Northern Wild Sheep and Goat Council

July 9, 2004

NWSGC POSITION STATEMENT ON HELICOPTER-SUPPORTED RECREATION AND MOUNTAIN GOATS

Introduction:

Less is known about mountain goats than other North American ungulates, due primarily to their relative scarcity and the inaccessible terrain they inhabit (Smith 1982, Festa-Bianchet et al. 1994, Wilson and Shackleton 2001). Disturbance of ungulates by helicopters can result in a variety of negative effects, including habitat abandonment significant enough to affect population status and herd viability, dramatic changes in seasonal habitat use, increased vulnerability to predation, alarm responses, decreased bouts of foraging and resting, increased animal movement and energy expenditure, and reduced productivity (Pendergast and Bindernagel 1976, MacArthur et al. 1979, Foster and Rahs 1981, Foster and Rahs 1983, Hook 1986, Joslin 1986, Pedevillano and Wright 1987, Dailey and Hobbs 1989, Côté 1996, Frid 1999, Denton 2000, Duchense et al. 2000, Gordon and Reynolds 2000, Phillips and Alldredge 2000, Dyer et al. 2001, Frid 2003, Gordon 2003, Keim and Jerde 2004).

Population and/or fitness-enhancing behaviors such as feeding, parental care, and mating may be detrimentally impacted in response to repeated helicopter disturbance, even when overt reactions to disturbance are not visible (Bunnell and Harestad 1989, Gill and Sutherland 2000, Frid and Dill 2002). Significant effects on reproduction, survival, and population persistence may occur. Increased vigilance resulting from disturbance may reduce the physiological fitness of disturbed animals by increasing stress, increasing locomotion costs (particularly during winters with severe snow conditions), and by reducing time spent in necessary behavior such as foraging or ruminating (Frid 2002). Physiological responses (e.g., elevated heart rates) to disturbance may not be directly reflected in overt behaviors, (Macarthur et al. 1982, Stemp et al. 1983, Harlow et al. 1986, Chabot 1991), but are nonetheless costly to individual animals, and ultimately, to populations.

Although the short-term behavioral responses of mountain goats to helicopter activity have been documented, longer-term habitat use and demographic consequences of disturbance remain poorly understood. Our recommendations are aimed at minimizing short-term behavioral disruptions that we believe are correlated with longer-term impacts. Research to date has not clearly identified thresholds of disturbance that trigger unacceptable responses; as a result, approach distances and other specific mitigation measures are precautionary recommendations.

Management recommendations:

Exclusion zones/avoidance:

Habitat segregation is typical of many ungulate species (Main et al. 1996), including mountain goats. During spring/summer/fall periods, adult male goats occupy habitats other than those occupied by nanny-juvenile ("nursery") groups (Geist 1964, Foster 1982, Risenhoover and Bailey 1982), with nursery groups typically occupying habitats more favorable for survival and reproduction (Fournier and Festa-Bianchet 1995). Adult female mountain goats have heightened sensitivity to disturbances during kidding and post-kidding periods (Penner 1988). Mountain goats are known to have a lower recruitment rate, compared to other ungulates (Bailey 1991, Festa-Bianchet et al. 1993). The health of mountain goat nursery groups provides obvious contributions to the reproductive success and survivorship of goat populations. Due to

the sensitivity of adult female mountain goats to disturbance, and the importance of this age/sex class to the persistence of local goat populations, restrictions on late spring and early summer helicopter activities should focus on areas occupied or likely to be occupied by nursery groups. The very activities that serve to document use are, in themselves, disruptive to mountain goats. However, documentation of crucial winter habitat use by mountain goats is essential to identify and conserve those important winter ranges, particularly in coastal mountain ranges where deep snows are typical.

Recommendation:
Helicopter avoidance should focus on those areas identified as crucial winter range, and those areas occupied or highly suspected as used by nursery groups. Particular attention should be given to helicopter activities during identified pre-kidding, kidding, and post-kidding periods; such restrictions require identification and mapping of mountain goat habitats and identifying exclusion zones prior to the issuance of annual or multi-year heli-recreation special use permits.

Distance from occupied habitats:
Behavioral responses to helicopter activity have been documented at distances of up to 2 km for mountain goats and other ungulate species (Côté 1996, Frid 2003, Gordon 2003). Recent studies have shown that short-term behavioral responses of mountain goats increase as helicopters approach within approximately 1.5 km of mountain goats. It must be noted, however, that minimum distance needed is modified strongly by topography and the amount of cliff cover/escape terrain available; increased buffer distances may be needed in more rolling terrain with less cliff cover, or in very narrow canyons/valleys.

Recommendation:
Helicopter activity should not occur within 1.5 km of occupied/suspected nursery group or crucial winter range habitats during critical periods.

Timing of activities:
Winter is of particular concern for management of disturbance stimuli. Winter is a period of severe nutritional deprivation for mountain goats (Chadwick 1983, Fox et al.1989, Shackleton 1999). Periods of deep snow can reduce food availability and dramatically increase locomotion costs (Dailey and Hobbs 1989). In winter, mountain goats are known to be relatively immobile (i.e., movements not exceeding 50m/hour) (Keim 2003), to occupy small ($<4km^2$) and specific habitat areas (Keim 2003, Schoen and Kirkoff 1982, Smith 1982), and to have high rates (>0.66) of winter home range fidelity (Keim 2003. Schoen and Kirkoff 1982). Selection of small, isolated winter habitats by goats may become compromised if management of helicopter-recreation activity neglects to consider winter mountain goat habitats and the needs of wintering goats. It is imperative that management of activities such as helicopter-skiing address and acknowledge the potential effects on mountain goat populations, through development of enforceable mitigation strategies.

Recommendation:
Helicopter activity should not occur on or near occupied winter ranges between November 15-April 30 each year. Helicopter activity should not occur on or near occupied or suspected nursery group habitats between May 1-June 15 each year. Mountain goat winter and kidding distribution and habitat selection should be known and mapped prior to issuance of annual or multi-year heli-recreation special use permits.

Helicopter approach vectors:
The rate and horizontal distance of helicopter approach vectors affect the degree of overt disturbance to ungulates. The degree of overt disturbance also varies, according to the availability of escape terrain and topography (Frid 2003, Wilson and Shackleton 2000). Additional research should be directed at identifying and documenting best management practices for mitigating approach vectors.

Recommendation:
Vertical and horizontal approach vectors should be considered when developing mitigation strategies. Strategies should also consider local conditions including refuge availability, topography, and amount and distribution of cliff cover suitable as escape terrain.

Habituation/Sensitization:
Animals may not be able to habituate to disturbance stress when disturbance is irregular and unpredictable (Bergerud 1978, Risenhoover and Bailey 1982, Penner 1988). Frid (2003) found that the proportion of Dall's sheep fleeing did not decrease with the number of cumulative weeks of disturbance. Habituation to disturbance stimuli often is partial or negligible, and habituation to strong disturbance stimuli may only partially occur (Bleich et al. 1994, Steidl and Anthony 2000, Frid 2003). Flight-initiation distance or vigilance might actually increase with repeated exposure to non-lethal stimulus if the stimulus is sufficiently adverse, resulting in sensitization to disturbance stimuli, the opposite of a habituation response (Frid and Dill 2002).

Recommendation:
It is inappropriate to assume that habituation of mountain goats to helicopter disturbance will occur over time. Reluctance to flee should not be perceived as habituation; numerous physiological responses occur, even in the absence of overt behavioral responses. All helicopter flights over or near crucial mountain goat habitat should be considered harmful to mountain goats populations, based on current knowledge. Additional research on the long-term behavioral effects of helicopters on mountain goats should be undertaken. Establishment of a cross-jurisdictional Research Steering Committee comprised of state and provincial government and non-government/academic experts is recommended. To enable such behavioral research to occur, spatially explicit control areas should be designated in which no helicopter-supported recreation term permits are issued.

Monitoring/Enforcement
Additional monitoring of the medium and long-term effects of helicopter activity on mountain goats is needed (Wilson and Shackleton 2000). Comprehensive, long-term land use and resource management plans, as well as project-specific activity plans, need to incorporate strategies and mitigation to protect and conserve critical mountain goat habitats, while still allowing commercial activities to occur, where appropriate. These plans need to thoroughly address helicopter-supported recreation effects on wildlife populations, both short and long term. These plans should identify research needed, cite pertinent existing research from other areas, and base helicopter-activity management on the best available scientific information. Enforcement of existing terms and conditions in special use permits should occur. If lacking, those terms and conditions, along with appropriate sanctions, should be developed for inclusion in activity/operating plans.

Recommendation:
Long-term monitoring is essential. If baseline data on mountain goat numbers, distribution, and seasonal habitat selection are lacking, steps should be taken to obtain those data. Monitoring should include both compliance with, and evaluation of the effectiveness of, mitigation strategies and exclusion zones. Long-term monitoring of mountain goat population performance is needed. Control areas to facilitate future behavioral research should be maintained, in which commercial helicopter activity is not permitted. Term permits should include enforceable provisions to address cases of non-compliance. Provisions should be included to modify permitted areas or conditions, based on new information, in an adaptive management approach. Permit fees should be adequate enough and used to conduct the monitoring and baseline data collection to manage these activities. Permitting of helicopter-supported recreation, especially in new areas, should not occur until managers have the

ability, funding, and mechanism to collect adequate population demographic and habitat use data, to properly manage, mitigate, and monitor this activity.

LITERATURE CITED

Bailey, J.A. 1991. Reproductive success in female mountain goats. Can. Journ. Zool. 69:2956-2961.

Bergerud, A.T. 1978. Caribou. Pgs. 83-101 *in* J.L. Schmidt and D.L. Gilbert, editors. Big Game of North America. Stackpole Books, Harrisburg, Pennsylvania, USA.

Bunnell, F.L., and A.S. Harestad. 1989. Activity Budgets and Body Weight in Mammals: How Sloppy Can Mammals Be? Current Mammology 2:245-305.

Chadwick, D.H., 1973. Mountain goat ecology-logging relationships in the Bunker Creek drainage of Western Montana. MSc. thesis, University of Montana, Missoula, Montana, USA.

Chabot, D. 1991. The use of heart rate telemetry in assessing the metabolic cost of disturbance. Trans. N. Amer. Wildl. and Nat. Res. Conf. 5:256-263.

Côté, S.D. 1996. Mountain goat responses to helicopter disturbance. Wildl. Soc. Bull. 24:681-685.

Dailey, T.V., and N.T. Hobbs. 1989. Travel in alpine terrain: energy expenditures for locomotion by mountain goats and bighorn sheep. Can. Journ. Zool.67:2368-2375.

Denton, J. 2000. Dealing with Unprecedented Levels of Aircraft-Supported Commercial Activities. Proc. Bienn. Symp. North. Wild Sheep and Goat Counc. 12:138-152.

Duchense, M., S.D. Côté, and C. Barrette 2000. Responses of woodland caribou to winter ecotourism in the Charlevoix Biosphere Reserve, Canada. Biol. Cons. 96:311-317.

Dyer, S.J., J.P. O'Neill, S.M. Wasel, and S. Boutin 2001. Avoidance of industrial development by woodland caribou. Journ. Wildl. Manage. 65:531-542.

Festa-Bianchet, M., M. Urquhart, and K.G. Smith, 1994. Mountain goat recruitment: kid production and survival to breeding age. Can. Journ. Zool.72:22-27.

Foster, B.R., and E.Y. Rahs 1981. A study of canyon dwelling goats in relation to proposed hydroelectric development in north-western British Columbia. Biol. Cons. 33:209-228.

_____, 1982. Observability and habitat characteristics of the mountain goat (*Oreamnos americanus*) in west-central British Columbia. MSc. thesis, University of British Columbia, Vancouver, British Columbia, Canada.

_____, and E.Y. Rahs 1983. Mountain goat response to hydroelectric exploration in northwestern British Columbia. Environ. Manage. 7:189-197.

Fournier, F., and M. Festa-Bianchet 1995. Social dominance in adult female mountain goats. Animal Behav. 49:1449-1459.

Frid, A. 1999. Fleeing decisions by Dall's sheep exposed to helicopter overflights. Report for the Yukon Fish and Wildlife Branch, Dept. of Renewable Resources, Whitehorse, Yukon, Canada.

_____, and L.M. Dill 2002. Human-caused disturbance stimuli as a form of predation risk. Cons. Ecol. 6:11.

_____. 2003. Dall's sheep responses to overflights by helicopter and fixed-wing aircraft. Biol. Cons. 110:387-399.

Geist, V. 1964. On the rutting behaviour of the mountain goat. Journ. Mamm. 45:551-568.

_____. 1975. On the management of mountain sheep: theoretical considerations. Pp. 77-98 in J.B. Trefethen, editor. The wild sheep of modern North America. Winchester Press, New York.

Gordon, S. M., and D.M. Reynolds 2000. The use of video for mountain goat winter range inventory and assessment of overt helicopter disturbance. Proc. Bienn. Symp. North. Wild Sheep and Goat Counc. 12:26-35.

_____. 2003. The behavioural effects of helicopter logging activity on mountain goat (*Oreamnos americanus*) behaviour. M.Sc. thesis, Royal Roads University, Victoria, British Columbia, Canada.

Harlow, H.J., E.T. Thorne, E.S. Williams, E.L. Belden, and W.A. Gern, 1986. Cardiac frequency: a potential predictor of blood cortisol levels during acute and chronic stress exposure in Rocky

Mountain bighorn sheep (*Ovis canadensis canadensis*). Can. Journ. Zool. 65:2028-2034.
Hicks, L.L. and J.M.Elder. 1979. Human disturbance of Sierra Nevada bighorn sheep. Journ. Wildl. Manage. 43:909-915.
Hook, D.L. 1986. Impacts of seismic activity on bighorn sheep movements and habitat use. Proc. Bienn. Symp. North. Wild Sheep and Goat Counc. 5:292-296.
Joslin, G.L. 1986. Mountain goat population changes in relation to energy exploration along Montana's Rocky Mountain front. Proc. Bienn. Symp. North. Wild Sheep and Goat Counc. 5:253-271.
Keim, J. 2003. Modeling core winter habitats from habitat selection and spatial movements of collared mountain goats in the Taku River drainage of north-west British Columbia. Ministry of Water, Land and Air Protection, Smithers, British Columbia, Canada.
Keim, J. and C.L. Jerde. 2004. Measuring spatial movement responses from GPS collared mountain goats during periods of aerial telemetry occurrence. Ministry of Water, Land and Air Protection, Smithers, British Columbia, Canada.
Kovach, S.D. 1979. An ecological survey of desert bighorn sheep to human harassment: A comparison of
disturbed and undisturbed populations. Ph.D. dissertation, Utah State University, Logan, USA.
MacArthur R.A, R.H. Johnson, and V. Geist. 1979. Factors influencing heart rate in bighorn sheep: a physiological approach to the study of wildlife harassment. Can. Journ. Zool. 57:2010-2021.
_____, V. Geist, and R.H. Johnston. 1982. Cardiac and behavioral responses of mountain sheep to human disturbance. Journ. Wildl. Manage. 46:351-358.
Main, M.B., F.W. Weckerly, and V.C. Bleich. 1996. Sexual segregation in ungulates: new directions for research. Journ. Mamm. 77:449-461.
Papouchis, C.M., F. J. Singer and W.S.Sloan. 2000. Responses of desert bighorn sheep to increased human recreation. Journ. Wildl. Manage. 65(3):573-582.
Pedevillano, C., and R.G. Wright. 1987. The influence of visitors on mountain goat activities in Glacier National Park, Montana. Biol. Cons. 39:1-11.
Pendergast, B., and J. Bindernagel. 1976. The impact of exploration for coal on mountain goats in northeastern British Columbia. British Columbia Ministry of Environment and Lands, Victoria, British Columbia, Canada.
Penner, D.F. 1988. Behavioral response and habituation of mountain goats in relation to petroleum exploration at Pinto Creek, Alberta. Proc. Bienn. Symp. North. Wild Sheep and Goat Counc. 6:141-158.
Phillips, G.E., and A.W. Alldredge. 2000. Reproductive success of elk following disturbance by humans during the calving season. Journ. Wildl. Manage. 64:521-530.
Risenhoover, K., and J.A. Bailey. 1982. Social dynamics of mountain goats in summer: implications for age ratios. Proc. Bienn. Symp. North. Wild Sheep and Goat Counc. 3:364-373.
Schoen, J.W. and M.D. Kirkoff. 1982. Habitat use by mountain goats in southeast Alaska. Final Report, Federal Aid in Wildlife Restoration Projects W-17-10, W-17-11, W-21-1, and W-21-2, Job 12, 4R, Alaska Department of Fish and Game, Juneau, Alaska.
Shackleton, D. M. 1999. Hoofed Mammals of British Columbia. Royal British Columbia Museum and UBC Press, Victoria and Vancouver, British Columbia, Canada.
Smith, K. 1982. Winter studies of forest-dwelling mountain goats of Pinto Creek, Alberta. Proc. Bienn. Symp. North. Wild Sheep and Goat Counc. 3:374-390.
Stemp, R.E. 1983. Heart rate responses of bighorn sheep to environmental factors and harassment. MSc. thesis, University of Calgary, Calgary, Alberta, Canada.
Wilson, S.F., and D.M. Shackleton. 2000. Backcountry recreation and mountain goats: a proposed research and adaptive management plan. Wildl. Bull. No. B-103. British Columbia Ministry of Environment Lands and Parks, Victoria, British Columbia, Canada.