UBC Alex Fraser Research Forest

Forest Stewardship Plan

Effective January 1, 2007
to December 31, 2012

Licence to Cut
L42502 (Gavin Lake Block)
L42641 (Knife Creek Block)

UBC Forestry
University of British Columbia
Welcome to Our Classroom

UBC Alex Fraser Research Forest
72 South Seventh Avenue, Williams Lake, BC
V2G 4N5
Phone (250) 392-2207 Fax (250) 398-5708
Email *ken.day@ubc.ca*

March 9, 2007

Al Balogh, RPF
District Manager
Central Cariboo Forest District
640 Borland St.
Williams Lake, BC V2G 4T1

Dear Sir:

Re: Letter of Transmittal, Forest Stewardship Plan, LTC L42502, L42641

Pursuant to the Forest and Range Practices Act, please find enclosed our Forest Stewardship Plan. This document is intended to provide, for the area we manage, results and strategies to achieve Government's objectives as described in the Forest and Range Practices Act and the Cariboo Chilcotin Land Use Plan.

The advertising period for this Forest Stewardship Plan was completed on January 16, 2007, and we have received only one written comment.

You will find that this plan is generally consistent with Management and Working Plan #3, which was recently submitted for your approval. If you need detailed rationale to support any of our Results or Strategies, please consult the Management and Working Plan and call me for an explanation.

We hereby submit this plan for your approval.

Sincerely,
UBC Alex Fraser Research Forest

Original Signed and Sealed

Ken Day, M.F., RPF
Manager

Cc: Jack Saddler, PhD, Dean of Forestry, UBC
Bruce Larson, PhD, Chair, Research Forest Advisory Committee, UBC

UBC Alex Fraser Research Forest

Forest Stewardship Plan

Effective January 1, 2007 to December 31, 2012

Licence to Cut

L42502 (Gavin Lake Block)

L42641 (Knife Creek Block)

Prepared By:

Ken Day, MF, RPF
Manager

29 Jan 2007
Date

REGISTERED PROFESSIONAL FORESTER
PROVINCE OF
J. KENNETH DAY
BRITISH COLUMBIA
NO. 1542

COPY

Accepted on Behalf of the UBC Faculty of Forestry

Jack Saddler, PhD
Dean, UBC Faculty of Forestry

5 Feb 07
Date

COPY

UBC Forestry
University of British Columbia
Welcome to Our Classroom

Goals of the Alex Fraser Research Forest

We will operate a viable forestry enterprise, to pursue the mission of the Faculty of Forestry and UBC. By managing our forest lands for education, research, and demonstration, we will positively affect natural resource science, management, and stewardship.

We will create a wide range of conditions to maintain a field laboratory that supports teaching, research, and demonstration in resource management and conservation.

We will protect investments in research and teaching from our management activities, and from other research activities.

We will thoughtfully carry out and document our activities, to actively support teaching and research for students, faculty, and professionals. We will make our experience available to those who seek it.

We will promote the use of the Research Forest, and ensure that the Research Forest remains relevant to the Faculty of Forestry, UBC, and the citizens of British Columbia and the world.

Forest Management Objectives

The objectives of forest management on the Research Forest support the goals outlined above. Our objectives for management are to:

Harvest timber to provide sufficient revenue to pay for the management of the Research Forest;

Provide opportunities for education, research, and demonstration in forest resources conservation and management;

Protect the soil of the Research Forest in all operations;

Sustain or enhance the resources available on the Research Forest for fish and wildlife habitat, water, timber, range, recreation;

Protect and conserve the values in place on the Research Forest, including research and education sites, visual quality, biological diversity, cultural heritage resources;

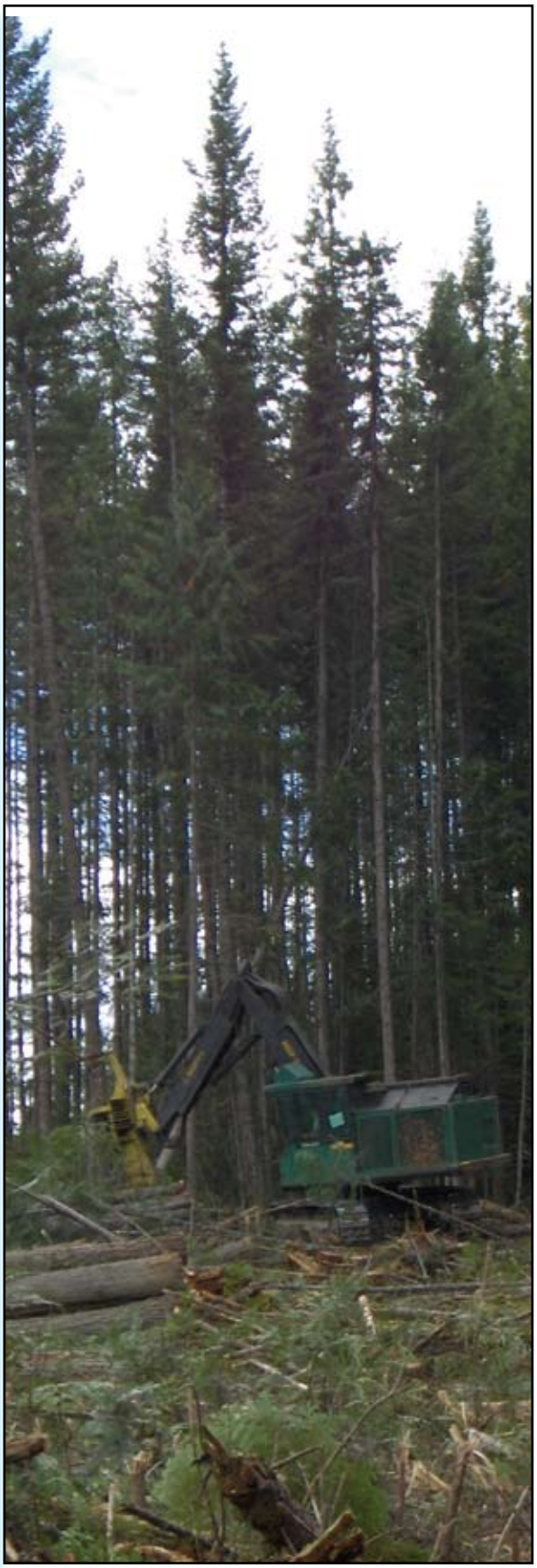
Protect the forest from catastrophic losses due to forest fires, insect and disease infestations

Grow and harvest a diverse range of timber products and non-timber forest products for sale;

Regulate the harvest of timber and non-timber forest products to minimize the periodic variation in revenue;

Regulate the composition of the forest to ensure vigorous and productive forests, a diversity of habitats, a diversity of product opportunities;

Carry out our activities to provide a safe, healthy, and secure environment in which to conduct our affairs.



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1. Introduction

Term of This Plan

The term of this Forest Stewardship Plan includes the period from January 1, 2007 to December 31, 2012.

Description of the UBC Alex Fraser Research Forest

The Research Forest comprises two distinct blocks of forest land near Williams Lake in the Central Cariboo Forest District. Please refer to the key map at Figure 1. The southern-most block, known as the Knife Creek block, is located on very gentle terrain adjacent to the San Jose Valley and is 3,487 ha in area. The Gavin Lake block, covering 6,315 ha, is located adjacent to Beaver Valley near Quesnel Lake, on gently rolling terrain. Both blocks are serviced by well maintained highways.

The dominant landform material on both blocks is a gravelly loamy morainal blanket or veneer over gently rolling terrain. The most commonly occurring soils on the Knife Creek block are Gray Luvisols. Dystric Brunisols and Gray Luvisols are the dominant soils found on the Gavin Lake block.

The Knife Creek block is located in the IDFdk3 biogeoclimatic subzone, with a small component of IDFxm. These subzones are dominated by interior Douglas-fir, but are differentiated by the absence of lodgepole pine and presence of bluebunch wheatgrass in the IDFxm. The eastern portion of the Knife Creek Block is transitional to the SBPSmk subzone, which is dominated by interior spruce and lodgepole pine.

The Gavin Lake block is primarily located in the SBSdw1 subzone, with a significant component of ICHmk3. The SBSdw1 is dominated by mixed stands of Douglas-fir, lodgepole pine, and trembling aspen. The ICHmk3 supports western redcedar, hybrid spruce, and subalpine fir.

Knife Creek and Gavin Lake Blocks fall within lands claimed by the Williams Lake Indian Band, and Gavin Lake Block falls within lands claimed by the Soda Creek Indian Band. Treaty negotiations between the Northern Shuswap Tribal Council and the Governments of Canada and British Columbia are currently at stage four in the six-stage treaty negotiation process.

The Gavin Lake Forest Education Society (GLFES) operates a residential Forestry Centre accommodating up to one hundred people of various ages at Gavin Lake, which is contained by the Research Forest. The area immediately surrounding the Centre is used extensively for forest resource education and recreation through GLFES programs. The Forestry Centre and its environment are fundamental to the development of the Research Forest. A formal Memorandum of Understanding between the Gavin Lake Forest Education Society and the University of British Columbia will ensure ongoing co-operation to the benefit of both parties.

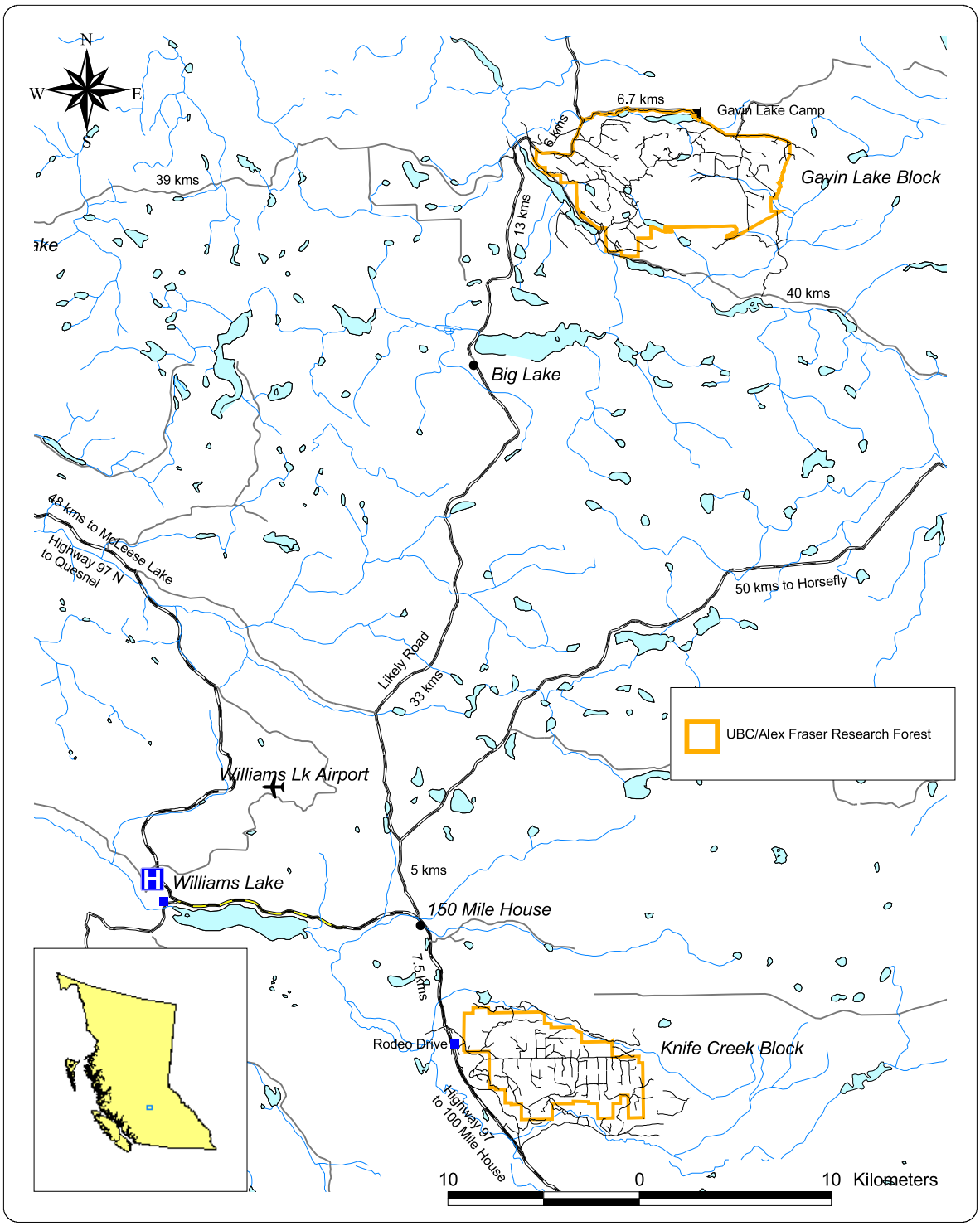


Figure 1: Location map for the UBC/Alex Fraser Research Forest.

Goals of the Alex Fraser Research Forest

1. We will operate a viable forestry enterprise, to pursue the mission of the Faculty of Forestry and UBC. By managing our forest lands for education, research, and demonstration, we will positively affect natural resource science, management, and stewardship.
2. We will create a wide range of conditions to maintain a field laboratory that supports teaching, research, and demonstration in resource management and conservation.
3. We will protect investments in research and teaching from our management activities, and from other research activities.
4. We will thoughtfully carry out and document our activities, to actively support teaching and research for students, faculty, and professionals. We will make our experience available to those who seek it.
5. We will promote the use of the Research Forest, and ensure that the Research Forest remains relevant to the Faculty of Forestry, UBC, and the citizens of British Columbia and the world.

Forest Management Objectives

The objectives of forest management on the Research Forest support the goals outlined above. Our objectives for management are to:

1. Harvest timber to provide sufficient revenue to pay for the management of the Research Forest;
2. Provide opportunities for education, research, and demonstration in forest resources conservation and management;
3. Protect the soil of the Research Forest in all operations;
4. Sustain or enhance the resources available on the Research Forest for
   - fish and wildlife habitat
   - water
   - timber
   - range
   - recreation;
5. Protect and conserve the values in place on the Research Forest, including
   - research and education sites
   - visual quality
   - biological diversity
   - cultural heritage resources;
6. Protect the forest from catastrophic losses due to
   - forest fires
   - insect and disease infestations

7. Grow and harvest a diverse range of timber products and non-timber forest products for sale;
8. Regulate the harvest of timber and non-timber forest products to minimize the periodic variation in revenue;
9. Regulate the composition of the forest to ensure
   - vigorous and productive forests
   - a diversity of habitats
   - a diversity of product opportunities;
10. Carry out our activities to provide a safe, healthy, and secure environment in which to conduct our affairs.

2. Notice of Public Review

Copy of Published Notice

THE WILLIAMS LAKE TRIBUNE, Thursday November 16, 2006 B9

815 Legal Notices

UBC ALEX FRASER RESEARCH FOREST

Forest Stewardship Plan
Notice Of Public Review

Please take note that a Forest Stewardship Plan has been prepared by the UBC Alex Fraser Research Forest for their operations in the vicinities of Knife Creek and Gavin Lake, and is now available for public review and comment.

You are welcome to review this plan during business hours (8:00 am to 12:00 pm, 1:00 pm to 4:30 pm) from Monday through Friday each week, at the office of the UBC Alex Fraser Research Forest located at 72 South 7th Ave. in Williams Lake.

We will be receiving written comments between November 16, 2006 and January 16, 2007, at which time this plan will be submitted to the District Manager, Central Cariboo Forest District for his approval. Written comments should be directed to:

Ken Day, RPF, Manager, UBC Alex Fraser Research Forest
72 South 7th Ave., Williams Lake, BC, V2G 4N5
Fax (250) 398-5708

List of Required Referrals

Agency Referred	Directed To	Date Sent
No Required Referrals		

Efforts Made to Meet with First Nation Groups Affected by the Plan

1. Letter to Williams Lake Band and Soda Creek Band Natural Resource Directors Dated Nov. 20, 2006
2. Spoke to Kristy Palmantier -- she is on secondement to MoE, and I should contact Able Hood at the Band office. Dec. 8, 2006
3. Called Able Hood and arranged a meeting for Jan. 9, 2007. Jan. 5, 2007.
4. Called Ken Michel at Soda Creek and left a voice mail requesting a meeting. Jan. 5, 2006.
5. Met with Abel Hood (T'exelc) January 9, 2007 and discussed our Management and Working Plan, our Forest Stewardship Plan, the nature of our relationship and how to proceed with consultation.
6. Followed up on meeting with Abel Hood by email January 9, 2007.
7. Met with Ken Michel and Teena Sellars (Xat'sull) January 18, 2007 and discussed our Management and Working Plan, our Forest Stewardship Plan, the nature of our relationship and how to proceed with consultation.
8. Followed up on meeting with Ken Michel and Teena Sellars by email on January 18, 2007.

3. Written Comments Received

1. Jane Perry, RPF; December 15, 2006.
   "This document is well-designed and information is clearly presented. It should be easily understood to all resource managers as well as to most of the informed public -- in other words, a reviewer does not have to be a professional or planner to be able to use this plan. The overall presentation of this FSP would probably give most reviewers a high level of confidence that the UBC AFRF landbase will be well managed over the duration that the FSP covers."

4. Changes Made to the Plan as a Result of Public Review and Comment

Date	Reviewer	Changes Made to this FSP
Dec 15/06	Jane Perry	None requested, none made.

6. Context For Forest Stewardship Plans

Tenure

The Research Forest is Crown Land held under tenure by The University of British Columbia. Tenure has two components:

- A Special Use Permit[1] (SUP 15382), which designates the land area of the Research Forest, and requires that the forest resources be managed according to an approved Management and Working Plan -- the SUP is issued by the District Manager.
- Two Licences To Cut[2] (L42641 – Knife Creek Block and L42502 – Gavin Lake Block) that authorize the forest management activities of the Research Forest within approved operational plans.

Together these documents provide the legal access for the University to the Research Forest, and the framework within which all activities must occur. These agreements are in effect until August 28, 2009. During the period of this plan, we will be seeking a new tenure agreement with the Crown, and when that agreement is reached we will amend this plan as necessary.

Legislation and Regulation

Under certain Forest Act tenures a Management Plan is a plan approved "which specifies proposed management to establish, tend, protect and harvest timber resources and conserve other resource values" (Province of BC 1996). The content of this plan generally complies with the content requirements specified[3] for a Management Plan written for a Tree Farm Licence.

This plan is written during the transition from the *Forest Practices Code of BC Act* (FPC) to the *Forest and Range Practices Act* (FRPA). FRPA requires that we write a Forest Stewardship Plan, which will replace the Forest Development Plan written and approved under the FPC, subject to the transition provisions of FRPA.

1 Issued under the Provincial Forest Use Regulation of the Forest Practices Code of BC Act
2 Issued under the Forest Act of BC. Recent Revisions to the Forest Act provide several different types of Licences to Cut, and we deem our documents to be Occupant Licences to Cut (Section 47.4(2)(a)).
3 Forest Act section 35(1)(d)

Cariboo Chilcotin Land Use Plan

The Cariboo-Chilcotin Land Use Plan (Province of BC 1995) "presents the overall framework for land use, conservation and economic development." The Land Use Plan divides the Cariboo-Chilcotin into three Resource Development Zones depending on intensity of use -- Enhanced, Special, and Integrated.

Both blocks of the Research Forest fall into Enhanced Development Zones:

Gavin Lake Block -- Polygon E5 Beaver Valley

Knife Creek Block-- Polygon E6 Williams Lake

Each Resource Development Zone is defined in the Land Use Plan, and then that definition is interpreted for each polygon. The Enhanced zone is defined (Province of BC 1995) as follows:

> *"The Enhanced Resource Development Zone includes areas where economic benefits and jobs will be increased through intensive resource management and development. In this zone, the plan challenges all local resource users and government to set targets for increased sustainable resource development. In particular, forest productivity will be maintained and enhanced through intensive reforestation, spacing, pruning, thinning, and new harvest practices."*

Resource targets were set for each polygon; these targets are stated for very broad areas, of which the Research Forest is a very small part.

Compliance With CCLUP Timber Targets

Table 1 indicates how the Research Forest is performing with respect to the timber targets established in the Cariboo-Chilcotin Land Use Plan. It is important to note that "Modified Harvesting" is defined (Province of BC 1995) as

> *"..any management practice which is other than the industry norm and has been modified to recognize other resource values."*

Under Management and Working Plan #3 (see discussion below), we have established that only the Timber Production Working Circle is deemed to be conventional harvesting. Areas of "No Harvest" include all categories of forest land in reserve or deferral.

Sub-Regional Plans

Two sub-regional plans affecting the Research Forest have been published (Anon 2005a, 2005b) and this plan takes direction from those sub-regional plans.

Resource Development Zones (from the CCLUP) are subdivided into Landscape Units, which are the basic unit for landscape level planning. While our management will not have a significant impact on the overall attainment of the resource targets, the status of the Landscape Units within which we are situated will have an impact on governments' objectives. Our commitments to those objectives will be reflected in our Forest Stewardship Plan.

Table 1: Compliance with Cariboo Chilcotin Land Use Plan (CCLUP) targets under Management and Working Plan #3 (MP#3) for the Alex Fraser Research Forest.

Timber Targets	Conventional Harv. (% by productive area)		Modified Harv.* (% by productive area)		No Harv.** (% by productive area)	
	CCLUP	MP#3	CCLUP	MP#3	CCLUP	MP#3
Gavin Lake Block	62	41	32	55	6	7
Knife Creek Block	45	0	50	96	5	4
Other Numeric Targets	Grazing (AUM)		Wildcraft (% Access)		Recreation (% Backcountry)	
	CCLUP	MP#3	CCLUP	MP#3	CCLUP	MP#3
Gavin Lake Block	40,076	Unknown	80	100	5	0
Knife Creek Block	212,400	Unknown	80	100	5	0
Other Numeric Targets	Mule Deer Winter Range (% of Area)					
	CCLUP	MP#3				
Gavin Lake Block	18	45				
Knife Creek Block	50	100				

*Modified Harvesting refers to silvicultural systems other than clearcutting, modified in consideration of wildlife or visuals.

** Including Reserves and Old Growth Management Areas, but not including Wildlife Tree Patches or Riparian Management Areas.

Management and Working Plan #3

The Management and Working Plan prepared in compliance with our tenure arrangements has recently been updated (Day 2006) and serves as the supporting rationale to this Forest Stewardship Plan. While the Management and Working Plan requires approval by the Forest District Manager, it is a strategic plan that seeks to join our corporate objectives with the Crown's land management objectives as stated in the CCLUP. It describes the objectives, indicates where each objective exists, discusses the values and uses in place on the Research Forest, and sets strategies to achieve the objectives while maintaining all the values.

This Forest Stewardship Plan draws directly from the Management and Working Plan to create the strategies and results that are laid out herein. The Management and Working Plan is written to be very readable and non-legalistic, and should be consulted for additional discussion of the results, strategies, and measures included in this Forest Stewardship Plan.

7. Forest Development Units

Forest Development Units (FDUs) are areas "where forest development may occur during the term of the plan, and within which, during the term of the plan, timber to be harvested or roads to be constructed are entirely located."[1]

FDU Boundaries are coincident with the Working Circle boundaries defined in Management and Working Plan #3 (Day 2006). Working Circles are portions of a Management Unit with unique primary forest management objectives, and include:

- Knife Creek Mule Deer Winter Range (KC FDU)
- Beaver Valley Mule Deer Winter Range (BV FDU)
- Gavin Lake Demonstration Area (GL FDU)
- ICH Timber Production Area (TP FDU)
- Reserves and Deferred Areas (RD FDU)

By dividing the forest land into areas with unique management objectives, we are able to describe areas that will be managed with a particular set of silvicultural systems. This process facilitates the prescription process and allows a clear link between the results and strategies employed to achieve the assigned goals and objectives. Appendix 1 presents maps of the Forest Development Units and their objectives. Table 2 shows the area allocated to each Forest Development Unit, and the silvicultural system and implementation details for each Working Circle.

Table 2: Summary of Research Forest area (hectares) for Management Units and Forest Development Units (FDUs) of the Alex Fraser Research Forest.

Management Unit	**FDU**	**Gross Area (ha)**	**Gross Area (%)**	**Dominant Silvicultural System**
Knife Creek Block	KC	3,333	34	Single Tree Selection
	RD	152	1	N/A
Knife Creek Block Total		3,486	35	
Gavin Lake Block	BV	2,846	29	Group Selection
	GL	706	7	Shelterwood
	RD	270	3	N/A
	TP	2,532	26	Clearcut
Gavin Lake Block Total		6,355	65	
Grand Total		9,840	100	

1 Forest Planning and Practices Regulation. http://www.for.gov.bc.ca/tasb/legsregs/frpa/frparegs/forplanprac/fppr.htm. (Accessed October 18, 2006).

8. Achieving Objectives Set by Government

FRPA Values and Objectives

FRPA relies upon licensees to achieve government's stated objectives, as defined in the Forest Practices and Planning Regulation. Those include objectives set by government for (quoted from Forest Planning and Practices Regulation (FPPR) B.C. Reg. 14/2004):

1. Soils
   "without unduly reducing the supply of timber from British Columbia's forests, to conserve the productivity and the hydrologic function of soils."

2. Timber
   - to "maintain or enhance an economically valuable supply of commercial timber from British Columbia's forests,"
   - to "ensure that delivered wood costs … are competitive in relation to equivalent costs in relation to regulated primary forest activities in other jurisdictions, and"
   - to "ensure that the provisions of this regulation and of the Act that pertain to primary forest activities do not unduly constrain the ability of a holder of an agreement under the *Forest Act* to exercise the holder's rights under the agreement."

3. Wildlife
   "without unduly reducing the supply of timber from British Columbia's forests, to conserve sufficient wildlife habitat in terms of amount of area, distribution of areas and attributes of those areas, for
   - the survival of species at risk
   - the survival of regionally important wildlife, and
   - the winter survival of specified ungulate species"

4. Water, fish, wildlife and biodiversity within riparian areas
   "without unduly reducing the supply of timber from British Columbia's forests, to conserve, at the landscape level, the water quality, fish habitat, wildlife habitat and biodiversity associated with those riparian areas."

5. Fish habitat in fisheries sensitive watersheds
   - not applicable to the Alex Fraser Research Forest because we are not situated in the watersheds listed in Schedule 2 of the Regulation.

6. Water in community watersheds
   "for water being diverted for human consumption through a licensed waterworks in a community watershed … to prevent (to the extent that it does not unduly reduce the supply of timber from British Columbia's forests) the cumulative hydrological effects of primary forest activities within the community watershed from resulting in
   - a material adverse impact on the quantity of water or the timing of the flow of the water from the waterworks, or
   - the water from the waterworks having a material adverse impact on human health that cannot be addressed by water treatment required" under an enactment or the pertinent waterworks licence."

- not applicable to the Alex Fraser Research Forest because we are not situated in a designated Community Watershed.

7. Wildlife and biodiversity - landscape level
   "without unduly reducing the supply of timber from British Columbia's forests and to the extent practicable, to design areas on which timber harvesting is to be carried out that resemble, both spatially and temporally, the patterns of natural disturbance that occur within the landscape."
8. Wildlife and biodiversity - stand level
   "without unduly reducing the supply of timber from British Columbia's forests, to retain wildlife trees."
9. Visual quality
   to manage visually sensitive areas according to the designated Visual Quality Objective, or according to the visual sensitivity class
10. Cultural heritage resources
    "to conserve, or, if necessary, protect cultural heritage resources that are
    -the focus of a traditional use by an aboriginal people that is of continuing importance to that people, and
    - not regulated under the *Heritage Conservation Act"*

FPPR Sec. 5: Soils

Objective Set by Government: "...to conserve the productivity and the hydrologic function of soils."

Factors: Amount of permanent access

Results for All FDUs

1. Maximum area of permanent access for a cutblock is 7% of total area under the site plan.
2. Target total area of roads (when all permanent roads are built) is 4% of the net area of the Research Forest.
3. Average gross area served by each landing built under this plan is 30 ha.

Factors: Amount and nature of soil disturbance in the Net Area to Be Reforested (NAR)

Results for All FDUs

1. Maximum proportion of a cutblock subject to soil disturbance[2] is 10% of the NAR, measured after the rehabilitation of temporary access structures has been completed.

2 Soil Disturbance means disturbance to the soil in the net area to be reforested in a cutblock because of temporary access structures; gouges, ruts, or scalps; or compacted areas, but does not include areas of soil rehabilitation in accordance with section 35 of the FPPR (FPPR Section 1(1))

Strategies For BV, GL, KC FDUs

1. Aim for a target density of 10% of the NAR of a stand to be occupied by permanent trails[3] planned for multiple harvest entries,
2. Re-use existing trails.
3. Lay out and mark trails in advance of logging to minimize trail density and reduce skidding damage (Nyland 1996).
4. Minimize trail width.
5. Maximize inter-trail distance.
6. Utilize ghost trails[4] to reduce the density of skid trails.

Strategies for All FDUs

1. Avoid soil compaction by armouring trail surface with non-merchantable logs, limbs and tops; or use under dry or frozen conditions.
2. Plan trail location to avoid wet soils, and if it is necessary to cross wet ground, prepare temporary crossings at the best locations with corduroy and/or snow.
3. Plan trail locations to avoid shallow soils with a high risk of soil displacement.
4. Take sites with slopes >60% out of the NAR.
5. Use cable harvest systems for blocks where slopes generally exceed 30%.
6. Identify unstable slopes during operational planning to avoid mass wasting.
7. Restore temporary access to productive condition.

FPPR Sec. 7: Wildlife

Objective Set by Government: "...to conserve sufficient wildlife habitat in terms of amount of area, distribution of areas and attributes of those areas for *the survival of species at risk*."

Strategy for All FDUs

1. Recognize that no species have been declared under FPPR Section 7 (2), but CCLUP objectives are in force and require us to "minimize disturbance and maintain habitat necessary to sustain species at risk as listed in the Identified Wildlife Management Strategy (2004) and its updates." (Anon 2005a, 2005b).
2. Recognize that the species shown in Table 3 potentially inhabit the Research Forest.
3. Follow the measures provided in the *Identified Wildlife Management Strategy* (2004) for each of the species shown in Table 3.

3 Permanent trails are not considered to be a withdrawal for permanent access if the soils beneath the trail remain productive, and if the trail is narrower than the target inter-tree distance at final harvest.
4 Ghost trails are those trails that are used by felling machinery but are not used for skidding or forwarding.

Table 3: BC Conservation Data Centre Listed Animal Species for the Former Horsefly and Williams Lake Forest Districts and the Central Cariboo Forest District (CCFD) which may be pertinent to the Alex Fraser Research Forest.

English Name	*Scientific Name*	Global Rank	Sub-National (Prov.) Rank	COSEWIC Status	BC Status	Identified Wildlife Order	Horsefly FD	Williams Lk FD	CC FD	Possible and Confirmed Occurrances By FDU			
										KC	BV	GL	TP
American White Pelican	*Pelecanus erythrorhynchos*	G3	S1B, SZN	NAR (1987)	RED	(JUNE 2006)		√	√		√ possible transient	√ possible transient	√ possible transient
Badger	*Taxidea taxus*	G5	S1	E (MAY 2000)	RED	I - JEFFERSONII SSP. (MAY 2004)		√	√	√ possible transient or resident	√ possible transient or resident	√ possible transient or resident	√ possible transient or resident
Caribou (southern population)	*Rangifer tarandus pop. 1*	G5T2Q	S1	T (MAY 2000)	RED	I (MAY 2004)	√		√		√ possible transient	√ possible transient	√ possible transient
Fisher	*Martes pennanti*	G5	S2		RED	(JUNE 2006)	√	√	√	√ possible resident	√ confirmed resident	√ possible resident	√ possible resident
Flammulated Owl	*Otus flammeolus*	G4	S3S4B, SZN	SC (NOV 2001)	BLUE	I - IDAHOENSIS SSP. (MAY 2004)		√	√	√ possible resident			
Fringed Myotis	*Myotis thysanodes*	G4G5	S2S3	DD (MAY 2004)	BLUE	I (MAY 2004)		√	√	√ possible resident (bluffs)			
Great Blue heron, herodias subspecies	*Ardea herodias herodias*	G5T5	S3B, S4N		BLUE	(JUNE 2006)	√	√	√	√ possible resident	√ confirmed resident	√ possible	√ confirmed
Grizzly Bear	*Ursus arctos*	G4	S3	SC (MAY 2002)	BLUE	I (MAY 2004)	√	√	√		√ possible transient	√ possible transient	√ possible transient
Lewis's Woodpecker	*Melanerpes lewis*	G4	S3B, SZN	SC (NOV 2001)	BLUE	I (MAY 2004)		√	√	√ possible transient or resident			
Long-billed Curlew	*Numenius americanus*	G5	S3B, SZN	SC (NOV 2002)	BLUE	I (MAY 2004)		√	√	√ possible transient (grassland and opening)			

	Scientific Name	Global Rank	Sub-National (Prov.) Rank	COSEWIC Status	BC Status	Identified Wildlife Order	Horsefly FD	Williams Lk FD	CC FD	Possible and Confirmed Occurrances By FDU			
										KC	BV	GL	TP
Prairie Falcon	*Falco mexicanus*	G5	S2B,SZN	NAR (1996)	RED	(JUNE 2006)	√	√	√	√ possible resident (bluffs)			
Sandhill Crane	*Grus canadensis*	G5	S3S4B, SZN	NAR (1979) G. CANADENSIS TABIDA ASSESSED	BLUE	(JUNE 2006)	√	√	√	√ confirmed resident	√ confirmed resident	√ confirmed resident	√ confirmed resident
Sharp-tailed Grouse, columbianus subspecies	*Tympanuchus phasianellus columbianus*	G4T3	S2S3		BLUE	(JUNE 2006)		√	√	√ possible resident	√ confirmed resident	√ confirmed resident	√ confirmed resident
Short-eared Owl	*Asio flammeus*	G5	S3B, S2N	SC (1994)	BLUE	I (MAY 2004)	√	√	√	√ possible resident	√ possible resident	√ possible resident	√ possible resident
Spotted Bat	*Euderma maculatum*	G4	S3S4	SC (MAY 2004)	BLUE	I (MAY 2004)		√	√	√ possible resident (bluffs)			
Wolverine, luscus subspecies	*Gulo gulo luscus*	G4T4	S3	SC (2003) WESTERN POPULATION ONLY	BLUE	I (MAY 2004)	√	√	√	√ possible transient	√ possible transient	√ possible transient	√ possible transient
Yellow-breasted Chat	*Icteria virens*	G5	S1B	E (NOV 2000)	RED	I (MAY 2004)		√	√	√ possible transient (low probability)			

4. Identify and inventory wildlife habitat features (stick nests, mineral licks, dens) as chance encounters allow.
5. Protect wildlife features identified in point 1 above in accordance with the recommendations from Price (2001) or subsequent measures as published by the Province.

Strategy for KC FDU

1. When financially feasible, restore grassland benchmark areas to grassland conditions as described in the Grassland Strategy (Cariboo-Chilcotin Grasslands Strategy Sub-committee 2001).
2. Reduce stand density in general to increase the area of grass understorey.

Objective Set by Government: : "...to conserve sufficient wildlife habitat in terms of amount of area, distribution of areas and attributes of those areas for *the survival of regionally important wildlife*." Regionally important wildlife are identified in sub-regional land use plans (Anon 2005a, 2005b) as those species indicated in Table 4.

Table 4: Regionally important wildlife as identified in Anon (2005a, 2005b) and their occurrence in the Alex Fraser Research Forest.

Species	Possible and Confirmed Occurrences by FDU				Comments
	KC	BV	GL	TP	
Mule Deer	√ confirmed resident	√ confirmed resident			Considered under objective for winter survival of ungulate species.
Mountain Goat					Not considered
California Bighorn Sheep					Not considered
Mountain Caribou		√ possible transient	√ possible transient	√ possible transient	
Moose	√ confirmed resident	√ confirmed resident	√ confirmed resident	√ confirmed resident	Considered under this objective.
Grizzly Bear		√ possible transient	√ possible transient	√ possible transient	Considered under this objective.
Fur-bearers	√ confirmed resident	√ confirmed resident	√ confirmed resident	√ confirmed resident	Considered under this objective.

Strategy for All FDUs

1. Retain sufficient cover in Riparian Management Areas to provide security and thermal cover for wintering moose. [Note: no key wetlands are identified within the Alex Fraser Research Forest.]

2. Retain a component of browse/forage species for moose and bears in all young stands, and particularly in standards units adjacent to riparian areas.
3. Retain sufficient riparian habitats, including large-diameter trees and wildlife trees, to provide for fur-bearers.

Objective Set by Government: "...to conserve sufficient wildlife habitat in terms of amount of area, distribution of areas and attributes of those areas for *the winter survival of specified ungulate species*."

Strategy for KC FDU

1. Manage this FDU in accordance with the General Wildlife Measures for Shallow and Moderate Snowpack Zones.
2. Continue to work closely with the Mule Deer Committee to provide examples and case studies for the implementation of the management direction.
3. Modify the implementation of the direction:
   - within the Interface Fire Plan area (Williams Lake and Area Interface Fire Committee 2005),
   - for the implementation of the grasslands strategy on benchmark areas.

Strategy for BV FDU

1. Manage this FDU in accordance with the General Wildlife Measures for Transition and Deep Snowpack Zones.
2. Continue to work closely with the Mule Deer Committee to provide examples and case studies for the implementation of the management direction.

Strategy for KC, BV FDUs

1. Address the risk of loss of timber and habitat values by harvesting according to the following priorities:
   a. imminent or expanding losses;
   b. salvage of dead timber;
   c. regeneration cuts in even-aged partial-cut systems;
   d. timber at risk of infestation by insects;
   e. timber of declining vigour;
   f. timber affected by disease;
   g. healthy vigorous timber.
2. Conduct annual reconnaissance to detect bark beetles, windthrow, and other tree or stand damage.
3. Conduct annual sanitation and salvage harvest programs to manage dispersed windthrow and bark beetle damage.

4. Annual sanitation and salvage harvest is exempted from the requirements to prepare a Site Plan under FPPR section 33(1)(b) if we retain at least 60% of the pre-harvest basal area (see also FPPR section 44(3)(h)).
5. For areas that are harvested without a Site Plan and result in an area greater than 1 ha that does not have at least 60% of the pre-harvest basal area, we will create an opening and complete the harvest under a Site Plan, thereby ensuring that all harvest area is re-stocked according to the stocking standards contained in section 9 (stocking standards).

FPPR Sec. 8: Water, Fish, Wildlife and Biodiversity Within Riparian Areas

Objective Set by Government: "...to conserve, at the landscape level, the water quality, fish habitat, wildlife habitat, and biodiversity associated with those riparian areas.

Factors:

1. The type of management regime required, having regard to:
- the need to buffer the ecosystem from introduction of deleterious materials,
- the role of trees and understory in conserving water quality, fish and wildlife habitat, and biodiversity,
- the need to maintain bank and channel integrity, and
- the relative importance and sensitivity of different riparian classes in conserving water quality, fish and wildlife habitat, and biodiversity.

2. The type, timing, and intensity of practices entailed in the management regime

3. The role of forest shading in controlling temperature increases in temperature-sensitive streams, if the increase might have a deleterious effect on fish or fish habitat.

Undertaking for All FDUs

1. In accordance with FPPR Sec.12(2) we undertake to comply with sections 47 to 51, 52(2), and 53 of the FPPR during the term of this plan.

Strategy (in accordance with FPPR Sec. 12 (3)) for KC and BV FDUs

1. Do not lay out regeneration gaps[5] in Riparian Management Zones.

Strategy (in accordance with FPPR Sec. 12 (3)) for KC, BV, GL and TP FDUs

1. Locate Wildlife Tree Patches by preference over Riparian Management Areas.
2. Avoid locating roads (except stream crossings) in Riparian Management Areas unless alternative locations are not practicable.

5 Regeneration Gaps are clear-felled areas where final harvest is completed on small areas distributed throughout a cutblock, as in group selection or single-tree selection silvicultural systems.

3. Harvesting within a riparian management area will proceed (except in the case of research designed and executed in accordance with our Research Use Policy) according to the following guidelines:

S3 Stream:

- Retain all trees within reserve zone.
- Retain at least 50% of basal area and wildlife trees that do not pose a risk to workers within management zone.
- Where windthrow risk is moderate to high in the reserve zone, retain a sufficient number of trees within the management zone to reduce windthrow within the reserve zone to acceptable levels.

S4 Stream:

- Establish machine-free zones at the slope break or on wet ground adjacent to streams
- Retain wildlife trees, non-commercial conifer trees, understorey deciduous trees, shrubs, and herbaceous vegetation to the fullest extent possible.
- Retain at least 25% of basal area within RMZ.

S6 Stream:

- Establish machine-free zones at the slope break or on wet ground adjacent to streams
- Retain at least 5% (basal area) of the codominant conifers within the RMA of streams. Consider leaving 3 m stubs.
- Remove windthrow-prone trees with roots embedded in the streambank.
- Remove slash and debris deposited into the stream at the time of harvest.
- Retain wildlife trees, non-commercial conifer trees, understorey deciduous trees, shrubs, and herbaceous vegetation within the RMZ to the fullest extent possible.

Wetlands and Lakes ICH:

- Establish machine-free zones at the slope break or on wet ground adjacent to wetlands or lakes
- Retain at least 40% (basal area) of the codominant windfirm conifers and all deciduous trees concentrated near the reserve zone or in RMZ where no reserve zone is required.
- Retain wildlife trees, non-commercial conifer trees, understorey deciduous trees, shrubs, and herbaceous vegetation within the RMZ to the fullest extent possible.

Wetlands and Lakes SBS:

- Establish machine-free zones at the slope break or on wet ground adjacent to wetlands or lakes

- Retain at least 10% (basal area) of the codominant windfirm conifers and 30% (basal area) of the deciduous trees concentrated near the reserve zone or in RMZ where no reserve zone is required.
- Retain wildlife trees, non-commercial conifer trees, understorey deciduous trees, shrubs, and herbaceous vegetation within the RMZ to the fullest extent possible.

FPPR Sec. 8.1: Fish Habitat in Fisheries Sensitive Watersheds -- Does Not Apply

A Fisheries sensitive watershed is defined as: "...an area identified in Schedule 2 of ..." the FPPR. Since the Alex Fraser Research Forest does not include any of the watersheds listed in Schedule 2, this objective does not apply to the Research Forest.

FPPR Sec. 8.2: Water in Community Watersheds -- Does Not Apply

A Community Watershed is defined as: a Community Watershed under the Forest Practices Code Act of BC.[6] Since the Alex Fraser Research Forest does not include any Community Watersheds designated under the Forest Practices Code Act, this objective does not apply to the Research Forest.

FPPR Sec. 9: Wildlife and Biodiversity - Landscape Level

Objective Set by Government: "...to the extent practicable, to design areas on which timber harvesting is to be carried out that resemble, both spatially and temporally, the patterns of natural disturbance that occur within the landscape."

Factors: The size, distribution and salient characteristics of the proposed harvest, in comparison to the size, distribution and characteristics of natural disturbances in the landscape, and considering the extent to which areas managed for ungulate winter range, riparian areas, and scenic areas complement efforts to impose natural disturbance patterns in the landscape.

Result for All FDUs

A network of Old Growth Management Areas (OGMAs) (Reserves and Deferrals FDU) has been established (Day 2006) in consideration of direction from government. Transitional OGMAs have also been designated outside of the RD FDU. Other parts of the land-base are outside the productive forest but still provide habitat values, such as:

- forested areas classified by the forest inventory as Environmentally Sensitive Areas because of shallow soils or very wet soils
- non-forested grass-lands, wetlands and lakes

They are summarized in Table 5, and depicted on maps located in Appendix 1.

6 Forest and Range Practices Act Section 180(e). http://www.for.gov.bc.ca/tasb/legsregs/frpa/frpa/part11.htm#section180 (accessed October 24, 2006)

Table 5: Area of the Alex Fraser Research Forest as classified by management for the conservation of biodiversity.

Land Type	Gavin Lake Block		Knife Creek Block		Total Research Forest	
	Area (Ha)	%	Area (Ha)	%	Area (Ha)	%
Environmentally Sensitive Areas	508.1	8.0	125.5	3.6	633.6	6.4
Non-Forest (including lakes)	299.1	4.7	49.3	1.4	348.4	3.5
Management Plan Reserves	129.9	2.0	64.4	1.8	194.3	2.0
Old Growth Management Areas (Perm. and Temp.)	331.4	5.2	84.1	2.4	415.5	4.2
Potential Harvest Area	5,086.3	80.0	3,162.3	90.7	8,248.6	83.8
Total	6,354.8	100.0	3,485.6	100.0	9,840.4	100.0

Strategy for RD FDU

1. Timber harvest within this FDU will occur rarely, and if harvest does occur it will be in accord with accepted procedures as approved by the Cariboo-Chilcotin Inter-Agency Management Committee (IAMC)/Manager's committee.
2. Permanent Old Growth Management Areas (OGMAs) will be maintained by replacing any areas >5 ha removed or subjected to salvage harvesting with suitable area of equivalent size in the same biogeoclimatic subunit.
3. Timber harvest within this FDU will occur only for the purposes of :
   - insect control essential to curtail severe damage to the no-harvest area or to other forest values at the landscape level,
   - salvage of dead timber (non-infectious) resulting from severe natural disturbance that has destroyed the ecological, wildlife or cultural values for the area [for example, catastrophic loss to wildfire],
   - control of wildfire,
   - seed cone collection, provided trees are not felled,
   - road construction where there is no other practicable location available,
   - thinning to enhance old-forest attributes within ogmas inside mule deer winter range in knife creek,
   - ecological restoration activities approved by statutory authorities.
4. Identify stands that are presently old but are recorded in the inventory as mature.

Strategy for KC, BV, GL, TP FDUs

1. Consider Transitional OGMAs to have the same status as Permanent OGMAs throughout the period of this plan.
2. Identify stands that are presently old but are recorded in the inventory as mature.

3. Seek to attract research in the subject area of managing for attributes of oldness.
4. Strive to achieve a minimum patch-size objective of 50 ha, based upon direction in Sub-Regional Plan (Anon 2005a, 2005b), to reduce fragmentation.
5. Maintain landscape connectivity by protecting riparian areas, sensitive sites (Day 2006), and retaining vegetation and advanced regeneration in harvested areas.
6. Manipulate the harvest queue to allow for the development of new areas of old forest, to:
   - improve the amount of interior old condition,
   - attain the patch-size direction
   - allow for the replacement of current OGMAs, in the event that a catastrophic failure should eliminate a current polygon.
7. Meet Mature+Old seral stage targets stated in hectares as the prorated contribution for the Research Forest (Table 6).

Table 6: Alex Fraser Research Forest commitment to sub-regional plan Mature+Old targets (Anon 2005a, Anon 2005b), compared to the unadjusted 2004 forest inventory.

		Gavin Lake Block		**Knife Creek Block**	
		NDT 2 ICHmk3	**NDT 3 SBSdw1**	**NDT 4 IDFxm, dk3**	
				Fir	**Pine**
Forested Area in Research Forest		3,209 ha	2,784 ha	3,184 ha	231 ha
Definition	Mature	>100	>100	>100	>100
	Old	>250	>140	>250	>140
Target	Mature+Old	>485 ha	>310 ha	>1,370 ha	>55 ha
Research Forest Status	Mature+Old	1252 ha	1336 ha	1624 ha	92 ha

Strategy for TP FDUs

1. Address the risk of loss of timber and habitat values by harvesting according to the following priorities:
   a. imminent or expanding losses;
   b. salvage of dead timber;
   c. regeneration cuts in even-aged partial-cut systems;
   d. timber at risk of infestation by insects;
   e. timber of declining vigour;
   f. timber affected by disease;
   g. healthy vigorous timber.
2. Conduct annual reconnaissance to detect bark beetles, windthrow, and other tree or stand damage.
3. Conduct annual sanitation and salvage harvest programs to manage dispersed windthrow and bark beetle damage.

4. Annual sanitation and salvage harvest is exempted from the requirements to prepare a Site Plan under FPPR section 33(1)(b) if we retain at least 60% of the pre-harvest basal area (see also FPPR section 44(3)(h)).
5. For areas that are harvested without a Site Plan and result in an area greater than 1 ha that does not have at least 60% of the pre-harvest basal area, we will create an opening and complete the harvest under a Site Plan, thereby ensuring that all harvest area is re-stocked according to the stocking standards contained in section 9 (stocking standards).

FPPR Sec. 9.1: Wildlife and Biodiversity - Stand Level

Objective Set by Government: "...to retain wildlife trees."

Factors: The sizes, condition, amount and location of trees that are suitable for wildlife habitat and contribute to stand level biodiversity; and the extent to which areas managed for ungulate winter range, riparian areas, OGMAs and scenic areas provide suitable habitat and assist in the conservation of stand-level biodiversity.

Result for All FDUs

1. Retain a mean of at least 8% of total stand area in Wildlife Tree Patches (WTPs), measured for cutblocks harvested in a calendar year.

Strategy for All FDUs

1. WTPs will generally be located within the boundaries of a cutblock.
2. WTPs will generally be used to protect wildlife features, sensitive sites, or riparian areas.
3. Areas where hardwoods (especially aspen) are infrequent should include hardwoods within WTPs when possible.
4. Scattered non-commercial veterans will be retained in the stand after harvest when practicable, and may contribute to the WTP target on the basis of proportional basal area.

FPPR Sec. 9.2: Visual Quality

Objective Set by Government: "...to ensure that the altered forest landscape for the scenic area falls into the [prescribed categories]."

Strategy for All FDUs

1. Manage scenic areas as described in Sub-Regional Plans (Anon 2005a, 2005b);
2. Prepare Visual Impact Assessments in scenic areas;
3. Recognize important visual elements in stand-level planning;
4. Employ organic forms, colours, and textures in stand-level planning within scenic areas;

5. Retain established roadside vegetation as a visual screen for highways and secondary roads.
6. Manage Lakeshore Management Areas to provide visual quality for recreation, depending upon the Lake Class, as follows:

Class B Lakes (Gavin, Little Gavin, Beaver, George)

- Clearcutting is not permitted. Cut less than 20% of the LMZ each 20 years; retain more than 50% of the original basal area
- Locate new haul roads outside the LMZ. Locate skid trails more than 30 m away from the Lakeshore Reserve Zone (LRZ).
- Backspar trails must be rehabilitated.

Class C Lakes (Prouton)

- Partial Cutting is preferred. Cut less than 40% of the LMZ each 20 years; retain more than 50% of the original basal area.
- If clearcutting, harvest less than 20% of the LMZ each 20 years in cutblocks smaller than 10 ha, and a maximum block width along the lakeshore is 400 m.
- Locate new haul roads outside the LMZ; locate spur roads and landings more than 100 m and skid trails more than 30 m away from the LRZ;
- Backspar trails must be rehabilitated.

Class D Lakes (Choate, Timothy, Jones)

- Partial Cutting is preferred. Cut less than 60% of the LMZ each 20 years; retain more than 50% of the original basal area.
- If clearcutting, harvest less than 30% of the LMZ each 20 years and a maximum block width along the lakeshore is 500 m.
- Locate new haul roads more than 75 m, spur roads and landings more than 40 m, and skid trails more than 30 m away from the LRZ.

Class E Lakes (West)

- Partial Cutting is preferred. Cut up to 100% of the LMZ each 20 years; retain more than 50% of the original basal area.
- If clearcutting, harvest less than 50% of the LMZ each 20 years and a maximum block width along the lakeshore is 500 m.
- Locate new haul roads, spur roads, landings and skid trails more than 30 m, away from the LRZ.

Strategy for GL FDUs

1. Address the risk of loss of timber and habitat values by harvesting according to the following priorities:
   a. imminent or expanding losses;
   b. salvage of dead timber;

c. regeneration cuts in even-aged partial-cut systems;
d. timber at risk of infestation by insects;
e. timber of declining vigour;
f. timber affected by disease;
g. healthy vigorous timber.

2. Conduct annual reconnaissance to detect bark beetles, windthrow, and other tree or stand damage.
3. Conduct annual sanitation and salvage harvest programs to manage dispersed windthrow and bark beetle damage.
4. Annual sanitation and salvage harvest is exempted from the requirements to prepare a Site Plan under FPPR section 33(1)(b) if we retain at least 60% of the pre-harvest basal area (see also FPPR section 44(3)(h)).
5. For areas that are harvested without a Site Plan and result in an area greater than 1 ha that does not have at least 60% of the pre-harvest basal area, we will create an opening and complete the harvest under a Site Plan, thereby ensuring that all harvest area is re-stocked according to the stocking standards contained in section 9 (stocking standards).

FPPR Sec. 10: Cultural Heritage Resources

Objective Set by Government: "...to conserve, or, if necessary, protect cultural heritage resources that are the focus of traditional use by an aboriginal people that is of continuing importance to that people, and not regulated under the Heritage Conservation Act."[7]

Factors with respect to traditional use of a cultural heritage resource by an aboriginal people:

- The relative value or importance of a particular cultural heritage resource;
- The relative abundance or scarcity of a cultural heritage resource;
- The historical extent of a traditional use;
- The impact on government granted timber harvesting rights of conserving or protecting a cultural heritage resource;
- Options for mitigating the impact that a forest practise might have on a cultural heritage resource.

Strategy for All FDUs

1. Produce an annual harvest plan for discussion with interested First Nations (Williams Lake Band and Soda Creek Band).

7 In spite of the exclusion of archaeological sites (cultural heritage resources regulated under the Heritage Conservation Act), our strategies will address all cultural heritage resources.

2. Consult with interested First Nations (Williams Lake Band and Soda Creek Band) regarding traditional uses practised within the area now included in the Research Forest.
3. Document all cultural heritage resources as they are identified by consultation, archaeological impact assessments, or in the course of development planning. Maintain an inventory of cultural heritage resources as they are identified, respecting the sensitivity of this inventory information, and without publishing it or making it otherwise generally available.
4. Cultural heritage resources may be conserved or protected by:
   - retaining examples, sites or features in untreated areas such as Wildlife Tree Patches,
   - protecting sites or features from mechanical disturbance within machine free zones,
   - leaving examples in the harvested area.

Objectives Not Captured By FRPA

Objective Set by CCLUP: Maintenance of Backcountry recreation opportunities in a significant portion of the areas of the region that are presently in a backcountry condition, principally in the SRDZ

Strategy for GL FDU

1. Recognize that the GL FDU contains the immediate environment for Gavin Lake Forest Education Centre, the Recreation Site at Gavin Lake, and much of the trail network established at Gavin Lake (Backcountry Polygon #6).
2. Primary management objectives are visual quality and recreation/demonstration.
3. Provide demonstration opportunities in conjunction with forest management activities.
4. Manage by shelterwood silvicultural system.
5. Manage access to avoid through-traffic on roads.
6. Cooperate with Gavin Lake Forest Education Society and MoFR to develop and maintain trails and facilities.

Strategy for BV FDU

1. Recognize that the BV FDU contains Backcountry Polygon #5, and the Recreation Site at Dorsey Lake.
2. Visual quality and wilderness character of the Beaver Valley tourist loop is protected by a large OGMA and management of this FDU by the group selection silvicultural system in pursuit of a mule deer winter range objective.
3. Wilderness character of the area is protected by access management, restricting loop roads through the polygon.

9. Stocking Standards

Stocking Standards for Free Growing Stands Generally

Free growing stands will be established on the net area to be reforested in each harvested cutblock.

Regeneration

Regeneration will be by natural or artificial means, depending on ecological conditions. Although flexibility in prescribing regeneration methods is required, site plans will generally follow the rationale shown in Table 7.

Areas prescribed for natural regeneration will be assessed immediately after harvest to determine scarification requirements. The areas will also be assessed within five years of harvest to determine status of regeneration, and to schedule further treatments as required.

Areas prescribed for planting will be planted after site preparation, if required. Mixed stands of species appropriate to the site will be planted and additional natural regeneration will add diversity to the stand. Planting densities are established higher than target stocking standards considering mortality and natural ingress.

Table 7: Determination of regeneration method depending upon Forest Development Unit (FDU) and Soil Moisture Regime (Klinka et al. 2004) for the Alex Fraser Research Forest.

FDU	**Soil Moisture Regime**	**Applicable Silvicultural Systems**	**Regen. Method**
Beaver Valley MDWR	Slightly Dry and drier	**Uneven-aged** Single Tree Selection; Irregular Shelterwood, Group Selection	**Natural --** reserve advanced regeneration of Douglas-fir and spruce
	Fresh and wetter	**Even-aged** Clearcutting; Clearcutting With Reserves; Irregular Shelterwood	**Natural** -- from advanced spruce or Douglas-fir regen; or **Planting**
Gavin Lake	All	**Even-aged** Clearcutting; Clearcutting With Reserves; Group Shelterwood, Irregular Shelterwood, Uniform Shelterwood	**Planting, or Natural** from advanced regeneration of Douglas-fir, spruce, or redcedar
		Uneven-aged Group Selection, Single Tree Selection	**Natural or Planting**
Timber Production	All	**Even-aged** Clearcutting; Clearcutting With Reserves; Group Shelterwood, Irregular Shelterwood, Uniform Shelterwood	**Planting or Natural**
Knife Creek MDWR	Slightly Dry and drier	**Uneven-aged** Single-Tree Selection; Group Selection; Irregular Shelterwood	**Natural** -- reserve advanced regeneration of Douglas-fir
	Fresh and Wetter	**Even-aged** Clearcutting; Clearcutting With Reserves; Irregular Shelterwood	**Natural --** reserve advanced regeneration of spruce; or **Planting**

Stocking Standards for Even-Aged Stands

Application: Stocking Standards for Even-Aged Stands apply to even-aged silvicultural systems and group selection systems in the BV, GL, and TP and KC Forest Development Units as described in Table 8.

Definition of Stocking Standards for Even-Aged Stands: Stocking Standards from Establishment to Free Growing Guidebook Cariboo Forest Region (Appendix # 1) (BC Ministry of Forests 2002) and approved in RESULTS as of November 7, 2006.

Table 8: Normal stocking standards approved in RESULTS and applicable to Forest Development Units (FDUs) of the Alex Fraser Research Forest.

FDU	RESULTS Standards ID
BV	40057, 40058, 40059, 40060, 40061, 40062, 40063, 40064, 40065
TP, GL	40050, 40051, 40052, 40053, 40054, 40055, 40056,
KC	40066, 40067, 40068, 40069, 40070, 40071, 40072, 40073, 40074, 40075, 40076, 40077, 40078, 40079, 40080, 40081, 40082, 40083, 40084, 40085

Variations from these standards can be applied under the following circumstances:

A. In cutblocks affected by root disease, all commercial species (lodgepole pine, Douglas-fir, redcedar, subalpine fir, spruce, aspen, cottonwood and white birch) are considered preferred.

B. In standards units with a complex of rocky or wet areas, the minimum inter tree distance can be set as low as 1.6 m, to select the best microsites or to increase stocking.

C. In standards units with a primary objective as Mule Deer Winter Range Habitat, minimum inter tree distance can be set as low as 1.6 m, to promote a clumpy habitat structure.

D. In cutblocks where they occur before harvest, aspen, birch and cottonwood are considered acceptable species.

E. In standards units where experimental plantings are established, those species included in the experiment are considered preferred.

Stocking Standards for Exempted Harvesting

We are exempted from the requirements to prepare a Site Plan[1] and establish a free growing stand[2] the if the timber harvesting is restricted to one or more of the following activities:

1. harvesting to eliminate a safety hazard;
2. harvesting to facilitate the collection of seed leaving an opening not greater than 1 ha;
3. removing felled trees from landings and road rights-of-way;
4. harvesting timber for experimental purposes if the harvesting will be carried out under controlled scientific or investigative conditions;
5. clearing areas for or within a recreation site or recreation trail;
6. felling and removing trees that have been or will be treated to facilitate the entrapment of pests; or
7. commercial thinning, removal of individual trees, or a similar type of intermediate cutting (see below); or
8. harvesting special forest products.[3]

Commercial Thinning, Removal Of Individual Trees, Or Similar Types Of Intermediate Cutting, Including Harvesting Special Forest Products

Application: Exempted Harvesting Stocking Standards will apply in all FDUs, in standards units where an average of at least 60% of the pre-harvest basal area has been retained.

Definition of Intermediate Cutting Stocking Standards: We will retain an average of at least 60% of the pre-harvest basal area with any given spot having a range from 0 to 100% of pre-harvest basal area, as influenced by leave tree distribution and measurement method (e.g. relascope basal area factor).

Trees will be selected to leave by balancing the characteristics of individual trees according to species preference (Table 9) and tree vigour (Table 10). We will leave trees from good and medium vigour classes that are free of wounds encompassing more than 1/3 of the stem circumference.

Leave tree distribution will reflect the pre-harvest distribution of suitable leave trees. Leave trees will be distributed throughout the entire standards unit with any contiguous hectare having not less than 30% of the pre-harvest basal area.

In a review of relavent literature Day (1997) showed that residual density of 60% is approximately equal to the onset of competition-induced mortality, assuming the pre-harvest density approximates maximum density. Our experience shows that residual stands of about 60% of the pre-harvest basal area are generally stable and not subject to catastrophic losses from wind or snow damage, particularly if uniformly thinned from below.

1 FPPR Section 33 (1) (b).
2 FPPR Section 44 (3)
3 **Special forest products:** as defined under Section 1 of the *Forest Act* and B.C. Regulation 355/87, these are: poles; posts; pilings; shakes; shingle bolts; Christmas trees; building logs; mining timbers, props, and caps; cribbing; firewood and fuel logs; hop poles; orchard props; car stakes; round stakes, sticks, and pickets; split stakes, pickets, palings, and lagging; and shake bolts, blocks, and blanks. (http://www.for.gov.bc.ca/hfd/library/documents/glossary/S.htm Accessed November 3, 2006)

Table 9: Species preference for retention in intermediate cutting, according to Forest Development Unit (FDU) at the Alex Fraser Research Forest.

FDU	Species preference order
BV	Douglas-fir, spruce, lodgepole pine, birch, aspen, subalpine fir
GL	Douglas-fir, spruce, redcedar, lodgepole pine, birch, aspen, subalpine fir, cottonwood
KC	Douglas-fir, spruce, lodgepole pine, aspen, birch
TP	Douglas-fir, redcedar, spruce, lodgepole pine, birch, aspen, subalpine fir, cottonwood, hemlock

Table 10: Vigour classes for selection of conifer leave-trees on the Alex Fraser Research Forest.

Species	Vigour Class	Judgement Criteria					
		Crown Pos-ition*	Height/ Diam Ratio (m/cm)	Crown Shape	% Live Crown **	Bark Characteristics	Form Problems or Damage
Douglas-fir	Good	D, CD	<0.8	Sharply pointed	>30	Reddish, big plates, Smooth light grey upper bole	None
	Med.	CD, I	0.8-1.0	Pointed	25-30	Big plates, smooth upper bole	Fork, sweep, crook
	Poor	I, S	>1.0	Rounded	<25	Dark grey, rough, flat	Cracks, conk, canker
Spruce	Good	D, CD	<.08	Sharply pointed	>40	Pink, flat plates	None
	Med.	CD, I	0.8-1.0	Pointed	30-40	Less pink, medium flakes	Fork, sweep, crook, small brooms
	Poor	I, S	>1.0	Round to flat	<30	Dark grey, rough, small flakes	Big cracks, canker, conk
Sub-alpine fir	Good	D, CD	<0.8	Sharply pointed	>50	Smooth, silver, resinous	None
	Med.	CD, I	0.8-1.0	Pointed	40-50	Medium smooth	Fork, sweep, crook
	Poor	S	>1.0	Round to flat	<40	Rough, dark plates	Big cracks, canker, conk
Red-cedar**	Good	D, CD, I	<0.8	Sharply pointed	Dense	Long uniform strips	None
	Med.	I	0.8-1.0	Pointed to round	Med.	Uniform strips	Fork, sweep, crook
	Poor	S	>1.0	Flat or spike	Thin	Rough, loose fibres	Big cracks, rot, fire scars
Lodge-pole pine	Good	D, CD	<0.8	Sharply pointed	>30	Light, small plates	None
	Med.	CD	0.8-1.0	Pointed	20-30	Medium plates	Fork, sweep, crook
	Poor	I, S	>1.0	Rounded to flat	<20	Loose, large plates	Cracks, canker, pitch tubes

*D=Dominant, CD=Co-dominant, I=Intermediate, S=Suppressed
**Because redcedar crowns generally extend well down the bole, density of foliage in the crown is a better indicator of vigour than live crown ratio.

Stocking Standards for Complex Stands

Application: Complex Stocking Standards apply in all FDUs, on standards units where:

- harvest has removed more than 40% of the pre-harvest basal area, and
- more than 5 m^2/ha of residual basal area remains.

Definition of Complex Stocking Standards: Complex stocking standards are used in standards units where we have created a complex residual stand with a heterogeneous mixture of small gaps, unharvested overstory trees, and variable thinning. In this situation:

- harvest has removed sufficient basal area so as to leave the stand insufficiently stocked by overstory trees, but
- harvest has not created conditions conducive to regeneration and growth of a second crop in a uniform arrangement.

We will determine stocking status of a complex stand by considering: the average density of residual overstory expressed as a percentage of 60% of pre-harvest density; and the average number of seedlings expressed as a percentage of target regneration density for a clearcut situation. In this way, any standards unity may be stocked by a combination of overstory and regeneration. Target and Minimum Stocking Standards (TSS and MSS) are taken from the applicable even-aged stocking standard (Table 8). Pre-harvest basal area is taken from a pre-harvest survey, from the un-logged condition within the standards unit, or from an adjacent equivalent site. The matrix of stocking conditions shown in Figure 2 will describe the outcomes of a stocking survey. This single matrix applies to all stands and all regeneration stocking levels, by the application of percentages to each standard (Target, Minimum, and preferred or preferred and acceptable species).

	AVERAGE POST-HARVEST BASAL AREA (% of 60% of pre-harvest BA)											
Average Well spaced (% of trees/ ha)		0	10	20	30	40	50	60	70	80	90	100
% of TSSpa MSSpa MSSp (Table 8)	0											
	10											
	20					Non Stocked						
	30											
	40											
	50											
	60											
	70											
	80							Stocked				
	90											
	100											

Figure 2: Determination of stocking status for complex stands by comparison of the density of overstory with the density of regeneration, for standards units on the Alex Fraser Research Forest. Rows and columns are labelled by their class mid-points. (TSSpa=Target Stocking standard, preferred and acceptable species, MSSpa=Minimum Stocking Standard, preferred and acceptable species, and MSSp= Minimum Stocking Standard, preferred species.)

For example, harvesting to remove beetle-killed lodgepole pine from a matrix of Douglas-fir and spruce has resulted in complex stands. This harvest has left us with an overstory with less than 60% of the initial basal area remaining, and insufficient growing space to establish regeneration at normal stocking densities. The normal stocking standards do not apply, nor do the standards for intermediate cutting.

We have created and used an approved stocking standard to manage this situation, where:

- the overstory component for the standards unit is judged against 60% of the pre-harvest basal area (since we assume 60% to be the lower limit of intermediate cutting, above), and
- the regeneration component for the standards unit is judged against the target and minimum stocking rate for the normal stocking standard in that FDU.

Comparing the percentage of overstory and percentage of regeneration allows us to judge the stocking status of a standards unit. An example of this approach is shown below for clarification.

Acceptable overstorey trees are defined as being

- any species,
- with sufficiently good form and health to provide sawlogs in a future entry, and
- distributed throughout the standards unit.

Example Application of Complex Stocking Standards: We assume that, at regeneration delay, we will assess the block. At that time we might find that there are 20 m^2/ha of residual basal area, and 200 well spaced acceptable stems per ha of trees less than 12.5 cm DBH.

1. 20 m^2/ha ÷26.5 m^2/ha = 75% of Target Post-Harvest BA (PHBA) and 200 well spaced stems/ha ÷ 1200 (TSSpa) = 17% of Target Stocking; or
2. 20 m^2/ha ÷26.5 m^2/ha = 75% of Target Post-Harvest BA (PHBA) and 200 well spaced stems/ha ÷ 700 (MSSpa) = 28% of Minimum Stocking

We would conclude that the stand is stocked above minimum, but below target.

	Well Spaced Trees/ha					Basal Area (m^2/ha) Average		Height Relat. To Compet. (%)
	Layer	Target Pref & Acc (TSSpa)	Min. Pref & Acc (MSSpa)	Min Pref (MSSp)	Min Horiz Distance Pref & Acc	Pre-harvest	60% of pre-harvest = Target Post-harvest BA (PHBA)	
I	1					44	26.5	
I	2,3,4	1200	700	600	2.0			150

Table of stocking conditions

	AVERAGE POST-HARVEST BASAL AREA (%) (PSTHR)											
Well spaced (% of trees/ ha)		0	10	20	30	40	50	60	70	80	90	100
% of TSSpa MSSpa MSSp	0											
	10											
	20					Non Stocked			1			
	30								2			
	40											
	50											
	60											
	70											
	80							Stocked				
	90											
	100											

Stocking Standards for Single Tree Selection

Application: Single Tree Selection Stocking Standards apply to stands in the KC FDU where harvest will abide by the direction from the Mule Deer Winter Range Strategy (Dawson et al. 2002).

Definition of Single Tree Selection Stocking Standards: For stands that are managed under single tree selection, post harvest stand structure will be prescribed by comparing pre-harvest stand structure to the long term stand structure objective (target stand) using the Reverse 'J' curve analyis methodology. The prescribed residual stand will be a step toward the target stand, based upon target stand structure, and current condition. Target stand structure is determined from Mule Deer Winter Range direction[4] (with greater detail from Dawson et al. 2002), and current condition is determined from pre-harvest cruising.

Single tree selection harvesting will remove 20% or less of the pre-harvest basal area, and as such is exempted from the requirements to establish a free growing stand.[5] This is technically sound, because in our practise single tree selection is controlled at the tree level by the application of appropriate marking rules and controls. In general, sites in the KC FDU naturally regenerate freely, and sufficiency of regeneration is not a management issue.

In single-tree selection stands, species preference for residual trees is as follows: Douglas-fir, lodgepole pine, spruce, aspen, birch. Trees will be selected to leave by balancing the characteristics of individual trees according to the criteria established in Tables 9 and 10 above.

Leave tree distribution will reflect the pre-harvest distribution of suitable leave trees. Leave trees will be distributed throughout the entire standards unit, but with a clumpy distribution of residual trees to satisfy the mule deer habitat objectives for these areas.

4 General Wildlife Measure Order #U-5-001, U-5-002 and U-5-003 Ungulate Winter Ranges Cariboo Chilcotin Land Use Plan, Shallow and Moderate Snow Pack Zone.

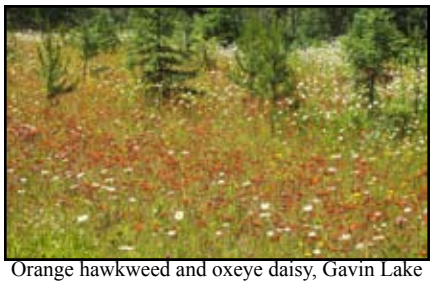
5 FPPR Section 44 (3)

10. Measures Against Invasive Plants

The Forest and Range Practices Act establishes another list of invasive plants under the Invasive Plants Regulation, which includes the species listed in Table 10.

Management of invasive plants is important, but is beyond our capacity alone. We must rely on the participation of all resource users to have an impact on these species. Perry (n.d.) indicates that, as a "land user group with information and land ethic principles" we have a role to play in preventing the spread of invasive plants.

Measures for management of invasive plants include:


Orange hawkweed and oxeye daisy, Gavin Lake Block. Both species are listed in the Invasive Plant Regulation.

- Establish ground cover on roads and landings by broadcast grass seeding, carried out within one year of disturbance using the seed mix recommended by the MoFR District Agrologist
- Develop awareness of invasive plants and their identification amongst staff, contractors, and equipment operators.
- Track the locations and extent of invasive plants on the Research Forest.
- Identify best management practices for the invasive plant species existing on the Research Forest.
- Cooperate with neighbours and ranchers to control the spread of invasive plants.
- Participate in or follow the progress of the Invasive Plant Council of BC.
- Promote research on invasive plants, particularly in the area of control methods and best management practices.
- Pursue the use of native ground-cover seed for rehabilitation purposes.

Table 11: Plants listed in the Invasive Plants Regulation (as of November 8, 2006) and their occurrence on the Alex Fraser Research Forest.

Weed Species	***Scientific name***	**Occurrence**		
		Knife Ck.	**Gavin Lk.**	**Nearby**
Anchusa [Bugloss]	*Anchusa officinalis*			
Baby's breath	*Gypsophila paniculata*			
Black knapweed	*Centaurea nigra*			
Blueweed	*Echium vulgare*			
Brown knapweed	*Centaurea jacea*			
Bull Thistle	*Cirsium vulgare*	Yes	Yes	Yes
Canada Thistle	*Cirsium arvense*	Yes	Yes	Yes
Common Burdock	*Arctium minus*	Yes	Yes	Yes
Common Tansy	*Tanacetum vulgare*		Yes	Yes
Dalmatian Toadflax	*Linaria dalmatica*			Yes
Diffuse Knapweed	*Centaurea diffusa*	Yes		Yes
Field Scabious	*Knautia arvensis*			
Giant Knotweed	*Polygonum sachalinense*			
Gorse	*Ulex europaeus*			
Hoary Alyssum	*Berteroa incana*			
Hoary Cress	*Cardaria draba*			
Hound's-tongue	*Cynoglossum officinale*			
Japanese Knotweed	*Polygonum cuspidatum*			
Leafy spurge	*Euphorbia esula*			
Marsh Thistle	*Cirsium palustre*			
Meadow Hawkweed	*Hieracium pilosella.*			
Meadow Knapweed	*Centaurea pratensis*			
Nodding Thistle	*Carduus nutans*			
Orange Hawkweed	*Hieracium aurantiacum*	Yes	Yes	Yes
Oxeye Daisy	*Chrysanthemum leucanthemem*	Yes	Yes	Yes
Perennial pepperweed	*Lepidium latifolium*			
Plumeless Thistle	*Carduus acanthoides*			
Puncture vine	*Tribulus terrestris*			
Purple Loosestrife	*Lythrum salicaria*			
Rush Skeletonweed	*Chondrilla juncea*			
Russian Knapweed	*Acroptilon repens*			
Scentless Chamomile	*Matricaria maritima*		Yes	Yes
Scotch broom	*Cytisus scoparius*			
Scotch Thistle	*Onopordum acanthium*			
Spotted Knapweed	*Centaurea maculosa*	Yes		Yes
St. John's-wort	*Hypericum perforatum*			
Sulphur Cinquefoil	*Potentilla recta*			
Tansy ragwort	*Senecio jacobaea*			
Teasel	*Dipsacus fullonum*			
Yellow Iris	*Iris pseudacorus*			
Yellow starthistle	*Centaurea solstitialis*			
Yellow toadflax	*Linaria vulgaris*			

11. Measures to Mitigate the Removal of Natural Range Barriers

Natural Range Barriers and Range structures control the movement of livestock within the range. Substantial investments in range structures require periodic maintenance, according to the following principles:

1. Research Forest activities which remove natural barriers to livestock movement will be discussed with the affected rancher, and will be mitigated by fencing operations performed by the Research Forest, if that is the will of the affected rancher;
2. Drift fences existing or built on the Research Forest will be maintained by the rancher;
3. Any damage done to any fence during Research Forest activities will be repaired by the Research Forest;
4. New drift fences and other range projects may be built on the Research Forest as required to enhance range management activities, but the location must be agreed upon to protect research and teaching sites;
5. Research trials may be fenced by the Research Forest as required;
6. All new fences built in mule deer winter range areas (Knife Creek and Beaver Valley FDUs) will have a maximum height of 106 cm (42 in), a bottom strand at 45 cm (18 in) from the ground, and top rails will be placed where deer frequently cross the fence.

12. References

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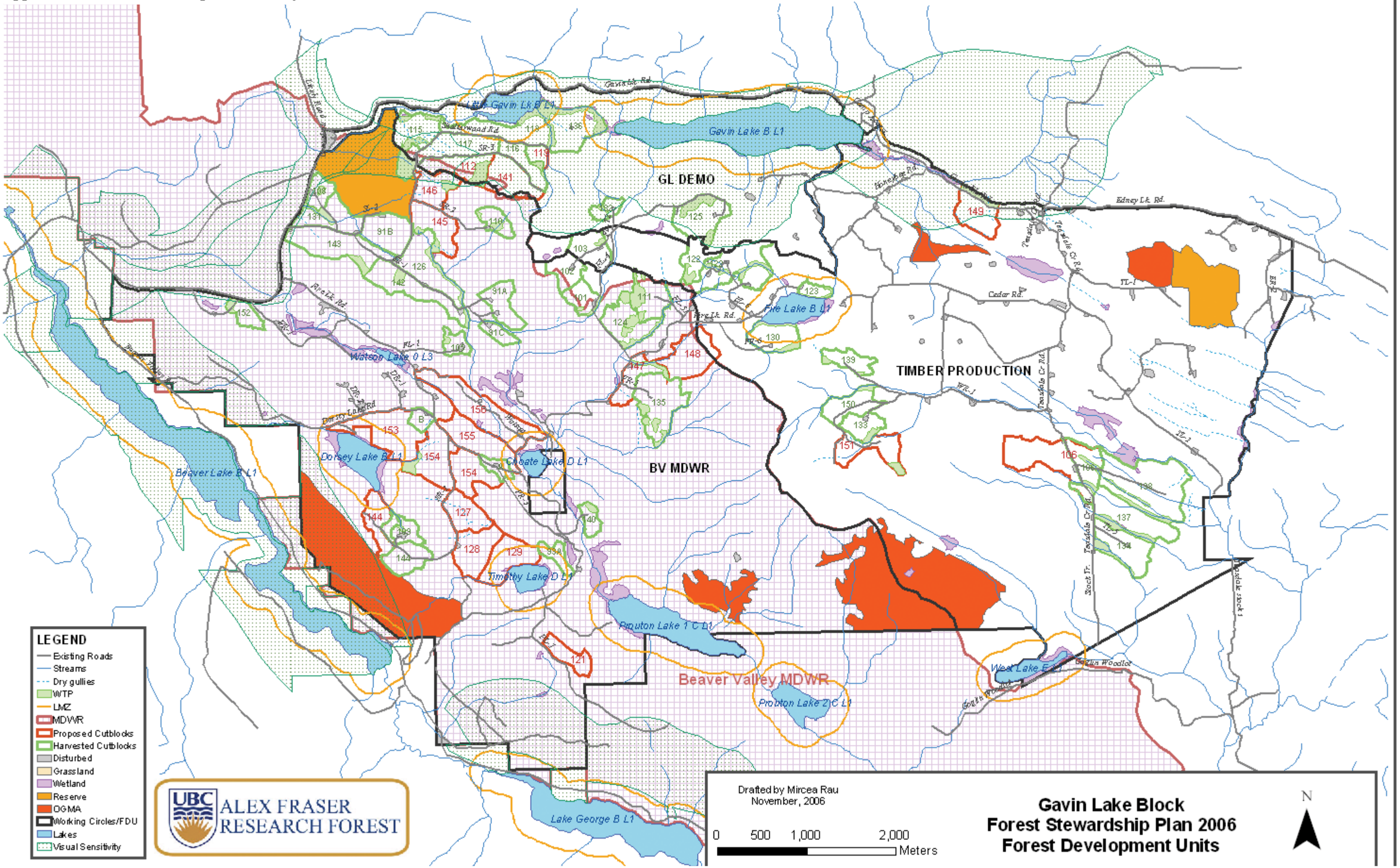
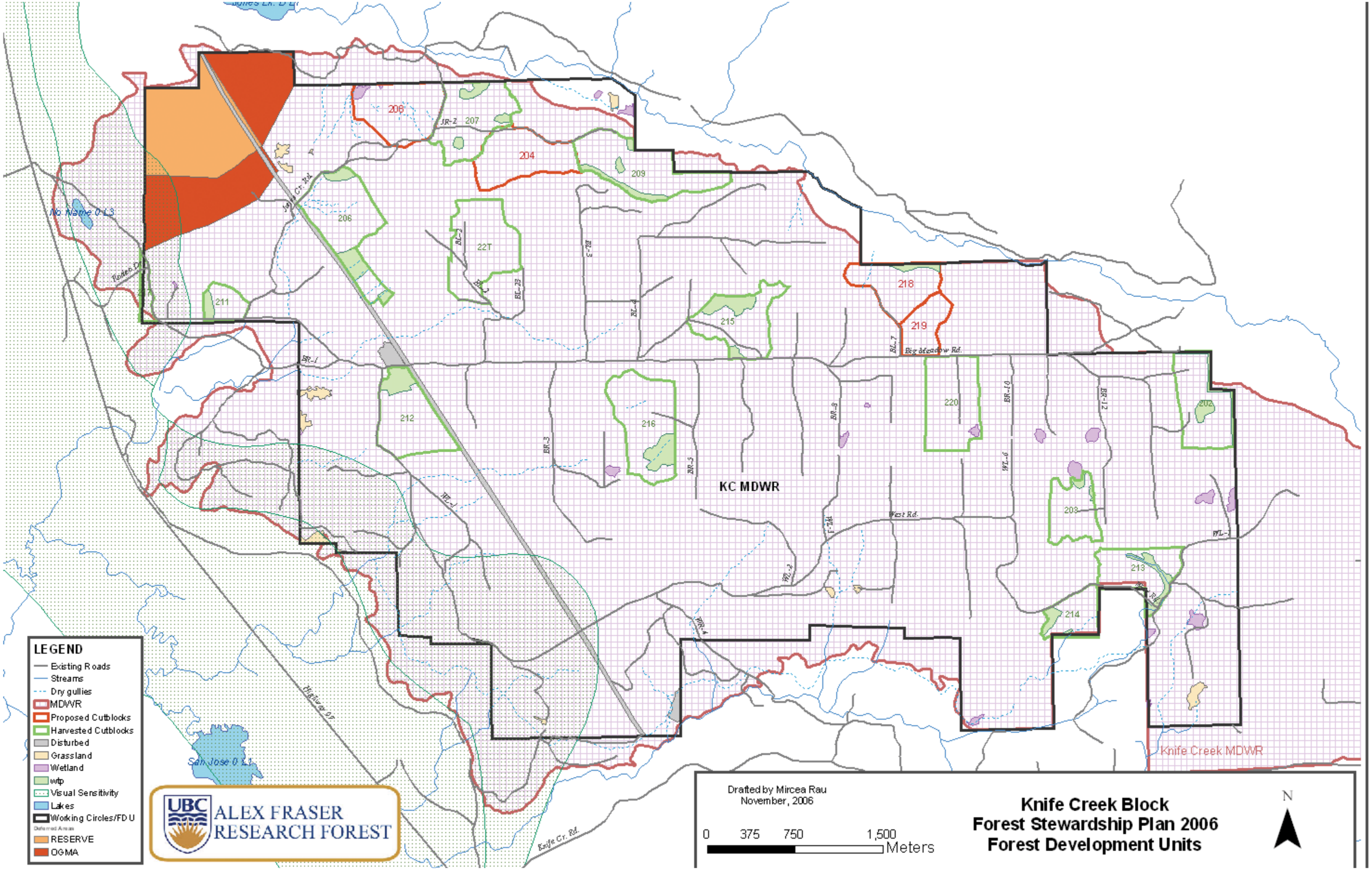
Appendix 1: Forest Development Units for the Alex Fraser Research Forest




LEGEND
Existing Roads
Streams
Dry gullies
MDWR
Proposed Cutblocks
Harvested Cutblocks
Disturbed
Grassland
Wetland
wtp
Visual Sensitivity
Lakes
Working Circles/FDU
Deferred Areas
RESERVE
OGMA
UBC
ALEX FRASER
RESEARCH FOREST
KC MDWR
Knife Creek MDWR
Drafted by Mircea Rau
November, 2006
0 375 750 1,500
Meters
Knife Creek Block
Forest Stewardship Plan 2006
Forest Development Units
N