

BIGHORN SHEEP UNIT MANAGEMENT PLAN
PINE VALLEY
Virgin River / Beaver Dam / Red Cliffs / Pine Valley North
August 2019

BOUNDARY DESCRIPTIONS

Iron and Washington Counties -

Virgin River - Washington County—Boundary begins at SR-18 and I-15 in St. George; northwest on SR-18 to US-91; southwest on US-91 to the Arizona-Utah state line; east along this state line to I-15; north on I-15 to St. George. USGS 1:100,000 Map: Saint George. Boundary questions? Call the Cedar City office, 435-865-6100.

Beaver Dam - Washington County--Boundary begins at SR-18 (Bluff Street) and I-15; north on SR-18 to Sunset Blvd; west on this blvd to Santa Clara Drive; north on this drive to SR-91; north on SR-91 to Gunlock Road; north on this road to the Manganese Wash road; west on this road to the Motoqua road; north on this road to the Utah-Nevada state line; south then east on this stateline to I-15; north on I-15 to SR-18 (Bluff Street).

Red Cliffs - Washington County--Boundary begins at Ash Creek and I-15; west along this creek to Sawyer Canyon bottom; west along this canyon canyon bottom to the drainage divide; west along this divide over Mount Baldy to Leap Creek Trail; north along this trail to Anderson Valley Trail; west along this trail to Mill Flat and Summit Trail; though Anderson Valley to the Summit Trail at Mill Flat; southwest along this trail to the Cottonwood Creek drainage near Burger Peak; south along this drainage to the Cottonwood Creek road; south along this road to the Cedar Bench road; west along this road to Diamond Valley road; west along the this road to SR-18; north on SR-18 to the Sand Cove Reservoir road; west along this road to the Gunlock Road; south on this road to SR-91; south on SR-91 to Santa Clara Drive; south on this drive to Sunset Blvd; east on this blvd to SR-18 (Bluff Street); south on SR-18 to I-15; north on I-15 to Ash Creek.

Pine Valley North - Iron and Washington counties--Boundary begins at Ash Creek and I-15; west along this creek to Sawyer Canyon bottom; west along this canyon canyon bottom to the drainage divide; west along this divide over Mount Baldy to Leap Creek Trail; north along this trail to Anderson Valley Trail; west along this trail to Mill Flat and Summit Trail; though Anderson Valley to the Summit Trail at Mill Flat; southwest along this trail to the Cottonwood Creek drainage near Burger Peak; south along this drainage to the Cottonwood Creek road; south along this road to the Cedar Bench road; west along this road to Diamond Valley road; west along the this road to SR-18; north on SR-18 to the Sand Cove Reservoir road; west along this road to the Gunlock Road; south along this road to the Manganese Wash road; west along this road to the Motoqua road; north along this road to the Utah-Nevada state line; north on this state line to the Union Pacific railroad tracks near Uvada; northeast along these tracks to the Lund highway; northeast along this highway to SR-56; east on SR-56 to I-15; south on I-15 to Ash Creek. Boundary questions? Call Cedar City office, 435-865-6100.

LAND OWNERSHIP

Land ownership and approximate area of modeled bighorn sheep habitat for the Pine Valley bighorn sheep management sub-units.

Virgin River

Ownership	MODELED BIGHORN HABITAT	
	Area (acres)	%
Bureau of Land Management	36,691	77.0%
Tribal	5,843	12.3%
Utah State Institutional Trust Lands	3,420	7.2%
Private	1,689	3.5%
Utah Department of Transportation	34	0.1%
Totals	47,677	100%

Beaver Dam

Ownership	MODELED BIGHORN HABITAT	
	Area (acres)	%
Bureau of Land Management	43,232	76.8%
Tribal	7,815	13.9%
Utah State Institutional Trust Lands	4,305	7.7%
Private	902	1.6%
Utah State Parks	5	<0.1%
Totals	56,259	100%

Red Cliffs

Ownership	MODELED BIGHORN HABITAT	
	Area (acres)	%
National Forest	51,881	49.6%
Bureau of Land Management	38,702	37.0%
Utah State Parks	6,257	6.0%
Private	3,337	3.2%
Utah State Institutional Trust Lands	2,179	2.1%
Tribal	1,984	1.9%
Utah Division of Wildlife Resources	329	0.3%
Totals	104,669	100%

Pine Valley North

Ownership	MODELED BIGHORN HABITAT	
	Area (acres)	%
National Forest	147,262	53.2%
Bureau of Land Management	104,569	37.8%
Private	17,158	6.2%
Utah State Institutional Trust Lands	7,498	2.7%
Utah State Parks	121	<0.1%
Tribal	8	<0.1%
Totals	276,616	100%

UNIT MANAGEMENT GOALS

It is proposed to expand the range of desert bighorns sheep in the Pine Valley unit in an effort to reestablish bighorns to their native ranges (Buechner 1960, Dalton and Spillet 1971) and to promote wildlife diversity in the area for hunting and viewing, in accordance with Utah Code 23-14-21. Specific goals are to:

- 1) Manage for a healthy population of desert bighorn sheep capable of providing a broad range of recreational opportunities, including hunting and viewing.
- 2) Balance bighorn sheep impacts with other uses such as authorized cattle grazing and local economies.
- 3) Maintain a population that is sustainable within the available habitat in the unit boundary.

HISTORY AND CURRENT STATUS

Desert bighorn sheep historically inhabited much of the available habitat on the southern end of the Pine Valley WMU near the Arizona and Nevada borders (Buechner 1960). As with most areas in Utah, they were nearly extirpated and eventually reintroduced to many areas throughout the state. In 1988, it was estimated that about 20 bighorn sheep occupied the Beaver Dam Mountain area of Utah. It was thought that these sheep had moved north from the Virgin Mountains of Arizona following a reintroduction into that area in 1979-80. During that time, no releases were planned in Utah because domestic sheep were still being grazed on the Utah side of the range.

In 1989, an MOU between the BLM, Utah Division of Wildlife, and the Arizona Game and Fish Department was signed to protect areas that were inhabited by bighorn sheep from changing livestock grazing management from cattle to sheep. Additionally, the Apex sheep allotment on the Beaver Dam Mountains was converted to cattle in 1994 which provided an opportunity to reintroduce wild sheep into the area. At that time, 25 sheep were transplanted to the Beaver

Dam Mountains from Lake Mead, AZ. Radio collared transplanted sheep (n=10) were monitored every couple of months until the collars stopped functioning in 1999. The telemetry data from these initial releases showed considerable movement across the Utah and Arizona state line.

There is extensive habitat available throughout the Pine Valley WMU which allows for more opportunity to reintroduce sheep into historical areas. Habitat for bighorn sheep was improved north of Highway 91 on the Beaver Dam Mountains when several wildfires occurred in 2006 and removed several thousand acres of old growth pinion and juniper. Additionally, the Pine Valley bighorn sheep unit was changed in 2013 to the same boundaries as the mule deer unit to provide for more transplants and wild sheep expansion.

Currently, the population is estimated to be approximately 100 sheep along the Virgin River. The newly expanded boundaries and a surplus of sheep on the Zion WMU have provided an opportunity to reintroduce new populations onto this unit. In November 2014, 26 desert bighorn sheep from the Zion unit were transplanted to the Beaver Dam subunit to create a new population. An additional 10 sheep were relocated to the Beaver Dam unit in November of 2015. A map of the Pine Valley sub-units, modeled habitat, and current bighorn sheep distribution is provided in Figure 1.

ISSUES AND CONCERNS

Potential Habitat: We modeled potential bighorn sheep habitat on the Pine Valley unit using methodology outlined by O'Brien et al. (2014). Bighorn sheep select habitat based on the proximity of steep-sloped escape terrain, forage availability, ruggedness, and horizontal visibility (Bleich et al. 1997, Valdez and Krausman 1999, Sappington et al. 2007). Bighorn sheep habitat is located throughout the unit in suitable rugged locations (Figure 1).

Livestock Competition: Interactions of bighorn sheep with domestic cattle are anticipated seasonally. Dietary overlap between cattle and bighorns has not surfaced as a concern with other bighorn populations in the state and is not expected for the Pine Valley herd. Desert bighorn annual use of forage classes, when compared to cattle, differ significantly (Dodd and Brady 1988). Likewise, bighorn sheep generally avoid areas where cattle are present (Bissonette and Steinkamp 1996), and also select areas with a much higher degree of slope (Ganskopp and Vavra 1987), which also minimizes competition for water. Desert bighorn sheep have the ability to utilize metabolic water formed by oxidative metabolism, preformed water found in food, and surface water, including dew. The amount of surface water required by desert bighorns is dependent on many factors, including body size, activity, forage moisture content, temperature, and humidity (Monson and Sumner 1980). In hot, dry periods, bighorns will water daily if possible but have remained independent of surface water for periods of 5-8 days (Blong and Pollard 1968, Turner and Boyd 1970, Turner 1973, Welles and Welles 1961, 1966). Across all seasons, desert bighorns drink on average every 10-14 days (Welles and Welles 1961). It has been reported, in extreme cases, that desert bighorns did not drink for a period of several months (Monson 1958, Mendoza 1976). Koplín (1960) found that a captive herd of desert bighorn sheep that were fed a dry ration and provided unlimited water drank an average of 4.9 liters (1.3 gal) per day.

Disease: Disease, especially bacterial pneumonia, has been responsible for numerous declines in bighorn populations throughout North America (Cassirer and Sinclair 2007). Pneumonia outbreaks typically affect all age/sex cohorts and are usually followed by several years of annual pneumonia outbreaks in lambs that dramatically reduce population growth (Spraker et al. 1984, Ryder et al. 1992, George et al. 2008). These events are attributed to the transfer of pathogens from domestic sheep (*Ovis aries*) or goats (*Capra aegagrus hircus*) to wild sheep through social contact (Singer et al. 2000, Monello et al. 2001, Cassirer and Sinclair 2007). Disease-induced mortality rates in bighorn sheep vary substantially by population due to multiple processes including contact rates, social substructuring, pathogen virulence, and individual susceptibility (Manlove et al. 2014, 2016). Therefore, spatial separation from domestic sheep and goats is the most important factor in maintaining overall herd health. It is not the intent of this plan or the DWR to force domestic sheep operators off of their ranges or out of business. Rather, the intent is to look for opportunities that will protect bighorn sheep populations while working with the domestic sheep industry.

Predation: Cougar predation may limit bighorn sheep in locations where predator populations are largely supported by sympatric prey populations (Hayes et al. 2000, Schaefer et al. 2000, Ernest et al. 2002), which, in this case, includes mule deer, domestic cattle, and elk. It has been hypothesized that declines in sympatric ungulate populations can increase predation on bighorn sheep as cougars switch to bighorns as an alternate prey source (Kamler et al. 2002, Rominger et al. 2004). It is anticipated that cougars will be the main predator of bighorns on the Pine Valley unit. If predation becomes a limiting factor, predator control work will be administered within the guidelines of the DWR Predator Management Policy. Predator management is coordinated with USDA Wildlife Services. Predator reduction work already occurs on the Pine Valley unit in conjunction with livestock losses, and therefore any additional work that may be done would be mutually beneficial to both livestock and other big game species.

POPULATION MANAGEMENT

Population Management Objective:

- 1) The Pine Valley Unit will be managed as four separate sheep sub-units with a total population objective of 650. Bighorn sheep currently occupy only the Virgin River and Beaver Dam sub-units.
 - Virgin River: 125 bighorn sheep
 - Beaver Dam: 200 bighorn sheep
 - Red Cliffs: 200 bighorn sheep
 - Pine Valley North: 125 bighorn sheep

Population Management Strategies:

Transplant Plan: Transplant(s) of wild bighorn sheep will be used to establish herds into sub-units that are currently not occupied by bighorn sheep. Initial transplant should ideally occur with a minimum of 40 bighorns. Newly transplanted bighorns will be monitored for general

movements and annual survival. Interested parties will be notified and given opportunity for discussion. This includes the Washington County Commission, BLM, USFS, and grazing permittees. If the population reaches or exceeds the population objective, management practices including transplants and ewe hunts may be incorporated to maintain the population at objective.

Monitoring: Monitoring of bighorn sheep will be conducted every 2-3 years by aerial survey to determine lamb recruitment, population status, ram-to-ewe ratios, range distribution, and ages and quantity of rams. The current population will likely require a minimum of 12 hours to conduct a complete trend count and survey adjacent areas to evaluate wild sheep dispersal. Additional ground classification may be conducted as conditions permit. GPS collars with mortality signals will be used to document cause-specific mortality and identify annual survival estimates. Space use will be monitored to assess potential overlap and competition with cattle. GPS collars will be added to the population as the original collars complete their usable lifespan. If bighorn sheep are found wandering into areas where there is high risk of contact with domestic sheep or goats, the DWR may remove these animals in accordance with the Utah Bighorn Sheep Statewide Management Plan and UDWR GLN-33.

Trend Count and Classification Data for the Virgin River sub-unit.

Year	Pop Est.	Total Count	Lambs/100 Ewes	Rams/100 Ewes
2002	144	72	33	167
2004	110	55	46	12
2007	76	38	29	52
2008	46	23	15	62
2010	72	36	22	76
2012	108	54	31	69
2014	104	52	21	59
2016	103	62	29	49

Trend Count and Classification Data for the Beaver Dam sub-unit.

Year	Pop Est.	Total Count	Lambs/100 Ewes	Rams/100 Ewes
2016	68	41	30	22

Predator Management: Predator management will be coordinated with USDA Wildlife Services prior to bighorn releases. If predation becomes a limiting factor on bighorns, predator control work will be administered within the guidelines of the DWR Predator Management Policy.

DISEASE MANAGEMENT

Disease Management Objectives:

- 1) Maintain a healthy population of desert bighorn sheep on the Pine Valley unit.
- 2) Maintain spatial separation from domestic sheep and goats.

Disease Management Strategies:

Disease Monitoring: Source herds used for establishing this population will be tested for pneumonia related pathogens prior to release to ensure healthy source stock. The DWR may perform periodic live captures to assess herd health, as well as take advantage of opportunistic sampling of hunter harvested bighorns or bighorns that are found dead.

Spatial Separation: Active domestic sheep allotments and farm flocks with domestic sheep will be evaluated for potential overlap with bighorn habitat prior to a bighorn transplant. The DWR will delineate areas where there is high risk for domestic sheep and goats to come in contact with wild sheep or where wild sheep may stray and come in contact with domestics. These areas will be considered areas of concern. Lethal or non-lethal removal of bighorns may be warranted in these areas to prevent comingling. The need to test wandering sheep from this unit will be evaluated on a case by case basis.

- Virgin River Sub-unit – There are no domestic sheep grazing allotments on federal land within this sub-unit. There are approximately 1,700 acres of private property in bighorn sheep habitat. Outreach efforts should continue with landowners about the need for spatial separation between wild and domestic sheep and goats.
- Beaver Dam Sub-unit – There are no domestic sheep grazing allotments on federal land within this subunit. There are approximately 900 acres of private property in bighorn sheep habitat. Efforts should continue with landowners to maintain spatial separation between wild and domestic sheep and goats. Expanding sheep onto the range along the Nevada border where private property exists should be avoided.
- Red Cliffs Sub-unit – Most domestic sheep grazing is several (>10 miles) to the north of this sub-unit. There is one BLM grazing allotment that may challenge effective separation. Manage for spatial separation between wild and domestic sheep.
 - There are approximately 3,300 acres of private property interspersed throughout this sub-unit. Private in-holdings within the USFS should be evaluated for domestic sheep grazing and all municipalities contacted about farm flocks prior to transplants and to help maintain effective separation between wild and domestic sheep and goats.
- Pine Valley North Sub-unit – There are several BLM grazing allotments that are available to domestic sheep in the northern portions of this sub-unit. There are more than 17,000 acres of private property in bighorn sheep habitat. While this sub-unit is the least ready for bighorn sheep reintroduction, outreach efforts should continue with landowners about the need for spatial separation between wild and domestic sheep and goats.

HABITAT MANAGEMENT

Habitat Management Objectives:

- 1) Maintain or improve sufficient bighorn sheep habitat to achieve population objective.
- 2) Support and encourage regulated livestock grazing and maintain/enhance forage production through range improvement projects on the Pine Valley unit.

- 3) Improve habitat and water availability where possible.

Habitat Management Strategies:

Monitoring: The DWR will assist land management agencies in monitoring bighorn habitat to detect changes in habitat quantity and quality.

Habitat Improvement: Vegetative treatment projects to improve bighorn habitat lost to natural succession or human impacts will be sought out and initiated. The DWR will cooperate with the BLM to utilize seeding, controlled burns, and/or mechanical treatments for conifer removal in order to increase and improve bighorn habitat across the unit. Habitat restoration projects will be planned and executed through the Utah Watershed Restoration Initiative program, allowing for public input to ensure that projects that are beneficial to both bighorn sheep and sympatric cattle are given priority.

Water Improvement: The DWR will work with the BLM and any private stakeholders to locate and cooperatively modify or improve existing water sources or install new water developments across bighorn habitat.

RECREATION MANAGEMENT

Recreation Management Objectives:

- 1) Provide high quality hunting opportunities on the Virgin River and Beaver Dam sub-units as well as the Red Cliffs and Pine Valley North sub-units when that population is established.
- 2) Increase public awareness and expand viewing opportunities of bighorn sheep.

Recreation Management Strategies:

Hunting: Hunting and permit allocation recommendations will be made in accordance with the Utah Bighorn Sheep Statewide Management Plan. A bighorn hunt will continue to be proposed on this unit. When sub-unit populations reach a population level that they can stand on their own, they will be proposed to be managed separately. Ewe hunts may be utilized as a tool for maintaining population objective.

Harvest Statistics for the Pine Valley, Virgin River Unit

Year	Permits	Mean Days Hunted	Harvest
2004	2	16.5	100%
2005	2	6.5	100%
2006	2	11.0	100%
2007	2	22.0	100%
2008	2	4.0	100%
2009	2	4.0	100%
2010	2	8.5	100%
2011	3	2.7	100%
2012	2	7.5	100%

2013	3	4.7	100%
2014	2	8.5	100%
2015	2	5.5	100%
2016	2	6	100%
2017	4*	3	100%
2018	3	5.3	100%

*includes statewide conservation permit

Non-Consumptive Uses: The DWR will look for opportunities to increase public awareness and expand viewing opportunities of bighorn sheep through viewing events and public outreach.

PUBLIC INVOLVEMENT

Public Involvement Objective:

- 1) Provide opportunities for local stakeholders and cooperating agencies to be involved in the management process and to jointly resolve potential issues involving bighorn sheep.

Public Involvement Strategies:

Plan Revision: If the population objective or other key components of this plan are to be revised in the future, affected cooperating agencies, local stakeholders, and grazing permittees will be invited to take part in the decision-making process.

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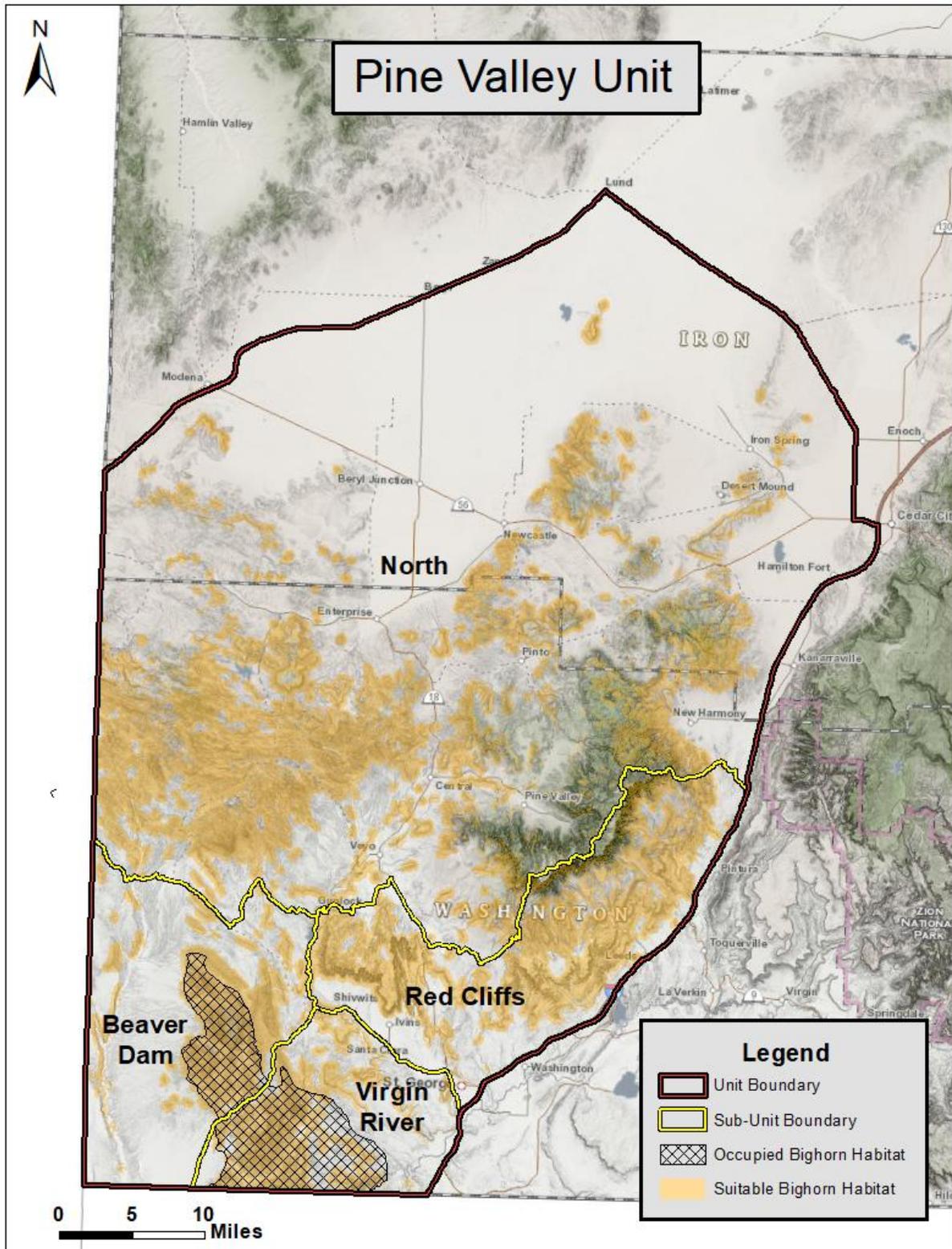


Figure 1. Pine Valley unit management boundary, modeled suitable bighorn sheep habitat, and currently occupied bighorn habitat.