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1ST BC Mountain Goat Workshop

March 1 & 2, 2005
Prince George

Summary of current issues, management practices, and research needs

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J. Ayotte
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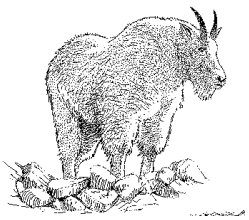
1st B.C. MOUNTAIN GOAT WORKSHOP

March 1 & 2, 2005
Prince George, BC

Summary of current issues, management practices, and research needs



Peace/Williston
Fish & Wildlife Compensation Program

BRITISH COLUMBIA

INTRODUCTION

The 1st BC Mountain Goat Workshop (Prince George, BC, March 1-2, 2005) was organized by the Peace/Williston Fish and Wildlife Compensation Program and the BC Ministry of Water, Land and Air Protection, Biodiversity Branch. The objectives of the workshop were to present results and techniques from recent research and inventory projects on mountain goats in BC, and to guide discussions to focus expert opinions on documenting the current status of knowledge on mountain goat ecology, management concerns and future research needs.

This was the first workshop held in BC to address research and management issues pertaining to mountain goats. Some mountain goat issues were addressed as components of two Northern Wild Sheep and Goat Council symposiums held in BC: the 1st NWSGC symposium in Pentiction (1978) and the 9th NWSGC symposium in Cranbrook (1994). As a measure of the change in research needs and management policies, the titles of BC mountain goat papers presented at the 1978 and 1994 symposiums are listed in Appendices A & B.

This summary is organized according to the sessional framework of the workshop which consisted of presentations followed by a discussion period for each of the following topic areas: 1) Impacts of forest harvesting, 2) Aerial disturbance, 3) Habitat supply modeling, 4) Population inventory and management, and 5) Goat management planning. Within each of these topic areas, a list of the presented papers is followed by a summary of the key issues raised and research needs developed.

SESSION 1: IMPACTS OF FOREST HARVESTING

PRESENTED PAPERS

1) Importance of mineral licks to mountain goats in north-eastern BC
Jeremy Ayotte

2) Mineral lick use by mountain goats: timing, frequency and duration of visits before and after forest harvesting
Mari Wood

3) Trail movements by mountain goats under pre and post timber harvesting conditions
Laurence Turney

4) Habitat use and wintering strategies of mountain goats in south-eastern BC
Kim Poole

KEY ISSUES

Mineral licks

Mineral licks provide mountain goats with sources of supplementary sodium (low concentrations of sodium in goat forage) and carbonates to buffer the pH of the rumen following the transition to spring forage (Ayotte). Lick use is a complex interaction among physiological demands, forage composition and the properties of lick material (soil and/or water). Consequently, lick use is variable over time and among individuals. Among studies on the use of licks by goats there appears to be peaks in use coinciding with spring forage change and periods of high physiological demands (e.g., lactation) during the months of May and June for males, and June, July, and August for females (Ayotte; Wood; Turney).

Some goats show a high fidelity to a single mineral lick, whereas others may move among several licks during a single season (Wood). Travel from the alpine to low-elevation licks is on well-worn main trails that often split into alternate trails near the lick area. Trails follow networks of cliff bands or escape terrain between alpine habitats and mineral licks. The use of remote trail cameras has documented goats using trails to licks during all hours of the night, although most travel to and from licks was during the day (Ayotte; Wood). Data from remote trail cameras also suggest that goats use main trails more when travelling to the licks and alternate trails when leaving from the licks (Ayotte; Wood).

Forest harvesting near mineral licks and access trails:

When some goats encountered a new logging road crossing the trail accessing a lick, they spent time either searching for the continuation of the trail, exploring the road cut-bank for new sources of exposed mineral soil, or turning back up the trail (Wood). However, most goats continued on to the lick. New road access to areas with goat habitat (especially where goats concentrate on licks and trails) has the potential to lead to local over-harvest, unless hunting regulations are very site specific for each sub-population. Visual buffers around licks and lick access trails may prevent increased hunting pressures on local goat populations. Avoiding forest harvesting activities around trails and licks during the spring/summer mineral lick use season will minimize short-term disturbance effects. It is unclear if removing timber immediately adjacent to trails will displace goats, although it is known that goats will continue to use trails if a forested buffer is retained (Wood). The post-logging effects of blow down in buffer or leave strips, or dense early seral growth in clearcuts around licks and access trails, on the risk of predation to mountain goats is unknown. Recent attempts to document the effects of habitat alterations near licks and trails have involved measurements of perceived threat as response variables (e.g., changes in frequency, timing, and duration of lick visits) (Wood; Turney). Post-logging increases in predator presence on lick trails has been documented by remote trail cameras (Turney). The long-term population effects of goats abandoning a lick area are unknown but may involve symptoms of chronic sodium deficiency and an inability for weak individuals to improve their condition in a relatively short amount of time.

Forest harvesting in mountain goat winter range:

Goats wintering in areas with high snowfall may make use of low-elevation forest compared to areas with lower snowfall where goats likely remain on wind-swept alpine ridges during the winter (e.g., Purcell Mountains versus the Rocky Mountains, Poole). Low elevation mature forest often linked to escape terrain, provides snow interception and litter-fall forage for goats, as well as potential trade-offs with increased predation threats. Coastal and interior areas should be considered separately when evaluating the requirements for mature forest as winter range habitat. Minimum requirements for mature forested winter range are unknown but should consider patch size/configuration and distance to escape terrain (150 m to 400m is currently accepted, less in the winter).

RESEARCH NEEDS/QUESTIONS

1) Do forested buffers around licks and trails minimize disturbance effects of forest harvesting including predation on lick use by goats (Quantify short and long-term effects)? What are the effects of complete removal of timber adjacent to trails/licks on goat use of the licks?
2) Lick abandonment: What are the population-level effects of chronic elemental deficiencies (especially sodium)?
3) Lick abandonment: What is the severity of digestive disorders associated with the transition to spring forage experienced by mountain goats?
4) Are mineral licks as significant in coastal regions as they are in the interior?
5) What are the winter range habitat requirements of mountain goats utilizing low-elevation mature forests?

SESSION 2: AERIAL DISTURBANCE

PRESENTED PAPERS

1) Effect of helicopter logging on mountain goat behaviour in coastal British Columbia
Steve Gordon

2) Effects of helicopters on canyon-dwelling mountain goats in northeast British Columbia Jeff Matheson

3) The development of a heli-ski and mountain goat habitat management model: a visual and audio analysis
Karina Andrus

4) Management of commercial recreation in relation to mountain goats and their habitat
Steve Wilson

KEY ISSUES

Efforts to measure behavioural and population-level responses of goats to aerial disturbances are necessary with increasing backcountry recreation tenures (helicopter skiing/hiking), oil and gas seismic activity, and helicopter logging. Factors relevant to aerial disturbance include: aircraft type, approach speed and vector, flight frequency and duration, weather (snow cover), terrain, season, and age/sex composition of the goat population. Consistent management parameters (e.g., minimum flight distances) are desirable across all resource sectors (recreation, oil and gas, and forestry). Development of techniques to document and interpret the cumulative effects of these resource activities are at an early stage.

The spectrum of potential mountain goat responses to aerial disturbance includes behaviours that may increase energetic costs (increased vigilante behaviour and short term movement away from areas with high forage quality: Gordon; Matheson) and/or include population-level effects (long-term abandonment of quality habitat and increased risk of predation and injury). These causal relationships and the severity of the effects are poorly understood and minimum flight distances from known goat populations are set at precautionary best estimates (1500-2000 m). Decisions on minimum flight distances also vary

with local goat population trends (i.e., declining versus stable or increasing) and the associated levels of risk managers are willing to take.

Although there is a need to standardize thresholds such as flight distance, the ultimate long-term effects of aerial disturbance that include aspects of habituation versus sensitization, are difficult to measure. Quantifiable variables that relate to population-level effects, such as distance moved and corresponding change in habitat quality, should be used to measure such disturbance effects. Experimental designs must include an adequate length of pre-disturbance sampling. If flight distance is to be used as a management rule, habitat effects also require consideration (e.g., alpine, forest, low-elevation canyons).

Aerial disturbances to goats can be managed with federal air regulations (they exist for some migratory bird species and caribou populations) and non-government certification schemes. Flight plans may be designed (spatially and seasonally) to reduce both visual and auditory disturbance to known goat populations (Andrus). The principles of adaptive management with site specific mitigation plans may also be used along with an onsite monitor to ensure implementation and compliance (Matheson; Churchill). The use of a more flexible (results-based) approach may be appropriate in situations where proponents are willing to determine population status prior to resource activities (which consider sightability issues: i.e., unseen goats may still be disturbed), implement a mitigation plan, monitor appropriateness of thresholds, and manage activities accordingly. A results-based approach that allows helicopter pilots to interpret levels of goat response to aerial disturbance has inherent limitations for conserving goat populations.

RESEARCH NEEDS/QUESTIONS

1) Use response variables measured at appropriate scales to determine effects of aerial disturbance that relate to a population level (i.e., the effects of aerial disturbance on the long-term viability of a local goat population).
2) Design long-term studies to monitor disturbance effects (appropriate pre- and post-disturbance sampling).
3) Design experimental studies that further refine thresholds for minimum flight distances.

4) What is the physiological evidence for habituation and/or sensitization of goats to aerial disturbance? Are sensitization effects quantifiable at the population-level (e.g., miscarriage)?
5) Explicitly define risk as a factor in management decisions and how it is linked to mountain goat population demographics and current trends.

SESSION 3: HABITAT SUPPLY MODELING AND MODEL APPLICATIONS

PRESENTED PAPERS

1) A simple model for predicting risk and habitat supply in the Morice Timber Supply Area

Laurence Turney

2) Mountain goat habitat supply modeling and applications in the Mackenzie TSA, north-central BC

Pamela Hengeveld

KEY ISSUES

Mountain goat habitat supply modelling projects have developed in response to increased concerns about the effects of forest development on mountain goat life requisites, displacement from quality habitat, and population viability (Hengeveld). Modelled parameters of potential goat habitat include areas with slopes > 40% and presence of rock outcrops (Turney). Map outputs from these GIS-based models require field work components to refine and interpret results (e.g., transects counts of pellets, tracks, and hair; Turney). The use of models such as Bayesian belief networks provides users with visual relationships among model variables (Hengeveld). Important utilities of these habitat models are to structure knowledge, focus hypotheses for future research, forecast disturbance impacts, and inform management decisions by assessing alternative strategies.

The assumptions that are incorporated within models must be explicit and acknowledged by their proponents. Biologists and managers are sensitive to overselling of the utility and applications of model outputs (e.g., habitat capability maps). Models are expensive to produce, and as costs go up, proponents may need to be reminded that “all models are wrong, but some are useful”. Where appropriate, future research funding should support projects that focus on refining existing models and testing hypotheses that have developed during sensitivity analyses of these models rather than creation of new models.

RESEARCH NEEDS/QUESTIONS

1) Researchers and managers need to maintain the cycle of model building to understand goat habitat requirements. This includes: data collection and interpretation, model formulation, model evaluation and continuous refinement. Future projects attempting to model goat habitat requirements should consider these aspects in their design.

SESSION 4: POPULATION INVENTORY AND MANAGEMENT

PRESENTED PAPERS

1) Mountain goat status and inventory in British Columbia
Ian Hatter

2) Consideration's for aerial inventories for mountain goats
Kim Poole

3) Efficiency of aerial surveys and models of population dynamics of mountain goats in Alberta
Steeve Côté

KEY ISSUES

Mountain goats in BC have been infrequently surveyed in the past. Most of these surveys have questionable precision (Hatter). Survey data (population estimates and trends) are critical to setting appropriate limited entry hunting (LEH) quotas and monitoring population viability. With variable data quality and unknown sampling efforts, interpretation is difficult. As a species that is sensitive to over-harvest (Côté), standardized population inventories that provide reliable estimates should be a priority for funding in BC. The current issues in the methodology of mountain goat population surveys involve the need for standards to define populations/sub-populations, choice of age and sex classes for herd classification (2 classes: kid and adult, may be the most reliable), correction for sightability, and survey frequency.

Current Resource Inventory Committee (RIC) standards should be updated to improve the rigour in data collection, reporting, storage, and availability. Sightability corrections should also consider behavioural reaction to helicopters. Currently, sightability corrections range from 30-66% on the coast and 55-84% in the interior. Although the specific curve of the relationship is not understood, sightability improves with increased search time (and expense). The type of model that was developed to address moose sightability issues in BC may not be useful in mountain goat habitat because of topographical features such as cliffs, canyons,and lack of vegetation/cover in the alpine.

RESEARCH NEEDS/QUESTIONS

1) New surveys need to explicitly state objectives and assess the limitations of the various survey methods used.
2) Develop standards to improve accuracy, rigour, and interpretation of survey data.
3) To improve understanding of population trends, it may be useful to inventory small (discreet) sub-units of a larger "population" more frequently and to cautiously extrapolate data.
4) Keep survey variables constant (e.g., seasonal timing, weather (e.g. temperature), time of day, use of trained/experienced observers only).
5) Calculate, standardize, and replicate survey effort (i.e., blocks/zones and times) with less emphasis on attempting to estimate how many animals were not seen.
6) Continue to investigate the use of marked animal techniques and resurveys (from both air and ground) as a basis for determining sightability correction factors.
7) Development of sightability models may not be important where conservative management (1-2% harvest) is practiced
8) Monitoring population trends may be more useful than estimating total population size.
9) Develop alternative, more precise and cost-effective methods to estimate goat population numbers (e.g., DNA analyses of hair and pellet samples).
10) Generally improve coordination between management and research efforts (research biologists should have some influence on funding decisions).

SESSION 5: GOAT MANAGEMENT PLANNING

PRESENTED PAPERS

1) Guidelines for determining sustainable harvest of mountain goats in BC
Ian Hatter

3) A review of Alberta's mountain goat management plan
Kirby Smith

KEY ISSUES

There is some uncertainty about sustainability of harvest rates in consideration of the low reproductive rates among mountain goats (Hatter; Côté; Smith). Sustainable harvests may be substantially higher in introduced populations with good range conditions and without predators. In contrast to introduced populations where some compensatory mortality may occur, hunting appears to lead to additive mortality in native populations (recruitment and productivity may actually decline with increasing harvest rates). Harvest rates at < 10% (of population) in Alberta were unsustainable (Smith). Other investigators have reported sustainable harvest rates to be 3 to 4%. The Caw Ridge, Alberta herd (~102 goats) had a modeled sustainable harvest (of males) of 1 per year or 1% of the population (Côté). Conservative hunting regulations are the primary mechanism to increase and restore goat populations.

In 1988 the hunting of mountain goats in Alberta was closed because of declining populations. The following rigid conditions will govern the re-opening of goat hunting seasons in this province: 1) minimum population of 50 goats, 2) at least 10 years of survey data, 3) billy/nanny ratio of 33/100, 4) an aerial survey for the previous year and summer prior to the proposed fall opening, and 5) the harvest rate will be < 3 % of the total estimated summer population.

Consensus among participants of the workshop was that the province of BC needs (moderate priority) to develop a mountain goat management plan. The plan should be developed in coordination with WLAP/MSRM. Initially, it may be appropriate to build a framework or to develop the plan in sections. The amount of detail in the plan will need to

balance guidance and coordination with flexibility for local situations. A provincial mountain goat management plan should serve to:

- Standardize survey methodology: providing standards and continuity in data collection
- Provide policy direction to government staff
- Focus and coordinate current and future research projects
- Provide recognition and acceptance of objectives to help secure funding
- Provide a form of communication among stakeholders and public
- Act as a buffer to changes in political directions regarding goat management
- Define the resources required to achieve the objectives (links to budgets)

Ideally, BC's mountain goat management plan should include:

1. Mountain goat history in BC (historic data and current status)
2. Management plan objectives (short- and long-term), and policies (e.g., transplanting)
3. Provincial perspective on significance of goats in BC (consumptive and non-consumptive values)
4. First nations perspective on goats
5. Roles and responsibilities (government and industry/recreation groups)
6. Description of population and sub-population by region
7. Descriptions of threats to goats (climate change, resource activities), short- and long-term risks and potential management actions to address risks
8. Goat habitat requirements
9. Research priorities
10. Descriptions of survey methods
11. Acceptable sustainable harvest rates (% population, % female)
12. Harvest level calculation methods
13. Link to LRMP's by region and local goat management objectives
14. Components of public education

(Note: If funds are limited, then activities 2, 6, 7, 9, 11, 12, and 13 should be considered the highest priority to complete)

RESEARCH NEEDS/QUESTIONS

1) BC needs to develop a reliable methodology for monitoring mountain goat population trends.
2) Current regional and provincial population estimates should revisit the coarse-filter estimate used in the past (1977, 1979, 1991)
3) A “tracking harvest strategy” should be employed in BC.
4) Long-term research (e.g., Caw Ridge goat project in Alberta) should expand to include other representative coastal and interior herds in BC.

APPENDIX A: B.C. MOUNTAIN GOAT PAPERS PRESENTED AT THE 1st NORTHERN WILD SHEEP AND GOAT COUNCIL SYMPOSIUM, PENTICTON, BC, 1978.

1) **Status of the mountain goat of the Similkameen River, BC**
   J.N. Bone

2) **Goat management in the Kootenays**
   R. Jamieson

3) **The goats of Goat Mountain: Evaluation of a proposal**
   D.M. Hatler

4) **Horn growth and quality management for mountain goats**
   B.R. Foster

5) **A systems approach to mountain goat management**
   D.M. Hebert

APPENDIX B: B.C. MOUNTAIN GOAT PAPERS PRESENTED AT THE 9TH NORTHERN WILD SHEEP AND GOAT COUNCIL SYMPOSIUM, CRANBROOK, BC, 1994.

1) **A method used for estimating mountain goat numbers in the Babine Mountains Recreation Area, British Columbia**
   D. Cichowski, D. Hass, and G. Schultze