Alberta Newsprint Company

DETAILED FOREST MANAGEMENT PLAN

APPENDIX A

HYDROGRAPHY

REFERENCE # 0-128

DEVELOPED WITH The Silvacom Group

Government of Alberta ■
Sustainable Resource Development

Forestry Division
Forest Management Branch
8th Floor, Great West Life Building
9920 – 108 Street
Edmonton, Alberta T5K 2M4
Telephone: 780-422-4567
www.alberta.ca

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April 20, 2011

Robert W. Stokes
Senior Manager
Forest Management Planning Section
Forest Management Branch
8th Floor, 9920-108 St
Edmonton, Alberta
T5K 2M4

Subject: Alberta Newsprint Company Ltd. (ANC) Watershed Assessment

The Watershed Assessment for the Alberta Newsprint Company Ltd. Forest Management Plan was completed to the best of my ability and professional knowledge.

Current information and the spatial harvest sequence supplied by the company were used for the assessment. The results would therefore change with variance from the spatial harvest sequence. This endorsement is solely for the work completed by SRD and submitted on this date.

Yours truly,

John Diiwu, PhD
Forest Hydrology Specialist
Forest Management Planning Section

Enclosure

Watershed Assessment of Preferred Spatial Harvest Sequence and comparison to Mountain Pine Beetle scenario for Alberta Newsprint Company Forest Management Area.

Forest Management Branch
Alberta Sustainable Resource Development

April 20, 2011

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1 Introduction

A watershed assessment was completed for Alberta Newsprint Company's (ANC) Forest Management Plan (FMP). The assessment identified hazard levels associated with harvesting and other disturbances. The Equivalent Clearcut Area (ECA)-based watershed assessment procedure was used to assess risks from proposed forest activities in the ANC FMA (see Appendix 1). The ECA method is one of ASRD's forest condition assessments. The assessment relies on the assumption that the area of watershed with recent stand-replacing disturbance can be used to identify a potential change to streamflow regime in terms of frequency, timing and magnitude of peaks and low flows, and associated risks to other watershed values. The FMA was delineated into 93 watersheds ranging in drainage area from about 1300 ha to about 17500 ha. The analysis identified several watersheds planned to have a high level of hazard. A Mountain Pine Beetle (MPB) scenario was used to compare the potential effects of MPB to the proposed 20-year Spatial Harvest Sequence (SHS). Recommendations for operational planning are presented in this report and are intended to mitigate the potential risk to watershed values.

Protection of water resources is a high priority for ANC during all phases of forest management activities. Throughout the FMA ANC is committed to ensure that water downstream of any forest management activity does not turn turbid due to erosion and sediment input from forestry operations; give special consideration to watercourses during planning, construction, and maintenance, and reclamation of roads; undertake detailed watershed assessments on all compartments prior to developing strategies; harvest highly sensitive areas only during winter when the ground is frozen; and minimize the number of watercourse crossings within the FMA.

2 Watershed Assessment Methods

2.1 Overview

The watershed hazard assessment is intended to assess the impact of natural and man made disturbances within a watershed. In particular it is designed to assess the impact of harvesting over time on individual watersheds within an FMA using the spatial harvest sequence and net-landbase.

The impact of a disturbance will vary based on the percentage of the polygon that has not yet recovered for an assessment period. The greatest impact of a disturbance is at the time the disturbance occurred where normally 100% of the stand is non-recovered. In most cases, a disturbance will recover with time as the vegetation regenerates to its original pre-disturbance state and full recovery. It is assumed that watershed hydrology has fully recovered when the vegetation regenerates to the pre-disturbance state. For the purpose of simplifying the application it is assumed that vegetation will regenerate based on its original inventory classification. The rate of recovery for vegetation is established through a recovery table that uses information such as yield curves to calculate the non-recovered percent of a stand over time.

The impact of disturbances is based on the percent area of the watershed that it covers and the percent of the disturbances area that has not yet recovered. For instance, a clearcut that is 100 ha may be 75% recovered at the age of 60 years after harvest. Therefore, at 60 years 25% of the area is not recovered. In effect 25 ha of this stand acts as if it is a new clearcut. Another way to look at the impact of the disturbance is to treat that non-recovered portion as an Equivalent Clearcut Area. Overall watershed hazard is determined by the percent of a watershed that is in a non-recovered (Equivalent Clearcut Area) state at a given point in time.

The Equivalent Clearcut Area (ECA) method was chosen for this assessment. The ECA method is a way of estimating the level of potential hydrologic impact to a watershed by accounting recovery of disturbed stands and expressing the total amount of disturbance as an Equivalent Clearcut Area of a watershed. Level of disturbance is expressed as a percentage of the total watershed area. This percentage is assumed to correspond to a possible modification of the watershed hydrology, and thresholds of percent area of the watershed (ECA) are used to define hazard levels: < 30% low, 30 – 50% medium, > 50% high hazard. These thresholds were derived from existing assessment procedures, literature and previous watershed assessments conducted in Alberta.

This concept uses a level of disturbance with potential impact on the watershed integrity to assign a hazard level. The method is a landscape level screening tool and does not mean there will be an impact. There are many other factors, such as amount and condition of roads, and riparian health affecting the watershed integrity. ECA < 30% has little or no potential impact on the function of the watershed. ECA between 30% and 50 % has a moderate potential impact with potential risk to watershed function; that is there are potential impacts on watershed values but there is the possibility that the watershed may recover on its own over time. ECA > 50 % represents a high potential hazard to watershed function which may affect watershed values and require some intervention for rehabilitation. This is only a coarse filter tool and recommendations to deal with refining, tracking and mitigating hazards is listed below in the recommendations section.

Hazard is assessed over a period of time taking into account future planned harvest operations and past disturbance information where available. Each disturbance can have an associated origin indicating the year that the disturbance took place. This enables the calculation of Equivalent Clearcut Area over a designated planning period.

2.2 Required Inputs

The watershed assessment requires a number of inputs (see Appendix 2) to enable the calculation of non-recovered values for a watershed. A watershed polygon feature class containing the watershed polygons that are to be assessed is needed that fully covers the study area. A disturbance polygon feature class derived from the net-landbase and spatial harvest sequence is also needed to establish past and future disturbances with associated disturbance origins. Finally, a recovery table is needed to calculate non-recoverable percentages for vegetated disturbances over time.

2.3 Stand Level Recovery Curves

Stand recovery curves (ECA_s) were derived from the yield curves provided by ANC. The Mean Annual Increment (MAI_i) is assumed to have a good relationship with the Leaf Area Index, which in turn is a good indicator of stand hydrological recovery. Full stand recovery ($ECA_s = 0$) was reached when the stand MAI is greater than or equal to maximum MAI (MAI_{max}). Equation [1] calculates the ECA_s for stand age (i) less than MAI_{max}:

$$ECA_s^i = \frac{MAI_{\max} - MAI_i}{MAI_{\max}} \qquad [1]$$

In this equation subscript "s" denotes time step and superscript "i" denotes the age of the stand. The Mountain Pine Beetle affected stands used a regeneration lag of 20 yrs, assumed the stand regenerated to a Spruce AB density stand, and that an affected stand was 80% ECA_s. Also, only 80% of the pine was expected to die.

2.4 Watershed ECA

The watershed ECA is calculated by calculating the Stand ECA for each stand and in each time step. This is done by using each polygon in the SHS and other disturbance polygon to determine the product of polygon area and corresponding ECAs from the start time to the end time. The time since disturbance or harvest is the stand age (i). The mid points of the SHS time periods were used as the harvest years. The watershed ECA is finally calculated by summing the Stand ECA for each watershed from the start time to the end time and expressing the ECA as a percentage of the total watershed area.

The ECA was calculated using ANC's netdown and their SHS. All harvest and fire disturbances from 1980 to present were selected from the netdown.

An in-house analysis tool was developed by ASRD and used for the assessment.

The starting date of 1980 was used in the assessment because past disturbances should be recovered to a point where they contribute minimally to the assessment. A 100 years time horizon (ending in 2079) was subjective, and possibly produced a misleading representation of the potential recovery of the preferred scenario, which is discussed in the results.

2.5 Development of Watershed Areas

Watersheds for the analysis were created using ESRI ArcHydro Tools by ASRD with a 100m DEM, re-sampled to 25m (see Figure 1). LiDAR data was not yet available. All harvest and fire disturbances from 1980 to present were selected from the netdown. The selection and the SHS were merged with the watershed layer to create the disturbance layer. The disturbance layer was used as an input to the in-house analysis tool developed

by ASRD. The in-house tool was then run for a time frame of 100 years; that is 1980 to 2079.

2.6 Scenarios of Watershed Values

Two scenarios were used for the assessment. The 70 year Spatial Harvest Sequence was provided by ANC and used to develop the first scenario (Scenario I). A second scenario was completed to investigate the potential impact of Mountain Pine Beetle (Scenario II), where 80% of all susceptible pine dies. All the stands in ANC's netdown that contained pine over 80 years old were selected. The area of each stand was divided by the percent pine to obtain an aspatial area of pine in that stand. That number was then divided by 80% to give the area of pine that would die. The pine death layer was then added to ANC's disturbance layer, which for this study only contained disturbances prior to 2010. No future disturbance was assumed.

3 Results

The ECA values are presented in three levels of risk of impact: ECA < 30%– low hazard (green); ECA between 30% and 50%– moderate Hazard (yellow); ECA > 50%– high hazard (red).

Figure 2 presents the ECA from 2009 – 2079 for each watershed, and this shows the recovery of ECA for the entire Spatial Harvest Sequence (Scenario I). The assessment of the recovery after the Spatial Harvest Sequence (Scenario I) is somewhat misleading as there will likely be harvesting past the 70 years SHS used in this assessment. This will result in higher ECA past 2050 as opposed to the recovery suggested by the current Figure 2.

Figures 3 to 6 present the spatial distribution of the maximum ECA for each watershed for years 0, 10, 20 and 50 of the SHS. These show the risks of the planned harvest by watershed. In Figure 7, the risks of Mountain Pine Beetle (MPB) attack by watershed are represented by the maximum ECA for the disaster scenario (Scenario II). Watersheds with moderate or high risk under the SHS and high risk under MPB scenario are summarized in Table 1. For most of the watersheds presented, Scenario II poses a greater risk than Scenario I throughout the simulation period. Also, most watersheds at risk are within the Little Smoky River corridor. However, the maximum ECA values for year 50 presented in Figure 6, as well as recovery curves in Figure 2 show that under the SHS watershed hydrology in most watersheds would be fully recovered to pre-disturbance levels by this time.

4 Recommendations

The impacts of MPB are predicted to be greater than the impacts of the planned harvesting. Also, the watershed hazard recovery of the MPB killed stands (Scenario II) is predicted to be slower than the harvest (Scenario I). The planned harvesting does have a few watersheds with high hazard levels and several watersheds with medium hazard

levels. However, most watersheds would be fully recovered to pre-disturbance levels by year 50. Moreover, the watersheds with medium hazard levels can be managed with appropriate mitigation strategies. This assessment has identified the hazard which is only part of the risk to watershed values. Recommendations presented here are therefore designed to define risk and to mitigate the hazards:

1) ANC should track at the operational stage of planning, the actual ECA of specific watersheds at the Final Harvest Plan (see Appendix 1 for descript of ECA method).
2) Determine presence of values in watersheds with medium and high hazard for the purpose of defining mitigation strategies.
3) Operationally assess the potential hydrologic impact of roads and riparian health/stability, in areas with high risk.
4) Ensure good operational practices and prompt reforestation
    - Timely removal of temporary roads and good location practices, possibly using new tools such as Wet Areas Mapping.
    - Retention of buffers along streams and wetlands.
    - Timing and location of proposed operations to minimize risk of erosion.
    - Minimize site disturbance associated with skidding and site preparation and avoidance of sensitive and wet soil areas, possibly using new tools such as Wet Areas Mapping.
    - Any other management strategies that would demonstrate due diligence by ANC.

Table 1 Watersheds with low, moderate or high risk under the SHS (Scenario I) and high risk under MPB (Scenario II)

Watershed ID	Scenario I	Scenario II	Difference in Risk (%)
7	60.76	59.98	-0.98
23	40.66	50.76	10.10
31	45.82	53.70	7.88
35	44.94	52.69	7.75
42	48.25	56.27	8.02
44	45.54	52.50	6.96
52	49.40	57.33	7.93
53	52.98	61.71	8.73
54	53.37	68.17	14.80
59	44.85	56.75	11.90
61	69.68	92.03	22.40
62	38.50	50.78	12.28
64	49.20	54.76	5.56
67	41.41	50.73	9.32
69	35.74	59.27	23.53
70	40.41	52.07	11.66
72	49.21	60.71	11.50
73	42.53	53.04	10.51
74	41.98	56.35	14.37
75	70.82	85.11	14.29
77	48.63	60.08	11.45
78	46.99	60.21	19.22
79	59.58	80.15	20.57
83	60.14	75.77	14.63
84	43.86	54.25	10.39
88	77.47	92.60	15.13
90	43.86	56.13	12.27
91	52.62	63.22	10.60
92	54.47	67.47	13.00
93	51.70	62.77	11.07
94	41.60	56.52	14.92
95	50.46	65.30	14.84
96	42.73	57.31	14.58
99	39.02	62.14	23.12
100	24.44	75.50	51.06

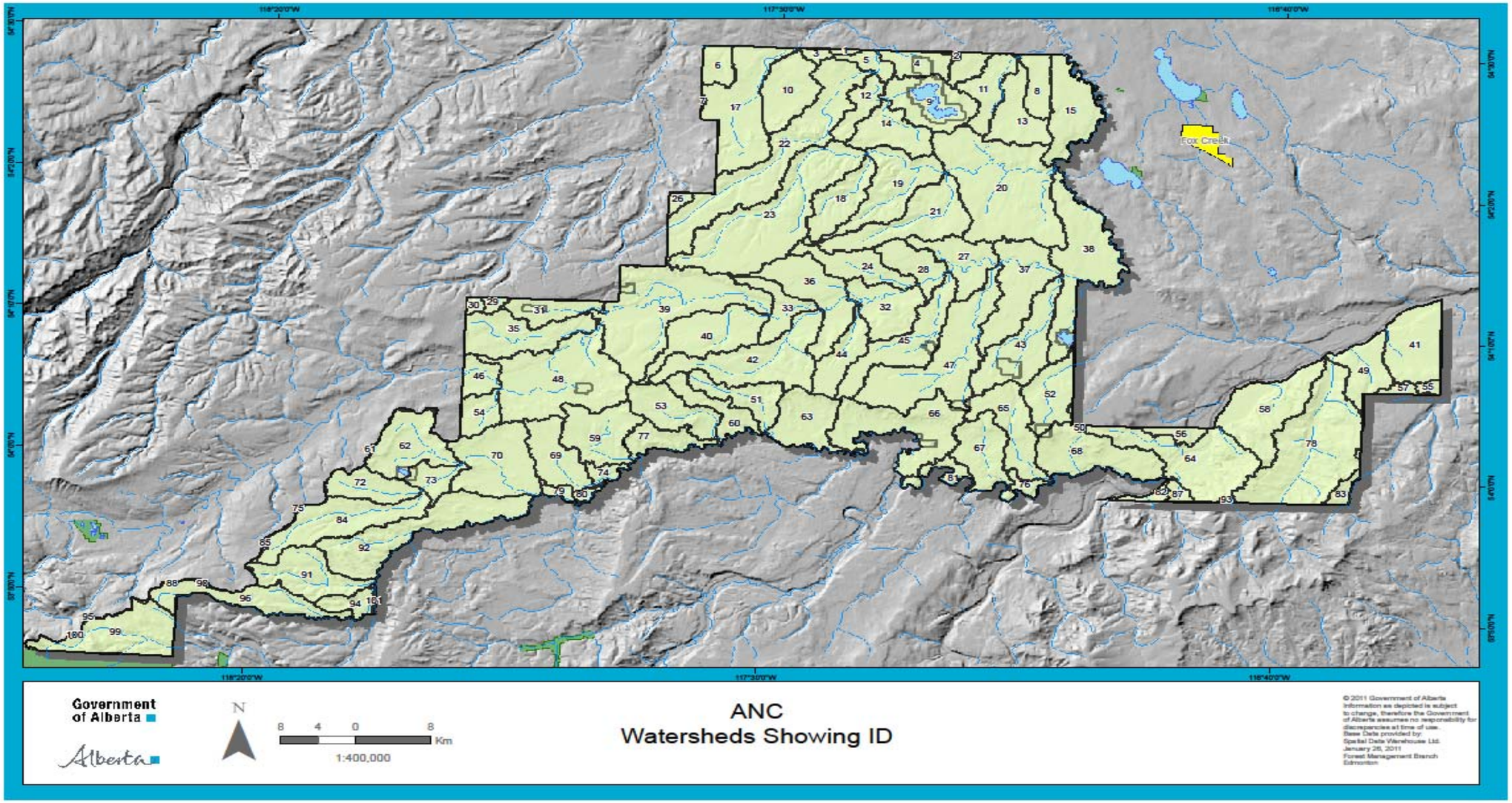


Figure 1 ANC Watersheds showing IDs

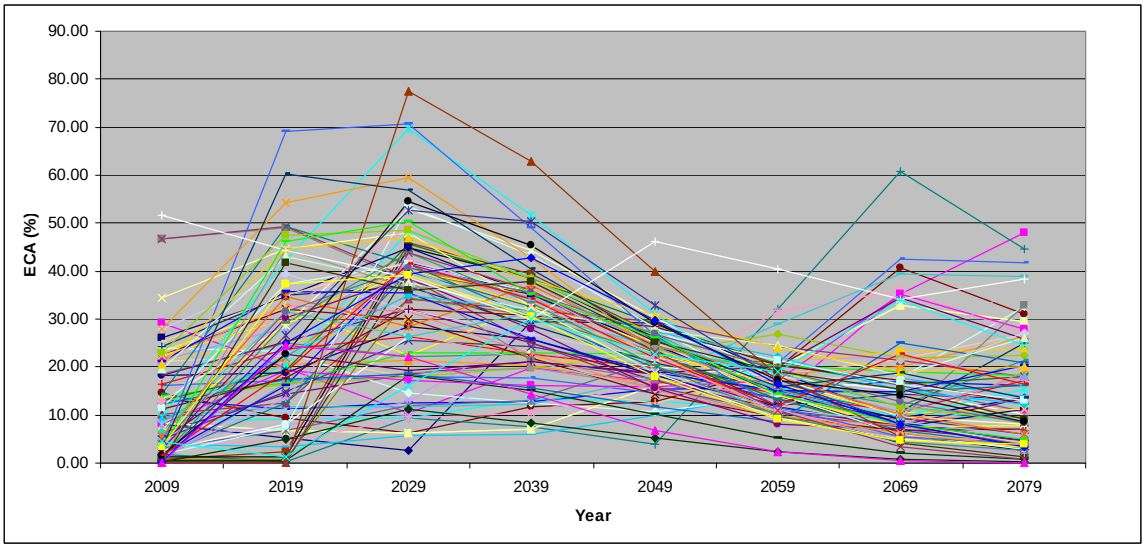


Figure 2 ECA from 2009 to 2079 for each Watershed for the Spatial Harvest Sequence Scenario I.

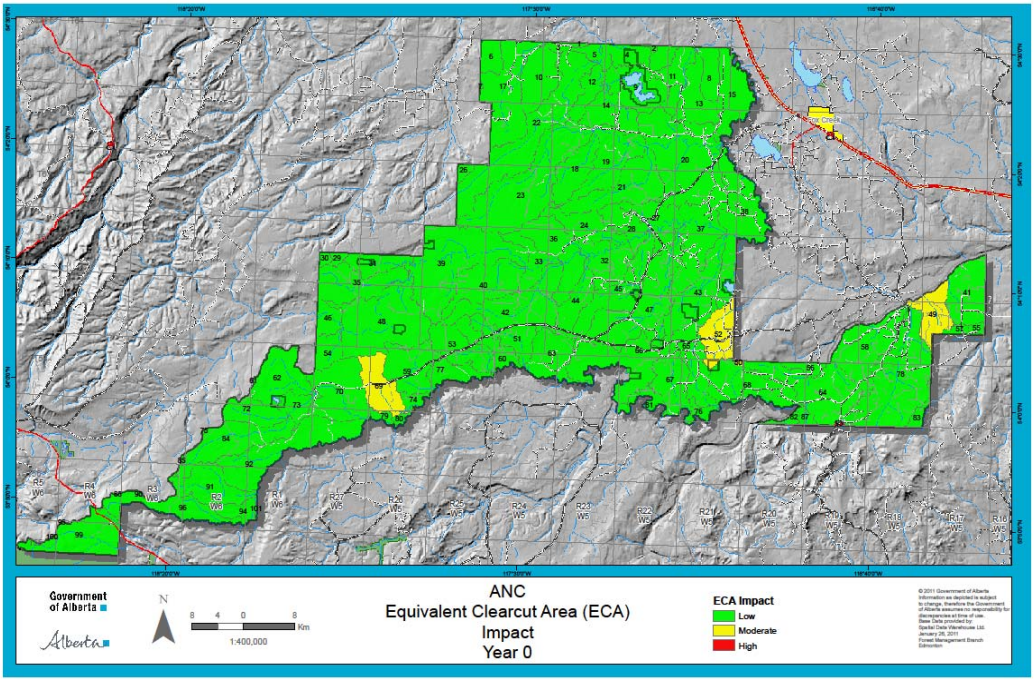


Figure 3 Maximum ECA for Year 0 of Spatial Harvest Sequence Scenario I.

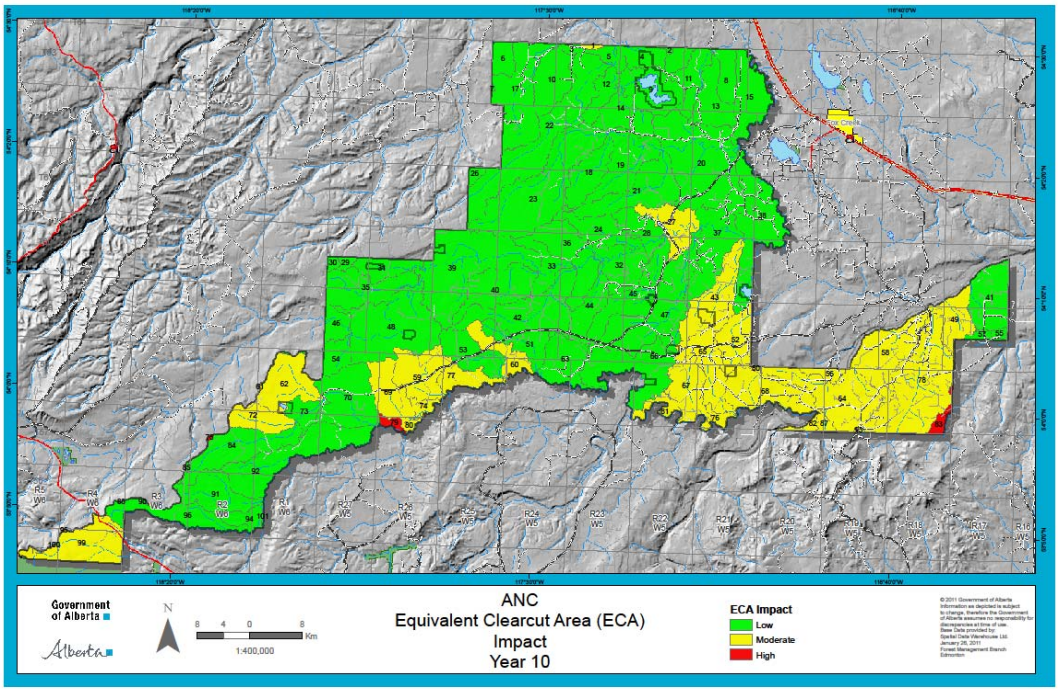


Figure 4 Maximum ECA for Year 10 of Spatial Harvest Sequence Scenario I.

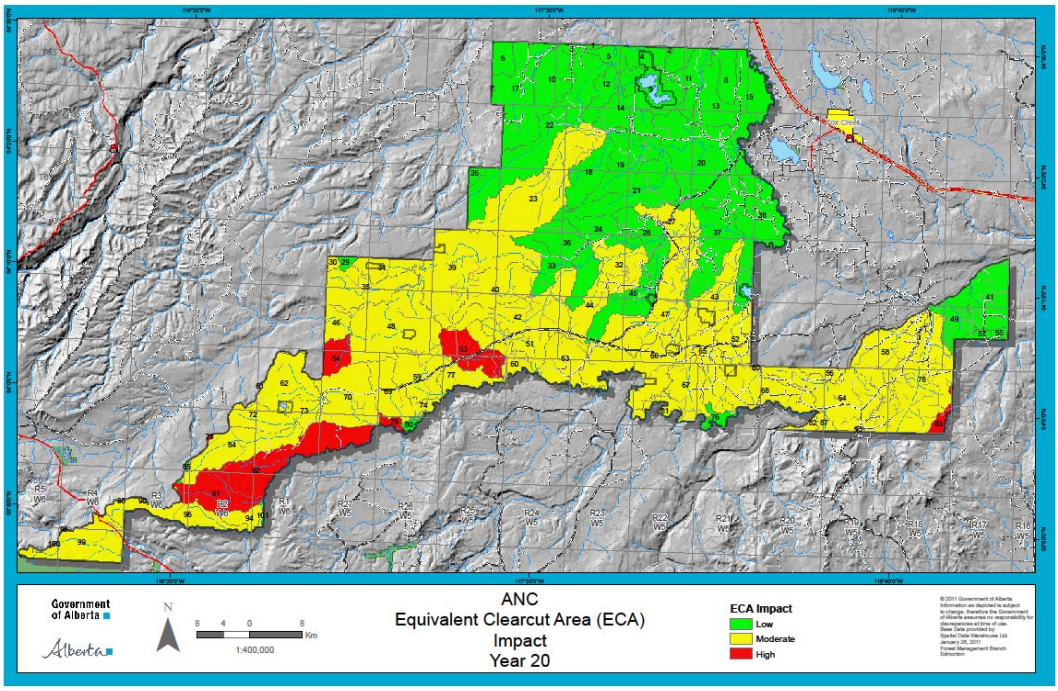


Figure 5 Maximum ECA for Year 20 of Spatial Harvest Sequence Scenario I.

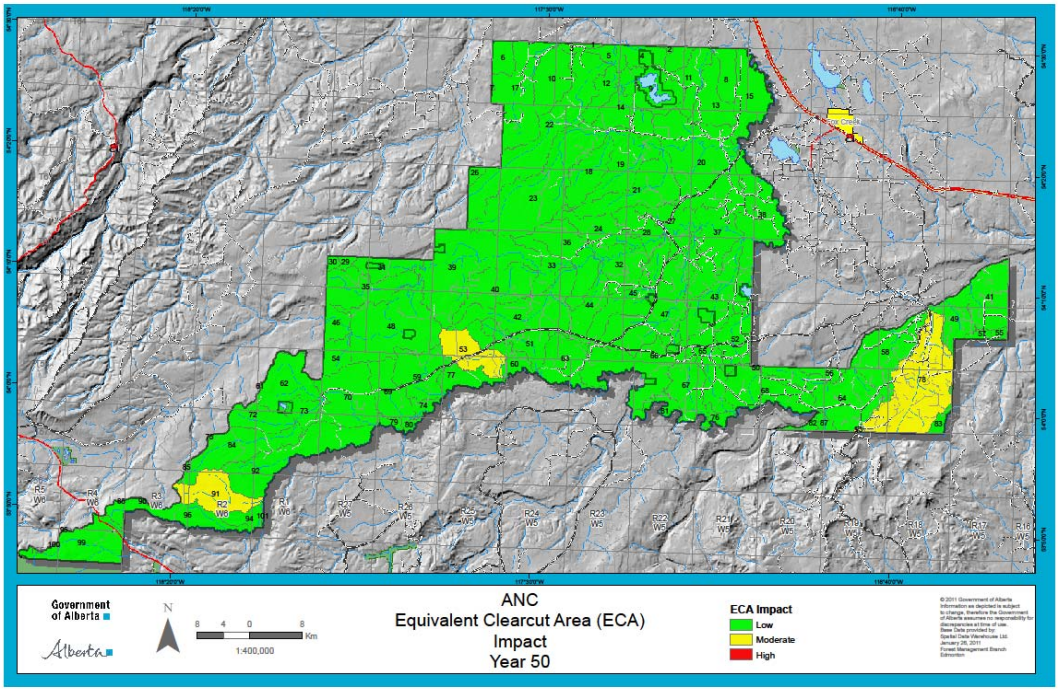


Figure 6 Maximum ECA for Year 50 of Spatial Harvest Sequence Scenario I.

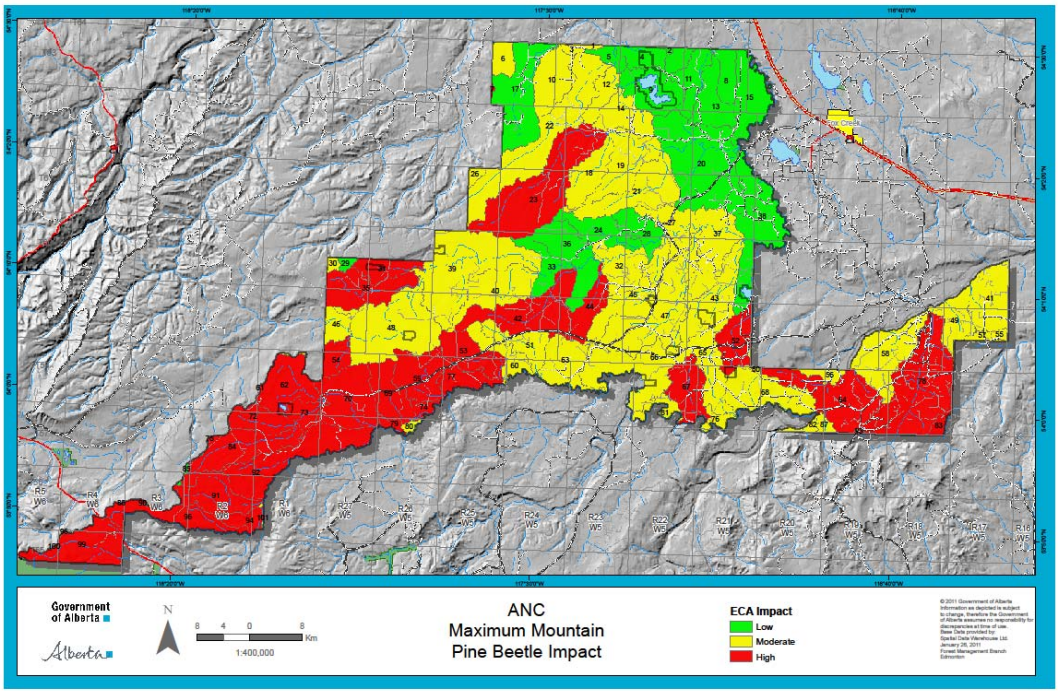


Figure 7 Maximum ECA for MPB Scenario II.

Appendix 1: The Equivalent Clearcut Area Method of Watershed Assessment for Forest Management Plans

Introduction

Watershed assessment under forest planning is intended to investigate potential impacts of the planned harvest on watershed values of concern. These values include flooding hazard, low flows, groundwater recharge, stream bank stability, fish habitat, drinking water impacts, and water quality in general.

The Equivalent Clearcut Area (ECA) method proposed is based on a risk assessment where the indicator of hazard is the amount of disturbance on the watershed and the consequence is a value of interest. The values noted above may inadvertently be addressed with the current methods, ie limiting the water yield change will limit the amount of disturbance (harvesting) and may result in a low risk to these values.

The watershed processes that are responsible for producing water yield and the flow regime differ dramatically between regions because of geography, climate, and topography. Therefore it is not practical to develop a standard method for the entire province of Alberta. The proposed ECA method is a modification of procedures implemented in neighbouring jurisdictions and is meant as a template that can be modified for specific areas of the province.

For this method, we assume that a watershed fully forested with mature stands is the "most stable" condition (ie provides the lowest level of hazard) that can be obtained in a watershed. Removing forests (harvesting, fire, Mountain Pine Beetle), and constructing roads will affect the forested condition and impact water values. To identify hazard and account for stand scale hydrological recovery, the ECA method is proposed. This method can represent a level of disturbance for all disturbances to the stands such as fire, MPB, and harvesting. The procedure starts with delineation of watersheds of appropriate drainage areas. It is recommended that drainage areas be at least 500 ha and not greater than 10,000 ha. However, the selected drainage areas depend on the physiographic region

of the province where the watershed assessment is being carried out. For example in the foothills region smaller watersheds may be used whilst in the boreal plains larger watersheds may be used. The input requirements and the algorithms for calculating ECA are briefly presented in subsequent sections below.

Inputs:

1. Start and end year of calculations
    - Suggested Start is 20 or 30 yrs before start of planning horizon
    - Suggested End is last year of the planning horizon, unless recovery of watersheds is a concern then Last year of planning horizon + desired recovery time
2. ECA thresholds for hazard levels – needed to review data, not for calculation:
    - 30 % and 50 % ECA are good standard values, but these are site specific and need to have expert professional judgment justify.
3. Output time increment (eg 5 or 10 yr)

Spatial Input files:

1. Watershed shapefile
    a. Unique ID
    b. Area of watersheds (ha)
2. Spatial Harvest Sequence (SHS)
    a. ID of Stand ECA curve (see development of Stand Equivalent Clearcut Area)
    b. Area of polygon (ha)
    c. Watershed Unique ID – produced by merging watershed and SHS files
    d. Optional – contributing area Boolean
3. Coverage of other disturbance (wildfire, other anthropogenic disturbances)
    a. ID of Stand ECA curve (see Development of Stand Equivalent Clearcut Area Curves in next section)
    b. Area of polygon (ha)
    c. Watershed Unique ID – produced by merging watershed with this disturbance file
    d. Optional – contributing area Boolean
4. Contributing area - Optional coverage of the area that contributes to streamflow during events of concern
    a. Boolean contributing or not-contributing

Development of Stand Equivalent Clearcut Area (ECAs) Curves

1. Calculate the Mean Annual Increment (MAI) from the Yield Curves
2. Full recovery ($ECA_s = 0$) when age of stand is MAI greater than or equal to maximum MAI (MAI_{max})

3. Calculate the ECA_s for stand age (i) less than MAI_{max}:

$$ECA_s^i = \frac{MAI_{\max} - MAI_i}{MAI_{\max}}$$

4. This may need to be expressed in 1 year time periods to allow for mid point of time periods. Use linear extrapolation to determine Stand ECA for years between time increments.

Calculate Equivalent Clearcut Area for watersheds

1. Calculate the Stand ECA for each stand and in each time step:
   - For each polygon in the SHS and other disturbance polygon (input files above) determine the product of polygon area and corresponding ECA_s from the start time to the end time. Use the time since disturbance or harvest as stand age (i).
   - If the planning period for the SHS is more than one year, use the mid point of the time period.
2. Calculate the watershed ECA
   - Sum the Stand ECA for each watershed from the start time to the end time.
   - If contributing area is used, only sum Stand ECA for polygons that are contributing.

Output

1. Summary file table linked to the Watershed shapefile
   a. Watershed ECA in percent for each time period (or year)
   b. Area harvested for each time period (or year)
   c. Maximum ECA in percent and corresponding time period/year
2. This can be colour-coded according to the ECA hazard thresholds and/or made into graphs showing the change in ECA through time for a given watershed(s)

Thresholds for Watershed Impacts

The following thresholds of impacts are being used:
ECA< 30%: Low impacts
30% <ECA<50%: Medium impacts
ECA> 50%: High impacts

Those watersheds for which high impacts have been identified by this method, it is recommended to define some mitigation strategies which may be applied to protect watershed values in the identified watersheds. Some recommended mitigation measures include, but are not limited to:

- timely removal of temporary roads,
- extra retention of trees,
- closure of roads to public (active roads have more erosion than inactive)
- focusing harvest on areas that are not expected to contribute to spring freshets.
- Timing of proposed operations (winter / summer)
- Site disturbance associated with skidding and site prep, etc

Appendix 2: ANC Watershed Assessment Data Preparation Procedure

Watershed Assessment Data Preparation for Submitted PFMS SHS
Using ANC's net landbase data and documentation, decisions were made on assigning each polygon into a recoverable or non-recoverable state:

Anthropogenic non-vegetated polygons, as classified by AVI, and polygons that through the landbase update process have been identified as being roads, mineral surface leases, pipeline installation leases and gravel pits were classified as being in a non-recoverable state.

All other polygons were considered to be in a recoverable state with the current recovered status determined by the vegetation type and years since disturbance.

Non-forested vegetated as well as naturally non-vegetated AVI types were considered to be in a fully recovered state. In combination with the non-recoverable land disturbances listed in the paragraph above, this means that anthropogenic disturbances such as pipelines, seismic and powerlines are considered to be in a recovered state by virtue of most of these features typically carrying a ground cover of grasses and shrubs.

Forested AVI types and polygons identified as cutblocks with a reforestation commitment were evaluated for recovery using an MAI relationship with full recovery happening at peak MAI.

Post AVI burns were treated as a disturbance with the year of burn as the year of disturbance to effectively reset the polygons age. These types were assumed to return to their pre-fire vegetation state.

An in-house analysis tool following "The Equivalent Clearcut Area Method of Watershed Assessment for Forest Management Plans" was then run to assess each watershed's periodic non-recovered proportion for assessment.

Watershed Assessment for Mountain Pine Beetle Disaster Scenario
The watersheds in the ANC FMA were evaluated for future impacts due to catastrophic forest loss from MPB infestation.

In addition to the data preparation process described above the following criteria was imposed on the model;

> The PFMS SHS was followed for the first 10 years.
>
> Approximately 80% of pine stands with greater than 60% pine content, older than or equal to 20 years of age were assumed to die after 10 years. These stands were assumed to regenerate to their original yield curve designation post mortality.

Stands meeting the pine criteria in the passive (non-contributing) landbase were also assumed to undergo the same criteria for mortality. No regeneration lag was applied to any of these stands.

The SHS was continued to be followed after mortality with the assumption those stands killed in the MPB outbreak, originally sequenced for harvest would be considered as salvage in years 11 to 20. The remaining 50 years of the SHS (post step down) tended to focus on less pine dominant areas.

Alberta Newsprint Company

DETAILED FOREST MANAGEMENT PLAN

APPENDIX B

FOREST SPECIES

REFERENCE # 0-128

DEVELOPED WITH The Silvacom Group

Forest Species

Forest species composition for each Natural Subregion in the ANC FMA is shown in Table 1. Pine dominated stands (C-P) is the most common yield type in the FMA with 46% of the area. Coniferous dominated yield types cover 88% of the area and Deciduous dominated yield types cover 12% of the area.

Table 1. Forest species composition in ANC FMA by Natural Subregion

Yield Curve Species Cover Group (YC_COV_GRP)	Yield Curve Species (YC_SP)*	Natural Sub-Region (NSR)								Total	
		Central Mixedwood		Lower Foothills		Subalpine		Upper Foothills			
		Area (ha)	% of NSR	Area (ha)	% of NSR	Area (ha)	% of NSR	Area (ha)	% of NSR	Area (ha)	% of FMA
CD-P	P	416	*2.9*	5,435	*3.5*	8	*0.1*	1,694	*1.0*	**7,553**	***2.2***
CD-S	SB	64	*0.4*	602	*0.4*	0	*0.0*	82	*0.1*	**748**	***0.2***
	SW	1,009	*6.9*	5,182	*3.3*	0	*0.0*	297	*0.2*	**6,487**	***1.9***
C-P	P	970	*6.7*	53,435	*34.3*	9,884	*69.4*	94,968	*58.8*	**159,257**	***46.0***
C-SB	SB	3,700	*25.4*	37,877	*24.3*	1,895	*13.3*	50,688	*31.4*	**94,159**	***27.2***
C-SW	SW	1,460	*10.0*	22,935	*14.7*	2,453	*17.2*	10,268	*6.4*	**37,116**	***10.7***
D	AW	5,142	*35.3*	18,229	*11.7*	0	*0.0*	2,011	*1.2*	**25,382**	***7.3***
	BW	150	*1.0*	1,003	*0.6*	0	*0.0*	41	*0.0*	**1,195**	***0.3***
	PB	174	*1.2*	457	*0.3*	0	*0.0*	76	*0.0*	**708**	***0.2***
DC-P	P	146	*1.0*	4,594	*3.0*	0	*0.0*	1,085	*0.7*	**5,825**	***1.7***
DC-S	SB	127	*0.9*	808	*0.5*	0	*0.0*	98	*0.1*	**1,032**	***0.3***
	SW	1,199	*8.2*	5,035	*3.2*	0	*0.0*	304	*0.2*	**6,538**	***1.9***
Total		**14,558**	**100.0**	**155,591**	**100.0**	**14,240**	**100.0**	**161,611**	**100.0**	**345,999**	**100.0**

*Yield Curve Species Group Calculated as Outlined in Section 5.6.3 of the "ANC Net Landbase Determination November 19, 2010" Document - "LT" Larch grouped as "SB" Black Spruce - "FB" or "FA" Fir species and Engelmann Spruce "SE" are grouped as "SW" White Spruce

Legend

Yield Curve Species Cover Group (YC_COV_GRP)	Description
C-P	Coniferous – Pine leading
C-SB	Coniferous - Black Spruce pure or leading
C-SW	Coniferous - White Spruce pure or leading
CD-P	Coniferous/Deciduous - Pine/Hardwood
CD-S	Coniferous/Deciduous - Spruce/Hardwood
D	Deciduous
DC-P	Deciduous/Coniferous – Hardwood/Pine
DC-S	Deciduous/Coniferous – Hardwood/Spruce

Yield Curve Species (YC_SP)*	Description
P	Pine
SB	Black spruce
SW	White spruce
AW	Trembling aspen
BW	White birch
PB	Balsam poplar

Alberta Newsprint Company

DETAILED FOREST MANAGEMENT PLAN

APPENDIX C

INHERENT DISTURBANCE REGIME

REFERENCE # 0-128

DEVELOPED WITH The Silvacom Group

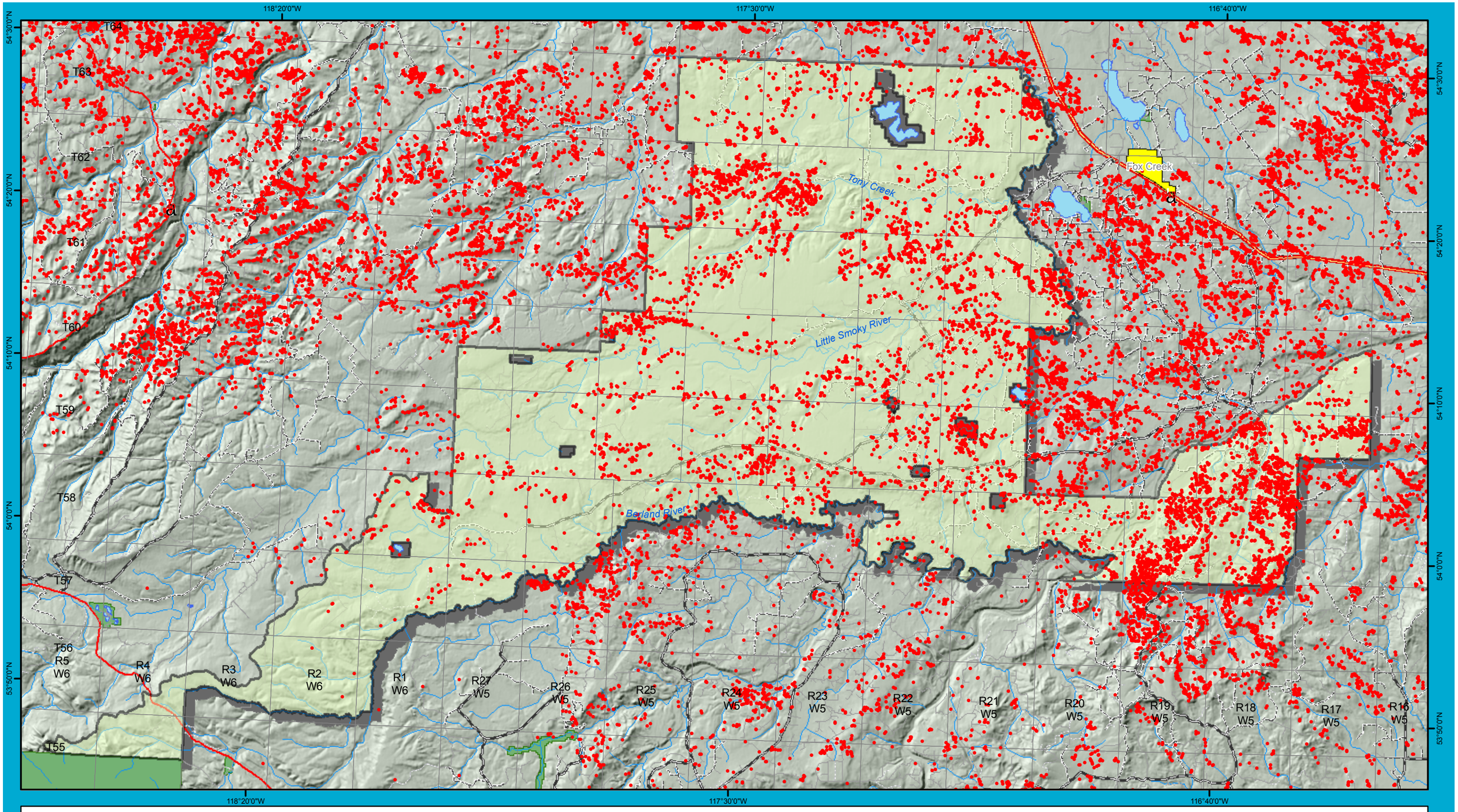
Inherent Disturbance Regime

Fire is the dominant stand replacing disturbance event in the ANC FMA. See "ANC Ltd FireSmart Management and Wildfire Threat Assessment" report (pp. 4 to 6) for a description on the fire regime in the ANC FMA.

In the last decade, mountain pine beetle has spread into the ANC FMA (see web link for historical outbreaks http://www.mpb.alberta.ca/BeetleFacts/historyinfestations.aspx). This is a new stand replacing disturbance event in these forests and research has begun to assess how mountain pine beetle will affect forest dynamics. The Foothills Growth and Yield Association, of which ANC is member, has partnered with Alberta Sustainable Resource Development and the Foothills Research Institute in a study entitled "Monitoring and Decision Support for Forest Management in a Mountain Pine Beetle Environment" to determine the successional pathways followed by pine dominated forests in Alberta following mountain pine beetle disturbance and to develop a decision support system for managers.

Forest insects and diseases contribute to gap phase disturbance dynamics. Significant forest insects and diseases in the ANC FMA include:

- Mountain Pine Beetle (*Dendroctonus ponderosae)*- see attached 2010 ASRD Mountain Pine Beetle Survey Map
- Armillaria (*Armillaria* sp) can cause significant tree mortality in young regenerated stands.
- Blister rust (*Cronartium comandrae*)
- Western gall rust (*Endocronartium comandrae*)
- Warren rootcollar weevil (*Hylobius warreni*)



Government of Alberta

Alberta

N

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2010 ASRD Mountain Pine Beetle Survey

2010 SRD Mountain Pine Beetle Survey Location*

**Presence of Mountain Pine Beetle to be confirmed by ground survey.*

Base Data provided by:
Spatial Data Warehouse Ltd.
January 26, 2011
Forest Management Branch
Edmonton

Alberta Newsprint Company

DETAILED FOREST MANAGEMENT PLAN

APPENDIX D

INVASIVE EXOTIC SPECIES

REFERENCE # 0-128

DEVELOPED WITH The Silvacom Group

Invasive Exotic Species

Invasive plant species that may be of concern for ANC include:

- **tall buttercup** - http://www.invasiveplants.ab.ca/Downloads/FS-TallButtercup.pdf
- **scentless chamomile** - http://www.invasiveplants.ab.ca/Downloads/FS-ScentlessChamomile.pdf
- **oxeye daisy** - http://www.invasiveplants.ab.ca/Downloads/FS-OxeyeDaisy.pdf
- **common tansy** - http://www.invasiveplants.ab.ca/Downloads/FS-CommonTansy.pdf
- **Canada thistle** - http://www.invasiveplants.ab.ca/Downloads/FS-CanadaThistle.pdf

Orange hawkweed may also be of concern. It is a prohibited noxious weed and must be destroyed according to the Weed Control Act. Orange hawkweed was first reported in the county of Athabasca for the first time ever in 2009. http://www.invasiveplants.ab.ca/Downloads/FS-OrangeHawkweed.pdf This observed infestation is the furthest north encounter to date. For more information on these invasive plant species, please refer to the Alberta Invasive Plant Council website (invasiveplants.ab.ca)

Some ecologically sensitive areas may require invasive species control. As necessary, the department will request ANC's cooperation and participation with control activities.

Alberta Newsprint Company

DETAILED FOREST MANAGEMENT PLAN

APPENDIX E

FOREST SUCCESSION TRAJECTORIES

REFERENCE # 0-128

DEVELOPED WITH The Silvacom Group

Forest Succession Trajectories

There is limited literature and none that covers the ANC FMA area.

For managed stands, transitions are defined in the ANC Forest Management Plan (FMP) Yield Curves document and descriptions provided in the Silviculture section of the FMP.

Unmanaged stands are assumed to transition back to their original species composition (i.e. like-to-like transitions).

Alberta Newsprint Company

DETAILED FOREST MANAGEMENT PLAN

APPENDIX F

LANDSCAPE FIRE ASSESSMENT

REFERENCE # 0-128

DEVELOPED WITH The Silvacom Group

Government of Alberta ■
Sustainable Resource Development

Wildfire Management Branch
10th Floor, 9920-108 St.
Edmonton, Alberta, T5K 2M4

December 29, 2010

Vicky Bossé
Acting Senior Manager
Forest Management Planning Section
8th Floor, 9920-108 St.
Edmonton, Alberta
T5K 2M4

RE: Alberta Newsprint Company Ltd. (ANC) FireSmart Analysis – Forest Condition Assessment

The Wildfire Threat Assessment modelled and the fire regime and history data gathered for the Alberta Newsprint Company Ltd. Forest Management Plan was completed to the best of my ability and professional knowledge.

This analysis used current information and the spatial harvest sequence supplied by the company. Any deviation from this harvest sequence will change the outcome of the analysis I submitted to the Forest Management Planning Section on November 5, 2010. This endorsement is solely for the work which I completed and submitted on that date.

Sincerely,

Stuart Kelm, RPF
FireSmart Forest Management Specialist
Wildfire Management Branch

Alberta Newsprint Company Ltd.

FireSmart Management and Wildfire Threat Assessment

November 2011

Completed By:

Alberta Sustainable Resource Development
Wildfire Management Branch

Introduction

The aim of wildfire management is to balance the ecological role of fire while protecting human life, communities, watersheds and sensitive soils, natural resources, and infrastructure. The intention of the Alberta FireSmart program is to integrate fire, forest, and land management planning through a broad risk and resource management approach.

The goal of FireSmart forest management planning is to create a landscape in which catastrophic fire is minimized. This is accomplished through a combination of:

- Reducing the fire behaviour potential
- Reducing the fire occurrence risk
- Reducing the exposure of values at risk to fire
- Increasing the wildfire suppression capabilities

FireSmart landscapes are managed with the recognition of the interaction between the ecological, economic, and social impacts of fire while identifying opportunities for the use timber harvest and other disturbance strategies to meet landscape management objectives.

In order to meet FireSmart objectives, forest management activities in the Alberta Newsprint Company Ltd. FMA will:

- Comply with provincial forest protection legislation, policy, and directives.
- Apply feasible FireSmart strategies within the FMA.
- Reduce the likelihood of large high-intensity, high-severity fires through the use of timber harvest targeting older age classes adjacent to values at risk.
- Ensure consultation with the public and stakeholders has occurred.

Defined Forest Area

The Alberta Newsprint Company Ltd. (ANC) FMA covers four Natural Subregions (NSR). These include the Central Mixedwood, Lower Foothills, Upper Foothills, and Sub-Alpine Natural Subregions (Figure 1).

The Lower Foothills NSR and the Upper Foothills NSR each cover 46 percent of the FMA. The other eight percent is equally split between the Sub-Alpine NSR and Central Mixedwood NSR.

The predominant Canadian Forest Fire Behaviour Prediction (FBP) fuel type occurring in the FMA is C2 (Figure 2). There is also a large percentage of C3 (mature pine) fuels located throughout the FMA.

There are no FireSmart Community Zones occurring in the FMA. The Fox Creek FireSmart Community Zone borders the northeast portion of the FMA (Figure 1).

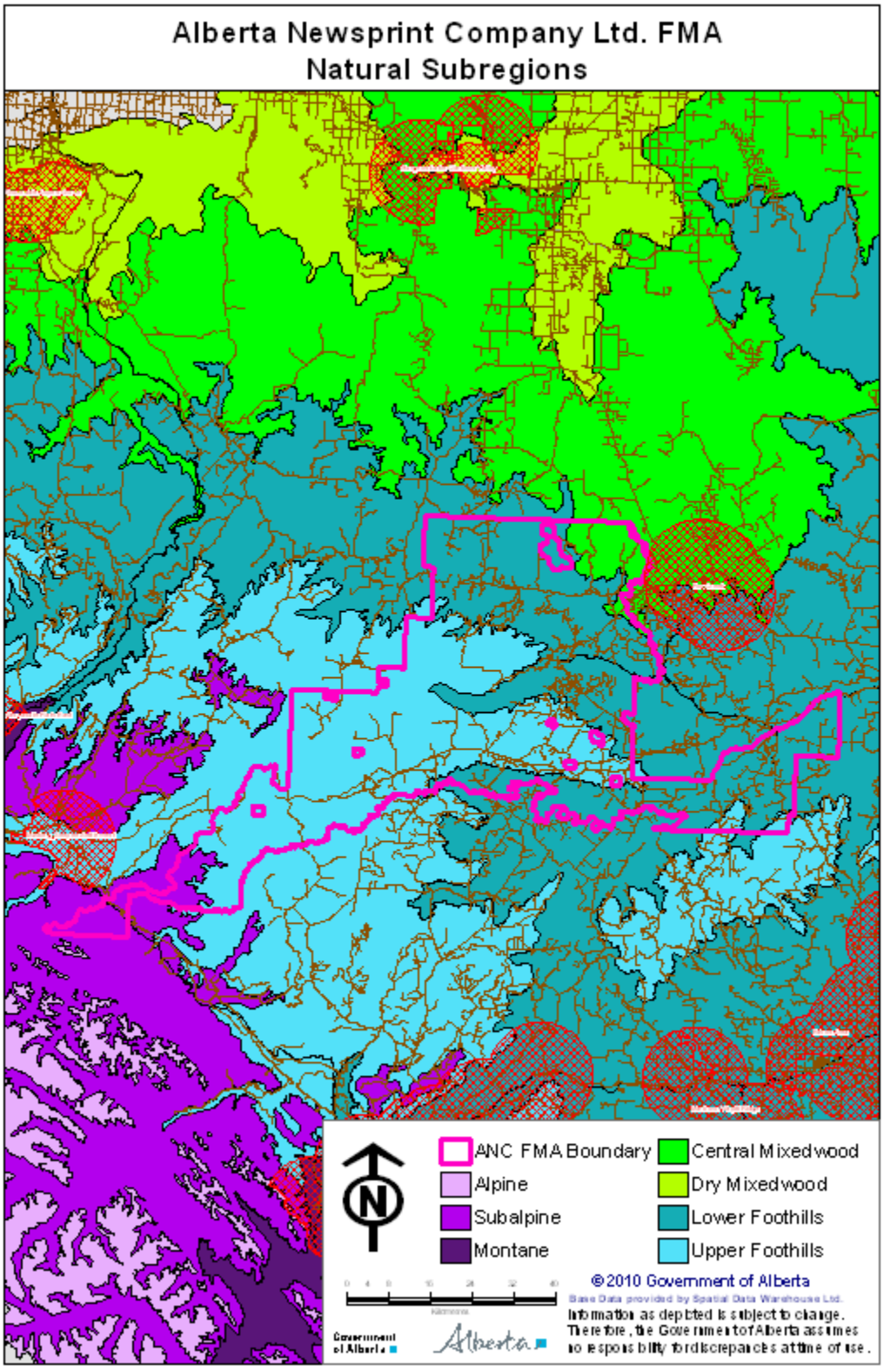


Figure 1. The Natural Subregions located in the defined area of the Alberta Newsprint Company Ltd. FMA.

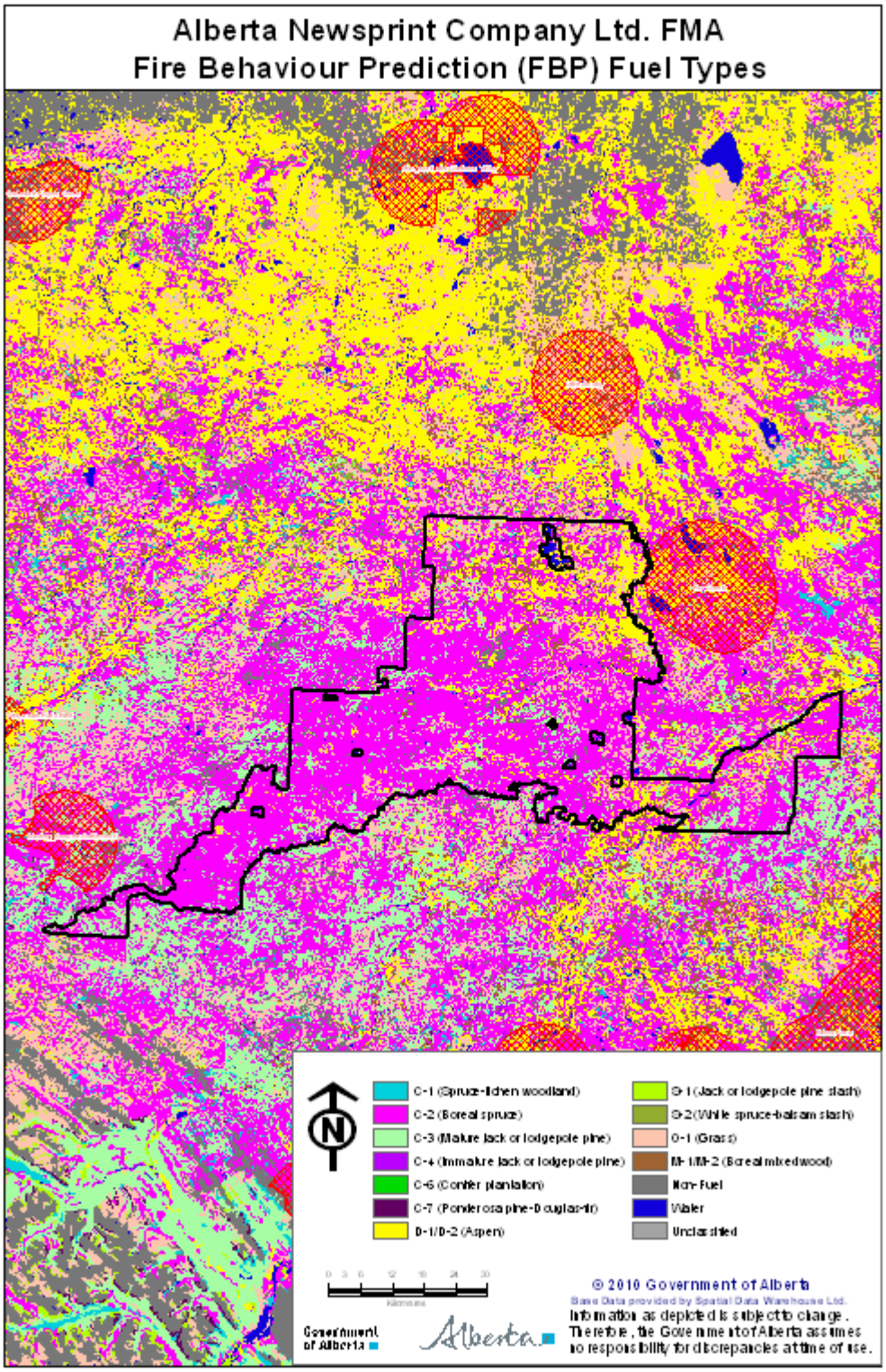


Figure 2. Canadian Forest Fire Behaviour Prediction (FBP) forest fuel types found in the Alberta Newsprint Company Ltd. FMA.

Fire Regime and Fire History

The following provides a general overview of the fire regime and fire history for the ANC FMA.

General Fire Regimes
The ANC FMA is located in the Central Mixedwood, Lower Foothills, Upper Foothills, and Sub-Alpine Natural Subregions.

The Central Mixedwood Natural Subregion is characterized by white spruce and trembling aspen forest cover types. The wildfire regime in this NSR is predominantly frequent small fires and infrequent large fires (Tymstra et al. 2005). Human caused fire occurrence peaks in May as aspen and mixedwood stands typically do not reach green-up until the end of the month (Tymstra et al. 2005).

The central Mixedwood NSR occurs in approximately four percent of the ANC FMA near the town of Fox Creek (Figure 1).

The Sub-Alpine Natural Subregion also occupies approximately four percent of the ANC FMA. This NSR is conifer dominated. The fire regime consists of infrequent small fires and very infrequent large wildfires (Tymstra et al. 2005).

The majority of wildfires in the Sub-Alpine NSR occur in summer with a peak area burned in August (Tymstra et al. 2005).

The Lower Foothills NSR occupies approximately 46 percent of the FMA. In this NSR, human-caused fires peak in May with lightning caused wildfires peaking later in the summer (Tymstra et al. 2005). Overall, the fire regime is considered to be one of frequent medium-sized fires (Tymstra et al. 2005).

The Upper Foothills NSR has a similar wildfire regime to the Lower Foothills NSR. The main difference is that the Upper Foothills NSR experiences more lightning caused wildfires (Tymstra et al. 2005). The peak fire season is from May to August in which frequent medium sized lightning caused wildfires occur (Tymstra et al. 2005).

Fire Size and Historical Fires
Tymstra et al. (2005) reported the provincial average fire size for the Central Mixedwood NSR and the Sub-Alpine NSR to be 198 hectares and 16 hectares respectively. The provincial average fire size for the lower foothills NSR was determined to be 77 hectares and 57 hectares for the upper Foothills NSR.

Historically, the 1950's and 1960's were the decades in which large fires occurred adjacent to and within the ANC FMA (Figure 3).

Fire Cycles
The roll back method was used by Andison (2000) to determine the fire cycle in the Lower Foothills NSR and Upper Foothills NSR. The fire cycle was determined to be 52 years for the Lower Foothills NSR and 61 years for the Upper Foothills NSR.

A number of studies with various methodologies have been used to determine the fire cycle in the Sub-Alpine NSR and Central Mixedwood NSR. These studies have provided a range in the fire cycles for these Natural Subregions. The range is from 80 years to 300 years for the Sub-Alpine NSR and 45 years to 476 years for the Central Mixedwood NSR. Roll back analysis tended to place the fire cycle for the Sub-Alpine NSR in the 80 year to 100 year range and in the 45 to 50 year range for the Central Mixedwood. These values were for studies completed in different areas of the province—the values are estimates and not specific to the ANC FMA.

Recommendations – Fire Regime and Fire History
To best mimic historical fires and emulate natural disturbances, the following should be considered:

- Where possible, harvest disturbances should be located in Natural Subregions and forest fuel types (C1, C2, and C3) which are prone to burning and result in large historical fire sizes.
- To mimic wildfire and other natural disturbances, harvest design should take advantage of modelling tools such as NEPTUNE or other disturbance based models.

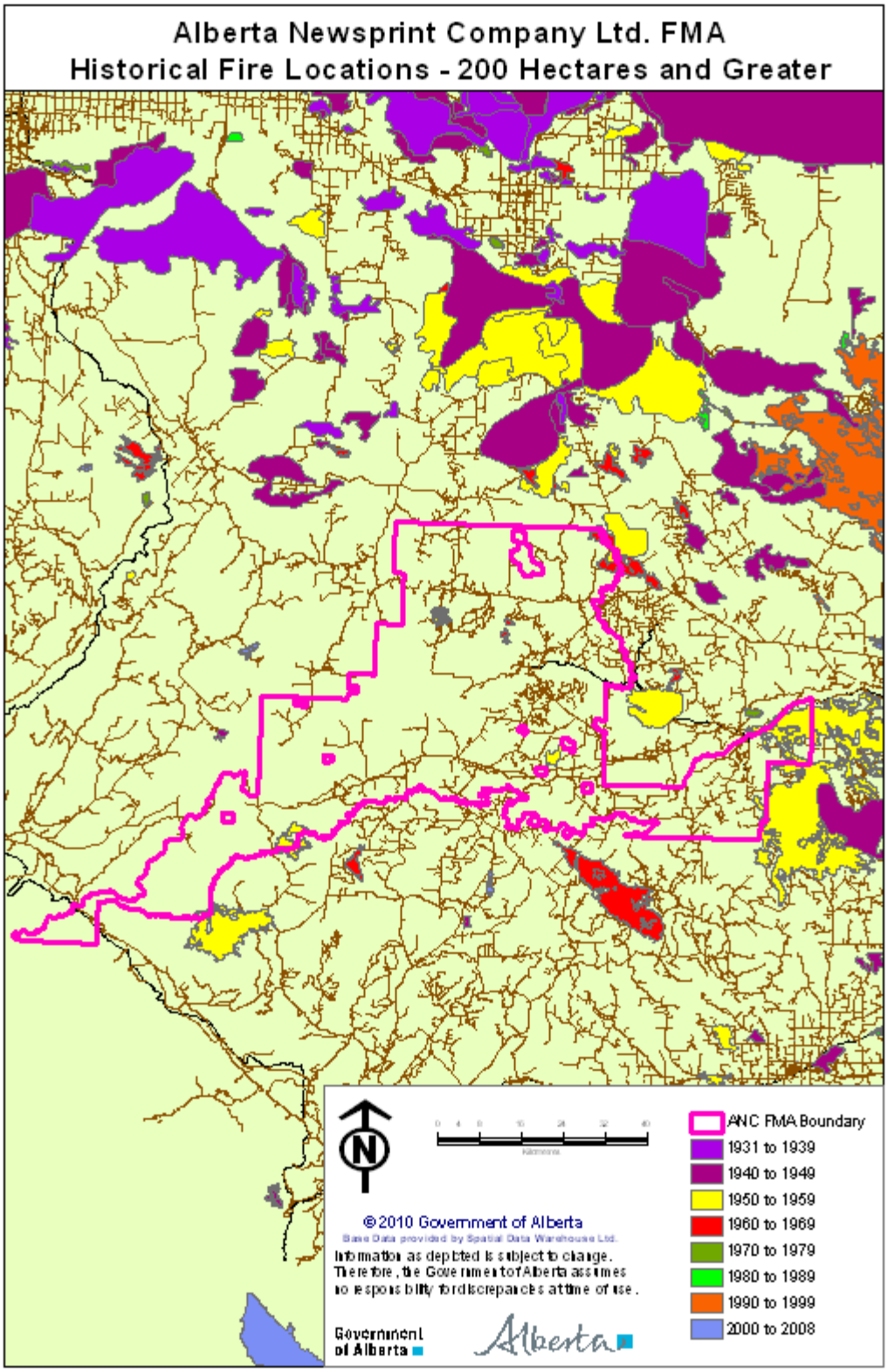


Figure 3. Historical fire locations in and adjacent to the ANC FMA.

Wildfire Threat Assessment

The Wildfire Threat Assessment Model (WTA Model) provides an analysis of what influence the preferred forest management strategy will have in achieving wildland fire management objectives on both the current and future forest states in the FMA.

The WTA Model is a spatial model which is used to rate the susceptibility of an area to the negative impact of wildfires. The WTA Model is an ArcGIS application which combines several data layers into one layer representing the final wildfire threat rating. Each of the underlying layers is weighted according to pre-determined parameters (Figure 4).

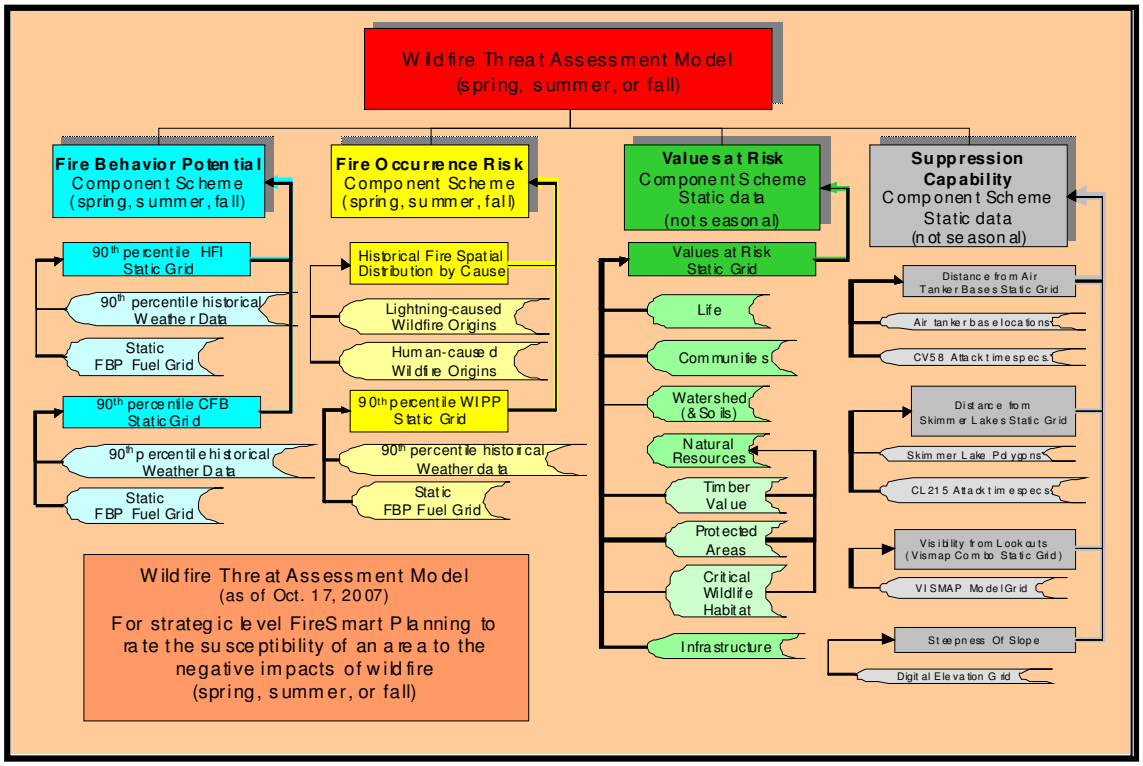


Figure 4. Wildfire threat model schematics.

The FireSmart objective for the preferred forest management strategy is to reduce the overall wildfire threat potential in the ANC FMA through:

- Reducing the fire behaviour potential
- Reducing the fire occurrence risk
- Reducing fire exposure to values at risk
- Enhancing wildfire suppression capability

Wildfire Threat Analysis – Wildfire Threat Rating and Fire Behaviour Potential

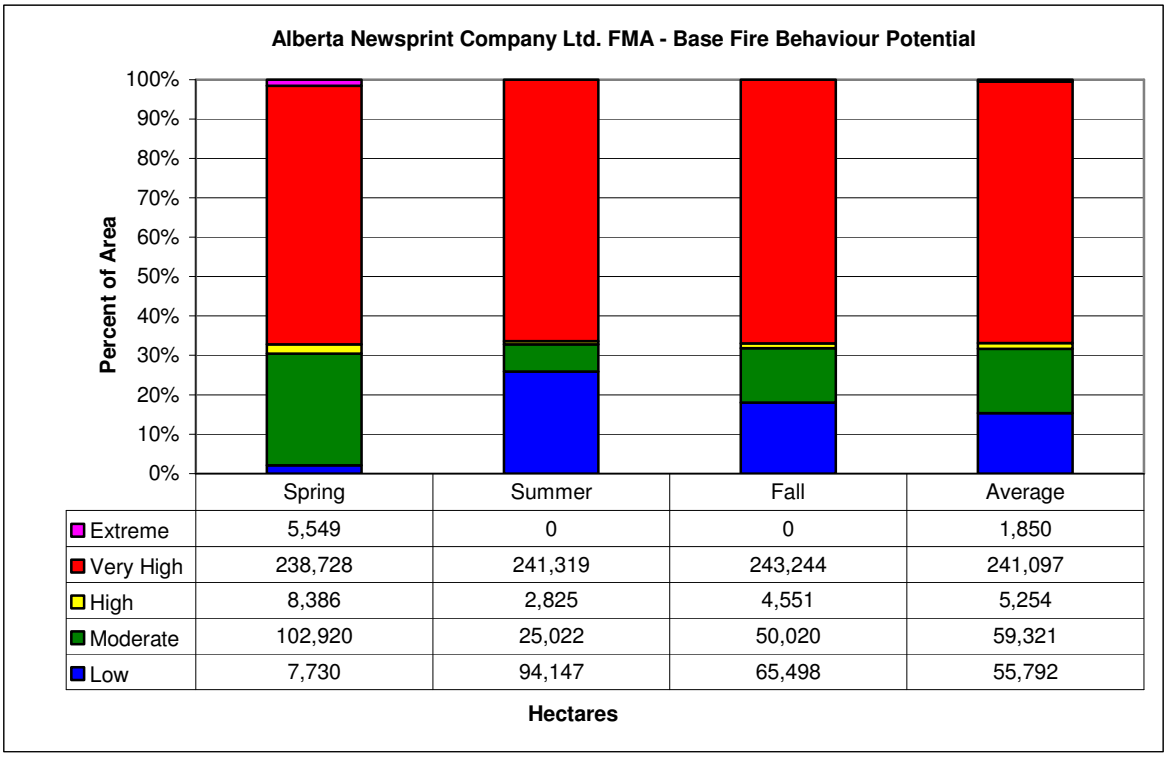
The wildfire threat analysis for the ANC FMA focused on the spring season as it is the season in which the greatest current fire behaviour potential and wildfire threat rating occurred (Figure 5 and 6).

Assessment of what influence the preferred forest management strategy will have on the wildfire threat potential in the FMA required an analysis of how the spatial harvest sequence would contribute to a reduction in fire behaviour potential. The analysis indicated how much area of high, very high, and extreme rated forest structure will be removed from the landbase.

The current four-step process described in Annex 3 of the *Alberta Forest Management Planning Standard* was used to forecast the relationship between harvest sequence and fire behaviour potential.

The Wildfire Threat Assessment – Fire Behaviour Potential was completed for the ANC FMA using the WTA Model. This output used forest fuel types, head fire intensity at the 90th percentile and crown fraction burn predictions as inputs. Fire behaviour potential was run for the current forest state. The model was then run incorporating the spatial harvest sequence to forecast fire behaviour potential at years 10, 20, and 50 (Figure 7, Table 1).

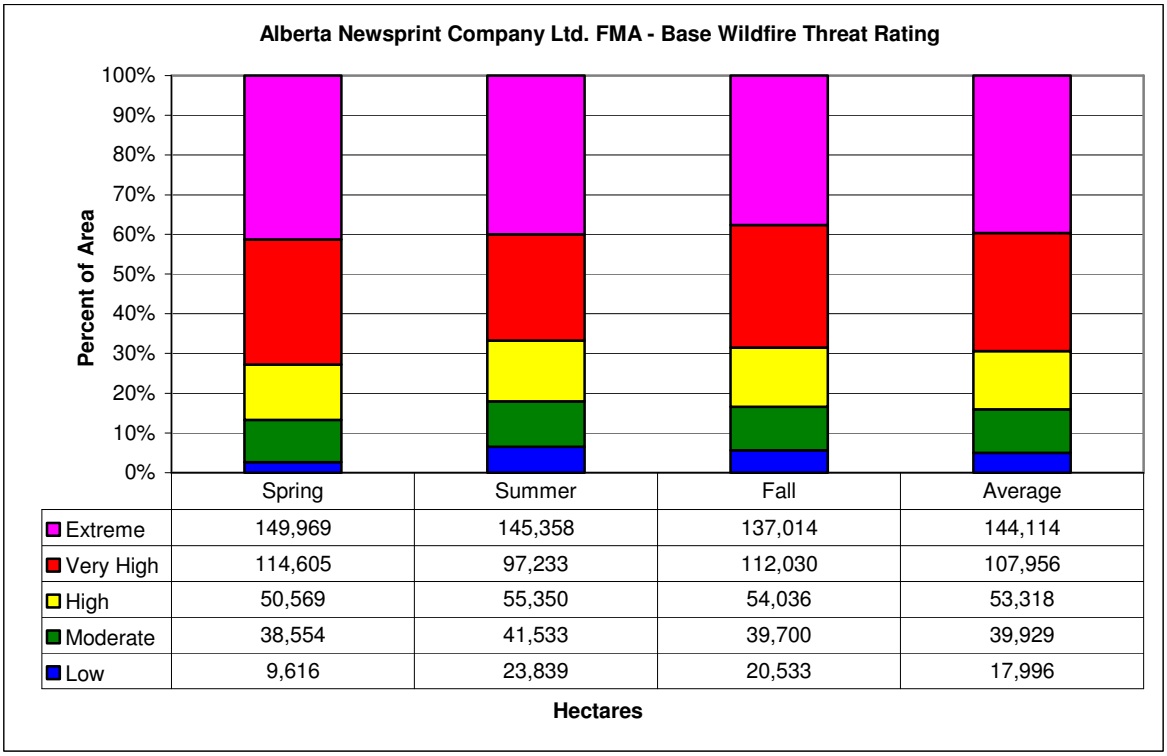
The Wildfire Threat Assessment - Wildfire Threat Rating was also completed. This output utilized fire behaviour potential, fire occurrence risk, values at risk, and suppression capability as inputs to determine the overall wildfire threat rating. This process was completed for the current forest state and then run incorporating the spatial harvest sequence to forecast future wildfire threat at years 10, 20, and 50 (Figure 8, Table 2).



	Spring	Summer	Fall	Average
Extreme	5,549	0	0	1,850
Very High	238,728	241,319	243,244	241,097
High	8,386	2,825	4,551	5,254
Moderate	102,920	25,022	50,020	59,321
Low	7,730	94,147	65,498	55,792

Hectares

Figure 5. Seasonal fire behaviour potential for the ANC FMA at the current forest state.



	Spring	Summer	Fall	Average
Extreme	149,969	145,358	137,014	144,114
Very High	114,605	97,233	112,030	107,956
High	50,569	55,350	54,036	53,318
Moderate	38,554	41,533	39,700	39,929
Low	9,616	23,839	20,533	17,996

Figure 6. Seasonal wildfire threat rating for the ANC FMA at the current forest state.

As previously mentioned, spring was the season with the greatest fire behaviour potential and the greatest wildfire threat rating. It was the season used to model the fire behaviour potential and wildfire threat rating at years 10, 20, and 50.

The spring season is generally influenced by cured grass fuel types which are common in disturbed areas and leafless deciduous stands. This value is reduced when cured fuels green-up in the summer.

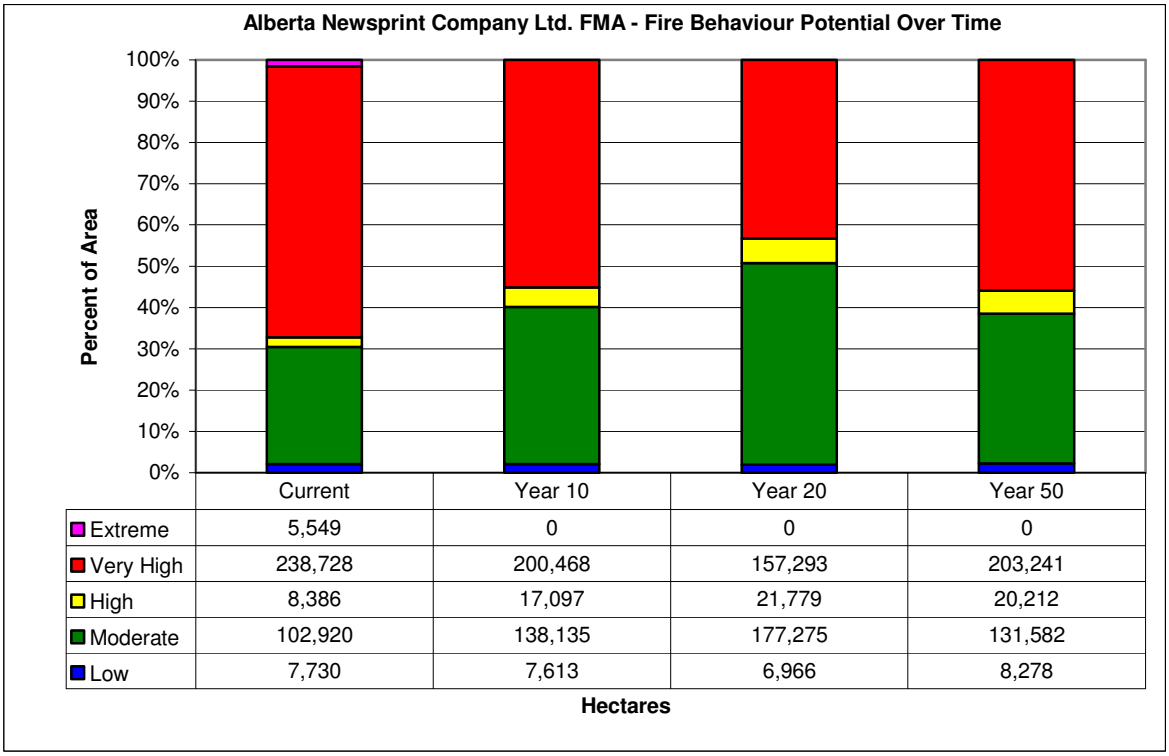


Figure 7. ANC FMA fire behaviour potential at the different time slices.

The extreme fire behaviour potential was completely removed from the FMA by year 10 through locating harvest disturbances in highly fire prone stands. These areas were predominantly located in the southeast portion of the FMA.

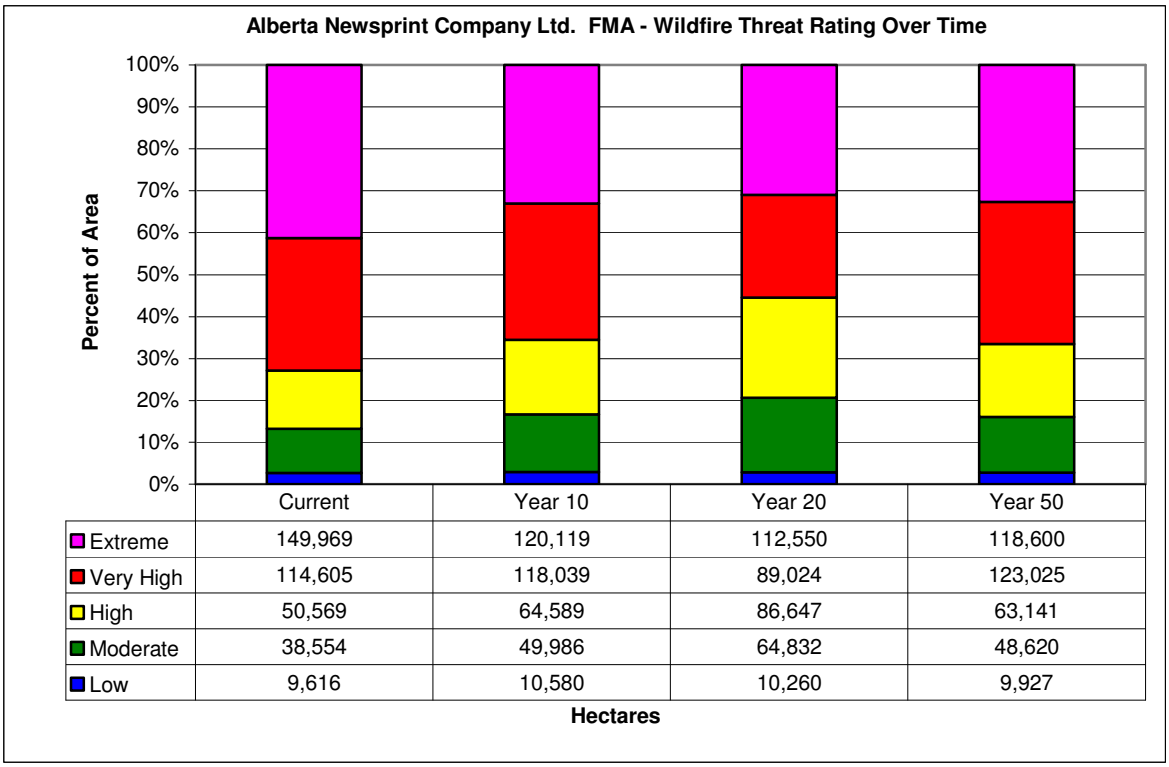
Very high fire behaviour potential was reduced by 38,260 hectares at year 10 and by an additional 43,175 hectares at year 20. This value increased at year 50 as the forest fuels transitioned back into the original fuel types.

Table 1. Percent of the FMA in the different fire behaviour potential classes at each time slice.

Fire Behaviour Potential Class	Current	Year 10	Year 20	Year 50
Low	2.07%	2.04%	1.86%	2.22%
Moderate	27.55%	36.97%	47.45%	35.22%
High	2.24%	4.58%	5.83%	5.41%
Very High	63.90%	53.65%	42.10%	54.40%
Extreme	1.49%	0%	0%	0%
Non-Fuel	2.76%	2.76%	2.76%	2.76%

The percent fire behaviour potential analysis at the different time slices showed a 9.40 percent decrease in the combined high, very high, and extreme categories from the current forest state to year 10. This was further reduced by 10.40 percent at year 20.

The percent fire behaviour in the combined high, very high, and extreme categories was reduced by 7.82 percent from the current forest state at the 50 year time slice.



	Current	Year 10	Year 20	Year 50
Extreme	149,969	120,119	112,550	118,600
Very High	114,605	118,039	89,024	123,025
High	50,569	64,589	86,647	63,141
Moderate	38,554	49,986	64,832	48,620
Low	9,616	10,580	10,260	9,927

Figure 8. ANC FMA wildfire threat rating at the different time slices.

The extreme wildfire threat rating is greatest at the current forest state. The value was reduced by 29,850 hectares at the year 10 time slice and by another 7,569 hectares at the year 20 time slice.

Very high wildfire threat decreased significantly at year 20 by 25,581 hectares from the current forest state. This value then increased by 34,001 hectares between the year 20 and year 50 time slices.

Table 2. Percent of the FMA in the different wildfire threat rating classes at each time slice.

Wildfire Threat Rating	Current	Year 10	Year 20	Year 50
Low	2.57%	2.83%	2.75%	2.66%
Moderate	10.32%	13.38%	17.35%	13.01%
High	13.53%	17.29%	23.19%	16.90%
Very High	30.67%	31.59%	23.83%	32.93%
Extreme	40.14%	32.15%	30.12%	31.74%
Non-Fuel	2.76%	2.76%	2.76%	2.76%

The percent wildfire threat rating at the different time slices depicted a decrease of 3.31 percent in combined high, very high, and extreme ratings at the 10 year time slice. This value was reduced by another 3.89 percent at the year 20 time slice. At the year 50 time slice, this value showed a 2.77 percent decrease from the current forest state.

When examining fire behaviour potential and wildfire threat rating, it is important to look at where harvest disturbances are placed on the landscape. Disturbances should be located in strategic locations to reduce problematic forest fuels, protect communities, increase the likelihood of fire containment and align with FireSmart and other landscape objectives.

Fire Occurrence Risk

Fire occurrence risk is based on the historical fire occurrence and wildfire ignition probability at the 90^{th} percentile.

The fire occurrence risk for the ANC FMA is generally low to moderate throughout the spring, summer, and fall seasons (Figures 9, 10, and 11). Much of the area associated with moderate to high fire occurrence is in locations frequently used for recreational activities or associated with industrial dispositions. While fire occurrence has traditionally been low to moderate, the potential for large fires to occur in the FMA should not be overlooked.

Overall Values at Risk

The ANC FMA has an extreme impact rating to values at risk from wildfire (Figure 12). The values at risk are based on human life, communities, watershed and soils, natural resources, and infrastructure. The proximity of the FMA to settled areas, a major transportation corridor, allocated timber, and oil and gas infrastructure has resulted in the extreme rating.

Wildfire Suppression Capability

Suppression capability is based on the distance from air tanker bases, distance from skimmer lakes, visibility from lookouts and the steepness of slopes. The suppression capability for the ANC FMA is rated moderate to less suppression capability (Figure 13).

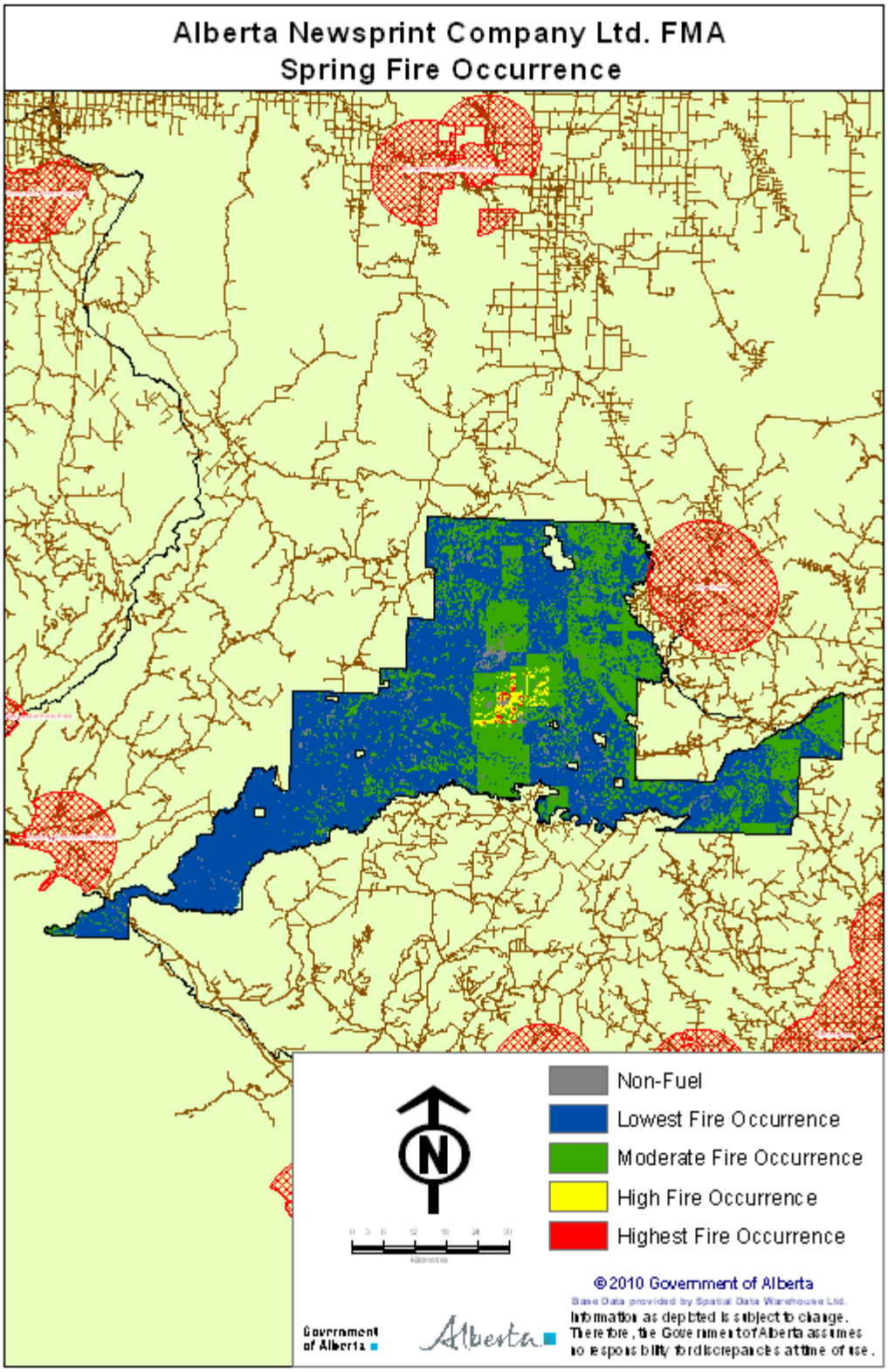


Figure 9. Spring fire occurrence risk.

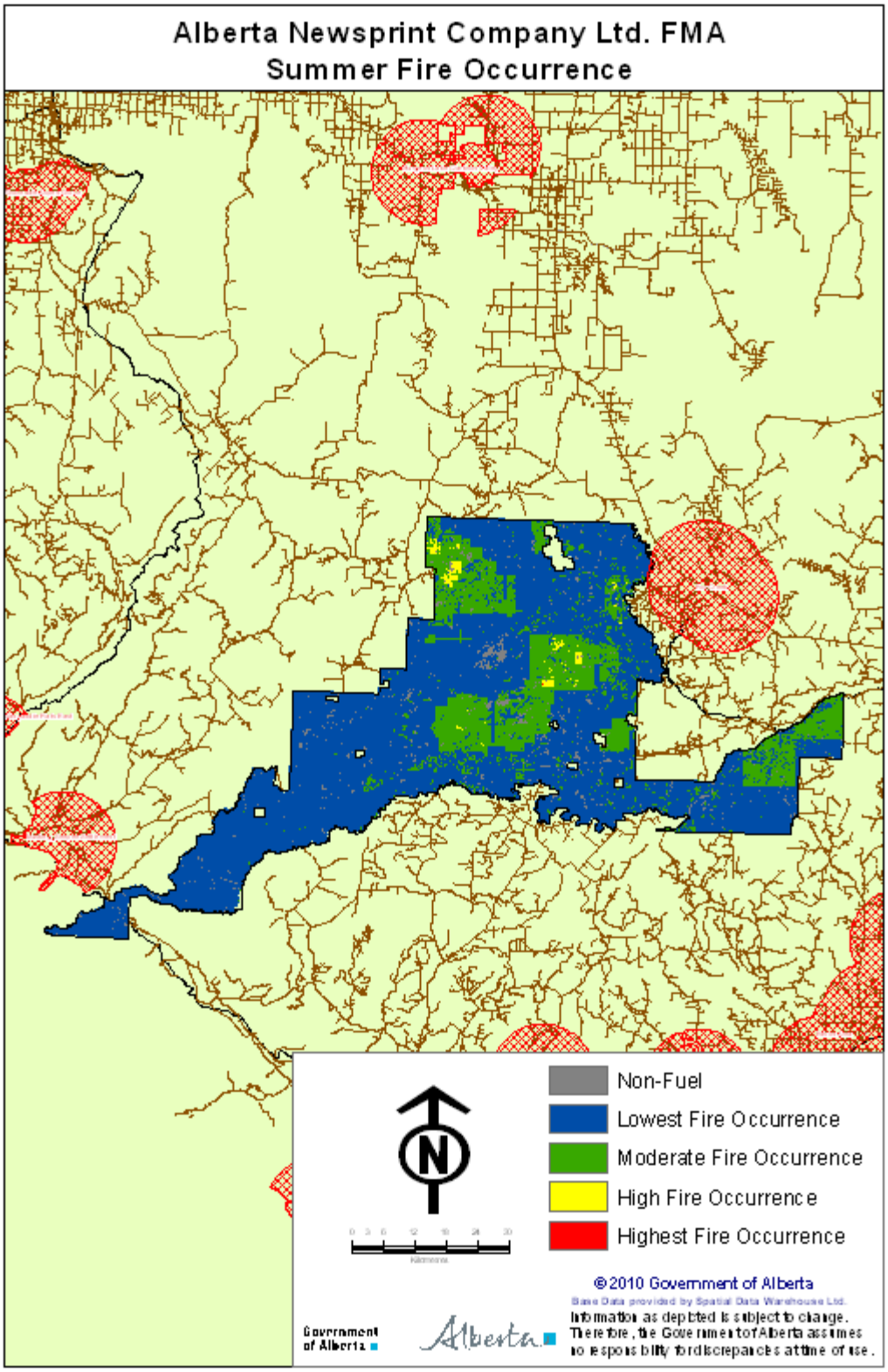


Figure 10. Summer fire occurrence risk.

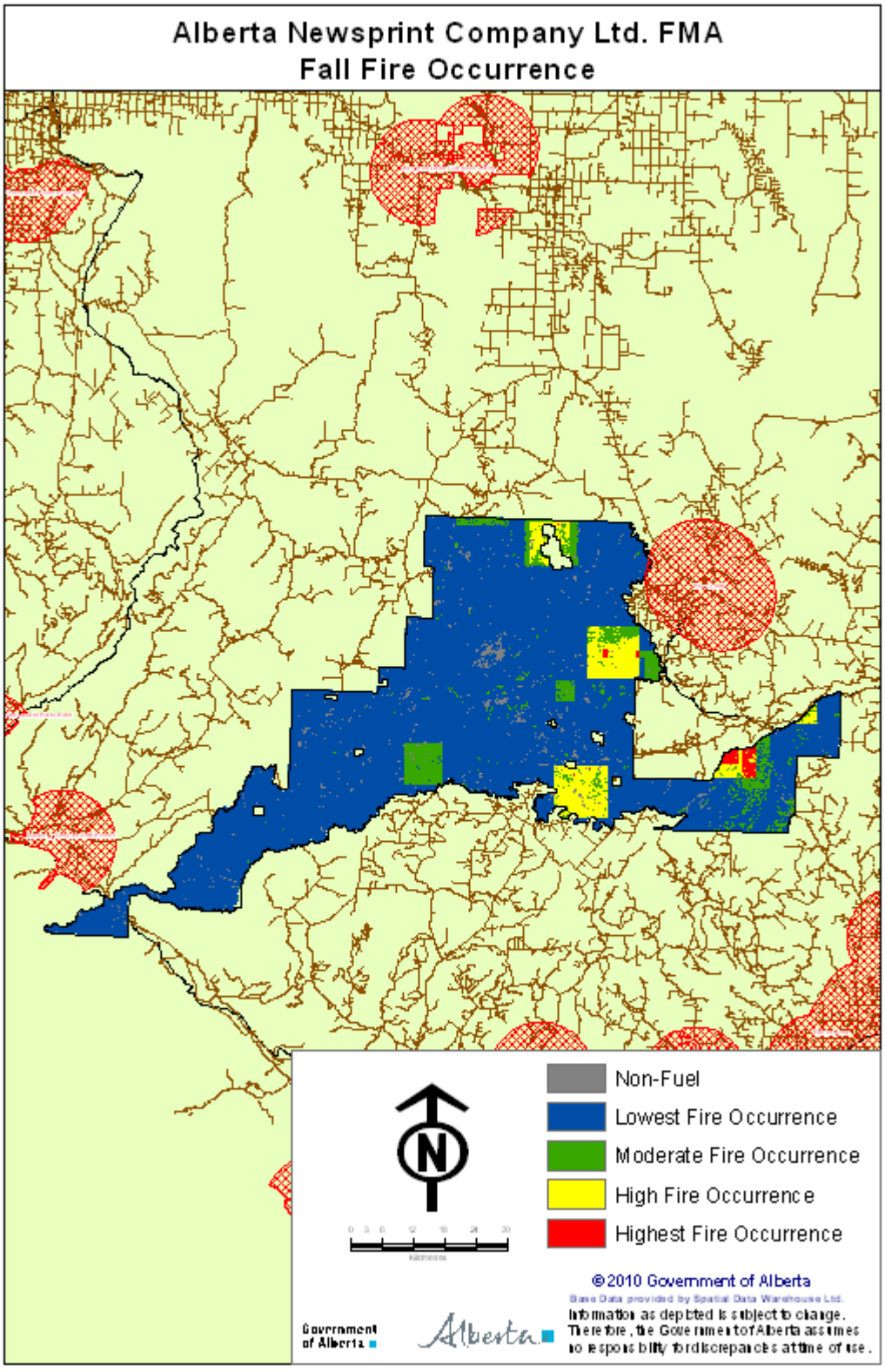


Figure 11. Fall fire occurrence risk.

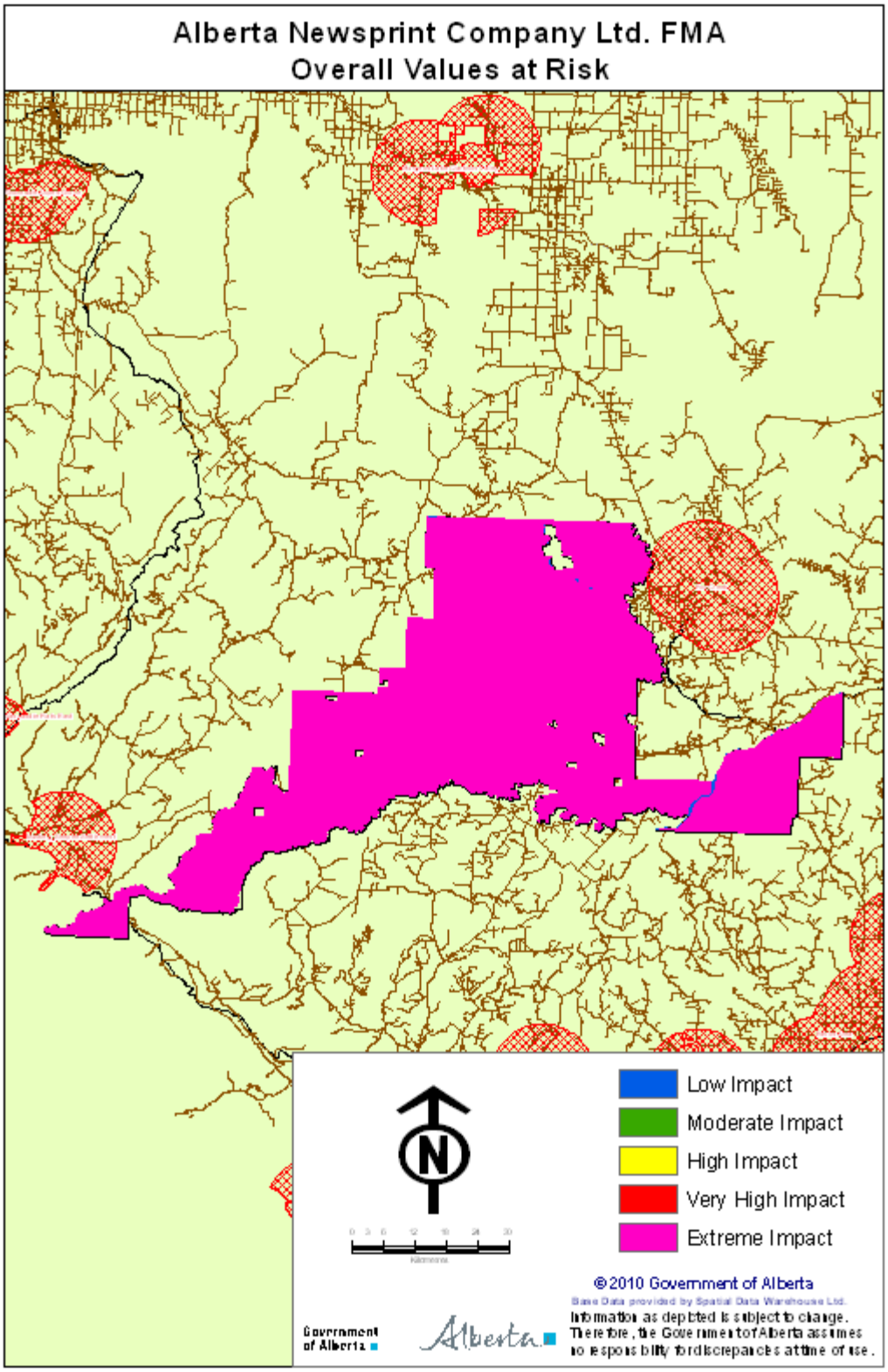


Figure 12. Overall values at risk.

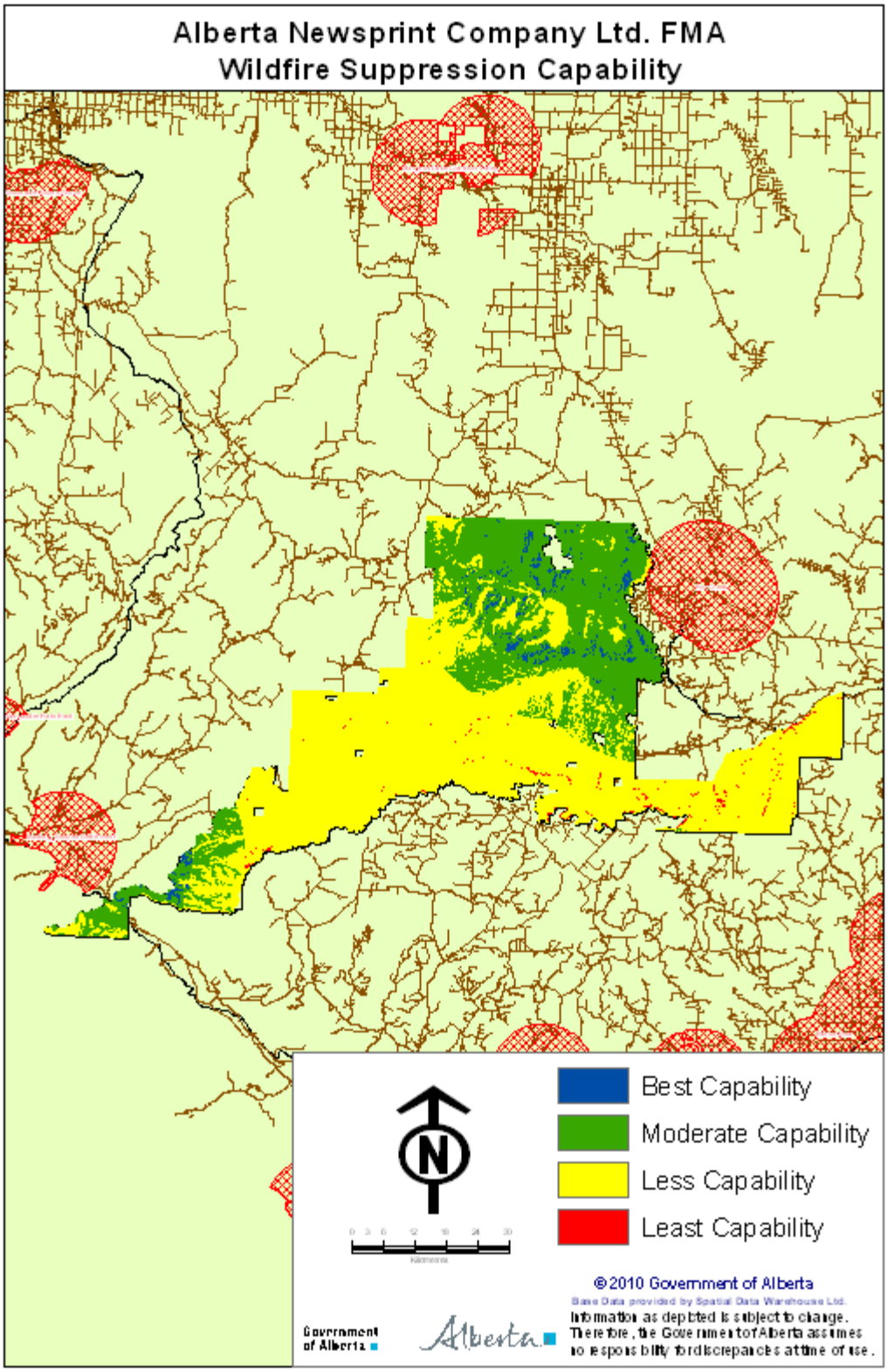


Figure 13. Wildfire suppression capability.

Performance Standards

The following performance standard identified in Annex 4, Section 5.2 of the *Forest Management Planning Standard* shall be targeted through the implementation of the ANC Forest Management Plan.

Target	Reduce the area in the extreme and high fire behaviour potential rating by at least 10 % across the FMA over the 20 year spatial harvest sequence.
Means to Identify Target	Planning process, Wildfire Threat Assessment
Legal / Policy Requirements	Alberta Forest Management Planning Standard
Means of Achieving Objective and Target	• Spatial harvest sequence • Other FireSmart and disturbance strategies
Monitoring and Measurement	Annual Operating Plan
Reporting	Stewardship Report
Acceptable Variance	Issue specific
Response	Adjust the harvest sequence.

Recommendations- Wildfire Threat Assessment and the ANC FMA

The following recommendations pertain to FireSmart management in the ANC FMA:

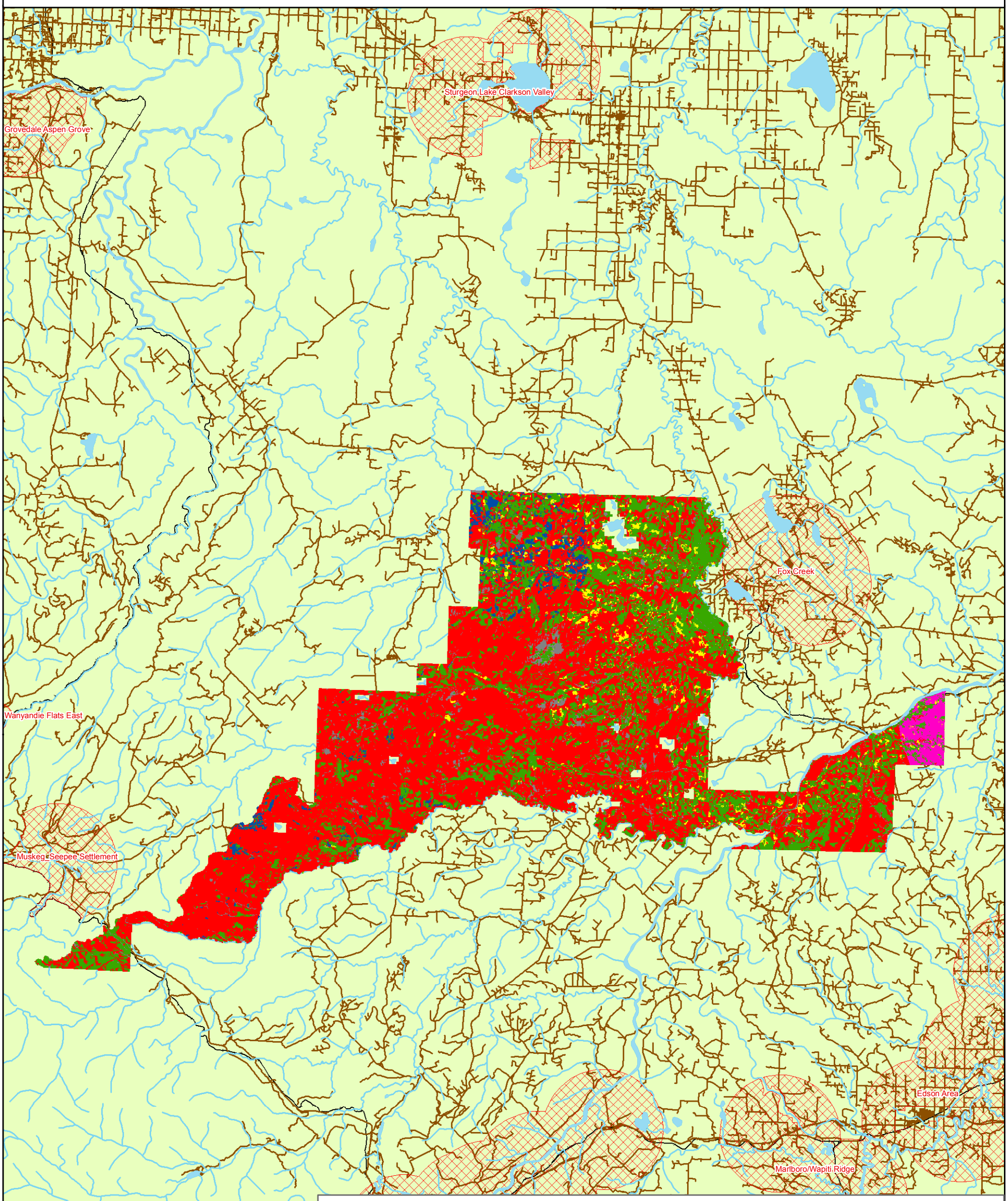
- The current SHS is targeting older age classes and pine stands. It has resulted in a reduction in fire behaviour potential by removing problematic C2 (boreal spruce) and C3 (mature jack or lodgepole pine) fuel types. This meets the performance standard identified in the *Forest Management Planning Standard*. Any variance from the SHS should be examined to ensure at least a 10 percent reduction in fire behaviour potential is met.
- The potential to create a wildfire containment strategy on the FMA by aligning harvest and other disturbances should be explored.
- Merchantable stands located near settled areas and other values (recreation areas, other infrastructure) should be considered for harvest disturbances to reduce the exposure of these values to potential wildfire.

References

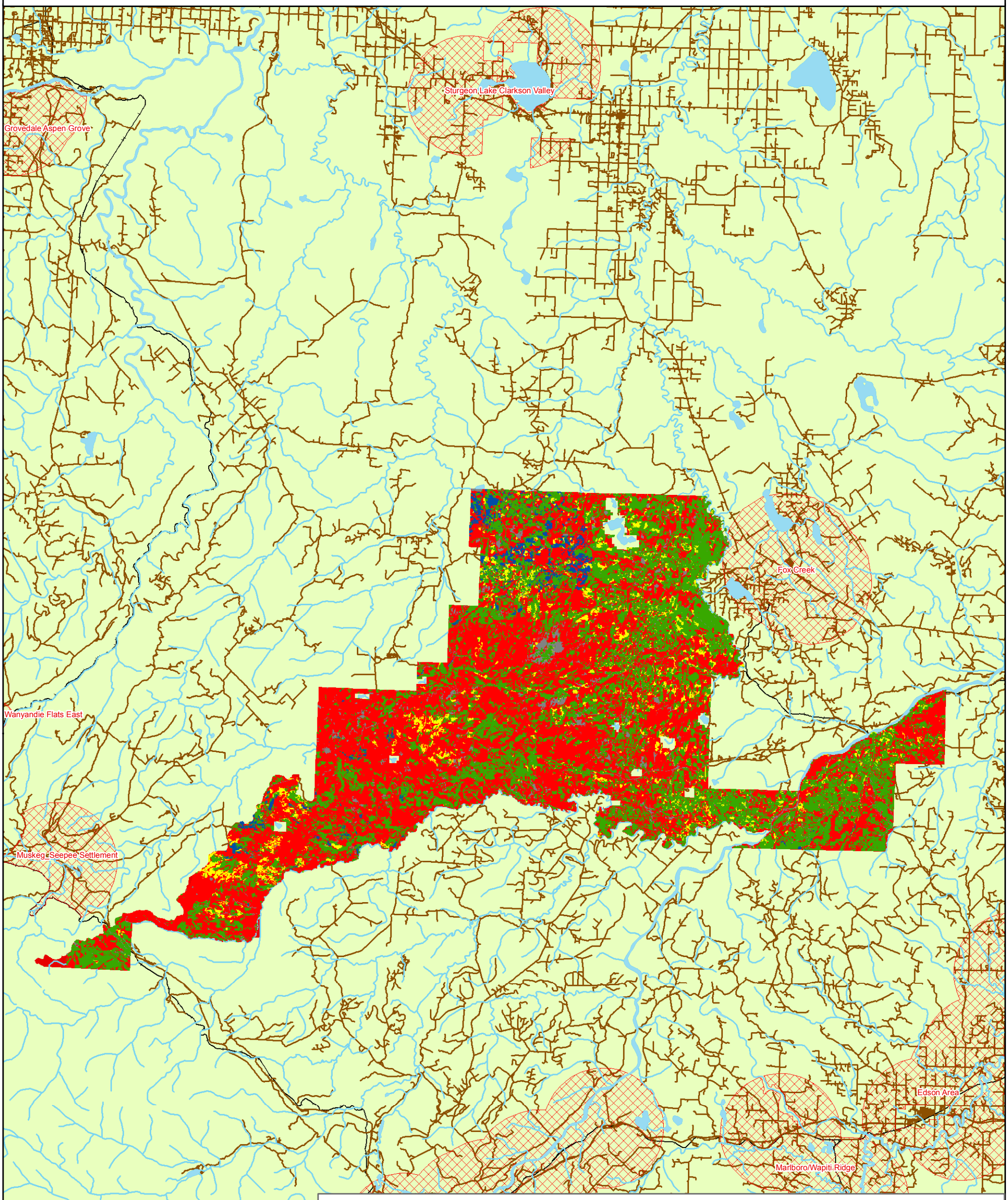
Andison, D. 2000. Landscape-level fire activity on foothills and mountain landscapes of Alberta. Alberta Foothills Disturbance Ecology Research Series, Report No. 2. Foothills Model Forest, Hinton, Alberta.

Tymstra, C., D. Wang, and M-P. Rogeau. 2005. Alberta wildfire regime analysis. Alberta Sustainable Resource Development, Forest Protection Division, Wildfire Policy and Business Planning Branch. Wildfire Science and Technology Report PFFC-01-05.

Alberta Newsprint Company Ltd. FMA
Fire Behaviour Potential - Current



Alberta Newsprint Company Ltd. FMA
Fire Behaviour Potential - Year 10



Alberta Newsprint Company Ltd. FMA
Fire Behaviour Potential - Year 20

Grovedale Aspen Grove
Sturgeon Lake Clarkson Valley
Fox Creek
Wanyandie Flats East
Musker Seepee Settlement
Edson Area
Marlboro/Wapiti Ridge

FireSmart Community Zone
Non-Fuel
Low Fire Behaviour Potential
Moderate Fire Behaviour Potential
High Fire Behaviour Potential
Very High Fire Behaviour Potential
Extreme Fire Behaviour Potential

N

0 4 8 16 24 32 40
Kilometres

Government of Alberta

Alberta

Alberta Newsprint Company Ltd. FMA
Fire Behaviour Potential - Year 50

Sturgeon Lake Clarkson Valley
Grovedale Aspen Grove
Fox Creek
Wanyandie Flats East
Musker-Seepee Settlement
Edson Area
Marlboro/Wapiti Ridge

FireSmart Community Zone
Non-Fuel
Low Fire Behaviour Potential
Moderate Fire Behaviour Potential
High Fire Behaviour Potential
Very High Fire Behaviour Potential
Extreme Fire Behaviour Potential

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Kilometres

Government of Alberta

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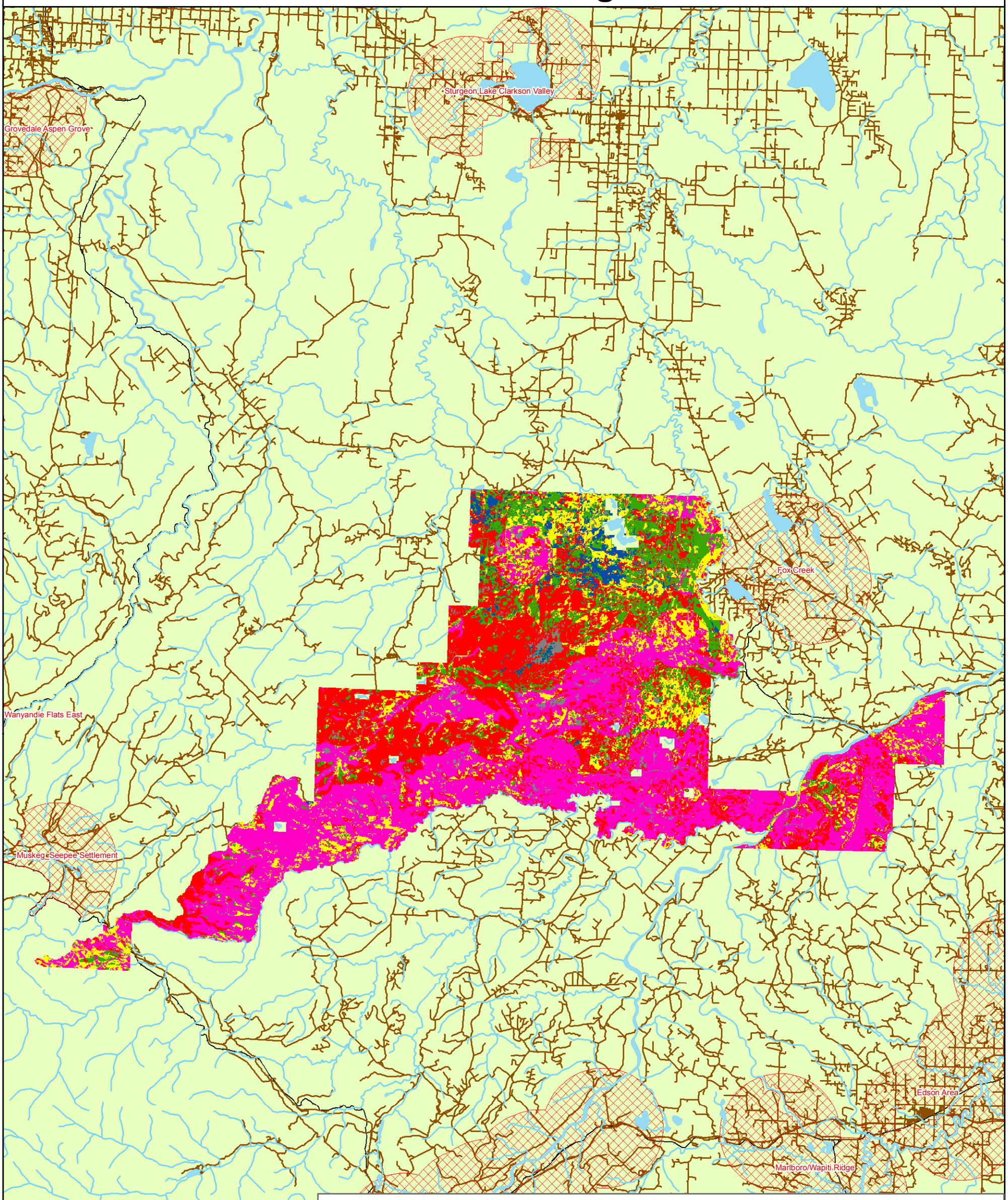
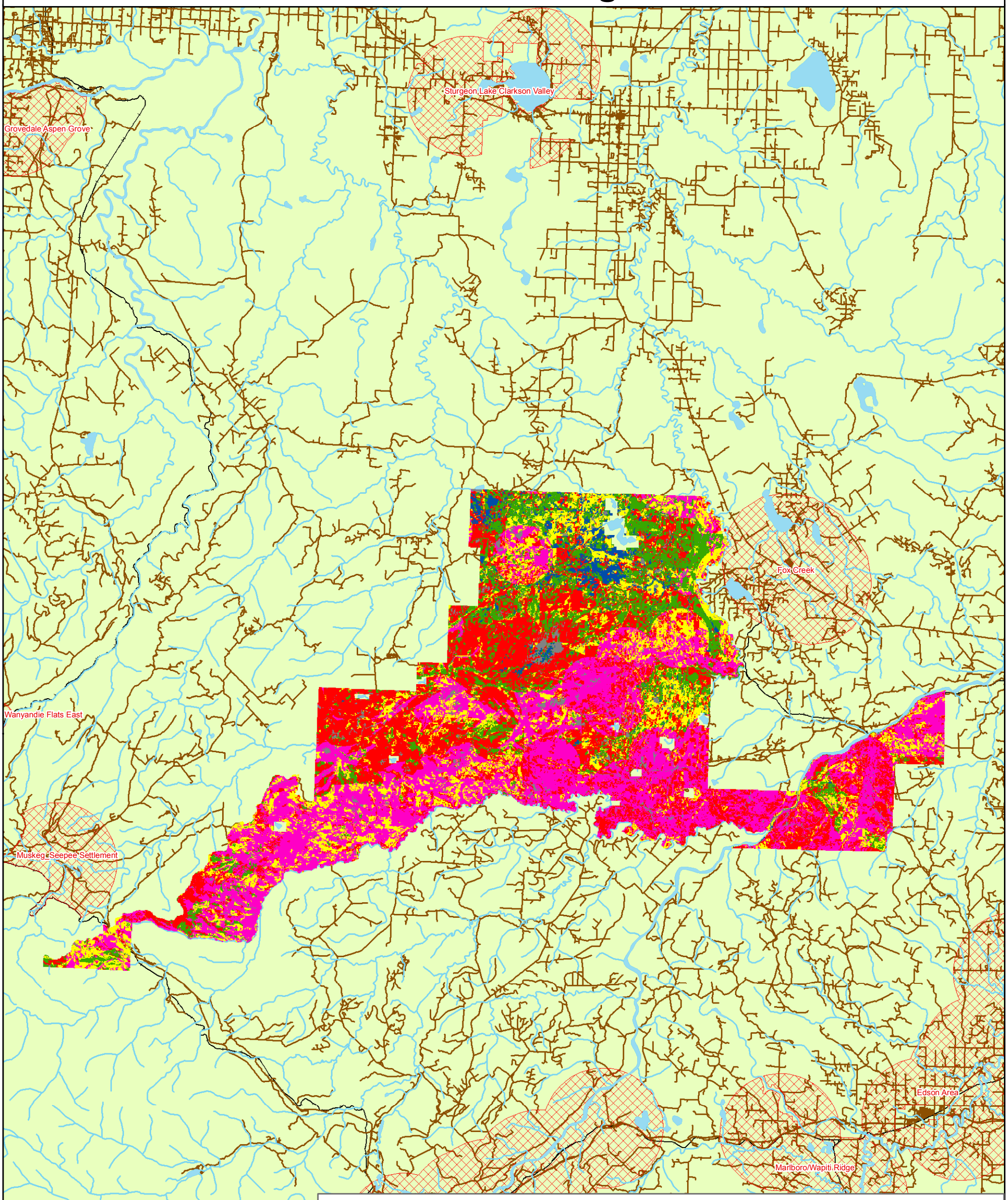
Alberta Newsprint Company Ltd. FMA
Wildfire Threat Rating - Current



Alberta Newsprint Company Ltd. FMA
Wildfire Threat Rating - Year 10



Alberta Newsprint Company Ltd. FMA
Wildfire Threat Rating - Year 20

Grovedale Aspen Grove
Sturgeon Lake Clarkson Valley
Fox Creek
Wanyandie Flats East
Muskeg-Seepee Settlement
Edson Area
Marlboro/Wapiti Ridge

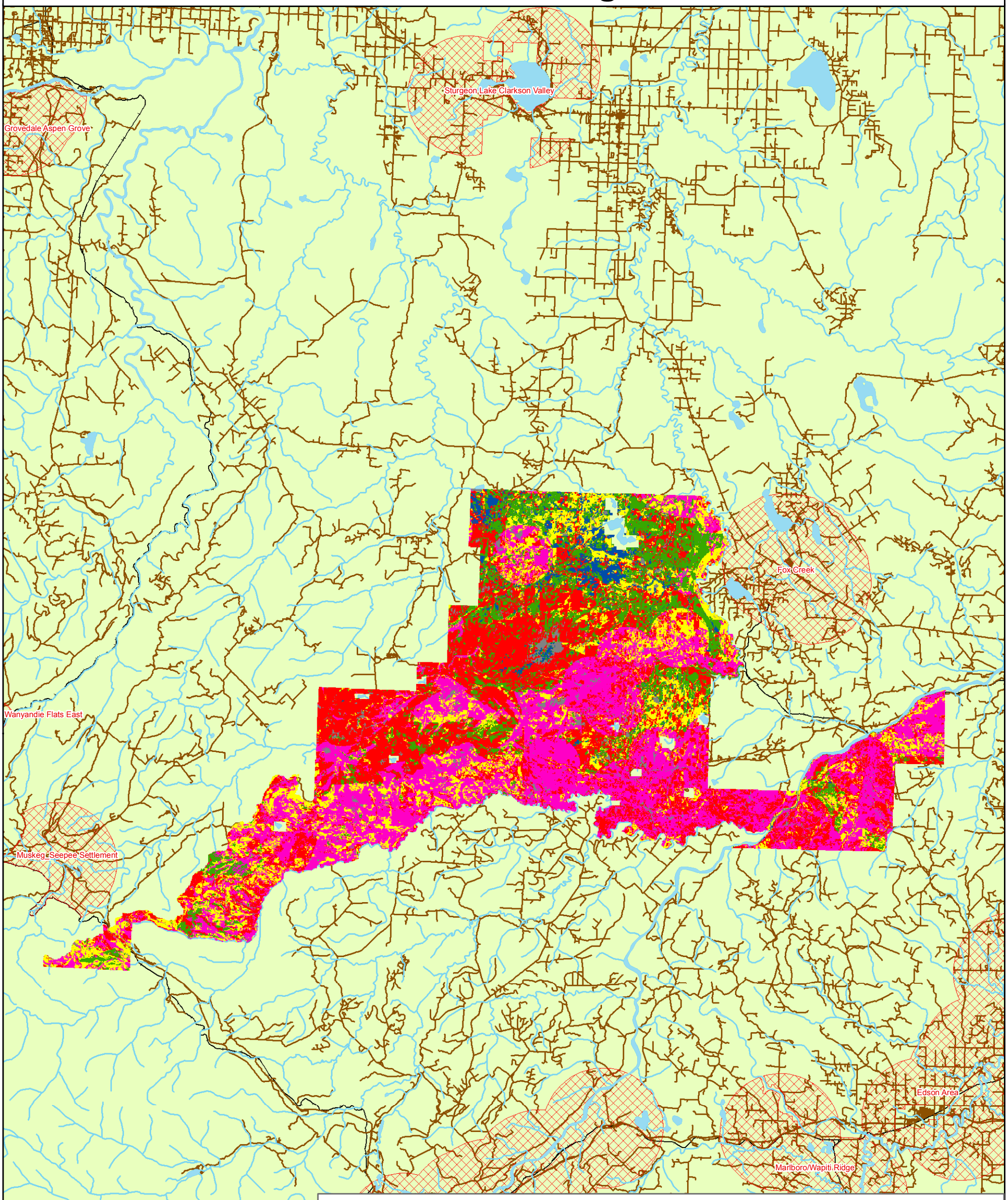
Non-Fuel
Low Wildfire Threat Potential
Moderate Wildfire Threat Potential
High Wildfire Threat Potential
Very High Wildfire Threat Potential
Extreme Wildfire Threat Potential
FireSmart Community Zone

0 4 8 16 24 32 40
Kilometres

Government of Alberta

Alberta

Alberta Newsprint Company Ltd. FMA
Wildfire Threat Rating - Year 50



Alberta Newsprint Company

DETAILED FOREST MANAGEMENT PLAN

APPENDIX G

FISH AND WILDLIFE RESOURCES

REFERENCE # 0-128

DEVELOPED WITH The Silvacom Group

Definitions of General Status Categories

General Status of Alberta Wild Species

General Status Rank Categories and their Definitions	
Rank	**Definitions**
At Risk	Any species known to be at risk after formal detailed status assessment and legal designation as *Endangered* or *Threatened* in Alberta.
May Be At Risk	Any species that may be at risk of extinction or extirpation, and is therefore a candidate for detailed risk assessment.
Sensitive	Any species that is not at risk of extinction or extirpation but may require special attention or protection to prevent it from becoming at risk.
Secure	A species that is not *At Risk*, *May Be At Risk* or *Sensitive*.
Undetermined	Any species for which insufficient information, knowledge or data is available to reliably evaluate its general status.
Not Assessed	Any species that has not been examined during this exercise.
Exotic / Alien	Any species that has been introduced as a result of human activities.
Extirpated / Extinct	Any species no longer thought to be present in Alberta (*Extirpated*) or no longer believed to be present anywhere in the world (*Extinct*).
Accidental / Vagrant	Any species occurring infrequently and unpredictably in Alberta, i.e., outside its usual range. These species may be in Alberta due to: • unusual weather occurrences • an accident during migration, or • unusual breeding behaviour by a small number of individuals If a species appears in Alberta with increasing predictability and more frequently, it may eventually be given a different rank. Changes in *Accidental/Vagrant* species may be a good indicator of general ecosystem or climatic changes.

2.3.5 Wildlife Species

This section addresses wildlife species that may be sensitive to forest management activities and which may be found within and around the FMA area. Lisa Wilkinson (Endangered Species Biologist, Natural Resources Service, Northern East Slopes region) provided a list of species that might be sensitive to forest management activities and that are known to inhabit this region. From this list we focused primarily on species that are 'At Risk' or 'May Be At Risk' (AE/SRD 2000). These species no longer have the capability to endure the cumulative effects of habitat loss, degradation, isolation, and increased competition and\or high sensitivity to human disturbance. Table 2.32 lists and describes the status categories. Table 2.33 lists the species of concern. Alberta Sustainable Resource Development will be notified upon discovery of any species of concern (defined in Table 2.33) by ANC or their agents.

Table 2.32 General status categories and descriptions

Rank (2000)	Equivalent Previous Rank (1996)	Definition
At Risk	Red	Any species known to be 'At Risk' after formal detailed status assessment and designation as 'Endangered' or 'Threatened' in Alberta
May Be At Risk	Blue	Any species that may be at risk of extinction or extirpation, and is therefore a candidate for detailed risk assessment.
Sensitive	Yellow	Any species that is not at risk if extinction or extirpation but that may require special attention or protection to prevent it from becoming at risk.
Secure	Green	A species that is not 'At Risk', 'May Be At Risk' or 'Sensitive'
Undetermined	Status Undetermined	Any species for which insufficient information, knowledge or data is available to reliably evaluate its general status.
Not Assessed	n/a	Any species that has not been examined for the 2000 status report
Exotic/Alien	n/a	Any species that has been introduced as a result of human activities
Extirpated/Extinct	n/a	Any species that no longer thought to be present in Alberta ('Extirpated' or no longer believed to be present anywhere in the world ('Extinct')
Accidental/Vagrant	n/a	Any species occurring infrequently and unpredictably in Alberta i.e. outside of its usual range. (These species may be in Alberta due to unusual weather occurrences, an accident during migration, or an unusual breeding behaviour by a small number of individuals. If a species appears in Alberta with increasing predictability and more frequently, it may eventually be given a different rank.)

Source: Alberta Environment/Sustainable Resource Development 2000

Table 2.33 Species of concern within the ANC FMA area, listed by status rank

Rank	Common Name	Scientific Name
At Risk	Trumpeter Swan	*Cygnus buccinator*
	Woodland caribou	*Rangifer tarandus caribou*
May Be At Risk	Canadian Toad	*Bufo hemiophrys*
	Northern long-eared bat	*Myotis septentrionalis*
	Grizzly bear	*Ursus arctos*
	Wolverine	*Gulo gulo*
Sensitive	Long-toed salamander	*Ambystoma macrodactylum*
	Black throated green warbler	*Dendroica virens*
	Cape May warbler	*Dendroica tigrina*

2.3.5.1 Amphibians

May Be At Risk

Canadian Toad (*Bufo hemiophrys*)

Distribution

The Canadian toad (*Bufo hemiophrys*) is limited, primarily, to the eastern half of Alberta, with isolated populations in Fort McMurray, and as far west as Slave Lake and the Rocky Mountain House area (Hamilton *et al.* 1998). There has been an occurrence of this species within the Athabasca river drainage, which overlaps with the southeastern portion of the FMA area. The Canadian toad is confined to elevations below 1,000 m in elevation (Hamilton *et al.* 1998).

Habitat Requirements

Critical habitat requirements for this species address foraging, escape cover, breeding, and over-wintering. The following lists the requirements and habitat types preferred for each of these life requisites.

Foraging/Escape Cover

The Canadian toad primarily feeds on terrestrial invertebrates including earthworms, beetles, and ants, which can be found in a variety of different habitat types. Predators include raptors such as northern harrier, red-tailed hawk, broad-winged hawk, and Cooper's hawk. However, the Canadian toad is most vulnerable during the tadpole stage when they are preyed upon by almost all carnivorous aquatic species. Egg laying habitat is critical because ephemeral ponds are more susceptible to desiccation, while permanent water bodies have higher competition and predator pressures. Thus, aquatic vegetation must be present to protect eggs and larvae from predation and displacement by water currents.

Breeding/Over-wintering

During the breeding season, the toad spends approximately two months in water or adjacent riparian habitats. Spawning habitats include natural ponds, burrow pits, streams, and lake margins, while permanent wetlands are preferred for breeding. After breeding, toads move to upland sites until the next breeding

season. Thus, suitable hibernacula are required for over-wintering. Suitable hibernacula sites include sandy soils and previously dug excavations (*i.e.*, ground squirrel burrows), and may be several hundred metres away from permanent wetlands. It is essential that the toad burrow to below the frost line in these hibernacula.

Status and Management

The Canadian toad is currently thought to be at risk of declining to population levels too small to be viable. It is designated under the Alberta Wildlife Act as a "non-game animal" and as such, it may not be killed, possessed or sold without a permit (Hamilton *et al.* 1998). There are several forestry–amphibian related research projects occurring in northeastern Alberta (Hamilton *et al.* 1998), which could be adapted for use in a province-wide management program.

Sensitive

Long-toed salamander (*Ambystoma macrodactylum*)

Distribution

The majority of long-toed salamander (*Ambystoma macrodactylum*) populations in Alberta are concentrated in mountain passes and associated river valleys (Graham and Powell 1999). Maximum elevations for this species in Alberta range from 2260 m in the south to 1495 m in the north (Powell *et al.* 1997). There are nine distinct populations in Alberta, and these distinct populations are often associated with particular river valleys (Graham and Powell 1999). The southeast corner of the ANC FMA area encompasses portions of the Athabasca river drainage and there are 43 known locations of long-toed salamanders within this drainage, although none have been directly observed or reported within the FMA area.

Habitat Requirements

Critical habitat requirements for this species address foraging, escape cover, breeding, and over-wintering. The following lists the requirements and habitat types preferred for each of these life requisites.

Foraging/Escape Cover

Larvae feed on a variety of prey including insects, crustacean zooplankton, and amphibian larvae (Sheppard 1997). Escape avoidance strategies are primarily related to habitat preferences during the larval stage with eggs usually being laid in shallow lakes void of predatory fish. During the adult stage, cover is usually found under downed woody debris in forested stands adjacent to water bodies.

Breeding/Over-wintering

The long-toed salamander requires both aquatic and terrestrial habitat for breeding (Graham and Powell 1999). Breeding habitat consists of lakes or ponds, and preferred lakes are often large and shallow, with boggy edges and aquatic vegetation (Hamilton *et al.* 1996; Graham 1997). Lakes with little aquatic vegetation may also be used, provided adjoining wetlands can provide the necessary habitat for egg laying (Graham 1997). Larvae are generally not found in ponds with predatory fish such as rainbow trout (*Oncorhychus mykiss*). There

is little information available on the over-wintering behaviour of the long-toed salamander (Graham and Powell 1999). However, there has been one study (Sheppard 1977) that examined a group of salamanders over-wintering in the Bow river valley. These hibernating groups were comprised of 8–14 mostly adult individuals, buried 50–70 cm below the surface in loose gravel (Sheppard 1977). Each group was located near large spruce trees in low, well-wooded areas with relatively high moisture and where snow cover remained until spring (Sheppard 1997).

Status and Management

The long-toed salamander does not appear to be in immediate danger of extirpation in Alberta (Graham and Powell 1999). However, populations of this species are not widespread and there is limited information regarding their natural history and the long-term effects of anthropomorphic habitat alterations on the long-toed salamander population.

2.3.5.2 Birds

At Risk

Trumpeter Swan (Cygnus buccinator)

Distribution

The trumpeter swan (*Cygnus buccinator*) is the largest native waterfowl species in North America. The population of swans occurring in Alberta is one of three known existing populations belonging to the Rocky Mountain subpopulation (Subcommittee on the Interior Population of Trumpeter Swans 1997). The largest local populations in Alberta are found in the Grande Prairie area within the Peace River Parkland Subregion. However, the swans are also colonizing areas west of Manning, Whitecourt and Edson (James 2000). There have been confirmed observations of trumpeter swans in the ANC FMA area (AE and ACA 2001). Trumpeter swans leave Alberta in early to mid-November and migrate to the United States for over-wintering.

Habitat Requirements

Critical habitat requirements for this species address foraging, cover, and nesting. The following lists the requirements and habitat types preferred for each of these life requisites.

Foraging

The trumpeter swan is primarily a herbivorous species, foraging on seeds, stems, leaves, and roots of submergent vegetation. However, newly hatched chicks feed primarily on insects, mollusks and crustaceans before becoming herbivorous. The swan prefers shallow, stable water with a relatively static level. The lake/pond must be shallow so as not to preclude foraging for lower aquatic plant parts (Pawlina et al. 2000).

Cover

The swan is found in small to medium-sized, shallow, isolated lakes with well-developed, submergent and emergent vegetation. Eggs and young are highly vulnerable to predation although few natural predators will approach the nest when guarded by the parents (Pawlina et al. 2000). The following habitat types serve as cover habitat for the swan: 1.) long, deep, narrow lakes for summering or staging areas, 2.) perched basins and associated terraces; 3.) valley bottom outflow streams that are linked to beaver ponds or perched basins; and 4.) oxbow wetlands associated with major river areas (Pawlina et al. 2000).

Nesting

The swan is a territorial species and will nest in the same lakes considered suitable for cover habitat. There is usually only one breeding pair of swans per lake and non-breeding individuals congregate on lakes not used for breeding. Nests are built on extensive mats of vegetation including, sedges, bulrushes, cattails, rushes, and horsetails. Nests are usually in water around 0.3–1.0 m deep (Pawlina et al. 2000).

Status and Management

Existing trumpeter swan habitat in Alberta is protected. However, there is a critical shortage of key wintering habitat in the United States, which may affect population growth (Anonymous 1996). ANC will adhere to provincial recommendations by maintaining a permanent forest buffer of 500 m around lakes or riparian areas known to have trumpeter swans, particularly in the sensitive time period between May 1 and Sept 30, as an operational timing constraint.

Sensitive

Black throated green warbler (*Dendroica virens*)

Distribution

The black-throated green warbler (*Dendroica virens*) arrives in Alberta in late May (FAN 1992) and is commonly observed in southern Alberta during the fall migration between mid-August and mid-September. In Alberta, this species is known to breed in the Boreal Forest Natural Region and portions of the northern Foothills Natural Region (FAN 1992) where it spends the summer months. There have been sightings within and around the ANC FMA area (AE and ACA 2001 and Norton 1999).

Habitat Requirements

Critical habitat requirements for this species address foraging, escape cover, and breeding. The following lists the requirements and habitat types preferred for each of these life requisites.

Forage/Cover

This species feeds primarily on insects, including beetles, flies, moths, spiders, grubs, and larvae. In springtime, the birds seek aspen and poplar trees and willow catkins in order to find their preferred food supply. In general, any habitat that supports an abundant supply of insects will be suitable for foraging habitat. Cover habitat includes forested stands dominated by white spruce, aspen,

lodgepole pine, and balsam poplar on sloping substrates with a mesic moisture regime. These cover habitats tend to be mid-aged, mid-canopy (at least 40% cover) riparian areas. Stands generally contain rose, baneberry, high-bush cranberry, bunchberry, bearberry, mosses, peavine, and American vetch in the understorey (Pawlina *et al.* 2000).

Breeding

This species prefers to nest in mature stands, and the territory of the male is inversely related to density of food supply. Stands dominated by large white spruce trees are the preferred nesting habitats, mature to overmature aspen mixedwood stands with coniferous trees and snags, and mature riparian stands of aspen-and poplar with some spruce are often used (Pawlina et al. 2000). Nests are often located 4.6 to 6.1 m above ground and close to the trunk. Population density tends to be higher in 60–80 year old aspen stands (Pawlina et al. 2000).

Status and Management

There are no specific management activities for this species in Alberta; however, there are several research initiatives in Alberta related to this species, such as Sustainable Forest Management Network (SFMN), Terrestrial and Riparian Organisms, Lakes and Streams (TROLS), Calling Lake project, and Ecosystem Management by Emulating Natural Disturbance (EMEND) (Norton 1999).

Cape May warbler (*Dendroica tigrina*)

Distribution

The Cape May warbler (*Dendroica tigrina*) arrives in May and is sparsely distributed in areas of suitable habitat in a limited range of northern Alberta (FAN 1992). This species is believed to only breed in the central portions of the Boreal Forest Natural Region (FAN 1992). The warbler begins its fall migration in August (to October) to its over-wintering habitat in the West Indies and Central and South America.

Habitat Requirements

Critical habitat requirements for this species address foraging, escape cover, and breeding. The following lists the requirements and habitat types preferred for each of these life requisites.

Forage/Cover

It is believed that this species feeds primarily on spruce budworm. However, it also gleans caterpillars and other insects in the lower canopy and catches flies in the upper canopy. Stands preferred by spruce budworm are also preferred by the warbler. Thus, white spruce dominated forests are the preferred habitat. During periods of unsuitable weather (rain, cold, and windy), the birds will forage amongst willows and berry producing shrubs (e.g., *Prunus* spp.) (Pawlina et al. 2000).

This species is commonly associated with mature and overmature coniferous-dominated forests throughout its range. These preferred stands tend to have closed canopies, richer nutrient levels and a mesic to subhygric moisture regime. Typical understorey species occurring in these stands include willow, cranberry, bunchberry, and palmate-leaved coltsfoot.

Breeding

This species is thought to nest only in the tops of coniferous trees and, therefore, are often subject to predation by red squirrels (Pawlina et al. 2000). These nesting stands are dense mature to overmature white spruce dominated forests. Fir-dominated stands may also be acceptable for nesting sites. Nests are commonly found at 12–15 m above ground, near the trunk in the uppermost dense cluster of branches (Pawlina et al. 2000).

Status and Management

The reliance of this species on mature and overmature white spruce-dominated stands puts this species at risk due to the demand of these types of stands by forestry companies. Confounding the potential risk of loss of breeding habitat is the loss of overwintering habitat in South America.

2.3.5.3 Mammals

At Risk

Woodland caribou (*Rangifer tarandus caribou*)

Distribution

The caribou inhabits mixed coniferous forests and alpine regions of west-central Alberta.

Habitat Requirements

Critical habitat requirements for this species address foraging, cover, and calving. The following lists the requirements and habitat types preferred for each of these life requisites.

Forage

The woodland caribou is a mixed feeder, during spring/summer it feeds on forbs, leaves of deciduous shrubs, sedges, lichens, and fungi. During winter, its diet is almost exclusively comprised of terrestrial and arboreal lichens with supplements of sedges. Summer forage is available in most habitat types, while lichens are most abundant in older coniferous stands with less than 50% canopy closure and thin mineral soils.

Cover/Calving

Some herds of woodland caribou in west-central Alberta migrate to satisfy their requirements for different habitat conditions as seasons change. While other herds are thought to choose similar cover types on a year-round basis. In general, cover types must modify temperatures and snow pack conditions. Caribou primarily use mixed coniferous stands (spruce and pine), relatively pure pine stands, and muskeg habitats. Mothers with calves require protection from predators and access to food supplies. Calving habitat is generally associated with muskeg habitat in proximity to plentiful lichens.

Status and Management

There are a variety of research initiatives regarding woodland caribou populations in Alberta. Section 5.1.2.7 contains specific caribou management strategies.

May Be At Risk

Northern long-eared bat (*Myotis septentrionalis*)

Distribution

The species distribution of the northern long-eared bat (*Myotis septentrionalis*) is continuous across northern Alberta, north of Cold Lake, Edmonton, and Jasper. There has been one confirmed sighting of the northern long-eared bat in Whitecourt (Caceres and Pybus 1997). Sightings have occurred in Edmonton, Hinton, Edson, Drayton Valley, and Grande Prairie, among others (Caceres and Pybus 1997). Thus, this species appears to have a wide distribution in Alberta and may occur within the ANC FMA area.

Habitat Requirements

Critical habitat requirements for this species address foraging, roosting, and winter hibernacula. The following lists the requirements and habitat types preferred for each of these life requisites.

Forage

This species is an opportunistic insectivore that will hawk prey from the air or glean prey from substrates. The bat prefers a wide variety of insect prey including moths (*Lepidoptera*), true bugs (*Hemiptera*), bees and wasps (*Hymenoptera*), flies (*Diptera*), and leafhoppers and aphids (*Homoptera*). Mature forest stands are important foraging habitat. The bats are most active in forests surrounding water bodies and watercourses, though they may also be found feeding near streetlights and houses (Pawlina et al. 1999).

Roosting/Winter Hibernacula

Peeling bark or cavities in partially decayed trees are common roost sites for northern long-eared bats. Warm roosts are especially important for reproductive females and juveniles. Caves and abandoned mines serve as the most common winter hibernacula. There are only two known hibernation sites in Alberta: Cadomin Cave in the Foothills Natural Region and Wood Buffalo National Park in the Boreal Forest Natural Region (Pawlina et al. 2000).

Status and Management

The narrow and restricted habitat requirements, particularly with regards to suitable roosting habitats, make this species susceptible to habitat loss and human disturbance. The Alberta Wildlife Act protects the hibernacula of the bat; however, bats may be hunted or harvested without a permit (Caceres and Pybus 1997). There are limited management activities for this species in Alberta.

Grizzly bear (*Ursus arctos*)

Distribution

The grizzly bear is the largest carnivore in Alberta with a range covering approximately 25% of the province (Pawlina 1998). The majority of the Alberta grizzly bears occur on the eastern slopes in the Rocky Mountain and Foothills Natural Regions of Alberta. There are two disjunct populations in Alberta occurring in the Swan Hills and northern Foothills outliers (Bentz and Saxena 1994). These areas overlap with the ANC FMA area.

Habitat Requirements

Critical habitat requirements for this species address foraging, cover, travel corridors and winter denning. The following lists the requirements and habitat types preferred for each of these life requisites.

Forage/Cover

Grizzly bears are foraging generalists, being omnivorous and feeding on berries, roots, insects, small mammals, carrion, fish, and ungulates. Linear disturbances such as roads, right-of-ways, seismic lines, well sites, and openings created by fire or logging often provide good forage habitat. Diverse areas with adequate thermal and security habitat are required so that bears can cope with climatic stress, human encounters, and seasonal or annual changes in food supply (Pawlina et al. 2000). A diverse array of habitats is utilized by grizzly bears including grasslands, shrublands, subalpine meadows, river valleys and a variety of coniferous and deciduous forests, with a preference for areas with high interspersion of habitats. Overmature forests are used for thermal cover and security.

Travel Corridor/Denning

Since the grizzly bear prefers areas with a high diversity of habitat types, they require suitable passages or corridors between these habitat types for safe traveling. River valley bottoms and ridge tops are often used as primary corridors for grizzly bears. Openings created by fire or logging may also be used between foraging and denning habitats. Denning habitats consist primarily of openings created by fire or logging, or steep alpine slopes.

Status and Management

Grizzly bears populations are thought to be stable. Due to their large spatial requirements, and the diversity and interspersion of habitat types, their greatest threat is continued loss or degradation of habitat through developmental and recreational activities (Anonymous 1996). Section 5.1.2.8 contains specific grizzly bear management strategies.

Wolverine (*Gulo gulo*)

Distribution

The wolverine (*Gulo gulo*) is the largest member of the weasel family (*Mustelidae*). Its range is limited to the northern half of the province and along the eastern slopes of the Rocky Mountains. Provided suitable habitat is available, the wolverine could potentially be found throughout 61% of the province (Pawlina

1998). There have been wolverines harvested within and around the ANC FMA area (Peterson 1997).

Habitat Requirements

Critical habitat requirements for this species address foraging, cover, and denning. The following lists the requirements and habitat types preferred for each of these life requisites.

Forage/Cover

The wolverine is a predatory scavenger whose hunting or scavenging habits vary with season. During the summer wolverines are found at high elevations in response to food availability. It is also primarily predatory during the summer and will hunt marmots, small mammals, and birds; however, it will also feed on insects, eggs, and berries. The wolverine is primarily a scavenger during the winter months and relies heavily on carrion. It will also kill weakened prey such as caribou, moose, and deer, and will hunt small mammals and porcupines when available. A large ungulate population, and thus winter carrion availability, is critical for winter survival. Foraging habitat use is related to prey habitat suitability.

Golden eagles, mountain lions, grizzly bears and wolves are the wolverine's primary predators. Forested areas serve as escape cover, where the wolverine can climb trees to avoid predators. Kits are particularly vulnerable to predation when born at insecure sites or while being moved between denning areas (Pawlina et al. 2000).

Denning

Females may use denning areas over consecutive years, and they tend to den on sites that receive significant snow cover (e.g., ravines, snow-covered rocky scree, boulder talus, taiga peat bogs with rocky areas or fallen trees, or snow-covered trees near treeline). Den tunnels are long and complex in order to protect kits, which require shelter. Dens are commonly found in alpine, subalpine, taiga or tundra habitat (Peterson 1997). Dens are seldom found in lower elevation forest stands, and are almost always at high elevations (i.e., Alpine) open areas. The critical feature of all wolverine dens is the dependency on deep snow (Pawlina et al. 2000).

Status and Management

Wolverines occur naturally in low densities because they require a large home range. They are most abundant where large ungulates are present and where carrion is available from hunter kills, predation, or natural mortality. Historically, wolverines have declined wherever ungulate populations have declined (Pawlina et al. 2000).

2.3.6 Habitat Types

The results of future habitat types are described in detail in Section 4.3. These habitat types are described in Table 2.34, with the modelling assumptions. In order to assess wildlife, ANC used a modelling approach that identifies broad level habitat requirements, termed habitat-type modelling. An exception to this was Grizzly Bears, where a Habitat Suitability Index (H.S.I.) approach was used. The habitat-type approach is NOT a guild

2.3.7 Fish Species

Species status, habitat use, distribution within Alberta and the probability of occurrence within the FMA area will be discussed, for specific species of interest.

2.3.7.1 Fish Species of Interest—Selection of Specific Species

The 'species of interest' discussed in this subsection are 1) fish species that are either known or thought to inhabit waterbodies in the FMA area, 2) either considered a 'species of special concern' by the Fisheries Management Division of Alberta Sustainable Resource Development, or 3) on the Alberta Natural Heritage Information Centre (ANHIC) 'tracking' or 'watch' lists. Fish species that are thought to have healthy, viable populations within the FMA area are not discussed in detail. Presently, fish species are not included in the provincial Wildlife Act. ANHIC does however rank fish species based on their rarity and the ranks are described in Table 2.41. All species that are either on the 'tracking' or 'watch' lists and are known or thought to be found in the FMA area, are discussed in detail, as to their distribution, habitat and spawning characteristics and their current status in Alberta.

Furthermore, information on the native rainbow trout is also presented although it is currently not a 'species of special concern' or on the tracking or watch lists. There is a lack of data for the native rainbow trout populations in Alberta in general. However because suitable habitat is close to the ANC FMA area, it has been included as an unofficial species of interest. The information presented here is a synthesis from sources within Alberta and British Columbia (where they are more widely distributed). Information on walleye is also presented because it a popular sport-fish and due to the recent introduction of reduced catch limits (due to over-fishing).

Table 2.41 Natural heritage element rarity ranks.

Code	Description
G1/S1	Critically imperiled because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction
G2/S2	Imperiled because of rarity (6-20 occurrences) or because of other factors demonstrably making it very vulnerable to extinction throughout its range
G3/S3	Either very rare or local throughout its range, or found locally in a restricted range (21-100 occurrences)
G4/S4	Apparently secure, though it might be quite rare in parts of its range, especially at the periphery
G5/S5	Demonstrably secure, through it might be quite rare in parts of its range, especially at the periphery

Source: Adapted from Nature Conservancy 1999

Global or G-rank: Based on the range-wide status of a species.

Sub-national or S-rank: Based on the status of a species in an individual state or province. S-ranks may differ between states or provinces based on the relative abundance of a species in each state or province.

2.3.7.2 Macroinvertebrates

Although there have not been any studies dealing specifically with macroinvertebrates within the ANC FMA area, the ecological role that macroinvertebrates play in aquatic

food chains has been well documented (Huryn and Wallace 2000; Pauly et al. 1998; Breitburg 1988). One of the most important roles macroinvertebrates play is the conversion of unavailable forms of carbon into materials that can be consumed by higher trophic levels. Aquatic invertebrates are divided into two general types: benthic (bottom-dwelling) species and those that inhabit the water column.

Benthic communities occur not only on the bottom of rivers, streams and lakes, but also on rock, sediment and plant surfaces. Furthermore, the profundal (bottom) and littoral (edge) habitats for benthic species are substantially different from one another and host entirely different suites of species. The profundal benthic communities are relatively simple communities of bacteria, protozoa, invertebrates and fish (Moss 1988). In lakes, these communities generally depend on the detritus from the overlying water as their source of energy. The littoral communities generally support a wider range of species.

Very little information relating to aquatic macroinvertebrates is available for the ANC FMA area.

2.3.7.3 Fish Descriptions

Alberta's fish communities are relatively diverse, with 51 native species representing 13 families (Nelson and Paetz 1992). Tables 2.42 and 2.43 provide a list of non-game and game fish species, and the general habitat types that likely occur in the ANC FMA area. This list is based on direct observations where they are available, the provincial Fisheries Management Information System (Alberta Environment 2001), and on Nelson and Paetz's *The Fishes of Alberta* (1992) Appendix 3 provides a list of studies competed in the ANC FMA area, the year of the study and all fish species observed.

Table 2.42. Non-game fish species expected to occur in the ANC FMA area.

Common Name	Scientific Name	Stream	River	Lake
Brook stickleback	*Culaea inconstans*	x	x	x
Fathead minnow	*Pimephales promeias*	x		x
Finescale dace	*Phoxinus neogaeus*	x		x
Iowa darter	*Etheostoma exile*	x		x
Lake chub	*Couesius plumbeus*	x	x	x
Longnose dace	*Rhinichthys cataractae*	x	x	x
Longnose sucker	*Catostomus catostomus*	x	x	
Northern redbelly dace	*Phoxinus eos*	x		x
Pearl dace	*Margariscus margarita*	x		x
Pygmy whitefish	*Prosopium coulteri*		x	
Redside shiner	*Richardsonius balteatus*		x	
Slimy sculpin	*Cottus cognatus*	x		x
Spoonhead sculpin	*Cottus ricei*	x	x	
Trout-perch	*Percopsis omiscomaycus*	x	x	x
White sucker	*Catostomus commersoni*	x	x	x

Table 2.43 Game fish species expected to occur in the ANC FMA area.

Common Name	Scientific Name	Stream	River	Lake
Arctic grayling	*Thymallus arcticus*	x	x	x
Athabasca Rainbow Trout	*Oncorhynchus mykiss*	x	x	
Brook trout	*Salvelinus fontinalis*	x	x	
Bull trout	*Salvelinus confluentus*	x	x	x
Burbot	*Lota lota*	x	x	x
Lake whitefish	*Coregonus clupeaformis*		x	
Mountain whitefish	*Prosopium williamsoni*	x	x	
Northern pike	*Esox lucius*	x	x	x
Rainbow trout	*Oncorphynchus mykiss*	x	x	x
Walleye	*Stizostedion vitreum vitreum*		x	x
Yellow perch	*Perca flavescens*	x		x

Fish Species of Interest

Arctic Grayling
(Thymallus arcticus)

Distribution
Within Alberta, Arctic grayling are primarily known in the Peace, Hay and Athabasca River Drainage systems. Within the FMA area, Arctic grayling have been observed in numerous rivers and streams and healthy populations are known to exist in the Little Smoky River and its tributaries (Nelson and Paetz 1992).

Habitat and Spawning Characteristics
Arctic grayling are commonly known as 'cold-water' fish and can live to approximately 12 years. They are typically restricted to cool streams, rivers and lakes, where they feed on aquatic and terrestrial insects, and on bottom organisms and plants (Nelson and Paetz 1992). Grayling are also known to feed on fish and small mammals, including shrews and voles, however this behaviour is relatively rare.

Spawning generally occurs in streams in late May to early June, when the water temperature ranges between 5-10 °C (Nelson and Paetz 1992). Grayling typically migrate from lakes and larger rivers to smaller streams to spawn. Commonly, the males on the spawning ground are territorial and will drive away other males when challenged. Females produce between 5,000 to 10,000 eggs annually and, following spawning, the eggs are commonly buried in streambed gravel.

Status
While Arctic grayling are distributed widely throughout most of northern Alberta, the total population sizes have declined in the past 20 to 30 years. Arctic grayling are a popular, easily caught sport fish and because of this, larger fish

can be rapidly depleted under even moderate angling pressure (Nelson and Paetz 1992).

Although Arctic grayling are generally tolerant of a wide range of environmental conditions, they can be susceptible to pollution, damage to riparian habitat and alteration of stream flow conditions. Due to these factors and their response to angling pressure, Arctic grayling are listed as a 'species of special concern' by the Fisheries Division of Alberta Environment. New angling regulations were introduced in 1998 to protect larger fish in order to help population sizes recover.

Athabasca Rainbow Trout
(Onchorhynchus mykiss)

Distribution
Native populations occur in the upper reaches of the Athabasca River Basin and upper Peace River Basin, reaching downstream to the south slopes of the Swan Hills. However, because rainbow trout are easy to raise in hatcheries, and are a very hardy and active sport fish, they have been stocked widely throughout Alberta lakes. There has most certainly been breeding between the native Athabasca Rainbow trout and the introduced trout and suspected hybridization with cutthroat trout in many Athabasca streams (Nelson and Paetz 1992).

Habitat and Spawning Characteristics
Athabasca rainbow trout are 'cold-water' fish and do best in lakes and streams with temperatures below 20 °C (Nelson and Paetz 1992). Rainbow trout can occupy a wide range of habitats, from large rivers and lakes in low valleys, to tributary streams and small lakes in rolling mid-elevation areas, to alpine streams and lakes (British Columbia Ministry of Fisheries, no date-a.). Stream-dwelling trout are typically found in small to moderate sized streams and rivers that are shallow and have a gravelly bottom, and pool-riffle habitats (British Columbia Ministry of Fisheries, no date-a). Lake-dwelling trout generally are found in deeper, cool lakes with adequate shallows and vegetation for food production. A gravelly tributary to the lake is required for spawning habitat (British Columbia Ministry of Fisheries, no date-a.).

The rainbow trout diet consists primarily of leeches, mollusks, crustaceans and both aquatic and terrestrial insects (Nelson and Paetz 1992). The habitat has a significant effect on rainbow trout growth rates. The native Athabasca rainbow trout in the Tri-Creeks area has the lowest observed growth rate in North America, and may well be the lowest in the world (Nelson and Paetz 1992). The Athabasca rainbow trout spawn later than the more southern, introduced rainbow trout. Spawning generally begins when water temperatures are approximately 6 °C, in late June. Hatching occurs as late as September (Nelson and Paetz 1992).

Status
As a whole, rainbow trout are widespread and numerous throughout the province. However this is largely due to stocking of introduced rainbow trout and not the presence of native fish. Few studies have been devoted to the native Athabasca rainbow trout, and as such little is known about current population

sizes and trends. The Athabasca rainbow trout is not currently ranked or tracked by the Fisheries Division of Alberta Environment, due to a lack of data.

Bull Trout
(Salvelinus fontinalis)

Distribution
Within Alberta, the bull trout is the only native trout species that can be found in all of the major eastern slopes drainages including the Peace, Athabasca, North Saskatchewan, Red Deer, Bow and Oldman river drainages (Berry 1994). It occupies 20,000 km of stream habitat and approximately 12,000 ha of habitat in 24 lakes (Berry 1994). Despite this apparent wide distribution, the range for bull trout in Alberta has decreased substantially in the past 25 to 50 years.

Habitat and Spawning Characteristics
Bull trout are typically found in lakes and streams, from alpine areas to sea level (Nelson and Paetz 1992). Three distinct life-patterns have been recognized. *Stream-residents* spend their entire lives in smaller, less productive headwater streams (Berry 1994). *River* populations spend the majority of their lives in larger rivers but migrate to smaller tributaries to spawn, while lake populations reside in lakes and also migrate to tributaries to spawn (Berry 1994). Bull trout prefer a maximum water temperature below 18 °C, and are most commonly associated with streams where flow levels are high in the spring and early summer and low through the remainder of the year (Berry 1994). The bull trout's primary food source is bottom fauna, insects and other fish, and occasionally surface food as well (Nelson and Paetz 1992).

Spawning usually occurs between September and October in small streams fed by groundwater or in streams or rivers with a medium gravel base (Berry 1994; Nelson and Paetz 1992). The eggs are shallowly buried in the gravel and remain there all winter. The eggs typically hatch between March and April, approximately 6-7 months following spawning.

Status
Bull trout face significant competition for habitat and food from introduced species such as brook and brown trout. These species share similar habitat, spawning and feeding requirements as the bull trout, and have reduced or displaced entire bull trout populations (Berry 1994). Moreover, bull trout and brook trout hybridization has led to the loss of some bull trout populations because the hybrids are sterile (Berry 1994).

Bull trout are susceptible to overfishing because the productivity is low in the streams they inhabit. Bull trout do not mature for approximately 5 to 6 years. Consequently, most bull trout harvested by anglers are immature and have not had the opportunity to spawn.

In 1995, the Bull Trout Management and Recovery plan was initiated. The species was designated a 'species of special concern' and a zero-limit placed on the harvest of the bull trout. Continued monitoring by the province will determine when populations have increased sufficiently to allow for a harvestable surplus.

Pygmy Whitefish
(Prosopium coulteri)

Distribution
Pygmy whitefish have been found in only a few locations in Alberta, including Waterton Lake, Solomon Creek (upper Athabasca river drainages), the Snake Indian River (where it drains into the Athabasca river in Jasper National Park), Athabasca river (between the Snaring and Snake Indian rivers) and in the Athabasca river at Whitecourt (Mackay 2000).

Habitat and Spawning Characteristics
Pygmy whitefish are generally found in the deepest locations of deep, cold lakes and in fast, cold mountain streams (Mackay 2000). In streams, pygmy whitefish coexist with the mountain whitefish but are much less abundant. Very little is known about the diet of riverine pygmy whitefish populations; however, some information is available for the lake dwelling populations. Their diet appears to be quite varied, consisting of invertebrates, larvae, insects and crustaceans (Mackay 2000).

Little information about spawning characteristics is available for riverine populations of the pygmy whitefish. In lake populations, spawning occurs in the fall, ranging from November to mid-January. Spawning tends to occur earlier in the Athabasca river population than for other recorded locations (Mackay 2000). Pygmy whitefish mature at an early age and at a small size (Mackay 2000).

Status
The population of pygmy whitefish in Alberta appears to be small and localized. Only eight fish have been collected from five locations in the province (Mackay 2000). There are too little data to estimate population size or trends within the province. However, their wide distribution along the upper Athabasca River tends to indicate a viable population (Mackay 2000).

The Alberta Natural Heritage Information Centre (ANHIC) ranks the pygmy whitefish as S1 based on the very few known observations in the province (ANHIC 2000). It is also considered 'vulnerable' by the Fisheries and Wildlife Management Division of Alberta Environment. However there is currently no management strategy specific to the pygmy whitefish (Alberta Environment 1999; Mackay 2000).

Spoonhead Sculpin
(Cottus ricei)

Distribution
The spoonhead sculpin has a relatively wide distribution through Alberta, and are known in the Slave, Peace, Athabasca, North Saskatchewan, upper Red Deer, Bow and upper Oldman river drainages (Nelson and Paetz 1992).

Habitat and Spawning Characteristics
Spoonhead sculpins are not commonly found in lakes, but are abundant in foothills and plains streams (Roberts 1988a). This species is commonly found in muddy rivers, but require clean, rocky or gravel bottomed streams for

reproduction and protective cover (Roberts 1988a). Spoonhead sculpins primarily consume aquatic invertebrates, such as stoneflies (*Hesperoperla* spp.). This species quite commonly becomes a food source for a variety of trout species, northern pike, burbot and walleye. In smaller creeks or the shallows of larger rivers, they might also be consumed by predators that forage underneath small rocks, including the burbot, American water shrew and American Dipper (Roberts 1988a).

Specific life history data for Alberta spoonhead sculpin populations is limited, and most information is inferred from eastern North American populations. Spawning generally occurs along lakeshores, creek bottoms and the margins of rivers between April and May, when the water temperature is approximately 6 °C (Roberts 1988a). The eggs hatch after approximately three weeks, but may hatch earlier if the water temperature is greater than 8 °C.

Status
Although the spoonhead sculpin is widespread through Alberta, their population numbers and trends are not well known. Where they are known to occur, they tend to be present in low numbers and there is a general lack of knowledge about the provincial population. Therefore, they are currently listed as S3 by ANHIC.

Spoonhead sculpins may also serve as indicators of the substrate cleanliness in rivers and streams. This species is not generally subject to harvest by anglers, thus population shifts reflect changes in the environment rather than angling pressure (Roberts 1988b).

Walleye
(Stizostedion vitreum vitreum)

Distribution
Walleye are widespread and abundant through Alberta. They are found in the Petitot, Hay, Slave, Peace, Athabasca, Beaver, North and South Saskatchewan, lower Red Deer, lower Battle, lower Bow, and lower Oldman river drainages (Nelson and Paetz 1992). Walleye are known as 'cool-water' fish and so are not found in the colder headwater streams and rivers of the mountains and high elevation foothills.

Habitat and Spawning Characteristics
In Alberta, walleye are most commonly found in lakes and large rivers (Nelson and Paetz 1992). They generally prefer large, moderately fertile lakes, and the most productive populations occur in lakes greater than 400 ha in size (Berry 1995). Their diet consists of fish, aquatic invertebrates, and insects. They will consume any species of fish available to them, and can be cannibalistic if other fish species are not available (British Columbia Ministry of Fisheries. no date-b).

Spawning occurs in streams and lakes during early spring, when water temperatures are approximately 5 °C (Nelson and Paetz 1992). Walleye tend to spawn over shallow, gravelly areas in tributary streams and lakes, just following ice break up. Females lay anywhere from 20,000 to over 600,000 small eggs in an evening (Nelson and Paetz 1992; British Columbia Ministry of Fisheries. no

date-b) and the eggs generally hatch after 12 to 18 days. Males mature at five years of age, while females do not mature until age six or older. Individuals can live to over fourteen years of age.

Status
The present distribution of walleye is not substantially different from their historical range, although some populations have been lost. Walleye disappeared from Wabamun Lake in the 1920s, from Pigeon Lake in the 1960s and were practically gone from North Buck Lake, Skeleton Lake, Lac La Biche and several others by the 1970s (Berry 1995). Despite stocking programs that have introduced tens of millions of eggs and fingerlings since the 1930s, walleye populations have continued to decline due to overfishing of adult walleye (Berry 1995).

While the Alberta walleye population is not in danger of extinction, controls were taken in 1995 to mitigate the decline in population. Currently, walleye are ranked as S3 on the ANHIC watch list.

2.3.8 Significant Biological Features

A key component in the protection of significant areas pertaining to wildlife and vegetation was the formal recognition of the Little Smoky Corridor, and the development of the Little Smoky River Corridor Management Strategy (see Appendix #5). Area stakeholders requested that this area be recognized as a unique area due the significant presence of rare plants. Special management initiatives were considered for its protection, and in response, ANC has applied land use controls to protect the habitat and the rare plants within it.

2.4 Social, Cultural and Economic Features

From ongoing public consultation between ANC and directly with communities in the FMA area and indirectly through the Regional Forest Advisory Committee, the range of non-market goods and services is relatively narrow. Table 2.44 lists the main activities and indicates the relative level of use intensity.

Table 2.44 Non-Market activities in the FMA area

Type of Activity	Activity Intensity
Hunting	H
Fishing	H
Berry-Picking	L
Summer ATV	M
Winter ATV	M – H
Hiking	L
Wildlife Viewing	M
Canoeing / Rafting	M
Camping	M – H

[1] L – Little known activity
M – Moderate level of activity
H – Significant amount of activity

Figure 2.58 depicts the general locations of documented recreational activities in the FMA area. Figure 2.59 depicts areas of documented and potential sport fishing in the area.

ANC Wildlife Species

ELCODE	GroupID	ScientificName	CommonName	Status2010	Status2005	Status2000	Background
AAABB01031	Amphibians	Bufo boreas	Western Toad	Sensitive	Sensitive	Sensitive	Population declining elsewhere and possibly within Alberta. Concentrated mainly in northern and western Alberta. Population requires long-term monitoring. Pollution and pesticides are threats in other parts of range, while drought poses a local threat.
AAAAA01080	Amphibians	Ambystoma macrodactylum	Long-toed Salamander	Sensitive	Sensitive	Sensitive	Few patchy, disjunct populations in mountain riparian areas. Distribution may be declining. Vulnerable to habitat destruction/alteration associated with industrial, recreational and transportation development. A "Species of Special Concern" in Alberta.
AMALC04011	Mammals	Rangifer tarandus	Caribou	At Risk	At Risk	At Risk	Most populations declining, with some at immediate risk of extirpation. Primary threat is increased predation by wolves in response to human activity. Maintenance of old-growth forest habitat is critical. Designated as “Threatened” under the Wildlife Act.
AMAJB01020	Mammals	Ursus arctos	Grizzly Bear	At Risk	May Be at Risk	May Be at Risk	Population estimates are currently underway. Currently sustaining its population under a very restrictive sport hunting regime. Greatest threat is loss and degradation of wilderness habitats through resource extraction and recreational development.
AMACC01150	Mammals	Myotis septentrionalis	Northern Long-eared Bat	May Be At Risk	May Be at Risk	May Be at Risk	Population size unknown, but uncommon over known range. Current forestry practices threaten habitat, as it relies on large, early decay trees for roosting. Need to incorporate habitat requirements into forest management.
AMAJF03010	Mammals	Gulo gulo	Wolverine	May Be At Risk	May Be at Risk	May Be at Risk	An uncertain provincial estimate of less than 1000 has been proposed. Trends in distribution and population unknown, but populations may be declining. Human disturbance and associated habitat fragmentation may negatively affect this secretive animal.
AMAJH01020	Mammals	Puma concolor	Cougar	Sensitive	Secure	Sensitive	
AMACC02010	Mammals	Lasionycteris noctivagans	Silver-haired Bat	Sensitive	Sensitive	Secure	Species is sensitive to mortality at current and (potentially) future wind energy projects. More research necessary to determine population size.
AMACC05030	Mammals	Lasiurus cinereus	Hoary Bat	Sensitive	Sensitive	Secure	Species is sensitive to mortality at current and (potentially) future wind energy projects. More research necessary to determine population size.
AMAJF01020	Mammals	Martes pennanti	Fisher	Sensitive	Sensitive	Sensitive	Species considered uncommon to rare. Population status is unknown, and trends in population and distribution uncertain. Current forestry practices may reduce availability of preferred habitat. Fisher harvest has declined since 1985.
AMAJH03010	Mammals	Lynx canadensis	Canada Lynx	Sensitive	Sensitive	Sensitive	Cyclic species. Estimated less than 8 000 individuals at the bottom of the cycle. Population has decreased in recent years, and some concern exists over habitat loss and fragmentation. Harvest is now set by quota.
ARADB36130	Reptiles	Thamnophis sirtalis	Red-sided Garter Snake	Sensitive	Sensitive	Sensitive	Common but localized. Public perception of declining population. Protection of key habitats and public education will ensure a stable population. Threatened by increased human development surrounding oil and gas activity.
ABNJB02030	Birds	Cygnus buccinator	Trumpeter Swan	At Risk	At Risk	At Risk	An estimated 166 breeding pairs occur in Alberta. Critical shortage of key winter habitat limits population growth. Breeding habitat relatively secure. Efforts underway to expand wintering areas. Designated as “Threatened” under the Wildlife Act.
ABPAE32010	Birds	Contopus cooperi	Olive-sided Flycatcher	May Be At Risk	Secure	Secure	
ABNCA02010	Birds	Podilymbus podiceps	Pied-billed Grebe	Sensitive	Sensitive	Sensitive	Threatened by degradation and loss of wetland habitat. Breeding Bird Survey data from Alberta suggest a population decline over the last four decades.
ABNCA03010	Birds	Podiceps auritus	Horned Grebe	Sensitive	Sensitive	Sensitive	Has declined across most of its range since 1966. Drought-related disappearance of small ponds and other forms of wetland degradation affect this species.
ABPBA01010	Birds	Certhia americana	Brown Creeper	Sensitive	Sensitive	Undetermined	A mature forest-dependent species that is vulnerable to forest fragmentation, and certain forest management practices.
ABNGA04010	Birds	Ardea herodias	Great Blue Heron	Sensitive	Sensitive	Sensitive	Overall trend for this species may be decreasing. Entire Alberta population dependent on fewer than 100 known nesting colonies. Management of these key habitats and protection from human disturbance is essential.
ABNJB10010	Birds	Anas crecca	American Green-winged Teal	Sensitive	Sensitive	Secure	A common, widespread species with no known threats but is rapidly decreasing in Alberta, Canada, and North America.
ABNJB11070	Birds	Aythya affinis	Lesser Scaup	Sensitive	Sensitive	Secure	Surveys show a long-term decline in populations within Alberta and surrounding jurisdictions. Alteration and loss of suitable habitat may pose threats.
ABNKC01010	Birds	Pandion haliaetus	Osprey	Sensitive	Sensitive	Sensitive	This species is uncommon, but widespread, and faces limited threats to population and habitat, including threats to nesting sites. Continued monitoring and protection of specific nest sites desirable.
ABNKC10010	Birds	Haliaeetus leucocephalus	Bald Eagle	Sensitive	Sensitive	Sensitive	A species once at risk throughout much of its North American range, but now recovering; low density in Alberta. Nests vulnerable to human disturbance, and as such, require protection.
ABNKC11010	Birds	Circus cyaneus	Northern Harrier	Sensitive	Sensitive	Secure	Appears to be declining in Alberta and across much of its North American range. Several threats to population and habitat identified. Maintenance and preservation of wetlands for waterfowl is beneficial to the Northern Harrier.
ABNKC12060	Birds	Accipiter gentilis	Northern Goshawk	Sensitive	Sensitive	Sensitive	Logging, industrial development, and human encroachment on nesting habitat may reduce populations in the boreal forest. Maintenance of mature forest breeding habitat needs to be incorporated into forest planning on both public and private lands.
ABNKD06020	Birds	Falco sparverius	American Kestrel	Sensitive	Secure	Secure	
ABNME08020	Birds	Porzana carolina	Sora	Sensitive	Sensitive	Secure	Large (>50%) declines have occurred in Alberta and all surrounding jurisdictions since 1994. Species threatened by loss of wetland habitat.
ABNMK01010	Birds	Grus canadensis	Sandhill Crane	Sensitive	Sensitive	Sensitive	Sparsely distributed through boreal and foothill bogs and marshes. Vulnerable to wetland loss; sensitive to human disturbance. Land use planning needs to incorporate the maintenance of breeding habitat.
ABNNM10020	Birds	Chlidonias niger	Black Tern	Sensitive	Sensitive	Sensitive	Wetland habitat vulnerable to alteration; species declining across its North American range, likely a result of habitat loss on both breeding and wintering grounds.
ABNSB08010	Birds	Glaucidium gnoma	Northern Pygmy-owl	Sensitive	Sensitive	Sensitive	Local populations in boreal forest, foothills and Rocky Mountains. Forest management plans need to ensure breeding habitat maintained.
ABNSB12020	Birds	Strix varia	Barred Owl	Sensitive	Sensitive	Sensitive	Likely fewer than 2000 breeding birds in the province. This interior forest species requires larger blocks of mature dense woodland. Forest fragmentation detrimental. Forest management plans need to ensure breeding habitat retained.
ABNSB12040	Birds	Strix nebulosa	Great Gray Owl	Sensitive	Sensitive	Sensitive	A naturally scarce species, widely distributed in foothill and boreal habitats. Requires stands of mature forest for nesting,thus is vulnerable to harvest.
ABNTA02020	Birds	Chordeiles minor	Common Nighthawk	Sensitive	Sensitive	Sensitive	Species has declined across most of its North American range since 1966, and has even disappeared from some parts of Canada. Declines require investigation. Food supply may be affected by pesticide use in urban and suburban areas.
ABNYF07090	Birds	Picoides arcticus	Black-backed Woodpecker	Sensitive	Sensitive	Sensitive	Maintenance of mature coniferous forests important. Standing dead trees (snags) required for nesting. Forestry and fire suppression practices may decrease the availability of these stand types.
ABNYF12020	Birds	Dryocopus pileatus	Pileated Woodpecker	Sensitive	Sensitive	Sensitive	Requires mature to old-growth trees for nesting. Essential to incorporate maintenance of breeding habitat into management plans on both public and private lands. Some threats to populations identified.
ABPAE32050	Birds	Contopus sordidulus	Western Wood-pewee	Sensitive	Secure	Secure	
ABPAE33070	Birds	Empidonax minimus	Least Flycatcher	Sensitive	Sensitive	Secure	Species has been declining in Alberta and surrounding jurisdictions. May be threatened by habitat changes on wintering range.
ABPAE35020	Birds	Sayornis phoebe	Eastern Phoebe	Sensitive	Sensitive	Secure	Populations are declining in Alberta and across parts of North America, possibly due to loss of habitat on wintering range.
ABPBX03040	Birds	Dendroica tigrina	Cape May Warbler	Sensitive	Sensitive	Sensitive	Current forestry practices may decrease availability of breeding habitat (old-growth forest). Species is an obligate neotropical migrant, and there has been severe loss of its wintering habitat.
ABPBX03100	Birds	Dendroica virens	Black-throated Green Warbler	Sensitive	Sensitive	Sensitive	Over 10 000 individuals in the province. Designated a “Species of Special Concern” in Alberta. Habitat loss and fragmentation resulting from industrial development threaten this old-growth dependent species.
ABPBX03220	Birds	Dendroica castanea	Bay-breasted Warbler	Sensitive	Sensitive	Sensitive	Dependent on old-growth forest. Forest management plans need to ensure retention of breeding habitat.
ABPBX12010	Birds	Geothlypis trichas	Common Yellowthroat	Sensitive	Sensitive	Secure	A common, widespread species with a declining population in Alberta and surrounding jurisdictions. Threats to habitat identified.
ABPBX16030	Birds	Wilsonia canadensis	Canada Warbler	Sensitive	Sensitive	Sensitive	Population in Alberta estimated at 2 000-10 000 individuals. Species has declined throughout entire Alberta range since 1966. May be vulnerable to habitat loss or deterioration by various forecast land uses.
ABPBX45050	Birds	Piranga ludoviciana	Western Tanager	Sensitive	Sensitive	Sensitive	Prefers old coniferous and mixedwood forest; obligate neotropical migrant. Species may be vulnerable to habitat loss or deterioration by various forecast land uses, mainly timber harvest.
ABPBXB5010	Birds	Euphagus carolinus	Rusty Blackbird	Sensitive	Sensitive	Secure	An uncommon but widespread species that has undergone steep declines across its range since 1966, and occupies a threatened habitat.
ABPBXB9190	Birds	Icterus galbula	Baltimore Oriole	Sensitive	Sensitive	Secure	Species has largely declined within Alberta and surrounding jurisdictions since 1994. Parkland habitat threatened by cultivation.
Citation: http://srd.alberta.ca/BiodiversityStewardship/SpeciesAtRisk/GeneralStatus/GeneralStatusofAlbertaWildSpecies2010/Search.aspx							

Alberta Newsprint Company

DETAILED FOREST MANAGEMENT PLAN

APPENDIX H

APPROVED PUBLIC INVOLVEMENT PROCESS

REFERENCE # 0-128

DEVELOPED WITH The Silvacom Group

7-DEC-09

ANC Timber Ltd.
Detailed Forest Management Plan
Public Involvement Process

Outline

I. Introduction

Effective public participation is vital to any Forest Product Company's Forest Management Planning process. As sustainable forest management finds its way into the public eye and media, members of the public become more aware of activities taking place in the forest environment and public involvement becomes increasingly important.

Members of the public have the right to be involved in the management of publicly owned forests. ANC accepts the responsibility of identifying interested parties and providing them with the opportunity to participate in the writing of their Detailed Forest Management Plan. Just as some parties are best involved on an ongoing basis, there will also be those parties whose needs and interests are short term.

ANC will be pro-active in identifying potentially interested parties in its planning process. Their public participation process will strive to accommodate the public's wide range of knowledge, interests, and varying levels of involvement, as well as differing cultural and economic ties with the forest. ANC will consider the broader public interest throughout Detailed Forest Management Plan development as well and openly involve its forest area workers.

Alberta's consultation policy for First Nations will be followed to address the needs of all applicable aboriginal forest users and communities.

The goal of all participants in a public involvement process should be to strive for a high degree of agreement. The Province of Alberta has sole decision-making authority and participants should not expect to be able to change existing laws, regulations, or public policies through the writing of this Detailed Forest Management Plan. ANC's public involvement process will respect existing authority for decisions associated with the use and management of its forest land base.

ANC has maintained a multi faceted public involvement process over time which they continue to build on. The existing process consists of communication efforts with the public at large as well as a standing Whitecourt Regional Forest Advisory Committee.

Millar Western and Blue Ridge Lumber Inc. have timber harvesting rights within the ANC Forest Management Agreement Area and as such have a vested interest in the Detailed Forest Management Plan contents. They will be invited to participate on the Detailed Forest Management Plan Plan Development Team and will have significant opportunity to review and influence various components of the Detailed Forest Management Plan as it is written.

As part of the development of the Detailed Forest Management Plan, this Public Involvement process will identify potential key milestones and elements that require varying levels of public involvement. What these milestones are and how they were decided on is explained in a later section of this document.

II. Public Participation Group

Alberta's Forest Management Planning Standard requires the formation of a Public Participation Group.

The Whitecourt Regional Forest Advisory Committee was formed some ten years ago with a mandate to discuss and advise several local Forest Products companies on forest management issues and concerns. The Terms of Reference for the Whitecourt Regional Advisory Committee is appended to this document as Appendix 3.

The Whitecourt Regional Forest Advisory Committee was approached and asked to participate as the Public Participation Group for the development of ANC's Detailed Forest Management Plan. The Whitecourt Regional Forest Advisory Committee has agreed to participate in reviewing and providing input into key components of ANC's Detailed Forest Management Plan. The Whitecourt Regional Forest Advisory Committee will be asked if the formation of sub-groups would be appropriate to handle details or elements that may arise through the process.

The Whitecourt Regional Forest Advisory Committee is made up of members from the public who represent various groups, levels of government and public interests.

III. Detailed Forest Management Plan Public Involvement Process

There are four key components to ANC Timber's Detailed Forest Management Plan Public Involvement Process:

- The Whitecourt Regional Forest Advisory Committee
- ANC Timber Ltd.'s Stakeholder list
- Public Workshops
- First Nations

Each component is explained below. It is ANC Timber's belief that these components ensure adequate opportunity for the public to become aware of the Detailed Forest Management Plan development and how they may provide input.

The Detailed Forest Management Plan Public Involvement Process recognizes the importance of feedback loops. If and when ANC receives input from the public it is recorded. All recorded feedback will be provided to Alberta Sustainable Resource Development. Anyone who provided the input will be able to ensure the feedback was received by reviewing the representation of that feedback to Alberta Sustainable Resource Development. The individual or organization providing the input will also be able to review drafts of the Detailed Forest Management Plan to ensure their input was addressed adequately. Should they feel their input was not adequately addressed they can express that concern in reviewing subsequent drafts of the plan (or portions thereof). It is possible, although not desirable, that the final version of the Plan will be submitted to Alberta with outstanding issues that were not resolvable between ANC Timber Ltd. and the proponent of the concern. If that is the case then the issue will be clearly identified in the Plan submission.

ANC Timber Woodlands Staff are kept abreast of plan development status at regular business review meetings. Other Alberta Newsprint Company staff will be kept informed through internal communications like company intranet and open employee meetings.

a. Whitecourt Regional Forest Advisory Committee

The Whitecourt Regional Forest Advisory Committee will kept informed of Detailed Forest Management Plan development progress through regular updates by ANC staff members at scheduled meetings. If the Whitecourt Regional Forest Advisory Committee requests it more detailed information will be provided.

b. ANC Timber Ltd.'s Stakeholder List

ANC maintains a list of Stakeholders who have shown interest in the activities of the company. The current list of stakeholders is included at the end of this document as Appendix 1.

Individuals and/or organizations came to be on the list through various means. If anyone or any organization expresses interest in ANC Timber's operations they are added to the list. As well, ANC staff professionals developed portions of the list by thinking about and considering who and which organizations within the community might have interest in receiving information about ANC Timber's operations. Another source providing direction on who should be added to the list is Alberta Sustainable Resource Development. If Alberta requests that a particular individual, organization, or sector be added to the stakeholder list they are.

This list will be used to identify who will receive information regarding Detailed Forest Management Plan development. The Whitecourt Regional Forest Advisory Committee was created to represent the broad range of interests that would be reflected by the stakeholder list.

c. Workshops

Everyone on ANC Timber's Stakeholder list and members of the Whitecourt Regional Forest Advisory Committee will be invited to two one day workshops hosted by ANC. ANC will work to identify people to represent currently vacant Whitecourt Regional Forest Advisory Committee positions. These individuals will not necessarily continue as Whitecourt Regional Forest Advisory Committee members but will represent associated current sectors during the workshops.

During the workshops participants will work on identifying indicators that best represent the forest and the social values to be sustained. This step is about identifying the local communities' social values to ensure that the forest resources are being managed in the best interest of present and future generations. Annex 4 of Alberta's Forest Management Planning Standard and the Canadian Council of Forest Minister's structure for Values, Objectives, Indicators and Targets will be used to guide the group in identifying key issues to be considered in Detailed Forest Management Plan development.

The range of issues to be addressed in this process will pertain to those indicators that best represent the forest and social values to be sustained. Concerns and issues will be identified at the workshops to help ANC in the development of the Detailed Forest Management Plan. Indicators will take the form of Values, Objectives, Indicators, and Targets.

The initial work of compiling a list of Values, Objectives, Indicators, and Targets will be done by ANC and the Plan Development Team. This list will be brought to the workshop for further review and input. Based on discussions at the workshops, the list will be modified as necessary.

Should more work be required after the workshop a schedule will be developed by workshop participants on how best to complete the exercise.

d. First Nation Consultation

Current Alberta Government Policy requires public consultation specific to First Nations. Alberta Sustainable Resource Development has advised ANC Timber to consult independently with; Alexander First Nation, Alexis Nakota Sioux Nation, Aseniwuche Winewak Nation, and Sturgeon Lake Cree Nation. Each of these communities will be contacted by ANC and invited to participate in independent consultation. The details of those consultations will depend on the extent to which the specific communities wish to become involved. ANC Timber will follow Alberta Government First Nations Consultation Guidelines (Appendix 2).

IV. Public Involvement Process Milestones

The goal of the Public Participation Group and the Plan Development Team in a public involvement process is to reach timely agreement to the highest degree possible. Issues brought forward by the Public Participation Group will be respected by ANC. The company agrees to either accept the input and revise management accordingly or respond with specific reasons for not accepting it. Any concern brought forward that cannot be accommodated will be disclosed to Alberta Sustainable Resource Development.

In addition to the workshops the Whitecourt Regional Forest Advisory Committee will be asked to provide timely review of key sections of the Detailed Forest Management Plan (Milestones) as they are drafted and advise ANC of comments or concerns. These milestones will be suggested by ANC Timber staff professionals and presented to the Regional Advisory Committee for their review and agreement. This will help to ensure any issues as they arise before completion of the final Detailed Forest Management Plan.

ASRD will be kept current on the status of the Public Involvement Plan during Plan Development Team meetings. More detailed summaries of the status of the Public Involvement Process will be provided to ASRD throughout Detailed Forest Management Plan development as request.

The following are the identified Milestones in the Detailed Forest Management Plan process where public involvement is critical.

- Identification of Values, Objectives, Indicators, and Targets
- Initiation of discussions with First Nations groups
- Review of Defined Forest Area Landscape Description
- Review of Preferred Forest Management Scenario
- Review of the Final Detailed Forest Management Plan Draft

The following is an approximate timeline when it is expected these milestones will be available for review:

- Identify all other affected stakeholders and schedule workshop by **January 1, 2009.**
- Initiate Aboriginal Consultation by **January 15, 2009.**
- Complete a review of the identified Values, Objectives, Indicators, and Targets with the Public Participation Group by **January 30, 2009**.

- Finalize Values, Objectives, Indicators, and Targets with the Plan Development Team by **July 1, 2009.**
- **May 15, 2009.** Compile all input received from First Nations and stakeholders to date.
- **February 1, 2010.** Present the Public Participation Group with the Preferred Forest Management Scenario Selection.
- Provide Public Participation Group with final draft for review by **March 1, 2010**

When a final draft is available ANC will present it to Public Participation Group for their final consideration and review. The general public will be invited to this session through media advertisements and letters to people on the Stakeholder list. If changes are requested and it is feasible to make those changes they will be made prior to submission. If ANC is not in agreement with the proposed changes or there are issues with the amount of time required to make the changes then ANC will submit the plan and include the requested changes in the submission.

V. ANC Detailed Forest Management Plan Public Involvement Process Timeline

Date	Task	Who	Specifics
January 15, 2009	**Initiate contact with all applicable First Nations Groups.**	**ANC**	**Provide First Nations with plain language text and maps explaining the desire for their input into the planning process. (See Gov't Guidelines for further detail)**
January 30, 2009	**Complete a review of the identified Values, Objectives, Indicators, and Targets with the Public Participation Group.**	**ANC and Whitecourt Regional Forest Advisory Committee**	**ANC will present the VOITs identified by them and the plan development team to the Public Participation Group (Whitecourt Regional Forest Advisory Committee) for review and discussion.**
May 1, 2009	**Have initial First Nations contacts completed and documented.**	**ANC**	**Document all efforts to communicate with First Nations and outcomes, comments, material provided, etc.**
May 1, 2009	**Identify all affected stakeholders. Contact and provide with necessary backup info and request for input.**	**ANC**	**Contact any stakeholders not represented by Whitecourt Regional Forest Advisory Committee or not included on existing contact lists for Whitecourt Regional Forest Advisory Committee representatives.**
April 15, 2009	**Compile all input received to date from the Public Participation Group members, other stakeholders and first nations.**	**ANC**	**Provide feedback to all parties as necessary.**

June 1, 2009	**Whitecourt Regional Forest Advisory Committee to sign off on all TSA sensitive Values, Objectives, Indicators, and Targets.**	**Whitecourt Regional Forest Advisory Committee**	**ANC will present the TSA sensitive Values, Objectives, Indicators, and Targets to Whitecourt Regional Forest Advisory Committee with detail. Following Whitecourt Regional Forest Advisory Committee's decision making process, receive sign-off.**
February 1, 2010	**ANC will present the Preferred Forest Management Scenario to Whitecourt Regional Forest Advisory Committee.**	**ANC Plan Development Team and Whitecourt Regional Forest Advisory Committee**	**Will require presentation of appropriate maps and documentation to Whitecourt Regional Forest Advisory Committee for consideration and timely comment. PDT and Whitecourt Regional Forest Advisory Committee to agree on any further communications with the public at large that may be necessary.**
March 1, 2010	**Provide Final Draft of Detailed Forest Management Plan to Whitecourt Regional Forest Advisory Committee**	**ANC**	**ANC to present the final Detailed Forest Management Plan draft to Whitecourt Regional Forest Advisory Committee. Concerns to be back to ANC in a timely manner.**
May 1, 2010	**Implementation of Detailed Forest Management Plan**	**ANC**	**ANC will continue to provide opportunity through Whitecourt Regional Forest Advisory Committee and other means for the public to be involved in the ongoing management of the Forest Management Agreement Area area. The details of these processes will be developed and included in the Detailed Forest Management Plan.**

The submission of the completed Detailed Forest Management Plan to the Province is to occur May 1, 2010. The above timeline is crucial to follow in order to meet this submission date. Open communication is key between all parties in order to allow this process to move forward.

VI. Communications

The success of this public involvement process will be influenced by the extent and quality of communications. Thought needs to be given to the ways in which ANC and Whitecourt Regional Forest Advisory Committee members communicate with other participants in the process, communications with those they represent, and communications with the broader public.

Whitecourt Regional Forest Advisory Committee members will be reminded that they have a responsibility to communicate key elements of this plan to the other community or group members they represent. Input is to be provided back to Whitecourt Regional Forest Advisory Committee and ANC.

ANC and Whitecourt Regional Forest Advisory Committee will agree upon the means with which key elements and milestones are to be communicated to the broader public. Examples include, but are not limited to, open houses, newspaper and radio articles, website, brochures and the like. The timing of such communication should coincide with the suggested timelines and required dates for compilation of public and stakeholder input. When media advertising is utilized the targeted communities will be Whitecourt, Fox Creek, Grande Cache and Edson.

Any external requests for information will be referred to ANC or the Whitecourt Regional Forest Advisory Committee chairman as per the Whitecourt Regional Forest Advisory Committee Terms of Reference. ANC also agrees to be open in revealing to Whitecourt Regional Forest Advisory Committee members any concerns brought to the company directly.

Even though the design and make up of Whitecourt Regional Forest Advisory Committee is intended to represent the broad spectrum of public opinion ANC recognizes that there needs to be opportunity for the general public to have influence on the Detailed Forest Management Plan contents. To that end ANC will advertise locally when they are presenting key information to the Whitecourt Regional Forest Advisory Committee group. The general public will be invited to attend those meetings.

Advertisements will be placed in local newspapers and on local radio stations in the early stages of plan development advising the public of the fact that ANC Timber is drafting a Detailed Forest Management Plan and asking for interested parties to get involved. The final draft of the plan will be placed in the local libraries to provide a chance for it to be reviewed by the public in advance of approvals.

Should the public have concerns with any aspect of the Detailed Forest Management Plan they will have opportunity to communicate those concerns directly to ANC, through one of the Whitecourt Regional Forest Advisory Committee members, or through contact with Alberta Sustainable Resource Development.

Appendix 1

Stakeholder List

Title	First Name	Last Name	Company Name	City
Mr.	Harold	Bellwood	Alberta Snowmobilers Association	Fox Creek
Mr.	Ron	Hellekson	Alberta Trapper's Association	Peers
Mr.	Harvey	Burnstick	Alexander First Nations	Morinville
Mr.	Nelson	Alexis	Alexis First Nations	Glenevis
Mr.	Tim	McTaggart	Anderson Exploration	Swan Hills
Mr.	Tim	Burns	Blue Ridge Lumber Ltd.	Whitecourt
Mr.	Steve	Whitely	BP Canada Energy Company	Calgary
Mr.	Don	Price	Burlington Resources Canada Ltd.	Drayton Valley
Mr.	Brent	Korolischuk	Canadian Natural Resources Ltd.	Edson
Mr.	Fred	Priestley-Wright	Community Timber Program	Niton Junction
Mr.	Garth	Davis	Conoco Phillips Canada	Calgary
Ms.	Karen	Reip	Daylight Energy	Calgary
	Surface Lands Division	Whitecourt Area	Devon Canada Corporation	Calgary
Ms.	Brenda	Davidson	Duvernay Oil Corporation	Calgary
Mr.	Danny	Way	EnCana Corporation	Calgary
Mr.	Dave	Geisbrecht	Exxon Mobil Canada	Whitecourt
Mr.	Morris	Lerohl	Fox Creek Fish & Game Association	Fox Creek
Ms.	Linda	Horyn	Fox Creek Historical Association	Fox Creek
Mr.	Pete	Dunhauer	Husky Oil Operations	Calgary
Mrs.	Deb	Edney	Kentek Forest Services	Whitecourt
Mr.	Dale	Gervais	MD of Greenview #16	Valleyview
Mr.	Ray	Hilts	Millar Western Forest Products Ltd.	Whitecourt
Mr.	Glen	Larsen	Millar Western Forest Products Ltd. - Fox Creek Wood Products Division	Fox Creek
Mr.	Mel	Zwarich	Northland Sno-Goers	Fox Creek
Mr.	Daryl	Smith	Primitive Area Steering Committee	Valleyview
Mrs.	Ann	Nagel	Swan Hills Historical Society	Swan Hills
Mr.	Larry	Shand	Swan Hills Outdoor Recreation Club	Swan Hills
Mr.	Don	Vines	Swan Hills Outdoor Recreation Club	Swan Hills
Mr.	Ken	Nagel	Swan Hills Sno-Goers	Swan Hills
Mr.	Rob	Gibb	Talisman Energy	Edson
Mr.	Greg	Pasychny	Town of Edson	Edson
Mrs.	Leora	MacKinnon	Town of Fox Creek	Fox Creek
Mrs.	Louise	Krewusik	Town of Grande Cache	Grande Cache
Mr.	Doug	McDermid	Town of Mayerthorpe	Mayerthorpe
Mrs.	Pamela	Marriott	Town of Swan Hills	Swan Hills
Mr.	Trevor	Thain	Town of Whitecourt	Whitecourt

	Surface Lands Division	Whitecourt Area	TransCanada Pipelines Ltd.	Calgary
Mr.	Randall	Mustus	Trapline #0519	Glenevis
Mr.	Daniel	Kootenay	Trapline #0520	Glenevis
Mr.	Roy	Perrin	Trapline #0556	Carrot Creek
Mr.	Stewart	Moses	Trapline #0566	Valleyview
Mr.	Felix	Stoney	Trapline #0574	Valleyview
Mr.	Albin	Alexis	Trapline #0684	Glenevis
Mr.	Alex	Stoney	Trapline #1021	Calais
Mr.	Darryl	Gravel	Trapline #1381	Hinton
Mr.	Percy	Kelley	Trapline #1789	Hinton
Ms.	Shirley	Luniw	Trapline #1945	Grande Cache
Mr.	Mark	Thesen	Trapline #1973	Drayton Valley
Mr.	Nelson	Niles	Trapline #1989	Drayton Valley
Mr.	Glen	Kalmbach	Trapline #2001	Barrhead
Mr.	Lloyd	Clark	Trapline #2372	Alder Flats
Mr.	Robert	Robinson	Trapline #2500	Edson
Mr.	Kelly	Evans	Trapline #2891	Hinton
Mr.	Fulton	Smyl	Weyerhaeuser Company Ltd.	Drayton Valley
Mr.	Gary	Smith	Whitecourt Environmental Society	Whitecourt
Mr.	Ken	Lindford	Whitecourt Trailblazers Snowmobile Club	Whitecourt
Mr.	Jim	Rennie	Woodlands County	Whitecourt
Mr.	Jay	Lowe	Yellowhead County	Niton Junction

Appendix 2

First Nations Consultation Guidelines (Relevant Sections Only)

Alberta's First Nations Consultation Guidelines on Land Management and Resource Development

(Updated November 14, 2007)

Outline:

Part I: Alberta's Guidelines

Please note

First Nations, project proponents, and government representatives engaging in First Nations consultation should consider Part 1 as both a starting point and a foundation for project-specific consultations. Part 1 outlines the generic components of all consultation. The Department-specific Guidelines in subsequent Parts supplement this generic outline with explicit directions for consultation within the regulatory authority of each Department. In the event of an inconsistency between Part 1 and the Department-specific Guidelines, the guidance in Part 1 should ordinarily prevail.

A. Background

On May 16, 2005, the Government of Alberta (Alberta) adopted the *Government of Alberta's First Nations Consultation Policy on Land Management and Resource Development* (Policy). In the Policy, Alberta makes the commitment to consult with First Nations where land management and resource development have the potential to adversely impact First Nations rights and traditional uses[1] of Crown lands (Rights and Traditional Uses).

In the Policy, Alberta committed to creating consultation guidelines (Guidelines) to fulfill its duty to consult, to offer procedures for consultation, and to ensure a practical and efficient consultation process. To ensure consistency across the Guidelines, a framework (Framework) was released on May 19, 2006.

The Guidelines, now outlined within this document, are intended to guide all parties involved in consultation, as they are consistent with the current state of the law on consultation.

B. Next Steps

Alberta views the process of developing Guidelines as ongoing. At the end of the 2006-07 operating season, Alberta conducted its first quality-assurance assessment to revise and adjust the Guidelines as necessary. Alberta will do similar assessments annually.

Alberta is recommending a trilateral process (involving representatives from industry, First Nations and government) to discuss the issues of timelines, notification and the capacity of all parties to implement First Nations consultation in the province. A bilateral process (involving individual First Nations and Alberta) will also be initiated, with the intent of clarifying areas of critical interest for First Nations and to bring consistency to

[1] Rights and traditional uses includes uses of public lands such as burial grounds, gathering sites, and historic or ceremonial locations, and existing constitutionally protected rights to hunt, trap and fish and does not refer to proprietary interests in the land.

the determination of "who to consult" regarding land management and resource development proposals.

Internal and external sessions are being planned to enhance the knowledge of all parties regarding the 2007-08 Guidelines as well as to discuss implementation issues, in an effort to increase communication and monitor the application of consultation more closely. Ministers participating in the Consultation Initiative have also committed to meet with First Nations chiefs on a semi-annual basis, to begin to structure a political process in recognition of the government-to-government nature of Alberta's relationship with First Nations.

C. The Role of the Crown

The duty to consult rests with the Crown (Alberta). While the key goal in all circumstances is to avoid or mitigate potential adverse impacts and to come to an agreeable solution, the agreement of all parties is not a requisite component of adequate consultation.

In some cases, consultation may reveal a duty to accommodate for the Crown to meet in making its decision. Accommodation can mean efforts to reconcile, adjust, or adapt. In that regard, it will be reflected in the regulatory approval process, which will take into account the efforts of project proponents to address First Nation concerns by making changes to plans and adjusting and adapting projects to minimize impacts.

Alberta acknowledges a duty to consult with First Nations where Alberta's actions have the potential to adversely impact treaty rights. In recognition of its role, Alberta may:

- Undertake consultation with First Nations on a range of provincial planning initiatives (e.g., *Water for Life: Alberta's Strategy for Sustainability*, integrated land management plans);
- Provide direction and support to proposed regional consultation tables;
- Work with First Nations to ensure traditional use study information is used to support consultation where such information is available;
- Provide information to First Nations and industry to assist in consultation activities;
- Where disputes arise, provide direction at the request of either party;
- Determine the adequacy of consultation activities with the intent of avoiding adverse impacts to First Nations Rights and Traditional Uses and making efforts to substantially address the concerns of First Nations;
- Report back to First Nations and industry regarding decisions; and
- Consider other issues or take other actions as Alberta deems necessary.

When considering approval of resource development projects, Alberta may delegate procedural aspects of its duty to project proponents (Proponents). This process is described in "The Role of Proponents," below. Such consultation activities are expected to comply with the Policy and Guidelines. To help ensure their adequate consultation and

compliance with the Policy and Guidelines, Alberta will review Proponents' consultation activities.

Alberta is also responsible for documenting the overall consultation process, including details about its:

- Decision on whether the duty to consult is engaged and, if so, whom to consult;
- Delegation of specific consultation activities to Proponents;
- Decision on the adequacy of the Proponents' performance of delegated activities; and
- Notification to First Nations and Proponents about its decisions.

Alberta remains fully engaged in the substantive aspects of consultation, even when some aspects are delegated. Specifically, Alberta will:

- Provide advice and make information available to Proponents, as able, regarding potential adverse impacts to Rights and Traditional Uses;
- Support Proponents by providing consistent advice on who to consult on a proposed project;
- Ensure Proponents provide First Nations with early and adequate notifications on proposed projects;
- Review and approve consultation plans;
- Oversee the consultation process by evaluating reports submitted by Proponents; and
- Make final decisions about project approvals once Alberta determines that consultation has been adequate.

Alberta will also monitor implementation of the Guidelines. Every year, Alberta will assess effectiveness of the Guidelines and determine whether changes are required. This monitoring will help to achieve an effective and efficient process and address concerns from all parties. Alberta encourages the development and discovery of best practices for consultation. Alberta will continue to rely on feedback from First Nations and industry to inform implementation and assessment of the Guidelines.

Finally, Alberta is committed to reviewing the Policy in May 2009—four years after it was initially approved. In the year leading up to that date, Alberta will seek feedback from First Nations and industry to inform this review.

D. The Role of Proponents

As manager of the consultation process, Alberta will delegate some project-specific activities to Proponents. This delegation may apply on projects that began before release of the Guidelines in September 2006 but require further regulatory approval. All consultation required by Alberta will be carried out in the manner described in these Guidelines. If a project approval process straddles the issuance of a revised version of these Guidelines, then affected Proponents should seek direction from the appropriate

Alberta staff, who will strive to manage the transition in accordance with the legitimate expectations of the parties involved.

It is Alberta's intention that the activities delegated to Proponents will be conducted within the existing regulatory framework and timelines. To help maintain those timelines, Alberta strongly encourages Proponents to begin notifying First Nations early on when planning their projects and, where possible, consulting with First Nations before applying for government approvals. Likewise, where appropriate, Alberta may encourage Proponents to initiate discussions with First Nations at the program level so that a broader, more integrated understanding of area development can be shared.

The minimal requirements for assessment and notification, consultation procedures, and review and decision-making are defined as follows:

1. Assessment and Notification

Alberta will determine which projects require consultation and inform Proponents about which First Nations they should consult with on those projects. Consultation on certain approval processes for certain projects may apply both on private lands and Crown lands within Alberta. Consultation may be required for projects on private lands if Alberta believes the project may adversely impact Rights and Traditional Uses (for example, by affecting animal populations on nearby lands on which a First Nation exercises a treaty right to hunt those animals for food). In such cases, Proponents will be advised that consultation is required.

When determining whether to delegate project-specific consultation, Alberta will consider the following:

- Specific traditional use information shared by First Nations;
- Lands selected as part of treaty land entitlement (TLE) negotiations;
- The magnitude and duration of the proposed project;
- Information shared at regional consultation tables;
- Information acquired through direct interaction with First Nations; and
- Other relevant information that comes to Alberta's attention.

Consultation will not be required where there is no potential for adverse impacts on Rights and Traditional Uses. In particular, consultation may not be required if:

- The First Nation has informed Alberta that they do not exercise Rights and Traditional Uses in the area; or
- The proposed activity was the subject of previous consultation and has had either minor or no subsequent changes and therefore is not subject to further potentially adverse impacts on Rights and Traditional Uses.

In those instances where consultation activities are delegated to a Proponent, the Crown may assist by:

- Advising whether notification will be required and with which First Nations;
- Providing First Nations contact information;
- Providing government contact information;
- Providing guidance and advice about the required consultation;
- Establishing timeframes within which consultation should occur relative to the magnitude and duration of the proposed project;
- Assessing and approving proposed strategies to avoid or mitigate potential adverse impacts on Rights and Traditional Uses; and
- Other steps or measures Alberta deems necessary.

2. Consultation Procedures

As stated in the Policy, Alberta's duty to consult will not be engaged on every proposed resource development activity. However, when it is, Alberta will require Proponents to follow specific consultation procedures for specific projects. In these instances, Proponents should do *at least* the following activities:

- Notify either the band council or a designate of potentially adversely impacted First Nations (a list of consultation contacts endorsed by each First Nation is available and regularly updated on the IIAR website at http://www.international.gov.ab.ca);
- Provide plain language information describing the scope and location of the project, and clearly identifying those potential adverse impacts which the Proponent anticipates in the short and long term;
- If required, meet to discuss comments and concerns of the potentially adversely impacted First Nations;
- Strategize to avoid or mitigate potential adverse impacts on Rights and Traditional Uses;
- Where agreement has not been reached about how to avoid or mitigate potentially adverse impacts, provide written reasons to Alberta; and
- In any case, before government approvals, provide to Alberta a summary of the efforts to share information relating to the project, with the same summary copied to the First Nation(s) to which it pertains.
- To ensure efficient processing of applications, it is advisable to complete consultation procedures prior to applying for approvals.

Alberta may verify that the First Nation(s) received the summary of consultation activities.

Alberta acknowledges that some First Nations have developed their own consultation protocols. Alberta encourages, but does not require, Proponents to be aware of those protocols when consulting with First Nations. Where appropriate, Alberta will continue to work with First Nations to incorporate aspects of these protocols into the Guidelines.

E. Response of First Nations

Alberta will require Proponents to provide written notification to First Nations where there are potential adverse impacts to Rights and Traditional Uses stemming from land management and resource development activities. Where notification is provided, First Nations must indicate in writing to the Proponent within a reasonable timeline if there are concerns with the proposed project. Where no response is received from a First Nation within 21 calendar days, it will be determined that they have no concerns with the project and the project approvals process will proceed without any further notice to the First Nation.

In responding to written notification within 21 days, a First Nation shall identify the name of the project that is being responded to and clearly identify the potential adverse impacts on Rights and Traditional Uses that call for further consultation. Further consultation will be conducted in accordance with the "Consultation Procedures" section.

F. "Adequate Consultation"

A primary concern of all parties is determining when consultation is "adequate." Although Proponents will be required to follow specific consultation procedures, Alberta remains responsible for ensuring that performance of delegated consultation activities has been adequate. Alberta will ensure a consistent and coordinated approach across departments to determine the adequacy of consultation whenever consultation is required. Alberta will also assess Proponent-led consultation activities.

As stated in the Policy, Alberta expects consultation to occur *before* decisions are made. Therefore, Alberta strongly encourages Proponents to begin notification activities early on when planning their projects and, where possible, consult with First Nations before applying to government departments for approval.

Alberta will review the consultation information submitted by Proponents for adequacy and completeness. Alberta may verify information with First Nations and seek advice from internal government personnel during its review. Where applications are considered incomplete or inadequate, Proponents may be required to consult further with First Nations.

Alberta may consider the following questions when assessing the adequacy of Proponent-led consultation with First Nations:

- Did the Proponent and the First Nation consult in a meaningful way that supports the spirit of collaboration?
- Did the Proponent and the First Nation exchange information in a reasonable amount of time before the project was to begin?
- Did the Proponent make reasonable efforts to avoid and mitigate First Nations concerns?
- How did First Nations participate in the process?
- How much did First Nations participate in the process?
- Were potential adverse impacts specifically identified?

- Was the scope of the potential impacts communicated effectively?

When consultation has occurred, Alberta will use the information provided to consider the potential adverse impacts of the project on Rights and Traditional Uses and send written notification of its decision in a timely manner to both the Proponent and the First Nation.

All regulatory decisions related to consultation will be made by Alberta, or its boards, to satisfy its duty to consult. An example is the Alberta Energy and Utilities Board (EUB). The EUB's Directive 056 (Energy Development Applications and Schedules) requires applicants to adhere to these Guidelines as well.[2]

Alberta remains fully engaged in the substantive aspects of consultation, and may take a role in the procedural aspects of project-specific consultation, when appropriate. For example, where disputes arise, Alberta encourages either party to seek direction from the appropriate government staff. While agreement is desirable, Alberta does not require consent by either First Nations or Proponents. Alberta has the final decision-making authority in assessing the adequacy of consultation. Where approval is given to move forward with a proposed project, Alberta has deemed consultation to have been adequate.

Department-Specific Guidelines

Each Alberta Ministry (Department) administers legislative and regulatory processes unique to its business functions. To promote an effective and efficient consultation process related to resource development, each Department has reviewed its internal processes to assess where to best incorporate First Nations consultation. The result has been development of Department-Specific Guidelines to ensure compatibility with various resource sectors. While each Department's requirements may vary, each Department intends its Guidelines to be both consistent with the current state of the law on consultation and compatible with the other Department-Specific Guidelines.

[2] EUB Directive 56, Section 2.1 (page 5)
http://www.eub.ca/docs/applications/submissions/1457147/10-004-2005-09-12-Directive056.pdf

Part IV:

Alberta Sustainable Resource Development Guidelines for First Nations Consultation on Resource Development and Land Management

Fish and Wildlife
First Nations Consultation Guidelines
2007/2008

SRD-Fish and Wildlife Division is committed to consult with First Nations regarding fish and wildlife management activities and proposed policy, legislative or regulatory changes that have the potential to adversely impact First Nations *Rights and Traditional Uses* of Alberta Crown lands.

Fish and Wildlife Division wants to ensure that both parties receive timely and relevant information in order to keep each other informed and foster positive relationships. This will allow for meaningful participation in the consultation process.

Consultation with First Nations will use the following process:

1. Assessment – The scope of consultation activities and the level of First Nation involvement (Treaty level organizations/ Regional Tribal Councils/First Nations) will be determined by the potential adverse impact the proposed changes (provincial, regional or local) may have on First Nations *Rights and Traditional Uses*. The First Nations or organizations that are to be contacted will be determined based on the following criteria:
    - Specific traditional use sites shared by First Nations;
    - Lands selected as part of Treaty Land Entitlement negotiations;
    - Magnitude and duration of the proposed project;
    - Information shared at regional consultation tables;
    - Information acquired through direct interaction with First Nations; and
    - Any other information that comes to Alberta's attention.

2. Notification – As part of the notification process, Fish and Wildlife Division will:
    - Provide a general outline of the consultation that will be undertaken:
    - Provide government contact information for consultation information and support;
    - Establish timeframes within which consultation should occur; and
    - Outline general strategies that may be used to avoid, mitigate or accommodate potential adverse impacts on First Nations *Rights and Traditional Uses*.

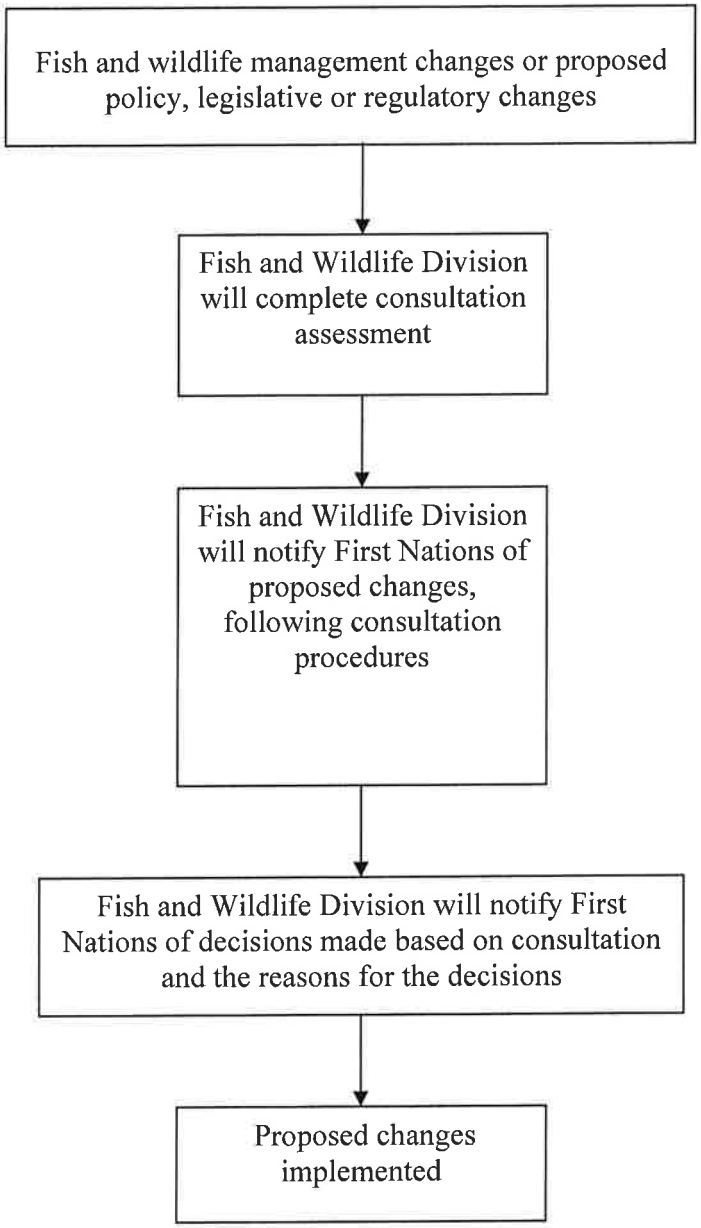
3. Procedures –
    - Notify First Nations at the outset of the proposed changes;
    - Provide plain language information describing the proposed changes, and the conservation reasons for proposing the changes;
    - Initiate meetings to discuss ideas, comments and concerns of the potential adverse impact to First Nations;

- Reasonable time will be provided for parties involved to review, consider and respond;
- Develop strategies to avoid, mitigate or accommodate the potential adverse impacts on First Nations *Rights and Traditional Uses*; and
- Notify the First Nations of the decisions made based on the consultations and the reasons for the decisions.

4. Fish and Wildlife Division will maintain a record of consultation activities and ensure fairness of process.

5. Fish and Wildlife Division will continue to strive to respond to issues of interest that arise throughout the year.

SRD - Fish and Wildlife Consultation Process



Land Management
First Nations Consultation Guidelines
2007/2008

SRD is committed to consult with First Nations regarding strategic level planning and operational landscape level initiatives that have the potential to adversely impact First Nations *Rights and Traditional Uses* of Alberta Crown lands.

Consultation with First Nations will use the following process:

1. Assessment – The scope of consultation activities and the level of First Nations involvement (Treaty level organization/Regional Tribal Council/First Nations) will be determined by the potential adverse impact the proposed initiatives (provincial, regional or local) will have on First Nations *Rights and Traditional Uses.* The First Nations or organizations that are to be contacted will be determined based on the following criteria:
    - Specific traditional use sites shared by First Nations;
    - Lands selected as part of Treaty Land Entitlement negotiations;
    - Magnitude and duration of the proposed project;
    - Information shared at regional consultation tables;
    - Information acquired through direct interaction with First Nations; and
    - Any other information that comes to Alberta's attention.

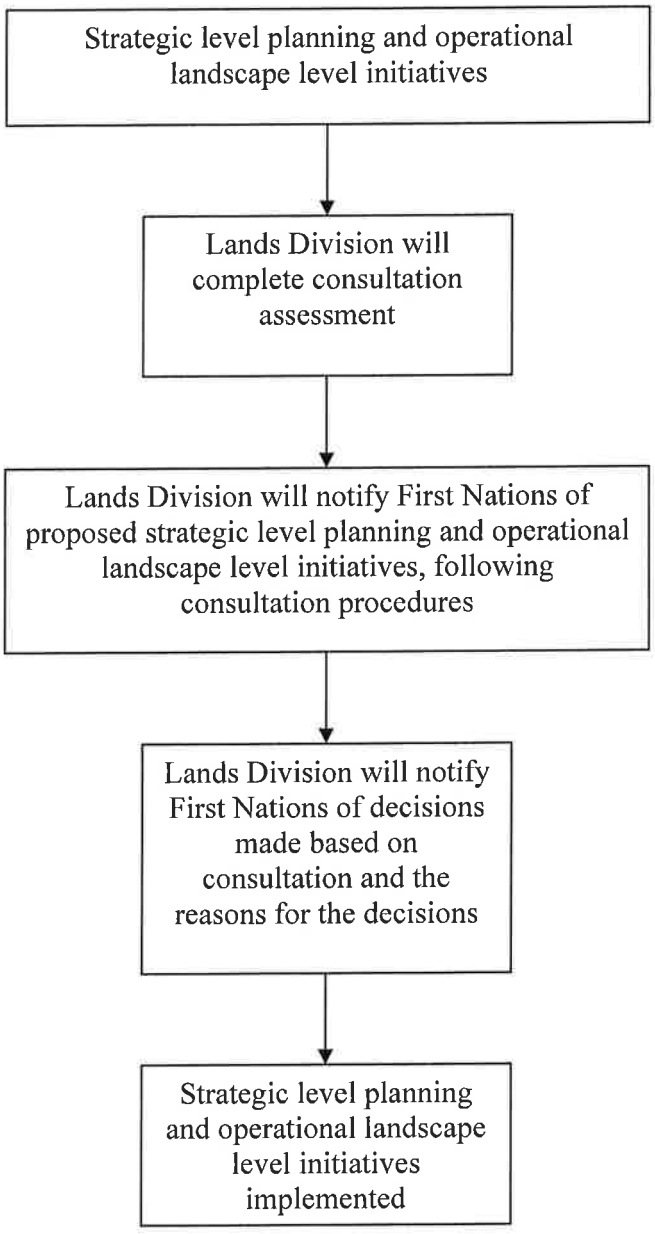
2. Notification –
    - For provincial-scale initiatives, contact Treaty level organizations first for advice on how they want to be consulted, other parties to include, and how information should be provided;
    - For operational landscape level initiatives, the appropriate Regional Tribal Council and/or First Nations will be approached first for advice on how they want to be consulted;
    - Provide government contact information for further information and support;
    - Establish timeframes within which consultation will occur; and
    - Outline general strategies that may be used to avoid, mitigate or accommodate potential impacts on First Nations *Rights and Traditional Uses.*

3. Procedures –
    - Involvement of Treaty level organizations/Regional Tribal Councils/First Nations at the early stages of the planning process;
    - Provision of plain language information describing the proposed plan, and identifying potential short and long term adverse impacts;

- Initiate meetings to provide information to First Nations about integrated land management planning activities thereby inviting First Nations to provide direct input and participate in the planning process;
- Reasonable time will be provided for parties involved to review, consider and respond;
- Develop strategies to avoid, mitigate or accommodate the potential adverse impacts on First Nations *Rights and Traditional Uses* whenever possible; and
- Inform the Treaty level organizations/Regional Tribal Councils/First Nations of the decisions made based on the consultations and the reasons for the decisions.

4. All forms of consultation and communication shall be documented.

SRD - Land Management Consultation Process



Conventional Oil and Gas
First Nations Consultation Guidelines
2007/2008

SRD is committed to consult with First Nations when it issues authorizations for conventional oil and gas activities that have the potential to adversely impact First Nations *Rights and Traditional Uses* of Crown lands. When applications for conventional oil and gas activities are submitted, some procedural aspects of consultation will be delegated to the project proponent.

Where SRD delegates the responsibility for consultation, the project proponent will consult with potentially affected First Nations on that proponent's planned development program for the season. Alberta recognizes development plans change as the season progresses and, as such, consultations will be undertaken with this in mind. The *Government of Alberta's First Nations Consultation Policy on Land Management and Resource Development* and Part I of the Consultation Guidelines apply to these consultations and prevail where there are any inconsistencies.

For the purposes of First Nation consultations, a proponent's seasonal development program may take the form of an Area Operating Agreement ("AOA") or some other package of proposed projects or activities scheduled to be executed within that season.

Area Operating Agreements

An AOA does not convey statutory approval for a company to proceed with its plans, but only what the company intends to follow when requesting individual site approval.

1. Where possible, consultation should occur during preparation of the operational planning (Part C) of the AOA. If this is not possible, the proponent will be required to have completed consultations prior to the issuance of approvals contemplated by the AOA. If desired, a First Nations Consultation Plan can be developed by the proponent during the preparation of the AOA with assistance from Alberta, as set out in Part I of the Guidelines.

2. Consistent with Part I of the Guidelines, SRD or Alberta staff will review the program contemplated in the AOA and will: (a) assess the duty to consult; and (b) identify which First Nations are to be consulted.

3. Proponents will provide First Nations with relevant information about their project including, but not limited to:

    - A proposed program plan including maps and proponent contact information; and
    - A proposed program schedule.

4. Proponents will initiate meetings with the First Nations to listen to and gain their input on the potential adverse impacts of the proposed program. First Nations responses and concerns are to be discussed and considered in the consultation process to identify possible methods to avoid or mitigate potential adverse impacts.

5. All forms of consultation and communication shall be documented. A summary of the consultations will be provided to Sustainable Resource Development and to the First Nations.

6. Matters requiring further consultation may require meetings among the proponents, First Nations, and Alberta for discussion.

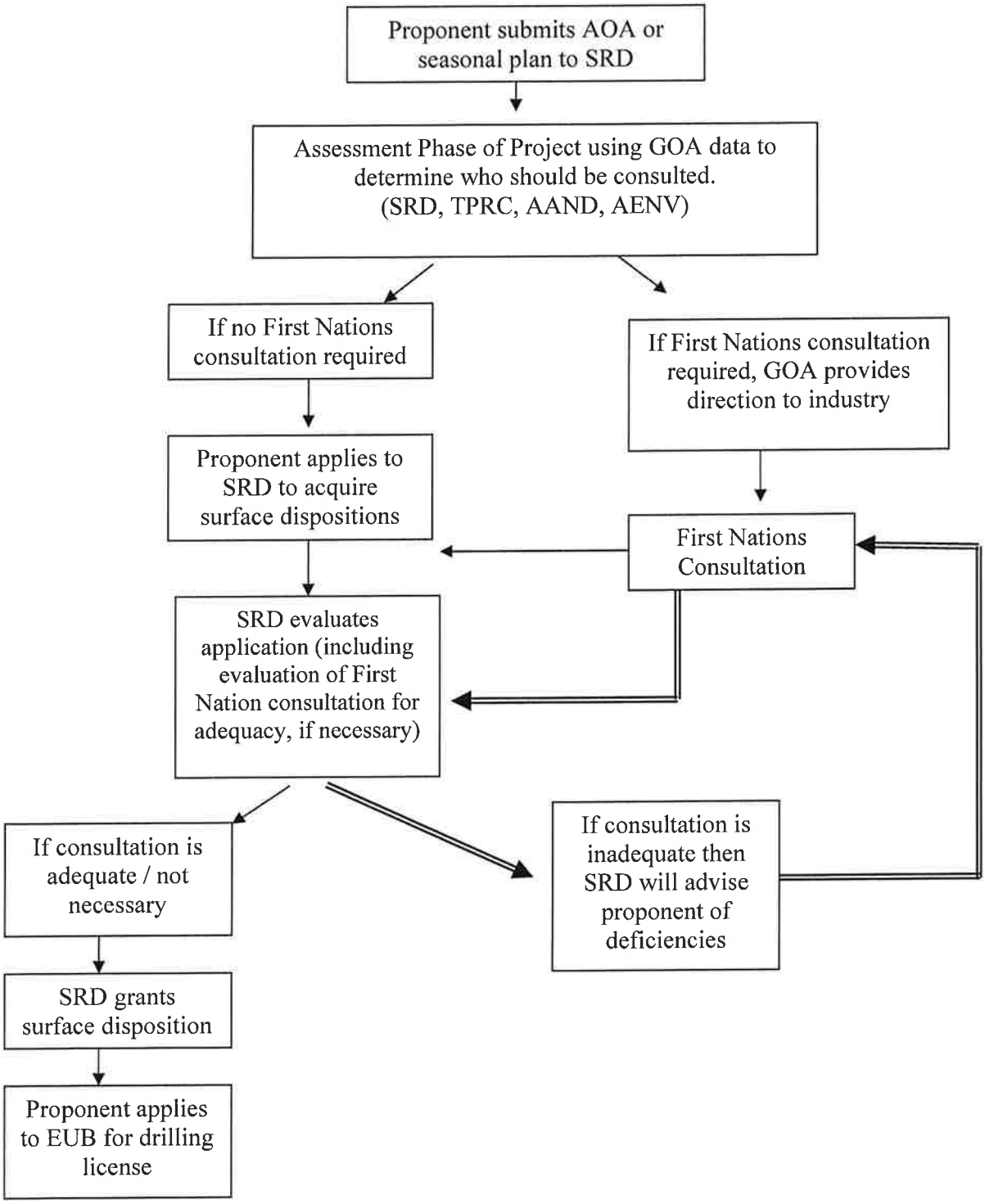
Other

1. For activities not included in an AOA, Alberta's Consultation Policy and the Guidelines will continue to apply. Industry proponents will review consultation requirements with their regular staff contacts within SRD.

2. The provisions of Part I of the Guidelines apply to these consultations. Project proponents may develop and execute consultation plans which include a package of proposed projects, or activities planned for the season.

SRD reserves the right to require consultation based on receipt of new information at any time during the approval process.

SRD - Conventional Oil & Gas Consultation Process



Forest Industry
First Nations Consultation Guidelines
2007-2008

SRD is committed to consult with First Nations before it issues authorizations for timber harvesting that have the potential to adversely impact First Nations *Rights and Traditional Uses* of Alberta Crown lands. The following procedural aspects of consultation will be delegated to project proponents:

The Forest Industry is required to initiate meetings with First Nations to review planned forest operations. Plans to be reviewed include, but are not limited to:

- Detailed Forest Management Plans (DFMPs)
- General Development Plans (GDPs)

1. Assessment – The scope of consultation activities and the level of First Nations' involvement will be determined by the potential adverse impact the proposed project may have on First Nations *Rights and Traditional Uses.* To provide advice on which First Nations are to be consulted, the Area will complete an assessment based on the following criteria:
    - Specific traditional use sites shared by First Nations;
    - Lands selected as part of Treaty Land Entitlement negotiations;
    - Magnitude and duration of the proposed forest operations;
    - Information shared at regional consultation tables;
    - Information acquired through direct interaction with First Nations; and
    - Any other information that comes to Alberta's attention.

2. Notification – The Area will assist Forest Industry by:
    - Advising Forest Industry which First Nations need to be consulted;
    - Providing First Nations contact information for consultation purposes;
    - Providing government contact information for further information and support; and
    - Establishing timeframes within which consultation should occur in relation to the magnitude and duration of the forest operations; and
    - Providing a general outline of the consultation that will be undertaken.

3. Procedures – The Forest Industry will:
    - Notify First Nations at the outset of the forest management planning process;

- Provide plain language information describing the forest management process, the scope and location of upcoming forest operations (including maps and schedules);-
- Initiate meetings to discuss the forest management planning process and to review ideas, comments and concerns of the potential short and long term adverse impacts to First Nations *Rights and Traditional Uses* as brought forward by First Nations;
- Provide reasonable time for First Nations to review, consider and respond;
- Develop strategies to avoid or mitigate the potential adverse impacts on First Nations *Rights and Traditional Uses* whenever possible;
- Where avoidance is not possible, consultation will be conducted with the goal of mitigating such adverse impacts; and
- Notify SRD of steps taken for avoidance and mitigation of potential adverse impacts on First Nations *Rights and Traditional Uses*;

5. All forms of consultation and communications shall be documented. A summary of the consultations will be provided to the Area and to the First Nations prior to approval.

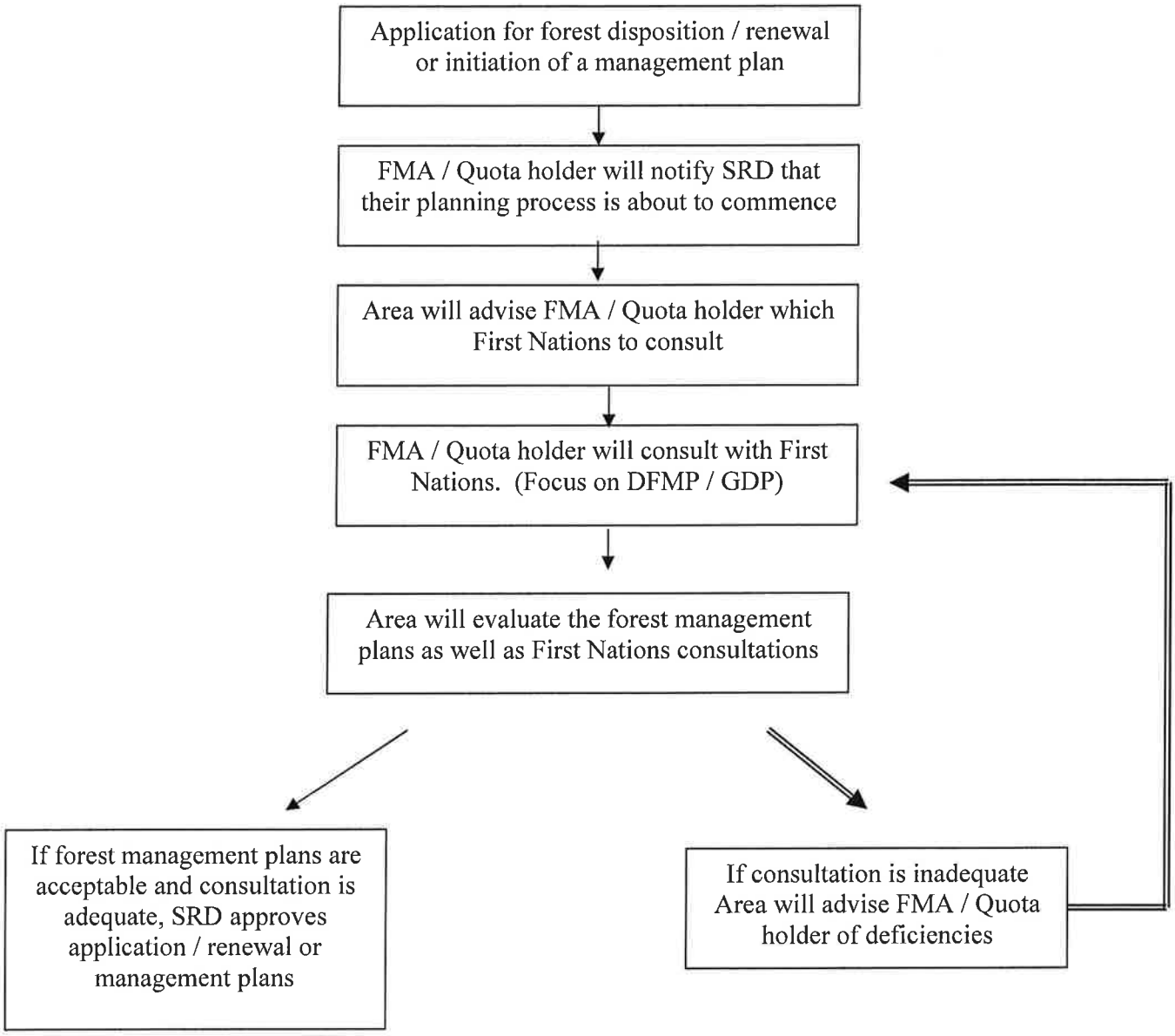
6. Matters requiring further consultation may require meetings among the Forest Industry, First Nations, and Alberta for discussion. Where a First Nation and/or the Forest Industry advise that there are irreconcilable issues, the Area will take the lead role in bringing about a resolution.

7. The Area will notify the First Nations of the decisions based on consultations and the reasons for the decisions.

Forest Management Agreements

Forestry Division will notify potentially affected First Nations of the government's intent to renew Forest Management Agreements (FMAs). Forestry Division will offer to meet to explain the forest management business model, including the tenure system and the planning process. The meeting will also be used to describe where opportunities for further consultation will occur. If necessary, the FMA holder will then undertake consultation with the potentially affected First Nations to listen and respond to concerns that such First Nations may have with the renewal of an FMA. The FMA holder is expected to document these discussions. Should a First Nations concern not be adequately addressed, it is expected that the Forestry Division will be appraised and will determine what, if any, further steps are required. The Crown remains ultimately responsible for consulting First Nations.

SRD - Forest Industry Consultation Process



Forest Management
First Nations Consultation Guidelines
2007-2008

SRD is committed to consult with First Nations regarding forest management activities that have the potential to adversely impact First Nations *Rights and Traditional Uses* of Alberta Crown lands.

In Crown managed Forest Management Units, the Area will consult with First Nations to review planned forest operations. Plans to be reviewed include, but are not limited to:

- Forest Management Plans (FMPs)
- General Development Plans (GDPs)

The following process for consulting with First Nations will be implemented:

1. Assessment – The scope of consultation activities and the level of First Nations' involvement will be determined by the potential adverse impact the proposed project may have on First Nations *Rights and Traditional Uses.* The First Nations that are to be contacted will be determined based on the following criteria:
    - Specific traditional use sites shared by First Nations;
    - Lands selected as part of Treaty Land Entitlement negotiations;
    - Magnitude and duration of the proposed forest operations;
    - Information shared at regional consultation tables;
    - Information acquired through direct interaction with First Nations; and
    - Any other information that comes to Alberta's attention.

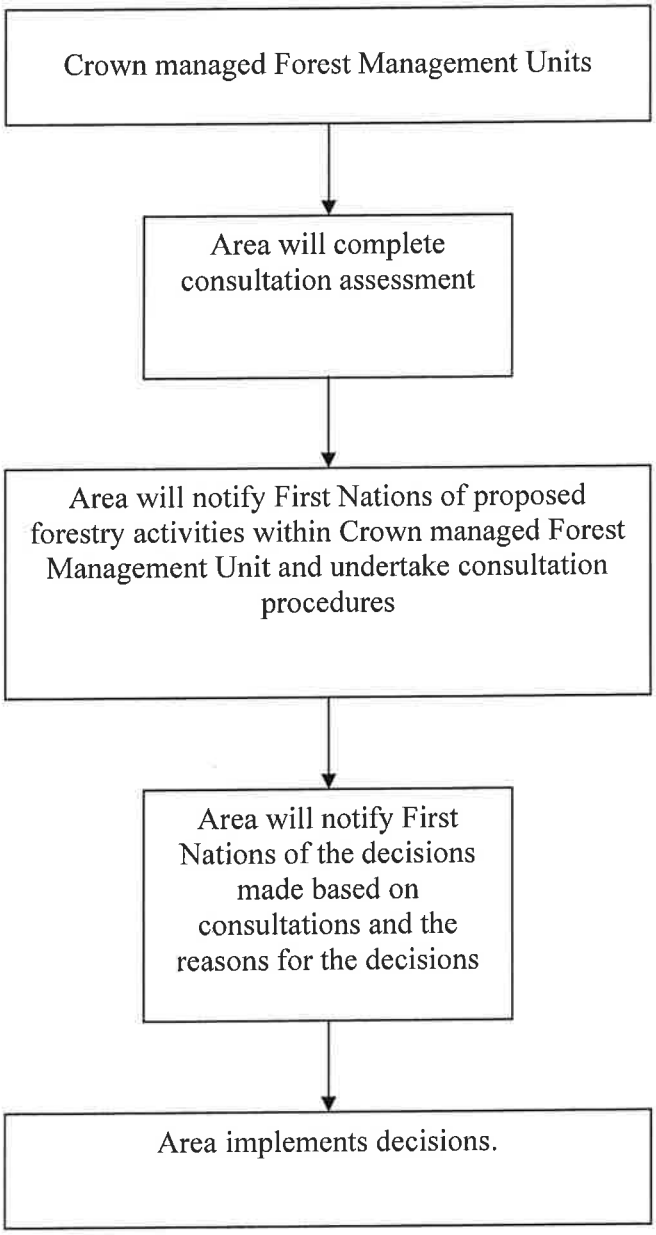
2. Notification –
    - Provide a general outline of the consultation that will be undertaken;
    - Provide government contact information for further information and support;
    - Establish timeframes within which consultation should occur; and
    - Outline general strategies that may be used to avoid, mitigate or accommodate potential adverse impacts on First Nations *Rights and Traditional Uses*.

3. Procedures –
    - Notify First Nations at the outset of the forest management planning process;
    - Provide plain language information describing the forest management process, the scope and location of the proposed project (including maps and schedules), and identify potential short and long term adverse impacts;
    - Initiate meetings to discuss the forest management planning process and to review ideas, comments and concerns about the potential adverse impacts to First Nations *Rights and Traditional Uses*;

- Provide reasonable time for First Nations to review, consider and respond;
- Develop strategies to avoid, mitigate or accommodate the potential adverse impacts on First Nations *Rights and Traditional Uses* whenever possible; and
- Notify the First Nations of the decisions made based on consultations and the reasons for the decisions.

4. All forms of consultation and communications shall be documented. A summary of the consultation shall be provided with the plan.

SRD - Forest Management Consultation Process



Forest Protection
First Nations Consultation Guidelines
2007-2008

SRD is committed to consult with First Nations regarding wildfire management activities that have the potential to adversely impact First Nations *Rights and Traditional Uses* of Alberta Crown lands.

When initiating the planning process for Wildfire Management, such as FireSmart or prescribed fire projects, the Area will use the following process for consulting with First Nations:

1. Assessment – The scope of consultation activities and the level of First Nations' involvement will be determined by the potential adverse impact the proposed project may have on First Nations *Rights and Traditional Uses.* The First Nations that are to be contacted will be determined based on the following criteria:
    - Specific traditional use sites shared by First Nations;
    - Lands selected as part of Treaty Land Entitlement negotiations;
    - Magnitude and duration of the proposed project;
    - Information shared at regional consultation tables;
    - Information acquired through direct interaction with First Nations; and
    - Any other information that comes to Alberta's attention.

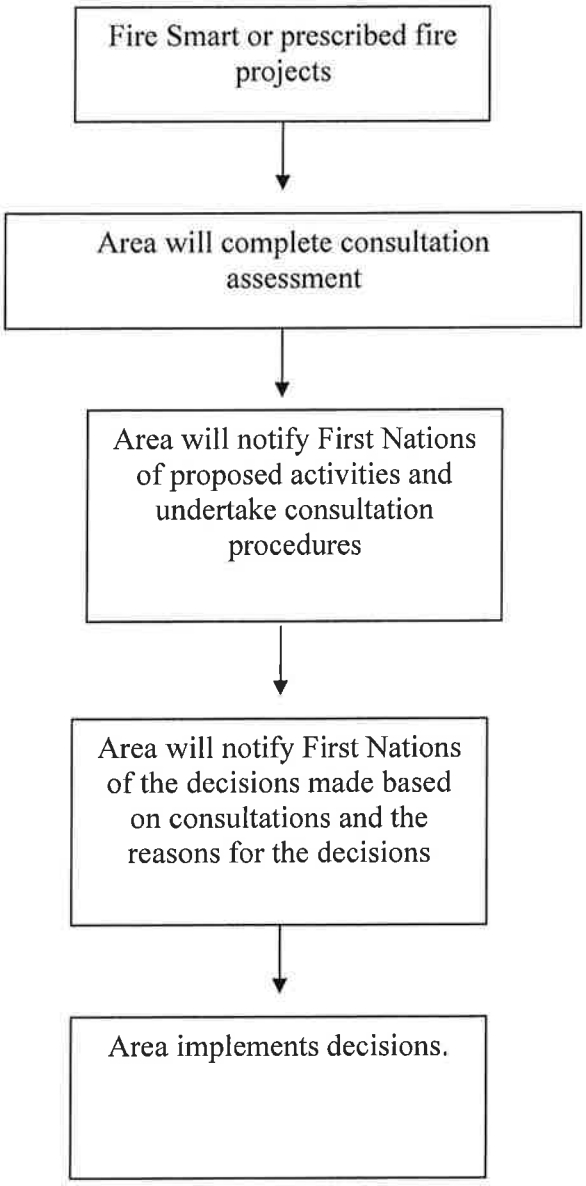
2. Notification –
    - Provide a general outline of the consultation that will be undertaken;
    - Provide government contact information for further information and support;
    - Establish timeframes within which consultation will occur; and
    - Outline general strategies that may be used to avoid, mitigate or accommodate potential adverse impacts on First Nations *Rights and Traditional Uses*.

3. Procedures –
    - Notify First Nations at the outset of the planning process;
    - Provide plain language information describing the planning process, the scope and location of the project (including maps and schedules), and identify potential short and long term adverse impacts;
    - Initiate a meeting to discuss the forest protection planning process and to review ideas, comments and concerns of the potential adverse impacts to First Nations;
    - Provide reasonable time for First Nations to review, consider and respond;
    - Develop strategies to avoid, mitigate or accommodate the potential adverse impacts on First Nations *Rights and Traditional Uses* whenever possible; and

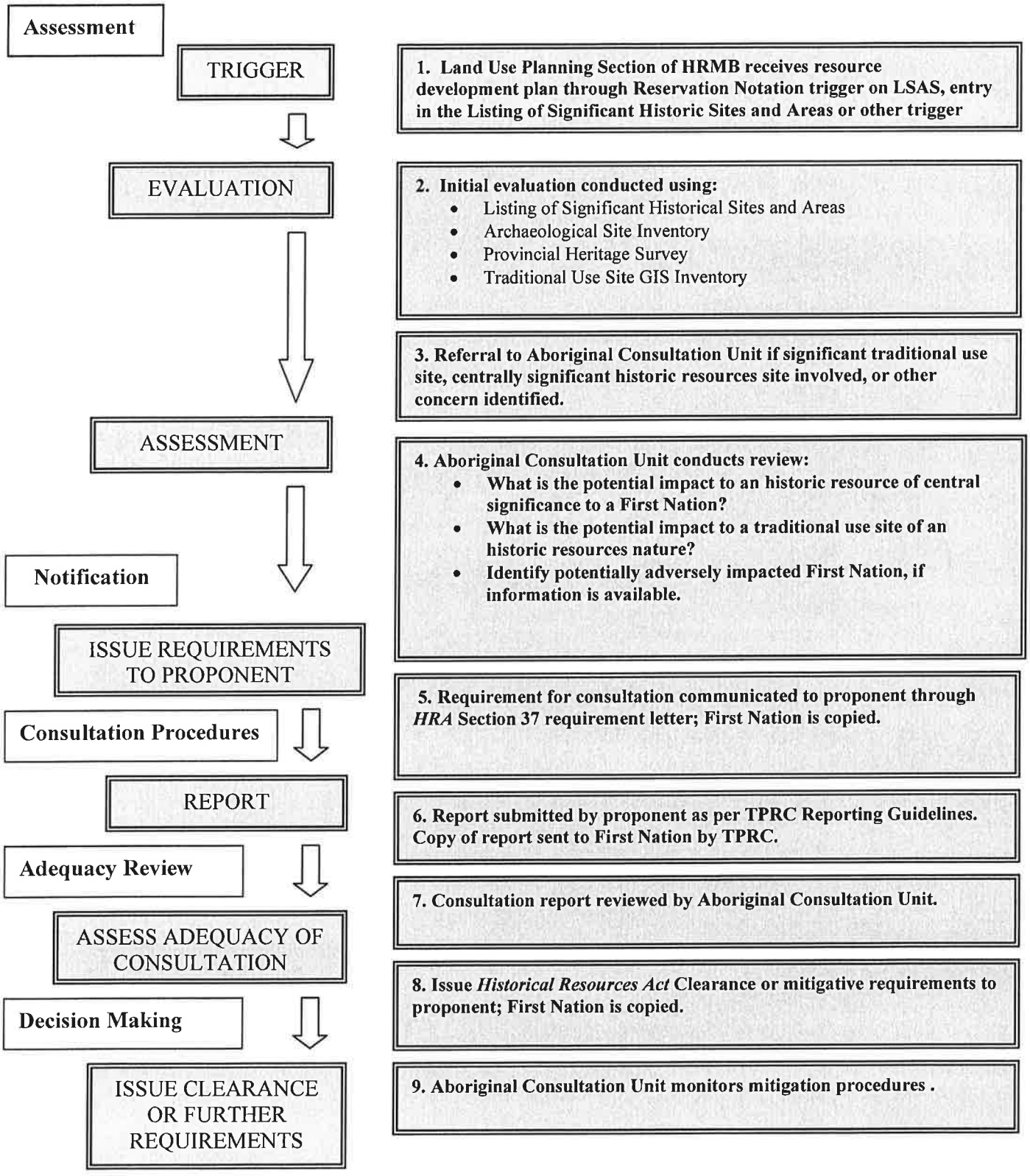
- Notify the First Nations of the decisions made based on consultations and the reasons for the decisions.

4. All forms of consultation and communications shall be documented. A summary of the consultations shall be provided with the Plan.

SRD Forest Protection Consultation Process



Appendix A. Internal TPRC Processes for Proponent-Led First Nation Consultation



Appendix B. Sector-Specific Consultation and Regulatory Processes

TPRC will attempt to integrate First Nations consultation into existing regulatory processes and maintain current timelines.

Ammonite Shell

TPRC is currently engaging in work to identify the significance of ammonite, known harvesting sites, and the impact of ammonite mining on First Nations Rights and Traditional Uses. It is anticipated that known harvesting locations will be protected through the *Listing* and as Reservation Notations on LSAS, in turn ensuring consultative addenda are placed on the sale notice. A TPRC Information Letter will be attached to approved Ammonite Shell Agreements, and will provide information regarding possible HRIA and TPRC-led consultation initiatives. At the exemption stage the Aboriginal Consultation Unit will review the proposed project and conduct consultation as necessary.

Conventional Oil & Gas

The *Listing* is the trigger for TPRC involvement in regulating conventional oil & gas activities, which includes wellsites, pipelines and associated access roads. The Environmental Field Report (EFR) required by SRD for surface dispositions also requires a review of the *Listing* for application purposes. The *Listing* will be used as a trigger for a referral to Aboriginal Consultation Unit staff to determine if the project may adversely impact First Nations Rights and Traditional Uses under TPRC's mandate. TPRC encourages project proponents to check the *Listing* during the planning stage for large scale drilling programs to facilitate efficient consultation efforts. Once a referral is received the consultation process will occur as detailed in the previous section.

Forestry Development

The current Historic Resource Management strategy for the Forestry sector is largely a self-managed program. A Historic Resources Management Plan, which details areas requiring pre and post development HRIAs is submitted to TPRC for review, and site clearance or mitigation requirements forwarded to the proponent. When available, TUS data can be incorporated into such a management plan. If the *Listing* indicates the presence of a traditional use site in a proposed development area, consultation should proceed as directed in the Guidelines.

Environmental Impact Assessments

As part of the Environmental Impact Assessment (EIA), project proponents may be required to consider the development's impact on First Nations' Rights and Traditional Uses relative to historic resources. Requirements by TPRC will be outlined in the project terms of reference and may include the following:

a) Document any participation by local First Nations in the field program conducted;

b) Identify sites of traditional use that may be considered historic resources, including cabin sites, spiritual and sacred sites, trails and graves;
c) Determine the Project and cumulative impact of development on these uses;
d) Document any concerns of First Nations with respect to Project impacts on historic resources;
e) Identify mitigation strategies proposed to address these concerns.

Project proponents will submit the required information to TPRC as per the Reporting Guidelines. The Aboriginal Consultation Unit will review the report and request supplemental information as needed. TPRC will then issue *HRA* Clearance or mitigation procedures to the proponent. Potentially adversely impacted First Nation(s) will be provided copies of any historic resources clearance letters issued for EIA reviewed projects.

Crown Mineral Sales

Traditional use study data of an historic resource nature may be placed as Restrictions on subsurface LSAS and uploaded as addenda to sale by the Department of Energy (DOE). TPRC will work with the DOE toward ensuring that the *Listing*, including traditional use sites, is uploaded for all types of mineral sales. Including historic resources information as addenda to sale could provide early notice to prospective proponents of the potential need to consult with First Nations regarding the *HRA*. In the interim, CMDRC referrals will be reviewed consistently by TPRC to determine if there are potential adverse impacts to known traditional use sites.

Aggregates, Geophysical, Power, Recreational and Transportation

These development sectors do not have a formalized heritage resource management program. As sector-specific programs are developed, Aboriginal issues, First Nations consultation and the use of traditional use data will be incorporated where possible. In lieu of a formalized regulatory process, known traditional use sites or areas may be protected through an entry on the *Listing* and as Reservation Notations on LSAS.

Appendix 3

Whitecourt Regional Forest Advisory Committee Terms of Reference – May 2007

REVISED MAY 18, 2007

WHITECOURT REGIONAL FOREST ADVISORY COMMITTEE (RFAC)

TERMS OF REFERENCE

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1. PURPOSE

The Regional Forest Advisory Committee is established to provide advice and recommendations to the forest industry and Sustainable Resource Development on matters dealing with forest management. The committee members, who represent a broad spectrum of resource interest, will try to ensure the advice and recommendations that are made are representative of the interests of all users.

The main purpose of the Regional Forest Advisory Committee is to identify forest concerns and issues, so the forest Companies can take them into consideration in their planning process.

The Regional Forest Advisory Committee will help identify indicators that best represent the forest and the social values to be sustained. It is about identifying the local communities' social values, to ensure that the forest resources are being managed in the best interest of present and future generations.

The advice and recommendations provided by the Regional Forest Advisory Committee is an integral part of forest management. The Regional Forest Advisory Committee does not have any decision making powers, but they do provide advice and recommendations to ensure that all local interests are effectively involved in forest management.

The Technical Scientific Committee will be created as necessary to deal with issues as required and as they arise to provide technical advice to the Regional Forest Advisory Committee. Joint meetings between the Regional Forest Advisory Committee and the Technical Scientific Committee may be held at agreed upon times.

WHITECOURT REGIONAL FOREST ADVISORY COMMITTEE (RFAC)

TERMS OF REFERENCE

2. MEMBERSHIP

Please refer to Appendix "A" for the ***Committee Member Representation and Status List.***

Opportunity remains for the addition of new members to RFAC, upon expression of interest and acceptance by other members of the Regional Forest Advisory Committee. Designation of member status will be determined on a case-by-case basis (i.e. someone who does not represent a specific interest group or organization). A member at large may be considered by RFAC on a case-by-base basis. Actual members are selected by their respective interest group or organization.

ACTIVE MEMBERS (VOTING)

Interest groups or organizations are selected by the Regional Forest Advisory Committee as per Appendix "A" from within the communities within the region to represent the views of that organization or interest group.

STANDING MEMBERS (NON-VOTING)

Standing members are representatives of Alberta Newsprint Company Ltd., Blue Ridge Lumber Inc., Millar and Sustainable Resource Development.

AD HOC (NON-VOTING)

Ad Hoc committees may be established from time to time to focus on specific issues and to allow greater community involvement by citizens who are directly affected by those issues. Ad Hoc committee members are invited only for the duration of the issue and are selected based on equitable representation. Ad Hoc committee members will only attend specific RFAC meetings as required.

OBSERVER STATUS (NON-VOTING)

All RFAC meetings are open. Guidelines for observing will be established at the beginning of the meeting at the discretion of the chair. Also, the chair may ask for comments from observers at a meeting. Generally, however, observers are to only watch the RFAC or Ad Hoc meeting with no involvement in the process.

WHITECOURT REGIONAL FOREST ADVISORY COMMITTEE (RFAC)

TERMS OF REFERENCE

3. PROCEDURES AND ISSUE MANAGEMENT

a. RFAC will select and prioritize issues, which could deal with any or all aspects of the forest companies' forest management. RFAC will only deal with one issue at a time. At the end of each issue, recommended issues are prioritized and the next one selected.

b. RFAC will develop and implement its own action plan to address issues selected. Standing members will participate in the discussions to present their viewpoints on issues as required.

c. Documented positions or recommendations from RFAC's investigations will be presented to standing members for response as required.

d. The standing members will seriously consider the recommendations of RFAC as required, then discuss them with the group and respond in writing.

e. All issues, positions and recommendations arising from RFAC will be documented and tracked, along with the standing members' responses.

f. The forest companies will provide an Annual Report for the **May meeting** to RFAC on RFAC's impact on the forest companies operations.

WHITECOURT REGIONAL FOREST ADVISORY COMMITTEE (RFAC)

TERMS OF REFERENCE

4. CHAIR RESPONSIBILITIES

a. The Chair and Vice-Chair of RFAC will be selected for a one year time period, at the **November** meeting, and will be elected from within the active membership list.

b. The Chair is the official spokesperson for RFAC, especially when dealing with the media.

c. The Chair will control RFAC meetings providing people the opportunity to speak and to be listened to.

d. The Chair has the authority to grant observer status to people who show up at the door for meetings. Also, at a meeting, the Chair may ask for comments from the observers.

e. The Chair has the authority to end discussion and evoke closure.

f. In the event the Chair is not in attendance, the Vice-Chair will chair the meeting. In the event the Chair and Vice-Chair are not in attendance, the active membership may elect a designated Chair for that meeting.

g. Chair and Vice-Chair have signing authority.

5. SECRETARY/TREASURER RESPONSIBILITIES
These responsibilities are two separate roles

A. THE TREASURER AND CO-TREASURER OF RFAC WILL BE SELECTED FOR A ONE YEAR TIME PERIOD, AT THE MAY MEETING, AND A SECRETARY WILL BE ELECTED FROM WITHIN THE ACTIVE MEMBERSHIP LIST OR HIRED.

b. The Secretary shall record and distribute minutes and correspondence as required.

c. The Secretary shall ensure minutes are distributed to the members.

d. The Treasurer and Co-Treasurer shall have signing authority.

e. The Treasurer shall produce an annual financial to date and activity report and budget at the **November** meeting.

f. The Secretary shall maintain official records of minutes.

WHITECOURT REGIONAL FOREST ADVISORY COMMITTEE (RFAC)

TERMS OF REFERENCE

6. **MEMBER RESPONSIBILITY**

a. RFAC members will strive to educate themselves on all aspects of the issues being discussed.

b. New members will be assigned to a standing committee member for orientation. This "buddy system" is expected to speed up the orientation process for the new member.

c. Members will try to:
- ♦ listen to and respect others' opinions
- ♦ understand others' views
- ♦ speak directly
- ♦ attend scheduled meetings
- ♦ use common sense

d. Members will try to represent their own views, the views of the public, as well as those of the organization or interest group they represent on RFAC, distinguishing between each.

e. If a member misses 3 meetings in a row without due cause, the interest group or organization they represent will be asked either to reconsider its membership, or to replace the member with someone able to participate on a regular basis.

f. If a member is unable to attend a RFAC meeting, that person will first attempt to inform the Secretary/Treasurer of their absence and if unable to do that, then notify a member of the committee who is attending meeting.

g. Members will attempt to go back to their organizations to acquaint them with the background and issues being discussed and to gather their opinions from this informed perspective.

h. Members will keep their organizations up to date on the progress and documentation of the issues being discussed, along with the responses from the standing members.

i. Members will deliver on assignments they accept.

WHITECOURT REGIONAL FOREST ADVISORY COMMITTEE (RFAC)

TERMS OF REFERENCE

7. NORMS / GROUND RULES FOR CONDUCTING MEETINGS

a. Members will show up on time.

b. Meetings will generally be held on the fourth Tuesday of January, March, May, September, and November and will start at 7:00 p.m. and finish at 9:00 p.m. on time.

c. Decisions will be developed by consensus building techniques, voting only as designated by the Chair. Consensus does not mean that you have to be in 100% agreement with the decision, but that you can live with the decision.

d. Minutes, submissions, and correspondence will be taken and distributed to members and others as agreed to by the committee.

e. Action commitments will be identified in the minutes and tracked.

f. At the end of each meeting, the agenda for the next meeting will be set. Additions or changes may be made at the beginning of any meeting.

g. The Chair will decide if a quorum exists at the beginning of each meeting.

WHITECOURT REGIONAL FOREST ADVISORY COMMITTEE (RFAC)

TERMS OF REFERENCE

8. OTHER INFORMATION

a. RFAC members will not be paid to attend regular or Ad Hoc meeting by RFAC.

b. With prior approval by RFAC, members may be compensated for out-of-pocket expenses, travel, lodging, meals, etc. for RFAC meetings, supported conferences, workshops, tours, etc. where not supplied funding by the organization or interest group they represent.

c. Forest companies will provide a budget to be administered by the treasurer.

9. CHANGES TO TERMS OF REFERENCE

a. The Terms of Reference will be reviewed once a year at the **November** meeting.

b. By agreement amongst RFAC members, the Terms of Reference may be amended, deleted, added to, or changed at any time.

10. MEDIA

a. The Chair of RFAC is the official spokesperson for RFAC and all media requests should be forwarded to the Chair.

APPENDIX "A"

COMMITTEE MEMBER REPRESENTATION AND STATUS LIST

	COMMITTEE MEMBER REPRESENTATION	STATUS
1	**Woodlands County**	Active Member (Voting)
2	Municipal District of Greenview No.16	Active Member (Voting)
3	Yellowhead County	Active Member (Voting)
4	Town of Fox Creek	Active Member (Voting)
5	Town of Mayerthorpe	Active Member (Voting)
6	Town of Swan Hills	Active Member (Voting)
7	Town of Whitecourt	Active Member (Voting)
8	Winter Recreation	Active Member (Voting)
9	Summer Recreation	Active Member (Voting)
10	Alexander First Nation	Active Member (Voting)
11	Alexis First Nation	Active Member (Voting)
12	Trappers	Active Member (Voting)
13	Forestry/Logging Contractor	Active Member (Voting)
14	Environmental Society	Active Member (Voting)
15	Education	Active Member (Voting)
16	Oil and Gas	Active Member (Voting)
17	Sustainable Resource Development	Standing Member (Non-voting)
18	Alberta Newsprint Company Ltd.	Standing Member (Non-voting)
19	Blue Ridge Lumber Inc.	Standing Member (Non-voting)

Note: A separate listing of members and their attendance at meetings is to be kept up to date by the Secretary and made available in the minutes.

Alberta Newsprint Company

DETAILED FOREST MANAGEMENT PLAN

APPENDIX I

BERLAND SMOKY RAD PLAN

REFERENCE # 0-128

DEVELOPED WITH The Silvacom Group

July 1, 2011

July 1, 2011

The Berland Smoky Regional Access Development (RAD) Plan was developed with the support of the Foothills Research Institute. This plan was led by the Government of Alberta represented by Sustainable Resource Development in partnership with the Foothills Landscape Management Forum (FLMF). With a focus on Integrated Land Management, both forest and energy sector companies participated in this effort. Alberta Government staff from Sustainable Resource Development (SRD) and Energy provided support, advice, and local expertise.

This Plan was developed as a model of collaboration between different resource users. Over 2 years has been spent on this coordinated effort and the FLMF member partner's below wish to have this plan approved and incorporated into the enhanced approval process, forest management plans, and validated in an new information letter.

Sincerely,

Foothills Landscape Management Forum: Program Lead: _____ and member companies;

Canadian Natural Resources Ltd. Per_____

Hinton Wood Products: Per_____

ANC Timber Ltd. Per:_____

Suncor Energy Inc. Per: ----------

ConocoPhillips Per: ----------

Devon Canada Corporation Per: ----------

Husky Oil Operations Ltd. Per: ----------

Talisman Energy Inc. Per: ----------

Canadian Forest Products Ltd Per: ----------

Encana Corporation Per: ----------

Tourmaline Per: _____

Paramount Per _____

Shell Canada Per _____

Foothills Forest Products Per:_____

EXECUTIVE SUMMARY

Four years ago, the Foothills Landscape Management Forum (FLMF) initiated a unique integrated industrial access planning process. In June, 2009, a Terms of Reference was established between government and the FLMF that outlined the governance structure, objectives and desired outcomes of the planning process referred to as the Regional Access Development (RAD) plan. The RAD plan is a significant advancement over past integrated land management (ILM) plans in the province, and perhaps, a prototype for further integrated land management plans.

The unique nature of this initiative is that it was jointly managed by government and industry to be used as an example for other areas of the province. There was significant investment and cooperation from the forest and energy industrial sectors operating in the foothills of Alberta. Through the FLMF, member companies received direction from Alberta Sustainable Resource Development (ASRD) and met on a regular basis over the past 22 months.

The RAD plan also incorporated new components including measuring land disturbance towards recommended land disturbance targets, assessing the achievability of meeting or exceeding land disturbance targets, refining the targets, ongoing monitoring and reporting, and mitigation strategies being incorporated directly into the plan.

The RAD plan identifies the permanent industrial primary and secondary roads corridors (EAP Class I and II) required over the next 30 years and beyond for a large landscape covering just over 1,000,000 hectares. It is anticipated that the corridors will support both the energy and forest sectors long term needs including non-conventional shale gas development.

OBJECTIVES (extracted from the approved TOR June 19, 2009)

1. Develop and implement an integrated industry access development plan that locates permanent road infrastructure for the long term (EAP Class I and II roads).
    - Through integration the RAD plan process is anticipated to result in an estimated 40% reduction in industrial access requirements as compared to "plan as you go".

2. Assess the feasibility of the ASRD-proposed land disturbance targets:
    - Maintain open route density for grizzly bear management within ±10% of current values;
    - Reduce the percentage of the area within 250 meters of anthropogenic disturbance by 15% from current values; and,
    - Show demonstrable progress toward targets within 5 years, and project progress over 20 year intervals.

3. Recommend alternative targets if the ASRD-proposed land disturbance targets (listed in pt. 2 above) are unattainable or unrealistic to continue to enable development of the resources within the RAD plan area.

4. Report on and track "open route densities" relative to targets suggested in draft grizzly bear recovery plans as follows:
    - Maintain open route densities below 0.6 km/km^2 in core Grizzly Bear Watershed Units (GBWU) and 1.2 km/km^2 in secondary GBWU.

5. Identify the opportunities, challenges, risks and benefits to industry and government of a land disturbance target-based management approach.

6. Inform and provide input into the LUF processes.

7. Monitor and track the actual impact to the landscape. These processes allow for better understanding, earlier intervention and action plan development to reduce the potential negative impact versus the current "plan as you go" approach. The RAD plan is designed to be a living and evolving plan for this exact purpose.

DEFINITIONS

Anthropogenic footprint: includes all human-caused disturbances on the landscape (roads, pipelines, well sites, seismic lines, trails, cut blocks, etc.)

Open route access: is any road, trail, or right of way (ROW) that permits motorized access for a 4X4 highway vehicle during summer conditions. Used for tracking against the density target for grizzly bear management.

Deactivated Road: a road that has been temporarily retired that will be used again in the future. Deactivation includes the retention of the road grade and could include removal of watercourse crossings, seeding, rollback, water bars and other methods to reduce erosion potential, reduce maintenance needs and prevent on-highway vehicle use.

Reclaimed Road: a road that has been returned to its previous productive and vegetative state. This includes establishing stable water drainage, contouring surfaces to a stable landform and reforestation on areas suitable for tree planting.

Redundant road: a road that is no longer required because there is a road that exists or is created that can provide the same business value (duplicate roads to the same site or area within 250m of "the corridor" not including "loop" roads).

Permanent access: (usually all weather) roads that will be required for long term industrial activities (i.e. second rotation, access to processing plants). For purposes of the RAD plan this includes all primary and secondary corridors (E.g. EAP Class I and II). This does not mean that the access routes will remain open for traffic at all times or built to an all-weather standard all the time. There will be cases where these access routes will be deactivated for periods of non-use; however, they will not be reclaimed.

Primary corridors: EAP Class I roads required for both the energy and forest sectors providing access to a suite of townships with known resource extraction activity. They will provide permanent access approximately 10 kilometers apart. Primary corridors will be permanent all weather access and capable of handling heavy year-round traffic loads and will be built when necessary to two lane, with a running surface up to an 11 meter top and a 30-40m ROW.

Secondary corridors: EAP Class II roads will be permanent all weather access essentially branching off the primary corridors and will provide permanent access to the development area. The routes would be suitable for energy and forest development and are considered necessary for first and subsequent second pass harvesting and/or access to well sites, etc. These may be deactivated from time to time but never fully reclaimed.

Temporary access (Tertiary roads): existing and proposed future access that will not be required for the long term as either a primary or secondary corridor and will be reclaimed when the intended use is complete.

RAD PLAN

This submission is a summary report in response to the Terms of Reference: "Regional Access Development (RAD) plan for the Berland Smoky Area" established and approved on June 19, 2009. In the two years leading up to this submission since the TOR was approved there were several planning meetings, workshops and industry sector reviews as well as a six month delay waiting for the conclusion of the upstream gas and oil "Enhanced Approval Project" (EAP) in the summer of 2010. Background information that supports this submission such as RAD plan process, planning steps, data sets, governance structure and learning's can be found in a separate report titled "Berland Smoky Regional Access Development plan- process and learning's 2011".

The RAD plan has been developed to optimally address the development footprint and associated EAP Class I and II access roads within the planning area to address:

- ✓ Habitat alteration and fragmentation for threatened woodland caribou and grizzly bear
- ✓ Optimal coordination making best efforts to plan and develop lineal footprint and access routes (roads) that meet the needs of the many industrial users in this area
- ✓ Identify unneeded roads and make recommendations for a subsequent process to address deactivating and reclaiming roads that are no longer necessary for development
- ✓ ASRD enhanced approval processes and improved regulation so that industry road applications proceed through the adjudication process in as efficient manner as possible

This level of operational and tactical integration will be considered input into the Land Use Framework Regional Plans (e.g., Upper Peace and Upper Athabasca) when they are developed for this area. This is also required for input into specific strategies for environmental values such as watershed management, grizzly bear, caribou, rainbow trout, and addressing the impacts of the mountain pine beetle.

The RAD plan is a projection of EAP Class I and II access required by industry (to the best of their knowledge in 2011) based on current allocations of gas and oil and forest tenures. The new and upgraded access is expected to be built over the next 30 years subject to market conditions (primarily natural gas).

Objective 1 in the TOR states that the RAD plan will "Develop and implement an integrated industry access development plan that locates permanent road infrastructure for the long term (EAP Class I and II roads)".

The map attached shows the all of the industry proposed EAP Class I and II primary and secondary road locations within 250 meters of the centre line. The roads are a mixture of

new access roads and upgraded access roads. Roads that may be deemed as unnecessary are noted as potential targets for deactivation, restoration and/or reclamation.

PROGRESS TOWARDS TARGETS

ASRD Recommended Land Disturbance Management Targets (TOR):

- maintain the open route density targets for grizzly bear management including within ±10% of current values, and
- reduce the percentage of the area within 250 meters of anthropogenic disturbance by 15% from current values, and
- Show demonstrable progress toward targets within 5 years, and project progress over 20 year intervals.

For purposes of tracking and assessing the targets the RAD plan is broken into two categories: anthropogenic footprint for caribou and open route density for grizzly bear.

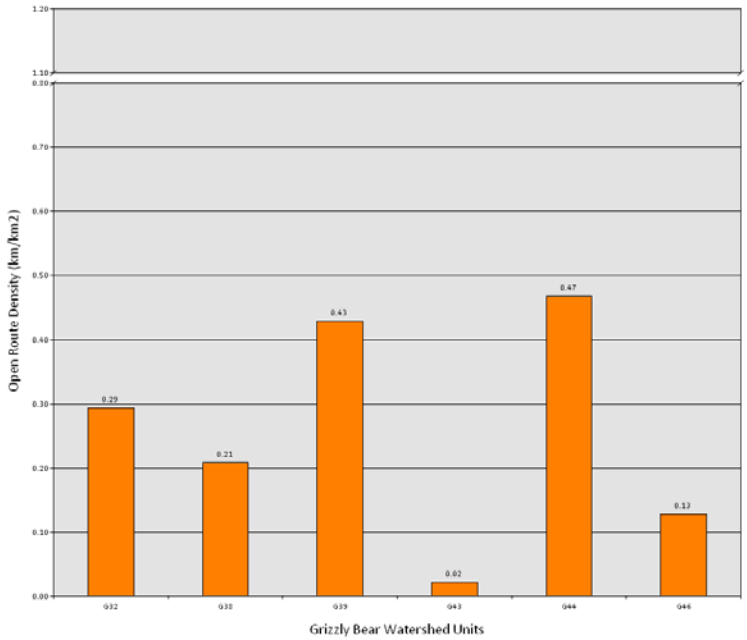
It is recognized by government and industry that the creation of an anthropogenic footprint has an effect on other values. The RAD plan process is the primary industry strategy make best efforts to integrate and plan roads and lineal corridors. This should result in reducing the amount and effects of access built. Once access is either proposed to be built or approved under this plan various environmental standards are employed (i.e. erosion control, creek crossings, etc) to mitigate the localized impact. In addition, as human use increases as a result of the access, strategies can be employed to manage the effects of human use.

The RAD plan is by design a document that is intended to be improved upon over time to provide a basis for industry and government to manage industrial footprint more effectively and collaboratively than ever before. There are areas that will require intensive discussions and resolution to further improve the value of the RAD exercise such as the implementation of landscape level footprint restoration.

Open route density

Open routes are defined as any existing road, trail, or ROW that permits motorized access for a 4X4 highway vehicle during summer conditions. All EAP Class I-IV roads and some known traveled pipelines and seismic lines are included in this analysis. May 2010 was determined to be the baseline from which to measure existing open route density. The baseline open route densities were grouped by habitat type (i.e., core or secondary GBWU) and results are shown in Figures 1 and 2.

Figure 1. Baseline open route density by core GBWU as of May, 2010.



Densities were recalculated in May, 2011 taking into account the proposed RAD plan routes (EAP Class I, II and III roads) and any other variances in the data during the past year. Results are presented in Tables 1 and 2. The percent change (Column D) was calculated by subtracting the value in Column C from the value in Column B, dividing it by the value in Column B and then multiplying it by 100.

Table1. Baseline open route density by core GBWU with proposed RAD plan (May, 2011).

Core GBWU	Baseline Open Route Density (km/km^2)	Baseline + new corridors Open Route Density (km/km^2)	% Change (+/-) Calc: (B-A)/A
G32	0.29	0.48	+66%
G38	0.21	0.42	+100%
G39	0.43	0.50	+16%
G43	0.02	0.28	+1300%
G44	0.47	0.51	+8%
G46	0.13	0.16	+23%

Figure 2. Baseline open route density by secondary GBWU as of May, 2010.

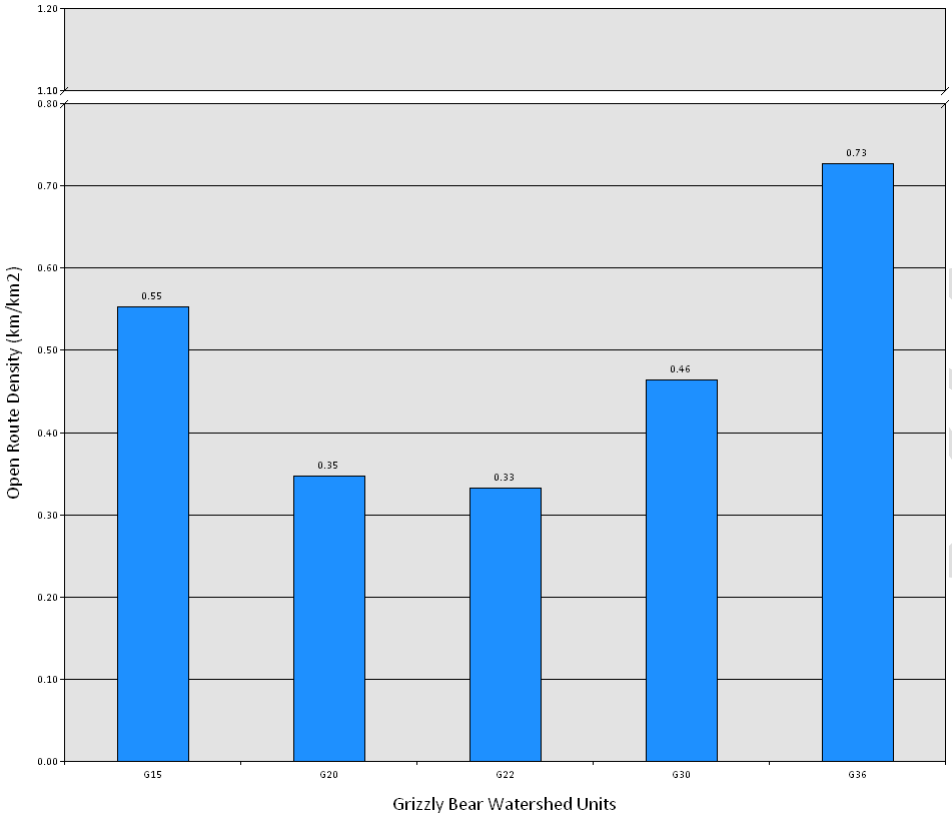


Table2. Baseline open route density by secondary GBWU with proposed RAD plan (May, 2011).

Secondary GBWU	Baseline Open Route Density (km/km²)	Baseline + new corridors (proposed RAD Plan) Open Route Density (km/km²)	% Change (+/-) Calc: (B-A)/A
G15	0.55	0.61	+11%
G20	0.35	0.52	+49%
G22	0.33	0.43	+30%
G30	0.46	0.60	+30%
G36	0.73	0.77	+5%

Note: the tables and graphs above do not include any existing barriers as effective (i.e. gates, creek crossing removed etc.)

REPORTING ON TARGETS

A) Open Route Density Target assessment:

Target 1. Maintain open route density for grizzly bear management within ±10% of current values.

Table 3. Comparison of baseline to permanent open routes in core GBWU.

Core GBWU	Baseline Density (km/km²)	Permanent Density (km/km²)	+ / -	difference	% change	Meets SRD target (yes/no)
G32	0.29	0.48	+	0.19	66	no
G38	0.21	0.42	+	0.21	100	no
G39	0.43	0.50	+	0.07	16	no
G43	0.02	0.28	+	0.26	1300	no
G44	0.47	0.51	+	0.04	8	yes
G46	0.13	0.16	+	0.03	23	no

Table 4. Comparison of baseline to permanent open routes in secondary GBWU.

Secondary GBWU	Baseline Density (km/km²)	Permanent Density (km/km²)	+ / -	difference	% change	Meets SRD target (yes/no)
G15	0.55	0.61	+	0.06	11	no
G20	0.35	0.52	+	0.17	49	no
G22	0.33	0.43	+	0.10	30	no
G30	0.46	0.60	+	0.14	30	no
G36	0.73	0.77	+	0.04	5	yes

Assuming all existing routes remain in place, all proposed routes are constructed, and all routes are open, the % change target would be exceeded in 5 of 6 Core GBWU and 4 of 5 Secondary GBWU. Cumulatively, **with no access restrictions (mitigation) applied**, the target would be exceeded by 55.9% in Core GBWU and 10.9% in Secondary GBWU. Overall the target would be exceeded by 27.7%.

Assessment of this proposed target provides limited value because the current state of access development in each GBWU is not uniform and therefore overall assessment of change is an inappropriate measure. For example, it is easy to meet the target in GBWU with high existing access, which will have a higher allowance for more access and at the same time need little additional access because development is already well supported by existing access. Conversely it takes little new development in GBWU with low existing access to exceed the target, and at the same time these are also the areas that need the most additional access to support new development.

Although this proposed target was not met with the stated assumptions, total open route density was below target # 2 for all GBWU (see figure 3 + 4). Mitigation strategies could reduce open route density to zero, if desired (see section on mitigation). Mitigation measures may include timing of road construction/reclamation to reduce physical route density, road deactivation and/or imposition of public use closures to increase closed route density, thus reducing open route density.

B) Assessment of the feasibility of the Anthropogenic disturbance target:

"Reduce the percentage of the area within 250 m of anthropogenic disturbance (roads) by 15% from current values."

The RAD plan proposes new construction and/or upgrading of existing access to permanent access in the amount of 53,095 hectares when buffered by 250m each side of the disturbance (See table 5) which puts the plan at an increase of 52% in class I and II roads. However, the overall anthropogenic buffered footprint is actually decreased by 17% when considering natural restoration of seismic lines (see appendix Results of lineal inventory). Thus overall, the ASRD target is met.

Table 5. Hectares of "area of influence" buffered by 250m each side of ROW center line

EAP Class	Lineal Disturbance (Industrial Footprint) Description	Baseline "buffered" by 250 m industrial footprint (ha)	new EAP Class I and II road ROW areas proposed + buffers of 250 m (ha)	Columns I + II (ha)	% Change	Area re-habilitated (ha)
I	All weather road - Paved	5,135	0	5,135	*0.0%*	
I	Gravel road – 2 lane, all weather	22,482	5,756	28,238	*25.6%*	
II	Gravel road – 1 lane, all weather	75,979	46,343	122,322	*61.0%*	
Sub-total EAP Class I and II roads		103,596	52,099	155,695	*50.3%*	
III	Unimproved road	58,292				
IV	Trail	10,440				
V	Winter Road	54,393				
n/a	Reclaimed Trail					1,496
n/a	Deactivated Road					3,278
n/a	Rehabilitated Road					4,451
Sub-total Other Roads		123,125				
n/a	Unclassified ROW	292				
n/a	Pipeline ROW	154,018				
n/a	Transmission Line ROW	3,624				
n/a	Reclaimed historic ROW					842
n/a	Railway ROW	5,690				
Sub-total Other ROW		163,624				
n/a	Historic > 5m wide seismic	653,338				
n/a	Rehabilitated > 5m wide seismic lines					[1]182,934

[1] Extrapolated from the Little Smoky lineal inventory results Oct 2010: A line was considered "restored" once there was sufficient coniferous vegetation re-established on the line to: 1) prohibit access by ATV's and 2) discourage any deciduous browse species from growing in the understory. Source Kirby Smith Fish and Wildlife, Edson.

Sub-total Historic Seismic lines > 5m wide		653,338				
Total Baseline	Hectares	1,043,683	Total Area Considered Rehabilitated			193,001

The net result shown in Table 6 Target summary calculation is that the anthropogenic target can be met when considering that 28% of the historical seismic lines have naturally recovered. This is because historical seismic lines (e.g. > 5m width) are the dominant lineal feature with the RAD plan area. Any new seismic lines are not counted as they are low impact (< 3m width).

Table 6. Summary table: Anthropogenic target calculation.

Total Baseline Lineal Footprint	**1,043,683 ha**
New Footprint Added by new EAP Class I and II roads	**52,099 ha**
Total Baseline Footprint	**1,095,782 ha**
Total Footprint "Considered" Rehabilitated	**-193,001 ha**
Total "Net" Baseline Footprint	**902,781 ha**
Percent % change (new Baseline footprint to former Baseline plus RAD EAP I & II additions)	**-18%**

CHALLENGES

The RAD plan demonstrates that the targets outlined in the TOR can be met but only with cooperation and support from the regulator (government) for open route density and with the inclusion of natural restoration of seismic lines for anthropogenic disturbance. However, the targets given need refinement to provide clearer direction to industry when considering development of an ILM plan of this nature in other areas. A full review and recommended refinement of the targets and subsequent mitigation strategies is contained later in the section on recommendations.

One of the deliverables outlined in the TOR not met with the RAD plan was to align pipeline routing with the access development needs. It was found early on that the energy sector was unable to clearly project long term pipeline needs. Although it is recognized that it is desirable that the same corridors be used from an ILM perspective, the business realities of that sector made this projection impossible. This will be compounded by the initiation of applying shale gas technologies to the area with multi-well pad drilling. However having this plan and the

seismic vegetation inventory available for planner's integration will be easier to achieve once the business needs dictate the need for additional pipelines.

It must be understood that this plan outlines a projection of infrastructure (access) requirements required over the next 30 years. Not all of the roads will be built at once and the opportunity for reclamation will increase over time resulting in better results with respect to the targets than reported.

ASSESSMENT OF TARGET & MANAGEMENT RECOMMENDATIONS

The RAD planning process was a learning experience for both the government and the industry and is an important step in the advancement of ILM planning in Alberta. Based on the learning's there are several areas and management strategies that the FLMF recommends as improvements to better meet the objective of continuous improvement and adaptive management.

In addition the TOR outlined that the RAD planning process objectives include: "Identify the opportunities, challenges, risks and benefits to industry and government of a land disturbance target-based management approach." The following recommendations are intended to provide for an assessment of the targets and potential improvements:

1. Communications

Recommendation 1: The government of Alberta through ASRD and the FLMF should jointly undertake the development and implementation of a comprehensive communications plan to educate others in the development of ILM plans. The strategy would also be used to seek ongoing support from public and other stakeholders for projecting over long periods the infrastructure (access) needs of industry for large landscape areas following extensive allocations of the resources. With projections of actual access needs established land managers will be better equipped to deal with cumulative impacts of land use decisions.

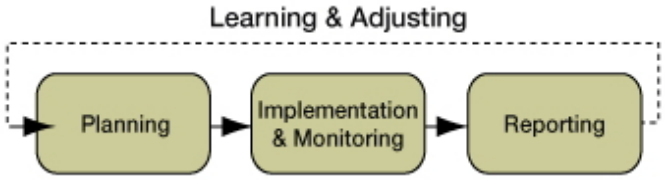
2. Periodic Review

Recommendation 2: The RAD plan should be jointly reviewed by government and the FLMF after a period of two years following approval and then in a timely manner after that review is complete. This review would include the following components: Are the access roads (EAP Class I and II routes) planned still valid considering any changes to industry's business needs (i.e., transition to non-conventional gas development such as shale gas, new technologies, new target energy formations), any changes to environmental or social value choices as result of GOA land use planning exercises,

results of monitoring and reporting, new research, access needs of new industries (i.e., mining or commercial recreation etc.

3. **Outcome-based management**

The RAD plan is a projection of access needs over time and is an important step in moving towards "outcome-based" management. Outcome or results-based management is a life-cycle approach to management that integrates strategy, people, resources, processes and measurements to improve decision-making, transparency, and accountability. The approach focuses on achieving outcomes, implementing performance measurement, learning and changing, and reporting performance.



Recommendation 3. The government and the FLMF should undertake the neccesary steps to move towards an outcome based management approach upon approavl of the Rad plan. The preliminary concept was presented to government in January 2011 titled "Foothills Land Stewardship Project". The first step will be to jiontly establish a Terms of referacne for this project.

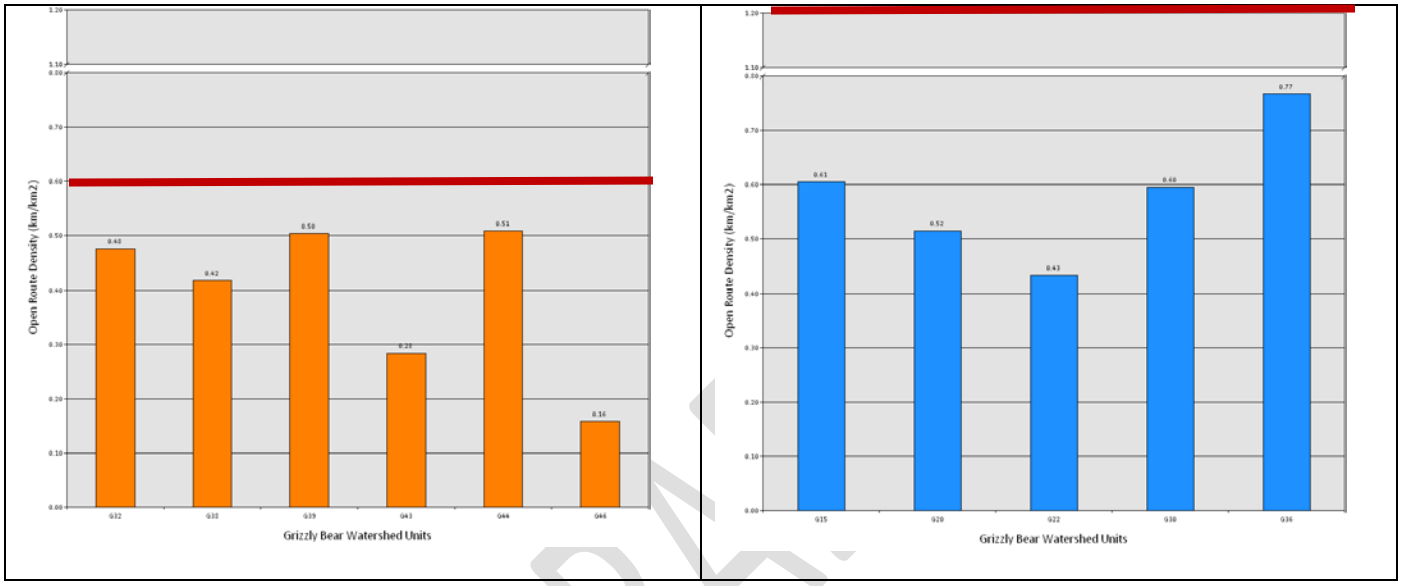
4. **Establish new targets**.

Open route density: Assessment of the aspirational target provides limited value because the current state of access development in each GBWU is not uniform and therefore proportion is an inappropriate statistic. It is easy to meet the target in GBWU with high existing access, which will have a higher allowance for more access and at the same time need little additional access because development is already well supported by existing access. Conversely it takes little new development in GBWU with low existing access to exceed the target, and at the same time these are also the areas that need the most additional access to support new development.

The FLMF recommends that the open route target be replaced as follows:

Open route density: should be tracked by density of open routes per km^2 over time which would provide consistency with grizzly bear research and recovery planning (Figure 3). It also removes the problem associated with staying within 10% of current values which is heavily influenced by pre-existing access density.

Figure 3. Proposed RAD plan open route densities compared to grizzly bear targets (May, 2011).



***Anthropogenic disturbance*:** The application of applying a 250 metre buffer to all disturbances has been a long standing and contentious issue with some managers. Arguably the area of influence on differing intensities of disturbances (i.e. an active road versus an old seismic line; a producing well versus drilling and completion activities) should be different but is difficult to assess and verify. The best measurement of anthropogenic disturbance, in the view of the FLMF, is to track actual hectares of disturbances over time to a better indication of where to focus future restoration (e.g. best bang for the buck) and removes the "skewed" or over stated influence of the seismic layer. This will easily demonstrate where opportunities for management intervention such as habitat restoration should be applied within the landscape. The following table (7) shows the actual hectares (non-buffered) of disturbance.

Table 7. Actual hectares of disturbance by category

FLMF Road Class	EAP Road Class	Description	A) Existing ROW (ha)	B) Proposed RAD plan + Planned IL 2008-05 corridors	**A + B**	% change increase or (decrease)	Reclaimed Hectares	Net total
1	I	All weather road - Paved	580	n/a	**580**	0%		
2	I	Gravel road – 2 lane	1,361	344	**1,705**	+25%		
3	II	Gravel road – 1 lane	3,051	1,897	**4,948**	+62%		
4	III	Unimproved road	2,037	20	**2,057**	+ 1%		
5	IV	Truck Trail	248	- 47	**201**	- 19%		
SUBTOTAL (FLMF Class 1 – 5)			**7,277**	**2,213**	**9,491**	**+30%***		
6	V	Winter Road	1,224	n/a	**1,224**			
7	n/a	Unclassified / unknown	3	n/a	**3**			
8	n/a	Deactivated Road	181	n/a	**181**			
9	n/a	Reclaimed Road	152	n/a	**152**			
10	n/a	Trail/Cutline	18	n/a	**18**			
n/a	n/a	Pipeline	13,447	n/a	**13,447**			
n/a	n/a	Transmission Line	218	n/a	**218**			
n/a	n/a	Railway	228	n/a	**228**			
14	n/a	Overgrown ROW	5	n/a	**5**			
n/a	n/a	Historic Seismic <5m	29,515	n/a	**21,080**	(28%)[2]	***(8,264)***	
Subtotal					**36,556**			
TOTAL (All categories)			**52,268**	**2,213**	**46,047**	**-12%*** **		

* Shows that in FLMF road classes 1-5 there is a net increase in roads by 30%

**28% reclaimed extrapolated from the Little Smoky lineal inventory

*** 12 % reduction in footprint if you applied the results of the inventory above

Recommendation 4: Open route densities: The targets should be revised and reported on annually. Open densities: The target for open route densities should align with grizzly bear recovery thresholds of 0.6 km of open route / km^2 for core grizzly bear and 1.2 km of open route /km^2. for secondary grizzly bear habitat. The achievement (or not) of this target should be reported on annually.

[2] Extrapolated from the Little Smoky lineal inventory results Oct 2010: A line was considered "restored" once there was sufficient coniferous vegetation re-established on the line to: 1) prohibit access by ATV's and 2) discourage any deciduous browse species from growing in the understory. Source Kirby Smith Fish and Wildlife, Edson.

Recommendation 5: Anthropogenic disturbance: The target should be revised to include only the actual hectares of disturbance (i.e., footprint) as opposed to the buffered hectares. The achievement (or not) of this target should be reported on annually in the monitoring report.

Recommendation 6. That ASRD and the FLMF utilize the seismic inventory and establish appropriate government sanctioned "protection" of naturally or artificially reclaimed lineal disturbances. Naturally reclaimed lines should be treated as a "Forested area" and artificial reclamation should have a sanctioned protection of investment. This could be considered as part the mandate of the task group discussed later in the restoration section.

5. Grizzly bear management

Managing road densities will not, on its own, sustain grizzly bear populations. In the past, management of road densities was used to reduce the chance of interaction of bears and humans. Open Route Density management is only one contribution towards effective grizzly bear management. The overall plan must include a combination of physical footprint management (i.e., RAD planning) and a human use plan (access management).

The RAD plan land base is important grizzly bear habitat and large portions are designated as core or secondary grizzly bear areas. Population densities in the area are among the highest in Alberta. High levels of human-caused mortality are the direct cause of Alberta grizzly bear population declines. Most grizzly bear mortality occurs during the fall hunting season[3]. The management strategy must be to maintain low levels of human-caused mortality through footprint management and human use management. The future vision is for the impact of the long-term road footprint to be minimized and human activities carrying on in ways that don't elevate human-caused grizzly bear mortalities to unacceptable levels.

In the past, the primary method imposed on industry was the use of gates to restrict public use. There are currently at least 161 barriers installed or built in the RAD plan area. For the purpose of this plan and reporting on open route density all existing barriers were considered to not be effectively restricting public use and therefore existing barriers had no impact on open route density calculations. As outlined in the restoration section this method should be abandoned as a primary strategy and replaced with more effective measures such as establishment of forest land use zones, education, and enforcement.

With the use of mitigation strategies available to government it is conceivable that open route density could be reduced to zero, if desired. With the learning's of the RAD plan process, industry and government can now use the RAD plan and its ongoing commitments to: a) partner on the

[3] See FRI grizzly bear research studies

development of landscape goals and objectives and b) bring their collective "management tools" together to better meet outcomes.

Recommendations 7: Grizzly Bear Management: The FLMF recommends that the government consider bringing the tools available to manage the issue of human caused mortality of grizzly bears.

a) Abandon the use of physical barriers as a primary human use strategy and replace with more effective measures such as establishment of forest land use zones, education, and enforcement.

b) Consider change in ungulate (moose elk, deer) hunting seasons to when bears are inactive and

c) Share in education and enforcement the new innovative measures outlined in a and b above.

6. Caribou management:

As discussed above human caused mortality of grizzly bear is the direct cause of population decline. Predation by carnivores is thought to be the main influence on caribou populations (Source) Human-caused mortality is not a large source of caribou mortality except in localized situations such as collisions along Highway 40 south of Muskeg. Local situations will be addressed as they arise. If poaching is determined to be a cause of caribou mortality then the use of the additional enforcement officers would be used as described in the open route access grizzly bear section.

Recommendation 8: Human Use: The FLMF recommends management of human use of active roads and other access through regulation and enforcement, not physical barriers. For example, gates and other physical barriers on active roads will be replaced with Forest Land Use Zones (FLUZ) or other regulatory method, coupled with increased levels of enforcement. Examples of mitigation include:

- FLUZ signs instead of gates.
- Emphasize control of human activity type (e.g. seasonal access, or activities involving guns) in preference over control of any human access.
- More enforcement/monitoring/population management officers (Aboriginal?).
- Signs and enforcement cost far less than gates and will be more effective.
- Industry does signs, government does FLUZ and enforcement.
- Note that the proportion of deactivated and reclaimed roads will increase, which will lower the open route density. Barriers on deactivated or reclaimed roads are still a useful tool.
- In some cases voluntary use of gates might be desirable on active roads – company choice.

7. Road Deactivation, Restoration and/or Reclamation

In addition to using ILM to reduce the amount of access needed, restoration is an important part of long term mitigation.

There are three categories of restoration:

i) Company disposition obligation;
ii) Project specific; and

iii) Landscape level (FLMF).

i. Company obligation restoration (Reclamation Certificates)

This is ongoing company-specific restoration for abandonment of roads (LOC's), well sites, inter-cut block roads, and other disturbances once resource activities are complete. This category will continue to be dealt with by the company and the regulator (government). The only role the FLMF will have is tracking the reclamation and disturbance layers as part of the RAD plan monitoring report

ii. Project specific restoration

In certain areas it may be determined that a company's project plans may warrant project specific restoration. In the past, project plans were primarily developed for "single purpose" without much regard for other operators on the landscape. As a result mitigation strategies employed primarily were to comply with imposed or negotiated disposition conditions such as: use existing access, reduced road standards, timing restrictions, equivalent to frozen etc. The net result is that many access routes currently being used by industry followed historical exploration seismic lines or were suitable to "freeze in" with little or no regard for whether the route was suitable for other operators such as log haul, best location for creek crossings, dry ground, future traffic loads as development progresses or suitable to build a more permanent grade (higher class of road).

Recommendation 9: Use of existing disturbances: The practice applying the condition of "best practice" of using existing access as the preferred corridor route will be stopped unless it is proven to be in the best location. In many cases using existing access and not coordinating with other users can result in duplication of roads, redundant roads, access being created in the wrong location to suit both industry's needs.

When reviewing this historical practice and projecting permanent corridor access requirements as outlined in the terms of reference in the RAD plan, many routes encounter existing access locations (usually historical seismic lines) that must be relocated, realigned, upgraded, or replaced in their entirety thereby creating redundancy. There are two categories of redundant as follows: 1. **Future redundant** resulting from constructing a new route in a better location suitable for industry and 2. **Historical redundant** is pre- 2010 that already exists as a result of past approved practices.

The FLMF member companies recognize that an important part of this RAD plan is to project long–term access needs, assess road redundancy, monitor towards targets and provide suggestions about how to restore access that is no longer needed (including the future and historical redundant roads). However this complex issue requires a detailed assessment of the landscape level benefit and mechanisms to implement effective restoration that will address access management objectives for caribou and grizzly bear.

Some of the redundant roads are defined and have been mapped in the RAD plan supporting data base at FRI.

To deal with the issue of creation of redundancy the industry recommends the following interim strategy:

Recommendation10. Restoration of redundant access:

a) When a proponent proposes to build a new RAD approved EAP Class I and/or Class II road, and that new road results in the creation of a redundant access road (that is also owned by the proponent), restoration of the redundant road will be proposed for restoration at the same time as constructing the new access road.

b) When a proponent proposes to build a new RAD approved EAP Class I and II road, and that road results in the creation of a redundant road (that is NOT owned by the proponent) the proponent will work with the existing owner of the redundant road to factor the redundant road's restoration into the landscape level road access restoration plan below: (see recommendation 10).

c) Historical redundancy: This category will also be dealt within the landscape level restoration plan as below. (See recommendation10).

iii. Landscape level restoration

This category is intended to develop a sustainable mechanism to assess, prioritize, resource and restore historical industrial footprint in the RAD plan area. It does not replace the other categories above or specific company obligations for reclamation certificates (RC's). This category may be managed by the FLMF and the regulator, on behalf of its member companies which will be determined by the task group (see recommendation 10), for the entire RAD plan area to ensure that the best value and habitat restoration effectiveness is achieved.

<u>Landscape level restoration selection:</u>

One of the problems with the RAD area is that it is:

- Not developed homogeneously,
- It is not fully developed, and
- existing development is not winding down, rather it appears to be increasing

A vast majority of existing wells are still producing and require access for the foreseeable future to maintain production. Facilities and pipelines are likely to process and transport increased energy resources from the plan area. Further, new mineral rights sales and subsequent application of new technologies will require additional or "enhanced" access roads to support exploration and well completions. Thus, many road access requirements are likely to exceed the current EAP threshold of > 100 days.

In addition, the forest sector has still not completed its first pass harvesting which means that most access will still be required to harvest reserve stands. Therefore, the selection of landscape-level unneeded roads or historic lineal industrial footprint is not so much of a prioritization exercise, rather it is a strategic assessment where the opportunity for restoring

unneeded access roads and/or un-needed historic lineal footprint is a 'good fit" with restoring habitat effectiveness for caribou and/or grizzly bears.

The industry wants to avoid: (a) unwarranted deactivation or restoration that has little or no impact on addressing habitat management issues for caribou and/or grizzly bear or (b) restoring or deactivating access roads or historic lineal footprint (where the latter makes sense, i.e., not creating "new" footprint) that remains needed or necessary.

The FLMF has identified the following as priority candidates for assessment of deactivation, restoration and/or remediation opportunities (not necessarily ordered in importance):

- Redundant roads ,
- historical "old" >5m wide seismic lines not already on a trajectory to recovery,
- reducing width of existing pipelines where there is little realistic opportunity that the pipeline may need to be twinned in the existing ROW,
- abandoned "orphan" well sites,

While it is recognized that not all of the above contribute towards meeting the target of reduction of road classes 1-5 see table below, all have value in reducing the area of influence of the disturbance (i.e., as shown in Table 4 with natural recovery of seismic lines). For example very few of the redundant roads created if restored will contribute to reducing open route access as they are mostly winter access (EAP Class V and VI)

Recommendation 11 Landscape level restoration: The FLMF recommends that the member companies, CAPP, AFPA, and ASRD strike a specific task team to address the issue of landscape level restoration in a timely manner.

The landscape restoration task group – made up of interested FLMF participating partners, government and others will review deactivation, restoration and/or remediation recommendations in a new process – the ToR for that process is to be defined which may include provincial scale. At the minimum it will include: who is involved, how deactivation, restoration and remediation are defined, and how recommendations are developed and assessed, types of deactivation, restoration and remediation, engagement and interaction processes for road owners, how and who resources road deactivation, restoration and reclamation; potential incentives that could be used to encourage timely deactivation, restoration and reclamation ; and how the entire process fits with the EAP process and new Public Land Act Regulations ,

8. Impact mitigation is primarily applied through a complex basket of regulations, policies, ground rules, disposition conditions, and industry practices. Arguably the mitigation basket is inadequate because cumulative effects on some resource values (e.g. species at risk) have not been successfully mitigated in accordance with GOA policy. This approach also places industry in the unfortunate position of trying to manage in areas where industry may have

created an impact but has no control (i.e. no responsibility or authority to mitigate) such as public access (human use) and species at risk population management.

Perhaps the most important improvement the RAD plan brings to the business model is to combine the areas of responsibilities of industry and government into one "place-based" access management strategy that provides input into other strategic planning initiatives (e.g., regional land use plans).

The RAD plan is a step in that direction whereby it outlines the opportunity to combine industrial ILM planning (i.e., access routing and industrial footprint management) with government tools to address human use and wildlife management and its potential impact resulting from the access development (see Table 1).

Recommendation 12. Shared responsibility: The government and industry desire additional development in the area, however, they also want effective management strategies employed to reduce the negative impacts of development on other values.

The FLMF recommends that industry manage and apply strategies to minimize and mitigate anthropogenic disturbance on habitat (vegetation) for key species like caribou and grizzly bear and that government maintain the accountability for assessing, and where feasible/practical, employing all available strategies available to manage human use of anthropogenic disturbance footprint and access routes and for wildlife population management.

9. The RAD plan is a "first ever" attempt within Alberta to forecast an integrated access development plan at this scale with a commitment for adaptive management, continuous improvement and annual monitoring to targets. Ultimately the RAD plan will provide a unique opportunity to also jointly develop and evaluate cumulative effects management with respect to land development on public lands.

Recommendation 13. This RAD plan should be incorporated in the EAP landscape assessment Tool (LAT[4]) as over-arching direction for road developers.

APPROVAL

RAD plan finalization and implementation and other similar ILM initiatives are, at this time, voluntary mitigation measures primarily undertaken by industry. It is the recommendation of the FLMF that key component's of the RAD plan be integrated with ASRD Enhanced Approval Processes. In addition, the RAD plan may be formally approved by government under the authority of the "Land Stewardship Act".

Government approval of the RAD plan includes the plan's amendment process and the development and distribution of a formal government communiqué (IL - Information Letter)

[4] Landscape assessment tool details can be found on the ASRD web site for Upstream Gas and Oil Approval standards Section 4 Enhanced Approval Process (EAP) Manual.

that informs all road owners and developers in the Smoky-Berland area to comply with the RAD plan or begin engagement in the RAD plan amendment process.

It is recognized that formal ASRD RAD plan endorsement (i.e., prior to legal designation in regulation under the ALSA) does not constitute approval of the proposed individual EAP Class I and II roads, only the general location of the road corridor at a landscape level. When a new road is proposed through an application, it will still have to be reviewed and adjudicated within ASRD EAP approval processes.

However, if the road application relates to a primary or secondary road(s) for the upstream oil and gas industry, and that road(s) is reflected in the RAD plan, then the application will be treated as a **standard** application. Further, it is anticipated that new forest road approvals will be subject to less review and oversight by SRD if they comply with the RAD plan. Road applications that comply with the Plan from either industry will **not** require additional justification and analysis of route options as this was already undertaken in the development of the RAD plan.

Approval of the Plan specifically provides industry with the ability to:

- Prepare detailed road access design and engineering, standards, and construction up to all weather roads standard (EAP Class 1 and II) in advance of the actual disposition application.
- Site specific proposals for actual grade and water course crossing locations, and environmental protection requirements, shall be submitted for any disposition within the approved RAD primary and secondary road corridor. Industry will determine when the road is necessary based on their business needs as well as the standard for resource extraction as a result of approved timber harvest and/or acquisition of mineral rights.
- At the time of disposition application, industry will continue to be expected to provide details of required stakeholder consultation and/or notification.

Government approval of the RAD plan will give the industry improved certainty of access and provide clear direction to government regulatory staff on primary and secondary road access development. The realization of "improved certainty" provides industry with incentive to voluntarily commit to significant contributions to ILM in Alberta as outlined in this plan.

In addition, the RAD plan and recommendations if fully implemented clearly identifies how industry and government can transparently work together to effectively mitigate impacts of development on other values.

The following section outlines the specific commitments and expectations of next steps.

COMMITMENTS

The signatory companies voluntarily commit to:

1. Maintaining an up to date inventory of lineal disturbances at the FRI data warehouse.

2. Contributing to FLMF annual reporting of targets (open route density, anthropogenic lineal density etc.), to government and public audiences.
3. Sharing with FLMF partners and government "as built" lineal disturbance data.
4. Restoring redundant roads as soon as practical after construction of a new access road that created the redundancy provided both roads are owned by the same company.
5. Working with the FLMF partners and government to develop a Smoky-Berland landscape level lineal disturbance restoration plan as outlined in that section of the RAD plan.
6. Working together and encourage new industry partners participation to expand the membership of the FLMF.
7. Working with the FLMF partners to promote, communicate and, where practical, apply lessons learned from the Smoky Berland RAD planning process to the broad objective of expanding Integrated Land Management tools, processes and plan and access management planning in other areas of the province.
8. Working with the FLMF partners and government on the development of a term of reference and implementation plan for the "Foothills Land Stewardship Project".
9. Adhering to the RAD plan where appropriate and engaging in the RAD plan amendment process where circumstances warrant a re-visit of the primary and secondary road access corridors.
10. Develop and implement an industry communications and education outreach strategies that support approval and implementation of the RAD plan
11. Working with FLMF partners and government (task group) to develop and implement landscape level restoration plans and seek ASRD approval of the restorations proposed within 24 months of the approval of the RAD plan.
12. Participating in periodic review of the RAD plan (i.e. first one within 2 years of approval) of the plan.
13. Participating in continuous improvement and adaptive management principles as they apply to Integrated Land Management (ILM) in the province.

The expectation of industry is that government will also agree to the key recommendations where they have the authority and responsibility such as:

Government commitments:

1. To ensure that all industrial operators that have Licences of Occupation for roads in the Smoky Berland RAD plan area adhere to the RAD plan, whether they are members of the FLMF, or not.
2. That the EAP LAT tool be updated to include the primary and secondary road RAD corridors so that any road applications relevant to these access routes are confirmed as EAP "standard applications"
3. That government uses its available tools for effective access management mitigation with respect to impacts to fish and wildlife populations (e.g. FLUZ, regulations, policies, etc.) and make the shift from industry gates to signage/education/enforcement owned by the government to facilitate development and effectively meet targets.

4. Participating in continuous improvement and adaptive management principles as they apply to Integrated Land Management (ILM) in the province.

RAD AMENDMENTS

EAP class I and II access applied for that are not within the approved corridors will require an amendment to the Plan. The amended corridor will have to be submitted for approval with appropriate justification including information confirming consultation and suitability for use by other partners/industrial users in the area.

The RAD plan will replace the existing ASRD Information Letter - IL 2008-05.

An amendment to the RAD plan (previously IL 2008-05) is required when a route is substantially changed from the approved plan. Substantial change is defined as:

- A new alternative route (i.e. originating from a different location or replacing a proposed one) and;
- A route that deviates more than 500 meters on either side of the approved route corridor unless otherwise agreed to by the local ASRD area managers however, it is recognized that the road standard, alignment, and need is not part of the review (only best location) or;
- A route that was not considered a "primary corridor" in the original plan but has sufficient justification to be upgraded to that standard.
- A route that was not considered a secondary corridor in the RAD plan but the business need now dictates that the route now requires a class II (up to 30 meter ROW all weather) as defined in the new EAP: Upstream Oil and Gas Pre-Application Information for the Enhanced Approval Process August 3, 2010.

EAP Class I - Primary Road Corridors amendment:

When any company (FLMF member or not) determines that they require a primary corridor (EAP Class I) that is not identified in the RAD plan to meet their needs the following steps will apply:

- In addition to the standard application processes, the company's FLMF representative (if they are a member of FLMF) should convene a technical meeting with the objective of examining alternatives to meet their access needs from an ILM perspective without questioning the business need. If the company pursuing the amendment is not an FLMF member, they will contact the FLMF coordinator to start the process.

- If alternative routes are available, the FLMF will conduct a ranking process with the company proposing the plan amendment and seek input from other FLMF member

companies to determine if any issues or conflicts exist. The purpose of this review and ranking is to maintain the integrity of the RAD plan and its objectives of meeting ILM goals and reducing impacts on other values. Once this review is complete, a letter will be offered to the company from the FLMF outlining the FLMF findings and assessment of meeting objectives.

EAP Class II Secondary Road Corridor amendment:

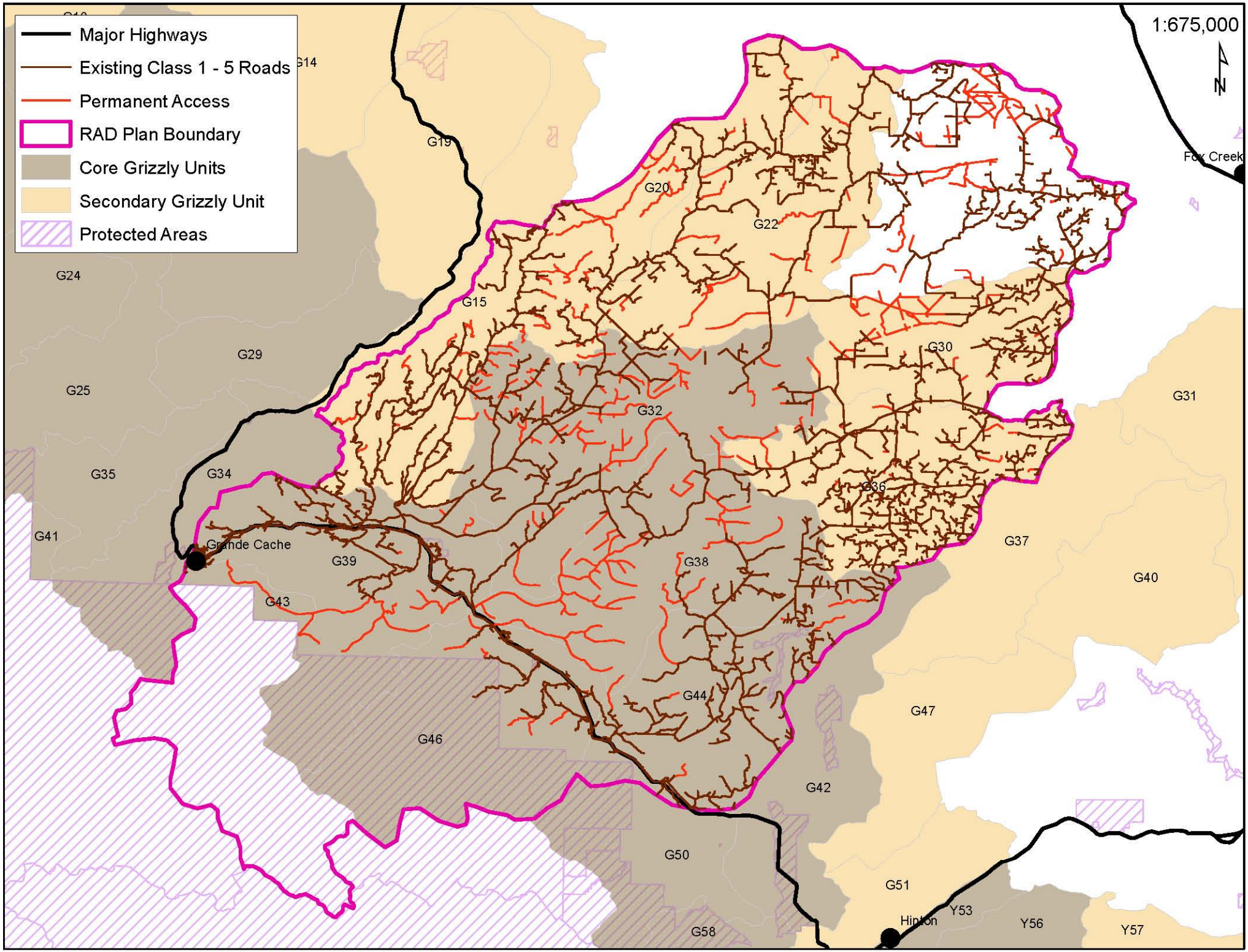
The EAP process allows for the construction of all-weather access EAP Class III (with justification, i.e., roads are needed for > 100 days) so most will not require any amendments to the RAD plan and will simply be tracked as part of the FLMF access road monitoring program. Therefore amendments to the secondary corridor plan should be only required if the right of way clearing of a class III is insufficient to adequately construct the road (i.e. terrain, safety, etc). If it is determined that the business need dictates a higher standard of access is required (i.e. upgrading from a EAP Class III to an EAP Class II) then the following process will apply:

- In addition to the company's standard application process, the proposing FLMF-member or Non-member Company will contact the FLMF to **advise** them of the need and the FLMF will coordinate some dialogue, assessment and a timely meeting with FLMF partners accordingly. The FLMF will conduct a brief review to determine if the new route is in the proximity of a "planned secondary corridor" to see if the new route can replace the planned one. If so, the planned route would be dropped from the secondary corridor plan at the time of submitting the annual monitoring report and replaced with the "as built" class II or III. This will not require any formal review or ranking on behalf of the FLMF as outlined in the primary corridor amendment.

Enhanced Approval Process (EAP)

The Class I and II roads and proposed roads for deactivation, restoration and/or remediation in the RAD plan should be incorporated in the Landscape Assessment Tool (LAT) as direction to gas and oil applications. The LAT is a web enabled geospatial mapping tool designed to assist the oil and gas industry with identification of base and sensitive landscape features associated with the land location being considered for development.

The new EAP process outlined in the Upstream Oil and Gas Pre-Application Information for the Enhanced Approval Process allows for the construction of class III roads with justification within the RAD plan area as follows unless there are other road construction directions specified in higher order plans (I.e. ILM plans such as the RAD plan). The vision is that the RAD plan should better facilitate approval of EAP Class III roads and allow for better development planning by industry. It is recognized that company business needs may change from time to time and roads planned for may be required to be upgraded to class 1 (primary) or class II (secondary) corridors.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Existing Class 1 - 5 Roads
Permanent Access
RAD Plan Boundary
Core Grizzly Units
Secondary Grizzly Unit
Protected Areas
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N
Fox Creek
Grande Cache
Hinton
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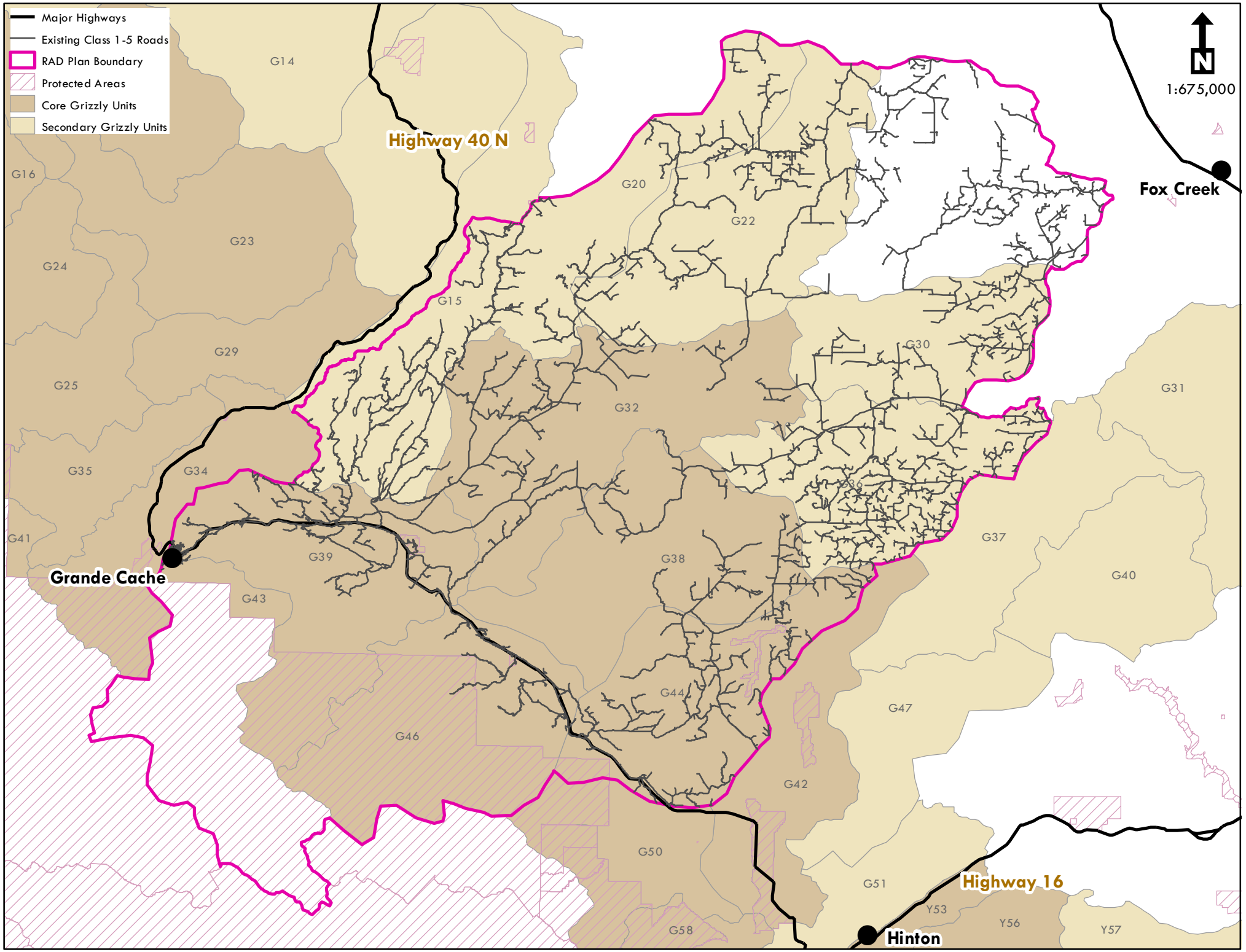
Major Highways
Existing Class 1-5 Roads
RAD Plan Boundary
Protected Areas
Core Grizzly Units
Secondary Grizzly Units
N
1:675,000
Highway 40 N
Fox Creek
Grande Cache
Hinton
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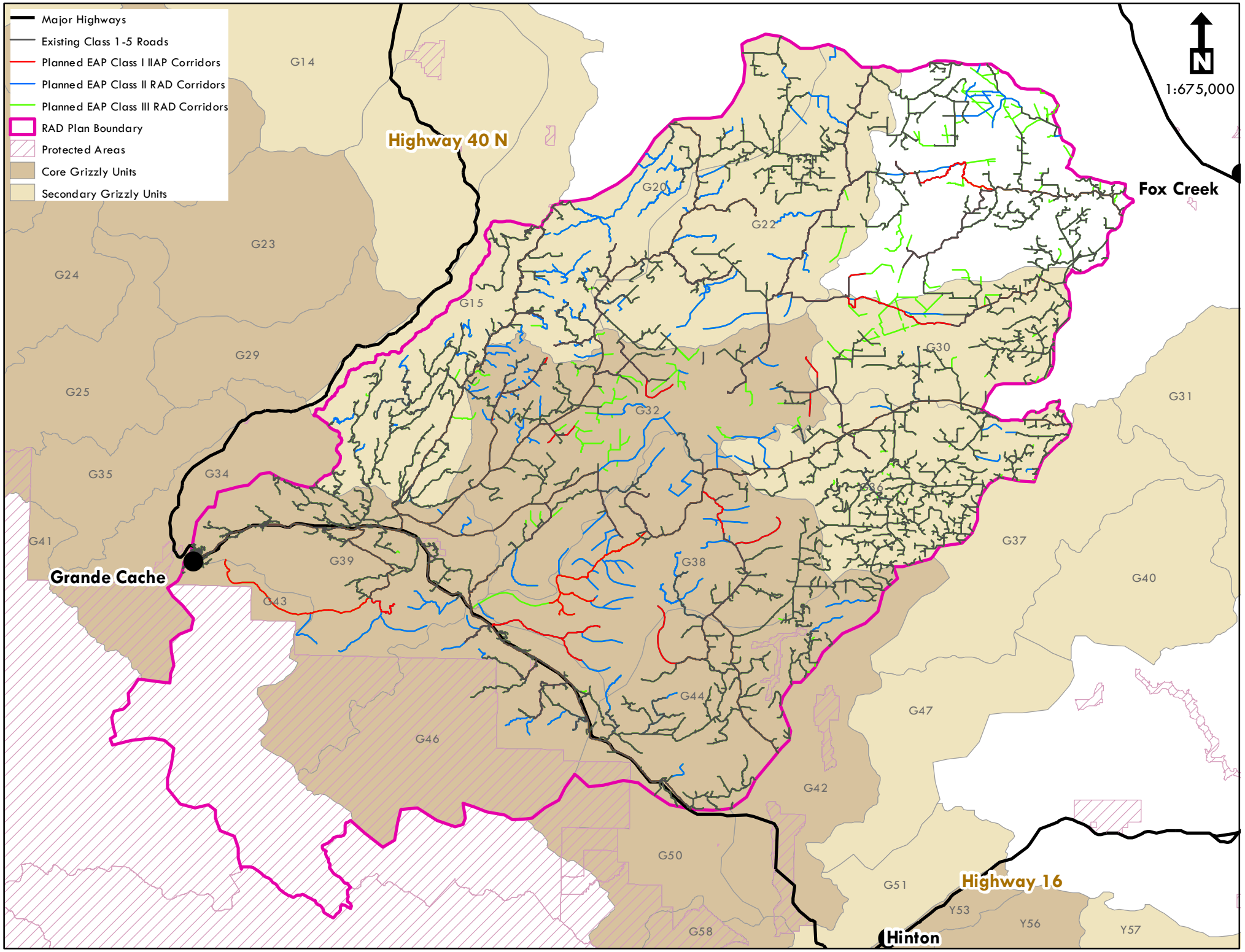
Major Highways
Existing Class 1-5 Roads
Planned EAP Class I IIAP Corridors
Planned EAP Class II RAD Corridors
Planned EAP Class III RAD Corridors
RAD Plan Boundary
Protected Areas
Core Grizzly Units
Secondary Grizzly Units
N
1:675,000
Highway 40 N
Fox Creek
Grande Cache
Hinton
Highway 16
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Alberta Newsprint Company

DETAILED FOREST MANAGEMENT PLAN

APPENDIX J

GRIZZLY BEAR ASSESSMENT

REFERENCE # 0-128

DEVELOPED WITH The Silvacom Group

Government of Alberta ■
Sustainable Resource Development

Forestry Division
Forest Management Branch
8th Floor, Great West Life Building
9920 – 108 Street
Edmonton, Alberta T5K 2M4
Telephone: 780-422-4567
www.alberta.ca

April 26, 2011

Robert W. Stokes
Senior Manager
Forest Management Planning Section
Forest Management Branch
8th Floor, 9920-108 St
Edmonton, Alberta
T5K 2M4

Subject: Alberta Newsprint Company Ltd. (ANC) Grizzly Bear Analysis

The Grizzly Bear Analysis for the Alberta Newsprint Company Ltd. Forest Management Plan was completed to the best of my ability and professional knowledge.

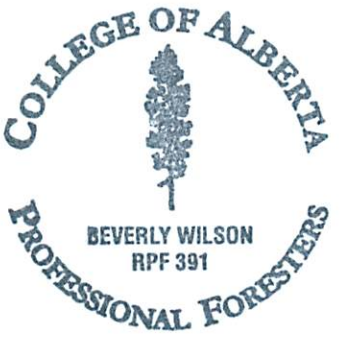
Current information and the spatial harvest sequence and road network supplied by the company were used for the analysis. The Foothills Research Institute Grizzly Bear Program (FRI GBP) models and tools were used by Brad Tyssen to create the 10-year predicted values from which the analysis was completed. The results would therefore change with variance from the spatial harvest sequence.

This endorsement is solely for the work completed by SRD and submitted on this date.

Yours truly,

Beverly Wilson

Beverly Wilson, RPF 391
Senior Resource Analyst
Resource Analysis Section



Enclosure

Analysis of Forest Management Activities on Grizzly Bear Habitat in ANC FMA (FMU W15)

1. Introduction

The primary reason to conduct an analysis of planned development activities in grizzly bear range is to support the goals of the *Alberta Grizzly Bear Recovery Plan 2008-2013*[1]. Our success will be measured by ensuring a viable self supporting population of grizzly bears in all currently identified grizzly bear conservation areas in Alberta.

In Alberta, six Grizzly Bear Population Units have been identified (work continues on the northern Alberta area). Grizzly Bear Population Units are management units based on genetic distinctions within the Alberta grizzly bear population. These population units are generally separated by major highway corridors. The population units are further subdivided into Grizzly Bear Watershed Units (GBWU), a management unit based on major watersheds subdivided along heights of land and occasionally along watercourses, to approximate the size of an adult female grizzly bear home range (~700 km^2). These are an appropriate landscape unit for generating, reporting and monitoring grizzly bear habitat metrics.

Each GBWU is characterised as being either Core or Secondary grizzly bear habitat based on current landscape conditions. Core Areas are areas of high habitat value (as measured by Resource Selection Function) and generally low mortality risk currently measured through Open Route Densities. Secondary Areas are areas of good habitat, reflecting the broader range of grizzly bears (see Figure 1).

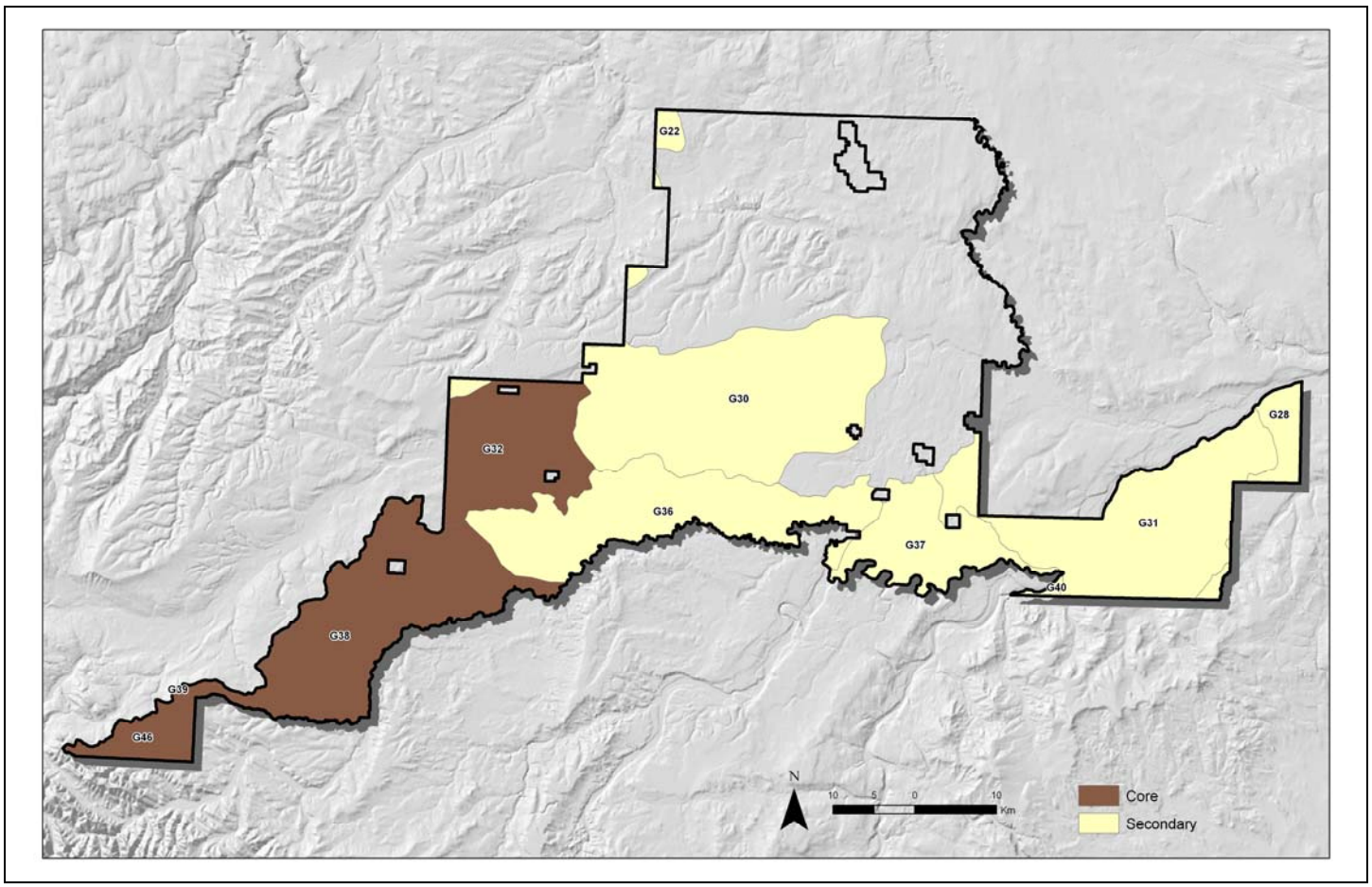
Research conducted in both Alberta and many other parts of grizzly bear range in North America, have found that the key to maintaining grizzly bear populations is to keep human caused grizzly bear mortality rates low. Regulating human use of access (specifically motorised vehicle routes) in grizzly bear range reduces the risk of human-caused mortality. Because human use of access is difficult to measure, the Recovery Plan recommends using Open Route Densities as a surrogate for the amount of human use.

Grizzly bears require three basic things in order to survive and sustain their populations: security, sustenance and the ability to reproduce. Security is related to a combination of habitat quality and survival rates (often associated with human-caused mortality) and can be measured using Open Route Densities. Resource Selection Functions (RSF) can be used as a surrogate for grizzly bear habitat and supply. Mortality Risk is a spatial model that represents the relative probability of human-caused grizzly bear mortality. It is a function of terrain ruggedness, distance from roads, streams, cutlines, and forest edges and land status (protected area, Green/White Area). For the purpose of this analysis, both Open Route Density and Mortality Risk will be used. Safe Harbour is a combination of habitat quality and risk. A safe harbour is an area of good habitat (high RSF values), to which bears are attracted by an abundance of resources, but also where the bear faces a low risk of human caused mortality (low Mortality Risk). Safe harbour was calculated using the following expression: [SH] = [RSF]*(10-[RISK]).

[1] Alberta Grizzly Bear Recovery Plan 2008-2013. 2008. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Recovery Plan No. 15. Edmonton, AB

The goal of wildlife and land managers is to try to meet these requirements for grizzly bears in both space and time while trying to meet societal demands for the use of grizzly bear habitat. Although our understanding of how this can be done is not perfect we do have a number of management products (tools and models based on extensive research) that allow us to predict current and future habitat conditions and mortality risk in a spatial manner. Maps, models and GIS applications, developed by the Grizzly Bear Project (GBP), Foothills Research Institute, can now be utilised to conduct assessments of proposed forest management activities on grizzly bear habitat. The objective of using the models and tools is to assist in managing for landscape conditions necessary for the long-term health and persistence of grizzly bears in the province of Alberta. Forest Management Plans must be examined in terms of their current and projected impacts on grizzly bear habitat quality, in order that the effect of planned development/activities can be quantified. Various alternatives can be compared/contrasted using the models and tools. A more detailed description of each dataset and tools can be found in Appendix 1.

Figure 1: Core and Secondary Grizzly Bear Watershed Units in ANC FMA (FMU W15)



2. Management Objectives

2.1. Open Route Density

Open Route Densities are defined as the total length of all open routes divided by the area of each grizzly bear watershed unit. During the summer of 2008, SRD Area staff teams verified over 25,000 km of "open routes". Only access routes accessible to a motorized vehicle with an overall width of 1.65 m (65”), typically a 4-wheel drive truck, were classified. The open route data has been used to calculate a baseline "open route density" for Core and Secondary grizzly bear conservation areas. Open route densities are part of the thresholds identified for the management of the Core and Secondary grizzly bear conservation areas. In Core Areas the open route density threshold is 0.6 km/km^2, while the open route density threshold in Secondary GBWUs is 1.2 km/km^2.

In both Core and Secondary GBWUs the objective is to maintain or reduce current levels of open route density. These objectives are most likely to be met through Integrated Land Management and long-term access management plans.

2.2. Resource Selection Function

We use resource selection function models (RSF) as a surrogate measure of grizzly bear habitat supply and quality. The model outputs are spatially explicit and are a probability surface to indicate the probability of grizzly bears occurring on the landscape. Research shows a clear relationship between high RSF values and the current presence and distribution of grizzly bears as determined by DNA population inventory work. These RSF models incorporate both grizzly bear habitat use and human use of the landscape.

At the present time we do not fully understand the relationship(s) between population size and habitat supply as measured by RSF scores. However maintaining or increasing RSF scores, in both space and time, in grizzly bear conservation areas is a focus of management actions. The maximum RSF layer was used because it shows those areas of high use across the spring, summer and fall seasons for grizzly bear life history.

In Core GBWUs, the objective is to maintain or increase the current maximum RSF values; while in Secondary GBWUs, the objective is to increase current maximum RSF values.

2.3. Mortality Risk

We use a grizzly bear mortality risk model to understand the spatial configuration of mortality risk for grizzly bears in any given land area (both population unit and GBWU). The mortality risk surface should be used in conjunction with the open route density information to understand how access and habitat variables interact to impact grizzly bear survival rates. Currently the mortality risk model output cannot be used to predict either grizzly bear population size or trend. However, clear relationships have been found, with research data showing that there is a low occupancy rate as mortality risk increases. This may reflect both short and long term effects of human caused mortality on resident bear population distribution and abundance.

In Core GBWUs the objective is to maintain or reduce current levels of mean mortality risk as determined through the mortality risk model. In Secondary GBWUs the objective is to reduce current levels of mean mortality risk.

2.4. Safe Harbour Index

The concept of safe harbour is an area within a watershed or population unit where there is high quality grizzly bear habitat (high RSF scores) combined in both space and time with low levels of grizzly bear mortality risk. These safe harbours therefore contain both food and security for grizzly bears. Safe harbours are expected to move over time, along with forest succession and the management of access life spans, across the landscape.

In all Core GBWUs the objective is to maintain or increase the quality (mean safe harbour index) that is currently present. In Secondary GBWUs the objective is to increase current safe harbour index. Special attention is needed to try to link safe harbours over time in adjacent watershed units.

3. Analysis

The analysis is a 5-step process:

1. Compile the required data.
2. Review management goals for development area.
3. Examine the current landscape conditions.
4. Generate future landscape conditions and examine future conditions.
5. Compare current and future conditions.

The first 10 years of the proposed 20-year spatial harvest sequence (SHS) and a new road network are required to generate future conditions for the area of interest. Because access has the greatest impact on grizzly bear mortality, new access generated by forest management activities, such as harvesting, must be included in the analysis.

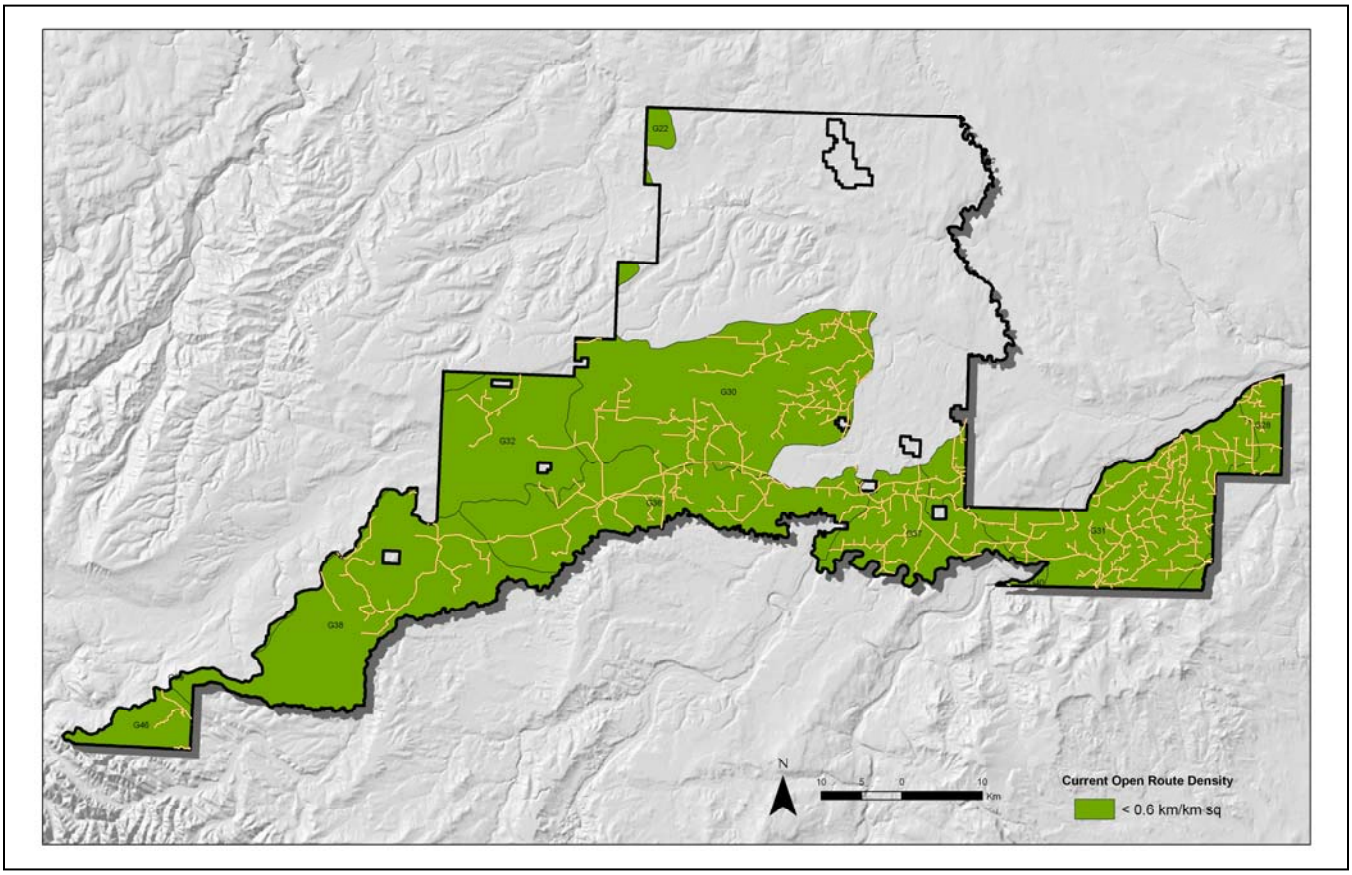
4. Current Conditions

4.1. Open Route Density

The average Open Route Density for the FMA in the Core Areas is 0.14 km/km^2, while the average in the Secondary Areas is 0.45 km/km^2 (see Table 1). The range of Open Route Density for the Core GBWUs is from 0.00 km/km^2 to 0.23 km/km^2 while the range for the Secondary GBWUs is from 0.09 km/km^2 to 0.81 km/km^2.

The Current Open Route Density by GBWU is illustrated in Figure 2. All roads identified are considered to be open for vehicular traffic, unless they have been identified as closed or reclaimed.

Figure 2: Current Open Route Density (km/km^2)



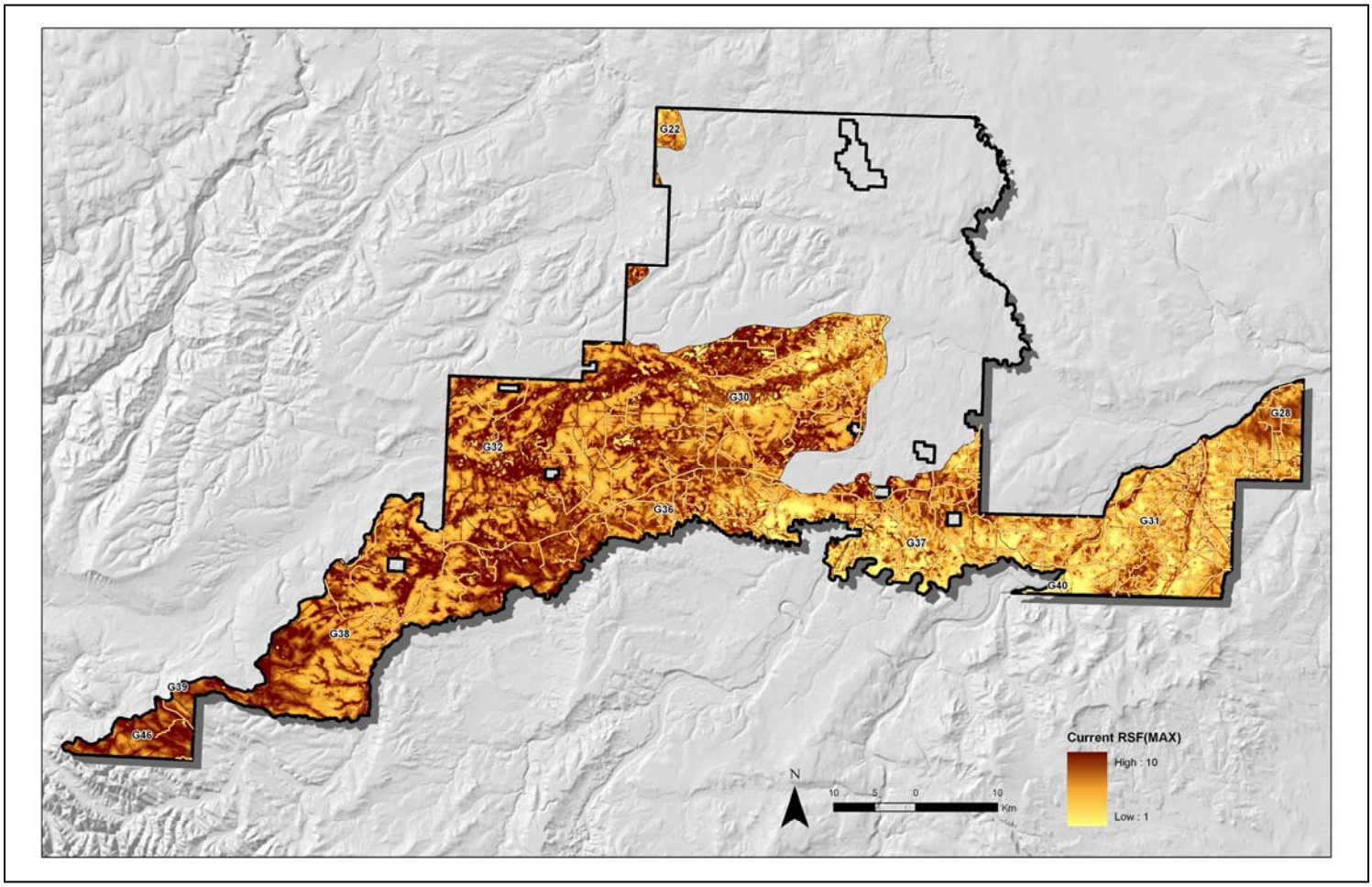
4.2. Resource Selection Function

The ANC FMA boundary was used to clip the Grande Cache Grizzly Bear Population Unit RSF[2]. A maximum RSF was created by combining the maximum values for the spring, summer and fall RSFs. Core and Secondary Grizzly Bear Watershed Units (GBWU) were overlaid on the maximum RSF so that the current conditions could be determined for each GBWU. Figure 3 shows the current maximum RSF values in ANC FMA.

RSF is scaled from 1 to 10, with 1 being low habitat value and 10 being the highest habitat value. Currently, the average maximum RSF value for the FMA in the Core Areas is 8.01, while the average in the Secondary Areas is 6.15 (see Table 2). The range of maximum RSF values for the Core GBWUs is from 7.45 to 8.67 while the range for the Secondary GBWUs is from 4.09 to 7.13.

[2] All data used in this analysis was from the 2009 Grizzly Bear Research Project Deliverables.

Figure 3: Current Maximum RSF in ANC FMA

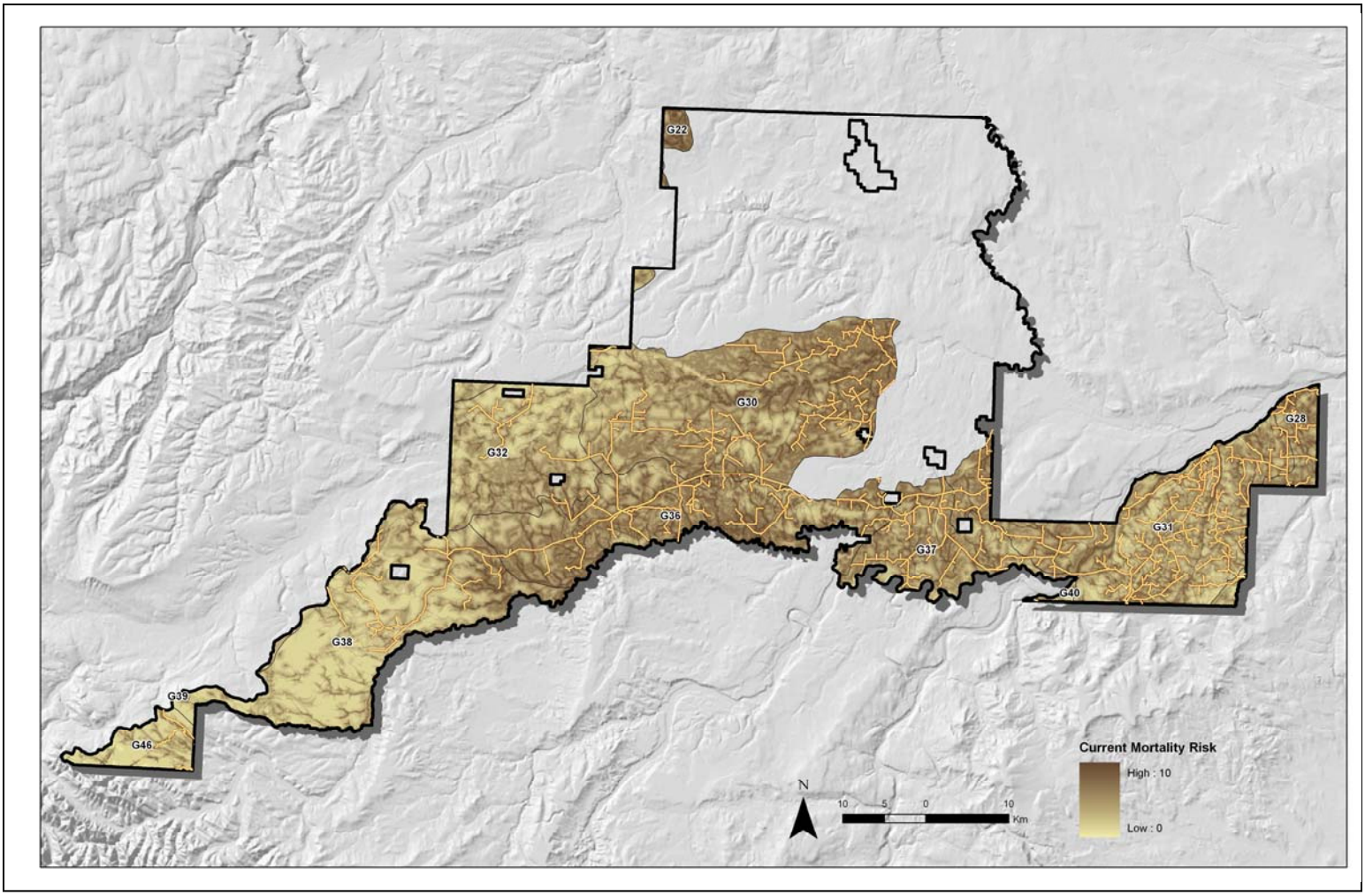


4.3. Mortality Risk

The ANC FMA boundary was used to clip the Mortality Risk model and Core and Secondary Grizzly Bear Watershed Units (GBWU) were overlaid. The current Mortality Risk is shown in Figure 4. It is apparent that where there are more roads, the risk is higher. Currently there is very little roading in the southwest corner of the unit (GBWUs G38 and G46) and as a result the Mortality Risk is lower there (see Figure 4).

Mortality Risk is scaled from 0 to 10, with 0 being lowest risk of mortality and 10 being the highest risk of mortality. The average Mortality Risk for the FMA in the Core Areas is 2.53, while the average in the Secondary Areas is 5.00 (see Table 2). The range of Mortality Risk for the Core GBWUs is from 1.31 to 3.59 while the range for the Secondary GBWUs is from 3.71 to 5.53.

Figure 4: Current Mortality Risk in ANC FMA

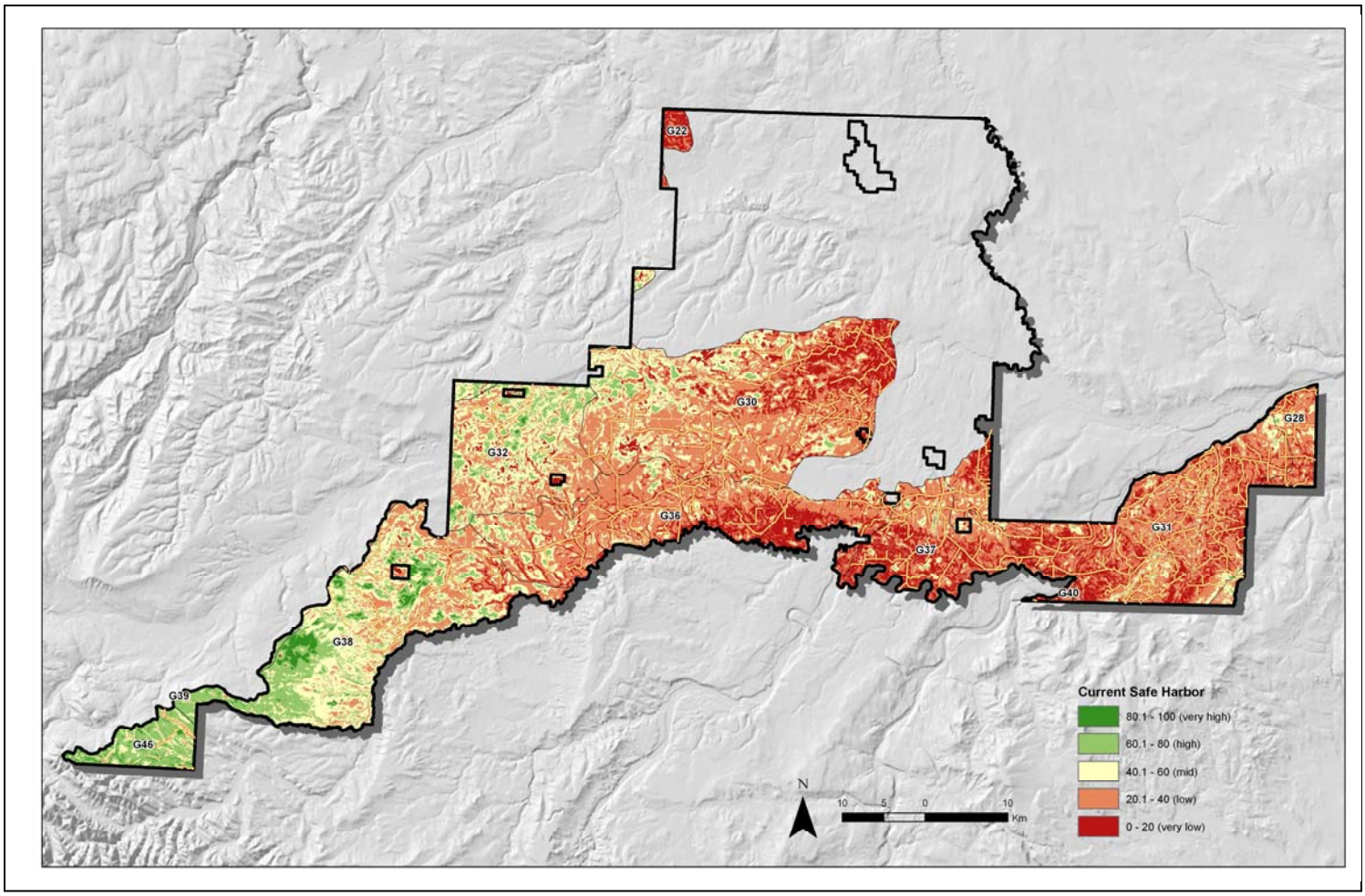


4.4. Safe Harbour Index

Because Safe Harbour is a combination of RSF and Mortality Risk, it is scaled from 0 to 100, with 0 being very low Safe Harbour and 100 being very high Safe Harbour (see legend in Figure 4). The mean Safe Harbour for the FMA in the Core Areas is 59.37, while the average in the Secondary Areas is 28.84 (see Table 2). The range of mean Safe Harbour for the Core GBWUs is from 46.99 to 73.92 while the range for the Secondary GBWUs is from 24.23 to 29.75.

Safe Harbour is greatest where there are fewer roads (lower Mortality Risk), as illustrated in Figure 5. The southwest corner of the FMA (GBWU G38) has the lowest Open Route density, which leads to more area of Safe Harbour.

Figure 5: Current Safe Harbour in ANC FMA

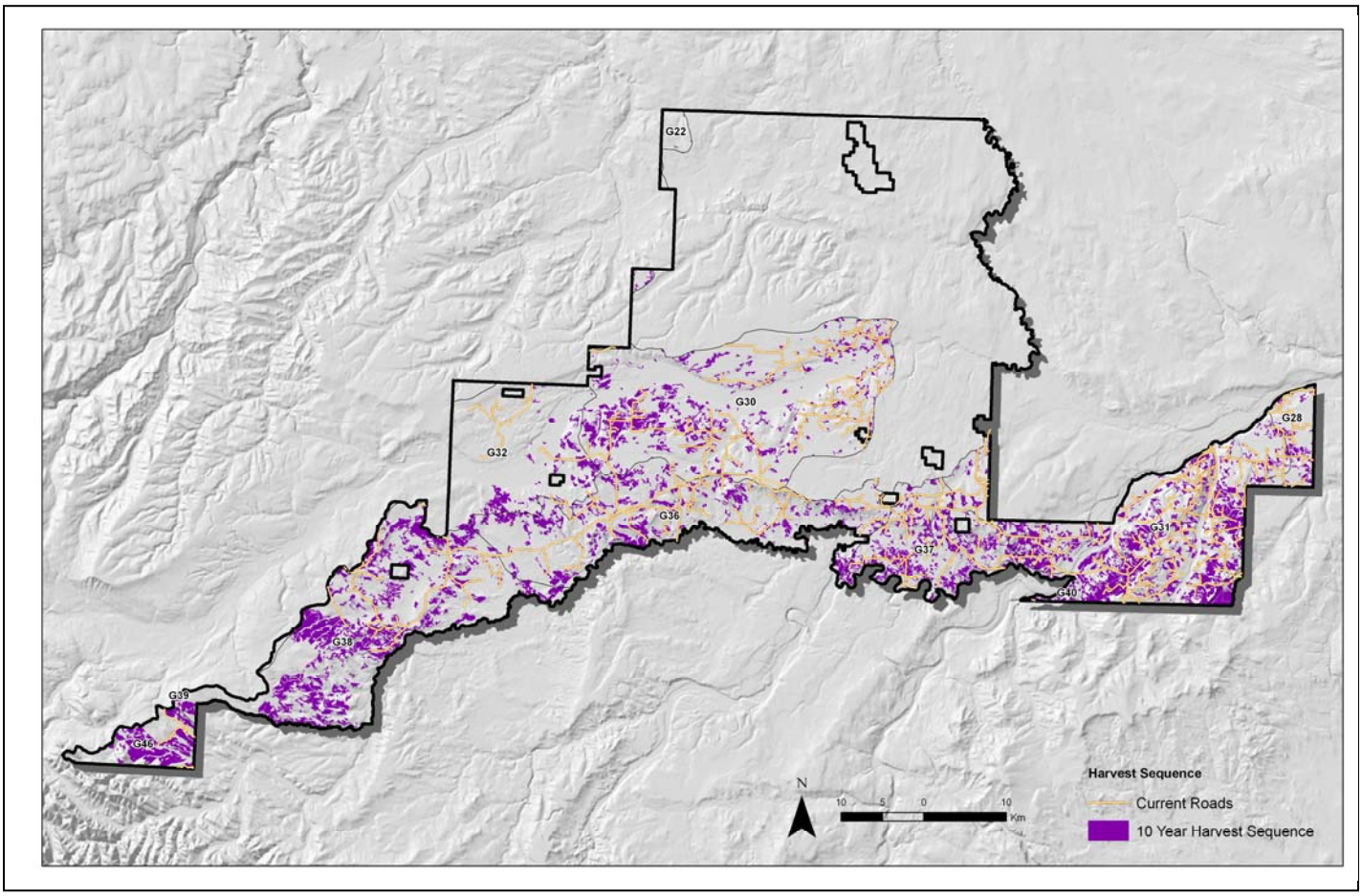


5. Future Landscape Conditions

The proposed spatial harvest sequence (SHS) and a new road network were used to generate future conditions for ANC FMA. The proposed road network is a combination of the major road corridor proposed by the Foothills Landscape Management Forum (FLMF) as well as a network generated using GIS technology. This road network may not accurately represent future ground conditions, but it is an approximation that is useful in this analysis. Because access has the greatest impact on grizzly bear mortality, new access generated by forest management activities, such as harvesting, must be included in the analysis.

The future ten-year spatial harvest sequence and road network are illustrated in Figure 6.

Figure 6: Future 10 Year Harvest Sequence and Road Network



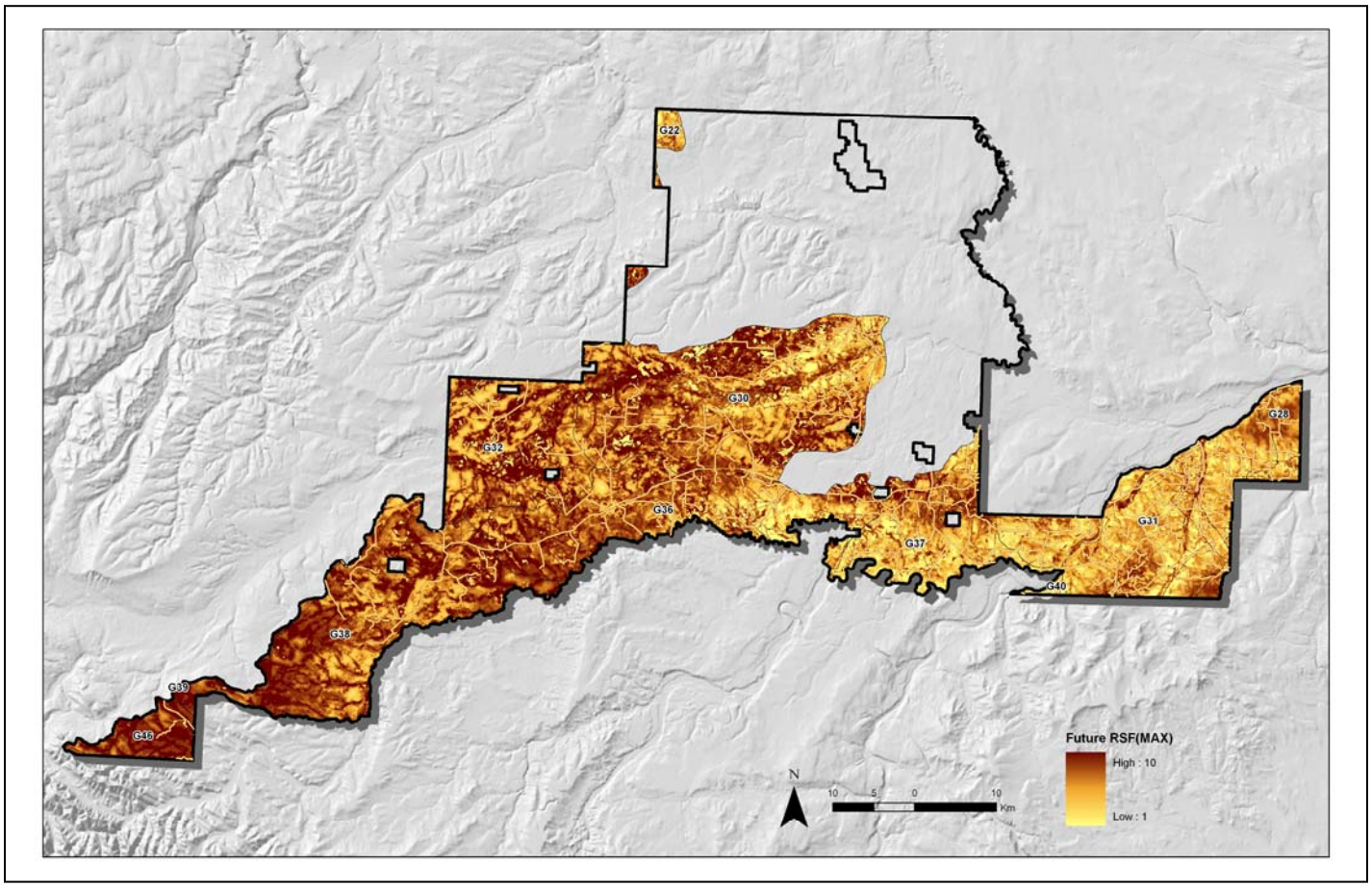
5.1. Open Route Density

ANC has no plans to add any permanent roads to their existing road network. As a result, future Open Route Densities are expected to remain the same as the current Open Route Densities in the context of forest management planning activities.

5.2. Resource Selection Function

The future average maximum RSF value for the FMA in the Core Areas is 8.53, while the average in the Secondary Areas is 6.64 (see Table 2). The range of maximum RSF values for the Core GBWUs is from 7.75 to 9.26 while the range for the Secondary GBWUs is from 5.04 to 7.13. Overall, there was a 6.5% increase in mean maximum RSF in the Core Areas and an 8.0% increase in the Secondary Areas (see Figure 7).

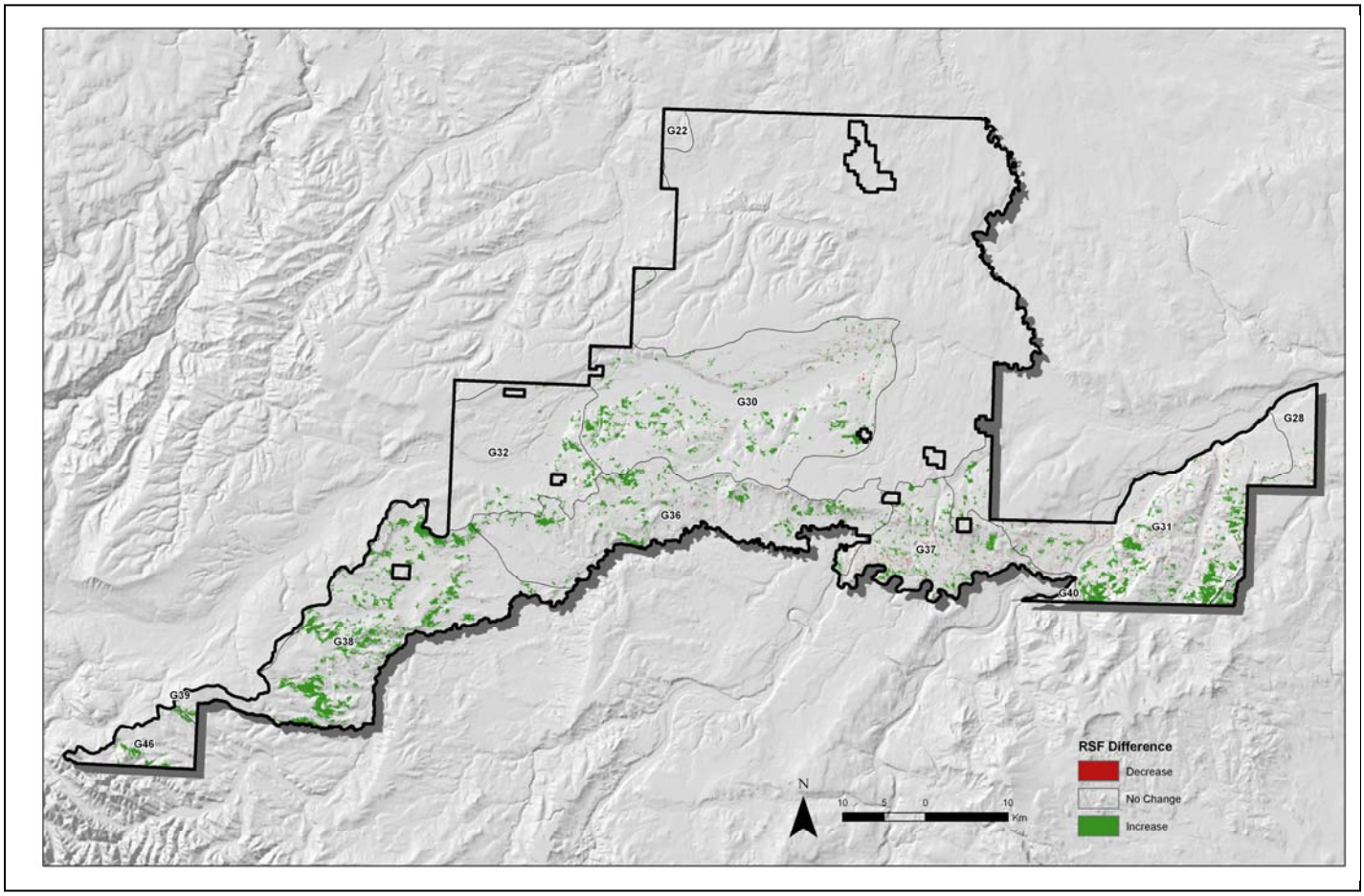
Figure 7: Future Mean Maximum RSF



Forest harvesting almost always results in higher RSF values. Some of the things we have learned through the Grizzly Bear Research Project are that grizzlies prefer younger regenerating stands for foraging, while they use the adjacent mature forest for cover. We have also learned that use of regenerating forest peaks at about 15 to 20 years post-disturbance in pine-dominated stands, which are not accounted for in our 10-year projection.

If we examine the differences between the current and future mean maximum RSF, we can see that by creating a road network and cutblocks, RSF has increased in the southwest corner of the FMA (see Figure 8).

Figure 8: Comparison of Differences in Current and Future RSF Values

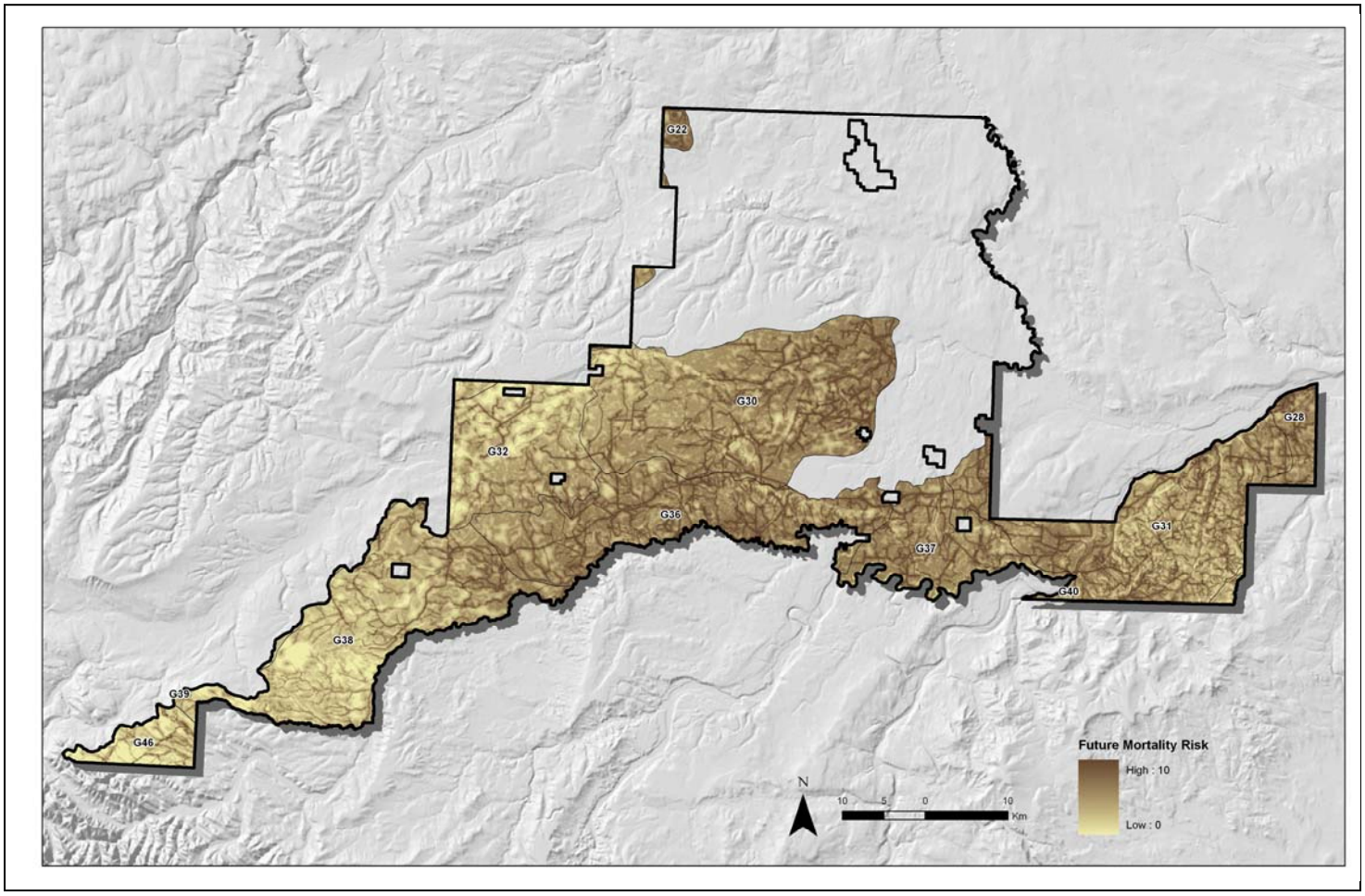


In GBWU G38, the mean maximum RSF has increased the most because there was no existing harvest pattern and very few roads. The replacement of mature and overmature forest stands with early seral stages results in more grizzly bear habitat (higher RSF values).

5.3. Mortality Risk

The future average Mortality Risk for the FMA in the Core Areas is 2.87, while the average in the Secondary Areas is 5.51 (see Table 2). The range of Mortality Risk for the Core GBWUs is from 1.43 to 3.78 while the range for the Secondary GBWUs is from 4.86 to 5.95. Overall, there was a 13.4% increase in average Mortality Risk in the Core Areas and a 10.1% increase in the Secondary Areas (see Figure 9).

Figure 9: Future Mortality Risk

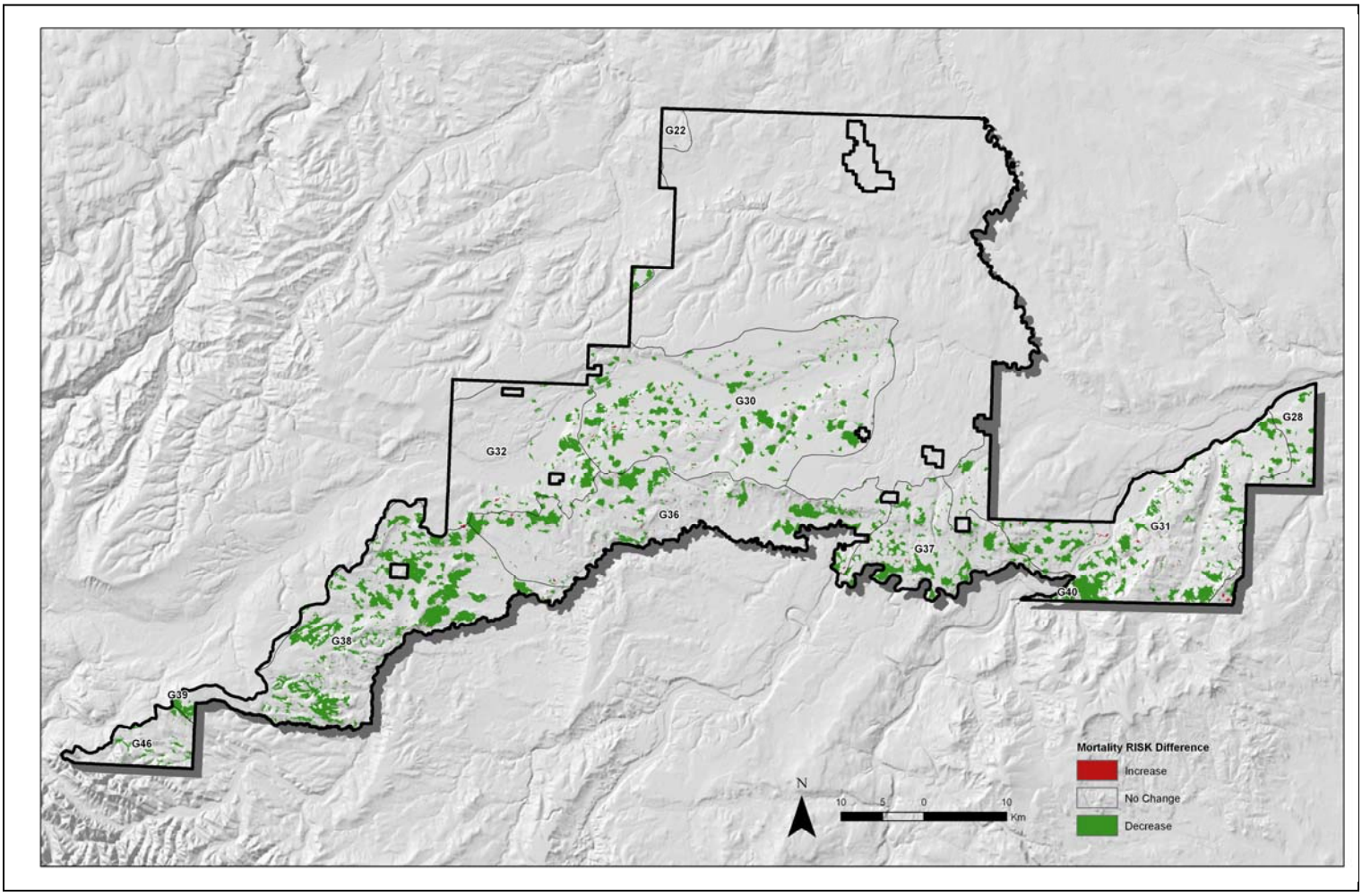


We know that the increasing number of roads and trails into grizzly bear habitat has increased the occurrence of bear-human interaction. Exposure to humans results in higher rates of mortality from human-bear encounters and poaching. As open access density increases, rate of grizzly bear survival decreases. It is estimated that 90% of all human-caused grizzly bear deaths occur within 500m of a road[3]. Increases in Mortality Risk, then, should act as a flag for resource managers that some mitigation measures may be necessary.

By examining the differences between current and future Mortality Risk, we can see where mitigation measures might be most effective in reducing Mortality Risk. Figure 10 illustrates the differences in current and future Mortality Risk.

[3] Alberta Grizzly Bear Recovery Plan 2008-2013. 2008. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Recovery Plan No. 15. Edmonton, AB. 68 pp. page 9

Figure 10: Comparison of Differences in Current and Future Mortality Risk

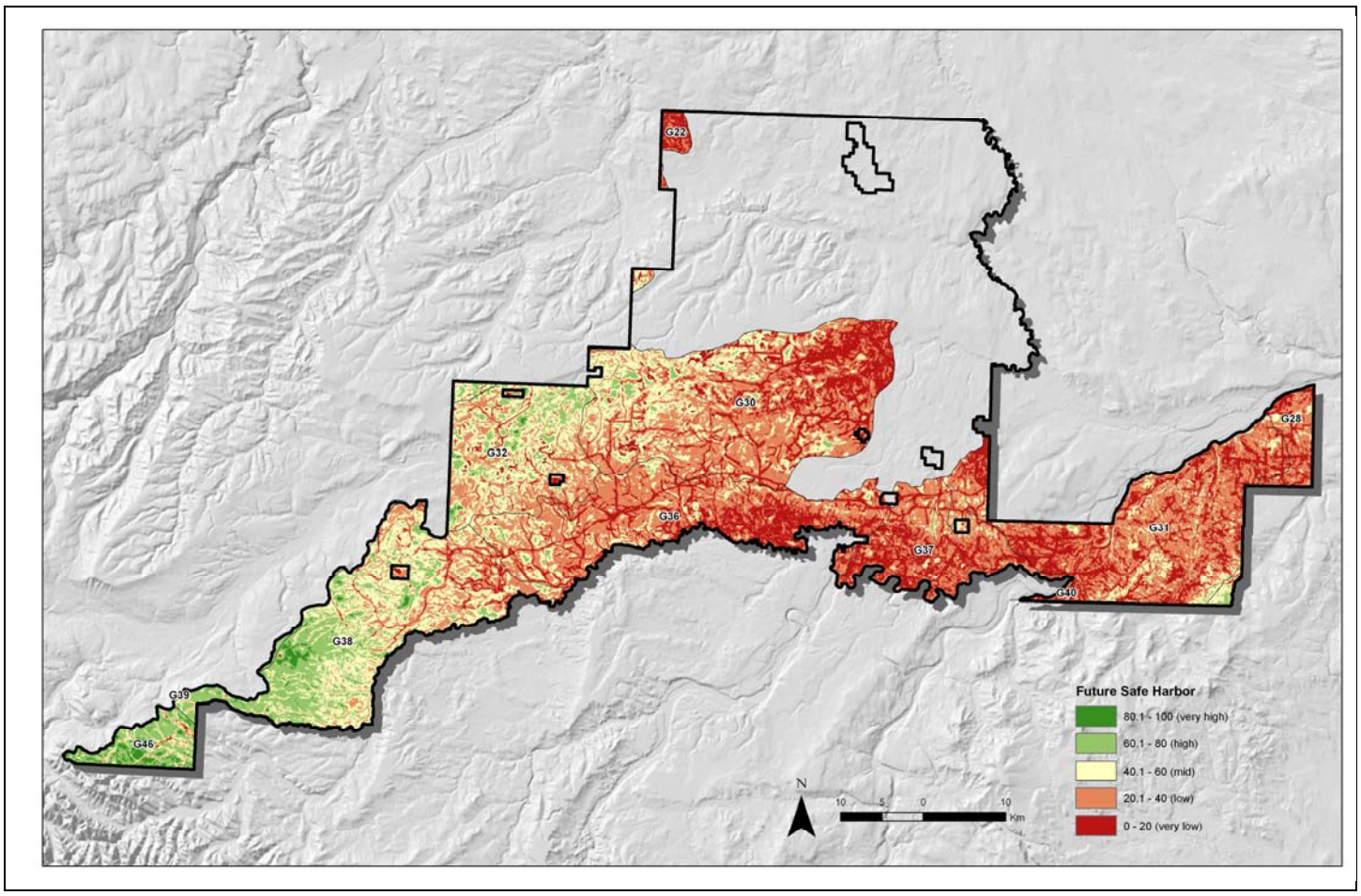


The greatest increases in Mortality Risk occur in GBWUs G38 (25.4%) and G46 (13.4%). These increases are a direct result of the new harvesting and temporary access. Both of these areas have not had any previous harvesting and very little access. Mitigation options that could result in a lowering of the Mortality Risk should be examined.

5.4. Safe Harbour

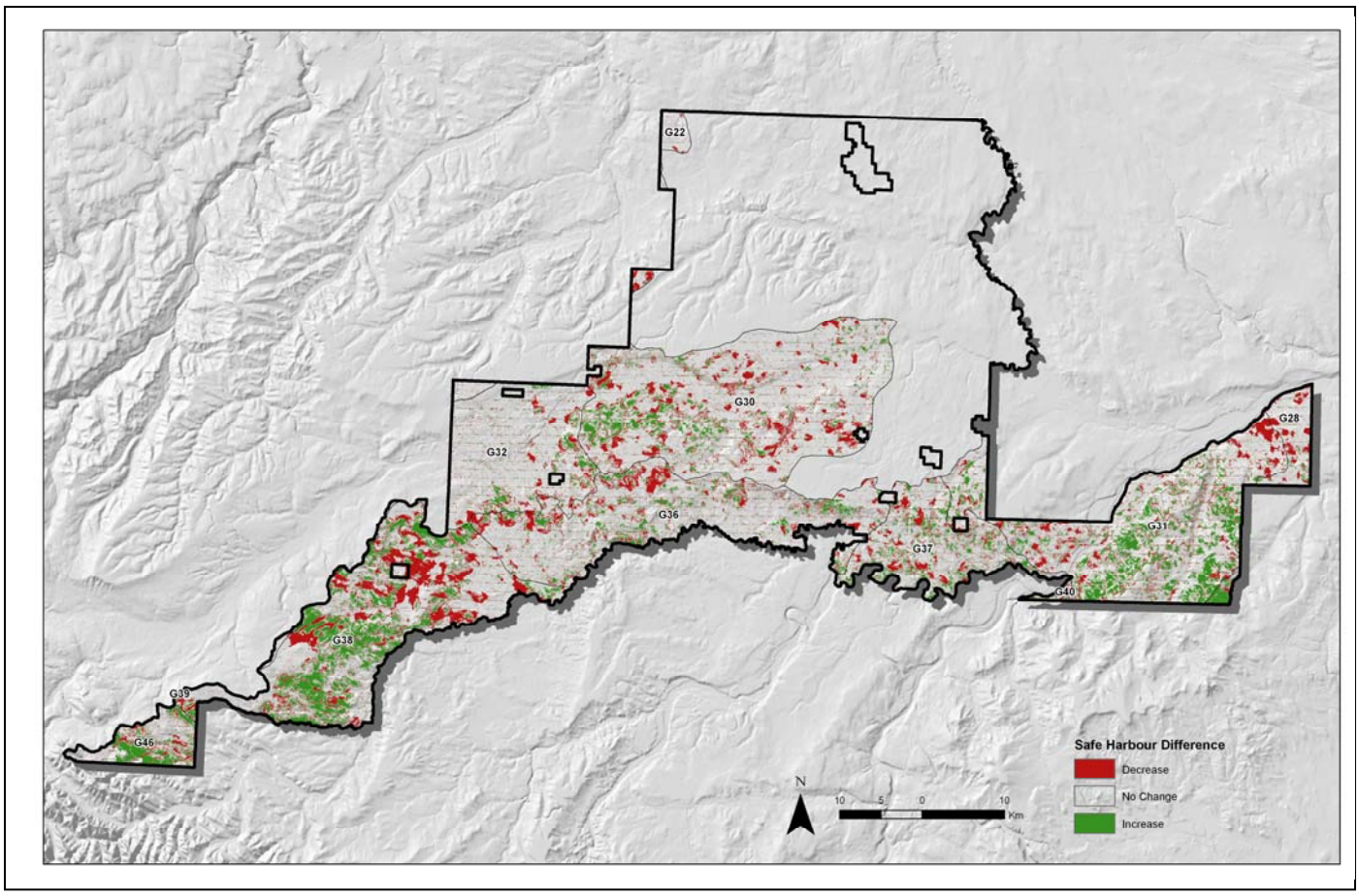
The future mean Safe Harbour for the FMA in the Core Areas is 60.33, while the average in the Secondary Areas is 28.98 (see Table 2). The range of mean Safe Harbour for the Core GBWUs is from 46.99 to 73.92 while the range for the Secondary GBWUs is from 24.23 to 33.63. Overall, there was a 1.6% increase in mean Safe Harbour in the Core Areas and a 0.5% increase in the Secondary Areas (see Figure 11).

Figure 11: Future Mean Safe Harbour



Typically, the creation of new openings in forested areas will result in an increase in RSF scores, due to the formation of edges and, in the case of forest harvesting, the replacement of mature or overmature stands with young seral stands. However, the construction of new access features that accompanies such development also leads to an increase in mean Mortality Risk. The Safe Harbour Index incorporates both these changes into a single value. Decreases in Safe Harbour are directly related to increases in Mortality Risk. By looking at the differences in current and future Safe Harbour (see Figure 12), we can see that the planned forest harvesting and road network negatively impact the amount and distribution of future Safe Harbour. There is an increase in Safe Harbour in some areas, due to the higher RSF values generated by harvesting.

Figure 12: Comparison of Differences in Current and Future Safe Harbour



5.5. Summary

Table 1 summarises the current Open Route Density for each GBWU. Currently, none of the GBWU Open Route Densities exceeds the threshold recommended by the *Alberta Grizzly Bear Recovery Plan 2008-2013*

Table 1: ANC FMA – Open Route Density by GBWU

GBWU	Habitat	Length (km)	Area (km^2)	Road Density (km/km^2)
G38	Core	85.08	442.1	0.19
G39	Core	0.00	0.8	0.00
G46	Core	15.03	66.8	0.23
G32	Core	38.20	261.0	0.15
G22	Secondary	0.00	33.0	0.00
G28	Secondary	41.80	59.1	0.71
G30	Secondary	255.74	569.8	0.45
G31	Secondary	341.30	423.2	0.81
G40	Secondary	0.49	5.6	0.09
G36	Secondary	162.33	368.6	0.44
G37	Secondary	110.27	171.0	0.64

Table 2 is a summary of the current and future Mean Mortality Risk, Maximum RSF and Safe Harbour Index for the ANC FMA, broken down by each GBWU.

Table 2: ANC FMA - Mortality Risk, RSF and Safe Harbour Summary

GBWU	Habitat	Area (km^2)	Index	Current	Future	Difference +/-	% Change
G38	Core	442.1	Mean Mortality Risk	2.91	3.65	0.74	25.4%
			Maximum RSF	7.45	8.28	0.83	11.1%
			Safe Harbour Index	51.30	51.74	0.44	0.9%
G39	Core	0.8	Mean Mortality Risk	1.31	1.43	0.12	9.2%
			Maximum RSF	8.36	8.82	0.46	5.5%
			Safe Harbour Index	73.92	75.09	1.17	1.6%
G32	Core	261.0	Mean Mortality Risk	3.59	3.78	0.19	5.3%
			Maximum RSF	7.54	7.75	0.21	2.8%
			Safe Harbour Index	46.99	46.98	-0.01	0.0%
G46	Core	66.8	Mean Mortality Risk	2.31	2.62	0.31	13.4%
			Maximum RSF	8.67	9.26	0.59	6.8%
			Safe Harbour Index	65.27	67.51	2.24	3.4%
G22	Secondary	33.0	Mean Mortality Risk	5.15	5.36	0.21	4.1%
			Maximum RSF	6.73	6.85	0.12	1.8%
			Safe Harbour Index	33.63	32.68	-0.95	-2.8%
G28	Secondary	59.1	Mean Mortality Risk	5.40	5.76	0.36	6.7%
			Maximum RSF	6.70	7.06	0.36	5.4%
			Safe Harbour Index	29.48	29.53	0.05	0.2%
G30	Secondary	569.8	Mean Mortality Risk	5.15	5.48	0.33	6.4%
			Maximum RSF	7.13	7.50	0.37	5.2%
			Safe Harbour Index	33.37	33.16	-0.21	-0.6%
G31	Secondary	423.2	Mean Mortality Risk	4.89	5.39	0.50	10.2%
			Maximum RSF	5.61	6.23	0.62	11.1%
			Safe Harbour Index	26.30	27.39	1.09	4.1%
G40	Secondary	5.6	Mean Mortality Risk	3.71	4.86	1.15	31.0%
			Maximum RSF	4.09	5.04	0.95	23.2%
			Safe Harbour Index	24.23	25.47	1.24	5.1%
G36	Secondary	368.6	Mean Mortality Risk	5.53	5.95	0.42	7.6%
			Maximum RSF	7.08	7.53	0.45	6.4%
			Safe Harbour Index	29.75	29.51	-0.24	-0.8%
G37	Secondary	171.0	Mean Mortality Risk	5.19	5.76	0.57	11.0%
			Maximum RSF	5.69	6.25	0.56	9.8%
			Safe Harbour Index	25.10	25.15	0.05	0.2%

6. Mitigation Opportunities

The model has identified core units G38 and G46 and secondary units G40 and G37 as units where the mortality risk has increased to a level where mitigation options should be considered. Operational planning can mitigate many of the impacts of timber harvesting. ANC can act to make roads impassable and to quickly reclaim access into completed compartments. On-going communication with the forest area should address these issues in annual operational planning. Achieving the structure retention target will contribute to

mitigating the effects of timber harvesting on grizzly bear habitat. ANC is further encouraged to practice integrated land management to minimize the associated negative effects on grizzly bear habitat.

Appendix 1

FRI Grizzly Bear Program Datasets to be used in Analysis

1. **Resource Selection Function (RSF) -** These raster-based datasets, at 30m resolution, show the relative probability of grizzly bear occurrence on the landscape. They are derived from grizzly bear location data collected by GPS radio collars, combined with landcover and other GIS layers, and have been tested and validated with at least 2 years of GPS data. Three population-level models have been developed for three seasons (spring, summer and fall) and then a maximum RSF layer is created. The maximum RSF layer shows those areas of ephemeral use, and whose significance may be underrepresented in a seasonal average RSF layer.
2. **Mortality Risk -** Using spatial and temporal data on grizzly bear mortalities, the GBP has produced a raster-based grizzly bear mortality risk dataset, which predicts the probability of human-caused grizzly bear mortality over the landscape. This dataset is based on the most current data for open, motorized linear access structures including roads and rights-of-way.
3. **Grizzly Bear Watershed Units (GBWU) -** Watershed analysis units for the Phase 6 study area were created to provide an appropriate mesoscale landscape unit for generating summary statistics for grizzly bear habitat. Major watersheds were subdivided (generally along heights-of-land, occasionally along watercourses) to approximate the size of an adult female grizzly bear home range (~700 sq km). The Alberta Grizzly Bear Recovery Plan identifies two important landscape units to aid in recovery efforts in Alberta. The first are Grizzly Bear Core (called Priority in the Recovery Plan) Areas which contain the highest quality grizzly bear habitat combined with the lowest level of grizzly bear mortality risk. These areas also have open route density thresholds of 0.6km/km^2. The second areas have been termed Grizzly Bear Secondary (called Dispersal in the Recovery Plan) Areas which are adjacent to the Core Areas. These Secondary Areas contain good quality grizzly bear habitat and have a higher level of mortality risk and a road density threshold of 1.2 km/km^2.
4. **Grizzly Bear Population Units -** Alberta Grizzly Bear population units are divisions mostly based on major highways and the Alberta Grizzly Bear Range. This data should be used as a reference only. The Yellowhead (formerly FMF Core) population unit, between Highway 16 and Highway 11, corresponds to BMA (Bear Management Area) 3 and was DNA-surveyed in 2004. Bear density was concentrated in the west half of the study area, and averaged 4.79 bears per 1000 sq km. The Clearwater population unit, between Highway 11 and Highway 1, corresponds to BMA 4 and was DNA-surveyed in 2005. Bear density was concentrated in the west half of the study area, and averaged 5.25 bears per 1000 sq km. The Livingstone population unit, between Highway 1 and Highway 3, corresponds to BMA 5 and was DNA-surveyed in 2006. The Castle (formerly Waterton) population unit, between Highway 3 and the US border, corresponds to BMA 6 and was DNA-surveyed in summer 2007.
5. **Safe Harbours -** A safe harbour is an area of good habitat (high RSF values), to which bears are attracted by an abundance of resources, but also where the bear faces a low risk of mortality. An attractive sink, then, is an area of good habitat (high RSF values) with a high risk of mortality.
6. **GIS applications -** Python geoprocessing scripts, and associated GIS input layers, allow the user to predict changes to grizzly bear habitat caused by industrial development. Planned

7. **Documents:** Supporting documents are included in the FRI GBP 2009 deliverables.

Alberta Newsprint Company

DETAILED FOREST MANAGEMENT PLAN

APPENDIX K

VOIT TARGET ANALYSES

REFERENCE # 0-128

DEVELOPED WITH The Silvacom Group

Seral Stage Target

CCFM Criterion:
1: Biological Diversity

CSA SFM Element:
1.1 Ecosystem Diversity – Conserve ecosystem diversity by maintaining the variety of communities and ecosystems that occur naturally in the ANC FMA

Value:
1.1.1. Landscape scale biodiversity

Objective:
1.1.1.1. Maintain biodiversity by retaining the full range of cover types and seral stages.

Indictor:
Area of old, mature, and young forest on the gross and net landbases in each Natural Subregion.

Target:
Area of old, mature plus old, and young forest on the gross and net landbases in each Natural Subregion at Year 10 shall equal the proportions shown in the following table with an acceptable variance of 10% (in area):

Seral Stage for entire ANC FMA	Gross Area Target (%)				
	Current	**Year 10**	**Year 50**	**Year 100**	**Year 200**
Old Forest	27.2	32.2	33.3	34.3	43.8
Mature plus old forest	72	62.8	40.2	54.3	50.5
Young forest	10.9	22	9.2	14.4	11.9

Seral Stage for entire ANC FMA	Net Landbase Target (%)				
	Current	**Year 10**	**Year 50**	**Year 100**	**Year 200**
Old Forest	18.7	19.0	4.2	1.5	18.1
Mature plus old forest	65.9	48.7	10.4	31.2	28.2
Young forest	16.1	32.9	13.9	21.7	18.0

Seral Stage by Natural Sub-region in ANC FMA	Gross Landbase Target (%)				
Lower Foothills	**Current**	**Year 10**	**Year 50**	**Year 100**	**Year 200**
Old Forest	22.5	31.7	28.7	30.0	36.8
Mature plus old forest	65.1	54.3	39.6	44.7	43.3
Young forest	14.5	21.5	14.0	12.7	13.3
	Net Landbase Target (%)				
Lower Foothills	**Current**	**Year 10**	**Year 50**	**Year 100**	**Year 200**
Old Forest	14.1	19.8	5.5	1.6	11.1
Mature plus old forest	59.0	41.6	15.3	21.9	20.4
Young forest	20.0	30.0	19.8	17.9	18.8

Seral Stage by Natural Sub-region in ANC FMA	Gross Landbase Target (%)				
Upper Foothills	**Current**	**Year 10**	**Year 50**	**Year 100**	**Year 200**
Old Forest	28.0	30.0	37.1	38.2	52.1
Mature plus old forest	77.8	70.4	40.4	65.0	59.1
Young forest	8.6	22.9	4.4	15.9	10.3
	Net Landbase Target (%)				
Upper Foothills	**Current**	**Year 10**	**Year 50**	**Year 100**	**Year 200**
Old Forest	19.0	15.8	2.6	1.3	27.4
Mature plus old forest	72.3	55.8	4.7	44.1	38.6
Young forest	13.7	36.6	7.1	25.4	16.4

Seral Stage by Natural Sub-region in ANC FMA	Gross Landbase Target (%)				
Central Mixedwood	**Current**	**Year 10**	**Year 50**	**Year 100**	**Year 200**
Old Forest	7.4	31.7	31.5	32.1	32.7
Mature plus old forest	58.2	64.2	44.1	36.8	36.7
Young forest	8.1	8.0	19.1	13.5	21.1
	Net Landbase Target (%)				
Central Mixedwood	**Current**	**Year 10**	**Year 50**	**Year 100**	**Year 200**
Old Forest	1.8	19.7	6.2	1.3	2.0
Mature plus old forest	51.2	53.8	18.9	7.9	7.7
Young forest	11.6	11.6	27.9	19.6	30.7

Seral Stage by Natural Sub-region in ANC FMA	Gross Landbase Target (%)				
Subalpine	**Current**	**Year 10**	**Year 50**	**Year 100**	**Year 200**
Old Forest	90.1	62.5	41.3	40.1	36.7
Mature plus old forest	95.4	68.3	41.8	55.0	44.1
Young forest	0.5	30.6	1.0	18.4	7.1
	Net Landbase Target (%)				
Subalpine	**Current**	**Year 10**	**Year 50**	**Year 100**	**Year 200**
Old Forest	91.0	45.1	5.6	2.9	17.4
Mature plus old forest	95.1	49.5	5.7	27.1	29.4
Young forest	0.8	49.6	1.5	29.9	11.4

Patch Size Distribution

CCFM Criterion:
1: Biological Diversity

CSA SFM Element:
1.1 Ecosystem Diversity – Conserve ecosystem diversity by maintaining the variety of communities and ecosystems that occur naturally in the ANC FMA

Value:
1.1.1 Landscape scale biodiversity

Objective:
1.1.1.2 Maintain biodiversity by avoiding landscape fragmentation

Indictor:
a) Range of patch sizes in each Natural Subregion in the ANC FMA

Target:
Distribution of patch size classes at Year 10 in each Natural Subregion shall equal the areas shown in the following table.

Year 10	Natural Subregion							
	Central Mixed Wood		Lower Foothills		Upper Foothills		Sub-Alpine	
Patch Class	Area(ha)	% of NSR Forested Area	Area (ha)	% of NSR Forested Area	Area(ha)	% of NSR Forested Area	Area (ha)	% of NSR Forested Area
0 -19	515	44%	10935	33%	9534	26%	376	9%
20-99	647	56%	14865	44%	16027	43%	1176	27%
100-250	0	0%	4571	14%	7694	21%	1206	28%
>250	0	0%	3066	9%	3940	11%	1602	37%
Total	1162	100%	33437	100%	37195	100%	4360	100%

Old Interior Forest

CCFM Criterion:
1: Biological Diversity

CSA SFM Element:
1.1 Ecosystem Diversity – Conserve ecosystem diversity by maintaining the variety of communities and ecosystems that occur naturally in the ANC FMA

Value:
1.1.1 Landscape scale biodiversity

Objective:
1.1.1.2 Maintain biodiversity by avoiding landscape fragmentation

Indictor:
b) Area of old interior forest by yield type

Target:
Area of old interior forest at Year 10 in each Natural Subregion shall equal the areas shown in the following table with an acceptable variance not exceeding 20%.

	Subalpine			
Yield Type	Gross Forested Area	Area of OIF Area (ha)	**% of OIF**	% of Gross Forested Area (ha)
C-P	9,884	3199	**59.97**	22.47
C-SB	1,895	1074	**20.13**	7.54
C-SW	2,453	1061	**19.89**	7.45
CD-P	8	0	**0.00**	0.00
CD-S				
D				
DC-P				
DC-S				
Total	14,240	5,334		37.46

	Lower Foothills			
Yield Type	Gross Forested Area	Area of OIF Area (ha)	**% of OIF**	% of Gross Forested Area (ha)
C-P	53,434	720	**10.32**	0.46
C-SB	37,876	4205	**60.24**	2.70
C-SW	22,935	1241	**17.78**	0.80
CD-P	5,435	89	**1.28**	0.06
CD-S	5,783	186	**2.66**	0.12
D	19,689	284	**4.07**	0.18
DC-P	4,594	108	**1.55**	0.07
DC-S	5,843	147	**2.11**	0.09
Total	155,589	6,980	100	4.49
	Upper Foothils			
Yield Type	Gross Forested Area	Area of OIF Area (ha)	**% of OIF**	% of Gross Forested Area (ha)
C-P	94,968	3,261	**23.49**	2.02
C-SB	50,687	9,152	**65.93**	5.66
C-SW	10,268	1,407	**10.14**	0.87
CD-P	1,694	2	**0.01**	0.00
CD-S	379	16	**0.12**	0.01
D	2,129	12	**0.09**	0.01
DC-P	1,085	21	**0.15**	0.01
DC-S	401	10	**0.07**	0.01
Total	161,611	13,881	100	8.59
	Central Mixed Wood			
Yield Type	Gross Forested Area	Area of OIF Area (ha)	**% of OIF**	% of Gross Forested Area (ha)
C-P	970	21	**2.47**	0.14
C-SB	3,700	538	**63.37**	3.70
C-SW	1,460	28	**3.30**	0.19
CD-P	416	20	**2.36**	0.14
CD-S	1,073	37	**4.36**	0.25
D	5,467	199	**23.44**	1.37
DC-P	146	0	**0.00**	0.00
DC-S	1,326	6	**0.71**	0.04
Total	14,558	849	100	5.83

Road Density – open all weather

CCFM Criterion:
1. Biological Diversity

CSA SFM Element:
1.1 Ecosystem Diversity: Conserve ecosystem diversity at the landscape level by maintaining the variety of communities and ecosystems that occur naturally in the ANC FMA

Value:
1.1.1 Landscape scale biodiversity

Objective:
1.1.1.1 Maintain biodiversity by minimizing access

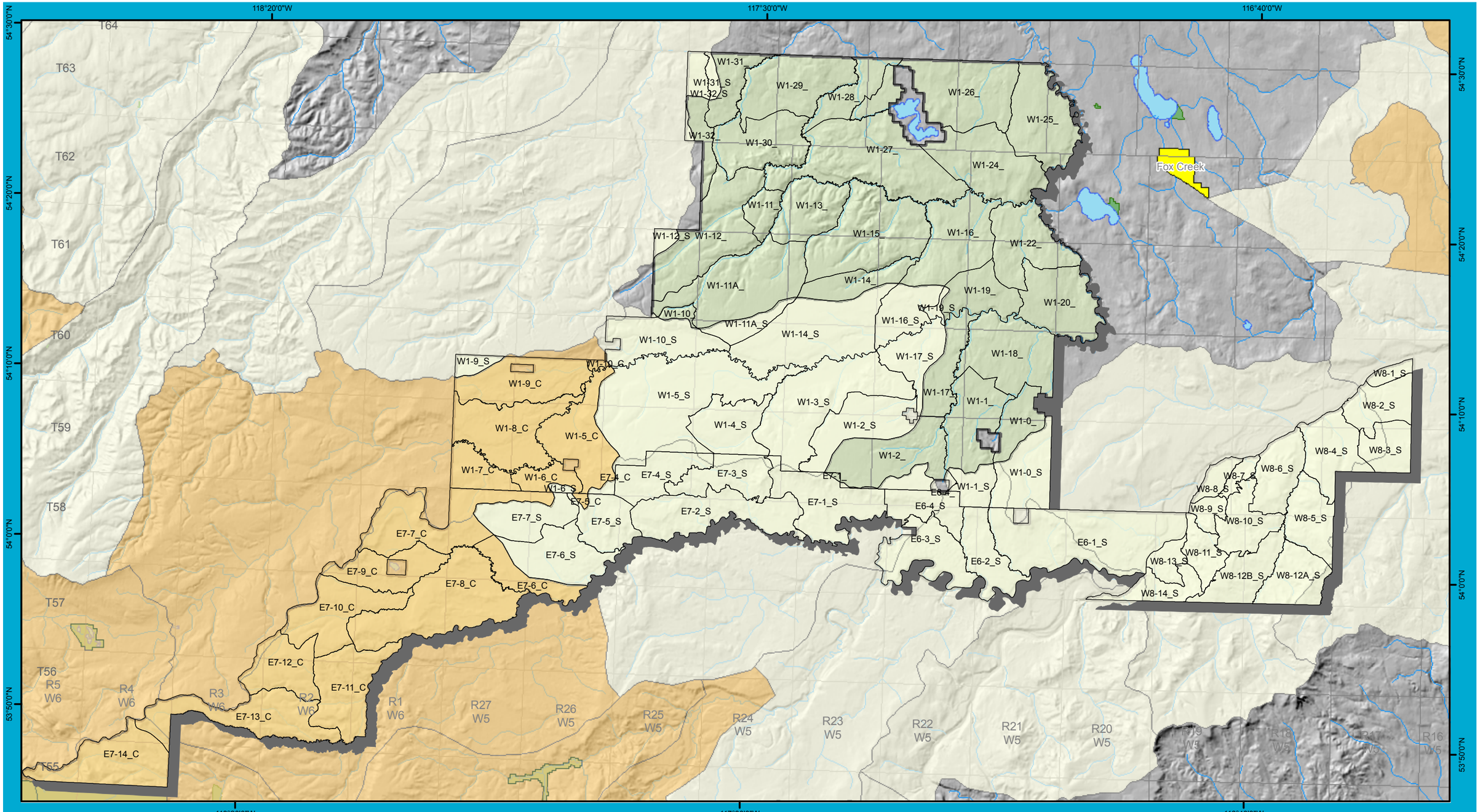
Indicator:
Open all-weather forestry road density by compartment

Target:
a) Less than 0.6 km/km^2 in compartments located in core grizzly bear habitat.
b) Less than 1.2 km/km^2 in compartments located in secondary grizzly bear habitat.

Note 1: Some compartments may cover both core and secondary grizzly bear habitat; the targets above will apply for each respective portion.

Note 2: In ANC compartments where the targets have been exceeded, work with other users to integrate operations and reclaim areas to meet targets over time. See attached road density map and table for current and year ten results.

Note 3: By selecting Grizzly Bear Watershed Units, lesser impacts are identified.



Government of Alberta

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N

10 5 0 10 Km

1:400,000

2011-2021 ANC Compartments by Grizzly Bear Habitat

No new permanent roads are planned.

Grizzly Bear Habitat

- Core
- Secondary
- Non-Critical

Base Data provided by:
Spatial Data Warehouse Ltd.
January 26, 2011
Forest Management Branch
Edmonton

Road Density Results

The open all weather road density was calculated using the ANC Compartments. The compartments were further identified as located within Core Grizzly Bear Conservation Area, Secondary Grizzly Bear Conservation Area or non-critical Grizzly Bear Area by adding a code of C, S or leaving blank. The road densities (see Tables 1a, 1b, 1c) in the Grizzly Bear Conservation Areas were derived using the SRD Grizzly Bear road layer; all other areas used the Base Features road layer.

Table 1a. Road Density by ANC Compartments - Core Areas

ANC Compartments	Area (Km^2)	Length of Road (Km)	Road Density (Km/Km^2)
W1-8_C	68.98	6.67	0.10
E7-10_C	57.66	10.64	0.18
E7-11_C	58.47	4.11	0.07
E7-13_C	67.34	4.86	0.07
E7-14_C	62.54	9.75	0.16
E7-6_C	27.33	10.31	0.38
E7-5_C	1.85	1.66	0.90
E7-7_C	77.09	14.59	0.19
E7-8_C	102.91	37.86	0.37
E7-9_C	39.95	10.31	0.26
W1-6_C	16.71	2.02	0.12
W1-5_C	55.99	8.44	0.15
W1-9_C	58.03	18.27	0.31

Compartment located in core area with road density exceeding open route density target threshold of 0.6 km/km^2

Table 1b. Road Density by ANC Compartments - Secondary Areas

ANC Compartments	Area (Km^2)	Length of Road (Km)	Road Density (Km/Km^2)
E6-1_S	119.71	73.90	0.62
E6-2_S	36.32	14.80	0.41
E6-3_S	49.25	25.09	0.51
E6-4_S	28.93	21.42	0.74
E7-1_S	60.01	23.34	0.39
E7-2_S	68.90	41.83	0.61
E7-3_S	38.58	29.09	0.75
E7-4_S	35.85	13.97	0.39
E7-5_S	33.12	15.34	0.46
E7-6_S	50.38	16.40	0.33
E7-7_S	37.72	0.72	0.02
W1-0_S	45.03	39.82	0.88
W1-1_S	17.61	14.51	0.82
W1-10_S	48.89	3.04	0.06
W1-11A_S	17.33	2.57	0.15
W1-12_S	5.75	0.53	0.09
W1-14_S	95.44	39.93	0.42
W1-16_S	32.13	21.67	0.67
W1-17_S	33.16	27.75	0.84
W1-19_S	3.77	6.15	1.63
W1-2_S	64.05	33.62	0.52
W1-3_S	97.32	57.16	0.59
W1-4_S	41.07	28.86	0.70
W1-5_S	150.87	42.54	0.28
W1-6_S	2.23	1.29	0.58
W8-1_S	7.83	10.18	1.30
W8-10_S	33.96	31.74	0.93
W8-11_S	21.14	18.71	0.89
W8-12A_S	37.95	20.79	0.55
W8-12B_S	38.51	38.14	0.99
W8-13_S	14.57	7.42	0.51
W8-14_S	23.36	7.87	0.34
W8-2_S	32.84	18.91	0.58
W8-3_S	27.28	19.77	0.72
W8-4_S	43.10	31.39	0.73
W8-5_S	36.91	37.36	1.01
W8-6_S	37.73	56.26	1.49
W8-7_S	8.36	4.64	0.56
W8-8_S	11.67	6.34	0.54
W8-9_S	11.19	4.85	0.43

Compartment located in secondary area with road density exceeding open route density target threshold of 1.2 km/km^2

Table 1c. Road Density by ANC Compartments - Non-Critical Areas

ANC Compartments	Area (Km^2)	Length of Road (Km)	Road Density (Km/Km^2)
W1-0_	25.36	23.60	0.93
W1-1_	52.12	34.29	0.66
E7-1_	0.85	1.41	1.66
E6-4_	0.25	0.55	2.21
W1-11_	15.79	1.71	0.11
W1-11A_	88.73	16.67	0.19
W1-12_	82.62	3.15	0.04
W1-13_	43.20	15.00	0.35
W1-14_	27.95	5.33	0.19
W1-15_	93.25	14.67	0.16
W1-16_	66.27	24.86	0.38
W1-17_	32.45	25.09	0.77
W1-18_	70.06	50.35	0.72
W1-19_	35.05	12.21	0.35
W1-2_	62.02	48.70	0.78
W1-20_	56.78	29.75	0.52
W1-22_	55.83	41.09	0.74
W1-24_	70.65	34.63	0.49
W1-25_	63.93	11.42	0.18
W1-26_	89.84	24.57	0.27
W1-27_	115.91	60.30	0.52
W1-29_	66.73	22.09	0.33
W1-30_	54.97	14.59	0.27
W1-31_	26.83	15.94	0.59
W1-32_	18.07	4.11	0.23

Road Density – open seasonal/temporary

CCFM Criterion:

1. Biological Diversity

CSA SFM Element:

1.1 Ecosystem Diversity Conserve ecosystem diversity at the landscape level by maintaining the variety of communities and ecosystems that occur naturally in the ANC FMA

Value:

1.1.1 Landscape scale biodiversity

Objective:

1.1.1.1 Maintain biodiversity by minimizing access

Indicator:

Open seasonal / temporary forestry road length within ANC FMA

Target:

Note: Data required from ANC to establish target

Structure Retention

CCFM Criterion:

1. Biological Diversity

CSA SFM Element:

1.1 Ecosystem Diversity Conserve ecosystem diversity at the landscape level by maintaining the variety of communities and ecosystems that occur naturally in the ANC FMA

Value:

1.1.2 Local/stand scale biodiversity

Objective:

1.1.2.1 Retain stand level structure

Indicator:

a) Residual structure (both living and dead) volume, within a harvest area, representative of the status (live / dead), sizes, and species of the overstorey trees within each compartment and the entire ANC FMA

Target:

a) A combination of single stems, clumps, and islands comprising 1% of the volume within each compartment and the entire ANC FMA area is retained as stand level structure. Note: A wide range in variability in harvest area-level retention within a compartment is desired to achieve the target level.

Downed Woody Debris

CCFM Criterion:

1. Biological Diversity

CSA SFM Element:

1.1 Ecosystem Diversity Conserve ecosystem diversity at the landscape level by maintaining the variety of communities and ecosystems that occur naturally in the ANC FMA

Value:

1.1.2 Local/stand scale biodiversity

Objective:

1.1.2.1 Retain stand level structure

Indicator:

b) Percentage of harvested area by subunit with downed woody debris equivalent to pre-harvest conditions

Target:

b) 100% of harvest areas having downed woody debris in amounts that, at minimum, reflect pre-harvest condition. Woody debris may be in the form of downed material or as standing snags. (See ANC Forest Management Plan page 6-11).

Fine Filter Species – Grizzly Bear

CCFM Criterion:

1. Biological Diversity

CSA SFM Element:

1.2 Species Diversity _ Conserve species diversity by ensuring that habitats for the native species found in the DFA are maintained throughout time.

Value:

1.2.1 Viable populations of identified plant and animal species

Objective:

1.2.1.1 Maintain habitat for identified high value species (i.e., economically valuable, socially valuable, species at risk, species of management concern)

Indicator:

Grizzly Bear:

Maintain or reduce current levels of mean mortality risk for grizzly bears in Core grizzly bear habitat; and reduce current levels of mean mortality risk in Secondary grizzly bear habitat.

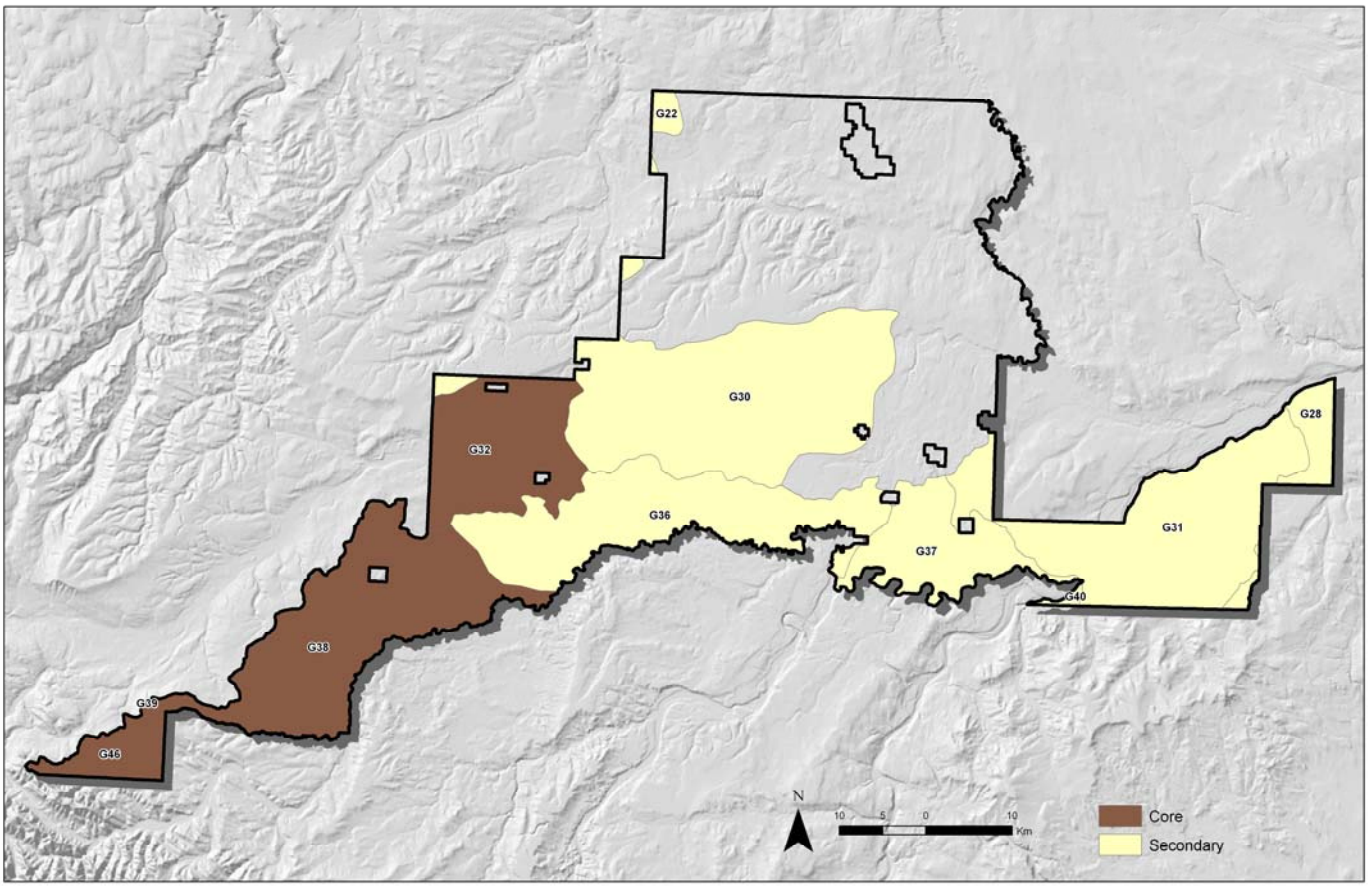
Target:

The grizzly bear model has identified core units G38 and G46 and secondary units G40 and G37 (see figure 1) as units where the mortality risk has increased to a level where mitigation options should be considered. Further details are available from the Grizzly Bear Assessment.

Operational planning can mitigate many of the impacts of timber harvesting. ANC can act to make roads impassable and to quickly reclaim access into completed compartments. On-going communication with the forest area should address these issues in annual operational planning. Achieving the structure retention target will contribute to mitigating the effects of timber harvesting on grizzly bear habitat. ANC is further encouraged to practice integrated land management to minimize the associated negative effects on grizzly bear habitat.

ANC will align its operational plans and practices with the grizzly bear management policy for Alberta once approved.

Figure 1: Core and Secondary Grizzly Bear Watershed Units in ANC FMA (FMU W15)



Fine Filter Species - Caribou
CCFM Criterion:
1. Biological Diversity

CSA SFM Element:
1.2 Species Diversity _ Conserve species diversity by ensuring that habitats for the native species found in the DFA are maintained throughout time.

Value:
1.2.1 Viable populations of identified plant and animal species

Objective:
1.2.1.1 Maintain habitat for identified high value species (i.e., economically valuable, socially valuable, species at risk, species of management concern)

Indicator:

Caribou:

Amount (ha) of gross primary intactness area within the ANC FMA. The West Central Caribou Committee "Primary Intactness Areas" are the key areas managed for caribou habitat over time in the ANC FMP.
Target:

Reporting Timeframe	Gross Primary Intactness Area (ha)
Current	26,643.6
Year 10	23,717.4
Year 50	13,805.2
Year 100	N/A
Year 200	N/A

Note:
- See attached maps for current, year 10 and year 50 projections.
- See section 6.2.2.1 Caribou on page 6-17 of the ANC 2010 Forest Management Plan for a description of the timber harvesting strategy for the Caribou range in the ANC FMA.
- ANC will align its operational plans and practices with the Woodland Caribou Policy for Alberta.

118°20'0"W

117°30'0"W

54°10'0"N

54°0'0"N

53°50'0"N

Redrock - Prairie Ck

Little Smoky

A La Peche

A La Peche

T59

T58

T57

T56

R7 W6

R6 W6

R5 W6

R4 W6

R3 W6

R2 W6

R1 W6

R27 W5

R26 W5

R25 W5

R24 W5

ANC
Planned Harvest and Caribou Intactness
Year 0

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N

6 3 0 6 Km

Intact Forest

Past Harvest (1980 -Present)

Caribou Range

Hydro Features

Divided Highway

Paved Road

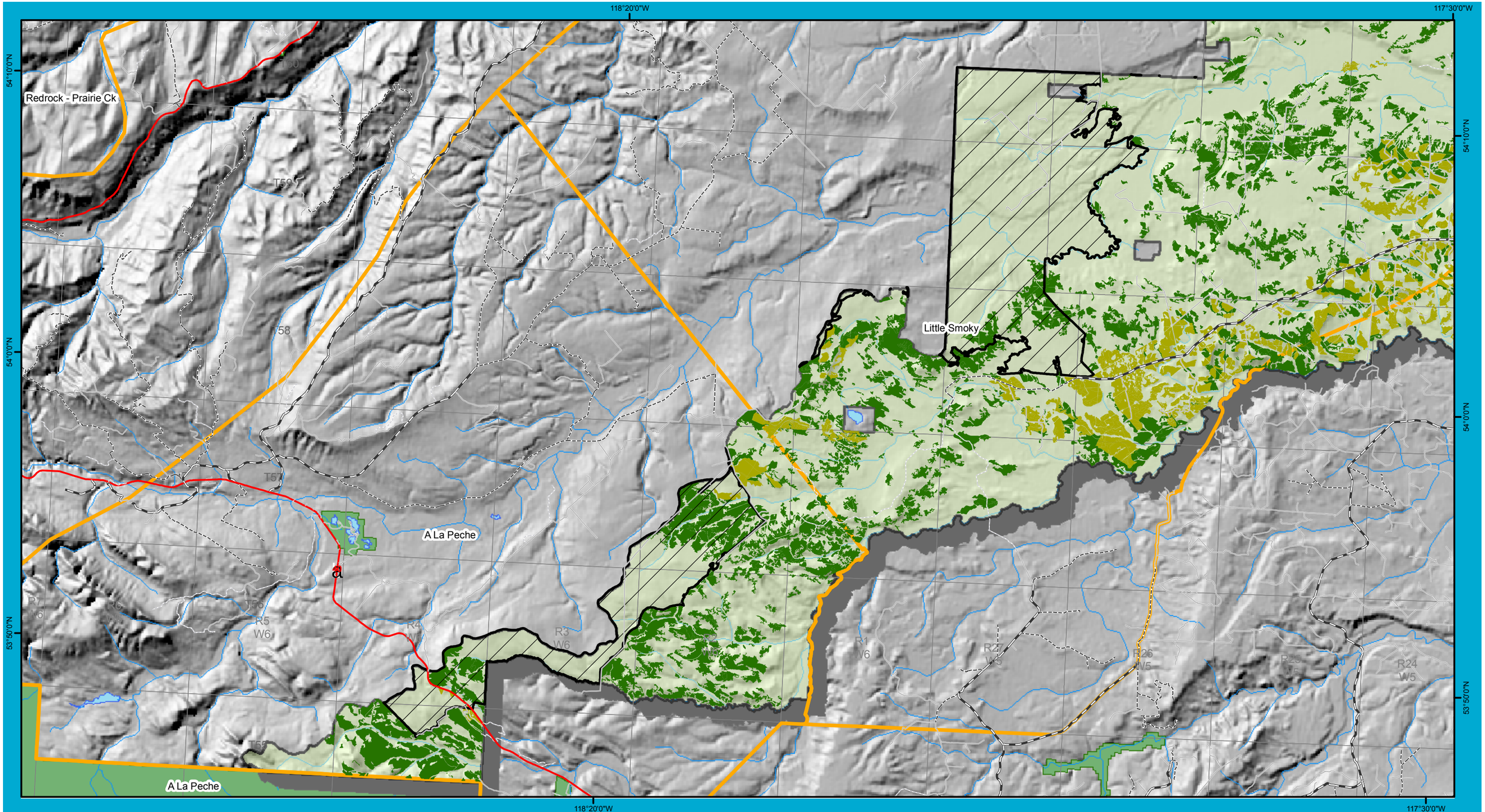
2 Lane Gravel Road

1 Lane Gravel Road

Unimproved Road

Truck-Trail

Base Data provided by:
Spatial Data Warehouse Ltd.
January 26, 2011
Forest Management Branch
Edmonton



Government of Alberta

Alberta

N

6 3 0 6 Km

ANC Planned Harvest and Caribou Intactness Year 10

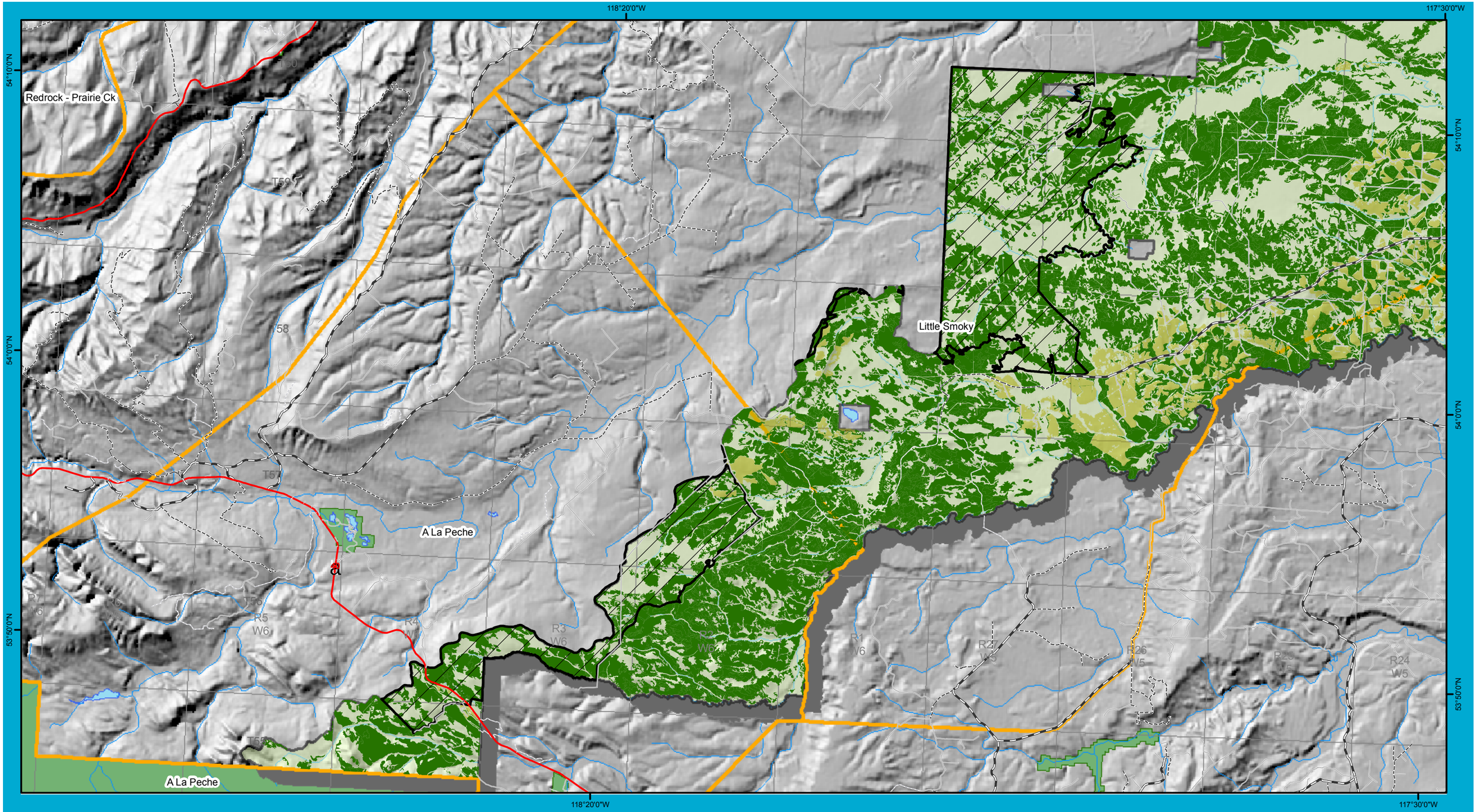
- Intact Forest
- Planned Harvest
- Past Harvest (1980 -Present)

Caribou Range

Hydro Features

- Divided Highway
- Paved Road
- 2 Lane Gravel Road
- 1 Lane Gravel Road
- Unimproved Road
- Truck-Trail

Base Data provided by:
Spatial Data Warehouse Ltd.
January 26, 2011
Forest Management Branch
Edmonton



Government of Alberta

Alberta

N

6 3 0 6 Km

ANC Planned Harvest and Caribou Intactness Year 50

- Intact Forest
- Planned Harvest
- Past Harvest (1980 -Present)

Caribou Range

Hydro Features

- Divided Highway
- Paved Road
- 2 Lane Gravel Road
- 1 Lane Gravel Road
- Unimproved Road
- Truck-Trail

Base Data provided by:
Spatial Data Warehouse Ltd.
January 26, 2011
Forest Management Branch
Edmonton

Water Yield

CCFM Criterion:
3. Soil and water

CSA SFM Element:
3.2 Water quantity and quality

Value:
3.2.1 Water quantity

Objective:
3.2.1.1 Limit impact of timber harvesting on water yield.

Indicator:
Forecasted impacts of timber harvesting on water yield are presented in the ANC Watershed Assessment.

Target:
Zero Water Act penalties,
Complete compliance with FMP

Fire Behavior
CCFM Criterion:
5. Multiple Benefits to Society

CSA SFM Element:
5.2 Communities and Sustainability

Value:
5.2.1 Risk to communities and landscape values from wildfire is low.

Objective:
5.2.1.1 To reduce wildfire threat potential by reducing fire behaviour, fire occurrence, threats to values at risk and enhancing fire suppression capability

Indicator:
1) Percentage reduction in Fire Behaviour Potential area (ha) within the FireSmart Community Zone

2) Percentage reduction in Fire Behaviour Potential area (ha) across the DFA now and over the planning horizon

Target:
1) Reduce the area (ha) in the extreme and high Fire Behaviour Potential rating categories by N/A% within the FireSmart Community Zone
Note: There are no FireSmart Community Zones in the ANC FMA.

2) Reduce the combined area (ha) in the extreme, very high and high Fire Behaviour Potential rating categories by 9.4% at year 10, further reduced by an additional 10.4% at year 20 across the ANC FMA and reduced by a total of 7.82% at year 50.

Note: Refer to ANC FireSmart Analysis Forest Condition Assessment for further information.

1 ANC Forest Management Agreement - Future Landscape Metrics Prediction – Supporting Documentation

FMP Scenario – Submitted (November 19, 2010) Preferred Forest Management Strategy (PFMS)

Future forest landscape metric estimates were developed to align with reporting required within *Alberta Forest Management Planning Standard -Annex 4 Performance Standards objectives 1.1.1.1 and 1.1.1.2.* This document summarizes the procedures used to develop the future landscape metric predictions and is organized into the following main sections:

- 1.1 Timber Supply Model Adjustments – Spatial Harvest Sequence Replay Scenario
- 1.2 Seral Stage / Cover Type Distribution (PS 1.1.1.1)
- 1.3 Young Forest Patch Distribution (PS 1.1.1.2a)
- 1.4 Old Interior Forest (PS 1.1.1.2b)

1.1 Timber Supply Model Adjustments – Spatial Harvest Sequence Replay Scenario

In order to assess and comply with *Annex 4 Performance Standards Objectives1.1.1.1 and 1.1.1.2* the future forest metrics of the FMA area had to be predicted for the gross forest FMA area. The submitted Remsoft Woodstock Timber Supply Analysis (TSA) models submitted, February 2, 2011, did not include a scenario in which the 70 year Spatial Harvest Sequence (SHS) could directly create outputs to assess the required future forest landscape metrics. A new model formulation was developed altering the submitted model formulations to:

1) Force the initial 70 years of harvest to be represented by the SHS;

   The 70 year submitted (*December 17, 2010*) SHS was utilized

2) Include the passive (non-contributing) landbase in the model;

   This allows the model to grow the passive forested landbase. It was assumed that all polygons assigned a "YC_COV_GRP" were forested.

3) Include additional Woodstock themes, to track additional outputs;

   THEME10 Yield Curve Cover Group
   –Assigned to YC_COV_GRP

THEME11 Landbase Status
- NETDOWN = 0 Assigned “A” or active landbase
- NETDOWN > 0 and FMA = “ANC” Assigned ”P_FMA”
- NETDOWN > 0 and FMA = “ ” Assigned ”P_N”

THEME12 Natural Sub-Region
- NSRNAME = "Central Mixedwood" Assigned "CM"
- NSRNAME = "Upper Foothills" Assigned "UF"
- NSRNAME = "Lower Foothills” Assigned "LF"
- NSRNAME = "Subalpine" Assigned “S”

4) Model years 70 – 200 modelled with same constraints and objectives included in original aspatial FMA holder PFMS model.

This new model scenario was then used to create future conditions files and reports that were used to complete assessments discussed in sections 1.2, 1.3 and 1.4.

1.2 Seral Stage / Cover Type Distribution (PS 1.1.1.1)

This section outlines the criteria used to report on seral stage and cover type distributions across the FMA for both the Gross forested and Active Landbase areas.

1.2.1 Cover Types

Alberta Newsprint Company’s (ANC) assigned cover types were utilized for reporting, as they account for the entire gross forested area. The cover types were defined as outlined in Figure 1.

Figure 1: Cover Type Distributions (Table Sourced from: Alberta Newsprint Company Detailed Forest Management Plan Page 2-26 (Submitted: *November 19, 2010)*

TABLE 2-6: COVER TYPE DEFINITION

COVER TYPE	DESCRIPTION	CONIFER CROWN CLOSURE (%)	LEADING CONIFER SPECIES CODE
C-P	Conifer – pine	80 – 100	PL, PJ, P
C-SB	Conifer – black spruce	80 – 100	SB, LT
C-SW	Conifer – white spruce	80 – 100	FB, FA, SW
CD-P	Conifer dominated mixedwood – pine leading conifer component	50 – 79	PL, PJ, P
CD-S	Conifer dominated mixedwood – spruce leading conifer component	50 – 79	FB, FA, SW SB, LT
DC-P	Deciduous dominated mixedwood – pine leading conifer component	20-49	PL, PJ, P
DC-S	Deciduous dominated mixedwood – spruce leading conifer component	20-49	FB, FA, SW SB, LT
D	Deciduous	0 – 20 (also requires >0% Deciduous Crown Closure)	ANY

1.2.2 Seral Stage Definitions

The *Alberta Forest Management Planning Standard* requires that targets be set for old, mature and young forest. The assessments used simplified seral stage definitions that were applied to all cover types in all natural subregions (Table 1).

Table 1: Seral Stage Classes

Seral Stage Class	Age (years)
Young	0 – 19
Immature	20 – 79
Mature	80 – 119
Old	120 – 179
Very Old	≥180

1.3 Young Forest Patch Distribution (PS 1.1.1.2a)

Patch size distribution is an indicator that measures the degree of fragmentation on the landscape. The definition of a patch according to the *Alberta Forest Management Planning Standard* is: "a stand of forest in the same seral stage, and not split by a linear feature greater than 8 m wide. A linear feature in this definition includes roads, pipelines, powerlines, and rivers, but does not include seismic lines. This assessment only examined the trend in "young" (refer to section 1.2.2) forest patches over time. The following patch size classes were utilized in this assessment:

- 0 – 19 hectares;
- 20 – 99 hectares;
- 100 – 250 hectares;
- >250 hectares.

1.4 Old Interior Forest (PS 1.1.1.2b)

Old Interior forest is defined in the *Alberta Forest Management Planning Standard* as "a Old forested[1] area greater than 100 hectares in size located beyond edge effect buffer zone[2] along forest edge[3]".

[1] Forested stands ≥ 120 years of age
[2] Edge effect buffer zone: 60m where adjacent area is non-forested or less than 40 years old; 30m where adjacent forest stand is ≤ 40 years old and less than mature forest; 0 m where adjacent stand is mature forest
[3] Forest edge: any of the following: a) a linear disruption in forest cover greater than 8m in width, or, b) the line along which forest seral stage class changes

Alberta Newsprint Company

DETAILED FOREST MANAGEMENT PLAN

APPENDIX L

COARSE FILTER FOREST CONDITION ASSESSMENT

REFERENCE # 0-128

DEVELOPED WITH The Silvacom Group

Government of Alberta ■
Sustainable Resource Development

Forestry Division
Forest Management Branch
8th Floor, Great West Life Building
9920 – 108 Street
Edmonton, Alberta T5K 2M4
Telephone: 780-422-4567
www.alberta.ca

April 26, 2011

Robert W. Stokes
Senior Manager
Forest Management Planning Section
Forest Management Branch
8th Floor, 9920-108 St
Edmonton, Alberta
T5K 2M4

Subject: Alberta Newsprint Company Ltd. (ANC) Coarse Filter Assessments

The Coarse Filter Assessments for the Alberta Newsprint Company Ltd. Forest Management Plan was completed to the best of my ability and professional knowledge.

Current information and the spatial harvest sequence supplied by the company were used for the assessment. The results would therefore change with variance from the spatial harvest sequence. I was responsible for interpreting data summaries as provided by SRD analysts. This endorsement is solely for the work completed by myself and submitted on this date.

Yours truly,

J. John Stadt
Forest Ecology Specialist
Forest Management Planning Section

Enclosure

Coarse Filter Assessments for the ANC FMA

Seral Stage Distribution across the ANC FMA

Figures 1-2 show the seral stage distribution for the Gross and Active Landbases in the ANC FMA. Maps 1-3 show the spatial distribution of seral stages across the ANC FMA at Years 0, 10, and 50. The net landbase comprises 66% of the total forested landbase and has a skewed species distribution compared to the passive landbase in that pine dominated is 60% of the active but only 18% on the passive. Conversely black spruce dominated is only 5% of the active but is 71% of the passive landbase. Pine dominated forest comprises 46% of the total landbase. Spatially, this pine dominated forest is focused in the Upper and Lower Foothills (see maps – no tabular data). Since the caribou range is aligned with the Upper Foothills with some Subalpine and Lower Foothills contribution, caribou range is thus largely comprised of pine dominated forest. Therefore the harvest focus on pine dominated forest to address MPB risks, results in caribou habitat seeing a higher level of harvesting over the first 20 years compared to the entire FMA.

In the Gross Landbase mature+old forest declines from 66% to 25% by year 20 and although varying through time, returns to the year 20 level by the end of the planning horizon. Old forest (old+very old) fluctuates through time (down to 2% at year 100) but ends up at year 200 at the same level as Year 0 (~19%). However, as only harvest disturbance is modeled, no disturbances are modeled on the passive landbase and trees there only die as a result of death-age functions in the model. Therefore old forest values for the gross landbase should be interpreted with caution. Harvest disturbance plays the significant factor in the seral stage distributions reported on the Active Landbase (rather than modeling assumptions such as “Death-age”) and therefore more attention should be paid to Active Landbase old forest distributions. The Active Landbase seral stage distribution follows the pattern for the Gross landbase.

Seral Stage Distribution in ANC FMA Natural Subregions

Figures 3-10 shows the seral stage distribution for the Gross and Active Landbase in each Natural Subregion in the ANC FMA. Seral stage distributions vary at the natural subregion scale. The seral stage distribution on the Upper Foothills, where caribou range is focused, shows a shift from 72% mature+old forest to 10% by year 20 with a return to 39% by year 200.

The amount of young seral forest doubles across the FMA from 11 to 22% in the first 10 years with most of this increase being seen in the Lower and Upper Foothills NSRs where pine is concentrated. Upper Foothills saw the largest proportional increase in young seral forest with a near tripling of young seral forest area. Caribou range in ANC’s FMA is mostly in this Upper Foothills NSR with some extending into the Lower Foothills and Subalpine as well. However, by Year 50 the area of young seral forest had fallen back to below 10% with Upper Foothills showing the largest shift again with young seral declining to half Year 0 levels (and 19% of Year 10 levels). In summary,

accelerated harvesting in the first 10 years is especially concentrated in the Upper Foothills, to a lesser extent in the Lower Foothills resulting in shifts in seral stage distribution to younger forests in these two NSRs. With the end of accelerated harvest levels and a small proportional shift of harvesting away from the Upper Foothills, young forest in the Upper Foothills drops back to and below year 0 levels.

Figure 1. Seral Stage distribution for ANC FMA Gross Landbase

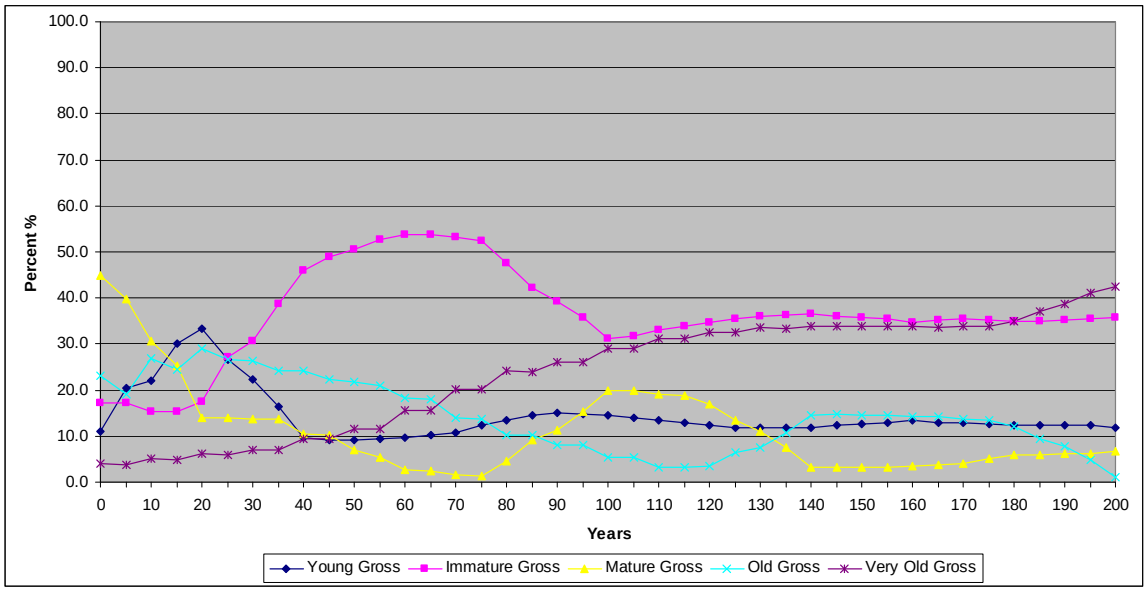


Figure 2. Seral Stage distribution for ANC FMA Active Landbase

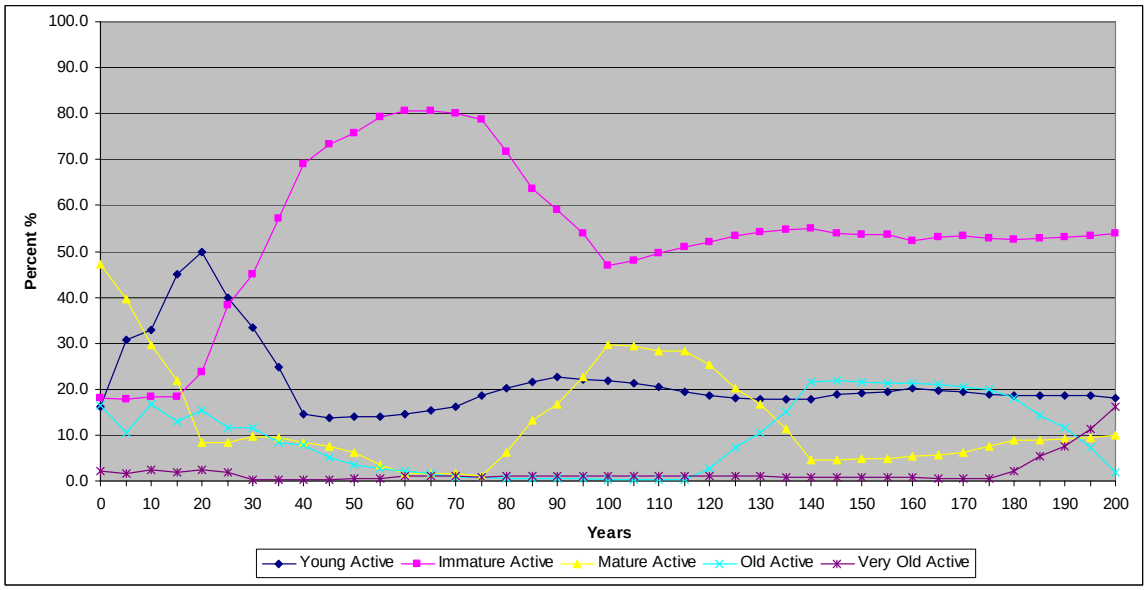


Figure 3. Seral stage distribution in the Lower Foothills – ANC FMA Gross Landbase

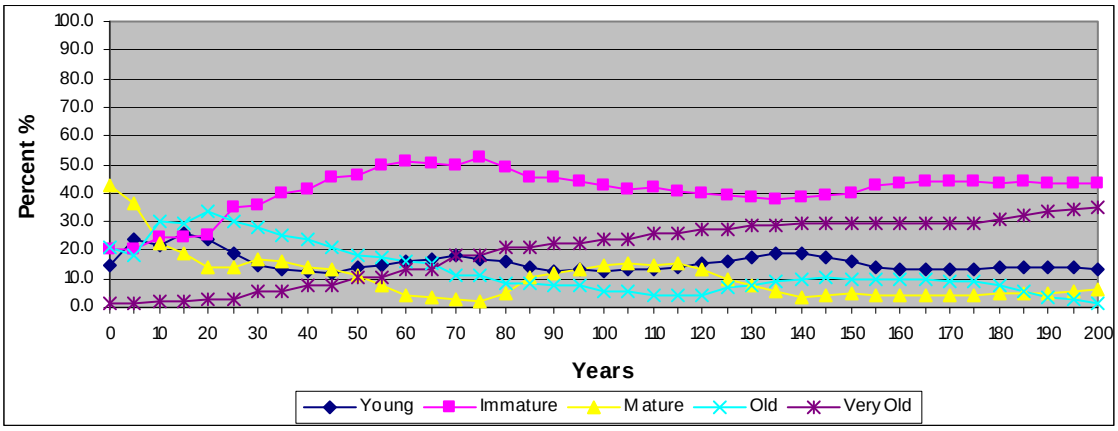


Figure 4. Seral stage distribution in the Lower Foothills – ANC FMA Active Landbase

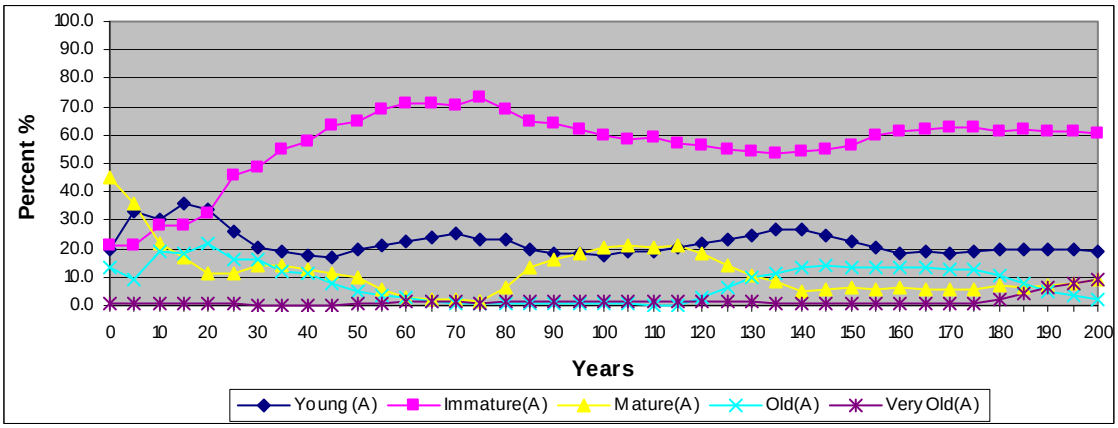


Figure 5. Seral stage distribution in the Upper Foothills – ANC FMA Gross Landbase

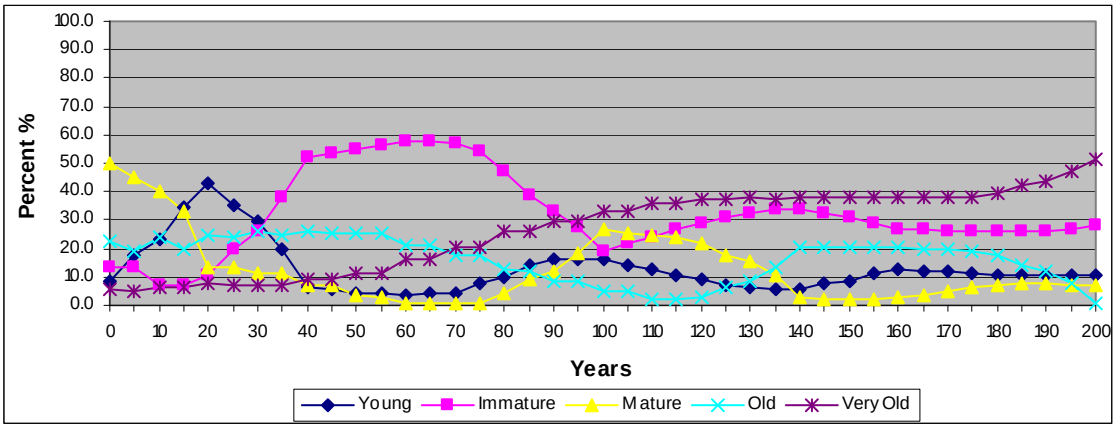


Figure 6. Seral stage distribution in the Upper Foothills – ANC FMA Active Landbase

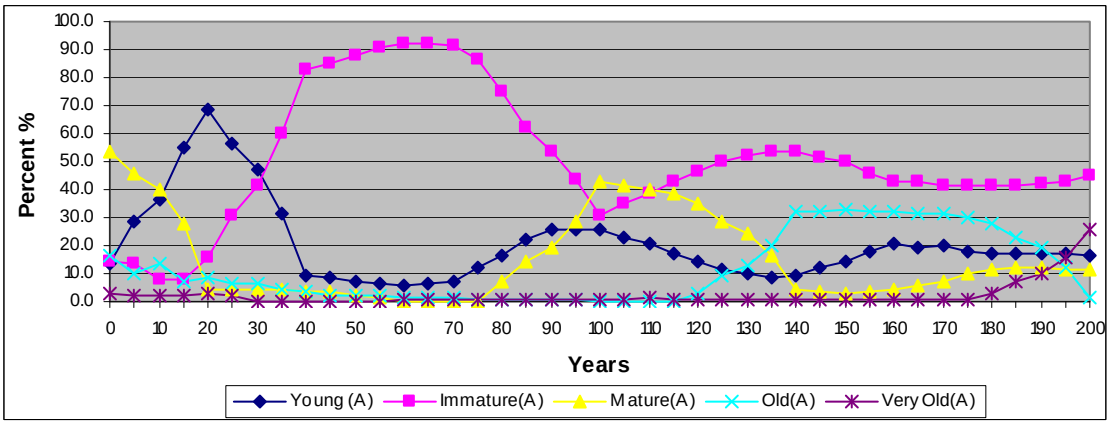


Figure 7. Seral stage distribution in the Central Mixedwood – ANC FMA Gross Landbase

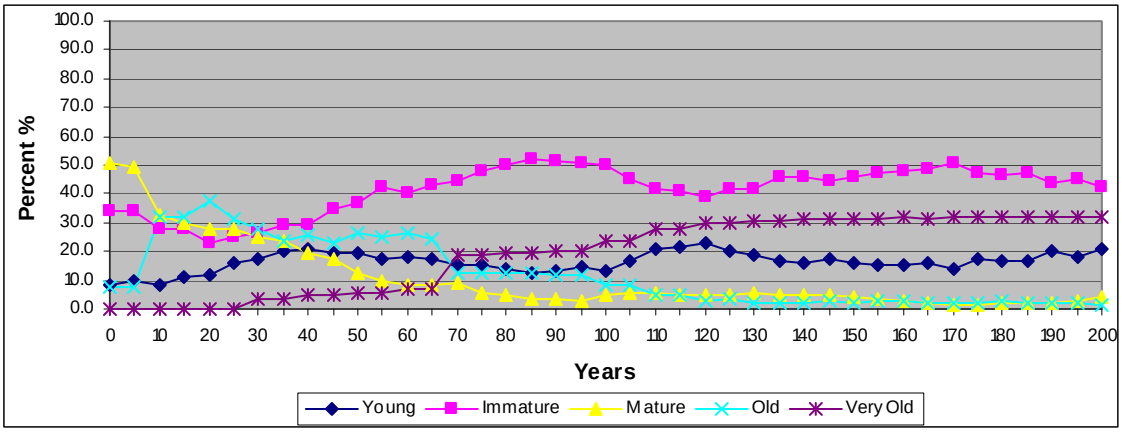


Figure 8. Seral stage distribution in the Central Mixedwood – ANC FMA Active Landbase

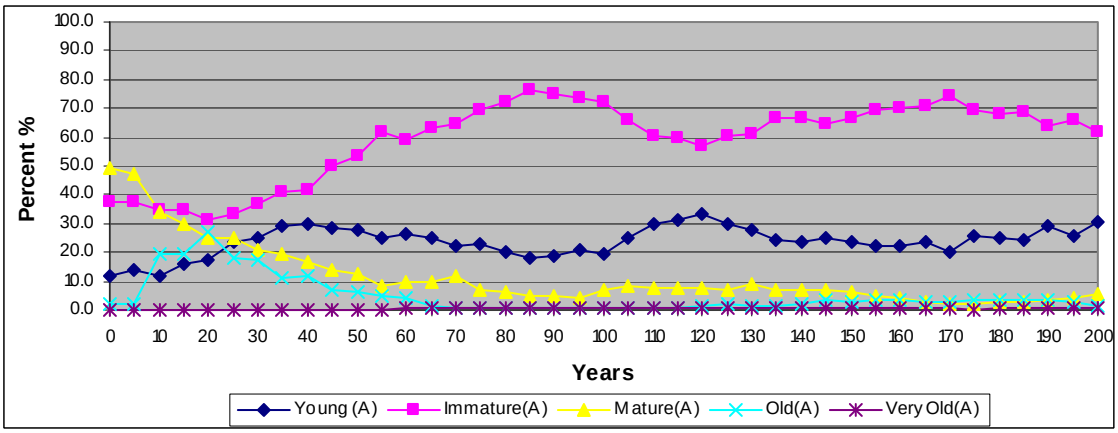


Figure 9. Seral stage distribution in the Subalpine – ANC FMA Gross Landbase

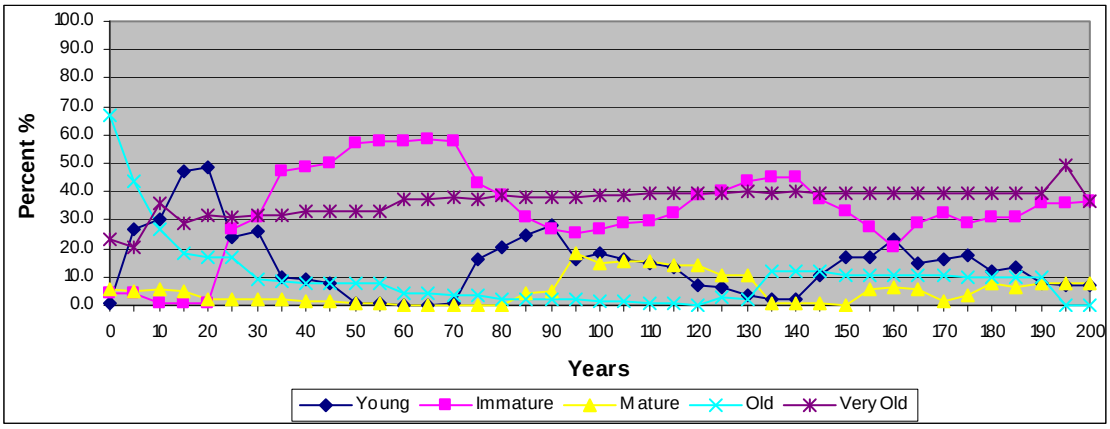
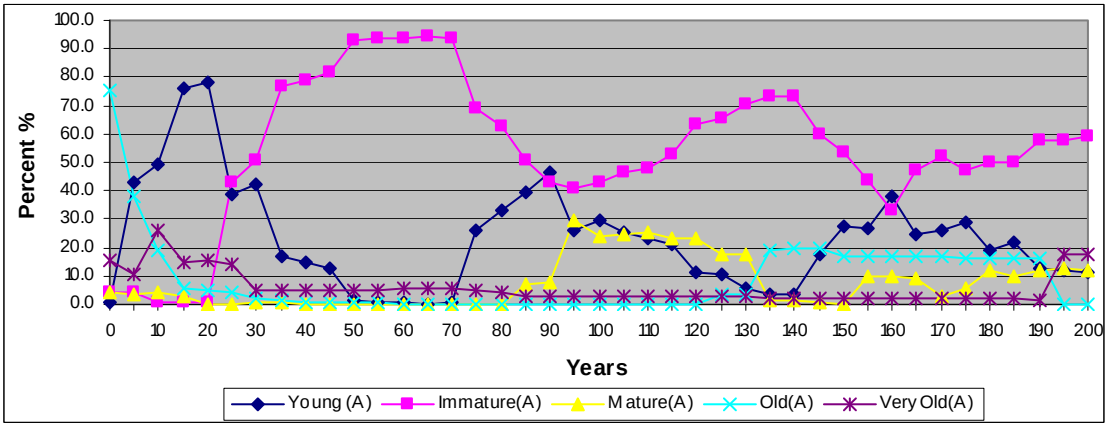
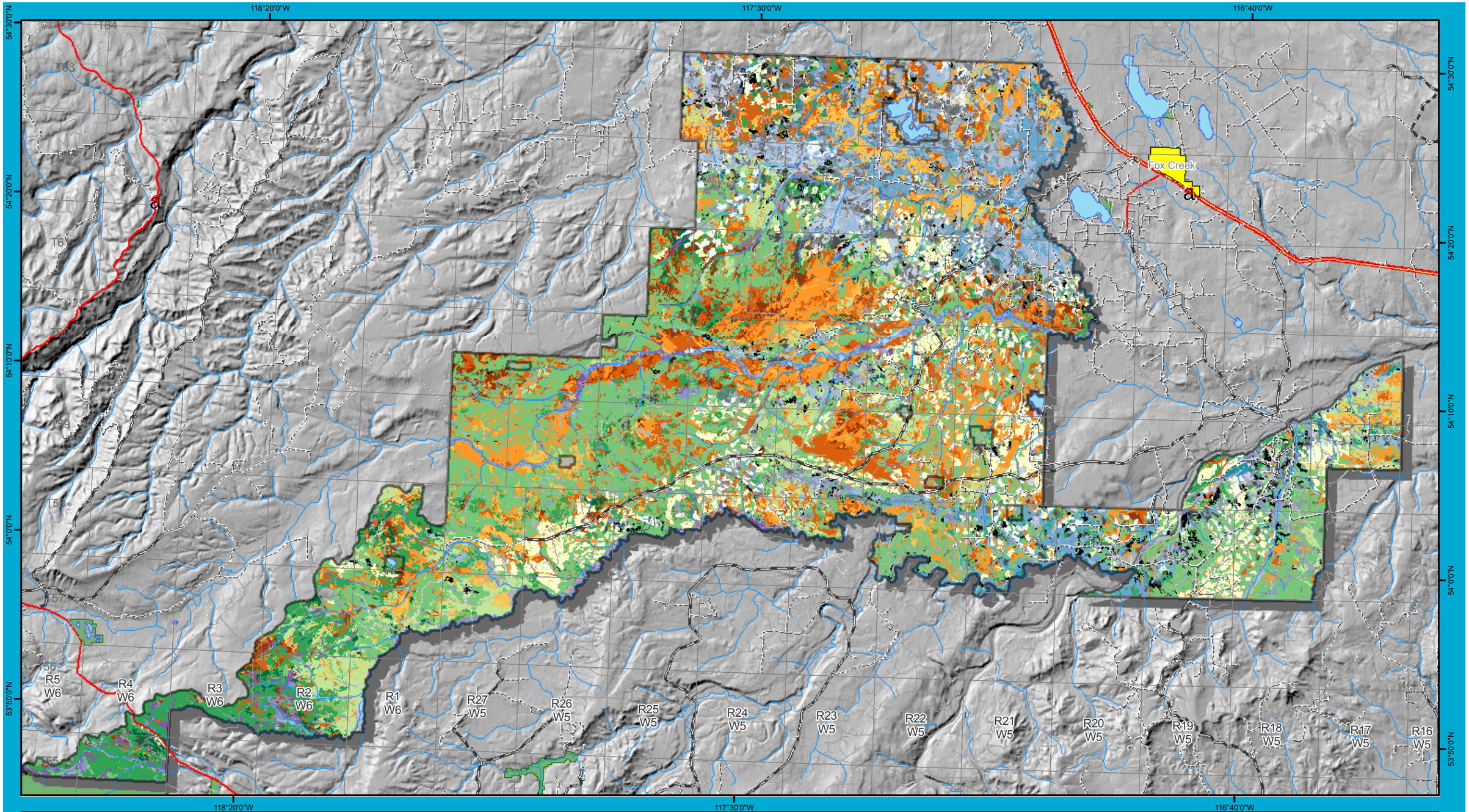


Figure 10. Seral stage distribution in the Subalpine – ANC FMA Active Landbase





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ANC Seral Stage Distribution Year 0

	P	SB	SW	D
Young				
Immature				
Mature				
Old				
Very Old				

CD-S
CD-P
DC-P
DC-P

Mixedwood stands have been grouped only by yield class for the purposes of this map. For further detail on Mixedwood classes please refer to the tabular data.

Base Data provided by:
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January 26, 2011
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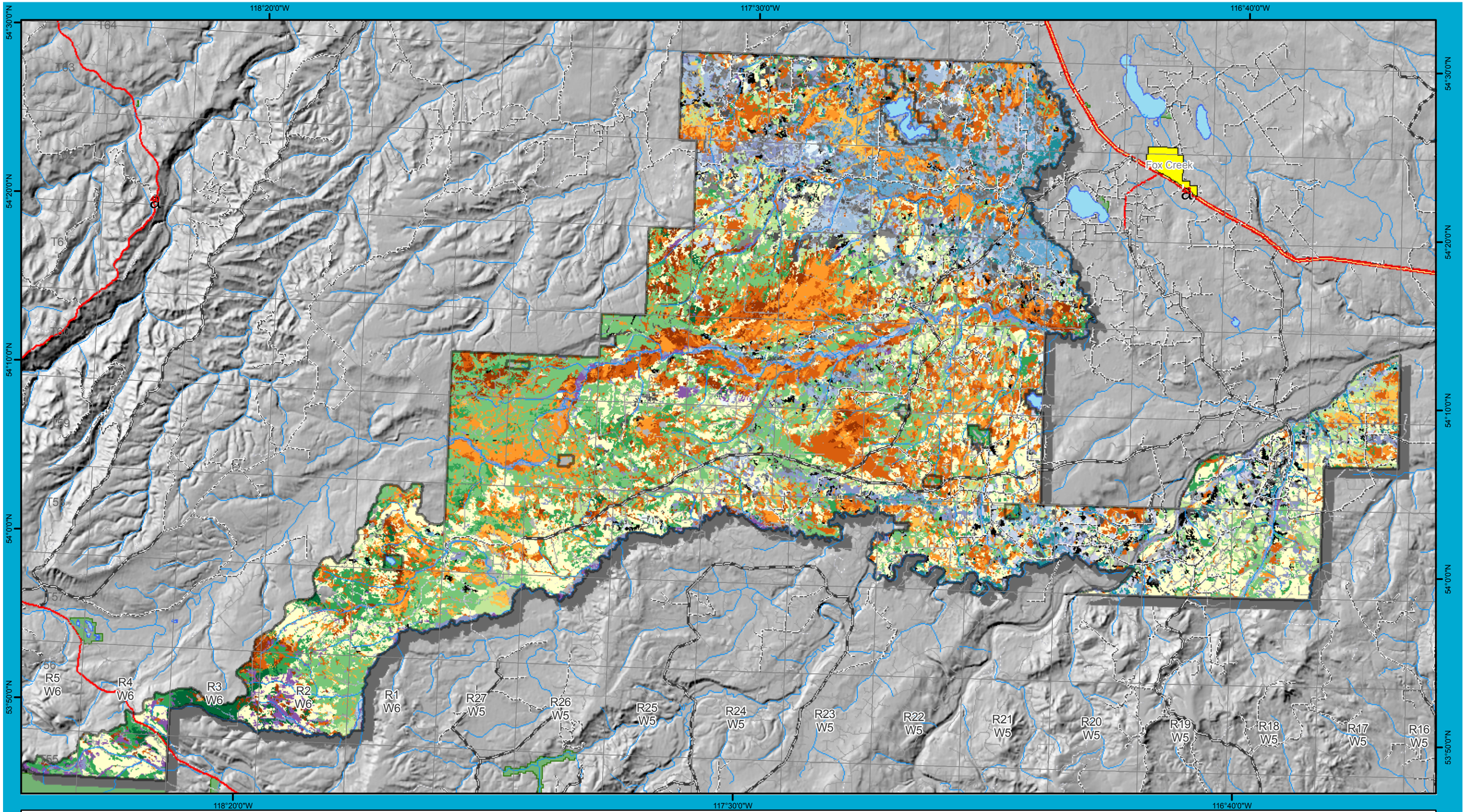

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ANC Seral Stage Distribution Year 10

	P	SB	SW	D
Young				
Immature				
Mature				
Old				
Very Old				

CD-S
CD-P
DC-P
DC-P

Mixedwood stands have been grouped only by yield class for the purposes of this map. For further detail on Mixedwood classes please refer to the tabular data.

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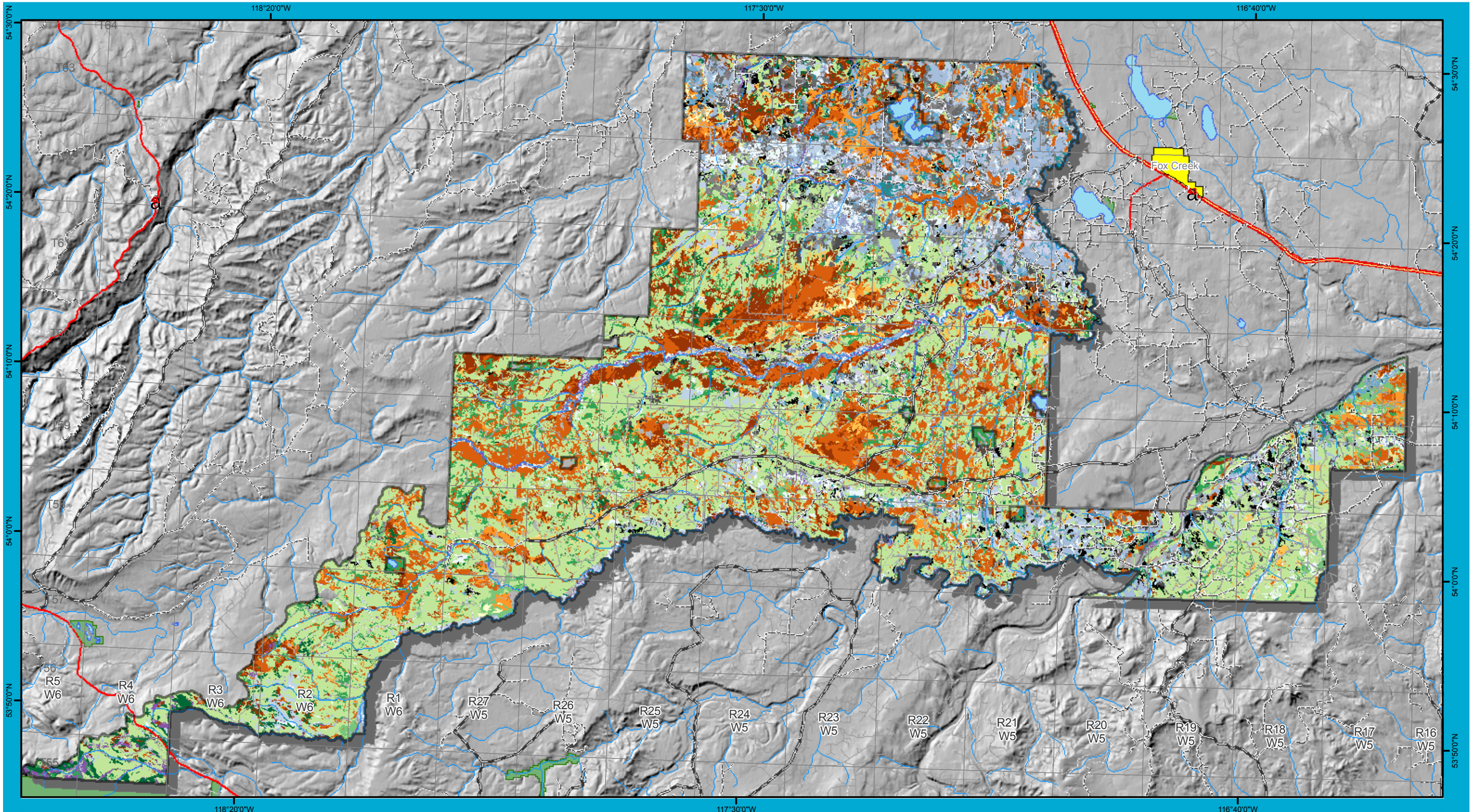

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ANC Seral Stage Distribution Year 50

	P	SB	SW	D
Young				
Immature				
Mature				
Old				
Very Old				

CD-S
CD-P
DC-P
DC-P

Mixedwood stands have been grouped only by yield class for the purposes of this map. For further detail on Mixedwood classes please refer to the tabular data.

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Patch size distribution of Young Forest in the ANC FMA

Table 1 shows the distribution of young forest patch sizes in each natural subregion in the ANC FMA. Maps 4-6 show the spatial distribution of young forest patches in Years 0, 10 and 50. Interpreting the spatial configuration of Young Forest requires an understanding of trends in amount of Young Forest (see Figures 1-10). Therefore trends in amount of Young Forest through time are discussed first.

- Due to the accelerated harvest the amount of young seral forest doubles across the FMA from 11 to 22% in the first 10 years (Figures 1 and 2) with most of this increase being seen in the Lower and Upper Foothills NSRs where pine is concentrated (Figures 3-6). Upper Foothills saw the largest proportional increase in young seral forest with a near tripling of young seral forest area. Caribou range in ANC's FMA is mostly in this Upper Foothills NSR with some extending into the Lower Foothills and Subalpine as well. However, by Year 50 the area of young seral forest had fallen back to below 10% with Upper Foothills showing the largest shift again with young seral declining to half Year 0 levels (and 19% of Year 10 levels). In summary, accelerated harvesting in the first 10 years is especially concentrated in the Upper Foothills, to a lesser extent in the Lower Foothills resulting in shifts in seral stage distribution to younger forests in these two NSRs. With the end of accelerated harvest levels and a small proportional shift of harvesting away from the Upper Foothills, young forest in the Upper Foothills drops back to and below year 0 levels.
- Patch size distribution:
    - Upper Foothills
        - the proportion of smaller patches (<100ha) declines from 88% of total young seral area to 69% in year 10. However, this reduction in the proportion of small patches does not represent reduced fragmentation in this NSR as the area of this NSR in smaller young patches more than doubles due to the accelerated harvest focused in this NSR. This raises potential risks to caribou as this doubling of area in young smaller patches will likely significantly increase alternate prey (moose and deer) habitat in the caribou zone.
        - By year 50, the proportion of area in smaller young seral patches increases to 97%. However, this does not reflect an increase in fragmentation as lower harvest levels in the Upper Foothills after the accelerated harvest ends resulting in the area of these small patches being lower than Year 0, and less than a third of Year 10. In addition, one must be careful in interpreting Year 50 spatial statistics as they are more reflective of model outputs than of detailed operational spatial harvest sequencing processes that create the harvest patches for the first 20 years. Spatial Harvest Sequences created in future plans will likely significantly change the actual spatial distribution seen in Year 50.
    - Lower Foothills
        - Similar pattern and trends as seen in the Upper Foothills however trends are less dramatic as harvest levels are proportionally lower in this NSR relative to the UF during this plan. Lower proportion of

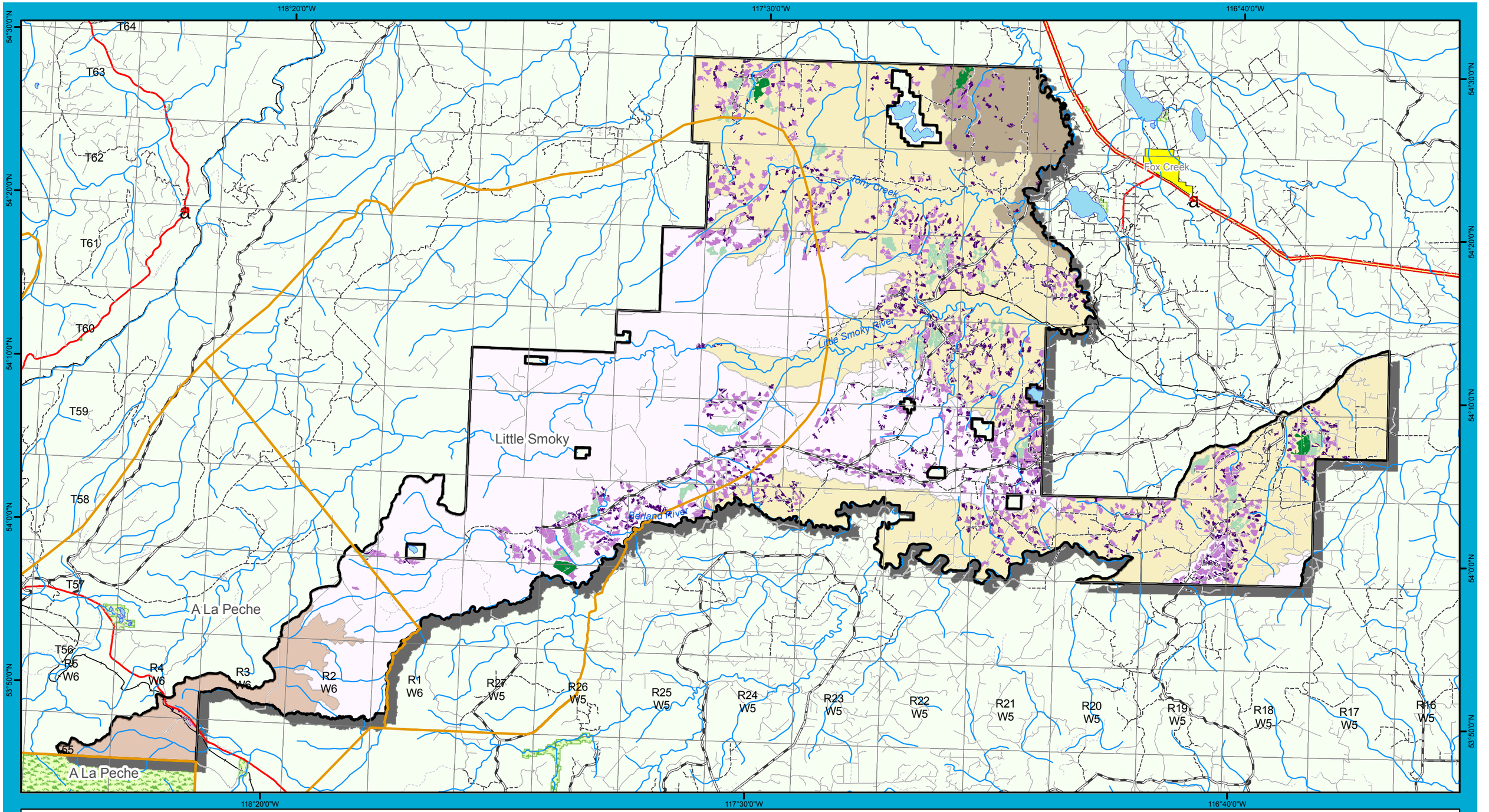
- Summary of key observed trend: Tripling of young seral forest area in Upper Foothills NSR resulted in doubling the area in smaller patch classes. Therefore despite a reduction in the proportion of small patches, the supply of small young patches favourable to moose and deer increases, which significantly increases short term risks to the part of the Little Smoky herd utilizing this area. By Year 50, this risk to caribou is reduced to Year 0 levels as harvest levels decline in the Upper Foothills NSR.

Table 1. Distribution of patch sizes of young forest in each Natural Subregion in the ANC FMA at Year 0, 10, and 50.

	Natural Subregion									
Year 0	Central Mixed Wood		Lower Foothills		Upper Foothills		Sub-Alpine			
Patch Class	Area(ha)	% of Young Patches	Area (ha)	% of NSR Forested Area	Area(ha)	% of NSR Forested Area	Area (ha)	% of NSR Forested Area	Total Area (ha)	% in FMA
0 -19	362	31%	7015	31%	3843	28%	50	70%	11270	29.84
20-99	548	46%	11675	52%	8304	60%	20	30%	20547	54.41
100-250	0	0%	3379	15%	1487	11%	0	0%	4866	12.88
>250	270	23%	552	2%	261	2%	0	0%	1083	2.87
Total	1180	100%	22621	100%	13895	100%	70	100%	37766	100.00
	14557	8%	155591	15%	161612	9%	14240	0%	346000	10.92

	Natural Subregion									
Year 10	Central Mixed Wood		Lower Foothills		Upper Foothills		Sub-Alpine			
Patch Class	Area(ha)	% of NSR Forested Area	Area (ha)	% of NSR Forested Area	Area(ha)	% of NSR Forested Area	Area (ha)	% of NSR Forested Area	Total Area (ha)	
0 -19	515	44%	10935	33%	9534	26%	376	9%	21360	28.05
20-99	647	56%	14865	44%	16027	43%	1176	27%	32715	42.96
100-250	0	0%	4571	14%	7694	21%	1206	28%	13471	17.69
>250	0	0%	3066	9%	3940	11%	1602	37%	8608	11.30
Total	1162	100%	33437	100%	37195	100%	4360	100%	76154	100.00
	14557	8%	155591	21%	161612	23%	14240	35%	346000	22.01

	Natural Subregion									
Year 50	Central Mixed Wood		Lower Foothills		Upper Foothills		Sub-Alpine			
Patch Class	Area(ha)	% of NSR Forested Area	Area (ha)	% of NSR Forested Area	Area(ha)	% of NSR Forested Area	Area (ha)	% of NSR Forested Area	Total	
0 -19	1237	44%	9731	45%	4182	58%	95	70%	15245	47.79
20-99	1386	50%	8617	40%	2767	39%	40	30%	12810	40.16
100-250	159	6%	2542	12%	229	3%	0	0%	2930	9.19
>250	0	0%	913	4%	0	0%	0	0%	913	2.86
Total	2782	100%	21803	100%	7178	100%	135	100%	31898	100.00
	14557	19%	155591	14%	161612	4%	14240	1%	346000	9.22



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Young Patch Size Distribution with Natural Subregion

Year Zero

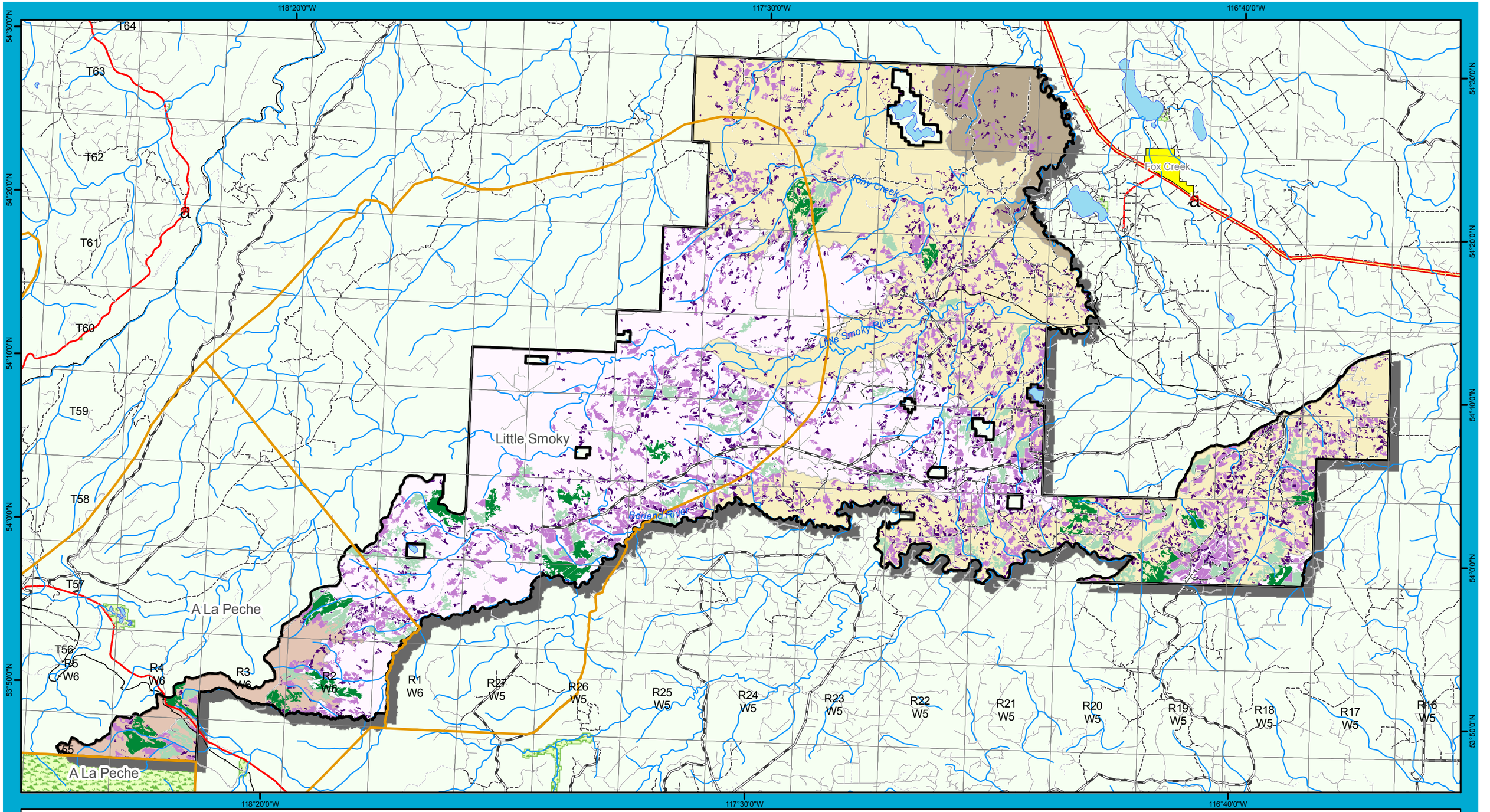
- <20 ha
- 20 -100 ha
- 100 - 250 ha
- > 250 ha

- Central Mixedwood
- Lower Foothills
- Subalpine
- Upper Foothills

- Caribou Ranges
- FMA Boundary
- Parks/ Protected Areas
- Hydrologic Features

- Divided Highway
- Paved Road
- 2 Lane Gravel Road
- 1 Lane Gravel Road
- Unimproved Road
- Truck-Trail
- Railways

Base Data provided by:
Spatial Data Warehouse Ltd.
Spatial Harvest Sequence provided by ANC Timber Ltd.
The data has been reinterpreted by SRD based on ANC's 2010 Forest Management Plan assumptions and strategies.
April 6, 2011
Forest Management Branch
Edmonton



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Young Patch Size Distribution with Natural Subregion

YearTen

- <20 ha
- 20 -100 ha
- 100 - 250 ha
- > 250 ha

- Central Mixedwood
- Lower Foothills
- Subalpine
- Upper Foothills

- Caribou Ranges
- FMA Boundary
- Parks/ Protected Areas
- Hydrologic Features

- Divided Highway
- Paved Road
- 2 Lane Gravel Road
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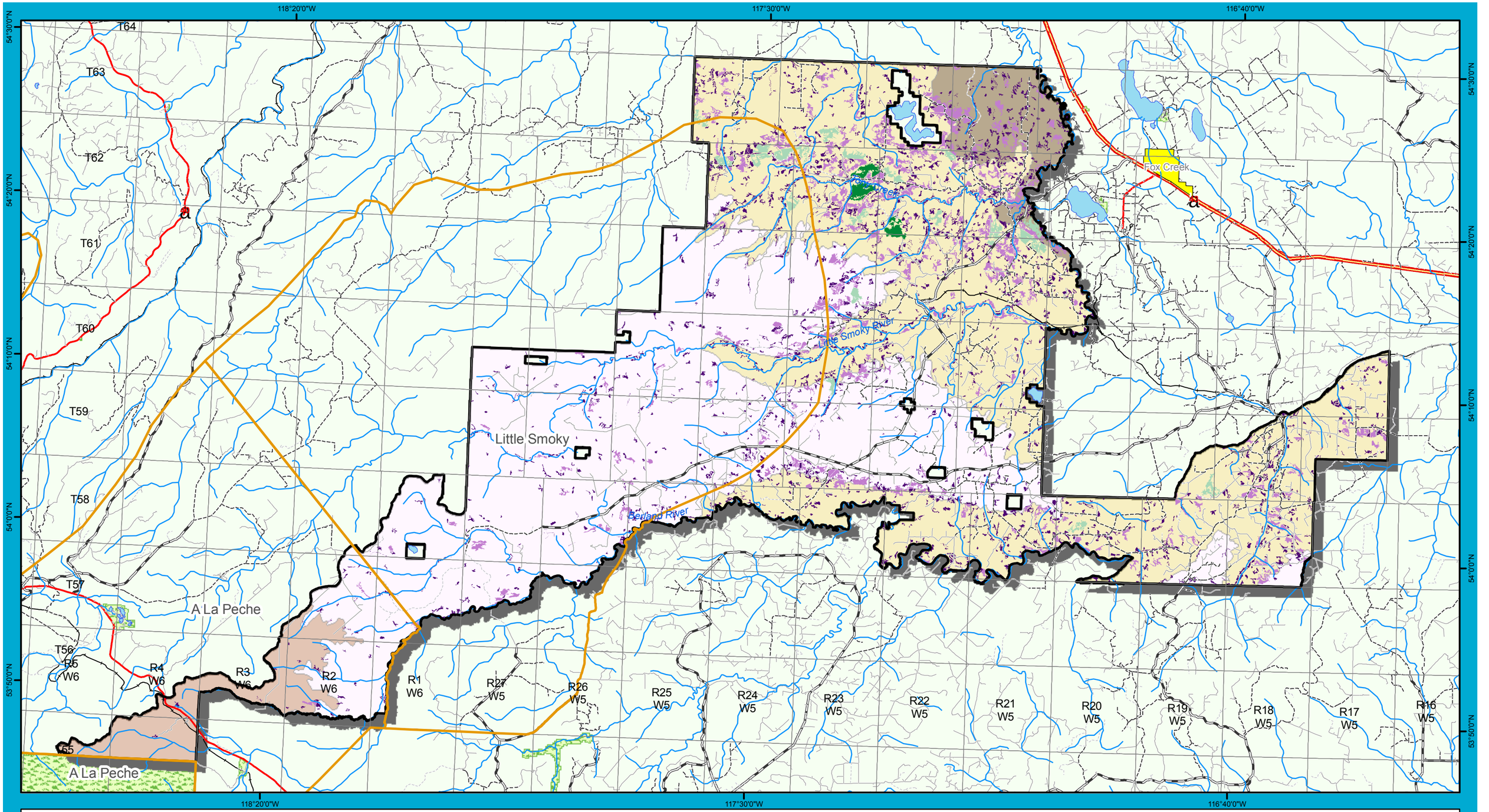

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Young Patch Size Distribution with Natural Subregion

Year Fifty

- <20 ha
- 20 -100 ha
- 100 - 250 ha
- > 250 ha

- Central Mixedwood
- Lower Foothills
- Subalpine
- Upper Foothills

- Caribou Ranges
- FMA Boundary
- Parks/ Protected Areas
- Hydrologic Features

- Divided Highway
- Paved Road
- 2 Lane Gravel Road
- 1 Lane Gravel Road
- Unimproved Road
- Truck-Trail
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Interior Old Forest in the ANC FMA

Table 2 shows the amount and percent of old interior forest at Year 0, 10, and 50 in each Natural Subregion (NSR) in the ANC FMA. Maps 7-9 show the spatial distribution of old interior forest in Years 0, 10, and 50. The amount of interior old forest drops in all NSR and for all major species groups.

The Upper Foothills is of particular interest due to its overlap with intact caribou range. The area of old interior pine dominated forest in the Upper Foothills drops from 7300 ha to 2128 ha by Year 50. The area of white spruce dominated forest in the Upper Foothills declines from 1775 ha to 105 ha. However, black spruce dominated forest in the same Upper Foothills NSR, which occurs primarily outside the Active Landbase, increases from 9391 ha to 15196 ha over the same period.

Table 2. Amount and percent of old interior forest at Year 0, 10, and 50 in each Natural Subregion in the ANC FMA.

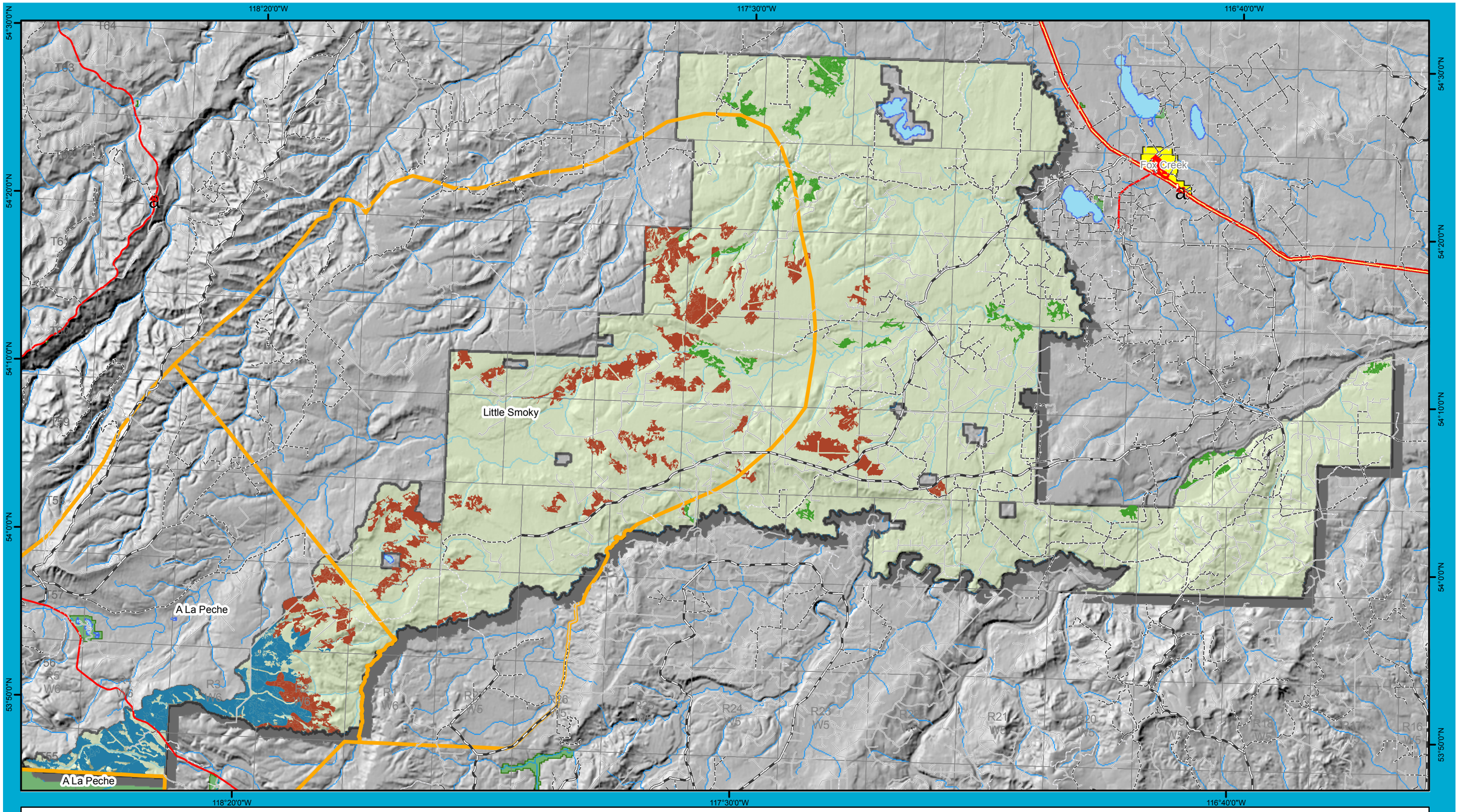
Sub Alpine										
		Year 0			Year 10			Year 50		
Yield Type	Gross Forested Area	Area of OIF (ha)	**% of OIF**	% of Gross Forested Area (ha)	Area of OIF Area (ha)	**% of OIF**	% of Gross Forested Area (ha)	Area of OIF (ha)	**% of OIF**	% of Gross Forested Area (ha)
C-P	9,884	7259	**70.695**	50.98	3199	**59.97**	22.47	744	**43.26**	5.22
C-SB	1,895	1169	**11.385**	8.21	1074	**20.13**	7.54	656	**38.14**	4.61
C-SW	2,453	1840	**17.92**	12.92	1061	**19.89**	7.45	320	**18.6**	2.25
CD-P	8	0	**0**	0.00	0	**0.00**	0.00	0	**0**	0.00
CD-S										
D										
DC-P										
DC-S										
Total	14,240	10,268.00	100	72.11	5,334		37.46	1,720		12.08

Lower Foothills										
		Year 0			Year 10			Year 50		
Yield Type	Gross Forested Area	Area of OIF (ha)	**% of OIF**	% of Gross Forested Area (ha)	Area of OIF Area (ha)	**% of OIF**	% of Gross Forested Area (ha)	Area of OIF (ha)	**% of OIF**	% of Gross Forested Area (ha)
C-P	53,434	1072	**19.336**	0.69	720	**10.32**	0.46	556	**7.88**	0.36
C-SB	37,876	2681	**48.359**	1.72	4205	**60.24**	2.70	6195	**87.81**	3.98
C-SW	22,935	1130	**20.382**	0.73	1241	**17.78**	0.80	152	**2.15**	0.10
CD-P	5,435	156	**2.8139**	0.10	89	**1.28**	0.06	44	**0.62**	0.03
CD-S	5,783	98	**1.7677**	0.06	186	**2.66**	0.12	8	**0.11**	0.01
D	19,689	231	**4.1667**	0.15	284	**4.07**	0.18	56	**0.79**	0.04
DC-P	4,594	94	**1.6955**	0.06	108	**1.55**	0.07	40	**0.57**	0.03
DC-S	5,843	82	**1.4791**	0.05	147	**2.11**	0.09	4	**0.06**	0.00
Total	155,589	5,544.00	100	3.56	6,980	100	4.49	7,055	100	4.53

Table 2 continued

Upper Foothils										
		Year 0			Year 10			Year 50		
Yiled Type	Gross Forested Area	Area of OIF (ha)	**% of OIF**	% of Gross Forested Area (ha)	Area of OIF Area (ha)	**% of OIF**	% of Gross Forested Area (ha)	Area of OIF (ha)	**% of OIF**	% of Gross Forested Area (ha)
C-P	94,968	7,300	**39.453**	4.52	3,261	**23.49**	2.02	2,128	**12.2**	1.32
C-SB	50,687	9,391	**50.754**	5.81	9,152	**65.93**	5.66	15,196	**87.12**	9.40
C-SW	10,268	1,775	**9.593**	1.10	1,407	**10.14**	0.87	105	**0.602**	0.06
CD-P	1,694	37	**0.2**	0.02	2	**0.01**	0.00	1	**0.005**	0.00
CD-S	379	0	**0**	0.00	16	**0.12**	0.01	1	**0.006**	0.00
D	2,129	0	**0**	0.00	12	**0.09**	0.01	3	**0.019**	0.00
DC-P	1,085	0	**0**	0.00	21	**0.15**	0.01	7	**0.04**	0.00
DC-S	401	0	**0**	0.00	10	**0.07**	0.01	2	**0.011**	0.00
Total	161,611	18,503	100	11.45	13,881	100	8.59	17,443	100	10.79

Central Mixed Wood										
		Year 0			Year 10			Year 50		
Yiled Type	Gross Forested Area	Area of OIF (ha)	**% of OIF**	% of Gross Forested Area (ha)	Area of OIF Area (ha)	**% of OIF**	% of Gross Forested Area (ha)	Area of OIF (ha)	**% of OIF**	% of Gross Forested Area (ha)
C-P	970	0	**0**	0	21	**2.47**	0.14	7	**1.27**	0.05
C-SB	3,700	0	**0**	0	538	**63.37**	3.70	511	**92.52**	3.51
C-SW	1,460	0	**0**	0	28	**3.30**	0.19	6	**1.09**	0.04
CD-P	416	0	**0**	0	20	**2.36**	0.14	27	**4.89**	0.19
CD-S	1,073	0	**0**	0	37	**4.36**	0.25	0.3	**0.05**	0.00
D	5,467	0	**0**	0	199	**23.44**	1.37	1	**0.18**	0.01
DC-P	146	0	**0**	0	0	**0.00**	0.00	0	**0**	0.00
DC-S	1,326	0	**0**	0	6	**0.71**	0.04	0	**0**	0.00
Total	14,558	0	0	0	849	100	5.83	552.3	100	3.79



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Interior Old Forest Patches
ANC
Year 0

Patches in Natural Subregions

- Central Mixedwood
- Lower Foothills
- Sub Alpine
- Upper Foothills

Caribou Range

Hydro Features

- Divided Highway
- Paved Road
- 2 Lane Gravel Road
- 1 Lane Gravel Road
- Unimproved Road
- Truck-Trail

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January 26, 2011
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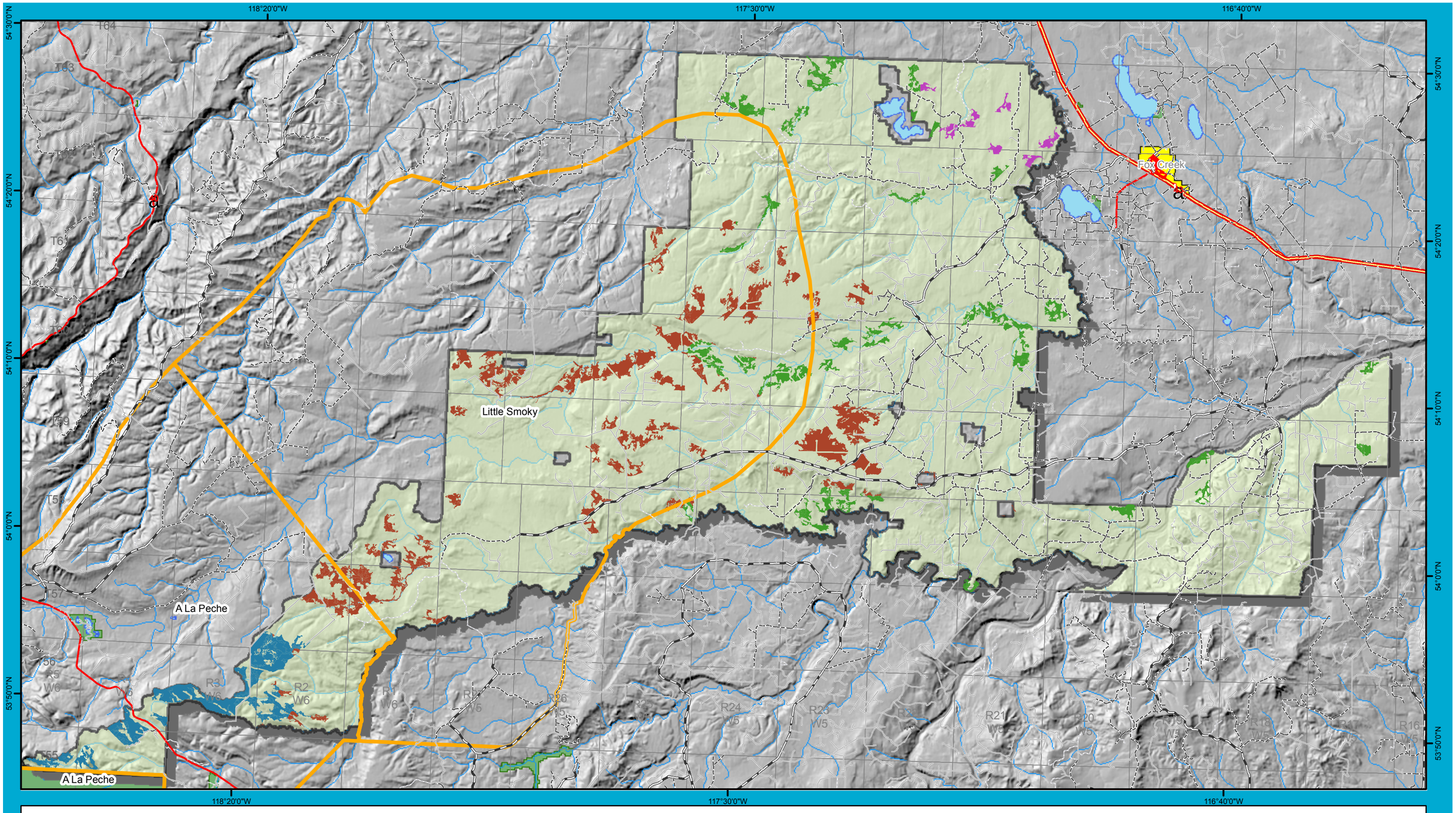

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Interior Old Forest Patches
ANC
Year 10

Patches in Natural Subregions

- Central Mixedwood
- Lower Foothills
- Sub Alpine
- Upper Foothills

Divided Highway
Paved Road
2 Lane Gravel Road
1 Lane Gravel Road
Unimproved Road
Truck-Trail

Caribou Range

Hydro Features

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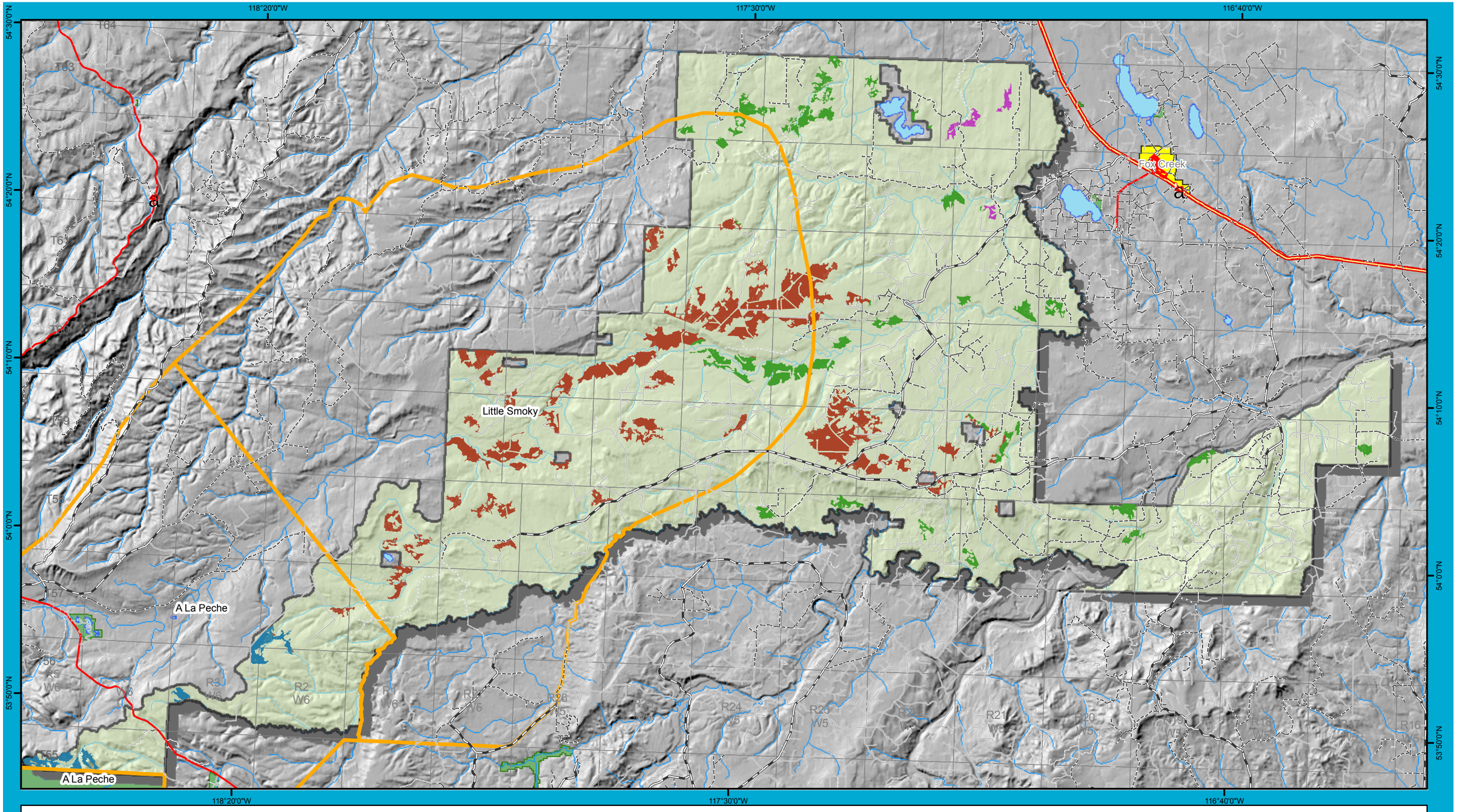

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Interior Old Forest Patches
ANC
Year 50

Patches in Natural Subregions

- Central Mixedwood
- Lower Foothills
- Sub Alpine
- Upper Foothills

Caribou Range

Hydro Features

- Divided Highway
- Paved Road
- 2 Lane Gravel Road
- 1 Lane Gravel Road
- Unimproved Road
- Truck-Trail

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Coarse Filter Assessment Summary and Implications:

The mountain pine beetle driven accelerated harvest in the first 20 years shifts the forest from being dominated by mature and old stands to being dominated by young and immature forest by year 20. By Year 100 old forest almost disappears. This shift is more pronounced in the Upper Foothills NSR where harvesting was concentrated due to the extensive mature and old pine stands in the area.

Consequences for caribou is a reduction in good forage habitat (old forest) and an increase in young seral habitats that favour alternate prey and which thereby increases predation mortality risk to caribou. Some recovery of older forests in the last 100 years will reduce this increased risk to caribou but risks will remain higher than Year 0 levels.

Changes in the spatial distribution of forest also have implications for caribou. The tripling of young seral forest area in Upper Foothills NSR by year 20 resulted in doubling the area in smaller patch classes. Therefore despite a reduction in the proportion of small patches, the supply of small young patches favourable to moose and deer increases, which significantly increases short term risks to the part of the Little Smoky herd utilizing this area. By Year 50, this risk to caribou is reduced to Year 0 levels as harvest levels decline in the Upper Foothills NSR.

Old forest species dependent on higher productivity habitats will find little suitable habitat at years 50 to 100 when the proportion of Active Landbase old forest drops to 1-2%. Species dependent on old interior forest conditions will have progressively reduced habitat for the assessed period between Year 0 and Year 50.