Non-Alpine Habitat Use and Movements by Mountain Goats in North-Central British Columbia - 2002-2003 Project Summary

Prepared for: Forest Research Program Forestry Innovation Investment

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INTRODUCTION

The common perception of the mountain goat as an inhabitant of remote, high elevation mountainous terrain may result in an underestimate of some components of the habitat use of this species and a failure to recognize the importance of non-alpine habitats to small and isolated populations. Mountain goats are known to use forested habitats for thermal and snow interception cover, dispersal routes, foraging and mineral licks, but the extent of this use has largely not been quantified. Recent studies of mountain goat habitat use in the Nadina Forest District indicate that some populations exist entirely in non-alpine cliff and forest complexes close to human habitation and forest development. The lack of information on forested habitat use by mountain goats restricts the abilities of forest and wildlife managers to plan and implement effective timber harvesting and habitat management strategies that will consider the conservation of mountain goat populations and habitats.

This study was developed as a multi-year project (proposed completion in March 2005) and the general goal was established as follows:

To develop management strategies that provide for the conservation of mountain goat habitats and populations and maintain a viable timber harvest.

The proposed objectives to meet this goal are to:

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 a sightability factor for mountain goats in forested habitats during winter and summer.

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

Through the support of numerous resource and government agencies and funding provided by the Forest Research Program of Forestry Innovation Investment (FII), preparations for study began in the fall of 2002. The results of this project, along with information gained from previous studies, will provide industry and government with practical management strategies that allow conservation of critical mountain goat habitat features and populations while maintaining a viable forest harvesting industry.

STUDY AREA

The study area is located in northwestern British Columbia between the towns of Houston and Burns Lake and encompasses an area of approximately 3,000 km² with elevations ranging from 600 to 2,200 m above sea level. Approximately 70 non-alpine cliff and canyon features comprising a minimum of 200 km² of used and potential mountain goat habitat are contained within the study area. It is estimated that a minimum population of 160 animals are found on these features, based on reconnaissance and intensive aerial surveys conducted in the area since 1998. Mountain goats were monitored on 6 sites in the study area, including Morice Mountain, Bob Creek Bluffs, Dungate Creek Bluffs, China Nose, Foxy Creek Canyon and Klo Creek Bluffs.
METHODS

Mountain goats were captured through aerial net-gunning techniques and were fitted with either global positioning system (GPS) collars or very high frequency (VHF) radio collars. During the animal handling procedure, blood, hair and tissue samples were taken for disease and DNA analysis and the animals were marked with high-visibility collar sleeves for developing seasonal sightability factors through mark-resight sampling techniques. The collared animals were relocated by aerial telemetry approximately once every 2 to 3 weeks, during which a description of the broad habitat characteristics of the animal locations were recorded. Two snow monitoring stations were established at each of the 6 study sites in order to observe snow depth and crust layers, as well as the snow-melt pattern in both open and closed canopy habitats. An aerial population survey of the study sites was completed in March 2003, and included a mark-resight survey for the calculation of a winter sightability factor. Mountain goat locations were mapped using a geographic information system (GIS) and location data was analysed to determine any patterns in movement and habitat use.

A total of 71 mountain goats were observed in the study area in the population survey conducted in March. Of these, 7 marked (collared) animals were sighted, yielding a winter sightability factor of 3.53, from which a total population estimate of $251 \pm 15$ goats was calculated. This figure must be used with caution as it is likely that it is an overestimation of the population. The low numbers of marked animals seen may have been due to marked animals hiding during the survey, as well as difficulty in seeing collared animals because of their winter coat or the collar was obscured by vegetation.

During two capture sessions conducted in January and March 2003, a total of 27 mountain goats were successfully collared (8 with GPS collars and 19 with VHF collars) on 6 separate study sites. Sex distribution of the collared animals was approximately even, with 14 males and 13 females and age ranged from 2 to 8 years (average of 3.8 years-of-age). One GPS collar experienced battery failure within 3 weeks of deployment, but it has not yet been recovered due to the difficult terrain that the collared animal is consistently located in.

Mountain goat movements varied greatly between study sites, but these movement differences were found to be insignificant by statistical analysis. Average daily distance moved by the mountain goats was $60.4 \pm 9.1$ m for females and $66.6 \pm 13.1$ m for males. Movements by some animals between rock bluffs within each study area were observed between relocation sessions, with distances between successive relocations ranging from 10 m to 6,357 m. Although mountain goats were relocated in a variety of forested and non-forested habitats, the majority of relocations were in steep slopes ($30-40^\circ$), southern aspects ($157.5^\circ$ to $207.5^\circ$) and non-forested habitat types.

During snow monitoring it was observed that non-forested sites had deeper snow levels than forested sites except where non-forested sites were
on wind-swept ridges. Snow monitoring has only been preliminary at this point and it is expected that more detailed information will result from a longer snow sampling period. A total of 71 mountain goats were observed in the study area in the population survey conducted in March. Of these, 7 marked (collared) animals were sighted, yielding a winter sightability factor of 3.53, from which a total population estimate of $251 \pm 15$ goats was calculated. This figure must be used with caution as it is likely that it is an overestimation of the population. The low numbers of marked animals seen may have been due to marked animals hiding during the survey, as well as difficulty in seeing collared animals because of their winter coat or the collar was obscured by vegetation.

**DISCUSSION AND RECOMMENDATIONS**

Current forest management practices for mountain goat habitats suggest the application of no-harvest buffers or wildlife habitat areas to protect important habitat features. These management strategies are based on the assumption that relatively small areas of mountain goat habitat occur in the forested land base and such management strategies for the conservation of these features would have little impact on available timber volumes. However, the effectiveness of these management practices has not been rigorously tested and the extent to which mountain goats use forested habitats adjacent to non-alpine cliff and canyon features has not been quantified.

The important objective of collaring and initial monitoring of a adequate number of animals has been accomplished in the first year of this project. However, an insufficient amount of data has been gathered upon which to base management recommendations and more long-term monitoring is required. The subsequent management strategies that will be developed from this study will help resource managers to formulate effective measures for protecting mountain goat habitats while maximizing the opportunity to use the forest resource. One final outcome of this project is a habitat suitability model that will provide an effective tool to determine potential timber and habitat supply impacts due to the application of the proposed management strategies.

The mountain goat population estimate was considered to be a preliminary and it is recommended that additional surveys be completed to ensure that this estimate is accurate. Other recommendations for further study include DNA analysis of hair and tissue samples to determine group relationships between study sites, ground-based surveys of animal locations to gather details of habitat use, recovery of GPS collars in the fall for data extraction, subsequent redeployment of these collars and continued monitoring of snow levels.

A detailed account of this project can be found in *Non-Alpine Habitat Use and Movements by Mountain Goats in North-Central British Columbia: 2002-2003 Interim Report* (Turney et al. in press.).

**SELECTED REFERENCES**

**Habitat Use and Movements**


Project Methods


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