

Copper Landscape Unit Plan

BULKLEY/CASSIAR FOREST DISTRICT

September 1999

Pre-amble

On April 21, 1998 the Bulkley Land and Resource Management Plan (LRMP) was approved by cabinet. At the time, MOF and MELP agreed that the best tool to implement the operational practices in the LRMP was through Landscape Unit Plans. As a result, the District Manager established and the DEO approved seven Biodiversity Objectives as landscape unit objectives on May 30, 1999. At the same time, their associated strategies were deemed District Manager (DM) Policy.

Based on LRMP direction, objectives for wildlife, fish, LRMP special management zones, timber, recreation, visual quality and range were developed, reviewed by the public, licensees, and branch staff with comments incorporated and were close to being ready for DM sign off by the beginning of June, 1999. On June 3, 1999 a memo regarding **Strategic Land Use Planning and Landscape Unit Planning** was released, signed by the Chief Forester and the Assistant Deputy Ministers of MELP, MEM, and LUCO. This memo states that Higher Level Plan Resource Management Zone (RMZ) objectives signed by cabinet would have to be established before objectives, other than the approved biodiversity objectives, could be established by the District Manager.

Higher level plan RMZ objectives are currently being developed. In the interim, in order to provide guidance in the development of operational plans, objectives for wildlife, fish, LRMP special management zones, timber, recreation, visual quality and range, and their associated strategies are now DM policy.

November 4, 1998

Re: Rationale for establishing Biodiversity Objectives in Landscape Unit Plans in the Bulkley TSA as Higher Level Plans under the Forest Practices Code of BC Act

The following provides rationale for my establishing objectives 1–7¹ in the following Landscape Units, as Higher Level Plan.

Babine	Chapman	Copper	Corya
Deep Creek	Blunt	Harold Price	Nilkitkwa
Reiseter	Telkwa	Torkelson	Trout Creek

The Bulkley LRMP, approved in March, 1998, by Government, is Ministerial Policy and was seriously considered. The LRMP represents an agreement negotiated by public and agency representatives using current information, scientific knowledge and agency policies. This agreement has been accepted by Government and will be delivered through Landscape Unit Plans which give clear direction to operational plans.

In establishing Landscape Unit Plan biodiversity objectives as Higher Level Plans, it is recognized that the information supporting them will change over time. It is fully expected that the objectives will need some form of revision based on those changes, in order that they continue to reflect current information, knowledge and policy. The Landscape Unit Plan is therefore recognized as a living document that will be subject to periodic revision as and when determined by the District Manager and the Designated Environmental Officer.

At this time, it is known that these objectives will be reviewed:

- In 1999, concurrent with the establishment of objectives for values other than biodiversity
 - As more information and knowledge is gained about First Nations values and specific sites of interest through consultation with each First Nation group,
- at which time these Higher Level Plan objectives may need to be amended, or new objectives added.

In establishing objectives 1–7 (and especially objective #4), I have read and am mindful of the Deputy Minister's directive on achieving acceptable biodiversity impacts. It is believed that biodiversity objectives being established will not materially affect the timber supply impacts that were agreed to through the LRMP and accepted by Government during the LRMP approval process. The Bulkley TSA is, however, currently undergoing Timber Supply Review II, the results of which will provide further information on current timber supply impacts associated with biodiversity objectives 1- 7. Upon completion of TSR II, these objectives will be reviewed.

Original Signed

Original Signed

Note: These objectives have been renumbered such that they read 1.1 to 1.7

Guenter Stahl, District Manager
Bulkley/Cassiar Forest District

Reid White
Designated Environment Official
I approve of this rationale

Order to Establish the Copper Landscape Unit and Objectives

Pursuant to Section 4 of the *Forest Practices Code of British Columbia Act*, I hereby order that the Crown land portion of the watershed of the Copper River, including all waters flowing into the Copper River and its headwater lakes (Aldrich, Dennis and McDonell lakes) to the boundary of the Bulkley Timber Supply Area and TFL No. 1 in the Kalum Forest District, will be established as a landscape unit effective May 30, 1999. The objectives, which are numbered 1 to 7 and attached to this Order, will be established as landscape unit objectives effective May 30, 1999.

The boundaries of the Copper Landscape Unit are shown on the 1:750,000 scale map, attached as Map 1.

note: Landscape Unit maps are available at a 1:50,000 scale at the Bulkley/Cassiar Forest District Office.

Original Signed November 4, 1998

Guenter Stahl, District Manager,
Bulkley/Cassiar Forest District
File Number 12500-25/cop

Date

Note: These objectives have been renumbered such that they read 1.1 to 1.7

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Statement of District Manager's Policy

Under section 41(1) of the *Forest Practices Code of British Columbia Act* (the "Act") I am required to approve an operational plan or amendment that has been prepared and submitted in accordance with the Act, the regulations and the standards, and that I am satisfied will adequately manage and conserve the forest resources to the area to which it applies.

I have reviewed the strategies for objectives 1 through 7³ of the Copper Landscape Unit Plan and believe they are relevant to, and will provide appropriate guidance in, the development of operational plans and amendments which pertain to the area covered by the Copper Landscape Unit Plan. I therefore recommend that these strategies be considered and incorporated into operational plans and amendments where possible.

I will continue to evaluate each operational plan or amendment on its own merit prior to making a decision on whether or not it should be approved. To assist me in this process where an operational plan or amendment does not incorporate the strategies I will expect an adequate explanation of the circumstances which justify their omission.

Approval:

Original Signed November 4, 1998

Guenter Stahl, District Manager
Bulkley/Cassiar Forest District

Date

File Number 12500-25/cop

Note: These objectives have been renumbered such that they read 1.1 to 1.7

November 8, 1998

File: 47250-35/Bulkley

Guenter Stahl
District Manager, Bulkley/Cassiar Forest District
Bag 6000
Smithers BC V0J 2N0

Dear Guenter:

Re: Approval of Biodiversity Objectives for the Bulkley Landscape Unit Plans

I was pleased to receive from the district's landscape unit planning team the biodiversity objectives for the landscape units in the Bulkley TSA for my approval under section 5.18.3 of *Higher Level Plans: Policy and Procedures*.

It is my understanding that the Bulkley TSA has a cabinet approved Land and Resource Management Plan and that these biodiversity objectives are consistent with this plan.

As the designated environment official (DEO), and in accordance with Section 5.18.3 of *Higher Level Plans: Policy and Procedures*, and under section 4(2) of the *Forest Practices Code of British Columbia Act*, I declare my approval for the District Manager of the Bulkley/Cassiar Forest District to formally establish the biodiversity objectives numbered 1 to 7 for the following landscape units:

Nilkitkwa	Babine	Torkelson	Harold Price
Blunt	Chapman	Reiseter	Deep Creek
Corya	Trout Creek	Copper	Telkwa

Yours truly,

Original signed November 8, 1998

Reid White, R.P.Bio., P.Eng.
Regional Manager, Fish, Wildlife, and Habitat
Ministry of Environment, Lands and Parks - Skeena Region

Note: These objectives have been renumbered such that they read 1.1 to 1.7

Statement of District Manager's Policy

Under section 41(1) of the *Forest Practices Code of British Columbia Act* (the "Act"), I am required to approve an operational plan or amendment that has been prepared and submitted in accordance with the Act, the regulations and the standards, and that I am satisfied will adequately manage and conserve the forest resources in the area to which it applies.

I have reviewed the following objectives and connected strategies of the Copper Landscape Unit Plan and believe they are relevant to, and provide appropriate guidance in, developing operational plans and amendments which adequately manage and conserve the forest resources of the area covered by the Copper Landscape Unit Plan:

Wildlife objectives	2.1 to 2.2
Fish objectives	3.1 to 3.2
LRMP Special Management Zone objectives	4.1 to 4.3
Timber objectives	5.1 to 5.3
Recreation objectives	6.1 to 6.2
Visual Quality objectives	7.1 to 7.3

Accordingly, where an operational plan or amendment does not incorporate these applicable strategies, I will expect an adequate explanation of the circumstances which justify the omission of, or deviation from, any applicable strategy.

Approval:

Original Signed September 23, 1999

Guenter Stahl, District Manager
Bulkley/Cassiar Forest District

Date

File Number 12500-25/Cop

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Introduction

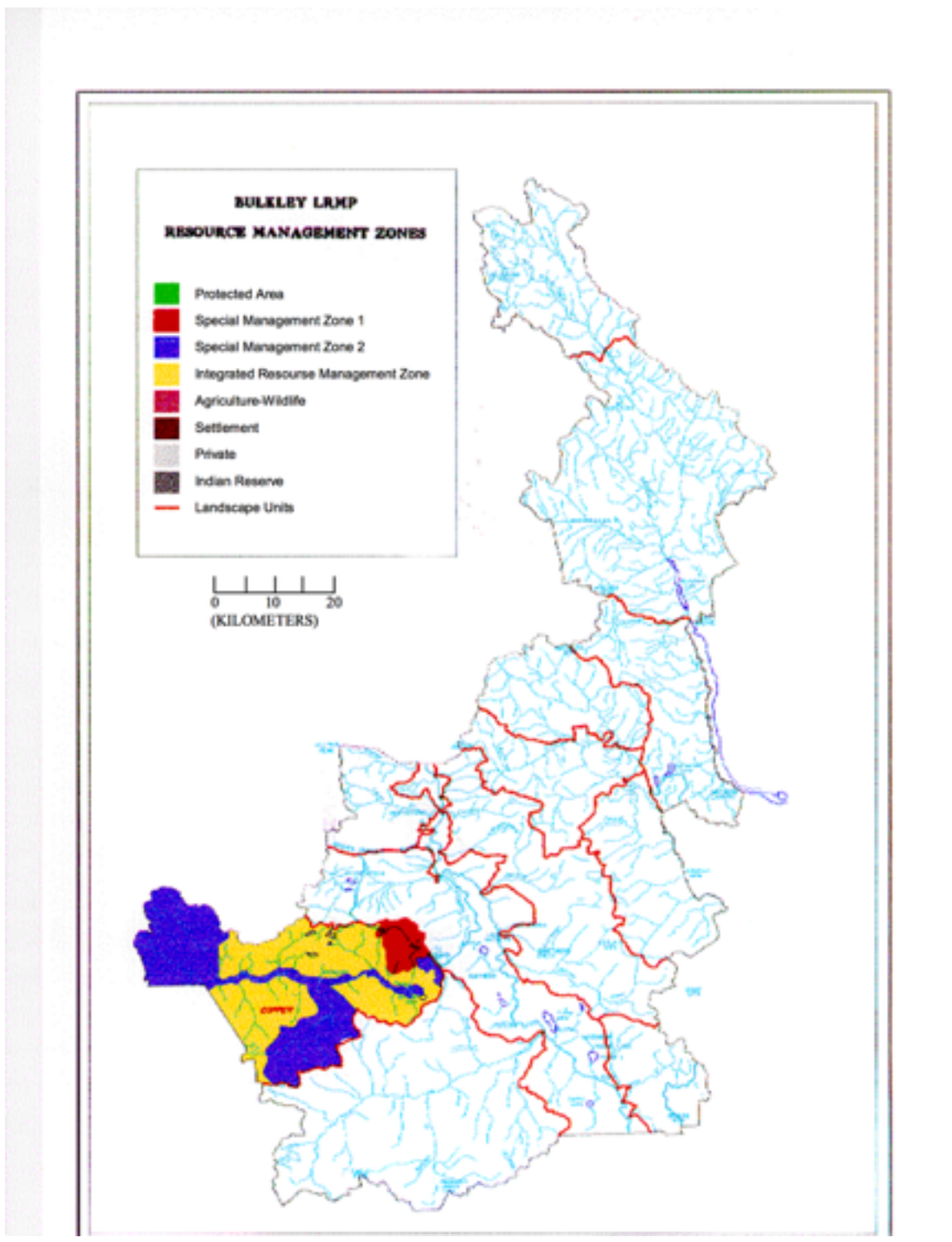
The Copper Landscape Unit Plan (LUP) outlines the objectives and the strategies for the resource management of the Copper River watershed within the Bulkley portion of the Bulkley/Cassiar Forest District (Map 1) . These objectives and strategies have been developed by the Ministry of Forests (MOF), BC Environment (BCE), and operational foresters involved with managing the forest resources in this landscape. This plan follows Ministerial Policy as stated in the signed Bulkley Land and Resource Management Plan (LRMP) signed by the Chief Forester and the Prince Rupert Regional Landscape Unit (RLUP) planning strategy signed by the District Manager, Regional Manager, and Regional Director. Additionally, the Biodiversity Guidebook was used to guide the development of this LUP.

The Copper Landscape Unit and its objectives are established by the District Manager of the Bulkley/Cassiar Forest District pursuant to Section 4.0 of the *Forest Practices Code of British Columbia Act* (the “Act”). Prior to establishment under the Act, the landscape unit and objectives will be approved by the Designated Environment Official for the Ministry of Environment, Lands and Parks. The objectives form the Higher Level Plan and provide direction for operational plans. The objectives for the Copper Landscape Unit provide sufficient detail to provide direction to the operational plans, yet remain flexible to allow creative solutions for meeting land management objectives. The objectives may be amended with appropriate rationale. The strategies presented in this plan provide detail on how these objectives can be met.

The March 1996 timber supply analysis of the Bulkley LRMP was a major consideration used in bringing a consensus to the LRMP. The analysis showed that the cumulative timber supply impact resulting from the LRMP management direction was up to approximately 10% of the Bulkley Timber Supply Area (TSA). The impacts summarized in this analysis were considered closely when establishing the following landscape unit objectives. Where objectives were established to meet a special management intent and where this caused greater impact to the timber supply in one area, objectives were modified elsewhere in the plan to lighten timber supply impacts, always with the goal of maintaining the 10% (“LRMP budget”) accepted timber supply impact. In the future, when new objectives and/or additional resource constraints are incorporated into the LUP, the LRMP budget will be considered and the goal will be to attempt to keep cumulative impacts to less than 10% of the Bulkley TSA.

The Copper Landscape Unit was assigned an intermediate biodiversity emphasis based on analysis of timber, biodiversity, recreation, mining values and LRMP zonation.

Map 1. Landscape Units in Bulkley Timber Supply Area



The Planning Area

The Copper Planning Unit covers 96,000 hectares and comprises the upper portion of the Copper River system, including Aldrich and Dennis Lakes which flow into the Zymoetz River, which in turn flows into and becomes the Copper River in the adjacent Kalum Forest District. Parts of this unit including Mulwain and Red Canyon Creeks, have been noted by the Seven Sisters planning process as having special values.

The Copper Planning Unit accounts for 12.5% of the Bulkley Plan Area's operable timbered landbase. Forty-one percent of the planning unit is operable, comprised of a mix of sawlog and pulp stands with pulp stands heavily predominating in the western, coastally influenced portion. Logging is a relatively recent activity in this landscape unit and is done mainly by the Small Business Enterprise Program. Eight percent of the operable timbered landbase of this unit has been logged to date.

The eastern portion of this unit is within the traditional territory of the Wet'suwet'en (Hagwilnegh,). The western portion falls within the Gitksan (Haakasxw, Duubsisxw, and Saksum Higookx houses) and Tsimshian's traditional territory.

Wildlife values are moderate in relative importance. Caribou have been seen near the Copper River and in the Engelmann-Spruce Subalpine Fir Biogeoclimatic Zone. Bears have been sighted along the river and in higher elevations. There is a lot of good, heavily used summer range for moose, but their winter range is restricted to areas adjacent to lakes and the river lowlands between Aldrich Lake and McDonell Lake.

Fisheries values is high in relative importance for spawning, rearing, water quality and recreational fishing. There are resident fish in the Serb, Red Canyon, Mulwain, Coal, Silvern and Passby Creeks, as well as in Dennis, McDonell, Hankin, Sandstone, and Louise Lakes. The Copper River is a classified water.

This unit is classified as 53% Semi-primitive Non-motorized (SPNM) and 16% Semi Primitive Motorized (SPM) according to the Recreation Opportunity Spectrum done in 1998. SPNM is defined as being further than 1 km from a road with very little or no motorized use. There is little evidence of people, minimal site modification, and a very high degree of naturalness. Similarly SPM is defined as further than 1 km from a road, however it may have occasional use by snowmobiles, ATV's, jetboats and mineral exploration that is air accessed. Scenic areas can be seen from the Copper River as well as the ski hill.

Main recreational features include the Copper River, Maxwell Falls on Lee Creek, and various lakes including McDonell, Dennis, Hankin, Aldrich, Sandstone, and Louise. At Hankin Lake there exists an opportunity for a recreation site with a unique "boat-in" experience. The McDonell Lake trail is located on the south side of the landscape unit and is most easily accessed from the Dennis West Forest Service Road (FSR). The Silvern Lakes Trail has been adopted by the Bulkley Valley Backpackers for maintenance and improvements with equipment and supply assistance from the Forest Service. A Forest Service Recreation Site on Dennis Lake is popular for picnics, fishing and

camping. The upper section of Passby Lake Trail that leads to Passby Lake is used for commercial trail riding tours.

Recreational use is moderate to high and includes trail riding, camping, angling, backpacking, canoeing, picnicking, hunting, skiing, snowmobiling, dog sledding, and mountaineering. The Copper River Guest Ranch offers trail riding and cabins on McDonell Lake. Commercial guides fish in the Copper River mainly during September and October. The landscape unit contains seven water licenses.

The estimated range use in this planning unit is 100 Animal Unit Months, or 1.6% of the Bulkley Plan Area program. There is one grazing license and one grazing lease on clearcut, natural meadow, deciduous and mixedwood forest forage types. Horses are kept on private land and on Crown range land for a tourism business.

Mineral exploration and mining in the landscape unit date back to the turn of the century. In the Duthie Mine and Silvern Lakes area, several small mines produced base and precious metals from vein deposits, and considerable reserves of large tonnage, low grade copper and molybdenum are identified at Louise Lake and on Serb Creek. Rock underlying the landscape unit is assessed as having a provincially high to extreme probability of hosting economic metallic mineral deposits. Forty-two mineral occurrences within the landscape unit, including coal, base and precious metal, attest to this area's significant mineral potential. Currently there are over twenty mineral claims in the area covering approximately 8,500 hectares.

Objectives and Strategies

Biodiversity

The Bulkley LRMP is founded on the principles of biodiversity and sustainability. Key to delivering the biodiversity component is the ecosystem network (Objectives 1.1 and 1.2). The ecosystem network provides for old growth retention, protection of the diversity of ecosystems (including rare ecosystems) present in the Copper Landscape Unit, forest interior conditions, and habitat connectivity. The ecosystem network is intended to be flexible and will be modified as new information and inventories become available. The ecosystem network will also accommodate new initiatives such as wildlife habitat areas and sensitive areas. Further direction for biodiversity is accommodated through varying cutblock sizes (Objective #1.5), retaining old growth (Objectives #1.3 and #1.4), retaining attributes of older forest (Objective #1.7) and managing for a diverse timber landbase (Objective #1.6).

Core Ecosystems

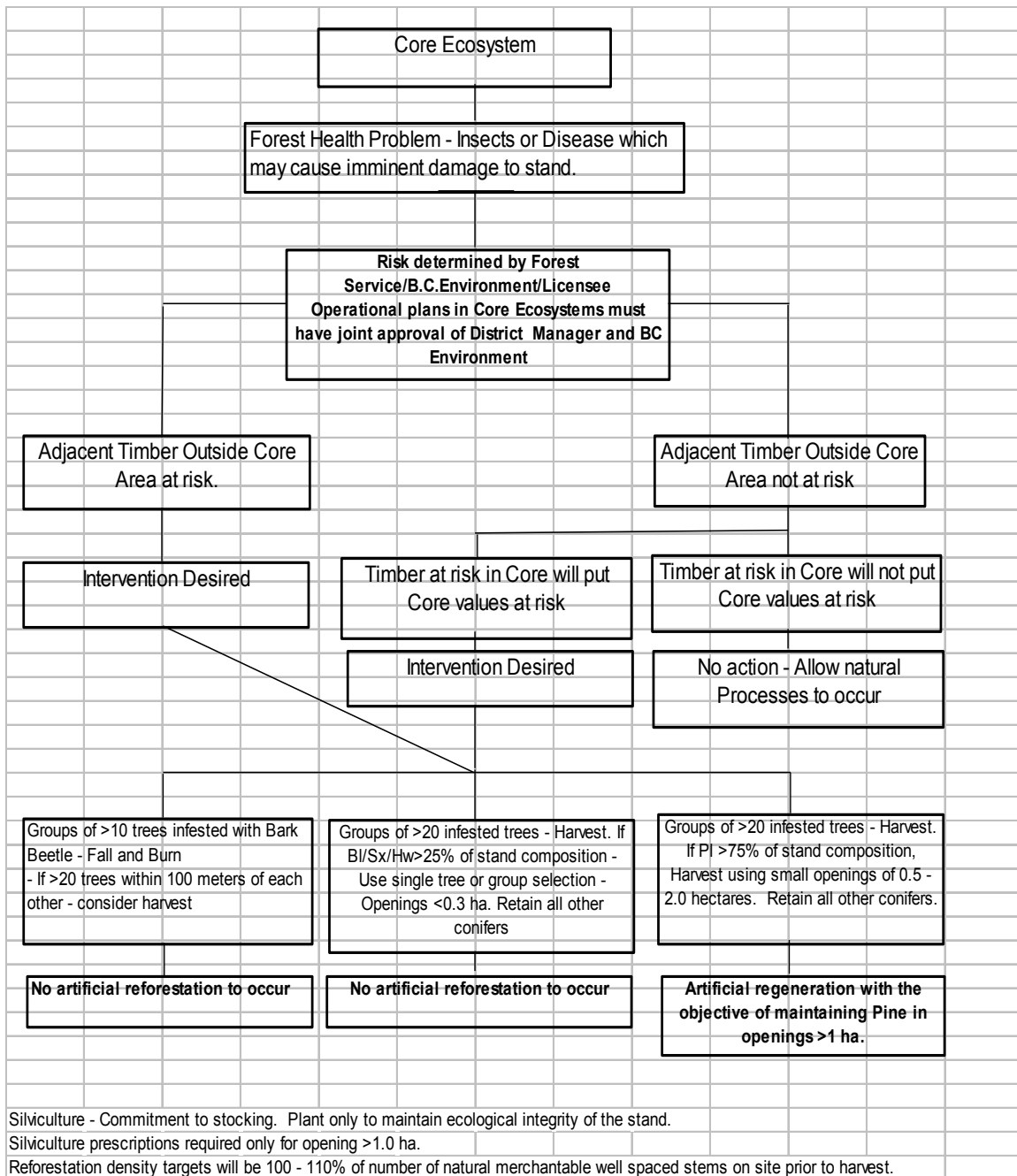
Objective #1.1

Maintain a representative cross-section of ecosystems, retain representative examples of old seral age classes (age classes 8 and 9), provide some areas with forest interior conditions, and retain representative examples of rare and endangered plant communities within the core areas indicated on Map 2.

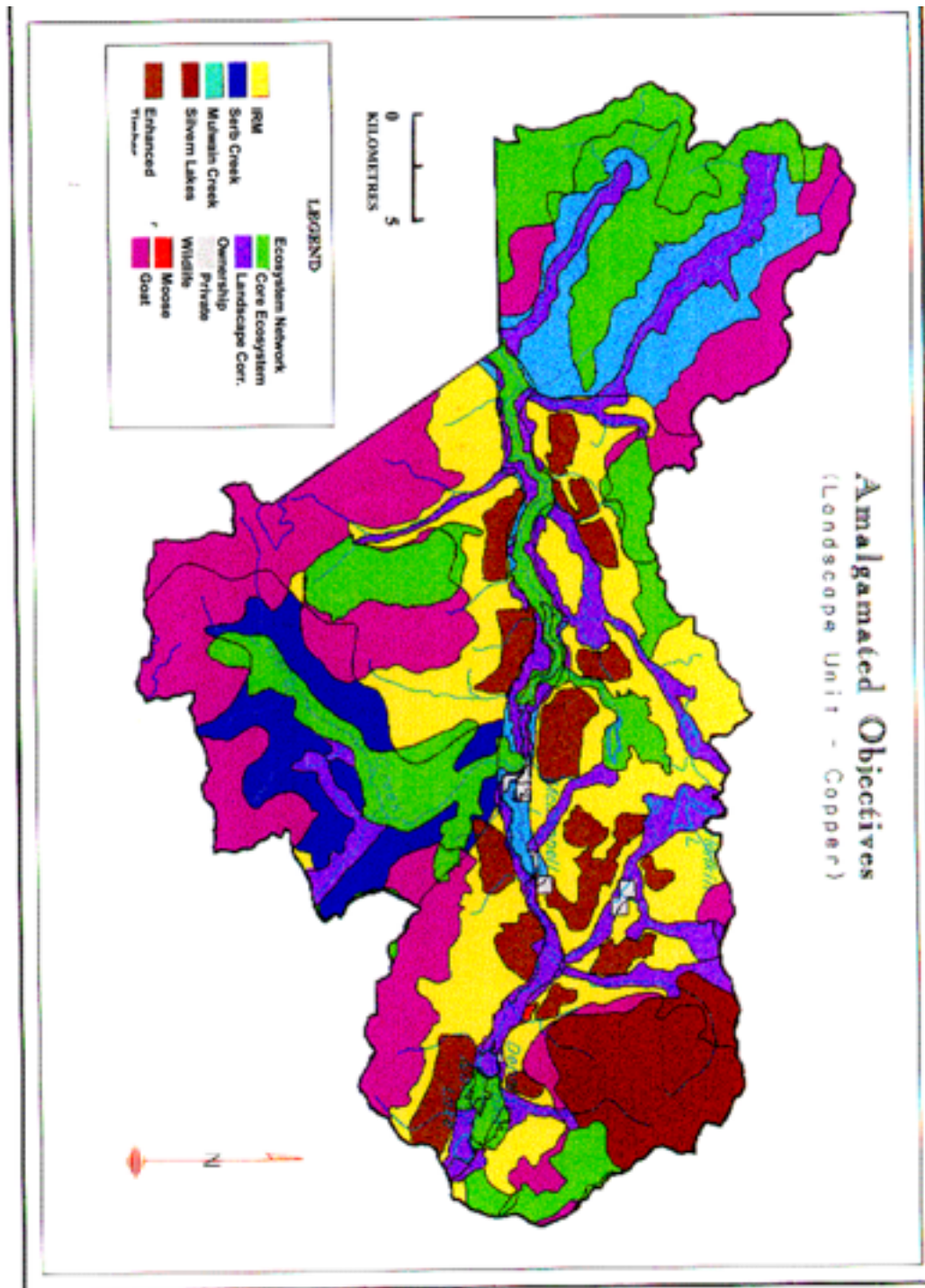
Strategies

1. Allow natural processes of insect feeding or disease to occur within core ecosystems unless infestations or infections threaten to spread into areas outside the core ecosystem. If intervention is required, then low impact treatments such as fall and burn or modified harvesting are acceptable.
2. Do not permit harvesting in core ecosystems unless harvesting is necessary for the following reasons:
 - 2.1. to address forest health problems (Figure 1), or
 - 2.2. to permit incidental tree cutting for mining and exploration purposes.
3. If harvesting does occur, no roads can be built (employ long skids or helicopter logging) and modified harvest practices such as single tree selection (to maintain old growth structure) or small openings (<2 hectares to create or maintain early seral conditions) should be utilized (Figure 1).
4. Where alternative access is not possible, roads can be built through a core ecosystem to avoid alienating operable timber outside the core ecosystem.
5. Do not issue new grazing opportunities or boundary changes of existing grazing tenures in core ecosystems.
6. Allow natural processes to occur within core ecosystems, including the natural succession of existing early seral areas.

Figure 1. Decision Matrix for Harvesting in Core Ecosystems



Map 2. Amalgamated Map



Landscape Corridors

Objective # 1.2

Maintain within a managed forest setting, landscape corridors (Map 2) dominated by mature tree cover and containing most of the structure and function associated with old forest for:

- i. providing habitat connectivity within the landscape, and
- ii. permitting movement and dispersal of plant and animal species.

Strategies

1. Operational plans for harvesting within landscape corridors should consider the harvest pattern adjacent to the corridor. For example, clearcuts adjacent to the corridor will constrain harvesting strategies within the corridor. Conversely, modified harvesting adjacent to the corridor will increase the flexibility for harvesting in a corridor (Table 1).
2. Inoperable forested areas within landscape corridors contribute to landscape connectivity. This area will be considered when determining the amount of area to be harvested, and in analyzing the impacts to determine whether harvest plans meet the corridor objectives.
3. Access into landscape corridors should be temporary unless no other alternative is reasonable for ecological or economic reasons.

Table 1. Decision matrix for harvesting options in landscape corridors.

	Timber Type	Maximum Block Size Adjacent to Clear Cuts	Maximum Block Size Adjacent to Partial Cuts	Silviculture System/Mgt. Strategy	Objective	Adjacency
I	Pine (No understory)	1.5 ha. max. 0.3 to 1.5 ha.	3.0 ha. max. 1.5 ha. ave.	Patchcuts or Clearcut with reserve if operationally feasible (i.e., in larger openings)	Artificial Regeneration (Pine major)	No harvest until the block is 50 years old
II	Pine (Bl/Sx Pole size understory of good quality)	1.5 ha. - 3.0 ha. dependent on amount of pole size saplings (5 - 15 cm.)	1.5 ha. - 3.0 ha. dependent on amount of pole size saplings (5 - 15 cm.)	Overstory Removal with reserves where operationally feasible (i.e. in larger openings)	Natural Succession to Spruce/ Balsam stand	No harvest until opening provides sufficient forested attributes.
III	Hemlock Spruce/ Balsam (little or no understory)	Groups 0.3 - 1.5 ha. dependent on the snag component in the stand	3.0 ha. max. 1.5 ha. ave.	Patchcuts or clearcut with reserve if operationally feasible (i.e. in larger openings)	Mainly artificial regeneration Spruce/ Balsam	No harvest until opening provides sufficient forested attributes.
IV	Spruce/ Balsam with good quality varied stand structure	Single Tree or Group selection (0.3 to 1.5 ha.) maintaining approx. 70 % basal area . Single Tree if low snag %. Groups if high snag %.	Single Tree or Group selection (0.3 to 1.5 ha.) maintaining approx. 70 % basal area . Single Tree if low snag %. Groups if high snag %.	Retain approx. 70% of the unit. If the area outside the corridor is a partial cut, flexibility will be considered.	Natural Regeneration Site may be fully stocked after harvest .	Few constraints.

Seral Stage

Objective # 1.3

Achieve representation of ecosystems in old seral condition over time. Apply old seral retention targets as follows:

Table 2. Old Seral Stage Targets⁶

NDT	BEC Subzone	Min Age	% of Forested Area
1	ESSFwv	250	>19
1	MHmm2	250	>19
2	CWHws2	250	>9
2	ESSFmc	250	>9
3	SBSmc2	140	>11

Strategies

1. Consider old forested areas that are inoperable or in core ecosystems, SM1, or parks as contributing to the old targets.
2. Show through analysis or mapping that old seral targets are met following planned forestry activities.

Objective # 1.4

Maintain the natural age class distribution across the landscape unit. Apply mature plus old and early seral retention targets as follows:

Table 3. Mature plus old forest targets

NDT	BEC Subzone	Min. Age	% of Forested Area
1	ESSFwv	120	>36
1	MHmm2	120	>36
2	CWHws2	80	>34
2	ESSFmc	120	>28
3	SBSmc2	100	>23

⁶ Reference: B.C. Forest Practices Code Biodiversity Guidebook

Table 4. Early seral targets

NDT	BEC Subzone	Max. Age	% of Forested Area
1	ESSFwv	40	<22
1	MHmm2	40	<22
2	CWHws2	40	<36
2	ESSFmc	40	<36
3	SBSmc2	40	<54

Strategies

1. Consider mature and old forested areas in inoperable, core ecosystems, SM1, or parks as contributing to the mature plus old targets.
2. Show through analysis that mature plus old targets will be met and that early seral targets will not be exceeded following planned forestry activities.

Patch Size Distribution***Objective # 1.5***

Attain a landscape pattern of development that represents the natural disturbance types in the landscape unit.

Strategies

1. Provide a range of opening sizes at the end of a rotation as per Table 5.

Table 5. Percent of forested area by NDT

NDT	BEC Subzone	Patch Sizes	Patch Sizes	Patch Sizes
		<40 ha	40-80 ha	80+ ha
1	ESSFwv	30-40%	30-40%	20-40%
	MHmm2			
2	CWHws2	30-40%	30-40%	20-40%
	ESSFmc			
3	SBSmc2	<40 ha	40-250 ha	250-1000 ha
		10-30%	10-30%	50-80%

2. Target larger (>60 hectares) early seral patches in Enhanced Timber Development areas.
3. The preferred order for achieving large cutblocks (>60 hectares) is:
 - 3.1. to amalgamate existing blocks;
 - 3.2. to enlarge existing cutblocks;
 - 3.3. to create new cutblocks greater than 60 hectares.
4. Retain structural attributes in or adjacent to cutblocks by retaining wildlife tree patches and leave areas. Give consideration to increased retention in larger openings.
5. For larger blocks (>60 hectares), consider a group of blocks within 600 metres and 20 years of each other to be a single patch. For smaller blocks (<40 hectares), consider a group of blocks within 100 metres and 20 years of each other to be a single patch. These guidelines may vary based on other considerations.
6. Size range of leave areas should be the same as that for adjacent openings.

Coniferous and Deciduous Diversity

Objective # 1.6

Maintain a diversity of coniferous and deciduous species across the Copper Landscape Unit and throughout the rotation, that represents the natural species composition of each biogeoclimatic subzone.

Strategies

1. Site prescriptions should retain advanced regeneration, poles and saplings.
2. Where hemlock and balsam are not planted but are a primary or secondary species, as per the *Establishment to Free Growing Guidebook for the Prince Rupert Forest Region*, facilitate natural regeneration by ensuring these species are a component of wildlife tree patches scattered throughout larger openings.
3. Incremental silviculture activities should ensure that all existing ecologically acceptable species on site will be represented.
4. Where the preharvest stand has a major component (greater than 20%) of deciduous species, retain a portion of these species as either wildlife tree patches and/or reserve patches (wildlife tree patches can include the retention of single trees).
5. Where the preharvest stand had little or no deciduous component, but deciduous species have invaded naturally, design control measures so the presence of deciduous species will not be eliminated from the site while also recognizing that free-growing requirements must be achieved. Preferably, retain deciduous in a clumpy distribution.
6. Do not assist conversion of natural deciduous stands to coniferous species.

Stand Structure

Objective # 1.7

Provide structural diversity within managed stands by retaining attributes of old forests such as coarse woody debris, standing dead trees, and standing live trees.

Strategies

1. Retain wildlife tree patches (WTP) containing suitable wildlife trees at the time of harvest and during silviculture activities. Locate wildlife tree patches to provide a range of old forest stand structural attributes such as standing dead trees, standing live trees, coarse woody debris, and root wads. Patches should be distributed throughout the block with distances between patches (or other suitable leave areas outside the block) not normally exceeding 500 metres.
2. Retain wildlife tree patches with each block, independent of silviculture system, and approximately in the percentages in Table 6.

Table 6. Targets for Wildlife Tree Patch retention in cutblocks

BEC subzone	% of cutblock to be retained as WTP
ESSFwv	3
ESSFmc	1
MHmm2	1
CWHws2	5
SBSmc2	5

3. Allow natural processes to occur within wildlife tree patches unless infestations or infections threaten to spread to non-wildlife tree patch areas. Where intervention is required, treatment will retain a diversity of structural attributes or a suitable replacement wildlife tree patch will be located.
4. Where possible, plan wildlife tree patches:
 - 4.1. to retain deciduous as well as coniferous trees,
 - 4.2. to retain some large, old trees,
 - 4.3. to provide connectivity within the cutblock,
 - 4.4. to provide structure in riparian management areas, and
 - 4.5. in areas already constrained.
5. Retention of coarse woody debris outside identified wildlife tree patches, core ecosystems and riparian reserve zones should not exceed utilization standards.

Wildlife

Mountain Goat

Objective # 2.1

Provide for thermal and snow interception cover and forage for wintering goat populations in areas near identified habitat shown on Map 2.

Strategies

1. Spatially and temporally distribute blocks and design blocks so forested connectors are maintained between mountain ranges in Kotsine Pass.
2. Harvesting within 200 metres of identified mountain goat habitat should either mimic small, natural openings (<5 hectares) if clearcut or be harvested with non-clearcut systems.

Objective # 2.2

Provide for security for mountain goat from an unregulated harvest in important mountain goat habitat identified on Map 2.

Strategies

1. Do not locate main haul roads within one km of identified mountain goat habitat or establish an access control point to limit access to this habitat.
2. Restrict access on spur roads to within one km of identified mountain goat habitat by using a deactivation strategy, access control point or temporary roads. Access restrictions must be in place prior to harvesting and after planting.
3. Avoid harvesting within 200 metres of goat habitat from April 15 to July 15 to avoid disturbing goats during the natal time period.

Fish

Fish Habitat

Objective # 3.1

Retain structure within the riparian management zone to reduce the risk of windthrow to the reserve zone. Retain structure within the riparian management zone to provide shade and maintain natural channel and bank stability.

Copper River Angling

Objective # 3.2

Maintain a primitive setting angling opportunity along the Copper River (Map 3).

Strategy

1. Restrict access as shown on Map 3, using a deactivation strategy, access control point or temporary roads.

LRMP Special Management Zones

The Bulkley LRMP designated the Silvern Lakes area (LRMP sub-unit 12-1), the Mulwain and Red Canyon Creek watersheds (LRMP sub-unit 12-5), the Serb Creek watershed (LRMP sub-unit 12-3), and a corridor centred on the Copper River (LRMP sub-unit 12-2) as special management zones. Silvern Lakes is designated as a special management one zone one (SM1) because of a combination of high recreation, visual values and mineral values (Objective #4.3). Areas designated as SM1 exclude all industrial activities except mineral exploration and mining.

Industrial activities in areas designated as special management zone two (SM2) will be carried out sensitively to ensure that impacts on identified values are minimized. The Mulwain and Red Canyon watersheds were designated as SM2 because of the sensitivity of the terrain and its potential to impact Copper River water quality. Also significant in these watersheds is the viewscape, as seen from the Seven Sister's Range (Objective # 4.1). The Serb watershed is designated as SM2 because of its complex wetland ecosystem.

The Copper River SM2 is designated to maintain high fisheries values (Objective #3.2) and important riparian ecosystem values (Objectives #1.1 and 1.2), to protect viewscape as seen from the Copper River (Objective #7.2), and to protect sensitive soils that may affect the river's water quality.

For the Mulwain/Red Canyon watersheds and the Copper River SM2, the *Forest Practices Code of B.C. Act* (the "Act") provides sufficient direction for managing and planning operations in sensitive terrain. The Serb watershed, however, has additional direction for lower intensity harvesting as detailed in Objective #4.2.

Objectives for the Serb watershed focus on lowering the harvest intensity, managing the viewscape from Serb Creek, maintaining the integrity of the wetland ecosystems and controlling the impact on grizzly bears. Intensity of harvest and the Serb Creek viewscape objectives complement each other, as a partial retention VQO produces a lower intensity harvest schedule than in the integrated resource management zone. This viewscape objective is implemented by establishing partial retention VQO objectives from Serb Creek (Objective #7.2). The wetland ecosystem is maintained by a core ecosystem (Objective #1.1). In addition, by reducing the operational period (through prolonged periods of harvesting inactivity), the impact on grizzly bears should be reduced. (Objective #4.2).

Mulwain Creek

(SM 2)(LRMP Zone 12-5)

Objective # 4.1

Limit access to the Seven Sisters Protected Area so that primitive recreation opportunities are maintained.

Strategy

1. Restrict non-industrial motorized access to the Seven Sisters Protected Area through strategic placement of access control points as shown on Map 3.

Serb Creek

(SM 2)(LRMP Zone 13-3)

Objective # 4.2

Discourage interactions between grizzly bears and people in the Serb Watershed.

Strategies

1. Only one side of Serb Creek should have active harvesting at any one time.
2. Serb Creek is not to be crossed.
3. Restrict non-industrial motorized access to the Serb Area (Map 3) through strategic placement of access control points.
4. Active forestry operations should be confined to a single area.
5. Harvest should be scheduled such that harvesting and basic silviculture occurs within a minimal time period (approximately 5 years), and a minimum of 15 years is scheduled between operational periods.

Silvern Lakes

(SM 1)(LRMP Zone 12-1)

Objective # 4.3

Maintain the high backcountry recreation and visual quality values while allowing for continued exploration and development of high mineral potential in the Silvern Lakes Special Management Zone (Map 2).

Strategy

1. Limit tree cutting only to that required for approved mineral exploration and development purposes including access.

Timber

The CopperLandscape Unit contains approximately 12% of the Timber Supply Area (TSA) contributing landbase. It also has a significant portion of the pulp stand portion of the landbase, which is an important segment of the partitioned Annual Allowable Cut (AAC).

The LRMP identified Enhanced Timber Development (ETD) areas within the operable landbase where the intent is to increase the available timber supply and to improve timber quality. Management of the timber resource is a high priority within these areas.

Therefore, ETD areas are located where there is low conflict with other values and where there is high potential for timber growth (Map 2). It is anticipated these areas may provide a framework for an intensive silviculture strategy and that they will be targeted for available intensive management funding (Objective #5.3).

Timber Supply

Objective # 5.1

Produce a long term secure supply of timber that is economically achievable, and ensure productive ground, in the timber harvesting landbase, is actively growing timber.

Strategies

1. Slow growing, poor quality balsam and hemlock stands on productive sites should be targeted for harvesting and replaced with thrifty growing managed stands.
2. All backlog Not Sufficiently Re-stocked (NSR) areas must be reforested as soon as possible.
3. Prescriptions will encourage a reduction in the time to regenerate harvested areas.

Objective # 5.2

Maintain the health and productivity of the timber resource.

Strategies

1. Salvage of damaged or diseased timber should occur as soon as possible in an economic and efficient manner according to objectives of the area.
2. Identify and use harvesting and silviculture techniques that limit the spread of forest disease and pests which reduce the value and volume of forest stand.
3. Results of annually monitored beetle activity shall be used to identify high priority harvesting blocks in five year development plans.

Enhanced Timber Development Areas

Objective # 5.3

Intensively manage the timber resource in all Enhanced Timber Development (ETD) areas shown in Map 2, to reduce the rotation and/or increase yield per hectare over time, in accordance with approved funding allocations

Strategies

1. Target ETD areas for some or all of the following intensive silviculture treatments:
 - 1.1. using genetically improved seed or superior planting stock;
 - 1.2. pre-commercial and commercial thinning;
 - 1.3. pruning;
 - 1.4. fertilizing; and,
 - 1.5. intensive brushing and weeding.
2. Uphold visual quality objectives where noted in ETD areas.
3. Identify high wildlife use areas (e.g. goshawk nests, mineral licks) at the stand level and either develop management techniques that maintain their specific values or consider for deletion from ETD area.

Recreation

The Copper Landscape Unit offers a diverse range of features that provide an ideal setting for a variety of summer and winter recreational opportunities. Easy road access and close proximity to Smithers make this area a popular destination for local, regional and international visitors during all seasons.

The Copper (Zymoetz) River is one of five classified rivers in the province. This classification recognizes the "wilderness-like" experience, the water clarity and exceptional sports fishing opportunities on this river. Other important streams include the Serb, Red Canyon, Mulwain and Passby. Maxwell Falls on Lee Creek is spectacular. Numerous lakes provide boating and fishing in a variety of settings ranging from easily accessible to semi-wilderness. Dennis Lake, at the headwaters of the Copper River, has a Forest Service Recreation Site. Copper River Ranch on McDonell Lake is a popular resort that features trail riding and non-motorized boating in the summer and cross-country skiing in the winter.

Big game species such as moose, deer, goat and bear are abundant and make the area popular for local and regional hunters. There is also a hunting guiding territory over this unit that services international clients.

As access into this planning unit has improved, the use of trails has increased. Hiking trails include: Silvern Lakes, McDonell Lake, Ashman Ridge, Passby Creek, Caribou Creek and Mount Leach/Pine Creek. Skiing in the Sandstone-Hankin-Louise Lakes corridor is popular during the winter months. Historic First Nations trails are being located in the McDonell Lake area..

Where logging blocks and/or roads are proposed over recreation trails, licensees will be required to consult with local outdoor organizations in the manner outlined in Section 7 of the Operation Planning Regulation of the *Forest Practices Code of British Columbia Act*.

Trail Management

Objective # 6.1

Ensure known trail locations as identified in Table 7 are passable, accessible, and identifiable after logging.

Table 7. Recreation Trail List (Trail heads)

Trail	Location
Ashman Ridge	Side road 3700 (km 0-3)
Caribou Mtn.	Across Copper River to Serb Creek
McDonnell Lake	Side road 7400 (0-9km)
Duthie Mine/Silvern Lakes (South)	Side road @ ~ 7010 km
Hankin Lake	Side road 7900 (0 to ~9km)

Strategies

1. Mark the original trail bed prior to logging, relocate the trail head following logging and clear the trail, by had if necessary, as part of operations.
2. In some instances it may be preferable to establish a new trail head after harvesting. In this situation an acceptable trail plan must be approved prior to harvesting.
3. Place signs so trails can be followed through blocks.

Recreational Access

Objective # 6.2

Maintain reasonable opportunity for access to existing recreational destinations as identified in Table 8.

Table 8. Recreational Destinations (Trail heads)

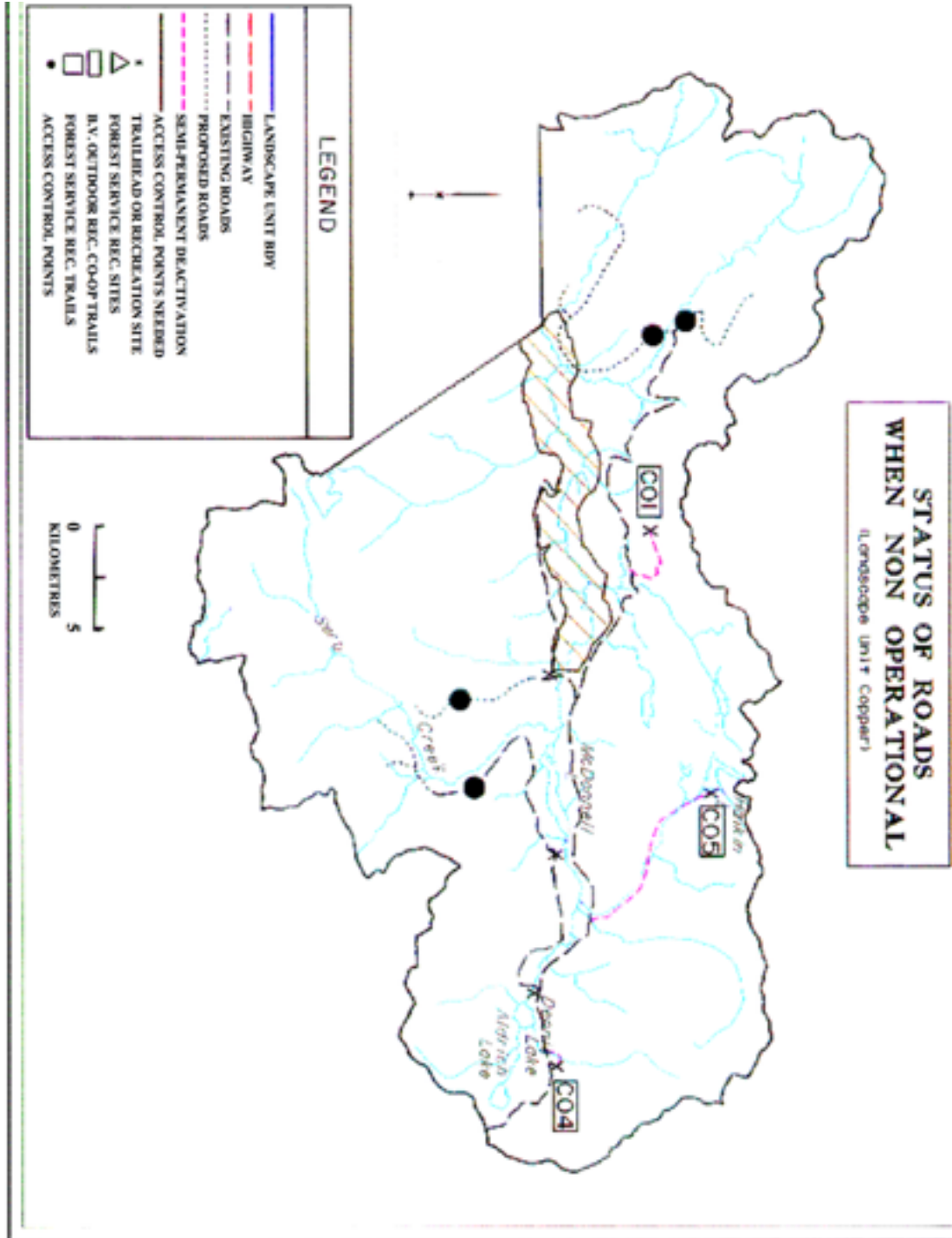
Trail	Location	symbol
Ashman Ridge	Side road 737 (km 0-3)	
Caribou Mtn.	Across Copper River to Serb Creek	
McDonnell Lake	Side road 7400 (0-9km)	
Duthie Mine/Silvern Lakes (South)	Side road @ ~ 7010 km	
Hankin Lake	Side road 7900 (0 to 9km)	

Strategies

1. When operations have ceased, permanently deactivate on-block roads unless the road provides access to a recreational destination. In this case, semi-permanently deactivate the roads to allow drive-through by pick-ups or equivalent type of vehicle to recreational destinations listed in Table 8 and shown on Map 3.
2. When operations have ceased, semi-permanently deactivate non-mainline roads which provide access to a recreational destination, to facilitate drive through by pick-ups or equivalent type of vehicles, as shown on Map 3.

3. When locating and designing landings, consider the opportunity for parking near trailheads listed in Table 7 and identified on Map 3.

Map 3. Status of Non-Operational Roads



Visual Quality

Operational forestry in the Copper Landscape Unit is relatively recent. The first visible clearcuts were made in the early 1980s. Visual aesthetics in this unit are a high priority. Landscape concerns have been incorporated into forest operations since 1990 with the practice of leaving patches within blocks and creating sensitive block designs. However, certain views have already been significantly altered, such as the view from the ski hill on Hudson Bay Mountain.

The Bulkley LRMP states that the scenic resources in the district are critical to the viability of the tourism/recreation sector and to the quality of life of the area residents. Applying creative block design and alternative silviculture prescriptions to create an interesting landscape is the preferred management strategy.

The LRMP recommends that the following scenic resources be addressed in the landscape unit plan as part of the normal planning process, with special attention given to the following: major corridors, recreation focus points, and specific viewpoints.

It is important to manage the visual resources from the viewpoints that were specified in the Bulkley LRMP (Map 4). Hence, visual quality objectives are being established for the scenic areas that were identified using visual landscape inventories (VLI) from those specified viewpoints.

Visual Quality Objectives (VQOs) are acceptable degrees of change from the natural appearing landscape caused by land-use alterations, such as logging or road building. Operational Plans such as Forest Development Plans and Access Management Plans must show they are consistent in achieving these VQOs.

Modification

Objective #7.1

Forest Management activities in modification areas identified on Map 4 must have natural appearing characteristics and blend in with existing landforms.

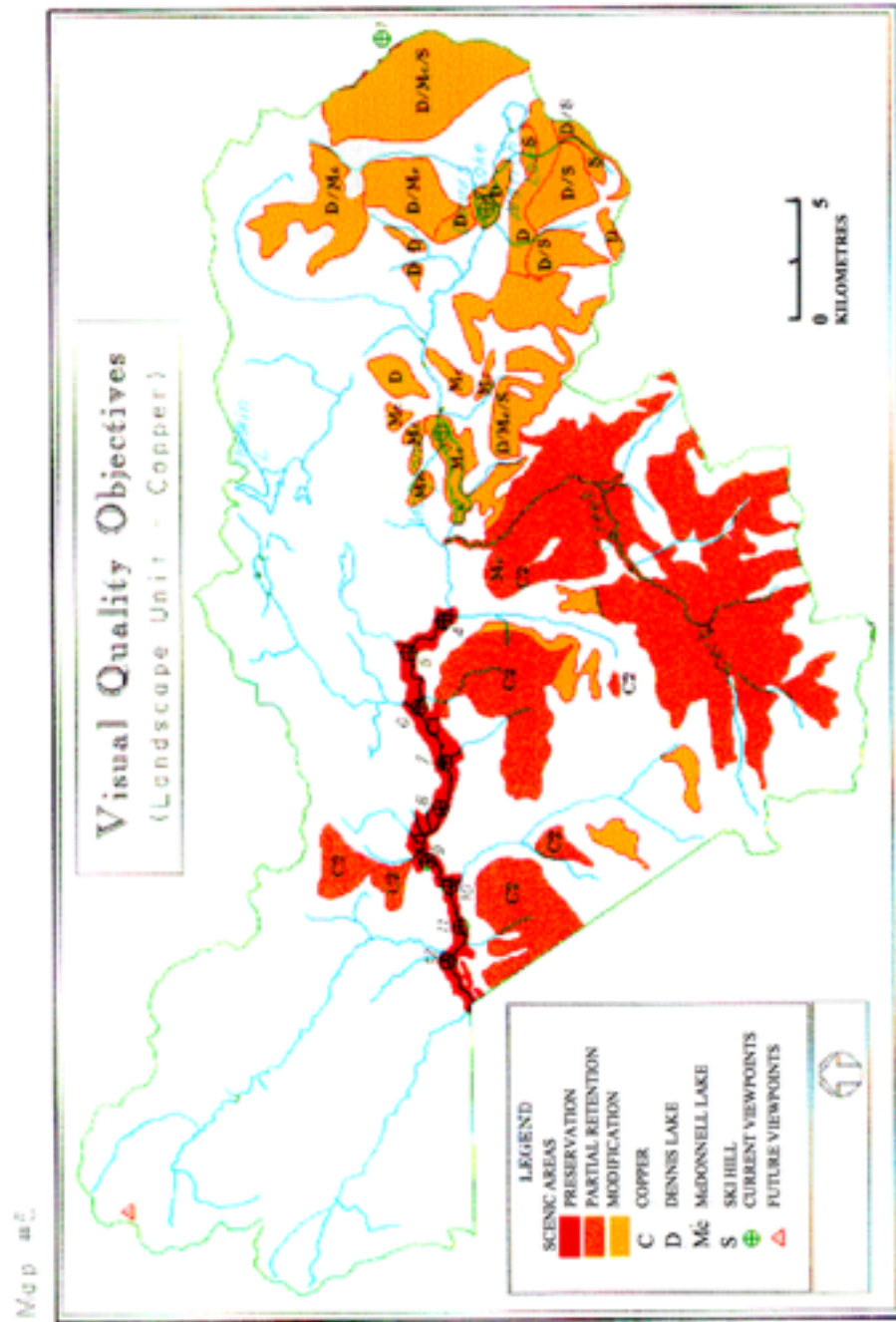
Strategies

1. Alterations must borrow from natural line and form to such an extent and on such a scale that they are comparable to natural occurrences.
2. Openings will exhibit elements of good block design which may include: strategic placement of leave trees and patches, feathered edges, and borrowing lines from the natural character of the landscape.
3. Visually effective green-up shall be 3 metres.
4. Alternative systems will be considered where stand structure is suitable.
5. Select a technique (i.e. sketch, photographic manipulation or computer model (DTM)) and prepare a Visual Impact Assessment (VIA) for each design option.

Consult the forest district if there is any doubt as to the technique necessary for a given operation.

6. VIA's must be done from viewpoints as identified on Map 4.

Map 4. Visual Quality



Partial Retention

Objective #7.2

Forest management activities in partial retention areas as identified on Map 4 may be noticeable but must blend well with the natural appearance of the landscape.

Strategies

1. Alterations must borrow from natural line and form to such an extent and on such a scale that they are comparable to natural occurrences.
2. Openings will exhibit elements of good block design including: strategic placement of leave trees and patches, feathered edges, and borrowing lines from the natural character of the landscape.
3. Alternative systems will be considered where stand structure is suitable.
4. Where visible openings are created, silviculture prescriptions will incorporate treatments to reduce the time to visually effective green-up(5 metres).
5. Select a technique (i.e. photographic manipulation or computer model (DTM)) and prepare a Visual Impact Assessment (VIA) for each design option. Consult the forest district if there is any doubt as to the technique necessary for a given operation.
6. VIA's must be done from viewpoints as identified on Map 4.

Preservation

Objective #7.3

Forest management activities in preservation areas as identified on Map 4 are to have no visible activity from designated viewpoints.

Strategies

1. Alterations must borrow from natural line and form to such an extent and on such a scale that they are comparable to natural occurrences.
2. Openings will exhibit elements of good block design including strategic placement of leave trees and patches, feathered edges, and borrowing lines from the natural character of the landscape.
3. Alternative systems will be considered where stand structure is suitable.
4. Select a technique (i.e. photographic manipulation or computer model (DTM)) and prepare a Visual Impact Assessment (VIA) for each design option. Consult the forest district if there is any doubt as to the technique necessary for a given operation.
5. VIA's must be done from viewpoints as identified on Map 4.

Access

Objectives and strategies relating to access are in various sections throughout the Copper Landscape Unit Plan. This section has been created for easier reference for those people planning access. See Table 9 for a comprehensive list of all objectives and strategies relating to access in the Copper Landscape Unit.

Ministry of Energy and Mines must be consulted on permanent deactivation plans at the forest development planning stage, to determine current use under permit for mineral exploration and development.

Table 9. Objectives and Strategies Relating to Access

Section	Objective Title	Objective #	Strategy #'s
Biodiversity	Core Ecosystems	1.1	3, 4
Biodiversity	Landscape Corridors	1.2	3
Wildlife	Mountain Goat	2.2	1, 2
Fish	Copper River Angling	3.2	1
LRMP SMZ	Mulwain Creek	4.1	1
LRMP SMZ	Serb Creek	4.2	2, 3
LRMP SMZ	Silvern Lakes	4.3	1
Recreation	Recreational Access	6.2	1, 2, 3

Implementation, monitoring and review

Implementation

Compliance with the LRMP

1. The landscape unit plan will be sent to appropriate government agencies to ensure compliance with the Bulkley Land and Resource Management Plan.
2. Future amendments to the plan must take direction from the LRMP.
3. No additional constraints to timber supply will be applied without considering the LRMP budget (see “Introduction” section for explanation of ‘LRMP budget’).

Plan implementation and transition strategy

1. Once approved by the District Manager (DM) of the Bulkley/Cassiar Forest District and the Designated Environment Official (DEO), the plan will be distributed to appropriate stakeholder groups and government agencies (Pacific Inland Resources, Skeena Cellulose Inc., Northwood Pulp and Timber Ltd., First Nations, the Ministry of Agriculture, Fisheries and Foods, the Ministry of Environment, Lands and Parks and the Ministry of Employment and Investment, Mines Division).
2. Agencies will work with licensees and other resource users on incorporating the guidelines of this plan into operational planning.

Transition strategy

The landscape unit plan establishment process includes a public review and comment period, approval of the plan by the Designated Environment Official, sign off by the District Manager (Ministry of Forests) and filing of the plan with the Regional Manager (Ministry of Forests). The objectives of the landscape unit plan are *legally established* as per the establishment date stated in the *Order to Establish* pages found at the beginning of each landscape unit plan.

The Forest Practices Code of British Columbia Act (FPC Act) includes several sections with higher level plan requirements including FPC Act s. 9.1, s.10(1)(d), s.11(c), s.12(b) and (c), s. 13(b) and s.16(b) and under Operational Planning Regulations sections 20, 21, 22 and 23. Table 10 represents a summary of transition requirements for Operational Plans in this landscape unit.

Table 10. Summary of transition requirements for Operational Plans

Stage of approval	Requirement for compliance with the plan
Awarded Timber Sale Licences/ issued Cutting Permits	Exempt (as per OPR s. 22 (1))
Category A-blocks and roads in an approved Development Plan (prior to 4 months after objective has been established)	Exempt (note: with this section of the table the DM is exempting these plans from OPR s. 21(1).)
Non-Category A blocks and roads and other new plans.	Must be in compliance

First Nations

The Bulkley Forest District recognizes that Landscape Unit Planning may be an effective level of planning for addressing many First Nations forest management concerns. At this stage, however, the Landscape Unit objectives and strategies in the Bulkley Forest District do not include First Nations input. These objectives and strategies have been developed strictly to implement the Bulkley LRMP. First Nations have been advised of the LUP process and have been invited to comment on draft Landscape Unit Plans, but have not been actively involved in their development.

This is now changing and there is currently interest in exchanging information between MOF and First Nations at the landscape unit level of planning. It is hoped that recurring forest planning issues can be dealt with at this level to diminish concerns encountered at the Operational Planning level.

The Wet'suwet'en First Nation's traditional territory covers the majority of the Bulkley Timber Supply Area, occupying area in all landscape units except the Babine and Nilkitkwa landscape units. Currently the Bulkley Forest District is working with the Wet'suwet'en on a landscape unit planning project to gather information on Wet'suwet'en historical and current values associated with the land in their traditional territory. Integrating these values into Landscape Unit Plans may result in a future amendment to the Landscape Unit Plans.

Interaction with the Gitksan and Fort Babine First Nations is less involved. Currently they are aware that objectives and strategies are being established and are invited to submit comments. As well, the Gitksan are discussing involvement in landscape unit planning at the Land and Resources working group meetings. The option to add on and amend Landscape Unit Plans to accommodate new information as it becomes available (eg., cultural heritage resource values) remains open.

Monitoring

MOF and MELP commit to best efforts in developing a monitoring strategy for each type of landscape unit objective to determine if the objectives are being met. MELP will be responsible for developing a monitoring methodology for wildlife, biodiversity and fish objectives. MELP and MOF will be responsible for developing a monitoring methodology for the LRMP Special Management Zone objectives and MOF will be responsible for developing the methodology for the timber, recreation, visual quality and range objectives. This monitoring will be done in conjunction with the Interagency Management Committee's (IAMC) strategy for monitoring the Bulkley's LRMP. The Community Resources Board(CRB) is expected to be an active participant in the monitoring and amendment phases.

In the interim it is recognized that monitoring, in a more simple sense, will be ongoing, and that issues may arise at any time that may warrant revisiting these objectives.

Plan review and amendment

This landscape unit plan will be amended as required to reflect new information from monitoring and experience from operational plans as landscape unit objectives and strategies are implemented. Amendments may be required to incorporate new information (e.g. inventories, details for single species management), lake classification, First Nations interests, watershed assessments, etc. Amendments may also be required to provide further detail in strategies to meet objectives. Future amendments of the landscape unit plans will include the details of the monitoring strategies once they are developed. Amendments will be completed as per the Forest Practices Code and Higher Level Plan procedures.

The District Manager will consider amending the boundary of ETD areas if other objectives or values have a significant impact. Possible reasons include significant wildlife use areas and significant impacts due to visual quality objectives. Any such deleted and replacement areas will be itemized and submitted with operational plans for tracking purposes .

Ecosystem network amendments will be by joint agreement between the district manager and the MELP district biologist. For example, amendments to the ecosystem network may be necessary when:

1. more specific ecological information about an area is acquired,
2. rare and endangered species habitat is identified but not already well represented by the ecosystem network (Appendix I)
3. mine exploration or development affects the existing core ecosystem objectives and attributes,
4. monitoring indicates a need for a boundary change.

Changes to the ecosystem network will include an appropriate transition strategy and impact on a licensee's operating area.

A future amendment will be required to incorporate the results from the work with the Wet'suwet'en and other First Nations. As well, a complete review of the objectives will occur within 3 years of the establishment date. An interagency team (including affected Licensees) will be assembled to review the plan, to review the results of monitoring these objectives and to recommend improvements.

Appendices

Appendix I Biogeoclimatic Description of the Copper Landscape Unit

The Copper Landscape Unit is the most ecologically varied of the landscape units in the Bulkley portion of the Bulkley/Cassiar Forest District, because it lies in a complex transition zone between the temperate rainforest climate of the coast and the continental sub-boreal climate of the interior, and includes both the rugged topography of the western Cordillera and the rolling plateaus and flattened peaks that characterize the Central Interior. The climatic and geological transition in the Copper is somewhat unique, because it is neither as abrupt as occurs from Telkwa Pass south to Tweedsmuir Park, nor as gradual as in the Skeena and Nass Valleys. The strong transitional character of the landscape unit makes classification into Biogeoclimatic units difficult and somewhat arbitrary.

The Copper River landscape can be divided into three broad elevational or vegetation bands: montane elevations below approximately 900-1050 metres; subalpine elevations extending to timberline at approximately 1500-1700 metres; and alpine elevations, from timberline up to the mountain tops. Within each of these elevational bands there is a strong coast/interior transition running from west to east. The line separating coastal and interior biogeoclimatic zones is drawn where hemlock and amabilis fir (coastal species) dominate over subalpine fir and hybrid spruce (interior species) in old forests on mid-slope sites. However there is a broad intermediate zone where the fit is not particularly good on either side of the line, particularly where there is an abundance of young stands (e.g. Coal Creek burn) or atypical (e.g. riparian and wetland) ecosystems.

Montane forests occupy the central valley floor and lower side slopes between 640 metres and roughly 1000 metres elevation. Low elevations west of Caribou Creek lie within the Coastal Western Hemlock biogeoclimatic zone (CWHws2 variant), while those to the east are within the Sub-Boreal Spruce biogeoclimatic zone (SBSmc2 variant). The south side of the Copper River valley is dominated by old growth forests of western hemlock and amabilis fir in the CWHws2, giving way to subalpine fir, hybrid spruce, and minor western hemlock in the SBSmc2. The north side of the valley has had a more active fire history and thus has a greater diversity of species and age classes. Mature and immature seral stands with a mixture of conifers (incl. lodgepole pine) and broadleaved tree species (trembling aspen, birch, willow, and black cottonwood) are common, and some scrub-steppe can be found on steep slopes near the river.

On the valley floor itself there is a diverse mix of ecosystems including open-grown spruce and subalpine fir riparian forests, wetlands, shrubby thickets, and herbaceous meadows. The abundance of subalpine fir in low-lying areas of the CWH zone is indicative of strong cold air flow and continental climatic influences. Scattered western redcedar occur near the Kalum Forest District boundary.

Biophysical Description of the Copper Landscape Unit

NDT	Biogeoclimatic subzone/ variant	Total Area (ha)	Forested Area (ha)	% total area forested (ha)	% of total area in LU
NDT 1	Engelmann Spruce - Subalpine Fir Zone, moist very cold (ESSFwv)	34,542	27,868	81	37
NDT 1	Mountain Hemlock, moist maritime (MHmm2)	17,973	12,647	70	19
NDT 2	Coastal Western Hemlock, wet submaritime (CWHws2)	13,015	11,715	90	14
NDT 2	Engelmann Spruce - Subalpine Fir Zone, moist cold (ESSFmc)	2,396	1,849	77	3
NDT 3	Sub-boreal Spruce, moist cold (SBSmc2)	9,273	8,080	87	10
NDT 5	Alpine (AT)	15,855	97	0	17

More than 56% of the landscape unit is classified within the subalpine Mountain Hemlock and Engelmann Spruce-Subalpine Fir biogeoclimatic zones. Two ESSF subzones (ESSFwv and ESSFmc) and one MH variant (MHmm2) converge in the Copper. The boundary separating the MH and ESSF zones lies somewhere west of Mulwain and Lee Creeks, but has not yet been finalized. Because all areas contain intermediate characteristics, differentiating among the various biogeoclimatic units is less important than understanding that the mingling of coastal, rainshadow, and continental climatic regimes produces a rich variety of subalpine forest and parkland ecosystems. Subtle valley-to-valley differences in precipitation, cloud formation and cold air ponding, can cause fairly dramatic changes in ecosystem properties.

The Mountain Hemlock zone (MHmm2 variant) occurs in areas with heavy snowfall, a short, wet growing season, and little or no fire history. Mountain hemlock and amabilis fir are dominant within closed forest; subalpine fir is usually dominant in exposed areas such as near timberline, around avalanche chutes, and in riparian areas. The rounded ridge separating Mulwain and Red Canyon Creeks is a complex of subalpine wetland and parkland. In the Engelmann Spruce-Subalpine Fir zone, subalpine fir is the dominant tree in closed, upland forest. Associated species in the ESSFwv include mountain hemlock, amabilis fir, western hemlock, hybrid spruce and lodgepole pine. Whitebark pine occurs sporadically on exposed rocky sites and dry gravelly soils. Broadleaved trees are uncommon, except on south exposures at low elevations. Towards the east, amabilis fir disappears and mountain and western hemlock become less common, while lodgepole pine, hybrid spruce and trembling aspen become more common. This portion is known as the ESSFmc. Non-forested ecosystems in the ESSF include shrub and herb-dominated

avalanche tracks, wetlands and subalpine meadows. Wetlands are common in areas of low relief throughout the ESSF. They are particularly well developed in the Serb valley. The Alpine Tundra zone (AT) encompasses 17 percent of the Copper River landscape. Much of the alpine is ice, snow, and sparsely vegetated rock. At lower elevations the vegetation is dominated by dwarf shrubs, herbs, mosses, liverworts and lichens. Krummholz forms of subalpine fir, mountain hemlock, hybrid spruce, whitebark and lodgepole pine occur near timberline. The AT has not been formally subdivided into coastal and interior subzones, but westwards the alpine tends to be dominated by mats of evergreen dwarf shrubs such as mountain heather, partridgefoot and crowberry, whereas towards the interior, deciduous dwarf willows and windswept grassy tundra become more common.

Appendix II. Red and Blue Listed Species Likely in the Copper Landscape Unit

Red and Blue Listed Plant Communities

Common Name	BEC Site series	Provincial Rank
Amabilis Fir/Western Red Cedar - Oak Fern	CWHws2/04	Blue
Amabilis Fir/Western Red Cedar - Devil's Club, Wet Submaritime	CWHws2/06	Blue
Subalpine Fir/Lodgepole Pine - Juniper - Lichen	ESSFmc/02	Blue
Subalpine Fir/Lodgepole Pine - Cladonia	ESSFwv/02	Blue
Subalpine Fir - Huckleberry - Crowberry	ESSFmc/03	Blue
Black Spruce/Lodgepole Pine - Feathermoss	SBSmc2/03	Blue
Sitka Spruce - Salmonberry, wet submarine 2	CWHws2/07	RED
Lodgepole Pine - Kinnikinnick	CWHws2/02	Blue
Lodgepole Pine - Sphagnum, Wet Submaritime 2	CWHws2/10	Blue
Cottonwood - Red Osier Dogwood	CWHws2/08	Blue
Mesic (montane) forb meadows - variable spp. Composition	all interior zones except AT	RED (Blue)
Cow parsnip - large leaved avens - stinging nettle - brome lush meadows	SBS/ICH/CWH	Blue ⁷

Appendix III. Ecosystem Network Summary of the Copper Landscape Unit

Core Ecosystems

Location	Area (ha)	Rationale						
		Biophysical	Species	Age Classes	NP Description	Wildlife	Rare and Endangered Spp.	Comment
Hudson Bay Mountain	940	AUs			Alpine	G		
Dennis Lake/ Aldrich Lk wetlands	320	SF	Pine Spruce	3/4/78	Swamp	M		– old fire
Serb Creek	3525	EW/WL	Balsam Pine	8/94/8	Alpine	GB	whitebark pine	– Serb fire – large wetland complex
Caribou Mountain	2230	AU/MFs/MF	Balsam	8/9	Alpine	G	whitebark pine	
Copper River	1475	SR/FR	Balsam Hemlock Pine	3/898		M	CWHws2/07 (red listed)	– wilderness qualities on Copper River (Core follows retention VQO boundary) – spruce/cottonwood riparian ecosystem – 60 year old Coal fire
Mulwain	7520	HP/MF	Balsam Hemlock	8/99	Alpine/ Alpine Forest	G		
Ashman Ridge	825	EW/AU	Balsam	8/9	Alpine	G		
Sandstone Lake								– Sandstone lake in a wilderness setting – Connectivity between Sandstone lake and Copper River – Steelhead spawning

Landscape Riparian Corridors

Location	Rationale
Pine Creek	- connectivity between Copper River and Telkwa River
Silvern Creek	- connectivity between Copper River and high elevation lakes
Passby Creek	- connectivity between Copper River and high elevation - critical spawning creek
Tributary to Willow Creek	- connectivity between Willow Creek and high elevation
Willow Creek	- connectivity between Copper River and Hankin Lake - Steelhead spawning
Copper River - Serb Creek Confluence to Dennis Lk	- connectivity along Copper Landscape Unit valley bottom - connectivity among valley bottom lakes - moose winter range - critical spawning grounds from McDonnell lake to Dennis Lake - critical steelhead spawning grounds at outlet of McDonnell Lake - fluvial meadows - scrub-steppe ecosystems (red listed SBSmc2/81)
Serb tributaries	- connectivity between Serb wetlands (core ecosystem) and other wetlands - minimizes fragmentation of grizzly bear habitat
Copper River	- widens core ecosystem (12.6) along Copper River for connectivity
Tribs to Sandstone and Copper River	- connectivity between McDonnell lake and Sandstone Lake
Lee Creek	- connectivity between Copper River and Caribou Mountain
Red Canyon	- connectivity between Copper River and Mulwain core ecosystem - red-listed ecosystem - CWHws2/07: Sitka Spruce - Salmonberry - bull trout
Mulwain	- connectivity between Copper River and Mulwain core ecosystem - red-listed ecosystem - CWHws2/07: Sitka Spruce - Salmonberry - bull trout
Coal Creek	- connectivity between Louise, Sandstone and McDonnell lake and high elevations - steelhead spawning
Serb tributary	- connectivity between Serb tributaries and Serb Creek core ecosystem.

Appendix IV. Acronyms

AAC	allowable annual cut
BEC	Biogeoclimatic Ecosystem Classification
CORE	Commission on Resources and Environment
FENs	forest ecosystem networks
LRMP	Land and Resource Management Plan
MELP	Ministry of Environment, Lands and Parks
MOF	Ministry of Forests
NDT	natural disturbance type
OGMAs	old growth management area
RMZ	resource management zone
VQO	visual quality objective

Natural disturbance types described in this report:

NDT1	Ecosystems with rare stand-initiating events
NDT2	Ecosystems with infrequent stand-initiating events
NDT3	Ecosystems with frequent stand-initiating events
NDT5	Alpine tundra and subalpine parkland

Appendix V. Glossary of Resource Planning Terms

age class

An interval into which the age range of trees, forest, stands or forest types is divided for classification. Forest inventories commonly group trees into 20-year age increments up to age 140 years, then a single class for trees between 141 and 250 years old, and a single class for those older than 250 years.

biodiversity (biological diversity)

The diversity of plants, animals and other living organisms in all their forms and levels of organization, including genes, species, ecosystems, and the evolutionary and functional processes that link them.

biogeoclimatic ecosystem classification (BEC)

A hierarchical classification scheme having three levels of integration: regional, local and chronological; and combining climatic, vegetation and site factors.

biogeoclimatic zone

A geographic area with a broadly homogenous macroclimate. Each zone is named after one or more of the dominant climax species of the ecosystems in the zone, and a geographic or climatic modifier (e.g. Interior Douglas Fir). British Columbia has 14 biogeoclimatic zones.

blue-listed species

Sensitive or vulnerable species as identified by the Ministry of Environment, Lands and Parks. 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. The blue list also includes species that are generally suspected of being vulnerable, but for which information is too limited to allow designation in another category.

coarse woody debris

Sound and rotting logs and stumps that provide habitat for fungi, plants, animals and insects and their predators, and that provide a source of nutrients for soil development. Material generally greater than eight to ten centimetres in diameter.

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 links vary in natural landscapes based on topography and natural disturbance regime. Breakage of these links results in fragmentation.

cultural heritage resource

For the purposes of the *Forest Act*, a cultural heritage resource is an object, site, or the 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.

cutblock

Defined in the *Forest Practices Code of British Columbia Act* as a specific area of land identified on a forest development plan, or in a license to cut, road permit, or Christmas tree permit, within which timber is to be or has been harvested.

ecosystem

A functional unit consisting of all the living organisms (plants, animals and microbes) in a given area, and all the non-living physical and chemical factors of their environment linked together through nutrient cycling and energy flow. An ecosystem can be of any size -a log, pond, field, forest or the earth's biosphere - but it always functions as a whole unit. Ecosystems are commonly described according to the major type of vegetation, for example, forest ecosystem, or range ecosystems.

forest development plan (FDP)

An operational plan, guided by the principles of integrated resource management, which details the logistics of timber development, usually over a period of five years. Methods, schedules and responsibilities for accessing, harvesting, renewing and protecting forest resources are set out to enable site-specific operations to proceed.

forest ecosystem network (FEN)

A zone that serves to maintain or restore the natural connectivity within an area.

forest interior conditions

Conditions achieved at a point where edge effects no longer influence environmental conditions within a patch of forest. For interior B.C. forests, the edge effect is generally felt for a distance equivalent to 100-200 meters into the stand. The conditions changed usually involve light intensity, temperature, wind, relative humidity and snow accumulation and melt.

forest resources

Defined in the *Forest Practices Code of British Columbia Act* as resources and values associated with forests and range including, without limitation, timber, water, wildlife, fisheries, recreation, botanical forest products, forage, and biological diversity.

guidebooks

Guidebooks are sets of guidelines and recommendations on how to best achieve requirements of the *Forest Practices Code of British Columbia Act*. The guidebooks are not legally enforceable. However, specifications and procedures recommended by the guidebooks may be incorporated into plans, prescriptions and contracts, in which case those specifications and procedures may become legally enforceable.

identified wildlife

Defined in the *Forest Practices Code of British Columbia Act Operational Planning Regulation* as those species at risk that the Deputy Minister of Environment, Lands and Parks or a person authorized by that Deputy Minister, and the Chief Forester, agree will be managed through a higher level plan, wildlife habitat area or general wildlife measure.

inoperable areas

Defined in the *Forest Practices Code of British Columbia Act* as areas unavailable for harvest for terrain-related or economic reasons. Characteristics used in defining inoperability include slope, topography (e.g. the presence of gullies or exposed rock), difficulty of road access, soil stability, elevation and timber quality. Operability can change over time as a function of changing harvesting technology and economics.

land and resource management plan (LRMP)

An integrated sub-regional consensus-based process requiring public participation that produces a land and resource management plan for review and approval by government. The plan establishes direction for land use and specifies broad resource management objectives and strategies.

landscape unit

Planning areas established under the *Forest Practices Code of British Columbia Act* by the District Manager, that are up to 100 000 hectares in size and are based on topographic or geographic features such as a watershed or series of watersheds.

natural disturbance types (NDTs)

A term used to characterize areas with different natural disturbance regimes. Five natural disturbance types are recognized as occurring in B.C.:

NDT1 Ecosystems with rare stand-initiating events

NDT2 Ecosystems with infrequent stand-initiating events

NDT3 Ecosystems with frequent stand-initiating events

NDT4 Ecosystems with frequent stand-maintaining fires

NDT5 Alpine Tundra and Sub-Alpine Parkland ecosystems

Northwest Weed Committee

Members include: Ministry of Forests, Ministry of Environment, BC Ministry of Agriculture, Fisheries, and Foods, Coalition for Alternatives to Pesticides, Bulkley-Nechako Regional District, Canadian National Railway, and Bulkley Valley Cattlemen's Association.

old growth management area (OGMA)

Defined in the *Forest Practices Code of British Columbia Act* Operational Planning Regulation as an area established under a higher level plan which contains or is managed to replace structural old growth attributes.

operable forest

That portion of the production forest that, under current market conditions, can be harvested at a profit.

operational plan

The *Forest Practices Code of British Columbia Act* states that within the context of area-specific management guidelines, operational plans detail the logistics for development. Methods, schedules, and responsibilities for accessing, harvesting, renewing and protecting the resource are set out to enable site-specific operations to proceed. Operational plans include forest development plans, access management plans, range use plans, silviculture prescriptions, and stand management prescriptions.

patch

A stand of similar-aged forest that differs in age from adjacent patches by more than 20 years. When using the term patch in designing landscape patterns, it refers to the size of either natural disturbance openings which lead to even-aged forests or those openings created by cutblocks.

protected area

A designation of areas of land and water set aside to protect natural heritage, cultural heritage or recreational values (may include national park, provincial park or ecological reserve designations).

range use plan

An operational plan that describes the range and livestock management measures that will be implemented to ensure that range resources are protected and that the management objectives for other identified resource values are achieved.

rare ecosystem

Plant communities listed as red or blue with the B.C. Conservation Data Centre.

red-listed species

Threatened or endangered species as identified by the Ministry of Environment, Lands and Parks. The taxa on the red list are either extirpated, endangered or threatened or are being considered for such status. Any indigenous taxon (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 B.C. if conditions are not altered.

regional land use plan

A plan identifying land use strategies at a regional level (e.g., a plan resulting from one of the CORE regional processes).

resource management zone (RMZ) - from regional or sub-regional plan:

A division or zone of the planning area that is distinct from other zones with respect to biophysical characteristics, resource issues or resource management direction. Resource management zones (in land and resource management planning [LRMP] these include settlement, agriculture, high intensity resource development, general resource development, low intensity resource development and protection) may be drawn on a map to describe general management intent. The zones are usually further defined using descriptive objectives and strategies to explain future land use and resource management activities.

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.

riparian reserve zone

Defined in the *Forest Practices Code of British Columbia Act* Operational Planning Regulation as that portion, if any, of the riparian management area or lakeshore management area located adjacent to a stream, wetland or lake of a width determined in accordance with Part 10 of the regulation.

rotation

The planned number of years between the formation or regeneration of a stand and its final cutting at a specified stage of maturity.

scenic area

Defined in the *Forest Practices Code of British Columbia Act* Operational Planning Regulation as any visually sensitive area or scenic landscape identified through a visual landscape inventory or planning process carried out or approved by the District Manager.

sensitive areas

Small areas established under the *Forest Practices Code of British Columbia Act* by the district manager to manage or conserve unique or locally significant resource values.

seral stages

The stages of ecological succession of a plant community, e.g., from young stage to old stage. The characteristic sequence of biotic communities that successively occupy and replace each other by which some components of the physical environment become altered over time.

site series

Sites capable of producing the same late seral or climax plant communities within a biogeoclimatic subzone or variant.

species composition:

The percentage of each recognized tree species comprising the forest type based upon the gross volume or the relative number of stems per hectare or basal area.

stand structure

The distribution of trees in a stand, which can be described by species, vertical or horizontal spatial patterns, size of trees or tree parts, age, or a combination of these.

timber harvesting landbase

Crown land within an area that is currently considered feasible and economic for forest management. Areas 100% constrained to timber harvesting--for example protected areas, riparian reserves or old growth management areas--do not contribute to the timber harvesting landbase.

visual quality objective (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 (note: another category, “aesthetic”, has been added for this plan).

wildlife trees

Defined in the *Forest Practices Code of British Columbia Act* Operational Planning Regulation as 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.