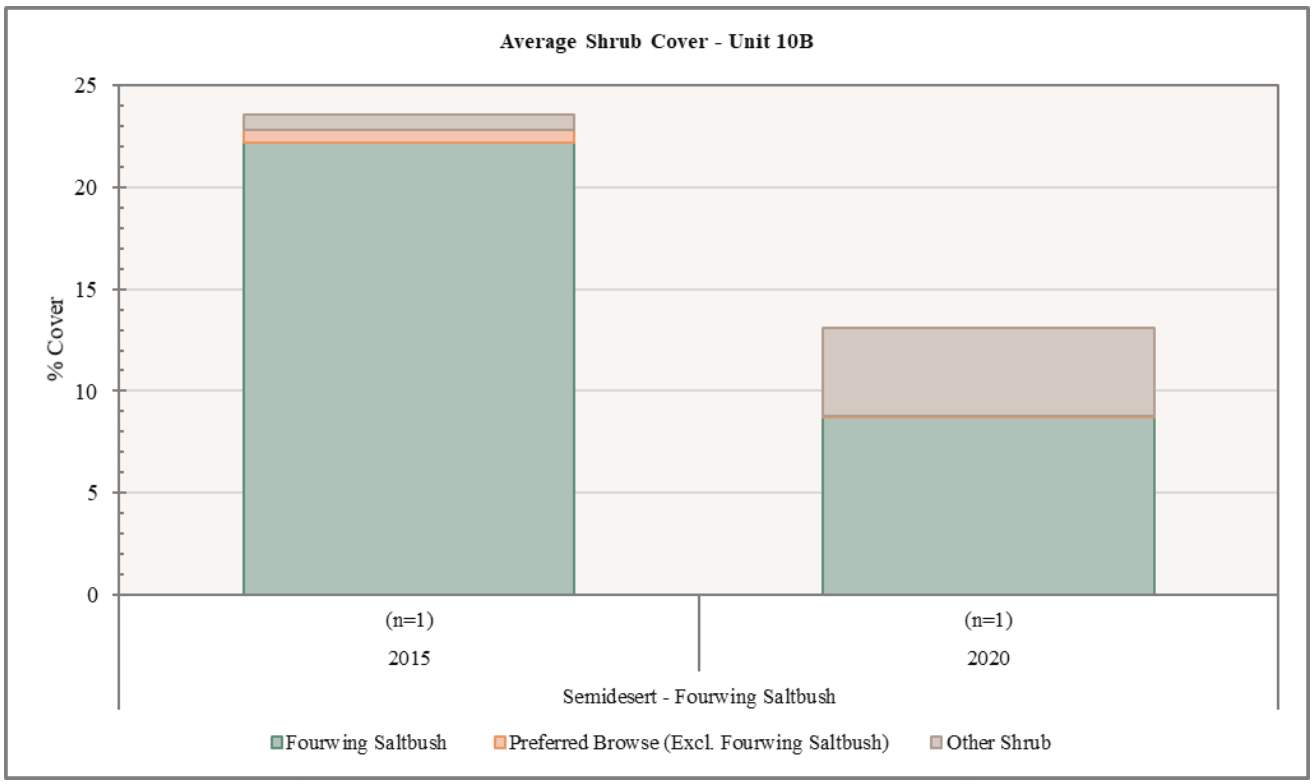


Figure 4.3: Average shrub cover for Semidesert - Fourwing Saltbush study sites in WMU 10B, South Book Cliffs.

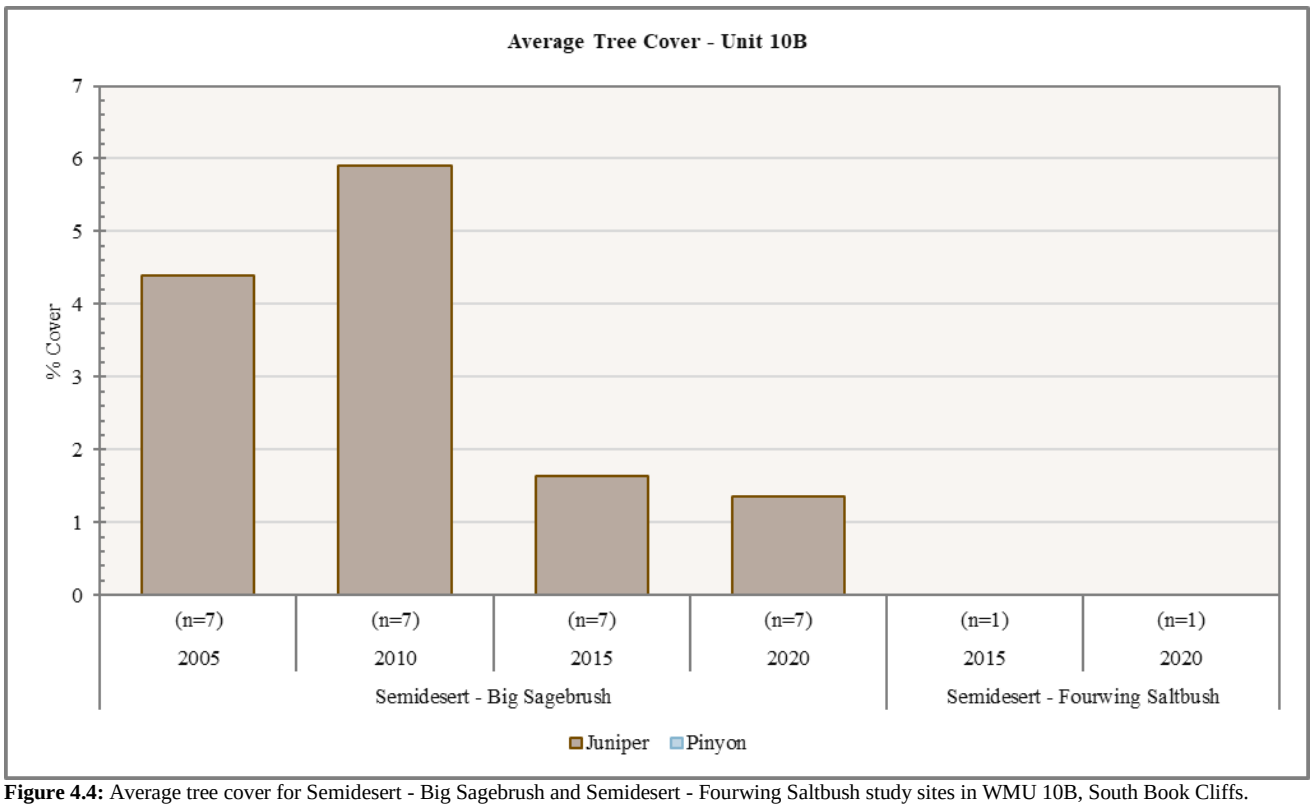


Figure 4.4: Average tree cover for Semidesert - Big Sagebrush and Semidesert - Fourwing Saltbush study sites in WMU 10B, South Book Cliffs.

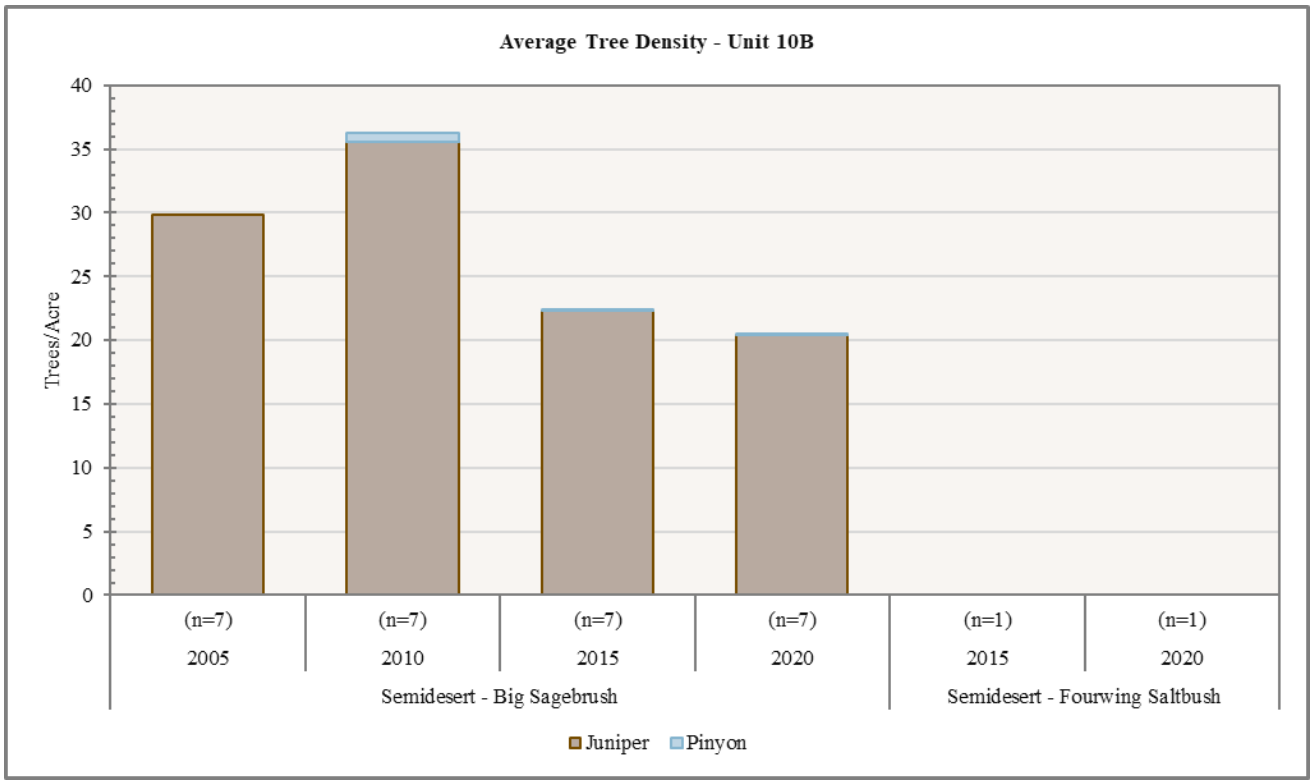


Figure 4.5: Average tree density for Semidesert - Big Sagebrush and Semidesert - Fourwing Saltbush study sites in WMU 10B, South Book Cliffs.

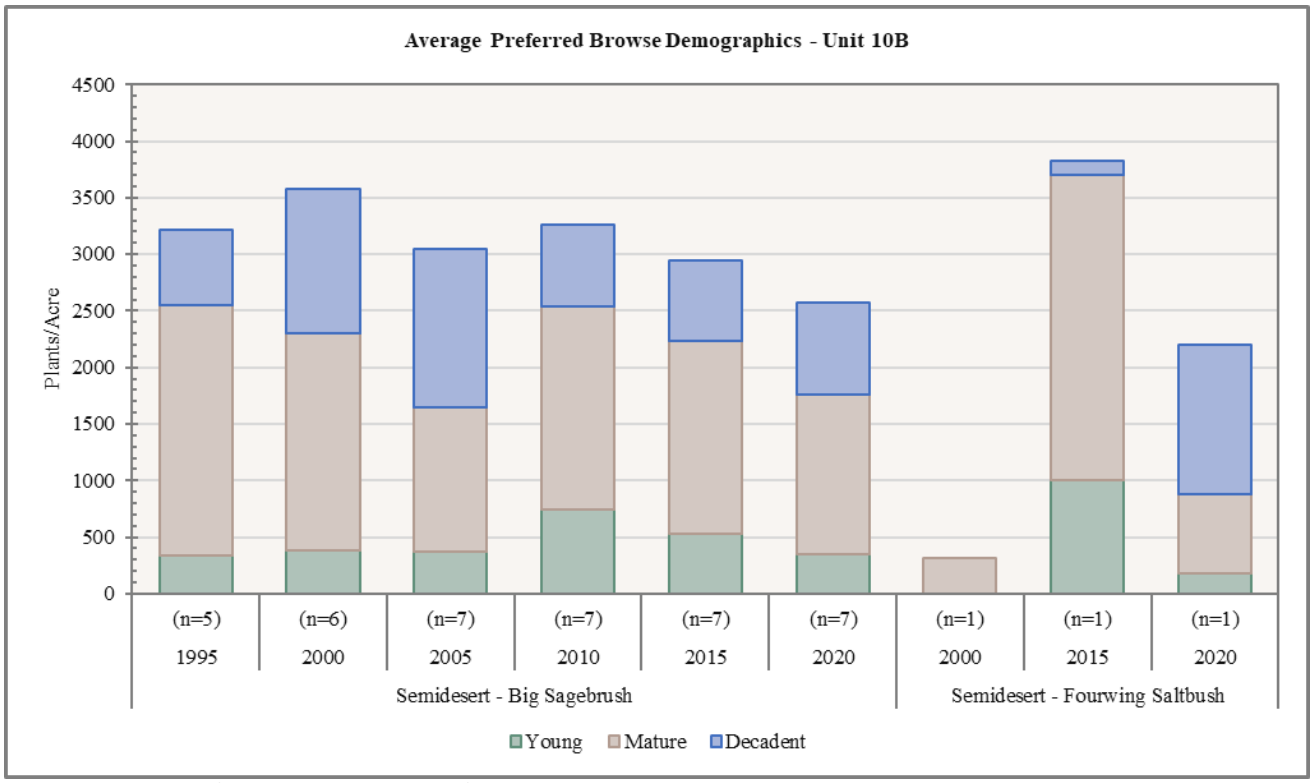


Figure 4.6: Average preferred browse demographics for Semidesert - Big Sagebrush and Semidesert - Fourwing Saltbush study sites in WMU 10B, South Book Cliffs.

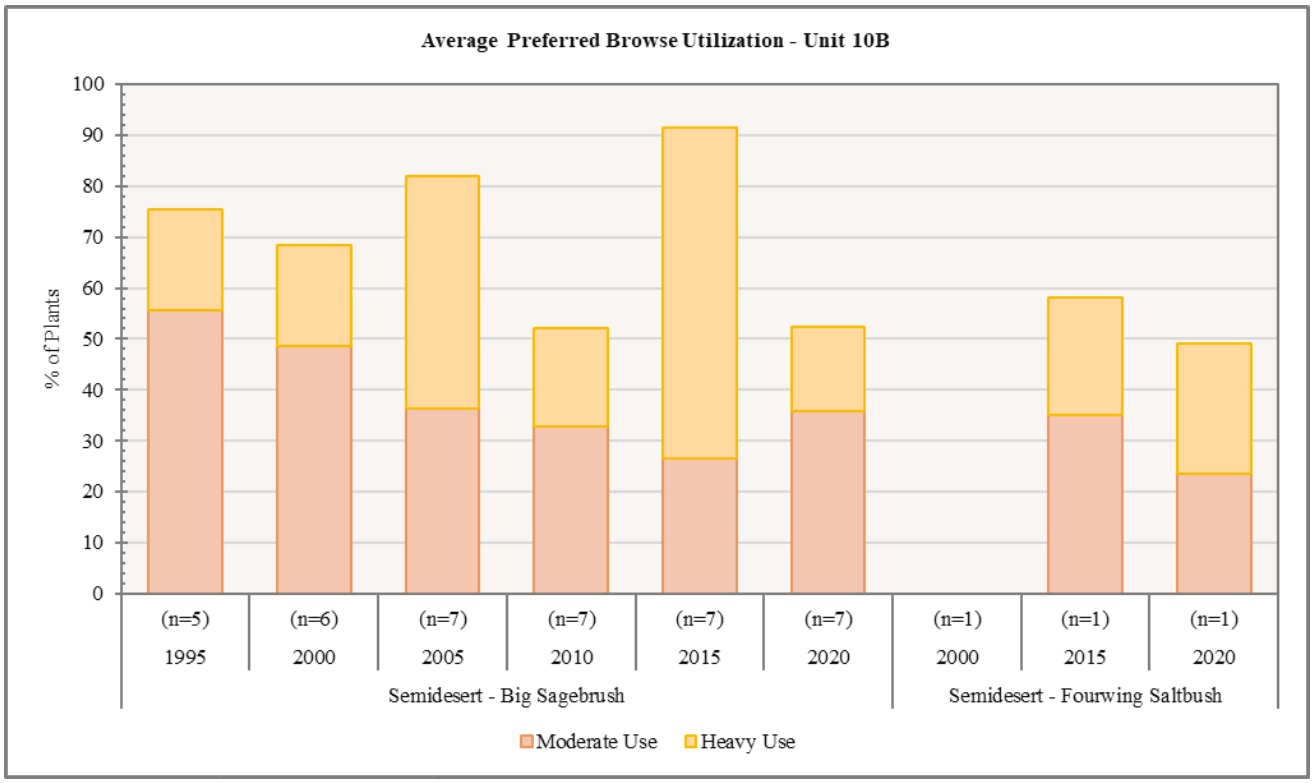


Figure 4.7: Average preferred browse utilization for Semidesert - Big Sagebrush and Semidesert - Fourwing Saltbush study sites in WMU 10B, South Book Cliffs.

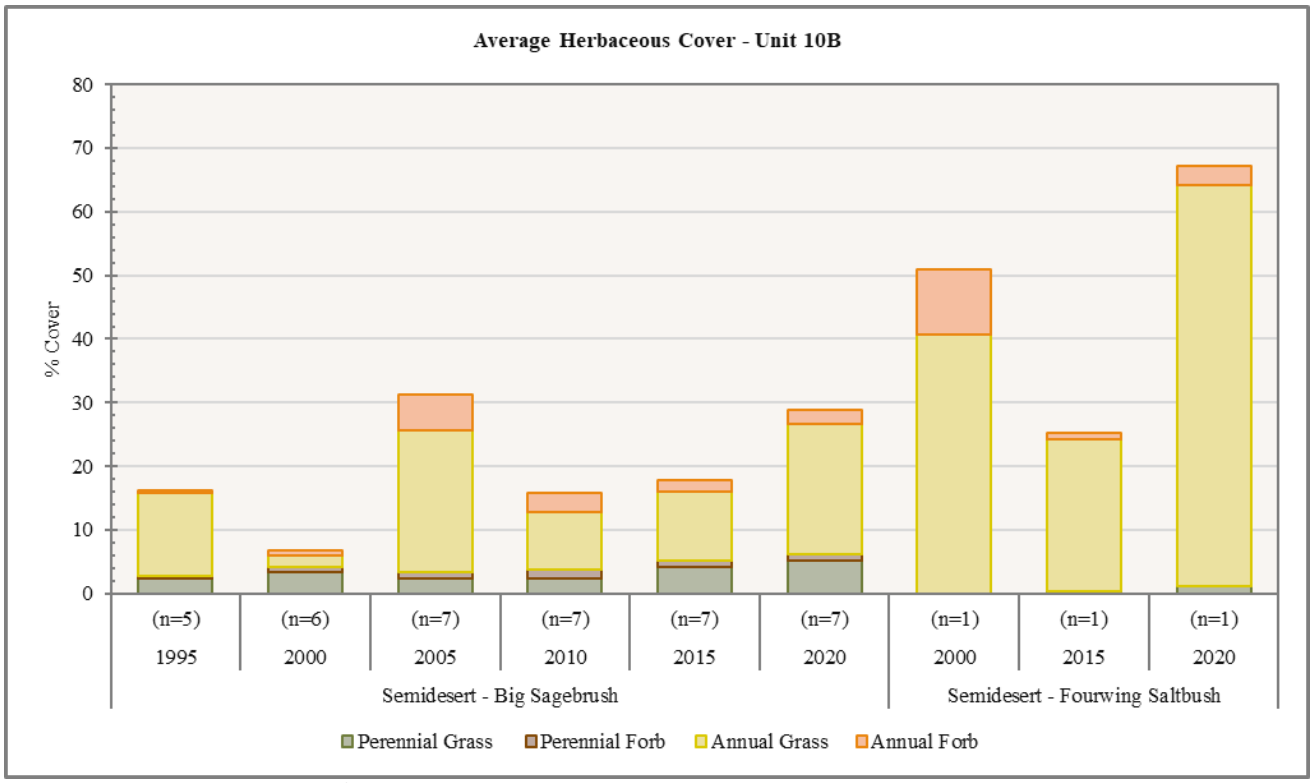


Figure 4.8: Average herbaceous cover for Semidesert - Big Sagebrush and Semidesert - Fourwing Saltbush study sites in WMU 10B, South Book Cliffs.

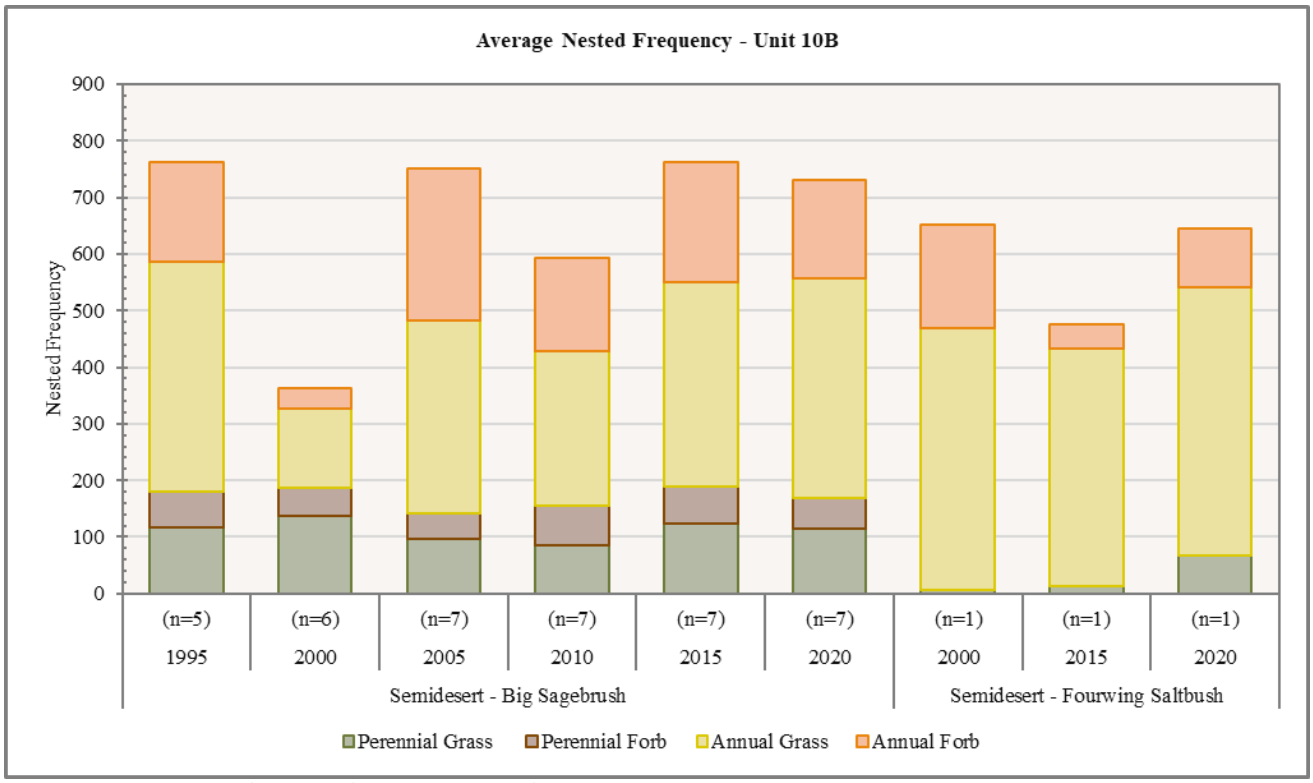


Figure 4.9: Average nested frequency of herbaceous species for Semidesert - Big Sagebrush and Semidesert - Fourwing Saltbush study sites in WMU 10B, South Book Cliffs.

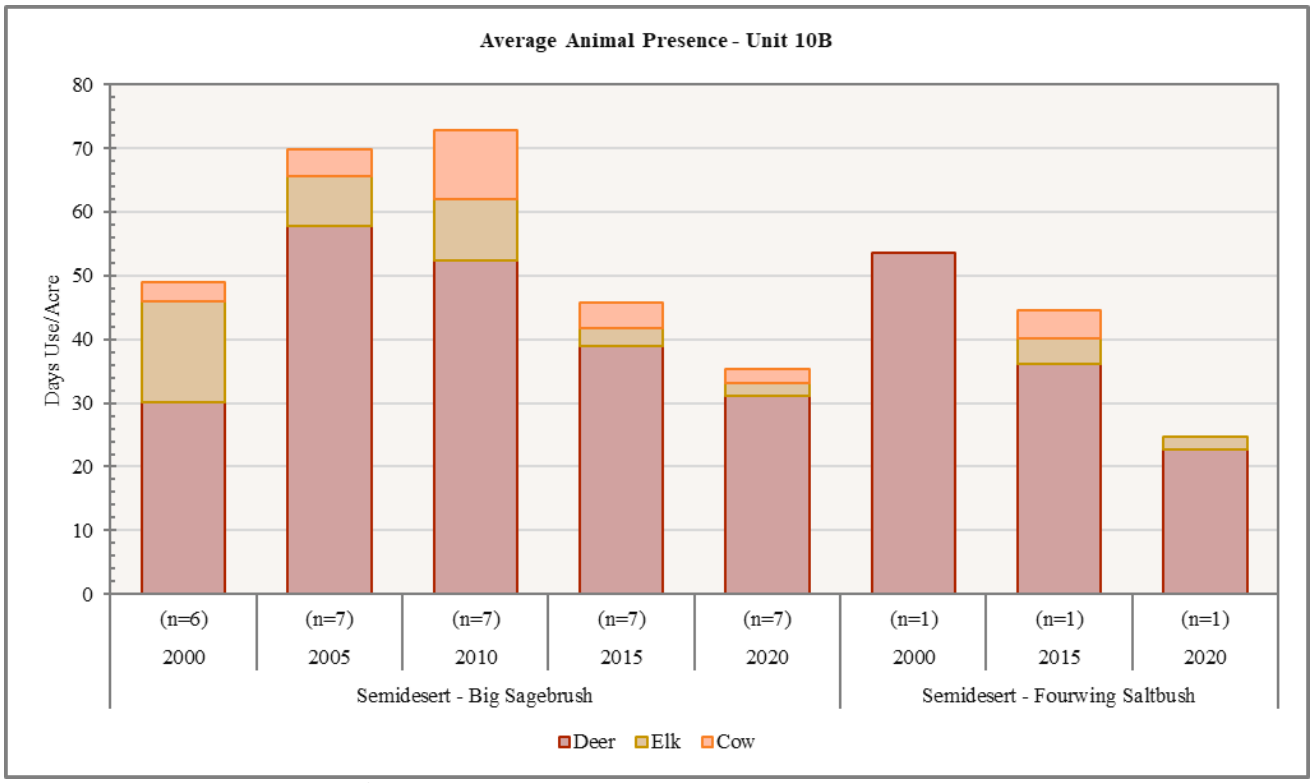
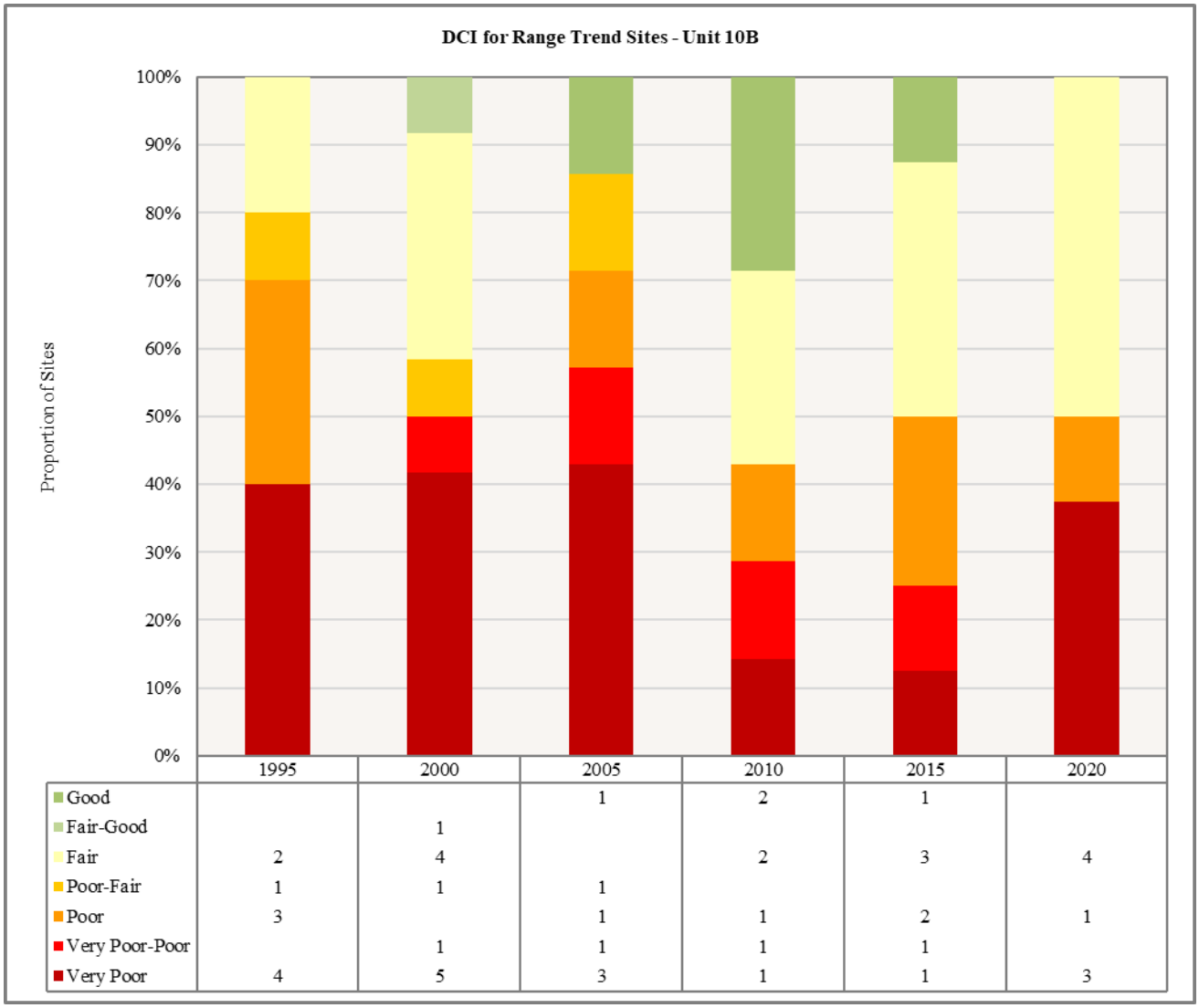


Figure 4.10: Average pellet transect data for Semidesert - Big Sagebrush and Semidesert - Fourwing Saltbush study sites in WMU 10B, South Book Cliffs.

Deer Winter Range Condition Assessment

The condition of deer winter range within the South Book Cliffs management unit has had an overall, but slight, improvement in averaged site conditions that have trended from very poor-poor in 1995 to poor in 2020. The Range Trend sites sampled within the unit have a moderate degree of conditional disparity between sites, but most sites are considered to be in poor to very poor condition. However, a few studies, East Floy Bench (10-14), Long Canyon (10-27), and East Calf Canyon (10-17), are regularly considered to be in fair and good conditions. Nash Wash 2 (10R-26) has the highest degree of winter range variability, which is due to large fluctuations in annual grass cover. The remaining studies, like East Horse Pasture (10-18) and West Horse Pasture (10-16), are in poor condition, lacking recruitment of young sagebrush plants and having a high amount of annual grass present.

The overall deer winter range assessment in 2020 for WMU 10B averages between poor and poor-fair, though most sites rank as being in fair condition. Nash Wash 2, West Horse Pasture and East Horse Pasture are currently considered to be in very poor condition: annual grass cover remains high on all of these sites. However, sagebrush density remains low with most sagebrush remaining decadent following the Nash Wash wildfire on the West Horse Pasture site. The four studies in fair winter condition be attributed to higher browse and perennial grass covers accompanied by lower annual grass cover. Improvement in winter range in this unit will come from reduction in annual grass while increasing browse and perennial grass covers (**Figure 4.11**, **Table 4.11**).

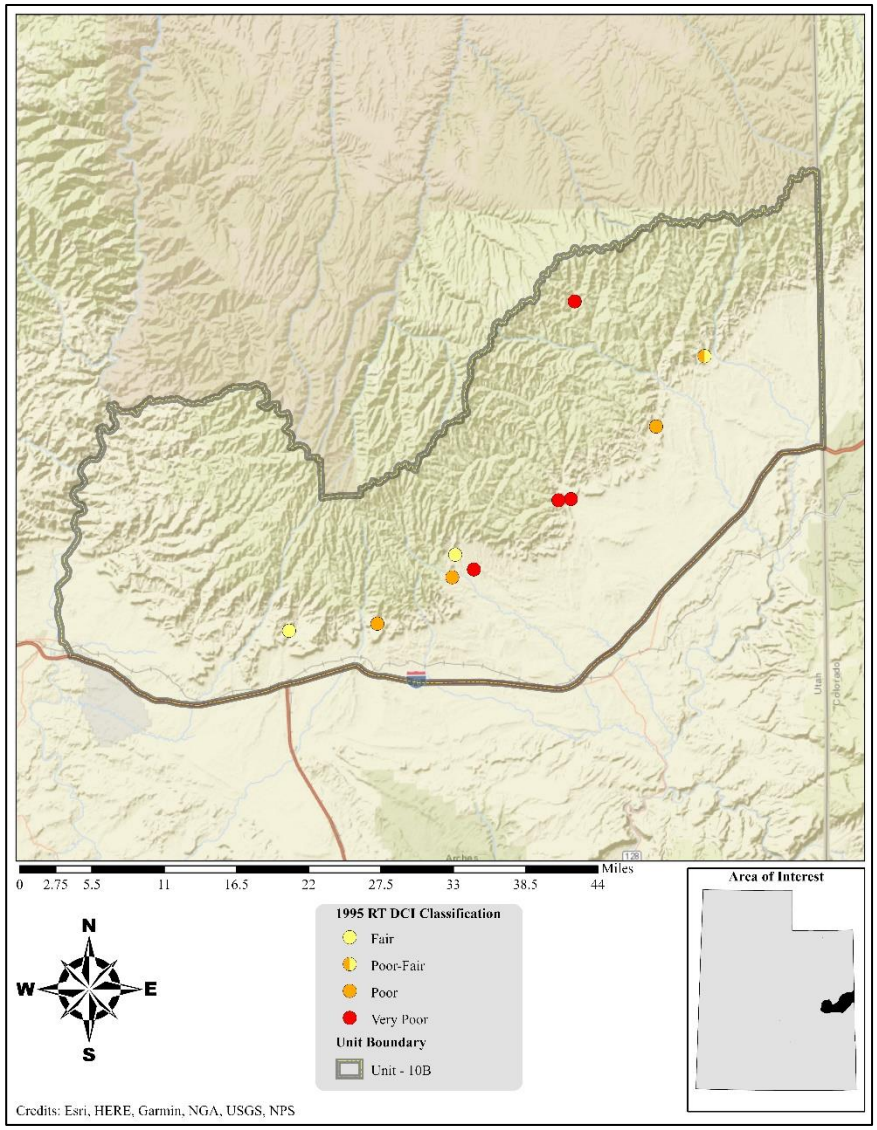


	1995	2000	2005	2010	2015	2020
Good			1	2	1	
Fair-Good		1				
Fair	2	4		2	3	4
Poor-Fair	1	1	1			
Poor	3		1	1	2	1
Very Poor-Poor		1	1	1	1	
Very Poor	4	5	3	1	1	3

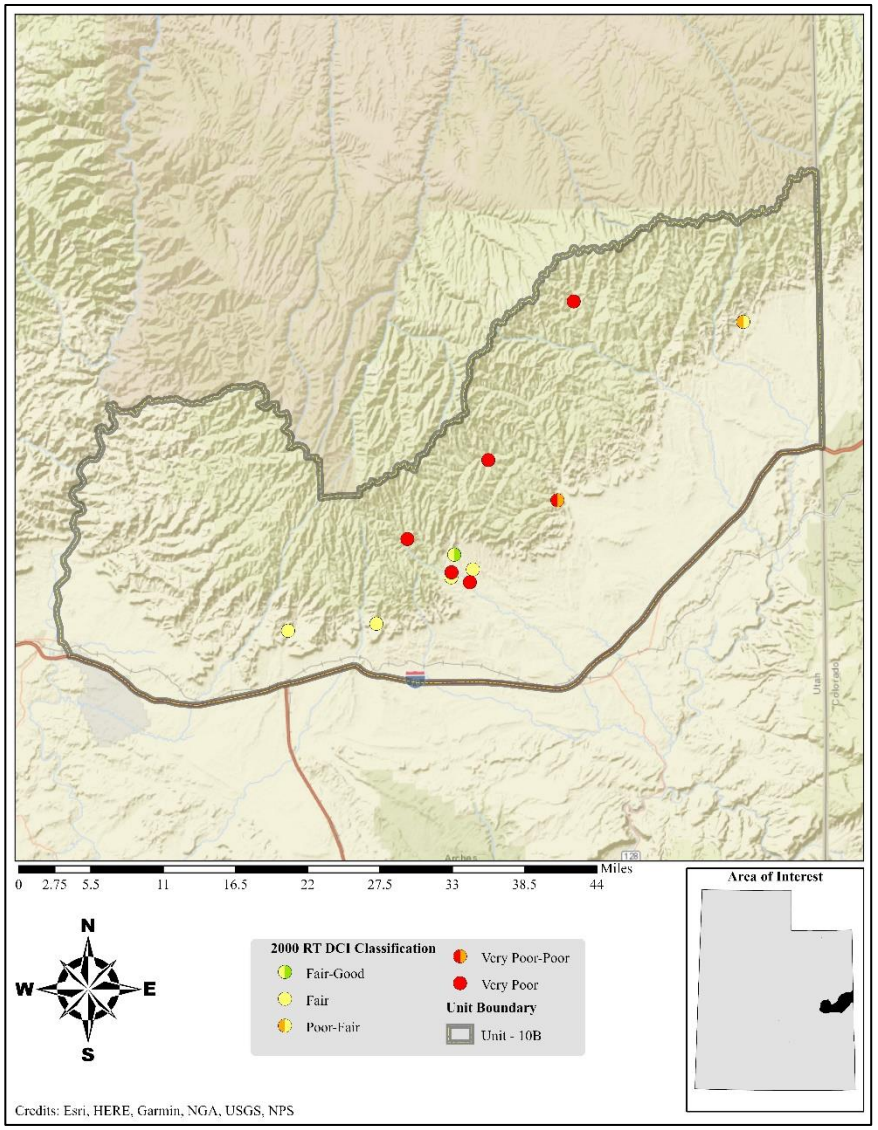
Figure 4.11: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 10B, South Book Cliffs.

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
10-14	1995	6.5	14.6	10.2	10.3	-5.2	0	0	**36.4**	**F**
10-14	2000	7.2	5.6	7.1	10.2	-0.8	0	0	**29.4**	**F**
10-14	2005	9.5	8.7	5.8	6.6	-6.7	0.3	0	**24.1**	**P-F**
10-14	2010	9.8	11.3	8.1	6.3	-2.1	0.9	0	**34.1**	**F**
10-14	2015	11.9	8.1	1.4	16.0	-3.2	1.1	0	**35.3**	**F**
10-14	2020	9.4	10.3	4.3	9.2	-4.3	0.7	0	**29.6**	**F**
10-15	1995	6.5	2.5	3.6	4.5	-1.4	1	0	**16.7**	**P**
10-15	2000	7.5	1.5	15	6.1	-0.1	0.6	0	**30.7**	**F**
10-15	2005	9.1	-13.7	1.1	9.2	-0.6	2.3	0	**7.4**	**VP**
10-15	2010	1.8	0	0	6.4	-0.1	1.6	0	**9.6**	**VP-P**
10-15	2015	2	0	0	10.6	-0.9	8.3	0	**19.9**	**P**
10-15	2020	5.6	0	0	29.3	-1.2	4.9	0	**38.6**	**F**
10-16	1995	15.3	7	1.1	3.7	-9	1.2	0	**19.4**	**P**
10-16	2000	18.8	7.3	0.3	11.5	-1.1	3.8	0	**40.6**	**F**
10-16	2005	9.6	-6.4	0.7	4.3	-20	3.5	0	**-8.4**	**VP**
10-16	2010	5.9	0	0	4.1	-14	8.5	0	**4.5**	**VP**
10-16	2015	1.6	0	0	14.3	-8.9	2.9	0	**9.8**	**VP-P**
10-16	2020	3.7	0	0	15.4	-20	4.5	0	**3.6**	**VP**
10-17	1995	21.8	9.8	10.2	1.3	-12.6	1.4	0	**31.8**	**F**
10-17	2000	24.7	7.3	11.7	0.8	-0.8	0.8	0	**44.6**	**F-G**
10-17	2005	28.8	5.7	15.0	1.8	-1.4	3.5	0	**53.4**	**G**
10-17	2010	26.4	9.8	15.0	3.5	-0.5	2.3	0	**56.4**	**G**
10-17	2015	23.1	9.6	15.0	2.4	-3.1	0.3	0	**47.3**	**G**
10-17	2020	22.5	9.8	14.4	3.4	-13.7	1.4	0	**37.8**	**F**
10-18	1995	10.6	9.6	0	3.2	-20	1.5	0	**5**	**VP**
10-18	2000	14.5	7.4	0.7	8.6	-5.2	1.9	0	**27.9**	**F**
10-18	2005	14.9	3.3	4.1	5.7	-20	1.4	0	**9.4**	**VP-P**
10-18	2010	17.8	6.9	0.5	5.9	-20	2.6	0	**13.7**	**P**
10-18	2015	12.8	3	0	7.3	-16.8	1.3	0	**7.5**	**VP**
10-18	2020	9.9	-3.9	1.4	3.9	-20	0.4	0	**-8.4**	**VP**
10-19*	1995	3.2	0	0	4.1	-14.7	0.1	0	**-7.4**	**VP**
10-20*	1995	2.5	0	0	6.6	-20	0.3	0	**-10.6**	**VP**
10-20*	2000	2.2	0	0	12	-4.2	0.7	0	**10.7**	**VP-P**
10-21*	1995	11.2	10.6	6.3	0.5	-11.4	0.3	0	**17.5**	**P**
10-22*	1995	13.6	12.2	9.8	2.9	-13.5	0.2	0	**25.2**	**P-F**
10-26	2000	24.8	-1.8	0	4.3	-0.8	0.4	0	**26.9**	**P-F**
10-26	2005	16.6	-7.4	0.3	4.5	-20	0.2	0	**-5.8**	**VP**
10-26	2010	30	4.1	0.6	6.4	-6.4	0.3	0	**34.9**	**F**
10-26	2015	23.9	7.5	1.5	5.9	-19.4	0.3	0	**19.6**	**P**
10-26	2020	24.3	2.6	1.3	6.9	-19.2	0.2	0	**16.1**	**P**
10-27	2005	29.9	6	2.8	2.5	-20	1	0	**22.2**	**P**
10-27	2010	30	11.3	12.4	2.1	-4.5	2	0	**53.3**	**G**
10-27	2015	30	6.7	1.3	1.6	-4.2	0.7	0	**36.1**	**F**
10-27	2020	30	-1.1	1.7	4.7	-4.5	2.3	0	**33**	**F**
10R-25*	1998	0	0	0	0	-20	0	0	**-20**	**VP**
10R-26	1998	4.7	0	0	0.1	-20	0	0	**-15.2**	**VP**
10R-26	2015	28.5	14	13.2	0.7	-17.9	0	0	**38.6**	**F**
10R-26	2020	11	-5	4.1	2.3	-20	0	0	**-7.5**	**VP**
10R-27*	1999	1.6	0	0	3.1	-0.5	7.8	0	**11.9**	**VP**
10R-30*	1999	22.7	10.5	0	4	-20	0	0	**17.2**	**VP**
10R-31*	1999	0	0	0	4.8	-6.6	0.4	0	**-1.4**	**VP**
10R-31*	2001	3.9	0	0	3.3	-20	2.5	0	**-10.4**	**VP**

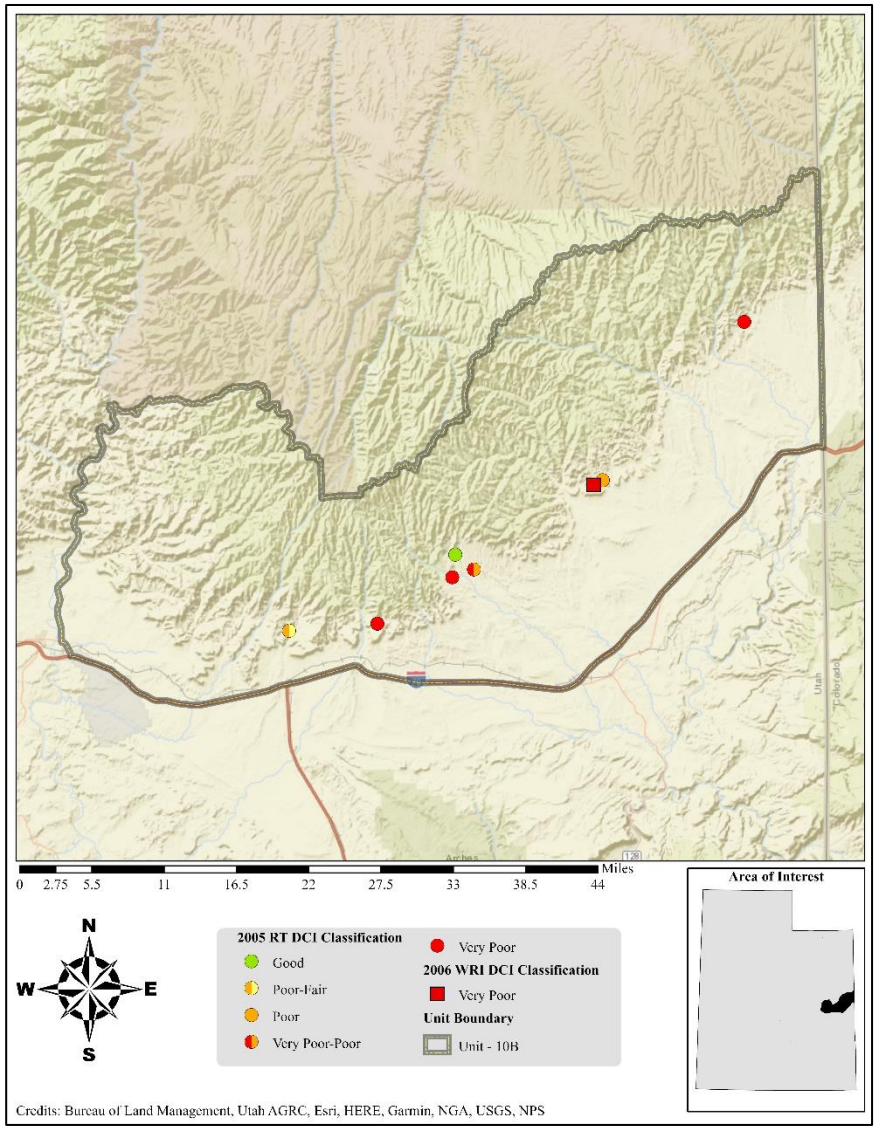
Table 4.11: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 10B, South Book Cliffs. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. *Studies with an asterisk have been suspended.



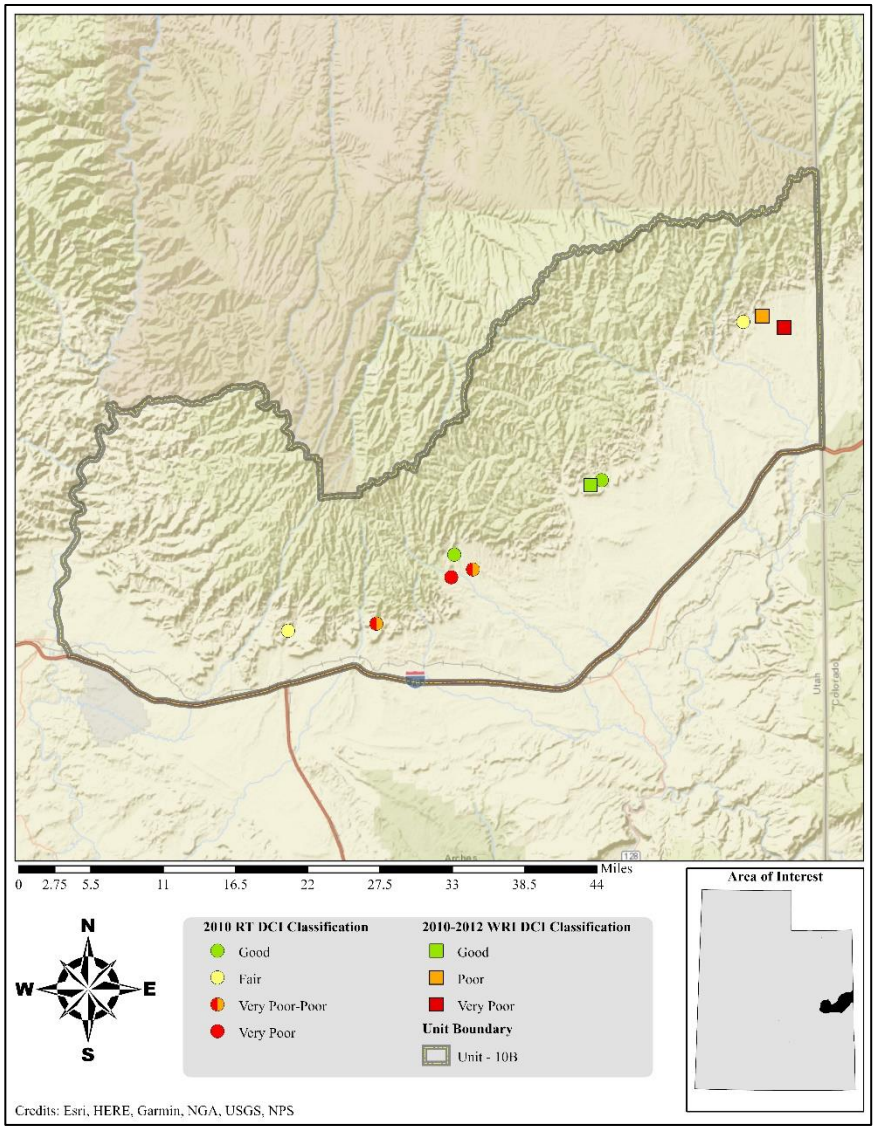
Map 4.10: 1995 Desirable Components Index (DCI) ranking distribution by study site for WMU 10B, South Book Cliffs.



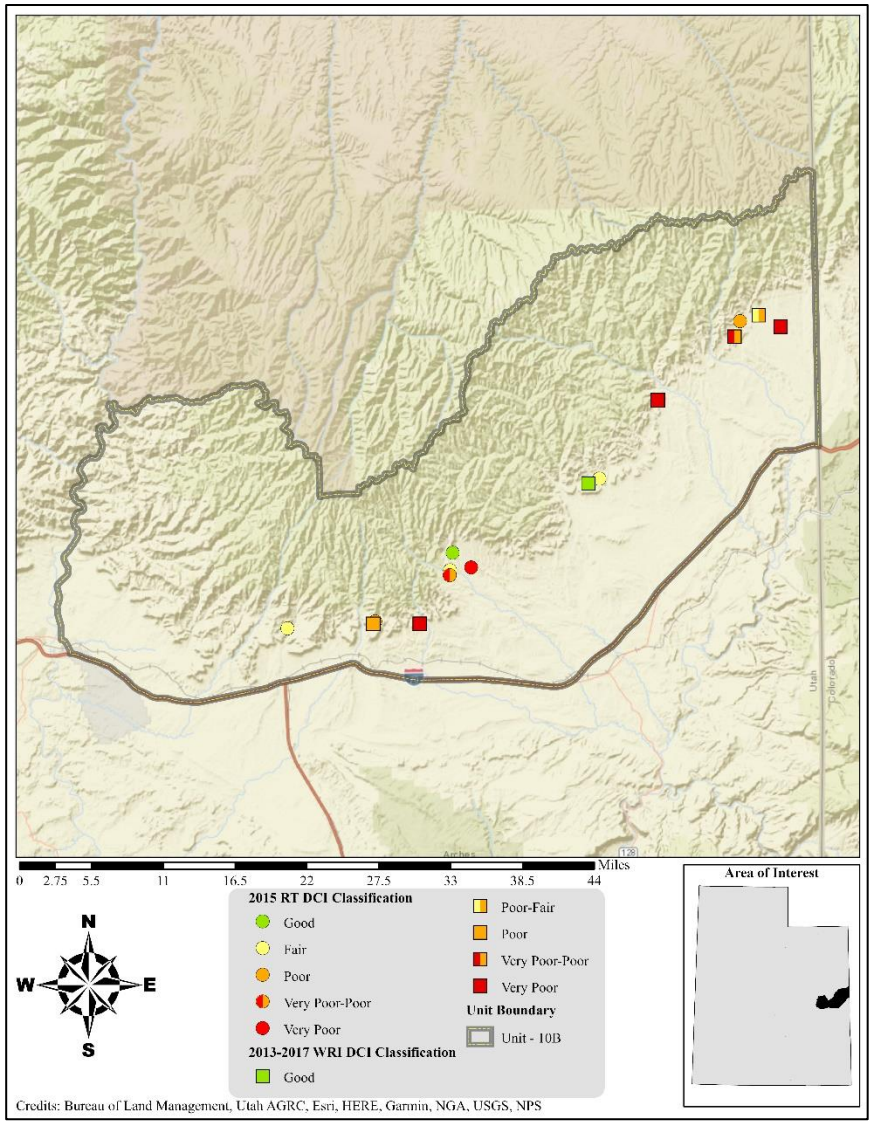
Map 4.11: 2000 Desirable Components Index (DCI) ranking distribution by study site for WMU 10B, South Book Cliffs.



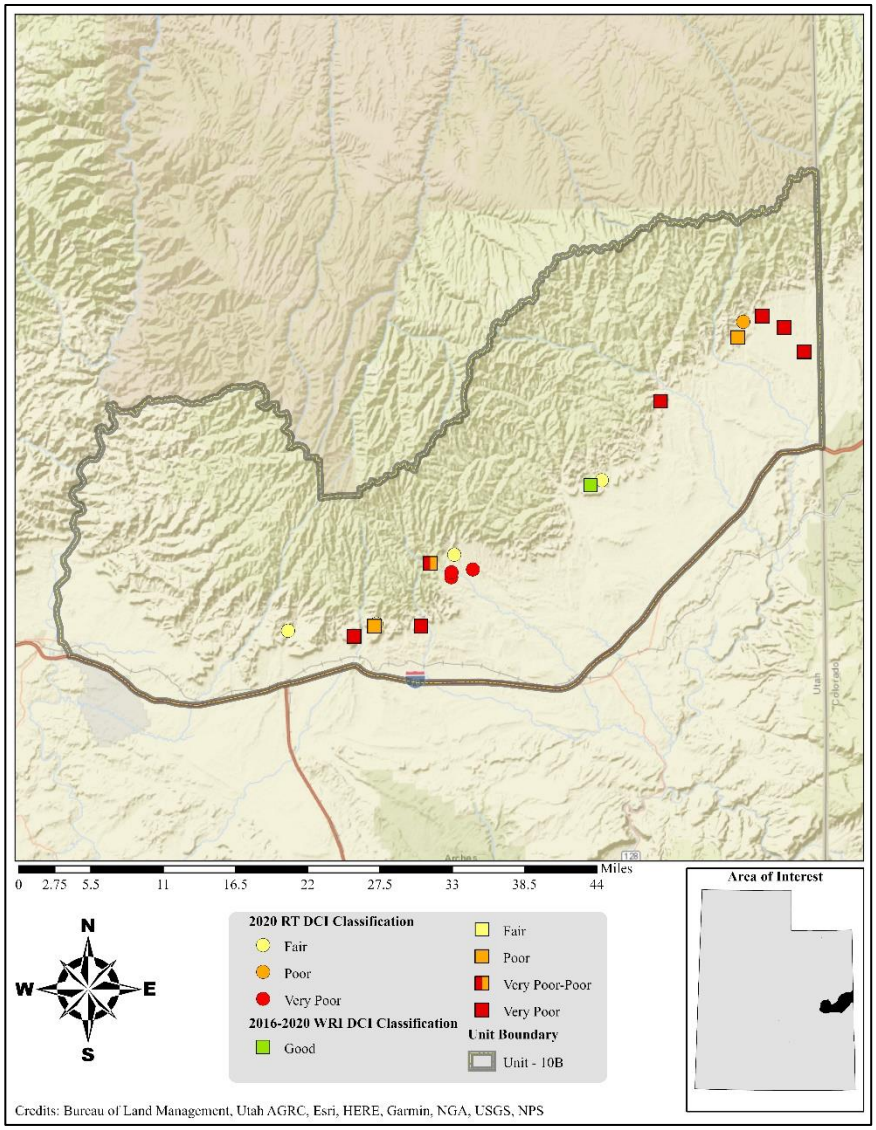
Map 4.12: 2005 Desirable Components Index (DCI) ranking distribution by study site for WMU 10B, South Book Cliffs.



Map 4.13: 2010 Desirable Components Index (DCI) ranking distribution by study site for WMU 10B, South Book Cliffs.



Map 4.14: 2015 Desirable Components Index (DCI) ranking distribution by study site for WMU 10B, South Book Cliffs.



Map 4.15: 2020 Desirable Components Index (DCI) ranking distribution by study site for WMU 10B, South Book Cliffs.

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
10-14	East Floy Bench	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
10-15	East Thompson Bench	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10-16	West Horse Pasture	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
10-17	East Calf Canyon	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
10-18	East Horse Pasture	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
10-26	Bitter Creek	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
10-27	Long Canyon	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-26	Nash Wash #2	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
10R-49	Long Canyon Bench Chaining	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
10R-50	Bitter Creek	Energy Development	High	Fragmentation and degradation/loss of habitat
		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	Medium	Reduced diversity of desirable grass and forb species
10R-54	Bitter Creek Herbicide	Energy Development	High	Fragmentation and degradation/loss of habitat
		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	Medium	Reduced diversity of desirable grass and forb species
10R-55	South Book Cliffs	Animal Use – Elk	High	Reduced understory shrub and herbaceous vigor
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-58	Dry Canyon	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-59	Sagers Bench	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-60	Hat Rock	Energy Development	High	Fragmentation and degradation/loss of habitat
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-62	West Thompson Bench	PJ Encroachment	High	Reduced understory shrub and herbaceous vigor
10R-63	Bar X Wash - Bitter Creek	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
10R-64	Bull Canyon	PJ Encroachment	High	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity

Table 4.12: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 10B, South Book Cliffs. 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

Semidesert (Big Sagebrush)

These lower elevation semidesert sagebrush sites support or have the potential to support Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) communities. These sites are generally considered to be in very poor to fair condition for deer wintering range habitat on the South Book Cliffs management unit. As is common for sites of this potential, the invasive annual grass species cheatgrass is a high-level threat and dominates the herbaceous understory on a majority of these sites. High amounts of cheatgrass can increase fuel loads and exacerbate the risk of wildfire. Although the threat level is low, all of these study sites are prone to encroachment by pinyon and juniper trees and are considered to be in Phase I of woodland succession. Presence of pinyon and juniper trees can reduce shrub and herbaceous understory health as woodland encroachment advances. Energy development is also a high-level threat on the West and East Horse Pasture, East Calf Canyon, and Bitter Creek study sites. Energy development leads to the direct loss of habitat and habitat fragmentation due to infrastructure development that may lead to physiological stress and displacement

of wildlife. Pellet transect data indicates that moderate use by cattle is occurring on the East Floy Bench study, posing a medium-level threat. Overuse by livestock can lead to decreased vigor and diversity in the shrub and herbaceous understory.

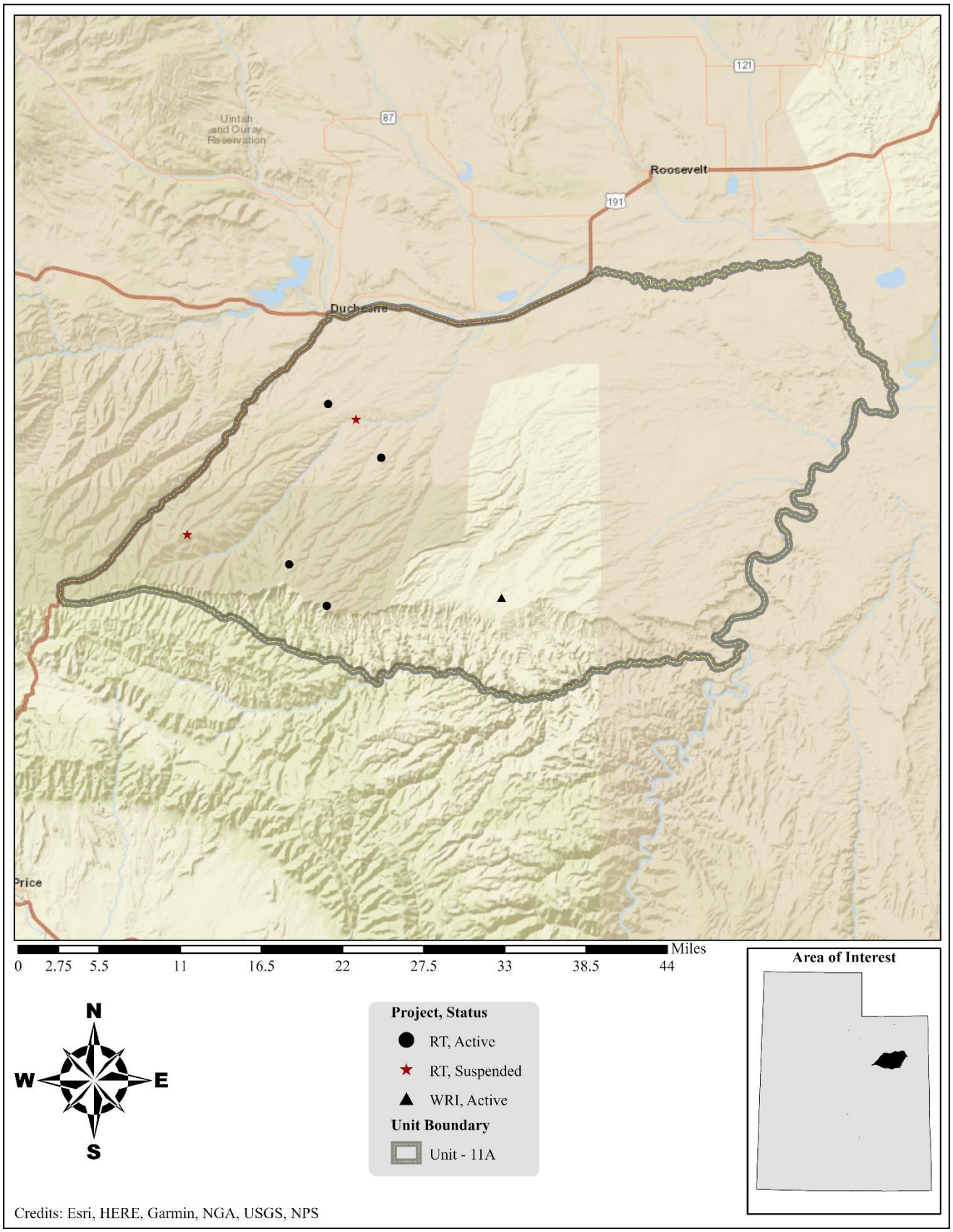
Treatments and considerations for this ecological type are few, but crucial in maintaining community function and avoiding subsequent ecological transition. It is strongly recommended that many sites undergo treatments to reduce annual grass that may include chemical control. Work to prevent and slow pinyon-juniper encroachment through bullhog, chaining, lop and scatter, etc. where needed should continue in these communities; care should be taken to select methods that will not increase annual grass loads. Monitoring may be needed to determine what energy development factors (noise, traffic, pollutants, fugitive dust, etc.) could be influencing wildlife in the area, and furthermore, if mitigation measures are needed to support wildlife. Attention should be given to observing contractual obligations in reclamation projects to ensure reseedings restore native grass and forb species if possible. Finally, a close examination of the East Floy Bench study and surrounding area is recommended to help determine if overuse by cattle may be occurring within the Crescent Canyon Allotment and associated pastures.

Semidesert (Fourwing Saltbush)

This lower elevation semidesert ecological type is represented by the Nash Wash 2 site, which has the potential to support a robust fourwing saltbush (*Atriplex canescens*) community. This site is considered to be in very poor condition for deer wintering range habitat on this management unit. Although the herbaceous understory provides a fair amount of cover, it is dominated by the introduced annual grass species cheatgrass, which can increase fuel loads and the risk of wildfire. In addition, all of the forbs within the understory are annual and the majority of these are introduced species.

The implementation of treatments to reduce annual grass loads is strongly recommended for this site. It is also recommended that perennial forbs and grasses be restored, but care must be taken in species selection and preference should be given to native species when possible.

5. WILDLIFE MANAGEMENT UNIT 11A – NINE MILE, ANTHRO



WILDLIFE MANAGEMENT UNIT 11A – NINE MILE, ANTHRO

Boundary Description

Duchesne and Uintah counties - Boundary begins at Duchesne and Highway US-191; southwest on US-191 to the Argyle Canyon Road; southeast on this road to the Nine Mile Canyon Road; east along this road to its end near Bulls Canyon; south from the end of the road to Nine Mile Creek; east along this creek to the Green River; north along this river to the Duchesne River; northwest along this river to US-40; west on US-40 to Duchesne and beginning point. Excludes all Ute Indian Tribal lands within this boundary.

Management Unit Description

Geography

The Nine Mile, Anthro Management Unit is located south of Duchesne and Highway 40, extending south into the Anthro Mountains. Elevation ranges from about 4,600 feet at the Green River to approximately 9,200 feet along Upper Cottonwood Ridge. This area falls within the Uinta Basin Watershed and major drainages include Sowers, Argyle, and Nine Mile Creeks, Big Wash, and Petes Wash. This management unit includes Nine Mile Canyon, which contains numerous petroglyphs, and a portion of Ashley National Forest. The city of Duchesne is partially located within this unit and Ouray is just outside of the northeastern boundary.

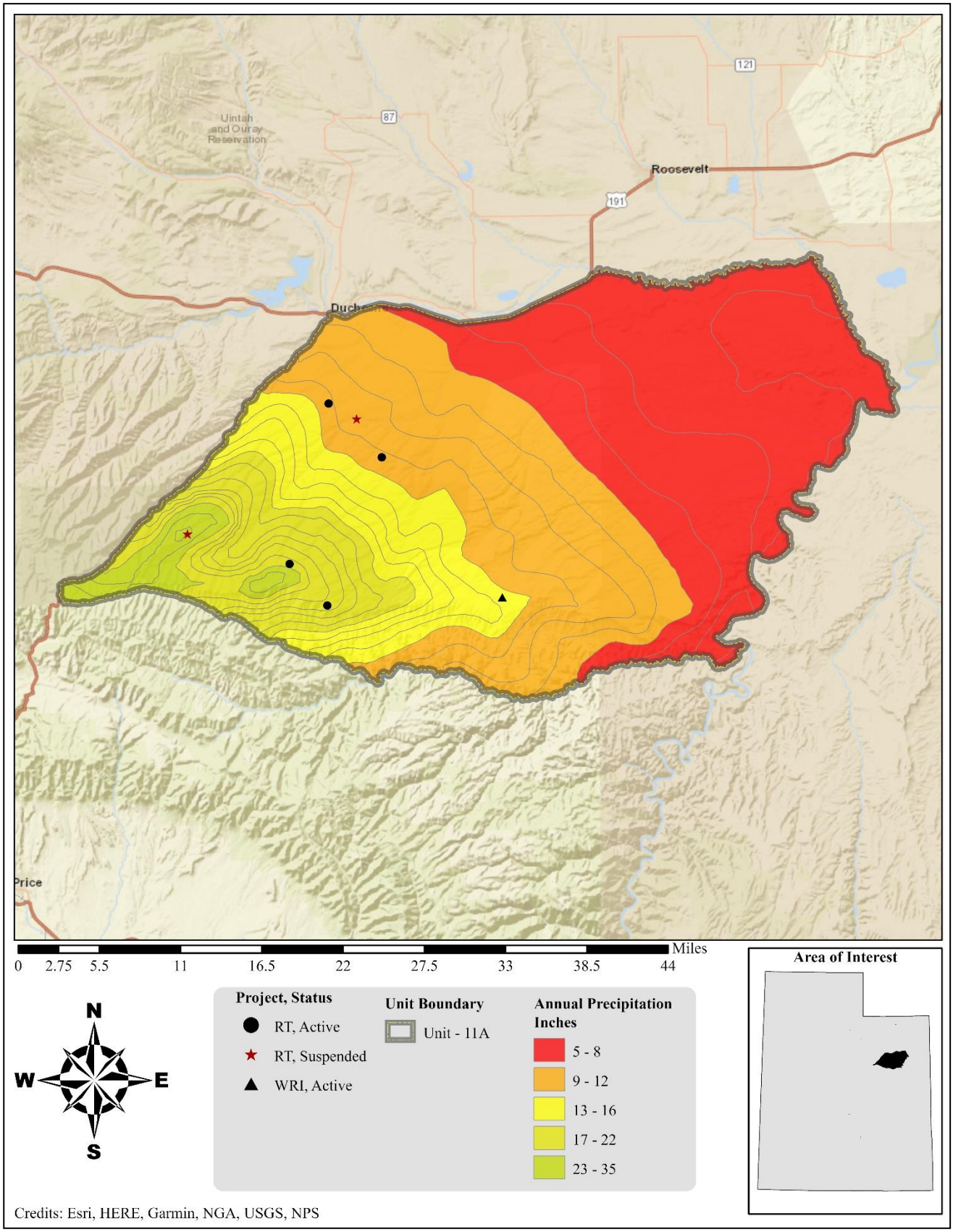
Climate Data

The 30 year (1981-2010) annual precipitation PRISM model shows precipitation ranges on the unit from 6 inches in the eastern portion to 25 inches in the southwest portion near Argyle Canyon. All of the Range Trend and WRI monitoring studies on the unit occur within 11-24 inches of precipitation (**Map 5.1**) (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 Northern Mountains and Uinta Basin divisions (Divisions 5 and 6).

The mean annual PDSI of the Northern Mountains division displayed years of moderate to extreme drought from 1988-1990, 2000-2003, 2012-2013, 2018, and 2020. The mean annual PDSI displayed moderately to extremely wet years from 1983-1986, 1995, 1997-1998, 2005, and 2011 (**Figure 5.1a**). 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 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, 2012-2013, and 2020; moderately to extremely wet years were displayed in 1983-1986, 1995, and 1997-1998 (**Figure 5.1b**) (Time Series Data, 2019).

The mean annual PDSI of the Uinta Basin division displayed years of moderate to extreme drought from 1989-1991, 2000, 2002-2003, 2012-2014, 2018, and 2020. The mean annual PDSI displayed moderate to extreme wet years from 1983-1985, 1993, 1997-1998, and 2005. The mean spring (March-May) PDSI displayed years of moderate to extreme drought in 1989-1992, 2002-2004, 2012-2014, and 2018. Moderate to extremely wet years for this time period were displayed in 1983-1985, 1993, 1995, 1998, 2005, 2011, and 2019 (**Figure 5.2a**). The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1989-1990, 2001-2003, 2007, 2012, 2017-2018, and 2020; moderately to extremely wet years were displayed in 1983-1986, 1993, and 1997-1998 (**Figure 5.2b**) (Time Series Data, 2020).



Map 5.1: The 1981-2010 PRISM Precipitation Model for WMU 11A, Nine Mile, Anthro (PRISM Climate Group, Oregon State University, 2013).

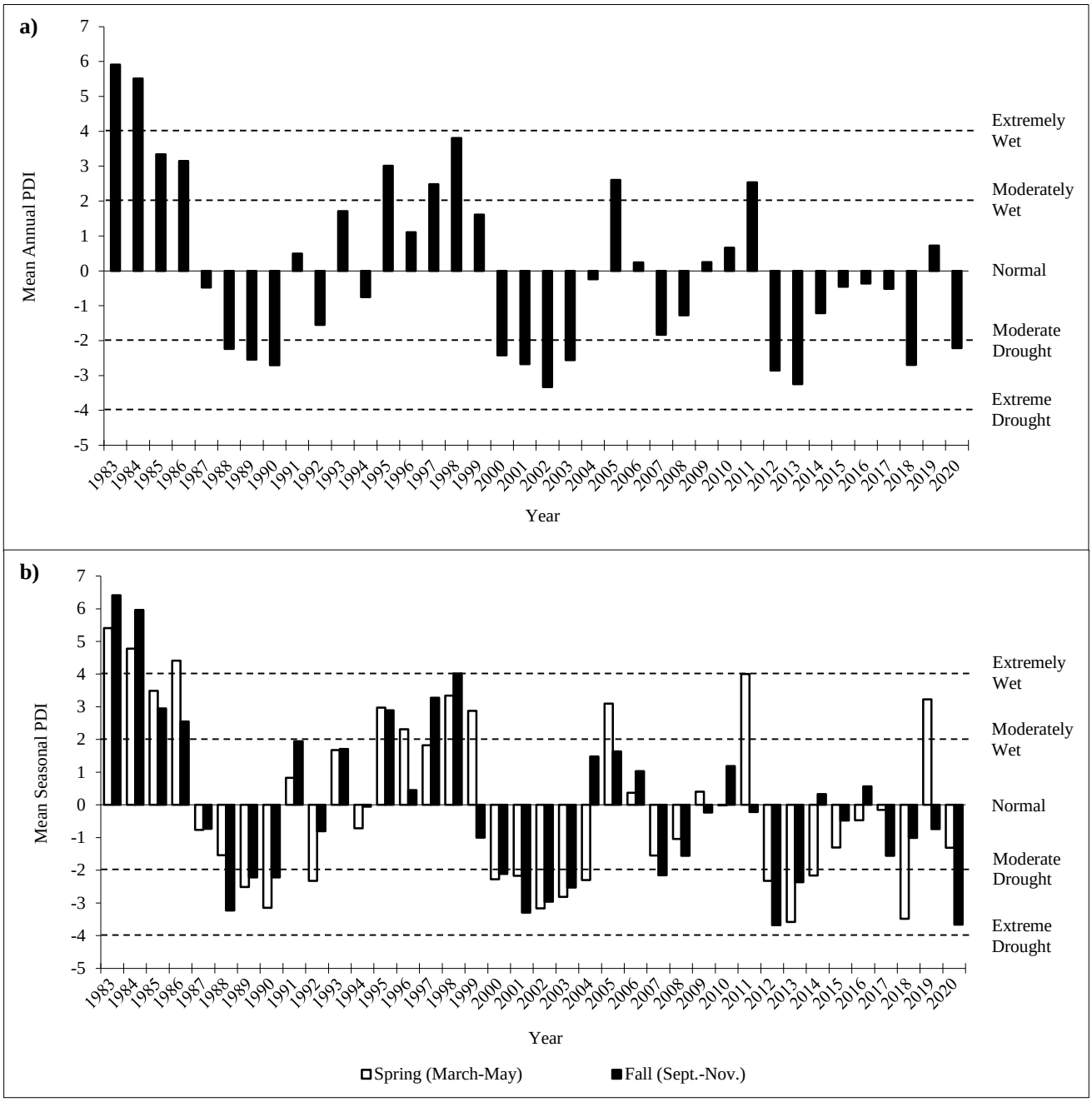


Figure 5.1: The 1983-2020 Palmer Drought Severity Index (PDSI) for the Northern Mountains division (Division 5). The PDSI is based on climate data gathered from 1895 to 2020. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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).

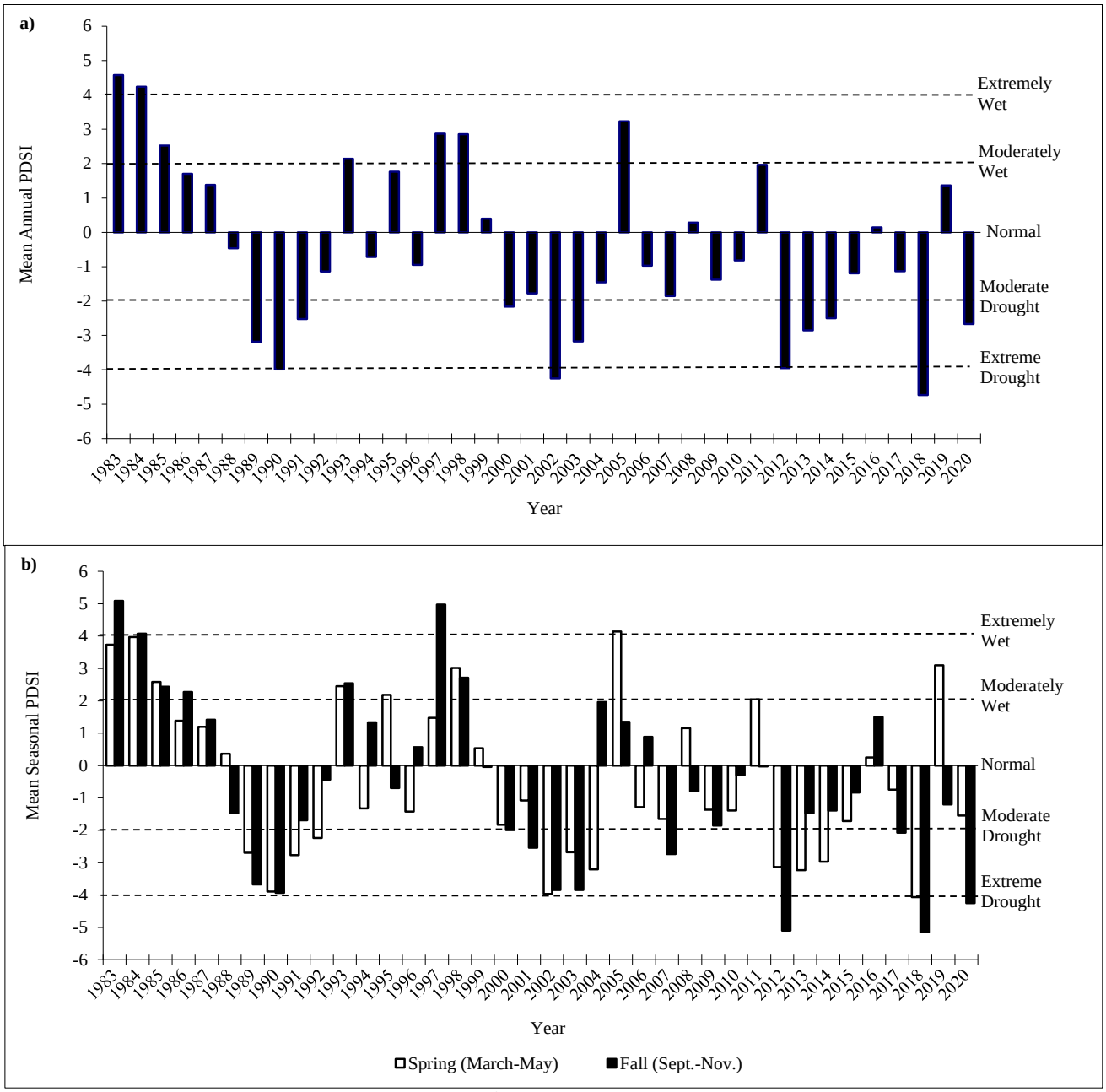


Figure 5.2: The 1983-2020 Palmer Drought Severity Index (PDSI) for the Uintah Basin division (Division 6). The PDSI is based on climate data gathered from 1895 to 2020. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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).

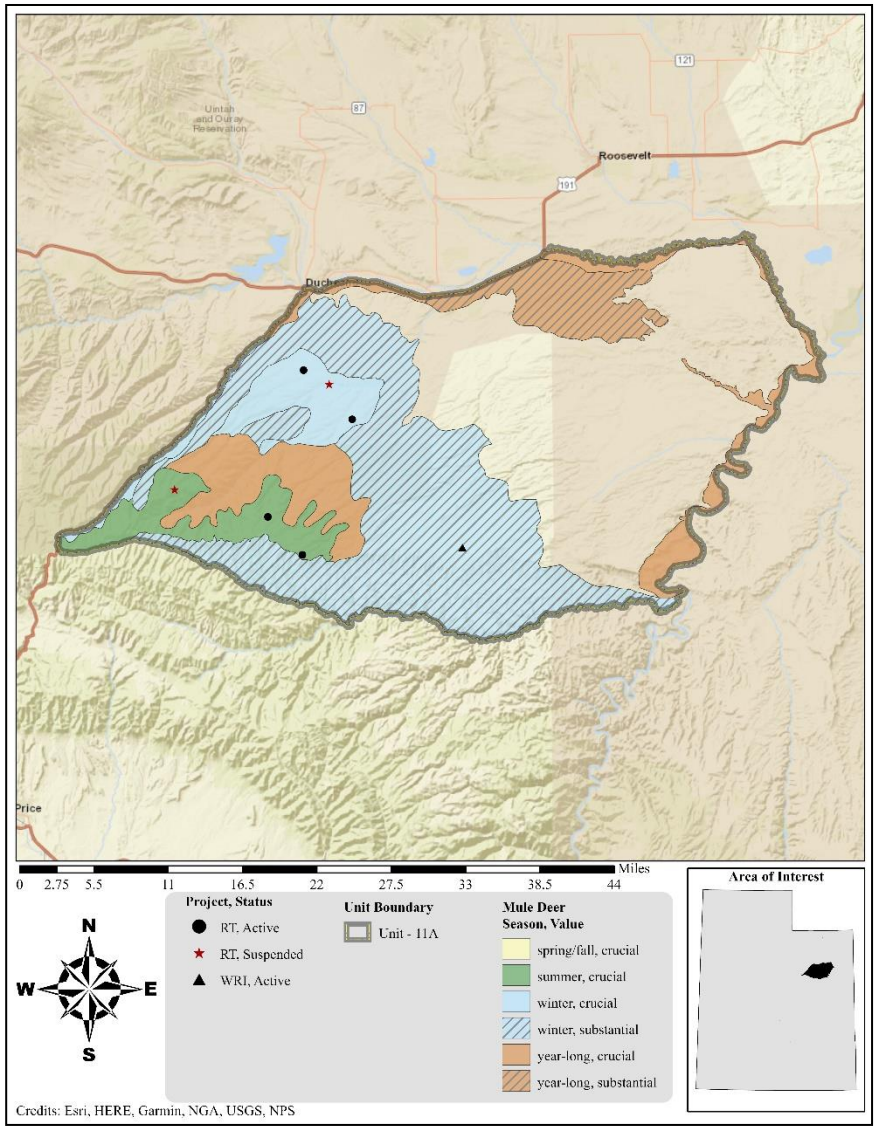
Big Game Habitat

There are an estimated 390,000 acres classified as deer range on Unit 11A with 62% classified as winter range, 9% as summer range, 29% as year-long range, and less than 1% classified as spring/fall range (**Table 5.1**, **Map 5.2**). The Bureau of Land Management (BLM)-managed lands comprise 46% of the winter range, U.S. Forest Service (USFS) lands comprise 10%, Utah School and Institutional Trust Lands Administration-owned lands (SITLA) comprise 7%, tribal lands comprise 21%, private lands comprise 13%, and the Utah Division of Wildlife Resources (UDWR) administers 3% of the range (**Table 5.2**, **Map 5.2**, **Map 5.8**). There are approximately 376,000 acres that are classified as elk range on Unit 11A with 42% considered to be winter range, 16% classified as summer range, and 42% classified as year-long range. Of the elk winter range, 36% is on tribal land, 26% is on private lands, 19% is on Forest Service lands, 13% is on BLM land, 4% is on UDWR lands, and 2% is on land managed by SITLA (**Table 5.3**, **Map 5.3**, **Map 5.8**).

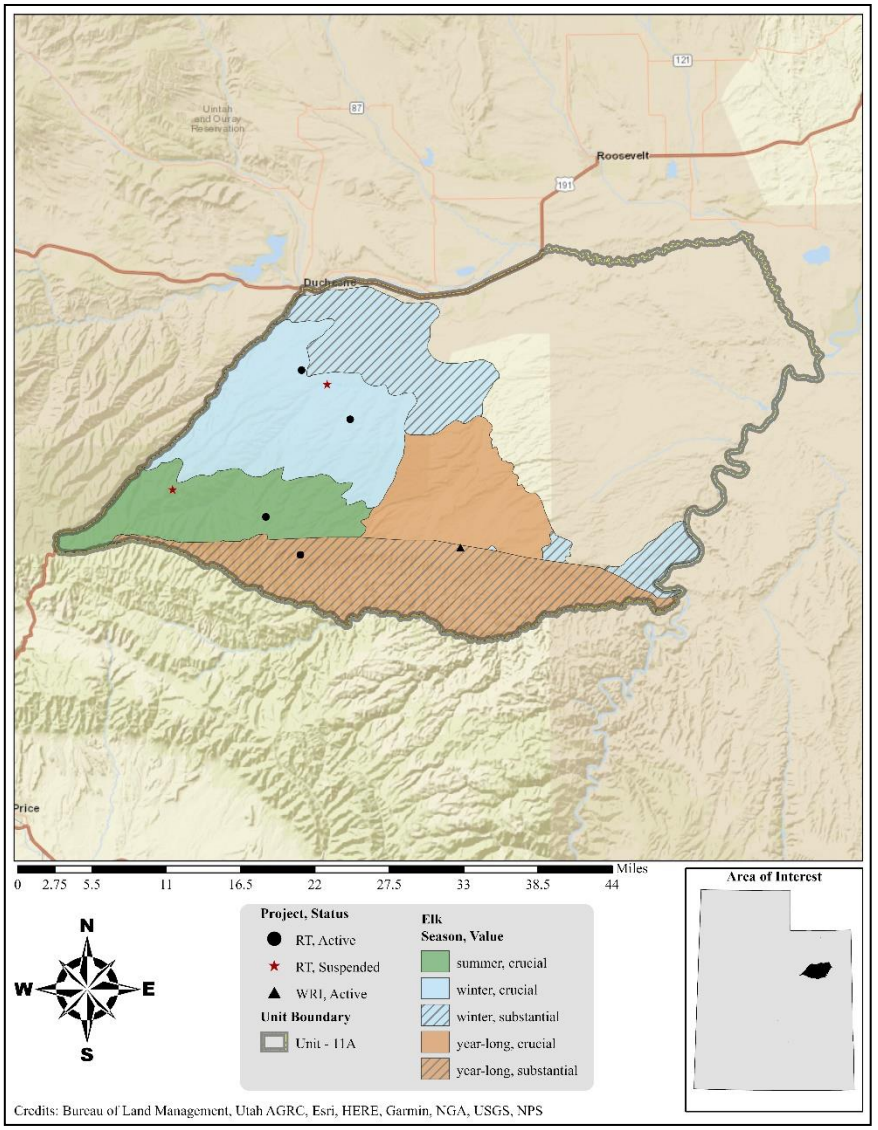
Anthro Mountain

There is a long and gradual northerly slope to the Anthro Mountain terrain that lends itself to an abundance of winter range. The long slopes are covered by pinyon-juniper woodland with natural openings of sagebrush. Grassy openings are often found in the drainages, and some ridge tops are covered with black sagebrush. Summer range is limited with most of the high country being comprised of open sagebrush slopes and scattered patches of aspen. Most of the winter range in the unit is available even in severe winters. The upper limits for winter range are generally considered to be between 8,000 and 8,500 feet. The desert country below 5,000 feet is seldom used by migrating deer.

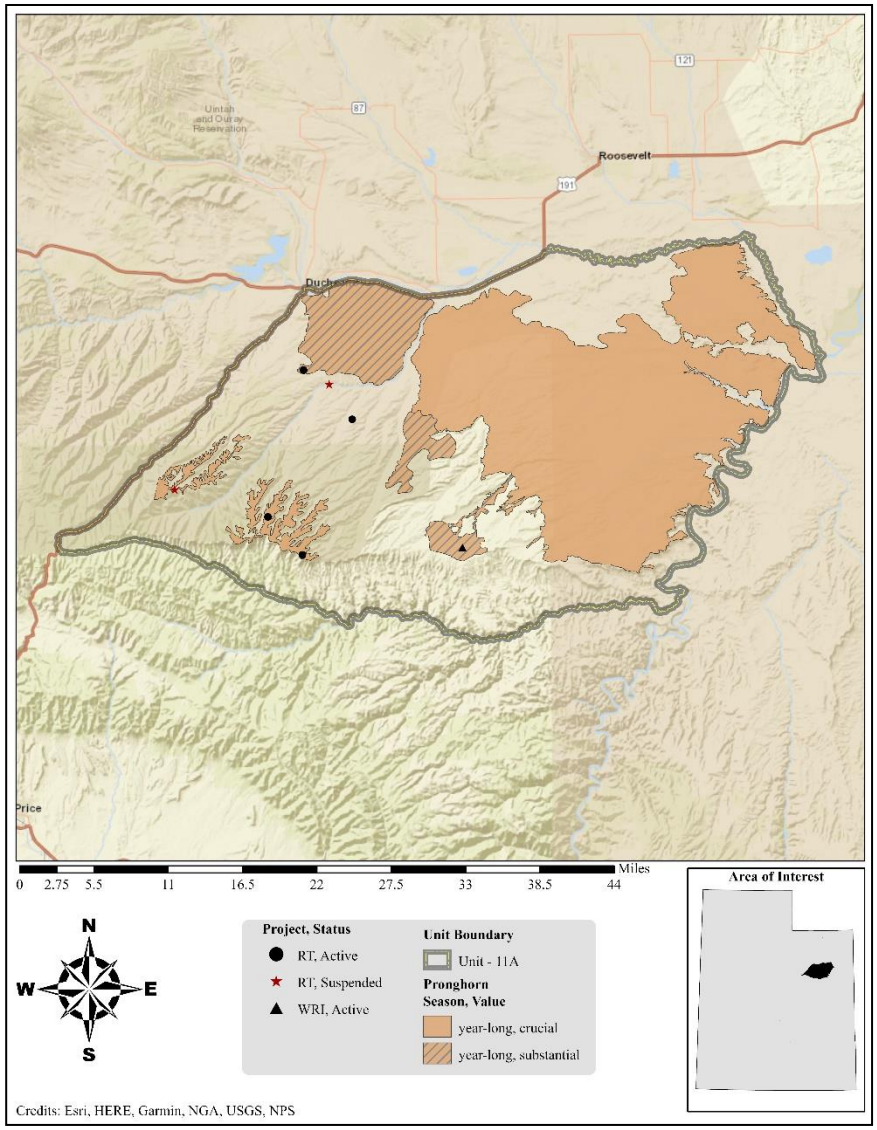
According to Landfire Existing Vegetation Coverage models, shrublands comprise approximately 62% of the unit. Of the shrubland land cover, combined sagebrush shrubland and steppe vegetation types make up 20% of the land cover, much of which is considered to be key mule deer habitat (**Table 5.7**).



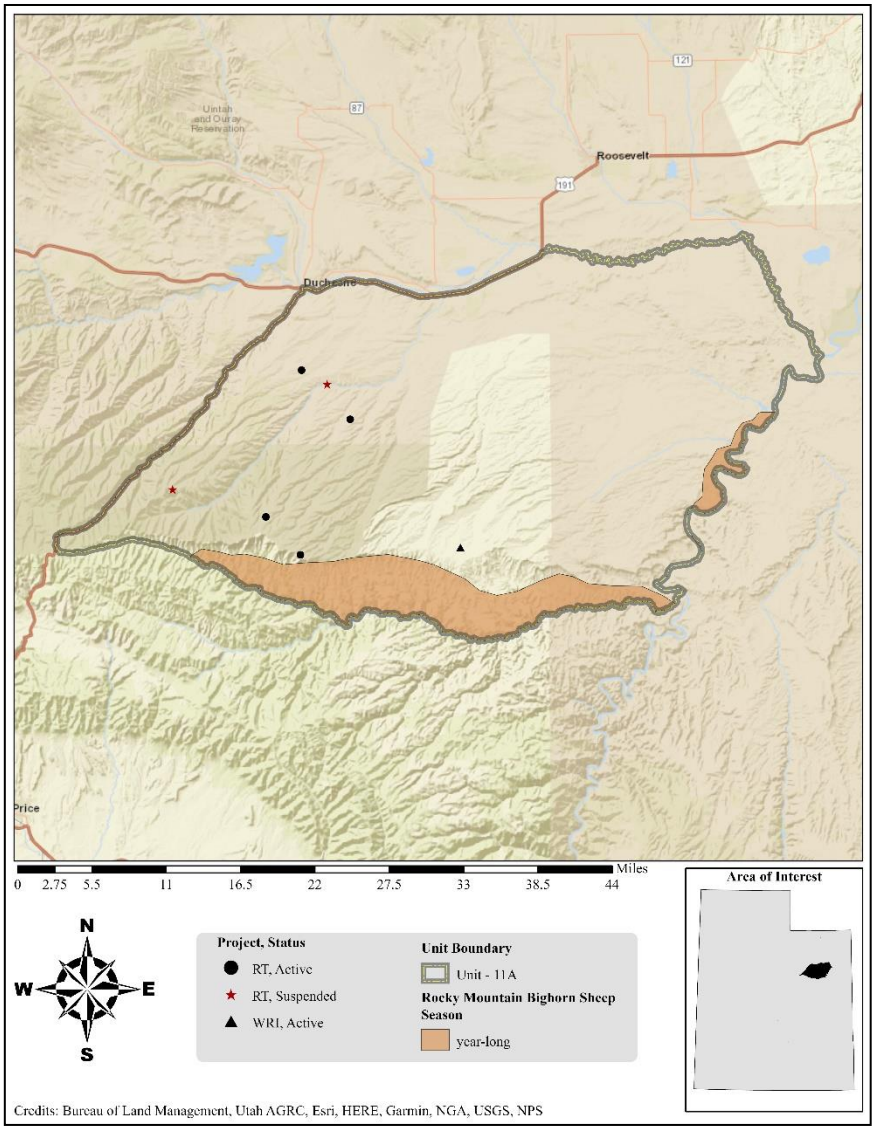
Map 5.2: Estimated mule deer habitat by season and value for WMU 11A, Nine Mile, Anthro.



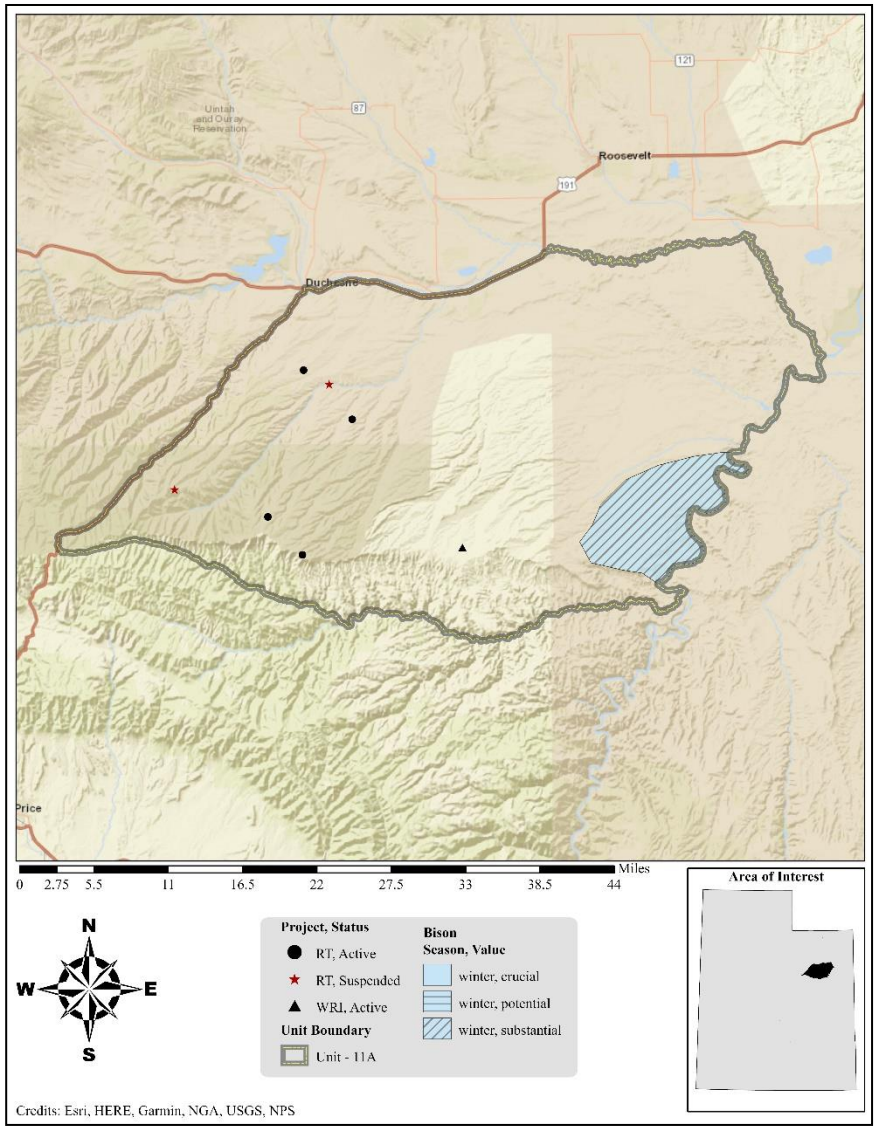
Map 5.3: Estimated elk habitat by season and value for WMU 11A, Nine Mile, Anthro.



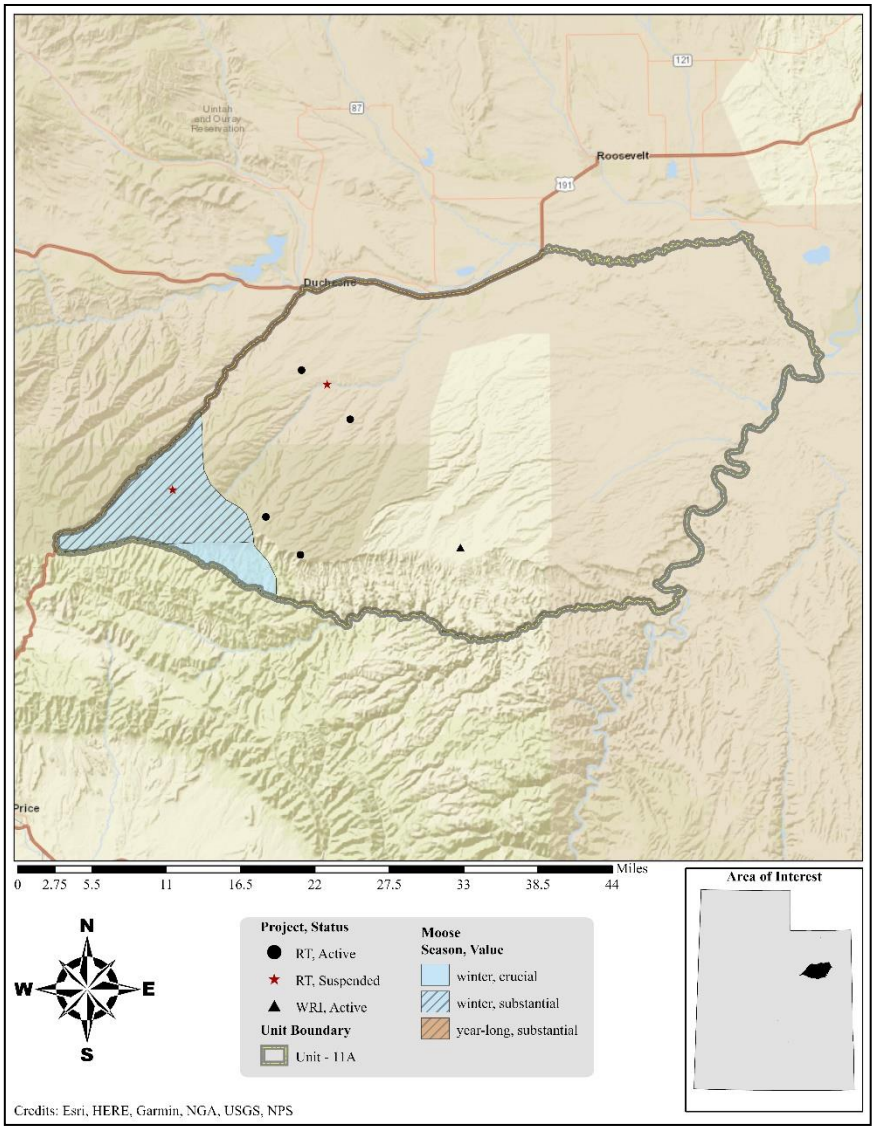
Map 5.4: Estimated pronghorn habitat by season and value for WMU 11A, Nine Mile, Anthro.



Map 5.5: Estimated Rocky Mountain bighorn sheep habitat by season and value for WMU 11A, Nine Mile, Anthro.



Map 5.6: Estimated bison habitat by season and value for WMU 11A, Nine Mile, Anthro.



Map 5.7: Estimated moose habitat by season and value for WMU 11A, Nine Mile, Anthro.

	Year Long Range		Summer Range		Winter Range		Spring/Fall Range	
Species	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
Mule Deer	111,474	29%	36,123	9%	241,127	62%	1,383	<1%
Elk	157,970	42%	59,881	16%	158,344	42%	0	0%
Moose	40	<1%	0	0%	50,469	100%	0	0%
Pronghorn	301,017	100%	0	0%	0	0%	0	0%
Bighorn Sheep	72,283	100%	0	0%	0	0%	0	0%

Table 5.1: Estimated mule deer, elk, moose, pronghorn, and Rocky Mountain bighorn sheep habitat acreage by season for WMU 11A, Nine Mile, Anthro.

	Year Long Range		Summer Range		Winter Range		Spring/Fall Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	14,421	13%	787	2%	109,716	46%	572	41%
Private	35,194	32%	1,481	4%	32,302	13%	708	51%
SITLA	946	1%	483	1%	17,393	7%	103	8%
UDOT	19	<1%	0	0%	0	0%	0	0%
FFSL	1,538	1%	0	0%	0	0%	0	0%
USFS	41,634	37%	33,372	93%	24,648	10%	0	0%
UDWR	268	<1%	0	0%	6,749	3%	0	0%
Tribal	17,455	16%	0	0%	50,320	21%	0	0%
Total	111,474	**100%**	36,123	**100%**	241,127	**100%**	1,383	**100%**

Table 5.2: Estimated mule deer habitat acreage by season and ownership for WMU 11A, Nine Mile, Anthro.

	Year Long Range		Summer Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	120,070	76%	1,047	2%	21,321	13%
Private	5,071	3%	1,464	3%	41,318	26%
SITLA	19,674	12%	231	<1%	2,441	2%
UDOT	0	0%	0	0%	19	<1%
FFSL	0	0%	0	0%	49	<1%
USFS	12,407	8%	57,140	95%	30,108	19%
UDWR	0	0%	0	0%	6,749	4%
Tribal	749	1%	0	0%	56,340	36%
Total	157,970	**100%**	59,881	**100%**	158,344	**100%**

Table 5.3: Estimated elk habitat acreage by season and ownership for WMU 11A, Nine Mile, Anthro.

	Year Long Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	38	95%	9,727	19%
Private	2	5%	4,180	8%
SITLA	0	0%	1,519	3%
USFS	0	0%	34,554	69%
Tribal	0	0%	488	1%
Total	40	**100%**	50,469	**100%**

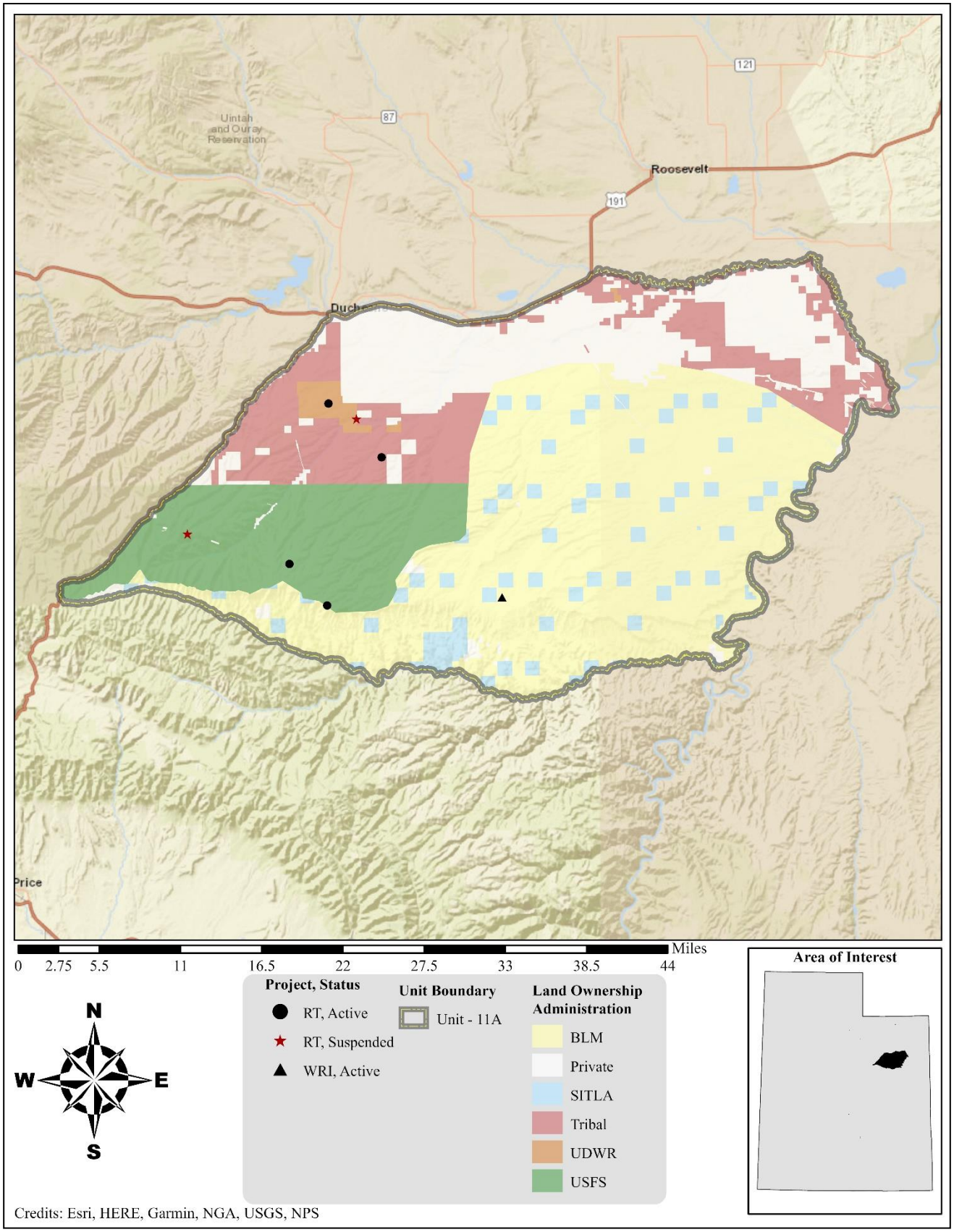
Table 5.4: Estimated moose habitat acreage by season and ownership for WMU 11A, Nine Mile, Anthro.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	161,331	54%
Private	77,661	26%
SITLA	20,446	7%
FFSL	1	<1%
USFS	15,723	5%
UDWR	1,027	<1%
Tribal	24,829	8%
Total	301,017	100%

Table 5.5: Estimated pronghorn habitat acreage by season and ownership for WMU 11A, Nine Mile, Anthro.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	57,212	79%
Private	4,114	6%
SITLA	10,168	14%
FFSL	728	1%
USFS	63	<1%
Total	72,283	**100%**

Table 5.6: Estimated Rocky Mountain bighorn sheep habitat acreage by season and ownership for WMU 11A, Nine Mile, Anthro.



Map 5.8: Land ownership for WMU 11A, Nine Mile, Anthro.

Group	Existing Vegetation Type	Acres	% of Total	Group % of Total
Shrubland	Inter-Mountain Basins Mixed Salt Desert Scrub	224,383	34.10%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	79,160	12.03%	
	Inter-Mountain Basins Big Sagebrush Shrubland	38,822	5.90%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	21,661	3.29%	
	Inter-Mountain Basins Montane Sagebrush Steppe	14,617	2.22%	
	Inter-Mountain Basins Mat Saltbush Shrubland	11,063	1.68%	
	Rocky Mountain Lower Montane-Foothill Shrubland	7,830	1.19%	
	Inter-Mountain Basins Greasewood Flat	3,822	0.58%	
	Colorado Plateau Pinyon-Juniper Shrubland	2,385	0.36%	
	Other Shrubland	557	0.08%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	421	0.06%	
	Southern Colorado Plateau Sand Shrubland	8	0.00%	
	Colorado Plateau Blackbrush-Mormon-tea Shrubland	3	0.00%	61.51%
Conifer	Colorado Plateau Pinyon-Juniper Woodland	109,106	16.58%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	10,839	1.65%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	3,216	0.49%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	1,381	0.21%	
	Southern Rocky Mountain Ponderosa Pine Woodland	1,253	0.19%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	1,149	0.17%	
	Other Conifer	1,140	0.17%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	359	0.05%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	10	0.00%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	3	0.00%	19.52%
Other	Sparsely Vegetated	66,406	10.09%	
	Agricultural	24,894	3.78%	
	Developed	7,040	1.07%	
	Hardwood	2,984	0.45%	
	Riparian	2,878	0.44%	
	Open Water	2,602	0.40%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	2,115	0.32%	
	Conifer-Hardwood	674	0.10%	16.66%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	5,068	0.77%	
	Interior West Ruderal Riparian Scrub	3,004	0.46%	
	Interior West Ruderal Riparian Forest	1,208	0.18%	
	Interior Western North American Temperate Ruderal Shrubland	135	0.02%	1.43%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	3,339	0.51%	
	Southern Rocky Mountain Montane-Subalpine Grassland	612	0.09%	
	Other Grassland	263	0.04%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	102	0.02%	0.66%
Exotic Herbaceous	Great Basin & Intermountain Introduced Annual Grassland	639	0.10%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	575	0.09%	
	Interior Western North American Temperate Ruderal Grassland	136	0.02%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	115	0.02%	0.22%
Total		**657,978**	**100%**	**100%**

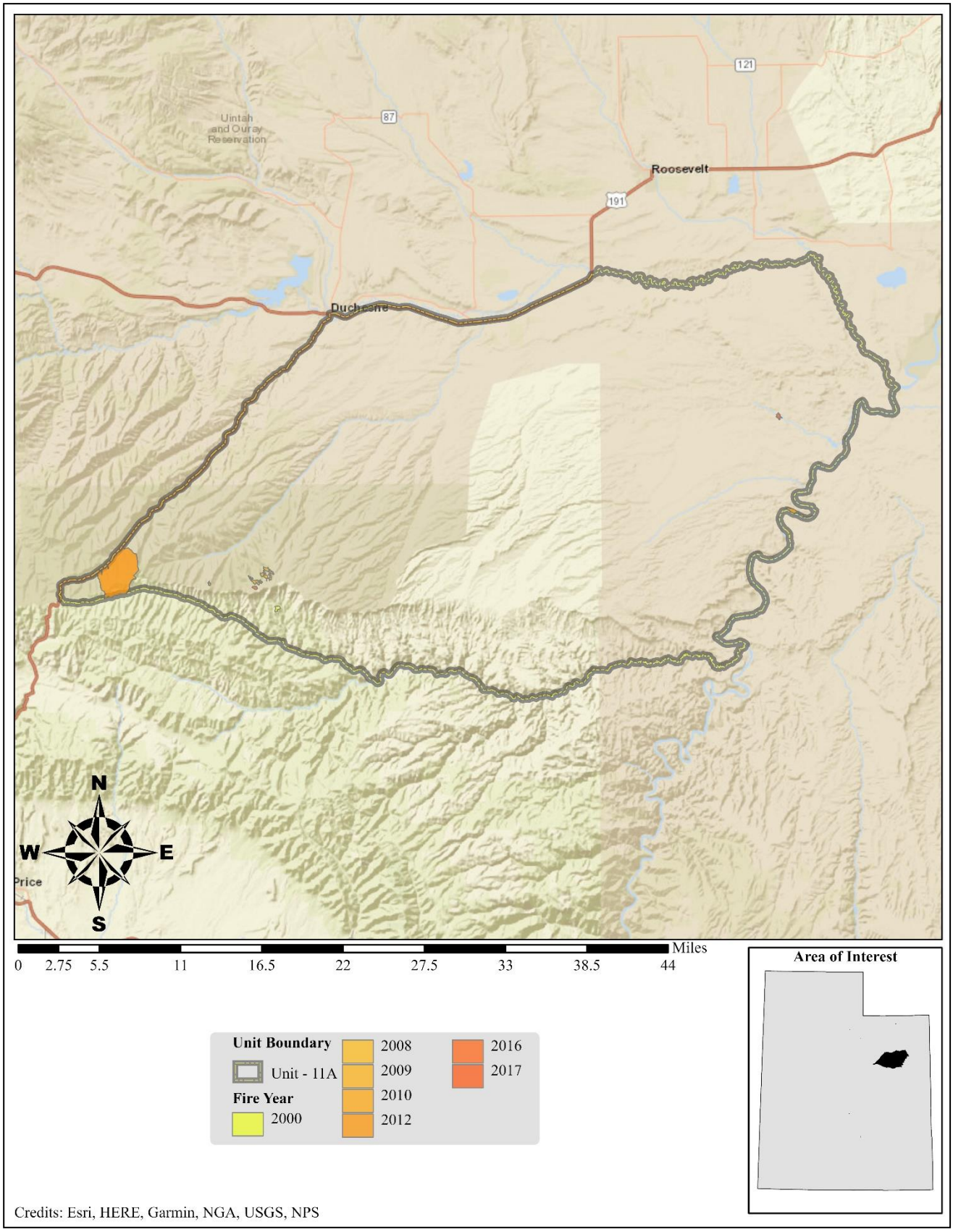
Table 5.7: LANDFIRE Existing Vegetation Coverage (LANDFIRE.US_140EVT, 2019) for WMU 11A, Nine Mile, Anthro.

Limiting Factors to Big Game Habitat

Cattle grazing is the major activity occurring on Forest Service-managed lands within management unit 11A. Oil and gas exploration and drilling, with their associated roads and year-round activity, are the prominent activities taking place on the lower ends of the ridges. Firewood cutting is also an important land use on Ute Tribal lands.

According to the Landfire Existing Vegetation Coverage model, nearly 17% of the Nine Mile, Anthro subunit is comprised of pinyon and juniper woodlands (**Table 5.7**): Encroachment by these woodland communities poses a significant threat to important rangelands. Invasion of these woodlands into sagebrush communities has been shown to decrease sagebrush and herbaceous cover, therefore decreasing available forage for wildlife (Miller, Svejcar, & Rose, 2000).

Deer fences and crossings limiting range are always a concern, but cooperation with the Utah Department of Transportation in construction of highway fences, passage structures, warning signs, etc. will continue in order to ensure proper access to habitat as well as deer and human safety.



Map 5.9: Land coverage of fires by year from 2000-2020 for WMU 11A, Nine Mile, Anthro (Geosciences and Environmental Change Science Center (GECSC) Outgoing Datasets, 2021).

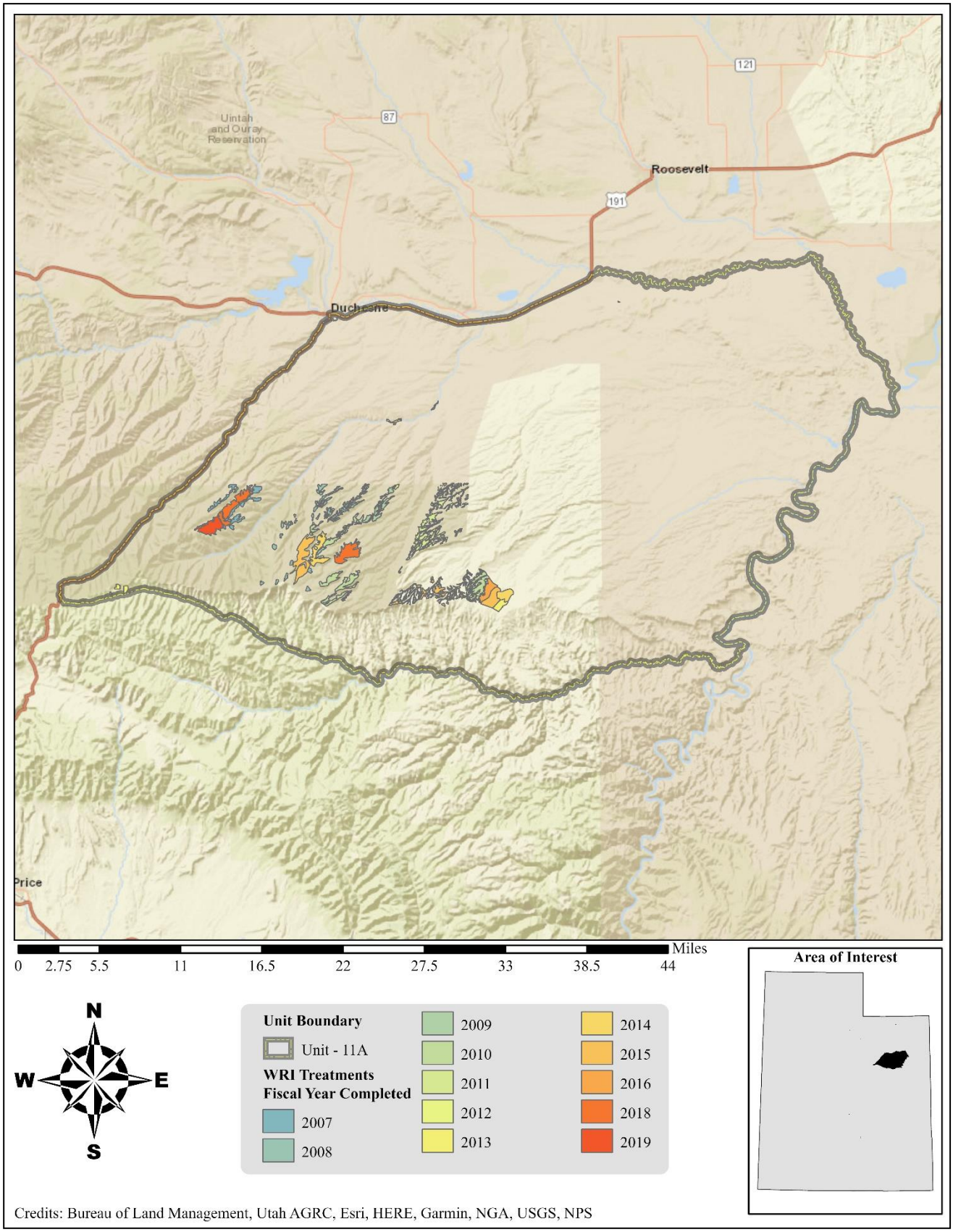
Treatments/Restoration Work

There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 16,158 net acres of land have been treated within the Nine Mile, Anthro unit since the WRI was implemented in 2004 (**Map 5.10**). Treatments frequently overlap one another bringing the total treatment acres to 16,348 acres for this unit. In addition, 4,814 acres are currently being treated (**Table 5.8**). 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.

Vegetation removal via hand crew is the most common management practice. Bullhog use for pinyon pine and Utah juniper removal is also very common. Other management practices include prescribed fire, seeding to supplement the herbaceous understory, planting and/or transplanting of desirable species, and herbicide application to remove weeds (**Table 5.8**).

Type	Completed Acreage	Current Acreage	Proposed Acreage	Total Acreage
Bullhog	**1,713**	**0**	**0**	**1,713**
Full Size	1,713	0	0	1,713
Forestry Practices	**0**	**3,839**	**0**	**3,839**
Thinning (Commercial)	0	3,839	0	3,839
Planting/Transplanting	**2**	**0**	**0**	**2**
Other	2	0	0	2
Prescribed Fire	**643**	**0**	**0**	**643**
Seeding (Primary)	**256**	**0**	**0**	**256**
Broadcast (Aerial-Helicopter)	138	0	0	138
Drill (Rangeland)	102	0	0	102
Hand Seeding	16	0	0	16
Vegetation Removal/Hand Crew	**13,734**	**975**	**0**	**14,708**
Lop & Scatter	13,734	975	0	14,708
Grand Total	**16,348**	**4,814**	**0**	**21,162**
***Total Land Area Treated**	**16,158**	**4,814**	**0**	**20,972**

Table 5.8: WRI treatment action size (acres) for completed, current, and proposed projects for WMU 11A, Nine Mile, Anthro. Data accessed on 02/09/2021. *Does not include overlapping treatments.



Map 5.10: WRI treatments by fiscal year completed for WMU 11A, Nine Mile, Anthro.

Range Trend Studies

Range Trend studies have been sampled within WMU 11A on a regular basis since 1982, with studies being added or suspended as was deemed necessary (**Table 5.9**). Due to changes in sampling methodologies, only data sampled 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 study sites have had some sort of disturbance or treatment prior to or since study establishment (**Table 5.10**). Range Trend studies are summarized in this report by ecological site.

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
11A-1	Upper Cottonwood Ridge	RT	Suspended	1988, 1995	Not Verified
11A-2	Wirefence Canyon	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020	Mountain Shallow Loam (Mountain Big Sagebrush)
11A-3	Chokecherry Canyon	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020	High Mountain Loam (Mountain Big Sagebrush)
11A-4	Cottonwood Canyon	RT	Active	1988, 1995, 2000, 2005, 2010, 2015	Semidesert Silt Loam (Winterfat)
11A-5	Nutter's Canyon	RT	Active	1988, 1995, 2000, 2005, 2010, 2015	Upland Shallow Loam (Black Sagebrush)
11R-1	Sowers	RT	Suspended	1997	Not Verified
11R-15	Big Wash	WRI	Active	2013, 2016	Upland Shallow Loam (Wyoming Big Sagebrush)

Table 5.9: Range trend and WRI project studies monitoring history and ecological site potential for WMU 11A, Nine Mile, Anthro.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
11A-2	Wirefence Canyon	Plow		1958-1959	2,363	
		Seed Unknown		1958-1959	2,363	
11A-3	Chokecherry Canyon	Prescribed Fire		1977	500	
		Prescribed Fire	Anthro-Mountain Prescribed Burn	Fall 2007	642	841
11R-15	Big Wash	Chain Unknown Bullhog	Anthro Mountain P-J Treatment	Historic January 2014	403	2465

Table 5.10: Range trend and WRI studies known disturbance history for WMU 11A, Nine Mile, Anthro. PDB = Pre-Database; LTDL = Land Treatment Digital Library (Pilliod & Welty, 2019)

Study Trend Summary (Range Trend)

Mountain (Big Sagebrush)

Due to their similarities, there are two study sites [Wire Fence (11A-2) and Chokecherry Canyon (11A-3)] that are summarized together and are classified as Mountain (Sagebrush) and High Mountain (Sagebrush) ecological sites, respectively. The Wirefence Canyon study is found in the southern portion of Wire Fence Canyon near the southwestern rim of the West Tavaputs Plateau. The Chokecherry Canyon site is found on the southwest rim of the West Tavaputs Plateau just above the Badland Cliffs (**Table 5.9**).

Shrubs/Trees: The primary browse species on these sites is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). Yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *lanceolatus*) is also present and co-dominant on these sites, and is increasing in cover. Shrub line intercept cover for both sagebrush and rabbitbrush has steadily increased since a prescribed burn on the Chokecherry Canyon study in 2007 (**Figure 5.3**). The preferred browse populations on these sites are largely composed of mature plants. Decadence within these populations has remained low over the sample period. Recruitment of young plants has remained low and has been decreasing overall, which may contribute to the overall decrease in the preferred browse population since the 2000 sample year (**Figure 5.7**). Overall utilization has generally decreased with the majority of the preferred browse receiving moderate use, which has also decreased (**Figure 5.8**).

Pinyon and juniper encroachment is not an issue for this ecological type and is therefore not discussed in this section (**Figure 5.5**, **Figure 5.6**).

Herbaceous Understory: The herbaceous understories of these sites are plentiful, diverse, and overall in good condition. Perennial grasses have been the largest component in the understories throughout the years with slender wheatgrass (*Elymus trachycaulus*) and smooth brome (*Bromus inermis*) as the dominant species that drive the herbaceous trend. Annual grasses have not been sampled. A diverse number of perennial forbs provide substantial cover, which has ranged from just over 11% in most sample years to over 6% in 2020. Annual forb cover has remained low and has never exceeded 1% (**Figure 5.9**, **Figure 5.10**).

Occupancy: Pellet group transect data indicates that total animal occupancy has generally decreased over the sample period in which elk are generally the primary occupiers. Deer pellet groups have ranged from 5 days use/acre in 2015 and 2020 to 37 days use/acre in 2005. The mean abundance of elk pellet groups has decreased with each consecutive sample year with the exception of 2020, and has been as low as 4 days use/acre in 2015 and as high as 51 days use/acre in 2000. Finally, the mean abundance of pellet groups indicates that cattle presence has remained low since the 2000 sample year (**Figure 5.11**).

Upland (Black/Low Sagebrush)

There is one site [Nutter's Canyon (11A-5)] that is classified as an Upland (Black/Low Sagebrush) ecological site. Nutter's Canyon is located on the West Tavaputs Plateau just east of Brundage Canyon (**Table 5.9**).

Shrubs/Trees: This representative site is dominated by black sagebrush (*Artemisia nova*). Other preferred browse species are present, but provide minimal and decreasing cover (**Figure 5.3**). Average preferred browse demographics indicate that the population has been comprised of mainly mature individuals during most sample years. However, young plants have had considerable densities in 2010 and 2015. Decadent plants made up high proportions of the population in the 2000 and 2005 sample years. Overall, the browse population deceased significantly in 2005, but has recovered as of the 2015 sample year (**Figure 5.7**). Preferred browse utilization has been highly variable over the sample period with moderate and heavy use alternating from year to year. Total utilization was above 80% in 2015 (**Figure 5.8**).

Low levels of encroachment by Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) are occurring on the Nutter's Canyon study site. Cover of twoneedle pinyon has steadily increased since 2005, but has remained low. The density of juniper on this study site was 4 trees/acre while that of twoneedle pinyon was 21 trees/acre in 2015, all of which were young trees (**Figure 5.5**, **Figure 5.6**).

Herbaceous Understory: This study site has a good herbaceous understory which has exhibited an overall increasing trend over the study years. Perennial grasses have consistently been the most dominant component and are mainly comprised of the native species needle-and-thread (*Hesperostipa comata*). Perennial forbs are moderately diverse, but have provided little cover at 1% or less since site establishment. Annual forbs are similarly rare and provide little cover (**Figure 5.9**, **Figure 5.10**).

Occupancy: Average pellet transect data indicates that occupancy has generally decreased from 2000 to 2015. Mean abundance of elk pellet groups has decreased precipitously since the 2000 sample year and has ranged from a low of 8 days use/acre in 2015 to a high of 40 days use/acre in 2000. The mean abundance of deer pellet groups has also decreased over the sample years, ranging from 5 days use/acre in 2000 to 41 days use/acre in 2005. Cattle pellet groups have not been observed on the Nutter's Canyon study (**Figure 5.11**).

Semidesert (Winterfat)

There is one site [Cottonwood Canyon (11A-4)] that is classified as a Semidesert (Winterfat) ecological site. The Cottonwood Canyon study is found on the northwest side of the West Tavaputs Plateau between Coyote Canyon and Cottonwood Canyon (**Table 5.9**).

Shrubs/Trees: Winterfat (*Krascheninnikovia lanata*) is the main browse species on the Cottonwood Canyon site with shadscale saltbush (*Atriplex confertifolia*) as a subordinate species. There was a slight decrease in cover of winterfat between 2005 and 2010, but it recovered in 2015 (**Figure 5.4**). Average preferred shrub demographics indicate that the populations of prairie sagewort (*Artemisia frigida*), winterfat, and saltbush are largely composed of mature and young individuals: this trend is largely driven by the sagewort population (**Figure 5.7**). Utilization has been highly variable from year to year and a trend is difficult to determine. Each sample year the majority of plants received moderate use (**Figure 5.8**).

Pinyon and juniper encroachment is not an issue for this ecological site and is therefore not discussed in this section (**Figure 5.5**, **Figure 5.6**).

Herbaceous Understory: The herbaceous understory of the Cottonwood Canyon site is generally abundant and stable. However, there was a notable increase in herbaceous cover in 2015, driven by an increase in the perennial grass species needle and thread (*Hesperostipa comata*). This site has been dominated by native perennial grasses during each sample year. The introduced annual grass species cheatgrass (*Bromus tectorum*) is present on this site, but in insignificant amounts. Cover of perennial and annual forbs has fluctuated over time, but both have remained relatively rare (**Figure 5.9**, **Figure 5.10**).

Occupancy: Average pellet transect data indicates that occupancy has fluctuated over time, but has exhibited a decreasing trend overall. Mean abundance of elk pellet groups has ranged from under 6 days use/acre in 2015 to 78 days use/acre in 2000. Mean abundance of deer/pronghorn pellet groups has ranged from 1 days use/acre in 2005 to 15 days use/acre in 2000 (**Figure 5.11**).

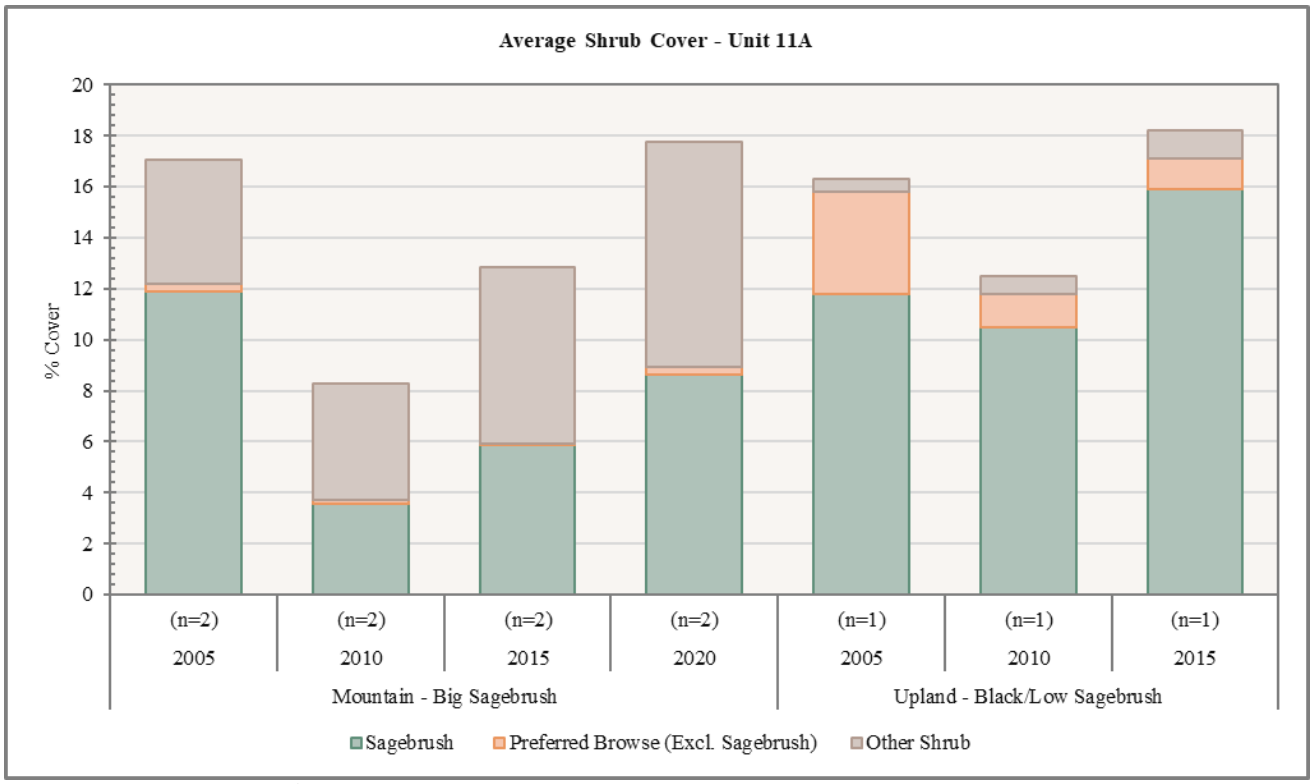


Figure 5.3: Average shrub cover for Mountain - Big Sagebrush and Upland - Black/Low Sagebrush study sites in WMU 11A, Nine Mile, Anthro.

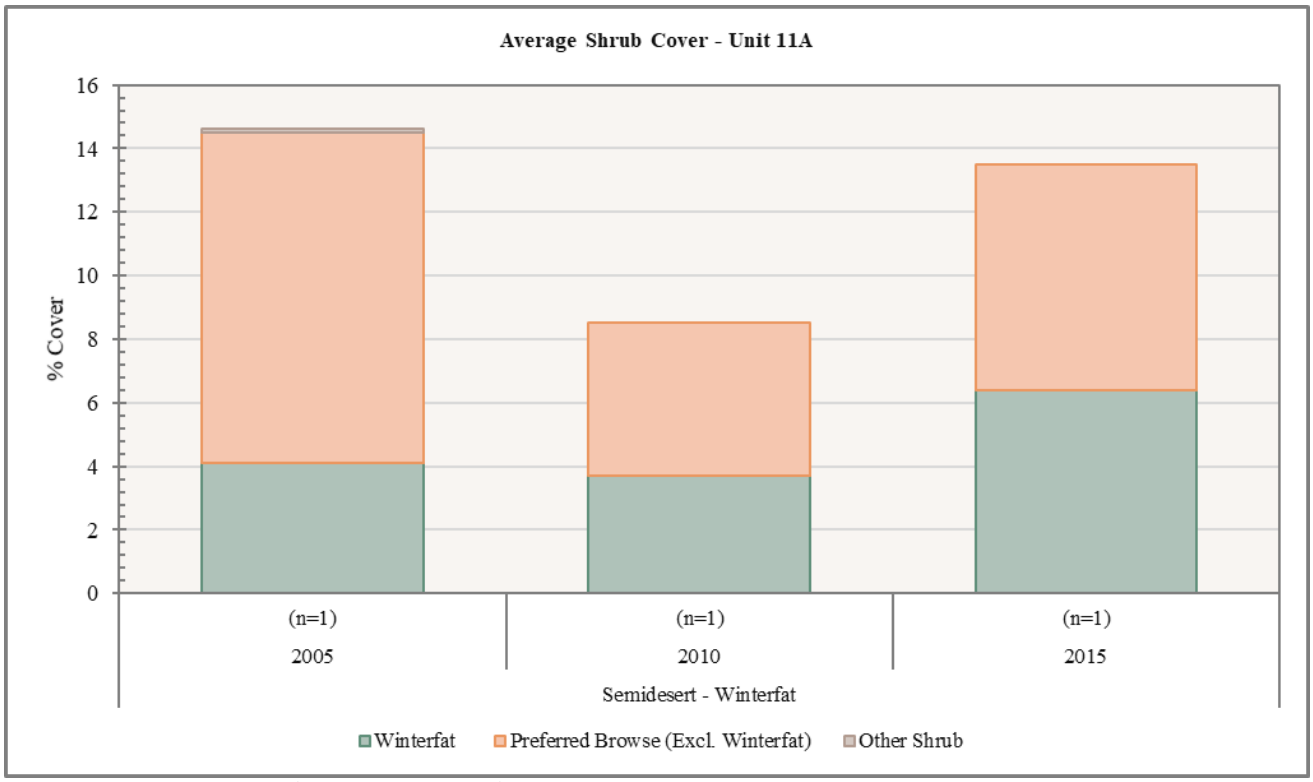


Figure 5.4: Average shrub cover for Semidesert - Winterfat study sites in WMU 11A, Nine Mile, Anthro.

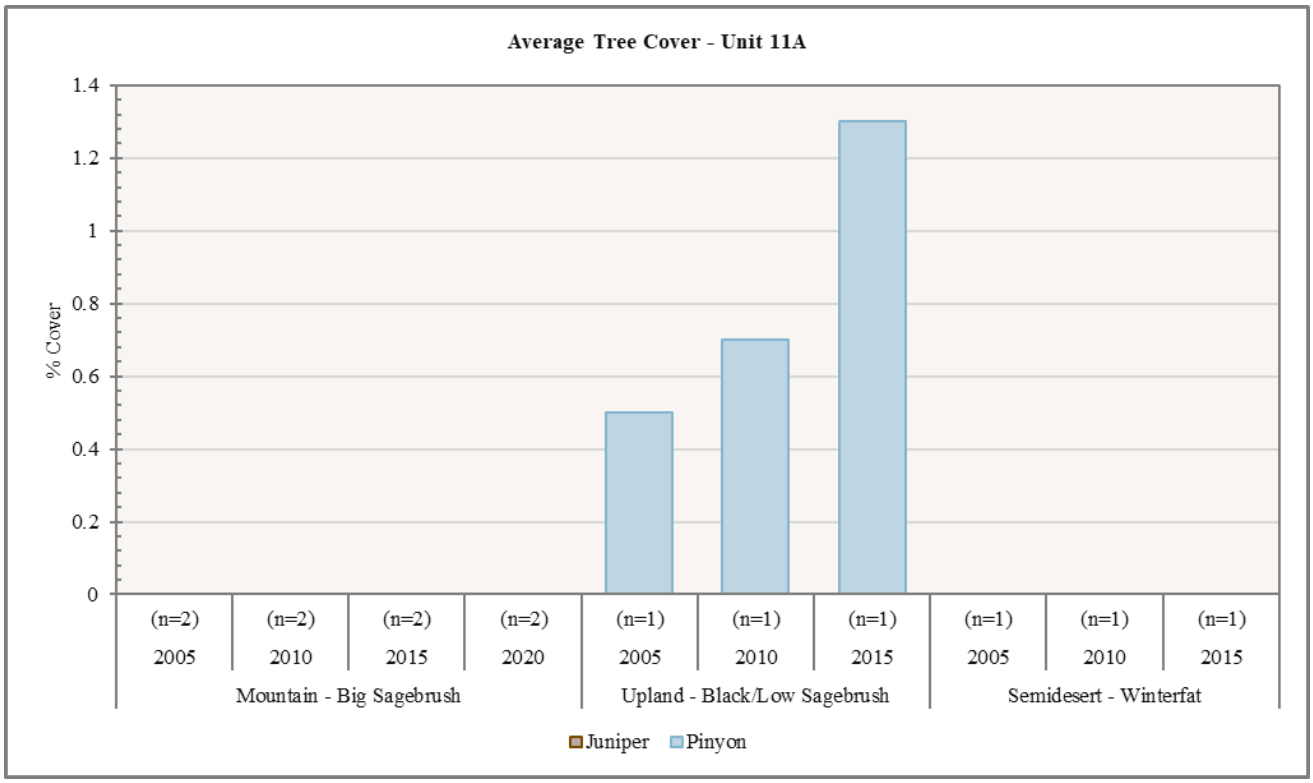


Figure 5.5: Average tree cover for Mountain - Big Sagebrush, Upland - Black/Low Sagebrush, and Semidesert - Winterfat study sites in WMU 11A, Nine Mile, Anthro.

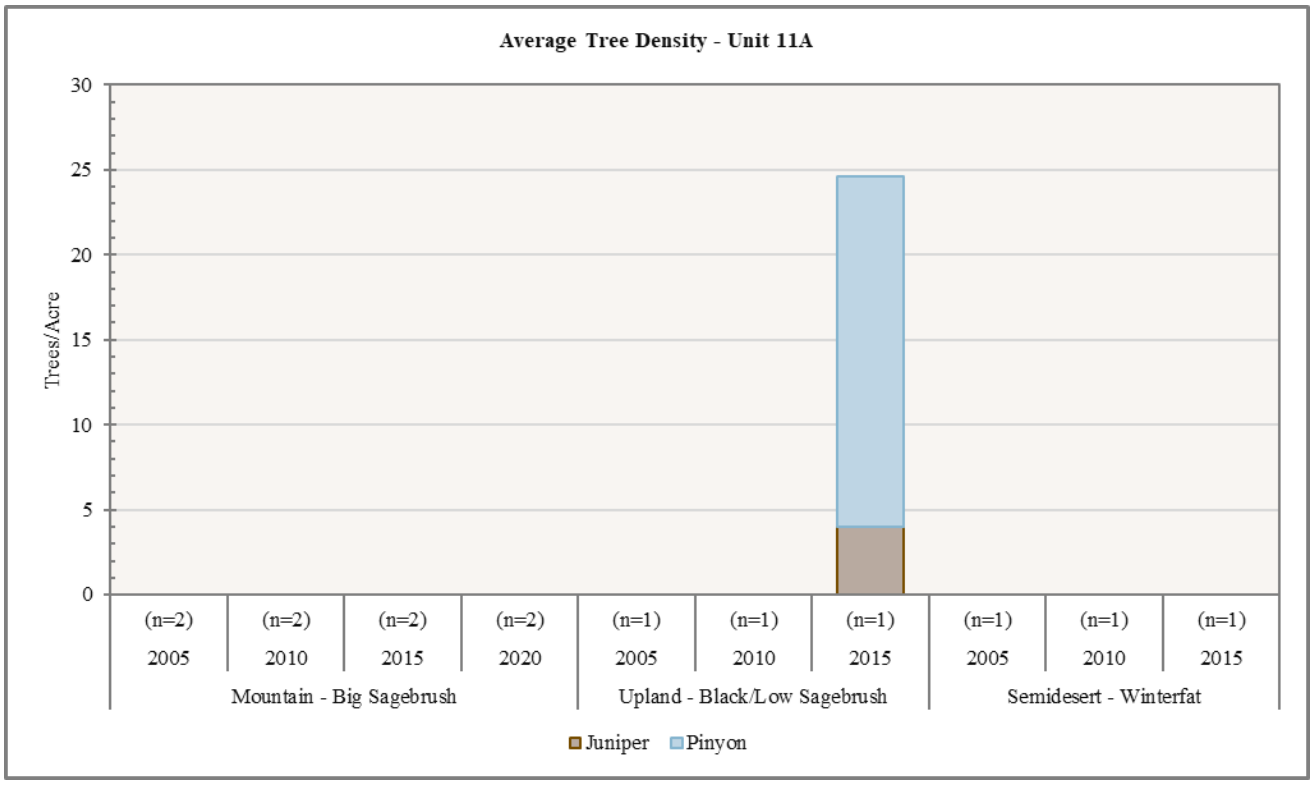


Figure 5.6: Average tree density for Mountain - Big Sagebrush, Upland - Black/Low Sagebrush, and Semidesert - Winterfat study sites in WMU 11A, Nine Mile, Anthro.

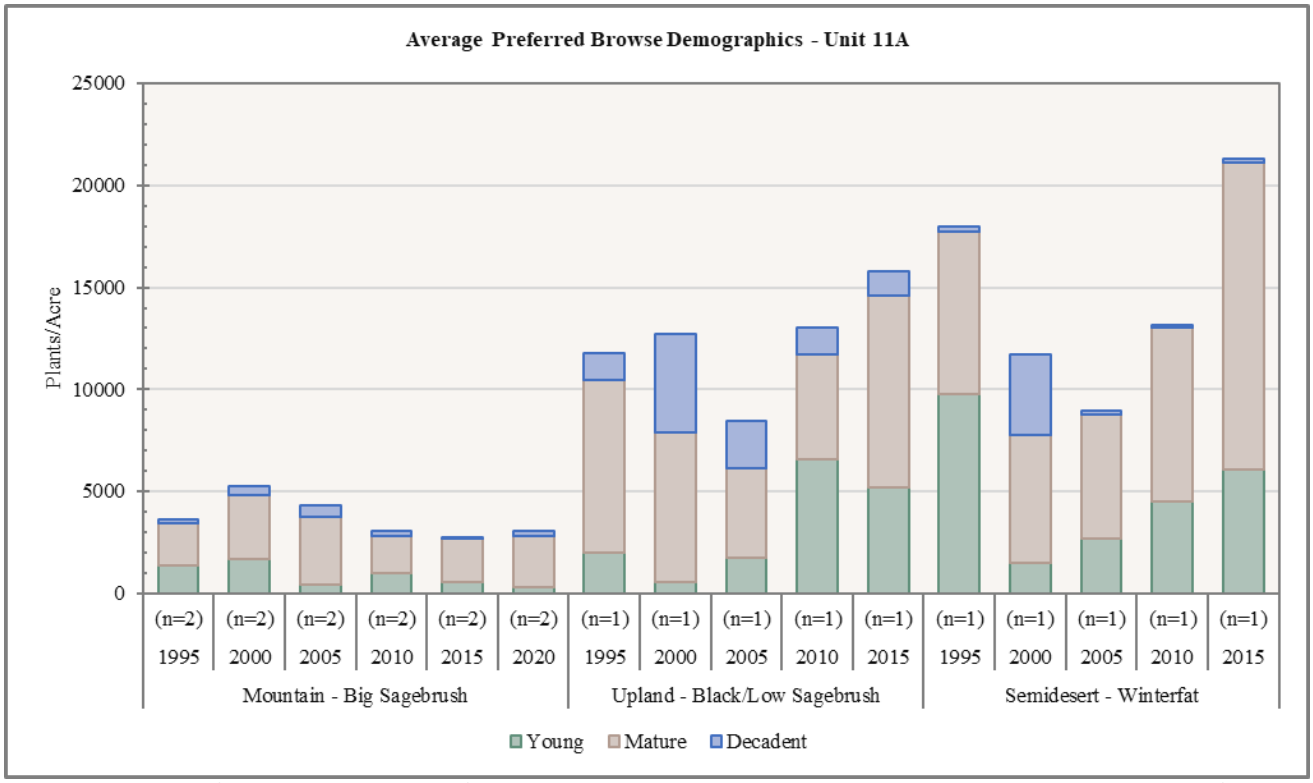


Figure 5.7: Average preferred browse demographics for Mountain - Big Sagebrush, Upland - Black/Low Sagebrush, and Semidesert - Winterfat study sites in WMU 11A, Nine Mile, Anthro.

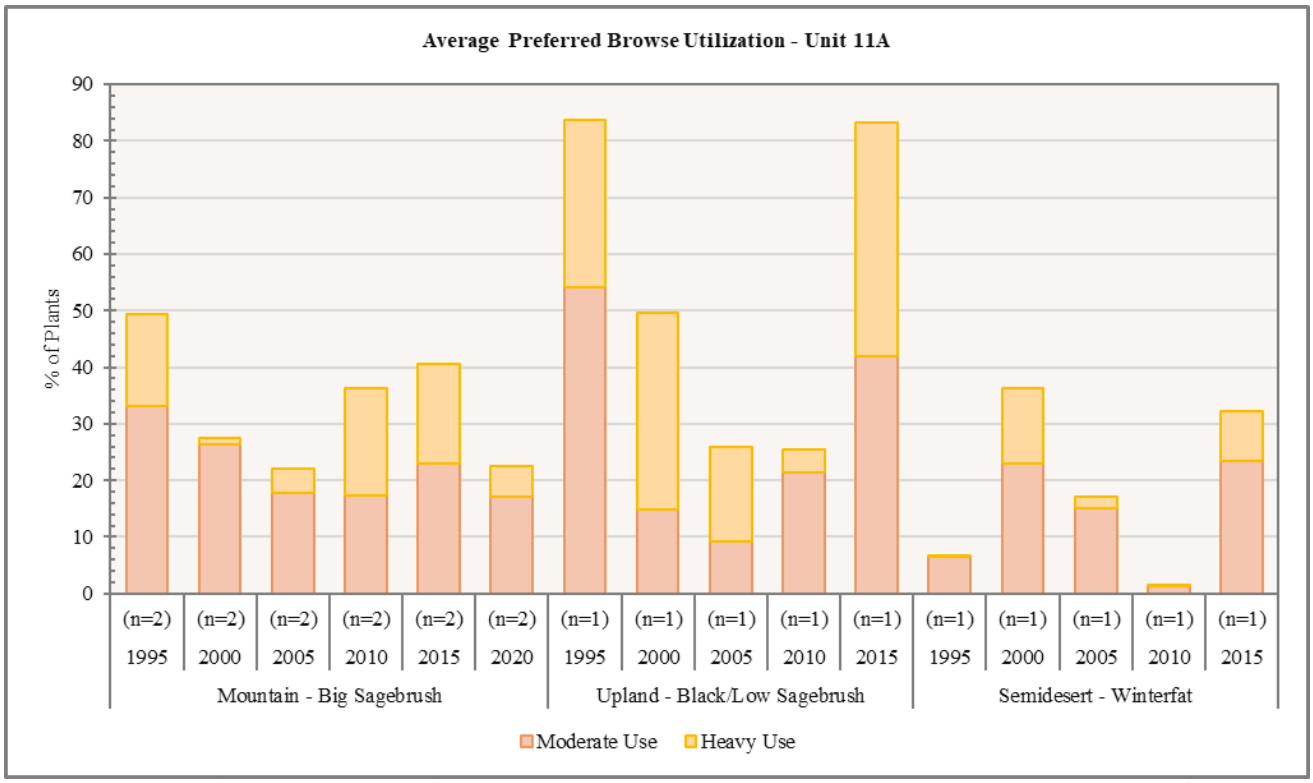


Figure 5.8: Average preferred browse utilization for Mountain - Big Sagebrush, Upland - Black/Low Sagebrush, and Semidesert - Winterfat study sites in WMU 11A, Nine Mile, Anthro.

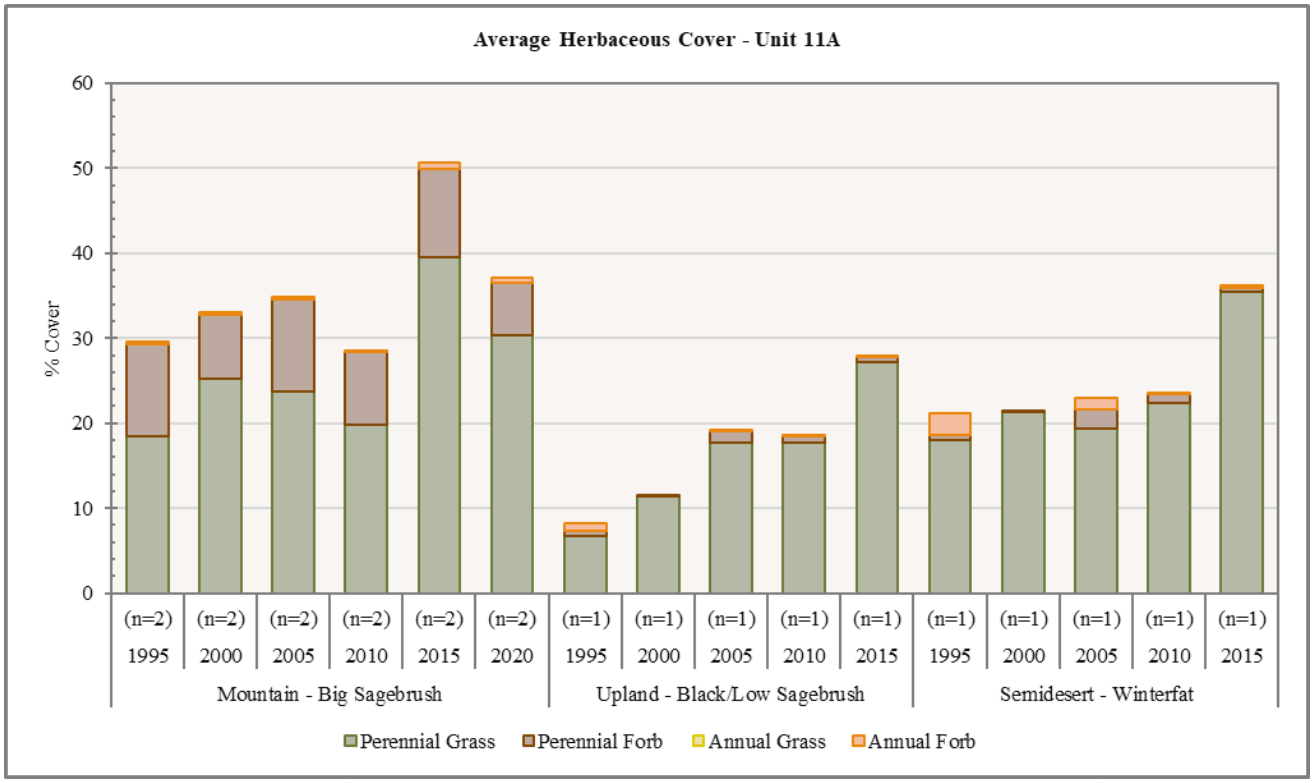


Figure 5.9: Average herbaceous cover for Mountain - Big Sagebrush, Upland - Black/Low Sagebrush, and Semidesert - Winterfat study sites in WMU 11A, Nine Mile, Anthro.

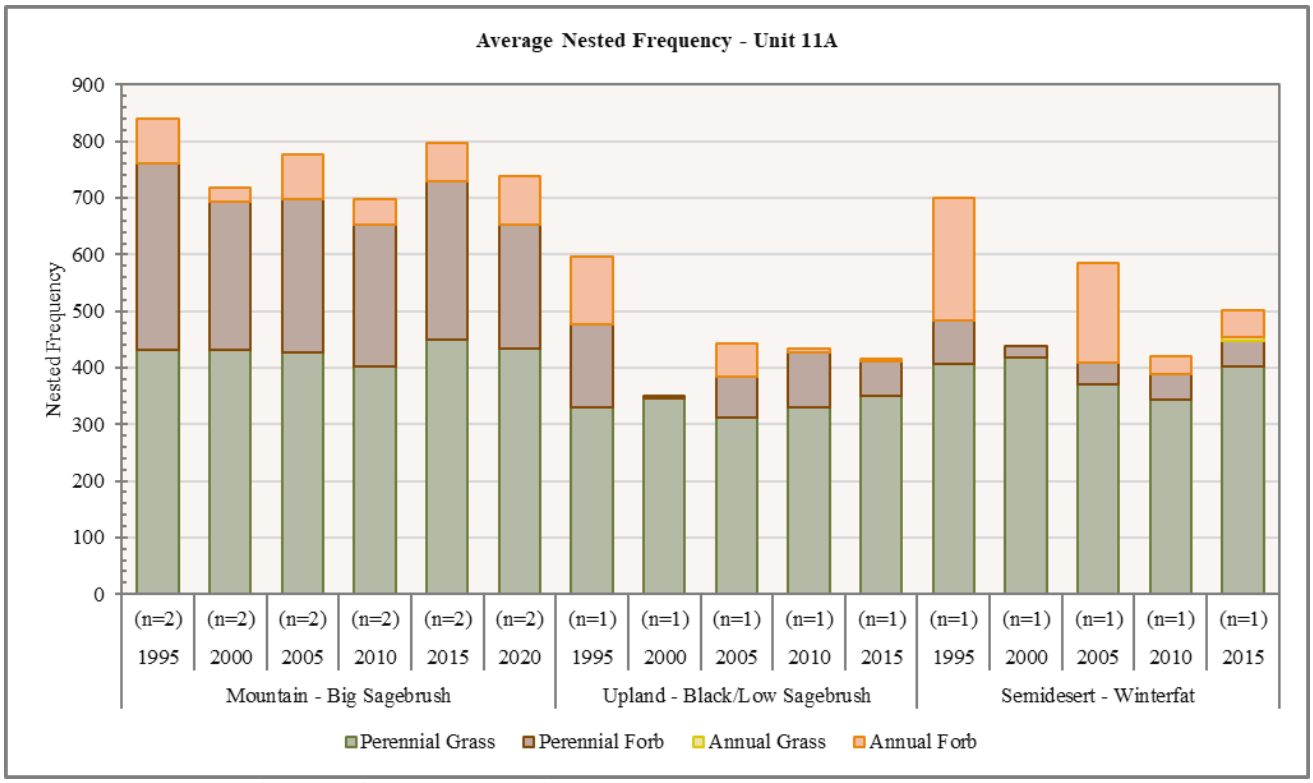


Figure 5.10: Average nested frequency of herbaceous species for Mountain - Big Sagebrush, Upland - Black/Low Sagebrush, and Semidesert - Winterfat study sites in WMU 11A, Nine Mile, Anthro.

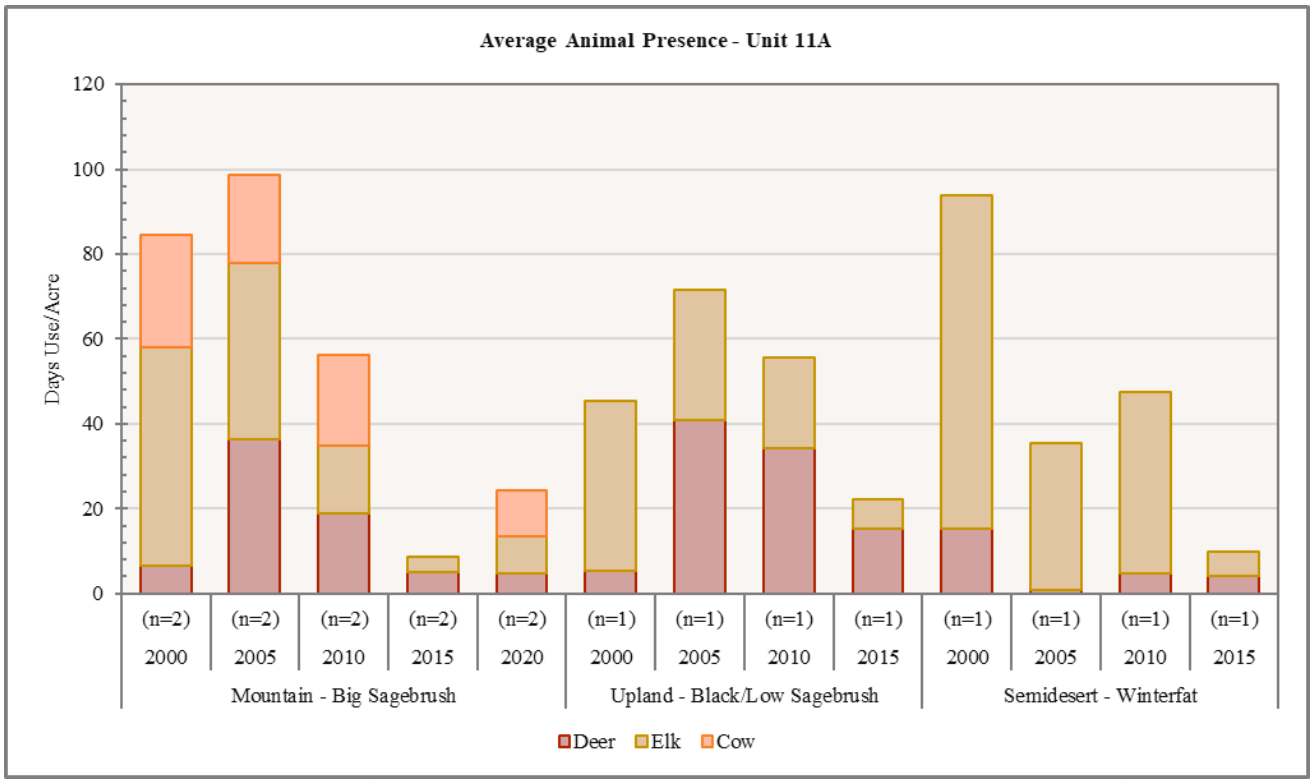


Figure 5.11: Average pellet transect data for Mountain - Big Sagebrush, Upland - Black/Low Sagebrush, and Semidesert - Winterfat study sites in WMU 11A, Nine Mile, Anthro.

Deer Winter Range Condition Assessment

The condition of deer winter range Nine Mile, Anthro management unit has had an overall improvement in averaged site conditions that have trended from a fair-good condition in 1995 to good-excellent condition in 2015.

All of the Range Trend study sites in 2015 (as Desirable Component Index data is not available for 2020), Cottonwood Canyon (11A-4) and Nutter's Canyon (11A-5), are considered to be in good-excellent condition and excellent condition, respectively. Nutter's Canyon has the highest degree of winter range variability which is due to an increase in perennial grass and browse covers and is considered to be positive for winter range condition (**Table 5.11**, **Figure 5.12**).

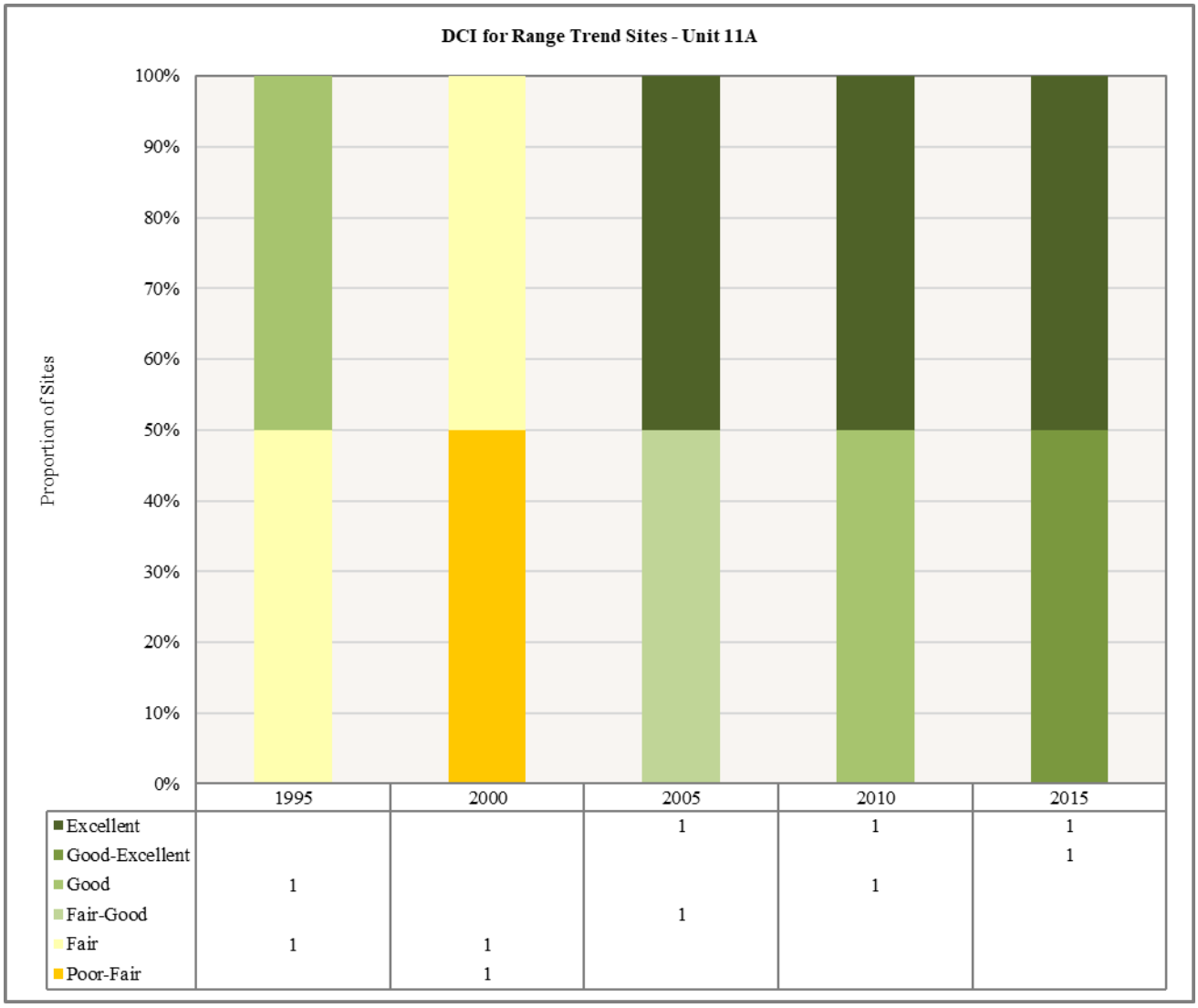
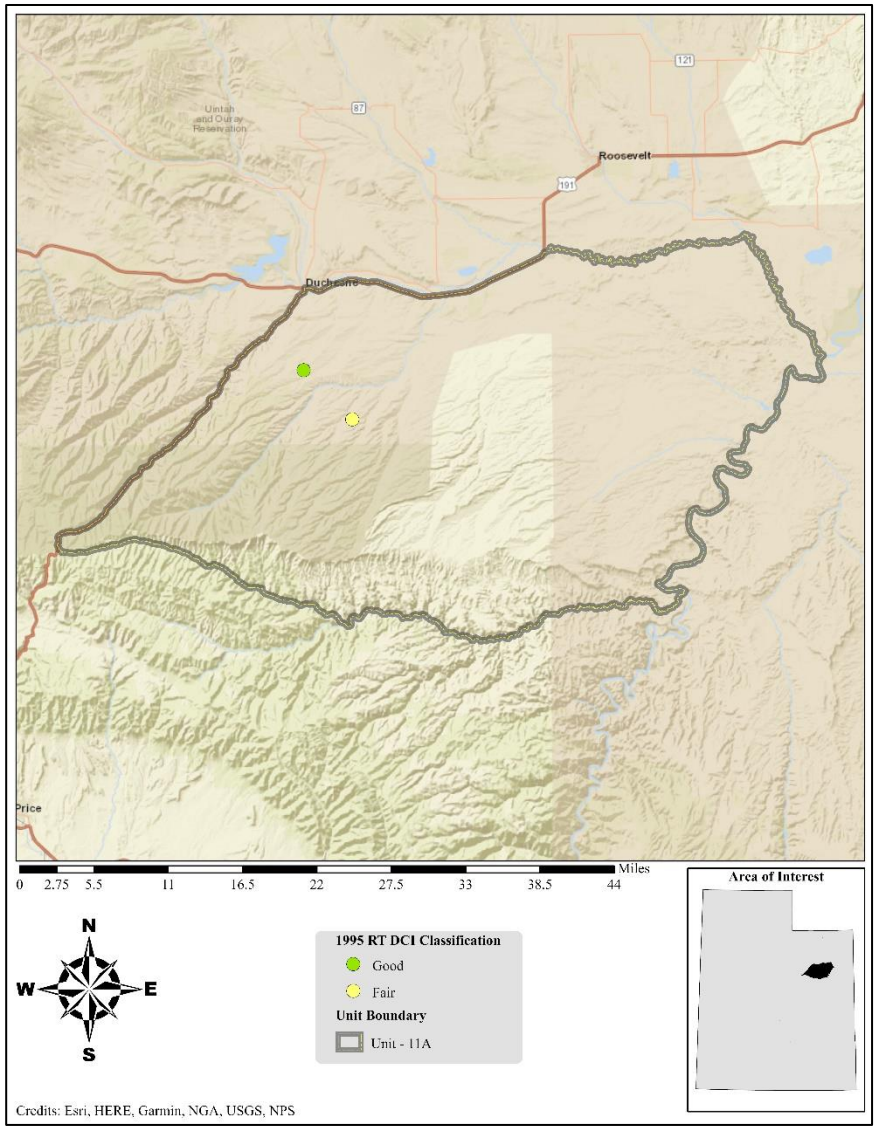


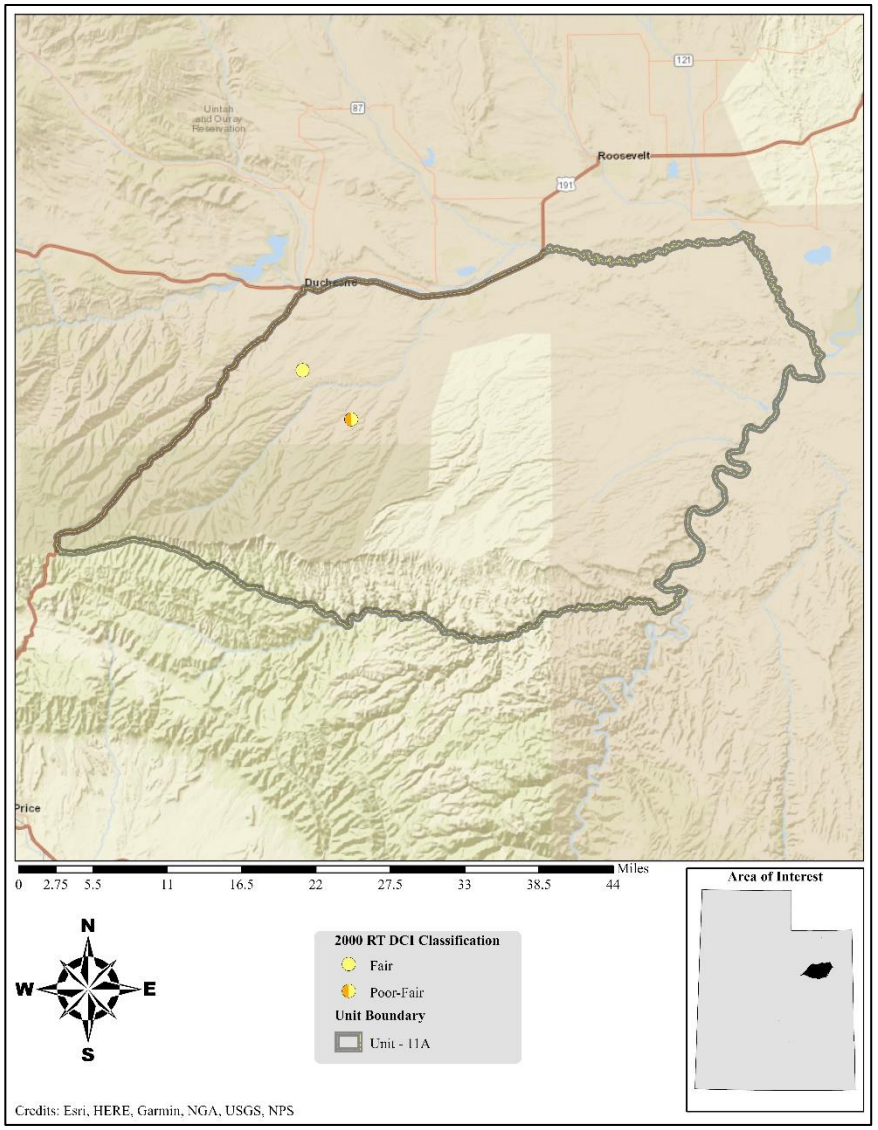
Figure 5.12: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 11A, Nine Mile, Anthro.

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
11A-04	1995	8.1	13.3	7	30	0	0.9	0	**59.3**	**G**
11A-04	2000	3.8	0	0	30	0	0.2	0	**34**	**F**
11A-04	2005	15.6	12.7	7	30	0	4.6	0	**69.8**	**E**
11A-04	2010	9.5	14.1	13.9	30	0	2	0	**69.4**	**E**
11A-04	2015	15.1	14.3	12.5	30	0	1	0	**72.8**	**E**
11A-05	1995	21.5	11.5	7.9	13.3	0	1.4	0	**55.6**	**F**
11A-05	2000	21.5	3.2	2	22.7	0	0	0	**49.4**	**P-F**
11A-05	2005	18.9	6.3	6.4	30	0	2.5	0	**64.2**	**F-G**
11A-05	2010	14.5	11.2	15	30	0	1.5	0	**72.1**	**G**
11A-05	2015	21.1	12.3	15	30	0	1.2	0	**79.6**	**G-E**

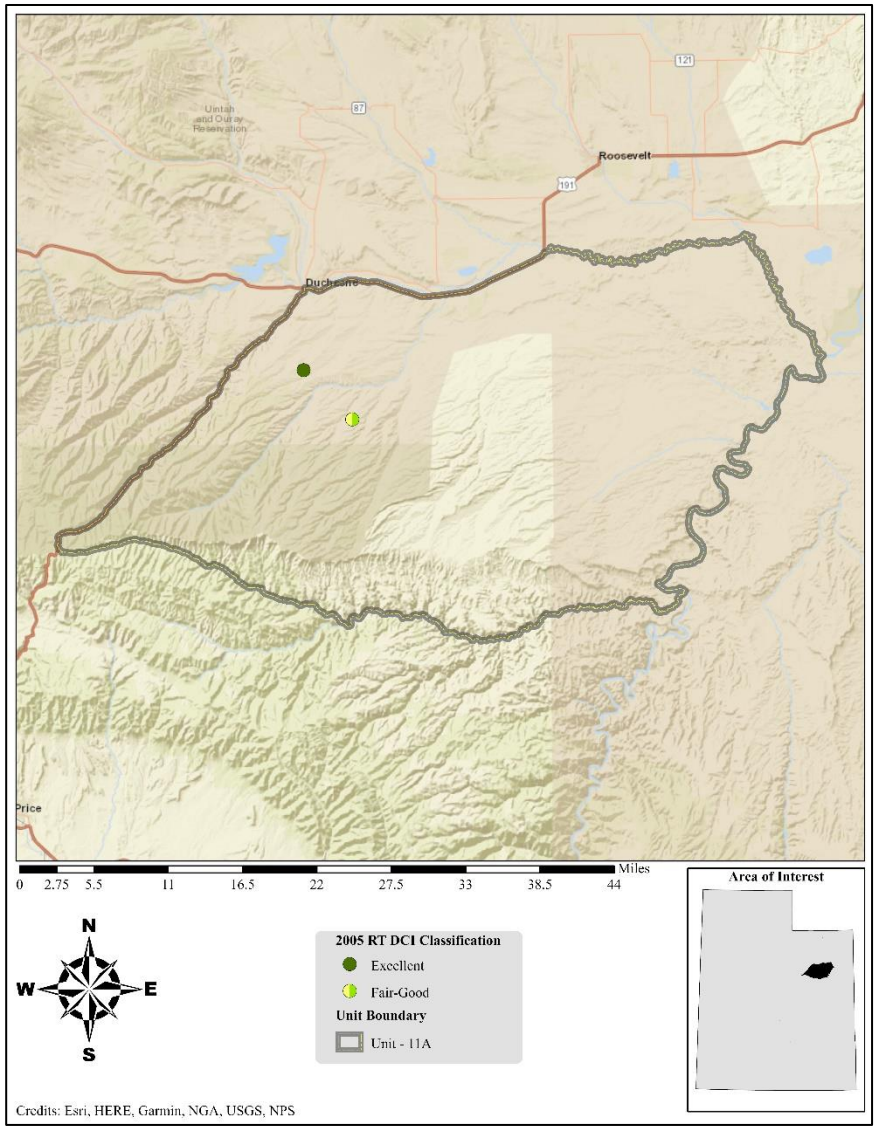
Table 5.11: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 11A, Nine Mile, Anthro. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. *Studies with an asterisk have been suspended.



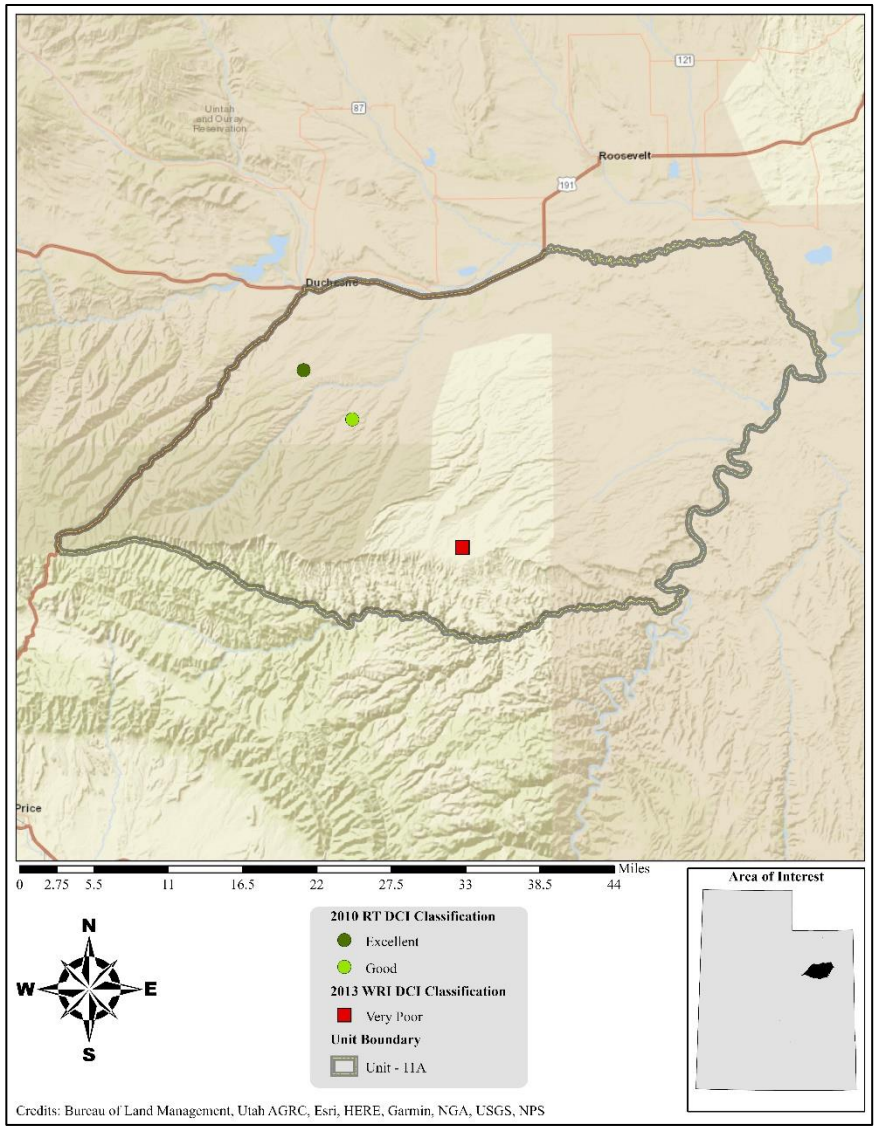
Map 5.11: 1995 Desirable Components Index (DCI) ranking distribution by study site for WMU 11A, Nine Mile, Anthro.



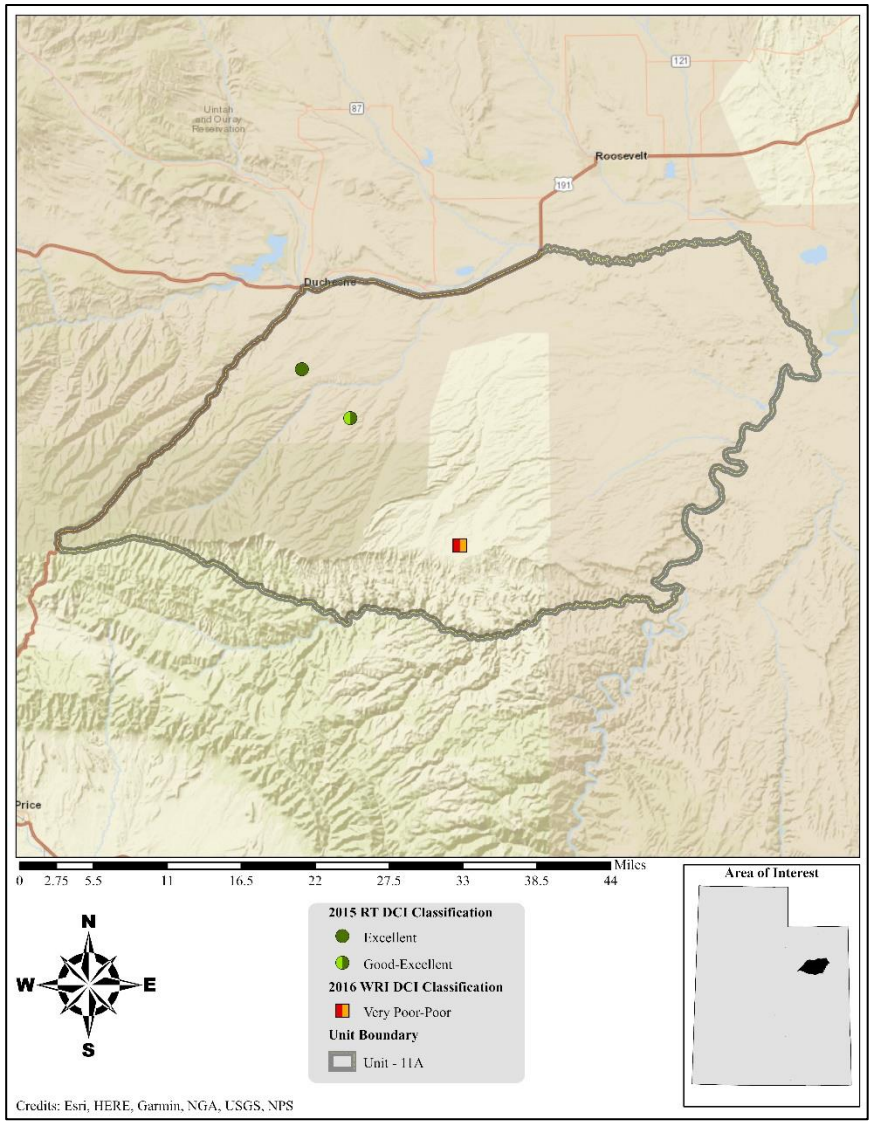
Map 5.12: 2000 Desirable Components Index (DCI) ranking distribution by study site for WMU 11A, Nine Mile, Anthro.



Map 5.13: 2005 Desirable Components Index (DCI) ranking distribution by study site for WMU 11A, Nine Mile, Anthro.



Map 5.14: 2010 Desirable Components Index (DCI) ranking distribution by study site for WMU 11A, Nine Mile, Anthro.



Map 5.15: 2015 Desirable Components Index (DCI) ranking distribution by study site for WMU 11A, Nine Mile, Anthro.

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
11A-2	Wirefence Canyon	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
11A-3	Chokecherry Canyon	None Identified		
11A-4	Cottonwood Canyon	Energy Development Annual Grass	High Low	Fragmentation and degradation/loss of habitat Increased fire potential and reduced herbaceous diversity
11A-5	Nutter's Canyon	Energy Development PJ Encroachment	High Low	Fragmentation and degradation/loss of habitat Reduced understory shrub and herbaceous vigor
11R-15	Big Wash	Introduced Perennial Grass PJ Encroachment	High Low	Reduced diversity of desirable grass and forb species Reduced understory shrub and herbaceous vigor

Table 5.12: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 11A, Nine Mile, Anthro. 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)

These high-elevation ecological sites support sagebrush communities and are generally considered to be in good condition for deer summer range on the Nine Mile, Anthro management unit. The stands of sagebrush and herbaceous understories found in these communities provide valuable browse and forage for wildlife. No threats have been identified on the Chokecherry Canyon study. However, introduced perennial grasses contribute a majority of the herbaceous cover on the Wirefence Canyon site. Although these grasses can provide valuable forage for wildlife, they may have the potential to lead to reduced diversity and abundance of more desirable native grass and forb species.

If reseeding is deemed necessary to restore the ecological integrity of the Wirefence Canyon site, care should be taken in species selection and preference should be given to native grasses and forbs when possible.

Upland (Black/Low Sagebrush)

The mid-elevation ecological site Nutter's Canyon supports a black sagebrush community that is considered to be in good to excellent condition for deer winter range habitat on this management unit. The herbaceous understory on this study site is in generally good condition with native perennial grasses as the dominant component. However, this study is located within one mile of oil/gas developments. This development can lead to reduced vigor of shrubs and herbaceous species as well as potential fragmentation and degradation of habitat. In addition, Utah juniper and twoneedle pinyon are encroaching on this site, a process that may reduce understory shrub and herbaceous health as the trees age.

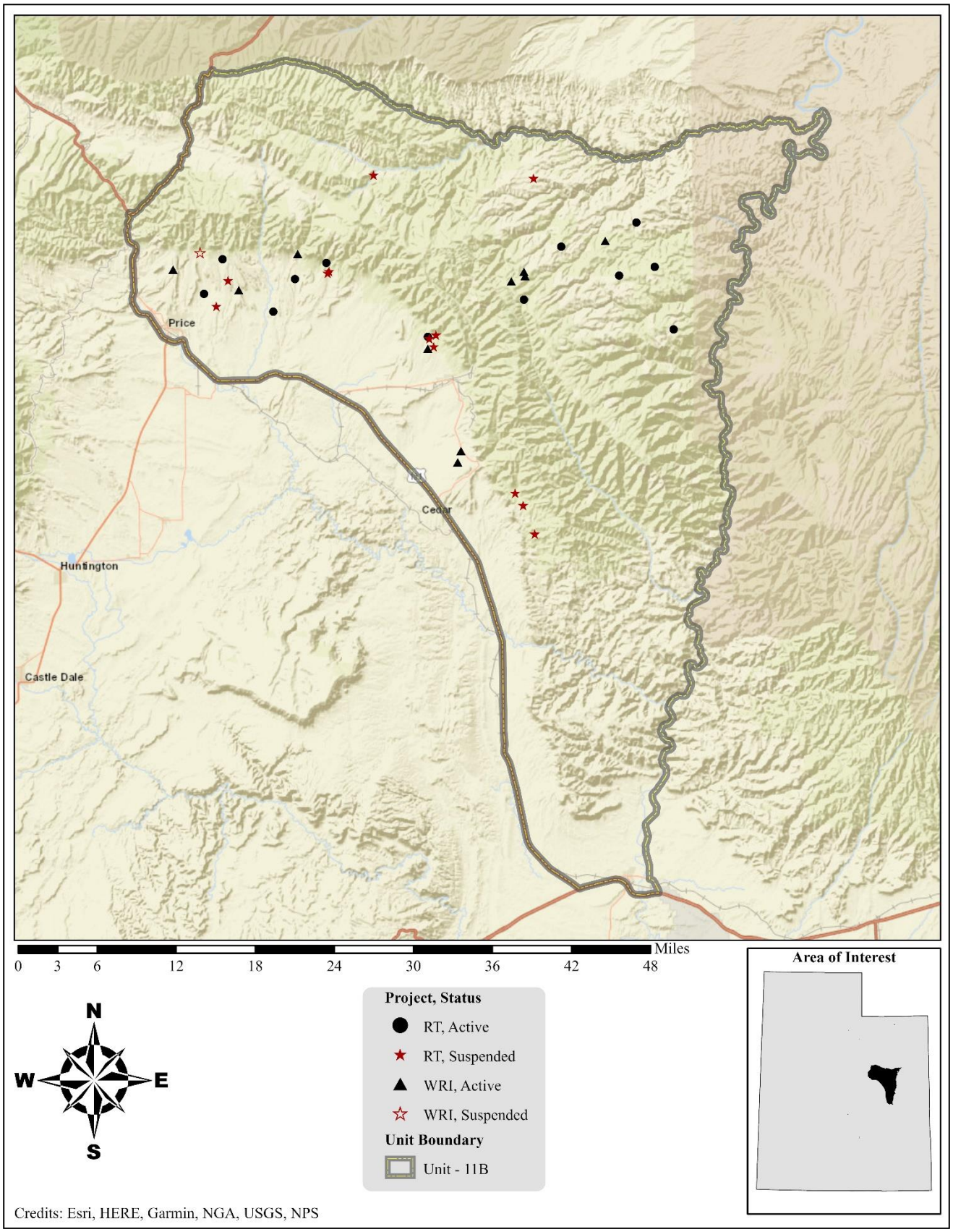
Continued monitoring of this community is advised. In addition, it is recommended that when it is deemed necessary, work to reduce pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should begin.

Semidesert (Winterfat)

This lower-elevation ecological site supports a winterfat community that is generally considered to be in good condition for deer winter range habitat on the Nine Mile, Anthro management unit. Communities of this ecotype generally support shrub and grass communities that provide valuable browse and forage in moderate to severe winters. However, this study is located within one mile of oil/gas developments. Energy development can lead to reduced vigor of shrubs and herbaceous species as well as potential fragmentation and degradation of habitat. Although the threat posed is low, annual grasses, namely cheatgrass, have been observed on this site. High amounts of cheatgrass can increase fuel loads and may have the potential to alter wildfire regimes within these communities. Monitoring of this study site should

continue. Treatments to reduce annual grass may be necessary in the future should cheatgrass increase in abundance and/or cover.

6. WILDLIFE MANAGEMENT UNIT 11B – NINE MILE, RANGE CREEK



WILDLIFE MANAGEMENT UNIT 11B – NINE MILE, RANGE CREEK

Boundary Description

Carbon, Duchesne, and Emery counties - Boundary begins at Green River and Interstate 70 (I-70); then west on I-70 to Highway US-6; northwest on US-6 to US-191; northeast on US-191 to Argyle Canyon Road; southeast on Argyle Canyon Road to Nine Mile Canyon Road; east on Nine Mile Canyon Road to its end near Bull Canyon; continuing along Nine Mile Creek to the Green River; south along the Green River to I-70 and beginning point.

Management Unit Description

Geography

The Nine Mile, Range Creek unit contains the eastern portion of Carbon County, the northeastern part of Emery County, and a small piece of southern Duchesne County. This triangular unit encompasses the West Tavaputs Plateau, bounded by the Book Cliffs and Soldier Canyon on the west, the Price River-Duchesne River drainage divide on the north and the Green River to the east. Topography is steep and rough. The major drainages are Nine Mile Creek, which drains Minnie Maude, Dry, Argyle, Cow, and Harmon Canyons into the Green River, Range Creek which drains the east side, and Pace, Whitmore, and Horse Canyons. Elevation ranges from 4,064 feet at Green River to 10,285 feet on Bruin Point. Communities within the unit include Helper, Price, Wellington, Sunnyside, East Carbon, and Green River.

Climate Data

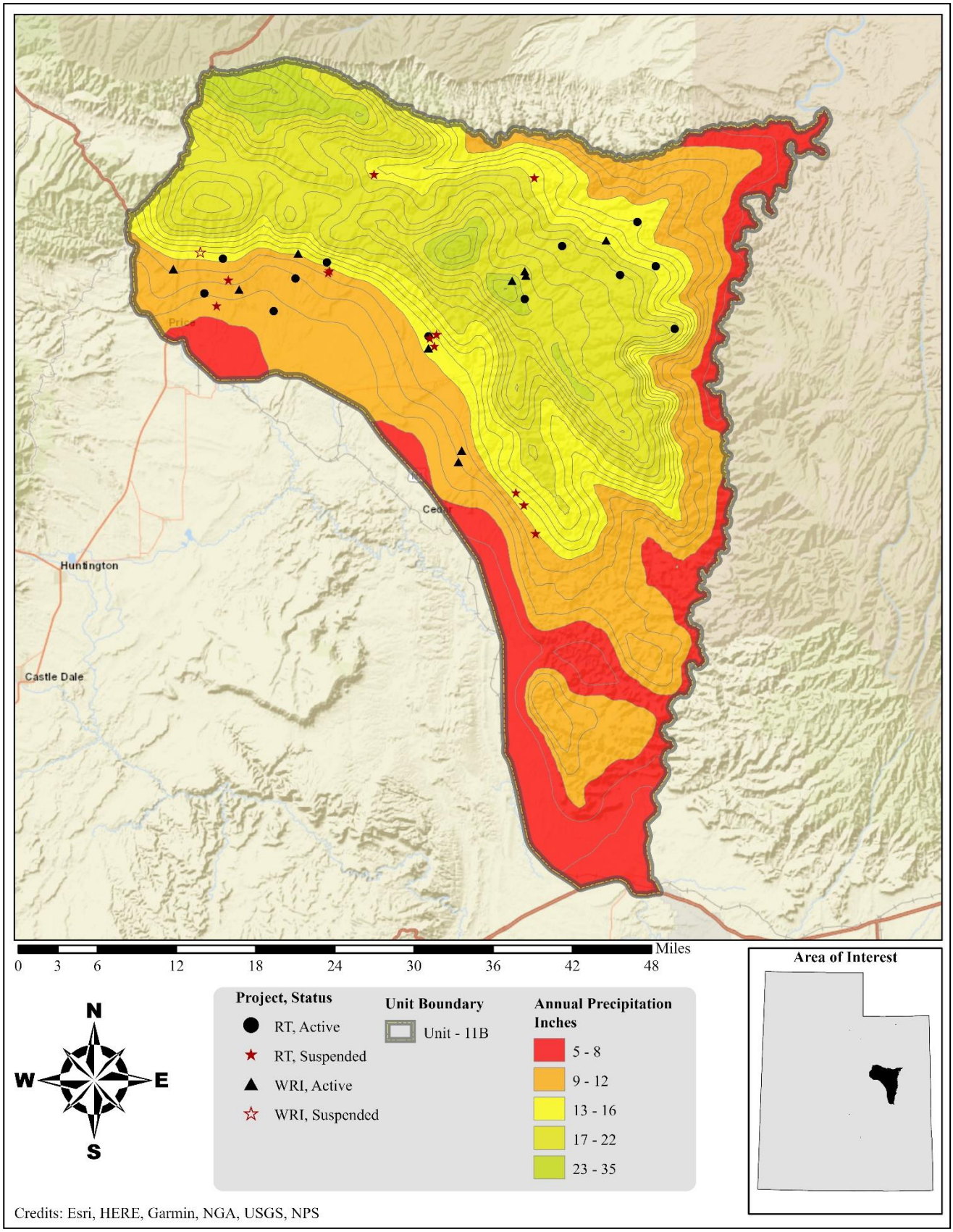
The 30 year (1981-2010) annual precipitation PRISM model shows precipitation ranges on the unit from 7 inches along portions of the Green River to 25 inches along Argyle Ridge. All of the Range Trend and WRI monitoring studies on the unit occur within 9-23 inches of precipitation (**Map 6.1**) (PRISM 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 Northern Mountains, Uinta Basin, and Southeast divisions (Divisions 5, 6, and 7).

The mean annual PDSI of the Northern Mountains division displayed years of moderate to extreme drought from 1988-1990, 2000-2003, 2012-2013, 2018, and 2020. The mean annual PDSI displayed moderately to extremely wet years from 1983-1986, 1995, 1997-1998, 2005, and 2011 (**Figure 6.1a**). 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 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, 2012-2013, and 2020; moderately to extremely wet years were displayed in 1983-1986, 1995, and 1997-1998 (**Figure 6.1b)** (Time Series Data, 2020)**.**

The mean annual PDSI of the Uinta Basin division displayed years of moderate to extreme drought from 1989-1991, 2000, 2002-2003, 2012-2014, 2018, and 2020. The mean annual PDSI displayed moderate to extreme wet years from 1983-1985, 1993, 1997-1998, and 2005. The mean spring (March-May) PDSI displayed years of moderate to extreme drought in 1989-1992, 2002-2004, 2012-2014, and 2018. Moderately to extremely wet years for this time period were displayed in 1983-1985, 1993, 1995, 1998, 2005, 2011, and 2019 (**Figure 6.2a**). The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1989-1990, 2001-2003, 2007, 2012, 2017-2018, and 2020; moderately to extremely wet years were displayed in 1983-1986, 1993, and 1997-1998 (**Figure 6.2b**) (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, 2018, and 2020. The mean annual PDSI displayed moderately to extremely wet years from 1983-1985, 2005, and 2019 (**Figure 6.3a**). The mean spring (March-May) PDSI displayed moderate to extreme drought in 1989-1991, 1996, 2002-2004, 2012-2013, and 2018; moderately to extremely wet years 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, 2017, and 2020; moderately to extremely wet years were displayed in 1983-1985, 1997, 2013, and 2019 (**Figure 6.3b**) (Time Series Data, 2020).



Map 6.1: The 1981-2010 PRISM Precipitation Model for WMU 11B, Nine Mile, Range Creek (PRISM Climate Group, Oregon State University, 2013).

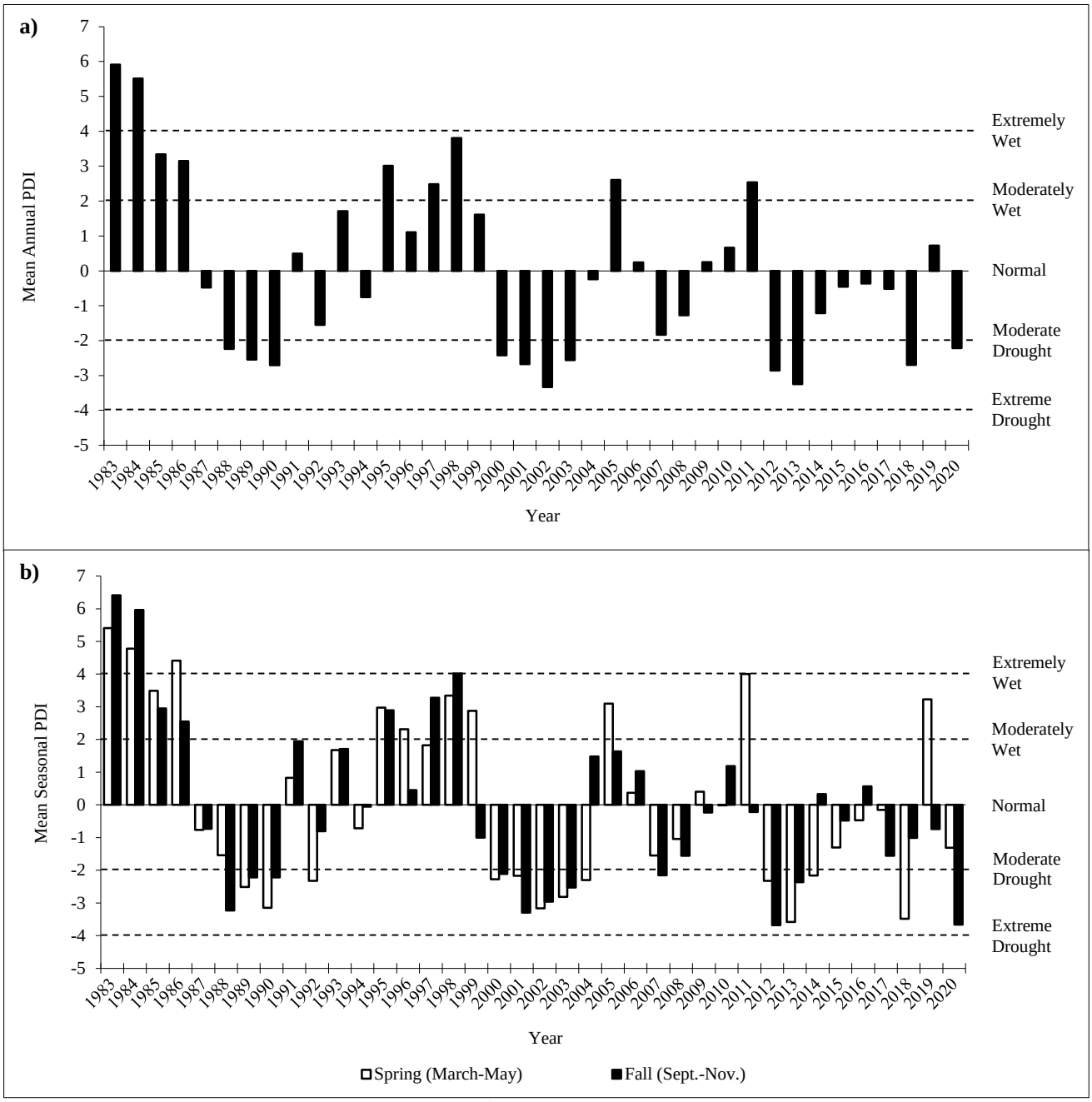


Figure 6.1: The 1983-2020 Palmer Drought Severity Index (PDSI) for the Northern Mountain division (Division 5). The PDSI is based on climate data gathered from 1895 to 2020. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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).

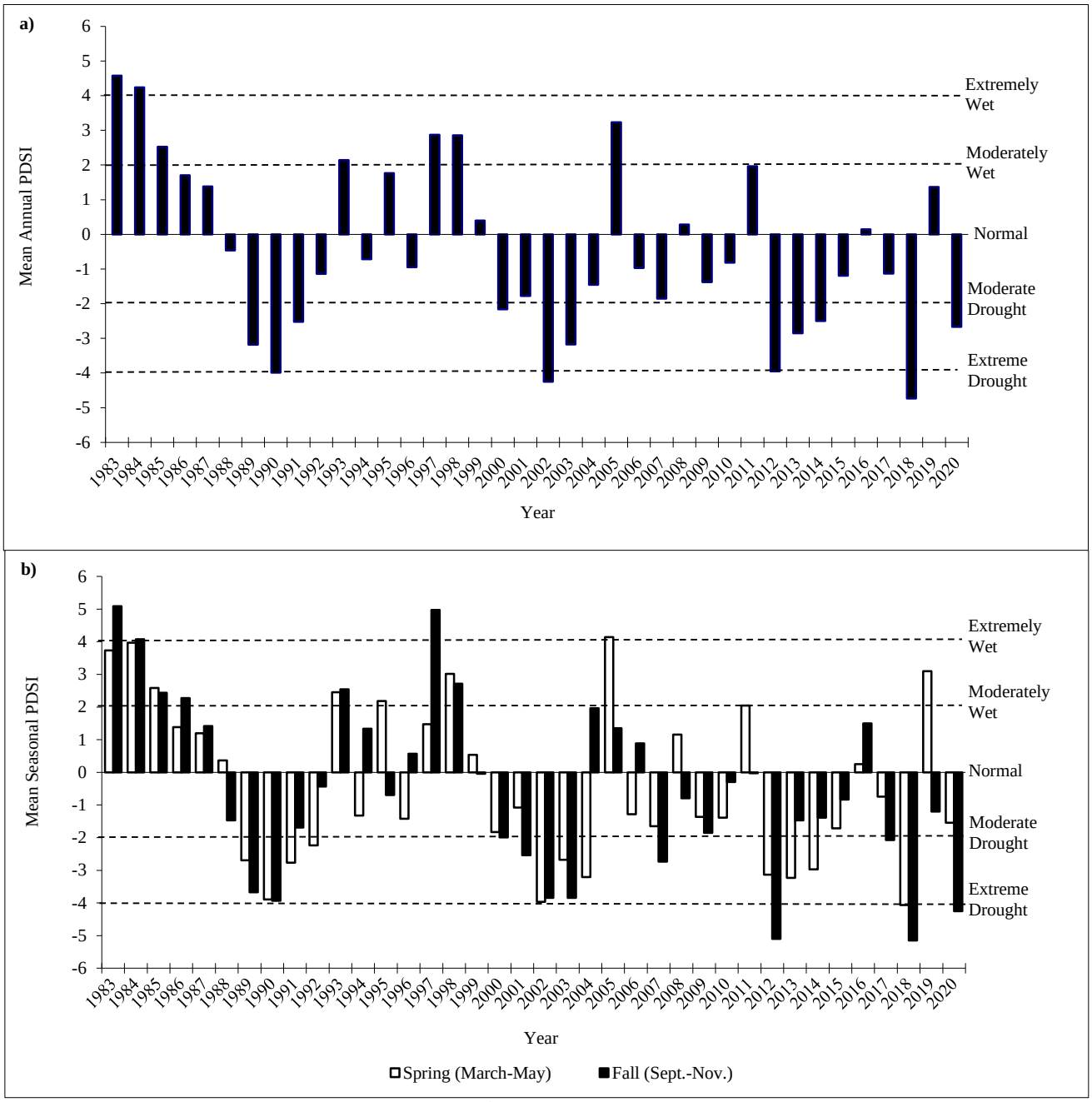


Figure 6.2: The 1983-2020 Palmer Drought Severity Index (PDSI) for the Uinta Basin division (Division 6). The PDSI is based on climate data gathered from 1895 to 2020. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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).

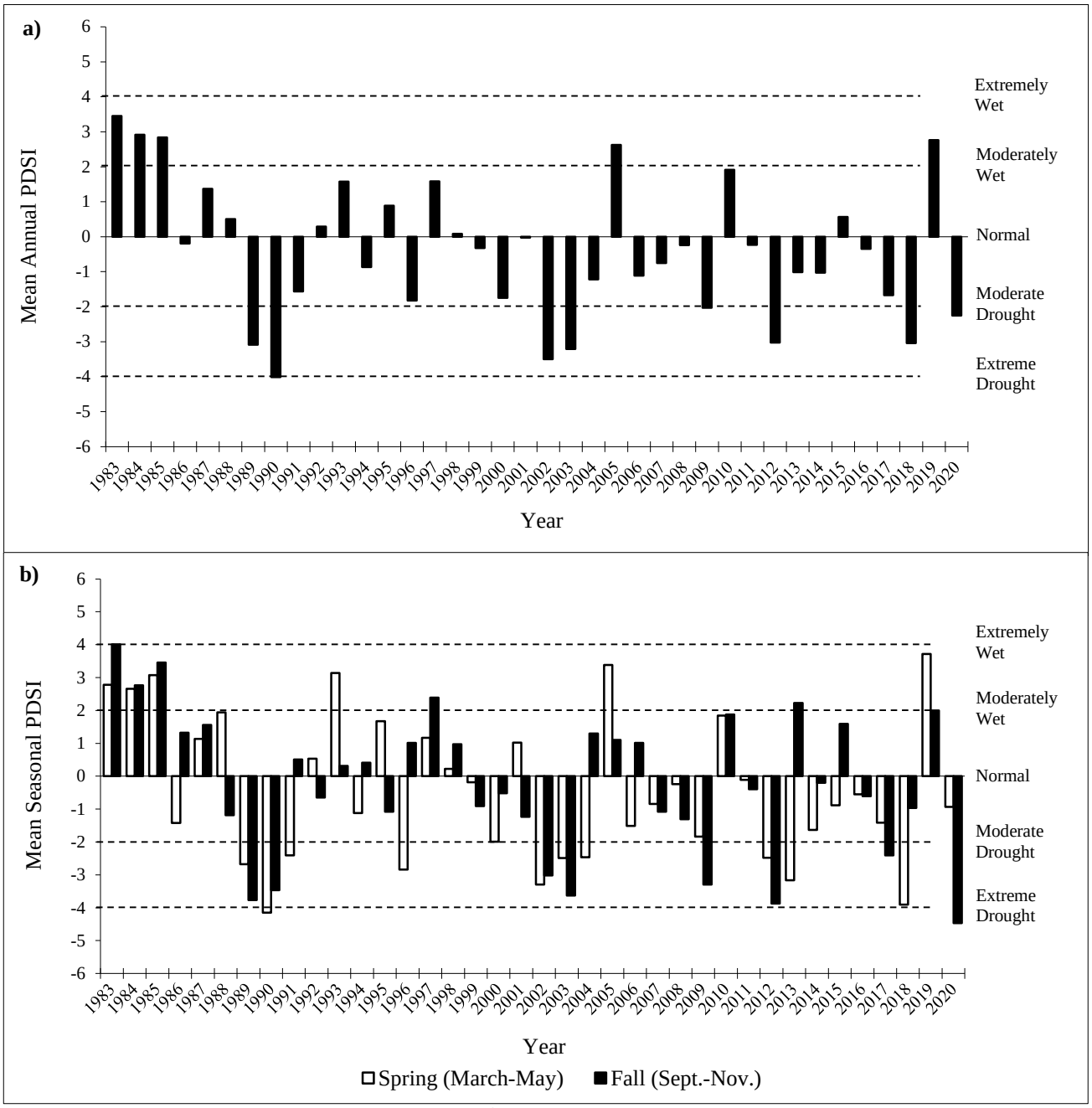


Figure 6.3: The 1983-2020 Palmer Drought Severity Index (PDSI) for the Southeast division (Division 7). The PDSI is based on climate data gathered from 1895 to 2020. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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 937,000 acres classified as deer range on Unit 11B with 58% classified as winter range, 24% as summer range, 14% as year-long range, and 1% classified as spring/fall range (**Table 6.1**, **Map 6.2**).

Bureau of Land Management (BLM)-managed land comprises 78% of the winter range, 13% is privately owned, the Utah School and Institutional Trust Lands Administration (SITLA) administrates 9%, and less than 1% is tribally owned land (**Table 6.2**, **Map 6.2**, **Map 6.7**). Of the elk winter range, 83% is managed by the BLM, 8% is privately owned, and 9% is managed by SITLA (**Table 6.3**, **Map 6.3**, **Map 6.7**). The unit presents several challenges to public land and wildlife managers. A majority of the summer range is on private land and hunting access is therefore limited. Some of the ranches are privately managed for trophy hunting.

According to Landfire Existing Vegetation Coverage models, shrublands comprise 35% of the unit. Of the shrubland, combined sagebrush shrubland and steppe make up 14% of land coverage for this unit, which is considered key habitat for mule deer (**Table 6.7**).

Normal winter range below 8,500 feet also completely encompasses the summer range. Severe winter range is limited to areas below 7,000 feet. On the east side of the unit, steep bare slopes limit use to the ridge tops and canyon bottoms along lower Nine Mile Creek and the Green River. During severe winters, all deer wintering in these areas are forced into the canyon bottoms, usually causing heavy winter losses. Along the west side of the unit from Soldier Creek Canyon east to Horse Canyon, access to the winter range is good. From Horse Canyon south, however, the Roan and Book Cliffs drop off sharply, presenting major obstacles to deer migration and preventing use of much of the lower elevation range. Winter concentration areas include Nine Mile Creek, Rock House Cow Camp area, Argyle Canyon, and Little Park.
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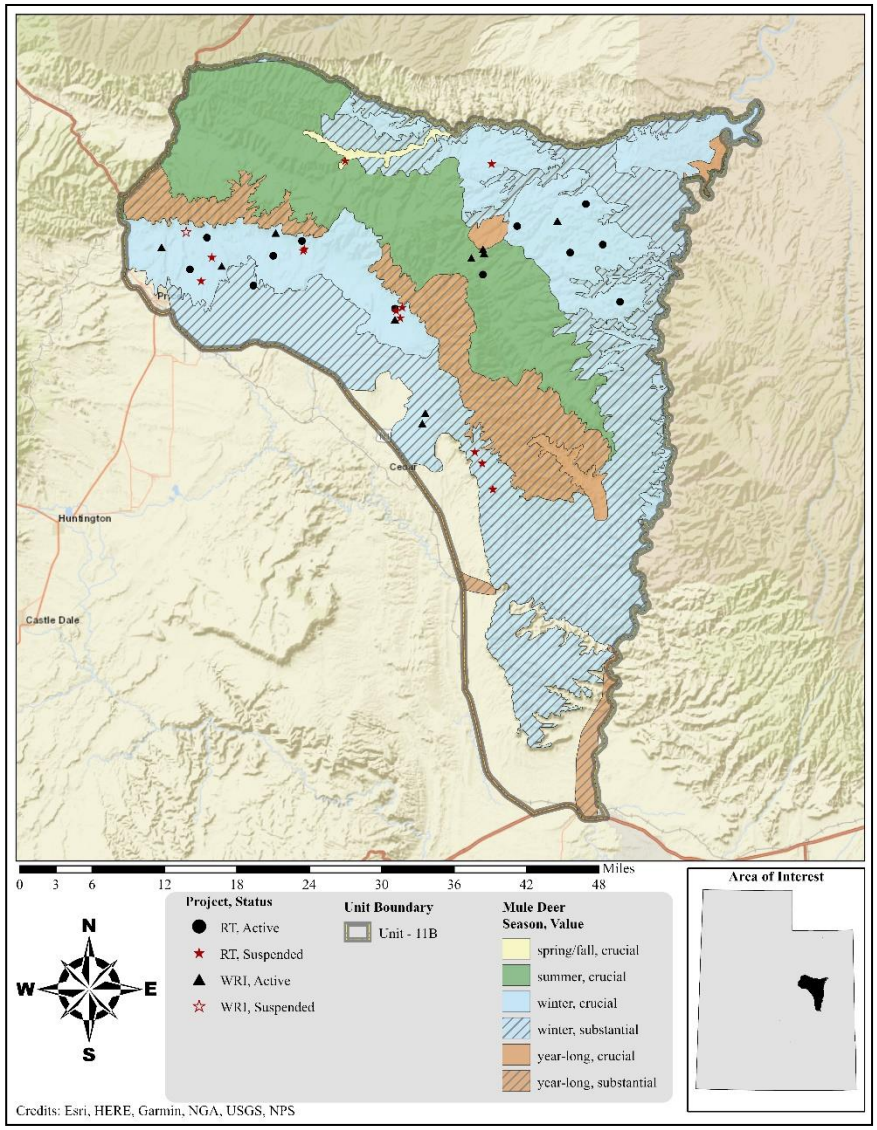
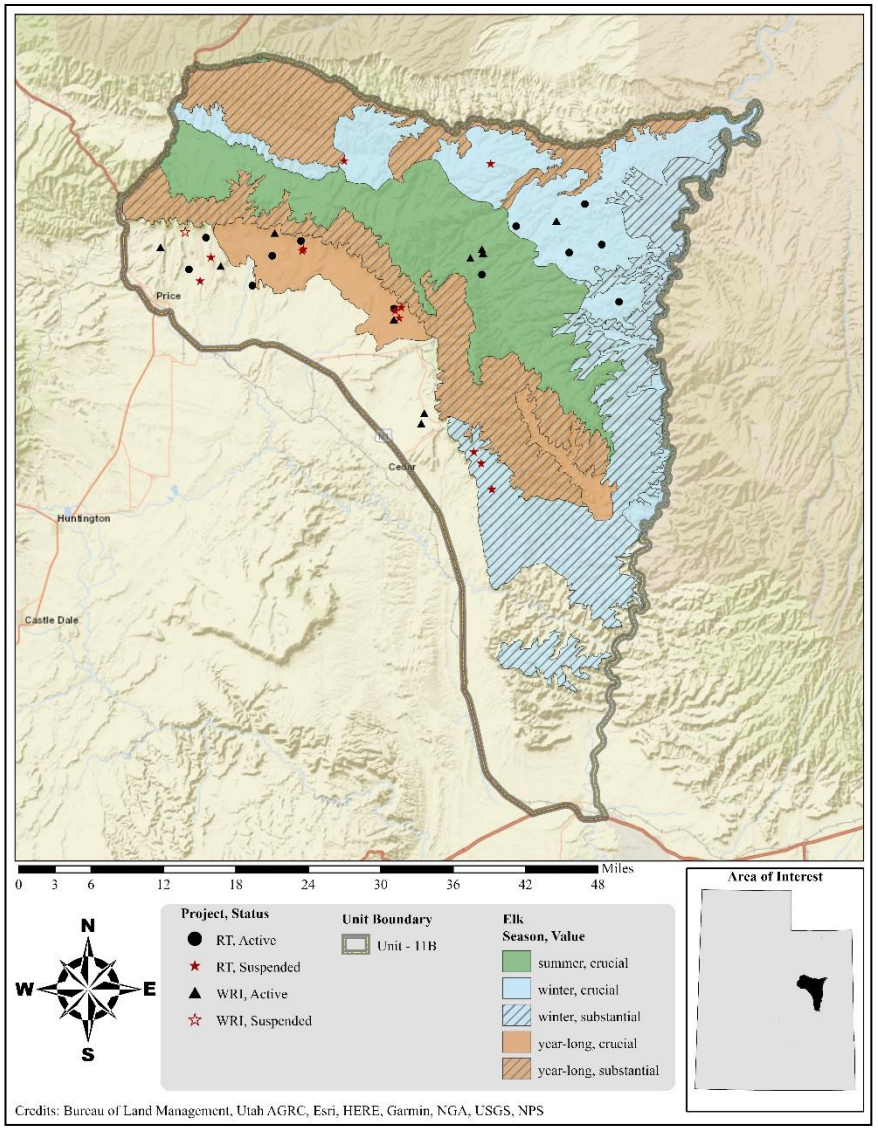
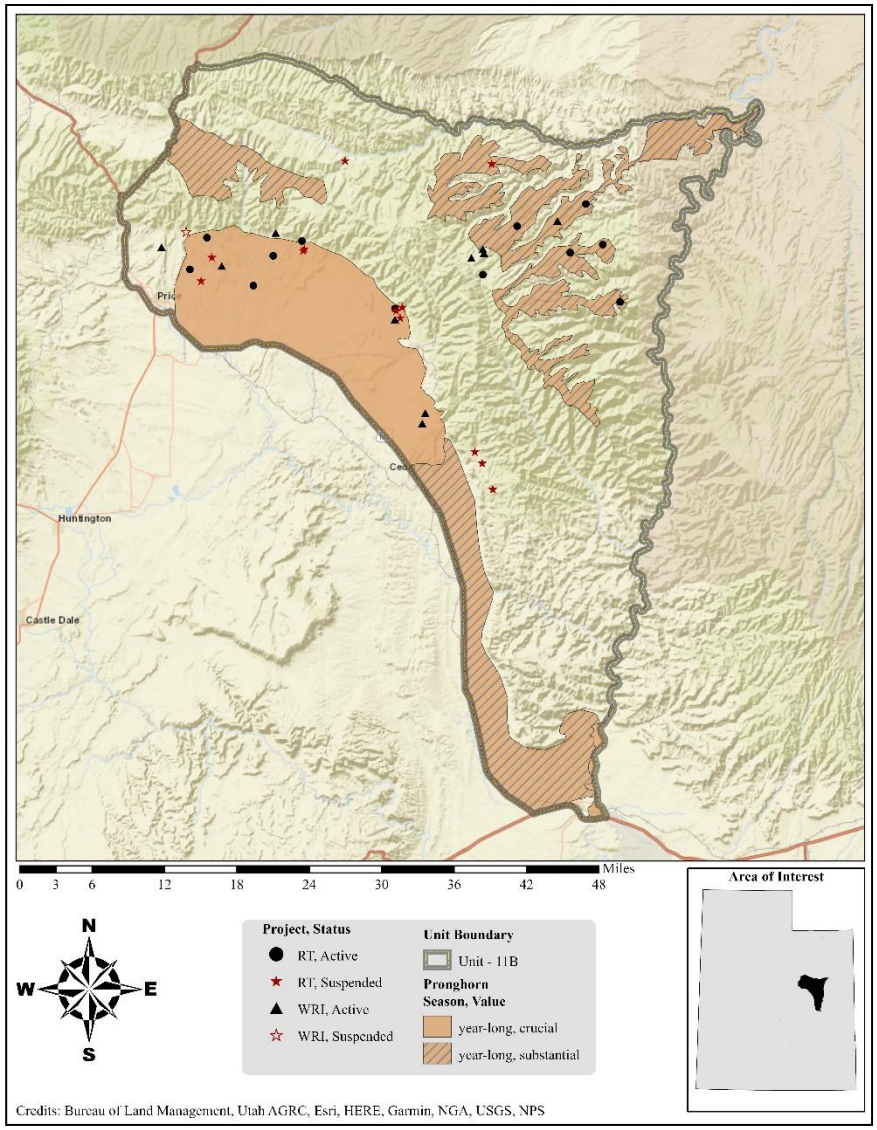


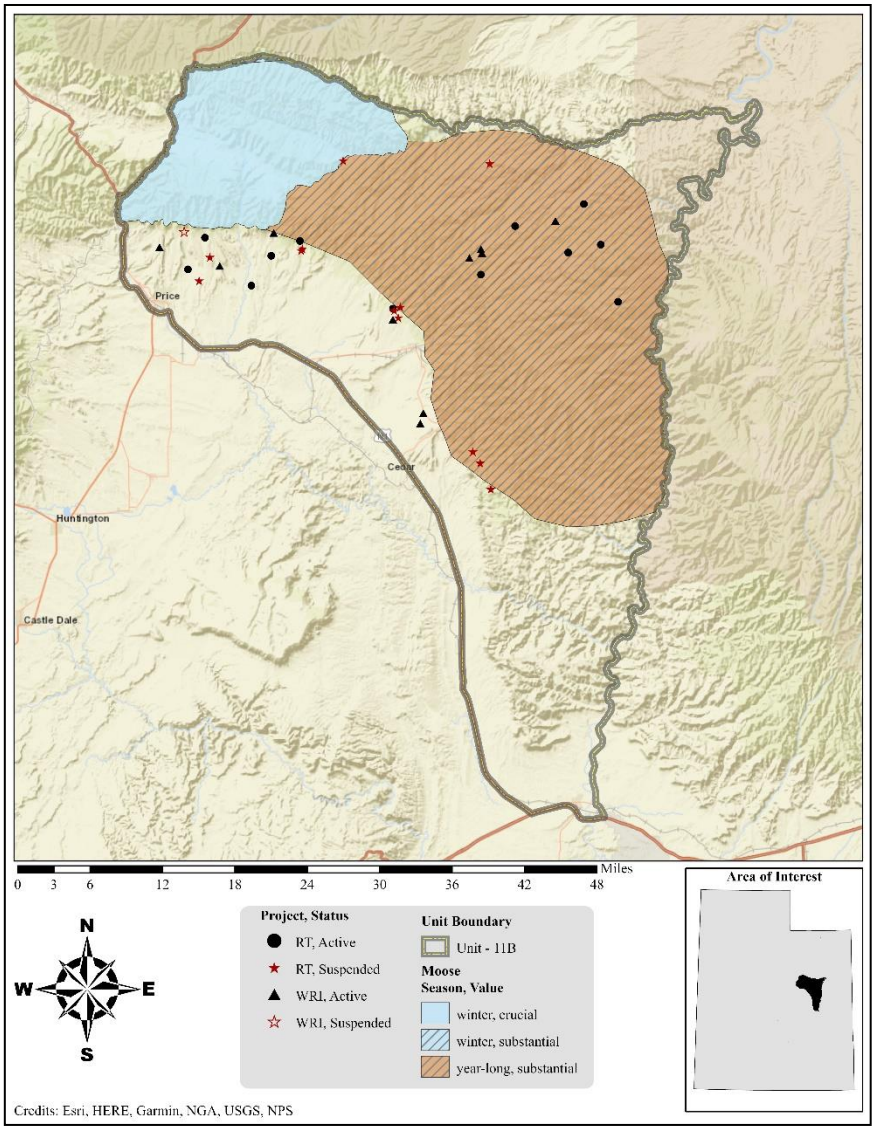
Map 6.2: Estimated mule deer habitat by season and value for WMU 11B, Nine Mile, Range Creek.



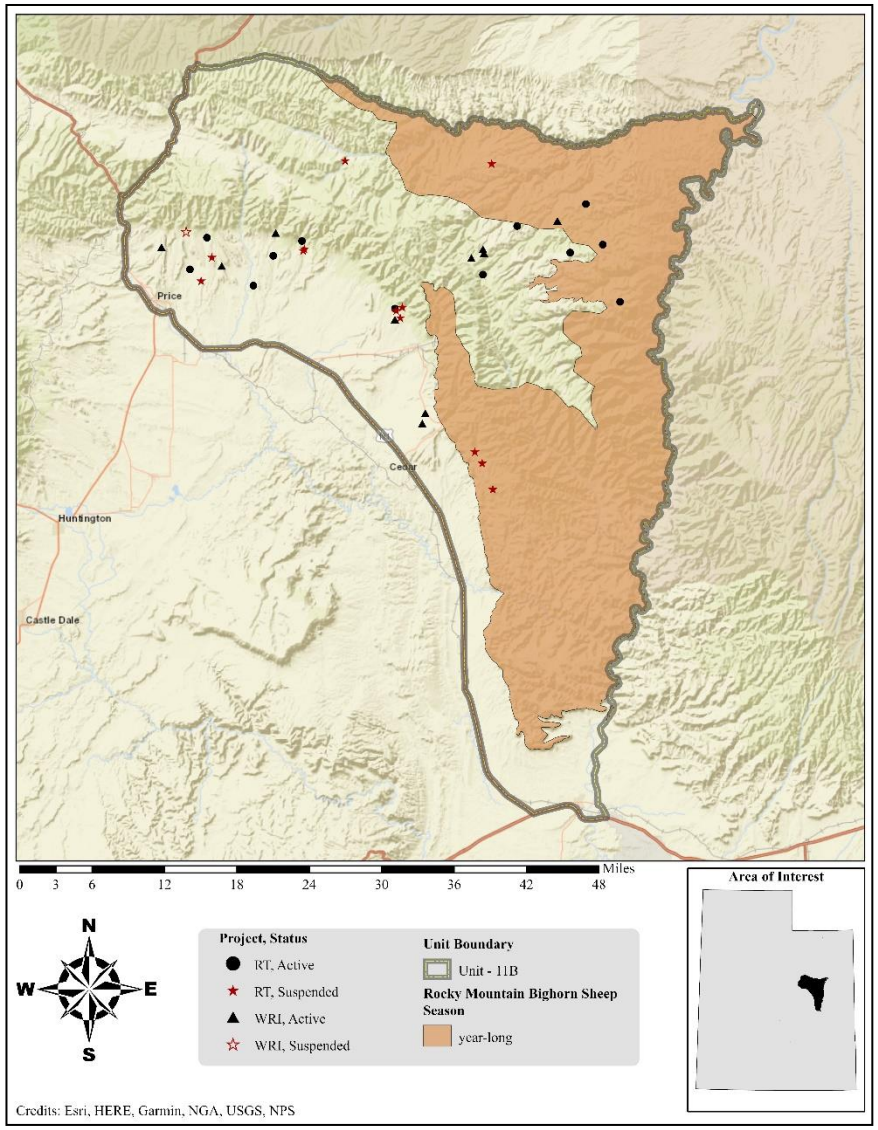
Map 6.3: Estimated elk habitat by season and value for WMU 11B, Nine Mile, Range Creek.



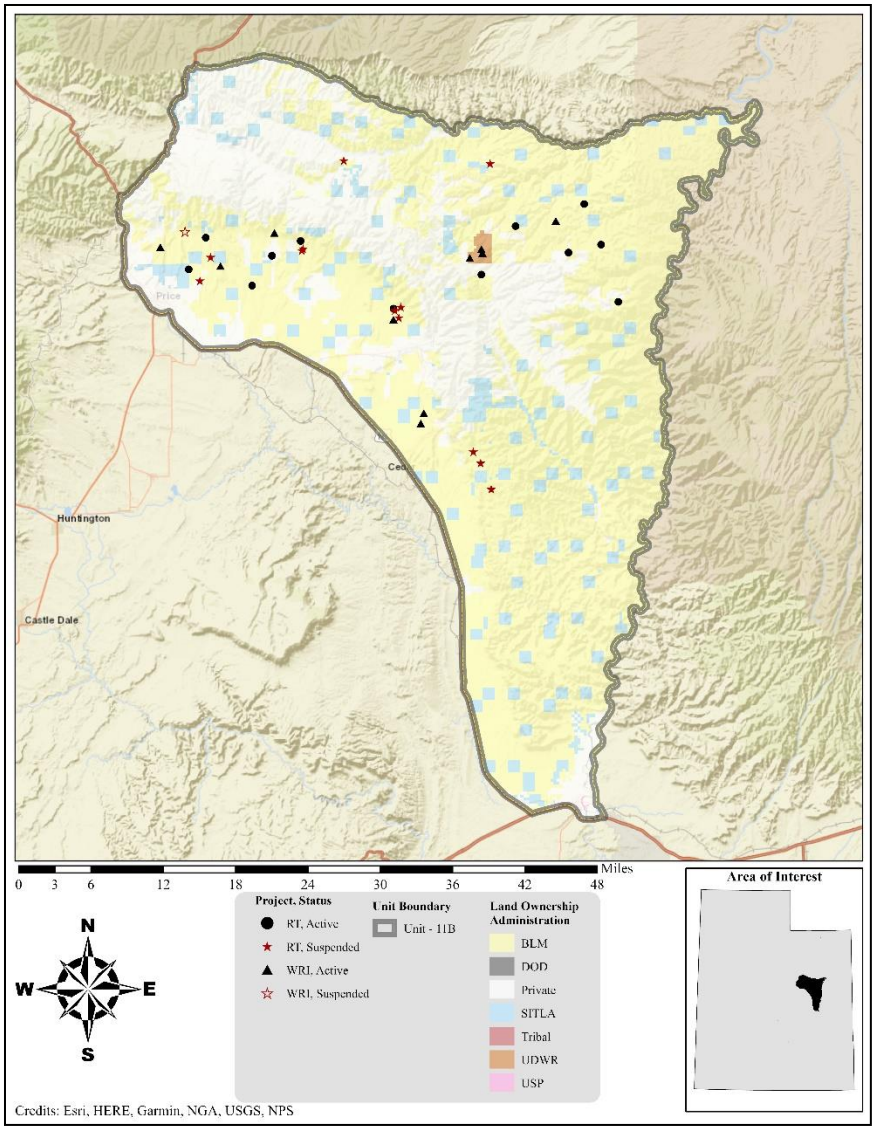
Map 6.4: Estimated pronghorn habitat by season and value for WMU 11B, Nine Mile, Range Creek.



Map 6.5: Estimated moose habitat by season and value for WMU 11B, Nine Mile, Range Creek.



Map 6.6: Estimated Rocky Mountain bighorn sheep habitat by season and value for WMU 11B, Nine Mile, Range Creek.



Map 6.7: Land ownership for WMU 11B, Nine Mile, Range Creek.

	Year Long Range		Summer Range		Winter Range		Spring/Fall Range	
Species	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
Mule Deer	126,482	14%	208,945	24%	542,232	61%	59,145	1%
Elk	247,854	35%	160,578	22%	305,353	43%	0	0%
Moose	431,075	76%	0	0%	132,597	24%	0	0%
Pronghorn	319,928	100%	0	0%	0	0%	0	0%
Bighorn Sheep	455,699	100%	0	0%	0	0%	0	0%

Table 6.1: Estimated mule deer, elk, moose, pronghorn, and Rocky Mountain bighorn sheep habitat acreage by season for WMU 11B, Nine Mile, Range Creek.

	Year Long Range		Summer Range		Winter Range		Spring/Fall Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	65,810	52%	43,306	21%	422,151	78%	2,972	32%
Private	43,997	35%	150,081	72%	70,480	13%	5,726	63%
SITLA	14,057	11%	14,024	7%	49,422	9%	444	5%
UDOT	2	<1%	0	0%	14	<1%	2	<1%
FFSL	1,188	1%	0	0%	0	0%	0	0
USP	135	<1%	0	0%	0	0%	0	0
UDWR	1,158	1%	1,531	<1%	0	0%	0	0
Tribal	102	<1%	3	<1%	166	<1%	0	0
DOD	32	<1%	0	0%	0	0%	0	0
Total	126,482	**100%**	208,945	**100%**	542,232	**100%**	9,145	**100%**

Table 6.2: Estimated mule deer habitat acreage by season and ownership for WMU 11B, Nine Mile, Range Creek.

	Year Long Range		Summer Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	126,677	51%	42,627	26%	254,391	83%
Private	93,911	38%	107,604	67%	24,116	8%
SITLA	27,263	11%	7,658	5%	26,542	9%
UDOT	2	<1%	0	0%	2	<1%
UDWR	0	0%	2,689	2%	0	0%
Tribal	0	0%	0	0%	302	<1%
Total	247,854	**100%**	160,578	**100%**	305,353	**100%**

Table 6.3: Estimated elk habitat acreage by season and ownership for WMU 11B, Nine Mile, Range Creek.

	Year Long Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	264,622	61%	29,026	22%
Private	126,601	29%	93,780	71%
SITLA	37,087	9%	9,787	7%
UDOT	1	<1%	4	<1%
UDWR	2,689	1%	0	0%
Tribal	74	<1%	0	0%
Total	431,075	**100%**	132,597	**100%**

Table 6.4: Estimated moose habitat acreage by season and ownership for WMU 11B, Nine Mile, Range Creek.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	196,017	61%
Private	94,125	29%
SITLA	27,395	9%
UDOT	200	<1%
FFSL	910	<1%
USP	24	<1%
UDWR	1,165	<1%
DOD	91	<1%
Total	319,928	**100%**

Table 6.5: Estimated pronghorn habitat acreage by season and ownership for WMU 11B, Nine Mile, Range Creek.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	374,676	82%
Private	36,213	8%
SITLA	44,413	10%
FFSL	79	<1%
Tribal	318	<1%
Total	455,699	**100%**

Table 6.6: Estimated Rocky Mountain bighorn sheep habitat acreage by season and ownership for WMU 11B, Nine Mile, Range Creek.

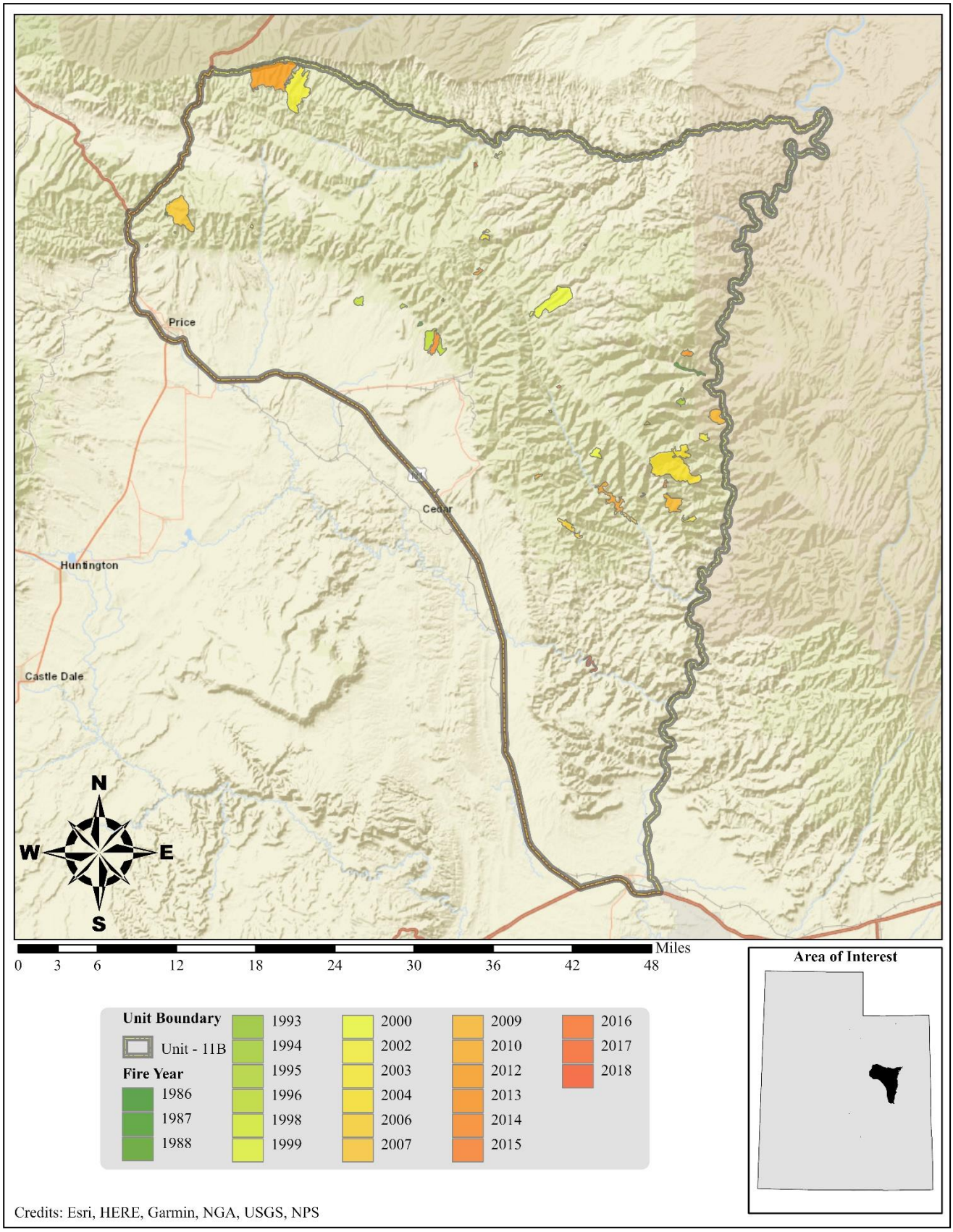
Group	Existing Vegetation Type	Acres	% of Total	Group % of Total
Conifer	Colorado Plateau Pinyon-Juniper Woodland	310,326	31.34%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	70,475	7.12%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	33,081	3.34%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	8,309	0.84%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	7,357	0.74%	
	Southern Rocky Mountain Ponderosa Pine Woodland	3,794	0.38%	
	Other Conifer	2,741	0.28%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	1,139	0.12%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	28	0.00%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	23	0.00%	
	Inter-Mountain Basins Juniper Savanna	<1	0.00%	44.15%
Shrubland	Inter-Mountain Basins Mixed Salt Desert Scrub	75,138	7.59%	
	Inter-Mountain Basins Big Sagebrush Shrubland	67,417	6.81%	
	Inter-Mountain Basins Mat Saltbush Shrubland	48,850	4.93%	
	Inter-Mountain Basins Montane Sagebrush Steppe	46,709	4.72%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	26,005	2.63%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	24,422	2.47%	
	Colorado Plateau Pinyon-Juniper Shrubland	23,910	2.41%	
	Rocky Mountain Lower Montane-Foothill Shrubland	12,207	1.23%	
	Inter-Mountain Basins Greasewood Flat	7,559	0.76%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	7,293	0.74%	
	Southern Colorado Plateau Sand Shrubland	5,135	0.52%	
	Colorado Plateau Blackbrush-Mormon-tea Shrubland	3,424	0.35%	
	Other Shrubland	1,755	0.18%	35.32%
Other	Sparsely Vegetated	96,949	9.79%	
	Hardwood	38,748	3.91%	
	Agricultural	12,404	1.25%	
	Developed	11,736	1.19%	
	Conifer-Hardwood	10,296	1.04%	
	Open Water	3,256	0.33%	
	Riparian	2,938	0.30%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	747	0.08%	17.88%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	12,037	1.22%	
	Interior West Ruderal Riparian Scrub	937	0.09%	
	Interior West Ruderal Riparian Forest	343	0.03%	
	Interior Western North American Temperate Ruderal Shrubland	315	0.03%	1.38%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	4,004	0.40%	
	Southern Rocky Mountain Montane-Subalpine Grassland	1,754	0.18%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	963	0.10%	
	Other Grassland	693	0.07%	0.75%
Exotic Herbaceous	Great Basin & Intermountain Introduced Annual Grassland	2,539	0.26%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	1,452	0.15%	
	Interior Western North American Temperate Ruderal Grassland	669	0.07%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	452	0.05%	0.52%
Total		**990,328**	**100%**	**100%**

Table 6.7: LANDFIRE Existing Vegetation Coverage (LANDFIRE.US_140EVT, 2019) for WMU 11B, Nine Mile, Range Creek.

Limiting Factors to Big Game Habitat

Major human activities in the area include mining and grazing. Habitat degradation and loss, public land winter range availability, winter range forage condition, and landowner acceptance limit big game habitat in this unit. Encroachment by pinyon-juniper woodland communities poses a substantial threat to important sagebrush rangelands. According to current Landfire Existing Vegetation Coverage models, nearly 31% of the Nine Mile, Range Creek unit is comprised of combined pinyon-juniper woodlands and shrublands (**Table 6.7**). Encroachment and invasion of these woodlands into sagebrush communities has been shown to decrease sagebrush and herbaceous cover, therefore decreasing available wildlife forage (Miller, Svejcar, & Rose, 2000).

Deer fences and crossings limiting range are also a concern. However, cooperation with the Utah Department of Transportation in construction of highway fences, passage structures, warning signs, etc. will continue in order to ensure proper access to habitat as well as deer and human safety.



Map 6.8: Land coverage of fires by year from 2000-2020 for WMU 11B, Nine Mile, Range Creek (Geosciences and Environmental Change Science Center (GECSC) Outgoing Datasets, 2021).

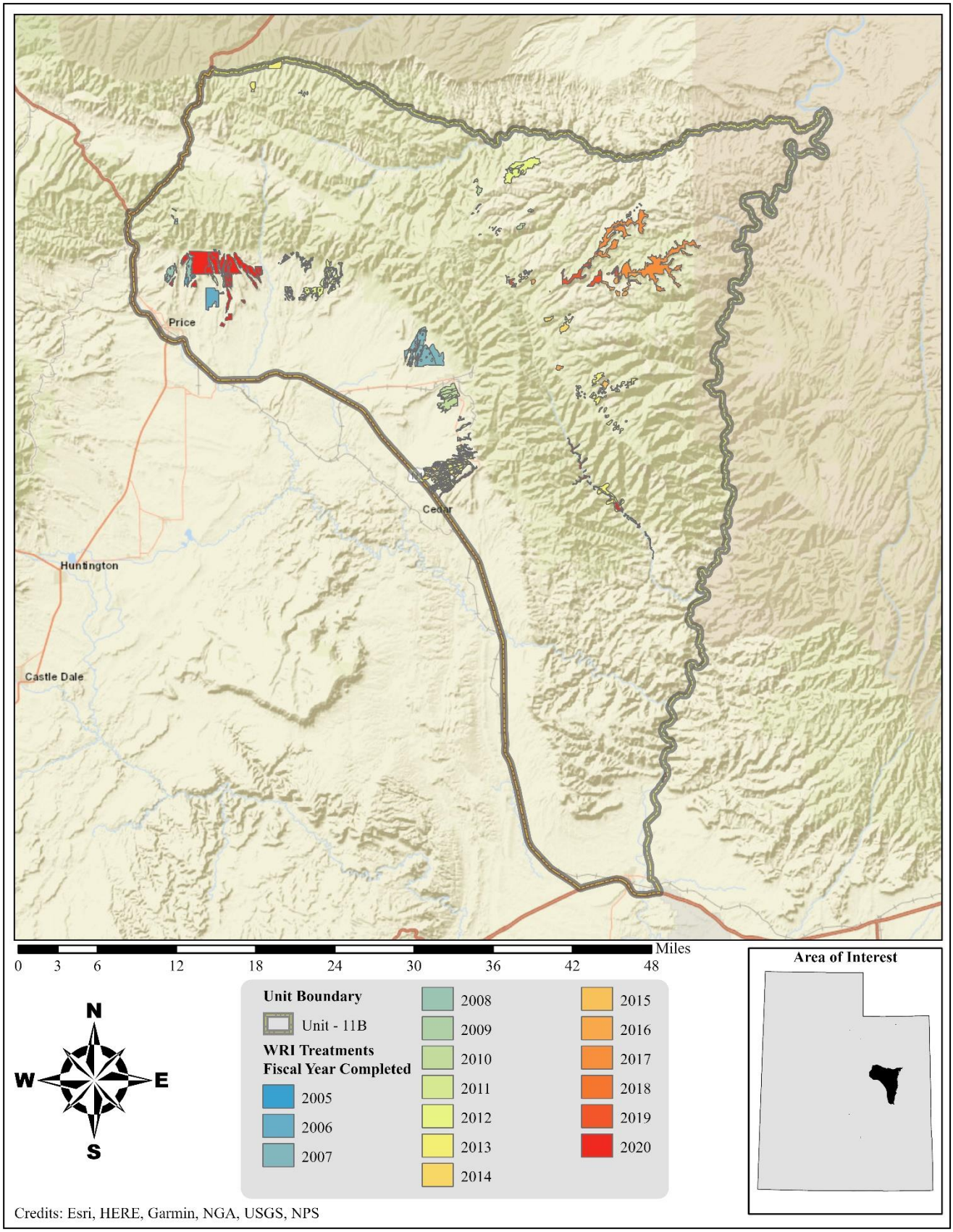
Treatments/Restoration Work

There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 23,461 net acres of land have been treated within the Nine Mile, Range Creek unit since the WRI was implemented in 2004 (**Table 6.9**). Treatments frequently overlap one another bringing the total treatment acres to 25,827 acres for this unit. Furthermore, 3,688 acres are currently being treated and treatments are planned for an additional 2,097 acres (**Table 6.8**, **Map 6.9**). 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.

Pinyon-juniper removal by mechanical mastication and hand crew are the most common management practices in this unit. Supplemental seeding and herbicide application are also common practices. Other management practices include seeding desirable shrub species, herbicide application to remove weeds, prescribed fire, harrow, and other similar vegetation removal techniques (**Table 6.8**).

Type	Completed Acreage	Current Acreage	Proposed Acreage	Total Acreage
Aerator	**1,445**	**0**	**0**	**1445**
Double Drum (One-Way)	1,445	0	0	1445
Anchor Chain	**491**	**0**	**0**	**491**
Ely (Two-Way)	491	0	0	491
Bulldozing	**229**	**129**	**0**	**358**
Tree Push	229	0	0	229
Other	0	129	0	129
Bullhog	**9,479**	**0**	**791**	**10270**
Full Size	9,183	0	791	9974
Skid Steer	296	0	0	296
Disc	**86**	**0**	**0**	**86**
Off-Set (Two-Way)	86	0	0	86
Harrow	**717**	**0**	**0**	**717**
≤15 ft. (One-Way)	117	0	0	117
≤15 ft. (Two-Way)	57	0	0	57
>15 ft. (One-Way)	543	0	0	543
Herbicide Application	**2,251**	**1,049**	**0**	**3300**
Aerial (Fixed-Wing)	926	0	0	926
Aerial (Helicopter)	862	0	0	862
Spot Treatment	16	1,049	0	1065
Ground	447	0	0	447
Mowing	**107**	**0**	**0**	**107**
Brush Hog	107	0	0	107
Prescribed Fire	**751**	**0**	**0**	**751**
Prescribed Fire	680	0	0	680
Pile Burn	71	0	0	71
Seeding (Primary)	**1,576**	**487**	**0**	**2,063**
Broadcast (Aerial-Fixed Wing)	649	0	0	649
Broadcast (Aerial-Helicopter)	743	0	0	743
Drill (Rangeland)	174	0	0	174
Ground	0	487	0	487
Hand Seeding	10	0	0	10
Vegetation Removal/Hand Crew	**8,694**	**2,023**	**1,306**	**12,023**
Lop & Scatter	7,611	1,592	1,306	10,508
Lop-Pile-Burn	1,084	431	0	1,514
Grand Total	**25,827**	**3,688**	**2,097**	**31,611**
***Total Land Area Treated**	**23,461**	**3,688**	**2,097**	**29,245**

Table 6.8: WRI treatment action size (acres) for completed, current, and proposed projects for WMU 11B, Nine Mile, Range Creek. Data accessed on 02/09/2021. *Does not include overlapping treatments.



Map 6.9: WRI treatments by fiscal year completed for WMU 11B, Nine Mile, Range Creek.

Range Trend Studies

Range Trend studies have been sampled within WMU 11B on a regular basis since 1986, with studies being added or suspended as was deemed necessary (**Table 6.9**). Due to changes in sampling methodologies, only data sampled 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 6.10**). Range Trend studies are summarized in this report by ecological site.

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
11B-1	Deadman	RT	Active	1986, 1994, 2000, 2005, 2010, 2015, 2020	Upland Stony Loam (Pinyon-Utah Juniper)
11B-2	Airport Bench	RT	Suspended	1986, 1994, 2000, 2005, 2010, 2015	Semidesert Loam (Wyoming Big Sagebrush)
11B-3	Airport	RT	Suspended	1986, 1994, 2000, 2005, 2010	Not Verified
11B-4	Coal Creek	RT	Active	1986, 1994, 2000, 2005, 2010, 2015, 2020	Semidesert Loam (Wyoming Big Sagebrush)
11B-5	'B' Canyon	RT	Active	1986, 1994, 2000, 2005, 2010, 2015, 2020	Upland Shallow Loam (Birchleaf Mountain Mahogany)
11B-6	Upper Cottonwood Ridge	RT	Active	1986, 1994, 2000, 2010, 2015, 2020	High Mountain Loam (Aspen)
11B-7	Cottonwood	RT	Active	1986, 1994, 2000, 2005, 2010, 2015, 2020	Upland Loam (Wyoming Big Sagebrush)
11B-8	Cedar Corral	RT	Active	1986, 1994, 2000, 2005, 2010, 2015, 2020	Mountain Stony Loam (Browse)
11B-9	Cedar Ridge	RT	Active	1986, 1994, 2000, 2005, 2010, 2015, 2020	Mountain Shallow Loam (Black Sagebrush)
11B-10	Upper Little Park Wash	RT	Suspended	1986, 1994	Not Verified
11B-11	Little Park Exclosure	RT	Suspended	1986, 1994, 2000	Not Verified
11B-12	Williams Draw	RT	Suspended	1994	Not Verified
11B-14	Prickly Pear	RT	Suspended	1994, 2000, 2005, 2010, 2015	Upland Loam (Birchleaf Mountain Mahogany)
11B-15	Twin Hollow	RT	Active	1994, 2000, 2005, 2010, 2015, 2020	Mountain Loam (Browse)
11B-16	Steer Ridge	RT	Active	1994, 2000, 2005, 2010, 2015, 2020	Mountain Shallow Loam (Mountain Big Sagebrush)
11B-17	Dugout Creek Unchained	RT	Suspended	1997, 2005	Upland Loam (Wyoming Big Sagebrush)
11B-18	Dugout Creek Sagebrush Chaining	RT	Suspended	1997, 2005	Not Verified
11B-19	Dugout Creek PJ Chained	RT	Active	1997, 2005, 2010, 2015, 2020	Upland Stony Loam (Pinyon-Utah Juniper)
11B-20	Deadman Creek	RT	Active	2015, 2020	Semidesert Loam (Wyoming Big Sagebrush)
11B-22	Soldier Creek	RT	Active	2020	Semidesert Loam (Wyoming Big Sagebrush)
11R-5	East Carbon Burn 1	RT	Suspended	1997	Not Verified
11R-6	East Carbon Burn 2	RT	Suspended	1997, 2000, 2005	Not Verified
11R-7	East Carbon Burn 3	RT	Suspended	1997, 2000, 2005	Not Verified
11R-8	Nine Mile 1	RT	Suspended	1997	Not Verified
11R-9	East Carbon Bullhog	WRI	Active	2006, 2010, 2014, 2018	Upland Shallow Loam (Birchleaf Mountain Mahogany)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
11R-10	West Coal Creek Bullhog	WRI	Active	2007, 2009, 2013, 2017	Upland Shallow Loam (Black Sagebrush)
11R-11	West Coal Creek Reference	WRI	Suspended	2009	Not Verified
11R-12	Burnt Cabin Spring	WRI	Active	2012, 2016	High Mountain Loam (Aspen)
11R-13	Horse Canyon	WRI	Active	2012, 2015, 2018	Upland Shallow Loam (Birchleaf Mountain Mahogany)
11R-14	Horse Canyon 2	WRI	Active	2012, 2015, 2018	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
11R-16	Cold Springs WMA	WRI	Active	2013, 2016	High Mountain Loam (Aspen)
11R-17	Dugout	WRI	Active	2013, 2016	Upland Shallow Loam (Birchleaf Mountain Mahogany)
11R-18	Cottonwood Ridge	WRI	Active	2015, 2018	Mountain Shallow Loam (Black Sagebrush)
11R-19	Knap Bench	WRI	Active	2019	Upland Shallow Loam (Birchleaf Mountain Mahogany)
11R-20	Flat Iron Mesa	WRI	Active	2019	High Mountain Loam (Aspen)

Table 6.9: Range trend and WRI project studies monitoring history and ecological site potential for WMU 11B, Nine Mile, Range Creek.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
11B-1	Deadman	Chain Unknown		1965-1966		
		Seed Unknown		1965-1966		
		Aerial Before	West Coal Creek	August 2007 and December 2007	1,868	847
		Bullhog	West Coal Creek	Fall 2007 and Spring 2008	1,868	847
11B-2	Airport Bench	Chain Unknown		1965		
		Seed Unknown		1965		
		Prescribed Fire		May 2005		
		Lop and Scatter	Miller Creek Watershed Restoration 2.0	May-June 2020	2,816	4734
11B-3	Airport	Chain Unknown		1965-1966		
		Rangeland Drill		1965-1966		
		Aerial Before	Price West Benches (Year 2) (Consumers) (Airport)	June 2004-December 2005	2,658	228
		Double Drum	Price West Benches (Year 2) (Consumers) (Airport)	June 2004-December 2005	2,658	228
		Aerial After	Price West Benches (Year 2) (Consumers) (Airport)	March 2005	2,658	228
11B-5	'B' Canyon	Two-Way Chain Unknown		1966		
		Seed Unknown		1966		
		Wildfire	East Carbon	1996	1,094	
		Chain Unknown		1996		
		Dribbler		1996		
11B-7	Cottonwood	Lop and Scatter	Cottonwood Ridge PJ Removal	July 2015-July 2016	1,019	3267
		Lop-Pile-Burn	Cottonwood Ridge Maintenance (Proposed)	May-June 2020	372	5404
		Aerial After	Cottonwood Ridge Maintenance (Proposed)	Fall 2020	450	5404
11B-8	Cedar Corral	Aerial Before	Bishop Ridge Pinyon and Juniper Removal	December 2015	490	3448
		Lop and Scatter	Bishop Ridge Pinyon and Juniper Removal	November 2015-January 2016	224	3448
11B-9	Cedar Ridge	Lop and Scatter	Tavaputs Plateau Sagegrouse Habitat Restoration 2.0 (Proposed)	2020	390	5007
11B-14	Prickly Pear	Chain Unknown		Mid 1970s		
		Seed Unknown		Mid 1970s		

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
11B-17	Dugout Creek Unchained	Aerial Before	Dugout Creek Pinyon/Juniper Removal	November 2010	208	1881
		Bullhog	Dugout Creek Pinyon/Juniper Removal	November 2010-February 2011	208	1881
		Aerial After	Dugout Creek Pinyon/Juniper Removal	February 2011	208	1881
11B-18	Dugout Creek Sagebrush Chaining	Aerial Before	Dugout Creek Pinyon/Juniper Removal	November 2010	208	1881
		Bullhog	Dugout Creek Pinyon/Juniper Removal	November 2010-February 2011	208	1881
		Aerial After	Dugout Creek Pinyon/Juniper Removal	February 2011	208	1881
11B-19	Dugout Creek PJ Chained	Chain Unknown		Fall 1996		
		Seed Unknown		Fall 1996		
		Lop and Scatter	Dugout Creek Fuels Reduction and Habitat Restoration: Phase II	May-September 2011	162	1935
11R-9	East Carbon Bullhog	Bullhog	East Carbon Phase II	December 2006	1,953	510
11R-10	West Coal Creek Bullhog	Seed Unknown	Woodhill PJ Control and Seeding	1966-1967		
		Two-Way Chain Unknown	Woodhill PJ Control and Seeding	1966-1967		
		Aerial Before	West Coal Creek	August and December 2007	1,868	847
		Bullhog	West Coal Creek	Fall 2007 and Spring 2008	1,868	847
11R-12	Burnt Cabin Spring	Prescribed	Cold Spring Aspen Enhancement Phase 2: Tavaputs Ranch	2015	191	1932
11R-13	Horse Canyon	Aerial Before	Horse Canyon Juniper Removal and Seeding	Fall 1963	920	LTDL
		Two-Way Chain Unknown	Horse Canyon Juniper Removal and Seeding	Fall 1963	920	LTDL
		Aerial Before	Horse Canyon Fuel Reduction and Habitat Restoration - Phase I	Fall 2012	1,173	2238
		Bullhog	Horse Canyon Fuel Reduction and Habitat Restoration - Phase I	Fall 2012	1,173	2238
11R-14	Horse Canyon 2	Lop and Scatter	Horse Canyon Fuel Reduction and Habitat Restoration	August-December 2012	447	2238
11R-16	Cold Springs WMA	Push	Cold Springs Conifer Removal/Aspen Regeneration Phase II	July 2013-June 2014	45	2637
		Prescribed Fire	Cold Springs WMA Conifer Removal Aspen Regeneration Phase V	December 2018	71	4043
11R-17	Dugout	Aerial Before	Dugout Creek Fuels Reduction and Habitat Restoration: Phase III	Fall 2013	395	2540
		Bullhog	Dugout Creek Fuels Reduction and Habitat Restoration: Phase III	Fall 2013	395	2540
11R-18	Cottonwood Ridge	Aerial Before	Cottonwood Ridge PJ Removal	October 2015-January 2016	1,048	3267
		Bullhog	Cottonwood Ridge PJ Removal	October 2015-January 2016	1,048	3267
		Aerial After	Cottonwood Ridge PJ Removal	January 2016-July 2017	1,048	3267
		Plateau/2,4-D	Cottonwood Ridge Maintenance (Proposed)	Fall 2020	1048	5404
11R-19	Knap Bench	Hand Planter	Miller Creek Watershed Restoration 2.0	Fall-Winter 2020	58	4734
11R-20	Flat Iron Mesa	Push	Cold Springs WMA Conifer Removal Aspen Regeneration Phase VI (Proposed)	Fall 2019	129	4840

Table 6.10: Range trend and WRI studies known disturbance history for WMU 11B, Nine Mile, Range Creek. PDB = Pre-Database; LTDL = Land Treatment Digital Library (Pilliod & Welty, 2019).

Study Trend Summary (Range Trend)

Mountain (Aspen)

There is one study [Upper Cottonwood Ridge (11B-6)] classified as a Mountain (Aspen) ecological site. This study site is located just west of Cottonwood Ridge above Range Creek **(Table 6.9**).

Shrubs/Trees: Gooseberry currant (*Ribes montigenum*) is the main browse species on this site, although a few other browse species contribute less cover. Average shrub cover is relatively low overall, but covers of mountain snowberry (*Symphoricarpos oreophilus*), preferred browse other than snowberry, and other shrubs have increased each sample year (**Figure 6.4**). Preferred browse demographic data shows that the community is comprised of mainly young and mature individuals and that density of each age class has increased over time (**Figure 6.16**). Browse utilization has fluctuated from year to year, but has increased overall; nearly 10% of mature plants were moderately browsed in the 2020 sample year (**Figure 6.20**).

Conifers including subalpine fir (*Abies lasiocarpa*), blue spruce (*Picea pungens*), and Douglas fir (*Pseudotsuga menziesii*) are the dominant trees on this site with cover and density increasing over time. Quaking aspen (*Populus tremuloides*) contributes a significant amount of cover, and cover has fluctuated from year to year with 17% in 2010, 11% in 2015, and 16% in 2020 (**Figure 6.8, Figure 6.12**).

Herbaceous Understory: This study site has a rich and abundant herbaceous component dominated by perennial grasses and forbs. This site supports some native grasses, but has been dominated by the introduced species Kentucky bluegrass (*Poa pratensis*) in most sample years, except in 2020 where the native perennial grass Columbia needlegrass (*Achnatherum nelsonii*) was the dominant species. Perennial grass cover has fluctuated over the years while that of perennial forbs has generally increased. There are no annual grasses found on this site and annual forbs have remained rare (**Figure 6.24**, **Figure 6.27**).

Occupancy: Average pellet transect data indicates that occupancy has generally decreased over the sample years and that primary occupants have varied. Elk pellet groups have had a mean abundance ranging from less than 1 days use/acre in 2015 to 26 days use/acre in 2000. Mean abundance of deer pellet groups has ranged from 0 days use/acre in 2000 to 9 days use/acre in 2020. Cattle use has been as low as 0 days use/acre in 2000 and 2020, and as high as 4 days use/acre in 2010 and 2015. Finally, horse pellet groups appeared for the first time in 2020 at 2.3 days use/acre (**Figure 6.30**).

Mountain (Big Sagebrush)

One site [Steer Ridge (11B-16)] is classified as a Mountain (Big Sagebrush) ecological site. Steer Ridge is found on top of Steer Ridge (**Table 6.9**).

Shrubs/Trees: The Steer Ridge study is dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), although antelope bitterbrush (*Purshia tridentata*) contributes comparable cover. Overall shrub cover has increased over the study period. Sagebrush cover increased between the 2005 and 2010 sample years, but has remained generally stable overall. Preferred browse and other shrubs have also remained stable over the sample period (**Figure 6.5**). Preferred browse demographics show that the population has been composed of mainly mature individuals in all sample years except 2010, when density of young surpassed that of mature plants. A small portion of the population has remained comprised of decadent plants. Both recruitment of young plants and overall density has fluctuated from year to year (**Figure 6.17**). Overall utilization has increased over the sample period with most plants displaying moderate use. Moreover, both moderate and heavy use have increased overall, but there was a notable decrease in utilization in 2010 (**Figure 6.21**).

As no trees are present on this representative site, the trends for both tree density and cover will not be discussed in this section (**Figure 6.9**, **Figure 6.13**).

Herbaceous Understory: Average herbaceous cover has varied from year to year, but has shown an increasing trend overall. Perennial grasses have been the main component in all sample years with needle-and-thread (*Hesperostipa comata*) being the most prevalent species on this representative site; introduced perennial grasses are not an issue in this community. The introduced annual grass species cheatgrass (*Bromus tectorum*) is present on the site, but in very low amounts. Perennial forb cover has generally and gradually increased in cover throughout the study years, while annual forbs have remained rare (**Figure 6.24, Figure 6.27**).

Occupancy: Overall average occupancy has increased over the sample period, and elk have been the primary occupants in every sample year. Elk pellet groups have had a mean abundance ranging from 57 days use/acre in 2015 to 82 days use/acre in 2000. Deer usage has been as low as 13 days use/acre in 2005 and as high as 50 days use/acre in 2015. Mean abundance of cattle pellet groups has ranged from 0 days use/acre in 2000 and 2005 to 3 days use/acre in 2020 (**Figure 6.30**).

Mountain (Black/Low Sagebrush)

One site [Cedar Ridge (11B-9)] is classified as a Mountain (Black/Low Sagebrush) ecological site. The Cedar Ridge study is located on Cedar Ridge near Cedar Ridge Canyon (**Table 6.9**).

Shrubs/Trees: Black sagebrush (*Artemisia nova*) dominates among browse species on this representative study. Sagebrush cover has increased gradually throughout the sample years while that of preferred browse and other shrubs has remained stable (**Figure 6.5**). Preferred browse demographics show that the population has been composed of mainly mature individuals in all sample years. Both young and decadent plants comprise a small portion of the sagebrush population. Recruitment of young plants and overall density has fluctuated from year to year (**Figure 6.17**). Utilization has increased each sample year, except when moderate use decreased from 27% in 2015 to 6% in 2020. However, heavy use has had an inverse relationship over the sample period, increasing from 20% in 2015 to 27% in 2020 (**Figure 6.21**).

The study is encroached by Utah juniper (*Juniperus osteosperma*) and to a lesser extent twoneedle pinyon (*Pinus edulis*). (**Figure 6.9**, **Figure 6.13**).

Herbaceous Understory: Average herbaceous cover has generally increased throughout the sample period. Perennial grasses have been the main component in all sample years with needle-and-thread (*Hesperostipa comata*) being the most prevalent species; introduced perennial grasses are not an issue in this representative community. The introduced annual grass species cheatgrass (*Bromus tectorum*) is present in the understory of this study, but in very low amounts. Perennial forb cover has generally remained consistent throughout the study years, while annual forbs have remained relatively rare (**Figure 6.24, Figure 6.27**).

Occupancy: Overall average occupancy has varied throughout the sample period, and primary occupants have fluctuated from year to year. Elk pellet groups have had a mean abundance ranging from 0 days use/acre in 2015 to 38 days use/acre in 2005. Deer usage has been as low as 0 days use/acre in 2000 and as high as 21 days use/acre in 2015. Mean abundance of horse pellet groups has ranged from 4 days use/acre in 2015 to 30 days use/acre in 2020. Cattle pellet groups have not been observed on this site (**Figure 6.30**).

Mountain (Browse)

There are two sites [Cedar Corral (11B-8) and Twin Hollow (11B-15)] that are classified as Mountain (Browse) ecological sites. The Cedar Corral study is located on Cedar Ridge above Cedar Corral Canyon, and the Twin Hollow study is found at the southeastern edge of Twin Hollow (**Table 6.9**).

Shrubs/Trees: The dominant browse component on these sites is a mixture of species including mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), Utah serviceberry (*Amalanchier utahensis*), alderleaf mountain mahogany (*Cercocarpus montanus*), and mountain snowberry (*Symphoricarpos oreophilus*); other browse species providing less cover are present on both sites. The total cover of mountain mahogany, preferred browse other than mountain mahogany, and other shrubs has increased each sample year (**Figure**

6.7). Preferred shrub populations have been composed of mainly mature individuals in all sample years. Recruitment of young plants has remained low and overall density has generally been stable (**Figure 6.17**). Overall utilization of preferred browse has increased over the sample period with the majority of plants receiving moderate use each sample year (**Figure 6.21**).

Average tree cover, namely contributed by twoneedle pinyon (*Pinus edulis*), increased slightly while density remained stable between 2005 to 2015.However, cover and density have been notably reduced in 2020 following a lop and scatter treatment on the Cedar Corral site (**Figure 6.9**, **Figure 6.13**). These trends are almost exclusively driven by the Cedar Corral study as point-quarter data reveals that trees have not been sampled on the Twin Hollow site since 2000.

Herbaceous Understory: The herbaceous composition on these sites is generally good. Average herbaceous cover has varied from year to year, but has increased overall. Perennial forbs and native grasses have been the dominant component throughout the study years; the Twin Hollow study is driving much of the trend as perennial grasses do not contribute very much cover on the Cedar Corral site. Both annual grasses and forbs remain rare, although the introduced annual grass species cheatgrass (*Bromus tectorum*) was observed on the Cedar Corral study in very low amounts (**Figure 6.25**, **Figure 6.28**).

Occupancy: Wildlife occupancy has steadily decreased while wild horse presence has increased over the sample years. Elk were the primary occupants of these sites in 2000 and 2005. Mean pellet group abundance showed that elk use had decreased to less than 1 days use/acre in 2015, but rebounded to 14 days use/acre in 2020. Deer usage has fluctuated over time. Estimated horse presence has increased, but remains relatively low at 15 days use/acre in 2020 (**Figure 6.31**).

Upland (Big Sagebrush)

One site [Cottonwood (11B-7)] is classified as an Upland (Big Sagebrush) ecological site. Cottonwood is found above Indian Swale on Sage Brush Flat (**Table 6.9**).

Shrubs/Trees: Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) is the browse species with the most cover on this representative study site; sagebrush cover is good and has slightly decreased overall. Other preferred shrub species are rare (**Figure 6.6**). Preferred browse (most of which is sagebrush) density has had minor fluctuations from year to year. The populations have mainly been comprised of mature plants, although decadence was more pronounced in 2000 and 2020. Preferred browse recruitment has increased overall over the duration of the sample period (**Figure 6.18**). Average utilization of preferred browse has varied each year since 1994. Moreover, moderate and heavy preferred browse utilization has also varied from year to year, but heavy use was notable in 2015 at 61% utilization (**Figure 6.22**).

Encroachment of twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) is a potential threat on this site. Although average cover has decreased over time and average density is relatively low, both cover and density could possibly increase in the future (**Figure 6.10**, **Figure 6.14**).

Herbaceous Understory: The herbaceous understory on this site is primarily dominated by the native perennial species needle and thread (*Hesperostipa comata*), which is the main driver for the perennial grass upward trend. Perennial forb cover has decreased overall and annual forbs have remained rare (**Figure 6.25**, **Figure 6.28**).

Occupancy: Average pellet transect data shows that although elk were initially the primary occupants with a mean pellet group abundance of 23 days use/acre in 2000, these sites have mainly been used by deer in recent sample years; elk usage has steadily decreased over time. Horse pellet groups were observed for the first time in 2020 at an estimated 4 days use/acre (**Figure 6.31**).

Upland (Browse)

There is one study ['B' Canyon (11B-5)] classified as an Upland (Browse) ecological site. 'B' Canyon is found at the base of West Ridge between B Canyon and Left Fork Canyon, and south of Stone Cabin Gas Field above Prickly Pear Canyon (**Table 6.9**).

Shrubs/Trees: Past primary browse on this site included alderleaf mountain mahogany (*Cercocarpus montanus*) and Mormon tea (*Ephedra viridis*). However, preferred browse has made up less than 1% of the cover in most sample years. As of 2020, Mormon tea and fourwing saltbush (*Atriplex canescens*) comprise 2% of browse cover (**Figure 6.7**). Populations of black sagebrush (*Artemisia nova*) and mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) were present in the 1994 sample year, but were removed following the East Carbon wildfire in 1996. Of the small populations of Mormon tea and saltbush, the majority are mature plants (**Figure 6.18**). Utilization has fluctuated over time, but overall use of preferred browse was very high in the 2000, 2005, and 2010 sample years (**Figure 6.22**).

Woodland encroachment by twoneedle pinyon (*Pinus edulis*) or Utah juniper (*Juniperus osteosperma*) is not an issue on this representative site. Density of pinyon was measured for the first time in 2020, but was quite low (**Figure 6.10**, **Figure 6.14**).

Herbaceous Understory: The study has a fair herbaceous component; the overall average cover has increased over time. However, the majority of perennial grass cover can be attributed to the introduced species crested wheatgrass (*Agropyron cristatum*). Annual grasses are absent from this study. Perennial forb cover has remained generally stable overall and annual forbs are extremely rare (**Figure 6.25**, **Figure 6.28**).

Occupancy: Overall animal use has had large fluctuations over time, and species occupancy has also varied from year to year. Mean abundance of elk pellet groups has ranged from 0 days use/acre in 2000 and 2020 to 7 days use/acre in 2005. Deer pellet groups have had a mean abundance ranging from 5 days use/acre in 2010 to 48 days use/acre in 2020. Finally, mean abundance of cattle pellet groups has been as low as 4 days use/acre in 2000 and as high as 42 days use/acre in 2005 (**Figure 6.31**).

Upland (Pinyon-Juniper)

Two studies [Deadman (11B-1) and Dugout Creek PJ Chained (11B-19)] are classified as Upland (Pinyon-Juniper) ecological sites. The Deadman study is located northeast of Price City. The Dugout Creek PJ Chained study is located west of Dugout Creek **(Table 6.9**).

Shrubs/Trees: Although browse in general is very limited on the Deadman site, the dominant species are alderleaf mountain mahogany (*Cercocarpus montanus*) and Mormon tea (*Ephedra viridis*). Overall average shrub cover has increased over time with more notable increases in preferred browse cover than in sagebrush cover, although sagebrush also increased in cover. (**Figure 6.6**). Sagebrush contributes very little cover and density on the Deadman study. The representative sagebrush populations, black sagebrush (*Artemisia nova*) and Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*), on the Dugout Creek PJ Chained study are mainly composed of mature individuals; there have been very few decadent plants since the 2005 sample year (**Figure 6.18**). Overall utilization has fluctuated over the sample period and has been low in most sample years: the exception to this was in 2015, when approximately 69% of the population displayed some form of hedging. Moderate and heavy use have been nearly equal to one another since 2005. However, in 2020 the majority of browse species displayed more signs of moderate use than heavy use (**Figure 6.22**).

Average tree cover decreased significantly between 2005 and 2010 due to a bullhog treatment in 2007/2008. Although cover and density are currently low as of 2020, Utah juniper (*Juniperus osteosperma*) is beginning to infill the sites and may lead to decreased herbaceous and understory health in the future if it is not addressed (**Figure 6.10**, **Figure 6.14**).

Herbaceous Understory: The herbaceous understories on these sites have been, on average, increasing in cover from year to year. However, this trend is due to increases in annual grass. Recent sample years indicate that the increasing trend in herbaceous annual grass, namely the introduced annual cheatgrass (*Bromus tectorum*), is driven by the Deadman study. Perennial grasses are present, but most cover is contributed by the introduced species crested wheatgrass (*Agropyron cristatum*) which is mainly found on the Dugout Creek PJ Chained study (**Figure 6.26**, **Figure 6.29**).

Occupancy: Overall animal usage of these sites has been highly variable over the sample years, and deer are the primary occupants of these sites. Elk use has ranged from 0 days use/acre in 2000 to 16 days use/acre in 2010. Mean abundance of deer pellet groups has been as low as 19 days use/acre in 2000 and as high as 57 days use/acre in 2020. Finally, cattle pellet groups have remained low with a mean abundance ranging from 3 days use/acre in 2000 and 2010 to 4 days use/acre in 2005 and 2020 (**Figure 6.32**).

Semidesert (Big Sagebrush)

There are three studies [Coal Creek (11B-4), Deadman Creek (11B-20), and Soldier Creek (11B-22)] that are classified as Semidesert (Big Sagebrush) ecological sites. Coal Creek is situated adjacent to Coal Creek and west of Soldier Creek. The Deadman Creek study is found just north of Deadman Creek. The Soldier Creek study is found nearly due east of Anderson Reservoir (**Table 6.9**).

Shrubs/Trees: The most abundant browse species on these sites is Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), with fourwing saltbush (*Atriplex canescens*) being present in much lower amounts. Overall sagebrush cover has increased over the study years and is driven by the addition of Deadman Creek and Soldier Creek studies in 2015 and 2020, respectively (**Figure 6.6**). Average sagebrush demographics reveal that the populations have varied from year to year, but are mainly composed of mature individuals as of the 2020 sample year. In 2005, however, decadent plants made up the majority of the sagebrush population on the Coal Creek study. Although variable, recruitment of young plants has been decreasing overall since 2000 (**Figure 6.19**). Average utilization has fluctuated over the sample period, but has increased overall. A utilization trend is difficult to determine between 2010 and 2020 due to studies having been added each subsequent year, which adds a degree of confounding comparability. Notable heavy use occurred in 2015 at 62% of total utilization (**Figure 6.23**).

Encroachment trends of twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) are driven by the addition of the Soldier Creek study in 2020. Potential for woodland infilling is a threat for all the representative sites, and further succession may lead to decreased herbaceous and understory health in the future if it is not addressed (**Figure 6.11**, **Figure 6.15**).

Herbaceous Understory: The herbaceous understories vary from site to site. The herbaceous understory of the Coal Creek study is dominated by a mixture of native perennial grasses that contribute moderately low cover; increases in overall average perennial grass cover from 2000 to 2010 can be attributed to the Coal Creek study. Annual grasses are present in extremely low amounts on this site and perennial and annual forbs have remained rare. The Deadman Creek study has an extremely depauperate understory that is devoid of graminoid cover, suppressing the average perennial grass cover in 2015. Furthermore, Deadman Creek is dominated by annual forbs and is the driver for increased annual forbs for the ecological type. Finally with the addition of the Soldier Creek study in 2020, overall average perennial grasses were further suppressed as the dominant herbaceous component on Soldier Creek lacks any substantial cover. Furthermore, annual grasses and forbs remain rare and do not affect the overall average for the ecological site (**Figure 6.26**, **Figure 6.29**).

Occupancy: Average pellet transect data indicates that animal occupancy has remained rather stable between the 2000 and 2010 sample years. However, there is an appearance of an upward trend in occupancy with the additions of the Deadman Creek study in 2015 and the Soldier Creek study in 2020. Deer have been the primary occupants in most sample years. Mean abundance of elk pellet groups has ranged from 0 days use/acre in 2000, 2005 and 2010 to 2 days use/acre in 2015. Deer usage has been as low as 4 days use/acre in 2000 and

as high as 87 days use/acre in 2020. Finally, mean abundance of cattle pellet groups has ranged from less than 0 days use/acre in 2000 to 3 days use/acre in 2010 (**Figure 6.32**).

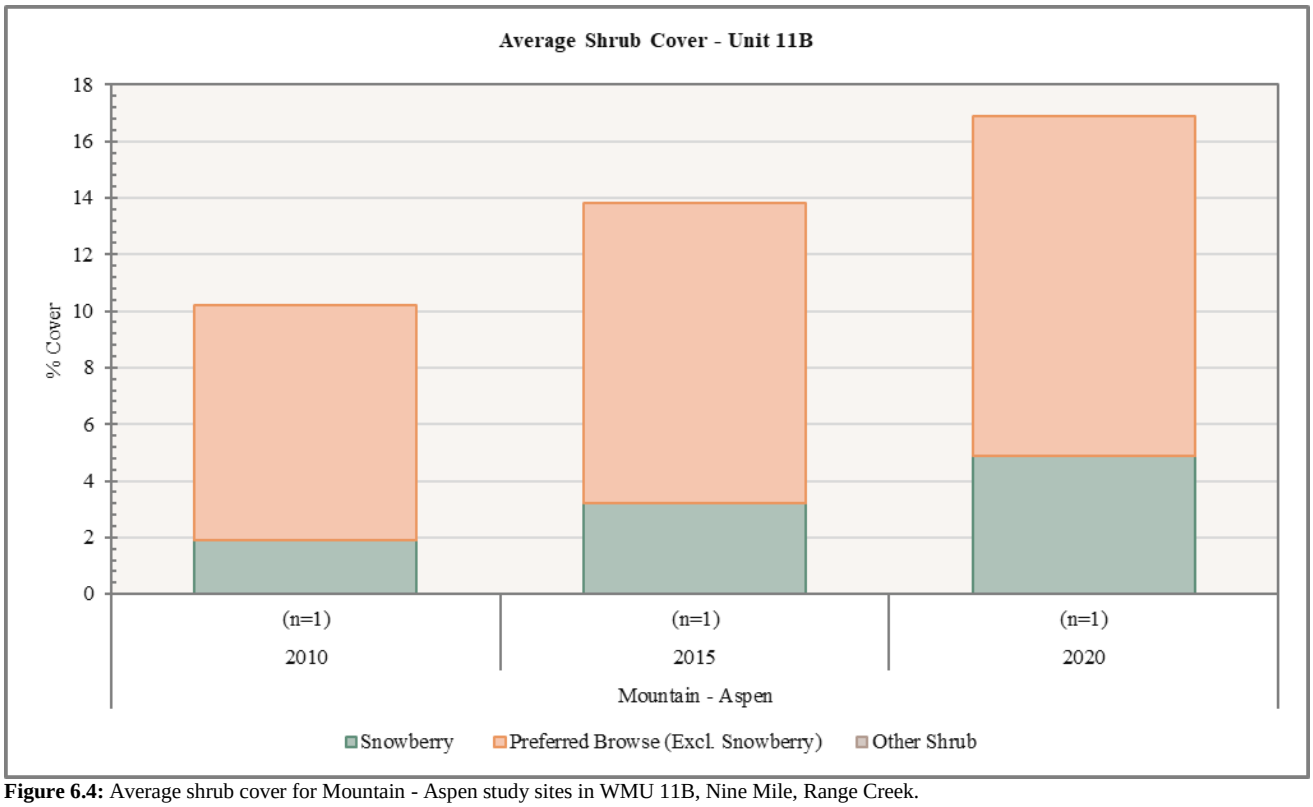


Figure 6.4: Average shrub cover for Mountain - Aspen study sites in WMU 11B, Nine Mile, Range Creek.

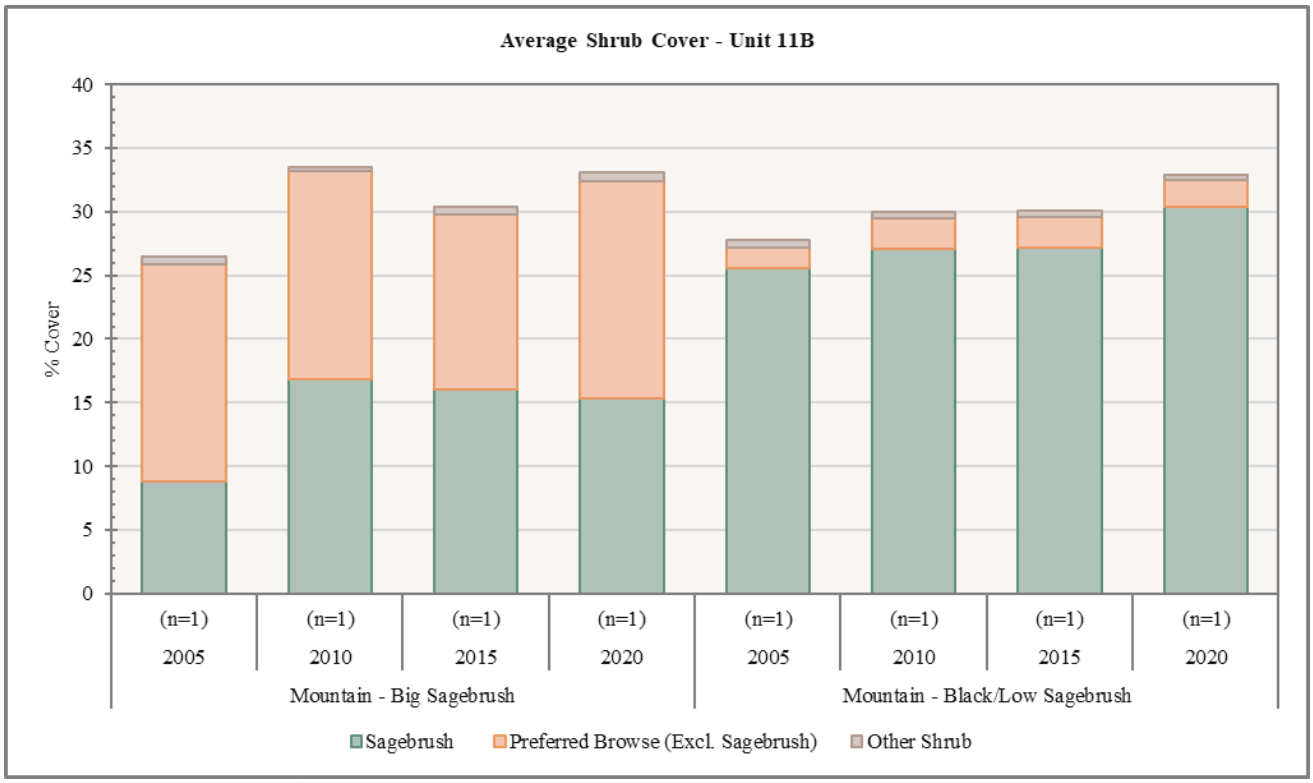


Figure 6.5: Average shrub cover for Mountain - Big Sagebrush and Mountain - Black/Low Sagebrush study sites in WMU 11B, Nine Mile, Range Creek.

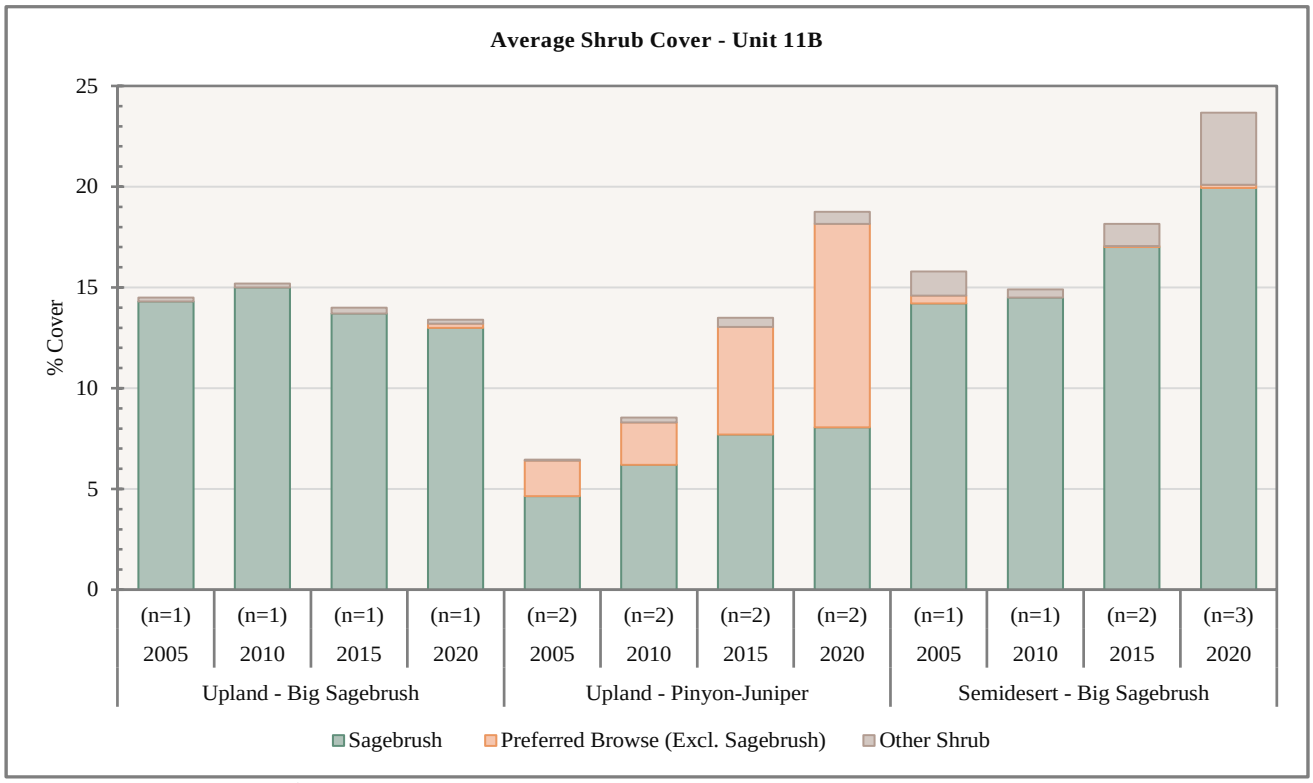


Figure 6.6: Average shrub cover for Upland - Big Sagebrush, Upland - Pinyon/Juniper, and Semidesert - Big Sagebrush study sites in WMU 11B, Nine Mile, Range Creek.

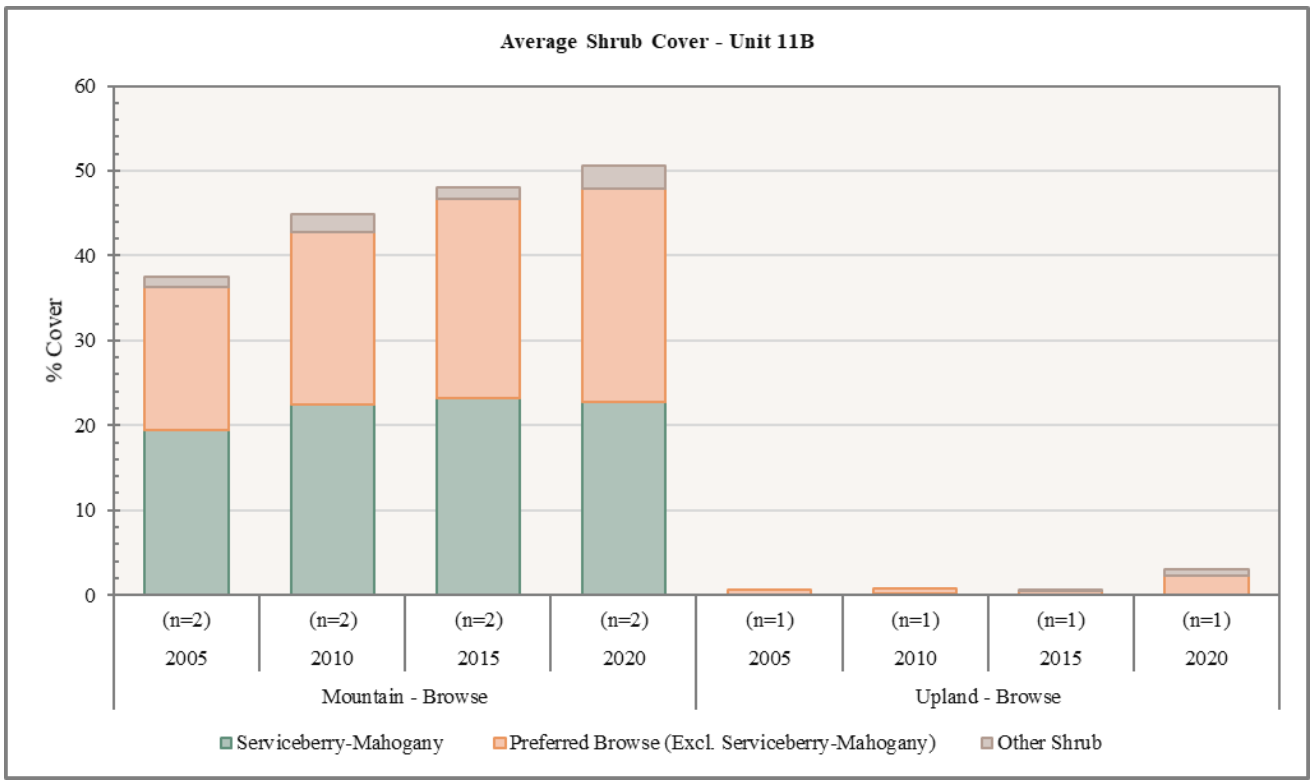


Figure 6.7: Average shrub cover for Mountain - Browse and Upland - Browse study sites in WMU 11B, Nine Mile, Range Creek.

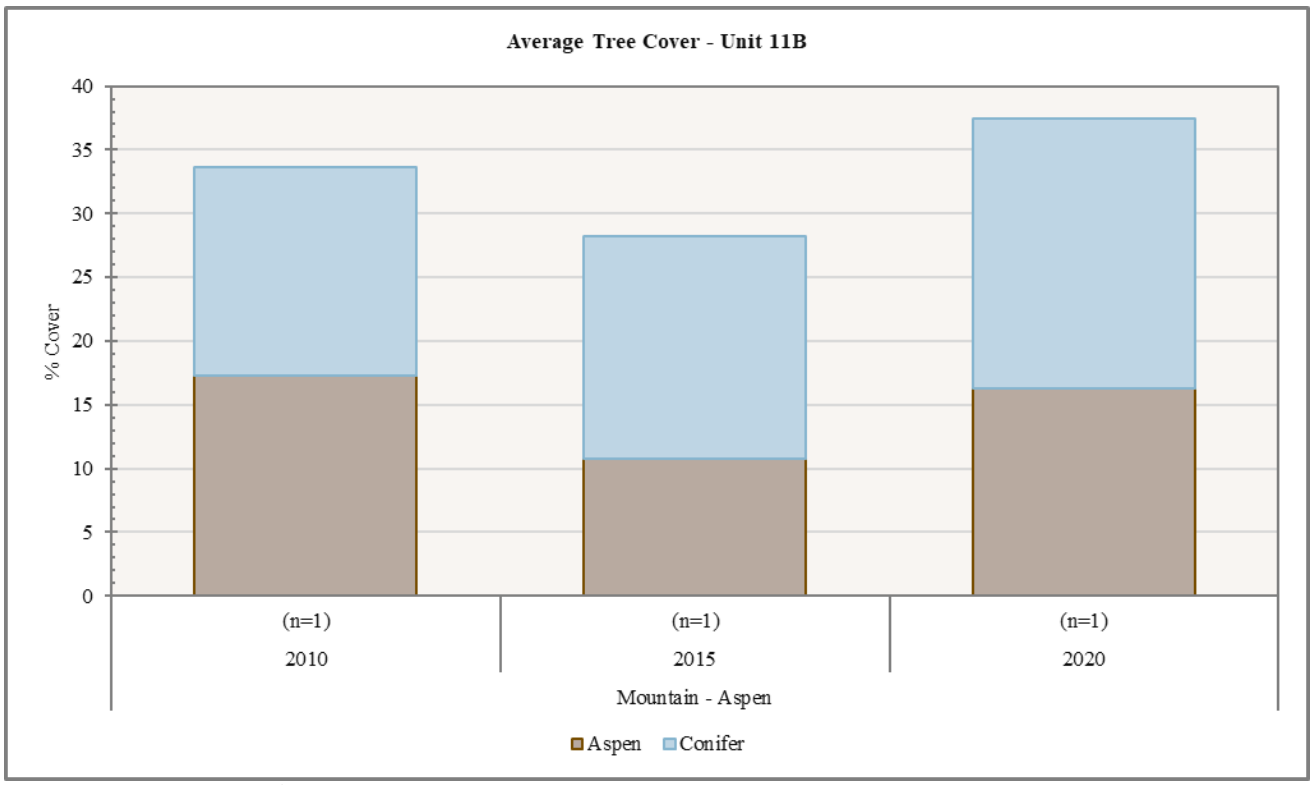


Figure 6.8: Average tree cover for Mountain - Aspen study sites in WMU 11B, Nine Mile, Range Creek.

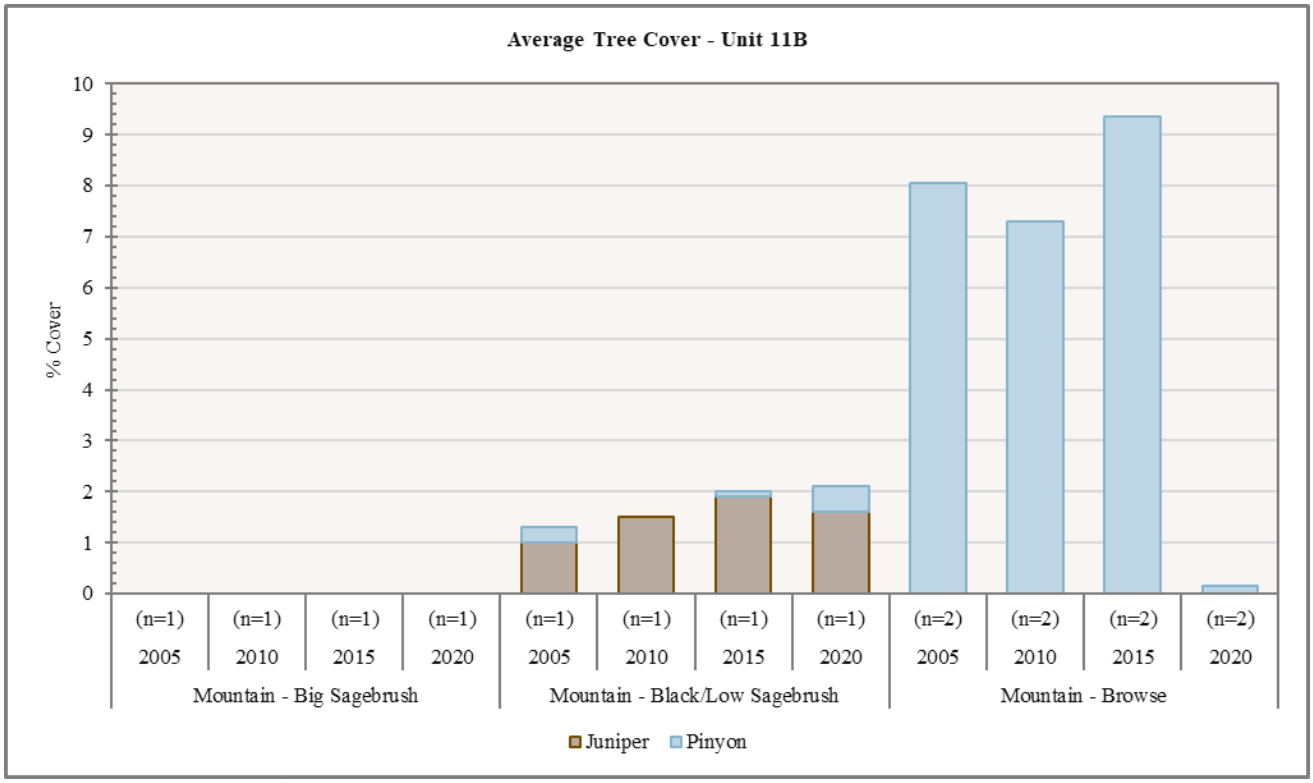


Figure 6.9: Average tree cover for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain - Browse study sites in WMU 11B, Nine Mile, Range Creek.

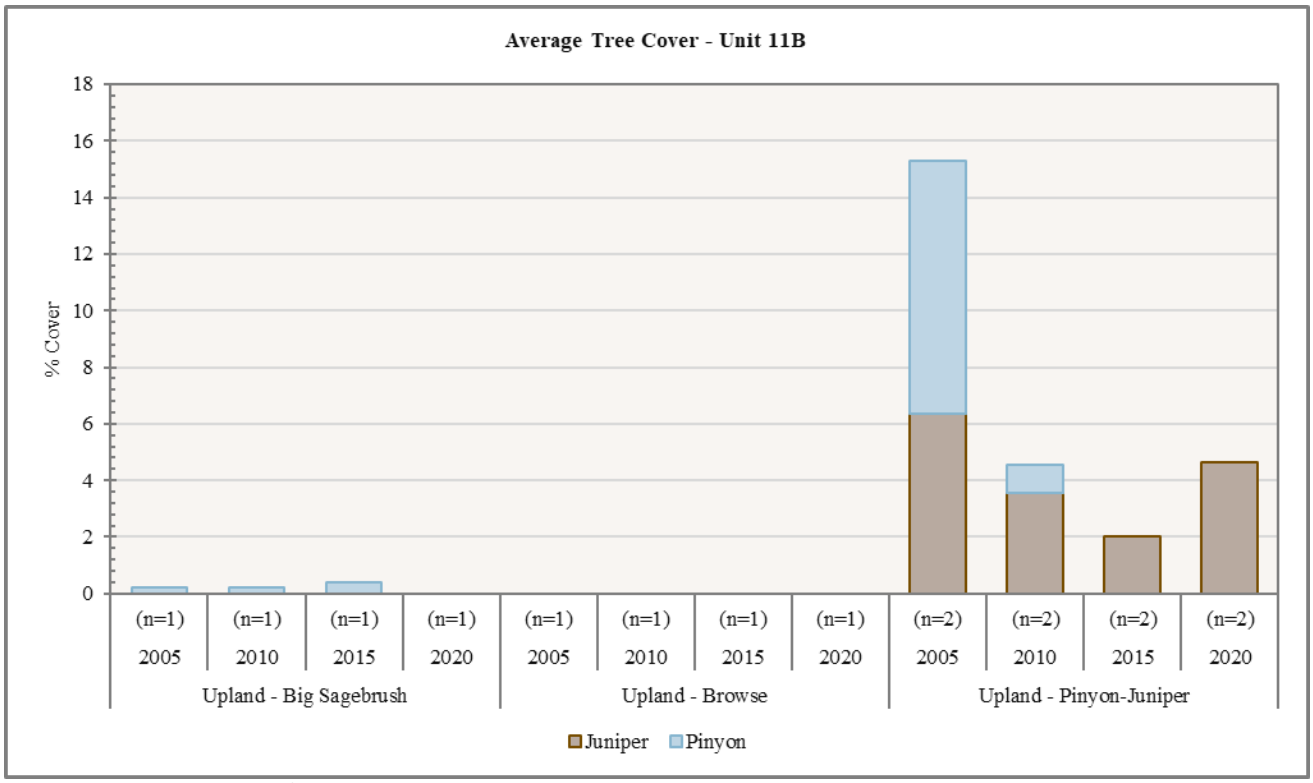


Figure 6.10: Average tree cover for Upland - Big Sagebrush, Upland - Browse, and Upland - Pinyon-Juniper study sites in WMU 11B, Nine Mile, Range Creek.

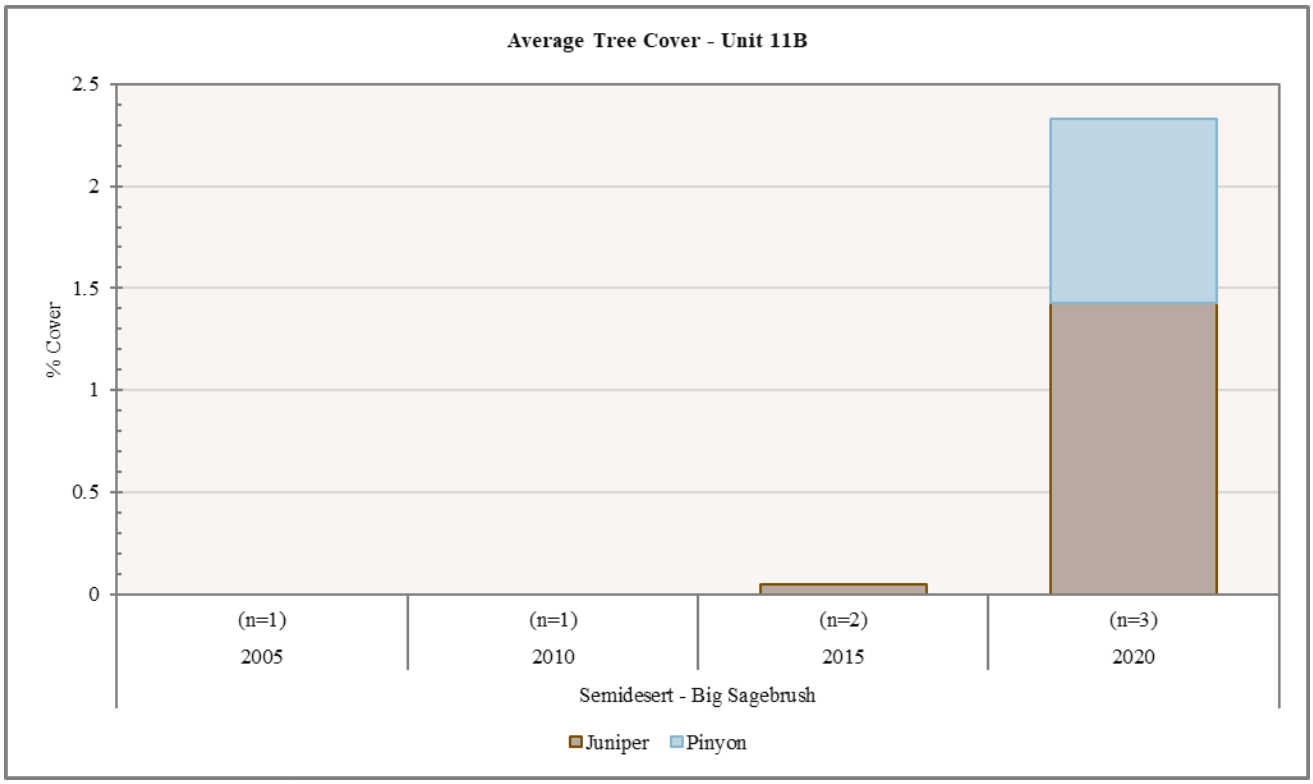


Figure 6.11: Average tree cover for Semidesert - Big Sagebrush study sites in WMU 11B, Nine Mile, Range Creek.

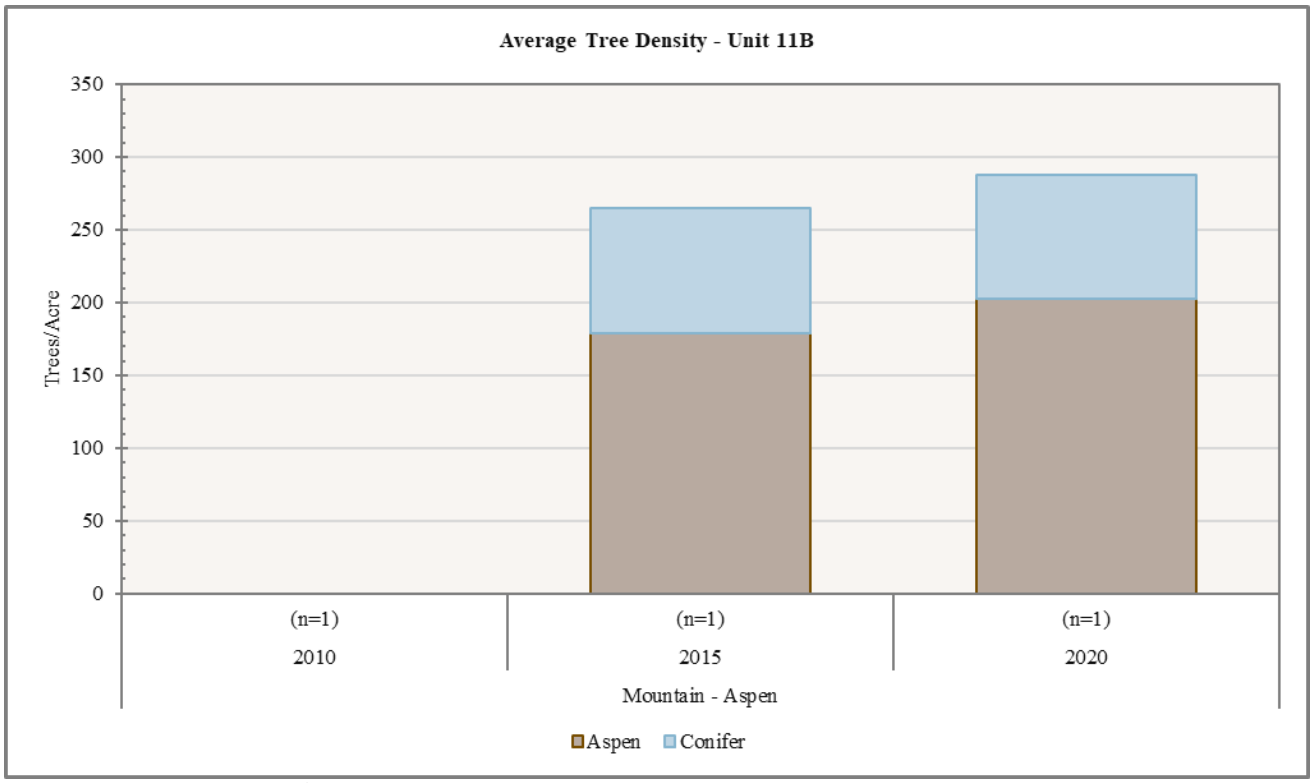


Figure 6.12: Average tree density for Mountain - Aspen study sites in WMU 11B, Nine Mile, Range Creek.

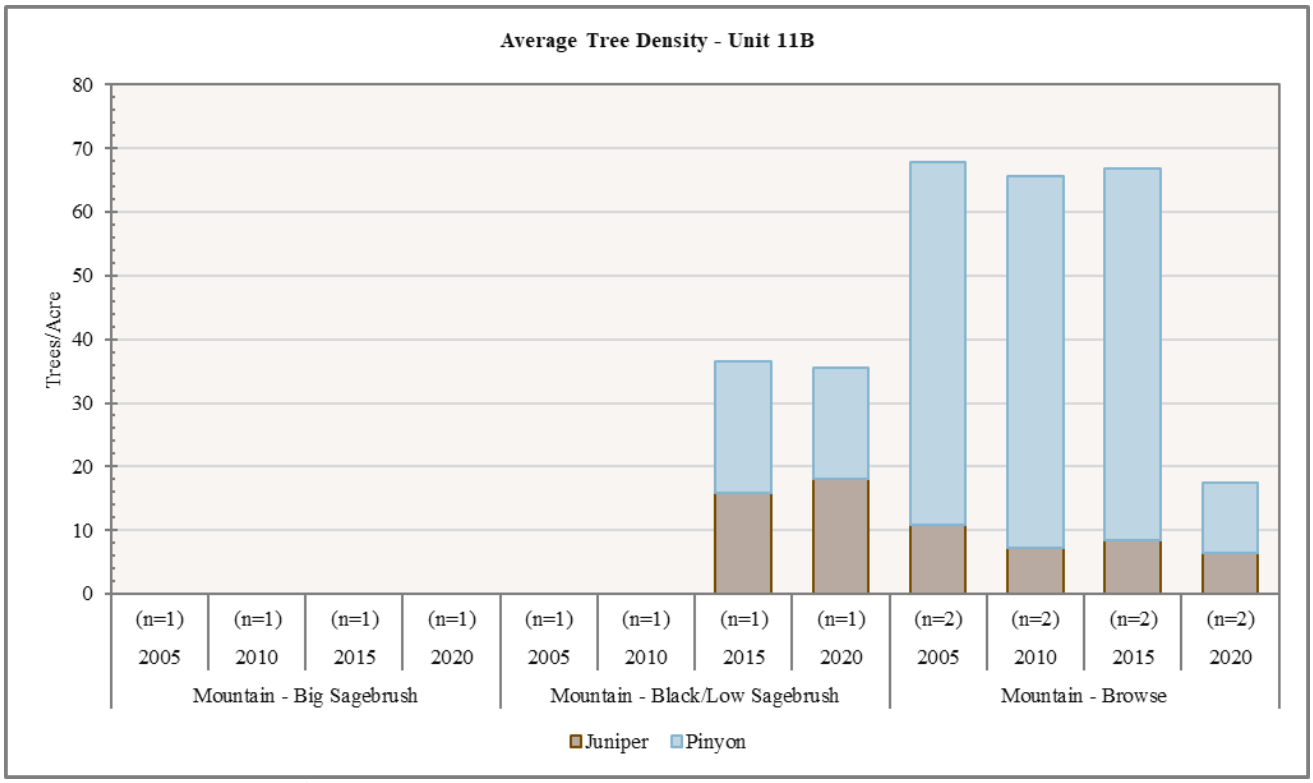


Figure 6.13: Average tree density for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain - Browse study sites in WMU 11B, Nine Mile, Range Creek.

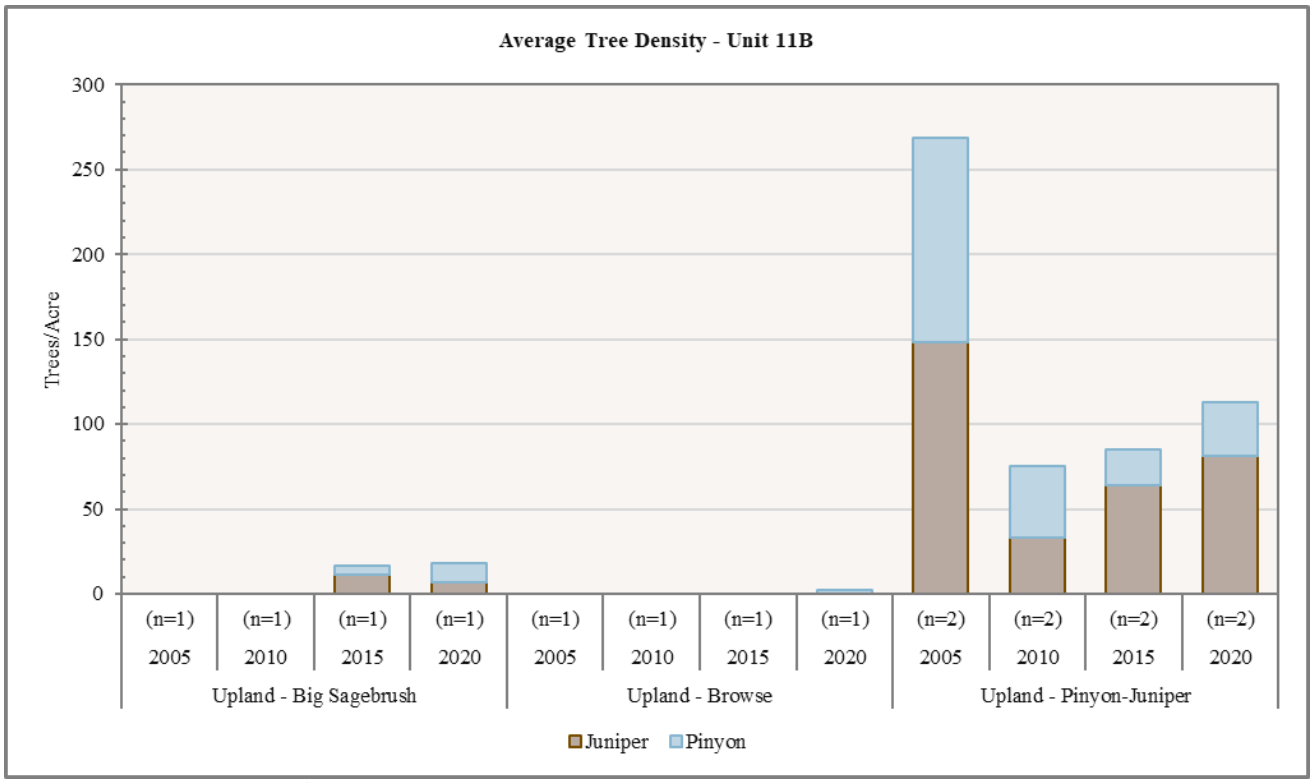


Figure 6.14: Average tree density for Upland - Big Sagebrush, Upland - Browse, and Upland - Pinyon-Juniper study sites in WMU 11B, Nine Mile, Range Creek.

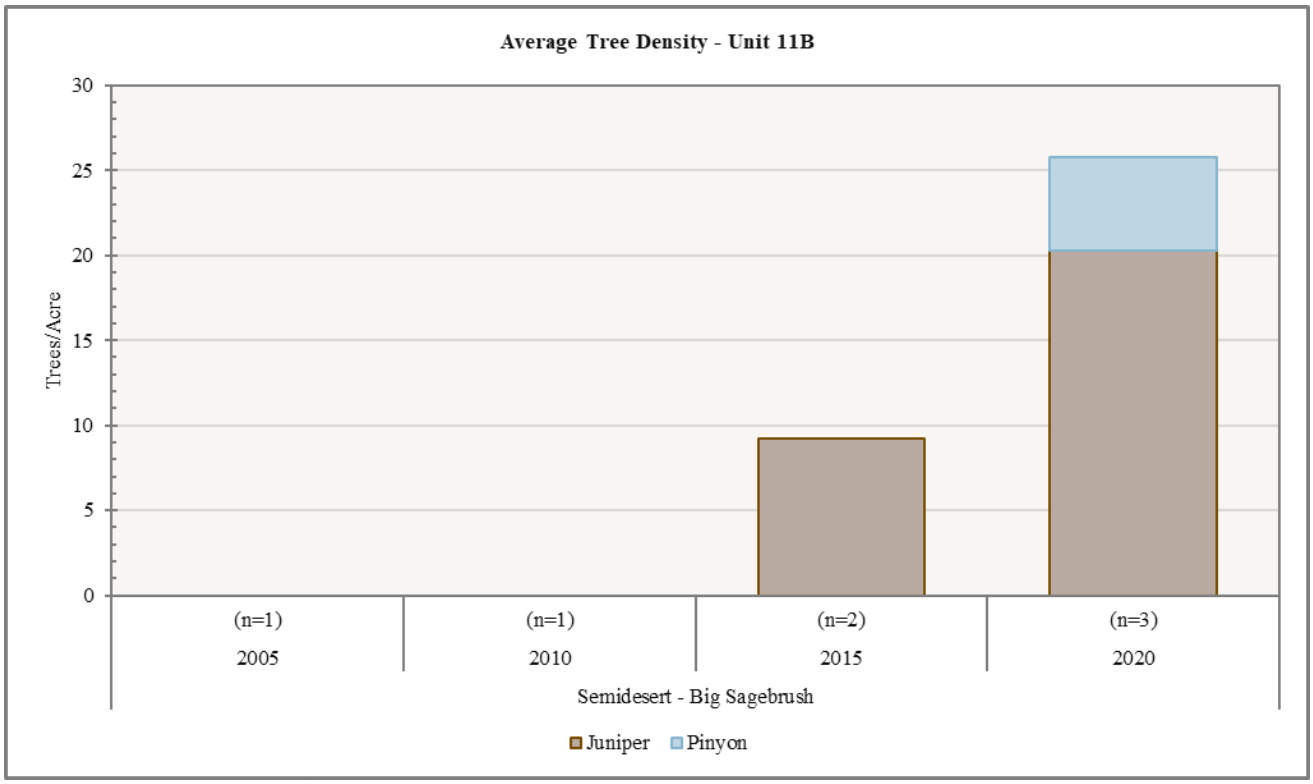


Figure 6.15: Average tree density for Semidesert - Big Sagebrush study sites in WMU 11B, Nine Mile, Range Creek.

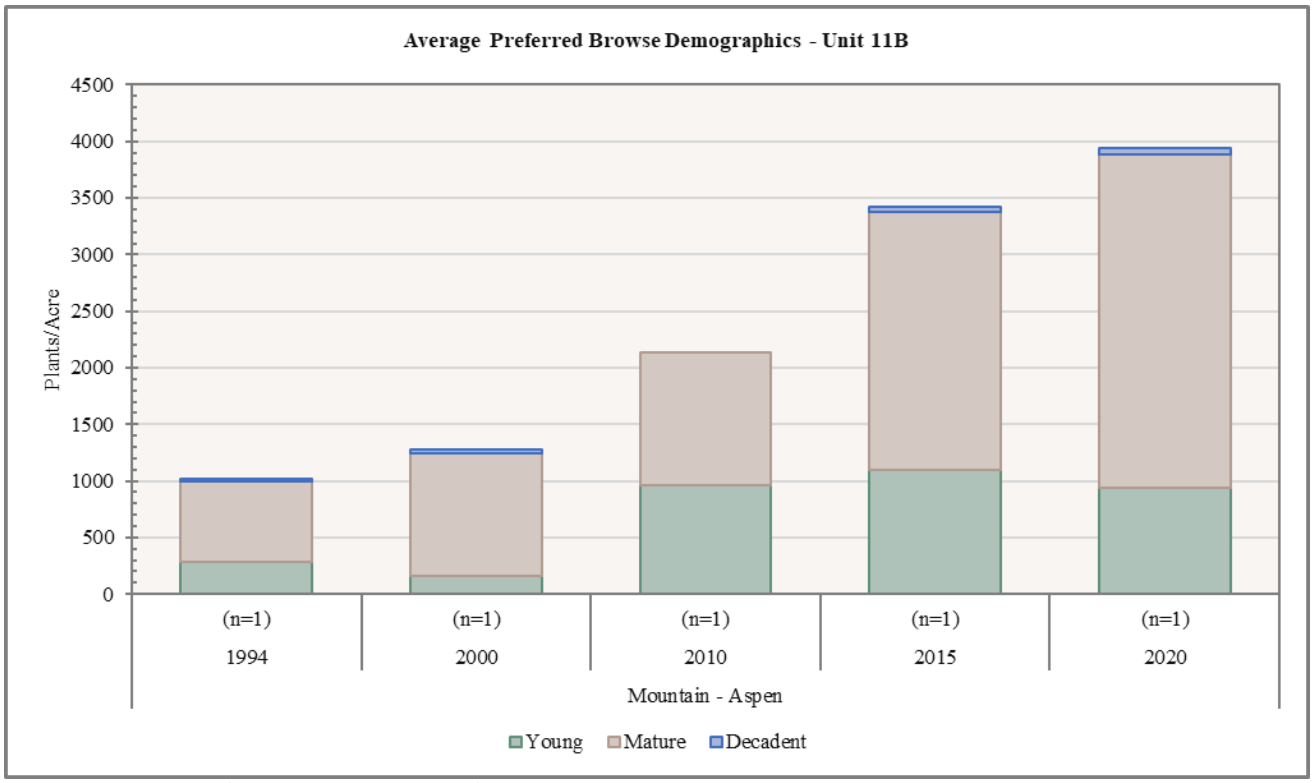


Figure 6.16: Average preferred browse demographics for Mountain - Aspen study sites in WMU 11B, Nine Mile, Range Creek.

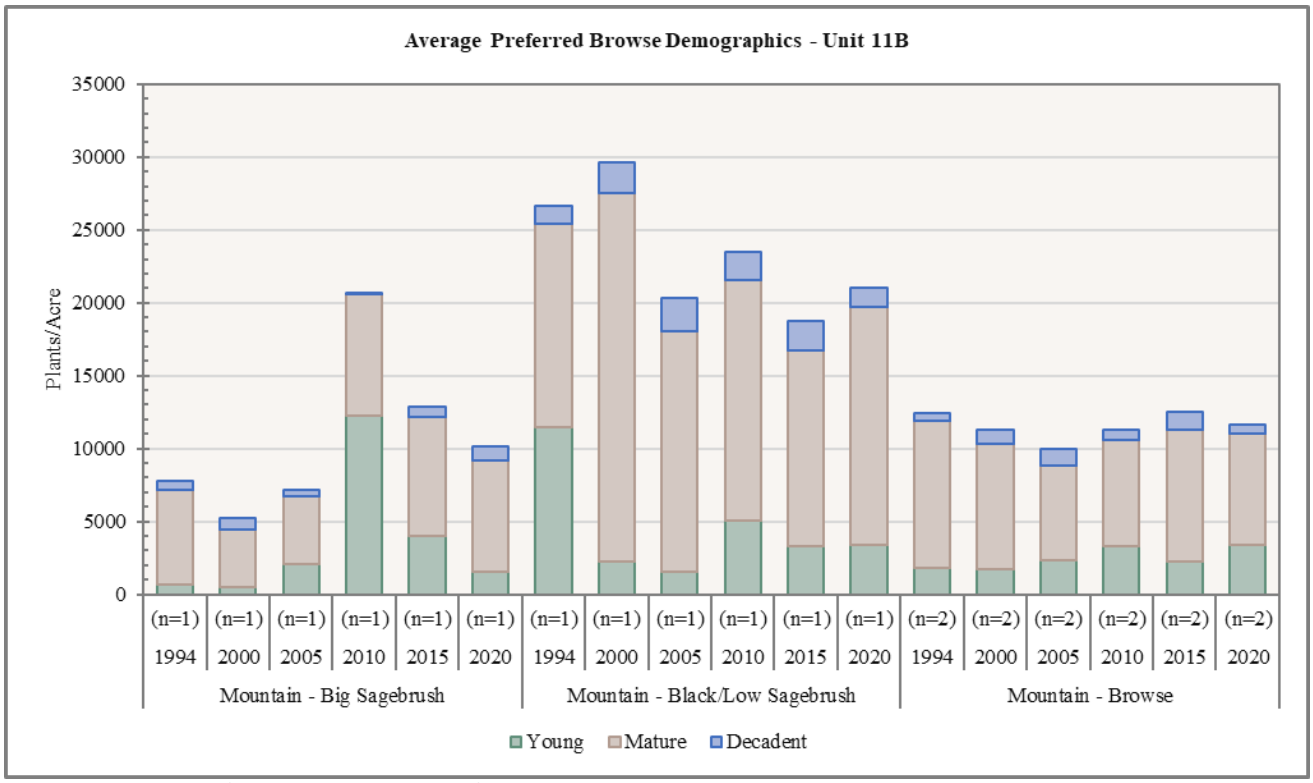


Figure 6.17: Average preferred browse demographics for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush and Mountain - Browse study sites in WMU 11B, Nine Mile, Range Creek.

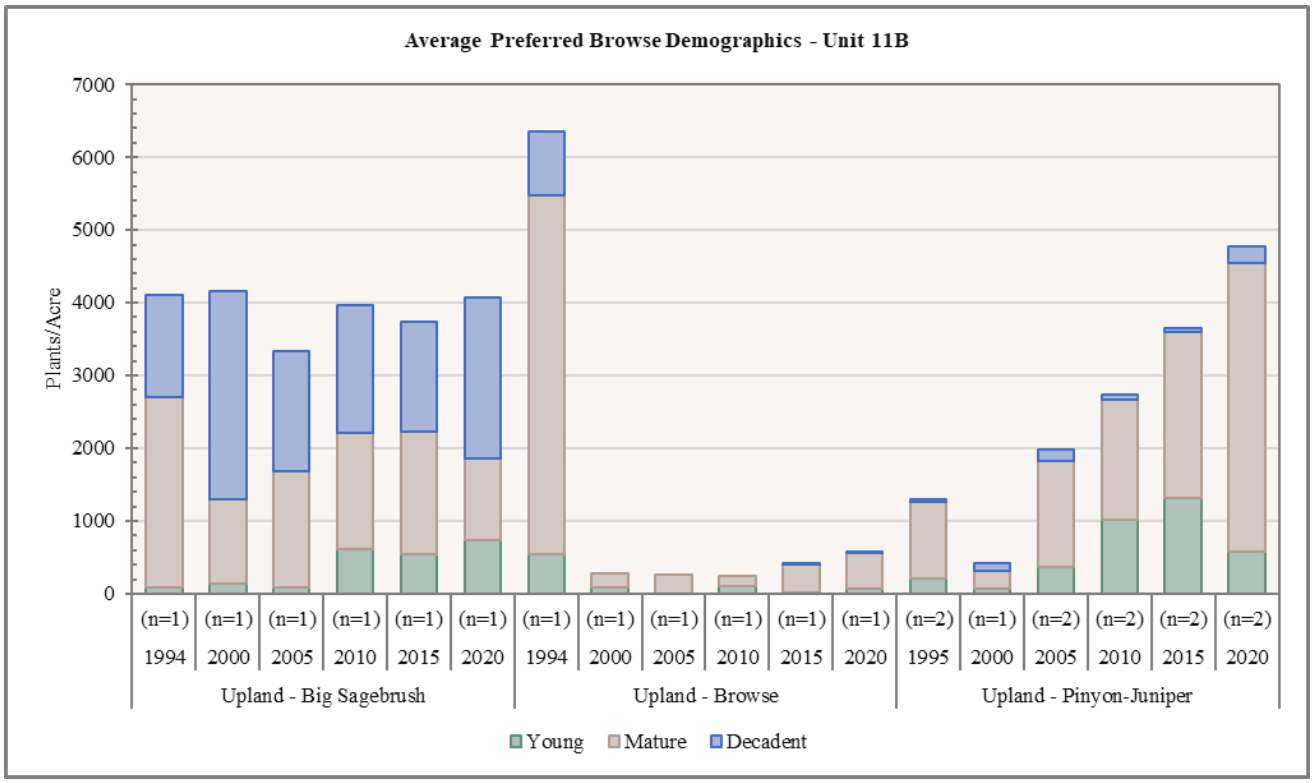


Figure 6.18: Average preferred browse demographics for Upland - Big Sagebrush, Upland - Browse, and Upland - Pinyon-Juniper study sites in WMU 11B, Nine Mile, Range Creek.

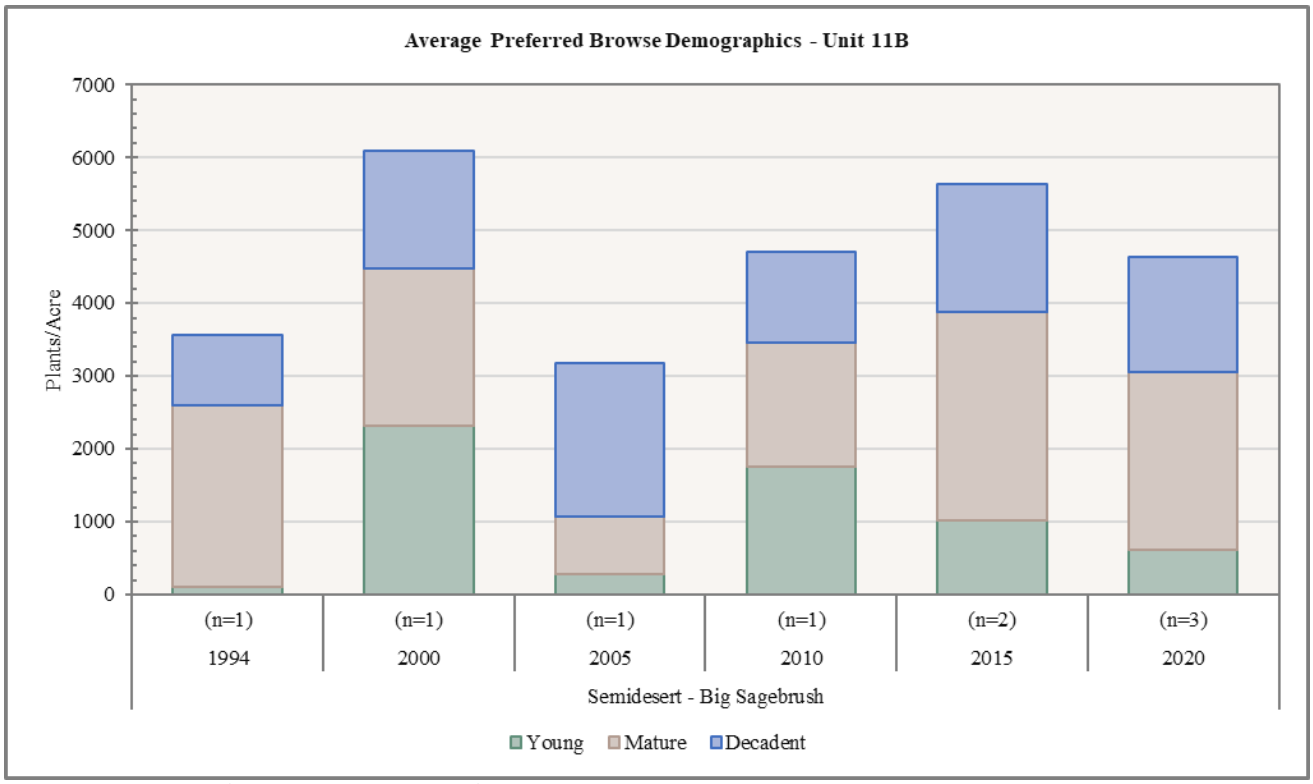


Figure 6.19: Average preferred browse demographics for Semidesert - Big Sagebrush study sites in WMU 11B, Nine Mile, Range Creek.

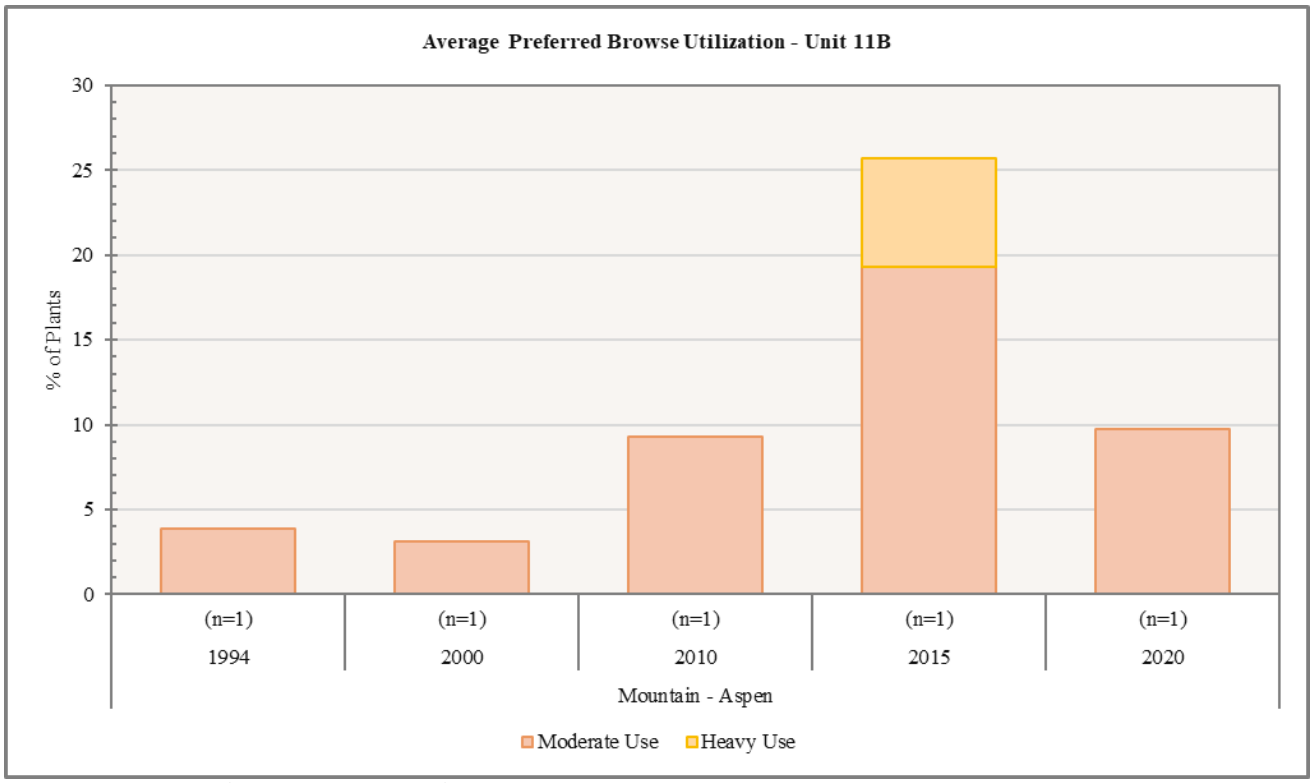


Figure 6.20: Average preferred browse utilization for Mountain - Aspen study sites in WMU 11B, Nine Mile, Range Creek.

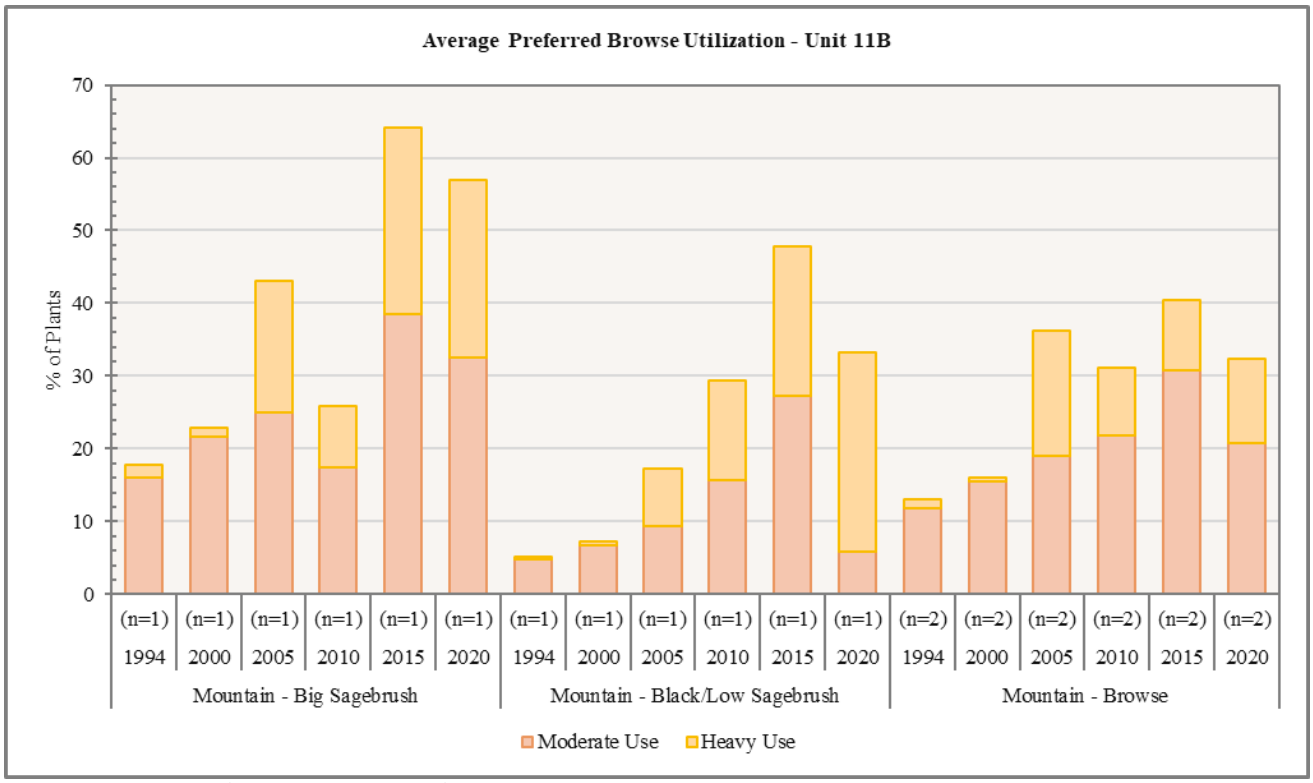


Figure 6.21: Average preferred browse utilization for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain - Browse study sites in WMU 11B, Nine Mile, Range Creek.

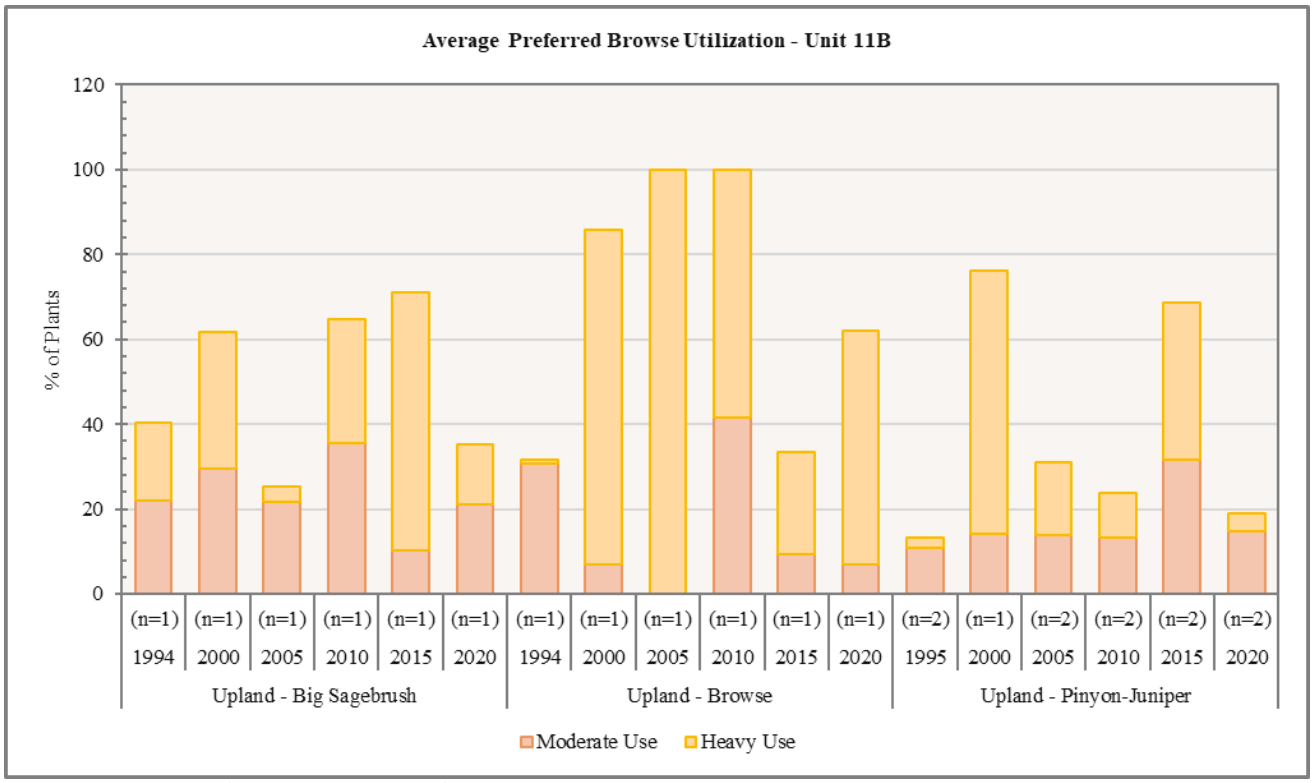


Figure 6.22: Average preferred browse utilization for Upland - Big Sagebrush, Upland - Browse, and Upland - Pinyon-Juniper study sites in WMU 11B, Nine Mile, Range Creek.

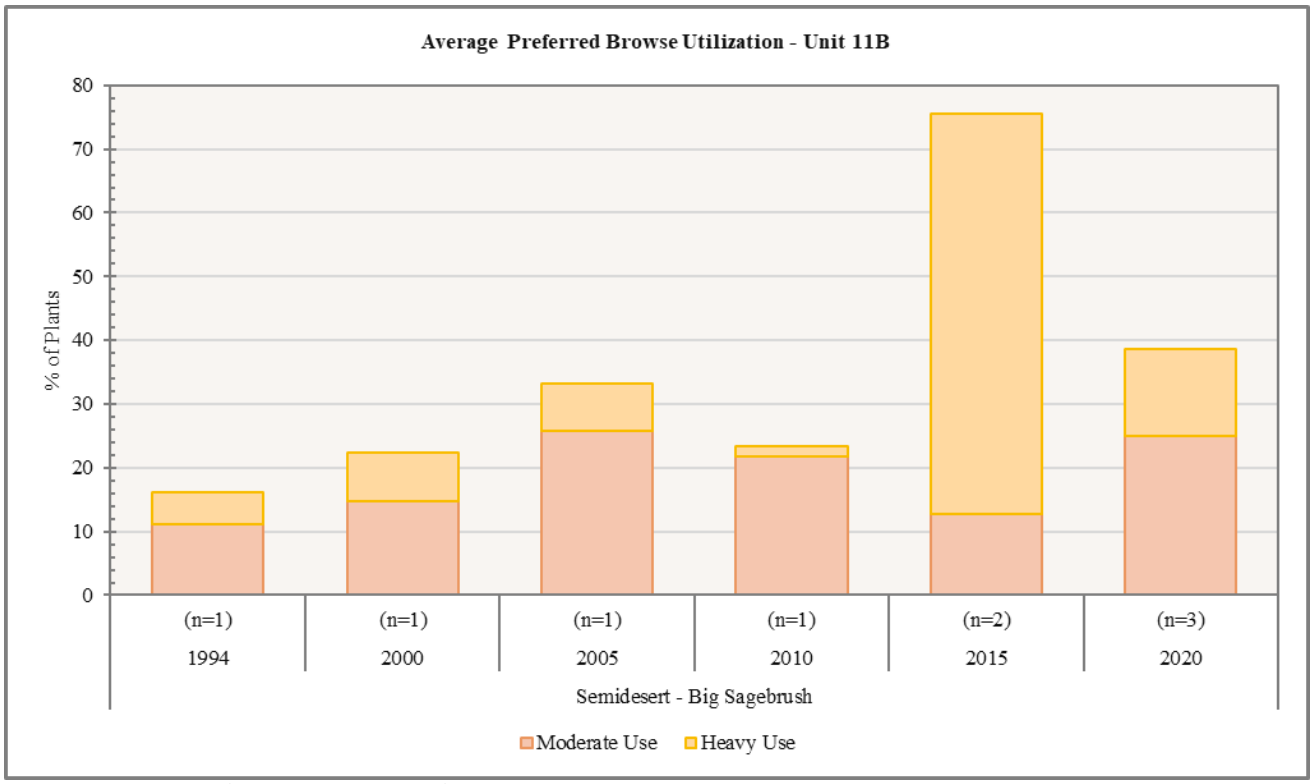


Figure 6.23: Average preferred browse utilization for Semidesert - Big Sagebrush study sites in WMU 11B, Nine Mile, Range Creek.

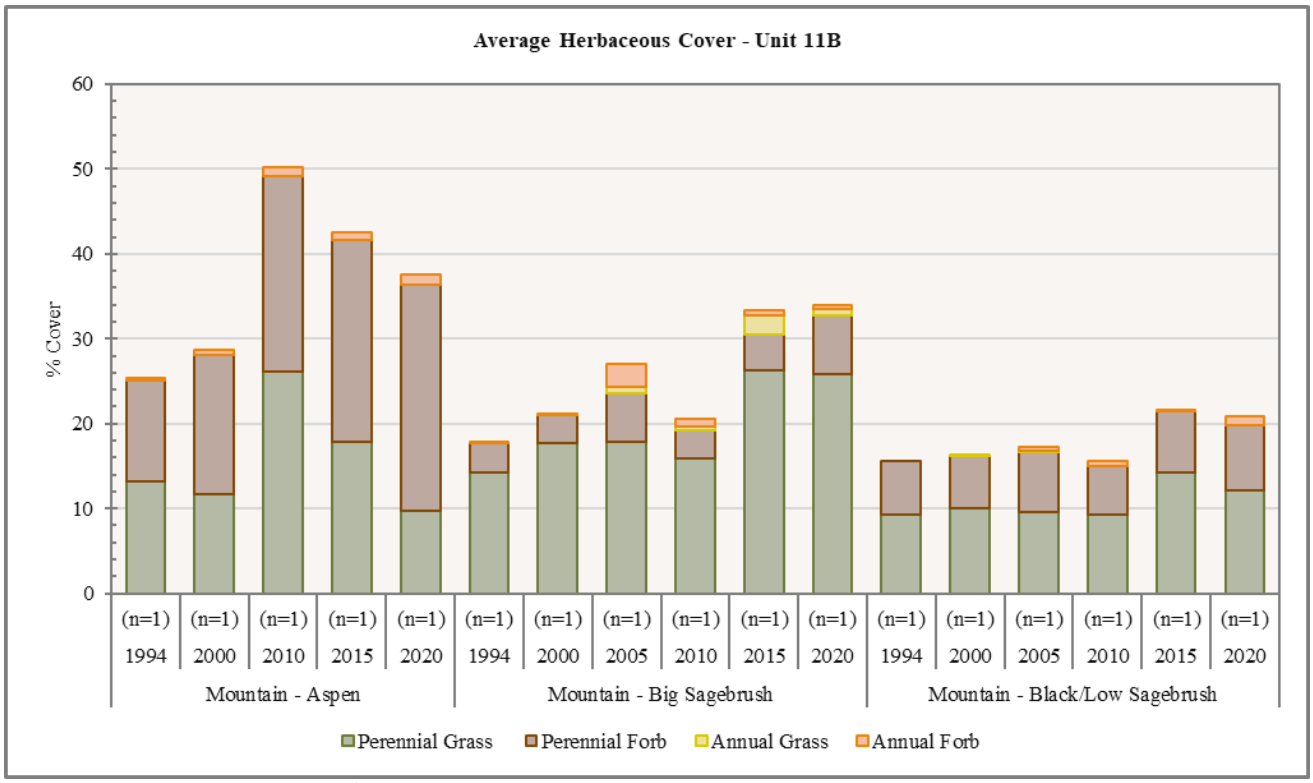


Figure 6.24: Average herbaceous cover for Mountain - Aspen, Mountain - Big Sagebrush, and Mountain - Black/Low Sagebrush study sites in WMU 11B, Nine Mile, Range Creek.

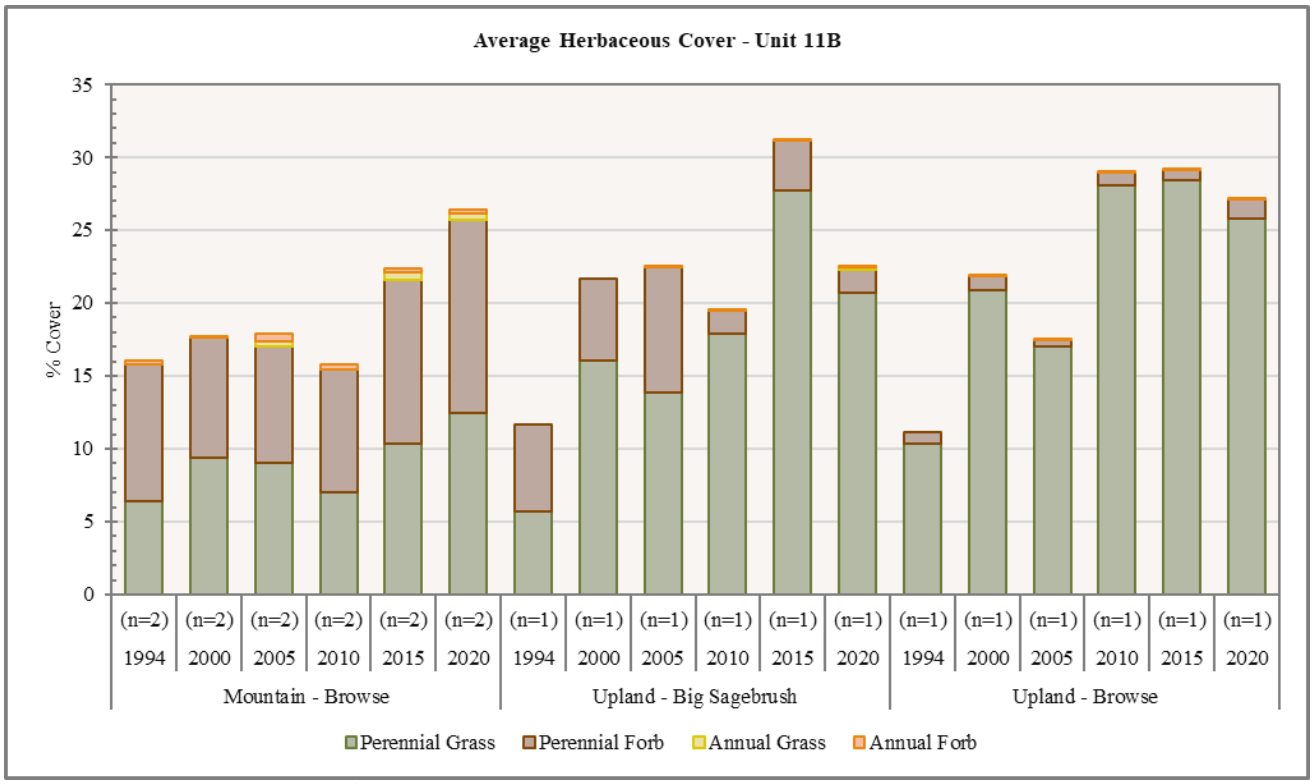


Figure 6.25: Average herbaceous cover for Mountain - Browse, Upland - Big Sagebrush, and Upland - Browse study sites in WMU 11B, Nine Mile, Range Creek.

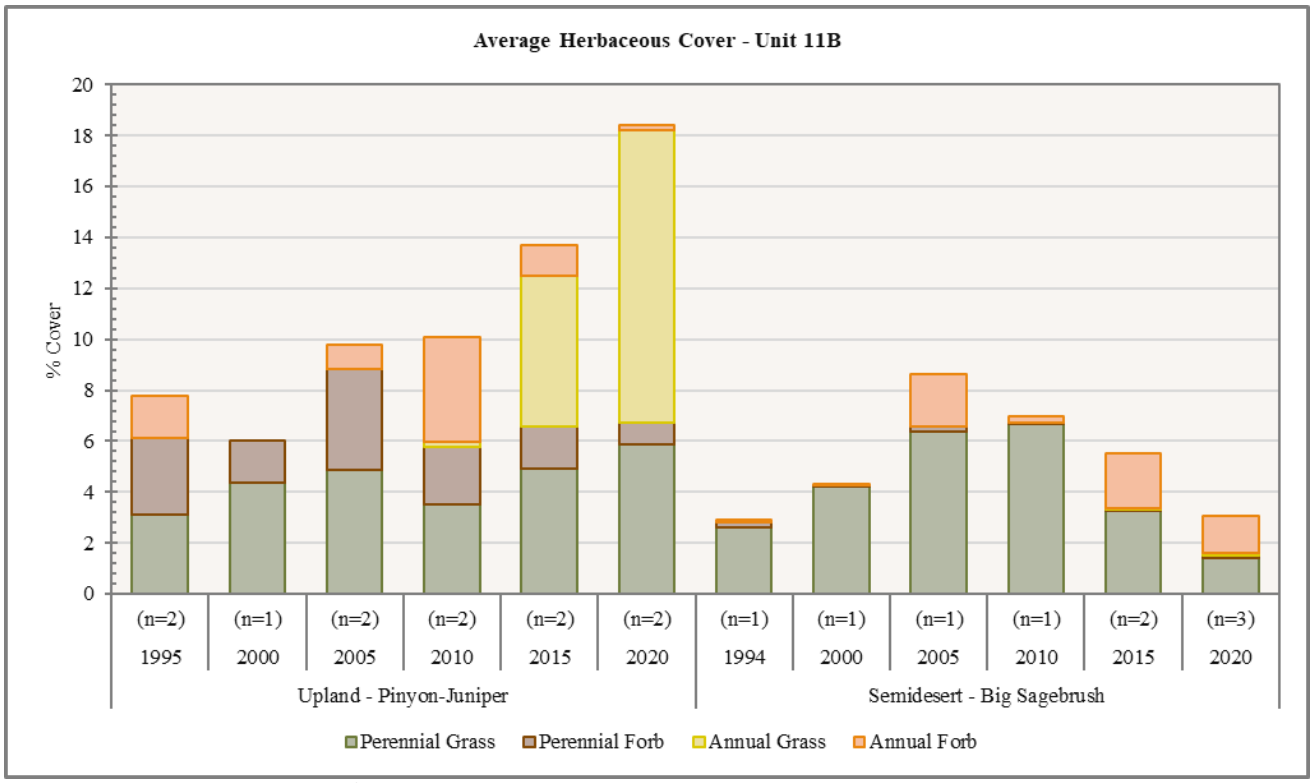


Figure 6.26: Average herbaceous cover for Upland - Pinyon-Juniper and Semidesert - Big Sagebrush study sites in WMU 11B, Nine Mile, Range Creek.

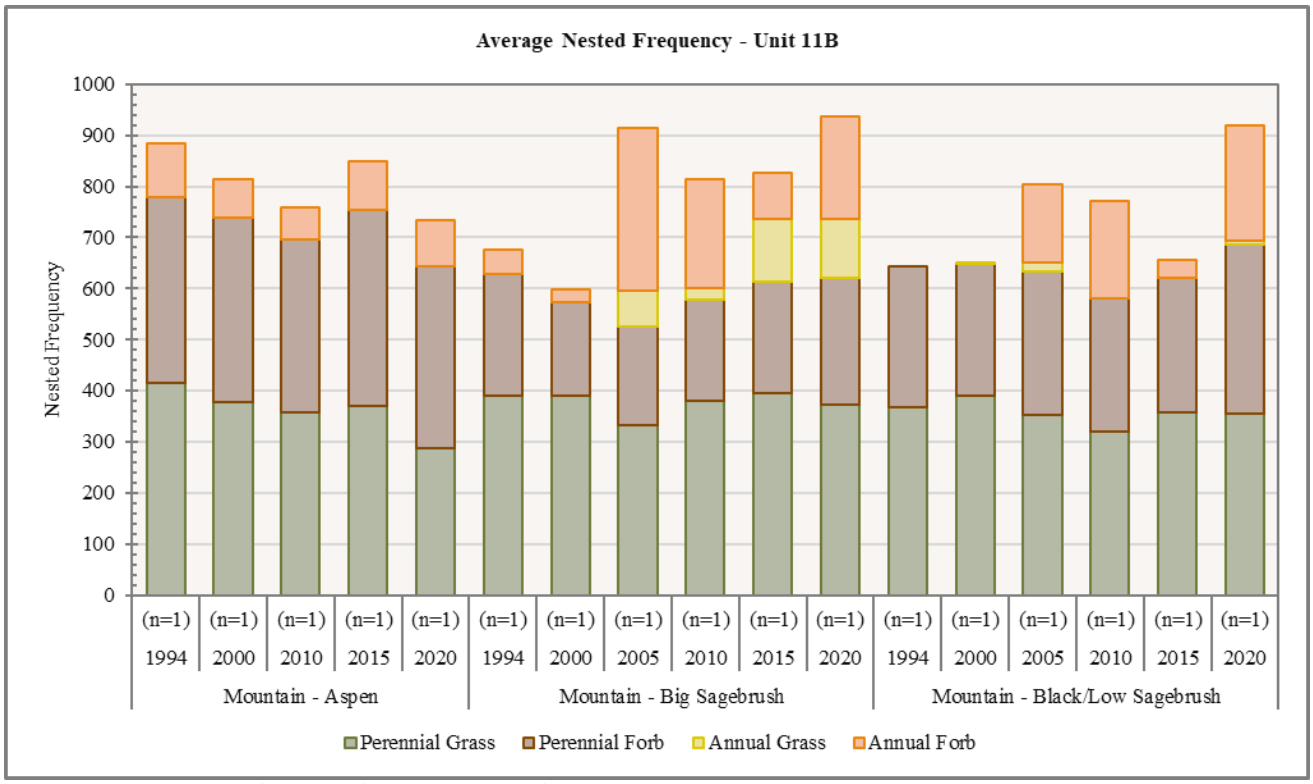


Figure 6.27: Average nested frequency of herbaceous species for Mountain - Aspen, Mountain - Big Sagebrush, and Mountain - Black/Low Sagebrush study sites in WMU 11B, Nine Mile, Range Creek.

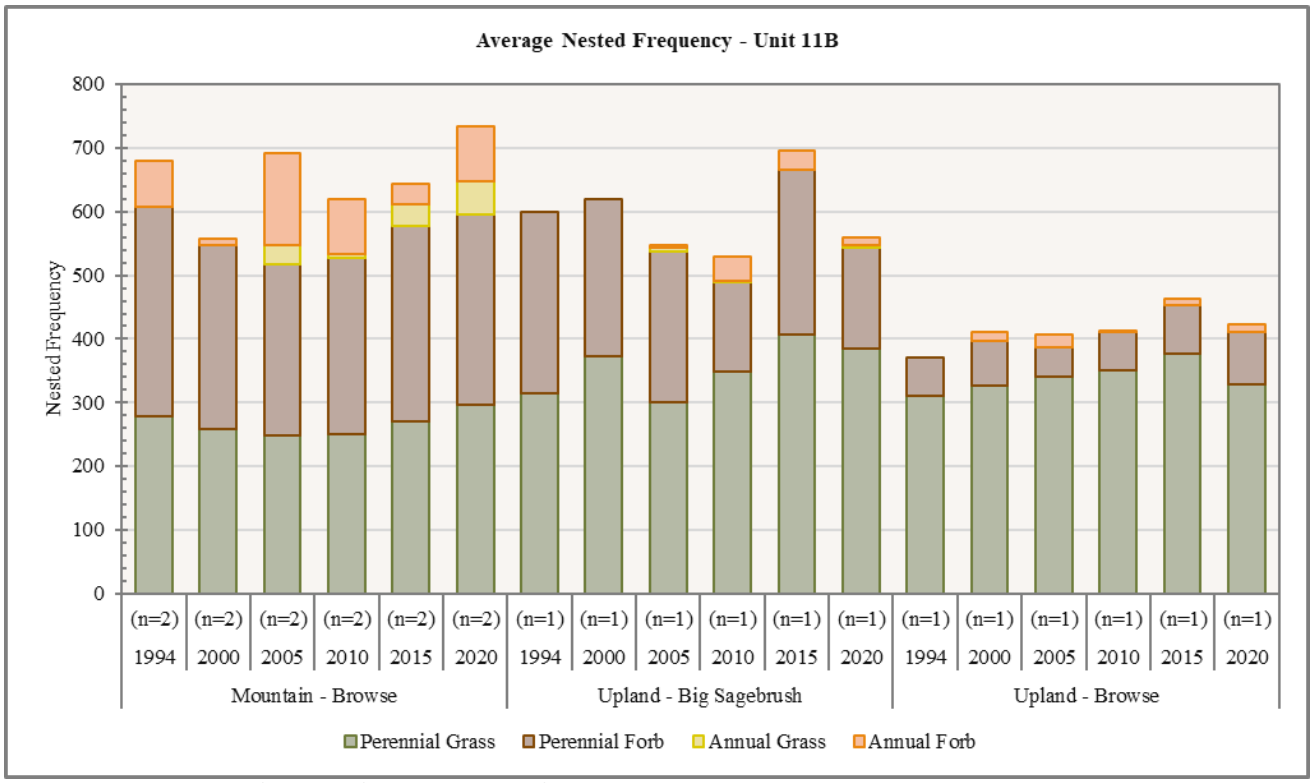


Figure 6.28: Average nested frequency of herbaceous species for Mountain - Browse, Upland - Big Sagebrush, and Upland - Browse study sites in WMU 11B, Nine Mile, Range Creek.

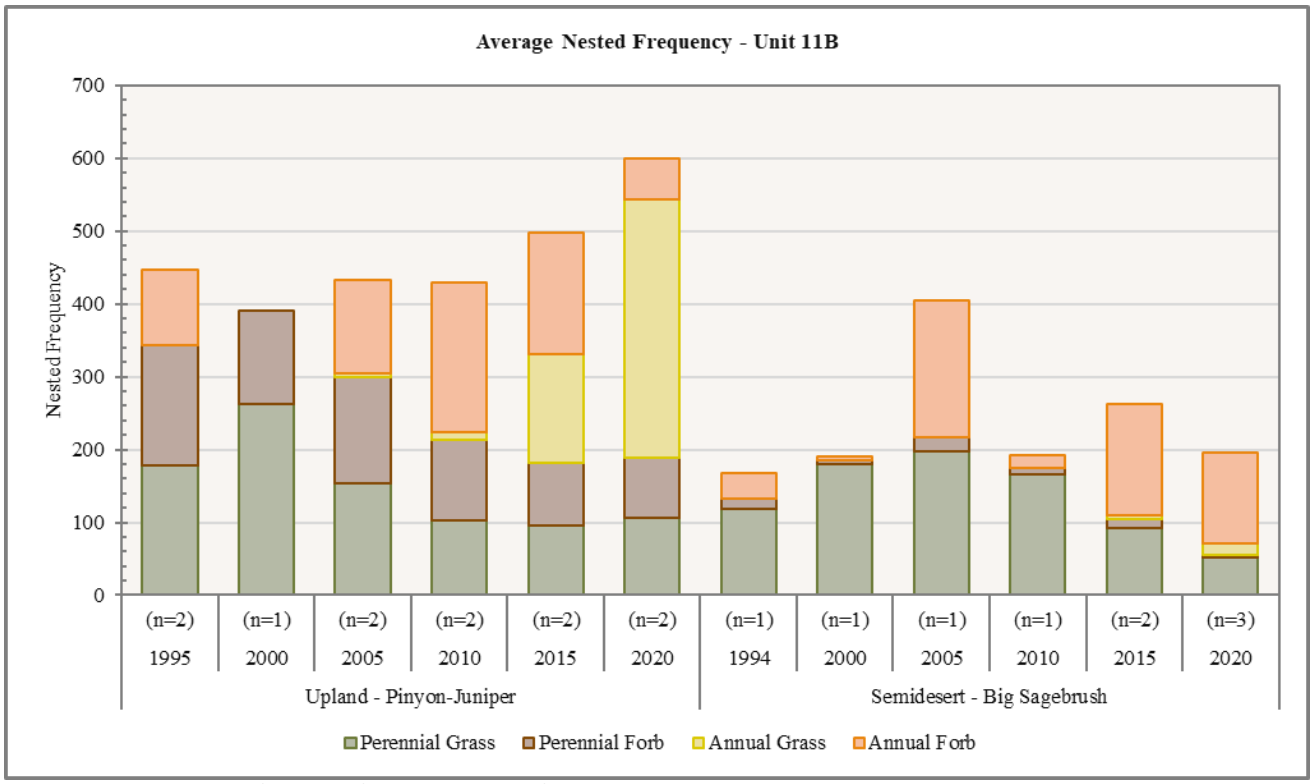


Figure 6.29: Average nested frequency of herbaceous species for Upland - Pinyon-Juniper and Semidesert - Big Sagebrush study sites in WMU 11B, Nine Mile, Range Creek.

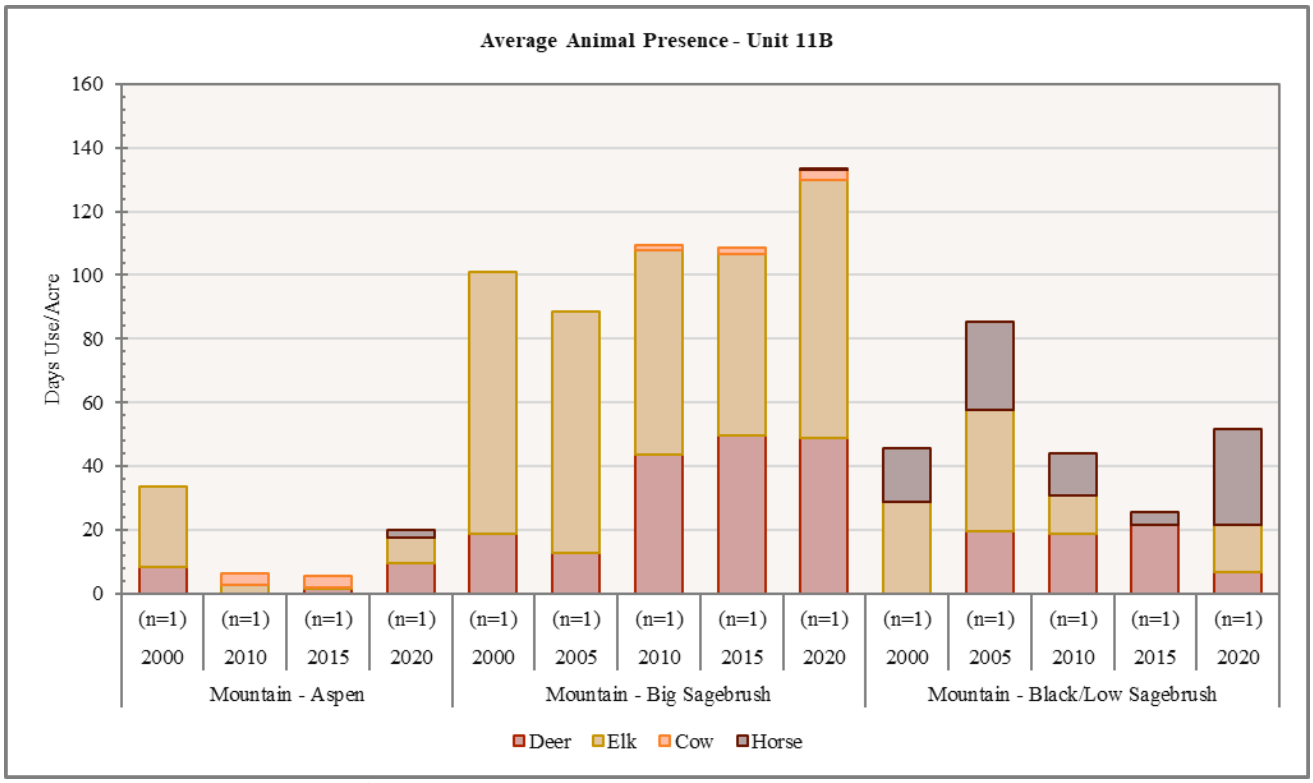


Figure 6.30: Average pellet transect data for Mountain - Aspen, Mountain - Big Sagebrush, and Mountain - Black/Low Sagebrush study sites in WMU 11B, Nine Mile, Range Creek.

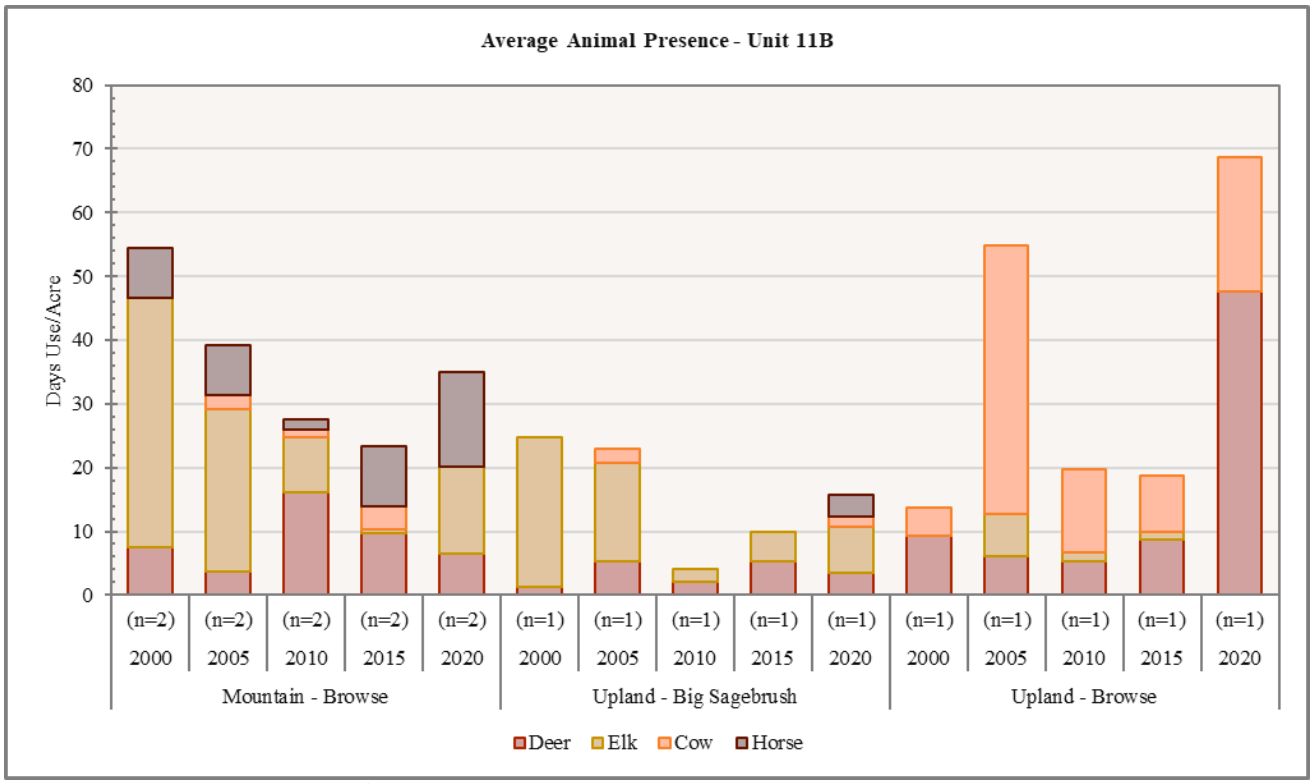


Figure 6.31: Average pellet transect data for Mountain - Browse, Upland - Big Sagebrush, and Upland - Browse study sites in WMU 11B, Nine Mile, Range Creek.

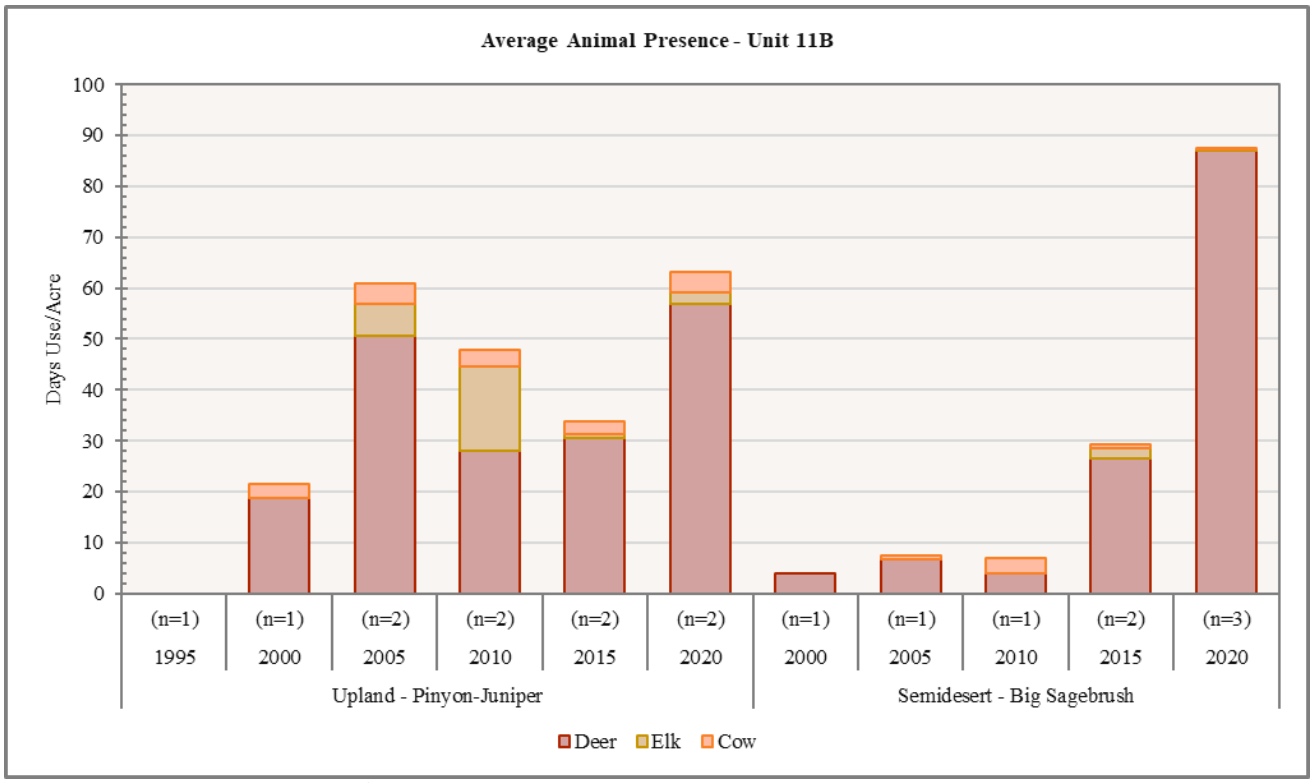
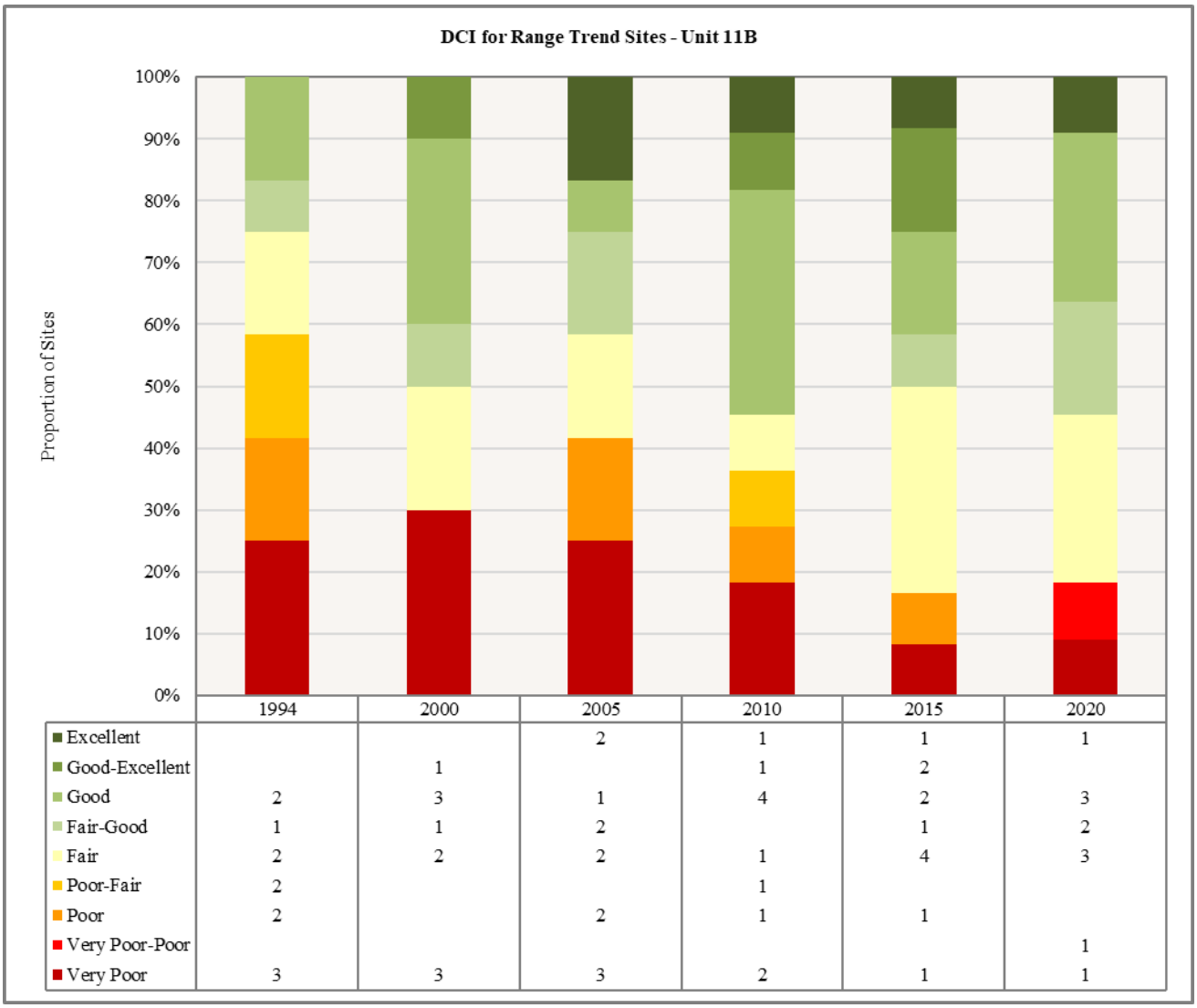


Figure 6.32: Average pellet transect data for Upland - Pinyon-Juniper and Semidesert - Big Sagebrush study sites in WMU 11B, Nine Mile, Range Creek.

Deer Winter Range Condition Assessment

The condition of deer winter range within the Nine Mile, Range Creek management unit has remained stable overall. Averaged unit conditions have improved slightly increasing from poor-fair in 1994 to fair in 2020. Range Trend sites sampled within the unit that are considered consistently to be in very poor condition include Deadman (11B-1) and 'B' Canyon (11B-5). Factors contributing to very poor winter conditions include the lack of browse cover and an undiversified age class structure among sagebrush. Coal Creek (11B-4), Cottonwood (11B-7), Cedar Corral (11B-8), Dugout Creek PJ Chained (11B-19), Deadman Creek (11B-20), and Soldier Creek (11B-22) are all sites with averaged conditions ranked as fair, and are the drivers for unit-wide conditions. Cedar Ridge (11B-9), Twin Hollow (11B-15), and Steer Ridge (11B-16) consistently have good wintering conditions. Airport Bench has had the highest degree of positive conditional change due to the removal of twoneedle pinyon and Utah juniper trees, which has allowed for increases in preferred browse and perennial grass covers (**Figure 6.33**, **Table 6.11**).



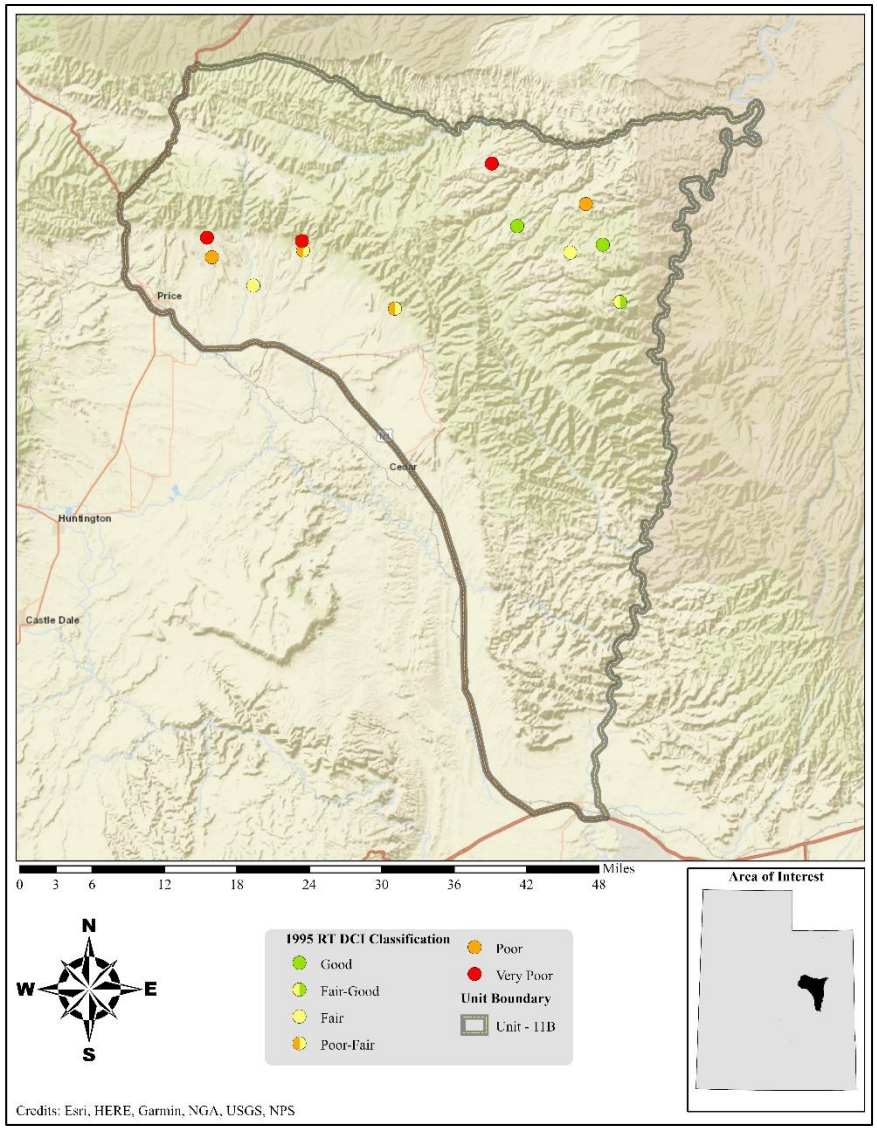
	1994	2000	2005	2010	2015	2020
Excellent			2	1	1	1
Good-Excellent		1		1	2	
Good	2	3	1	4	2	3
Fair-Good	1	1	2		1	2
Fair	2	2	2	1	4	3
Poor-Fair	2			1		
Poor	2		2	1	1	
Very Poor-Poor						1
Very Poor	3	3	3	2	1	1

Figure 6.33: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 11B, Nine Mile, Range Creek.

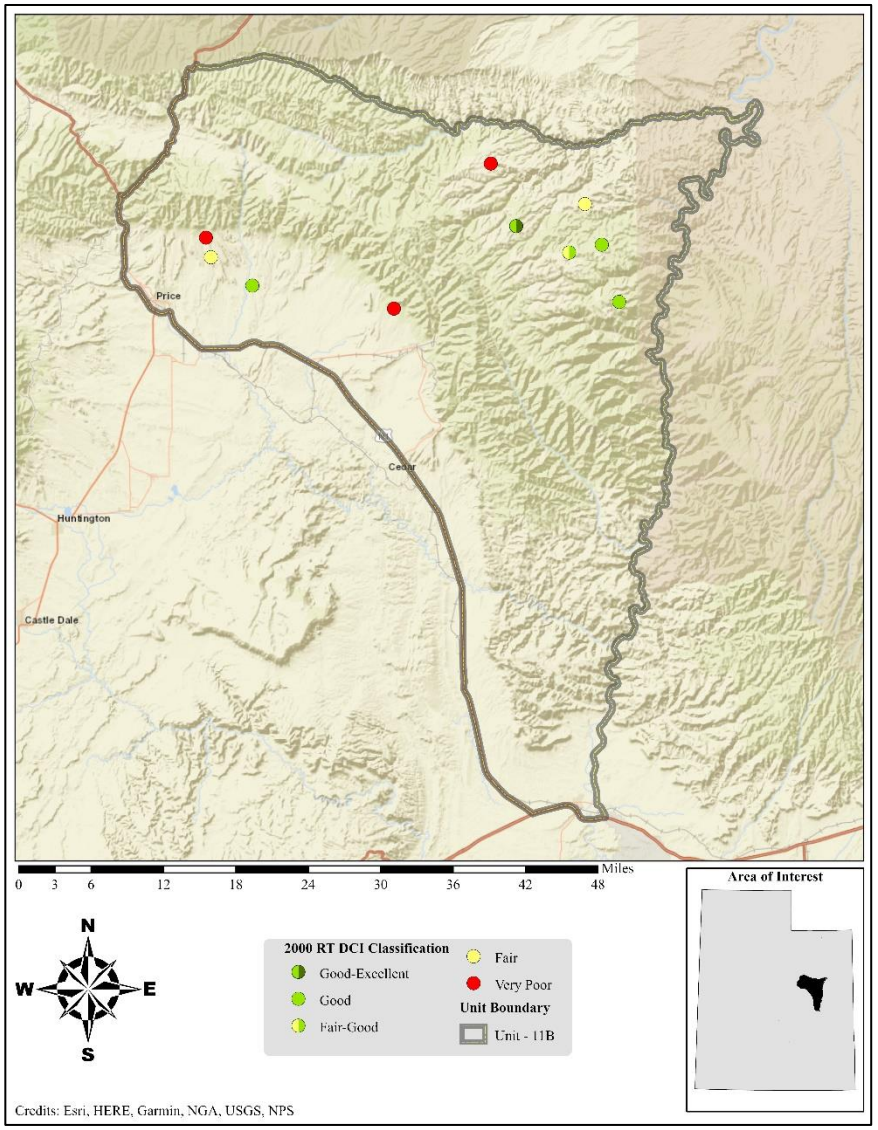
Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
11B-01	1994	2.8	0	0	10.5	0	2.7	0	**16**	**VP**
11B-01	2000	3.8	0	0	8.7	0	3.3	0	**15.8**	**VP**
11B-01	2005	2.2	0	0	0.3	0	4.8	0	**7.3**	**VP**
11B-01	2010	1.2	0	0	1.8	0	4	0	**6.9**	**VP**
11B-01	2015	9.7	14.3	15	1.8	-1.1	3.1	0	**42.8**	**P**
11B-01	2020	20.2	13.7	1.3	1.5	-12.1	0.9	0	**25.4**	**VP**
11B-02*	1994	0.3	0	0	14.3	0	2.2	0	**16.8**	**P**
11B-02*	2000	0.2	0	0	30	0	0.5	0	**30.7**	**F**
11B-02*	2005	3	0	0	6	0	5.6	0	**14.6**	**P**
11B-02*	2010	1.3	0	0	24.1	0	0.9	0	**26.1**	**P-F**
11B-02*	2015	2.3	0	0	30	0	0.2	0	**32.5**	**F**
11B-04	1994	19.2	7.6	1.4	5.2	0	0.4	0	**33.8**	**F**
11B-04	2000	20.9	8	15	8.5	0	0.1	0	**52.5**	**G**
11B-04	2005	18.2	-5.7	3.8	12.8	0	0.4	0	**29.4**	**F**
11B-04	2010	18.1	7.1	15	13.3	0	0.1	0	**53.6**	**G**
11B-04	2015	16.4	7.7	15	13	0	0.3	0	**52.4**	**G**
11B-04	2020	22.3	6.2	12.9	4.8	0	0	0	**46.1**	**F-G**
11B-05	1994	14	11.4	3.8	20.7	0	1.5	0	**51.5**	**P-F**
11B-05	2000	0.5	0	0	30	0	1.9	0	**32.4**	**VP**
11B-05	2005	0.9	0	0	30	0	0.8	0	**31.7**	**VP**
11B-05	2010	1.1	0	0	30	0	1.7	0	**32.8**	**VP**
11B-05	2015	0.7	0	0	30	0	1.4	0	**32.1**	**VP**
11B-05	2020	2.9	0	0	30	0	2.8	0	**35.7**	**VP-P**
11B-07	1994	17.7	4.6	0.7	11.3	0	10	0	**44.4**	**P**
11B-07	2000	19.7	-5.7	1.7	30	0	10	0	**55.7**	**F**
11B-07	2005	17.9	0	1.2	27.6	0	10	0	**56.7**	**F**
11B-07	2010	18.8	1.4	7.8	30	0	3.2	0	**61.1**	**F**
11B-07	2015	17.1	2.5	7.2	30	0	6.9	0	**63.6**	**F-G**
11B-07	2020	16.5	-1.3	9	30	-0.1	3.3	0	**57.4**	**F**
11B-08	1994	22.3	13.3	7.6	7.1	0	10	0	**60.3**	**F**
11B-08	2000	30	11.1	8.9	11.5	0	10	0	**71.4**	**F-G**
11B-08	2005	30	9.8	15	6.3	-0.5	10	0	**70.6**	**F-G**
11B-08	2010	30	12.4	15	6	0	10	0	**73.4**	**G**
11B-08	2015	30	12.2	8.7	6.2	-0.8	10	0	**66.3**	**F**
11B-08	2020	30	12.7	10	14.9	-0.7	10	0	**76.9**	**G**
11B-09	1994	16	13.6	15	18.4	0	10	0	**73**	**G**
11B-09	2000	26.8	12.6	3.9	20	0	10	0	**73.4**	**G**
11B-09	2005	30	11.7	3.8	19.1	-0.1	10	0	**74.5**	**G**
11B-09	2010	30	12.3	11.7	18.6	0	10	0	**82.6**	**G**
11B-09	2015	30	11.3	9.8	28.6	0	10	0	**89.7**	**G-E**
11B-09	2020	30	12.8	10	24.2	0	10	0	**87**	**G**
11B-14*	1994	1	0	0	10	0	8	0	**19.1**	**VP**
11B-14*	2000	2.2	0	0	9.9	0	8.1	0	**20.2**	**VP**
11B-14*	2005	5	0	0	13.1	0	7.5	0	**25.5**	**VP**
11B-14*	2010	8	12	5	10.6	0	7.9	0	**43.4**	**P**
11B-14*	2015	9.4	10.2	11.9	16	0	10	0	**57.5**	**F**
11B-15	1994	29.7	13.7	10	18.6	0	10	0	**82**	**G**
11B-15	2000	30	13.5	11.3	25.9	0	10	0	**90.7**	**G-E**
11B-15	2005	30	13.5	14.4	29.7	0	10	0	**97.5**	**E**
11B-15	2010	30	13.9	15	21.9	0	10	0	**90.8**	**G-E**
11B-15	2015	30	12.2	10.2	30	0	10	0	**92.3**	**E**
11B-15	2020	30	13.7	15	30	0	10	0	**98.7**	**E**
11B-16	1994	16.3	12.1	5.9	28.5	0	7	0	**69.7**	**F-G**
11B-16	2000	20.6	10.8	5.2	30	0	6.6	0	**73.1**	**G**
11B-16	2005	30	13.5	9.6	30	-0.5	10	0	**92.7**	**E**
11B-16	2010	30	14.7	15	30	-0.3	6.7	0	**96.2**	**E**
11B-16	2015	30	12.1	11.9	30	-1.7	8.3	0	**90.6**	**G-E**
11B-16	2020	30	12.1	6.2	30	-0.5	10	0	**87.8**	**G**
11B-17*	1997	12.3	5.7	14.2	13.4	-1.1	3.7	0	**48.4**	**P-F**
11B-17*	2005	13.3	3	8.2	20.5	-0.4	3.2	0	**47.7**	**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
11B-19	1997	3.7	0	0	1.9	0	9.3	0	**14.9**	**VP**
11B-19	2005	14.5	14	8.8	19.2	0	10	0	**66.5**	**F-G**
11B-19	2010	20.5	14.6	14.9	12.4	-0.3	5	0	**67**	**G**
11B-19	2015	23.9	14.7	15	18	-7.8	3.6	0	**67.3**	**G**
11B-19	2020	26.6	12.9	7.5	22	-5.1	2.6	0	**66.4**	**F-G**
11B-20	2015	26.3	3.6	1.7	0	0	0.1	0	**31.6**	**F**
11B-20	2020	28.4	2.1	1.5	0	0	0	0	**31.9**	**F**
11B-22	2020	24.8	5.6	6.1	3.7	-0.2	0.5	0	**40.5**	**F**

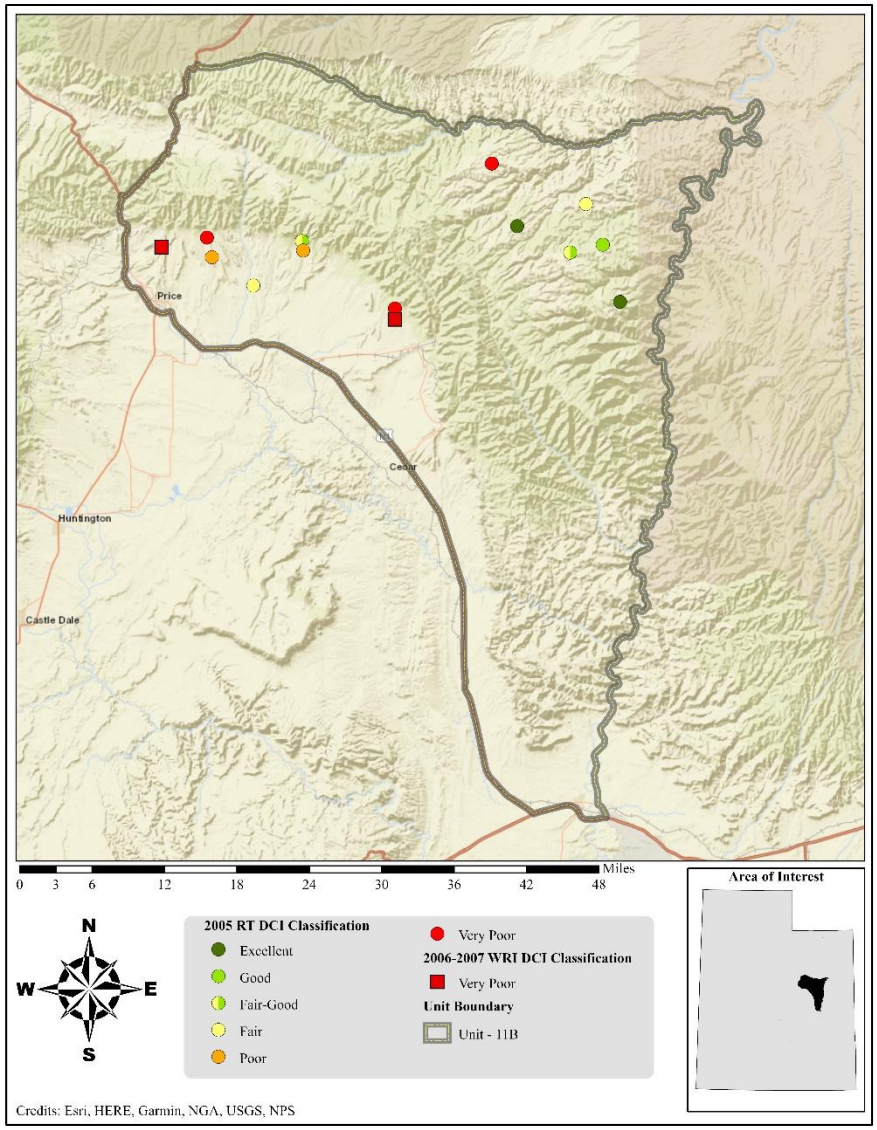
Table 6.11: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 11A, Nine Mile, Range Creek. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. *Studies with an asterisk have been suspended.



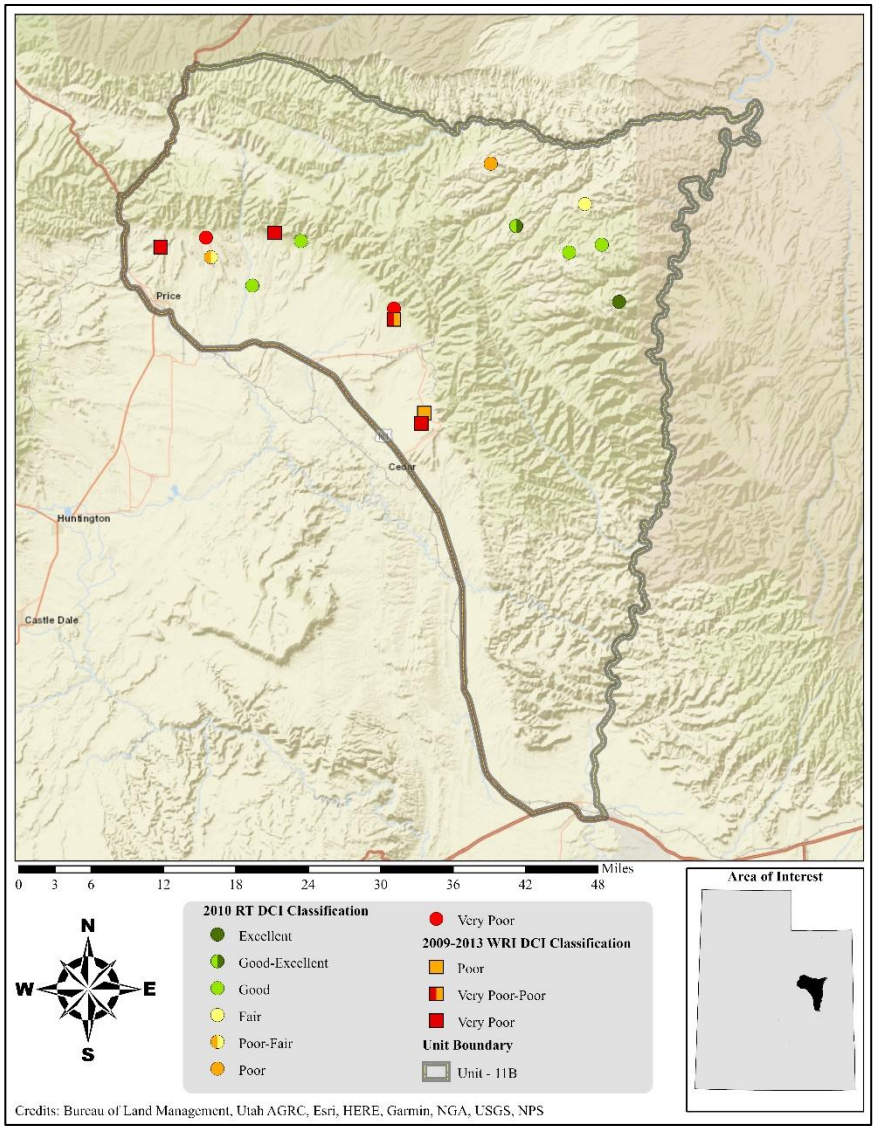
Map 6.10: 1995 Desirable Components Index (DCI) ranking distribution by study site for WMU 11B, Nine Mile, Range Creek.



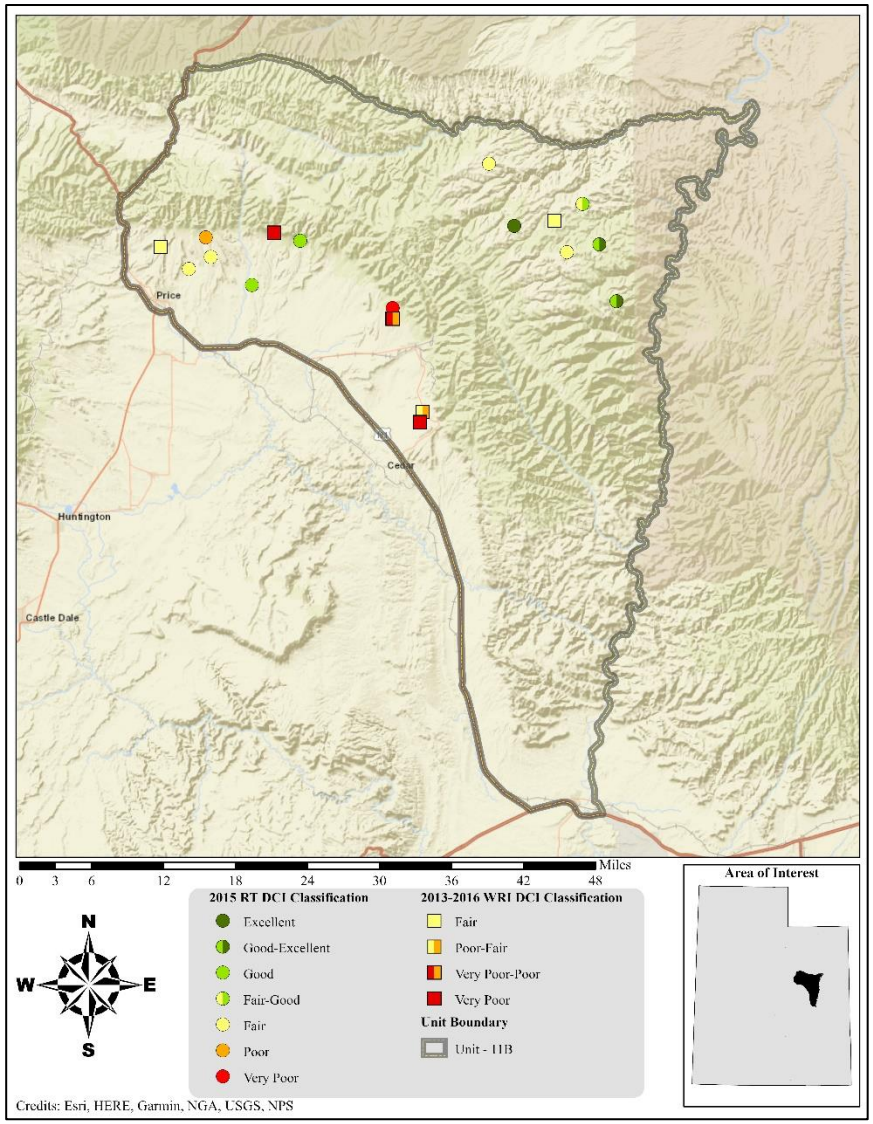
Map 6.11: 2000 Desirable Components Index (DCI) ranking distribution by study site for WMU 11B, Nine Mile, Range Creek.



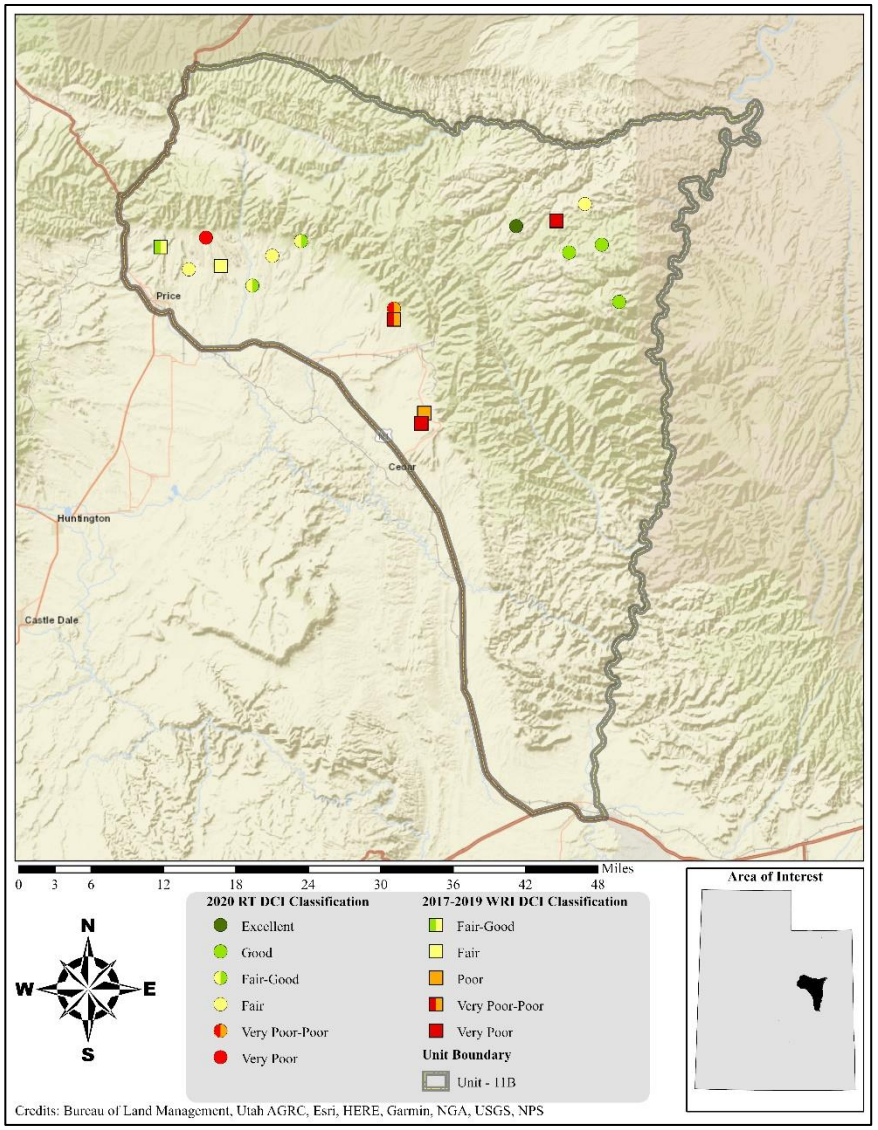
Map 6.12: 2005 Desirable Components Index (DCI) ranking distribution by study site for WMU 11B, Nine Mile, Range Creek.



Map 6.13: 2010 Desirable Components Index (DCI) ranking distribution by study site for WMU 11B, Nine Mile Range Creek.



Map 6.14: 2015 Desirable Components Index (DCI) ranking distribution by study site for WMU 11B, Nine Mile, Range Creek.



Map 6.15: 2020 Desirable Components Index (DCI) ranking distribution by study site for WMU 11B, Nine Mile, Range Creek.

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
11B-1	Deadman	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
11B-4	Coal Creek	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
11B-5	'B' Canyon	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
11B-6	Upper Cottonwood Ridge	Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
11B-7	Cottonwood	Energy Development	High	Fragmentation and degradation/loss of habitat
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
11B-8	Cedar Corral	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
11B-9	Cedar Ridge	Animal Use – Horse	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
11B-15	Twin Hollow	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
11B-16	Steer Ridge	Animal Use – Elk	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
11B-19	Dugout Creek PJ Chained	Introduced Perennial Grass	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
11B-20	Deadman Creek	Energy Development	High	Fragmentation and degradation/loss of habitat
		Animal Use – Deer	Medium	Reduced/less vigorous browse component
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
11B-22	Soldier Creek	Animal Use – Deer	High	Reduced/less vigorous browse component
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
11R-9	East Carbon Bullhog	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
11R-10	West Coal Creek Bullhog	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Energy Development	High	Fragmentation and degradation/loss of habitat
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
11R-12	Burnt Cabin Spring	Animal Use – Elk	Medium	Reduced understory shrub and herbaceous vigor
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
11R-13	Horse Canyon	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
11R-14	Horse Canyon 2	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
11R-16	Cold Springs WMA	None Identified		
11R-17	Dugout	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
11R-18	Cottonwood Ridge	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
11R-19	Knap Bench	Energy Development	High	Fragmentation and degradation/loss of habitat
		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
11R-20	Flat Iron Mesa	None Identified		

Table 6.12: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 11B, Nine Mile, Range Creek. 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)

This high-elevation ecological site supports an aspen community and is generally considered to be in fair condition for deer and elk summer range habitat on the Nine Mile, Range Creek management unit. This community supports a diverse and abundant herbaceous understory that provides valuable forage during the summer months. However, the herbaceous understory is dominated by introduced perennial grass species which can often be aggressive at higher elevations: this may lead to reduced prevalence and abundance of other more desirable native grass and forb species. Conifer encroachment is another concern on this site: these trees may compete with aspen and understory species for resources.

It is recommended that monitoring of this community continue. 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.

Mountain (Big Sagebrush)

The high-elevation ecological site Steer Ridge supports a robust sagebrush community and is considered to be in good condition for deer wintering range within this management unit. The sagebrush communities in areas of this ecological type generally provide valuable browse in mild and moderate winters. Pellet transect data suggests that elk use above what sites of this ecological type can support may be occurring. Sustained high usage by elk can result in reduced shrub and herbaceous vigor. The introduced annual grass species cheatgrass has been observed in the understory of this study in low amounts. The threat posed is currently low, but if annual grasses increase in the future, they could boost fuel loads and exacerbate the risk of wildfire.

Monitoring of this community should continue in the future. Further investigation of this study site and the surrounding area is recommended: this may help determine if high usage by elk is occurring throughout the localized area.

Mountain (Browse)

These high-elevation browse communities are considered to be in good to excellent condition for deer wintering range on the Nine Mile, Range Creek management unit. These communities support a dense shrub populations that provide browse in moderate to severe winters. Pinyon and juniper encroachment is occurring on these study sites. Although the studies are currently considered to be within Phase I of woodland succession, further encroachment can lead to reduced understory shrub and herbaceous health if not addressed. In addition, the introduced annual grass species cheatgrass has been observed on the Cedar Corral study. Although the threat posed is currently low, annual grasses have the potential to add to fine fuel loads and affect the ecological resiliency of the site should they increase in the future.

It is strongly recommended that monitoring of these studies continue in the future. Work to prevent and reduce pinyon and juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) may be advisable in the future if tree presence increases on these sites.

Mountain (Black/Low Sagebrush)

This high-elevation study site, Cedar Ridge, is considered to be in good condition for deer winter range habitat on the unit. Communities of this ecological type generally support sagebrush populations that provide valuable browse in mild to moderate winters. According to available pellet transect data, this site may be experiencing high usage by horses. Sustained use by horses above what sites of this ecological type can support may lead to reduced vigor, abundance, and diversity of herbaceous species. In addition, the introduced annual grass species cheatgrass has been observed on this site. Annual grasses can result in increased fuel loads and altered wildfire regimes in high amounts. However, cheatgrass abundance and cover on this site have remained low throughout the study period. Finally, pinyon and juniper have been observed in cover and density measurements on this study. The threat posed is currently low, but tree encroachment can lead to reduced understory shrub and herbaceous vigor should it increase in the future.

Further investigation of the Cedar Ridge site and surrounding area is recommended, as it may help with determining whether high horse use is occurring throughout the localized area. Although a lop and scatter treatment recently occurred in the area, the tree component that remains on this site indicates that infilling could occur in the future. As such, continued monitoring of this study site is also advisable.

Upland (Big Sagebrush)

This mid-elevation upland ecological site which supports a sagebrush community is considered to be in fair condition for deer winter range habitat on the Nine Mile, Range Creek management unit. Communities of this ecological type generally support shrub populations that provide valuable browse in moderate to severe winters. Energy development may pose a threat to this study, as gas/oil developments are located within one mile of the site. This development can lead to reduced vigor of shrubs and herbaceous species as well as

potential fragmentation and degradation of habitat. In addition, the introduced annual grass species cheatgrass is present on this site with low abundance. Although the threat posed is currently low, cheatgrass can boost fuel loads and exacerbate the risk of wildfire if it increases in the future. Finally, pinyon and juniper have been observed on this site in 2020 in density measurements; sustained and increasing tree encroachment can lead to reduced vigor in the shrub and herbaceous components. However, encroachment likely does not pose an immediate threat to this study site, and the site is currently considered to be within Phase I of woodland succession.

Continued monitoring of this study site is recommended. Work to reduce pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) may be advisable if encroachment continues in the future. Furthermore, treatments to reduce annual grasses could also be necessary if abundance and/or cover increase over time.

Upland (Browse)

This mid-elevation study site is considered to be in very poor to poor condition for deer winter range habitat on the unit. These communities generally support shrub populations that provide browse in mild to moderate winters. However, this study site burned in 1996, and the browse component has been slow to reestablish. Like many of the higher elevation mountain potential sites, this site has introduced perennial grasses as the dominant herbaceous component. These introduced grasses have the potential to be aggressive and may lead to reduced diversity and abundance of other native grass and forb species. Twoneedle pinyon was observed in point-quarter density measurements in 2020. Although the threat level will likely be low for quite some time, tree encroachment can reduce understory shrub and herbaceous health if it increases over time.

Monitoring of this study site should continue. If reseeding is deemed necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native grass species when possible.

Upland (Pinyon-Juniper)

These mid-elevation twoneedle pinyon/Utah juniper communities generally support mixed shrub populations that provide browse for wildlife. The Deadman study site is considered to be in very poor condition for deer winter range within this management unit, while the Dugout Creek PJ Chained study is in fair to good condition. Annual grasses, mainly cheatgrass, are an issue in these communities: cover is currently high on the Deadman site and moderate on the Dugout Creek PJ Chained study. High amounts of annual grasses can increase fuel loads and may have the potential to alter wildfire regimes. Although currently a low-level threat, pinyon and juniper encroachment is occurring on these sites. Increases in tree abundance and cover could possibly lead to reduced understory shrub and herbaceous health over time if not addressed. Energy development may pose an additional threat to the Deadman site, as the study is located with one mile of gas/oil developments. This development can lead to reduced vigor of shrubs and herbaceous species as well as potential fragmentation and degradation of habitat. In addition, introduced perennial grass species dominate the herbaceous understory of the Dugout Creek PJ Chained site. Although these grasses act as important forage for wildlife, they can be aggressive at higher elevations and may lead to reduced diversity and abundance of more desirable native species.

Treatments to reduce annual grass may be necessary if high amounts continue to be sustained on these studies. Monitoring of these communities should continue, and work to reduce pinyon and juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) may be advisable when and where it is deemed necessary. If reseeding is needed to help restore the herbaceous understory, care should be taken in species selection: native grasses and forbs should be used whenever possible.

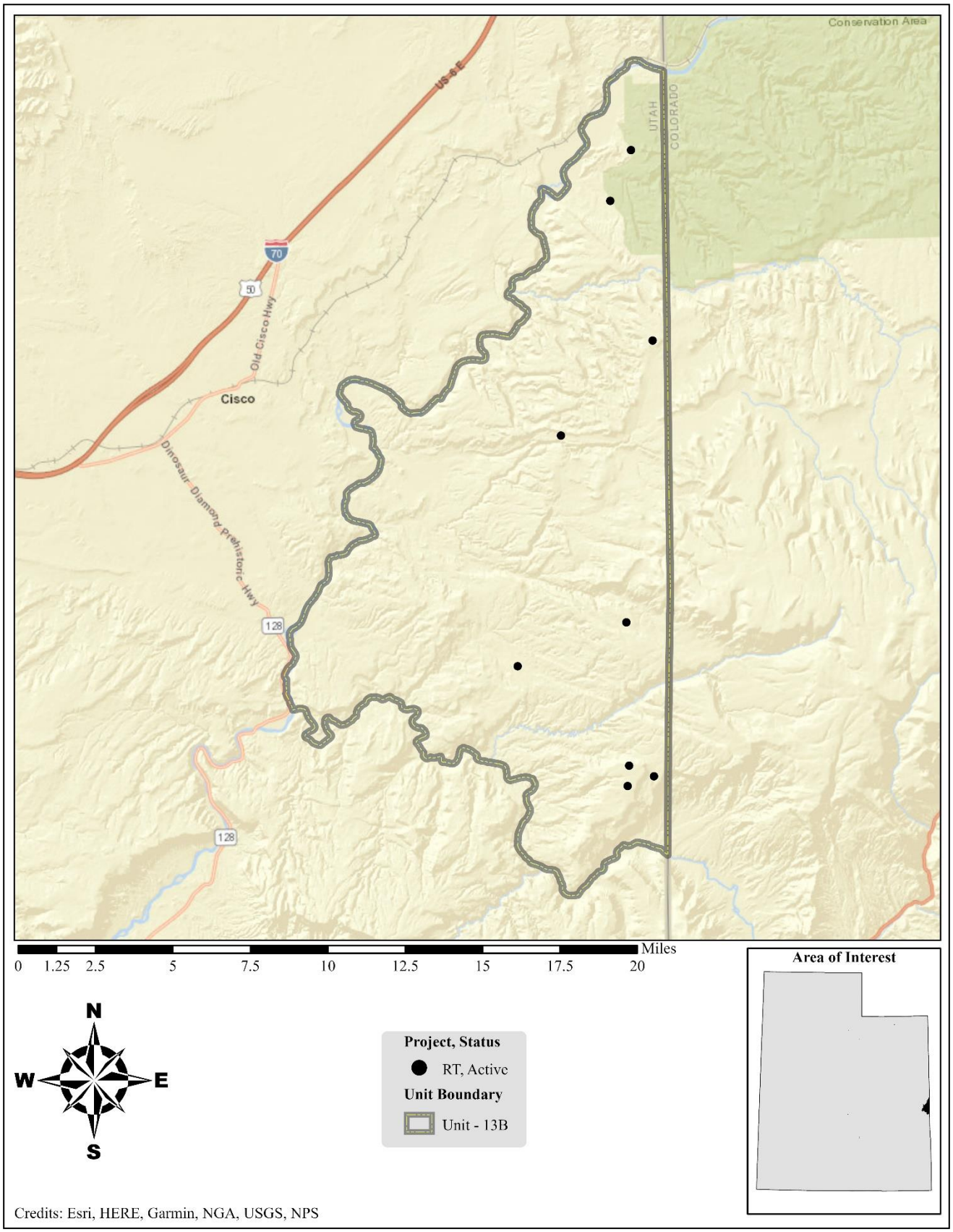
Semidesert (Big Sagebrush)

These low-elevation semidesert ecological sites that support sagebrush communities are considered to be in fair to good condition for deer winter range habitat on the Nine Mile, Range Creek management unit. Sagebrush populations on these sites are generally robust. Encroachment of pinyon and juniper is a low-level threat on all three sites. Although the sites are considered to be in Phase I of woodland succession, increasing

tree encroachment in the future could lead to reduced understory shrub and herbaceous vigor. Annual grasses, primarily cheatgrass, are also present on the Coal Creek and Soldier Creek studies. Cover and abundance of cheatgrass are currently low, but increased amounts in the future could add to fuel loads and exacerbate the risk of wildfire in these communities. Energy development may pose a threat to the Deadman Creek study, which is located within one mile of oil/gas developments. This development can lead to reduced vigor of shrubs and herbaceous species as well as potential fragmentation and degradation of habitat. Finally, pellet transect data suggests that deer usage above what sites of this ecotype can support may be occurring on the Deadman Creek and Soldier Creek studies. Sustained high use by deer may lead to reduced vigor and/or density of the browse component.

Monitoring of these study sites in the future is advisable. Furthermore, closer examination of the Deadman Creek and Soldier Creek studies and surrounding areas is recommended, as it may aid in determining if high deer usage is occurring throughout the localized area. Efforts to reduce pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should begin on these sites if and when they are deemed necessary. Annual grass abundance and cover should be monitored, as treatments may be advisable if these grasses increase in the future.

7. WILDLIFE MANAGEMENT UNIT 13B – DOLORES TRIANGLE



WILDLIFE MANAGEMENT UNIT 13B – DOLORES TRIANGLE

Boundary Description

Grand County - Boundary begins at the Colorado River and Utah-Colorado state line; southwest along the Colorado River to the Dolores River; east along the Dolores River to the State line; north along the state line to the Colorado River and beginning point.

Management Unit Description

Geography

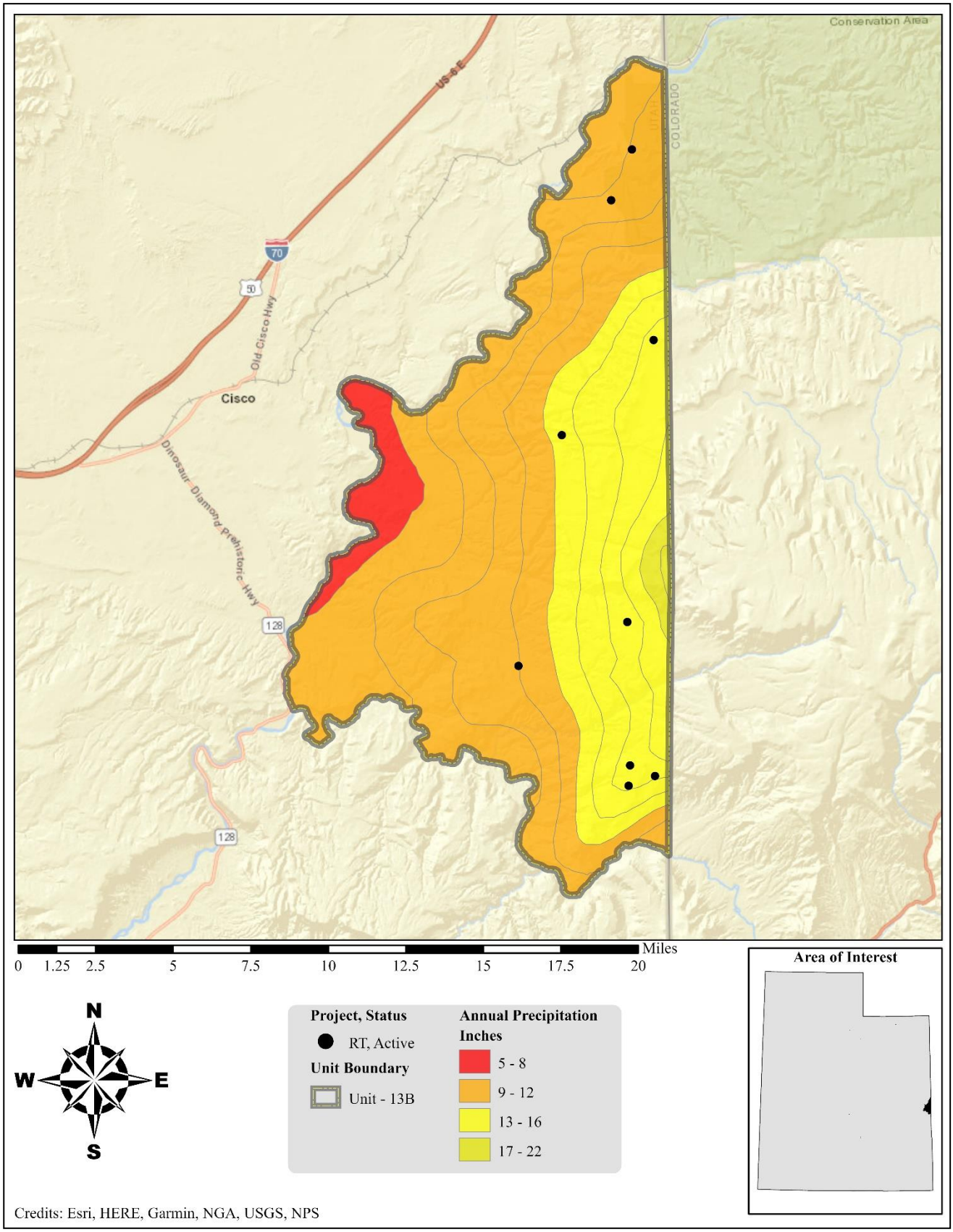
The Dolores Triangle unit is formed by the Colorado River, the Dolores River, and the Colorado-Utah state line. Topography is varied with relatively flat mesas above 7,000 feet, large rocky rough canyons and broken country at the middle elevations, and low desert along the Colorado River. Four drainages dominate the area. The Granite Creek flows into the Dolores River, and Ryan Creek, Coates Creek, and Little Dolores River empty into the Colorado River. There are ranches scattered throughout the area, but Fruita and Grand Junction, Colorado are the closest municipalities. Access to the unit is through Colorado by way of Glade Park or by fording the Dolores River near its confluence with the Colorado River at Dewey; however, fluctuating water levels and undulating bottom contours make crossing the river hazardous.

Climate Data

The 30 year (1981-2010) annual precipitation PRISM model shows precipitation ranges on the unit from 8 inches in the western portion near Cisco to 18 inches on the mesas above Ryan Creek. All of the Range Trend and WRI monitoring studies on the unit occur within 10-15 inches of precipitation (**Map 7.1**) (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 were 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, 2018, and 2020. The mean annual PDSI displayed moderately to extremely wet years from 1983-1985, 2005, and 2019 (**Figure 7.1a**). The mean spring (March-May) PDSI displayed moderate to extreme drought in 1989-1991, 1996, 2002-2004, 2012-2013, and 2018; moderately to extremely wet years 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, 2017, and 2020; moderately to extremely wet years were displayed in 1983-1985, 1997, 2013, and 2019 (**Figure 7.1b**) (Time Series Data, 2020).



Map 7.1: The 1981-2010 PRISM Precipitation Model for WMU 13B, Dolores Triangle (PRISM Climate Group, Oregon State University, 2013).

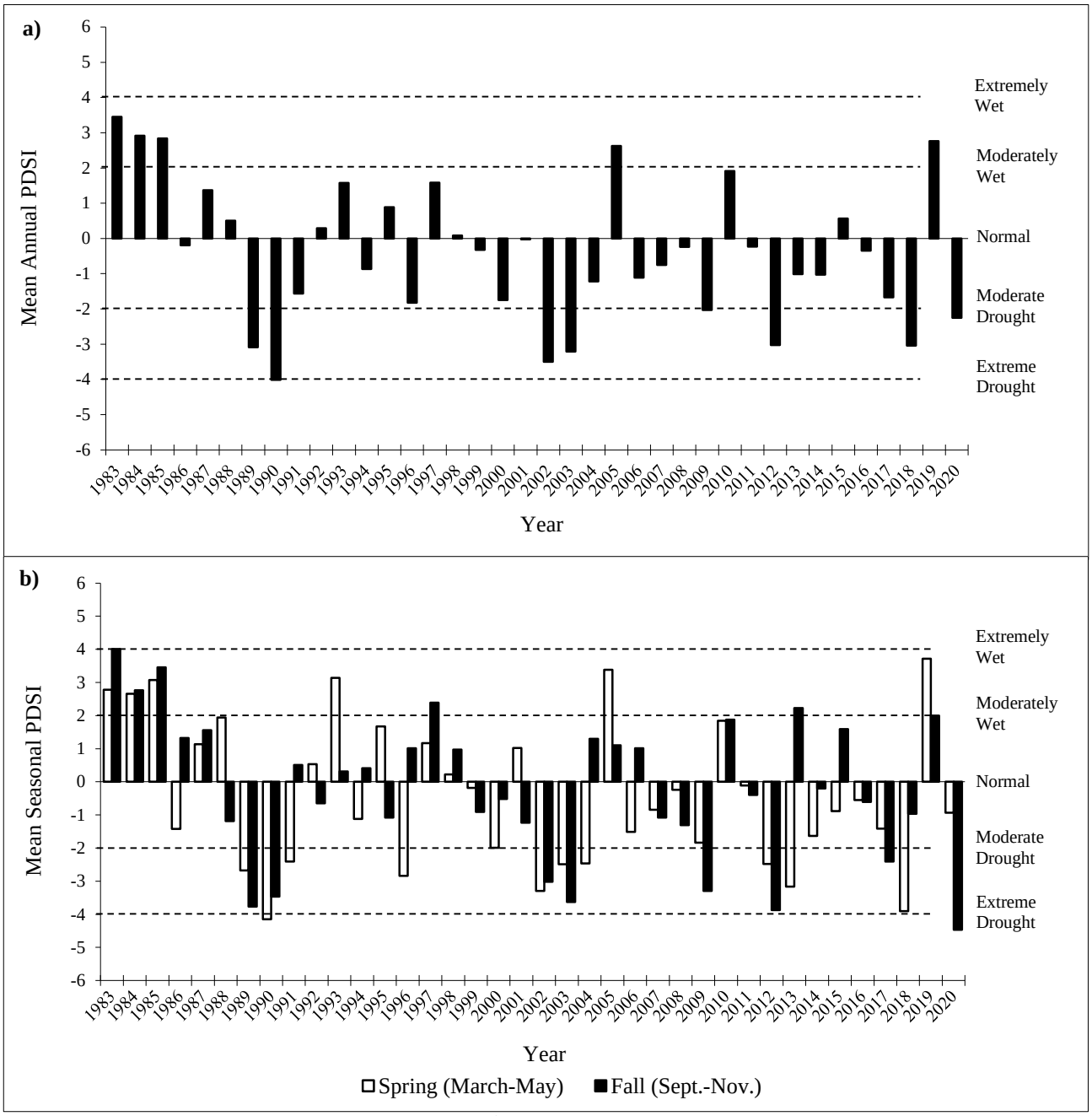


Figure 7.1: The 1983-2020 Palmer Drought Severity Index (PDSI) for the Southeast division (Division 7). The PDSI is based on climate data gathered from 1895 to 2020. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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

This subunit is comprised of 100,859 acres of deer range and 70,020 acres of elk range, all of which is classified as winter range (**Table 7.1**, **Map 7.2**). For both deer and elk ranges, the Bureau of Land Management (BLM) manages about 92%, Utah State Institutional Trust Lands (SITLA) manages 3% and 2%, respectively, and the remaining 3% and 2%, respectively is privately owned (**Table 7.2**, **Map 7.2**, **Table 7.3**, **Map 7.3**,**)**.

According to Landfire Existing Vegetation Coverage models, shrublands comprise just over 48% of the unit. Of the shrubland, nearly 23% consists of blackbrush and Mormon tea according to the model. Combined sagebrush shrubland and steppe is a minor component with nearly 8% providing land cover (**Table 7.4**); both blackbrush and sagebrush are key browse species for mule deer.

The Dolores Triangle Unit serves as winter range for deer, which spend the remainder of the year in Colorado's Pinon Mesa area. Few deer reside in the unit year-round, and those that do are found along the. Colorado River. Concentrated areas for deer during normal winters are Steamboat Mesa, Lower Steamboat Mesa, Fish Park, Big Triangle, Ryan Park, and Granite Park. Only during severe winters with abnormally heavy snowfall are deer forced to disperse into the lower desert range where forage quality is poor. Severe winter range and normal winter range are not separated into different categories because much of the land to the east is too high for normal winter range; the whole unit could therefore be considered crucial. The ranches with agricultural land scattered throughout the herd unit offer valuable forage to the deer in the spring and fall.

Coles and Pederson (1967) identified and described five vegetation types which make up the winter range on the unit. The desert shrub type is dominated by blackbrush, which occupies the lower portions of this winter range. This type is most important during severe winters although few desirable forage species are found within it. The grass type is found in the Granite Park and Steamboat Mesa areas. These were once large sagebrush parks, but have undergone a conversion to grasses (much of it cheatgrass) after overgrazing during the wrong time of the year (fall and/or spring), wildfires (reoccurring more often after the increase in weedy species), and sagebrush treatments. These areas were formerly important deer wintering areas, but now receive increased use by elk. The sagebrush type is found above the desert shrub type, up to and within the pinyon-juniper woodlands. It provides important browse to both deer and livestock. The pinyon-juniper type, like the grass type, has undergone some changes due to competition with the mature trees, extended drought, and heavy use in some years. An understory of cliffrose and black sagebrush has diminished somewhat through the years and is the least productive vegetation type on the unit: this type is common on the slopes and higher mesas. The pinyon-juniper-sagebrush type occupies the upper portions of the winter range and provides important cover and forage for wildlife. In recent years, many wildfires have burned a large number of acres of this vegetation type (Coles & Pederson, 1967).
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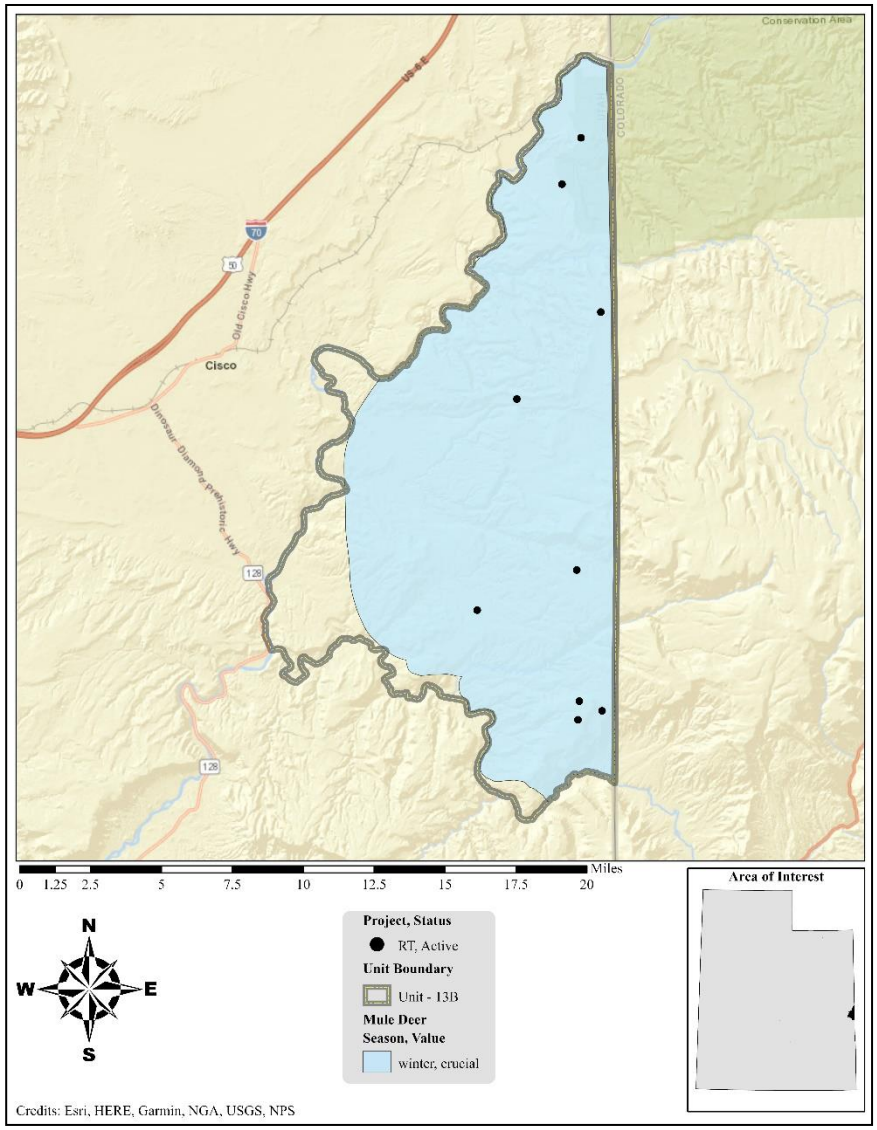
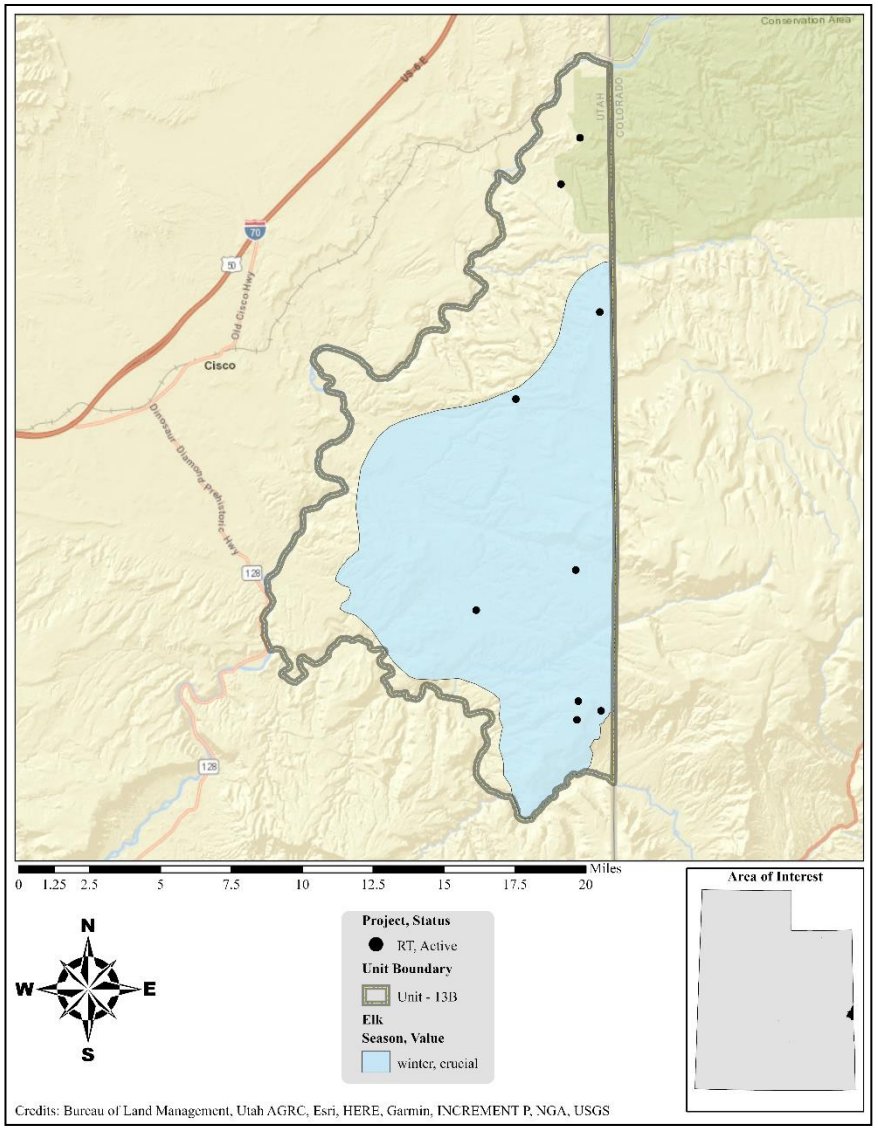
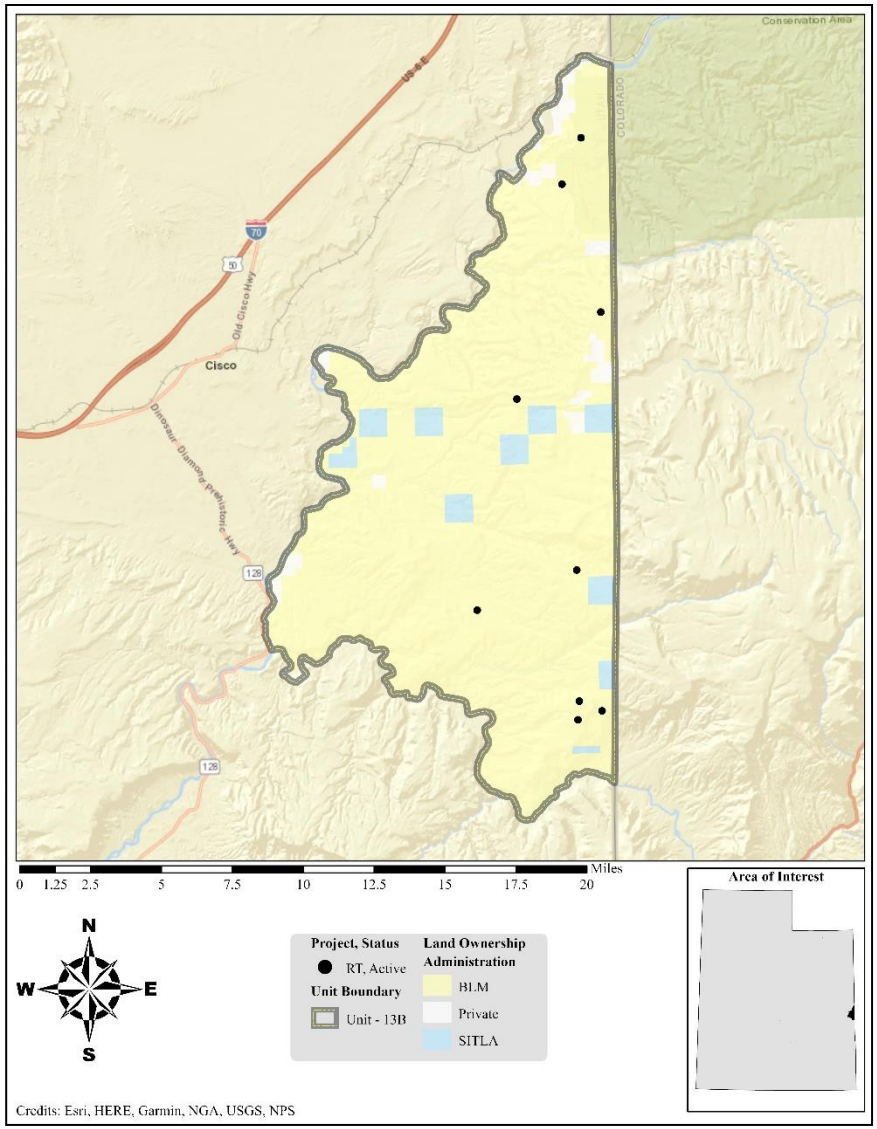


Map 7.2: Estimated mule deer habitat by season and value for WMU 13B, Dolores Triangle.



Map 7.3: Estimated elk habitat by season and value for WMU 13B, Dolores Triangle.



Map 7.4: Land ownership for WMU 13B, Dolores Triangle.

	Winter Range	
Species	*Area (acres)*	*%*
Mule Deer	100,859	100%
Elk	70,020	100%

Table 7.1: Estimated mule deer and elk habitat acreage by season for WMU 13B, Dolores Triangle.

	Winter Range	
Ownership	*Area (acres)*	*%*
BLM	92,480	92%
Private	2,676	3%
SITLA	5,235	5%
FFSL	467	<1%
Total	100,859	**100%**

Table 7.2: Estimated mule deer habitat acreage by season and ownership for WMU 13B, Dolores Triangle.

	Winter Range	
Ownership	*Area (acres)*	*%*
BLM	64,437	92%
Private	1,282	2%
SITLA	4,301	6%
Total	70,020	**100%**

Table 7.3: Estimated elk habitat acreage by season and ownership for WMU 13B, Dolores Triangle.

Group	Existing Vegetation Type	Acres	% of Total	Group % of Total
Shrubland	Colorado Plateau Blackbrush-Mormon-tea Shrubland	26,240	22.42%	
	Colorado Plateau Pinyon-Juniper Shrubland	9,435	8.06%	
	Inter-Mountain Basins Big Sagebrush Shrubland	9,075	7.75%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	4,805	4.10%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	1,868	1.60%	
	Southern Colorado Plateau Sand Shrubland	1,454	1.24%	
	Inter-Mountain Basins Mat Saltbush Shrubland	1,315	1.12%	
	Rocky Mountain Lower Montane-Foothill Shrubland	878	0.75%	
	Inter-Mountain Basins Greasewood Flat	780	0.67%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	251	0.21%	
	Inter-Mountain Basins Montane Sagebrush Steppe	60	0.05%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	47	0.04%	
	Other Shrubland	26	0.02%	48.04%
Conifer	Colorado Plateau Pinyon-Juniper Woodland	46,055	39.34%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	46	0.04%	
	Southern Rocky Mountain Ponderosa Pine Woodland	12	0.01%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	7	0.01%	
	Other Conifer	5	0.00%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	3	0.00%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	2	0.00%	39.41%
Other	Sparsely Vegetated	6,910	5.90%	
	Open Water	881	0.75%	
	Agricultural	878	0.75%	
	Riparian	252	0.22%	
	Hardwood	54	0.05%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	<1	0.00%	
	Developed	<1	0.00%	7.67%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	4,539	3.88%	
	Interior West Ruderal Riparian Scrub	149	0.13%	
	Interior West Ruderal Riparian Forest	127	0.11%	
	Interior Western North American Temperate Ruderal Shrubland	72	0.06%	4.18%
Exotic Herbaceous	Great Basin & Intermountain Introduced Annual Grassland	421	0.36%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	114	0.10%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	75	0.06%	
	Interior Western North American Temperate Ruderal Grassland	7	0.01%	0.53%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	200	0.17%	
	Other Grassland	4	0.00%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	4	0.00%	
	Southern Rocky Mountain Montane-Subalpine Grassland	1	0.00%	0.18%
Total		**117,056**	**100%**	**100%**

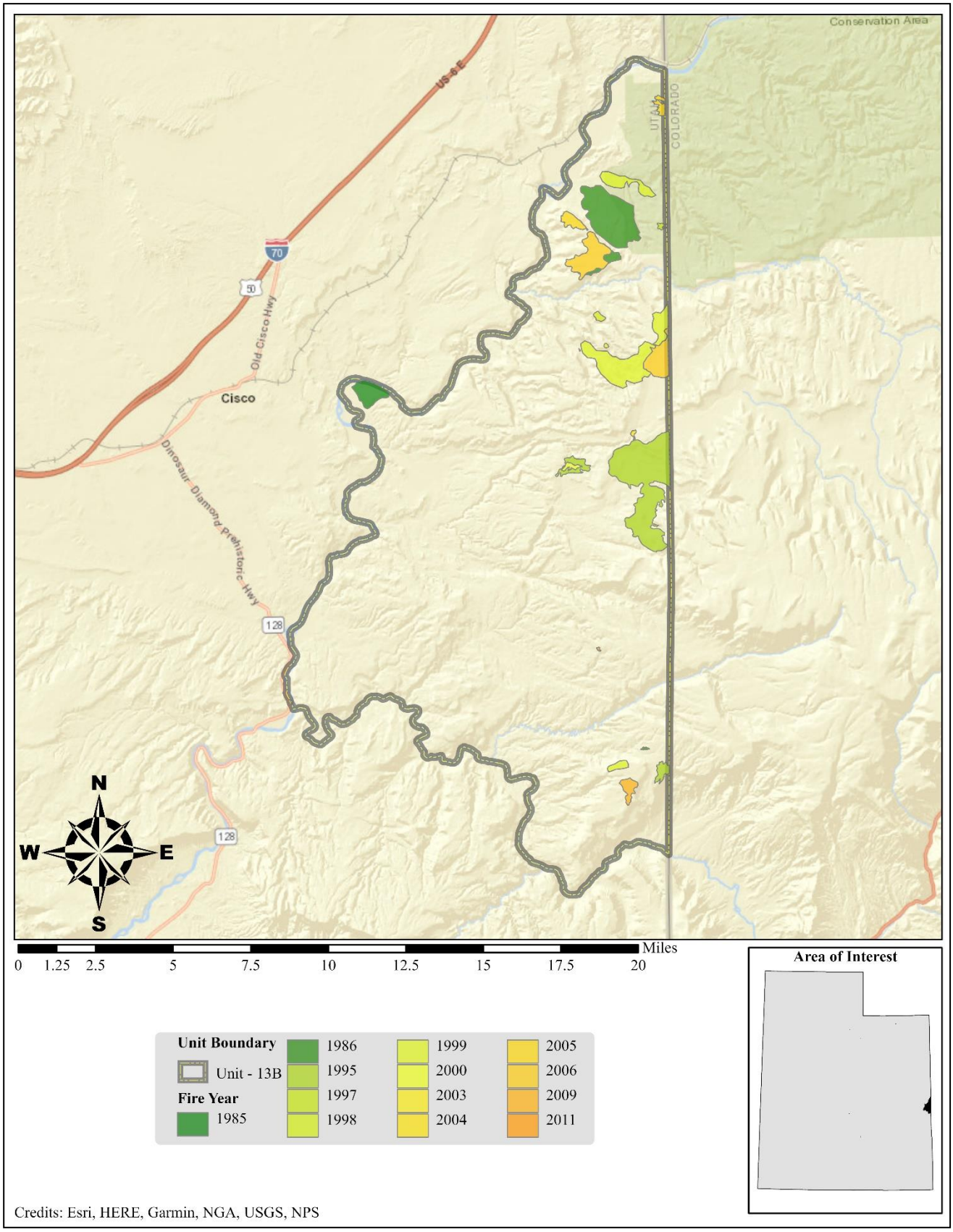
Table 7.4: LANDFIRE Existing Vegetation Coverage (LANDFIRE.US_140EVT, 2019) for WMU 13B, Delores Triangle.

Limiting Factors to Big Game Habitat

Livestock grazing is the single most important land use in the area. Winter sheep use began in the early 1900s. Now, most of the AUMs the BLM allocates for livestock use are for cattle, although some winter sheep use still occurs. The evolving dominance of pinyon-juniper along with excessive use by livestock and big game has led to deteriorating range conditions. Both livestock and deer numbers were reduced in the past to help improve the range. Range conditions were in a state of improvement in the mid-1980s, but continued drought has caused deterioration in sagebrush communities.

According to current Landfire Existing Vegetation Coverage models, 47% of the Dolores Triangle unit is comprised of combined pinyon-juniper woodlands (39%) and shrublands (8%) (**Table 7.4**). Encroachment and invasion of these woodlands into sagebrush communities has been shown to decrease sagebrush and herbaceous cover, therefore decreasing available wildlife forage (Miller, Svejcar, & Rose, 2000).

Continued range monitoring could maintain and protect ranges from further loss and degradation. Cooperation between federal, state, and local governments and private landowners could further maintain and preserve crucial habitat through agreements with land management agencies, the use of conservation easements and the like on private lands, planning and evaluating resource use and developments that might affect habitat quality, and developing specific vegetation objectives to maintain the quality of important deer use areas. In addition, forage production could be maintained or improved through direct range improvements such as reseedings, controlled burns, water developments, tree removal, etc.



Map 7.5: Land coverage of fires by year from 2000-2020 for WMU 13B, Dolores Triangle (Geosciences and Environmental Change Science Center (GECSC) Outgoing Datasets, 2021).

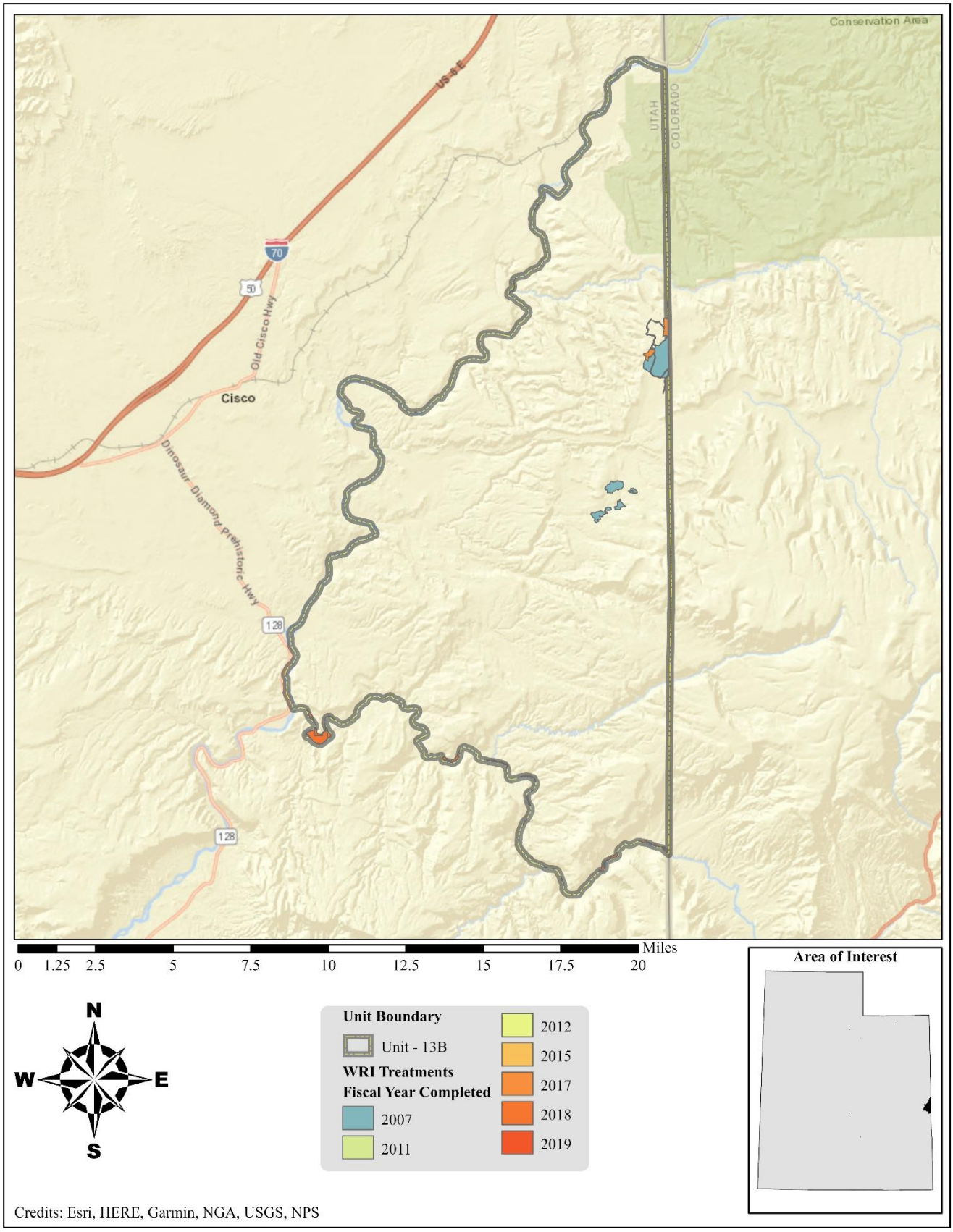
Treatments/Restoration Work

There has been some effort to address some of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 766 net acres of land have been treated within the Dolores Triangle unit since the WRI was implemented in 2004 (**Map 7.6**). Treatments frequently overlap one another bringing the total treatment acres to 818 acres for this unit. In addition, 84 acres are currently being treated within the Dolores Triangle management unit (**Table 7.5**, **Map 7.6**). 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.

Removal of pinyon pine and Utah juniper by anchor chain and hand crew are the most common management practices in this unit. Few other management practices occur on this unit, but some fire prevention has been performed through greenstripping (**Table 7.5**).

Type	Completed Acreage	Current Acreage	Proposed Acreage	Total Acreage
Anchor Chain	**457**	**0**	**0**	**457**
Smooth (One-Way)	457	0	0	457
Greenstripping	**54**	**0**	**0**	**54**
Planting/Transplanting	**0**	**84**	**0**	**84**
Other	0	84	0	84
Vegetation Removal/Hand Crew	**307**	**0**	**0**	**307**
Lop & Scatter	307	0	0	307
Grand Total	**818**	**84**	**0**	**902**
***Total Land Area Treated**	**766**	**84**	**0**	**850**

Table 7.5: WRI treatment action size (acres) for completed, current, and proposed projects for WMU 13B, Dolores Triangle. Data accessed on 02/09/2021. *Does not include overlapping treatments.



Map 7.6: WRI treatments by fiscal year completed for WMU 13B, Dolores Triangle.

Range Trend Studies

Range Trend studies have been sampled within WMU 13B on a regular basis since 1986, with studies being added or suspended as was deemed necessary (**Table 7.6**). Due to changes in sampling methodologies, only data sampled 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 7.7**). Range Trend studies are summarized in this report by ecological site.

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
13B-1	Lower Westwater-Dolores	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020	Semidesert Sandy Loam (Wyoming Big Sagebrush)
13B-2	Upper Westwater-Dolores	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020	Semidesert Sandy Loam (Wyoming Big Sagebrush)
13B-3	Fish Park	RT	Active	1986, 1995, 2000, 2005, 2010, 2020	Upland Loam (Big Sagebrush)
13B-4	Red Cliffs	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020	Semidesert Sandy Loam (Blackbrush)
13B-5	Buckhorn Draw	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020	Semidesert Sandy Loam (Blackbrush)
13B-6	Ryan Creek	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020	Upland Shallow Loam (Pinyon/Utah Juniper)
13B-7	Steamboat Mesa North	RT	Active	1986, 1995, 2000, 2005, 2010, 2015	Upland Loam (Big Sagebrush)
13B-8	Steamboat Mesa South	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020	Upland Loam (Big Sagebrush)
13B-9	Steamboat East Bench	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020	Upland Shallow Loam (Pinyon/Utah Juniper)

Table 7.6: Range trend and WRI project studies monitoring history and ecological site potential for WMU 13B, Dolores Triangle.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
13B-2	Upper Westwater-Dolores	Wildfire	Snyder 3	July 1986	1,200	
13B-3	Fish Park	Chain Unknown		1968	2,600	
		Seed Unknown		1968	2,600	
13B-6	Ryan Creek	Chain Unknown		1968	1,800	
		Aerial Unknown		1968	1,800	
		Tebuthiuron			300	
		Wildfire	Ryan Creek	1989	3,947	
13B-7	Steamboat Mesa North	Two-Way Chain Unknown	Steamboat Mesa Allotment Chaining	1968		
		Seed Unknown	Steamboat Mesa Allotment Chaining	1968		
13B-8	Steamboat Mesa South	Wildfire	Steamboat Mesa	July 2009	172	
13B-9	Steamboat East Bench	Two-Way Chain Unknown	Steamboat Mesa Allotment Chaining	1968		
		Seed Unknown	Steamboat Mesa Allotment Chaining	1968		

Table 7.7: Range trend and WRI studies known disturbance history for WMU 13B, Delores Triangle. PDB = Pre-Database; LTDL = Land Treatment Digital Library (Pilliod & Welty, 2019).

Study Trend Summary (Range Trend)

Upland (Big Sagebrush)

There are three studies [Fish Park (13B-3), Steamboat Mesa North (13B-7), and Steamboat Mesa South (13B-8)] classified as Upland (Big Sagebrush) ecological sites that are found in the Dolores Triangle Management Unit. The Fish Park study is found in a valley east of Marble Canyon. The Steamboat Mesa North study is found on the north end of Steamboat Mesa. The Steamboat Mesa South study is located at the midpoint of Steamboat Mesa (**Table 7.6**).

Shrubs/Trees: The browse species that each study has in common is Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), though it contributes little to no cover on the Steamboat Mesa North and Steamboat Mesa South studies. Total shrub cover has decreased overall, a trend that can be partially attributed to a 2009 wildfire on the Steamboat Mesa South study. The increase in cover and shift in dominance from other shrub to sagebrush between 2015 and 2020, however, is due to 'n values' and which studies were sampled each year: Ryan Creek was sampled in 2020 and not in 2015, while Steamboat Mesa North was sampled in 2015, but not in 2020 (**Figure 7.2**). Preferred browse demographics indicate that total density has decreased overall, but there was an increase between 2010 and 2015. Again, this increase is largely due to the difference in which sites were sampled each year. Mature plants have comprised a majority of these populations throughout the study period, although the number of decadent individuals was nearly equal to that of mature plants in 2020. Recruitment of young has also decreased over time (**Figure 7.8**). Utilization of preferred browse has fluctuated, but has generally remained moderate to high; 39% of plants were moderately browsed and 26% were heavily browsed in 2020 (**Figure 7.10**).

Active encroachment by Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) is occurring on all three study sites. Tree cover and density have generally decreased overall. However, the significant decrease in density between 2015 and 2020 is mainly due to the difference in which sites were read each year. For example, juniper and pinyon on Steamboat Mesa North had densities of 137 trees/acre and 113 trees/acre (respectively) in 2015, but the site was not sampled in 2020 (**Figure 7.4**, **Figure 7.6**).

Herbaceous Understory: The herbaceous understories of these study sites have generally remained abundant, although the composition differs from site to site. The Steamboat Mesa North study has remained dominated by the perennial grass species crested wheatgrass (*Agropyron cristatum*) with annual grasses contributing little cover. In contrast, the Steamboat Mesa South study has remained dominated by the introduced annual grass species cheatgrass (*Bromus tectorum*) throughout the study years. Dominance has fluctuated between crested wheatgrass and cheatgrass from study year to study year on the Fish Park study. Total average herbaceous cover has increased overall, a trend largely driven by annual grasses on the Steamboat Mesa South site. The perennial and annual forb communities have remained diverse in composition over the sample years, but they have generally been minor understory components overall (**Figure 7.12**, **Figure 7.14**).

Occupancy: As has been mentioned in previous sections, it is important to consider the 'n values' and differences in which sites were sampled each year and consider the implications that this may have on average vegetation and occupancy trends. Pellet group transect data indicates that the identity of the primary occupants has fluctuated and that overall occupancy has generally decreased over the sample years. Deer were the primary occupants between 2000 and 2010 and have had a mean pellet group abundance as low as 7 days use/acre in 2020 and as high as 47 days use/acre in 2000. Elk were the main occupants in 2015 and 2020, and average pellet group abundance has ranged from less than 1 days use/acre in 2000 to 23 days use/acre in 2010 and 2015. Finally, cattle have been present with a mean pellet group abundance fluctuating between 3 days use/acre in 2020 and 23 days use/acre in 2000 (**Figure 7.16**).

Upland (Pinyon/Utah Juniper)

There are two study sites [Ryan Creek (13B-6) and Steamboat East Bench (13B-9)] that are classified as Upland (Pinyon/Utah Juniper) ecological sites. Ryan Creek is located on a rolling flat southwest of Ryan Creek. The Steamboat East Bench study is found east of and below Steamboat Mesa (**Table 7.6**).

Shrubs/Trees: The shrub community on Ryan Creek is limited with rubber rabbitbrush (*Ericameria nauseosa* ssp. *hololeuca*) as the main species; broom snakeweed (*Gutierrezia sarothrae*) and alderleaf mountain mahogany (*Cercocarpus montanus*) contribute the most shrub cover on the Steamboat East Bench study as of 2020. Preferred browse cover other than sagebrush has decreased over the study period, while that of other shrubs has increased. Total shrub cover has varied from year to year, but overall has remained generally stable (**Figure 7.2**). Average preferred browse density has exhibited a slight overall decrease. Mature individuals have comprised a majority of these browse populations throughout the study period, although decadent and young plants have also been present (**Figure 7.8**). Average utilization of preferred browse has generally remained low, with 30% or less of plants displaying signs of moderate to heavy usage in most sample years. However, utilization was significant in 1995 and 2015, with 43% and 65% of plants receiving moderate and heavy use, respectively (**Figure 7.10**).

Cover and density trends for trees are entirely driven by the Steamboat East Bench study site, as no trees have been present on the Ryan Creek study since 1986. Both Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) have been observed on Steamboat East Bench. Tree cover has fluctuated from year to year, but has remained high (**Figure 7.4**). Density has also varied between sample years, but has generally been high: density of juniper was 45 trees/acre and that of pinyon was 60 trees/acre in 2020 (**Figure 7.6**).

Herbaceous Understory: Data shows that average herbaceous frequency has fluctuated, but has decreased overall. Average herbaceous cover has also varied between sample years, but has displayed an overall trend that is mainly stable. Herbaceous trends are largely driven by the Ryan Creek study site; although the understory on Steamboat East Bench is diverse, it has generally not been very abundant when compared with Ryan Creek. The Ryan Creek study has been dominated by perennial and/or annual grasses in all sample years. The introduced perennial grass crested wheatgrass (*Agropyron cristatum*) has been the dominant perennial grass species since site establishment with cover exhibiting an overall increase. In addition, the introduced annual grass species cheatgrass (*Bromus tectorum*) has varied in abundance between low and high over the sample period, and may place the site at an increased risk of fire and lower ecological resiliency. Cover of perennial forbs has been variable and has ranged from nearly 1% in 2010 to nearly 5% in 2005. Annual forb cover has remained low in most sample years except 2005, when redstem stork's bill (*Erodium cicutarium*) was the dominant component of the herbaceous understory (**Figure 7.12**, **Figure 7.14**).

Occupancy: Pellet transect data indicates that deer have been the primary occupants in all sample years except 2015, when elk pellet groups were more abundant than those of any other species. In addition, average pellet transect data shows that occupancy has fluctuated from year to year, but has slightly increased overall. Mean abundance of deer pellet groups has ranged from 13 days use/acre in 2015 to 38 days use/acre in 2010. Elk pellet groups have had an average abundance as low as 4 days use/acre in 2010 and as high as 24 days use/acre in 2015. Mean abundance of cattle pellet groups has fluctuated between 3 days use/acre in 2015 and 15 days use/acre in 2010 (**Figure 7.16**).

Semidesert (Big Sagebrush)

There are two study sites [Lower Westwater-Dolores (13B-1) and Upper Westwater-Dolores (13B-2)] that are classified as Semidesert (Big Sagebrush) ecological sites. The Lower Westwater-Dolores study is found on the north side of Jones Canyon while the Upper Westwater-Delores study is located to the south of the canyon (**Table 7.6**).

Shrubs/Trees: Despite being classified as semidesert sagebrush sites, shrub species are limited to nearly absent as of 2020. Basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) and fourwing saltbush (*Atriplex canescens*) have been the only preferred browse species sampled and have only been observed on the Lower Westwater-Dolores study site. Furthermore, line intercept cover of any shrub species has not been recorded since 2005 on either study site (**Figure 7.2**). In 1995, mature plants were the dominant demographic in these preferred browse populations. However, decadence increased as overall density decreased. Decadent individuals were the population majority from 2000 through 2005, after which no preferred browse has been observed in density data. There has been no recruitment of young plants within these populations since 2000

(**Figure 7.9**). Utilization of preferred browse increased as density decreased; all plants were heavily used in 2005. However, no utilization has been observed since that time, as no browse species have been recorded in density measurements (**Figure 7.11**).

Pinyon and juniper encroachment will not be discussed in this section as it is not occurring at this time (**Figure 7.5**, **Figure 7.7**).

Herbaceous Understory: The herbaceous understories of these studies are plentiful. However, the herbaceous communities are dominated by annual grasses and forbs, mainly cheatgrass (*Bromus tectorum*) and redstem stork's bill (*Erodium cicutarium*). Although total herbaceous cover has fluctuated over the sampling period, combined mean cover for annual grass and forbs has shown an overall increasing trend. Perennial grass abundance and cover have displayed slight increases over time, but they have been a minor component in all sample years. Perennial forbs have remained rare throughout the study period (**Figure 7.13**, **Figure 7.15**).

Occupancy: Pellet group transect data indicates that animal presence has exhibited an overall decrease. Deer were the primary occupants in 2000, with a mean pellet group abundance ranging from 6 days use/acre in 2020 to 44 days use/acre in 2000. Cattle have been the primary occupants in all other sample years, and average pellet group abundance has been as low as 17 days use/acre in 2015 and as high as 46 days use/acre in 2020. Finally, mean abundance of elk pellet groups has fluctuated between less than 1 days use/acre in 2005, 2015, and 2020 and 6 days use/acre in 2000 (**Figure 7.17**).

Semidesert (Blackbrush)

There are two study sites [Red Cliffs (13B-4) and Buckhorn Draw (13B-5)] that are classified as Semidesert (Blackbush) ecological sites. The Red Cliffs study is found east of Dry Gulch while the Buckhorn Draw study is located on a flat south of Buckhorn Draw and east of Scharf Mesa (**Table 7.6**).

Shrubs/Trees: The shrub component of the Red Cliffs study is dominated by blackbrush (*Coleogyne ramosisima*), while that of Buckhorn Draw is dominated by spiny hopsage (*Grayia spinosa*). The other preferred browse species present on both sites is Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), but it provides little cover. Average line intercept cover of blackbrush has remained fairly stable overall and was at 10% as of 2020; this average is driven by the Buckhorn Draw study. Cover of other preferred browse has been stable since 2010, but has remained minimal throughout the study period (**Figure 7.3**). A majority of the preferred browse populations have been classified as mature for all sample years, although decadent individuals increased significantly between 2015 and 2020. Recruitment of young plants has varied, but has generally remained low. Total preferred browse density has decreased over time (**Figure 7.9, Figure 1.9**). Utilization has fluctuated over the sample period. Forty percent or less of the browse population has displayed signs of moderate to heavy use in most years. However, utilization increased in 2015 and 2020, when over 80% of plants were moderately to heavily browsed (**Figure 7.11**).

Both twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have been observed on these sites, the latter of which has provided the entirety of the tree cover in all sample years. Tree cover has fluctuated, but has been low overall. Average tree density has decreased over time, a trend largely driven by the Buckhorn Draw study (**Figure 7.5**, **Figure 7.7**).

Herbaceous Understory: The herbaceous understories of these studies have fluctuated in cover and frequency, but are abundant and provide good cover as of 2020. However, the introduced annual grass species cheatgrass (*Bromus tectorum*) has been the dominant herbaceous component in most sample years on both study sites. Perennial grasses have fluctuated over the sample period, with much of the cover trend being driven by the Buckhorn Draw study. Annual forbs have provided little cover, but have been moderately abundant in some sample years. Perennial forbs have remained rare (**Figure 7.13**, **Figure 7.15**).

Occupancy: Pellet group transect data indicates that deer primarily occupy these study sites and that total animal occupation has fluctuated over the sample period. The mean abundance of deer pellet groups has

ranged from 31 days use/acre in 2015 to 65 days use/acre in 2010. Elk have had an average pellet group abundance as low as less than 1 days use/acre in 2000 and 2020 and as high as 6 days use/acre in 2010. Finally, the mean abundance of cattle pellet groups has ranged from 2 days use/acre in 2015 to 25 days use/acre in 2010 (**Figure 7.17**).

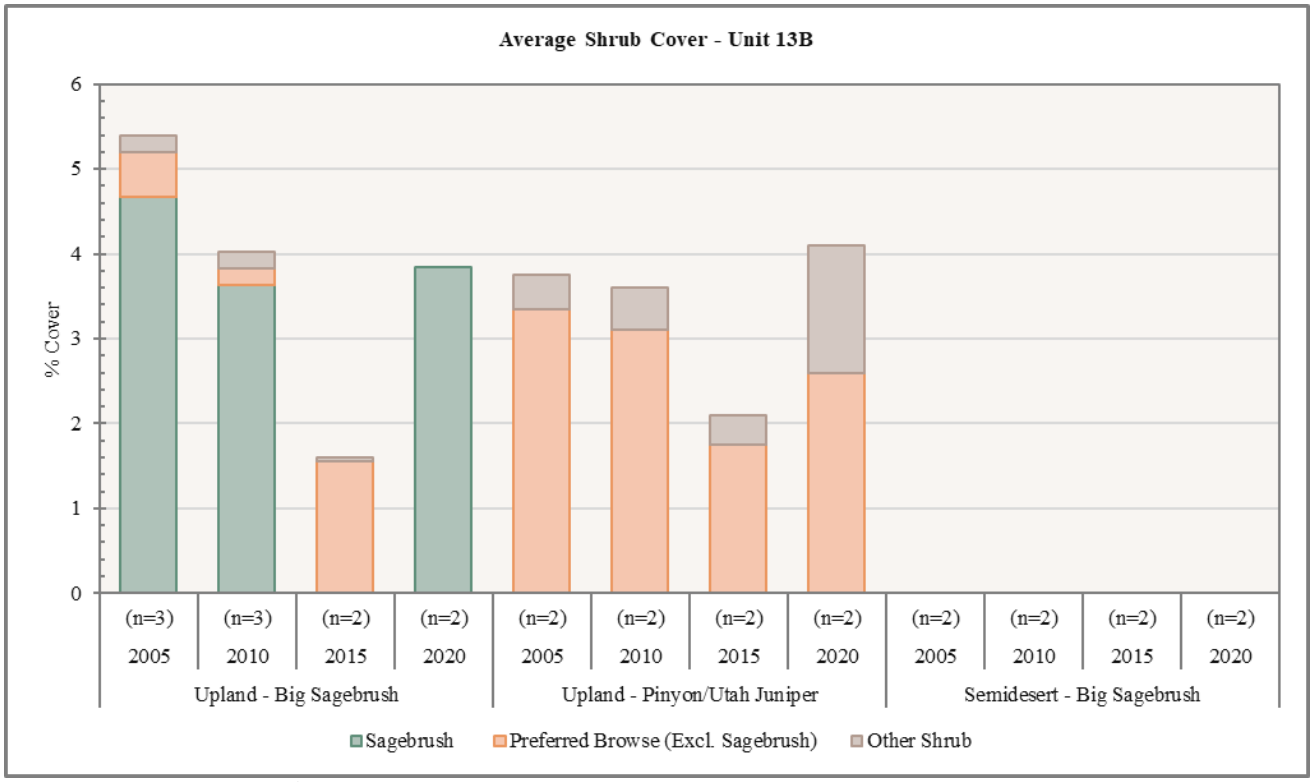


Figure 7.2: Average shrub cover for Upland - Big Sagebrush, Upland - Pinyon/Utah Juniper, and Semidesert - Big Sagebrush study sites in WMU 13B, Dolores Triangle.

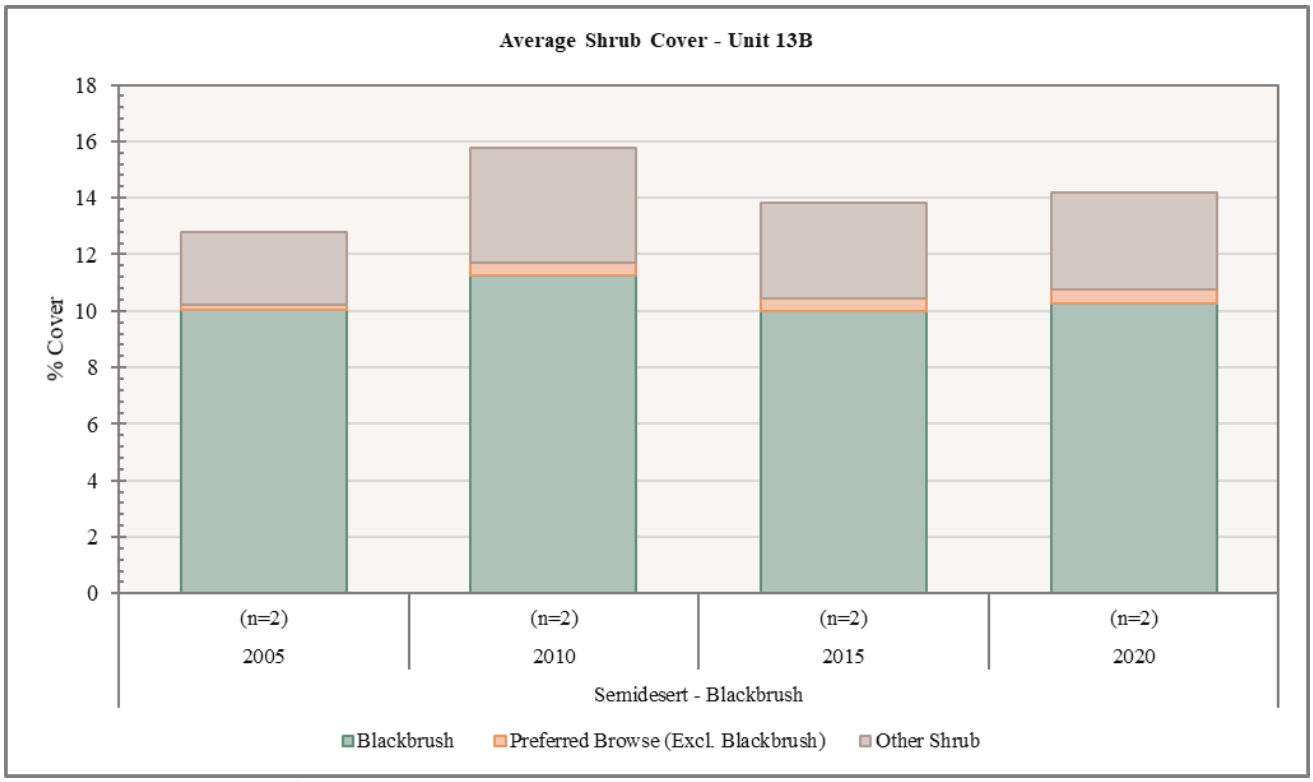


Figure 7.3: Average shrub cover for Semidesert - Blackbrush study sites in WMU 13B, Dolores Triangle.

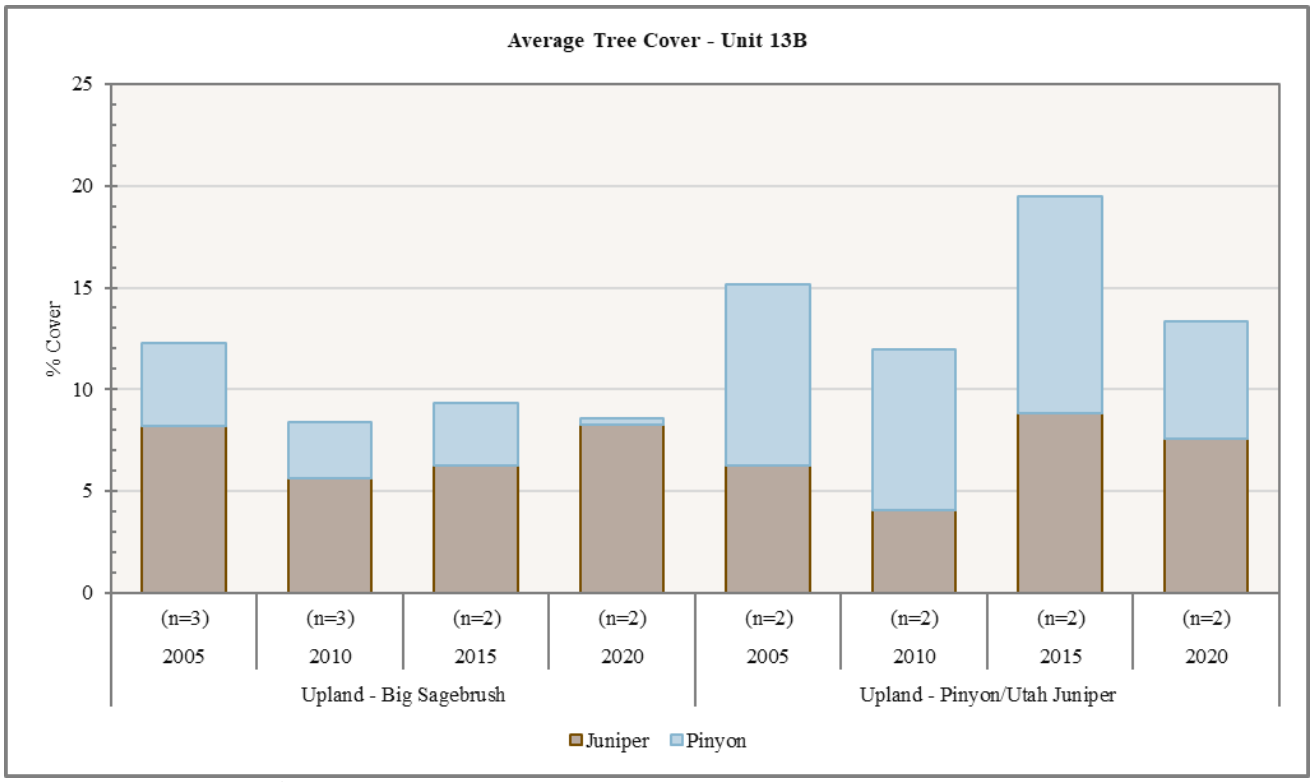


Figure 7.4: Average tree cover for Upland - Big Sagebrush and Upland - Pinyon/Utah Juniper study sites in WMU 13B, Dolores Triangle.

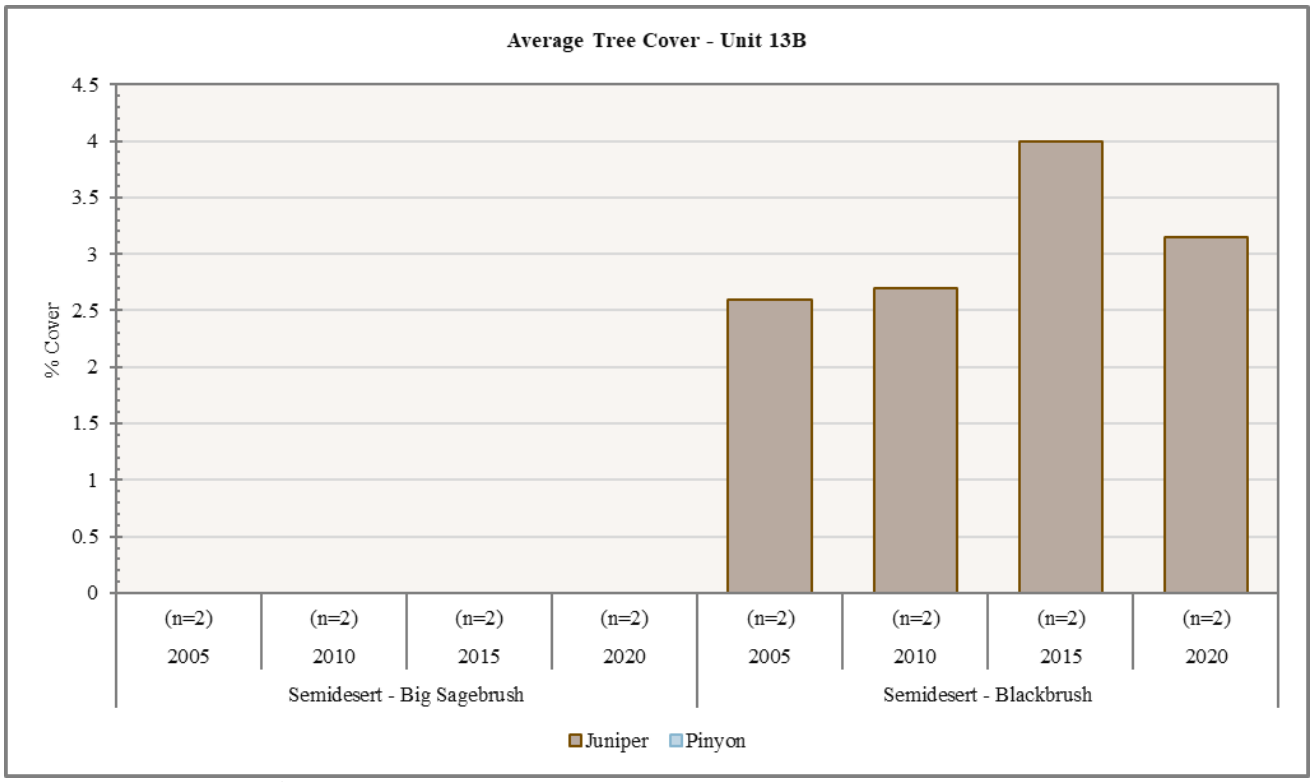


Figure 7.5: Average tree cover for Semidesert - Big Sagebrush and Semidesert - Blackbrush study sites in WMU 13B, Dolores Triangle.

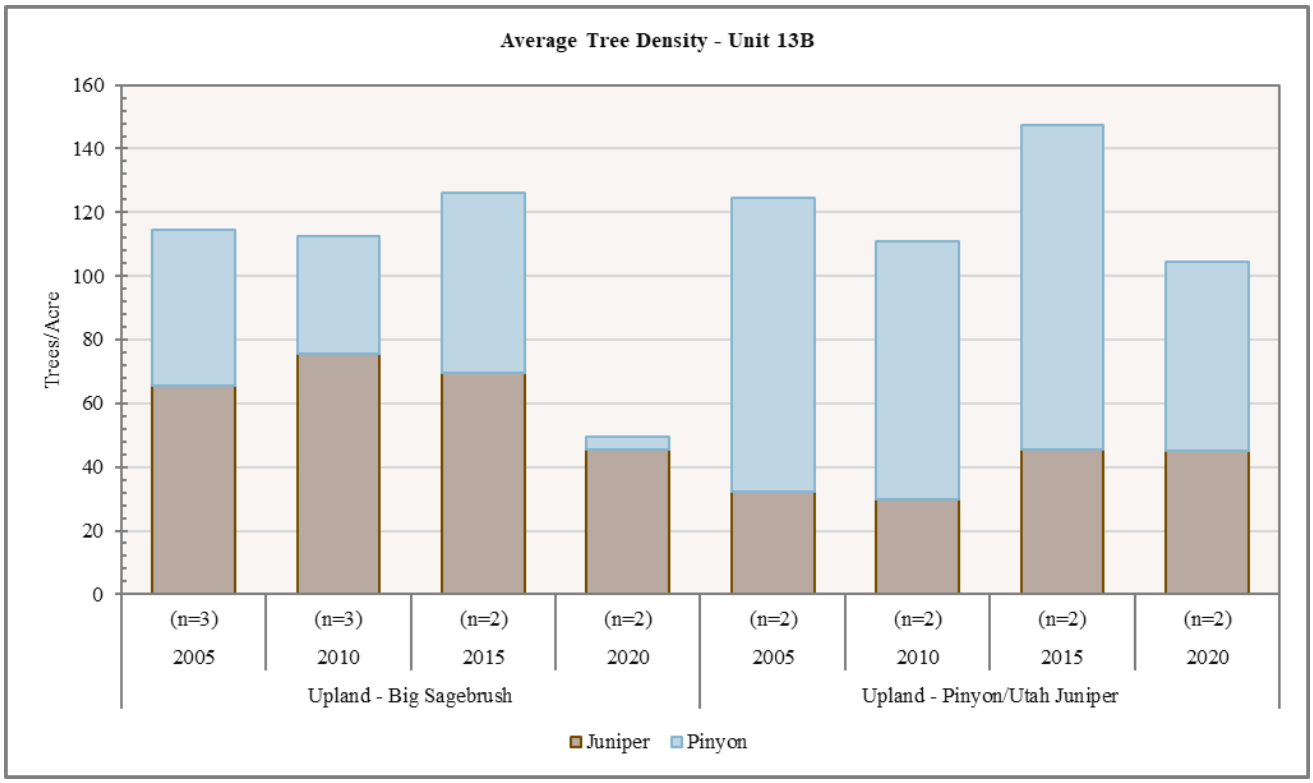


Figure 7.6: Average tree density for Upland - Big Sagebrush and Upland - Pinyon/Utah Juniper study sites in WMU 13B, Dolores Triangle.

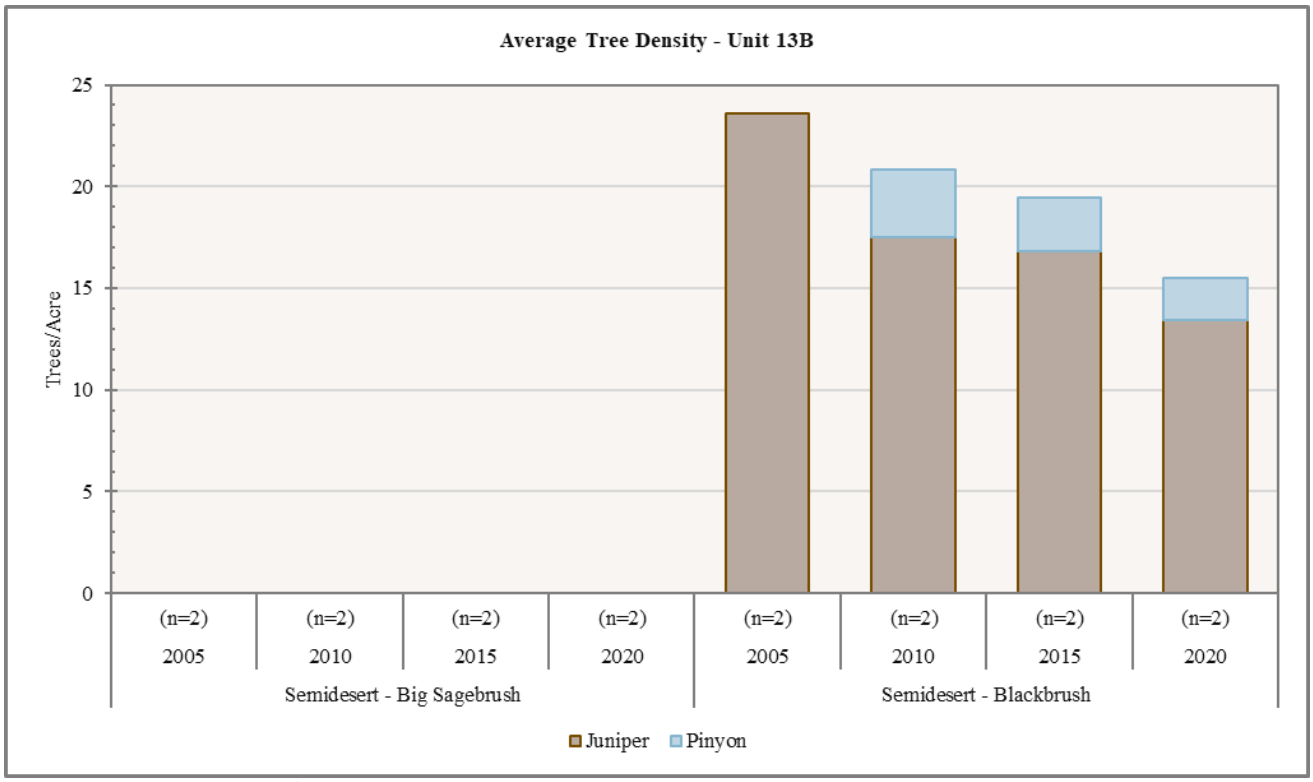


Figure 7.7: Average tree density for Semidesert - Big Sagebrush and Semidesert - Blackbrush study sites in WMU 13B, Dolores Triangle.

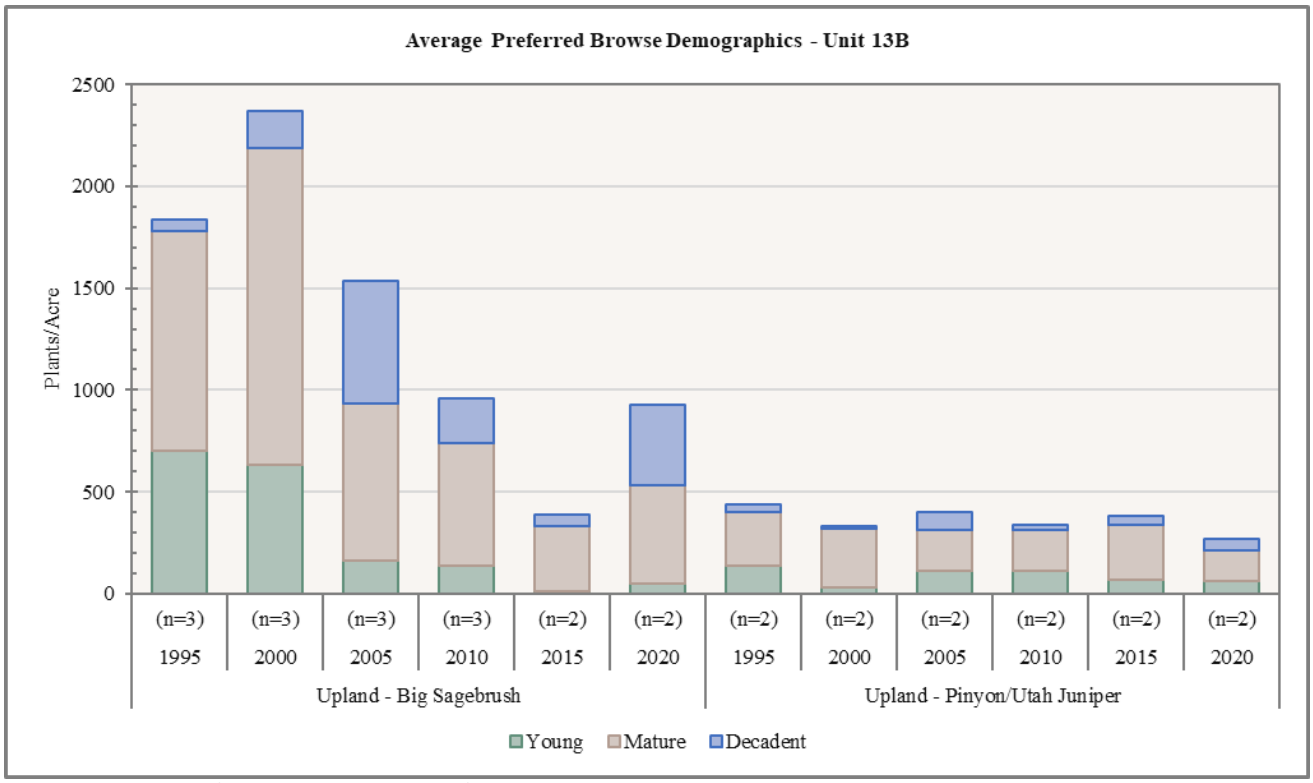


Figure 7.8: Average preferred browse demographics for Upland - Big Sagebrush and Upland - Pinyon/Utah Juniper study sites in WMU 13B, Dolores Triangle.

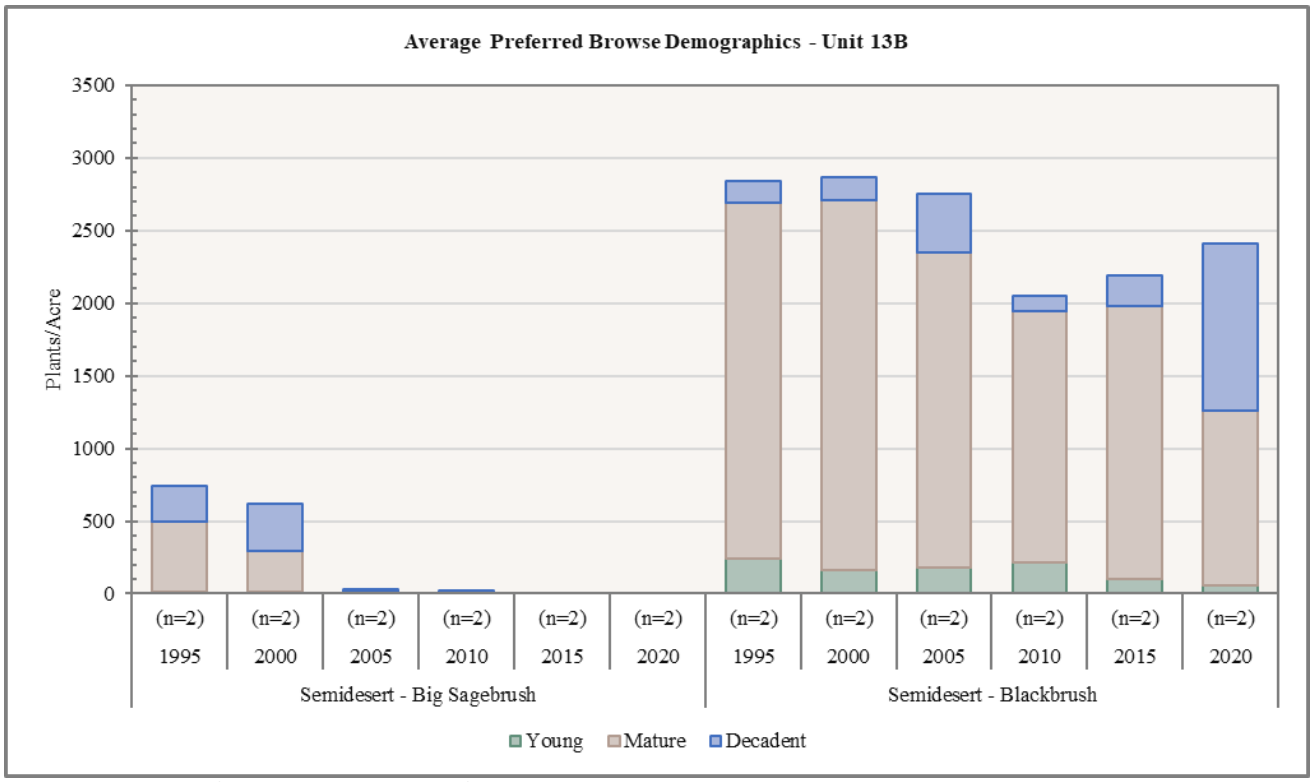


Figure 7.9: Average preferred browse demographics for Semidesert - Big Sagebrush and Semidesert - Blackbrush study sites in WMU 13B, Dolores Triangle.

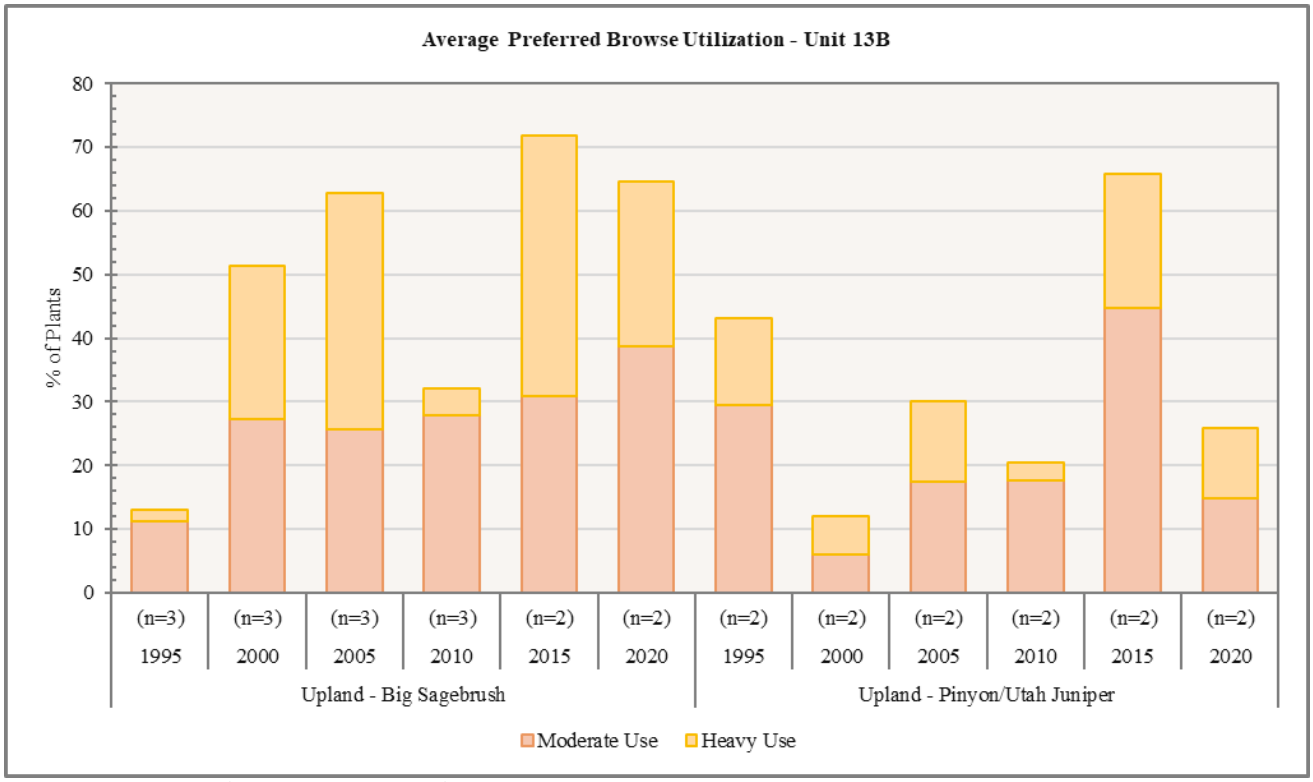


Figure 7.10: Average preferred browse utilization for Upland - Big Sagebrush and Upland - Pinyon/Utah Juniper study sites in WMU 13B, Dolores Triangle.

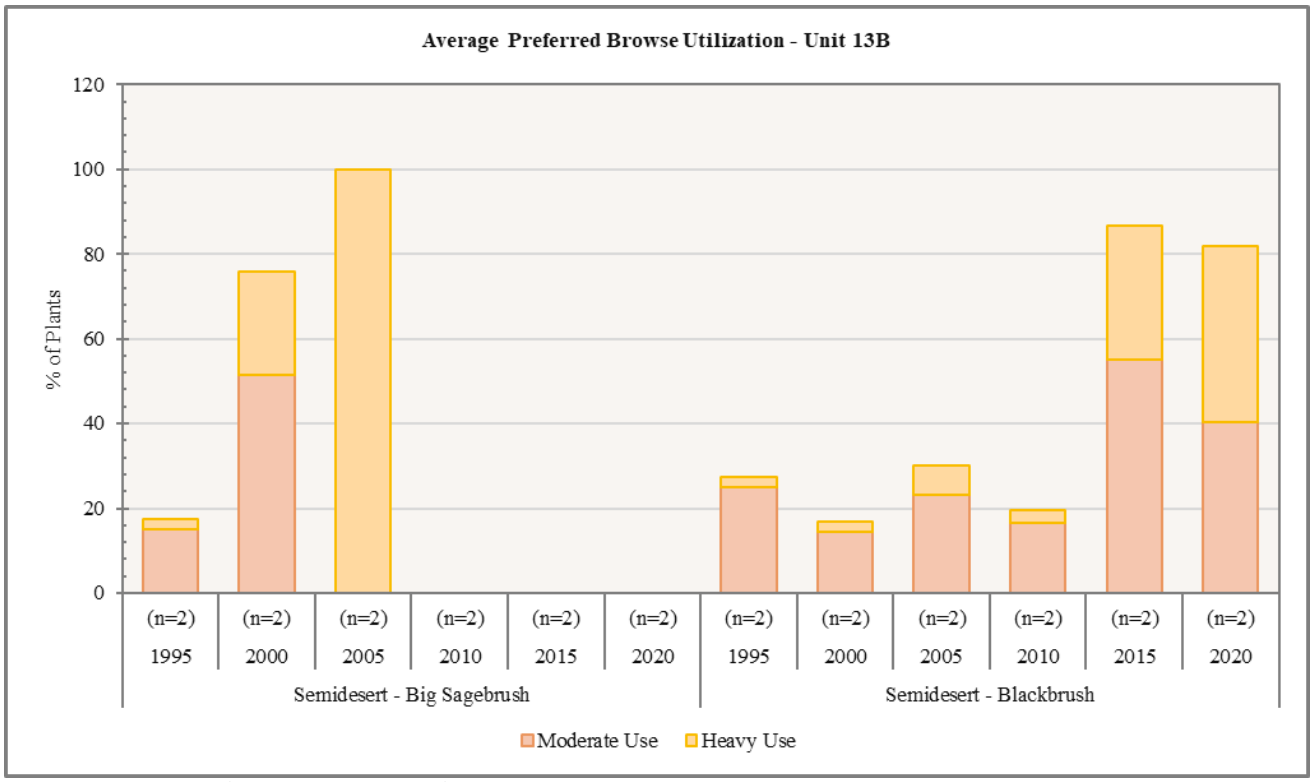


Figure 7.11: Average preferred browse utilization for Semidesert - Big Sagebrush and Semidesert - Blackbrush study sites in WMU 13B, Dolores Triangle.

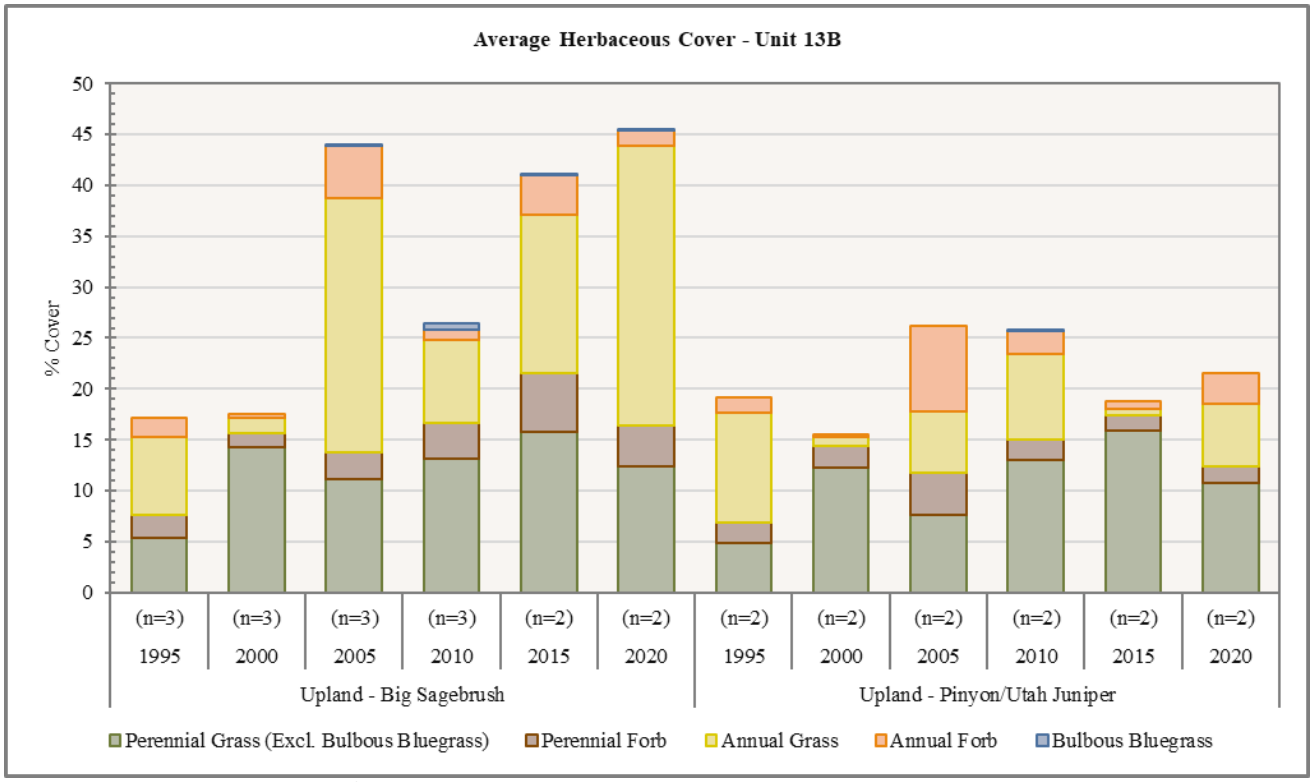


Figure 7.12: Average herbaceous cover for Upland - Big Sagebrush and Upland - Pinyon/Juniper study sites in WMU 13B, Dolores Triangle.

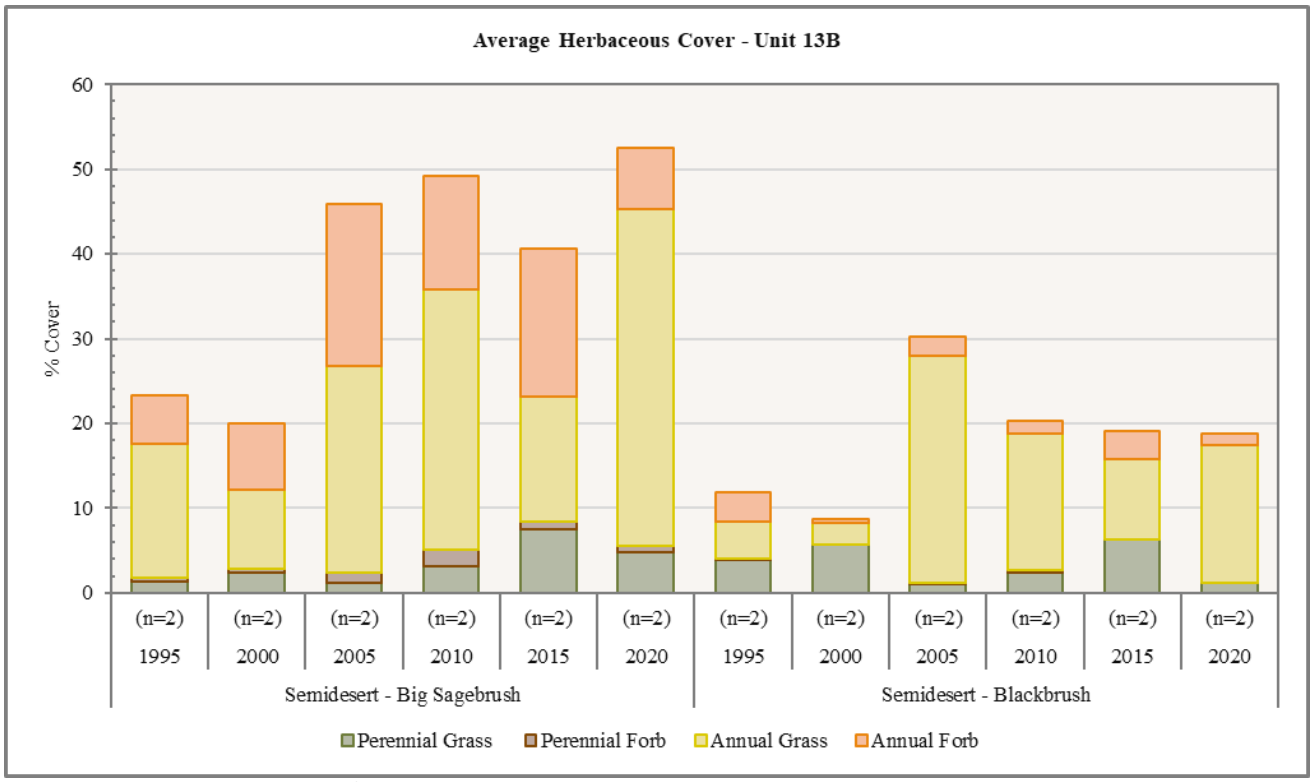


Figure 7.13: Average herbaceous cover for Semidesert - Big Sagebrush and Semidesert - Blackbrush study sites in WMU 13B, Dolores Triangle.

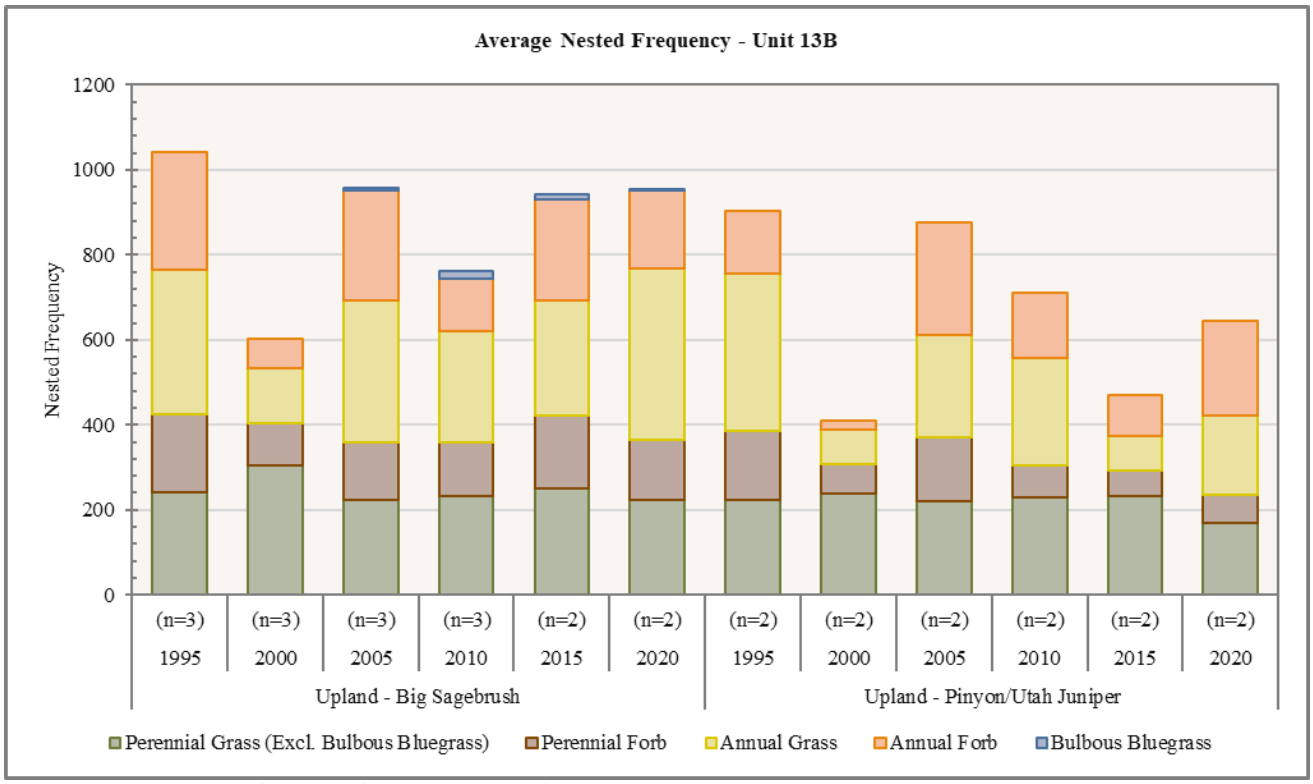


Figure 7.14: Average nested frequency of herbaceous species for Upland - Big Sagebrush and Upland - Pinyon/Utah Juniper study sites in WMU 13B, Dolores Triangle.

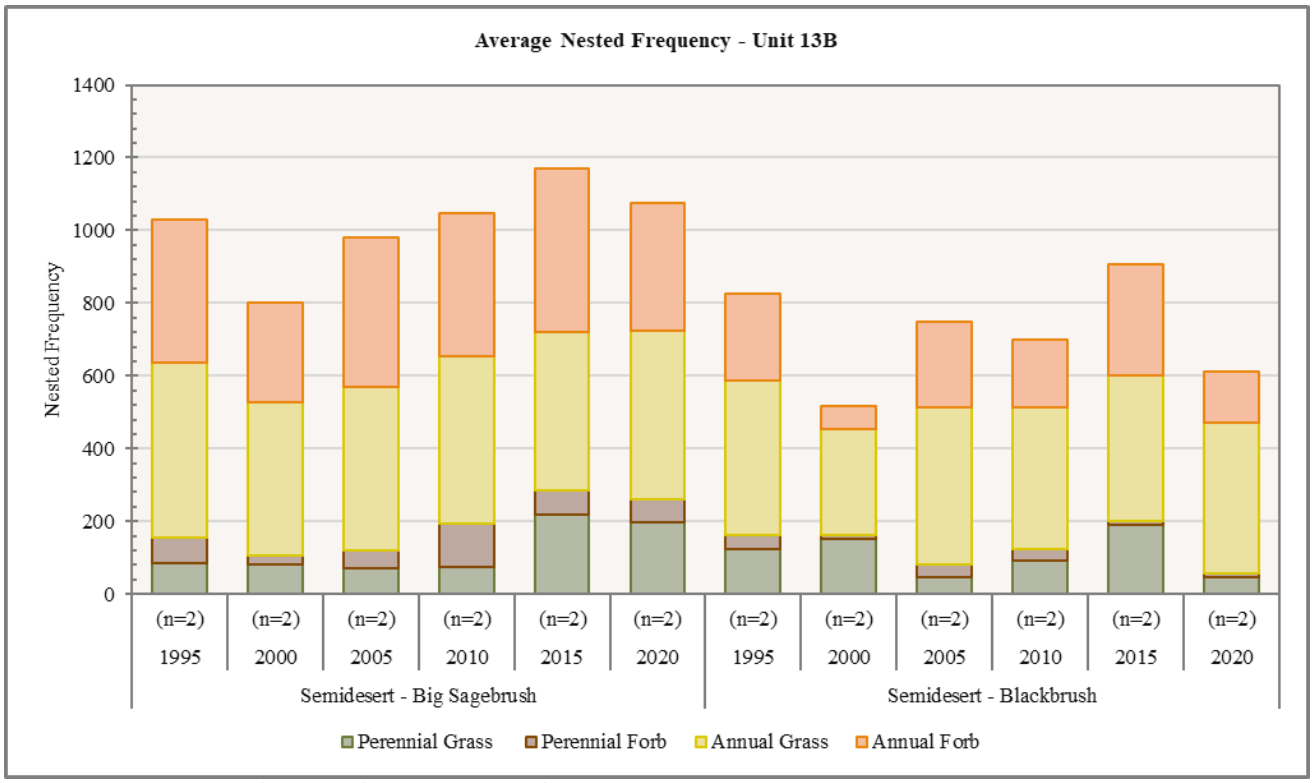


Figure 7.15: Average nested frequency of herbaceous species for Semidesert - Big Sagebrush and Semidesert - Blackbrush study sites in WMU 13B, Dolores Triangle.

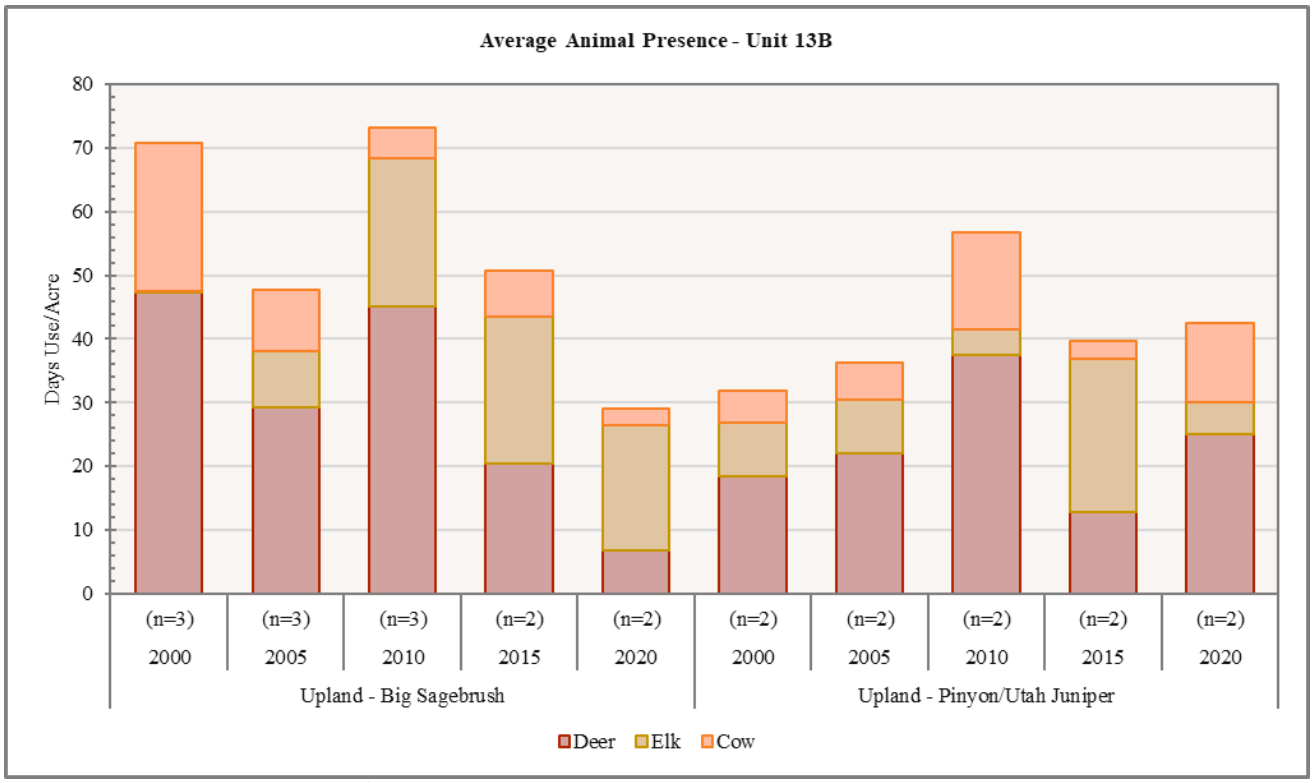


Figure 7.16: Average pellet transect data for Upland - Big Sagebrush and Upland - Pinyon/Utah Juniper study sites in WMU 13B, Dolores Triangle.

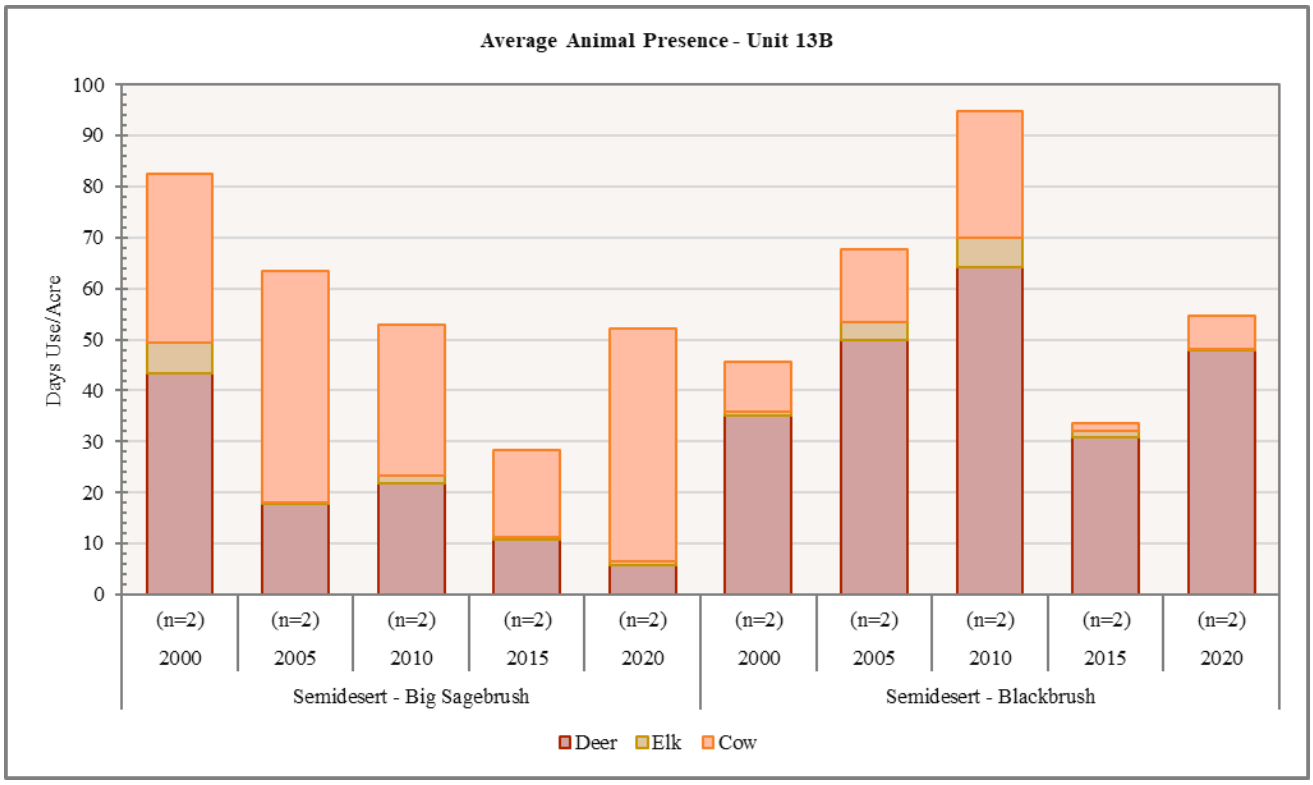
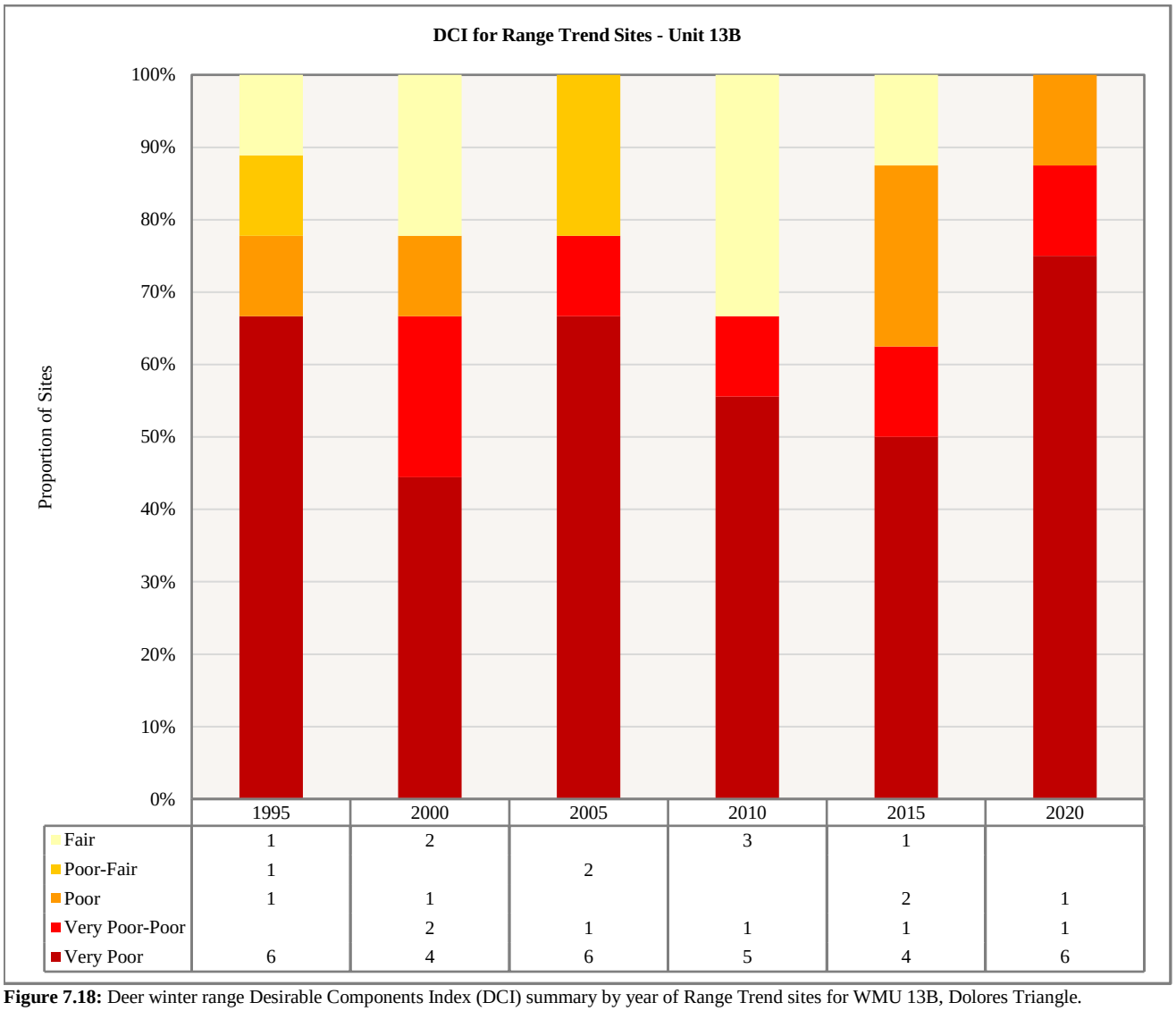


Figure 7.17: Average pellet transect data for Semidesert - Big Sagebrush and Semidesert - Blackbrush study sites in WMU 13B, Dolores Triangle.

Deer Winter Range Condition Assessment

The condition of deer winter range within the Dolores Triangle management unit has remained fairly consistent overall. However, deterioration of wintering conditions has been slight with averaged overall site conditions decreasing from very poor-poor in 1995 to very poor in 2020. Most sites remain in very poor condition from year to year. Both the Lower and Upper Westwater-Dolores (13B-1 and 13B-2) studies and the Ryan Creek (13B-6) and Steamboat Mesa South (13B-8) studies have remained in very poor condition with very little to no variance in wintering conditions from year to year. These poor conditional states can be attributed to the lack of preferred browse species and high amounts of annul grass covers on these sites following wildfires that initiated community transition. Buckhorn Draw (13B-5), Steamboat Mesa North (13B-7), and Steamboat East Bench (13B-9) studies all have remained very poor in most sampled years. The Red Cliffs (13B-4) and Fish Park (13B-3) studies have deer wintering ranges that average as fair to poor-fair, but provide an important source of browse for wintering deer. Fish Park and Steamboat East Bench have the highest degree of conditional change that span from fair to very poor range conditions, and may indicate that that these sites may respond positively to vegetation augmentation. As stated above, these low DCI scores across the unit are driven mainly by the lack of preferred browse cover and high amounts of annual grass cover found on these sites (**Figure 7.18**, **Table 7.8**).

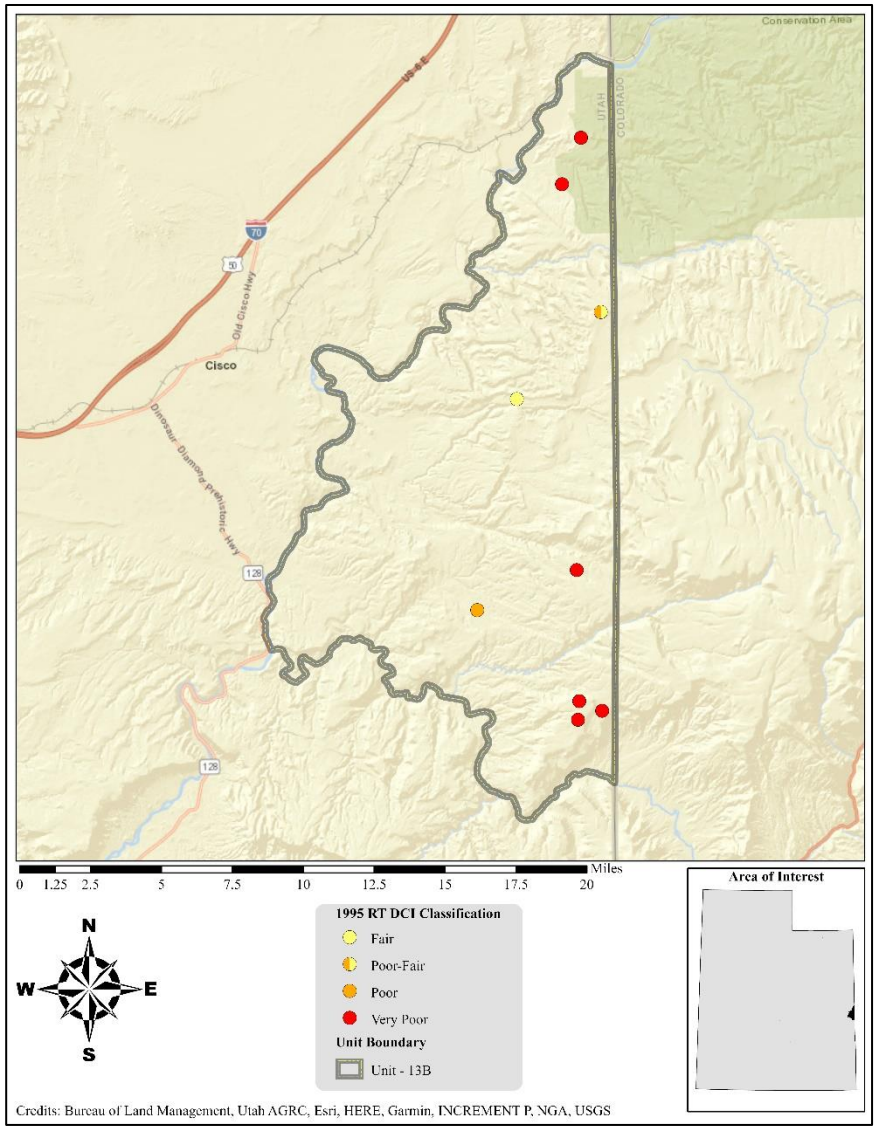


	1995	2000	2005	2010	2015	2020
Fair	1	2		3	1	
Poor-Fair	1		2			
Poor	1	1			2	1
Very Poor-Poor		2	1	1	1	1
Very Poor	6	4	6	5	4	6

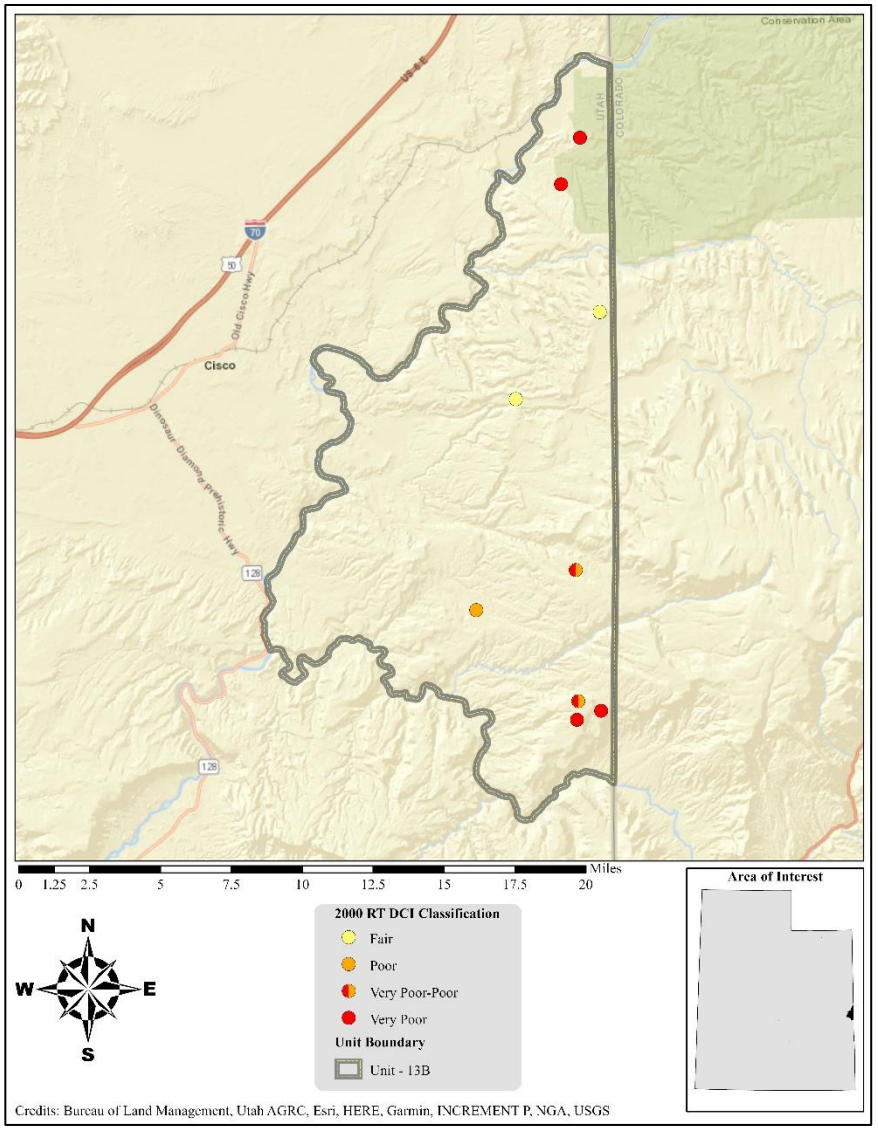
Figure 7.18: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 13B, Dolores Triangle.

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
13B-01	1995	2.1	0	0	4	-9.3	1.2	0	**-2.1**	**VP**
13B-01	2000	3	0	0	5.5	-9.3	0.3	0	**-0.5**	**VP**
13B-01	2005	0	0	0	2.8	-20	1.7	0	**-15.5**	**VP**
13B-01	2010	0	0	0	9	-17.5	5.8	0	**-2.7**	**VP**
13B-01	2015	0	0	0	10.6	-5.8	1.1	0	**5.8**	**VP**
13B-01	2020	0	0	0	9.8	-13.3	1.6	0	**-2**	**VP**
13B-02	1995	0	0	0	1.4	-14.4	0.6	0	**-12.4**	**VP**
13B-02	2000	0	0	0	4.2	-4.7	1.5	0	**0.9**	**VP**
13B-02	2005	0	0	0	2	-15.6	2.8	0	**-10.9**	**VP**
13B-02	2010	0	0	0	3.5	-20	1.8	0	**-14.7**	**VP**
13B-02	2015	0	0	0	19.5	-16.2	2.6	0	**5.9**	**VP**
13B-02	2020	0	0	0	9.5	-20	1.6	0	**-8.9**	**VP**
13B-03	1995	14.4	14.4	15	7.8	-4.2	2.7	0	**50.1**	**P-F**
13B-03	2000	20.7	12.3	7.9	13.5	-0.9	3.2	0	**56.8**	**F**
13B-03	2005	13.6	-2.2	0.9	21.8	-15.6	3.1	0	**21.5**	**VP**
13B-03	2010	13.6	7.3	4.8	30	-4.7	1.2	0	**52.2**	**F**
13B-03	2020	9.6	2	2.7	28.9	-7.4	1.2	0	**37**	**VP-P**
13B-04	1995	16.6	13.9	1.3	1	-3.4	0.1	0	**29.5**	**F**
13B-04	2000	14.4	13.7	1.5	1.8	-1.7	0	0	**29.7**	**F**
13B-04	2005	18.7	11.4	0.9	4	-11.5	0.2	0	**23.7**	**P-F**
13B-04	2010	19.3	13.6	2.3	2.2	-9.6	0.6	0	**28.3**	**F**
13B-04	2015	18.9	11.9	2.4	2	-4.6	0.1	0	**30.6**	**F**
13B-04	2020	15.1	0.2	1.2	2.7	-10.7	0.2	0	**8.7**	**VP-P**
13B-05	1995	1	0	0	14.5	-3.1	0.4	0	**12.9**	**P**
13B-05	2000	3.7	0	0	20.9	-2	0.1	0	**22.6**	**P**
13B-05	2005	1.8	0	0	0.4	-20	0.5	0	**-17.3**	**VP**
13B-05	2010	2	0	0	7.5	-14.5	0.8	0	**-4.2**	**VP**
13B-05	2015	2.3	0	0	23.3	-9.5	0.2	0	**16.2**	**P**
13B-05	2020	1.9	0	0	1.9	-13.7	0.1	0	**-9.8**	**VP**
13B-06	1995	0.2	0	0	12.7	-13.8	5.3	0	**4.4**	**VP**
13B-06	2000	0.2	0	0	30	-1.3	5.1	0	**34**	**VP-P**
13B-06	2005	1.3	0	0	19.7	-6.9	9.4	0	**23.4**	**VP**
13B-06	2010	1.1	0	0	30	-10.7	2.4	0	**22.9**	**VP**
13B-06	2015	1.1	0	0	30	-0.8	4.4	0	**34.8**	**VP-P**
13B-06	2020	1.8	0	0	30	-9.2	3.5	0	**26**	**VP**
13B-07	1995	1.9	0	0	18.4	-1	6.7	0	**26**	**VP**
13B-07	2000	2	0	0	30	0	4.2	0	**36.1**	**VP-P**
13B-07	2005	2	0	0	30	-1.6	6.6	0	**37**	**VP-P**
13B-07	2010	0.8	0	0	30	-2.6	5.5	0	**33.8**	**VP-P**
13B-07	2015	4.3	0	0	30	-0.3	6.2	0	**40.2**	**P**
13B-08	1995	1.9	0	0	6	-12	4.1	0	**0**	**VP**
13B-08	2000	2.9	0	0	30	-2.3	1.4	0	**32**	**VP**
13B-08	2005	4	0	0	8.7	-20	6.2	0	**-1.1**	**VP**
13B-08	2010	0	0	0	9.4	-11	10	0	**8.4**	**VP**
13B-08	2015	0	0	0	27.9	-20	10	0	**17.9**	**VP**
13B-08	2020	0	0	0	20.6	-20	10	0	**10.6**	**VP**
13B-09	1995	6.5	0	0	6.9	-2.3	2.8	0	**13.9**	**VP**
13B-09	2000	5.9	0	0	15.5	-0.1	3.3	0	**24.7**	**VP**
13B-09	2005	8.2	11	15	10.9	-2	7.4	0	**50.5**	**P-F**
13B-09	2010	7.7	12.5	15	14.6	-1.9	5.6	0	**53.5**	**F**
13B-09	2015	3.5	0	0	3.6	-0.1	1.7	0	**8.7**	**VP**
13B-09	2020	5.5	0	0	4.2	-0.1	2.8	0	**12.4**	**VP**

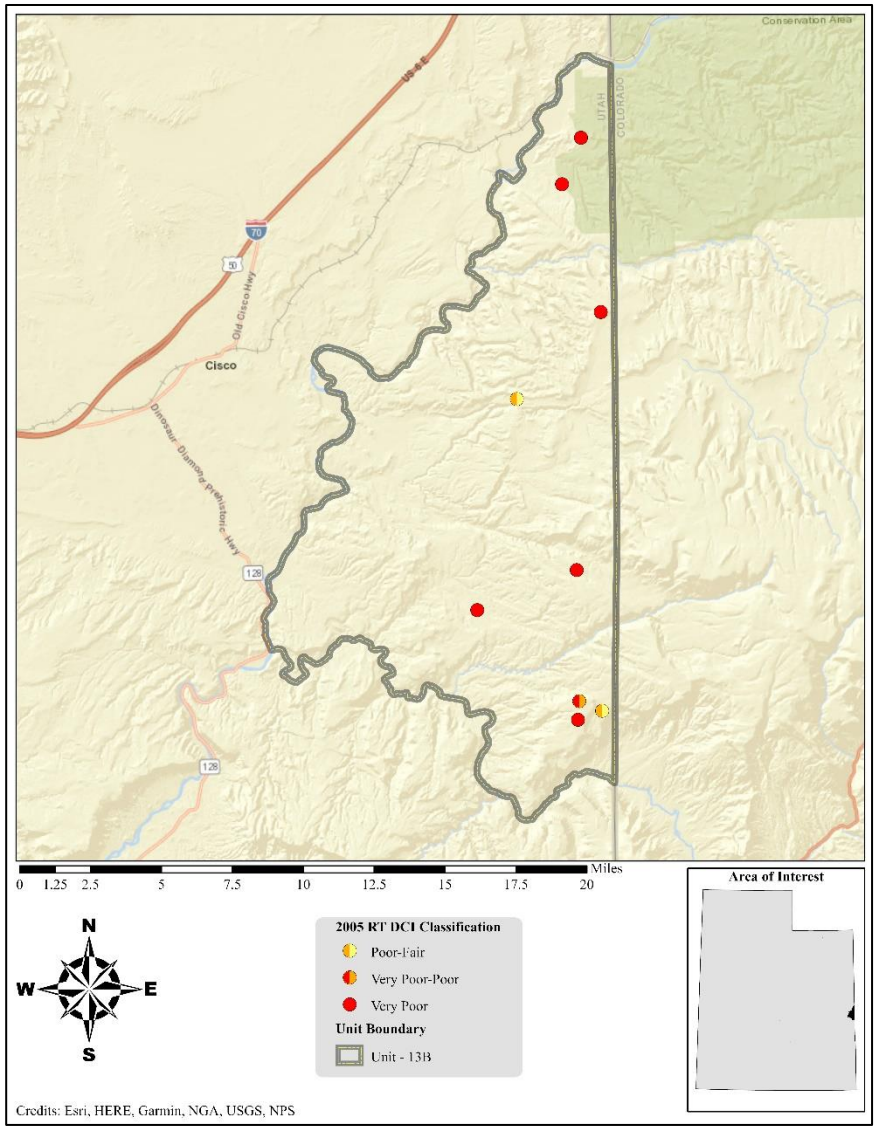
Table 7.8: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 13B, Dolores Triangle. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. *Studies with an asterisk have been suspended.



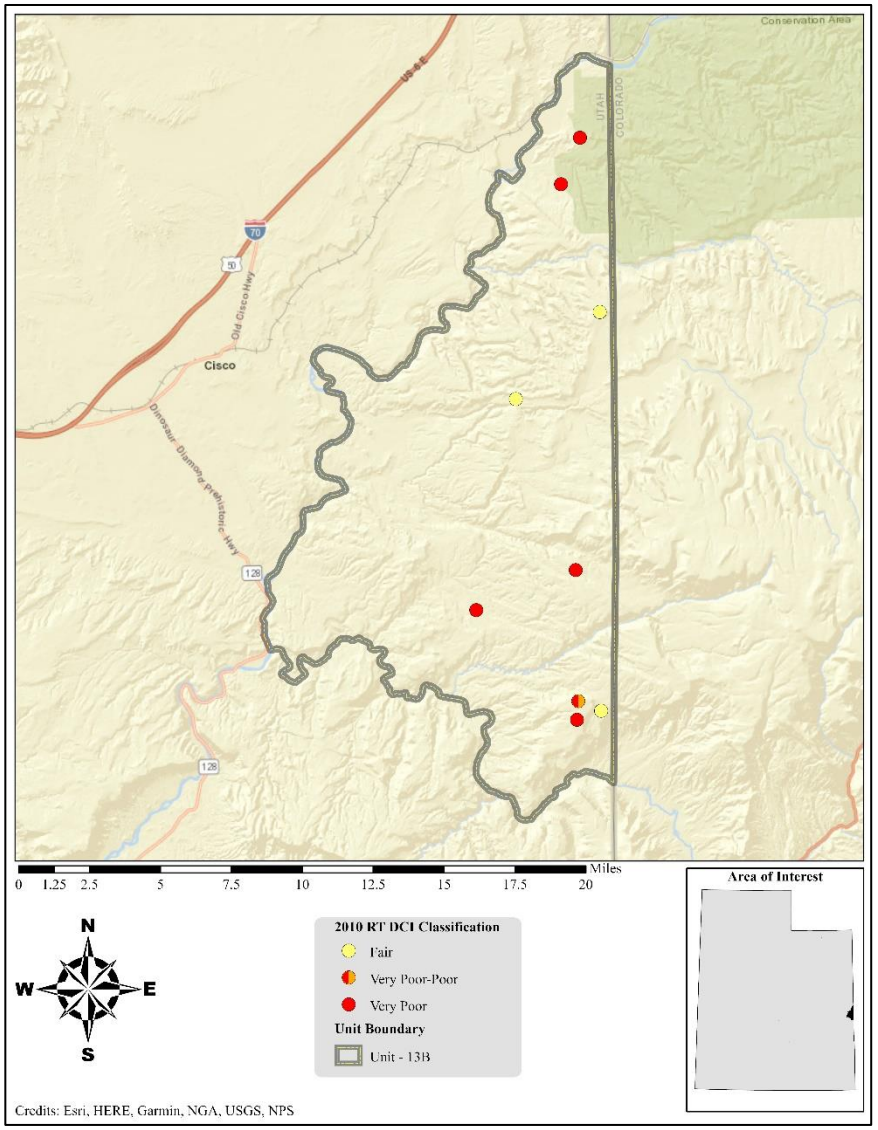
Map 7.7: 1995 Desirable Components Index (DCI) ranking distribution by study site for WMU 13B, Dolores Triangle.



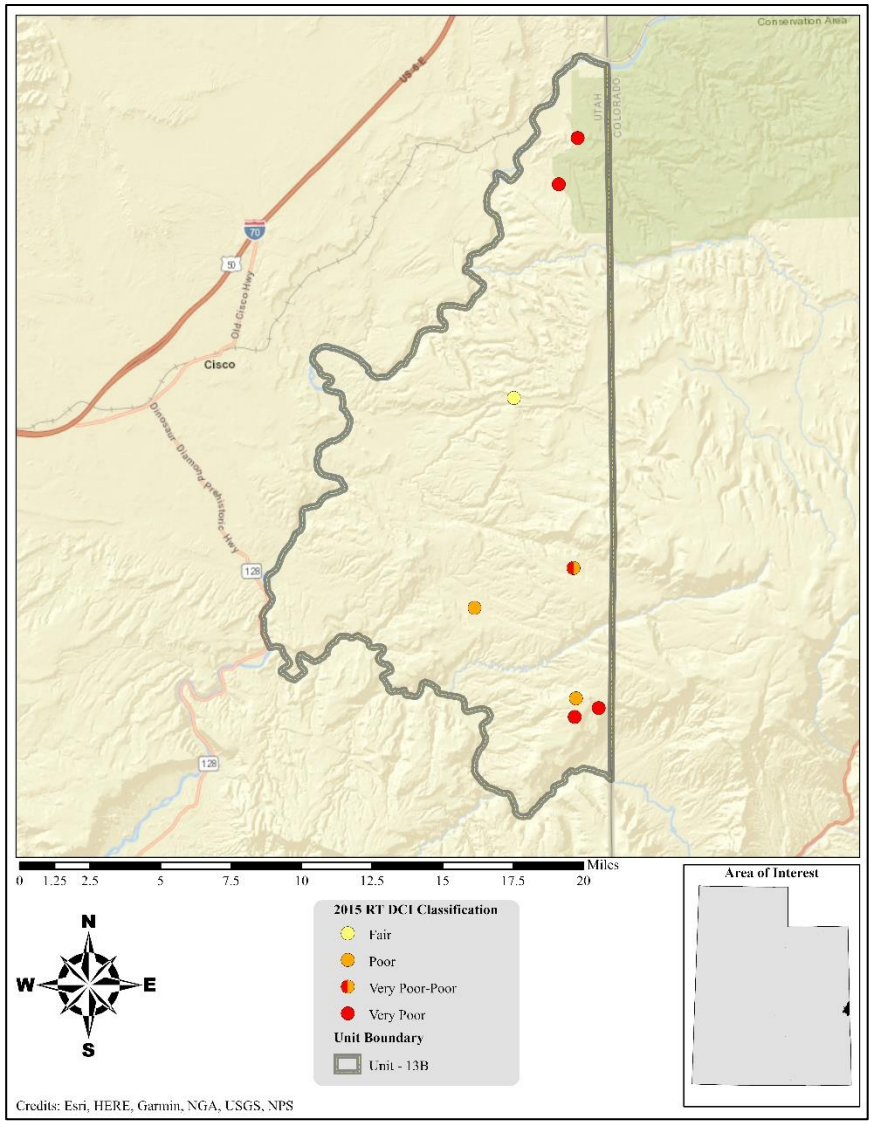
Map 7.8: 2000 Desirable Components Index (DCI) ranking distribution by study site for WMU 13B, Dolores Triangle.



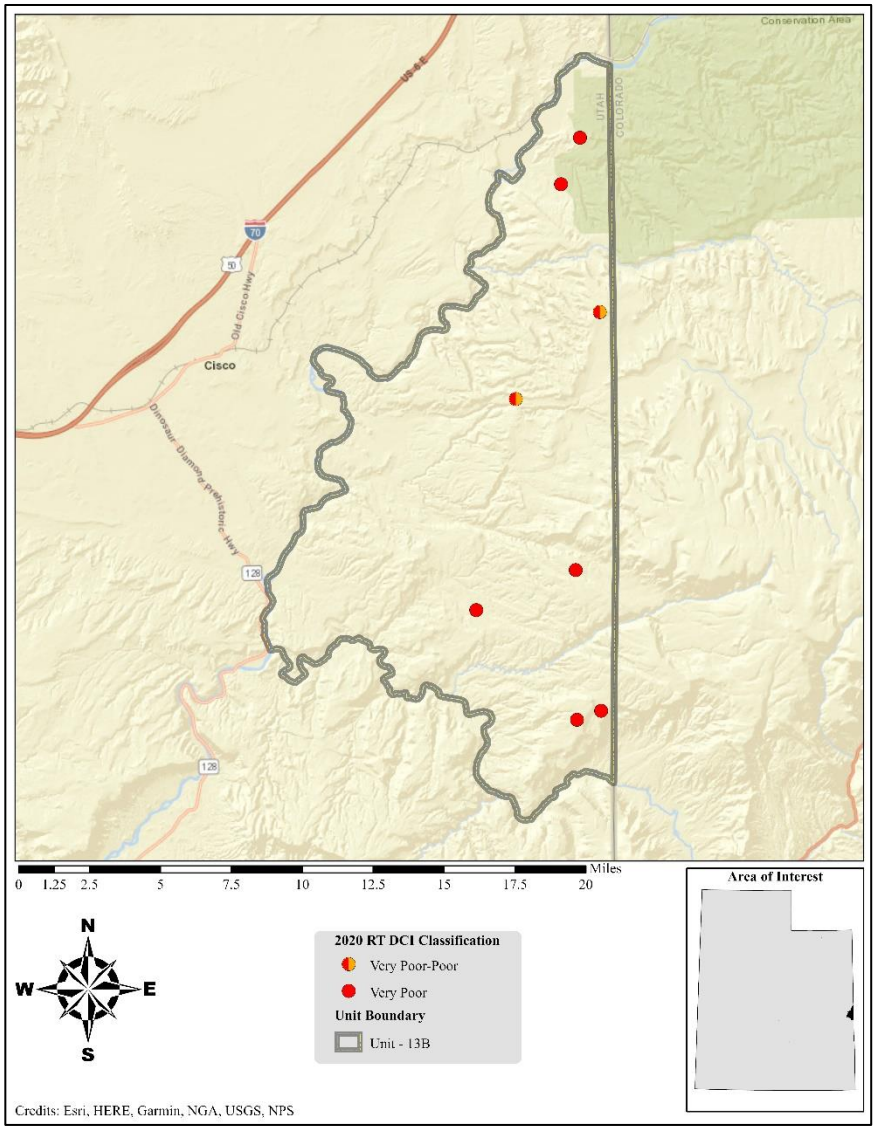
Map 7.9: 2005 Desirable Components Index (DCI) ranking distribution by study site for WMU 13B, Dolores Triangle.



Map 7.10: 2010 Desirable Components Index (DCI) ranking distribution by study site for WMU 13B, Dolores Triangle.



Map 7.11: 2015 Desirable Components Index (DCI) ranking distribution by study site for WMU 13B, Dolores Triangle.



Map 7.12: 2020 Desirable Components Index (DCI) ranking distribution by study site for WMU 13B, Dolores Triangle.

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
13B-1	Lower Westwater-Dolores	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Climate Change	High	Loss of habitat and shift in ecological community type
13B-2	Upper Westwater-Dolores	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Climate Change	High	Loss of habitat and shift in ecological community type
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
13B-3	Fish Park	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
13B-4	Red Cliffs	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
13B-5	Buckhorn Draw	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Climate Change	Medium	Loss of habitat and shift in ecological community type
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
13B-6	Ryan Creek	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
13B-7	Steamboat Mesa North	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
13B-8	Steamboat Mesa South	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
13B-9	Steamboat East Bench	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	High	Reduced understory shrub and herbaceous vigor
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity

Table 7.9: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 13B, Delores Triangle. 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

Upland (Big Sagebrush)

These mid elevation sagebrush ecological sites are generally considered to be in very poor condition for deer winter range habitat on the Dolores Triangle management unit. This community supports an undiversified herbaceous understory of introduced perennial and annual grasses that provide little forage during winter months. This undiversified structure on the Fish Park and Steamboat Mesa North studies can partially be attributed to the presence of crested wheatgrass (*Agropyron cristatum*). As an introduced perennial grass, crested wheatgrass can be competitively aggressive and capable of reducing diversity and abundance of more desirable native species, and is considered to be a high-level threat. In addition, these upland communities are under a high-level threat from introduced annual grasses, primarily cheatgrass (*Bromus tectorum*), on the Fish Park and Steamboat Mesa North and South study sites. Increased amounts of cheatgrass can boost fuel loads and increase the threat of wildfire in these communities. Though pinyon and juniper tree encroachment in

these communities presents a low to medium threat, the Fish Park and Steamboat Mesa North sites are currently in Phase II of woodland succession. This phase is indicated by reduced shrub and herbaceous understory health on the previously mentioned sites.

A number of land treatment types are needed to address the current threats in sites of this upland sagebrush ecological type. The most pressing need is cheatgrass reduction treatments, which need to occur across sites of this ecological type. When reseeding is necessary to restore herbaceous species in these communities, care should be taken in species selection and preference should be given to native grass species when possible. The introduced perennial grass crested wheatgrass is often seeded after a treatment and although it provides valuable forage, this and other introduced grass species can often be aggressive at higher elevations and can reduce the diversity and abundance of other more desirable native grass and forb species. Work to reduce pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should also continue in these communities, and additional care should be taken in selecting less disruptive treatment methods that will not increase annual grass loads.

Upland (Pinyon/Utah Juniper)

Sites of this mid elevation upland ecological type support perennial grass communities and are generally considered to be in very poor condition for deer winter range habitat on this unit. The introduced perennial grass crested wheatgrass (*Agropyron cristatum*) dominates these sites and presents a high-level threat to community structure and function. Although this species provides valuable forage, this and other introduced grass species can often be competitively aggressive at higher elevations, which can lead to reduced diversity and abundance of other more desirable native grass and forb species. Sites of this community type are highly threatened by invasion from annual grasses, primarily cheatgrass (*Bromus tectorum*). Increased amounts of cheatgrass can boost fuel loads and exacerbate the threat of wildfire in these communities. Finally, as a representative for this upland community, the Steamboat East Bench study site is prone to infilling by twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) trees, and is considered to be transitioning from Phase II to Phase III of woodland succession. While infilling by pinyon-juniper trees marks later successional states within this community type, it reduces browse and herbaceous cover and 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 or problematic to community function. Areas with high cheatgrass cover and abundance will likely need chemical treatments to control fuel loads and reduce fire recurrence. When implementing disturbances to reduce tree cover, care should be taken to use methods that do not encourage increases in annual grass. It is advised that selective removal of trees be done in areas of late stage woodland succession to promote earlier successional states that are defined by a more diversified plant communities and are more beneficial to wildlife. In addition, it is recommended that monitoring of these sites continue in order to track and mitigate potential threats to the loss of species diversity.

Semidesert (Big Sagebrush)

The lower elevation semidesert Wyoming big sagebrush ecological type is represented by the Upper and Lower Westwater-Dolores studies which are generally considered to be in very poor condition for deer winter range habitat on the unit. The sampled communities support annual and perennial grass populations that provide valuable forage in moderate to severe winters. However, as illustrated on the Westwater-Dolores studies, sites of this community type are susceptible to invasion from annual grasses, primarily cheatgrass (*Bromus tectorum*), which pose a high-level threat to these communities' functional potential. High amounts of cheatgrass can increase fuel loads and increase the threat of wildfire within these communities. Pellet transect data indicates that high cattle use may be occurring on the Upper and Lower Westwater-Dolores sites. Heavy cattle usage may have the potential to lead to reduced diversity of desirable grasses and forbs.

Efforts should be made to revitalize the browse and herbaceous functional groups for this ecological potential. If a treatment to rejuvenate sagebrush occurs, care should be taken in selecting treatment methods that will not increase annual grass loads. Moreover, treatments to reduce annual grass are necessary on and near the study sites, which will likely need repeated chemical treatments. Further investigation on the Westwater-Dolores

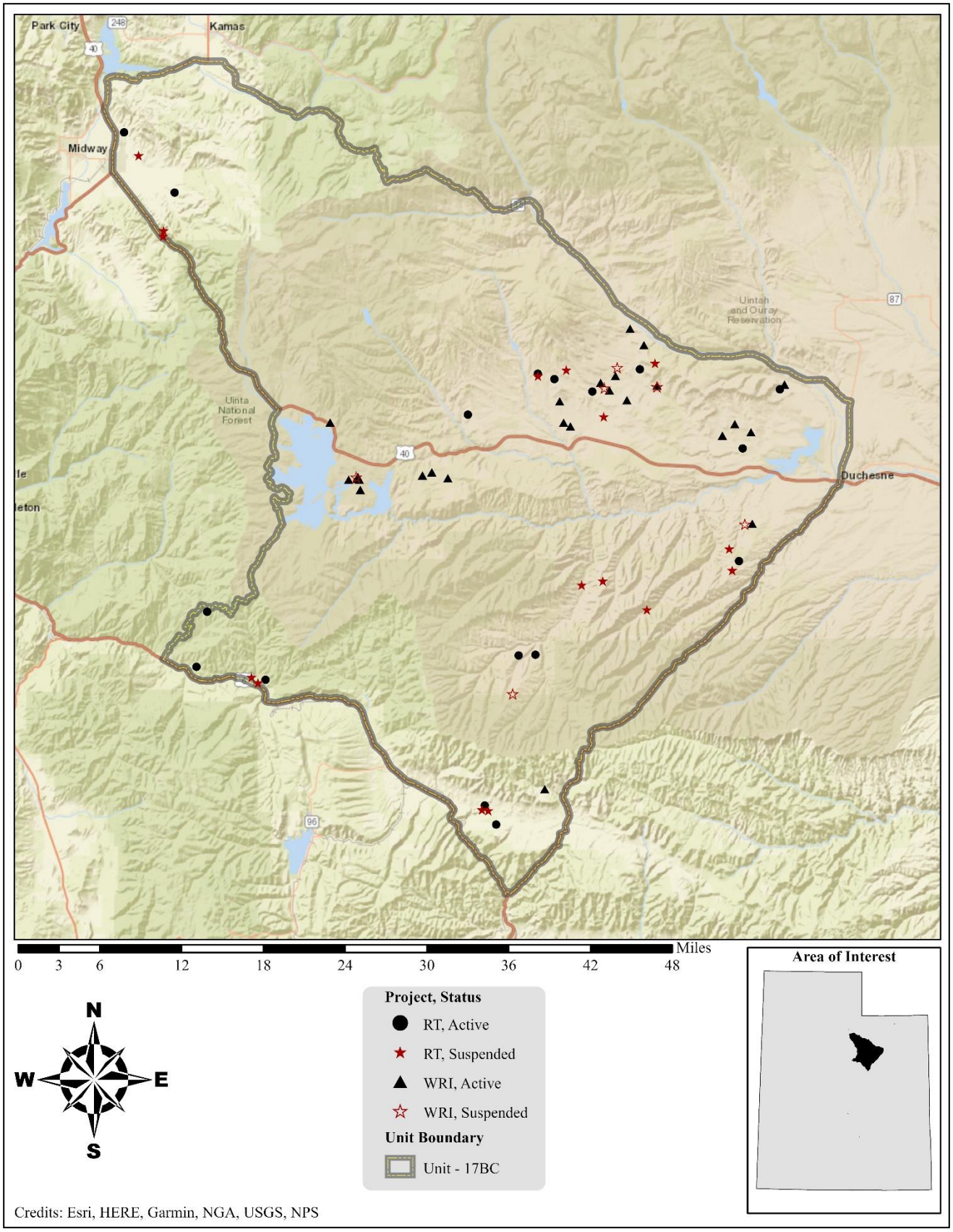
studies and surrounding areas is recommended to determine if high cattle use is occurring across the Buckhorn allotment and associated pastures.

Semidesert (Blackbrush)

These lower elevation semidesert blackbrush communities are generally considered to be in very poor condition for deer winter range habitat on the Dolores Triangle management unit. These communities support, or have the potential to support, shrub populations that provide valuable browse in moderate to severe winters. The Red Cliffs site maintains a stable, mature population of blackbrush (*Coleogyne ramosissima*), while the Buckhorn Draw site is deplete of valuable browse species. These study sites are at a high-level of threat from annual grasses invasion, primarily by cheatgrass (*Bromus tectorum*). Increased amounts of cheatgrass provide fine fuel loads and exacerbate the risk of wildfire within these communities. Although it poses a low-level threat, sites of this ecological potential are prone to encroachment from twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) trees; both sites mentioned above are considered to be in Phase I of woodland succession. Pinyon and juniper encroachment can reduce understory shrub and herbaceous health if not addressed. Pellet transect data indicates that high use by deer and/or cattle may be occurring on the sites mentioned above. Overuse by these animals poses a medium to high-level threat to the vigor and diversity of the shrub and herbaceous component. Finally, climate change is a medium-level threat on the Buckhorn Draw site. 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.

Treatments to reduce annual grass are necessary on these sites and possibly in areas that are prone to cheatgrass invasion. Due to the amount of cheatgrass on these sites, they will likely need to be treated through repeated chemical treatments. Moreover, when reseeding becomes necessary to restore diverse herbaceous communities, care should be taken in seed selection and preference should be given to native species. In addition, 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 Red Cliffs and Buckhorn Draw sites and surrounding areas may be necessary to determine if high deer and/or cattle usage is occurring across the associated wildlife range and cattle allotments. Finally, it may be beneficial to review management strategies in response to ecological shifts caused by climate change.

8. WILDLIFE MANAGEMENT UNITS 17B, 17C – WASATCH MOUNTAINS – CURRANT CREEK - AVINTAQUIN



WILDLIFE MANAGEMENT UNIT 17B, 17C – WASATCH MOUNTAINS, CURRANT CREEK - AVINTAQUIN

Boundary Description

Wasatch, Summit, Daggett, Uintah, Duchesne counties - Boundary begins at the junction of Interstate 15 and Interstate 80 in Salt Lake City, then east on I-80 to Highway US-40; south on US-40 to State Route (SR)-32; east on SR-32 to SR-35; southeast on SR-35 to SR-87; south on SR-87 to Duchesne and Highway US-191; south on US-191 to Highway US-6, northeast on US-6 to I-15; north on I-15 to I-80 in Salt Lake City and the beginning point.

Management Unit Description

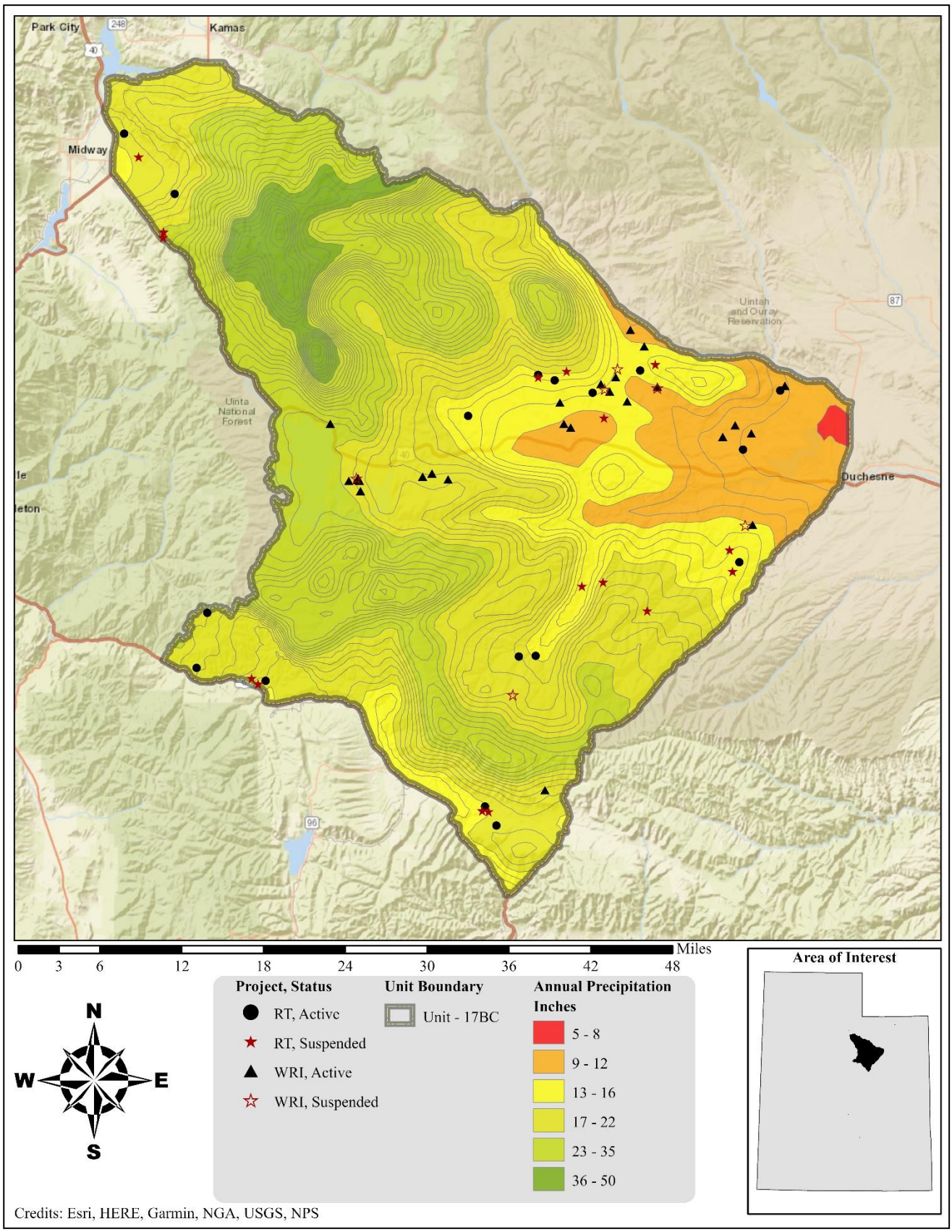
Climate Data

The 30-year (1981-2010) annual precipitation PRISM model shows that unit precipitation ranges from 8 inches in the eastern portion (north of the city of Duchesne) to 43 inches on the peaks of the Wasatch Mountains. All of the Range Trend and WRI monitoring studies on the unit occur within the 9-20 inch precipitation zone (**Map 8.1**) (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 Northern Mountains and Uinta Basin divisions (Divisions 5 and 6).

The mean annual PDSI of the Northern Mountains division displayed years of moderate to extreme drought from 1988-1990, 2000-2003, 2012-2013, 2018, and 2020. The mean annual PDSI displayed moderately to extremely wet years from 1983-1986, 1995, 1997-1998, 2005, and 2011 (**Figure 8.1a**). 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 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, 2012-2013, and 2020; moderately to extremely wet years were displayed in 1983-1986, 1995, and 1997-1998 (**Figure 8.1b**) (Time Series Data, 2020).

The mean annual PDSI of the Uinta Basin division displayed years of moderate to extreme drought from 1989-1991, 2000, 2002-2003, 2012-2014, 2018, and 2020. The mean annual PDSI displayed moderately to extremely wet years from 1983-1985, 1993, 1997-1998, and 2005. The mean spring (March-May) PDSI displayed years of moderate to extreme drought in 1989-1992, 2002-2004, 2012-2014, and 2018. Moderately to extremely wet years for this time period were displayed in 1983-1985, 1993, 1995, 1998, 2005, 2011, and 2019 (**Figure 8.2a**). The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1989-1990, 2001-2003, 2007, 2012, 2017-2018, and 2020; moderately to extremely wet years were displayed in 1983-1986, 1993, and 1997-1998 (**Figure 8.2b**) (Time Series Data, 2020)



Map 8.1: The 1981-2010 PRISM Precipitation Model for WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin (PRISM Climate Group, Oregon State University, 2013).

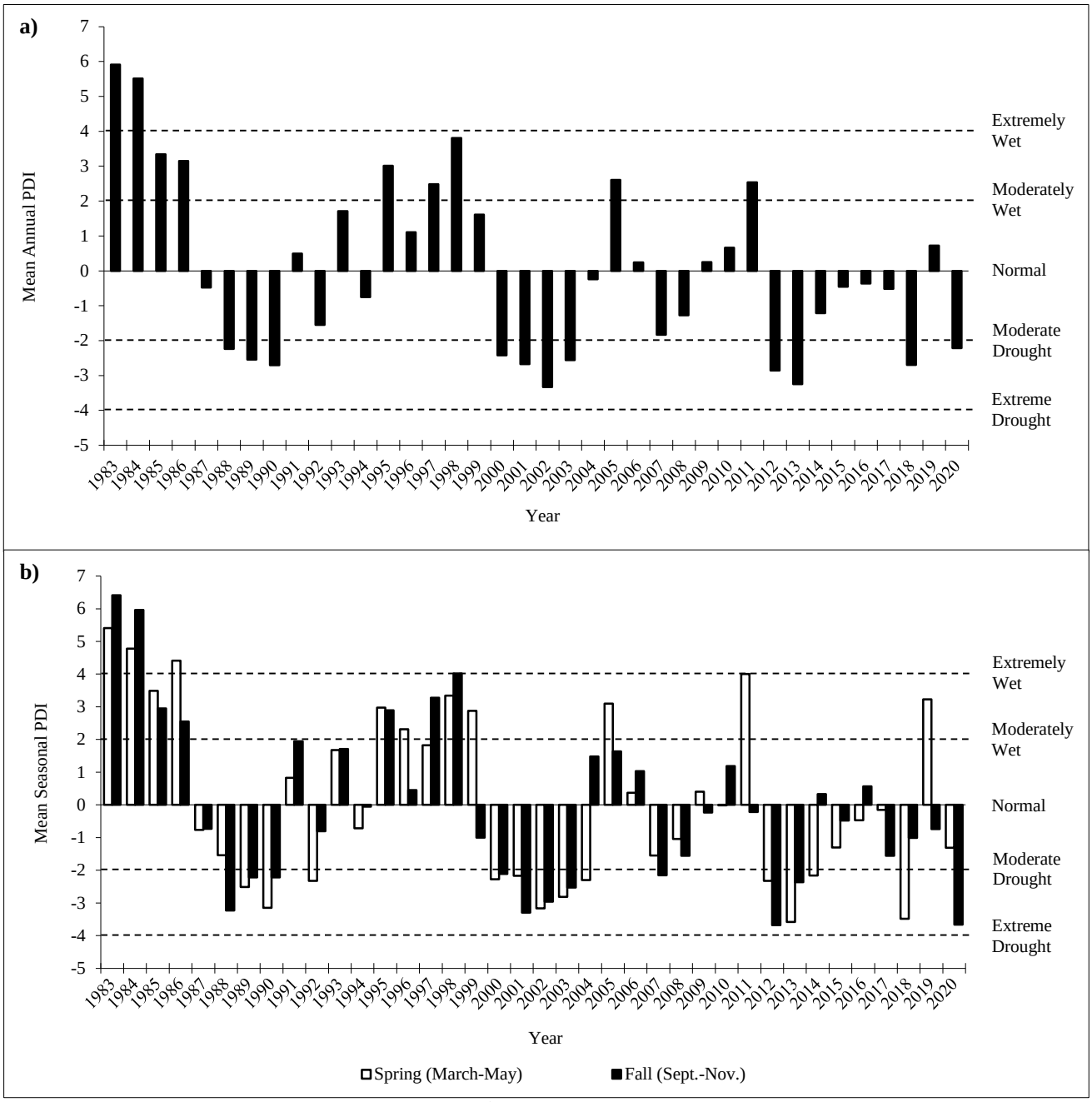


Figure 8.1: The 1983-2020 Palmer Drought Severity Index (PDSI) for the Northern Mountains division (Division 5). The PDSI is based on climate data gathered from 1895 to 2020. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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).

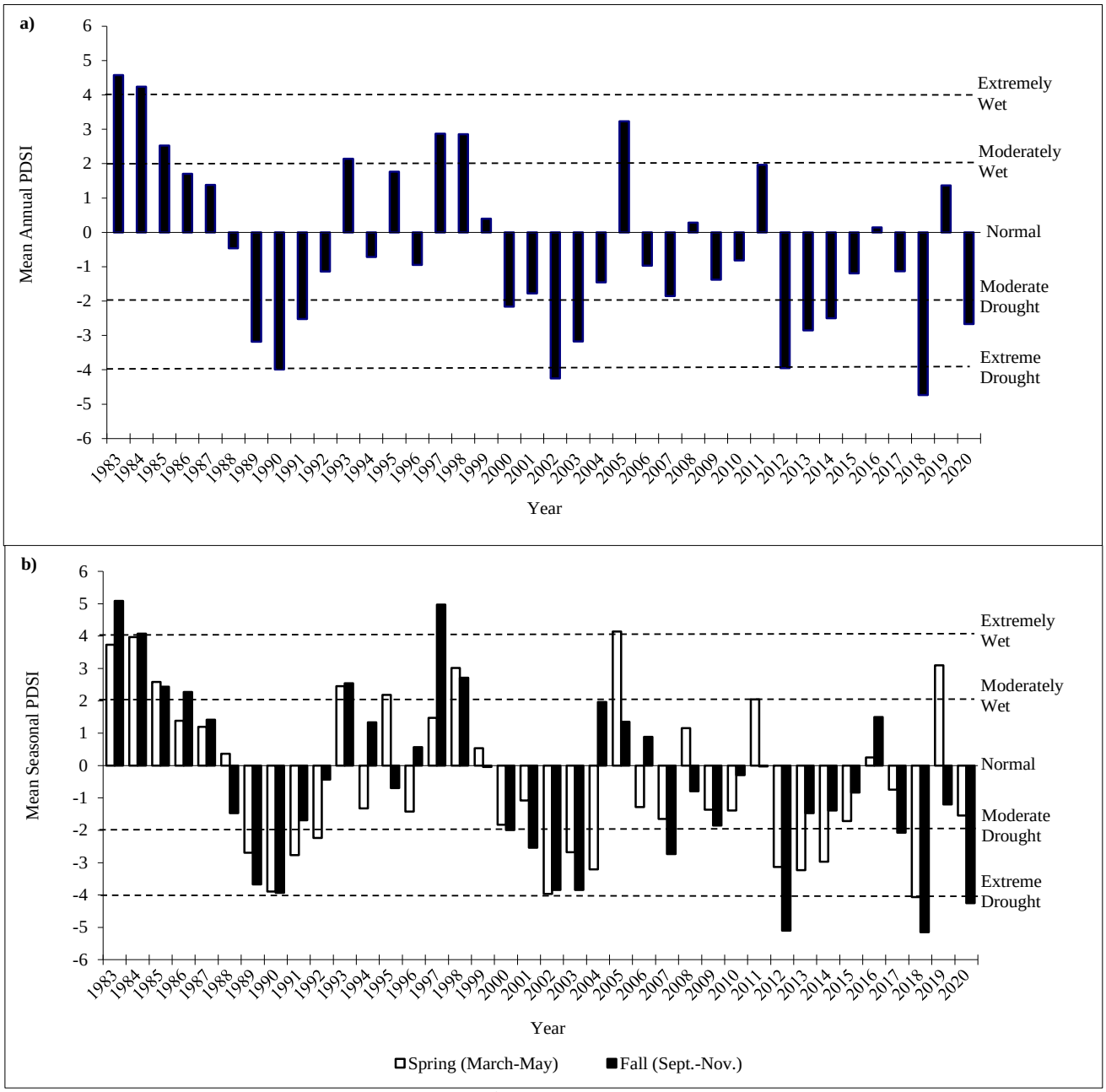


Figure 8.2: The 1983-2020 Palmer Drought Severity Index (PDSI) for the Uinta Basin division (Division 6). The PDSI is based on climate data gathered from 1895 to 2020. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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

Wildlife Management Unit 17 is divided into six smaller, more manageable subunits. These are Diamond Fork (17A), Timpanogos (17A), Salt Lake (17A), Heber (17A), and Currant Creek-Avintaquin (17B and 17C). The Northeastern Region 2020 report covers only the Currant Creek-Avintaquin subunits. The Salt Lake subunit no longer contains range trend studies due to lack of access and development. The Diamond Fork, Timpanogos, and Heber subunits are monitored as part of the Central Region rotation.

Subunits 17B and 17C contains Starvation and Currant Creek Reservoirs and portions of Ashley National Forest. Major drainages include the West Fork Duchesne River, Currant Creek, Red Creek, the Strawberry River, and Avintaquin Creek. The town of Fruitland also falls within the boundaries of Unit 17. Elevation of this unit ranges from 5,600 near the city of Duchesne to over 10,000 feet in the Wasatch Mountains.

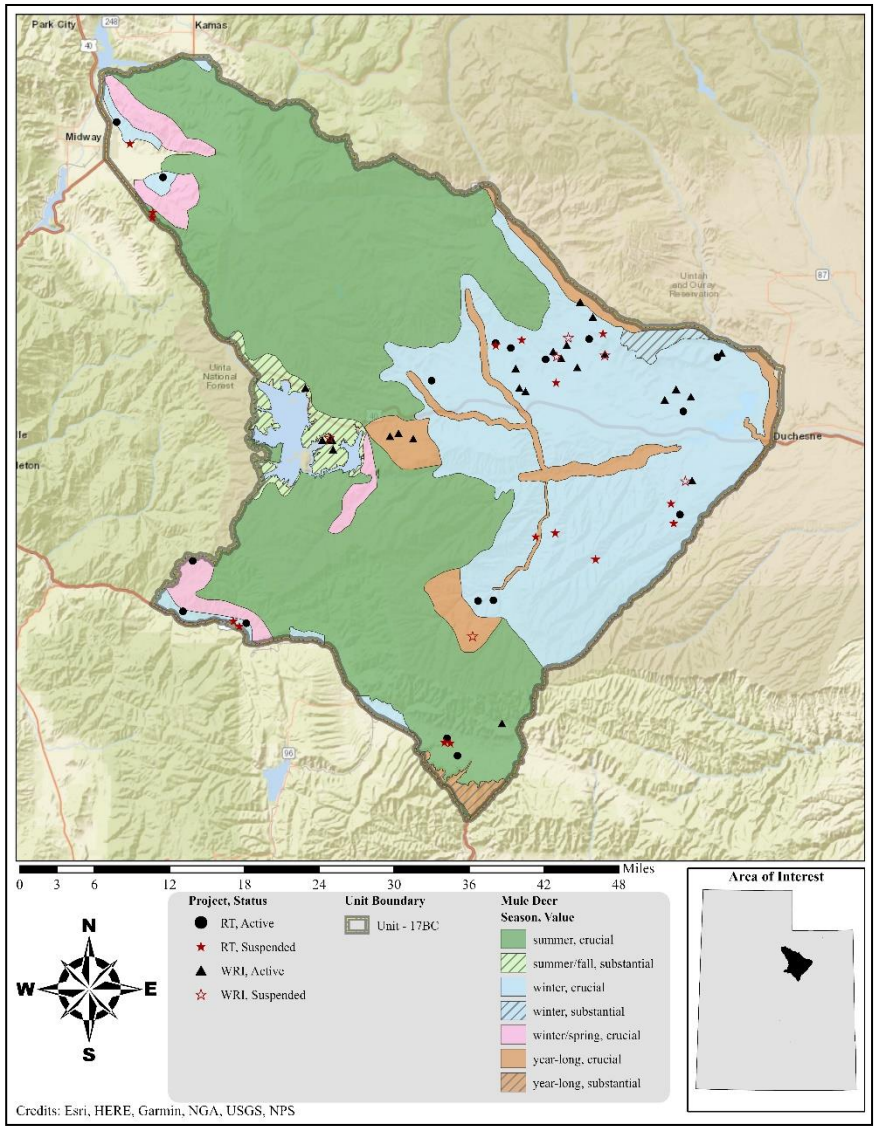
Big Game Habitat

Over 1 million acres within the Currant Creek-Avintaquin subunits are considered to be deer range with 34% classified as winter range, 54% as summer range, 6% as year-long range, and approximately 6% as transitional ranges (**Table 8.1**, **Map 8.2**).

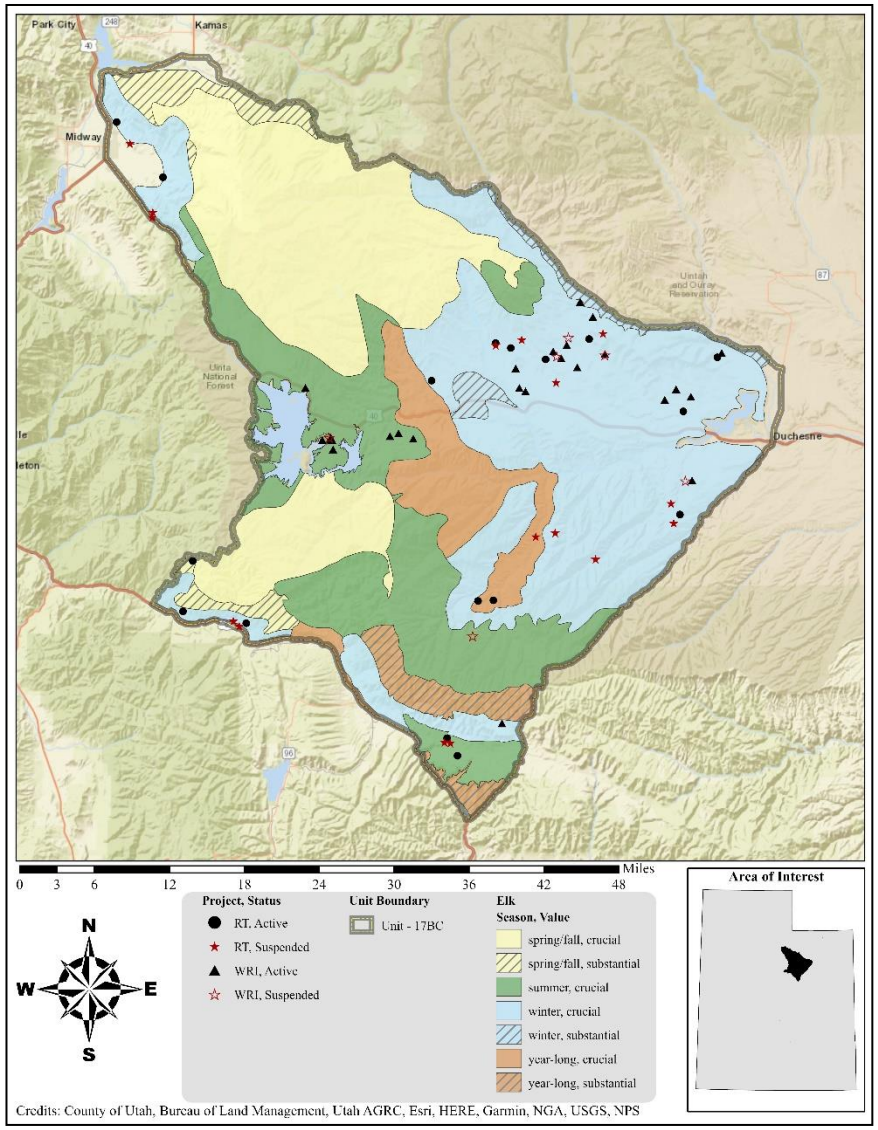
Forty six percent of deer winter range is on private land, while 21% is managed by the Utah Division of Wildlife Resources (UDWR), 20% is tribal land, 10% is administered by the U.S. Forest Service (USFS), 2% is managed by Utah State Parks (USP), 1% is owned by the Utah School and Institutional Trust Lands Administration (SITLA), and less than 1% is administered by the Bureau of Land Management (BLM) (**Table 8.2**, **Map 8.2**, **Map 8.6**). There are nearly 1 million acres estimated as elk range within the Currant Creek-Avintaquin subunits with 39% classified as winter range, 21% as summer range, 30% as transitional range, and 10% as year-long range (**Table 8.3**, **Map 8.3**). Private landowners administer 53% of the elk wintering range, UDWR 20%, tribal 16%, USFS 9%, and SITLA 2%. The BLM, USP, and Utah Department of Transportation (UDOT) administers less than 1% of elk winter range (**Table 8.3**, **Map 8.3**, **Map 8.6**). As most of the winter range in this unit now lies on private land, managing wildlife populations is a challenge.

According to Landfire Existing Vegetation Coverage models, shrublands comprise 31% of the unit. Of the shrubland, combined sagebrush shrubland and steppe make up nearly 22% of land coverage for this unit, which is considered key habitat for mule deer (**Table 8.6**).

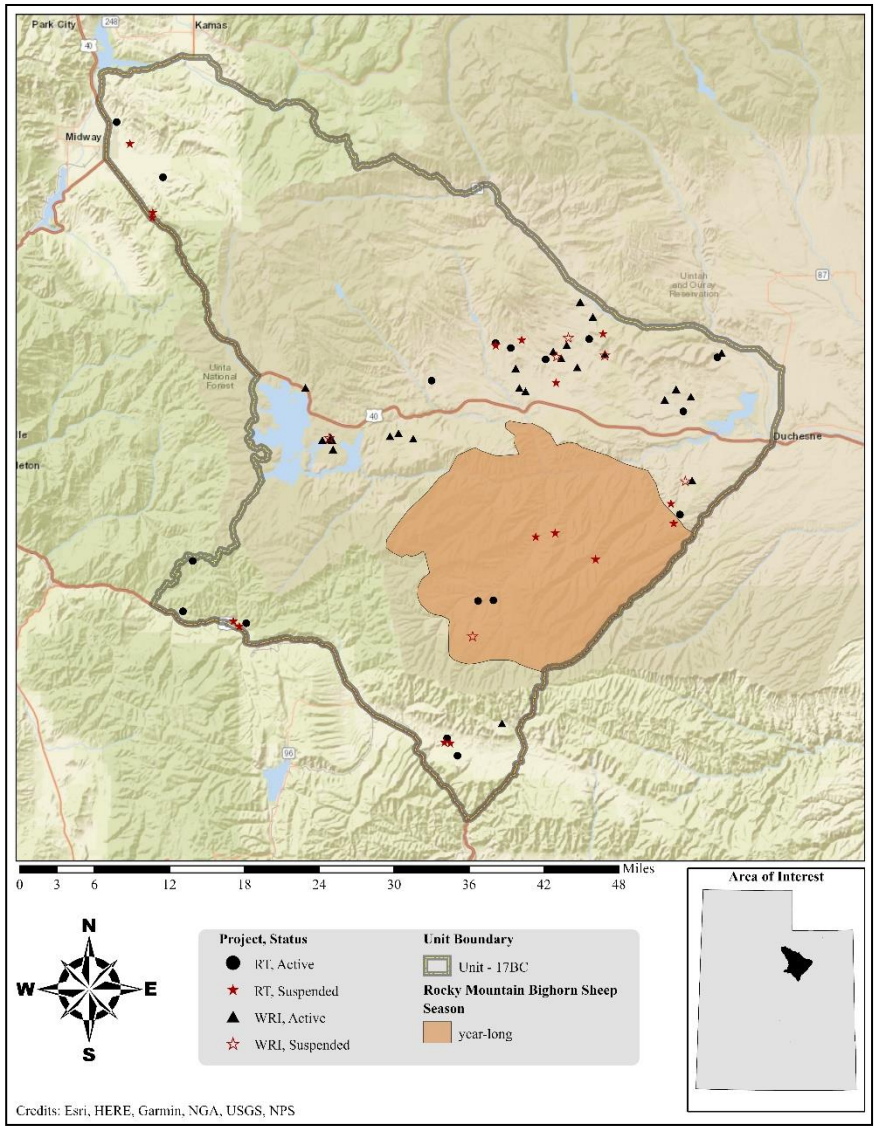
The areas that are considered to be crucial deer winter habitat include the lower foothills on the south and east side of Tabby Mountain, Blacktail Mountain, Grey Wolf Mountain, Santaquin Draw, Beer Springs, Rabbit Gulch, Sink Draw, the lower ends of Little Horse Ridge and Horse Ridge, West Bench, and the lower ridges above the Strawberry River Valley.



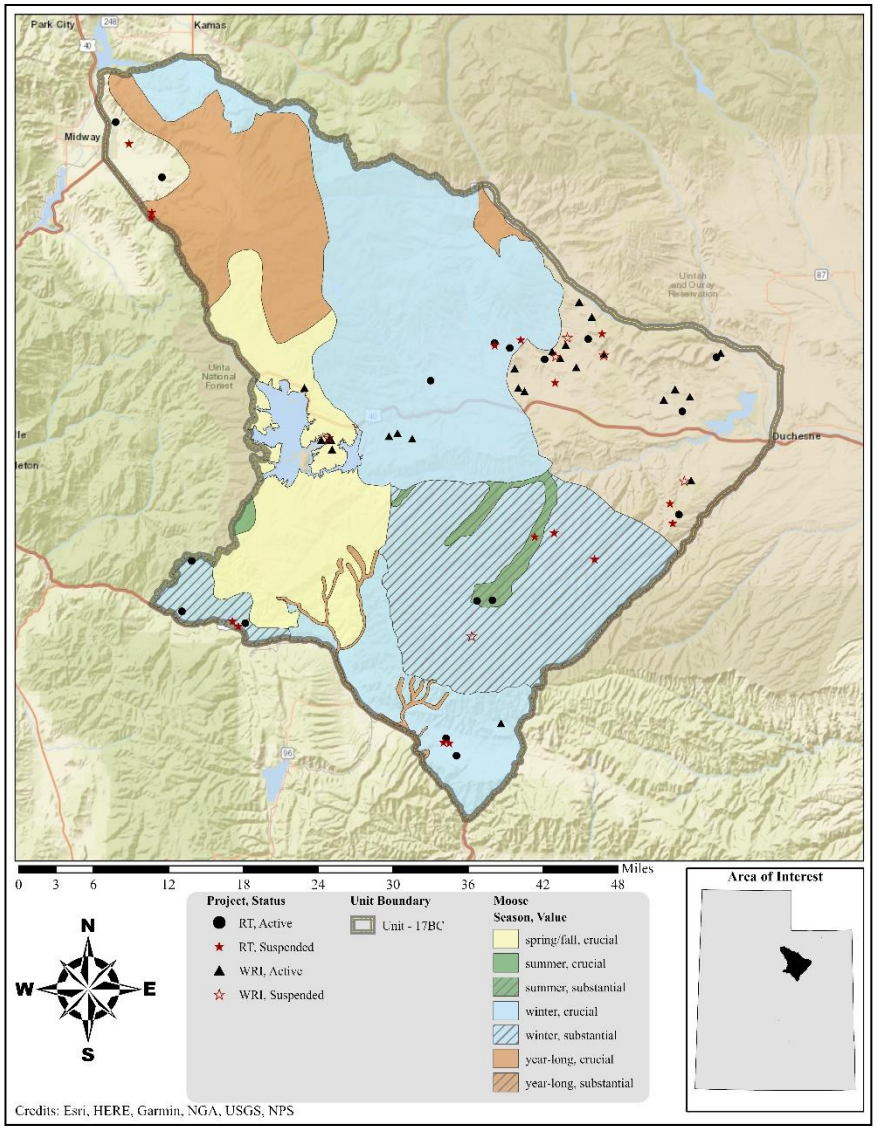
Map 8.2: Estimated mule deer habitat by season and value for WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.



Map 8.3: Estimated elk habitat by season and value for WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.



Map 8.4: Estimated Rocky Mountain bighorn sheep habitat by season and value for WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.



Map 8.5: Estimated moose habitat by season and value for WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

	Year Long Range		Summer Range		Winter Range		Winter/Spring Range		Summer/Fall Range	
Species	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
Mule Deer	64,015	6%	547,675	54%	345,092	34%	36,463	4%	21,556	2%
Elk	103,346	10%	208,287	21%	387,719	39%	0	0%	0	0%
Moose	132,604	16%	18,128	2%	542,186	66%	0	0%	0	0%
Bighorn Sheep	193,650	100%	0	0%	0	0%	0	0%	0	0%

	Spring/Fall Range	
Species	*Area (acres)*	*%*
Mule Deer	0	0%
Elk	294,981	30%
Moose	130,436	16%
Bighorn Sheep	0	0%

Table 8.1: Estimated mule deer, elk, moose, and Rocky Mountain bighorn sheep habitat acreage by season for WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

	Year Long Range		Summer Range		Winter Range		Winter/Spring Range		Summer/Fall Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	4,480	7%	13,016	2%	305	<1%	38	<1%	0	0%
Private	36,290	57%	161,937	30%	159,004	46%	21,789	60%	2,097	10%
SITLA	74	<1%	30,860	6%	2,544	1%	524	1%	0	0%
UDOT	15	<1%	20	<1%	13	<1%	0	0%	0	0%
USFS	1,626	3%	314,169	57%	34,215	10%	13,701	38%	18,691	87%
USP	414	<1%	0	0%	6,950	2%	0	0%	0	0%
UDWR	16,027	25%	25,282	5%	73,454	21%	411	1%	0	0%
Tribal	5,089	8%	2,391	<1%	68,607	20%	0	0%	769	3%
Total	64,015	**100%**	547,675	**100%**	345,092	**100%**	36,463	**100%**	21,556	**100%**

Table 8.2: Estimated mule deer habitat acreage by season and ownership for WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

	Year Long Range		Summer Range		Winter Range		Spring/Fall Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	8,776	8%	6,668	3%	2,366	<1%	0	0%
Private	49,251	48%	46,253	22%	204,130	53%	70,588	24%
SITLA	1,621	2%	3,718	2%	6,736	2%	21,958	7%
UDOT	7	<1%	<1	<1%	24	<1%	0	0%
USP	0	0%	0	0%	1,170	<1%	0	0%
USFS	21,264	21%	131,671	63%	34,061	9%	194,368	66%
UDWR	13,320	13%	19,164	9%	76,315	20%	6,096	2%
Tribal	9,106	9%	813	<1%	62,918	16%	1,970	1%
Total	103,346	**100%**	208,287	**100%**	387,719	**100%**	294,981	**100%**

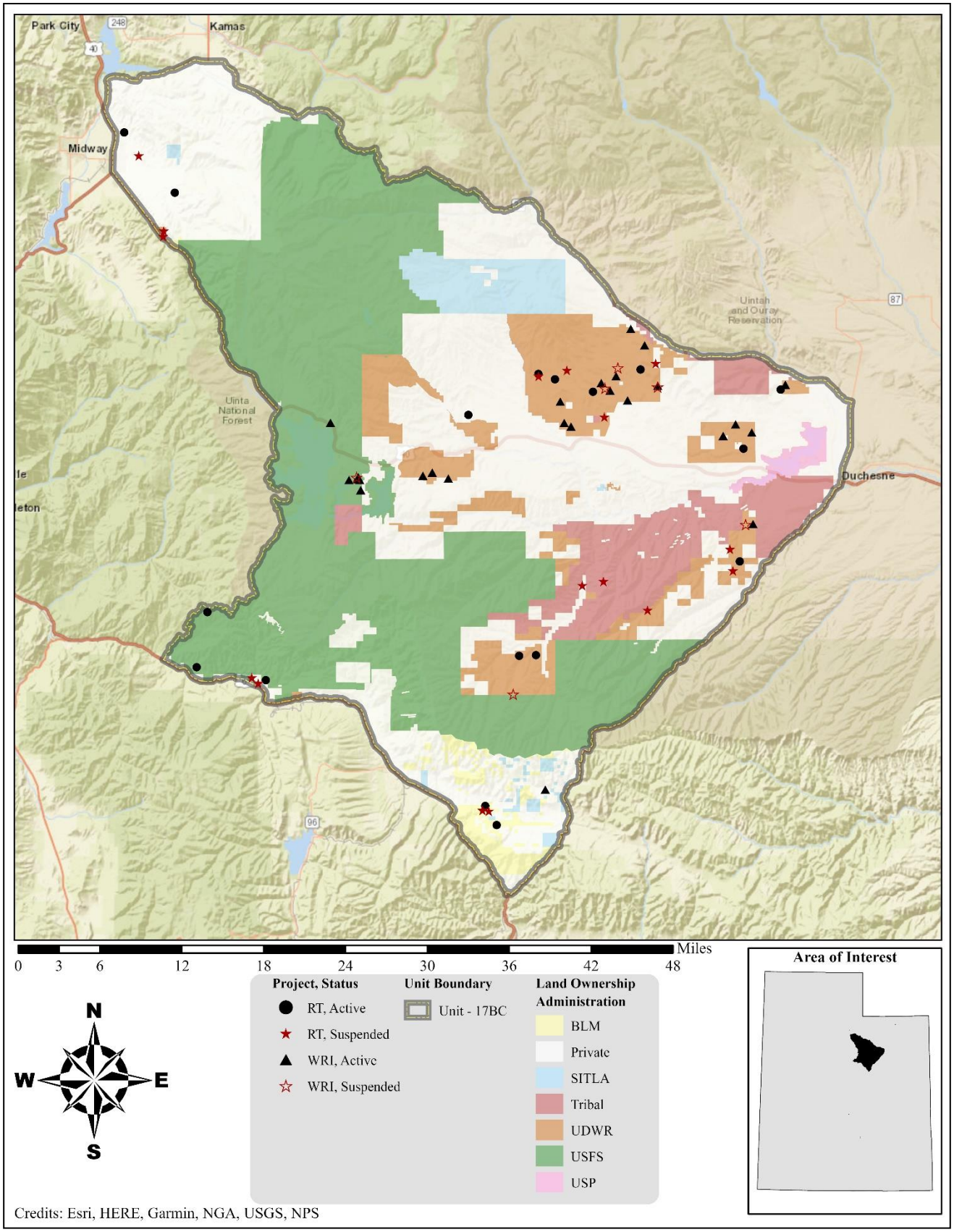
Table 8.3: Estimated elk habitat acreage by season and ownership for WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

	Year Long Range		Summer Range		Winter Range		Spring/Fall Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	1,363	1%	0	0%	16,477	3%	0	0%
Private	47,970	36%	5,732	32%	204,231	38%	16,449	13%
SITLA	998	1%	0	0%	32,432	6%	0	0%
UDOT	22	<1%	0	0%	14	<1%	0	0%
USFS	81,990	62%	4,952	27%	184,405	34%	110,967	85%
UDWR	260	<1%	2,516	14%	73,762	13%	278	<1%
Tribal	0	0%	4,927	27%	30,865	6%	2,741	2%
Total	132,604	**100%**	18,128	**100%**	542,186	**100%**	130,436	**100%**

Table 8.4: Estimated moose habitat acreage by season and ownership for WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

	Year Long Range	
Ownership	*Area (acres)*	*%*
Private	51,746	27%
SITLA	160	<1%
USFS	68,002	35%
UDWR	28,402	15%
Tribal	45,339	23%
Total	193,650	100%

Table 8.5: Estimated Rocky Mountain bighorn sheep habitat acreage by season and ownership for WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.



Map 8.6: Land ownership for WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

Group	Existing Vegetation Type	Acres	% of Total	Group % of Total
Conifer	Colorado Plateau Pinyon-Juniper Woodland	197,365	18.89%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	46,450	4.45%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	41,535	3.98%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	23,047	2.21%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	11,402	1.09%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	10,470	1.00%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	6,436	0.62%	
	Southern Rocky Mountain Ponderosa Pine Woodland	2,938	0.28%	
	Rocky Mountain Lodgepole Pine Forest	2,901	0.28%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	2,061	0.20%	
	Other Conifer	813	0.08%	33.07%
Shrubland	Inter-Mountain Basins Montane Sagebrush Steppe	170,390	16.31%	
	Inter-Mountain Basins Big Sagebrush Shrubland	48,214	4.62%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	41,733	4.00%	
	Rocky Mountain Lower Montane-Foothill Shrubland	19,286	1.85%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	19,246	1.84%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	17,595	1.68%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	10,504	1.01%	
	Colorado Plateau Pinyon-Juniper Shrubland	2,522	0.24%	
	Other Shrubland	844	0.08%	
	Inter-Mountain Basins Mat Saltbush Shrubland	433	0.04%	
	Inter-Mountain Basins Greasewood Flat	324	0.03%	
	Rocky Mountain Alpine Dwarf-Shrubland	33	0.00%	
	Southern Colorado Plateau Sand Shrubland	2	0.00%	31.70%
Other	Hardwood	159,576	15.28%	
	Sparsely Vegetated	52,260	5.00%	
	Conifer-Hardwood	38,440	3.68%	
	Open Water	19,978	1.91%	
	Agricultural	18,494	1.77%	
	Developed	17,889	1.71%	
	Riparian	15,427	1.48%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	858	0.08%	30.91%
Grassland	Rocky Mountain Subalpine-Montane Mesic Meadow	14,059	1.35%	
	Southern Rocky Mountain Montane-Subalpine Grassland	13,897	1.33%	
	Inter-Mountain Basins Semi-Desert Grassland	3,057	0.29%	
	Other Grassland	1,406	0.13%	3.10%
Exotic Herbaceous	Interior Western North American Temperate Ruderal Grassland	3,714	0.36%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	3,396	0.33%	
	Great Basin & Intermountain Introduced Annual Grassland	2,456	0.24%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	9	0.00%	0.92%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	2,196	0.21%	
	Interior Western North American Temperate Ruderal Shrubland	610	0.06%	
	Interior West Ruderal Riparian Scrub	296	0.03%	
	Interior West Ruderal Riparian Forest	22	0.00%	0.30%
Total		**1,044,585**	**100%**	**100%**

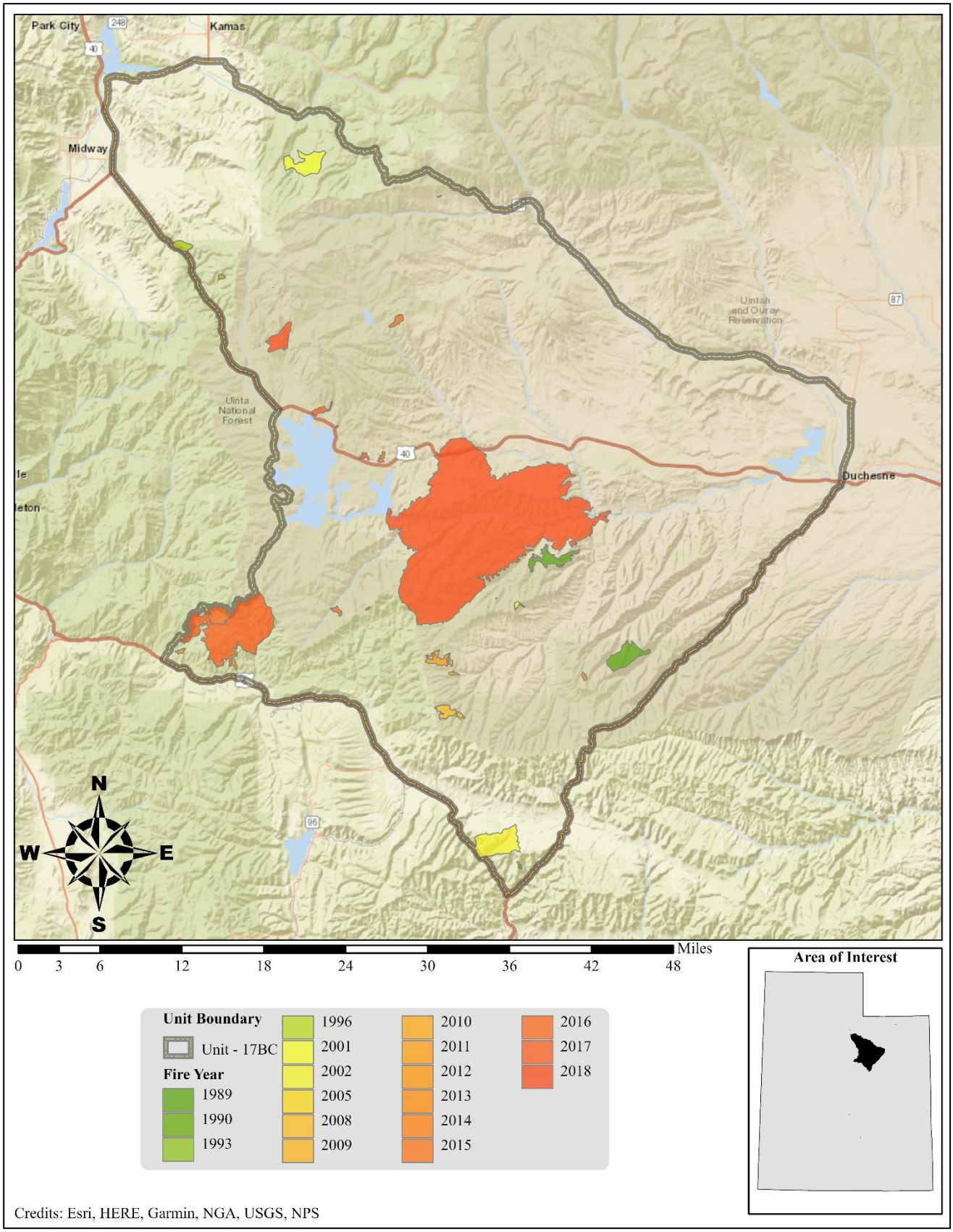
Table 8.6: LANDFIRE Existing Vegetation Coverage (LANDFIRE.US_140EVT, 2019) for WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

Limiting Factors to Big Game Habitat

Habitat quality and quantity is a limiting factor in this unit. Cooperation between federal, state, local, and tribal governments, and private landowners could help maintain and protect ranges from further loss and degradation. Through agreements with land management agencies, the use of conservation easements and the like on private lands, planning and evaluating resource use and developments that affect habitat quality, and developing specific vegetation objectives to maintain the quality of important deer use areas can help maintain and protect wildlife ranges. Habitat treatment strategies used to prevent range degradation and loss include reseeding areas dominated by cheatgrass (*Bromus tectorum*) with desirable perennial vegetation, reseeding burned areas, creating fuel breaks and vegetated green strips, and reducing expansion of pinyon and juniper woodlands into sagebrush habitats via lop and scatter or mechanical means such as chaining and bullhog.

According to the Landfire Existing Vegetation Coverage model, nearly 19% of the Currant Creek-Avintaquin subunits is pinyon and juniper woodland (**Table 8.6**): encroachment by these woodland communities poses a significant threat to important sagebrush rangelands. Invasion of these woodlands into sagebrush communities has been shown to decrease sagebrush and herbaceous cover, therefore decreasing available forage for wildlife (Miller, Svejcar, & Rose, 2000).

Deer fences and crossings limiting range are also a concern, but cooperation with the Utah Department of Transportation in construction of highway fences, passage structures, warning signs, etc. will continue in order to ensure proper access to habitat as well as deer and human safety.



Map 8.7: Land coverage of fires by year from 2000-2020 for WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin (Geosciences and Environmental Change Science Center (GECSC) Outgoing Datasets, 2021).

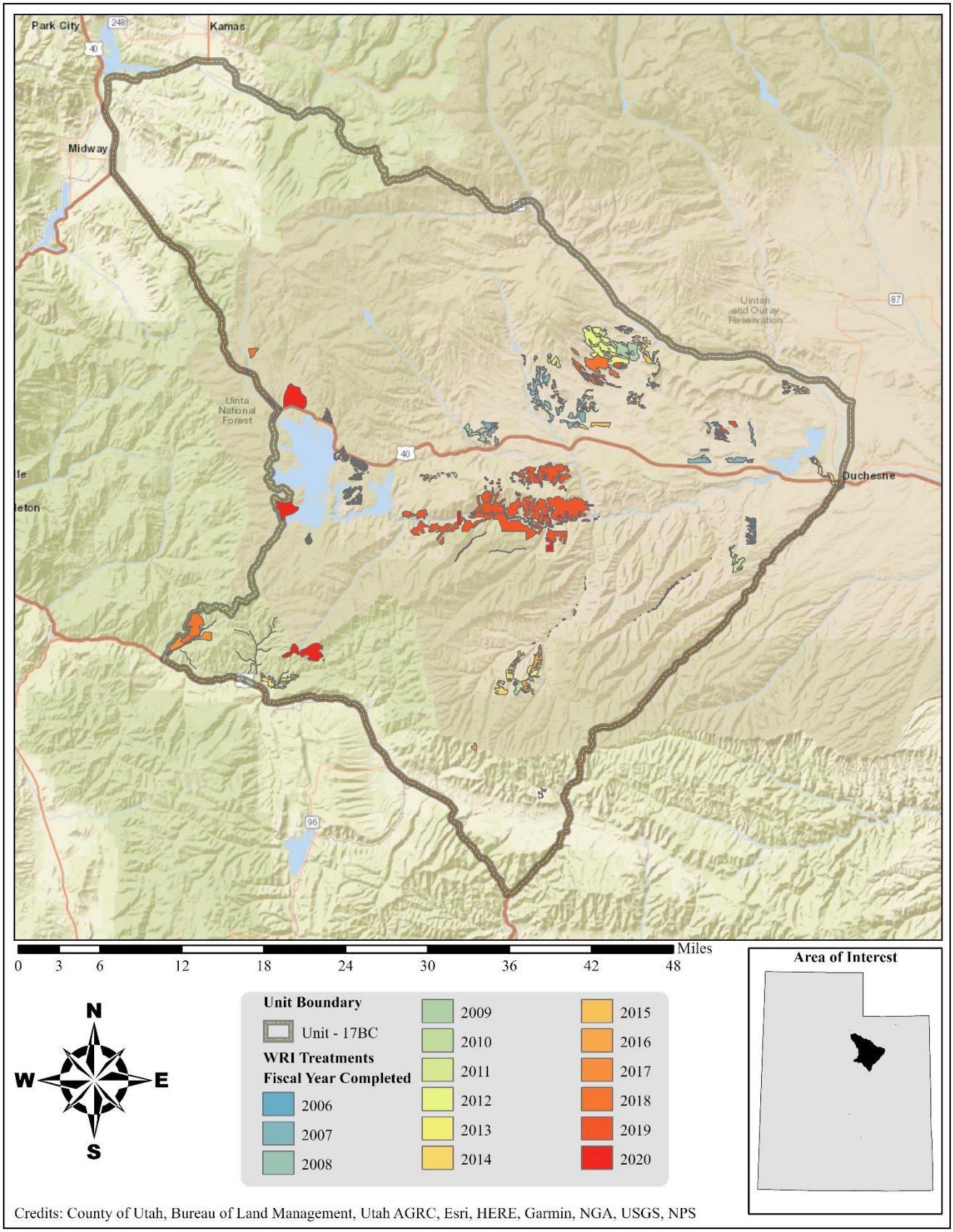
Treatments/Restoration Work

There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 37,982 net acres of land have been treated within the Wasatch Mountains unit since the WRI was implemented in 2004 (**Map 8.8**). Treatments frequently overlap one another bringing the total treatment acres to 39,056 acres for this unit. An additional 69,401 acres are currently being treated and treatments are proposed for a further 8,373 acres (**Table 8.7**). 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.

Vegetation removal via hand crew and supplemental seeding are the most common management practices in this unit. Other management practices include herbicide application to remove weeds, harrow and bullhog use to remove twoneedle pinyon and Utah juniper, and other similar vegetation removal techniques also occur throughout the unit (**Table 8.7**).

Type	Completed Acreage	Current Acreage	Proposed Acreage	Total Acreage
Anchor Chain	**3,016**	**0**	**0**	**3,016**
Ely (One-Way)	706	0	0	706
Ely (Two-Way)	2,310	0	0	2,310
Bulldozing	**14**	**0**	**0**	**14**
Tree Push	14	0	0	14
Bullhog	**2,270**	**0**	**0**	**2,270**
Full Size	2,228	0	0	2,228
Skid Steer	43	0	0	43
Chain Harrow	**913**	**0**	**0**	**913**
>15 ft. (One-Way)	199	0	0	199
>15 ft. (Two-Way)	651	0	0	651
≤15 ft. (Two-Way)	63	0	0	63
Disc	**7**	**0**	**0**	**7**
Off-Set (One-Way)	7	0	0	7
Forestry Practices	**39**	**23,276**	**348**	**23,662**
Thinning (Commercial)	0	21,142	0	21,142
Group Selection Cuts	0	2,135	0	2,135
Coppice Cutting	39	0	348	386
Harrow	**744**	**0**	**0**	**744**
>15 ft. (One-Way)	85	0	0	85
>15 ft. (Two-Way)	270	0	0	270
≤15 ft. (One-Way)	389	0	0	389
Herbicide Application	**2,746**	**378**	**0**	**3,124**
Aerial (Fixed-Wing)	224	378	0	603
Spot Treatment	2,254	0	0	2,254
Ground	268	0	0	268
Interseeding	**547**	**0**	**0**	**547**
Mowing	**401**	**229**	**0**	**630**
Brush Hog	388	229	0	617
Other	13	0	0	13
Planting/Transplanting	**1,233**	**1,233**	**1,162**	**3,628**
Container Stock	1,233	1,233	1,162	3,628
Prescribed Fire	**1,243**	**40,196**	**5,150**	**46,589**
Seeding (Primary)	**15,439**	**100**	**0**	**15,538**
Broadcast (Aerial-Fixed Wing)	15,166	0	0	15,166
Broadcast (Aerial-Helicopter)	8	0	0	8
Drill (Rangeland)	216	100	0	316
Ground (Mechanical Application)	43	0	0	43
Hand Seeding	5	0	0	5
Seeding (Secondary/Shrub)	**92**	**0**	**0**	**92**
Ground (Mechanical Application)	92	0	0	92
Skid-Steer Mounted Tree Cutter	**83**	**0**	**0**	**83**
Hydraulic Shears	83	0	0	83
Vegetation Removal/Hand Crew	**10,269**	**3,988**	**1,715**	**15,972**
Lop & Scatter	10,214	3,988	1,715	15,917
Lop-Pile-Burn	55	0	0	55
Other	**<1**	**1**	**0**	**1**
Road/Parking Area Improvements	<1	1	0	1
Road Decommissioning	<1	0	0	<1
Grand Total	**39,056**	**69,401**	**8,373**	**116,830**
***Total Land Area Treated**	**37,982**	**59,501**	**8,373**	**105,856**

Table 8.7: WRI treatment action size (acres) for completed, current, and proposed projects for WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin. Data accessed on 02/09/2021. *Does not include overlapping treatments.



Map 8.8: WRI treatments by fiscal year completed for WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

Range Trend Studies

Range Trend studies have been sampled within WMU 17 on a regular basis since 1982, with studies added or suspended as was deemed necessary (**Table 8.8**). Due to changes in sampling methodologies, only data sampled 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 study sites have had some sort of disturbance or treatment prior to or since study establishment (**Table 8.9**). Range Trend studies are summarized in this report by ecological site.

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
17-48	Blacktail Ridge	RT	Suspended	1982, 1988, 1995	Not Verified
17-49	Grey Wolf Mountain	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020	Upland Loam (Mountain Big Sagebrush)
17-50	Lower Santaquin Draw	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020	Upland Loam (Mountain Big Sagebrush)
17-51	Santaquins Cabin	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020	Upland Loam (Mountain Big Sagebrush)
17-52	Cutoff	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020	Upland Loam (Mountain Big Sagebrush)
17-53	Two Bar Ranch	RT	Active	1982, 1988, 1995, 2000, 2005, 2009, 2010, 2015, 2020	Upland Loam (Wyoming Big Sagebrush)
17-54	Peatross Ranch	RT	Suspended	1982. 1988, 1995, 2000	Not Verified
17-55	Lower Horse Ridge	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020	Mountain Loam (Browse)
17-56	Sams Canyon	RT	Suspended	1982, 1988, 1995, 2005, 2010	Not Verified
17-57	Skitzy Canyon	RT	Suspended	1982, 1988, 1995, 2000, 2005, 2010	Mountain Loam (Mountain Big Sagebrush)
17-58	Buck Knoll	RT	Suspended	1982, 1988, 1995, 2000, 2005, 2010	Mountain Loam (Browse)
17-59	Emma Park	RT	Active	1994, 2000, 2005, 2010, 2015, 2020	Mountain Stony Loam (Mountain Big Sagebrush)
17-65	Little Horse Ridge	RT	Active	2005, 2010, 2015, 2020	Mountain Loam (Browse)
17-66	Sand Wash	RT	Active	2005, 2010, 2015	Upland Loam (Wyoming Big Sagebrush)
17-67	Rabbit Gulch	RT	Active	1997, 2001, 2005, 2010, 2015, 2020	Semidesert Loam (Wyoming Big Sagebrush)
17-68	Road Hollow	RT	Active	2015, 2020	Mountain Shallow Loam (Black Sagebrush)
17R-2	Beer Spring	RT	Suspended	1997	Not Verified
17R-3	Santaquin Draw	RT	Suspended	1997	Not Verified
17R-5	Smith Property	RT	Suspended	1997	Not Verified
17R-6	Lake Canyon	RT	Suspended	1997	Not Verified
17R-7	Emma Park Harrow Grazed	RT	Active	2001, 2005, 2010, 2015, 2020	Mountain Loam (Mountain Big Sagebrush)
17R-8	Emma Park Harrow Ungrazed	RT	Suspended	2001, 2005, 2010	Mountain Loam (Mountain Big Sagebrush)
17R-9	Emma Park Meadow	RT	Suspended	2001, 2005	Not Verified
17R-10	Santaquin Draw	WRI	Suspended	2004	Not Verified

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
17R-11	Santaquin Greasewood	WRI	Active	2004, 2007, 2009, 2010, 2012, 2016, 2020	Upland Loam (Mountain Big Sagebrush)
17R-12	Santaquin Chaining	WRI	Active	2004, 2007, 2009, 2010, 2012, 2016, 2020	Upland Loam (Mountain Big Sagebrush)
17R-13	Rabbit Gulch Chaining	WRI	Active	2005, 2008, 2013, 2017, 2020	Semidesert Alkali Loam (Black Greasewood/Wyoming Big Sagebrush)
17R-14	Skitzy Chaining	WRI	Active	2005, 2008, 2009, 2013, 2015, 2018	Upland Stony Loam (Black Sagebrush)
17R-15	Golden Stairs Chaining	WRI	Active	2005, 2008, 2013, 2017, 2020	Upland Loam (Mountain Big Sagebrush)
17R-16	Grey Wolf Chaining	WRI	Active	2005, 2008, 2013, 2017, 2020	Upland Loam (Mountain Big Sagebrush)
17R-17	Strawberry Grouse 1	WRI	Active	2005, 2012, 2016	Mountain Loam (Mountain Big Sagebrush)
17R-18	Wildcat Sage-grouse	WRI	Active	2005, 2012, 2015, 2020	High Mountain Loam (Silver Sagebrush)
17R-19	Road Hollow	WRI	Active	2005, 2012, 2016	Mountain Shallow Loam (Mountain Big Sagebrush)
17R-20	Road Hollow Ridge	WRI	Active	2005, 2012, 2016	17R-20
17R-21	Blacktail Chaining	WRI	Active	2006, 2009, 2010, 2013, 2019	17R-21
17R-22	Allen Smith Reseed	WRI	Active	2006, 2010, 2015, 2020	17R-22
17R-23	Rabbit Gulch Interseed	WRI	Active	2006, 2010, 2013, 2017	Semidesert Loam (Wyoming Big Sagebrush)
17R-24	East Santaquin Chaining	WRI	Active	2006, 2010, 2013, 2017, 2020	Upland Loam (Mountain Big Sagebrush)
17R-25	Trout Creek Dixie	WRI	Active	2006, 2010, 2014, 2018	Mountain Loam (Mountain Big Sagebrush)
17R-26	Two Bar-Sand Wash Chaining	WRI	Active	2007, 2010, 2013, 2017	Upland Shallow Loam (Black Sagebrush)
17R-27	Two Bar-Black Tail Chaining	WRI	Active	2007, 2009, 2011, 2014, 2018	Upland Loam (Mountain Big Sagebrush)
17R-28	Santaquin PJ Reference	WRI	Suspended	2009	Not Verified
17R-29	Skitzy Reference	WRI	Suspended	2009	Not Verified
17R-30	Two Bar PJ Reference	WRI	Suspended	2009	Not Verified
17R-31	Badger Hollow Mow	WRI	Active	2011, 2014, 2019	Mountain Loam (Mountain Big Sagebrush)
17R-32	Badger Hollow Control	WRI	Suspended	2011	Not Verified
17R-33	Badger Hollow Harrow	WRI	Active	2011, 2014, 2019	Mountain Loam (Mountain Big Sagebrush)
17R-34	Wildcat	WRI	Active	2012, 2015, 2019	Mountain Loam (Mountain Big Sagebrush)
17R-35	Tabby Mountain	WRI	Active	2013, 2016, 2020	Upland Loam (Mountain Big Sagebrush)
17R-36	Horse Ridge	WRI	Suspended	2015	High Mountain Loam (Aspen)
17R-37	West Fork Willow Creek	WRI	Active	2015, 2018	High Mountain Loam (Aspen)
17R-38	North Rabbit Gulch	WRI	Active	2018	Upland Loam (Mountain Big Sagebrush)
17R-39	Cockey Hollow	WRI	Active	2018	Upland Loam (Mountain Big Sagebrush)
17R-41	Wildcat Aspen	WRI	Active	2019	High Mountain Loam (Aspen)

Table 8.8: Range trend and WRI project studies monitoring history and ecological site potential for WMU 17B, 17C, Wasatch Mountains, Currant Creek – Avintaquin.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
17-49	Grey Wolf Mountain	Disc Unknown Seed Unknown		Fall 1990 Fall 1990		
17-51	Santaquins Cabin	Chain Unknown Seed Unknown Disc Unknown Seed Unknown Lop and Scatter	 Coyote Draw Pinyon and Juniper Thinning	Historic Historic Fall 1995 Fall 1995 Summer 2006	 270 270 1,240	 328
17-55	Lower Horse Ridge	Bullhog	Horse Ridge Bullhog	June 2016	759	3293
17-57	Skitzy Canyon	Chain Unknown Seed Unknown Lop and Scatter	 Skitzy Canyon Lop and Scatter	1977-1978 1977-1978 November-December 2010	 390	 1729
17-58	Buck Knoll	Chain Unknown Seed Unknown Lop and Scatter	 Skitzy Lop and Scatter	Historic Historic November-December 2010	 390	 1729
17-67	Rabbit Gulch	Chain Unknown Seed Unknown Lop and Scatter	 	Historic Historic 2004-2005	 1,250	
17-68	Road Hollow	Lop and Scatter	Skitzy Lop and Scatter	Fall 2010	392	1729
17R-2	Beer Spring	Lop and Scatter	Coyote Draw Pinyon and Juni	July 2006-June 2007	1,240	328
17R-7	Emma Park Harrow Grazed	One-Way Dixie Seed Unknown	 	2000 2000	 	
17R-8	Emma Park Harrow Ungrazed	One-Way Dixie Seed Unknown	 	2000 2000	 	
17R-11	Santaquin Greasewood	Aerial Before One-Way Smooth Dribbler Aerial After	Santaquin Greasewood Santaquin Greasewood Santaquin Greasewood Santaquin Greasewood	October 2004 October-November 2004 October-November 2004 December 2004	380 380 380 1,755	PDB PDB PDB PDB
17R-12	Santaquin Chaining	Aerial Before Two-Way Ely Aerial After Lop and Scatter	Santaquin P-J Santaquin P-J Santaquin P-J Cockey Hollow Vegetation Management Project	October 2004 October-November 2004 December 2004 October-November 2017	300 300 1,755 1,400	PDB PDB PDB 3969
17R-13	Rabbit Gulch Chaining	Tordon, 2,4-D Aerial Before Two-Way Ely Aerial After	Rabbit Gulch WMA Range Rehabilitation Rabbit Gulch WMA Range Rehabilitation Rabbit Gulch WMA Range Rehabilitation Rabbit Gulch WMA Range Rehabilitation	June 2005 November 2005 January 2006 January 2006	167 300 167 167	66 66 66 66
17R-14	Skitzy Chaining	Aerial Before Two-Way Ely Aerial After	Skitzy Canyon Range Rehabilitation Skitzy Canyon Range Rehabilitation Skitzy Canyon Range Rehabilitation	November 2005 November 2005 November 2005	529 529 529	69 69 69
17R-15	Golden Stairs Chaining	Aerial Before Two-Way Ely Dribbler Aerial After Lop and Scatter	Golden Stairs Range Rehabilitation Golden Stairs Range Rehabilitation Golden Stairs Range Rehabilitation Golden Stairs Range Rehabilitation Tabby Mountain Chaining Maintenance	September 2005 October-November 2005 November 2005 December 2005 October 2013	170 170 170 170 2,200	52 52 52 52 2570
17R-16	Grey Wolf Chaining	Aerial Before Two-Way Ely Dribbler Aerial After Lop and Scatter	Grey Wolf Mountain Rehabilitation Grey Wolf Mountain Rehabilitation Grey Wolf Mountain Rehabilitation Grey Wolf Mountain Rehabilitation Tabby Mountain Chaining Maintenance	October 2005 October-November 2005 November 2005 February 2006 October 2013	463 463 463 463 2,200	93 93 93 93 2570
17R-19	Road Hollow	Mower One-Way Chain	Badger Hollow /Chicken Spring Ridge Habitat Improvement Badger Hollow /Chicken Spring Ridge Habitat Improvement	August-September 2011 August-September 2011	60 125	1816 1816
17R-21	Blacktail Chaining	Aerial Before Two-Way Ely/Smooth Dribbler Aerial After	East Santaquin Draw P/J Chaining East Santaquin Draw P/J Chaining East Santaquin Draw P/J Chaining East Santaquin Draw P/J Chaining	September 2006 September-October 2006 September-October 2006 January 2007	450 450 450 450	367 367 367 367

17R-22	Allen Smith Reseed	Disc Unknown		Early 1990s		
		Seed Unknown		Early 1990s		
		Spike		Early 2000s		
		Aerial Before	Sink Draw Interseeding	November 2006	546	417
		Cattle	Sink Draw Interseeding	November 2006	546	417
		Scalper	Tabby Browse Plots	November 2013	78	2681
		Dribbler	Tabby Browse Plots	November 2013	78	2681
17R-23	Rabbit Gulch Interseed	Rangeland Drill	Rabbit Gulch Interseeding	February-March 2007	129	420
		Plateau	Rabbit Gulch Winter Range Improvement Phase II (Proposed)	September 2019	362	4799
17R-24	East Santaquin Chaining	Aerial Before	East Santaquin Draw P/J Chaining	September 2006	449	367
		Two-Way Ely/Smooth	East Santaquin Draw P/J Chaining	September-October 2006	449	367
		Dribbler	East Santaquin Draw P/J Chaining	September-October 2006	449	367
		Aerial After	East Santaquin Draw P/J Chaining	January 2007	449	367
		Lop and Scatter	Tabby Mountain chaining maintenance	October 2013	1,915	2570
17R-25	Trout Creek Dixie	Broadcast Unknown	Trout Creek Sagebrush Enhancement	July-September 2007	112	323
		Two-Way Dixie	Trout Creek Sagebrush Enhancement	July-September 2007	112	323
17R-26	Two Bar-Sand Wash Chaining	Two-Way Ely	2-bar Pinyon and Juniper Thinning	September-October 2007	978	368
		Dribbler	2-bar Pinyon and Juniper Thinning	September-October 2007	978	368
		Aerial After	2-bar Pinyon and Juniper Thinning	October 2007	978	368
		Aerial After	2-bar Pinyon and Juniper Thinning	January 2008	978	368
		Lop and Scatter	Tabby Mountain chaining maintenance	October 2013	1,915	2570
17R-27	Two Bar-Black Tail Chaining	Aerial Before	2-Bar Pinyon and Juniper Thinning	September 2007	978	368
		Two-Way Ely	2-Bar Pinyon and Juniper Thinning	September 2007	978	368
		Dribbler	2-Bar Pinyon and Juniper Thinning	September 2007	978	368
		Aerial After	2-Bar Pinyon and Juniper Thinning	January 2008	978	368
		Lop and Scatter	Tabby Mountain chaining maintenance	October 2013	1,915	2570
17R-31	Badger Hollow Mow	Mower	Badger Hollow/Chicken Spring Ridge Habitat Improvement	August-September 2011	60	1816
17R-33	Badger Hollow Harrow	Two-Way Chain	Badger Hollow /Chicken Spring Ridge Habitat Improvement	August-September 2011	253	1816
17R-34	Wildcat	Two-Way Chain	Wildcat Harrow	October 2012	244	2309
17R-35	Tabby Mountain	Scalper	Tabby Browse Plots	October-November 2013	79	2681
17R-37	West Fork Willow Creek	Coppice Cutting	West Fork Willow Creek Aspen Restoration Phase 1	May 2016	25	3222
17R-38	North Rabbit Gulch	Plateau	Rabbit Gulch Winter Range Improvement Phase I	October 2018	224	4447
17R-39	Cockey Hollow	Aerial Before	Cockey Hollow phase II	September 2018	663	4433
		Bullhog	Cockey Hollow phase II	September-November 2018	663	4433
		Aerial After	Cockey Hollow phase II	December 2018	663	4433

Table 8.9: Range trend and WRI studies known disturbance history for WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin. PDB = Pre-Database; LTDL = Land Treatment Digital Library (Pilliod & Welty, 2019).

Study Trend Summary (Range Trend)

Mountain (Big Sagebrush)

Two studies [Emma Park (17-59) and Emma Park Harrow Grazed (17R-7)] are classified as Mountain (Sagebrush) ecological sites. The Emma Park and Emma Park Harrow Grazed studies are found in Emma Park (**Table 8.8**).

Shrubs/Trees: The primary browse species on these ecological sites is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), the cover of which has increased over time. A small number of other preferred browse species are present, but they contribute little cover (**Figure 8.3**). Preferred browse demographics show that average density has fluctuated from year to year, but has increased overall. Mature individuals have been the dominant demographic in these populations in all years except 2010, when young plants were the most abundant. Decadence has varied, but has generally decreased (**Figure 8.9**). Utilization of preferred browse was low between 1994 and 2010 with less than 30% of plants being moderately or heavily browsed in each sample year. However, average utilization has since increased with 83% and 58% of plants being moderately to heavily used in 2015 and 2020, respectively (**Figure 8.11**).

Trees contribute no cover on either study site. However, Utah and Rocky Mountain juniper (*Juniperus osteosperma* and *J. scopulorum*) were observed in low amounts for the first time in 2020 in density measurements, indicating that encroachment is occurring (**Figure 8.5**, **Figure 8.7**).

Herbaceous Understory: The herbaceous understories on these study sites are diverse, abundant, and primarily composed of perennial grasses. These perennial grasses are largely native, but some introduced species are present on both sites. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed in the understories of both studies, but in very low amounts. A diverse number of perennial forbs provide good cover, although the amount of cover has fluctuated through the study years. Annual forbs have remained rare and have consistently contributed less than 1% cover (**Figure 8.13**, **Figure 8.15**).

Occupancy: Average pellet group transect data indicates that the identity of the primary occupants of these study sites has fluctuated between deer, elk, and cattle. Occupancy has also varied from year to year, but has decreased overall. Deer have had a mean pellet group abundance ranging from 4 days use/acre in 2015 to 12 days use/acre in 2010. Elk use has ranged from 4 days use/acre in 2020 to 15 days use/acre in 2005. Finally, cattle pellet groups have had an average abundance ranging from 9 days use/acre in 2015 to 27 days use/acre in 2010 (**Figure 8.17**).

Mountain (Black/Low Sagebrush)

There is one study site [Road Hollow (17-68)] that is considered to be a Mountain (Black/Low Sagebrush) ecological site: this study is located near the top of Road Hollow (**Table 8.8**).

Shrubs/Trees: Black sagebrush (*Artemisia nova*) is the dominant browse species on this site; other preferred browse species provide little additional cover. Preferred browse cover increased between 2015 and 2020 (**Figure 8.3**). Average preferred browse demographics shows that total density has increased and that mature plants have been the dominant demographic in both sample years. Decadence exhibited a slight increase, but remains low as of 2020. Recruitment of young also increased between 2015 and 2020 (**Figure 8.9**). Utilization of preferred browse decreased over the sample period; less than 30% of plants were moderately or heavily browsed in both sample years (**Figure 8.11**).

Both twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) are present on this study site. Tree cover was limited upon study establishment in 2015, and no cover was observed in 2020. Tree density has remained stable and moderate, with juniper as the most abundant species (**Figure 8.5**, **Figure 8.7**).

Herbaceous Understory: This study has an abundant herbaceous understory that contributes good cover; average nested frequency and cover have exhibited a slight decrease over the study period. The introduced perennial grass species crested wheatgrass (*Agropyron cristatum*) has been the dominant component in both sample years, with native species providing less cover. Annual grasses have not been recorded on this site in any study year. Perennial forbs contribute a small amount of additional cover, and annual forbs remain rare (**Figure 8.13**, **Figure 8.15**).

Occupancy: Average pellet transect data indicates that elk primarily use this site and that overall animal usage has increased over the sample years. Mean abundance of elk pellet groups was 15 days use/acre in 2015 and 26 days use/acre in 2020. Deer have also been present on this site with an average pellet group abundance of 3 days use/acre in 2015 and 18 days use/acre in 2020 (**Figure 8.17**).

Mountain (Browse)

There are two studies [Lower Horse Ridge (17-55) and Little Horse Ridge (17-65)] that are classified as a Mountain (Browse) ecological sites: these studies are located on Little Horse Ridge, south of Avintaquin Creek (**Table 8.8**).

Shrubs/Trees: Alderleaf mountain mahogany (*Cercocarpus montanus*) is the dominant browse species on these sites, the cover of which has increased over time. Numerous other preferred browse species also provide cover. In addition, shrubs other than preferred browse species have exhibited an overall increase in cover (**Figure 8.4**). Preferred browse demographics indicate that density has increased over time, a trend partly driven by the Little Horse Ridge study; decadence has remained low. Recruitment of young plants has fluctuated, but has slightly increased overall (**Figure 8.9**). Utilization of preferred browse has generally decreased, with 18% of plants being moderately hedged and 14% heavily hedged in 2020 (**Figure 8.11**).

Tree cover has increased over time while density has slightly decreased, with twoneedle pinyon (*Pinus edulis*) more dominant than Utah and Rocky Mountain juniper (*Juniperus osteosperma* and *J. scopulorum*). Furthermore, much of the trends for twoneedle pinyon can be largely attributed to the Little Horse Ridge study. Tree encroachment will likely continue on these sites in future sample years if a disturbance does not occur (**Figure 8.5**, **Figure 8.7**).

Herbaceous Understory: These study sites have diverse and abundant herbaceous understories that are dominated by native perennial grasses. Annual grasses have not been observed on either study. Perennial forbs are fairly diverse and have generally contributed low amounts of additional cover. Annual forbs have been rare throughout the study period (**Figure 8.13**, **Figure 8.15**).

Occupancy: According to average pellet transect data, deer primarily occupy these study sites and total occupancy has fluctuated over time. Mean abundance of deer pellet groups has fluctuated between 18 days use/acre in 2015 and 34 days use/acre in 2005. Elk have also been present, with an average pellet group abundance ranging from 2 days use/acre in 2000 to 18 days use/acre in 2010. Finally, cattle pellets were observed in 2005 with a mean abundance of 1 days use/acre, but have not been observed in any other sample year (**Figure 8.17**).

Upland (Big Sagebrush)

There are six studies [Grey Wolf Mountain (17-49), Lower Santaquin Draw (17-50), Santaquins Cabin (17-51), Cutoff (17-52), Two Bar Ranch (17-53), and Sand Wash (17-66)] that are classified as Upland (Sagebrush) ecological sites. The Grey Wolf Mountain study is located on the northern slope of Grey Wolf Mountain, adjacent to Coyote Draw. Lower Santaquin Draw is situated in the southern portion of Santaquin Draw. The Santaquins Cabin study is found west of Beer Spring. The Cutoff study site is located east of Currant Creek and southeast of Water Hollow. Two Bar Ranch is found in Rabbit Gulch below Blacktail Ridge. Finally, the Sand Wash study site is located on Blacktail Mountain, just west of West Bench (**Table 8.8**).

Shrubs/Trees: Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) is the dominant browse species on all sites except Two Bar Ranch, on which shadscale saltbush (*Atriplex confertifolia*) co-dominates and Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) has had an overall increase in cover since 2005. Sand Wash is also dominated by Wyoming big sagebrush and is also excluded from the 2020 data. Other browse species are often present on these study sites, although they contribute much less cover. Sagebrush cover has fluctuated little over the sample years (**Figure 8.3**). Average preferred browse (mainly sagebrush) demographics indicate that overall preferred browse density has decreased over time. The browse populations have been mainly composed of mature plants throughout the duration of the study period. The amount of decadent plants has varied from year to year, while young individuals have been present to a greater extent than decadent individuals. Recruitment of young plants has had slight variability from year to year (**Figure 8.10**). Utilization across the ecotype has been variable from year to year. However, the overall trend of combined browse utilization has decreased. On average, shrubs in this ecotype display more moderate utilization than heavy utilization, except in 2015, when heavy use was 56% and moderate use was 17% (**Figure 8.12**).

Average tree cover has remained relatively stable throughout the duration of the sample period. However, the Sand Wash study drives the trends for Utah juniper (*Juniperus osteosperma*); Sand Wash was not assessed in

2020 and accounts for the decrease in average cover and density in 2020. Specifically concerning the overall decrease in tree density: this could possibly be partially attributed to the difference in the number of studies sampled each year (the 'n value') and the fact that not every site has twoneedle pinyon (*Pinus edulis*) or juniper present (**Figure 8.6**, **Figure 8.8**).

Herbaceous Understory: These study sites generally have plentiful and diverse herbaceous understories that are dominated by perennial grasses. Although native species like needle and thread (*Hesperostipa comata*) are usually present and dominate some sites, introduced species such as crested wheatgrass (*Agropyron cristatum*) are the dominant component on many other sites and are responsible for large increases in average perennial grass cover. Annual grasses such as cheatgrass (*Bromus tectorum*) are present on some sites, but in low amounts. Average perennial forb cover has decreased overall, from 5% in 1995 to 3% in 2020. Annual forbs remain rare, contributing less than 1% average cover in most study years (**Figure 8.14**, **Figure 8.16**).

Occupancy: Average pellet group transect data indicates that the identity of the primary occupants of these study sites has been deer and elk. Cattle presence has remained low from year to year. Combined animal occupancy has varied between sample years, but has decreased overall. Deer have had a mean pellet group abundance ranging from 28 days use/acre in 2015 to 64 days use/acre in 2000. Elk use has ranged from 18 days use/acre in 2000 to 35 days use/acre in 2005. Finally, cattle pellet groups have had an average abundance as low as 1 days use/acre in 2015 and as high as 7 days use/acre in 2010 (**Figure 8.18**).

Semidesert (Big Sagebrush)

One site [Rabbit Gulch (17-67)] is classified as a Semidesert (Big Sagebrush) ecological site and is located just north of Rabbit Gulch (**Table 8.8**).

Shrubs/Trees: Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) is the dominant browse species on this site, although other lower cover browse species are present. Sagebrush cover has increased from year to year. However, there was a notable decrease in sagebrush cover in 2020 (**Figure 8.3**). Sagebrush density has decreased year after year. Mature individuals make up a majority of the population. Recruitment of young plants has decreased over time, and, except in 1995, decadent plant density has consistently been greater than that of young plants (**Figure 8.10**). Utilization data shows that use has been variable with moderate utilization decreasing over the duration of the study while heavy utilization has inversely increased over the same period (**Figure 8.12**).

Point-quarter data indicates that the densities of Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) are low, with most of the juniper trees being young, small trees. There has been no cover recorded for either species (**Figure 8.6**, **Figure 8.8**).

Herbaceous Understory: The herbaceous component of this site has decreased over time and is dominated by perennial grasses. Although many of these perennial grass species are native, the introduced species crested wheatgrass (*Agropyron cristatum*) contributes the most cover. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed in the past, but the native species sixweeks fescue (*Vulpia octoflora*) completely comprises the small annual grass component that is currently present on this site. Perennial and annual forbs have remained rare (**Figure 8.14**, **Figure 8.16**).

Occupancy: Average pellet transect data shows that deer primarily use this site and that overall animal usage has decreased throughout the duration of the study. Mean abundance of elk pellet groups has ranged from 2 days use/acre in 2015 to 42 days use/acre in 2010. Deer pellet groups have had a mean abundance ranging from 11 days use/acre in 2015 to 173 days use/acre in 2000. Cattle usage has been as low as 0 days use/acre in 2015 and as high as 12 days use/acre in 2005 (**Figure 8.18**).

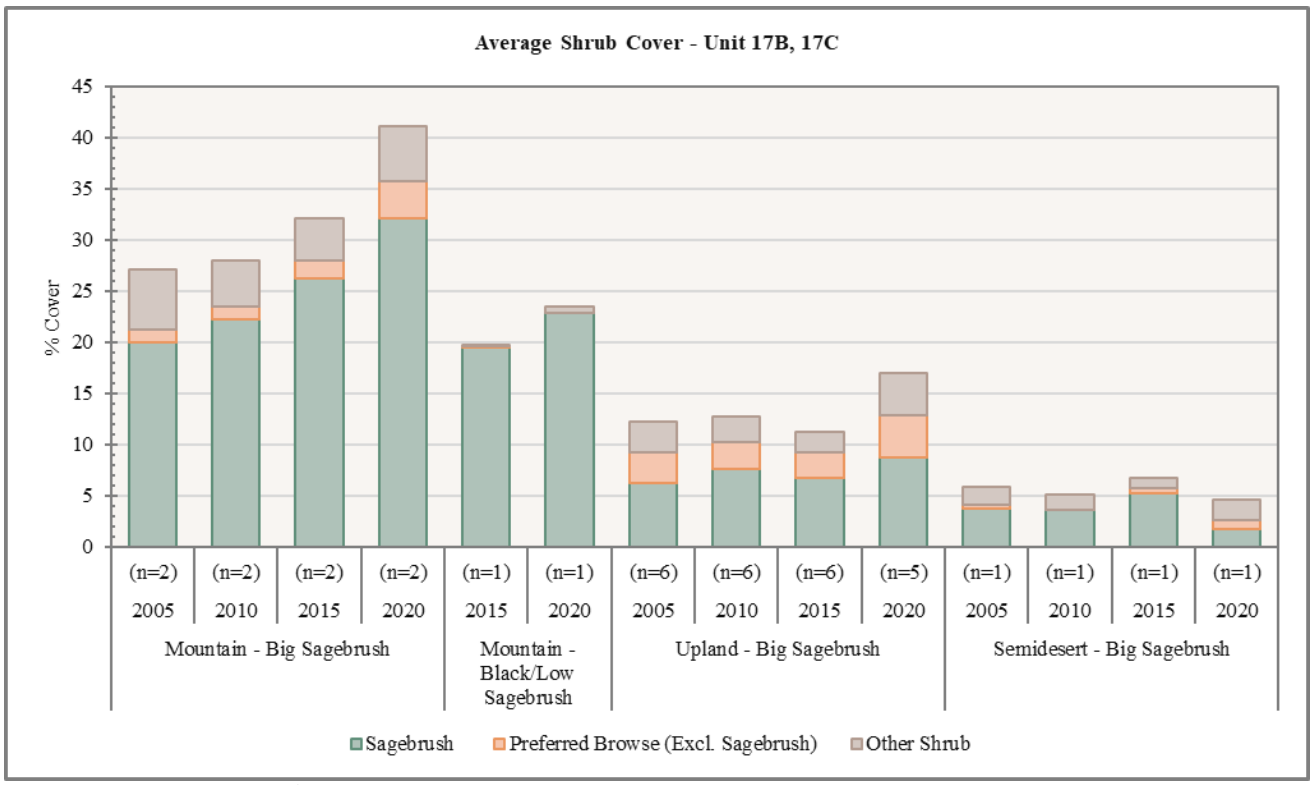


Figure 8.3: Average shrub cover for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

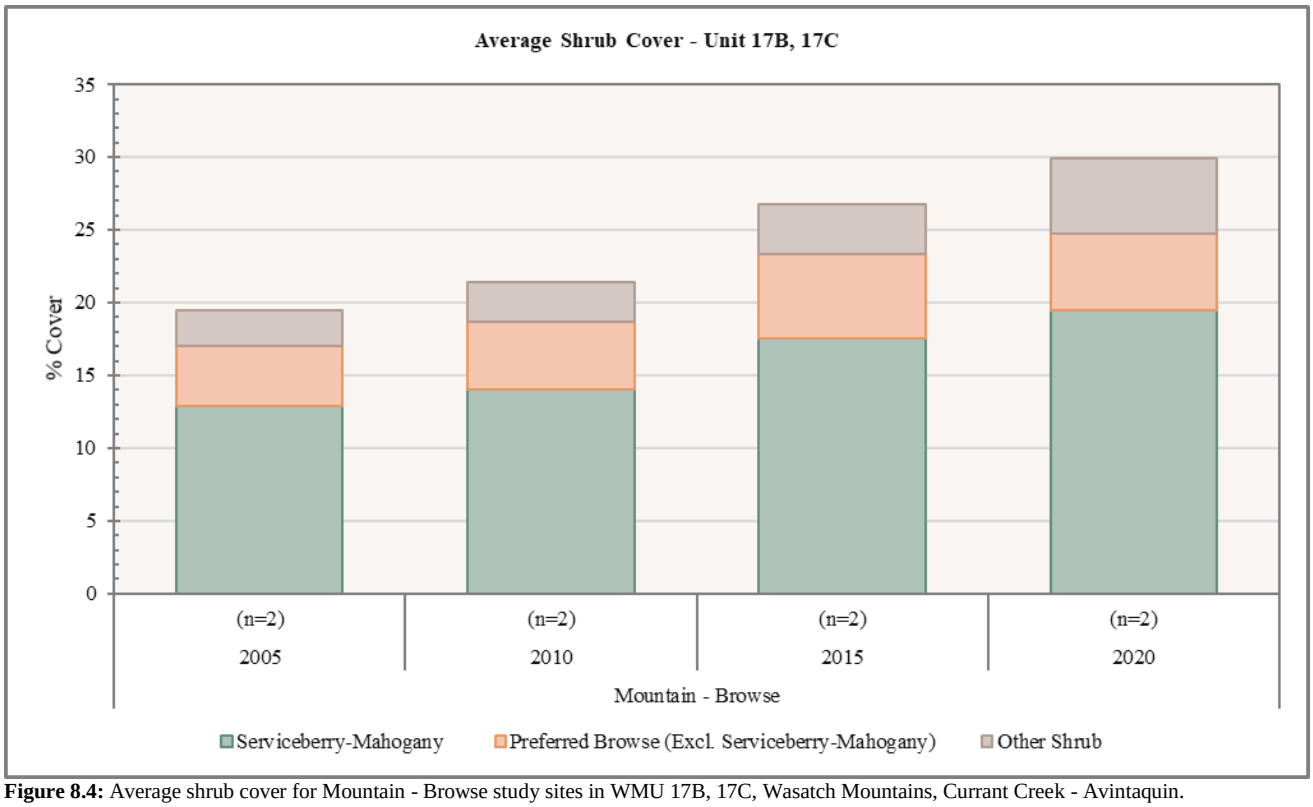


Figure 8.4: Average shrub cover for Mountain - Browse study sites in WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

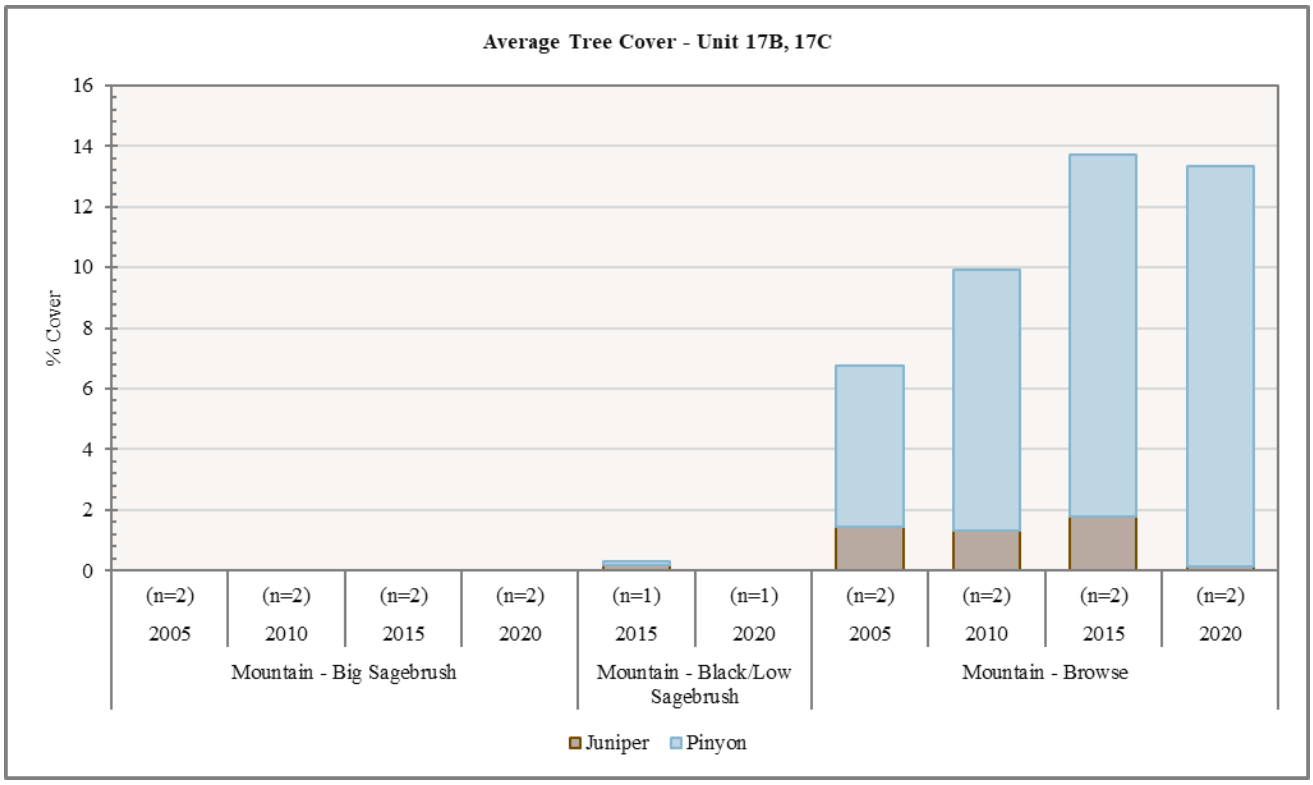


Figure 8.5: Average tree cover for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain - Browse study sites in WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

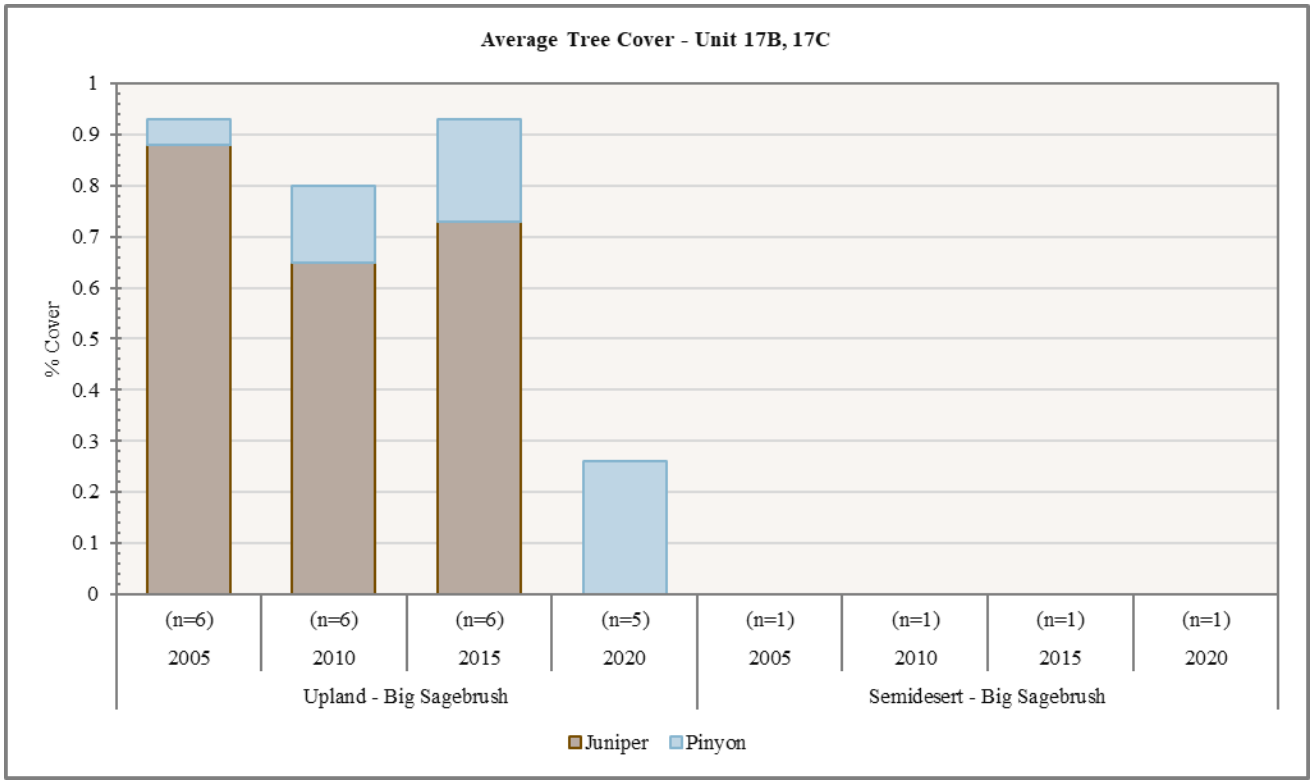


Figure 8.6: Average tree cover for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

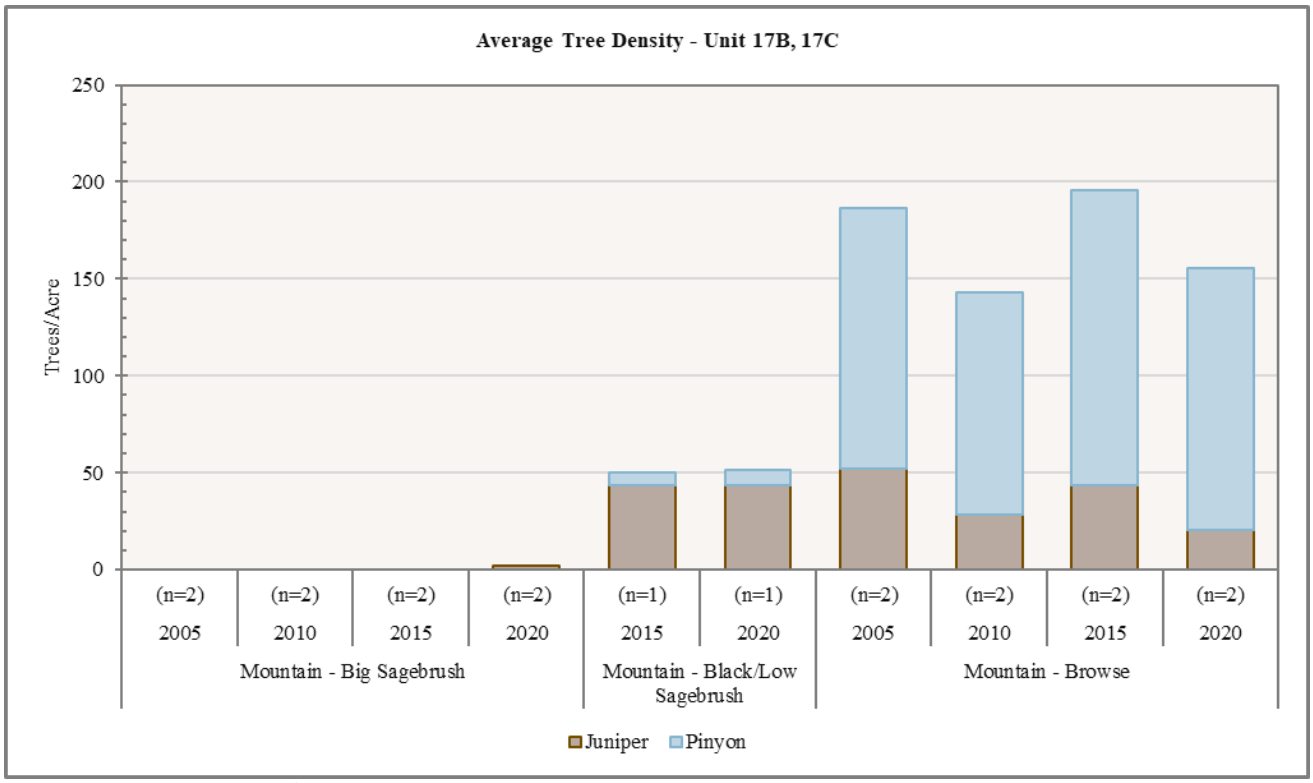


Figure 8.7: Average tree density for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain - Browse study sites in WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

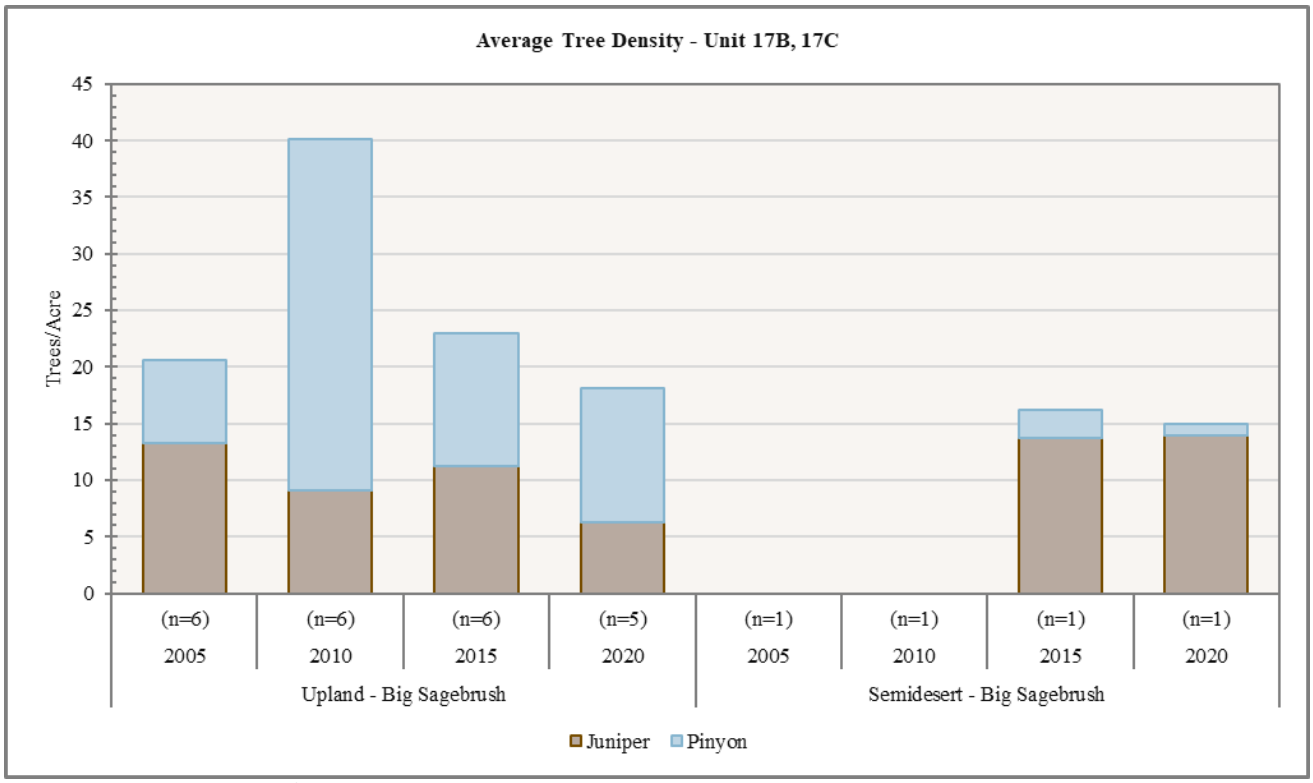


Figure 8.8: Average tree density for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

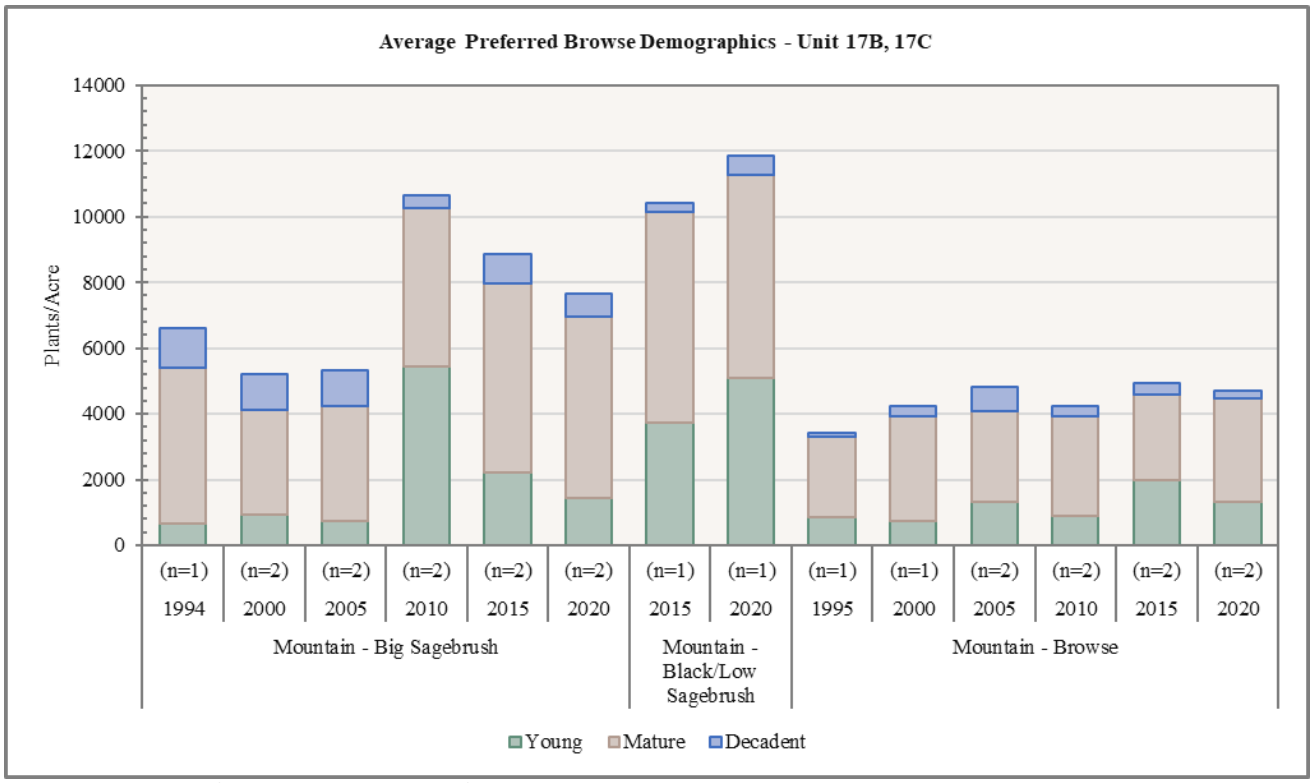


Figure 8.9: Average preferred browse demographics for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain - Browse study sites in WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

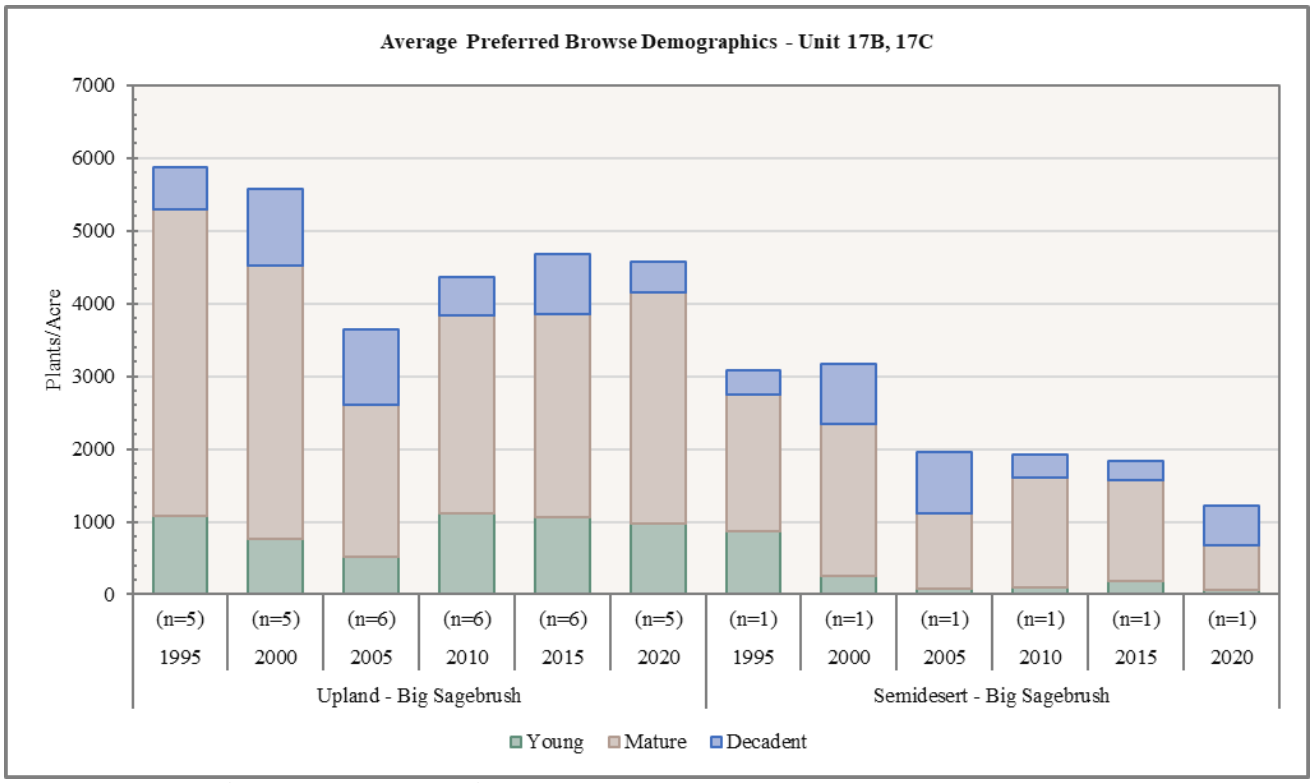


Figure 8.10: Average preferred browse demographics for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

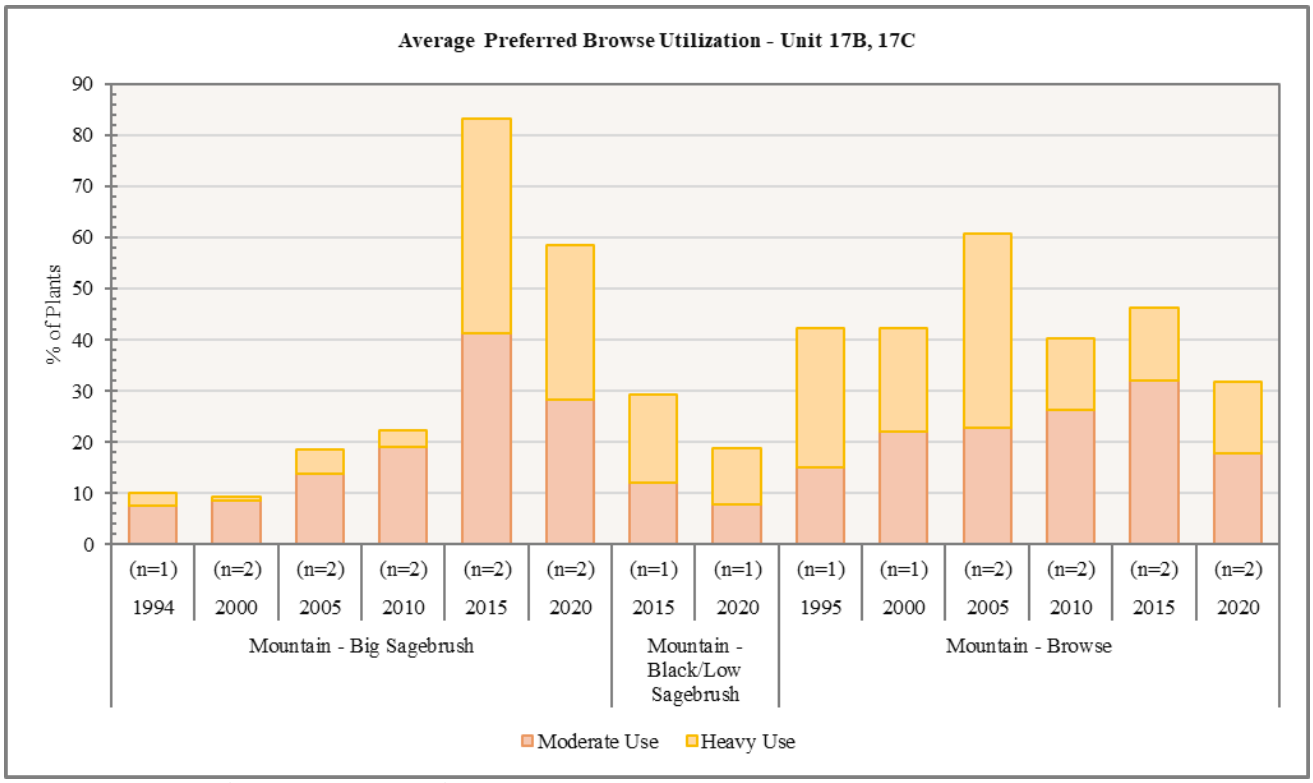


Figure 8.11: Average preferred browse utilization for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain - Browse study sites in WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

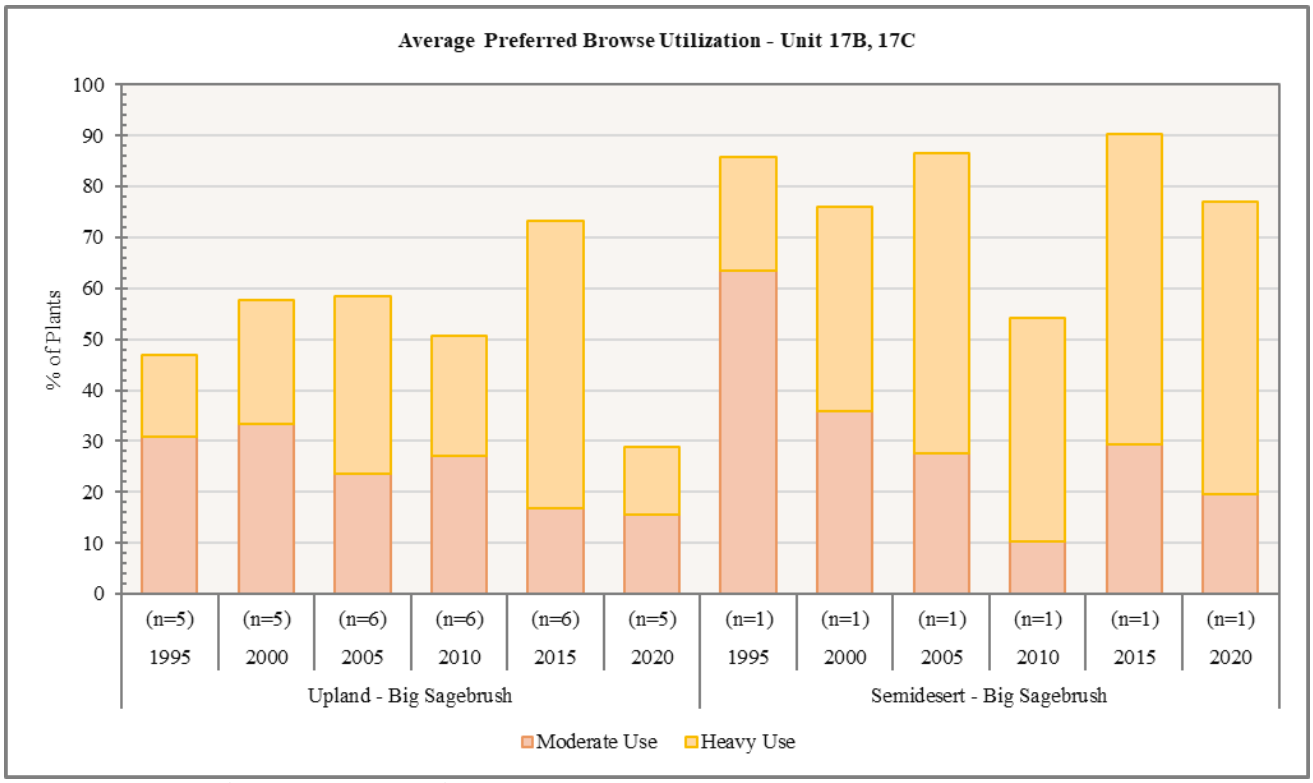


Figure 8.12: Average preferred browse utilization for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

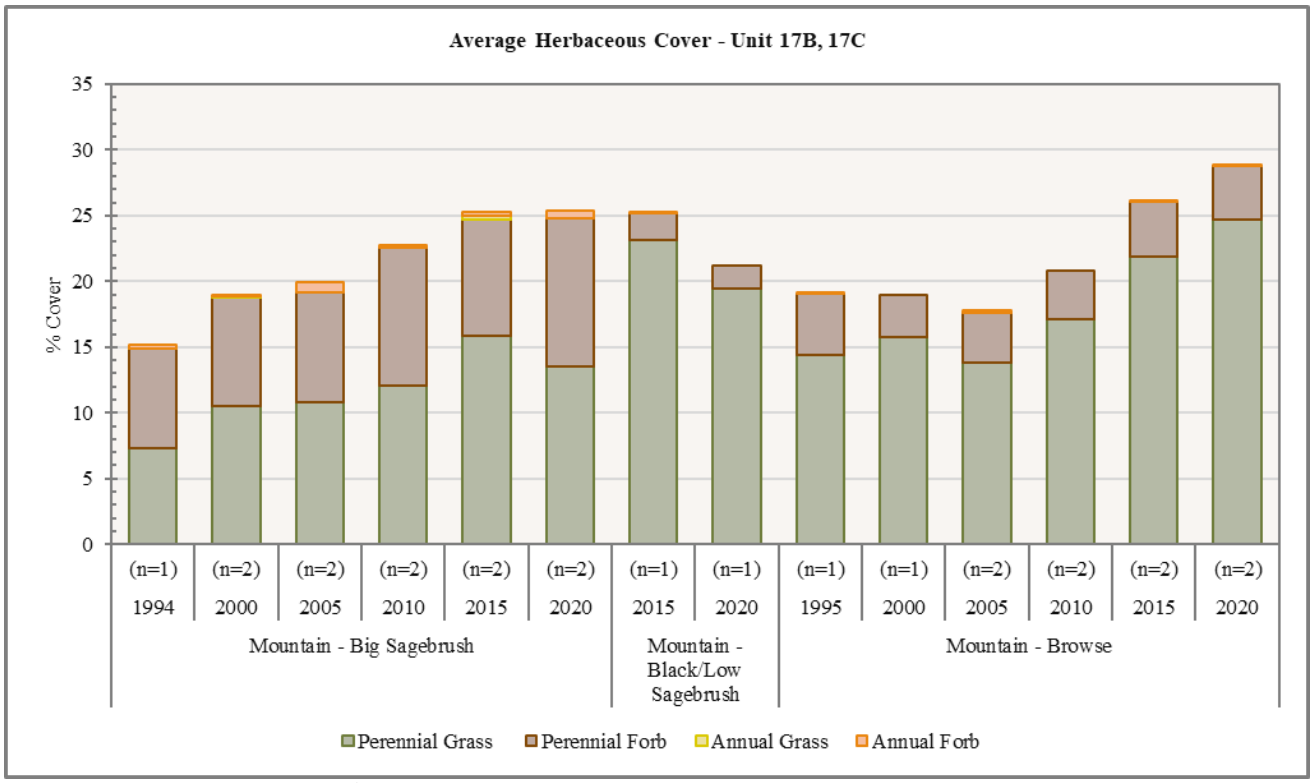


Figure 8.13: Average herbaceous cover for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain - Browse study sites in WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

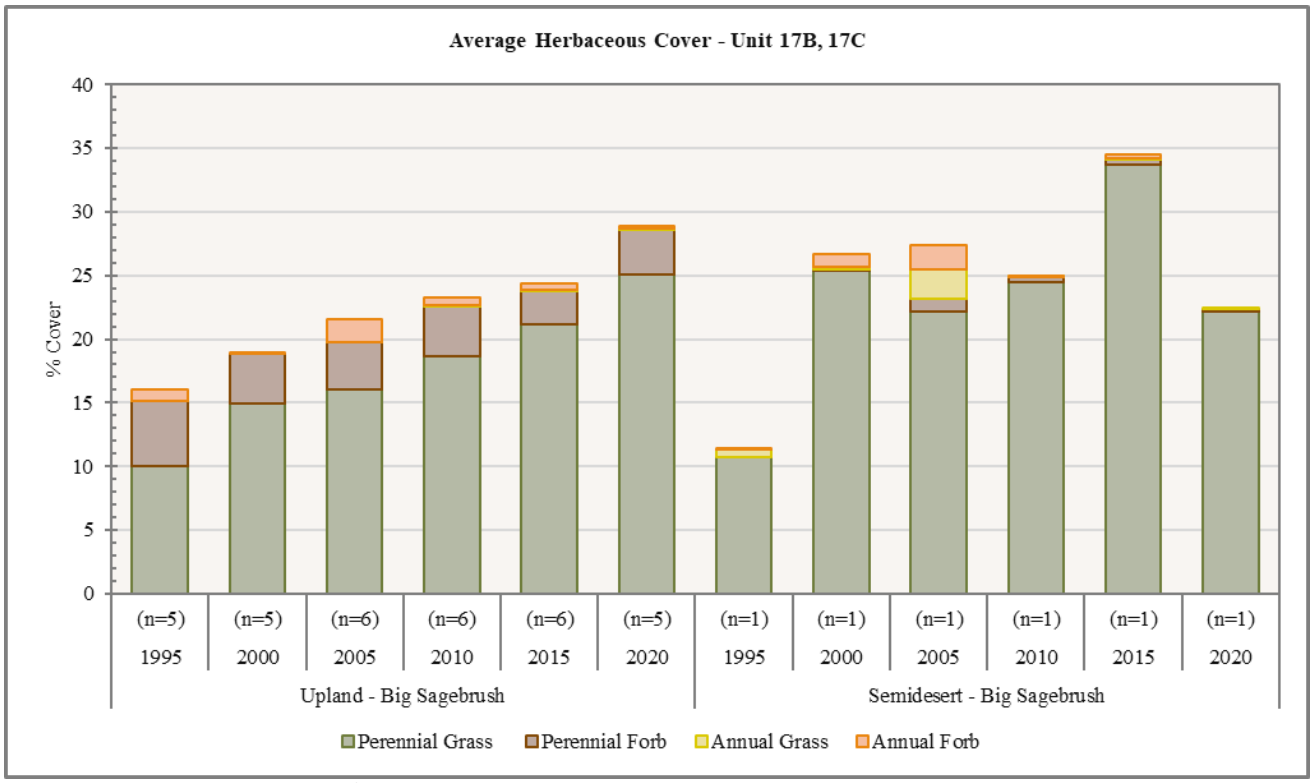


Figure 8.14: Average herbaceous cover for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

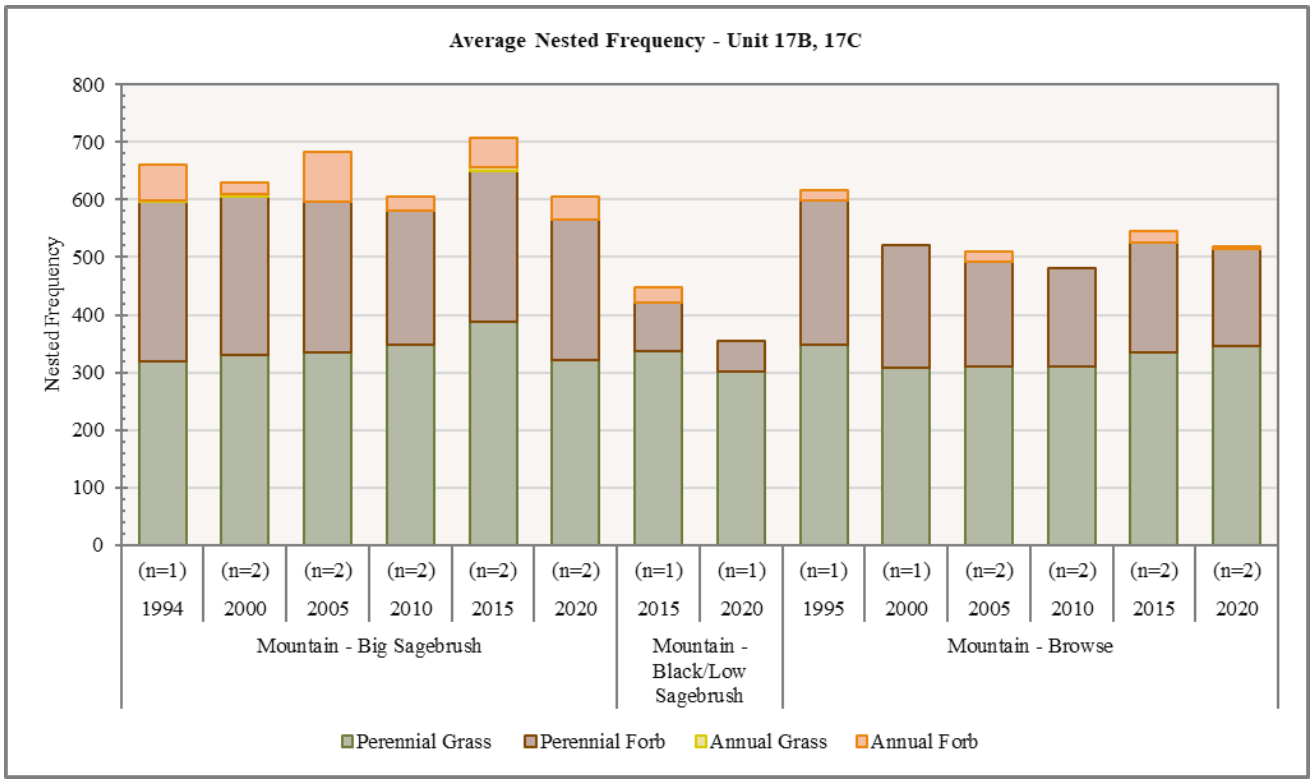


Figure 8.15: Average nested frequency of herbaceous species for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain - Browse study sites in WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

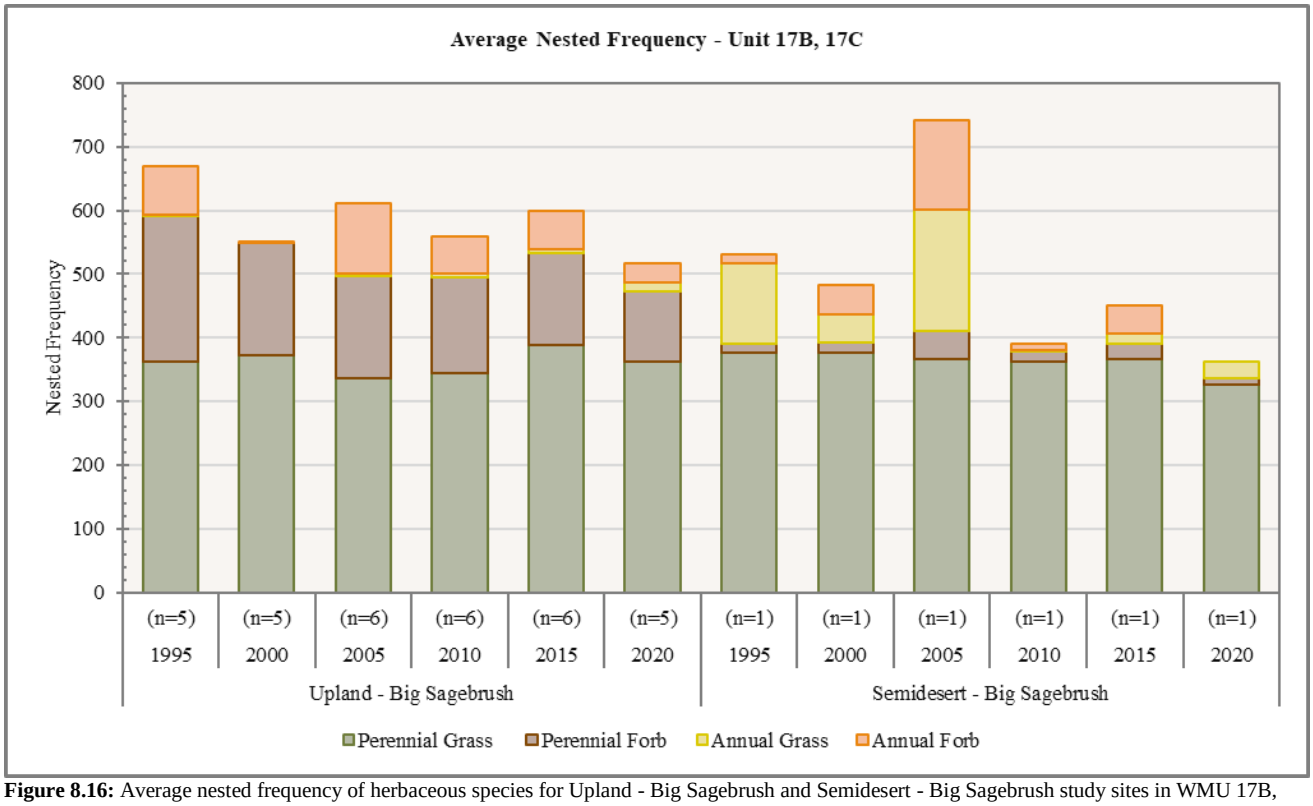


Figure 8.16: Average nested frequency of herbaceous species for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

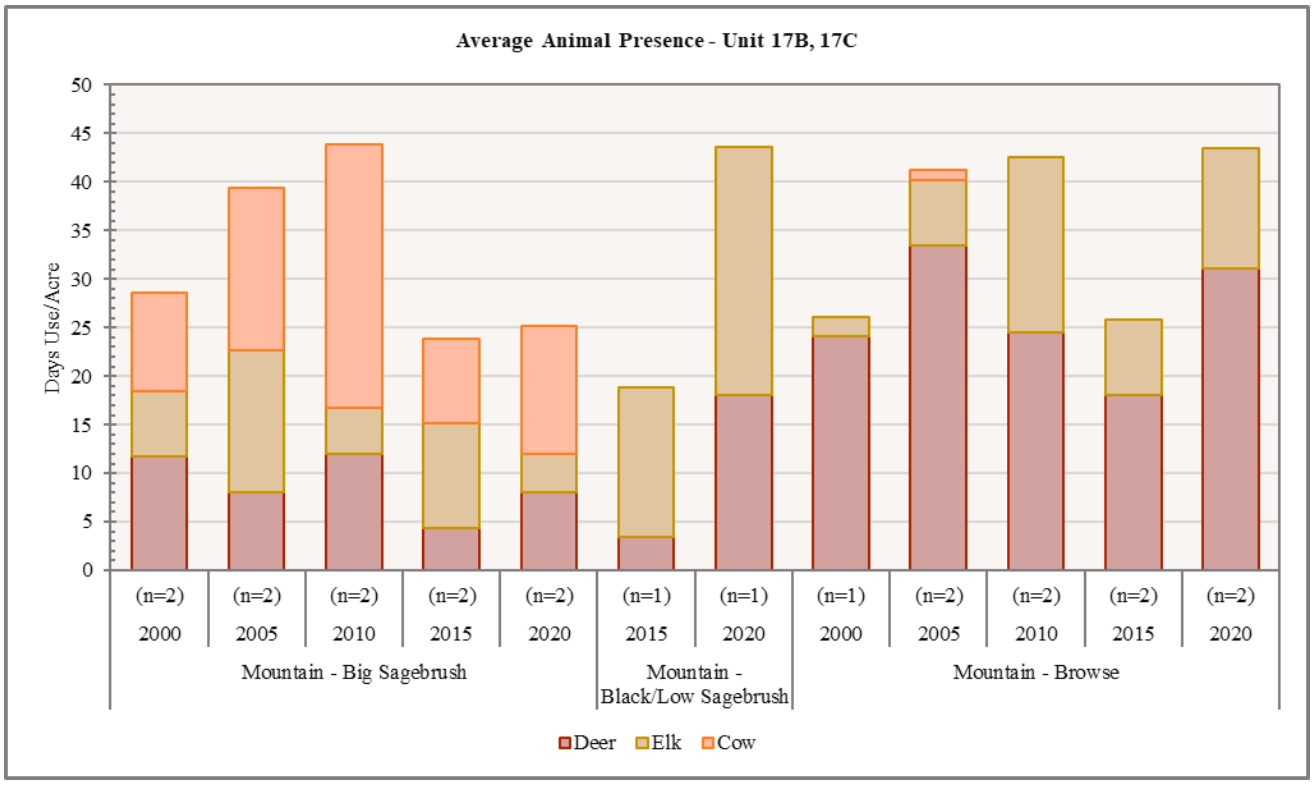


Figure 8.17: Average pellet transect data for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain – Browse study sites in WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

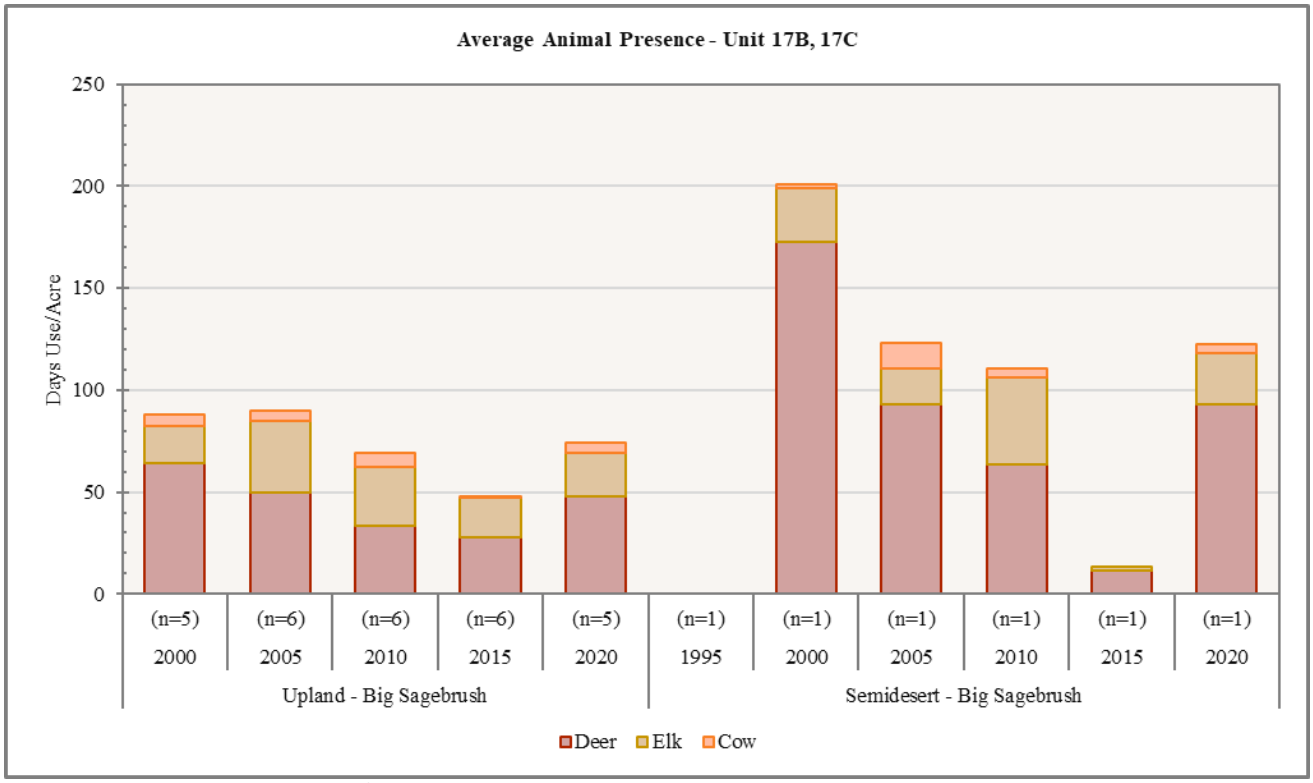


Figure 8.18: Average pellet transect data for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin.

Deer Winter Range Condition Assessment

The condition of deer winter range within the Wasatch Mountains – Currant Creek-Avintaquin management combined subunits has had improvement in averaged site conditions that have trended from fair winter range conditions in 1995 to good winter conditions in 2020. Range Trend sites sampled within the unit have some conditional disparities between sites. Range Trend sites sampled within the unit that are consistently considered to be in poor to fair condition include Grey Wolf Mountain (17-49) and Sand Wash (17-66) due to depressed browse and perennial forb cover. Lower Santaquin Draw (17-50), Two Bar Ranch (17-53), and Rabbit Gulch (17-67) average fair deer wintering conditions. Santaquins Cabin (17-51), Cutoff (17-52), Lower Horse Ridge (17-55), Little Horse Ridge (17-65), and Road Hollow (17-68) are all regularly found to be in good to excellent condition for wintering deer. These ideal conditions are attributed to high preferred browse and perennial grass covers. Presence of annual grass is either minimal or absent. Lower Santaquin Draw and Cutoff have the highest degree of conditional change that ranges from poor to good and fair-good to excellent conditions, respectively. Changes on these sites are considered to be positive due to improvements in preferred browse age class structure and increases in cover (**Figure 8.19**, **Table 8.10**).

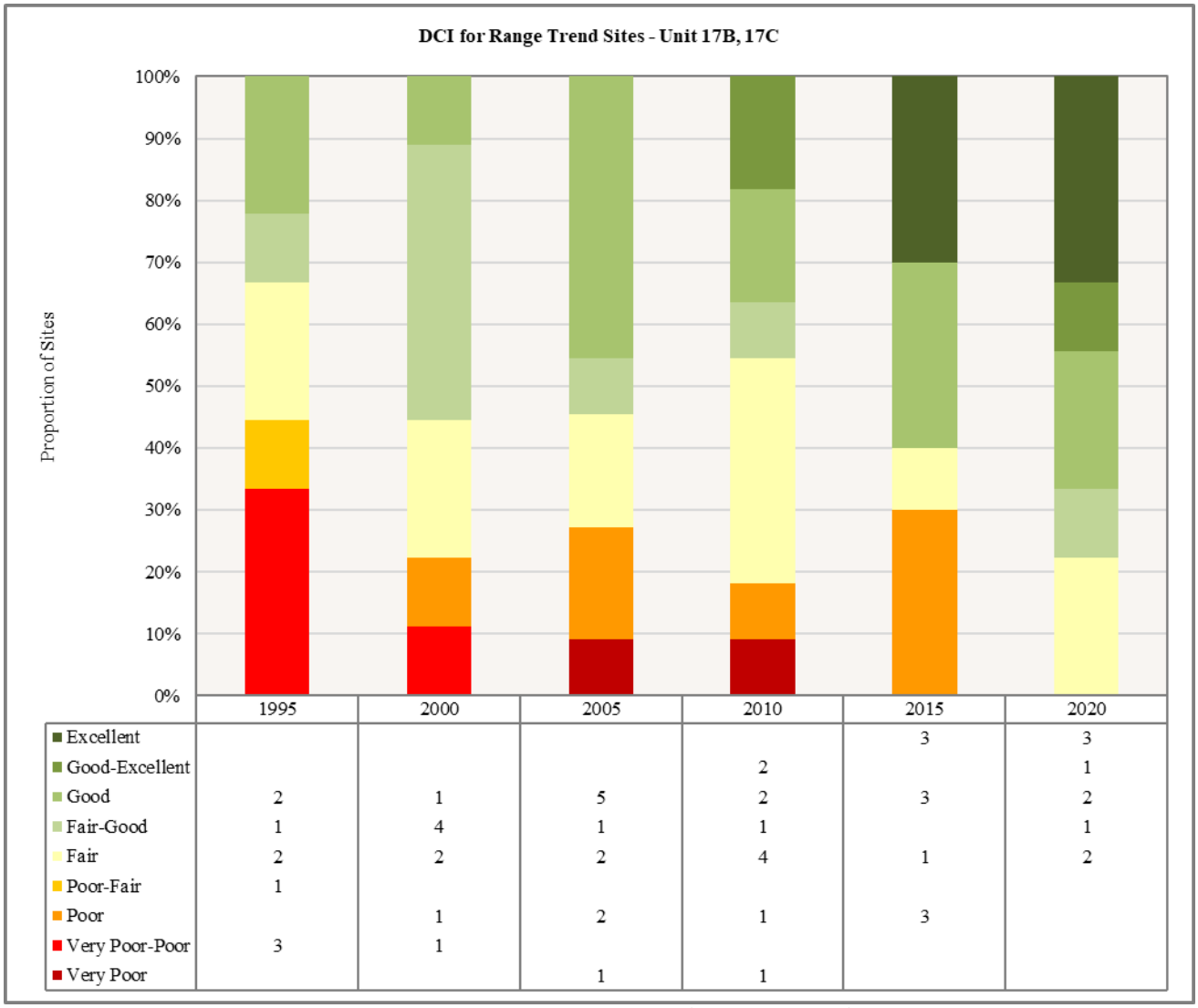
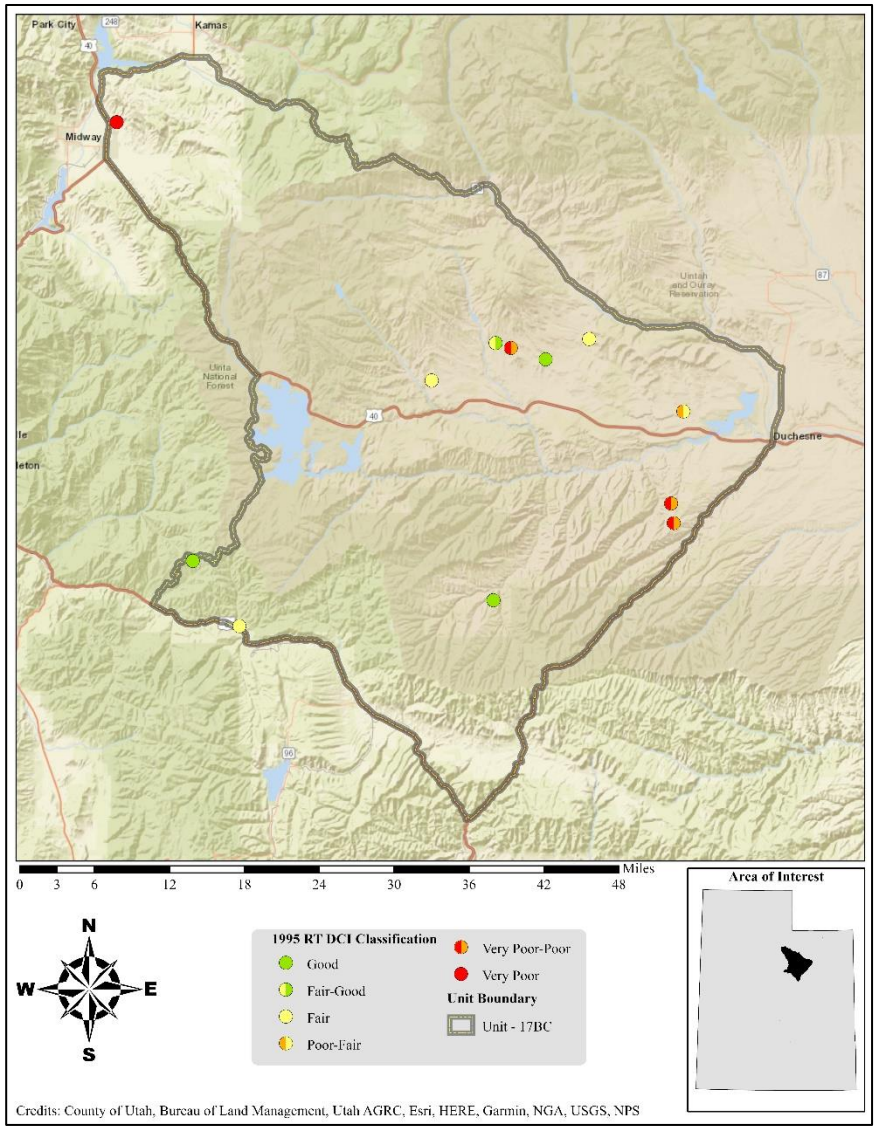


Figure 8.19: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 17B, 17C, Wasatch Mountains, Currant Creek – Avintaquin.

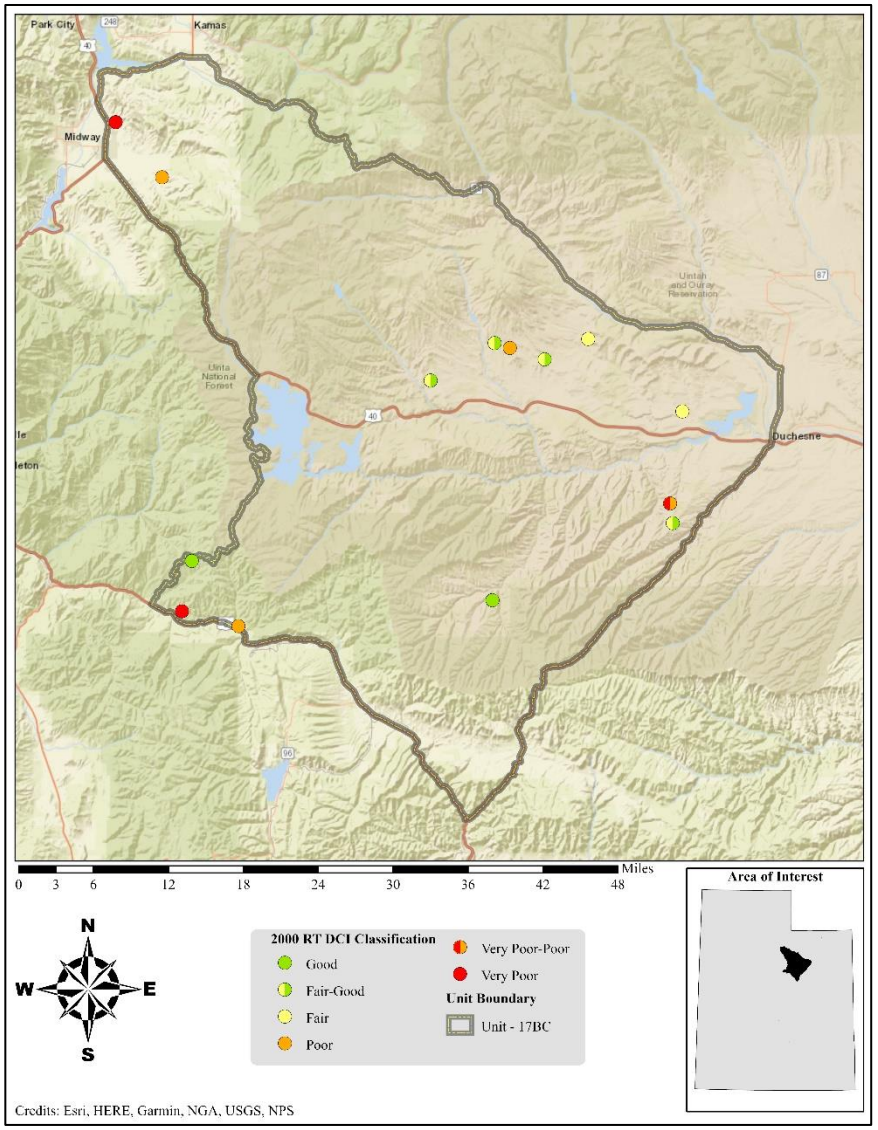
Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
17-49	1995	3.3	0	0	20	0	10	0	**33.3**	**VP-P**
17-49	2000	5.2	0	0	30	0	6.5	0	**41.7**	**P**
17-49	2005	5.9	0	0	30	0	7.6	0	**43.5**	**P**
17-49	2010	6.8	12.4	6.7	30	0	4.9	0	**60.7**	**F**
17-49	2015	6.4	0	0	30	0	2.4	0	**38.8**	**P**
17-49	2020	9.4	12.3	6.4	30	0	3.2	0	**61.3**	**F**
17-50	1995	14	12.7	7.8	25.6	0	8.5	0	**68.6**	**G**
17-50	2000	13.3	8.8	6.9	30	0	5.2	0	**64.1**	**F-G**
17-50	2005	8.8	6.4	10.8	30	0	8.6	0	**64.5**	**F-G**
17-50	2010	7.6	5.7	10.3	30	0	3.9	0	**57.5**	**F**
17-50	2015	6.5	2.4	6.4	30	0	2.4	0	**47.7**	**P**
17-50	2020	9.8	10.5	14.2	30	0	3.5	0	**68**	**G**
17-51	1995	13.6	13.1	8	21.4	0	8	0	**64.1**	**F-G**
17-51	2000	10.7	12.7	9.3	30	0	4.2	0	**66.8**	**F-G**
17-51	2005	11.3	8.8	15	30	-0.1	4.2	0	**69.2**	**G**
17-51	2010	15.8	13.9	15	30	-0.1	3.8	0	**78.4**	**G-E**
17-51	2015	15.4	10.8	15	30	0	1.1	0	**72.2**	**G**
17-51	2020	19	12.3	15	30	0	0.6	0	**77**	**G**
17-52	1995	16.5	5.5	7.3	18.9	0	10	0	**58.3**	**F**
17-52	2000	14.2	5.7	8	25.4	0	10	0	**63.3**	**F-G**
17-52	2005	24.3	4.5	6.7	21.8	-0.1	10	0	**67.2**	**G**
17-52	2010	25.7	12	11.9	16.2	0	10	0	**75.7**	**G**
17-52	2015	20	10.7	14.3	30	0	10	0	**85**	**E**
17-52	2020	23.4	10.7	13.5	30	0	10	0	**87.5**	**E**
17-53	1995	16.5	11.2	12.2	14.1	0	2	0	**56.1**	**F**
17-53	2000	20.9	6.7	5.7	19.9	0	1.3	0	**54.5**	**F**
17-53	2005	13.1	6.7	3.4	23.9	0	6.2	0	**53.3**	**F**
17-53	2009	13.6	0	0	30	0	3.6	0	**47.1**	**P**
17-53	2010	13.7	11.3	6.4	30	0	5.3	0	**66.8**	**F-G**
17-53	2015	13.8	6.9	4.3	30	-0.2	1.3	0	**56**	**F**
17-53	2020	19.1	11.9	4.6	30	-0.5	0.7	0	**65.8**	**F-G**
17-55	1995	10.1	14.5	10.1	28.7	0	9.4	0	**72.9**	**G**
17-55	2000	17.4	13.3	8.5	30	0	6.3	0	**75.5**	**G**
17-55	2005	22.3	10.3	10.9	22.6	0	10	-2	**74.1**	**G**
17-55	2010	28.9	13.1	7.6	30	0	7.1	0	**86.7**	**G**
17-55	2015	30	13.5	15	30	0	10	0	**98.5**	**E**
17-55	2020	30	12.8	14.3	30	0	9	-2	**94.2**	**E**
17-57*	1995	1.1	0	0	30	0	10	0	**41.1**	**VP-P**
17-57*	2000	2.5	0	0	30	0	6.1	0	**38.6**	**VP-P**
17-57*	2005	1.8	0	0	30	0	5.1	0	**36.9**	**VP**
17-57*	2010	1.9	0	0	30	0	1.9	0	**33.8**	**VP**
17-58*	1995	5.6	0	0	30	0	3.6	0	**39.1**	**VP-P**
17-58*	2000	9.3	14.8	14	30	0	1.6	0	**69.7**	**F-G**
17-58*	2005	17.6	14.9	8.8	30	0	2	0	**73.3**	**G**
17-58*	2010	19.3	13.1	2.3	30	0	1.5	0	**66.2**	**F**
17-65	2005	26.3	11.7	15	30	0	4.9	0	**87.9**	**G**
17-65	2010	24.3	13.2	13.6	30	0	7.6	0	**88.7**	**G-E**
17-65	2015	30	12.9	15	30	0	6.8	0	**94.7**	**E**
17-65	2020	30	14	15	30	0	7.4	0	**96.4**	**E**
17-66	2005	6	0	0	30	0	1.1	0	**37.1**	**P**
17-66	2010	7.3	1.4	8.5	30	0	0.8	0	**47.8**	**P**
17-66	2015	7.3	2.7	6.5	30	0	0.4	0	**46.8**	**P**
17-67	1997	5.4	0	0	21.4	-0.5	0.1	0	**26.4**	**P-F**
17-67	2001	5.5	0	0	30	-0.1	0.2	0	**35.6**	**F**
17-67	2005	5.1	0	0	30	-1.8	1.8	0	**35.1**	**F**
17-67	2010	4.6	0	0	30	0	0.8	0	**35.4**	**F**
17-67	2015	7.1	10.8	4.8	30	-0.1	0.7	0	**53.2**	**G**
17-67	2020	3.2	0	0	30	-0.1	0.4	0	**33.5**	**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
17-68	2015	24.5	14.2	15	30	0	4.2	0	**87.9**	**G**
17-68	2020	28.6	13.6	15	30	0	3.5	0	**90.7**	**G-E**

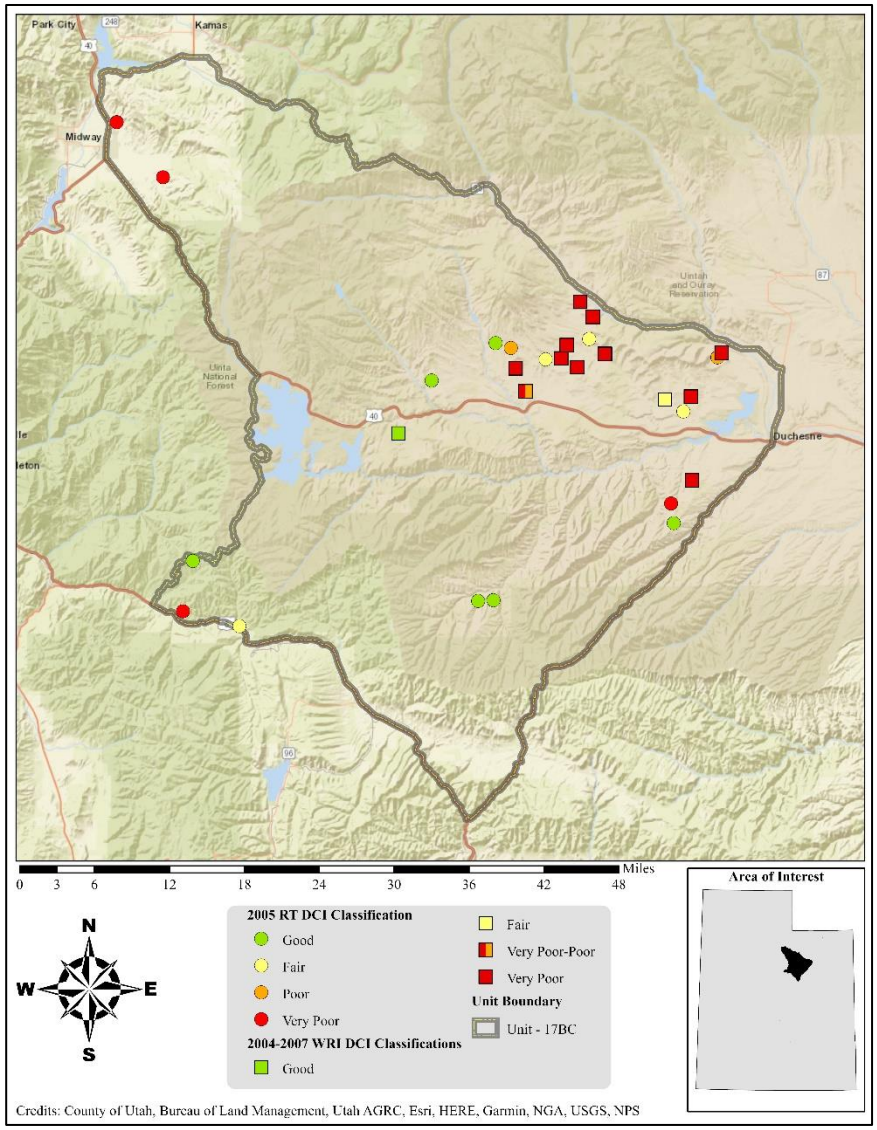
Table 8.10: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 17B, 17C, Wasatch Mountains, Currant Creek - Avintaquin. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. *Studies with an asterisk have been suspended.



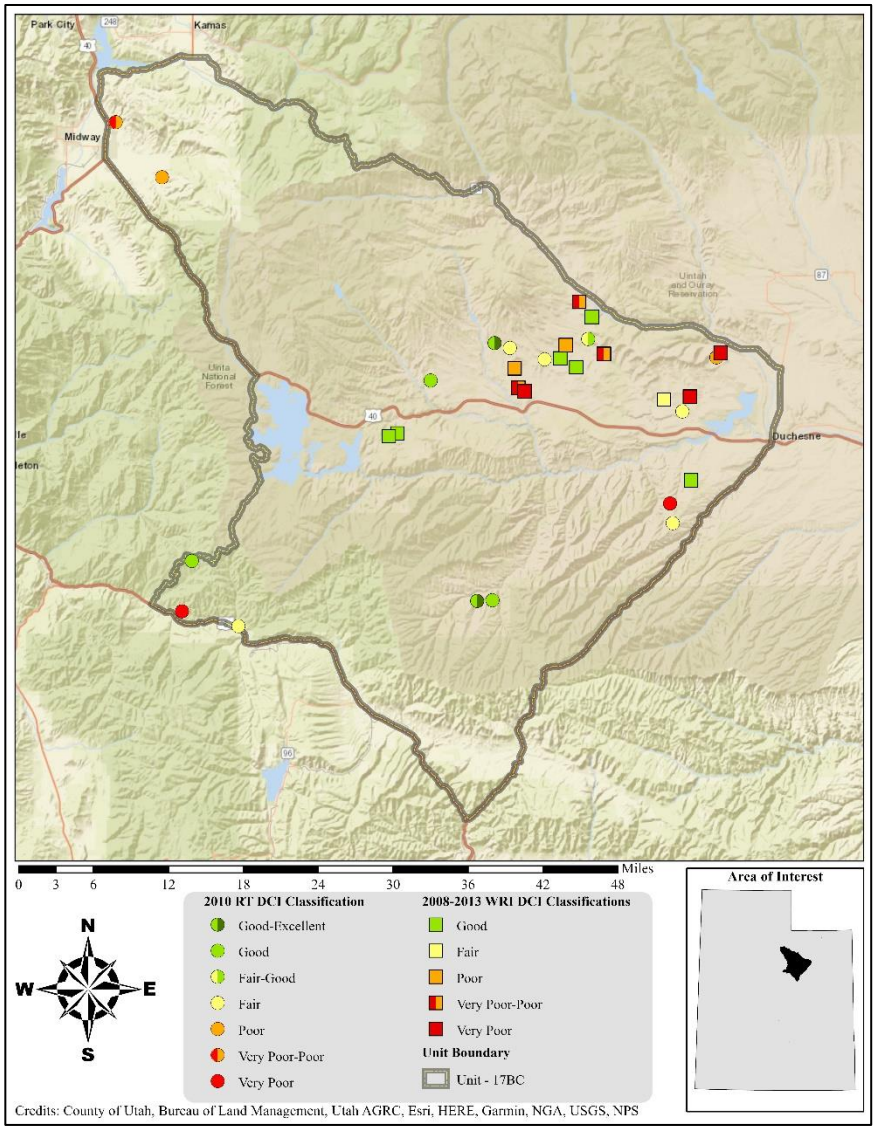
Map 8.9: 1995 Desirable Components Index (DCI) ranking distribution by study site for WMU 17B, 17C, Wasatch Mountains, Currant Creek – Avintaquin.



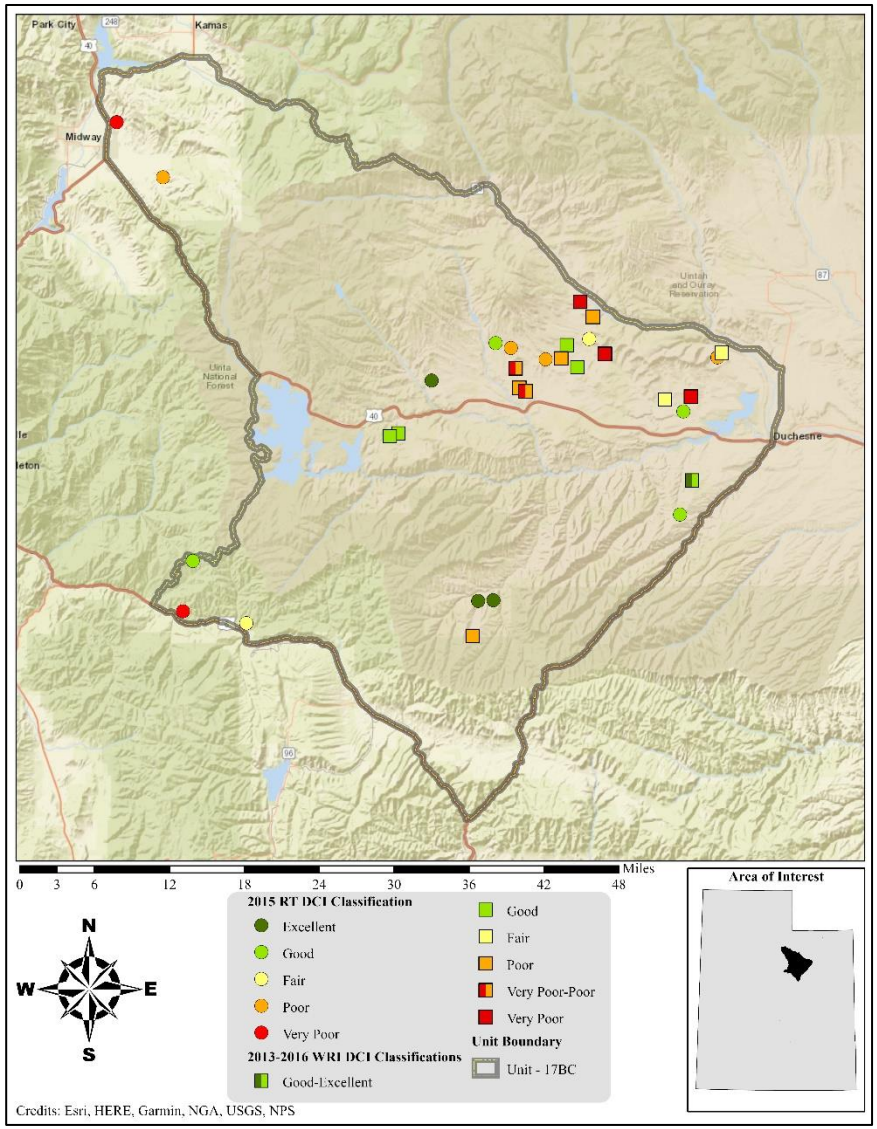
Map 8.10: 2000 Desirable Components Index (DCI) ranking distribution by study site for WMU 17B, 17C, Wasatch Mountains, Currant Creek – Avintaquin.



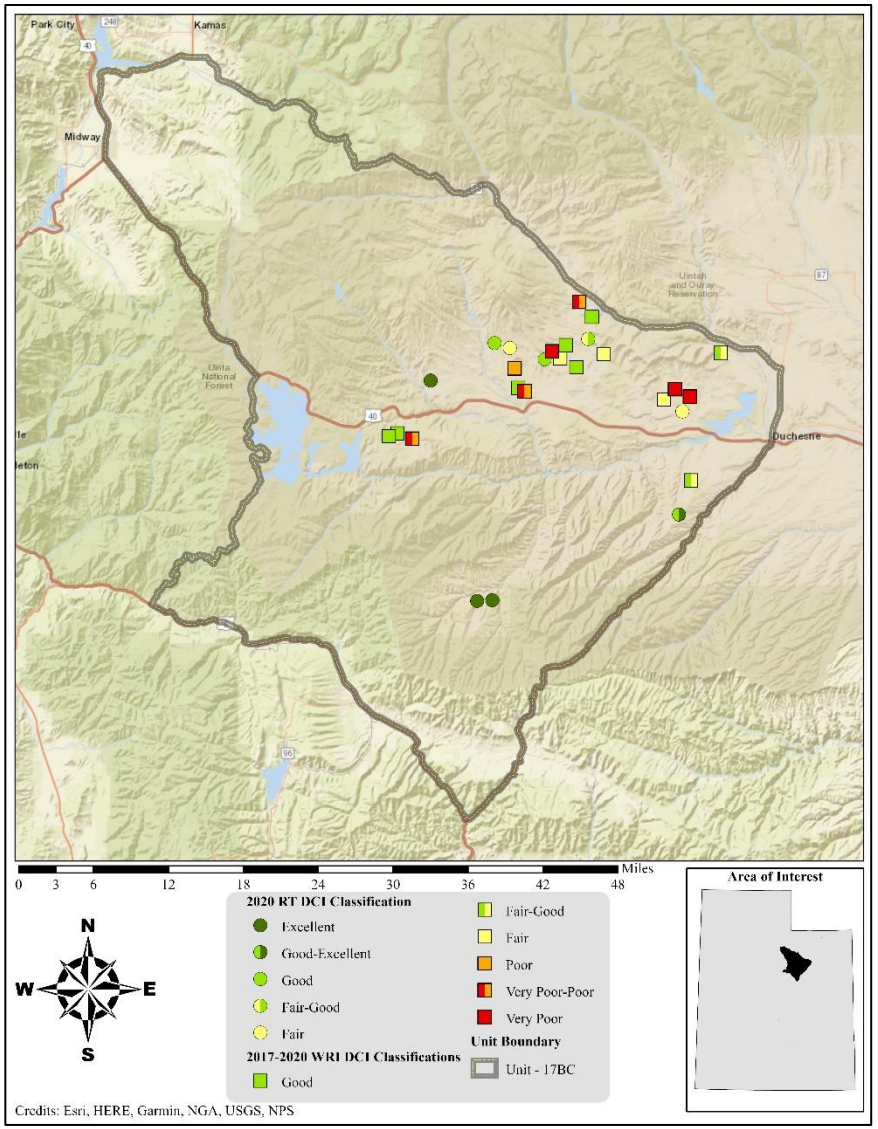
Map 8.11: 2005 Desirable Components Index (DCI) ranking distribution by study site for WMU 17B, 17C, Wasatch Mountains, Currant Creek – Avintaquin.



Map 8.12: 2010 Desirable Components Index (DCI) ranking distribution by study site for WMU 17B, 17C, Wasatch Mountains, Currant Creek – Avintaquin.



Map 8.13: 2015 Desirable Components Index (DCI) ranking distribution by study site for WMU 17B, 17C, Wasatch Mountains, Currant Creek – Avintaquin.



Map 8.14: 2020 Desirable Components Index (DCI) ranking distribution by study site for WMU 17B, 17C, Wasatch Mountains, Currant Creek – Avintaquin.

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
17-49	Grey Wolf Mountain	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
17-50	Lower Santaquin Draw	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
17-51	Santaquins Cabin	Introduced Perennial Grass	High	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
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
17-52	Cutoff	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
17-53	Two Bar Ranch	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
17-55	Lower Horse Ridge	Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
17-59	Emma Park	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
17-65	Little Horse Ridge	PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
17-66	Sand Wash	Energy Development	High	Fragmentation and degradation/loss of habitat
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
17-67	Rabbit Gulch	Energy Development	High	Fragmentation and degradation/loss of habitat
		Introduced Perennial Grass	High	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
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
17-68	Road Hollow	Energy Development	High	Fragmentation and degradation/loss of habitat
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
17R-7	Emma Park Harrow Grazed	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
17R-11	Santaquin Greasewood	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
17R-12	Santaquin Chaining	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Energy Development	Low	Fragmentation and degradation/loss of habitat
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
17R-13	Rabbit Gulch Chaining	Energy Development	High	Fragmentation and degradation/loss of habitat
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
17R-14	Skitzy Chaining	Energy Development	High	Fragmentation and degradation/loss of habitat
		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
17R-15	Golden Stairs Chaining	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
17R-16	Grey Wolf Chaining	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
17R-17	Strawberry Grouse 1	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
17R-18	Wildcat Sage-grouse	None Identified		
17R-19	Road Hollow	Urban Development	High	Fragmentation and loss of habitat
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
17R-20	Road Hollow Ridge	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
17R-21	Blacktail Chaining	Annual Grass	Medium	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
17R-22	Allen Smith Reseed	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
17R-23	Rabbit Gulch Interseed	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Energy Development	High	Fragmentation and degradation/loss of habitat
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
17R-24	East Santaquin Chaining	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

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
17R-25	Trout Creek Dixie	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Energy Development	Low	Fragmentation and degradation/loss of habitat
17R-26	Two Bar-Sand Wash Chaining	Energy Development	High	Fragmentation and degradation/loss of habitat
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
17R-27	Two Bar-Black Tail Chaining	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Energy Development	Low	Fragmentation and degradation/loss of habitat
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
17R-31	Badger Hollow Mow	Urban Development	High	Fragmentation and loss of habitat
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
17R-33	Badger Hollow Harrow	Urban Development	High	Fragmentation and loss of habitat
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
17R-34	Wildcat	Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
17R-35	Tabby Mountain	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
17R-37	West Fork Willow Creek	Introduced Perennial Grass	High	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
17R-38	North Rabbit Gulch	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
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
17R-39	Cockey Hollow	PJ Encroachment	High	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
17R-41	Wildcat Aspen	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species

Table 8.11: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 17B, 17C, Wasatch Mountains, Current Creek – Avintaquin. 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)

These higher elevation ecological sites are generally considered to be in good condition for deer summering range on this unit. These communities support dense, robust sagebrush populations and abundant herbaceous understories that provide valuable browse and forage for wildlife. The introduced annual grass species cheatgrass is present on the Emma Park Harrow Grazed study as of 2020 and has been observed on the Emma Park site in previous sample years. Although cover and abundance are currently low, cheatgrass can increase fuel loads and may have the potential to alter wildfire regimes should it increase in the future. Although tree density is very low, juniper encroachment is occurring on both sites. These studies are considered to be within Phase I of woodland succession, but continued, increasing encroachment can lead to reduced shrub and herbaceous understory health if not addressed. The introduced perennial grass species Kentucky bluegrass is present in the understory of the Emma Park study, although cover and abundance are low as of 2020. While introduced perennial grasses can provide valuable forage, they can often be aggressive at higher elevations, potentially leading to a reduction in the prevalence and abundance of other more desirable native grass and forb species.

It is recommended that monitoring of these study sites continue in the future. Although encroachment of pinyon and juniper is limited, work to prevent and reduce these tree species may be advisable if density and cover increase over time. If reseeding is deemed necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native grass species when possible. Reseeding of perennial forbs may not be necessary on these sites as they already have high diversity.

Mountain (Black/Low Sagebrush)

This higher elevation ecological site, Road Hollow, supports a black sagebrush community and is considered to be in good to excellent condition for deer winter range habitat on the Wasatch Mountains, Currant Creek – Avintaquin management unit. Communities of this ecological type generally support robust shrub populations that provide valuable browse in mild to moderate winters. Energy development may pose a risk to this site, as the study is located within one mile of oil/gas developments. Maintenance work associated with energy sources can lead to reduced vigor of shrubs and herbaceous species in the area. Introduced perennial grasses including crested wheatgrass and Russian wildrye dominate the herbaceous understory on this site. While these grass species provide valuable forage, they can often be aggressive at higher elevations and may lead to a reduction in the abundance and diversity of more desirable native grass and forb species. In addition, pinyon and juniper have been observed in point-quarter density measurements, placing this study site within Phase I of woodland succession. The threat posed is currently low, but sustained and increasing tree encroachment over time could lead to reduced understory shrub and herbaceous vigor.

Although encroachment of pinyon and juniper is limited, work to prevent and reduce these species may be advisable if trees increase in the future. If reseeding is deemed necessary to restore the ecological integrity of the herbaceous understory, care should be taken in species selection and preference should be given to native species when possible.

Mountain (Browse)

These high elevation mountain ecological sites which support browse communities are considered to be in excellent condition for deer winter range habitat on this unit. These study sites are host to shrub populations that provide valuable browse in moderate to severe winters. Pinyon and juniper encroachment is a concern on both of these study sites, posing a medium-level threat on the Little Horse Ridge site and a low-level threat on the Lower Horse Ridge study. Sustained tree encroachment can lead to reduced understory shrub and herbaceous health if not addressed. In addition, noxious weeds are present on the Lower Horse Ridge site. Although cover and abundance are very low as of 2020, these species can be aggressive, leading to reduced abundance and diversity of other desirable herbaceous species.

Continued monitoring of these study sites is strongly recommended. Tree-reducing treatments have taken place on the Lower Horse Ridge study. However, work to reduce pinyon and juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) may be advisable on both sites to aid in restoring the ecological integrity of the community. Furthermore, treatments such as herbicide application may be prudent if noxious weed abundance and/or cover increase in the future.

Upland (Big Sagebrush)

These mid elevation sagebrush communities are generally considered to be in fair to good condition for deer winter range habitat on the Wasatch Mountains – Currant Creek-Avintaquin unit: the exception to this is the Sand Wash study, which is in poor condition. Communities of this ecological type support sagebrush populations that provide valuable browse in mild to severe winters. The Grey Wolf Mountain, Lower Santaquin Draw, and Santaquins Cabin studies have introduced perennial grasses in the herbaceous understories. These introduced grasses have the potential to be aggressive and may reduce the abundance of other native grass and forb species. In addition, annual grasses are present or have been observed in the past on the Two Bar Ranch, Cutoff, and Santaquins Cabin study sites. Invasion from annual grasses, primarily cheatgrass, is a potential threat to the herbaceous understories of these communities. Cover of cheatgrass is currently low, but increased amounts in the future could boost fuel loads and exacerbate the risk of wildfire in these communities. Although tree cover is low, pinyon and juniper encroachment is occurring on all of these sites, and they are considered to be within Phase I of

woodland succession: continued encroachment can lead to reduced shrub and herbaceous understory health if not addressed. Energy development may be an additional threat on the Sand Wash study, as it is located within one mile of oil/gas developments. Maintenance work associated with energy sources may have the potential to lead to reduced shrub and herbaceous vigor in the area. Finally, pellet transect data indicates that overuse by deer may be occurring on the Santaquins Cabin site. Sustained deer usage above what communities of this ecological type can support may result in a reduced and/or less vigorous browse component.

Closer examination of the Santaquins Cabin study and the surrounding area is recommended, as it may help determine if high deer use is occurring throughout the localized area. Continued monitoring of these sites is advisable, and work to reduce pinyon and juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) may be prudent if encroachment in these communities increases in the future. 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.

Semidesert (Big Sagebrush)

This low elevation study site, Rabbit Gulch, is classified as being in fair condition for deer winter range habitat on the unit. This study site supports a sagebrush population that provides valuable browse in mild to severe winters, although decadence has increased over time. Energy development poses a threat to this site, as the study is located within one mile of oil/gas developments. Maintenance work associated with energy sources may lead to reduced health and vigor of shrub and herbaceous species in the area. In addition, the herbaceous understory of this ecological site is dominated by the introduced perennial grass species crested wheatgrass. This and other introduced perennial grass species have the potential to be aggressive and may outcompete other native grass and forb species. Pellet transect data indicates that use by deer above what communities of this ecological type can support may be occurring on this site. Sustained high deer usage may have the potential to lead to a reduced and/or less vigorous shrub component. In addition, the introduced annual grass species cheatgrass has been present in the past in the herbaceous understory. Although the threat remains low, annual grasses can boost fuel loads, affect the ecological resiliency of the community, and may exacerbate the risk of wildfire if they increase in the future. Pinyon and juniper encroachment has been an issue on this site in the past, but density has remained low in the years following a previous reduction treatment. However, trees have been observed in point-quarter density, indicating that there may be potential for infilling in the future.

Continued monitoring of this ecological site is recommended. If reseeding should be necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native grass species if possible. Further tree-removing treatments (e.g. bullhog, chaining, lop and scatter, etc.) may be advisable if infilling increases in the future. Finally, closer examination of this site and the surrounding area is recommended to help determine if high deer use is occurring throughout the localized area.

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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 error 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.