

Mule Deer Ungulate Winter Range (U-7-002) Report

Fort St. James Forest District Omineca Region

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1.0 Introduction

The Environmental Stewardship Division, of the Ministry of Water, Land and Air Protection (WLAP) is charged with the task of developing *Ungulate Winter Range* (UWR) areas and objectives to ensure winter survival for ungulate species in the Omineca Region. Ungulate Winter Ranges that meet certain biological and policy criteria must be confirmed under Section 69 of the *Operational Planning Regulations* (OPR) of the *Forest Practices Code* (FPC) to be considered in forest management activities regulated by the FPC. In accordance with the OPR, the term “ungulate winter range” means an area that is identified as being critical for the winter survival of an ungulate species; mule deer in this case.

As such, UWR objectives need to consider key life requisites including thermal cover, security cover and forage sources as well as potential risk factors such as road access, and conflicts with other user groups.

1.1 Background

Recent amendments to the *Operational Planning Regulation* (OPR) of the *Forest Practices Code* (FPC) have created a specific definition and regulations to provide the legal basis for management of ungulate winter ranges (UWR) on Provincial Forest land. A two-step process was approved for the establishment of UWR under the Regulation.

1. Grandparenting of existing mapped winter ranges that had wildlife management plans and/or strategies, and were managed as UWR, was completed on October 15, 1998.
2. The remaining candidate winter ranges include:
 - those that were previously mapped but not grandparented by October 15, 1998, and
 - those that were accounted for in TSR 1 but were not mapped.

All *Forest Practices Code* candidate and grandparented ungulate winter ranges are to be finalized as quickly as possible, and those meeting the conditions of the MOU confirmed by October 15, 2003. The overall intent is to:

- (1) identify the areas that are necessary for the winter survival of mule deer;
- (2) ensure that these areas are distributed in the most effective way for maintaining mule deer across their natural range; and
- (3) ensure that timber supply impacts do not exceed those included in Timber Supply Review 1 (TSR1) (Stewart Guy *pers. comm*).¹

¹ 8000 hectares of ESA W1 and W2 are available for UWR identification in the Fort Saint James Forest District (John Pousette and Doug Beckett, Ministry of Forests, *pers. comm*).

The proposed UWRs for mule deer in Fort St. James are Type 1(c), meaning the “UWR and objectives that have been identified and incorporated into TSR 1 ...and were included in TSR 1...before April 1, 1998, but not mapped”. By replacing Environmentally Sensitive Areas for Wildlife with UWR, no net impact to timber supply shall result.

2.0 Approach and Methods

Consistent with emerging policy direction, proposed management objectives for these mule deer UWRs are based on the best scientific information available, and focus on criteria that are measurable, achievable and easily monitored². Using the best information available, each objective is defined using measurable landscape as well as stand level attributes required to maintain the functional integrity of each winter range. This approach is consistent with the FPC intent of ‘known ungulate winter range’ as well as the anticipated framework of the results-based Forest and Range Practices Act, which emphasizes results or ‘specific measurable outcomes’.

An effort was made to ensure all mule deer UWR objectives are supported by explicit assumptions and cited literature. Regional information is used whenever possible; however, data from other parts of BC, the Pacific Northwest or Alberta are also used to fill in gaps. Despite these sources of information, knowledge gaps remain. Although our understanding of ungulate winter habitat is improving, there remains few empirical data on habitat thresholds (i.e., how much is enough?), efficacy of access control as well as the spatial and temporal effects of land use management activities (i.e., habitat supply). Therefore, professional judgement was required to interpret the available information and propose a course of action.

To develop mule deer UWR objectives, a number of biological as well as potential risk factors were considered including:

Biological Criteria

- ❖ Thermal Cover (snow interception)
- ❖ Security Cover (screening)
- ❖ Forage production (Quality and Quantity)

Potential Risk Factors

- ❖ Access Management (e.g., access control points)
- ❖ Conflict between User Groups (e.g., mineral conflicts)

² Monitoring is defined as a process to determine the extent to which a program, plan or activity achieves its specified goals and objectives

- ❖ Industrial Activities (e.g., timing of timber harvesting, commercial tourism)
- ❖ Compromising biological integrity of an UWR

The primary purpose of the biological criteria is to recognize that all winter ranges need to provide an adequate supply of habitat over time. As such, mule deer UWRs should ideally be managed as biological units designed to meet both landscape as well as stand level objectives. Management objectives need to minimize potential negative effects of forest harvesting activities (e.g., roads, amount of harvest, timing of harvest) not only within the winter range but also outside the established winter range boundaries. That is, it is important to recognize that mule deer interact with their environment at both fine and coarse spatial scales (Pearson and Turner 1995). Because designated mule deer UWRs will be ‘embedded’ within the larger landscape matrix, they will be subject to watershed processes and landscape level land management regimes. For example, Landscape Unit seral stage distributions as well as other management regimes outside the UWR have the potential to affect the suitability and overall integrity of the winter range. This is especially true for those mule deer UWRs in the Fort St. James Forest District, as they are all relatively small. Regardless of UWR size, mature forest cover requirements should be met using area controlled harvesting regimes or forest cover constraints that apply over a set time period. The primary purpose of stand-level objectives is to explicitly state the desired or target outcome of stand structure habitat objectives.

Other potential risk factors or ‘stressors’ that can reduce habitat suitability (e.g., road access, human disturbance) need to be considered because they have the potential to result in habitat displacement and/or mortality. Thus, mule deer were assessed with respect to their sensitivity to human disturbance in an effort to focus the UWR objectives. Other guiding principles used to develop objectives included:

- ❖ Consistency between proposed UWR objectives and Higher Level Plans (i.e., LRMPs)
- ❖ Ensure the objectives incorporate spatial and temporal factors (e.g., rotation length)
- ❖ Ensure objectives reflect regional habitat suitability/capability and are consistent with natural disturbance patterns
- ❖ Recognize that not all of the desired information is currently available. Therefore, use the best information available, document assumptions and adapt over time as necessary (i.e., practice adaptive management).

The areas identified and corresponding objectives focused on key winter habitat requirements and identify any assumptions, especially those that are believed to affect functional aspects of mule deer winter range (e.g., crown

closure, roads). A rationale is provided for the recommended UWR objective. As best as possible, these objectives reflect regional habitat suitability and capability. Objectives are tailored to local ecological conditions and reflect biogeoclimatic subzone variants. Because of local TEM/PEM projects it was possible in certain instances to use information at the site series or ecosystem unit level to help guide stand-level objectives. These projects provided local information, which was useful in defining the range of stand attributes (e.g., crown closure, shrub cover, species composition) for high rated ungulate habitats.

Winter range boundaries were identified using appropriate algorithms developed to delineate high suitability (or in some instances, high capability) winter habitat polygons. These criteria are summarised in Appendix 2. Topographic features (aspect, slope, elevation) were a critical component, as well as the presence and age of Douglas-fir. Other factors that influence mule deer population viability and survival that are not explicitly addressed in this report include intra and inter-specific competition and predation risk.

Competing land use objectives and timber supply impacts are identified where known in Section 6.0 and 7.0.

3.0 Mule Deer Ungulate Winter Range Criteria: Winter Ecology and Habitat Requirements - Biological Rationale

Thermal Cover and Snow Interception

A review of the pertinent literature suggests that the ability for a forest stand to intercept snow and provide both thermal cover and accessible forage are the primary habitat variables influencing deer winter habitat selection in British Columbia and the Pacific Northwest (Hanley 1989, Nyberg *et al.* 1990, Kirchhoff and Schoen 1987, Armleder *et al.* 1994, Terry and Simpson 1996). In particular, trees with large interlocking crowns help reduce snow accumulation and significantly reduce energy expenditures by deer, which increases their probability of survival (Parker *et al.* 1984, Armleder *et al.* 1986, Kirchhoff and Schoen 1987). Parker *et al.* (1984) reported deer energy expenditures increased by 50% in 25 cm of snow and more than doubled in 40 cm, which represented about 60% of brisket height. Most studies have cited critical snow depths > 40 cm restrict deer movement. In addition, to increased energy demands, deeper snow depths bury shrubs, which decreases forage availability (Waterhouse *et al.* 1994).

Therefore, the ability of forest stands to provide adequate snow interception

cover is a key component of these mule deer winter range objectives. Because snow accumulation varies by biogeoclimatic subzone, the mule deer winter range objectives are stratified by 'deep' and 'very deep' snowpack zones as a first approximation. This is consistent with methods used in all other WLAP Regions.

In order to provide snow interception cover, an easily measured stand attribute variable is required. Despite some of the methodological problems, percent crown closure is used most often to manage snow interception cover (Armleder and others). In BC, typical crown closures recommended to retain mule deer winter range vary by biogeoclimatic subzone. Armleder *et al.* (1994) reported mule deer in the IDF biogeoclimatic zone used stands with moderate crown closures (36-65%) more often compared to their relative availability. The West Kootenay UWR objectives suggest between 30-50% crown closure of trees >80 years old (Appendix 1). These objectives were developed from radio-telemetry studies and PEM projects. Other areas in the southern interior have recommended crown closures to be at least 46% post harvest.

In order to provide objectives for snow interception cover in the Omineca Region, knowledge of local mule deer winter habitat use and specific stand structure attributes are required. A number of winter tracking studies (FRBC) have been conducted to identify the northern distribution of mule deer winter habitat use and movement patterns in the Omineca Region including the Prince George, Vanderhoof, Fort St. James and Robson Valley Forest Districts (D'Arcy and Storke 1998, Safford and D'Arcy 2000, Safford 2001). In addition, *Terrestrial Ecosystem Mapping* (TEM) was completed for mule deer winter ranges in a portion of the Fort. St. James Forest District (TFL 42, Tanizul Timber), which provides additional information on regional habitat suitability and capability using provincial standards (Keystone 1998; RIC 1999). Radio-collared studies of deer are limited to the Robson Valley (Ingham 2000) in the Omineca WLAP Region.

Overall, these studies have reported high suitability mule deer winter habitats occur on mesic, subxeric and xeric sites within the drier SBS subzone variants including the SBSdk, SBSdw2, SBSdw3 and SBSdh, (D'Arcy and Storke 1998, Keystone 1998). These ecosystems are represented by the mature and old structural stages of the 01, 02, 03 and 04 site series, all of which have a significant component of Douglas fir. Visual estimates of crown closure vary between 30-85% (D'Arcy and Storke 1998, Timberline 1998) for these site series. In the Robson Valley, mule deer preferred forests dominated by mature spruce and Douglas fir forest with canopy closures > 55% (Ingham 2000).

In addition to crown closure, basal area (m^2/ha) has also been recommended to manage stand structure on mule deer winter ranges in the IDF biogeoclimatic

zone (MOF 1999). Basal area is easily measured and provides an effective means of monitoring both wildlife and timber objectives. Depending on stand-level objectives and crown closure class, this approach suggests retaining a total target stand basal area as well as basal area of large diameter (> 40 cm DBH) Douglas-fir trees. In a related study, these researchers have also reported that low volume partial-cutting (20% single tree selection) has not affected mule deer use, which suggests their basal area retention targets are adequate to maintain deer winter attributes (Armleder *et al.* 1998). Although these methods have been developed in the IDF (NDT 4), similar approaches could be developed for winter ranges in this region, which occur in NDT 3. Other studies have also found basal area to be a useful predictor of snow interception. In the Fort St. James and Vanderhoof Forest Districts, D'Arcy and Storke (1998) found a significant relationship between basal area and snow depth in Douglas-fir stands in the SBSdw3. Forest stands with greater basal area (46-59 m²/ha) resulted in significantly reduced snow depths (8-19 cm). Prescribing basal area retention targets to manage stand structure on winter ranges is useful because it is easily measured and focuses stand management on larger trees, which have better snow interception ability. However, sufficient site specific information on stand structure would be required to determine appropriate basal area retention targets, and are therefore not included as objectives at this time.

Winter Forage

To maintain mule deer winter range, adequate supplies of forage are also required. Mule deer browse occurs in a variety of forested as well as non-forested ecosystems including cutblocks and cultivated fields. The dry Douglas-fir ecosystems mentioned previously, provide adequate amounts of forage, however, some ecosystem units provide more abundant browse than others (D'Arcy and Storke 1998, Keystone 1999). Stands with canopy gaps, for example, provide better developed shrub layers and preferred browse species including saskatoon (*Amelanchier alnifolia*), Douglas maple (*Acer douglasii*), and common snowberry (*Symphoricarpos albus*). Habitat suitability in these ecosystems is often enhanced by the close proximity of natural non-forested ecosystems (openings), which provide higher shrub cover (>30%) of preferred browse species (Keystone 1998, Keystone 1999). Although mule deer browse primarily on shrubs, they also will feed on arboreal lichen litterfall (Stevenson 1985, Waterhouse et al. 1991, Waterhouse et al. 1994). Douglas-fir is a common food item in the winter diet of mule deer. Older Douglas-fir foliage provides better quality forage (Armleder *et al.* 1986).

Overall, the best available information indicates mule deer winter range objectives should focus on the following stand-level features:

- (1) Tree Species Composition (Overstory)
- (2) Crown Closure and/or Basal Area
- (3) Age Class and Stand Structure
- (4) Shrub Species Composition and Abundance

Interspersion of Thermal Cover and Foraging Areas

In addition to these stand level features, an estimate of the total area retained in mature forest is required. The optimum mix of thermal cover, security cover and foraging areas have not been studied locally. However, extensive research in the Pacific Northwest has documented that a 60:40 ratio of forage: cover is considered optimal for winter mule deer habitat (Thomas et al. 1979).

In the West Kootenays, deer management guidelines recommend increasing forest retention targets in wetter biogeoclimatic subzones. In drier and shallow snow subzones, a minimum of 20% forest retention in age class ≥ 80 years is recommended with a minimum forage requirement of 15% ≤ 20 years old (Mowat *et al.* 2002, see Appendix 1). Their maximum retention level for mule deer is 40% in age ≥ 100 years old and a minimum of 5% ≤ 20 years to maintain foraging habitat. In these habitats, crown closure requirements are $\geq 50\%$.

Access Management and Human Disturbance

Roads generally decrease the value of habitat for mule deer (Towry 1984). The estimated zone of influence extends for 100 m from the road into adjacent habitat. As such, it is recommended that roads be located away from UWR. In particular, avoid dry south facing slopes. If roads are required, ensure visual screen buffers and deactivate as soon as possible.

Harper and Eastman (2000) reviewed the potential impacts of recreation activities on various wildlife species. In general, the availability of information suggests that human disturbances on winter ranges (e.g., snowmobile) can result in deer habitat displacement. However, the severity of response appears to vary with the intensity of human use (Dorrance *et al.* 1975, Freddy *et al.* 1986.) Freddy suggested persons afoot including snowmobiles should remain >190 m from deer to prevent overt movement responses.

4.0 Mule Deer Ungulate Winter Range Criteria

Warning

The following planning objectives are a unofficial consolidation of the management objectives established within the legal order pertaining to this Ungulate Winter Range. Official ungulate winter range orders may be accessed and downloaded from this Web Site http://wlapwww.gov.bc.ca/wld/uwr/ungulate_app.html .

While every attempt has been made to ensure accuracy and completeness, these management objectives cannot be guaranteed. Users should always refer to the official order, which may be amended from time to time,

The following proposed management objectives reflect the goal to maintain mule deer winter range to provide high suitability snow interception, cover and foraging opportunities (shrubs, conifer and arboreal lichen litterfall):

Management Objectives

Desired Habitat Condition

1. Within each ungulate winter range (UWR) Unit numbers 1, 2, 3, 4, 5, 11, 12, and 14, maintain a minimum of 40% of winter range area in age class 8 (>140 years) or greater at all times with a crown closure of >56% (Douglas-fir, spruce).
2. Within each UWR Unit numbers 9, 10, 15, 16, 17, and 18, maintain a minimum of 50% of stands in age class 8 (>140 years) or greater and with a crown closure of mature forest >66% (Douglas fir, spruce).
3. Within all UWR Units, maintain species composition as Douglas-fir leading, with a minimum of 50% Douglas-fir.
4. Within all UWR Units, maintain 30—40% shrub cover of preferred deciduous forage species.

Timber Harvest

5. Within UWR Unit number 19, no commercial forest harvesting.
6. Within all UWR Units except Unit Number 19, keep timber harvesting openings irregular in shape, <1 ha in size and < 250 m wide.
7. Schedule winter forest operations during the period of least disturbance to mule deer.
 - a) Avoid winter forestry development (including harvesting) between December 15th and April 15th.

Forest Health

8. Within all UWR units, maintain high suitability winter habitat attributes by managing bark beetle populations to maintain low levels of beetle brood in the UWR.
 - a) Sanitation or salvage activities may occur within the limits of UWR desired habitat condition objectives. (1 “Low levels” reflect endemic population levels, with high suitability winter habitat attributes still available).

Fire Management

9. Within all UWR Units, reflect UWR objectives in appropriate fire management plans.
10. Consider the use of prescribed fire to reduce understory fuel loading and improve UWR forage characteristics.

Range Management

11. For all UWR units
 - a) Livestock use will not exceed 10% of current year's shrub growth
 - b) Manage for a desired plant community with abundant shrub species composition that will maintain a minimum 30 - 40% cover of deciduous shrubs that are preferred browse species. These included Saskatoon (*Amelanchier alnifolia*), Prickly Rose (*Rosa acicularis*), Common Snowberry (*Symphoricarpos albus*), Choke Cherry (*Prunus spp.*), Red Osier Dogwood (*Cornus stolonifera*), Willow sp, (*Salix* sp), Black Twinberry (*Lonicera involucratee*), Highbush Cranberry (*Viburnum edule*), Black Huckleberry (*Vaccinium membranaceum*), Douglas Maple (*Acer galbrum*) and Trembling Aspen regeneration (*Populus tremuloides*)
 - c) No livestock grazing will occur on south facing slopes until shrub leaf out.
 - d) New range development features such as, but not limited to, waterholes, fences, salt blocks, corrals, access road and trails, that would result in concentration of livestock in the UWR unit will not be developed within the UWR unit.

Access Management

12. Within all UWR Units, manage road access to limit human disturbance to mule deer.
 - a) Construct roads to the lowest class practicable while maintaining safety and environmental standards.
 - b) Where reasonable alternatives exist, plan the location and design of major/secondary access routes to avoid the UWR.
13. Within all UWR Units, minimize new road construction and other access development.
 - a) Maintain the existing length of active roads by permanently deactivating roads in a 1:1 ratio to the amount of new road construction.
14. Within UWR Unit number 19, do not construct any new roads.

5.0 Strategic Land Use Plan Recommendations

Management objectives for mule deer were identified in the 1999 Fort St. James Land and Resource Management Plan (LRMP). The Ungulate Winter Ranges and corresponding objectives identified in Section 4.2 contribute to achieving the following LRMP objective:

“Objective - Maintain (and enhance where appropriate) deer populations and habitat.

- Identify, survey and map important mule deer winter ranges, such as south-facing slopes with mature Douglas-fir cover. Provide updates as new information becomes available.
- In Douglas-fir stands providing known deer winter range:
 - Endorse developing and implementing plans to integrate mule deer habitat requirements.

- Consider forest management and silviculture systems that provide mule deer habitat and perpetuate Douglas-fir habitat.”

Mule deer are specifically recognised in a number of Resource Management Zones (Stuart Trembleur, Pinchi and Sowchea-Cunningham).

6.0 Forestry Resource Impacts

These proposed UWRs are located within the Prince George Timber Supply Area, Fort St. James Forest District, and are within the operating areas of a number of Forest Licensees:

Table 1: Forest Licensee/Ungulate Winter Range Overlap

Forest Licensee	UWR area	UWR Unit No.	Current Forest Development Plan conflicts
Canadian Forest Products Ltd.	Pinchi Fault 2	12	No conflicts with current approved FDP
	Pinchi Fault 4	14	No conflicts with current approved FDP
	Whitefish	18	No conflicts with current approved FDP
	Tezzeron Mtn. West	10	Category A blocks (Hat 561 and Hat 550) approved in FL A40873 2001-2006 Amendment #22. Intent is to harvest in light of mule deer winter range values.
	Tezzeron Mtn. East	9	Category A blocks (Hat 527, 560, 529, 542 and 506) Approved in FL A40873 2001-2006 Amendment #22. Mule deer winter range values were recognised.
Apollo Forest Products Ltd.	Tchensut	15	Some overlap with Cat A approved CP 362 Block 898
	Pinchi Hill	5	No conflicts with current approved FDP
	Battleship	4	Some overlap with Cat A approved CP 25 Blocks 126 and 132
	Mt. Pope	1	No conflicts with current approved FDP
	Mt. Pope East	19	No conflicts with current approved FDP

Ministry of Forests, Timber Sales Program	Pinchi Fault 1	11	No conflicts with current approved FDP
	Murray Ridge East	2	No conflicts with current approved FDP
	Murray Ridge West	3	No conflicts with current approved FDP
	Trembleur East	16	No conflicts with current approved FDP
	Trembleur West	17	Overlap with Cat A approved block SBAP027, SBAP028, and the associated road access to SBAP028.
	Murray Ridge East	2	No conflicts with current approved FDP
	Murray Ridge West	3	No conflicts with current approved FDP

Total area (ha) identified in proposed Mule Deer Ungulate Winter Range in the Fort St. James Forest District, Omineca Region is 3657.2 ha. This equates to a total Timber Harvesting Landbase impact of 1145 ha, as determined by Ministry of Forests Timber Supply Analysts. This leaves 6855 ha remaining of the total 8000 ha available in the Fort St. James Forest District for further UWR designation.

Table 2: Timber Harvest Land Base (THLB) Netdown Summary

UWR Unit No.	UWR Name	Map No.	Gross Area (ha)	100% THLB Netdown (ha)	Conversion Factor Based on Application of UWR Management Objectives	THLB Impact/Netdown of Proposed UWR (ha)
1	Mt. Pope	2	80.3	45.0	0.57	25.65
2	Murray Ridge East	3	550.1	145.8	0.57	83.11
3	Murray Ridge West (2 polygons)	4	478.2	227.8	0.57	129.85
4	Battleship	5	569.3	391.7	0.57	223.27
5	Pinchi Hill	5	221.1	88.3	0.57	50.33
9	Tezzeron Mtn. East	8	299.0	149.1	0.64	95.42
10	Tezzeron Mtn. West	8	125.1	105.2	0.64	67.33
11	Pinchi Fault 1	7	60.4	23.6	0.57	13.45
12	Pinchi Fault 2	7	151.5	124.4	0.57	70.91
14	Pinchi Fault 4	9	100.9	63.3	0.57	36.08

15	Tchensut	11	241.8	132.8	0.64	84.99
16	Trembleur East	10	48.4	38.3	0.64	24.51
17	Trembleur West (2 polygons)	10	374.4	245.4	0.64	157.06
18	Whitefish (2 polygons)	6	180.8	23.1	0.64	14.78
19	Mt. Pope East	4	176.1	67.8	1	67.8
					Total	1144.54

7.0 Other Resource Impacts

This proposal was referred to the Ministry of Energy and Mines and the Ministry of Sustainable Resource Management. One UWR area that included a former mine was subsequently dropped from the proposal. Another UWR area is underlain by mineral claims (Murray Ridge (East)). Concerns are noted in Appendix 3.

The Ministry of Sustainable Resource Management noted no conflicts or concerns with this proposal.

The Ministry of Forests Range Officer noted no range tenure overlaps with this referral.

Woodlots and Protected Areas were excluded from this proposal.

UWR Unit numbers 2 and 3 (Murray Ridge East and Murray Ridge West) do not overlap with the Murray Ridge Ski Hill Special Use Permit.

8.0 First Nations

Following the government expectations for First Nations consultation, each band with an interest in the mule deer UWR area was contacted. The Tlazt'en First Nation provided a positive response. We were unable to receive any feedback from the others.

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Appendix 1 - Mule Deer UWR Rationale

Mule Deer UWR Rationale Fort St. James Forest District

The criteria considered during identification of Mule Deer Ungulate Winter Range included:

1. Tree species (Fdi) and % cover of tree species (>60%)
2. Age of tree (101 to 140 (age class , and 141+ years for present use, or young plantations, if suitable slope and aspect and probable success at re-establishment of a Fdi leading stand)
3. Slope (Range 1 - 10° to 25° {16 to 47%} and Range 2 - 26° to 50° {48 to 120%})
4. Aspect (110 ° to 250° {SE, S and SW} and 251° to 290° {W})
5. Crown closure (>60%)
6. Location (proximity/adjacency to):
 - Other UWR areas
 - Roads
 - Park areas that provide UWR habitats
 - Early spring foraging habitat
5. Size of UWR area (at least 50 ha)
6. Snow depth information (using, where available, average snow depth of biogeoclimatic subzone)
7. Elevation
8. Winter food supply (expected vegetation in biogeoclimatic subzone)

The newest available forest cover database available from MSRM, (new VEG model, November 2002) was used as the database for this analysis. The database was queried to choose any polygon that has Fdi present.

A 25 x 25 m grid was then laid over the database. An algorithm was applied to the Digital Elevational Model (DEM) points. For Each polygon, the number of hectares for each of the following slope and aspect ranges was calculated.

Aspect:

- 0 to 109 degrees
- 110 to 250 degrees (SE, S and SW) - preferred mule deer winter range
- 251 to 290 degrees (W) - preferred mule deer winter range
- 291 to 360 degrees

Slope:

- 0 to 15 % (<10 degrees)
- 16 to 47% (10 to 25 degrees) Range 1 - preferred mule deer winter

- range
- 48 to 120 (26 to 50 degrees) Range 2 - preferred mule deer winter range
- 121+ (>50 degrees)

The number of ha/polygon of each of the slope and aspect ranges was converted into a percentage of the polygon.

Four queries were run to highlight spatially the location of preferred mule deer winter range slopes (Range 1 and 2) and aspects (Range A and B) with greater than 60% Fdi:

1.
 - Fdi leading and is $\geq 60\%$
 - $>50\%$ of the total polygon slope area ranges between 10° to 25°
 - $>75\%$ of the total polygon aspect area ranges from 110° to 250° (SE,S and SW)
2.
 - Fdi leading and is $\geq 60\%$
 - $>50\%$ of the total polygon slope area ranges between 26° to 50°
 - $>75\%$ of the total polygon aspect area ranges from 110° to 250° (SE,S and SW)
3.
 - Fdi leading
 - $>50\%$ of the total polygon slope area ranges between 10° to 25° (Range 1)
 - $>50\%$ of the total polygon aspect area ranges from 251° to 290° (W)

Note: a 50% threshold was used for the west aspects as the district has very few Fdi leading, slope Range 1 with a west aspect
4.
 - Fdi leading and is $\geq 60\%$
 - $>50\%$ of the total polygon slope area ranges between 26° to 50°
 - $>50\%$ of the total polygon aspect area ranges from 251° to 290° (W)

Polygons adjacent to these highlighted polygons were then examined to see if they:

- missed being highlighted due to model oversights (for example, a polygon that had 50% slope with Range 1 and 50% Range 2 would have 100% preferred slopes, but would not have been highlighted due to model design. NB: Future modeling should ensure queries would capture multiple preferred ranges within one polygon that add up to a minimum threshold percentage of a polygon.
- Just missed the threshold minimum or percentage criteria set. For

example, for query 1, if an adjacent polygon met all criteria, but had only 70 percent of the polygon with slope range 1 rather than 75%, it was included in the proposed UWR.

- Provided connectivity between polygons highlighted via queries 1 through 4 and met some of the mule deer winter range criteria (species, age, crown closure, slope, aspect).
- Provided tree species, age, slope, aspect and crown closure for mule deer winter range, but polygon had north slopes in it or a portion of flat ground. These polygon were highlighted to include only the appropriate slope or aspect range in the UWR polygon boundary.
- Small polygons that did not get highlighted through the above 4 queries, but were entirely in the proposed UWR where included within the UWR boundary.

All proposed UWR areas (regardless of total size) were referred to appropriate licensees, Forest Service, Energy and Mines, Ministry of Sustainable Resource Management and First Nations with an interest in the area.

All comments received were reviewed and summarized in Appendix 3. Changes were made where applicable.

Appendix 2 - Summary of Consultation

Comments/Concerns	Contact Name (<i>WLAP responses in italics</i>)
<p>1. Proposed UWRs overlap with approved and Cat A blocks. Does this preclude harvest?</p>	<ul style="list-style-type: none"> • Apollo Forest Products (Sinclair Group) • Canfor • BC Timber Sales • Tanizul Timber <p><i>No. Blocks are approved, and FDP objectives don't have to change.</i></p> <p><i>However, if field work has not been completed or a SP has not been submitted, we put these forth as Best Management Practices (BMP's) and strongly recommend applying them unless other objectives that maintain high suitability mule deer ungulate winter range can be rationalized with appropriate scientific rationale.</i></p>
<p>2. Concern re. harvesting restriction for cutblock size, given current and likely beetle activity.</p> <p>- Is there a cutblock size restriction for the Tchensut area?</p>	<ul style="list-style-type: none"> • Apollo Forest Products (Sinclair Group) • Canfor • BC Timber Sales <p><i>Maintaining high suitability stand structural attribute requirements for the winter needs of mule deer are the priority. The objectives (modified in some instances since referral) are intended to reflect this.</i></p> <p><i>Yes, the cutblock restriction would apply to the Tchensut area and is even more important given the very deep snowpacks.</i></p>
<p>3. Areas have not been ground truthed to confirm suitable habitat conditions. Forest cover info used without confirming on ground. Concern re. accuracy of forest cover info.</p>	<ul style="list-style-type: none"> • MOF • Canfor <p><i>The best available information was used, given time constraints. Both WLAP staff have many years experience living and working in this district. All sites were flown, and adjustments made to the original proposal where appropriate.</i></p>

Comments/Concerns	Contact Name (<i>WLAP responses in italics</i>)
<p>4. No info available re. mule deer use of proposed areas, historical existence of deer in the area, or baseline deer population information. Concern that UWRs for mule deer may not be required at present time, and special mgmt considerations for certain stand types would suffice. Mule deer are not currently a species at risk.</p>	<ul style="list-style-type: none"> • MOF • Apollo (in vicinity of Tchensut) • Canfor <p><i>WLAP is charged with the task of identifying critical winter range for ungulates, and that is what we have done. D'Arcy and Stork (1998) documented use in some of the proposed UWR polygon. KEYSTONE (1999) noted Fdi stands on TFL 42 could provide winter thermal cover, and that there was merit in managing these types for mule deer winter range attributes. We will practice adaptive management, and if areas are demonstrated not to receive use during critical snow conditions, we are willing to make the necessary adjustments. Consider:</i></p> <ol style="list-style-type: none"> (1) <i>"In situations where the welfare of deer...must be considered, their habitat requirements will be of paramount importance in long-range planning and in layout of timber sales"</i> (2) <i>"...mistakes in habitat management may require decades to correct"</i> (3) <i>"Winter ranges are more sensitive to land management decisions that are summer and spring-fall ranges because of their scarcity and higher intensity of use" (Thomas, 1979)</i>
<p>5. Concern that if UWRs are designated and info becomes available that these are not suitable habitat areas, then it would be a very cumbersome process to have these areas deleted</p>	<ul style="list-style-type: none"> • MOF <p><i>Concern noted. All polygons reflowed March 2003 and adjustments were made where appropriate.</i></p>
<p>6. Does MSRM have a process in place to update forest cover information to reflect UWR designation? Will ESAw's be removed from the forest cover to reflect the new UWR?</p>	<ul style="list-style-type: none"> • MOF <p><i>Will forward this concern to MSRM</i></p>
<p>7. Concern this proposal used ESAw numbers for TSR1, not TSR2.</p>	<ul style="list-style-type: none"> • MOF <p><i>We understand the ESA numbers (for wildlife) are the same for both TSRs (Chris Ritchie, pers.comm.)</i></p>
<p>8. Confusion around wording of forest health objectives</p>	<ul style="list-style-type: none"> • MOF <p><i>Wording revised with the assistance of MOF to provide more clarity.</i></p>

Comments/Concerns	Contact Name (<i>WLAP responses in italics</i>)
<p>9. Concern that smaller UWR polygons may not be manageable. Not documented or communicated what minimum size is appropriate.</p>	<ul style="list-style-type: none"> • MOF • Canfor <p><i>All suitable polygons that were modeled were presented, with the info provided that we may decide to drop some based upon feedback and further consideration. A number of small UWR polygons have been dropped from this proposal, and a few others have been modified slightly to provide a more manageable area.</i></p>
<p>10. To accurately address timber supply impacts, a conversion of area to volume needs to be done. Can't fully comment without this info. Canfor concerned the timber supply impact to be approx. 50% greater, given location of UWR polygons mainly outside of ESAw's.</p>	<ul style="list-style-type: none"> • MOF • Canfor <p><i>WLAP will not exceed their allotted budget for UWR designation. The resultant database will have a 100% netdown applied, and then impacts from objectives determined. Have referred this concern to MOF.</i></p>
<p>11. One Licensee will bear the brunt of the mule deer UWRs. Is there any intent to apportion UWRs amongst FLs? If there is no evidence of use within the Tchensut area, Apollo would like to see it dropped, given its higher snow depths.</p>	<ul style="list-style-type: none"> • Apollo Forest Products • MOF <p><i>Identification of UWRs based on biological criteria. At the present time there is no intent to drop the two most northerly UWR areas (Trembleur and Tchensut). We have direct evidence of summer mule deer use north of Leo Creek (48 and 60km north, respectively). Mule deer <u>may</u> travel up to 100km to reach suitable winter range (Glen Watts, pers.comm.), but without radio collar info it is difficult to know where Leo Creek mule deer might overwinter. Anecdotal evidence of recent (March 2003) mule deer use just north of Trembleur West (Unit #17), in the vicinity of Baptiste Creek. These two polygons represent the closest suitable critical winter range. WLAP staff are willing to assist MOF or FLs in addressing the question of evidence of use, with adjustment of UWRs as appropriate to meet mule deer needs.</i></p>
<p>12. TFL 42 not part of TSR process. UWR proposal used netdowns from MWP #3. Now operating under MWP #4. Additional timber supply impacts anticipated.</p>	<ul style="list-style-type: none"> • MOF • Canfor • Tanizul Timber Ltd. <p><i>A number of TFL concerns raised, and will now be addressed and treated under a separate submission. This will allow for more timely consideration of those UWR areas proposed within the PG TSA portion of the Ft. St. James FD.</i></p>

Comments/Concerns	Contact Name (<i>WLAP responses in italics</i>)
<p>13. At least one area underlain by mineral claims Murray Ridge East (Unit #2). Other proposed UWR areas cover known mineral occurrences including a former mine (Necoslie). Mt. Pope East (Unit #19) located in an area of high metallic and industrial mineral potential, but no historical record of activity. UWR restrictions should consider the impact on the mineral sector. There should be flexibility to accommodate mineral exploration and development activities.</p>	<ul style="list-style-type: none"> • Nick Massey, Energy and Mines <p><i>Concern noted. Necoslie area dropped due to small size.</i></p>
<p>14. No overlap with any range tenures</p>	<ul style="list-style-type: none"> • Karen Tabe, MOF
<p>15. No comments to add to what is proposed.</p>	<ul style="list-style-type: none"> • MSRM (Beryl Nesbit, Habitat Biologist)
<p>16. Would rather see measurable strategies or guidance rather than prescriptive objectives. The boxed text in Sec. 3.2 thought to be a more reasonable objective, manageable at the landscape level, with the following 'objectives' as strategies.</p>	<ul style="list-style-type: none"> • BCTS • Canfor <p><i>Maintaining high suitability stand structural attribute requirements for the winter needs of mule deer are the priority. The objectives (modified in some instances since referral) are intended to reflect this.</i></p>
<p>17. Within the Trembleur UWR area, forest health mgmt is a high priority, and includes 2 blocks scheduled for harvest this winter, plus future possible Mtn. Pine beetle blocks. Significant component of Pl in these blocks. And the blocks are in the higher snowpack subzone. Winter range objectives too restrictive to allow for attempting to control spread of MPB.</p>	<ul style="list-style-type: none"> • BCTS <p><i>Approval of current blocks not an issue. Current blocks not completely within UWR area. Maintaining high suitability stand structural attribute requirements for the winter needs of mule deer are the priority. See comment 11 above, which indicates this Trembleur area closest to mule deer known to occur 48km north in the Leo Creek area. Recent evidence of mule deer (March 2003) nearby.</i></p>

Comments/Concerns	Contact Name (<i>WLAP responses in italics</i>)
18. Only age class distribution, shrub cover and opening size are meaningfully measureable, and no objectives felt to be reasonably achievable.	<ul style="list-style-type: none"> • Canfor <p><i>These are the objectives required to maintain mule deer ungulate winter range. Text amended to provide more clarity and to improve measureability.</i></p>
19. Some concerns regarding the selection criteria and methodology	<ul style="list-style-type: none"> • Canfor <p><i>Text amended to provide more clarity. Licensees welcome to discuss any further questions with local WLAP staff.</i></p>
20. Description of 'relatively small' in Sec. 2 is misleading.	<ul style="list-style-type: none"> • Canfor <p><i>Text amended</i></p>
21. Neither the methodology nor objectives clearly identify the need to maintain disturbance over time.	<ul style="list-style-type: none"> • Canfor <p><i>Disagree. % of stand to be maintained within a specific age class with a specific crown closure still allows for volume removal over time. Fire mgmt also discussed.</i></p>
22. Concern with process of developing these mule deer UWRs; inadequate timelines to respond and consider FL feedback, no FL involvement with development of the UWRs, no collaborative approach	<ul style="list-style-type: none"> • Canfor <p><i>WLAP commits to and has considered all input.</i></p>
23. Concern with Mt. Pope East. Some area of THLB included along S and SE side, where felt there were potential logging chances for small scale salvage. Would prefer not to see this area included in this UWR Unit (100% netdown)	<ul style="list-style-type: none"> • Apollo <p><i>73.3 ha of THLB included in unit to provide snow interception, thermal and security cover needs. Bulk of polygon is open Douglas-fir type, used as winter feeding area.</i></p>
Unclear how the stand-level management of these polygons (the only management approach possible on such small areas) will fulfill landscape-level objectives when the landscape-level objectives apparently apply only to those small polygons. There may be a conflict between the small polygon size and the claim that these areas provide for landscape-level objectives (Sec. 2.0).	<ul style="list-style-type: none"> • Canfor <p><i>Concern noted.</i></p>

Comments/Concerns	Contact Name (<i>WLAP responses in italics</i>)
<p>23. Canfor supports ecosystem level management, with fine filter strategies to manage species at risk. Mule deer never raised as a species requiring fine filter management. Inappropriate to impose legislated objectives until the use (and extent of use) can be confirmed. Willing to practice a conservative approach until the info can be gathered.</p>	<ul style="list-style-type: none"> • Canfor <p><i>The workshop referred to in this concern dealt specifically with species at risk; hence mule deer would not have been discussed. Again, WLAP is charged with the task of identifying critical winter range for ungulates, and that is what we have done. WLAP staff are willing to assist MOF or FLs in addressing the question of evidence of use, with adjustment of UWRs as appropriate to meet mule deer needs. We are willing to apply adaptive management as better info becomes available. We suggest a conservative approach could be tried on blocks that are already approved.</i></p>
<p>24. Tl'azt'en Nation supports any proposals that deals with wildlife within their traditional area as long as objectives with [which] restrict logging in the protected area for moose, deer, elk caribou and are managed to maintain habitat needed by those regulates [ungulates?]</p>	<ul style="list-style-type: none"> • Tl'azt'en Nation
<p>25. Middle River Band Yekooche First Nation Nak'azdli First Nation</p> <p>No formal responses received.</p>	

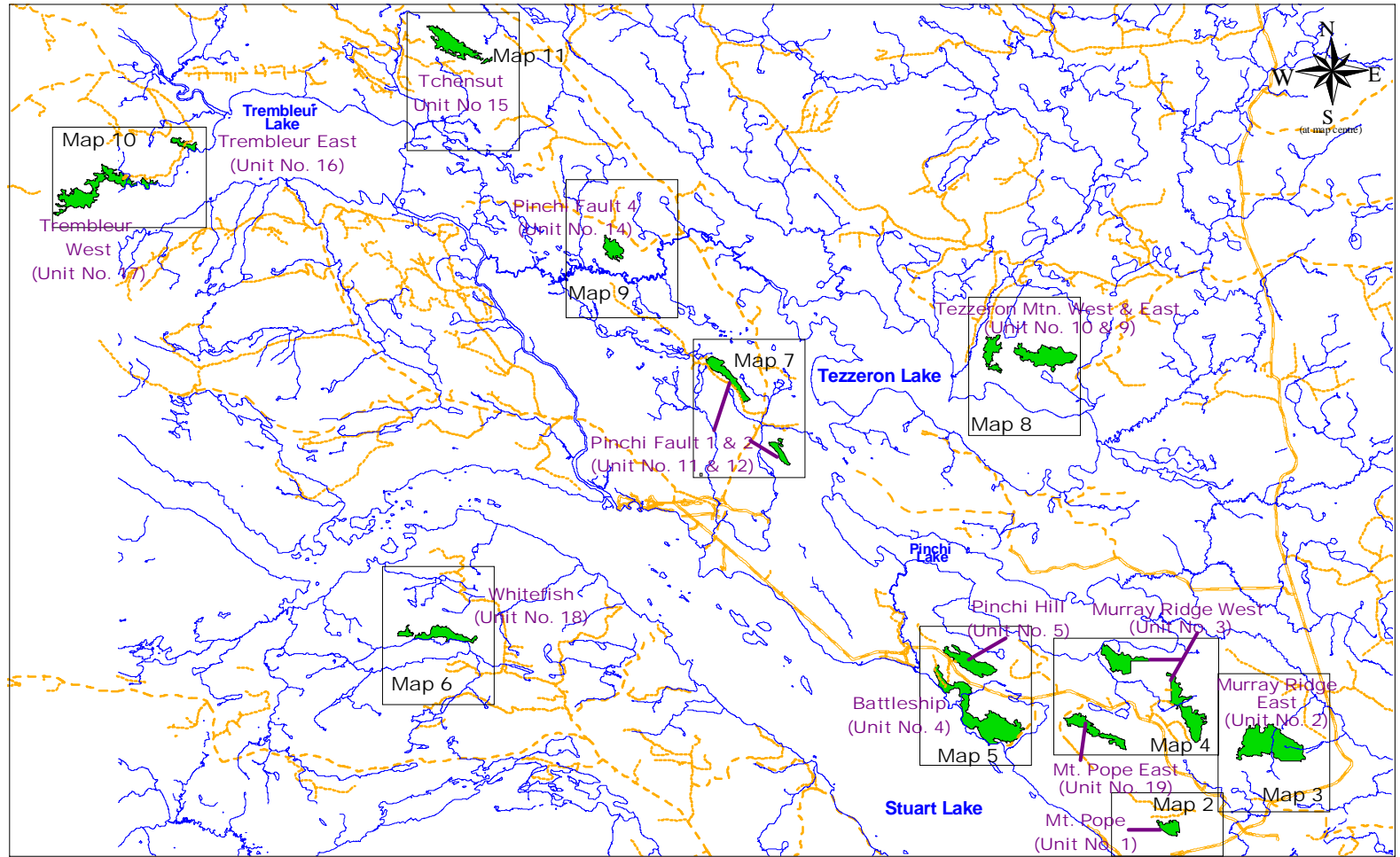
Appendix 3 - Mule Deer UWR Maps

Mule Deer UWR Maps Fort St. James Forest District

11 maps supplied digitally in metafile format.

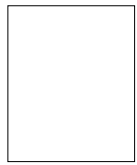
Map No.	UWR Name	Paper size	Orientation
1	Overview map	11 x 17	landscape
2	Mt. Pope	Letter	portrait
3	Murray Ridge East	Letter	Portrait
4	Murray Ridge West Mt. Pope East	Letter	Landscape
5	Battleship Pinchi Hill	Letter	Portrait
6	Whitefish	Letter	Portrait
7	Pinchi Fault 1 Pinchi Fault 2	Letter	Portrait
8	Tezzeron Mt. East Tezzeron Mtn. West	Letter	Portrait
9	Pinchi Fault 4	Letter	Portrait
10	Trembleur East Trembleur West	Letter	Landscape
11	Tchensut	Letter	portrait

Overview and Key Map of Mule Deer Ungulate Winter Ranges in Fort St. James Forest District (Prince George TSA Portion)



Legend

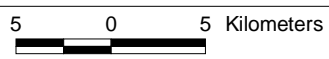
- Proposed Ungulate Winter Range
- Airport
- - - Airstrip
- + + + Rail Line
- Power Line
- Pipeline
- Road Permit Road
- Highway
- - - Forest Service Road (FSR)



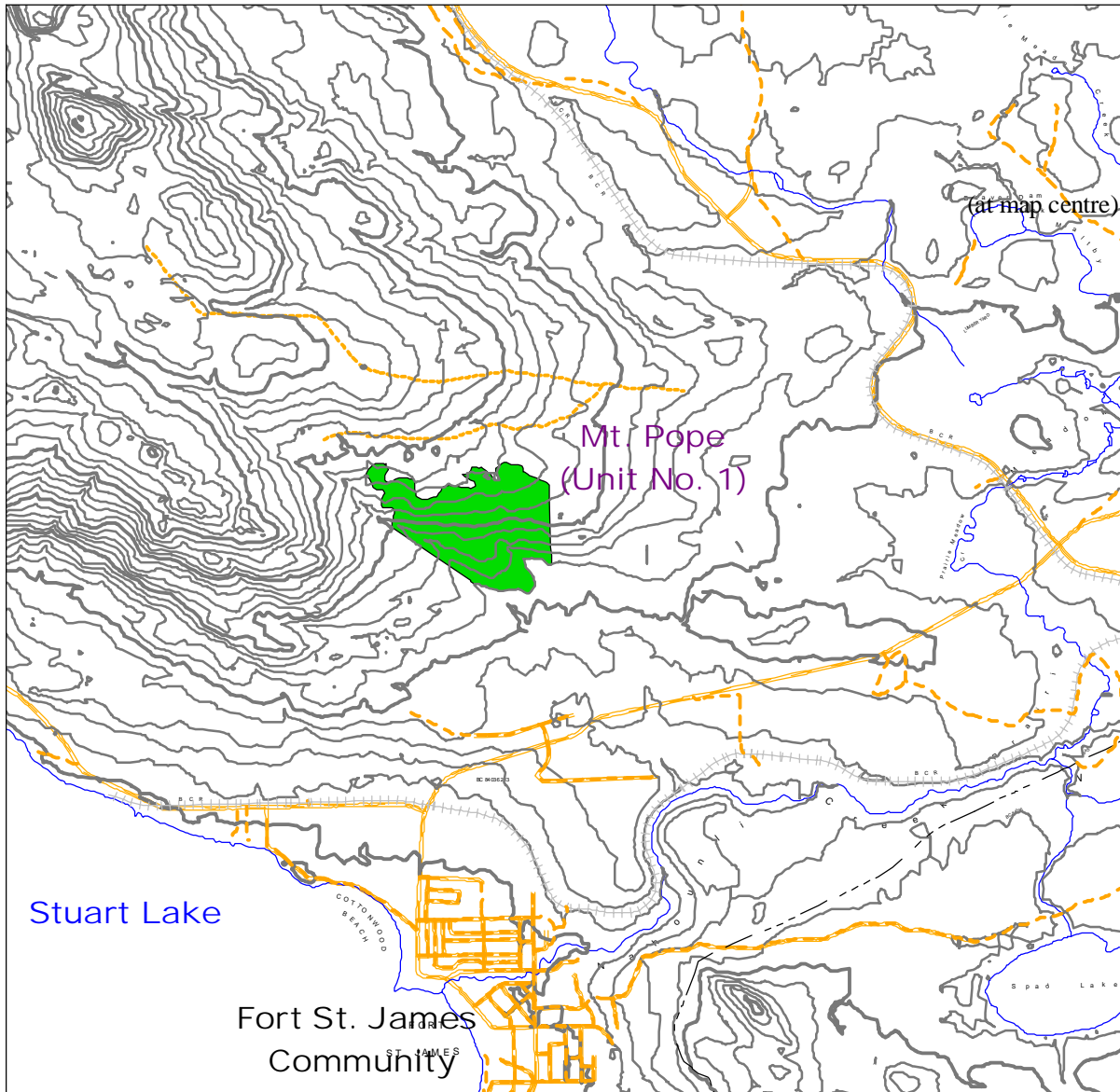
8 1/2 X 11
paper size

Map 1

1:250,000

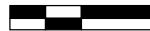


Mt. Pope Ungulate Winter Range

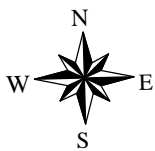


1:50,000

500 0 500 Meters



Legend



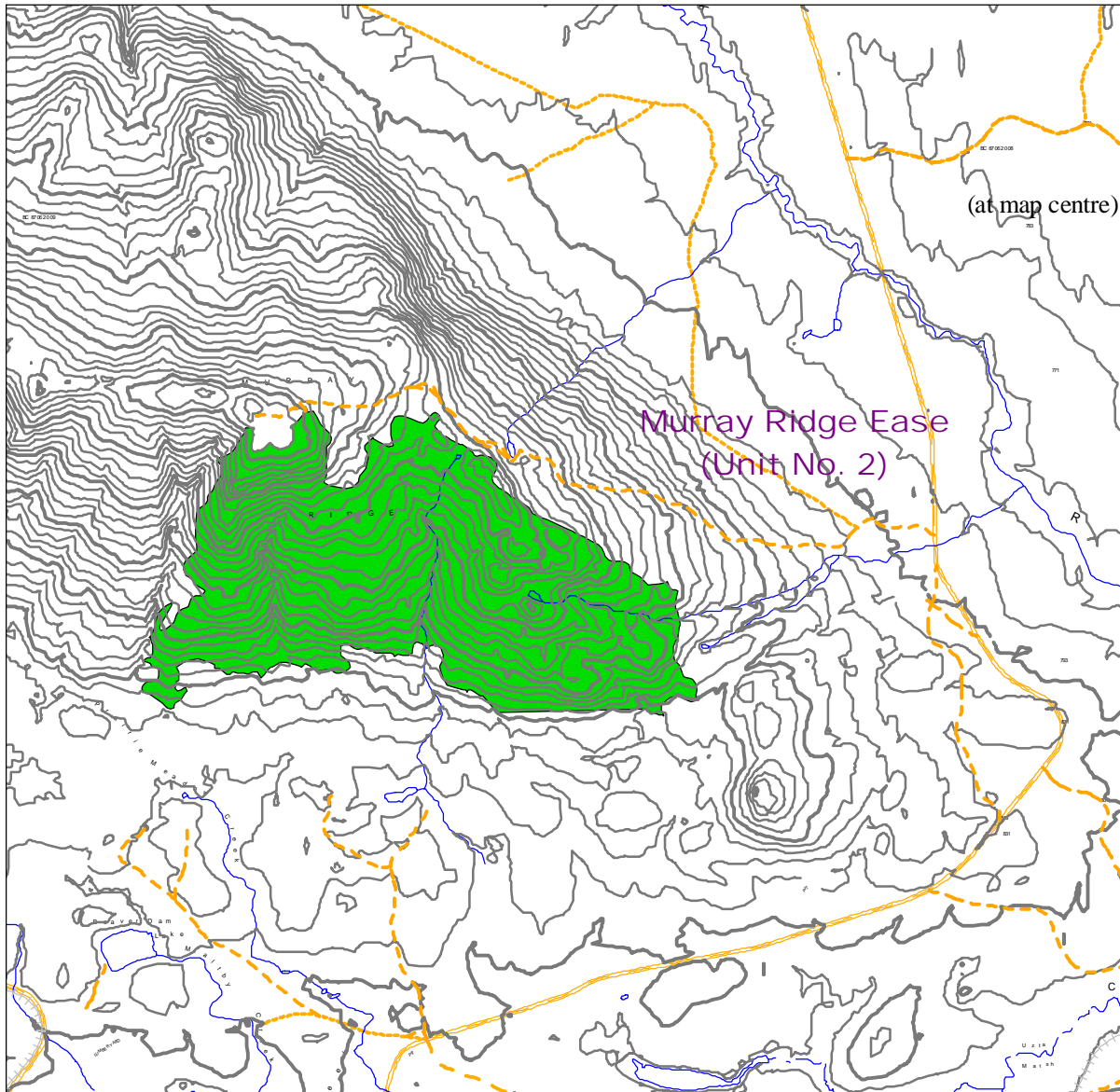
- Ungulate Winter Range
- Airport
- Airstrip
- Rail Line
- Power Line
- Pipeline
- Road Permit Road
- Highway
- Forest Service Road (FSR)

Map 2

Ministry of Land,
Water and Air Protection
Omineca Region
April 2003



Murray Ridge East Ungulate Winter Range



Approximate Scale 1:50,000

500 0 500 Meters



Legend



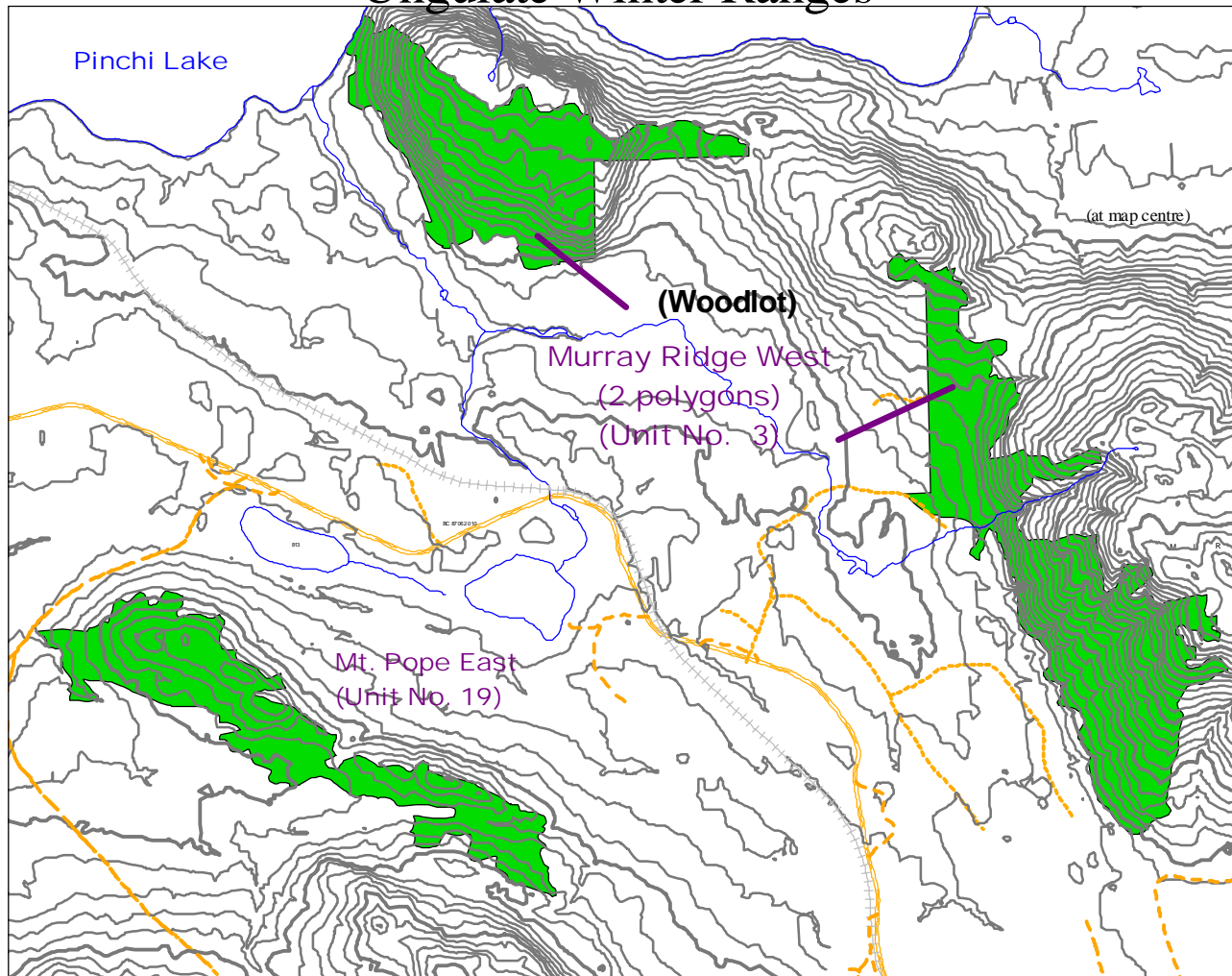
- Ungulate Winter Range
- Airport
- Airstrip
- Rail Line
- Power Line
- Pipeline
- Road Permit Road
- Highway
- Forest Service Road (FSR)

Map 3

Ministry of Land,
Water and Air Protection
Omineca Region
April 2003



Mt. Pope East and Murray Ridge West Ungulate Winter Ranges



Legend



- Ungulate Winter Range
- Airport
- Airstrip
- Rail Line
- Power Line
- Pipeline
- Road Permit Road
- Highway
- Forest Service Road (FSR)

Map 4

Approximate Scale 1:50,000

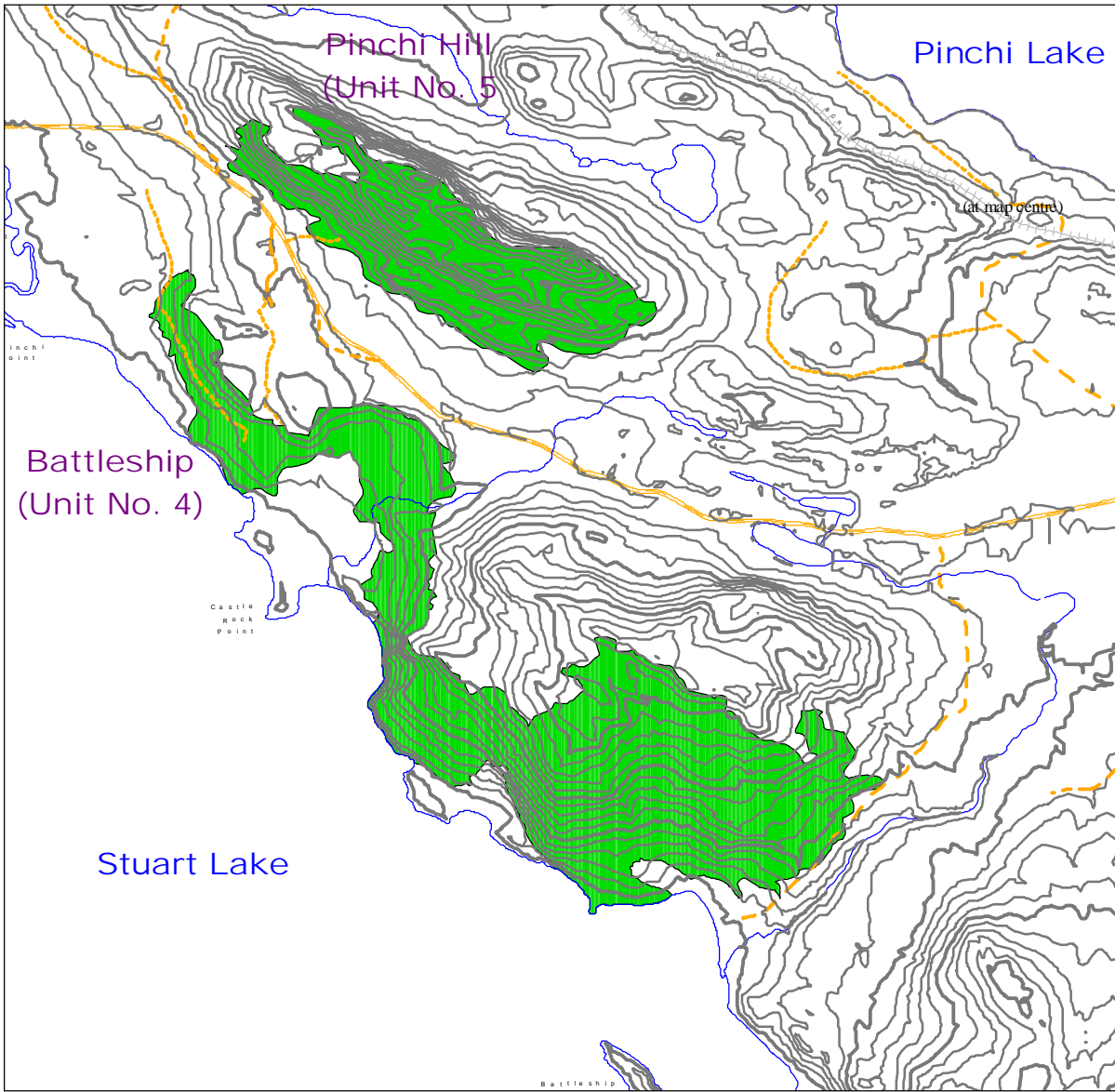
500 0 500 Meters



Ministry of Land,
Water and Air Protection
Omineca Region
April 2003








Pinchi Hill and Battleship Ungulate Winter Range



Approximate Scale 1:50,000

500 0 500 Meters

Legend

	Ungulate Winter Range
	Airport
	Airstrip
	Rail Line
	Power Line
	Pipeline
	Road Permit Road
	Highway
	Forest Service Road (FSR)

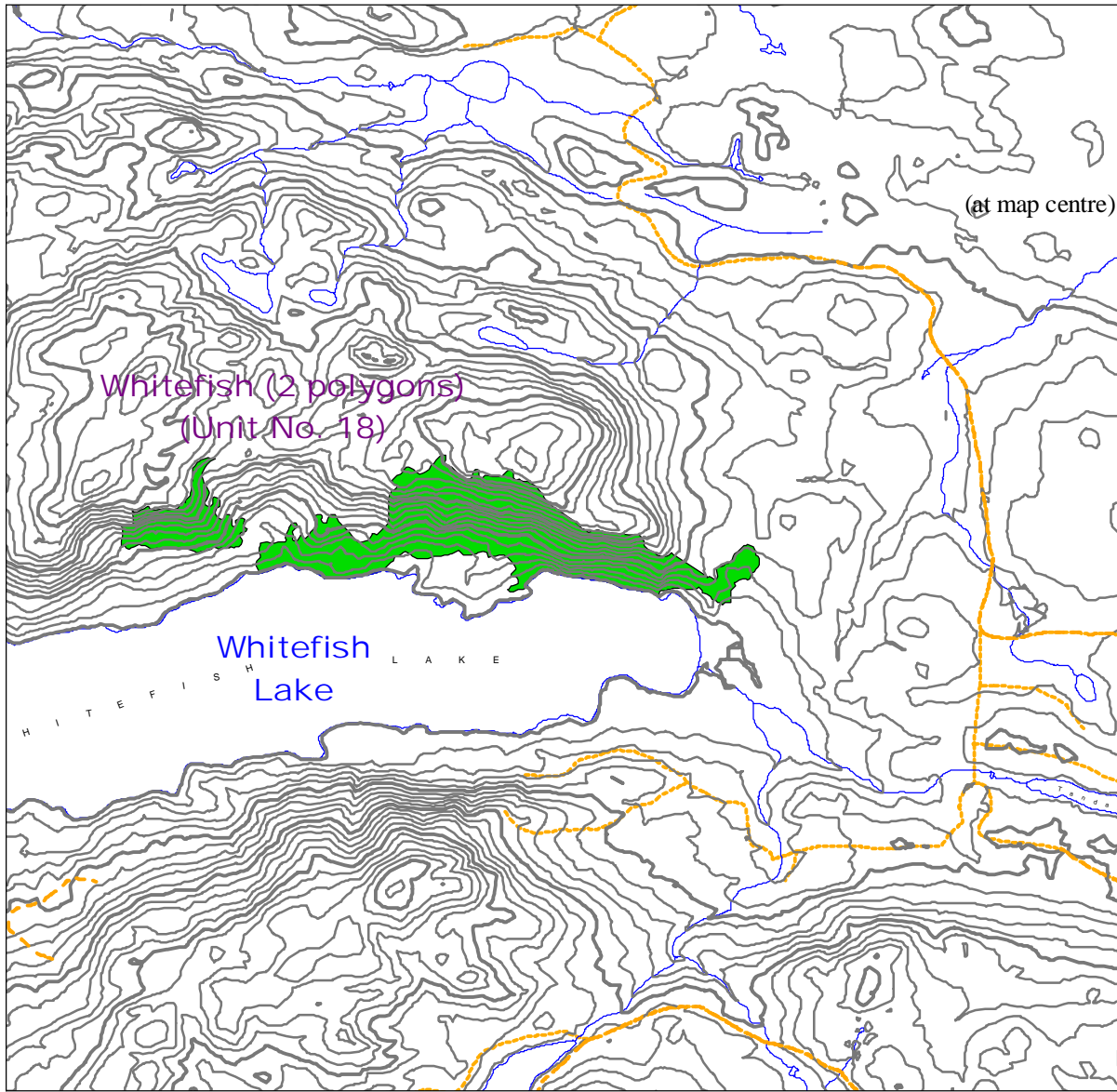


Map 5

Ministry of Land,
Water and Air Protection
Omineca Region
April 3, 2003



Whitefish Ungulate Winter Range



Approximate Scale 1:50,000

500 0 500 Meters



Legend



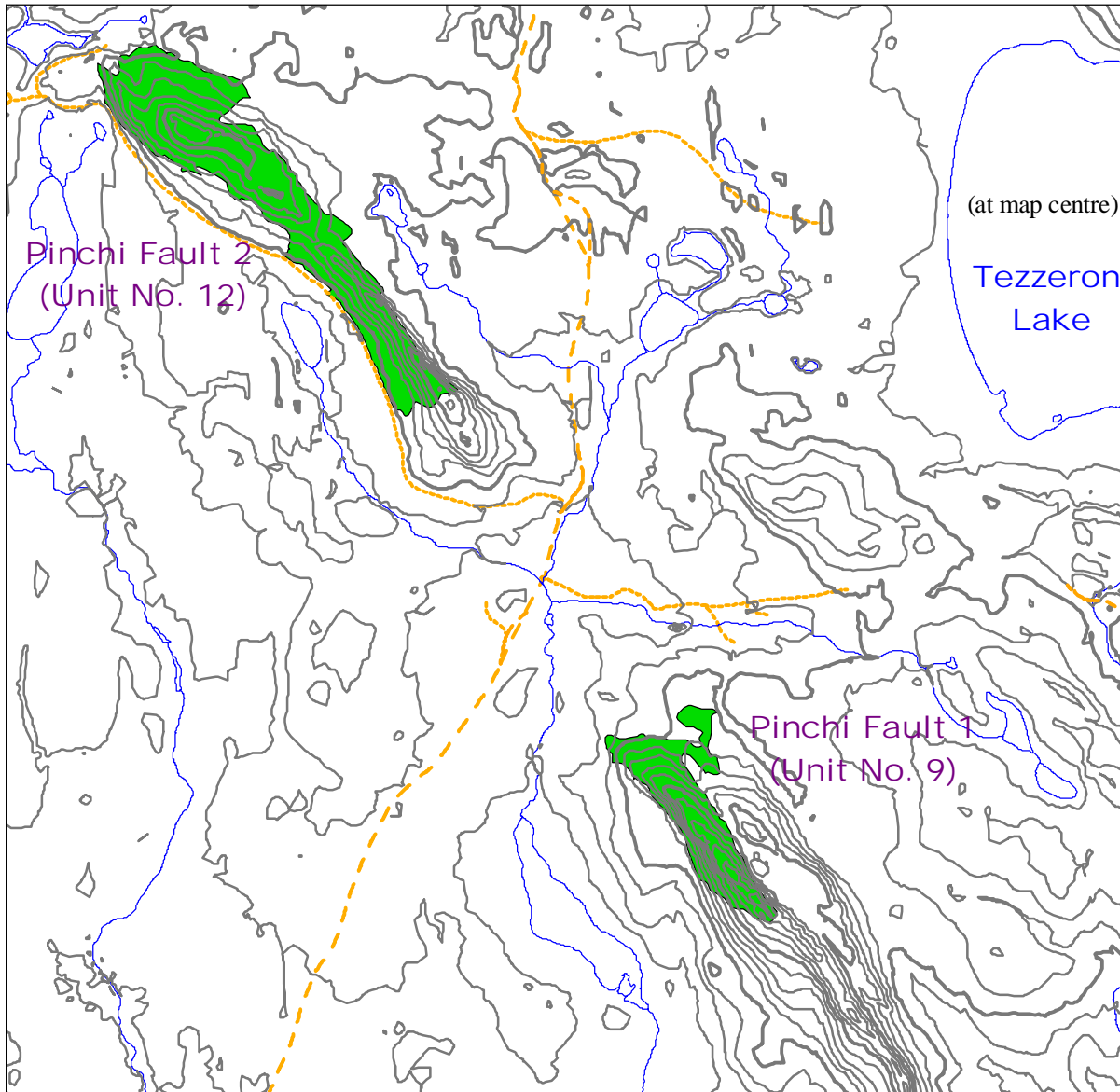
- Ungulate Winter Range
- Airport
- Airstrip
- Rail Line
- Power Line
- Pipeline
- Road Permit Road
- Highway
- Forest Service Road (FSR)

Map 6

Ministry of Land,
Water and Air Protection
Omineca Region
April 2003

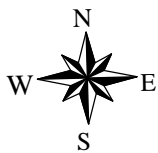


Pinchi Fault 1 and 2 Ungulate Winter Ranges



1:50,000

Legend



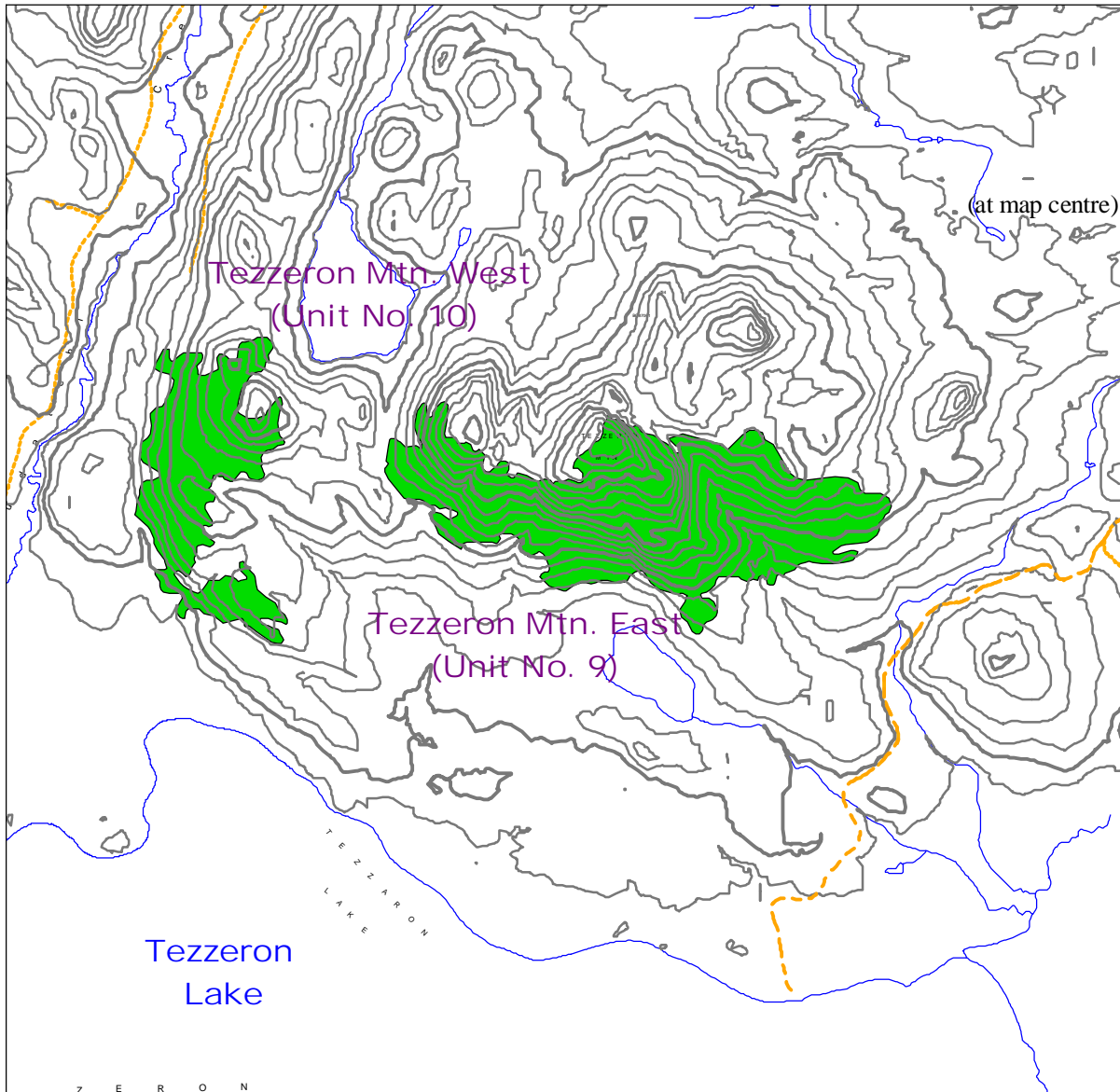
- Ungulate Winter Range
- Airport
- Airstrip
- Rail Line
- Power Line
- Pipeline
- Road Permit Road
- Highway
- Forest Service Road (FSR)

Map 7

Ministry of Land,
Water and Air Protection
Omineca Region
April 2003

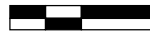


Tezzeron Mtn. West and East Ungulate Winter Ranges



Approximate Scale 1:50,000

500 0 500 Meters



Legend



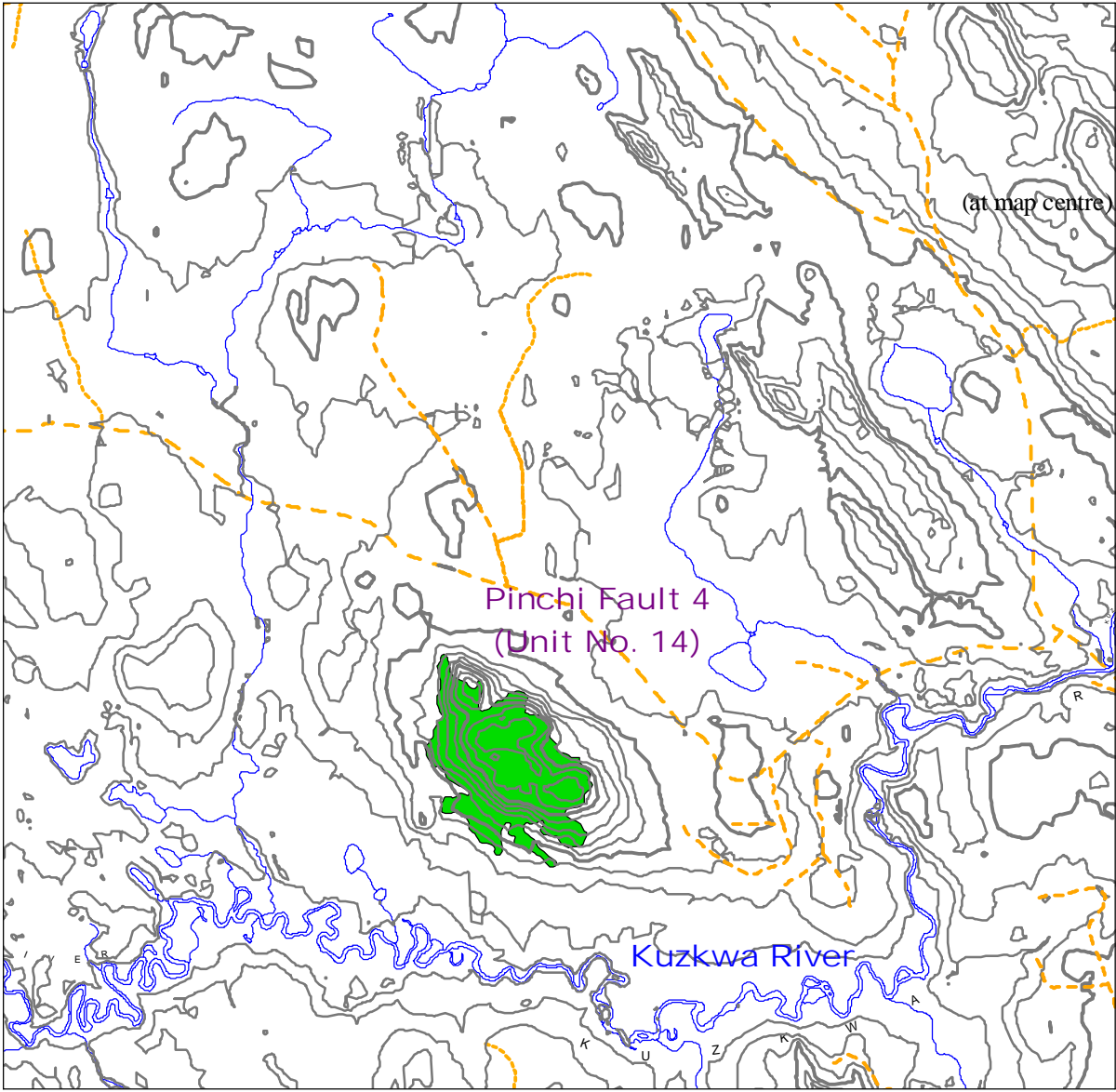
- Ungulate Winter Range
- Airport
- Airstrip
- Rail Line
- Power Line
- Pipeline
- Road Permit Road
- Highway
- Forest Service Road (FSR)

Map 8

Ministry of Land,
Water and Air Protection
Omineca Region
April 2003



Pinchi Fault 4 Ungulate Winter Range

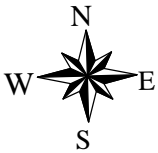


Approximate Scale 1:50,000

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Legend



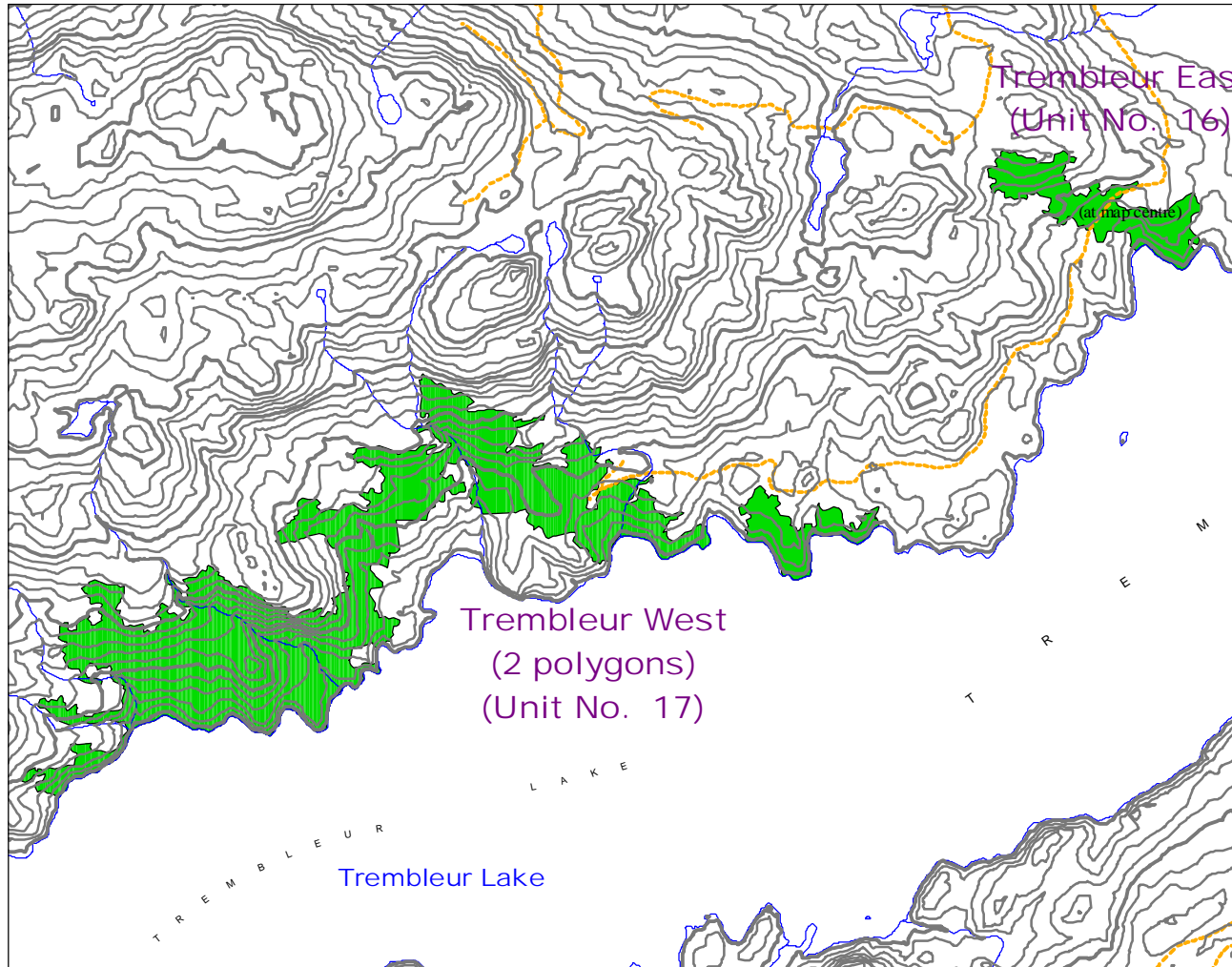
- Ungulate Winter Range
- Airport
- Airstrip
- Rail Line
- Power Line
- Pipeline
- Road Permit Road
- Highway
- Forest Service Road (FSR)

Map 9

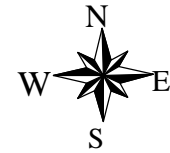
Ministry of Land,
Water and Air Protection
Omineca Region
April 2003












Trembleur West and East Ungulate Winter Ranges



Legend



-  Ungulate Winter Range
-  Airport
-  Airstrip
-  Rail Line
-  Power Line
-  Pipeline
-  Road Permit Road
-  Highway
-  Forest Service Road (FSR)

Map 10

Approximate Scale 1:50,000

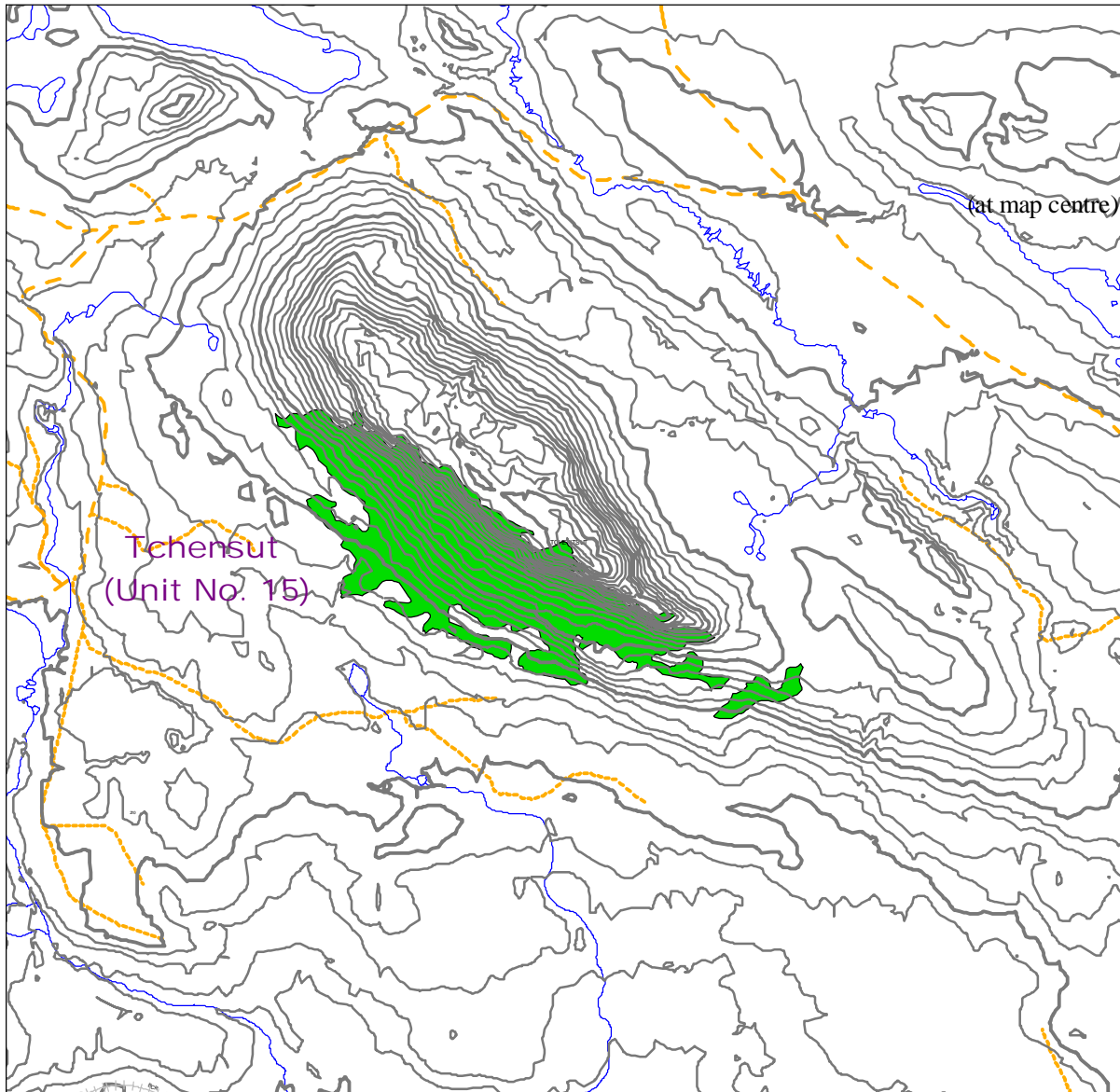
500 0 500 Meters



Ministry of Land,
Water and Air Protection
Omineca Region
April 4, 2003



Tchensut Ungulate Winter Range



Approximate Scale 1:50,000

500 0 500 Meters



Legend



- Ungulate Winter Range
- Airport
- Airstrip
- Rail Line
- Power Line
- Pipeline
- Road Permit Road
- Highway
- Forest Service Road (FSR)

Map 11

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