

**BIGHORN SHEEP UNIT MANAGEMENT PLAN**  
**FILLMORE, OAK CREEK**  
**August 2019**

**BOUNDARY DESCRIPTION**

---

Juab, Millard, Sanpete, Sevier and Utah counties—Boundary begins at Black Rock Road and I-15(Exit 135); west on Black Rock Road to SR-257; north on SR-257 to US-6/50; east on US-6/50 to US-6; northeast on US-6 to Santaquin and I-15; south on I-15 to Exit 135 and Black Rock Road. Boundary questions? Call the Cedar City office, 435-865-6100.

**LAND OWNERSHIP**

---

Table 1. Land ownership and approximate area of modeled bighorn sheep habitat for the Fillmore, Oak Creek bighorn sheep management unit.

Ownership	MODELED BIGHORN HABITAT	
	Area (acres)	%
Bureau of Land Management	59,429	37.4%
National Forest	53,272	33.5%
Private	38,473	24.2%
Utah State Institutional Trust Lands	7,104	4.5%
Utah Division of Wildlife Resources	777	0.5%
<b>Totals</b>	<b>159,055</b>	<b>100%</b>

**UNIT MANAGEMENT GOALS**

---

The Oak Creek unit is located west of Scipio and east of Delta (Figure 1). Bighorn sheep were transplanted to the Oak Creek unit in an effort to reestablish sheep to their native ranges (Buechner 1960, Dalton and Spillet 1971) and promote wildlife diversity in the area for hunting and viewing. Bighorn were first transplanted to the unit in January 2014, with subsequent transplants in January 2015 and 2016. This plan will guide future management decisions consistent with the Utah Statewide Bighorn Sheep Management Plan. Specific goals are to:

- 1) Manage for a healthy population of Rocky Mountain 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**

---

Bighorn sheep are native to the Oak Creek Mountains (Dalton and Spillett 1971), but were finally extirpated. In January 2014, 33 sheep were transplanted from Antelope Island and the Newfoundland Mountains to the Oak Creek unit. Sixty-five more sheep were transplanted from Antelope Island to the Oak Creek unit in January 2015 and January 2016. The unit was last surveyed in November 2017 and resulted in a population estimate of 134 bighorns.

## **ISSUES AND CONCERNS**

---

Potential Habitat: We modeled potential bighorn sheep habitat on the Fillmore, Oak Creek 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 mountain range (Figure 1). In 2012, the Clay Springs fire burned over 100,000 acres resulting in substantially improved bighorn sheep habitat. Additional habitat exists in other areas that have become dominated by old growth pinyon and juniper forests that have reduced value to bighorn. Aggressive habitat restoration efforts to return these areas into productive early successional stages will further expand bighorn sheep habitat throughout the Oak Creek unit.

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 Oak Creek herd. 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).

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.

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 Oak Creek

unit. If predation becomes a limiting factor, predator control work will be administered within the guidelines of the DWR Predator Management Policy.

## **POPULATION MANAGEMENT**

---

### **Population Management Objectives:**

- 1) Achieve and maintain a population objective of up to 300 Rocky Mountain Bighorn Sheep within suitable habitat across the unit.

### **Population Management Strategies:**

Transplant/Hunting Plan: 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. Additional ground classification may be conducted as conditions permit. GPS and VHF collars with mortality signals will be used to document cause-specific mortality and identify annual survival estimates. Monitor radio collars at least 6 times per year. GPS collars may be added to the population as the original collars complete their usable lifespan. If conditions exist where disease concerns or other issues are evident, the population objective may be reduced to ensure population viability. 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.

Predator Management: A predator management plan is currently in place for this unit since populations levels are well below objective. 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 rocky mountain bighorn sheep on the Fillmore, Oak Creek unit.
- 2) Maintain spatial separation from domestic sheep and goats.

### **Disease Management Strategies:**

Disease Monitoring: 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: Manage for spatial separation between wild sheep and active domestic sheep allotments. 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.

## **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.
- 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 as well as identify and protect crucial bighorn sheep habitats.

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 land management agencies 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 USFS and 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 opportunities for hunting and viewing of bighorn sheep.
- 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. Ewe hunts may be utilized as a tool for maintaining population objective.

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.

## LITERATURE CITED

---

- Bissonette, J. A. and M. J. Steinkamp. 1996. Bighorn sheep response to ephemeral habitat fragmentation by cattle. *The Great Basin Naturalist* 319-325.
- Bleich, V. C., R. T. Bowyer, and J. D. Wehausen. 1997. Sexual segregation in mountain sheep: resources or predation? *Wildlife Monographs* 3-50.
- Buechner, H. K. 1960. *The Bighorn Sheep in the United States, Its Past, Present, and Future*. *Wildlife Monographs*: 3-174.
- Cassirer, E. F., and A. R. E. Sinclair. 2007. Dynamics of pneumonia in a bighorn sheep metapopulation. *Journal of Wildlife Management* 71:1080-1088.
- Dalton, L.B., and J.J. Spillett. 1971. The bighorn sheep in Utah: past and present. 1<sup>st</sup> North American Wild Sheep Conference 1:32-53.
- Ernest, H. B., E. S. Rubin, and W. M. Boyce. 2002. Fecal DNA analysis and risk assessment of mountain lion predation of bighorn sheep. *Journal of Wildlife Management* 66:75-85.
- Ganskopp, D. and M. Vavra. 1987. Slope use by cattle, feral horses, deer, and bighorn sheep. *Northwest Science* 61.
- George, J. L., D. J. Martin, P. M. Lukacs, and M. W. Miller. 2008. Epidemic pasteurellosis in a bighorn sheep population coinciding with the appearance of a domestic sheep. *Journal of Wildlife Diseases* 44:388-403.
- Hayes, C. L., E. S. Rubin, M. C. Jorgensen, R. A. Botta, and W. M. Boyce. 2000. Mountain lion predation of bighorn sheep in the peninsular ranges, California. *Journal of Wildlife Management* 64:954-959.
- Kamler, J. F., R. M. Lee, J. C. deVos, W. B. Ballard, and H. A. Whitlaw. 2002. Survival and cougar predation of translocated bighorn sheep in Arizona. *Journal of Wildlife Management* 66:1267-1272.
- Manlove, K. R., E. F. Cassirer, P. C. Cross, R. K. Plowright, and P. J. Hudson. 2014. Costs and benefits of group living with disease: a case study of pneumonia in bighorn lambs (*Ovis canadensis*). In *Proceedings of the Royal Society of London B* 281(1797):2014-2331.
- Manlove, K. R., E. F. Cassirer, P. C. Cross, R. K. Plowright, and P. J. Hudson. 2016. Disease introduction is associated with a phase transition in bighorn sheep demographics. *Ecology* 97:2593-2602.
- Monello, R. J., D. L. Murray, and E. F. Cassirer. 2001. Ecological correlates of pneumonia epizootics in bighorn sheep populations. *Canadian Journal of Zoology* 79:1423-1432.
- O'brien, J. M., C. S. O'brien, C. McCarthy, and T. E. Carpenter. 2014. Incorporating foray behavior into models estimating contact risk between bighorn sheep and areas occupied by domestic sheep. *Wildlife Society Bulletin* 38:321-331.

- Rominger, E. M., H. A. Whitlaw, D. L. Weybright, W. C. Dunn, and W. B. Ballard. 2004. The influence on mountain lion predation on bighorn sheep translocations. *Journal of Wildlife Management* 68:993-999.
- Ryder, T. J., E. S. Williams, K. W. Mills, K. H. Bowles, and E. T. Thorne. 1992. Effect of pneumonia on population size and lamb recruitment in Whiskey Mountain bighorn sheep. In *Proceedings of the Eighth Biennial Symposium of the Northern Wild Sheep and Goat Council* 136-146.
- Sappington, J. M., K. M. Longshore, and D. B. Thompson. 2007. Quantifying landscape ruggedness for animal habitat analysis: a case study using bighorn sheep in the Mojave Desert. *Journal of Wildlife Management* 71:1419-1426.
- Schaefer, R. J., S. G. Torres, and V. C. Bleich. 2000. Survivorship and cause-specific mortality in sympatric populations of mountain sheep and mule deer. *California Fish and Game* 86:127-135.
- Singer, F. J., E. S. Williams, M. W. Miller, and L. C. Zeigenfuss. 2000. Population growth, fecundity, and survivorship in recovering populations of bighorn sheep. *Restoration Ecology* 8:75-84.
- Spraker, T. R., C. P. Hibler, G. G. Schoonveld, and W. S. Adney. 1984. Pathologic changes and microorganisms found in bighorn sheep during a stress-related die-off. *Journal of Wildlife Diseases* 20:319-327.
- Valdez, R. and P. R. Krausman. 1999. *Mountain sheep of North America*. University of Arizona Press.

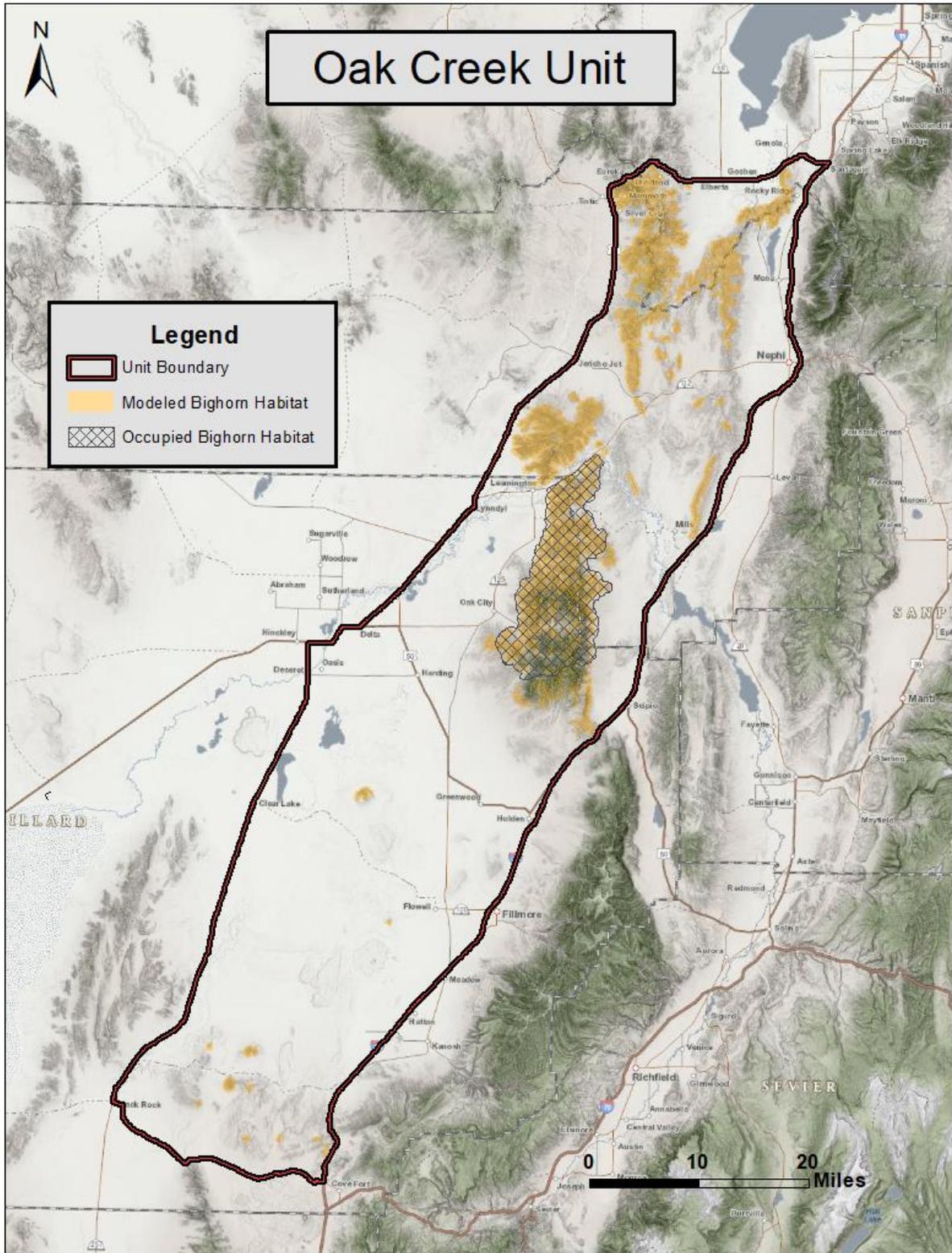


Figure 1. Fillmore, Oak Creek unit management boundary, modeled suitable bighorn sheep habitat, and currently occupied bighorn habitat. Millard and Juab Counties, UT, USA.