

## **BIGHORN SHEEP MANAGEMENT PLAN**

### **DATA ANALYSIS UNIT RBS-37 Mount Zirkel Herd**

GAME MANAGEMENT UNIT  
S73

Prepared for:  
Colorado Parks and Wildlife

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DAU RBS-37 (Mount Zirkel Bighorn Sheep)  
**EXECUTIVE SUMMARY**

**GMUs:** S73  
**Land Ownership:** 26% Private, 62% USFS, 2% State, 10% BLM  
**Posthunt Population:** Previous Objective None, 2011 Estimate, 50-75, Preferred Objective 150-200  
**Posthunt Sex Ratio:** Previous Objective None, 2011 Observed 125, Preferred Object 60-80

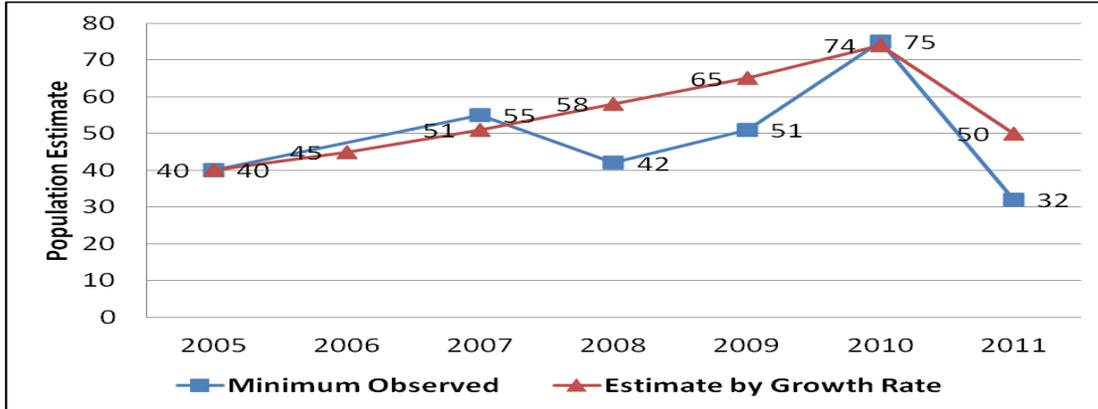


Figure 1: RBS-37 bighorn posthunt population estimate and observed from 2005 to 2011.

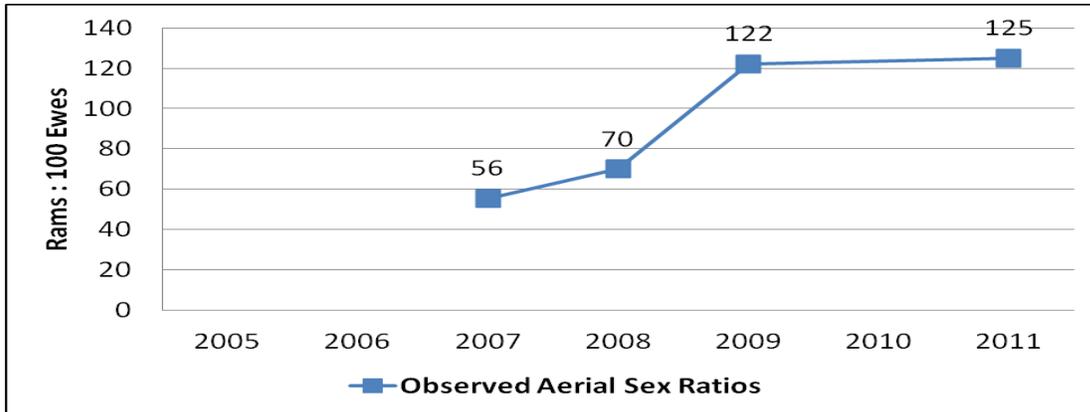


Figure 2: Observed posthunt sex ratios for RBS-37 from 2005 to 2011.

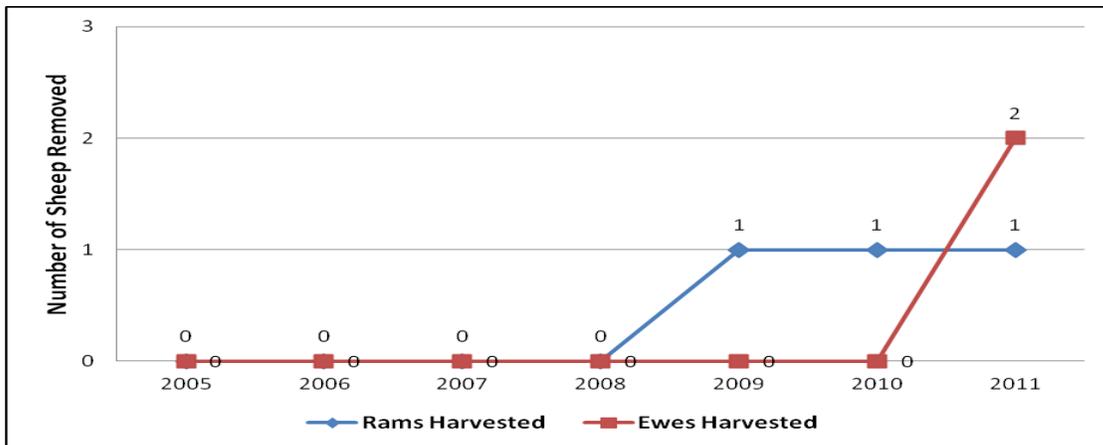


Figure 3: RBS-37 ram and ewe removals via harvest from biological year 2005 to 2011.

## **Background Information**

The Mount Zirkel Bighorn Sheep herd (Rocky Mountain Bighorn Sheep Data Analysis Unit (DAU) RBS-37 is one of the newest herds in Colorado. In January of 2005 forty Rocky Mountain bighorns were released into historical sheep habitat of the Park Range 20 miles west of Walden, Colorado. Since that time the herd has grown substantially providing wildlife viewing, photography, and recently hunting opportunities.

DAU RBS-37 consists of one Game Management Unit (GMU) S73. It encompasses 487 square miles (1,353 square kilometers) in Jackson and Routt Counties. No municipalities exist within the DAU boundaries. However, nearby towns include Cowdrey, Walden, and Steamboat Springs. The majority of actual useable sheep habitat is in the western half of the DAU and is comprised of National Forest Service land with most of that lying within the Mount Zirkel Wilderness. The eastern half of RBS-37 has little or no value to bighorns consisting of mostly private or BLM land near and along the valley floor of North Park.

Bighorn sheep were indigenous to the Park Range including the Mount Zirkel Wilderness area. It has been estimated that up to 1,000 Rocky Mountain bighorn sheep may have lived in this range into the late 1800s. However, by the mid 1900s the indigenous bighorn herd had likely disappeared. Since a 2005 reintroduction, the new herd has grown to an estimated 75 bighorns. There is currently no established population or sex ratio objective for these sheep since the herd is new. Potential threats to this herd include disease epidemics following contact with domestic livestock or from high densities of wild sheep in concentrated areas, severe winter weather events, and potential predation from mountain lions on limited sheep winter range.

## **Population Objective Alternatives**

This DAU plan presents 3 population objective alternatives. Because this is a new herd whose biological potential is unproven it may take many years for the herd to fully establish. Alternative One, 100 – 150 bighorn, the current population estimate is below this alternative. Alternative One would increase then stabilize the population below estimated carrying capacity. Alternative Two, 150 – 200 bighorn, is more than twice the current population estimate but well within realistic population potential. Alternative Three, 250 – 350 bighorn, is an optimistic objective which could be obtained if enough winter habitat becomes available.

## **Sex Ratio Objective Alternatives**

DAU plan sex ratio objective alternatives presented here are similar to those in other Colorado sheep DAU plans. Alternative One, 40 – 60 rams per 100 ewes, this range is probably lower than naturally occurring sex ratios in bighorn herds and would require ram reductions. Increased ram licenses would be off- set by reduced number, average age and horn size of rams available for viewing and harvest. Alternative Two, 60 – 80 rams per 100 ewes, is thought to be at the lower end of natural sex ratio of bighorn herds and would also call for a reduction from the current observed sex ratio estimate. This alternative focuses on maximizing quantity and quality of rams while maintaining herd reproductive potential and growth. This option could provide the greatest license

potential over the long term. Alternative Three, 80 – 100 rams per 100 ewes is near the current sex ratio estimate. Under this alternative, the sex ratio would remain near its current level. Alternative Three could result in a herd with the lowest reproductive potential, the lowest numbers of ram licenses, and the greatest ram age and horn size.

### **Preferred Alternatives**

After the conclusion of the public input process all results indicated a strong preference for the following alternatives based on 64 completed surveys. For population objective 53% of respondents choose alternative two, 23% alternative one, 21% alternative three, and 3% were not sure.

#### **Preferred Population Objective - Alternative Two: 150 – 200 Bighorn Sheep**

is more than twice the current population estimate but well within realistic population potential. This objective seeks to extend the useable winter range and population of the herd. This moderate population level would optimize the number of bighorn sheep the current and future improved habitat can support.

For sex ratio objective alternatives based on 64 completed surveys 70% of respondents choose alternative two, 17% alternative three, 11% alternative one, and 2% were not sure.

#### **Preferred Sex Ratio Objective - Alternative Two: 60 – 80 Rams per 100 Ewes**

is thought to be at the lower end of natural sex ratio of bighorn herds and would call for a reduction from the current observed sex ratio estimate. This alternative focuses on optimizing quantity and quality of rams while maintaining herd reproductive potential and growth. This option could provide the greatest license potential over the long term.

This DAU plan was approved by the Colorado Parks and Wildlife Commission on:

December 7, 2012.

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## INTRODUCTION AND PURPOSE

Colorado Parks and Wildlife (CPW) manages bighorn sheep for the use, benefit and enjoyment of the people of the state in accordance with the CPW's Strategic Plan, the Colorado Bighorn Sheep Management Plan (George et al. 2009) and mandates from the Colorado Parks and Wildlife Commission and the Colorado Legislature. Colorado's wildlife resources 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 4).

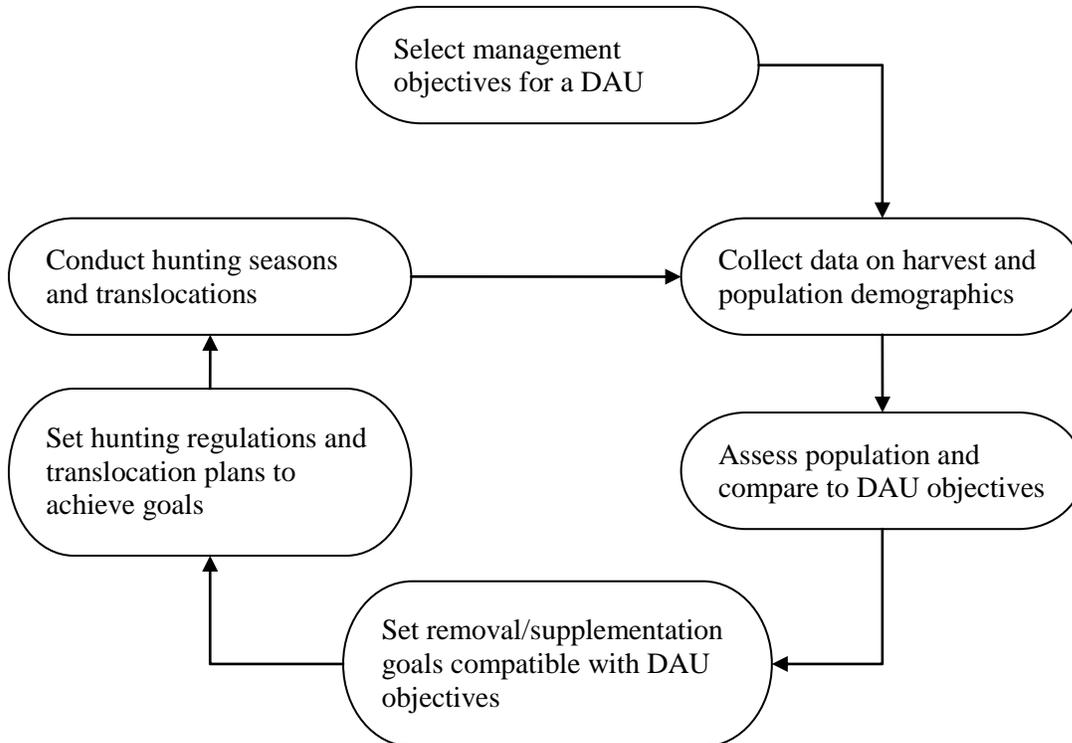


Figure 4: Management by Objective process used by Colorado Parks and Wildlife to manage big game populations by Data Analysis Unit.

In this approach, big game populations are managed to achieve population objectives 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 the majority 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) in order to distribute hunters and harvest within a DAU.

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

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

The DAU 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 DAU plan. Removal goals are then set. Based on these goals specific removal strategies are made for the coming year to either maintain the population or move it toward the objectives. (e.g., license numbers and allocation are set, translocation plans are made). Hunting seasons and translocations are then conducted and evaluated. The annual management cycle then begins again (Figure 4).

## **DESCRIPTION OF DAU**

### **Location**

Bighorn sheep DAU RBS-37 consists of one Game Management Unit (GMU), S73. This DAU encompasses 487 square miles (1,353 square kilometers) in Jackson and Routt Counties. The Mount Zirkel Wilderness area occupies 218 square miles (607 square kilometers) of that area. No municipalities exist within the DAU boundaries. However, nearby towns include Cowdrey, Walden, and Steamboat Springs. The majority of actual useable sheep habitat is in the western half of the DAU and is comprised of US Forest Service land, with most of that lying within the Mount Zirkel Wilderness. Much of the eastern half of RBS-37 has little or no value to bighorns consisting of mostly private or BLM land near and along the valley floor of North Park, the exception being Delaney Butte, Sheep Mountain and smaller hills with suitable escape terrain. The boundary of S73- MOUNT ZIRKEL encompasses the following area in Jackson and Routt Counties; on the North by the Mount Zirkel Wilderness boundary, USFS Trail 1125, USFS 660, and Big Creek Road (USFS 600); on E by Jackson CRs 6W, 7, 12W, 18 and 5; on S by Jackson CR 24, and Buffalo Pass Road (USFS 60); and on W by Mount Zirkel Wilderness Area boundary (Figure 5).

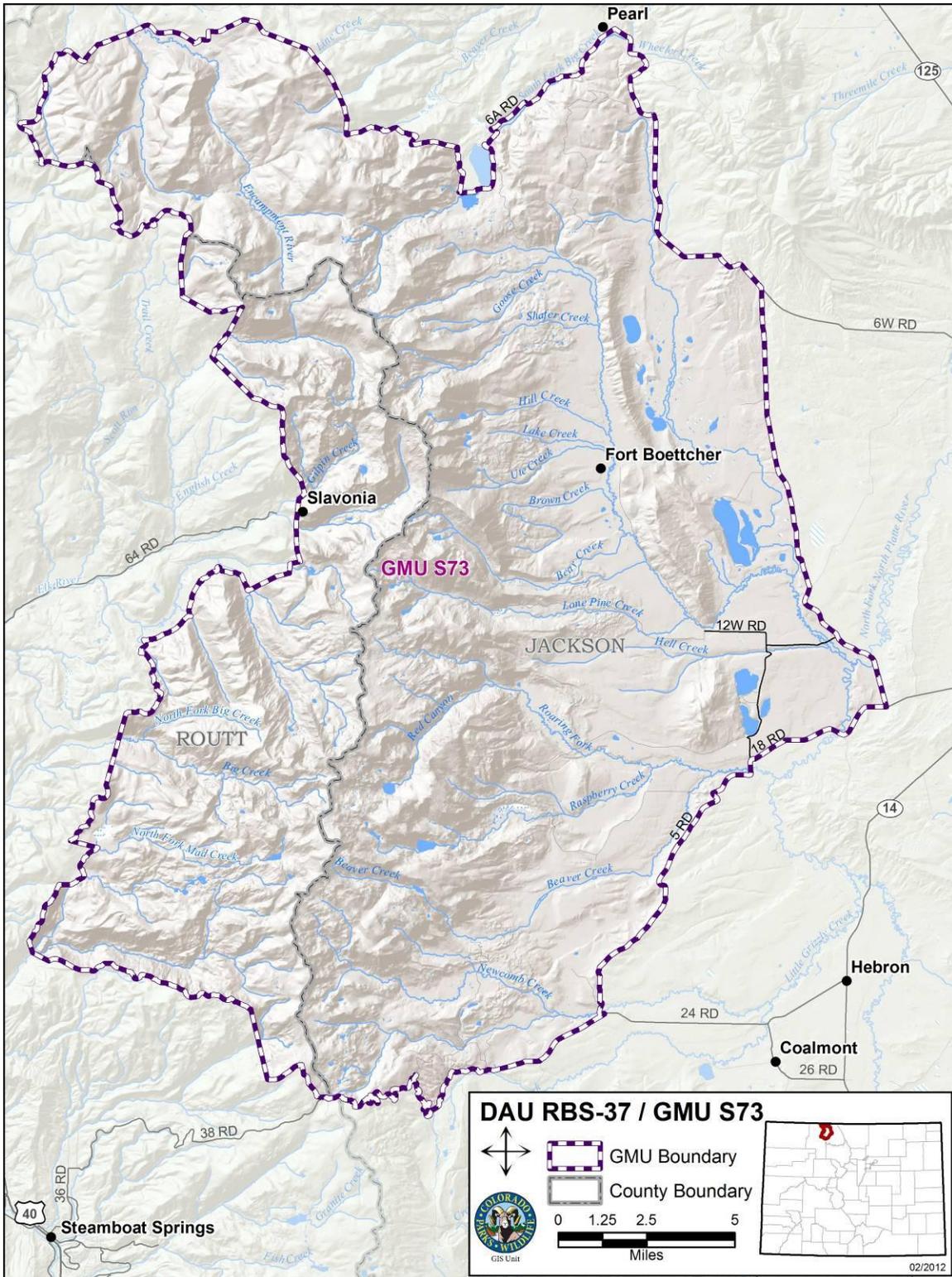


Figure 5: Geographic location of bighorn sheep Data Analysis Unit (DAU) RBS-37 and Game Management Unit (GMU) S73.

## **Physiography**

### ***Topography***

The East side of the DAU in North Park is relatively flat, sagebrush grassland with numerous small ponds and wetlands interspersed with willow lined drainages. The mountains on the West side of the DAU rise rapidly from the valley floor to the alpine zone above timberline on the Continental Divide. The Park Range merges with the Sierra Madre Range near the Colorado-Wyoming border. Elevations range from 7,917 feet at Cowdrey to 12,180 feet at Mount Zirkel. The headwaters of the mighty North Platte River begin on the east side of the divide and flow northward into Wyoming. Other major tributaries are the Elk and Encampment Rivers. Popular fishing lakes in the area include Delaney Buttes, Lake John, and Big Creek Lakes, among others.

### ***Climate***

The climate across the DAU is fairly similar with mean precipitation increasing with elevation while temperature decreases with increasing elevation. Mean annual precipitation at 10,000 ft. in the Routt National Forest is about 40 inches, while approximately 11.5 inches fall near Walden. This high level of precipitation on the top of the divide produces a tremendous amount of excellent forage for summer and fall bighorn grazing. Winters are windy, cold, and snowy. The summers are short, cool, and dry. The average temperature measured at Walden is 37.8 degrees F, with a temperature range between -50 degrees F and 90 degrees F. The growing season averages 33 days, mostly in the month of July with between 15 and 45 frost free days annually. Moderate to severe winds are common everywhere in the DAU prevailing to the northeast where extreme down slope conditions on the east slope of the Zirkel's often prevent aerial bighorn surveys.

### ***Vegetation***

On the east side of the Continental Divide (Jackson County) vegetation varies with sagebrush, mixed sage, and irrigated grass hay fields lining the valley floor, a variety of willow species along stream courses. Vegetation changes from a complex of mountain shrub, lodgepole pine, and aspen at mid elevations to spruce-fir as, then tundra as elevation increases. Where Jackson and Routt meet on top subalpine forest from 8,500' – 11,600' to timberline occur on both sides of the Divide. Stands of limber and possibly white fir also occur at higher elevations. Alpine tundra, alpine willows, rocky substrate and cliffs dominate above timberline. Moving west and lower in elevation into Routt County subalpine forest gives way to lodgepole pine intermixed with aspen then to mid-elevation mountain shrub zones further west.

### **Land Management**

Of the 487 square miles (1,353 square kilometers) in DAU RBS-37, approximately 26% (127 mi<sup>2</sup>) is private land, 62% (302 mi<sup>2</sup>) is Routt National Forest land (including 52% (251 mi<sup>2</sup>) of wilderness), 2% (10 mi<sup>2</sup>) is state land and 10% (48 mi<sup>2</sup>) is BLM. Most of the national forest property is located in the western ½ of the DAU (Figure 6).

Approximately 120 square miles of this DAU is occupied by bighorn sheep. Of this occupied range, approximately 93% (453 mi<sup>2</sup>) is in Routt National Forest land (including 251 mi<sup>2</sup> of designated wilderness), 2% (10 mi<sup>2</sup>) is private land, 1% (5 mi<sup>2</sup>) is state land, and 4% (19 mi<sup>2</sup>) is BLM.

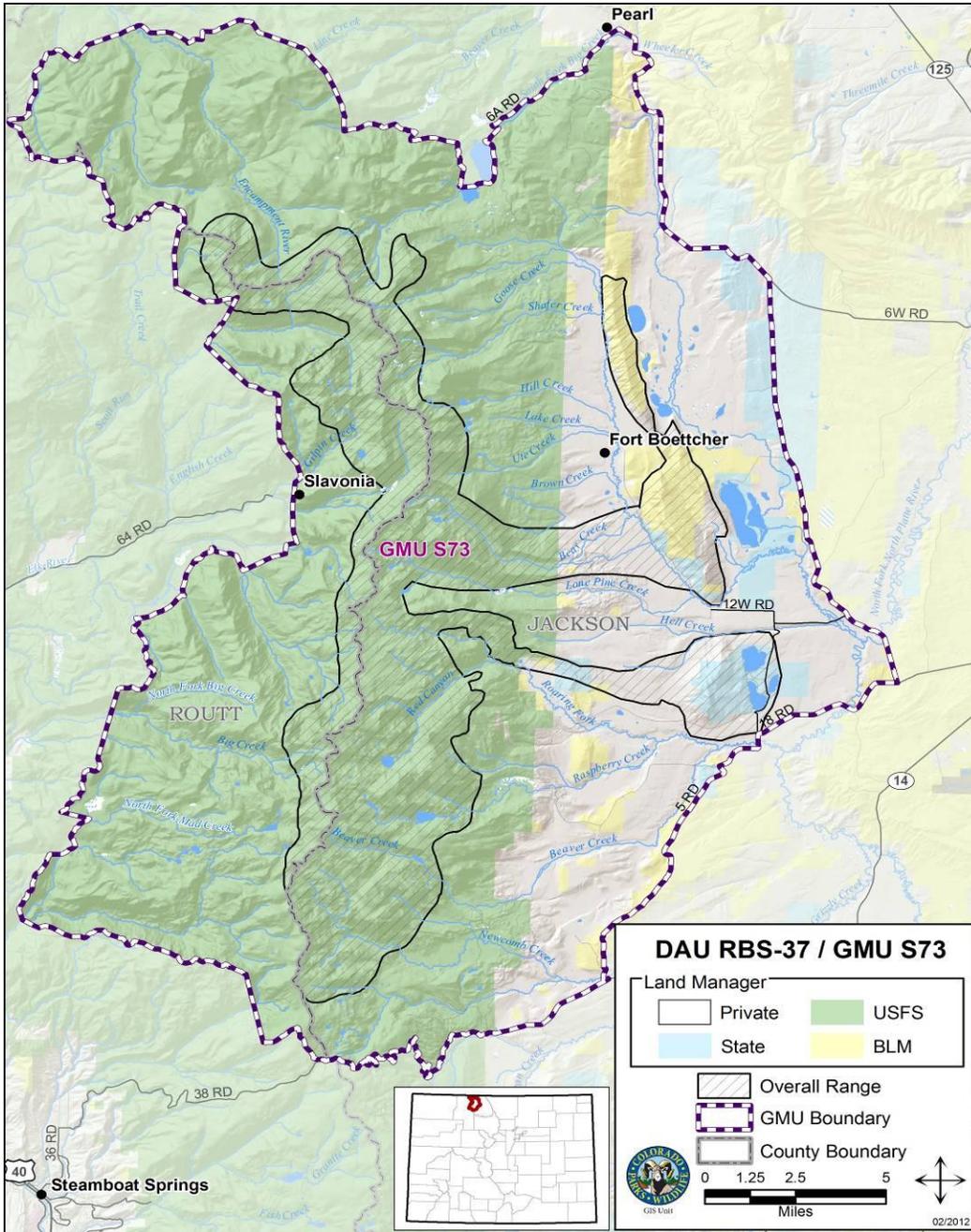


Figure 6: Land ownership in bighorn sheep DAU RBS-37 showing overall bighorn sheep range within the DAU boundary. Not all overall range is currently occupied by bighorn sheep.

## Habitat Resources

The amount of available bighorn sheep habitat in DAU RBS-37 was estimated through a spatial analysis as outlined in the Colorado Bighorn Sheep Management Plan (George et al. 2009). This analysis identified the areas topographically suitable as bighorn sheep habitat and then removed areas that were known to be unsuitable due to vegetative characteristics. Bighorn sheep habitat models continue to improve as new technology, such as GPS collars, provide actual location data and habitat use from live bighorns. This on the ground habitat use information will help refine existing models. As these models continue to evolve and improve they will be incorporated into future bighorn management. The following habitat parameters were the best available when the maps were created.

Bighorn sheep escape terrain was defined as those areas with slopes greater than or equal to 60% (i.e., approximately 27 degrees). All areas within 300m of escape terrain were considered topographically suitable habitat. Areas within 500m of escape terrain were also included if escape terrain occurred on at least 2 sides. Areas that contained unsuitable vegetation (e.g., spruce fir containing areas) were removed from the topographically suitable area in order to estimate the amount of suitable bighorn habitat. Using this definition, DAU RBS-37 contains 284 mi<sup>2</sup> (737 km<sup>2</sup>) of suitable bighorn habitat (Figure 7). This spatial analysis is very useful for generating a map of the areas that may be suitable for use by bighorn and for calculating the amount of habitat that may be available to them. However, this is an overestimate of the actual suitable bighorn habitat as not all of the area identified as suitable habitat is actually available for use by bighorn. Much of the area designated as suitable bighorn habitat actually contains vegetation that limits bighorn use, but that could not be mapped due to limitations in the spatial model.

The amount of suitable winter range was estimated as suitable habitat with a southerly aspect. DAU RBS-37 contains 143 mi<sup>2</sup> (369 km<sup>2</sup>) of suitable winter range; (Figure 8).

Lambing habitat was defined as suitable habitat in patches of at least 2 ha in size with slopes  $\geq 60\%$  and southerly, easterly or westerly aspects. DAU RBS-37 contains 37 mi<sup>2</sup> (95 km<sup>2</sup>) of suitable lambing habitat (Figure 9).



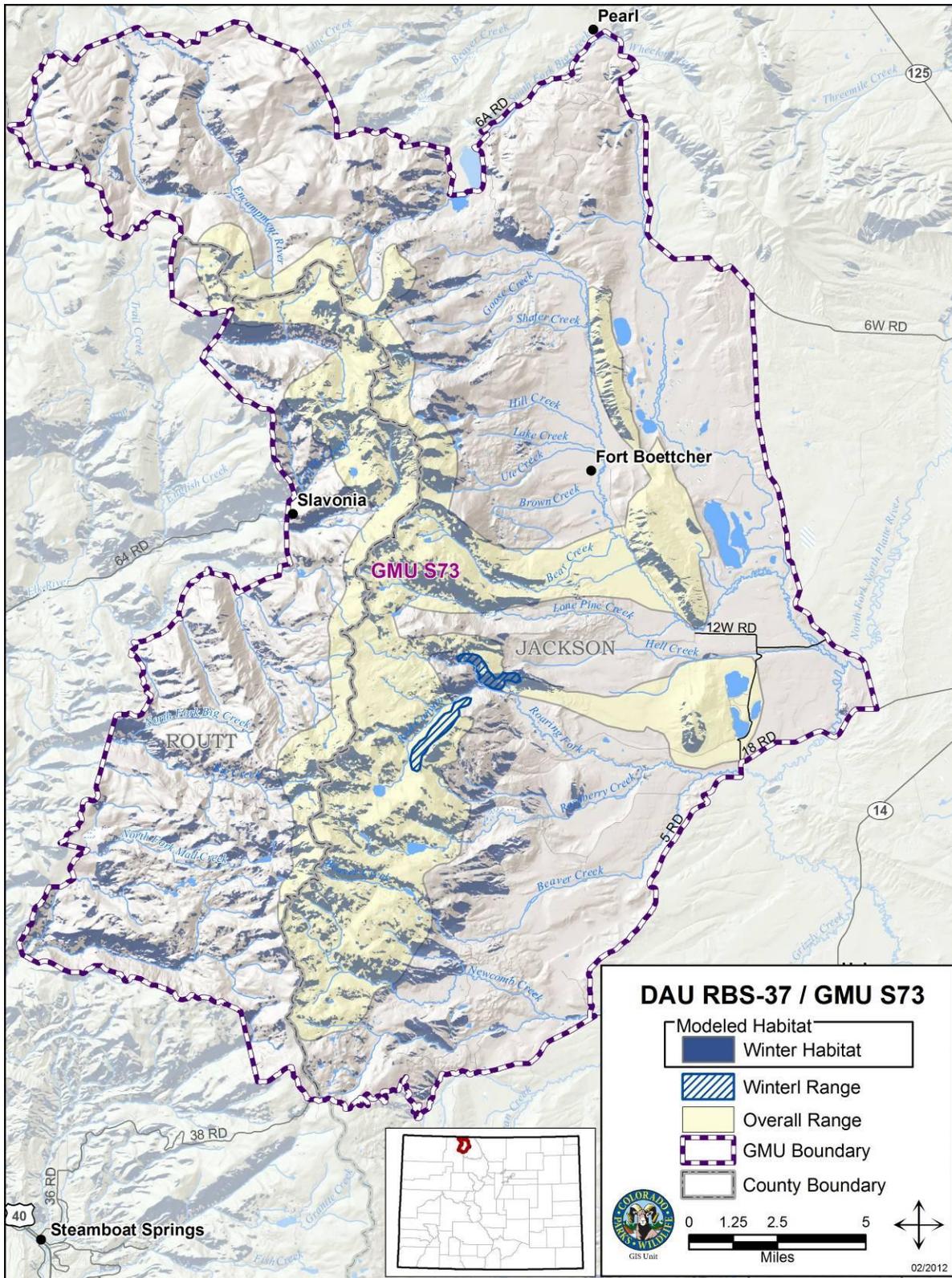


Figure 8: Modeled bighorn sheep winter habitat and overall range in DAU RBS-37.

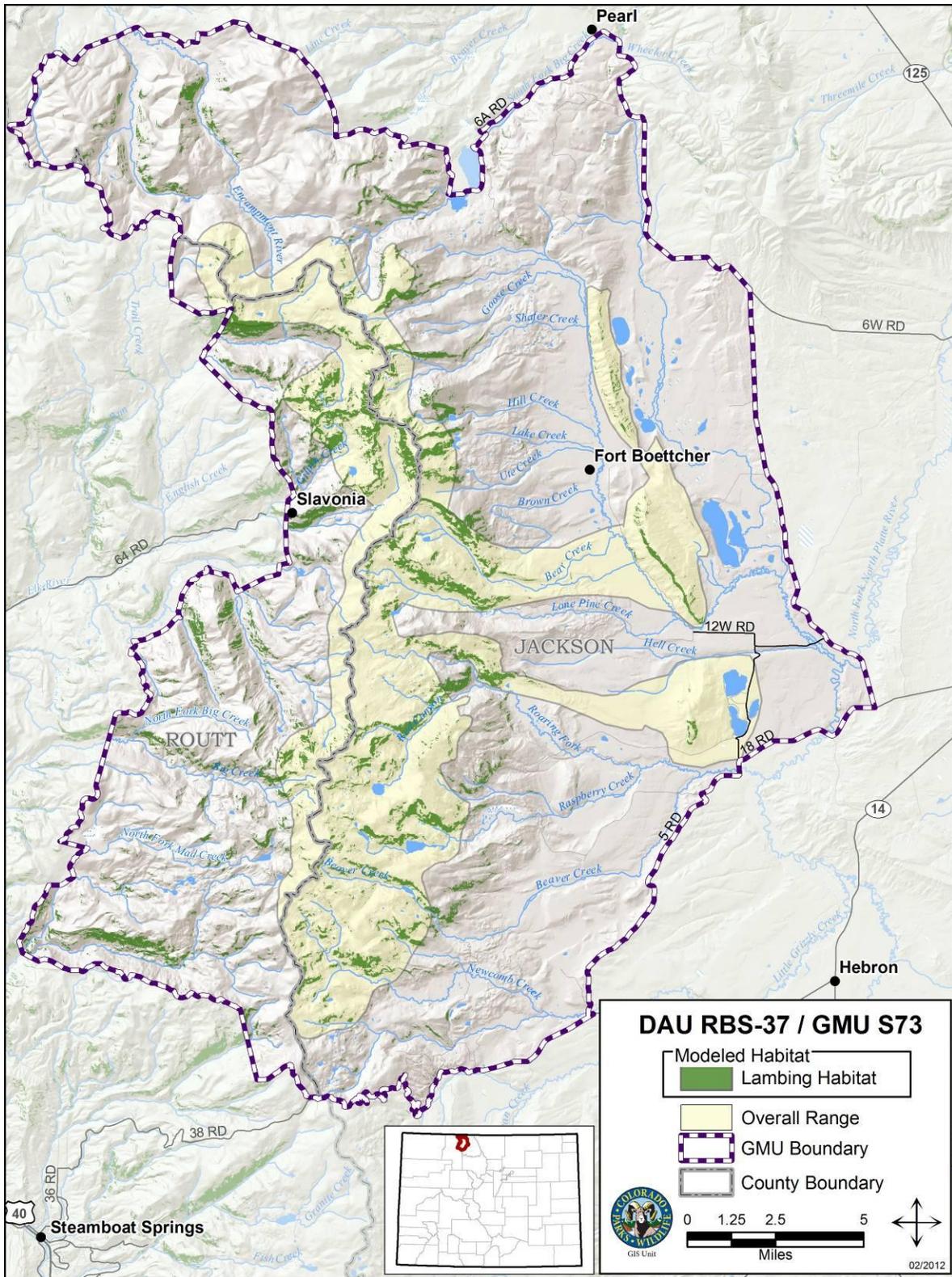


Figure 9: Modeled bighorn sheep lambing habitat and occupied range in DAU RBS-37.

## BIGHORN SHEEP POPULATION HISTORY

### Population History

Rocky Mountain bighorn sheep are indigenous to the Park and Rabbit Ears Ranges to the south and at one time were probably interconnected. However, by the early to mid 1900s bighorns were likely extirpated from both areas. In 1988 the USDA, Forest Service, and the Rocky Mountain Bighorn Society jointly funded a study conducted by Robert Hoover and Associates to research the history of bighorn sheep in this area. Hoover's findings are documented in "*History and Current Status of Bighorn Sheep, Park and Rabbit Ears Mountain Ranges, Colorado*" (Hoover 1988). In researching all readily available sources of information including literature review, agency files and reports, and personal interviews, Hoover compiled a comprehensive history of this wild sheep population.

Information gathered by Hoover indicates the Rocky Mountain bighorn sheep in the Park Range alone may have reached as many as 1,000 animals at its peak. The forest habitat was markedly different 200 years ago than it is today. Hoover states "periodic burning of the forest before 1879, and the big fires of 1879 set by Ute Indians, played a significant role in setting back forest succession in Colorado. The 1879 fire burned an area some 40 miles long, extending from the North Fork of the Elk River on the north to Sarvice Creek on the south (USDA For. Serv., 1975)". These conditions would have been ideal for bighorn sheep population expansion just as woody vegetation encroachment reduces both bighorn habitat and population size. A report by Wakelyn (1987:904) stated that "absence of fire or habitat management has been a major cause of habitat loss for bighorns in Colorado". Fire suppression or lack of large fires in this area since the late 1800s probably contributed to the near complete disappearance of bighorn sheep in this area by the mid 1900s.

Hoover (1988) reports the first settlers arrived in North Park in 1877 and many of them made a business of market hunting and sending the meat out of the park. In 1884 a "Mr. Payne" arrived in North Park and noted the country at this time swarmed with deer, elk, antelope, bear, and that mountain sheep were quite common. However, during the 1880s big game declined so much that a statewide closure on bighorn sheep hunting was established beginning in 1885 and, for the first time in Colorado, hunting seasons were established for big game animals. Bighorn sheep hunting remained closed in Colorado until a limited season was established in 1953. However, the Park Range remained closed to sheep hunting at that time.

Even after the hunting of bighorn sheep was banned in Colorado poachers continued to ply their trade on bighorns on Sheep Mountain (named for the bighorns that used to winter there) and Mount Zirkel (Hoover 1988). In addition to market hunting and poaching those living off the land also contributed to declining bighorn sheep numbers. In 1905 the Routt National Forest, then called the "Park Range Forest Reserve", was established and written records for the forest were kept for the period 1905-1975. Cary (1911:62) surveyed for bighorn sheep in the Park Range and reported them "tolerably common in 1905 on the Park Range between Buffalo Pass and Mount Zirkel".

In the early 1900s local ranch hands recalled “several hundred bighorn sheep would drift downhill in late fall, then cross the meadows to winter on Sheep Mountain”. The heyday for the Park Range bighorns was soon to end and by 1917 the forest supervisor’s report said few deer, elk, or bighorn sheep remain on the forest...mountain sheep were dying and only 9 bighorns were known to be left on the forest. In 1921 (ibid.:58) reported an estimate of 155 bighorn on the forest. These figures are contradictory but the higher figure probably refers to total sheep including bighorns in other areas of the forest.

Poaching of bighorns continued into the 1920s when there still were some bighorns remaining on the Continental Divide between Ute and Red Dirt Passes. Hoover (1988) reported local Walden residents recalling bighorn meat being served at a hotel in Walden and fresh bighorn hides being found in a Walden rental house in the late 20s. By the 1930s the remaining bighorns in the Diamond park area were killed off by “millionaire hunters”, guided by a local resident. The herd in the Sheep Mountain area had become “scarce as hens teeth”, according to a landowner who owned a portion of Sheep Mountain. Between 1940 and 1946 scattered reports of less than 10 bighorns seen by private citizens scaling the highest peaks of the Park Range were the only observations recorded.

Finally in 1945 or 1946 (year not clear), George W. Jones, a Colorado Department of Game and Fish biologist completed the first official survey of the Park Range for bighorns. Hoover was able to interview Jones in September of 1988 and observe the original survey maps with recorded details of bighorn sightings Jones had written on the maps. Surprisingly, Jones had found the following numbers of sheep: Davis Peak area 15 head; Seven Lakes area, 11 head; Mica Basin, Big Agnes and Mount Zirkel, 14 head; Mount Ethyl, 22 head; totaling 62 bighorns. Then in 1948 it was reported that an entire herd consisting of 34 total bighorn sheep perished when they were swept into a lake by a rock slide or avalanche above Diamond Park. A local domestic sheep producer or his herder witnessed the herd disappear after the slide and upon investigating the scene found dead bighorns mixed in the debris field. This incident may have occurred at Little Agnes Lake. In the early 1950s a USFS employee reported finding “a half dozen or more bighorn skulls” in Little Agnes. A federal aid document by Moser and Pillmore (1956) estimated 50 bighorns in the Park Range in 1956 though Hoover discovered few other reports of bighorns observed there in the 1950s.

In the 1960s reports of bighorns in the Park Range dwindled to sightings of a half dozen sheep or less, or simply reports of possible sheep tracks seen. The last documented sighting of bighorns reported to DOW researcher William Rutherford occurred in 1961 or 1962. Five bighorns were reported to have been seen in 1966 by a domestic sheep herder in the Gilpin or Mica lake area.

Bear and Jones (1973) considered bighorn sheep extinct in the area by 1970. Their document, “*History and Distribution of Bighorn Sheep in Colorado*”, states the following, “MOUNT ZIRKEL - The Park Range is historical bighorn range, but appears to be void of bighorns at the present date. Jones observed 15 bighorns on Black Mountain, 25 head on Mt. Zirkel, and 22 head on Mt. Ethel on surveys conducted in the late 1940's. Jones (1948) reported 17 bighorns (rams, 10 ewes, and 3 lambs) in the Big Creek Lake area. A rancher from Rawlins, Wyoming, who grazes domestic sheep in this area said he last saw bighorns in this range of mountains in the late 1950's. No bighorn sheep were sighted while conducting aerial surveys (helicopter) in this

area in 1969 and 1970. The Park Range should be examined for a possible bighorn transplant site.” This claim was backed up by Clifford Moser, a retired DOW bighorn biologist who seriously doubted any bighorns were left in the Park Range at that time. Occupied range maps for bighorn sheep in Colorado by Armstrong (1972) reveal no occupied habitat in the Park or Rabbit Ears Ranges. But maps by Sandfort and Rutherford showed bighorns remaining in the early 1970s. Three bighorn ewes were photographed in 1972 above Big Creek Lakes and a young ram was observed in 1972 on Mad Creek by a surveyor looking through his transit.

The Wyoming Game and Fish Department released 42 bighorn sheep approximately 3 miles south of Encampment, Wyoming and 12 miles north of the Colorado-Wyoming Stateline in January of 1976. The release consisted of 2 adult rams, 2 yearling rams, 12 ram lambs, 18 adult ewes, and 8 unspecified (ewe lambs?). These sheep were released along the Encampment River whose headwaters begin in Colorado. Beginning in summer of 1976 bighorn sightings resumed in the Park Range with some of these no doubt as a result of the Wyoming introduction. By 1983 the Encampment herd had increased to an estimated 150 head but following the severe winter of 1983-84 was reduced to 50-60 head. Sporadic bighorn sightings and reports of bighorns in the Park Range came in through 1988 when Hoover conducted his investigation.

Hoover attempted to verify any recent bighorn sightings reported to him in 1988 at check stations he set up at, or near, trailheads leading into the Zirkel Wilderness for the sole purpose of gaining information on bighorn sightings from back country users. Several positive reports of bighorn sightings were obtained from the check points indicating there were at least a few bighorns still roaming the area in the late 1980s. Few records exist of bighorn sheep sightings for the next 25 years. For all intents and purposes any viable self sustaining population was gone from the Park Range until bighorns were re-introduced in 2005.

As early as the 1970s the possibility of transplanting bighorns into the Mount Zirkel Wilderness was being discussed. Records found in the Steamboat Springs Parks and Wildlife office bighorn file contain correspondence between CDOW and USFS staff on sheep transplants, concerns over available winter habitat, corridors between summer and winter range, and competition with domestic livestock. Over the years several winter range flights were conducted to evaluate where snow free winter habitat might occur. On the ground, back country trips were taken to substantiate the habitat observed from the air. In addition, habitat analysis of possible winter range was performed on several promising areas including the south rim of Red Canyon, Red Elephant Mountain, Sheep Mountain near Delaney Butte, and Arapaho Ridge in the Rabbit Ears Range.

The major obstacle to initiating the transplant was timber encroachment leading to an apparent lack of travel corridors between summer and winter ranges. Without this connectivity it was feared newly translocated bighorns would not be able to survive hard winters on the alpine in sufficient numbers to maintain a population. Finally in year 2000, over 20 years since first proposed, a group of USFS and CDOW employees began looking into the feasibility of using prescribed fire to open up historic migration routes from the alpine to winter range on Sheep Mountain in preparation for bringing in wild sheep.

The wheels of government turn slowly and before the burns could be carried out nature did what needed to be done. In August of 2002 a fire broke out on the west side of the Mount Zirkel Wilderness in an area aptly named Burn Ridge. Under heavy wind the fire raced eastward up and over the Continental Divide and down the other side through Red Canyon until the flames died out in the sagebrush foothills of North Park. This could not have worked out better if it had been planned. The fire cleared a swath up to one and a half miles wide right through some of the best known historic bighorn habitat of the Park Range and opened a travel corridor to Delaney Butte which lies directly south of Sheep Mountain.

With plenty of good habitat now available plans were laid to begin the process of bringing bighorns back to this native range. In early January of 2005 a total of 40 bighorns captured on the Forbes-Trinchera Ranch in the San Luis Valley were released at the bottom of Red Canyon. The release occurred on private ground adjacent to Routt National Forest land near the edge of the Mount Zirkel Wilderness Area. The 40 sheep released consisted of 3 adult rams, 5 young rams, 1 young ewe, 16 adult ewes, 11 female lambs and 4 male lambs. The sheep quickly adapted to their new home making extensive use of the winter range in Red Canyon the first few winters and pioneering into the high country and alpine slopes of the Zirkel's during the summer and fall. By autumn of 2010 the herd was estimated to have grown to somewhere between 75 and 100 animals. The winter of 2010-11 saw huge amounts of late winter snows that continued into May. When it finally ended, the Park Range had received approximately 260% of average snow fall! This no doubt took a toll on older bighorns as 6 of the original radio-marked ewes from the 2005 transplant and at least 3 unmarked sheep succumbed during winter or early spring 2011. These mortalities and the corresponding loss of production certainly set the herd back; however, the full extent of the herd reduction may not be realized for several years.

The population estimates for years 2005 to 2011 were derived from the average population growth rate of 16 successfully transplanted bighorn sheep herds in Colorado (McCarty and Miller 1998). The known number of sheep at introduction was multiplied by .13 annually to obtain the expected herd size each year. These estimates are also substantiated by various population census trips and sheep hunter mandatory reports of sheep sighted while hunting (Figure 110).

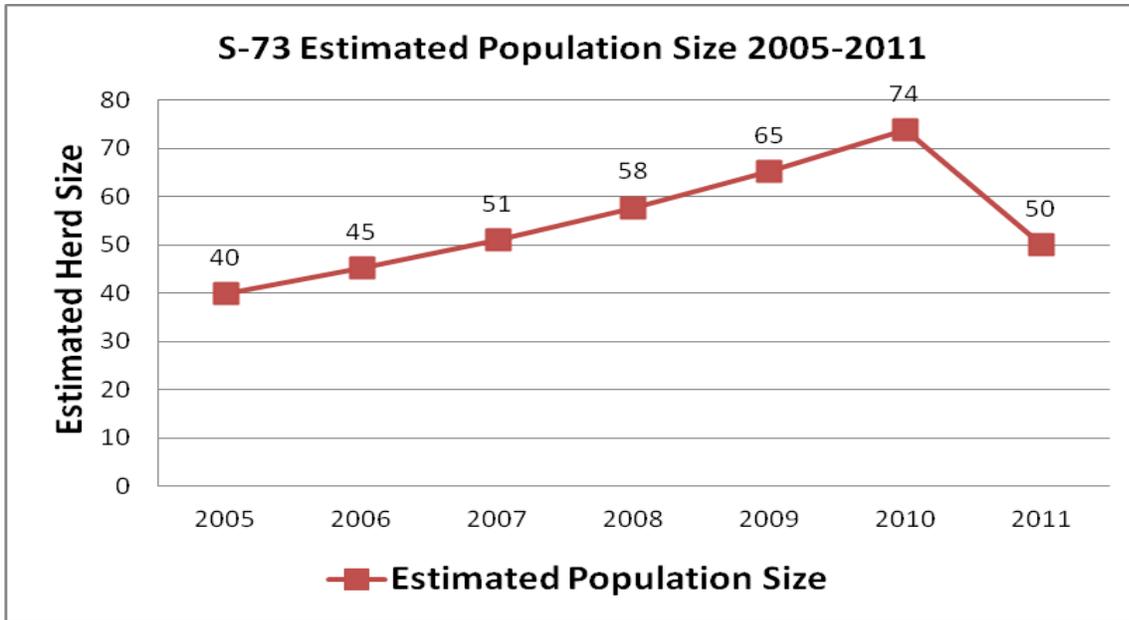


Figure 10: Population estimates for DAU RBS-37 from 2005 to 2011.

Currently there is not enough data or history of this relatively new herd to adequately model it. However, using observed data from annual ground surveys, winter aerial surveys, reports from the public and bighorn sheep hunters a minimum number of sheep in RBS-37 can be obtained. Note that the 75 animals observed in 2010 came from two ram hunters who scouted and hunted separately. One hunter and his party estimated seeing 50 different ewes and lambs and a single herd of 22 rams. The other hunter and his guide observed “at least 50 ewes and lambs” as well as 5-6 rams. See the *Inventory Methods* and *Population Estimation* sections for more details. (Figure 11).

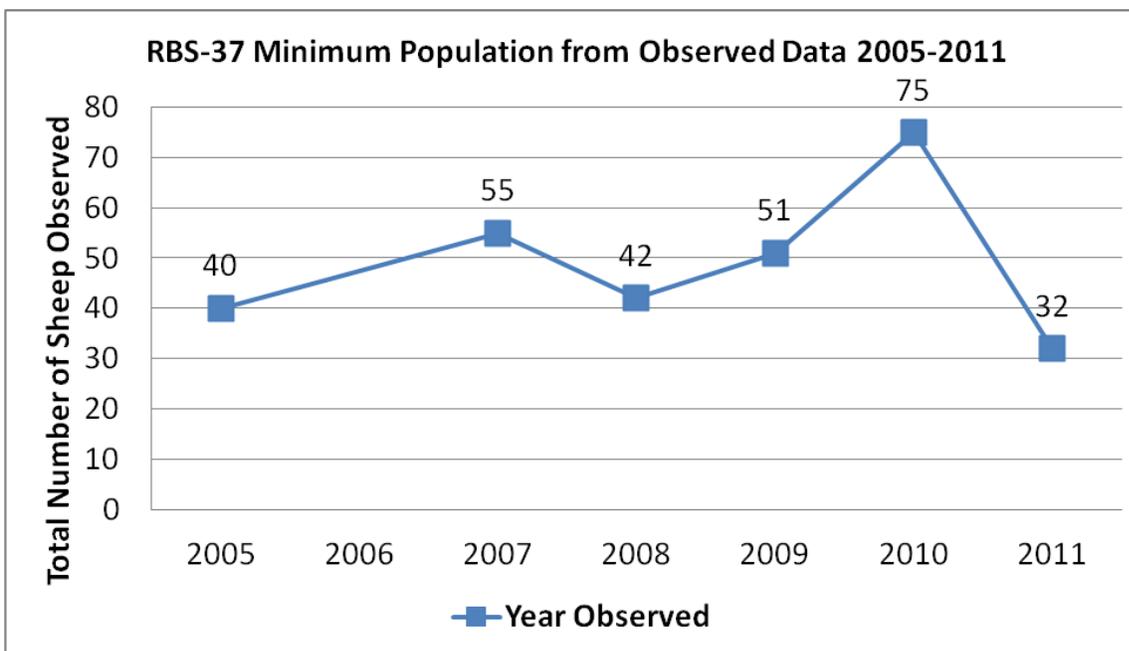


Figure 11: Observed minimum population estimates for DAU RBS-37 from 2005 to 2011.

Estimating population numbers of wild animals over large geographic areas is a difficult and approximate science. The CPW recognizes the difficulties of estimating the size of bighorn populations as a challenge in managing populations and attempts to maximize accuracy of these estimates by using the latest technology and inventory methodology available. As better information and techniques become available (e.g., new estimates of survival/mortality, wounding loss, sex ratios, density, or new modeling techniques and software) they are evaluated and used where appropriate. The population estimate presented in this document should, therefore, not be considered a completely accurate enumeration of the animals in the DAU.

## **Distribution**

For approximately 30 years prior to the reintroduction of bighorn in 2005 bighorn were virtually absent from the Park Range. While occasional reports of bighorn sightings have occurred on the high peaks of the Zirkel Wilderness area during this period these were likely bighorns who wandered south from the Encampment herd in Wyoming venturing as far south as Mt Ethel. The sheep transplanted into Red Canyon in 2005 have expanded their range greatly. Currently, bighorns in DAU RBS-37 have been documented as far north as Mount Zirkel, east to Delaney Butte and Sheep Mountain, south to Fish Creek Falls near Steamboat Springs, and west above Wolverine Basin. However, the eastern side of the range is used much more heavily by bighorns than the west side (Figure 12) depending on the season.

The main herd generally congregates in Lower Red Canyon beginning in late October. In winter bighorn use shifts to low elevation areas east of the divide mainly using south and southwest facing slopes but sheep are increasingly staying high using windblown alpine ridges as snow depth allows. The south rim of Red Canyon holds small numbers of sheep on windblown areas and the last few years sheep have been found over two miles north of Red Canyon on Bear Mountain in mid-winter. Likewise in milder winters some sheep may stay up near the Continental Divide all winter. As of January 20, 2012 a satellite collared ram has been at timberline for most of the winter, most recently on Mount Zirkel at an elevation of 3,638 m (11,936 ft).

In the winter of 2008-2009 a ewe, lamb, and young ram were observed on Delaney Butte. They have returned every winter since. The ewe was captured by net gun and satellite collared in January 2009. Her movements have been tracked from Delaney Butte, over to Red Canyon and then to the alpine for the past two summers. During aerial classification flights by CPW in December of 2011 this ewe was spotted on the south end of Delaney Butte along with another ewe, a yearling ewe, two lambs and a 5/8 curl ram. It appears a migration route from Red Canyon to Delaney Butte to Sheep Mountain and back has been established. Satellite and visual observations have documented these sheep crossing from the north end of Delaney Butte onto the south end of Sheep Mountain and back again. Though some domestic sheep are pastured several miles northeast of Delaney Butte in summer and fall they are trucked out prior to bighorn breeding season and the return of bighorns to Delaney from their high country summer range.

In summer RBS-37 sheep spend a high percentage of their time in the alpine zone along the Continental Divide mainly in the vicinity of Lost Ranger Peak, Ptarmigan Lake, The Dome, Lake of the Crags, Mount Ethel, and increasingly Mount Zirkel. Currently known summer bighorn range is spread out over a 27 km (16 mile) stretch from the north side of Mount Zirkel

south to Round Mountain located near Buffalo Pass. These sheep have been pioneering farther and farther each year. Satellite locations have found summer movements of sheep extending further down sparsely treed ridges on the west side and even down to the valley floor on the east side of the Divide. In summer of 2010 several ewes were observed in sparse timber just off a county road in North Park. Their location was verified by the satellite collar one of them was wearing. Then in early January of 2012, likely due to unseasonably mild weather, a group of five young rams, 5/8 curl or less, were observed near Fish Creek Falls by a reputable observer. It will be imperative in future years to be vigilant in maintaining as much knowledge as possible on the locations and range of bighorns here and their proximity to active domestic sheep grazing allotments (Figure 13).

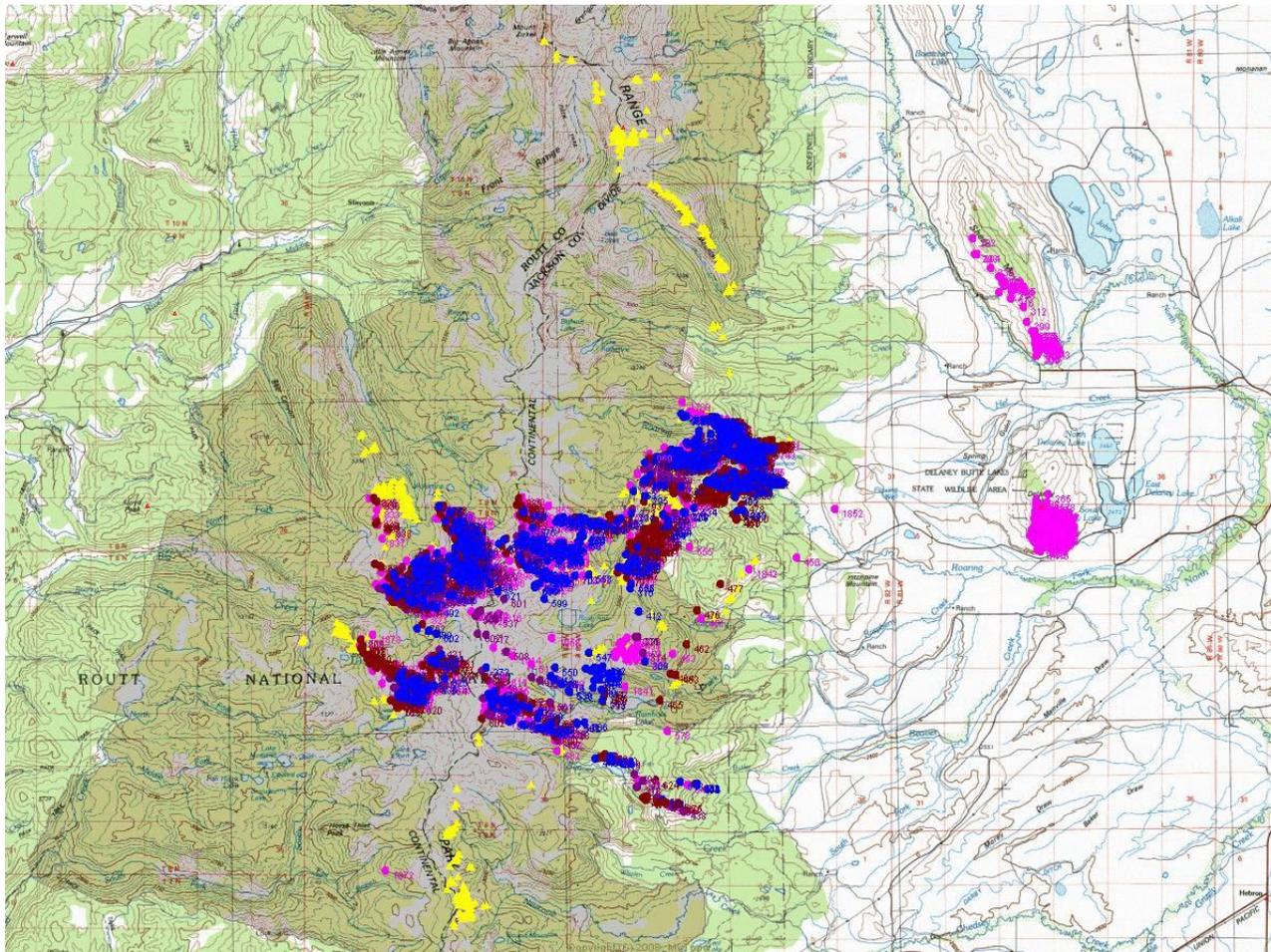


Figure 12: Distribution of bighorn sheep in DAU RBS-37 derived from 9,484 satellite collar locations taken year round, 5 ewes (7,504 locations) and 2 rams (1,980 locations). Furthest south locations are near Round Mountain, furthest north locations are on Mount Zirkel.

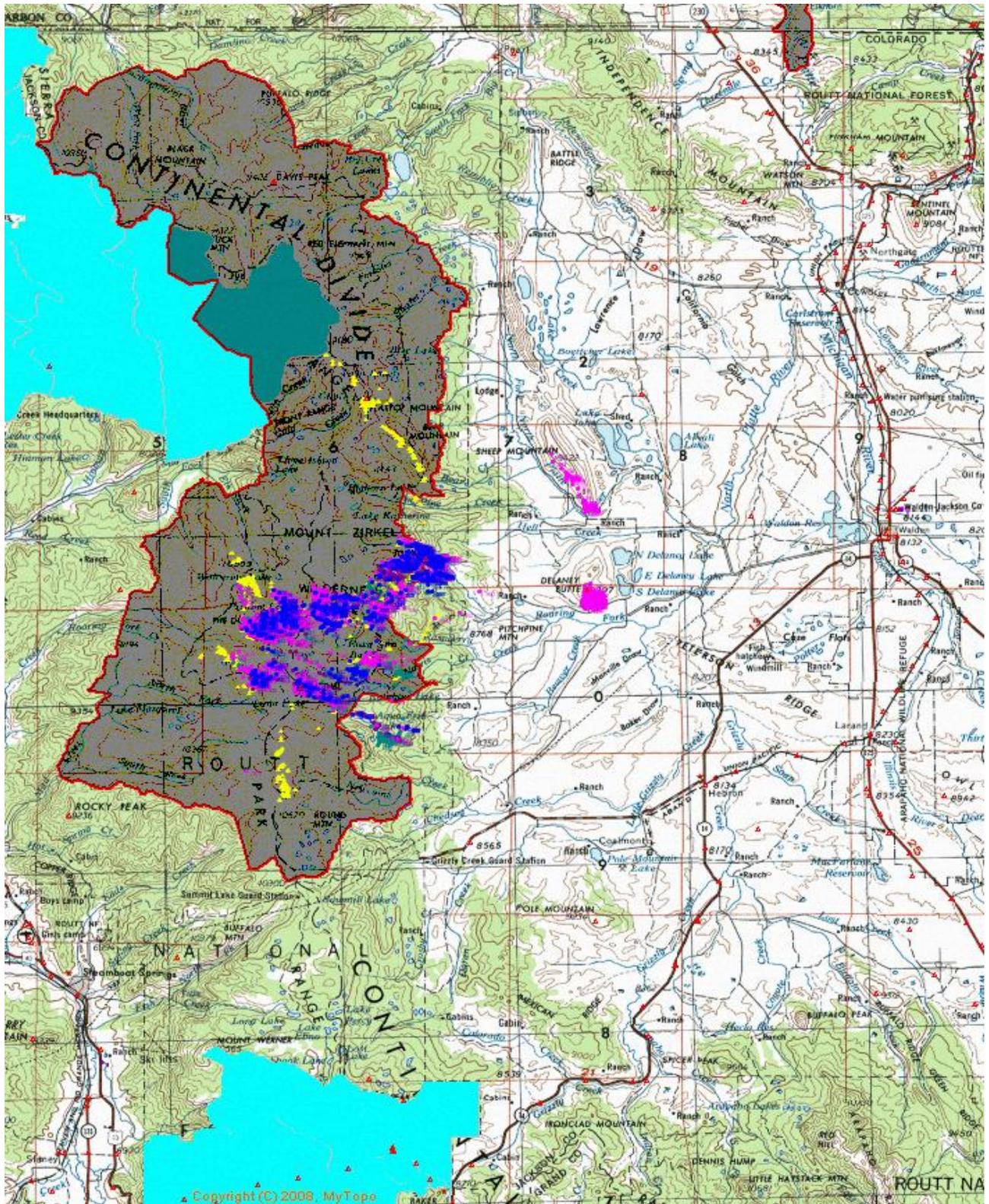


Figure 13: Grazing allotments in proximity to RBS-37 shown in light blue, Mount Zirkel Wilderness in gray with red border, satellite collared bighorn sheep locations shown in yellow, pink, and dark blue. Overlap of Big Agnes Allotment and Wilderness shown as solid gray.

## **Movement**

### ***Interaction of Subherds within the DAU***

There are no subherds of bighorn sheep in this DAU. However, there is connectivity of sheep habitat throughout the DAU and into southern Wyoming where wild bighorns currently exist. In all probability wild sheep from Wyoming have crossed the Colorado-Wyoming state line and entered the Park Range along the Continental Divide. At this time no “Colorado” sheep are known to have ventured north any further than Mount Zirkel which is approximately 20 km (12 miles) from the Wyoming border.

### ***Interaction with other DAUs***

Interchange between the Mount Zirkel bighorn herd and other Colorado sheep herds is a very low probability. Though occasional long-range dispersal of young bighorn rams does occur, the nearest wild sheep herds to RBS-37 in Colorado are the RBS-1, Rawahs/Upper Poudre at 25 air miles and RBS-3, Never Summer herd at 40 air miles between sheep habitat. Significant barriers exist to prevent contact including miles of low sage brush country with no suitable escape terrain and miles of heavily treed conifer cover. The highest probability of bighorn sheep interacting with RBS-37 comes from Wyoming herds; one just across the border near Encampment (24 miles north and east of Mount Zirkel), the other along the rocky slopes of the Platte River’s North Gate Canyon (18 miles east and north of Mount Zirkel). However, to date no interchange or contact between these wild sheep herds has been known to occur. After the Encampment Wyoming herd was released in the 1970’s sightings of bighorns in the Zirkel’s became more frequent, especially on the north end near Big Creek Lakes. This would indicate bighorn sheep, have and probably still do, cross the state line.

Several bighorn sheep of unknown origin have been sighted near suitable bighorn habitat in RBS-37. A single mature ram was sighted and photographed in November of 2008 near Columbine, Colorado. In 2010 on the north end of North Park, several miles south of the Colorado-Wyoming line a mature bighorn ram somehow found its way into “Trophy Mountain Ranch” through double fencing designed to keep elk in the facility and other ungulates out. In both cases the sheep could not have been from the Zirkel transplant since all sheep from the original release in 2005 were ear tagged and/or radio collared. Neither of these rams was marked in any way, but to achieve the size observed these animals would have been part of the original release in order to have originated from the Red Canyon herd. As a precautionary measure, the ram entrapped in Trophy Mountain was euthanized and the carcass examined. Results found the lymphoid follicles of the spleen moderately depleted, some typical lungworm lesions (no bacterial pneumonia), and submucosal gland and ducts markedly distended by mucus-filled cysts (sinus infection extending into bone around teeth and sinuses). The ram near Columbine was never reported again.

## Herd Management History

### *Inventory Methods*

Although the RBS-37 reintroduction took place in January of 2005 no official bighorn surveys were initiated until 2007. Several telemetry flights were conducted in the winter of 2005 to locate the radio collared sheep which mainly stayed in Red Canyon close to the release sight. The exception was a radio collared mature ram (radio frequency 165.211) that shortly after the release went west up and over the Continental Divide and down into the south fork of the Elk River drainage where exhausted from struggling through deep snow he succumbed to the elements. Jim Hicks, then terrestrial biologist for the Colorado Division of Wildlife, who was instrumental in bringing bighorns back to the Zirkel's, retired later that year and surveys for sheep were suspended until a new biologist was hired in 2006. Starting in April of 2006, bi-monthly telemetry flights were conducted to keep track of movements and range of collared sheep. Some baseline location data were needed prior to beginning ground surveys in summer of 2007.

Coordinated summer ground surveys have taken place each July or August in DAU RBS-37 since 2007 (Table 1). During these surveys, teams of observers simultaneously search for bighorn sheep along specified routes or search areas. Since 2007, aerial winter surveys have also taken place during the breeding season each December/January (Table 2).

Total counts are higher during the winter survey because the bighorn sheep are more concentrated and accessible for counting. Ram:ewe ratios during the summer surveys are highly variable due to the spatial separation of rams and ewes during the surveys. The ram:ewe ratios are more reliable during the winter surveys when rams and ewes are together. The observed number of rams per 100 ewes during the winter survey has ranged from 56 to 125 (Figure 14). Fall lamb to ewe ratios are a commonly used measure of herd recruitment. Since 2007, in DAU RBS-37, they have ranged from 42 to 61 lambs per 100 ewes (Figure 15). Lamb to ewe ratios fluctuates from year to year. The low ratio of lambs to ewes observed in 2011 and low recruitment is likely a direct result of the extreme winter weather of 2010/2011.

Table 1: Results of the DAU RBS-37 summer coordinated ground surveys from 2005 to 2011. In 2005 and 2006 no formal survey was conducted. Beginning in 2007 surveys were conducted annually. In 2009, only rams were observed thus with no ewes or lambs accounted for no age or sex ratios could be calculated. The highest number of unduplicated bighorn seen on a single day in each year is shown in each column.

YEAR	UNIT	RAM	EWE	LAMB	UNKNOWN	TOTAL	R:E ratio	L:E ratio
2005	S73	NC	NC	NC	NC	NC	NC	NC
2006	S73	NC	NC	NC	NC	NC	NC	NC
2007	S73	13	9	7	0	29	144	78
2008	S73	18	9	4	0	31	200	44
2009	S73	15	0	0	0	15		
2010	S73	17	13	3	0	33	131	23
2011	S73	14	16	2	0	32	88	13
Long Term		77	47	16	0	140	164	34

Table 2: Results of the DAU RBS-37 winter aerial surveys from 2005 to 2011. In 2005 and 2006 no formal survey was conducted. Surveys were conducted on single days post-hunt in 2007, 2008, 2009, and 2011. The 2010 aerial survey was cancelled due to four consecutive days of extreme weather conditions preventing flying.

Year	Ewes	Lambs	Yrlng.	1/2	5/8	3/4	7/8	Full	Uncl.	Total	R:E Ratio	L:E Ratio
2005	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
2006	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
2007	27	13	0	1	9	5	0	0	0	55	56	48
2008	20	8	1	4	5	3	1	0	0	42	70	40
2009	18	11	0	3	6	5	2	0	6	51	122	61
2010	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
2011	12	5	0	4	6	4	1	0	0	32	125	42
Long-Term	77	37	1	12	25	17	4	0	6	180	78	48

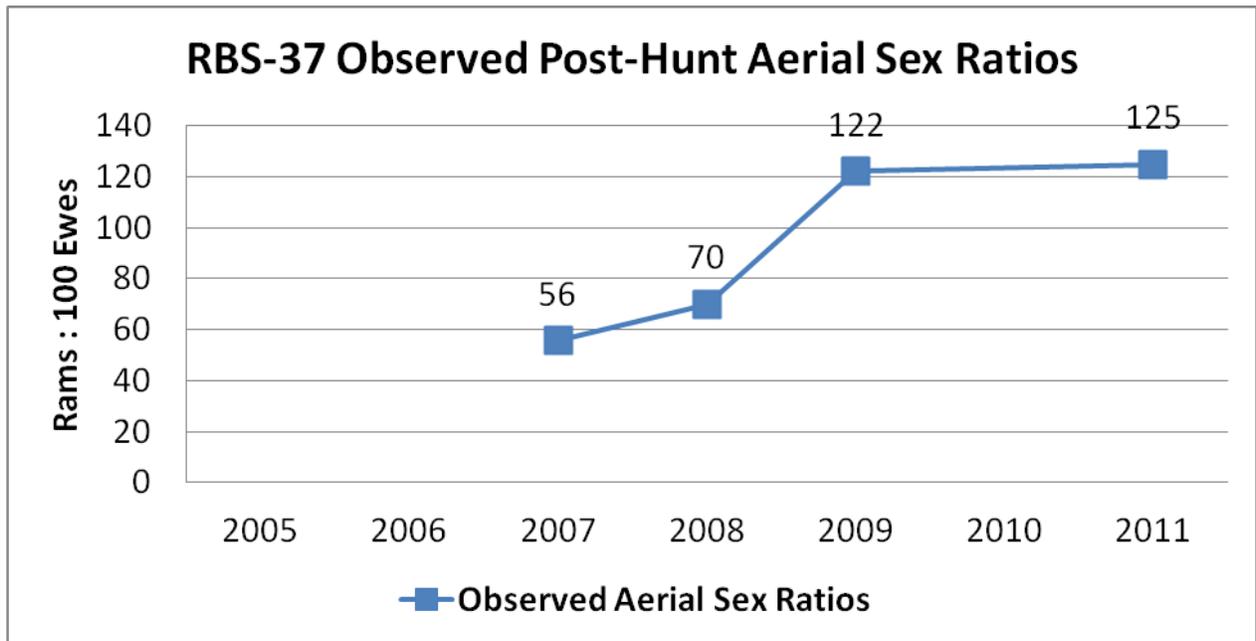


Figure 14: Observed posthunt rams per 100 ewes during winter surveys from 2005 to 2011.

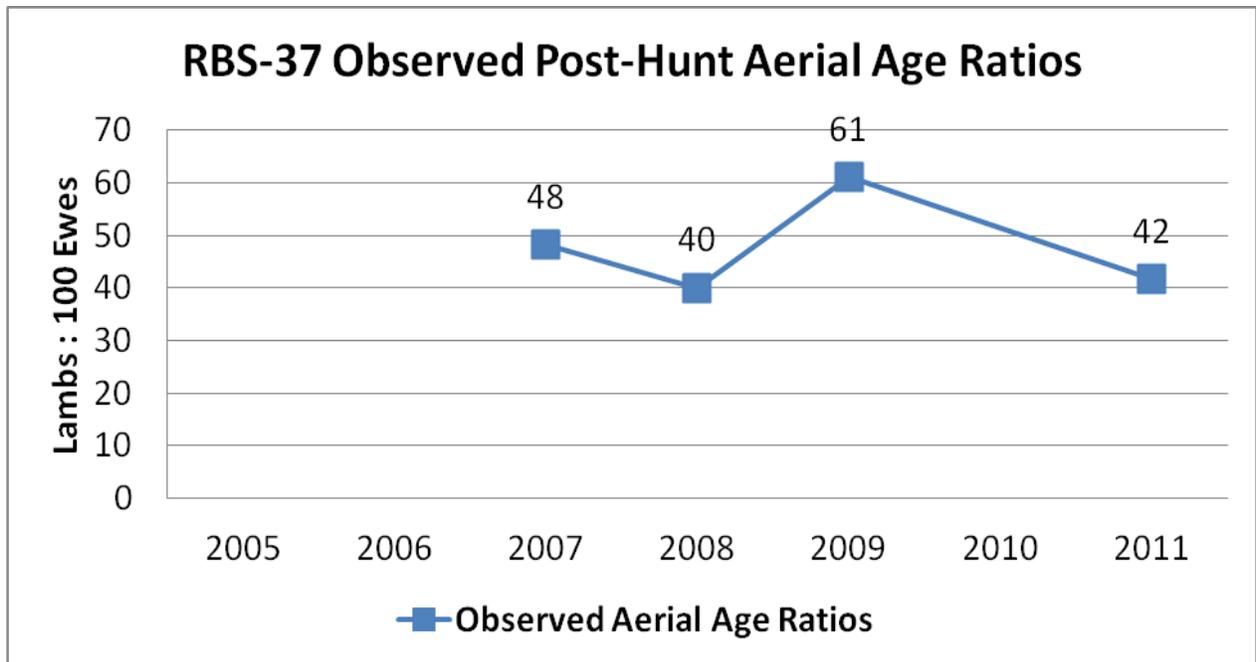


Figure 15: Observed posthunt lambs per 100 ewes during winter surveys 2005 to 2011.

### **Population Estimation**

Colorado’s Bighorn Sheep Management Plan 2009-2019 (George, et.al.2009) states that reliable data on bighorn sheep herd composition, recruitment and population numbers are necessary to develop management objectives and should be based on rigorously collected data. This sheep herd is too young and does not have sufficient data to build a reliable bighorn population model. Lacking mark resight data to aid in population estimation we must rely on what we do have, base population at the time of transplant and survey data from 2005 – 2011. Realistically survey data began in 2007 since no formal census was conducted in 2005 or 2006 (we know how many sheep were released in 2005). In winter of 2010 severe weather conditions prevented a classification flight so at best there are 4 years of good aerial data available along with 5 years of summer ground data and sheep hunter reports. In addition to this McCarty and Miller (1998) analyzed 16 successfully transplanted bighorn sheep herds in Colorado to determine the average growth rate for new herds.

Using the average population growth rate of 13% from McCarty and Miller (1998) for years 2005 to 2010 yields a posthunt 2010 population in RBS-37 of 74 bighorns (Figure 10). Had that rate of growth continued in 2011 the population estimate would have grown to approximately 84 sheep. However, the extreme snowpack of 2010/2011 most definitely set reproduction, recruitment and survival of this herd back fairly significantly. By early spring of 2011 six radio collared ewes had died along with several other non collared sheep whose carcasses were found while searching for the radio collared sheep mortalities. During summer and winter surveys of 2011 few lambs were found with ewes and no ewes and lambs were found on the nursery ground near Lost Ranger and Mount Ethel. In addition, a mature mountain lion was observed from the helicopter 10 yards above a group of sheep during the December 2011 census. This cat may have contributed to some of the bighorn mortality RBS-37

experienced in 2011. In early January of 2012 licensed hunters killed a lion near the location of the lion observed during the classification flight.

During the 2010 bighorn sheep hunting season in RBS-37 two ram licenses were allocated. Both hunters spent considerable time in sheep country but did not hunt together. Interestingly enough both hunters and their parties reported seeing somewhere around 50 ewes and lambs plus numerous rams. One ram hunter successfully killed a large ram out of a single group of 22 rams. Added together, 50 ewes and lambs plus a minimum of 22 rams yields 72 bighorns observed that fall, strikingly close to the 13% rate of growth estimate of 74 sheep (figure 11).

***Translocations***

To date there have been no translocations from the Mount Zirkel into any other area. If any translocations occur in the near future they would likely be moving sheep within the DAU in order to expand winter range of the existing herd.

A single release of sheep into RBS-37 occurred during the 2005 reintroduction. All 40 bighorns (Table 3) came from the same source herd on the Forbes-Trinchera Ranch located in the San Luis Valley RBS-18, Sheep unit S51. The sheep that came to the Zirkels from S51 originally came from British Columbia in 1990. The late Malcolm Forbes who owned the 170,000 acre ranch wanted to restore indigenous species back on the ranch. At the same time wildlife officials in British Columbia wanted to reduce the size of the bighorn herd near the headwaters of the Columbia River and were cooperative in getting Forbes some of the animals. After going through the legal procedures required to bring wild bighorn sheep to Colorado 34 bighorns (5 rams, 19 ewes, 10 lambs) were released on his ranch. The herd thrived and rapidly increased to an estimated 250-300 sheep by the mid 2000s. This set the stage to use Forbes-Trinchera bighorns as a source herd for reintroducing sheep into the Park Range in 2005.

Table 3: Number of bighorn sheep translocated to RBS-37, Mt Zirkel (Red Canyon).

Year	Ram	Ewe	Yearling	Lamb	Total	To	From
2005	8	17		15	40	Red Canyon	Forbes- Trinchera
Total	8	17		15	40		

***Hunting Season Structure, License Numbers and Timing***

Unregulated market hunting, along with habitat losses and introduced diseases, contributed to reductions in bighorn numbers in the 1860s and 1870s. In response to declining bighorn populations, the Colorado legislature placed a moratorium on bighorn sheep hunting in 1885 (George et al. 2009). By 1953, many of the herds in the state had recovered and several areas were reopened to hunting.

Bighorn numbers in DAU RBS-37 remained too low for a hunting season until 2009 at which time a season was established with a quota of two rams. Ram hunting has occurred in DAU RBS-37 from the inaugural season of 2009 through 2011 with 2 ram tags each year. The bighorn sheep population has been growing at typical rates for recently introduced herds with strong lamb to ewe ratios. In order to keep this herd productive and prevent over use of limited winter

range in Red Canyon a ewe season was established in 2011 with 3 tags. This should help control the size of the population until sheep begin using other winter areas on their own or more winter range can be improved to support more wintering bighorns. Current seasons are considered rifle seasons but hunters can use any legal method of take during the rifle season.

### **Curl restrictions**

Minimum curl restrictions have been used in Colorado to direct ram harvest towards the desired age classes. Restrictions have included a minimum size for legal harvest of ½ curl, ¾ curl, and full curl (Table 5). Restrictions in DAU RBS-37 follow the current statewide ½ curl restrictions.

### **Non-resident licenses**

In 2009 no non-resident sheep tags were issued. In 2010 and 2011 a non-resident ram tag was issued both years. No non-resident ewe tags have been allocated at this time. Since 1989, 10% of statewide sheep licenses have been offered to non-resident hunters annually. Units that have low total number of licenses available generally rotate which unit receives the non-resident license each year so that over the course of multiple years the 10% non-resident quota is fairly allocated to all qualified herds.

### **Season Timing**

Hunting seasons have always occurred during September and early October. Rams are hunted beginning in early September with the season ending in mid-October (Table 4). Ewe hunting begins as soon as the ram season ends and runs until the end of October. This provides ram hunters an opportunity to hunt without ewe hunters disturbing rams they are hunting. Ewe hunt timing is designed to put pressure on ewes near traditional winter range possibly forcing them to look for new winter areas and spread out pressure on the winter habitat in Red Canyon. Ideally the ewe season would occur in November or December but in many years heavy snow fall prevents reasonable hunter access to winter range where these sheep are found.

### **Hunting Unit Boundaries**

RBS-37 contains a single bighorn sheep unit, S-73. The official hunting unit boundary description reads, “S73 MOUNT ZIRKEL (JACKSON, ROUTT CO's.) - bounded on N by Mount Zirkel Wilderness boundary, USFS Trail 1125, USFS 660, and Big Creek Road (USFS 600); on E by Jackson CRs 6W, 7, 12W, 18 and 5; on S by Jackson CR 24, and Buffalo Pass Road (USFS 60); and on W by Mount Zirkel Wilderness Area boundary”.

### **Harvest**

Hunters have harvested one bighorn ram annually in DAU RBS-37 (Table 6). From 2009 to 2011 hunter success rates have been 50-60% (Figure 16). For the first year of ewe hunting in DAU RBS-37 the success rate for ewe hunters was 67% with two out of three hunters taking ewes (Figure 17). The ram hunter success rate has been 50% (Figure 18). Horn characteristics of harvest rams can be found in Figure 19.

Table 5: Licenses offered and ram curl restrictions in DAU RBS-37 from 2009 to 2011.

Year	Rifle Licenses			Archery Licenses			Total Licenses			Curl Restriction
	Ram	Ewe	Total	Ram	Ewe	Total	Ram	Ewe	Total	
2009	2	0	0	0	0	0	2	0	2	1/2
2010	2	0	0	0	0	0	2	0	2	1/2
2011	2	3	0	0	0	0	2	3	5	1/2

Table 6: Rifle season dates and lengths in DAU RBS-37 from 2009 to 2011.

Yr	Season Start Date		Season End Date		Season Length (days)	
	Ram	Ewe	Ram	Ewe	Ram	Ewe
09	9/01		10/04		34	
10	9/07		10/07		31	
11	9/06	10/17	10/9	10/31	34	15

Table 7: Bighorn sheep harvest in DAU RBS-37 from 2009 to 2011.

Year	Rifle Harvest			Archery Harvest			Total Harvest		
	Ram	Ewe	Total	Ram	Ewe	Total	Ram	Ewe	Total
2009	1	0	1	0	0	0	1	0	1
2010	1	0	1	0	0	0	1	0	1
2011	1	2	3	0	0	0	1	2	3

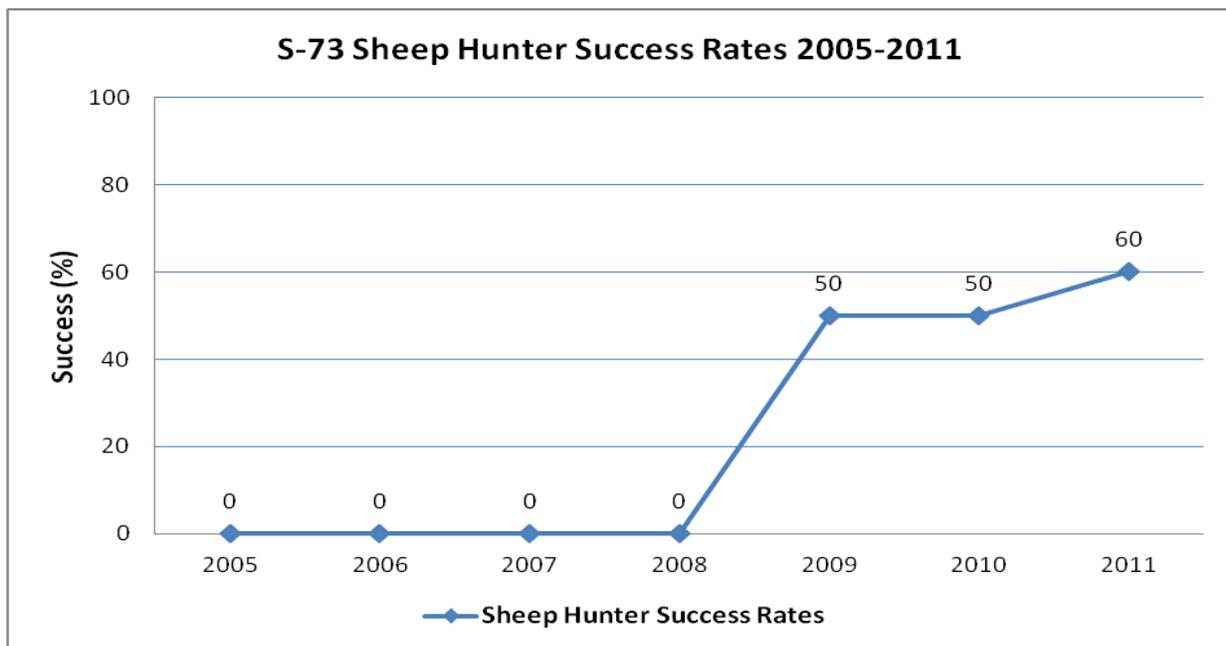


Figure 16: Hunter success rates in DAU RBS-37 calculated as number of bighorn harvested divided by the number of licenses issued.

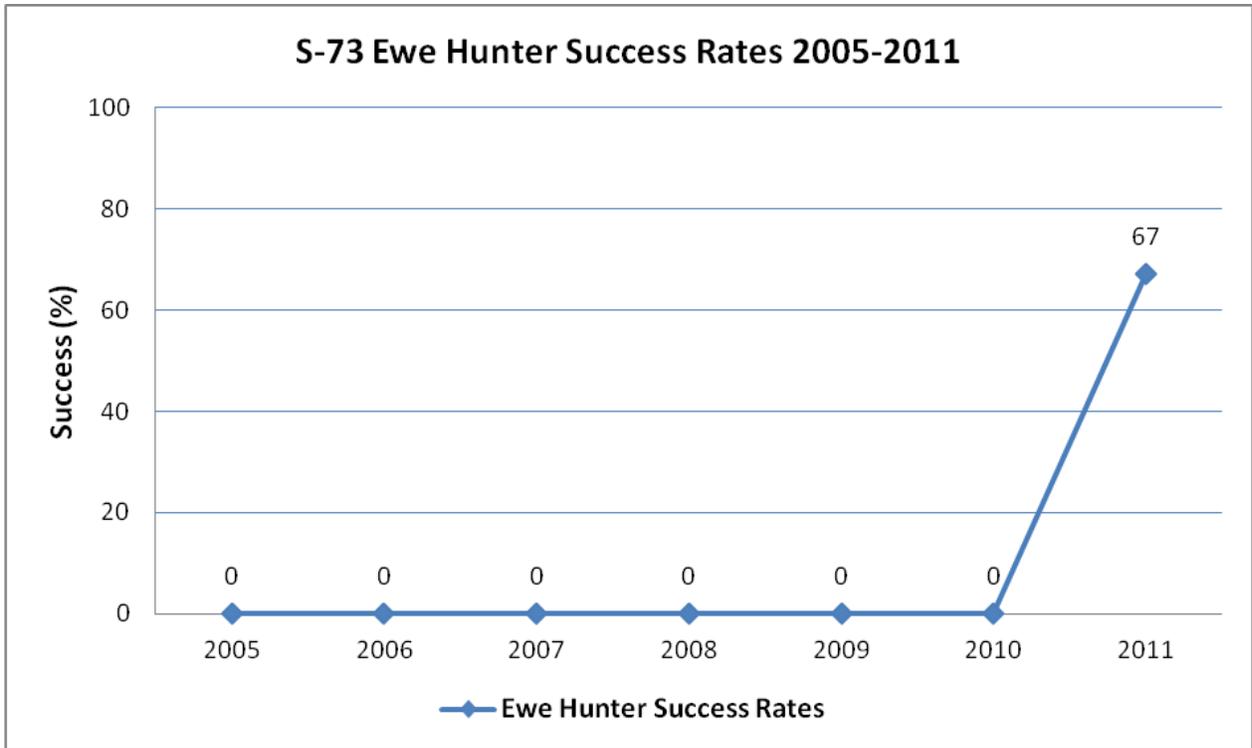


Figure 17: Rifle ewe hunter success rates in GMU S73 calculated as number of bighorn ewes harvested divided by the number of ewe licenses issued.

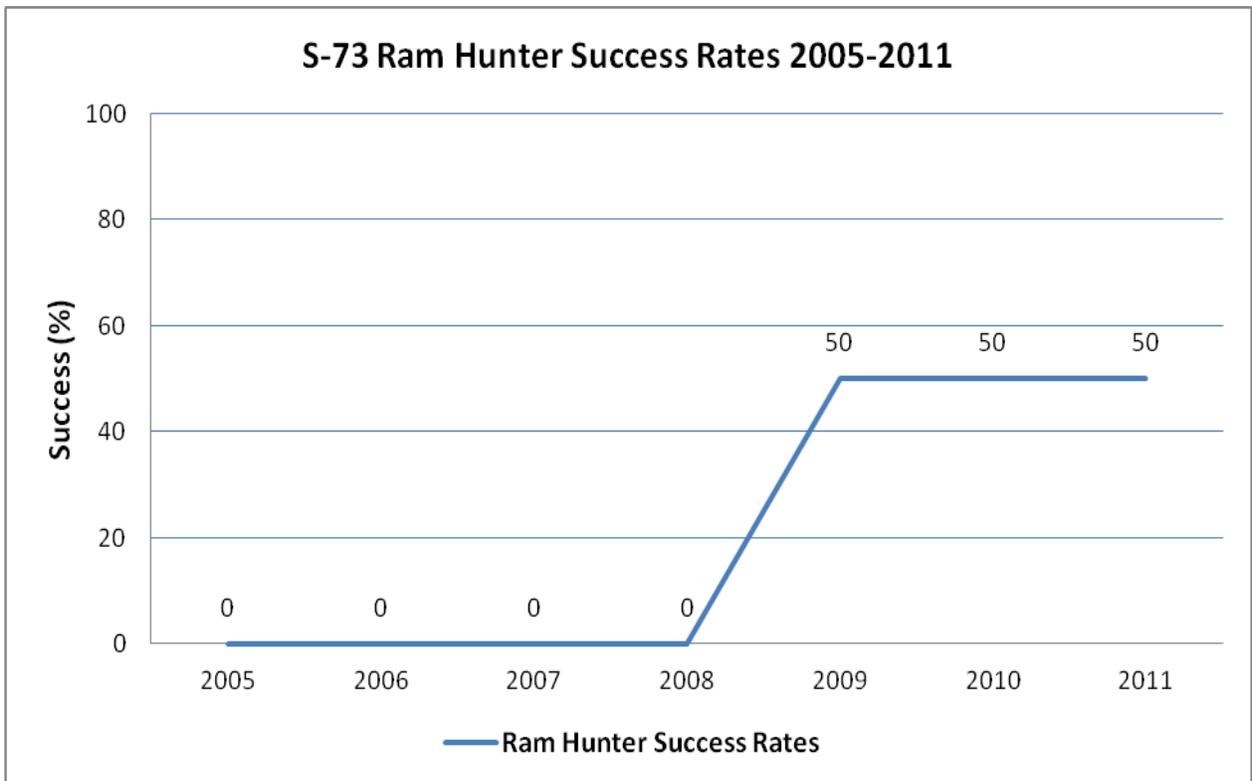


Figure 18: Rifle ram hunter success rates in GMU S73 calculated as number of bighorn rams harvested divided by the number of ram licenses issued.

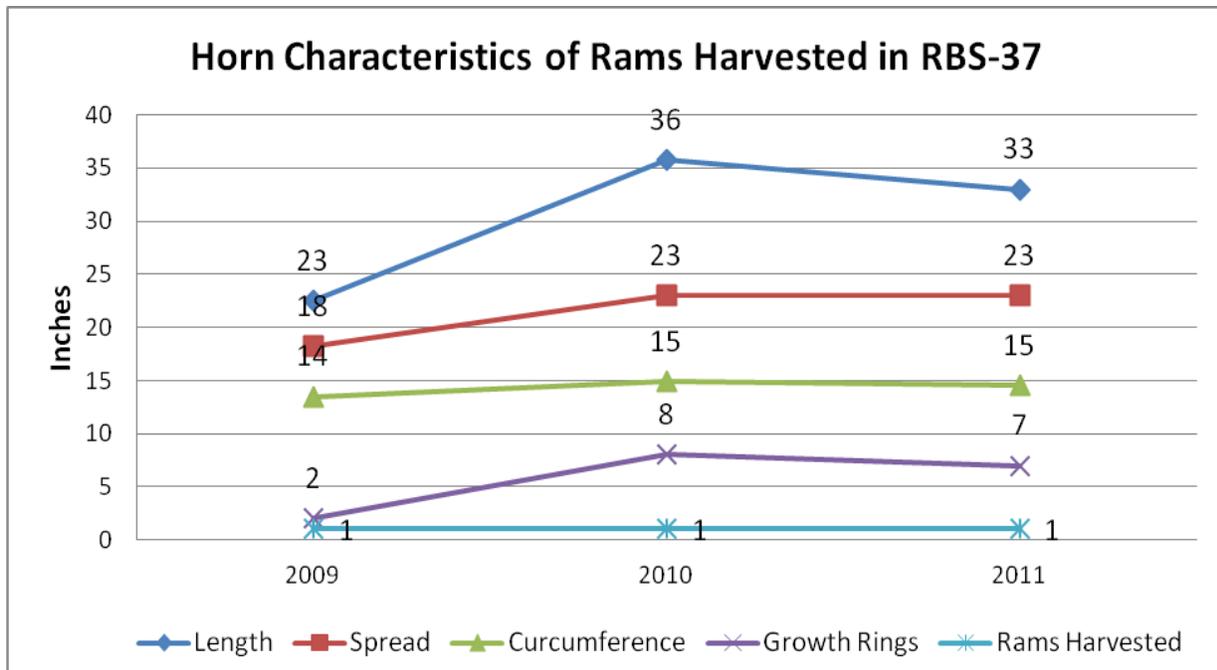


Figure 19: Average length, spread, circumference and number of rings, of horns of rams harvested in GMU RBS-37 from 2009 to 2011. The number of harvested rams measured each year is shown as “Rams Harvested”.

## MANAGEMENT ISSUES

### Habitat Quality

In the summer of 1988 a habitat evaluation of bighorn sheep winter range was (Hoover 1989) conducted by the USFS. Several promising historically used areas including the south rim of Red Canyon, Red Elephant Mountain, Sheep Mountain near Delaney Butte, as well as Arapaho Ridge (in the Rabbit Ears Range) were analyzed to determine if they were still suitable for bighorn sheep. Results of the evaluation concluded that the south rim of Red Canyon was unsuitable as bighorn winter habitat due to scarcity of forage vegetation. Arapaho Ridge and Red Elephant were both considered acceptable for bighorn winter use in average winters. Because Arapaho Ridge is not part of the Parks Range it warrants no further mention in this document. Red Elephant had excellent grass and grass-like forage, good soil development, the right slopes for lambing and escape cover, and snow free areas. Sheep Mountain had ample forage areas with ready access to escape cover though winter forage was thought to be limited to small scattered patches. Interestingly, now that bighorns have been reintroduced to Red Canyon, they use the south Rim of Red Canyon extensively with small numbers there in winter. This may not necessarily contradict the study finding of “not suitable as winter range” because only a few sheep can be found on the south rim in the middle of winter. That is likely all that can be supported by the small amount of available forage.

Fire suppression over the last 100 years had resulted in the encroachment of shrubs and trees into bighorn sheep habitat and a corresponding loss of open terrain preferred by bighorns. However several large fires in 2002, the Hinman fire at 16,000 acres and the 14,000 acre Burn Ridge fire opened up large swaths of timber leading to an increase in habitat quantity and quality. The Burn Ridge fire was instrumental in providing enough open habitat to set the stage for the 2005 bighorn reintroduction. Under heavy wind the fire raced eastward up and over the Continental Divide and down the other side through Red Canyon until the flames died out in the sagebrush foothills of North Park. This could not have worked out better if it had been planned. The fire cleared a swath up to one and a half miles wide right through some of the best known historic bighorn habitat of the Park Range and opened a travel corridor to Delaney Butte which lies directly south of Sheep Mountain.

Most of the lodgepole pine stands in the DAU have been infested with mountain pine beetle (*Dendroctonus ponderosae*) resulting in the loss of approximately 85% of live lodgepole trees by 2011. Dying trees turned a burnt orange color as the needles dried and then fell to the ground. These trees, now dead for many years, are increasingly blowing over in strong winds or simply rotting off at the base and falling. Additionally the “Routt Divide Blowdown” of 1997 blew over hundreds of acres of spruce-fir trees in a patchwork pattern on the west side of the Divide. The short term effect of these events have been positive for bighorn sheep opening previously heavy tree cover to provide the open terrain essential to wild sheep. The long-term effect this will have on bighorn sheep is unknown as bighorn will avoid areas with thick blow down and reduced visibility. The effects of fallen dead trees and vegetation succession following lodgepole mortality on bighorn habitat will vary within the DAU. How that will affect bighorn use of specific areas is yet to be known. In areas of regenerating aspen stands sheep use will begin to decline due to visual obstruction, likewise areas that come back with few trees and shrubs will likely remain higher quality bighorn habitat. Water is abundant throughout the range.

## **Impacts of Human Development**

Although several county roads run through portions of the DAU nearly all bighorn sheep use of the range occurs in or adjacent to the Mount Zirkel Wilderness where motorized use is not permitted. Roads that bisect traditional movement corridors in sheep habitat are lightly used and pose a very small risk to Zirkel sheep. To date no S-73 sheep are known to have been killed in vehicle collisions.

Additionally very little habitat fragmentation has or will occur as long as the Mount Zirkel Wilderness remains intact. Any habitat loss or fragmentation that occurs through development of commercial and residential sites and associated infrastructure (e.g., smaller roads, pedestrian paths, etc) will be on the periphery of useable sheep habitat and therefore pose little threat to this herd. A very low percent of occupied bighorn range in DAU RBS-37 is privately owned. The Routt National Forest comprises most of the western half of the DAU.

## **Human Recreation Impacts**

Due to its remote wilderness nature and distance from large human population centers, DAU RBS-37 sustains a moderate amount of recreational use. Backpacking, camping fishing, hiking, hunting, wildlife viewing and wildlife photography are primary uses. Mountain biking is very popular on trails and roads near Steamboat Springs but biking is not allowed in wilderness areas.

Off-road vehicle trails are not a big factor in DAU RBS-37, however the Grizzly-Helena trail runs along the eastern edge of the Mt. Zirkel Wilderness crossing portions of bighorn habitat including the mouth of Red Canyon. There have been reported ATV incursions into the Wilderness along non-motorized trails on the eastern side of the Park Range. The amount of recreational use will likely continue to increase as the human population increases in this state. Disturbance by humans recreating with dogs in S-73 bighorn sheep habitat has not been documented despite high numbers of recreational users bringing dogs into the area.

## **Diseases and Parasites**

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. Bighorn sheep managers generally agree that bacterial pneumonia is the main reason for Rocky Mountain bighorn sheep population declines across much of the west in recent decades. Some strains of pneumonia-causing bacteria commonly carried by domestic livestock are highly pathogenic to bighorns (CAST 2008, Lawrence et al. 2010), and introduction of a pathogenic bacteria strain or another novel pathogen into bighorn populations can lead to all-age die-offs and low lamb recruitment (e.g., George et al. 2008, Wolfe et al. 2010). In some instances, low lamb recruitment can last for a decade or more (e.g., George et al. 2008). Once introduced, at least some of these pathogenic bacterial strains apparently can persist in bighorn herds long after the initial epidemic (Miller and Wolfe 2011). Infected carriers may serve as a source of infection for other animals in the same herd and for other herds and populations through natural movements and translocations. The susceptibility of bighorn sheep to pathogens originally introduced by domestic livestock is regarded as the primary factor limiting Rocky Mountain bighorn sheep populations in Colorado (George et al. 2009, Miller and Wolfe 2011). Moreover, the continued presence of introduced pathogens appears to have played an important role in preventing statewide bighorn numbers from rebounding to some approximation of historical levels (George et al. 2008, 2009; Miller and Wolfe 2011). Based on a substantial volume of literature (reviewed in CAST 2008 and elsewhere), it follows that one of the most important aspects of bighorn sheep management is to keep them separated from domestic livestock (CAST 2008, George et al. 2008, 2009, Wolfe et al. 2010).

The decline and eventual disappearance of the Park Range bighorn herds has been attributed largely to a combination of overharvest (market hunting and poaching) and habitat loss from reduced fire frequency and/or fire suppression (Hoover 1988). In contrast to many other native Colorado bighorn herds (Bear and Jones 1973, Goodson 1982), accounts of disease epidemics apparently are not an integral part of the Park Range bighorn herds' histories (Hoover 1988). Regardless of whether the bighorns indigenous to the Park Range were exposed to novel pathogens via interactions with livestock, native bighorns in the Park Range disappeared in the late 1950s or early 1960s (Hoover 1988). Consequently, the new herd was started without potential for contaminating the newly introduced sheep or spreading a novel pathogen from the reintroduced herd to any native bighorns remaining.

Apparently healthy bighorns were used to re-colonize the Park Range. Blood samples from members of the source herd (Forbes-Trinchera) used for the RBS-37 transplant in 2005 were analyzed for disease prior to their release into Red Canyon. All sheep captured were in excellent condition. Serology indicated exposure or recent infection with PI3 (parinfluenza). Culture

results from oropharyngeal swabs isolated *Pasteurellaceae* bacteria from 22 samples. These *Pasteurellaceae* isolates were considered "opportunistic commensals" that would not be likely to cause all-age die-offs (Miller and Wolfe 2011). In 2007, the Forbes-Trinchera herd was sampled again for a separate capture and transplant to Utah. During the 2007 screening, antibody titers to BRSV (bovine respiratory syncytial virus) were detected. The test results stated "Generally BRSV is not a significant problem itself but can contribute to pneumonia in combination with bacteria such as pasteurella. The appearance of this virus also suggests that there are additional pathogens circulating around causing respiratory problems in our BHS". All sheep transplanted during 2005 received antibiotics and a dose of ivermectin to treat for lungworms and mites. All in all the sheep going into RBS-37 from Forbes-Trinchera appeared healthy and probably were relatively disease free after treatment. As standard practice, any bighorn sheep captured or handled in RBS-37 in the future will be screened for select respiratory pathogens whenever possible.

## **Interspecific Competition**

There are currently two active domestic sheep grazing allotments on Forest Service lands within this DAU, the Buffalo Pass allotment to the south and the Big Agnes allotment to the north. These historic allotments were present and active long before the 2005 bighorn reintroduction proposal. Because contact between wild bighorn sheep and domestic sheep increases the probability of respiratory disease outbreaks, before the Zirkel transplant was approved a Memorandum of Understanding (MOU) between the USDA Forest Service (USFS) Medicine Bow-Routt National Forests, Parks Ranger District and the former Colorado Division of Wildlife (CDOW) was entered into. The purpose of this MOU was to document the cooperation between the two agencies in the reintroduction and tracking of Rocky Mountain bighorn sheep as it relates to animals health and environment (**Appendix A**).

Additionally, a statewide MOU was entered into in 2009 by the USDA Forest Service (USFS) Rocky Mountain Region, USDI Bureau of Land Management Colorado State Office (BLM), Colorado Department of Agriculture (CDOA), Colorado Wool Growers Association (CWGA), and the former Colorado Division of Wildlife (CDOW). The purpose of this MOU is to provide guidance in reducing contact between domestic and wild sheep in order to minimize interspecies disease transmission while maintaining healthy bighorn sheep herds and maintain a viable domestic sheep industry as a result of reduced conflicts (**Appendix B**).

Within RBS-37 specific guidelines, *Bighorn Sheep Interaction Protocol*, have been developed to define actions to be taken if contact between wild and domestic sheep should occur (**Appendix C**). In order to minimize the chances of such an occurrence, CPW staff works closely with Routt National Forest, Hahn's Peak/Bears Ears and Park Ranger Districts Biologists and Range Conservationists to discuss and coordinate regularly the herd status of Zirkel bighorns and domestic grazing allotment activities and stocking plans. Additionally, local USFS staff participates in the annual summer bighorn classification surveys organized by CPW.

Practices outlined by Western Association of Fish and Wildlife Agencies (WAFWA; **Appendix D**) and US Animal Health Association (USAHA 2009; **Appendix E**) should be consulted as well.

Mountain goats do not occur in this DAU. The nearest known mountain goat sighting to this herd is of a single male over 30 miles south on Parkview Mountain (2009-2011) on the southern end of North Park. It is not current policy of CPW to allow mountain goats to expand their current range further north so there is little chance of bighorn-mountain goat competition in RBS-37.

Elk occur year round within bighorn sheep use areas in this DAU especially on the alpine. Currently light competition between elk and bighorn sheep is probable on the alpine and likely to increase as bighorn numbers in this herd increase. Mule deer are also present within this DAU in fairly low densities in summer and fall but nearly all migrate out of the DAU by mid-winter. Shiras moose occur sparsely throughout bighorn range here but in such low numbers they are not likely to represent a competitive threat to bighorns. There is limited dietary overlap between wild ungulates in RBS-37 because densities of deer, elk, moose, and sheep are low on summer range as all are dispersed over a large geographic area. Only on bighorn winter range could interspecific competition be limiting to bighorn populations through competition for forage. However, only a few moose and small numbers of elk remain near sheep winter range after the first heavy snows of the season.

## **Predation**

The effect of predation on the DAU RBS-37 bighorn sheep population is mostly unknown; however, predation is probably a very minor source of bighorn mortality, especially of adult mortality. Mountain lions, coyotes, and bobcats all inhabit RBS-37 bighorn sheep range and it is likely that each accounts for some bighorn mortality. From 2005 – 2011, twenty seven adult bighorn were radio collared. Eleven of these bighorn have died mostly from unknown causes. Examination of carcass bone marrow indicates poor body condition likely leading to starvation or predisposition to disease and predation. It is not known how many of these animals were depredated because most mortality has occurred during winter or early spring when snow conditions make it very difficult to access winter range for monitoring radio collars. Therefore, by the time mortalities are accessible in spring not much of the sheep carcasses or evidence of cause of death remain. Most carcasses have been fed on by predators, scavengers, or both.

## **Illegal Kill**

There are no known recent cases of illegal take in DAU RBS-37. Any illegal take impacts on the population are likely not noticeable.

## **Watchable Wildlife**

The Mount Zirkel sheep herd has value to the people of Colorado as a watchable resource in a wilderness setting. Though not the easiest herd to access, many backpackers, fisherman, hikers and hunters enjoy seeing and photographing these sheep each year. The results of local and national surveys completed in 2006, suggest that the total economic impact of wildlife viewing in Colorado is estimated to be \$1.22 billion, close to the total economic impact of both hunting and fishing combined (\$1.8 billion) (BBC 2008). Wildlife viewing recreation continues to attract a growing number of participants nationwide (US Fish and Wildlife Service 2006).

## **PUBLIC INPUT IN DAU PLANNING PROCESS**

Multiple methods were used to solicit public input on plans for future management of this herd including a public meeting, a 30-day public comment period, and direct notification to individuals or groups with a known interest in wild sheep by E-mail, telephone, or personal conversation. Postcards were mailed out to the all hunters who applied for a sheep hunting license in S-73 over the past two seasons alerting them of the draft plan on the CPW website and how to comment on it. Additionally the USFS Hahns Peak/Bears Ears Ranger District sent copies of the draft to all grazing allotment permittees in the area along with a cover letter notifying them of the opportunity to comment on the plan. A survey was included with the draft plan on the CPW website asking for preferred alternatives and other comments. This same survey was used at the public meeting to obtain comments from meeting participants.

The public meeting was held in Walden, Colorado on February 28, 2012. This meeting and a link to the draft plan was advertised in local newspapers, on the CPW website, through a mailing to each person that had applied for a hunting license in GMU S73 during the 2 previous years and through personal notification of groups or individuals known to be interested. The meeting was attended by four local District Wildlife Managers and the terrestrial biologist fro Area 10, three USFS employees and three members of the public, including a reporter for the Jackson County Star newspaper.

The draft plan was placed on the CPW's website from February 17 to March 18, 2012 for the 30 day public comment period. A link to this website was sent to interested parties and to everyone who had submitted comments during the scoping phase.

Public comments received included the following:

- 1) Three surveys returned from the public meeting.
- 2) Two written letters and one survey through regular mail.
- 3) Sixty four surveys from the CPW website
- 4) Letters from the Colorado Wool Growers Association, the Rocky Mountain Bighorn Society, and one domestic sheep allotment permittee.

Written comments and the survey results can be viewed in **Appendix F** letters in **Appendix G**.

## **MANAGEMENT RECOMMENDATIONS AND FUTURE NEEDS**

### **Prevention of contact between bighorn sheep and domestic livestock**

Based on published literature and experiences elsewhere in Colorado, one of the most important aspects of bighorn sheep management in the Park Range is to keep bighorns separated from domestic livestock (CAST 2008, George et al. 2008, 2009, Wolfe et al. 2010). Appendices D and E contain detailed recommendations on measures that may be effective in accomplishing this goal.

In 2007, several years after the introduction of bighorn sheep into Red Canyon, the United States Forest Service and the Colorado Division of Wildlife signed a MOU to help prevent contact

between bighorn sheep and domestic sheep. This “Red Canyon MOU” expired July 30, 2011. However, the following actions listed in the MOU are imperative to maintaining the health and viability of the RBS-37 herd and should continue to be followed by both parties as long as these concerns remain.

Management Actions from the Red Canyon MOU state:

C. FOREST SERVICE SHALL:

1. Assist in the monitoring of rangeland conditions in the release area as they are able. Any efforts and funding for any habitat modification that might be identified will be documented within separate agreements citing the appropriate authorities for the exchange of funds.

2. Require that the current and future grazing permittees manage the sheep on the FS allotments in order to minimize potential contacts and conflict between the wild and domestic sheep.

3. Inform USFS domestic sheep permittees through the annual operating plan of the release and advise them of the agreed-upon protocol for handling any native/domestic sheep contact.

4. Inform CDOW as soon as possible of any bighorn sheep sightings within sheep allotment boundaries in the Parks Range.

D. CDOW SHALL:

1. Monitor the condition of occupied ranges in an attempt to determine appropriate population levels. The CDOW may also identify opportunities for habitat modification with the goal of increasing carrying capacity, maintaining existing habitat, or helping to facilitate separation of the species.

2. Consult with the USFS well in advance of any additional releases of Rocky Mountain Bighorn sheep planned for this site.

3. Not recommend discontinuing domestic sheep grazing on currently active sheep allotments on National Forest System lands within or adjacent to the Parks Range north of Highway 40 and east of National Forest System Road 129.

4. They may recommend that currently vacant domestic sheep and goat allotments be retained in vacant status. This does not limit possible future discussions seeking changes to sheep and goat allotments by willing parties should bighorn range farther than expected.

5. Ear tag all Bighorn sheep released upon capture for easy identification. A portion of the bighorns will be radio collared to establish use patterns and monitor movement.

5. Provide regular updates to the USFS about data collected in this process.

6. Develop a management plan for the Zirkel bighorn sheep as the herd of sheep becomes established.”

The CDOW and the USFS agree to evaluate all instances where bighorns are observed in areas where they have or are likely to come into contact with domestic sheep in order to assess the risk of disease transmission. It is clear to both parties that if any potential of disease transmission exists, these animals will be removed under the direction of the CDOW and not be allowed to return to the established herd. All parties to this agreement will work to this goal with a removal protocol to be established.”

In 2011 CPW developed the following protocol:

#### Actions for **Known** Contact

Any bighorn sheep **known** (i.e., documented) to have been in contact with either domestic sheep or domestic goats would be removed. This handles the more obvious cases where rams show up in domestic herds during the breeding season or are bedding in with goats.

**For those instances, the biologist and DWM work together to rapidly remove the bighorn sheep in question, with notice to the AWM and NW Region Senior Terrestrial Biologist.**

#### Actions for **Possible** Contact

The other, much more frequent, circumstance where bighorns may, or are likely to, have been in contact but where there is no proof that contact has occurred. There is not currently agreement within the region as to how these sheep should be handled. Thus, at present, these instances will still have to be handled on a case by case basis, based on an assessment of the totality of the circumstances (proximity, duration, etc.). In those instances around the region where contact may have occurred, but is not proven, do the following.

**Early notification to the AWM and to NW Region Senior Terrestrial Biologist so that we can work through the chain for a ruling, make early attempts to find and stay on the sheep in question, and try to document whether contact is occurring or has occurred. Because the range of potential contacts varies over a substantial range of severity, we'll need to talk about these sheep before a control action is taken.**

### **Population Management throughout the Herd**

The two main limiting factors for RBS-37 are the amount of winter range and proximity of bighorns to domestic sheep. The management strategy for the Zirkel herd is to maintain the population at a moderate level within the constraints of the available winter habitat and prevent contact with domestic livestock to the extent possible in order to reduce the probability of respiratory disease outbreaks (see Diseases and Parasites section). The CPW's primary management tool to control this herd's population size is hunting. The best tools to prevent such contact are continued monitoring using radio collars on both wild bighorns and domestic sheep, where necessary and possible, along with summer ground classification and winter aerial census. As this is a fairly new herd whose range expansion is not yet fully realized it may take many more years of fairly intense monitoring, including use of satellite or GPS collars, to document home range size.

### **Capture and Marking of Sheep**

Capturing sheep is a necessity of long term bighorn management in order to obtain biological samples, to mark sheep for mark resight studies, and to track wild sheep with radio telemetry collars. Many methods can be utilized for capture including dart gun, drop net, clover trap, and aerial net gun. Far and away aerial net gunning from a helicopter using a well trained crew is the most cost effective and efficient way to capture most ungulates, especially bighorn sheep.

The rugged and often remote habitat where bighorns live make capturing them especially challenging. The fact that most of the RBS-73 herd spends it's time year round in the Mount

Zirkel Wilderness makes capturing them even more difficult. Wilderness rules prevent use of motorized equipment within the wilderness boundary unless a waiver is granted to allow a specific operation. In winter of 2010/11, a short term use permit was granted to the former Colorado Division of Wildlife by the United States Forest Service in order to capture and radio collar up to nine bighorn sheep inside the Mount Zirkel Wilderness boundary. One of the conditions mentioned in the order was that other less intrusive means of capturing sheep inside or outside wilderness boundaries should be sought. This may have been a onetime exception allowing helicopter landings in the wilderness for the purpose of collaring bighorn sheep. All nine sheep were net gunned and radio collared in one afternoon in March of 2011. In the future other means or methods to capture bighorns for management purposes need to be tried.

As long as domestic sheep or goat grazing allotments are active and stocked within or near suitable bighorn habitat then some means of tracking wild sheep should be maintained. Without telemetry capabilities on bighorns it is impossible to monitor their whereabouts in remote locations. The most expensive but best option for tracking sheep is with the use of satellite collar technology. For the past two years up to five bighorns at a time in the Zirkel herd have worn satellite collars. These collars send a location signal to a satellite that then sends the sheep's location directly to a computer. Multiple locations per day can be sent from each animal wearing a collar. These collars have a "virtual fence" technology so if the animal wearing the collar gets within a preprogrammed distance of a grazing allotment an e-mail is sent to a computer alerting the person in charge of the collars that action should be taken to prevent contact between the wild sheep and domestics. So far this scenario has not played out in the Zirkel herd but it is a possibility.

## **Habitat Improvement Recommendations**

Fire suppression over the last 100 years has lead to tree and shrub encroachment into bighorn sheep range, causing habitat loss and fragmentation. The CPW should work with land managers to use prescribed burns or forest thinning in order to reduce the visual obstruction in bighorn sheep range and improve forage quality. These efforts should concentrate on winter range, which is limiting this herd's population potential. The CPW should also work with the US Forest Service and other emergency response agencies to allow naturally occurring fires to continue where possible.

Current habitat projects being planned by the USFS include prescribed burning near Aqua Fria in the "Grizzly Analysis Area". Removing woody vegetation through burning on or below steep rocky slopes will open more suitable sheep habitat for escape and forage. Furthermore the southeast facing aspect of this area will lend itself to possible use by bighorns in winter. Currently light use of this area has been documented by radio collared sheep during spring, summer, and fall.

Efforts should be undertaken to open travel corridors through heavy timber from Bear Mountain to Red Canyon and to Sheep Mountain. At present some travel of satellite collared sheep has been noted between Red Canyon and Bear Mountain through an old burn and dead lodgepole. Though movement of bighorns from Red Canyon to Delaney Butte does occur, no movement from Red Canyon or Bear Mountain to Sheep Mountain has been observed.

## **Critical Habitat Protection**

Because the majority of year round range for this herd occurs within wilderness boundaries little threat exists for even minor losses of this habitat. However, critical areas for protection should include all known and potential winter range as well as possible travel corridors. Much of this protection will include preventing forest succession from taking over open terrain making it unsuitable for bighorns. Efforts should be made to work with private landowners between the Park Range and Delaney Butte and Sheep Mountain to ensure no barriers to prevent movement of bighorns back and forth between these important areas are erected.

## **Use as a Source Herd for Translocations**

The Mount Zirkel herd could serve as a source for bighorn sheep translocations at some point in the future but that will be many years down the road assuming this herd continues to thrive and grow to its potential.

## **Need for Range Extension Translocations**

The Mount Zirkel herd is slowly extending its summer range to the north along the Continental Divide. There is ample suitable unoccupied bighorn habitat, especially summer habitat to the north and west of the currently occupied range. Some of this habitat is of high quality. However, range extension management into these areas is not being pursued by CPW due to the proximity of these areas to domestic sheep grazing allotments on USFS land. Range extensions into these areas would increase the possibility of bighorn sheep from this herd contacting domestic livestock and thus increasing the probability of introducing novel pathogens into the Mount Zirkel herd.

## **Information Needs**

Clearly the priority for data in RBS-37 should be focused on mark resight population estimation, maintaining radio collars (preferably satellite collars) on sheep to track range expansion, and finding ways to increase winter range which is the biggest limiting factor for this herd.

# **MANAGEMENT OBJECTIVES**

## **Posthunt Population Objective**

The posthunt population objective should be established at a level that allows for a healthy, self-sustaining herd while providing quality hunting and wildlife viewing opportunities. It is difficult to estimate this ideal population level for this herd; however, we can base a population objective on basic wildlife population management theory and the population performance of this herd at various population levels in the past.

Many studies on various species have shown that animal populations are most productive and individual animals are healthiest at approximately half the maximum number of animals that the habitat can sustain. At high population densities, the health of individual animals, the body and horn size of individual animals and recruitment of young animals into the population decrease due to competition among individuals for resources. Several studies in bighorn sheep specifically have suggested that disease caused mortality is higher in densely populated herds

than in less densely populated herds and have shown decreased lamb recruitment at high sheep densities (Jorgenson and Wishart 1993; Portier et al. 1998).

The optimum number of bighorn for this DAU is unknown and changes with habitat condition. The Mount Zirkel herd reached an estimated high of 1,000 bighorn sheep in the late 1800's. This high population density was likely the result of regular and sustained burning of the habitat by natural occurrences and the Ute Indians. As fire occurrence was reduced in both frequency and area, woody cover through natural succession eventually reduced the quantity of bighorn habitat. Correspondingly the carrying capacity for bighorns was certainly greatly reduced as well.

The current challenge with setting specific management objectives for this herd lies with just how much habitat these sheep eventually utilize and where it is geographically. On one hand if objectives are too low the herd will be held below its potential on the other hand if they are set too high density dependent induced disease and, or, reduced survival may come into play.

There are no current population objectives for RBS-37. It would seem prudent at this time to establish population objectives that would not limit but encourage moderate herd expansion. This approach would put emphasis on habitat improvement and possible trap and transplant within the DAU to help expand the range of the herd. Any range expansion must be carefully monitored and planned (where possible) to minimize exchange with domestic livestock. Holding the herd population too low will result in the loss of recreational and biological potential of this bighorn herd that has just recently been restored into its former range.

### ***Alternative One: 100 – 150 Bighorn Sheep***

Alternative One is slightly above the current population estimate of 50 -75 bighorn. Alternative One would increase then stabilize the population below estimated carrying capacity and would result in a highly productive small herd requiring ewe hunting to keep the population low.

### ***Alternative Two: 150 – 200 Bighorn Sheep***

Alternative Two, 150 – 200 bighorn, is more than twice the current population estimate but well within realistic population potential. This objective seeks to extend the useable winter range and population of the herd. This moderate population level would optimize the number of bighorn sheep the current and future improved habitat can support.

### ***Alternative Three: 250 – 350 Bighorn Sheep***

Alternative Three, 250 – 350 bighorns, is an optimistic objective which could be obtained if enough winter habitat becomes available. This alternative would likely require extensive habitat manipulation, reduction or elimination of domestic sheep grazing in the DAU, or both.

## **Posthunt Sex Ratio Objective**

The posthunt sex ratio objective should be set at a level that provides for the long-term health of the herd while providing the public with the desired level and quality of recreational opportunities. The higher the sex ratio of a herd is, the higher the number, age, and horn size of the rams in the herd. These rams are highly valued by wildlife viewers, photographers and hunters. However, fewer rams can be harvested if high ram to ewe ratios are to be maintained,

so hunting opportunity is lower at higher sex ratios. Also, the higher the ram to ewe ratio is, the lower the reproductive potential of the herd. That is because the higher the number of rams at a given population size, the lower the number of ewes and, therefore, the lower the number of potential lambs. Another consideration when setting sex ratio objectives is that at very high sex ratios the stress levels of ewes during the breeding season are thought to increase, possibly leading to detrimental effects on recruitment. Finally, high sex ratios may lead to increased extra range movements by rams thereby increasing the probability of contact between bighorn and domestic sheep or bighorn from other herds and the related risks of disease transmission. It is difficult to estimate the “natural” range of sex ratios of bighorn sheep herds. However, given the slightly higher mortality rates of adult rams than ewes, it is thought to be below parity.

There is no current sex ratio estimate for RBS-37 but DAU plan sex ratio objective alternatives presented here are similar to those in other Colorado sheep DAU plans. Recreational users of the back country including backpackers, hikers, hunters, and photographers have not expressed dissatisfaction with the current sex ratio and the quality of bighorn it has provided. With a low density of bighorns currently in the DAU this may change as the herd reaches its potential.

### ***Alternative One: 40 – 60 Rams per 100 Ewes***

Alternative one, this range is probably lower than naturally occurring sex ratios in bighorn herds and would require ram reductions. Higher ram licenses would be off- set by reduced number, average age and horn size of rams available for viewing and harvest.

### ***Alternative Two: 60 – 80 Rams per 100 Ewes***

Alternative two is thought to be at the lower end of natural sex ratio of bighorn herds and would also call for a reduction from the current observed sex ratio estimate. This alternative focuses on optimizing quantity and quality of rams while maintaining herd reproductive potential and growth. This option should provide the greatest license potential over the long term.

### ***Alternative Three: 80 – 100 Rams per 100 Ewes***

Alternative three is near the current sex ratio estimate. Under this alternative, the sex ratio would remain near its current level. Alternative Three could result in a herd with the lowest reproductive potential, the lowest numbers of ram licenses but greatest ram age and horn size.

## **PREFERRED ALTERNATIVES**

After the conclusion of the public input process results indicated a strong preference for the following alternatives based on 64 completed surveys.

### **Preferred Population Objective - Alternative Two: 150 – 200 Bighorn Sheep**

For population objective 53% of respondents choose Alternative Two, 23% Alternative One, 21% Alternative Three, and 3% were not sure. Colorado Parks and Wildlife recommends Population Objective Alternative Two, 150 – 200 bighorn. This alternative represents a significant increase from the current population estimate but well below historic bighorn sheep numbers in the Park Range. This population range is expected to be low enough to reduce the probability of catastrophic disease epidemics and allow for healthy individual animals and moderate to high recruitment rates. As a result, this is expected to result in higher numbers and

larger rams available for take by hunters, than alternative One but fewer than alternative Three. Given that distribution and movement patterns of this herd are still not entirely known (especially for rams) keeping the population at a mid-range should help minimize wild/domestic interactions while maximizing viewing and hunting opportunities. Alternative Two is expected to optimize long-term herd health, as well as hunting, viewing and photography opportunities.

### **Preferred Sex Ratio Objective - Alternative Two: 60 – 80 Rams per 100 Ewes**

Of 64 completed surveys 70% of respondents choose Alternative Two for preferred sex ratio objective, 17% Alternative Three, 11% Alternative One, and 2% were not sure. Colorado Parks and Wildlife recommends Sex Ratio Objective Alternative Two based on public input, recreational opportunity, and future herd potential and is thought to be the most biologically appropriate. This alternative focuses on optimizing quantity and quality of rams while maintaining herd reproductive potential and growth.

### **Management Implications**

Regardless of which alternatives are chosen the future of this herd will largely depend on how much historic bighorn range they ultimately utilize and how well management actions prevent catastrophic disease outbreaks and habitat loss. By selecting population alternatives that allow the herd to continue to grow and spread out, bighorn sheep may eventually occupy extensive areas of the Parks Range. The downside of this is that the potential for overpopulation, disease outbreaks, and reproductive rate declines increases as herd size approaches carrying capacity. The proper number of bighorns to optimize herd size and health will be determined many years in the future. Current activities should focus on continued monitoring, habitat improvement, and winter range extension. These activities must be carried out through close cooperation and planning by all pertinent agencies and landowners involved in management of this herd, particularly CPW and the USFS.

### **Acknowledgements**

Without the assistance and cooperation of numerous agencies and individuals this herd of wild sheep would not exist today. A vision that began in the 1970s finally came together in 2005 when those 40 sheep restored a living legacy back to the Park Range. Many thanks to the Bureau of Land Management (BLM), Colorado Division of Wildlife (CDOW), United States Forest Service (USFS), Rocky Mountain Bighorn Society (RMBS), and Jackson County, without whose support the reintroduction would not have been possible.

Over the years many individuals have given much, from volunteers on sheep counts to, wildlife professionals, to those offering financial support. But some deserve individual recognition. Bob Swift, a North Park landowner, granted access on his property to CPW for the initial release and continues to be a major cooperater in management needs of this herd. Jim Hicks, retired CDOW biologist, led the charge and worked tirelessly over the years to make this reintroduction happen. Jim continues to assist by participating in summer Zirkel bighorn surveys and sharing his expertise. Kirk Snyder, long time North Park District Wildlife Manager for the CDOW, whose district the sheep went into, was dedicated and passionate about wildlife and wild places. Though Kirk is no longer with us his legacy and spirit live on in this herd of wild sheep, roaming from Red Canyon to Lost Ranger Peak and beyond.

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# Appendix A – Red Canyon Memorandum of Understanding (MOU)

FROM: US FOREST SERVICE MEMBER

FS Agreement No. T-405 P 002/005 F-273  
Cooperator's No.

## MEMORANDUM OF UNDERSTANDING between

USDA FOREST SERVICE, MEDICINE BOW-ROUTT NATIONAL FORESTS,  
PARKS RANGER DISTRICT  
and the  
COLORADO DIVISION OF WILDLIFE

This **MEMORANDUM OF UNDERSTANDING** is hereby entered into by and between the USDA Forest Service, Medicine Bow-Routt National Forests, Parks Ranger District, hereinafter referred to as the Forest Service, and the Colorado Division of Wildlife, hereinafter referred to as the CDOW.

**A. PURPOSE:** The purpose of the Memorandum of Understanding is to document the cooperation between the Forest Service and CDOW in the reintroduction and tracking of Rocky Mountain Bighorn Sheep as it relates to the health of the animals and effects on habitat.

### RED CANYON HERD

The CDOW, in January 2005, reintroduced Rocky Mountain Bighorn sheep into the previously occupied range on private property near Red Canyon located in the western portion of North Park in Jackson County, Colorado. This land is adjacent to National Forest System lands and is about ¾ of a mile east of the Mt. Zirkel Wilderness Area. Red Canyon is a portion of the historic bighorn sheep range which supported a population of native bighorn sheep until the 1950s. When this release took place it was the hope of the CDOW that the sheep would winter near the release site and migrate west to summer near the continental divide in the Park Range. Radio-fitted sheep, as hoped, moved to the higher elevations for the summer of 2005 and have returned to the release site to winter in 2005/2006.

Both parties to this agreement understand that the reintroduction of Bighorn sheep into historic habitat comes with the risk of failure. Both parties understand that adjustment of current administrative and/or management practices may be necessary in order to reduce that risk. It is agreed that annual cooperative evaluations and consultations will continue after the release.

The CDOW and the USFS agree to evaluate all instances where bighorns are observed in areas where they have or are likely to come into contact with domestic sheep for the risk of disease transmittal. It is clear to both parties that if any potential of disease transmittal exists, these animals will be removed under the direction of the CDOW and

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not be allowed to return to the established herd. All parties to this agreement will work to this goal with a removal protocol to be established.

**B. STATEMENT OF MUTUAL BENEFIT AND INTERESTS:** The USFS, within the concept of multiple-use, desires progressive native wild sheep management compatible with appropriate grazing by domestic livestock. Prior to the release of the bighorn sheep, the CDOW considered, as part the evaluation process, the potential of interaction of the native sheep with domestic sheep. It is clear from experience and research that domestic sheep carry pathogens, primarily *Pasteurella sp.*, which can cause bacterial pneumonias in wild sheep, often leading to catastrophic die-offs and elimination of the wild populations. A 9 mile buffer is the CDOW recommended distance (BLM Guidelines) between domestic sheep and native sheep, whereas the USFS does not recognize any single buffer distance but prefers to evaluate each situation on a case-by-case basis. The closest domestic sheep allotments exceed the recommended nine-mile buffer. The CDOW benefit in this project is to identify opportunities for habitat modification with the goal of increasing bighorn sheep carrying capacity or maintaining existing habitat.

**C. FOREST SERVICE SHALL:**

1. Assist in the monitoring of rangeland conditions in the release area as they are able. Any efforts and funding for any habitat modification that might be identified will be documented within separate agreements citing the appropriate authorities for the exchange of funds.
2. Require that the current and future grazing permittees manage the sheep on the FS allotments in order to minimize potential contacts and conflict between the wild and domestic sheep.
3. Inform USFS domestic sheep permittees through the annual operating plan of the release and advise them of the agreed-upon protocol for handling any native/domestic sheep contact.
4. Inform CDOW immediately of any bighorn sheep sightings within sheep allotment boundaries in the Parks Range.

**D. CDOW SHALL:**

1. Monitor the condition of occupied ranges in an attempt to determine appropriate population levels. The CDOW may also identify opportunities for habitat modification with the goal of increasing carrying capacity, maintaining existing habitat, or helping to facilitate separation of the species.
2. Consult with the USFS if and when additional releases of Rocky Mountain Bighorn sheep will occur at this site.
3. Not recommend discontinuing domestic sheep grazing on currently active sheep allotments on National Forest System lands within or adjacent to the Parks Range north of Highway 40 and east of National Forest System road 129. They may recommend that currently vacant domestic sheep and goat allotments be retained in vacant status.

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- 4. Ear tag all Bighorn sheep released upon capture for easy identification. A portion of the bighorns will be radio collared to establish use patterns and monitor movement.
- 5. Provide regular updates to the USFS about data collected in this process.
- 6. Develop a management plan for the Zirkel bighorn sheep as the band of sheep becomes established.

**E. IT IS MUTUALLY AGREED AND UNDERSTOOD BY ALL PARTIES THAT:**

- 1. FREEDOM OF INFORMATION ACT (FOIA). Any information furnished to the Forest Service under this instrument is subject to the Freedom of Information Act (5 U.S.C. 552).
- 2. PARTICIPATION IN SIMILAR ACTIVITIES. This instrument in no way restricts the Forest Service 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 the Department of Agriculture, Forest Service and Colorado Department of Wildlife and shall remain in effect until July 30, 2011. This MOU may be extended or amended upon written request of the Department of Agriculture, Forest Service or Colorado Division of Wildlife and the subsequent written concurrence of the other(s). The Department of Agriculture, Forest Service or Colorado Division of Wildlife may terminate this MOU with a 60-day written notice to the other(s).
- 4. RESPONSIBILITIES OF PARTIES. The Department of Agriculture, Forest Service and Colorado Division of Wildlife 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. PRINCIPAL CONTACT. The principal contacts for this instrument are:

Forest Service Project Contact	Cooperator Project Contact
Bob Mountain and Jena Hickey	Susan Werner
Medicine Bow-Routt National Forests	Colorado Division of Wildlife
2468 Jackson St.	925 Weiss Drive
Laramie, WY 82070	Steamboat Springs, CO 80487
Phone: (307) 745-2411	Phone: (970) 871-2842
FAX: (307) 745-2398	FAX: (970) 871-2853
E-Mail: <a href="mailto:bmountain@fs.fed.us">bmountain@fs.fed.us</a>	E-Mail: <a href="mailto:susan.werner@state.co.us">susan.werner@state.co.us</a>
<a href="mailto:jenahickey@fs.fed.us">jenahickey@fs.fed.us</a>	

Forest Service Administrative Contact	Cooperator Administrative Contact
Sam Fairbairn	
Medicine Bow-Routt National Forests	
2468 Jackson St.	
Laramie, WY 82070	
Phone: (307) 745-2391	Phone:
FAX: (307) 745-2398	FAX:
E-Mail: sfairbairn@fs.fed.us	E-Mail:

6. **NON-FUND OBLIGATING DOCUMENT:** Nothing in this MOU shall obligate either the Department of Agriculture, Forest Service or Colorado Division of Wildlife 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 Department of Agriculture, Forest Service and Colorado Division of Wildlife 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.

7. **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.

THE PARTIES HERETO have executed this instrument:

COLORADO DIVISION OF WILDLIFE

USDA FOREST SERVICE  
 Medicine Bow-Routt National Forests

*Ron D. Velarde*  
 \_\_\_\_\_  
 RON D. VELARDE  
 NW Regional Manager

*Mary H. Peterson 2/12/07*  
 \_\_\_\_\_  
 MARY H. PETERSON  
 Forest Supervisor

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

*Sam Fairbairn 1/9/07*  
 \_\_\_\_\_  
 Sam Fairbairn Date  
 FS Agreement Coordinator

## Appendix B – Statewide Memorandum of Understanding (MOU)

Forest Service Agreement No. 09-MU-11020000-006  
Bureau of Land Management BLM-MOU-CO-482  
Agreement No. \_\_\_\_\_

### 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 Division of Wildlife (CDOW). 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.

- 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. CDOW AND CWGA AGREE TO THE FOLLOWING:**

- a. CDOW 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 regulation and direction regarding closure or modification of active domestic sheep allotments to resolve documented resource conflicts.
- b. The CDOW 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 CDOW and CWGA understand that the USFS/BLM will follow current regulation and 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 CDOW using means determined appropriate by CDOW. 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 CDOW 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 CDOW may seek remedies under existing statutory authority in cases where contact with bighorn sheep may occur.
- e. CDOW 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, CDOW 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.

**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. 552).
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 Division of 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 Division of 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.

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 Division of Wildlife (DOW), Colorado Department of Agriculture, and the Colorado Woolgrowers Association.

Randall Karstoft (FOR) ANTONIE L. DIXON March 2, 2009  
USDA Forest Service (USFS) Date  
Rocky Mountain Region

Jody Wind 3/23/09  
USDI Bureau of Land Management (BLM) Date  
Colorado State Office

Thomas E. Remington 2/11/09  
Colorado Division of Wildlife (CDOW) Date

John R. Stulp 3-30-09  
Colorado Department of Agriculture (CDOA) Date

Am [Signature] 3/26/09  
Colorado Woolgrowers Association (CWGA) Date

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

Monica Cordova 3/2/09  
Monica Cordova DATE  
Forest Service G&A Specialist

### **Bighorn Sheep / Domestic Interaction Protocol Area 10 Field Ops and Terrestrial**

This document is meant to provide guidance and steps to be taken by Area 10 Colorado Parks and Wildlife field personnel when **known contact** or **possible contact** between wild bighorn sheep and domestic sheep or goats has occurred. The following paragraphs describe the actions and proper channels for the appropriate response to such instances and have been agreed upon by Area 10 Field Operations and Terrestrial staff in accordance with the issue as discussed at the regional level.

#### Actions for **Known** Contact

As summarized in an E-mail from Brad Petch dated Thursday, August 25, 2011, “The issue of when to take bighorns in contact with domestic animals was last discussed at a regional staff meeting several months ago. The resulting agreement was that any bighorn sheep **known** (i.e., documented) to have been in contact with either domestic sheep **or** domestic goats would be removed. This handles the more obvious cases where rams show up in domestic herds during the breeding season or are bedding in with goats like the most recent Granby incident”.

**For those instances, the preference is that the biologist and DWM work together to rapidly remove the bighorn sheep in question, with notice to the AWM and NW Region Senior Terrestrial Biologist.**

#### Actions for **Possible** Contact

“This agreement does not cover the other, much more frequent, circumstance where bighorns may, or are likely to have been in contact, but where there is no proof that contact has occurred. There is not currently agreement within the region as to how these sheep should be handled. Thus, at present, these instances will still have to be handled on a case by case basis, based on an assessment of the totality of the circumstances (proximity, duration, etc.). In those instances around the region where contact may have occurred, but is not proven, I’d like to do the following”.

**Early notification to the AWM and to NW Region Senior Terrestrial Biologist so that we can work through the chain for a ruling, make early attempts to find and stay on the sheep in question, and try to document whether contact is/has occurred. Because the range of potential contacts varies over a substantial range of severity, we’ll need to talk about these sheep before a control action is taken.**

#### USFS Grazing Allotments

When such instances occur in association with domestic sheep grazing allotments administered by the U.S. Forest Service additional information may apply. The following guidance comes from the “*Biological Evaluation & Assessment for the Big Agnes Allotment Hahn’s Peak/Bears Ears*”

*Ranger District*, dated August 31, 2007. Also see the Red Canyon and Statewide MOU's following the BE.

1. **Bighorn Sheep:** An MOU was developed between the CDOW and USFS Medicine Bow Routt National Forest that outlines a feasible strategy for reducing the potential for the interaction of domestic and wild sheep. This MOU specifies the following:
  - i. Forest Service Shall:
    1. Assist in the monitoring of rangeland conditions in the release area as they are able. Any efforts and funding for any habitat modification that might be identified will be documented within separate agreements citing the appropriate authorities for the exchange of funds.
    2. Require that the current and future grazing permittees manage the sheep on the FS allotments in order to minimize potential contacts and conflict between the wild and domestic sheep
      - i. The permittee will not be allowed to take domestic sheep into the Big Agnes unit or the Mica Lake unit of the allotment without permission from the USFS. The USFS will check with CDOW regarding if bighorns are present within the unit, prior to issuing permission. Permission would not be granted if wild bighorns are within these units.
      - ii. The permittee will be required to have at least one guard dog with the herd.
      - iii. **Recommended Management Approach** (not required project design criteria): If bighorns are found within the sawtooth range or on Big Agnes or Little Agnes Mountain, then the permittee should not be graze sheep east of the North Fork of the Elk River.
    3. Inform the USFS domestic sheep permittees through the annual operating plan of the release and advise them of the agreed-upon protocol for handling any native/domestic sheep contact
      - i. CDOW will provide the agreed upon protocol to the USFS prior to the finalization of the Annual Operating Plan. This protocol is not listed specifically here, as it may change over time.
    4. Inform CDOW immediately of any bighorn sheep sightings within sheep allotment boundaries in the Parks Range.
  - ii. CDOW Shall:
    1. Monitor the condition of occupied ranges in an attempt to determine appropriate population levels. The CDOW may also identify opportunities for habitat modification with the goal of increasing the carrying capacity, maintaining existing habitat, or helping to facilitate separation of the species.
    2. Consult with the USFS if and when additional releases of Rocky Mountain Bighorn sheep will occur at this site.
    3. Not recommend discontinuing domestic sheep grazing on currently active sheep allotment on National Forest System lands within or adjacent to the Parks Range north of Highway 40 and east of the National Forest System road 129. They may recommend that currently vacant domestic sheep and goat allotments be retained in vacant status.

4. Ear tag all Bighorn sheep released upon capture for easy identification. A portion of the bighorn rams will be radio collared to establish use patterns and monitor movement.
  - i. A portion of the younger rams within the herd will be targeted for capture and collaring every other year. Younger rams are anticipated to be more likely to expand beyond the existing use areas, than mature rams.
5. Provide regular updates to the USFS about data collected in this process.
6. Develop a management plan for the Zirkel bighorn sheep as the band of sheep becomes established.

## Appendix D

**Note: this appendix refers to specific management recommendations taken from the Western Association of Fish and Wildlife Agencies (WAFWA) Wild Sheep Working Group and is not the document in its entirety:**

### **RECOMMENDATIONS FOR DOMESTIC SHEEP AND GOAT MANAGEMENT IN WILD SHEEP HABITAT March, 2012**

#### ***Recommendations to WAFWA Agencies***

- Historic and suitable but currently unoccupied wild sheep range should be identified, evaluated, and compared against currently-occupied wild sheep distribution and existing or potential areas where domestic sheep or goats may occur.
- Risk assessments should be completed at least once per decade (more often if warranted) for existing and potential wild sheep habitat. These assessments should specifically identify where and to what extent wild sheep could interface with domestic sheep or goats, and the level of risk within those areas.
- Following completion of site or herd-specific risk assessments, any translocations, population augmentations, or other restoration and management strategies for wild sheep should minimize the likelihood of association between wild sheep and domestic sheep or goats. Agencies should:
  - Avoid translocations of wild sheep into areas with no reasonable likelihood of effective separation from domestic sheep or goats.
  - Re-evaluate planned translocations of wild sheep to historical ranges as potential conflicts, landscape conditions, and habitat suitability change.
  - Recognize that augmentation of a wild sheep herd from discrete source populations poses a risk of pathogen transfer (CAST 2008) and thus, only use source stock verified as healthy through a proper health assessment (WAFWA 2009) for translocations. Source herds should have extensive health histories and be regularly monitored to evaluate herd health. Wild sheep managers should evaluate tradeoffs between anticipated benefits such as demographic, behavioral and genetic interchange, and the potential consequences of mixing wild sheep from various source herds.
  - Develop and employ mapping or modeling technology as well as ground based land use reviews prior to translocations to compare wild sheep distribution and movements with distribution of domestic sheep or goats. If a translocation is implemented and association with domestic sheep or goats occurs, or is likely to occur beyond an

- identified timeframe or pre-determined geographic area, domestic sheep or goat producers should be held harmless.
- The higher the risk of association between wild sheep and domestic sheep or goats, the more intensively wild sheep herds should be monitored and managed. This is particularly important when considering “new” vs. “augmented” wild sheep populations.
    - Site-specific protocols should be developed when association with domestic sheep or goats is probable. For example, decisions concerning percentage of translocated wild sheep that must be radio-collared for achieving desired monitoring intensities should in part, be based upon the subsequent level of risk of association with domestic sheep or goats.
    - Intensive monitoring provides a mechanism for determining proximity of wild sheep to domestic sheep or goats and for evaluating post-release habitat use and movements.
    - Budgets for wild sheep translocation projects should include adequate funding for long-term monitoring.
  - Wild sheep managers should identify, analyze, and evaluate the implications of connectivity and movement corridors between largely insular herds comprising a meta-population against opportunities for increased association with domestic sheep or goats. Analyses should include distribution and continuity (Mack 2008) among populations of wild sheep and the anticipated frequency of movement among or within wild sheep range. In doing so, the benefits of genetic interchange and its resultant implications for population viability, must be weighed against the risks of disease transmission (Bleich et al. 1990), especially if dispersing or wandering wild sheep could travel across domestic sheep or goat grazing allotments or trailing routes, private land holdings or other areas where the potential transfer of endemic pathogens from an infected wild herd to a naïve herd could occur.
  - Removal of wild sheep known, or suspected to have closely associated with domestic sheep or goats is considered to be an effective management tool. Atypical movements by wild sheep can heighten risk of association with domestic sheep or goats. Additional measures to achieve effective separation should be implemented if such association occurs. However, removal of wild sheep from occupied, normally-anticipated wild sheep range is not always the best management option. Continuous risk of association exists during active grazing seasons when domestic sheep or goats are grazed within normally-anticipated wild sheep range. Thus, removal of individual wild sheep is an ineffective method for maintaining separation, and has potentially negative consequences for population viability. Removal of wild sheep should occur only after critical evaluation and further implementation of measures designed to minimize association and enhance effective separation.
  - Wild sheep populations should have pre-determined population objectives, and should be managed at agreed-upon densities to minimize the potential for dispersal. Because some

dispersal occurs regardless of population density, some risk of association is always present if domestic sheep or goats are within range of dispersing wild sheep.

- Agencies should develop a written protocol to be implemented when association between wild sheep and domestic sheep or goats is confirmed. Notification requirements, appropriate response and post-contact monitoring options for both domestic sheep and goats and dispersing or wandering wild sheep should be included. Moreover, wildlife agencies should collaborate with agricultural agencies, land management agencies, producers and permittees, grazing industry representatives, and wild sheep advocates to develop an effective, efficient, and legal protocol to be implemented when feral or abandoned domestic sheep or goats threaten to associate with wild sheep but for which no owner can be identified. Written protocol examples are provided in Appendix B (British Columbia Fish, Wildlife and Habitat Management Branch) and Appendix C (Wyoming Game and Fish Department).
- Wildlife agencies should develop databases as a system to report, record, and summarize association between wild sheep and domestic sheep or goats and its outcome; the WAFWA WSWG website (<http://www.wafwa.org/html/wswg.shtml>) would be a logical host. Further, wildlife managers and federal/crown land managers should encourage prompt reporting by the public of observed proximity between wild sheep and domestic sheep or goats.
- Wild sheep managers should coordinate with local weed or pest management districts, or other applicable agencies or organizations involved with weed or vegetation management, to preclude the use of domestic sheep or goats for noxious weed or vegetation control in areas where association with wild sheep is likely to occur. Agencies should provide educational information and offer assistance to such districts regarding disease risks associated with domestic sheep or goats. Specific guidelines (Pybus et al. 1994) have already been developed and implemented in British Columbia, and are available at: <http://www.for.gov.bc.ca/hfp/publications/00006/>.
- Specific protocols for sampling, testing prior to translocation, and responding to disease outbreaks should be developed and standardized to the extent practical across state and federal jurisdictions. Several capture and disease-testing protocols have been developed and are available to wild sheep managers (Foster 2004, UC-Davis 2007, WAFWA 2009). Protocols should be reviewed and updated as necessary by the WAFWA Wildlife Health Committee (WHC) and presented to WAFWA Directors for endorsement. Once endorsed, agencies should implement the protocols, and the WHC should lead an effort to further refine and ensure implementation of said protocols.
- Agencies should coordinate and pool resources to support the ongoing laboratory detection and interpretation of important diseases of wild sheep. Furthermore, wild sheep managers should support data sharing and development and use of standardized protocols (WAFWA 2009). Interagency communication between wildlife disease experts such as the WAFWA Wildlife Health Committee (WHC) should be encouraged to enhance strategies for monitoring, managing and improving health of wild sheep populations through cooperative efforts.

- Wild sheep management agencies should develop educational materials and outreach programs to identify and interpret the risk of association between wild sheep and domestic sheep or goats for producer groups, owners of small and large farm flocks, animals used for packing and 4-H animals. In some cases, regulation may be necessary to maintain separation.

### **Recommendations to BLM, USFS, Parks, Protected Areas and Other Applicable Land Management Agencies**

- Joint federal land management agency guidelines on management of domestic sheep or goats in wild sheep habitat should be developed and included in broad agency policy documents. Guidelines should be based on the need to minimize risk of association and provide effective separation between domestic sheep or goats and wild sheep. Approved guidelines should not include an automatic “sunset” provision or expiration date but, if there is a maximum longevity (i.e., a “sunset clause”) specified by federal policy and if appropriate and timely review cannot be completed, guidelines should remain in effect, rather than becoming obsolete, until any mandated review can be completed.
- The use of domestic sheep or goats as pack animals by persons that travel in identified wild sheep habitat should be prohibited by the appropriate management agency (e.g., USDA Forest Service 2011). Where legislation or regulations are not already in place, an outreach program to inform potential users of the risks associated with that activity should be implemented to discourage use of domestic sheep or goats as pack animals.
- Land management agencies that regulate or are responsible for domestic sheep or goat grazing allotments, trailing routes, vegetation management, use as pack stock, or any other uses involving domestic sheep or goats should only authorize such use(s) outside of occupied wild sheep range.
- Land management agencies should require immediate notification by permittees and their herders of association between wild sheep and domestic sheep or goats and in no case should it be more than within 24 hours of any such event. Notification procedures, including phone numbers and contact information for permittees and use of satellite phones in backcountry settings, should be outlined in Annual Operating Instructions for grazing allotments and trailing permits, and should include consequences for failure to report.
- Land management agencies should map active and inactive domestic sheep or goat grazing allotments and trailing routes, including information on dates of use and contact information for responsible grazing or trailing permittees.
- Land management agencies must ensure that advance written instructions (such as USFS Annual Operating Instructions) exist, and that they address management, retrieval, and disposition of domestic sheep or goats present on public lands prior to or after permitted grazing or trailing dates.

- Land management agencies should work collaboratively with state, provincial, and territorial wildlife and agricultural interests to develop written agreements that address management, retrieval, and disposition of domestic sheep or goats occupying public lands where there is no permitted use. Such agreements should also address the presence of feral sheep or goats and other exotic ungulates, especially ovines such as aoudad, red sheep, urial, or argali that are detected on public lands.
- Land management agencies should review domestic sheep allotment boundaries or other use areas, such as trailing routes, and reconfigure boundaries or routes to avoid or minimize overlap with occupied wild sheep habitat. Techniques available to accomplish this include the use of geographic or topographic barriers that enhance species separation, and temporal or spatial separation resulting from implementation of novel domestic sheep or goat grazing management strategies.
- Land management agencies should undertake habitat enhancements that improve wild sheep habitat outside allotment boundaries in an effort to attract wild sheep away from domestic sheep allotments.
- Land management agencies should undertake water developments to divert wild sheep away from domestic sheep allotments or domestic sheep or goats away from areas used by wild sheep.
- Land management agencies should ensure that Annual Operating Instructions require careful management and vigilant herding to minimize potential association between wild sheep and stray domestic sheep or goats. A count-on, count-off inventory of domestic sheep or goats must be required as a condition of operation with follow-up provisions to account for missing livestock.
- In areas of high risk of association, trucking should be required to minimize risks associated with trailing. Trucking of domestic sheep or goats is preferred to trailing because there is less chance of straying and, thereby, less likelihood of association with wild sheep, particularly when domestic sheep are in estrus.
- Land management agencies should require marking of all permitted domestic sheep and goats to provide for rapid ownership identification of stray animals.
- In the event of trailing, on-site compliance monitoring to minimize strays must be conducted by the permittee or the land management agency.
- Land use or resource management plans should explicitly address the potential for domestic sheep or goats to associate with wild sheep. Land use plans should evaluate the suitability of permitting activities involving domestic sheep or goats, and determine the best course of action with respect to wild sheep conservation. Plans should also identify general areas of public land where domestic sheep or goats cannot be permitted for weed control, commercial grazing, recreational packing, vegetation management, or other uses.

- Land management agencies should coordinate with appropriate entities involved in weed control programs that use domestic sheep or goats on public or Crown lands (Pybus et al. 1994), adjoining private lands, or state, provincial, and territorial wildlife habitat management areas to minimize risk of association between domestic sheep or goats and wild sheep.
- Within occupied or suitable wild sheep habitat, where topography, vegetation, and other parameters allow, conversions of allotments from domestic sheep or goats to types of domestic livestock that pose a lower risk of disease transmission to wild sheep should be implemented.
- Within suitable, historic wild sheep habitat not currently occupied by wild sheep, agencies should not convert cattle grazing allotments to domestic sheep or goat grazing, or allow trailing if restoration of wild sheep populations is an agency goal.
- Under emergency conditions, stocking of allotments not currently under permit to domestic sheep or goats should be permitted only after an adequate risk assessment has been completed. Any such assessment must include appropriate documentation and the conclusion that effective separation can be assured, and can be accomplished via project-level NEPA analysis.
- Land management agencies should incorporate state, provincial, or territorial wild sheep management plans either in, or as supplements to, federal resource or land use management plans, and collaborate with wildlife agencies to ensure comprehensive risk assessments (Clifford et al. 2009, USDA Forest Service 2010a, b) of domestic sheep or goat grazing allotments or trailing routes in wild sheep habitat are thorough and complete. To accomplish this objective, training adequate to allow the preparation of such assessments must be provided.
- Where mandatory buffer zones (frequently cited as a minimum of 9 airline miles [14.5 km]) between domestic sheep or goats and wild sheep have been used to minimize association, it should be recognized that buffer zones apply to herds or populations of wild sheep, rather than individual wandering wild sheep. In some cases, buffer zones have been effective in reducing association between wild sheep and domestic sheep or goats. However, in contiguous wild sheep habitat where movements by wild sheep have the potential to exceed *a priori* expectations, buffer zones may not be effective or practical (Schommer and Woolever 2001).
- Topographic features or other natural or man-made barriers (e.g., fenced, interstate highways) can be effective in minimizing association between wild sheep and domestic sheep or goats. Site-specific risk assessments should be completed to evaluate the efficacy of using natural barriers, defined buffer zones, or other actions to minimize risk of contact. Given the wide range of circumstances that exists across jurisdictions, buffer zones may not be needed in all situations. Conversely, buffer zones should not be precluded as an effective method to address potential association between wild sheep and domestic sheep or goats.

- Land management agencies, in collaboration with jurisdictional domestic sheep or goat health agencies, should work with producers and permittees to prevent turnout or use of sick or diseased domestic sheep or goats on grazing allotments and trailing routes. Sick or diseased domestic sheep or goats can increase risk of association with wild sheep because they likely are less able to keep up with their bands and are more prone to straying. Sick or diseased animals observed on the range should be reported to land management agency personnel immediately, and inter-agency coordination to address the situation should promptly occur. Further, responsible agencies must require that domestic sheep or goats are in good health before being turned out. For example, Alberta and British Columbia have developed health certification protocols (Pybus et al. 1994) that must be complied with before domestic sheep are turned out for vegetation management in conifer regeneration efforts (available at: <http://www.for.gov.bc.ca/hfp/publications/00006/>). We emphasize that the higher the risk of association between domestic sheep or goats with wild sheep, the higher the certainty of domestic animal health should be. Further, it must be recognized that even clinically healthy domestic sheep or goats can still carry pathogens that are transmissible to wild sheep, and thus, pose a significant risk to wild sheep.
- Proportional to risk of association between domestic sheep or goats and wild sheep, land management agencies should work with stakeholders to implement a variety of management practices. Examples include: herders, dogs or other guarding animals trained to repel animals foreign to domestic sheep bands or goat flocks (wandering wild sheep or various predators), regular counts, removal of sick animals, confinement of domestic sheep or goats at night, adequate fencing configurations, covenants, allotment retirements, conversion of class of livestock, trucking versus trailing, and others. Effectiveness of management practices designed to reduce risk of association are not proven (Baumer et al. 2009, Schommer 2009) and therefore should not be solely relied upon to achieve effective separation. Such practices could however, help achieve separation when applied outside of occupied wild sheep range or connected and potentially mitigate impacts associated with straying domestic sheep or goats, or wandering wild sheep.
- Land management agencies and wildlife agencies should cooperatively manage for quality wild sheep habitat and routinely monitor habitat to detect changes in condition.
- In areas where association between wild sheep and domestic sheep or goats is likely, land management agencies should post advisory signs at trailheads, campgrounds, and other high-use areas that are designed to educate visitors about the issue of interaction and to encourage prompt reporting of association of wild sheep with domestic sheep or goats. Agencies should also ensure that individuals keep dogs under immediate voice control or on leash to prevent scattering of domestic sheep or goats in permitted areas, or disturbances to wild sheep.
- Land management agencies should clearly define the processes, protocols, and timelines for short-term or emergency management actions when intervention is needed to minimize risk of association between wild sheep and domestic sheep or goats.

- Land management agencies should develop programs to foster and recognize the benefits of compliance, cooperation, and cost-sharing in efforts to prevent commingling of wild sheep and domestic sheep or goats on shared ranges.
- In collaboration with wild sheep management agencies, land management agencies should investigate and implement an option to allow the permittee or producer, or appropriate agency representatives, to remove commingling wild sheep and, where not already established, develop or clarify legal authority for removing stray domestic sheep from public lands by lethal means.
- Risk assessment should be conducted on an appropriate geographic scale regardless of jurisdictional boundaries. Recognizing the limits of regulatory authority, land management agencies should consider private in-holdings and adjacent private lands when conducting risk assessments.
- Land management agencies should closely evaluate timing of permitted domestic sheep or goat grazing or trailing activities to reduce risk of disease transmission. For example, grazing estrous domestic females heightens attraction and increases the probability of association between wild sheep and domestic sheep, and should be eliminated where benefits can be accrued.
- In areas of high risk of association between wild sheep and domestic sheep or goats, agencies and permittees should ensure enhanced monitoring of grazing and trailing patterns using global positioning system (GPS) collars or other technology that provide detailed data on movements and grazing patterns. While enhanced monitoring will not reduce risk of association, it is vital for development of meaningful risk assessments and to ensure appropriate management recommendations are taken to achieve effective separation.

### **Recommendations to Wild Sheep and Other Conservation Organizations**

- Recognize and support efforts of wild sheep management agencies and industry leaders in maintaining effective separation.
- Assist wildlife and land management agencies with development of informational brochures and other materials that identify and explain risk of association between wild sheep and domestic sheep or goats.
- Assist wildlife and land management agencies with educational efforts regarding risks associated with the use of domestic sheep or goats as pack animals in wild sheep habitat. If use is authorized, encourage participants to closely control, tether, and night-pen their pack stock. Encourage prompt reporting of association between wild sheep and domestic sheep or goats, and promote a reporting system for monitoring association between wild sheep and domestic sheep or goats.

- Maintain or establish open lines of communication with domestic sheep or goat producers and industry organizations to reduce polarization. Jointly organized and cooperatively-funded workshops on risk assessment, identification of practical strategies to achieve effective separation, development and distribution of pamphlets or brochures, and public speaking opportunities are tangible examples of collaborative, multi-disciplinary approaches to address potential disease transmission.
- Continue to negotiate alternatives or incentives for domestic sheep or goat permittees to shift their operations to grazing allotments outside of wild sheep habitat. Advocate that permittees convert to a different class of livestock with lower risk of disease transmission or waive permitted domestic sheep or goat use in areas where risk assessment indicates high potential for association with wild sheep.
- Encourage and support development and funding of cooperative research, and encourage agencies and conservation groups to commit resources necessary to maintain wild sheep populations.

### **Suggested Management Practices for Domestic Sheep and Goat Permittees**

*The following suggestions are based largely on recommendations provided by CAST (2008), Baumer et al. (2009), or USAHA (2009), and are intended to provide a responsible and common-sense approach for reducing risk of association. However, there is no science-based evidence or evaluation that assesses the effectiveness of these actions to reduce risk or enhance separation (Schommer 2009).*

- Implement the following reporting and record keeping procedures or use an existing standard such as the BC (Appendix B) or Wyoming (Appendix C) models:
  - Require prompt, accurate reporting by herders working on domestic sheep or goat grazing allotments where association of wild sheep with domestic sheep or goats is possible.
  - Support fluency in English or translators for foreign herders in order to facilitate accurate reporting.
  - Require sheepherders to use cellular or satellite phones or two-way radios, and location equipment such as GPS receivers to report and record grazing movements and encounters with wild sheep. Seek cost-sharing partnerships for providing communications equipment when an operator changes grazing management practices for the sole purpose of minimizing domestic sheep association with wild sheep. Partnerships could include wildlife management agencies, federal land managers, or private organizations.

- Require herders to record GPS locations, counts, losses and other information in a log book.
- Place only experienced, informed and responsible sheepherders on allotments located near wild sheep habitat.
- Ensure that all domestics are individually marked and traceable to source flocks.
- Conduct full counts when trailing, immediately any time scattering occurs and regularly during general grazing.
- Develop agreements between permittees and wildlife agencies that provide for locating and reacquiring all stray domestic sheep, either dead or alive. In the event of missing domestic sheep, a comprehensive search should be initiated immediately and the land manager and state wildlife agency must be notified of missing and subsequent recovery of animals.
- Develop a detection and response protocol that includes:
  - Reporting of wild sheep and domestic sheep associations (animal counts and GPS location) to the appropriate wildlife agency.
  - Reporting of stray or missing domestic sheep to the land management agency who will, in turn, report that information to the wildlife agency.
  - Removal of stray domestic sheep by the permittee, land manager or wildlife agency personnel.
  - Removal of individual commingling wild sheep by wildlife agency personnel.
  - Collection of standardized diagnostic samples from stray domestic sheep or commingling wild sheep.
- Utilize the following trailing procedures:
  - Conduct full counts when moving on and off each allotment/grazing site.
  - Truck domestic sheep through “driveway” areas that pass through occupied wild sheep habitat.
  - Truck in water (if needed) to reduce straying.
  - Immediately remove animals unable to stay with the flock/herd and move them to a base property.
  - Avoid trailing more than 5 miles per day and stop trailing when sheep or lambs show signs of fatigue. Provide for a “babysitter” or removal of lagging sheep when trailing.

- In the event that all animals cannot be accounted for, the permittee must advise the responsible agency and initiate efforts to locate missing animals and implement removal protocol as necessary.
- Sick domestic sheep should be removed from allotments immediately and must never be abandoned.
- Select herder's camp, nighttime bedding ground, and midday bedding ground locations that maintain communication between guard dogs and herding dogs by smell, sound (barking) and sight, and to take advantage of differences in the sleep cycles of guard dog and herding dogs. Place mature and effective guard dogs and herding dogs with domestic sheep (at least 2 of each per 1000 animals) and do not use female dogs in heat.
- If grazing on federal lands, comply with established "bed ground" standards. Where conditions permit, construct temporary electric or boundary fences to ensure that domestic sheep remain within selected bedding grounds.

### **Suggested Management Practices on Private Lands**

- Recognize that domestic sheep or goat farming on private lands can influence wild sheep population viability on adjacent public or other private lands.
- Report any observed association between wild sheep and domestic sheep or goats on or near private land to the appropriate wildlife conservation agency.
- Cooperate with wildlife agencies in reporting and removing feral sheep or goats and other exotic bovine ungulates such as aoudad, red sheep, urial, or argali that are detected within or near wild sheep habitat.
- Participate in cooperative educational efforts to enhance understanding of the issues of disease transmission between domestic sheep or goats and wild sheep.
- Do not release or leave unattended domestic sheep or goats in areas where they may seek, or be sought, by wild sheep.
- Cooperate with appropriate agencies, agricultural and producer associations, conservation organizations, and other interested stakeholders to develop effective, comprehensive risk management approaches to help ensure effective separation between wild sheep and domestic sheep or goats, consistent with private property rights in and near wild sheep habitat.
  - Possible approaches include, but are not limited to, changing species or class of livestock, purchase of land or the domestic sheep or goats, use of methods to ensure physical separation, or development of conservation incentives, bylaws, covenants, or legislation.

- Consider partnerships with non-governmental organizations and wild sheep advocate groups for cost sharing on risk management/mitigation strategies such as fencing, or other domestic sheep or goat management actions that reduce risk of disease transmission from private flocks to wild sheep.
- Support “effective separation” fencing standards that are designed to prevent nose-to-nose contact and aerosol transmission through adequate physical distance, in order to reduce transmission of respiratory disease agents. Examples include: electric outrigger fences (2 feet from page (woven) wire fencing) and double fencing (two page-wire fences with a minimum spacing of at least 10 feet). A combination of fencing methods with or without the use of effective livestock guardian dogs may be most effective to ensure that wild sheep do not physically contact domestic sheep or goats on private land.
- Participate in or support cooperative research to enhance understanding and test mitigation protocols for disease risk management.
- Carefully consider the consequences of using domestic sheep or goats for weed control on private lands where association with wild sheep could occur. Work with agencies to develop alternative weed management strategies to reduce risk of association, while adequately managing weed problems.

## Appendix E

### WILDLIFE DISEASES

#### RECOMMENDATIONS ON BEST MANAGEMENT PRACTICES FOR DOMESTIC SHEEP GRAZING ON PUBLIC LAND RANGES SHARED WITH BIGHORN SHEEP

USAHA Joint Working Group  
Committee of Wildlife Diseases and  
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October 2009

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## REPORT OF THE COMMITTEE

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### Introduction

In October 2007, the United States Animal Health Association (USAHA) Committees on Wildlife Diseases and Sheep and Goats established a working group comprised of staff or members of state and federal animal health agencies, wildlife and public land management agencies, the American Sheep Industry and Wild Sheep Foundation (formerly Foundation for North American Wild Sheep (FNAWS)). The working group was charged with developing best management practices for grazing domestic sheep (and goats) on public lands where contact between domestic sheep and bighorn sheep may occur. This working group concept was subsequently endorsed by USAHA as part of a broader resolution on "Cooperative Research and Management of Wildlife/Livestock Disease Interactions" approved in October 2007. The task of this subcommittee was limited to one specific aspect of domestic sheep management, the interaction of bighorn sheep and domestic sheep on public lands. Consistent with USAHA direction, this document primarily focuses on the domestic sheep portion of best management practices in these situations. A comprehensive list of best management practices for bighorn sheep can be found in the Western Association of Fish and Wildlife Agencies (WAFWA) Bighorn Sheep Working Group Recommendations for Domestic Sheep and Goat Management in Wild Sheep Habitat (1).

Although public lands grazing is a privilege and agencies are not required to offer alternative allotments for domestic sheep grazing, work group members recognize the historical role that public land grazing has

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played in sustaining viable working landscapes and rural communities, and that domestic sheep and goats, as well as bighorn sheep, are important to the cultural and ecological heritage of most western states. The work group also recognizes that domestic livestock grazing can be a useful tool for habitat management. The working group, co-chaired by Drs. Walt Cook and Michael Miller, assembled relevant background information and met via multiple teleconferences, email and in person at the 2008 USAHA meeting to develop and discuss recommended best management practices. As per the group's charge, the recommendations that were developed focus on practices intended to minimize opportunities for interspecies contact on shared range that could lead to transmission of respiratory pathogens. In some recent pneumonia epidemics in bighorn sheep, the cause has been attributed to endemic respiratory pathogens, and in other epidemics the cause has been attributed to pathogens introduced via interactions with domestic sheep (2). These recommendations do not presume to estimate the probability or risk of contact. Quantifying the risk of interspecies disease transmission between bighorn sheep and domestic sheep in a natural setting is problematic (2). Further research is needed to better understand and estimate the magnitude of potential risk to bighorn sheep arising from interactions with domestic sheep and other wild ruminant species, as well as the risks of endemic disease and potential influences of seasonal and environmental factors on these risks. Indeed, the original USAHA resolution that led to this working group directed federal agencies to fund research on epidemiology and pathogenesis of bighorn/domestic sheep disease interactions.

These recommended best management practices are intended to serve as one element of more comprehensive approaches for managing the health of bighorn sheep populations. We recognize that all of the management practices listed may not be incorporated into some management plans, but offer them as a complete list for consideration. Hopefully these recommendations will complement or emphasize risk reduction practices already in place, and encourage their development elsewhere. Although national in scope, these recommendations do not mandate programs at the state, local, or tribal level. Local primacy dictates that management occurs at the state or regional level whenever possible. The work group members believe that these recommended best management practices represent a viable alternative to terminating domestic sheep grazing on public lands where goals include minimizing the risk of epidemics in bighorn sheep that may result from interspecies contact. However, there are cases where these practices have been considered and mutually judged to be infeasible by responsible agencies and permittees or their representatives in the course of negotiations via established processes for timely conflict resolution. When this occurs, the work group members encourage timely identification of alternative grazing allotments or arrangements to minimize impacts on permittees

## REPORT OF THE COMMITTEE

and interruption of ongoing domestic sheep operations.

**Recommended best management practices for grazing domestic sheep (and goats) on public lands where contact with bighorn sheep may occur:**

### Domestic sheep husbandry

1. Select only highly gregarious breeds of sheep (e.g., Merino, Rambouillet, "Western/white-faced ewes", fine wools and crosses thereof) for grazing on shared ranges.
2. Use pregnant domestic ewes or ewe-lamb pairs (i.e., ewes with lambs) for grazing near occupied bighorn sheep habitats; avoid grazing open ewes, yearling replacement ewes and ewes that have lost their lambs because ewes in estrus attract bighorn rams.
3. Maintain a band size of less than 900 ewes with single lambs (1,800 total) or 700-800 ewes with twin lambs (2,100 to 2,400 total), or of less than 1,500 dry ewes or yearlings.
4. Require instruction/training and supervision for ranch (i.e. camp tenders and shepherders) and agency staff members and frequent instructions to the shepherders concerning locations where forage and water is available for domestic sheep and monitor that the grazing standards and guidelines are being followed.
5. Require instruction/training and supervision for ranch (i.e. camp tenders and shepherders) and agency staff members and frequent instructions to the shepherders concerning recognizing bighorn sheep and allowable methods for preventing contact between bighorn sheep and domestic bands.
6. Place more experienced, informed, and responsible shepherders on allotments located nearest to bighorn sheep habitats.
7. Place mature and effective guard dogs and herding dogs with domestic sheep (at least 2 of each per band). Female dogs in heat should not be placed on allotments.
8. Conduct full counts of all individual ewes when moving onto and off of each allotment.
9. Maintain an appropriate ratio of marker sheep within bands; depending on local needs and conditions, ratios should be no fewer than 1 marker for every 100 adult sheep. More markers may be required when dictated by local conditions.
10. Count marker sheep on a regular basis, immediately any time sheep scatter and more frequently (e.g., once or twice per day) if required under local grazing agreements. It is customary to count marker sheep when they are bedded and this should be encouraged. After sheep scatter, complete a full count as soon as reasonably possible.
11. Place bells on at least 1 in every 100 mature ewes to serve as

## WILDLIFE DISEASES

warning, and for identification and location of sheep relative to other sheep.

12. Select camp locations and bedding grounds that are acceptable to sheep and encourage sheep to remain within the bedding grounds.
13. Select herder's camp, nighttime bedding ground, and midday (siesta) bedding ground locations that maintain communication between guard dogs and herding dogs by smell, sound (barking) and sight, and to take advantage of differences in the sleep cycles of guard dog and herding dog. If grazing federal lands, comply with established "bed ground" standards. Construct temporary electric or boundary fences in congregation areas (e.g., bed grounds) where feasible.
14. Truck in water (if needed) to prevent straying.
15. In situations where sheep are difficult to observe because of dense vegetation or difficult terrain, always count marker sheep after emerging from such conditions.
16. Increase sheepherder vigilance on bright moonlit nights because sheep may rise to graze under these conditions.
17. Truck domestic sheep through "driveway" areas that include occupied bighorn sheep habitat where interspecies contact is considered likely by the land management agency staff in consultation with the state wildlife management agency staff. It is not always possible to truck sheep into certain rugged areas; in these cases other arrangements may need to be made.
18. Do not trail more than 5 miles per day and stop trailing when sheep or lambs show signs of fatigue. Provide for a "babysitter" or removal of lagging sheep when trailing. Follow additional agency guidelines (where applicable) on federal lands.
19. Remove sick or physically disabled domestic sheep from the band.
20. Require that sheepherders use communication equipment such as cellular or satellite phones or two-way radios (when service is adequate) and location equipment such as global positioning system (GPS) receiver to report and record grazing movements and encounters with bighorn sheep. Seek cost-sharing partnerships for providing electronic and other equipment when an operator changes grazing management practices for the sole purpose of minimizing domestic sheep contact with bighorn sheep; these partnerships could include wildlife management agencies and private organizations.
21. Have sheepherders use a log book or other record keeping aids to record GPS locations, counts, losses, and other information as needed or required.

### Domestic goat husbandry

Because domestic goats are less gregarious than domestic sheep and have a greater tendency to stray or disperse, the work group recommends

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that domestic goats are not grazed in occupied bighorn sheep habitat.

When goats are grazed near bighorn sheep for weed control or other purposes, electric fencing can be used to keep the two species apart. Pack goats used in bighorn sheep habitats should be tethered when not being trailed.

### Strays and commingling responses

1. Develop a commingling detection and response protocol that includes the following:
  - a. reporting bighorn sheep (including a count and GPS location) that are attempting to associate with domestic sheep bands;
  - b. reporting stray or missing domestic sheep to the land management agency;
  - c. immediate, two-way notification (between permittee and land management agency) of actual commingling sightings;
  - d. a post turn-off stray domestic sheep removal protocol;
  - e. a protocol for removing individual commingling bighorn sheep;
  - f. where feasible, collect standardized diagnostic samples on stray domestic sheep and commingling bighorn sheep;
  - g. instructions for domestic sheep herders to not leave sick domestic sheep behind when trailing or moving from or between allotments.
2. Develop and follow a plan for locating and reacquiring (dead or alive) stray sheep. If a domestic sheep is determined to be missing, the permittee will immediately initiate a comprehensive search and notify the land manager.
3. Allow/encourage the permittee or producer and appropriate agency representatives to remove any stray domestic sheep in areas where interspecies contact could occur.
4. Allow/encourage the permittee or producer and appropriate agency representatives to haze bighorn sheep that appear intent on commingling.
5. Allow/encourage the permittee or producer and/or appropriate agency representatives to remove commingling bighorn sheep.
6. Where not already established, develop or clarify legal authorities for removing stray domestic sheep from public lands by lethal means.
7. Encourage voluntary allotment monitoring by permittees or independent observers in conjunction with federal and state agencies; where used, independent observers should receive prior training from permittees or agency personnel.
8. Develop pilot incentive/recognition programs to foster and recognize compliance, cooperation, and cost-sharing in efforts to prevent commingling of bighorn sheep and domestic sheep on shared ranges.

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### Allotment boundary and habitat manipulations

1. Review domestic sheep allotment boundaries and/or use and reconfigure where appropriate and feasible to avoid or minimize overlap with critical bighorn sheep habitat. Where feasible, use strategies and techniques including:
  - a. geographic/topographic barriers that enhance species separation;
  - b. seasonal or spatial separation through domestic sheep grazing management.
2. Undertake habitat enhancements that improve bighorn sheep habitats (both summer and winter range) outside allotment boundaries and/or attract bighorn sheep away from domestic sheep allotments.
3. Undertake water developments to enhance bighorn sheep distribution or to move domestic livestock away from preferred bighorn sheep foraging areas by augmenting available natural water sources.
4. Where appropriate and feasible, determine the number of domestic sheep animal unit months (AUMs) that overlap bighorn sheep habitat and negotiate among cooperators (state, federal, industry, private) to locate potentially available replacement AUMs or allotments if necessary.

### Other bighorn sheep management practices

1. Manage for bighorn sheep population densities and distribution that reduce potential for interspecies contact.
2. Use hunting and/or other means to discourage bighorn sheep from using domestic sheep allotments where alternative suitable habitats are available.
3. Use hunting and/or other means to discourage bighorn sheep from staying in proximity to or approaching domestic sheep bands.
4. Remove all sick or dead bighorn sheep encountered.

The foregoing best management practices are based on current understanding about the circumstances leading to pasteurellosis epidemics in bighorn sheep after contact with domestic sheep. Improved understanding about this relationship and about controlling respiratory diseases in sheep in general should allow refinement of these practices. Research needs to be funded; federal, state and non-profit agencies and organizations are all encouraged to fund research. For example, developing methods that decrease the occurrence or severity of pneumonia and pasteurellosis in either domestic or bighorn sheep, including the development and use of vaccines, immunostimulants, or long-acting therapeutic agents, might lead to advances in managing both. Outcomes of such research could aid in decreasing risks posed by interspecies interactions, or decreasing bighorn sheep susceptibility to

pathogens. In developing biologic and therapeutic agents as tools, future research should focus not only on safety and efficacy of the products, but also on the potential for practical use in free-ranging populations.

The work group members recognize that this issue is controversial. Indeed, many of the recommendations found here were not reached via consensus but through majority opinion. This has been an important issue throughout the western United States. Several other working groups both at the state (e.g. Wyoming, 3) and national level (Western Association of Fish and Wildlife Agencies, 1) have convened working groups to address this issue. It is our hope that the list of options provided here will assist land and wildlife managers and permittees to reduce conflicts and minimize the risk of disease transmission.

**References:**

1. Western Association of Fish and Wildlife Agencies (WAFWA). 2007. Wild Sheep Working Group, Initial Subcommittee. Recommendations for Domestic Sheep and Goat Management in Wild Sheep Habitat, June 21, 2007. 27 pp. <http://www.wafwa.org/documents/wswg/>

## Appendix F – Survey Results and Written Comments

### Mount Zirkel Bighorn Sheep Management Plan

#### 1. Are you a resident of Colorado? (Please check one.)

		Response Percent	Response Count
Yes		47.6%	30
No		52.4%	33
		answered question	63
		skipped question	1

#### 2. Have you hunted bighorn sheep in the past?

		Response Percent	Response Count
Yes		52.4%	33
No		47.6%	30
		answered question	63
		skipped question	1

#### 3. Have you applied for a bighorn sheep hunting license in GMU S73 in the past?

		Response Percent	Response Count
Yes		85.7%	54
No		14.3%	9
		answered question	63
		skipped question	1

**4. Which of the activities listed below do you participate in that may affect your interest in bighorn sheep in the Mount Zirkel area? (Check all that apply.)**

		Response Percent	Response Count
Hunting		98.4%	62
Wildlife Watching		50.8%	32
Own land in or near bighorn sheep range		1.6%	1
Livestock production or grazing		3.2%	2
Hiking, skiing and other outdoor recreation		39.7%	25
Other (please specify)		7.9%	5
		<b>answered question</b>	<b>63</b>
		<b>skipped question</b>	<b>1</b>

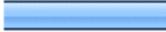
**5. How important are wild bighorn sheep to you?**

		Response Percent	Response Count
Very Important		90.3%	56
Somewhat Important		9.7%	6
Neither Important, nor Unimportant		0.0%	0
Somewhat Unimportant		0.0%	0
Very Unimportant		0.0%	0
I am not sure.		0.0%	0
		<b>answered question</b>	<b>62</b>
		<b>skipped question</b>	<b>2</b>

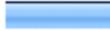
**6. How important is it to you that there are bighorn sheep in Colorado in the future?**

		Response Percent	Response Count
Very Important		98.4%	61
Somewhat Important		1.6%	1
Neither Important, nor Unimportant		0.0%	0
Somewhat Unimportant		0.0%	0
Very Unimportant		0.0%	0
I am not sure.		0.0%	0
		answered question	62
		skipped question	2

**7. To what extent do you agree with the statement below? (Please check one.) I believe that CPW is currently doing an adequate job of managing bighorn sheep in GMU S73.**

		Response Percent	Response Count
Strongly agree		18.0%	11
Somewhat agree		45.9%	28
Neither agree, nor disagree		9.8%	6
Somewhat disagree		1.6%	1
Strongly disagree		0.0%	0
I am not sure.		24.6%	15
		answered question	61
		skipped question	3

8. To what extent do you agree with the statement below? (Please check one.) I believe that federal agencies are currently doing an adequate job of managing bighorn sheep in GMU S73.

		Response Percent	Response Count
Strongly agree		6.5%	4
Somewhat agree		17.7%	11
<b>Neither agree, nor disagree</b>		29.0%	18
Somewhat disagree		16.1%	10
Strongly disagree		3.2%	2
I am not sure.		27.4%	17
		<b>answered question</b>	<b>62</b>
		<b>skipped question</b>	<b>2</b>

**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 Jackson and Routt County. (Please type a number from 1 to 7 which indicates how important you feel each item should be, where 1 is the most important item and 7 is the least important.)**

	Response Average	Response Total	Response Count
Bighorn sheep populations	2.02	121	60
Deer and elk populations	2.23	134	60
Non-motorized recreation (hiking, backpacking, skiing, etc.)	3.43	206	60
Motorized recreation (ATV riding, Off-road driving, etc.)	4.90	294	60
Livestock grazing	4.39	268	61
Mineral extraction and mining	5.43	328	60
<b>Residential and commercial development</b>	<b>6.03</b>	<b>362</b>	<b>60</b>
	<b>answered question</b>		<b>61</b>
	<b>skipped question</b>		<b>3</b>

**10. Which of the following do you believe is the main factor limiting the number of bighorn sheep in Colorado? (Please check one.)**

		Response Percent	Response Count
Disease		50.8%	31
Predation		16.4%	10
Hunting		0.0%	0
Loss of habitat/Land development		23.0%	14
Competition with other wildlife or domestic animals for food		1.6%	1
I am not sure.		4.9%	3
Other (please specify)		3.3%	2
		<b>answered question</b>	<b>61</b>
		<b>skipped question</b>	<b>3</b>

**11. Have you reviewed the draft bighorn sheep management plan for GMU S73? (Please check one.)**

		Response Percent	Response Count
Yes		50.0%	30
No		50.0%	30
		<b>answered question</b>	<b>60</b>
		<b>skipped question</b>	<b>4</b>

**12. 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 GMU S73? (Please check one.)**

		Response Percent	Response Count
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.		11.5%	7
<b>Maintain current ram hunting opportunity and sex ratio, which would limit crowding and encourage harvest of rams of different ages, but would decrease each hunter's likelihood of drawing a license.</b>		68.9%	42
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 would require the longest wait to draw a permit.		18.0%	11
I am not sure.		1.6%	1
	<b>answered question</b>		<b>61</b>
	<b>skipped question</b>		<b>3</b>

**13. Which of the following alternatives would you prefer to guide CPW's decisions about the number of bighorn sheep in GMU S73 in the next 10 years? (Please check one.)**

		Response Percent	Response Count
<p>Small increase in population: A slight increase in population in the next several years, then a stable number of bighorn sheep maintained through hunter harvest. The number of hunting licenses available would remain nearly stable and risk for disease would be minimized, but the opportunity to view wild sheep would be reduced.</p>		23.0%	14
<p><b>Moderate increase in population: Increase current number of bighorn sheep, which will eventually allow for some level of increases in the number of hunting licenses available each year, and an increase in the opportunity to view wild sheep. This alternative may increase the risk of diseases among wild sheep.</b></p>		52.5%	32
<p>Large increase in population: doubling or tripling the number of wild sheep which will allow for longer-term increases in the number of hunting licenses available each year for both rams and ewes, increased opportunities to view wild sheep, but may also increase the risk of disease as the bighorn population increases.</p>		21.3%	13
<p>I am not sure.</p>		3.3%	2
		<b>answered question</b>	<b>61</b>
		<b>skipped question</b>	<b>3</b>

**14. Please use the space below to write any additional comments or observations about bighorn sheep management in the Mount Zirkel area that you would like to share.**

Response  
Count

31

Habitat treatment on winter range should be a priority. CPW should also work with the USFS to improve travel corridors between summer and winter ranges, and to improve connectivity of habitat throughout the DAU. Fire is our friend. Protecting migration routes through private property to winter range is very important. CPW should work with the USFS to reduce potential conflicts between domestic sheep and bighorn sheep. This includes recommending the closure of all vacant grazing allotments in bighorn sheep habitat. CPW should not even consider renewing the statewide MOU when it expires. There is nothing in the mission statement of CPW about maintaining a healthy livestock industry in Colorado. The only concern of CPW should be the welfare of bighorn sheep populations in the state. There are other state agencies with the mission of representing the interests of the livestock industry. Each agency should focus on their own mission. CPW should work with landowners in the eastern portion of the DAU to reduce the likelihood of bighorn sheep interaction with domestic sheep on winter range.

Habitat improvement on winter range should be a top priority along with opening the forest along historic BHS travel corridors. Vacant domestic sheep allotments should be retired where they overlay current or potential BHS habitat

Prescribed burns are needed to open corridors to winter range. Specifically a corridor from Bear Mt. to Sheep Mt. The population will have difficulty increasing without access to additional winter range. Reduce the amount of domestic sheep grazing near the wilderness area.

Thanks for reintroducing the sheep here and doing a great job in general

As WY resident just to the north of the CO border I have been recreating in the Zirkel Wilderness more often lately. As I expand trips to the south I hope to meet the sheep expanding their range north. I also am hopeful that my daughter ( a CO resident) will draw this unit someday. I hope that you are able to keep expanding the opportunities for viewing and hunting. Thanks for your effort.

I don't like the present system of drawing for sheep in this unit or any other. Those with more points should be allowed to hunt 1st!

Your plan is well thought out and well prepared. I think there is room to sustain additional sheep on the landscape. This format is also a great method to collect survey data. Thanks for the opportunity to provide comments.

There are many "equal" factors limiting sheep in CO. Land Development, disease, etc... The Zirkel herd is basically a disease issue waiting to happen. We should consider it an opportunistic herd allowing more harvest/opportunity and less quality because there is no way to control the domestic interaction that will occur (which we knew when the sheep were transplanted). Raise a bunch of sheep, give folks an opportunity to hunt and if the day comes when domestics transfer disease....at least you will have maximized the benefit of the herd. Our state's sheep harvest "objectives" in almost every unit is significantly less than it

should be especially when compared to our peer states. Use this herd as a test to see how it holds up to different (increased) harvest/opportunity scenarios. If lamb recruitment is good....would suggest much more aggressive ewe harvest as a test as well.

S73 should be managed for a ram age at harvest >8 years old. It is important that the federal agencies reduce any domestic sheep grazing allotments within 35 miles of this bighorn sheep population, no matter what the cost. The domestic sheep industry is the main reason for the decline of bighorn sheep populations across the west and should be held responsible for any further declines.

I live in Steamboat and apply for this unit with the idea I could use a bow at the start of the season and use the rifle if I have a hard time finding them with a bow. It's close and a little earlier than most rifle hunts. I would trust Colorado DOW to find the right answers with the idea that we have a sustainable herd.

Thank you for including me in this survey. One of the earlier questions asked us to rank the uses for the unit. I believe I put livestock production as number 3 but feel the livestock production should probably not include domestic sheep in the areas. Are there currently any domestic sheep grazing these counties other than 4H or FFA projects around the barn?

My current age is 60 years, and I realize I may never successfully draw, however management and control of these majestic animals is the only way to insure their survival. Keep up the good work.

Sounds like there is a lot of room for habitat improvement. also don't be afraid to buy out sheep allotments we all know what kills wild sheep. it only takes one tame sheep and years of hard work and lots of money and the herd of wild sheep are gone.

I observed a single mature ram on Arapaho Ridge in 1997 while elk hunting, I have several pictures of the ram with the North Park in the back ground. Over crowding, thus leading to a higher rate of disease, seems to have historically had the greatest negative impact on sheep herds within the state. I would urge the CPW to work towards maintaining a healthy herd rather than to succumb to pressure to drastically increase herd size and potentially loose the entire herd.

On a previous question about importance i marked that grazing and sheep population were very important. The grazing of domestic animals needs to be monitored much more strictly to insure that domestic sheep and goats can not interact with the wild sheep. The practice of open range should not be allowed in sheep areas and ranchers should be held accountable. Landowners have no issues when it comes to charging thousands of dollars to hunt sheep on their property so they should also be fined if domestic animals venture into sheep habitat. Predator hunting should also be increased in the sheep units.

I have not heard much about the Mount Zirkel area and the proposals made for bighorn sheep. I feel like if this is a important interest for the CPW service they should make more effort to spread information and awareness for bighorn sheep in Colorado.

The draft management plan was interesting. keeping adequate separation from domestic sheep should be the top priority issue.

I am not as familiar with this area as I am in others. But I applaud the DOW for the choice of gene pool which made up the original transplant. I am in favor on not allowing domestic sheep grazing on the range. I would favor the purchase, if need be, of the current sheep grazing leases from the ranchers to ensure no comingling of domestic and wild sheep. I would disagree with any plan to transplant or allow any wolf introduction into the general area or in fact the state.

I would assume that CPW has already eliminated all possible contact between wild sheep and domestic sheep and goats on the entire range of the Mount Zirkel sheep herd or it is just a matter of time before there is a major die-off in the area no matter how many wild sheep there are.

As much as I would love to hunt Bighorn sheep "in my own backyard" I have concerns about the tags being issued. Based upon my scouting and reports from others in the know, it seems as though the herd is rather small and that the area in which they range is even smaller, relatively speaking. For these reasons I would like to see a more cautious, conservative management plan for this herd. Even if it means closing the season for a few years.

I think the herd should be kept as high as is safely possible

The biggest concern that CPW needs to be concerned with is how to deal with the wolves that are moving down from the north. When they get there (if they are not already there), how is CPW & CDOW going to maintain current ungulate populations in S73, and the rest of Colorado? Disease is something that CPW needs to be concerned with, but right now predation, mainly wolves, is what they should be prepared to deal with.

Manage sheep for their health and well being above all

While I understand that the ram/ewe ratio is very high, this is a problem of not enough ewes. There are NOT too many rams. Ram licenses should remain the same and the ewe licenses should be eliminated until the population increases. It should be acceptable to the CPW to have a higher than normal ram/ewe ratio until we have enough ewe population and recruitment to justify giving out more ram licenses. After the population grows, it would then be more realistic to reduce the ram/ewe ratio.

I drew a tag in 2010, I did not shoot a ram. I saw a number of rams the oldest being about 7.5 yrs. I thought you may have opened the unit a couple of years too early for rams. The ewe and lamb population was strong which means good things to come.

Just want you to do everything possible to increase the population size, which would eventually allow for more ram licenses, but maintain trophy quality as bighorn sheep hunting should be a trophy hunt, given the number of years it takes to draw the license.

Get rid of the sheep allotments.

It can be summed up for me as a hunter pretty simply. I would love to draw a tag to hunt in an area, but would be disappointed to draw a tag and see nothing but half curl rams throughout the hunt. I spend a lot of time in the Poudre Canyon hunting and trapping, but rarely (once every other season) see even a legal ram while up there. If there are only a small amount of half curl rams in an area that will be hunted, I would like to see the number of tags reduced until the "quality"

of the herd remains. I don't know how many cattle diseases are transmissible to big horn sheep, but I remember from my Wildlife Biology studies that there are certain diseases that domestic sheep carry that can have devastating impacts on big horn populations. I don't know how much sheep or even goat grazing is practiced in the Zirkel area, but that is one thing that I don't like to see in an area that I am interested in hunting sheep. I worry that the presence of sheep, and the possibility of disease transmission to big horn sheep, will influence the herd in the long run. Just my two cents, thanks for reading.

The sheep area 73 is in my opinion a very harsh climate and or habitat for sheep. The reason that I say this is my personal observation of the lack of lambs with the ewes and the marginal growth as indicated by the growth rings on the ram I harvested in 2011.

I believe that there is a strong interest for more opportunity to view and hunt sheep in this unit. I also believe that there is more opportunity for this herd to grow than first thought.

All Ewe hunting should be done with archery only tags since it is used primarily as a dispersal method. I feel that there is a significant amount of habitat for a large increase in herd size. Also the amount of sheep grazing in and around the Zirkel wilderness is ridiculous. As an elk hunter who hunts buffalo pass every year the amount of sheep grazing in and around the wilderness is extremely excessive. I see stray sheep every year lost in the wilderness and around the town of Steamboat. These stray sheep are what cannot be controlled and easily could spread disease. I also feel that the season dates for mountain lion hunting does not allow access to where these mountain lions which are feeding on these sheep.

Don't have a computer and only applied for S-73 because I thought with my 3 preference points I would be lucky. Don't know anything about area.

I would hope that the department that manages these sheep don't let them populate to where disease and starvation would take a big toll. It has been said that the faster you climb the harder you fall so I believe they need to be managed through hunting. Their summer range is adequate to handle a lot more sheep, winter range, I'm not sure about that. I have personally seen 23 rams in one bunch and 9 ewes and lambs in another plus 15 ewes and lambs in another. I have been doing pack trips in that unit since early 50s and it is a great privilege to see sheep there. Seen a big gray wolf there last fall so I could only ??? ?? do to the public pressure and predators. Good luck.

**Public suggestions for possible herd objectives/management:**

Expect 50% success rate

Option 1 – no change, 2 ram, 1 ewe license

Option 2 – first season Aug. 15 – Sept. 15, 2 ram, 1 ewe

Second season Sept. 20 – Nov. 1, 2 ram, 1 ewe

Rams  $\frac{3}{4}$  curl or 6 years old

Option 3 - first season Aug. 10 – Sept. 10, 2 ram, 1 ewe

Second season Sept. 11 – Oct. 11, 2 ram, 1 ewe

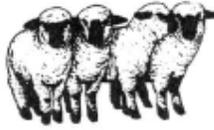
Third season Oct. 12 – Nov. 15, 2 ram, 1 ewe

Option 4 – Harvest as many rams and ewes to keep herd at 80 – 100 animals

Option 5 – Transplant 20 animals at a time when herd reaches 100

Option 6 – Combination of options 3 and 5

## Appendix G – Written Letters



### *Colorado Wool Growers Association*

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Colorado Parks & Wildlife  
PO Box 775777  
Steamboat Springs, CO 80487  
Jeff.yost@state.co.us

March 15, 2012

**RE: Comments Pertaining to the Bighorn Sheep Management Plan  
DAU RBS – 37 Mount Zirkel Herd**

The Colorado Wool Growers Association (CWGA) is adamantly opposed to any bighorn sheep herd expansion within Colorado. Our organization's position of not supporting expansion stems from two key issues: 1) anti-grazing groups are using the bighorn/domestic sheep conflict as a means to leverage sheep ranchers off of their grazing allotments; and 2) the U.S. Forest Service's (USFS) litigation driven, current policy using the presence or proximity of bighorn sheep to domestic sheep grazing allotments to eliminate domestic sheep grazing.

A very timely example of the negative and overreaching impacts of bighorn sheep management appeared March 9<sup>th</sup>, in the Grand Junction *Daily Sentinel* article entitled "Forest Service authorizes restricted alabaster mine." The mine site is near Redstone. The article indicates that the Colorado Parks and Wildlife agency (CPW) is concerned about the declining bighorn sheep herd, which apparently, has been declining in the absence of any mining in that area for a number of years. The Forest Service's response (which one would assume was made in cooperation with CPW) to issuing the mining permit was to include a \$52,500/year fee for 5 years, that the mine owner must pay for a monitoring study of bighorn sheep in the area. These types of decisions are nothing short of extortion, and are in direct conflict with multiple-use objectives for federal land.

Prior to the 2005 bighorn release, staff from the Division of Wildlife (DOW) contacted our Executive Director Bonnie Brown, and told her that the DOW was in the process of transplanting bighorns, but the domestic sheep permittees didn't need to worry because the transplant was taking place on private ground. Brown immediately expressed her concerns that bighorns were unlikely to stay on private ground, and the DOW again gave reassurance that this transplant would not have any negative impacts on domestic sheep grazing allotments.

### Comments Regarding Specific Language in the DAU RMS-37 Plan

The plan's language is shown in *italics*

Page 3: *"By the early to mid-1900's greatly reduced fire frequency and disease transmission from large numbers of domestic sheep grazing the alpine likely contributed to the disappearance of this herd."..... "Potential threats to this herd include disease epidemics following contact with domestic livestock or from high densities of wild sheep in concentrated areas, severe weather events, and potential predation from mountain lions on limited winter sheep range."* The plan gives an extensive description of the bighorn sheep population history which provides an explanation for the eventual disappearance of bighorns in the DAU. Over-hunting and fire suppression are identified as the causes. *"Fire suppression or lack of larges fires in this area since the late 1800's no doubt contributed to the near complete disappearance of bighorn sheep in this area."* Disease transmission from domestic sheep is never identified as a contributing factor to the decline of this herd, yet the management plan periodically interjects that disease transmission from domestic sheep has something to do with the herd decline.

Additionally, contact between bighorn sheep and domestic sheep does not automatically equate to disease transmission. While it is true that disease transmission can occur between domestic and bighorn sheep in forced enclosure situations, the degree of risk of potential disease transmission in open range situations is unknown. Furthermore, bighorns and domestic sheep would *never!* be penned together on the open range, so making the assumption that if disease transmission occurs in forced enclosure settings, then disease transmission must or is highly likely to occur on the open range is at best, an unsubstantiated claim.

Page 23: *"To prevent possible disease transmission the ram in Trophy Mountain was euthanized and disease tested."* Since this ram was in a fenced enclosure with elk, the statement leads the reader to believe that CPW had reason to suspect disease transmission between elk and the bighorn ram. This scenario speaks to the point that that disease transmission to bighorns is a lot more complicated than just simply leaping to the conclusion that domestic sheep are the always the problem.

Page 33: *"There are a number of strains of pneumonia causing bacteria commonly carried by domestic livestock that are highly pathogenic to bighorns, and introduction of a pathogenic strain or another novel pathogen into bighorn populations can cause all-age die-offs and lead to low lamb recruitment."... "The susceptibility of bighorn sheep to pathogens originally introduced by domestic livestock is regarded as the primary factor limiting Rocky Mountain bighorn sheep populations in Colorado."..... "Based on a substantial volume of literature, one of the most important aspects of bighorn sheep management is to keep them separated from domestic livestock (George et al. 2009)."..... "The decline and eventual disappearance of the Park Range bighorn herds was no doubt influenced by a combination of market hunting, habitat loss from reduced fire frequency and/or fire suppression, and pneumonia epidemics resulting from contact with domestic sheep."* The management plan doesn't mention that bighorns naturally carry a variety of *Pasteurellaceae* bacteria even in the absence of contact with domestic sheep. The degree of risk of disease transmission under range conditions is unknown; therefore, it is only speculation that domestic sheep introduced pathogens to bighorns, and the information should be presented as such, instead of stating it as a known fact. A substantial volume of literature has been unduly influenced by "pen studies," and makes unqualified assumptions about disease transmission on the open range. We are all aware that if bighorns and domestic sheep are forced

to co-mingle disease transmission can occur. However, forced co-mingling never occurs on the open range so those studies are of limited value. The DAU RBS-37 plan also fails to mention that the *Pasteurellaceae* bacteria is extremely fragile once it leaves the respiratory tract, and is only viable for a short time once it is in the environment. Therefore, direct contact (i.e. – nose-to-nose) and possibly even prolonged contact is needed to transmit the bacteria. The degree of risk with a random encounter or just having the two species in proximity of each other doesn't automatically equate to disease transmission. Additionally, all-age die-offs and reduced lamb recruitment can and does occur in the absence of contact with domestic sheep.

*Page 36: "Red Canyon MOU"* The Red Canyon MOU has expired and the CPW and USFS should adhere to Memorandum of Understanding for Management of Domestic Sheep and Bighorn Sheep that was adopted by CDOW, USFS, BLM, CDA, and the CWGA in 2009.

*Page 37-38:* CPW should make every effort to capture and observe bighorns that are suspected of contact with domestic sheep, instead of just killing the bighorn. Capture and observation would result in better management data, than what is gained by just killing the bighorn based on an assumption that disease transmission might have taken place.

*Page 38: "While the best tools to prevent contact are continued monitoring use radio collars on both wild bighorns and domestic sheep...."* The presence of livestock protection dogs can act as a deterrent to discourage bighorns from approaching bands of domestic sheep, CPW and sheep permittees should work together to utilize this important management tool.

*Page 38: "The management strategy for the Zirkel herd is to maintain the population at a moderate level within the constraints of the available winter habitat and prevent contact with domestics as is possible in order to reduce the probability of catastrophic disease mortality.* Once again, the degree of risk of disease transmission under open range conditions is unknown; therefore, it is inaccurate to state that contact with domestic sheep results in the *probability of catastrophic disease mortality.*

*Page 39: Satellite collars.* We are interested in proactive ideas and solutions that adhere to the intent of the MOU between CPW and the CWGA to maintain healthy bighorn populations and sustaining an economically viable domestic sheep industry.

*Page 40: "Range extension management into these areas is not being pursued by CPW due to the proximity of these areas to domestic sheep grazing allotments on USFS land."* We appreciate CPW consideration of not expanding the bighorn sheep range in this area. Until the USFS reverses its trend of reducing or eliminating domestic sheep grazing due to the proximity of bighorns, we cannot support expansion of bighorn herds.

*Page 56: Appendix D – Recommendations taken from : Western Association of Fish and Wildlife Agencies (WAFWA) Wild Sheep Working Group Recommendations for Domestic Sheep and Goat Management in Wild Sheep Habitat – July 21, 2010.* This document should not be included in the DAU management plan. It does not meet the intent of the MOU signed by the CPW and the CWGA, nor does it support USFS multiple-use objectives.

In closing, the Colorado Wool Growers Association is not opposed to bighorn sheep. Like other residents of Colorado we highly value these majestic animals. Unfortunately, the bighorn sheep are being used as a tool to leverage sheep producers off of their federal grazing allotments. Until such a time that better science, and balance and objectivity can be incorporated into the management of bighorn herds in Colorado, the CWGA regretfully objects to any additional herd expansion that jeopardizes the viability of our industry.

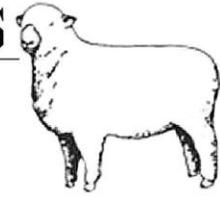
Respectfully,

*Gary Visintainer*  
CWGA President

CC: Ron Velarde



# RAFTOPOULOS RANCHES



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December 13, 2012

## Big Horn Sheep Management Plan DAU RBS – 37 Mount Zirkel Herd

Raftopoulos Brothers Livestock and S Lazy S Ranch are sheep permittees on The Medicine Bow-Routt National Forest. We would like to take the opportunity to comment on the afore mentioned draft plan.

In considering this plan, we need to understand recent history and the MOUs that were and should continue to be in place. The DOW entered into MOUs with the Forest Service as well as the Colorado Woolgrowers Assn., BLM, and the Colo. Dept. of Agriculture. The essence of the agreement was the understanding that domestic sheep allotments would not be jeopardized as well as any bighorns that came into contact with domestic sheep and/or strayed from the area would be captured and dealt with accordingly. These agreements should continue to be honored.

According to the CPW Bighorn Sheep Management Plan, any trans-located herd is to be given a tier 2 or lower status. The Mt Zirkel herd is a trans-located herd.

In the third paragraph on page 3, the author insinuates that domestic sheep may have led to the die off of the original herd. He has no scientific knowledge of this and this statement should be eliminated. In fact, his history of this herd states that the lack of fires, extensive hunting, and natural disasters led to the die off. In the same paragraph he alludes to the potential threats of domestic sheep.

Due to the tier 2 status of this herd as well as the unknown of winter range potential, Alternative one for both population and sex ratio objectives should be utilized. The Ram's Mt. herd in Canada experienced an all age die off when they tried to manage numbers at full potential of winter range carrying capacity. The Georgetown herd in Colorado is experiencing the same all age die off. There are no domestic sheep in either area.

We support big horn sheep populations in the U.S., but they can be introduced and managed for the benefit of everyone involved without being a detriment to other interested parties. The domestic sheep industry in Colorado is an important sector of our economy and depends on the National Forest lands for their ability to raise a natural product for the consumers in this country. Sheep allotments use only 5% of the total lands administered by the US Forest Service, which leaves 95% of those lands available for introduction of big horns without any conflict, political or otherwise.

We would hope the CPW takes our comments into consideration in establishing the Big Horn Sheep Management Plan DAU RBS – 37 Mount Zirkel Herd.

Respectfully Submitted,

Steve Raftopoulos  
Raftopoulos Bros Livestock  
S Lazy S Ranch



Rocky Mountain Bighorn Society  
P. O. Box 8320  
Denver, Colorado 80201  
720-201-3791

March 18, 2012

Jeff Yost  
Terrestrial Biologist - CPW  
P.O. Box 775777  
Steamboat Springs, CO 80487

Dear Mr. Yost:

The Rocky Mountain Bighorn Society (RMBS) welcomes the opportunity to comment on the draft management plan for Rocky Mountain bighorn sheep DAU RBS-37 prepared by Colorado Parks and Wildlife (CPW) biologists. Our organization represents approximately 800 members, with a mission to promote science-based management of Colorado's state animal, the Rocky Mountain bighorn sheep, and to assure the sportsman's privilege to pursue bighorn sheep.

The RMBS is pleased to see issues we believe to be a priority for this DAU are included in the draft management plan. We agree that habitat treatment on winter range and in travel corridors is of primary importance in RBS-37. We encourage CPW to engage conservation partners such as RMBS and Wild Sheep Foundation to develop treatment plans and funding sources for habitat improvement in the DAU. We also believe that protecting migration corridors and minimizing the potential for interaction with domestic sheep on private land in the eastern portion of the DAU is critical. The Natural Resources Conservation Service and Owl Mountain Partnership may prove to be excellent partners in accomplishing these goals.

The potential for interaction between bighorn sheep and domestic sheep is of great concern as this herd expands its range. We acknowledge both the Statewide Memorandum of Understanding (MOU) and the Red Canyon MOU, but we encourage CPW to engage the issue with the U. S. Forest Service to the extent possible. A long-term goal should be the permanent closure of all vacant grazing allotments within occupied or suitable bighorn sheep habitat in or adjacent to the DAU. Modification of boundaries of active allotments may be another alternative to reduce the likelihood of interaction. We would like to see a DAU map included in the management plan that shows active and vacant grazing allotments overlaid with bighorn sheep overall range.

Despite the volume of literature definitively linking interaction with domestic sheep to all-age die-offs and long-term low recruitment rates in bighorn sheep, many domestic

sheep producers and other members of the general public continue to deny that this link exists. We would like to see many more references to specific literature that supports this knowledge included in the "Diseases and Parasites" section (Pg. 33) of the draft management plan.

The RMBS prefers **Alternative Two: 150-200 Bighorn Sheep** under *Posthunt Population Objective* in the draft management plan. We recognize that current habitat conditions in the DAU may preclude a larger population without risking detrimental aspects of high density such as reduced recruitment and increased disease risks. In addition, the risk of domestic sheep interaction makes a moderate population objective prudent at this time. However, if habitat treatment increases the quantity and quality of bighorn sheep habitat, and the status of active domestic grazing allotments in the DAU changes, we hope that CPW will revisit the posthunt objective as range conditions improve.

The RMBS prefers **Alternative 2: 60-80 Rams per 100 Ewes** under *Posthunt Sex Ratio Objective* in the draft management plan. We believe that this alternative allows for both adequate hunter opportunity and optimum reproductive potential for the herd. This metric is preferred over average hunter success rate or average age of harvested rams, which both may often be affected by the effort or ability of the individual hunters who draw tags.

Some studies have suggested that more aggressive harvest of bighorn sheep, particularly ewes, may reduce the likelihood of detrimental aspects of high density, such as reduced recruitment and increased disease risks. As the Mount Zirkel Herd nears its objective, it may make an excellent candidate for CPW to evaluate the effects of increased harvest rates on herd health and growth rate. We encourage CPW to consider testing management strategies for bighorn sheep that are "outside the box" of tools currently used by bighorn sheep managers.

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  
Vice President  
Rocky Mountain Bighorn Society  
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(970) 640-6892