B.C. Mountain Goat Workshop, Prince George, BC 2005

Project Title: Habitat use and Movements of Mountain Goats within Forested Landscapes near Houston, BC.

1. **Project Leader(s)**: Laurence Turney
2. **Project Team Members**: Roy Blume, Anne-Marie Roberts, Jessica Murray and Todd Mahon
3. **Project contact information**: Phone: (250) 877-6705 Fax: (250) 877-6805
   Email: laurence@ardea.ca Web page: www.ardea.ca
4. **Project location**: Central portion of Nadina Forest District, near Houston, BC.
   Coastal: ☐ Transition: ☒ Interior: ☐
5. **Project timeframe**: Start (month/year): Jun/2001 End (month/year, or ongoing): Ongoing
6. **Project status**: Data collection ☒ Analysis ☒ Write-up ☒ Publication ☐
7. **Project objectives**: (briefly describe the primary objectives of your project)

   This project was initiated in mid-2001 with a limited scope, as part of the ongoing work near Nadina Mtn. to investigate habitat use and movements by mountain goats in the forested landscape. In mid-2002 a comprehensive three-year study was initiated to increase the sample size of monitored goats with the following objectives:

   1. Monitor movements of mountain goats among isolated cliff and canyon features to determine frequency of movements between these areas and identify critical habitat features such as mineral licks, natal areas and winter use areas.

   2. Monitor the differences in habitat use and movement patterns of mountain goats in areas with and without proposed forest harvesting activities.

   3. Determine sightability factors for mountain goats in forested habitats during winter and summer.

   4. Investigate the feasibility of using DNA analyses of tissue and hair samples to determine individuals within the population of mountain goats in the study area and the use of hair sampling as a method for population surveys or movement detection.

   5. Provide management recommendations to forest and wildlife managers to minimize impacts from forest harvesting activities on mountain goat habitats and populations.

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

Research ☒	Habitat Use: ☒	Forestry Interactions: ☒
Management ☒	VHF collars: ☒	Oil & Gas Interactions: ☐
Inventory ☒	GPS collars: ☒	Mineral Exploration: ☐
Predation: ☐	Harvest: ☐	Aerial Disturbance: ☐
Habitat Modeling: ☒	Population Dynamics: ☐	Human Disturbance: ☒

   Other: Movement patterns, Sightability, DNA investigations

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

In July 2001 three mountain goats were captured, south of Nadina Mtn. by Clover trap and fitted with Lotek GPS collars. One collar failed after nine days of data collection, while the remaining two collars, one on an adult female and the other on an adult male, were recovered in June 2002. From these three collars a total of 3,857 GPS locations were recorded over a total period of 671 collar days.

The GPS collars had a mean successful fix acquisition rate of 72.4%, with 16.6% being 3D fixes. For the two animals that were collared throughout the study period, fix acquisition was somewhat higher in spring and early summer than in fall and winter.

Most GPS locations (>84% of locations for each animal) were in the ESSFmc zone, with the remaining locations being in the SBSmc2 zone. A higher proportion of locations were found in ESSFmc/01 sites in winter and of ESSFmc/04 sites in spring/summer compared to other site types. GPS locations tended to be on steep slopes (41-60º slope) in early spring to summer, and moderate slopes (21-40º slope) in winter. Forested GPS locations were dominated by subalpine fir/hybrid white spruce during the winter months and by lodgepole pine subalpine fir during the spring and summer months. Winter GPS locations were in mature (141-250 yrs) forests with tall trees (>28.5 m) and high canopy closure (46-65%), while spring, summer and fall GPS locations were in middle age class (81-140 yrs) forests with shorter trees (10.5-19.4 m) and moderate canopy closure (26-45%).

Habitat plots were completed at 138 randomly selected GPS locations from two of the mountain goats. Mountain goat sign was found in 98 of these plots, with the most common sign type being trails, pellet groups and feeding sign. Other sign found included beds, tracks and hair clumps. Although plots were found in a wide variety of locations and habitat types, most plots were in mature forest, in middle to upper slope positions, on moderate slopes (21-40º), and cool aspect (285-135º). The most common ecosystem types found in the plots were ESSFmc 02, 03 and 04 (64.5% of all plots).

Home range size varied seasonally with smaller areas being used in winter and larger areas used in spring, summer and fall. Habitat selection analysis found that in all seasons, the collared goats preferred steeper slopes and older forests and non-forested sites with gentle slopes.

In January and March 2003, 27 mountain goats were captured on six sites within the study area, including Morice Mountain, Bob Creek Bluffs, Dungate Creek Bluffs, China Nose, Foxy Creek Canyon and Klo Creek Bluffs. Eight animals were fitted with global positioning system (GPS) and 19 animals with very high frequency (VHF) radio collars. During the 2003-2004 project year the collared animals were relocated using radio-telemetry every four to six weeks in order to identify movements, mortality, trends in habitat use and to monitor collar function. All collars were located at each of 16 telemetry sessions and 381 telemetry points were mapped from these flights. Landscape position and habitat information were recorded for most telemetry locations.

In March 2004, all GPS collars were recovered and the data was downloaded for a preliminary analysis of telemetry locations for home range and movement patterns. Differences in mean home range sizes for seasons, animal sex, and age, were not found to be significant, while comparisons between individuals and general use locations were. Daily movement distances between individuals showed significant differences. There were no significant differences in daily movement distances between males and females or between adults and juveniles. There were significant differences in the daily movement distances between the individuals of different ages and between months, seasons and locations.

Mortality investigations were carried out on four animals that died during the summer and early fall of 2003. The mortality rate of 15% was higher than expected, with at least two mortalities likely caused by predators. Tissue and hair samples were obtained from collared animals in the 2003 capture sessions and analyzed in early 2004 to determine the potential for distinguishing individuals. Based on the DNA analysis, it was considered to be very likely that individuals would be able to be identified in this population using tissue and hair samples.

Very limited work was carried out in 2004-2005 due to lack of funding. Two GPS collars were recovered in early 2005 with limited data due to early collar failures. A telemetry flight to determine the functionality of the remaining VHF collars in early 2005 was unable to locate one collar, but all other collars were functioning.

Future work planned for this project for 2005-2006 includes: continuation of telemetry monitoring of the VHF collared animals to detect gross movement patterns, completion of more sightability investigations, completion of habitat use assessments and resource selection analysis, and more in-depth analysis of existing movements and activity data.

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

Turney, L and A.M. Roberts. 2004. Non-alpine habitat use and movements of mountain goats in north-central British Columbia. Summary of 2003-2004 activities. Unpub. rep. prep. for Morice and Lakes Innov. For. Prac. Agree. Smithers, BC. 30pp.

Turney, L., R. Blume, A.M. Roberts and J. Murray. 2003. Non-alpine habitat use and movements by mountain goats in north-central British Columbia: Annual operational report 2002-2003. Unpub. rep. prep. for Forest Research Program, Forest Innovation Investment. Smithers, BC. 24pp + append.

Blume, R., L. Turney and A.M. Roberts. 2003. Habitat use by mountain goats near Nadina Mountain: site investigations of GPS collar locations. Unpub. rep. prep. for the Morice and Lakes IFPA. Smithers, BC. 35pp + append.