B.C. Mountain Goat Workshop 2005

Project Title: Mountain Goats in the Skeena Region

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4. **Project location**: Skeena Region BC
5. **Project timeframe**: Start (month/year): 1999 End (month/year): 2005
6. **Project objectives**: (briefly describe the primary objectives of your research)

   Following are four separate Study Objectives conducted within 5spatially explicit mountain goat ranges in the Skeena Region of BC:

1) To measure spatial movements made by collared mountain goats (VHF and GPS Collars), define winter habitat selection by collared mountain goats, and develop a GIS algorithm to identify winter habitat areas selected by mountain goats.

2) To develop methods of identifying increases in movement of GPS collared mountain goats, as determined by spatial GPS collar locations, during concurrent periods of VHF aerial telemetry flights. To determine if there exists evidence that GPS collared mountain goats move differently during periods of concurrent VHF aerial telemetry flights verse periods without aerial telemetry flights.

3) To apply a winter mountain goat habitat GIS algorithm, validate and verify winter habitats predicted by the algorithm, and spatially compare suitable habitats with confirmed habitat use to locations of known helicopter ski runs.

4) To collect winter habitat use data for mountain goats by conducting a helicopter inventory; to apply and test the geographic information system (GIS) based modeling approach to confirm its accuracy and utility for mountain goat winter habitat identification in coastal ecosystems; to test existing habitat identification methods in the North Coast and; to identify defensible candidate goat winter ranges for legal designation in the North Coast as Ungulate Winter Range (UWR) under the Forest and Range Practices Act (FRPA).

7. **Project descriptors** (select all that apply):

Research ☐	Habitat Use: ☒	Forestry Interactions: ☐
Management ☐	VHF collars: ☒	Oil & Gas: ☐
Inventory ☐	GPS collars: ☒	Aerial Disturbance: ☒
Coastal: ☒	Harvest: ☐	Human Disturbance: ☐
Transition: ☒	Predation: ☐	Population Dynamics: ☐
Interior: ☒		

Other:

8. Project description (provide a brief description of your project including objectives, goals, methods, and main findings or results to date):

1) A total of 6,337 winter locations from 10 GPS collared mountain goats during three winter seasons (January1 to April 30, 2000 to 2002) were used to determine winter movements, winter habitat selection, and derive a core winter habitat algorithm for mountain goats in the Taku River Drainage. Collared mountain goats moved on average 20.41 □1.24m/hr in the 2000 season, and 34.03 □1.24m/hr in the 2001/2002 seasons. Winter home range sizes of GPS collared mountain goats ranged from 0.24km2 for a winter season to 3.9km2 for a period from February 14 to April 30 using a 95% adaptive kernel home range methodology. A total of 322 aerial telemetry locations from 16 to 18 radio collared mountain goats over three winter seasons in the study area were used to determine the average distance between center points of Jennrich-Turner (1969) Bivariate Normal Home Range areas for each individual in multiple years. Mountain goats used winter habitats that had center points that were on average 1284 □703m to 1878 □1045m distances apart in multiple years. A total of 774 mountain goat observation locations were taken during a helicopter survey in the study area on March 9-11, 2000. Mountain goats were observed at elevations ranging from 400m to 2200m (average 1264m). Habitat selection tests were used to test expected (5□ slope classes, 20□ aspect classes, and forest canopy height classes) against observed habitat proportions from winter GPS collar locations. Slope steepness, aspect classes, and non-forested habitats were selected for. An exponential relationship was found for the number of GPS collar locations verses distance from slopes from 45□ to 60□ steep at 100m intervals. A GIS algorithm was developed to identify core winter habitats for mountain goats based upon GPS collar findings in the study area. The derived model was tested against the 322 VHF aerial telemetry locations and against the 774 winter survey locations for validity. Significant differences between expected proportions from modeled habitats verses observed proportions from both VHF telemetry locations and winter survey locations were found. The derived model correctly identified 82.82% of all winter mountain goat, GPS locations.

2) Many studies have commented on wildlife movements in response to helicopter and fixed-wing aircraft over-flights. However, research orientated aerial telemetry has never been investigated as a disturbance variable. The potentially deleterious effects of displacing an animal are relatively unknown and are therefore rarely discussed or considered when proposing new telemetry research. We draw on the opportunity of 16 GPS collared mountain goats (Oreamnos americanus) that recorded location data over a 4 month winter period where regular telemetry flights were conducted. We evaluate two models using Akaike's Information Criteria to discriminate between distributions of step lengths during telemetry flights and at times other than during telemetry flights. In 5 of 16 individuals there was evidence for different distributions of step length during periods of disturbance. Two behavioral responses, short and long movements, occurred more often on days of aerial telemetry events than expected. The implications for studies that use aerial telemetry and GPS collar locations to track animal movement are discussed.

3) A significant increase in recreational activity (helicopter skiing) has occurred in the Bell II area of northwest British Columbia, and a process for mitigating detrimental impacts to local mountain goat populations is required. The late-winter distribution of mountain goats in the Bell II area was assessed using helicopter survey observations to validate and verify a winter mountain goat habitat suitability index model. During this survey, 314 mountain goats were observed in the area. A habitat suitability index algorithm applied to the study area predicted 9.8% of the study area as suitable winter mountain goat habitat. The algorithm correctly predicted 93% of the mountain goat habitat use observations recorded during the inventory, given a 63% area based commission error. In

sum 14,063ha of winter mountain goat habitat, or 3.6% of the study area, is confirmed as suitable winter habitat identified to have winter mountain goat habitat use. There remains no method to track changes in the mountain goat population or winter habitat use over a temporal scale as no previous mountain goat data is available for the study area. A preliminary analysis of proximity found that 35% to 60% of 559 commercial helicopter ski runs were located within 500m to 2000m of confirmed winter habitats in the study area. A management approach that integrates the findings of this study with mountain goat conservation and commercial backcountry recreation in the area should be evaluated.

9. Project documentation (provide a list of citations for all progress, final, or published reports)

Keim, J, and C.L. Jerde. 2004. Measuring movement responses of wintering mountain goats during aerial telemetry occurrences. Submitted, Proceedings from the Northern Wild Sheep and Goat Council 2004 Symposium.

Keim, J. 2004. Confirming Winter Mountain Goat Habitats from a Habitat Suitability Model in the Bell II Study Area. Submitted, Proceedings from the Northern Wild Sheep and Goat Council 2004 Symposium.

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. Unpubl. In press.

AXYS Environmental Consulting Ltd.; J. Keim. 2005. Identifying Mounatin Goat Winter Ranges in the North Coast of British Columbia. BC Ministry of Water Land and Air Protection, Skeena Region. Smithers BC.