Dease-Liard Sustainable Resource Management Plan

November 2004

BRITISH COLUMBIA

Ministry of Sustainable Resource Management

BRITISH COLUMBIA

VANCOUVER 2010

Reference: 38378

Dear Readers:

As Minister of Sustainable Resource Management, I am pleased to confirm approval of the Dease-Liard Sustainable Resource Management Plan (SRMP) as government policy, and convey it to all participating ministries for implementation. The Dease-Liard SRMP contains key management direction for resource development and conservation. Based on this plan, this ministry will establish land use objectives as legal direction to forest and range operations.

This document will assist government agencies by providing landscape-level strategic direction for resource management within the plan area. The Ministry of Sustainable Resource Management will continue to facilitate plan implementation, monitoring, review and amendment.

We recognize and appreciate the dedication and significant efforts of government staff, First Nations and stakeholders in developing this plan. I encourage their continued participation in the plan monitoring and implementation processes.

Yours truly,

George Abbott

George Abbott
Minister

Ministry of Sustainable Resource Management

Office of the Minister

Mailing Address:
PO Box 9054 Stn Prov Govt
Victoria BC V8W 9E2

Location:
Parliament Buildings, Victoria

Order Establishing the Dease-Liard Landscape Unit and Objectives

Order

I. Pursuant to Section 4 (1) of the *Forest Practices Code of British Columbia Act*, the area covered by the Dease-Liard Sustainable Resource Management Plan, as indicated on Map 1 of the plan, is established as the Dease-Liard Landscape Unit.

II. Landscape units established under the "order establishing provincial non-spatial old growth objectives"[1] will, on the effective date of this order, cease to have effect for the area in this new order.

III. Pursuant to Section 4 (2) of the *Forest Practices Code of British Columbia Act,* objectives listed in the following table and contained in the Dease-Liard Sustainable Resource Management Plan are established as landscape unit objectives[2].

IV. Biodiversity emphasis for landscape units and old growth objectives established under the "order establishing provincial non-spatial old growth objectives" will, on the effective date of this order, cease to have effect for the area in this new order.

Section	Subsection	Objectives
3. Biodiversity/Wildlife	3.1.2.1	1
	3.1.2.4	1
	3.2.2.2	1, 2, 3, 4, and 6
	3.2.3.2	1
	3.2.7.2	1
4. Community Use	4.2	1
5. Cultural Heritage Resources	5.2	3, and 4
7. Timber	7.3 Timber Area B	1
8. Visual Quality	8.2	1

V. Transition

Pursuant to Section 10 (1) (d) (ii) of the *Forest Practices Code of British Columbia Act* and Section 16 (2) of the *Forest and Range Practices Act*, forest development plans and/or forest stewardship plans submitted for approval on or following the effective date of this proposed order are to be consistent with the objectives of this order.

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[1] "Order establishing provincial non-spatial old growth objectives" came into effect on June 30, 2004.

[2] For convenience, the use of the symbol ☛ in the Dease-Liard Sustainable Resource Management Plan document indicates that the objective is established as a landscape unit objective under this order.

Order establishing the Dease-Liard Landscape Unit and objectives (cont'd.)

VI. Effective Date of Order

This order takes effect on February 1, 2005.

2004/12/16

Herb Langin, Regional Director **Date**
Northern Interior Region
Minister of Sustainable Resource Management

Foreword

The purpose of the Dease-Liard Sustainable Resource Management Plan (SRMP) is to provide long-term sustainability of jobs, communities and natural resources in the Dease-Liard area. In keeping with the *Governance Principles for Sustainable Resource Management*, the plan provides the following:

- *Certainty*, by providing clear management direction to resource users;
- *Efficiency,* in the allocation, development and use of natural resources, by clarifying the timing and nature of activities that can occur in the area;
- *Flexibility*, by presenting results-based standards that will allow resource users to use their innovation and professional skills in developing implementation strategies;
- *Transparency,* by creating the plan in a spirit of openness of information and in consultation with First Nations, stakeholders, the general public, and government agencies; and
- *Accountability,* by setting measurable objectives and indicators that can be tracked over time.

The Dease-Liard SRMP has been developed in partnership with the Kaska Dena First Nation and consultation with Tahltan and Teslin Tlingit First Nations, key stakeholders, and government agencies. The final plan is intended to provide a balance of social, economic and environmental values that meets the interests of all those who have a concern for the area.

A copy of the Dease-Liard SRMP may be obtained as follows:

- on the Ministry of Sustainable Resource Management (MSRM) website at http://srmwww.gov.bc.ca/ske/srmp/index.htm; or
- upon request from the Ministry of Sustainable Resource Management. Please contact:

  Ministry of Sustainable Resource Management
  Skeena Region
  Box 5000
  Smithers BC V0J 2N0
  Ph: 250-847-7260

Acknowledgements

This plan was completed with the dedicated input of a number of individuals and organizations. We thank everyone who has contributed their time and knowledge to this document including: Kaska Dena First Nation and their representatives Norm McLean and Dave Crampton; Ministry of Forests, Skeena-Stikine Forest District; and Ministry of Water, Land and Air Protection, Skeena Region.

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List of Acronyms Used

AAC	Annual allowable cut
AOA	Archaeological Overview Assessment
ATV	All terrain vehicle
BCTS	British Columbia Timber Sales
BEC	Biogeoclimatic ecosystem classification
BWBS	Boreal Black and White Spruce biogeoclimatic zone
CDC	Conservation Data Centre
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPAWS	Canadian Parks and Wilderness Society
CWD	Coarse woody debris
DFO	Department of Fisheries and Oceans (now Fisheries and Oceans Canada)
DIAND	Department of Indian Affairs and Northern Development
DLAA	Dease-Liard Area Assessment
ECA	Equivalent clearcut area
FPC	Forest Practices Code
FRC	Forest Resources Council
FRPA	Forest and Range Practices Act
FSP	Forest Stewardship Plan
IMA	Interim Measures Agreement
IWMS	Identified wildlife management strategy
LRMP	Land and resource management plan
LWBC	Land and Water British Columbia
MELP	Ministry of Environment, Lands and Parks[1]
MEM	Ministry of Energy and Mines
MKMA	Muskwa-Kechika Management Area
MOF	Ministry of Forests
MOU	Memorandum of Understanding
MSRM	Ministry of Sustainable Resource Management
NDT	Natural disturbance type
NTS	National Topographic System
OGMAs	Old Growth Management Areas
PAS	Protected Areas Strategy
RPAT	Regional protected areas team
SWB	Spruce Willow Birch biogeoclimatic zone
SRMP	Sustainable Resource Management Plan
THLB	Timber harvest land base
TSA	Timber supply area

[1] In June of 2001 the Ministry of Environment, Lands and Parks was replaced by the Ministry of Water, Land and Air Protection and the Ministry of Sustainable Resource Management.

TSB	Timber supply block
TSR	Timber supply review
TUS	Traditional use study
VLI	Visual Landscape Inventory
VQO	Visual quality objective
WLAP	Ministry of Water, Land and Air Protection
WTP	Wildlife tree patch

Glossary

Adaptive management	The rigorous combination of management, research, and monitoring so that credible information is gained and management activities can be modified by experience. Adaptive management acknowledges institutional barriers to change and designs means to overcome them.
Allowable annual cut (AAC)	The rate of timber harvest permitted each year from a specified area of land, usually expressed as cubic metres of wood per year. The chief forester sets AACs for timber supply areas (TSA) and tree farm licences (TFLs) in accordance with Section 7 and/or Section 170 of the *Forest Act*. The district manager sets AACs for woodlot licences.
Archaeological sites	Locations containing or with the potential to contain the physical remains of past human activity. These sites are assessed through archaeological impact assessments.
Biodiversity	The diversity of plants, animals and other living organisms in all their forms and levels of organization, including the diversity of genes, species and ecosystems, as well as the functional processes that link them.
Biogeoclimatic zones (BEC)	A system of ecological classification based primarily on climate, soils, and vegetation that divide the province into large geographic areas with broadly homogeneous climate and similar dominant tree species. Zones are further broken down into subzones (based on characteristic plant communities occurring on zonal sites) and variants (based on climatic variation within a subzone).
Blue-listed species	Sensitive or vulnerable species as identified by WLAP. Blue-listed species are considered to be vulnerable and "at risk" but not yet endangered or threatened. Populations of these species may not be declining but their habitat or other requirements are such that they are sensitive to disturbance.
Coarse filter management	An approach to maintaining biodiversity that involves maintaining a diversity of structures within stands and a diversity of ecosystems across the landscape. The intent is to meet most of the habitat requirements of most of the native species.
Critical habitat	Areas considered to be critically important for sustaining a population and where development may cause an unacceptable decline in the population.
Cultural heritage resources	An object, a site or a location of a traditional societal practice that is of historical, cultural or archaeological significance to the province, a community, or an aboriginal people. Cultural heritage resources include archaeological sites, structural features, heritage landscape features, and traditional use sites.

Ecological reserve	Public land reserved for ecological purposes under the Ecological Reserve Act including areas: (a) suitable for scientific research and educational purposes associated with studies in productivity and other aspects of the natural environment; (b) that are representative examples of natural ecosystems within the province; (c) where rare or endangered native plants or animals in their natural habitat may be preserved; and (d) that contain unique and rare examples of botanical, zoological or geological phenomena.
Ecosystem Based Management	An adaptive approach to managing human activities that seeks to ensure the coexistence of healthy, fully functioning ecosystems and human communities. The intent is to maintain those spatial and temporal characteristics of ecosystems such that component species and ecological processes can be sustained, and human well-being supported and improved.
Fine filter management	An approach to maintaining biodiversity that is directed towards particular habitats or individual species whose habitat requirements are not adequately covered by coarse filter management. These habitats may be critical in some way and the species threatened or endangered.
Habitat suitability	A habitat interpretation that describes the current potential of a habitat to support a species. Habitat potential is reflected by the present habitat condition or successional stages.
Landscape connectivity	A qualitative term describing the degree to which late-successional ecosystems are linked to one another to form an interconnected network. The degree of interconnectedness and the characteristics of the linkages vary in natural landscapes based on topography and natural disturbance regime. Breaking of these linkages may result in fragmentation.
Fragmentation	Occurs when large continuous forest patches are converted into one or more smaller patches surrounded by areas disturbed naturally or by human activities.
Monitoring	Ongoing assessment of how well the goals and objectives of the SRMP are being implemented.
Natural disturbance regime/ process	Describes the timing and nature of naturally-occurring phenomena such as fire, windthrow, landslides, and single tree death that result in changes to ecosystems and landscapes.
Protected area	A designation for areas of land set aside from resource development activities to protect natural heritage, cultural heritage, or recreational values (includes national park, provincial park, and ecological reserve designations).
Red-listed species	Threatened or endangered species identified by WLAP. The taxa on the red list are either extirpated, endangered, threatened or are being considered for such status. Any indigenous taxa (species or sub-

	species) threatened with imminent extinction or extirpation throughout all or a significant portion of its range in British Columbia is endangered. Threatened taxa are those indigenous species or sub-species that are likely to become endangered in British Columbia if conditions are not altered.
Riparian area	Areas of land adjacent to wetlands or bodies of water such as swamps, streams, rivers or lakes including both the area dominated by continuous high moisture content and the adjacent upland vegetation that exerts an influence on it.
Scenic area	Any visually sensitive area of scenic landscape identified through a visual landscape inventory or planning process carried out or approved by a district manager.
Seral (forest or stage)	Sequential stages in the development of plant communities [e.g. from young (or early seral) stage to old stage (or old seral)] that successively occupy a site and replace each other over time.
Stand initiating disturbance	A natural disturbance event, such as wildfire, wind, landslides, and avalanches that significantly alter an ecosystem. In most cases, there is considerable mortality of plant species, some degree of site disturbance and the initiation of successional processes that will form a new plant community with a different structure and likely a different composition than its predecessor.
Sustainable	A state or process that can be maintained indefinitely. The principles of sustainability integrate three closely interlinked elements - the environment, the economy and the social system - into a system that can be maintained in a healthy state indefinitely.
Timber Harvesting Land Base	Crown forested land within the timber supply area that is currently considered feasible and economical for timber harvesting.
Timber Supply Area (TSA)	An integrated resource management unit established in accordance with Section 6 of the *Forest Act*. TSAs were originally defined by an established pattern on wood flow from management units to the primary timber-using industries. They are the primary unit for allowable annual cut determinations. A TSA may be subdivided into a number of Timber Supply Blocks.
Tourism capability	Assesses whether the necessary biophysical features are present to support a given activity.
Two-zone model	Mineral exploration and mining are addressed in SRM Planning through the use of the "two-zone model". This model ensures that mining applications are considered, subject to all applicable low, anywhere but in parks, ecological reserves, protected heritage property or an area under the *Environment and Land Use Act.*
Visual Landscape Inventory (VLI)	An inventory that identifies visible areas that have known or potential scenic value as seen from selected viewpoints, such as towns, parks,

	recreation sites, highway and river corridors.
Visual Quality Objectives (VQO)	A resource management objective established by the district manager or contained in a higher level plan that reflects the desired level of visual quality based on the physical characteristics and social concern for the area. Five categories of VQO are commonly used; preservation, retention; partial retention, modification and maximum modification.
Visually Effective Green-up (Greened-up)	A cutblock that supports a stand of trees that has attained the green-up height specified in a higher level plan for the area, or in the absence of a higher level plan for the area, has attained a height that is 3 m or greater, and if under a silvicultural prescription, meets the stocking requirements of that prescription, or if not under a silviculture prescription, meets the stocking specifications for that biogeoclimatic ecosystem classification specified by the regional manager.
Wildlife tree	A tree or group of trees that are identified in an operational plan to provide present or future wildlife habitat. A wildlife tree is a standing live or dead tree with special characteristics that provide valuable habitat for the conservation or enhancement of wildlife. Characteristics include large diameter and height for the site, current use by wildlife, declining or dead condition, value as a species, valuable location and relative scarcity.

1. Planning Context

1.1 Introduction

The Dease-Liard Sustainable Resource Management Plan (SRMP) has been prepared to address sustainable management of land and resources in the Dease and Liard River drainages in the far north of British Columbia. This area has seen little large-scale resource development activity. For this reason, most of the area remains relatively remote and undeveloped. The SRMP provides an opportunity for proactive planning to provide framework for sustainable economic development of the area.

An important goal for the plan is to provide for a range of economic opportunities in the area while maintaining the integrity of its natural resources. On March 31, 2003, the province and the Kaska signed a renewal Interim Measures Agreement in which they made a commitment to work together to identify forest tenure opportunities for the Kaska Dena in the Mackenzie Forest District and/or Skeena-Stikine Forest District. Following completion of the SRMP, the Minister of the Ministry of Forests (MOF) will have sufficient information to proceed with the apportionment of the timber in the Dease-Liard Timber Supply Block and enable allocation of a forest tenure. Other economic development opportunities (i.e. commercial recreation and tourism) may be identified in the future. Some background work has been done on a tourism/commercial recreation, but due to the lack of resources it was not possible to complete the chapter to the Kaska's and province's standards. This chapter may be added at a later time.

The extensive forests, rivers, lakes and wetlands of the Dease-Liard provide habitat to a diverse array of plants and wildlife. The large predator-prey systems inherent to the northern boreal forests, and their component wildlife species, are key values in this plan and in adjacent plans. This plan recognizes the imperative of conserving important ecological values as well as providing social and economic stability to the people who live in the area.

The Dease-Liard is within the asserted traditional territory of the Kaska Dena, Tahltan and Teslin Tlingit First Nations. The Kaska Dena was a partner in development of the plan and all decisions were made by consensus. Two other First Nations were invited to provide input into the plan. This plan builds on the draft Dease-Liard Area Assessment technical document (DLAA) that was developed between 1999 and 2001.

The DLAA focussed on identifying forestry opportunities within the asserted traditional territory of the Kaska Dena and developing management direction for timber operations in consideration of multiple resource values. The DLAA was developed as a partnership between the Kaska Dena, the former Bulkley/Cassiar Forest District[2] and former Ministry of Environment, Lands and Parks, Skeena Region. The planning process was rolled over into the Dease-Liard SRMP, with expanded plan boundaries, in the fall of 2001. The zones that were developed as part of the DLAA process (Map 15) were considered as a spatial identification of the Kaska values and concerns and were the basis for subsequent zoning and finalization of management direction.

There are a number of reports and other supporting information that went into the development of the Dease-Liard SRMP. A significant portion of this information has been compiled into a separate Dease-Liard SRMP Background Document, which is available on the Ministry of Sustainable Resource Management (MSRM) website at http://srmwww.gov.bc.ca/ske/planning/strategic_planning.html; or upon request from MSRM, Skeena Region.

[2] The Bulkley Cassiar Forest District has been expanded and is now called the Skeena-Stikine Forest District. The Ministry of Environment, Lands and Parks is now the Ministry of Water, Land and Air Protection.

1.1.1 Plan goals

The vision and purpose of the Dease-Liard SRMP is to provide for a wide range of economic opportunities and conserve cultural and environmental resources.

Additional goals are:

- to develop general and/or site specific objectives and strategies to direct timber harvesting operations with the intent of maintaining the range of cultural, environmental and economic values in the plan area;
- to provide greater certainty of development potential of the landbase by proactively reducing and/or preventing conflict on the ground; and
- to promote economic opportunities for sustainable economic development.

This plan was developed within a principle of openness of information. MSRM consulted with First Nations, stakeholders, and government agencies in preparing and finalizing this plan (Appendix B). All information used in the development of the plan is available upon request, except data or information recognized as confidential under the *Freedom of Information and Protection of Privacy Act*. Third party information used in the plan may only be released with the approval of the holder of the information.

1.1.2 Benefits of the plan

The Dease-Liard SRMP has been developed to:

a) Address key ecological values

This plan provides objectives to maintain biodiversity values across the landbase as well as the habitat features important to key wildlife species. These include caribou, moose, mountain ungulates, and grizzly bears.

b) Address key social and cultural values

The plan will be finalized with extensive input from local residents, particularly the communities of the Kaska Dena. Chapters are included on Community Use and Cultural Heritage Resources.

c) Create opportunities for forest development

This plan will provide management direction for forestry activities in consideration of a range of environmental, social and cultural values in consultation with local First Nations, key stakeholders, government agencies and members of the general public. The completed SRMP will provide the Ministry of Forests (MOF) with the information needed to allocate a forest tenure in the area.

d) Provide a made-for-the-Dease-Liard plan that allows flexibility and innovation

The Dease-Liard is remote and undeveloped relative to more southerly portions of the province. The issues and challenges faced in this area are distinct and are not always suited to the policies and direction developed at a provincial scale. The Dease-Liard SRMP has been developed to reflect the distinct situation in the Dease-Liard and builds in flexibility to allow innovative approaches to development in this remote area.

e) Allow additional issues to be addressed as they arise

This version of the Dease-Liard SRMP focuses on timber development and sets management direction to guide forest development balanced with environmental, social and cultural values. Additional chapters on resource-based activities, such as tourism, may be added to the plan at a later date.

1.1.3 Process overview

The Sustainable Resource Management (SRM) Planning process is generally a technical process, not a consensus-based process such as previous Land and Resource Management Plans (LRMP). It has been accomplished in partnership with the Kaska Dena First Nation and accommodates the Kaska Dena interests. The process deferred slightly from the landscape level planning process as recommended by MSRM planning policies due to the following circumstances:

- a LRMP has not been completed for the plan area and consequently, social choice decisions have not been made. Some social decisions have been be made during this process;
- there was no strategic direction to be followed; and
- this process was the continuation of the DLAA process and it built upon that process.

Consistent with provincial direction, establishment of protected areas has not been considered. Areas having significant values that may require protection have been identified and concerns and values for these areas have been documented. While this process looks at resource values in terms of the effect from timber harvesting, other processes may occur at a later date to look at other Crown land uses such as protected areas, tourism, and mining.

The key phases in the planning process are as follow:

Phase 1: Process Initiation

- assemble the planning team
- develop detailed work plan

Phase 1 Milestone: Detailed work plan completed.

Phase 2: Information Gathering

- summarize previous years work
- compile existing inventories

Phase 2 Milestone: Relevant information assembled and accessible to team members.

Phase 3: Plan Development

- review the history and work completed to date
- draft the plan and develop implementation, monitoring and reporting methodology
- obtain Kaska Dena agreement on the proposed draft plan

Phase 3 Milestone: Draft Sustainable Resource Management Plan Completed

Phase 4: Government, Key Stakeholders and First Nations Consultation

- present/provide the draft plan to the key stakeholders, affected First Nations and government agencies for their input
- revise the draft plan as appropriate
- obtain Kaska Dena agreement on the proposed revisions

Phase 4 Milestone: Revised Draft Sustainable Resource Management Plan Completed

Phase 5: Public Review

- implement 60 day public review period

- revise the draft plan as appropriate
- obtain Kaska Dena agreement on the proposed revisions

Phase 5 Milestone: Final Draft Sustainable Resource Management Plan Completed

Phase 6: Plan Approval

- review and approval of the final draft plan by the minister
- filing the order

Phase 6 Milestone: Sustainable Resource Management Plan Approved and Released

Phase 7: Data Warehousing

The primary task of Phase 7 is warehousing of the data sets used for the analysis during plan development.

1.2 Plan area

The Dease-Liard plan area covers approximately 2.4 million hectares within the Dease-Liard Timber Supply Block of the Cassiar Timber Supply Area. It extends from Dease Lake and the upper Turnagain watershed to the Yukon Border and west-to-east, from the Little Rancheria watershed to Tatisno Mountain and Tatisno Creek (Map 1). The majority of the plan area falls within the traditional territory of the Kaska Dena First Nation. There is an overlap with the Tahltan First Nation in the southwest and a small overlap with the traditional territory of the Teslin Tlingit in the west (Map 3). There are three communities within the plan area: Dease Lake, Good Hope Lake, and Lower Post. A town site of Cassiar is located within the plan area. Watson Lake is 20 km north of the plan area, across the Yukon border.

The topography of the area is predominantly rolling terrain incised by the major rivers into shallow valleys in plateau/plain areas and into steep-walled canyons in mountainous areas. The geography includes numerous kettle features, drumlin and esker formations, and frequent small lakes and wetlands filling depressions of glacial origin. Because the area is north of the Arctic divide the rivers drain northeast to the Liard River and into the Mackenzie River system. The climate is continental (relatively dry and cold), with low snow depths relative to more coastal areas.

1.3 Resource values and economic profile

1.3.1 Ecosystems

The Dease-Liard is a boreal ecosystem, lying within the Northern Boreal Mountains Ecoprovince. Boreal forests occur in a broad band across northern Canada, Alaska and Eurasia. The boreal forests in the Dease-Liard are relatively diverse because of the number of bedrock types and the varied terrain, ranging from mountains with tundra to forested floodplains of substantial rivers. The plan area overlaps with two ecoregions, six ecosections and three biogeoclimatic zones (Table 1; Map 2).

Table 1: Biogeoclimatic zones and ecosections in the Dease-Liard SRMP

Ecosystem classification	Zone	Characteristics
Biogeoclimatic Ecosystem Classification (BEC)	Boreal White and Black Spruce (BWBS)	BWBS dk1: Cordilleran variant (250 – 1100 m). Forests are predominantly white spruce, with some component of trembling aspen, lodgepole pine and subalpine fir. Well-developed moss layer. BWBS dk2: northernmost variant (350 – 1200m). Occurs north of the BWBSdk1 to the Yukon border. Forests are lodgepole pine and white spruce with minor components of trembling aspen and black spruce.
	Spruce-Willow-Birch (SWB)	Subalpine zone (600 – 1400m). Lies above the BWBS zone. Near the limit of climatic conditions that support forest growth. Zonal sites: well-developed shrub layer dominated by grey-leaved willow and scrub birch; white spruce dominant. Tall deciduous shrubs in upper elevations.
	Alpine Tundra (AT)	Alpine zone (1000 – 1600m). Lies above the SWB zone. Severe climate. Rock, ice and snow are characteristic. Zonal system: dwarf willow, sedge grass, cryptogram tundra.
Ecoregion Classification a) Liard Basin Ecoregion	Liard Plain Ecosection	Broad, rolling inter-mountain plain. Cold subarctic climate
b) Boreal Mountains and Plateaus Ecoregion	Cassiar Range Ecosection	Broad band of mountains, predominantly granite
	Southern Boreal Plateau	Deeply incised plateaus with extensive rolling alpine and willow-birch.
	Ketchika Mountains Ecosection	High mountains and low, wide valleys in the rainshadow of the Cassiar ranges.
	Stikine Plateau Ecosection	Rolling plateau ranging from lowland to alpine. Relatively dry and cold climate with low snow depths.
	Tuya Range Ecosection	Widespread rolling alpine landscape. Tuyas Little boreal forest due to high elevations.

1.3.2 Communities

The Dease-Liard is sparsely populated. There are only three communities, Lower Post, Good Hope Lake, and Dease Lake, all of which are along major highways. A town site of Cassiar is located within the plan area as well. Watson Lake is just outside the plan area in the Yukon, but is integrally tied to the Dease-Liard. The plan area is not within a regional district; the Regional District of Kitimat-Stikine only extends as far north as Iskut and Telegraph Creek.

Lower Post

Lower Post was originally established as a Hudson's Bay Trading Post in 1887. As the trading post became more permanent, the local population, who were predominantly Kaska, began to settle in the area, first at Lower Post and later in the nearby community of Watson Lake.

Following its establishment as a trading post, Lower Post was supported by a number of transportation improvements which helped link it with more populated areas. Most notable were the construction of a small airstrip in 1925 allowing the town to become the first stop on an air route from Edmonton to Whitehorse, and the construction of a rough road linking it to Watson Lake, which would eventually become part of the Alaska Highway. The construction of the Alaska Highway, during World War II, vastly improved the connection of the community with the outside world.

Today, Lower Post has a fluctuating seasonal population with around 125 year-round residents. The local economy consists mainly of sustenance activities such as hunting, fishing and trapping, and Band services. There are few facilities in Lower Post itself, but the town Watson Lake, which is 20 minutes away by car, has a full range of services including stores, government services, post office and airport. The headquarters for the Kaska Dena Council is located in Lower Post. The Council comprises the Dease River Band Council, Kwadacha Band (Fort Ware) and Daylu Dena Council (formerly the Lower Post First Nation).

Good Hope Lake

The community of Good Hope Lake straddles Highway 37 on the west side of the lake of the same name. Its population is approximately 100. The town is approximately 140 km south of Watson Lake and 120 km north of Dease Lake. According to elders, the community is located on the site of a permanent village that pre-dated European contact at an important node in a network of intensively used trails. Until its closure in 1992, the main source of employment in Good Hope Lake was the Cassiar asbestos mine. The mine closure was very hard on the community. A few band members continue to work for smaller operations that remain in the area and the construction of a highway maintenance camp has also brought some employment opportunities. The Dease River Band Council is based out of Good Hope Lake.

Dease Lake

Dease Lake is located on Highway 37 in the southern end of the plan area. The town is a main supply and service centre for the Stikine region and has a population of around 650. A number of government and other public offices (e.g. school district, highways, and health clinic) and a banking service are located there, as well as recreation facilities (community hall, outdoor and indoor skating rinks, curling arena, and school gym), accommodations, restaurants, service stations and a campground. A large number of residents are employed seasonally.

Cassiar

The first claim on McDame Mountain was staked in fall of 1950 by two prospectors and two equipment operators. Asbestos had been known in the area by white men since 1872 and the local First Nations for centuries. In spring of 1951 began an effort to develop and bring to production the high-grade Cassiar Asbestos Mine.

As the Mine prospered, a modern community evolved with a population approaching 2,000, its own store, school, hospital, churches and recreation facilities. In 1992, when the asbestos mining operation in northern British Columbia closed, the town that played an important socio-economic role in the region was closed too. The Mine's employees and their families were forced to leave.

1.3.3 Historical land and resource use

Aboriginal people have used the Dease-Liard area since time immemorial. Since pre-contact times, the First Nations people have secured food through gathering, trapping, hunting and fishing. In early times, food gathering depended completely on mobility. In late summer, hunters and their families moved into the mountains to hunt goat, sheep, woodland caribou, and marmots. Meat was dried and cached for winter use. Women did the principle collecting of fruits and vegetables. These were mainly berry crops and included soapberry, high- and low-bush cranberry, salmonberry, raspberry, strawberry, currant and blueberry. Vegetables included fern roots and fiddleheads, lily bulbs, birch sap, mushrooms, muskeg apples, wild onions, rose hips and wild rhubarb.

In the late autumn, families gathered at various lakes where they lived for the winter season on fresh fish or dried meat stored in autumn caches. Although game was the preferred food, fish, because of its availability, was the dietary mainstay particularly throughout the winter months. Whitefish, northern pike, trout and grayling were available locally.

The first commercial activity between the First Nations people and European immigrants was through the fur trade. A longstanding trade already existed between the Russian and the Interior Tlingit by the time the Hudson's Bay Company began asserting trade territories in the 1830s. The Hudson's Bay Company established several trading posts throughout the early-to-mid 1800s, leading to the establishment of the communities of Lower Post and Dease Lake. In the 1870s, gold was discovered in the Cassiar District, near the present-day community of Good Hope Lake, causing a small gold rush and bringing more people into the area. The building of the Alaska Highway and creation of air links between Watson Lake and increased the accessibility of the north and, along with it, an increase in the extraction and use of natural resources. This included mineral exploration and development, sport fishing, and commercial big game hunting.

1.3.4 Current Economic Profile

The economy of the Dease-Liard area is based primarily on natural resources and on public administration. While the area has an abundance of natural resources, economic development is hampered by limited infrastructure, the long distance to markets, long cold winters, and a small and scattered resident population. First Nation's administrative offices and government offices are among the largest employers. The other employers are construction, mining, retail and tourism. Guide-outfitting is a significant contributor to the local economy and employment. Guided fishing and hunting provide seasonal employment. Sustenance activities (e.g., fishing, hunting, trapping, and mushroom picking) are an important part of the local economy as well as being integral to the cultural and social fabric of the communities.

The area is rich in resources for mineral exploration and mining. Oil, gas, coal and coalbed methane potential may exist to the west of Dease Lake and within the north-north east lobe of the plan area. The planning area has seen moderate to intensive mineral activity.

Placer gold has been mined primarily from the McDame, Thibert and Dease Creek areas. Placer jade boulders have been extracted from the Provencher and Letain Creek areas, south of the Turnagain River which is at the eastern end of a very rough 'jade road' beginning just south of Dease Lake. The Dease-Liard area provides a high proportion of the jade sold out of Canada. Dease Lake calls itself the "Jade" Capital of the World and nephrite jade has been mined from the area since the 1960s

Slightly to the east of the jade rich area is the Kutcho Creek developed prospect. This property was extensively explored in the 1980's for copper, zinc, silver and gold. Falling metal prices and both a lack of financing and nearby infrastructure contributed to the owners not developing the property after having completed most stages of the Mine Development Review Process (now known as the Environmental Assessment Process).

Two gold mines operated during the 1980's; one several kilometres northwest, the other a few kilometres southeast of Jade City. Respectively, the Taurus (gold) and Cusac (gold, silver) mines closed as prices fell for precious metals (e.g. gold, silver).

Just fifteen kilometres to the west of these gold mines is the Cassiar asbestos mine which produced, as a finished product, 2.7 million tonnes of high quality asbestos fibre during its 46 years of operation[3]. As was the norm during that time, an entire town existed around the remote minesite. With the mine closure in 1992 the entire town was dismantled. This seriously affected the economy of the area and the loss of a 'homesite', a fully serviced town, was a heartache for many. Several years before the closure the mining method had changed from open pit to underground extraction and the company retrained its workers. Unfortunately the underground conditions created very "plastic" slow movement which drove costs up excessively with having to drill and re-drill the same ground. Significant ore resources remain underground. Another resource is the large tailings pile and in 1999 reprocessing began. This employed several people from nearby communities. The plan was to utilize previously discarded lengths of asbestos fibre and eventually extract magnesium from the tailings as well. Unfortunately, an electrical fire at the mill, late in 1999, shut down all production of chrysotile (asbestos) fibre, resulting in a loss of 40 jobs. As a by product of the past asbestos mining, a significant amount of jade rock is being produced each summer from waste at the mine (e.g. 50 tonnes in 1998).

Located in the Tootsie River area, in the northwest corner of the planning area, is the Silvertip property. This silver, lead and zinc rich developed prospect recently entered the Environmental Assessment Process. However, depressed base metal (e.g. zinc, lead, copper) prices will weigh heavily on the ability to develop this property.

Mineral exploration and mining has a long history in the planning area. A significant number of mineral prospects within the plan area have been sufficiently explored to have grade and tonnage resources known at the site. The ability to develop these deposits will depend on successfully completing the Environmental Assessment Process and at the same time encountering favourable metal prices, investor confidence and foremost having sufficient infrastructure available to make it an economically viable project.

The area has high potential for the development of recreation/tourism industry, especially backcountry recreation and tourism due to the extensive areas of wilderness, remote rivers, striking viewscapes, and an abundance of fish and wildlife. The Alaska and Cassiar Highway corridors provide opportunities for front-country tourism facilities such as accommodations, restaurants and gas stations. Tourism in the area is seasonal, with many of the lodges and gas stations closing for the winter months. Boya Lake Provincial Park is an attractive recreational location north of Good Hope Lake. No commercial recreation tenures exist within the park and income is generated through camping fees.
With its diversity and abundant wildlife species and extensive backcountry areas, the Dease-Liard area is considered to have high-quality big game hunting. The guide outfitting industry is dependent on maintaining healthy wildlife populations and the wilderness experience of clients. Game species include Stone's sheep, mountain goat, northern caribou, grizzly and black bear and moose. There are four guide outfitters who have significant portions of their territories in the plan area and three others

[3] Details of the deposit and mining history can be found in the Minfile database record (104P-005) of the Ministry of Energy and Mines.

with only a minor portion in the area. The guide outfitters that have tenures in this area operate on a seasonal basis.

Only the north-eastern portion of the plan area, in the Liard plains, is suitable for forestry. Short operating seasons and long distances to markets have prevented large-scale forest development to date. There are currently no forest tenures in the area. Small amounts of timber are harvested under MOF Timber Sales Program, primarily for local needs around the communities of Dease Lake, Good Hope Lake and Lower Post. There are several portable mills operating intermittently in the area.

Trapping provides seasonal income for a number of First Nations and other residents and is an important part of the local subsistence economy. The number of individual species trapped is influenced by furbearer numbers and market prices. Marten are the most frequently trapped species. Although difficult to quantify, the pursuit of traditional activities such as fishing, hunting, trapping and berry-picking provide an important and continuing contribution to the First Nations economy and culture. These activities are also important to non-aboriginal residents.

1.4 First Nations

Most the plan area lies within the asserted traditional territory of the Kaska Dena First Nation. The Dease-Liard also overlaps the traditional territories of Tahltan and Teslin Tlingit First Nations. Kaska territory extends into the Yukon and Northwest Territories as far north as the Ross River drainage and into the Akie River in Mackenzie Forest District to the south (Map 3). The Kaska Nation includes the Dease River Band Council, Kwadacha Band (Fort Ware) and Daylu Dena Council (formerly the Lower Post First Nation) in British Columbia and Liard First Nation and Ross River Dena Council in the Yukon.

The Kaska Dena Council, Liard First Nation, and Ross River Dena Council are negotiating together at the Kaska Nation treaty negotiation table. Kaska Nation is a transboundary negotiation table, representing the Kaska traditional territories in the Yukon and British Columbia. The Kaska Dena Council is in Stage 4 of the negotiations process (negotiation of an agreement-in-principle). The Liard and Ross River First Nations are in Stage 2 of the process.

In 2003, the Kaska First Nations signed a Bi-lateral Agreement with the Yukon territorial government to establish a partnership in respect of "the management, development and beneficial enjoyment of lands and resources" within the Kaska traditional territory in the Yukon. An outcome of the Bi-lateral Agreement has been the appointment of the Kaska Forest Stewardship Council, with representation by the Kaska Dena, Canada, and the Yukon government. The council will have a prime responsibility in planning and making forest recommendations on public lands within Kaska traditional territory in the southeast Yukon. The British Columbia-based Kaska Dena Council is a member of the Kaska Forest Stewardship Council. The Council is currently developing a framework for regional and sub-regional forest management plans. The Kaska are also negotiating a Forest Management partnership with the Yukon government to manage their traditional territory.

A significant portion of the plan area to the southwest is within the asserted traditional territory of the Tahltan. Tahltan territory extends over the entire Stikine River watershed to the south and there are Tahltan communities in Dease Lake, Telegraph Creek and Iskut. The Tahltan First Nation is based in Telegraph Creek, and the Iskut First Nation is based in Iskut. The Tahltan Nation is not participating in the British Columbia Treaty Negotiation process.

The plan area overlaps a minor portion of the asserted traditional territory of the Teslin Tlingit to the west. The traditional territory of the Teslin Tlingit includes the drainage system of Teslin Lake in northern British Columbia and the southern Yukon (Map 3). All of the Teslin Tlingit reserves and communities are in the Yukon. The Teslin Tlingit Council is in Stage 4 of the British Columbia Treaty

process and is negotiating with a number of other First Nations at the Northern Regional Negotiations table. The Teslin Tlingit have already negotiated agreements on land settlement and self-government with Canada and the Yukon government. These agreements received Royal Assent in July 1994.

1.5 Plan scope

1.5.1 Current policy framework for SRMPs

SRMPs address the range of resource values in a watershed with consideration for both economic interests and environmental stewardship. They are designed to provide "one-stop shopping" for users of Crown lands and resources. Foresters, tourism operators, land agents and other users of Crown land must look to SRMPs to know the kinds of activities that can occur in a particular area and how those activities should be carried out.

Cabinet has approved a set of sustainability principles to guide planning and management of Crown land and resources. These principles fall within the themes of providing certainty in decision-making, shared stewardship, and accountable and responsive government. The Dease-Liard SRMP has been developed to be consistent with the sustainability principles (Appendix A).

This document recognizes the government-to-government relationship that exists between the First Nations and the provincial government. The plan has been developed within the following principles:

- Aboriginal rights will not be unjustifiably infringed upon by resource development activities of the Crown or its licensees;
- the Crown and its licensees have an obligation to consider potentially existing aboriginal rights in decision-making processes that could lead to impacts on those rights; and
- consultation with First Nations will continue to be consistent with provincial policy[4].

1.5.2 Scope of the Plan

The Dease-Liard SRMP was primarily created to direct the management of forestry activities. For this purpose, objectives and strategies have been developed for the sustainable management of a range of resource values in the plan area. These values include wildlife, biodiversity, cultural heritage, visual quality, community use, and timber. The plan may be amended to address additional resource values as new issues arise. The plan does not deal with the establishment of protected areas. The SRMP will not direct exploration and development activities of the mineral and energy sectors (the "two-zone model" applies), but objectives and strategies will be considered during the permitting and approval processes for mineral and energy-related projects (e.g., the environmental impact assessment process). It is outside the scope of the SRMP to deal with the allocation of land and resources. This is addressed through tenuring and permitting processes.

1.5.3 Planning for adjacent areas

There are no pre-existing strategic plans guiding resource management in the Dease-Liard area. There are a number of plans providing strategic direction for areas bordering the Dease-Liard. The SRMP has been developed to be consistent with adjacent management direction, to the extent possible.

The entire northern portion of the plan area, borders the Yukon Territory. In July 2002, the Government of Yukon, Government of Canada and the Kaska Dena signed a memorandum of understanding (MOU) on forest management for the south-eastern Yukon within Kaska territory. As

[4] As outlined in *Provincial Policy for Consultation with First Nations*, October 2002.

part of the MOU, the Yukon Territorial Government and Kaska Dena are commencing a regional forests management plan for the area, which is due to be completed in 2005. The chair of the Kaska Forest Resources Stewardship Council, which oversees the development of the regional forests management plan, has also been involved in the development of the Dease-Liard SRMP, which will help to harmonize the management direction on both sides of the border. In addition, the Council and the Yukon Territorial Government will be provided opportunities to review and comment on the completed SRMP.

Within British Columbia, the Dease-Liard adjoins the Cassiar-Iskut Stikine LRMP to the southwest and the Fort Nelson LRMP to the east and southeast. The Atlin-Taku area is on the western border of the plan area. Development of an Atlin-Taku LRMP is under review.

The Fort Nelson LRMP was approved by Cabinet in 1997. The entire eastern boundary of the Dease-Liard borders the Muskwa-Kechika Management Area (MKMA). Within the MKMA resource development, including roaded development, can proceed while ensuring that the wilderness characteristics and wildlife habitat are maintained. The Muskwa-Kechika Management Area is comprised of a number of resource management zones, three of which are adjacent to the Dease-Liard. The primary management intent in these zones is to maintain wildlife habitat, in particular, wintering areas for caribou and to maintain intact large predator-prey systems integrated with mineral exploration and development. Backcountry recreation in a semi-primitive and primitive setting is also a key value.

The Cassiar Iskut-Stikine LRMP was approved in 2001. Most of the zoning adjacent to the Dease-Liard plan area is for general management direction. There is one protected area at the northern tip of the Tuya drainage. Special management zones, primarily for wildlife values, are located in the McBride drainage (caribou and moose) and the Hottah-Tucho Lakes area (grizzly bears; large predator-prey systems) integrated with commercial timber harvesting and mineral exploration and development.

1.6 Resource use and development activity

The following is affirmed with respect to resource use and development activity in the Dease-Liard SRMP area, outside of protected areas:

Mineral Resources

- Mineral exploration and development, including roaded resource development, is permitted in all zones subject to standard regulatory approval processes and conditions.
- Existing mineral tenure rights are not diminished by the Dease-Liard SRMP.
- New mineral tenures can be staked and recorded on all mineral lands outside of protected areas according to the *Mineral Tenure Act* and Regulations.

Timber harvest

- The Dease-Liard SRMP supports opportunities for timber harvesting for commercial or local use, consistent with objectives, strategies and zoning.

Commercial recreation and tourism

- The Dease-Liard SRMP allows development of facilities and infrastructure for commercial recreation and tourism, consistent with the objectives, strategies and zoning. A tourism chapter may be developed at a later time to provide further direction to commercial recreation and tourism activities and development.

Guide-Outfitting

- Land management activities will be carried out to sustain existing guide-outfitting opportunities.
- Guide-outfitters will be notified about proposed resource developments in a timely manner.
- Industrial proponents and guide-outfitters will be encouraged to work co-operatively to accommodate guide-outfitting values, resource values and resource development operations.

Hunting and fishing

- Hunting and fishing are recognized activities in the SRMP area, within and outside of protected areas.
- Local and resident hunters and fishers will be consulted on planning and management that affects their activities.

Trapping

- Existing trapping tenures are recognized. Trapping and the use of trapline areas is recognized as a way of life and of special year-round significance to First Nations people and local residents.
- Trapline holders will be notified about proposed resource development activities in a timely manner.

Agricultural Resources

- Grazing is considered an appropriate use of Crown land, subject to the terms and conditions identified in approved grazing tenures and range use plans.

Cultural Heritage Resources

- The Kaska Dena First Nation have gathered information on archaeological sites, traditional use areas, and trails. This information was used in their contribution to land use decisions in the planning process.
- Cultural heritage information of traditional, social or spiritual importance is protected from disclosure by the *Freedom of Information and Protection of Privacy Act.*
- Cultural heritage resources will be further protected and managed in accordance with the existing legislation, policies, procedures, agreements, and protocols.

2. Access

The Dease-Liard remains relatively unroaded to date, due to its remoteness, low population and small amount of resource development. Issues may arise related to ecological and cultural heritage resources as previously unroaded areas become roaded through resource development activities.

The SRMP provides objectives and strategies to guide access development and highlights areas of concern. It is the expectation of the SRMP that implementation of access management control for roads that may be developed for timber extraction (within Timber Area A) will be responsibility of the forest tenure holders. If required, WLAP will use their mandate and legislation to implement access management control measures on roads that may be developed for other resource extraction or development (e.g. mining and tourism) outside of Timber area A in cooperation with appropriate agencies. Objectives pertaining to access are not mandatory for the exploration and development of sub-surface resources; however, they will be considered during the permitting and approval processes for mineral and energy-related projects.

The Forest and Range Practices Act and the Mineral Exploration Code provide the framework for access development, such as road layout and construction in a consideration of a range of resource values.

Table 2. Objectives and strategies for access (road and air) related to specific resource values

Section	Objectives	Strategies
2.: Access	1	1.1 and 1.2
3.2.2.2: Management direction for caribou	6 and 7	6.2, 6.3, 6.6 to 6.8, and 7.1
3.2.3.2: Management direction for moose	2	2.1
3.2.4.2: Management direction for mountain goat and Stone's sheep	1and 2	1.1, 1.2, and 2.1 to 2.3
3.2.5.2: Management direction for grizzly bear	2 and 4	2.3, 4.1, and 4.2
3.2.6: Management direction for furbearers	4	4.1
3.2.7.2: Management direction for bull trout	1	1.1
3.2.8.2: Management direction for endangered wildlife	2	2.3
4.2: Management direction for community uses	1	1.1
5.2: Management direction for cultural Heritage	3	3.2

Plan Goals for Access

- To provide adequate access to meet social and economic objectives for the plan area.
- To minimize the impacts of road development and use on wildlife and other ecological values.

Objectives	Strategies
1 To minimize the impact of road development in previously undeveloped areas.	1.1 No permanent access structures (such as bridges) are allowed across the Dease or Liard Rivers. Licensee will submit an access management proposal with their forest stewardship plans when crossing these rivers. 1.2 Do not construct circle routes that connect two or more main road networks.

3. Biodiversity/ Wildlife

3.1 Biodiversity

3.1.1 Overview of ecosystems

3.1.1.1 Types of ecosystems

The Dease-Liard is a boreal ecosystem characterized by a mosaic of mixed conifer-deciduous forests, lakes, river valleys, wetlands, and peat bogs. The dominant tree species are conifers, such as pine, and black and white spruce, that are well-adapted to the long, cold winters, short summers, and thin, acidic soils.

Biogeoclimatic zones and ecosections are shown in Map 2 and summarized in Table 1, Section 1.3.1. At least one-third of the plan area is in the Boreal White and Black Spruce (BWBS) biogeoclimatic zone. This is the largest contiguous area of BWBS in British Columbia west of the Rocky Mountains. It comprises a large rolling plain of lodgepole pine, black spruce, white spruce, and trembling aspen forests with frequent lakes and wetlands, extending up to elevations of 1000-1100 m (DeLong *et al.* 1991). Most of this falls in the Liard variant (BWBSdk2), with a more continental climate. There is a ribbon of the Stikine variant (BWBSdk1) in the upper Dease valley, where the climate is less extreme (Banner *et al.* 1993).

The Spruce-Willow-Birch biogeoclimatic zone occurs at higher elevations than the BWBS, from as low as 900 m up to 1500 m elevation. Forests are predominantly white spruce and subalpine fir, with some lodgepole pine, black spruce and trembling aspen. The landscape also has extensive shrub carr communities, comprised of various willows and scrub birch, both in valley bottoms and on higher slopes (Pojar and Stewart 1991*a*).

Above the SWB, the Alpine Tundra zone covers large portions of the south and west of the plan area. This zone is dominated by a complex of dwarf willows, grasses, sedges, and lichens, but also includes a variety of wet meadow, krummholz and unvegetated areas (Pojar and Stewart 1991*b*).

The periodically flooded habitats in the major valley bottoms (Liard, Dease, Rapid, Turnagain, and Blue) appear to have the highest species richness. This is certainly true for breeding bird communities in the Liard valley (Eckert *et al.* 1997) and probably results from the relatively high productivity and diverse, well-interspersed plant communities of the floodplains. The extensive upland forests and shrub carrs of the BWBS and SWB are less species rich. The fauna includes a number of species associated with arctic ecosystems (and likely northern refugia), such as arctic ground squirrel.

There are 15 red and blue-listed plants or plant communities that potentially occur in the Dease-Liard (Appendix C)[5]. Some of the rare and more unique species occur on relatively uncommon areas such as calcareous bedrock (e.g., calcium rich uplands and the calcium-rich marl lakes of the middle Dease drainage), in the wetlands and bogs, and on open slopes with frequent fire disturbance amid forested areas.

3.1.1.2 Natural disturbance patterns

The Dease-Liard is a fire-dominated landscape. Wild fire is the most prevalent and extensive natural disturbance in the Boreal White and Black Spruce (BWBS). Fires have been shown to occur in whole stands in the BWBSdk, covering very large areas (DeLong 1998, Wong *et al.* 2002). Flooding along

[5] Red-listed species are endangered or threatened with extinction if current threats are not managed for. Blue-listed species are vulnerable because of particular sensitivity to human activities.

major rivers may cause localized stand replacement. A number of other disturbances affect tree growth and individual tree survival, but rarely cause mortality of whole stands. These include endemic woody tissue feeders, such as the spruce bark beetle, defoliators such as the eastern spruce budworm and the forest tent caterpillar, and fungi such as tomentosus root rot (Wong *et al.* 2002). There have been regular outbreaks of spruce budworms in the easternmost part of the plan area in the Liard River valley (Shore and Alfaro 1986).

Wild fire is the dominant and extensive stand-initiating disturbance in the Spruce-Willow-Birch (SWB), but occurs much less frequently than in the BWBS. Gap dynamics play a key role in stand structure in the SWB (Wong *et al.* 2002). The result is a wider distribution of stand ages and fewer even-aged stands.

A 1999 study of fire history patterns in the plan area identified the following characteristics that are important to consider in forest management:

- fires are substantially more frequent in the lower elevations of the plan area (i.e. BWBS compared to SWB or AT), and are more frequent and tend to be larger in the rolling, plateau country of the Liard Plain (BWBSdk2) rather than in the mountain valleys (BWBSdk1 and SWB);
- the plan area includes some large patches of very old boreal forest (>250 years), especially in the Blue River area (Francis *et al.* 1999). These forests are likely structured by gap replacement processes;
- south-facing valley slopes tend to be more frequently disturbed than north-facing slopes (Rogeau 2001);
- fires leave patches of unburnt forest. The median area of unburned "islands" in boreal mixed wood forest has been shown to increase with fire size and the number of unburned islands per 100 hectares tends to be most numerous in fires of 200 to 2000 ha (Eberhart and Woodard 1987).

3.1.2 Management direction for biodiversity

Plan Goal for Biodiversity

- To maintain the natural biodiversity of the Dease-Liard SRMP area, including the full range of functional ecosystems, over time and at all scales.

Biodiversity is addressed using two types of management: coarse and fine-filter. Coarse filter management occurs throughout the landbase and assumes that the habitat needs of most species will be addressed by managing forests in a way that reflects the natural disturbance process for the area. "Fine filter management" addresses the more specialized habitat requirements of species whose needs are not met by the broad-brush coarse filter management. Fine filter management for caribou, grizzly bear, moose, mountain goat, Stone's sheep, furbearers, and bull trout is outlined in Section 3.2: Wildlife.

Management direction for biodiversity is consistent with the principals of ecosystem based management, Kaska Dena values, and caribou habitat requirement, and differs from the recommendations of the *Forest Practices Code Biodiversity Guidebook*. The rationale and analysis method for developing seral targets is provided in Appendix D. Table 3 compares the mean fire return intervals recommended by the *Biodiversity Guidebook* and the intervals used in the plan. The Dease-Liard SRMP will address the following elements of biodiversity: seral stage distribution, retention of old growth forest, landscape connectivity, stand structure, species composition, and patch size.

Table 3. Comparison of mean fire return intervals by biogeoclimatic unit

Ecosystem	Natural disturbance type	SRMP return intervals	Biodiversity Guidebook return intervals
BWBSdk1	3	175	125
BWBSdk2	3	140	100
SWB	2	300	200

3.1.2.1 Seral stage distribution

Table 5 provides targets for maintaining a distribution of seral stages, which are correlated with stand age, within ecosystems across the landbase. This is to ensure that an adequate amount of mature and old forest remains in each bioeoclimatic variant and that there is not an excessive amount of early forest (<40 years). The targets for early and mature plus old seral stages are based on natural seral stage distributions; the targets for old seral stage are based on the recommendations of the *Biodiversity Guidebook* for the high biodiversity emphasis option. This approach was taken to balance environmental and economic values. The following were considerations:

- a need to provide some flexibility in regards to the areas that may be harvested. Only a small percent (approximatelly19 %) of the total Crown forested landbase within BWBS dk1 and dk2 (where harvesting may take place) is available for harvesting. This area is further constrained as a result of management direction that was developed for other resource values such as wildlife and visual;
- a significant amount of mature (100-140 years old) exists within the non-contributing landbase and will grow into old seral within the next 5-20 years; and
- consistency with the caribou management direction (large openings and reduced amount of roads).

For the purposes of biodiversity planning the entire plan area is considered one landscape unit i.e., targets for seral stage representation are to be met for the entire area within a BEC variant.

Targets for old forest representation can be achieved in two ways:

a) by mapping specific areas of old forest retention (called old growth management areas or OGMAs) across the landbase; or
b) by planning the timing and location of forestry activities so that adequate amounts of representative old forest are always present.

Method b) is recommended for the Dease-Liard, despite the establishment of OGMAs being required under current policy. This is because the dispersed and small area of harvestable landbase, and the relatively low rate of harvest makes it possible to plan dynamically to meet old growth targets over time. In addition, the entire target for old forest can be met outside of timber harvesting landbase, so the risk to long-term biodiversity of not spatially establishing OGMAs is low.

The target for mature seral stage can also be met outside of timber harvesting landbase. Appendix G provides the results of the analysis of the current seral stage distribution. A new analysis may be required in the case of catastrophic natural events such as large scale fires to ensure the targets are not exceeded as a result of harvesting operations.

The *Biodiversity Guidebook* suggests that seral stage targets should be set separately for the alluvial sites to ensure that old and mature forests are not disproportionately harvested within these sites. The

targets have been developed for alluvial sites, in the plan area, even though this was considered not to be critical due to the following:

- Most of the alluvial sites fall within the Timber Area B and C (no commercial harvesting);
- Some of the sites, that fall within the Timber Area A (allows commercial timber harvesting), such as parts of Dease, Liard and Highland Rivers have been identified as scenic areas or significant visual areas and have extremely high harvesting constraints in place;
- A small portions of other potential alluvial sites (e.g. along French, Blue and Little Rancheria Rivers) fall within Timber Area A and do not have harvesting constraints except riparian management; however, the targets for these sites can be met from non contributing landbase; and
- Overall, the targets can be met from non contributing landbase.

Objectives	Strategies
☛1 Maintain seral distributions of forests by BEC variant for the entire plan area, consistent with Tables 4, 5 and 6.	1.1 Seral stage targets to be met across the landbase over time i.e., without mapping specific old growth management areas.

Table 4. Seral stage definitions (ages in years[6]) by biogeoclimatic unit (based on the *Biodiversity Guidebook* (1995).

BEC unit	NDT	Age (years)		
		Early	Mature	Old
SWB	2	<40	120 - 250	>250
BWBS dk	3	<40	100 - 140	>140

☛ Indicates that the objective is established as legal objective.

6 The upper age class limits for mature seral stages may be higher (particularly for the SWB and BWBSdk1) than shown here, however, the forest cover inventory uses these age class breakes for forests 140 years old or older, and operational planning will be based on the existing inventory.

Table 5. Target seral stage distribution (% of forested landbase in each BEC unit) derived from Appendix 4 of Ministry of Forests (1995).

BEC variant	MRI	% of forested landbase to be retained		
		Early	Mature + old	Old[7]
SWB	300	< 12	> 67	> 13
BWBS dk1	175	< 20	> 57	> 16
BWBS dk1 alluvial sites	200	<18	>61	>16
BWBS dk2	140	< 25	> 50	> 16
BWBS dk2 alluvial sites	160	<22	>54	>16

In the case of catastrophic events such as wildfires or insect outbreaks, the District Manager may temporarily deviate from the requirements of Table 5 for the BWBS dk2. Allowed deviations are presented in Table 6. For more information refer to Appendix D.

Table 6. Allowable deviations from the seral stage targets set in Table 5

BEC variant	% of forested landbase to be retained		
	Early	Mature + old	Old
BWBS dk2	< 33	> 37	> 16

3.1.2.2 Temporal and spatial distribution of cutblocks

Targets for spatial distribution of cutblocks, also called "patch size distribution", are based on the pattern that would be expected due to natural disturbances such as fire and windthrow. The distribution of patch sizes varies depending on the ecosystem. The assumption is that the wildlife and flora within these ecosystems will be adapted to the landscape pattern and will fare better if these patterns are mimicked.

Table 7 shows the recommended targets for patch size distribution in the BEC zones in the Dease-Liard. Most openings should be in the range of 200 – 1000 ha. Some openings may be very large (see Apendix D). A diversity of silvicultural systems should be applied in these opening aimed at mimicking the remnant structure left by fires.

There are a number of reasons for creating large openings instead of a checkerboard of smaller openings:

- consistency with the principals of ecosystem based management;

[7] Due to inaccuracies in forest cover information, it is difficult to make a meaningful assessment of the age class distribution for the area. There may be more old forest on the landbase than what is shown presently

- predator-prey systems (wolf – moose – caribou; and lynx – snowshoe hare) have evolved to deal with these landscape patterns of habitat change, and may not persist with the same dynamics if the patterns are changed to the patchy small clearcuts recommended in the *Biodiversity Guidebook;*
- there is a benefit to wildlife and fish conservation in reducing the number of new roads built each year. Concentrating logging in some areas allows other large areas to remain completely un-roaded; and
- concentrating harvest in adjacent areas over a number of years results in the economic benefit of reduced road building costs per year.

	Strategies
1 Maintain a distribution of patch sizes within the plan area consistent with Table 7.	1.1 Harvest by amalgamating blocks through a mixture of silviculture techniques. 1.2 Within larger openings, consider increased retention and undertake measures to maintain stand structure that reflects the remnant structure following a fire (see Section 3.1.2.4: Stand Structure/ Wildlife Tree Retention). 1.3 Within alluvial sites, apply openings of <50 ha.

Table 7. Target distribution of patch sizes (harvest units and leave areas)[8] in the plan area[9]

Opening Size (ha)	**% harvested forest area within plan area[10]**
<50	5-10
50 – 100	5-10
>100	80-90

3.1.2.3 Landscape connectivity

Connectivity refers to degree to which the condition of a landscape facilitates or impedes movement. In landscapes where natural disturbances, such as fires, are rare, species are adapted to continuous cover of old and mature forest for movement. In landscapes where wild fires are relatively common, there are many fire-adapted species that require large openings for movement and dispersal. The most useful approach to maintaining connectivity across the landscape for as many organisms as possible is to follow a coarse filter approach to forest management that reflects that natural pattern of change in forest cover over time (as described above in Sections 3.1.2.1 and 3.1.2.2).

For the most part, connectivity is not an issue in the Dease-Liard. This is due to the small amount of harvestable forest, which ensures that large, contiguous areas of old and mature forest will remain across the landbase. In addition, management direction for caribou provides measures to maintain connectivity in high value habitat areas. Connectivity along stream riparian areas is addressed in 3.1.2.7: Riparian Management.

☛ Indicates that the objective is established as legal objective.

8 Patch size refers to a single cutblock or an aggregate of cutblocks.

9 The Dease-Liard SRMP provides policy direction regarding the patch size distribution. Section 64 of the Forest Planning and Practices Regulation under FRPA prevails.

10 Considering that a very small percent of the SWB may be harvested in any given time, the objectives have been set for the plan area for the purpose of simplicity.

3.1.2.4 Stand structure/ wildlife tree retention

While there tends to be limited retention of green patches following the large fires in the plan area, a large number of burnt snags are remnant that contributes to habitat for marten and other furbearers. These snags provide shading, coarse woody debris, denning, and provide entry into snow packs by marten. Snags and coarse woody debris also provide nutrients to the soil, contribute to porosity and aeration, and help to regulate soil density.

Stand structure objectives are met by retaining structure within harvested areas. This is done by:

- retaining unharvested, remnant patches of mature and old forest as Wildlife Tree Patches (WTPs). Wildlife tree retention should, as a first priority, protect trees having important habitat characteristics; and
- retaining other structural elements such as coarse woody debris, advanced regeneration, standing dead trees, and individual live trees across the opening.

Targets have been identified to maintain structural features of forests within harvested areas (Table 8). These targets are based on the *Landscape Unit Planning Guide (1999)*. Section 3.2.2: Caribou outlines additional stand structural requirements specific to caribou habitat.

The need for stand structure within cutblocks, increases as the size of openings increases. This is consistent with studies on boreal mixed wood of northern Alberta, where the size of unburned "islands" increased with fire size (Eberhart and Woodard 1987).

Objectives	Strategies	Management considerations
☛1 Retain unharvested Wildlife Tree Patches (WTPs) in each cutblock for the full rotation as per Table 8[11].	1.1 Where possible, include representation of productive as well as non-productive sites in WTPs.	To the extent possible, include some or all of the following in WTPs: • a mixture of deciduous and coniferous trees • standing dead trees, CWD and root wads • structural characteristics important to wildlife, such as: large nest platforms, hunting perches, bear dens, largest trees on site (height and/or diameter) and/or veterans; and locally important wildlife tree species Harvest block design should take into account the natural configuration of wildfire disturbance events, recognizing

☛ Indicates that the objective is established as legal objective.

[11] For blocks over 60 ha in size, retention within riparian reserve zones and riparian management areas will not contribute towards the WTR retention targets.

Objectives	Strategies	Management considerations
		green timber retention that occurs due to riparian areas, seepage sites, topographic breaks or changes in species composition.
2 Retain remnant structure in harvested openings outside of WTPs, including snag retention and/or promotion, and coarse woody debris.	2.1 Retain coarse woody debris and standing snags in the opening to restore marten habitat as quickly as possible following timber removal activities. 2.2 Increase retention of structure in openings > 60 ha (15-20 % retention) without unduly impacting timber supply. This could be accomplished by: retaining non-merchantable trees, advanced regeneration, non-commercial tree species, etc.	Provide structure for subnivean access for small mammals on cutblocks e.g., by leaving some coarse woody debris, slash piles, or windrows. Locate slash piles or windrows near to wildlife tree patches.

Table 8 Targets for stand structural retention by biogeoclimatic variant (as per Table A 3.1 of the *Landscape Unit Planning Guide, 1999)*

Biogeoclimatic variant	Amount of wildlife tree retention required (as a % of cutblock size)
BWBSdk1 and BWBSdk2	1%
SWB	1%

3.1.2.5 Species composition

Specific strategies have not been developed to address the maintenance of species diversity. Given the extent of non-contributing landbase within the plan area, it is not anticipated that species composition at the landscape level will be an issue. In addition, this is somewhat addressed under the *Forest and Range Practices Act* and guidelines for planting appropriate species. Silviculture guidelines presented by Banner *et al.* (1993) provide the best reference for maintaining appropriate species composition on managed sites.

3.1.2.6 Rare ecosystems

Appendix C summarizes CDC red- and blue-listed plant species and plant communities with the potential to occur in the plan area. Generally, rare plants and plant communities will be identified at the operational scale during forest development planning. Measures are required to protect rare plants or plant communities where these are identified on the landbase. This could include placing rare plants or plant communities within wildlife tree patches.

Objectives	Strategies
1 To conserve rare plant species and ecosystems (listed in the most updated version of the British Columbia CDC) where these are identified at the operational level.	1.1 Where possible, include rare plants and ecosystems in wildlife tree patches, reserves, exclusion areas, or outside of cutblock boundaries.

3.1.2.7 Riparian management

Boreal ecosystems have abundant lakes, streams and wetlands. Boreal lakes are the most numerous of any lake type on earth and occur in very high densities across the north (Schindler, 1998). Wetland ecosystems, including peatlands or muskeg, are also ubiquitous. The numerous wetlands, peat, lakes, streams, and rivers in boreal forests store and filter a large proportion of the world's supply of unfrozen water.

Riparian ecosystems are often highly biodiverse. They provide important connectivity in terms of movement of water, nutrients, plants, and animals, moderate stream temperatures and provide important nutrient and structural inputs into streams. Management of riparian forest is necessary to maintain critical structure and function, including land-to-water influence and connectivity. Riparian areas provide critical habitat to a number of species.

Wetland ecosystems in boreal forests often have little merchantable timber and, so, are not as vulnerable to forestry activities. On the other hand, lowland riparian forests adjacent to creeks, streams, rivers, and lakes are often the most likely area to be logged because these areas have the highest timber volume and quality. Map 8 (timber harvesting landbase) shows that merchantable stands of timber most often occur adjacent to streams and rivers, although economically viable stands are more widespread on the Liard Plains.

Objectives	Strategies	Management considerations
1 Conserve riparian habitat by minimizing disturbance to the structural and functional features of riparian habitat, including critical habitat features.	1.1 Conduct riparian habitat management practices consistent with existing legislation, policy and best management practices outlined in the *Forest Practices Code Riparian Area Management Guidebook (1995)* to all riparian areas, including fish-bearing streams and active flood plains. 1.2 On a site-specific basis and where ecologically appropriate, increase the riparian reserve or management areas to maintain the structure and function of riparian habitat, including: • riparian vegetation and microclimate; • stream temperature; • adequate canopy closure to provide shading and leaf litter input to the	Incorporate local information from the public and First Nations when identifying sensitive aquatic and riparian habitats. Other examples where riparian management might be increased include: • areas of sensitive fish habitat such as streams, including S4, at lake inlets and outlets and spawning and rearing areas; • to provide connectivity within wetland complexes in the boreal forest; • in or directly adjacent to highly sensitive habitat

Objectives	Strategies	Management considerations
	stream; • natural channel morphology and stream bank stability; • sources of large woody debris in streams; and • important habitat attributes such as wildlife trees, coarse woody debris, and nesting sites. 1.3 Avoid gravel extraction from riparian habitat and floodplains unless no other sources of suitable gravel are readily available.	areas such as ungulate winter range and major stream confluences; and • habitat for terrestrial rare and endangered species e.g., northern goshawk. • Fully reclaim riparian habitats when operations are completed. •
2 Locate roads to minimize environmental impacts to riparian habitats, wetlands and wetland complexes, lake-headed streams and rivers and river floodplains.	2.1 Where roads need to be located in or near riparian habitat, take measures to minimize disturbance of riparian values, including: • leave undisturbed sections of riparian habitat on one side of rivers; • where possible, coordinate construction of all infrastructures to use the same right-of-way.	Conduct riparian management consistent with the Section 47 of the Forest Planning and Practices Regulation under FRPA.

3.2 Wildlife

3.2.1 Overview of wildlife values

The Dease-Liard is home to a rich diversity of wildlife species. Species are adapted to the vast expanse of fire-dominated forest, extensive wetlands and waterways, and continental climate.

A substantial number of bird and mammal species in these boreal forests and mountain ranges have large ranges or are migratory. The plan area includes the ranges of two herds of woodland caribou that migrate between lowland winter ranges and subalpine and alpine calving, summer and rutting ranges. Grizzly bears have very large home ranges. Caribou and wolves, along with grizzly bear, black bear, and moose comprise a predator-prey system that occupies the majority of the plan area. The northern boreal forest is also home to a number of fur-bearing predators such as lynx and various members of the weasel family (e.g., wolverine, fisher, pine martin, mink, and ermine). Woodland caribou, grizzly bear, wolverine, fisher are all blue-listed species, as is the northern long-eared myotis bat.

Northern forests are the breeding grounds for a large proportion of Canada's bird population. Valley bottom habitats are particularly important for bird habitat. It is likely that many migratory passerines, waterfowl and shorebirds use the wide valley of the Dease River, with its lakes and wetlands, as a flyway through the northern boreal mountains on their way from coastal wintering areas to their summer ranges in the these mountains, or on the Liard Plain, or further north. There are eight species of red- or blue-listed birds that use the Dease-Liard area for all or part of their life cycle. Most important habitats for rare birds are wetlands, alpine areas, and open, early seral habitats.

All drainages in the plan area are tributary to the Liard River, and therefore part of the Arctic drainage system via the Mackenzie River. The fish fauna includes some species with arctic affinities, such as grayling and round whitefish, as well as others with wider distribution in British Columbia, such as lake char, bull trout, northern pike, and mountain whitefish. Bull trout and dolly varden are blue-listed. Fish are still relatively abundant and of large size in many lakes and rivers in the area.

3.2.2 Caribou

3.2.2.1 Caribou habitat and distribution

The caribou in the Dease-Liard are woodland caribou (*Rangifer tarandus*) of the northern ecotype. There are two herds in the plan area, the Horseranch Herd and the Little Rancheria Herd. These two migratory herds have distinct seasonal alpine ranges but overlapping winter ranges in the lowland boreal forests of the Liard River basin, on both sides of the British Columbia-Yukon border (Maclean, *in prep.*; Florkiewicz et al, *in prep*).

The combined populations of the Little Rancheria and Horseranch herds are estimated at approximately 1800 (Marshall, 1999). Populations are considered to be stable (Marshall, 1999) and the habitats are relatively unfragmented (Maclean, *in prep.;* Florkiewicz et al, *in prep.*). Northern caribou were blue-listed by the CDC in 2002. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has designated the northern caribou found in the Northern Mountains National Ecological Area (which encompasses the entire Dease-Liard) as being of "Special Concern".[12] *Special concern* status is given to species that are particularly sensitive to human activities or natural events but are not currently endangered or threatened (COSEWIC, 2003).

Northern caribou in the Dease-Liard migrate twice a year. The first migration begins in early November when the caribou move down to lower elevation forested habitats. The majority of the herds are on their winter range by January and stay there until April. Winter range consists of lower elevation lodgepole pine-leading stands with high terrestrial lichen cover and glacio-fluvial soils where caribou can dig through shallow snow for ground lichens. These forest types occur in association with black spruce sedge fen bogs or wetlands that provide access to arboreal lichens and mineral overflow on frozen lakes and wetlands. In the spring, herds move to higher elevation alpine habitats for calving, summer, and rut. In the spring, summer and fall, the caribou graze in the subalpine on terrestrial lichens and alpine on grasses, sedges, horsetails, leaves of willow and birch, and a variety of flowering plants.

Winter ranges provide critical habitat, since winters are long and severe and winter food sources are extremely important. The reliance of northern caribou on ground lichens means that snow interception cover is very important; a deep snow pack makes it difficult to access this important winter staple and requires large amounts of much-needed energy. Thermal cover is also important to conserve energy.

Wolves are the principle predator of caribou, although grizzly bears may prey on calves. As moose move into areas opened up by logging or road development, wolves tend to follow, increasing predation on caribou. Roads also result in increased mortality risk due to hunting, particularly where roads bisect winter ranges. The annual harvest rate of caribou in the Little Rancheria Herd is estimated at 5% (Adamczewski et al, *in prep*).

3.2.2.2 Management direction for caribou

Northern caribou depend on a concentration of lodgepole pine, black spruce sedge fen, riparian habitats. Habitats are distributed based on fire history, soil type, and surficial geology. Current

[12] Northern caribou in the Southern Mountains National Ecological Area are designated as "Threatened" by COSEWIC.

concentrations of critical high use winter habitats are indicated on Map 6. Guidelines on management for woodland caribou focus on a landscape approach, considering habitat requirements over large spatial and temporal scales (several forest management units over 80 years or more). Guidelines must also consider the necessity of winter habitat recruitment due to forest senescence or natural disturbance events. Primary considerations in the management of caribou habitat include:

- conserving large, contiguous areas of old forest;
- protection of strategic calving areas; and
- planning primary roads and road corridors to avoid winter habitat.

As part of a long-term study of caribou, moose, and wolves in the Dease-Liard, caribou winter habitats were estimated by examining winter range use by radio-collared individuals (MacLean, *in prep.*). Over 80 individuals were monitored to identify winter range and critical habitats related to forest cover in lieu of fine scale ecological mapping. Caribou winter ranges were mapped between 1996 and 2001. As a result of this project, two types of winter range and migration corridor were mapped for the plan area:

a. *Core Winter Range*: The area of highest density habitat use by caribou by the late winter period (January to April). Use of these areas by caribou is significantly higher than in surrounding areas. Habitat features include (a) concentrations of lower elevation lodgepole pine-leading stands with high terrestrial lichen cover and glaciofluvial soils in association with black spruce sedge fen bogs or wetlands that provide access to arboreal lichens; and (b) mineral overflow on frozen lakes and wetlands. Core areas are the most critical to winter survival and long-term population persistence.

b. *Extended Winter Range*: Extended winter range surrounds and acts as a buffer to the core habitat. These areas are known to be used by caribou in the winter, but less heavily at this time than the core habitat. Attributes of Extended Winter Range are the same as for Core Winter Range however the density of habitat is lower than in the core range and is dispersed over a larger area. Management is required across the Extended Winter Range to ensure movement of caribou from alpine ranges to high value winter habitats.

c. A *Migration Corridor* linking seasonal habitats. Surveys have shown that caribou consistently migrate through the Little Rancheria River and Big Creek drainages to get from their alpine summer ranges to the Yukon and British Columbia portion of their lowland winter range (Adamczewski et al, *in prep*).

Plan Goals for Northern Caribou

- A continuous supply of suitable, mature, year-round habitat distributed both geographically and temporally across the landscape in such manner as to ensure permanent range occupancy.
- Large patches of unfragmented habitats linked to minimize or reduce effects of edge, moose, predators, and roads.

Objectives	Strategies
☛1 Maintain the quality of core caribou winter range habitats by not harvesting timber within the **Core Caribou Winter Range zone** (Map 4) unless required for	1.1 Core Caribou Winter Range zone will be considered for Ungulate Winter Range designation under the *Forest and Range Practices Act.* 1.2 Use low impact forest health management techniques.

Objectives	Strategies
road construction or essential control of insect infestations and diseases.	
□2 Maintain the structural and functional integrity of critical caribou habitats within the **Extended Caribou Winter Range zone**. Harvesting is not acceptable within identified **selected caribou habitats**[13] (Map 4), unless required for road construction or essential control of insects' infestations and diseases, or where it can be proven, on the ground, that the stands are not suitable for caribou (see footnote 12 for the description of stands suitable for caribou).	2.1 Avoid timber harvesting within forest stands that are rich in terrestrial lichens, have lodgepole pine as the leading species and that meet all of the following characteristics: • classified Site Series BWBSdk2/02 or 03; and • open canopied on glaciofluvial soils (includes eskers and river terraces). 2.2 Avoid timber harvesting within any other stands identified, by trained personnel, as caribou habitat during operational planning and activities. 2.3 Use low impact forest health management techniques. 2.4 Extended Caribou Winter Range zone and selected habitats may be considered for Ungulate Winter Range designation under the *Forest and Range Practices Act.*
□3 To maintain the structural and functional integrity of the **Caribou Migration Corridor** linking seasonal ranges (Map 4).	3.1 Maintain a continuum[14] of mature and old forest cover within the mapped Caribou Migration Corridor (Map 4), focusing on retention of forest stands that are rich in terrestrial lichens and have lodgepole pine as the leading species.

☛ Indicates that the objective is established as legal objective.

[13] Selected caribou habitats are areas with the following stand level attributes:

- Alpine and non-productive;
- Forest stands that are aged between 40-80 years or 100-120 years; with crown closure between 25-35% 55-65%; with site index between 10-15; Lodgepole Pine as the leading species; classified site series 02 or 03; rich in terrestrial lichens; between 500-700 m or 1300-1700 m elevation; slopes between 0-4%; and easterly, southerly, southwest, or northwest aspects.

[14] Continuum is defined as a minimum 2 km wide band of contiguous stands across the migration corridor zone. Presently, there is enough old and mature forest outside of THLB to provide the continuum.

Objectives	Strategies
	species.
□4 Minimize forest fragmentation within the Timber Area A (Map 12).	4.1 Concentrate forestry activities by aggregating timber harvesting temporally and spatially (see Section 3.1: Biodiversity). 4.2 Maintain extensive large patches of contiguous, mature forest (see Section 3.1.2.2: Temporal and spatial distribution of cutblocks). 4.3 During the layout of harvest blocks, maintain linkages of mature forest cover[15], between selected habitats within the Extended Caribou Winter Range zone (Map 4).
5 Maintain the quality of potential/historical winter caribou habitats outside of the current known winter distribution of caribou (Core and Extended Caribou Winter Range zones).	5.1 Consider avoiding timber harvesting within forest stands that are rich in terrestrial lichens, have lodgepole pine as the leading species and meet all other characteristics specified in strategy 2.1. If harvesting takes place, ensure that terrestrial lichens are perpetuated in abundance through stand rotation. 5.2 Apply a diversity of silvicultural systems to emulate natural disturbances with respect to landscape patterns and stand structure (see Section 3.1: Biodiversity). 5.3 Provide visual barriers along mainline roads, including Highway 37 to provide cover for migrating caribou. 5.4 Monitor caribou movement and habitat use in a responsive manner that would quickly identify when shifts occur in caribou winter range. Adaptive management is required to accommodate caribou winter range shifts to areas outside of the current caribou core and extended winter ranges (see Appendix E).
□6 Minimize disturbances to caribou related to road development and use within Core and Extended Caribou Winter Range zones and Migration Corridor (Map 4).	6.1 Minimize forestry operations near the core caribou winter range zone between January 1 and April 30. 6.2 Wherever possible, build roads outside of the Core Caribou Winter Range zone. 6.3 Licensees will apply access control measures to new road development in the Core Caribou Winter Range zone from January 1 to April 30. 6.4 Licensees will apply access management control measures to new road development and, whenever possible, avoid resource development within the Caribou Migration Corridor during the following caribou migration seasons: • April 15 to May 31 (spring migration)

[15] Mature forest cover: a stand can meet the mature seral criteria if, after partial cutting, the residual stand volume and stand attributes (see Appendix 5 of the *Biodiversity Guidebook*) are greater than 70% of the natural stand (all original diameter classes are represented in proportion to the average stand profile for the sub-zone and variant).

Objectives	Strategies
	• October 15 to November 30 (fall migration). 6.5 Licensees, WLAP and MOF will work with Yukon agencies to harmonize seasonal operating windows to minimize disturbance to migrating caribou. 6.6 Avoid placing roads on south-facing slopes and eskers. 6.7 Minimize active road density by decommissioning all secondary and/or tertiary roads within mapped winter ranges and migration corridor within one year of completing basic silvicultural requirements. 6.8 If roads are to be in place for multiple years, then their use during the winter months should be discouraged.
7 Minimize linear development in the Dease-Liard plan area.	7.1 Methods for resource development should de-emphasize the need for linear developments; alternate methods are to be used whenever possible.
8 Maintain and enhance caribou habitats by conducting operational research and through the application of various silvicultural systems.	8.1 Forest licensees, WLAP, and MOF to explore funding sources to establish studies of lichen enhancement on harvested sub-mesic site series (Site Series BWBSdk2 01, 04 and 05) by establishing experimental trials around patch harvesting or selection harvesting (opening up the mature forest canopy to create more light and reduce the competitive advantage of feathermosses). 8.2 Forest licensees, WLAP, and MOF to explore funding sources to establish silvicultural trials in these same sub-mesic sites to increase lichen abundance (i.e. reduced stocking densities and increase the patchy distribution of planted trees such that the drier microsites are often free of regeneration).

3.2.3 Moose

3.2.3.1 Moose habitat and distribution

Moose (*Alces alces*) are one of the most widespread and commonly encountered large mammal species in the plan area. They are an important game species and an integral component of large predator-prey systems. In British Columbia, the species is of management concern (yellow-listed) and considered locally widespread, abundant and secure.

Moose occupy most of the plan area in one season or another, but most of the winter range occurs in the valley bottoms or on the Liard Plain. Population surveys in 1997 produced an estimate of 2,023 moose in the plan area (Marshall 1997). The population is considered stable, with a population density similar to other northern boreal moose populations, but lower than provincial benchmark populations.

Moose are associated with riparian habitats, especially floodplains and large wetlands. Generally, areas with a mosaic of habitat types are best for moose, including adequate openings for browse, forested cover for thermal, security and snow interception, and mineral licks. The most critical habitats are winter and calving ranges, since the challenges of winter survival are greatly increased when important

habitat elements are removed or reduced in quality. Moose critical habitat elements include the following:

A) Winter range for moose is a matrix of:

- open canopied mixed coniferous, pine or spruce leading forest stands;
- a mixture of early and mature seral forest classes;
- lakes, wetlands, and riparian features; and
- unique elements such as burns; and
- primarily lower elevations (500-700 m).

B) Calving range for moose is a matrix of:

- open to medium canopied cottonwood-coniferous, pine or spruce leading forest stands;
- a mixture of early and mature seral forest classes;
- lakes, wetlands, and riparian features;
- unique elements such as burns; and
- primarily lower elevations (500-800 m).

Moose in the plan area have two general home range types. Home range is the area used by individuals to fulfill their critical foods and habitats. Home ranges can have seasonal components such as winter or calving. Moose residing in the Liard Basin generally have a non-migratory home range where all of their seasonal habitat requirements are met in one general area. There may be localized shifts in habitat use within the home range, such as female moose moving onto islands in lakes for calving or using homogenous stands with high blowdown and close canopy forest stands. Female moose residing in the more mountainous areas of the plan are more migratory, moving to upper elevation habitats for calving and then to lower forested habitats by winter.

As part of a long-term study of caribou, moose, and wolves in the Dease-Liard, moose winter and calving habitats were examined to identify forest cover attributes associated with areas of highest habitat use (MacLean, *in prep.*). Home ranges were determined for each radio-collared individual over the winter (November 1 – April 15) and calving period (May 1 – June 15). Overall, 73 % of the individuals used core winter home range of 150 km^2 or less[16]. 65% of individuals used extended winter range of 500 km^2 or less. Calving home ranges were similar in size and cumulative frequency as winter home ranges. Moose winter and calving habitats were derived using similar map coverage and techniques as applied to caribou (MacLean, *in prep.*).

3.2.3.2 Management direction for moose

Some of the key factors that affect moose populations as a result of development are:

- decreases in forest cover and landscape connectivity, which can result in loss of snow interception or security cover and increases in the energy required to move through winter snows. Note, that carefully planned logging can have a beneficial effect as an agent of forest renewal, increasing habitat diversity and abundance of forage;
- increases in roads, which can increase direct mortality from vehicular collisions, concentrated hunting efforts, increased predator access, and poaching; and

Management strategies to minimize impacts to moose include:

[16] Adaptive kernels were used to determine home ranges. The kernel provided estimates of areas for core areas and extended home ranges. The mean home range area (and 95% confidence intervals) for core and extended winter home ranges are 135.73 ± 66.37 km^2, and 808.29 ± 503.53 km^2 respectively. The variability with mean areas is the result of individuals using a larger area for winter habitat use because of age, sex, or reproductive status.

- managing timber harvesting to provide important attributes of moose winter range and calving habitat (forage, snow interception cover, visual screening);
- access management to minimize mortality risk to moose;
- managing the amount of early seral and mature – old seral forest across the landbase (addressed in Section 3.1: Biodiversity); and
- aggregating timber harvesting in time and space (address in Section 3.1: Biodiversity).

Plan Goals for Moose

- To maintain the structural and functional attributes of moose habitat.
- To minimize mortality risk to moose, outside of mortality due to legal hunting activity.

Objectives	Strategies
1 Maintain moose critical habitat elements (snow interception, security cover, forage opportunities, and visual screening) within high value moose habitats shown on Map 5.	1.1 Within high value moose habitats identified on Map 5 maintain or enhance the production of moose forage (e.g. willow, high bush cranberry, etc. etc.) during forestry activities including reforestation e.g., by: • providing openings of 10-15 years in age over time; • applying variable stocking to achieve patchiness; • reducing conifer stocking or promoting the minimum conifer density; • maintaining similar species distribution to natural stands; • giving preference to manual treatments for vegetation control while enhancing moose winter forage; and • using prescribed burning, where appropriate.
	1.2 Time and locate logging to maintain connectivity of continuous mature and old forest cover linking areas of mapped moose winter and calving ranges, consistent with natural disturbance patterns. 1.3 Where moose winter range overlaps with caribou winter range, management priority will be placed on caribou winter range.
2 To minimize potential for access-related mortality of moose.	2.1 Where possible, locate permanent roads outside of moose winter and calving ranges. 2.2 Within moose winter and calving ranges, provide visual screening of swamps, south-facing slopes, rivers or openings along highways, secondary roads, and main forestry/mining roads.

3.2.4 Mountain ungulates (mountain goat and Stone's sheep)

3.2.4.1 Mountain ungulate habitat and distribution

The mountain goat *(Oreamnos americanus)* is recognized as a regionally significant species under the Identified Wildlife Management Strategy. Mountain goats live in rugged mountainous areas. Summer

and winter habitats vary primarily by elevation. Between June and September, mountain goats are found on cliff faces and in alpine and subalpine meadows feeding on grasses, sedges, rushes and forbs. In winter, predator avoidance and, in some areas, deep snow, confine mountain goats primarily to old and mature forest stands near escape terrain. Features of winter range include south and west-facing slopes generally within 400 meters of steep escape terrain (MOF & MELP, 1997). Mature (age classes 6 and 7) and old forest provide thermal cover and forage in the winter. Shrubs, lichen, and conifers supplement the winter diet. Some goats feed on wind-blown mountain ridges where forage is exposed or snow coverage is minimal.

Stone's sheep (*Ovis dalli stoneii*) are a sub-species of thinhorn sheep. The sub-species only occur in south-central Yukon and northern British Columbia as far east as the Pine River valley in the northern Rocky Mountains. Sheep usually seek out treeless ranges with little or no snow cover in the winter, being poorly adapted to deal with snow at any depth. Winter ranges tend to be small and limited. Grasses and grass-like plants are a main food source. Mineral licks are an important source of dietary sodium. Stone's sheep are not considered at risk in British Columbia because they are relatively common and their main habitats are remote and not threatened by human activities.

Stone's sheep and mountain goat are found throughout the plan area in alpine habitats, including the Cassiar Range, Tuya Range, Kechika Mountains, Southern Boreal Mountain Plateau, and Stikine Plateau ecosections. A survey in the Cassiar ranges portion of the plan area in March 1998, produced minimum counts of 335 thin-horn sheep and 213 mountain goats (Marshall 1998). These are recognized to be underestimates of the full population, but the survey covered the majority of the ranges of these species in the plan area.

3.2.4.1 Management direction for mountain goat and Stone's sheep

Stone's sheep and mountain goat are primarily managed by maintaining landscape connectivity between mountain blocks and limiting disturbance (direct and indirect) during sensitive periods (e.g., lambing and kidding, winter). Access is the main cause of disturbance. Increased road access increases potential for poaching and harassment. Recent studies have also highlighted impacts to thinhorn sheep and goats from aircraft and commercial recreation activities (e.g., helicopter skiing) (Keim 2003, Wilson and Shakelton, 2001,Frid, 1999, Stockwell et al., 1991, Côté, 1996, Sutherland, 1996, Gill et al. 1996, Maier et al. 1998, White et al. 1999, Macarthur et al., 1982).

Because mountain ungulate winter range is limited, even small areas of habitat alteration within winter habitat can have a disproportionately larger effect on the associated ungulate population. Since most, if not all, habitat for mountain goats and Stone's sheep is found outside of the area where timber harvesting may take place (Map 12: Timber Area A), removal of forest cover through logging is unlikely to be an issue. However, efforts should be made to minimize impacts to habitat and movement corridors wherever possible during other development activities.

Other management practices involve prescribed burning of subapline ranges for willow and forage enhancement to seasonal ranges.

Plan Goals for Mountain Ungulates:

- To maintain the structural and functional attributes of mountain ungulate winter range.
- To avoid disturbance of mountain ungulates during vulnerable periods.
- To minimize mortality risk, outside of legal hunting activity.

Objectives	Strategies
1 Minimize potential for disruption and mortality of	1.1 Minimize road construction within high value mountain ungulate habitats (see Map 6).

Objectives	Strategies
mountain ungulates due to roads and public access.	habitats (see Map 6). 1.2 If roads are required within high value mountain ungulate habitats, minimize impacts on ungulate populations as follows: • design roads to minimize fragmentation of habitats and minimize road density in sub-alpine and alpine ecosystems; • consider restrictions on motorized recreational use (e.g., ATVs, snowmobiles); • locate roads so as not to create ready public access to alpine areas e.g., by ATVs; • deactivate roads when projects are completed.
2 Avoid disturbing animals during kidding and lambing.	2.1 Avoid locating roads near natal areas for mountain ungulates. Where locating roads near to natal areas is unavoidable, minimize road use during kidding/lambing times (April 15 – June 15) and deactivate temporary roads after use. 2.2 To the extent possible, avoid repeated flights in or near to natal areas for mountain ungulates between April 15 and June 15. 2.3 Inform local pilots of known natal areas and provide information on flying practices to minimize disturbance of goats and sheep.

3.2.5 Grizzly bear

3.2.5.1 Grizzly bear habitat and distribution

Very little is known about the ecology of grizzly bears (*Ursus arctos*) that use the BWBS and SWB biogeoclimatic zones relative to bears using more southerly and coastal ecosystems (e.g., the CWH, ICH, IDF and SBS). What is known suggests that bears using these ecosystems are very distinct ecologically from coastal and more southern bears. Much of the information in this section comes from personal communication about work completed by D. Wellwood and K. Diemert on similar ecosystems in the Taku River and Atlin Lake area.

Grizzly bears obtain a large part of their energy and nutrient requirements from eating vegetation (berries, greens and roots). However, protein and fats from animal tissue (e.g., salmon, ground squirrels, moose and caribou calves and carrion) can also be an important component of their diet. Two of the defining features of bear habitat in the Dease-Liard area are: (1) that the rivers in the Dease-Liard are not salmon-bearing; and (2) based on data collected in the BWBS and SWB in the Atlin Lake area, the habitat quality is likely lower than many of the southerly and coastal ecosystems of British Columbia (D. Wellwood, pers. comm.). For this reason, bears may need to forage over a larger area and may make use of non-fish meat sources as a larger component of their diet compared with some areas in British Columbia.

Home ranges consist of areas providing primary food sources, as well as back-up forage that is only used on an occasional basis. The diversity and abundance of known food plants used by grizzly bears appears to be much lower than in many other areas of British Columbia. Therefore a failure in the crop of a well-used food plant species, such as a year with poor berry production, may have a relatively large effect on reproductive success. Human-bear conflicts may also increase as hungry bears overcome their wariness of humans to obtain non-natural foods. Bears using northern BWBS and

SWB ecosystems appear, in general, to be contending with lower overall habitat quality and diversity of major food plant species, a shorter growing season, and longer denning period, leading to predictions that these bears will have lower population densities and bigger home ranges than bears using more southerly and coastal ecosystems, such as the ICH, SBS and CWH. Because of these constraints, bears may also be more vulnerable to impacts related to human activities (D. Wellwood, pers. comm.). COSEWIC has classified grizzly bears as "vulnerable" due to habitat loss, low reproduction, and slow recovery rates. The species is blue-listed by the CDC in British Columbia. One of the key issues regarding grizzly conservation is that the bear is very slow to reproduce, magnifying the implications of population decreases due to human activity. Northern interior grizzly bears have the lowest recruitment rates of all terrestrial mammals (Environment Yukon, 1997) [17].

According to the provincial estimate, the density of grizzly bears in the Dease-Liard is between 10 and 20 bears/1000 km^2 (Hamilton and Austin, 2002), which is low relative to other areas of British Columbia. This estimate is a minimum and may be higher in more mountainous areas (e.g., Cassiar Ranges Ecosection, Horse Ranch Mountain, and Little Rancheria Mountains) due to the large ungulate biomass bears access through spring moose and caribou calving and hunter gut piles in the fall (N. Maclean, pers comm., 2003). Densities are lower in the Liard Plain. Grizzly bear populations in the plan area appear to be stable (A.N.Hamilton, pers comm.); however, there is a perception of localized decline around communities Although there is no active inventory and monitoring of grizzly bear populations in the Dease-Liard to assess population trends, WLAP carefully monitors grizzly bear mortality.

The primary human influences on grizzly bears and their habitats are related to roads and road use. This includes:

- potential for increased risk of *bear mortality* due to human-grizzly bear interactions e.g., bears being shot in defence of life and property; illegal kills.
- potential for increased risk of *displacement* of grizzly bears from their preferred habitats, primarily due to disruption (noise, human activity).

In the Dease-Liard, where most of the landbase is unroaded, there are fewer issues related to displacement of bears due to roads, with the exception of the Alaska and Cassiar Highways. Both of these roads are main thoroughfares and have potential to displace bears and, possibly, filter their movement. These roads are most likely to cause disruption where they cross riparian areas that are used as travel routes by bears.

Roads have the potential to increase encounters between people and bears and also to increase the lethality associated with those encounters. Most of the plan area is unroaded, which reduces the mortality risk. However, new road development, particularly in or near to critical habitat, could displace bears and increase risk of mortality.

Critical habitats are areas that are considered essential for bear survival. These areas have high forage, bedding or proven denning value, particularly in situations where these habitats are in short supply. Critical habitat areas tend to receive repeated and/or prolonged use by at least one bear. Overall, these relatively small areas of habitat can contribute in a large way to the overall seasonal requirements of a bear, and thus of a population.

Critical habitat areas are defined at the stand level and are typically one to five hectares in size. Critical habitats in the Dease-Liard include dens, herb dominated avalanche tracks with adjacent forest; non-

[17] Females do not reproduce until age 6.5 – 9.5; average litter size is 1.6 – 1.9; there is a 3 – 5 year interval between litters; and cub of year mortality is 25 – 45% in the first year.

forested fens; herbaceous riparian meadow/wetland complexes and seepage sites; subalpine parkland meadows; and old burns or other natural successional areas dominated by *Vaccinium* (blueberry) species. Non-forested critical habitats include a core area and buffer of forested cover. Patches of forested critical habitat do not require an additional forested buffer.

3.2.5.2 Management direction for grizzly bear

Two of the main reasons for decline of grizzly bear populations are habitat loss and increased mortality due to roads and habituation:

- Habitat loss reduces critical habitat, resulting in reduced forage availability, denning potential, and security cover;
- Roads increase mortality risk by increasing potential for human-bear interactions and increasing potential for poaching;
- Human-bear conflict as a result of food and garbage conditioning, which leads to bears being killed "in defence of life and property".

Grizzly bears are at a higher density in watersheds with mountain blocks and are at lower densities in the Liard basin, where most of the timber harvesting landbase occurs. It is assumed that strategies to minimize impacts to critical habitat for grizzly bears, supported by SRMP management direction for access and riparian areas as well as strategies to maintain ungulate populations (primarily caribou and moose), will address most of the habitat requirements of grizzly bears in the plan area.

Viewing of grizzly bears can be a popular tourism activity in areas where bears congregate. Viewing can be an effective, non-impacting use of wildlife, but there are special considerations for viewing bears since the presence of humans can either habituate bears or create stress for them and cause them to abandon their habitat. Also, viewers may also be at risk if they do not act appropriately.

Plan Goals for Grizzly Bear

- To minimize mortality risk to bears.
- To maintain the structural and functional attributes of critical grizzly bear habitat.
- To minimize disruption of bears due to human activities.

Objectives	Strategies
1 Maintain the structural and functional attributes of critical habitat patches for grizzly bears (see Map 7).	1.1 Wherever possible, avoid development activities within 50 m of critical foraging habitats such as: herb dominated avalanche tracks with adjacent forest; non-forested fens; herbaceous riparian meadow/wetland complexes and seepage sites; subalpine parkland meadows; and old burns or other natural successional areas dominated by *Vaccinium* (blueberry) species. 1.2 Wherever possible, avoid development activities within 1 km of winter dens. 1.3 Management direction for Access (Section 2), Riparian Management (Section 3.1.2.7) and ungulates (caribou and moose, Section 3.2) will contribute to maintaining habitat requirements for grizzly bears.
2 Minimize mortality risk to grizzly bears resulting	2.1 Provide visual screening along roads in form of windfirm forest buffer and do not conduct vegetation management or stand tending adjacent to roads. 2.2 Do not use roadside seed mixture that are conductive to bear foraging, at

Objectives	Strategies
from increased road access.	least for roads that will be open for extended period of time. 2.3 Use access control points when developing roads into areas of high value grizzly habitat.
3 Prevent bear mortality resulting from bear-human interactions.	3.1 Where possible, initiate programs to educate members of the public and visitors re low impact garbage handling methods. 3.2 Remote tourism lodges should implement complete bear conflict prevention programs.
4 Minimize disruption of bears due to helicopter use.	4.1 Maintain a separation distance of 500m (1500 ft) between helicopters and grizzly bears. 4.2 Inform local pilots of SRMP guidelines and practices to minimize disturbance of grizzly bears.

3.2.6 Fur-bearers (marten, fisher, wolverine)

3.2.6.1 Furbearer habitat and distribution

Pine marten

The pine marten is an arboreal member of the weasel family. The preferred habitat for marten (*Martes americana*) is mature and old growth coniferous forest. Marten often forage around coarse woody debris - downed trees, stumps and hollow trees, but may venture into dense younger forests or more open areas to find food. Denning also occurs in coarse woody debris. Loss of mature forested landscape has contributed to the decline in abundance of marten in North America (CWS, 2000). Marten trapping is a mainstay of British Columbia's fur industry.

Fisher

Fishers (*Martes pennanti*) have been described as a habitat specialist associated with late-successional forest. They are generally associated with riparian and dense wetland forest having older forest characteristics. Forest structure is particularly important (Banci, 1989). Large-diameter trees with cavities and downed logs, especially riparian cottonwoods, are important as natal den sites, with families moving to larger cavities as the young grow. Connectivity of forest cover may be very important as fishers avoid habitats that do not have overhead cover (Cannings et al, 1999).

Fisher are blue-listed in British Columbia. The species is vulnerable to hydroelectric development, over-trapping, and habitat loss, particularly in low-elevation riparian habitats. Forest harvesting increases access for trappers, which is a concern because fishers are taken in marten traps. This distribution of fisher in the plan area is currently not well known.

Wolverines

Wolverines (*Gulo gulo luscus*) are shy species that are generally found in remote areas of undisturbed wilderness. Studies have shown that trapping and transportation corridors are the largest factors influencing survivorship (Krebs and Lewis, 1999). Roads are a significant barrier to movement and a cause of high mortality. In addition, increases in human activity (e.g., due to snowmobiling, logging, and helicopter use) diminishes the capacity of areas to support wolverine, particularly for reproductive females who will abandon dens if disturbed (*Ibid*).

Wolverine feed on large herbivore, primarily as carrion. Maintaining healthy ungulate populations will benefit wolverine.

3.2.6.2 Management direction for furbearers

Plan Goals for Furbearers

- To maintain the structural and functional attributes of furbearer habitat.
- To avoid disruption of furbearers due to human activities such as development and recreation.

Objectives	Strategies
1 Maintain important characteristics of pine marten habitat such as forest structural attributes and mature and old forest providing interior forest conditions.	1.1 See Section 3.1: Biodiversity. This includes retaining large, contiguous areas of old and mature forest and leaving coarse woody debris on cutblocks as habitat and to provide subnivean access. 1.2 Locate logging over space and time to provide forest interior conditions in areas of high value marten habitat, in keeping with natural disturbance patterns. See Section 3.1.2.2: Temporal and Spatial Distribution of Cutblocks.
	1.3 Improve information about marten distribution prior to harvesting using simple methods such as consultation with trappers, conducting a snow track surveys or using soot plates to record marten presence/absence.
2 Maintain important characteristics of fisher habitat such as forest structural attributes and mature and old forest along riparian corridors.	2.1 See Section 3.1.2.7: Riparian Management. This plan assumes that riparian reserves will maintain the habitat characteristics required by fisher. 2.2 Improve information about fisher distribution prior to harvesting in or adjacent to old or mature riparian forest using simple methods such as consultation with trappers or using soot plates to record fisher presence/absence.
3 Maintain important characteristics of wolverine habitat such as large, undisturbed areas.	3.1 See Section 3.1: Biodiversity and Section 3.2: Wildlife. This plan assumes that management direction for coarse filter biodiversity, ungulate habitat and grizzly bear habitat will address many of the habitat needs of wolverine and other furbearers.
4 Manage access to maintain large areas of undisturbed habitat in sub-alpine and alpine ecosystems.	4.1 Undertake strategies to maintain large areas of undisturbed habitat in sub-alpine and alpine ecosystems. Examples include: • minimize road density in sub-alpine and alpine ecosystems. • locate roads so as not to create ready public access to alpine areas e.g., by ATVs.

3.2.7 Bull trout

3.2.7.1 Bull trout habitat and distribution

Bull trout (*Salvelinus confluentus*) are a char species and blue-listed in British Columbia. Populations are declining throughout its global range and in British Columbia; major declines have occurred in the Columbia and lower Fraser systems (Cannings and Ptolemy, 1998). The species is very similar taxonomically to Dolly Varden, another blue-listed species.

Sizeable bull trout populations and numerous concentration areas are known to occur along Blue River, Dease River and, potentially, the Liard River.

3.2.7.2 Management direction for bull trout

Bull trout are extremely sensitive to habitat degradation and are considered an indicator of ecosystem health (*Ibid*). Human activities that change stream temperature, substrate composition, habitat complexity, channel stability, or create migration barriers can cause declines in bull trout populations.

- Road development can alter stream characteristics and in-stream activities should be timed to avoid periods of bull trout sensitivity.
- Roads may increase angler access, increasing the risk of over-fishing, particularly in bull trout congregation areas.
- Removal of riparian cover can result in increased stream temperature. Bull trout are a cold water species. Increases in temperature can prevent spawning success and encourage competition with other salmonid species. Bull trout do not compete favourable with introduced salmonids (Buktenica, 1994, as cited in Cannings and Ptolemy, 1998).

Plan Goal for Bull Trout

- To minimize impact of forestry and road development on bull trout habitat.
- To prevent over-fishing of bull-trout at congregation areas.

Objectives	Strategies	Management considerations
☛1 Conserve critical bull trout habitat, including significant staging/rearing areas and over-wintering and post-spawn emigration habitat and natal streams.	1.1 Do not locate permanent access structures within 750m of known bull trout staging areas. 1.2 Do not log within 500m of known bull trout habitat and known or suspected spawning or natal tributary reaches.	The preferred period for in-stream operations is late July and early August. Avoid in-stream operations during periods of bull trout spawning activity i.e., between August 15 and October 1. Locate crossings upstream of known habitat attributes. Identify bull trout habitat occurrence prior to resource development planning. Maximum daily temperatures of bull trout streams should not exceed 12 degrees Celsius.

3.2.8 Other endangered wildlife and habitats (trumpeter swans, raptors)

3.2.8.1 Habitat and distribution of endangered wildlife species

Gyrfalcons (*Falco rusticolus*) nest on cliff faces in mountainous alpine tundra above treeline in the SWB and AT. Cliff nests may be above water or ground and are mostly on bare ledges. Gyrfalcons are migratory, breeding in the north and moving into southern Canada for the winter. They prey on birds and small mammals, including ptarmigan and ground squirrels.

The number of breeding gyrfalcons in British Columbia is presumed to be stable ((Fraser et al, 1999). The main threat to these birds is illegal harvesting of young for the falconry trade. The remoteness of breeding sites reduces the threat of human disturbance at nest sites.

Trumpeter swans *(Cygnus buccinator)* breed locally but are widely distributed across northern British Columbia. They winter along the Pacific Coast. They nest in a variety of ponds, lakes, marshes, and occasionally rivers, but avoid acidic, stagnant or eutrophic waters.(Fraser et al, 1999). Breeding season is generally from April to September, although breeding times may vary by location.

Trumpeter swans are blue-listed in British Columbia. The species has made a significant come-back in the last 30 years and the listing may eventually be changed (Fraser et al, 1999). Swans are mainly susceptible to human disturbance during the nesting season. Any disruptive activity on a nesting lake, including boating, may cause nest abandonment (MELP/MOF, 1999).

Other endangered wildlife and habitats may be present in the plan area. To view the list of blue and red listed species that may be found in the plan area refer to the following website http://srmapps.gov.bc.ca/apps/eswp and search under Prince Rupert/Cassiar. Any endangered wildlife identified during harvest planning and activities will be managed according to the applicable policies and best management practices.

3.2.8.2 Management direction for endangered wildlife

Plan Goal for Endangered Wildlife

- To minimize disturbance of CDC red- and blue-listed wildlife species and their habitats.

Objectives	Strategies	Management considerations
1 Maintain nesting and foraging habitat for nest sites of **gyrfalcon.**	1.1 Note presence of raptors and nest sites (active, inactive, alternate) during baseline monitoring for applicable projects and processes.	Exact locations of aeries should be kept confidential unless it is in the best conservation interest of the birds.
	1.2 Do not remove or destroy nest sites, even if inactive, and avoid development activities that could disrupt raptors during sensitive periods (in particular courtship and nest establishment). Sensitive periods may vary by species, site and year.	Includes blasting and road construction or modification.

Objectives	Strategies	Management considerations
2 Minimize disturbance of critical habitat areas (nesting and over wintering areas, spring migration stops) for **trumpeter swans.**	2.1 Retain the structural integrity of emergent vegetation in and around nesting areas to provide cover and nesting habitat. 2.2 Maintain a visual buffer around wetlands with nesting and over-wintering sites. 2.3 Plan location and timing of resource development activities (e.g., road construction and logging) to minimize disturbance of nesting and wintering areas. 2.4 Discourage boating activity on water bodies known to support trumpeter swan breeding colonies.	Based on inventory and available information on trumpeter swans in the plan area and in adjacent areas, developed detailed and site appropriate strategies to minimize disturbance of critical swan habitats. Also, see *Identified Wildlife Management Strategy* for trumpeter swans. Minimize timber harvesting and road construction and use during the breeding season (April – September). Do not establish recreational facilities adjacent to areas known to support trumpeter swan breeding colonies.

3.3 Fire Management

The SRMP directs that forestry be planned to emulate the natural disturbance patterns (as outlined in Section 3.1: Biodiversity). Approaches to fire suppression and prescribed burning will also have an important influence on natural patterns on the landscape. The recommended approach to fire management in the plan area is to identify areas for limited suppression where fires will be allowed to burn unless they threaten existing facilities or key resource values. The SRMP also identifies Initial Attack Zone where any fires will be immediately suppressed.

3.3.1 Management direction for fires

Plan Goal for Fire Management

- Natural patterns of fire disturbance across the SRMP area.

Objective	Strategy
1 Manage fire to minimize damage to people and property while allowing natural disturbance processes to occur.	1.1 Endeavour to extinguish fires within the "Initial Attack Zone" (Map 8). 1.2 Outside of the "Initial Attack Zone", monitor and manage fires to prevent damage to existing facilities and key resource values. 1.3 Reclaim fire roads and cat trails built for fire fighting.
2 Enhance wildlife habitat consistent with natural disturbance patterns through prescribed	2.1 Prepare a prescribed fire plan in consultation with the Northwest Fire Centre of the Ministry of Forests to identify and monitor prescribed fire areas. The plan will:

Objective	Strategy
burning.	• identify areas of high wildlife/low timber conflicts; • monitor old burns and schedule burning when appropriate; • identify and schedule new burns when necessary; and • consider the cumulative effect of fire management on the landscape.

4. Community Use

4.1 Resource values

There are three communities in the plan area: Lower Post (population 125), Good Hope Lake (population 100), and Dease Lake (population 650). All three communities are predominantly First Nations. Priorities for management of Crown lands adjacent to these communities includes visual quality, water quality, and opportunities to carry out activities of importance to communities members such as traditional use activities, recreation and sustenance activities.

A study prepared in 2001 for the Kaska Dena Council as part of Treaty-related measures identified *community expansion lands* and *community regional lands* adjacent to their communities. These are lands that are used heavily by community members and are important for Kaska interests. The Kaska have expressed an interest in having an enhanced level of participation in land use management and decision-making in these areas.

4.2 Management direction for community uses

Map 5 shows Community Use zones within the plan area. These zones include all of the "community expansion lands" and parts of the "community regional lands" identified by the Kaska Dena and described in the previous section. A Community Use zone may be identified for the community of Dease Lake as part of the review and consultation regarding the SRMP.

The primary goal for management within Community Use zones is to maintain the quality of life of local residents. A number of community-related concerns are addressed in other chapters, including Visual Quality (Section 9) and maintenance of traditional use areas (Section 5: Cultural Heritage Resources). The resources important to sustenance activities are addressed under Wildlife (Section 3.2). The SRMP recognizes that economic stability and jobs are also important to local communities. Sustainable economic development is addressed in Section 7: Timber.

This section deals primarily with maintaining water quality and ensuring adequate consultation with local residents during development planning. Within Community Use zones, a number of "Sensitive Watersheds" have been identified, where the priority for management is to maintain the quality of drinking water.

Plan Goal for Community Use Zones

- Communities that provide the quality of life valued by their residents, including an attractive setting, clean drinking water, access to recreational activities in the surrounding area, and the ability to carry out traditional and sustenance activities.

Objective	Strategy
☛1 Maintain the quality and potability of community water supply, within "Sensitive Watersheds" (Map 9), at natural levels.	1.1 Manage "Sensitive Watersheds" identified on Map 9 using the following guidelines: • No more than 5% of the Timber Harvesting Land Base to be less than 5 meters in height or 27 years old; • A 20 metre Riparian Reserve Zone and a 20 metre Riparian Management Zone to be established to either side of all streams; • All landings and roads not in active use are to be deactivated by the first spring or fall following harvest; • All unused landings are to be revegetated.
2 To maintain the aesthetic quality of communities and their surroundings.	2.1 Visual Quality is addressed in Section 8.
3 To ensure that community members are aware of, and can provide input into, proposed developments.	3.1 Proponents are to advertise proposed developments in local communities and provide opportunity for review and comment of proposed developments by community members. 3.2 Proponents will consider input from community members and will make this input publicly available, accompanied by an explanation about how this input was addressed.

5. Cultural Heritage Resources

5.1 Resource values

Cultural heritage resources in the Dease-Liard planning area reflect past and present uses by both aboriginal and non-aboriginal people. Three categories of resources are considered cultural heritage resources: (1) archaeological sites containing physical remains of past human activity. such as, old grave sites, rock art, old village sites, lithic scatters (rock chips--often obsidian-- from making stone tools, etc.); (2) historic sites such as pioneer settlements, historic buildings, and pioneer trails; and (3) First Nations traditional use sites which may or may not show physical evidence of human-made artifacts or structures but maintain significance to living communities. These include fishing sites, hunting camps, traditional trails, berry picking areas, legend/sacred sites, etc.

Cultural heritage resources are protected under the *Heritage Conservation Act*. These resources include all pre-1846 features such as archaeological sites and artifacts, culturally modified trees (CMTs), aboriginal rock art, and burial places. The Archaeological and Registry Service Branch of MSRM[18] manages archaeological sites and information under the *Heritage Conservation Act*.

[18] Registry and Resource Information Division

Traditional Use Studies (TUS) have been conducted for the Kaska Dena and Tahltan asserted traditional territories. The information in the TUS is held by the relevant First Nation and can only be accessed with written permission of the custodian.

Map 10 shows the two main heritage trails[19] in the plan area, the Davie and McDame Trails. The Davie Trail is a historic trail, linking the Kaska communities to the north and south, dating back to the early 1900s. The McDame Trail dates back to the gold rushes of the late 1800s. The trail extends from McDame Mountain in the Cassiar Range to Dease Lake and Telegraph Creek and originally provided a main trade route through the area. The trail and mountain are named for Henry McDame, a black miner from the Bahamas, who travelled with John Robert Giscome from Jamaica to the northern gold fields in the 1860s.

5.2 Management direction for cultural heritage resources

Cultural heritage resources will be managed in a manner consistent with the existing legislation, policies and protocols. The Ministry of Forests makes referrals to First Nations as part of forest development planning. This includes consulting with First Nations regarding any activities that might impact sites or areas of traditional use and conducting Archaeological Impact Assessment in areas of high potential for archaeological sites.

Mineral exploration specifically addresses cultural heritage resources in the application for a *Mines Act* permit and First Nations are consulted regarding proposed exploration programs. In the case of mine development, consultation with First Nations is required to identify archaeological sites and assess potential impacts of the proposed mining operation.

Plan Goal for Cultural Heritage Resources

- To recognize and respect the heritage and cultural values of archaeological sites, First Nations traditional use sites and pioneer heritage sites in planning and management of resource development activities.

Objective	Strategy
1 Minimize impact of development on First Nations' traditional use Sites.	1.1 Consistent with current policy, consult with First Nations before approving development activities to determine whether there may be an impact on traditional use sites. Where impacts are identified, work co-operatively with the First Nations to minimize impacts.
2 Conserve archaeological resources.	2.1 For activities approved on Crown Land, including timber harvesting, determine the need for an Archaeological Impact Assessment on a case-by-case before undertaking activities with significant potential to disturb archaeological sites.
☛3 Maintain the integrity of the McDame and Davie Trails (see Map 10) by providing a 100 meter no-harvest zone to either side of the	3.1 Harvesting is permitted within the 100m trail buffer for the essential control of insect infestations and diseases. Where harvesting within the buffer is necessary, undertake logging to minimize impact to the trail e.g., • maintain a 20 m machine-free buffer to either side of the trail; • fall and skid timber away from trails;

[19] The trails have not been designated as Heritage Trails under the *Heritage Conservation Act*.

Objective	Strategy
trails.	• apply partial harvesting silviculture systems; • retain non-commercial trees; • establish landings outside trail corridor; • reforest harvested areas promptly; • ensure the trail is left in its condition prior to logging. 3.2 Minimize the impact of roads crossing the trail, as follows: • minimize the number of road crossings. Only cross the trail where no feasible alternative exists; • cross as close to a right angle to the trail as possible; • trail entries at road crossings to be well maintained, free of debris and well marked with signs.
☛4 Conserve cultural and historical values within the Horse Ranch zone (Map 11) by not harvesting timber within the zone.	4.1 Harvesting is permitted within the Horse Ranch zone for the following purposes: • tourism/recreation development; • mining exploration and development; • oil and gas exploration and development; and • local needs such as for firewood, fence rails, and building materials (including for construction of commercial facilities).

6. Protected areas

The Dease-Liard SRMP was primarily created to direct the management of forestry activities. The plan will not deal with the establishment of protected areas.

6.1 Summary of existing parks and their values

Four protected areas currently exist in the Dease-Liard planning area. Two are provincial parks and two are ecological reserves (Table 9, Map 11). Management within the protected areas is provided under separate management direction statements prepared by WLAP, therefore, these areas are outside of the mandate of the Dease-Liard SRMP.

Table 9. Existing protected areas (parks and ecological reserves) within the Dease-Liard plan area

Protected Area	Size (ha)
Boya Lake Provincial Park	4, 700
Hyland River Provincial Park	30
Blue/Dease Rivers Ecological Reserves	940
Chicken's Neck Mountain Ecological Reserve	680

Boya Lake is managed according to a Parks Management Direction Statement prepared in 2001. Boya Lake is a large lake and wetland complex having distinct glacial landforms and clear, aquamarine

water. The 4600 ha park is just off of Highway 37 and attracts high levels of recreational use (camping, fishing, and boating). The park is also important to the Kaska Dena for spiritual and ceremonial purposes. Hyland River Provincial Park is a small park (80 ha) on the Alaska Highway.

Two ecological reserves (Blue/Dease Rivers, est. in 1975; and Chickens Neck Mountain, est. in 1975) are managed by WLAP to ensure the long-term maintenance of their ecological values. These ecological reserves are open to the public for non-destructive pursuits such as hiking, nature observation and photography. Consumptive activities (e.g., hunting, freshwater fishing, camping, and gathering of plants) are prohibited by regulation. Motorized vehicles are not allowed.

6.2 Summary of areas proposed for protection by the Kaska Dena and their values

6.2.1 Protected Areas Strategy study areas

The provincial Protected Areas Strategy (PAS) is a systematic approach to planning for new protected areas. In 1996, the northwest region of the province was assessed by the Regional Protected Areas Team (RPAT) to determine how well current protected areas represent the variety of ecosystems, special features, cultural features and recreational uses in the area. This project, called a "Gap Analysis", identified a number of potential additional protected areas (called "study areas") to meet the following goals[20]:

- Goal 1 (Representativeness): To protect viable, representative examples of the natural diversity of the province, representative of the major terrestrial, marine and freshwater ecosystems, the characteristic habitats, hydrology and land forms, and the characteristic backcountry recreational and cultural heritage values of each ecosection.
- Goal 2 (Special Features): To protect the special natural, cultural heritage and recreation features of the province, including rare and endangered species and critical habitats, outstanding or unique botanical, zoological, geological and paleontological features, outstanding cultural heritage features, and outstanding recreational features such as trails.

The PAS report (RPAT, 1996) identifies six Goal 2 study areas (Table 10, Map 11). No Goal 1 study areas have been identified. The terms of reference for the Dease-Liard SRMP does not include establishment of new protected areas. Any new protected areas for the Dease-Liard will need to be put forward to Cabinet through other processes, such as treaty negotiations.

Table 10. Goal 2 study areas within the Dease-Liard plan area

Study Area	Size (ha)	Values and attributes
Dease/French Rivers Proposed Ecological Reserve	3,500	Boreal forest (BWBS) ecosystems developed on calcareous parent materials; includes mature and seral forests, mature floodplain forest, steppe grassland, complex of sand dunes and wetlands, tamarack swamps, outstanding lichen flora.
Blue River Warm Springs	3,950	Warm mineral springs, tufa deposits, wetlands downstream, some small eskers.
Liard Eskers	10,500	One of the most distinctive compound esker/kettle fields in province; eskers range from 100 metres to several kilometres in

[20] A description of the Protected Area Strategy and details of the Regional Study Area project can be found in *Protected Areas Strategy for British Columbia: The Prince Rupert Region PAS Report,* RPAT, (1996).

Study Area	Size (ha)	Values and attributes
		length.
Horse Ranch Lake	2,350	Outstanding esker formation, lakes, rich wetlands (orchids) and boreal forest.
Porter Landing Historical Site		Located at the outlet of Dease Lake where Thibert Creek comes in from the west and forms a delta which is a natural dam that holds Dease Lake in place. It is also known as Thibert's Landing where a Hudson's Bay Company set up a supply depot for the diggings on Thibert Creek. In August 1878, gold was found 30 km northwest of Porter Landing, and with the new stampede, Porter Landing boomed. By the early 1900's Porter Landing was all but abandoned.
Laketon Historical Site		Laketon is built on the delta that Dease Creek has flung out into the lake, making almost a narrows at this point. During the great gold rush in the middle 1870's, and for some years later, Laketon was the "capital" of the Cassiar District. Several structures, including the log jail house, the blacksmith shop and several other cabins, in various degrees of decay, a cemetery, and the remnants of the neatly walled Chinese gardens are what remain of Laketon, as well as a colourful history.

6.2.1 Horse Ranch

In addition to the Cabinet approved Goal 2 Protected Areas Strategy study areas, the Kaska identified the Horse Ranch (Map11) as an area that they would like to see protected. The area is comprised of high-value habitat for caribou, moose and furbearers. It has a high cultural/historic significance for the Kaska. The Canadian Parks and Wilderness Society (CPAWS) is also promoting protection of the Horse Ranch. The area has been identified as no-harvest zone.

7. Timber

7.1 Timber values

Only a small percent of the total plan area is suitable for timber harvesting, primarily due to extensive subalpine and alpine areas with low timber volumes. Harvestable stands are scattered throughout the plan area but the major concentration of timber available for harvesting is in the north and northeast portions of the plan area (see Map 12: Timber). The average timber volume in the operable areas (THLB) is estimated to be 211 m^3/ha (TSR II). The Cassiar TSA Inventory Audit (1996) suggests that the inventory likely over-estimates volume by 29%.

The relative proportion of economic forest types within the Dease-Liard TSB (the plan area covers the majority of the TSB) is lodgepole pine (59%), spruce (38%), and subalpine fir (2%) (TSR II).

7.2 Economic development

There is currently no commercial forestry activity in the Dease-Liard. The Dease-Liard plan area falls within the Dease-Liard Timber Supply Block (TSB) of the Cassiar Timber Supply Area (TSA). The 2002 AAC for the Cassiar TSA is set at 305,000 m^3, partitioned amongst the Iskut and Boundary, Atlin

and Dease-Liard TSBs. The Dease-Liard TSB was allocated 153,000 m^3 in the partition, however it remains unapportioned. The completion of the Dease-Liard SRMP will allow the Minister to fulfill his mandate and apportion the Dease-Liard TSB.

Deterrents to large-scale timber development include the high cost of operations (due to the relatively low volumes and inaccessibility of merchantable timber), long distances to processing facilities and markets, a lack of local infrastructure, and a low and cyclical demand for timber locally. In 2002, the Kaska Dena Council completed an evaluation of the logging opportunity in the Dease-Liard Timber Supply Block in order to examine the economic feasibility of timber harvesting. The findings are summarized in the report *Identification of Logging Chance Opportunity in the Dease-Liard Timber Supply Block* (*2002*). The study identified a number of challenges to economic forestry development in the plan area, including:

- lack of local processing facilities, resulting in a high cost of transporting wood to distant locations like Houston, Terrace and Fort Nelson;
- most of the operable lands are unroaded, adding an additional cost for road development;
- domestic wood prices are low and unlikely to rise in the near future; and
- most of the area is in pine, which sells poorly on global markets compared to spruce, and must compete with competitively-priced pine from Russia.

Interim Measures Agreement and the Kaska Forest Enterprise

In 2000, the Kaska Dena and the province of British Columbia negotiated a 2-year Interim Measures Agreement (IMA). The IMA established a Forest Resources Council (FRC), which served as the consultation and planning vehicle between MOF and Kaska. The original IMA expired in December, 2002. The newly negotiated IMA will expire in March 2005.

In the IMA, the province and the Kaska agreed to work together to identify opportunities for the Kaska Dena to:

- achieve a share of the economic benefits that flow from the development of the forest sector within their Traditional Territory;
- access available volumes of timber in their Traditional Territory, including volumes that may come available as a result of any transfer of forest licences; and
- obtain a timber tenure in the Mackenzie Forest District and/or Skeena-Stikine Forest District[21].

Some of the tangible outcomes of the IMA were training of Kaska Dena in technical, operational and management aspects of forestry and a Forestry Economic Measures Agreement, entitled Kaska Forest Enterprise. The Agreement will span a 3-year period through March 31, 2005 and is critical to building on the IMA and positioning Kaksa for an important economic development enterprise in the forest sector.

The first component of Kaska Forest Enterprise includes a continuation of the Forest Resource Council established in the Interim Measures Agreement. The second and substantive component of the Agreement involves the establishment of a viable Kaska forestry enterprise. Once the Minister of Forests has apportioned the AAC for the Dease-Liard TSB, the Ministry of Forests and the Kaska Dena Council will identify a timber tenure opportunity for the Kaska Dena.

[21] Formerly the Bulkley Cassiar Forest District.

7.3 Management direction for timber

Some of the main strategic planning issues related to the timber resource are:

- Availability of an economically and operationally feasible timber supply in the short and long-term;
- Potential impact of forestry activities on other resource values (e.g., wildlife, biodiversity, cultural heritage resources, visual quality); and
- The need to maintain the health and productivity of managed forest stands.

The plan area is divided into three timber zones (Map 12):

- Timber Area A;
- Timber Area B; and
- Timber Area C.

The zone boundaries were derived based on the following: (a) timber harvesting land base mapping completed for the second Timber Supply Review (TSR II), (b) information collected through the Dease-Liard Area Assessment process, including input concerning Kaska Dena values and concerns, and (c) background work completed for future development of the tourism/recreation chapter.

Due to many overlapping zones for different resource values, it was a big challenge to produce a consolidated zones map. Map 13 is intended to serve as a surrogate for such map. The planning area is divided in a few areas based on the resource values that are being managed for. It was created primarily to benefit operational forestry planning (it identifies the areas where management emphasis is on timber). It did not consider sub-surface resources, and is not intended for mineral sector.

Forest management is governed under the *Forest Act* and *Forest and Range Practices Act*. The *Forest and Range Practices Act* contains a results-based forest practices code that sets objectives and desired land-based outcomes for forest management that forest companies must meet during their operations. Forest Stewardship Plans (FSPs)[22] outline strategies to implement the results-based code and other desired outcomes. FSPs should be consistent with the SRMP as it applies to the forest resource. They are subject to standard processes of public review and First Nations consultation and accommodation.

Timber Area A

Timber Area A (Map 12) encompasses the areas with the highest concentration of timber suitable for commercial harvesting. This zone may contribute directly in the short or long term to the forest sector economy. The resource management direction in the Dease-Liard SRMP was set to maximize forestry economic viability while conserving core environmental values and emulating natural disturbance patterns. An assumption was made that management direction in the plan will not cause significant timber supply impacts that are additional to what has been presented in the Appendix F. It should be noted, however, that the quality of the existing timber inventory is poor and a detailed ecosystems mapping (such as site series mapping) was not available. If monitoring of the plan implementation proves that the assumption made in regards to the impacts was wrong, the plan will be revisited and management direction re-examined.

Harvesting will be conducted in Timber Area A consistent with the objectives for other resource values. The zone overlaps areas of high value caribou habitat. Areas of high timber value will be managed adaptively to ensure that the effects of forestry activities on caribou and other resource values are monitored and adjustments made where necessary to minimize the impacts.

[22] Formerly called Forest Development Plans

All Crown forest land outside of protected areas and parks is proposed to be legally designated as Working Forest. Within the Working Forest, area-based targets may be set to provide forest companies with increased certainty of access to lands available to forestry activities. Forestry activities within the Working Forest must be consistent with the SRMP and its objectives. Within the Dease-Liard, forested lands within Timber Area A but outside of areas constrained to timber harvesting (such as riparian reserves, caribou selected habitats, etc.) will be designated as Working Forest. Note that the Working Forest designation does not limit negotiations with First Nations in the treaty process or affect the legal obligation of the province to consult on First Nations interests.

Plan Goals within the Timber Area A

- To maintain a sustainable and economically viable timber supply that contributes to local community stability in the short and long term.
- To maintain the structural and functional integrity of ecosystems within managed forests at all spatial scales.
- To maintain the health and productivity of managed forest stands.

Objective	Strategy
1 Maintain an economically and operationally feasible timber supply over the short and long-term.	1.1 Establish Working Forest landbase and timber access targets.

Timber Area B

The majority of the Timber Area B (Map 12) does not contain timber suitable for harvesting (THLB as determined during the TSR II process). The timber that is considered suitable is scattered and isolated. Overall, the area has low timber values. On the other hand, the area is known to have high values for other resources in particular wilderness tourism/recreation, wildlife and cultural. Currently, there is no access to Eagle, Four-Mile, and Rapid River drainages. The Kaska would like to see ether protection or harvest deferral in these drainages.

The main objective is to manage this area for resource values other than timber, noticeably to maintain wilderness tourism/recreation opportunities. Harvesting is not considered appropriate except in certain circumstances (see strategy 1.1). Even though the entire THLB that falls within the zone (approximately 6 % of the total forested zone area) will not be available for harvesting, the impact on the economy of the area is low because the net return from harvesting timber in the area would be low to nil due to the high operating costs. Marginal economics are further supported by the assessment completed in 2002 for the Kaska Dena Council by the Sterling Wood Group Ltd.

A preliminary study of existing and potential tourism/recreation opportunities shows that in its current state, the area has potential for further tourism/commercial recreation economic development and offers some opportunities to provide expanded quality tourism products. Trends research suggests that tourism is expected to gradually increase in the region. Key tourism and recreation values for the zone include its remote wilderness, large wildlife species (Stone's sheep, mountain goat, northern caribou, grizzly and black bear, and moose), variety of sports fish species, navigable rivers and large, pristine lakes.

Guide-outfitting is the areas most established backcountry tourism product, drawing visitors primarily from Europe, the United States and Canada. Guide-outfitting is significant contributor to the local economy and employment base. There are four guide outfitters who have significant portions of their territories in the plan area and three others with a minor portion in the plan area. The guide outfitting

industry is dependent on maintaining healthy wildlife populations and the wilderness experience of clients.

Background work has been done for the development of a tourism/recreation chapter; however, due to the lack of resources, the chapter could not be completed to the standards desired by the Kaska and MSRM and incorporated into the plan at this time. It may be added at a later time. Objectives and strategies to maintain tourism values will be identified for application across the landbase and within specific zones.

Plan Goals within the Timber Area B

- To host a viable, local tourism industry offering quality tourism products in a perceived wilderness setting, which are both environmentally sustainable and culturally appropriate.
- To maintain opportunities to enjoy a wide spectrum of wilderness-related outdoor recreation activities.

Objective	Strategy
☛1 Maintain a wide spectrum of public and commercial wilderness/backcountry recreation/tourism values, opportunities and activities within the Timber Area B by not harvesting timber within the area.	1.1 Harvesting is permitted within the Timber Area B for the following purposes: • tourism/recreation development; • mining exploration and development; • oil and gas exploration and development; • local needs such as for firewood, fence rails and building materials (including for construction of commercial facilities); and • to access timber and resources in Timber Area A.

Timber Area C

Timber Area C (Map 12) encompasses the area where timber values are considered low. Only about 12 % of the total forested landbase in the Timber Area C falls within the THLB. The area is known to have very high wildlife (such as Core and parts of the Extended Caribou Winter Range zones) and cultural values (Horse Ranch zone), and the main objective is to mange this area for those values.

Harvesting is not considered appropriate except in certain circumstances. For details on resource values and management direction for this area refer to the following sections of the plan: Section 3.2.2: Caribou, Section 5: Cultural and heritage resources, and Section 6: Protected areas. For the boundaries of the Core and Extended Caribou Winter Range zones and Horse Ranch zone refer to Maps 4 and 11 respectively. The statements made in regards to the economic impacts of not harvesting the timber within the Timber Area B apply to this area as well.

8. Visual Quality

8.1 Resource values

The Dease-Liard area is renowned for its scenic beauty. Scenic areas and significant visual areas, such as viewscapes from communities and travel corridors (including roadways and waterways), have been mapped throughout the plan area (Map 14: Visual Quality). Within these areas, emphasis will be

placed on maintaining aesthetically-pleasing visual values to support recreation, tourism and quality of life.

8.2 Management direction for visual quality

Where forestry activities overlap areas of scenic value, MOF and SRM have the authority to set visual quality objectives (VQOs) to ensure that visual quality is maintained. Visual quality objectives may be formally established under the *Forest and Range Practices Act* (MOF) or *Land Act* (SRM), prescribing standards for maximum allowable disturbance and green-up.

VQOs apply to the range of forestry-related activities, including logging and road development. Other types of resource development (e.g., mining, utility corridors, tourism) are not required by law to be consistent with visual quality objectives. However, non-forestry related activities should be carried out in respect of the visual values within scenic areas.

Plan Goals for Visual Quality

- A scenic landscape that supports world class tourism and recreation potential.
- Scenic natural viewscapes from communities.
- Along highway corridors, scenic values that are generally undisturbed and consistent with a viewer expectations.
- Along river corridors, scenic values that are consistent with a pristine wilderness experience, where viewers see little or no evidence of human use.

Objectives	Strategies	Management Considerations
☛1 Maintain the visual quality of identified scenic areas (Map 14) as follows: • Ensure that resource development activities are not visually evident or, if evident, remain subordinate as viewed from the following: ○ along Highway 37; ○ Wheeler Lake; and ○ communities of Good Hope Lake, and Dease Lake. • Ensure activities are not visible or difficult to perceive as viewed from the Dease River.	1.1 Use the existing Visual Landscape Inventory as interim visual quality objectives until replaced by better information. 1.2 Maintain a 5 m Visually Effective Green-up. 1.3 Forest management activities will be consistent with the objective of maintaining the integrity of visual resources. It is recognized that salvage harvesting following catastrophic events (e.g., fire, blowdown, infestation) may compromise visual quality from time to time.	
2 Maintain the visual quality of identified significant visual areas (Map 14) as follows: • Ensure that resource development activities are not visually evident or, if	2.1 Maintain a 5 m Visually Effective Green-up. 2.2 Forest management activities will be consistent with the objective of	Prior to development, the Alaska Highway, Lower Post, and Liard and Highland Rivers will be established as scenic areas following a visual landscape inventory to more

Objectives	Strategies	Management Considerations
evident, remain subordinate as viewed from the following: o Alaska Highway; o community of Lower Post; and o Liard and Highland Rivers.	maintaining the integrity of visual resources. It is recognized that salvage harvesting following catastrophic events (e.g., fire, blowdown, infestation) may compromise visual quality from time to time.	clearly define areas of visual sensitivity.

9. Plan Implementation, Monitoring and Amendment

Following Government approval of the plan, the management objectives and targets will be applied through a dual process of implementation and monitoring. Implementation and monitoring of the plan is a shared responsibility between government agencies and stakeholders.

9.1 Implementation

Implementation of the Dease-Liard SRMP will occur through a number of processes:

- ongoing delivery of government programs, policies and initiatives within the framework of existing legislation, regulation and management guidelines;
- approval of applications for tourism and commercial recreation and other tenures;
- approval of Forest Stewardship Plans; and
- legal establishment of the selected elements of the plan under provincial legislation.

In addition, SRMP direction will be considered during the environmental assessment and other approval processes for mineral and energy projects.

9.2 Monitoring

The monitoring phase of the plan involves ongoing assessment of (a) compliance with the plan during implementation; and (b) the effectiveness of plan direction in meeting SRMP goals and objectives. Individual government ministries and agencies will assume responsibility for monitoring those aspects of the plan relevant to their mandate. To the greatest extent possible, SRMP monitoring will take advantage of existing agency environmental and natural resource management monitoring and research programs.

Subject to available funding, every two years, MSRM will prepare a public review of this SRMP to assess progress in plan implementation. Review findings will be documented and published on the regional website. This review will guide service plan development and setting of priorities and practices for SRMP implementation.

Adaptive Management

The Dease-Liard SRMP was developed using the best available information and knowledge complimented by the First Nations traditional knowledge. At the same time, we recognize that there is inevitably some amount of uncertainty as to the ultimate effectiveness of management recommendations. To address this uncertainty an adaptive management approach is recommended that will provide continual improvement of management policies and practices. By monitoring key response indicators over time and incorporating new information and knowledge, MSRM will be able

to analyze the outcome of management practices in light of the original SRMP objectives an incorporate those results into the plan. Management within caribou habitat is a primary area of focus for adaptive management (Appendix E).

9.3 Plan Amendment

Based on available funding, every five years, MSRM will conduct a review of this SRMP to assess the effectiveness of the SRMP in meeting the plan's defined goals and objectives.

Where regional review of effectiveness monitoring results shows that the SRMP is not effective in achieving stated plan goals, MSRM will coordinate the development of measures to improve plan effectiveness in consultation with First Nations and stakeholders.

A SRMP and/or the legal objectives that have been established to implement the SRMP, may be subject to review at times other than the 5-year scheduled review periods in order to address issues that may arise. Final decisions on plan amendment are the responsibility of MSRM.

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Appendices

Appendix A: Achievement of sustainability principles

The following table summarizes the effectiveness of the Dease-Liard SRMP in aligning with the provincial Governance Principles for Sustainable Resource Management. These sustainability principles were designed to reflect a commitment to adopt a scientifically-based, principled approach to environmental management that ensures sustainability, accountability and responsibility. Draft sustainability principles were approved by Cabinet in May 2002.

Principle	Intent of principle	Dease –Liard SRMP
Accountability	Setting performance-based standards and indicators and implementing mechanisms for compliance, auditing and reporting on progress towards sustainable resources management. An effective enforcement regime is a key part of accountability.	Objectives have been written to provide clear direction that can be measured and tracked for compliance and effectiveness. Attempts have been made to address all significant interests in an open manner in the SRMP and accompanying Background Report.
Certainty	Making timely and clear resource management decisions within a predictable and understandable regulatory framework.	• The plan has been developed consistent with the draft Standards for Sustainable Resource Management Planning. • The plan is consistent with existing legislation. Rationales are provided where direction has been provided that is suited to the Dease-Liard area but not consistent with provincial policy. • Efforts have been made to ensure the consistency of the plan with management in adjacent jurisdictions (Yukon, Cassiar Iskut-Stikine LRMP area, Fort Nelson LRMP area). Agencies within the Yukon Territorial Government have been provided an opportunity to review and comment on the plan.
Competitiveness	Ensuring that British Columbia remains internationally competitive by removing barriers to investment and promoting open trade.	• The SRMP was developed in consideration of the distinct challenges facing development in this remote and relatively undeveloped area. • Objectives and strategies have been prepared to encourage development while conserving other environmental, social and cultural values. • Economic development opportunities are identified in the introduction to timber chapter. A timber feasibility assessment has been completed for the plan area. • Studies have been completed on externalities affecting economic development and these are cited in the plan.
Efficiency	Maximizing the net benefits arising from the allocation, development and use of natural resources.	• The timber impact assessment provides a simple evaluation of the trade-offs between economic and environmental values in the

Principle	Intent of principle	Dease –Liard SRMP
		plan area.
Innovation	Encouraging innovative approaches, technologies and skills to ensure the sustainability of natural resources.	• Innovativeness is key to successful resource development in this remote area. • Where appropriate, objectives and strategies have been developed to allow flexibility and creativity in their implementation. • The entire SRMP has been developed to reflect the issues distinct to the Dease-Liard.
Integration	Ensuring that resource management decisions integrate economic, environmental and social considerations for the benefit of present and future generations.	• The zoning and objectives in the SRMP aim to balance timber development with environmental, social, and cultural values.
Science-based decision-making	Making justifiable decisions informed by science-based information and risk assessment.	• The plan was developed based on up-to-date information on ecology and resource management. The plan includes an extensive list of references that provided best available information to allow science-based decision-making. • Local and provincial experts in a variety of fields provided expert opinion and feedback on best management practices. • Management of sensitive ecological values is conservative and is based on the precautionary principle.
Shared Responsibility	Encouraging cooperation among First Nations; federal, provincial and local governments; industry and non-governmental organizations in developing and implementing resource management policies.	• The Dease-Liard Area Assessment, which provided the foundation for the SRMP, was developed in partnership between the Ministry of Forests, former Ministry of Environment, Lands and Parks, and the Kaska Dena First Nation. • Planning will not occur for plan implementation and monitoring until a forest tenure is in place and resource development activity is planned.

Principle	Intent of principle	Dease –Liard SRMP
Transparency	Establishing open and understandable decision-making processes including consulting with key interests prior to making decisions. Transparency also includes the public release of monitoring and compliance records and tracking of sustainability indicators.	• All efforts have been made to consult the range of First Nations, stakeholders and interests and provide them with an opportunity to review and provide input into the final product • Risks associated with the plan have not been formally assessed, however a consideration of risk was implicit in the science-based decision making that went into plan development and the plan will be implemented based on an adaptive management approach. • The plan includes a section on implementation and monitoring. Sustainability indicators will be tracked as part of ongoing plan monitoring and evaluation.
Continual improvement	Learning from the past and looking for new and improved approaches to resource management.	• The SRMP has been developed on the principle of adaptive management. A set of guidelines for adaptive management of activities within caribou habitat is included within the plan. • The plan will be evaluated at regular intervals and amended where necessary, as outlined in the document. • The plan may be monitored for effectiveness, if funding is available.

Appendix B: Involvement of First Nations, stakeholders, provincial agencies, and the general public in the SRMP

Dease-Liard Area Assessment Process

The DLAA process was a partnership between the MOF, former MOE and the Kaska Dena First Nation. As partners in the process the Kaska Dena Council and the Kaska communities had an opportunity to be intensively involved in the development of the draft technical report. Substantial amount of valuable traditional knowledge and information that was provided by the Kaska people was crucial considering many gaps in the inventory information.

During the DLAA process, meetings were held with a small group of Kaska Dena who then took the information from these meetings back to the communities. As an outcome of these community consultations, suggestions were provided on the establishment of zone boundaries (see Map 15) and management direction to address concerns and values brought forward by the Kaska Dena. This information was captured in the draft DLAA technical report, which was folded into the Dease-Liard SRMP. The zones, which were developed as part of the DLAA process (Map 15), were used during the Dease-Liard Sustainable Resource Management Planning Process as a spatial identification of the Kaska values and concerns and were the basis for subsequent zoning and finalization of management direction.

Dease-Liard Sustainable Resource Management Process

A preliminary draft of the plan was sent to the: affected First Nations (Teslin Tlingit and Tahltan); key stakeholders (guide outfitters and Canadian Parks and Wildlife Society); provincial government agencies (Land and Water BC, Ministry of Forests, Ministry of Water Land and Air Protection, Ministry of Energy and Mines, and MSRM Resource Planning Branch); Dease Lake Planning Advisory Committee; Yukon Territorial Government, Renewable Resources; and Department of Indian and Northern Affairs, Yukon. The plan was revised based on the comments received.

Kaska Dena First Nation

The Kaska Dena First Nation was a partner in the planning process. The Kaska representatives were involved in all stages of plan development. All decisions have been made by consensus. The plan was also reviewed by the Kaska Joint Natural Resource Agency, Daylu Dena Council and Dease River First Nation leadership. The comments from these reviews have been incorporated. The Kaska Dena support the plan.

Tahltan First Nation

The Tahltan did not actively participate in the planning process. Meetings were held in November of 2002 in Dease Lake and Iskut with the Tahltan and Iskut Bands. The main objectives of the meetings were to discuss the planning process and the Tahltan First Nation interests in the planning area. The preliminary draft plan was sent to both Band offices. No comments were received. A follow up conversation revealed that nether office reviewed the plan. Revised draft plan was also sent to both Bands for review, but no response has been received.

Teslin Tlingit First Nation

The Teslin Tlingit did not actively participate in the planning process. A letter was sent in January 2003 with the intent to inform the Teslin Tlingit First Nation about the planning process and to invite them to provide input regarding any values they may hold within the plan area. The preliminary draft plan was sent to their office. One comment was received regarding the planning process and this was clarified. Other comments were operational in nature and related to MOF's mandate. As a result they could not be addressed by MSRM. Revised draft plan was also sent to the Teslin Tlingit office for review, but no response has been received.

Ministry of Forests and Water, Land, and Air Protection

Extensive comments were received from these two ministries. Individual and/or group meetings were held with both agencies to review the comments and address their concerns. In most instances, suggested changes to the plan were incorporated. Both agencies support the plan.

Ministry of Energy and Mines and the mining sector

The MEM did not have concerns with the plan as it does not constrain mineral exploration or development. A mineral industry representative reviewed the draft plan, and had minor concerns that have been addressed.

Canadian Parks and Wilderness Society

The CPAWS has reviewed the plan and provided written comments. The summary of comments and responses are summarised in Appendix J.

Public Consultation

An opportunity for the general public to review and comment on the plan will was provided during a 60-day review and comment period. An open house was held in the community of Dease Lake. The summary of comments received during this period and responses are summarised in Appendix J.

Appendix C: CDC Red- and Blue-listed Plant Species and Plant Communities in the Dease-Liard

There are 16 blue or red listed plants (element occurrences) currently listed in the British Columbia Conservation Data Centre for ecosections in the plan area. The British Columbia Species and Ecosystems Explorer is a website that allows users to search for rare animals, plants and natural plant communities for the entire province or by forest district. To view the listed species for the Dease-Liard, go to (http://srmapps.gov.bc.ca/apps/eswp) and search under Prince Rupert/ Cassiar.

Note that the CDC lists recorded sightings of these plant species. Because this area is remote and, for a large part, unroaded, there may be fewer rare plant species listed in the British Columbia Species and Ecosystems Explorer database than actually occur on the landbase.

Of the rare plant species that are listed by the CDC, at least three are found on calcareous soils, three in wetlands, and at least four on open slopes among the forests. Calcium rich uplands support some rare plant species such as two-flowered cinquefoil, tundra milk vetch and smooth draba[23]. Wetlands and bogs support such rare plant species as European water hemlock, hairy butterwort, and whitish rush. Some sites, frequently disturbed by fire, flooding or landslides, often have a fairly stable grassland, forb or shrub community (edaphic climax). These include such rare plant species as Gorman's penstemon, Davis' locoweed and Yukon lupine.

Ecosection	Plant species (scientific name)	Plant species (common name)
Liard Plains	*Cicuta virosa* *Pinguicula villosa* *Lupinus kuschei* *Penstemon gormanii*	European water hemlock Hairy butterwort Yukon lupine Gorman's penstemon
Kechika Mountains	*Chamaerhodos erecta nuttallii* *Poa pseudoabbrviata* *Potentilla elegans*	American chamaerhodos Polar bluegrass Elegant cinquefoil
Cassiar Ranges	*Potentilla biflora* *Astragalus umbellatus* *Draba panderiana* *Lesquerella arctica* *Draba glabella* *Potentilla elegans* *Descuriana sophoides* *Juncus albescens* *Oxtropis jordalii davisii*	Two-flowered cinquefoil Tundra milk-vetch Palander's draba Arctic bladderpod Smooth draba Elegant cinquefoil Northern tansy mustard Whitish rush Davis' locoweed

[23] The calcium-rich marl lakes of the middle Dease drainage have a unique invertebrate fauna, including some rare molluscs: cloaked physa (*Physa megalochlamys*), obtuse physa (*Physa sibirica*), and attenuate fossaria (*Fossaria truncatula*).

There are two CDC-listed rare plant communities in the plan area. These are:

Ecosystem (Scientific name)	Ecosystem (English name)	Biogeoclimatic unit
Carex lasiocarpa/ Drepanocladus aduncus	S moss	BWBSdk1 SWB
Poa glauca ssp. *rupicola*	Glaucous bluegrass	AT SWB/00

Appendix D: Rationale for seral stage targets

Developing Targets for Seral Stage Spatial and Temporal Distribution

Prepared by:
Don Reid, MSRM, May 2003
Revised July 2003

Introduction

This document summarizes the approach used to provide targets for seral stage distribution (temporal and spatial) at a regional scale as part of the Dease–Liard SRMP process. These targets would apply to whatever mix of natural disturbance and man-made disturbance (notably forest harvesting) might occur in the plan area.

Objective

The objective of this exercise is to develop seral stage targets that approximate the conditions likely to have been produced by natural disturbance regimes in the plan area in the absence of large scale human changes to the forest age distribution.

This objective can be seen as the application of the coarse filter for biodiversity conservation. The assumption behind this objective is that biodiversity conservation is more likely to be achieved if forest harvesting and timber land base management are applied at similar spatial and temporal scales to natural disturbance regimes. Conversely, biodiversity conservation is more at risk as divergence from those regimes increases.

What are the Patterns of Natural Disturbance?

Wong et al. (2002) provide a summary of natural disturbance patterns and processes in each of the biogeoclimatic regions of British Columbia. The plan area includes forested landscapes in the Boreal Black and White Spruce (BWBS) dk1 and dk2 variants, and the Spruce-Willow Birch (SWB) zone. The BWBS is similar to much of the southern boreal forest of Yukon and Alberta, so studies from those areas may also be useful. Fire is by far the prevalent cause of stand-replacing disturbances in this zone, and the only stand-replacing disturbance that has received much study in the British Columbia portion of the zone. The Biodiversity Guidebook of the former British Columbia, Forest Practices Code (MoF 1995) classifies the BWBS as Natural Disturbance Type 3 (ecosystems with frequent stand-initiating events), and the SWB as NDT 2 (ecosystems with infrequent stand-initiating events).

There are a number of published and unpublished studies with data pertaining to these ecosystems (Table 1). Within the plan area itself, Francis et al. (1999) studied fire disturbance patterns in both the Blue River development block (all BWBSdk2). They also studied all of NTS 1:250,000 mapsheet 104P, which covers portions of BWBSdk1 and dk2, and SWB, in the north-central part of the plan area, including most of the areas proposed for timber harvesting. DeLong (1998) and Rogeau (2001) studied portions of the BWBS in north central British Columbia (MacKenzie TSA). Parminter (pers. comm.) did field studies in the BWBS in the 1980s, and combined that with estimates from other boreal areas of western Canada to produce a summary table published in Hamilton and Nicholson (1990). Studies from southern Yukon (Hawkes 1982; BWBS but drier than the Dease-Liard), and central Alberta (Cumming 1997; BWBS similar to that in B.C.) are also presented for reference, as are data from the Biodiversity Guidebook (MoF 1995).

Temporal Patterns – Data from the Dease – Liard Plan Area

Disturbance Rate and Return Interval are different ways of expressing the same data, and relate to the proportion of the landbase burned per year and the temporal frequency of fires. Different metrics can be calculated depending on how one classifies (e.g., lumps the time sequence) the data set.

For the Blue River study area, Francis et al. (1999, Table 1) present data on area burned in each successive fire event. The history is dominated by two massive fires (1730 and 1830), and a series of smaller fires since 1890. Table 1 presents mean and ranges of metrics for each of these three periods (i.e. 1890-2000, 1830-2000, & 1730-2000). Disturbance rate (% area burned / year) is calculated as:

$$\frac{\text{Total area burned by all fires in the time period (ha)}}{\text{Total study area (ha)} \times \text{Time periods (years)}}$$

For the total study area I used the total area covered by all the fires (35,442 ha), since the entire study area was attributed to one or other fire in the 270 year time period. Return Interval (years) is calculated from the Disturbance Rate (Proportion burned / year) by:

$$\frac{1.00}{\text{Proportion burned/year}}$$

This gives the number of years for all portions of the study area to experience fire, assuming that fires burn areas independently.

For the 104P mapsheet, Francis et al. (1999, Table 9) present data on area burned by Ecoregion. This shows a marked increase in fire frequency and burn area at low to mid-elevations (<1200 m) in the Liard Basin (LB) and Boreal Mountains and Plateaux (BMP), as compared to higher elevations (>1200 m). This elevation break corresponds fairly well with the transition from BWBS to SWB (1000-1100 m, DeLong et al. 1991), and could be used here to differentiate disturbance rates in these zones. However, the zone from 800-1200 m shows a significantly reduced disturbance rate from the zone below 800 m, so a calculation of each is warranted. Also the boundary of the BMP and LB ecoregions (Dease confluence with Rapid R.) corresponds fairly well with that between the BWBSdk2 (most in LB) and BWBSdk1 (most in BMP) (Dease confluence with Four Mile R.), so the data in Francis et al. (1999) were used to differentiate these variants.

To gain an estimate of Disturbance Rate for the BWBSdk2, I first used data for area burned in the sum of Low and Medium elevations of LB as a proportion of total area in each of those portions of the LB (calculated from the area burned as a % of total area)) (Francis et al. 1999, Table 9c). A total of 65,902 ha were burned in a total study area of 558,094 ha, over a 50 year period. Secondly I made the same calculations for just the Low elevation portion of the LB (A total of 50,855 ha were burned out of 270,938 ha in a 50 year time period).

For an estimate of Disturbance Rate for the BWBSdk1, I used the same approach, but using data for the BMP instead of the LB. For Low and Medium elevations combined, 20,541 ha were burned out of 297,298 ha in 50 years. For Low elevations alone, 6,464 ha were burned in an area of 27,624 ha over 50 years.

Temporal Patterns – Data from Other Areas

Parminter's data (published in Hamilton and Nicholson 1990) suggest different average return intervals for different cover types: Sb (75-125), At Pl Sw (100-150) and Pl Sw Bl (150-200). The BWBSdk2 would include substantial portions of all three of these cover types (Banner et al. 1993). Their overall range is 75-200 years, the midpoint of which is 137.5 years. The BWBSdk1 would be predominantly the last of the three cover types (PlSwBl) (Banner et al. 1993), with a midpoint of 175 years.

DeLong (1998) summarized data on Disturbance rate for a number of northern British Columbia. ecological regions. His Dry Cool Boreal designation corresponds closely to the BWBSdk1, and data in Table 1 are taken directly from his Table 3, using the values for different time periods to give a range of values for the measures. Wong et al. (2002) summarize results from Rogeau (2001) for the BWBS portions of the MacKenzie TSA, and the data in Table 1 are directly from Wong et al. (2002). Similarly I have taken data directly from Wong et al. (2002) for two other boreal areas, - southern Yukon (Hawkes 1982) and boreal mixedwood of Alberta (Cumming 1997).

Choosing Parameter Values for Return Interval

None of the studies in Table 1 provides the ultimate Return Interval estimation; each has its own biases in terms of time period assessed, study area size and methods of assessment. Yet choosing a set of values, even a single value, is necessary in order to calculate seral sage targets. In this case, the need is to calculate seral stage targets for the Liard Plains, encompassing the BWBSdk2 in non-mountainous terrain where forest harvesting will take place, and for the BWBSdk1 of the Dease River valley in more mountainous terrain. (Forest harvesting is not anticipated in the SWB).

The estimates from Francis et al (1999) are almost certainly overestimates of return interval in that fires were suppressed in the study area during at least the later portion of the study period (1940-1990) (Parminter pers. comm..), and the study area was relatively small and not representative of patterns across the broader landscape (Francis et al. 1999). Data in Delong (1998) may also result in overestimates of return interval to the extent that the portions of the BWBS he refers to are mostly mountainous, where fires tend to be less extensive, and perhaps less frequent. The data provided by Parminter are more synthetic across a range of BWBS conditions and also include information from non-mountainous portions of the B.C. BWBS, similar to the Liard Plains ecoregion (BWBSdk2). They also correspond quite well to some of the Yukon data.

All the data indicate that the Biodiversity Guidebook (MoF 1995) proposes figures that are biased towards a fast return interval. By underestimating the return interval, and applying factors other than return interval in the calculation of seral targets, the Guidebook would produce a landscape with different distribution of seral stages than that found in a fire regime. The Guidebook recommends even shorter return intervals (100 years) for deciduous stands than the coniferous stands (125 years), in line with the trend presented by Parminter. In other boreal systems there is evidence that aspen dominated stands may be a long term climax forest type, dominated by gap dynamics, that canopy tree age is a biased estimator of stand age in such forests (Cumming et al. 2000), and that deciduous leading stands burn less frequently than the various coniferous stands (Cumming 2001). I do not differentiate return intervals for different BWBS cover types in these recommendations, because of the uncertainty.

In summary, the data presented by Parminter seem to represent a good compromise, with sufficient detail to represent conditions that might be found in the BWBSdk2 of the Liard Plains themselves,

and the BWBS dk1 of the Dease valley. These are the portions of the plan area where forest harvesting is most likely. A reasonable choice of a single value for stand-replacing Disturbance Return Interval for the BWBSdk2 would be 140 years (essentially the mid-point of the range of average return intervals presented by Parminter), and for the BWBSdk1, 175 years (once again the midpoint of the range of values for the cover type dominating that subzone). The difference between the two subzones is reasonable given the differences in fire return interval between the LB and BMP ecosections reported by Francis et al. (1999) (Table 1). As well as giving a single value for disturbance return interval (from which seral stage targets would be calculated), it is perhaps more ecologically meaningful to give a range of values within which the manager can choose (fires result in a constantly changing representation of forest age classes over time).

Here I present this option for the BWBSdk2. For example a reasonable range of return intervals might be 100 to 180 years (with a mid-point of 140 years), judging by the data in Table 1. It is likely that managers will more often wish to allow cumulative disturbances (logging plus fire plus other stand replacing events) to approximate return intervals less than 140 years, rather than at longer return intervals. For example, a manager might want to exceed the early seral (<40 year old) stage target based on 140 years (i.e. allow disturbances to create early seral in the return interval range from 100-140 years), especially when unsuppressed wildfire contributes significantly to the extent of early seral landscape. However, the forest should not be consistently managed to this lower part of the range of return intervals. The manager's option to allow a landscape scale representation of early seral at return intervals of 100-140 years for a few years must be balanced by a corresponding management to longer return intervals (from 140-180 years) in other years. I recommend using a twenty-year running average of disturbance return interval to achieve this balance, with a proviso that the twenty year running mean must fall within the middle 25% of the entire range of reasonable return intervals (i.e. between 130 and 150 years, a 20 year span within the broader 100-180 year range). This running mean would be calculated based on seral representation at the end of the calendar year for each of the preceding 20 years. Twenty years is half the length of the age range of most of the seral stage classes. Therefore it provides a reasonable length of time within which substantial recruitment to a seral class can result from ongoing ageing of stands. The figures for seral stage representation in this flexible regime are in Table 3, focussing on the deviation from 140 years that is most likely when managing for forestry and fires. When fires are the only substantial source of stand-replacing disturbance, then management targets can be relaxed somewhat (e.g., there is no need to adhere to the 20-year running mean rule).

Incorporating a range of targets, along with a running mean rule, is risky, and potentially costly. The manager will have to act cautiously in allowing combined natural and human-induced disturbances to exceed the early seral target based on a 140 year return interval. It will not be easy to manage all future disturbances (e.g., wildfires) to achieve the necessary twenty year running average after an "excess" of early seral has been allowed. When forest harvesting alone is sufficiently extensive to approximate the 140 year targets, then management must include concerted fire suppression throughout the area within which seral targets are calculated. Conversely, if forest harvesting is abandoned for a number of years, the manager should ensure that any ongoing fire suppression is not resulting in seral stage representation that exceeds the values at the upper end of the range (i.e. Return Interval of 180 years).

Calculating Seral Stage Targets from Return Intervals

Seral Stage Targets are calculated from the Return Interval data using the negative exponential distribution relationship outlined in Appendix 4 of the Biodiversity Guidebook (MoF 1995). The proportion of the landscape with stand age > t (years) is calculated as:

$$e^{[-(t/b)]}$$

where b is the estimated Return Interval in years.

For each seral stage class (early, Mid, Mature and Old) by NDT type, a maximum age is attributed by the Biodiversity Guidebook (MoF). These are the break points (i.e. t values) for calculating the proportion in each class. The results are summarized in Table 2.

Spatial Patterns

Table 1 includes estimates of mean and modal patch size for fire-induced disturbances. Theses are taken directly from the Tables in the various references. Once again it is clear that the recommendations of the Biodiversity Guidebook (MoF 1995) are invalid. They suggest a set of very small opening sizes that would fragment the landscape in a much more severe way than the more extensive opening sizes created by wild fire. There is strong empirical evidence to recommend opening sizes > 250 ha, and frequently >1,000 ha.

Desirable distribution of opening sizes in the plan area (modified using data in Francis *et al.* 1999 (Table 8), DeLong 1998 (Table 3), Rogeau 2001, and Ministry of Forests 1995 (Table 13)).

Opening Size (ha)	% harvested forest area within plan area[24]
<100	10 - 20
100 – 2,000	60 - 80
2,000 – 10,000	10 - 20

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[24] Considering that a very small percent of the SWB may be harvested in any given time, the plan area is used for the purpose of simplicity.

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Table 1. Summary of fire-induced disturbance rates and patch sizes in the plan area and related boreal regions.

GEOGRAPHIC AREA	SOURCE	MEAN DISTURBANCE RATE (% area / yr)	RANGE IN DISTURBANCE RATES (% area / yr)	MEAN RETURN INTERVAL (years)	RANGE IN RETURN INTERVAL (years)	MEAN PATCH SIZE (ha)	MODAL PATCH SIZE CLASS (ha)
Study Area							
Blue River Forest development Area (BWBSdk2)	Francis et al. 1999 (Table 1 using 1890-2000 (110y); 1830-2000 (170y) & 1730-2000 (270y))	0.326	0.195 – 0.413	342	242 - 513	180	40 - 250
Liard Basin Ecoregion at mid and low elevations (<1200 m) - corresponds to BWBSdk2 and lower SWB	Francis et al. 1999 (Table 9, 1940-1990)	0.236	n/a	424	n/a	3,903 (For entire 104P map sheet, which includes BWBS, SWB and AT)	1,000 – 10,000 (For entire 104P map sheet, which includes BWBS, SWB and AT)
Liard Basin Ecoregion at low elevations (<800 m) – corresponds to lower BWBSdk2	Francis et al. 1999 (Table 9, 1940-1990)	0.375	n/a	267	n/a		
Boreal Mtns and Plateaus Ecoregion at mid to low elevations (<1200 m) – corresponds to BWBS dk1 and lower SWB	Francis et al. 1999 (Table 9, 1940-1990)	0.138	n/a	725	n/a	3,903 (For entire 104P map sheet, which includes BWBS, SWB and AT)	1,000 – 10,000 (For entire 104P map sheet, which includes BWBS, SWB and AT)
Boreal Mtns and Plateaus Ecoregion at low elevations (<800 m) – corresponds to lower BWBSdk1	Francis et al. 1999 (Table 9, 1940-1990)	0.468	n/a	214	n/a		
Northern B.C.							
BWBS undifferentiated through Fort Nelson and Mackenzie FDs – likely corresponds to BWBSdk2	Parminter (pers comm.) as published in Hamilton and Nicholson 1990	0.727	1.33 – 0.50	137.5 (mid-pt of range)	75 - 200	n/a	3,000 – 10,000
BWBS PlSwBl types through Fort Nelson and Mackenzie FDs – likely corresponds to BWBSdk1	Parminter (pers comm.) as published in Hamilton and Nicholson 1990	0.571	0.67 – 0.50	175 (mid-point of range)	150-200	n/a	3,000 – 10,000
BWBS dk1 in Mackenzie Forest District	DeLong 1998 (Table 3 using 1910 - 1950)	0.300	0.22 – 0.38	333	267 - 455	n/a	101 - 1,000

Mackenzie TSA, incl. SBS, BWBS, ESSF and SWB	Rogeau 2001 in Wong et al. 2002 (1860 – present)	0.32 - 1.33 (BWBS)	0.31 - 1.49 (BWBS); 0.32-0.45 (SWB)	60 - 330 (BWBS)	75 - 303 (BWBS); 220 - 303 (SWB)	960 – 2880 (BWBS); 2270 – 2880 (SWB)	n/a
Other							
Boreal forest in Kluane National Park, Yukon	Hawkes 1982 in Wong et al. 2002	n/a	0.75 – 0.43	n/a	133 - 234	140 - 1600	n/a
Boreal mixedwood forest of northern Alberta	Cumming 1997 in Wong et al. 2002 & Eberhart and Woodard 1987	0.41	n/a	244	n/a	21 – 17,770 (Range)	n/a
Biodiversity Guidebook							
BWBS with deciduous prominent	Ministry of Forests 1995 (Table 10)	1.00	n/a	100	n/a	n/a	n/a
BWBS with coniferous prominent	Ministry of Forests 1995 (Table 10)	0.80	n/a	125	n/a	n/a	n/a
BWBS alluvial	Ministry of Forests 1995 (Table 14)	n/a	n/a	n/a	n/a	<20 ha (30-50%); 20–40 ha (30-50%); 40-80 ha (10-30%)	n/a
SWB	Ministry of Forests 1995 (Table 6)	0.50	n/a	200	n/a	<40 ha (30-40%); 40-80 ha (30-40%); 80-250 ha (20-40%)	

Table 2. Age class distribution of Seral Classes by NDT type, and percentage of land base in each class by Return Interval

	NDT 3 (BWBS) RI = 125 y (MoF 1995)		NDT 3 (BWBS) RI = 140 yr (This work)		NDT 3 (BWBS) RI = 200 y (This work)		NDT 3 (BWBS) RI = 175 y (This work)		NDT 2 (SWB) RI = 300 y (This work)		PRESENT CONDITION (BWBSdk2)	
SERAL CLASS	Age Class (y)	% of Land Base	Age Class (y)	% of Land Base	Age Class (y)	% of Land Base	Age Class (y)	% of Land Base	Age Class (y)	% of Land Base	Age Class (y)	% of Land Base
EARLY	<40	27	<40	25	<40	18	<40	20	<40	12	<40	11
MID	40 - 100	28	40 - 100	25	40 - 100	21	40 - 100	23	40 – 120	21	40 – 100	30
MATURE	100 - 140	12	100 - 140	13	100 - 140	11	100 - 140	12	120 – 250	24	100 – 140	33
OLD	> 140	33	> 140	37	> 140	50	> 140	45	> 250	43	> 140	27

Table 3. Percentage of the land base in each seral class based on stand-replacing disturbance return intervals (RI) suggested for the BWBSdk2

SERAL CLASS	LOW END of Range; RI = 100 years	LOWEST VALUE for 20-year RUNNING MEAN; RI = 130 years	MIDPOINT of RANGE; RI = 140 years	HIGHEST VALUE for the RANGE; RI = 180 years
Early (< 40 years)	33	27	25	20
Mid (40-100 years)	30	28	25	23
Mature (100-140 years)	12	12	13	11
Old (> 140 years)	25	33	37	46

Appendix E: Adaptive Management Strategy for Caribou

Adaptive management criteria and process for woodland caribou in the Dease-Liard Sustainable Resource Management Plan

Prepared by:
Norm MacLean
LGL Limited[25]

Woodland caribou habitat management requires a multi-scale approach to retain critical stand level habitats while ensuring an adequate matrix of mature and old forest cover at the landscape scale. In addition, woodland caribou movements and winter range use are a complex relationship related to snow cover, lichen abundance, predation, direct and indirect disturbances and forest succession. Winter range use will shift over time on the landscape and forest management plans must be flexible to incorporate new information.

The desired approach to forest management planning is to apply adaptive management approaches to the implementation and monitoring of forest plans. The key components to the approach are measurable indicators and the process for applying new information before it becomes dated and further impacts occur.

To determine measurable indicator(s) for this plan area, woodland caribou studies on determining landscape habitat thresholds were reviewed. Woodland caribou studies in northern Alberta have reviewed impacts to caribou populations from linear developments and forest development. The herds are not hunted so the impacts to the populations could be measured and correlated to linear developments and forest harvesting. The authors reported that populations with cumulative habitat disturbances (habitats that have turned to permanent early seral (e.g. roads, right of ways) and/or temporarily not contributing to caribou habitat (e.g., cutblocks, oil and gas well sites) greater than 50% at the landscape scale were decreasing. In addition, caribou at the stand level avoided linear developments and industrial openings (e.g. oil wells, cutblocks) by at least 250m from the edge. The avoidance further reduced available habitats and mature forest cover for caribou (Bradshaw et al. 1997, Bradshaw et al. 1998, Dyer 1999, Dyer et al. 2001, James and Stuart-Smith 2000, and Stuart-Smith et al. 1997). Direct impacts to woodland caribou associated with industrial activities include:

- loss of arboreal and terrestrial lichens;
- loss of forest cover and avoidance of disturbed forests.

Indirect effects on caribou associated with industrial activities include:

- increased access for hunting;
- increased access for predators;
- altered predator-prey balances where caribou numbers decrease while other ungulates increase.

Dyer (1999, 2001) showed caribou in northern Alberta avoided oil and gas infrastructure (including roads) by distances of 250-1000m. This reduces the availability of undisturbed sites and can cause habitat fragmentation as infrastructure increases. Recently, Francis et al. (2002) suggested an approach of determining cumulative effect thresholds for woodland caribou in the Yukon.

[25] P.O. Box 33011
Whitehorse, YT
Y1A 5Y5

Yukon government agencies have begun exploring cumulative habitat thresholds for woodland caribou and have begun applying the technique through existing environmental assessment processes [see Yukon Department of Fisheries and Oceans Canada (DIAND) Environment Directorate – Kaska Forest Resources Screening report 2003]. The additional concern for the Yukon and northern British Columbia in determining cumulative thresholds is the caribou harvest by licensed hunters and First Nations. Currently woodland caribou populations in southeast Yukon and in the Dease Liard Sustainable Resource Management Plan are stable to increasing with the existing harvest (Marshall 1999).

In order to ensure that caribou populations do not decline related to linear developments or forest harvesting, a cumulative threshold below 50% is required for caribou at the landscape scale. Given the annual variability of caribou harvest and lack of specific threshold information for the caribou herds in the plan area, a recommendation of 35-40% initial threshold would be required. The threshold should be applied across the caribou habitat management areas (e.g. core winter range, extended winter range, and migration corridor). Given the lack of timber harvesting in the plan area, it will be some time before the threshold would be reached. This allows the process to be developed for determining the appropriate threshold and its implementation and monitoring in the plan area.

Once the Sustainable Resource Management Plan is approved, the implementation and monitoring will primarily be the responsibility of British Columbia Ministry of Water, Land, and Air Protection, Ministry of Forests, and Ministry of Sustainable Resource Management. Therefore, the process to determine the appropriate threshold should involve these ministries and the Kaska Dena Council. It is recommended that a joint implementation and monitoring working group should be formed within 2 years of timber harvesting commencing in caribou management zones and that involves the above parties. The working group would be involved in all aspects of implementation and monitoring and would be responsible to compile the necessary information and modeling to provide a precise threshold. The new information would replace the initial estimate of 35-40% and the working group would develop the criteria and process to monitor the landbase at appropriate intervals (e.g., 2-4 years depending on rate of timber harvest) and apply the new information to the Dease Liard plan and its management direction.

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Appendix F: Analysis of plan implications for timber supply

There is currently no commercial forestry activity in the Dease-Liard. The Allowable Annual Cut (AAC) for the Cassiar Timber Supply Area, set in 2002, is 305,000 m^3, partitioned amongst the Iskut and Boundary, Atlin, and Dease-Liard Timber Supply Blocks (TSBs). The Dease-Liard TSB was allocated 153,000 m^3 in the partition, however, to date, this allocation has not been apportioned. It is anticipated that, once the Dease-Liard SRMP is completed and approved, the timber in the TSB will be apportioned and timber tenure allocated for the area.

The Dease-Liard TSB has a total of 138,000.00 ha within the timber harvesting landbase. A 17,992.00 ha or 13 % is located outside of the plan area and 120,008.00 or 87 % is within the plan area. Table 1 summarizes the timber harvesting landbase (as determined during the TSR II process) for different timber zones in the Dease-Liard TSB.

Table 1: Timber harvesting landbase – Dease-Liard TSB

Zone	Area (ha)
Dease-Liard SRMP area-total	2,400 000.00
THLB within Dease-Liard Timber Supply Block - total	138,000.00
THLB within TSB but outside SRMP area	17,992.00
THLB within Dease-Liard SRMP area within the Dease-Liard Timber Supply Block	120,008.00
THLB within Dease-Liard SRMP: Timber Area A	77,655.00
THLB within Dease-Liard SRMP: Timber Area B	31,708.00
THLB within Dease-Liard SRMP: Timber Area C	10,645.00

The Dease-Liard SRMP contains management direction that places constraints on timber harvesting to maintain other resource values such as wildlife, biodiversity, visual quality, tourism/recreation, and cultural heritage resources. Table 2 shows the result of an area-based assessment of the amount of land removed completely (100% netdown) from the timber harvesting landbase as a result of objectives and strategies in the Dease-Liard SRMP. An assessment was not completed of areas of partial constraints to timber harvesting such as scenic areas, significant visual areas and sensitive watersheds.

Table 2: Area of 100% reduction from the timber harvesting landbase as a result of the SRMP

Zone	Management direction	Area (ha)
Core Caribou Winter Range	No harvesting within Core Caribou Winter Range unless required for road construction or control of insects and diseases.	3,129.00
Selected habitats	No harvesting within selected caribou habitats unless required for road construction or control of insects and diseases.	991.00
Horse Ranch Zone	No harvesting within this zone in order to maintain cultural and	7,516.00

	historic values.	
Davie Trail	No harvesting within 100 m on ether side of the trail	711.00
McDame Trail	No harvesting within 100 m on ether side of the trail	357.00
Timber Area B (excluding McDame Trail)	No harvesting within this zones (except small scale removal; see Section 7.3) in order to maintain wilderness/backcountry tourism/recreational values and to a lesser extent wildlife and cultural heritage.	31,351.00

Table 3 outlines the % reduction of THLB within the TSB and SRMP area for different values.

Table 3: Timber supply impacts

Resource Value	THLB Reduction (ha)	% THLB Reduction within the TSB	% THLB Reduction within the SRMP
Wildlife	4,120.00	3	4
Cultural Heritage	8,584.00	6	7
Tourism/Recreation	31,351.00	23	26
Total	44, 055.00	32	37

Even though 23 %/26% of the THLB has been removed to maintain tourism/recreation values (Timber Area B), the impact on the economy of the area is low because the net return from harvesting timber in the area would be low to nil due to the high operating costs. Marginal economics are further supported by the assessment completed in 2002 for the Kaska Dena Council by the Sterling Wood Group Ltd. The findings are summarised in the report *Identification of Logging Chance Opportunity in the Dease-Liard Timber Supply Block*.

A preliminary study of existing and potential tourism/recreation opportunities shows that in its current state, the area has potential for further tourism/commercial recreation economic development and offers some opportunities to provide expanded quality tourism products. Trends research suggests that tourism is expected to gradually increase in the region. Key tourism and recreation values for the zone include its remote wilderness, large wildlife species (Stone's sheep, mountain goat, northern caribou, grizzly and black bear, and moose), variety of sports fish species, navigable rivers and large, pristine lakes.

Guide-outfitting is the areas most established backcountry tourism product drawing visitors primarily from Europe, the U.S. and Canada. Guide-outfitting is significant contributor to the local economy and employment base. There are four guide outfitters who have significant portions of their territories in the plan area and three others with a minor portion in the plan area. The guide outfitting industry is dependent on maintaining healthy wildlife populations and the wilderness experience of clients.

It should be noted that the impacts presented are somewhat overestimated. A % THLB reduction was applied, in the TSR II process, to the areas identified as completely removed from the THLB to meet the requirements for stand stricture (wildlife tree retention) and riparian management. This was not considered in the assessment presented. As a result, parts of THLB were removed twice. In addition, the TSR II reduced the THLB overall the DLTSB to meet wildlife tree retention requirements. After plan approval only 1% retention will be required. This will have an upward pressure on the timber supply during next AAC determination.

A formal assessment of risk to environmental values was not completed as part of the plan. Due the remoteness of the plan area and lack of development to date, the limited amount of timber available for harvesting, and the provisions for environmental values in the SRMP, the overall risk to environmental values as a result of the plan is estimated to be low.

Appendix G: Current Seral Stage Distribution (analysis completed in 2003)

BEC Variant	Total Forested Area	Early Existing %/ha Total	Early Existing %/ha in NC	Early Existing %/ha in THLB	Mid Existing %/ha Total	Mid Existing %/ha in NC	Mid Existing %/ha in THLB
BWBS dk1	76,016.00	13.5/ 10,283.00	11.5/ 8,813.00	2/ 1,470.00	20/ 15,093.00	16/ 12,426.00	4/ 2,667.00
BWBS dk2	464,063.00	11/ 50,173.00	10/ 43,594.00	1/ 6,579.00	30/ 138,344.00	23/ 105,952.00	7/ 32,392.00
SWB un	446,444.00	11/ 50,292.00	<11>10/ 48,743.00	<1/ 1,548.00	29/ 129,875.00	26/ 115,802.00	3/ 14,073.00

BEC Variant	Total Forested Area	Mature Existing %/ha Total	Mature Existing %/ha in NC	Mature Existing %/ha in THLB	Old Existing %/ha Total	Old Existing %/ha in NC	Old Existing %/ha in THLB
BWBS dk1	76,016.00	35/ 26,564.00	29/ 22,097.00	6/ 4,467.00	32/ 24,077.00	23/ 17,240.00	9/ 6,837.00
BWBS dk2	464,063.00	33/ 152,035.00	28/ 130,753.00	5/ 21,282.00	27/ 123,511.00	21/ 95,767.00	6/ 27,744.00
SWB un	446,444.00	60/ 266,114.00	56/ 249,861.00	4/ 16,253.32	0/ 164.00	N/A	N/A

Appendix I: Socio-Economic and Environmental Assessment summary

A. Socio-Economic Assessment

Socio-Economic Setting

Communities

The Dease-Liard is sparsely populated. There are only three communities, Lower Post, Good Hope Lake, and Dease Lake, all of which are along major highways. The Cassiar town site is also located within the plan area. Watson Lake, located outside the plan area in the Yukon, is an important service centre for Dease-Liard communities.

Lower Post - Lower Post has a fluctuating seasonal population with around 125 year-round residents. The local economy consists mainly of sustenance activities such as hunting, fishing and trapping, and Band services. There are few facilities in Lower Post itself, but the town Watson Lake, which is 20 minutes away by car, has a full range of services including stores, government services, post office and airport. The Kaska Dena Council headquarters are located in Lower Post. The Council comprises the Dease River Band Council, Kwadacha Band (Fort Ware) and Daylu Dena Council (formerly the Lower Post First Nation).

Good Hope Lake - The community of Good Hope Lake straddles Highway 37 on the west side of the lake of the same name. Its population is approximately 100. The town is approximately 140 km south of Watson Lake and 120 km north of Dease Lake. Until its closure in 1992, the main source of employment in Good Hope Lake was the Cassiar asbestos mine. The mine closure was very hard on the community. A few band members continue to work for smaller operations that remain in the area and the construction of a highway maintenance camp has also brought some employment opportunities. The Dease River Band Council is based out of Good Hope Lake.

Dease Lake - Dease Lake is located on Highway 37 in the southern end of the plan area. The town is a main supply and service centre for the Stikine region and has a population of around 650. A number of government and other public offices (e.g. school district, highways, and health clinic) and a banking service are located there, as well as recreation facilities (community hall, outdoor and indoor skating rinks, curling arena, and school gym), accommodations, restaurants, service stations and a campground. A large number of residents are employed seasonally.

Cassiar - As the Cassiar Asbestos Mine prospered, a modern community evolved from 1950s to a population approaching 2,000, with its own store, school, hospital, churches and recreation facilities. In 1992, when the asbestos mining operation in northern British Columbia closed, the town that played an important socio-economic role in the region was closed too. The mine's employees and their families were forced to leave.

Current Economic Structure

Economic dependency estimates developed by BC STATS provide an indication of the basic sectors that make up the structure of, and drive local economies. The key sources of basic employment in the Dease-Liard SRMP area are shown in the table below.

Dease-Liard SRMP Area Economic Dependencies

Basic Sector[a]	% of basic employment	% of basic income[b]
Public Sector	54	43
Construction	16	19
Forestry	11	7
Mining	8	7
Tourism	8	4
Other[c]	4	N/A
Non-employment income	N/A	20

Source: BC STATS, 2003 BC Community Dependency Model, January, 2004

(a) "Basic" sectors of the economy are sectors, such as forestry, tourism and mining, that create flows of income into a region and are drivers of the local economy. Includes direct and indirect contribution of the sector to the area economy.

(b) Before tax income, including non-employment sources of income such as pensions, investments and transfer payments.

(c) "Other" includes parts of manufacturing and other miscellaneous industries.

Forests

The Dease-Liard plan area falls within the Dease-Liard Timber Supply Block (TSB) of the Cassiar Timber Supply Area (TSA). The allowable annual cut (AAC) for the Cassiar TSA, set in 2002, is 305,000 m^3, partitioned amongst the Iskut and Boundary, Atlin and Dease-Liard TSBs. The Dease-Liard TSB was allocated 153,000 m^3 in the partition, however it remains unapportioned and there are currently no forest tenures or commercial forestry activity in the area. Small amounts of timber are harvested under the MOF Timber Sales Program, primarily for local needs around the communities of Dease Lake, Good Hope Lake and Lower Post. This timber is processed at portable mills operating intermittently in the area.

Deterrents to large-scale timber development include the high cost of operations (due to the relatively low volumes and inaccessibility of merchantable timber), long distances to processing facilities and markets, a lack of local infrastructure, and a low and cyclical demand for timber locally.

Timber Supply

The Dease-Liard TSB has a total of 138,000 ha within the timber harvesting landbase. Approximately 18,000 ha (13%) is located outside the Dease-Liard SRMP area and about 120,000 (87%) is within the SRMP area. The SRMP area is divided into three zones. The timber harvesting landbase associated with the timber zones is summarized in the table below.

Dease-Liard TSB Timber harvesting landbase

Zone	THLB Area (ha)
Within Dease-Liard SRMP Area	
Timber Area A	77,655
Timber Area B	31,708
Timber Area C	10,645
Sub-total	***120,008***
Outside Dease-Liard SRMP area	17,992
Total	***138,000***

Timber Area A has the highest concentration of timber suitable for commercial harvesting. This zone could potentially contribute in the short and long term to development of the forest sector in the SRMP area. The SRMP's management direction for this area was developed to maximize forestry economic viability while conserving core environmental values. The zone overlaps areas of high value caribou habitat.

The majority of the Timber Area B does not contain timber suitable for harvesting. The timber that is considered suitable is scattered and isolated. The area does have high wilderness tourism/recreation, wildlife and cultural values and the main objective is to manage this area for these values. Under the SRMP, timber harvesting will be permitted to allow for tourism/recreation development; mining exploration and development; oil and gas exploration and development; local needs such as for firewood, fence rails and building materials (including for construction of commercial facilities); and to access timber and resources in Timber Area A.

Timber Area C also has low timber values. The area is known to have very high wildlife and cultural values, and the SRMP's main objective for this area is to mange for those values. Harvesting is not considered appropriate except as specified in the SRMP's management direction for caribou and cultural heritage resources.

Implications of the SRMP

- The SRMP supports opportunities for timber harvesting for commercial or local use, consistent with objectives, strategies and zoning set out in the plan.
- No new protected areas will be established under the SRMP. However, the SRMP contains management direction to maintain resource values such as wildlife, biodiversity, visual quality, tourism/recreation, and cultural heritage resources. Estimates of the impacts of the SRMP on the timber harvesting landbase are summarized in the table below. These estimates were derived by simply calculating the size of the areas that have been fully removed from the THLB as determined during the MOF's TSR II process rather than a formal timber supply analysis of the SRMP management direction.

Impacts of the SRMP on the timber harvesting land base

Resource Value	THLB Reduction (ha)	% THLB Reduction within TSB	% THLB Reduction within SRMP area
Wildlife	4,120	3	4
Cultural Heritage	8,584	6	7
Tourism/Recreation	31,351	23	26
Total	44,055	32	37

- It is estimated that the SRMP will result in the removal of 32% of the THLB. As there is currently no harvesting in the area, the THLB reduction represents a reduction in future harvest potential.
- Given that the AAC for the Cassiar TSA is not currently fully allocated, and that the economics of timber extraction in the area is marginal due to small piece size, lower value species and grades and distance to markets, the reduction in THLB will not affect current harvest levels or short term employment or fibre dependencies for the area.
- The largest reduction in THLB is in Timber Area B where approximately 31,000 ha have been removed to maintain tourism/recreation values. As noted above, the majority of this area does not

contain timber suitable for harvesting and an assessment indicates returns from timber harvesting in the area would be extremely low due to the high operating costs.
- Certainty in access to timber on the remaining areas as a result of land use planning will reduce potential land use conflicts and help to better define a licence opportunity in the area for MoF.
- The final impact of the SRMP on allowable harvest levels will not be known until the Chief Forester makes an AAC determination that considers the SRMP.

Minerals

The Dease-Liard SRMP area is rich in mineral resources. Oil, gas, coal and coalbed methane potential may exist to the west of Dease Lake and within the north-north east lobe of the plan area. Mineral exploration and mining have a long history in the planning area. A number of mineral prospects within the plan area have been sufficiently explored and have known grade and tonnage resources.

- Placer gold has been mined primarily from the McDame, Thibert and Dease Creek areas.
- Placer jade boulders have been extracted from the Provencher and Letain Creek areas.
- The Kutcho Creek property was extensively explored in the 1980s for copper, zinc, silver and gold. Falling metal prices and a lack of financing and nearby infrastructure contributed to the owners not developing the property.
- The Taurus (gold) and Cusac (gold, silver) mines operated during the 1980s but closed as precious metal prices fell.
- The Cassiar asbestos mine, which closed in 1992, produced 2.7 million tonnes of high quality asbestos fibre during its 46 years of operation. Significant ore resources remain underground. A plan to produce chrysotile (asbestos) fibre and extract magnesium from the large tailings pile at the site was halted after an electrical fire in 1999. A significant amount of jade rock is being produced each summer from waste at the mine (e.g. 50 tonnes in 1998).
- The Sivertip property, located in the northwest corner of the planning area, is a silver, lead and zinc rich developed prospect that has recently entered the Environmental Assessment Process. However, base metal (e.g. zinc, lead, copper) prices will weigh heavily on the ability to develop this property.

The ability to develop these deposits will depend on favourable metal prices, investor confidence and having sufficient infrastructure available to make it an economically viable project.

Implications of the SRMP

- Currently, mineral resource development is specifically excluded in the area's four existing Protected Areas.
- Under the SRMP, mineral exploration and development, including roaded resource development, is permitted in all zones subject to standard regulatory approval processes and conditions.
- Existing mineral tenure rights are not diminished by the SRMP.
- New mineral tenures can be staked and recorded on all mineral lands outside of protected areas according to the Mineral Tenure Act and Regulations.

Commercial Recreation and Tourism

The Dease-Liard SRMP area has potential for the development of recreation/tourism industry, especially backcountry recreation and tourism due to the extensive areas of wilderness, remote rivers, viewscapes, and an abundance of fish and wildlife. The Alaska and Cassiar Highway corridors provide opportunities for front-country tourism facilities such as accommodations, restaurants and gas stations. Tourism in the area is seasonal, with many of the lodges and gas stations closing for the winter months.

Implications of the SRMP

- The Dease-Liard SRMP allows development of facilities and infrastructure for commercial recreation and tourism, consistent with the objectives, strategies and zoning.

Guide-Outfitting, Hunting, Fishing and Trapping

With its diversity and abundant wildlife species and extensive backcountry areas, the Dease-Liard area is considered to have some of the best big game hunting in North America. Game species include Stone's sheep, mountain goat, northern caribou, grizzly and black bear and moose. There are four guide outfitters who have significant portions of their territories in the plan area and three others with a minor portion in the area. The guide outfitters that have tenures in this area operate on a seasonal basis. The guide outfitting industry is dependent on maintaining healthy wildlife populations and the wilderness experience of clients.

Trapping provides seasonal income for a number of First Nations and other residents and is an important part of the local subsistence economy. The number of individual species trapped is influenced by furbearer numbers and market prices, with Marten being the most frequently trapped species. Although difficult to quantify, the pursuit of traditional activities such as trapping provide an important and continuing contribution to the First Nations economy and culture. These activities are also important to non-aboriginal residents.

Implications of the SRMP

- Land management activities will be carried out to sustain existing guide-outfitting opportunities, and guide-outfitters will be notified about proposed resource developments in a timely manner.
- Industrial proponents and guide-outfitters will be encouraged to work co-operatively to accommodate guide-outfitting values, resource values and resource development operations.
- Hunting and fishing are recognized activities in the SRMP area, within and outside of protected areas.
- Local and resident hunters and fishers will be consulted on planning and management that affects their activities.
- Existing trapping tenures are recognized.
- Trapline holders will be notified about proposed resource development activities in a timely manner.

B. Environmental Values

- A formal assessment of the risks and benefits to environmental values associated with the SRMP has not been completed.
- Due the remoteness of the plan area and lack of development to date, the limited amount of timber available for harvesting, and the provisions for environmental values in the SRMP, the overall risk to environmental values as a result of the plan is estimated to be low.

Appendix J: Public review summary and response

Source	Comments	Response
BCTS, Skeena Business Area	For the glossary: A definition for timber harvesting land base should be added	A definition has been added.
BCTS, Skeena Business Area	For Appendix F: A map showing the Cassiar TSA and the Dease-Liard TSB (and other TSBs) would be useful.	The management direction applies within the plan area. SRMP is not concerned about mapping of TSB areas as no direction refers to them. No action will be taken.
BCTS, Skeena Business Area	For Appendix F: In table 1 please include the total area of the SRMP.	SRMP total area has been added.
BCTS, Skeena Business Area	For Appendix F: In table 1 please add "THLB within" to row 1, 3, 4, 5, 6. It would make the table clearer.	"THLB within" added to rows identified.
BCTS, Skeena Business Area	A definition of the timber harvest land base is also needed. What is the minimum vol/ha requirement that must be met.	The first part of the comment has already been addressed. No action will be taken for the second part. Questions related to the timber supply analysis should be directed to MOF.
CPAWS	Of special concern to us was section 3.1.2.2: which states "Most openings should be in the range of 200-1000 ha". After further discussion with the Kaska Dena we understand the following; that they declined to have this defined as a legal requirement in this document, and that the current Ministry of Forests guidelines limit cut blocks to 60 ha in this forest region is still legal requirement. Given this information we would suggest that further modification to the language in this section should be considered to more accurately reflect the still existing policies and requirements, and to avoid any possible confusion of conflict in the future.	The following has been added to the section 3.1.2.2 of the SRMP: The Dease-Liard SRMP provides policy direction regarding the patch size distribution. Section 64 of the Forest Planning and Practices Regulation under FRPA prevails in this regards.
CPAWS	In section 3.1.2.7, riparian management, one of the strategies suggested is to allow for roads along rivers on one side only. We understand that the intent of this section would be to not allow riparian	The following has been added to the management considerations: Conduct riparian management consistent with the Section 47 of the Forest Planning and Practices

	disturbance along rivers of a certain size, but to allow it along minor or intermittent streams. The document should say that specifically, instead of implying that roads will be allowed along rivers.	Regulation under FRPA.
CPAWS	In section 3.2.8.2 we would recommend that strategy 1.2 be made a legal requirement of the plan.	Considering that harvesting may take place only outside of gyrfalcons' habitat and distribution (nests on cliff faces in mountainous alpine tundra above tree line in the SWB and AT), the impact from harvesting is not expected. The plan can provide legal direction only to the forestry operations. This strategy has been included for information purposes for other recourse users/developers, and will remain as a policy direction only.
CPAWS	In section 9.2, monitoring, we suggest that language in regards to effectiveness monitoring principals be excluded until such time those principals have been fully developed and subject to both peer review and public consultation.	The reference to the effectiveness monitoring principals has been removed form the document.