

# OREGON'S BIGHORN SHEEP & ROCKY MOUNTAIN GOAT MANAGEMENT PLAN

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Oregon Department of Fish and Wildlife



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## COVER PHOTO CREDITS

Right Top: Capturing the original mature California bighorn ram in Williams Lake, British Columbia before transport to Oregon in 1954 (Vic Masson).

Right Bottom: Rocky Mountain goats in the Wallowa Mountains of northeastern Oregon (Vic Coggins, ODFW).

Left Top: Modern net-gun capture technology using a helicopter and custom made transport bags to insure safety for animal and animal handlers (Nancy Smogar, ODFW).

Left Bottom: A young California bighorn ram in the acclimation pen at Hart Mountain National Antelope Refuge prior to release in 1961 (Vic Masson).

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## EXECUTIVE SUMMARY

Two bighorn sheep subspecies are native to Oregon: Rocky Mountain and California bighorn sheep. Expansion of American civilization without wildlife protection or management, and domestic livestock diseases led to their extirpation from Oregon by the mid 1940's. Present populations are the result of reintroductions and occupy only a small percentage of historic ranges. Oregon now supports 12 Rocky Mountain bighorn herds with a population estimate of 637 animals, and 32 California bighorn herds with 3,700 animals. Land use changes have rendered much of the original wild sheep ranges unsuitable for occupancy, but there is still considerable suitable habitat into which bighorns have been, or can be re-established.

The mountain goat (*Oreamnos americanus*) is perhaps the least recognized and least known of Oregon's big game species. The goat's obscurity is likely a result of the steep and rugged nature of its habitat. Consequently much of their habitat in Oregon remains intact. Rocky Mountain goats also were extirpated from Oregon during or prior to European settlement. Present populations also are the result of reintroductions with a 2003 estimated population of 400 animals in 3 main herds, and five other areas where goats are occasionally observed.

Bighorn sheep and Rocky Mountain goat restoration in Oregon has been possible because of the generosity and cooperation of other states and Canadian provinces contributing transplant stock without compensation, the assistance of dedicated individuals and groups such as Foundation for North American Wild Sheep and Oregon Hunters Association, and funding provided by annual auction and raffle tags. Additionally, the success of Oregon's program is due to the dedication of legislators, sportsmen and women, and biologists working together for a common goal.

The first *Oregon Bighorn Sheep Management Plan* was implemented in 1986. Stated goals were to establish viable bighorn herds in all suitable habitat while maintaining subspecies integrity within Oregon by maintaining separation of their respective distributions. *Oregon's Bighorn Sheep Management Plan* was revised in 1992. A dramatic expansion in distribution and number of bighorns indicates a great deal of progress was made toward fulfilling original goals of the plan. However, because large amounts of habitat remained unoccupied, the goal of expanding bighorn sheep distribution and numbers was retained. Further, many of the original issues and management strategies have remained consistent since 1986 and continue to direct current management of wild sheep in Oregon. No formal planning process has been implemented for Rocky Mountain goat management in Oregon. Historically, restoration and management efforts have been developed and implemented at local ODFW district levels with most funding provided through grants from organized groups such as Oregon Hunters Association.

This plan provides overall management direction for Oregon's bighorn sheep and Rocky Mountain goat programs for the next 10 years. It is ODFW's goal to have healthy populations of bighorn sheep and Rocky Mountain goat in all available, suitable habitat within Oregon. This plan summarizes the history and current status of Oregon's bighorn sheep and Rocky Mountain goats. It presents management guidelines for populations in Oregon and will guide future transplant activities, as well as assisting other concerned resource management agencies with planning efforts.

## TABLE OF CONTENTS

EXECUTIVE SUMMARY .....	i
TABLE OF CONTENTS .....	ii
LIST OF FIGURES AND TABLES .....	iv
<b>ROCKY MOUNTAIN BIGHORN SHEEP .....</b>	<b>1</b>
History .....	1
Description .....	3
Habitat .....	4
Transplants .....	5
Research .....	6
Current Management .....	6
<i>Subspecies Integrity</i> .....	7
<i>Population Management</i> .....	7
<i>Recreational Opportunity</i> .....	7
<i>Disease Management</i> .....	8
<i>Habitat Management</i> .....	8
<i>Law Enforcement</i> .....	9
Future Restoration Priorities and Research Needs .....	9
Hells Canyon Initiative .....	10
<b>CALIFORNIA BIGHORN SHEEP .....</b>	<b>11</b>
History .....	11
Description .....	13
Habitat .....	14
Transplants .....	16
Current Distribution and Status .....	16
Research .....	17
Current Management .....	18
<i>Subspecies Integrity</i> .....	18
<i>Population Management</i> .....	19
<i>Recreational Opportunity</i> .....	19
<i>Disease Management</i> .....	19
<i>Habitat Management</i> .....	19
<i>Law Enforcement</i> .....	20
Future Restoration Priorities and Research Needs .....	20
<b>ROCKY MOUNTAIN GOAT .....</b>	<b>23</b>
History .....	23
Description .....	26
Habitat .....	28

Transplants .....	29
Current Distribution and Status .....	30
Research .....	30
Current Management .....	31
Future Restoration Priorities and Research Needs .....	31
<b>ECONOMICS OF WILD SHEEP AND GOAT MANAGEMENT .....</b>	<b>34</b>
Economic Values .....	34
1991 Bighorn Hunter Survey .....	35
Nonconsumptive Values and Economic Impact .....	37
Program Income .....	38
Program Expenditures .....	39
Capture Cost .....	40
Transplant Monitoring .....	41
Population Monitoring .....	41
Research Costs .....	41
<b>ISSUES AND STRATEGIES .....</b>	<b>42</b>
Rocky Mountain Bighorn Management Issues .....	42
California Bighorn Management Issues .....	42
General Bighorn Management Issues .....	43
Rocky Mountain Goat Management Issues .....	48
All Species Management Issues .....	49
<b>LITERATURE CITED .....</b>	<b>51</b>
<b>APPENDICES .....</b>	<b>57</b>

## LIST OF FIGURES AND TABLES

Figure 1. Historic and current distribution of Rocky Mountain and California bighorn sheep in Oregon.....	1
Table 1. Current status and 2003 population estimate for Rocky Mountain bighorn Sheep herd in Oregon.....	2
Figure 2. Trend in Rocky Mountain bighorn sheep tag sales, Oregon, 1978–2002. ....	3
Table 2. Rocky Mountain bighorn sheep ram harvest in Oregon, 1978–2002. ....	3
Table 3. Date, source, and origin of stock used for Rocky Mountain bighorn sheep transplant into Oregon, 1939–2002. ....	5
Table 4. History of Rocky Mountain bighorn transplanted from Oregon to other states, 1980–1986.....	6
Table 5. Rocky Mountain Bighorn Habitat Improvement Projects 1992-2002.....	8
Table 6. Proposed transplant sites for Rocky Mountain bighorn sheep in Oregon. ....	9
Figure 3. Trend in California bighorn tag sales, Oregon, 1965–2003. ....	11
Table 7. Current status and 2003 population estimate for California bighorn sheep herds in Oregon.....	12
Table 8. California bighorn sheep ram harvest in Oregon, 1965-2002. ....	13
Table 9. Oregon’s California bighorn sheep transplant history, 1954–2003.....	15
Table 10. California bighorn sheep captured in Oregon and released in other states, 1968–2003.....	16
Table 11. California bighorns captured from Oregon herds, 1960-2003.....	17
Table 12. Proposed transplant sites for California bighorn sheep in Oregon. ....	21
Figure 4. Historic and current distribution of Rocky Mountain goats in Oregon. ....	23
Figure 5. Trend in Rocky Mountain goat tag sales, Oregon, 1978–2002. ....	24
Table 13. Current status and 2002 population estimate for Rocky Mountain goats in Oregon.....	24
Table 14. Rocky Mountain goat harvest history in Oregon, 1965-2002. ....	25

Table 15. Rocky Mountain goat transplant history in Oregon, 1950-2002. ....	30
Table 16. Proposed transplant sites for Rocky Mountain goats in Oregon. ....	32
Table 17. Recent trend in special wild sheep auction bid prices at the annual FNAWS banquet and convention. ....	36
Table 18. Estimated bighorn sheep hunter expenditures and associated personal income impacts in Oregon, 1991 and 2002.....	37
Table 19. Controlled bighorn sheep tag sales and revenue in Oregon, 1975–2002.....	38
Table 20. Annual bighorn program revenue from special auction and raffle tags in Oregon, 1987–2002.....	39
Table 21. Rocky Mountain goat controlled applications, tags, and revenue generated, Oregon, 1997–2002.....	39
Table 22. Total annual revenue from Oregon’s bighorn sheep tags, 1975–2002.....	40

## ROCKY MOUNTAIN BIGHORN SHEEP

### History

Rocky Mountain bighorns occurred in northeast Oregon (Bailey 1936) from the John Day-Burnt River divide north and east to the Snake River and the Oregon-Washington state line (Figure 1). They were especially abundant in Hells Canyon and the Wallowa Mountains. Archeological evidence suggests bighorn sheep were important to native Americans as a source of food and clothing, and petroglyphs depicting bighorn sheep can be found in several locations within their original Oregon ranges. During Oregon's homesteading era of early settlement, human populations were widely distributed throughout northeastern Oregon, bringing settlers into close contact with many herds. As a result, bighorns were a primary source of food for settlers and miners. Market hunting for bighorn also occurred because ram heads were valued mounts for people living in the eastern United States.

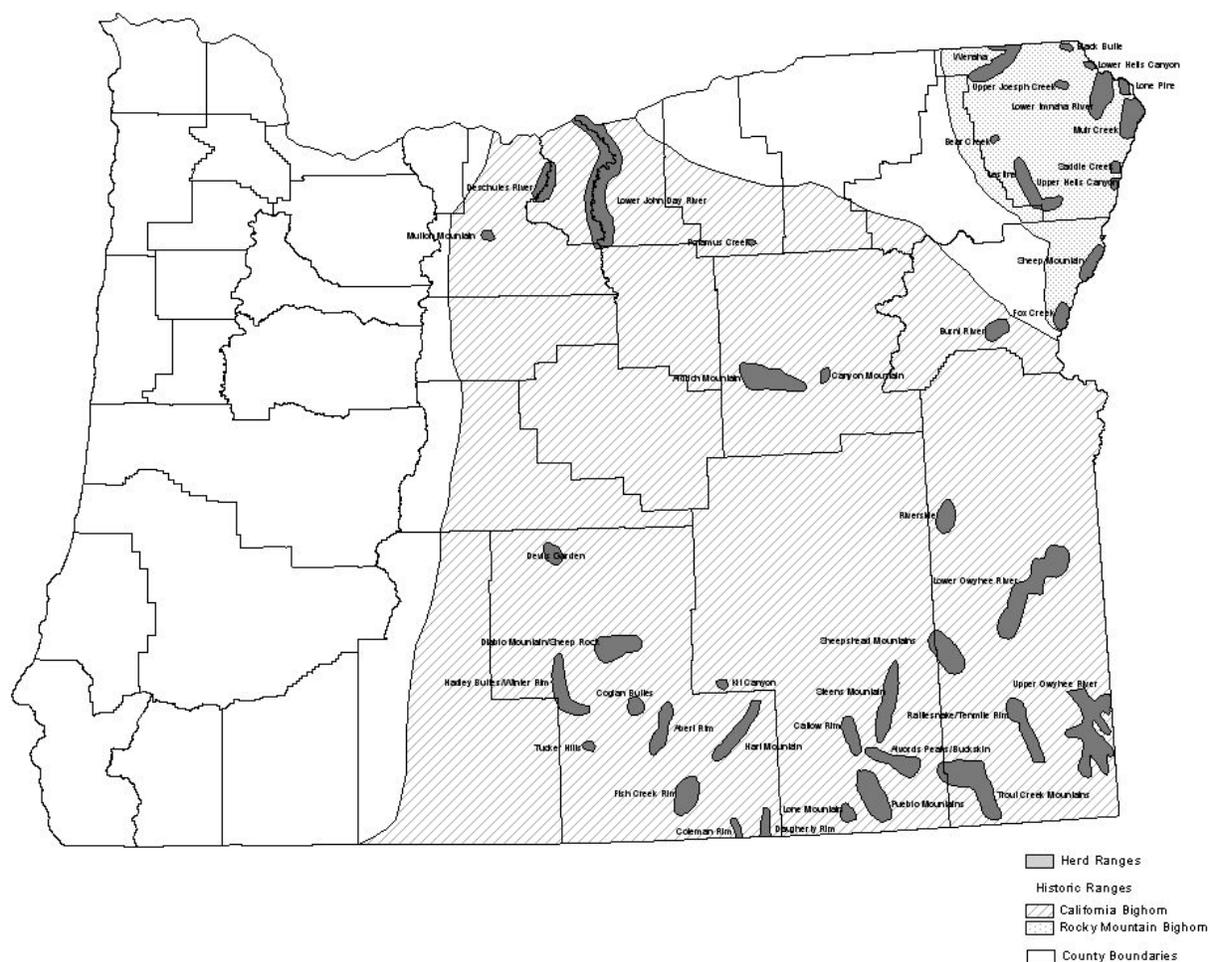


Figure 1. Historic and current distribution of Rocky Mountain and California bighorn sheep in Oregon (Adapted from Williams and Schommer 2001).

Between 1880–1920, thousands of domestic sheep grazed northeastern Oregon. Many bands were trailed through bighorn sheep habitat and no doubt came in contact with bighorns. At the time, impacts of domestic sheep disease and parasites on bighorns was not known. However, it has since been demonstrated that bacteria commonly carried by domestic sheep can infect and kill healthy bighorns (Foryet et al. 1994).

In 1911, mountain sheep (bighorns) were provided total protection from hunting (Anonymous 1911). Additional protection was attempted in the early 1900's through establishment of State Game Refuges. Because the few remaining Rocky Mountain bighorns at that time were reported in the Wallowa Mountains, the Wallowa Mountain Sheep Refuge was established in northeast Oregon in 1927 (Anonymous 1927). Unfortunately this attempt failed and Rocky Mountain bighorns were extirpated from Oregon by 1945. Indiscriminate hunting, unregulated grazing by domestic livestock, and parasites and diseases carried by domestic livestock all contributed to the eventual demise of Oregon's native Rocky Mountain bighorns.

An attempt was made to introduce Rocky Mountain bighorn sheep to Hart Mountain National Antelope Refuge in 1939 when 23 individuals were obtained from Montana and released on Hart Mountain's west slope. The last survivor of this transplant was observed in 1947. The first successful Rocky Mountain bighorn sheep transplant was in 1971 when 40 animals from Jasper National Park, Canada were reintroduced to Hells Canyon and the Wallowa Mountains. In 1992 the population was estimated to be 460 animals. Twelve separate herds are now considered established with a 2003 population estimate of 637 animals (Table 1).

Although the statewide population has increased, several pasteurellosis related die-offs have reduced rates of population increase and caused declines in some individual herds.

Controlled hunting for Rocky Mountain bighorn sheep began again in the fall of 1978 when two 6-day hunts with four tags each were authorized in the Hurricane Divide hunt area. Since that time, 181 rams have been harvested from 7 areas (Table 2). Number of Rocky Mountain bighorn tags authorized annually has been as high as 11 and as low as 3 (Figure 2). Horn measurements from harvested rams suggest hunters harvest predominately mature rams.

The Foundation for North American Wild Sheep and Safari Club International recognize the Rocky Mountain sub-species of bighorn as a separate trophy award category and keep separate

Table 1. Current status and 2003 population estimate for Rocky Mountain bighorn sheep herd in Oregon.

Herd Name	# Releases (# animals)	2003 Estimate	Current Status
Lostine	1 (20)	80	Increasing
Bear-Minam	4 (48)	35	Static
Lower Hells Canyon	3 (45)	35	Increasing
Lower Imnaha	3 (36)	165	Increasing
Upper Joseph Canyon	None <sup>a</sup>	40	Increasing
Wenaha	2 (43)	65	Static
Upper Hells Canyon	2 (54)	45	Static
Muir Creek	2 (27)	25	Declining
Saddle Creek	None <sup>a</sup>	10	Static
Lone Pine	None <sup>a</sup>	12	Increasing
Sheep Mountain	4 (42)	35	Declining
Fox Creek	2 (24)	90	Increasing
Total		637	

<sup>a</sup> Established by natural dispersal from other herds.

records. At this time neither Boone and Crockett Club or Pope and Young Club recognize Rocky Mountain bighorns as a separate award category. Twenty-four Rocky Mountain bighorn rams have scored greater than 180 points, which is the minimum for record book entry. Through 2002, 12 rams have been taken by auction or raffle tag holders.

Table 2. Rocky Mountain bighorn sheep ram harvest in Oregon, 1978-2002.

Hunt	Unit	Rams Harvested	Years Hunted	Boone & Crockett Score	
				Range	Average
Hurricane Divide	Snake River, Minam, Imnaha, Pine	66	20	111 5/8 – 203 5/8	163 0/8
Lower Imnaha	Snake River	78	18	122 6/8 – 184 6/8	162 7/8
Sheep Mtn.	Pine	8	7	157 1/8 – 183 7/8	170 1/8
Lookout Mtn.	Lookout	2	2	162 5/8 – 181 4/8	172 1/8
Bear Creek	Minam	5	4	120 0/8 – 164 5/8	142 3/8
Chesnimnus-Sled Springs <sup>a</sup>	Chesnimnus, Sled Springs	10	8	159 2/8 – 200 6/8	182 3/8
Wenaha	Wenaha	12	6	124 2/8 – 184 0/8	157 4/8
		181		111 5/8 – 203 5/8	164 3/8

<sup>a</sup> Eight auction or lottery tags and four draw tagholders hunted area.

Harvest has rarely exceeded 15% of the total estimated ram population and is typically less than 5% of the total population. Bag limit for bighorn hunts through 1990 was one ram with horns 3/4 curl or larger and all hunters were required to attend a pre-hunt orientation designed to show hunters how to field judge rams. In 1991 the bag limit was changed to one bighorn ram and mandatory pre-hunt orientation requirements were dropped. Since the first season, hunters have been required to have their harvested ram checked and scored by Department staff. Oregon law allows an individual to hold only one controlled bighorn permit in a lifetime.

## Description

Wild sheep are members of the Bovidae family, sub-family Caprinae (Nowak 1999) with two species native to North America, commonly called thinhorn and bighorn sheep. Rocky Mountain bighorns (*Ovis canadensis canadensis*) are a subspecies of bighorn sheep.

Rocky Mountain bighorns are the most abundant and largest bodied bighorn in North America and are generally found in sub-alpine to alpine habitats. Rocky Mountain bighorns have large bodies, thick coats and comparatively small ears. Mature rams have heavy robust horns with obvious brooming, bases 13–16 inches in circumference, and 36–40 inches in length.

Exceptionally large ram horns will exceed 45 inches in length with basal circumference larger than 17 inches and be more than full curl. Ewe horns are typically 8–10 inches long.

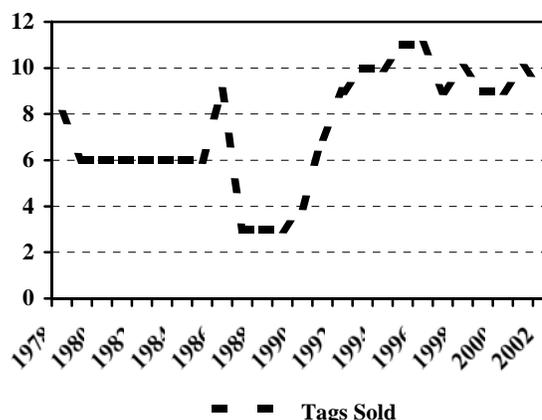


Figure 2. Trend in Rocky Mountain bighorn sheep tag sales, Oregon, 1978–2002.

Bighorn sheep are gregarious and spend most of the year in distinct group associations. Except for the breeding season, adult ram groups live separate from ewe-lamb-subadult groups. Ram groups are frequently called "bachelor groups" and usually occupy different habitats than females and young which reduces competition for available resources. Ram groups maintain a social hierarchy established and maintained primarily through head butting rituals. There is little interaction between males and females until breeding season or rut occurs.

Bighorns are polygamous and a few dominant rams do most of the breeding. In Oregon, Rocky Mountain bighorns breed in November and early December. Gestation is approximately 180 days and a single lamb is usually born. The lambing season generally spans May–June. Shortly before lambing, ewes become solitary and seek a secluded place in rugged terrain. After approximately one week, the ewe and lamb join other ewes and newborn lambs to re-form the ewe-lamb-subadult groups they will associate with for most of the year. Ewes usually become reproductively active at two years old. They remain reproductively active throughout their life span but are in their prime from ages 3–10.

Ages are determined by counting growth rings on the horns. Bighorn sheep are relatively long lived animals. Those surviving their first year commonly live 10–12 years. Ewes tend to live longer than rams even in the absence of ram hunting. In Oregon, The oldest known ram age is 15 ½ years old while the oldest known ewe age is 19 ½ years old.

## **Habitat**

Rocky Mountain bighorn sheep habitat in Oregon consists of either canyons associated with the Snake River and its tributaries, or grassland winter ranges with alpine summer ranges in the Wallowa Mountains. Canyon habitats are typified by low elevation steep bunchgrass slopes interspersed with rock rims. Bighorns move along canyon walls but generally do not move to alpine summer ranges. However, rams from upper Hells Canyon do move to the Wallowa Mountain alpine ranges for summer. Elevational use in canyon habitats varies from 1,000–5,000 ft. Bighorns in the Wallowa Mountains migrate between high elevation (>8000 ft) alpine summer ranges and steep grassland winter ranges on the Lostine Wildlife Area at elevations of 4,500-7,500 ft. Most northeast Oregon bighorn herds have excellent grassland ranges with abundant food. Canyon habitats have short, mild winters allowing excellent animal growth. Because forage generally dries out in August and September resulting in lower forage quality and quantity, canyon bighorns may be nutritionally stressed on ranges with few shrubs in years with poor autumn rains.

Grasses are the major item in bighorn diets throughout most of the year. However, forbs and shrubs are seasonally important depending on type and availability. In certain plant communities, fire can be used to remove dead, unpalatable forage, renew plant growth and vigor, improve forage quantity and quality, and retard juniper encroachment. Bighorn sheep generally are not competitors for forage with domestic cattle and other big game species because they typically occupy rugged habitats not used by other big game species. Domestic sheep can compete with bighorn sheep for forage because open range operations frequently include trailing through remote, rugged habitat.

## Transplants

Since 1971 a total of 444 Rocky Mountain Bighorn have been transplanted to establish new herds or supplement existing herds (Table 3). Early transplants were not always successful because bighorns were released in areas containing domestic sheep. After disease implications were understood, subsequent transplants were completed in areas without domestic sheep and transplant success increased. Sixty-six animals have been transplanted from Oregon herds to sites in Idaho or Washington (Table 4).

Table 3. Date, source, and origin of stock used for Rocky Mountain bighorn sheep transplant into Oregon, 1939–2002.

Date	Source	Origin	Release Site	County	#
1939	Montana	Not Known	Hart Mountain	Lake	23
4/71	Alberta, Canada	Jasper Park	Upr Hells Canyon	Wallowa	20
11/71	Alberta, Canada	Jasper Park	Lostine River	Wallowa	20
1/76	Lostine River	Jasper Park	Bear Creek	Wallowa	17
1/77	Lostine River	Jasper Park	Bear Creek	Wallowa	8
1/78	Lostine River	Jasper Park	Battle Creek	Wallowa	5
1/79	Lostine River	Jasper Park	Battle Creek	Wallowa	29
1/79	Salmon R., ID	Panther Cr.	Lwr. Imnaha	Wallowa	15
1/81	Lostine River	Jasper Park	Hass Ridge	Wallowa	10
1/83	Lostine River	Jasper Park	Wenaha Canyon	Wallowa	15
1/84	Sullivan L., WA	Waterton/T. Falls	Bear Creek	Wallowa	11
1/84	Salmon R., ID	Panther Creek	Hass Ridge	Wallowa	11
12/84	Salmon R., ID	Cove Creek	Wenaha WA	Wallowa	28
12/85	Salmon R., ID	Ebenezer	Minam River	Wallowa	12
1/90	Tarryall CO	Tarryall, CO	Sheep Mtn.	Baker	21
2/90	Cottonwood Cr., CO	Cottonwood Cr.	Sheep Mtn.	Baker	9
12/93	Wildhorse Is., MT	Sun River MT	Cherry Creek	Wallowa	9
12/93	Wildhorse Is., MT	Sun River MT	Fox Creek	Baker	12
2/94	Wildhorse Is., MT	Sun River MT	Downey Creek	Wallowa	14
2/94	Wildhorse Is., MT	Sun River MT	Fox Creek	Baker	12
2/95	Alberta, Canada	Cadomin	Joseph-Cottonwood Cr.	Wallowa	16
2/95	Alberta, Canada	Cadomin	Jim Cr.	Wallowa	22
2/95	Alberta, Canada	Cadomin	Sheep Mtn.	Baker	10
2/95	Lostine, Oregon	Waterton/Jasper	Sheep Mtn.	Baker	2
12/97	Spences Bridge, B.C.	Baniff N.P.	Muir Creek	Wallowa	13
1/98	Lostine, Oregon	Waterton/Jasper	McGraw	Wallowa	15
2/99	Alberta, Canada	Cadomin	Muir Creek	Wallowa	14
2/00	Alberta, Canada	Cadomin	Minam River	Wallowa	17
2/00	Alberta, Canada	Cadomin	Big Sheep Creek	Wallowa	19
12/01	Lostine, Oregon	Waterton/Baniff	Quartz Creek	Wallowa	15
Total			Total		444

Rocky Mountain bighorns have been moved into Oregon from 8 different source herds. Source stock is selected to match the habitat at the release site as closely as possible. For example, an effort is made to release sheep that live in alpine summer ranges to release sites that contain this type of habitat. Because transplanted sheep occasionally are used to supplement existing populations in an effort to increase genetic diversity, lineage of the source stock also is considered in selection of the release site.

## Research

Disease and parasite studies began in the early 1980's with the aid of Washington State University and other universities. Early work focused on the role of lungworms, scabies, and

pneumonia in bighorn populations. Field treatments were developed and evaluated for some of the parasites. The role of domestic sheep as a cause of mortality in bighorns was evaluated in penned studies. Current research on Rocky Mountain bighorn sheep is being conducted under the auspices of the multi-state Hells Canyon Initiative (HCI) with emphases including causes of bighorn mortalities. While research is ongoing, early results indicate pneumonia is a major limiting factor for Hells Canyon bighorns. Cougar predation has been the second highest cause of adult mortality in radio-collared bighorns.

Other research completed or ongoing as part of HCI includes:

- Health issues from domestic goat-bighorn interactions.
- Development and evaluation of sightability helicopter surveys to monitor populations.
- The role of nutrition and bighorn density in disease ecology.
- Genetic identification of disease causing bacteria.
- Lamb survival and causes of mortality.
- The role of trace element (selenium, copper, and zinc) levels in herd health.
- Evaluation of parameters affecting transplant success.
- Epidemiology of the Lostine herd die-off.
- Evaluation of vaccination for management of pasteurellosis.
- Genetic aspects of disease resistance in bighorn sheep.
- Bighorn home ranges and movements.

## Current Management

Rocky Mountain bighorn management is comprised of a mix of priorities that attempt to incorporate current livestock industry grazing practices, are cooperative with public and private land managers, and maintains population characteristics consistent with the habitat capabilities of the herd range. Further, the Department strives to actively and openly communicate with all groups and individuals during decision making processes and much of Oregon's current bighorn sheep management program reflects input provided by organized groups, both supportive of and not supportive of bighorn sheep.

The Department strives to keep all wildlife populations healthy and a healthy Rocky Mountain bighorn population is free of disease with sufficient lamb recruitment to sustain a stable or increasing population trend. Currently, management direction is a combination of implementing

Table 4. History of Rocky Mountain bighorn transplanted from Oregon to other states, 1980–1986.

Date	Source	Origin	Release Site	#
1/80	Lostine River	Jasper Park	Chief Joseph, WA	10
1/84	Lostine River	Jasper Park	Salmon River, ID	16
12/84	Lostine River	Jasper/Waterton	Beaverhead Mtns, ID	22
1/86	Lostine River	Jasper/Waterton	Pahsimeroi Mtns, ID	18
Total				66

strategies identified in previous bighorn management plans, implementation of recent research findings, and management of specific issues and situations after evaluation by the Department as follows.

### ***Subspecies Integrity***

Source stock for transplants into Rocky Mountain bighorn range have been the Rocky Mountain bighorn subspecies. In addition to selecting only Rocky Mountain sheep, the Department attempts to utilize source stock from habitats that closely resemble habitats found in Oregon release sites. Since 1997, all Rocky Mountain bighorn transplants have been coordinated through Hells Canyon Initiative.

### ***Population Management***

Trapping and transplanting is used to maintain the Lostine herd at a level compatible with limited winter range. Other Rocky Mountain bighorn herds have large areas of habitat and low population densities making herd reductions unnecessary. Bighorn sheep transplants are usually composed primarily of females, lambs, and young rams. The ram to ewe ratio (ram:ewe) of the transplant is usually 1:3–4. The Department does not transplant mature rams because they are difficult to handle and tend to wander once released, increasing chances of encountering domestic sheep. Continued trapping and transplanting over time results in skewed ram ratios that can affect breeding efficiency and herd growth. Hunting is used to manage ram:ewe ratios.

### ***Recreational Opportunity***

Active recreational opportunities involving bighorn sheep primarily focus on two activities: viewing and photographing or hunting. Viewing and photographing bighorns can and does occur nearly year-round in many areas. Relatively easy to boat access to Rocky Mountain bighorn viewing opportunities occurs along the Snake River of northeastern Oregon. Most other opportunities require varying levels of back-country travel, many times on foot over rugged terrain.

Bighorn sheep hunting is based on three basic premises: 1) The Department is directed by statute to provide recreational opportunity, part of which is hunting opportunity; 2) There are adequate rams available in individual populations to support removal by hunting; and 3) Proper management of bighorn sheep includes keeping the total population size at a level compatible with the social and biological carrying capacity of the area.

Oregon's existing bighorn seasons are designed to provide a quality hunting experience with an opportunity to harvest a mature ram. The number of tags authorized each year is based on total population size, proportion of rams in the population and their relative size or age, size of the herd range or hunt area, and previous recruitment rates. Some relatively small herd ranges could cause hunter crowding if too many permits were authorized for a specific period and two or more consecutive hunts are often authorized to reduce crowding. Although bag limit has been any ram since 1991, bighorn sheep hunts are considered a “trophy” opportunity and seasons are designed to provide an opportunity to harvest a mature ram.

Hunters are required to check out of their hunt area upon completion of their hunt. Successful hunters must have their ram marked by the Department with a permanent identification pin. Ram age and horn measurements (green Boone and Crockett score) are recorded during checkout and data are used to monitoring hunter success and population characteristics.

Recreational opportunities (hunting and non-hunting) depend on annual population inventories. Depending on the herd, bighorns are surveyed from late winter through early summer using ground or aerial techniques. Bighorn inventories are designed to measure herd trend, annual lamb recruitment, and age distribution of rams. Population estimates using sightability models are being evaluated in Hells Canyon.

### ***Disease Management***

As with all wildlife, some diseases are a natural part of bighorn sheep life histories. However, bighorn sheep also are susceptible to a number of domestic livestock diseases (Appendix 1). When bighorns and domestic sheep or goats have been in contact, disease transmission may result in death of the bighorns. Thus, separation of domestic sheep and goats from bighorns is a management priority. Biologists work with land managers and permittees to modify grazing allotments or change class of livestock grazed from sheep to cattle. Domestic goats have been used in Hells Canyon for weed control. However, biologists have worked with goat owners and landowners to reduce potential for contact. Videos and brochures are used to educate the public on the dangers of domestic sheep and goats pose to bighorns. Brochures are invaluable for educating visitors to bighorn habitat concerning potential impacts of pack goats. Parasite occurrence is monitored through fecal analysis. When high parasite loads are measured, medicated salts and minerals are provided.

Whenever possible, bighorns that stray near domestic sheep or goats are captured, moved, or destroyed. Land acquisitions by the Nez Perce Tribe or other public agencies has been used to protect some public lands used by bighorn herds. These efforts have had some success in reducing potential conflicts with domestic sheep in the Wenaha and upper Joseph Creek herds.

### ***Habitat Management***

Habitat management has consisted of noxious weed control, seedings, controlled burns, spring and water developments (Table 5), and management of grazing. Noxious weeds are a serious threat to native plant communities and directly affect habitat quality. The department provides support and funding for weed control efforts in bighorn habitat on public and private land. Yellow star thistle, knapweed, leafy spurge, and other plant species have been sprayed, hand pulled, and/or had insects released for biological control. In some locations, domestic goats

Table 5. Rocky Mountain Bighorn Habitat Improvement Projects 1992-2002.

Development Type	Herd	Unit	# Springs or Acres
Spring Developments			
	Upper Joseph Creek	Chesnimnus	2
	Lower Hells Canyon	Chesnimnus	4
	Lostine	Minam	1
	Lower Imnaha	Snake River	7
	Wenaha	Wenaha	3
Controlled Burns			
	Lostine	Minam	250
	Lower Imnaha	Snake River	400
Seedings			
	Lower Imnaha	Snake River	5
	Wenaha	Wenaha	80

have been used for noxious weed control. However, because goats also may harbor bacteria that can cause disease in bighorns, the Department coordinates with private and public landowners using domestic goats to minimize potential for impact to bighorn populations.

Controlled burns have been used on the Lostine Wildlife Area to remove encroaching conifers and improve forage quality on bighorn winter range. Spring developments are completed to improve water quality and quantity in canyon habitats. Purchase of a domestic sheep allotment by bighorn advocacy groups has been utilized to retire the last Wallowa Mountain allotment. While this was done primarily to prevent contact and subsequent disease, alpine ranges used by bighorns have improved to the benefit of bighorns as well as other wildlife species using these areas.

Salt with added selenium is routinely put out to improve bighorn health by raising selenium levels that are known to be low in Oregon, and to minimize bighorn use at salt licks established for domestic livestock.

### ***Law Enforcement***

Protection of Rocky Mountain bighorn from illegal harvest or harassment is identified as an enforcement priority in the Oregon State Police Cooperative Enforcement Planning Process.

### **Future Restoration Priorities And Research Needs**

Establishing Rocky Mountain bighorns in areas of available, suitable habitat is a priority (Table 6). Eleven potential sites are new release areas while 4 are supplemental releases. Several sites have domestic sheep conflicts but bighorns will not be released until conflicts are resolved.

Table 6. Proposed transplant sites for Rocky Mountain bighorn sheep in Oregon.

Transplant Priority	Site Name	District	County	New or Supplement	Comments
1	Sluice/Rush Creek	Wallowa	Wallowa	New	
1	Sand/Yreka Creek	Wallowa	Wallowa	New	
1	Hat Point Plateau	Wallowa	Wallowa	Supplement	Summer Range Release
1	Minam	Wallowa	Wallowa	New	Predation, Non-Migratory
1	Deep Creek/Teaser Ridge	Wallowa	Wallowa	New	Domestic Goats, Private Land
1	Lone Pine	Wallowa	Wallowa	Supplement	
1	Quartz Cr/Two Corral	Wallowa	Wallowa	Supplement	
2	Big Sheep Creek	Wallowa	Wallowa	New	Domestic Sheep
3	Mid-Joseph Creek	Wallowa	Wallowa	Supplement	Domestic Sheep
3	Sheep Creek (G. Rhonde)	Union	Union	New	Domestic Sheep
3	Deadhorse Ridge	Wallowa	Wallowa	New	Domestic Sheep
3	Spring Creek	Wallowa	Wallowa	New	Domestic Sheep
3	S. Fork Walla Walla	Umatilla	Umatilla	New	Domestic Sheep
3	Mud Creek	Wallowa	Wallowa	New	Domestic Sheep
3	Jim Creek	Wallowa	Wallowa	New	Domestic Sheep, Disease

Trap and transplant activities will follow guidelines adopted by the Northern Wild Sheep and Goat Council (Foster 2003, in press). Measuring transplant success is important and will be

determined using radio-collared animals in all releases. Monitoring will occur as often as twice a month or as frequently as time and budgets allow.

Reliable science and research should continue to guide management strategies. Future research should focus on causes of pneumonia outbreaks and identification of causative pathogens using modern genetic technology. Evaluation of limiting factors for individual herds, transplant techniques, and survey methods is needed. Where possible, research should be subjected to peer review for publication and validation of results.

Wolf populations in the Idaho recovery area continue to expand. With population recovery, wolves may expand into NE Oregon habitats. Information regarding impacts of potential wolf pack establishment in or near Rocky Mountain bighorn sheep herd ranges is needed.

Productive bighorn populations can exceed the carrying capacity of their habitat. If this occurs, lower reproductive performance, habitat damage, or straying can result. Population reduction is the preferred management tool to regulate population size. The department has relied on trapping and transplanting to regulate bighorn sheep populations. In 1993, the Oregon Legislature passed a law allowing the Oregon Wildlife Commission to authorize tags with ewe bag limits. Most current Rocky Mountain bighorn population levels are within capabilities of respective herd ranges. Ewe seasons will not be considered unless individual herds increase beyond the capabilities of the trap and transplant program. At this time, a ewe tag is considered a hunter's once-in-a-lifetime bighorn opportunity in Oregon.

### **Hells Canyon Initiative**

Hells Canyon Initiative (HCI) is a long-term, cooperative project to restore Rocky Mountain bighorn sheep to the Hells Canyon area of Oregon, Idaho and Washington. The partnership between Idaho, Washington and Oregon state wildlife agencies, the Bureau of Land Management, the US Forest Service, and the Foundation for North American Wild Sheep and was formalized by cooperative agreement in 1997. Efforts in 2003 will likely add the Nez Perce tribe to the agreement. The initiative area covers 8,800 square miles and over 1.3 million acres of bighorn habitat. The Oregon portion of HCI includes most historic Rocky Mountain bighorn habitat in the state. HCI's goal is to have self sustaining bighorn populations in the initiative area by 2007. The 2003 population estimate in the tri-state area is slightly more than 900 bighorns with some populations in decline and work continues through the Hells Canyon Restoration Committee to attain its stated goals.

## CALIFORNIA BIGHORN SHEEP

### History

Historically, California bighorns were the most abundant wild, native sheep in Oregon (Towell and Geist 1999). They were found throughout the steeper terrain of southeast Oregon, and the non-timbered portions of the Deschutes and John Day River drainages (Figure 1) with the timbered regions of the Blue and Umatilla mountains separating them from Rocky Mountain bighorn sheep. Similar to Rocky Mountain bighorn sheep, California bighorns were an important source of food and clothing for native Americans, and were utilized heavily for food and trophies during the homesteading and early settlement periods of Oregon. Thousands of domestic sheep also were trailed across eastern Oregon, including most California bighorn habitats. This likely resulted in contact with bighorns which may have led to mortality as a result of livestock related diseases and parasites.

Attempts to protect California bighorn began as early as 1899 with regulated hunting, and in 1911 with full protection of bighorn sheep (Anonymous 1911). The Steens Mountain Game Refuge was established in southeast Oregon around 1915 because the last California bighorns remaining by this time were reported there (Anonymous 1915). Unfortunately this attempt failed and California bighorns were extirpated from Oregon by 1915. Indiscriminate hunting, unregulated grazing by domestic livestock, and parasites and diseases carried by domestic livestock all contributed to the eventual demise of Oregon's native bighorns.

Efforts to restore California bighorn sheep to Oregon began in 1954 when 20 California bighorn sheep from Williams Lake, British Columbia were successfully released in a 1,000 acre holding pasture on the west face of Hart Mountain. From 1954 through 1985 California bighorn were intermittently transplanted within Oregon as animals and funding were available. With approval of the auction tag in 1985, bighorn sheep management in Oregon had a stable funding source. At about this same time the Hart Mountain, Leslie Gulch, and Steens herds had increased to levels that could support captures for release into new areas. Oregon now supports 3,700 California bighorn in 32 herds (Table 7).

The first Californian bighorn sheep hunting seasons occurred in 1965 when two hunts with three tags each were authorized on Hart Mountain National Antelope Refuge. Since the first season in 1965, the number of California bighorn hunts and tags authorized increased to a high of 98 in 1995 (Figure 3). However, tag numbers steadily declined to 44 in 2002. Most of the increase during the early 1990's were due to skewed ram ratios as high as 140 rams:100 ewes on Hart Mountain as a result of captures. Tag numbers were increased to bring ram ratios down and subsequent tag numbers decreased as ratios were aligned. An additional

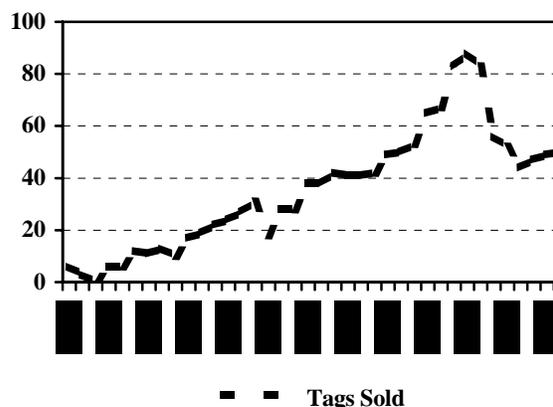


Figure 3. Trend in California bighorn sheep tag sales, Oregon, 1978–2002.

Table 7. Current status and 2003 population estimate for California bighorn sheep herds in Oregon.

Herd Range	Sub-herds	# Releases (# animals)	2003 Estimate	Current Status
Abert	Abert Rim	3 (10)	150	Stable
	Rehart Rim		30	Stable
Alvord Peaks	Alvord		140	Stable
	Buckskin Mt.			
Burnt River		2 (24)	80	Stable
Catlow Rim	N. Catlow Rim	2 (35)	160	Stable
	S Catlow-Lone Mtn.	1 (15)	90	Stable
Coleman Rim		1 (15)	50	Stable
Daugherty Rim		1 (20)	60	Stable
Deschutes River	Lower River	3 (65)	200	Increasing
	Mutton Mtn.	1 (20)	20	New
Devils Garden	Devils Garden	3 (29)	40	Declining
	East Lava Field	3 (33)		
Fish Creek Rim		2 (14)	100	Stable
Hart Mountain- Poker Jim		1 (20)	300	Stable
John Day River	Lower River	4 (66)	450	Increasing
	Philippi-Blalock		50	Increasing
	Aldrich Mt.	3 (18)	90	Stable
	McClellan	2 (22)	140	Stable
	Canyon Mtn.	1 (21)	8	Not Viable
	Potamus Creek	1 (21)	25	New
Kit Canyon		1 (18)	17	New
Malheur River	Riverside	2 (17)	100	Increasing
Owyhee River	Upper Owyhee	4 (107)	100	Declining
	Lower Owyhee	7 (124)	200	Declining
	Rattlesnake	1 (19)	100	Stable
Pueblo Mtn.		3 (40)	150	Stable
Steens Mountain	East Steens	4 (46)	275	Stable
Sheepsheads	Mickey Butte	4 (71)	140	Increasing
	Wildcat			
Summer Lake	Coglan Butte	1 (17)	150	Stable
	Diablo-Sheep Rk.	2 (26)	170	Stable
	Hadley	2 (26)	50	Declining
	Tucker Hills		15	Stable
	Winter Ridge	2 (22)	8	Not Viable
Trout Creek Mt	E. Trout Creeks	3 (50)	150	Increasing
	Ten Mile Rim	1 (15)	30	Not Viable
		Total	3,706	

cause for the decline is the decrease in overall population numbers in the Hart Mountain, Owyhee, and Steens herds. Harvest rarely exceeded 15% of the total estimated ram population and is usually less than 5% of the total population. Since the first bighorn season, hunters have been required to have their harvested ram checked and scored by Department staff.

Although tag numbers have declined, number of hunts available has increased as number of herds has increased. In 1991 there were 16 California bighorn hunts; in 2002 there were 31 hunts. Through 2002, a total of 1,315 tag holders have taken 1,125 California bighorn rams for an overall hunter success rate of 85 percent (Table 8). Seven rams have been taken by auction or raffle tag holders. The Department records the age and horn measurements (green Boone and Crockett score) of each harvested ram to monitor harvest. The largest California bighorn ram taken in the state came from Alvord Peaks in 1997 and scored 184 7/8 points. Safari Club International and FNAWS have recently began recognizing California bighorn as a separate trophy award category and more auction and raffle tag holders, as well as other trophy hunters, have shown an interest in hunting California over Rocky Mountain bighorn.

Table 8. California bighorn sheep ram harvest in Oregon, 1965-2002.

Hunt Area	# Rams Harvested	# Years Hunted	Boone and Crockett Score	
			Range	Mean
Aldrich-McClellan- Murderers Cr	48	17	106 5/8 – 176 3/8	152 4/8
Pueblos-Alvord Peak	6	3	150 0/8 – 173 7/8	161 0/8
East Beatys Butte	56	12	85 7/8 – 171 4/8	148 6/8
Catlow Rim	7	4	141 2/8 – 175 7/8	164 1/8
Alvord-Buckskin	51	12	126 7/8 – 184 7/8	153 3/8
Burnt River	7	7	125 4/8 – 160 6/8	146 7/8
Deschutes River	12	5	134 0/8 – 167 1/8	158 3/8
East Trout Creek Mtn.	11	7	116 7/8 – 163 4/8	142 1/8
Hart Mountain-Poker Jim	379	37	100 7/8 – 175 5/8	157 0/8
John Day River	23	7	107 6/8 – 180 6/8	163 0/8
Owyhee	195	29	97 6/8 – 176 5/8	151 2/8
Riverside	12	9	136 6/8 – 168 1/8	150 5/8
South Central	34	14	96 0/8 – 172 7/8	158 0/8
Steens Mountain	227	35	30 7/8 – 175 4/8	148 0/8
Warner/Abert Rim	57	20	101 1/8 – 180 7/8	155 6/8
Total	1,125		30 7/8 – 184 7/8	

Under the ¾ curl or larger regulations, most California bighorn rams are legal at 4 years of age. Since 1991 under the any ram regulation, a few hunters have taken younger rams. However, most hunters continue to take larger-horned animals. Prior to the any ram rule 446 California bighorn rams were harvested with an average score of 151 7/8. Since the any ram rule, 664 California bighorn rams have been harvested with an average score of 151 7/8. Prior to the any ram rule overall hunter success was 77% versus 85% after the rule. Since 1992 California bighorn seasons have been a minimum of 9 days long. In addition to longer seasons, the any ram rule may aid in increasing hunter success.

## Description

California bighorn sheep (*O. c. californicus*) also are a sub species of bighorn sheep (*Ovis canadensis*) within the Bovidae family, sub-family Caprinae (Nowak 1999). Historically, and at

present, California bighorns are the most abundant bighorn in Oregon (Toweill and Geist 1999). California bighorn ranges are separated from Rocky Mountain bighorn ranges by the Blue and Umatilla mountains.

California bighorns are usually smaller than Rocky Mountain bighorns with a less blocky build and smaller horns. Historically California bighorns occupied all of the dry mountain ranges west of the Rocky Mountains, east of the Cascade and Sierra ranges, and from British Columbia to California. California bighorns are generally found in arid mountain ranges below 8,000 feet. Horns of mature rams rarely exceed 36 inches long or a basal circumference of 16 inches.

Similar to Rocky Mountain bighorns, California bighorns are polygamous with a few dominant rams do most of the breeding. However, California bighorns generally breed earlier (October–November) than Rocky Mountain bighorns and subsequently lamb a bit earlier (April–May). Gestation is approximately 180 days and a single lamb is usually born. Shortly before lambing, ewes become solitary and seek a secluded place in rugged terrain. After about one week, the ewe and lamb join other ewes and newborn lambs to re-form the ewe-lamb-subadult groups they will associate with for most of the year. Ewes usually become reproductively active at two years old. However, there is evidence that with good nutrition such as found in the John Day and Deschutes rivers of north-central Oregon, California bighorn may breed as yearling ewes (Oregon Department of Fish and Wildlife, unpublished data). They remain reproductively active throughout their life span but are in their prime from ages 3–10.

Ages are determined by counting growth rings on the horns. Bighorn sheep are relatively long lived animals. Those surviving their first year commonly live 10–12 years. Ewes tend to live longer than rams even in the absence of ram hunting.

## **Habitat**

In Oregon, most California bighorn herds are non-migratory. Herd ranges generally provide contiguous summer and winter range and sheep are therefore year long residents not moving through areas of non-habitat. Thus dispersal and establishment of new populations in new habitats is limited. In general, California bighorn sheep prefer rugged, open habitats with high visibility of their surroundings. Survival is positively correlated with amount of cliffrock, rimrock, and rocky outcroppings. Rocky outcrops are particularly important for lambing and escape from predators.

California bighorn diets are very similar to Rocky Mountain bighorn diets and grasses make up the bulk of their annual diet. Forbs and shrubs are used seasonally but use is dependent on type and availability. In certain plant communities, fire can be used to remove dead, unpalatable forage, renew plant growth and vigor, improve forage quantity and quality, and retard encroachment of junipers or other coniferous trees. California bighorns generally do not compete for forage with domestic cattle and other big game species due to differences in habitat use patterns but can compete with domestic sheep.

Water is an essential requirement for California bighorn and in some cases lack of water may limit distribution. Management options such as spring developments or guzzler installations have made historic habitat once-again suitable for bighorn reintroductions. Poor water quality has caused bighorn mortality in two recent instances. A blue-green algae bloom in the Owyhee herd range killed at least 11 bighorns during summer of 2001. Blue-green algae is only toxic under specific conditions, generally associated with hot weather and stagnant water. The extent of this problem in other herds is unknown at this time. Poisoning by *clostridia* toxin is suspected of killing 15 bighorns on Winter Ridge during summer 1996. *Clostridia* are soil born anaerobic bacteria that produce a virulent toxin during reproduction. Bottom sediments in an above ground guzzler tank coupled with low water resulted in anaerobic conditions that favored growth of *clostridia*. When sheep drank from the guzzler they were poisoned and died.

Substantial amounts of historic habitat are not currently suitable for California bighorns because of long-term habitat change. For example, civilization has occupied some historic ranges or converted them to other uses making these sites unsuitable for bighorn sheep. Fire suppression activities throughout the last 100 years have allowed woody plants and conifers to encroach upon once "open" habitat, decreasing their suitability

Table 9. Oregon's California bighorn sheep transplant history, 1954 – 2003.

Year	Capture site	Release site	County	Total
1954	Williams Lake, BC	Hart Mountain	Lake	20
1960	Hart Mountain	Steens Mountain	Harney	4
1961	Hart Mountain	Steens Mountain	Harney	7
1965	Hart Mountain	Leslie Gulch	Malheur	17
1971	Hart Mountain	Strawberry Mtns	Grant	21
1975	Hart Mountain	Abert Rim	Lake	3
1976	Hart Mountain	Pueblo Mountains	Harney	16
1976	Hart Mountain	Abert Rim	Lake	2
1977	Hart Mountain	Abert Rim	Lake	5
1978	Hart Mountain	Aldrich Mountain	Grant	14
1980	Hart Mountain	Pueblo Mountain	Harney	7
1980	Hart Mountain	Fish Creek Rim	Lake	2
1981	Hart Mountain	Aldrich Mountain	Grant	4
1983	Hart Mountain	Iron Point	Malheur	21
1983	Hart Mountain	Deary Pasture	Malheur	14
1983	Hart Mountain	Pueblo Mountain	Harney	17
1984	Hart Mountain	Hadley Creek	Lake	8
1987	Leslie Gulch	Burnt River	Baker	15
1987	Hart Mountain	Painted Canyon	Malheur	15
1987	Hart Mountain	Riverside	Malheur	8
1987	Hart Mountain	Oregon Canyon	Malheur	27
1987	Hart Mountain	Red Butte	Malheur	16
1988	Steens/Alvord	McClellan Mtn	Grant	15
1988	Steens/Alvord	Fish Creek Rim	Lake	12
1988	Leslie Gulch	Riverside	Malheur	9
1989	Hart Mountain	L John Day River	Gilliam	14
1989	Hart Mountain	Coglan Butte	Lake	17
1989	Hart Mountain	North Catlow Rim	Harney	17
1990	Hart Mountain	Cottonwood Creek	Malheur	14
1990	Hart Mountain	Sheepshead Mtns	Harney	16
1990	Hart Mountain	Whitehorse Creek	Malheur	19
1990	Williams Lake, B.C.	L John Day River	Gilliam	15
1991	Hart Mountain	Diablo Rim	Lake	15
1991	Hart Mountain	Sheep Rock	Lake	11
1991	Hart Mountain	Sheepshead Mtns	Harney	17
1991	Steens/Alvord	Coleman Rim	Lake	15
1992	Aldrich Mountain	Winter Ridge	Lake	16
1992	Hart Mountain	Lone Mountain	Harney	15
1992	Hart Mountain	McClellan Mtn	Grant	7
1992	Hart Mountain	Rattlesnake Creek	Malheur	19
1993	Steens Mountain	Ten Mile Rim	Malheur	15
1993	Steens Mountain	Sharon Creek	Malheur	36
1993	Hart Mountain	Squaw Creek	Harney	17
1993	Hart Mountain	Three Mile Creek	Harney	18
1993	Up Owyhee - Idaho	East L Deschutes	Sherman	35
1993	Hart Mountain	Winter Ridge	Lake	6
1994	Leslie Gulch	Middle Owyhee	Malheur	21
1994	Hart Mountain	Daugherty Rim	Lake	20
1994	Steens Mountains	North Table	Malheur	20
1995	Hart Mountain	Mill Creek	Lake	18
1995	Hart Mountain	N Fork Owyhee	Malheur	17
1995	Steens Mountains	West L Deschutes	Wasco	18
1995	Iron Point	Jacknife Creek	Sherman	21
1995	McIntyre Ridge	Devils Garden	Lake	16

for bighorns. Because bighorns rely on their vision as a way to avoid predators, dense stands of junipers or other conifers can reduce visibility and increase predator effectiveness. Further, junipers may compete for water and nutrients needed by forage plants on desert ranges and therefore can decrease forage quantity and quality as well as live water availability from springs and seeps. Some junipers can be beneficial by providing shade and escape cover in certain instances. However impacts of large dense stands are generally negative.

Table 9. Continued

Year	Capture site	Release site	County	Total
1996	Hart Mountain	Sheepshead Mtns	Harney	17
1996	L John Day River	Stonehouse Cnyn	Harney	18
1997	McGee - Nevada	Burnt River	Baker	9
1999	L John Day River	West L Deschutes	Wasco	12
1999	L John Day River	East Garden	Lake	8
1999	East L Deschutes	East Garden	Lake	12
1999	East L Deschutes	Little Ferry Cnyn	Sherman	15
2000	Santa Rosa Mts. NV	Steens Mountains	Harney	16
2001	Santa Rosa Mts. NV	Leslie Gulch	Malheur	15
2001	Abert Rim	East Lava Field	Lake	5
2001	McClellan Mtn	Devils Garden	Lake	2
2002	McClellan Mtn	Mutton Mountains	Wasco	20
2002	East L Deschutes	Sheepshead Mtns	Harney	21
2002	L John Day River	Birch Creek	Malheur	20
2002	L John Day River	East Lava Field	Lake	8
2002	L John Day River	Devils Garden	Lake	13
2003	Abert Rim	Potamus Creek	Morrow	21
2003	L John Day River	Kit Canyon	Lake	16
			Total	1,052

## Transplants

Since the first successful re-introduction of California bighorn in 1954 on Hart Mountain, a total of 1,314 California bighorn have been trapped in Oregon and transplanted to 50 Oregon, 8 Nevada, 3 Washington, 1 Idaho, and 1 North Dakota sites (Table 9, Table 10). Although 11 populations have been used as a source of animals, the majority (78%) of Oregon captures have been conducted in 3 populations:

Hart Mountain (53%), Lower John Day River (13%), and Steens Mountain (12%, Table 11). Fifty-six California bighorns were imported from Williams Lake, B.C (15) and Nevada (41) to Oregon as supplements to the John Day River, Burnt River, Steens Mountain, and Leslie Gulch herds. Supplements to the Steens Mountain and Leslie Gulch herds were specifically to increase genetic variability with the ultimate goal of improving lamb recruitment. The Nevada source herd was originally from Pentiction BC and therefore different stock than the Williams Lake/Hart Mt. stock used to establish these herds.

Table 10. California bighorn sheep captured in Oregon and released in other states, 1968–2003.

Year	Capture site	Release site	State	#
1968	Hart Mtn	Sheldon NWR	NV	8
1984	Hart Mtn	Jackson Mtns	NV	13
1987	Leslie Gulch	Jackson Mtns	NV	17
1987	Hart Mtn	Sheldon NWR.	NV	15
1987	Hart Mtn	Santa Rosa Mtns	NV	5
1990	Aldrich Mtn	Various Herds	WA	13
1991	Steens/Alvord	Montana Mtns	NV	15
1991	Hart Mtn	Sheldon NWR	NV	14
1994	Hart Mtn	Trout Creek Mtns	NV	20
1996	Hart Mtn	South Badger	NV	18
2000	L John Day R	Jim Sage Mtn	ID	20
2000	Aldrich Mtn	Jim Sage Mtn	ID	10
2001	L John Day R	Teiton	WA	14
2001	Hart Mtn	Jim Sage Mtn	ID	15
2003	Coglan Buttes	Double-H Mtns	NV	20
2003	L John Day R	Various Herds	WA	20
2003	L John Day R	Little MO Badlands	ND	6
2003	L Deschutes R	Little MO Badlands	ND	19
			Total	262

## Current Distribution and Status

In 1954 there were 20 California bighorns in Oregon. By 1984 the population estimate was 723 bighorns in 9 herds. Since 1984, an aggressive relocation effort and good recruitment in some established herds expanded populations to an estimated 3,706 sheep in 32 herds. As herds have increased, substantial interchange has occurred between transplants and several transplant sites may now be included in a single herd range.

Currently, California bighorns are located in most available habitat throughout historic Oregon ranges. Several herds have declined. For example, the Hart Mountain herd was estimated at 500 animals in 1992 and 300 in 2002. Other herds showing declines from historic highs include Steens and Owyhee. Possible reasons for declines include habitat degradation, predation, genetics, herd range size, and disease. A combination of factors is likely involved.

Population monitoring and results of recent research studies suggest that predation by cougars has increased in some bighorn populations during the last ten years. Because cougars effectively prey on all sex and age classes, and most California bighorn herds are less than 300 individuals, cougars can have a significant impact. Further, animals in several recent transplants have split into small groups and scattered widely which is abnormal behavior for California bighorn transplants. Cougar harassment is suspected of causing the abnormal behavior. Besides direct loss of individuals, scattering may result in use of sub-optimal habitat, further compromising the transplant's success. Other known bighorn predators include golden eagles, coyotes and bobcats. However, they are only effective on very young lambs and their predation rates likely are not limiting population growth. As wolf recovery continues in Idaho and wolves potentially expand into Oregon, they also may become a factor in California bighorn sheep management.

Less than 20% of Oregon's original habitat for California bighorns is still available. Remaining habitats are fragmented and separated with large areas of unsuitable habitat. Thus bighorn numbers are controlled to keep herds below carrying capacity. When numbers exceed available habitat capacity, animals may become stressed or stray. Stress, poor physiological condition, or poor forage availability may increase susceptibility to disease and predation. Straying increases the opportunity for individuals to contact domestic sheep or goats.

## Research History

Research on California bighorn conducted in Oregon includes status and habitat use of bighorn on Hart Mountain (Cottam 1984, Kornet 1978, Payer 1992) and Steens Mountain (VanDyke 1978). Parasite and disease occurrence in Hart Mountain bighorn has been reported (Kistner and

Table 11. California bighorns captured from Oregon herds, 1960-2003.

Herd Range	Number
Hart Mountain	639
Lower John Day R	149
Steens/Alvord	147
Lower Deschutes R	68
Leslie Gulch	47
Aldrich Mtn.	39
Abert Rim	26
McClellan	22
Iron Point	21
Coglan Butte	20
McIntyre Ridge	16
<b>Total</b>	<b>1,194</b>

Wise 1979, Kistner 1981). Blood chemistry and trace mineral values from bighorn captured in Oregon for transplant or research was reported by Whittaker et al. (2000).

All of Oregon's California bighorn herds were started from descendants of the original 20 bighorns brought from Williams Lake, BC and released on Hart Mt. in 1954. Although the transplant program has been highly successful, because the source stock came from a fairly small population there is evidence of reduced genetic variability in Oregon's California bighorn herds (Whittaker et al., in review). It has been shown that low genetic variability can lead to reduced survival of young and also result in population decline (Thorahill 1993). To address this concern and test if increasing genetic variability will improve lamb survival, 15 ewes from a Nevada population originating from near Penticton, BC were released in the Steens in 2000 and Leslie Gulch in 2001. Short term objectives for this project are: 1) Compare genetic diversity of several established California bighorn herds (Hart Mt., Steens, Leslie Gulch, Lower John Day, and the Santa Rosa in Nevada); 2) Measure the degree of mixing of a supplemental transplant with an existing herd; 3) Determine the cause and timing of mortality of ewes and lambs and compare between resident and transplanted sheep in Leslie Gulch. This research is still in progress and it will be several years before we know if increasing genetic variability will result in improved lamb recruitment. The long term objective is to determine the impact of genetic variability on population persistence.

## **Current Management**

Similar to Rocky Mountain bighorn, current California bighorn management represents a mix of priorities consistent with the needs of the livestock industry, public and private land managers, habitat capabilities of the herd range, and the desires of groups or individuals interested in Oregon's bighorn sheep management program. Healthy California bighorn populations are typified by sufficient lamb recruitment to sustain a stable or increasing population trend, and are free of disease. Currently, management direction is a combination of implementing strategies identified in previous bighorn management plans, implementation of recent research findings, and management of specific issues and situations after evaluation by the Department as follows.

### ***Subspecies Integrity***

Subspecies integrity is maintained in the trap and transplant program. Because California bighorn populations have had more substantial increases than Rocky Mountain bighorn, trapping and transplanting to start new herds and keep existing herds within carrying capacity has been more extensive. Source stock from Oregon herds is readily available. Because all Oregon herds have been started primarily from Hart Mountain bighorns, efforts have been made to find source herds that did not come from Williams Lake, BC in an effort to evaluate and manage genetic variability (Whittaker et al. In Review). Minimum transplant size for starting new California bighorn herds is 20 animals and monitoring requirements are the same as Rocky Mountain bighorn. Specific capture and transport activities in the trap and transplant program follow the capture guidelines adopted by the Northern Wild Sheep and Goat Council (Foster 2003, in press).

In the 1992 Oregon Bighorn Management Plan clearance of release sites by federal agencies was required. Since that time it has been determined that re-introductions of wildlife on National Forest and U.S. Bureau of Land Management lands is a “State Action” and National Environmental Policy Act (NEPA) analysis is not required for them to proceed (Federal File Code 1950/2640 and Appeal Case File Code 1570(215)). However, the Department continues to work with federal land managers prior to any release to ensure habitat needs are met and any conflicts with domestic sheep are analyzed and adequately addressed. Transplant sites on private land must receive landowner approval prior to release of bighorn sheep. Cooperative agreements to ensure habitat integrity of release sites and reasonable public hunting access must be in place prior to release.

Annual trap and transplant plans as well as decisions regarding other budget expenditures are decided at an annual coordination meeting. Originally, management of California bighorns was the only topic discussed. Recently, however, all aspects of Oregon’s bighorn management program have been reviewed, and decisions made on annual trap and transplant activities, inventory needs, research direction and budget expenditures.

### ***Population Management***

Inventory activities are similar to used for Rocky Mountain bighorn, although ground inventory for California bighorn is usually impractical. Ground inventories are most effective when bighorn are concentrated on winter range. Most California bighorn ranges in Oregon do not have substantial elevation differences and therefore bighorn can be dispersed throughout the herd range the entire year. These ranges do not consistently get deep snow to concentrate bighorns into low elevation snow free areas. The Steens Mountain, Aldrich Mountain, and Lower Deschutes California bighorn herds are the only herds inventoried from the ground. Inventory data is used to develop population management models. In July, 2001, sightability techniques were used to estimate herd size in Leslie Gulch (Taylor et al 2003).

### ***Recreational Opportunity***

The basic recreational opportunities presented under Rocky Mountain bighorn are the same for California bighorn with the primary focus including viewing and photographing wild bighorns as well as hunting. However, because there are more California bighorn herds in Oregon, there is more of each type of opportunity available.

### ***Disease Management***

California and Rocky Mountain bighorn are equally susceptible to disease (Appendix 1). Most open range domestic sheep allotments in California bighorn range were switched to cattle prior to the Department’s efforts to reintroduce bighorns. Therefore, potential for contact between California bighorns and domestic sheep is generally lower than for Rocky Mountain bighorns. California bighorn are not transplanted to areas where they may come in contact with domestic or exotic sheep. In those instances where stray bighorn come near domestic or exotic sheep, the Department attempts to capture or destroy stray bighorns.

### ***Habitat Management***

Noxious weeds are a concern in California bighorn habitat. In southeast Oregon cheatgrass reduces forage quality and quantity on lower elevation bighorn range. Dalmatian toadflax is a concern on the John Day River herd ranges. The department has provided funding to Baker County to control Leafy Spurge near Burnt River Canyon to protect bighorn range and to remove the use of domestic sheep and goats for weed control near bighorns.

Department biologists coordinate with private landowners and federal land managers to ensure protection from domestic sheep contact, review recreation and prescribed fire plans for impacts to bighorn, and develop specific habitat improvement projects.

Herd ranges should be managed to provide contiguous summer and winter range because most California bighorn herds are non-migratory. Prescribed fires in sheep habitat should be designed to burn not more than 50% of the shrub component in a mosaic pattern.

### ***Law Enforcement***

The Coordinated Enforcement Planning process of Oregon State Police is used by each district with California bighorns to identify enforcement needs.

### **Future Restoration Priorities And Research Needs**

In 1992, the primary management emphasis was reintroduction of California bighorn sheep into as much suitable habitat as possible. Most available herd ranges have now been stocked, although there is room within some ranges to expand distribution and for numbers to increase. Several areas would provide good habitat but cannot be stocked at this time due to either conflicts with domestic sheep or other issues. Emphasis for trapping and transplanting California bighorns during this plan will be to: 1) Re-introduce California bighorns into remaining suitable habitat as conflicts are resolved; 2) Supplement existing herds to expand distribution and increase genetic variability; 3) Supplement existing herds to increase genetic variability; and 4) Assist other states with California bighorn restoration efforts.

A total of 51 sites have been identified for California bighorn sheep release (Table 12). Priorities will be evaluated annually and necessary changes, if warranted, will be made. Strict adherence to the priority listing will not always occur due to delays in obtaining landowner approval, unexpected land use changes, conflicts with domestic sheep, habitat quality, weather factors when bighorn are available for capture, and source of transplant stock. In general, transplants to start a new herd in unoccupied habitat will take precedence over supplements, and supplements to expand both range and increase genetic variability will take precedence over supplements just to increase genetic variability. Sites with potential domestic sheep conflicts will not be stocked as long as this potential exists. To date, population management needs have been met through the trap and transplant program and ewe seasons have not been authorized. Ewe seasons will not be considered unless individual herds increase beyond the capabilities of the trap and transplant program. At this time, a ewe tag would be considered a hunters once-in-a-lifetime bighorn opportunity in Oregon.

Table 12. Proposed transplant sites for California bighorn sheep in Oregon.

Herd Range	Habitat Quality	Site Name (Class) <sup>a</sup>	District	Limitations	
Abert	High	Abert Rim (S2)	Lake	Juniper/Cougar	
	Medium	Rehart Rim (S2)	Lake		
Alvord	High	Alvord Peaks(S2)	Harney	Cougar	
Burnt River	High	Burnt River (S2)	Baker		
Catlow Rim	High	N. Catlow Rim (S2)	Harney		
Coleman Rim	High	Coleman Rim (S2)	Lake		
Daugherty R.	High	Daugherty Rim (S2)	Lake		
Deschutes Riv.	High	Mutton Mt. (S1)	Warm Spg Res.		
	High	Lower Deschutes (S2)	Columbia		
	High	Buck Hollow (N)	Columbia		Access
	High	Upper Deschutes (N)	Deschutes		Exotics
	High	Criterion (N)	Columbia		Domestics Pvt.
Devils Garden	Low	Devils Garden (S2)	Deschutes	Juniper/Cougar/ WSA	
Glass Butte	Low	Glass Butte (S2)	Lake	Juniper/Cougar	
Fish Creek R.	High	Fish Creek Rim (S2)	Lake		
Hart Mt.	High	Hart Mt. (S2)	Lake		
John Day Riv.	High	Lower River (S1)	Col./ Hepp.		
	High	Pine Hollow (S1)	Columbia		
	Medium	North Fork (S1)	Heppner		Conifer
	Medium	Canyon Mt. (S1)	Grant		
	High	Aldrich (S2)	Grant		
	High	McClellan (S2)	Grant		
	High	Upper River (N)	Grant/Hepp.		
	High	Black Canyon (S1)	Ochoco	Domestics Publ.	
	Medium	Sutton Mt. (N)	Heppner	Domestic Pvt.	
	Juniper	Low	Buzzard Ck. (N)	Harney	
	Malheur Riv.	Low	Kit Canyon (S1)	Lake	
		High	Riverside (S2)	Harney	
Owyhee River	High	Cottonwood Cr. (N)	Malheur	Domestics Publ.	
	High	Black Canyon (N)	Malheur	Domestics Publ.	
	High	Calf Creek (N)	Malheur	Domestics Publ.	
	High	Hog Creek (N)	Malheur	Domestics Publ.	
	High	Soldier Creek (S1)	Malheur	Cougar	
	High	Iron Point (S1)	Malheur		
	High	W. Little Owyhee (N)	Malheur		
	High	Painted Canyon (S1)	Malheur		
	High	Deary Pasture (S1)	Malheur		
	Medium	Dry Cr. Buttes (S1)	Malheur		Guzzler
Medium	Red Butte (S1)	Malheur	Cougar/Guzzler		
High	Leslie Gulch (S2)	Malheur			
Medium	North Table Mt. (S2)	Malheur			
High	Succor Creek (N)	Malheur	Domestics Publ.		
High	West L Owyhee Res. (N)	Malheur	Domestics		
High	East L Owyhee Res. (N)	Malheur	Domestics Pvt.		
High	Lower Owyhee R. (N)	Malheur	Domestics Pvt.		
Pueblo Mt.	High	Pueblo Mt. (S2)	Harney	Access	
Steens Mt.	Medium	Frenchglen Rim (N)	Harney		
	High	East Steens (S2)	Harney		
High	Kiger Canyon (N)	Harney	Domestics Pvt.		
High	Little Blitzen (N)	Harney	Domestics Pvt.		
High	Big Indian (N)	Harney	Domestics Pvt.		
High	Lower Blitzen (N)	Harney	Domestics Pvt.		

Table 12. Continued.

Sheepsheads	High	Table Mt. (S1)	Harney	Guzzler
	High	Folly Farm (S1)	Harney	Guzzler
	High	Sheepshead Mt. (S2)	Harney	
Summer Lake	Medium	Coffee Pot Rim (S1)	Lake	
	Medium	Diablo (S2)	Lake	
	Medium	Coglan Butte (S2)	Lake	
	Medium	Sheep Rock (S2)	Lake	
	Medium	Hadley (S2)	Lake	Juniper/Cougar
	Low	Winter Ridge (S1)	Lake	Cougar/Water
Trout Creeks	High	Indian/Cottonwood (S1)	Malheur	Cougar
	High	Oregon Canyon (S1)	Malheur	Cougar
	High	Whitehorse Ck (S1)	Malheur	Cougar
	Medium	Red Mountain (N)	Harney	Domestic Publ.

<sup>a</sup> N = New Site; S1 = Supplement for range expansion; S2 = Supplement for management of genetic variability.

Low genetic variability in California bighorn herds may reduce herd health and lamb survival. The Department will actively seek source stock that did not originate from Williams Lake BC in an effort to increase genetic variability in Oregon herds. Also, the Department will consider releasing more than 20 sheep in each transplant in an effort to increase genetic variability and reduce the impacts of predation on new transplants. Continued trapping can skew ram ratios in source herds. The Department will consider moving a larger proportion of rams when there is potential to skew ratios in source populations.

Wildlife management is most efficient when based on results of sound scientific investigations. Although California bighorn management can continue to be successful in Oregon, additional research on a number of issues will improve the Department's overall bighorn program. California bighorn research needs include:

- Evaluation of population specific adult survival and identification of causes of mortality.
- Evaluation of water quality, distribution, and potential impacts to population expansion.
- Evaluation and improvement of survey methodology and population modeling for management.
- Long term effects of potentially low genetic variability on population performance and management direction.
- Effects of juniper encroachment on population viability and land management.
- Evaluation of techniques to remove juniper from bighorn range and still retain understory integrity.

## ROCKY MOUNTAIN GOAT

### History

Most archaeological evidence of Rocky Mountain goats in Oregon occurs in northeastern Oregon (Randolph and Dahlstrom 1977, Leonhardy and Thompson 1991, Lyman 1995) and dates from 300 – 1,500 years old (Figure 4). One 2000 years old archaeological record was found in Rattlesnake Creek in the Owyhee drainage of southeast Oregon (Lyman, 1988) but it is not clear whether this record is from a resident animal or whether it was traded for by indigenous peoples. Lyman (1988) suggested mountain goats were present throughout the Oregon Cascades in suitable habitat, including Mt. Hood, Mt. Jefferson, and the Three Sisters based on pre-historic evidence from Washington, Oregon, and California (Richardson et al. 1829, Rideout and Hoffmann 1975).

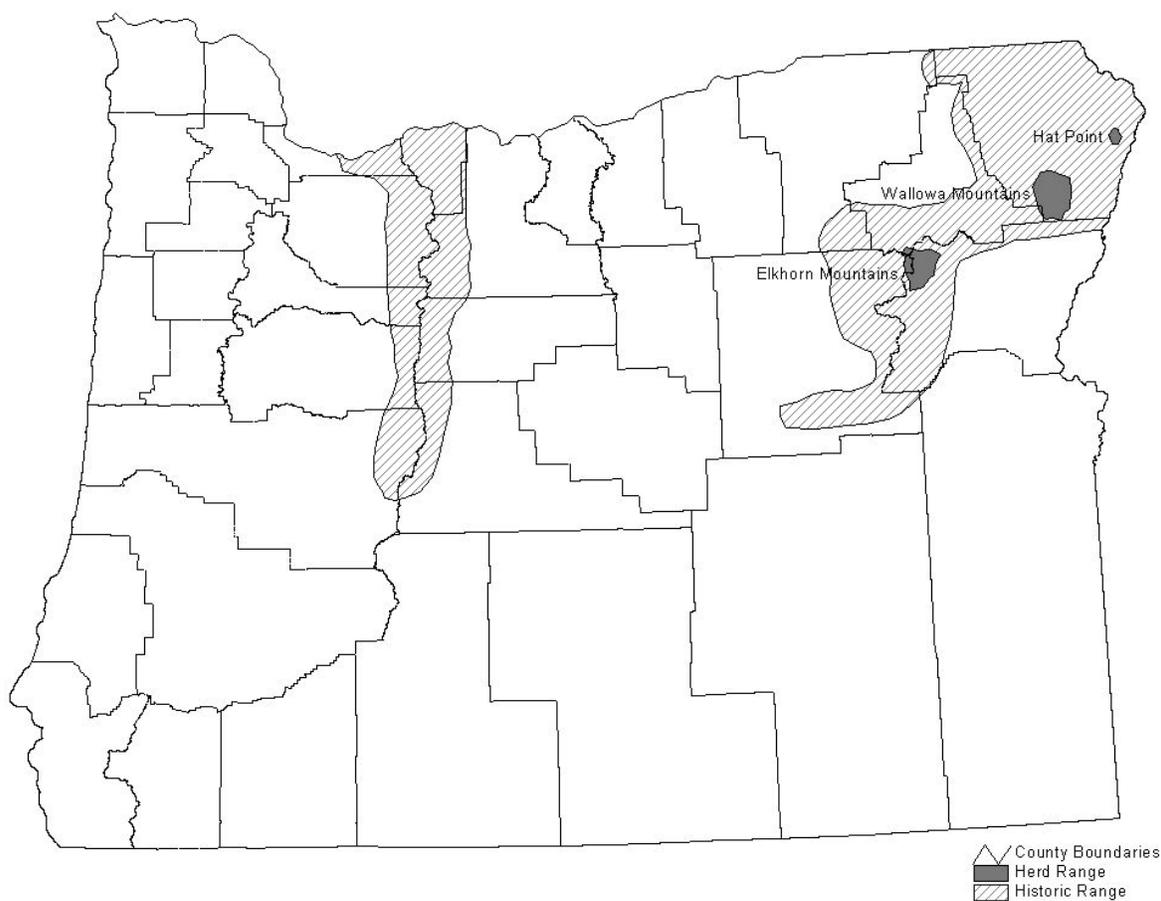


Figure 4. Historic and current distribution of Rocky Mountain goat in Oregon.

Lewis and Clark provide the first European reports of Rocky Mountain goats in Oregon in their journals ca. 1806 (Moulton 1990). Although there was some confusion in distinguishing between mountain goats and sheep, accounts from other early explorers ca. 1799 – 1815 also suggest mountain goats were plentiful along the Columbia River and in the Cascade and Coast Ranges of Oregon and Washington (Figure 4; Ord 1815, Richardson et al. 1829, Suckley and

Gibbs 1860, Coues 1897, Grant 1905). All accounts indicate goats were readily used by local indigenous people of the area. It is believed they were used by the native people from the area more for food than for tools or religious ceremonies (Reagan and Womack, 1981). Rocky Mountain goats occur in remote, inaccessible, patchy, and disjunct habitats. Thus, habitats where mountain goats would have normally occurred were not areas the first European explorers, or settlers, would have commonly traveled, hunted, camped, or lived.

Rocky Mountain goats indigenous to northeastern Oregon likely disappeared prior to European settlement during the late 19<sup>th</sup> and early 20<sup>th</sup> century (Grant 1905). Matthews and Coggins (1995) theorize improved mobility resulting from horses and more efficient weapons (firearms) may have influenced tribal hunting impacts on mountain goats. Rocky Mountain goats likely disappeared from the Oregon Cascades during the 19<sup>th</sup> century as a result of climatic fluctuation, impacts of severe weather on isolated populations, impacts of Native American hunters, and impacts from European fur traders.

Rocky Mountain goats were reintroduced to the Wallowa Mountains in 1950 when 5 animals from the Chopaka Mountains in Washington were released at the base of Joseph Mountain (Table 13). Since 1950, 12 transplants from 5 sources have been made to 4 mountain ranges in Oregon. Thirty-three were released in the Wallowa's during the 1980's, and 20 were transplanted to the Wallowa's from the Elkhorn Mountains in 2002. From 1969-1976 three transplants totaling 15 goats were released in the Tanner Butte area of the Columbia River Gorge but none survived. A total of 21 goats from 3 sources were released in the Pine Creek drainage of the Elkhorn Mountains from 1983-1986. In July 2000 16 goats were captured in the Elkhorn Mountains and transplanted to Sluice Creek in upper Hells Canyon, 20 goats were moved from the Elkhorns to Cornucopia Creek in 2002, and 18 were moved to Steamboat Creek in 2003. In 2003 the estimated population in Oregon was 420 animals in 3 main herds, and six other areas where goats are occasionally seen (Table 13).

Table 13. Current status and 2003 population estimate for Rocky Mountain goats in Oregon.

Herd Name	# Releases (# Animals)	2002 Estimate	Status
Wallowa Mountains	4 (38)	230	Increasing
Elkhorn Mountains	3 (21)	150	Increasing
Hat Point	1 (16)	40	Increasing
Vinegar Hill	Dispersal	6	Unknown
Strawberry Mountains	Dispersal	4-6	Unknown
Wenaha River	Dispersa	2-3	Unknown
Cornucopia	1 (20)	6-10	No Data
Mt. Ireland	Dispersa	4-6	Unknown
Tanner Butte	3 (15)	0	Extirpated
Steamboat Creek	1 (18)	12	No Data
Minimum Total		454	

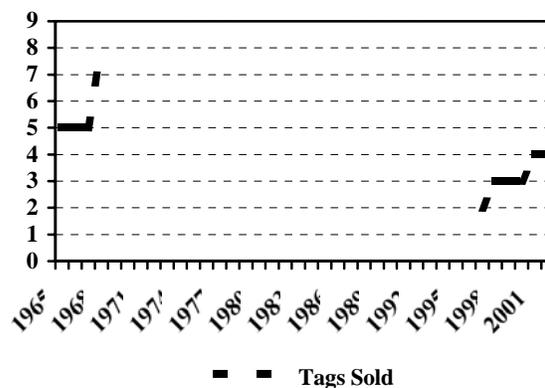


Figure 5. Trend in Rocky Mountain goat tag sales, Oregon, 1978-2002.

Mountain goats were extirpated from Oregon prior to any formal regulatory or harvest management. Regulated mountain goat hunting began in 1965 in the Wallowa Mountains and continued through 1968 (Table 14). A total of 23 tags were issued and 20 animals (13 males and 7 females) were harvested. The population declined during this period, hunting was stopped following the 1968 season, and the season remained closed through 1996. The goat season reopened in 1997 for the Wallowa and Elkhorn Mountains with one tag in each area. As of October 2003, 41 goats have been legally harvested in Oregon (Figure 5).

Throughout much of their geographic range, Rocky Mountain goat populations declined noticeably in the late 1950's into the 1960's. Numerous studies implicated overharvest as the reason for population declines (Bailey

1986, Hall and Bibaud 1978, Hebert and Smith 1986, Haywood et al. 1980, Johnson 1977, Kuck 1977, and Phelps et al. 1975). In most cases, goat populations were poorly monitored and harvest quotas were based on those used for other big game species. Compensatory mortality was thought to affect goats the same as it did other ungulates, which supported harvest rates of 20% or greater. In many established goat populations hunting appears to be additive mortality, since harvest or removal of goats does not seem to increase survival or reproduction of the remaining animals. Additive hunting mortality may have caused the population declines observed from 1966-1968 in the Wallowa goat herd, and is the reason today's tag numbers are very conservative.

Annual hunting continues in the Elkhorn and Wallowa mountains with a limited number of tags. A person can hold only one controlled mountain goat tag in a lifetime. No tags are currently available to nonresidents. All tags are issued through a public drawing. The bag limit is currently one mountain goat, and hunters are required to attend a mandatory pre-hunt orientation class. Hunters are encouraged to harvest a male goat and are required to check out through the local ODFW field office within 72 hours of completing their hunt. Currently the goat season occurs during mid September and runs 12 days.

In 2003, the Oregon Legislative Assembly adopted statute authorizing the Oregon Fish and Wildlife Commission to issue one special auction tag and one special raffle tag for hunting Rocky Mountain goats. Implementation will begin with a single raffle tag during the 2004 hunting seasons. Special auction and raffle tags will be valid for the months of September and October in all Rocky Mountain goat hunting areas where the Commission authorizes controlled hunt tags.

Table 14. Rocky Mountain goat harvest history in Oregon, 1965-2002.

Year	Hunt Area	Tags	Harvest	
			Male	Female
1965	Hurricane Divide	5	4	1
1966	Hurricane Divide	5	3	2
1967	Hurricane Divide	5	3	2
1968	Hurricane Divide	8	3	2
1997	Hurricane Divide	1	1	0
1997	Elkhorn Mts.	1	1	0
1998	Hurricane Divide	1	1	0
1998	Elkhorn Mts.	2	2	0
1999	Hurricane Divide	1	0	1
1999	Elkhorn Mts.	2	2	0
2000	Hurricane Divide	1	1	0
2000	Elkhorn Mts.	2	2	0
2001	Hurricane Divide	2	2	0
2001	Elkhorn Mts.	2	2	0
2002	Hurricane Divide	2	1	0
2002	Elkhorn Mts.	2	2	0
2003	Hurricane Divide	2	0	1
2003	Elkhorn Mts.	2	2	0
<b>Total</b>		<b>46</b>	<b>32</b>	<b>9</b>

## Description

Rocky Mountain goats also are members of the Bovidae family, sub-family Caprinae (Nowak 1999). Rocky Mountain goats are the only living species of its genus, *Oreamnos americanus* and naturally occur in the rugged mountains of western North America. Their current range is restricted to Alaska, northwest Canada, and the northern Rocky Mountain and northern Cascade Mountain regions of the inter-mountain west.

Rideout (1978) recognized 4 subspecies of the mountain goat: *O. a. missoulae* in Alberta, southeastern British Columbia, Montana, and Idaho; *O. a. americanus* in western British Columbia and Washington; *O.a. kennedyi* in the Copper River area of Alaska; and *O.a. columbiae* in northern British Columbia, Yukon, and southern Alaska. However, Cowan and McCrory (1970) examined 167 skulls and found no cranial features diagnostic of these subspecies and suggested there was no justification for their designation. Oregon's native mountain goats were *O. a. americanus*. However, heredity of mountain goats reintroduced to Oregon includes all 4 subspecies.

Mountain goats have dense white wool overgrown by long guard hairs 8 inches long over the back and legs when in full coat. Long guard hairs form a prominent beard and create the characteristic high-shouldered shape. Goats are usually all white except for black hooves, horns, eyes, and nose. Some individuals have been reported with brown hairs scattered along the back to form a narrow dark dorsal line (Holroyd 1967, Rideout 1978, Harmon 1944, Hanson 1950 in Brandborg 1955, Richardson 1971), but this line disappears as goats age.

The goat's shaggy, dense coat provides insulation and camouflage for living in a cold climate with persistent snow patches. However, goat fur is not fed by oil glands and therefore is not very moisture repellent (Casebeer et al. 1950). Goats are often observed quickly seeking shelter from heavy, cold rains and wet snows. Goats shed their hair annually beginning in early May, although date depends on locality, sex, age, condition, and reproductive status. Most goats have completed molting by early August and the new, short coat provides relief from late summer heat. New hair grows steadily and a full winter coat is developed by late fall.

Mountain goats are relatively stocky with short, thick legs. Front legs and shoulders are heavily muscled and powerful for climbing in steep habitat. Sizes varies considerably within sex and age class and is dependent on environmental conditions such as habitat quality and climate. Females reach a maximum weight of about 150 pounds or more by 3–4 years, whereas males continue their growth until 5 years, reaching weights of 150-260 pounds. Adult males are generally 10-30 percent larger than females (Brandborg 1955, Rideout 1978, Houston et al. 1989).

Both sexes have slender, pointed, black horns, about 10 inches long on adults. Not visible at birth, the horns grow 2-3 inches in the first year, double their length in the second year, and reach about 8 inches by age 3. Goats can be aged by counting growth rings that form annually after the first year. Horns differ between sexes. Male horns are larger at the base and curve gradually backward from base to tip, whereas female horns are more slender and tend to grow straight up from the base bending sharply backward near the tip. Crescent-shaped supraoccipital

glands lie behind the horn bases of both sexes but are more prominent and active in males. They are believed to function in the species' rutting behavior (Geist 1964).

Mountain goat hooves are large with prominent dew-claws to facilitate movement through deep snow. Digits are protected by hard outer shells with sharp edges that catch and hold on the slightest projections. Protruding slightly beyond each shell is a pliable, convex pad, which provides surefooted traction on steep, smooth, and slippery rocks.

Rocky Mountain goats are polygamous and breed between early November and Mid-December (Geist 1964). Dominant males are very active, moving between herds in search of estrous females, and tending such females throughout their 2-3 day receptive period (DeBock 1970, Chadwick 1983). Gestation lasts about 180 days with the peak of births near the 1<sup>st</sup> of June. As parturition approaches, pregnant nannies seek seclusion, often in the steepest roughest terrain in their range. A single kid is normally born, although twinning is not uncommon in low density populations on productive ranges (Holroyd 1967, Hibbs et al. 1969, Houston and Stevens 1988). Triplets have been reported on rare occasions (Lentfer 1955, Hayden 1984, Hoefs and Nowlan 1998). Birth weights average 12 pounds and kids gain approximately 0.44 pounds per day for the first 5 months (Smith et al. 1995).

Kids are precocious, able to move on steep slopes within hours of birth. During the first few days, the nanny and kid remain close with frequent nursing bouts (Brandborg 1955, Chadwick 1983). Nursing becomes less frequent and of shorter duration within 10 days (Stevens 1980) and effectively terminates by late August. Kids begin eating forage and ruminating shortly after birth, and forage regularly by 6 weeks of age (Brandborg 1955, Chadwick 1983). One to two weeks after birth nannies and kids rejoin other females and young in small nursery herds on summer ranges. Yearlings also join these nursery herds, while 2 year old males gradually assume a more solitary existence typical of adult males. Kids remain with their mothers through winter, benefiting from their mother's social status and access to foraging sites. Although orphaned kids can survive the winter, survival is enhanced if their mothers are present to break trails and paw for forage through deep snow (Chadwick 1983). Nannies become less tolerant of kids in spring, eventually abandoning them as they prepare for another birth. Although yearlings are part of nursery herds and benefit from the association, they are rejected and kept apart from newborn kids. Yearlings dig for their own forage in winter or utilize craters abandoned by others. Nannies often defend locations and exclude subordinates from foraging areas during winter. As a result, yearling mortality can be high during severe winters (Smith et al. 1999).

Mountain goats defend personal space and herd structure is based on a dominance hierarchy. Dominance is determined largely by competitor size, but is influenced by an individual's health and vigor. Hierarchical position improves with age, increasing size, and experience, and declines as health and vigor decline in older individuals. Kids are dominated by yearlings, yearlings by 2-year olds, and 2-year olds by adults. Dominant goats normally control the best foraging sites and cover. Thus the largest, strongest, healthiest and most reproductive nanny of the herd provides herself and her kid with the best environment and chance for survival.

Two year old males are usually capable of dominating females when establishing herd hierarchies. However, the presence of young males often initiates aggressive behavior from

protective nannies within nursery herds. Sub-adult males segregate themselves from nannies to avoid conflict and reduce injuries, possibly resulting in more optimal use of limited resources.

Adult males associate with females and nursery herds only during the rut. Males begin appearing on the fringes of nursery herds in late October. In November, adult males are actively rutting, continually searching for estrous females. Males mark vegetation with horn glands, dig rutting pits, and use their front feet to toss urine soaked soil against their bodies. Males can be identified from a considerable distance during the rut by their stained coats. Females become increasingly tolerant of males as the rut progresses and dominant males guard estrus females from subordinate males. The rut diminishes by mid December and males resume their solitary existence, allowing nannies to utilize the best winter ranges.

## **Habitat**

Mountain goat habitat varies throughout North America ranging from dense coastal forests at sea level in Alaska (Smith 1986) and British Columbia (Hebert and Turnbull 1977) to alpine basins in Colorado (Hibbs 1967) and Oregon (Matthews and Coggins 1994). Suitable Rocky Mountain goat habitat is dominated by cliffs or extremely steep rocky slopes (Kerr 1965, Holroyd 1967, Johnson 1983, Chadwick 1983). Cliffs and rock outcrops provide security cover. Nannies utilize the least accessible and most secure crannies for parturition and the first days with new born kids (von Elsner-Schack 1986). Nursery groups and even large adult males stay close to such cliffs most of the time. Cliff areas are often broken by narrow talus chutes, lush avalanche slopes, or are adjacent to less precipitous areas of quality forage. Sun and wind swept south to west facing slopes limit snow depth and provide greatest food availability during winter. North and east facing slopes often have greater snow and water accumulations that lead to succulent summer forage.

Cliffs and associated features also are important for thermal regulation. Overhangs, caves, lee sides of rocks or ridges, and dense conifers near cliffs provide shelter from severe weather. These features also provide protection from cold soaking rains and excessive heat during summer. Lingering snow banks are used by goats for summer cooling.

Mountain goats have very broad food tolerances and eat almost any forage including species not normally used by other ungulates. However, they tend to select flower-heads, buds, or foliage parts that are presumably more nutritious (Casebeer et al. 1950). Grasses are preferred in most areas and are used year round if available (Saunders 1955, Chadwick 1973, Smith 1976, Johnson 1983). Browse is an important summer food in some areas (Casebeer et al. 1950), but normally provides winter forage, especially when herbaceous plants are buried in snow (Brandborg 1955, Smith 1976). Where goats inhabit forests to escape deep snow or excessive heat, arboreal lichens are a preferred forage (Richardson 1971, Chadwick 1973, Smith 1976). Frequent conifer consumption, particularly firs (Saunders 1955, Geist 1971, Smith 1976) seems to be associated with severe winter conditions (Geist 1962, Kerr 1965, Johnson 1983).

A generalized foraging strategy allows goats to take advantage of the limited forage choices available. Goats, particularly nursery groups, appear to select topographically secure habitats and eat whatever is available (Johnson 1983). Seasonal variation in forage and habitat selection

suggests security needs become less important as kids age and the need for abundant quality forage increases.

Water requirements are largely unknown. In some areas goats left areas when water dried up (Anderson 1940, Johnson 1983), which may explain the absence of goats from otherwise suitable habitat in Oregon (Wigal and Coggins 1982). Brandborg (1955) saw no evidence of daily movements to reach water in Idaho or Montana. Goats frequently eat snow, which may fulfill much of their water requirement. Further, succulent vegetation may allow goats to obtain their water requirement from forage.

Like other ungulates, goats frequent available mineral licks, with most use in May, June, and July (Brandborg 1955, McCrory 1965, Hebert 1967, Stevens 1979). All sex and age groups use mineral licks, although timing varies (Singer and Doherty 1985). Mineral constituents and concentrations vary considerably and undoubtedly affect attractiveness and nutritional value of licks. In Oregon, mineral blocks are used in the Wallowa and Elkhorn Mountains. Goats exhibit high use of mineral blocks and placement has been effective in managing goat distributions.

Mountain goats are relatively slow moving, sedentary animals that associate in small to moderate size groups. Seasonal ranges often exist at different elevations or aspects on the same mountain or ridge. Suitable forage and water, as well as escape cover and climate selection are required for all seasons. Since adult males and nursery groups are separated most of the year, suitable habitat must exist for both.

Studies of mountain goat home ranges are few, but Rideout (1977) reported annual home ranges of 18.6, 12.0, 9.3, and 8.3 mi<sup>2</sup> (48.3, 31.1, 24.0, and 21.5 km<sup>2</sup>) for yearlings, 2-year olds, adult females and adult males, respectively. Females use traditional summer and winter ranges (Rideout 1977, Smith 1976). Males appear to have less fidelity to seasonal ranges.

Because of the habitats goats prefer, very little landscape manipulation is possible. The Department will consult with land management agencies regarding habitat monitoring and the impacts of goat use. In areas where monitoring indicates overuse of forage species, goat management may include density reduction, use of techniques to discourage goat use or redistribute animals, or protection of specific plant communities. Landscape alteration such as commercial development and potential loss of critical habitats will require Department involvement in planning and mitigation measures. Goat habitat management will vary with site characteristics, ownership, and local concerns. Generally the best habitat management option is limiting human access by discouraging trails and roads that allow motorized vehicles.

## **Transplants**

Mountain goats have been released in Oregon on 13 separate occasions (Table 15). Early transplants in the Wallowa Mountains were successful. However low productivity and overharvest limited population growth. Transplants during the 1980's stimulated population growth in the Wallowa Mountain herd and subsequent trapping was used to start the Elkhorn Mountains herd. By 2000, the Elkhorn herd had increased to levels that have supported moving 54 goats into Hells Canyon and the south Wallowa Mountains since July 2000.

Transplants to the Columbia Gorge in the 1970's likely failed because of small transplant size, scattering of individual goats, and too few males in the transplant (Matthews and Coggins, 1994). Observations of 1–4 individuals were occasionally reported from 1973–1991; however, no goats have been reported since 1991.

Table 15. Rocky Mountain goat transplant history in Oregon, 1950-2002.

Year	Origin of Stock	Male	Female	Total Released	Release Site	Range
1950	Chopaka Mt., WA	3	2	5	Joseph Mt.	Wallowa Mts.
1969-70	Olympic N.P., WA	2	6	8	Tanner Butte	Columbia Gor.
1975	Olympic N.P., WA	2	4	6	Tanner Butte	Columbia Gor.
1976	Olympic N.P., WA	1	0	1	Tanner Butte	Columbia Gor.
1983	NF Clearwater, ID	3	3	6	Pine Creek	Elkhorn Mts.
1985	Olympic N.P., WA	2	6	8	Hurricane Cr.	Wallowa Mts.
1985	Olympic N.P., WA	4	4	8	Pine Creek	Elkhorn Mts.
1986	Misty Fjord, AK	3	5	8	Hurricane Cr.	Wallowa Mts.
1986	Misty Fjord, AK	2	5	7	Pine Creek	Elkhorn Mts.
1989	Olympic N.P., WA	8	9	17	Hurricane Cr.	Wallowa Mts.
2000	Elkhorn Mts., OR	3	13	16	Sluice Creek	Hells Canyon
2002	Elkhorn Mts., OR	7	13	20	Summit Pt.	Wallowa Mts.
Total		40	70	110		

### Current Distribution and Status

The Wallowa Mountain goat herd was established with 5 releases. The population remained static through the mid 1980's, never exceeding 45 animals. Kid recruitment has improved following additional releases and has remained moderately high ( $\bar{x} = 39$  kids:100 adults) since 1990. The 2003 population estimate for the Wallowa Mountains was 230 goats. Dispersal into vacant habitat adjacent to traditional core use areas is occurring throughout the Wallowa Mountains.

Mountain goats in the Elkhorn Mountains were established from 3 releases and annual surveys were initiated in 1987. Kid:adult ratios have been high and the population has increased rapidly with a 2003 population estimate of 150 goats. Individuals from this population continue to move into adjacent habitat including Vinegar Hill and the Strawberry Mountains.

Mountain goats transplanted to Hells Canyon in July 2000 continue to be monitored. Seven of the 16 individuals were radio collared and have remained near the release site. Reproduction has been good and the 2003 population estimate was 40 animals.

### Research History

One mountain goat study has been conducted in Oregon. Vaughan (1975) studied seasonal habitat use of mountain goats in the Wallowa Mountains from 1972–1973 and developed population management models. He found low productivity was more likely responsible for lack of population growth rather than high mortality.

## **Current Management**

Unlike bighorn sheep management, recent mountain goat management has not been directed by a guiding management document. Decisions regarding recent hunting seasons have been made using public Fish and Wildlife Commission hearings, and recent mountain goat trapping and transplanting activities have been conducted with full knowledge and cooperation of respective land management agencies.

Where healthy goat populations are present, sufficient kid recruitment is available to sustain a stable or increasing population trends. Current management efforts focus on monitoring population size, composition, trend, and harvest. In parts of the Elkhorn Mountains, goats have become a nuisance at campsites due to their desires for salt. Strategic salt placement has alleviated this problem. Trapping and transplanting efforts are being used to control the Elkhorn population, supplement existing herds, and establish new populations elsewhere in the state.

Research indicates mountain goat population are very sensitive to over-harvest, and goats cannot sustain harvest rates typical of other ungulate species (Haywood et al. 1980, Adams and Bailey 1982, Gonzalez-Voyer et al. in press). Harvest should be directed at the males because survival of nanny-kid groups is dependent on the dominant nanny leading the group between summer and winter ranges. Harvest of the dominant nanny can compromise survival of the entire group.

In Oregon, tags are controlled to ensure harvest does not exceed five percent of the estimated population. Hunters are required to attend a pre-hunt orientation class to learn sex identification techniques in order to protect female goats.

Like all wildlife, individual Rocky Mountain goats may contract a variety of diseases (Appendix 1). However, there is little evidence wildlife diseases are significant at the population level.

## **Future Restoration Priorities And Research Needs**

With adoption of statute authorizing special auction and raffle tags to hunt Rocky Mountain goats beginning in 2004, Oregon now has the potential for a stable funding source dedicated to Rocky Mountain goat management and research. Using the highly successful Oregon bighorn program as a template, issues that have limited development of goat management, trapping and transplanting, and data collection can now be addressed.

Mountain goat behavior can have significant application to management. Sexual segregation and solitary existence of males makes it difficult to determine sex ratios. Surveys during the rut may improve visibility of males and lead to more accurate sex-ratio data.

Productivity (kids:100 adults 2 years and older) should be determined during midsummer when kids are 2–3 months old. Ground surveys generally provide more accurate count and classification data in Oregon. However, a combination of ground and aerial surveys may be employed if goats are scattered over a wide area. Experienced observers should be used to avoid classification bias.

Information on animal distribution and seasonal range location should be determined. Because most goat surveys are conducted in summer, specific winter range locations are often unknown and aerial surveys between December and March are recommended. Radio collared individuals from recent transplants can be utilized to document seasonal distribution.

Population goals need to be established for specific goat herds. A population goal is defined as the optimal number sustainable in a particular area over time. Established goals will provide direction for future population and human use management. Population goals may be difficult to establish without historical data for vacant or under-stocked ranges. Initial goals will be established based on current knowledge of goat life history requirements and judgment of local biologists. However, goals will be periodically reviewed based on herd trends, range condition, social concerns, and new biological information.

Primary management emphasis for the future will be to establish viable goat populations in all suitable habitat in Oregon (Table 16). Transplants will require landowner (private and/or government agency) cooperation.

Transplant priorities will be reviewed annually. Areas with an expected maximum population of less than 50 goats will have lower priority because smaller herds are more prone to

local extinction. Strict adherence to priorities will not always be practical due to delays obtaining landowner cooperation, weather, and access factors when goats are available.

Releases should include a minimum of 15 animals with no less than 1 male per 4 females. When possible, younger animals should be selected. All goats released will be ear-tagged, and a minimum of 3 individuals will be radio-collared. However, more transmitters are preferred when funding is available. Radio monitoring should be conducted monthly during the first 18 months post release to monitor distribution and transplant success.

Cost of capturing and transplanting goats varies with capture method and source stock location. Net gunning, drop netting, and clover trapping are all viable capture methods. Net gunning is the least time consuming and most selective method. However, net gunning also is the most expensive and most dangerous method for goats and people. Drop netting is less expensive but requires more time and personnel, and requires a flat area for the net. Drop nets have been used successfully in the Elkhorn Mountains. The Elkhorn drop net site will likely be the most practical and cost effective means of obtaining transplant stock for future Oregon releases. Clover traps catch few animals at a time, require commitment of personnel, may separate nannies and kids, and are less selective for sex and age.

Table 16. Proposed transplant sites for Rocky Mountain goats in Oregon.

Priority	Site Name	District	Limitations
1	Eagle Creek <sup>a</sup>	Baker	None
1	Mt. Jefferson	Deschutes	Winter Range
1	Three Sisters	Deschutes	Winter Range
1	Upper Whitewater	CTWIR	None
1	Three-Fingered Jack	Deschutes	Winter Range
1	Wenaha River	Wallowa	None
1	Strawberry Wilderness	Grant	None
1	Tanner Butte	Mid Col.	None
1	Herman Creek	Mid Col.	None
1	Dodson	N. Willam.	None

<sup>a</sup> Supplemental Release

Mountain goats are particularly vulnerable to hunting, and harvest should be strictly controlled and monitored. In order to focus harvest on adult males, pre-hunt orientation classes will remain mandatory to help tag holders distinguish between male and female goats. The following criteria will be used to determine hunt areas and tag numbers:

1. Herd population survey data should be indicative of a stable or growing population 3–5 years prior to initiation of harvest.
2. The population should be  $\geq 50$  animals comprised of at least 15% males.
3. Harvest should be no greater than 5% of the total population and no more than 50% of the harvest should be adult females. If more than 50% of the annual harvest is adult females, the following year's tag quota may be reduced.

Where goat numbers exceed established management goals or other social problems arise, additional removal of goats may be necessary. Trapping and transplanting, an increase in tags, salting to draw goats out of the area, or other options may be employed.

Mountain goat research should focus on management needs of local populations. Data on seasonal movements, habitat use, diet, and factors affecting reproduction or recruitment are needed to improve management of established populations. Herd health information from blood assays, identification of parasites and disease exposure also are needed. Research designed to examine human impacts may be necessary in the future.

## ECONOMICS OF WILD SHEEP AND GOAT MANAGEMENT

### Economic Values

Economists typically evaluate two recreational uses of wildlife: hunting and wildlife watching. Further, two different approaches are used to describe the economic importance of wildlife based activities: financial activity associated with money people spend to buy goods and services on their recreational trips; and net willingness to pay.

Expenditures at businesses that provide goods and services produce direct and indirect effects on business revenues, jobs, and personal income at local and state levels. Purchases initiate cash flows with direct effects on businesses and, through the "multiplier process", on income, employment, and the general economy. This approach to valuing things is the expenditure and economic impact approach.

People buy things because they need or want them and spend money to hunt or watch wildlife because they enjoy doing it. Hunting and wildlife viewing have a personal or user value like any other leisure activity or market good they purchase. In most cases, people expect a product or activity to be worth at least as much, and probably more, than what they spend to procure it. Thus, people have a "total willingness to pay" for products or activities equal to or greater than what they actually spend. The difference between total willingness to pay and what is actually spent is "consumer surplus" or "net economic value." Valuing hunting from the user's viewpoint is the economic value approach.

Most products of land and water, such as agricultural commodities, or privately and publicly owned timber, are priced in national or world market places. Conflicting demands for market products are resolved in the market, and prices are established when users bid against one another for the available supply. It is conceptually, if not actually, easy to measure economic impacts and economic values associated with commodity production, because market price and production cost information tell us how society values these products.

This is not often true for wildlife and associated recreational activities. The United States Public Trust Doctrine assigns wildlife resources ownership to State or Federal Governments (Loomis et. al. 1984). Rights to use or appreciate these resources are not often sold in a competitive market. Thus, wildlife and associated recreation is a nonmarket, or non-financial, economic value. No market prices exist to indicate how society as consumers values resources, or to signal society as a resource producer how much should be supplied. Therefore, economic value is difficult to assess without information available to determine fully what people are willing to pay.

People seem to intuitively understand economic impact approaches to wildlife values; however, "economic value" or "consumer surplus" concepts are difficult to understand as an economic benefit because it represents money that is not collected as payment for the benefit received. That no one actually charges consumers the full amount they would be willing to pay to use resources does not make the consumer surplus any less real. In concept, uncollected moneys can be thought of as income that remains to be used by the consumer for other purposes.

To complicate matters, there also are important nonuse or "passive use" values associated with wildlife. The most common nonuse value is existence value, or willingness to pay just to know a wildlife resource exists. There is disagreement among economists about whether passive use values can be measured accurately (Diamond and Hausman 1994, Hanneman 1994, Portnoy 1994). Regardless, they are qualitatively reflected in expressions of social and cultural values.

The two measures of economic effects (economic impact and economic value) are different dimensions of the economic importance of fish and wildlife. They must be kept separate when evaluating the economic importance of fish and wildlife, or when being used to improve resource policy decisions.

Federal benefit-cost analyses generally compare the net economic value or economic surplus of a project to cost of the project. It also can be used to compare net benefits alternative management options. Analyses based on this measure can be useful at state, regional or national level.

In contrast, the economic impact approach is used to estimate the relationship of fish and wildlife related activities to the financial economy (business revenues, jobs, personal income) of a local community, county, multi-county region, or state. Analyses based on economic impact measures are most relevant at the level of local, county or multi-county economies.

Bighorn sheep hunting is highly restricted in Oregon and the value of bighorn hunting may be relatively high compared to big game hunting in general. The clearest indication of the value of bighorn sheep hunting to hunters are prices received for special bighorn sheep auction tags. In recent years, some western states have auctioned a limited number of bighorn sheep tags or permits at the annual national FNAWS convention to raise funds for bighorn sheep management programs (Table 4). In Oregon, the auction tag price has averaged \$66,111 per year over the last nine years. The average price received by 14 other states, two Canadian provinces, and Mexico was \$93,174 (range \$44,278–\$258,571). The single highest tag price was \$405,000 in 1998 in Alberta.

### **1991 Bighorn Hunter Survey**

ODFW surveyed Oregon bighorn sheep hunters in 1991 and asked questions about recent hunting activities, actual hunting expenditures, and willingness to pay above current costs. We also asked questions about preseason scouting activities. Questionnaires were returned by 48 of 60 Oregon bighorn sheep hunters.

About 77% of hunters made an average of 2.2 pre-season scouting trips per hunter, with an average trip length of 2.3 days. Average expenditure per scouting trip was \$123.87, with about 77 percent (\$96) spent in Eastern Oregon. Adjusted for inflation to 2002 dollars, average expenditure would be \$152.86 per scouting trip with \$118 spent in Eastern Oregon.

Table 17. Recent trend in special wild sheep auction bid prices at the annual FNAWS banquet and convention.

State or Province	Sheep Species	Year									Mean
		1995	1996	1997	1998	1999	2000	2001	2002	2003	
Alaska	Dall			200,000	50,000	22,500	30,000	27,500	19,000	40,000	55,571
Alberta	R. M.	225,000	200,000	405,000	330,000				250,000	200,000	258,571
Arizona	Desert or R. M.	233,000	285,000	295,000	140,000	125,000	162,000	165,000	155,000	105,000	185,000
British Columbia	Calif. or R. M.						172,000	110,000	100,000	122,000	126,000
California	Desert	110,000	101,000	84,000	95,000	76,000	76,000	80,000	68,000		86,250
Colorado	R. M.	67,000	55,000	32,500	56,000	93,000	73,000	90,000	88,000	89,000	71,500
Idaho	Calif. or R. M.	70,000	101,000	33,000	55,000	36,500	46,000	80,000	47,500	90,000	62,111
Mexico Biosphere	Desert		54,000		51,000	50,000	49,000	57,500	56,000	64,000	54,500
Mexico Biosphere	Desert		48,000			57,000	82,500	65,000	58,000	45,000	59,250
Mexico Biosphere	Desert		73,000								73,000
Mexico Tiburon	Desert				195,000	97,500	90,000	85,000	96,000	90,000	108,917
Mexico Tiburon	Desert				200,000	100,000	91,000	72,500	87,000	93,000	107,250
Montana	R. M.	281,000	220,000	238,000	300,000	130,000	95,000	100,000	90,000	132,500	176,278
Navaho Nation	Desert									31,000	
Nevada	Calif.						59,000	47,500	67,000	50,000	55,875
Nevada	Desert									89,000	
New Mexico	Desert or R. M.	123,000	100,000	78,000	77,500	85,000	85,000	75,000	157,500	130,000	101,222
Oregon	Calif. or R. M.	73,000	50,000	30,000	59,000	87,500	76,000	67,500	74,000	78,000	66,111
Texas	Desert									62,000	
Utah	Desert	41,000	62,000	47,000	44,000	44,000	45,000	50,000	68,500	50,000	50,167
Utah	Rocky	72,000	40,000	39,000	36,000	37,500	45,000	50,000	57,000	80,000	50,722
Washington	Calif.	67,500	55,000	35,000	27,500	32,000	39,000	43,000	49,500	50,000	44,278
Wyoming	R. M.	38,000	27,500	35,000	65,000	35,000	81,000	38,000	68,000	40,000	47,500
Average annual bid/tag		116,708	98,100	103,577	116,000	84,618	77,583	72,417	87,158	82,405	93,174

The average length of a bighorn sheep hunting trip was 7.1 days with 3.8 days actually devoted to hunting. Estimated average variable expenditures per trip was \$1,164 per hunter, excluding purchases of durable equipment, license fee, and tag fee (Table 5). Durable equipment expenditures totaled \$30,660 (Average \$511/hunter) in 1991 USD. Inflated to 2002 dollar values, equipment expenditures for 60 bighorn sheep hunters were worth \$37,834 (Average \$631/hunter). Five of 48 hunters hired guides for their hunt with fees ranging from \$700–\$3,500 in 1991.

Table 18. Estimated bighorn sheep hunter expenditures and personal income impacts in Oregon based on an average trip of 7.1 days, 1991 and 2002. Scouting trips are not included.

	Statewide		Eastern Oregon	
	Total	Impact	Total	Impact
1991 Value (USD \$)				
Trip Expenditure	\$69,851	\$62,460	\$40,715	\$28,130
Expenditure/Hunter	\$1,164	\$1,041	\$679	\$469
Expenditure/Day	\$164	\$147	\$96	\$66
2002 Value (USD \$)				
Trip Expenditure	\$86,196	\$77,075	\$50,242	\$34,712
Expenditure/Hunter	\$1,436	\$1,285	\$838	\$579
Expenditure/Day	\$202	\$181	\$118	\$82

Hunters also were asked what their hunting experience was worth to them over and above actual costs. Net willingness to pay above cost (“net economic value” or “user value”) per bighorn sheep hunter trip averaged \$1,510. Based on this, the total net economic value of bighorn sheep hunting in Oregon in 1991 was over \$90,000 (\$111,000 in 2002 inflation adjusted dollars). When asked hypothetically what they would sell their tags for and give up the opportunity to hunt, 32 of 48 (67%) indicated they would not sell their tag at any price. Average price for 13 hunters (excluding one offer for one million dollars) who indicated willingness to sell was \$19,100 per tag. Average willingness to pay and willingness to sell figures indicate hunters value bighorn sheep hunting over and above actual participation costs.

### Nonconsumptive Values and Economic Impact

Only rough estimates of nonconsumptive user values are available. For nonconsumptive uses such as wildlife viewing or photography, 1996 National Survey data for Oregon (U.S. Fish and Wildlife Service 1998a) were used to produce an estimate of \$19–\$20 per activity day (Boyle et. al. 1998). This value applies to trips taken away from home for the primary purpose of wildlife viewing or photography. The U.S. Forest Service (undated) estimated a 1990 value for nonconsumptive use of \$26.06 per activity day. Nonconsumptive users of all fish and wildlife in Oregon spent \$406.7 million on trips away from home in 1996 (Caudill and Laughland 1998). These expenditures were associated with \$216.1 million in state level total personal income. No reliable estimates are available for number of activity days or expenditures of nonconsumptive use specifically for bighorn sheep in Oregon.

The value of hunting "unique species" in Idaho has been studied in Idaho (Loomis et. al. 1985). Average net willingness to pay per permit was \$239. Based on an average 8.6 days hunting per permit, average value per hunter day was \$27.80 in 1985 dollars. Oregon and Idaho are similar in terms of having many more hunters applying for tags than available tags. However, the Idaho estimate of willingness to pay above cost is less than the estimates for Oregon and Nevada.

Nevada issues roughly twice the number of bighorn sheep tags annually as Oregon (Kay undated). Nevada's resident bighorn sheep hunters spent an average of \$2,258 per trip (average party of two hunters) and indicated they were willing to pay, on average, an additional \$1,615 per hunt to pursue desert bighorn sheep. Nonresident expenditures were much greater. Estimates are roughly consistent with Oregon's 1991 bighorn sheep hunter economic survey.

## Program Income

In the early years of Oregon's bighorn sheep program, lack of a reliable funding source prevented the development of a stable, long term program. Because the number of tags authorized annually is limited (Table 6), revenue from tag sales is not sufficient to fund a program. Even though as much as \$16,000 has been generated through sales of controlled bighorn tags, this revenue is not dedicated to the bighorn sheep program. In comparison, revenue from controlled tags was \$1,163,695 for deer and \$1,194,620 for elk in 2002.

Table 19. Controlled bighorn sheep tag sales and revenue in Oregon, 1975–2002.

Year	Resident				Non-Resident				Total
	Apps	Tags	Fee	Income	Apps	Tags	Fee	Income	
1975		19	\$10	\$190					\$190
1976		22	\$10	\$220					\$220
1977		32	\$10	\$320					\$320
1978		36	\$10	\$360					\$360
1979		37	\$10	\$370					\$370
1980		24	\$25	\$600					\$600
1981		34	\$25	\$850					\$850
1982		34	\$25	\$850					\$850
1983		44	\$25	\$1,100					\$1,100
1984		44	\$25	\$1,100					\$1,100
1985		48	\$25	\$1,200					\$1,200
1986		50	\$25	\$1,250					\$1,250
1987	3,602	44	\$25	\$1,100					\$1,100
1988	2,998	41	\$90	\$3,690	138	3	\$900	\$2,700	\$6,390
1989	2,693	47	\$90	\$4,230	69	3	\$900	\$2,700	\$6,930
1990	2,878	51	\$90	\$4,590	96	3	\$900	\$2,700	\$7,290
1991	3,323	57	\$90	\$5,130	128	3	\$900	\$2,700	\$7,830
1992	3,259	60	\$90	\$5,400	92	4	\$900	\$3,600	\$9,000
1993	3,526	74	\$90	\$6,660	113	4	\$900	\$3,600	\$10,260
1994	3,924	91	\$90	\$8,190	197	5	\$975	\$4,875	\$13,065
1995	8,888	102	\$90	\$9,180	515	7	\$975	\$6,825	\$16,005
1996	8,828	88	\$90	\$7,920	634	7	\$975	\$6,825	\$14,745
1997	9,870	68	\$90	\$6,120	803	4	\$975	\$3,900	\$10,020
1998	10,575	60	\$90	\$5,400	1,002	4	\$975	\$3,900	\$9,300
1999	11,979	56	\$90	\$5,040	1,345	3	\$975	\$2,925	\$7,965
2000	12,360	59	\$90	\$5,310	1,497	3	\$975	\$2,925	\$8,235
2001	12,982	56	\$90	\$5,040	1,608	3	\$975	\$2,925	\$7,965
2002	13,307	56	\$90	\$5,040	2,065	3	\$975	\$2,925	\$7,965

In 1985, the Oregon Legislature gave the Fish and Wildlife Commission authority to auction one bighorn sheep tag per year to the highest bidder with the intent to dedicate revenues for the bighorn sheep program. The first tag was auctioned in 1987, and one tag has been sold each year since (Table 7). From 1987–1992, five tags were auctioned at the annual Oregon Hunters Association statewide banquet for an average bid of \$41,800 (\$25,000–\$56,000). After 1991, the tag has been auctioned at the annual Foundation for North American Wild Sheep national convention. Average FNAWS price is \$71,455 (\$27,000–\$99,000), of which ODFW receives 90 percent (average \$64,310) as program income. Total auction program income 1987–2002 is \$986,600. In 1991, the Oregon Legislature passed legislation allowing one bighorn tag for raffle which has been drawn since 1992. Total raffle income since 1992 is \$485,609 and averages

\$40,467 annually (\$16,682–\$77,086; Table 7). The Department has used this money to leverage funds from other federal agencies and private organizations for trap and transplant activities, habitat improvement projects, research, monitoring, disease testing and management, and some equipment purchases. To date, nearly \$150,000 matching funds have been generated through this process.

Mountain goat tag sales began again in 1997 with only two resident tags offered at \$90 each (Table 8). Three tags were offered in 1998–2000. Four tags have been offered subsequently. Because they are

extremely limited in number, mountain goat tags sold through the controlled hunt process will not be a significant source of revenue for Oregon's mountain goat program. No dedicated revenue sources have been authorized for the Oregon mountain goat program. Legislation is was adopted during the 2003 session to authorize the annual sale of an auction tag and a raffle tag for mountain goats. Recent sales of special tags for other species including Rocky Mountain goats suggests that potential revenue for a mountain goat auction tag would be significant but not as high as for bighorn sheep tags. Goat auction tag bid prices in Colorado and Washington have averaged \$8,783 and \$8,000, respectively. Oregon will implement the new legislation initially by raffling a tag. Projected annual revenue for raffle ticket sales is about \$40,000 annually. By statute, revenues will be placed in a separate fund dedicated to Rocky Mountain goat management and research.

## Program Expenditures

Bighorn sheep management is expensive and costs vary depending on program objective, research needs, specific management issues, and region. Costs for northeast Oregon are far less than southeast Oregon because due to differences in number of established herds and the corresponding availability of transplant stock. Currently, Oregon's bighorn program expenditures closely match available income (Table 9). Since 1996, available funds have generally been allocated toward three primary objectives: 1) One-third for Rocky Mountain

Table 20. Annual bighorn program revenue from special auction and raffle tags in Oregon, 1987–2003.

Year	Auction		Raffle	Total
	Bid	Net	Net	Revenue
1987	\$56,000	\$56,000		\$56,000
1988	\$35,000	\$35,000		\$35,000
1989	\$47,000	\$47,000		\$47,000
1990	\$46,000	\$46,000		\$46,000
1991	\$25,000	\$25,000		\$25,000
1992	\$57,000	\$51,300	\$26,208	\$77,508
1993	\$102,000	\$91,800	\$45,000	\$136,800
1994	\$110,000	\$99,000	\$45,683	\$144,683
1995	\$73,000	\$65,700	\$40,019	\$105,719
1996	\$50,000	\$45,000	\$41,043	\$86,043
1997	\$30,000	\$27,000	\$22,945	\$49,945
1998	\$59,000	\$53,100	\$16,682	\$69,782
1999	\$87,500	\$78,750	\$39,962	\$118,712
2000	\$76,000	\$68,400	\$48,653	\$117,053
2001	\$67,500	\$60,750	\$42,029	\$102,779
2002	\$74,000	\$66,600	\$77,086	\$143,686
2003	\$78,000	\$70,200	\$40,300	\$110,500

Table 21. Rocky Mountain goat controlled applications, tags, and revenue generated, Oregon, 1997–2002.

Year	Applications	Tags	Revenue
1997	3,626	2	\$180
1998	3,446	3	\$270
1999	4,091	3	\$270
2000	4,301	3	\$270
2001	4,825	4	\$360
2002	5,135	4	\$360
2003	5,420	4	\$360

bighorn restoration and research through Hells Canyon Initiative; 2) One-third for California bighorn restoration and research; and 3) One-third for miscellaneous projects and needs that include habitat projects, water development, population monitoring and surveys, meetings, travel, and publications. For objective 1 and 2, the major costs are primarily associated with trapping and transplanting, and salaries for temporary personnel to monitor research animals. Beginning in 2004, ODFW will have stable income and dedicated funding for Rocky Mountain goat management with a statutorily authorized auction and raffle program similar to bighorn sheep.

### Capture Costs

The expense for a particular capture method is nearly fixed; that is, it costs about the same to capture 10 as it does to capture 20 or 30 bighorn. Normally Oregon employs two bighorn sheep capture methods: a Permanent corral-type trap on the Lostine winter range for Rocky Mountain bighorn and helicopter net gunning for all California bighorn captures and some Rocky Mountain bighorn captures. Other capture methods such as drop nets, drive nets, and chemical immobilization may also be used for specific situations.

To capture and relocate bighorn costs approximately \$1,100 per animal for most methods but may vary due to topography, habitat, access, and the cost of helicopter time. Personnel costs are difficult to assess due to variable needs during actual trapping and the use of volunteers. However, including salary, operating costs, and standard per diem rates, the estimated daily cost for a 20 person capture crew is \$5,474. Thus, quick and efficient capture methods are preferred. In total, to capture and release 20 bighorn sheep within Oregon cost approximately \$28,500.

Table 22. Total annual revenue from Oregon's bighorn sheep tags, 1975–2003.

Year	Controlled Tags <sup>a</sup>	Auction Tag	Raffle Tag	Total
1975	\$190			\$190
1976	\$220			\$220
1977	\$320			\$320
1978	\$360			\$360
1979	\$370			\$370
1880	\$600			\$600
1981	\$850			\$850
1982	\$850			\$850
1983	\$1,100			\$1,100
1984	\$1,100			\$1,100
1985	\$1,200			\$1,200
1986	\$1,250			\$1,250
1987	\$1,100	\$56,000		\$54,700
1988	\$6,390	\$35,000		\$41,390
1989	\$6,930	\$47,000		\$53,930
1990	\$7,290	\$46,000		\$53,290
1991	\$7,830	\$25,000		\$32,830
1992	\$9,000	\$51,300	\$26,208	\$86,508
1993	\$10,260	\$91,800	\$45,000	\$147,060
1994	\$13,065	\$99,000	\$45,683	\$157,748
1995	\$16,005	\$65,700	\$40,019	\$121,724
1996	\$14,745	\$45,000	\$41,043	\$100,788
1997	\$10,020	\$27,000	\$22,945	\$59,965
1998	\$9,300	\$53,100	\$16,682	\$79,082
1999	\$7,965	\$78,750	\$39,962	\$126,677
2000	\$8,235	\$68,400	\$48,653	\$125,288
2001	\$7,965	\$60,750	\$42,029	\$110,744
2002	\$7,965	\$66,600	\$77,086	\$151,651
2003	\$9,660	\$70,200	\$40,300	\$120,160

<sup>a</sup> Not dedicated specifically to the bighorn sheep program.

No specific budget exists for Rocky Mountain goat management in Oregon. However, trapping and transplanting has occurred recently, primarily due to generous donations from interested

organizations such as Oregon Hunters Association and other resource management agencies. The cost to capture and relocate 15–20 goats in Oregon is approximately \$14,800.

### **Transplant Monitoring**

Once a transplant is made, radio-collared animals should be relocated at least 1–2 times a month to ascertain movements and transplant success. Monitoring is best accomplished using fixed wing aircraft and cost depends on flight length and aircraft rental cost. This expense usually lasts for about 3 years post-release. Flights can be accomplished using aircraft furnished and piloted by the Oregon State Police. When this aircraft is not available, flights must be done with commercially rented aircraft costing \$100–\$150/hr . Most flights take from 2–4 hours to locate all animals in the release. Assuming maximum rental cost and maximum flight time, cost to monitor one bighorn sheep or Rocky Mountain goat transplant could be as high as \$19,000/year.

### **Population Monitoring**

Bighorn sheep and mountain goat population monitoring should be intensive enough to detect changes in herd productivity, determine areas used, measure gross range utilization, and be able to detect disease or parasite factors. Monitoring includes annual collection of herd composition and survey data (usually by helicopter or fixed-wing aircraft) plus periodic ground observation of each herd range to determine lamb production, animal condition, and habitat use and condition. Such work is necessary for proper management. Establishing new bighorn herds will increase annual management activity. This will accelerate progress toward the goals of the plan but will also increase program costs.

Wildlife population monitoring is a normal duty for field staff and has historically been planned for with district survey funds. Although funds from the ODFW bighorn account have been used in the past to survey bighorn populations, it has occurred infrequently and has been associated with specific extreme situation needs. When funds are allocated for surveys normally paid for by game management sources, it reduces funds available for other bighorn program priorities. As survey needs increase with increasing number and size of populations, other sources of funding may be necessary.

### **Research Costs**

Cost associated with bighorn research projects are difficult to predict but are generally associated with laboratory analyses, purchase of radio-telemetry equipment, flight time for population monitoring and surveys, and monitoring radio-collared individuals for movements and survival. Increased monitoring efforts for research projects represent additional work load for district staff. Therefore, a large portion of recent expenditures for research on both subspecies of bighorn are associated with project specific technician salaries. Including salary and operating costs, technicians cost \$3,000–\$3,500/month. Thus, maintaining a technician for a specific project accounts for about \$21,000 every six months.

## ISSUES AND STRATEGIES

Members of the public, organized interest groups, other state and federal land management agencies, and Department staff have identified a number of issues facing bighorn sheep and Rocky Mountain goat management. Some of these issues have been retained from previous plans because of their continued relevance. These issues have been grouped into five broad categories by species or sub species they potentially affect: Rocky Mountain bighorns, California bighorns, both bighorn subspecies, Rocky Mountain goats, and all species or subspecies. Strategies were developed and are presented that address each issue.

Issues have been prioritized into three broad categories (High, Medium, Low). Because priorities are based on current knowledge and conditions, they can be expected to change in response to new knowledge and information. Responding to issues and implementation of specific strategies in some cases is opportunistic and therefore may not always occur in priority order. Further, completion of potential strategies outlined in this plan will be dependent on adequate staff, funding, and scientific information and support.

### Rocky Mountain Bighorn Management Issues

**Issue:** Rocky Mountain bighorn sheep transplant stock is not always readily available.

**Priority:** Medium

**Proposed Management Strategies:**

- ODFW will continue to use in-state herds for transplant stock as herd growth allows.
- ODFW will continue to seek transplant stock from out-of-state sources.

### California Bighorn Management Issues

**Issue:** In 1992 the top priority of the California bighorn program was to establish viable herds in all available and suitable habitats within Oregon. Most available California bighorn habitat have established herds and priorities for California bighorn need to be revisited.

**Priority:** High

**Proposed Management Strategy:**

- ODFW will annually evaluate trap and transplant priorities for California bighorn sheep based on the potential to:
  - Establish a new herd in remaining available and suitable habitat.
  - Supplement an existing herd to expand its range, increase genetic diversity.
  - Control population numbers in source herds.
  - Address a specific research need.
  - Address a specific management issue.
  - Address specific habitat issues.

**Issue:** Encroachment of noxious weeds, and woody vegetation in bighorn habitat is decreasing habitat quality.

**Priority:** High

**Proposed Management Strategies:**

- ODFW will work with state and federal land management agencies to approve the use of herbicide applications, prescribed fire, or other acceptable habitat management methods to control junipers, noxious weeds, and woody vegetation in bighorn habitat on public lands.
- ODFW will cooperate with private landowners to control junipers, noxious weeds, and woody vegetation on private lands associated with bighorn habitat.
- ODFW will work with private and public land managers to develop alternatives to the use of domestic sheep or goats for controlling noxious weeds.

**Issue:** Available California bighorn sheep transplant animals are derived from Williams Lake, BC heredity which may effect genetic diversity.

**Priority:** Medium

**Proposed Management Strategies:**

- ODFW will continue to seek transplant stock from source herds that are not derived primarily from Williams Lake BC.
- ODFW will continue to use in-state herds derived from Williams Lake source stock for transplants when other stock is not available.
- ODFW will complete the long-term investigation on effects of low genetic diversity on bighorn sheep.

**Issue:** As California bighorn populations increase, the number of animals to be removed for population control may exceed the capabilities of the trap and transplant program. Because habitats are restricted, allowing bighorn sheep populations to expand without control is not an option due to potential for catastrophic population level impacts.

**Priority:** Medium

**Proposed Management Strategies:**

- ODFW will continue to manage sheep numbers within available habitat capacity.
- ODFW may authorize ewe seasons or either-sex bag limits when trapping and transplanting excess animals is not practical.
- ODFW may provide transplant stock to other states willing to pay capture, health testing, and relocation costs.

**Issue:** Available free water may be limited in quantity and quality in some occupied and unoccupied California bighorn ranges.

**Priority:** Low

**Proposed Management Strategies:**

- ODFW will evaluate water availability and quality for established California bighorn herd ranges.
- ODFW will evaluate water availability of potential California bighorn release sites prior to release of any bighorns.
- Where needs have been identified, ODFW will work with the responsible land manager, other landowners, individuals, and organized sports groups on ways to develop water sources for California bighorns.
- ODFW will work with federal agencies as needed to facilitate any NEPA processes required to establish new water sources on federal lands.

- ODFW will investigate prevalence of contaminants in guzzlers, springs, and other available water sources for California bighorn sheep.

## **General Bighorn Management Issues**

**Issue:** Historic integrity of the two bighorn sheep subspecies should be maintained.

**Priority:** High

### **Proposed Management Strategies:**

- ODFW will only transplant Rocky Mountain bighorn in its historic range in northeast Oregon, north of the Burnt River drainage and east of the John Day River drainage.
- ODFW will only transplant California bighorn in its historic ranges of central and southeast Oregon, as well as the Deschutes and John Day River drainages.
- ODFW will coordinate transplant activities with adjacent states. Joint trap and transplant activities and trades will be considered whenever beneficial opportunities exist.
- ODFW will continue to provide sheep to or receive sheep from other states in order to re-establish a sub-species or enhance genetic diversity of established herds throughout their historic range.

**Issue:** Parasites and diseases, especially those transmitted from domestic sheep, domestic goats or exotic sheep, can negatively impact bighorn sheep.

**Priority:** High

### **Proposed Management Strategies:**

- ODFW will not introduce bighorn sheep into locations where they may potentially come into contact with domestic sheep, domestic goats, or exotic sheep.
- ODFW will work with land management agencies, weed control districts, and private individuals to minimize the likelihood of contact between established bighorn sheep herds and domestic sheep, domestic goats, or exotic sheep.
- ODFW will work with land management agencies in an effort to locate domestic sheep grazing allotments, and recreational use of pack goats away from established and proposed bighorn sheep ranges.
- ODFW will conduct sufficient herd observations to ensure timely detection of disease and parasite problems. This may include mid- to late summer, early winter, and late winter surveys.
- ODFW will initiate biological sampling and collections using the best available veterinary assistance when problems are reported to verify the extent of the problem.
- ODFW will promote and support an aggressive research program to reduce bighorn vulnerability to diseases and parasites, including cooperation with other wildlife professionals and academic research institutions.
- ODFW will cooperate with sporting and conservation organizations and other individuals attempting to purchase domestic sheep grazing allotments which conflict with bighorn management.
- ODFW will evaluate, or cooperate with the development of options to recover the cost of managing disease outbreaks.

**Issue:** Bighorn sheep are wild animals and will explore new territory. During these expansion movements they may contact domestic sheep or exotic sheep.

**Priority:** High

**Proposed Management Strategies:**

- ODFW will treat wandering bighorn sheep as an emergency situation and the possibility of bighorn sheep–domestic sheep contact will be evaluated by district wildlife biologists as quickly as possible.
- ODFW will attempt to capture any bighorn that has contacted domestic or exotic sheep, or has strong potential to mix with domestic or exotic sheep. All captured bighorns with potential to have had contact with domestic or exotic breeds will:
  - Not be released back into the population.
  - Be quarantined and tested for diseases negatively impacting bighorns.
  - Be given to appropriate facilities for disease related research.
  - Be humanely euthanized.
- If live capture is impractical or impossible, ODFW will humanely destroy wandering bighorns prior to their return to an established herd

**Issue:** Select diseases can have a negative impact on both bighorn sheep and domestic livestock. Both the Department and the livestock industry want to minimize the potential for disease transmission between bighorn sheep and domestic livestock.

**Priority:** High

**Proposed Management Strategies:**

- ODFW will continue to test bighorns for presence of diseases important to both bighorn sheep and the livestock industry.
- ODFW will not release bighorns with questionable health status. Veterinary assistance on all capture operations will be encouraged.
- ODFW will not release bighorn with clinical signs of diseases of mutual concern to the Department and the livestock industry. The presence of titers to specific diseases will not be considered clinical disease.
- ODFW will not release bighorns from outside Oregon until they are inspected by a licensed veterinarian. State and Federal rules regulating importation will be followed.

**Issue:** Management activities on private land holdings adjacent to established bighorn sheep populations may pose a threat to the welfare of those herds.

**Priority:** High

**Proposed Management Strategies:**

- ODFW will work with adjacent landowners to minimize or prevent problem development.
- ODFW will continue to educate private landowners and livestock producers regarding the health risks of bighorn sheep contact with domestic sheep or goats.
- ODFW may purchase critical bighorn habitat if alternative methods of cooperation are unavailable and bighorn habitat values are present.

**Issue:** Poaching and black-market activity in bighorn sheep horns, capes and mounts could lead to depletion of the large ram population and penalties for poaching may not be severe enough. The Oregon Hunter's Association was instrumental in having legislation

developed in the 2003 session to double the damages that may be assessed for illegally killing wildlife and if enacted, the damages for poaching a bighorn sheep will go from \$3,500 to \$7,000 in ORS 496.705.

**Priority:** High

**Proposed Management Strategies:**

- ODFW will continue permanently mark all hunter harvested rams.
- Private possession of bighorn sheep horns is not allowed, except that OAR 635-65-765 allows possession of bighorn sheep horns legally taken during an authorized hunting season.
- ODFW will emphasize the situation through the Coordinated Enforcement Program with the Oregon State Police as situations warrant.
- ODFW will work with neighboring states to develop regulations which do not allow possession of bighorn sheep horns not taken by legal hunting.
- ODFW will continue to develop and support increases in fines and restitution values for bighorn sheep.

**Issue:** Private ownership of live bighorn sheep and live exotic sheep could pose a threat to existing bighorn sheep populations or preclude restoration of bighorn sheep to suitable historic habitat.

**Priority:** High

**Proposed Management Strategies:**

- ODFW will continue to work with public land management agencies to ensure that exotic sheep are not allowed to occupy established or potential bighorn sheep ranges on public lands.
- ODFW will work with private individuals who own exotic sheep to reduce the chances of disease transmission between wild bighorns and exotic sheep.
- ODFW will continue to investigate potential options and methods to remove exotic breeds from public and private lands.

**Issue:** Some historic habitat may not currently be in suitable condition to support a release of bighorn sheep. However, management practices could be implemented which would make the habitat suitable for bighorn sheep.

**Priority:** Medium

**Proposed Management Strategies:**

- ODFW will work to identify deficiencies in established bighorn ranges and potential release sites.
- When the deficiencies of such an area are identified, ODFW will work with the appropriate land management agencies or landowners to correct those deficiencies prior to release.
- ODFW will cooperate in implementation of actions leading to improvements in established bighorn sheep ranges or potential release sites.

**Issue:** Bighorn sheep occupying private lands may not be accessible to the public.

**Priority:** Medium

**Proposed Management Strategies:**

- Where private land may make up a significant portion of a bighorn sheep range, ODFW will strive to obtain written agreements prior to release from landowners to allow public access to the bighorn herds.
- ODFW will not transplant bighorns into areas where reasonable public access is not possible.
- ODFW will consider land purchases to gain public access to established bighorn herd ranges.
- ODFW will cooperate in development of permanent or long term easements that secure public access to bighorn sheep herd ranges.
- ODFW will work with landowners to evaluate potential Access and Habitat proposals that increase public access to bighorn herd ranges.

**Issue:** Recreational opportunities associated with bighorn sheep are highly valued by the public.

**Priority:** Medium

**Proposed Management Strategies:**

- ODFW will continue to keep the public informed on progress of the overall program.
- ODFW will continue to inform the public about optimum viewing opportunities and will consider partnering with organized sport groups to develop non-hunting values for bighorn sheep.
- ODFW will continue to develop high quality harvest opportunities based on biological and social information that maximizes recreational opportunities.

**Issue:** As cougar populations have increased, predation on established bighorn herds has increased to a level to reduce population growth, and predation is reducing the potential for successful transplants.

**Priority:** Medium

**Proposed Management Strategies:**

- ODFW will evaluate the level and causes of bighorn mortality within established bighorn herds.
- ODFW may increase the number of bighorns released at specific sites.
- ODFW may evaluate opportunities to increase cougar harvest in specific bighorn herd ranges.
- ODFW may implement agency control of cougars in release sites where cougar predation has been identified as a possible limiting factor on success of the transplant.
- ODFW may implement agency control of cougars on established herd ranges where cougar predation may potentially cause extirpation of an established population.

**Issue:** Recovering wolf populations from central Idaho may expand into eastern Oregon with potential to prey on bighorn sheep.

**Priority:** Medium

**Proposed Management Strategies:**

- ODFW will ensure bighorn sheep values and management is considered adequately in development of the Oregon Wolf Management Plan.
- ODFW will evaluate the potential for wolf predation to be an additive mortality factor in established bighorn herds.

**Issue:** Several of Oregon's Native American tribes have expressed interest in providing a harvest opportunity for bighorn sheep to tribal members.

**Priority:** Medium

**Proposed Management Strategies:**

- ODFW will continue to develop opportunities for tribal involvement in bighorn sheep management in Oregon.
- ODFW may provide transplant stock to tribes with historic bighorn habitat within their reservation to establish herds for tribal management.
- ODFW will continue to work with tribal representatives to develop:
  - Written agreements for tribal bighorn harvest off reservation lands but within the individual tribe's ceded hunting area.
  - Written agreements for transplants into suitable habitats within reservation lands.

**Issue:** Wilderness or Wilderness Study Area (WSA) designation causes challenges during completion of habitat improvement projects by restricting mechanical treatments or herbicide use.

**Priority:** Low

**Proposed Management Strategies:**

- ODFW will strive to keep present and potential bighorn sheep habitat in the highest degree of remoteness possible.
- ODFW will work with land management agencies to investigate techniques to effectively control junipers, noxious weeds, and woody vegetation in wilderness and WSA's.

**Issue:** The Department has received requests for additional bighorn sheep auction tags.

**Priority:** Low

**Proposed Management Strategy:**

- ODFW does not support additional bighorn sheep auction tags because it may reduce auction revenues if the price received for multiple tags is less than the amount received for the one unique tag annually.

**Issue:** The Department has received suggestions for a higher bighorn tag fee to reduce competition for existing tags and improve the 'quality' of hunters drawing tags.

**Priority:** Low

**Proposed Management Strategy:**

- At this time neither the legislature or ODFW believe a revenue-maximizing tag fee would be equitable.

**Issue:** Current statute allows only one controlled bighorn sheep tag in a persons lifetime. If controlled ewe seasons are authorized, tags may not be desirable to hunters because of this statute, thus negatively impacting ODFW's ability to manage populations.

**Priority:** Low

**Proposed Management Strategy:**

- ODFW will seek legislation that changes the statute to allow one controlled ram tag and one controlled ewe tag in a hunters lifetime.

## Rocky Mountain Goat Management Issues

**Issue:** New dedicated funding will be available for the mountain goat program with authorization of the raffle and auction program but management costs may still surpass available funding.

**Priority:** High

**Proposed Management Strategies:**

- ODFW will continue to develop alternative funding sources to leverage funds dedicated for mountain goat management.
- ODFW will pursue create an additional auction tag when goat populations are sufficient to support the additional tag.

**Issue:** Responsible federal land management agencies desire more input into development of trapping and transplanting objective within Oregon.

**Priority:** High

**Proposed Management Strategy:**

- ODFW will communicate locally with agencies responsible for potential mountain goat release sites prior to any goats being released.

**Issue:** Biologists should employ appropriate methods to obtain annual population and herd composition information.

**Priority:** High

**Proposed Management Strategies:**

- ODFW will strive to conduct surveys during mid- to late summer when goats are most visible.
- ODFW will utilize ground surveys, aerial surveys, or a combination of both depending on local habitat conditions and accessibility, to monitor population status.
- ODFW will classify goats using experience observers.
- ODFW will seek additional funding to complete surveys as goat populations and distribution expand

**Issue:** In some mountain ranges goats may have a negative impact on their habitat or state and federally listed plant species.

**Priority:** High

**Proposed Management Strategies:**

- ODFW will cooperate with associated land management agencies in development and implementation of population and habitat monitoring programs to survey goat numbers and vegetative communities when and where appropriate.
- If it is determined that habitat is in decline, or a plant species of concern is being impacted by goats, ODFW will cooperatively develop and implement appropriate management actions to protect species of concern.

**Issue:** Geographic isolation between populations and lack of genetic interchange may greatly increase the chance of local extinction or population stagnation.

**Priority:** Medium

**Proposed Management Strategies:**

- ODFW can provide genetically diverse stock for new herds from both the Wallowa and Elkhorn Mountains goat populations which were established with goats from 3 separate geographic areas.
- ODFW will transplant animals from different geographic areas when and where possible for supplementing isolated herds to improve or maintain genetic variability.

**Issue:** Mountain goat herds may increase beyond desired population goals.

**Priority:** Medium

**Proposed Management Strategy:**

- ODFW considers trapping and transplanting to be the primary population control measure at this time.
- ODFW may implement nanny harvest in situations not conducive to goat trapping.

**Issue:** Capture myopathy was observed in goats captured in Alberta and British Columbia (Hebert and Cowan 1971, Jorgenson and Quinlan 1996). Selenium or vitamin E deficiencies may have been predisposing factors to this condition.

**Priority:** Medium

**Proposed Management Strategies:**

- ODFW may utilize preventative measures such as selenium or vitamin E injections whenever goats are trapped and handled.
- ODFW will provide salt based trace minerals in areas frequented by goats.

**Issue:** Persons camping in some areas inhabited by goats may experience damage to camp gear or aggressive behavior by individual goats seeking salt or other minerals.

**Priority:** Low

**Proposed Management Strategy:**

- ODFW will provide information at appropriate locations to educate the public regard potential conflicts in areas where public–goat confrontations are common.
- ODFW will provide salt or other minerals to entice goats out of high public use areas and reduce potential conflict.
- ODFW will cooperatively evaluate and/or develop camping regulations in high public use area to minimize potential public–goat interactions.

**All Species Management Issues**

**Issue:** Communication with the public and other management agencies will be required for successful implementation of this plan over the next 10 years.

**Priority:** High

**Proposed Management Strategies:**

- ODFW will provide written notification to agencies of input opportunities for decision points on implementation of this plan.
- ODFW will provide public notification of input opportunities for decision points on implementation of this plan.

**Issue:** Costs associated with bighorn sheep and mountain goat management are increasing as populations expand and increase, and trapping and transplanting operations are expensive and face some serious cost challenges.

**Priority:** High

**Proposed Management Strategies:**

- ODFW will work with Department of Administrative Service, aircraft vendors and the insurance industry to find reasonable solutions to increasing costs.
- ODFW will make annual big game inventory a budget priority within the game program.
- ODFW will explore other inventory techniques that may effectively measure population parameters at reduced costs.

**Issue:** Current population survey procedures may not be adequate in terms of frequency, timing, intensity, and statistical reliability.

**Priority:** Medium

**Proposed Management Strategies:**

- ODFW should evaluate each herd to determine appropriate survey methods and timing.
- ODFW will continue to pursue additional private or special funding sources for bighorn management survey efforts.
- ODFW will pursue public support for continued authorization of bighorn auction and raffle tags through education and information efforts explaining the benefits of these programs.
- ODFW will continue investigating ways to improve survey or application of different techniques.

**Issue:** The department has received numerous requests for tag fees for bighorn sheep and Rocky Mountain goats should be required at the time of application.

**Priority:** Low

**Proposed Management Strategies:**

- ODFW does not favor a system for drawing a bighorn sheep tag inconsistent with the system used for deer, elk and other species. Reinstating the “old” system with up-front payment for bighorn sheep would also require reprogramming the information systems software. Additional staff time would be required to operate the separate systems.

**Issue:** The department has received numerous requests to allow successful applicants for one bighorn subspecies to apply for the other subspecies.

**Priority:** Low

**Proposed Management Strategies:**

- ODFW will evaluate options to allow hunters to hold one controlled Rocky Mountain bighorn tag and one California bighorn tag in a lifetime.
- If it is determined there are no significant biological or social impacts and there is potential for increased income, ODFW may develop legislative proposal to allow two bighorn tags in a lifetime.

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## LIST OF APPENDICES

<b>Appendix 1:</b> Parasites and diseases of wild sheep and goats. ....	58
<b>Appendix 2:</b> Classification of bighorn sheep rams. ....	62
<b>Appendix 3:</b> Summary of accomplishments on management concerns and strategies identified in the 1992 plan. ....	63
<b>Appendix 4:</b> Detailed historical record of Rocky Mountain goats in Oregon. ....	67
<b>Appendix 5:</b> Memorandum of agreement establishing the Hells Canyon Initiative and restoration committee (Spacing has been condensed to minimize space requirements). ....	70
<b>Appendix 6:</b> Groups identified for public input working group for revision of the Bighorn Sheep – Rocky Mountain goat management plan. ....	74
<b>Appendix 7:</b> Dates and locations for bighorn sheep – Rocky Mountain goat management plan public input meetings. ....	77
<b>Appendix 8:</b> Synthesis of public input received on the revised bighorn sheep Rocky Mountain goat management plan. ....	78

## APPENDIX 1: PARASITES AND DISEASE OF WILD SHEEP AND GOATS

### Bighorn Sheep Disease

Disease surveillance and management is a priority in bighorn sheep conservation. Bighorns are susceptible to several diseases and parasites which have caused both acute and chronic herd reductions. Although most other big game species are susceptible to various diseases and parasites, they generally are not impacted to the level documented in bighorns.

When bighorn sheep come in contact with domestic sheep, bighorns usually die of pneumonia within 3-7 days of contact (Foryet et al. 1994, Martin et al. 1996, Schomer and Woolever 2001). Because exposed bighorns do not die immediately infected individuals may return to their herd and infect other individuals, which can cause 70–100% of the herd to die. For this reason the Department will not release bighorns in locations where with a known potential to contact domestic sheep.

Experience has shown there is no fixed separation distance between wild and domestic sheep that insures protection from disease. In Hells Canyon, a 25 mile buffer between bighorns and an open range domestic sheep allotment has not protected wild bighorns from disease (Schommer and Woolever, 2001). Following a 1993 die-off of California bighorn in the Aldrich herd a change in trailing practices to keep domestic sheep approximately 5 miles away from wild sheep in the spring and 20 miles in the fall has been adequate. Each situation is different and managers must design adequate buffers to prevent contact between bighorns and domestic sheep.

With the exception of lungworm and scabies, most diseases negatively effecting bighorns commonly occur in domestic sheep and disease prevalence in bighorns generally increases with contact between bighorns and domestic sheep. Following are brief descriptions of the primary parasites and diseases negatively affecting bighorn sheep in Oregon.

#### *Lungworm*

Two species of lungworm (*Protostrongylus* spp) are found in bighorn sheep populations. Healthy bighorns in good habitat can coexist with lungworms with minimal negative impact. However, in some cases, lungworm loads can increase to exceptionally high levels resulting in lung damage that leads to pneumonia. Lungworm larva in pregnant ewes can cross the placenta and infect the fetus. Consequently, newborn lambs can harbor lungworm and die of pneumonia within a few months after birth. The Department is concerned about lungworm in bighorn sheep because low productivity caused by lungworms impacts recovery and management efforts. Lungworms are present in all Oregon bighorn populations. Lungworm levels may be monitored seasonally through fecal analysis. Corrective action is generally initiated when high levels are documented. Actions may involve trapping and transplanting to reduce the population size. In some bighorn herds treatment with anthelmintic drugs has been used by feeding medicated pellets or salt. Treatment has been successful in herds readily accepting supplements. However, results have been poor in some herds due to a reluctance of bighorns to use medicated feed supplements. No other cost-effective method of drug delivery currently exists.

## *Pasteurellosis*

Pasteurellosis refers to the chronic and acute pneumonia, septicemia, and other infections caused by bacteria of the genus *Pasteurella*, that are lethal to bighorn sheep. Prior to 2000, bacteria causing pasteurellosis were all classified as *Pasteurella* spp. In 2000 *Pasteurella haemolytica*, which has been implicated as causing many bighorn die-offs, was reclassified as *Mannhaemia haemolytica*. Although there are now two genera of bacteria involved in bighorn pneumonia outbreaks, the disease is still commonly referred to as Pasteurellosis.

Pasteurellosis has played a significant role in bighorn population declines throughout western North America (Miller 2000). Occurrence of epidemics followed settlement and establishment of domestic sheep grazing, and may reflect the introduction of novel pathogens causing bacterial pneumonia into naïve bighorn populations (Miller 2000). Disease, along with habitat degradation and unregulated hunting, resulted in extirpation of wild sheep from Oregon. In modern times, pasteurellosis outbreaks have occurred in 1972, 1983–84, 1986–87, 1995–96 and 1999 in some Oregon Rocky Mountain bighorn herds, and 1991 in the Aldrich Mountain California bighorn herd. Contact with domestic sheep or goats is the most likely source for these outbreaks. Ongoing research in Hells Canyon indicates pasteurellosis continues to be the leading cause of mortality in Oregon's Rocky Mountain bighorns.

Pneumonia outbreaks occur almost annually somewhere in the U.S. or Canadian bighorn range. Outbreaks range in severity from 100% mortality to only a few animals dying. Poor lamb survival generally follows. Studies in Hells Canyon indicate lambs contract pneumonia and the disease can spread through entire lamb groups. Lambs likely contract the disease from their mothers or from other con-specifics in the herd. Long term monitoring of the Lostine herd indicates surviving bighorns recover and eventually lamb survival increases to normal levels.

California bighorn herds in British Columbia, California, North Dakota, and Oregon have experienced catastrophic pneumonia outbreaks. Most have been circumstantially linked to contact with domestic sheep or goats. Oregon's single pneumonia epidemic in California bighorns occurred in the Aldrich Mountain herd in 1991 which abruptly declined from 100 animals to 32 animals. The cause was unknown at the time, but pneumonia was suspected. Subsequent information indicated pneumonia caused the decline. No definitive evidence as to what caused the pneumonia outbreak was found. However, trailing practices on an open range domestic sheep allotment within 5 miles of this bighorn herd were altered in 1993, and to date, no other die-offs have occurred. Other California bighorn herds have had significant unexplained reductions in populations. Leslie Gulch has had a dramatic population decline and *Pasteurella haemolytica* variants suspected in other disease outbreaks were isolated (Al Ward, University of Idaho, Personal Communication). However, no deaths have been attributed to pasteurellosis despite the presence of lethal variants of this bacteria. Field treatment of pasteurellosis with antibiotics has had some success but prevention needs to be emphasized. The most effective prevention is separation between bighorns and domestic sheep or goats.

### ***Soremouth***

Also called contagious ecthyma, soremouth is a viral disease of sheep and goats that causes sores on the mouth, nostrils, and eyelids. Sores also may be found on the teats of females and external genitalia. Sores on the teats of ewes or mouths of lambs may inhibit nursing and foraging, resulting in increased mortality. The effect on adults is usually of minor consequence. Soremouth has been seen in the Lower Imnaha, Lower Hells Canyon, and Redbird, Idaho Rocky Mountain bighorn herds. It was first documented in the Lower Imnaha population in the fall of 1991 when two harvested rams were found infected. This disease has been suspected in heavy lamb losses in South Dakota (G. Brundige Pers. Comm.). The impact of soremouth to Oregon herds appears minimal. Hunters need to be aware that contagious ecthyma can be transmitted to humans through contact with infected animals. Further, since soremouth is a common ailment of domestic sheep and goats, potential spread could impact the domestic livestock industry.

### ***Scabies***

Scabies is caused by a surface feeding mite (*Psoroptes ovis*). Symptoms include oozing skin sores with scab formation. Sores are caused by chronic skin irritation from mouth parts of the mites, and possibly from an immune response to proteins from feeding mites. Sores usually develop in the ears first, and ear canals are often completely filled with debris (Foreyt et al. 1990). Advanced cases of scabies can cause mortality (Lange et al. 1980, Foreyt et al. 1990).

Scabies was first diagnosed in Oregon in the Wenaha Rocky Mountain bighorn herd in 1984. It was confirmed in one of 27 transplant animals from Lemhi County, Idaho that were released on Wenaha Wildlife Area near Troy, Oregon. By March 1989, 5 of 21 bighorns sampled (24%) had visible scabies sores. A serious decline in the California bighorn herd in nearby Cottonwood, WA occurred in 1988 and was thought to be a result of scabies (Foreyt et al. 1990). By 1990, scabies was diagnosed in the Black Butte herd on the Oregon-Washington border 22 airmiles from the original source. Scabies is present in most Hells Canyon bighorn herds and was confirmed in the Lostine herd in January 2003.

While scabies has caused serious losses in some herds, we have seen eventual recovery in other Hells Canyon bighorns. The Wenaha bighorn herd has had a low incidence of visible scabies lesions in recent years. Scabies appears very contagious and has infected Canadian transplants and other herds with no prior history of the parasite. Heavy infestations can cause severe hair loss that may lead to death especially during winter months.

Scabies can be treated with the anthelmintic drugs through injection or feed formulations. Both the Wenaha and Lostine herds have been treated orally for scabies. All Oregon bighorns captured for reasons other than removal from the herd are routinely given anthelmintic drugs. Research indicates the *Psorptes* mite infecting bighorns is host specific and not transmissible to livestock (Wright, et al. 1981, Foreyt et al. 1990). Scabies, although monitored for during captures, has not been found in any California bighorn herds in Oregon.

## Mountain Goat Disease

Numerous studies have examined parasites of mountain goats (Cowan 1951, Brandborg 1955, Kerr and Holmes 1966, Richardson 1971, Cooley 1976, Samuel et al. 1977, Johnson 1983). Most parasites are considered of minor consequence to goats unless animals were already stressed by other factors such as malnutrition during severe winters. However, kid survival was significantly higher in herds de-wormed with phenothiazine salt blocks (Johnson 1983). Fecal analysis from goats in the Wallowa and Elkhorn Mountains indicate *Coccidia* is commonly found from low to moderate levels, while *Nematodirus*, *Trichuris*, and *Moniezia* have only been detected in a few individuals. No lungworm larvae have been detected.

There is little evidence of disease being significant at the population level, but individual goats contract a variety of diseases. Pasteurellosis, paratuberculosis, contagious ecthyma, West Nile virus, antibodies to parainfluenza 3, respiratory syncytial virus (Dunbar et al. 1986), and bovine viral diarrhea have been diagnosed in herds outside Oregon. There is no known instances of disease transmission between mountain goats and domestic livestock or other wildlife.

White muscle disease (capture myopathy) was observed in goats captured in Alberta and British Columbia (Hebert and Cowan 1971, Jorgenson and Quinlan 1996). Selenium (vitamin E) deficiencies, or stress, may have been predisposing factors to this condition.

## APPENDIX 2: CLASSIFICATION OF BIGHORN SHEEP RAMS

Bighorns are classified for population monitoring purposes either from the air or ground. Major classes are: Ewe, Lamb and Ram. Rams are further broken down into Class I through IV. Horns are present on all classes of bighorns. Identifying characteristics to differentiate bighorns into the various classes are: Size and shape of the horn. Shape of head when observed from the side. Relative body size. With experience, classification of bighorns is relatively easy.

Ewe horns are usually 6-10 inches long and the width of the horn base, when viewed from the side, is approximately the width of the ear. Nose length is longer than in lambs. Descriptively, the distance from the front of the eye to the tip of the nose is longer than the distance from the front of the eye to the back of the head. Size of horn bases is the key characteristic to differentiate ewes from yearling rams.

Lamb horns are usually less than 4 inches and appear black from a distance if they can be observed at all. Nose length is short, giving the head a “boxy” look when viewed from the side. Descriptively, the distance from the front of the eye to the tip of the nose is shorter than the distance from the front of the eye to the back of the head. Head shape is the key characteristic to differentiate lambs from other age classes. Lambs are usually smaller than adults, however a ram lamb observed late in their first year (March–May) can appear as large as a yearling ewe.

Rams are classified based on horn growth and the amount of brooming. Brooming is wear on the tips of the horns so that rather than coming to a fine point the end of the horn appears large and blunt. Ram horns have large bases compared to ewes and even in yearling rams, the width of the base when viewed from the side is obviously wider than the width of the ear. Ram horns curl and the amount of curl is described in quarters defined by a crosshair centered at the eye, with the rear horizontal passing through the ear. Class I rams are usually yearlings and the tip of the horn is within the first quarter. Class II rams are more than quarter curl but the tip of the horn does not extend out of the second quarter. Class III rams have  $\frac{3}{4}$  curl horns but the tips are not broomed. Class IV rams have  $\frac{3}{4}$  curl or full curl horns with obvious brooming on both tips.

California bighorn rams rarely have horns that reach to full curl and therefore it is the amount of brooming that differentiates a Class III ram from a Class IV ram. Rocky Mountain bighorn rams commonly have horns that reach full curl. Occasionally the horn configuration on a large Rocky Mountain ram will be very wide and flared. These types of horns rarely broom off, but commonly exceed full curl. Any ram that has full curl horns is considered Class IV.

**APPENDIX 3:  
ACCOMPLISHMENTS ON MANAGEMENT CONCERNS AND STRATEGIES  
IDENTIFIED IN 1992 PLAN**

**Concern 1. Maintenance of Sub-species Integrity.**

- During the life of the 1992 plan, 32 California bighorn releases were completed and 14 Rocky Mountain bighorn releases were completed. Sub-species used in all transplants were consistent with the historic range in Oregon.

**Concern 2. Availability of Source Stock and Secure Funding for Transplant Program.**

- As new California bighorn herds increased availability of source stock for transplants became readily available. These new source herds were derived from Hart Mountain stock and therefore are closely related. With declines in lamb recruitment in the established herds, concerns arose over a lack of genetic diversity. Genetically diverse source stock is limited because these bighorns would have to come from other states or provinces. Stock from in state sources is available.
- Rocky Mountain bighorns have a relatively limited range in Oregon and numbers have not increased similar to California bighorns. Therefore Rocky Mountain transplants are dependent on source stock from other states or provinces. Availability can still be limited, however Oregon has been successful at securing bighorns for transplant.
- In 1992 the auction tag was new and there was no additional raffle tag. Secure funding for Oregon's bighorn program was still an issue. With these tags funding is secure for priority projects. As with any program there is more to do than funding allows, so it is important that annual activities are prioritized and budgeted.

**Concern 3. Timely Approval of Transplant Sites by Land Management Agencies.**

- After this issue was identified, department biologists worked with their respective land management agencies to secure the necessary approvals. Approvals were secured timely enough so as not to negatively impact the transplant program.
- At this time re-establishment of bighorns into historic habitat is supported by all Oregon land management agencies and has been emphasized in their planning documents.
- Efforts to settle domestic sheep–bighorn conflicts through land management agency planning still results in some conflict, in specific cases. However, the issues are generally not associated with approval of the transplant but altering allotment management to provide adequate buffers between bighorns and domestics.
- Recent reviews of federal statute determined that NEPA analysis and approval is not necessary for certain wildlife management activities including transplanting of wildlife.

**Concern 4. Parasite and Disease Issues as a Result of Domestic/Bighorn Contact.**

- In 1992 there was still disagreement whether contact between domestic sheep and bighorns resulted in death of the bighorns. Through research this has been proven beyond doubt and is now accepted as fact.
- The USFS published guidelines to develop buffers between domestics and bighorns (Schomer and Woolover, 2001). The BLM has recognized the need for buffers in their planning documents.
- The department has taken several actions on this concern. Herd monitoring is important for detection of disease and is completed annually. Testing of captured bighorns for prevalence of *Pasteurella* and *Mannheimia* is standard. No transplants have been completed to sites with domestic sheep conflicts. One California bighorn release was postponed after a

domestic sheep conflict developed on adjacent private land. Those sites identified as having domestic conflicts in 1992 have not been stocked as the conflicts have not been resolved. The Department has worked with private landowners and the Baker County weed department to solve conflicts between bighorns and domestic goats used for weed control in the Burnt River Canyon.

**Concern 5. Straying of Individual Bighorn and Contact with Domestic Sheep.**

- Numerous reports of stray bighorns have been investigated by biologists. These investigations have resulted in 5 bighorns being captured near domestics and quarantined, 2 bighorns being captured in an area of non-habitat without domestics and being returned to their herd, and 10 bighorn being destroyed. The quarantined bighorns were not returned to their respective herds.

**Concern 6. Impact of Select Diseases on Both Bighorns and Domestic Livestock.**

- Disease testing has become standard protocol on all bighorn captures for transplant, and a veterinarian is a member of each capture team. All bighorns imported into Oregon have had health certificates issued by the source state or province and import permits issued by Oregon Department of Agriculture.

**Concern 7. Management Activities on Private Land May Pose a Threat to Established Bighorn Herds.**

- These activities are primarily related to the husbandry of domestic or exotic sheep and goats. Several instances have occurred where private landowners close to established bighorn herds have started raising domestic or exotic sheep or goats. In each instance the department biologist has met with these landowners and explained the disease issues. To date, private landowners have been very willing to work with department biologists to reduce any potential disease transmission.

**Concern 8. Need for Ewe Harvest.**

- In 1993 the Oregon Legislature approved legislation that allows the Wildlife Commission to approve ewe seasons. Harvest of bighorn ewes is a once in a lifetime opportunity. Ewe seasons have not been authorized by the Commission, but the option is available at such time that the limitations of the trap and transplant program are not sufficient to meet population control needs.

**Concern 9. Hart Mountain, Steens and Leslie Gulch may be Approaching Carrying Capacity.**

- In 1992 it was thought poor lamb recruitment in these herds may have been a result of approaching Carrying Capacity. In an effort to address this in the Steens herd, 132 animals were removed either through trapping operations or hunting seasons. After removal, lamb recruitment did not increase and the population stabilized at the lower level. In 1996 Hart Mountain Refuge burned approximately 1/4 of the sheep habitat in an effort to increase forage for bighorns. Since that time, the Hart Mt. herd has decreased from approximately 500 animals to 300 animals.
- If restrictions of Carrying Capacity were effecting lamb recruitment there should have been an increase when the Steens population was reduced and habitat for the Hart population was improved. It does not appear lamb recruitment was reduced as a result of the herds approaching Carrying Capacity.

**Concern 10. Current Survey Procedures may not be Adequate.**

- No evaluation has been completed into the best methods or timing for surveys of the various bighorn herds. Harney district currently surveys the Steens herd from the ground in

late winter, rather than from the air in the spring. This has been effective for this herd. It is more labor intensive than flying, but less expensive. In July 2000, in cooperation with Idaho Game & Fish, a sightability estimate of the Leslie Gulch Herd was completed. This method shows promise as an effective method to estimate total population, but it needs to be evaluated on herd ranges with different habitat conditions.

- With the increase in bighorn numbers the department's management budgets have been insufficient to insure all bighorn herds are surveyed each year. Bighorn program funds have been prioritized for trapping, research and habitat development activities and have not been available for survey needs.

**Concern 11. Insufficient Funding for Bighorn Management Program.**

- The department has continued to auction 1 tag and raffle 1 tag each year. Funds generated from these tags plus leveraged dollars from sports groups are responsible for the success of the bighorn reintroduction, habitat work and research activities.
- In the 1992 plan the top program priority was trap and transplant of bighorns.

**Concern 12. Poaching Could Lead to Depletion of Large Rams.**

- All hunter harvested rams have been pinned by department personnel. Any other bighorn parts given to educational facilities have been accompanied with a possession permit.
- All sheep districts emphasize bighorn poaching as an issue in Coordinated Enforcement Planning with Oregon State Police.
- Efforts to develop common pinning and possession requirements between neighboring states were unsuccessful.

**Concern 13. Ownership of live bighorn sheep and live exotic sheep.**

- There are several sites in Wheeler County, and one site in the Upper Deschutes River–Crooked River Canyon where mouflon sheep, either privately owned or unclaimed, exist on private land and occasionally stray onto public land. At this time none of these exotic sheep are impacting existing bighorn herds. Because of disease concerns no transplants of bighorns have been considered in the vicinity of these exotics.
- No captive bighorns exist in Oregon. Their possession is controlled through Oregon's Wildlife Integrity Rules.
- In 1993 the department reviewed the status of exotic sheep under Oregon law and it was determined that they are livestock and rules enacted for their management are administered by Oregon Department of Agriculture.

**Concern 14. Some Historic Habitat is not in Suitable Condition to Support Bighorns.**

- Since 1992, 12 guzzlers have been built for 8 California bighorn herds, and 10 guzzlers have been modified to benefit 3 California bighorn herds. In addition one well and one spring was improved for the benefit of bighorns.
- Prescribed fire was used to benefit bighorns on Hart Mt. Refuge and the Aldrich herd range. Wildfire has impacted bighorn habitat in Leslie Gulch, Hart Mt. and Abert Rim. Some of the impact has been positive and some has been negative.
- Noxious weeds have been treated on 270 acres in two sites in the Burnt River.
- Forage seedings for bighorns were completed on 130 acres in the lower Deschutes River, 10 acres on Aldrich and 5 acres in the Devil's Garden.

**Concern 15. Bighorns on Private Land may not be Accessible to Public.**

- The only bighorn herd with substantial access restrictions is the Lower John Day River. Access commitments were in place prior to bighorns being released, but landowners have

since backed out of those commitments. Hunting seasons are being proposed which will allow boat access to public lands within this herd range.

- Other areas with available habitat but private land access restrictions have not been stocked.

**Concern 16. Value of Bighorn Recreational Opportunities.**

- The public is regularly informed both formally through print and radio media, and informally through personal contacts with biologists, about bighorn viewing opportunities.
- Average length of bighorn hunting seasons in 11 days. Although the number of tags available has declined in the last 5 years, the number of hunts has increased. The department has provided as much hunting opportunity as possible while maintaining a high quality hunting experience.

## APPENDIX 4: DETAILED HISTORICAL RECORD OF ROCKY MOUNTAIN GOATS IN OREGON

### *Early Accounts*

The first reports of mountain goats in the Oregon territory are found in the Lewis and Clark expedition journals (Moulton 1983-2000). On April 10, 1806 while camped near Brant Island, which lies in the southern portion of the Columbia River, (now called Bradford Island, near present day Bonneville dam) Lewis writes “These people informed us that these sheep were found in great abundance on the heights and among the cliffs of the adjacent mountains, and that they had lately killed these two from a herd of 36 at no great distance from their village”. Clark describes the same encounter “they killed those animals among the rocks in the mountains under which they live, and that great numbers of those animals inhabit those mountains and that the lamb was killed out of a gang of 36 a short distance from the village”. Lewis and Clark’s description of these “sheep” is that the “skin is white color”, the horns are four inches long, cylindrical, smooth, black, erect and pointed, they rise from the middle of the forehead a little above the back of the eyes. On April 12, 1806, while camped on the north side of the Columbia (present day Skamania Co. WA.) Clark describes “20 natives” that visited his camp from the south side of the river (present day State of Oregon), “A man described the sheep skin his daughter was wearing. He had killed the sheep in the mountains immediately above his village, and that on those mountains great numbers of those animals were to be found in large flocks among the steep rocks”. Lewis and Clark report the habitat in this area to be fir and cedar trees and “high, steep and rocky”. Habitat at the location today could be described the same way on the south side of the Columbia River. In addition, on Lewis and Clark’s map of the area of “Brant Island”, they wrote “high mountains” on the south side of the Columbia near Brant Island, and made no special note of any mountains on the Washington side of the river. Parker (1938) lends credence to this as he reports “about the Cascades it is very mountainous, especially on the south side. Both Lewis and Clark go on further to state “the white haired sheep is found in greater abundance on the chain of mountains which forms the commencement of the woody country on this coast and which pass the Columbia between the great falls and rapids” (Moulton 1983-2000).

Ord (1815) who referred to mountain goats as *Ovis montanus*, or *Mazama Montana*, also referred to Lewis and Clark’s journals in reference to mountain goats along the Columbia, even though Lewis and Clark never saw a goat in this area they still wrote “we have nevertheless too many proofs to admit a doubt of their existing, and in considerable numbers, on the mountains near the coast”. In fact, the “Type Specimen” of *Oreamnos montanus* (*Ovis*) was described in 1815, the locality was “Mountains adjacent to Brant Island, Columbia River, Oregon (Elliot 1901). Ord (1815) first referred to these animals as *Ovis* (sheep) as did Lewis and Clark, Rafinesque (1817) changed the genus of the type specimens to *Oreamnos*, the present day mountain goat genus. This is further evidence that what Lewis and Clark encountered in the Columbia River Gorge were mountain goats, and not wild sheep. Hollister (1912) also reports the “first recognized form” or type specimen of *Oreamnos montanus* as inhabiting the Cascade Mountains and nearby ranges.

Accounts from other early explorers also support the historic presence of mountain goats in Oregon. In Henry and Thompson's journals of 1799 – 1814, from Fort George on the Columbia River they write "A canoe arrived from the Willamette River with seven "shamoys" weighing from 50-80 pounds each. They were six days coming from the falls" (Coues 1897). Coues (1897) footnotes that "shamoy" is the European word chamois, "but in any event meaning the Rocky Mountain goat, *Haplocerus montanus*, which in those years was common in the Cascade and Coast Ranges of Oregon and Washington". While exploring for a railroad route, Suckley and Gibbs (1860) report, "they (goats) were formerly, if not now, abundant on Mt. Hood. The animal was also known to members of the Northwest and Hudson's Bay Companies from the first establishment of their trading posts on the banks of the Columbia River (Richardson et al. 1829).

Grant (1905) is more specific in his thorough paper on Mountain Goats. Grant reports 'the most southerly Oregon records that the writer has been able to obtain is Mt. Jefferson in that State, latitude 44 40' North". Richardson et al. (1829) reported the range even further south into California to 40 North latitude. Grant (1905) goes on to report the only place they still occurred in Oregon was the mountains of Wallowa County. Grant (1905) felt that mountain goats "have long since vanished from Mt. Hood and from other peaks in the western part of the state, where they once abounded". In the course of his research Grant (1905) summarized all known facts about mountain goats, and discarded a large amount of data in the literature and finally concluded, "within the United States the mountain goat is only found in Idaho, Montana, Washington, and Oregon". In a publication recommended by the Smithsonian Institution, Hall and Kelson (1959) recognize the Mt. Jefferson site as an "actual geographic occurrence", and produced a range map that included Mt. Jefferson as a "peripheral record – station of occurrence". Thompson et al. (2000) also recognized these early works by zoological societies to describe the range of mountain goats in maps that included Alaska, British Columbia, Washington, Oregon, Idaho, and Montana. The maps purposefully did not include reports of goats in Utah, Wyoming, Colorado, California, and New Mexico. In contrast, Bailey (1936) after citing six other authors whom believed goats were native to Oregon, questions if goats ever were native to Oregon. Bailey (1936) also admits, "that it is not improbable that in earlier times goats may have occupied Mt. Hood and perhaps other peaks in the Oregon Cascades as well as the Wallowa Mountains in NE Oregon".

### ***Archaeological Evidence: Historic and Pre-historic***

Most of the historical archaeological evidence in Oregon occurs in the northeast part of the State. Randolph and Dahlstrom (1977) describe evidence of mountain goats at two different excavation levels at the Bernard Creek rockshelter in Hell's Canyon on the Idaho side of the river. The remains at the Bernard Creek site are 300 – 1000 years old, and are believed to be evidence the goats were used as food instead of raw materials for tools or religious objects (Reagan and Womack 1981). Mountain goat remains that dated from 500 – 1500 years before present have also been identified at Camp Creek in Hell's Canyon on the Oregon side of the river (Leonhardy and Thompson 1991). Mountain goat remains make up less than 0.5% of total faunal samples in northeast Oregon and the south Cascades of Washington, where numerous excavations have occurred (Lyman 1995), making goat remains very difficult to detect, even when they are being looked for. Lyman (1995) argues that lack of an archaeofaunal sample is neither adequate nor

appropriate to serve as a basis for arguing mountain goats were not present at a site prior to 1925. One reason for a lack of paleontological fossils is that, “remains of alpine species undergo particularly heavy erosion in fast running streams and consequently are seldom preserved” (Harrington 1971). Prehistoric sites include a record from Rattlesnake Creek in the Owyhee drainage of southeast Oregon that is approximately 2000 years old (Lyman 1988). Additional fossil sites include Samwell Cave and Potter Creek cave, both sites are in California (Rideout and Hoffmann 1975). These two fossil sites lend credence to the reported discovery of mountain goats in California by Fathers Piccolo and DeSalvatierra (Richardson et al. 1829).

Lyman (1988) lists documented historical mountain goat occurrence on Mt. Jefferson in the Oregon Cascades, and the Wallowa Mountains. Based on these historic, and the above prehistoric sites in Washington, Oregon and California, Lyman (1988) developed a mountain goat dispersal model and conjectures that mountain goats were present throughout the Oregon Cascades in suitable habitat. Lyman’s (1988) suspected historic occurrence includes Mt. Hood, Mt. Jefferson, the Three Sisters, into northern California, and the Wallowa Mountains.

**APPENDIX 5:  
MOA ESTABLISHING HELLS CANYON INITIATIVE AND RESTORATION  
COMMITTEE**

(Spacing has been condensed to minimize space requirements)

**MEMORANDUM OF AGREEMENT**  
**among**  
**OREGON DEPARTMENT OF FISH AND WILDLIFE,**  
**IDAHO DEPARTMENT OF FISH AND GAME,**  
**WASHINGTON DEPARTMENT OF FISH AND WILDLIFE,**  
**USDA FOREST SERVICE WALLOWA-WHITMAN NATIONAL FOREST,**  
**BUREAU OF LAND MANAGEMENT,**  
**and the**  
**FOUNDATION FOR NORTH AMERICAN WILD SHEEP**  
**for**  
**RESTORATION OF BIGHORN SHEEP POPULATIONS**  
**in**  
**THE HELLS CANYON AREA**

This Memorandum Of Agreement (MOA) is entered into by the STATE OF OREGON through its Department of Fish and Wildlife (ODFW), the STATE OF IDAHO through its Department of Fish and Game (IDFG), the STATE OF WASHINGTON through its Department of Fish and Wildlife (WDFW), the USDA FOREST SERVICE WALLOWA-WHITMAN NATIONAL FOREST (USFS), the BUREAU OF LAND MANAGEMENT (BLM), and the FOUNDATION FOR NORTH AMERICAN WILD SHEEP (FNAWS). The parties mutually agree as follows:

**I. BACKGROUND**

Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*) historically occurred in the Hells Canyon area of northeastern Oregon, southeastern Washington, and western Idaho. For various reasons, sheep populations were extirpated from this area by the mid 1940's. Efforts to re-establish bighorn populations have resulted in both successes and failures since reintroductions began in 1971. Presently, bighorn populations remain well below even the most conservative estimates of carrying capacity for Hells Canyon, and many areas of suitable habitat remain unoccupied.

Management of bighorns in the Hells Canyon area is complicated by multiple land ownership and management authorities. Much of the suitable bighorn sheep habitat is managed by the USFS (Hells Canyon National Recreation Area, Wallowa-Whitman National Forest) and the Bureau of Land Management. Livestock grazing on public lands is also primarily governed by the USFS and BLM. Bighorn populations are primarily managed under state authorities. Although objectives and management criteria are well established as part of each state's Bighorn Management Plan, animals cross political boundaries. Interaction among agencies involved has allowed reintroductions and management to proceed in the past with much of the funding provided by FNAWS. Establishment of a long term, coordinated effort to restore bighorn populations to Hells Canyon will foster inter-agency communication and interaction, maximize

returns from expenditures, reduce conflicts with domestic livestock, and provide direction for bighorn management in the area well into the future.

## **II. PURPOSE**

The purpose of this MOA is to cooperatively establish guidelines for pursuing a common goal of restoring healthy Rocky Mountain bighorn sheep populations in the Hells Canyon area of northeastern Oregon, southeastern Washington, and west central Idaho. Specifically, the Hells Canyon project area will be defined as the rectangular area encompassing the Snake River drainage from the Clearwater River near Lewiston, Idaho and Clarkston, Washington, south to Brownlee Reservoir in Oregon (Figure 1). The project area will be bounded on the east by the Snake river - Salmon river divide, and will include the Wallowa-Whitman National Forest in Oregon and Umatilla National Forest in Washington.

This MOA establishes the membership and guidelines of conduct for an inter-agency committee responsible for overseeing all tasks associated with bighorn sheep restoration and management efforts in the Hells Canyon area (Exhibit A, Hells Canyon Bighorn Sheep Restoration Committee Guidelines). This agreement also will facilitate the development of, and progress toward, long term population and management objectives for bighorns in the Hells Canyon area (Exhibit B, Hells Canyon Bighorn Sheep Restoration Plan).

### **A. Obligations common to all agencies and organizations**

1. Each agency or organization will assign two representatives to the Hells Canyon Bighorn Sheep Restoration Committee as outlined in Exhibit A, Hells Canyon Bighorn Sheep Restoration Committee Guidelines.
2. Each agency or organization will cooperate through active membership on the Hells Canyon Bighorn Sheep Restoration Committee (Exhibit A), in the development, attainment, evaluation, and modification of goals, objectives, and strategies for restoring healthy bighorn sheep populations in the Hells Canyon Area as outlined in Exhibit B, Hells Canyon Bighorn Sheep Restoration Plan.
3. Each agency or organization will provide effective, timely, and accurate communication with all parties involved, and between representatives to the committee and their respective agency or organization.
4. Each agency or organization will solicit external peer review of goals, objectives, methodologies, and pertinent publications associated with or resulting from bighorn sheep restoration efforts in the Hells Canyon Area.
5. Each agency or organization will participate in identifying and contacting interested and affected stakeholders such as tribes, adjacent landowners, and organized sports groups for participating in an external advisory capacity. Input, and actions resulting from contact with stakeholders will be incorporated into all annual reports from the Hells Canyon Bighorn Sheep Restoration Committee.
6. Each agency or organization will participate in the preparation, review, and publication of an annual report from the Hells Canyon Bighorn Sheep Restoration Committee detailing tasks, expenditures, and results of activities completed.
7. Each agency or organization will participate in funding this agreement in an equitable manner within budgetary, regulatory, and personnel limits specific to each agency or organization. All funding requests from and between agencies and organizations will be reviewed by the committee.

8. Participation in this agreement will allow personnel from each agency or organization to work in and assist personnel from other participating agencies or organizations. Any work associated with this agreement conducted by personnel outside their normal duty area will be conducted only with explicit permission, and within personnel limits specific to each agency or organization.

### III. GENERAL PROVISIONS

**A. Liability.** Each party agrees that it will be responsible for its own acts and the results thereof and shall not be responsible for the acts of the other parties and results thereof. Each party therefore agrees that it will assume all risk and liability to itself, its agents or employees, for any injury to persons or property resulting in any manner from conduct of its own operations, and the operations of its agents, or employees, under this agreement, and for any loss, cost, damage, or expense resulting at any time from any and all causes due to any act or acts, negligence or the failure to exercise proper precautions, of or by itself or its own agents or its own employees, while occupying or visiting the premises under and pursuant to this agreement.

**B. Discrimination.** During the performance of this agreement, the cooperators agree to abide by the terms of the Executive Order 11246 on nondiscrimination and will not discriminate against any person because of race, color, religion, sex, or national origin.

**C. Participating in Similar Activities.** This agreement in no way restricts any agency or organization from participating in similar activities with other public and private agencies, organizations, and individuals.

**D. Restriction for Delegates.** Pursuant to Section 22, Title 41, United States Code, no member of, or Delegate to, Congress shall be admitted to any share or part of this agreement, or any benefits that may arise therefrom.

**E. Principal Contacts.** The principal contacts for this agreement are listed in Exhibit A, Hells Canyon Bighorn Sheep Restoration Committee Guidelines.

**F. Non-fund Obligating Document.** This agreement is neither a fiscal nor a funds obligation document. Any action involving reimbursement or contribution of funds between agencies or organizations will be handled in accordance with acceptable laws, regulations, and procedures including those for Government procurement and printing. Any funds received by an agency or organization, from a participating agency or organization, as a result of this agreement will be received without incurring overhead costs.

### IV. TERMINATION

This agreement will remain valid until terminated as provided herein. This agreement may be terminated by mutual written consent signed by all parties, or by any party upon thirty days notice, in writing, delivered by certified mail or in person to each agency or organization.

Termination of this agreement by a single agency or organization does not prohibit reauthorization of a similar agreement among remaining agencies or organizations provided restoration of healthy bighorn sheep populations in Hells Canyon is still biologically, logistically, and legally feasible.

### V. MODIFICATIONS

The terms of this agreement shall not be waived, altered, modified, supplemented or amended, in any manner whatsoever, except by written instrument signed by all parties. Upon agreement of

all parties, additional cooperators may be added to this agreement in the future provided terms of this agreement are not waived, altered, modified, supplemented, or amended unless as specified within this agreement.

**IN WITNESS WHEREOF**, the parties have executed this agreement through their duly authorized officials as of the last date written below:

_____ Oregon Dept. Fish and Wildlife	_____ Date
_____ Idaho Dept. Fish and Game	_____ Date
_____ Washington Dept. Fish and Wildlife	_____ Date
_____ USDA Forest Service, Wallowa/Whitman N. F	_____ Date
_____ Bureau of Land Management	_____ Date
_____ Foundation for North American Wild Sheep	_____ Date

**APPENDIX 6:****PUBLIC INPUT WORKING GROUP PARTICIPANTS NOTIFIED FOR 2003  
BIGHORN SHEEP – ROCKY MOUNTAIN GOAT MANAGEMENT PLAN**

Organization–Group–Agency	Contact Person	Action
Foundation for North American Wild Sheep 720 Allen Avenue Cody, WY 82414–3402	Ray Lee, Executive Director (307) 527–6261	Sent Draft II, 13 May 2003
Oregon Chapter, FNAWS 1111 Netherlands Road Trail, OR 97541	Jane Hunts, President (541) 878–2374	Sent Draft II, 13 May 2003
Washington Chapter, FNAWS PO Box 176 Ottis Orchards, WA 99027	Steve Kline, President 800–382–5401 bighorns@msn.com	Sent Draft II, 13 May 2003
Idaho Chapter, FNAWS 3000 S Powerline Rd Nampa, ID 83686	Chuck Middleton 208-465-0352	Sent Draft II, 13 May 2003
Oregon Hunters Association 1826 Icabod Ct NE Salem, OR 97305	Sandy Sanderson - President 503-551-7648	Sent Draft II, 13 May 2003
Safari Club International – Portland Chapter 32838 Old Bunker Hill Rd St. Helens, OR 97051	Bill Perkins – President 503-366-0233	Sent Draft II, 13 May 2003
USDA Forest Service Wallowa–Whitman National Forest PO Box 907 Baker City, OR 97814	Tim Schommer, (541) 523–6391	Sent Draft II, 13 May 2003
Confederated Tribes of Warm Springs Reservation of Oregon Natural Resources Department PO Box C Warm Springs, OR 97761	Terry Luther (541) 553–2001	Sent Draft II, 13 May 2003
Confederated Tribes Umatilla Indian Reservation PO Box 638 Pendleton, OR 97801	Carl Scheeler, Wildlife Program Manager (541) 966–2395	Sent Draft II, 13 May 2003
Nez Perce Tribe Wildlife Management Program PO Box 365 Lapwai, ID 83540–0365	Keith Lawrence (208) 843–7372	Sent Draft II, 13 May 2003
Oregon Cattleman’s Association PO Box 216 Jordan Valley, OR 97910	Robert Skinner – President 541-586-2282 or 541-586-2285 Glen Stonebrink, Lobbyist (503) 361–8941 x12	Sent Draft II, 13 May 2003

Organization–Group–Agency	Contact Person	Action
Oregon Farm Bureau 3415 commercial St SE Suite 117 Salem, OR 97302	Dave Dillon – Executive V.P. 503-399-1701 Greg Addington, Lobbyist (503) 399–1701	Sent Draft II, 13 May 2003
Oregon Sheep Growers Association 1270 Chemeketa St NE Salem, OR 97301	Richard Kosesan – Executive Vice President 503-364-5462	Sent Draft II, 13 May 2003
Bureau of Land Management Oregon State Office 333 SW 1 <sup>st</sup> Avenue PO Box 2965 Portland, OR 97208	George Buckner (503) 808–6382	Sent Draft II, 13 May 2003
Oregon Native Plant Society 3920 SW Willamette Corvallis, OR 97333	Esther Mcevoy 541-754-0893	Sent Draft II, 13 May 2003
USFWS, Hart Mountain National Antelope Refuge PO Box 111 Lakeview, OR 97630	Mike Nunn (541) 947–3315	Sent Draft II, 13 May 2003
Oregon Division of State Lands 20300 Empire Ave., Suite 1 Bend, OR 97701	Nancy Pustis, E Oregon Area Manager (541) 388–6112	Sent Draft II, 13 May 2003
Hells Canyon Preservation Council PO Box 2768 La Grande, OR 97850	Brett Brownscombe 541-963-3950	Sent Draft II, 13 May 2003
Oregon Natural Desert Association 16 NW Kansas Bend, OR 97701	Bill Marlett 541-330-2638	Sent Draft II, 13 May 2003
National Park Service John Day Fossil Beds National Monument 32651 Hwy 19 Kimberly, OR 97848	Ken Hyde Chief Integrated Resources (541) 987–2333	Sent Draft II, 13 May 2003
Oregon Chapter Sierra Club 2950 SE Stark Suite 110 Portland, OR 97214	Mari Margil 503-238-0442	Sent Draft II, 13 May 2003
Columbia River Gorge Commission 288 Jewett Ave PO Box 730 White Salmon, WA 98672	Commission Chair (509) 493-3323	Sent Draft II, 13 May 2003
Multnomah Anglers & Hunters Association PO Box 13771 Portland, OR 97213	Ruth Ann James - President	Sent Draft II, 13 May 2003
Oregon IzaakWalton League 329 SE 29 <sup>th</sup> Portland, OR 97214	Jeanne Norton 503-235-7634	Sent Draft II, 13 May 2003
Oregon Bowhunter Association 50674 Deer Forest Drive La Pine, OR 97739	George Johnson – President 541-536-1685	Sent Draft II, 13 May 2003

Organization–Group–Agency	Contact Person	Action
Traditional Archers of Oregon 20080 SW Jaquith Rd. Newberg, OR 97132	Rich Thompson	Sent Draft II, 13 May 2003
Oregon Guides and Packers Association 531 SW 13 <sup>th</sup> St Bend, OR 97702	Phil Donovan	Sent Draft II, 13 May 2003
Oregon Department of Agriculture 635 Capitol Street NE Salem, OR 97301	Roger Huffman (503) 986–4681	Sent Draft II, 13 May 2003
Bureau of Reclamation 214 Broadway Boise, ID 83702	Jack Larocco (208) 378–5155	Sent Draft II, 13 May 2003
Washington Department of Fish & Wildlife 600 Capitol Way N Olympia, WA 98501–1091	Donny Martorello (360) 902–2521	Sent Draft II, 13 May 2003
Idaho Department of Fish & Game 600 S Walnut Boise, ID 83707	Dale Toweil (208) 334–2920	Sent Draft II, 13 May 2003
Nevada Division of Wildlife 1100 Valley Rd. Reno, NV 89512	Mike Cox (775) 688–1556	Sent Draft II, 13 May 2003
Spot Country Outfitters 4888 Highway 140 Eagle Point, OR 97524	Elvin Hawkins (541) 830–7295	Sent Draft II, 13 May 2003
Lee Martin PO Box 507 Kent, OR 97033	(541) 333–2304	Sent Draft II, 13 May 2003
Jim Peterson 552 NW Peppermint Prineville, OR 97754	(541) 447–6530	Sent Draft II, 13 May 2003
Troy Vest 31718 S. Palmer Rd. Molalla, OR 97038	(541) 829–9314	Delivered Draft II, 13 May 2003

**APPENDIX 7:****DATES AND LOCATIONS FOR BIGHORN SHEEP – ROCKY MOUNTAIN GOAT  
MANAGEMENT PLAN PUBLIC INPUT MEETINGS**

Date and Time	Location	Address	Attendance
12 June 2003 7:00-9:00 pm	Medford (OHA)	JJ Norths Grand Buffet	51
16 June 2003 7:00-9:00 pm	Salem	Chemeketa Community College Building 50, Room 111	3
17 June 2003 6:00-7:00 pm	Baker City	2 <sup>nd</sup> Floor Conference Room, Federal Building 1550 Dewey Street	0
17 June 2003 1:00-5:00 & 7:00-9:00 pm	Burns	ODFW District Office 237 S. Hines Blvd.	2
17 June 2003 7:00-9:00 pm	Bend	Drill Floor Room Bend Armory	8
17 June 2003 6:00-8:00 pm	Tillamook	ODFW Office 4907 E Third Street	0
18 June 2003 6:00-7:00 pm	The Dalles (OHA)	ODFW Screens Shop 3561 Klindt Dr.	12
18 June 2003 7:00-9:00 pm	LaGrande	E. Oregon University, Hoke Room 301 1 University Blvd.	6
18 June 2003 7:00-9:00 pm	Klamath Falls	OSU Extension Office 3328 Vandenberg Avenue	3
18 June 2003 7:00-9:00 pm	Ontario	Malheur County Extension Office 710 SE 5 <sup>th</sup> Avenue	9
18 June 2003 7:00-9:00 pm	Springfield (OHA)	Union Hall 1116 South A Street	35
19 June 2003 7:00-9:00 pm	Enterprise	Best Western Motel 1200 Highland Avenue	7
19 June 2003 7:00-9:00 pm	Clackamas	ODFW NW Regional Office Building #16	0
19 June 2003 6:00-7:30	Canyon City	Grant School District Conference Rm 401 North Canyon City Blvd.	8
Total Public Meeting Attendance			146

**APPENDIX 8.  
SUMMARY OF PUBLIC INPUT PROCESSES FOR THE REVISED BIGHORN  
SHEEP ROCKY MOUNTAIN GOAT MANAGEMENT PLAN**

**Public Working Group**

**Public Meetings & General Input on Public Draft III**

**General Input on Revised Public Draft IV**