

WILDLIFE INFOMETRICS INC.

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# MODELING

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## Assessment of Pine-Lichen Winter Range in the Chase Herd Study Area

ANDREA M. DOUCETTE<sup>1</sup>, R. SCOTT MCNAY<sup>2</sup>

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<sup>1</sup>Wildlife Infometrics Inc., PO Box 308, Mackenzie, BC, V0J 2C0, wild\_info@cablerocket.com

<sup>2</sup>Slocan Forest Products Ltd., PO Box 310, Mackenzie, BC, V0J 2C0, mcnays@mackenzie.slocan.com

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## ABSTRACT

Caribou are an important indicator species of ecological health in B.C. Population numbers have declined over several decades to concerning levels and in the Mackenzie TSA, several caribou herds are listed as “threatened” by COSEWIC. In an effort to conserve caribou populations and habitat, land use managers in the Mackenzie forest district have developed several conservation strategies while retaining continued resource extraction and recreational uses.

This report was an analysis of the effectiveness and efficiency of specific caribou conservation strategies in preserving Pine-Lichen Winter Range (PLWR) in the Chase herd area. Conservation strategies included the Caribou Management Strategy Zone 1, Protected Areas, and PLWR Ungulate Winter Ranges (UWR). PLWR UWR was identified as most effective at capturing total current and potential PLWR<sub>preferred</sub> within the Chase herd area (79% of the total PLWR<sub>preferred</sub>). Additionally, PLWR UWR was identified as being six times more efficient as a conservation strategy for protecting PLWR<sub>preferred</sub> than Caribou Management Strategy Zone 1 and Protected Areas. These results are a strong indication that Caribou Management Strategy Zone 1 and Protected Areas be re-evaluated as caribou conservation strategies within the Mackenzie TSA.

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## INTRODUCTION

In British Columbia (B.C.), caribou populations have declined over several decades from approximately 30,000-40,000 animals to 16,500 (B.C. MELP 2000). As of May 2002, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has listed various caribou herds in B.C. as extinct, threatened, or of special concern (COSEWIC 2002). Specific northern caribou herds (Wolverine, Chase, Kennedy Siding) in the Mackenzie TSA region are currently considered threatened which is defined as “[a] species likely to become endangered if limiting factors are not reversed” (COSEWIC 2002, p. 1).

Northern caribou herds and their habitat have increasingly been threatened by anthropogenic activities such as agricultural development, timber harvesting, mining, hunting, and intense human activity. Introducing these extensive activities may alter basic ecological interactions beyond rates that are sustainable if development is not managed properly. Consequently, in B.C., there are strong efforts to conserve caribou populations and their habitat through proactive and adaptive management.

Two approaches have been undertaken in the Mackenzie TSA to identify effective caribou conservation strategies while maintaining continued resource extraction and recreational uses. Examples are strategic land-use plans such as the Mackenzie Land and Resources Management Plan (LRMP) – including Caribou Management Strategies 1 through 4 and delineation of Protected Areas, and the Ungulate Winter Range (UWR) proposals underway as part of the Forest Practices Code (Schmidt and McNay 2002). For this report, our objective was to assess specific conservation strategies for their effectiveness and efficiency in conserving caribou Pine-Lichen Winter Ranges (PLWR) in the Chase herd area of the Mackenzie TSA. For further background information on these strategies, caribou ecology, and additional analyses, refer to the report entitled Wolverine, Chase, Finlay and Scott Caribou Herds – Ungulate Winter Range (UWR): Final Report. The report herein serves as an addendum to Schmidt and McNay (2002).

## STUDY AREA

The Chase study area encompasses the Mesilinka, Osilinka, Swannell, and Ingenika river drainages and is approximately 1.3 million hectares in size. Elevation ranges from 750 to 2,250 meters above sea level and common physical characteristics are steep mountain ranges, wide valleys, and several watersheds. Human activity such as timber harvesting and road development are present. The Chase caribou herd was estimated to be 700 animals (Zimmerman et al. 2002) and caribou movement within the Chase herd area varied from 20-90 km.

## METHODS

Caribou conservation strategies evaluated for this report included: 1) Caribou Management Strategy Zone 1 from the Mackenzie LRMP, 2) Protected Areas from the Mackenzie LRMP, and 3) UWR PLWR in the Chase herd area (Appendix A) from the Ungulate Winter Range initiative. Caribou Management Strategy Zone 1 and Protected Areas in the Chase were formed with caribou habitat conservation being the primary objective. The regions identified to represent these strategies were subjectively chosen with an explicit, but informal, intent to balance ecological objectives with broad social and economic objectives (B.C. Government 2000). UWR's were identified using the CHASE (Caribou Habitat Assessment and Supply Estimator) model (McNay and Zimmerman in prep.) with resulting stratifications of high or medium value for the management of PLWR and HEWR (High Elevation Winter Range) (Schmidt and McNay 2002). This analysis included only high-value PLWR UWR.

PLWR is characterized as "habitat used by northern caribou in terms of the relative preference they demonstrate for specific conditions during early winter" (McNay and Zimmerman in prep., p. 48). A PLWR model for the Omineca Northern Caribou Project (ONCP) was developed to "predict foraging potential for caribou resulting from the ecological features that are present at a site and the forestry treatments conducted there...[t]he foraging value of these sites was then modified by the limiting factors that constrain the success of caribou at a site" (McNay and Zimmerman in prep., p. 49) (Figure 1).

Using the PLWR model, current and potential PLWR were identified for the Chase herd. Using 2000 government data, current PLWR is defined as the distribution of available PLWR across the Chase area landscape. Schmidt and McNay (2002, p. 15) defined potential PLWR as the "projected PLWR potential by setting all PLWR on the landscape between 70 and 140 years old (i.e., optimum as PLWR)...[t]his condition represents the maximum amount of PLWR that can hypothetically occur on the landscape." Specific spatial layers used to create current and potential PLWR were forest cover, biogeoclimatic zones (specifically ATun, BWBSdk1, and SBSmk2), elevation, slope, curvature of the landscape (concave, convex, flat), and aspect. Refer to Appendix B for descriptions of these and other spatial layers provided with this report.

Current and potential PLWR were classified into three habitat preferences: preferred, equivocal, and avoided, henceforth denoted  $PLWR_{\text{preferred}}$ ,  $PLWR_{\text{equivocal}}$ , and  $PLWR_{\text{avoided}}$ . Schmidt and McNay (2002, p. 15) defined these preferences as:

Preferred

"[t]hose habitats that are used by caribou in a greater proportion than that occurring on the land"

Equivocal

"[t]hose habitats used by caribou in relatively equal proportions to that occurring on the land"

Avoided

"[t]hose habitats that are used by caribou in a lesser proportion than that occurring on the land".

Using ArcGIS 8 ® software, amounts of PLWR in each preference class were calculated for each caribou conservation strategy to determine the effectiveness of strategies for conserving PLWR. It is acknowledged that there was some spatial overlap between strategies.

To determine the effectiveness of each strategy at capturing current and potential PLWR, percentage representation was calculated using the amount of classified PLWR found within each strategy, to that found within the total Chase herd area. To determine the efficiency of each strategy at capturing PLWR, comparisons were made among the percentage representation of classified PLWR found within each conservation strategy.

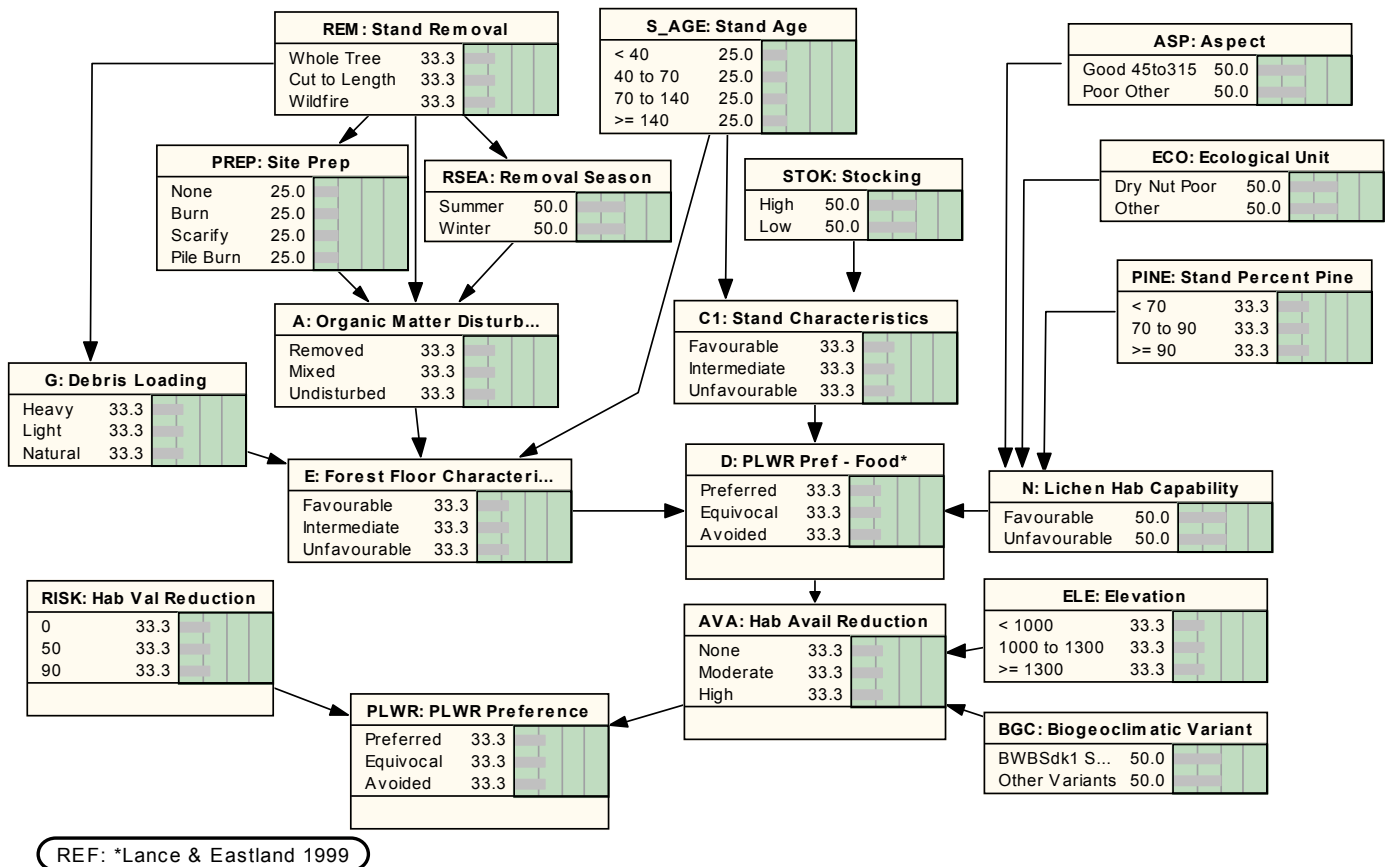


Figure 1: Ecological factors and relationships characterizing preference for pine-lichen winter ranges by northern caribou in north central British Columbia.

## RESULTS

### General

For comparison among the conservation strategies, it was important to realize their spatial boundaries within the Chase herd area. The Caribou Management Strategy Zone 1 was the largest within the Chase herd area with approximately 343,194 hectares. This accounted for 26% of the total area in the Chase. Protected areas were 7% of the total Chase herd area with an area of 99,084 hectares. Between these two were high-valued PLWR UWR's which contained 120,623 hectares or 9% of the total area in the Chase herd.

### Current and Potential PLWR in the Chase Area

Within the Chase herd area, approximately 0.7% and 1% of the land base provided current and potential PLWR<sub>preferred</sub>, respectively. Similar results were found for PLWR<sub>equivocal</sub>. Most of the Chase herd area was classified as PLWR<sub>avoided</sub> (Table 1). See Appendix C and Appendix D for the spatial distribution of current and potential PLWR, respectively.

Table 1. Percent of total area (ha) in current, and potential, classified PLWR (Avoided, Equivocal, and Preferred) in the Chase herd area.

	Avoided % (ha)	Equivocal % (ha)	Preferred % (ha)	Total Herd Area
<b>PLWR Current</b>	98 (1,321,846)	0.8 (10,128)	0.7 (9,924)	1,341,898
<b>PLWR Potential</b>	98 (1,314,694)	0.7 (10,055)	1 (17,149)	1,341,898

### Current and Potential PLWR within Conservation Strategies in the Chase Herd Area

The analysis of effectiveness (Table 2) revealed that PLWR UWR was most effective (79%) at retaining overall PLWR<sub>preferred</sub> under both conditions (i.e., current and potential). Caribou Management Strategy Zone 1 captured 30% and 37% of overall current and potential PLWR<sub>preferred</sub>, respectively, while Protected Areas were least effective.

Table 2. Percent of total herd area and, in brackets the area (ha), of current, and potential, classified PLWR (Avoided, Equivocal, and Preferred) enclosed by regions representing different conservation strategies (Caribou Management Strategy Zone 1, Protected Areas, PLWR UWR).

Conservation strategy	Current PLWR			Potential PLWR		
	Avoided % (ha)	Equivocal % (ha)	Preferred % (ha)	Avoided % (ha)	Equivocal % (ha)	Preferred % (ha)
Caribou Management Strategy Zone 1	25 (335,919)	42 (4278)	30 (2997)	25 (333,213)	36 (6243)	37 (3738)
Chase Area Parks	7 (97,063)	10 (1,003)	10 (1,018)	7 (96,742)	8 (1,297)	10 (1,045)
PLWR UWR	8 (105,686)	70 (7,118)	79 (7,819)	8 (101,078)	60 (6023)	79 (13,522)

### Current and Potential PLWR within Conservation Strategies

PLWR UWR provided 6% and 11% more current and potential PLWR<sub>preferred</sub>, respectively, than Protected Areas and Caribou Management Strategy Zone 1 (Table 3).

Table 3. Percent, and area (ha), of regions representing different conservation strategies (Caribou Management Strategy Zone 1, Protected Areas, PLWR UWR) characterized by current and potential PLWR (Avoided, Equivocal, and Preferred).

Conservation strategy with total area in ha	Current PLWR			Potential PLWR		
	Avoided % (ha)	Equivocal % (ha)	Preferred % (ha)	Avoided % (ha)	Equivocal % (ha)	Preferred % (ha)
Caribou Management Strategy Zone 1 (343,194)	98 (335,919)	1 (4278)	1 (2997)	98 (333,213)	1 (6243)	1 (3738)
Chase Area Parks (99,084)	98 (97,063)	1 (1,003)	1 (1,018)	98 (96,742)	1 (1,297)	1 (1,045)
PLWR UWR (120,623)	88 (105,686)	6 (7,118)	6 (7,819)	84 (101,078)	5 (6,023)	11 (13,522)

## DISCUSSION AND MANAGEMENT IMPLICATIONS

Overall, PLWR UWR was most effective as a conservation strategy for sustaining PLWR<sub>preferred</sub> in the Chase herd area. Referring to Table 2, PLWR UWR captured 8 to 13 times more PLWR<sub>preferred</sub> than Protected Areas and 3 to 4 times more than Caribou Management Strategy Zone 1. Additionally, Table 3 showed that although the PLWR UWR total area is less than half the size of the Caribou Management Strategy Zone 1, this strategy provided 6 times more the protection of PLWR<sub>preferred</sub>.

These results were expected since UWR's were developed based on an ecological understanding of caribou life requisites (Schmidt and McNay 2002), while Protected Areas and Caribou Management Strategies were generated more as a balance of multiple objectives. However, it is clear that if conservation of caribou habitat is a primary objective, strategies should consider specific natural features at the onset of the design phase. Perhaps it is now appropriate for managers to review Protected Areas and Caribou Management Strategy Zone 1, and research alternate borders for the conservation of caribou populations and habitat. By doing so, conservation strategies can develop into reliable and defensible administrative tools through continued monitoring and adaptive management.

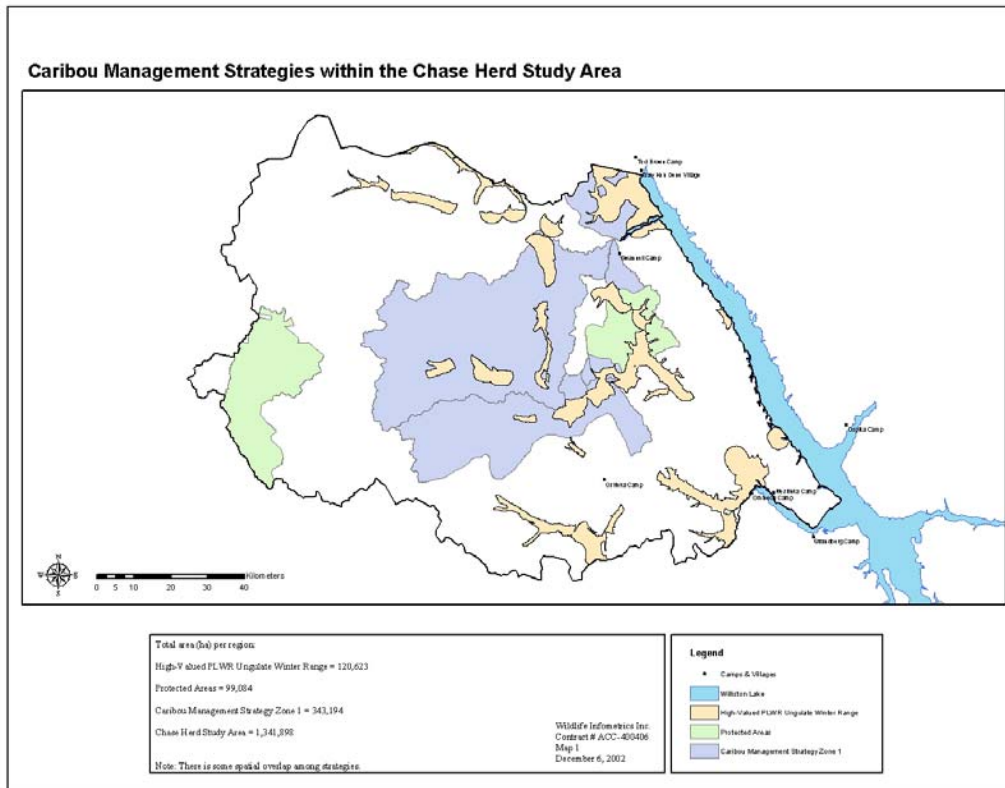
## ACKNOWLEDGMENTS

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## APPENDIX A. CARIBOU MANAGEMENT STRATEGIES WITHIN THE CHASE HERD STUDY AREA



## APPENDIX B. CHASE HERD AREA METADATA

All data provided for the Chase herd study area is in albers projection (B.C. government standard). Below are descriptions of all data provided to Abitibi Consolidated under Contract # ACC-400406.

### ArcGis8\_Layers

Data in this folder consist of ArcGis8 layers that were previously shapefiles for ArcView version 3.2.

Layers:

- a) Camps & Villages: point locations of camps and villages in the Mackenzie TSA
- b) Caribou Management Strategy Zone 1: polygons of Caribou Management Strategy Zone 1 in the Chase herd area
- c) Chase Herd Area: polygon and line of Chase Herd Study Area
- d) High-valued PLWR Ungulate Winter Range: polygons of high-valued PLWR UWR in the Chase herd area
- e) Protected Areas: polygons of protected areas in the Chase herd area
- f) Williston Lake: polygon of entire Williston Lake

### ArcGis8\_projects

This folder contains .mxd (ArcMap) files for the 3 maps provided in this report.

- a) cms\_boundaries.mxd: Map 1 in the report showing the Chase herd study area and caribou management strategies within the Chase.
- b) plwr\_cur.mxd: Map 2 in the report showing the distribution of classified current PLWR in the Chase herd area with caribou management strategy boundaries.
- c) plwr\_cap.mxd: Map 3 in the report showing the distribution of classified potential (or capability) PLWR in the Chase herd area with caribou management strategy boundaries.

### Spatial\_data

This folder contains subsequent folders that provide specific shapefiles and grids for the Chase herd study area. Shapefiles (for ArcView 3.2) provided are similar to the ArcGis8 layers listed above.

Sub-folders:

a) camps\_villages

a\_camps\_villages.shp: point locations of camps and villages in the Mackenzie TSA ('a' refers to albers projection)

b) chase\_base\_grids

i) aspcrcl: derived aspect from the digital elevation model (DEM) and reclassified aspect:

Code	Value
1	45.001 – 314.999 degrees
2	315 – 360; -1 – 45.001 degrees

ii) bgc: biogeoclimatic zones for the Chase herd study area

Code	BEC_Label
1	BWBSdk1
2	SWBmk
3	SWBmks
4	ATun
5	ESSFmv3
6	ESSFmvp3
7	SBSmk2
8	ESSFmv4
9	ESSFmvp4
10	SBSwk2
11	ATp
12	ESSFmc
13	SBSmc2
14	ATunp

iii) curvrcl: derived curvature of land from the DEM and reclassified curvature:

Code	Value	Label
1	-4333.032 - -0.001	Concave
2	-0.002 – 2746.271	Flat/Convex

iv) elevrcl: derived elevation from the DEM and reclassified elevation:

Code	Value
1	<1000
2	>=1001 - <1200
3	>=1201 - <1300
4	>=1301

v) fc: forest cover attributes for the Chase herd study area

vi) slopercl: derived slope from the DEM and reclassified slope:

Code	Value
1	<40%
2	>=41%

b) chase\_boundary

a\_chase\_bndry: polygon of Chase herd study area

bndry\_line: line of Chase herd study area

c) cms\_zone1

cms\_zone1: polygons of Caribou Management Strategy Zone 1 in Chase herd study area

d) hewr\_cap\_cur\_grids

hewr\_cap: classified (1=avoided; 2=equivocal; 3=preferred) High-Elevation Winter Range (HEWR) capability for the Chase herd study area

hewr\_cur: classified (1=avoided; 2=equivocal; 3=preferred) High-Elevation Winter Range (HEWR) current (year 2000) for the Chase herd study area

e) parks

a\_parks\_chase: polygons of parks in Chase herd study area

f) plwr\_cap\_cur\_grids

plwr\_cap\_new: classified (1=avoided; 2=equivocal; 3=preferred) Pine-Lichen Winter Range (PLWR) capability for the Chase herd study area

plwr\_cur\_new: classified (1=avoided; 2=equivocal; 3=preferred) Pine-Lichen Winter Range (PLWR) capability for the Chase herd study area

g) plwr\_grids\_by\_cms

plwr\_c\_cms1: PLWR current in Caribou Management Strategy Zone 1

plwr\_c\_inplwr: PLWR current in PLWR Ungulate Winter Ranges

plwr\_c\_park: PLWR current in parks

plwr\_p\_cms1: PLWR potential in Caribou Management Strategy Zone 1

plwr\_p\_inplwr: PLWR potential in Caribou Management Strategy Zone 1

plwr\_p\_park: PLWR potential in parks

h) UWR

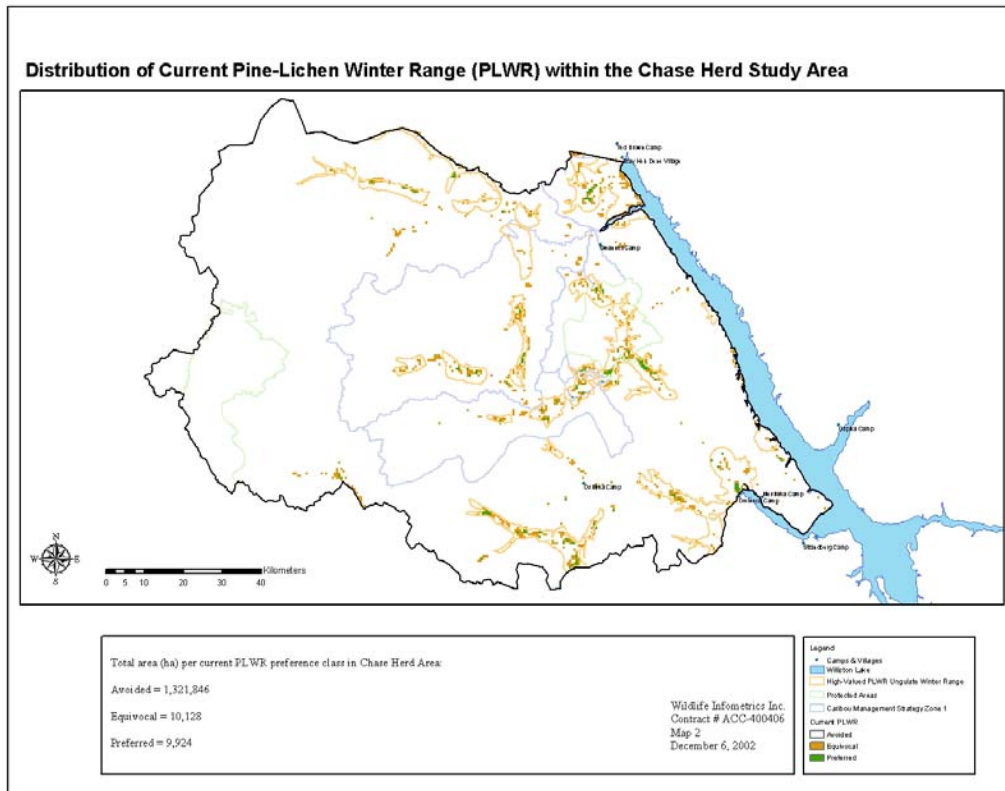
a\_chase\_mgmt\_dir: all high and medium-value UWR polygons in Chase for PLWR and HEWR

a\_chase\_mgmt\_high\_plwr: all high-value PLWR UWR polygons in Chase

i) Williston Lake

a\_willistonlake: Williston Lake in Mackenzie TSA

## APPENDIX C. DISTRIBUTION OF CURRENT PINE-LICHEN WINTER RANGE (PLWR) WITHIN THE CHASE HERD STUDY AREA



## APPENDIX D. DISTRIBUTION OF POTENTIAL PINE-LICHEN WINTER RANGE (PLWR) WITHIN THE CHASE HERD STUDY AREA

