

MOUNTAIN GOAT STATUS AND MANAGEMENT IN WYOMING

DOUG McWHIRTER, Wyoming Game & Fish Department, 2820 State Highway 120,
Cody, Wyoming 82414 USA

Abstract: Mountain goats (*Oreamnos americanus*) are not generally considered native to Wyoming, but originated from transplants in Montana and Idaho. Wyoming currently has two populations of mountain goats, one in the Beartooth and Absaroka Mountains east of Yellowstone National Park (the Beartooth Herd Unit), and one in the Snake River Range south of Grand Teton National Park (the Palisades Herd Unit). Expansion into Wyoming following both transplants was slow, as was population growth once goats became established in Wyoming. Hunting seasons in Wyoming were not initiated until 27 years after the 1942 Montana transplant, and 30 years following the 1969 Idaho transplant. Not until the late 1980s did goats begin to expand their range and increase in number. Trend counts of mountain goats in Wyoming have ranged from 72 to 149 in the Beartooth Herd Unit since aerial surveys began in 1986, and from 54 to 76 goats in the Palisades Herd Unit since aerial surveys began in 1997. Harvest of mountain goats in Wyoming is controlled by issuance of limited quota licenses. Mandatory registration is required for all successful goat hunters to gather sex, age, and distribution information on harvested goats. Hunting licenses for mountain goats in Wyoming are very desirable, and the odds of drawing a mountain goat license are extremely low. Since 1995, Wyoming mountain goat licenses have been once-in-a-lifetime permits. More detailed information on the history and current status of mountain goats in Wyoming is included.

Key words: Wyoming, mountain goat, *Oreamnos*, management, hunting, transplants.

HISTORICAL OCCURRENCE

Similar to other locations in western North America, the historical occurrence of mountain goats (*Oreamnos americanus*) is uncertain. It is clear, however, that mountain goats were present in Wyoming at one point in time. Archaeological evidence shows mountain goats were present in western, central and southeast Wyoming during the late Pleistocene, approximately 10,000 to 15,000 years ago (Laundre' 1990, Guilday et al. 1967, Anderson 1974).

More recent evidence, however, is generally lacking, although some historical reports of mountain goats in Wyoming do exist. A U.S. Army hunting party in the southern Teton Range of Wyoming reportedly killed a mountain goat in the 1840s (Cooke 1847-1848), and a map produced by Hornaday (1914) titled "Distribution of the White Mountain Goat", depicts an "actual occurrence" in the Teton Mountains near Jackson, Wyoming.

Additional investigations, however, have failed to substantiate the occurrence of mountain goats in Wyoming in recent history. Many early travelers through

Wyoming kept detailed journals, but few made mention of mountain goats. Those reports that did mention seeing goats have generally been discounted as observations of Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*) or pronghorn antelope (*Antilocapra americana*). A specific investigation into the occurrence of mountain goats in Wyoming by Skinner (1926) concluded goats were not present historically in Wyoming. Recent investigations have reached the same conclusion (Laundre' 1990).

A review of historical documents lends credibility to the assertion that mountain goats were present in Colorado prior to 1900 (Irby and Chappell 1994), and increases the possibility that goats may have been present in Wyoming as well. Varley and Varley (1996) have suggested that evidence from Colorado and several other locations represents isolated, remnant populations of mountain goats at risk of natural extinction. Although in reference to the Greater Yellowstone Ecosystem, a statement by Schullery and Whittlesey (2001) could be applied to historical occurrence of mountain goats throughout Wyoming; "it is impossible to prove absolutely that there were no goats in the ecosystem prior to modern introductions, but historical evidence demonstrates that if present, such goats must have been exceedingly rare and uncharacteristically unsightable."

INTRODUCTION/COLONIZATION

Although Wyoming currently has two distinct mountain goat herds, no introductions of mountain goats have been conducted in Wyoming. Both the Beartooth Herd Unit (BHU) and the

Palisades Herd Unit (PHU) (Figure 1) originated from goat transplants in the neighboring states of Montana and Idaho.

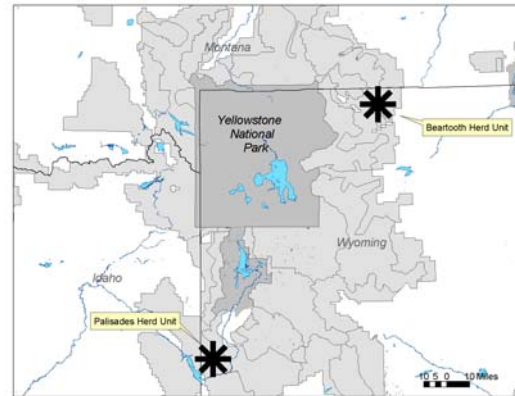


Figure 1. Location of the Beartooth Herd Unit (BHU) and the Palisades Herd Unit (PHU), northwest Wyoming.

Beartooth Herd Unit

The Beartooth population resulted from the release of 12 goats into the Rock Creek drainage of the Beartooth Mountains southwest of Red Lodge, Montana and near the Montana-Wyoming state line in 1942 (Cooney 1946). No information is available on the sex or age composition of released animals. In addition, it is possible that goats from a release of 28 goats between 1949 and 1953 into the East Rosebud Creek drainage also found their way into Wyoming. The source herd for both transplants was the Deep Creek drainage in Teton County, Montana.

The first recorded sightings of mountain goats in Wyoming occurred in 1946, in the Beartooth Mountains along the Montana-Wyoming state line. Although the exact location is not known, this probably represents a movement of less than 8 km (5 mi) from the original release site on Rock Creek. The next

recorded sighting was near Deep Lake on the Beartooth Plateau, in the late 1950's by a Shoshone National Forest aerial fire patrol. Observations in this area represent a movement of approximately 16-24 km (10-15 mi) from the release site.

The first formal surveys of the BHU were performed in the early 1970s, when a total of 96 goats were counted (Fenner 1974, Laake 1976). By this time, goats had reached the Clarks Fork of the Yellowstone River, approximately 32 km (20 mi) from the Rock Creek release site. Additional research was not undertaken until the late 1980s (Haynes, 1991, Hanna 1989), when the population was estimated to be near 150 animals and more detailed information was gathered on goat distribution and habitat use. By this time, goats had been observed in the Wind River drainage in the south end of the Absaroka Range, 130 km (80 mi) from the original release site.

The area first colonized in Wyoming is the southernmost extension of the Beartooth Mountain Range, commonly known as the Beartooth Plateau. The Beartooth Mountains are an uplifted fault block oriented in a northwest-southeast direction, with near vertical normal faults near the southern end in Wyoming (Poldervarrt and Bentley 1958). Sedimentary layers covered the Beartooths at one time, but were stripped from most of the higher elevations, leaving a relatively flat, uniform surface, or exhumed peneplane, which was then greatly modified by erosion and glaciation (Hughes 1933). This glaciation dissected the higher elevations, creating five major plateau segments; the East Rosebud, Silver Run,

Hellroaring, Line Creek, and Beartooth (Johnson and Billings 1962). Many small glaciers still exist in the Beartooths, but most are stagnant or retreating. The resulting landscape is that of a relatively flat, undulating surface incised by steep, sheer-walled canyons.

Elevations within the BHU range from 3,400 m (11,200 ft) on the Beartooth Plateau to 1,200 m (4,400 ft) at the mouth of the Clarks Fork Canyon. As might be expected with such an elevational range, a diversity of vegetation types is found within the BHU. At higher elevations on the Beartooth Plateau, alpine tundra communities are found, including permafrost and a higher percentage of arctic species than most other alpine ranges in the lower 48 states (Billings 1988). Conifer species range from krummholz-type whitebark pine (*Pinus albicaulis*) at the highest elevations to subalpine fir (*Abies lasiocarpa*), Englemann spruce (*Picea engelmannii*), and lodgepole pine (*Pinus contorta*) as elevations decrease. At lower elevations, including goat winter ranges in the Clarks Fork Canyon, xeric adapted species such as sagebrush (*Artemisia* spp.), yucca (*Yucca glauca*), prickly pear (*Opuntia polyacantha*), and bluebunch wheatgrass (*Pseudoroegneria spicata*) are found. Conifer species at these elevations are limber pine (*Pinus flexilis*) and juniper (*Juniperus* spp.).

Other large mammal species that share habitats within the BHU include bighorn sheep (*Ovis canadensis*), elk (*Cervus elaphus*), mule deer (*Odocoileus hemionus*), moose (*Alces alces shirasi*), grizzly bears (*Ursus arctos horribilis*), black bears (*Ursus americanus*),

mountain lions (*Felis concolor*), wolves (*Canis lupus*), coyotes (*Canis latrans*), and wolverine (*Gulo gulo*).

Currently, summer cattle grazing occurs within portions of the BHU, and until 2002, so did domestic sheep grazing on portions of the Beartooth Plateau.

Palisades Herd Unit

The Palisades population resulted from the release of 5 goats (2 males, 3 females) into the Palisades Creek drainage of the Snake River Range, southeast of Swan Valley, Idaho near the Idaho-Wyoming state line (Hayden 1989). In addition, it is possible that animals from a release of 7 goats (5 males, 2 female) in 1970 and 1971 in the Black Canyon drainage also found their way into Wyoming. The source herds for these transplants was the Snow Peak and Black Mountain populations in Shoshone and Clearwater Counties, Idaho.

The first recorded sighting of PHU mountain goats in Wyoming occurred in 1975, when 6 goats were seen on Wolf Mountain in the Snake River Canyon, approximately 32 km (20 mi) from the original release site on Palisades Creek. The next recorded sighting was of 2 goats on Teton Pass west of Jackson, Wyoming in 1977. If these goats were from the Palisades release, it would represent a movement of approximately 26 km (16 mi). If these goats originated from the Black Canyon release, the distance moved would be approximately 43 km (27 mi).

The first formal surveys of the Idaho portion of PHU were performed as part of a Master's Thesis project in the early

1980's (Hayden 1989). A total of 142 goats were counted in 1983; evidence of vigorous population growth following the 1969 transplant. By this time, goats had reached Grand Teton National Park, and observations were reported throughout the length of the Teton Range. The northernmost sighting in the Teton Range (Forellen Peak) represents a movement of approximately 90 km (56 mi) from the Palisades Creek release site. By 1986, the population was estimated at 230 individuals. Still, few goats remained as yearlong residents of Wyoming.

The area inhabited by the Palisades goat population is commonly known as the Snake River Range. Part of the Overthrust Belt, the Snake River Range was formed through compression along the Darby, Absaroka, and St. Johns Thrust Faults (Albee et al. 1977). Deposited marine sediments were folded and thrust eastward (Armstrong and Oriel (1965). Peaks, cirques, and cliffs of the Snake River Range are gray-green limestones, with some white dolomite. Along the Snake River Canyon, black, gray, green, and red shales can be found.

Elevations range from 1,700 m (5,600 ft) to over 3,000 m (9,900 ft). At higher elevations, habitat types consist of dry meadows with scattered timber, primarily Englemann spruce and subalpine fir. As elevations decrease, Douglas fir (*Pseudotsuga menziesii*) and limber pine are found. Compared to the BHU, the PHU contains more shrub-dominated habitats. These shrub communities at low to mid elevations are comprised of bigtooth maple (*Acer grandidentata*), Rocky Mountain maple (*Acer glabrum*), serviceberry (*Amalanchier alnifolia*), ninebark

(*Physocarpus malvaceus*), curl-leaf mountain mahogany (*Cercocarpus ledifolius*), and Utah juniper (*Juniperus osteosperma*). Early seral vegetation found in avalanche chutes, of which there are many, also include shiny-leaf ceanothus (*Ceanothus yelutinus*), chokecherry (*Prunus virginiana*), and red osier dogwood (*Cornus stolonifera*).

Other wildlife species found within the PHU include elk, mule deer, moose, and black bears.

Permitted livestock grazing includes summer grazing of both domestic sheep and cattle.

POPULATION MONITORING

Due to low population densities and other management priorities, mountain goat data were not collected in the BHU until 1986, and 1997 in the PHU. Currently, both Herd Units are systematically surveyed every other year (in summer) by aerial trend count and classification surveys. In alternate years, attempts are made to gather ground classifications in order to obtain productivity information. Although efforts are made to classify goats into adult male, adult female, and juvenile categories, most data collected only differentiates between adult goats and kids. This is particularly true for aerial surveys. No attempt has been made to construct a population simulation model for either herd unit.

In the BHU, results of these surveys show a range in the number of goats seen during trend count flights from 72 in 1991 to 149 in 1992 (Figure 4). This disparity in results between years illustrates the difficulty in gathering

consistent goat population data in the BHU. In general, trend counts revealed increased numbers of goats in the early 1990s; an increase that has been maintained since. Based on the amount of the area not flown and poor sightability in some portions of the herd unit, there may be as many as 200 goats in the BHU.

Although the data set for the PHU is rather small, trend counts have yielded relatively similar numbers of goats, ranging from 54 in 1997 to 76 in 2000 (Figure 2). Movement in and out of Idaho could easily explain the slight variation in numbers encountered. The general trend is that of a consistent sample of slightly over 50 goats. The number of goats in the Wyoming portion of this population is not thought to be significantly more than this.

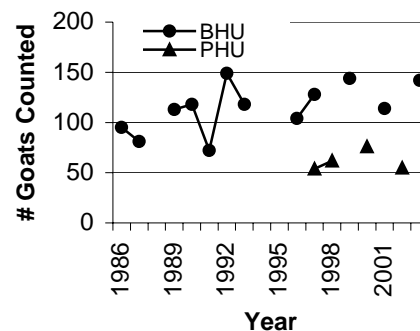


Figure 2. Mountain goat trend counts for the Beartooth Herd Unit (BHU) and Palisades Herd Unit (PHU), 1986-2003.

Classification surveys in the BHU revealed very high productivity in the late 1980's and has been relatively consistent at approximately 30-40 kids:100 adults since 1994 (Figure 3).

Productivity in the PHU has shown a similar trend, dropping from a high of 59

kids:100 adults in 1997 to an average of 31 kids:100 adults from 1998-2002 (Figure 3).

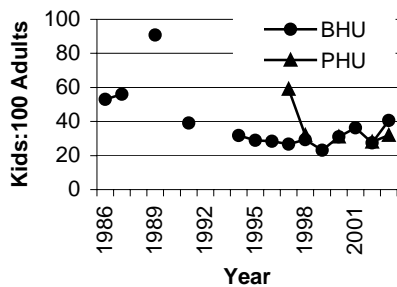


Figure 3. Kid:100 adult ratios for the Beartooth Herd Unit (BHU) and the Palisades Herd Unit (PHU), 1986-2003.

HARVEST MANAGEMENT

Mountain goats licenses in Wyoming are issued on a limited quota basis, for both residents and nonresidents. By Wyoming Statute (23-1-703 (e)), 25% of all mountain goat licenses go to non-residents and 75% to residents, which translates into permits issued by hunt area in increments of 4. Since 1995, mountain goat licenses have been a once-in-a-lifetime permit. In 2004, the cost of a resident mountain goat license was \$100 and a non-resident license was \$1,800.

Hunting licenses for mountain goats in Wyoming are very desirable, and drawing odds for both residents and non-residents are extremely low. In 2004, 2,621 residents applied for one of the 12 resident permits, representing a 0.46% chance of drawing, or 218:1 odds. Similarly, 294 nonresidents applied for one of the 4 nonresident permits issued in 2004, representing a 1.36% chance of drawing, or 74:1 odds.

Prior to 1998, harvest information was gathered from a mail harvest survey

questionnaire, followed by phone interviews of non-respondents. In 1998, a mandatory registration regulation was implemented for successful mountain goat hunters, in order to gather important data on the sex/age and distribution of harvest. Successful hunters must present the skull or horns attached to the skull plate and the hide or cape for registration, within 15 days of harvesting the goat.

Although some of the first hunting seasons in the BHU ran from September 10 through November 15, mountain goat hunting seasons in both the Beartooth and the Palisades Herd Units open September 1 and close October 31. Although not specific to mountain goat hunting, by State Statute (23-2-401 (a)) all non-resident big game hunters must be accompanied by a licensed professional guide or resident guide if hunting in a designated wilderness area. Two U.S. Forest Service wilderness areas are found within the BHU; the North Absaroka and the Absaroka-Beartooth Wildernesses. There is no designated wilderness within the PHU.

The BHU was first hunted in 1969 (27 years after the initial transplant), when the population was felt to be approximately 100 goats. Four permits were issued from 1969-1979. Based on high success rates and low hunter effort, permit numbers were increased to 8 in 1980 even though the population was still estimated to be near 100 individuals. Due to increased trend counts, high productivity rates, and an apparent range expansion, permit levels were increased from 8 to 12 in 1993, where they have remained.

Following survey efforts that determined a minimum population of at least 50

goats resided in Wyoming, the PHU was first hunted in 1999 (30 years following the initial transplant), when four permits were issued. Permit levels have remained at 4 in the PHU.

Goat harvest levels have generally followed permit levels (Figure 4). In the BHU, goat harvest averaged 3.4 goats/year when 4 permits were issued, 7.3 goats/year when 8 permits were issued, and 11.6 goats/year when 12 permits were issued. Every permitted goat hunter in the PHU has been successful to this point.

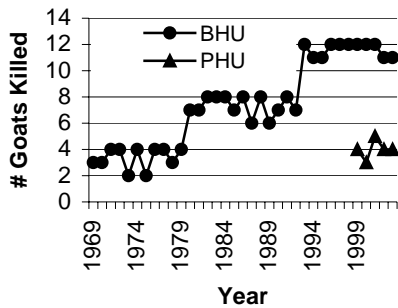


Figure 4. Mountain goat harvest in the Beartooth Herd Unit (BHU) and Palisades Herd Unit (PHU), 1969-2003.

With the exception of a couple years in the early 1970's, hunter success has been quite high (Figure 5). Still, over the last 35 years, hunter success has averaged 92.5% in the BHU. Again, to date, all hunters in the PHU have been successful.

Hunter effort, which is the number of days hunted per goat harvested, shows a similar trend to that of hunter success. With the exception of a very high effort in 1975, hunter effort in the BHU has generally remained less than 5 days per goat harvested, averaging 4.3 days/goat (Figure 6). Similarly, hunter effort in

the PHU has also been less than 5 days, averaging 3.1 days per goat harvested.

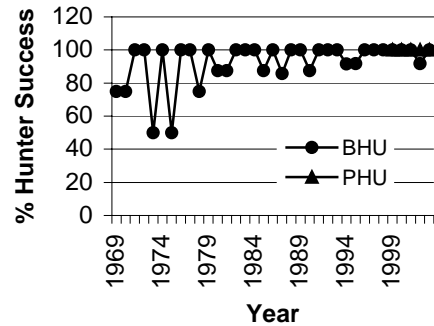


Figure 5. Mountain goat hunter success in the Beartooth Herd Unit (BHU) and Palisades Herd Unit (PHU), 1969-2003.

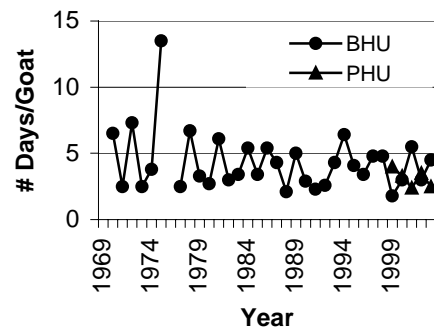


Figure 6. Mountain goat hunter effort in the Beartooth Herd Unit (BHU) and the Palisades Herd Unit (PHU), 1969-2003.

Harvest of female goats has varied in the BHU, with three noticeable peaks occurring in the early to mid 1970s, the late 1980s, and 1997 when females represented more than 40% of the total harvest (Figure 7). Since 1969, females have comprised an average of 29% of the total harvest of mountain goats in the BHU. With the exception of one female taken in the PHU in 2001, all harvested goats have been billies.

Since 1995, mountain goat hunters have been provided advance information on

the identification of male and female goats to encourage harvest of billies and minimize harvest of nannies. However, following this effort, average representation of females in the harvest remained unchanged at 29%.

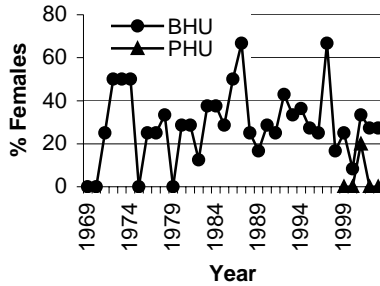


Figure 7. Percent females in mountain goat harvest from the Beartooth Herd Unit (BHU) and the Palisades Herd Unit (PHU), 1969-2003.

Since the first mountain goat season was held in 1969, all hunters, both successful and unsuccessful, have been asked how many different goats they observed during their hunt. There is, of course, some bias in these data due to uncertainty of duplicate sightings and the influence a single hunter might have at such low permit levels, but it does provide some insight into long-term population trends. Although variable from year to year, an increasing trend through time is depicted for the BHU (Figure 8). These data mimic estimated population trends for the Beartooth population. Although a limited number of years are represented, the data from the PHU show some of the same variability seen in the BHU.

Even though mandatory registration was not implemented until 1998, successful hunters were asked to measure the horn

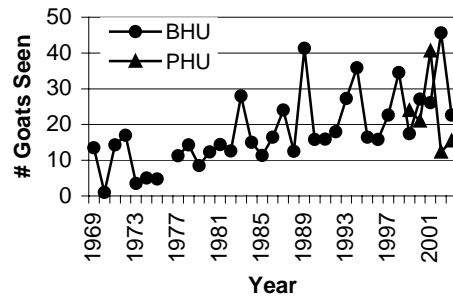


Figure 8. Average number of mountain goats seen by hunters in the Beartooth Herd Unit (BHU) and the Palisades Herd Unit (PHU), 1969-2003.

length of their goat. Although there has been annual variation between 8 and 9 inches, horn length of harvested billies has averaged 222 mm (8 ¾ in) in the BHU and 233 mm (9 ¼ in) in the PHU (Figure 9). It would have been interesting to compare these data versus animal age, but mandatory registrations that allow age determination only began in 1998. Over this short period, however, average age has declined in both the BHU and PHU (Figure 10).

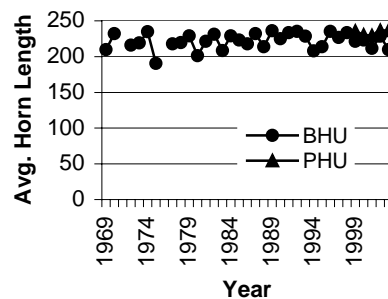


Figure 9. Average horn length of harvested billies in the Beartooth Herd Unit (BHU) and the Palisades Herd Unit (PHU), 1969-2003.

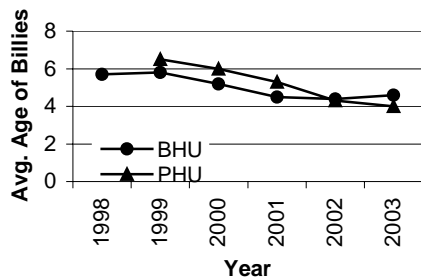


Figure 10. Average age of harvested billies from the Beartooth Herd Unit (BHU) and the Palisades Herd Unit (PHU), 1998-2003.

FUTURE MANAGEMENT ISSUES

Once established in Wyoming, goat populations in both the Beartooth and Palisades Herd Units have done well. Numbers increased, huntable populations were established, and hunting seasons were initiated. Expansion did not cease at Wyoming Game & Fish Department delineated hunt area boundaries, however, but continued into unoccupied habitats in the Shoshone and Bridger-Teton National Forests and Yellowstone and Grand Teton National Parks. This has not been entirely problematic, as the BHU was enlarged in 1996 to accommodate an expanding population and allow additional hunting opportunities. However, outcome of debate over status of the mountain goat as part of the native fauna of the Greater Yellowstone Ecosystem and their future management may prove controversial, as many consider goats a non-native, or exotic species.

Relative to the management of exotic species, the National Park Service must abide by statutory law, regulatory law, and policy (Varley and Varley 1996). Currently, National Park Service policy

directs that exotic species be managed (up to and including eradication) if control is prudent and feasible, and if the exotic species interferes with natural processes and the perpetuation of natural features, natives species, or natural habitats (National Park Service 2001:37; section 4.4.4.2).

In response to these questions, Yellowstone National Park (YNP) has initiated alpine vegetation studies in areas of mountain goat colonization, and established systematic aerial mountain goat surveys to determine population trends. Once additional funding is secured to continue these investigations and collect adequate information addressing the potential effects of colonizing mountain goats, various management alternatives will be considered, and a YNP mountain goat management plan will be developed.

The pace and scale of oil and gas development has increased dramatically in Wyoming. Mineral interest in the Beartooth Mountains is not new, but successful natural gas wells have been drilled in the area recently and proposals to conduct 3-dimensional seismic operations have been submitted to federal land management agencies.

Many activities associated with oil and gas development have been shown to be detrimental to mountain goats including seismic exploration (Joslin 1986), roading (Singer 1975, Singer and Doherty 1985), and helicopter supported activities (Cote 1996, Shank 1979, Gordon and Reynolds 2002). Recommendations and mitigation measures for these activities in occupied mountain goat habitat will prove

beneficial as oil and gas development continues.

Another potential impact in mountain goat habitats is helicopter-supported recreation. The sensitivity of mountain goats to helicopter disturbance is becoming better understood, and it is clear that helicopters are a significant disturbance factor (Keim 2004, Gordon 2004). The popularity of heli-skiing, heli-hiking, and other helicopter assisted activities in other areas has increased concern regarding these activities in Wyoming goat habitats (Varley 1999). Recently developed recommendations for helicopter activities in mountain goat habitats should help minimize impacts from increasing recreational activities.

In 2002, twelve mountain goats in a captive herd of 16 goats in northwestern Nebraska became ill and subsequently died. Of the 12 deaths, West Nile Virus was isolated as the causative agent in 11 goats (Todd Cornish, Wyoming State Veterinary Laboratory, personal communication). If this small sample is indicative of mountain goat mortalities, they would be more susceptible than equines to West Nile Virus. Plans have been developed to sample harvested mountain goats in Wyoming to determine previous exposure and/or resistance to West Nile Virus.

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