

BIGHORN SHEEP HERD MANAGEMENT PLAN

DATA ANALYSIS UNIT RBS-05

Buffalo Peaks/Mount Silverheels/Tenmile Range

GAME MANAGEMENT UNITS

S12, S39, and S78



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DAU RBS-05 (Buffalo Peaks/Mount Silverheels/Tenmile Herd)

EXECUTIVE SUMMARY

GMUs: S-12 (Buffalo Peaks), S-39 (Mount Silverheels), S-78 (Tenmile Range)
 Tier Status: 1 (≥ 100 animals for $\geq 90\%$ of the years since 1986; native population comprised of one or more interconnected herds that have received few (≤ 50 animals total) if any supplemental releases of Rocky Mountain bighorn sheep in the past (George et al. 2009))
 Land Ownership: USFS 47%, Private 37%, BLM 8%, State 3%, CPW 3%, Other 2%
 Posthunt 2017 Age and Sex Ratio Estimate: 50 rams:100 ewes:25 lambs
 Posthunt 2017 Population Estimate: 290; Approved Objective 300 (Range 250-350)
 3-yr Average Age of Harvested Rams: 2015-2017 Estimate 6.4 years; Approved Objective 6-8

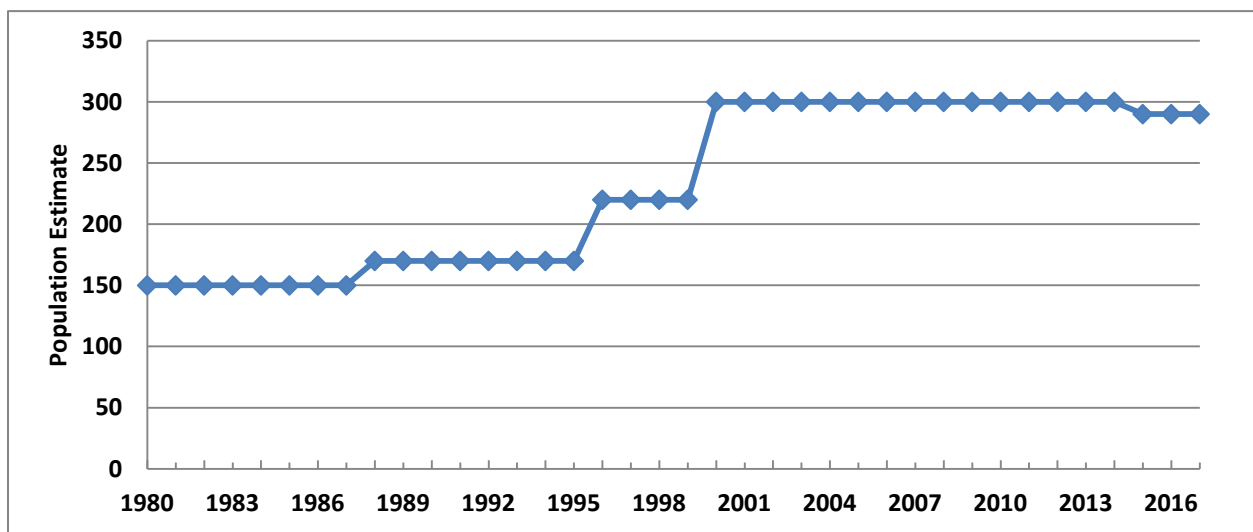


Figure 1. DAU RBS-05 post-hunt population estimates from 1980-2017.

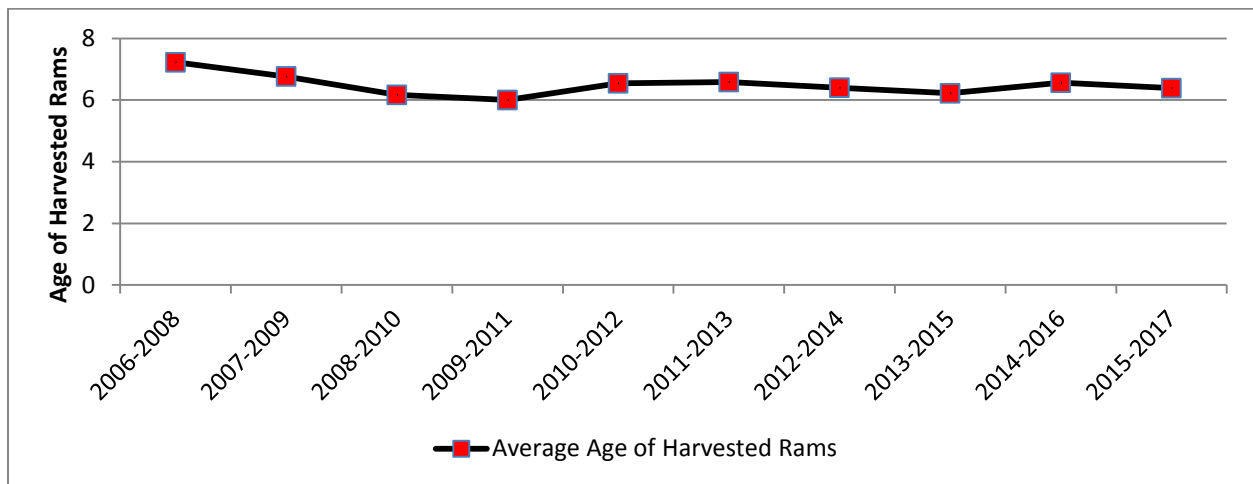


Figure 2. Three-year average age of rams harvested in RBS-05 from 2006-2017.

BACKGROUND & ISSUE SUMMARY

Rocky Mountain bighorn sheep Data Analysis Unit (DAU) RBS-05 consists of Game Management Units (GMUs) S-12 (Buffalo Peaks), S-39 (Mount Silverheels), and S-78 (Tenmile Range). The DAU is approximately 1,300 mi² and includes portions of Chaffee, Lake, Park, and Summit counties. The RBS-05 sheep herd is indigenous, meeting the criteria for Tier 1 designation (George et al. 2009). The 2017 post-hunt population estimate for RBS-05 is approximately 290 animals. Habitat in this DAU is abundant and anecdotally in good condition, although due to high elevations and heavy annual snowfall available winter forage is likely a limiting factor for this population.

The first official hunting season for bighorn rams in RBS-05 occurred in 1953 in what is currently GMU S-12, when 10 licenses were issued (Bear and Jones 1973). In 2010, hunting seasons were instituted in S-39. In 2017, S-12 license holders were allowed to pursue sheep in S-78. Current hunting license allocations include 21 ram tags and 4 ewe tags across all seasons in the DAU. The three-year average age of ram harvested in the DAU has been at or above six years of age (Figure 2).

MANAGEMENT OBJECTIVES

To solicit input for this herd management plan we mailed 749 postcards to applicants for hunts in this DAU and directed them to an online survey. We also sent the plan to federal partners and interest groups for review. Lastly, we posted the plan on the web for a 30-day comment period. The following represent our preferred alternatives:

Population size: The current population estimate in RBS-05 is stable at approximately 300 animals. Key limiting factors for this population include winter range carrying capacity and the potential for disease transmission following contact with domestic livestock. Considering bighorn distribution, winter range capability, population density/density dependence, and the potential risks of contact with domestic livestock, the following management objective was selected: *Population objective 300 sheep (range 250-350)*

Ram and Ewe Harvest Objective: *Maintain a 3-yr average age of rams harvested of 6-8 yrs old.* This alternative maintains the current harvest regime in the DAU. Moderate ram license increases may be possible based on population performance. This alternative should provide a quality experience, moderate levels of crowding, and diverse age-classes of rams. *Ewe harvest: Maintain ewe harvest as a population management tool and for hunter opportunity.* This is currently how we manage ewe harvest.

Strategies for obtaining objectives and addressing issues: Both the preferred alternatives are consistent with our current management in RBS-05 Therefore a change in harvest management is not expected with this plan. The most significant issue for RBS-05 is the potential for disease transmission from domestic livestock, particularly from domestic sheep and goats (George et al. 2009). There is one active domestic sheep grazing allotment in the northwest portion of RBS-05, which numbers 1,300 domestic sheep annually from June 25-September 30. This area does not overlap with the primary bighorn population in this DAU, but sightings of wild sheep have occurred occasionally in the past. To prevent interaction between wild bighorns and domestic sheep, CPW is proposing a change of GMU boundaries to isolate this area and offering disease management licenses to hunters who can demonstrate that they have observed bighorn in the areas of overlap.

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INTRODUCTION AND PURPOSE

Colorado Parks and Wildlife (CPW) manages big game for the use, benefit, and enjoyment of the people of the state in accordance with the CPW's Strategic Plan (2010-2020), with bighorn sheep management directed under the Colorado Bighorn Sheep Management Plan (George et al. 2009). Bighorn sheep management is also determined by mandates from the Colorado Parks and Wildlife Commission (PWC) and the Colorado Legislature. Colorado's wildlife species require careful and increasingly intensive management to accommodate the many and varied public demands and growing human impacts. The CPW uses a "Management by Objective" approach to manage the state's big game populations (Figure 3).

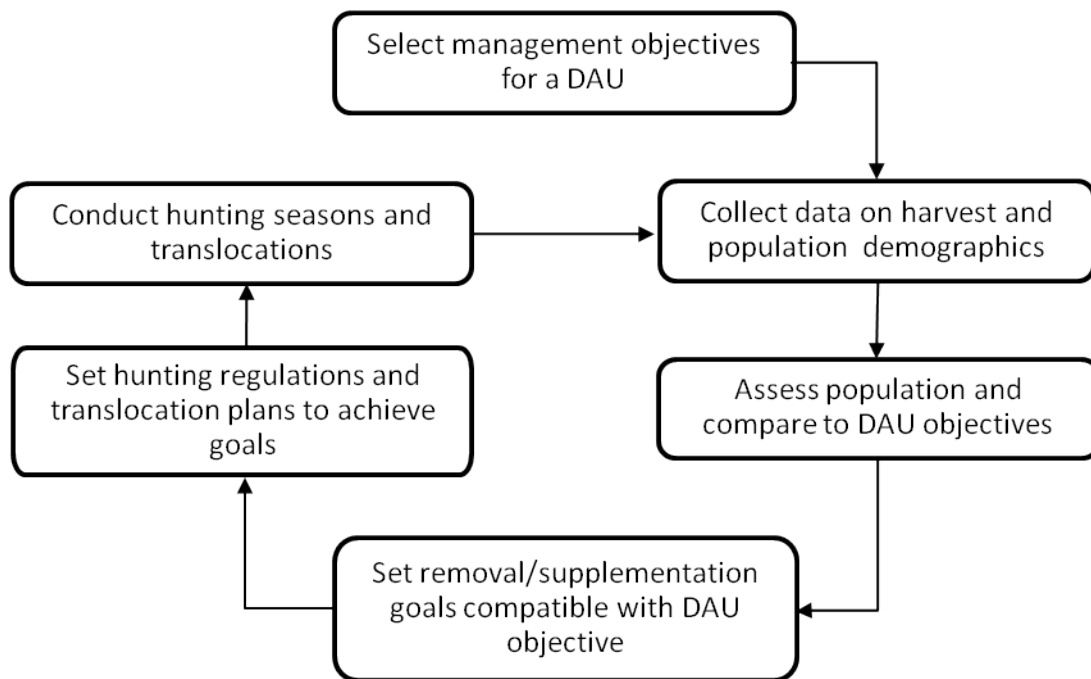


Figure 3. Management by Objective process used by Colorado Parks and Wildlife to manage big game populations by Data Analysis Unit.

With the Management by Objective approach, big game populations are managed to achieve the population objective established for a Data Analysis Unit (DAU). A DAU is the geographic area that includes the year-round range of a big game herd. A DAU includes the area where most of the animals in a herd are born, live, and die. DAU boundaries are delineated to minimize interchange of animals between adjacent DAUs. A DAU may be divided into several Game Management Units (GMUs) to distribute hunters and harvest within a DAU.

Management decisions within a DAU are based on a herd management plan. The primary purpose of a herd management plan is to establish population and sex ratio (i.e., the number of males per 100 females) objectives for the DAU. The herd management plan also describes the strategies and techniques that will be used to reach these objectives. During the herd management planning process, public input is solicited and collected through questionnaires, public meetings, and comments to CPW staff and the PWC. The intentions of the CPW are

integrated with the concerns and ideas of various stakeholders including the United States Forest Service (USFS), the Bureau of Land Management (BLM), city and county governments, hunters, guides and outfitters, private landowners, local chambers of commerce and the public. In preparing a herd management plan, agency personnel attempt to balance the biological capabilities of the herd and its habitat with the public's demand for wildlife recreational opportunities. Herd management plans are approved by the PWC and are reviewed and updated every 10 years.

The herd management plan serves as the basis for the annual herd management cycle. In this cycle, the size and composition of the herd is assessed and compared to the objectives defined in the herd management plan. Removal goals are set. Based on these goals, specific removal strategies are made for the coming year to either maintain the population or move it towards the established objectives (e.g., license numbers and allocation are set, translocation plans are made). Hunting seasons and/or translocations are then conducted and evaluated. The annual management cycle then begins again (Figure 3).

The purpose of this herd management plan is to set population and harvest objectives for the Buffalo Peaks/Mount Silverheels/Tenmile Range bighorn sheep herd (RBS-05; GMUs S12, S39, S78). The herd management plan will be in place from 2019-2029 with the expectation that it will be reviewed and updated in 2029.

DESCRIPTION OF DAU

Location, Boundaries, Land Management, and Physiography

Rocky Mountain bighorn sheep Data Analysis Unit (DAU) RBS-05 consists of Game Management Units (GMUs) S-12 (Buffalo Peaks), S-39 (Mount Silverheels), and S-78 (Tenmile Range). The DAU is approximately 1,300 mi² and includes portions of Chaffee, Eagle, Lake, Park, and Summit counties. Municipalities include Breckenridge, Buena Vista, Leadville, and Fairplay. The bighorn population in the DAU utilizes primarily public lands, which represent the majority of the DAU (61%). It is bounded on the north by the Resolution Creek Road (USFS Rd 702), Resolution Creek, Ptarmigan Pass, Wilder Gulch, I-70, the Swan River Road, USFS 6, the Continental Divide, and the North Fork of the South Platte River, on the east by US 285, Park CRs 77 and 23, on the south and west by US 24 (Figure 4).

Elevations in the DAU range from 14,296 feet at Mount Lincoln to approximately 8,000 feet at the intersections of US highways 24 and 285 near Johnson Village. The 30-year average precipitation for the DAU is 16 inches, which falls primarily as winter-spring snow fall and summer rains. Topography ranges from parks and grasslands to high elevation alpine habitats.

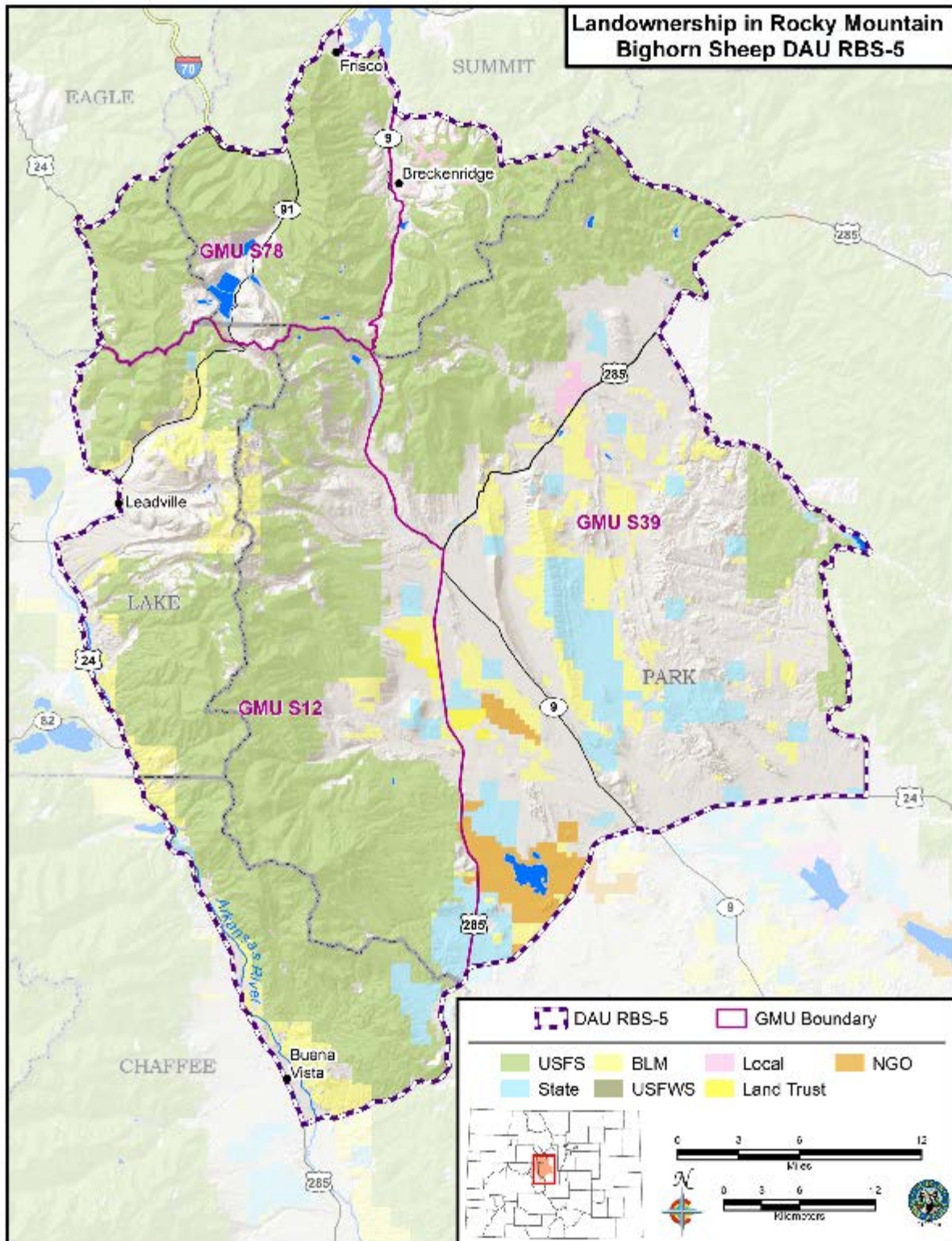


Figure 4. RBS-05 geography, GMU boundaries, and landownership.

DAU HERD HISTORY

Introduction and historic population monitoring

The RBS-05 bighorn sheep herd is indigenous to the region, and one of the highly valued native populations in Colorado. Due to the inherent difficulties with estimating the population size of high elevation mountain sheep populations, it's not exactly known how many sheep historically inhabited the RBS-05 geographic area, though it appears that the current population size is as high as has ever been recorded. Moser (1962) estimated the population at 150 animals during the 1950's, while Bear and Jones (1973) estimated as few as 50-100 animals in what is now S-12/S-78 and another 20-30 in what is now S-39, around 1970. However, since accurate aerial surveys were difficult to obtain during those decades, the precision of historic estimates is unknown. Estimates of the population size have increased from 150 in the 1980's to the current estimate of approximately 300 animals (Figure 5). The population has recruited approximately 30 lambs per 100 ewes annually throughout most of the DAU in recent years, while post-hunt ram:ewe ratios have recently averaged approximately 50 rams per 100 ewes. Current population estimates, as well as ratios of lambs:100 ewes:rams are generally obtained during periodic helicopter surveys. Helicopter surveys of this DAU are dependent on weather conditions, which during the winter months can be difficult because of strong winds.

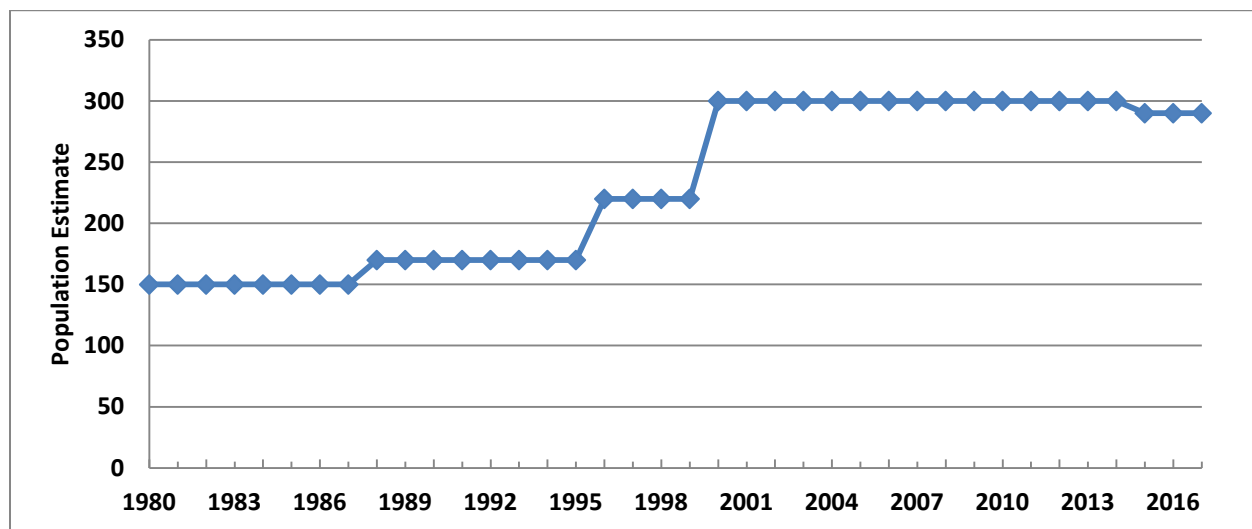


Figure 5. DAU RBS-05 post-hunt population estimates from 1980-2017.

Translocations (to and from the DAU)

Several small transplants of sheep have occurred into the RBS-05 DAU over the decades to augment the Granite (S-12) and Mount Silverheels (S-39) sub-herds (Table 1). However, most of the sheep in the DAU are indigenous to the area.

Table 1. Historic transplants of bighorn sheep into DAU RBS-05.

Date	Capture Location	Release Site	Ram	Ewe	Yrlg	Lamb	Total
1/26/78	Tarryall Range (Sugarloaf)	Granite	5	7	0	5	17
3/23/78	Pike's Peak	Granite	2	5	0	1	8
3/28/78	Pike's Peak	Granite	1	3	0	0	4
1/7/88	Trickle Mtn (Saguache)	Mt Silverheels	2	11	0	7	20
1/27/89	Almont Triangle	Buffalo Peaks	3	2	0	0	5
2/21/00	Mt. Maestas-Silver Mt.	Trout Creek Pass	0	10	1	1	12
2/22/12	Granite	Limestone Ridge	0	7	0	0	0

Historic and current distribution

Approximately 150 bighorns inhabit the alpine portion of GMU S-12, ranging from the Buffalo Peaks on the south end of the unit to the Continental Divide on the north end of the unit. Another 50-60 bighorns currently exist in the Granite sub-herd of S-12, ranging along the Arkansas River corridor between Granite and Riverside. Another dozen or so sheep exist in the Limestone Ridge area, near Trout Creek Pass, in S-12. As of 2018, the current estimate on S-39 is 90 bighorn sheep. We are not aware of any sheep in S-78, per the new boundary that was established in January of 2019.

Hunting and harvest history

The RBS-05 population currently appears to be stable near 300 animals. Traditionally, hunting licenses have been issued conservatively for two reasons. The first is to maintain a quality experience for hunters who draw licenses. In 2018, 40,993 hunters applied for 298 bighorn sheep licenses in Colorado. Hunters often wait for more than 10 years to draw licenses with the expectation of a high-quality hunting experience. More licenses may contribute to hunter crowding and diminish the experience, particularly if sheep tend to concentrate in a few small geographic areas. The second reason for conservative license allocation is the threat of stochastic events outside of the influence of management. Pneumonia epidemics, in particular, have led to large-scale population declines which are typically followed by lengthy periods of low lamb recruitment. The frequency, intensity, and duration of any future disease events will impact bighorn sheep hunting opportunities in RBS-05.

The first official hunting season for bighorn rams in RBS-05 occurred in 1953 in what is currently GMU S-12, when 10 licenses were issued (Bear and Jones 1973). Hunting seasons were instituted in S-39 in 2010. Though no historic hunting seasons have occurred in S-78, beginning in 2017, S-12 license holders were allowed to pursue sheep in S-78. Current hunting

license allocations consists of 10 archery ram licenses, 7 rifle ram licenses, and 2 rifle ewe licenses for S-12/S78, and 2 archery ram license, 3 rifle ram licenses, and 2 rifle ewe licenses for S-39 (Table 2 and Appendix A). The average age of ram harvested in the DAU has fluctuated around 6-8 years of age over the past 10 years (Figure 6). Since 2006, the three-year average age of harvested rams has been between 6-7 in all but one of the three-year intervals (2006-2008; Figure 7). Hunter success rates have averaged 80% for ram rifle licenses and 23% for ram archery licenses in RBS-05 during the same time period (Appendix A).

Table 2. 2018 Hunting license allocation in RBS-05.

<i>GMU</i>	<i>Archery Ram</i>	<i>Rifle Ram</i>	<i>Archery Ewe</i>	<i>Rifle Ewe</i>
<i>S-12 and S-78</i>	10	7	0	2
<i>S-39</i>	2	3	0	2
<i>S-78*</i>	0	0	0	0
<i>DAU Total</i>	12	10	0	4

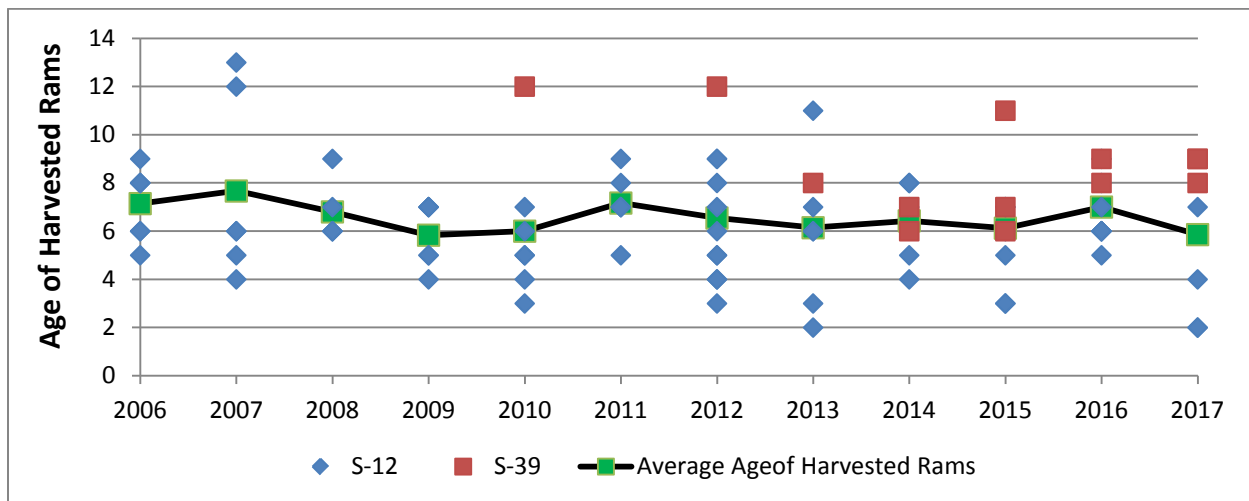


Figure 6. Age of rams harvested by hunters in RBS-05 over the last 10 years, 2006-2017.

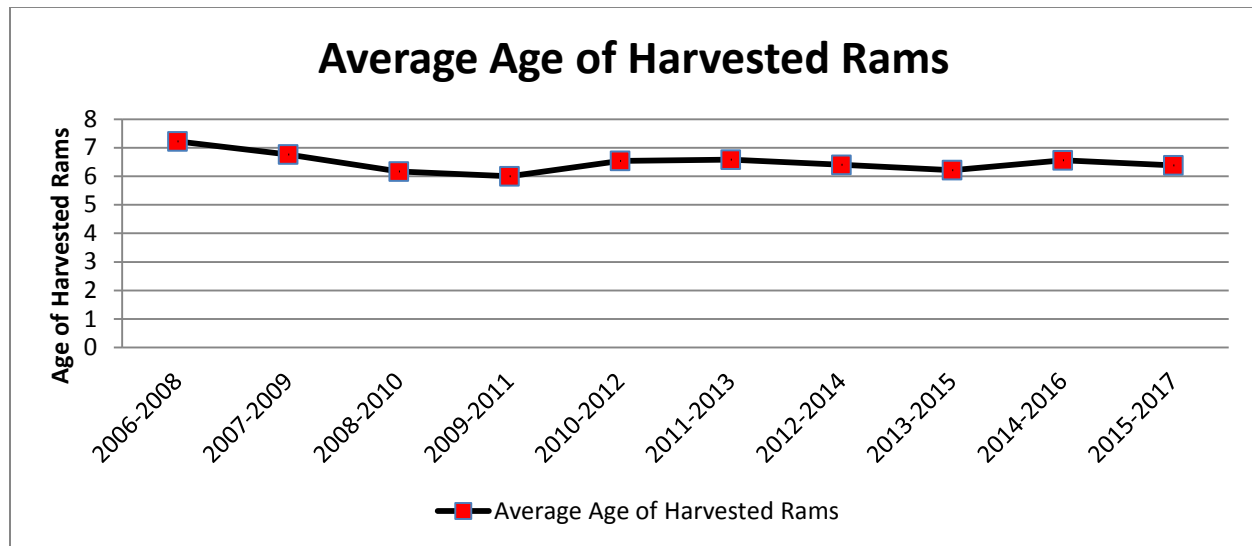


Figure 7. Three-year average age of rams harvested in RBS-05 from 2006-2017.

All sheep licenses in Colorado are issued through a limited drawing system, and an applicant must acquire three preference points before they are eligible for license drawings. Rams harvested in Colorado are required to have horns that are $\geq \frac{1}{2}$ curl, and ewes are required to have horns ≥ 5 inches. All sheep hunters must submit a mandatory check form following their hunt that includes details specific to their hunting experience and the number, locations, and composition of sheep observed. Successful hunters must personally present their animal for inspection within five days of harvest so that horn measurements can be collected and a permanent plug embedded in ram horns. Successful ram hunters are required to wait five years post-harvest before they are eligible to begin applying for a license again.

CURRENT HERD BIOLOGY & MANAGEMENT ISSUES

Available habitat and bighorn densities

Bighorn sheep habitat in RBS-5 was largely derived by agency observations, harvest locations and locations on helicopter surveys. Movement of sheep in Granite was derived from radio collared sheep. Approximately 26% of the RBS-05 DAU is classified as bighorn sheep habitat, with 24% of the DAU being designated as summer range, 12% being designated as winter range, and 4% being suitable lambing habitats (Figures 8 and 9). Only 5% (157 km²; 38,827 acres) of the DAU is classified as severe winter range, meaning only 5% of the habitat is available to bighorns during the worst 2 winters out of 10. It is during these winters that available forage could be a limiting factor for the population. Given the current post-hunt 2017 population estimate of 300 animals, densities of sheep on winter range likely approach 2.0 sheep/km² during severe winters. These densities are similar to documented winter densities currently observed in other high elevation, alpine bighorn populations in Colorado, which range from 1.25 sheep/km² in the San Juan herds (RBS-21 and RBS-22) to 2.7 sheep/km² in the Georgetown herd (RBS-03). Research conducted on Ram Mountain in Alberta, Canada documented a population crash when local bighorn population exceeded a density of 6.2 bighorn/km², (Jorgenson et al 1997, Festa-Bianchet 2003). This decline apparently was not disease related, which suggests that it occurred in response to some undetermined density dependent factor(s). Unfortunately, few other density studies have been performed on

bighorns and none have been done in Colorado. Though densities of sheep in the Ram Mountain studies far exceed current documented densities in RBS-05, the Ram Mountain studies demonstrate the importance of maintaining a population density below carrying capacity.

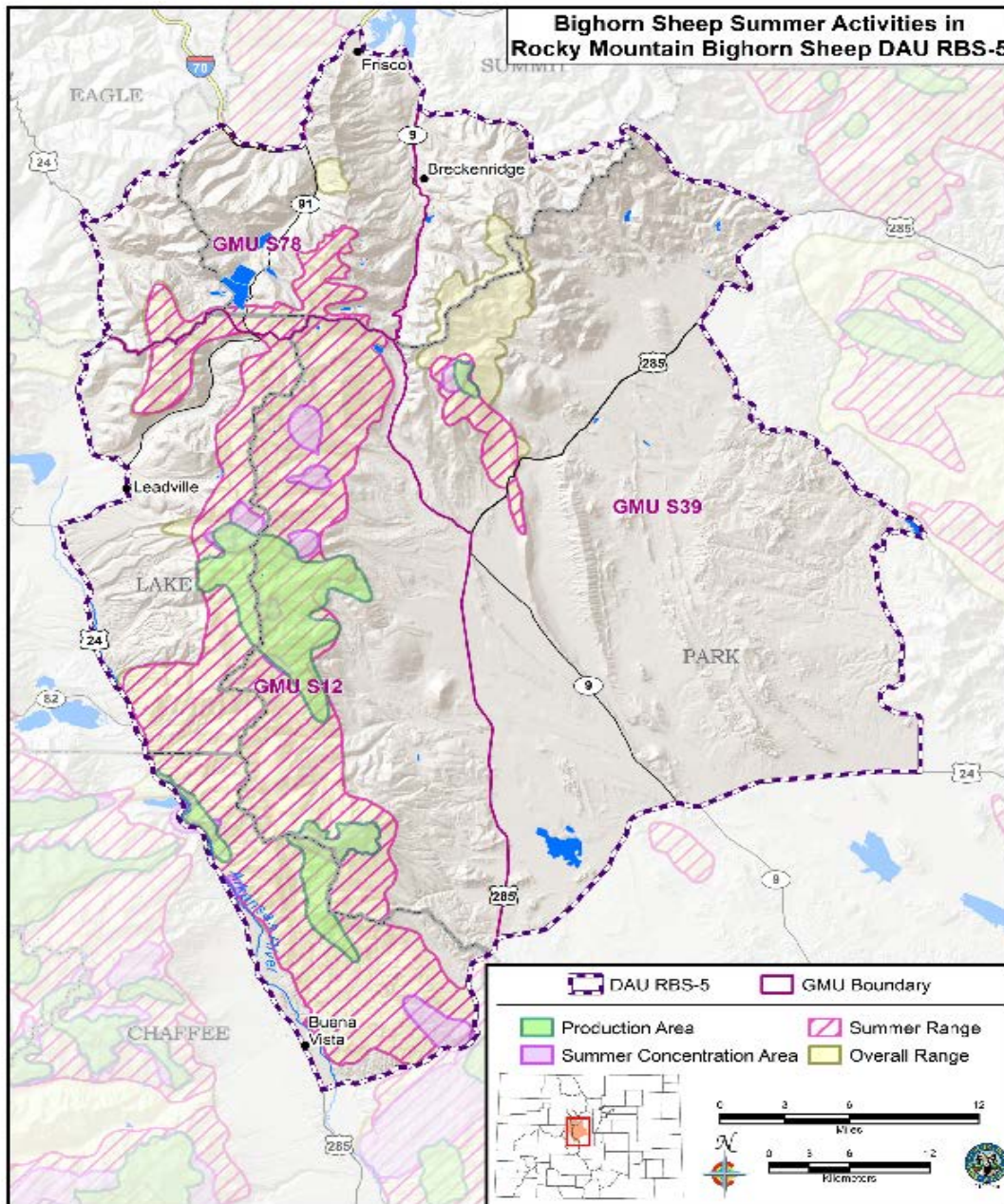


Figure 8. Overall range, summer range, summer concentration areas, and lamb production areas for bighorn sheep in RBS-05.

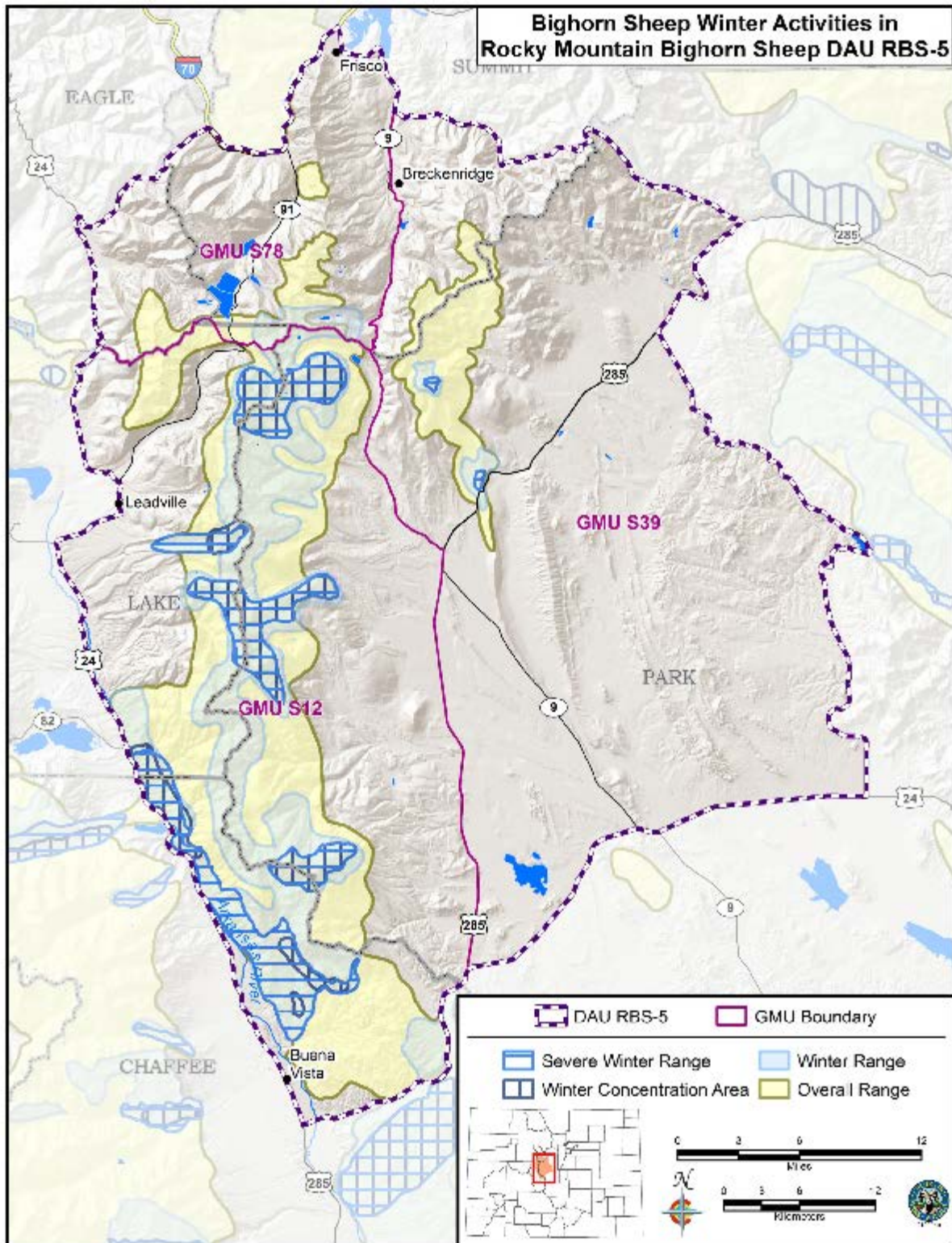


Figure 9. Overall range, winter range, severe winter range, and winter concentration areas for bighorn sheep in RBS-05.

Disease and interactions with domestic livestock

Bighorn sheep are unique among Colorado's big game species with respect to the influence that infectious diseases have on population performance and species abundance. The susceptibility of bighorn sheep to pathogens originally introduced by domestic livestock is regarded as the primary factor limiting bighorn sheep populations in Colorado. Respiratory disease is by far the most important health problem in contemporary bighorn populations. In addition to initial all-age die offs, pneumonia epidemics in bighorn sheep can lead to long-term reductions in lamb survival and recruitment resulting in stagnant or declining populations over many years (George et al. 2009). Interaction between bighorn sheep and domestic sheep and goats is a significant management issue for bighorn populations in Colorado and elsewhere, which is corroborated in the existing literature (Beecham et al. 2007, Schommer and Woolever 2008, George et al. 2009, Lawrence 2010, WAFWA 2010, Wehausen et al. 2011). Native North American wild sheep species are quite susceptible to pasteurellosis, the generic term for disease (often respiratory) caused by bacteria in the family *Pasteurellaceae* (Miller 2001). Some strains of these bacteria carried by domestic sheep and goats are particularly pathogenic in bighorns (reviewed by Miller 2001, US Department of Agriculture [USDA] 2006, George et al. 2008).

In February 2011, *Mycoplasma ovipneumoniae* and *Pasteurellaceae* were detected in the Granite sub-herd through routine sampling and that year no lambs survived to the following winter. Since that time, annual lamb recruitment has been severely depressed, ranging from 0 - 8 lambs recruited annually (Table 3). In February 2013, CPW staff captured, radio collared, and fitted 15 pregnant ewes with vaginal implant transmitters (VITs). We monitored radio collars and VITs weekly using radio telemetry until mid-April. Beginning in mid-April, radio collars and VITs were monitored daily by a team of field technicians. When a VIT was expelled, the VIT and radio collared ewe were radio tracked from the ground to locate the potential birth site and neonate lamb. When a newborn lamb was captured, it was fitted with an expandable, breakaway radio collar that allowed us to monitor its survival and released back to its mother. One VIT was expelled in early April and was not located at a birth site. The remaining 14 VITs were expelled at birth sites and we were able to capture and collar a neonate lamb at each site within 48 hours of parturition. We captured and collared a 15th lamb from an uncollared ewe we found while tracking in on one of the VIT sites. Birth dates ranged from May 8 - June 19 (median date May 14). In total, use of the VITs allowed us to detect, capture and radio collar 15 neonate lambs within 48 hours of parturition and monitor their survival daily throughout their first months of life. Dead lambs were recovered within 12 - 48 hrs following death and recovered carcasses were submitted for necropsy and laboratory assessment. Of the lambs captured, all 15 were dead by 130 days of age: 11 died of apparent pneumonia within 8-10 weeks of age, 1 died from trauma after being kicked or trampled, 1 was killed by a mountain lion, and 2 died of starvation likely caused by abandonment after capture (Grigg et al. 2017). Since acquiring *Mycoplasma ovipneumoniae* and *Pasteurellaceae* in 2011, the Granite sub-herd of S-12 has declined from approximately 100 animals to less than 50 due to low lamb recruitment. No other portions of the RBS-05 herd currently appear to be infected and lamb recruitment remains at higher levels (averaging approximately 30 lambs recruited annually per 100 ewes since 2009) outside of the Granite sub-herd.

Table 3. Population surveys conducted in GMUs S-12 and S-39 since biological year 2009 (in this instance, beginning May 1 annually with the onset of the lambing season).

Bio Year	S-12 alpine				S-12 Granite			
	Ewes	Lambs	Rams	Date of survey	Ewes	Lambs	Rams	Date of survey
2009	37	4	26	4/11/2010	42	18	18	3/1/2010
2010					58	20	23	3/1/2011
2011	62	16	24	1/5/2012	54	0	13	3/1/2012
2012					34	8	4	3/1/2013
2013	52	22	25	12/15/2013	35	1	5	3/1/2014
2014	27	9	13	12/10/2014	30	3	6	3/1/2015
2015					28	2	11	1/1/2016
2016					20	7	5	1/1/2017
2017	17	6	6	12/10/2017	26	10	11	1/1/2018

S-39				
Bio Year	Ewes	Lambs	Rams	Date of Survey
2009	30	8	19	3/2/2010
2010				
2011	32	9	24	2/7/2012
2012	20	7	11	2/19/2013
2013				
2014	19	12	7	1/6/2015
2015				
2016	7	7	13	2/24/2017
2017				

There are two domestic sheep grazing allotments in RBS-05, the vacant Arkansas Allotment and the active Sugarloaf Allotment, which is in the northwest portion of RBS-05 (Figure 10). In the Sugarloaf Allotment, 1,300 domestic sheep graze annually from June 25-September 30. As such, the potential for contact between wild and domestic sheep continues to exist within this DAU (Figure 10); therefore, on-going and future management actions should focus on maintaining effective separation between the species (WAFWA 2010, MOU 2009--see Appendix C). Pioneering bighorn sheep, particularly young rams, are most likely to co-mingle with domestic livestock. Conversely, stray domestic sheep are also likely to associate with wild sheep groups if they are separated from their primary band. Sheep, wild or domestic, are highly gregarious by nature and are likely to interact with other sheep as they encounter one another.

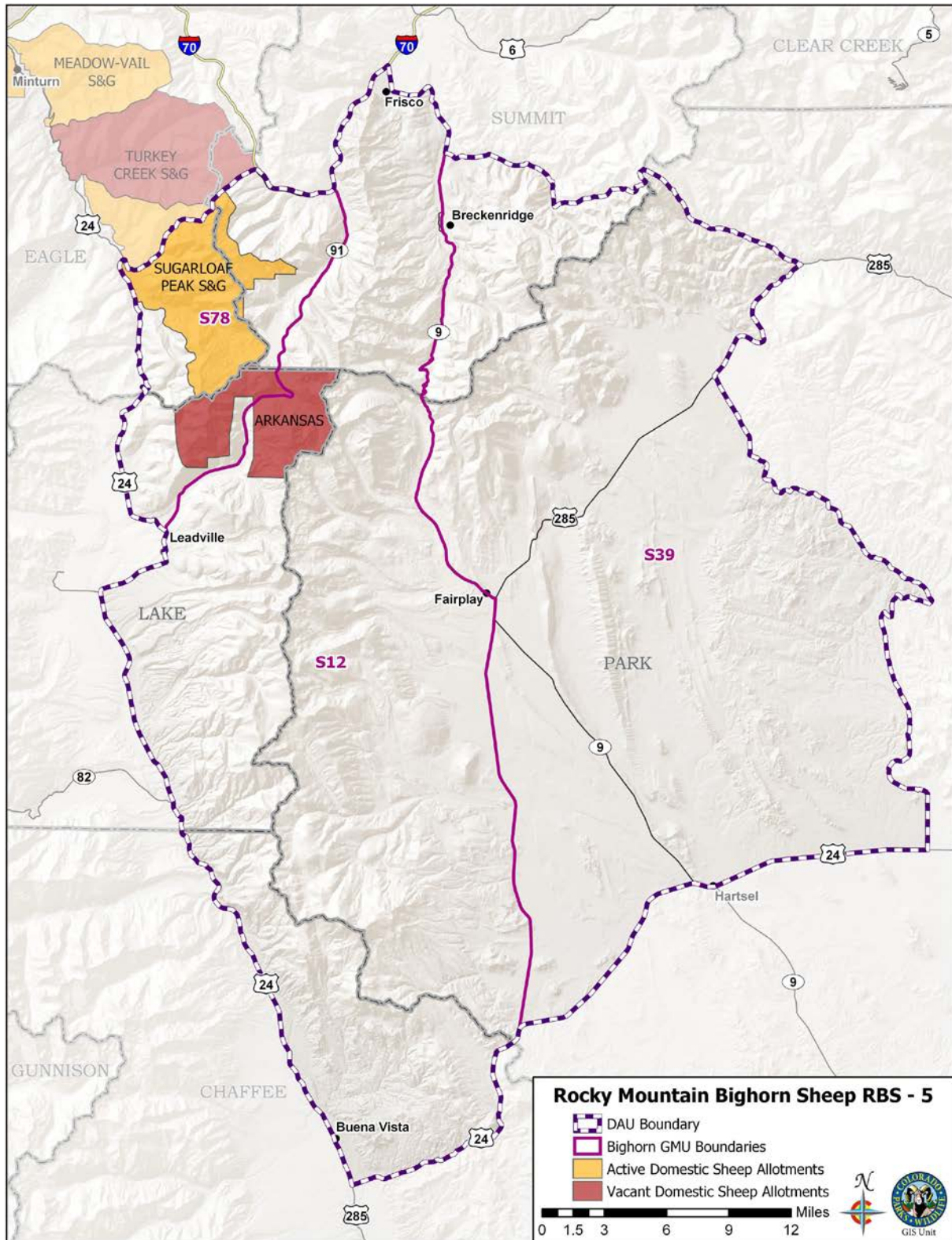


Figure 10. Active and vacant domestic sheep grazing allotments in proximity to RBS-05.

Recreational impacts

Perpetually increasing recreational use, mostly from hikers and backpackers, is another primary concern for bighorn sheep in RBS-05. Recreation is a driving economic force in local communities and occurs throughout the year. These communities continue to grow, resulting in rising demands for recreational opportunities, higher impacts on natural resources, and potential increases in habitat fragmentation. Quality wildlife habitat includes food, water, shelter, space, and connectivity, which is imperative to maintaining healthy wildlife populations. Large blocks of contiguous habitat are most likely to promote the long-term viability of a species. Habitat becomes fragmented as land use changes break the landscape into smaller more distinct "patches." These patches may not provide fundamental habitat requirements resulting in a diminished carrying capacity for the species across the landscape. Wildlife living within fragmented habitat is more vulnerable to stochastic population declines stemming from disease, increased rates of predation, or habitat loss or modifications. Fragmentation often leads to diminished immigration and emigration rates that are vital for promoting genetic diversity, range expansion, and recolonization in the event of localized extirpation. Most wildlife managers agree, with support from the scientific literature, that recreation has the potential to impact wildlife distribution and abundance (Joslin and Youmans 1999, Valdez and Krausman 1999, Papouchis 2001, Taylor and Knight 2003, Keller and Bender 2007, Naylor et al. 2008, Goldstein et al 2010). The "zone of influence" of recreational activities for wildlife may extend for some distance beyond the actual activity and will vary depending on habitat composition, topography, and a species' tolerance of human disturbance.

Bighorn sheep inhabit open country and are particularly vulnerable to disturbance from recreation. For example, sheep will often flee at the sight of humans on a distant ridge, even when they are a considerable distance away (Holl and Bleich 1983). Ewes with young lambs are particularly flighty and every effort should be made to document and protect lambing and nursery areas from excessive disturbance. In a previous section density dependent influences were discussed; human activity, including recreation, may perpetuate higher densities of bighorn sheep in areas where they seek refuge from disturbance resulting in unintended impacts on the population. During aerial surveys in the summer and fall, it is standard to see large numbers of hikers on each of the high peaks in RBS-05, while bighorns generally avoid the human intrusion in those areas. It's currently estimated that approximately 260,000 people climb Colorado's 14ers each year, several of which occur in RBS-05. These peaks draw high levels of recreational interest, increasing potential negative or unintended impacts, such as higher level of disturbance on alpine bighorn sheep populations in RBS-05 and elsewhere by users.

Winter range is also crucial for bighorn sheep across Colorado. The needs of wildlife in the winter should be carefully considered during all land-use and recreational planning. Disturbance from recreation is typically unnecessary and additive during the winter months when bighorn are already on a downward starvation curve. Some bighorn populations have no choice but to habituate to human activities during the winter; however, activities such as snowmobiling, dog walking, and backcountry skiing all have significant potential to disturb and displace wintering sheep (Graham 1980, MacArthur et al. 1982, Etchberger et al. 1989).

Recreation has the potential to limit the overall range of bighorn and discourage use of suitable habitats that are consumed by human activities. CPW biologists intend to continue working with federal agencies, Non-Governmental Organization's (NGO's), and local

jurisdictions in the future to ensure that recreational activities are not detrimental to bighorn sheep in RBS-05.

Mountain Goat/Bighorn Interactions

Mountain goats were first introduced into Colorado in 1948 with the intent of establishing populations that would support controlled hunting (Hibbs 1966). Subsequent translocations occurred in several areas around the state during the next 25 years. Mountain goats provide unique wildlife viewing and hunting opportunities and have proven to be extremely effective at pioneering into new areas. Issues related to sympatric bighorn and mountain goat populations are comprehensively discussed in the Colorado Bighorn Sheep Management Plan (2009). Of chief management concern is the potential for resource competition within a given habitat once mountain goat populations become established, thereby reducing bighorn population vigor. The statewide plan is clear on mountain goat management in bighorn habitat: "The DOW will strive to manage mountain goat populations and distribution via the DAU planning process to limit their expansion into Tier 1 and Tier 2 bighorn sheep DAU's." Furthermore, CPW Commission Regulation #230 grants the director of Parks and Wildlife the authority to issue special management licenses to hunters to harvest mountain goats found outside of an established mountain goat unit. Using this tool, managers may remove pioneering mountain goats preemptively, and before any significant population establishment has occurred.

While the geographic area of RBS-05 is managed primarily for bighorn sheep, a sizable mountain goat population exists to the north in GMUs G-10 (Tenmile Herd, 2015 post-hunt pop est = 50) and G-16 (Mt Guyot Herd, 2015 post-hunt pop est = 140). While some overlap occurs with G-10 along the northern portion of RBS-05, most of RBS-05 is purposefully void of mountain goats to lessen competition with bighorn populations. Mountain goats wandering into the S-12 portion of RBS-05 outside of the G-10 and G-16 boundaries are removed by hunters using the special management licenses described above.

Hunter Harvest Objectives and Management

Ewe Hunting

Increasing densities of bighorn create unique management ramifications, specifically regarding disease and the potential for increased susceptibility to disease and disease transmission. Bighorns, particularly ewe groups, are often slow to pioneer into vacant habitat, and therefore tend to congregate in the same places year after year. As the population grows, densities increase in these traditional use areas, which may lead to localized habitat degradation, reduced animal body condition and vigor, and subsequent increased vulnerability to disease.

Wild sheep studies conducted on Ram Mountain in Alberta, Canada, offer some valuable insight into the role density plays in bighorn population dynamics. Results from these studies indicated that lamb mass and winter survival decreased as population density increased (Portier et al. 1998), that yearling female survival was negatively affected by density, and that age at first reproduction was also negatively correlated with population size (Jorgenson et al. 1997). Establishing conservative ewe harvest may reduce intraspecific competition, increase juvenile survival, lower age at first reproduction, provide hunter opportunity, increase hunter attained herd information, encourage use of new habitats/dispersal, and possibly reduce the risk and severity of disease outbreaks.

Recommendations for ewe harvest are presented in the Colorado Bighorn Sheep Management Plan (George et al 2009). These recommendations should provide managers with the general framework for establishing ewe hunting seasons across the state (Table 4). In the plan, off-take rates revolve around a population objective and observed winter lamb:ewe ratios. Healthy bighorn sheep populations (ie. high winter lamb:ewe ratios and adult survival) can sustain relatively high levels of annual female harvest. For example, in a population that is at objective with an observed winter lamb:ewe ratio of 25:100, the recommendation is for an off take of <12% of the prehunt ewe population. In a population of 300 sheep with a ram:ewe:lamb ratio of 50:100:25, that would equate to a harvest of ~20 ewes. In RBS-05, we currently lack sufficient data to recommend this level of harvest. However, managers will consider additional ewe hunting opportunity and strategies in the future if the population continues to be stable-increasing. Consideration will be given so that ewes in sub-herds that are most accessible to hunters are not overharvested, and that impacts are minimized on social structure and “legacy” movement patterns. Ewe seasons and ram seasons may overlap but the hunting of ewes should not interfere with the quality of the hunt experienced by ram hunters. In the absence of a specified population objective, managers will adapt harvest on an annual basis based on the best available data and information available, and whether the herd is at, or exceeds the expected population size objective.

Table 4. Recommended ewe removal rates via hunting and translocations from Colorado’s Bighorn Sheep Management Plan.

<i>Estimated Population in Relationship to Objective</i>	<i>Observed Winter Lamb:Ewe Ratio</i>	<i>Ewe Removal or Harvest Rate as a Percentage of Total Population</i>	<i>Comments</i>
<i>≥25% below</i>	<i>NA</i>	<i>No ewe removals</i>	<i>Exceptions allowed for disease management</i>
<i><Objective, but within 25%</i>	<i>≥40:100</i>	<i>Up to 5% of total post hunt population ≥1 year old</i>	<i>Or up to 12% of pre hunt ewe population</i>
<i>At Objective</i>	<i>≥40:100</i> <i>20-39:100</i> <i><20:100</i>	<i>5-10% of total post hunt population ≥1 year old</i> <i><5% of total post hunt population ≥1 year old</i> <i>No ewe removals</i>	<i>Or 12-24% of pre hunt ewe population</i> <i>Or <12% of pre hunt ewe population</i> <i>Exceptions allowed for disease management</i>
<i>Over Objective</i>		<i>≥10% of total post hunt population >1 year old</i>	<i>≥24% of pre hunt ewe population</i>

Ram Hunting

Several strategies are outlined in Colorado’s bighorn sheep management plan regarding ram harvest (George et al 2009). Ram harvest rates of 2-5% of the post-hunt population and/or 4-

10% of the total post-hunt ram numbers are recommended, as long as winter lamb:ewe ratios exceed 20:100. Similar to ewe hunting, ram licenses will be driven by winter lamb:ewe ratios, sheep densities on winter ranges, and average age of harvested animals. Using a 2017 post-hunt population estimate of 300, and assuming a winter lamb:ewe ratio greater than 20:100 (preferably higher) across the DAU, RBS-05 can hypothetically sustain a harvest of between 6 and 15 rams, which is congruent with current ram harvest in the DAU. Opportunities for increasing licenses in this DAU will be considered in the future depending on population performance.

Ram hunting opportunity will be provided in all three RBS-05 game management units as long as population performance allows. Ram hunting will be focused on providing a quality hunting experience, and to a lesser extent population management. Ram hunting will not be used to manage for a specified male:female ratio; however, biologists will manage ram hunting in accordance with the alternative selected during this planning process.

ISSUE SOLICITATION PROCESS

Online Survey

In February 2017, we mailed postcards to all 2016 1st choice applicants for bighorn sheep licenses in the DAU, which included archery and rifles hunts in GMU S-12 and S-39 (n=749 postcards). The postcard directed recipients to an online survey. Individuals were also instructed to call the CPW Southeast Regional Service Center if they wished to receive a paper copy of the survey. One-hundred two (102) individuals responded. The complete survey text, survey data, and written comments are available in Appendix B.

In the first part of the survey, we asked hunters several questions to assess their interest and familiarity with the RBS-05 DAU and bighorn sheep management. Over half (53/102) of the respondents had visited the DAU more than 10 times in the last 10 years, even though only five respondents lived in the DAU. Approximately a third (35/102) hunted bighorn sheep in Colorado previously. Respondents thought that bighorn sheep populations, followed by deer & elk populations, should be the highest priorities for land management agencies in the area.

The second part of the survey focused on current and future management of bighorn sheep in the DAU. We first asked whether CPW was currently doing an adequate job of managing the species (Figure 11). Overall, respondents were satisfied with our current bighorn sheep management. Eighty-two respondents provided an opinion on the question, with 82% (67/82) indicating that they somewhat or strongly agreed that CPW was doing an adequate job. Eleven (13%) were neutral and four (5%) disagreed that our current bighorn sheep management was adequate. An additional 20 people responded to the question but either marked that they were not sure about our management or marked "Other" as their response. We next asked respondents how we should manage ram harvest and sex ratio over the next 10 years in the DAU (Figure 12). The majority (74% or 70/94) want us to maintain the current sex ratio and level of ram hunting opportunity in the DAU. Finally, we asked about changes to population size. Respondents overwhelmingly asked for an increase in population size in with 66 of 90 (73%) indicating they wanted a small increase in population size and 21 of 90 (23%) asking for a large increase in population size (Figure 13).

Thirty-five respondents provided written comments (See Appendix B). Several people expressed concern about the bighorn sheep preference point system and the number of years it takes to draw a sheep license. There was both positive and negative feedback on the hunting experience in the unit. Several hunters had difficulty finding sheep while some of the hunters were pleased with their harvest. Respondents also expressed concern about other recreational activities (e.g., hiking) in the DAU, especially in S-12.

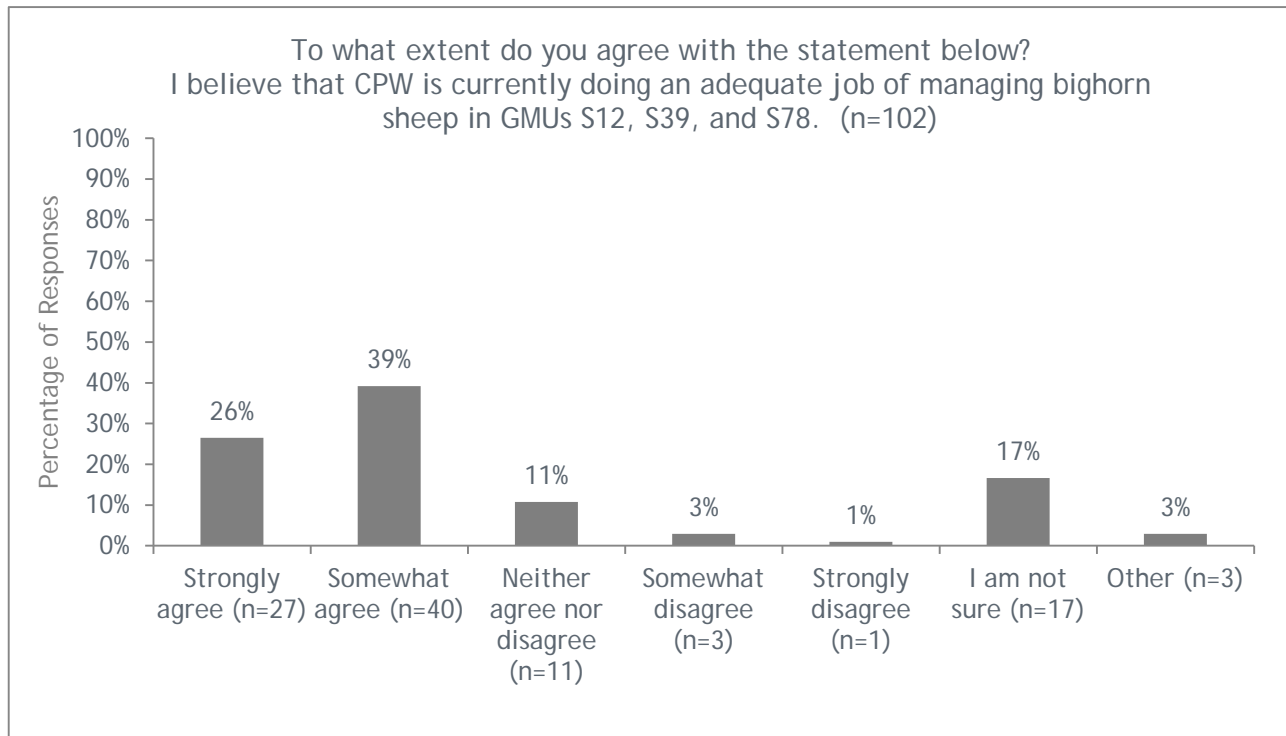


Figure 11. Percentage of responses to question asking respondents to rate CPW's current management of bighorn sheep in RBS-05.

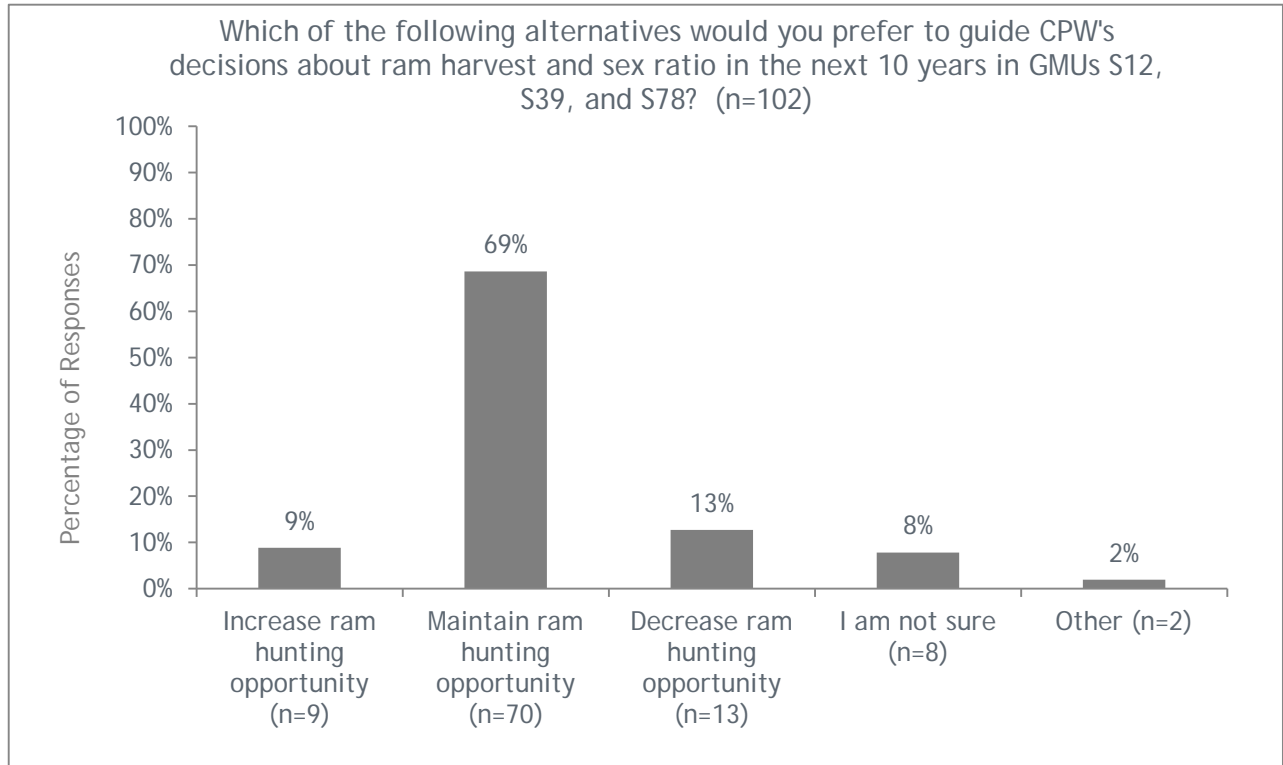


Figure 12. Percentage of responses to the question asking respondents how they would like to see ram harvest and sex ratio managed in RBS-05 for the next 10 years.

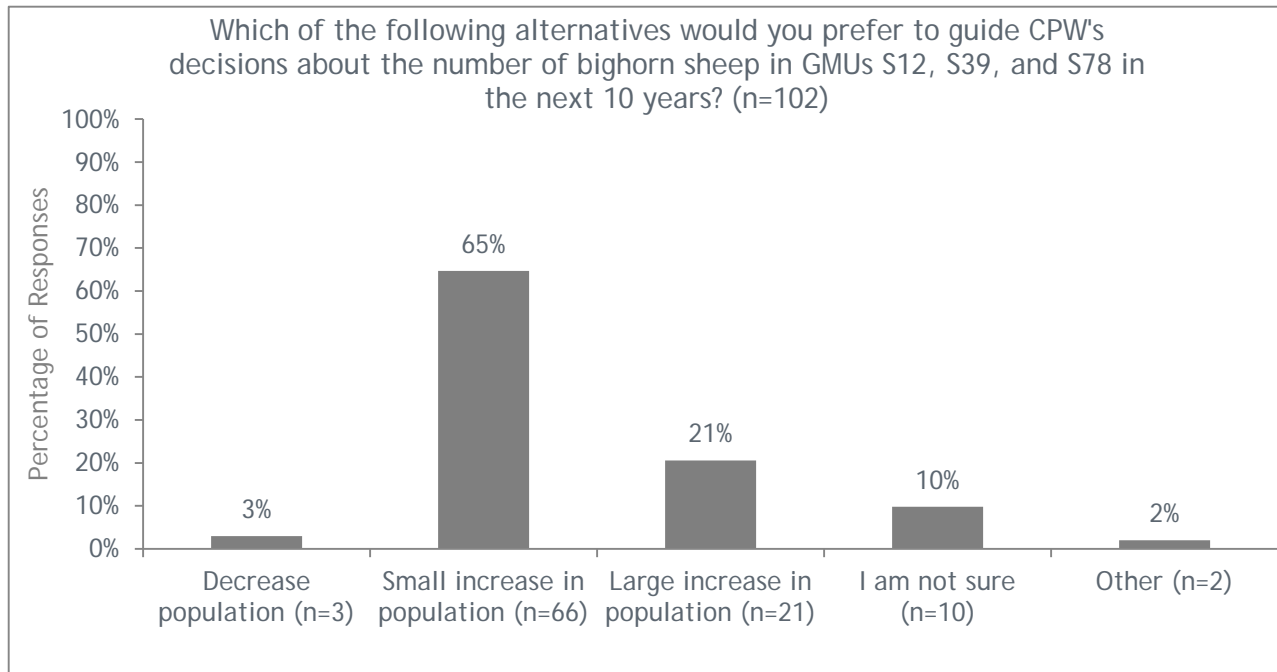


Figure 13. Percentage of responses to the question asking respondents how they would like to see the population size change in RBS-05 over the next 10 years.

30-Day Comment Period

The draft plan was posted on the website for a 30-day comment period in September, 2018. It was also sent to county commissioners, federal land management agencies and special interest groups for review and comment. CPW received comments from Western Watersheds Project and Rocky Mountain Bighorn Society (Appendix D).

MANAGEMENT RECOMMENDATIONS AND FUTURE NEEDS

Herd Management

DAU RBS-05 will be managed as a primary (Tier 1) core population. Primary core populations are defined as those that are large (≥ 100 for $\geq 90\%$ of the years since 1986), native populations comprised of one or more interconnected herds that have received few (i.e. ≤ 50 animals total) if any supplemental releases in the past. RBS-05 meets those criteria.

The management strategy for the bighorn sheep herd in RBS-05 is to maintain the population at a stable level and reduce the potential for catastrophic disease outbreaks causing mortality and suppressed lamb recruitment. Currently, CPW's primary management tools are hunting, habitat manipulations and improvements, and disease monitoring.

Domestic Sheep and the Potential for Disease Transmission

Regarding domestic sheep and disease transmission, the following Management Goal is established in Colorado's statewide management plan (George et al. 2009):

- *CPW will strive to prevent introductions of infectious or parasitic diseases from domestic livestock that could adversely impact bighorn population performance and viability. The CPW will work cooperatively with the USFS, BLM and private landowners to minimize the potential for bighorn sheep to contact domestic livestock whenever practicable.*

To this end, Colorado Parks and Wildlife advocates strict adherence to recommendations presented in the Western Association of Fish and Wildlife Agencies (WAFWA), *Recommendations for Domestic Sheep and Goat Management in Wild Sheep Habitat* (2012) and U.S. Animal Health Association's, *Recommendations on best management practices for domestic sheep grazing on public land ranges shared with bighorn sheep* (2009). These types of recommendations and Best Management Practices (BMP's) are only effective if consistently implemented and rigorously enforced. WAFWA managers emphasize the goal of "effective separation," which they define as "spatial and/or temporal separation between wild sheep and domestic sheep or goats resulting in, at most, minimal risk of potential association and subsequent transmission of respiratory disease between animal groups." In 2014, CPW was a signatory to a Memorandum of Understanding (MOU) for Management of Domestic Sheep and Bighorn Sheep (Appendix C). The MOU was crafted over an 18-month period by the US Forest Service, Bureau of Land Management, CPW, Colorado Department of Agriculture, and the Colorado Woolgrowers Association. The purpose of the MOU "is to provide general guidance for cooperation in reducing contact between domestic and bighorn sheep in order to minimize potential interspecies disease transmission and to ensure healthy bighorn sheep populations while sustaining an economically viable domestic sheep industry in Colorado." CPW remains committed to continued collaboration with area sheep producers and federal agency staff who work towards the mutually beneficial purpose described in the MOU.

CPW is concerned about the potential for disease transmission between domestic sheep and wild bighorns within the active Sugarloaf Peak allotment in RBS-05. The area of overlap is mapped as historic bighorn range, but CPW is not aware of any currently-established bighorns within RBS-05 west of Hwy 91 and east of Hwy 24. However, given historic sightings in this area and the close proximity of the active allotment, CPW will take a proactive management approach. We will follow the recommendations of WAFWA and the existing MOU by proactively eliminating bighorn sheep that wander into the area that directly overlaps with the Sugarloaf Peak domestic sheep allotment in S-78 (Figure 10). To accomplish this, CPW recommends that the GMU boundary for S-12/S-78 be modified, so that S-78 will include the portions of the DAU to the west of Hwy 91 and east of Hwy 24. S-12 would then be expanded to the North and encompass all of the Ten-Mile Range (Figure 14). This boundary modification was completed in January of 2019. In S-78, CPW will first perform an aerial helicopter survey of S-78 in the winter, or summer of 2019 to document any bighorn sheep present, or not within the unit. Any bighorns found within S-78 will be removed as long as the domestic sheep allotment is still active. Removals will happen by publicizing this intent and issuing disease management licenses to any hunter that can demonstrate to CPW that a bighorn sheep is present in this area. With this action, CPW is proactively managing to prevent interactions with domestic sheep much as feasibly possible. After 3 years of this active

management approach, CPW will perform an evaluation of the approach to determine whether they believe it is achieving the goal of creating effective separation. Depending on the outcome of the evaluation, CPW will determine whether to continue, or discontinue the separation approach. Additionally, CPW will continue to have conversations with the USFS regarding the future of the Sugarloaf Peak allotment along with the recommendation that the Arkansas allotment remains vacant.

This active approach is being proposed in order to protect a Tier 1 bighorn sheep herd, but also warrants an examination of the habitat potential in S-78, to gain a better understanding of what is being given up with this approach. To better understand bighorn sheep habitat potential in S-78, we performed a GIS analysis of the modified boundaries of both S-12 and S-78 to spatially quantify the amount of suitable bighorn sheep habitat for each GMU. Suitable habitat was defined as: land areas with slopes >60% (escape terrain), plus the contiguous land within 300 m; plus land within 1000 m of escape terrain on at least 2 sides. From these areas we removed area of dense vegetation, human developments, or areas blocked by man-made or natural barriers. In S-78, we estimated 79 km² of suitable bighorn habitat, which is approximately 30% of the area within the GMU. In S-12, we estimated 400 km² of suitable habitat, which is 27% of the area within the GMU (Figure 15).

The current population estimate in S-12 is 210 bighorn sheep, or 0.525 sheep/km² of modeled sheep habitat. Assuming that S-78 could support the same density as S-12, we estimate that available (modeled) habitat can support 40 bighorn sheep. There are a lot of assumptions being made in this simple analysis, but it does indicate that there is suitable summer habitat in S-78.

Despite the possibility of suitable summer range habitat in S-78, winter range availability may be limited, or non-existent. Given the importance of winter habitat availability for densities of sheep in S-12, we examined winter habitat availability in both S-12 and S-78 using modeled snow depth data provided by the National Operational Hydrologic Remote Sensing Center (<https://www.nohrsc.noaa.gov/interactive/html/map.html>). Initial analysis suggests that average snow depths are significantly different between S-12 and S-78 with S-78 having on average roughly 50% more snow than what is modeled for S-12. Given this, we believe that winter habitat availability is a significant issue for the annual presence of sheep in S-78 and the realistic population that could be expected in this area is less than 40 sheep.

Given the threat of disease transmission from an active domestic sheep allotment and limited habitat potential for bighorns in S-78, CPW believes this proactive management approach is the best way to protect the core bighorn populations in S-12 and S-39 so long as the disease threat from the Sugarloaf Peak domestic sheep allotment exists.

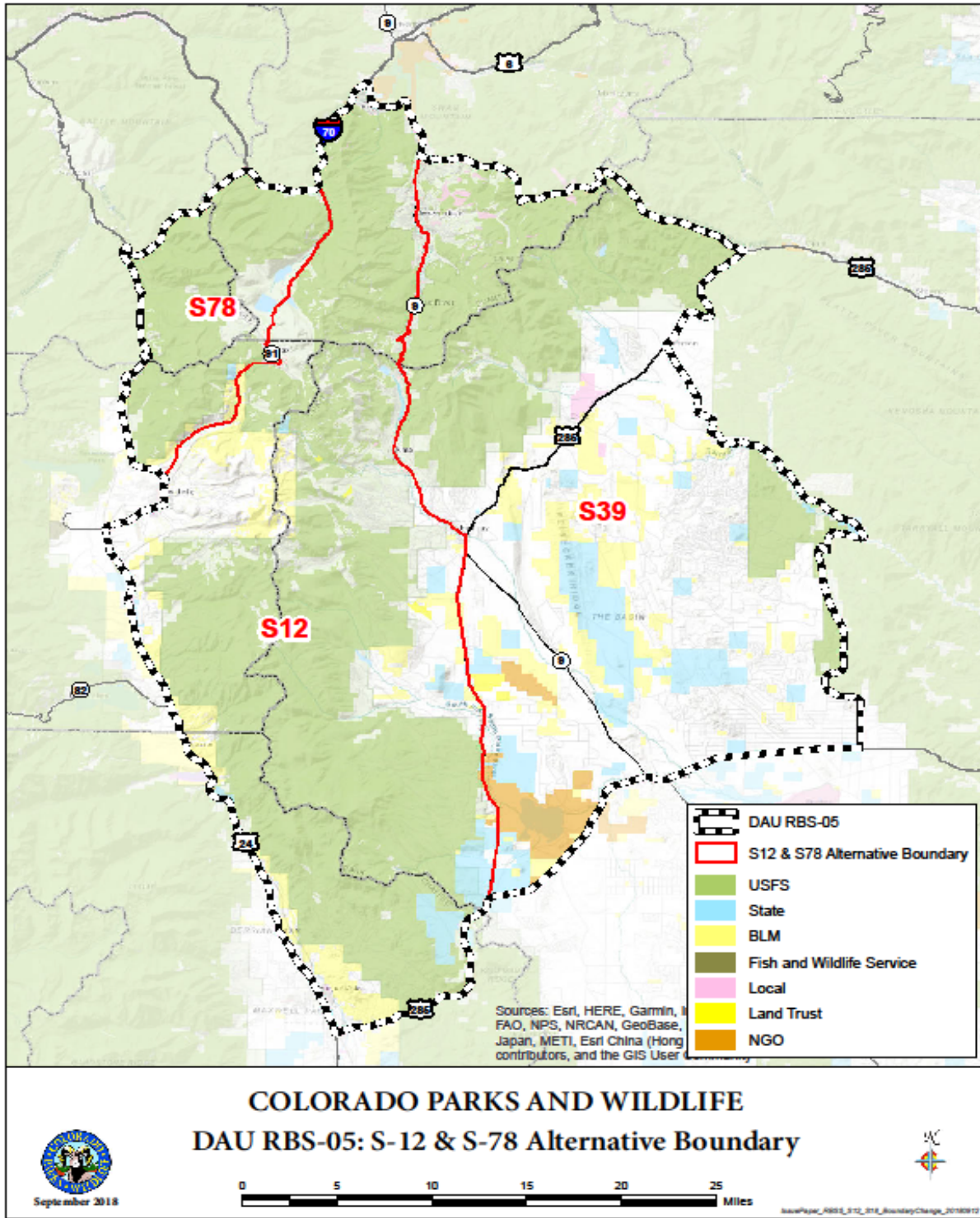


Figure 14. Proposed boundary changes to S-12 and S-78.

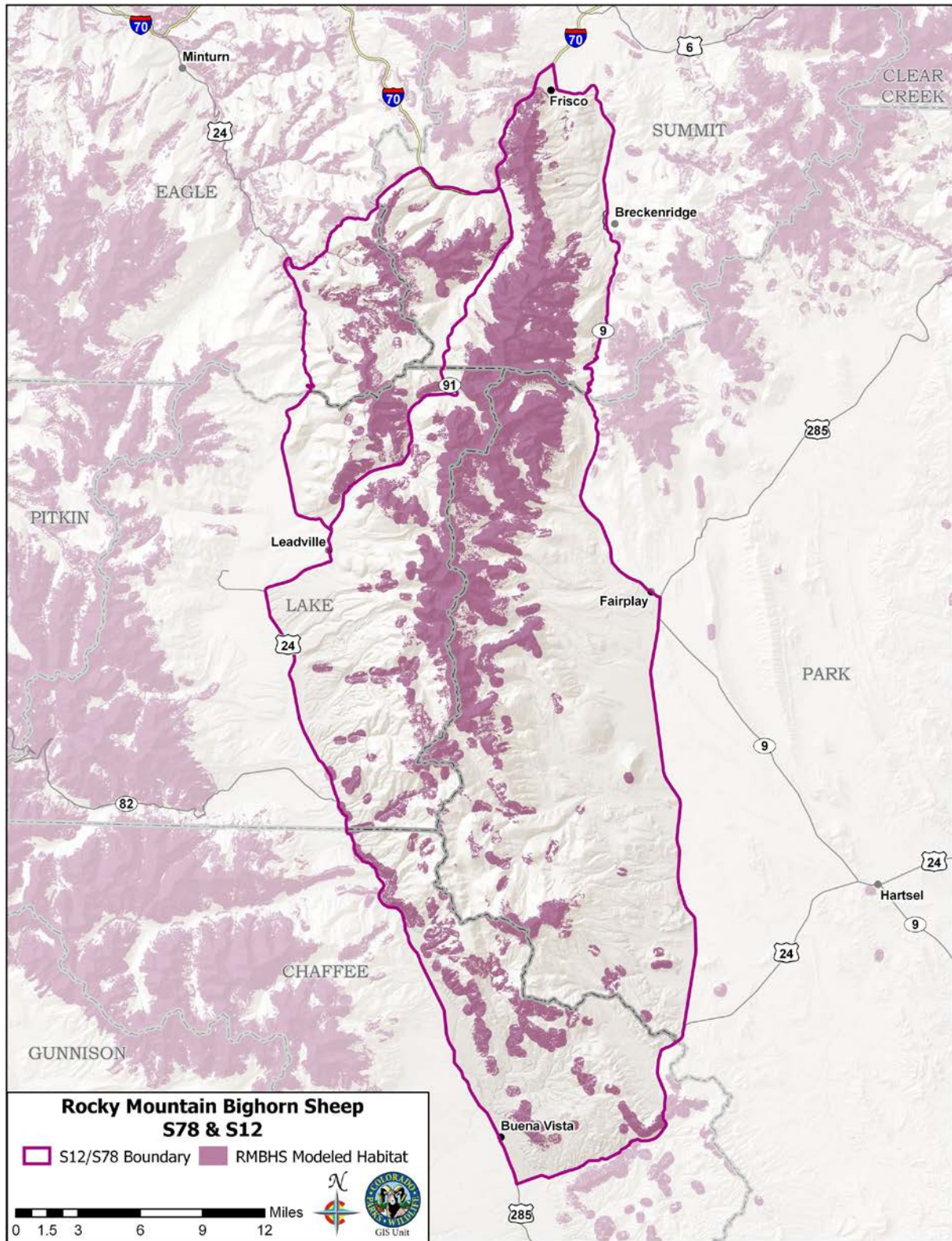


Figure 15. Modeled bighorn sheep habitat in S-78 and S-12.

Population objective range

The current population estimate in RBS-05 is stable at approximately 300 animals. Key limiting factors for this population include winter range carrying capacity, and the potential for disease transmission following contact with domestic livestock. Considering bighorn distribution, winter range capability, population density/density dependence, and the potential risks of contact with domestic livestock, the following management objective was selected:

Approved Alternative: Population objective 300 sheep (range 250-350)

- This alternative will:
 - Maintain the current density of bighorn sheep across modeled winter ranges, index density if and when model is refined. Density should not exceed 2.5 bighorn/km²
 - Encourage managers to respond with targeted hunting licenses, including increased ewe licenses, non-lethal harassment, or managed culling if densities exceed winter range capacity or if individual or small groups of bighorn expand their range into novel areas where the risk of contact with domestic livestock is considered too high
 - Assume that the risk of contact with domestic livestock is maintained at the current level
 - Allow for current watchable wildlife opportunities to be maintained

Alternative 2: Population objective 200 sheep (range 150-200)

This alternative would result in a decrease from the current population and represents an available winter range density of 1.3 sheep/km².

Alternative 3: Population objective 400 sheep (range 350-450)

This alternative would result in an increase from the current population and represents an available winter range density of 2.7 sheep/km².

Ram and Ewe Harvest Objective Alternatives

Ram and ewe hunting will continue throughout RBS-05 as long as population performance allows. Hunter crowding, hunter experience, age of harvested rams, and maintaining watchable wildlife opportunities are all factors that are to be considered when discussing bighorn harvest management. The harvest management objectives in this DAU will focus on average age of harvested ram and allows for ewe harvest to manage population size and winter range densities.

Approved alternative: Maintain a 3-year average age of 6-8 for hunter harvested rams.

- This alternative will essentially maintain the current harvest regime in the DAU. Moderate ram license increases may be possible based on population performance. This alternative should provide a quality experience, moderate levels of crowding, and diverse age-classes of rams.

Preferred alternative: Maintain ewe harvest as a population management tool as well as to allow for hunter opportunity.

- This alternative allows for ewe harvest depending on population performance and winter range densities.

Alternative 2: Maintain a 3-yr average age of rams harvested of 5-7 years old.

Under this alternative, ram license allocation may increase which is expected to decrease the age of harvested rams. Similarly, the horn size of the harvested rams would likely decrease.

Alternative 3: Maintain a 3-yr average age of rams harvested of 7-9 years old.

Under this alternative, ram license allocation would likely decrease but average age of ram harvested and horn size would increase.

Both preferred alternatives are supported from the feedback that we received through the hunter survey with feedback supporting a slight increase in the population and maintaining ram hunting opportunities.

Strategies for Achieving Objectives

The selected preferred alternatives are supported by the current management for both rams and ewes within RBS-05. Therefore, it is not expected that significant changes will be needed to achieve the preferred alternatives.

Strategies for Addressing Management Concerns

In this plan, we have identified three significant issues to managing bighorn sheep in RBS-05, which include disease transmission, recreational impacts and sheep/goat interactions. Here are our strategies to address these issues:

- CPW will modify the GMU boundary for S-12/S-78, so that S-78 will include the portions of the DAU to the west of Hwy 91. S-12 would then be expanded to the North and encompass all of the ten-mile range (Figure 14). This was completed in January 2019.
- CPW will perform an aerial helicopter survey of S-78 in the winter, or summer of 2019 to document any bighorn sheep present, or not within the unit.
- Due to overlap with the Sugarloaf Peak domestic sheep allotment, bighorn in S-78 will be eliminated from this unit as long as the domestic sheep allotment is still active. This will happen by publicizing this intent and issuing disease management licenses to any hunter that can demonstrate to CPW that a bighorn sheep is present in this area. With this action, CPW is actively managing to prevent interactions much as feasibly possible. In the event that the Sugarloaf Peak allotment changes status to a livestock type other than domestic sheep, made inactive, or vacated, CPW will cease this management strategy.
- After 3 years of this active management approach, CPW will perform an evaluation of the approach to determine whether they believe it is achieving the goal of creating effective separation. Depending on the outcome of the evaluation, CPW will determine whether to continue, or discontinue the separation approach.
- CPW will continue to have conversations with the USFS regarding the future of the Sugarloaf Peak allotment along with the recommendation that the Arkansas allotment remains vacant.
- CPW will manage ewe harvest to keep the population within the objective range.
- CPW will actively comment on land use proposals that involve recreation and to the extent possible, will align comments with the conservation of bighorn sheep.
- CPW will management licenses for the removal of mountain goats I the primary bighorn sheep habitat in S-12.

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APPENDIX A: Hunting License and Harvest History in RBS-05

Harvest and hunter statistics for all manners of take: S-12, 1953-2015.

S-12		# of Licenses				# of Harvests				# of Hunters				% Success			
Year	Post Hunt Pop.	Ram	Ewe	E/S	Total	Ram	Ewe	E/S	Total	Ram	Ewe	E/S	Total	Ram	Ewe	E/S	Total
1953	NA	10	0	0	10	9	0	0	9	NA	NA	NA	NA	NA	NA	NA	NA
1954	NA	70	0	0	70	0	0	33	33	NA	NA	NA	NA	NA	NA	47.1	47.1
1955	NA	10	0	0	10	1	0	0	1	NA	NA	NA	NA	NA	NA	NA	NA
1956	NA	20	0	0	20	4	0	0	4	NA	NA	NA	NA	NA	NA	NA	NA
1957	NA	70/60	0	0	70/60	0	0	32	32	NA	NA	NA	NA	NA	NA	53.3	53.3
1958	NA	50	0	0	50	0	0	24	24	NA	NA	NA	NA	NA	NA	48	48
1959	NA	10	0	0	10	2	0	0	2	NA	NA	NA	NA	NA	NA	NA	NA
1960	NA	10	0	0	10	3	0	0	3	NA	NA	NA	NA	NA	NA	NA	NA
1961	NA	10	0	0	10	3	0	0	3	NA	NA	NA	NA	NA	NA	NA	NA
1962	NA	10	0	0	10	8	0	0	8	NA	NA	NA	NA	NA	NA	NA	NA
1963	NA	10	0	0	10	2	0	0	2	NA	NA	NA	NA	NA	NA	NA	NA
1964	NA	10	0	0	10	3	0	0	3	NA	NA	NA	NA	NA	NA	NA	NA
1965	NA	16	0	0	16	2	0	0	2	NA	NA	NA	NA	NA	NA	NA	NA
1966	NA	10	0	0	10	1	0	0	1	NA	NA	NA	NA	NA	NA	NA	NA
1973	NA	1	0	0	1	1	0	0	1	1	0	0	1	100	0	0	100
1974	NA	2	0	0	2	0	0	0	0	NA	NA	NA	NA	0	0	0	0
1976	NA	5	0	0	5	1	0	0	1	5	0	0	5	20	0	0	20
1977	NA	10	0	0	10	3	0	0	3	10	0	0	10	30	0	0	30
1978	NA	10	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0
1979	NA	15	0	0	15	2	0	0	2	15	0	0	15	13	0	0	13
1980	NA	23	0	0	23	5	0	0	5	23	0	0	23	22	0	0	22
1981	NA	26	0	0	26	6	0	0	6	25	0	0	25	24	0	0	24
1982	NA	27	0	0	27	3	0	0	3	27	0	0	27	11	0	0	11
1983	NA	27	0	0	27	2	0	0	2	26	0	0	26	8	0	0	8
1984	NA	27	0	0	27	2	0	0	2	26	0	0	26	8	0	0	8
1985	NA	27	0	0	27	3	0	0	3	27	0	0	27	11	0	0	11
1986	NA	20	0	0	20	4	0	0	4	20	0	0	20	20	0	0	20
1987	NA	20	0	0	20	8	0	0	8	20	0	0	20	40	0	0	40
1988	NA	20	0	0	20	5	0	0	5	18	0	0	18	28	0	0	28
1989	NA	20	0	0	20	7	0	0	7	16	0	0	16	44	0	0	44
1990	150	20	0	0	20	3	0	0	3	16	0	0	16	19	0	0	19
1991	150	20	0	0	20	7	0	0	7	17	0	0	17	41	0	0	41
1992	150	20	0	0	20	7	0	0	7	17	0	0	17	41	0	0	41
1993	150	20	0	0	20	8	0	0	8	17	0	0	17	47	0	0	47

1994	150	20	0	0	20	8	0	0	8	17	0	0	17	47	0	0	47
1995	150	21	0	0	21	10	0	0	10	19	0	0	19	53	0	0	53
1996	200	20	0	0	20	8	0	0	8	19	0	0	19	42	0	0	42
1997	200	20	0	0	20	4	0	0	4	20	0	0	20	20	0	0	20
1998	200	16	0	0	16	7	0	0	7	14	0	0	14	50	0	0	50
1999	200	15	0	0	15	4	0	0	4	14	0	0	14	29	0	0	29
2000	200	16	0	0	16	5	0	0	5	15	0	0	15	33	0	0	33
2001	200	16	0	0	16	4	0	0	4	14	0	0	14	29	0	0	29
2002	200	16	0	0	16	6	0	0	6	13	0	0	13	46	0	0	46
2003	200	16	0	0	16	5	0	0	5	14	0	0	14	36	0	0	36
2004	200	17	0	0	17	5	0	0	5	17	0	0	17	29	0	0	29
2005	200	16	0	0	16	5	0	0	5	12	0	0	12	42	0	0	42
2006	200	16	0	0	16	7	0	0	7	15	0	0	15	47	0	0	47
2007	200	16	0	0	16	6	0	0	6	15	0	0	15	40	0	0	40
2008	200	16	0	0	16	5	0	0	5	14	0	0	14	36	0	0	36
2009	200	16	0	0	16	6	0	0	6	14	0	0	14	43	0	0	43
2010	200	16	0	0	16	6	0	0	6	15	0	0	15	40	0	0	40
2011	200	16	0	0	16	6	0	0	6	12	0	0	12	50	0	0	50
2012	200	16	2	0	18	10	1	0	11	13	2	0	15	77	50	0	73
2013	200	16	2	0	18	5	1	0	6	13	1	0	14	38	100	0	43
2014	200	16	2	0	18	5	1	0	6	16	1	0	17	31	100	0	35
2015	200	16	2	0	18	5	2	0	7	12	2	0	14	42	100	0	50

Rifle harvest and hunter statistics for S-12, 1953-2015.

Year	Rifle Post Hunt Pop.	# of Licenses				# of Harvests				# of Hunters				% Success			
		Ram	Ewe	E/S	Total	Ram	Ewe	E/S	Total	Ram	Ewe	E/S	Total	Ram	Ewe	E/S	Total
1953	NA	10	0	0	10	9	0	0	9	NA	NA	NA	NA	NA	NA	NA	NA
1954	NA	70	0	0	70	0	0	33	33	NA	NA	NA	NA	NA	NA	47.1	47.1
1955	NA	10	0	0	10	1	0	0	1	NA	NA	NA	NA	NA	NA	NA	NA
1956	NA	20	0	0	20	4	0	0	4	NA	NA	NA	NA	NA	NA	NA	NA
1957	NA	70/60	0	0	70/60	0	0	32	32	NA	NA	NA	NA	NA	NA	53.3	53.3
1958	NA	50	0	0	50	0	0	24	24	NA	NA	NA	NA	NA	NA	48	48
1959	NA	10	0	0	10	2	0	0	2	NA	NA	NA	NA	NA	NA	NA	NA
1960	NA	10	0	0	10	3	0	0	3	NA	NA	NA	NA	NA	NA	NA	NA
1961	NA	10	0	0	10	3	0	0	3	NA	NA	NA	NA	NA	NA	NA	NA
1962	NA	10	0	0	10	8	0	0	8	NA	NA	NA	NA	NA	NA	NA	NA
1963	NA	10	0	0	10	2	0	0	2	NA	NA	NA	NA	NA	NA	NA	NA
1964	NA	10	0	0	10	3	0	0	3	NA	NA	NA	NA	NA	NA	NA	NA

1965	NA	16	0	0	16	2	0	0	2	NA	NA	NA	NA	NA	NA	NA	NA
1966	NA	10	0	0	10	1	0	0	1	NA	NA	NA	NA	NA	NA	NA	NA
1979	NA	15	0	0	15	2	0	0	2	15	0	0	15	13	0	0	13
1980	NA	8	0	0	8	4	0	0	4	8	0	0	8	50	0	0	50
1981	NA	12	0	0	12	5	0	0	5	12	0	0	12	42	0	0	42
1982	NA	12	0	0	12	3	0	0	3	12	0	0	12	25	0	0	25
1983	NA	12	0	0	12	2	0	0	2	11	0	0	11	18	0	0	18
1984	NA	12	0	0	12	2	0	0	2	11	0	0	11	18	0	0	18
1985	NA	12	0	0	12	3	0	0	3	12	0	0	12	25	0	0	25
1986	NA	10	0	0	10	4	0	0	4	10	0	0	10	40	0	0	40
1987	NA	10	0	0	10	8	0	0	8	10	0	0	10	80	0	0	80
1988	NA	10	0	0	10	5	0	0	5	9	0	0	9	56	0	0	56
1989	NA	10	0	0	10	7	0	0	7	10	0	0	10	70	0	0	70
1990	150	10	0	0	10	3	0	0	3	10	0	0	10	30	0	0	30
1991	150	10	0	0	10	7	0	0	7	10	0	0	10	70	0	0	70
1992	150	10	0	0	10	7	0	0	7	9	0	0	9	78	0	0	78
1993	150	10	0	0	10	5	0	0	5	10	0	0	10	50	0	0	50
1994	150	10	0	0	10	6	0	0	6	9	0	0	9	67	0	0	67
1995	150	11	0	0	11	8	0	0	8	11	0	0	11	73	0	0	73
1996	200	10	0	0	10	6	0	0	6	9	0	0	9	67	0	0	67
1997	200	10	0	0	10	4	0	0	4	10	0	0	10	40	0	0	40
1998	200	6	0	0	6	6	0	0	6	6	0	0	6	100	0	0	100
1999	200	5	0	0	5	2	0	0	2	5	0	0	5	40	0	0	40
2000	200	6	0	0	6	3	0	0	3	6	0	0	6	50	0	0	50
2001	200	6	0	0	6	2	0	0	2	6	0	0	6	33	0	0	33
2002	200	6	0	0	6	6	0	0	6	6	0	0	6	100	0	0	100
2003	200	6	0	0	6	3	0	0	3	6	0	0	6	50	0	0	50
2004	200	6	0	0	6	3	0	0	3	6	0	0	6	50	0	0	50
2005	200	6	0	0	6	4	0	0	4	5	0	0	5	80	0	0	80
2006	200	6	0	0	6	6	0	0	6	6	0	0	6	100	0	0	100
2007	200	6	0	0	6	5	0	0	5	6	0	0	6	83	0	0	83
2008	200	6	0	0	6	4	0	0	4	6	0	0	6	67	0	0	67
2009	200	6	0	0	6	4	0	0	4	6	0	0	6	47	0	0	47
2010	200	6	0	0	6	5	0	0	5	6	0	0	6	83	0	0	83
2011	200	6	0	0	6	3	0	0	3	4	0	0	4	75	0	0	75
2012	200	6	2	0	8	5	2	0	7	5	1	0	6	100	50	0	86
2013	200	6	2	0	8	2	1	0	3	5	1	0	6	40	100	0	50
2014	200	6	2	0	8	4	1	0	5	6	1	0	7	67	100	0	71
2015	200	6	2	0	8	5	2	0	7	6	2	0	8	83	100	0	88

Archery harvest and hunter statistics for S-12, 1980-2015.

S-12	Archery	# of Licenses				# of Harvests				# of Hunters				% Success			
		Year	Post Hunt Pop.	Ram	Ewe	E/S	Total	Ram	Ewe	E/S	Total	Ram	Ewe	E/S	Total	Ram	Ewe
1980	NA	15	0	0	15	1	0	0	1	15	0	0	15	7	0	0	7
1981	NA	14	0	0	14	1	0	0	1	13	0	0	13	8	0	0	8
1982	NA	15	0	0	15	0	0	0	0	15	0	0	15	0	0	0	0
1983	NA	15	0	0	15	0	0	0	0	15	0	0	15	0	0	0	0
1984	NA	15	0	0	15	0	0	0	0	15	0	0	15	0	0	0	0
1985	NA	15	0	0	15	0	0	0	0	15	0	0	15	0	0	0	0
1986	NA	10	0	0	10	0	0	0	0	10	0	0	10	0	0	0	0
1987	NA	10	0	0	10	0	0	0	0	10	0	0	10	0	0	0	0
1988	NA	10	0	0	10	0	0	0	0	9	0	0	9	0	0	0	0
1989	NA	10	0	0	10	0	0	0	0	6	0	0	6	0	0	0	0
1990	150	10	0	0	10	0	0	0	0	6	0	0	6	0	0	0	0
1991	150	10	0	0	10	0	0	0	0	7	0	0	7	0	0	0	0
1992	150	10	0	0	10	0	0	0	0	8	0	0	8	0	0	0	0
1993	150	10	0	0	10	3	0	0	3	7	0	0	7	43	0	0	43
1994	150	10	0	0	10	2	0	0	2	8	0	0	8	25	0	0	25
1995	150	10	0	0	10	2	0	0	2	8	0	0	8	25	0	0	25
1996	200	10	0	0	10	2	0	0	2	10	0	0	10	20	0	0	20
1997	200	10	0	0	10	0	0	0	0	10	0	0	10	0	0	0	0
1998	200	10	0	0	10	1	0	0	1	8	0	0	8	13	0	0	13
1999	200	10	0	0	10	2	0	0	2	9	0	0	9	22	0	0	22
2000	200	10	0	0	10	2	0	0	2	9	0	0	9	22	0	0	22
2001	200	10	0	0	10	2	0	0	2	8	0	0	8	25	0	0	25
2002	200	10	0	0	10	0	0	0	0	7	0	0	7	0	0	0	0
2003	200	10	0	0	10	2	0	0	2	8	0	0	8	25	0	0	25
2004	200	11	0	0	11	2	0	0	2	11	0	0	11	18	0	0	18
2005	200	10	0	0	10	1	0	0	1	7	0	0	7	14	0	0	14
2006	200	10	0	0	10	1	0	0	1	9	0	0	9	11	0	0	11
2007	200	10	0	0	10	1	0	0	1	9	0	0	9	11	0	0	11
2008	200	10	0	0	10	1	0	0	1	8	0	0	8	13	0	0	13
2009	200	10	0	0	10	2	0	0	2	8	0	0	8	25	0	0	25
2010	200	10	0	0	10	1	0	0	1	9	0	0	9	11	0	0	11
2011	200	10	0	0	10	3	0	0	3	8	0	0	8	38	0	0	38
2012	200	10	0	0	10	5	0	0	5	8	0	0	8	63	0	0	63
2013	200	10	0	0	10	3	0	0	3	8	0	0	8	38	0	0	38
2014	200	10	0	0	10	1	0	0	1	10	0	0	10	10	0	0	10
2015	200	10	0	0	10	0	0	0	0	9	0	0	9	0	0	0	0

Harvest and hunter statistics for S-39, 2008-2015.

S-39		# of Licenses				# of Harvests				# of Hunters				% Success			
Year	Post Hunt Pop.	Ram	Ewe	E/S	Total	Ram	Ewe	E/S	Total	Ram	Ewe	E/S	Total	Ram	Ewe	E/S	Total
2008	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2009	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	60	1	0	0	1	1	0	0	1	1	0	0	1	100	0	0	100
2011	60	1	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0
2012	80	1	0	0	1	1	0	0	1	1	0	0	1	100	0	0	100
2013	80	1	0	0	1	1	0	0	1	1	0	0	1	100	0	0	100
2013*	80	1	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0
2014	80	2	0	0	2	2	0	0	2	2	0	0	2	100	0	0	100
2014*	80	1	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0
2015	80	2	0	0	2	2	0	0	2	2	0	0	2	100	0	0	100
2015*	80	1	0	0	1	1	0	0	1	1	0	0	1	100	0	0	100

*Archery

APPENDIX B: Online Survey Text and Responses



RBS05 Survey S12, S39, and S78 Bighorn Sheep Herd Management Plan

Colorado Parks and Wildlife (CPW) is interested in your input on the management of the S12 (Buffalo Peaks), S39 (Mount Silverheels), and S78 (Tenmile Range) bighorn sheep herds in Chaffee, Lake, Park, and Summit Counties. This area is also referred to as Data Analysis Unit (DAU) RBS-05 (see map on the next page).

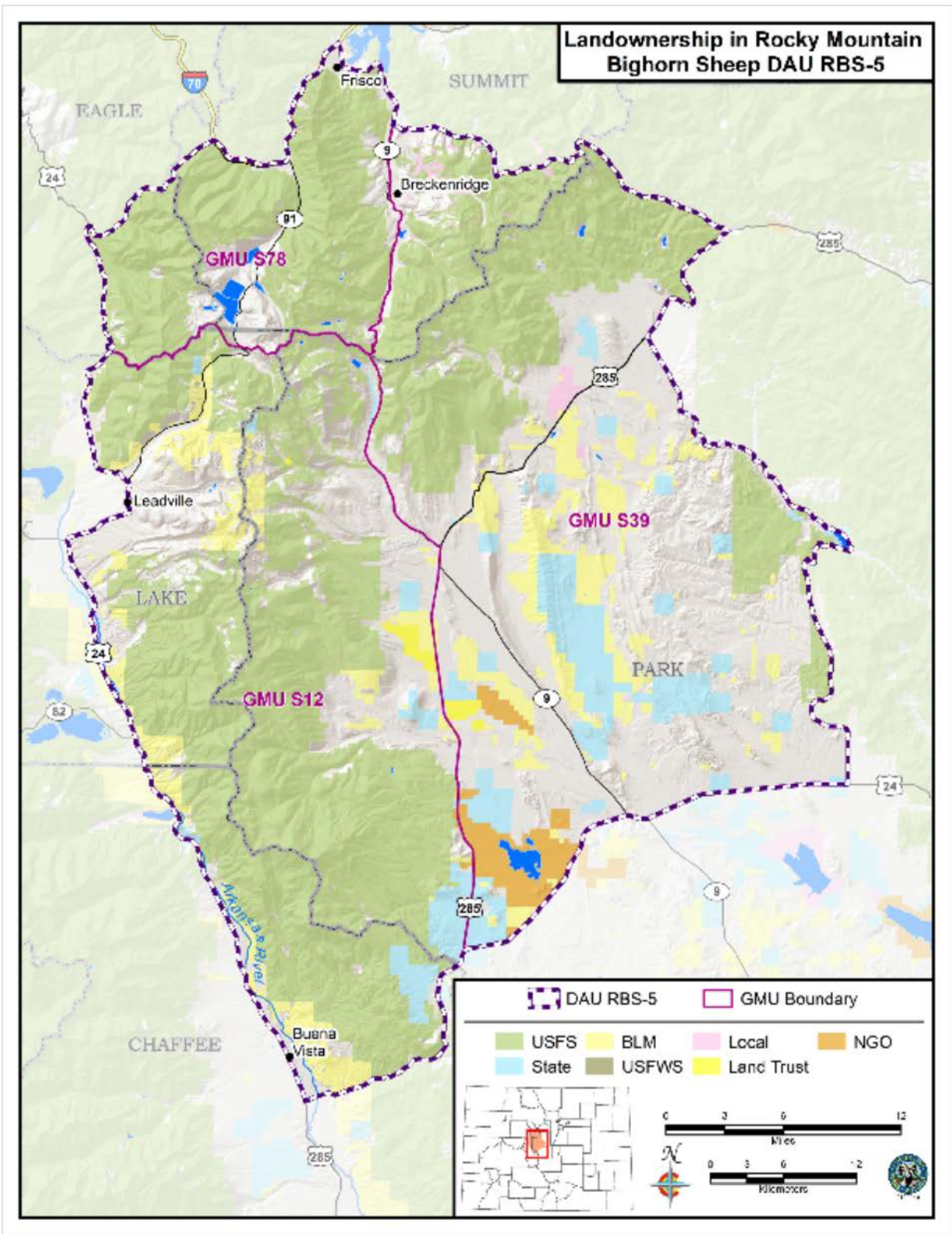
In Colorado, bighorn sheep populations are managed within specific geographic areas with a bighorn sheep management plan. Management plans describe population and sex ratio objectives and actions CPW will take to manage bighorn sheep for a 10 year period in that particular area. CPW is interested in incorporating the concerns and desires of the public with the biological characteristics of the S12/S39/S78 bighorn sheep herd in the management plan it is developing for the next 10 years. Public input is a very important part of the planning process.

Filling out the following survey will help us learn what you think about bighorn sheep in S12/S39/S78 and how you interact with wild sheep in this area. The information you provide will help CPW develop objectives and management actions for the bighorn sheep herd in these GMUs.

If you have any questions about this plan, please contact me, Jamin Grigg, at 719-530-5537 or by email at jamin.grigg@state.co.us

Thank you for your interest in Colorado's wildlife.

Jamin Grigg
Wildlife Biologist
Colorado Parks and Wildlife
Salida



1. Are you a resident of Colorado? (*n=102 responses*)

- Yes (*n=70; 68.6%*)
 No (*n=32; 31.4%*)

2. Do you live within the boundaries of GMUs S12, S39, or S78? (*n=102 responses*)

- Yes (*n=5; 4.9%*)
 No (*n=97; 95.1%*)
 Not sure (*n=0*)

3. Have you hunted bighorn sheep in Colorado in the past? (*n=102 responses*)

- Yes (*n=35; 34.3%*)
 No (*n=67; 65.7%*)

4. Have you applied for a bighorn sheep hunting license in GMU S12, S39, or S78 in the past? (*n=101 responses*)

- Yes (*n=97; 96.0%*)
 No (*n=4; 4.0%*)

5. Which of the following activities do you participate in that may affect your interest in bighorn sheep in this area? (Please check all that apply.) (*n=101 responses*)

- Hunting (*n=100; 99.0%*)
 Wildlife watching (*n=55; 54.4%*)
 Hiking, skiing, or other outdoor recreation (*n=50; 49.5%*)
 Livestock production or grazing (*n=2; 2%*)
 I own land in or near S12, S39, or S78 (*n=9; 8.9%*)
 Other (please specify) (*n=5; 5.0%*)

1	Family cabin in S12
2	Fishing
3	Have ranch in Park county, CO
4	Owner of Matschee Guide Service LLC
5	Population of the species, Pressure

6. Approximately how many times have you visited the S12/S39/S78 area in the last 10 years? (Please check one.) (*n=102 responses*)

- 0 visits (*n=11; 10.8%*)
 1-5 visits (*n=23; 22.6%*)
 6-10 visits (*n=15; 14.7%*)
 10-25 visits (*n=12; 11.8%*)
 More than 25 visits (*n=38; 37.3%*)
 Other (please specify) (*n=3; 2.9%*)

1.	Scouting and guiding 60 days per year
2.	Live in s12
3.	I received a Sheep tag in 2016 for s-12 and hunted 24 days, I have visited the zone countless times

7. How important is it to you that there continue to be wild bighorn sheep in Colorado in the future? (*n*=102 responses)

- Very important (*n*=101; 99.0%)
- Somewhat important (*n*=1; 1%)
- Neither important nor unimportant
- Somewhat unimportant
- Very unimportant

8. To what extent do you agree with the statement below? (*n*=102 responses)

I believe that CPW is currently doing an adequate job of managing bighorn sheep in GMUs S12, S39, and S78.

- Strongly agree (*n*=27; 26.5%)
- Somewhat agree (*n*=40; 39.2%)
- Neither agree nor disagree (*n*=11, 10.8%)
- Somewhat disagree (*n*=3; 2.9%)
- Strongly disagree (*n*=1; 1%)
- I am not sure (*n*=17; 16.7%)
- Other (please specify)

9. The following are all considerations of city, county, state and federal agencies when deciding how to use and manage land in this area. Please tell us which of these you feel should be most important in future land use decisions in Chaffee, Lake, Park, and Summit Counties. (Please rank the following by choosing a number from 1 to 7 indicating how important you feel each item should be, where 1 is the most important item and 7 is the least important). (*n=102 responses*)

	1	2	3	4	5	6	7	Response Count	Rating Average
Bighorn sheep populations	48.8% <i>n=40</i>	37.8% <i>n=31</i>	6.1% <i>n=5</i>	3.7% <i>n=3</i>	0% <i>n=0</i>	0% <i>n=0</i>	3.7% <i>n=3</i>	82	1.83
Deer and elk populations	37.0% <i>n=34</i>	45.7% <i>n=42</i>	8.7% <i>n=8</i>	1.1% <i>n=1</i>	2.2% <i>n=2</i>	3.3% <i>n=3</i>	2.2% <i>n=2</i>	92	2.04
Nonmotorized recreation (hiking, backpacking, skiing etc.)	12.1% <i>n=11</i>	1.1% <i>n=1</i>	50.6% <i>n=46</i>	16.5% <i>n=15</i>	8.8% <i>n=8</i>	5.5% <i>n=5</i>	5.5% <i>n=5</i>	91	3.47
Motorized recreation (ATV riding, offroad driving etc.)	2.3% <i>n=2</i>	5.6% <i>n=5</i>	12.4% <i>n=11</i>	29.2% <i>n=26</i>	22.2% <i>n=18</i>	20.2% <i>n=18</i>	10.1% <i>n=9</i>	89	4.61
Livestock grazing	2.3% <i>n=2</i>	2.3% <i>n=2</i>	12.4% <i>n=11</i>	29.2% <i>n=26</i>	28.1% <i>n=25</i>	18.0% <i>n=16</i>	7.9% <i>n=7</i>	89	4.64
Mineral extraction and mining	2.3% <i>n=2</i>	3.4% <i>n=3</i>	6.7% <i>n=6</i>	14.6% <i>n=13</i>	23.6% <i>n=21</i>	32.6% <i>n=29</i>	16.9% <i>n=15</i>	89	5.19
Residential and commercial development	5.9% <i>n=6</i>	3.0% <i>n=3</i>	1% <i>n=1</i>	7.9% <i>n=8</i>	12.9% <i>n=13</i>	13.9% <i>n=14</i>	55.5% <i>n=56</i>	101	5.82

10. Which of the following alternatives would you prefer to guide CPW's decisions about ram harvest and sex ratio in the next 10 years in GMUs S12, S39, and S78?
(n=102 responses)

- Increase ram hunting opportunity, which would decrease the number of rams relative to the number of ewes in the herd. This may increase hunter crowding and reduce the age of rams harvested, but would allow more hunters to draw a permit each year. (n=9; 8.8%)
- Maintain current ram hunting opportunity and sex ratio, which would limit crowding and encourage harvest of rams of different ages, but require longer to draw a permit. (n=70; 68.6%)
- Decrease ram hunting opportunity, which would increase the number of rams relative to ewes in the herd. This would lead to the least crowding and greatest harvest of older rams, but require the largest number of preference points to draw a permit. (n=13; 12.8%)
- I am not sure. (n=8; 7.8%)
- Other (please specify) (n=2; 1.9%)

1.	My desire is to harvest an older ram not a younger one. If the populations increase to the point of adding more tags without negatively affecting the age structure then I would support that decision. 2016, my son harvested a 12 yr old ewe in S-41. He and I were ecstatic over the opportunity to harvest such an animal.
2.	Increase archery opportunities which will increase hunting opportunity with less impact on rams due to lower success.

11. Which of the following alternatives would you prefer to guide CPW's decisions about the number of bighorn sheep in GMUs S12, S39, and S78 in the next 10 years?

- Decreasing population: Reduce number of sheep through increased hunter harvest, which would temporarily increase the number of hunting licenses available and may maintain or reduce the current risk of diseases among wild sheep, but would reduce the opportunity to view wild sheep. (n=3; 2.9%)
- Small increase in population: Small increase in the number of bighorn sheep, which will allow for small increases in the number of hunting licenses available each year, stable opportunity to view wild sheep but may increase the risk of disease among wild sheep. (n=66; 64.7%)
- Large increase in population: Increase wild sheep numbers by up to 50%, which will allow for long term increases in the number of hunting licenses available each year for rams and ewes, increased opportunities to view wild sheep, but may also increase the risk of disease among wild sheep. (n=10; 9.8%)
- I am not sure. (n=10; 9.8%)
- Other (please specify) (n=2; 2.0%)

1.	What is the risk for diseases? If the carrying capacity will allow for increases in the population, I am for that. If the risk of disease outweighs a higher population number then I am for decreasing the number of animals. We can only do our best to avert diseases, but may not be able to avoid them all together.
2.	Maintain Sheep Population as is in S39

12. Please use the space below to write any additional comments or observations about bighorn sheep management in S12, S39, and S78 that you would like to share. (n=35 responses)

1	Actually have a preference point system that is fair & reasonable, which it is not currently. Colorado residents should have an opportunity to hunt the species while they can still walk, the current draw system is going to drive me out after 16+ years applying, pretty disappointing!
2	Any livestock grazing on or near public land with bighorn sheep needs to be free of domestic sheep. If I am lucky enough to draw a ram tag in one of these areas I will be looking for an old (7 1/2+) ram so favor managing for a population that includes a few older rams.
3	Better predator control
4	does the sheep plan affect the Mtn. Goat plan. I know the habitat is shared for both. How is human multi-use affecting the herds. My experience in S-41 showed the sheep did not mind the high number of hikers/users, as I do not think most of the users even knew the sheep were present the area.
5	Gorgeous area-Have traveled all over Colorado for 60+ years-Show my love for it by not living there but visiting and trying to leave only quickly fading footprints! Good luck on your tasks.
6	Hunted S39 last year. Good numbers of sheep and especially lambs. All were seen within a relatively small geographical area. If tags are increased it would lead to significant crowding unless there were multiple short seasons to distribute to hunting pressure.
7	Hunting opportunity is important but herd health is more so. Future use of this amazing resource is reliant on the outdoor community. Hunting opportunity may have to change to keep sheep healthy and herd ratios in check. I do not want to wait longer than the 20 plus years it may take to draw my tag but if that means having sheep to view and hunt in the future, I trust the Division to make appropriate determination of herd health.
8	Hunting pressure is heavy, unlicensed outfitters causing heavy traffic and undue stress on hunters and sheep
9	I am 69 years old. I have 17 preference points. I may be too old to get up the mountain by the time I get drawn. I wish you would give older applicants an increased chance of being drawn. Maybe additional weighted points depending on age.
10	I am looking forward to
11	I elk hunted 49 last year and I spent a great deal of time in the north part of unit. I only saw 6 rams. I feel that it has been over pressured throughout the past few years
12	I enjoy being able to be in this area and see sheep. It does seem as though there has been plenty of hunting pressure in S12 with as many tags as there is. Lot of people in the same area ... at least that's how it has felt in recent years.
13	I have never hunted a game animal for so many days with the results I experienced , I also had the benefit of two observers who also spent a total of over 20 days looking during the period of my license. I also spent the entire 7 days spotting prior to my season beginning
14	I hunt with a longbow, the success ratio for this type of hunting is extremely low compared to rifle and even compound bows. Additional hunting opportunities for this type of hunting would have very little impact on the population but allow more opportunity to hunt
15	I hunted a bighorn ram in S39 during the 2016 rifle season. Great hunt and amazing country. I would love it if hunters 10, 20, 50 years into the future could have the same experience. Maintain this treasure. Don't change a thing.
16	I hunted for 18 days in 2016 for a sheep in unit 12. I never saw a ram that was bigger than a 3/4 curl so I never harvested a ram.
17	I hunted there in 2016 and harvested a beautiful ram. It is incredibly country and one of the most amazing experiences of my life. I think Colorado is doing an amazing job of managing their sheep.
18	I shared an extensive report to CPW through Dan Prenzlou regarding a very arduous S-12 RMB archery hunt in 2016. It also was published in RMBS newsletter.
19	I think how it is being maintained currently is fine. I have been studying the populations and

	tags in the statistics. For example unit S20 I think that is a perfect amount of Tags for that heard in that specific area.
20	I think it is good that unit S78 was added to the huntable area of S12. I have observed rams crossing back and forth between S78 and S12. I do not agree with suppressing the mountain goat population in S12. I do not believe that there is any evidence that mountain goat populations cause a loss of sheep or sheep carrying capacity. I have observed thriving mountain goat populations in S12. These goats should be managed for a large population and quality hunting just as the sheep are.
21	I would be interested in seeing a later rut hunt for archery hunters. I would like to say that overall I think you guys do a good job but like everyone else I want to hurry up and draw a tag before I get to old to go hunting. Maybe give a season that is really good as far a dates that will attract lots of applicants that will open up the draw odds on some of the other hunts in the area that isn't quit as sweet. Just a suggestion, thank you for letting me give my opinion.
22	I'm not real up on the sheep situation in these areas but having hunted sheep once in S12 quite a few years ago, it just wouldn't work to have more people in this area during a sheep hunt.
23	It is difficult to answer numbers 11 and 12 because you do not provide any data on current populations. Are you at, under, or above objectives. If there are old rams dying of old age, I would like to see permits increased. Also, I have been led to believe that most disease among wild sheep is from co-mingling with domestic sheep and goats. I would love to see more wild sheep and more hunting opportunities but I do not know where your populations stand with respect to winter range carrying capacity, disease potential, predation, etc.
24	It's important to continue to expand opportunities to hunt bighorn sheep but also allow public access to areas
25	my answers were based on s12, i do not have much knowledge on the other 2 units....i am not sure on the actual population in s12, because of this i am not sure about some of my answers regarding increasing or decreasing the heard size, it does look like the harvest numbers have declined in the past few years...i think they are becoming harder to hunt, not sure of the reasons why
26	Not sure that I like the weighted points for sheep. I think that it may work better for moose that have fewer opportunities to draw.
27	S12 is on the verge of being overharvested. I would cut ram permits a bit. I would love to draw a license, but when I do, I want a good chance to get a 3/4 curl or larger ram. Same with S39. I don't know S78
28	S39 does not have a very spread out herd of sheep so I would like to see license numbers stay the same to avoid hunter crowding with hunters going after the same herd of sheep at the same time.
29	Take nonresident tags out of these units.
30	Thanks for the opportunity to give my input.
31	The increase in hikers and backpackers in S12 has a negative affect for hunters who draw a Bighorn Sheep tag or Bull Elk license in unit 49.
32	The long term sustainabililty of the Bighorn is what is most important. Even if I never get a tag.
33	The number of years of applying for a sheep permit should be combined with the age of the applicant. I may be too old to use it if I ever draw a permit. Maybe add a preference point each year after 70.
34	Way to many hikers in s12
35	when i first started applying for sheep in S 12 there were more sheep tags (9), over the years, the numbers of animals have gone down and the quality in horn size has decreased, which in my mind the younger rams are being taken before their prime. so why don't we go back to the 3/4 rule. and then the tags can be regulated to the number of ram to ewe ratio.

APPENDIX C: Domestic & bighorn sheep management MOU

October 14, 2013

MEMORANDUM OF UNDERSTANDING FOR MANAGEMENT OF DOMESTIC SHEEP AND BIGHORN SHEEP

I. TO MINIMIZE POTENTIAL INTERSPECIES DISEASE TRANSMISSION

The purpose of this Memorandum of Understanding (MOU) is to provide general guidance for cooperation in reducing contact between domestic and bighorn sheep in order to minimize potential interspecies disease transmission and to ensure healthy bighorn sheep populations while sustaining an economically viable domestic sheep industry in Colorado.

II. STATEMENT OF MUTUAL BENEFITS AND INTEREST:

The interested parties of this MOU include the USDA Forest Service (USFS) Rocky Mountain Region, USDI Bureau of Land Management Colorado State Office (BLM), Colorado Department of Agriculture (CDOA), Colorado Woolgrowers Association (CWGA), and the Colorado Parks and Wildlife (CPW). The aforementioned parties have a mutual desire to prevent or minimize to the extent feasible direct contact between domestic sheep and bighorn sheep by developing and implementing mutually agreeable guidelines. By adhering to these guidelines, all parties should mutually benefit by maintaining healthy bighorn sheep populations while maintaining a viable domestic sheep industry as a result of reduced conflicts.

III. AUTHORITY

- a. The Act of October 21, 1976, Public Law 94-579, Federal Land Policy and Management Act (FLPMA); Section 302.

IV. ALL PARTIES AGREE THAT;

- a. Contact between bighorn sheep and domestic sheep sometimes occurs under rangeland conditions.
- b. Contact between domestic sheep and bighorn sheep increases the probability of respiratory disease outbreaks in bighorn sheep.
- c. Not all disease outbreaks and reduced recruitment in bighorn sheep can be attributed to contact with domestic sheep.
- d. Gregarious behavior of bighorn sheep and domestic sheep, as well as dispersal, migratory, and exploratory behaviors of bighorn sheep traveling between populations, increases the potential for contact.
- e. Several species of bacteria in the family *Pasteurellaceae*, other bacteria, virus and other agents can occur in apparently healthy free-ranging bighorn sheep and in apparently healthy domestic sheep.
- f. Bighorn sheep translocated to vacant or occupied bighorn ranges and domestic sheep moved onto grazing allotments should be in apparent good health, and where feasible herd health evaluations should be made for both species prior to release or turn-out to help reduce the potential for introducing new pathogens or pathogen strains into established bighorn sheep herds.

October 14, 2013

- g. All parties will act to familiarize the public with the potential risks regarding disease transmission between bighorn sheep and domestic sheep.
- h. The goal is to minimize contact by decreasing the opportunities for domestic/bighorn sheep interaction; while still recognizing that some vacant sheep allotments are important to the domestic sheep industry as forage reserves or for other economic or management reasons.

V. CPW AND CWGA AGREE TO THE FOLLOWING:

- a. CPW and CWGA agree that closure of active domestic sheep allotments on public lands will not be recommended based solely on the potential for interaction between domestic and bighorn sheep. However, they recognize that the USFS and BLM will continue to follow existing direction regarding closure or modification of active domestic sheep allotments to resolve documented resource conflicts.
- b. The CPW and CWGA may jointly or individually recommend vacant domestic sheep allotments for closure, modification, forage reserve status, activation, or management options at any time, including via standard USFS/BLM NEPA processes. The CPW and CWGA understand that the USFS/BLM will follow current direction for closure, modification, activation, and management of vacant domestic sheep allotments to include consideration of recommendations from parties to this MOU.
- c. Individual bighorn sheep, or small groups of bighorn sheep (<5) that through dispersal or other movements come in contact with domestic sheep will be promptly removed by the CPW using means determined appropriate by CPW. Permittees and herders will be encouraged to operate in a manner that reduces opportunities for contact between bighorn sheep and their flocks and to notify CPW as soon as possible if bighorn sheep appear with domestic sheep.
- d. Domestic sheep that stray into occupied bighorn sheep habitat or are not gathered and removed as specified by the allotment management plan pose a risk of interaction and will be removed by the owner as soon as possible or as otherwise specified by the land management agency. If stray domestic sheep are not claimed and reasonable attempts to locate their owner fail, then CPW may seek remedies under existing statutory authority in cases where contact with bighorn sheep may occur.
- e. CPW will inform land management agencies and domestic sheep industry representatives of proposals for transplants of bighorn sheep and will afford an opportunity for comment on translocation proposals prior to animals being released. Bighorn translocation proposals will include disease transmission risk and habitat evaluations consistent with existing CDOW guidelines and directives. In general, transplants will not occur in proximity (e.g., probable travel distance of dispersing bighorn sheep) to occupied domestic sheep allotments unless physical barriers to movement or other mitigating circumstances exist. Furthermore, CPW assumes the risk of potential respiratory disease transmission from domestic sheep operations that are within proximity (probable travel distance of dispersing bighorn sheep) of the transplant location.
- f. Domestic sheep, when moved to grazing allotments in areas of potential contact with bighorn sheep, will be in apparent good health as determined by accepted best management practices for range sheep production.
- g. Bighorn sheep, when moved for translocation, will be in apparent good health as determined by accepted best management practices for bighorn sheep management.

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VI. IT IS MUTUALLY AGREED AND UNDERSTOOD BY ALL PARTIES:

1. FREEDOM OF INFORMATION ACT (FOIA). Any information furnished to the Forest Service and Bureau of Land Management under this instrument is subject to the Freedom of Information Act (5 U.S.C. 522).
2. PARTICIPATION IN SIMILAR ACTIVITIES. This instrument in no way restricts the Forest Service, Bureau of Land Management or the Cooperator(s) from participating in similar activities with other public or private agencies, organizations, and individuals.
3. COMMENCEMENT/EXPIRATION/TERMINATION. This MOU takes effect upon the signature of all parties and shall remain in effect for five years from the date of execution. This MOU may be extended or amended upon written request of any of the parties and the subsequent written concurrence of the other(s). Any party may terminate this MOU with a 60-day written notice to the other(s).
4. RESPONSIBILITIES OF PARTIES. The Forest Service, Bureau of Land Management and all other parties and their respective agencies and office will handle their own activities and utilize their own resources, including the expenditure of their own funds, in pursuing these objectives. Each party will carry out its separate activities in a coordinated and mutually beneficial manner.
5. NON-FUND OBLIGATING DOCUMENT. Nothing in this MOU shall obligate the Forest Service, Bureau of Land Management, Colorado Parks and Wildlife, Colorado Department of Agriculture, or Colorado Woolgrowers Association to obligate or transfer any funds. Specific work projects or activities that involve the transfer of funds, services, or property among the various agencies and offices of the Forest Service, Bureau of Land Management, Colorado Parks and Wildlife, Colorado Department of Agriculture, and Colorado Woolgrowers Association will require execution of separate agreements and be contingent upon the availability of appropriated funds. Such activities must be independently authorized by appropriate statutory authority. This MOU does not provide such authority. Negotiation, execution, and administration of each such agreement must comply with all applicable statutes and regulations.
6. ESTABLISHMENT OF RESPONSIBILITY. This MOU is not intended to, and does not create, any right, benefit, or trust responsibility, substantive or procedural, enforceable at law or equity, by a party against the United States, its agencies, its officers, or any person.
7. Conflicts between the participants concerning procedures under this MOU which cannot be resolved at the operational level will be referred to successively higher levels, as necessary, for resolution.
8. AUTHORIZED REPRESENTATIVES. By signature below, the cooperator certifies that the individuals listed in this document as representatives of the cooperator are authorized to act in their respective areas for matters related to this agreement.

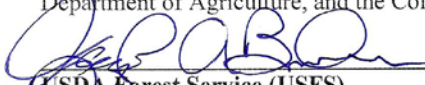
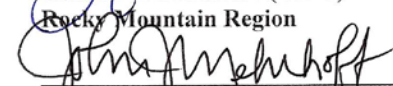
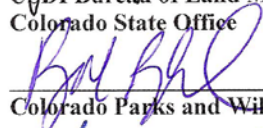
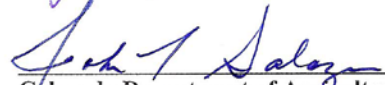

3

October 14, 2013

THE PARTIES HERETO have executed this instrument.

APPROVED:

This MOU is between the USDA Forest Service, Rocky Mountain Region, USDI Bureau of Land Management Colorado State Office, Colorado Parks and Wildlife (CPW), Colorado Department of Agriculture, and the Colorado Woolgrowers Association.

	<u>4-7-14</u>
USDA Forest Service (USFS) Rocky Mountain Region	Date
	<u>1-15-14</u>
USDI Bureau of Land Management (BLM) Colorado State Office	Date
	<u>1-9-14</u>
Colorado Parks and Wildlife (CPW)	Date
	<u>1-9-14</u>
Colorado Department of Agriculture (CDOA)	Date
	<u>1/15/14</u>
Colorado Woolgrowers Association (CWGA)	Date

The authority and format of this Instrument has been reviewed and Approved for signature.

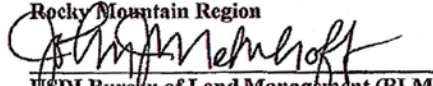
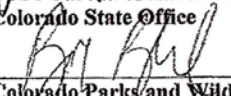
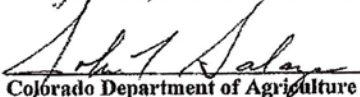

Monica Cordova _____ DATE
Forest Service G&A Specialist

October 14, 2013

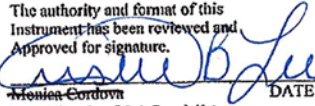
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APPROVED:

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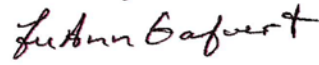
USDA Forest Service (USFS) Rocky Mountain Region	Date
	1-15-14
USDI Bureau of Land Management (BLM) Colorado State Office	Date
	1-9-14
Colorado Parks and Wildlife (CPW)	Date
	1-9-14
Colorado Department of Agriculture (CDOA)	Date
	1/15/14
Colorado Woolgrowers Association (CWGA)	Date

The authority and format of this instrument has been reviewed and approved for signature.

 DATE 2-11-14

Monica Cordova
Forest Service G&A Specialist
Cristie B. Lee

(2/7/14) OK to approve. Signed by partners prior to FS G&A review / approval process.



APPENDIX D: Written Comments



Western Watersheds Project
 PO Box 1770
 Hailey, ID 83333
 tel: (208) 788-2290
 fax: (208) 475-4702
 email: wwp@westernwatersheds.org
 web site: www.westernwatersheds.org

Working to protect and restore Western Watersheds and Wild

October 8, 2018

Submitted by email to jamin.grigg@state.co.us

RE: RBS-5 DAU Plan

Mr. Grigg,

Thank you for the opportunity to provide comments on the RBS-5 DAU Plan, which includes GMUs S-12, S-78, and S-39. Western Watersheds Project works to protect and conserve the public lands, wilderness, wildlife, and natural and cultural resources of the American West through education, scientific study, public policy initiatives, and litigation. Western Watersheds Project and its staff and members use and enjoy public lands, including the lands at issue here, and their wildlife, cultural, and natural resources for health, recreational, scientific, spiritual, educational, aesthetic, and other purposes. Western Watersheds Project has over 1,500 members nationwide, including many in Colorado.

When Colorado Parks and Wildlife sets population goals based on the risk of disease to bighorn sheep from domestic sheep grazed on federal lands, and federal land management agencies assert that current management is having no significant impact on bighorn sheep populations because CPW population goals are being met, the result is a mutual abdication of responsibility for the status of bighorn sheep in Colorado. Bighorn sheep were listed as a state Species of Greatest Conservation Need in 2005, yet the total number of bighorn sheep in Colorado has declined since this time. Bighorn sheep are listed as Sensitive Species for both BLM in Colorado and the Forest Service in Region 2, which includes Colorado, yet more than half of Colorado's bighorn sheep populations are at risk due to authorized domestic sheep grazing on federal lands. CPW "advocates strict adherence to recommendations presented in the Western Association of Fish and Wildlife Agencies (WAFWA) Recommendations for Domestic Sheep and Goat Management in Wild Sheep Habitat (2012)" to prevent the introduction of livestock pathogens into bighorn sheep populations, yet CPW is party to an MOU that guarantees that those management recommendations will not be implemented or followed. This, predictably, ensures that bighorn sheep populations will remain suppressed in the state.

While CPW acknowledges a number of limitations to bighorn sheep security in the unit, CPW here seeks to implement a primary management strategy of hamstringing the population's expansion. CPW does not address cattle grazing here, yet cattle may displace bighorn sheep, including from critical lambing range, winter range, and water sources, and cattle can pass pathogens such as RBST and BVD to bighorn herds. CPW acknowledges the problem of domestic sheep straying from federal allotments, but does not have a strategy for reporting, documenting, or removing strays, or for educating recreational users about the importance of reporting strays or observed interspecies contacts. CPW acknowledges the risk of bighorn sheep foraging to the Forest Service domestic sheep allotments, but will not recommend the removal of privately-owned domestic sheep from these public lands. Officials at CPW are well aware of allotment management issues on federal lands, including straying, trespass grazing, and overgrazing, and CPW is likewise aware that there is inadequate oversight and monitoring on federal allotments due to federal

staffing and budget issues, yet CPW relies solely on untested and inadequate livestock permittee BMPs that are in most cases voluntary to prevent disease outbreaks in the unit.

CPW should assess and disclose the potential for genetic isolation and reduced population fitness due to habitat fragmentation, the impacts to habitat quality from state and federal actions, the quantitative probability that pneumonic disease will occur in the unit, and the current and potential limitations to hunting and wildlife viewing opportunities due to each of these factors. What is the potential carrying capacity of the unit and surrounding habitat if the domestic sheep grazing on Forest Service lands were discontinued? What effect is cattle grazing on the Fourmile and McQuaid Forest Service allotments having on bighorn sheep winter range and severe winter range in southern portions of S12? Where could winter range be improved? How does CPW plan to educate or manage recreational users visiting the area to reduce disturbance to bighorn sheep? How should weed goats and pack goats be managed to protect bighorn sheep? How many bighorn sheep could the unit support if each of these factors were mitigated through actions within the authority of state and federal agencies?

Why, in 2018, is CPW relying primarily on hunter surveys to gauge interest in alternative management strategies in the unit? The Draft DAU plan notes record numbers of recreational visitors to the area, and the survey respondent results note that more than half of hunters also engage in recreational wildlife watching. Yet recreational users are characterized as a nuisance, and not as a stakeholder group. Does CPW not recognize that recreationists contribute vast sums to Colorado's state and local economies, and that those visitors choose to recreate in the areas they do in part because of wildlife and wildlife viewing opportunities? How might CPW engage a representative suite of stakeholders?

If CPW is merely focused on being responsive to its primary financial customer base, hunters, it contradicts that focus when it dismisses survey results showing that hunters rank livestock grazing as one of the lowest priorities for the unit. It further contradicts its primary customers' interests when it signs and repeatedly renews an MOU which prioritizes low-value and low-employment commercial agricultural production over wildlife. With the agency's highest priority in the unit placed on an anachronistic commercial industry with little real importance according to economic and employment data or to other stakeholder groups, CPW is operating as an extension of politically-connected agricultural interests. This contradicts the agency's mission, undermines the credibility of the agency, and harms the interests of hunters, recreationists, and local economies.

Melissa Cain
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P.O. Box 8320 • Denver, CO • 80201-8320

October 8, 2018

Jamin Grigg
Wildlife Biologist, Area 13
Colorado Parks and Wildlife
7405 Highway 50
Salida, CO 81201

Dear Mr. Grigg:

Thank you for the opportunity to provide input on the draft Bighorn Sheep Herd Management Plan for data analysis unit RBS-05. The Rocky Mountain Bighorn Society (RMBS) is a non-profit bighorn sheep conservation organization based in Colorado for 43 years, with a mission to promote the science-based management of bighorn sheep, educate the public about their life and habitat, and assure the sportsman's rights in proper opportunities. Please accept this comment letter on behalf of our 800 members.

The RMBS supports Colorado bighorn sheep management strategies that restore healthy populations across all suitable federal lands wild sheep habitat. Western Colorado is unique in its broad distribution of well-connected habitat and its statewide population of bighorn sheep. However, the statewide population remains slightly below what was estimated it exist in 1915 when it was said that bighorns only existed in scattered remnant populations. It is not clear how CPW has classified bighorn sheep habitat in the DAU; in particular, how the agency has quantified available winter range (modeling, general agency observation, etc.). If managers are relying on observations of winter use areas, they may simply not be aware of available winter range that has not been utilized at the current population level, which is the highest ever observed. It is important to note that 74% of survey respondents want CPW to manage for more bighorn sheep in RBS-05. The RMBS supports this goal as well.

The management plan states that population estimates and lamb:100 ewes:rams ratios are obtained during annual helicopter surveys, yet Table 3 seems to indicate that helicopter surveys are conducted approximately every other year. Given the designation of RBS-05 as a Tier 1 herd, CPW should consider prioritizing annual surveys of the DAU to increase the probability of detecting stochastic events such as winter mortality and disease epizootics.

The RMBS has considerable concerns regarding the proposal to create a bighorn sheep exclusion area in historical, high quality alpine bighorn sheep habitat, in deference to domestic sheep. Bighorn sheep populations westwide are at only about 5% of historical pre-settlement estimates. Before committing to reducing the size of actual and potential bighorn sheep habitat for a Tier 1 herd, it seems prudent for CPW to work with the US Forest Service and the Sugarloaf Allotment permittee to determine if there are lower risk sheep grazing allotments in the general vicinity that could accommodate the permittee. The draft management plan does not present an analysis of

what the potential is for the S-78 portion of the DAU to produce or accommodate more bighorns. Since winter range at high elevation may be limiting across the DAU, it seems prudent to analyze what is being given up by proposing to exclude bighorns from this area, analyze what other grazing options are out there and only then make a decision to create a buffer area.

It is not clear in the draft management plan how frequently potential bighorn sheep interaction has been documented by CPW in S-78. The agency already has a policy to lethally remove bighorn sheep that are confirmed or suspected to have come in contact with domestic sheep, which has been utilized frequently in recent years. While the USFS has a multiple use mandate that includes domestic livestock grazing where suitable, they must consider impacts to sensitive species such as bighorn sheep when analyzing proposed actions. Recommendations from state wildlife agencies as cooperators play a significant role in those analyses. Creating a bighorn sheep exclusion area in S-78 to reduce the risk of interaction with domestic sheep on federal lands puts the onus of maintaining separation on CPW, rather than on the USFS where it belongs. It is not clear to us why CPW is taking responsibility to protect the domestic sheep industry at the expense of a Tier 1 population of the state mammal.

While the Jorgenson paper is good, the Ram Mountain habitat of Alberta differs significantly from the alpine habitat found in much of RBS-05. While maintaining a density of 2.5 bighorns/km² may be desirable, the reality is that is an assumption. Other high altitude herds in Co (S-9) have over time maintained higher densities.

The RMBS supports the proposed strategy to maintain a 3-yr average age of rams harvested of 6-8 years old. We prefer that hunters have the opportunity to harvest older age class rams given a reasonable hunting effort. However, we acknowledge that some hunters only wish to fill their license, and may not choose to pass up a young ram to search for a more mature ram. We expect CPW staff to rely more heavily on herd inventory data, if available, when considering future hunter opportunity.

In conclusion, the RMBS supports the general management philosophy proposed in the draft RBS-05 herd management plan, but we support the 74% of poll respondents that call for CPW to manage for an increasing population in the DAU. We do not support the creation of a bighorn sheep exclusion area in S-78, nor the issuance of disease management licenses to remove bighorns in this area. The CPW should analyze the habitat in S-78 to determine potential carrying capacity, and work with federal land managers to reduce the risk to our wild, native ungulate populations imposed by their agency's' management actions.

Thank you for giving RMBS the opportunity to comment on this draft management plan. Please do not hesitate to contact me if you have any questions or concerns about our comments. Also, please apprise us of future opportunities to comment on this plan or other bighorn sheep management issues.

Sincerely,



Terry E. Meyers
Executive Director

Forest
Service

Salida Ranger District

5575 Cleora Road
Salida CO 81201
719-539-3591/719-539-3593

File Code: 2600
Date: November 12, 2018

Jamin Grigg; Wildlife Biologist
Colorado Parks and Wildlife
7405 HWY 50
Salida CO 81201

Dear Jamin Grigg,

The Pike and San Isabel National Forest, Salida, Leadville and South Park Ranger Districts appreciate the opportunity to comment on the Draft Bighorn Sheep Management Plan for RBS-05. We support the preferred alternative that was developed. We have additional information to contribute to the plan. The San Isabel National Forest has vacated the Arkansas Allotment located north of Leadville, CO. It was vacated with the Salida-Leadville Range Allotment Management Plan Decision Notice of September 2008. There are no proposals to reopen the Arkansas Allotment. National Environment Policy Act (NEPA) analysis would be required to assess the environmental effects of a proposal to reopen the allotment prior to making a decision.

The U.S. Forest Service will continue to partner with Colorado Parks and Wildlife to improve habitat conditions on public lands within the area. Prescribed burns, forest clearing and seasonal closures of road and trails during critical time periods for bighorn sheep will be considered. We appreciate our partnership with CPW and look forward to developing new habitat projects in the future.

Sincerely,

JAMES PITTS District Ranger



----- Forwarded message -----

From: Fitzwilliams, Scott -FS <sfitzwilliams@fs.fed.us>
Date: Mon, Dec 31, 2018 at 10:31 AM
Subject: Draft RBS-05 Plan
To: jt.romatzke@state.co.us <jt.romatzke@state.co.us>

JT...

I wanted to provide you some comments regarding CPW's draft management plan; specifically how it relates to S78 which is located on the White River National Forest. After reviewing the draft plan, we are supportive of the direction it outlines. It is consistent with the MOU we have agreed to and given the locations of domestic sheep allotments within S78, we believe it is the best course of action. The draft plan recognizes the need to focus our efforts to improve sheep habitat and populations where there is the best opportunity for success. We will continue to work with you and your staff on the implementation of the plan and continued sheep habitat improvement projects throughout the White River National Forest.

If you have additional questions, or need additional information, please don't hesitate to contact me.

Regards,

-Scott

Scott Fitzwilliams
Forest Supervisor

1/2/2019

State.co.us Executive Branch Mail - Fwd: Draft RBS-05 Plan



Forest Service
White River National Forest

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