Peace Region
Aerial Surveys
March 2004

Gathto Creek (Photo by Graham Suther)

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ABSTRACT

This report summarizes the results of aerial surveys conducted within the Peace Region by Ecosystem staff from the Ministry of Water, Land and Air Protection (MWLAP). To complete a late-winter reconnaissance-level wildlife inventory and habitat assessment, 77 areas of interest were identified for survey in the Peace and Fort Nelson Forest Districts (FD). Overview flights were completed during 6 days in late March 2004 within 27 draft and 31 potential Ungulate Winter Ranges (UWRs), 8 existing Wildlife Habitat Areas (WHAs), 6 sites identified by the Oil and Gas Commission for future Coalbed Methane (CBM) exploration, and 5 additional areas of interest. Animal sightings, evidence of use by wildlife, and associated habitat descriptions and conditions were recorded for each area of interest.

A total distance of 3,621 km was searched over approximately 31 survey hours in the 2004 aerial survey. A total of 6,481 ungulates, 10 canids including wolves (*Canis lupus*) and coyotes (*Canis latrans*) and 101 other incidental sightings (primarily horses) were noted during the 6 survey routes. Overall ungulate counts per species ranged from 5 bighorn sheep (*Ovis canadensis*) to 4,703 elk (*Cervus elaphus*). The total number of animals observed along each survey route ranged from 18 on March 24 (Day 4) to 3,191 on March 25 (Day 6). No animals were observed within 30 areas of interest.

Based on the results of these surveys, recommendations for UWR habitat enhancement and boundary adjustments were made. Areas suitable for future UWR proposals were also noted. Wildlife management considerations and other recommendations were provided for the CBM interest areas.

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ACKNOWLEGMENTS

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Thanks are due to Graham Suther, Pierre Johnstone and Nick Baccante (MWLAP) for assisting with these surveys in the field. Nicola Freeman (BC Conservation Foundation, Williams Lake) and Jason Kubian (Data Technician – MWLAP) assisted with programming and downloading data from the GPS unit. Rod Backmeyer identified a number of areas to include in the surveys and provided helpful suggestions regarding flight routes. Graham Suther compiled photos for inclusion in this report. Devin Scheck (Oil and Gas Commission, Fort St. John) supplied information on the location of Coalbed Methane interest areas. Special thanks to Nick Baccante and Pierre Johnstone for their assistance with the mapping requirements of this project and to Nick Baccante, Graham Suther and Rod Backmeyer for providing editorial comments on the report.

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1.0 INTRODUCTION

Background:

In British Columbia (BC), species at risk[1] are afforded special protection under the *Forest and Range Practices Act* (FRPA). Various protective mechanisms, such as Wildlife Habitat Areas (WHAs) or Ungulate Winter Ranges (UWRs, can be established for these species to protect areas of critical or limiting habitat on provincial crown land. Within such areas, objectives are set or general wildlife measures are applied to direct industrial practices (e.g. forestry and range activities) and to ensure that habitat integrity and function are maintained. Support for the establishment of WHAs and UWRs has become a very high priority in the Peace Region.

A number of draft UWRs have been identified for elk (*Cervus elaphus*) and bighorn sheep (*Ovis canadensis*) in the Peace Region. An inventory and habitat evaluation of these areas would provide further support for these proposals. In addition, several areas have been identified as potential UWRs for one or more species, including elk, mountain goat (*Oreamnos americanus*), Stone's sheep (Ovis dalli *stonei*), moose (*Alces alces*), mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), and caribou (*Rangifer tarandus*). These areas require surveys to confirm their suitability prior to engaging in formal UWR proposals.

A number of WHAs have been approved in the Peace Region. Monitoring habitat conditions and wildlife use of these areas would provide useful information to determine the effectiveness of WHAs in protecting critical habitat for species at risk.

Industrial pressures, primarily from activities associated with mineral and petroleum exploration and development, are increasing in the Peace Region. Recently, a number of areas have been identified by the Oil and Gas Commission for future Coalbed Methane (CBM) exploration and development (D. Scheck, *pers. comm*.). Such developments make identification and protection of critical wildlife habitats of utmost importance. There is a need for wildlife inventory and habitat assessments within these CBM interest areas prior to the initiation of this program.

This study:

Aerial surveys are an efficient method of traveling to widespread and/or remote geographic areas and may be the only practicable method for systematically covering large tracts to survey wildlife and their habitat. Depending on ground

[1] Species at risk include both blue-listed and red-listed species. The blue-list includes any indigenous species, subspecies or community considered to be *vulnerable* (special concern) in British Columbia. Blue-listed elements are at risk, but are not *extirpated*, *endangered*, or *threatened* (CDC 2003). The red-list includes any indigenous species, subspecies or community considered to be *endangered* or *threatened* in British Columbia. Species at risk are of special concern because of characteristics that make them particularly sensitive to human activities or natural events (CDC 2003).

conditions, the visibility of ungulates and other wildlife can be markedly improved during aerial surveys compared to ground-based observations. In conjunction with wildlife counts, habitat assessments can be conducted efficiently and effectively from the air.

In order to evaluate habitat and record wildlife occurrences within draft and potential Ungulate Winter Ranges (UWRs), existing Wildlife Habitat Areas (WHAs), sites targeted by the Oil and Gas Commission for future Coalbed Methane (CBM) exploration, and other areas of interest, MWLAP Ecosystem staff conducted an aerial survey within the Peace and Fort Nelson Forest Districts over a six-day period in March 2004. This report summarizes the results of these flights. The primary objectives of this aerial survey were:

- To complete a late-winter reconnaissance-level inventory and habitat assessment and document wildlife occurrences and habitat conditions within areas of interest;
- To use this information to support UWR proposals to manage and protect critical areas from potential disturbances or impacts due to human activities;
- To use this information to guide future establishment of UWRs or WHAs in new areas, as appropriate;
- To improve the existing knowledge base and help to ensure successful conservation and management of critical, limiting habitat used by wintering ungulates;
- To identify potential habitat enhancement opportunities to increase the ability of winter ranges to support ungulates;
- To complete a reconnaissance of CBM interest areas and document wildlife occurrences and habitat values;
- To provide management recommendations specific to the CBM interest areas.

2.0 METHODS

2.1 Survey Areas

Survey areas included riparian and forested habitats, river valleys and canyons, lower and mid-elevation slopes, and high-elevation alpine habitats within the Boreal White and Black Spruce (BWBS), Sub-boreal Spruce (SBS), Engelmann spruce – Sub-alpine fir (ESSF) and Alpine Tundra (AT) biogeoclimatic zones (Table 1). Meidinger and Pojar (1991) outline the location, distribution and ecological conditions of these biogeoclimatic zones, including descriptions of their climate, topography, and associated vegetation communities.

To complete a late-winter reconnaissance-level inventory and habitat assessment, six survey routes and 77 areas of interest were identified in the Peace and Fort Nelson Forest Districts (FD) (Table 1, Figure 1). Areas of interest included draft or potential UWRs, a subset of existing WHAs, sites targeted by the Oil and Gas Commission for future Coalbed Methane (CBM) exploration, and other miscellaneous locations.

Table 1. The number of areas of interest and BEC zones, subzones, and variants encountered along six survey routes during the 2004 aerial survey.

Survey Route[1]			Areas of Interest[1]	BEC[2]
Label	Date (2004)	Distance (km)		
Day 1	March 17	232	13	BWBSmw1, BWBSwk1; ESSFmv2; AT
Day 2	March 18	650	14	BWBSmw1; BWBSwk1
Day 3	March 19	823	17	BWBSmw1; BWBSwk1; BWBSwk2; SBSmk; ESSFmv2; ESSFmv4; ESSFmvp; AT
Day 4	March 23	487	4	BWBSmw1, BWBSwk1, SBSwk2, ESSFmv2, ESSFmvp, AT
Day 5	March 24	847	14	BWBSmw2, BWBSwk2,SWBmk, SWBmks, AT
Day 6	March 25	582	6	BWBSmw2, BWBSwk3, SWBMK, AT

[1]see below for a detailed description of the survey routes and areas of interest
[2]Biogeoclimatic Ecosystem Classification Zones, Subzones, and Variants

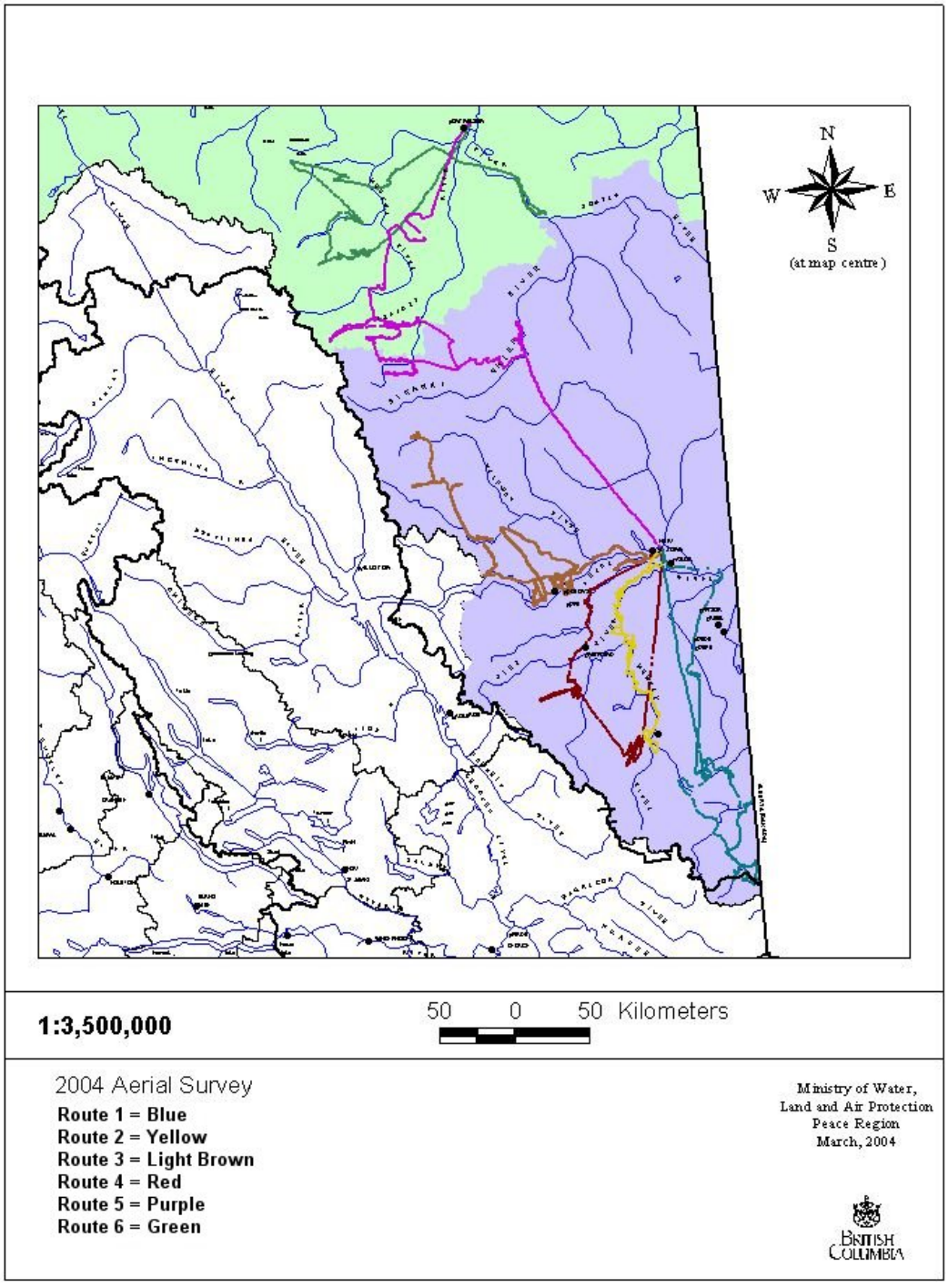

Figure 1. Overview map of the six routes covered in the 2004 aerial survey.

Draft and Potential Ungulate Winter Ranges (UWRs)

Twenty-seven draft and 31 potential UWR areas were identified for inventory and habitat evaluations. Draft UWRs included 24 elk and 4 bighorn sheep areas. Potential sites were selected based on existing records showing prior occupancy by ungulates, apparent habitat suitability (e.g. habitat enhancement areas), and recommendations from regional Wildlife Biologists (R. Backmeyer, *pers. comm.*). Conservation Data Center (CDC) element occurrence data and anecdotal sighting information from the Peace Region were also compiled to identify search areas and focus survey efforts.

Habitat types searched in the survey were specific to the ungulate species of interest, and included:

- low-elevation, riparian areas and river floodplains (e.g. moose, bison (*Bison bison*);
- open, warm (south-facing) aspects along river breaks or valleys, often within areas that had been previously burned (e.g. elk, mule deer);
- open, wind-swept, warm-aspect vegetated slopes and ridges (e.g. elk, caribou);
- rocky, wind-swept slopes adjacent to steep escape terrain (e.g. Stone's sheep);
- steep river canyons with extensive cliff complexes and adjacent conifer stands (e.g. mountain goats);
- high-elevation alpine ridges and mountains, with steep rugged terrain, rocky outcrops, and cliffs (e.g. bighorn sheep, mountain goats).

Areas with colder aspects (e.g. north-facing slopes) were generally avoided during the flights. Most of the survey effort was spent searching within elk winter ranges.

Existing Wildlife Habitat Areas (WHAs)

Eight existing WHAs were identified for assessment during the 2004 aerial survey. Specific WHA identifying tags or locations are not provided in this report due to the sensitivity of the information.

Coalbed Methane (CBM) Areas

Six CBM interest areas were identified in Oil and Gas Commission application/approval documents (D. Scheck, *pers. comm*.). Approximate locations of these CBM areas are shown in Figure 2 and summarized in Table 2. The *Wapiti / Red Deer*, *South Grizzly*, *Wolverine* / *Bullmoose*, and *Sukunka* / *Highhat* CBM areas all appear to follow the same coalfield seam bed.

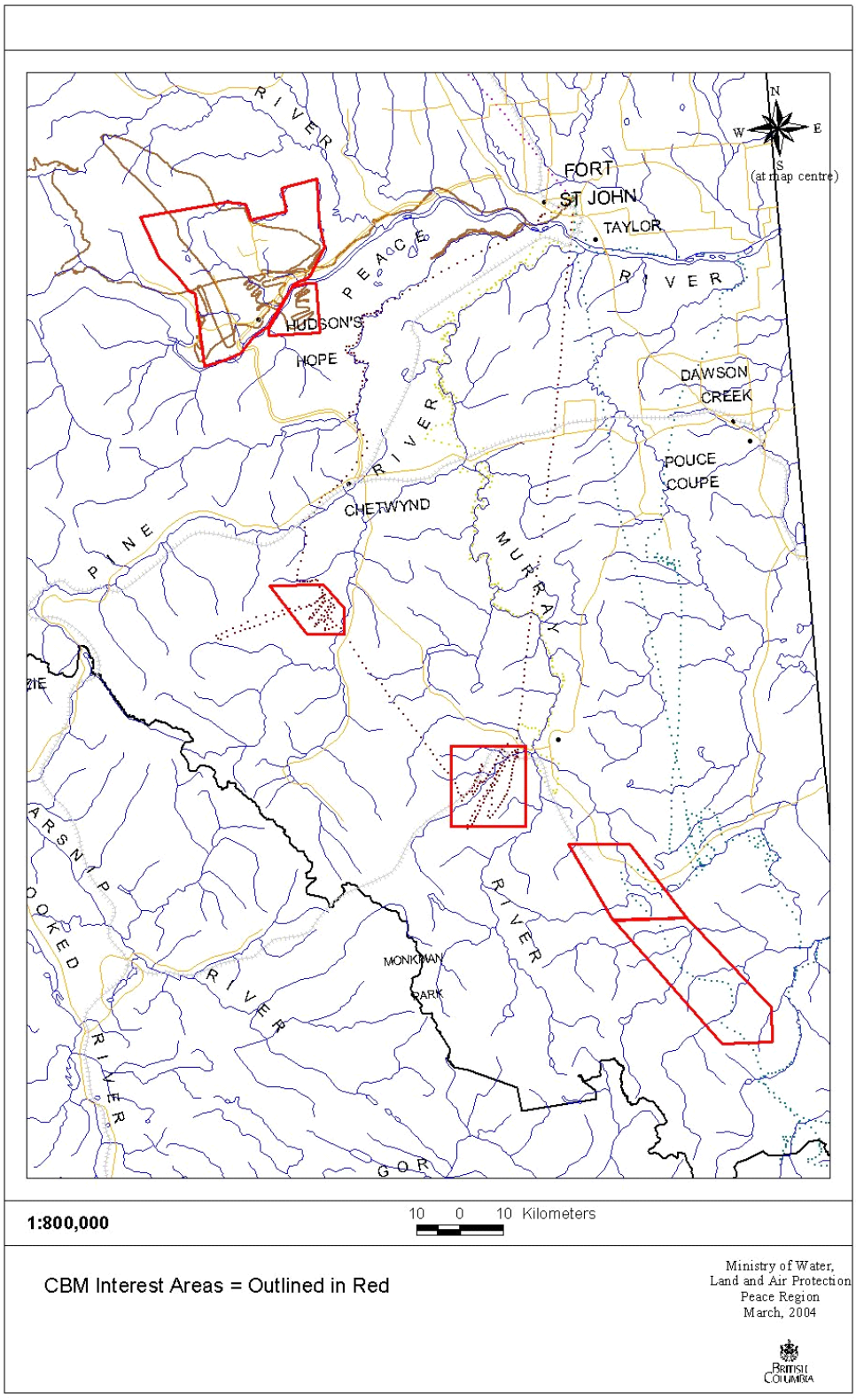

Figure 2. Overview map showing the approximate location of six CBM interest areas assessed during the 2004 aerial survey.

Table 2. Location, topography and BEC zones within the six CBM areas included in the 2004 aerial survey.

CBM Area	General Area	Approximate Bounds / Location	Topography	BEC[1]
Wapitii / Red Deer	➢ Southeast portion of the Peace Region	➢ Holtslander Creek in the southeast ➢ Fearless Creek in the northwest	➢ relatively flat ➢ generally increasing relief to the south and southwest	➢ BWBSmw1, wk1 ➢ ESSFmv2, mvp ➢ ATun
South Grizzly	➢ Southeast portion of the Peace Region	➢ Fearless Creek in the south ➢ Heritage Highway in the north and east ➢ Quintette Mountain in the west	➢ relatively flat ➢ generally increasing relief to the south and west	➢ BWBSmw1, wk1 ➢ SBSwk2 ➢ ESSFmv2, mvp ➢ ATun
Wolverine / Bullmoose	➢ Southwest of Tumbler Ridge	➢ within the Wolverine River watershed ➢ within Canfor Chetwynd's Tree Farm License (TFL)	➢ relatively flat within the floodplain ➢ generally increasing relief on both sides of the river ➢ height of land in southern portion	➢ BWBSmw1, wk1 ➢ SBSwk2 ➢ ESSFmv2, mvp ➢ ATun
Sukunka / Highhat	➢ South of Chetwynd	➢ Highway 97 in the north ➢ Hasler Creek in the west ➢ Sukunka River in the east ➢ Blind Creek in the south ➢ Within Canfor Chetwynd's TFL	➢ flat to rolling ➢ small mountains occurring (e.g. Highhat Mtn.)	➢ BWBSmw1 ➢ SBSwk2 ➢ ESSFmv2
Hudson's Hope CBM #1 *Hudson's Hope* CBM #2	➢ Vicinity of Hudson's Hope ➢ CBM #1: south of Peace River ➢ CBM #2: north of Peace River	CBM #1 ➢ Farrell Creek in the east ➢ Lynx Creek in the west CBM #1 ➢ Farrell Creek in the north and east ➢ Butler Ridge in the west ➢ Peace River in the south	➢ relatively flat ➢ generally increasing relief to the west and north	CBM #1 ➢ BWBSmw1 CBM #2 ➢ BWBSmw1, wk2 ➢ ESSFmv4

[1]Biogeoclimatic Ecosystem Classification Zones, Subzones, and Variants

Additional Areas:

Five additional areas of interest were identified for evaluation in the field, including proposed burn areas and caribou habitat, (R. Backmeyer, *pers. comm*.), moose habitats (A. Ackerman, *pers. comm*.), proposed National Energy Board sites (P. Johnstone, *pers. comm*.), and other recent industrial developments (G. Suther, *pers. comm*.).

2.2 Flight Routes

Six flight routes were selected to maximize coverage of areas of interest, minimize total flight time, and take advantage of the location of fuel caches (Figure 1). Prior to the surveys, overview (1:400K) and detailed (1:20K to 1:100K) field maps and route descriptions were prepared for each flight path. Mapped features included topography (contours and/or hillshade images), water, transportation, private property, historical burn areas (e.g. prescribed burns for habitat enhancement), parks and protected areas, and MWLAP regional boundaries. Digitized polygons of areas of interest (e.g. draft UWRs and existing WHAs) were included, where available. CBM and miscellaneous areas of interest were identified on field maps for assessment during the flights. Grid graticules and Universal Transverse Mercator (UTM) waypoints that identified the start and end of search areas were added to the maps to aid in navigation. Prior to each flight, these waypoints were provided to the pilot for entering into the aircraft's onboard Global Positioning System (GPS) unit to ensure that each area was located and searched with minimal time expenditure.

Additional areas of suitable habitat were opportunistically surveyed during the route as time and budget/fuel constraints allowed.

2.3 Data Collection

An *Ungulate Winter Range Aerial Survey Spreadsheet* was developed for the aerial survey and included fields for recording wildlife sightings and habitat information. Seven variables were identified for collection within each of the areas of interest, including:

- General Location;
- Site Name – e.g. the draft UWR polygon number or WHA tag;
- Flight path – in UTM coordinates (NAD 83, Zone 10);
- Start and end time of search;
- Habitat description and condition – such as the amount and type of forest cover, the extent and quality of escape terrain, thermal and security cover, and foraging opportunities;
- Evidence of use – including the presence and location of animal tracks, browse, cratering, bedding depressions, and other signs;
- Additional comments – including opportunities for habitat enhancement.

For each wildlife sighting, the following information was recorded:

- Species;
- Number of animals (classified by gender, adults/young, if possible);
- Location – position in UTM coordinates (NAD 83, Zone 10);
- Time of sighting;
- Activity/behaviour of animals, including response to aircraft;
- Associated habitat features.

Photographs of habitat, evidence of use, and wildlife were taken opportunistically during the flights.

During each survey, the start and end times to complete a search area and flight path were automatically recorded using a hand-held GPS unit (Trimble, GeoExplorer 3) programmed to continually monitor the aircraft's position every 30 seconds[2]. The location and time of wildlife sightings were recorded in the GPS unit by manually entering a sequence upon encountering individuals along the flight route. The remaining information was noted on the field forms by the data recorder attending each flight.

2.4 Survey Timing

Optimal survey times are species-specific and depend on local and annual winter conditions, but in general, range from January to February (Stone's sheep, moose, deer) and extend through March (Bison, elk, caribou) (RISC 2002). The timing of this survey was limited by funding constraints; surveys began after receipt of funding was confirmed and ended just prior to the close of the 2003_04 fiscal year.

Surveys were scheduled, as much as was feasible within the limited time available, to avoid interfering with other ongoing studies. To minimize excessive disturbance to overwintering ungulates, certain sites were avoided altogether if other flights had recently been conducted within the areas.

2.5 Aerial Surveys

Methods employed during the aerial surveys were consistent with the Resource Inventory Standards Committee *Aerial-based Inventory Methods for Selected Ungulates: Bison, Mountain Goat, Mountain Sheep, Moose, Elk, Deer and Caribou,* Standards for Components of British Columbia's Biodiversity No. 32 (RISC 2002) and guidelines outlined in the *Best Management Practices for Aircraft Operations / Wildlife in NE BC* (MWLAP *draft*, 2004).

The RISC (2002) document highlights several factors to consider when surveying ungulates, including:

[2] Although not done here, the aircraft height above ground and speed can be calculated from this information.

- *Timing of visits*: Surveys conducted during sensitive times can increase the probability of adverse effects to wildlife. Due to the use of helicopters to complete this work, the aerial survey has the potential to cause disturbance to ungulates during a critical and energetically stressful period;
- *Detectability*: The atmospheric, light and weather conditions, altitude flown, time of day, ground conditions (e.g. snow cover versus bare ground), and habitat conditions (e.g. forested versus open areas) can affect the detectability of wildlife and their sign. These factors can lead to biased results if surveys are conducted under unfavorable conditions. Observers can differ in their skill in locating or sighting animals, a factor that needs to be considered when scheduling surveys. Observer fatigue during lengthy flights can also result in missed animals.

The following protocols were adhered to during the aerial survey of 2004 in the Peace Region:

- Every effort was made to minimize impacts to wildlife. Prolonged or low-level helicopter work in the vicinity of wildlife was avoided. The amount of time spent hovering near animals was limited and occurred just long enough to document habitat conditions and count individuals. If animals appeared stressed or started to flee, observers left the area immediately;
- Within the time available, surveys were conducted as much as possible during optimal weather conditions (e.g. clear cold weather);
- The total flight time during aerial monitoring was limited to reduce observer fatigue;
- At a minimum, the same two trained observers were used on all flight routes; additional trained observers attended a subset of the 6 flights.

An A-star helicopter was used for all flights to increase manoeuvrability and power and decrease transit time, ensuring safer, more reliable access into high-elevation, mountainous terrain. Draft UWRs and existing WHAs were searched by following pre-determined routes aligned with the slope or other land features (e.g. tops of river breaks); CBM and miscellaneous areas of interest were systematically searched by flying parallel transects approximately 200 m apart and aligned with contours or other land features (e.g. riparian corridors). Aircraft speed within search polygons ranged from 40 – 70 knots; the height above ground ranged from 400 to 600 m. Forests were also searched briefly and opportunistically while *en route* to the search areas.

Three to four passengers attended each flight, functioning as observers during the entire flight route. Observers searched for wildlife and evaluated habitat from both sides of the aircraft. In addition, the navigator (in the front seat) recorded details on field maps and directed the pilot along the flight route and within search areas. The data recorder documented wildlife sightings, sign, and habitat features (e.g. large stick nests, mineral licks) and recorded their UTM positions. The third and sometimes fourth observer(s) were present to assist in searching areas, counting animals, and photographing sites.

2.6 Data Compilation

Information from field forms was entered into Excel spreadsheets. For each survey, rover files containing records of the flight route were downloaded from the GPS unit to spreadsheets using the *GPS Pathfinder Office 2.0* program. Information from field forms was added to these spreadsheets and the files were converted into shapefiles for display on maps. Locations of wildlife sightings were uniquely identified by species on detailed route maps (MLWAP regional files).

3.0 RESULTS

A total of 6,482 ungulates, 10 canids including wolves (*Canis lupus*), and coyotes (*Canis latrans*), and 101 other incidental sightings (primarily horses) were noted during 6 routes in the 2004 aerial survey (Tables 3 and 4). Overall ungulate counts per species ranged from 5 bighorn sheep to 4,703 elk (Table 3). The total number of animals observed along each survey route ranged from eighteen on Day 4 to 3,191 on Day 6 (Table 4). A total of 3,621 km was flown over approximately 31 survey hours, including an inventory and habitat evaluation of 27 draft UWRs, 31 potential UWRs, 8 existing WHAs, 6 CBM areas and 5 miscellaneous sites (Table 4). No animals were observed within 30 areas of interest (Table 5).

A subset of photographs taken at CBM areas and a number of other sites are presented in Appendix 1 (additional photographs are available from MWLAP). Any habitat descriptions recorded during the flights are summarized in the sections below.

Table 3. Number of animals (by species) sighted during each flight route in the 2004 aerial survey.

Observation		Number of sightings during each flight						Total (per species)
Species	**Code**	**Day 1**	**Day 2**	**Day 3**	**Day 4**	**Day 5**	**Day 6**	
Moose	ALAL	10	15	115	5	40	46	**231**
Mule Deer	ODHE	140	11	492	--	--	--	**643**
White-tailed Deer	ODVI	--	--	12	--	--	--	**12**
Elk	CEEL	--	240	542	--	936	2,985	**4,703**
Stone's sheep	OVDS	--	--	--	--	84	62	**146**
Bighorn Sheep	OVCA	5	--	--	--	--	--	**5**
Mountain goat	ORAM	1	--	--	12	53	--	**66**
Caribou	RATA	--	--	13	--	--	--	**13**
Bison	BIBI	--	--	663	--	--	--	**663**
Wolf	CALU	--	--	--	--	--	2	**2**
Coyote	CALA	--	--	7	--	1	--	**8**
Other[1]	--	1	--	2	1	1	96	**101**
Total (per day)		**157**	**266**	**1,846**	**18**	**1,115**	**3,191**	**6,593**

[1]includes raptors and horses.

Table 4. Number of animals (by species) sighted within each area of interest in the 2004 aerial survey.

Route	General Area	Primary Purpose	Number of Animals Observed												Total
			ALAL	ODHE	ODVI	CEEL	OVDS	OVCA	ORAM	RATA	BIBI	CALU	CALA	OTHER	
Day 1	Peace River	Potential UWR	1	140											141
	Halfmoon Creek	Potential UWR	4												4
	Thunder Creek / Red Willow	Reconnaissance (RATA)	2											1	3
	Belcourt Creek	Potential UWR							1						1
	Nekik Mountain	Draft OVCA UWR						5							5
	En route		3												3
Day 2	Pine River	Draft CEEL UWR (025)	2	3		32									37
	Pine River	Draft CEEL UWR (002)				3									3
	Pine River	Draft CEEL UWR (003)		4		7									11
	Pine River	Draft CEEL UWR (004)	2			25									27
	Pine River	Draft CEEL UWR (005)	2			140									142
	Pine River	Draft CEEL UWR (007)		1											1
	Pine River	Draft CEEL UWR (009)	3	3		9									15
	Coldstream Creek / Murray River	Draft CEEL UWR (015)				13									13
	Murray River	Draft CEEL UWR (050)	1												1
	Murray River	Draft CEEL UWR (017)				1									1
	Murray River	Draft CEEL UWR (022)	1			4									5
	En route		4			6									10
Day 3	Moberly River	Draft CEEL UWR (001)	4	17		80									101
	Peace R. (Grand Haven, Wilder Creek)	Potential UWR	3	131		41							1		176
	Peace River (Bear Flat area)	Potential UWR	5	158	4	37									204
	Peace River (Halfway River area)	Potential UWR	12	46											58
	Peace River (to Farrell Creek)	Potential UWR	2	12											14
	Farrell Creek	Burn area, potential UWR	7	31		19									57
	Lynx & Farrell Creek, S of Peace	*Hudson's Hope* CBM Area #1	3	15	3	1									22
	Farrell, Lynx, Brenot Creeks, Beryl Prairie, Hudson's Hope area	*Hudson's Hope* CBM Area #2	57	81	5	33							6		182
	Lynx & Brenot Creek confluence	Reconnaissance (CBM / forestry)	11			7									18
	Dunlevy Area	Potential UWR				208									208
	Aylard Ridge	Potential UWR								13					13
	Graham River	Burn areas, potential UWR				2									2
	Chowade River	Burn areas, potential UWR	11			108								2	121
	Halfway River	Burn areas, potential UWR									663				663
	En route			1		6									7

Table 4. (continued)

Route	General Area	Primary Purpose	Number of Animals Observed												Total
			ALAL	ODHE	ODVI	CEEL	OVDS	OVCA	ORAM	RATA	BIBI	CALU	CALA	OTHER	
Day 4	Wolverine River, Wolverine Mine Site, Perry Creek, Two Creek, Bullmoose	*Wolverine / Bullmoose* CBM area	3						12					1	16
	Highhat Mountain, Bluff Creek, Highhat River	*Sukunka / Highhat* CBM area	2												2
Day 5	Sikanni Chief River	Potential UWR							13						13
	Buckinghorse River	Potential UWR							12						12
	Buckinghorse River	Existing WHA							7						7
	Buckinghorse River	Existing WHA							8						8
	Buckinghorse River	Existing WHA							6						6
	Nevis Creek	Potential UWR	18			2	30								50
	Besa River	Burn areas, potential UWR	4			149	3						1	1	158
	Richard's Creek	Burn areas, potential UWR				154	4		5						163
	Prophet River	Burn areas, potential UWR	8			416	47								471
	Muskwa River	Burn areas, potential UWR				126			2						128
	En route		10			89									99
Day 6	Gathto Creek and tributaries	Burn areas, potential UWR	19			2,154	62					2		77	2,314
	Tuchodi River	Burn areas, potential UWR				780								14	794
	Dead Dog Creek	Burn areas, potential UWR				26								5	31
	Chischa River	Burn areas, potential UWR				24									24
	Fort Nelson River	Reconnaissance (ALAL)	24			1									25
	En route		3												3

[1]CEEL draft UWRs are within the U-9-001 series; OVCA draft UWRs are within the U-9-002 series.

Table 5. Areas of interest without animal sightings during the 2004 aerial survey.

Route	General Area	Primary Purpose[1]
Day 1	Kiskatinaw River	Potential UWR
	Old Wives Mountain	Draft UWR
	Mistanusk Creek	Existing WHA
	Belcourt Creek	Existing WHA Draft CEEL UWR (048)
	Torrens Ridge	Draft OVCA UWR
	Dinosaur Ridge	Draft OVCA UWR
	Saxon Ridge	Draft OVCA UWR
	Red Deer / Grizzly S / Flatbed Creek	*S Grizzly* CBM area *Wapiti / Red Deer* CBM area
Day 2	Pine River	Draft CEEL UWR (006) Draft CEEL UWR (008) Draft CEEL UWR (010)
	Coldstream Creek / Murray River	Draft CEEL UWR (016)
	Murray River	Draft CEEL UWR (049) Draft CEEL UWR (018) Draft CEEL UWR (019) Draft CEEL UWR (020) Draft CEEL UWR (021) Draft CEEL UWR (023)
Day 3	Portage Mountain	Potential UWR
	Bullhead Mountain	Potential UWR
Day 4	Chetwynd area, NW of Hwy 97	Potential UWR (TSR II)
	Moberly River	Reconnaissance (ALAL)
Day 5	Sikanni Chief River	Existing WHA
	Buckinghorse River	Existing WHA #1 Existing WHA #2
	Borrett Creek	Burn areas, potential UWR
	Tenaka Creek	Burn areas, potential UWR
Day 6	Akue Creek	Reconnaissance (forestry activity)

[1]draft UWRs within the U-9-001 series (CEEL) and U-9-002 series (OVCA).

3.1 Habitat Assessments – Day 1

Background Information:	
General Route Description	Fort St. John → Peace River → Kiskatinaw River → Halfmoon Creek → Thunder Creek / Red Willow area → Mistanusk Creek → Belcourt Creek → Nekik Mountain → Torrens Ridge → Dinasaur Ridge → Saxon Ridge → *Wapiti* / *Red Deer* CBM area → *S Grizzly* CBM area → Fort St. John
Forest District(s)	Peace Forest District
BGC	BWBSmw1, BWBSwk1; ESSFmv2; AT
Date	March 17, 2004
Weather	-2°C, overcast, light snow
Number of Observers	2 plus one observer/data recorder
Flight Duration	0845 - 1445
Total Animals Observed	157
Areas of interest:	**Comments:**
Peace River breaks	Habitat consists of gentle to steep warm-aspect slopes, generally open foraging areas mid-slope to forested (primarily deciduous) in drainages and along lower slopes and upper benches. Abundant mule deer present on open slopes, a number bedded at the top of the river breaks.
Halfmoon Creek	Habitat is comprised of small-diameter forested stands, with a minimal understory. South facing slopes have been burned for ungulate winter range enhancement.
Thunder Creek / Red Willow	Numerous old tracks, significant areas of more recent tracks, possible cratering (difficult to distinguish from melting snow patches), no caribou sighted. Extensive riparian meadow complexes in area.
Old Wives Mountain	Trees are getting tall within the old burn polygon, some nice open slopes, extensive high capability habitat.
Belcourt Creek	Mature coniferous forests proximal to large cliff complexes appear to provide excellent thermal and security cover for canyon goats. In response to the helicopter's presence, one individual ORAM was observed moving from the escape terrain into the forested habitat above the cliff complex. The area was vacated immediately.
Nekik Mountain	Good trails along west side, 5 rams observed on east site on ridge near steep talus slope, with scattered coniferous trees. Extensive areas of wind-swept, bare ground.
Torrens Ridge	South-facing, warm aspect, wind-swept slopes within Kakwa park appear to provide excellent foraging opportunities for bighorn sheep, many scattered rocky

	outcrops and steep rock faces provide adjacent escape terrain. Several trails are present. However, no trails were observed on the north side of Torrens Ridge and the snow depth was excessively deep.
Dinosaur Ridge	Good, warm aspect, wind-swept slopes within some areas, extent limited by heavily forested slopes, higher-elevation open habitats and ridges provide connectivity to extensive sheep habitat in Alberta. Semi-fresh tracks present in many areas.
Saxon Ridge	Good summer range, heavily treed with limited escape terrain for bighorn sheep winter range.
Wapiti / Red Deer CBM area	Consist primarily of contiguous, lower elevation, mature pine-spruce forest with pockets of aspen (*Populus tremuloides* Michx.) and other deciduous species. In general, the majority of the interest area has experienced relatively little oil and gas exploration and development activities in comparison with oil and gas fields elsewhere in the Peace Region. Some fresh trails (likely moose) scattered throughout.
South Grizzly CBM area	The interest area appears to consist primarily of contiguous, lower elevation pine-spruce forest with pockets of deciduous forest, primarily aspen. In general, the majority of the interest area has experienced relatively little oil and gas exploration and development activities in comparison with oil and gas fields elsewhere in the Peace Region. However, some infrastructure and impacts including roads and wellsites do exist both within and adjacent to the CBM area.
Photos (Appendix 1)	Peace River, Kiskatinaw River, caribou search polygon, Old Wives Mountain burn area, Belcourt Creek canyon and burn area, south face of Dinosaur Ridge, CBM areas (x2)

3.2 Habitat Assessments – Day 2

Background Information:	
General Route Description	Fort St. John → Pine River → Colstream Creek → Murray River → Fort St. John
Forest District(s)	Peace Forest District
BGC	BWBSmw1; BWBSwk1
Date	March 18, 2004
Weather	Overcast, windy, snowing, flight was cancelled mid-way due to inclement weather and poor visibility.
Number of	3 plus one observer/data recorder

Observers	
Flight Duration	0852 - 1200
Total Animals Observed	266
Areas of Interest:	**Comments:**
Pine River / Murray River draft UWR areas	In general, habitats included brush/forested areas within the riparian corridor and lower river benches, slight to steep warm-aspect mid-slopes with open areas and scattered forested stands in patches or draws/gullies, some very steep clay banks. Specific notes: ➢ 004 – numerous trails in polygon, forest cover a spruce/aspen mixedwood, not very dense; ➢ 005 – some clay banks, very steep areas, brushy flats, numerous ungulate trails, ca. 100 elk in agricultural field adjacent to polygon, riparian with aspen leading mixedwoods, scattered spruce and balsam poplar (*Populus balsamifera ssp. balsamifera)*; ➢ 006 – chute area, some very steep sections, terrain very unstable, habitat not ideal for UWR; ➢ 007 – numerous trails along upper slope, steep unstable sloped areas from mid-slope down to river, habitat not ideal for UWR; ➢ 009 – some very steep sections, other areas with more consistent forest cover, still segments of suitable habitat. ➢ 008 – the entire polygon was not surveyed, limited open slopes in this polygon, primarily forested. ➢ 010 – no open habitat except for a small area on upper slopes, many old trails, forested habitat included mature aspen / spruce mixedwoods; ➢ 016 – numerous trails, extensively forested in segments; ➢ 015 – forested upper bench and top, elk observed standing and bedded in forest adjacent to open slopes, numerous trails along upper sloped areas, extensive forests below and above; ➢ 050 – evidence of burn along top portions, not clear if mid-slopes were burned, logged along top of break; ➢ 018 – steep open slopes with numerous trails, forested above and below openings; ➢ 019 – a series of ridges, small polygon; ➢ 020 – lots of debris on the ground, black spruce (*Picea mariana* (Mill) B.S.P.) in the area, parts that have not been burned, heavily forested, conifer riparian forests, very few open areas;

	➢ 021 – open slopes, forested above and below, numerous trails, no animals observed, forests along river primarily coniferous, and coniferous – deciduous mixedwoods; ➢ 022 – extensive forested areas, numerous trails on upper slopes, heavily treed at southern end of polygon; ➢ 023 – rocky areas, few to no trails observed, habitat improves slightly into polygon, foraging opportunities appear limited, high shrub cover.
Photos (Appendix 1)	Pine River (x2)

3.3 Habitat Assessments – Day 3

Background Information:	
General Route Description	Fort St. John → Peace River → Moberly River → Farrell Creek → Hudson's Hope CBM Area #1 → Hudson's Hope CBM Area #2→ Lynx and Brenot Creek area → Portage Mountain → Bullhead Mountain → Dunlevy Area → Aylard Ridge → Graham River → Chowade River → Halfway River → Fort St. John
Forest District(s)	Peace Forest District
BGC	BWBSmw1; BWBSwk1; BWBSwk2; SBSmk; ESSFmv2; ESSFmv4; ESSFmvp; AT
Date	March 19, 2004
Weather	Overcast, snowing, clear and sunny by mid-morning, visibility adequate for conducting survey.
Number of Observers	3 plus one observer/data recorder
Flight Duration	0913 - 1430
Total Animals Observed	1,846
Areas of interest	**Comments**
Moberly River	Patches of conifer (primarily spruce) on the floodplain and sloped areas, intermittent gullies, many ungulates observed within polygon, riparian habitat a combination of conifer and deciduous forests (aspen) with shrub/brush.
Farrell Creek	Burn area, open slopes with deciduous and coniferous forests.
Hudson's Hope CBM areas	➢ CBM #1 (south of Peace River): appears to consist primarily of contiguous forest cover with deciduous cover dominating near the Peace River and coniferous (spruce) dominating further inland, minimal open

	habitat, minimal understory. ➢ CBM #2 (north of Peace River): is comprised of a mix of cleared land for agricultural purposes, deciduous dominated stands closer to the Peace River, and several large patches of shrub dominated plant communities. Further to the north and west within this interest area, forest stands are largely coniferous dominated with small deciduous patches and small brush patches throughout. Dogwood (*Cornus* stolonifera) shrub patches appear extensively browsed by moose. Harvested areas distributed throughout the CBM area. ➢ In general, the majority of the interest area has experienced relatively little oil and gas exploration and development activities in comparison with oil and gas fields elsewhere in the Peace Region.
Lynx and Brenot Creek Confluence	Deciduous forests with brushy patches, scattered small openings.
Chowade River Burn	Relatively open, shrubby habitat, intermixed with patches of coniferous / deciduous forests, coniferous stands within gullies, open areas with minimal shrub cover, both sides of the river have been burned.
Photos (Appendix 1)	CBM #2 overview (x2), Dunlevy areas (x2), Chowade River burn, and Halfway River (bison).

3.4 Habitat Assessments – Day 4

Background Information:	
General Route Description	Fort St. John → *Wolverine* / *Bullmoose* CBM area → *Sukunka* / *Highhat* CBM area → Chetwynd → Moberly River → Fort St. John
Forest District(s)	Peace Forest District
BGC	BWBSmw1, BWBSwk1, SBSwk2, ESSFmv2, ESSFmvp, AT
Date	March 23, 2004
Weather	Sunny, clear
Number of Observers	3 plus 1 observer/data recorder
Flight Duration	1310 - 1727
Total Animals Observed	18
Areas of interest:	**Comments:**
Wolverine /	This CBM interest area has been significantly impacted by

Bullmoose CBM Area	a variety of resource users both past and present. Infrastructure and impacts on the south side of the Wolverine River within the area of interest includes roads, wellsites, hydro lines, old mine sites and associated rail lines. Anthropogenic impacts on the north side of the river are significantly greater than on the south side and include forestry cutblocks, mainline and secondary access roads, hydro lines, and mainline railway. However, even with the current level of impact within this area of the watershed, large mature forest patches persist primarily in the lower elevations on the south side of the river. Forests include extensive mature coniferous stands (pine) and areas of mature mixedwoods (lodgepole pine (*Pinus contorta* var. *latifolia)*, spruce, and aspen).
Sukunka / Highhat CBM area	The eastern portion of the interest area borders the Sukunka River breaks, portions of which have undergone ungulate winter range enhancement burns. These warm aspect breaks are being reviewed by MWLAP for further ungulate winter range enhancement potential. Forest cover on the eastern boundary of the interest area (i.e. top of breaks) is primarily deciduous (i.e aspen). The breaks themselves consist of a mix of open, grassy slopes and deciduous shrub and tree cover. Immediately west of the breaks where the CBM interest area occurs the forest cover appears to consist primarily of large tracts of contiguous, coniferous forest comprised primarily of lodgepole pine, white/Engelmann spruce (*Picea glauca* (Moench). Voss or Picea engelmannii), and subalpine fir (*Abies lasciocarpa*). Additionally, a number of wet meadows comprised of a variety of shrubs and black spruce occur within the CBM interest area. In general, the majority of the area has experienced relatively little oil and gas exploration and development activities in comparison with oil and gas fields elsewhere in the Peace Region. However, some infrastructure and impacts to the landscape were noted, including roads, wellsites, and cutblocks, within the interest area and in the general vicinity.
Chetwynd	Generally good habitat, numerous game trails along warm-aspect slopes.
Moberly River	Numerous wildlife tracks along river.
Photos (Appendix 1)	*Wolverine / Bullmoose* CBM area (x4), *Sukunka / Highhat* CBM area (x3), Chetwynd TSR II area (x2).

3.5 Habitat Assessments – Day 5

Background Information:	
General Route Description	Fort St. John → Sikanni Chief River → Buckinghorse River → Nevis Creek → Besa River → Richard's Creek → Prophet River → Muskwa River → Borrett Creek → Tenaka Creek → Fort Nelson
Forest District(s)	Peace Forest District, Fort Nelson Forest District
BGC	BWBSmw2, BWBSwk2,SWBmk, SWBmks, AT
Date	March 24, 2004
Weather	Sunny, windy, snowing
Number of Observers	2 plus 1 observer/data recorder
Flight Duration	0833 - 1651
Total Animals Observed	1,115
Areas of interest:	**Comments:**
Sikanni Chief River	Extensive cliff complexes and adjacent conifer forests on top of breaks, numerous goats observed in area. Along one cliff complex, a recent Canfor cutblock has a minimal buffer strip (only 4- to 5-m wide) along the top break.
Buckinghorse River	Large oil rig approximately 500 m from canyon edge, mature forests adjacent to extensive cliff complexes (escape terrain) provide thermal and security cover for mountain goats, numerous well-defined trails within areas of interest.
Neves Creek	Numerous tracks, open wind-swept upper slopes and ridges, some steep rocky slopes (escape terrain), extensive coniferous forests within floodplain, excellent UWR habitat.
Besa River	Burn areas and wind-swept ridges provide open slopes with foraging opportunities, extensive open spruce forests, excellent multi-species (sheep, elk, moose) UWR areas.
Richard's Creek	Recent burn areas provide extensive open slopes with foraging opportunities, numerous elk present. Some steep slopes, upper slopes very steep with rocky outcrops and cliffs.
Prophet River	Mineral lick observed in floodplain, open warm-aspect slopes and ridges, steep escape terrain intermixed with forested areas, extensive contiguous forests within floodplain, large elk herds present on mid- to upper-slopes, numerous sheep also observed. Some areas with tall willow thickets, excellent UWR areas.

Muskwa River	Open slopes, large burn areas, escape terrain present. Some burn areas identified on field maps do not appear to be burned in the field (old forest fires?), extensive pine forests in these areas.
Borrett Creek / Tenaka Creek	Old burn, very brushy, not suitable for CEEL UWR, not a productive burn area, patchy forested areas with openings, extensive pine forests.
Photos	Sikanni River (x4), Nevis valley, Besa River, Richard's Creek, Prophet River (x2), Muskwa River

3.6 Habitat Assessments – Day 6

Background Information:	
General Route Description	Fort Nelson → Gathto Creek → Tuchodi River → Dead Dog Creek → Chischa River → Akue Creek → Fort Nelson River.
Forest District(s)	Fort Nelson Forest District
BGC	BWBSmw2, BWBSwk3, SWBMK, AT
Date	March 25, 2004
Weather	Overcast, high cloud ceiling
Number of Observers	2 plus 1 observer/data recorder
Flight Duration	0833 - 1422
Total Animals Observed	3,191
Areas of Interest:	**Comments:**
Gathto Creek	Numerous wildlife and wildlife tracks, extensive warm-aspect open areas from low to upper slopes, wind-swept ridges and rock faces, minimal adjacent forest cover (only in draws/gullies), sheep observed on open upper slopes near escape terrain (cliff and steep outcrops). Some range is heavily impacted, with extensive browse. Brushy patches scattered throughout. Open deciduous forests (aspen) on lower slopes, some elk observed in forested side channel areas, large CEEL herds on open slopes. Several groups of horses free-ranging in area. Habitat within exclosure area did not appear different from surrounding range. Many groups of CEEL bulls.
Tuchodi River	Extensive open slopes and ridges, wind-swept and warm aspects, large CEEL herds present.
Chischa River	No tracks or trails were observed in most areas, a few trails were present within one burn area, low UWR potential.

Akue Creek	Old forest fire areas, some old and new tracks, cliff complexes, open sloped areas.
Fort Nelson River	Extensive cutblocks along and within floodplain, some old tracks, very few trails in most areas, no moose were observed within several areas of apparently suitable habitat.
Photos (Appendix 1)	Gathto Creek (x2)

4.0 DISCUSSION

The aerial survey of 2004 provided inventory and habitat information needed to support a number of draft UWRs. In addition, several potential UWR sites were evaluated and new UWRs will be proposed based on the results of this exercise. However, the single survey flight over each area of interest provided a snapshot of late-winter use by ungulates and other wildlife. Multiple surveys throughout the winter (including early- and mid-winter in addition to late-winter inventories) and over multiple years under different winter conditions (e.g. mild to severe) are required to fully document winter habitat use patterns by ungulates. In addition, monitoring was not intended to measure ungulate population numbers or trends; a more intensive and systematic approach is needed to meet this objective. Furthermore, habitat assessments completed during the 2004 aerial survey do not describe winter habitat conditions characteristic of each site but instead provide an idea of conditions at the time of the survey.

The following sections summarize the results of the aerial inventory and habitat assessments within the six CBM areas of interest and provide details regarding wildlife values in these areas. Caution must be used when interpreting the results of the aerial survey within the CBM areas. A single overview flight is not adequate to fully document wildlife and associated values within the interest areas. A more intensive approach using a number of methods is required to properly assess wildlife occurrences and habitat values and to develop appropriate mitigative and management strategies.

***Wapiti/Red Deer* CBM Area**

No wildlife was sighted during the reconnaissance flight of this area. However, use of this area by wildlife (i.e. ungulates) was evident via tracks and trails throughout. Due to the relatively contiguous nature of the forest, an intensive search for wildlife was not conducted. However, northern caribou (*Rangifer tarandus caribou*) are known to utilize forested habitat during the winter within this CBM interest area. The Narraway caribou herd, which occur in the extreme southeast of the Region, are known to spend the summer in the mountains within the Region, and move to low elevation pine forests for winter in both Alberta and BC. The Narraway herd is blue-listed in BC and identified as *Threatened* by the Committee on the Status of Wildlife in Canada (COSEWIC). Currently, a recovery team is assembled within BC and is working on a recovery strategy for this and other caribou herds. Results and recommendations from that work should be reviewed by MEM as this federal recovery planning process is currently ongoing.

In general, caribou habitat management practices need to provide a continual supply of large, connected areas of suitable summer and winter habitat where access and human disturbance are minimized (Bergerud and Page 1987, Seip

and Chichowski 1996). Fragmentation of forested habitat due to increased exploration, production and access development increases the risk to caribou that summer and over-winter in this CBM interest area. This caribou herd migrates from higher elevations in the summer to low elevation pine stands in the winter. This herd is known to move significant distances between BC and Alberta. Habitat modifications that improve access for humans as well as for predators can be detrimental to caribou populations (Seip and Brown 1996).

In addition to caribou, other species that require interior forest condition including furbearers such as American marten (*Martes Americana*), wolverine (*Gulo gulo luscus*), which is blue-listed, and fisher (*Martes pennanti*), which is red-listed, likely reside within this CBM interest area. Fisher, which prefer habitat resembling that found in the sub-boreal spruce, spruce-willow-birch, and boreal black and white spruce biogeoclimatic zones, are strongly associated with riparian and riparian-associated habitats, particularly those with large spruce trees and large balsam poplar trees (IWMS Vol. 1, 1997). Marten, which are extremely sensitive to even low levels (20-30%) of habitat fragmentation, will generally avoid large openings without structure. Both fisher and marten prefer canopy cover as well as structural complexity at the ground level including large-diameter coarse woody debris and a developed understory (Proulx 2001). Both species are most often associated with mature coniferous forest cover.

Northern goshawk (*Accipiter gentiles atricapillus*), an accipiter that has been noted in the Peace as *Regionally Important Wildlife* (formal designation pending), also depend on large contiguous forest patches for long-term survival. A typical territory of a breeding pair can exceed 200 hectares in size and contain several nest sites that may be used over the course of several years (IWMS Vol. 1 1997). Fragmentation of habitat and human disturbance can lead to the abandonment of a nest or territory. Northern goshawks are known to occur in the vicinity of this CBM interest area.

South Grizzly **CBM Area**

No wildlife was sighted during the reconnaissance flight of this area. However, use of this area by wildlife (i.e. ungulates) was evident via tracks and trails throughout. Due to the relatively contiguous nature of the forest, an intensive search for wildlife was not conducted. However, northern caribou (Quintette herd) have been known to utilize forested habitat (low elevation pine stands) during the winter within the vicinity of this CBM interest area. Telemetry research is currently underway for this herd as is a federal recovery planning process (Seip, *pers. comm.*). Northern caribou are blue-listed provincially and the Quintette herd is identified as *vulnerable* by COSEWIC. As with the Wapiti/Red Deer interest area, species requiring large tracts of undisturbed coniferous/coniferous mixed forest with ample interior forest condition would utilize this area.

Wolverine/Bullmoose CBM Area

Within the CBM area of interest 3 moose (*Alces alces*) and 12 mountain goats (*Oreamnos americanus*) were noted. All moose were found in forested habitat ranging from mature pine stands to a young aspen stand. The mountain goats were found at high elevation within the unvegetated AT biogeoclimatic zone on the south side of the river near an abandoned mine site.

Mountain goats are usually found in the most rugged mountainous areas of steep cliffs and rock bluffs, narrow ledges, rocky canyons, talus and rocky slopes (IWMS 1997). Mountain goats are yellow-listed and have been noted in the Peace Region as *Regionally Important Wildlife* (formal designation pending). Goats require older age class forest for winter cover and suitable winter feeding areas. These areas usually border rough, steep escape terrain. In summer, the diet of goats consists of alpine and subalpine grasses, sedges, rushes and forbs. In winter, the grass/forb component of their diet is supplemented or even replaced by a variety of shrubs as well as conifers including alpine fir, several pine species or juniper. Goats rarely move more than 400 m from escape terrain except to visit mineral licks (IWMS 1997).

Disturbance to mature forest cover adjacent to escape terrain could result in the loss of critical winter habitat for this sensitive ungulate species. Additionally, direct disturbance to mineral licks as well as to travel corridors to/from mineral licks could result in abandonment of the lick and potential increased mortality to the population due to physiological stress. Linear corridors within mountain goat habitat including seismic lines, transportation routes, and pipelines may increase the level of human disturbance to goats and increase the risk to goat populations via hunting or poaching activities. Linear corridors may also contribute to increased predation rates on goats.

The Wolverine River watershed is also rich with other wildlife not recorded during the reconnaissance survey of this area. This area is known to contain a healthy population of grizzly bears, and caribou have been known to occur in the Bullmoose area. A bald eagle was noted during the survey and given the patchiness of forest cover in the lower elevations, other raptors that prefer edge type habitat would be common. The Wolverine River itself and many of its tributaries contain a wide variety of sports fish, and is considered a high-value fishery in the Peace. Bulltrout (*Salvelinus confluentus* Suckley), which are blue-listed provincially and considered a *Species at Risk*, have been identified as requiring fine filter management under the *Forest and Range Practices Act* (FRPA) of BC. Bulltrout are extremely sensitive to habitat degradation and are considered an indicator species of ecosystem health (IWMS 1997). Increases in exploration and access infrastructure could reduce the quality of habitat for species such as Bulltrout that require clean, well-oxygenated water within a narrow range of temperature conditions. The Wolverine watershed contains both rearing and spawning habitat for Bulltrout. Potential impacts to fish from increased CBM activity include degradation of water quality from sedimentation

and from water by-products of gas production. Stream crossings that do not provide fish passage on an annual basis could further impact Bulltrout and other fish species.

Other sports fish including Mountain Whitefish (*Prosopium williamsoni* Girard), Rainbow Trout (*Oncorhynchus mykiss* Walbaum), and Arctic Grayling (*Thymallus arcticus* Pallas), also noted as *Regionally Important Wildlife* in the Peace Region (formal designation pending), have also been recorded as occurring within the Wolverine watershed. While these species are slightly less sensitive to habitat degradation than Bulltrout, water quality and fish passage are still prevalent issues.

***Sukunka/Highhat* CBM Area**

Within this CBM interest area 2 moose and 1 raptor, a red-tailed hawk, were recorded. Like other areas where large tracts of contiguous forest occur, wildlife species that require interior forest condition are more likely to reside. Westworth Associates Environmental Ltd. (1998) conducted a wildlife inventory of the Burnt River Landscape Unit which partially overlaps the CBM interest area. Results from winter track surveys from that study indicate that furbearing species including American marten, fisher, mink (*Mustela vison*), weasel (*Mustela* ssp). lynx (*Lynx canadensis*), and wolverine occur within in this area. As previously mentioned, fisher are red-listed and considered a *Species at Risk* in BC. Wolverine are blue-listed (vulnerable) provincially and also considered a *Species at Risk*. Wolverine use a wide variety of habitats and can range from valley bottoms to alpine meadows (IWMS 2004). The distribution of their prey, primarily large ungulates usually obtained as carrion, tends to dictate where wolverine range. Other wolverine prey, some of which were recorded Westworth Environmental Associates Ltd. (1998) include snowshoe hares (*Lepus americanus*), porcupines, sciurids (e.g. red squirrels, flying squirrels, chipmunks, etc.), mice, voles, birds, fish, and vegetation (IWMS 2004). For both wolverine and fisher, landscape level strategies are required to manage to maintain viable populations.

***Hudson's Hope* CBM Area #1 and #2**

Within the CBM interest area south of the Peace River, 3 moose (2 adults, one calf), 15 mule deer, 3 white-tail deer, and 1 elk were noted. On the north side of the Peace River within the CBM interest area 75 moose, 112 mule deer, 5 white-tail deer, 59 elk and 6 coyotes were recorded. The mix of forest cover and open areas (e.g. private/agricultural lands, and large shrub dominated patches) creates ample forage opportunities for grazers and browsers alike as well as sufficient security and thermal cover. All ungulates noted within the CBM areas of interest prefer ecotonal (edge) habitats. It should be noted that a prime elk/mule deer ungulate winter range exists on the lower end of Farrell Creek where a previous enhancement burn on the southeast-facing river breaks has created excellent grazing and browsing opportunities for these species. This

ungulate winter range will likely be put forward by MWLAP for formal designation under the FRPA.

In addition to CBM potential in this area, conventional oil and gas, agriculture, and forestry also have interests and the cumulative impact of such development may have negative consequences for many wildlife species that may currently use this area for part or all of their life cycle. Biologists surveying this area during the reconnaissance flight noted that the habitat mix within this CBM interest area is ideal for a variety of raptors including, but not limited to, bald eagle, red-tail hawk in ecotonal areas and northern goshawk, where large areas of contiguous forest cover occur. As discussed previously, northern goshawk are noted as *Regionally Important Wildlife* within the Peace Region (formal status pending) under the FRPA. Moreover, pure deciduous stands that provide interior forest conditions make ideal habitat for the Connecticut Warbler, which is red-listed in BC and noted as a *Species at Risk* under FRPA. This type of forest stand is more common within the CBM interest area closer to the Peace River. Lastly, it should be noted that the BC Conservation Data Center has noted three plant species to occur within or near the Hudson's Hope CBM interest areas: prairie buttercup (*Ranunculus rhomboideus*) is red-listed, Nuttall's sunflower (*Helianthus nuttallii* var. *nuttallii*) is red-listed, and Arkansas rose (*Rosa arkansana* var. *arkansana*) is blue-listed.

5.0 MANAGEMENT RECOMMENDATIONS

Based on the habitat assessments during the 2004 aerial survey, the following areas are recommended for habitat enhancement to enhance foraging habitat for ungulates:

- Old Wives Mountain;
- Draft CEEL UWR 008, 020, and 023;
- Sukunka River – along warm aspect breaks in the vicinity of Blind and Bluff Creeks;
- Prophet River E – areas require another prescribed burn (but some portions can be seen from the highway, viewscapes need to be considered in this area);
- Prophet River – several sites (see detailed field notes, MLWAP regional files);
- Highhat Mountain area;
- Gathto Creek.

The following draft UWRs and existing WHAs require boundary adjustments:

- Draft CEEL UWR 009;
- Buckinghorse WHA #6: could be extended to include additional highly suitable habitat.

Potential UWR areas of interest that include several sites with excellent UWR habitat and that are suitable for future UWR proposals include the following general areas:

- Gathto Creek;
- Sikanni Chief;
- Buckinghorse River;
- Neves Creek;
- Besa River;
- Richard's Creek;
- Prophet River; and
- Muskwa River.

Many of these areas would support multi-species UWR proposals.

Potential UWRs and draft UWRs that should not be included in future UWR proposals or require further survey effort include:

- Halfmoon Creek – habitat is not currently suitable for elk UWR;
- Torrens Ridge – this area may be of value for wintering bighorn sheep during early winter or under more mild winter conditions, provides continuity with excellent UWR within Kakwa Park, has possible value as a travel corridor area between bighorn summer and winter ranges; however, further inventory under these times/conditions is recommended;
- Saxon Ridge – habitat does not have enough escape terrain and is too heavily forested for wintering bighorn sheep, habitat appears to have good summer range potential;
- Draft CEEL UWR 006 – habitat is not currently suitable for elk UWR;
- Draft CEEL UWR 007 – habitat is not currently suitable for elk UWR;
- Borrett Creek, Tenaka Creek, and Akue Creek areas.

Recommendations to MEM for CBM Areas of Interest

The following CBM MWLAP recommendations are preliminary and are based on local knowledge and recent aerial reconnaissance surveys conducted in March 2004. Over time, as detailed environmental information for the above noted CBM interest areas becomes available, detail may be added to these recommendations and/or additional recommendations added. However, present recommendations will assist MEM staff involved in CBM planning/tenure sales and Oil and Gas Commission (OGC) staff involved in CBM application review/approval and regulation.

MWLAP CBM recommendations are as follows:

- MEM/OGC undertake a literature review to document all known fish/wildlife and habitat knowledge within each CBM area of interest. In the absence of such site-specific information review/consult other relevant information sources (note: government does not house all relevant literature and data);

- MEM consults with caribou Recovery Team leaders and reviews Recovery Plans/Strategies prior to tenure sales;
- MEM/OGC conduct habitat/impact assessments in the area of proposed operations. Information contained in such assessments include baseline environmental conditions (e.g. wildlife species present in the area, abundance and distribution; critical habitat – winter, lambing, calving and rutting habitat; fish and aquatic ecosystems; presence of wildlife habitat features such as mineral licks, wallows, game trails, sticknests, etc.);
- Site specific habitat/impact assessments should also address the disposal of produced water with respect to impacts to fish and fish habitat, water quality and volume;
- Site specific habitat/impact assessments should also provide recommendations for habitat protection and strategies for fish and wildlife that complement provincial/federal strategies in CBM interest areas
- Migration corridors for large game and riparian corridors are maintained and remain functional;
- Within tenure documents, MEM includes terms and conditions to protect pre-disturbance fish and wildlife abundance and distribution and associated habitat prior to the sale of tenure (i.e. proponents are aware of constraints to development prior to tenure acquisition);
- Proponents provide restoration/reclamation plans with associated timelines;
- Access management plans are completed for each CBM interest area in order to minimize linear developments, coordinate with other industrial users, and minimize the number of stream crossings;
- The overall footprint within CBM interest areas is minimized through efficient planning, and potential adverse impacts to fish, wildlife and habitat are addressed via compensation options prior to any activity on the ground;
- An adaptive management approach is considered by MEM, the OGC and proponents in order to facilitate the evolution of best management guidelines over time.

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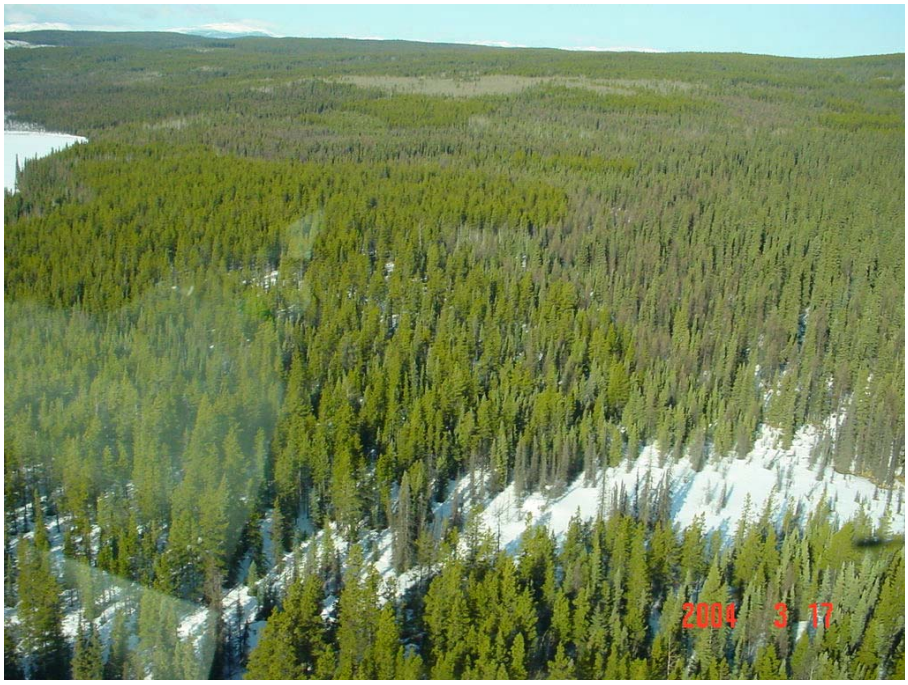
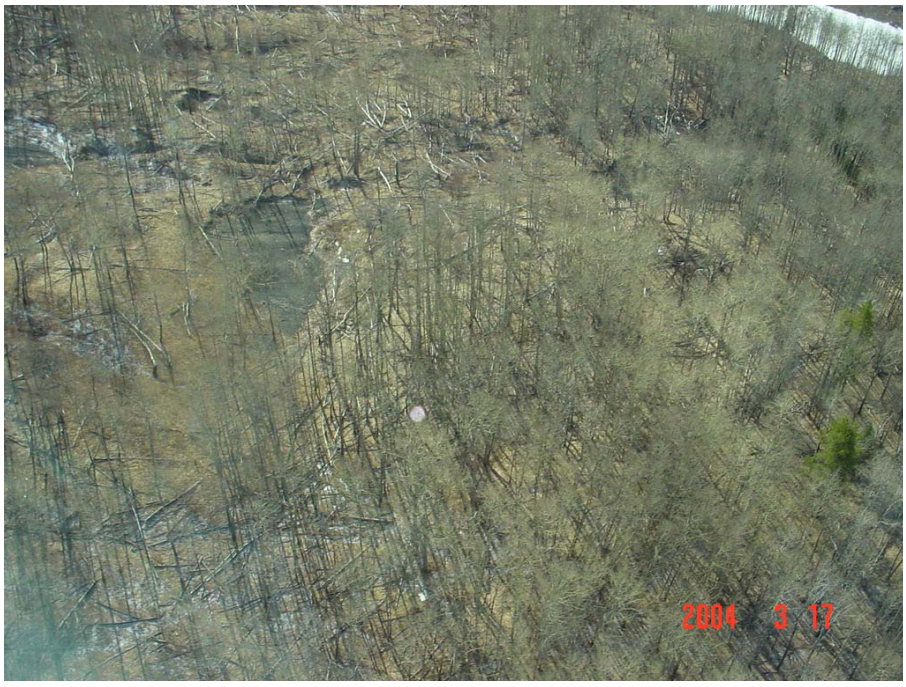
APPENDIX 1. PHOTO DOCUMENTATION DURING AERIAL SURVEYS

March 17: Kiskatinaw River (view upstream near confluence with Peace River)

March 17: South side of the Peace River looking downstream (approximately 10 km downstream of Taylor)



March 17: Caribou area of interest (south of Bearhole)



March 17: Old Wives Mountain burn area

March 17: Mountain Goat WHA #1

March 17: Belcourt burn area

March 17: south face of Dinosaur Ridge

March 17: *Wapiti / Red Deer* CBM area (near Wapiti River)

March 17: *Wapiti / Red Deer* CBM area (near Wapiti River)

March 17*: Wapiti / Red Deer* CBM area

March 18: Pine River (near confluence with Peace River)

March 18: Pine River (near confluence with Peace River)

March 19: *Hudson's Hope* CBM #2 Area, overview near Hudson's Hope

March 19: *Hudson's Hope* CBM #2 Area, overview near Hudson Hope

March 19: Dunlevy UWR

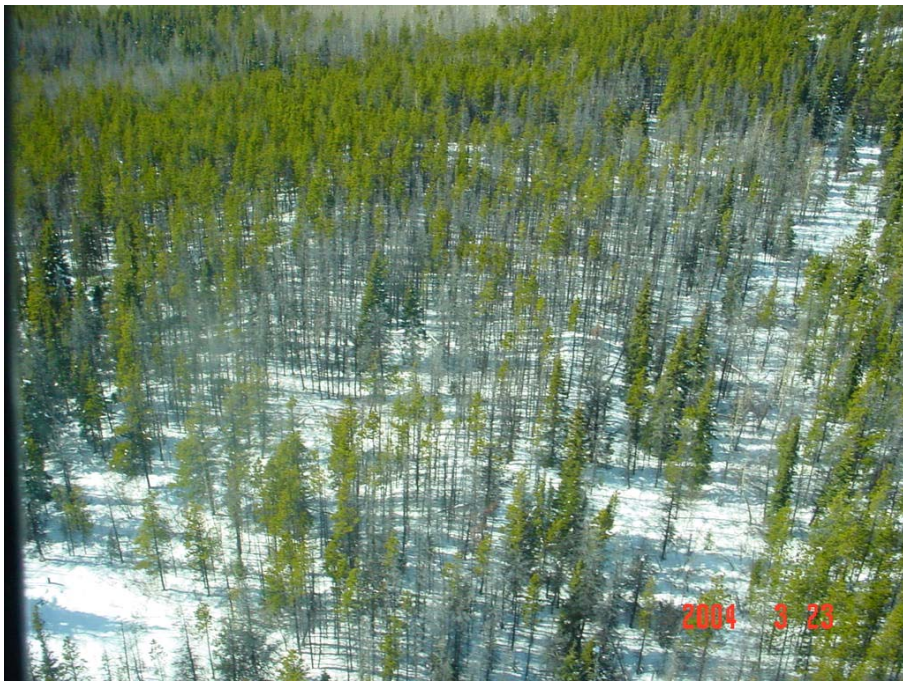
March 19: Dunlevy UWR

March 19: Chowade River Burn

March 1: Bison in the Halfway River drainage

March 23: *Wolverine / Bullmoose* CBM area

March 23: *Wolverine / Bullmoose* CBM area



March 23: *Wolverine / Bullmoose* CBM area

March 23: *Wolverine / Bullmoose* CBM area

March 23: *Sukunka* / *Highhat* CBM area

March 23: *Sukunka* / *Highhat* CBM area

March 23: *Sukunka* / *Highhat* CBM area

March 23: Potential UWR identified in TSR II (Chetwynd Area)

March 23: Potential UWR identified in TSR II (Chetwynd Area)

March 24: Sikanni River (south side in protected area)

March 24: Sikanni River (south side outside of protected area)

March 24: Sikanni River WHA #1

March 24: Sikanni River WHA #5 (note mountain goat in top right of photo)

March 24: moose browse in Nevis Valley

March 24: UWR on the Besa River

March 24: UWR on Richards Creek

March 24: East end of Prophet River

March 24: South slope of Prophet River, requires burning

March 24: Muskwa River and south facing slope

March 25: Gathto Creek (goat/sheep habitat)

March 25: Gathto Creek (note elk)