Mule Deer Ungulate Winter Range for the Vanderhoof Forest District (U-7-011) Report

Prepared By:

Leslie Yaremko, R.P.Bio.
Ecosystem Officer, Omineca Region
Environmental Stewardship Division
Ministry of Water, Land and Air Protection

July 9, 2003

TABLE OF CONTENTS

TABLE OF CONTENTS 2
1.0 Ungulate Winter Range Designation - Background Information 4
2.0 Mule Deer Winter Ecology and Habitat Requirements 4
2.1 Detailed Species Account (MSRM, 2003) 5
2.2 General Ecology and Key Habitat Requirements 5
2.3 Winter Habitat Use 5
2.4 Interspersion of Thermal Cover and Foraging Areas 8
2.5 Security Habitat 9
3.0 UWR Selection Methodology 9
3.1 UWR Size 10
3.2 Risk Factors 11
3.3 Local Knowledge 11
4.0 Vanderhoof Mule Deer UWR - General Area Description 12
5.0 Vanderhoof Land and Resource Management Plan (LRMP) 14
6.0 Aerial Reconnaissance of Candidate UWR 15
7.0 Results 15
8.0 Candidate Ungulate Winter Range VHMD_OrmondOona {Refer to Map 2} 16
8.1 Site Description 16
8.2 Selection Criteria 16
8.3 Linkage to LRMP 17
8.4 Forestry Impacts 17
8.5 Mineral Resource Impacts 17
8.6 Agricultural Issues 17
9.0 Candidate Ungulate Winter Range VHMD_ FraserLakeNorth1 {Refer to Map 2} 17
9.1 Site Description 18
9.2 Selection Criteria 18
9.3 Linkage to LRMP 18
9.4 Forestry Impacts 18
9.5 Mineral Resource Impacts 18
9.6 Agricultural Issues 19
10.0 Candidate Ungulate Winter Range VHMD_ GaiusPointUpland1 {Refer to Map 2} 19
10.1 Site Description 19
10.2 Selection Criteria 19
10.3 Linkage to LRMP 20
10.4 Forestry Impacts 20
10.5 Mineral Resource Impacts 20
10.6 Agricultural Issues 20
11.0 Candidate Ungulate Winter Range VHMD_ FraserLakeNorth2 {Refer to Map 2} 21
11.1 Site Description 21
11.2 Selection Criteria 21
11.3 Linkage to LRMP 21
11.4 Forestry Impacts 21
11.5 Mineral Resource Impacts 21
11. 6 Agricultural Issues 22
12.0 Candidate Ungulate Winter Range VHMD_FrancoisNorth1 {Refer to Map 3} 22
12.1 Site Description 22

12.2 Selection Criteria 22
12.3 Linkage to LRMP 23
12.4 Forestry Impacts 24
12.5 Mineral Resource Impacts 24
12.6 Agricultural Issues 24
13.0 Candidate Ungulate Winter Range VHMD_ FrancoisNorth2 {Refer to Map 3} 25
13.1 Site Description 25
13.2 Selection Criteria 25
13.3 Linkage to LRMP 25
13.4 Forestry Impacts 26
13.5 Mineral Resource Impacts 26
13.6 Agricultural Issues 26
14.0 Candidate Ungulate Winter Range VHMD_ Chilako {Refer to Map 4} 26
14.1 Site Description 27
14.2 Selection Criteria 27
14.3 Linkage to LRMP 27
14.4 Forestry Impacts 27
14.5 Mineral Resource Impacts 27
14.6 Agricultural Issues 27
15.0 Desired Habitat Condition 28
16.0 Approved UWR Management Objectives 28
Appendix I - Summary of Targeted Stakeholder Consultation 31
Appendix II – Maps of Vanderhoof Mule Deer UWR 33
Literature Cited 34
Other References: 36

1.0 Ungulate Winter Range Designation - Background Information

The British Columbia Ministry of Water Land and Air Protection (MWLAP) is responsible for developing Ungulate Winter Ranges (UWR) and establishing UWR management objectives. UWR meeting specific 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, "ungulate winter range" means an area identified as critical/necessary for the winter survival of an ungulate species. As such, UWR objectives consider key life requisites including thermal cover, security cover, forage sources, and potential risk factors such as road access. Under the Forest and Range Practices Act (FRPA), objectives for UWR are required to provide guidance to Forest Stewardship Plans (FSPs), Range Stewardship Plans (RSPs), and other operational plans. Under the FRPA, Ministry of Forests (MOF) will hold the authority for approval of FSPs, RSPs, and other operational plans. These operational plans will be required to be consistent with objectives set by government, including those for UWR. A FSP, RSP, or other operational plan will be required before timber harvesting, road construction, or livestock grazing can occur on Crown land, unless otherwise prescribed or exempted in legislation.

This UWR initiative is for Mule Deer (*Odocoileus hemionus hemionus*) within the Vanderhoof Forest District, Omineca Region of British Columbia. The following report entails a review of existing information on Mule Deer winter habitat requirements, with a clear and defensible rationale for the selection of UWR units and associated recommended management. The overall objectives are to:

- identify the areas necessary for winter survival of Mule Deer,
- ensure these areas are distributed effectively for maintaining Mule Deer across their natural range,
- ensure that timber supply impacts do not exceed those included in Timber Supply Review 1 (TSR1).

The process by which UWRs are designated currently requires that timber supply impacts do not exceed those included in Timber Supply Review 1 (TSR1)[1]. Therefore, an "UWR budget" was provided by MOF to apply to each forest district. For example, within the Vanderhoof Forest District, 3500 ha are available to designate as UWR through the current process.

2.0 Mule Deer Winter Ecology and Habitat Requirements

The following description of species account information for Mule Deer (section 2.0) was extracted from the Ministry of Sustainable Resource Management website, 2003, and from a summary report on establishing ungulate winter range objectives for the Omineca Region prepared by Triton Environmental Consultants, 2002.

[1] Provincially, there are 3 types of UWR that MWLAP may establish. The UWR for Mule Deer in Vanderhoof are categorized as Type I UWR, meaning that the UWR are specified by spatially explicit units that have been incorporated into TSR1 allowances (MWLAP, 2003). By replacing Environmental Sensitive Areas in Vanderhoof with UWR, no net impact to timber supply shall result.

2.1 Detailed Species Account *(MSRM, 2003)*

Scientific Name: *Odocoileus hemionus hemionus* (*interior British Columbia subspecies*)
Species Code: M_ODHE
Status: Yellow-listed (any indigenous species or subspecies (taxa) which is not at risk in British Columbia).

2.2 General Ecology and Key Habitat Requirements

Interior Mule Deer food habitat varies across its range, but typically Interior Mule Deer food is found in open coniferous forests and early structural stages where a variety of grasses, forbs, and shrubs occur, depending upon season (Ehlers et al., 1998). During the spring, areas of early green-up are important for feeding. This occurs on moderate to steep, south and west facing slopes at medium elevations. During the summer season, Interior Mule Deer are usually found at higher elevation habitats such as subalpine parkland, alpine tundra, and shrubby alpine/subalpine wet meadows. In the fall, Interior Mule Deer often occur in the same habitat areas as in the spring season. The winter season forces them from high elevation habitats to low elevation areas with specific habitat characteristics to ensure their survival. Winter survival for Interior Mule Deer is dependent on old growth or mature Douglas-fir stands with well developed canopies that intercept snow, provide security, thermal cover, and provide food. If snow accumulations exceed 50 cm then an area is generally avoided (Ehlers et al., 1998).

Interior Mule Deer are capable of digesting a wide variety of plants. They are mainly browsers, but they will also eat forbs and grasses, especially during the spring season. Forage preferences are determined by both the seasonal variations in forage digestibility and protein content, and by the nutritional requirement of the animals.

Interior Mule Deer breed during mid-October and early December (Stevens and Lofts 1988). Fawns are born in June after a gestation of approximately 210 days (Banfield 1981). Optimum fawning habitat has a dense understory of low shrubs or small trees from 0.6 - 1.8 m tall, and a tree overstory of approximately 50% crown closure. Good fawning habitat typically occurs in close proximity to suitable foraging areas (Stevens and Lofts 1988).

Interior Mule Deer in the Rocky Mountains are strongly migratory; they move from subalpine habitats to montane lower elevation winter range when the snow depth becomes too great (Wallmo and Regelin, 1981). Deer use of an area is usually hindered when snow depths become greater than 40 - 45 cm; their mobility and access to forage is affected (Gilbert et al., 1970; cited in Geist 1981, Schuerholz et al., 1988). Snow is one of the principal limiting factors to deer, and fawn survivorship is seriously compromised with heavy snowfall (Schuerholz et al., 1988).

Distances traveled between summer and winter ranges may be highly variable (Brown, 1992). Spring migration is caused primarily by the growth of new vegetation on exposed south-facing slopes of the winter range. As snow recedes, the deer move upward following the emergent vegetation. Late autumn and early winter migrations from summer range are prompted by increasing snow depth and decreasing forage availability.

2.3 Winter Habitat Use

Thermal Cover

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).

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. In B.C., typical crown closures recommended to retain Mule Deer winter range vary by biogeoclimatic subzone. Armleder et al. (1994) reported Mule Deer in the Interior Douglas-fir (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 (Triton, 2002). 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 (Triton, 2002).

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 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 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). 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 Dry-Cool Sub-Boreal Spruce (SBSdk), Blackwater Dry Warm Sub-Boreal Spruce (SBSdw2), and Stuart Dry Warm Sub-Boreal Spruce (SBSdw3) (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 sites 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).

Winter represents a critical season for deer species due to the associated energetic costs of maintaining body temperature and moving through snow. Forest cover influences snow depth, density, and surface hardness, and Mule Deer typically expend most energy walking through crustless, dense, deep snow (i.e. sinking depths greater than 25 cm) (Nyberg and Janz, 1990). Conditions that produce favourable snow conditions for deer include dense young-growth (>10 m tall), and old-growth forests (Nyberg and Janz, 1990). Canopy closure (i.e. stands taller than 10 m with greater than 60% crown closure) exerts the most influence on snow interception, and creates areas with snow conditions that do not limit deer movement (Bunnell et al., 1985). Multi-layered Douglas-fir forests with deep wide crowns, and high crown closures are the preferred winter habitats for Interior Mule Deer. Additionally, north aspects also provide good snow interception in the

winter, as they can support denser stands of higher crown closures, and therefore, may be used during severe weather conditions (Strategy Committee, 1996).

Multi-layered stands provide the best thermal habitat because they protect deer from the chill factor associated with low temperature and increasing wind speed much more effectively than do single-layered, even-aged stands (Armeleder et al., 1986, Thomas et al., 1979). A mix of trees 1 to 10 m in height is effective at reducing air movement at deer level (Armeleder and Dawson, 1992, Thomas et al., 1979). 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 m^2/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, site specific information on stand structure would be required to determine appropriate basal area retention targets.

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, Douglas maple, and common snowberry. 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).

Mule Deer winter habitat is most often associated with valleys on south-facing, gentle-moderate sloping areas with mature or old growth Douglas-fir forests. Snow depths within these stands are reduced and food is readily available in the form of Douglas-fir foliage and lichens, which fall from large trees. In some cases, Douglas-fir may make up 90% of winter diets. Douglas-fir foliage from older trees is the most common food item in the winter diet of Mule Deer, and foliage from the crowns of older trees is more nutritious than that from young trees. Shrubby open areas are used if snow depths are <50 cm. On windy days, deer may use topographic features to minimize effects of windchill while feeding (Woods, 1988).

Preferred winter foods are as follows: saskatoon (Amelanchier alnifolia), willow (Salix spp.), Douglas-fir (Pseudotsuga menziesii), Douglas maple (Acer glabrum), tree lichens (Alectoria spp., Bryoria spp.), bearberry (Arctostaphlos uva ursi), pasture sage (Artemisia frigida), ceanothus (Ceanothus spp.), falsebox (Paxistima myrsinites), penstemon (Penstemon spp.), rose (Rosa spp.), choke cherry (Prunus virginiana),

cottonwood stems and dried leaves (Populus balsamifera), bitterbrush (Purshia tridentata), snowberry fruit (Symphoricarpus spp.), wheatgrasses (Agropyron spp.), sedges (Carex spp.), silaged false hellebore (Veratrum viride), and cow parsnip (Heracleum lanatum) (Keay and Peek, 1980, Geist, 1981, Blower, 1982). High-quality browse production in combination with the light snowfall that is characteristic of the Interior Douglas-Fir biogeoclimatic subzone provides deer with some of the best winter range in British Columbia (Schuerholz et al., 1988). Mule Deer rely heavily on woody browse in winter (70%), while forbs (15%) and grasses (11%) decline in use (Kufeld et al., 1973). These are general values and actual use in specific areas will vary widely. Although succulent graminoids and forbs are utilized as supplemental

forage species when available, browse provides the bulk of the annual diet for Mule Deer (Cowan, 1947, Sheppard, 1960, Flook, 1964). Cowan (1947) analyzed Mule Deer diet content to be 79% browse, 15% graminoids, and 6% forbs in the winter. Similarly, Waterhouse et.al. (1994) reported diet compositions from winter ranges in the central interior of British Columbia to be 45-76% conifers, 15-50% shrubs, 1-7% graminoids, and 1-6% forbs. Willms et.al. (1976) recorded a shift from low shrubs, graminoids, and forbs to tall shrubs and trees as snow depths increased.

Winter foraging habitat preferences for Mule Deer are generally dictated by temperature, snow depth, and quality/quantity of forages. Areas of lower temperature and shallow snow depths (south facing slopes) are selected by Mule Deer during winter and result in greater concentrations of Mule Deer at these sites. Similar to other areas of North America, Douglas-fir is a consistent feature of winter foraging habitat for Interior Mule Deer (Geist, 1981, Berg, 1983, Stevens and Lofts, 1988, Armleder et.al., 1986, Dawson et.al. 1990, Waterhouse et.al. 1994). Within the central interior, Waterhouse et al. (1994) concluded that the average amount of Douglas-fir in the diets of Mule Deer was between 24% and 73% and was the most abundant forage species in Mule Deer winter diets. Wallmo (1981) found that the consumption of Douglas-fir increased when deer used forests as a refuge from deep snow conditions in open habitats. A study of winter Mule Deer habitat in the central interior of B.C. indicated that this species selected older stands (aged 140 years or greater) when snow depths were greater than 26 cm. (Armleder et al., 1994). In the same study, winter ranges dominated by Douglas-fir were used more often than areas where other tree species were most common.

Overall, the best winter range consists of an interspersion of shrubby foraging areas, thermal cover, and security cover (Armleder et al., 1986) that has the following habitat attributes:

- south east to south west aspect (exceptions may occur in large river valleys)
- moderate to steep slope (>25%)
- deep snowpack biogeoclimatic zones (deer will winter up to 1000 metres in elevation)
- Douglas-fir as the predominant tree species (mature and over-mature trees present)
- moderate to high canopy closure (and/or large basal area)
- abundant shrub species composition
- vertical diversity and habitat edges are also important, as deer can balance food and cover requirements in a smaller geographic area

2.4 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). 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 ≥50%.

2.5 Security Habitat

Security habitat for Interior Mule Deer is essential for hiding from predators and hunters. For Interior Mule Deer the most effective security cover hides 90% of the animal at a distance of 60 m or less, and security

patches need to be 180 m or more in diameter (Thomas et al., 1979). Generally, mature or old growth forests with a dense shrub or patchy conifer understory will satisfy security cover requirements. In the growing season, uneven aged stands of Douglas-fir forests provide good protection from wind and heat loss. Areas of steep broken terrain can also be used as security habitat. (Nyberg and Janz, 1990). The stand's density, diameter of trees, and the density of understory vegetation determine its value as security cover (Nyberg and Janz, 1990). Tree boles and foliage provides the best cover, yet short, dense vegetation and coarse woody debris provide adequate screening in some areas (Nyberg and Janz, 1990). In flat terrain, small trees 1 to 2 m in height can provide effective security cover; whereas, in broken terrain, both large and small trees can provide effective cover (Armeleder and Dawson, 1992). Security cover also reduces deer energy expenditure by reducing the need and the distance to flee (Armeleder and Dawson 1992, Armeleder et al., 1986). Thick-forested habitats, such as thickets, provide security habitat. Security cover tends to be structurally complex, and is important during the hunting season. Very dense stands of young trees (e.g. sum of basal diameter exceeding 311 m (Smith and Long, 1987; cited in RIC, 1998) likely form adequate security habitat. In relatively exposed habitats, such as large shrub/grasslands, Mule Deer will also select foraging areas that are adjacent to steep topography for additional security (Wambolt and McNeal, 1987).

It is widely acknowledged that ungulate winter habitat requirements are associated with both topographic as well as vegetative features. Within a winter range all aspects and slopes are valuable (Harmleder et. al., 1986). Although topographic features (elevation, aspect slope) are a critical component of ungulate winter range, they are not discussed in detail here, as they represent fixed variables that cannot be managed. The topographic features of ungulate winter range will be captured during the spatial analysis and identification of winter range boundaries. It should be emphasized that the objective contained in this report represent a first approximation and may need to be further refined according to reflect site specific locations.

3.0 UWR Selection Methodology

A concerted effort was made to ensure that selection of UWR and associated objectives were supported by explicit assumptions and cited literature. Regional information was used whenever possible; however, data from other parts of BC, the Pacific Northwest, or Alberta were also used to fill in gaps. In addition, draft UWR objectives from other MWLAP regions were also reviewed and suggested where appropriate. 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
- the spatial and temporal effects of land use management activities (i.e. habitat supply)

Therefore, there are instances where professional judgement was required to interpret the available information and propose a course of action. This is especially true for those objectives recommending forest cover constraints and access control. These objectives should be viewed as working hypotheses and implementing within an adaptive management framework.

The proposed UWRs for Vanderhoof Forest District were selected as high value Mule Deer winter habitat through assessing the best scientific information available. This included using species account and habitat selection information for Mule Deer as described in the above section (section 2.0, Winter Ecology & Habitat Requirements). In general, it defines the life requisites and key habitat requirements for Mule Deer, which enables us to select (through GIS analysis) habitat that is capable of supporting Mule Deer in the winter. Snow interception, thermal cover, security cover, and quality/quantity of forage production were the main habitat attributes assessed that contribute to high value Mule Deer winter habitat.

Overall, the information reviewed attempts to focus on key winter habitat requirements and identifies any assumptions, especially those that are believed to affect functional aspects of ungulate winter range (i.e. crown closure, roads, etc.). As best as possible, UWR objectives reflect regional habitat suitability and capability. Thus, objectives were considered in relation to ecological conditions and biogeoclimatic subzone variants. Because of local Terrestrial Ecosystem Mapping (TEM) / Predictive Ecosystem Mapping (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, etc.) for high rated ungulate habitats.

It is important to note that some factors that influence ungulate population viability and survival were not explicitly addressed in this report; these include:

- intra and inter-specific competition
- predation risk
- connectivity (among winter or other seasonal ranges including critical habitats)

Using the best information available, each objective was defined using measurable landscape and 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 Practices Code, which emphasizes results or 'specific measurable outcomes'.

3.1 UWR Size

Kufeld et al., (1989) examined winter home range size and seasonal distribution patterns of Mule Deer populations in the Rocky Mountain Foothills. Using minimum convex polygon model, winter home range areas for Mule Deer were observed to by ~211 ha, on average (Kufeld et al., 1989). Average home range for Interior Mule Deer varies widely between individuals, sexes, and habitat occupied. Bucks generally use larger areas than the does. Deep snow can impede movements, especially young animals; therefore, winter ranges are smaller than summer ranges. In selecting UWR, we generally strived to designate polygons that captured large areas as opposed to smaller areas, and an effort was made to avoid proposing UWRs less than 50 ha (the proposed UWRs in this report range from 54.2 ha to 883.2 ha).

3.2 Risk Factors

For the areas of interest that were selected as possible UWR, we conducted a general assessment of potential risk factors. Access management, private land holdings, and industrial activities were assessed and formed the basis of several decisions in determining UWR boundaries. 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 (Triton, 2002). As such, the selected UWR were positioned away from roads where possible. Harper and Eastman (2000) reviewed the potential impacts of recreation activities on various wildlife species and in general, they found that human disturbances on winter ranges (e.g. snowmobile) can results 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 (1986) suggested persons afoot including snowmobiles should remain >190 m from deer to prevent overt movement responses. A full assessment of the potential impacts of risk factors on the proposed Mule Deer UWR was not completed as part of this report, partly because not all of the desired information is currently available, and partly due to time constraints. Therefore, our approach was to use the best information available, document assumptions, and adapt over time as necessary.

3.3 Local Knowledge

In addition to using the widely accepted species accounts, we sought out information from local studies. Madrone Consultants conducted a study of Mule Deer winter range in the Fort St. James and the northern part of the Vanderhoof Forest Districts in 1998 (D'Arcy et. al., 1998). In this study, 9 survey areas were investigated (stratified by forest type and slope); 2 of the 9 survey areas investigated in this past study were in the Vanderhoof Forest District. Madrone selected several study areas and examined 3 indices of use: fecal pellet group density, browse utilisation, and winter track density. Habitat attributes were also examined (i.e. mesoslope position, snow interception, and snow density). In general, Madrone confirmed that deer use was primarily on south-facing slopes with a Douglas-fir forest cover component. The results of the Madrone study were compared to the results of our assessment, and in several cases were used to add further support to proposed UWRs.

Further local knowledge was used in selecting UWR units through consultation with local experts and stakeholders. Local knowledge was obtained from, Ministry of Forests, Ministry of Water Land and Air Protection staff (Ecosystem Biologists, and Vanderhoof Conservation Officers), as well as members of the local Vanderhoof Fish & Game Club.

The [2]Vanderhoof Innovative Forest Practices Agreement (IFPA) members were also consulted throughout the process and their local knowledge was utilized in the selection of UWR areas. The Vanderhoof IFPA includes the following forest licensee members:

- L&M Lumber
- Canadian Forest Products Ltd. **(**Canfor)
- Fraser Lake Sawmills
- Slocan Group – Plateau Division
- Lakeland Mills
- Ministry of Forests Small Business Program

[2] The Vanderhoof IFPA was established in 1999 and essentially is an industry-government partnership including communities, resource users, and First Nations. Their mandate is to be leaders in the development and implementation of innovative forest practices for the forest district landbase.

- Avison Management

Introductory consultation with MOF and forest licensee stakeholders began in October/02, and review of preliminary draft UWR areas and accompanying rational reports/management objectives in mid-November/02. A final draft of the UWR packages was distributed March 7/03, with feedback being welcomed into June/03. Refer to Appendix I for detailed Summary of Consultation.

Although, MWLAP no longer regularly reviews Forest Development Plans (FDPs), as a part of the overall "consultation process", MWLAP conducted a cursory check of relevant FDPs and amendments that were in their possession. However, MWLAP relied on forest licensees to notify them of any potential conflicts with their FDPs (Appendix I).

In addition to agency input from MOF, Ministry of Sustainable Resource Management (MSRM) was also consulted through review of final draft UWR packages. Specific feedback and concerns are recorded in Appendix I Summary of Consultation.

Consultation with First Nations occurred between March and May/03. Based on advice from the Ministry of Forests Aboriginal Liaison Officer, final draft Mule Deer UWR packages were sent to the following 5 First Nations:

- Cheslatta Carrier Nation
- Nadleh Whut'en First Nation
- Saik'uz First Nation
- Stellat'en First Nation
- Yekooche First Nation

Letters, draft UWR reports, and accompanying maps were sent to the above First Nations in March/03. MWLAP indicated that the establishment of UWR are not meant to affect traditional activities such as hunting, trapping, or berry/plan collecting. Input, comments, or assistance from First Nations was invited several times (March letter, follow-up phone calls, and May letter); however, MWLP did not receive any input from the First Nations listed above.

4.0 Vanderhoof Mule Deer UWR - General Area Description

The following description has been selected from the Vanderhoof Land and Resource Management Plan (LRMP) (Refer to section 4.0):

> "The Vanderhoof Forest District is marked by the landscapes of the North Central Interior Plateau and the Nechako Valley, which emerged from a glacial lake basin. The lacustrine soils in the valley bottom are fertile agricultural lands, while the low-rolling to upland terrain of the plateau is mostly forested with sub-boreal spruce and pine. Forests of the area are mostly lodgepole pine and spruce, with scattered patches of aspen and birch. Some Douglas-fir stands are found, but the Vanderhoof LRMP area is approaching this species' northern reaches of its natural range. A history of frequent wildfires has left a natural mosaic of forest ages. Old forests (greater than 250 years) are relatively uncommon in this area, except for the scattered groves of old-growth Douglas-fir, and the few higher elevation mature Engelmann spruce and sub-alpine fir forests.

The four ecosections which divide the LRMP planning area are the Babine Upland, Nechako Lowland, Bulkley Basin, and the Nazko Upland. Within the LRMP's four ecosections are eight vegetation zones (biogeoclimatic subzones). Each can be described in terms of the dominant tree species that prevails when protected from fire. It is important to note that lodgepole pine is the dominant tree species across the Vanderhoof area, but for biogeoclimatic classification, each of the zones is characterized by the dominant tree species in a climax or "old growth" state. Most of the vegetation zones are fairly geographically specific or elevational dependent. The candidate Mule Deer UWRs fall within 4 different Biogeoclimatic Zones, which are summarized in Table I below.

Table I: Summary of Biogeoclimatic Zones for the Candidate Mule Deer Ungulate Winter Ranges

Biogeoclimatic Zone	Mean Annual Snowfall (cm)	Elevation Range (m)	Description
SBSdk Dry Cool Sub-Boreal Spruce	188.1	700-1050	The driest of the variants described in this table, but intermediate in temperature. Forests often dominated by lodgepole pine and trembling aspen. Climax forests dominated by hybrid white spruce with subalpine fir generally. Douglas-fir occurs as a long-lived seral species on drier sites and is often associated with bedrock outcrops. Black spruce is restricted to wetlands. Paper birch occurs sporadically, often in combination with Douglas-fir. Black cottonwood occurs along streams and rivers associated often with hybrid white spruce.
SBSdw2 Blackwater Dry Warm Sub-Boreal Spruce	204.1	750-1100	The SBS is dry and warm relative to other biogeoclimatic units in the region. The warmth of this variant reflects its southern position and lower elevation. Winter precipitation is relatively low for the region. The forests are diverse tending to be mixtures of lodgepole pine, Douglas-fir and hybrid white spruce with lodgepole pine and/or Douglas-fir dominating on drier sites. Hybrid white spruce dominate on wetter sites. Black spruce occurs in wetlands and in combination with pine on poorer upland sites. Trembling aspen forms upland deciduous forests, and black cottonwood is common along streams and rivers.
SBSdw3 Stuart Dry Warm Sub-Boreal Spruce	204.2	750-1100	the SBSdw3 is warm relative to other biogeoclimatic zones in the region. Winter precipitation is relatively low. The forests are diverse tending to be mixtures of lodgepole pine, Douglas-fir, and hybrid white spruce with lodgepole pine and/or Douglas-fir dominating on drier sites . Hybrid white spruce dominate on wetter sites. Black spruce occurs in wetlands, and in combination with lodgepole pine on poorer upland sites. Deciduous forests are most commonly dominated by trembling aspen, but localized paper birch forests do exist. Black cottonwood is common along streams and rivers.
SBSmc2 Babine Moist Cold Sub-Boreal Spruce	237.1	850-1350	The climate is the wettest and snowiest of the SBS biogeoclimatic units in the area. Climax forests are dominated by hybrid white spruce and subalpine fir. Lodgepole pine is common on all sites but tends to dominate on drier sites. Black spruce occurs in wetlands and on sites with poor soils in combination with lodgepole pine. Black cottonwood occurs along streams and rivers often associated with hybrid white spruce. Forest productivity is moderate but limited by the relatively short growing season. The SBSmc2 is bordered at lower elevations by SBSdk.

* Table I adapted from Delong et. al. 1993.

The proposed Mule Deer UWRs are within Natural Disturbance Type 3 (NDT3), which represent ecosystems with frequent stand-initiating events. The Biodiversity Guidebook characterises NDT3 as being historically influenced by frequent stand-initiating wildfire with an average return interval of 100 to 150 years (Province of British Columbia, 1995). The Biodiversity Guidebook identifies Douglas-fir as the most fire-resistant tree species in this natural disturbance type, and that where present, it determines the number and size of mature remnant stands that survive extensive crown fires to provide structural diversity.

The Biodiversity Guidebook and the "Handbook for Timber and Mule Deer Management Co-ordination on Winter Ranges in the Cariboo Forest Regions" (Armleder et. al., 1986) provided the guidelines to evaluate the age and canopy closure of a forest stand. For the SBS biogeoclimatic unit:

- trees <40yrs were considered to be early seral stage,
- trees >100 years were considered to be mature, and
- trees >140 years were classified as old.

Canopy coverages were considered to be:

- low if between 0-35%
- moderate if between 36 and 65%
- high if >65%

5.0 Vanderhoof Land and Resource Management Plan (LRMP)

The Vanderhoof LRMP (MOF, 1997) was developed by a planning group that consisted of a cross section of public participants with local, regional, and provincial interests, and gov't agency staff. The participants represented a wide range of values, including water, fisheries, heritage, culture, recreation, tourism, wildlife, agriculture, mining, timber, access, and conservation interests. The LRMP was ratified in 1996 and was a successful consensus-based process with public involvement. The LRMP documents that Mule Deer populations for the Vanderhoof area are in general considered healthy, and that in the winter months they are concentrated on steep south-facing slopes where they find a shallower snow pack and the earliest spring forage. The LRMP directs "to maintain or enhance Mule Deer populations" and habitat and natural resource managers should:

- Endorse identification and mapping of important Mule Deer winter ranges, such as south facing slopes with mature Douglas-fir cover.
- For Douglas-fir stands providing known Mule Deer winter range, endorse developing and implementing plans to integrate Mule Deer habitat requirements. (e.g. implement alternative silviculture systems to maintain uneven-aged stands or other strategies outlined in the Handbook for Timber and Mule Deer Management) (Armleder et. al., 1986).

Additionally, the LRMP directs old growth management to target the management of Douglas-fir. Douglas-fir is the most fire resistant tree species in this area and often is key to determining the amount and distribution of the mature forest remnants. Single veteran Douglas-fir trees can be up to 500 years old.

A key principle of the Vanderhoof LRMP is to use Resource Management Zones (RMZs) to delineate specific resource values and management objectives. The type of RMZ determines the type of activities (i.e. recreation, timber harvesting, trapping etc.) and level of intensity permitted. Some of the RMZs are further classified into subzones. For example, the proposed UWRs north of Francois Lake fall within the "Francois North RMZ". This zone is classified as a Multi-Value Emphasis RMZ which is characterized as follows:

- Generally manages development through Subzones, which integrate a wide array of resource values and permissible uses.

- Resource development will be integrated with requirements of other resource values.
- Investments in resource development and enhancement are encouraged and will be integrated with other management objectives.

Management direction for NDT3 areas from the LRMP include:

- Old growth management strategies are met primarily by maintaining mature and seral stage requirements as outlined in the Biodiversity Guidebook for NDT3 and NDT2, with a particular emphasis on maintaining the distribution and abundance of Douglas-fir, the most fire-resistant tree species in this area. Old growth management strategies will also incorporate snag/wildlife tree retention and recruitment within harvesting areas.

- Consider partial cutting systems in Douglas-fir and in some spruce and true fir stands, to maintain mature forest attributes.
- Retain some mature Douglas-fir or tamarack in stands where they constitute a minor component of the stand.
- Where Douglas-fir or tamarack is a component of a stand, it should also form a component of the regenerated stand.

6.0 Aerial Reconnaissance of Candidate UWR

Candidate UWRs (with the exception of one) were additionally assessed through aerial reconnaissance on March 14/03. This overview flight was conducted with staff from MWLAP, MSRM, and Vanderhoof MOF. As a result of the overview flight, several of the draft UWRs were amalgamated into a larger unit and several boundary adjustments were made based on topographic and vegetative features observed. Field observations and photo-documentation are provided in the Results section below.

7.0 Results

7 areas were ultimately selected as candidate UWRs in Vanderhoof (Table II). The total area identified in candidate Mule Deer UWRs is 2327.8 ha. This equates to a total timber harvesting land base impact of 775.9 ha, as provided by MOF Timber Analysts. There is an Environmental Sensitive Area (ESA) impact budget of 3500 ha for Vanderhoof Forest District from TSR 1. Detailed accounts of each candidate UWR are presented below discussing their overall assessment (which considered such factors as snow-pack zone, slope, topography, forest cover, species composition, age, canopy closure, candidate UWR size, and adjacency to roads, etc.)

Table II: Timber Harvesting Land Base (THLB) Netdown Summary:

UWR_NAME	UWR_LABEL	Gross Area (ha)	100% THLB Netdown (ha)	Conversion Factor Based on Application of UWR Management Objectives	THLB Impact/Netdown of Proposed UWR (ha)

VHMD_OrmondOona	VD-001	436.3	268.4	0.64	171.8
VHMD_FraserLakeNorth1	VD-002	322.6	272.2	0.64	174.2
VHMD_GaiusPointUpland1	VD-003	422.1	1.2	1	1.2
VHMD_FraserLakeNorth2	VD-004	54.2	38.1	0.57	21.7
VHMD_FrancoisNorth1	VD-005	883.2	460.8	0.64	294.9
VHMD_FrancoisNorth2	VD-006	117.3	51.1	0.64	32.7
VHMD_Chilako	VD-007	92.2	79.4	1	79.4

Total THLB = 775.9 ha

8.0 Candidate Ungulate Winter Range VHMD_OrmondOona {Refer to Map 2}

UWR_NAME	UWR_LABEL	Gross Area (ha)	THLB Impact (ha)
VHMD_OrmondOona	VD-001	436.3	171.8

8.1 Site Description

The majority of this candidate UWR falls within the Babine Moist Cold Sub-Boreal Spruce (SBSmc2) biogeoclimatic zone. A small fraction of it falls within the Dry Cool Sub-Boreal Spruce (SBSdk). The Vanderhoof LRMP describes the general area as having lodgepole pine, white spruce, and Douglas-fir forested hillsides rising steeply from the Ormond and Oona lakeshores. The LRMP documents the area to be relatively unaltered by human activity.

8.2 Selection Criteria

VHMD_OrmondOona UWR includes suitable habitat attributes for Mule Deer winter range. Although Mule Deer winter habitat may be limited in the SBSmc2 subzone due to it's relatively deep snow accumulations, this UWR was selected based on it's combination of the forest cover, slope, aspect, and habitat attributes. A significant portion of VHMD_OrmondOona UWR is centered around stands that are Douglas-fir leading by >60%, between 16 and 47% slope, with a south, south-east, or south-west aspect. It also includes areas of similar slope and aspect that are leading with Douglas-fir, but < 60%. Finally, this candidate UWR includes some important secondary habitat for Mule Deer winter habitat that has slopes of >48%. A good portion of the "core habitat" captured in the candidate UWR is old Douglas-fir forest (>140 yrs) with moderate canopy closure. The areas connecting the "core habitat" include a large component of pine dominant stands that vary in age and canopy closure, as well as a few hybrid spruce stands. Several of the stands are Douglas-fir leading with combinations of old trees with relatively open canopy closure and younger denser stands. An aerial overview of VHMD_OrmondOona UWR (conducted on March 14/03) confirmed the appropriateness of this area based on topographic and vegetative conditions (Figure I). One set of fresh ungulate tracks, and one set of old ungulate tracks were observed within the UWR.

Figure I: Aerial overview of VHMD_OrmondOona UWR (located on the eastern slope of this photo).

8.3 Linkage to LRMP

VHMD_OrmondOona UWR lies within the Ormond-Oona Subzone of the larger Vanderhoof –North RMZ in the Vanderhoof LRMP. The LRMP direction is to manage this subzone as Multi-Value Emphasis.

8.4 Forestry Impacts

VHMD_OrmondOona UWR lies within Canfor's Barlow Operating Area, but to MWLAP's knowledge does not pose any conflicts with their 2002-08 Forest Development Plan.

8.5 Mineral Resource Impacts

VHMD_OrmondOona UWR does not appear to be in conflict with surrounding mineral resource operations/interests.

8.6 Agricultural Issues

VHMD_OrmondOona UWR is not close to any private land lots, and agricultural activity does not predominate in the immediate area.

9.0 Candidate Ungulate Winter Range VHMD_ FraserLakeNorth1 {Refer to Map 2}

UWR_NAME	UWR_LABEL	Gross Area (ha)	THLB Impact (ha)
VHMD_FraserLakeNorth1	VD-002	322.6	174.2

9.1 Site Description

VHMD_FraserLakeNorth1UWR spans 2 Biogeoclimatic Zones; most of it is within the Babine Moist Cold Sub-Boreal Spruce (SBSmc2), but a portion of it is within the Stuart Dry Warm Sub-Boreal (SBSdw3) zone where the winter precipitation is relatively low.

9.2 Selection Criteria

Although Mule Deer winter habitat is not optimal in the SBSmc2 subzone due to it's relatively deep snow accumulations, the VHMD_FraserLakeNorth1 UWR was selected based on the forest cover, slope, aspect, and other habitat attributes which make it suitable for Mule Deer winter range. A significant portion of the candidate UWR is centered around stands that are Douglas-fir leading by >60%, between 16 and 47% slope, with a south, south-east, or south-west aspect. It also includes areas of similar slope and aspect that are leading with Douglas-fir, but < 60%. Finally, VHMD_FraserLakeNorth1 UWR includes some good secondary habitat for critical Mule Deer winter habitat, where Douglas-fir is the leading species on slopes that range from 48% to 120%. Much of the "core habitat" captured in the UWR is old forest with moderate canopy closure. Areas within the UWR that are adjacent to the ideal type of habitat, include stands with lodgepole pine and hybrid spruce that also have a good Douglas-fir component. Many of these stands are mature forest with moderate to high canopy closure.

An aerial overview of this candidate UWR (conducted on March 14/03) confirmed the habitat suitability based on topographic and vegetative conditions. One set of ungulate tracks were observed throughout the UWR on this flight.

9.3 Linkage to LRMP

A very small portion of VHMD_FraserLakeNorth1 UWR falls partially within the Nechako Valley RMZ, which is a settlement and agricultural zone. The majority of it falls within the Vanderhoof North RMZ, which has a resource development emphasis. An objective of the Vanderhoof North LRMP is to maintain Douglas-fir wildlife habitat, which is generally consistent with the intent of this UWR.

9.4 Forestry Impacts

VHMD_FraserLakeNorth1 UWR lies within Canfor's Barlow Operating Area, but to MWLAP's knowledge does not pose any conflicts with their 2002-08 Forest Development Plan.

9.5 Mineral Resource Impacts

VHMD_ FraserLakeNorth1 UWR does not appear to be in conflict with any mineral resource operations/interests.

9.6 Agricultural Issues

VHMD_ FraserLakeNorth1 UWR is situated within the general vicinity of several private land lots. However, to our knowledge there are no direct conflicts with it's location. MWLAP was advised by MOF that it overlaps with a crown range tenure (thus, we predict overlap between livestock use and the UWR).

10.0 Candidate Ungulate Winter Range VHMD_ GaiusPointUpland1 {Refer to Map 2}

UWR_NAME	UWR_LABEL	Gross Area (ha)	THLB Impact (ha)
VHMD_GaiusPointUpland1	VD-003	422.1	1.2

10.1 Site Description

VHMD_GaiusPointUpland1 UWR falls within the Dry Cool Sub-Boreal Spruce (SBSdk) Biogeoclimatic Zone, which receives an average annual snowfall of ~ 150-200cm (which is less snow than other biogeozones in the area). Within the candidate UWR, lodgepole pine and Douglas-fir dominate in the western portion, while spruce is more common on the eastern sections. Narrow bands of cottonwood and aspen occur in the drainages on toe-slopes.

10.2 Selection Criteria

Gaius Point Upland is currently a Fish and Wildlife Reserve. MWLAP proposes it's designation as an UWR because of it's previously documented value to both Mule Deer and Moose, and because it has extensive south-facing exposures and numerous rocky outcrops, which are a distinctive habitat feature in this area. In 1998, Industrial Forestry Service Ltd., (IFS) conducted a site assessment and management plan for the Gaius Point Upland Fish and Wildlife Reserve. They documented considerable sign of winter use by Mule Deer, especially within the southern section around the rock outcrops. IFS recommendations included protection of the site from intrusion and disturbance. Their report stated that no active management shall be required in the short-term and that no timber harvesting should be allowed in the reserve (IFS, 1998).

An aerial overview of this candidate UWR (conducted on March 14/03) confirmed the suitability of habitat (based on topographic and vegetative conditions) for ungulate winter range (Figure II). One deer and many fresh and old ungulate tracks were observed within the candidate UWR on this flight.

Figure II: Aerial overview of VHMD_GaiusPointUpland1 UWR.

10.3 Linkage to LRMP

VHMD_GaiusPointUpland1 UWR is located within the Nechako West RMZ, which is a Resource Development Emphasis zone. Within the LRMP high value Mule Deer habitat is recognized as being present within the area, and the wildlife management objective for this RMZ is generally to maintain existing wildlife populations.

10.4 Forestry Impacts

To MWLAP's knowledge this candidate UWR does not pose any conflicts with forest licenses development plans.

10.5 Mineral Resource Impacts

A quarry is situated in similar terrain approximately 2 km to the east of this proposed UWR (IFS,1998), but VHMD_ GaiusPointUpland1 UWR does not appear to be in direct conflict with any mineral resource operations/interests.

10.6 Agricultural Issues

Much of the surrounding land, and the Nechako Valley as a whole, has been deforested and converted to agricultural use, especially pasture and hay production. The VHMD_ GaiusPointUpland1 UWR area is essentially an island of residual coniferous forest. It's relative isolation has increased it's importance to wildlife species such as Mule Deer.

11.0 Candidate Ungulate Winter Range VHMD_ FraserLakeNorth2 {Refer to Map 2}

UWR_NAME	UWR_LABEL	Gross Area (ha)	THLB Impact (ha)
VHMD_FraserLakeNorth2	VD-004	54.2	21.7

11.1 Site Description

VHMD_FraserLakeNorth2 UWR is within the Stuart Dry Warm Sub-Boreal biogeoclimatic subzone (SBSdw3), which is relatively warm compared to other biogeoclimatic zones in the region. Winter precipitation is also relatively low in this zone with diverse forests of lodgepole pine, and Douglas-fir.

11.2 Selection Criteria

VHMD_FraserLakeNorth2 UWR includes a significant portion of some of the best type of winter habitat for Mule Deer available in the district based on the habitat attributes present. The "core habitat" within the UWR was selected based on it's combination of the forest cover, slope, and aspect that make this area important for Mule Deer in the winter. A significant portion of the UWR is centered around stands that are Douglas-fir leading by >60%, between 16 and 47% slope, with a south, south-east, or south-west aspect. Also captured within VHMD_FraserLakeNorth2 UWR, are some adjacent stands of mature hybrid spruce dominant forest with moderate canopy closure, some mature pine dominant forest with moderate canopy closure, and some other Douglas-fir leading stands with mature trees of moderate canopy closure. These areas provide security cover and additional foraging opportunities.

An aerial overview of VHMD_FraserLakeNorth2 UWR (conducted on March 14/03) confirmed the habitat suitability based on topographic and vegetative conditions for ungulate winter use. No ungulate tracks were observed throughout the candidate UWR on this particular overview flight.

11.3 Linkage to LRMP

VHMD_FraserLakeNorth2 UWR is situated by the Nechako Valley RMZ, which is a settlement and agricultural zone. The LRMP objective for wildlife in this zone is to maintain (or enhance) wildlife, habitat, which is overall consistent with the intent of establishing UWR in this area.

11.4 Forestry Impacts

VHMD_FraserLakeNorth2 UWR lies within Canfor's Barlow Operating Area, but to MWLAP's knowledge does not pose any conflicts with their 2002-08 Forest Development Plan.

11.5 Mineral Resource Impacts

VHMD_ FraserLakeNorth2 UWR does not appear to be in conflict with any mineral resource operations/interests.

11. 6 Agricultural Issues

VHMD_ FraserLakeNorth2 UWR is surrounded to the west, south and east by private land lots. However, to our knowledge there are no direct conflicts with it's location. MWLAP was advised by MOF that the UWR overlaps with a crown range tenure (thus, we predict overlap between livestock use and the UWR).

12.0 Candidate Ungulate Winter Range VHMD_FrancoisNorth1 {Refer to Map 3}

UWR_NAME	UWR_LABEL	Gross Area (ha)	THLB Impact (ha)
VHMD_FrancoisNorth1	VD-005	883.2	294.9

12.1 Site Description

VHMD_FrancoisNorth1 UWR falls within both the SBSdk Biogeoclimatic Zone (deep snowpack zone) and the SBSmc2 Biogeoclimatic Zone (very deep snowpack zone). The Vanderhoof LRMP describes the general area as containing open grassland and mixed deciduous and Douglas-fir forests rising from Francois Lake to the top of Savory Ridge, which includes some of the most important winter range for Mule Deer in the Vanderhoof LRMP area. The southern slopes and older healthy stands of pine and Douglas-fir have attracted infestations of mountain pine beetle and Douglas-fir beetle. The Vanderhoof LRMP reports that some selection logging has occurred to control these infestations. Groves and single veteran Douglas-fir trees scattered throughout the zone contribute significantly to the forage and shelter needs of the resident Mule Deer.

12.2 Selection Criteria

VHMD_FrancoisNorth1 UWR includes a significant portion of some of the best type of winter habitat for Mule Deer available in the district according to the habitat attributes present. The "core habitat" within the candidate UWR was selected based on it's combination of the forest cover, slope, and aspect that make this area important for Mule Deer in the winter. A significant portion of the candidate UWR is centered around stands that are Douglas-fir leading by >60%, between 16 and 47% slope, with a south, south-east, or south-west aspect. This candidate UWR also includes areas of similar slope and aspect that are leading with Douglas-fir, but < 60%. Finally, VHMD_FrancoisNorth1 includes some good secondary habitat for critical Mule Deer winter habitat, that has slopes >48%. Much of the Douglas-fir forest within the candidate UWR is old with moderate canopy closure. The areas that connect the "core habitat" include Douglas-fir dominant stands that are of an early seral stage (i.e. between 60 and 65 years) with moderate canopy closure (ranging from 35-50%), and some stands of lodgepole pine and spruce. Adjacent openings likely have a high grass and shrub component, which will be important for spring forage.

VHMD_FrancoisNorth1 UWR captures an area that was previously rated as "High Winter Range Potential" through the work conducted by Madrone Consultants (D'Arcy et. al., 1998). Of the overall 9 survey sites

Madrone inventoried in Fort St. James and the northern part of Vanderhoof (all with Douglas –fir as the leading forest cover species), they found the largest number of pellet group counts in the area North of Francois Lake, which was significantly different from the other survey areas. The year Madrone conducted their investigation on Mule Deer habitat (1998) the Vanderhoof Forest District received very little snow, and was therefore not ideal for tracking surveys. However, of the tracking data collected, the greatest number of tracks per km was observed in the Douglas-fir stands North of Francois Lake. Thus, the Madrone report provides further support for proposing this general area as UWR. Their conclusion of this area was documented as follows:

> "[The area North of]Francois Lake was very heavily utilized by deer in the winter months of 1997/98, as illustrated by both the pellet group and tracking data…a moderate amount of browse particularly on *Amelanchier alnifolia* and *Rosa acicularis* was evident in this area, and thus supports the pellet group data. The high level of utilisation observed in this survey area may be a function of the distribution of ecological variation of the landscape. This survey area (classified as SBSdk), is bordered by Francois Lake on the south side and by the SBS moist cool variant number 2 (mc2) to the north."

An aerial overview of this candidate UWR (conducted on March 14/03) further confirmed the appropriateness of this area based on topographic and vegetative conditions (Figure III). Several sets of ungulate tracks were observed throughout VHMD_FrancoisNorth1, and the overview flight assisted in final selection of the UWR boundary (previously being considered as several small areas, as opposed to the larger 883 ha unit currently proposed).

Figure III: Aerial overview of VHMD_FrancoisNorth1 UWR.

12.3 Linkage to LRMP

VHMD_FrancoisNorth1 UWR falls within the LRMP's "Francois North" Resource Management Zone (RMZ), which is a Multi-Value Emphasis RMZ. The Francois North zone lies north of the private lands

along Francois Lake and includes the area around Endako Mines. The east boundary takes in the Stellako River corridor, and the west boundary lies up against the Burns Lake Forest District. Selection of UWR North of Francois Lake is consistent with the intent of the Vanderhoof LRMP in terms of wildlife and old growth management. Relevant objectives and strategies for the Francois North RMZ are documented in the Vanderhoof LRMP as follows:

Wildlife	• Maintain habitat attributes • Maintain critical winter range for Mule Deer.	• Retain aspen and Douglas-fir on south facing slopes and leave snag Douglas-fir trees as wildlife trees. • Maintain older forests at a prescribed level to maintain the high value of riparian areas for wildlife. • Maintain a level of connectivity of the mature forest along Savory Ridge.
Agriculture	• Ensure compatible management for cattle, Mule Deer and forest resources	• Develop a capacity figure for range use by cattle that does not negatively impact critical Mule Deer winter range. • Develop and implement a monitoring program for range utilization. • Investigate grazing impacts on Douglas-fir seedlings • Maximize cattle range usage while respecting other resources. • Consider fire as a tool for range and wildlife enhancement where appropriate.
Timber Harvest	• Manage Douglas-fir stands for sustainability	• Inventory Douglas-fir stands. • Proactively manage fir to decrease gaps in age class distribution. • Maintain a supply of Douglas-fir seed for planting on suitable sites to offset poor natural regeneration.
Access	• Manage access	• Consider minimizing access to critical wildlife areas (e.g. south facing Mule Deer slopes)

12.4 Forestry Impacts

VHMD_FrancoisNorth1 UWR lies within Canfor's Endako Operating Area, but to MWLAP's knowledge does not pose any conflicts with their 2002-08 Forest Development Plan.

12.5 Mineral Resource Impacts

VHMD_FrancoisNorth1 UWR does not appear to be in conflict with surrounding mineral resource operations, namely, [3]Endako Mines.

12.6 Agricultural Issues

VHMD_FrancoisNorth1 UWR is within the general vicinity of several private land lots, and in several places it's southern boundary is relatively close to a road. MWLAP was advised by MOF that the UWR overlaps with a crown range tenure (thus, we predict overlap between livestock use and the UWR). The Vanderhoof LRMP documents that the Francois Lake community is generally concerned about the potential competition for range forage between domestic livestock and Mule Deer in high value winter range. However, there are no direct conflicts with the candidate UWR location, as it is not on private land. The

[3] Endako Mines, a large molybdenum mine owned by Placer Dome Ltd., holds mineral tenures on extensive parcels of Crown Land in this zone. The company is actively exploring mineral tenures west of the developed mine for projected ore bodies. The Francois North RMZ has high metallic potential for molybdenum-copper-tungsten deposits. The western third of the zone near Haney Lake is considered to have moderate metallic potential.

southern boundary of the candidate UWR does lie against a road, and it is recognized that this may create some disturbance into the UWR.

13.0 Candidate Ungulate Winter Range VHMD_ FrancoisNorth2 {Refer to Map 3}

UWR_NAME	UWR_LABEL	Gross Area (ha)	THLB Impact (ha)
VHMD_FrancoisNorth2	VD-006	117.3	32.7

13.1 Site Description

Almost all of this UWR falls within the SBSmc2 Biogeoclimatic Zone except for a small portion, which is in the SBSdk.

13.2 Selection Criteria

VHMD_FrancoisNorth2 UWR includes a good portion of some of the best type of winter habitat for Mule Deer available in the district based on the habitat attributes present. The "core habitat" was selected based on it's combination of the forest cover, slope, and aspect that make this area important for Mule Deer in the winter. Much of it has Douglas- Fir leading stands, between 16 and 47% slope, with a south, south-east, or south-west aspect. Much of this Douglas-fir forest is either mature or old with canopy closure ranging from low to moderate. It also captures some surrounding pine, hybrid white spruce, and aspen.

An aerial overview of this candidate UWR (conducted on March 14/03) confirmed the habitat suitability based on topographic and vegetative conditions for ungulate winter use. On this flight, several ungulate tracks were observed throughout the VHMD_FrancoisNorth2 UWR.

13.3 Linkage to LRMP

VHMD_FrancoisNorth2 UWR falls within the "Francois North" Resource Management Zone (RMZ), which is a Multi-Value Emphasis RMZ. The Francois North zone lies north of the private lands along Francois Lake and includes the area around Endako Mines. The east boundary takes in the Stellako River corridor, and the west boundary lies up against the Burns Lake Forest District.

Selection of UWR North of Francois Lake is consistent with the intent of the Vanderhoof LRMP in terms of wildlife and old growth management. Relevant objectives and strategies for the Francois North RMZ are documented in the Vanderhoof LRMP as follows:

Wildlife	• Maintain habitat attributes • Maintain critical winter range for Mule Deer.	• Retain aspen and Douglas-fir on south facing slopes and leave snag Douglas-fir trees as wildlife trees. • Maintain older forests at a prescribed level to maintain the high value of riparian areas for wildlife. • Maintain a level of connectivity of the mature forest along Savory Ridge.
Agriculture	• Ensure compatible management for cattle, Mule Deer and forest resources	• Develop a capacity figure for range use by cattle that does not negatively impact critical Mule Deer winter range. • Develop and implement a monitoring program for range utilization. • Investigate grazing impacts on Douglas-fir seedlings • Maximize cattle range usage while respecting other resources. • Consider fire as a tool for range and wildlife enhancement where appropriate.
Timber Harvest	• Manage Douglas-fir stands for sustainability	• Inventory Douglas-fir stands. • Proactively manage fir to decrease gaps in age class distribution. • Maintain a supply of Douglas-fir seed for planting on suitable sites to offset poor natural regeneration.
Access	• Manage access	• Consider minimizing access to critical wildlife areas (e.g. south facing Mule Deer slopes)

13.4 Forestry Impacts

VHMD_FrancoisNorth2 UWR lies within Canfor's Endako Operating Area, but to MWLAP's knowledge does not pose any conflicts with their 2002-08 Forest Development Plan.

13.5 Mineral Resource Impacts

VHMD_FrancoisNorth2 UWR does not appear to be in conflict with surrounding mineral resource operations, namely, Endako Mines.

13.6 Agricultural Issues

VHMD_FrancoisNorth2 UWR is surrounded by private land lots within very close proximity. However, there were no immediate conflicts identified. Concerns do exist for the integrity of this candidate UWR because of it's location in amongst a highly used area by humans. MWLAP was advised by MOF that the candidate UWR overlaps with a crown range tenure (thus, we predict overlap between livestock use and the UWR). The Vanderhoof LRMP documents that The Francois Lake community is generally concerned about the potential competition for range forage between domestic livestock and Mule Deer in this high value winter range.

14.0 Candidate Ungulate Winter Range VHMD_ Chilako {Refer to Map 4}

UWR_NAME	UWR_LABEL	Gross Area (ha)	THLB Impact (ha)
VHMD_Chilako	VD-007	92.2	79.4

14.1 Site Description

VHMD_Chilako UWR is in the Blackwater Dry Warm Sub-Boreal Spruce (SBSdw2), which is dry and warm relative to other biogeoclimatic zones in the region.

14.2 Selection Criteria

A "core area" of ideal Mule Deer winter habitat is included within the proposed UWR; it is dominated by old Douglas-fir (>60%) with moderate canopy closure on south-facing slopes. Also captured within the UWR are hybrid spruce stands and several old pine leading stands with moderate canopy closure. The UWR connects to a marsh at it's south boundary.

Note: This candidate UWR was not assessed through an aerial overview.

14.3 Linkage to LRMP

This UWR is located within the Nechako West RMZ, which is a Resource Development Emphasis zone. Within the LRMP high value Mule Deer habitat is recognized as being present within the area and the wildlife management objective for this RMZ is generally to maintain existing wildlife populations.

14.4 Forestry Impacts

VHMD_Chilako UWR lies within Canfor's Bobtail Operating Area. Initially the area did not overlap with Canfor's 2002-08 Forest Development Plan. However, upon a recent forest health related amendment application, a new proposed category A cutblock was found to correspond with ~1/3 of the candidate UWR. The boundary of the originally proposed UWR was adjusted to avoid conflict with Canfor's plans. The proposed boundary of the UWR is now adjacent to several harvested cutblocks. Although it is relatively small and isolated amongst many roads and forest harvest activity, it still offers many of the habitat

attributes suitable for Mule Deer winter habitat (i.e. dominated by old Douglas-fir with moderate canopy closure on southern slopes), and it is within the SBSdw2 (dry and warm relative to other biogeoclimatic zones in the district).

14.5 Mineral Resource Impacts

VHMD_ Chilako UWR does not appear to be in conflict with any mineral resource operations/interests.

14.6 Agricultural Issues

VHMD_ Chilako UWR does not appear to be in direct conflict with any private land lots for agriculture. However, it is adjacent to the northern boundary of an existing range tenure (Julie MacDougall, pers. com.) and is within "Butcher Flats" grazing license (thus, we predict overlap between livestock use and the UWR).

15.0 Desired Habitat Condition

Designation of these UWR units compliments the measures already in effect in the Vanderhoof Forest District for the management of Mule Deer. Forest licensees are already familiar with managing for Mule Deer within their area of operations through the application of 2 main guiding documents: 1) LRMP (through RMZ direction) and 2) District "Douglas-fir Management Guidelines for the Prince George Forest Region (MOF, 2001). The purpose of the Douglas-fir Management Guidelines is to provide guiding principles and interim objectives, to ensure that at a landscape scale Interior Douglas-fir resource are adequately managed and conserved throughout its range in the region.

Ungulate winter ranges need to provide an adequate supply of habitat over time. As such, 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, timing of harvest), not only within the winter range, but also outside the established winter range boundaries. It is important to recognize that ungulates interact with their environment at both fine and coarse spatial scales (Pearson and Turner 1995). Because designated UWRs will be 'embedded' within the larger landscape matrix, they will be subject to watershed processes and landscape level land management regimes (Triton, 2002). 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 may be especially true for UWRs that are relatively small (100-1000 ha). 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 outcome of stand structure habitat objectives. Professionals preparing operational plans have site-specific discretion and flexibility in prescribing methods to achieve these management objectives.

16.0 Approved UWR Management Objectives

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 maybe amended from time to time.

Within all proposed Mule Deer UWR units maintain winter range to provide high suitability snow interception cover and foraging opportunities (shrubs, conifer and arboreal lichen litterfall) at both landscape and stand-levels. This will be accomplished by applying the following specific management objectives to the proposed UWRs:

16.1 Habitat Condition

For UWR units VD-04, VD-03, and VD-07 (deep snowpack biogeoclimatic zones (i.e. SBSdk, SBSdw2, SBSdw3)), maintain a minimum of 40% of winter range area in age class 8 (>140 years) or greater at all times. Maintain a crown closure of >56% (Douglas-fir, Spruce).

For UWR units [4] VD-05, VD-06, VD-01, and VD-02 (very-deep snowpack biogeoclimatic zones (i.e. SBSmc2)), maintain a minimum of 50% of stands in age class 8 (>140 years) or greater. Maintain crown closure of mature forests >66% (Douglas-fir, Spruce).

For all UWR units, within each UWR unit maintain species composition as Douglas-fir leading with a minimum of 50% Douglas-fir.

For all UWR units, maintain 30-40% deciduous shrub component of preferred deciduous forage species. This may include a combination or a dominance of the following species: Saskatoon (*Amelanchier alnifolia*), Prickly Rose (*Rosa acicularis*), Common Snowberry (*Symphoricarpos albus*), Choke Cherry (*Prunus spp*.), Red Osier Dogwood (*Cornus stolonifera)*, Willow sp, (*Sallix* sp), Black Twinberry (*Lonicera involucrate)*, Highbush Cranberry (*Viburnum edule)*, Douglas Maple (*Acer galbrum)*, Black Huckleberry (*Vaccinium membranaceum)* and Trembling Aspen regeneration *(Populus tremuloides)*

16.2 Timber Harvest

For UWR units VD-04, VD-03, and VD-07 (deep snowpack biogeoclimatic zones (i.e. SBSdk, SBSdw2, SBSdw3)), maintain a minimum of 40% of winter range area in age class 8 (>140 years) or greater at all times. Maintain a crown closure of >56% (Douglas-fir, Spruce).

For UWR units VD-03 and VD-07, no forest harvesting within the UWR, with the exception of forest-health related sanitation activities as described below.

For UWR units VD-05, VD-01, VD-06, VD-02, VD-04:

- Any timber harvesting openings within UWRs shall be irregular in shape and <1ha in size and < 250 m wide.
- Develop and implement harvesting schedules that time forestry operations to avoid activities during the winter periods (December 15th to April 15th) when deer are using the UWR. If Mule Deer are not utilizing the UWR, winter harvest may be considered if supported by monitoring information on the spatial arrangement of Mule Deer (i.e. evidenced through overview flights, track assessments, radio collar data etc.)

16.3 Forest Health Management

For all UWR units, maintain high suitability winter habitat attributes by managing bark beetle populations to maintain low levels of beetle brood in the UWR. “Low levels” are those that still allow for maintenance of high suitability winter habitat attributes. Sanitation thinning (partial harvest) may occur within UWR, only if it is within the limits of UWR stand structural attribute requirements (see habitat condition management objectives).

16.4 Fire Management

[4] The entire VD-05 UWR will be treated as if it were in the very deep snowpack subzone (SBSmc2), although some portions of this UWR are within the SBSdk, which is a deep snowpack subzone. Similarly, VD-02 spans 2 different biogeoclimatic zones, but the majority is within the very deep snowpack subzone.

For all UWR units:

- Consider the use of prescribed fire to reduce understory fuel loading and improve UWR forage characteristics.
- Limit fire suppression and allow natural fires to burn within UWR where there is no significant risk to adjacent forest lands or property.
- [5]Reflect UWR objectives in appropriate Fire Management Plans. During unsuitable burning conditions, an aggressive first response, (which may include a full and rapid response to a "light hands on the land" policy) would be utilised to prevent stand destroying events.

16.5 Range Management Objectives

For all UWR units:

- Avoid displacement of Mule Deer by livestock.
- Livestock use will not exceed more than 10% of current year's shrub growth.
- Manage for a desired plant community with abundant shrub species composition that will maintain a 30-40% cover of deciduous shrubs that are preferred browse species including, but not limited to, 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 involucrate)*, Highbush Cranberry (*Viburnum edule)*, Black Huckleberry (*Vaccinium membranaceum,* Douglas Maple (*Acer galbrum)* and Trembling Aspen regeneration *(Populus tremuloides).*
- No livestock grazing should occur on south facing slopes until shrub leaf out.
- 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.

16.6 Access Management

For all UWR units, avoid/minimize new road or access development. This is to be achieved through application of the following sub-objectives:

- Where reasonable alternatives exist, plan the location and design of major/secondary access routes to avoid the UWR.
- Review and update Access Management Plans to consider UWR areas and objectives. Avoid human use of high value Mule Deer habitat during winter periods. Access management points should include access closure points by signage and physical structures (i.e. concrete barriers, deep road trenches etc.), or other proven methods.
- Minimize new road construction and other access development. New roads should be in the vicinity of existing roads to decrease landscape fragmentation.
- Construct roads and trails to the lowest class with the proposed use and necessary safety and environmental standards.
- Maintain the existing length of active roads by permanently closing and rehabilitating roads in a 1:1 ratio to the amount of new road construction.

[5] If the season is suitable and burn conditions favorable (i.e. early spring), a low intensity ground fire may be of benefit to Mule Deer habitat, and so in some areas UWR should be allowed to burn.

Appendix I - Summary of Targeted Stakeholder Consultation

MWLAP undertook targeted consultations with key stakeholders (i.e. other gov't agencies and forest licensees) and First Nations throughout the development of the proposed UWR. In addition to ongoing correspondence and updates (email/telephone), to achieve consultation, several key meetings/presentations were arranged:

▪ On July 22/02 and September 13/02 MWLAP met in Prince George with Forest Planners from Canfor to obtain a preliminary exchange of ideas regarding the UWR initiative and process (i.e. confirm geographic scope, species priorities, timeframe, agency roles, and confirmation of information resources).

▪ On October 18/02 MWLAP met in Vanderhoof with the Vanderhoof IFPA members to introduce the UWR initiative and collect local knowledge and recommendations from various stakeholders. Participants included Canfor, Slocan Plateau Division, Fraser Lake Sawmills, L&M Lumber, and Avison Management.

▪ On October 22/02 MWLAP met in Vanderhoof with several MOF staff to introduce the UWR initiative and collect local knowledge of candidate areas.

▪ On October 22/02 MWLAP consulted the Vanderhoof district Conservation Officers to discuss the UWR initiative and to gather their local knowledge on potential areas for Mule Deer UWR.

▪ On November 4/02 focus areas for UWR, biological rational, and broad level management objectives for Mule Deer UWR were distributed to stakeholders for their review. MWLAP asked for input and asked if stakeholders could identify ways of making these sections better or more understandable and if there were any major concerns.

▪ At the November 22/02 Vanderhoof LRMP meeting, MSRM (on behalf of MWLAP) distributed a written update on UWR. This update described the purpose for the UWR initiative, the intent, timeframe, and the methods used to determine candidate UWR areas. A MWLAP contact was provided if stakeholders wished to find out more information. Several local residents/landowners subsequently provided comments, submitted questions, and requested additional information.

▪ On November 25/02 in Vanderhoof MWLAP presented IFPA licensee stakeholders and MOF staff with the preliminary Mule Deer UWR and the accompanying draft management objectives. At the end of this presentation, MWLAP collected several comments from the discussion and invited written feedback on the proposed UWRs, the proposed management objectives, and on the methodology/rational used.

▪ MWLAP received written feedback from Canfor on December 3/02. Based on the comments collected MWLAP made several adjustments to the draft UWR areas and objectives and provided written feedback on the issues raised Canfor on February 20/03.

▪ MWLAP received written feedback from MOF on December 6/02, April 1/03 and June 13/03. Based on the comments collected MWLAP made several adjustments to the draft UWR areas and objectives and provided written feedback on the issues raised by MOF on May 14/03 and June 4/03.

- Final draft UWR packages were distributed to forest licensees and First Nations stakeholders on March 7/03. Final written comment was requested by the end of March/03, and then extended to the end of May/03.

Appendix I (attached) documents the consultation . We have grouped the stakeholder comments and concerns under general themes, rather than providing a verbatim account of the many discussions. Participants in the above mentioned process are encouraged to contact Leslie Yaremko (Email: Leslie.Yaremko@gems5.gov.bc.ca or phone (250) 614-9901) if they wish to suggest additions, clarifications, or corrections to this summary.

Appendix II – Maps of Vanderhoof Mule Deer UWR

Refer to attached maps:

Map #	UWR_NAME
Map 1	Key Map of all Vanderhoof Mule Deer UWR Units
Map 2	VHMD_OrmondOona, VHMD_FraserLakeNorth1, VHMD_GaiusPointUpland1, & VHMD_FraserLakeNorth2
Map 3	VHMD_FrancoisNorth1, & VHMD_FrancoisNorth2
Map 4	VHMD_Chilako

Literature Cited

Armleder, H. M., M. Waterhouse, D. Keisker, and R. Dawson. 1994. Winter habitat use by Mule Deer in the central interior of British Columbia. Can. J. Zool. 72:1721-1725.

Armleder, H. M., M. Waterhouse, R. Dawson, and K.E. Iverson. 1998. Mule Deer response to low-volume partial cutting on winter ranges in central interior British Columbia Research Report No. 16. Ministry of Forests, Research Program, Cariboo Region.

Armleder, H. M., R. J. Dawson and R. Thomson. 1986. Handbook for Timber and Mule Deer Management Co-ordination On Winter Ranges In The Cariboo Forest Region. Land Management Handbook No. 13. BC Ministry of Forests, Victoria, BC.

Armleder, H.M. and R.J. Dawson. 1992. Logging on Mule Deer winter range: a guide for loggers. Ministry of Forests, Victoria, B.C. report: Q.P.#11917.

Banfield, A.W.F. 1981. The Mammals of Canada. University of Toronto Press. Canada.

Banfield, A. W. F. 1987. The Mammals of Canada. National Museums of Canada. University of Toronto Press. Toronto, Ontario.

B.C. Environment. 1997. British Columbia ungulate species regional population estimates and status preseason 1997. Spreadsheet prepared by I. Hatter, B.C. Environment, Victoria, B.C.

Berg, B.J. 1983. Wild and domestic ungulate interactions in the Bob Creek Area, southwestern Alberta. M.Sc. Thesis. University of Alberta, Edmonton, Alberta. 153 pp.

Blower, D. 1982. Key Winter Forage Plants for B.C. Ungulates. Min. of Environment. Victoria, B.C.

Bodurtha, T.S., J.M. Peek, and J.L. Lauer. 1989. Mule Deer habitat use related to succession in a bunchgrass community. J. Wildl. Manage. 53:314-319

British Columbia Land Use Strategy. 1997. Vanderhoof Land and Resource Management Plan.

Brown, C.G. 1992. Movements of Idaho Mule Deer. J. Wildl. Mange. 56: 246-253.

Bunnell, FL., RS. McNay, and CC Shank. 1985. Trees and snow: the deposition of snow on the ground. A review and quantitative synthesis. BC Min. Environ. and Min. For., Victoria, BC. IWIFR-17.

Cannings, R. A. and A. P. Harcombe (eds.) 1990. The Vertebrates of British Columbia: Scientific and English Names. Royal British Columbia Museum Heritage Record No. 20; Wildlife Report No. R24. Ministry of Municipal Affairs, Recreation and Culture and Ministry of Environment. Victoria, B.C.

Collins, W. B. and P. J. Urness. 1983. Feeding Behaviour and Habitat Selection of Mule Deer and Elk on Northern Utah Summer Range. Journal of Wildlife Management 47(3):646-663.

Cowan, I. McT. 1947. Range competition between Mule Deer, bighorn sheep and elk in Jasper Park, Alberta. N.Am.Wildl.Conf. 12:223-227.

D'Arcy, M., and J. Stork. 1998. Inventory of Mule Deer winter habitat in the Fort St. James and Vanderhoof Forest Districts. Report prepared for CANFOR, Isle Pierre Division. Madrone Consultants, Prince George.

Dawson, R.J., H.M. Armleder and M.J. Waterhouse. 1990. Preferences of Mule Deer for Douglas_fir foliage from different sized trees. J. Wild. Manage. 54:378-382.

DeLong, C. 1999. Ecology of Douglas-fir at its northern limits. In: Lousier, J.D. and W.B.

Kessler, editors. 1999. Ecology and management of interior Douglas-fir (Pseudotsuga menaiesii var glauca) at the northern extreme of its range. Proceedings of a workshop held October 1996 in Fort St. James British Columbia. UNBC, Prince George, BC.

DeLong. C. 2000. Natural Disturbance Units of Prince George Forest Region. unpubl. Report.

Delong. C., D. Tanner and M. Jull. 1993. A filed guide for site identification and interpretation for the southwest portion of the Prince George Forest Region. Land Management Handbook No. 24. Ministry of Forests, Prince George Region.

Deschamp, J.A., P.J. Urness, and D.D. Austin. 1979. Summer diets of Mule Deer from lodgepole pine habitats. J. Wildl. Manage. 43:154 -161

Dorrance M.J., P.J. Savage, and D.E. Huff. 1975. Effects of snowmobiles on white-tailed deer. J. Wildl. Manage. 39: 563-569.

Ehlers, T. S. Bennett , P. Corbett. 1998. TFL #14 Ungulate Winter Range Inventory: Year 2 1996/97.Unpublished report for Crestbrook Forest Industries Ltd. Parson, B.C.

Flook, D.R. 1964. Range relationships of some ungulates native to Banff and Jasper National Parks, Alberta. Pages 119-129 In: Crisp, D.J. (ed.). Grazing in terrestrial and marine environments. Blackwell Sci. Publ., Oxford.

Freddy, D.J., W. Bronaugh, and M.C. Fowler. 1986. Responses of Mule Deer to disturbance by person afoot and snowmobiles. Wildl. Soc. Bull 14:63-68.

Geist, V. 1981. Adaptive Strategies in Mule Deer. Ch. in Mule and Black-tailed Deer of North America. O.C. Wallmo (ed). A Wildlife Management Institute Book. Univ. of Nebraska Press, Lincoln.

Goulet, L. A. and D. J. Haddow. 1985. An Inventory of Wildlife Resources on the Liard river, Northern British Columbia: A report of the 1978, 1980 and 1981 Field Studies. B.C. Hydro. Report No. Ess-30.

Graham, R. 1999. Douglas-fir management in the Northwestern United States. In: Lousier, J.D. and W.B. Kessler, editors. 1999. Ecology and management of interior Douglas-fir (Pseudotsuga menaiesii var glauca) at the northern extreme of its range. Proceedings of a workshop held October 1996 in Fort St. James British Columbia. UNBC, Prince George, BC.

Hanley, T.A., C.T. Robbins and D.E. Spalinger. 1989. Forest habitats and the nutritional ecology of sitka-black-tailed deer: a research synthesis with implications for forest management. USDA. PNW General Technical Report – 230.

Harper, W.L., and D. Eastman. 2000.Wildlife and Commercial Backcountry Recreation in British Columbia: Assessment of Impacts and Interim Guidelines for Mitigation. BC. Environment, Victoria, B.C.

Industrial Forestry Service Ltd., 1998. Gaius Point Upland: Site Assessment and Management Plan. Report to MOE Fish & Wildlife Branch, Omineca Region.

Ingham, L. 2000. Interim report on a Mule Deer and white-tailed deer habitat study in the Robson Valley. Columbia Basin Fish and Wildlife Program.

KEYSTONE, 1998. Terrestrial Ecosystem Mapping: Habitat Attributes, Species Relative Abundance and Wildlife Interpretations for the Morrison IRM Unit, Morice Forest District. Houston Forest Products, Houston, B.C.

KEYSTONE, 1999. Terrestrial Ecosystem Mapping with Wildlife Interpretations for TFL 42 (Tanizul Timber). FRBC Report.

Kirchhoff, M.D., and J.W. Schoen. 1987. Forest cover and snow: implications for deer habitat in southeast Alaska. Journal of Wildlife Management. 51:28-33.

Kufeld, R.C., Bowden, D.C. and D.L. Schrupp. 1989. Distribution and movements of female Mule Deer in the Rocky Mountain foothills. J. Wildl. Manage. 53(4):871-877.

Kufeld, R.C., O.C. Wallmo, and C. Feddema. 1973. Foods of the Rocky Mountains Mule Deer. U.S. Dept. Agric. For. Serv. Res. Paper RM-11

Ministry of Forests (MOF). 1997. Vanderhoof Land and Resource Management Plan. January, 1997.

Ministry of Forests. 1999. Structural definitions for management of Mule Deer winter range habitat in the Interior Douglas-fir Zone. Extension Note #25. Ministry of Forests, Cariboo Region.

Ministry of Forests. 2001. Douglas-fir Management Guidelines for the Prince George Forest Region. Forest Practices Note. Prince George Region.

Ministry of Sustainable Resource Management. 2003. Detailed Species Account Information for Mule Deer (interior BC Subspecies. MSRM website.

Ministry of Water Land and Air Protection (MWLAP), 2003. Procedures Manual For Establishing Ungulate Winter Ranges and Objectives (internal draft document).

Mowat, G, Robert G. D'Eon , Guy Woods, Michael Panian, Kim G. Poole, Robert Serrouya and Jack Wierzchowski. 2002. West Kootenay Ungulate Winter Range Mapping. DRAFT Prepared for: B.C. Ministry of Water, Land, and Air Protection, Fish and Wildlife Division Kootenay Region, Nelson, B.C

Mule Deer Winter Range Strategy Committee. 1996. Regional Mule Deer Winter Range Strategy for the Cariboo-Chilcotin Land Use Plan.

Nyberg, JB. & DW. Janz. (technical editors) 1990. Deer and elk habitats in coastal forests of southern British Columbia. BC Min.For., BC Min. Environ., Wildl. Hab.Can., Council of For. Indust. BC., Victoria, BC.

Parker, K.L., Robbins, C. T. and T.A. Hanley. 1984. Energy expenditures for locomotion by Mule Deer and elk. J. Wild. Manage. 48(2): 474-487.

Petticrew, P. S. and L. Jackson. 1980. Preliminary Deer Management Plan for British Columbia. B.C. Ministry of Environment, Fish and Wildlife Branch., Victoria, B.C.

Pritchard, M., 2002. Ministry of Forests, Vanderhoof, BC. Personal communication.

Province of British Columbia. 1995. Biodiversity Guidebook. Ministry of Forests, Victoria, B.C.

Resources Inventory Committee. 1997d. Standardized Inventory Methodologies for Components of British Columbia's Biodiversity: Ground Based Census Techniques for Selected Cervids - Moose, Elk, Mule/Black-tailed Deer, White-tailed Deer and Fallow Deer. Draft - March 1997. Wildlife Branch, Ministry of Environment, Lands and Parks, Victoria, B.C.

Resources Inventory Committee (RIC). 1999. British Columbia Wildlife Habitat Ratings Standards. Version 2.0. BC Ministry of Environment, Lands and Parks, Victoria, BC 97 pp.

Resource Inventory Committee. 1999. Wildlife Habitat Ratings Standards in British Columbia. RIC. Ministry of Environment, Lands and Parks. Victoria, B.C.

Resources Inventory Committee (RIC). 1998. British Columbia Wildlife Habitat Ratings Standards. Resource Inventory Committee. Draft. Victoria, B.C.

Safford, K. 2001. Robson Valley Winter Range Project. Phase 1. Final Report. Prepared for Enhanced Forest Management Pilot Project, Ministry of Forests.

Safford, K. and M. D'Arcy. 2000. Elk and Mule Deer winter range inventory in the Prince George LRMP area. Report prepared for CANFOR, Prince George.

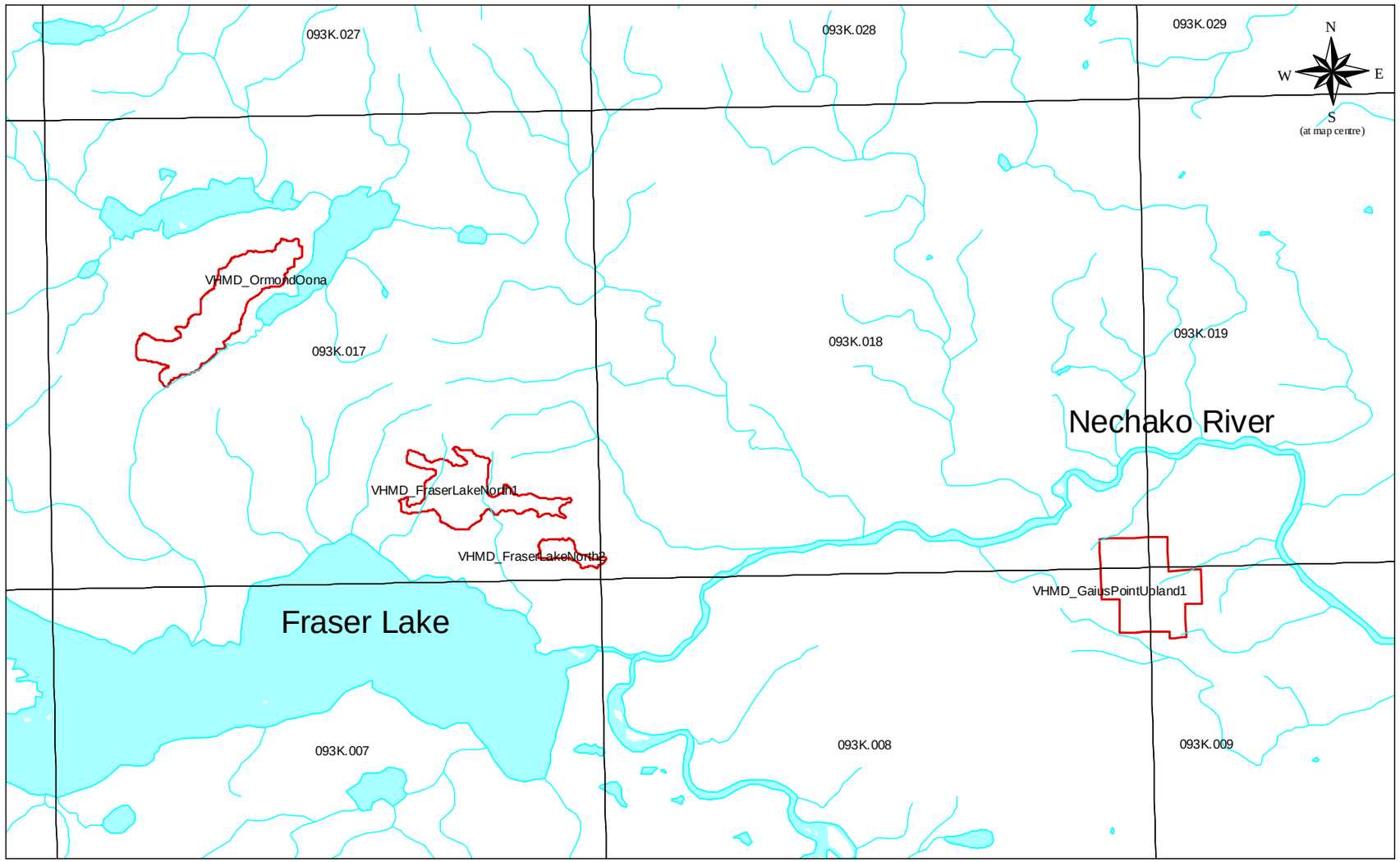
Schuerholz, G., P. McNamee and M.R.C. Massie. 1988. Estimation of the effect of intensive logging on ungulates (cervids) in the White River drainage. Canadian Forestry Service Pacific Forestry Centre. 35 pp.

Sheppard, D.H. 1960. The ecology of the Mule Deer of the Sheep River region. M.Sc. Thesis, University of Alberta, Edmonton. 123 pp.
Simpson K. 1995. Wildlife Management Plan for TFL 5. Report prepared fro Weldwood of Canada.
Stadt, J. 2001. The Ecological Role of Beetle-Killed Trees: A review of salvage impacts. Report prepared for the Chief Forester, Ministry of Forests. 13 pp.
Stelfox, J.B. 1993. Hoofed mammals of Alberta. Lone Pine Publishing, Edmonton, AB. 241 pp.
Stevenson, S.K. 1985. Enhancing the establishment and growth of arboreal lichens in intensively managed forests. Problem Analysis. BC Environment IWIFR –26. 40 pp.
Stevens, V. and S. Lofts. 1988. Wildlife Habitat Handbooks for the Southern Interior Ecoprovince. Volume 1: Species Notes for Mammals. Wildlife Report No. R-15. Ministry of Environment, Wildlife Branch. Victoria, B.C.
Terry, E., and K. Simpson. 1996. Mule Deer winter range assessment. 100 Mile House Forest District, 100 Mile House, B.C. pp.25.
Thomas, J. W., H. Black, R. J. Scherzinger, and R. J. Pedersen. 1979. Deer and Elk. in Wildlife Habitats in Managed Forests: the Blue Mountains of Oregon and Washington. J.W. Thomas (tech. editor). U.S. Department of Agriculture Forest Service, Agriculture Handbook, 553. pp 104-127.
Towry, R. K. 1984. Wildlife habitat requirements - Mule Deer. Pages 101-104 in R. L. Hoover, and D. L. Wills. Managing forest lands for wildlife. Colorado Division of Wildlife.
Triton Environmental Consultants Ltd., 2002. Establishing Ungulate Winter Range Objectives – Omineca Region.
Wallmo, O.C. and W.L. Regelin. 1981. Rocky Mountain and Intermountain Habitats. Ch. in Mule and Black-tailed Deer of North America. O.C. Wallmo (ed). A Wildlife Management Institute Book. Univ. of Nebraska Press, Lincoln.
Wambolt, C.L. and A.F. McNeal. 1987. Selection of winter foraging sites by elk and Mule Deer. J. Environmental Manage. 25:285-291.
Waterhouse, M.J., H.M. Armleder, and R.J. Dawson 1991. Forage litterfall in Douglas-fir forests in the central interior of British Columbia. BC Ministry of Forests, Research Note 108.
Waterhouse, M.J., H.M. Armleder, R.J. Dawson. 1994. Winter food habits of Mule Deer in the Central Interior of British Columbia. Research Note ISSN 0226-9368 No. 113. B.C. Ministry of Forests Research Branch. Victoria B.C.30p.
Wilmes, W., A. McLean, and R. Ritcey. 1976. Feeding habits of Mule Deer on fall, winter and spring ranges near Kamloops, British Columbia. Can. J. Anim. Sci. 56:531-542.
Wood, A. K. 1988. Use of shelter by Mule Deer during winter. Prairie Nat. 20 (1):15-22.

Other References:

Ministry of Forests. 1998. Guide To Writing Resource Objectives and Strategies. Ministry of Forests, Forest Practices Branch Strategic Planning and Policy Section. Victoria, BC, December, 1998.
Ministry of Forests. 2002. A Results-Based Forest and Range Practices Regime. A discussion paper for public review and comment.
Ministry of Sustainable Resource Management. 2002. Sustainable Resource Management Planning: a landscape-level strategy for resource development.
Pearson. S.M. and M. Turner. 1995. Winter habitat use by large ungulates following fire in northern Yellowstone National Park. Ecological Applications 5: 744-755

Map 2: VHMD_OrmondOona, VHMD_Fraser Lake North1, VHMD_FraserLakeNorth2, and VHMD_GaiusPointUpland1 UWR Units



1:20,000 (BCGS) Mapsheet Grid

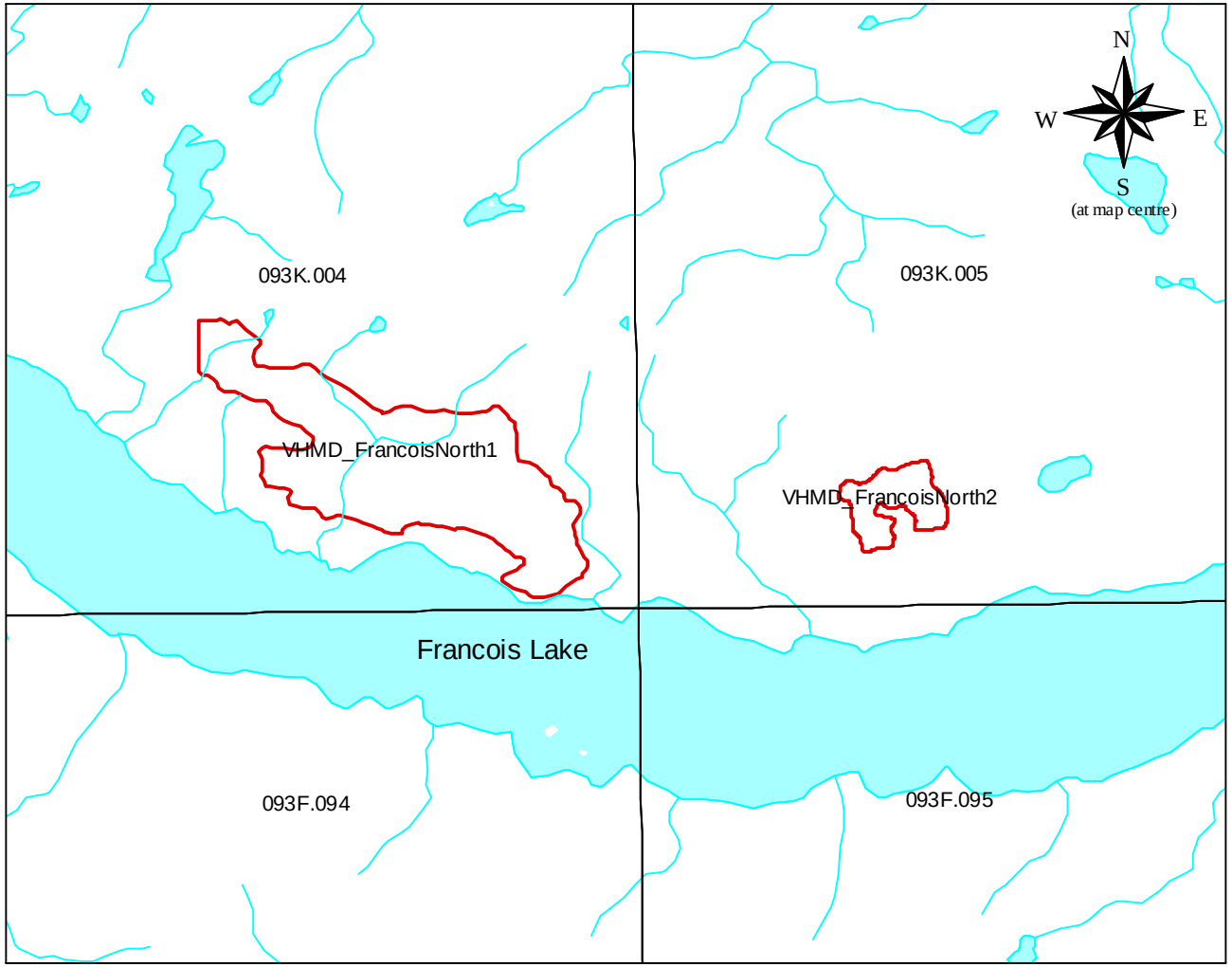
Mule Deer Ungulate Winter Range Units

1:100,000

2 0 2 Kilometers

Ministry of Water, Land and Air Protection
Omineca Region
July 9, 2003

Map 3: VHMD_FrancoisNorth1 & VHMD_FrancoisNorth2 UWR Units



1:20,000 (BCGS) Mapsheet Grid

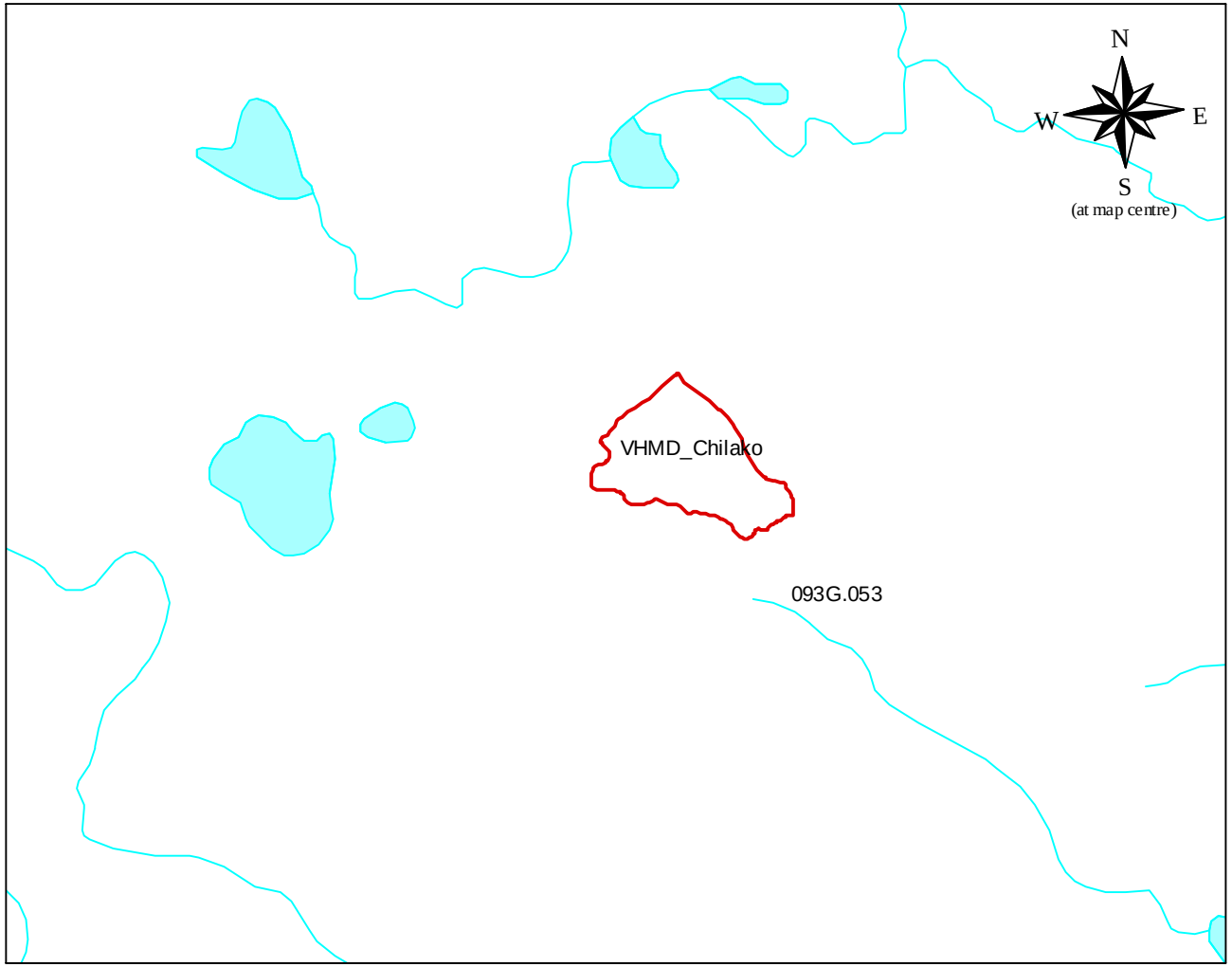
Mule Deer Ungulate Winter Range Units

1:100,000

1 0 1 Kilometers

Ministry of Water,
Land and Air Protection
Omineca Region
July 9, 2003

Map 4: VHMD_Chilako UWR Unit



1:20,000 (BCGS) Mapsheet Grid

Mule Deer Ungulate Winter Range Units

1:50,000

500 0 500 Meters

Ministry of Water,
Land and Air Protection
Omineca Region
July 9, 2003