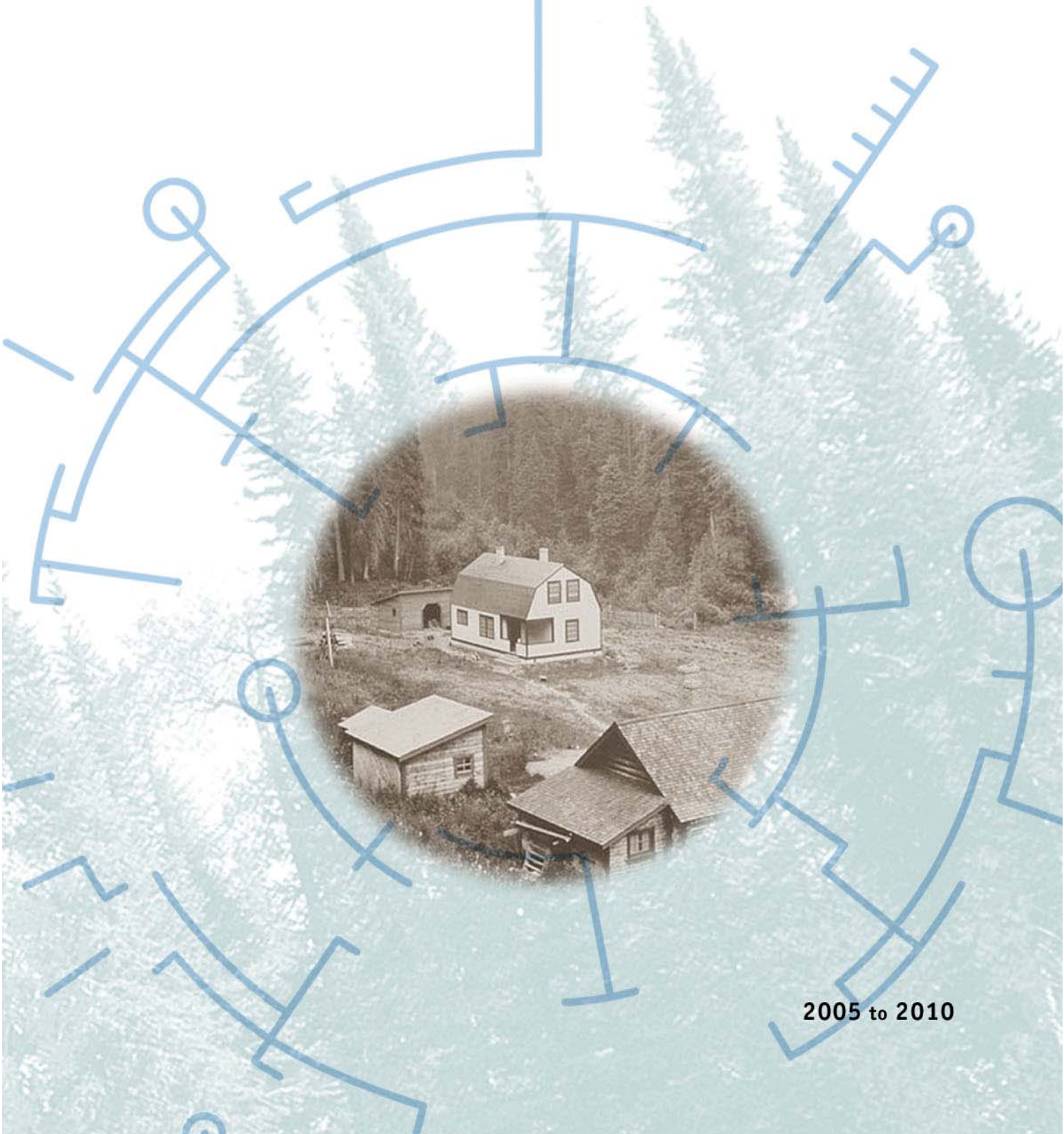




Aleza Lake Research Forest

Management Plan #2

Aleza Lake Research Forest



2005 to 2010



Management Plan #2

2005 to 2010

Aleza Lake Research Forest Society



Prince George Forest District
October 2005

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October, 2005

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1.0 Introduction

The **Aleza Lake Research Forest (ALRF)** is an approximately 9,000 hectare tract of moist sub-boreal upland forests, wetlands, small lakes, and river floodplain, located 60 kilometers east of Prince George in east-central British Columbia (**Figure 1**, below).

The ALRF is near the eastern edge of the Central Interior Plateau, near the foothills of the northern Columbia (Cariboo) and Rocky Mountain ranges. This diverse area has been managed as an experimental or research forest for over eight decades.

The ALRF became a university research forest in May 2001, when tenure for the area was granted to the **Aleza Lake Research Forest Society (ALRFS)**, a cooperative venture of the *University of Northern British Columbia (UNBC)*, the *University of British Columbia (UBC)*, and other partners. The ALRFS is a provincially registered non-profit society (Society #S-42412), and the purposes of the ALRFS are stated in its Constitution as approved under the Society Act.

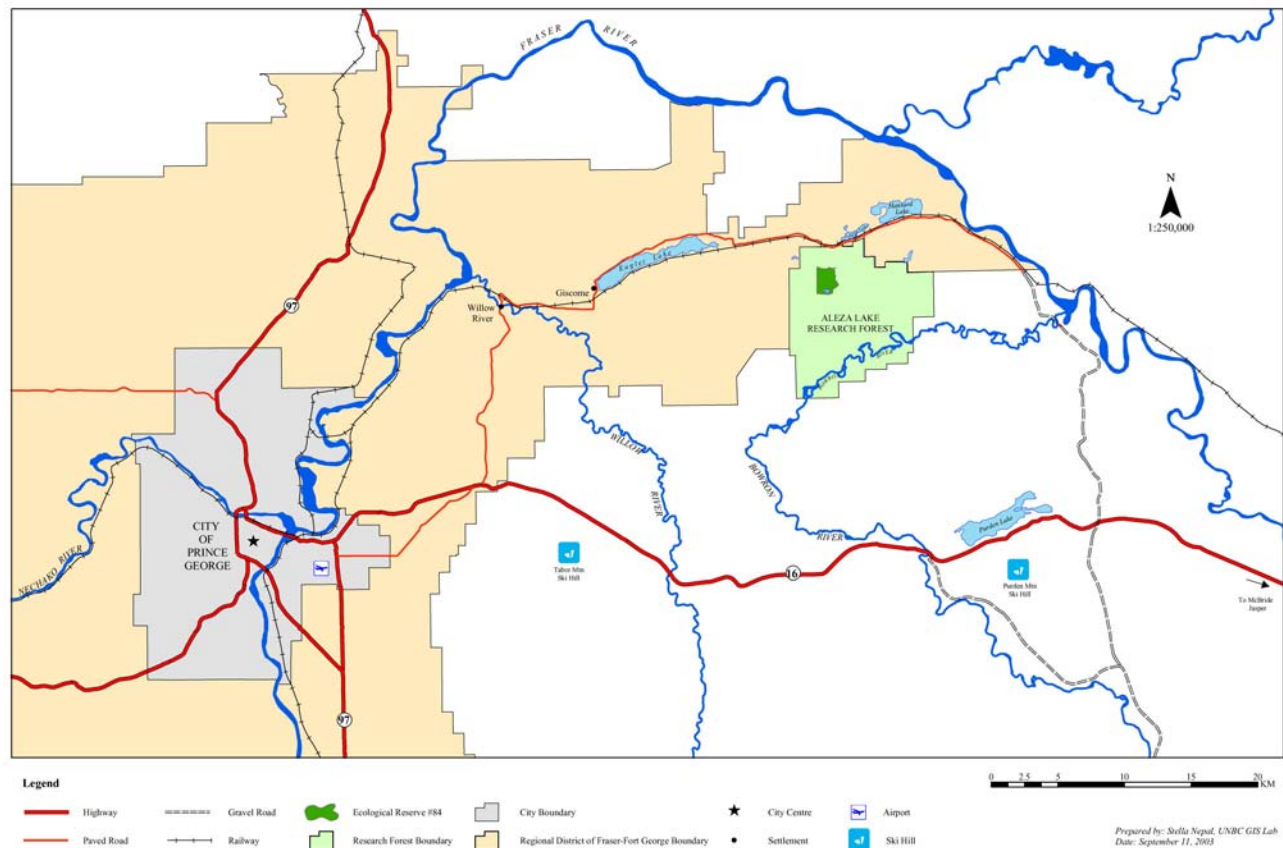


Figure 1. Aleza Lake Research Forest (60 kilometers east of Prince George, BC)

Forest management tenure for the Aleza Lake Research Forest has been granted by the *BC Ministry of Forests* to the ALRFS through Special Use Permit #S23615, which authorizes the ALRFS to occupy and manage this area of Crown Land, and conduct forest land management on this area.

The Special Use Permit (SUP) tenure (as modified by a recent November 2004 SUP amendment):

- Authorizes use of this area of Crown Land for research and educational purposes (Section 1.01(a));
- Mandates that the permittee (the ALRFS) prepare and submit a Management Plan for the Aleza Lake Research Forest, and prescribes required content for the plan (Section 3.01(Plans));
- Outlines the general terms under which forest management, and related research and education activities on the ALRF will be conducted.

The tenure document specifically states that “*The Management Plan for the Aleza Lake Research Forest will commit the Aleza Lake Research Forest Society to principles of sustainability and to total resource management. The Research Forest will be managed to facilitate research and teaching in a wide range of topics of interest to natural resource management.*” (SUP Schedule B, Section 1.05)

The following **Management Plan #2** for the Aleza Lake Research Forest succeeds and replaces the previous Management and Working Plan #1 (MWP #1) for the Aleza Lake Research Forest. MWP #1 guided the development of the ALRF since 1992, up to and including its initial years (2001–2005) as a university research forest. The original ten-year term of MWP #1 (Nov. 1992 to 2002) was extended to April 30, 2005 by the BC Ministry of Forests.

This new Management Plan for the Aleza Lake Research Forest will in turn help guide the ALRF as it enters a new phase of development with expanded management goals and objectives that reflect its role as a university research forest and the stated purposes of the Aleza Lake Research Forest Society.

2.0 Aleza Lake Research Forest Management Plan #2

2.1 Term and Scope

The term of **Management Plan #2** is **2005 to 2010**.

The scope and purpose of this Management Plan is:

- 1) To provide a strategic plan to guide forest operations and land management practices within the Aleza Lake Research Forest;
- 2) To ensure the management direction of the ALRF is consistent with the purposes of the ALRF Society;
- 3) To ensure that the goals and management direction of the ALRF are consistent with legislated land management requirements, and tenure provisions;
- 4) To provide consistency and continuity in management direction between previous management plans and anticipated future plans; and
- 5) To outline strategies that build upon past and current management goals, directing management activities towards achievement of an overall desired future forest condition (or desired range of conditions), and to identify measurable indicators and/or targets.

2.2 Purposes of the Aleza Lake Research Forest Society

As stated in its constitution, the purposes of the Aleza Lake Research Forest Society are as follows:

- 1) “to undertake stewardship of the Aleza Lake Research Forest (the Forest);
- 2) to ensure that the management and operation of the Forest is devoted to education and research with respect to sustainable forest management, silviculture, and forest ecology;
- 3) to hold property in the form of;
 - i. *Crown tenures of the research forest lands,*
 - ii. *Capital improvements on those lands, and*
 - iii. *Capital assets,*as are necessary to manage and operate the Forest and the educational and research activities which will take place therein;
- 4) to allow access and input into the management and operation of the Forest by each of the University of British Columbia and the University of Northern British Columbia;
- 5) to pursue the goal of providing a long term, financially self-sufficient research facility, funded primarily by harvesting and selling timber in a manner consistent with the other purposes of the Society;

- 6) to promote and support education and research relating to sustainable forest management and long term studies in silviculture and forest ecology by sharing and disseminating information and knowledge gained through the research conducted at the Forest;
- 7) to create educational and research opportunities in forest ecology, forest management, ecosystem management and sustainable forest resource management;
- 8) to assist in fulfilling the educational and research needs of the University of British Columbia and the University of Northern British Columbia;
- 9) to maintain the natural levels of biodiversity throughout the Forest by way of retaining all natural ecosystem components, processes, structural attributes and micro-processes;
- 10) to foster innovation in ecologically-sound management strategies and practices, and in research, extension and demonstration strategies and projects;
- 11) to provide opportunities for demonstrations, testing, and refinement of a range of silvicultural systems and partial-cutting techniques;
- 12) to do all such things as are incidental or conducive to the attainment of the purposes herein expressed.”

2.3 ALRF Management Vision

The ALRF management vision is a statement of both the current management intent and the long-term legacy that the ALRFS will strive to pass on to future generations of forest users. The ALRF vision guides the goals and strategies outlined in this plan.

The management vision for the Aleza Lake Research Forest is to develop a scientifically and technically innovative, financially self-sustaining university-based research forest. The ALRF will be managed to facilitate, promote, maintain and create opportunities for knowledge-building through forest research, demonstration, education, and training for local, regional, national and international users.

The Research Forest will strive to be a leader in forest management and research regionally and provincially. The ALRF will be a strong and complementary component of a network of other university research forests and long-term integrated forest research sites in British Columbia, Canada and western North America.

To accomplish this, the ALRF will strive to create a wide spectrum of teaching and learning opportunities for forest researchers and educators, by creating and maintaining stand- and landscape-level examples of a range of forest management activities. Objectives will range from high-intensity forest management which promotes timber production and other extractive forest uses, to low-intensity or passive management which promotes natural ecosystem processes relatively free from anthropogenic disturbances or influences.

On designated areas of the ALRF landbase, active forest management will explicitly include timber harvesting and silvicultural management of forest stands for timber production and other extractive uses. Timber harvesting and similar forest-based revenue generation also supports the ALRF management vision and mandate by ensuring short- and long-term financial security for the ALRFS.

Revenues from harvesting are used to finance annual and periodic activities including:

- 1) ALRF research support services and resource management activities such as data management, resource inventories, research trial re-measurements, environmental monitoring, and archiving;
- 2) field-based educational programs and demonstration sites; and
- 3) legislated forest land management responsibilities such as road maintenance and silvicultural obligations.
- 4) Revenues will also be used to support long-term amenities for Research Forest functioning, including:
 - a. *improvements to physical infrastructure on the forest such as road and trail expansion, potential development of a research station, and additional research trials;*
 - b. *funding for maintenance of key ALRF support staff positions; and*
 - c. *the establishment and maintenance of inventory information management tools including map and research project databases.*

Long-term harvest rates will be based on the productive capacity of the portion of the land base designated for timber harvesting. Note that short-term harvest rates may vary from long-term rates, based on market forces and other ALRF objectives, including research and demonstration, but will be reconciled over prescribed cut control periods.

In the marketing and sale of forest products, the ALRF will strive for an independent market-logging approach, to respond to market demand, and capture the best timber values possible from each unit of timber available for harvesting. In this context, “best” timber values will consider and balance both short- and long-term economic values in addition to the ALRF’s knowledge-building goals.

A carefully planned diverse and innovative harvest regime will allow the ALRF to foster improved understanding and stewardship of northern forest and riparian ecosystems in an innovative operational field environment. Harvest locations and methods are linked to opportunities for demonstration, advancing scientific knowledge, and enhancing the art and practice of forest management.



2.4 ALRF Management Goals

Goals are guiding statements that connect the vision with realistic implementation strategies. The goals outlined below integrate past management directions, the purposes of the ALRF Society, legislated tenure requirements, and management intent and guidance for the area provided by strategic documents including the Prince George Land and Resource Management Plan (LRMP).

The forest management goals of the ALRF are as follows:

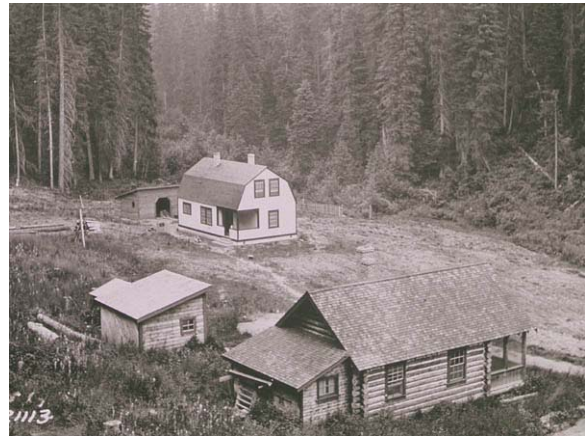
- 1) To promote forest research, education and demonstration on the ALRF;
- 2) To assist in fulfilling the educational and research needs of UNBC, UBC and other research institutions;
- 3) To demonstrate to a wide range of forest-users,
 - *components of the local forest ecology;*
 - *a range of silvicultural systems and partial cutting techniques implemented over time;*
 - *examples of forestry field research;*
 - *the history of the ALRF and the surrounding region;*
- 4) To foster innovation in,
 - *ecologically-sound management strategies and practices;*
 - *forest research;*
 - *extension and demonstration strategies and projects;*
- 5) To provide research and educational opportunities for,
 - *testing and refinement of a range of silvicultural systems and partial cutting techniques;*
 - *forest ecology, forest management, resource management and ecosystem management;*
- 6) To harvest timber using silvicultural systems and harvest methods (including access methods) which are compatible with other management goals;
- 7) To maintain target levels of biodiversity throughout the forest;
- 8) To manage designated habitat for locally and regionally significant wildlife and fish species; and,
- 9) To operate a long-term financially self-sustaining facility.

3.0 Context and Scope of the Plan

3.1 ALRF History and Development

In 1924, the Northern Interior Forest Experiment Station was established on the Aleza Lake Forest Reserve by the British Columbia Department of Forests and Lands. The Experimental Station was one of two established in each of the principal forest regions (southern coast and northern Interior), and was considered to be representative of typical forest conditions in the northern Interior (Barr, 1928; Schmidt, 1993). The photo below shows the Station in 1926.

The original Aleza Lake Forest Reserve covered an area of 2,540 hectares (6,350 acres) and was established by legislative Order-in-Council by the BC provincial government on May 8, 1924. This original area included the northern portion and northern boundaries of the present-day Aleza Lake Research Forest. The Aleza Forest Reserve area was expanded slightly to 2,680 hectares in 1927 and to a total area of 6,940 hectares in 1941, including land immediately south of the original area and north of the Bowron River.



In 1949, after a hiatus extending from the Great Depression to the end of World War II, the area was re-opened by the British Columbia Forest Service (BCFS) as the Aleza Lake Experimental Forest. The first ten-year management plan was prepared in 1950 (DeGrace, 1950). In 1954, a legal boundary survey was performed for the Reserve, and a 0.8 kilometre wide north-south strip was added along the west boundary. A new management and working plan was prepared in 1957 (Decie, 1957). In 1959, minor boundary revisions brought the total area to 7,930 hectares.

The BCFS Aleza Lake Forest Experimental Station was closed in the fall of 1963, and the Forest Reserve was transferred to the BCFS District Forester in Prince George. The station buildings were removed one year later. Though the Chief Forester at that time, F.S. McKinnon RPF, directed that the Aleza Lake Forest Reserve be retained as a forest experiment station, the planned review of this transfer after 10 years was never carried out, and the Reserve lay dormant. In 1984, the Aleza Lake Forest Reserve designation was dissolved by legislative Order-in-council, and the area was added to the adjacent Purden Forest Reserve, as part of the Prince George Timber Supply Area (TSA). From 1984 to 1997, the research forest was managed as several TSA “planning cells”. The western two-thirds of the Forest Reserve were allocated to Northwood Pulp and Timber’s Forest License A18165, while the eastern third of the Reserve was allocated to the BC Ministry of Forests’ Small Business Forest Enterprise Program.

In 1990, renewed interest in the Aleza Lake Forest Reserve resulted in the formation of an inter-agency Aleza Lake Steering Committee to address management issues on the area. This Steering Committee included government, research, and licensee representatives, and was joined by UNBC in 1993. A new management plan and working plan (MWP #1) for the area was completed in 1992. The area was renamed the Aleza Lake Research Forest and officially re-opened in 1993.

In 1997, the Steering Committee unanimously recommended that management of the ALRF be offered to BC universities. In 1998, the Chief Forester of British Columbia invited proposals from BC universities to assume long-term management responsibilities for the ALRF. A joint management proposal submitted by the University of Northern British Columbia and the University of British Columbia was accepted by the BC Ministry of Forests in 2000. The Aleza Lake Research Forest Society was formed in November 2000, and the Special Use Permit tenure for management of the Research Forest was issued to the Society in 2001. The area of the Research Forest was determined to be 8,983 hectares (excluding Ecological Reserve #84), including new areas of the Bowron River floodplain and adjoining slopes south of the Bowron River.

Finally, in August 2003, Amendment #2 to SUP #23615 incorporated a 19 hectare vacant gravel pit reserve previously identified as SUP 19957, into SUP #23615. This additional area was re-designated as forest land, given that less than one hectare of gravel was extracted from the area.

Therefore, as of April 2005, the area of SUP #23615 is approximately 9,002 hectares. This area surrounds, but does not include the 269 hectare Ecological Reserve.

The total area of the ALRF plus Ecological Reserve #84 is approximately 9,271 hectares.

3.2 Legislative and Regulatory Framework

The ALRF tenure has **two components**:

1. **Special Use Permit (SUP #S23615)**: Issued by the BC Ministry of Forests, Prince George District Manager, the current SUP was issued to the ALRFS in 2001 for 25 years, and is renewable every five years. The SUP designates the land area of the Research Forest, and requires that the Research Forest be managed under an approved Management Plan renewable at least once every five years.

The SUP requires that the Management Plan:

- outline management objectives;
 - contains harvest and disturbance history, resource and research inventory, zoning, and other maps;
 - includes measures for consultation with other resource users and First Nations;
 - includes a timber supply analysis that outlines that short- and long-term availability of timber and an operational timber supply projection;
 - describes inventories of the forest, recreation, fisheries wildlife, range, and cultural and heritage resources in the permit area;
 - must be prepared by a professional forester, and is approved by the ALRFS Board of Directors;
 - must be consistent with the conditions of the Permit;
 - include any other information on the development, management, and use of the permit areas that the District Manager requires; and
 - include a commitment by the Permittee to implement the approved Management Plan.
2. **License to Cut (LTC #L45514)**: Issued by the Prince George Forest District, the LTC provides legal cutting authority for timber harvesting within the ALRF within the scope of the SUP and the ALRF management plan.

Together, these two documents provide the ALRF Society with legal access to the ALRF land area and timber resources, as well as the legal framework within which all forest land management activities must occur.

Other legislation directly applicable to this Management Plan includes, but is not restricted to, the provincial Ecological Reserves Act, Mining Act, Wildlife Act and the Federal Fisheries Act.

3.3 ALRF Management Structure

The ALRF Society *Board of Directors* guide and oversee the administration, financial management and strategic planning for the ALRF. Under this guidance, the Manager and staff of the ALRF provide expert local knowledge of the forest land base, conduct land management activities, operational planning, budgeting, and implement research and education programs. The Board of Directors is mandated by the constitution of the Society.

As per the constitution, the **seven directors** of the ALRFS are constituted as follows:

- University of Northern British Columbia (*UNBC, two directors*)
- University of British Columbia, Faculty of Forestry (*UBC, two directors*)
- BC Ministry of Forests or successor organization (*BCMoF, one director*)
- BC Ministry of Environment, Lands, and Parks or successor organization (*BCMoELP, one director*). Note: This directorship currently alternates between the BC Ministry of Sustainable Resource Management (MSRM) and the BC Ministry of Water, Land, and Air Protection (WLAP).
- Forest industry representative (*one director*)

Figure 2 shows the current organizational chart for the Society and staff.

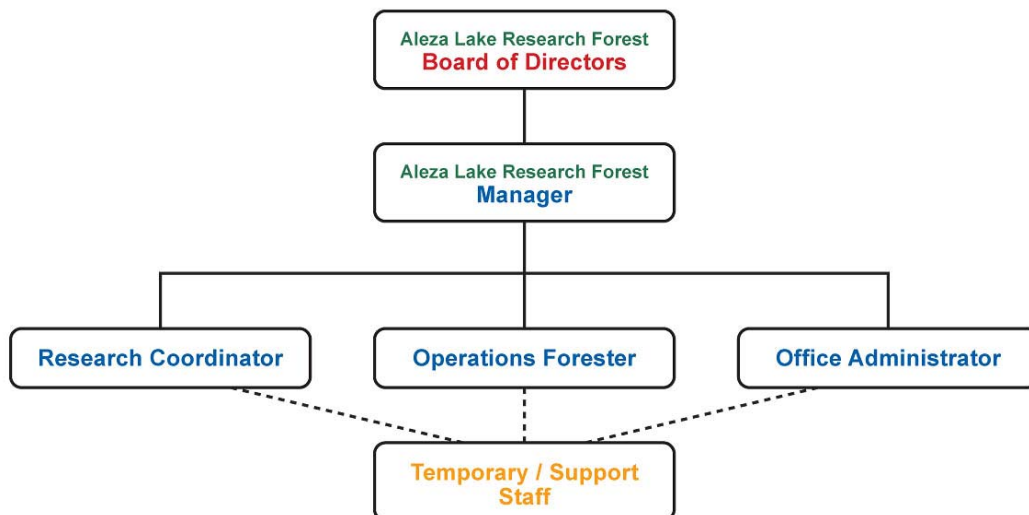


Figure 2. ALRFS Organizational Chart

3.4 Prince George Land and Resource Management Plan (LRMP)

The Prince George LRMP is the approved strategic guiding government document for forest land use planning in the Prince George Forest District for the period of 1999-2009. The LRMP was produced as a result of a consensus-based public planning process. The LRMP outlines broad management objectives applicable to the entire LRMP area under the plan, with more specific objectives and strategies for designated Resource Management Zones within the LRMP.

While LRMP objectives and strategies are not legally binding upon either government or forest tenure holders, they do provide important guidance on overall management intent for LRMP area.

3.4.1 Background on LRMP Provisions for the ALRF area

Under the Prince George LRMP, the ALRF area north of the Bowron River is designated as Resource Management Zone #30: Special Resource Management – Natural Habitat. The LRMP's stated management intent for the Aleza Lake Research Forest is to:

Provide a secure land base on which to conduct long term scientific research studies in silviculture and forest ecology, including the associated education and demonstration activities. The research program(s) will recognize the need to manage for non-timber forest resources while doing specific studies that differ from currently accepted methods and standards.

As a consequence of the 2001 ALRF boundary expansion, encompassing the Bowron River Floodplain and upland sites, LRMP objectives for the Willow River Valley RMZ (RMZ #27) also now apply to this management plan. The LRMP indicates that this area has "significant fish and wildlife values" (pp 116 and 126). The LRMP draws particular attention to the section of the Bowron River Valley below the 2,200 feet (670 metre) elevation contour from Box Canyon (several kilometers upstream from the ALRF boundary) to its confluence with the Fraser River (located downstream from the ALRF) stating that (pp 116), "Back channels of both the Bowron and the Willow Rivers provide important rearing areas for salmon, and wet forest complexes provide good habitat for moose and fur bearers." LRMP management recommendations for these units are summarized in **Appendix 1**.

3.4.2 ALRF Management Plan #2 in Relation to the LRMP

The ALRF Management Plan will be consistent with the principles and intent of the PG LRMP.

In the context of ALRF Management Plan #2, the Prince George LRMP will be considered as an important historical public consultation and forest management planning document that communicates general management intent and direction for the ALRF Permit area. The ALRF Management Plan strives to be complementary to, and consistent with general intent and direction of the LRMP. ALRF Management Plan #2 will replace and succeed ALRF Management Plan #1, as it is currently referenced in the PG LRMP.

The ALRF Management Plan #2, when approved by government, will specify more detailed and site-specific resource management plans and strategies for the various forest areas and resources in the ALRF SUP area.

3.5 Previous Management Plans

The vision and goals outlined in this management plan encompass the historical management direction indicated in previous formal or informal management plans and other guiding documents for the ALRF.

These plans and documents include:

- The Aleza Lake Forest Experiment Station: its development and purpose. (Barr, 1928);
- Preliminary Working Plan for the Aleza Lake Experimental Forest (DeGrace, 1950);
- Working Plan for Forest Experiment Reserve, Aleza Lake, 1957-1967 (Decie, 1957); and,
- Aleza Lake Research Forest Management and Working Plan #1, 1992-2002 (Jull, 1992). This plan was adopted as the ALRF's management plan for the period of 2001-2005 (term extended).

Historical objectives and management intent for the Research Forest were considered in light of current regional land use plans, tenure arrangements, regulatory requirements, inventory, and map information.

3.5.1 Background on ALRF Management and Working Plan #1 (1992-2003 – April 30, 2005)

This plan provided management direction for the ALRF over the past decade. The following eight key elements are outlined in the document (Jull, 1992):

- 1) Designation of the Camp Creek, Bear Road, and Bowron management compartments. These designations reflect differences in physical characteristics (e.g., landforms and soils), management objectives and silvicultural systems used.
- 2) Strategies to protect certain areas containing permanent sample plots designated in the plan as "long-term historical research areas".
- 3) Protection of three forest reserves (including the legislated Ecological Reserve) as representative of undisturbed forest ecosystems in each of the three management compartments.
- 4) Establishment of "old growth emphasis areas" to provide connectivity and buffering for the reserve areas. This would be achieved through harvesting and silvicultural practices that maintain old growth characteristics.
- 5) Development of demonstration trails in the Camp Creek compartment including an interpretive program.
- 6) A proposed classroom facility at the Old Ranger Station Site on Highway 16A (Upper Fraser Road).
- 7) Maintenance of existing forest infrastructure including roads and permanent plots and the establishment of new sample plots on unrepresented sites.
- 8) Information gathering and collation including: a timber re-inventory; survey and map biogeoclimatic site types; wildlife habitat study; preparation of a GIS database; and creation and maintenance of an archive system for records and data.

The original Management and Working Plan #1 should be referred to for specific details of any of the above points.

4.0 Description of the Area

4.1 Location and Geography

The ALRF is located 60 kilometers east of Prince George British Columbia, in the Upper Fraser River basin, on the eastern edge of the Central Interior Plateau, near the foothills of the northern Cariboo and Rocky Mountain ranges. The ALRF is located directly south of the village of Aleza Lake, BC, and is accessed via Highway 16 East and the Upper Fraser Road. The ALRF is an approximately 9,000 hectare tract of moist sub-boreal upland forest, wetlands, small lakes, and river floodplain (**Figure 4**, following page).

The Research Forest extends from the Bowron River and floodplain in the south, across a broad rolling plateau, to the Hansard Creek watershed in the north. The Research Forest is located at the approximate latitude of 54° 07' north, and longitude of 122° 04', and lies between 600 and 750 metres above sea level (ASL). The highest points within the ALRF are situated in the southwestern and eastern portions of the ALRF.

Situated in the Wet Cool (SBSwk1) subzone of the Sub-boreal Spruce biogeoclimatic zone, the Aleza forest is representative of a broad montane transitional zone between the climate of drier plateau forests to the west, and the wet, snowy mountain forests of the adjacent Interior Cedar Hemlock (ICH) and Engelmann spruce-subalpine fir (ESSF) forests to the east. About 85% of the ALRF is composed of gently rolling and sometimes gullied terrain covered by upland spruce-fir forests and wetlands with some hardwoods and other conifers. The remaining 15% is composed of the Bowron River floodplain. The Bowron River floodplain is a complex mosaic of alluvial sites, ranging from old river channels, alluvial wetlands and freshly-deposited gravel bars and higher terraces.

Lands and forest tenures adjacent to the Research Forest include private and Crown land lots along the northern boundary, and Woodlot License #269 adjacent to the northeastern boundary. Along this northern boundary, some private land has been cleared for agricultural use, mainly hay (dairy) production. Most other private land parcels along this boundary have been logged off over the last 20 years. The south, west, and eastern lands adjoining the Aleza Lake Research Forest are Crown Land currently in the Forest License A18165 (Canadian Forest Products Ltd.) chart area, and area allocated to BC Timber Sales Ltd. The proportion of shared boundary is shown in **Figure 3** below.

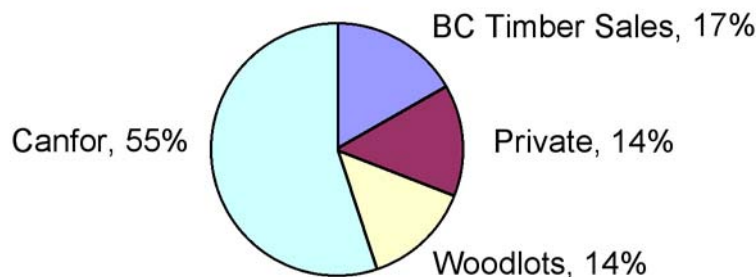


Figure 3. Proportion of Aleza Lake Research Forest perimeter shared with other land or tenure holders

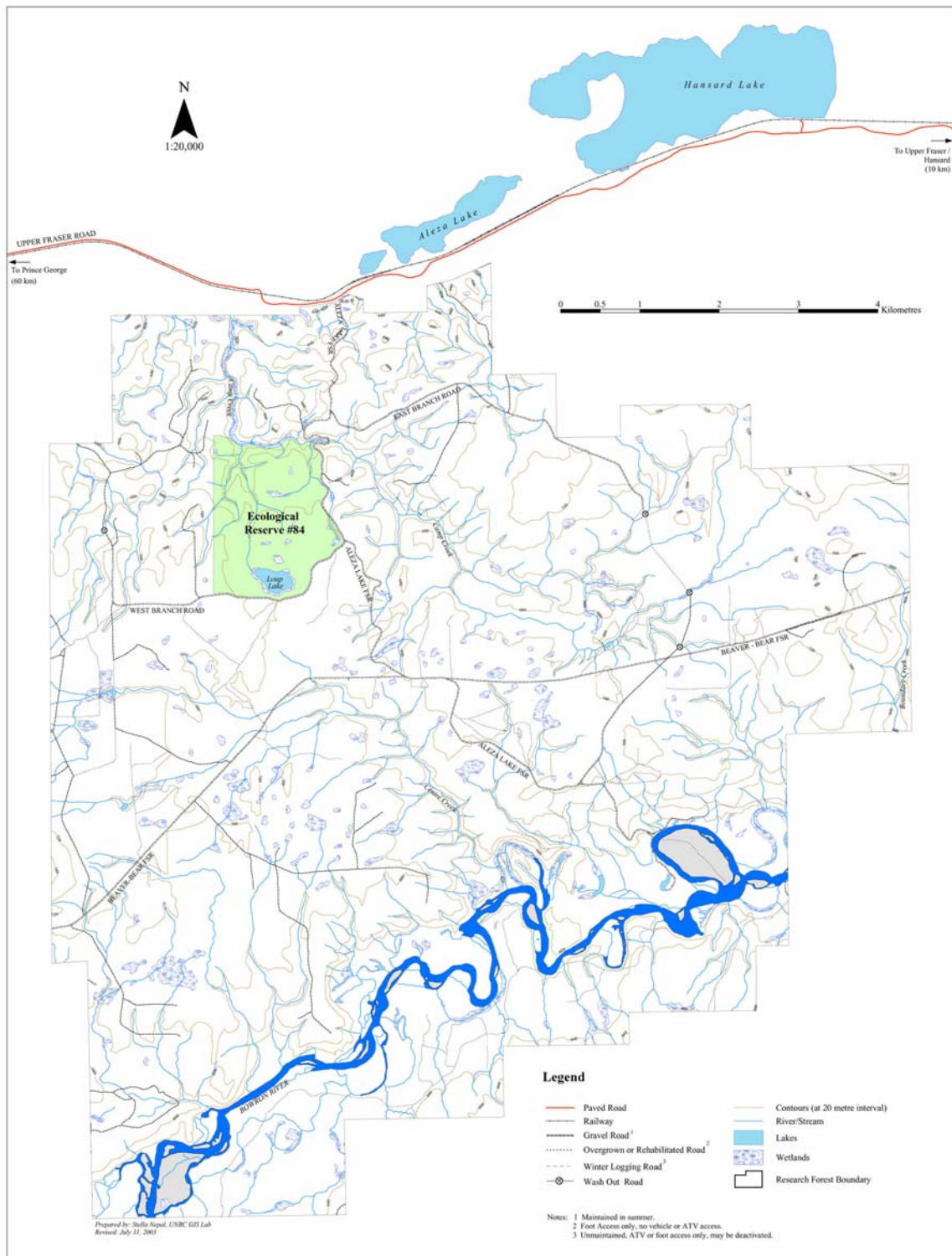


Figure 4. Aleza Lake Research Forest land base / roads

4.2 Land Use and History

4.2.1 Aboriginal Peoples: Lheidli T'enneh Nation

The area of the ALRF is located within the traditional aboriginal territory of the Lheidli T'enneh Nation. The name Lheidli T'enneh essentially translates as “the people from where the rivers flow together”. The Lheidli T'enneh is affiliated with the Carrier-Sekani aboriginal peoples. Lheidli T'enneh communities are located at Shelley, BC, and one other location near Prince George, BC. The Lheidli T'enneh has recently completed an Agreement-in-Principle regarding a proposed Treaty Settlement with the provincial and federal levels of government (BC Treaty Commission, 2003); this agreement identifies proposed Treaty Settlement lands and treaty provisions. Negotiation of a final treaty agreement is still pending at the time of writing this plan.

Although published accounts of Lheidli T'enneh traditional use in the ALRF are of limited or restricted availability, some information is publicly known. Traditional use reports available to the BC Ministry of Forests indicate a potential historical aboriginal trail route through the lower Bowron River corridor (through the southern portion of the ALRF) linking the Upper Fraser River with the Willow River watershed. The closest known archaeological site to the ALRF to date is near Eaglet Lake, some 15 to 20 kilometers west of the Research Forest. The BC Register of Geographic Names records that Aleza Lake itself (referring to both the lake and a European settlement established around 1914-15) was named after a First Nation elder woman who lived in the area.

The Upper Fraser River system, including the lower Bowron, appears to be well used – historically and currently – by the Lheidli T'enneh for fishing, especially in tributary streams. The Bowron River below Box Canyon upstream from the ALRF is navigable by boat, although subject to some logjams. The Lheidli T'enneh have an agreement with the federal Department of Fisheries and Oceans for harvest of salmon runs in the lower Bowron River, including the section within the Aleza Lake Research Forest.

4.2.2 European Settlement

Europeans explored the Upper Fraser area beginning in 1793, from Giscome Portage to the Blackwater River near Quesnel, with the explorations of Alexander Mackenzie. However, significant European settlement in the Upper Fraser River area further upstream began in earnest with the building of the Grand Trunk Pacific (later Canadian National Railway) through the Yellowhead Pass and Upper Fraser River valley in 1914/15. Since the early 1900s to 1920's, forestry and timber harvesting has been a dominant land use in this area.

From about the turn of the century up to the 1960's, timber harvesting tended to be localized within a few miles of mills, railways, and navigable rivers. Such timber harvesting was often selective, with stands of best access and prime timber quality being cut first, and in most cases, only merchantable large sawlogs being removed from stands through "diameter-limit" partial-cuts. Prime spruce and occasionally Douglas-fir tended to be the targets of these early operations. Most timber was skidded by horses along plank road to mills or river log dumps. Mechanized logging began around the Second World War, and tractors and skidders replaced horses in the woods.

At this time, forestry nurtured a string of small saw-milling, logging, and farming communities in the Upper Fraser River region along 200 kilometers of the Grand Trunk Pacific railway east of Prince George, BC. This area was, and still is, collectively known as the “East Line”. In later decades, the rise of the pulp economy, improved transportation routes, and centralization of tenures has resulted in a gradual decline in local communities and a shift of populations and services from Upper Fraser to Prince George.

4.2.3 Timber Harvesting

Historically, timber harvesting activities on the ALRF progressed over time from north to south, and is now dispersed throughout most of the Research Forest. Timber development took place in several distinct periods.

Timber harvesting on the Aleza Lake Research Forest dates back to the completion of the Grand Trunk Pacific Railway in 1914-15. The oldest known timber harvesting on the ALRF dates back to the 1919-1927 period in the north-central portion of the Research Forest. Operations at this time primarily involved selective hand-felling of large spruce, with horse-yarding to local mills. A range of areas were harvested using selection- and other partial-cutting methods in the north to central portion of the forest between the mid-1940's to early 1960's. These methods included single-tree selection, alternate strip cuts, and seed block systems, and intermediate-utilization (IU) cutting methods.

Following construction of the Beaver-Bear Road in the late 1970's, operations shifted to clearcut and plantation methods resulting in a series of cutblocks in the Research Forest. Clearcutting has been the predominant timber harvesting method used in the Research Forest over the last 25-30 years. Limited use of partial cutting systems in the ALRF has occurred in recent years.

Exhibit A shows the harvesting history over the Aleza Lake Research Forest.

4.2.4 Licensed Trapline and Guide-Outfitter Licenses

Two trapline license areas (License #'s 707T006 and 707T007), and one guide-outfitter (License #707G001) are found within the ALRF (**Figure 5** on following page). The trappers typically focus on fur-bearers such as pine marten.

The guide-outfitter has a seasonal campsite within the Research Forest near the end of the Aleza Lake Road along a back-channel of the Bowron River. Nearby within one kilometre to the east is a boat launch location where the guide-outfitter uses the deeper waters of the backchannel to access the main stem of the Bowron River. The guide has a lodge facility with buildings along the Bowron River, located approximately 1.5 kilometers east of the ALRF boundary.

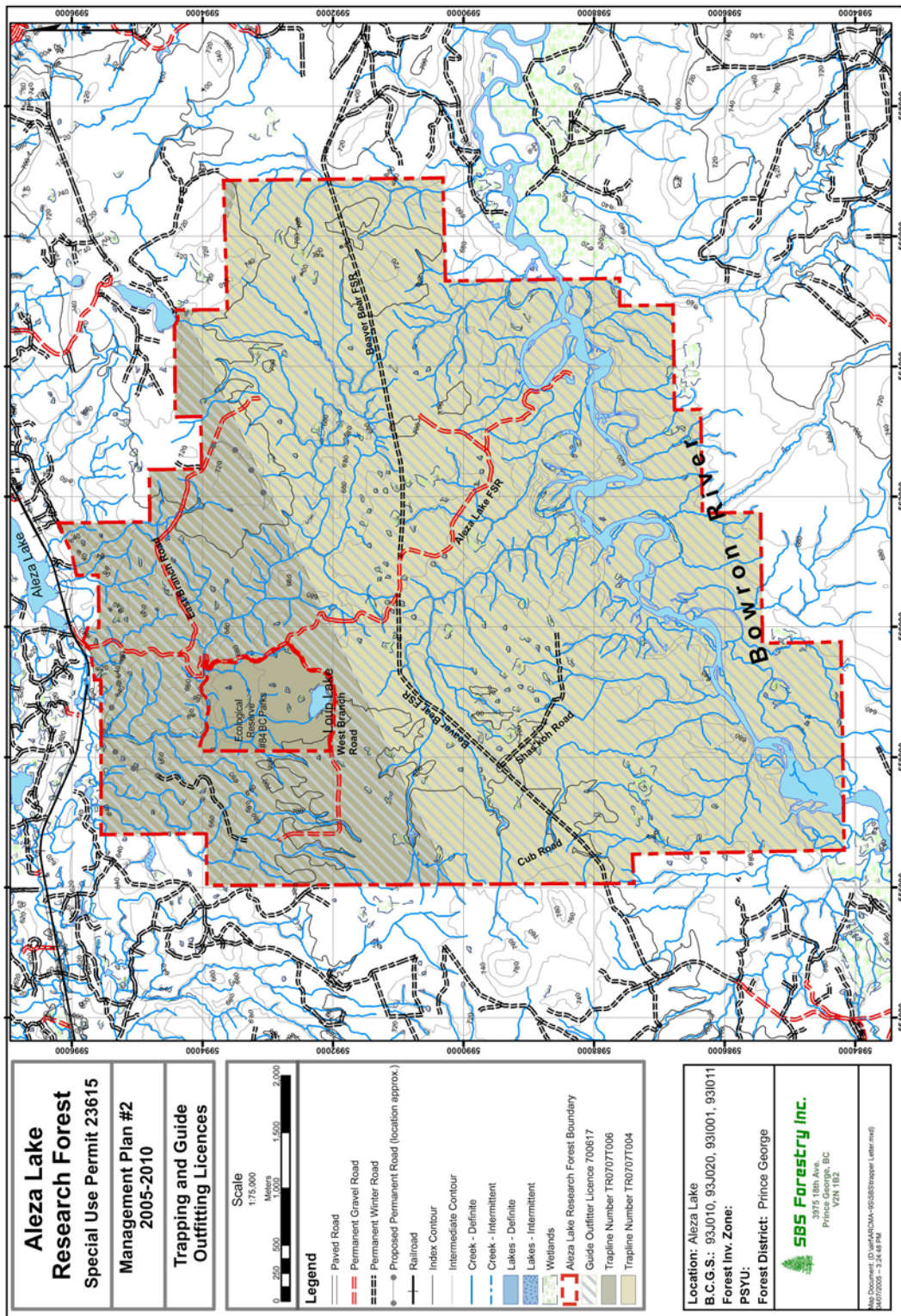


Figure 5. Trapping and guide-outfitter licences within the Aleza Lake Research Forest

4.2.5 Ecological Reserve #84 (Aleza Lake Ecological Reserve)

Ecological Reserve #84 is a 269 hectare area designated under the Ecological Reserve Act and Protected Areas Act, and is managed by BC Parks. Ecological Reserve #84 (ER #84) is legally excluded from the Special Use Permit for the ALRF, even though ER #84 is completely surrounded by the SUP area. The ecological reserve was established February 10th, 1978.

BC Parks recently developed a Purpose Statement for ER #84 (BC Parks, 2003). As described by the Purpose Statement, ER #84 protects forest ecosystems representative of a wet cool region of the Sub-boreal Spruce biogeoclimatic zone. ER #84 contributes towards Protected Areas representation of the McGregor Plateau Ecoregion, which is primarily represented by the nearby Purden Lake Provincial Park. Except for the shallow 12 hectare lake near the south boundary and a few small bogs, the reserve is completely forested.

Under the Act, the Ecological Reserve designation will:

“...reserve Crown land for ecological purposes including the following areas:

- (a) areas suitable for scientific research and educational purposes associated with studies in productivity and other aspects of the natural environment;*
- (b) areas that are representative examples of natural ecosystems in British Columbia;*
- (c) areas that serve as examples of ecosystems that have been modified by human beings and offer an opportunity to study the recovery of the natural ecosystem from modification;*
- (d) areas where rare or endangered native plants and animals in their natural habitat may be preserved;*
- (e) areas that contain unique and rare examples of botanical, zoological or geological phenomena.*

Any area established as an ecological reserve under this Act is “immediately withdrawn and reserved from any further disposition that might otherwise be granted under any Act or law in form in British Columbia.” This includes but is not limited to, “...dispositions under the following Acts: Coal Act, Forest Act, Land Act, Mineral Tenure Act, Mining Right of Way Act, Petroleum and Natural Gas Act, Range Act, Water Act.”

The Ecological Reserves Act does not allow any anthropogenic disturbances within the reserve, including timber harvesting, road construction, silviculture, or pest management of any kind. Research activities within ER #84 must be authorized by a BC Parks permit, and must be consistent with the Act (for example, research within the reserve shall generally be passive monitoring or observation, and will not involve disturbances, including destructive sampling).

4.2.6 Hunting and Fishing

There is high use of the ALRF area for moose hunting during the September to November hunting season. Hunting pressure in this area is very high, especially along roads and other more accessible areas. To a lesser extent, some hunting of black bear occurs during the May and fall hunting seasons. Autumn hunting for grouse by local residents also occurs on this area. The guide-outfitter accesses moose and bear hunting opportunities by boat along the Bowron River.

Although the main upland streams on the Research Forest are fish-bearing, they have low recreational fishing potential. Use of the Bowron River by recreation enthusiasts is currently restricted by poor access.

4.2.7 Agriculture and Grazing

There are no grazing or agricultural leases or permits on the ALRF. Earlier soil surveys in the region (e.g. – Dawson 1989) noted the agricultural potential of the soils, but there has been no historical or current agricultural development on the ALRF. Relatively small, local agricultural operations (mainly cattle / dairy / haying) occur outside of the Research Forest, and are concentrated in the corridor between the small communities of Willow River, Giscome, Newlands, Aleza Lake, and Hansard.

4.3 Physiography and Bedrock Geology

The ALRF is situated on the McGregor Plateau of the Fraser Basin in the Interior Plateau physiographic region (Prince George LRMP, 1999). Holland (1976) identified this area as being within the Nechako Plain portion of the Interior Plateau. The Interior Plateau is generally typified by level to moderately rolling terrain. Within the Aleza Lake Research Forest, hummocky, gently sloping, and sometimes dissected glaciolacustrine landforms, along with occasional rock outcrops, results in a landscape with more pronounced local relief. Glaciolacustrine landforms have been incised and overlain by Holocene deposits of the Bowron River, and more locally by smaller upland creeks.

The northern half of the ALRF drains north-northwest into the Hansard Creek (Aleza Lake / Hansard Lake) watershed. In the southern half, surface water drains southward into the Bowron River. The Aleza-Hansard Lakes and Bowron River drainages are both tributary to the Fraser River.

Bedrock geology consists predominantly of rocks from the Wolverine Metamorphic Complex (Struik and Fuller 1988; Struik 1989). These rocks are granodioritic plutons, rhyolites, and granites. Smaller amounts of pillow basalts, breccia, phyllite, and minor micritic limestone may also outcrop in parts of the study area (Struik et al. 1990). Exposed bedrock is found in only a few locations in the Research Forest, primarily at elevations higher than 720 to 750 metres ASL and in two locations along the Bowron River and Hansard Creek, respectively.

4.4 Quaternary History and Landforms

Landforms in the ALRF area are primarily glaciolacustrine or fluvial in origin, and are described in detail by Oikos (1995).

Regional studies of surficial geology indicate that the relatively low-lying region surrounding the ALRF was occupied by a glacial lake basin (or a series of lake basins) during the late glacial period (approximately 9 to 10K years before present) (Tipper 1971). Local ecological and terrain mapping carried out within the Research Forest in 1993 and 1994 support this conclusion (Oikos 1995).

Within the Research Forest, and in surrounding areas, it appears that lake levels remained stationary, developing beaches at an elevation between 740 to 750 metres ASL. This elevation is comparable to beach levels found around Prince George (Tipper 1971). Gravel and stone deposits located near the southwestern corner of the ALRF are consistent with these findings. Other lakeshore deposits are found towards the southern and eastern portions of the ALRF at elevations between 685 to 710 metres ASL. These deposits suggest that the glacial lake levels were temporarily stationary for a period before the lake drained and lake levels receded.

As the shore lines receded, drainage patterns became established across the floor of the former glacial lake. Dissection and incision of the glaciolacustrine terrain was probably most rapid at this time, especially across the central and northern portions of the study area. Between the elevations of 680 to 700 metres, two drainage patterns developed as water flowed north towards the Aleza Lake waterway system, and south towards the Bowron River.

During the Holocene, the Bowron River cut down into glaciofluvial deposits found along the southern boundary of the ALRF. This activity resulted in a broad floodplain with a complex micro-topography produced by lateral cutting and overbank deposition. The Bowron floodplain landscape is composed of relatively level surfaces formed at different heights above the river. Recent activity occurring directly adjacent to the main channel has formed smaller benches at various heights, aquatic and semi-aquatic areas in cutoff and seasonally-flowing oxbows, and extensive wetlands in inter-levee depressions in backchannel areas.

4.5 Soils and Parent Materials

Soils in the upland portion of the ALRF north of the Bowron River are predominantly Luvisols, and include Podzolic Gray Luvisols of the Bednesti Association in relatively well drained areas, and Gleyed Orthic Gray Luvisols of the Pineview Association in poorly-drained, level areas with higher clay content (Dawson 1989). On sandy soils, Dystric Brunisols are typical and provide some of the most productive sites in the study area. These sites are beach deposits formed in the shallow waters of the post-glacial lake and are more limited in occurrence than the fine-textured silts and clays. Shallow caps of loamy to sandy soils occurring over fine-textured glaciolacustrine deposits are more common than deeper deposits of sand. On the few bedrock outcrops in the study area, Brunisols or Folisols are typical. These soils are derived from bedrock weathering and are thin with high coarse fragment content. In gullies, soils are water-deposited sands and silts. These fluvial deposits are of recent origin and are typically Orthic, Cumulic, or Humic Regosols, with some degree of gleying.

Although of limited areal coverage, soils of the Organic Order are common in the ALRF, and form in level to depressional landscape positions where drainage is impeded. Fibrisols and Mesisols are the most frequently occurring members of this group. On the floodplain of the Bowron River, soils

are younger: Orthic, Cumulic, and Gleyed Regosols predominate. Different subgroups of the Organic and Gleysol Orders are common in wetland areas of the floodplain.

The dominant process in Luvisol development is the translocation of clays from the upper soil horizons to create a mostly impermeable Bt horizon at depth. In the ALRF, this dense and thick Bt layer commonly occurs at the 10–20 cm depth. Layers above this are generally granular, and may include some organic matter. It is this upper layer that allows for rainfall penetration, moderate downslope drainage, and, consequently, the establishment of many of the herbaceous species that characterize ecosystems of the ALRF. This upper soil horizon is also the area of most nutrient uptake by trees, and is thus critically important to site productivity. It follows that machine traffic across these soils can easily destroy the granular soil structure that is responsible, in large part, for ecosystem diversity and productivity.

The predominance of fine-textured soils in the ALRF creates forested ecosystems that differ somewhat from forests that occur on morainal or coarse-fluvial deposits, more common in higher-elevation sections of the SBSwk1. Some ecological attributes of fine-textured glaciolacustrine deposits include better soil water retention, poor water movement (drainage), and difficult root penetration. Most site series sampled in the ALRF represent a fine-textured phase of the different site series.

4.6 Climate

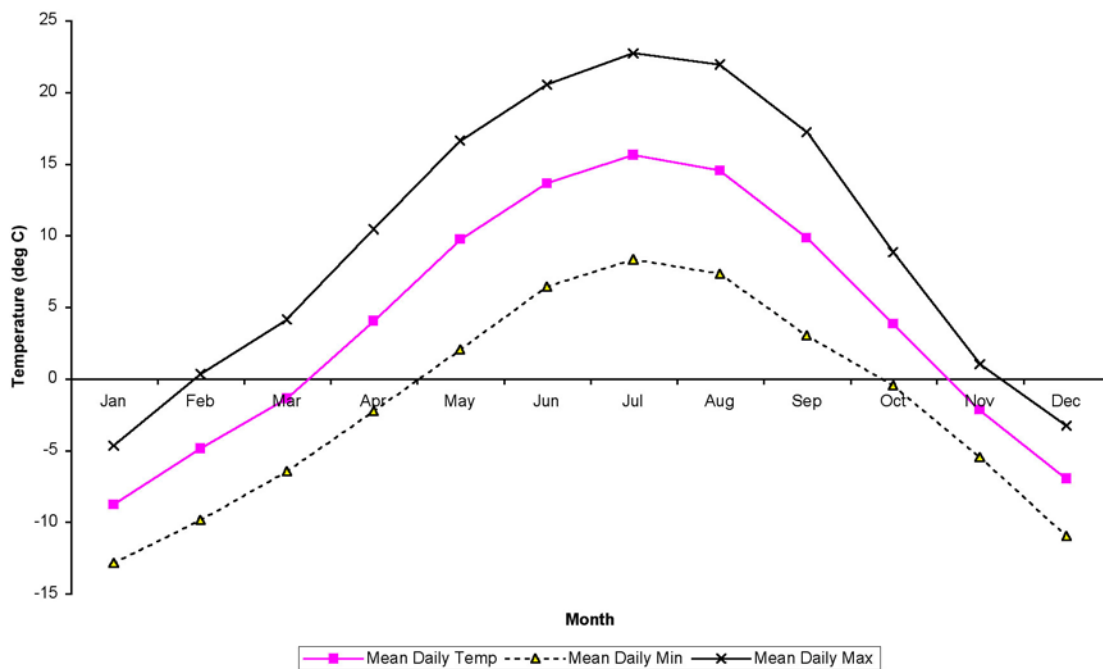
The SBSwk1 is characterized by cold, snowy winters, moist cool summers, and relatively heavy snowpack accumulations in the winter months (DeLong 2003). The continental nature of the climate is modified by relatively warm and moist Pacific air masses so that prolonged periods of dry weather or extremes of temperature are infrequent. The ALRF lies on the eastern edge of the Central Interior plateau and near the western slopes of the Rocky Mountains. Here, the Pacific air masses build up against the mountains, resulting in higher levels of precipitation compared to more central areas of the plateau. The boundary of the more humid Interior Cedar Hemlock Zone (ICHvk2 subzone) and Very Wet SBSvk2 subzone lie 10 to 20 kilometers to the southeast and east respectively, resulting in the moister climatic conditions found in the ALRF, compared to the drier westerly SBS subzones. The sporadic occurrence of western hemlock and isolated occurrence of western red cedar point to the transitional nature of the climate in the SBSwk1.

Data from the weather station at Aleza Lake (BC Atmospheric and Environment Service) summarizing typical long-term climatic characteristics for the period (1952-1980) are presented in **Table 1**. Monthly mean and extreme air temperature trends for the period 1993-2003 are illustrated in **Figures 6** and **7**. Monthly precipitation trends (snow and rainfall) for 1952 to 1980 are shown in **Figure 8**. Current data from 1993 to present is also available (Sagar 2002; unpublished data).

Table 1. Aleza Lake Research Forest climate data summary (AES Station, Aleza Lake) (1952-1980).

Parameter	Max.	Min.	Mean
Mean Annual Precipitation (mm)	1315.3	682.4	894.9
Mean Rainfall (mm)	914.0	388.6	555.7
Mean Snowfall (mm)	592.5	160.5	339.3
Mean Annual Temperature (C°)	4.9	0.9	3.1
Extreme Coldest Temperature (C°)	-32.2	-46.7	-40.4
Extreme Hottest Temperature (C°)	36.0	27.2	32.2
Maximum 1-Day Precipitation (mm)	57.2	20.3	34.4
Maximum 1-Day Rainfall (mm)	55.9	19.3	30.6
Maximum 1-Day Snowfall (cm)	49.3	17.3	27.9

Source: Sagar, R.M. 1993. Aleza Lake, British Columbia AES Climate Station Data 1952-1980 Data Summary and Users Guide. Unpublished report prepared by R.M. Sagar Consulting Ltd. for the Prince George Forest Region, BC Ministry of Forests, Prince George, BC. 18 pp.

**Figure 6. Trend in Mean Daily Temperatures by Month (1993-2003)**

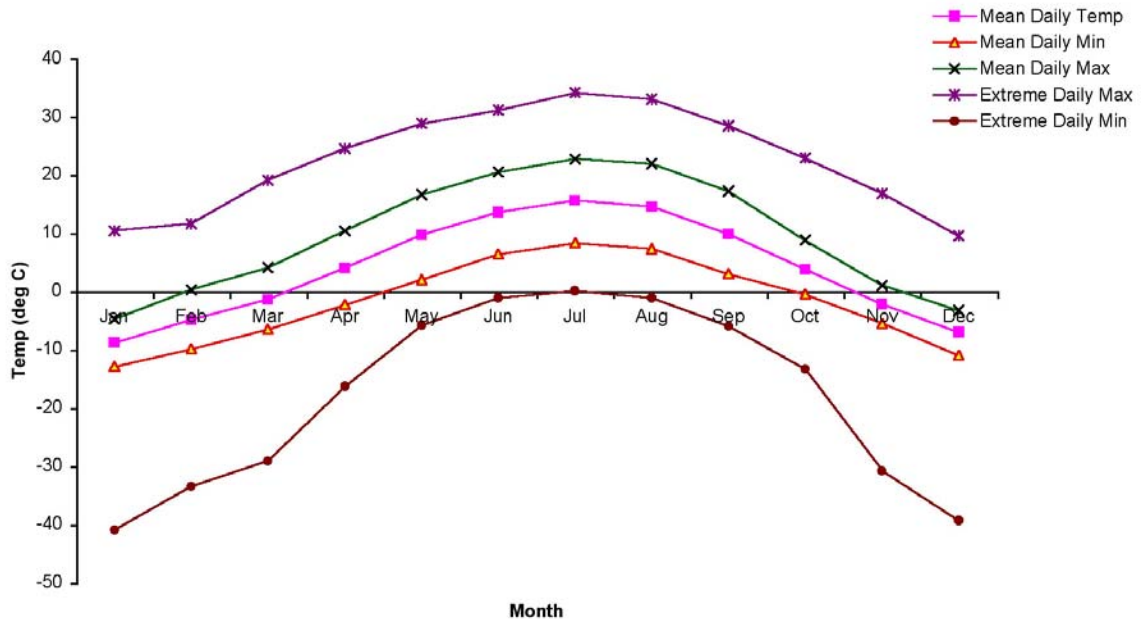


Figure 7. Mean and Extreme Minimum and Maximum Daily Temperatures by Month (1993-2003)

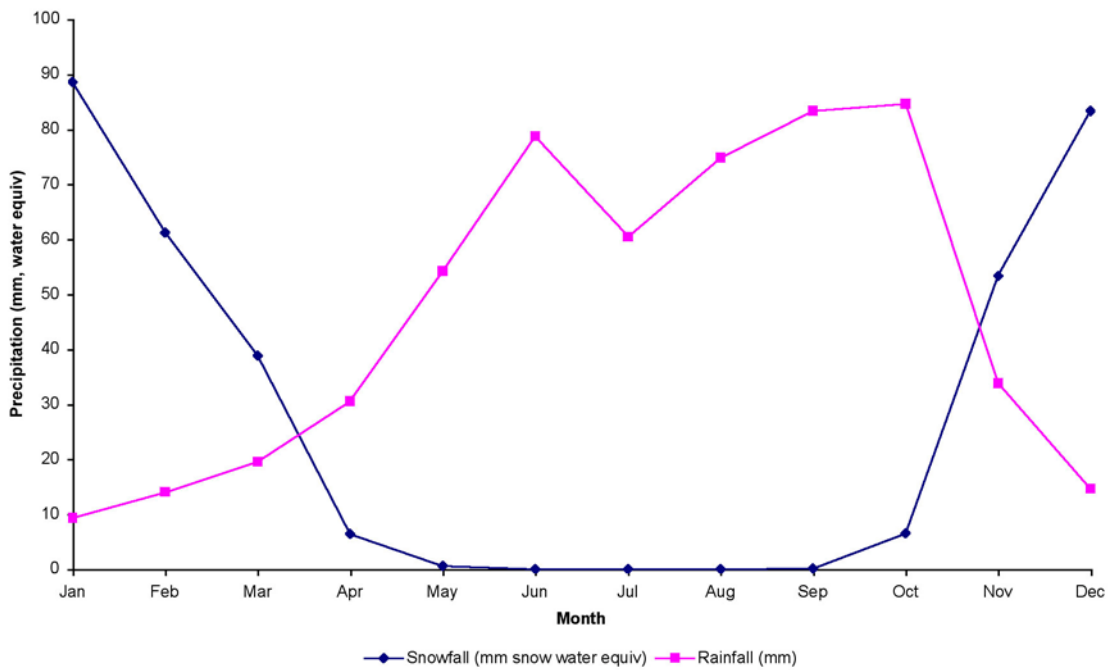


Figure 8. Monthly Snowfall and Rainfall Precipitation Trends

4.7 Hydrology and Watersheds

The ALRF is located entirely in the upper Fraser River Basin. The Research Forest area, however, is separated into two distinct, similarly-sized watersheds divided by a shallow height of land running roughly east-west across the middle of the Forest. The northern half of the ALRF drains in a northerly direction into the Hansard Creek watershed (gazetted name; locally known as Camp Creek within the Research Forest boundary), while in the southern portion of the Research Forest, surface drainage flows southward into the Bowron River (see **Exhibit B**). Within these predominant watersheds are several significant creeks and sub-basins. Note that as most small creeks and sub-basins lack gazetted names, local names or designations have been used for reference.

Camp Creek is the portion of Hansard Creek within the Research Forest and flowing into Aleza Lake north of the Research Forest. Camp Creek is the largest single sub-basin and year-round stream within the Research Forest, and with the exception of Slaney Creek (gazetted name), most streams and drainages in the north half of the ALRF are tributary to the main stem of Camp Creek. Camp Creek has two main tributaries, locally designated as North and South Camp Creeks, which join about halfway up its stream-length within the Research Forest. Two lakes and numerous small swamps and wetlands feed Camp Creek, including the 12 hectare Loup Lake in Ecological Reserve #84, and a similar-sized large lake (unnamed) in the northeastern corner of the Research Forest. The boundaries of the Camp Creek watershed are almost entirely within the ALRF. The main stem of Camp Creek has a well-developed floodplain, especially in its lower reaches. Camp Creek has substantial fish populations.

Firebreak Creek (local name) is located near the northwestern portion of the Research Forest. This drainage is a moderate-sized year-round tributary of Camp Creek, flowing into Camp Creek at a junction north of the Research Forest boundary. This stream is named for the western firebreak cleared along the west boundary of the Research Forest in the late 1940's. Firebreak Creek is frequently dammed by numerous old and more recent beaver ponds at several points along its length, but has significant fish values, including rainbow trout and minnow species.

Slaney Creek (gazetted name) is a small drainage flowing through the north central part of the Research Forest and directly into Aleza Lake near the old Ranger Station site. Flow in this creek is relatively seasonal and ephemeral in nature due to the small basin area. Although small, Slaney provides habitat for a resident population of rainbow trout.

The ALRF encompasses approximately 10 linear kilometres of the Bowron River and associated floodplain. A Water Survey of Canada gauging station along the Bowron River in the southwestern portion of the Research Forest has a continuous year-round record of river flows since 1977.

Figure 9 on the following page summarizes this data. A similar record of Bowron River flows at a former gauging station, located near Hansard, extends this record from 1945 to 1976.

Numerous sub-basins drain north and south through the ALRF as minor tributaries to the Bowron River. Of these, the most substantial are Boundary Creek (local name), which flows south and parallels the southeastern boundary of the Research Forest, and Ravine Creek (local name), which drains the lacustrine plain in the west-central portion of the Research Forest. These streams are fed by the numerous bogs, swamps and wetlands found throughout this drainage area. Other than beaver ponds, no lakes are found within these sub-basins. Numerous other smaller, primarily ephemeral drainages also dissect the area.

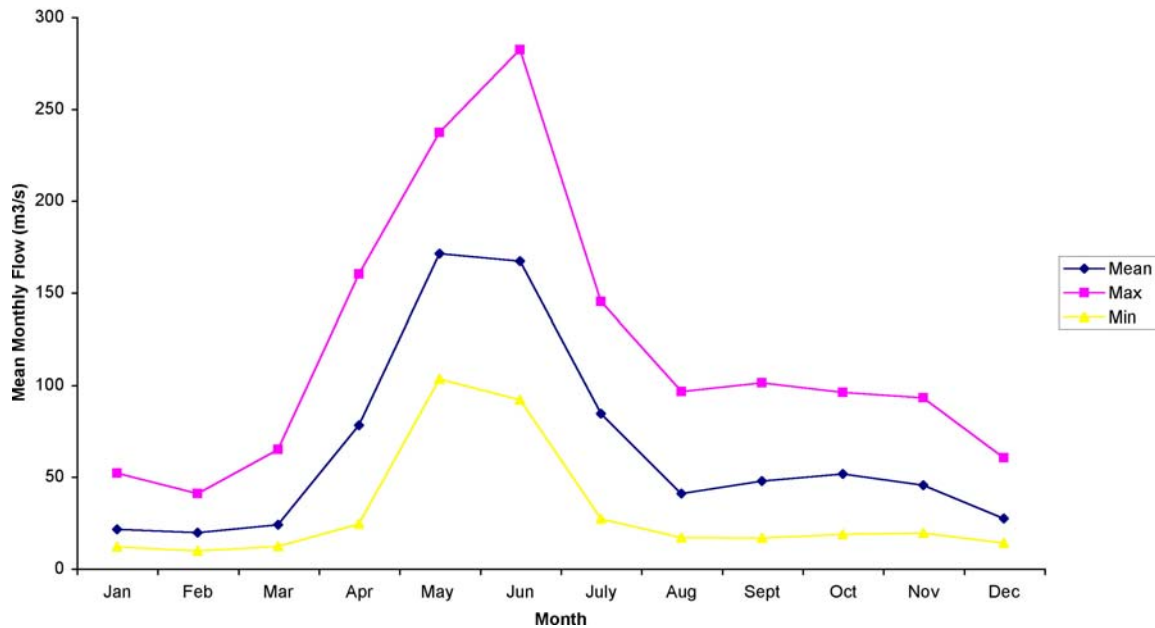


Figure 9. Mean Flow by Month (1977-2004) – Bowron River (below Box Canyon)
Water Survey of Canada, Hydrometric Station 008KD007

4.8 Forest Vegetation

Forest cover information is provided in **Exhibits C-1 to C-3**, including leading species and age class distribution.

4.8.1 Upland Forests

The mature and old-growth stands in the ALRF are dominated by mature mixed stands of hybrid white spruce (*P. glauca x engelmannii*) and subalpine fir (*Abies lasiocarpa*), with paper birch (*Betula papyrifera*) frequently occurring as a minor component. Scattered individuals of Douglas-fir (*Pseudotsuga menziesii*) also occur on drier upland sites, ridges, and some wetland margins.

Mature stands are characteristically unevenaged or two-aged, with the understory composed mainly of subalpine fir, with some spruce. Spruce individuals as old as 250 to 300 years of age can be found (but are more commonly 150 to 250 years) while the more numerous but shorter-lived subalpine fir or 'balsam' is generally 100 to 175 years at maturity.



A typical spruce/subalpine fir stand in the ALRF. The majority of the forest is composed of these mixed stands.

There are anecdotal but so far unsubstantiated reports of some Douglas-fir veterans scattered through the forest exceeding 500 years in age (Decie 1957); more recently, in 2002 and 2004, ALRF staff have documented Douglas-fir that are 375 to 400 years of age.

The main agents of tree mortality in these wet SBSwk1 forest types appear to be small outbreaks of insects (bark beetles), stem rots, and small windthrows (Lewis and Lindgren, 1999; Newbery, 2001; Lewis and Lindgren, 2002). Lightning strikes and small fires have occasionally been recorded on the ALRF (Decie 1957), and there is evidence of infrequent but significant historical wildfires. The presence of fire-seral lodgepole pine (*Pinus contorta* var. *latifolia*) snags, scattered mature pines in some stands and the presence of charcoal in the upper soil horizons of these sites provide clues to the fire history of the ALRF.



Large, old Douglas-fir such as these are found scattered throughout the forest on well-drained, south facing sites.

Timber harvesting has been a major agent of change influencing forest vegetation in the past century. Older partial cuts appear to have shifted somewhat to an increase in subalpine fir, while more recent clearcuts have heavy invasion of birch, aspen, and willow, along with some subalpine fir and spruce regeneration. Trembling aspen (*Populus tremuloides*) is present in scattered locations in mature stands, but appears to be more abundant as a vigorous invader with birch and black cottonwood (*Populus balsamifera* ssp. *trichocarpa*) in prescribed burned areas or disturbed mineral soils. Black spruce (*Picea mariana*) and lodgepole pine are generally confined to areas of heavy organic deposits in bogs where high water tables restrict the establishment of other tree species. Western hemlock (*Tsuga heterophylla*) occurs as scattered individuals throughout coniferous types, although usually as small understory trees. Western red cedar (*Thuja plicata*) occurs very rarely on southfacing slopes in the Bowron River area. Black cottonwood is a common seral tree species on the alluvial floodplains of the Bowron River.

Non-forested ecosystems are of limited distribution in the ALRF north of the Bowron River. Shrub-sedge communities in fens, and emergent shoreline and wetland sedge communities, are examples of the type of non-forested ecosystems that do occur.

4.8.2 Floodplain Forests

The floodplain of the Bowron River supports a complex mosaic of different plant communities which reflect changes in soil texture and drainage, microelevation in relation to the flooding regime of the river, and natural and post-harvesting forest succession. Impressive interior spruce stands occupy the highest benches. Many stands have had diameter-limit or clearcut logging, though some remain unharvested. Logged stands are now dominated by interior spruce and subalpine fir residuals, and regenerated black cottonwood. Clearcut stands may also support shrub-herb communities dominated by young black cottonwood. Pure black cottonwood stands in several successional stages occur on benches of increasing elevation adjacent to the Bowron River.



Stands of large cottonwood trees are found within the Bowron River floodplain.

Depressional areas away from the main channel of the Bowron River support a variety of forested, semi-forested, and non-forested communities.

4.9 Forest Productivity and Timber Values

The ALRF has several characteristics which make it a very productive area for tree growth, including a relatively low elevation, moderately well-drained but fine-textured lacustrine soils, a moist climate with abundant summer precipitation, and a moderate growing season of about 90 to 100 frost-free days.

Individual spruce trees exceeding 40 metres in height and 70 centimetres in diameter at breast height are not uncommon on better growing sites in the ALRF. These large spruce are capable of producing high quality, large dimension lumber, with a relatively low percentage of knot-free wood.

On the best sites, natural stand volumes in mature stands approach 450 to 500 m³/ha (gross volume), but are typically 250 to 350 m³/ha on average sites.

Site indices (reference age 50 years) for interior spruce range from approximately 14 to 24 metres, with corresponding potential mean annual increments (MAIs)¹ in even-aged stands of 3 to 6 m³/ha/yr.

MAIs on individual long term permanent sample plots² in diameter limit harvest stands on the ALRF have ranged from 4.5 to 8.1 m³/ha/yr, and collections of plots in single tree selection stands reached MAIs³ of 4.4 to 6.1 m³/ha/yr. On average, productivity is generally greater on the northern

¹ Based on managed stand yield tables contained in the database associated with the WinTIPSY computer program. Figures assume a 12.5 cm merchantability limit and operational adjustment factors (OAFs) of 5% for area net-down and 10% for pest net-down.

² Figures assume a 12.5 cm merchantability limit and incorporate the equivalent of the pest related OAF but not the area OAF.

³ Based on average of 10, to 15 plots per stand located only on upland sites. Figures assume a 12.5 cm merchantability limit and incorporate the equivalent of the pest related OAF but not the area OAF. Figures are net of losses caused by post-harvest windthrow events, which resulted in up to 50% volume losses in the residual stands.

half of the forest, which has a higher proportion of moderately well to well drained, well aerated soils.

Natural mature stands on the ALRF are mainly comprised of interior spruce and subalpine fir, with minor components of paper birch, Douglas-fir, lodgepole pine, trembling aspen, black cottonwood and western hemlock. Natural regeneration in the older cuttings has favoured subalpine fir and hybrid spruce, with the deciduous species becoming more prevalent in some of the areas having heavier removals and intensive scarification. Planting in the later clearcuts has favoured interior (hybrid) spruce, with some plantings of lodgepole pine and Douglas-fir.

Volume productivity on the ALRF will likely be highest for well-stocked stands of interior spruce, Douglas-fir, and lodgepole pine. Black cottonwood will also do very well, particularly on the Bowron River floodplain. Productivity for subalpine fir and paper birch is somewhat less, although, management for paper birch may result in a very high-value product should markets develop. An area summary of productive and non-productive forest is provided in Section 5.4.1.

5.0 Resource Inventories and Analyses

5.1 Current Inventory Information

5.1.1 Forest Cover Inventory

As mentioned in Section 4.8, forest cover maps are provided in **Exhibits C-1 to C-3**. Forest cover (FC1) data is based on current 2003 map sheets from the BC Ministry of Sustainable Resource Management. This information is based on a 1992 re-inventory for the Purden area, and included reclassification and re-stratification of forest cover polygons for the ALRF, primarily through aerial photography. Some limited ground sampling was included in this process. Since 1992, forest licensees and the BC Ministry of Forests have provided updates of harvest openings and regeneration status.

5.1.2 Ecosystem and Terrain Mapping

Ecosystem and terrain mapping was carried out for the ALRF in 1993 and 1994 by Oikos Ecological Services Ltd and a report prepared (Oikos, 1995). This information has been integrated with current GIS databases for the ALRF.

5.1.3 Plants

Common understory plants vary with ecological conditions and seral stage on the ALRF. Common species are summarized in **Appendix 2**. A complete plant list is found in Oikos (1995). Recent research by Botting and Fredeen (2005) and Campbell and Fredeen (2005) have also produced a preliminary list of epiphytic plants (lichens, liverworts and bryophytes) that are listed in **Appendix 3**.

Table 2, following, presents a list of plant species at risk in the Prince George Forest District as identified by the BC Ministry of Sustainable Resource Management. This list comprises species whose range may overlap with the ALRF but whose presence in the Research Forest is not confirmed. Code definitions are provided in **Appendix 4**.

Table 2. Prince George Forest District Plant Species at Risk in the Research Forest Area

Scientific Name	Common Name	STATUS		
		Global	Provincial	BC Status
<i>Acorus americanus</i>	American sweet-flag	G5	S2S3	BLUE
<i>Anemone virginiana</i> var. <i>cylindroidea</i>	riverbank anemone	G5TNR	S1	RED
<i>Apocynum x floribundum</i>	western dogbane	G4G5	S2S3	BLUE
<i>Carex scoparia</i>	pointed broom sedge	G5	S2S3	BLUE
<i>Carex sprengelii</i>	Sprengel's sedge	G5?	S1	RED
<i>Carex tenera</i>	tender sedge	G5	S2S3	BLUE
<i>Carex tonsa</i> var. <i>tonsa</i>	bald sedge	G4G5TNR	S2S3	BLUE
<i>Draba fladnizensis</i>	Austrian draba	G4	S2S3	BLUE
<i>Dryopteris cristata</i>	crested wood fern	G5	S2S3	BLUE
<i>Eriophorum vaginatum</i> ssp. <i>vaginatum</i>	sheathed cotton-grass	G5TNR	S3	BLUE
<i>Juncus stygius</i>	bog rush	G5	S2S3	BLUE
<i>Malaxis brachypoda</i>	white adder's-mouth orchid	G4	S2S3	BLUE
<i>Malaxis paludosa</i>	bog adder's-mouth orchid	G4	S2S3	BLUE
<i>Megalodonta beckii</i> var. <i>beckii</i>	water marigold	G4G5T4	S3	BLUE
<i>Melica smithii</i>	Smith's melic	G4	S2S3	BLUE
<i>Nymphaea tetragona</i>	pygmy waterlily	G5	S2S3	BLUE
<i>Pedicularis parviflora</i> ssp. <i>parviflora</i>	small-flowered lousewort	G4T4	S3	BLUE
<i>Platanthera dilatata</i> var. <i>albiflora</i>	fragrant white rein orchid	G5TNR	S2S3	BLUE
<i>Pyrola elliptica</i>	white wintergreen	G5	S2S3	BLUE
<i>Sparganium fluctuans</i>	water bur-reed	G5	S2S3	BLUE

Source: BC Ministry of Sustainable Resource Management

5.1.4 Wildlife

The main sources of information on wildlife are: local knowledge (guide-outfitter and other forest users), ALRF wildlife inventory surveys, and data from the BC Ministry of Water, Land and Air Protection. Wildlife surveys at the ALRF started in 2003 and are ongoing. Although limited, the preliminary inventory data collected provide a picture of species and habitats in the Research Forest. Wildlife inventories focus on presence/not detected surveys in the form of winter tracking surveys and a wildlife sighting records. For additional information, **Appendix 5** provides a list of common and scientific names for the species typically found in the region.

5.1.4.1 Mammals

Wildlife inventories and recent field surveys in the ALRF confirm the presence of the following mammal species:

- Grizzly bear (*Ursus arctos*)
- Black bear (*Ursus americanus*)
- Gray wolf (*Canis lupus*)
- Moose (*Alces alces*)
- White tailed deer (*Odocoileus virginianus*)
- Pine marten (*Martes americana*)
- Lynx (*Lynx canadensis*)
- Coyote (*Canis latrans*)
- Beaver (*Castor canadensis*)
- Porcupine (*Erethizon dorsatum*)
- Snowshoe hare (*Lepus americanus*)
- River otter (*Lutra canadensis*)
- Red Squirrel (*Tamiascirus hudsonicus*)
- Mice/Voles (various species)

Black bears are fairly common in the ALRF and grizzly bears also make occasional use of the area. Black bears tend to be particularly active throughout the forest in June when sightings are frequent. Initial results of an ongoing bear den inventory reveals excavated dens along major drainages in upland areas and possible cottonwood tree dens in the Bowron Floodplain. The guide-outfitter observes black bears denning in cottonwood trees in late September, coinciding with the arrival of Grizzly bears into the floodplain. Douglas-fir trees also appear to be important habitat features for black bears as claw marks are consistently observed on large stems (approximately > 40 cm). Spring bear hunt activity occurs on the Research Forest by the guide-outfitter within the Bowron Floodplain and by the general public in the upland areas. Local knowledge reveals that grizzly bears pass through the Research Forest in spring and fall.



Wolf tracks are often found along the Bowron River, on roads, and on wildlife trails. River otter tracks were observed along the Bowron River in the summer and in the lower reaches of Camp Creek in the winter. Possible wolverine tracks were found in the West Bear Management Unit. Small mammal prey species are documented during winter tracking surveys include snowshoe hare, red squirrel, mice, and voles. Squirrel middens are observed in mature, old, and in partially cut stands older than 40 years.

Another information source focuses on ungulate capacity mapping of the ALRF. Biophysical ratings are based on photo-interpretations of landforms, surficial materials, and climate, with a limited amount of ground information to supplement the former (Personal communication, Dave King, Ministry of Environment, Prince George, BC). These ratings do not take into account factors such as access, forest cover disturbance, or economics. The ALRF has low capacity for most ungulate species. For mule deer, this Low rating indicates a carrying capacity of less than 3 animals/km²/year due to high winter snowpacks. This is consistent with the lack of mule deer sightings in the ALRF thus far. For moose, carrying capacity is rated as High (5-8 animals/km²/yr) on the alluvial floodplains of the Bowron River, Moderate (3-5 animals/km²/yr) on the slopes adjacent to the floodplain as well as the rolling hills and creeks of the northern part of the forest, and Low on the rest of the forest area. The ALRF area, as with most of the surrounding plateau, is heavily used for moose-hunting from early September through early November each year.

5.1.4.2 Birds

Little information is currently available on bird species in the ALRF. Various species have been observed but not positively identified. A list of typical bird species for the mid-elevational SBSwk1 plateau forests around the ALRF and adjacent forest types is found in Lance and Phinney (2001) and presented in **Appendix 6**. Cavity-nesting birds include the three-toed woodpecker (*Picoides tridactylus*), hairy woodpecker (*Picoides villosus*) and pileated woodpecker (*Dryocopus pileatus*), while secondary nesters include passerine birds such as warblers and flycatchers. Larger birds include boreal owls, great grey owls, and great horned owls, and raptors, including northern goshawks and red-tailed hawks. Staff have observed Great Grey Owls (*Strix nebulosa*), and various species of woodpeckers possibly the three-toed, hairy, and/or pileated woodpeckers, which are known to be in the area.

Bald eagles (*Haliaeetus leucocephalus*) and ospreys (*Pandion haliaetus carolinensis*) nest in and near riparian areas and adjacent ridges near the Bowron River. While there is currently little recorded information on waterfowl species on the ALRF, some species were observed in Ecological Reserve #84 on Loup Lake and are believed to be the Common Goldeneye (*Bucephala clangula*), and a family of Mergansers (*Mergus* spp.).

5.1.4.3 Amphibians and Reptiles

Although detailed inventory information is unavailable, several species of frogs and toads common to the sub-boreal spruce zone may occur within the ALRF. Frogs and toads have been observed in the Research Forest, but have not been definitively identified. Significant numbers of migrating juvenile frogs were observed between June and August in upland and floodplain habitats. One species of toad, the Western Boreal Toad (*Bufo boreas*), and two species of frog, the Columbia spotted frog (*Rana luteiventris*) and the wood frog (*Rana sylvatica*) are known to exist in the area. One species of salamander, the long-toed salamander (*Ambystoma macrodactylum*), is also found in the area, but has not been observed in the ALRF to date. A common garter snake (*Thamnophis sirtalis*) has been observed in the Research Forest.

5.1.4.4 Fish

There is limited information on fish habitat values in the upland lakes and streams of the ALRF. Some low-gradient north and south-flowing streams contain trout and some minnow species. Aleza and Hansard Lakes north of the Research Forest contain rainbow trout (*Oncorhynchus mykiss*), sturgeon (*Acipenser transmontanus*), squawfish (*Ptychocheilus oregonensis*), and suckers (*Catostomus*). The Bowron River has resident populations of Rainbow Trout, Dolly Varden (*Salvelinus malma*), and Bull Trout (*Salvelinus confluentus*).

Recent stream sampling at some road crossings in the ALRF in 2002 (Environmental Dynamics, 2002) indicated that three out of four north-flowing stream reaches sampled had resident populations of fish. Slaney and Camp Creeks have rainbow trout populations, while Firebreak Creek has Rainbow Trout and Brassy Minnow (*Hybognathus hankinsoni*) populations. Fish habitat in these streams ranges from good in the larger stream reaches, and moderate to marginal in smaller streams. These findings from 2002 sampling indicate the need for more extensive inventory of other ALRF streams and stream reaches in coming years.

The Bowron River has important runs of chinook (*Oncorhynchus tshawytscha*) and sockeye salmon (*Oncorhynchus nerka*) which travel through the ALRF into the upper reaches of the river. The lower Bowron River is also believed to harbour white sturgeon, especially in river reaches close to its confluence with the Fraser River (Mackenzie, 2000).

5.1.4.5 Species of Concern

Species of special concern in the ALRF and surrounding region are selected from those identified as locally important (via LRMP) and from provincial and national initiatives such as the British Columbia Identified Wildlife Management Strategy (BC IWMS), the Species at Risk Act (SARA), and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Some wildlife species of concern are observed at ALRF, but most are only potentially present. Species of concern for the Prince George Forest District are listed in **Table 3**. A species status code ranking key is provided in **Appendix 4**.

The confirmed presence of certain mammal, bird, and fish species of concern in the Research Forest is limited. Grizzly bears do use the ALRF area. White sturgeon is potentially present in the lower reaches of the Bowron River. Past inventories (LGL Limited, 1997) have noted sturgeon presence in the Bowron River near the confluence with the Fraser River. Inventories upstream of the Research Forest were inconclusive, although sturgeons have historically been recorded in the Bowron River as far upstream as Box Canyon (upstream from the ALRF). Bull Trout and Dolly Varden are present in the Bowron River system, but inventory information for the lower reaches of the Bowron within the ALRF is unavailable. Another fish species of concern in the ALRF is the brassy minnow in Firebreak Creek.

Table 3. Blue-listed, Red-listed, and Identified Wildlife, Fish & Insect Species in the Prince George Forest District

Scientific Name	Common Name	STATUS				
		Global	Provincial	COSEWIC	BC Status	Identified Wildlife
<i>Accipiter gentilis laingi</i>	Northern Goshawk, <i>laingi</i> subspecies	G5T2	S2B	T (NOV 2000)	RED	
<i>Acipenser transmontanus</i> pop. 5	White Sturgeon (Upper Fraser River population)	G4T1Q	S1	E (NOV 2003)	RED	
<i>Ardea herodias herodias</i>	Great Blue heron, <i>herodias</i> subspecies	G5T5	S3B,S4N		BLUE	
<i>Asio flammeus</i>	Short-eared Owl	G5	S3B,S2N	SC (1994)	BLUE	I (MAY 2004)
<i>Botaurus lentiginosus</i>	American Bittern	G4	S3B,SZN		BLUE	
<i>Colias meadii</i>	Mead's Sulphur	G4G5	S3		BLUE	
<i>Dolichonyx oryzivorus</i>	Bobolink	G5	S3B,SZN		BLUE	
<i>Epitheca canis</i>	Beaverpond Baskettail	G5	S3		BLUE	
<i>Grus canadensis</i>	Sandhill Crane	G5	S3S4B,SZN	NAR (1979) G. CANADENSIS TABIDA ASSESSED	BLUE	
<i>Gulo gulo luscus</i>	Wolverine, <i>luscus</i> subspecies	G4T4	S3	SC (2003) WESTERN POPULATION ONLY	BLUE	I (MAY 2004)
<i>Martes pennanti</i>	Fisher	G5	S2		RED	
<i>Myotis septentrionalis</i>	Northern Long-eared Myotis	G4	S2S3		BLUE	
<i>Somatochlora brevicincta</i>	Quebec Emerald	G3	S3		BLUE	
<i>Ursus arctos</i>	Grizzly Bear	G4	S3	SC (MAY 2002)	BLUE	I (MAY 2004)

Source: BC Ministry of Sustainable Resource Management (July 2003)

5.2 Archaeological Overview Mapping

Archaeological potential overview mapping has been conducted by the BC Ministry of Forests to assess and identify areas of archaeological potential. Areas within or adjacent to the Research Forest that are expected to have high potential include Loup Lake (within Ecological Reserve #84), the Bowron River floodplain and escarpment, and an unnamed lake just outside the northeast corner of the ALRF.

5.3 Growth and Yield Data

A preliminary summary of existing sources of timber growth and volume estimates at the ALRF has been prepared by Farnden (2003).

Eighteen sample plots were established between 1926 and 1936 and have been maintained to the present day. Ten of the plots are located in stands that were logged to a diameter limit in either 1919 or 1927. The remaining eight plots are in old-growth stands that have never been harvested. These long term permanent sample plots best represent conditions in the well drained upland forest types that predominate in the northern portions of the Research Forest (SBSwk1 site series 01, 05, and 08 as per DeLong, 2003). A set of yield curves applicable to uneven-aged management based on the long-term dataset from the above plots was developed by Farnden (1998).

In addition, a set of inventory plots was established in six selection-cut timber sales on the ALRF in the early 1950's to 1960's, and were re-measured in 1990 and 1995. These provide an excellent resource for validating growth projections in partially-harvested stands. Similarly, nine permanent sample plots were established in a partially-cut shelterwood stand at the ALRF in 1996, and re-measured in 2001.

There are no known growth-and-yield permanent sample plots at the ALRF in even-aged stands or plantations. Yields for these stand types can currently be projected by using yield models (FVS or TASS/TIPSY) calibrated through data from similar ecosystems outside the Research Forest. Farnden (2003) summarizes these yield models and the advantages and limitations of each.

5.4 Timber Supply Analysis

An initial timber supply analysis for the Aleza Lake Research Forest was completed in 2003, and a final report was completed in March 2005 in consultation with the BC Ministry of Forests, Northern Interior Forest Region (Dewhurst et al, 2005). The following is an abridged summary of the highlights of that report. The original report should be referred to for additional detail.

The timber supply analysis for the ALRF was conducted with the dual purpose of providing operational decision support for the Research Forest manager as well as a case study test and calibration of an innovative decision support tool developed at UNBC. The *Lurch Forest Planning Model* (“Lurch”) is an analytical decision support system designed to address complex forest management problems that encompass multiple resource values (e.g. timber, biodiversity, habitat) over large areas and long planning horizons (Dewhurst et al. 2005).

Eight management scenarios were completed for the ALRF:

- **one base case scenario** established by simulating a parallel BC Ministry of Forests analysis using FSSIM;
- **four harvest scenarios** which explored a range of feasible annual harvest limits to determine maximum and minimum levels and their effects on old growth; and
- **three old growth scenarios** which examined a range of feasible old forest (or “old growth”) targets to determine maximum and minimum levels and their effects on timber harvest.

The implications of each management scenario were modelled and reported for selected indicators:

- Harvest volume (m³)
- Seral stage (% area) (defined according to BC Ministry of Forests' Biodiversity Guidebook 1995):
 - Early (1-40 years)
 - "Young" (41-100 years)
 - Mature (>100 years up to 139 years)
 - Old (>140 years)
- Uneven-aged stands (% by area)
- Standing volume (m³)

5.4.1 Netdown Analysis

Spatial netdowns for the ALRF are summarized below in **Table 4**. An ArcInfo Geographic Information System was used to divide the land base into two net-down levels for the Lurch analysis. The first level (the analysis land base) excluded non-forested areas, and included unmanaged areas (e.g., research natural areas) and sites of low productivity which contribute to biodiversity indicators such as seral stage but do not contribute to timber supply. The second level (the timber harvesting land base) excludes unmanaged areas, and contributes to all management indicators.

Table 4. Area summary calculated in the ALRF netdown analysis for timber supply and forest plan modelling

Land designation	Area (hectares)
Total ALRF area	9,251.9
Net out areas	
Lakes, streams, wetlands, rivers, non-productive and non commercial brush	1,222.4
Not satisfactorily restocked	248.1
Analysis land base	7,781.4
Unmanaged areas and low productivity sites	1,678.7
Timber harvesting land base	6,102.7

5.4.2 Analysis Assumptions

The analysis was conducted using the best available inventory information to March 2003. Management scenarios were modeled over a 200 year planning horizon, with the exception of the base case scenario which covered a 400 year planning horizon. Seral stage indicators were reported for even-aged and unmanaged forest areas. Seral stages were defined⁴ according to

⁴ Early: 1-40 years; Mature: >100years; Old: >140 years

the BC Ministry of Forests' Biodiversity Guidebook (1995) for Sub-boreal spruce (SBS), Natural Disturbance Type 3 (NDT3).

Uneven-aged managed areas were calculated separately from seral stage. Stand yields were taken from the BC Ministry of Forests' Prince George Timber Supply Review (TSR) Analysis (2001) tables for even-aged stands and from Farnden (1998) for uneven-aged stands. Further detail on the analysis assumptions can be found in Dewhurst et al. (2005).

5.4.3 Analysis Results: Harvest Levels and Biodiversity

The base case scenario represents a steady long-term harvest level given the various constraints and assumptions related to the harvestable land base (i.e., areas outside of reserves and non-forested areas), harvest systems used (partial cut and clear cut) and the estimated productive capacity of the ALRF. Using the same assumptions and constraints, the harvest scenarios were developed to assess the sensitivity of old growth availability to a variety of harvest regimes over the planning horizon. Likewise, the old growth scenarios demonstrate impacts of various old growth targets on harvest volume. An overview of these scenarios is provided in **Appendix 7**.

The feasibility of attaining the attempted targets across the 200 year planning horizon varied for all the scenarios. However, regardless of the volume or old growth targets, the general trend across all scenarios result in an average harvest volume of 15,000-16,000 m³/year, with an average of 30-32% of managed and unmanaged old growth. The scenarios demonstrated that biodiversity and timber supply were fairly resilient to this range of possible management pathways. Any one of these pathways, however, does not necessarily represent a desirable management regime because of irregular timberflow, ecological risks associated with maximizing harvest levels or old growth, and other uncertainties (see Section 8.4).

The base case scenario is a desirable management pathway because it provides a balance between old growth retention and harvest flow that ensures the ecological and financial viability of the Research Forest.

The results of the base case scenario are shown in **Figures 10 and 11**.

Annual Harvest by Landscape Unit - Base Case Scenario

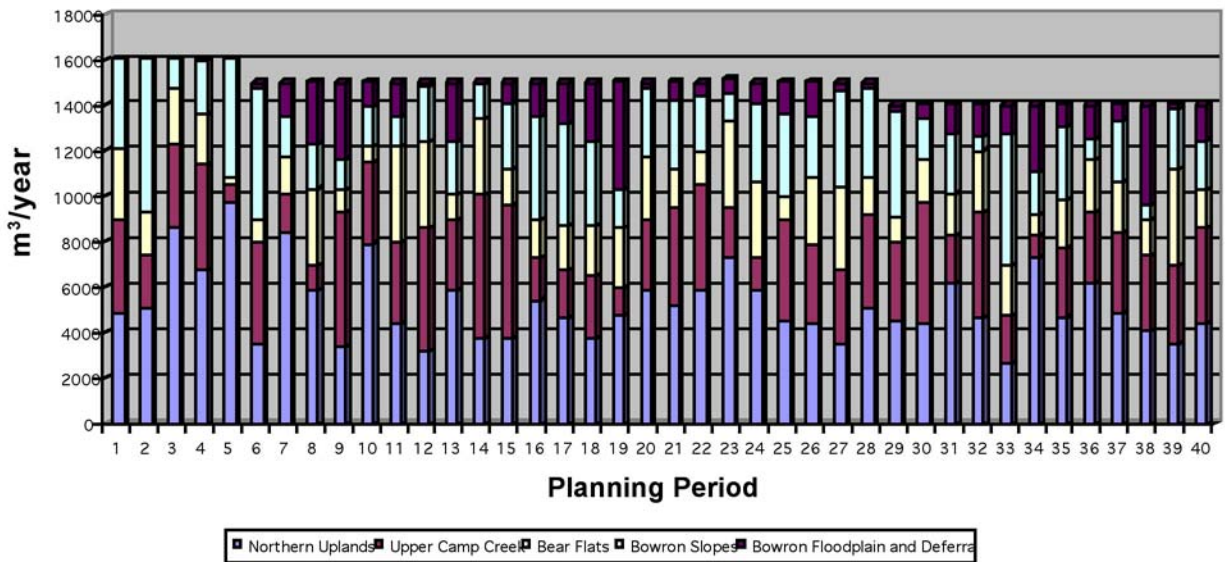


Figure 10. Results of the long-term base case harvest scenario for Aleza Lake Research Forest
 Planning periods represent 10 year increments (Dewhurst et al., 2005)

In the base case, the goal of scenario planning was a relatively non-declining even flow of harvest volumes over time, with no abrupt adjustments or 'fall-down' in harvest volumes. In the base case (as shown in **Figure 10**), harvest level projections start at 16,000 m³/yr for the first five decades, and slowly ramps down to 15,000 and 14,000 m³/yr over the next 350 years.

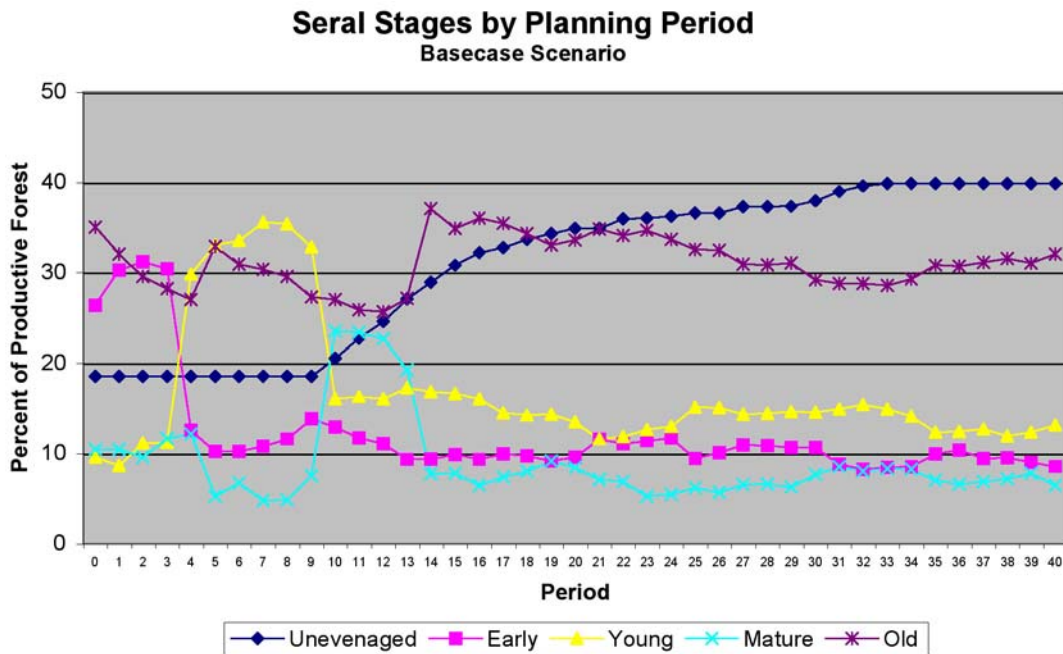


Figure 11. Graph showing indicator results from the Aleza Lake Research Forest base case timber supply scenario Planning periods represent 10 year increments (Dewhurst et al., 2003). Seral stages are defined as: Early – age class 1 & 2; Young – age class 3 & 4; Mature – age class 5 & 6; Old – >age class 7

Under the base case scenario and assumptions, the percent of the ALRF in old forest will range from approximately 27% to 38% over the 400 year simulation period as shown in **Figure 11**. In the analysis, uneven-aged management systems (not included in old or mature forest statistics) are maintained at 18% of the analysis land base until year 90 when areas south of the Bowron River are accessed and the uneven-aged forest area increases gradually to 30% and greater after 140 years.

In contrast, an example of an alternative, somewhat more aggressive harvest scenario (Harvest Scenario #1), prioritized the prompt harvest of older age classes of forest before the maximum harvest age was reached. This latter scenario starts at an initial harvest rate of 22,479 m³/year in the first decade, progressively ramping down over the following six decades to a uniform harvest level of 14,000 m³/year by decade 7. Harvest Scenario #1 and other aggressive scenarios resulted in a gradual decline in old forest to 23-25% of the ALRF for 13 decades before a return to higher old forest levels 14-15 decades in future. A graph comparing the Base Case and Harvest Scenario #1 is shown in **Figure 12**.

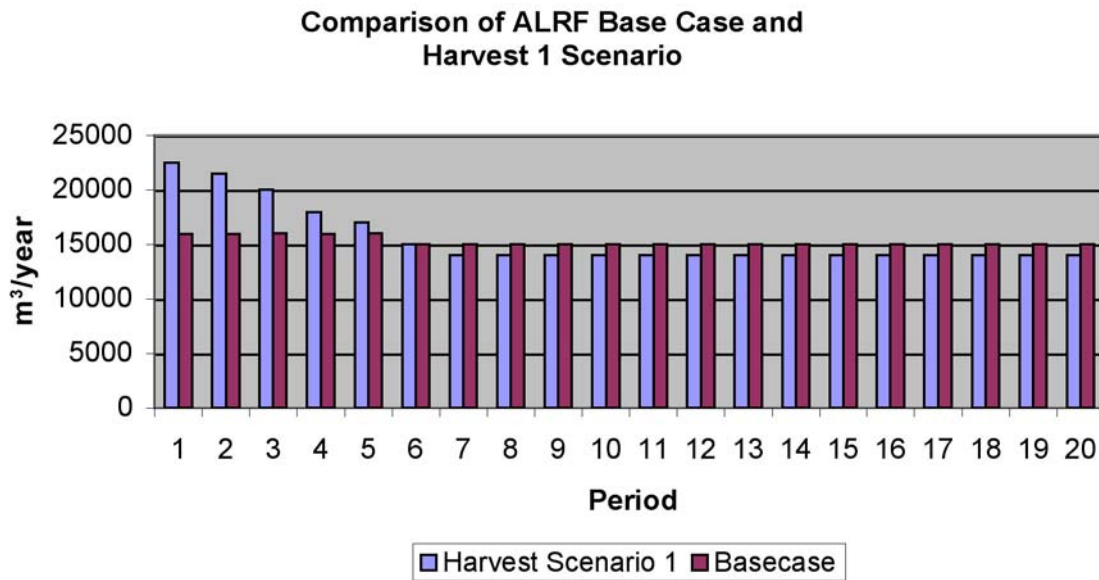


Figure 12. Comparison of base case scenario (even harvest flow over 200 years) with Harvest Scenario #1 (more aggressive harvesting of older age classes over the first 50 years)

5.5 Inventory Priorities

On the ALRF area, inventory information is limited, and improved information is desirable in the following key areas:

- 1) Critical habitats for wildlife;
- 2) Inventory on wildlife;
- 3) Stream and fish inventory (including distribution and abundance) in upland streams and lakes;
- 4) Updated site indices for forest cover polygons (ongoing by the PG MoF District);
- 5) Age class, site series and site indices in the Central Plateau and West Bear management units;
- 6) More detailed soils and terrain stability mapping; and
- 7) Inventory of plant species at risk.

ALRF commitments to fulfill some of the information needs identified above are listed in Section 9 (Licensee Commitments) of this document. Inventories not listed in Section 9 will be conducted if funding and other resources are available.

6.0 Research and Demonstration Site Management

This section describes objectives and strategies to manage research and education sites throughout the Aleza Lake Research Forest.

6.1 ALRFS Mandate for Research and Education

The Aleza Lake Research Forest Society is mandated to facilitate research and education activities on the ALRF. The goals to support this mandate are to:

- 1) Ensure that the management and operation of the Forest is devoted to education and research with respect to sustainable forest management, silviculture, and forest ecology;
- 2) Create educational and research opportunities in forest ecology, forest management, ecosystem management and sustainable forest resource management;
- 3) Assist in fulfilling the educational and research needs of the University of British Columbia and the University of Northern British Columbia;
- 4) Foster innovation in ecologically-sound management strategies and practices, and in research, extension and demonstration strategies and projects; and
- 5) Provide opportunities for demonstrations, testing, and refinement of a range of silvicultural systems and partial-cutting techniques.



6.2 Background: Statutory Requirements for Research Sites

From a statutory perspective, research project sites have received some measure of recognition and formal protection in British Columbia forest legislation and regulation. Under the earlier Forest Practices Code of BC Act and regulations, known “government-approved” growth-and-yield and research installations were recognized as resource features which needed to be considered in operational planning. Forest Practices Code provisions did not provide further guidance on what criteria defined “government-approved” research projects or plots.

Under the present Forest and Range Practices Act (FRPA), legal obligations for protection and management of research installations and permanent plots for growth and yield or other research have shifted somewhat. Section 70(1) of the Forest Planning and Practices Regulation (effective December 13, 2004) specifies that “an authorized person who carries out a primary forest activity must ensure that the primary forest activity does not damage or render ineffective a resource feature.”

The regulation defines a primary forest activity as one or more of the following: “Timber harvesting; Silvicultural treatments; and/or; Road construction, maintenance, and deactivation.”

Under FRPA, resource features are defined under Section 5 of the Government Actions Regulation. This section of the regulation states that: “the minister responsible for the Forest Act by order may identify one or more of the following as resource features in relation to a specified area.

- a) Crown land used for research or experimental purposes
- b) an interpretative forest site, recreation site, or recreation trail.”

Under FRPA, activities that constitute “primary forest activity” are fairly unambiguous. It also appears that, under FRPA, Crown Land used for research or experimental purposes, interpretative sites, and recreation sites and trails, do not assume the legal definition of “resource feature”, until identified as such by order of the minister responsible. Based on available information to date, no such resource features have been identified by the minister on the ALRF area.

While there are no legislatively designated resource features at ALRF, there are important research and demonstration sites that require management under the ALRFS mandate. The past and current legislation provide inadequate guidance on research site management. Furthermore, there is very little provision for research that is focused on experimental management techniques where a site is subject to periodic treatments that would constitute primary forest activity. This flexibility in management is essential in a Research Forest.

6.3 Research Site Categories and Management Strategies

The location and classification of known research sites in the ALRF are provided in **Exhibit D**. Under this plan, a research site is defined as a location within the Research Forest where information is collected on a particular subject. Information collection activity at the ALRF can range from long-term, continuous monitoring of one research site to a single information gathering visit at another. Appropriate management strategies must reflect this diversity to successfully integrate ALRF forest operations with research site maintenance. To facilitate this, research sites are grouped under one of five categories:

- Category A:** The site has undergone active information collection in an undisturbed state and will be continuously monitored for an undetermined length of time into the future, usually five years or more.
- Category B:** The site has undergone active information collection and is under an experimental series of treatments and will be continuously monitored for an undetermined length of time into the future, usually five years or more.
- Category C:** The site has been undergoing active information collection either undisturbed or under experimental treatments but will be monitored only for a short period of time, usually less than five years.
- Category D:** Long or short-term monitoring to gather baseline information on changes to forest ecosystems or productivity throughout regular forest operations or treatments.
- Category E:** The site has been used in the past for information collection but is no longer used for research. The site is documented for information purposes only.

Research site status can change over time depending on funding opportunities, information needs (both internal and external to the ALRF), and other management needs that are yet to be identified. For example, inactive research sites can become active again, either temporarily or for a long-term study. Likewise, temporary research can become long-term studies. Strategies to manage forest operations in or around research sites vary according to the status, duration, and objective of a project. **Table 5** describes the strategies according to research site category.

Research site locations and project summaries for all active and inactive studies are maintained and archived by the ALRFS. Ongoing archival research is required to update projects conducted before 2001 when project inventories were initiated by the ALRFS. Some raw data is also archived by the ALRF.

Table 5. Research Site Categories and Management Strategies

Research Site Category	Nature of Research	ALRF Designated Sites	Measures to Protect Feature During Forest Operations	Duration of Protective Measures
A	Long-term research sites in mature or old-growth stands, requiring total exclusion of disturbance by forest operations. May include sites established within previously managed stands (e.g., partial cuts).	<ul style="list-style-type: none"> Research Branch Experimental Plots (EP), established 1926-1936. Teaching reserves. 	80 metre reserve zone / buffer from edge of feature (or two tree heights, whichever is greater).	Permanent / Ongoing.
B	Long-term research sites in immature or second-growth stands requiring total exclusion of external disturbances or treatments by forest operations.	<ul style="list-style-type: none"> Long-term Controlled Experimental Field Trials. Permanent Weather Stations (1). Long-term Demonstration trials. Progeny and provenance trials. Landing rehabilitation sites. Carbon flux monitoring site. 	Minimum 30-metre reserve zone / buffer from edge of buffer.	Planned duration of trial or installation.
C	Short-term experimental field trials and study sites requiring temporary buffering from current forest operations.	<ul style="list-style-type: none"> Graduate student projects Other temporary projects 	Minimum 80 metre reserve zone in mature timber or 30 metre reserve zone in stands < 15 metres average height.	< 5 years unless otherwise designated.
D	Ecosystem or Stand Monitoring Installations <i>Long- or short-term ecosystem or stand monitoring sites, plots, or transects which do not require protection or buffering from forest operations. Such projects monitor stand- or landscape level effects of routine forest operations and treatments not subject to experimental protocols.</i>	<ul style="list-style-type: none"> 1948-63 TSX Plots (Stand development monitoring plots in selection partial cuts). Wildlife Inventory Transects. Shelterwood Trial. 	<ul style="list-style-type: none"> Routine forest operations permitted within and around installations or monitoring locations. Locations to be identified during operational planning and markings relocated following operations. 	Planned duration of trial or installation.
E	Temporary or inactive sites where no future measurements or assessments are planned.	<ul style="list-style-type: none"> Temporary sample plot or temporary observation point. 	No protection or special considerations.	Not applicable.

6.4 Management Objectives for Research Sites

The management objectives for research sites at the ALRF are:

- 1) To build and maintain an inventory of all known active and inactive research sites on the ALRF;
- 2) To control forest operations within or around active research sites for the duration of the project by:
 - a) Minimizing or preventing impacts of logging activity or other forest operations on active research sites through comprehensive research site inventories;
 - b) Coordinating forest operations with researchers in specific areas to implement or maintain a desired set of experimental treatments, and research or monitoring objectives;
 - c) Providing direct or indirect support of research infrastructure (e.g., site maintenance, road access);
- 3) To maintain effectiveness of research by:
 - a) Minimizing external forest operations activities that would increase windthrow, fire, and pest risk in or near the site;
 - b) Avoiding changes to site drainage and soil characteristics (e.g. during road construction or harvesting);
 - c) Avoiding impacts due to transported substances into research site (e.g. – fertilizers, chemical herbicides or pesticides, and sediment from road construction) unless such treatments are specifically prescribed by researcher and approved by ALRF and provincial and federal permitting agencies;
 - d) Consulting with researchers on forest operations activities within or around research sites; and
- 4) To facilitate and create opportunities for possible future research by maintaining natural forest areas and implementing a variety of silvicultural systems.

6.5 Long-term Research at ALRF

There are currently 13 long-term research projects underway in the ALRF with a total of 149 research plots or sites. Of these, four projects are active, two are inactive and the remaining projects are under review. These long term research projects are listed in **Table 6**. Research categories for these and other research sites may change over the term of this plan. Substantive changes in research categorization for sites listed in Table 6 will be documented by the ALRF and the District Manager informed on a periodic or as needed basis (no more than once annually).

Table 6. Current long-term research trials at ALRF and their status and management strategies

Project	Year(s) established	Number of Sites or Plots	Status	Management Strategy
Growth and Yield Permanent Sample Plots	1920s & 30s	17	Category A	Protection
Wildlife Monitoring Site	2004	1	Category A	Protection/ Wildlife Habitat Reserve
Climate Station	1990	2	Category B	Protection/necessary site maintenance
Road and Landing Rehabilitation Trial	1995	15	Category A	Protection
Shelterwood Trial	1995	9	Category D	Forest operations
Spruce Progeny Trial	1960s	1	Category D	Protection
Spruce Provenance Trial	1960s	1	Category D	Protection
Timber Sale 37528 Trial	1947	16	Category D	Forest operations/experimental treatments
Timber Sale 42765 Trial	1954	21	Category D	Forest operations/experimental treatments
Timber Sale 53791 Trial	1956	16	Category D	Forest operations/experimental treatments
Timber Sale 58443 Trial	1956	13	Category D	Forest operations/experimental treatments
Timber Sale 70021 Trial	1957	20	Category D	Forest operations/experimental treatments
Timber Sale 77418 Trial	1961	17	Category D	Forest operations/experimental treatments

6.6 Demonstration Trails

6.6.1 Existing Trails

Approximately four kilometres of walking trails (1.6 kilometres with interpretive signs) were built in the northern part of the Research Forest in the early 1990s. Upgrades to the trails – including clearing, crossings and danger-tree assessments – occurred in 2003 and 2004. A new 600 metre trail to access the Bowron River was built in 2004.



6.6.2 Future Trail Plans

Sites for education and demonstration vary according to the audience and the objectives of the field excursion to the forest. Consequently, demonstration infrastructure (e.g., trails, signs etc.) will attempt to accommodate as broad an audience as possible.

Improvements to the trail network (**Figure 13**), mainly in the northern part of the forest, will occur over the term of this plan, including: trail maintenance, updated signage, and trail expansion. Concentrating trails in this area will maximize recreational access throughout the year (e.g., hiking and snowshoeing) with minimal cost for road clearing in the winter months. Demonstration topics, targeting the general public, will focus on site appropriate information on forest ecosystems, research, and innovations in forest management. Information delivery to visitors will involve a combination of self guided tours (with interpretive signs or brochures) and staff led tours.

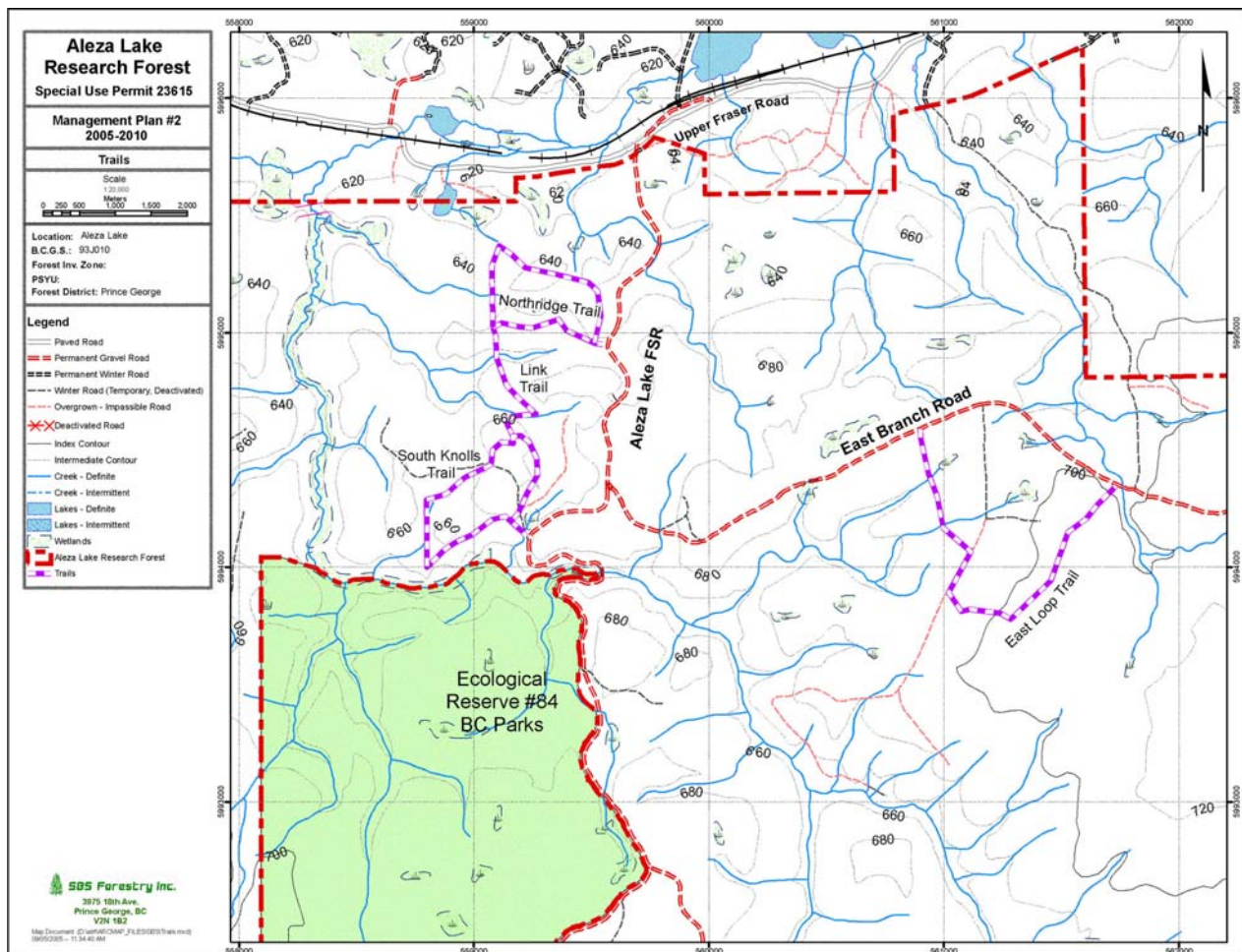


Figure 13. Previously established trails (North Ridge, South Knolls, Link, and East Branch trails) will be maintained and enhanced over the term of this plan

6.6.3 Road-based Demonstration

Road-based demonstration will be designed to be accessible by vehicle, and therefore will focus on sites of interest that are close to the main roads, and will cover several management units. These sites will be established as a linked series of sites for self-guided tours and located where access by foot already exists (e.g., deactivated roads) whenever possible. Sites of interest currently without access may require some trail development. These sites will be identified over the term of this plan.

7.0 ALRF Landscape Level Forest Zoning and Resource Management Integration

7.1 Rationale and Guiding Principles for ALRF Landscape Zoning

The purpose of resource-use zoning at the ALRF is to provide spatially defined objectives, strategies, and targets to guide the implementation of the management plan at the strategic, operational, and site plan level. Zoning of the ALRF landbase will aid in the identification of areas of distinctly different ecosystems, terrain units, forest types, land use designations, or resource characteristics within the ALRF. In addition, zoning will help define the spatial separation and allocation of resource management activities and objectives within the land base.

The ALRF zoning scheme involves the designation of “**management units**” and “**research natural areas**” representing different resource uses or emphases on the land base. Geographic delineation of specific management units and research natural areas (RNAs) in this plan has considered the following information:

- 1) History and pattern of both natural disturbances and forest harvesting;
- 2) Productivity, land capability, physical characteristics, and geographic distribution of different forest cover, site types and landforms (e.g. biogeoclimatic site series);
- 3) Location and distribution of known sensitive areas and/or high value areas or resources;
- 4) Protection and/or maintenance of forest-level and stand-level biodiversity, including known critical habitats, and/or rare or representative ecosystems, and consideration of habitat connectivity and fragmentation between old forest retention areas, high value or unique forest ecosystems and habitats, and designated areas such as ecological reserves;
- 5) Provision for, and efficient spatial arrangement of, a productive commercial forest land base adequate to provide both substantial opportunities for research and demonstration, and also provide financial self-sufficiency for ALRF forest management operations and educational / research support services;
- 6) Access management for existing and potential future resource use objectives or emphases; and
- 7) Objectives and land-use designations approved in previous management plans and LRMPs.

7.2 Overview

Over the ALRF as a whole, management objectives and strategies will be coordinated to integrate diverse educational, research, and forest management values. Zoning strategies on the ALRF range are a continuum of management approaches ranging from intensively managed to semi-natural and unmanaged forests.

The **four basic landscape zoning designations** on the ALRF are:

- 1) intensive forest management (5,038 ha);
- 2) intermediate forest management (1,944 ha);
- 3) legacy research plot protection (223 ha);
- 4) old forest retention areas/research natural areas (1,553 ha)

A comparative summary of landscape zone objective and strategies is provided later in **Table 8** on pages 57 to 59. Specific forest management targets and indicators for each zone are provided later in **Table 10**, found on page 86.

7.3 Detailed Description of Management Units and Research Natural Areas

Exhibit E presents a map of ALRF Management Units and Research Natural Areas. A summary of these Management Units and their resource emphases is presented in **Table 7** on page 56.

7.3.1 Intensive Forest Management Units

Intensive Forest Management Units in the ALRF include the *Northern Uplands Unit* and the *West Bear Unit*.

7.3.1.1 General Management Intent and Strategies

The primary forest resource management emphasis in the Northern Uplands and West Bear Units is focused on forest land management for intensive and high-quality timber production, including facilitation of associated research and education opportunities. Specific objectives include:

- Maintenance and enhancement of forest productivity;
- 80-100 year rotations for evenaged stands and 25 to 35 year cutting cycles for unevenaged stands;
- Enhancement of timber quality, value, and tree species, vigor, and size mixes;
- Use of a wide range of silvicultural systems; and
- Biodiversity and ecosystem management approaches and targets consistent with the general management intent and timber management focus of these Units.

Key research and education opportunities in the Northern Uplands and West Bear Units will in general tend to be oriented towards research studies and experimentation focused on intensive forest management and extractive forest uses, using a wide range of silvicultural systems. Activities in these units will be coordinated to:

- 1) Maximize opportunities for innovative research related to forest management.
- 2) Maximize opportunities for education and demonstration of harvest methods.

- 3) Enhance and maintain education and demonstration opportunities.
- 4) Enhance road access in Northern Uplands and West Bear Units for ALRF research, education, and forest management, consistent with overall access management issues and objectives for each area.
- 5) Generate appropriate revenue for support of ALRF operations through timber harvesting.

7.3.1.2 Description of Intensive Management Units in the ALRF

Northern Uplands Unit

The Northern Uplands Unit occupies approximately 3,435 hectares in the north to northwestern portion of the ALRF. Its northern and western boundaries are the boundaries of the Research Forest, and its southerly boundary abuts the lowland plateau forests of the West Bear Unit, and Bowron Slopes unit to the east.

The Northern Uplands are characterized by gently rolling hills and benches that are dissected in several areas by steep-sided draws and rounded knolls. Camp, Firebreak, and Slaney Creeks and their tributaries flow in a northerly direction through the area. The Hansard (or Camp) Creek watershed dominates the topography of most of the Unit. The Northern Uplands Unit contains Loup Lake, the one large upland lake located entirely within the ALRF. This Unit surrounds Ecological Reserve #84 on two sides, to the west and north.

The Northern Uplands Unit is one of the most diverse and productive forest areas in the Research Forest, and represents the original Aleza Lake Forest Experiment Station area. Harvesting in the north-central portion of this area dates back to 1919. Previous silvicultural system trials and partial-cutting methods implemented in this area between 1945 and 1963 include excellent examples of single-tree selection, alternate strip cutting, diameter-limit cutting, clearcut and plantation methods, and mixedwood systems. More recently, uniform shelterwood methods were implemented in this area in the mid-1990s. Significant areas of uncut mature and old stands are interspersed throughout this Unit, including the Aleza Lake Ecological Reserve (ER #84) which forms the approximate geographical centre of the Management Unit.

The east end of the Northern Uplands Unit has been heavily clearcut logged and planted from the mid-1960's to late 1980's, resulting in extensive plantations ranging in age from 15 to 40 years. Some mature spruce-subalpine fir stands are still present in the easterly portions of the Camp Creek headwaters. Some rock knolls and rocky uplands in the northeast corner contain Douglas-fir/hemlock complexes and rare fire-origin spruce stands.

West Bear Unit

The West Bear Unit is a 1,603 hectare area of very gently rolling lowland and plateau forest extending from the Northern Uplands in the north and northwest, Central Plateau Unit to the east, and the Bowron Slopes to the south. The West Bear unit extends from the central portion of the ALRF in a southwesterly direction. The Beaver-Bear Forest Service Road bisects the northern portion of the Unit. The West Bear Unit corresponds to the western portion of the former Bear Road Compartment referred to in MWP #1.

Forest productivity in the West Bear Unit is variable, ranging from very good to low, and is highly influenced by topographic position and soil drainage in this gentle undulating topography. Raised or sloping sites with better drainage and soil aeration are moderately to highly productive for forest growth, while broad depressional areas with high water tables and poorer soil aeration form extensive “forested wetlands” with apparently very limited, if any, commercial forest management potential.

Due to the hummocky meso-topography of this unit, and interspersed forested-wetland timber types amongst more productive sites, forest inventory information in the West Bear Unit is considered to be of only modest reliability, particularly for forest cover polygons identified as age classes 3 to 7 (40 to 139 years). Re-inventory of forest cover and ecological site series is a high priority for this Management Unit over the term of this Management Plan.

Throughout the 1980’s and 1990’s, “first pass” clearcut harvesting and plantation establishment were the dominant feature of forest management in the West Bear area. Future management activities will focus on integrating past and future harvest disturbances into more natural patch size characteristics and size distributions for this forest type.

7.3.2 Intermediate Forest Management Units

Intermediate Forest Management Units include the *Central Plateau Unit* and the *Bowron Slopes Unit*.

7.3.2.1 General Management Intent and Strategies

The general intent of forest management in intermediate units is to provide a greater focus on forest habitat objectives and maintenance of stand structural biodiversity than intensive units, while still providing for timber harvesting and management opportunities consistent with these objectives.

Intermediate forest management units are considered in this plan to be “linkage” or “transitional” zones in terms of forest resource management emphasis. These units are geographical areas of linkage and transition between the more intensive timber management emphases of the Northern Upland and West Bear units, and the Research Natural Areas and Ecological Reserve #84. In these latter areas, non-extractive forest uses, old forest retention, and natural processes tend to dominate. These intermediate units are also envisioned in this plan to provide a greater degree of landscape-level connectivity throughout the ALRF, providing ‘corridors’ of enhanced biodiversity management and structural habitat retention through managed areas of the ALRF.

General management strategies to be employed in these intermediate units include:

- Ecosystem-oriented timber management integrated with enhanced forest biodiversity and habitat management;
- Increased amount of landscape level structural and WTP retention: i.e. - generally higher levels of wildlife tree / WTP retention relative to intensive management zones;
- Use of silvicultural systems with extended rotations (140 years) or cutting cycles;

- Maintenance of ecological connectivity between geographically separated RNAs and reserves;
- Integration of timber harvesting with biodiversity objectives; and
- Maintenance of existing permanent road transportation corridors.

Research and education opportunities in the Central Plateau and Bowron Slopes Units will be oriented towards study of mixed-use forest management for upland forests which integrate timber management with enhanced forest habitat, extended rotations, and structural biodiversity objectives.

Retention of forest cover in the form of mid-seral, mature, and late seral forest characteristics are the primary focus. This is to be achieved through extended harvest rotations and cutting cycles as well as the implementation of more stringent green up requirements.

Road access management strategies for the Central Plateau and Bowron Slopes Units will differ substantially. In the Central Plateau, there is an extensive permanent road network which serves both ALRF user and non-ALRF road use permit holders (i.e. Canadian Forest Products Ltd. in the case of the Beaver-Bear Forest Service Road). In the Bowron Slopes, much of the area is relatively remote by ALRF standards at present. The Bowron Slopes has limited road access except for the existing Aleza Forest Service Road which accesses the Bowron River. The relatively low road density and lack of permanent road system helps to minimize roaded hunting access to wildlife populations in this Unit and the adjacent Bowron River floodplain.

7.3.2.2 Description of Intermediate Management Units in the ALRF

Central Plateau Unit

The 901 hectare Central Plateau Unit is located in the geographical centre of the ALRF, and is bisected by two major road corridors, including the Aleza Forest Service Road (under road use permit to the ALRFS) and the Beaver-Bear Forest Service Road (currently under road permit to Canadian Forest Products Ltd.). This Unit is ecologically variable, ranging from the deeply dissected Camp Creek ravine along its northeast perimeter, to the gently rolling plateau and more poorly drained flat sites to the south and west of the Unit. Due to its geographic position within the ALRF, the Central Plateau is considered to be an important linkage zone between the Floodplain and Central Ravine RNAs to the south, the Ecological Reserve #84 to the northwest, and extensive Hansard (Camp) Creek and watershed to the north and northeast. Forest cover is predominantly spruce-subalpine fir.

Past forest practices in this zone range from some single-tree selection and group selection harvesting in some areas in the early 1960's, to more recent clearcutting practices in the early- to mid-1990's. A large 136-hectare clearcut, harvested and broadcast burned in 1990 and located near the centre of this Unit, is a major legacy of forest harvesting in this Unit.

Bowron Slopes Unit

The Bowron Slopes Unit includes 1,043 hectares of north and south-facing slopes of the Bowron River escarpment. Slopes in this Unit range from < 5% on the plateau above the Bowron escarpment, to greater than 60% below the escarpment in some locations. General

terrain ranges from gradual uniform slopes to steep dissected ravines and precipices up to approximately 60m in height. The slope break is far less extreme in the eastern portions of the Bowron Slope, leading relatively gradually up to the east-west watershed divide. West of the Central Ravine RNA, the Bowron escarpment is steep to precipitous with significant slope stability issues.

Forest cover includes the spruce-subalpine fir mix typical of much of the ALRF, but also includes Douglas-fir forest types on steeper upland areas and headlands on the heights of land above the Bowron River, especially on more southerly slopes. These warmer moist aspects also have some pockets of western hemlock and very rare occurrences of western red cedar. Forest harvesting history has been mixed, ranging from clearcut harvesting in some areas, to diameter limit (I.U.) logging along the eastern portion of the Bowron Slopes.

The Prince George LRMP identifies very high wildlife values below the 2,200 foot (+/-660 m) elevational contour in this area. This area is significant wildlife habitat for a wide variety of species due to the Bowron Slopes' role as a transitional zone between the riparian ecosystems of the Bowron floodplain and the upland forests of the northern ALRF.

It is anticipated that research and education opportunities in the Bowron Slopes will tend to be studies oriented toward the distinctive ecosystems of the Bowron escarpment area and adjacent Bowron River floodplain, and towards the testing and development of innovative strategies for addressing the challenges of balancing habitat and timber management objectives in similar situations. Therefore, additional access management strategies in the Bowron Slopes Unit include:

- “Wilderness access” emphasis with no permanent road development (other than existing Aleza FSR 4311.01), or long-term winter roads;
- Limit or prevent expansion of hunting pressure via motorized road-based vehicular access, including ATV's where feasible;
- Aerial / helicopter based timber harvesting access in areas of the Bowron Slopes south of the Bowron River, and steeper areas of the Bowron River escarpment and associated steep ravines and gullies;
- Development and implementation of ‘aggressive’ road deactivation techniques following ground-based timber harvesting in more gentle terrain north of the Bowron escarpment;
- Timber management and silvicultural systems consistent with above emphases.

7.3.3 Legacy Research Management Units

The applicable unit is the *Slaney Unit*.

7.3.3.1 General Management Intent and Strategies

The Slaney Unit extends over 223 hectares in the extreme north-central portion of the ALRF. About 70% of this area was horse-logged between 1919 and 1927, while some areas in the western portion of the unit include unharvested old stands. The Slaney Unit is one of the core research areas used by researchers in the early years of the old Aleza Lake Forest Experiment Station.

The unit contains 12 of 18 long-term growth and yield permanent sample plots (also referred to as Experimental Plots (EPs)) established by P.M. Barr and G.H. Barnes of the BC Forest Service between 1926 and 1936. These EPs have been re-measured on a periodic basis up to the present day. The plots are of great significance provincially, because they represent one of the longest-running and most comprehensive datasets on the growth, development, and dynamics of partial-cut and old-growth stands in BC in general, and for spruce-subalpine fir stands in particular.

A primary resource management emphasis in the Slaney Unit is protection of the long-term permanent sample plots. Timber management and harvesting is permitted in this zone, but will be constrained by implementing plot buffers that will adequately protect the physical integrity of the plots.

General management intent and strategies include:

- Primary goal of no forest management or human-caused disturbance to Experimental Plots #'s 45, 50, 103, 112, 117- 119, 148-150, 291 and 292, including minimum 80-metre no-harvest reserves around each EP, as per Section 6.3 of this plan.
- Research-oriented timber management emphasis in areas outside EP reserves, using silvicultural systems, forest management, and research methods which are compatible and consistent with the primary goal, and minimize adverse or undue wind exposure and forest health risks to the EPs.
- Range of silvicultural systems to be used as above, with an emphasis on creating opportunities for comparative studies of silvicultural systems and alternative stand structures and management options.

7.3.4 Research Natural Areas

Research Natural Areas (RNAs) are designated areas of unique, locally-significant, or representative forest types, ecosystems, or landforms. RNAs are a fundamental element of the ALRF biodiversity management strategy, and provide baseline reference sites for present and future ecological studies. RNAs will be managed to minimize or reduce future anthropogenic disturbance including timber harvesting, road-building, or other extractive resource uses within the boundaries of the RNAs.

RNA areas within the ALRF were identified based on unique, distinctive, or representative terrain, soil, and landscape features, not simply on forest cover characteristics alone. While ALRF RNAs may generally include a substantial proportion of late seral or old forest, their location and function in landscape zoning extends beyond being “old-growth” or old-forest reserves to being “ecosystem reserves”. This principle is a vital one, considering the potential effect of future natural disturbances and processes on the ALRF landscape and RNAs.

Various types of natural disturbances (wind, insects, etc.) and ecological changes may be expected over time within RNAs, and potentially include severe or catastrophic events. Major or minor ecological disturbances or changes will generally be considered to be part of the expected ecological dynamics of the RNA, and can provide research opportunities and baseline comparisons in future.

Old-forest and related ALRF biodiversity objectives will be considered for the ALRF as a whole, for areas both inside and outside RNAs, as discussed in Section 8.2.3.1 of this plan.

RNA locations or boundaries may be reconsidered and/or amended in the future, in the event of major or catastrophic events (such as fire, wind, or insect infestations), as per Section 11.

7.3.4.1 General Management Intent and Strategies

RNAs will have generally passive forest management oriented towards:

- Retention of extensive upland and floodplain forest ecosystems in a relatively unmanaged state in which human disturbances are minimized;
- Recruitment of old forest characteristics in previously disturbed areas of the Bowron floodplain;
- Establishment and maintenance of large contiguous non-roaded areas within the ALRF;
- Maintenance and recruitment of old-growth and late seral forest characteristics;
- No new permanent bladed roads or access structures within RNAs;
- Allowing existing old roads to regenerate naturally;
- Limiting timber extraction to forest health management measures necessary to protect adjacent management units (including limited timber salvage upon approval by ALRFS Board of Directors); and
- Fire control and suppression as necessary to limit risk to surrounding ALRF management units.

It is anticipated that research and education opportunities in RNAs at the ALRF will tend to be oriented towards:

- 1) Study of disturbance ecology, and mature and late seral upland and floodplain forest ecosystems;
- 2) Recruitment and development of old forest characteristics;
- 3) Study of riparian and aquatic habitats;

- 4) Study of fish and wildlife populations in late seral and riparian areas; and
- 5) Study of the Bowron as a large geomorphically active river system.

7.3.4.2 Research Natural Areas in the ALRF

Floodplain RNA

The Floodplain RNA includes high quality wildlife and fish habitat previously identified in the Prince George LRMP process; floodplain spruce and cottonwood forest ecosystems; and a dynamic fluvial geomorphological environment.

The Floodplain RNA is 1,333 hectares in area, and encompasses the alluvial floodplain and riparian zone of the Bowron River and upland areas south of the river. The unit is dominated by rich riparian ecosystems and very productive spruce and cottonwood stands on higher river terraces. Oikos (1995) identified plant communities and ecosystems typical of lower, medium and higher alluvial terraces, as well as wetland and riparian ecosystems. The Bowron River, and the many wetlands, ponds, oxbows, river backchannels, forests, and herb-shrub communities, form a rich mosaic of ecosystems and diverse terrestrial and aquatic habitats.

The Floodplain RNA is widely recognized as having very high values as a wildlife corridor, moose winter range, seasonal grizzly bear use (especially fall months), and year-round raptor and other wildlife habitat. The Bowron River has substantial sockeye and Chinook salmon runs, and a wide assemblage of Fraser Basin fish species, including white sturgeon in the lower reaches. Both a local guide-outfitter and trapper make use of the Aleza Lake Forest Service Road for river access by boat up and down the lower Bowron River up to Box Canyon above the ALRF boundary.

Due to high biodiversity, fisheries, and wildlife values, a large portion of the Floodplain unit is designated as the Floodplain RNA. The eastern and southern portion of the unit was diameter-limit logged in the mid-1960s as part of a spruce-beetle salvage program. There has since been no recent harvesting in this unit except for a small six hectare backlog plantation (circa 1995).

Central Ravine RNA

The Central Ravine RNA is 196 hectares in size, and includes the lower portion of a large, heavily forested ravine, stream system, and adjacent upland forests, with extensive mature stands of spruce, subalpine fir, and scattered paper birch and western hemlock. Douglas-fir frequently occurs on steep ravine sidewalls and upper slope crests. No timber harvesting has occurred historically in this RNA.

This stream system is a direct tributary to the Bowron River and is potentially fish-bearing in its lower reaches. Indicators of high slope instability have been observed in several areas within the ravine.

The Central Ravine RNA adjoins the Floodplain RNA to the south, but is very distinct from the latter in terms of ecosystems and terrain characteristics.

Rockpiles RNA

The 24 hectare Rockpiles Research Natural Area encompasses granitic rocky knolls protruding well above the glaciolacustrine deposits of the surrounding ALRF plateau. Soils include fractured bedrock with folisols (thin organic soils over bedrock) and colluvial soils. Forest cover is characterized by extensive forest stands dominated by hemlock and by Douglas-fir on warmer

aspects. These sites are very unusual for the area and for the ALRF. This ecosystem type extends northwestward beyond the west boundary of the Research Forest.

Table 7. A summary of Management Units and their resource emphases.

These areas are approximate and exclude non-forested and non-vegetated land surfaces such as gravel bars and water.

Management Unit	Area (ha)	Primary Resource Emphasis	Secondary Resource Emphasis
Northern Uplands	3,435	Forest Operations / Timber Management	Research & Education/Demonstration
West Bear	1,603	Forest Operations / Timber Management	Riparian Management
Bowron Slopes	1,043	Landscape Corridor and Intensive Access Management	Forest Operations / Timber Management
Central Plateau	901	Landscape Corridor	Forest Operations / Timber Management
Slaney	223	Long-term Permanent Sample Plots	Forest Operations / Timber Management
MU Total	7,205		

Research Natural Area	Area (ha)	Unique Resource Value or Feature
Rockpiles RNA	24	Rocky knolls with folisols (thin organic soils over bedrock) and colluvial soils. Extensive forest stands dominated by hemlock and by Douglas-fir on warmer aspects. Unusual for area and for ALRF. Strong potential for expansion westward of ALRF.
Central Ravine RNA	196	Large dissected gully and creek system with extensive mature stands of spruce, subalpine fir, and scattered paper birch and western hemlock, with frequent occurrence of mature Douglas-fir on steep sidewalls and upper crests. Steep sided draw has high slope instability in many areas. Potentially fish-bearing creek in lower reaches, draining into Bowron River.
Floodplain RNA	1,333	High quality wildlife and fish habitat; floodplain spruce and cottonwood forest ecosystems; dynamic fluvial geomorphological environment
RNA Total	1,553	

Ecological Reserve	Area (ha)	Unique Resource Value or Feature
Ecological Reserve #84	269	Area designated under the <i>Ecological Reserve Act</i> , February 10th, 1978, and more recently under <i>Protected Areas Act</i> , and is managed by BC Parks. Area is legally excluded from other land uses, including the Special Use Permit for the ALRF. ER #84 protects forest ecosystems representative of a wet cool region of the Sub-boreal Spruce biogeoclimatic zone, and contributes towards Protected Areas representation of the McGregor Plateau Ecosection. Except for the shallow 12 hectare lake near the south boundary and a few small bogs, the ecological reserve is completely forested, primarily with mature spruce-subalpine fir forest. Other tree species include Douglas-fir, paper birch, western hemlock, trembling aspen.

Table 8. Summary of Objectives and Strategies of ALRF Management Units and Research Natural Areas

Landscape Zoning	Intensive Forest Management	Intermediate Forest Management	Legacy Research	Research Natural Areas
Area (ha)	5,038	1,944	223	1,553 (not including ER #84)
Applicable ALRF Management Units	<i>Northern Uplands Unit West Bear Unit</i>	<i>Central Plateau Unit Bowron Slopes Unit</i>	<i>Slaney Unit</i>	<i>(Bowron) Floodplain RNA Central Ravine RNA Rockpiles RNA</i>
Forest Management Emphasis	Timber management	<ul style="list-style-type: none"> Landscape connectivity and enhanced structural retention between Research Natural Areas and ER 84 Maintain remote character (limited or minimal new permanent road access) in Bowron Slopes unit. Timber management consistent with above objectives 	Protection of area with abundant long-term 80+ year old permanent sample plots	Retention and recruitment of old forest and protection of sensitive or unique ecosystems
Timber Production Emphasis	High	Moderate	Moderate	Low to None <i>(incidental salvage if required and as feasible)</i>
Biodiversity Emphasis	Low	Moderate-High	Low	High
Potential Research and Education Opportunities	<ul style="list-style-type: none"> a) Regeneration trials b) Demonstration of forest engineering and harvest methods c) Demonstration and research on the effects of various silvicultural systems d) Pre- and Post harvest studies 	<ul style="list-style-type: none"> a) Innovative forest engineering and harvest methods b) Innovative stand and landscape level biodiversity-focused timber management c) Maximize opportunities for innovation in access management in sensitive areas; d) Wildlife inventories and monitoring 	<ul style="list-style-type: none"> a) Growth and yield of old-growth and partially cut forest b) Silvicultural system research and demonstration area 	<ul style="list-style-type: none"> a) Research and education oriented towards study of mature and older upland and floodplain ecosystems and the development, characteristics, and processes provided by old forests.

Landscape Zoning	Intensive Forest Management	Intermediate Forest Management	Legacy Research	Research Natural Areas
<p style="text-align: center;">Resource Management Objectives</p>	<ol style="list-style-type: none"> 1. Maintain and enhance forest productivity 2. Enhance timber quality and profile; 3. Maximize opportunities for innovative research related to forest productivity and management. 4. Maximize education and demonstration opportunities 5. Generate ALRF-supporting revenue through timber harvesting and contribute to ALRF timber harvesting landbase. 6. Enhance road access; 	<ol style="list-style-type: none"> 1. Maintain landscape-level spatial connectivity and enhanced levels of forest structural biodiversity between old forest retention areas, including RNAs and Ecological Reserve #84 2. Maximize opportunities for innovative research related to integrating habitat and biodiversity management with forest management 4. Bowron Slopes only: Minimize or prevent development of new long-term road access to maintain remote forest conditions 5. Bowron Slopes only: 6. Limit increased hunting pressure via motorized road-based vehicular access 7. Generate ALRF-supporting revenue through timber harvesting, and contribute to ALRF timber harvesting land base, as consistent with other objectives. 	<ol style="list-style-type: none"> 1. Ensure the physical integrity of designated Category “A” research sites 2. Ensure the maintenance of natural processes within the plots. 3. Provide opportunities for testing and demonstration of partial cut silvicultural systems outside designated research sites. 4. Generate ALRF-supporting revenue through timber harvesting, and contribute to ALRF timber harvesting land base, as consistent with other objectives 	<ol style="list-style-type: none"> 1. Maintain presence of extensive areas of old-growth and late seral forest characteristics 2. Maintain presence of large contiguous non-roaded areas 3. Recruitment of old forest characteristics in previously disturbed areas (Floodplain RNA) 4. Maximize opportunity for research and monitoring in late seral stands (control sites) 5. Maximize opportunity for research in rare and unique sites. 6. Enhance and maintain education and demonstration opportunities

Landscape Zoning	Intensive Forest Management	Intermediate Forest Management	Legacy Research	Research Natural Areas
<p>General Resource Management Strategies</p>	<ul style="list-style-type: none"> a) Implement a range of even-aged and uneven-aged stand management strategies; b) Emphasize partial cut and smaller patch cut systems in Northern Uplands unit. c) Develop demonstration and walking trail access in designated portions of Northern Uplands Unit d) Develop Shask'oh road access in the West Bear with controlled access. 	<ul style="list-style-type: none"> a) Develop and implement modified harvest practices and silvicultural systems to integrate timber harvesting with wildlife and biodiversity management b) Maintain existing permanent all-season and winter roads but limit new access through prompt deactivation. c) Bowron Slopes unit: Aggressively deactivate temporary winter vehicle access and bladed structures within 0.8 km of the Bowron River after use. d) Bowron Slopes unit: NO road access south of Bowron River (emphasize aerial / helicopter harvesting methods) 	<ul style="list-style-type: none"> a) Establish a minimum 80 m no harvest buffer around the plots b) Limit human access to the plots by roads or trails 	<ul style="list-style-type: none"> a) No new permanent bladed roads or access structures within RNAs b) Allow existing old roads to regenerate naturally c) Monitor forest health d) Limit timber extraction to forest health management measures (including limited timber salvage upon approval by ALRFS Board of Directors). e) Fire control and suppression permitted as necessary to limit risk to managed forest areas and research sites within and outside ALRF.

8.0 Forest Objectives, Strategies, and Practice Requirements

The purpose of this section is the following:

- 1) To summarize the statutory framework for landscape- and stand-level forest practices at the ALRF;
- 2) To describe the specific objectives, strategies, and practice requirements for the conservation and management for different resource values and attributes in the ALRF;
- 3) To identify and describe specific measurable targets or indicators that will be used for assessing management results; and
- 4) To outline and describe operational and site planning processes as they will be conducted at the ALRF.

8.1 Statutory Framework for Forest Practices

8.1.1 Applicable Permits, Legislation, and Regulations

Special Use Permit #S23615 (Section 6.01), dated May 22nd, 2001, specifies that the ALRF (the permittee) must comply with the *Forest Act* and the *Forest Practices Code of British Columbia Act* and the regulations and standards made under that Act. Section 11.01(b) of the SUP states that “*the successor to this Act*” will apply if the latter Act is repealed. At the time this plan was finalized, provisions of the Forest Practices Code Act relating to strategic planning and provincial forest use remain in force; however, other Code provisions relating to operational planning have been repealed and replaced by *Forest and Range Practices Act* (FRPA) requirements

SUP #S23615 Amendment #3 (dated November 29th, 2004) “eliminates the need for government approval of forest development plans (or forest stewardship plans) and silviculture prescriptions (or site plans) on the Permit area”. This amendment specifies that “operational and site plans should still be developed”, and these plans should be “consistent with the intent and direction established in the Management Plan”, and “contain information similar to that required in operational or site plans developed under the Forest and Range Practices Act”.

For forest practices, therefore, this management plan is consistent with FRPA, and the regulations and standards made under that Act. As holder of License to Cut #L45514 under the Forest Act, the Aleza Lake Research Forest Society is defined as an “agreement holder” for the purposes of the Act.

Other legislation applicable to forest practices in the ALRF includes, but is not restricted to, the:

- *Forest Planning and Practices Regulation* (provincial);
- *Government Actions Regulation* (provincial);
- *Wildfire Act* and regulations (provincial); and
- *Fisheries Act* and regulations (federal).

8.1.2 Biodiversity Order

The *Order Establishing Landscape Biodiversity Objectives for the Prince George Timber Supply Area* (also referred to in this plan as the “Biodiversity Order” or “the order”) was signed on October 20th, 2004, by the Regional Director, Northern Interior Region, BC Ministry of Sustainable Resource Management, pursuant to Sections 4(1) and 4(2) of the Forest Practices Code of British Columbia Act.

The order establishes and describes landscape biodiversity objectives across the Prince George Timber Supply Area (TSA), and specifies objectives for “old forest retention”, “old interior forest” and “young forest patch size distribution”. These objectives are specified for individual geographically-defined areas of the TSA; these areas are termed natural disturbance units (or NDUs). These objectives apply to all provincial Crown land in the Prince George Timber Supply Area except area-based tenures specified in the Order.

This management plan will be consistent with the Biodiversity Order for the period of this plan. Where variances from this order are identified, a supporting rationale is provided. Note that in this management plan, biodiversity objectives for old forest and old interior forest have been considered for the ALRF landbase alone. Areas external to the ALRF other than ER #84 have not been considered at this time.

The Landscape Objectives Working Group (LOWG) for the Prince George TSA was consulted in the preparation of this plan. Based on information received by the ALRF to date from *Shannon Carson* of the then Ministry of Sustainable Resource Management (June, 2005), the LOWG is supportive of the ALRF landbase being excluded from the Order, and the landbase being removed from their calculations and contributions.

8.2 Biological Diversity and Wildlife

8.2.1 Natural Disturbance Units

Based on Map #1 of the Order, the Aleza Lake Research Forest is geographically transitional between two Natural Disturbance Units (NDUs): the McGregor Plateau NDU, and the Wet Trench – Valley NDU. According to the Ministry of Agriculture and Lands (Shannon Carson, personal communication, June, 2005), the boundary between these two NDUs identified in the Order runs approximately east to west through the southern half of the ALRF.

Therefore, this management plan must consider the objectives of both NDUs. For the purposes of the plan, the NDUs are not considered separately. Rather, the plan has considered the current condition of the entire ALRF landbase as a whole. Where the objectives of the NDUs differ, the more stringent (higher) NDU objective has been applied.

8.2.2 Contribution of Protected Areas (Ecological Reserve #84)

As discussed previously, Ecological Reserve #84 is under the jurisdiction of BC Parks and is completely surrounded by, but excluded from the ALRF Special Use Permit area. However, as per Section D1 of the Biodiversity Order, Ecological Reserve #84 is considered under this management plan to contribute to the ALRF's Old Forest Retention and Old Interior Forest objectives.

8.2.3 Consistency with Biodiversity Order

The ALRF conducted a GIS map analysis of age Class 8 and 9 forest types on the research forest to identify areas of "Old Interior" forest, using a stepwise categorization:

1) Category 1: Modified (Partially-cut) Old Forest:

Includes all forest inventory polygons age class 8+9 within the boundaries of 1919-1963 (partial-cut) harvesting.

2) Category 2: Perimeter Unmodified Old Forest:

Includes all age class 8+9 that is:

- a) outside the boundaries of 1919-1963 harvesting and;
- b) less than 200 metres from the edge of any post-1963 (clearcut) harvesting disturbance; or
- c) less than 200 metres from a permanent winter or all-season road.

3) Category 3: Unmodified Interior Old Forest:

Includes all age class 8+9 that is:

- a) outside the boundaries of 1919-1963 harvest units;
- b) greater than 200 metres from the edge of any post-1963 (clearcut) harvesting disturbance; and
- c) greater than 200 metres from any permanent winter or all-season road.

The analysis did not apply "edge effects" to natural wetlands. The map produced as a result of this analysis is provided in **Exhibit F**.

8.2.3.1 Old Forest Retention

This management plan and condition of the ALRF landbase during the term of this plan is consistent with old forest objectives in the Biodiversity Order.

Under the Order, the objective for minimum percent of the forest landbase in the SBSwk1 subzone to be retained as Old Forest (inventory age classes > 140 years) is 26% in the McGregor Plateau NDU and 30% for the Wet Trench-Valley NDU. Based on the forest cover inventory for the ALRF and ER #84 combined, the current percentage of old forest is 36.9%.

Forest cover polygons classified as age classes 5, 6, and 7 (80-139 years) will contribute to future recruitment of old forest on the ALRF.

These currently total 19.7% of the ALRF forested landbase. In addition, field examinations of some forest-cover polygons by ALRF staff suggest that a significant proportion of the polygons classified as younger age classes may in fact be age class 8 (140-250 years). Therefore, actual percentage of old forest at the ALRF may potentially be significantly higher than 37%.

8.2.3.1.1 Old Interior Forest

The management plan is consistent with objectives for Old Interior Forest under the Biodiversity Order. In SBSwk1 subzones in both the McGregor Plateau and Wet Trench NDUs, the objective for minimum percent of the Old Forest requirement that must be Old Interior Forest is 10%.

Approximately 40% of the existing old forest (age class 8 and 9) at the ALRF can be considered to be old interior forest, under current assumptions (see distribution of old forest in the **Exhibit F** map). Of the approximately 3,300 hectares of old forest at the ALRF, approximately 1,300 hectares meets the interior conditions required.

The spatial distribution of old and old interior forest at the ALRF illustrated in **Exhibit F** clearly shows the impact of eighty years of historical harvesting on old forest at the ALRF.

Several of the remaining large contiguous patches of interior forest are located in Ecological Reserve #84 and the Research Natural Areas designated under this plan.

Successful maintenance of target levels of old and old interior forest on the ALRF over time will require a detailed longer-term strategy to balance timber harvesting objectives with old forest objectives. ALRF commitments for development of this strategy are detailed in Section 9 of this plan.

8.2.3.1.2 Young Forest

The management plan will not conform to the standard Young Forest Patch Size Objectives identified in the Biodiversity Order, based on the following rationale:

- 1) Trending towards a standardized patch size distribution would be inconsistent with other forest management objectives and forest zoning strategies described in this plan, and would limit the ability of the ALRF to achieve its research and educational goals, including utilizing a range and variety of silvicultural systems;
- 2) Fire or other large stand-initiating events do not appear to be the dominant agent of natural disturbance on the ALRF;
- 3) It would be difficult or ineffective to try to apply larger patch sizes to the ALRF, given the limited size of the ALRF landbase (9,000 hectares more or less); and
- 4) The ALRF is a very small proportion of the Prince George TSA and the McGregor Plateau and Wet Trench-Valley NDUs. Variance from young forest objectives by the ALRF is not likely to significantly impact on the young forest patch size objectives of licensees elsewhere in these NDUs.

8.2.3.2 Identified Wildlife Strategies and Ungulate Winter Range

On the ALRF, there are no known provincially-designated wildlife habitat features, wildlife strategies, or ungulate winter range, as defined by the *Forest Planning and Practices Regulation* and *Government Actions Regulation*. As described in other sections of this plan, ALRF staff will collect wildlife inventory and habitat description information during the period of this plan to help inform future wildlife management strategies on the Research Forest.

8.2.4 Wildlife Tree and Coarse Woody Debris Retention

8.2.4.1 General Considerations and Objectives

Forest management practices at the ALRF are guided by a mandate to promote and maintain research and educational opportunities, as well as provide a range of forested habitats and ecosystem processes within managed and unmanaged areas of the landscape. Forest management at the ALRF will maintain a wide variety of stand structures, tree species compositions, seral stages, wildlife habitats, and wildlife trees across the managed forest land base.

The landscape zones described in Section 7 of this plan provide the “coarse filter” approach for maintenance of forest-level biodiversity and forest ecosystem connectivity at the ALRF. Stand- and cutblock-level management objectives for wildlife tree patches, wildlife trees, and coarse woody debris provide a finer-scale framework for maintenance of forest stand structure, variability, and biodiversity.

Across the ALRF, management practices for promotion of stand level biodiversity will include two main approaches:

- 1) Post-harvest retention of residual late seral stand characteristics, wildlife trees and patches, and coarse woody debris structures after logging; and
- 2) Recruitment strategies which will promote desired stand structures and habitat conditions in second-growth stands.

Minimum standards and practices for coarse woody debris (CWD) and wildlife tree (WT) retention on harvested cutblocks throughout the ALRF will be consistent with the *Forest and Range Practices Act* and the *Forest Planning and Practices Regulation*, as amended from time to time. However, the general intent of this management plan is to substantially exceed statutory minimum CWD and WT levels.

CWD and WT post-harvest retention objectives will be relatively lower in forest management units with a timber management emphasis (Northern Uplands and West Bear Units) and higher in forest management units with a mixed habitat / timber management emphasis (Bowron Slopes and Central Plateau Units). In addition, Research Natural Areas covering approximately 20% of the ALRF landbase will have little or no harvesting disturbance, and therefore high levels of mature forest retention.

Desired future forest conditions for Wildlife Tree / Wildlife Tree Patch and CWD retention objectives for each ALRF management unit are described in **Table 10** on page 87.

ALRF cutblocks will retain a targeted percentage of Wildlife Tree Patch or reserve retention on average, though individual cutblocks may have a wide range of retention conditions. Dispersed reserves or leave-trees will contribute to the required retention area on a basal area basis.

8.2.4.2 Wildlife Tree Patch Implementation Strategies

The principal strategies for maintenance of stand-level biodiversity in ALRF management units are retention and recruitment of Wildlife Tree Patches (WTPs), dispersed reserve trees, and coarse woody debris.

WTPs are fixed areas within or adjacent to harvest cutblocks which remain unharvested, so that the forest in the WTP can continue to develop large trees, dead trees, and CWD. Some WTPs may be located in riparian areas, but upland WTPs will also be identified.

Generally, areas identified for wildlife tree retention should be a representation or reflection of the stands being harvested in adjacent areas. Stand conditions in WTPs will represent the range of stand densities, species distributions, and stand structures found in harvested stands as well as unharvested stands. When possible, deciduous, Douglas-fir, and hemlock stems will be represented. WTPs should also include and prioritize retention of trees, stands, and ecosystems indicating favourable characteristics for, or evidence of, wildlife use.

It is recognized in this plan that it is currently considered generally preferable to aggregate wildlife tree patch retention into larger units (i.e., > 2 hectares, for greater continuity of habitat within the patch), and potentially less fragmentation and edge effects, including windthrow. For the term of this plan, large WTPs > 2 hectares will constitute a majority (i.e., > 60% of total WTP area) of all WTPs prescribed and implemented under ALRF site plans, in relation to areas harvested under this management plan.

Also, in general, WTP implementation and layout will strive for physical connectivity between adjacent candidate WTP areas, adjacent unlogged areas, and riparian ecosystems. The degree of connectivity between WTP areas within any given area or cutblock will be determined on a site specific basis.

In addition to WTPs that are generally representative of adjacent harvested areas, WTP strategies on the ALRF will include identification and WTP designation for unusual and unique stand characteristics or notable local forest ecosystems (for example, pockets of Douglas-fir or unusual plant species). In addition to biodiversity considerations, protection of such sites will retain important future teaching and research sites. These types of WTPs may not necessarily be “representative” of more common surrounding ecosystems or stand types.

The WTP concept can also be applied in silvicultural stand-tending treatments in immature second-growth stands, by mapping and identifying specific areas of the stand that can be excluded from management treatments, allowing for undisturbed retention and recruitment of wildlife trees and unmanaged stand structural biodiversity.

Taking all of the above into consideration, over the term of this plan, the ALRF will promote and implement a diversity of WTP and CWD retention approaches, with the goal of promoting high-quality research and educational opportunities that examine the ecological functionality and qualities of forest habitats created by different WTP retention strategies.

Pre-harvest WTP / CWD Planning

In pre-timber harvest planning, planned harvest areas and related adjacent areas will be assessed for appropriate stand level wildlife tree retention opportunities. ALRF strategies for WT and WTP retention will include identification, retention, and recruitment of:

- 1) Stand structures appropriate to ecological conditions;
- 2) Unusual and unique stand characteristics or notable local forest ecosystems for future teaching and research sites. High priorities will include mature spruce-balsam forests on sandy or coarser soils, pockets of Douglas-fir, or unusual plant species;
- 3) Riparian areas with suitable (windfirm) boundaries; and
- 4) Trees or ecosystem features with abundant evidence of past, existing, or potential wildlife activity. These features may or may not be associated with older trees and stands.

Through modification of harvest practices, cutting boundaries, and post-harvest silvicultural practices, WTP strategies will aid in the recruitment and retention of the following old-forest or late-seral attributes in ALRF stands:

- 1) Standing dead trees (where safe to do so);
- 2) Live and dead standing trees for future recruitment of coarse woody debris;
- 3) Horizontal structural diversity (i.e., protection of stand structure originating in canopy gaps and clumps);
- 4) Variety of canopy layers where ecologically suitable; and
- 5) Retention of large old trees, where safe to do so, and where ecologically suitable.

In general, the mix of WTP strategies used at the ALRF will vary from stand to stand, and across the landscape to facilitate comparison of different WTP strategies for research and educational purposes.

Wildlife Tree Patch Recruitment in immature and second-growth stands

For relatively homogeneous immature or previously harvested areas with little or no existing WTP or CWD retention (e.g., plantations resulting from past harvesting with little or no previous WT retention), stand level biodiversity, variability, and older-forest characteristics will be promoted through various silvicultural strategies, including (but not restricted to) the following:

- 1) Retention of hardwood patches which have established in coniferous plantations through natural regeneration or suckering;
- 2) Application of a range of spacing densities, not just one uniform density;
- 3) Species mixes and/or multi-layered stand structures in managed stands through promotion of natural regeneration in combination with planted stock; and
- 4) Stand tending and juvenile or commercial thinning to promote and maintain a desired proportion of naturally regenerated tree species in a plantation.

8.2.4.3 Coarse Woody Debris Retention and Recruitment

CWD management will focus on leaving a wide range of piece sizes well distributed on harvested sites, but a key focus will be on CWD pieces greater than 30 cm in diameter at the largest end.

Specific harvest strategies for promoting CWD retention include leaving larger, non-merchantable or non-commercial material at the stump, operator training to avoid yarding of non-commercial large material, and reduction of piling and burning except for heavy roadside and landing accumulations. Occasionally, localized redistribution of material may be desirable.

As well as post-harvest retention of CWD, equally important will be silvicultural strategies that aid in CWD recruitment in future in existing managed stands. CWD recruitment strategies will include:

- 1) Retention of shorter-lived tree species (e.g. deciduous species, subalpine fir) in mixture with more preferred crop species (spruce, Douglas-fir, etc) for future CWD recruitment;
- 2) Retention of selected standing green coniferous stems, especially including large-diameter trees, for future stand structure and CWD recruitment. Standing green trees may be retained both as dispersed trees and in patches; and
- 3) Creation and retention of “stubbed” trees or snags (standing stems cut at 3 to 5 metres in height) during mechanized feller-buncher harvesting operations.

CWD retention following forest harvesting operations (excluding road construction) will be monitored on cutblocks within five years following harvesting, and assessed over the life of the management plan.

Desired future forest conditions for post-harvest coarse woody debris (CWD) retention for ALRF management units are described in **Table 10** on page 87.

8.3 Soils and Soil Conservation

ALRF practices for soil disturbance limits, permanent access structure limits, landslide prevention, natural surface drainage patterns, and re-vegetation of roads, will be consistent with the *Forest and Range Practices Act* and the *Forest Planning and Practices Regulation*, as amended from time to time.

8.4 Timber Management and Forest Health

8.4.1 Timber Harvesting

8.4.1.1 Allowable Annual Cut

For the cut control period prescribed in Section 8.4.2.1 of this management plan, timber harvest rates for the Aleza Lake Research Forest will be based on an **allowable annual cut (or AAC) of 16,000 cubic metres per year**.

This initial five-year harvest level is a conservative management approach in consideration of potential uncertainties and future adjustments in the AAC.

Potential uncertainties identified include:

- 1) Quality and reliability of forest inventory data, especially in some of the wetter, low-lying plateau areas of the ALRF;
- 2) Potential constraints on future timber availability relative to the original timber supply analysis assumptions, based on some changes in forest zoning strategies, adjustments in wildlife tree retention strategies, and changes in reserve / research natural area boundaries since the original analysis;
- 3) Unknown potential unrecoverable losses from catastrophic disturbance events, windthrow, or spruce beetle outbreaks; and
- 4) Potential increases in site index estimates, based on possible future old-growth site index (OGSi) adjustments, which were not factored into the current timber supply analysis.

During the period of this plan, a new timber supply analysis for the ALRF incorporating all new management plan assumptions and any new information will be prepared and completed as detailed in Section 9 of this plan.

8.4.2 Cut Control

8.4.2.1 Cut Control Period

Under this plan, the start of the first cut control period is set retroactively to January 1st, 2004, and the end of the five-year cut control period is therefore December 31st, 2008.

8.4.2.2 Cut Control Limit

The ALRF will ensure that the volume of timber harvested during a cut control period will not exceed 105% of the sum of the allowable annual cuts for the period.

8.4.3 Stand Harvesting Priority

Timber will be harvested in a manner consistent with the objectives of the ALRF. Timber harvesting priorities and scheduling at the ALRF will consider several interlocking factors:

Research and Educational Opportunities:

- a. Operational demonstration opportunities;
- b. Research trial scheduling and implementation;

Silvicultural Opportunities:

- c. Partial-cut harvest treatments for release of regeneration, or improvement of stand quality and species composition;
- d. Commercial thinning opportunities;

Forest Health:

- e. Existing or potential mortality and stand damage due to insects, pathogens, and weather events;
- f. Relative susceptibility of trees and stands to catastrophe or substantial losses; and;
- g. Salvage of dead or damaged merchantable timber.

In general, harvesting efforts will be directed in the following overall standard order of harvest priority. (Note: exceptions to the standard harvesting priority will be made by the ALRF on a case by case basis, where necessary to facilitate specific research and demonstration projects.)

- 1) Timber infested by insects;
- 2) Salvage of dead and dying merchantable timber;
- 3) Silvicultural rehabilitation of productive sites occupied by stands of rapidly declining quality and vigour;
- 4) Scheduled stand entries for removal of timber in partial-cuts and stand improvement cuts for release and/or thinning of regeneration and adjacent residual trees;
- 5) Timber at risk of infestation by insects;
- 6) Timber significantly affected by disease;
- 7) Timber of gradually declining vigour; and
- 8) Healthy, vigorous timber.

In general, older stands will be targeted for harvesting first. Deciduous species may be harvested if/when appropriate markets are available. Stands being managed under unevenaged systems will be managed under an approximately 30-year cutting cycle.

8.4.4 Harvesting Methods

The following list of harvest methods includes many of the methods anticipated to be commonly used at the ALRF during the period of the plan. However this list is not definitive or exclusive of other methods not listed below.

Generally, on most areas of the ALRF, timber will be harvested using ground-based equipment configurations appropriate to the local terrain, soils, logging season and site sensitivity:

- 1) Tracked or Rubber-tired skidding;
- 2) Mechanical and/or hand-felling;
- 3) Horse logging;
- 4) Excavator forwarding (“hoe chucking”);
- 5) Low ground pressure machines; and
- 6) Combinations of the above.

Helicopter yarding, cable yarding, or similar aerial yarding systems may be used, particularly in specific circumstances where terrain, season of logging, sensitive soils, or road access limits or prevents the use of conventional ground-based yarding systems. These circumstances include:

- 1) Steep or severely gullied terrain;
- 2) Sensitive or fine-textured soils where summer logging is desirable, but conventional ground-based harvest systems would create unacceptable damage to the site and soils.
- 3) Areas of the ALRF south of the Bowron River;
- 4) Areas where slope instability or other geographical barriers limit or prevent construction of suitable road access;
- 5) Salvage situations in remote or rugged terrain;
- 6) All of the above.

Cable harvest systems may also be used on appropriate settings on steep slopes or other sites where adequate deflection or log suspension can be achieved. In general on the ALRF, sustained slopes greater than 40-45% may be most suitable.

Exceptions will be made for specific research purposes or special sites. The logging method will be chosen to utilize the most cost-effective method of harvesting in order to meet the requirements of the research, silviculture prescription, suitable utilization levels, and the future growth potential of the site. Most of the logging has historically tended to be either log or tree length skidding or yarding. Mobile loaders at roadside or landing are usually used in loading logging trucks.

8.4.5 Silvicultural Systems

8.4.5.1 *Vision for ALRF Silvicultural Systems*

As documented in earlier sections of this plan, historically, and to the present, the Aleza Lake Research Forest has been perhaps best known in British Columbia and elsewhere for the extensive experimentation and monitoring of a range of silvicultural systems dating back to the early 1920's. Much of this pioneering work, and network of sites, continues to be an important benchmark, not only for forest research and education, but also for operational application of similar systems elsewhere.

With respect to the prescription and application of silvicultural systems and stand management, the ALRF today strives to build on this tradition of excellence as a world-class research facility and teaching forest, with continuing emphasis on the demonstration and implementation of many different silvicultural techniques.

Consistent with Section 2.3 (ALRF Management Vision), this vision directs ALRF forest harvesting and management practices towards providing opportunities for research, and demonstrating, on an ongoing operational basis:

- a) a robust range of currently-applied silvicultural systems at the ALRF, to provide comparisons for research and educational purposes; and
- b) incorporation of innovative stand management techniques into routine day to day operations, at the Aleza Lake Research Forest.

8.4.5.2 *General Principles for ALRF Silvicultural Systems*

At the ALRF, the following principles will be applied to the selection and application of silvicultural systems (adapted in part from Smith, 1986, and Cole, 1985). In general, for a given stand and site, the silvicultural system prescribed will be the best or most feasible combination of harvest and silvicultural treatments to meet the following basic goals:

- 1) Consistency with the goals and objectives of the management unit or land-use zoning (and may include site-specific research or demonstration objectives);
- 2) Research, demonstration, and educational opportunities for the site (where applicable) that are consistent with # 1 above;
- 3) Consistency with the ecology and silvics of the desired tree species or stand;
- 4) Regeneration of the desired species, of a defined type and condition, over a defined timeframe. Incorporates vegetative control if necessary to establish target stocking levels and acceptable growth rates;
- 5) Efficient use of growing space and site productivity, bearing in mind timber and non-timber resource objectives;

- 6) Efficient use of financial capital and timber growing stock;
- 7) Development and maintenance of target stand structure, species composition and stand conditions that:
 - a) meet allocated resource management objectives over the longest possible time,
 - b) minimize damage from pests, wind and fire; and
 - c) where applicable, optimize silvicultural opportunities for stand improvement and for regeneration cuttings, including, for example:
 - i) partial-cut harvest treatments for release of understory regeneration or pole-sized trees,
 - ii) improvement of stand quality and species composition through removal of trees and patches of declining vigor or inferior quality,
 - iii) commercial thinning opportunities, and
 - iv) natural regeneration or under-planting opportunities;
- 8) Operational practicality and compatibility with acceptable logging methods (including harvesting economics and cost, including layout constraints and equipment availability and configuration) so that the future stands produced can be efficiently and effectively cultured and harvested; and
- 9) Efficient spatial arrangement and organization of forest operations.

8.4.5.3 Site- and Stand-level Considerations for Prescription of Different Silvicultural Systems at the ALRF

Over and above social, economic, or harvesting considerations, different ALRF sites have combinations of physical, biological or ecological characteristics that may favor or limit the successful use of various partial-cut silvicultural systems. Based on past operational experience at the ALRF, it is generally expected that certain management units, soil types, stand conditions, and tree species will be suited to certain types of silvicultural systems.

For example, at a landscape level, the rolling terrain of the Northern Uplands Unit tends to have a greater proportion of sites and stand conditions suited to partial-cut and uneven-aged management than the hummocky, more poorly-drained terrain of the West Bear Unit. However, it must be stressed that these are generalizations only; for a given stand or site, more site-specific considerations may apply.

Factors Supporting Consideration of Partial-cut Systems

For the purposes of Management Plan #2, “partial-cut” silvicultural systems or prescriptions are defined as:

- a) Group selection, single-tree selection, and strip selection systems (as per **Table 9** on page 76) in which less than 40% of the pre-harvest area or basal area of the stand has been removed by timber harvesting within an approx. 25- to 40-year cutting cycle;
- b) Patch cut systems (as per **Table 9**) in which less than 40% of the pre-harvest area of the stand has been removed by timber harvesting, and has not yet achieved green-up as per Section 8.4.6 of this plan.
- c) Uniform shelterwood, group shelterwood, or irregular shelterwood systems (as per **Table 9**), in which less than 60% of the pre-harvest area or basal area of the stand has been removed by harvesting, within the initial 10-15 year regeneration period.

Combinations of site and stand factors that may suggest or favor closer evaluation of partial-cut silvicultural system options include:

- 1) Favorable stand structure, and tree vigor (or opportunities to increase stand condition and vigor) through harvest removal of selected poorer or declining trees. More specifically, this includes stands or sites where many (or perhaps most) of the existing tree cohorts (e.g., the majority of the basal area, uniformly or in groups) have good prospects for maintenance or improvement of growth and vigor following a harvest removal of some other, less favorable or commercially mature trees. Such sites and stands may often be related to a past history of partial-cutting or similar natural disturbances.
- 2) Stand or area management objectives and target stand structures that include emulation of finer-scale natural disturbance characteristics (e.g., small gap regeneration) or promote management or creation of multi-layered or multi-aged (or two-aged) stand characteristics (e.g., either dispersed or in discrete small groups).
- 3) Moderately to well-drained soils with > 40 cm rooting depth, and low to moderate windthrow hazard or risk based on the Windthrow Handbook (Stathers et al, 1994) and informed by local operational experience with past partial-cut treatments and harvest boundaries on similar sites.
- 4) Stands or soils with apparently relative little evidence of significant historic wind damage events (see also #2 above).
- 5) Terrain and potential access routes and/or treatment-unit boundaries which facilitate efficient removal of trees to be harvested while minimizing logging damage or future wind damage to the residual stand.
- 6) Sites of favorable existing or future road location, accessibility, and/or profile which provide superior opportunities for education and demonstration related to partial-cut silvicultural systems to students, forest practitioners, and the public.

Factors Supporting Consideration of Clearcut or Similar Even-aged Regeneration Methods

At the ALRF, some site and stand conditions tend to support consideration of clearcut or allied regeneration methods or systems (e.g., “clearcut-with-reserves”), rather than the partial-cut systems described earlier in this section and in **Table 9** on the following page. Clearcut and similar even-aged systems prescribe the removal, via harvesting, of most or all of a single stand, excluding reserves or WTPs, in one stand entry, followed by prompt reforestation, often via planting of seedlings. Site and stand conditions which favor these latter systems include:

- 1) Unfavorable existing stand structures, advanced stand age, or pathology inconsistent with future stand management objectives. This may include poor or declining overall tree vigor or quality (either currently or in the near future). More specifically, this can include stands or sites where many (or perhaps most) of the existing tree cohorts (e.g., the majority of the basal area, throughout the stand or treatment unit) have poor or declining potential growth and vigor, and overall stand volumes or economic value will decline substantially without harvest intervention.
- 2) Similar to #1, stands in which widespread shallow tree rooting, rots, or unstable stems (e.g., widespread stems with heart-rot or butt-rot) presents unacceptably high worker safety or windthrow risks for partial-cutting or high-retention harvest methods.
- 3) Relatively poorly-drained soils with <30 cm rooting depth, and moderate to high to moderate windthrow hazard or risk based on the Windthrow Handbook (Stathers et al, 1994) and informed by local operational experience with past partial-cut treatments and harvest boundaries on similar sites;
- 4) Stands or soils with apparently abundant and widespread evidence of significant historic wind damage events (see also #2 above).
- 5) Terrain and potential access routes and/or treatment-unit boundaries which severely limit or prevent efficient removal of trees to be harvested, or incur unacceptable harvesting or wind damage to the residual stand.
- 6) Stand or habitat management objectives that include emulation of larger-scale natural disturbance characteristics (e.g., large patch sizes similar to fires, for example) or promote management or creation of generally even-aged single- or multi-species stands (with or without reserves).
- 7) Intensive stand management objectives which will harvest and remove old or mature stands of less desirable, unhealthy, or inferior species and stand characteristics, and regenerate these harvested areas with new stands of more desirable species, under relatively even-aged stand conditions.
- 8) Sites of favorable existing or future road location, accessibility, and/or profile which provide superior opportunities of even-aged silvicultural systems (or comparisons of different silvicultural systems) for education and demonstration to students, forest practitioners, and the public.

Table 9. General definitions of ALRF silvicultural systems, for the purpose of ALRF Management Plan #2.
 These definitions are provided to clearly categorize ALRF silvicultural systems based on current or potential practices at the Research Forest, and are not intended for prescriptive purposes.

Stand Structural Objective	Spatial arrangement of harvest and regeneration within stand	Spatial and temporal pattern of Leave-tree or Patch Retention	Applicable Silvicultural System
Even-aged	Clear-felled large openings, > 3 ha.	Low or no long-term retention of unharvested areas. Dominantly open conditions.	Clearcut (may include deciduous-coniferous "mixedwoods"), or; Clearcut with reserves (low retention)
	Uniform removal of most or all mature overstory, with retention of advance regeneration of adequate stocking, quantity, and suitability as crop trees.	Retention of adequate stocking and quality of advance regeneration for timber crop trees.	Natural shelterwood
Even-aged with reserves	Clear-felled large openings, generally > 3 ha.	<u>Less</u> than 50 % of cutblock is within 60 metres (i.e. - approx 2 tree heights) from either a harvest boundary or edge of a long-term retention patch.	Clearcut with reserves
		<u>Greater</u> than 50 % of cutblock is within 60 metres (i.e., approx 2 tree heights) from either a harvest boundary or edge of a long-term retention patch.	Variable Retention
Generally Even-aged to Two-aged	Clear-felling of small openings generally > 0.5 ha but < 3 ha. A maximum of 40% of the stand will be harvested over the whole stand prior to 3 m green-up of these harvested openings.	No point within the harvested area is > 60 metres (i.e. - approx 2 tree heights) from either a harvest boundary or edge of a long-term retention patch (or WTP).	Patch cut
	Clear-felled small or large groups with retention of seed trees (e.g. Douglas-fir or paper birch) with adequate seedbed for natural regeneration.	Dispersed mature live seed trees for crop tree regeneration objectives (plus reserves).	Seed tree
Two-aged	Dispersed partial harvest that retains > 40% of pre-harvest basal area, and creates adequate seedbed, to promote natural regeneration, under well distributed healthy mature overstory.	One or more stand entries for harvest of mature overstory within +/- 25 years of initial stand entry.	Uniform shelterwood (Seed Cut) Uniform shelterwood (Regeneration Cut)
		Long-term retention of mature overstory for > 25 years after initial stand entry, up to one rotation (80 years) or more.	Irregular shelterwood
		One or more stand entries for harvest of mature overstory within +/- 25 years of initial stand entry.	Group shelterwood
Unevenaged (Multi-aged)	Small groups, generally < 0.5 ha. (up to 1 ha.), removing < 40% of stand by area per +/- 25-40 yr cutting cycle.	Selection systems can be applied with or without reserves.	Group selection Strip selection
	Dispersed, uniform harvest and regeneration pattern, removing < 40% of stand basal area per +/- 25-40 yr cutting cycle.	Selection systems can be applied with or without reserves.	Single-tree selection

8.4.6 Maximum Cutblock Size and Harvesting Adjacent to another Cutblock

ALRF practices regarding:

- maximum cutblock size; and
- harvesting adjacent to another cutblock

will be consistent with the *Forest and Range Practices Act*, and the *Forest Planning and Practices Regulation*, as amended from time to time, with the following exception:

Minimum “green-up” height for cutblocks in the Central Plateau and Bowron Slopes Management Units is increased, relative to the above, to five metres, to provide for additional hiding cover for wildlife.

8.4.7 Forest Health

At the ALRF, forest health management will consider forest ecosystem dynamics and function as well as the health and condition of individual stands and trees.

Prescription and application of forest health strategies will provide opportunities for a wide diversity of operational and experimental approaches, rather than a narrowly-defined set of methods focused on timber management alone. Forest health strategies will consider and balance:

- 1) Education, and research opportunities for the rigorous testing and comparison of different forest health management methods and approaches;
- 2) Existing mortality or declines in tree vigor, and relative risk of loss of adjacent trees or stands;
- 3) Potential beneficial or detrimental aspects of forest health agents for forest habitat, stand structure, and ecosystem function (e.g., creation of canopy gaps, wildlife trees, and coarse woody debris); and
- 4) Potential for economic salvage of existing or incipient mortality in a manner that minimizes impacts to other forest resources.

General strategies for monitoring and management of forest health issues in natural and managed stands are outlined in **Appendix 8**.

ALRF forest health management practices will be consistent with the *Forest and Range Practices Act* and the *Forest Planning and Practices Regulation*, as amended from time to time. If the ALRF uses trap trees or pheromones to concentrate insect populations, the ALRF must ensure that the insect brood is destroyed before the insects emerge.

8.4.8 Regeneration, Use of Seed, and Free Growing Stands

ALRF practices regarding use of seed, regeneration, and achievement of free growing stands will be generally consistent with the *Forest and Range Practices Act* and the *Forest Planning and Practices Regulation*, as amended from time to time. ALRF practices will be consistent with the Chief Foresters Standards for Seed Use, as amended from time to time.

This management plan provides for exceptions to the above legislation, regulations, and standards, when applying research or educational demonstrations within the ALRF. These exceptions or variances will be rationalized, documented within operational plans, and the Ministry of Forests informed.

General surveys to monitor stand establishment and development are summarized in **Appendix 9**, and will be subject to the above legislation, regulations, and standards.

8.4.9 Stocking Standards (General)

Stocking standards that apply to the ALRF will be generally consistent with the standards established by the Chief Forester and subsequent amendments for biogeoclimatic areas within the ALRF (SBSwk1), with the exception of the silvicultural systems referenced in Section 8.4.9.1 of this plan. The latter will be consistent with the stocking standards and stand structural objectives specified in that section of the plan.

This management plan also provides for additional exceptions to the application of stocking standards in respect to any silvicultural system, when applying research or educational demonstrations within the ALRF. These exceptions or “variances” will be rationalized, documented within operational plans, and the Ministry of Forests informed.

Over the term of this management plan, reforestation research trials and operational demonstrations within the ALRF may include, the following types of examinations of tree species performance:

- 1) Silvicultural performance of paper birch (Ep) and trembling aspen (At) on SBSwk1-01 (mesic) and moister sites, and regeneration strategies to address the risk of moose browsing;
- 2) Silvicultural performance of Douglas-fir (Fdi) on warmer frost-shedding slopes on SBSwk1-07 (Sxw-Twinberry-Oak Fern) site series, and transitional 07/08 coarser-textured (sandy) phases of the 08 (Sxw-Devils Club) site series. Initial priority sites for Douglas-fir demonstration trials will include elevated ridges, slopes and terraces with lower risk of growing season frost;
- 3) Silvicultural performance of subalpine fir (Bl) on SBSwk1-07 (Sxw-Twinberry-Oakfern) and moister sites, and regeneration strategies to address the risk of moose browsing;

- 4) Silvicultural performance of lodgepole pine (PI) on moister-than-mesic site series. Currently the ALRF has little silvicultural experience with pine plantations older than 20 years on upland sites, and there are virtually no stands of upland natural pine at the Research Forest. In general, the ALRF management approach will be to allow reforestation of pine as per stocking standards, but only as minor mixtures of pine (not pure stands) combined with plantings of other coniferous species, until more long-term experience is gained; and
- 5) Exploratory assessments of silvicultural performance of BC tree species or seedlots in the SBSwk1 subzone at the ALRF outside their recognized ecological range; such species may include, for example, western red cedar (*Thuja plicata*), western larch (*Larix occidentalis*), tamarack (*Larix laricina*), and western white pine (*Pinus monticola*).

8.4.9.1 Reforestation Standards and Stand Structural Objectives for “Complex” Stands (Single-tree Selection and Irregular Shelterwood Systems)

This section describes the stocking standards and stand structural objectives for management of spruce-subalpine fir stands by single-tree selection (STS) and irregular shelterwood (ISW) silvicultural systems at the ALRF. These stocking standards are based on operational experience and growth-and-yield data in uneven-aged and partial-cut stands at the ALRF and elsewhere.

In general, the management intent of the above silvicultural systems will be to direct timber harvesting and leave tree selection to: (a) maintain or enhance stand quality, and (b) maintain or enhance composition of spruce and other desirable species relative to subalpine fir, especially in previously high-graded stands. Subalpine fir management strategies will take into account the shorter pathological rotation and sensitivity to damage of this species relative to spruce.

Target post-harvest stand structures and stocking standards for single-tree selection and irregular shelterwood systems at the ALRF will be prescribed according to the following factors:

- a) Residual basal area ($\text{m}^2/\text{ha}.$);
- b) Target stand structure (stems per hectare per diameter class);
- c) Target species composition (by basal area);
- d) stocking of suitable regeneration;
- e) cutting cycle or stand re-entry period.

Appropriate residual basal area is defined as either:

- 60% or more of pre-harvest basal area for STS, or 40% for ISW; or
- B- level stocking ($> 20 \text{ m}^2/\text{ha}.$)

Target stand structure will be defined as the target and acceptable range of stems-per-hectare or basal area by species by or size diameter class.

8.5 Riparian Areas, Watersheds, and Aquatic Habitats

Minimum ALRF forest practices in streams and riparian areas will be consistent with the *Forest and Range Practices Act* and the *Forest Planning and Practices Regulation*, as amended from time to time.

In general, ALRF practices will strive to achieve enhanced management practices around classifiable streams and riparian areas through the following measures:

- 1) Assessment of fish presence, or absence and habitat quality for a minimum of 300 metres upstream and downstream of stream crossings for forest roads;
- 2) On S5 or S6 streams, assessment of potential impacts on downstream fish-bearing waters, through fish habitat assessments to determine minimum downstream distance to known fish habitat (up to 2 km); and
- 3) Consistency with BC MoF Prince George Forest District policies for S4 streams, as amended from time to time.

Variances from the above for experimental or research purposes will be proposed in consultation with and authorized by applicable provincial and federal agencies. During the term of this management plan, the ALRF will consult with applicable agencies including the BC Ministry of Forests, to develop administrative protocols for examining situations where variances from these practices are desired for research, experimental, and educational purposes.

8.5.1 Temperature sensitive streams or Fisheries Sensitive Watersheds

The ALRF contains no known temperature sensitive streams or fisheries sensitive watersheds, the latter as defined by the *Forest and Range Practices Act* and the *Forest Planning and Practices Regulation*.

8.5.2 Licensed Waterworks

The ALRF contains no licensed waterworks (including water supply intakes or water storage and delivery infrastructure) as defined in *Forest and Range Practices Act* and the *Forest Planning and Practices Regulation*.

8.5.3 Community Watersheds

The ALRF contains no community watersheds, as defined by the *Forest and Range Practices Act* and the *Forest Planning and Practices Regulation*.

8.6 Research Site Locations

Management of ALRF research site locations relative to forest operations and primary forestry activities will be consistent with Section 6 of this plan.

8.7 Cultural and Heritage Resources

The ALRF will manage cultural and heritage resources in a manner consistent with the *Heritage Conservation Act*, the *Forest and Range Practices Act*, and the *Forest Planning and Practices Regulation*, as amended from time to time.

In this management plan, and in future operational planning, the Aleza Lake Research Forest will consider all available information on known culturally significant features and aboriginal traditional use areas, where identified in or (where relevant) adjacent to the ALRF.

In addition, the ALRF will consider information and identified values of the Lheidli T'enneh Nation as it relates to the ALRF landbase.

Should the ALRF by any means become aware of new (i.e., previously unknown) cultural or heritage information or land management issues related to First Nations, the ALRF will inform, and seek guidance from, the District Manager, BC Ministry of Forests Prince George District. The ALRF will respect and conserve First Nations cultural or heritage values accordingly based upon the direction provided by the District Manager.

8.8 Visual Quality

This plan is consistent with the 2004 Visual Landscape Inventory for the Prince George Forest District (including recommended Visual Quality Class and Visual Sensitivity Class).

During the term of this plan, the ALRF will undertake and complete a visual resource inventory and mapping project to identify potential scenic areas and/or visually-sensitive areas from the following ALRF viewpoints and travel routes:

- 1) Areas of the Bowron Slopes unit visible from the main channel of the Bowron River;
- 2) Upper Fraser Road; and
- 3) Kilometres 0 through 4 on the Aleza Lake Forest Service Road (FSR #4311.01).

Interim strategies to protect visual quality in these areas during the term of this plan will include:

- completion of visual impact assessments for proposed forest harvesting and road construction activities prior to such activities taking place; and
- implementation strategies consistent with a partial retention Visual Quality Objective (as per the BC MoF 2001 Visual Quality Assessment Guidebook).

The interim strategies noted will be applied on the following areas:

- a) Bowron Slopes below the Bowron River northern escarpment (670 metre elevation or less);
- b) Areas within 0.5 km and potentially visible (via line of sight) from the above section of the Aleza Lake FSR; and
- c) Locations visible within one kilometre from viewpoints on the Upper Fraser Road.

In general, measures to protect scenic values in areas without known visual quality objectives may include:

- visual screening of harvested areas using on-block mature tree retention and judicious placement of uncut reserves,
- partial cutting (including patch cutting, as defined in this plan),
- modification of block boundaries as required to reduce visual impact; and
- prompt clean-up and revegetation of disturbed areas close to public travel routes.

8.9 Roads and Access Management

Eight decades of forest development and road-building by different forest tenure holders has produced an extensive network of roads and access trails in the ALRF. Only a portion of these are currently usable, or are status roads under active road permits or road use permits. Road use and condition (some are actively used and some are inactive) varies widely on older roads. Many old inactive or non-status roads have reforested or re-vegetated naturally; others have been rehabilitated through prescribed treatments and/or long-term research trials.

The existing ALRF road network, including permanent all-weather gravel roads, winter roads, and temporary cutblock access roads are shown in **Exhibit B**. As well as existing permanent roads, this map includes:

- a) the approximate location of new permanent roads and stream crossings proposed to be constructed under this management plan; and
- b) old roads that are currently known to be overgrown, rehabilitated, or re-vegetated, and therefore effectively impassible.

Exhibit B will guide development of permanent access and road construction during the term of the plan.

Road and access management plays a key role in managing access into and throughout the ALRF. During the term of this management plan, the ALRF will undertake the following actions as the first steps in establishing long-range road and access strategies for the Research Forest:

- 1) Develop a current inventory for all existing roads on the ALRF, and assemble known information including road status, standard of construction, level of deactivation, stream crossings, and other relevant information;
- 2) Develop an action plan for all roads and stream crossings, as appropriate, on road sections for which the ALRF has direct management and maintenance responsibility (including ALRF road use permits, or ALRF road construction or modification authorized by SUP S23615); and

- 3) Continue to undertake a yearly or periodic inspection program for ALRF road sections, including stream crossings, running surfaces, ditches and drainage structures, and related issues, to determine maintenance requirements, maintenance budgets, and actions to be undertaken under the maintenance program.

At minimum, road development standards, stream crossings, road deactivation, and operational management will be consistent with the *Forest and Range Practices Act* and the *Forest Planning and Practices Regulation*, as amended from time to time.

8.10 Wildfire and Prescribed Fire

ALRF management planning practices will be consistent with the *Wildfire Act* and related regulations, as amended from time to time.

8.11 Operational Plans

8.11.1 Site Plans

Before the ALRF implementing a forest practice on the Research Forest, the ALRF will prepare a site plan for the area. Applicable forest practices requiring a site plan, as defined under this management plan, will include:

- 1) timber harvesting;
- 2) ALRF road use or modification not covered by an existing road use permits, by pre-existing SUP amendments, or by road users agreements;
- 3) road construction;
- 4) stream crossing construction or deactivation on fish-bearing streams;
- 5) silviculture treatments greater than one hectare, including grazing for the purposes of brushing;
- 6) commercial collection of botanical forest products (excludes incidental collection of plant samples for research or teaching purposes); and
- 7) prescribed fire use and related control and suppression.

The ALRF may amend or cancel a site plan at any time, and is not required to obtain approval of a site plan or an amendment of a site plan.

The site plan must include:

- a) description of the site;
- b) a map depicting the general location of the forest practice;
- c) identified critical site factors and resource features;
- d) desired treatment results (objectives and measures); and
- e) a description of the treatment to be implemented on the applicable treatment unit, and treatment scheduling (if critical for protection of forest resource values)

Site level plans and any amendments to the plan must be:

- a) Consistent with the management plan;
- b) Consistent with the Special Use Permit, License to Cut, and other statutory requirements; and
- c) Signed by a qualified registered professional.

8.11.1.1 Site Plan Exemptions

Forest practices exempt from site plans under this management plan will include:

- a) minor road maintenance activities including grading, minor surfacing, brush clearing to improve road visibility and user safety, and routine drainage structure maintenance (i.e., activities that will not adversely impact fish-bearing waters);
- b) juvenile non-merchantable spacing, tree-planting, pruning treatments and research trials five hectares or less (excludes grazing and pesticides);
- c) minor forest harvesting and minor salvage operations as described in Section 8.11.2.1 (Exemptions from Forest Operating Plans); and
- d) road deactivation including drainage and sediment control (i.e., water-barring, cross-drains and sediment control) not impacting fish-bearing waters.

Although exempted from site planning, activities listed in b) and c) above will be documented archived by the ALRF.

8.11.2 Research Forest Stewardship Plans (RFSPs)

As noted in previous sections, Special Use Permit (SUP) #S23615 Amendment #3 (dated November 29th, 2004) “eliminates the need for government approval of forest development plans (or forest stewardship plans)”. The SUP amendment specifies that “operational and site plans should still be developed”, and these plans should be “consistent with the intent and direction established in the Management Plan”, and “contain information similar to that required in operational or site plans developed under the *Forest and Range Practices Act*.”

Therefore, for the purpose of the SUP and this Management Plan, a Research Forest Stewardship Plan (RFSP) is defined as an operational plan that is consistent with the intent and direction established in the ALRF Management Plan, and contains information similar to that required in operational plans (e.g., Forest Stewardship Plans [FSPs]) developed under the *Forest and Range Practices Act*. For greater clarity, the RFSP is intermediate between the Management Plan and individual site plans.

RFSPs will be consistent with the management plan, but provide greater detail on the location and implementation of primary forestry activities including timber harvesting, silviculture treatments, and road construction, maintenance, and deactivation.

While information content in the RFSP will be “similar” to that required under FSPs under FRPA, RFSP content will vary from FRPA forest stewardship plans in the following important respects:

- 1) The RFSP does not require government approval;
- 2) Where information, and specified results required for RFSPs are substantially the same as information contained in the ALRF management plan, the latter plan will be referenced directly by the RFSP;
- 3) At the ALRFS’ discretion, RFSPs may be prepared for individual management units in the Research Forest area within which the ALRFS proposes to conduct these activities, rather than the whole ALRF area;
- 4) RFSP maps will show planned timber harvesting, road construction, and road deactivation activities, for a period not exceeding five years; and

Additional information that may be found in an RFSP will include:

- a) New information not included in the current management plan; and
- b) If applicable, a consultation report containing:
 - i. A list of the persons or groups that have been provided with information, or given the opportunity to be consulted, regarding the RFSP content;
 - ii. A copy of the written comments received in the course of public consultation regarding the RFSP; and
 - iii. A description of any amendments or modifications to the RFSP made in response to such comments.

Review and comment processes for RFSPs shall be consistent with the *Forest and Range Practices Act* and Section 10 (Public Consultation) of this management plan. The ALRF shall provide opportunity for review and comment of the RFSP, or major amendments to the plan, to persons interested or affected by operations under the RFSP for a period of:

- 1) at least 10 days from the first date of publication, if the plan is to address: i) timber that is dead, infested with pests, or is requested to be harvested to facilitate the removal of dead, infested or damaged timber; and ii) timber that must be harvested expeditiously to prevent the spread of pests or a significant reduction in the economic value of the timber due to a deterioration in the quality of the timber; or
- 2) in any other case, a minimum of 30 days from the first date of publication.

8.11.2.1 Exemptions from Research Forest Stewardship Plans

The ALRF will be exempt from the requirement to prepare RFSPs or site plans, for the following minor harvesting and salvage operations:

- 1) harvesting timber to eliminate a safety hazard;
- 2) harvesting timber to facilitate the collection of seed, leaving an opening not greater than one hectare;
- 3) harvesting timber to facilitate a research or educational purpose, leaving an opening not greater than one hectare or exceeding 500 m³ in total volume;

- 4) removing felled trees from landings and road rights of way; and
- 5) harvesting timber not exceeding a volume of 500 m³ that,
 - a) is in danger of being significantly reduced in value, lost or destroyed by insect infestation, fire, or disease, or
 - b) has been treated or will be treated by the ALRF to facilitate the entrapment or elimination of pests.

8.11.3 Best Available Information

Subject to any requirement to use known information, the most comprehensive and accurate information available to the ALRF will be used when preparing an operational plan or site plan.

When experimenting with innovative, non-conventional and new forest practices for which information on treatment methods, outcomes, or success is relatively limited or non-existent, the ALRF will consider the following:

- a) The best available published information, to the degree that it exists;
- b) Similar information from other biogeoclimatic zones or other regions;
- c) Expert opinion; and
- d) The exercise of professional due diligence and appropriate caution in limiting the areal extent and application of such practices on the ALRF until such time as actual treatment results can be assessed in greater detail and with more certainty.

8.11.4 Notifying and Reporting to Government

Notification and reporting to government by the ALRF will be consistent with agreement holder responsibilities under the *Forest and Range Practices Act* and the *Forest Planning and Practices Regulation*.

Table 10. Summary of Desired Future Forest Conditions for ALRF Management Units

Desired Future Forest Condition	Northern Uplands Unit West Bear Unit	Central Plateau Unit Bowron Slopes Unit	Slaney Unit	(Bowron) Floodplain RNA Central Ravine RNA Rockpiles RNA
	Desired Rate of Harvesting Disturbance (per decade) *, ***	11% per decade (Range: 9–13%)	7% per decade (Range 5–8%)	No target (Small Unit)
Average Rotation Length **	90 years (Range 80–100)	140 years (Range 120–160)	90 years (Range 80–100)	250 years
Minimum Wildlife Tree / Patch Retention Condition (as a % of total area) ****	> 7% (Acceptable range 4–12% for cutblock)	> 14% (Acceptable range 4–24% by cutblock)	Not applicable	Not applicable
Coarse Woody Debris (CWD) Condition (post-harvest)	20 m ³ per ha (Acceptable range 0–40 m ³ per ha)	40 m ³ per ha (Acceptable range 10–100 m ³ per ha)	20 m ³ per ha (Acceptable range 0–40 m ³ per ha)	Not applicable
Median Early Seral Forest Condition (% of Area in Age Classes 0–40 years)	40%	30%	No target (Small Unit by area)	0–6%
Maximum Early Seral Forest Condition (% of Area in Age Classes 0–40 years)	60%	40%	No target (Small Unit by area)	12%

* Management zone targets expressed above will be monitored at the management unit level (i.e. – integrated at a landscape scale), for the management units listed above.

** Average cutting cycles for unevenaged management (where applicable) will be assumed to be 25–33% of the stated rotation length.

*** Each hectare of clearcut harvesting or similar low-retention harvest prescriptions (e.g. – clearcut with reserves) will contribute one hectare of Equivalent Clearcut Area (ECA). However, ECA for partial-cut silvicultural systems including patch cuts will be estimated on a pro-rated basis by area, based on volume removal expressed as a percentage of the pre-harvest cruised volume removed from a cutblock. For example, a 10 hectare cutblock with 40% partial cut volume removal will have an ECA of four hectares. Wildlife tree patches will be included in this determination.

**** Target mean percentage of WTP / Reserves is an average for the management unit. On a cutblock-by-cutblock basis, the range may vary as specified. In certain cases, the ALRF may designate WTPs or Reserves independent of cutblock location, to protect unique or unusual local ecosystems, or smaller-scale ecological characteristics in an area.

9.0 Licensee Commitments

The Aleza Lake Research Forest Society (“the permittee”) undertakes the following commitments during the term of this plan:

- 1) Systematic re-inventory and re-assessment of (a) existing forest cover classification, and (b) biogeoclimatic site series mapping in the West Bear and Central Plateau Management Units (approximately 2,500 hectares total). Standards will be determined in consultation with applicable agencies (e.g., Ministry of Agriculture and Lands, Integrated Land Management Bureau or successor agency);
- 2) Based on current forest inventory data up to July 1st, 2006, a new timber supply analysis will be completed for the entire ALRF and submitted to the District Manager, Prince George Forest District, by December 15th, 2007;
- 3) Develop and implement an ongoing inventory and monitoring of wildlife species and habitats;
- 4) Completion of a reconnaissance-level fish stream inventory and stream reach classification on Hansard (Camp) Creek and its main tributaries;
- 5) Completion and ongoing maintenance of at least five kilometers of walking and interpretive trails in the Northern Uplands Management Unit;
- 6) Maintenance and enhancement of the existing Research and Demonstration Project Inventory and Database for the ALRF, in consultation with other BC university research forests. This will include ongoing documentation and archiving of information related to historical research projects and project locations in the ALRF;
- 7) Development of an administrative protocol and ALRF forest practice standard for research and experimental studies in streams, riparian areas, and aquatic habitats, in consultation with applicable ministries and universities. In particular, this protocol will address research or experimental situations in which substantial variances from normal operational practices or statutory minimums are desired;
- 8) Completion of an interim implementation strategy regarding conservation and management of old forest and interior old forest in the ALRF;
- 9) Visual quality inventory for selected areas of the forest as outlined in Section 8.8; and
- 10) Actions for road and access management on the ALRF, as outlined in Section 8.9.

10.0 Public Consultation

The Research Forest will undertake mandatory review of ALRF plans (as specified below) based on the following principles:

- 1) For management plans, timber supply analyses, and major amendments, a notice will be published in a local newspaper for a 60 day public review and comment period;
- 2) For management plans, a notice and document copy will be provided to licensed tenure holders (i.e., licensed trapline holders and guide outfitter) within the SUP area for a 60 day review and comment period;
- 3) Copies of ALRF management plans and major amendments will be provided to the BC Ministry of Forests for the purpose of government-to-First Nations referral and consultation;
- 4) For Research Forest Stewardship plans,
 - a. a notice will be published in a local newspaper for public review and comment, for a period consistent with Section 8.11.2; and
 - b. a notice and document copy will be provided to licensed tenure holders (i.e., licensed trapline holders and guide outfitter) in the SUP area for review and comment, for a period consistent with Section 8.11.2.
- 5) Consistent with the public consultation time periods described above, a notice of opportunity for review and comment of all plans will be provided to the University of Northern BC and University of BC research communities, including active ALRF researchers.

ALRF activities and programs may potentially be of interest to a wide variety of groups in the local community and elsewhere. The ALRF will endeavor to make information available about the Research Forest including: research and education activities, programs, and opportunities; implementation strategies; and monitoring activities.

The following target groups were identified as having an interest in information on Aleza Lake Research Forest activities (this list is not exclusive of other interest groups that may be identified during the term of this plan):

Government Agencies (or successor agencies)

BC Ministry of Forests, Prince George District
 BC Ministry of Environment
 BC Ministry of Agriculture and Lands, Integrated Land Management Bureau

Research & Education Community

UNBC Faculty of Natural Resources and Environmental Studies
 UBC Faculty of Forestry Advisory Committee
 Other faculties within UNBC and UBC
 Active ALRF Researchers
 BC Ministry of Forests, Northern Interior Forest Region

First Nations

Lheidli T'enneh Nation

Local Resource Users

Guide outfitter

Trappers

Neighbouring land owners

Local communities/municipalities

Forest industry

General public

The ALRF will provide the opportunity to meet with, at least annually:

- the BC Ministry of Forests, District Manager (or designate);
- the local research community;
- First Nations;
- Licensed tenure-holders in the SUP area; and
- the general public.

Additional methods for information sharing and discussion may include:

- Website (<http://alrf.unbc.ca>)
- Email
- Newsletters
- Field tours
- Meetings
- Presentations

11.0 Amendments to the Management Plan

At its discretion, the Board of Directors of the Aleza Lake Research Forest Society, in consultation with the BC Ministry of Forests' District Manager (Prince George Forest District), may direct that a major amendment to the current management plan be prepared. In general, amendments to the management plan will be considered only when substantial changes to the strategic direction of the plan are deemed necessary.

Amendments to a current plan may be needed on occasion, to address, for example:

- a) major changes in land tenure, area, legal status, or administration; and/or,
- b) catastrophic events unforeseen during the initial preparation and approval of the plan (e.g., large forest fires, wind damage, insect epidemics), which will prevent, or greatly hinder, effective implementation of the current plan.

11.1 Amendment Types

11.1.1 Mandatory MP Amendments

- 1) If the District Manager, ALRFS or ALRF Manager reaches the conclusion that a forest practice conducted by the ALRFS is unlikely to ensure that the objectives of the management plan will be achieved over time, the ALRFS will:
 - a) modify the forest practice; and
 - b) if an amendment to the management plan is required, submit the amendment to the District Manager for approval.
- 2) If the ALRFS or ALRF Manager submits an amendment to the district manager in 1(b) above, the ALRFS will not carry out the forest practices referred to above, in any parts of the Aleza Lake Research Forest that would be materially affected by the amendment until the amendment is approved.
- 3) The District Manager may relieve the ALRFS or ALRF Manager from the above requirements

11.1.2 Optional MP Amendments

The ALRFS or ALRF Manager may submit to the District Manager for approval an amendment to this plan.

11.2 Periodic Management Plan Review

As directed by the District Manager, or as requested by the ALRFS and agreed to by the District Manager, the ALRF Manager and the District Manager will each review the management plan to determine whether the plan should be amended as a result of one or more of the following:

- a) substantial natural disturbance, infestation, or other natural destruction of forest resources in the ALRF area;
- b) information developed in the course of research and experiments pertaining to ecosystem or forest management applicable to the forest types and resources found in the ALRF area;
- c) changes in the district manager's or government's social, economic, and environmental objectives that are reasonably likely to affect the ALRFS' ability to manage forest resources in the ALRF area, to achieve the objectives of the plan;
- d) activities conducted or planned in the ALRF area by the government, or other tenure holders or permits, licences, leases, agreements, or other tenures issued by the government which are reasonably likely to affect the ALRFS' ability to manage the ALRF area to achieve the objectives or criteria specified in the plan;
- e) public comment received in the course of referrals and public review of forest practices in the ALRF area, as described in Section 10; and/or
- f) other events or matters that both the District Manager and the ALRFS believe warrant changes to the plan.

11.3 Term of Management Plan and Replacement

This management plan commences on the effective date specified by the District Manager. Should the District Manager not specify an effective date in the notice of approval of the plan, the default effective date shall be assumed to be the date of notice of the District Manager's approval of the plan.

The plan commences on the effective date and remains in force until the earlier of:

- a) five years from the effective date,
- b) approval of a replacement management plan,
- c) termination of the management plan by the District Manager, or
- d) termination of the management plan by the ALRFS Board of Directors.

The ALRFS may submit, for approval by the District Manager, a replacement management plan on or before the fifth anniversary of the term of the current management plan.

12.0 References and Literature Cited

- Anonymous. 1997. Recommended Prince George Land and Resource Management Plan. Draft #2. Prince George LRMP Working Table, Prince George, BC.
- Barr, P.M. 1924. Report of preliminary investigations. Northern Interior Forest Experiment Station. Dept. of Lands, Forest Branch, Victoria, BC. Unpublished.
- Barr, P.M. 1928. The Aleza Lake Forest Experiment Station: its development and purpose. Unpublished mimeo. Research Division, British Columbia Forest Service, Victoria, BC.
- BC Ministry of Forests, 1995. Biodiversity Guidebook.
Available at: <http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/biodiv/biotoc.htm>
- BC Parks, 2003. Aleza Lake Ecological Reserve: Purpose Statement. British Columbia Ministry of Water, Lands, and Air Protection. Environmental Stewardship Division. BC Parks.
Available at: http://wlapwww.gov.bc.ca/bcparks/planning/mgmtplns/aleza/aleza_ps.pdf
- BC Treaty Commission, 2003. Lheidli T'enneh Treaty Negotiations Summary of Agreement in Principle. Available at: http://www.bctreaty.net/nations_2/agreements/Lheidli%20T%27enneh%20AIP%20Summary%20May%202003.pdf
- Campbell, J. and A. Fredeen. 2005. Arboreal lichen diversity and abundance at Aleza Lake Research Forest: Effect of host tree species and soil type. Unpublished ALRFS seed grant report.
- Cole, D.M., 1985. Acceptable silvicultural systems in relation to desired stand character and successional roles of lodgepole pine. In: Integrating management strategies for the mountain pine beetle with multiple resource management of lodgepole pine forests. McGregor and Cole (eds) US Dept. Agric., US Forest Service General Tech. Publ. INT-174. pp.45-56.
- Dawson, A.B. 1989. Soils of the Prince George - McLeod Lake Area. Report # 23. British Columbia Soil Survey. Ministry of Environment Tech. Report # 29. BC Ministry of Environment and Ministry of Agriculture and Fisheries, Victoria, BC.
- Decie, T. 1957. Working Plan for the Forest Experiment Station Aleza Lake: For the period April 1st, 1957 to March 31st, 1967. BC Forest Service. Prince George, BC.
- DeGrace, L. 1949. A preliminary working plan for the Aleza Lake Experimental Forest. BC Forest Service. Prince George Forest District. Unpublished.
- DeLong, C. 2003. A field guide for site identification and interpretation for the southeast portion of the Prince George Forest Region. Research Branch, B.C. Ministry of Forests, Victoria, BC Land Management Handbook No. 51.
- Dewhurst, S.D., M.K. Karjala, and D. Beckett. 2005. A preliminary timber supply analysis for the Aleza Lake Research Forest. Unpublished report prepared for the Aleza Lake Research Forest Society.
- Environmental Dynamics, 2002. Environmental Management Plan: Proposed crossing upgrade at km 8.3 on the Aleza Forest Service Road (Aleza Lake Research Forest) Prince George Forest District. Unpublished report prepared for the Aleza Lake Research Forest Society.
- Farnden, C. 1996. Stand density management diagrams for lodgepole pine, white spruce and interior Douglas-fir. Information Report BC-X-360. Pacific and Yukon Region, Canadian Forest Service, Pacific Forestry Centre, Victoria, BC. 37 pp.

- Farnden, C. 1998. Recommendations for future harvesting and research on the 1946-1963 single tree selection sales at the Aleza Lake Research Forest. Unpublished report submitted to BC Ministry of Forests, Prince George Forest Region and the Aleza Lake Steering Committee.
- Farnden, C. 2003. Data sources suitable for timber, biomass and carbon modeling on the Aleza Lake Research Forest. Unpublished report prepared for the Aleza Lake Research Forest Society.
- Holland, S. S. 1976. Landforms of British Columbia. A Physiographic Outline. Bulletin 48, British Columbia Department of Mines and Petroleum Resources. Victoria, BC. 138 pp.
- Jull, M. 1992. Aleza Lake Research Forest Management Plan #1. Unpublished document prepared for the Aleza Lake Research Forest Steering Committee.
- Lance, A. and M. Phinney. 2001. Bird responses to partial retention timber harvesting in central interior of British Columbia. *For. Ecol. Mgmt.* 142: 267-280.
- Lewis, K.J., and B.S. Lindgren. 2002. Relationship between spruce beetle and tomentosus root disease: two natural disturbance agents of spruce. *Can. J. For. Res.* 32: 31-37.
- Lewis, K.J., and B.S. Lindgren. 1999. Influence of decay fungi on species composition and size class structure in mature *Picea glauca X engelmannii* and *Abies lasiocarpa* in sub-boreal forests of central British Columbia. *For. Ecol. Mgmt.* 123(2-3): 135-143.
- MacKinnon, A., J. Pojar and R. Coupe, eds. 1992. Plants of Northern British Columbia. Lone Pine Publishing, Edmonton, Alberta.
- McKenzie, S. 2000. Fraser River White Sturgeon Monitoring Program: Comprehensive report (1995-1999). RL&L Environmental Services Ltd. Prepared for BC Fisheries, BC Ministry of Environment. December 2000. 108 pp.
Available at: http://wlapwww.gov.bc.ca/wld/documents/fisheriesrpts/rl_l_white_sturgeon/rl_summary_1995_1999.pdf
- Meidinger, D. 1988. Recommended vernacular names for common plants of British Columbia. Research Report. Internal Reports of the Ministry of Forests and Lands Research Program. Research Branch, BC Ministry of Forests. Victoria, BC.
- Newbery, J.E., K.J. Lewis, and M.B. Walters. 2004. Estimating time since death of *Picea glauca X engelmannii* and *Abies lasiocarpa* in wet cool sub-boreal spruce forest in east-central British Columbia. *Can. J. For. Res.*
- Oikos Ecological Services Ltd. 1995. Forest Ecosystem/Terrain Mapping Aleza Lake Research Forest Prince George Forest Region 1993-1995. Contract report for the Forest Sciences Section, Prince George Forest Region, BC Ministry of Forests, Prince George, BC.
- Oliver, C.D. and B.D. Larson. 1990. Forest stand dynamics. First edition. McGraw-Hill Inc. New York, NY. 500 pp.
- Perry, D.A., R.A. Meurisse, B. Thomas, R. Miller, J. Means, C.R. Perry and R.F. Powers (eds.). 1989. Maintaining the long-term productivity of Pacific Northwest forest ecosystems. Timber Press, Portland, OR. 256 pp.
- Powers, R.F. and K. Van Cleve. 1991. Long-term ecological research in temperate and boreal forest ecosystems. *Agron. J.* 83:11-24.
- Province of British Columbia. 1995. Biodiversity guidebook. Forest Practices Code of British Columbia. BC Ministry of Environment, Lands and Parks, and BC Ministry of Forests, Government of British Columbia. Victoria, BC,
- Sagar, R.M. 1993. Aleza Lake, British Columbia AES Climate Station Data 1952-1980 Data Summary and Users Guide. Unpublished report, R.M. Sagar Consulting Ltd. for the Forest Sciences Section, Prince George Forest Region, BC. BC Ministry of Forests, Prince George, BC.

- Smith, D.M. 1986. The practice of silviculture. 8th Edition. John Wiley and Sons. New York.
- Spilsbury, R.H. 1954. Some notes for guidance in the drafting of a comprehensive working plan for the Aleza Lake Experiment Station. Research Division, BC Forest Service, Victoria, BC. Unpublished Mimeo. 6 pp.
- Stathers, R.J., T.P. Rollerson and S.J. Mitchell. 1994. Windthrow handbook of British Columbia Forests. Research Branch Working Paper 9401, BC Ministry of Forests, Victoria, BC.
- Struik, L.C. 1989. Regional geology of the McLeod Lake map area, British Columbia. In: Current Research, Part E, Geological Survey of Canada, Paper 89-1E, p. 109-114.
- Struik, L.C. and E.A. Fuller. 1988. Preliminary report on the geology of the McLeod Lake area, British Columbia. In: Current Research, Part E, Geological Survey of Canada, Paper 88IE, p. 39-42.
- Struik, L.C., E. A. Fuller and T.E. Lynch. 1990. Geology of Prince George (east half) Map Area 93G/E, Open File. Scale 1:250,000. Geological Survey of Canada.
- Tipper, H.W. 1971. Glacial geomorphology and Pleistocene history of central British Columbia. Geological Survey of Canada, Bulletin 196. 89 pp.

Appendix 1

Land and Resource Management Plan (LRMP): *Management Objectives and Recommended Strategies*

LRMP Management Objective	Recommended LRMP Strategies
Manage marten habitat to provide opportunity for population levels to be maintained	<ul style="list-style-type: none"> • In areas of high suitability marten habitat, managed dead and downed woody material and wildlife tree retention in harvested areas to maintain habitat (denning, hunting) for marten
Manage moose habitat to provide opportunity for population levels to increase	<ul style="list-style-type: none"> • Provide an effective forested buffer around all known areas of critical habitat for moose • Avoid construction of permanent roads in riparian habitats, except where alternate road location results in higher environmental risks/impact (e.g., unstable soils, critical habitat areas) or where terrain precludes other road location • Minimize the length and duration of non-permanent roads in riparian habitat • Use existing stream crossings and discourage new crossings • Avoid brush control in riparian habitat and areas of critical winter range. Establish or maintain connectivity between riparian complexes, island remnants of timber and upland areas of mature forest • Maintain the amount and distribution of deciduous forest cover found in unmanaged stands within the RMZ. • Maintain a windfirm riparian management zone along watercourses that meets or exceeds FPC requirements • Minimize the amount of vegetation management in riparian habitat and areas of critical winter range
Permit timber harvesting with silvicultural systems which are compatible with priority/emphasis resource values	<ul style="list-style-type: none"> • Minimize the use of chemicals, such as herbicides and fertilizers in stand management • Consider alternative harvesting practices where silviculturally appropriate, economically viable and environmentally appropriate and while managing for the recreation, water quality, wildlife and visual quality values • Encourage a diversity of silvicultural systems across the landscape in order to maintain natural landscape patterns and stand structure. All options should be considered, including patch cutting, group selection, clear cutting with reserves and conventional clear cutting
Maintain Douglas-fir component	<ul style="list-style-type: none"> • Retain large old Douglas-fir during forestry operations in order to provide structural diversity • Encourage partial cutting systems in Douglas-fir stands, where stand attributes allow • Retain some mature Douglas-fir where they constitute a minor component of the stands and where stand attributes allow • Encourage a component of the regenerated stand to be Douglas-fir where Douglas-fir was a component of the harvested system

Appendix 2

Common and Scientific Names of Common ALRF Plant Species

Plant type	Common Name	Latin Name
Shrubs	Devil's Club	<i>Oplopanax horridus</i>
	thimbleberry	<i>Rubus parviflorus</i>
	black twinberry	<i>Lonicera involucrata</i>
	black huckleberry	<i>Vaccinium membranaceum</i>
	oval leafed-blueberry	<i>Vaccinium ovalifolium</i>
	high-bush cranberry	<i>Viburnum edule</i>
	wild rose	<i>Rosa acicularis</i>
	black currant	<i>Ribes lacustre</i>
	willows	<i>Salix</i> spp.
	elderberry	<i>Sambucus racemosa</i>
	alders	<i>Alnus</i> spp.
Herbs	oak fern	<i>Gynocarpium dryopteris</i>
	lady fern	<i>Athyrium filix -femina</i>
	bunchberry	<i>Cornus canadensis</i>
	rosy twisted-stalk	<i>Streptopus roseus</i>
	one-sided wintergreen	<i>Orthilia secunda</i>
	three-leaved foam flower	<i>Tiarella trifoliata</i>
	sweet-scented galium	<i>Galium triflorum</i>
	queen's cup	<i>Clintonia uniflora</i>
	five-leaved bramble	<i>Rubus pedatus</i>
	common horsetail	<i>Equisetum arvense</i>
	false Solomon's seal	<i>Smilacina racemosa</i>
	spiny wood fern	<i>Dryopteris assimilis</i>
	violets	<i>Viola</i> spp.
wild sasparilla	<i>Aralia nudicaulis</i>	

Appendix 3

Lichen, Moss and Bryophyte Species

Lichens			
<i>Alectoria</i> spp	<i>Cladonia digitata</i>	<i>Melanelia elegantula</i>	<i>Peltigera praetextata</i>
<i>Alectoria sarmentosa</i>	<i>Cladonia ecmocyna</i>	<i>M. exasperatula</i>	<i>Peltigera rufescens</i>
<i>Bryoria</i> spp	<i>Cladonia fimbriata</i>	<i>M. subelegantula</i>	<i>Peltigera</i> sp. nov. #1
<i>Bryoria non-sorediate</i>	<i>Cladonia gracilis turbinata</i>	<i>M. subaurifera</i>	<i>Peltigera</i> sp. nov. #2
<i>Bryoria sorediate</i>	<i>Cladonia norvegica</i>	<i>Mycoblastis sangunarius</i>	<i>Peltigera</i> spp
<i>Cladina arbuscula</i> ssp beringiana	<i>Cladonia ochrochlora</i>	<i>Nephroma bellum</i>	<i>Platismatia glauca</i>
<i>Cladina rangiferina</i>	<i>Cladonia phyllophora</i>	<i>Nephroma helveticum</i>	<i>Pseudocyphellaria anomala</i>
<i>Cladina</i> spp	<i>Cladonia sulphurina</i>	<i>N. isidiosum</i>	<i>T. chlorophylla</i> <i>T. orbata</i>
<i>Cladonia acuminata</i>	<i>Cladonia umbricola</i>	<i>N. parile</i>	<i>Ramalina dilacerata</i>
<i>Cladonia bacilliformis</i>	<i>Hypogymnia austerodes</i>	<i>Parmelia hygrophila</i>	<i>R. thrausta</i>
<i>Cladonia botrytes</i>	<i>H. bitteri</i>	<i>P. sulcata</i>	<i>Stereocaulon tomentosum</i>
<i>Cladonia cariosa</i>	<i>H. occidentalis</i>	<i>Parmeliopsis ambigua</i>	<i>Sticta fuliginosa</i>
<i>Cladonia carneola</i>	<i>H. oroborealis</i>	<i>P. hyperopta</i>	<i>Tuckermannopsis chlorophylla</i>
<i>Cladonia cenotea</i>	<i>H. physodes</i>	<i>Peltigera aphosa</i>	<i>Tuckermannopsis orbata</i>
<i>Cladonia cervicornus</i>	<i>H. rugosa</i>	<i>Peltigera canina</i>	<i>Usnea</i> spp
<i>Cladonia cfr cyanipes</i>	<i>H. tubulosa</i>	<i>Peltigera degenii</i>	<i>Usnea filipendula</i>
<i>Cladonia chlorophaea</i>	<i>H. vitatta</i>	<i>Peltigera extenuata</i>	<i>U. scabrata</i>
<i>Cladonia coniocraea</i>	<i>Lobaria hallii</i>	<i>Peltigera horizontalis</i>	<i>U. chaetophora</i>
<i>Cladonia cornuta</i> var <i>cornuta</i>	<i>L. pulmonaria</i>	<i>Peltigera leucophlebia</i>	<i>U. lapponica</i>
<i>Cladonia crispata</i> <i>crispata</i>	<i>L. scrobiculata</i>	<i>Peltigera membranacea</i>	<i>Vulpicina pinastri</i>
<i>Cladonia deformis</i>			
Mosses			
<i>Aulacomnium androgynum</i>	<i>Campyllum calcareum</i>		<i>Dicranum polysetum</i>
<i>Aulacomnium palustre</i>	<i>Ceratodon purpureus</i>		<i>Dicranum scoparium</i>
<i>Brachythecium</i> spp	<i>Dicranum fuscescens</i>		<i>Dicranum</i> spp
Liverworts			
<i>Anastrophyllum helleranum</i>	<i>Harpanthus flotvianus</i>	<i>Lophozia</i> spp	<i>Pleurozium schreberi</i>
<i>Barbilophozia barbata</i>	<i>Herzogiella seligeri</i>	<i>Marchantia polymorpha</i>	<i>Ptilidium californicum</i>
<i>Barbilophozia</i> spp	<i>Hylocomium splendens</i>	<i>Mnium lycopodioides</i>	<i>Ptilidium pulcherrimum</i>
<i>Blepharostoma trichophyllum</i>	<i>Jamisoniella autumnalis</i>	<i>Mnium spinulosum</i>	<i>Ptilidium</i> spp
<i>Cephalozia</i> spp	<i>Jamisoniella</i> spp	<i>Orthotrichum speciosum</i>	<i>Pohlia nutans</i>
<i>Cephaloziella rubella</i>	<i>Jungermannia</i> spp	<i>Plagiochila porelliodes</i>	<i>Polytrichum juniperinum</i>
<i>Cephaloziella</i> spp	<i>Lescurea stenophylla</i>	<i>Plagiomnium insigne</i>	<i>Ptilium crista-castrensis</i>
<i>Dicranum tauricum</i>	<i>Lophocolea heterophylla</i>	<i>Plagiomnium</i> spp	<i>Rhizomnium nudum</i>
<i>Eurhynchium praelongum</i>	<i>Lophocolea minor</i>	<i>Plagiothecium carvifolium</i>	<i>Rhytidiadelphus triquetrus</i>
<i>Eurhynchium pulchellum</i>	<i>Lophocolea</i> spp	<i>Plagiothecium denticulatum</i>	<i>Sanionia uncinata</i>
<i>Geocalyx graveolens</i>	<i>Lophozia longiflora</i>	<i>Plagiothecium laetum</i>	<i>Tetraphis pellucida</i>
Bryophytes			
			<i>Orithricum</i> spp.

Appendix 4

Species Ranking Definitions

GLOBAL RANK

Rank	Definition
G1	Critically Imperiled – At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2	Imperiled – At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G3	Vulnerable – At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
G4	Apparently Secure – Uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5	Secure – Common; widespread and abundant.
T#	Infraspecific Taxon (trinomial) – The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above for global conservation status ranks. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T-rank cannot imply the subspecies or variety is more abundant than the species as a whole—for example, a G1T2 cannot occur. A vertebrate animal population, such as those listed as distinct population segments under the U.S. Endangered Species Act, may be considered an infraspecific taxon and assigned a T-rank; in such cases a Q is used after the T-rank to denote the taxon's informal taxonomic status.

PROVINCIAL RANK

National (N) and Subnational (S) Conservation Status Ranks

Status	Definition
NX	Presumed Extirpated – Species or community is believed to be extirpated from the nation or state/province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
SX	Possibly Extirpated (Historical) – Species or community occurred historically in the nation or state/province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become NH or SH without such a 20-40 year delay if the only known occurrences in a nation or state/province were destroyed or if it had been extensively and unsuccessfully looked for. The NH or SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.

Status	Definition
NH	Critically Imperiled – Critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.
SH	Imperiled – Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.
N1	Vulnerable – Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
S1	Apparently Secure – Uncommon but not rare; some cause for long-term concern due to declines or other factors.
N2	Secure – Common, widespread, and abundant in the nation or state/province

BC STATUS

RED Extirpated, Endangered, or Threatened in British Columbia.

BLUE At risk, but not Extirpated, Endangered or Threatened.

COSEWIC

Extinct (X) A wildlife species that no longer exists.

Extirpated (XT) A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.

Endangered (E) A wildlife species facing imminent extirpation or extinction.

Threatened (T) A wildlife species likely to become endangered if limiting factors are not reversed.

Special Concern (SC) A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

Data Deficient (DD) A wildlife species for which there is inadequate information to make a direct, or indirect, assessment of its risk of extinction.

Not At Risk (NAR) A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.

Appendix 5

Common and Scientific Names of ALRF Wildlife and Fish Species

Type	Common Name	Latin Name
Mammals	Moose	<i>Alces alces</i>
	Mule deer	<i>Odocoileus hemionus</i>
	Black bear	<i>Ursus americanus</i>
	Grizzly bear	<i>Ursus arctos</i>
	American pine marten	<i>Martes americana</i>
	Snowshoe hare	<i>Lepus americanus</i>
	Fisher	<i>Martes pennanti</i>
	Wolverine	<i>Gulo gulo</i>
	Ermine	<i>Mustela erminea</i>
	Red-backed vole	<i>Clethrionomys gapperi</i>
	Mice	None – multiple species
	Grey wolf	<i>Canis lupus</i>
	Coyote	<i>Canis latrans</i>
Red squirrel	<i>Tamiasciurus hudsonicus</i>	
Birds	Three-toed woodpecker	<i>Picoides tridactylus</i>
	Hairy woodpecker	<i>Picoides villosus</i>
	Pileated woodpecker	<i>Dryocopus pileatus</i>
	Boreal owl	<i>Aegolius funereus</i>
	Great grey owl	<i>Strix nebulosa</i>
	Great horned owl	<i>Bubo virginianus</i>
	Northern goshawk	<i>Accipiter gentiles</i>
	Redtailed hawk	<i>Buteo jamaicensis</i>
	Bald eagle	<i>Haliaeetus leucocephalus</i>
	Osprey	<i>Pandion haliaetus</i>
	Warblers	None – multiple species
	Flycatchers	None – multiple species
	Reptiles & Amphibians	Western boreal toad
Wood frog		<i>Rana sylvatica</i>
Columbia spotted frog		<i>Rana luteiventris</i>
Long-toes salamander		<i>Ambystoma macrodactylum</i>
Garter snake		<i>Thamnophis sirtalis</i>
Fish	Rainbow trout	<i>Oncorhynchus mykiss</i>
	Bull trout	<i>Salvelinus confluentus</i>
	White sturgeon	<i>Acipenser transmontanus</i>
	Brassy minnow	<i>Hybognathus hawkinsoni</i>
	Chinook salmon	<i>Oncorhynchus tshawytscha</i>
	Sockeye salmon	<i>Oncorhynchus nerka</i>
	Dolly varden	<i>Salvelinus malma</i>
	Sucker fish	<i>Catostomus sp.</i>
Northern squawfish	<i>Ptychocheilus oregonensis</i>	

Appendix 6

Bird Species and Habitats in the ALRF Area

Common Name	Latin Name	Habitat
American redstart	<i>Setophaga ruticilla</i>	Mature forest and edges of early seral habitat
Mountain bluebird	<i>Sialia currucoides</i>	Retention patches and edges of early seral habitat
Red-breasted nuthatch	<i>Sitta canadensis</i>	Mature forest and edges of early seral habitat
Red-breasted sapsucker	<i>Sphyrapicus ruber</i>	Mature forest and edges of early seral habitat
Clay-colored sparrow	<i>Spizella pallida</i>	Retention patches and edges of early seral habitat
Chipping sparrow	<i>Spizella passerina</i>	Mature forest and edges of early seral habitat
Calliope hummingbird	<i>Stellula calliope</i>	Retention patches and edges of early seral habitat
Great grey owl	<i>Strix nebulosa</i>	Retention patches and edges of early seral habitat
Tree swallow	<i>Tachycineta bicolor</i>	Retention patches and edges of early seral habitat
Greater yellowlegs	<i>Tringa melanoleuca</i>	Early seral habitat and tree edges
Winter wren	<i>Troglodytes troglodytes</i>	Mature forest and edges of early seral habitat
American robin	<i>Turdus migratorius</i>	Mature forest and edges of early seral habitat
Orange-crowned warbler	<i>Vermivora celata</i>	Retention patches and edges of early seral habitat
Cassin's vireo	<i>Vireo cassinii</i>	Mature forest and edges of early seral habitat
Warbling vireo	<i>Vireo gilvus</i>	Mature forest and edges of early seral habitat
Wilson's warbler	<i>Wilsonia pusilla</i>	Mature forest and edges of early seral habitat
White-throated sparrow	<i>Zonotrichia albicollis</i>	Mature forest and edges of early seral habitat

Appendix 7

ALRF Timber Supply Analysis Scenario Overview

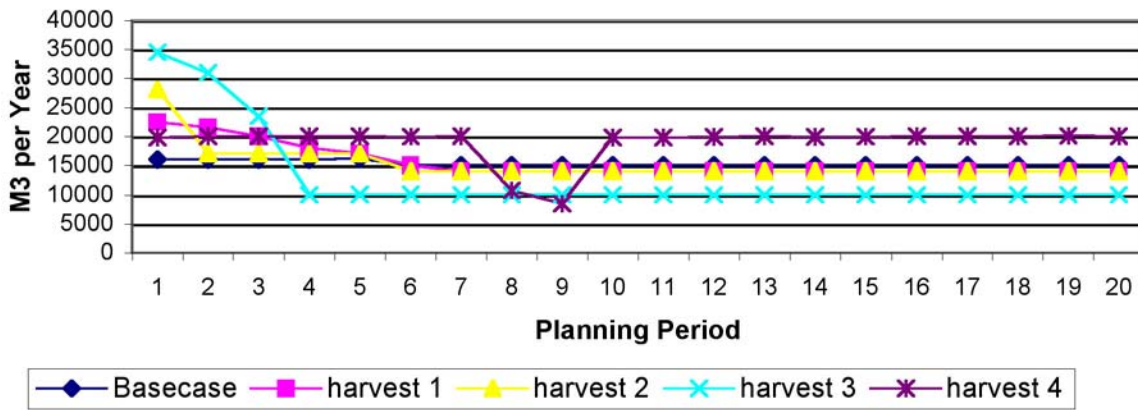
Harvest Scenarios

Harvest Scenarios		Basecase	1	2	3	4
Objective		To maintain a steady long-term harvest level (LTHL)	To maximize near-term volume for as long as possible & decline to LTHL	Maximize timber volume in period 1 and decline to LTHL	Establishing and maintaining a LTHL of 10000 as early as possible	Sustain a LTHL of 20000
Harvest volume summary (m ³ /yr)	Average	15253.25	15498.31	15301.54	12950.08	18894.53
	Median	15000.3	14000	14000.05	10000.2	19946.05
	Maximum	16039.7	22479.5	28001.1	34495.1	20000.4
	Minimum	14999.8	13999.8	14000	10000	8447.28
Old growth summary (%)	Average	29.9	30.4	34.1	25.7	27.6
	Median	28.6	28.1	26.4	24.9	25.8
	Maximum	38.2	38.5	53.5	35.0	35.0
	Minimum	23.1	23.8	22.4	22.4	23.0

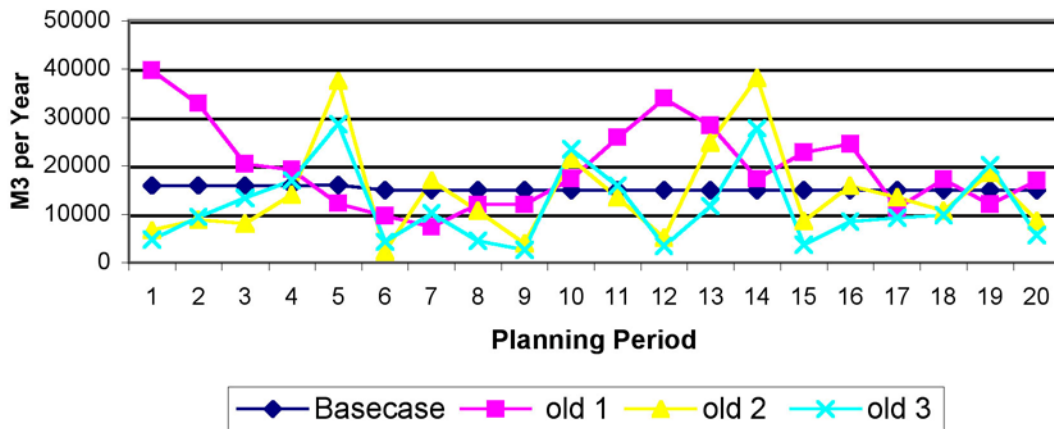
Old Growth (Biodiversity) Scenarios

Old Growth Scenarios		1	2	3
Objective		To limit old growth to 21% of the productive forest area	To maintain existing (35%) levels of old growth	To increase to 50% old growth as soon as possible
Harvest volume summary (m ³ /yr)	Average	19670.15	14411.42	11733.22
	Median	17382.55	12117.25	9660.3
	Maximum	39653.9	38118	28577.9
	Minimum	7403	2309.7	2713.5
Old growth summary (%)	Average	22.8	34.9	40.6
	Median	22.0	35.0	36.9
	Maximum	35.0	35.6	50.1
	Minimum	19.9	33.4	33.5

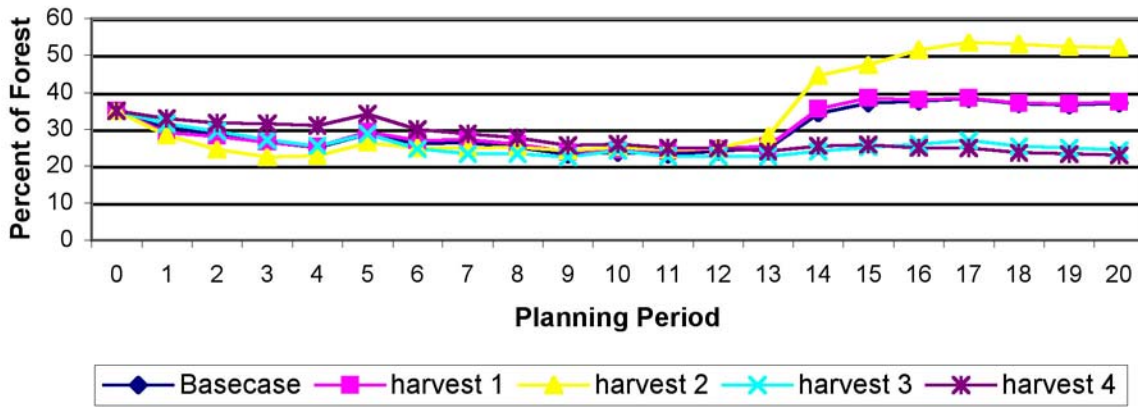
Harvest Volume Base case and harvest scenario results



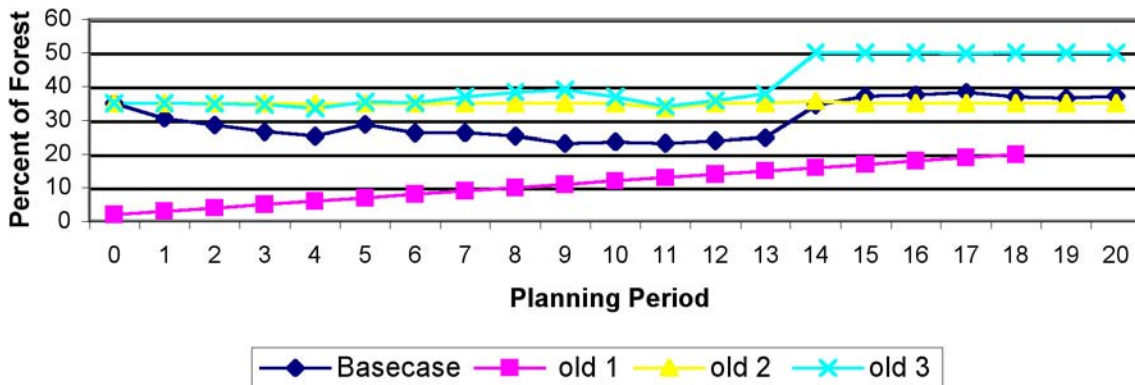
Harvest Volume Base case and old growth scenario results



Percent Old Growth Base case and harvest scenario results



Percent Old Growth Base case and old growth scenario results



Appendix 8

ALRF Management Strategies with Regard to Various Forest Damage Agents

Damage Agent	Strategy
Bark Beetles	<ul style="list-style-type: none"> • Prompt detection • Prompt salvage • Plan harvest according to risk of loss • Thorough ground reconnaissance • Thorough cleanup • Deployment of traps and trap trees as necessary • Adherence to district transportation restrictions
<i>Tomentosus</i> Root Rot	<ul style="list-style-type: none"> • Identification of disease centres • Encouraging mixed species stands
Spruce Terminal Weevil (<i>Pissodes strobi</i>)	<ul style="list-style-type: none"> • Establishing spruce in mixed stands or under partial canopy • Limited juvenile spacing or brushing of spruce stands • Encourage moderate over-topping by other species • Limit pruning of spruce stands
Stem Rust (<i>Endocronartium</i> spp.) [lodgepole pine]	<ul style="list-style-type: none"> • Remove at spacing • Avoid pure stands of pine.
Growing Season Frost	<ul style="list-style-type: none"> • Identify frost-prone sites before and after harvest • Plant frost tolerant species in frosty positions • Plant Douglas-fir on upland sites or in frost-sheltered positions
Rodents	<ul style="list-style-type: none"> • Regenerate sites promptly • Avoid peak population cycles for stand tending • Regenerate mixed species
Wind Damage	<ul style="list-style-type: none"> • Consider direction of dominant damaging winds (especially southerly to westerly winds) in design of cutblock and reserve boundaries • Maintain existing stable stand edges and incorporate into operational management strategies • Conduct windthrow hazard and risk ratings for operational plans and silvicultural prescriptions • Conservative harvest removals and opening sizes in partial cuts • Avoid partial cuts on areas of poor rooting and / or high wind exposure

Appendix 9

Silviculture Surveys Planned for the ALRF

Type of Survey	Timing	Objectives
Plantability	Within eight months of harvesting (may include walkthrough)	Assessment of the requirement for site preparation
Stocking Survival	After planting	To determine planted and natural stocking and/or to establish survival baselines
	Six months – one year after planting	To assess the survival and condition of planted seedlings and determine the requirement for fill-plant (informal walk through)
Regeneration	Two years after planting	To assess stocking to compare it to standards (MoF statistical standards)
Brushing	Depends on the site but should be scheduled at least three years before earliest free-to-grow date	To assess requirements for brushing treatments to achieve free growing status
Free-growing	Latest free growing dates as per provincial standards and vary by site series (Generally 10-15 years after harvest)	To determine whether the plantation has met free growing status (MoF standards)

Appendix 10

ALRF Suggested Regeneration Guidelines for Tree Species Selection, Stocking, and Free Growing Status. This table presents suggested guidelines only, and is not a legal standard for ALRF reforestation. Please refer to Sections 8.4.8 and 8.4.9 of ALRF Management Plan #2 for additional detail.

BGC Classification		Regeneration Guide Species			Stocking (i) <i>Well spaced / ha.</i>			Regen Delay (max years)	Free Growing Assessment	Free Growing Min. Height (ii)	
Site Series	Site Series Name	Preferred (p)	Acceptable (a)	Broadleaf Species	Target	MIN pa	MIN p		Latest (years)	Species	Height (m)
1	Sxw - Oak Fern	Fd ₃₂ PI Sx	Bl _{29,32}	Act _b At _a Ep _a	1200	700	600	4	15	PI	2.0
										Fd	1.4
										At, Ep	3.0
02*	PI - Huckleberry - Cladina	Fd PI	Sx		1000	500	400	7	15	PI	1.4
										Others	0.8
3	PI - Huckleberry - Velvet leaved Blueberry	Fd PI	Sx ₂₈	At _b	1200	700	600	7	15	PI	2.0
										Fd	1.4
										Others	1.0
4	SxwFd - Knight Plume	Fd PI Sx ₂₈		At _b	1200	700	600	7	15	PI	2.0
										Fd	1.4
										At	3.0
										Others	1.0
5	Sxw - Huckleberry - Highbush Cranberry	Fd Sx	PI	At _a Ep _a	1200	700	600	7	15	PI	2.0
										Fd	1.4
										Bl, At, Ep	3.0
										Others	1.0
6	Sx - Pink Spirea - Oak Fern	PI Sx ₃₂	Bl _{29,32}	Act _b At _a Ep _a	1200	700	600	4	15	PI	2.0
										Bl, At, Ep	3.0
										Others	1.0
7	Sxw - Twinberry - Oak Fern	Sx ₃₂	Fd _{9,32} Bl _{29,32} PI	Act _b At _a Ep _a	1200	700	600	4	15	PI	2.0
										Bl, At, Ep	3.0
										Others	1.0
8	Sxw - Devil's Club	Sx	PI Bl ₂₉ Fd _{3,9,53}	Act _b At _a Ep _a	1200	700	600	4	15	PI	2.0
										Bl, At, Ep	3.0
										Others	1.0
9	Sxw - Horsetail	Sx _{1,32} PI ₁	Bl _{29,32}	At _a Ep _a	1000	500	400	4	15	PI	1.4
										Bl, At, Ep	3.0
										Others	0.8
10	Sxw - Devil's Club - Lady Fern	Sx _{1,32}	PI ₁ Bl _{29,32}	Act _a	1000	500	400	4	15	PI	1.4
										Others	0.8
11*	SbSxw - Scrub birch - Sedge	PI ₁ Sb Sx _{1,32}			400	200	200	4	15	PI	1.4
										Others	0.8
12	SbPI - Feathermoss	PI	Sb Sx ₃₂	At _b	1200	700	600	7	15	PI	2.0
										Others	1.0

Conifer Tree Species Codes

Act - Black Cottonwood	Fd - Douglas-fir
At - Trembling Aspen	Hw - Western hemlock
Bl - Subalpine fir	PI - Lodgepole pine
Cw - Western redcedar	Sx - Hybrid white spruce or interior spruce
Ep - Paper birch	
Sb - Black spruce	

Cautionary and Restrictive Codes

1 elevated microsites are preferred	29 risk of heavy browsing by moose
3 restricted to sandy or coarse-textured soils	32 limited by growing-season frosts
9 restricted to crest, southerly, or westerly slopes	53 minor component
12 suitable on cold air drainage sites	
23 restricted to trial use	a productive, reliable, and feasible regeneration option
28 limited by moisture deficit	b limited in productivity, reliability and/or feasibility

Exhibits

Aleza Lake Research Forest Map Folio

Exhibit A..... Harvesting History
Exhibit B..... Topography and Road Access
Exhibit C-1 Forest Cover
Exhibit C-2 Leading Species
Exhibit C-3 Age Class
Exhibit D..... Research Sites
Exhibit E..... Management Units and Research Natural Areas
Exhibit F Distribution of Old and Old Interior Forest