

# **BC MOUNTAIN GOAT WORKSHOP**

**March 1-2, 2005**  
**Prince George, BC**

**PROJECT INFORMATION SHEETS**

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# **PROVINCE-WIDE**

**Project Title: TOURISM WILDLIFE PROJECT TEAM**

**1. Project Leader(s):** Rod Davis

**2. Project Team Members:** Steve Gordon, Phil Belliveau (Biologists)

**3. Project contact information:** Phone: (250) 847-7298 Fax:

Email: Steve.Gordon@gov.bc.ca

Web page:

**4. Project location:** BC

Coastal:  Transition:  Interior:

**5. Project timeframe:** Start (month/year): 03/03 End (month/year, or ongoing): 12/05

**6. Project status:** Data collection  Analysis  Write-up  Publication

**7. Project objectives:** (briefly describe the primary objectives of your project)

Develop wildlife guidelines for commercial backcountry recreation operators

**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: Recreation management

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

The Tourism Wildlife Project Team is revising the interim wildlife guidelines for commercial backcountry recreation. The team is using a results- and risk-based approach to develop desired behaviours, indicators and limits related to a variety of backcountry recreation activities. New guidelines are being drafted for aerial- and ground-based activities near mountain goats and their habitats.

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

Wilson, S. F., and D. Hamilton. 2005. A strategy to manage backcountry recreation in relation to wildlife and habitats. Version 1.1 EcoLogic Research Report Series No. 28. Prepared for: Prepared for: BC Ministry of Water, Land and Air Protection, Victoria.

**Project Title: MONITORING THE EFFECTIVENESS OF MOUNTAIN GOAT HABITAT MANAGEMENT**

1. **Project Leader(s):** Steve Wilson

2. **Project Team Members:**

3. **Project contact information:** Phone: 2502477435 Fax: 2502477436

Email: sfwilson@shaw.ca

Web page:

4. **Project location:** BC

Coastal:  Transition:  Interior:

5. **Project timeframe:** Start (month/year): 1-Apr-04 End (month/year, or ongoing): 31-Mar-05

6. **Project status:** Data collection  Analysis  Write-up  Publication

7. **Project objectives:** (briefly describe the primary objectives of your project)

To design an effectiveness monitoring program for mountain goat habitat management under FRPA

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:

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

The project is proposing a design for a monitoring program to determine the effectiveness of habitat management under FRPA; namely, Ungulate Winter Ranges, Wildlife Habitat Areas and Wildlife Habitat Features. Recommended effectiveness indicators address a number of key monitoring questions and are stratified by the resources required to measure.

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

Wilson, S. F. 2005. Monitoring the effectiveness of of mountain goat habitat management. DRAFT. Prepared for: BC Ministry of Water, Land and Air Protection, Biodiversity Branch, Victoria.

## **LOWER MAINLAND – REGION 2**

**Project Title: THE EFFECTS OF HELICOPTER LOGGING ON MOUNTAIN GOAT BEHAVIOUR IN COASTAL BRITISH COLUMBIA**

1. **Project Leader(s):** Steve Gordon

2. **Project Team Members:** Steve Gordon, Steve Wilson

3. **Project contact information:** Phone: 2508477298

Fax: 250 847 7728

Email: Steve.Gordon@gems1.gov.bc.ca

Web page: N/A

4. **Project location:** Powell River, BC

Coastal:  Transition:  Interior:

5. **Project timeframe:** Start (month/year): April 2001 End (month/year, or ongoing): Sep 2002

6. **Project status:** Data collection  Analysis  Write-up  Publication

7. **Project objectives:** (briefly describe the primary objectives of your project)

To document the effects of helicopter logging activity on mountain goat behaviour.

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:

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

We examined the effect of helicopter activity associated with industrial forestry on the behaviour of coastal mountain goats (*Oreamnos americanus*) during spring, summer and autumn 2001 and 2002. We collected 959 hours of instantaneous scan data on 2 herds over 95 field days in the upper Powell River watershed in south-western BC. The proportion of time adult females and kids spent engaged in different behaviours differed among disturbance phases and year. No obvious pattern was observed in 2001 but both age-sex classes spent less time bedded during phases associated with helicopter activity than during other phases in 2002. Overt changes in behaviour were also observed anecdotally during helicopter yarding activities in both 2001 and 2002.

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

Gordon, S.M and S.F. Wilson, 2004. Effect of helicopter logging on mountain goat behaviour in coastal British Columbia. Proceedings, Proceedings of the 14<sup>th</sup> Biennial Symposium of the Northern Wild Sheep and Goat Council 14. In press.

Gordon, S.M., 2003. The effects of helicopter logging activity on mountain goat (*Oreamnos americanus*) behaviour. MSc. thesis, Royal Roads University. 75 pp.

**Project Title: CHILLIWACK DISTRICT MOUNTAIN GOAT WINTER RANGE INVENTORY**

- 1. **Project Leader(s):** Bill Jex, Greg George
- 2. **Project Team Members:** Steve Rochetta, Jack Evans
- 3. **Project contact information:** Phone: -6048242310 Fax: -6048584905  
Email: Bill.Jex@gems6.gov.bc.ca Web page:  
ftp://ftpsry.env.gov.bc.ca/pub/outgoing/Wildlife/Mountain\_Goats/Chilliwack\_Forest\_District/
- 4. **Project location:** WLAP Region 2, Chilliwack District  
Coastal:  Transition:  Interior:
- 5. **Project timeframe:** Start (month/year): 02/97 End (month/year, or ongoing): 03/01 & ongoing
- 6. **Project status:** Data collection  Analysis  Write-up  Publication

7. **Project objectives:** (briefly describe the primary objectives of your project)  
To facilitate the identification and establishment of Mountain Goat Winter Range habitat for the Fraser TSA.

8. **Project descriptors** (select all that apply):
- |   |  |  |
|---|--|--|
| Research <input type="checkbox"/>                     | Habitat Use: <input checked="" type="checkbox"/>         | Forestry Interactions: <input checked="" type="checkbox"/> |
| Management <input checked="" type="checkbox"/>        | VHF collars: <input type="checkbox"/>                    | Oil & Gas Interactions: <input type="checkbox"/>           |
| Inventory <input checked="" type="checkbox"/>         | GPS collars: <input type="checkbox"/>                    | Mineral Exploration: <input type="checkbox"/>              |
| Predation: <input type="checkbox"/>                   | Harvest: <input type="checkbox"/>                        | Aerial Disturbance: <input type="checkbox"/>               |
| Habitat Modeling: <input checked="" type="checkbox"/> | Population Dynamics: <input checked="" type="checkbox"/> | Human Disturbance: <input type="checkbox"/>                |
- Other:

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

Winter aerial inventory (RIC methodology) to identify winter range habitats and habitat use by Mountain Goats in coastal and transitional areas. This provided cursory/baseline population estimates and age/sex class demographic information which supported harvest/non-harvest recommendations, and for comparison to previously collected datasets from the 1960's, 1971 and 1984. Development of GWR polygons also facilitated quantifying attributes of the habitats, for use in testing habitat suitability models and their criteria (RIC model and benchmarks). GWR polygons were delivered as part of WLAP's role in FPC/FRPA planning processes which prescribed habitat management measures related to forest development and industrial activities (including mining and back country recreation) in and about winter range habitat.

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

Jex, W. A. 2004. Fraser Timber Supply Area Mountain Goat Winter Range Plan: Submission for Designation and Establishment of Mountain Goat (*Oreamnos americanus*) Winter Ranges, within the Fraser Timber Supply Area. Unpublished report. MWLAP Chilliwack.

Jex, W. A. 2004. Analysis of the Topographic Habitat Attributes for Mountain Goat (*Oreamnos americanus*) Winter Ranges on the Southern Mainland Coast of British Columbia. Unpublished report. MWLAP Chilliwack.

Jex, W. A. 2001. Winter Range Rationale and Polygon Submission of Mountain Goat-Winter-Range Habitat for Inclusion in Timber Supply Review III for the Fraser Timber Supply Area (November 2001). Unpublished report. MWLAP Chilliwack.

**Project Title: A GPS- TELEMETRY STUDY OF MOUNTAIN GOAT HABITAT USE IN SOUTH COASTAL B.C.**

- 1. **Project Leader(s):** Wayne Wall, International Forest Products Limited
- 2. **Project Team Members:** S. Taylor and Y.Kulis
- 3. **Project contact information:** Phone: 250.286.5143 Fax: 250.286.5150  
Email: wayne\_wall@interfor.com Web page: n/a
- 4. **Project location:** Bute and Toba Inlets
- 5. **Project timeframe:** Start (month/year): 10/2001 End (month/year): 07/2003
- 6. **Project status:** Data collection  Analysis  Write-up  Publication

7. **Project objectives:** (briefly describe the primary objectives of your research)  
Describe seasonal home ranges; movements; selection patterns of winter habitat; predict winter habitat use.

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

- |  |  |  |
|--|--|--|
| Research <input checked="" type="checkbox"/>   | Habitat Use: <input checked="" type="checkbox"/> | Forestry Interactions: <input checked="" type="checkbox"/> |
| Management <input checked="" type="checkbox"/> | VHF collars: <input type="checkbox"/>            | Oil & Gas: <input type="checkbox"/>                        |
| Inventory <input type="checkbox"/>             | GPS collars: <input checked="" type="checkbox"/> | Aerial Disturbance: <input type="checkbox"/>               |
| Coastal: <input checked="" type="checkbox"/>   | Harvest: <input checked="" type="checkbox"/>     | Human Disturbance: <input type="checkbox"/>                |
| Transition: <input type="checkbox"/>           | Predation: <input type="checkbox"/>              | Population Dynamics: <input type="checkbox"/>              |
| Interior: <input type="checkbox"/>             |  |  |
| Other:   |  |  |

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

We analyzed data collected from 18 GPS collars from 2001 to 2003 in southwestern coastal British Columbia to improve understanding of coastal mountain goat (*Oreamnos americanus*) habitat use and its relation to forestry operations. We described seasonal home ranges, movements, and winter habitat selection patterns to predict winter habitat use in similar geographic areas. Seasonal periods were determined for individual goats by observing shifts in elevation use. For habitat selection analyses determined at 2 different scales, we used a Geographic Information System (GIS), digital forest cover mapping, and a 25-m raster digital elevation model (DEM). At a broad scale of selection, we pooled locations across animals and conducted chi-square analyses for 18 goats. At a finer scale of selection, we used logistic regression to determine resource selection functions (RSF) for 15 individual goats. We used an information theoretic approach (AIC) to select the most likely models from an a priori set of candidate models to determine biological factors driving coastal winter habitat selection. We averaged selection coefficients from individual RSFs in a second-stage analysis

to develop predictive maps of relative likelihood of use across the study area. Use of younger forests was greater than expected, particularly among males, and was largely associated with previously-burned stands 20-40 yrs old. However, use of mature and old forests was relatively high for both sexes and was higher for males (42%) than for females (29%). Presence data was best fit by global models. Selection coefficients of RSFs were relatively consistent but variable for forest volume. At the fine scale, males were consistently associated with higher forest volume and older forest age. Females were more often associated with older forest age yet with lower forest volume.

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

1. HABITAT SELECTION BY MOUNTAIN GOATS IN SOUTH COASTAL B.C. (Submitted to NWSGC) 2004

Shawn Taylor, Goat Mountain Resources, 1461 Thorpe Ave., Courtenay, B.C., V9N 7K7

Wayne Wall, International Forest Products, Unit 311, 1180 Ironwood Rd., Campbell River, BC V9W 5P7

Yolanta Kulis, University of British Columbia, Forest Sciences, 2424 Main Mall, Vancouver, B.C. V6T 1Z4

2. A GPS- telemetry study of mountain goat habitat use in south coastal B.C. : S. Taylor, W. Wall and Y. Kulis ( Project Completion Report) July 2004

## **KOOTENAYS – REGION 4**

**Project Title: MOUNTAIN GOATS IN THE KICKING HORSE CANYON,  
TRANS CANADA HIGHWAY**

**1. Project Leader(s):** Kim Poole

**2. Project Team Members:** Andrew Walker

**3. Project contact information:** Phone: 2508254063 Fax: 2508254073

Email: klpoole@shaw.ca

Web page:

**4. Project location:** Kicking Horse Canyon, east of Golden

Coastal:  Transition:  Interior:

**5. Project timeframe:** Start (month/year): May 2000 End (month/year, or ongoing): Jul 2000

**6. Project status:** Data collection  Analysis  Write-up  Publication

**7. Project objectives:** (briefly describe the primary objectives of your project)

The objectives of this study were to identify potential impacts to mountain goat use of and access to the bluffs adjacent to two bridges and their approaches in the Kicking Horse Canyon east of Golden, B.C.; to assess these impacts; and to recommend potential mitigation required to bridge and approach design and construction that will minimize impacts to the goats.

**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: Highway Interactions

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

We reviewed existing literature on mountain goat use of mineral licks and the impact of disturbance on goats. Between late May and mid-July 2000 we conducted three 8-9 day observation sessions at the bridges to document goat use of the bluffs adjacent to these sites. We mapped trails into the bluffs, areas of concentrated mineral lick use, and bedding sites. We also reviewed road and harvest mortality data, conducted interviews with residents and local wildlife officials, and obtained information from other wildlife researchers with experience in the area.

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

Poole, K.G., and A.B.D. Walker. Mountain goats in the Kicking Horse Canyon, Trans Canada Highway. Unpublished report for B.C. Ministry of Transportation and Highways, Victoria, B.C.

**Project Title: MOUNTAIN GOAT POPULATION INVENTORIES IN THE EAST KOOTENAY - VARIOUS**

1. **Project Leader(s):** Kim Poole

2. **Project Team Members:** Garth Mowat, Ian Adams

3. **Project contact information:** Phone: 2508254063 Fax: 2508254073

Email: klpoole@shaw.ca

Web page:

4. **Project location:** MUs 4-22 and 4-26 (2004), 4-34 (2002 and 2003), 4-36 and 4-40 (2002)

Coastal:  Transition:  Interior:

5. **Project timeframe:** Start (month/year): Aug-Sep End (month/year, or ongoing):

6. **Project status:** Data collection  Analysis  Write-up  Publication

7. **Project objectives:** (briefly describe the primary objectives of your project)

Determine numbers, distribution, and kid-adult ratios of mountain goats.

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:

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

Standard aerial survey protocol, varying primarily by effort among areas.

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

Poole, K. 2004. Mountain goat survey in Management Units 4-22 and 4-26, East Kootenay, British Columbia, August 2004. Unpublished report for Water, Land and Air Protection, Cranbrook, B.C.

Poole, K.G. 2003. Mountain goat monitoring in Canadian Mountain Holidays' Bobbie Burns summer operating area, East Kootenay, September 2003. Unpublished report prepared for Canadian Mountain Holidays, Cranbrook, B.C.

Poole, K.G., and I. Adams. 2002. Mountain goat monitoring in Canadian Mountain Holidays' Bugaboo and Bobbie Burns heli-hiking areas, East Kootenay, September 2002. Unpublished report prepared for Canadian Mountain Holidays, Cranbrook, B.C.

Poole, K.G., and G. Mowat. 2002. Mountain goat survey in Management Units 4-36 and 4-40, East Kootenay, August–September 2002. Unpublished report prepared for the Golden & District Rod and Gun Club, Golden, B.C.

**Project Title: MOUNTAIN GOATS IN THE EAST KOOTENAY: EVALUATION OF HABITAT USE, WINTERING STRATEGIES, AND POTENTIAL IMPACTS OF HIGH-ELEVATION LOGGING**

- 1. **Project Leader(s):** Kim Poole
- 2. **Project Team Members:** Kari Stuart-Smith and Irene Teske
- 3. **Project contact information:** Phone: 2508254063 Fax: 2508254073  
Email: klpoole@shaw.ca Web page:
- 4. **Project location:** East Kootenay, St. Mary and White rivers  
Coastal:  Transition:  Interior:
- 5. **Project timeframe:** Start (month/year): Jan 2004 End (month/year, or ongoing): Sep 2005
- 6. **Project status:** Data collection  Analysis  Write-up  Publication

7. **Project objectives:** (briefly describe the primary objectives of your project)
- 1. Determine mountain goat habitat use and selection with a focus on the winter period in 2 areas of the East Kootenay characterized by different snow conditions and goat wintering strategies.
  - 2. Determine the potential effects of forestry development on low-elevation winter habitat use by mountain goats, and use of low-elevation mineral licks and historic trails to these licks, using retrospective analysis and an experimental design.
  - 3. Develop a model of winter habitat capability for goats within the study areas, and compare the performance of this model to the Sinclair et al. (2001) model.
  - 4. Use radiocollared goats to quantify animal sightability at different survey intensities.

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

- |   |  |  |
|---|--|--|
| Research <input checked="" type="checkbox"/>          | Habitat Use: <input checked="" type="checkbox"/> | Forestry Interactions: <input checked="" type="checkbox"/> |
| Management <input checked="" type="checkbox"/>        | VHF collars: <input type="checkbox"/>            | Oil & Gas Interactions: <input type="checkbox"/>           |
| Inventory <input checked="" type="checkbox"/>         | GPS collars: <input checked="" type="checkbox"/> | Mineral Exploration: <input type="checkbox"/>              |
| Predation: <input type="checkbox"/>                   | Harvest: <input type="checkbox"/>                | Aerial Disturbance: <input type="checkbox"/>               |
| Habitat Modeling: <input checked="" type="checkbox"/> | Population Dynamics: <input type="checkbox"/>    | Human Disturbance: <input type="checkbox"/>                |
- Other:

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

We placed GPS collars on 15 goats of both sexes in each study area (St. Mary River (Purcell Mountains; deeper snow, possibly higher forest use by goats) and White River (Rocky Mountains; shallower and drier snow; high forestry impact)) in early January 2004. Collars were programmed to

take just under 4 fixes per day, with an expected battery life of 19–20 months. Four goats died between Feb-Jul 2004; these collars were re-deployed in Nov 2004. Collars have been monitored every 1-2 months, and appear to be functioning well (~88% fix success). Seasonal movements of up to 20 km have been recorded in both areas.

Aerial surveys were attempted in September 2004 to test for sightability of radio-collared goats at different survey intensities. The White River was surveyed at low intensity on 6 September. Survey effort averaged 1.1 minutes/km<sup>2</sup> in 8 blocks totalling 98 km<sup>2</sup>. A total of 126 goats was seen, including 22 kids (21 kids:100 adults). Five of 10 collared goats were observed (50% sightability). The St. Mary study area was surveyed at high intensity on 8 September. Survey effort averaged 1.7 minutes/km<sup>2</sup> in 9 blocks covering 121 km<sup>2</sup>. Seventy goats were seen including only 5 kids (8 kids:100 adults). Ten of 12 collared goats (83%) were observed. We had intended to re-survey each area at the opposite intensity using a different pair of observers. Unfortunately, due to inclement weather for 2 weeks, the sightability surveys were not completed. We will attempt to redo this sightability work in Aug 2005, prior to collar removal.

Data analysis and habitat model development will occur after collars are retrieved and location data downloaded in fall 2005. .

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

Poole, K. 2003. Mountain goats in the East Kootenay: evaluation of habitat use, wintering strategies, and potential impacts of high-elevation logging; study design and detailed work plan. Unpublished report, Aurora Wildlife Research, Nelson, British Columbia.

Poole, K., K. Stuart-Smith, and I. Teske. 2004. Mountain goats in the East Kootenay: evaluation of habitat use, wintering strategies, and potential impacts of high-elevation logging. Interim progress report. Unpublished report for Tembec Industries, Inc., Cranbrook, B.C., and B.C. Ministry of Water, Land and Air Protection, Cranbrook, B.C.

**Project Title: MOUNTAIN GOAT WINTER HABITAT USE IN THE WEST KOOTENAY REGION OF BRITISH COLUMBIA**

1. **Project Leader(s):** Kim Poole

2. **Project Team Members:** Garth Mowat

3. **Project contact information:** Phone: 2508254063 Fax: 2508254073

Email: klpoole@shaw.ca

Web page:

4. **Project location:** Slocan Valley, West Kootenay

Coastal:  Transition:  Interior:

5. **Project timeframe:** Start (month/year): Sep 1996 End (month/year, or ongoing): Apr 1997

6. **Project status:** Data collection  Analysis  Write-up  Publication

7. **Project objectives:** (briefly describe the primary objectives of your project)

The objectives of this study were to delineate mountain goat winter range in Slocan Forest Products' (SFP) Tree Farm License 3 (TFL 3) using local knowledge and aerial surveys.

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:

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

Little is known about the winter habitat use of mountain goats in the West Kootenays of southeastern British Columbia. Relevant literature and interviews with local people familiar with mountain goat distribution suggested increased use of forested habitats during winter in interior wet belt climates, placing goats and forestry development into a situation of potential conflict. Aerial surveys were conducted between late September 1996 and mid-April 1997 in portions of Tree Farm License (TFL) 3 in the central Selkirk Mountains. Eight surveys were flown, and a total of 74 goats were observed (16% kids). Habitat characteristics were examined on goat locations (n = 39) and tracks (n = 50) overlaid on Forest Cover and TRIM data using a GIS. Goat distribution shifted seasonally from use of more open, alpine habitats at higher elevations during the fall to use of more forested south-facing slopes at lower elevation during winter. Winter movements appeared to be restricted to relatively small areas adjacent to steeper habitat. Movements of up to 7 km were observed in April into basins avoided during winter. Most locations were in the Alpine Tundra (AT) and Engelmann Spruce -

Subalpine Fir (ESSF) biogeoclimatic zones, however some winter locations were in the Interior Cedar - Hemlock (ICH) zone. Older aged subalpine fir (*Abies lasiocarpa*), Douglas-fir (*Pseudotsuga menziesii*), and Engelmann spruce (*Picea engelmannii*) were the dominant tree species associated with goat locations or tracks. Goat and track locations were closely associated with escape terrain (defined as >100% slope on open terrain); 86% of locations were <400 m from escape terrain. It is unknown whether suitable winter goat range is limiting in the Selkirk Mountains. Logging practices should maintain a diversity of habitats, including mature and old forest timber, centred on identified cliff systems. This study provided an indication of mountain goat winter habitat use in TFL 3, however radio collaring is required if a relatively unbiased, systematic assessment of goat habitat use is desired. Radio collars would enable location of goats in all habitats, including closed canopy forests. Newly developed GPS collars could cost-effectively provide the unbiased data required by forest managers to enable integration of goat habitat concerns and forest development.

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

Poole, K.G., and G. Mowat. 1997. Mountain goat winter habitat use in the West Kootenay Region of British Columbia. Unpublished report for B.C. Ministry of Environment, Lands and Parks, Nelson.

## **CARIBOO – REGION 5**

**Project Title: MOUNTAIN GOATS (OREAMNOS AMERICANUS) IN AND NEAR THE BRITTANY TRIANGLE AND TRAPLINE AREAS, BRITISH COLUMBIA**

- 1. **Project Leader(s):** Mike W. Demarchi
- 2. **Project Team Members:** same
- 3. **Project contact information:** Phone: 2506560127 Fax: 2506554761  
Email: demarchi@lgl.com Web page: www.lgl.com
- 4. **Project location:** southwest Chilcotin, BC  
Coastal:  Transition:  Interior:
- 5. **Project timeframe:** Start (month/year): 07/03 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)  
Provide an opinion on mountain goat ecology, conservation, and management

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

- |  |   |  |
|--|---|--|
| Research <input type="checkbox"/>              | Habitat Use: <input type="checkbox"/>         | Forestry Interactions: <input checked="" type="checkbox"/> |
| Management <input checked="" type="checkbox"/> | VHF collars: <input type="checkbox"/>         | Oil & Gas Interactions: <input type="checkbox"/>           |
| Inventory <input type="checkbox"/>             | GPS collars: <input type="checkbox"/>         | Mineral Exploration: <input type="checkbox"/>              |
| Predation: <input type="checkbox"/>            | Harvest: <input type="checkbox"/>             | Aerial Disturbance: <input type="checkbox"/>               |
| Habitat Modeling: <input type="checkbox"/>     | Population Dynamics: <input type="checkbox"/> | Human Disturbance: <input type="checkbox"/>                |
- Other: Opinion

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

This report provides an opinion on matters pertaining to mountain goat conservation in and near the Claim Area. The report’s goal is to objectively answer questions regarding mountain goat conservation and habitat protection in and near the Claim Area. The opinion covered topics including the distribution and abundance of mountain goats, suitability of local habitats, impacts of industrial forestry and access developments, and a review of provincial and regional conservation and management issues pertaining to mountain goats.

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

DEMARCHI MW. 2004. Mountain Goats (*Oreamnos americanus*) in and near the Brittany Triangle and Trapline Areas, British Columbia: expert opinion. LGL Report EA1605. Prepared for Chief Roger William. 37 p.

**Project Title: REGION 5 INTERIOR MOUNTAIN GOAT WINTER RANGE IDENTIFICATION AND MAPPING**

1. **Project Leader(s):** Patrick Dielman

2. **Project Team Members:**

3. **Project contact information:** Phone: -3984561 Fax:

Email: Pat.Dielman@gems9.bc.ca Web page:

4. **Project location:** Quesnel Highlands (M.U. 5-15 ), Western Chilcotin Ranges (M.U.'s 5-04, 5-05, 5-06, and 5-12 Coastal:  Transition:  Interior:

5. **Project timeframe:** Start (month/year): Feb/1999 End (month/year, or ongoing): March 2003

6. **Project status:** Data collection  Analysis  Write-up  Publication

7. **Project objectives:** (briefly describe the primary objectives of your project)

Identify and map mountain goat winter range locations for designation as ungulate winter range under FRPA.

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

Research <input type="checkbox"/>	Habitat Use: <input checked="" type="checkbox"/>	Forestry Interactions: <input type="checkbox"/>
Management <input checked="" type="checkbox"/>	VHF collars: <input type="checkbox"/>	Oil & Gas Interactions: <input type="checkbox"/>
Inventory <input checked="" type="checkbox"/>	GPS collars: <input type="checkbox"/>	Mineral Exploration: <input type="checkbox"/>
Predation: <input type="checkbox"/>	Harvest: <input type="checkbox"/>	Aerial Disturbance: <input type="checkbox"/>
Habitat Modeling: <input type="checkbox"/>	Population Dynamics: <input type="checkbox"/>	Human Disturbance: <input type="checkbox"/>

Other:

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

Used reconnaissance level winter inventories ( goat and track observations) to identify and map mountain goat winter ranges throughout interior portion of Cariboo Region. Some basic habitat use parameters were recorded such as slope, aspect, elevation, vegetative cover, and distance to escape terrain. The focus was on areas outside of parks and protected areas All mountain complexes outside of parks and protected areas were inventoried at least once.

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

A preliminary analysis of habitat parameters were summarized in draft progress reports after initial two winters however final product is a gis map layer outlining winter range locations.

## **SKEENA – REGION 6**

**Project Title: DEVELOPMENT OF A HELI-SKIING AND MTN. GOAT HABITAT MANAGEMENT MODEL**

1. **Project Leader(s):** Karina Andrus

2. **Project Team Members:** Karina Andrus, Tracy Howlett

3. **Project contact information:** Phone: 6049381949 Fax: 6049381247  
Email: kandrus@cascade-environmental.ca Web page: www.cascade-environmental.ca

4. **Project location:** Skeena Region of British Columbia

Coastal:  Transition:  Interior:

5. **Project timeframe:** Start (month/year): n/a End (month/year, or ongoing): 2005

6. **Project status:** Data collection  Analysis  Write-up  Publication

7. **Project objectives:** (briefly describe the primary objectives of your project)

To further the discussion on mtn. goat disturbance space including both visual & audio disturbance.

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

Research <input checked="" type="checkbox"/>	Habitat Use: <input type="checkbox"/>	Forestry Interactions: <input type="checkbox"/>
Management <input checked="" type="checkbox"/>	VHF collars: <input type="checkbox"/>	Oil & Gas Interactions: <input type="checkbox"/>
Inventory <input type="checkbox"/>	GPS collars: <input type="checkbox"/>	Mineral Exploration: <input type="checkbox"/>
Predation: <input type="checkbox"/>	Harvest: <input type="checkbox"/>	Aerial Disturbance: <input checked="" type="checkbox"/>
Habitat Modeling: <input checked="" type="checkbox"/>	Population Dynamics: <input type="checkbox"/>	Human Disturbance: <input checked="" type="checkbox"/>
Other: Noise Modeling		

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

A Habitat Management Model (HMM) was prepared to evaluate the existing management strategies for heli-skiing operations located in the vicinity of confirmed and unconfirmed mountain goat habitat in northwestern British Columbia. The model is a three dimensional analysis which incorporated a predictive habitat model, a viewshed analysis and a noise model simulation. The results of the predictive habitat model were utilized to define the confirmed and unconfirmed habitat polygons from which the visual and audio analysis could occur.

The HMM analyzed the visual and audio impact of helicopter overflights on mountain goats within 500 m, 1000 m, 1500 m and 2000 m from confirmed and unconfirmed mountain goat habitat. The HMM for 1000 m and 1500 m found there was no change with the West flight path and minimal change (0.37 % in area) for the East flight path to disturbance levels HMM 1 and HMM 2. The HMM 1 and HMM 2 disturbance levels accounts for the potential visibility and non-visibility of a helicopter to mountain goats and for helicopter audio levels greater than 70 dB. Existing

management strategies developed by the Ministry of Water, Land and Air Protection Skeena Region and Last Frontier Heliskiing were analyzed within the context of the HMM.

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

Andrus, Karina J. (2005). A heli-skiing and mountain goat (*Oreamnos americanus*) habitat management model: A case study of the Skeena Region interim wildlife management objectives. Unpublished Master of Science, Royal Roads University, Victoria, B.C.

**Project Title: MOUNTAIN GOAT INVENTORY IN THE NASS WILDLIFE AREA REGION A**

- 1. **Project Leader(s):** Mike W. Demarchi; Steve R. Johnson; Gary F. Searing
- 2. **Project Team Members:** Same
- 3. **Project contact information:** Phone: 2506560127 Fax: 2506554761  
Email: demarchi@lgl.com Web page: www.lgl.com
- 4. **Project location:** Nass and Kitimat ranges ecosections, BC  
Coastal:  Transition:  Interior:
- 5. **Project timeframe:** Start (month/year): 09/96 End (month/year, or ongoing): 10/98
- 6. **Project status:** Data collection  Analysis  Write-up  Publication

7. **Project objectives:** (briefly describe the primary objectives of your project)  
Determine distribution and abundance of mountain goats and habitat in a portion of the Nass Wildlife Area to assist in treaty-related wildlife management decisions.

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

- |   |  |  |
|---|--|--|
| Research <input type="checkbox"/>                     | Habitat Use: <input checked="" type="checkbox"/> | Forestry Interactions: <input checked="" type="checkbox"/> |
| Management <input type="checkbox"/>                   | VHF collars: <input type="checkbox"/>            | Oil & Gas Interactions: <input type="checkbox"/>           |
| Inventory <input checked="" type="checkbox"/>         | GPS collars: <input type="checkbox"/>            | Mineral Exploration: <input type="checkbox"/>              |
| Predation: <input type="checkbox"/>                   | Harvest: <input type="checkbox"/>                | Aerial Disturbance: <input type="checkbox"/>               |
| Habitat Modeling: <input checked="" type="checkbox"/> | Population Dynamics: <input type="checkbox"/>    | Human Disturbance: <input type="checkbox"/>                |
- Other:

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

During autumn 1996 and 1997, we surveyed eight inventory blocks covering 6427 km<sup>2</sup> in west-central British Columbia for Mountain Goats (*Oreamnos americanus*) and estimated that a minimum of 2272 individuals occupied the area. Totals were not adjusted for sightability. For areas above the minimum elevations of goat sightings, the overall population density was 0.70 goats • km<sup>-2</sup>. Mountain Goats occurred in groups of 1-33 animals and at elevations ranging from 500 to 2050 m. Most (87.3%) were observed in alpine or cliff areas, but many (10.7%) were observed in timbered areas, especially near the coast. The present Mountain Goat population appears healthy, but expanding forestry operations in Mountain Goat habitat and increased road access will necessitate more refined management in the near future. Additional winter survey work documented goat distribution during winter; habitat suitability modelling of the Nass Wildlife Area was completed.

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

Demarchi, M. W., S. R. Johnson, and G. F. Searing. 1997. Mountain goat inventory in the Nisga'a Wildlife Management Area, Region A. Final 1996 Annual Report prepared for Forest Renewal BC by Nisga'a Tribal Council, New Aiyansh, BC, and LGL Limited, Sidney, BC. 13 p.

Demarchi, MW, SR Johnson. 1998. Mountain goat inventory in the Nisga'a Wildlife Management Area, Region A. Report prepared for Forest Renewal BC by Nisga'a Tribal Council, New Aiyansh, BC, and LGL Limited, Sidney, BC. 26 p.

Demarchi, MW, SR Johnson, GF Searing. 2000. Mountain goat (*Oreamnos americanus*) distribution and abundance in westcentral British Columbia. *Canadian Field Naturalist* 114(2) 301-306.

Yazvenko, SB, GF Searing, MW Demarchi. 2002. Wildlife habitat assessment in the Nass Wildlife Area. LGL Report EA1097. Prepared for Forest Renewal BC by Nisga'a Tribal Council, New Aiyansh, BC, and LGL Limited, Sidney, BC.

**Project Title: MOUNTAIN GOATS IN THE SKEENA REGION**

1. **Project Leader(s):** Jonah Keim

2. **Project Team Members:** BC Ministry of Water Land and Air Protection

3. **Project contact information:** Phone: 7804326888 Fax:

Email: jkeim@shaw.ca Web page:

4. **Project location:** Skeena Region BC

5. **Project timeframe:** Start (month/year): 1999 End (month/year): 2005

6. **Project status:** Data collection  Analysis  Write-up  Publication

7. **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).

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

- |   |  |   |
|---|--|---|
| Research <input type="checkbox"/>               | Habitat Use: <input checked="" type="checkbox"/> | Forestry Interactions: <input type="checkbox"/>         |
| Management <input type="checkbox"/>             | VHF collars: <input checked="" type="checkbox"/> | Oil & Gas: <input type="checkbox"/>                     |
| Inventory <input type="checkbox"/>              | GPS collars: <input checked="" type="checkbox"/> | Aerial Disturbance: <input checked="" type="checkbox"/> |
| Coastal: <input checked="" type="checkbox"/>    | Harvest: <input type="checkbox"/>                | Human Disturbance: <input type="checkbox"/>             |
| Transition: <input checked="" type="checkbox"/> | Predation: <input type="checkbox"/>              | Population Dynamics: <input type="checkbox"/>           |
| Interior: <input checked="" type="checkbox"/>   |  |   |
| Other:  |  |   |

**9. 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 (January 1 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  $\pm$  1.24m/hr in the 2000 season, and 34.03  $\pm$  1.24m/hr in the 2001/2002 seasons. Winter home range sizes of GPS collared mountain goats ranged from 0.24km<sup>2</sup> for a winter season to 3.9km<sup>2</sup> 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  $\pm$  703m to 1878  $\pm$  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  $\times$  slope classes, 20  $\times$  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 versus distance from slopes from 45  $\times$  to 60  $\times$  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 versus 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.

**10. 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 Mountain Goat Winter Ranges in the North Coast of British Columbia. BC Ministry of Water Land and Air Protection, Skeena Region. Smithers BC.

**Project Title: MOUNTAIN GOAT USE OF A CANYON AT FOXY CREEK, BRITISH COLUMBIA**

- 1. **Project Leader(s):** Todd Mahon
- 2. **Project Team Members:** Laurence Turney
- 3. **Project contact information:** Phone: (250) 846-5449 Fax:  
Email: wildfor@bulkley.net Web page:
- 4. **Project location:** Foxy Creek canyon south-east of Houston, BC.  
Coastal:  Transition:  Interior:
- 5. **Project timeframe:** Start (month/year): 2000 End (month/year, or ongoing): 2002
- 6. **Project status:** Data collection  Analysis  Write-up  Publication

7. **Project objectives:** (briefly describe the primary objectives of your project)

The study at Foxy Creek canyon was conducted to determine the population status, the general extent of goat use of forested habitats above the canyon rim, the location and extent of critical winter and other seasonal use habitats and locate any other high use areas including mineral licks and trails.

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

- |  |  |  |
|--|--|--|
| Research <input type="checkbox"/>              | Habitat Use: <input checked="" type="checkbox"/>         | Forestry Interactions: <input checked="" type="checkbox"/> |
| Management <input checked="" type="checkbox"/> | VHF collars: <input type="checkbox"/>                    | Oil & Gas Interactions: <input type="checkbox"/>           |
| Inventory <input checked="" type="checkbox"/>  | GPS collars: <input type="checkbox"/>                    | Mineral Exploration: <input type="checkbox"/>              |
| Predation: <input type="checkbox"/>            | Harvest: <input type="checkbox"/>                        | Aerial Disturbance: <input type="checkbox"/>               |
| Habitat Modeling: <input type="checkbox"/>     | Population Dynamics: <input checked="" type="checkbox"/> | Human Disturbance: <input type="checkbox"/>                |
- Other:

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

A combination of airphoto assessments, overview aerial surveys, and reconnaissance level ground surveys along the canyon rim were used to identify key habitat features and the extent of geographic use of the canyon by mountain goats. High and moderate relative use by goats (as indexed by sign) was concentrated in the lower and mid canyon strata, where the amount of escape terrain was greatest. Goats also use two side canyons that join Foxy Canyon from the west. Well-defined trails occurred along the rim (and occasionally out to 50m from the rim) of the lower and mid canyon sections and along the north sides of the 2 side canyons. Several areas where goats were found to be licking mineral soil along the rim of the canyon in the mid and lower sections indicated possible mineral licks.

Sign transects and snow track surveys were used to determine habitat use of the forested areas adjacent to the canyon. Eighty-five percent of all goat sign was located within 80m of the canyon

rim and 95% of all sign was observed within 150m of the canyon rim. Relative habitat use was examined for 3 broad habitat classes that occurred along the rim of the canyon: mature forest, clearcut, and 40y burn. Use was lowest in the 40y burn for all types of sign and variable, depending on the type of sign, between mature forest and clearcuts. During the winter, use was limited to the lower and mid canyon sections and almost all use was below the canyon rim. The few tracks that were observed above the canyon rim were all in mature forest habitat and 80% were within 60m of the canyon rim. Goats were selecting areas with lower snow accumulation, either on the steep slopes of the canyon wall or in the mature forest where the canopy provided snow interception.

Aerial population surveys were conducted in the fall of 1999, 2000 and 2001 to estimate the number of mountain goats within Foxy Canyon. Population estimates ranged between 30-46 animals with no population trend evident over the 3 years surveyed. Juvenile to adult ratios of 0.20-0.27:1 indicates healthy reproduction in the population.

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

- Mahon, T. 2000. Wildlife habitat assessment report, Foxy Creek canyon, CP 15 blocks 10+11. Unpub. rep. prep. for Canadian Forest Products Ltd. Telkwa, BC.
- Mahon, T and L. Turney. 2002. Canyon-dwelling mountain goats along Foxy Creek: status, habitat use patterns and management recommendations - 2001/2002 final report. Unpub. rep. prep. for Small Business Forest Enterprise Program, Min. of Forest. Telkwa, BC. 32pp.
- Turney, L., T. Mahon, R. Blume and J. Farkvam. 2001. Mountain goat populations, movement patterns and habitat use in forested habitats near Nadina Mountain and Foxy Creek British Columbia - 2000 summary report. Unpub. rep. prep. for Houston Forest Products Ltd, Canadian Forest Products Ltd. and Min. of Env. Lands and Parks. Smithers, BC. 24pp + append.

**Project Title: ENVIRONMENTAL RISK ASSESSMENT BASE CASE - MOUNTAIN GOATS**

- 1. **Project Leader(s):** Brad Pollard
- 2. **Project Team Members:** Brad Pollard
- 3. **Project contact information:** Phone: -2506380110 Fax: -2506381098  
Email: bpollard@acerresourceconsulting.com Web page: none
- 4. **Project location:** North Coast LRMP Area  
Coastal:  Transition:  Interior:
- 5. **Project timeframe:** Start (month/year): 09/02 End (month/year, or ongoing): 02/04
- 6. **Project status:** Data collection  Analysis  Write-up  Publication

7. **Project objectives:** (briefly describe the primary objectives of your project)  
Determine the relative risk to mountain goats of maintaining status management in North Coast Landscape Units as a baseline for North Coast LRMP decisions.

8. **Project descriptors** (select all that apply):
- |   |  |  |
|---|--|--|
| Research <input checked="" type="checkbox"/>          | Habitat Use: <input checked="" type="checkbox"/>         | Forestry Interactions: <input checked="" type="checkbox"/> |
| Management <input checked="" type="checkbox"/>        | VHF collars: <input type="checkbox"/>                    | Oil & Gas Interactions: <input type="checkbox"/>           |
| Inventory <input type="checkbox"/>                    | GPS collars: <input type="checkbox"/>                    | Mineral Exploration: <input checked="" type="checkbox"/>   |
| Predation: <input type="checkbox"/>                   | Harvest: <input type="checkbox"/>                        | Aerial Disturbance: <input checked="" type="checkbox"/>    |
| Habitat Modeling: <input checked="" type="checkbox"/> | Population Dynamics: <input checked="" type="checkbox"/> | Human Disturbance: <input checked="" type="checkbox"/>     |
- Other:

9. **Project description** (provide a brief description of your project including methods and main findings or results to date):  
Using a Bayesian belief network and three environmental indicators, a risk tree was developed based on referential and personal background information. After peer review baseline data of the environmental indicators were used to establish the relative risk on continued status quo management in North Coast Landscape Units. Results indicated that 2 LU had a high risk, the majority of LU maintained a low or moderate risk primarily due to their relative isolation and low overlap between currently identified operable areas and identified winter range.

10. **Project documentation** (provide a list of citations for all progress, final, or published reports)  
Published as part of the North Coast LRMP background documentation.

**Project Title: UPPER DALA AND KITIMAT RIVER  
SUITABILITY/CAPABILITY MAPPING FOR 6 SELECTED  
SPECIES - INCLUDING MOUNTAIN GOATS**

1. **Project Leader(s):** Brad Pollard

2. **Project Team Members:** Brad Pollard

3. **Project contact information:** Phone: -2506380110 Fax: -2506381098  
Email: bpollard@acerresourceconsulting.com Web page: none

4. **Project location:** In four map sheets covering the upper Kitimat River and upper Dala River in the Kalum Forest District Coastal:  Transition:  Interior:

5. **Project timeframe:** Start (month/year): 11/96 End (month/year, or ongoing): 04/98

6. **Project status:** Data collection  Analysis  Write-up  Publication

7. **Project objectives:** (briefly describe the primary objectives of your project)

Using developed TEM mapping, establish suitability and capability of ecological polygons for winter mountain goats use.

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

Research <input checked="" type="checkbox"/>	Habitat Use: <input checked="" type="checkbox"/>	Forestry Interactions: <input type="checkbox"/>
Management <input checked="" type="checkbox"/>	VHF collars: <input type="checkbox"/>	Oil & Gas Interactions: <input type="checkbox"/>
Inventory <input checked="" type="checkbox"/>	GPS collars: <input type="checkbox"/>	Mineral Exploration: <input type="checkbox"/>
Predation: <input type="checkbox"/>	Harvest: <input type="checkbox"/>	Aerial Disturbance: <input type="checkbox"/>
Habitat Modeling: <input checked="" type="checkbox"/>	Population Dynamics: <input type="checkbox"/>	Human Disturbance: <input type="checkbox"/>

Other: Seasonal Movement in coastal and transition landscapes

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

Based on TEM mapping, each ecological type or complex was examined to determine their relative value to wintering mountain goats. Methods relied on extensive summer field sampling and winter inventory counts and tracking. The main finds were that while TEM could provide important correlations with suitable habitat, other factors such as aspect, slope, slope shape, and landscape influences were not considered adequately in the TEM classifications, especially in alpine environments, to make associations with actual use patterns.

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

Report and Maps submitted to Smithers MLWAP and District and Skenna Sawmills Ltd-final distribution unknown.

**Project Title: MOUNTAIN GOAT WINTER RANGE INVENTORY**

1. **Project Leader(s):** Brad Pollard

2. **Project Team Members:** Brad Pollard

3. **Project contact information:** Phone: -2506380110 Fax: -2506381098  
Email: bpollard@acerresourceconsulting.com Web page: none

4. **Project location:** Kalum and North Coast Forest Districts

Coastal:  Transition:  Interior:

5. **Project timeframe:** Start (month/year): 06/99 End (month/year, or ongoing): 04/04

6. **Project status:** Data collection  Analysis  Write-up  Publication

7. **Project objectives:** (briefly describe the primary objectives of your project)

Identify potential winter range areas and use helicopter overflights to confirm use and delineate winter range boundaries.

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

Research <input type="checkbox"/>	Habitat Use: <input checked="" type="checkbox"/>	Forestry Interactions: <input checked="" type="checkbox"/>
Management <input checked="" type="checkbox"/>	VHF collars: <input type="checkbox"/>	Oil & Gas Interactions: <input type="checkbox"/>
Inventory <input type="checkbox"/>	GPS collars: <input type="checkbox"/>	Mineral Exploration: <input type="checkbox"/>
Predation: <input type="checkbox"/>	Harvest: <input type="checkbox"/>	Aerial Disturbance: <input type="checkbox"/>
Habitat Modeling: <input checked="" type="checkbox"/>	Population Dynamics: <input type="checkbox"/>	Human Disturbance: <input type="checkbox"/>

Other:

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

Aerial photographs, NTS topographic maps, TRIM maps, local information and grey literature were used to identify areas with known or high probability of containing wintering mountain goats. These areas were then mapped at a scale of 1:20,000 and flown during the most limiting winter conditions available. For most area, helicopter surveys identified which areas were being used and which areas showed no evidence of use. Based on available data and habitat, winter range areas were identified and mapped as the final product.

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

Reports and maps submitted to Smithers WLAP, Skeena Sawmills Ltd., and Ministry of Forests Kalum District - final distribution unknown.

**Project Title: AN INVENTORY OF ALPINE MOUNTAIN GOAT HABITAT IN THE MORICE FOREST DISTRICT**

- 1. **Project Leader(s):** Laurence Turney, R.P.Bio.
- 2. **Project Team Members:** Roy Blume, Anne-Marie Roberts
- 3. **Project contact information:** Phone: (250) 877-6705 Fax: (250) 877-6805  
Email: laurence@ardea.ca Web page: www.ardea.ca
- 4. **Project location:** Morice Timber Supply Area (Nadina Forest District)  
Coastal:  Transition:  Interior:
- 5. **Project timeframe:** Start (month/year): Aug/2002 End (month/year, or ongoing): Mar/2003
- 6. **Project status:** Data collection  Analysis  Write-up  Publication

7. **Project objectives:** (briefly describe the primary objectives of your project)

The overall goal of this project was to delineate alpine mountain goat habitat in the Morice Forest District, to address habitat requirements for this species in strategic land use zonation and operational forest development planning.

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

- |   |   |  |
|---|---|--|
| Research <input type="checkbox"/>                     | Habitat Use: <input type="checkbox"/>         | Forestry Interactions: <input checked="" type="checkbox"/> |
| Management <input type="checkbox"/>                   | VHF collars: <input type="checkbox"/>         | Oil & Gas Interactions: <input type="checkbox"/>           |
| Inventory <input checked="" type="checkbox"/>         | GPS collars: <input type="checkbox"/>         | Mineral Exploration: <input type="checkbox"/>              |
| Predation: <input type="checkbox"/>                   | Harvest: <input type="checkbox"/>             | Aerial Disturbance: <input type="checkbox"/>               |
| Habitat Modeling: <input checked="" type="checkbox"/> | Population Dynamics: <input type="checkbox"/> | Human Disturbance: <input type="checkbox"/>                |
- Other:

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

The availability of security habitat, in the form of cliffs, rock outcrops and steep slopes, is an important aspect of mountain goat habitat selection. Alpine areas in the district provide large areas of suitable habitat and are the core locations of mountain goat populations in the district. Work for this project included a review of population inventory data, the delineation of potential alpine habitat through digital orthophoto analysis and the assessment of potential alpine habitat through aerial and ground reconnaissance. A total of 529 potential habitat polygons were delineated in the study area through aerial assessment, ground checks and visual assessments. A total of 118 mountain goats were observed during the assessment, as well as numerous trails and other sign. Approximately 47% of the potential habitat polygons were found to contain evidence of use by mountain goats, although all delineated polygons were considered suitable habitat. This project identified potential habitat at a broad scale, and analysis of aspect, slope and elevation characteristics of the area of potential habitat

polygons identified some general trends. Results showed that there was not a significant difference in aspect distribution of all polygons, but those polygons observed to have use by mountain goats tended to be more north or south facing. More area of polygons tended to be within moderate slope ranges (31 – 50°), rather than having steep slope (>50°). Approximately one third of the total area of all potential habitat polygons is within a 1500 to 2100 m elevation range. The area of polygons containing evidence of use by elevation range appears to be proportional to availability, except for the lowest and highest elevation ranges, which display less observed use by total polygon area than available area in those elevation ranges

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

Turney, L., Blume, R., 2002. An Inventory of Alpine Mountain Goat Habitat in the Morice Forest District. Unpub. rep. prep. for Ministry of Sustainable Resource Management. Smithers, BC. 17pp + append.

**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 <input checked="" type="checkbox"/>          | Habitat Use: <input checked="" type="checkbox"/> | Forestry Interactions: <input checked="" type="checkbox"/> |
| Management <input checked="" type="checkbox"/>        | VHF collars: <input checked="" type="checkbox"/> | Oil & Gas Interactions: <input type="checkbox"/>           |
| Inventory <input checked="" type="checkbox"/>         | GPS collars: <input checked="" type="checkbox"/> | Mineral Exploration: <input type="checkbox"/>              |
| Predation: <input type="checkbox"/>                   | Harvest: <input type="checkbox"/>                | Aerial Disturbance: <input type="checkbox"/>               |
| Habitat Modeling: <input checked="" type="checkbox"/> | Population Dynamics: <input type="checkbox"/>    | Human Disturbance: <input checked="" type="checkbox"/>     |

Other: Movement patterns, Sightability, DNA investigations

**9. 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 (41-60° slope) in early spring to summer, and moderate slopes (21-40° 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 (21-40°), and cool aspect (285-135°). 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.

**10. 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.

**Project Title: INVENTORIES AND ASSESSMENTS OF NON-ALPINE MOUNTAIN GOAT HABITATS IN THE MORICE AND LAKES TIMBER SUPPLY AREAS**

- 1. **Project Leader(s):** Laurence Turney and Todd Mahon
- 2. **Project Team Members:** Roy Blume and Mike Nelligan
- 3. **Project contact information:** Phone: (250) 877-6705 Fax: (250) 877-6805  
Email: laurence@ardea.ca, wildfor@bulkley.net Web page: www.ardea.ca
- 4. **Project location:** Nadina Forest Distret (Morice and Lakes Timber Supply Areas)  
Coastal:  Transition:  Interior:
- 5. **Project timeframe:** Start (month/year): Oct/1997 End (month/year, or ongoing): Mar/2003
- 6. **Project status:** Data collection  Analysis  Write-up  Publication

7. **Project objectives:** (briefly describe the primary objectives of your project)

This project description provides a summary of a number of inter-related studies that were carried out between 1997 and 2003 to look at the extent and use of non-alpine mountain goat habitats in the Morice and Lakes Timber Supply areas (TSAs). The central portions of the two TSAs contain numerous rocky bluffs, cliffs and canyons within a forested landscape away from mountainous areas, which are used by a population of over 100 mountain goats. The situation is relatively unique for mountain goats in terms of the isolation of relatively small areas, with limited escape terrain, within distributed over a forested landscape. This situation may make this goat population sensitive to natural and human related mortality factors and disturbance. The objectives of the individual studies was to determine the amount of non-alpine mountain goat habitat was in the Morice and Lakes TSAs and to examine methods for predicting their occurrence, as well as determining the amount of use they receive by mountain goats.

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

- |   |  |  |
|---|--|--|
| Research <input type="checkbox"/>                     | Habitat Use: <input checked="" type="checkbox"/> | Forestry Interactions: <input type="checkbox"/>  |
| Management <input type="checkbox"/>                   | VHF collars: <input type="checkbox"/>            | Oil & Gas Interactions: <input type="checkbox"/> |
| Inventory <input checked="" type="checkbox"/>         | GPS collars: <input type="checkbox"/>            | Mineral Exploration: <input type="checkbox"/>    |
| Predation: <input type="checkbox"/>                   | Harvest: <input type="checkbox"/>                | Aerial Disturbance: <input type="checkbox"/>     |
| Habitat Modeling: <input checked="" type="checkbox"/> | Population Dynamics: <input type="checkbox"/>    | Human Disturbance: <input type="checkbox"/>      |

Other:

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

The initial study started in October 1997 and concluded in October 1998 to monitor seasonal and weather related habitat use of a number of sub-alpine forested rocky bluffs near Nadina Mtn, through

observations of mountain goats, sign and habitat assessments. The majority of mountain goat observations were of resting or feeding behaviours with feeding behaviours increasing during the fall and winter. Use of steep rocky habitats was most often observed, along with use of forested habitats during the fall and summer.

In 1999 a multi-year, multi-task project was initiated to monitor movements of mountain goats from Nadina Mtn to a nearby mineral lick, initiate population monitoring and determine the extent of non-alpine habitat use near Nadina Mtn. The non-alpine habitat use portion of the study was undertaken to identifying potential habitats through interviews with resource users and managers, air-photo interpretation and aerial surveys. Ground sign removal transects were then conducted on 29 habitat sites using 100m belt transects. Sign density varied by site, with some sites with no current use, having very high sign densities, indicating intensive use in the past.

During 2000, sites near Nadina Mtn were revisited and ground sign removal transects were conducted to determine which sites were revisited and establish some estimate of frequency of revisit by mountain goats. Based on the sign removal transects, higher quality habitats near Nadina Mtn were re-used, while habitats further away did not have any sign, suggesting a lower re-visitation rate.

In 2000 and 2001 inventories of non-alpine mountain goat habitats were undertaken in the Morice and Lakes Forest districts to determine the extent and use of these habitats. Potential habitats were initially identified using a Geographic Information System (GIS) query of slopes greater than 40 degrees. Air-photos were then examined to determine if the steep slopes were considered to be mountain goat habitat, based on the amount steep rocky terrain. Fixed-wing aerial assessments were then conducted on the potential habitats and a rating provided dependent on type and extent of the areas deemed to be suitable escape terrain. Ground assessments were then conducted on a sub-sample of the areas to determine if the areas were currently or historically used by mountain goats. A total of 1,291 potential non-alpine mountain goat habitat areas were identified. Approximately half of the areas were rated as Nil (no goat habitat potential) based on air photo interpretation, GIS review, aerial surveys, or ground surveys, resulting in a total of 593 habitat areas that offered suitable habitat for mountain goats (442 Morice, 151 Lakes).

In 2002, further ground sign surveys were conducted at 103 potential habitat areas within the central Morice and Lakes Forest Districts to refine our estimates of occupancy and complete a resource selection function analysis. Mountain goat sign was detected at 56 of these sites. The proportion of areas used by goats differed between the two Districts, with much lower frequency of use in the Lakes (31%) than in the Morice (65%). Two different models were tested as part of the resource selection function (RSF) analysis and both found that the only habitat variable that was significantly correlated with use by mountain goats was the amount of escape terrain. Further, the results indicated that if any escape terrain was available then there was a significant probability that goats could use the area.

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

- Mahon, T., M. Nelligan, L. Turney, and R. Blume. 2003. Inventory of mountain goats in non-alpine habitats in the Morice and Lakes Forest Districts. Unpub. rep. prep. for Houston Forest Products Ltd. and Canadian Forest Products Ltd. Smithers, BC. 14pp.
- Turney, L., R. Blume and T. Mahon. 2002. An inventory of non-alpine mountain goat habitat in the Lakes Forest District. Unpub. rep. prep. for Min. Sus. Res. Man., CanFor Ltd. and Houston Forest Products Ltd. Smithers, BC. 20pp + append.

- Turney, L., R. Blume, J. Farkvam and T. Mahon, 2002. Mountain goat movement patterns and forested habitat use near Nadina Mountain, British Columbia - 2001 summary report. Unpub. rep. prep. for Houston Forest Products Ltd, Canadian Forest Products Ltd, Min. of Water, Land and Air Prot. and Min. of Sust. Res. Manage. Smithers, BC. 19pp + append.
- Turney, L., R. Blume, and T. Mahon. 2001. An inventory of non-alpine mountain goat habitat in the Morice Forest District. Unpub. rep. prep. for Min. of Env., Lands & Parks. Smithers, BC. 23pp + append.
- Turney, L., T. Mahon, R. Blume and J. Farkvam. 2001. Mountain goat populations, movement patterns and habitat use in forested habitats near Nadina Mountain and Foxy Creek British Columbia - 2000 summary report. Unpub. rep. prep. for Houston Forest Products Ltd, Canadian Forest Products Ltd. and Min. of Env. Lands and Parks. Smithers, BC. 24pp + append.
- Turney, L., R. Blume and T. Mahon. 2000. Mountain goat populations and movement patterns near Nadina Mountain -1999 summary report. Unpub. rep. prep. for Min. of Env. Lands and Parks, Northwood Inc. and Houston Forest Products Ltd. Terrace, BC. 24pp + append.
- Turney, L., R. Blume and T. Mahon. 1999. Habitat use by mountain goats near Nadina mountain - final report. Unpub. rep. prep. for Min. of Env. Lands and Parks and Houston Forest Products Ltd.. Terrace, BC. 32pp + append.
- Pacific Cascade Consultants Ltd. and WildFor Consultants Ltd. 1998. Telkwa Mountain Goat Project – Field Report: January to March 1998. Unpub. rep. prep. for Ministry of Env., Lands and Parks. Terrace, BC. 15pp.
- Ardea Biological Consulting and WildFor Consulting Ltd. 1998. FRBC mountain goat project, field report – April to September 1998. Unpub. rep. prep. for Min. of Env. Lands and Parks. Terrace, BC. 13pp + append.
- Turney, L. 1998. Telkwa mountain goat project – field report: October to December 1997. Unpub. rep. prep. for Min. of Env., Lands and Parks. Terrace, BC. 8pp.

**Project Title: MOUNTAIN GOAT TRAIL MOVEMENTS NEAR NADINA MOUNTAIN**

- 1. **Project Leader(s):** Laurence Turney
- 2. **Project Team Members:** Roy Blume, Todd Mahon, Jamie. Farkvam
- 3. **Project contact information:** Phone: (250) 877-6705 Fax: (250) 877-6805  
Email: laurence@ardea.ca Web page: www.ardea.ca
- 4. **Project location:** Nadina Mountain, south of Houston, BC.  
Coastal:  Transition:  Interior:
- 5. **Project timeframe:** Start (month/year): Jul/1999 End (month/year, or ongoing): Apr/2005
- 6. **Project status:** Data collection  Analysis  Write-up  Publication

7. **Project objectives:** (briefly describe the primary objectives of your project)

Monitor the effects of forest harvesting near, and a road built across a trail used by mountain goats to access a mineral lick near Nadina Mountain, south of Houston, BC. This project was part of a comprehensive set of projects related to mountain goat habitat use and the effects of roads and timber harvesting on mountain goats in forested areas of the Morice and Lakes Timber Supply Areas.

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

- |  |   |  |
|--|---|--|
| Research <input checked="" type="checkbox"/>   | Habitat Use: <input type="checkbox"/>         | Forestry Interactions: <input checked="" type="checkbox"/> |
| Management <input checked="" type="checkbox"/> | VHF collars: <input type="checkbox"/>         | Oil & Gas Interactions: <input type="checkbox"/>           |
| Inventory <input type="checkbox"/>             | GPS collars: <input type="checkbox"/>         | Mineral Exploration: <input type="checkbox"/>              |
| Predation: <input type="checkbox"/>            | Harvest: <input type="checkbox"/>             | Aerial Disturbance: <input type="checkbox"/>               |
| Habitat Modeling: <input type="checkbox"/>     | Population Dynamics: <input type="checkbox"/> | Human Disturbance: <input type="checkbox"/>                |
- Other:

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

A remote camera monitoring system was used to monitor pre and post-harvesting mountain goat use patterns of a trail used by mountain goats to access a mineral lick near Nadina Mountain, south of Houston, BC. Following road construction and timber harvesting, the trail was re-monitored to determine the effects of the road and nearby timber harvesting on movement patterns.

1999 (Pre-Harvest) - Preliminary year of study, with limited data gathered due to late start and development of techniques. Results showed that goat use of the trail was found to be higher during the early morning (dark) hours and female mountain goats were detected more often than males.

2000 (Pre-Harvest) - Results indicated an increase in the number of events and photos of animals using the trail system. Adult female goats and kids were photographed most often during the period May to October 2000. Mean travel times were calculated for identifiable goats along the trail and it

was determined that mountain goats tended to travel faster returning from the mineral lick than going towards it. The trail monitoring program was also able to document, animals hesitating to venture onto the trail, possibly due to the noise of the trail monitoring equipment.

2001 (Pre-Harvest) - Results showed that single mountain goats accounted for 73% of the photographs from trail monitoring, with groups of two animals accounting for 22% of the photographs and groups of three or more animals making up the remaining 5%. Adult female mountain goats with kids were the most frequently photographed group type during trail monitoring, followed by nannie/kid pairs with barren females and/or juveniles. Males tended to travel alone and female mountain goats caused approximately three times as many photographs as males. Several animals could be identified as they travelled between monitoring sites by coat markings or VHF radio collars, and from tracking this movement it was found that the average time of travel to the mineral lick was generally similar to the time of travel of animals returning to Nadina Mountain. The average stay of these identifiable female mountain goats at the mineral lick was just over 2 days.

2004 (Post-Harvest) - Overall, trail use patterns were similar post-harvest as what was found pre-harvest, although the overall numbers of goat events was less and travel to the lick stopped about one month earlier in 2004 when compared to 2000/2001. Single mountain goats accounted for 55% of the photographs resulting from trail monitoring in 2004, with groups of animals accounting for 45% of the photographs. Adult female mountain goats with kids or young were the most frequently photographed group type during trail monitoring, followed by nanny/kid pairs with barren females and/or juveniles. There was no difference in the number of events on either side of the road where the trail crossed, but there was a significant difference in the travel times from the pre-harvest to the post-harvest years. During the 2004 sessions, the average travel times were about 35 to 40 minutes, while the 2000/2001 travel times averaged 22 to 27 minutes. In 2004 there was a marked increase in the number of photographs of moose and black bears using the trail than what was seen in 2000/2001.

The road will be de-activated in 2005 to hopefully reduce human use and in 3 years it is planned that the trail will be monitored again to see if travel patterns have resumed.

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

- Turney, L. and C. Vandermark. *in prep.* Trail movements by mountain goats under pre and post timber harvesting conditions. Unpub. rep. prep. Canadian Forest Products Ltd. Smithers, BC.
- Turney, L., R. Blume, J. Farkvam and T. Mahon, 2002. Mountain goat movement patterns and forested habitat use near Nadina Mountain, British Columbia - 2001 summary report. Unp. rep. prep. for Houston Forest Products Ltd, Canadian Forest Products Ltd, Min. of Water, Land and Air Prot. and Min. of Sust. Res. Manage. Smithers, BC. 19pp + append.
- Turney, L., T. Mahon, R. Blume and J. Farkvam. 2001. Mountain goat populations, movement patterns and habitat use in forested habitats near Nadina Mountain and Foxy Creek British Columbia - 2000 summary report. Unpub. rep. prep. for Houston Forest Products Ltd, Canadian Forest Products Ltd. and Min. of Env. Lands and Parks. Smithers, BC. 24pp + append.
- Turney, L., R. Blume and T. Mahon. 2000. Mountain goat populations and movement patterns near Nadina Mountain -1999 summary report. Unpub. rep. prep. for Min. of Env. Lands and Parks, Northwood Inc. and Houston Forest Products Ltd. Terrace, BC. 24pp + append.

**OMINECA – REGION 7a**

**Project Title: MOUNTAIN GOAT HABITAT SUPPLY MODELING AND APPLICATIONS IN THE MACKENZIE TIMBER SUPPLY AREA, NORTH-CENTRAL BC**

1. **Project Leader(s):** R.Scott McNay, Pamela Hengeveld
2. **Project Team Members:** Rick Ellis, Mari Wood, Fraser Corbould, Ross Lennox, Doug Heard, Doug Wilson, Bill Arthur, Shelby Lefebvre, Sam Davis, Jeremy Greenfield, Karl Sturmanis, Robert Tomah
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Web page: www.wildlifeinfometrics.com    www.synergyecology.ca
4. **Project location:** Mackenzie Timber Supply Area, north-central BC  
Coastal:     Transition:     Interior:
5. **Project timeframe:**    Start (month/year): Jan 2003    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)

Project components include mountain goat habitat supply modeling, population inventory and habitat-use data collection (to verify and calibrate the models), and policy development. The results are intended to serve resource managers and planners, and provide measurable progress toward developing innovative policies and improved standards for a) demonstrating due diligence and accountability in Forest Stewardship Plan submissions and Forest Certification programs, and b) establishing adaptive management strategies that balance timber supply and mountain goat habitat needs. The ultimate goal is to develop Goat HSM as a useful operational decision-support tool that allows a transparent, quantitative assessment of disturbance impacts on goat habitats, and contributes to the development of adaptive management strategies that can be applied to other geographical areas.

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

- |   |  |  |
|---|--|--|
| Research <input checked="" type="checkbox"/>          | Habitat Use: <input checked="" type="checkbox"/>         | Forestry Interactions: <input checked="" type="checkbox"/> |
| Management <input checked="" type="checkbox"/>        | VHF collars: <input checked="" type="checkbox"/>         | Oil & Gas Interactions: <input type="checkbox"/>           |
| Inventory <input checked="" type="checkbox"/>         | GPS collars: <input type="checkbox"/>                    | Mineral Exploration: <input type="checkbox"/>              |
| Predation: <input checked="" type="checkbox"/>        | Harvest: <input checked="" type="checkbox"/>             | Aerial Disturbance: <input checked="" type="checkbox"/>    |
| Habitat Modeling: <input checked="" type="checkbox"/> | Population Dynamics: <input checked="" type="checkbox"/> | Human Disturbance: <input checked="" type="checkbox"/>     |

Other:

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

Our approach to mountain goat habitat supply modeling employs Netica to formulate a Bayesian Belief Network concerning the likely state or condition of mountain goat habitats given observed states or conditions of key ecological factors. To date, predictive models have been developed for mineral licks, lick access trails, summer escape terrain, and winter escape terrain habitats. The key ecological input factors, the influence diagrams, and the choice of conditional probabilities fundamental to each node in the models were all based on a consensus of opinion taken from a variety of professionals experienced in the ecology of mountain goats. Model results express values for habitat capability, habitat preference (capability modified by disturbance impacts), and habitat value (preference modified by predation risk and hunter harvest levels). Collectively, these sub-models are testable hypotheses that represent our understanding of mountain goat ecology and influential management factors.

Trial applications of the models have been conducted in the lower Ospika River drainage, the upper Osilinka / Mesilinka river drainages, and the Truncate Creek area, in the Mackenzie TSA. Multi-year planning scenarios were evaluated for Truncate Creek (3 scenarios, 8 time steps), using preliminary data to demonstrate the model's utility and intended application as a planning tool. Preliminary tests of the mineral lick and escape terrain models were conducted in 2004-2005. All work completed to date is documented in our annual progress reports.

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

Hengeveld, P.E., M.D. Wood, R. Ellis, R.S. McNay, and R. Lennox. In Prep (2005). Mountain goat habitat supply modeling in the Mackenzie Timber Supply Area, north-central British Columbia. Version 3.0 – June 2005.

Hengeveld, P. E. and R.S. McNay. 2005. Mountain goat habitat supply modeling: pilot project test results. Report No. SAE005. Synergy Applied Ecology, Mackenzie, BC. 25pp plus appendices.

Hengeveld, P. E. 2005. An ecosystem approach to planning for sustainable management of mountain goats and timber supply: Mountain goat management recommendations for the Mackenzie Timber Supply Area. Report No. SAE006. Synergy Applied Ecology, Mackenzie, BC. 15 plus appendices.

McNay, R.S. and P.E. Hengeveld. 2004. Response to FIA Forest Science Program Call for Proposals 2004/05: An Ecosystem Approach to Planning for Sustainable Management of Mountain Goat Resource Values and Timber Supply (Proposal Number Y051348). Rep. No. 102, Wildlife Infometrics Inc., Mackenzie, BC. 17pp plus appendices.

Hengeveld, P.E. 2004. Mountain goat habitat supply modeling: developing an operational tool for sustainable forest management planning. Wildlife Infometrics Inc. Report No. 110. Wildlife Infometrics Inc., Mackenzie, British Columbia, Canada. 35pp plus appendices.

Hengeveld, P.E., M.D. Wood, R. Ellis, R.S. McNay, and R. Lennox. 2004. Mountain goat habitat supply modeling in the Mackenzie Timber Supply Area, north-central British Columbia. Version 2.0 – March 2004. Wildlife Infometrics Report No. 109. Wildlife Infometrics Inc., Mackenzie, British Columbia. 69 pp.

Hengeveld, P. E. 2003. Mountain Goat Habitat Supply Modeling: Developing an Operational Tool for Sustainable Forest Management Planning. Response to FII RFP FR 2003/04. Wildlife Infometrics Inc. Report No. 116. Wildlife Infometrics Inc., Mackenzie, British Columbia, Canada. 38pp.

Hengeveld, P.E., M. Wood, R. Ellis, and R. Lennox. 2003. Mountain goat habitat supply modeling in the Mackenzie Timber Supply Area, north-central British Columbia, Year 1 – March 2003. Wildlife Infometrics Inc Report No. 46. 47pp plus appendices.

Hengeveld, P.E. 2002. Mountain goat mineral lick habitat supply model, with preliminary application in the Ospika River drainage, north-central B.C.: Response to FII RFP Number FII RFP RES 2002-03. Wildlife Infometrics Inc Report No. 2. 26pp plus appendices.

**Project Title: MOUNTAIN GOAT INVENTORY AND HABITAT SELECTION IN THE ROBSON VALLEY, BRITISH COLUMBIA**

- 1. **Project Leader(s):** Kim Poole
- 2. **Project Team Members:** Kim Poole, Doug Heard, Glen Watts
- 3. **Project contact information:** Phone: 2508254063 Fax: 2508254073  
Email: klpoole@shaw.ca Web page:
- 4. **Project location:** Robson Valley  
Coastal:  Transition:  Interior:
- 5. **Project timeframe:** Start (month/year): Jul 1997 End (month/year, or ongoing): Mar 2000
- 6. **Project status:** Data collection  Analysis  Write-up  Publication

7. **Project objectives:** (briefly describe the primary objectives of your project)

1. Determine the patterns of movements and habitat/forest use by mountain goats with the expectation that forest use would primarily be during the period when goats used low elevation mineral licks and during winter., and 2. Estimating mountain goat population size and densities in Robson Valley; determining sightability correction factors.

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

- |  |  |  |
|--|--|--|
| Research <input checked="" type="checkbox"/>   | Habitat Use: <input checked="" type="checkbox"/> | Forestry Interactions: <input checked="" type="checkbox"/> |
| Management <input checked="" type="checkbox"/> | VHF collars: <input checked="" type="checkbox"/> | Oil & Gas Interactions: <input type="checkbox"/>           |
| Inventory <input checked="" type="checkbox"/>  | GPS collars: <input checked="" type="checkbox"/> | Mineral Exploration: <input type="checkbox"/>              |
| Predation: <input type="checkbox"/>            | Harvest: <input type="checkbox"/>                | Aerial Disturbance: <input type="checkbox"/>               |
| Habitat Modeling: <input type="checkbox"/>     | Population Dynamics: <input type="checkbox"/>    | Human Disturbance: <input type="checkbox"/>                |
- Other:

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

Abstract (habitat): To identify the potential for adverse effects of forest development on Mountain Goats (*Oreamnos americanus*), we documented the patterns of forest use by goats and the factors influencing goat habitat use. We used a combination of 15 very high frequency (VHF) and six global positioning system (GPS) radiocollars to document the distribution and movements of 21 (15 female, 6 male) goats from 1997–1999 in the mountains surrounding the Robson Valley in east-central British Columbia. Because canopy closure reduces the likelihood that a GPS receiver will obtain a location fix, we estimated that GPS collars underrepresented forest use by about 23%. Three goats used separate winter and summer ranges separated by 8–13 km, while most simply exhibited seasonal shifts in elevation. In winter, goats were more often at lower elevations, in commercial forest stands, on southerly aspects, and moved less each hour and over the course of the

winter. Goat use declined in areas >500 m from escape terrain and goats were found lower in elevation from evening to dawn compared to daylight hours. Collared goats used high elevation licks, which were either within their home range, or in two cases, 6 and 14 km from their typical home range. We documented use of known mid-elevation mineral licks by three collared goats, but no use of known low elevation (valley bottom and lower slopes) mineral licks. Robson Valley goats appeared to be at relatively low risk from disturbances related to logging, because although forest use was documented during winter, it occurred primarily on high elevation, steep slopes where trees were currently of low commercial value, and goats made little use of low elevation mineral licks. We recommend that in this area a forested buffer of 500 m around cliffs should be left to reduce the possibility of adverse effects on goats; especially on southerly aspects above 1300 m.

Abstract (inventory): A random sample unit survey using sightability correction was used to estimate mountain goat (*Oreamnos americanus*) population size along the Robson Valley in east-central British Columbia in August 1998. Twenty random sample units (12.4  $\pm$  0.67 [SE] km<sup>2</sup> area) were surveyed in a 2,707-km<sup>2</sup> census zone above the 5,500-foot (1675 m) contour line. Standard helicopter survey techniques were employed to thoroughly search each unit (mean survey effort of 3.8  $\pm$  0.21 min/km<sup>2</sup>). Twelve radio-collared goats within the census zone provided sightability correction. We counted 127 mountain goats in the 20 units, covering 248 km<sup>2</sup> (10.2% of the census zone). The uncorrected population estimate for the census zone was 1,400  $\pm$  260 goats (95% CI 900 to 1,900), and the mean density was 0.51 goats/km<sup>2</sup>. Observers saw 8 of 12 radio-collared goats (67%), giving an adjusted population estimate for the census zone of 2,100 (95% CI 1,200 to 3,800), and an adjusted density of 0.77 goats/km<sup>2</sup>. Accuracy and precision of future surveys could be increased by accurate stratification, sampling more units, using more marked (collared) goats, and ensuring that the marked segment of the population better reflects the composition of the census population.

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

- Poole, K.G., and D.C. Heard. 2003. Seasonal habitat use and movements of mountain goats, *Oreamnos americanus*, in east-central British Columbia. *Canadian Field-Naturalist* 117:565-576.
- Poole, K.G., D.C. Heard, and G.S. Watts. 2000. Mountain goat inventory in the Robson Valley, British Columbia. *Biennial Symposium Northern Wild Sheep and Goat Council* 12:114-124.
- Poole, K.G., and D.C. Heard. 1998. Habitat use and movements of mountain goats as determined by prototype GPS collars, Robson Valley, British Columbia. *Biennial Symposium of the Northern Wild Sheep and Goat Council* 11:22-35.

**Project Title: APPLICATION OF MTN. GOAT WINTER HABITAT MODEL**

**1. Project Leader(s):** Sandra Sulyma Joanne Vinnedge

**2. Project Team Members:** Jonah Keim Doug Heard Len Vanderstar

**3. Project contact information:** Phone: 2509965262 Fax: 2509965290

Email: Joanne.Vinnedge@gems7.gov.bc.ca Web page:

**4. Project location:** Fort St. James FD

Coastal:  Transition:  Interior:

**5. Project timeframe:** Start (month/year): Feb/2004 End (month/year, or ongoing): Mar/2004

**6. Project status:** Data collection  Analysis  Write-up  Publication

**7. Project objectives:** (briefly describe the primary objectives of your project)

A habitat model developed by Jonah Keim was applied to the mountainous portions of the Fort St. James Forest District that overlap with the Omineca WLAP regional boundary. The results were used as a preliminary tool to identify where potential Mountain Goat Ungulate Winter Range areas may be located.

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

Research <input type="checkbox"/>	Habitat Use: <input checked="" type="checkbox"/>	Forestry Interactions: <input type="checkbox"/>
Management <input type="checkbox"/>	VHF collars: <input type="checkbox"/>	Oil & Gas Interactions: <input type="checkbox"/>
Inventory <input type="checkbox"/>	GPS collars: <input type="checkbox"/>	Mineral Exploration: <input type="checkbox"/>
Predation: <input type="checkbox"/>	Harvest: <input type="checkbox"/>	Aerial Disturbance: <input type="checkbox"/>
Habitat Modeling: <input checked="" type="checkbox"/>	Population Dynamics: <input type="checkbox"/>	Human Disturbance: <input type="checkbox"/>

Other:

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

Jonah Keim contracted to apply mtn. goat winter habitat model to portion of Fort St. James Forest District. Model was applied, spatial results provided, and a late winter helicopter survey conducted to evaluate applicability to local conditions.

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

Keim, J. 2004. Application of a predictive winter habitat model for mountain goats: in the Fort St.James study area. Report prepared for Min. of Water, Land and Air Protection, Omineca Region. unpubl. report.

**Project Title: OSPIKA GOAT ADAPTIVE MANAGEMENT TRIAL: TIMING, FREQUENCY AND DURATION OF VISITS TO MINERAL LICKS BY MOUNTAIN GOATS BEFORE AND AFTER FOREST HARVESTING**

- 1. **Project Leader(s):** Mari Wood, Fraser Corbould
- 2. **Project Team Members:** Mari Wood, Fraser Corbould, Greg Blackburn, Doug Heard, Dale Seip, Scott McNay, Pamela Hengeveld, and Doug Ambedian
- 3. **Project contact information:** Phone: 2505654191 Fax: 2505656629  
Email: mari.wood@gov.bc.ca Web page: <http://www.bchydro.com/pwcp/>
- 4. **Project location:** Ospika River drainage, north-central B.C.  
Coastal:  Transition:  Interior:
- 5. **Project timeframe:** Start (month/year): Mar 02 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)

To determine the impacts of different forest harvesting options on mountain goat use of low-elevation mineral licks and access trails. Treatments include retention of a buffer strip along a forested access trail (150m either side of the trail), and no buffer strip (i.e. clearcut).

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

- |  |  |  |
|--|--|--|
| Research <input checked="" type="checkbox"/>   | Habitat Use: <input checked="" type="checkbox"/>         | Forestry Interactions: <input checked="" type="checkbox"/> |
| Management <input checked="" type="checkbox"/> | VHF collars: <input checked="" type="checkbox"/>         | Oil & Gas Interactions: <input type="checkbox"/>           |
| Inventory <input type="checkbox"/>             | GPS collars: <input type="checkbox"/>                    | Mineral Exploration: <input type="checkbox"/>              |
| Predation: <input type="checkbox"/>            | Harvest: <input type="checkbox"/>                        | Aerial Disturbance: <input type="checkbox"/>               |
| Habitat Modeling: <input type="checkbox"/>     | Population Dynamics: <input checked="" type="checkbox"/> | Human Disturbance: <input type="checkbox"/>                |
- Other:

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

Mountain goats primarily use high elevation, steep escape terrain, however, forested habitats are often used for obtaining forage in winter, and for accessing low-elevation mineral licks in spring, summer, and fall. Goats rely heavily on mineral licks to replenish sodium reserves that are flushed from the body due to the intake of potassium-rich spring forage. Licks and their forest access trails are traditionally used by successive generations of goats. Although goats are thought to be particularly sensitive to disturbance from and displacement by various industrial activities, it is unknown how adaptable they are to relatively quick, large-scale habitat modifications given their strong fidelity and traditional use of mineral licks and trails. Many wildlife managers believe that

goats are sensitive to disturbance and that forestry activities near traditional licks and trail systems will have long-term negative effects. However, the direct or indirect impacts on goats when timber surrounding licks and trails is partially or completely removed are unknown. Current policies for the management of mountain goats and their associated mineral licks and access trails in BC are clearly inadequate at this time and provide no specific direction for the operational management of forest harvesting.

We propose to monitor the behavioural response of goats to different forest harvesting strategies, then, in co-operation with Canfor and the government agencies, model these results to assist in developing new management strategies and/or policies. An experimental approach is being used to evaluate the impacts of harvesting timber adjacent to primary access trails on the use of mineral licks by goats. The project study design initially involved monitoring goat use at 4 mineral lick complexes in the lower Ospika Valley over a 6-year period. Data would be collected for at least 1 year of pre-manipulation and 2 years of post-manipulation at each of 2 treatment licks: 1) retention of approximately 150m of timber on each side of a goat access trail ("Buffered"), and 2) complete removal of timber along one side of an access trail ("Partially Buffered"). The 3rd and 4th mineral licks served as controls. The behavioural response of collared and un-collared goats at the licks would be monitored by remote radio-telemetry dataloggers and remote cameras. Logging adjacent to the "Buffered" trail occurred in the winter of 02/03, while harvesting along the "Partially Buffered" trail was permanently cancelled by Canfor in Dec 04. Currently, removal of the forested buffer retained as the first treatment site (the "Buffered" scenario) is being investigated as a substitute treatment. The "No Buffer/Clearcut" treatment would involve complete removal of the buffer strip along the trail.

In the April to November period of 2002, 2003 and 2004, remote telemetry dataloggers and remote cameras were established at the 4 Ospika licks and along access trails. Equipment was maintained and downloaded on a regular basis. Future monitoring plans are dependent on the feasibility of conducting the second treatment to test the "No Buffer/Clearcut" scenario. If the buffer strip is harvested in winter 05/06, monitoring will continue for 3 more years: 1 year of pre (2005) and 2 years of post (2006, 2007) harvesting data collection. If harvesting of the buffer strip is not feasible, then one final year of monitoring will be conducted in summer 2005, thus resulting in 1 year of pre and 3 years of post-treatment data for the original "Buffered" lick scenario). Radio-collared goats are also being monitored biweekly by fixed-wing aircraft during the April to November period to determine movements and range use between lick visits, and to detect mortalities.

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

Data on file, PFWWCP, Prince George, BC. Final project report and publications upon completion of project.

**Project Title: IDENTIFICATION OF MOUNTAIN GOAT MINERAL LICKS IN THE WILLISTON RESERVOIR WATERSHED, NORTH-CENTRAL B.C.**

1. **Project Leader(s):** Mari Wood

2. **Project Team Members:** Mari Wood, Pamela Hengeveld

3. **Project contact information:** Phone: 2505654191 Fax: 2505656629  
Email: mari.wood@gov.bc.ca Web page: <http://www.bchydro.com/pwcp/>

4. **Project location:** Williston Reservoir watershed, north-central B.C.

Coastal:  Transition:  Interior:

5. **Project timeframe:** Start (month/year): Oct 1999 End (month/year, or ongoing): Aug 2000

6. **Project status:** Data collection  Analysis  Write-up  Publication

7. **Project objectives:** (briefly describe the primary objectives of your project)

- To identify mineral licks used by mountain goats, and determine and rank their degree of use by goats, in the Williston Reservoir watershed
- To bring mountain goat mineral lick locations to the attention of resource managers, and recommend the establishment of WHA's, WHF's, or forest harvesting deferrals.

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

Research <input type="checkbox"/>	Habitat Use: <input checked="" type="checkbox"/>	Forestry Interactions: <input checked="" type="checkbox"/>
Management <input checked="" type="checkbox"/>	VHF collars: <input type="checkbox"/>	Oil & Gas Interactions: <input type="checkbox"/>
Inventory <input checked="" type="checkbox"/>	GPS collars: <input type="checkbox"/>	Mineral Exploration: <input type="checkbox"/>
Predation: <input type="checkbox"/>	Harvest: <input type="checkbox"/>	Aerial Disturbance: <input type="checkbox"/>
Habitat Modeling: <input type="checkbox"/>	Population Dynamics: <input type="checkbox"/>	Human Disturbance: <input type="checkbox"/>

Other:

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

Mineral licks used seasonally by mountain goats are seldom close to secure escape terrain (often located along creek draws in valley bottoms). Goats are known to migrate up to several km through forested habitats to reach mineral licks, typically using one well-defined trail. Identification of low-elevation mineral licks and access trails used by mountain goats is the first step in ensuring protection of such licks/trails particularly during forest harvesting activities.

In 1999, potential low-elevation mineral licks in the Ospika River drainage were identified from sites noted on biophysical habitat maps, and from a detailed review of clay bank locations on forest cover maps. In October, after the peak mineral lick use season, potential lick sites were surveyed from a

Bell 206 helicopter; those with obvious goat use observed from the helicopter such as presence of tracks/trails or moulted hair in adjacent trees, were then subjected to detailed ground investigations. The degree of use and importance of each lick was then classified according to the presence and abundance of goat sign at the lick (tracks, hair, scat, licking sites). In 2000, these same methods were used to identify goat licks outside of the Ospika drainage within the remainder of the Williston Reservoir watershed. In addition, guide-outfitters, trappers, First Nations, and local community residents were contacted to obtain local knowledge of low-elevation goat lick locations, however, no additional licks beyond those identified using forest cover maps were found.

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

Data on file, PFWWCP, Prince George, BC.

**Project Title: MOUNTAIN GOAT INVENTORY IN THE WILLISTON RESERVOIR WATERSHED, NORTH-CENTRAL BC**

- 1. **Project Leader(s):** Mari Wood
- 2. **Project Team Members:** Mari Wood, Fraser Corbould
- 3. **Project contact information:** Phone: 2505654191 Fax: 2505656629  
Email: mari.wood@gov.bc.ca Web page: <http://www.bchydro.com/pwcp/>
- 4. **Project location:** Various locations within Williston Reservoir watershed, north-central B.C.  
Coastal:  Transition:  Interior:
- 5. **Project timeframe:** Start (month/year): Mar 93 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)
  - To determine presence/absence, distribution, minimum population size, and population demographics (age/sex ratios) of mountain goats on various ranges within the Williston watershed.
  - To aid in protection of critical areas/habitats/populations through provision of data to WLAP to 1) integrate with forest management plans, 2) designate Protected Areas, special management areas, WHA's, or UWR's, and 3) assist with determination of harvest quotas.

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

- |  |  |  |
|--|--|--|
| Research <input type="checkbox"/>              | Habitat Use: <input checked="" type="checkbox"/>         | Forestry Interactions: <input type="checkbox"/>  |
| Management <input checked="" type="checkbox"/> | VHF collars: <input type="checkbox"/>                    | Oil & Gas Interactions: <input type="checkbox"/> |
| Inventory <input checked="" type="checkbox"/>  | GPS collars: <input type="checkbox"/>                    | Mineral Exploration: <input type="checkbox"/>    |
| Predation: <input type="checkbox"/>            | Harvest: <input checked="" type="checkbox"/>             | Aerial Disturbance: <input type="checkbox"/>     |
| Habitat Modeling: <input type="checkbox"/>     | Population Dynamics: <input checked="" type="checkbox"/> | Human Disturbance: <input type="checkbox"/>      |

Other:

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

Several mountain goat ranges in the Williston Reservoir watershed have been surveyed by the PFWWCP since 1993. Most have been winter alpine surveys conducted in conjunction with surveys for other high-elevation ungulate species (caribou, Stone's sheep). Two summer inventories were conducted specifically for mountain goats, both in the Nabesche River drainage. All inventories have been intensive attempts at total counts conducted by Bell 206 helicopter, but with no correction for sightability.

Mar 1993 - Russel Range - 211 goats (168 adults, 43 kids); 26K:100A  
Mar 1994 - Akie/Pesika: Shovel Cr. to Pesika Cr. - 6 goats (5 adults, 1 kid)  
Pesika Cr. to Kwadacha R - 30 goats (26 adults, 4 kids); 15K:100A  
Mar 1996 - Mt. Selwyn/Mt. Crysedale - 6 goats (5 adults, 1 kid)  
July 1998 - Nabesche drainage (Mt. Brewster) - 62 goats (51 adults, 11 kids); 25K:100A  
Feb 1999 - Wolverine Range - 13 goats (10 adults, 3 kids)  
Feb 1999 - Germansen Range - 5 goats (4 adults, 1 kid)  
Mar 2000 - Akie/Pesika: Pesika Cr to Kwadacha R - 34 goats (29 adults, 5 kids); 17K:100A  
Sep 2003 - Nabesche drainage (Mt. Brewster) - 89 goats (65 adults, 24 kids); 37K:100A

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

- Wood, M.D. 1994. Muskwa Range (east of Finlay River) winter ungulate inventory, March 1994. Peace/Williston Fish and Wildlife Compensation Program Report No. 32. 6 pp.
- Hengeveld, P.E. and M.D. Wood. 1998. Misinchinka Ranges winter ungulate inventory, March 1996. Peace/Williston Fish and Wildlife Compensation Program Report No. 175. 19pp plus appendices.
- Hengeveld, P.E. and M.D. Wood. 2000. Wolverine caribou herd winter survey 1999. Peace/Williston Fish and Wildlife Compensation Program Report No. 231. 11pp plus appendices.
- Corbould, Fraser B. 2001. Abundance and distribution of Stone's sheep and mountain goats on the Russel Range, March 1993. Peace/Williston Fish and Wildlife Compensation Program, Report No. 243. 18pp plus appendices.
- Wood, M.D. 2002. Summer inventory of mountain goats and Stone's sheep in the Nabesche River drainage, north-eastern British Columbia, 1998. Peace/Williston Fish and Wildlife Compensation Program Report No. 265. 14pp plus appendices

## **PEACE – REGION 7b**

**Project Title: THE IMPORTANCE OF MINERAL LICKS TO UNGULATES IN NORTH-CENTRAL BC**

- 1. **Project Leader(s):** Jeremy Ayotte, Kathy Parker
- 2. **Project Team Members:** Michael Gillingham, Lito Arocena, Doug Heard
- 3. **Project contact information:** Phone: 8043513 Fax:  
Email: jeremy.ayotte@gmail.com Web page:
- 4. **Project location:** Tuchodi watershed, Northern Rockies Prov. Park, Muskwa-Kechika Manage. Area  
Coastal:  Transition:  Interior:
- 5. **Project timeframe:** Start (month/year): 09/02 End (month/year, or ongoing): 06/04
- 6. **Project status:** Data collection  Analysis  Write-up  Publication
- 7. **Project objectives:** (briefly describe the primary objectives of your project)  
1) Document seasonal use of licks, 2) Determine properties of lick soil, 3) Estimate elemental concentrations in forage

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

- |  |   |  |
|--|---|--|
| Research <input checked="" type="checkbox"/> | Habitat Use: <input type="checkbox"/>         | Forestry Interactions: <input type="checkbox"/>  |
| Management <input type="checkbox"/>          | VHF collars: <input type="checkbox"/>         | Oil & Gas Interactions: <input type="checkbox"/> |
| Inventory <input type="checkbox"/>           | GPS collars: <input type="checkbox"/>         | Mineral Exploration: <input type="checkbox"/>    |
| Predation: <input type="checkbox"/>          | Harvest: <input type="checkbox"/>             | Aerial Disturbance: <input type="checkbox"/>     |
| Habitat Modeling: <input type="checkbox"/>   | Population Dynamics: <input type="checkbox"/> | Human Disturbance: <input type="checkbox"/>      |
- Other: Elemental nutrition

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

Research was conducted at three dry licks that were all near valley bottom on the east slope of the Northern Rocky Mountains 120 km SW of Ft. Nelson. We conducted behavioural observations (May-Aug, 2002) of 3 dry lick areas (used by mountain goats and Stone's sheep) to document hourly and seasonal lick use. Mountain goats appeared to travel to licks more in the morning than the afternoon, but did not show any pattern in time leaving the lick. They also travelled to the lick during all hours of the night, which contrasts to the use of licks by Stone's sheep that tended to leave the lick to return to the alpine during daylight hours. It also appeared that more mountain goats travelled to the lick on the main trail than away, which was opposite to the use of trails by Stone's sheep (more sheep used main trails when travelling away from the lick than when travelling to the lick). Female mountain goats on average spent longer time at the lick and licked for a higher proportion of that time than males although these differences were not significant. In terms of seasonal use of licks, two peaks in lick use were common to both Mountain goats and Stone's sheep (although data was highly

variable across the spring and summer). The first peak in early July, may have been related to the late-greening of alpine forage, and the second in early August may have been influenced by high lactation demands combined with a reluctance to travel down to valley bottom until their young were old enough that the threat of predation was acceptable. We then used our behavioural observations to quantify the lick area in terms of intensity of use in order to select high- and low-use sites within the lick area. We collected soil samples from 10 controls, 10 low-use and 10 high-use sites at each lick. Methods of soil analyses generally pertained to theories on lick function and specifically related to the digestive physiology of the ruminant. Sodium and carbonates were the two soil properties that we found concentrated in almost all licks. Magnesium and sulphates were also high in some of the licks. In order to assess whether these elements that are high in the lick soil were also low in the diet, we collected forage samples across elevation and time. Sodium, which was high in all dry lick soils, was also low in the diet of mountain goats compared to the maintenance requirements of captive wild and domestic ruminants and the lactation demands of cattle. In conclusion, I combined behavioural and chemical data to assess the importance of mineral licks to mountain goats and generally found that lick use is a complex interaction between physiological demands, forage composition, and the properties of licks soils. Consequently the use of licks is variable over time and among individuals, and it appears that licks may serve multiple functions. Specifically, licks are sources of supplemental sodium (especially during high physiological demand such as lactation) and sources of carbonates for pH buffering during the transition to spring forage. Managers should consider that lick use is a fundamental component of mountain goat foraging strategies as access to licks may allow weak individuals an opportunity to improve their condition in a relatively short amount of time.

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

1) Progress reports and a final report are kept at the Muskwa-Kechika Management Area resource library:

Muskwa-Kechika Management Area

Information Office

9908-100th Avenue

Fort St. John, B.C.

V1J 1Y5

Phone (250) 262-0065

Fax (250) 262-0077

[coordinator@muskwa-kechika.com](mailto:coordinator@muskwa-kechika.com)

2) Ayotte, J. 2004. The importance of licks to ungulates in north-central BC. Masters thesis. University of Northern BC, Prince George BC.

3) Ayotte, J. [submitted]. Use of natural licks by four ungulate species in north-central British Columbia. [Ecoscience]

4) Ayotte, J. [submitted]. Chemical composition of lick soils: potential benefits for ungulates. [Ecoscience]

**Project Title: WILDLIFE MONITORING, TALISMAN SUKUNKA, D-3-L, 93-P-4, CBM TEST CORE HOLE**

1. **Project Leader(s):** Brian Churchill

2. **Project Team Members:** Karen Stroebel

3. **Project contact information:** Phone: 2507875518 Fax: 2507875519

Email: Brian@chillborne.ca

Web page:

4. **Project location:** MU 7-21 Bullmoose Mountain

Coastal:  Transition:  Interior:

5. **Project timeframe:** Start (month/year): Aug 2001 End (month/year, or ongoing): October 2001

6. **Project status:** Data collection  Analysis  Write-up  Publication

7. **Project objectives:** (briefly describe the primary objectives of your project)

The objective of the monitoring plan was “ to monitor wildlife before during and after the construction of access roads and drilling of the test core hole to provide data on the efficacy of the mitigation measures and to identify the appropriate measures required for full development”.

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:

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

Wedesigned a wildlife mitigation and monitoring plan forttest hole drilling project for coal bed methane on Bullmoose Mountain the site of the 1985 mountain goat transplant. Our onsite monitor documented goat behaviour prior to the initiation of the program and during the entire cycle of construction, drilling and decommissioning. In total 1483 individual goats were observed in 225 groups during 34 monitoring days. From analysis of observed goat behavior we provided reccomendations for a mitigation plan for a larger project might result from the test hole program.

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

Churchill Brian & Karen Stroebel, February 2002Wildlife Monitoring Report ;Talisman Sukunka, d-3-l, 93-P-4, CBM Test Core Hole Bullmoose Mountain, Talisman Energy Inc./CDX Canada, 41pp.

**Project Title: EFFECTS OF HELICOPTERS ON CANYON-DWELLING MOUNTAIN GOATS IN NORTHEAST BRITISH COLUMBIA**

- 1. **Project Leader(s):** Jeff Matheson
- 2. **Project Team Members:** Steve Moore, Clint Smyth, Bill Nalder
- 3. **Project contact information:** Phone: 6046850275 Fax: 6046846241  
Email: jmatheson@eba.caq Web page:
- 4. **Project location:** Belcourt Creek  
Coastal:  Transition:  Interior:
- 5. **Project timeframe:** Start (month/year): 8/2003 End (month/year, or ongoing): 4/2004
- 6. **Project status:** Data collection  Analysis  Write-up  Publication

7. **Project objectives:** (briefly describe the primary objectives of your project)  
Determine effects of helicopters on canyon-dwelling mountain goats.

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

- |  |   |   |
|--|---|---|
| Research <input type="checkbox"/>              | Habitat Use: <input type="checkbox"/>         | Forestry Interactions: <input type="checkbox"/>             |
| Management <input checked="" type="checkbox"/> | VHF collars: <input type="checkbox"/>         | Oil & Gas Interactions: <input checked="" type="checkbox"/> |
| Inventory <input checked="" type="checkbox"/>  | GPS collars: <input type="checkbox"/>         | Mineral Exploration: <input type="checkbox"/>               |
| Predation: <input type="checkbox"/>            | Harvest: <input type="checkbox"/>             | Aerial Disturbance: <input checked="" type="checkbox"/>     |
| Habitat Modeling: <input type="checkbox"/>     | Population Dynamics: <input type="checkbox"/> | Human Disturbance: <input type="checkbox"/>                 |
- Other:

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

During a heli-portable seismic program, we studied a population of mountain goats (*Oreamnos americanus*) inhabiting river canyons in northeast British Columbia, Canada. We first conducted ground and aerial-based inventories and then monitored mountain goat behavioural responses while helicopters were operating in the vicinity of goats. To minimise disturbance to goats, a mitigation strategy was developed prior to commencement of helicopter activity. During all helicopter activities, biologists monitored goat behaviour and terminated helicopter activity if goats appeared alarmed or ready to take flight. Helicopter type, distance to helicopter, goat age and sex, behavioural activity and behavioural response to helicopter were recorded for each observed goat.

In general, goats exhibited an increased level of awareness, alertness and alarm with decreasing helicopter distance. At distances between 500 and 2000 m, 80% of goats exhibited either no response or an unconcerned response to helicopters. At distances less than 500 m, 18% of goats were concerned or took flight. The goats in our study appear to show a lower alarm response than those reported by other authors. We suggest that this may be due to the way helicopters were managed by

terminating flights when goats were showing increasing levels of alertness and alarm. Other potential factors include the lower visibility of helicopters by goats within the narrow canyons, short-term habituation process to helicopters since helicopters usually began far and approached slowly and repeated exposure.

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

Matheson J., C. Smyth, D. Ebner, B. Nalder and S. Moore. 2004. Management of Heliportable Geophysical Activities in Mountain Goat Habitat in Northeast British Columbia: Recommendations & Implications For Petroleum Exploration. Prepared for Veritas Energy Services. Prepared by EBA Engineering Consultants Ltd.

Matheson J., S. Moore, C. Smyth and B. Nalder. 2004. Effects of Helicopters on Canyon-Dwelling Mountain Goats in Northeast British Columbia. Unpublished manuscript. Currently in review for Wildlife Society Bulletin.

**Project Title: MOUNTAIN GOATS AND STONE'S SHEEP IN THE BUCKINGHORSE, SIKANNI CHIEF AND BOAT DRAINAGES, PROPHET RIVER TERRITORY**

- 1. **Project Leader(s):** Kim Poole
- 2. **Project Team Members:** Darcy Fear
- 3. **Project contact information:** Phone: 2508254063 Fax: 2508254073  
Email: klpoole@shaw.ca Web page:
- 4. **Project location:** Prophet River, northeastern BC  
Coastal:  Transition:  Interior:
- 5. **Project timeframe:** Start (month/year): Sep 1997 End (month/year, or ongoing):
- 6. **Project status:** Data collection  Analysis  Write-up  Publication

7. **Project objectives:** (briefly describe the primary objectives of your project)

The objectives of this study were to delineate goat and sheep range in the southeastern portion of the Prophet River Territory in northeastern British Columbia, and to identify characteristics of the habitat and terrain features used by these ungulates.

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

- |  |  |   |
|--|--|---|
| Research <input type="checkbox"/>              | Habitat Use: <input checked="" type="checkbox"/> | Forestry Interactions: <input checked="" type="checkbox"/>  |
| Management <input checked="" type="checkbox"/> | VHF collars: <input type="checkbox"/>            | Oil & Gas Interactions: <input checked="" type="checkbox"/> |
| Inventory <input checked="" type="checkbox"/>  | GPS collars: <input type="checkbox"/>            | Mineral Exploration: <input type="checkbox"/>               |
| Predation: <input type="checkbox"/>            | Harvest: <input type="checkbox"/>                | Aerial Disturbance: <input type="checkbox"/>                |
| Habitat Modeling: <input type="checkbox"/>     | Population Dynamics: <input type="checkbox"/>    | Human Disturbance: <input type="checkbox"/>                 |

Other:

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

Relatively isolated populations of mountain goats (*Oreamnos americanus*) and Stone's sheep (*Ovis dalli stonei*) inhabit the cliffs along the forested lower sections of the Buckinghorse and Sikanni Chief rivers and the Boat Creek drainage in northeastern British Columbia. Aerial and ground surveys were conducted in late September 1997 to delineate goat and sheep range in this portion of the Prophet River Territory, and to identify characteristics of the habitat and terrain features used by these ungulates. The areas were surveyed for 5.3 hours using a Super Cub, 0.6 hours using a Cessna 206, and 0.4 hours using an A-star helicopter. One day was spent on the ground at each of five locations, accessed by helicopter. A minimum of 90 mountain goats and two Stone's sheep were observed during the study, mostly along lower portions of the Buckinghorse and Sikanni Chief rivers. Most goats were observed on southeast to west facing slopes on cliffs/banks, vegetated

benches within the cliff complex, or in the immediately adjacent timber above the cliffs. Pellet transects in the mature coniferous forests back from the cliff top suggest limited foraging or bedding activity beyond 50 m from the cliff. Trails used by goats were observed through the mature timber connecting adjacent cliff complexes. Commercial-grade mature timber was found immediately above most cliffs containing animals or tracks. Goats were observed in mature forests dominated by trembling aspen (*Populus tremuloides*) and lodgepole pine (*Pinus contorta*) in the Boat Creek area and by white spruce (*Picea glauca*) and black spruce (*Picea mariana*) in the Buckinghorse/Sikanni area. Mature aspen and pine stands dominated forests directly above the cliffs in the Boat Creek area, and in the Buckinghorse/Sikanni area black spruce-dominated forests were most often found above cliffs, followed by white spruce and pine-dominated forests. These unique populations of ungulates are potentially vulnerable to habitat disturbance and harvesting because of the limited escape terrain and ease of access within each section of habitat. Management recommendations include restrictions on hunting and resource development activities in the vicinity of the cliffs. Further research should be directed at delineating seasonal habitat use and movements through aerial surveys and/or use of radio-collaring.

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

Poole, K.G., and D.A. Fear. 1998. Mountain goats and Stone's sheep in the Buckinghorse, Sikanni Chief and Boat drainages, Prophet River Territory. Prophet River Wildlife Inventory Report No. 3. Unpublished report for the Prophet River Indian Band, Fort Nelson.

**Project Title: NABESCHE RIVER MOUNTAIN GOATS AND MINERAL LICKS, NORTH-EASTERN BC**

- 1. **Project Leader(s):** Mari Wood
- 2. **Project Team Members:** Mari Wood (John Elliott, via proposal to PFWWCP)
- 3. **Project contact information:** Phone: 2505654191 Fax: 2505656629  
Email: mari.wood@gov.bc.ca Web page: <http://www.bchydro.com/pwcp/>
- 4. **Project location:** Nabesche River drainage, north Peace Arm Williston Reservoir, north-eastern BC  
Coastal:  Transition:  Interior:
- 5. **Project timeframe:** Start (month/year): July 1998 End (month/year): Ongoing
- 6. **Project status:** Data collection  Analysis  Write-up  Publication
- 7. **Project objectives:** (briefly describe the primary objectives of your project)
  - To expand the current range and population size of mountain goats in the Nabesche River drainage through the establishment of artificial mineral licks.

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

- |  |  |  |
|--|--|--|
| Research <input checked="" type="checkbox"/>   | Habitat Use: <input checked="" type="checkbox"/>         | Forestry Interactions: <input type="checkbox"/>  |
| Management <input checked="" type="checkbox"/> | VHF collars: <input type="checkbox"/>                    | Oil & Gas Interactions: <input type="checkbox"/> |
| Inventory <input checked="" type="checkbox"/>  | GPS collars: <input type="checkbox"/>                    | Mineral Exploration: <input type="checkbox"/>    |
| Predation: <input type="checkbox"/>            | Harvest: <input type="checkbox"/>                        | Aerial Disturbance: <input type="checkbox"/>     |
| Habitat Modeling: <input type="checkbox"/>     | Population Dynamics: <input checked="" type="checkbox"/> | Human Disturbance: <input type="checkbox"/>      |
- Other:

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

Mountain goats are known for their strong mineral demands during the summer months which can be a primary factor in their distribution. Goats in the Nabesche River drainage are primarily restricted to the Mt. Brewster range which has a low-elevation mineral lick at its south end. An aerial inventory in July 1998 confirmed the lack of goats in mountainous areas surrounding Mt. Brewster, and the lack of visible low-elevation clay-bank mineral licks similar to that at Mt. Brewster. It was thought that the lack of mountain goats in these surrounding areas was potentially due to a lack of natural mineral licks in those areas, and that artificial mineral licks should be established in an attempt to expand the current range of goats into these surrounding areas (WLAP, Ft. St. John).

Fifteen 50-lb. sodium chloride blocks were placed out at each of 10 treatment sites, and 3 blocks at each of 3 control sites in August 1999. The control sites were established on Mt. Brewster to ensure

goats would utilize this particular form of salt. Use of the treatment and control sites was evaluated in August 2001: high use of the control sites was noted and no to low use of the treatment sites. Eight of the 10 treatment sites were replenished with 25 salt blocks/site in May 2003; the remaining 2 sites were not re-supplied. The sites were re-assessed for use by goats in September 2003, with no to low use observed again. All goats sighted during a helicopter inventory of the Nabesche River drainage in Sep 2003 were located on Mt. Brewster; no goats were observed in the salt block treatment areas. Plans are to replenish the 8 treatments sites again in spring 2005 and 2007, with a final population survey to occur in summer 2008. If goats are found to have colonized the treatment site areas, more permanent solutions to creation of a mineral lick will be investigated (e.g. blasting to expose a known mineral vein).

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

Wood, M.D. 2002. Summer inventory of mountain goats and Stone's sheep in the Nabesche River drainage, north-eastern British Columbia, 1998. Peace/Williston Fish and Wildlife Compensation Program Report No. 265. 14pp plus appendices.