WINTER RECREATION AND HUMAN DISTURBANCE ON MOUNTAIN GOATS: A REVIEW

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Abstract: Human activities can disturb wildlife. Many wildlife species including mountain goats (*Oreamnos americanus*) are most vulnerable to human-caused disturbances in the winter. Recreation can have detrimental effects on goat populations during winter. A review of literature on human disturbance and goat winter ranges led to the hypothesis that conflict between goats and most recreation types are rare because of spatial segregation. Use of helicopters for winter recreation may pose a threat, and in those cases, special guidelines may be needed to avoid disturbance.

INTRODUCTION

As human activities expand into wildlife habitat managers struggle to understand the effects of these activities and minimize impacts. The effects of human recreation on various wildlife species have been documented in many situations (Knight and Gutzwiller 1995). Alterations of behavior, induced by human disturbances, can affect physiology, distribution, habitat use, fecundity, and population health (Penner 1988, Knight and Gutzwiller 1995). Some human-caused disturbances of mountain goats have been investigated; however, little is known specifically about the effects of winter recreation on mountain goats.

Mountain goats are one of the least understood of all big game mammal species in North America (Eastman 1977, Chadwick 1983). Management has principally focused on the need for better population information and methods for setting harvest (Brandborg 1955, Eastman 1977, Wigal and Coggins 1982). Eastman (1977) assessed research needs for goats and found non-hunting impacts, resulting from human disturbance, ranked within the top third among management priorities, but very little had been done on the subject.

DOCUMENTED DISTURBANCE

Based on the potential for disturbances to wintering goat populations, area restrictions, closures and other mitigation measures were enacted to minimize winter recreation including foot, snow machine and helicopter travel on the Sawtooth National Forest and Sawtooth National Recreation Area in Idaho (USDA Forest Service 1997, Hamilton *et al.* 1996). Observations of ski, helicopter, and snowmobile use near wintering mountain goats suggested a significant level of disturbance was occurring (Hamilton Pers. Comm.)

Beyond this case, mostly anecdotal reports are the basis for conclusions specific to winter recreation. The general effects of human disturbance on mountain goats were examined for context. Some goat populations were adversely affected by logging (Chadwick 1973, Hebert and

Turnbull 1977, Smith and Raedeke 1982) and mineral, coal, gas, and oil development (Hebert and Turnbull 1977, Pendergast and Bindernagel 1977, Smith 1982, Joslin 1986). In these cases, declines in goat populations occurred when developments were in or near goat habitats. The mechanisms for population declines were not always clear. However, they seemed to be related to improved access for hunting or poaching (Chadwick 1973, Foster 1977, Hebert and Turnbull 1977, Smith and Raedeke 1982, Smith 1994), abandonment of habitat due to alterations or disturbance (Chadwick 1973, Hebert and Turnbull 1977, Pendergast and Bindernagel 1977), or continual stress as a result of human presence (Joslin 1986).

Controlling human access was often suggested as the management tool potentially having the greatest effects on the long-term health of mountain goat populations (Chadwick 1973, 1983; Eastman 1977, Hebert and Turnbull 1977, McFetridge 1977, Wigal and Coggins 1982, Joslin 1986, Haynes 1992). Joslin (from Haynes 1992) states, "motorized access in or near mountain goat habitat is probably the single biggest threat to goat herds throughout North America."

Several authors looked at goats affected by proximity to people, traffic and noise during summer (Holroyd 1967, Singer 1978, Thompson 1980, Singer and Doherty 1985, Pedevillano and Wright 1987). Goats have shown tolerance, and in cases without harvest or harassment, the ability to readily habituate to humans on foot and road traffic (Bansner 1978, Stevens 1983, Singer and Doherty 1985, Pedevillano and Wright 1987, Penner 1988). Goats approached on foot were either mildly evasive, tolerant or curious (Brandborg 1955, Holroyd 1967, Thompson 1980, Pedevillano and Wright 1987).

Penner (1988) wrote that "goats are adaptable and can habituate to potentially adverse stimuli if they are gradually acclimatized and negative associations are avoided." This was best achieved when stimuli sources were localized and highly predictable (Penner 1988, Singer 1985). Sudden, loud noises from traffic (Singer 1978, Singer and Doherty 1985, Pedevillano and Wright 1987), blasting, drills (Singer 1985, Penner 1988), and helicopters (Penner 1988, Cote' 1996) elicited extreme alarm responses from goats habituated to human presence.

SPATIAL CONSTRAINTS

Due to narrow habitat requirements, goats on winter range are vulnerable to disturbances by winter recreationists (Smith 1982, Chadwick 1983, Smith 1984, Wigal and Coggins 1988). The principal factors in mountain goat mortality seemed to be winter severity and snow depths (Adams and Bailey 1982, Wigal and Coggins 1982, Swenson 1985). Snow depth and snow morphology was often the underlying factors in causes of death that included the availability of winter forage and its effect on body condition (Brandborg 1955, Edwards 1956, Holroyd 1967), the frequency of intra specific interactions and its resulting levels of stress (Petocz 1972, Chadwick 1977, Kuck 1977, Smith 1977, Foster and Rahs 1982), the susceptibility to accidents including avalanches and falls (Holroyd 1967, Chadwick 1983, Smith 1984), the susceptibility to disease and parasites (Wigal and Coggins 1982), and the susceptibility to predation (Brandborg 1955, Holroyd 1967, Foster and Rahs 1982). Accidents related to avalanches; rock, snow, and ice fall; and precipitous falls appear to account for most natural deaths (Brandborg 1955, Holroyd 1967, Chadwick 1983, Foster and Rahs 1982, Wigal and Coggins 1982, Smith 1984).

The principal factors in mountain goat winter range habitat selection seem to be close proximity to cliff habitats and low snow accumulations (Brandborg 1955, Smith 1977, Smith 1994). Thus, winter habitats were often steep and rocky, located on south-facing slopes and exposed to wind and sun (Brandborg 1955, Chadwick 1973, Gilbert and Raedeke 1992, Smith 1994, Varley 1995). Brandborg (1955) noted that goats in Montana and Idaho used, "the lowest available winter ranges that provide preferred combinations of broken terrain and vegetative cover." Smith (1977) found wintering goats in the Bitterroot Range used cliff habitats >70% of the time observed. Kuck (1977) found the selection of winter habitat for goats in the Lemhi Mountains of Idaho was determined by the physical, snow shedding characteristics of an area rather than the forage types present.

Wintering goats severely restrict their movements, so that their distribution is often confined to critically small islands of habitat (Kuck 1977). In the Bitterroot Range, 36 goats occupied a linear distance of 5 km throughout the winter (Smith 1977). Similarly, 17 wintering goats used 3.5 ha in the Swan Range of northern Montana (Chadwick 1973). In very severe winters, goats will continue descending to lower elevations (Rideout 1977), while in Alaska they ascended to windswept ridges or mountain tops (Hjeljord 1973).

Goats typically migrated between summer and winter ranges each fall and spring (Brandborg 1955, Holroyd 1967, Kuck 1977, Smith 1977, Wigal and Coggins 1982). These migrations were often short, elevational shifts to adjacent areas (Holroyd 1967, Chadwick 1973, Varley 1995). The use of transitional ranges between summer and winter ranges is atypical (Kuck 1977). In the Rocky Mountains, summer ranges were often high elevation settings, such as the tops of mountain ridges and peaks above timberline (Brandborg 1955, Holroyd 1967, Wigal and Coggins 1982). In the Greater Yellowstone area, summer ranges are typically between 2,500 and 4,000 meters in elevation. During the summer months, goats used alpine meadows, slide-rock slopes, talus, and cliff ledges, and usually avoid timbered areas (Saunders 1955, McFetridge 1977, Thompson 1981, Varley 1995).

POTENTIAL CONFLICTS

Although human activities can cause detrimental disturbances to mountain goat populations, few documented cases refer specifically to winter recreation. Due to the remote and rugged nature of goat wintering habitats in the Greater Yellowstone area, recreational use of such areas appears to occur at low levels.

Mountain goat habitats are inaccessible to most winter recreationists for several reasons. Many occupied goat winter ranges occur within established National Forest Wilderness areas within which motorized travel is strictly prohibited. In other cases the terrain is simply too rugged for most people. For recreation, humans tend not to seek the combination of rocky, rugged terrain and low-snow conditions required by mountain goats. Rather, users prefer the deep snow conditions avoided by goats. The discrepancy in site preferences appears to be a factor in mutual avoidance by goats and humans during winter. However, a few human activities may potentially result in conflicts.

Unlike other recreation forms, ice-climbing opportunities are often found in goat winter ranges, but the effects of this activity are unknown. Ice climbing is highly localized at specific sites and predictable in its occurrence. These two characteristics may facilitate goat tolerance of human presence. Therefore, ice-climbing may not pose a significant threat to mountain goats.

Snowmobiles and helicopters can effect goat behavior, depending upon the proximity and duration of the disturbance (Singer and Doherty 1985), Pedevillano and Wright 1987, Cote' 1996). Assessing management considerations similar to and including the Sawtooth National Forest case, the Idaho Department of Fish and Game (1990) identified helicopter use for transporting skiers as an activity potentially detrimental to goats. In general, helicopter use in the near vicinity of goats has resulted in disturbance. Helicopters should be flown no closer than 2-2.5 km from areas where goats are known to be wintering in order to avoid disturbances (Haines 1992, Cote' 1996).

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