

*A Component of
British Columbia's
Land Use Strategy*

Recommended Fort St. James Land and Resource Management Plan

Socio-Economic and Environmental Assessment

prepared by:

**Gary Holman, Consulting Economist &
Jim Trask (R.P. Bio.), ECL Envirowest Consultants**

in co-operation with the

Fort St. James LRMP Inter-agency Planning Team



**BRITISH
COLUMBIA**

April 1998

MEMORANDUM

TO: Ft. St. James LRMP Working Group
FROM: Gord Enemark (Senior Analyst), Ministry of Employment & Investment
RE: Final Ft. St. James LRMP Socio-economic/Environmental Assessment
DATE: April 30, 1998

This document constitutes the final version of the Socio-economic and Environmental Assessment of your proposed Land and Resource Management Plan. Like the previous draft, presented to you in February 1998, the purpose of the assessment is to evaluate the nature and significance of the impacts/trade-offs occurring when comparing the LRMP's recommended land use scenario to the "Base Case" scenario, the latter being the default management regime most likely to occur in the absence of an LRMP. Moreover, the report is not meant to recommend any particular land use plan, which is the task of the Working Group; rather, the idea is to provide an objective, "arm's length" accounting of what the implications are of the LRMP vs. the Base Case, for decision-making purposes only. The methodology is also, we believe, consistent with that outlined in the provincial government's *Social and Economic Impact Assessment for Land and Resource Management Planning in BC, Interim Guidelines*, 1993.

The socio-economic portion of the document was undertaken by Gary Holman (Consulting Economist) and the environmental component was written by Jim Trask (R.P. Bio.) of ECL Envirowest Environmental Consultants. Considerable advice and information was provided by government agencies, including those represented on the Ft. St. James Inter-agency Planning Team.

Finally, the key conclusions of the assessment do not differ from those reached in the previous draft. However, we did attempt to address concerns raised by Working Group and community members as appropriate.

Please contact me anytime should you have any concerns you would like to express, via:

Ministry of Employment & Investment
P.O. Box 9327, Stn Prov Govt
Victoria, BC V8W 9N3
Ph: 250-952-0699 (Enquiry BC: 1-800-663-7867); Fax: 250-952-0705
E-mail: gordon.enemark@gems8.gov.bc.ca

SOCIO-ECONOMIC ASSESSMENT SUMMARY MATRIX

| KEY ACCOUNTS | BASE CASE IMPLICATIONS “Without LRMP” (Includes TSR, FPC, & RPAT PAs) | LRMP IMPLICATIONS vs. BASE CASE |
|---|---|--|
| ECONOMIC DEVELOPMENT SUMMARY | <ul style="list-style-type: none"> Up to 113,000 m3/yr. of timber harvest & ~ 70 local jobs (5% of Plan Area employment) at risk after 30 yrs. due to TSR / FPC timber impacts Slow population & economic growth for at least 30 yrs. Timber fall-down during yrs. 30-100 could result in closures of some mills in Plan Area, however some may close before then due to current mill over-capacity in TSA | <ul style="list-style-type: none"> No measurable timber supply implications due to LRMP, but higher costs to economic sectors due to LRMP recommendations LRMP is more supportive of wilderness tourism & other nature-based livelihoods LRMP would somewhat reduce long term mineral potential Growth potential in agriculture maintained. Otherwise similar to Base Case |
| SECTOR SUMMARY | | |
| Forestry | <ul style="list-style-type: none"> “Starting point” is 1996 PG TSA AAC determination of 9.4 million m3/yr. & current Plan Area harvest of 2.9 million m3/yr. (1.7 million m3/yr. is processed in Ft. St. James) Up to 113,000 m3/yr. (7%) reduction in timber available for local processing by Year 31 (subject to Chief Forester’s AAC determinations) which may place 55 local forestry jobs at risk after that time Significant timber falldown of about 5% per decade due to TSR/FPC, beginning after 30 yrs. Some opportunities for mitigation, e.g. new site productivity research Will continue as dominant industry | <ul style="list-style-type: none"> LRMP management strategies do not have measurable harvest impacts but are likely to add costs to forestry operations, which is already an issue in the Base Case due to FPC and FRBC stumpage No quantifiable losses to existing forestry jobs in short-medium term (i.e. up to 30 years) due to LRMP strategies; longer term less certain Otherwise similar to Base Case |
| Tourism & Recreation | <ul style="list-style-type: none"> Continued timber harvesting & related development would increase access to roaded recreation opportunities RPAT proposed protected area for Nation Lakes implies enhanced certainty for this provincially significant recreation resource In long term, “back-country” wilderness tourism potential would be diminished by increased road access & timber harvesting pressure on fish & wildlife | <ul style="list-style-type: none"> Increase in % of land base in new PAs & Special RMZs vs. Base Case (10% to 26%) & shift from Resource Development RMZs (88% to 31%) to General RMZs (2% to 44%) Stricter access controls would reduce pressure on fish / wildlife Lack of protected status for most of Nation Lakes chain implies higher risk of key values being compromised Encouragement for wilderness tourism, but still some erosion in wilderness values in longer term as forestry road network grows |
| Subsistence Fishing / Trapping | <ul style="list-style-type: none"> Increasing risk to fish habitat & old growth dependent furbearers with continued timber harvesting / road access | <ul style="list-style-type: none"> Higher % of land base in new PAs / SMZs & more stringent access restrictions would somewhat better protect fisheries / furbearers. |
| Agriculture / Range | <ul style="list-style-type: none"> FPC could increase cost of grazing for some operators Market factors / historical trends suggest slow future growth. | <ul style="list-style-type: none"> Supportive LRMP management strategies (e.g. identification of future Agricultural Development Areas) will enhance growth prospects Growth trend similar to Base Case. |

SOCIO-ECONOMIC ASSESSMENT SUMMARY MATRIX (cont.)

| KEY ACCOUNTS | BASE CASE IMPLICATIONS | LRMP IMPLICATIONS vs. BASE CASE |
|---|---|--|
| Mining / Energy | <ul style="list-style-type: none"> No operating or proposed metallic mines in Plan Area, but significant potential Significant coal potential in northern extreme of Plan Area Gas / oil potential in mid-to-north part of Plan Area, but timing of any future production highly uncertain RPAT PAs would preclude minimal amounts of any potential resources | <ul style="list-style-type: none"> No existing or planned developments precluded 8% of high metallic and 6% of high industrial mineral potential precluded by LRMP PAs 2350 ha. (2%) of mineral/placer tenure in new PAs is to be “grandfathered” Some access management strategies are a concern and may raise costs Otherwise similar to Base Case |
| COMMUNITY STABILITY / QUALITY OF LIFE | <ul style="list-style-type: none"> Population / economy will grow slowly for foreseeable future Long term (after 30 yrs.) timber supply impacts could result in possible community disruption. Decline in some wilderness recreation values Major community concern about raw logs leaving district, exacerbated by impending planned TSA re-allocation of some harvesting from PG District | <ul style="list-style-type: none"> Minimal negative impacts of LRMP on area economy, but some higher costs to resource industries Lack of protected status to Nation Lakes chain less favourable for tourism than Base Case LRMP somewhat more supportive of wilderness values vs. Base Case, but still some decline in these values in long term Otherwise similar to Base Case |
| FIRST NATIONS ISSUES | <ul style="list-style-type: none"> On-reserve population comprises 40% of Plan Area total Concerns re impacts of continued timber harvesting on cultural sites and fish / wildlife resources Potential timber harvest impacts after 30 yrs. Could reduce job opportunities Resolution of land claims would provide larger resource base, economic development funds, & more resource management control | <ul style="list-style-type: none"> LRMP should not affect First Nations job potential LRMP better protects cultural / heritage resources, fishing / trapping & wilderness tourism, but still some decline in these values over time |
| GOVT. REVENUE | | |
| Local | <ul style="list-style-type: none"> Any (likely longer term) mill closure(s) could result in reduction to local tax base | <ul style="list-style-type: none"> Similar to Base Case |
| Provincial | <ul style="list-style-type: none"> Potential loss of up to \$7.4 million per year in undiscounted nominal forestry-related tax revenues during Years 30-40 Potentially much larger losses after Year 40, due to Base Case timber impacts as harvest approaches long term (sustainable) level | <ul style="list-style-type: none"> LRMP would not result in any measurable harvest-related loss in forestry revenues, but higher harvesting costs could reduce stumpage payments incrementally vs. the Base Case |
| ECONOMIC EFFICIENCY (Net Resource Value) | <ul style="list-style-type: none"> As of the present, each BC household would have to sacrifice up to 43 cents per year to obtain the environmental benefits from the TSR/FPC crown land management regime | <ul style="list-style-type: none"> LRMP would not result in any measurable harvest-related net resource value reduction, but higher timber harvesting costs could result in an incremental decline vs. the Base Case |

ENVIRONMENTAL ASSESSMENT SUMMARY MATRIX

| KEY ACCOUNTS | BASE CASE IMPLICATIONS (includes TSR, FPC, & RPAT PAs) | LRMP IMPLICATIONS vs. BASE CASE |
|--------------------------|--|---|
| BIO-DIVERSITY | <ul style="list-style-type: none"> • <1% existing Protected Areas increased to 5.9% with RPAT proposed Protected Areas; provides adequate ecosystem representation in 4 of 9 ecosections • Subalpine and alpine ecosystems at lower risk than low elevation Sub-Boreal Spruce ecosystems (high risk) • Reductions in natural levels of biodiversity are anticipated in 88% of the Plan Area in the equivalent to Resource Development RMZs • Landscape connectivity much improved with FPC riparian reserves, relative to the TSR, however, reserves may be functionally impaired within large areas of intensive resource development, mostly in the south • Without a higher level plan (such as the LRMP), the flexibility of the FPC and its guidebooks would favour management for low biodiversity emphasis over large areas | <ul style="list-style-type: none"> • 5.8% in proposed Protected Areas provide significant representation for 3 of 9 ecosections: low elevation ecosections still poorly represented • Subalpine and alpine ecosystems at low risk, most low elevation SBS ecosystems still at high risk • Reductions in natural levels of biodiversity are anticipated in 31% of Plan Area in Resource Development RMZs • 7 protected areas >5,000 ha in size increase landscape connectivity, 3 are supported by Special Management RMZs • Recognition of unique ecosystems requiring special management more likely to maintain viable representative examples • RMZ zoning and key management objectives will direct the selection of biodiversity emphasis options and likely result in a more balanced overall distribution, but little change in the south |
| WILDLIFE HABITATS | <ul style="list-style-type: none"> • Significantly increased protection of riparian habitats is provided with the FPC relative to the (pre-FPC) TSR management regime • Wetlands within large areas of intensive resource development (mostly in the south) likely to become isolated and sustain reduced wildlife values • Low elevation spruce-pine habitats at greatest risk • Douglas-fir and deciduous at high risk due to no formal management strategy and flexibility of the FPC/guidebooks without higher level plan direction • The identification and protection of critical wildlife habitats largely occurs on a case by case basis (subject to negotiation) relative to proposed logging activities | <ul style="list-style-type: none"> • The application of strategies for wildlife and fisheries would improve protection of riparian habitats over the Base Case • Strategies to maintain the functional values of wetlands is incrementally better than the base case, however, both wetlands and riparian habitats may be degraded due to isolation within Resource Development RMZs • Low elevation spruce-pine habitats still at greatest risk from intensive silvicultural practices favouring early seral habitat generalists • Existing Douglas-fir and deciduous at low risk with strategies to maintain representative occurrences throughout the landscape • Strategies direct BC Environment to identify valuable wildlife habitats and develop appropriate management plans |
| MOOSE | <ul style="list-style-type: none"> • FPC riparian reserves should mitigate long term impacts in many areas but may not be adequate in Resource Development RMZs • Long term declines anticipated in the southern portion of the Plan Area with sustained intensive silvicultural practices, increased road access and legal/illegal hunting pressure | <ul style="list-style-type: none"> • Decreased proportion of high value moose habitat in areas zoned for Resource Development • Strategies address vegetation mgt., visual buffers & important habitats better than Base Case • Access management for grizzly and increased protection of large river riparian habitats may provide some benefits for moose |
| MOUNTAIN GOAT | <ul style="list-style-type: none"> • Increased road access associated with the lack of a management plan anticipated to result in declines in some areas from illegal hunting | <ul style="list-style-type: none"> • Access mgt. for grizzly/caribou may benefit goats • Strategies specific to maintain the functional values of habitats and movement corridors better than Base Case |

ENVIRONMENTAL ASSESSMENT SUMMARY MATRIX (cont.)

| KEY ACCOUNTS | BASE CASE IMPLICATIONS | LRMP IMPLICATIONS vs. BASE CASE |
|--|--|---|
| GRIZZLY BEAR | <ul style="list-style-type: none"> Anticipated long term declines in grizzly anticipated Management largely focused on areas under immediate development pressures and not at the landscape level Bear-human conflicts including illegal hunting anticipated to continue/increase along transportation corridors, particularly along salmon-bearing rivers | <ul style="list-style-type: none"> Strategies for access management for important habitats will likely reduce risks in some areas but depends on the ability of BC Environment to identify these habitats and on future stakeholder agreements; moderate risks overall Long term declines in grizzly anticipated in Resource Development RMZs, mainly in south Bear-human conflicts anticipated to continue/increase along transportation corridors, especially along salmon-bearing rivers |
| CARIBOU | <ul style="list-style-type: none"> The lack of adequate caribou count and habitat mapping and no formalized management plan leave caribou at high risk The utilization of large areas by small, dispersed groups of caribou presents a difficult and complex management situation requiring greater research and significant effort to develop but no committed long-term plan being pursued Takla/Blanchet herd at greatest risk from progressive isolation as more of the surrounding forested areas come under intensive silvicultural management | <ul style="list-style-type: none"> Caribou management strategies would result in a formalized plan that provides long term protection of important habitats and places caribou at low to moderate risk overall The establishment of new Protected Areas and management direction for caribou in Special Management zones affords a high level of protection for the main groups of caribou The smaller Takla herd remains at high risk from progressive isolation as and co-operative management with Mackenzie would reduce risks for the Wolverine herd |
| SPECIES AT RISK (excluding grizzly & caribou reported above) | <ul style="list-style-type: none"> FPC stream, lake and wetland reserves adequate to maintain important habitats for bald eagle, American bittern and trumpeter swan Fisher at high risk in Resource Development RMZs due to loss of denning sites & access Wolverine at high risk without a caribou management plan FPC riparian reserves may not be adequate to protect important bull trout habitats in small streams and place them at moderate risk overall Omineca River Arctic grayling at high risk and Nation River grayling at moderate risk from cumulative watershed impacts although FPC riparian reserves, FRBC programs and Watershed Restoration activities may partially mitigate potential impact | <ul style="list-style-type: none"> LRMP strategies provide incremental benefits for some species at risk through access management planning and maintaining the functional integrity of key habitats, relative to the Base Case Fisher at moderate-high risk in Resource Development RMZs Wolverine may benefit from strategies for grizzly and caribou, where they co-exist Strategies to protect critical habitats for red and blue-listed species depend on the ability of BC Environment to identify them and on competing objectives such as limits on timber impacts Bull trout habitats in small streams remain at moderate risk Arctic grayling populations at moderate and low risk from cumulative watershed impacts in Omineca and Nation Rivers, respectively |
| FISHERIES | <ul style="list-style-type: none"> FPC stream, lake and wetland reserves significantly increase protection for important fish habitats relative to the (pre-FPC) TSR Moderate negative impacts to fish are anticipated in 7 of 44 "Fish Units" Moderate benefits anticipated in 5 Fish Units Significant benefits anticipated in 1 Fish Unit | <ul style="list-style-type: none"> FPC stream, lake and wetland reserves significantly increase protection for important fish habitats relative to the TSR Moderate negative impacts to fish are anticipated in 4 of 44 Fish Units Moderate benefits anticipated in 15 Fish Units Significant benefits anticipated in 2 Fish Units |

PART I:

SOCIO-ECONOMIC ASSESSMENT

prepared by

Gary Holman, Consulting Economist

in cooperation with the

Ministry of Employment and Investment (Economics Branch)

and the

Ft. St. James Inter-agency Planning Team

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EXECUTIVE SUMMARY

The quantifiable socio-economic implications related to crown land use changes arise primarily from the potential timber supply impacts of the "Base Case" scenario (i.e., the "default" land use regime in the absence of the LRMP) rather than from the LRMP's proposed land use scenario. The implications for other sectors are more difficult to quantify because they mainly relate to future potential, rather than existing economic activities. *The impacts for all sectors will occur gradually over several decades.*

The timber supply analysis provided by independent forestry consultants indicates that in the **Base Case** (i.e., without the LRMP, but including new Protected Areas), the amount of Plan Area harvest flowing to local processors is likely to decline by about 113,000 m³/yr. (7% of the current level) after 30 years, subject to AAC decisions by the Province's Chief Forester. This could place up to 70 Ft. St. James area jobs at risk by Year 31, equal to about 5% of the Plan Area workforce. The longer term impacts are more significant, as the PG TSA (which includes the Plan Area) harvest is forecast to decline by about 5% per decade between Year 31 and Year 100, with Base Case reductions in timber available for processing in the Plan Area reaching up to 629,000 m³/yr by Year 100 (37% of the current amount of harvest processed locally). Harvest reductions of this scale could result in some mill closures in the Plan Area after 50 years, although some mills in the TSA may close sooner due to present over-capacity. ***For LRMP management strategies, any incremental timber harvest impacts are not measurable due to the broad nature of the recommendations, but are likely to raise the costs to the forest industry.***

The proportion of the Plan Area in Protected Areas and Special Management Zones is higher (about 26% of the Gross Land Base) in the LRMP than in the Base Case (about 10%). There is also a reduction in the proportion in Resource Development Zones (from 88% to 31%), and an increase in the area under Multi-Value Management (from 2% to 44%). Thus the LRMP should preserve more opportunities for the wilderness tourism sector and First Nations fisheries, trapping, and other subsistence activities, than would the Base Case. However, there will still be some gradual negative impacts on these values even with the LRMP. A notable trade-off is that unlike the government's candidate in the Base Case, the LRMP does not recommend most of the Nation Lakes chain for protected status, which will likely compromise key recreation/tourism values in that area over time.

The LRMP would not preclude any existing farm operations. Some may face higher costs, but most of this can be attributed to the Forest Practices Code. Agricultural land in the Plan Area is now underutilized, and LRMP recommendations that potentially increase the availability of agricultural land will also help to maintain future opportunities.

The LRMP would not affect any existing mines or energy resources. Recommended Protected Areas would preclude about 8% and 6% of high metallic and industrial mineral lands respectively, and LRMP management strategies are likely to increase the costs of

exploration and development. However, all of the 2350 ha. of existing mineral/placer tenure in proposed Protected Areas would be “grandfathered” for future activity.

1.0 Introduction

This final report assesses the socio-economic implications of the proposed land use plan developed by the Fort St. James Land and Resource Management Plan (LRMP) Working Group. Again, it is important to note that the LRMP document is a strategic plan that provides broad direction to lower level planning. Therefore, this assessment takes a similar “broad-brush” approach and evaluates only the key implications of the LRMP compared to those of the “Base Case,” i.e. the default land use regime that is likely to occur in the absence of an LRMP.

The assessment is both qualitative (i.e. descriptive) and quantitative (i.e. numerical) in nature and is based on the Ministry of Forests' (Prince George Forest Region) Geographic Information System (GIS) area analysis (see summary of area statistics in Appendix 1) and resource analyses for timber, mineral, agriculture, recreation and other values provided by government agencies on the Fort St. James LRMP Inter-agency Planning Team (IPT).

The Base Case includes the 1995 Timber Supply Review (TSR) management regime (on which the Chief Forester's 1996 TSA AAC determination was based), the Forest Practices Code (FPC), and other current management initiatives. The impacts of proposed 189,000 ha. of proposed Protected Areas as recommended by the Regional Protected Areas Team (RPAT) are also attributed to the Base Case, since it is likely that about 5.7% in new Protected Areas (due to the provincial Protected Areas Strategy and the target set for the Ft. St. James LRMP) would have been implemented in the Plan Area even in the absence of the LRMP process. The RPAT areas are therefore the best estimate of where those Protected Areas would be if there were no LRMP.

The proposed LRMP divides the Gross Land Base (GLB) of the 3.2 million ha. Plan Area into five broad Resource Management Zones (RMZs): Protected Areas (PAs), Special Management (SMZs), Multi-Value Management (MVZs), Resource Development (RDZs), and Agriculture/Settlement (ASZs). In order to develop a Base Case map and area statistics that can be meaningfully compared to the LRMP's proposed Plan, the IPT used these same RMZ designations to "label" the management zones that would likely prevail in the Base Case. Table 1 summarizes the proportion of the land base under each of the five land use designations for both the Base Case and the LRMP.

**TABLE 1: LAND USE ZONES AS % OF THE GROSS LAND BASE
OF THE FORT ST. JAMES LRMP PLAN AREA^a**

| | Proposed Protected Areas | Special Management^c | Multi-Value^c | Resource Development^b |
|------------------|-------------------------------------|---|--------------------------------|---|
| Base Case | 6.0% | 4.0% | 1.8% | 88.3% |
| LRMP | 5.9% | 19.6% | 43.9% | 30.7% |

(a) Defined as the 3,174,426 hectares comprising the Fort St. James Forest District.

- (b) Includes Agriculture/Settlement, which comprises less than 1% of the Plan Area.
- (c) Includes LRUP & VQO areas that existed or likely to be implemented without an LRMP.

Generally, although the locations differ, the overall proportion of the Gross Land Base (GLB) of the Plan Area in PAs is similar in the Base Case and the LRMP. However, the proportion of Special Management Zones (SMZs) is significantly higher (about 20% of the GLB) in the LRMP than in the Base Case (4%). There is also a significant reduction in the proportion of the Plan Area in Resource Development Management (from 88% to 31%), and an increase in the area under Multi-Value Management (from 2% to 44%).¹

The quantifiable socio-economic implications of the Base Case and proposed Fort St. James LRMP arise primarily from potential timber supply impacts. The socio-economic implications for other sectors are more difficult to quantify because they mainly relate to future potential, rather than existing economic activities. *The impacts for all sectors will likely occur gradually over several decades.*

2.0 Forestry

Base Case (i.e., without the LRMP)

Forestry dominates the Plan Area economy, accounting for an estimated 46% of basic employment.² Currently, about 40% of the 2.9 million m³/yr (non-TFL) Plan Area harvest is exported to sawmills elsewhere in the Prince George Timber Supply Area (PG TSA).

The Base Case scenario includes the 1995 Timber Supply Review (TSR) management regime (on which the Chief Forester's 1996 AAC determination was based), the Forest Practices Code (FPC), and other current management initiatives. The impacts of the 189,000 ha. of new Protected Areas as recommended by the Regional Protected Areas Team (RPAT) are also attributed to the Base Case, since the Protected Areas Strategy would likely have been implemented in the Plan Area even without the LRMP.³

The Gross Land Base (GLB) is about 3.2 million ha and the pre-FPC Timber Harvesting Land Base (THLB) is 1.4 million ha, or about 45% of the GLB. The FPC (mainly riparian buffers and wildlife tree patches) reduces the THLB by about 126,000 ha, to 41% of the GLB. The GIS analysis indicates that the RPAT proposed Protected Areas

¹ These land use changes are somewhat exaggerated because the Base Case designations do not factor in implementation of the FPC Biodiversity Guidelines and other possible management constraints that may be implemented (e.g. Caribou management zones) in the absence of the LRMP. Also for the LRMP, the % of the GLB in each RMZ category is somewhat different than the "official" distribution of 5.9% in PAs, 17% in SMZs, 45% in MVZs, and 32% in RDZs, since Base Case VQOs and the LRUPs within all LRMP-designated zones are assumed to be either Special Management or Multi-Value resource emphasis.

² Basic employment arises from income that flows into the Plan Area from outside (e.g., forestry, tourism, public sector income, etc.) and is considered to "drive" the Area economically.

³ The timber supply impacts of RPAT PAs are underestimated somewhat because the RPAT PAs used in the timber supply modelling (about 155,000 ha) fell short of the target established by the Province for the Plan Area (about 181,000 ha. or about 5.7% of the Plan Area).

would further reduce the THLB by 83,000 ha, resulting in a Base Case THLB of about 1.2 million ha, or 38% of the GLB. The RPAT areas would also reduce the post-FPC mature/old growth volumes from a stock of about 276 million m³ to 259 million m³, a reduction of 6.2%.

The Fort St. James Plan Area is one of three Forest Districts in the Prince George TSA. *This means that harvest reductions within any Forest District are pro-rated among all licensees within the entire TSA.* Timber supply impacts (all from Base Case initiatives such as the TSR, FPC, and PAS) on harvesting and milling employment within the Ft. St. James Plan Area are therefore estimated at 18% (i.e., the estimated 1.7 million m³/yr.⁴ of Ft. St. James District harvest processed locally, divided by the TSA AAC of 9.4 million m³/yr) of the total harvest impact on the overall TSA.

Another factor that must be considered in the timber analysis is the expected re-allocation of harvesting from the Prince George Forest District (which is experiencing short term timber supply shortages due to "green-up" and other related constraints) to the Fort St. James and Vanderhoof Districts. *The extent of the re-allocation was not finalized by the Ministry of Forests at the time of this analysis*, but was estimated to be in the range of 300,000 m³/yr to 800,000 m³/yr. in total. It is assumed for purposes of the timber analysis that harvest levels in the FSJFD would increase by the upper end of the range, or 600,000 m³/yr. (i.e., to 3.5 million m³/yr.), implying that the Vanderhoof harvest would increase by 200,000 m³/yr.; the corresponding decrease in harvest in the Prince George Forest District would therefore be 800,000 m³/yr. Note that this re-allocation will not affect the AAC apportionments to licensees, only where in the TSA that the timber is harvested.

It is also assumed that the re-allocated harvesting will be undertaken primarily by contractors from outside the Plan Area (although some increase in local harvesting jobs is possible) and that logging and processing job impacts within the Plan Area will occur on a pro-rated basis, as TSA harvest levels begin to fall some decades into the future.⁵

A TSA-level timber supply analysis is not available at this time, but an approximate "rolled up" analysis has been undertaken for purposes of this assessment, as contained in Appendix 2. Harvest flows estimates, based on timber supply analyses for each LRMP-area in the TSA by Timberline Forest Inventory Consultants (for Ft. St. James) and Industrial Forest Service (Vanderhoof and Prince George), were provided under the direction of the Ministry of Forests. Separate Base Case (i.e. post-TSR, FPC, and PAS) harvest flows for the Fort St. James District and post-LRMP harvest flows from the Vanderhoof and Prince George Districts are summed up into an overall TSA harvest flow estimate from which pro-rated timber supply impacts on the Plan Area are then estimated. The results indicate that *harvest reductions to Ft. St. James area timber processors in the Plan Area can be deferred for about 30 years* (subject to Chief Forester

⁴ See *Socioeconomic/Environmental Base Case: Ft. St. James LRMP*, May 1995, p. 5-4.

⁵ This approach may overstate the magnitude and timing of logging job impacts. If non-residents harvest the additional allocation to the FSJ FD, significant local logging employment impacts may occur only after the harvest level falls below the current level of 2.9 million m³.

AAC determinations) and are estimated to be about 113,000 m³/yr during years 31 to 40, or about 7% of the amount now processed locally.⁶ After year 40, the overall TSA harvest level declines by an average of roughly 5% per decade until year 100. The Base Case timber harvest impact of about 113,000 m³ by year 31 could place at risk up to 55 timber harvesting and processing jobs and 15 spin-off jobs in the Plan Area during that fourth decade. This potential impact represents about 5-6% of current Plan Area employment and income. Jobs at risk for the Prince George TSA as a whole are larger in absolute terms, but smaller as a proportion of the overall TSA economy. The potential local, TSA, and provincial forestry-related economic implications of Base Case timber harvest reductions expected to occur by year 31 are presented in Table 2.

There are many unknowns that make quantitative assessment of forestry-related economic impacts in the long term very uncertain. For example, new “site index” data indicate that timber growth rates, and therefore sustainable harvest levels, may be higher than currently assumed. Long term trends in technology, forest product prices, operability and timber utilization compound these uncertainties.⁷ However, if the Base Case falldown in the TSA harvest levels suggested by the timber supply analyses does occur, it could result in the closure of one or two of the larger mills in the Plan Area (as well as some others in Vanderhoof and/or Prince George) even without an LRMP. While this is not likely to occur for 50 years, rationalization of the regional industry could occur sooner for other reasons (e.g., current mill over-capacity relative to the TSA’s current AAC).

Land and Resource Management Plan

The timber supply analysis provided by Timberline/MoF indicates that the LRMP’s Protected Area recommendations have no additional harvest impact, in the short and long term, compared to the Base Case RPAT-recommended Protected Areas. This is due to the fact that the Protected Areas proposed by the LRMP comprise a lower proportion of the Timber Harvesting Land Base (about 71,000 ha or 5.5% of total THLB) than those proposed by RPAT (about 83,000 ha or about 6.4%). The amount of mature and old growth timber that would be precluded from harvesting in the LRMP PAs is about 16 million m³, compared to about 17 million m³ in the RPAT PAs.

It is important to note that Timberline's analysis was not able to ascertain any measurable harvest impacts from the LRMP’s management prescriptions outside of new Protected Areas, due to the practical difficulties encountered in trying to assess LRMP objectives and strategies that mainly consist of broad direction to lower level planning. It is likely, though, that in addition to some implications for the harvest, such measures will also result in cost increases for planning, access management, etc., especially in Special

⁶ Minor harvest reductions of about 17,000 m³/yr, on a pro-rated basis, begin by year 21, but these are not likely not significant enough to result in local employment impacts, or can be deferred until Decade #4.

⁷ For a discussion of some of these factors, see *The Truth is Out There*, L. Pedersen address to NFPA, April, 1997. The document suggests that the harvest in the PG Forest Region could be increased from about 19 million m³/yr to about 25 million m³/yr over the next 100 years.

Management Zones. It is acknowledged that the cost implications of initiatives such as the FPC are already a concern in the Base Case.⁸

TABLE 2:
POTENTIAL FORESTRY SOCIO-ECONOMIC IMPACTS
OF THE BASE CASE AND PROPOSED LRMP PLAN^a

| | Base Case* | | | LRMP** | Total |
|--|-----------------------------------|-----|-----|-----------------------|------------------|
| | TSR | FPC | PAs | PAs & Mgt. Strategies | Base Case & LRMP |
| Harvest Impact Yrs. 0-30 | 0 | 0 | 0 | - | 0 |
| Harvest Impact Yrs 31-40 ('000 m3) | 113 | 0 | 0 | - | 113 |
| % Decline per Decade Starting Yr 41 | ~5% per decade until year 100 | | | - | 5%/decade |
| Harvest Impact as of Yr 100 ('000 m3) | 530 | 40 | 59 | - | 629 |
| | Impacts During Years 31-40 | | | | |
| Fort St. James Forest District | | | | | |
| Direct Jobs at Risk (PYs/yr) ^a | 50-53 | 0 | 0 | - | 50-53 |
| Total Jobs at Risk (PYs/yr) ^b | 57-67 | 0 | 0 | - | 57-67 |
| Employment Income at Risk (\$mill/yr) ^c | \$2.4-\$2.8 | 0 | 0 | - | \$2.4-\$2.8 |
| Jobs at Risk as % of District Total | 3.9%-4.7% | 0 | 0 | - | 3.9%-4.7% |
| Income at Risk as % of District Total | 5.2%-5.8% | 0 | 0 | - | 5.2%-5.8% |
| Prince George TSA (incl. FSJ FD) | | | | | |
| Direct Jobs at Risk (PYs/yr) ^d | 115-125 | 0 | 0 | - | 115-125 |
| Total Jobs at Risk (PYs/yr) ^e | 155-190 | 0 | 0 | - | 155-190 |
| Employment Income at Risk (\$mill/yr) ^c | \$6.2-\$7.3 | 0 | 0 | - | \$6.2-\$7.3 |
| Jobs at Risk as % of TSA Total | 0.3%-0.4% | 0 | 0 | - | 0.3%-0.4% |
| Income at Risk as % of TSA Total | 0.4%-0.5% | 0 | 0 | - | 0.4%-0.5% |
| Provincial (incl. PG TSA) | | | | | |
| Direct Jobs at Risk (PYs/yr) ^d | 115-125 | 0 | 0 | - | 115-125 |
| Total Jobs at Risk (PYs/yr) ^e | 205-265 | 0 | 0 | - | 205-265 |
| Employment Income at Risk (\$mill/yr) ^c | \$7.4-\$9.1 | 0 | 0 | - | \$7.4-\$9.1 |
| Potential BC Revenues (\$mill/yr) ^f | \$4.5-\$7.4 | 0 | 0 | - | \$4.5-\$7.4 |
| Net Resource Value per BC Household g | \$0.17-\$0.43 | 0 | 0 | - | \$0.17-\$0.43 |

* Base Case impacts (i.e. Timber Supply Review, Forest Practices Code and RPAT candidate Protected Areas) were derived by adding the LRMP timber supply analyses for the three Districts comprising the Prince George TSA. Plan Area timber supply impacts to Ft. St. James processors for years 31-40 are estimated as a pro-rated 18% (or 1,700,000/9,350,000) share of the 625,000 m3/yr in Base Case TSA impacts expected to occur by year 31, equal to 113,000 m3/yr., which excludes timber exports out of the Plan Area. Prince George TSA-level and provincial-level impacts for years 31-40 include that portion of TSA timber impacts that can reasonably be attributed to the Plan Area at that time, i.e. 36% (or 3,150,000/8,725,000) of 625,000 m3/yr., equal to 225,000 m3/yr., including Plan Area timber exports. For a description of potential

⁸ See *Financial State of the Forest Industry and Delivered Wood Cost Drivers*, KPMG for MoF, April, 1997. The report estimated that total wood costs increased by 80% over the 1992-96 period. The FPC accounted for about one-quarter of this increase, and stumpage and other factors for the rest.

timber impacts, see Appendix 2. Estimates of potential impacts on TFL 42 in the Ft. St. James District have not been assessed but would not be expected to change the results significantly.

** Timberline's analysis was unable to discern any harvest impacts from LRMP management objectives/strategies over and above the Base Case, due to the broad nature of the management direction contained in the LRMP document. See discussion in text.

Notes to Table 2:

(a) Direct jobs at risk in Plan Area based on 0.44-0.47 PY/'000 m³ in woodlands (logging/hauling/roadbuilding/silviculture) and sawmilling. Range of estimates based on with and without silviculture. Value-added assumed not to be linked to incremental changes in harvest levels - see Appendix 3. Current maximum forestry jobs Plan estimated at about 1,000. (Source: *Fort St. James LRMP Socio-Economic and Environmental Base Case*, May 1995.)

(b) Plan Area indirect/induced impacts derived with economic base employment multipliers (i.e. total direct/indirect/induced employment divided by direct employment) of 1.21-1.29 for woodlands and 1.11-1.24 for processing. Multiplier estimates net out log hauling and road building which are included in direct impacts. Range of estimates based on with and without social safety net/worker migration. Total Plan Area employment estimated at 1,435 as of 1991. (Source: *B.C. Local Area Economic Dependencies and Impact Ratios*, Ministry of Finance and Corporate Relations, 1995)

(c) Average after-tax income (including benefits) for forestry estimated at about \$45,000/job. Indirect and induced income impacts based on average after-tax income (including benefits) of \$25,000/job. (Source: *Prince George TSR Socio-economic Analysis*) Total 1991 after-tax income (including adjustment for benefits) in Plan Area estimated at about \$47 million. (Source: MFCR)

(d) Direct jobs at risk in the PG TSA and provincially based on jobs per '000 m³ harvested in woodlands (logging/hauling/roadbuilding/silviculture) and sawmilling of 0.51-0.55 PY/'000 m³. (Source: *Prince George TSR SEA*.) Range of employment estimates based on with and without silviculture. Includes jobs at risk in all three TSA Forest Districts caused by the total TSA-level timber impact that can reasonably be attributed to the Ft. St. James Plan Area, estimated to be 225,000 m³/yr. during years 31-40. Assumes that incremental harvest impacts do not directly affect employment levels in pulp and paper and value-added processing either inside or outside the Plan Area - see Appendix 3.

(e) PG TSA employment multipliers estimated at 1.41-1.58 for woodlands and 1.33-1.51 for sawmilling. (Source: *Prince George LRMP Socio-economic & Environmental Assessment*, Gary Holman and Jim Trask, February 1998.) Provincial multipliers estimated at 1.67-1.94 for woodlands and 1.83-2.29 for sawmilling. (Source: MFCR B.C. Input-Output Model). Lower multipliers are based on BCIOM adjusted for social safety net. Total 1991 TSA after-tax income (including adjustment for benefits) estimated at \$1.5 billion and employment at 46,000.

(f) Potential B.C. revenue impacts include: average target stumpage for the Interior ranging from about \$15/m³ - \$27/m³ (with and without FRBC share); \$2.46/m³ for the BC share of personal, corporate/logging income taxes; personal income tax rates of about 27% forestry and 19% for indirect/induced sectors, and a BC share of personal income tax of 33%. Utilized estimated TSA-level harvest impact of 225,000 m³/yr. that can be attributed to Plan Area. (Sources: *Prince George LRMP Socio-Economic Assessment*, Price Waterhouse and MoF Valuation Branch)

(g) Using a harvest impact of 225,000 m³/yr/., estimated as the annualized indicated stumpage revenue loss (based on \$13/m³-\$32/m³ estimates from MoF Valuation Branch, 1990-96) divided by the 1.4 million households in BC (1996 Census) using a 6% discount rate. This indicator is a proxy for the cost of the economic rents forgone from lower a Base Case timber harvest, i.e. the amount that each BC household would have to be willing to sacrifice annually to achieve the environmental benefits associated with land management constraints due to TSR, FPC, etc.

3.0 Tourism and Recreation

Base Case (i.e., without the LRMP)

Total direct tourism employment in the Plan Area is estimated at approximately 100, and comprises an estimated 8% of basic employment. Some of this employment is based directly or indirectly on wilderness or “back-country” tourism portion of the sector, which is assumed to be more strongly linked to changes in crown land use than is the “front-country” (e.g., motels and restaurants) component. There is good growth potential in guide-outfitting and other forms of wilderness tourism based on attractions such as:

- Nation Lakes chain offering 110 km canoe trip through 4 remote lakes, with 3 lodges, 13 campsites, and recreation potential considered similar to the Bowron Lakes.
- Large network of Stuart, Trembleur and Takla Lakes, popular for power-boaters.
- Numerous lakes scattered throughout the District and associated hunting and fishing opportunities. Many of the Plan Area's 15 fishing resorts are on these lakes, some with air access only.
- Sustut River steelhead fishery.
- Large, scenic wilderness areas, especially in the northern portion of the Plan Area.

In the Base Case, about 9% of total guide/outfitter territories are in Protected Areas proposed by RPAT or in VQO/LRUP areas that are considered to be “Special Management-type” Zones. Also in PAs or SMZs are: 8% of high tourism capability areas (according to mapping done by the Ministry of Small Business, Tourism and Culture), 14% of MoF recreation sites, and less than 15% of rare and endangered sport fish and 61% of large river/riparian habitats, and 25% of lakes with special management needs.

The Ministry of Forests also has a provincial Recreation Inventory, split into three main categories:

Recreation Opportunities Spectrum (ROS) - The ROS divides the Gross Land Base into “Primitive Non-Motorized” (areas >5000 ha. and >8 km from a 4-wheel drive road), “Semi-Primitive Non-Motorized” (areas >1000 ha. and >1 km from a 4-wheel drive road), “Semi-Primitive Motorized (areas >1000 ha. and >1 km from a 2-wheel drive road), and the remaining Resource Roaded land base.

Recreation Features Inventory - The two relevant classifications are “Significant Features - Very High” (provincially significant with a very high capability to attract recreational, educational, or scientific use) and “Significant Features - High” (regionally significant with a high capability to attract recreational use).

Management Class Inventory - The two relevant classifications are “Outstanding” (areas of outstanding recreational, educational, scientific, or heritage value and more appropriately managed for recreation values) and “Requiring Special Management” (areas that require special management considerations to maintain recreational values).

Referring to these classifications, contained in Base Case Protected and Special Management areas are 24% of recreation opportunities requiring special management, 37% of very high and 20% of high recreation features, but only 0.1% of primitive and 12% of semi-primitive recreation areas.⁹

While the Base Case provides some protection for some key wilderness recreation and tourism values (e.g. the large Nation Lakes RPAT PA and the Sustut River SMZ), there are significant proportions of these values located in the assumed equivalent to “Resource Development Zones.” For example, 86% of guide-outfitter territories, 99% of primitive recreation opportunities, 88% of high tourism capability and 68% of lakes with special management needs are in zones with resource development as the management emphasis. Continued timber harvesting and related road access in these zones would likely result in erosion of wilderness recreation and tourism values over time. Although impacts on wilderness tourism potential will also have some implications for front-country tourism, as noted above, the business done by these facilities is less strongly linked to crown land use and resource management.¹⁰

Land and Resource Management Plan

Generally, the proportion of the Plan Area in Special Management Zones (SMZs) is significantly higher (about 20% of the overall land base) in the LRMP, than in the Base Case (about 4%). There is also a significant reduction in the proportion of the Plan Area in Resource Development Management (from 88% to 35%), and an increase in the area under Multi-Value Resource Management (from 2% to 22%). Therefore, in general, there is a significant shift in the LRMP from a management emphasis on resource development to a management regime that takes into account recreation and environmental values.

More specifically, the LRMP places about 21% of total guide/outfitter territories, 16% of high tourism capability, 39% of forest recreation sites, 36% of recreation opportunities

⁹ It is acknowledged that the expanding road networks caused by resource development has both positive and negative implications for tourism and outdoor recreation. While roads increase access for many recreationists, they also have a negative affect on the pristine nature of back-country experiences that are important to some individuals, and will increase the pressures on fish and wildlife populations.

¹⁰ In fact, a significant portion of the revenues received by the local “front-country” accomodation and meal sector stems from travel by those working in the resource industries.

requiring special management, 89% of very high and 36% of high recreation features, 43% of lakes with special management needs, 9% of primitive, and 17% of semi-primitive recreation opportunities in PAs or SMZs. The proportion of rare and endangered sport fish and of large river/riparian habitats that are in such zones, is also increased somewhat in the LRMP. Other key LRMP recommendations for recreation and tourism include:

- Management strategies designed to better protect Caribou populations (e.g. access management and joint MELP/MoF approval of forest development plans in critical habitat) are particularly important to local guide-outfitters.
- Access and sensitive resource management strategies (e.g. for Sustut and Kluatantan Rivers) that will better protect wilderness fisheries (particularly the Class 1 steelhead fishery) and lakes values.

There are also 13 small Goal 2 Protected Areas, 5 of which combine with the proposed Nation PA and the Lower Nation SMZ to encompass lakes to create a potential recreation and tourism experience *potentially* similar to the Bowron Lakes south-east of Prince George. However, unlike the Bowron Lakes, most of the Nation Lakes chain would not be contained in Protected Areas, as would be the situation in the Base Case with the RPAT-recommended Nation proposed Protected Area.¹¹

Because of these proposed changes, the LRMP should on balance preserve more opportunities for the wilderness tourism sector and the fish and wildlife resources upon which they depend, than would the Base Case. However, with continued timber harvesting and road access, there will still be some wilderness tourism potential foregone over the longer term even with the LRMP (although front-country tourism should continue to grow indefinitely). For example, 38% of guide-outfitter territories, 59% of MoF recreation sites, 46% of semi-primitive recreation opportunities and 54% of high tourism capability areas are still in Resource Development RMZs. Also, some rare and endangered sport fish (e.g. arctic grayling bull trout) and related wilderness angling opportunities may still be negatively impacted by resource development and increased road access over time.

4.0 Mining and Energy

Base Case (i.e., without the LRMP)

There are presently no major mines operating in the Plan Area, although the Ministry of Energy and Mines (MEM) consider it to be one of the higher ranked mineral potential areas in BC. There is small scale, intermittent production at the Ogden Mountain jade

¹¹ The LRMP reduces the RPAT candidate Nation Lakes PA but retains that area not protected (i.e. the Lower Nation RMZ) as a Special Management Zone. According to the GIS-generated area statistics contained in Appendix 1, the overall proportion of recreation and tourism values in Protected Areas is generally less in the LRMP compared to the Base Case, primarily because of the reduction in the Nation Lakes PA and the increase in the size of the predominantly higher elevation Upper Sustut/Thumb PA.

occurrence and a number of placer gold properties. Total direct mining employment in the Plan Area is estimated at approximately 40, comprising about 3% of basic employment.

There are no proven deposits within RPAT's candidate Protected Areas, but 2 out of 25 prospects and 9 out of 218 showings¹² are located in RPAT PAs, and therefore could be precluded from potential development in the Base Case if they became viable. RPAT PAs would also preclude about 8% and 6% of high metallic and high industrial mineral potential, respectively, as well as 5% of mineral tenures.

There are no proven energy reserves in the Plan Area, although there is some moderate potential for oil and gas in the Bowser-Whitehorse Basin from the upper half of Takla Lake to the Lower Sustut area. There has been no oil and gas drilling activity and no leased tenures in the Plan Area. RPAT's Lower Sustut PA would preclude a small proportion (perhaps 5%) of oil and gas potential in the Plan Area. There is significant coal resource potential in the Groundhog area at the north end of the Plan Area. A number of hydroelectric opportunities also exist in the Plan Area.

Land and Resource Management Plan

The LRMP would not preclude any of the existing jade or placer operations, proven deposits or prospects. It would also "grandfather" the approximately 2,350 ha¹³ of existing mineral and placer tenures (less than 2% of total tenured area) in proposed PAs. Thus, the LRMP would not directly preclude any existing employment, or any future employment associated with the most promising mineral deposits in the Plan Area. In particular, the Nation PA has significantly lower impacts on mineral values and tenures than the RPAT proposal. Therefore, with respect to the implications of Protected Areas for the mineral sector, the LRMP would be an improvement over the Base Case.

Although 16 out of 218 (about 7%) showings are located within the LRMP's proposed Protected Areas, many of these showings (particularly the more promising ones) would likely be tenured and therefore the grandfathering provision of the LRMP would allow further exploration and development. However, the expansion of existing tenure would not be allowed and this may affect the viability of existing tenures. LRMP PAs would also preclude about 8% and 6% of high metallic and industrial mineral potential, respectively. However, the likelihood and timing of development of mineral potential, and therefore its economic significance, is very uncertain.

¹² Occurrences include producing mines, past producers, proven deposits (developed prospects with defined deposits and grades), prospects (occurrences for which there is some indication of dimension) and showings (not sufficiently defined to permit resource estimation). Note the latest data from the Ministry of Energy and Mines indicates there are 28 prospects and 225 showings in the Plan Area.

¹³ This is net of 450 ha of mineral tenure in the Upper Sustut/Thumb that has recently been forfeited., according to *Fort St. James Land and Resource Management Plan Mineral Resource Analysis*, Ministry of Energy and Mines, January, 1998.

The increase in the proportion of the land base in SMZs (including 1 of 10 proven deposits, 6 of 25 prospects, 35 of 218 showings, and 12% of mineral tenure), and LRMP management strategies could increase the costs of mineral exploration and development. There are also some access management strategies in the Plan that could increase exploration and development costs. Of particular concern are strategies which:

- minimize roads into alpine and sensitive wildlife areas
- recommend considering non-roaded exploration if site specific needs are identified
- require assessments of impacts of new roads in the Sustut RMZ, which could affect the cost and viability of access to the Kemess gold-copper project and the Klappan coal property, both of which are located just outside the Plan Area

However, the viability of affected mineral occurrences and/or the incremental costs of the access and management strategies, and therefore the economic significance of these changes in management emphasis, is uncertain. This is a concern for investor confidence, particularly during the short-term implementation period for the LRMP.

The Upper Sustut/Thumb PA in the LRMP would preclude a similar (although highly uncertain) amount of oil and gas potential lands as (i.e. has no incremental impact compared to) the Base Case. The remainder of the oil and gas potential in the Bowser-Whitehorse Basin is located in Resource Development and Multi-Value RMZs.

The Special Management Zone at the north end of the Plan Area includes the Groundhog coal potential, however, LRMP does not preclude any potential coal developments, although this zoning, along with the LRMP's access management strategies, could increase exploration and development costs. However, the viability of the Groundhog resource, the incremental costs of management changes and therefore the economic significance of these changes is uncertain.

B.C. Hydro has indicated that it has no significant concerns about the LRMP.

5.0 Agriculture

Base Case (i.e., without the LRMP)

Agriculture activity, limited to the southern portion of the Plan Area, consists primarily of livestock and some mixed farming. There is also some grazing activity and 8 agricultural tenures on Crown land. Total local employment in the industry as of 1991 is estimated at about 35-55, accounting for about 3%-4% of basic sector employment. There is room for expansion of the agriculture sector, e.g. within the Necoslie River valley and east of Pinchi Lake). However, as per historical trends, market factors leading to marginal profitability imply that it is likely that growth in this sector will continue to be slow.

It does not appear that RPAT PAs would preclude any existing operations, tenures or ALR land. The new riparian areas (on both streams and lakes) and biodiversity strategies

established under the FPC could preclude or limit access for some cattle grazing. There could also be some additional costs associated with fencing riparian areas, and new watering structures, and / or relocation and development costs of establishing new range areas. These impacts will be site dependent, affecting some operators more than others.

Land and Resource Management Plan¹⁴

As in the Base Case, the LRMP PAs appear to have negligible implications for existing agricultural operations in the Plan Area. There are some management strategies in the LRMP that could increase the cost of operating on agricultural land (e.g. encouragement of strategies to maintain and/or enhance wildlife and aquatic habitat), although most of these management constraints have been or will be implemented through Base Case initiatives such as the FPC and possibly the new Fish Protection Act.

The key supportive recommendations in the LRMP for agriculture include:

- Mapping of lands with high potential for agriculture and use this information to identify and zone Agricultural Development Areas for future development.
- Deferring the inclusion of forested lands with Canada Land Inventory Class 5 arable or better, from the Forest Land Reserve until arability has been better assessed.

Overall, the changes due to the LRMP are unlikely to have significant implications on existing or potential activity in the local agriculture sector vs. the Base Case, and would not result in the loss of any existing jobs. Market factors will continue to be the primary determinant of growth in agriculture. Some agricultural land in the Plan Area is now underutilized, and LRMP recommendations that potentially increase the availability of agricultural land will also help to maintain opportunities for long term growth.

6.0 Subsistence Fisheries and Trapping

Base Case (i.e., without the LRMP)

Trapping and fishing are the primary sources of income for about 10 people in the Plan Area, based on 1991 data. However, trapping and fishing are important sources of supplemental income or sustenance for many more residents, particularly First Nations.

In the Base Case, 88% of the Plan Area is in Resource Development Management Zones, with priority for timber harvesting, mining, agriculture or settlement. Therefore, the risks to fisheries and habitat for fur-bearers (e.g. marten) would increase over time as activities such as timber harvesting and related road access throughout the THLB proceeds.

These impacts would be mitigated somewhat by the FPC and the RPAT Protected Areas. However, as mature and old growth forests are converted to younger forests, income

¹⁴ Because the Agricultural/Settlement zone accounts for less than 1% of the Plan Area, it was included in the area statistics for the Resource Development Zones.

from trapping of old growth dependent fur-bearers would likely decline. Fisheries resources may also be impacted as continued timber harvesting affects habitat quality and logging road access results in increased fishing pressure.

Land and Resource Management Plan

As noted previously, the LRMP significantly increases the overall proportion of the Plan Area in Special Management Zones (from about 4% to 20%). There is also a significant reduction in the proportion of the Plan Area in Resource Development Management Zones (from 88% to 35%), and an increase in the area under Multi-Value Resource Management (from 4% to 24%). Because of these zoning changes and a number of other management strategies proposed in the Plan, there is generally improved management for fisheries and fur-bearers compared to the Base Case.

However, although the LRMP better manages these resources, there is still some risk of longer term declines in some of these values, and the economic/subsistence activities dependent on these resources. For example, given trapping's reliance on marten/fisher, and these species' dependence on mature/old growth forest cover, which will decline over the long term, trapping incomes are likely to also decline. Also, although the Plan will better protect salmonoid and freshwater species than in the Base Case, these resources will still be negatively affected by continued resource development and expanding road access.

7.0 First Nations Concerns

Base Case (i.e., without the LRMP)

The Plan Area include portions of traditional territories of the Carrier, Sekani, Gitksan, and Tahltan Nations. The Carrier First Nations living in the Plan Area are the Nakazd'li, Yekooch, Takla Lake Band, and the Tl'azt'en Nation. The estimated First nations on-reserve population is about 1,800 and comprises about 40% of total population in the Plan Area, with additional aboriginals living off-reserve.

Logging and silviculture are probably the single most important private sector sources of employment to local First Nations. While the harvest impacts of the Base Case are relatively minor in the short term, they could be significant in the longer term. Traditional and subsistence activities (hunting, fishing, trapping) are also an important part of First Nations' culture and livelihood. Protection of the resources upon which these traditional activities depend, and the desire for greater involvement in resource management have been on-going issues of concern to First Nations in the Plan Area.

Both First Nations communities are implementing economic development plans (including logging and tourism) and recent Court decisions will give them greater input into resource use decisions. The eventual resolution of land claims will also make an important contribution to their economic development and resource management goals.

Land and Resource Management Plan

In general, the land use changes and management strategies proposed in the LRMP are more supportive of First Nations' traditional and subsistence values, as well as nature-based economic development opportunities (e.g. wilderness tourism). The LRMP would also provide greater protection for natural and traditional values while requiring more sustainable resource development, both within specific areas of interest and in the Plan Area as a whole. These management directions appear to be generally consistent with historical First Nations' concerns. However, as discussed above, there are still some resource values and related economic activities (e.g. trapping) which are likely to decline over time, although to a lesser degree than in the Base Case. Finally, as indicated in Section 2, there are no measurable timber harvesting and resulting socio-economic implications of the LRMP for all residents, including First Nations.

8.0 Community/Worker Adjustments; Mitigation/Transition Issues

This discussion applies generally to impacts attributable to both the Base Case and the LRMP. This is because both “market driven” adjustments (i.e. voluntary industry attempts to find alternative wood supplies or reduce costs) and government mitigation measures could vary with the severity of the timber supply impacts of the Base Case and the LRMP.

“Market Driven” Adjustments

The forestry employment impacts estimated (all of which are attributable to the Base Case rather than the LRMP) are characterized as “jobs at risk” because of uncertainties inherent in forecasting over a 30+ year period and because estimates are based on the unrealistic assumption that firms and workers make no adjustments to minimize impacts. For example, firms throughout the TSA could attempt to offset timber shortages through log imports, greater utilization of timber currently considered inoperable or non-commercial, salvage timber, and technological changes increasing lumber recovery. Also, firms will likely attempt to reduce non-recoverable losses over time, as roaded access (e.g. to windfall timber) throughout the Prince George TSA gradually increases.

There are other “economic” adjustments that can be made by firms to lower labour costs (e.g., periodic shutdowns, attrition, pension bridging, transfers to other licensee operations) without permanent involuntary lay-offs.¹⁵ This is not to trivialize the difficult adjustments for individual workers who are displaced, but rather, attempts to show the different forms that impacts caused by timber harvest reductions may take. For example, adjustments to harvest reductions through periodic closures mean that impacts would take the form of some income losses for a larger group of workers rather than permanent job losses for a smaller group. (It is recognized that such strategies increase the fixed cost

¹⁵ For example, a pulp mill in Prince George recently reduced its workforce by 15% over three years by offering voluntary early retirement incentive packages to its employees.

share of commercial forestry activities.) Growth in value-added forest processing activities is also likely to continue if, as a result of harvest reductions, forest companies wish to diversify their revenue base beyond primary processing.

“Pro-Active” Mitigation Measures

There are several measures that could mitigate the employment, income and government revenue impacts of land use changes in the short term. Probably the most important is for MoF to defer and gradually phase in harvest reductions, which the timber supply analysis undertaken for the assessments of all three LRMPs in the TSA indicates is possible. This allows time for transition measures and growth in other sectors to take effect.

Other initiatives that can mitigate impacts include incremental silviculture and watershed restoration funded by FRBC, and policies to encourage improved timber utilization and value-added processing (e.g. as provided for in the provincial Timber and Jobs Accord).

An Economic Strategy

A formal economic strategy could also be developed. For example, a key concern of Plan Area residents is the amount of timber that leaves the Forest District to be processed elsewhere and the lack of benefits returning to the Plan Area from these exports.¹⁶ This concern is currently being exacerbated by the re-allocation of timber harvesting within the TSA that will allow for, at least temporarily, several hundred thousand more cubic metres of timber to be harvested in the Ft. St. James District due to green-up/adjacency constraints in the Prince George Forest District. Taking into account these and other concerns, such a strategy could suggest an number of items, for example:

- allotting a specific proportion of the funding to Forest Renewal BC’s Omineca-Peace region be put aside annually into an “endowment fund” for economic development in the Plan Area closer to the time when timber harvest reductions are expected
- working with the Ministry of Forests to obtain timber allocated for a locally-controlled, community-based forest license or licenses
- assessing new value-added wood opportunities, whereby logs currently sawn in the Plan Area could be further processed locally
- evaluating an expansion of the THLB and analyzing the implications of new data on timber growth and yield
- other ideas that have been suggested by the Working Group

¹⁶ These concerns were articulated in detail by the Mayor of Ft. St. James in a letter to the Ministry of Forests dated March 10, 1998.

Finally, it should be noted that a combination of a well-articulated community vision and consensus on an action plan can be a strong vehicle for effecting change related to future economic development in smaller, less economically diversified communities.

APPENDIX 1:
GIS AREA ANALYSIS SUMMARY - GROSS LAND BASE AREA STATISTICS
FOR KEY MAPPED SOCIO-ECONOMIC RESOURCE VALUE INDICATORS^a

| Key Mapped Indicators (000's of ha. unless noted) | Total ^b (000 ha) | Base Case | | | | Proposed LRMP Plan | | | |
|--|--------------------------------|----------------|---------------------------|------------------|---|--------------------|---------------------------|------------------|---|
| | | % Protected | % Special ^c | % Multi-Value | % Resource Development ^d | % Protected | % Special ^c | % Multi-Value | % Resource Development ^d |
| Gross Land Base | 3,174 | 6.0 | 4.0 | 1.8 | 88.3 | 5.9 | 19.6 | 43.9 | 30.7 |
| Timber Harvesting Land Base | 1,292 | 6.4 | 3.4 | 1.7 | 88.5 | 5.5 | 10.1 | 36.7 | 47.7 |
| Forestry | | | | | | | | | |
| Mature/Old Conif. Vol. ('000 m3) | 275,683 | 6.2 | 3.7 | 1.6 | 88.7 | 5.8 | 10.0 | 36.1 | 48.2 |
| Recreation & Tourism | | | | | | | | | |
| Total Guide-Outfitter Area | 2,444 | 6.7 | 5.0 | 2.1 | 86.2 | 6.4 | 14.5 | 41.2 | 37.8 |
| MoF Recreation Sites (#) | 37 | 8.1 | 5.4 | 5.4 | 81.1 | 0.0 | 39.0 | 2.4 | 58.5 |
| Very High Recreation Features | 88 | 15.8 | 20.8 | 9.6 | 53.8 | 3.1 | 85.4 | 9.4 | 2.1 |
| High Recreation Features | 191 | 10.6 | 9.5 | 2.4 | 77.5 | 9.1 | 27.2 | 33.9 | 29.8 |
| Rec. Opportunities Req. Spec. Mgt. | 795 | 12.3 | 11.3 | 4.4 | 72.0 | 7.9 | 28.1 | 33.2 | 30.8 |
| Primitive Rec. Opportunities | 78 | 0.0 | 0.1 | 0.8 | 99.0 | 0.0 | 8.6 | 83.4 | 8.0 |
| Semi-Primitive Rec. Opportunities | 1,031 | 7.9 | 3.7 | 2.1 | 86.4 | 6.3 | 10.2 | 37.8 | 45.8 |
| High Tourism Capability | 149 | 6.6 | 1.5 | 3.5 | 88.4 | 6.0 | 10.4 | 29.8 | 53.9 |
| Mineral Potential | | | | | | | | | |
| Developed Prospects (#) | 13 | 0.0 | 7.7 | 7.7 | 84.6 | 0.0 | 10.0 | 80.0 | 10.0 |
| Prospects (#) | 25 | 8.0 | 4.0 | 0.0 | 88.0 | 0.0 | 25.0 | 53.5 | 21.4 |
| Showings (#) | 218 | 4.1 | 7.3 | 1.4 | 87.2 | 7.1 | 16.0 | 58.2 | 18.7 |
| Mineral Tenures | 180 | 5.0 | 6.4 | 1.6 | 86.7 | 1.4 | 12.0 | 56.0 | 30.7 |
| Placer Tenures | 6 | 0.0 | 0.0 | 0.0 | 100.0 | 3.4 | 0.0 | 90.6 | 6.0 |
| High Metallic Mineral Potential | 1,802 | 7.6 | 5.2 | 2.8 | 84.4 | 7.5 | 16.9 | 46.4 | 29.3 |
| High Industrial Mineral Potential | 501 | 5.8 | 6.2 | 2.5 | 85.5 | 6.2 | 18.0 | 32.9 | 43.0 |

(a) Percentages may not add to 100% due to rounding.

(b) Numbers are in hectares unless otherwise specified. Timber Harvesting Land Base is post-FPC land base.

(c) All retention and partial retention VQOs are included in "Special Management" in the Base Case and in the proposed LRMP Plan. It is acknowledged that VQOs may not impact mining exploration, but would likely pose some incremental constraints for mine development.

(d) "Resource Development" includes the very small amount of agriculture and settlement (less than 1% of the GLB) in the Plan Area.

APPENDIX 2:
ESTIMATED OVERALL PRINCE GEORGE TSA HARVEST FLOWS
AND PRO-RATED FT. ST. JAMES PLAN AREA TIMBER IMPACTS

Section 63 of the *Forest Act* implies that harvest reductions within a Forest District are pro-rated among all licensees within the TSA. Therefore, a TSA-level timber supply analysis would be most appropriate for Plan Area assessment. While such an analysis will not be available for some time, a second-best “rolled-up” additive exercise is done using post-LRMP harvest flow estimates done for the three LRMP processes in the TSA. (Note that none of the three land use plan resulted in measurable harvest impacts from the LRMP management objectives and strategies, exclusive of new Protected Areas.)

The table below outlines the expected achievable harvest flow situation for the TSA by summing the timber supply analysis results provided by IFS (Vanderhoof and Prince George) and Timberline (Ft. St. James). It assumes that the current TSA harvest (excluding TFLs) of 9,345,000 m³/yr is maintained as long as possible without compromising long run sustainability, as per current MoF policy. The harvest flows assume a re-allocation from the PG Forest District of 600,000 m³/yr to Ft. St. James and 200,000 m³/yr. to Vanderhoof. The TSA harvest impacts are then pro-rated by 18% (the approximate share of TSA timber processed in Ft. St. James) to estimate Plan Area impacts on local processors. This “rolled-up” analysis indicates Base Case impacts of about 113,000 m³/yr. by Year 31, i.e. 7% of the current 1.7 million m³/yr. processed in the Plan Area. By Year 100, the overall harvest reduction is about 629,000 m³/yr, or 37% of the current amount processed locally. The estimates on the following page attempt to separate TSR, FPC, and PAS impacts. Note that none of the three timber analyses were able to assess the harvest impacts of LRMP management objectives/strategies outside of proposed Protected Areas, due to their “high level” or “strategic” nature.

Ft. St. James District & PG TSA Post-LRMP Harvest Flow Estimates
(Includes TSR, FPC, PAS and LRMP* Impacts)

| Year | FSJ District | Vhoof. District | PG District | Total PG TSA | PG TSA Impact | FSJ Plan Area Share of Impact** | Plan Area Impact per Decade |
|--|--------------|-----------------|-------------|--------------|---------------|---------------------------------|-----------------------------|
| | A | B | C | D=A+B+C | E=9350-D | F=0.18 x E | |
| Thousands of Cubic Metres of Harvest per Year | | | | | | | |
| 0 | 2900 | 1700 | 4750 | 9350 | - | - | - |
| 1-10 | 3500 | 1900 | 3950 | 9350 | 0 | 0 | 0 |
| 11-20 | 3500 | 1900 | 3950 | 9350 | 0 | 0 | 0 |
| 21-30 | 3500 | 1805 | 3950 | 9255 | 95 | 17 | 17 |
| 31-40 | 3150 | 1625 | 3950 | 8725 | 625 | 113 | 96 |
| 41-50 | 2835 | 1465 | 3950 | 8250 | 1100 | 198 | 85 |
| 51-60 | 2550 | 1315 | 3560 | 7425 | 1925 | 347 | 149 |
| 61-70 | 2290 | 1250 | 3215 | 6755 | 2595 | 467 | 120 |
| 71-80 | 2150 | 1250 | 2900 | 6300 | 3050 | 549 | 82 |
| 81-90 | 2150 | 1250 | 2615 | 6015 | 3335 | 600 | 51 |
| 91-100 | 2150 | 1250 | 2455 | 5855 | 3495 | 629 | 29 |

* Timber analyses not able to identify impacts of LRMP management objectives/strategies.

** Estimated as 18% of TSA impact, since 18% of TSA timber flows to FSJ mills, i.e. 1.7 million m³/yr. of the current total TSA AAC of 9.4 million m³/yr.

APPENDIX 3: **LINKAGE OF FORESTRY AND PUBLIC SECTOR EMPLOYMENT** **TO INCREMENTAL TIMBER HARVEST REDUCTIONS**

Direct Forestry Jobs in Pulp & Paper and Value Added Processing

The impact estimates in Table 2 of the report assume that only woodlands/hauling-related and solid wood processing jobs are directly linked to incremental timber harvest changes (see Figure 1, p. 3-3) and that existing employment in value-added facilities and pulp mills (in the PG TSA and elsewhere in BC) will not be affected by the incremental reductions in Plan Area timber harvesting levels during the fourth decade cited in this report.

To explain, value-added facilities use output from sawmills, not raw timber, and therefore can substitute for incremental reductions in timber volumes by purchases from other sawmills both inside and outside of the Plan Area, since their purchases only comprise a small percentage of the overall demand for BC lumber. Initiatives such as the expanded woodlot program and the Jobs and Timber Accord should also assist value-added facilities. Limited data show that value-added wood employment in B.C. has increased from 11,660 in 1990 to 14,010 by 1994 (Source: Forestry Canada, Victoria).

Pulp mills (primarily in Prince George, so this discussion is only relevant to TSA and provincial-level impacts) are also likely to replace any marginal reductions in fibre supply (e.g. by importing timber, purchasing pulp quality logs, or substituting under-utilized fibre such as hardwoods or sawdust) or adjust output without necessarily incurring permanent lay-offs. As shown in Figure 1, the historical data indicates that BC pulp/paper/allied mill employment is not linked to marginal changes in harvest levels in BC.

The net effect of incremental harvest reductions in the fourth decade may be to marginally increase the costs of a portion of wood / fibre requirements for value-added and pulp mills. For example, if the total Base Case and LRMP impact on chip supplies was in the order of 140,000 m³/yr. (i.e., 40% of the possible 350,000 m³/yr. FSJ FD harvest reduction after 40 years) as of year 40, this would comprise about 2.6% of the total fibre requirements of PG TSA pulp mills (estimate based on *Prince George TSA Socio-Economic Analysis*, Ministry of Forests, March 1995, p. 73); assuming fibre costs comprise about 37% of total operating costs in 1996 (Price Waterhouse, op. cit. 1996), an illustrative 50% increase in delivered wood costs of the lost fibre requirement would result in an increase of about 0.5% in overall annual pulp mill operating costs.

It is acknowledged, however, that there may have been “foregone growth” in some portions of the value-added and pulp/paper sectors as a result of the declines in provincial timber harvest since 1987. Also, the significantly larger Base Case harvest reductions forecasted for the longer term in the Plan Area and the TSA could negatively affect employment levels in these sectors, although the lead times may be sufficient to allow for development of strategies to at least partially mitigate the impacts.

Public Sector Employment

It is assumed that employment in the public sector (i.e., government, health, education, etc.) is not linked to *incremental changes* in forestry employment. For example, this assumption means that no Ministry of Forests, Forest Renewal BC, etc. jobs are included in the direct forestry job impact estimates. Also, since the Ministry of Finance and Corporate Relations multipliers treat the local public sector as a “basic” sector (i.e. dependent on factors outside the region), no local public sector jobs are included in indirect/induced spin-off impacts that are linked to changes in direct forestry employment projected to occur in the Plan Area 30-40 years from the present.

Again, there is evidence to suggest that this assumption is justified, as shown in Figure 2 on p. 3-4. This data indicates that over a 10-year period in every case but one, declines in local forestry (and mining) employment in various Central Interior areas were matched by corresponding increases in public sector employment. The reason for this is likely that public sector employment is linked to changes in local private sector employment only if there is a significant change in local population. However, the data also indicates that even this linkage may be weaker than expected. For example, in the 3 of 4 cases where the populations declined (where one might expect some out-migration from the area by health and education workers due to lower demand for their services), overall public sector employment in fact increased. (In the final case, the Ft. St. James area, it declined only marginally.)

A more rigorous analysis (e.g., using multiple regression techniques, for which data is currently lacking) would be necessary to more clearly demonstrate that local public sector employment is unaffected by incremental reductions in forestry employment. For example, it may be that spin-off job impacts in the government sector arising due to reductions in forestry employment become “foregone opportunities” that are more than offset by increases in other basic sectors (e.g. tourism) or by government policy decisions unrelated to local forestry activity. (However, note that since non-forestry related private sector activities usually comprise a much smaller portion of basic employment in forestry-dominated regional economies, they would have to grow substantially to offset any impacts due to forestry.) It is acknowledged, though, that some declines in existing public sector employment may result if mill closures cause population out-migration to occur as a result of Base Case timber impacts after 40-50 years unless there is off-setting growth in non-forestry sectors, new confirmed data on higher timber growth/productivity, etc.

In summary, what the data does clearly show is that service-providing businesses, the local public sector, and populations in regional timber-dominated economies can continue to grow, albeit more slowly, even if there are incremental declines in forestry (and mining) sector activities.

FIGURES 1 & 2 ARE HARD COPY AND SHOULD BE PLACED HERE.

APPENDIX 4: **GLOSSARY OF TERMS USED IN SOCIO-ECONOMIC ASSESSMENT**

Agricultural Land Reserve: Land designated and reserved for agricultural purposes under the *Agricultural Land Commission Act* (the reserve covers about 5% of the Province and includes most of BC's high quality agricultural land). It includes both public and private lands, and covers land being farmed and land with agricultural potential. Non-agricultural uses on the ALR are regulated.

Area Analysis: Using a Geographic Information System (GIS), this involves the generation of area-based statistics by overlaying mapped values upon one another within a computer database. This analysis is used in the assessment work to provide the hectarage of each resource value (e.g., Grizzly Habitat, Timber Harvesting Land Base, etc.) in each Resource Management Zone (i.e., Special Management, General, Enhanced, Agriculture-Settlement, and Protected Areas) category.

Base Case Scenario: The over-arching socioeconomic and environmental trends, as well as the implications of the land management regime in a planning unit, that are most likely to occur in the absence of a land use plan. It is the "benchmark" to which a proposed land use plan scenario is compared in order to assess the impacts of the plan.

Basic and Non-Basic Income/Employment: Basic income is assumed to flow into a local economy from the outside that economy, and can consist of incomes received from selling goods (e.g. forest products) and services (e.g., tourism) to non-local markets, or can take the form of government expenditures (e.g., civil servant incomes, pensions, social assistance, etc.) and investment income (e.g., bank interest) accruing to community members. Non-Basic Income is paid to individuals in the local economy for the goods/services they provide to other individuals in the community, (e.g., most retail activity). Basic employment consists of the jobs in the Basic Sectors (normally Forestry, Mining, Tourism, Agriculture, Fishing/Trapping, Construction and "Other") and Non-Basic Employment consists of jobs in the Non-Basic Sector (e.g., most retail, personal services, etc.)

BC Input-Output Model (BCIOM): The Ministry of Finance and Corporate Relations' detailed set of BC industry/commodity (602 commodity, 216 industry, and 136 final demand accounts) accounting data that attempts to simulate the structure of the BC economy via a set of mathematical equations that describe the relationships among its sectors. A major use of such a model is to provide quantitative estimates at the provincial level of the indirect and induced employment (multiplier) impacts caused by a change in the output of a particular sector, e.g. forestry.

Direct Impacts: The change in income/employment that occurs as a direct result of a change in resource industry activity, e.g. mill jobs affected due to a change in timber processed in that sawmill.

Indirect Impacts: The change in income/employment of workers in businesses that supply goods to the firm or sector that is experiencing the direct impacts, e.g. a change in machine shop employment due a change in sawmill activity.

Induced Impacts: The change in income/employment of workers in businesses that rely on purchases of goods/services from wage-earners in the direct and indirect sectors experiencing the impacts, e.g. variations in motor vehicle sales to workers due to changes sawmill, machine shop, etc. activity.

Long Term: For economic analysis, the time period after which the entrepreneur has the ability to alter the capital stock (i.e., plant and equipment); typically, one enters the long run in 2-3 years, but it does vary. In this socioeconomic analysis, the long run generally implies more than one decade. Note that for environmental values, the long run is typically a much greater period of time.

Long Term Harvest Level (LTHL): The estimated annual harvest projection for a management unit that is sustainable for an indefinite time period, usually hundreds of years, given that management constraints and other assumptions remain unchanged. The LTHL is based on the long term timber productivity of the management unit, but does not normally take into account the positive affects of managed silvicultural treatments on available timber volumes.

Long Run Sustained Yield (LRSY): See Long Term Harvest Level.

Mature / Old Growth Timber: Defined using the *Biodiversity Guidelines* biogeoclimatic classification. Thus, mature / old growth coniferous volumes are defined to include all BWBS (NDT 3), SBPS (NDT 3), SBSwk1 (NDT 2), SBS (NDT 3), and ICH (NDT 1 & 2) stands older than 101 years, and SWB (NDT 2), AT (NDT 1 & 2), and ESSF (NDT 1 & 2) stands older than 121 years.

Multiplier: A variable that, when calculated in the form of a numerical estimate, provides a quantitative approximation of the indirect and induced income or employment impact caused by a prior direct change in income or employment. Multipliers are applied to the direct income/employment impacts in resource industries to estimate the total income and employment effects in both the planning area and the province overall. For example, an employment multiplier of 2.0 for the forest sector means that for each direct forestry job, one additional “spin-off” job is associated with it. Provincial level multipliers are larger than local multipliers because at the local level, a greater proportion of income “leaks” out of the area to purchase non-local goods and services.

Mineral Occurrences: Documented evidence of site-specific mineralization. Occurrences are divided into Producing Mines, Past Producing Mines, Developed Prospects (occurrences with defined grades and tonnages), Prospects (occurrences with some indication of dimension), and Showings (occurrences that are not sufficiently defined to permit resource estimation.)

Mineral Potential: Mapped estimates of the areas of the Gross Land Base that are judged by the Energy and Minerals Division of the Ministry of Employment and Investment to have either High, Medium, or Low capabilities for producing future mineral discoveries.

Mitigation: Measures that reduce the negative impacts of a particular action.

Multiple Accounts Analysis (MAA): An analysis of the nature and socioeconomic / environmental significance of the impacts of a new project or policy, e.g. from a crown land use plan such as an LRMP. The analytical framework is separated into various categories or “accounts” so that the reader can make “apples and oranges” comparisons among impacts on different values (i.e. forestry, wildlife, recreation, mining, etc.) within a land use scenario or among various scenarios (e.g., the Base Case vs. the Land Use Plan). This analysis uses extensively the Area Analysis (see above) and Resource Analysis (see below) information provided by government agencies. MAA is sometimes referred to as “Socioeconomic & Environmental Assessment.”

Net Present Value (NPV): The value in today’s dollars of a future stream of cash payments, predicated on the concept that a dollar received in the present is worth more than a dollar received in the future, since funds received in the present will begin to earn interest immediately. For example, the NPV of a dollar received a year from today is $\$1/1.05 = \0.95 if the interest rate on savings is 5%. If presented on an annualized basis, the estimate indicates the constant annual cash flow amount that if paid over a certain finite number of years, would equate to the NPV sum.

Net Resource Value: A provincial level account which estimates net benefit in terms of economic rents that are foregone due to changes in land use, expressed as a dollar amount per B.C. household. This account shows the “opportunity cost” of a particular land use scenario, e.g. the annualized (see NPV above) dollar amount that each household would have to be willing to sacrifice in order to obtain the non-monetary benefits associated with that scenario.

Non Declining Yield (NDY): Similar to Long Term Harvest Level, but takes into account the effects of managed silvicultural treatments on timber volumes available in the long term.

Person-Year (PY): One year of full-time work, e.g. could be one person working for 12 months, 2 people working 6 months, etc. PY estimates are often used to facilitate comparisons of employment impacts among different sectors where seasonal jobs are an important component, e.g., forestry, tourism, etc. For purposes of the Prince George LRMP socioeconomic impact assessment (as per the Jobs & Timber Accord), a Person-Year (PY) of milling employment is assumed to be equivalent to 1 job, a PY of woodlands harvesting/trucking employment is assumed to be equivalent to 1.2 jobs. Because of their short term and highly seasonal nature, the PY equivalent of silvicultural employment is also assumed to be the total number of “jobs” for this sector.

Person -Year Coefficient or Ratio: The number of PYs of direct forestry employment associated with the timber harvest for a particular area, divided by that harvest. The result

provides the ratio of Person-Years of employment associated with each 1000 cubic metres of timber harvest.

Potential Natural Gas Reserves: Estimates of the quantity of natural gas occurring in a particular area, where those quantities have not yet been proven to be economic to extract.

Proven Natural Gas Reserves: Estimates of quantity of natural gas occurring in particular area, where those quantities have been proven to be economic to extract. Note these estimates change every year as new extraction occurs and as new additions of economic resources are added.

Qualitative Assessment: An analysis in which an impact is described in words rather than using numbers, e.g. an unknown change in costs to a sector due to a land use change. Qualitative assessments are used primarily where there is too much uncertainty to have confidence in quantified impacts.

Quantitative Assessment: Where an impact is described by some change in the numerical value of a certain variable, e.g. an estimate of the change in government revenue from a land use change.

Recreation Opportunities Spectrum (ROS): A Ministry of Forests inventory which classifies the land base into various categories based on road density. ROS #1 (Primitive Non-Motorized) is defined as areas greater than 5000 hectares and more than 8 kilometers from a 4-wheel drive road, ROS #2 (Semi-Primitive Non-Motorized) is defined as areas greater than 1000 hectares and more than 1 kilometer from a 4-wheel drive road, and ROS #3 (Semi-Primitive Motorized) is defined as areas greater than 1000 hectares and more than 1 kilometre from a 2-wheel drive road. ROS #4 and #5 (Resource Road) constitute the remaining land base.

Regional Protected Areas Team: A group of public servants from various ministries, working at the level of a Forest Region (e.g., the Prince George Forest Region), who make recommendations for candidate protected areas as per the provincial Protected Areas Strategy.

Rent or Economic Rent: The above-normal financial returns to a commercial activity that occur as a result of the product produced by that activity being in relatively fixed supply. Rent can accrue to the entrepreneur, or can be captured in the form of taxes by government or as wages by labour.

Resource Analysis: An analysis of the impacts on the physical units of a resource (e.g. m³/yr. of timber, mineral production, wildlife populations, etc.) resulting from changes in land use. This analysis is usually provided by the resource agencies (e.g., Ministry of Forests' timber supply analysis) and is based primarily on the Area Analysis (see above).

Short Term: In economic analysis, that period during which an entrepreneur does not have the time to vary the capital stock (i.e., plant and equipment), e.g. 2-3 years. In this socioeconomic analysis, this term is utilized to describe that period covering the near future, e.g. within a single decade.

Short Term Harvest Level (STHL): The estimated annual harvest projection for a management unit that can be maintained from the present time for specific limited period, usually less than several decades, assuming management constraints remain unchanged. Since the STHL is based primarily upon the stock of available mature timber, there can in fact be an infinite number STHL's depending on how fast the liquidation of mature timber is assumed to occur. Note the Allowable Annual Cut (AAC) is an example of a one short term harvest level.

Timber Harvesting Land Base (THLB): That portion of the "Gross Land Base" of a defined management unit (e.g., a unit such as a Forest District or Timber Supply Area) considered by the Ministry of Forests to be available for long-term timber supply. Therefore from the Gross Land Base, areas known as "Forested Exclusions" (e.g., non-merchantable timber) and Non-Forested Exclusions (i.e., alpine areas) are "netted out" in arriving at the THLB. It is assumed that Forested Exclusions generally contribute more to non-timber values, such as wildlife habitat, than do Non-Forested Exclusions. Note that the THLB often changes over time.

Timber Supply Model: A computerized analytical tool that, after inputting the appropriate data and assumptions (e.g., Timber Harvesting Land Base, growth rate of timber, etc.), provides forecasts of potential annual short and long term harvest levels over time.

Visual Quality Objective (VQO): A management zone that defines a particular level of landscape alteration from forestry and other activities. The objective for an area can range from Preservation VQO (where up to 1% of the landscape can be visible altered by harvesting) to Modification VQO (where up to 25% of the visible area can be altered).

APPENDIX 5:
LIST OF ACRONYMS USED IN SOCIO-ECONOMIC ASSESSMENT

AAC: Allowable Annual Cut
ALR: Agricultural Land Reserve
ASZ: Agriculture-Settlement Zone
EMD: Energy and Minerals Division of the Ministry of Employment & Investment
EMZ: Enhanced Resource Development Zone
FSJ FD: Ft. St. James Forest District (equivalent to Plan Area)
FPC: Forest Practices Code
FRBC: Forest Renewal BC
GMZ: General Resource Management Zone
GIS: Geographic Information System
IFS: Industrial Forest Service
IPT: Inter-agency Planning Team
LRUP: Local Resource Use Plan
LRMP: Land and Resource Management Plan
LTHL: Long Term Harvest Level
MEI: Ministry of Employment & Investment
MFCR: Ministry of Finance and Corporate Relations
MSBTC: Ministry of Small Business, Tourism & Culture
MoF: Ministry of Forests
m³/yr: cubic metres per year
NDY: Non-Declining Yield
NFPA: Northern Forest Products Association
OG: Old Growth
PAS: Protected Areas Strategy
PA: Protected Area
PGFD: Prince George Forest District
PY: Person-Year (of employment)
RPAT: Regional Protected Areas Team
SEA: Socio-Economic Analysis
SMZ: Special Resource Management Zone
Tcf: Trillion cubic feet
THLB: Timber Harvesting Land Base
TSA: Timber Supply Area
TSR: Timber Supply Review
TFL: Tree Farm License
VQO: Visual Quality Objective

PART II:

ENVIRONMENTAL ASSESSMENT

prepared by

Jim Trask (R.P. Bio.), Envirowest Consultants

in cooperation with

BC Environment

and the

Ft. St. James Inter-agency Planning Team

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EXECUTIVE SUMMARY

The LRMP's proposed Protected Areas and the management objectives/strategies for the remainder of the Plan Area's crown land base (especially within the 17%-20% of the Plan Area in Special Resource Management) will reduce the risks to many key environmental values. For biodiversity in general, the 5.9% in new Protected Areas recommended by the LRMP (vs. the 0.1% currently in parks and the 6.0% in government-recommended Protected Areas that would likely have been implemented in the "Base Case" default land use regime) results in 7 Protected Areas larger than 5000 hectares and significant representation in 3 of 9 ecosections. However, low elevation Sub-Boreal Spruce ecosystems are more poorly represented than in the Base Case, primarily due to the larger Upper Sustut-Thumb and correspondingly smaller Nation Lakes and Mt. Blanchet Protected Areas recommended by the LRMP. Long term reductions in natural levels of biodiversity are anticipated in areas with a Resource Development emphasis, which are reduced from an estimated 88% of the Plan Area in the Base Case) to 31% in the LRMP.

Management strategies for riparian/wetland areas that are aimed at maintaining wildlife and fisheries habitat values are an improvement over the Base Case, although riparian habitats in Resource Development Zones remain subject to isolation and functional impairment over time. The LRMP also directs BC Environment to continue to identify critical wildlife habitats, where strategies to maintain important values are to be applied.

The LRMP results in lower risk levels for several key indicator species. For example, the LRMP strategies for moose to address vegetation management, visual buffers, and key habitats are an improvement over the Base Case. The incremental measures recommended by the LRMP for caribou (a formalized management plan, new Protected Areas, key strategies in Special Management Zones, etc.) reduce the risk levels to low-moderate vs. moderate-high in the Base Case, however the smaller Wolverine and Takla herds remain at higher risk of long term declines. Access management strategies and recommended future identification of key habitats also reduce the overall risk of long term declines to a moderate level for grizzly bear (with population declines likely in the southern portion of the Plan Area) although successful management is dependent on future processes involving BC Environment and local stakeholders. Risks to fisher and wolverine, both provincially blue-listed species, are also reduced. Access management strategies for grizzly bear and caribou should provide some benefits for mountain goat.

In the Base Case, the FPC stream, lake, and wetland reserves significantly increase protection for key fisheries resources within the Plan Area relative to the pre-FPC management regime, with negative impacts expected in only 7 of the 44 "Fish Units" covering the Plan Area. The LRMP adds incremental measures, such that negative impacts are only expected in 4 of 44 Fish Units and increased protection of fisheries values are anticipated in 17 Fish Units, relative to only 6 in the Base Case. As for fish species of particular concern from a provincial perspective, even with the LRMP strategies, blue-listed bull trout remain at moderate risk in small streams; red-listed arctic

grayling appear to be at moderate risk in the Omineca River and low risk in the Nation River.

1.0 INTRODUCTION

The purpose of this resource analysis is to provide an assessment of the environmental consequences associated with the proposed Ft. St. James Land and Resource Management Plan (LRMP). The analysis presented here summarizes the incremental changes in key environmental values that would result from the implementation of the proposed land use plan relative to the Base Case. The Base Case provides a benchmark by which the LRMP scenario can be compared and assumes a continuance of current management practices. Current management includes recent government initiatives such as the Forest Practices Code (FPC), Forest Renewal BC (FRBC) and the provincial Protected Areas Strategy (PAS). Where possible, area statistics and management practices at the time of the last Timber Supply Review (TSR), which was prior to the introduction of the FPC, are presented in order to better illustrate the incremental changes in land use and forest management practices associated with the Base Case and LRMP scenarios.

In general, this analysis illustrates differences between land use scenarios (TSR, Base Case, LRMP) with respect to key environmental values at the landscape level. Conclusions and trend statements are italicized within each section for quick reference. Additional background information on environmental values is provided in the plan document.

2.0 INDICATORS, MEASURES, METHODS AND ASSUMPTIONS

A range of indicators were selected in order to assess the effects of the land use scenarios on environmental values (i.e. fish, wildlife, biodiversity, etc.) and to determine whether desired future conditions for environmental values are likely to be achieved. The selection of indicators was constrained by the type, quality and availability of information. The indicators chosen for this resource analysis are primarily area-based and are consistent with those identified during a resource analysis indicator workshop held by the Ministry of Environment Lands and Parks in March, 1995.

The proportion and distribution of land occurring within each resource development emphasis option is used as the measure for evaluating general biodiversity and species status. Management objectives and strategies contained in the LRMP document, including general management direction and Resource Management Zone (RMZ) specific prescriptions are cited where appropriate. Professional judgment is used to assess the relative significance of impacts based on area statistics, and to evaluate the effectiveness of management strategies.

Landscape and stand level management recommendations contained in the FPC Biodiversity Guidebook (1995) provide a framework for managing biodiversity according to natural disturbance type (NDT). Five NDT's and three biodiversity emphasis options are identified and described in the guidebook. The management recommendations for each NDT are modeled to approximate the natural disturbance

patterns within different ecosystem types. Management objectives and strategies in the LRMP document are compared with those in the biodiversity guidebook to illustrate incremental differences between the Base Case and LRMP scenarios. In addition, it is assumed that the FPC biodiversity guidebook recommendations for retention of rare ecosystems, patch sizes, landscape connectivity, stand structure and species composition would be followed for each biodiversity emphasis option and NDT in the Base Case.

Although all major land use activities are considered in this assessment, timber harvesting affects the greatest proportion of the landbase with respect to fish and wildlife habitat suitability and is featured throughout this analysis. Tracking and guiding the methods, intensity and pattern of timber harvesting is a powerful technique of managing and manipulating wildlife habitats to achieve the desired conditions.

The management of wildlife populations typically involves the use of habitat mapping, which provides a readily available data source for the assessment of potential impacts to wildlife. Understanding and predicting wildlife response to changes in habitat at the landscape level is highly complex. The application of Geographic Information Systems (GIS) has become an important tool in the management of fish and wildlife habitat at the landscape level. Many different layers of information (e.g. wildlife habitat, timber values, natural disturbance patterns etc.) can be input into a GIS for the purposes of modeling habitat suitability and conducting area analyses.

This assessment of environmental consequences associated with land use scenarios is largely based on GIS analysis. GIS improves the predictive abilities of resource managers and will continue to be important tool in the evolution of forest/wildlife management strategies.

To facilitate this analysis, it has been assumed that the general management direction for each of the identified Resource Management Zone (RMZ) designations represent varying levels of resource use intensity, or from another perspective, varying levels of management opportunities for the conservation of environmental values. In order of decreasing resource use intensity, or increasing opportunities for the conservation of environmental values are: Settlement/ Agriculture, Resource Development, Multi-Value, Special Management and Protected Areas.

To support the analyses and conclusions, it is necessary to make clear statements about the assumptions used. Throughout this analysis, the indicators, measures, methods and assumptions are presented within the appropriate sections. A number of key assumptions apply to the analysis in general, including the following:

- mimicing patterns and processes of natural disturbance in managed forests promotes the maintenance of natural biodiversity
- Protected Areas and special management RMZs provide more options and opportunities for maintaining native species and ecological processes

- the greater the amount of each ecosystem in special management and protected RMZs, the greater the probability that most native species and ecological processes will be maintained

It is important to recognize that the assumptions on which this analysis is based are intended to illustrate differences between land use scenarios at the landscape level and may not accurately reflect RMZ level outcomes.

3.0 LANDSCAPE LEVEL OVERVIEW

The redistribution of resource use intensity in the Gross Land Base (GLB) demonstrates a significant improvement in the outlook for key environmental values in the LRMP scenario relative to the Base Case (Figure 1). This is largely attributable to a reduction in areas within Resource Development RMZs from 88% to 31% of the GLB, about 1/3 of which moves into Special Management RMZs. The LRMP scenario also distributes the land base more evenly among RMZ categories, which suggests a balanced, more sustainable land use regime.

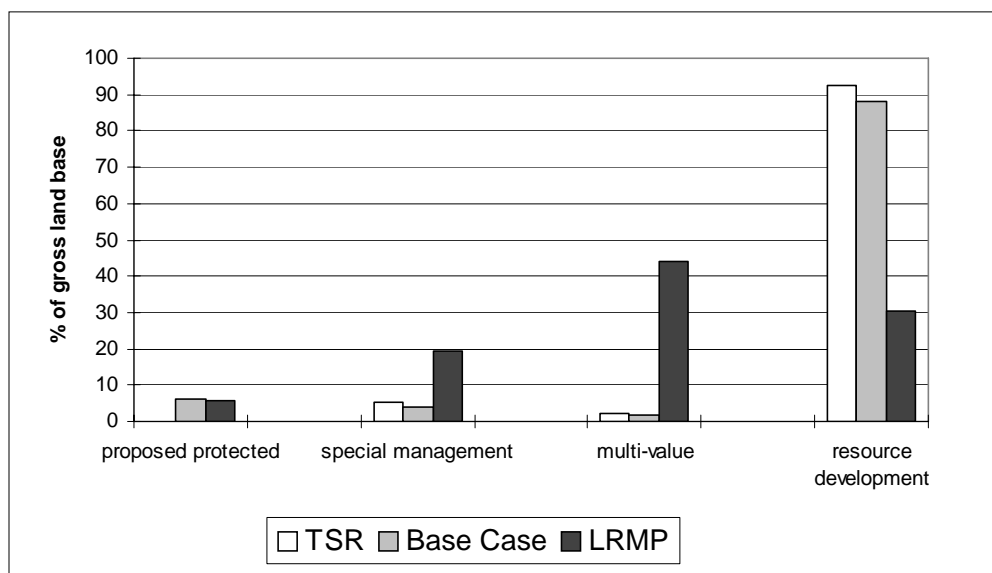


Figure 1. Distribution of Lands within Resource Management Zone Categories

As management strategies for Special Management RMZs feature conservation of key local environmental values (i.e. wildlife habitats, caribou, grizzly bear, fish), it is anticipated that they will also contribute to the maintenance of representative ecosystems; the LRMP scenario places 15.7% more of the Gross Land Base into Special Management RMZs than the Base Case, and when combined with Proposed Protected Areas, totals ~25.5% of the GLB. The combined proportion of ecosystems occurring in special and protected RMZs is used as a measure of ecosystem representation. Resource development activities are also subject to more comprehensive planning to address strategies for the conservation of recreational and scenic values in Special Management

RMZs, including access considerations and Visual Quality Objectives, which may confer incremental environmental benefits.

In general, improved outlooks for key environmental values within the Timber Harvesting Land Base are associated with the introduction of the FPC and the recommended best management practices in the associated guidebooks¹⁷. Several FPC guidebooks have been developed to address environmental issues and sensitivities, including: (i) Biodiversity Guidebook, (ii) Managing Identified Wildlife Guidebook (not yet released), (iii) Riparian Management Area Guidebook, (iv) Fish Stream Identification Guidebook and (v) Stream Crossing Guidebook. Reductions associated with meeting FPC requirements such as riparian reserve zones and wildlife tree patches, have been applied to the Base Case and LRMP scenarios and reduce the Timber Harvesting Land Base by approximately 8.9%. The management objectives and strategies in the LRMP document are consistent with those of the FPC guidebooks, which provides the operational link that gives direction to resource managers in developing management prescriptions.

In both the Base Case and LRMP scenarios, Protected Areas would increase to nearly 6% of the GLB from the existing less than 0.1%. The addition of new Protected Areas reduces the Timber Harvesting Land Base (THLB) to 38.1% and 38.5% of the GLB in the Base Case and LRMP scenarios, respectively; the pre-PAS THLB is 40.7% of the GLB after subtracting FPC netdowns. This suggests that there is a relatively small impact on the "working forest" due to the addition of new Protected Areas.

Forested and non-forested exclusions from the Timber Harvesting Land Base account for 23.9% and 35.6% of the Gross Land Base, respectively, and reductions to the Timber Harvesting Land Base occur for many reasons. Polygons within each exclusion category are recorded separately in the timber inventory database, which results in significant overlap in classification (e.g. inoperable terrain and environmentally sensitive areas), which make it difficult to extract meaningful areal estimates. A significant proportion of forested exclusions are environmentally sensitive areas and inoperable terrain associated with the mountainous terrain, particularly in the northern portions of the Plan Area. Non-forest lands include areas that are not capable of growing productive forest (i.e. wetlands, lakes, rock) but can be important features for biodiversity. Forested and non-forested reductions are often viewed as a mitigating factor where they comprise a significant proportion of the landscape.

The Agriculture/Settlement classification applies to only one small (0.5% of the Gross Land Base) RMZ encompassing Fort St. James and surrounding areas, although settlement/agriculture is also prevalent along the lower Necoslie River in the Necoslie RMZ. Although LRMP management objectives and strategies for water, fish and

¹⁷ key statements from the *Preface* in FPC guidebooks - "*The recommendations in the **guidebooks** are not mandatory requirements, but once a recommended practice is included in a **plan**, prescription or contract, it becomes legally enforceable.*" and "*Where ranges are not specified, flexibility in the application of the guidebook recommendations may be required, to adequately achieve **land and resource management objectives specified in higher-level plans.***"

trumpeter swan are favourable, their effectiveness in the RMZ may be limited by the over-riding influences of habitat alteration and alienation as well as landholder discretion.

The introduction of the FPC significantly improves the outlook for key environmental values in both the Base Case and LRMP scenarios, relative to pre-FPC management. LRMP general management objectives and strategies support, and are consistent with, those of the FPC and its guidebooks, which prescribe ecosystem management techniques that mimic natural disturbance patterns. In many cases, the collective local knowledge of working group members has led to site-specific management direction in the LRMP scenario that is incremental to the FPC.

The reduction in land base area in Resource Development RMZs and corresponding increase of area in Special Management RMZs in the LRMP scenario significantly improves the outlook for key environmental values over the Base Case.

4.0 BIOLOGICAL DIVERSITY

The assessment of potential impacts to natural biodiversity is considered at the landscape and stand levels in the Base Case and the LRMP scenarios. At the landscape level, the relative proportion of ecosystems occurring in Proposed Protected and Special Management RMZs illustrates incremental differences between the Base Case and LRMP scenarios. The evaluation of the potential impacts to biodiversity at the stand level is more subjective as and is based on the interpretation of future conditions resulting from current operating practices (Base Case) and with the application of LRMP defined management objectives and strategies.

The FPC Biodiversity Guidebook (1995) provides a framework for the assessment of potential impacts to biodiversity at the landscape and stand levels. The underlying assumption of the Biodiversity Guidebook is "all native species and ecological processes are more likely to be maintained if managed forests are made to resemble those forests created by the activities of natural disturbance agents such as fire, wind, insects and disease". Management objectives are described in the biodiversity guidebook for five natural disturbance types (NDT's) occurring within the Province; four occur within the Plan Area (Table 1).

The NDT 1 includes wet subzones of the Engelmann Spruce-Subalpine Fir (ESSF) zone, of which, only the ESSFwv occurs within the Plan Area. Less than 8,000 ha (20%) of the ESSFwv is available for harvest in both the Base Case and LRMP scenarios. Most of the ESSFwv occurs in forested and non-forested exclusion categories, which suggests that NDT objectives for seral stage distribution, landscape connectivity and representation of natural successional communities will be met.

| Table 1. Natural disturbance types in the Fort St. James LRMP area. | | | |
|--|-----------|--|---|
| NDT | % of LRMP | Subzones/Variants | Key Management Principles from the FPC Biodiversity Guidebook |
| 1 | 1.6 | ESSFwv | <ul style="list-style-type: none"> • maintain a relatively high proportion of forests with mature and old seral attributes • partial cutting and some small clearcuts should be used • some aggregated cutblocks with larger leave areas recommended • rare site series should be retained in greater proportion than their occurrence • connectivity of mature and old forest important • a variety of canopy layers and spatial patchiness is important for biodiversity • maintain a significant component with natural successional plant species communities • avoid extensive conversion to early seral species |
| 2 | 30.6 | ESSFmv1 ESSFmv3 ESSFmv4 ESSFmc ICHmc1 SWBmk | <ul style="list-style-type: none"> • maintain a range of small-medium sized (<250 ha) similarly aged forest patches • some aggregated cutblocks with larger leave areas recommended • rare site series should be retained in greater proportion than their occurrence • connectivity of mature and old forest important • maintaining snags, veteran trees, and coarse woody debris in even-aged stands important for biodiversity • even-aged silvicultural systems with wildlife tree patches are appropriate to mimic natural stand-initiating events |
| 3 | 50.9 | SBSdk SBSdw3 SBSwk3 SBSmk1 SBSmc2 BWBSdk1 | <ul style="list-style-type: none"> • a clustered harvest pattern using large (250-1,000 ha) aggregated harvest units and equal-sized leave areas most closely simulates the natural pattern of large fires and large unburned areas • retention of island remnants important for biodiversity • riparian corridors provide most connectivity • rare site series should be retained in greater proportion than their occurrence • management for even-aged systems and retention of large old Douglas-fir important for maintaining biodiversity • retention of Douglas-fir recommended |
| 5 | 16.9 | At | <ul style="list-style-type: none"> • livestock grazing should limit patches in early to mid-seral condition to <5 ha • maintain 85% in late seral or climax condition • no new range tenures should be established without approval of MoELP • manage livestock grazing to avoid extensive trail creation and browse damage to shrubs |

NDT1 - Ecosystems with rare stand-initiating events (350 yr)

NDT2 - Ecosystems with infrequent stand-initiating events (200 yr)

NDT3 - Ecosystems with frequent stand-initiating events (BWBS - 100 yr, SBS - 125 yr)

NDT5 - Alpine Tundra and Subalpine Parkland ecosystems

The NDT 5 describes non-forested alpine and sparsely treed subalpine parkland ecosystems, which comprise 16.8% of the Gross Land Base. LRMP management direction emphasizes the value of alpine habitats over the FPC, for which there is no direct timber harvesting pressures other than access, and imparts greater regional significance to the maintenance of alpine ecosystems.

The main portion of the Timber Harvesting Land Base is comprised of NDT 2 and NDT 3 forests. NDT 2 describes moist ESSF, SWB and ICH subzones occurring in more mountainous areas. The NDT 3 is primarily represented by SBS subzones (49% of the GLB) which occur throughout lower elevation areas and sustain the greatest timber harvesting pressures. The implications of the large proportion of NDT 3 with respect to the maintenance of biodiversity are largely associated with cutting pattern, seral stage, patch size distribution and landscape connectivity. LRMP management objectives

support key recommendations in the Biodiversity Guidebook strategies for RMZs in NDT2 and NDT3 forests, in particular:

- seral stages should occur in a variety of patch sizes consistent with the NDT
- management for a variety of stand densities
- retain forest attributes including coarse woody debris, wildlife trees and deciduous species
- provide landscape connectivity along riparian corridors and through the use of FEN's
- retention of Douglas-fir and unique habitats in proportion to their natural occurrence

The existing pattern of harvest in NDT 3 forests includes dispersed and clustered, medium (80-250 ha) to large-sized (>250 ha) cutblocks and leave areas, which, when projected into the future without the application of the FPC (i.e. TSR), would likely result in non-natural patch size and seral stage distribution. It is anticipated that the RMZ designations and management direction provided in the LRMP scenario will result in changes in the selection of biodiversity emphasis options and in the application of biodiversity guidelines that will provide greater benefits for environmental values than the Base Case.

Over the long-term, the application of FPC biodiversity guidelines plus incremental LRMP management direction should result in a more natural seral stage distribution, patch size distribution and maintain more significant habitat elements at the landscape level than the Base Case. The consistency of both the LRMP and FPC management objectives provide a strong basis for sustainable ecosystem management.

Forested exclusions represent approximately 23.9% of the Gross Land Base in the Base Case and LRMP scenario. Apart from new Protected Areas, the increase in forest exclusions in the Base Case and LRMP scenarios (over the TSR) is largely associated with FPC riparian reserve zones and wildlife tree patches, both of which contribute to biodiversity. Other forested exclusions that contribute to biodiversity include inoperable areas, environmentally sensitive areas, problem forest types and low productivity forest types. It should be recognized that the contribution of forested exclusions to the maintenance of biodiversity is dependent on their size and spatial distribution.

The proportion of non-forested exclusions remains constant in both scenarios at 35.4% of the Gross Land Base. Non-forested exclusions include wetlands and alpine tundra, which have a direct contribution to natural biodiversity. The proportion and distribution of each type was not available for this analysis but should be considered subordinate to portions of the landbase that are subject to change (working forest).

Forested and non-forested exclusions account for 37.1% and 27.6% of the ESSF subzones, respectively. New proposed Protected Areas contain significant proportions of ESSF in both the Base Case and LRMP scenarios, 4.8 and 6.5%, respectively. In addition, a total of 19.9% of the ESSF occurs in Special management RMZs in the LRMP

scenario relative to only 1.1% in the Base Case. The small proportion of ESSF available for harvest and the lack of resource development in alpine areas suggests that natural levels of biodiversity will be maintained in mountainous areas.

Lower timber harvesting effort in the ESSF translates into increased harvesting pressure in more accessible, higher value SBS forests, which are predominantly within high resource use intensity RMZs in all scenarios, although the LRMP reduces the proportion to 55.5% of the Gross Land Base; from a high of 88% under TSR management and 83% in the Base Case. Although forested and non-forested exclusions of 21.2% and 21.9% of the total SBS, respectively, contribute to the maintenance of biodiversity, the overall value is often limited by the small areal size of the exclusion polygons. In general, it is anticipated that plant and animal communities that characterize successional forests resulting from natural disturbance events will be negatively affected within large contiguous areas of high intensity RMZs, largely due to the long-term effects of intensive silvicultural activities. The application of LRMP management objectives and strategies and FPC biodiversity guidebook recommendations will be critical to maintaining biodiversity in SBS subzones.

The LRMP defined strategies for maintaining landscape connectivity, stand structural attributes and species composition are consistent with, and occasionally more extensive than the recommendations of the FPC Biodiversity Guidebook. The LRMP scenario provides the greatest incremental benefits towards maintaining natural levels of biodiversity.

4.1 Protected Areas Strategy

The Protected Area Strategy (PAS) is designed to protect large representative examples of natural diversity (“Goal 1” areas) as well as smaller areas with significant special features (“Goal 2” areas). The LRMP has identified nine Goal 1 areas totaling about 187,000 ha. and 13 Goal 2 areas totaling 509 ha.

A key PAS objective is to increase Protected Areas to 12% of the Gross Land Base within the Province, ideally capturing 12% of each unique ecosystem. However, the provincial goal of protecting 12% of all ecosystems is precluded by over-representation in existing Protected Areas. Additionally, regional targets vary as a result of other considerations such as internationally or provincially significant wildlife species or provincially rare or unique ecosystems. The recommended target for the Fort St. James LRMP was to increase Protected Areas to approximately 5.8% of the Plan Area, which is used in this analysis as the target for ecosystem representation.

The latest information published by the Province with respect to the current status of Protected Areas¹⁸ highlights gaps in representation and identifies high priority features for protection. The report identifies significant gaps in representation in interior sub-

¹⁸ “A Protected Areas Strategy for British Columbia: Provincial Overview and Status Report,” LUCO, April 1996.

boreal spruce ecosystems. Specific features with high priority for protection include: (i) sub-boreal spruce/pine forests - all successional stages, (ii) northern limits of Douglas-fir dry forest, (iii) moose (high concentrations), woodland and mountain caribou, grizzly, salmon spawning areas, and (iv) recreation corridors. All are featured in general and RMZ-specific management direction in the LRMP scenario.

Prior to the introduction of the PAS, existing parks and ecological reserves comprised less than 1 tenth of 1% of the Plan Area. New proposed Protected Areas would increase the total protected area to 5.9% of the LRMP area (Table 2).

| Table 2. Proposed Protected Area summary - Fort St. James LRMP | | |
|---|-----------------------|--------------------------------|
| Area of Interest | Area in ha (% of GLB) | Major Subzones |
| Mount Blanchet | 24099 (0.8) | ESSFmv3, SBSwk3, At |
| Damdochax | 8107 (0.3) | SBSmc2 |
| Fleming | 41590 (1.3) | SBSmc2, SBSdw3, SBSdk, ESSFmv1 |
| Mount Pope | 1944 (0.1) | SBSdw3 |
| Muzdenchoot | 602 | ESSFmv3 |
| Nation | 19836 (0.6) | SBSmk1, ESSFmv3, SBSwk3 |
| Omineca | 7055 (0.2) | BWBSdk1 |
| Stuart River | 5575 (0.2) | SBSdw3 |
| Upper Sustut/Thumb | 77582 (2.4) | At, ESSFmc, ESSFmv3, SBSmc2 |
| Total | 186390 | |

Biogeoclimatic Zone

SBS - Sub-Boreal Spruce Zone
 SWB - Spruce - Willow - Birch Zone
 BWBS - Boreal White and Black Spruce Zone
 ESSF - Engelmann Spruce - Subalpine Fir Zone
 At - Alpine Tundra Zone

Climate Modifiers

Precipitation: Climate:
 d - dry w - warm
 m - moist k - cool
 w- wet c - cold
 v - very cold

The Proposed Protected Areas (PPAs) put forward by the government's Regional Protected Areas Strategy team to meet provincial ecosystem representation goals in the Base Case were largely accepted by the LRMP, with the exception that the Upper Sustut/Thumb PPA was significantly increased in size with corresponding decreases in the sizes of the Nation Lakes and Mount Blanchet PPAs, resulting in reduced representation of SBS subzones (7.5% in the Base Case, 5.5% in the LRMP). The lower representation of SBS forests in the LRMP scenario are also in part associated with boundary changes to benefit wildlife populations.

The Upper Sustut/Thumb is the largest PPA (2.4% of the GLB). The relatively large size of this PPA will provide for the maintenance of viable sub-populations of key wildlife species (grizzly, caribou, mountain goat, bald eagle). High elevation ecosystems and wildlife habitats are featured. The RMZs surrounding this PPA are zoned as Multi-Value, which provides an added buffer from contiguous Resource Development RMZs in the southern portion of the Plan Area.

The second largest PPA is the Fleming, which comprises 1.3% of the GLB (41,590 ha). The Fleming and the smaller Nation and Omineca PPAs provide important low elevation wildlife habitats and ecosystem representation of SBS forests.

The Mount Blanchet PPA encompasses a relatively large (24,099 ha) mountain range bounded along most of its border by Takla Lake. The unroaded access and steep, mountainous terrain provides for the long-term maintenance of undisturbed wilderness habitats for caribou, mountain goat and grizzly as well as representation of Douglas-fir at the northern limits of its range. The Base Case PPA boundary extended farther north and captured more low elevation SBSwk3 forest, which is under-represented in Protected Areas at the Provincial level.

The linear nature of the proposed Stuart River protected area makes it less insular and more susceptible to influences of adjacent land use activities. Recommended Protected Areas in adjacent Plan Areas (Vanderhoof and Prince George) expand the Stuart River PPA and enhance its viability. The deciduous south-facing slopes in the Fort St. James Plan Area are a key feature of the Stuart River PPA, particularly for a small herd of elk.

The LRMP's Proposed Protected Areas would make a significant contribution in maintaining natural ecosystems and species assemblages. Provincially significant habitats for woodland caribou, mountain goat, and grizzly bear would be protected as well as representative examples of ESSF and some SBS forests. The Base Case recommended Protected Areas (previously suggested by the government's Regional Protected Areas Team) provide greater representation of SBS subzones, but the reduction in the proportion of SBS subzones in Resource Development RMZs from 83% in the Base Case to 55.5% in the LRMP scenario is also significant.

4.2 Ecosystem Representation

There are two useful land classification schemes that capture the variation in plant and animal communities at a sub-regional scale. Ecosections (Regional Ecosystem Classification) are contiguous areas with similar climate and physiography, which are large enough to sustain a variety of plant and wildlife communities. Nine ecosections transect the Plan Area. Biogeoclimatic subzones and subzone variants (Biogeoclimatic Classification) are characterized by a particular combination of dominant plant species. A total of fourteen biogeoclimatic subzones/variants transect the Plan Area. Subzones and subzone variants are dispersed within sub-regional areas and often occur within a relatively narrow elevational range and/or in relation to aspect. Each subzone has different values for different subsets of wildlife species.

Ecosections are ecologically heterogeneous with different major ecosystems (represented by biogeoclimatic subzones/variants) distributed along elevational gradients. Both ecosections and subzones/variants are targeted for protection in the PAS and are useful in this analysis as they represent different scales.

4.2.1 Ecosections

Of the nine ecosections that transect the LRMP area, the Babine Upland (BAU), Eastern Skeena Mountains (ESM) and Manson Plateau (MAP) ecosections comprise approximately 77% of the Plan Area. Significant proportions of the total provincial area of the ESM (91%), MAP (66%) and BAU (42%) ecosections occur within the Plan Area. Minor proportions of the Southern Omineca Mountains (SOM) and Nechako Lowland (NEL) ecosections are contained within the plan boundaries. Relatively insignificant proportion of the Southern Skeena Mountains (SSM), Northern Skeena Mountains (NSM) and Southern Boreal Plateau (SBP) ecosections occur within the Plan Area (Figure 2).

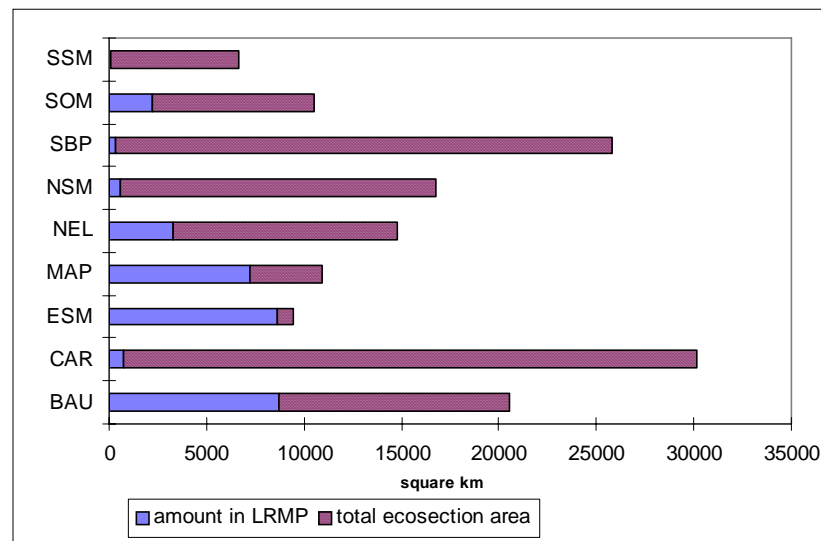


Figure 2. Provincial ecosection areas within the Fort St. James LRMP area.

The combined proportion of each ecosection occurring in protected and special resource development emphasis categories provides a measure of ecosystem representation over large portions of the Plan Area (Table 3).

| Table 3. Indicator, method and assumptions for ecosection representation. | |
|---|---|
| Indicator | % of ecosection in protection and special management RMZs |
| Method | Divide the total area in protection and special management RMZs by the total ecosection area within the LRMP. |
| Assumptions | Protection and Special management emphasis RMZs provide more options for maintaining native species and natural ecological processes. |

In general, significant proportions of ecosections in mountainous areas occur within protected and special RMZs where those in lower elevation areas are poorly represented (Figure 3).

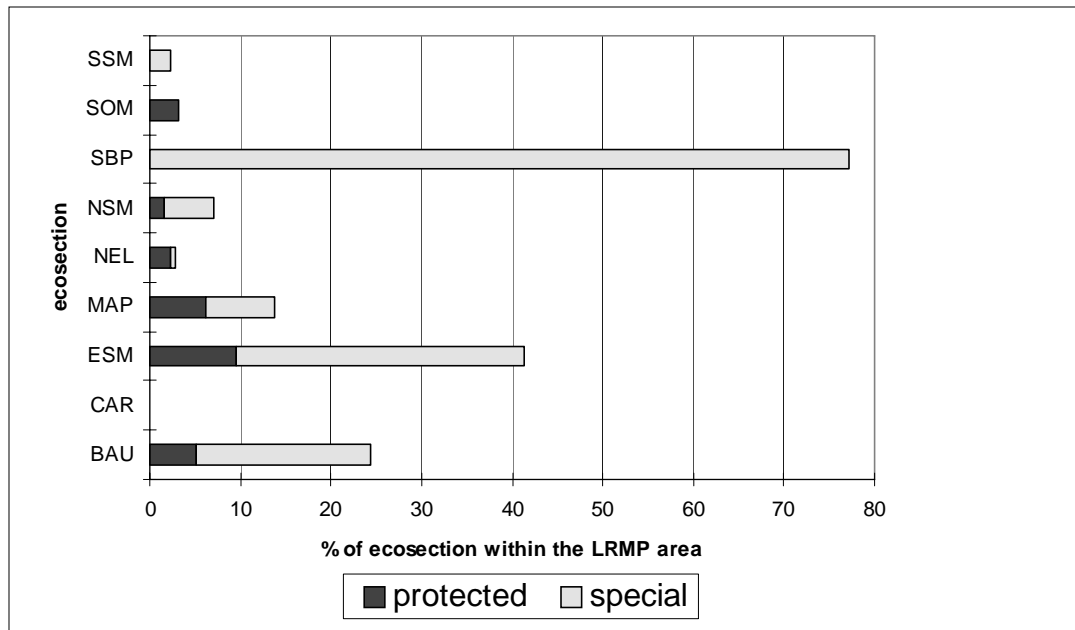


Figure 3. Ecosystem representation within the Fort St. James LRMP area.

The NEL and BAU ecosections are typical of low elevation interior plateau sub-boreal spruce forest while the ESM and SOM are largely comprised of subalpine forest and alpine tundra with significant representation of montane sub-boreal spruce (SBSmc2). These ecosections show the pattern in protection of mountainous terrain across the Province. A total of 4.7% of the NEL and 9.1% of the ESM occur in existing and proposed Protected Areas within the Province (Table 4).

Significant proportions of the total provincial area of the MAP, ESM and BAU ecosections occur within the Fort St. James LRMP area. These ecosections are predominantly characterized by low elevation sub-boreal spruce forests that are representative of interior plateau ecosystems and all are poorly represented in Protected Areas at the provincial level with the exception that a significant proportion of SBSmc2 is represented in Tweedsmuir Park. This disparity in representation has occurred throughout the province where a total of 61.2% of new Protected Areas established between 1991 and 1996 are classified as subalpine or alpine (PAS Status Report - 1996). The lack of large undisturbed areas of lowland forest and a tendency towards selecting fewer, larger areas for protection are reasons cited in the PAS report. However, this may also reflect changes made by land and resource planning groups to accommodate economic and wildlife considerations. Increasing the proportion of Protected Areas in mountainous areas increases the proportional area of inoperable terrain and lower value forest types, and thus minimizes the impacts on timber supply.

Adding the area occurring in special RMZs to the area in protection for each of the ESM, MAP and BAU ecosections improves the outlook for ecosystem representation in the LRMP scenario; the combined area exceeds 40% in the ESM, 20% in the BAU and 10% in the MAP ecosection.

| Table 4. Ecosection representation at the Provincial level. | | | | | | | | | | | |
|--|-------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|--------------|
| | FT | VH | PG | MA | KA | MO | KI | CA | BU | LA | TOTAL |
| BAU | 43.2 | 4.8 | 0.1 | 9.0 | ∅ | 20.8 | 1.0 | ∅ | 6.5 | 14.6 | 100 |
| | 2.2 | 0.2 | 0 | 0 | ∅ | 0 | 0.2 | ∅ | 0.3 | 0 | 2.9 |
| CAR | 2.2 | ∅ | ∅ | 58.6 | ∅ | ∅ | ∅ | 39.2 | ∅ | ∅ | 100 |
| | 0 | ∅ | ∅ | 4.9 | ∅ | ∅ | ∅ | 0 | ∅ | ∅ | 4.9 |
| ESM | 90.4 | ∅ | ∅ | 1.0 | 5.7 | ∅ | 0.5 | 2.4 | ∅ | ∅ | 100 |
| | 8.6 | ∅ | ∅ | 0.3 | 0.1 | ∅ | 0 | 0.1 | ∅ | ∅ | 9.1 |
| MAP | 65.6 | ∅ | ∅ | 30.7 | ∅ | 1.2 | ∅ | ∅ | 2.5 | ∅ | 100 |
| | 4.1 | ∅ | ∅ | 2.0 | ∅ | 0 | ∅ | ∅ | 0 | ∅ | 6.1 |
| NEL | 23.2 | 14.2 | 57.8 | 4.7 | ∅ | ∅ | ∅ | ∅ | ∅ | ∅ | 100 |
| | 0.6 | 0.5 | 3.6 | 0 | ∅ | ∅ | ∅ | ∅ | ∅ | ∅ | 4.7 |
| NSM | 3.3 | ∅ | ∅ | ∅ | 49.4 | ∅ | 10.5 | 36.8 | ∅ | ∅ | 100 |
| | 0.5 | ∅ | ∅ | ∅ | 0 | ∅ | 0 | 0.4 | ∅ | ∅ | 0.9 |
| SBP | 1.2 | ∅ | ∅ | 13.4 | ∅ | ∅ | ∅ | ∅ | ∅ | ∅ | 100 |
| | 0 | ∅ | ∅ | 4.0 | ∅ | ∅ | ∅ | ∅ | ∅ | ∅ | 43.1 |
| SOM | 21.4 | ∅ | ∅ | 78.6 | ∅ | ∅ | ∅ | ∅ | ∅ | ∅ | 100 |
| | 0.7 | ∅ | ∅ | 21.2 | ∅ | ∅ | ∅ | ∅ | ∅ | ∅ | 21.9 |
| SSM | 0.9 | ∅ | ∅ | ∅ | ∅ | ∅ | 66.9 | ∅ | 32.2 | ∅ | 100 |
| | 0 | ∅ | ∅ | ∅ | ∅ | ∅ | 0.7 | ∅ | 4.7 | ∅ | 5.4 |

Top cell of row = % of total provincial area of each ecosection.

Bottom cell of row = % of the provincial area of each ecosection in existing and proposed protected areas within each Plan Area.

LEGEND

Ecosection

BAU - Babine Upland

CAR - Cassiar Ranges

ESM - Eastern Skeena Mtns.

MAP - Manson Plateau

NEL - Nechako Lowland

NSM - Northern Skeena Mtns

SBP - Southern Boreal Plateau

SOM - Southern Omineca Mtns.

SSM - Southern Skeena Mtns.

Plan Area

FT - Fort St. James LRMP

VH - Vanderhoof LRMP

PG - Prince George LRMP

MA - Mackenzie LRMP

KA - Kalum LRMP

MO - Morice LRMP

KI - Kispiox LRMP

CA - Cassiar LRMP

BU - Bulkley LRMP

LA - Lakes LRMP

Ecosection representation in the LRMP's PPAs favour high elevation ecosystems. LRMP designated Special Management RMZs significantly decreases the proportion of key ecosections (ESM, MAP, BAU) in Resource Development RMZs. The NEL and BAU ecosections remain under-represented at the LRMP and provincial levels.

Achieving viable representative examples of interior plateau forest is somewhat constrained by the lack of large undisturbed areas; most is highly fragmented as a result of historically high rates of timber harvest.

4.2.2 Biogeoclimatic Subzones and Subzone Variants

Where ecosections provide provincial/sub-regional perspectives for large ecosystems, the impacts of land use activities within biogeoclimatic subzones/variants are more discernible for plant/animal communities and are an appropriate indicator of potential ecosystem impacts (Table 5).

| Table 5. Indicator, method and assumptions for biogeoclimatic ecosystem representation. | |
|--|--|
| Indicator | % of biogeoclimatic subzones/variants in PPAs and Special Management RMZs. |
| Method | Divide the area of each subzone/variant in protected and special RMZs by the total area of each subzone/variant within the LRMP area. |
| Assumptions | Protected and Special management RMZs (~ high biodiversity emphasis) provide more options for maintaining native species and natural ecological processes. |

Portions of a total of 24 biogeoclimatic subzones/variants representing 6 biogeoclimatic zones occur within the LRMP area. The dominant subzones/variants occur within the Sub-Boreal Spruce (SBS) biogeoclimatic zone, which comprises 49% of the Plan Area. High elevation ecosystems include Engelmann Spruce - Subalpine Fir (ESSF) and Alpine Tundra (AT) zones, which comprise an additional 30.2% and 16.9% of the Gross Land Base, respectively. Minor proportions of Interior Cedar - Hemlock (ICH), Spruce-Willow-Birch (SWB) and Boreal White and Black Spruce (BWBS) subzone variants are also represented.

The combined area in Protected Areas and Special Management RMZs improves the outlook for SBS representation in the LRMP scenario, relative to the Base Case (Figure 4). However, with the exception of the SBSmc2, the SBS subzones are under-represented in existing and proposed Protected Areas at the Provincial levels (Table 6).

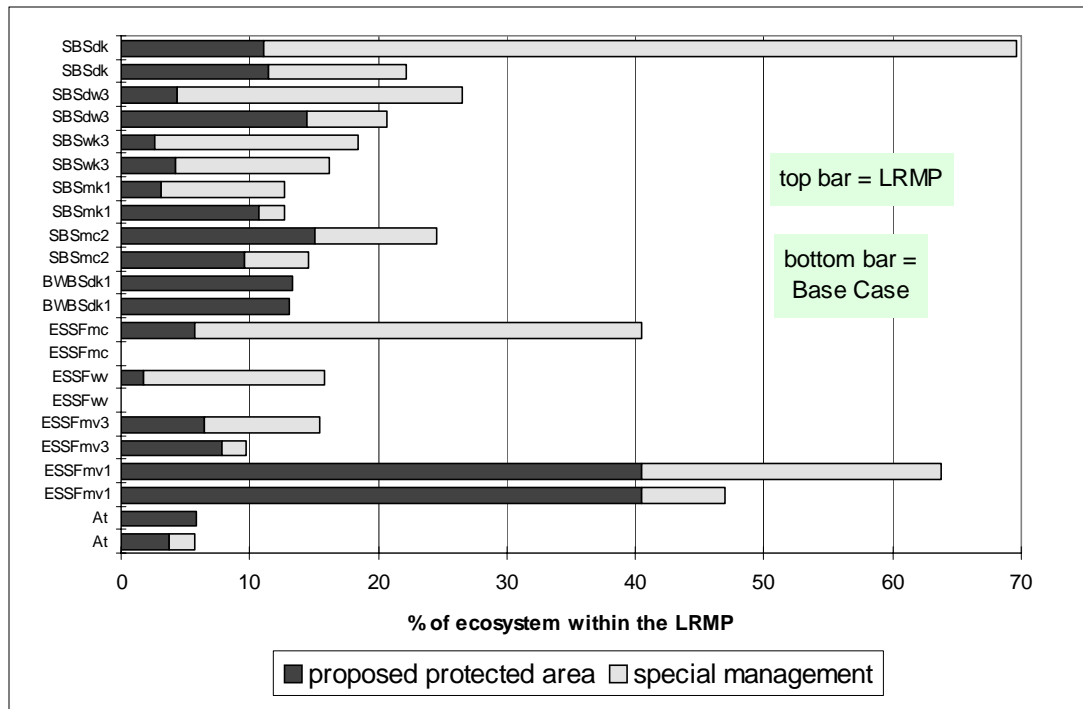


Figure 4. Biogeoclimatic Representation within the LRMP (top bar = Base Case)

Significant proportions of the total provincial area of the SBSwk3 (90%), SBSdw3 (39%) and SBSmk1 (35.5%) occur within the Plan Area, all of which are under-represented in Protected Areas at the District and Provincial levels. Although a significant proportion of the SBSdk is represented in protection and special management RMZs within the Plan Area, representation is poor at the provincial level. The SBSmk2 is well represented at the District and Provincial levels. The Base Case provides greater representation of SBS subzones than the LRMP scenario, although this is partially mitigated by the addition of Special management RMZs in the LRMP scenario. Poor representation of SBS subzones is prevalent throughout the central interior of the province.

The ICHmc1 comprises less than 1% of the Plan Area and is poorly represented at both the District and Provincial levels.

With the exception of the ESSFwv, the ESSF subzones are well represented at both the District and Provincial levels. The LRMP scenario increases the proportion of ESSFwv in protection and adds a significant proportion of special management, which improves the outlook for ecosystem representation over the Base Case. The significant proportion of forested exclusions in ESSF subzones should also ensure that representative examples of subalpine forests are maintained throughout the landscape.

| Table 6. Biogeoclimatic representation for selected subzone/variants at Regional and Provincial levels | | | | | | | | | | | | |
|---|-------------|------------|-------------|-------------|------------|------------|------------|------------|------------|------------|-------------|----------------|
| | ESSF mv1 | ESSF wv | ESSF mv3 | ESSF mc | ICH mc1 | SBS dk | SBS dw3 | SBS wk3 | SBS mk1 | SBS mc2 | BWBS dk1 | AT |
| PRINCE GEORGE FOREST REGION | | | | | | | | | | | | |
| Fort St. James LRMP - 3,174,427 ha | | | | | | | | | | | | |
| % of LRMP* | 0.5 | 1.6 | 16.1 | 12.0 | 0.5 | 2.1 | 10.9 | 13.4 | 15.5 | 8.0 | 1.6 | 16.8 |
| % of province** | 8.8 | 2.8 | 43.5 | 33.4 | 2.8 | 5.3 | 39.0 | 90.0 | 35.5 | 11.7 | 2.0 | 2.9 |
| % in PA's*** | 3.0 | 0 | 2.8 | 2.0 | 0 | 0.6 | 1.8 | 2.4 | 1.1 | 1.7 | 0.2 | 0.2 |
| Prince George LRMP - 3,415,112 ha (incl. Kakwa Recreation Area) | | | | | | | | | | | | |
| % of LRMP | 0.2 | 0 | 0 | 0 | 0 | 0 | 7.9 | 0 | 19.0 | 0.1 | 0 | 6.5 |
| % of province | 2.8 | 0 | 0.1 | 0 | 0 | 0 | 30.3 | 0 | 46.9 | 0.1 | 0 | 1.2 |
| % in PA's | 0.1 | 0 | 0 | 0 | 0 | 0 | 1.5 | 0 | 2.8 | 0 | 0 | 0.4 |
| Vanderhoof LRMP - 1,374,122 ha | | | | | | | | | | | | |
| % of LRMP | 11.9 | 0 | 0 | 0 | 0 | 23.0 | 19.9 | 0 | 0 | 14.8 | 0 | 0 |
| % of province | 75.7 | 0 | 0 | 0 | 0 | 25.5 | 30.7 | 0 | 0 | 9.4 | 0 | 0 |
| % in PA's | 3.5 | 0 | 0 | 0 | 0 | 0.7 | 0.8 | 0 | 0 | 0.3 | 0 | 0 |
| Mackenzie LRMP - 6,130,604 ha | | | | | | | | | | | | |
| % of LRMP | 0 | 0 | 10.0 | 0 | 0 | 0 | 0 | 0 | 4.0 | 0 | 11.6 | 33.8 |
| % of province | 0 | 0 | 52.6 | 0 | 0 | 0 | 0 | 0 | 17.6 | 0 | 26.7 | 11.4 |
| % in PA's | 0 | 0 | 8.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7.6 | 1.6 |
| CARIBOO FOREST REGION (CCLUP) | | | | | | | | | | | | |
| Quesnel Forest District - ha | | | | | | | | | | | | |
| % of LRMP | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | |
| % of province | 9.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4.7 | 0 | 0.3 |
| % in PA's | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.3 |
| PRINCE RUPERT FOREST REGION | | | | | | | | | | | | |
| Kalum Forest District - 4,007,085 ha | | | | | | | | | | | | |
| % of LRMP | 0 | 14.1 | 0 | 0 | 6.4 | 0 | 0 | 0 | 0 | 0.7 | 0 | 27.8 |
| % of province | 0 | 31.1 | 0 | 0.1 | 48.7 | 0 | 0 | 0 | 0 | 1.4 | 0 | 6.1 |
| % in PA's | 0 | 0 | 0 | 0 | 0.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0.6 |
| Morice Forest District - 1,514,368 ha | | | | | | | | | | | | |
| % of LRMP | 0 | 0 | 2.2 | 14.0 | 0 | 9.3 | 0 | 2.9 | 0 | 47.6 | 0 | 10.4 |
| % of province | 0 | 0 | 2.8 | 18.7 | 0 | 11.3 | 0 | 9.1 | 0 | 33.3 | 0 | 0.9 |
| % in PA's | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 |
| Kispiox Forest District - 1,307,208 ha | | | | | | | | | | | | |
| % of LRMP | 0 | 29.5 | 0 | 3.0 | 17.5 | 0 | 0 | 0 | 0 | 3.9 | 0 | 15.3 |
| % of province | 0 | 21.3 | 0 | 3.4 | 43.2 | 0 | 0 | 0 | 0 | 2.3 | 0 | 1.1 |
| % in PA's | 0 | 0 | 0 | 0 | 3.3 | 0 | 0 | 0 | 0 | 0.3 | 0 | 0 |
| Cassiar Forest District - 14,829,830 ha | | | | | | | | | | | | |
| % of LRMP | 0 | 5.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12.8 | 37.8 |
| % of province | 0 | 41.4 | 0 | 0.6 | 0 | 0 | 0 | 0 | 0 | 0 | 71.3 | 30.7 |
| % in PA's | 0 | 3.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12.4 | 4.6 |
| Bulkley Forest District - 758,629 ha | | | | | | | | | | | | |
| % of LRMP | 0 | 8.1 | 0 | 26.1 | 3.6 | 9.1 | 0 | 0 | 0 | 31.3 | 0 | 13.7 |
| % of province | 0 | 3.4 | 0 | 17.4 | 5.2 | 5.5 | 0 | 0 | 0 | 11.0 | 0 | 0.6 |
| % in PA's | 0 | 0 | 0 | 1.3 | 0 | 0.1 | 0 | 0 | 0 | 0.5 | 0 | 0.1 |
| Lakes Forest District - 1,558,524 ha | | | | | | | | | | | | |
| % of LRMP | 0.5 | 0 | 0.7 | 14.0 | 0 | 41.6 | 0 | 0.3 | 0 | 30.3 | 0 | 5.4 |
| % of province | 3.4 | 0 | 0.9 | 19.2 | 0 | 52.4 | 0 | 0.9 | 0 | 21.8 | 0 | 0.5 |
| % in PA's | 0 | 0 | 0 | 14.1 | 0 | 1.1 | 0 | 0 | 0 | 6.6 | 0 | 0.4 |
| VANCOUVER FOREST REGION | | | | | | | | | | | | |
| Mid-Coast LRMP - ha | | | | | | | | | | | | |
| % of LRMP | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | | 0 | |
| % of province | 0 | 0 | 0 | 7.2 | 0 | 0 | 0 | 0 | 0 | 4.3 | 0 | 4.1 |
| % in PA's | 0 | 0 | 0 | 6.9 | 0 | 0 | 0 | 0 | 0 | 4.3 | 0 | 0.8 |
| Total in PA's | 6.6 | 3.3 | 11.0 | 17.4 | 3.9 | 2.5 | 4.1 | 2.4 | 3.9 | 9.5 | 20.2 | >9.0 |

* % of LRMP refers to the % of each Plan Area that each biogeoclimatic subzone/variant comprises

** % of province refers to the % of the total provincial area of each subzone/variant in each Plan Area

*** % in PA's refers to the % of the total provincial area of each subzone/variant in existing and proposed Protected Areas within each LRMP Plan Area

4.3 Landscape Linkages

Landscape linkages are typically mature forested corridors linking wilderness areas. They serve two major functions in the conservation of natural biodiversity: (1) they provide habitat for plants and animals; and (2) they act as travel corridors which provides for the seasonal movements and exchange of genetic material in wide ranging species.

The size of proposed Protected Areas and linkages between them is used to evaluate landscape connectivity (Table 7). It is anticipated that Special management RMZs will provide the greater opportunities for maintaining landscape linkages than the Base Case.

| Table 7. Indicator, Method and Assumptions for Landscape Linkages | |
|--|---|
| Indicator | the size and connectivity of protected and special RMZs |
| Method | a subjective assessment of the degree of connectivity. FPC FEN's are attributable to the Base Case except where LRMP direction exceeds the NDT level. |
| Assumptions | large areas (>5,000 ha) are better than small areas. connected areas (>600 m wide corridors) are better than isolated areas. |

A total of seven Proposed Protected Areas (PPAs) exceed 5,000 ha in size in both the Base Case and LRMP scenarios, including: Mount Blanchet, Damdochax, Fleming, Nation, Omineca, Stuart and Upper Sustut. Special management RMZs along the Nation Lakes chain to the Nation PPA, along the Sustut River to the Upper Sustut/Thumb PPA, and along Stuart and Trembleur lakes to the Fleming PPA are supportive in terms of providing landscape-level linkages in both scenarios. The Stuart River PPAs in Vanderhoof, Fort St. James and Prince George provides a large movement corridor within a landscape of dominated by Resource Development RMZs.

The large proportion of inoperable terrain in the central and northern portions of the Plan Area reduce the need for extensive landscape linkages, although the Special Management designation of the 277,000 ha Groundhog RMZ provides greater opportunities for establishing and maintaining landscape linkages in the LRMP scenario. As the main access and greatest timber values in the northern portion of the Plan Area occur in the valley bottoms, which are also important wildlife corridors, the movements of some species may be affected by increased fragmentation and road development leading to increased human interaction and loss of habitat connectivity in the long term.

Extensive contiguous areas zoned for enhanced resource development (primarily silviculture) in the southern portion of the Plan Area are associated with less inoperable terrain, greater access and higher timber values. Landscape connectivity within and across the southern portion of the Plan Area is anticipated to be low in both the Base Case and LRMP scenarios.

Habitat value mapping developed for the LRMP identifies wildlife movement corridors throughout the Plan Area. The LRMP does not provide specific management direction for individual corridors but often feature the preservation of wildlife corridors in the management direction for individual RMZs. The LRMP also recognizes Forest Ecosystem Networks (FEN) as a means to preserve wildlife movement corridors, which are best supported within special management RMZs in NDT 2 forests (primarily ESSF).

Special management RMZs adjacent to portions of three of the six PPAs greater than 5,000 in size provide increased opportunities for the maintenance of connectivity between PPAs and adjacent areas and increases the long-term viability of PPAs.

The Stuart River and Nation PPAs as well as the Special management RMZs along the Sustut and Nation rivers provide long-term landscape linkages within the Plan Area and adjacent areas in both the LRMP and Base Case scenarios. The larger size of the Nation PPA in the Base Case provided a better linkage than the LRMP scenario.

Landscape connectivity, apart from FPC riparian management areas, is poor in the southern portions of the Plan Area in both the Base Case and LRMP scenarios, primarily due to the high proportion of Resource Development RMZs. The identification of wildlife movement corridors and provision of management strategies to maintain their functional values impart greater incremental benefits to the LRMP scenario, however, high levels of existing access and habitat modification as well as competing management objectives will likely result in low levels of landscape connectivity in the long-term.

5.0 WILDLIFE

5.1 Wildlife Habitats

This section includes data and background information relevant to describing biophysical habitat classes, which was not available for inclusion in the Base Case document.

Biophysical Habitat Classes

Biophysical Habitat Classes (habitat classes) are relatively broad ecosystem classifications used by the Wildlife and Habitat Protection branches of the Ministry of Environment, Lands and Parks (MoELP) to provide a framework for managing natural resources (i.e. wildlife). Each unique habitat class sustains different habitat values for individual wildlife species and larger groups of species at regional or even provincial scales, depending on species distributions.

Habitat classes are mapped at the landscape level (1:250,000) and lack sufficient detail for operational planning. Aerial photographs, topographic and forest cover mapping (at more suitable scales) are typically used to confirm and refine habitat boundaries for areas of concern at the development referral stage. This analysis considers only the proportion and distribution of habitat classes occurring within the Plan Area. Factors influencing the

quality of habitat classes, including seral stage¹⁹, slope, aspect and land use patterns are not considered in the Habitat Class mapping but were considered in the development of Habitat Feature maps for use by the LRMP working group members. This analysis presents data for habitat classes and habitat features separately but integrates the two in the discussion, where there is overlap.

There are 25 habitat classes that occur within the Plan Area, two are dominant on the landscape (60% collectively) within the LRMP Plan Area (Table 8), specifically White Spruce - Subalpine Fir (SF) and Engelmann Spruce - Subalpine Fir (EF). Sub-Boreal White Spruce - Lodgepole Pine (SL) is the third most abundant habitat class, comprising 9.7% of the GLB.

The SL habitat class extends west from Prince George to Vanderhoof and north into the Fort St. James Plan Area along the Stuart River. The SL dominates the landscape in the area surrounding Stuart, Trembleur and Tezzeron lakes and the lower portion of Middle River. The SL is distributed in large, relatively contiguous polygons at the lowest elevations, largely within the SBSdw3 subzone in the southern portion of the Plan Area. These low elevation spruce-pine forests are important for timber production and sustain primary habitats for a broad range of wildlife species such as moose, black bear, wolf and marten.

The SF habitat class is largely represented within the SBSmk1 and SBSwk3 subzones, which occur at slightly higher elevations and are cooler and wetter than the SBSdw3. The SBSmk1 occurs in the southeastern portion of the Plan Area, predominantly within the headwaters of the Salmon River. The SF habitat class is dominant in the SBSwk3 subzone, which occurs throughout the valley bottoms in more mountainous areas in the central and northern portions of the Plan Area. SF and SL habitats are distributed in relation to elevation in the foothills of the Babine Uplands ecosection in the southwestern portion of the Plan Area. Both SF and SL habitats occur within NDT 3 forests, which are characterized by frequent stand-rejuvenating events, however, fires are likely more prevalent in the drier SL forest in the southern portion of the Plan Area. As a result of drier climate and fire, greater proportions of Douglas-fir and early seral forest types including lodgepole pine, natural grassland, and deciduous forest are associated with occurrences of the SL habitat class.

| Table 8. Occurrence of biophysical habitat classes in the Ft. St. James LRMP area. | | | | |
|---|-----------|------|-------------|----------------|
| Habitat Class | Area (ha) | (%)* | Sensitivity | Impact Factors |
| Alpine Meadow (AM) | 22143 | 0.7 | high | R, M |
| Alpine Tundra (AT) | 116517 | 3.6 | high | R, M |
| Alpine Unvegetated (AU) | 263994 | 8.1 | low | |

¹⁹“Seral” or successional stage refers to age groupings used to characterize forest succession over incremental time periods in order to facilitate forestry prescriptions and wildlife interpretations. Examples of terminology after Harris 1984) include: regeneration (0-10 yrs), seedling-sapling, pole timber, saw timber, large sawtimber, and old growth.

| | | | | |
|---|--------|------|--------|---------------|
| Avalanche Track (AV) | 28504 | 0.9 | high | R, L |
| Boreal White Spruce - Lodgepole Pine (BP) | 27531 | 0.8 | low | F, G |
| Cultivated Field (CF) | 17073 | 0.5 | low | |
| Douglas-fir - Lodgepole Pine (DL) | 2247 | 0.1 | high | R, F, G, L, H |
| Engelmann Spruce - Subalpine Fir Dry Forested (EF) | 972199 | 29.8 | high | R, F, L |
| Engelmann Spruce - Subalpine Fir Wet Forested (EW) | 20355 | 0.6 | high | R, F, L |
| Subalpine Fir - Scrub Birch Forested (FB) | 49171 | 1.5 | medium | R, M |
| Engelmann Spruce - Subalpine Fir Dry Parkland (FP) | 6361 | 0.2 | high | R, L |
| Glacier (GL) | 7702 | 0.2 | low | |
| Interior Western Hemlock - Subalpine Fir (IS) | 94 | 0 | medium | |
| Large Lake (LL) | 120839 | 3.7 | low | |
| Lodgepole Pine (LP) | 111921 | 3.4 | low | F |
| Small Lake (LS) | 10217 | 0.3 | medium | L, R |
| Rock (RO) | 673 | 0 | low | |
| unknown (S) | 4778 | 0.1 | | |
| White Spruce - Subalpine Fir (SF) | 982812 | 30.1 | medium | L |
| Sub-Boreal White Spruce/Lodgepole Pine (SL) | 316661 | 9.7 | medium | L, F, H |
| Slow Perennial Stream (SP) | 2045 | 0.1 | medium | L, G, R |
| Subalpine Shrub/Grassland (SU) | 15974 | 0.5 | high | R, G |
| Wetland (WL) | 34167 | 1.1 | high | R, L |
| White Spruce - Black Cottonwood (WR) | 21122 | 0.6 | high | L, R, G, H, M |
| Habitat Impact Factors: L - logging; G - grazing; R - roads/access; F - fire suppression; M - mining; H - human disturbance/settlement | | | | |

* % refers to the proportion of the total area in the habitat database (3,262,785 ha) for the LRMP area

NOTE: Incomplete and inaccurate data due to technical problems account for ~5.3% of the total habitat area.

The Engelmann Spruce - Subalpine Fir Dry Forested habitat class (EF) is actually represented within two moist subzone variants, the ESSFmv3 and ESSFmc, which occur throughout the Plan Area at subalpine elevations (>1,100 m a.s.l.). The EF occurs in broad elevational bands between the SBS subzones in the valley bottoms and alpine habitats of mountain ranges. The EF habitats are less contiguous than the lower elevation habitat classes and are characterized by infrequent stand-rejuvenating events (NDT2). The EF habitat class is particularly important for caribou, marten and other old growth dependent species.

Several uncommon habitat classes, each comprising less than 5% of the Plan Area, represent rare or sensitive ecosystems that sustain high and/or unique values for wildlife,

examples include: Avalanche Track (AV), Subalpine Shrub/Grassland (SU), Douglas-Fir - Lodgepole Pine (DL), White Spruce - Black Cottonwood (WR) and Wetland (WL).

Recognition of the high values and sensitivities of uncommon habitat classes to resource development activities are not featured in policy and legislation relevant to the conservation of natural habitat values under TSR management, with the exception of a 1% netdown for riparian. The FPC provides protection for the WR and WL habitat classes and the LRMP scenario adds protective strategies to maintain DL and SU habitat classes.

Habitat classes such as cultivated field, rock and glacier have limited values in terms of functioning ecosystems on which naturally occurring wildlife species depend. Such habitats are relatively unaffected by the LRMP and are not featured in this analysis.

Habitat Feature Mapping

Habitat Feature mapping was produced by BC Environment for use in planning by working group members. This mapping features important wildlife habitats and movement corridors, comprising 40.2% of the GLB.

Layering habitat classes and habitat feature mapping with RMZs and other resource value mapping (e.g. timber, mining, recreation etc.) provides a means to assess prospective benefits and potential impacts to wildlife in the Base Case and LRMP scenarios. The proportion of biophysical habitat classes and wildlife habitat types within PPAs and Special Management RMZs is used to compare and contrast the Base Case and LRMP scenarios (Table 9).

| Table 9. Indicator, Method and Assumptions for Wildlife Habitat Assessment | |
|---|--|
| Indicator | The proportion of <u>habitat classes</u> and <u>habitat features</u> occurring in Proposed Protected Areas and Special Management RMZs |
| Method | GIS analysis |
| Assumptions | Proposed Protected Areas and Special Management RMZs have the highest biodiversity emphasis and provide greater opportunities for maintaining natural habitat attributes. The greater the proportion of a particular biophysical habitat class in Proposed Protected Areas and Special Management RMZs, the greater the likelihood that the requirements of wildlife species dependent upon them will be met. |

The proportion of dominant biophysical habitat classes and several of the uncommon habitat classes, as well as the proportion of all of the identified wildlife habitat types, occurring in PPA and Special Management RMZs are featured in the following two figures. Figure 5 presents data for selected biophysical habitat classes in the LRMP scenario. Figure 6 contrasts the Base Case and LRMP scenarios for all of the important habitats identified in Habitat Feature mapping used by working group members. The results of the resource analysis are presented in the following subsections, which group

equivalent or similar habitat types described by provincial habitat classes and local wildlife habitat value mapping.

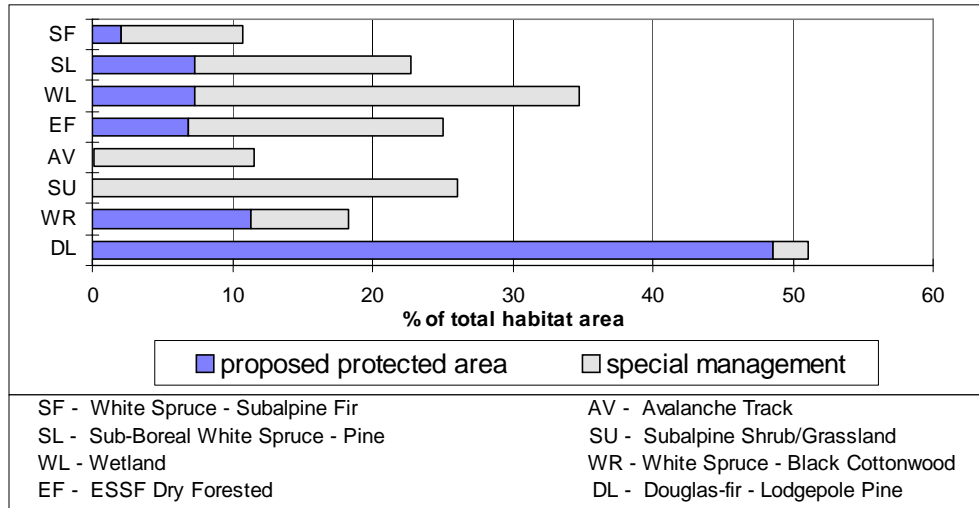


Figure 5. Distribution of biophysical habitat classes in the Ft. St. James Plan Area

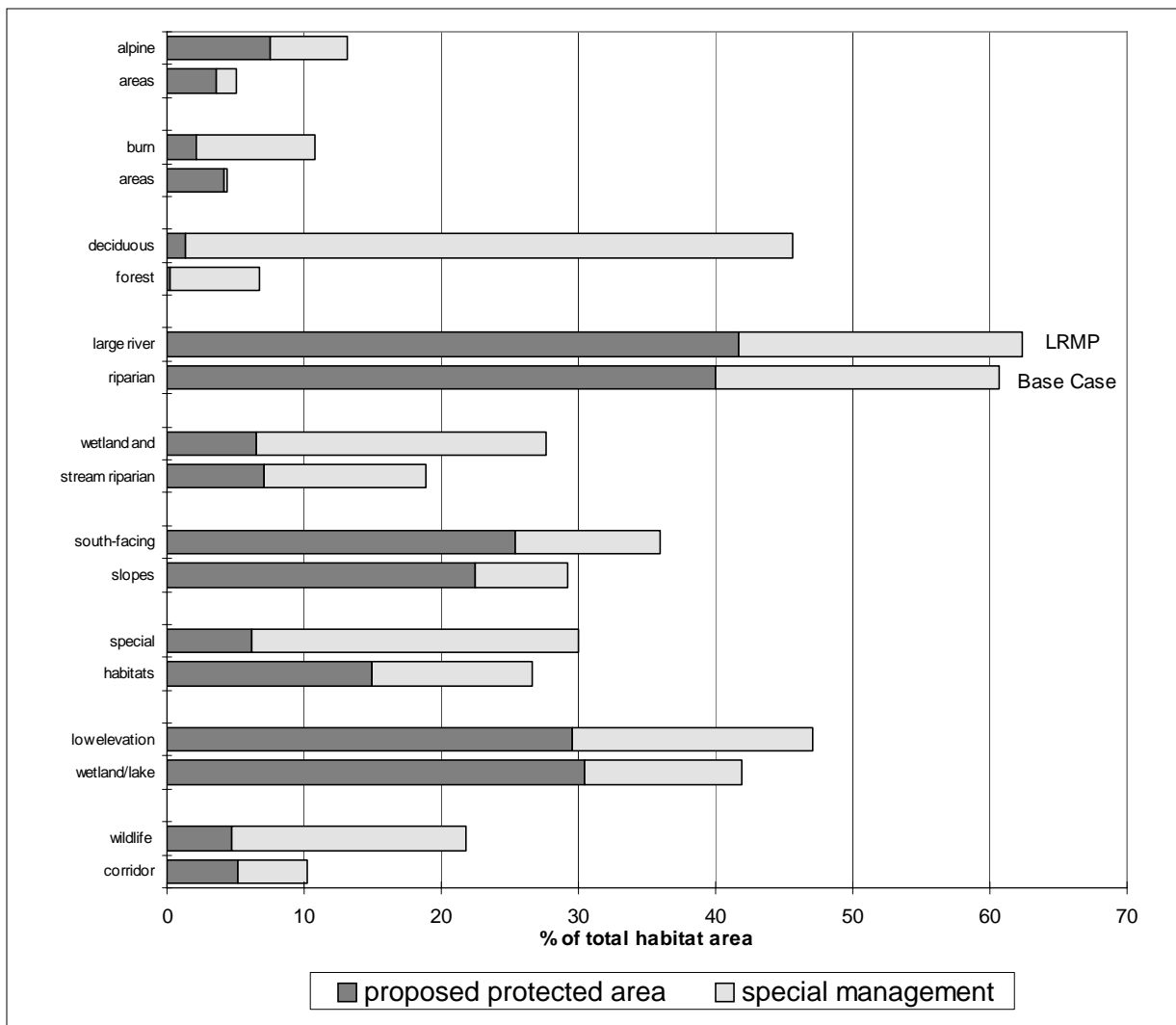


Figure 6. Distribution of selected wildlife habitat features in the Ft. St. James Plan Area.

In general, the LRMP scenario places a greater proportion of important wildlife habitats in PPAs for 4 of the 9 identified habitat types (alpine areas, deciduous forest, large river riparian, south-facing slopes) as well as a greater proportion of all habitat types when adding the proportion occurring in Special Management RMZs, relative to the Base Case.

5.1.1 Riparian Habitats

Riparian habitats are unique in that they are the interface (ecotone) areas between aquatic and terrestrial habitats. Riparian zones typically receive a disproportionately higher level of use by a larger number of wildlife species than any other habitat type (Harris 1984, Thomas 1979, Bunnell *et al.* 1990). Wildlife species featured in the LRMP document that are strongly associated with riparian habitats (most include the aquatic as well) include: trumpeter swan, bald eagle, waterfowl, cavity nesters, furbearers (aquatic and

terrestrial), moose, elk, deer and grizzly bear. Maintaining the quality of riparian habitats is viewed as essential in the conservation of biological diversity in managed landscapes.

The estimated reduction in Timber Harvesting Land Base associated with riparian reserves within the Fort St. James Forest District at the time of the last Timber Supply Review (TSR) was 1%. The Timber Harvesting Land Base was reduced by 8.91% in both the Base Case and LRMP scenarios to account for the estimated area requirements of Forest Practices Code (FPC) stream, lake and wetland reserve and management zones. This represents a significant improvement in protection for riparian habitats, although the functional values of riparian habitats are strongly influenced by the type and intensity of adjacent resource development activities at local and RMZ scales.

The White Spruce - Black Cottonwood Riparian (WR) habitat class comprises approximately 0.6% of the LRMP area. Significant occurrences of WR are found along portions of all of the major rivers. The WR functions as a wildlife movement corridor, provides critical spring and winter range for ungulates, spring and fall habitat for grizzly bear, denning sites for fisher, nesting habitat for bald eagles and a large number of cavity nesters. Most of the WR occurs in Resource Development (57%) and Multi-Value (25%) RMZs in association with forests with the highest timber values.

Two habitat types were developed to represent the major riparian habitats within the Plan Area, specifically, Large River Riparian (LRR) and Wetland/Stream Riparian (WSR). The LRR comprises 0.5% of the GLB and is represented along portions of several of the major rivers, including the Tachie, Middle, Nation, Driftwood and Omineca rivers. The WSR occurs in numerous smaller polygons comprising a total of 2.4% of the GLB. The fundamental difference between these two riparian habitat types is largely a matter of scale. Riparian habitats along large rivers are typically a mosaic of floodplain (black cottonwood) and wetland (primarily alder or willow swamp) habitats, which sustain disproportionately higher wildlife habitat values than smaller streams as they are more extensive and contain greater proportions of deciduous trees and shrubs. Riparian habitats within large river valleys provide important year-round wildlife habitats and movement corridors.

Riparian habitats along small streams sustain high values for many of the same wildlife species as large rivers, often higher values for some and lower for others. Large River Riparian Habitats, including floodplains and associated wetlands are typically narrow and linear polygons, which when combined with the high sensitivity to disturbance and disproportionately high wildlife values, require conservative management approaches.

A similar proportion of Large River Riparian Habitats occur in Protected and Special Management RMZs in both the Base Case and LRMP scenarios, roughly 40% and 20% of the total habitat area, respectively. Large River Riparian habitats along the Driftwood River remain in Resource Development in both the Base Case and LRMP scenarios, however, the LRMP contains strategies to protect important riverine habitats.

In general, populations of many wildlife species dependent on riparian habitats are anticipated to remain healthy at the landscape level with the implementation of the FPC and establishment of riparian management zones. A long-term decline in numbers of some wildlife species will likely occur within the extensive contiguous Resource Development RMZs in the southern portion of the Plan Area as a result of the prevalence of intensively managed forests adjacent to riparian zones; increased and more permanent access, minimal reserves, shorter rotations and more intensive stand tending practices decrease the suitability of riparian and adjacent habitats required by wildlife to fulfill critical life history functions (nesting, denning, foraging).

Riparian reserves occurring at middle to high elevations of river watersheds, particularly those with high equivalent clearcut areas²⁰, are likely to have a limited contribution to overall landscape connectivity. The increase in proportion (length) of smaller streams with increasing elevation results in a greater proportion (length) of streams with minimal (or lacking) reserves. The induced edge effect and/or lack of forest interior conditions would reduce riparian values for many wildlife species where inoperable terrain or other environmentally sensitive areas are lacking in adjacent forested areas.

The implementation of LRMP general management strategies to maintain the functional values of riparian habitats, provide wildlife corridors and provide optimal management for salmon habitats should provide greater incremental benefits to riparian habitats and increase potential benefits to fish and wildlife over the Base Case.

5.1.2 Wetlands

Wetlands provide important habitat for a large number of wildlife species including moose, aquatic furbearers, waterfowl and American bittern. The wetland habitat class (WL) comprises approximately 1.1% of the LRMP area, however, this is likely an underestimate where many wetlands are small and difficult to map at the landscape level. A significant proportion of identified wetlands occur in Special Management RMZs (27.4%) and PPAs (7.3%) in the LRMP scenario.

The Low Elevation Wetland/Lake habitat type identified in the habitat value mapping, comprises 1.6% of the GLB and is largely represented within 4 of the 7 polygons of this habitat type. These are areas of low, rolling terrain that contain numerous small lakes and wetlands and sustain moderate to high wildlife values. The largest occurrence lies within the Fleming PPA in both the Base Case and LRMP scenarios.

At the time of the last TSR, there was no formal protection given to wetlands. Although wetlands receive some protection through the FPC in the Base Case, the LRMP defined management strategies to maintain the functional values of numerous identified important wetland habitats are incrementally more beneficial.

²⁰"Equivalent Clearcut Area" - the proportional area of forest in a watershed in a non-hydrologically recovered state

In general, wetlands occurring within Resource Development RMZs are more likely to become isolated where nominal (FPC) reserves and greater proportions of forest in young age classes would be favoured wherever possible to meet competing timber objectives. From a long term perspective, wetlands within Resource Development RMZs are likely to sustain decreased utilization by some wildlife species; examples include moose, cavity nesters and some species of waterfowl.

5.1.3 Low Elevation Coniferous Forest

Low elevation coniferous forests are represented by several habitat classes, the two dominant ones are White Spruce - Subalpine Fir (SF) and Sub-Boreal White Spruce - Lodgepole Pine (SL), which comprise 39.8% of the GLB (Table 8). Early seral SL habitats provide important foraging and hunting areas for species such as moose, mule deer, wolf and lynx. Mature SL habitats provide important habitat for species such as marten and owls. Many wildlife species utilize a range of seral stages of SL to fulfill different life history requirements. The SF habitat class sustains similar values as mature SL habitats but lacks the diversity of the SL in terms of in early successional forest types (deciduous, pine).

In the LRMP scenario, the dominant low elevation spruce-fir habitat class (SF) is under-represented in PPAs (2.1% of the total habitat area). The LRMP scenario increases the proportion of SF in Special Management RMZs (10.8%) as well as the total area in PPA and Special Management RMZs over the Base Case.

Where significant proportions of the SF and SL habitat classes occur within Resource Development RMZs, 48.9% and 59.7%, respectively, it is anticipated that wildlife species that are strongly associated with early to middle successional forest, usually habitat generalists would be favoured where habitat specialists and species dependent on mature and old growth SF and SL forest (i.e. marten) would decline. A reduction in the number of naturally occurring wildlife species is not anticipated in the Base Case or LRMP scenarios.

Douglas-fir is at the northern extent of its range in the Plan Area. It is most frequently found on warm, dry south-facing aspects associated with the large lakes (Stuart, Trembleur) in the southwestern portion of the Plan Area, where it typically occurs in small stands or as scattered individuals, rarely as a leading species. Douglas-fir trees are fire resistant and often remain as veterans in regenerating stands following wildfire, providing habitat complexity and critical mule deer winter range. Virtually all of the known significant occurrences of Douglas-fir habitats are identified in wildlife habitat value mapping as either South-facing Slopes or Special Habitat.

The lack of a formal management strategy to maintain Douglas-fir in the TSR and Base Case scenarios would likely result in a continued trend of reduced representation. A total of 48.6% of the identified DL habitats occur in PPAs in the LRMP scenario. The general management objective for Douglas-fir in the LRMP scenario directs resource

managers to develop a management plan to maintain a range of seral stages across the landscape, but no target levels are provided. In general, the LRMP scenario will likely result in the development of a plan to manage Douglas-fir habitats throughout the District, however, it is unknown whether the plan would provide better representation than the Base Case scenario.

A long term reduction in Douglas-fir representation may occur as a result of the continued gradual reduction of basal area within managed stands where it was a minor component at the time of harvest. It has been estimated that most (80%) of naturally occurring Douglas-fir types have been harvested already and restocking efforts have largely been unsuccessful.

5.1.4 Deciduous Forest

Upland deciduous forests within the Plan Area are primarily early seral ecosystems that are dominated by aspen and to a lesser extent paper birch, which largely occur throughout the low elevation areas in the southern portion of the Plan Area and tend to be more persistent on dry south-facing slopes. Young deciduous forest provides important foraging opportunities for a wide range of wildlife species including moose and deer, where old aspen stands have higher values for cavity nesting birds and reduced values for browsing species such as moose and deer.

Deciduous or mixed deciduous-coniferous forest types are typically early successional stages of coniferous forest that are largely undescribed in the biophysical habitat class system. The Ministry of Forests (MOF) database indicates an estimated 3.9% of the GLB sustains deciduous forest types, most of which (60.8%) is described as immature. Important deciduous forest habitats identified in habitat value mapping comprise 1.1% of the GLB.

The existing policy regarding retention of deciduous trees at the time of the last TSR did not promote retention as a secondary component of regenerating stands, which favoured exclusion or stand conversion and provided no target levels at the stand or landscape levels. A continuation of TSR management practices would result in the gradual reduction in the frequency and proportion of occurrences of deciduous types.

The implementation of general management strategies defined by the LRMP would promote the retention of naturally occurring deciduous-leading stands, where identified as important wildlife habitats and support inclusion of deciduous trees where they are a component in existing stands. The extent to which LRMP objectives and strategies would be applied is uncertain and subject to competing objectives. Gradual reductions in the amount of deciduous forest in areas of intensive silviculture is anticipated to continue.

5.1.5 High Elevation Ecosystems

Alpine and subalpine habitats sustain a unique and diverse subset of the local flora and fauna. Many wildlife species use high elevation habitats as summer range, including grizzly bear, mountain goat, caribou, wolverine, migratory and resident birds. Alpine habitats occurring within the Plan Area are represented within three biophysical habitat classes (AM, AT, AU) and one biogeoclimatic zone (Alpine Tundra), the former comprising 12.4% and the latter (probably more accurate) comprising 16.9% of the GLB. Alpine Areas identified in the Habitat Feature mapping comprise 13.7% of the GLB and feature important habitat for caribou, thimblehorn sheep and mountain goat.

The LRMP scenario increases the representation of Alpine Tundra in PPAs from 3.7% in the Base Case. Alpine Tundra in Special Management RMZs increases from 2% to 27.2% of the GLB over the Base Case. A lower proportion of important Alpine Areas (Habitat Feature Mapping) occur in PPAs (3.6% and 1.4%) and Special Management RMZs (7.5% and 5.7%) in both the Base Case and LRMP scenarios, respectively.

Subalpine habitats occurring within the Plan Area are represented within five biophysical habitat classes (EF, EW, FB, SU, AV) and four main biogeoclimatic subzones (ESSFmv1, ESSFmv3, ESSFmc, ESSFwv), the former comprising 33% and the latter comprising 30.4% of the GLB. The Engelmann Spruce - Subalpine Fir Dry Forested (EF) habitat class is particularly important for caribou, marten and other old growth dependent species.

In addition to the 18.1% of the EF habitat class that occurs in Special Management RMZs and 6.9% in PPAs, a significant proportion of the total area of EF occurs in forested and non-forested exclusions. A significant proportion of the EF habitat class would, therefore, be maintained in a natural state in the LRMP scenario, providing a moderate improvement over the Base Case.

The Avalanche Track (AV) habitat class comprises less than 0.9% of the LRMP area and largely occurs in the subalpine and alpine habitats where it sustains particularly high habitat values for species such as grizzly bear and marmot. The value of AV habitats can be reduced as a result of road construction activities and the removal of adjacent timber.

No special consideration is given to protecting wildlife values of AV habitats in either the TSR or Base Case scenarios. LRMP defined strategies to maintain the functional values of AV habitats within RMZs where grizzly bear are featured provide greater potential benefits for wildlife species dependent on AV habitats, particularly for grizzly bear.

5.1.6 Old Growth Coniferous Forest

Old growth forests provide essential habitats for plant and animal species which are generally not available in younger forests. Old growth forests are characterized by a wide range of tree ages and sizes (including large diameter), multi-layered canopies, standing snags and large logs on the forest floor and in streams. Old growth forests

provide primary habitats for species including grizzly bear, caribou, owls and woodpeckers.

One of the major threats to old growth forests is fragmentation. Fragmenting old growth stands can have deleterious consequences where increasing isolation of habitats can affect species dispersal and reproductive success. Fragmentation of old growth stands reduces the quality of habitat for various reasons, including: (i) the edges of old growth stands are poorer quality due to increased disturbance (i.e. wind) and climatic extremes; (ii) small stands are not suitable for species that require larger home ranges or forest interior conditions; and (iii) animals and plants moving between widely spaced old growth habitats are susceptible to higher rates of mortality. For these reasons, the long term viability of populations of some species may be lower in landscapes where old growth habitat is highly fragmented.

The Biodiversity Guidebook provides a means to evaluate the prospective amount and distribution of old growth in the Base Case and Consensus Plan (Table 10).

| Table 10. Indicator, Method and Assumptions for Old Growth Representation | |
|--|---|
| Indicator | % of LRMP area maintained as old growth |
| Method | Total ha maintained at an old seral stage according to the Natural Disturbance Type (NDT) definition of old and target percentages for each biodiversity emphasis option. |
| Assumptions | Old growth provides unique biodiversity values. The closer the total to the target for high biodiversity emphasis (by NDT), the greater the likelihood that key ecosystem elements are maintained. Forested exclusions maintain old growth. |

The MOF database indicates that old growth coniferous forest²¹ comprises an estimated 17.9% of the Plan Area. Forested exclusions of old growth coniferous forest account for approximately 5.3% of the Plan Area. Estimates of the proportion and distribution of old growth that would exist in managed forests under the Base Case and LRMP scenarios cannot reliably be modeled as biodiversity emphasis options have not yet been designated at the Landscape Unit level.

The proportion of existing old growth coniferous forest occurring in PPAs and Special Management RMZs comprises 4.9% and 4.4%, and 5.6% and 12.6% in the Base Case and LRMP scenarios, respectively. Equally important is the shift in resource management emphasis at the landscape level. The LRMP scenario reduces the proportion of the GLB in Resource Development from 88% to 31% and increases the proportion in Special Management RMZs from 4% to 20%. This suggests that the LRMP scenario will result in a greater proportion of the landbase being managed for intermediate and high biodiversity emphasis and natural seral stage distribution, which would translate into greater proportions of old growth.

²¹ The MOF definition of old growth includes age class 8 and 9 (>140 year old) forests.

In general, the anticipated proportion of old growth coniferous forest maintained on the landscape is significantly increased from the TSR in both the Base Case and LRMP scenarios. In the TSR scenario, significant occurrences of old growth would be limited to forested exclusions (currently 5.3%) and existing ecological reserves. The significant decrease in area in Resource Development RMZs in the LRMP scenario will likely translate into a greater proportion and larger contiguous areas of old growth than the Base Case.

5.1.7 Special Habitats

The Special Habitats identified in the LRMP habitat feature mapping describe 17 areas with special features occurring in 12 discrete polygons comprising 4.2% of the GLB. The common themes of these areas include: combined Douglas-fir representation and mule deer winter range, burn areas, high-value wildlife habitats, important grizzly bear, moose and riparian habitats. A total of 11.7% and 14.9% of Special Habitats occur within Special Management RMZs and PPAs in the Base Case, relative to 23.8% and 6.2% in the LRMP scenario, respectively.

The 3.6% higher proportion of Special Habitats in the combined total area in Special Management RMZs and PPAs in the LRMP scenario (30.2%) likely provides less value relative to the 8.7% greater area occurring in PPAs in the Base Case. However, it is likely that RMZ specific LRMP strategies designed to maintain the functional values of identified Special Habitats will result in greater protection for habitat values over the Base Case for Special Habitats within the Resource Development RMZs, where 66.6% and 56.6% of Special Habitats occur in the Base Case and LRMP scenarios, respectively.

5.2 Species at Risk

Eleven (4 mammal, 4 bird and 3 fish) of the total estimated 231 vertebrate species that occur within the Fort St. James Forest District (LRMP area), are found on Conservation Data Centre red and blue-lists.²² Most of these species are habitat specialists that are found in low numbers and may be widely distributed on the landscape (i.e. grizzly, caribou) or conversely, found only in localized areas (i.e. stone sheep, trumpeter swan). Where observations of uncommon species likely represent a small proportion of the actual occurrences, professional judgment based on habitat suitability is used in the assessment of the potential impacts to these species. General trend statements are used to demonstrate the incremental differences between the TSR, Base Case and LRMP scenarios (Table 11) for all listed species. Species with well known distributions and habitat requirements are discussed in more detail in the following sections of this analysis.

²²The Conservation Data Centre collects, interprets, maintains and stores records pertaining to species considered at risk within BC. Red- and Blue-listed species are candidates for legal designation as rare or endangered and threatened or vulnerable, respectively

| Table 11. Red and Blue Listed Species Trends within the Fort St. James LRMP Area | | | | |
|---|---|--|---|---|
| Red List | Sensitivity | TSR | Base Case | LRMP |
| Arctic grayling | fishing pressure, increased peak flows, channel scour and turbidity, logging | high risk in Omineca R. moderate risk in Nation River (see Sec 6.1.1) | moderate risk in Omineca R. low risk in Nation R. (see Sec 6.1.1) | moderate risk in Omineca R. low risk in Nation R. (see Sec 6.1.1) |
| white sturgeon | water quality, water quantity, riparian impacts | moderate risk where critical habitats not known, no research | research underway to determine distribution and status, low risk | recommend development of sturgeon management plan, low risk |
| Blue List | | | | |
| bull trout | road development, disturbance of small stream habitats, overfishing, increased water temperature | high risk with lack of riparian protection (see Sec 6.1.2) | moderate risk with FPC riparian protection, may still decline in small streams (see Sec 6.1.2) | remain at moderate risk in small streams (see Sec 6.1.2) |
| grizzly bear | increased access, poaching | high risk (see Sec 5.2.1) | high risk (see Sec 5.2.1) | moderate risk (see Sec 5.2.1) |
| stone sheep | increased access, poaching | unknown | unknown | unknown |
| fisher | overtrapping, reduction in old forest, riparian impacts, loss of denning sites (large diameter snags) | high risk due to increased access, loss of denning sites, reduction in old forest, riparian impacts (see Sec 5.2.2) | moderate risk with FPC riparian protection, wildlife tree retention and seral stage requirements (see Sec 5.2.2) | low-moderate risk with less area in Resource Development RMZs; loss of denning sites may still be a limiting factor (see Sec 5.2.2) |
| wolverine | declines in ungulate populations - primarily caribou | high risk without a caribou management plan or Protected Areas (see Sec 5.2.3) | moderate risk with FPC management and new Protected Areas (see Sec 5.2.3) | low risk, will benefit from grizzly/caribou management where they coexist (see Sec 5.2.3) |
| short-eared owl | habitat alienation and fragmentation | unknown | unknown | unknown |
| trumpeter swan | disturbances on wintering grounds | moderate-high risk (see Sec 5.2.4) | reduced risk with FPC riparian protection (see Sec 5.2.4) | low risk with strategies to minimize disturbance (see Sec 5.2.4) |
| sandhill crane | harassment, poaching | unknown | unknown | unknown |
| American bittern | riparian disturbance | moderate risk due to lack of wetland/riparian protection | low risk with FPC wetland/riparian protection | same as Base Case |

Potential impacts to stone (thinhorn) sheep, short-eared owl, sandhill crane, and American bittern are difficult to assess due to their low densities and casual occurrences within the Plan Area and they are not featured in this analysis.

White sturgeon are known to occur in the Stuart, Tachie and Middle rivers as well as Stuart, Trembleur and Takla lakes, however their present population status is largely unknown. White sturgeon are known to be sensitive to changes in water quality and quantity. This third consecutive year of intensive research on white sturgeon throughout the Fraser Basin and including the LRMP Plan Area, will begin to provide information necessary to identify their distribution, relative abundance and key habitats as well as their status and sensitivity.

The present application of the FPC includes identifying habitats that are important for maintaining red- and blue-listed species as they occur on the landscape. This task is currently being funded by Forest Renewal BC as a component of larger Terrestrial Ecosystem Mapping contracts. The LRMP has endorsed this process with similar strategies, the combination of which improve the outlooks for several listed species. It is anticipated that LRMP management strategies for caribou and grizzly bear would also benefit wolverine due to the fact there is a significant overlap in the distribution and habitat preferences of each.

The outlook for species that are dependent on riparian habitats such as grizzly bear and American bittern improves significantly from the TSR with the application of FPC stream, wetland and lakeshore reserves. LRMP strategies to maintain the functional integrity of important riparian and low elevation lake/wetland areas are incrementally more beneficial than the Base Case. Riparian habitats that occur on private land are unaffected by the FPC and remain at risk from human disturbance.

5.2.1 Grizzly Bears

Grizzly bears are currently blue-listed as they are vulnerable to human disturbance, occur at low densities, have large home range requirements, and a low reproductive rate. The single greatest cause of declining grizzly populations across their range is habitat loss. Many of the potential threats to grizzly bear populations are associated with human settlement and road access, particularly in remote areas. It is generally accepted that large, relatively undisturbed areas are required to maintain grizzly bear populations. However, large, relatively undisturbed areas are becoming increasingly rare, which implies that the majority of grizzly bear habitat will require a coordinated approach to habitat management at the landscape level, such as that recommended in the *Grizzly Bear Conservation Strategy*, (1995).

Grizzly bears require a variety of seral stages to meet seasonal habitat requirements. Important habitats include mature forests, herb-dominated avalanche chutes, subalpine meadows, riparian areas, floodplains, salmon-bearing streams, and habitats containing berry-producing shrubs. Grizzly bear occur throughout the Plan Area and are generally found at low-moderate densities in the plateau forests within the southern portion of the

Plan Area and at moderate to high densities in the more mountainous central and northern portions of the Plan Area.

Historically there has been no stated objective or policy to maintain grizzly bear or important grizzly bear habitats within the Plan Area. The stated general management objective for grizzly bear in the LRMP scenario is to "Maintain or enhance grizzly habitat and populations", which is supported by strategies that recommend completing habitat mapping and stakeholder processes to consider the potential for establishing "Grizzly Bear Management Areas". Strategies also provide direction to establish management zones to maintain important grizzly bear habitats and conduct access management planning for areas considered to sustain high habitat suitability.

It is likely that without considerable efforts to develop a comprehensive management plan within the District and adjacent Plan Areas, the goal of maintaining grizzly bear at their present numbers on all of their present range would be unattainable (with the current land use patterns). Many of the smaller watersheds have not yet been accessed and would not likely sustain the same high values as they would in their undisturbed natural state. Additionally, sustained intensive silvicultural practices and frequent bear-human interactions associated with the extensive existing and future access in Resource Development RMZs occurring throughout much of the southern portion of the Plan Area are likely to reduce the overall habitat values for grizzly bear in these areas.

Overall, the outlook for grizzly bear is significantly improved in the LRMP scenario, however, it is likely that grizzly numbers will continue to decline from their present low-moderate densities in the southern portion of the Plan Area. Grizzly densities could be maintained at, or near their present levels in the central and northern portions of the Plan Area with the application of LRMP strategies, although this is dependent on the ability of BC Environment to identify important grizzly habitats and on the outcomes of future access management agreements.

The application of general management direction and RMZ strategies for grizzly bear reduces the risk of major long-term declines in population to a moderate level in the LRMP scenario, from high in the Base Case. Bear-human conflicts, including poaching activities are anticipated to continue to be a pressure along the main transportation routes within major river corridors.

5.2.2 Fisher

Like grizzlies, fisher are a wide ranging species that occur in low densities on the landscape and utilize a wide range of habitats including riparian, burns and mature forest. Because fisher are readily trapped, they are susceptible to over-harvesting. The vast majority of fisher den sites are found in large diameter (>90 cm), hollow, dead trees (mostly black cottonwood).

The introduction of FPC wildlife tree patch reserves, and riparian reserve and management zones provide increased protection for fisher habitats (including denning)

in both the Base Case and LRMP scenarios, relative to the TSR. Strategies to maintain habitat values associated with burns and other important wildlife habitats identified in the LRMP scenario are incrementally more beneficial than the Base Case. Reduced habitat values and denning opportunities within extensive areas under intensive silviculture may reduce fisher utilization of habitats in the southern portion of the Plan Area.

In general, fisher populations are anticipated to remain stable in both the Base Case and LRMP scenarios. The greater protection of important fisher habitats in the LRMP scenario reduces the risk of long-term population declines, relative to the Base Case.

5.2.3 Wolverine

Similar to grizzly bear and fisher, wolverine are wide ranging and occur at low densities on the landscape. In contrast to grizzly and fisher, wolverine are habitat specialists, with the greatest overlap in habitat requirements with caribou and grizzly bear. Wolverine are typically associated with high elevation ecosystems and utilize caribou as an important food source.

Due to the dependence of wolverine on caribou and caribou habitats, the risk of long-term population declines was considered to be high in the TSR scenario due to the lack of a formalized management plan for caribou as well as a lack of Protected Areas.

Overall, wolverine populations are anticipated to remain stable in both the Base Case and LRMP scenarios. Where the habitat requirements of wolverine overlap with caribou and grizzly bear, LRMP strategies to maintain important grizzly bear and caribou habitats are anticipated to benefit wolverine.

5.2.4 Trumpeter Swan

Trumpeter swan numbers have naturally fluctuated from a low a 100 birds to a maximum of nearly 1,000 as a result of winter conditions. Trumpeter swans overwinter on the Stuart, Tachie and Middle rivers where warm water released from large lakes maintains areas of open water. During mild winters, they are more widely distributed. Potential impacts to trumpeter swans are largely associated with foreshore developments, mortality associated with overhead transmission lines, and logging adjacent to wintering areas.

Although no formalized management plan exists for trumpeter swans, the MoELP screen resource development applications and attempt to minimize potential impacts to swans. The LRMP scenario endorses management to maintain important trumpeter swan habitats, including minimizing disturbances, which reduces the risk of impacts to trumpeter swans.

5.3 Wildlife Species of Special Interest

5.3.1 Woodland Caribou

Six generally distinct sub-populations of woodland caribou are known to utilize habitats within the central and northern portions of the Plan Area. A general description of herd sizes, distributions, seasonal migrations and habitat use is provided in Section 3.7 of the LRMP document and are not recounted here.

This section focuses on the results of the resource analysis, which is largely based on the distribution of caribou habitats within each of the identified resource management zone categories (Table 12). A risk analysis was also completed for the four major herds based on the average risk levels associated with 10 different variables, which was independently assessed by four individuals with expertise in the area.

| Table 12. Indicator, method and assumptions for caribou | |
|--|--|
| Indicator | % of caribou habitats occurring in each RMZ category |
| Method | GIS analysis using RMZ and caribou habitat mapping. |
| Assumptions | Proposed Protected Areas and Special Management RMZs provide the greatest level of protection for caribou habitats. The maintenance of lichen communities within mature coniferous forest is essential for the maintenance of caribou habitat values. Caribou are affected by timber harvesting patterns, access and landscape connectivity. |

Caribou habitats comprise a significant proportion (70%) of the GLB; 10.1% high value, 19% medium value, and 41.1% low value. Caribou management areas are comprised of high and medium value caribou habitat, which comprises 29% of the GLB. High value caribou habitats were considered part of the harvestable land base in the TSR and Base Case. Of the total high value caribou habitat, 27.8% occurs in forested exclusions and 53.3% in non-forested exclusions. Approximately 4.7% of the Timber Harvesting Land Base contains 18.9% of the high value caribou habitat, which indicates that the proportion of high value caribou habitat that could be harvested would impact a minor proportion of high value habitats. However, the over-riding effects of habitat modification, fragmentation and access result in disproportionate impacts to caribou.

The LRMP scenario decreases the proportion of high value caribou habitat in Proposed Protected Areas (PPAs) from 8.3% to 6.3% but also reduces the proportion of high value caribou habitat in Resource Development RMZs (where caribou are at greatest risk) to 3.4%, from 89.2% in the Base Case (Figure 7). The LRMP scenario also increases the proportion of high value caribou habitats in Special Management RMZs (caribou emphasis) to 44.1% from 2.9% in the Base Case. Collectively, the proportion of high value caribou habitat in PPAs and Special Management RMZs is significantly increased in the LRMP scenario (50.4%), relative to the Base Case (11.2%) which provides increased protection for caribou. The LRMP scenario also identifies 4 connective corridors.

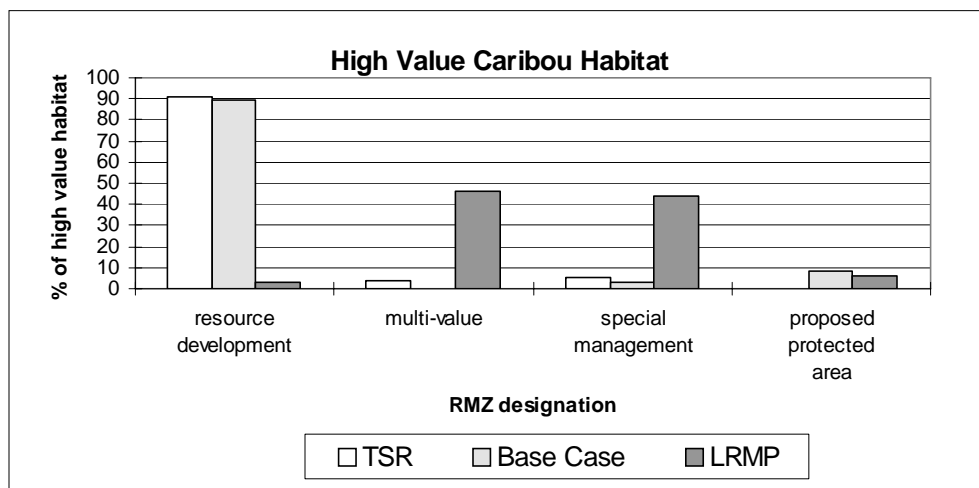
The proportion of medium value caribou habitat occurring in PPAs is slightly lower in the LRMP scenario (5.7%) relative to the Base Case (6.1%). However, the reduction of medium value habitat occurring in Resource Development RMZs in the LRMP scenario (3%), relative to the Base Case (92.3%), and the greater proportion of medium value habitat occurring in Special Management RMZs in the LRMP (44.1%) relative to the Base Case (2.9%), are significant.

The LRMP scenario places a greater proportion of low value caribou habitats in PPAs (6.4%) and Special Management RMZs (10.4%) than the Base Case, 5% and 4.7%, respectively. The 67% reduction in the proportion of low value habitats occurring in Resource Development RMZs in the LRMP scenario is also significant.

The lower proportion of high and medium value caribou habitats occurring in PPAs in the LRMP scenario is largely a result of modifications of the Mt. Blanchet PPA boundaries. The expansion of the Upper Sustut/Thumb PPA in the LRMP scenario slightly increases the proportion of caribou medium habitat in PPAs. The relatively small proportion of caribou habitat in PPAs indicates caribou are at high risk in the absence of a management plan.

A similar pattern can be seen in the distribution of caribou habitats within each identified RMZ category. In general, the addition of new Protected Areas, reduction in proportion of caribou habitats occurring in Resource Development RMZs and increase in proportion of caribou habitats in Special Management RMZs provide the higher overall level of protection for caribou habitats in the LRMP scenario.

In order to assess the overall risk to caribou, a total of 10 variables other than the distribution of habitats within RMZ categories were considered, including 1) wolf predation, 2) bear predation, 3) calf predation, 4) poaching, 5) winter access, 6) summer access, 7) habitat fragmentation, 8) habitat/range isolation, 9) habitat conversion (or modification), and 10) low numbers. Each of the 10 variables was ranked for each selected herd on a scale of 1 to 3 by four professionals, with the average risk values are presented in Figure 8.



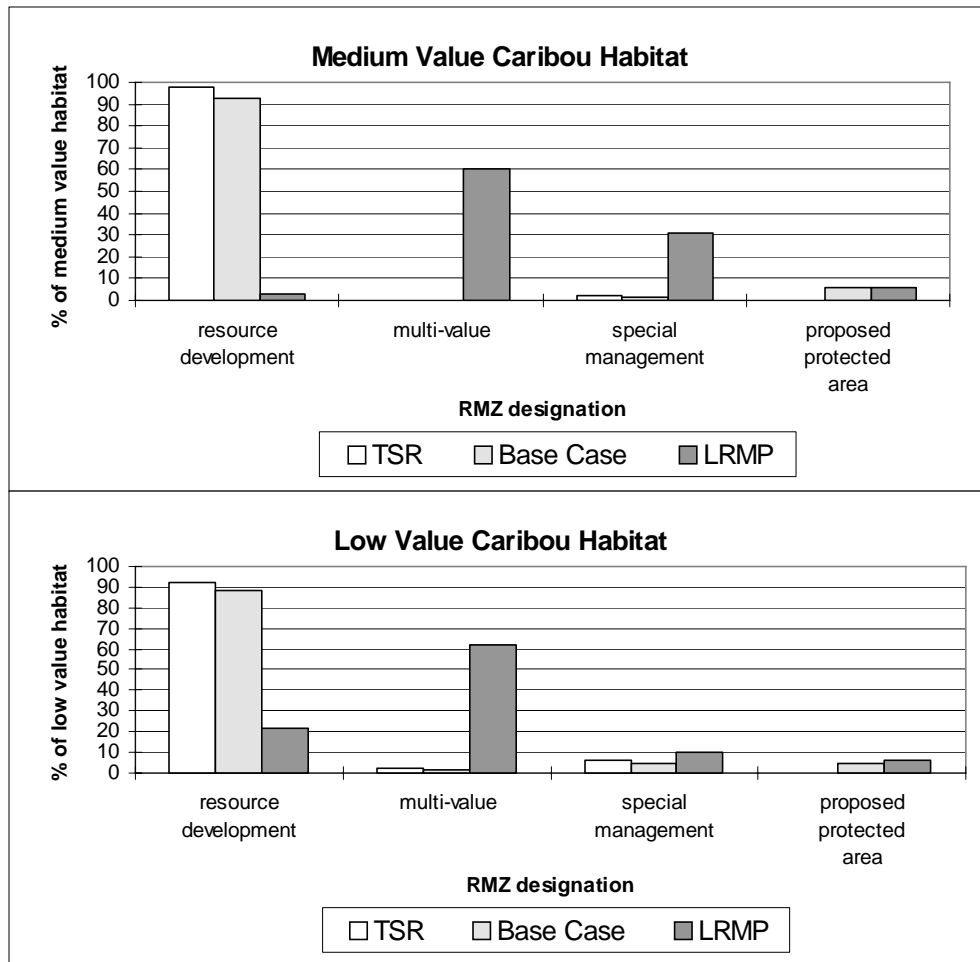


Figure 7. Distribution of caribou habitat within resource management zones.

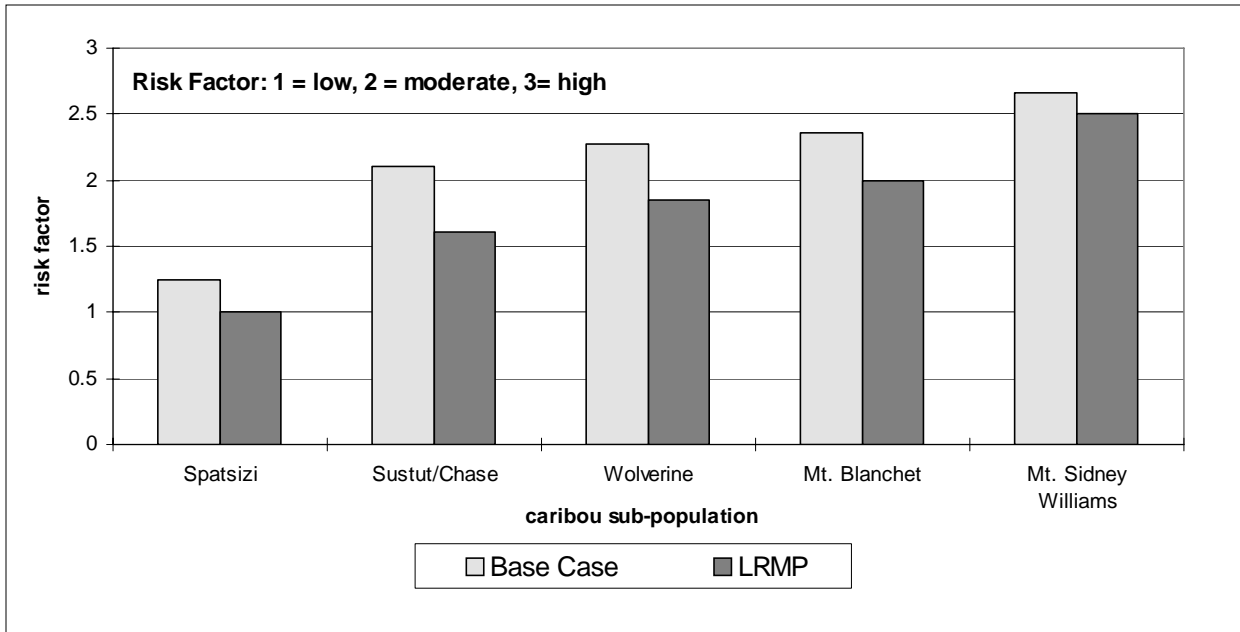


Figure 8. Risk analysis for selected caribou sub-populations in the Fort St. James LRMP area.

In terms of the overall risk of long-term population declines, the Spatsizi herd, which is the largest with roughly 3,000 animals, is least at risk, largely due to the fact that significant portions of their range occur within Spatsizi Plateau Wilderness Park.

The Sustut/Chase herd of between 600-700 animals are at moderate risk in the Base Case and low-moderate risk in the LRMP scenario. Although the Upper Sustut/Thumb PPA provides significant protection of high value calving habitats and summer range for this herd, habitat conversion and isolation are primary concerns.

The Wolverine herd of approximately 250-300 animals is at moderate risk in both the Base Case and LRMP scenarios, the primary concerns are associated with habitat fragmentation and isolation, although low numbers are also a concern.

Small family groups of caribou utilizing habitats on Mt. Blanchet, Mt Sidney Williams and the Mitchell Range are considered part of the Takla herd, which numbers approximately 100 animals. As the habitat values and risks to caribou utilizing the Mt. Blanchet and Mt. Sidney Williams areas are different, they were considered separately. The Mt. Blanchet PPA protects a significant proportion of high value habitats, however the risk of habitat fragmentation and habitat isolation remains high. The Mt Blanchet PPA is bordered by, and Mt. Sidney Williams lies within, Resource Development RMZs. The Takla herd is at the greatest overall risk.

The lack of a formalized management plan results in a high risk of long-term declines in caribou sub-populations throughout the Plan Area in the TSR scenario. The addition of new proposed Protected Areas in the Base Case reduces the risk to a low-moderate level

for the Chase herd and moderate-high for the Mt. Blanchet herd. The provision of caribou management strategies and the designation of Special Management RMZs with caribou emphasis in the LRMP scenario provide the greatest prospective benefits for caribou and further reduce the risk to a low-moderate level for the Chase herd and moderate for the Wolverine herd.

The Takla herd remains at moderate to high risk as a result of the anticipated continued habitat/range isolation and habitat fragmentation as well as the small size of the herd, disturbance and poaching associated with increased access, and increased predation.

5.3.2 Moose

Moose are widely distributed, although they are most abundant in the lower elevation plateau forests in the southern portion of the Plan Area which is characterized by more numerous wetlands and small lakes as well as more extensive river riparian habitats, relative to the more mountainous central and northern portions.

Moose utilize a wide range of habitat types (forested and non-forested) and seral stages to meet different life history requirements (breeding, foraging) and accommodate daily movements (travel, security and thermal cover). Early seral forest in cutblocks, burns in spruce-pine forests and riparian habitats provide year-round forage for moose. Moose frequent wetlands and shallow lakes through the spring and summer to feed on aquatic and emergent vegetation. Moose find ample browse in cutblocks but use is typically low until stands green up enough to provide cover, which roughly coincides with the suppression of shrub growth from the shading of maturing conifers. On average sites, moose utilization is typically greatest in 15-25 year old stands.

Moose require areas of dense cover for travel, security and thermal cover. Riparian corridors along streams with high shrub cover provide resting, hiding, calving and foraging opportunities and are of particular importance. Thermal cover is largely provided by mid to late seral coniferous forest. River corridors are important for daily, as well as seasonal movement and dispersal over large areas. River corridors act as refugia for moose in agriculture/settlement areas and more mountainous portions of the Plan Area.

Where moose populations are stable or increasing, it may be inferred that habitat conditions are suitable for other generalist species²³ of birds and small mammals as well as predators such as wolf, coyote, lynx and black bear. Appropriate management of moose winter range may include regulation of access to control hunting pressure.

The majority of moose habitat occurs within extensive areas zoned as Resource Development in both the Base Case and LRMP scenarios, where it is anticipated that intensive silvicultural practices, increased hunter success rates and increased poaching

²³ Generalist Species in this context refers to species that utilize a wide range of habitat types and successional stages (including early and mid-seral).

associated with greater permanent road access, and greater proportions of early to mid seral forest will continue to suppress moose numbers within the southern portion of the Plan Area as the more forest stands are accessed and come under intensive silvicultural management.

Maintaining forested linkages between important moose habitats such as winter range, wetlands and shallow lakes is an important consideration. The FPC riparian reserve and management zones provide opportunities to maintain connectivity across much of the landscape. Wetland complexes²⁴ are given additional protection by the FPC, which maintains forested linkages for moose. Reserve and management zones around the periphery of lakes and wetlands provide security cover for foraging, although cutting patterns may temporarily isolate such areas in a matrix of early seral forest and reduce their accessibility to moose.

Several LRMP strategies were developed to provide direction towards meeting the objectives of maintaining and/or enhancing moose population levels within the Plan Area. Opportunities to provide protection for moose habitat, including critical winter range, are supported through the selective use of strategies addressing forested buffers and vegetation management issues. Apart from critical habitats recognized by BCE, the application of such strategies is largely to the discretion of resource managers and subject to competing featured objectives. The extent to which critical habitats are protected are dependent on the ability of BCE to recognize and identify them. LRMP defined fisheries and wetland/riparian management strategies are beneficial to moose.

The Fleming PPA is characterized by numerous small lakes and wetlands, which sustain high value year-round moose habitats, the long-term viability of the Fleming PPA is supported by Special Management RMZs extending along Stuart and Trembleur lakes. Important moose habitats are also protected in the Omineca PPA. Valuable moose habitat along the Nation River was better protected in the Nation PPA in the Base Case.

5.3.3 Mountain Goat

Mountain goat are found at moderate to high densities in suitable habitats within the central and northern portions of the Plan Area. Mountain goat winter range includes lower elevation forests that are usually associated with escape terrain (steeper, rocky). Although timber harvesting does not typically have significant direct effects on mountain goat habitats, increased access in remote areas may lead to increased poaching, and timber harvesting patterns can disrupt or degrade travel corridors. Mineral exploration and recreational activities can also have negative impacts.

The LRMP objective to "Manage alpine habitats and adjacent areas to maintain mountain goat populations" is supported by several strategies such as completing habitat mapping, identifying critical habitats (licks, birthing areas) and movement corridors, and

²⁴Complexes of three or more wetlands greater than 1 ha each in size where management zones are coincident or overlap are upgraded to W1's and given greater protection under the FPC.

developing access management plans. It is anticipated that the mountain goat population will remain stable and healthy with the application of LRMP strategies, in contrast to the Base Case where the risk of long-term declines is significantly higher.

5.3.4 Deer

Both white-tailed and mule deer occur within the Plan Area, largely as a result of the continued expansion of settlement and agriculture areas. White-tailed deer are strongly associated with agricultural areas and occur in such low numbers that major crashes occur during severe winters. Mule deer are generally better adapted to survive the harsh winters, occur in greater numbers, and utilize natural habitats to a greater extent than white-tailed deer.

Critical winter range for mule deer is largely associated with steep south-facing slopes where the snowpack is typically lower and greater and more accessible (in winter) forage is found. South-facing aspects with veteran Douglas-fir are of the highest value due to the greater snow interception, which facilitates movement and increasing access to forage. Important south-facing slopes were identified on Habitat Feature mapping produced for use by working group members and provides a means to evaluate prospective impacts or benefits associated with the Base Case and LRMP scenarios.

Important south-facing slopes identified in Habitat Feature mapping comprises 2.0% of the GLB. The LRMP places a greater proportion of south-facing slopes in PPAs (25.4%) and Special Management RMZs (10.5%) relative to the Base Case (22.5% and 6.7%, respectively). The LRMP scenario provides a greater level of protection for critical winter range.

LRMP defined general management objectives and strategies provide direction towards maintaining important deer habitats through further mapping, the maintenance of Douglas-fir habitats and vegetation management, which are incrementally more beneficial than the Base Case.

6.0 Fisheries

6.1 Fisheries Management and Supporting Programs

Recent and more frequent collapses of commercial salmon stocks are a result of the cumulative impacts of decades of over-fishing, ocean survival and impacts to salmon spawning and rearing habitats. Several relevant government initiatives have been developed in order to improve protection of fisheries resources as well as to identify and restore impacted fish habitats. The LRMP process is intended to provide higher level direction to these programs (described below), which it does through direct reference or coincidental use of equivalent or incremental objectives and strategies.

The protection of environmental resource values, including fish and fish habitat, is a stated objective of the *Forest Practices Code of British Columbia Act* (FPC) introduced

in 1995. Relevant components of the FPC and associated guidebooks provide increased protection for fisheries resources through the establishment of riparian reserve and management zones, fisheries sensitive zones, stream crossing and road deactivation requirements, and watershed assessments.

Forest Renewal British Columbia (FRBC) is a recently established (1994) crown corporation that is primarily funded by increased stumpage fees. One of FRBC's fundamental objectives is to increase the productive capacity and environmental values of forest lands. FRBC provides funding for enhanced forestry work as well as environmental programs such as the Watershed Restoration Program (WRP) and baseline fisheries inventories.

Watershed assessment procedures developed for the FPC have become an essential analytical tool for evaluating the cumulative effects of development activities on the natural hydrologic and sediment transport regimes of rivers throughout the Province. Watershed assessments provide a framework to evaluate the development status of watersheds and considers many variables such as terrain sensitivity, roads, and equivalent clearcut area²⁵.

The Department of Fisheries and Oceans (DFO) and Ministry of Environment, Lands and Parks (MoELP) play an active role in the day to day management of fish and fish habitat. The DFO offices in Prince George (DFO 1995) and Smithers (DFO 1997) produced equivalent reports for their respective portions of the Fraser and Skeena watersheds occurring within the Plan Area for use by LRMP working group members, although the Skeena report was not available for use until late in the process. These reports summarize the available salmon resource information including featured species, biophysical conditions, development activity and levels of concern for each identified planning unit. Each planning unit is classified according to the sensitivities and level of management required to maintain fisheries values. The reports also provide management objectives and strategies for each planning unit, which are generally more comprehensive than the LRMP strategies. Although the application of both DFO and LRMP objectives and strategies would provide a high level of protection for fisheries values, the link between the two documents is indefinite and, from a DFO perspective, less effective.

MoELP manages resident fish species such as lake trout and rainbow trout as well as the anadromous steelhead. MoELP presently manages FRBC funded projects such as watershed assessments, habitat restoration, fish and fish habitat inventories. MoELP also manages the red-listed white sturgeon and Arctic grayling as well as the blue-listed bull trout. The interpretation and implementation of LRMP management objectives and strategies will involve both agencies.

²⁵"Equivalent Clearcut Area" is the proportional area of forest within a watershed unit that is at an equivalent state of hydrologic recovery as a recent clear-cut, which is determined by applying a reduction factor based on stand age to account for hydrologic recovery due to forest regeneration.

6.2 Stream Fisheries

Fish Units

In order to facilitate this assessment as well as to develop a management tool for use in future planning, the LRMP area was divided into 44 distinct watershed based Fisheries Planning Units (Fish Units) ranging in size from 14,000 to 159,000 ha in size, which were co-operatively defined by the MoELP and the DFO (Figure 9). Fish Units represent areas with similar topography, management concerns, and fish habitat values. The boundaries of Fish Units are watershed based, as are some other types of planning unit boundaries, which would facilitate management in the future.

Figure 9. Fort St. James Fish Habitat Units (in hard copy only)

Featured Species

Fish Units sustain similar physical and biological attributes, which, in combination with the position in the watershed, largely determines the occurrence and proportional abundance of fish species present. Physical features such as stream size and discharge volume, stream gradient, confinement and channel pattern affect fish species distribution and abundance.

The fish species featured in this portion of the analysis are primarily of commercial and game-fishing value and include sockeye salmon, chinook salmon, coho salmon, chum salmon, kokanee salmon, Arctic grayling, bull trout, steelhead and rainbow trout. White sturgeon are included due to their red-listed status.

Arctic grayling (red-listed) and bull trout (blue-listed) are appropriate indicator species as they are sensitive to changes in water quality and are susceptible to declines as a result of fishing pressure within the LRMP area. Arctic grayling are only found in the Omineca and Nation watersheds and bull trout are widely distributed. Both species have suffered declines throughout their respective ranges as a result of fishing pressure and impacts to habitats.

Grayling tend to occur in river mainstems and are particularly susceptible to cumulative watershed impacts and loss of habitat complexity associated with increased peak flows and channel scour resulting from increased rates of snowmelt and surface runoff in watersheds with a high rate of timber harvesting. Large bull trout are particularly susceptible to fishing mortality at creek mouths within, and at the outlet of lakes (i.e. Stuart Lake) and juveniles are susceptible to habitat impacts in the steep mountain streams where they rear. Bull trout are the dominant, and often the only species occurring in the headwater tributaries in mountainous areas where the terrain sensitivity and potential for habitat impacts associated with road development and timber harvesting is typically high. Salmon and trout are also sensitive to changes in habitat and water quality but are less specialized in their habitat requirements than grayling and bull trout.

The population size and status is largely unknown for white sturgeon occurring within the Plan Area. Sturgeon are known to occur within the Stuart, Tachie and Middle rivers as well as Stuart, Trembleur and Takla lakes. Although key habitats and sensitivities have yet to be identified, it can be assumed that white sturgeon are sensitive to cumulative watershed-level impacts to water quality. Ongoing research aimed at determining the present status of white sturgeon throughout the Fraser Basin will provide direction for future management.

Fisheries Analysis

The assessment of potential fisheries impacts is constrained by the lack of fish and fish habitat information for most watersheds. The types and intensity of resource development activities within Fish Units provides an indirect measure of potential impacts to fish habitat. The major underlying assumption in this portion of the analysis is based on the relationship of increasing equivalent clearcut area with increasing proportion of Resource Development within each Fish Unit, which approximates the potential impacts on stream fisheries values (Table 13).

| Table 13. Indicator, method and assumptions for fisheries impact assessment. | |
|---|--|
| Indicator | proportion of Fish Unit in PPAs, Special Management and Resource Development RMZs. |
| Method | Total the area in PPAs, Special Management and Resource Development for each Fish Unit. Use professional judgement to assign a value of -2, -1, 0, +1, +2 to each unit (-2 = strong negative impact, 0 = no impact, etc.). Consider existing levels of development, fish species and terrain sensitivity. |
| Assumptions | Some fish species are more sensitive to development than others. The risk of impacts to fish increases with increased levels of development: (Resource Development > Multi-Value > Special Management > Proposed Protected Area) Greater risks to fish in Resource Development RMZs are associated with: 1) greater road density and road life with fewer road deactivation opportunities 2) greater proportion of lands in an early or arrested state of hydrologic recovery 3) greater potential for cumulative watershed impacts 4) fewer opportunities for enhanced watershed management 5) fewer opportunities for enhanced riparian protection. |

The assessment of the relative magnitude and significance of the potential impacts on fisheries values requires professional judgment where future conditions such as harvest rates within sub-basins and road densities are difficult, if not impossible to predict relative to known fisheries values within management units. The scale used in assessing impacts is both subjective and relative. Weighting factors considered include: fish species sensitivities, fish use (spawning, rearing, migration), terrain sensitivity,

development activity, existing impacts and LRMP management objectives and strategies. The overall ranking of potential impacts expressed for each Fish Unit (Table 14) was derived through subjective analysis of all available information.

| Table 14. Assessment of impacts: Ranking value definitions. | |
|--|--|
| value | definition |
| +2 | significantly enhanced protection for fisheries values |
| +1 | moderately enhanced protection for fisheries values |
| 0 | no anticipated impacts or benefits to fisheries values |
| -1 | moderate impacts to fisheries values |
| -2 | significant impacts to fisheries values |

In general, significant impacts to fisheries values are anticipated with sustained TSR management, largely as a result of the large proportion of sensitive terrain in the central and northern portions of the Plan Area, and extensive contiguous areas of Resource Development in the southern portion of the Plan Area. Mitigating factors in the TSR are limited to areas with restrictions on timber harvesting associated with restrictive visual quality objectives (i.e. Stuart, Takla and Nation lakes), Local Resource Use Planning along the Sustut River (not completed), and the large proportion of forested and non-forested exclusions (largely inoperable and non-forested) in mountainous areas.

In general, the introduction of the Protected Areas Strategy and the FPC improve the outlook for fisheries values in the Base Case over TSR management. The primary components of the FPC that benefit fisheries values include watershed, terrain and site hazard assessments, riparian reserve and management zones, wildlife tree patch retention, soil conservation requirements and road construction, maintenance and deactivation requirements. Liabilities associated with meeting FPC requirements provide a measure of security for compliance. The Watershed Restoration Program, funded through Forest Renewal BC, has a significant potential to restore impacted fish habitats, however, the distribution and level of effort is unknown at this time.

Of the total 44 identified Fish Units, 10 have greater than 80% of the unit area occurring in Resource Development RMZs, 3 of which have 100% (Figure 10). All of these Fish Units occur in the plateau and foothill areas in the southern portion of the Plan Area where timber values are the greatest.

At the landscape level, the LRMP scenario reduces the proportion of the Gross Land Base in Resource Development RMZs from 88.3% (Base Case) to 30.7 % and provides management strategies and objectives that are specific to maintaining or enhancing fisheries values. This largely results in an improved outlook over the Base Case for 9 fisheries units; 32 remain the same, and 3 (Chuchi, Tchentlo north and Tchentlo south) are better protected in the Base Case as a result of the larger Nation PPA.

The potential aggregate impacts at the landscape level are minimized in the LRMP scenario, with an overall net benefit to fisheries values, in terms of the level of protection (Table 15). In total, the potential impacts to fisheries values sum to -55 under TSR management, +4 in the Base Case and +13 in the LRMP scenario.

Significantly enhanced protection for fisheries values (+2) is anticipated in only 1 Fish Unit (Cunningham) in both the Base Case and LRMP scenarios, which is largely attributable to the fact that greater than 50% of the unit area occurs within the Fleming PPA.

Although significant proportions of the Upper Sustut, Asitka/Willow, Bear Lake and Stuart River fish units occur within PPAs (24-42%), only minimal (0) to moderate (+1) protection for fisheries values are anticipated where high proportions of Resource Development in association with highly sensitive terrain and sensitive fish habitats are the main factors limiting prospective benefits in the long term.

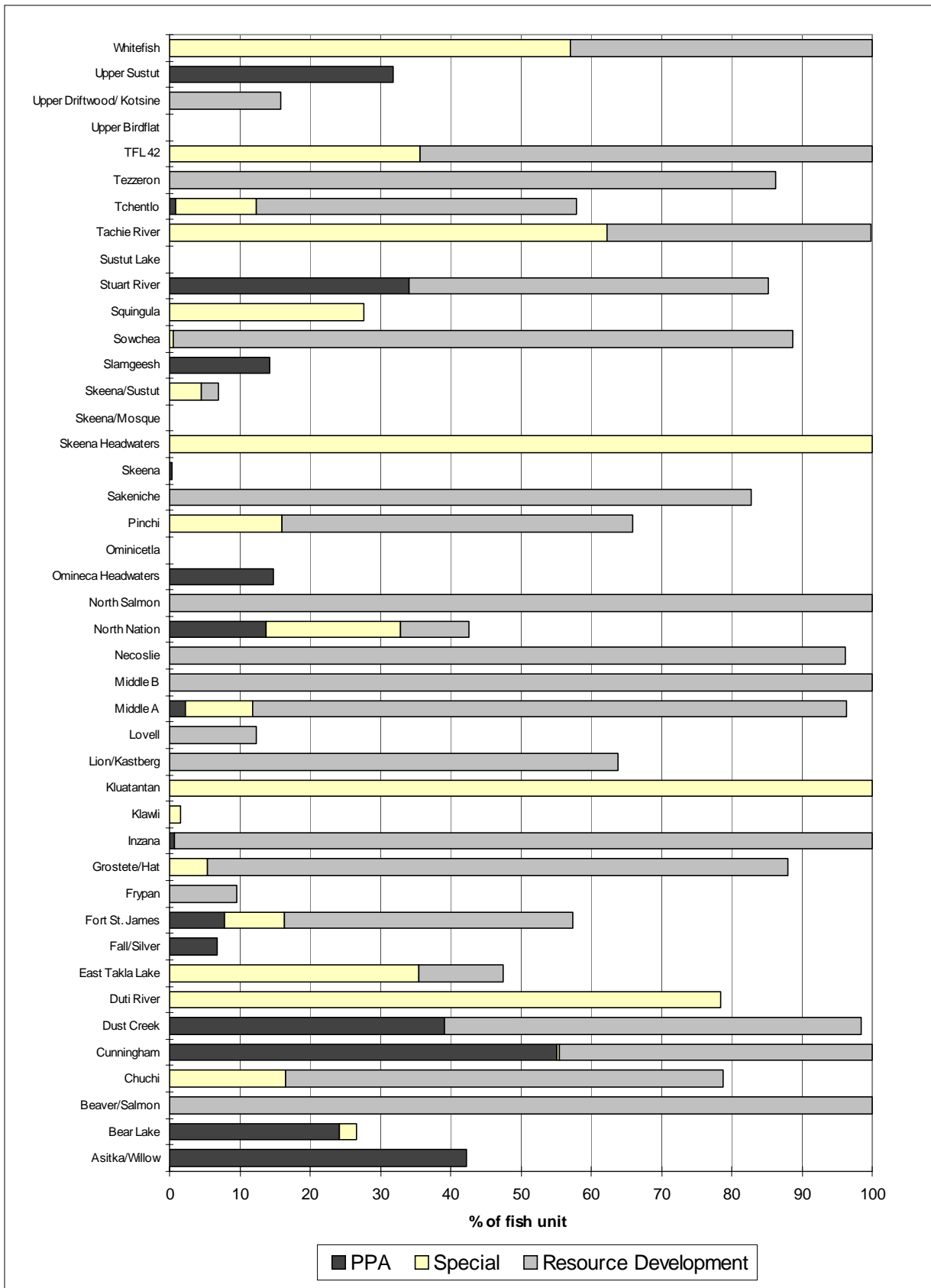


Figure 10. Distribution of resource development within fisheries units.

| Table 15. Fish Unit values, sensitivities and outlooks. | | | | | | | |
|--|-------------------------------------|-------------|------|-------------------|------------|-----------|------------|
| Fisheries Unit (% of GLB excl. large lakes) | Key Species (rivers and streams) | Sensitivity | | Impact Factors | Outlook | | |
| | | terrain | fish | | TSR | BC | LRMP |
| Whitefish (1.7) | RB | L | L | T | -1 | +1 | +1 |
| Upper Sustut (1.1) | SK, CH, CO, ST | H | H | T, L | -1 | -1 | +1 |
| Upper Driftwood/Kotsine (2.4) | SK, CH, KO, BT | M | H | T, L | -2 | -1 | -1 |
| Upper Birdflat (2.3) | CO, ST, BT | H | H | T, L | -1 | 0 | 0 |
| TFL 42 (1.3) | RB, KO | M | M | T | -1 | 0 | +1 |
| Tezzeron (3.0) | RB, KO | L | L | T | -1 | 0 | 0 |
| Tchentlo (north = 1.4) | RB | M | L | T, M | -1 | +1 | 0 |
| Tchentlo (south = 1.6) | RB | M | L | T, M | -1 | +1 | 0 |
| Tachie River (0.4) | WS, SK, CH, KO | L | H | T, L | -1 | 0 | +1 |
| Sustut Lake (1.7) | SK, CH, CO, ST | H | H | T, L | -1 | 0 | 0 |
| Stuart River (0.5) | WS, SK, BT, CH | L | H | T, L | -1 | +1 | +1 |
| Squingula (2.2) | SK, CO, BT, RB | H | H | T, L | -1 | 0 | +1 |
| Sowchea (1.4) | RB, SK | L | L | T, M | -1 | 0 | 0 |
| Slamgeesh (1.7) | SK, CH, CO, PK | H | H | T, L | -2 | +1 | +1 |
| Skeena (2.7) | ST, CH, SK, CO, PK, CM | H | H | T, L | -2 | 0 | 0 |
| Skeena/Sustut (3.0) | ST, CH, SK, CO, PK, CM | H | H | T, L | -1 | 0 | +1 |
| Skeena/Mosque (3.1) | ST, CH, SK, CO, PK, CM | H | H | T, L | -1 | 0 | 0 |
| Skeena Headwaters (2.8) | CH, CO, ST, BT | M | M | T, L, M | -1 | 0 | +1 |
| Sakenichie (1.2) | SK, KO, RB, BT | M | M | T | -1 | 0 | 0 |
| Pinchi (2.9) | RB, SK, CH, KO | L | L | T | -1 | 0 | 0 |
| Ominicetla (3.8) | GR, BT, RB | H | H | T, L | -2 | -1 | -1 |
| Omineca Headwaters (2.9) | BT | H | M | T, L, M | -1 | +1 | +1 |
| North Salmon (1.7) | CH, RB | M | M | T | -1 | -1 | -1 |
| North Nation (3.8) | RB | M | M | T, M | -1 | +1 | +1 |
| Necoslie (1.4) | RB | L | L | A, T | -1 | 0 | 0 |
| Middle B (1.7) | WS, SK, CH, KO, RB, BT | M | L | T, L | -1 | 0 | 0 |
| Middle A (1.4) | WS, SK, CH, KO | H | H | T, L | -2 | 0 | 0 |
| Lovell (1.2) | SK, KO, BT | M | M | T, L | -1 | 0 | 0 |
| Lion/Kastberg (3.1) | SK, BT, KO | M | H | T, L | -2 | 0 | 0 |
| Kluatantan (2.0) | SK, CO, BT, RB, ST | M | L | L, M | 0 | +1 | +1 |
| Klawli (1.6) | BT, RB | M | L | T | -1 | 0 | 0 |
| Inzana (1.3) | RB | L | L | T | -1 | 0 | 0 |
| Grostete/Hat (3.0) | SK, CH | L | M | T, L | -1 | 0 | 0 |
| Frypan (1.6) | SK, KO, BT | M | H | T, L | -2 | 0 | 0 |
| Fort St. James (0.8) | RB | L | L | T, L, S, A | -1 | 0 | 0 |
| Fall/Silver (3.3) | GR, RB | H | H | T, L, M | -1 | 0 | 0 |
| East Takla Lake (2.5) | SK, BT, KO | M | M | T, L | -2 | -1 | +1 |
| Duti River (5.0) | ST, RB, CO, DV | H | H | L | -1 | 0 | +1 |
| Dust Creek (1.9) | SK, RB, KO | M | H | T, L | -2 | -1 | -1 |
| Cunnigham (2.3) | SK, BT | H | M | T, L | -2 | +2 | +2 |
| Chuchi (3.4) | GR, RB | M | H | T, M | -2 | +1 | 0 |
| Beaver/Salmon (3.6) | CH, RB | L | M | T | -1 | 0 | 0 |
| Bear Lake (1.4) | CH, SK, PK, CO, ST | H | H | L | -1 | 0 | 0 |
| Asitka/Willow (3.0) | SK, CO, ST, BT, RB | M | M | T, L, M | -2 | -1 | +1 |
| Total | | | | | -55 | +4 | +13 |

Fish: WS- white sturgeon, PK- pink salmon, SK- sockeye salmon, CH- chinook salmon, CO- coho salmon, CM- chum salmon, KO- kokanee, GR- grayling, BT- bull trout, ST- steelhead, RB- rainbow

Sensitivity: L-low, M-moderate, H-high. Terrain-sensitivity to disturbance. Fish-species sensitivity and stock value

Impact factors: T - timber, L - linear (roads, pipelines, etc), A - agriculture, S - settlement, M - mining

Significant impacts (-2) are not anticipated in any Fish Units in either the Base Case or LRMP scenarios, in contrast to significant (-2) impacts anticipated in 12 Fish Units and moderate (-1) impacts in the remaining units except for one (Kluatantan), in the TSR scenario.

The LRMP scenario does not change the outlook within 4 fisheries units where moderate impacts (-1) to fisheries values are anticipated to be maintained from the Base Case. Moderate impacts (-1) in the North Salmon fish unit are largely associated with high existing levels of development, combined with significant existing impacts, the occurrence of sensitive fish species (chinook, sockeye, kokanee) and the lack of mitigating factors. The anticipated moderate impacts (-1) in the Dust Creek, Ominicetla and Upper Driftwood/Kotsine fish units are largely associated with sustained (long-term) high levels of harvest and major road development in close association with sensitive terrain and important habitats for sensitive species (sockeye, kokanee, grayling, bull trout). Although nearly 40% of the Dust Creek fish unit occurs within the Mt. Blanchet PPA, the highest fish values occur within the Resource Development portion of the unit.

The salmon resource analysis reports produced by DFO for the Fraser (1995) and Skeena (1997) portions of the Plan Area contain prioritized lists of Watershed Planning Units²⁶ requiring further assessment where high levels of concern associated with sensitive biophysical features, fish species and habitats were identified. The Skeena report identified one third of the watershed as requiring an *Enhanced*²⁷ level of management including 5 of the 13 identified planning units in the Skeena portion of the Plan Area. Nine of the 16 planning units in the Fraser portion of the Plan Area are identified as requiring an *Enhanced* level of management.

The watershed planning units (DFO) with the greatest biophysical sensitivity in the Fraser Basin portion of the LRMP area are consistent with the Beaver/Salmon, Fleming, Middle A, East Takla Lake, Frypan, Dust, Upper Driftwood/Kotsine and Lion/Kastberg Fish Units. The Upper Driftwood/Kotsine and Lion/Kastberg Fish Units are equivalent to the Driftwood watershed planning unit (DFO), which is identified as having the highest priority for additional assessments due to the high biophysical sensitivity and development pressures. Concern for impacts to sockeye and chinook salmon spawning habitats are associated with sustained high levels of resource development and terrain sensitivity (steep valley walls and lacustrine sediments). A major transportation corridor (including BC Rail) and an extensive (and growing) road network associated with timber harvesting occur in the valley bottom along the Driftwood River.

The Upper Driftwood/Kotsine and Lion/Kastberg Fish Units are comprised of Resource Development and Multi-Value in both the Base Case and LRMP scenarios. The more

²⁶ Watershed Planning Units are similar in nature, but generally larger than the Fish Units used in this analysis.

²⁷ All watersheds classified as requiring an "Enhanced" level of management indicated a high level of concern for biophysical conditions related to sensitive terrain features in conjunction with a high level of concern for forestry or linear developments and require additional inventories and planning.

sensitive terrain, sustained development pressures and a lack of mitigating factors result in moderate potential for impacts (-1) to fish in the Upper Driftwood/Kotsine Fish Unit in both the Base Case and LRMP scenarios. The LRMP recommendation to consider designating the lower portion of the Driftwood River within the Lion/Kastberg Fish Unit as a Sensitive Area under the FPC may lead to incrementally greater protection for fisheries values relative to the Base Case, although the overall outlook is for no significant impacts or benefits to fish in both scenarios.

Portions of the Skeena watershed occurring within the Plan Area are characterized by steep, mountainous terrain, with the highest fisheries values occurring along the valley bottoms, which increases the management concern with respect to road development and high equivalent clearcut areas, particularly at higher elevations where sensitive bull trout habitats are at moderate risk of impact. The watershed planning units (DFO) in the Skeena portion of the LRMP area with the greatest biophysical sensitivity include the Sustut River, Sustut Lake, Bear River and Bear Lake. These two watersheds support unique and significant stocks of salmon and steelhead and both have sensitive terrain features.

LRMP strategies for the Lower Sustut RMZ to design of a zone along the lower Sustut and Bear rivers that is to be reserved from resource extraction in order to maintain a remote recreational wilderness experience associated with a world class fishery, core high value habitats for chinook salmon and steelhead, and key wildlife habitats reduce the risk of impacts to fish. These strategies are supported by the "no net loss of fisheries habitat" management intent and sediment control strategies in the Sustut RMZ, which encompasses the Lower Sustut RMZ. The larger Upper Sustut-Thumb PPA in the LRMP scenario results in moderate (+1) anticipated protection for fisheries values in the Upper Sustut and Asitka/Willow Fish Units, relative to moderate anticipated impacts (-1) in both in the Base Case.

6.2.1 Arctic Grayling

Arctic grayling are a featured species of interest within the Plan Area due to the high level of concern associated with significant declines in numbers within the past decade at the watershed level, as well as for their high recreational values. Low grayling densities, low juvenile survivorship and the susceptibility to angling pressure increases the vulnerability to further declines. The recent upgrade to red-listed status for Arctic grayling has raised the profile of this species, which has resulted in greater effort in conducting inventories and assessments within the Prince George Region, particularly the Williston Watershed.

Within the LRMP area, Arctic grayling are only found in the Omineca River and the Nation River downstream of Chuchi Lake. Although the numbers of grayling within the Plan Area are believed to be stable, the total populations in these systems appear to be depressed at the watershed level. Cumulative impacts associated with the construction of the Williston Reservoir and increased access for timber harvesting are considered to be

the likely causes. Grayling are featured species in only 3 Fish Units (Chuchi, Fall/Silver and Ominicetla).

The Ominicetla and Fall/Silver Fish Units predominantly occur within Multi-Value RMZs and the Chuchi Fish Unit is largely comprised of Resource Development (62%) and Multi-Value (21%) RMZs in the LRMP scenario.

Within the Chuchi Fish Unit, the portion of the Nation River utilized by Arctic grayling is naturally buffered by extensive linear wetland bordering the channel, low potential for increased access, and stable flows maintained by large lakes immediately upstream.

Overall, no significant impacts or benefits to fisheries values are anticipated in the Fall/Silver or Chuchi fish units either the Base Case or LRMP scenarios, relative to moderate (-1) to significant (-2) impacts under TSR management, however a moderate risk of impacts to Arctic grayling stocks is maintained in the Base Case and LRMP scenarios in the Fall/Silver fish unit as a result of cumulative impacts associated with high levels of resource development, sensitivity to changes in habitat quality, and the increased vulnerability of declining stocks.

Highly sensitive terrain and fish species (grayling, bull trout) and the cumulative effects of sustained development are anticipated to result in moderate impacts (-1) to fisheries values in the Ominicetla Fish Unit, particularly Arctic grayling stocks.

Relevant LRMP general management objectives and strategies include conducting research, inventories and mapping in order to develop management strategies that would be applicable at the site-specific level with the goal of enhancing populations of red-listed and blue-listed species. Moderate risks to grayling stocks and important habitats will persist in the absence of a comprehensive management plan.

Although it is difficult to assess the potential for recovery, a sustained catch-and-release policy, area closures, increased inventory and assessment, access management planning, the use of optimal stream crossing structures, guide participation, and habitat restoration would be essential management tools.

6.2.2 Bull Trout

Bull trout are widely distributed within the LRMP area and are featured species in 17 of the 44 identified Fish Units. Bull trout occur on the provincial blue-list as a result of significant declines in stocks throughout their range, which has largely been attributed to impacts associated with increasing resource development activity. The typically low densities of bull trout, low reproductive capacity, susceptibility to angling pressure and sensitivity to changes in water quality support listing bull trout as a vulnerable (blue-listed) species. The increased awareness of declining populations of bull trout has led to increased levels of inventory, research and management considerations, which are an indication that increased protection (where possible) may be forthcoming.

High value bull trout habitats are typically found in the middle to upper portions of river watersheds. Juvenile bull trout utilize all accessible and suitable portions of streams up to the highest elevations. Bull trout spawning areas are frequently associated with groundwater seepage areas and are often found in subalpine to alpine elevations in association with low-gradient stream reaches within broadly U-shaped valleys and occasionally large bowl areas at the heads of valleys.

Road development, surface erosion and slope failures are major concerns in mountainous portions of the Plan Area, which are characterized by a prevalence of steep-walled valleys with sensitive terrain and soil features. High value bull trout habitats frequently occur within narrow valley bottoms where steep terrain limits road alignment options and increases the risk of impacts, primarily increased sediment entrainment. Even minor increases in the proportion of fine sediments in bull trout spawning gravels significantly reduces egg survival (Baxter and McPhail 1994).

No significant impacts (-2) to fisheries values are anticipated in either the Base Case or LRMP scenarios for Fish Units featuring bull trout, relative to moderate (-1) to significant (-2) impacts anticipated for all Fish Units (except the Kluatantan) under TSR management, however a moderate risk of impacts to bull trout stocks is maintained in the Base Case and LRMP scenarios as a result of the large proportion of bull trout habitats occurring in mountainous areas, high sensitivity to changes in habitat and water quality, and vulnerability due to low or declining stocks.

A greater proportion of known (incomplete) bull trout habitats occur in PPAs in the Base Case (11.3%) relative to the LRMP scenario (5.2%). Relevant LRMP general management objectives and strategies with potential to mitigate impacts include conducting research, inventories and mapping in order to develop management strategies that would be applicable at the site-specific level with the goal of enhancing populations of red-listed and blue-listed species. The potential effectiveness of management strategies are limited where terrain hazards are high. Some level of impacts will occur within many fish units featuring bull trout.

Bull trout are particularly susceptible to fishing pressure, which is associated with access. LRMP recommendations for access management planning associated with maintaining lake trout populations and important wildlife habitats may benefit bull trout in some areas.

6.2.3 White Sturgeon

White sturgeon are known to occur in the Stuart, Tachie and Middle rivers as well as Stuart, Trembleur and Takla lakes. Recent research indicates that the Stuart River is most likely a spawning system. Large pool habitats in the mainstems of large rivers have been found to provide critical overwintering sites and often sustain many adults. The process of identifying and protecting these critical habitats has begun but will not likely be completed with the present allocated funding.

In general, the introduction of the FPC, FRBC and other recent government initiatives reduce the risk of significant impacts to white sturgeon habitat through the establishment of riparian reserve and management zones, and by funding watershed assessments and fisheries inventory work.

It is unknown whether additional funding to continue inventory and assessment work would be available in the absence of a land use plan, however, the LRMP general management direction includes strategies to identify and map red-listed and blue-listed species and develop management plans to maintain and monitor at-risk species and habitats, which would require additional research effort. Thus, the LRMP scenario increases the chances that a management plan for white sturgeon will be developed.

6.3 Lake Fisheries

An assessment of potential impacts to fisheries values is difficult to achieve where fishing pressure generally has a greater overall impact on fish populations in lakes than adjacent land use activities. Over time, as access is provided to more lakes through block roads associated with timber harvesting adjacent to lakes, fishing pressure increases and results in impacts to lake resident fish populations. Lake trout and bull trout are particularly sensitive to angling pressure and have a long recovery period relative to other species such as rainbow trout. The application of the FPC lake classification and associated shoreline reserve zones will only help to prevent access to within 200 m of Class A lakes where access restrictions are not in place. Opportunities for increased shoreline reserve zones and access restrictions are greater in PPAs and Special Management RMZs. Therefore, the incremental difference in the proportion of lake trout lakes in low intensity resource development and Protected Areas should provide a reasonable (general) measure of the difference between the Base Case and the LRMP scenarios.

A greater proportion of lake trout habitat occurs in PPAs in the Base Case (11.4%) relative to the LRMP scenario (4.9%). This is largely due to the larger Nation PPA in the Base Case, which encompassed three lake trout lakes (Chuchi, Tchentlo and Witch) that are contained within the Lower Nation Special Management RMZ in the LRMP scenario. LRMP strategies to coordinate planning to establish restrictive visual quality objectives along the river and lake corridors that comprise the Nation Lakes Chain canoe route and to minimize further improvements to lakeshore access are mitigating factors.

Lake trout are featured in the LRMP general management objectives and strategies, which endorse the designation of sensitive or unique fish stocks as "regionally important fish" and recommend the development of management strategies to conserve habitats for "regionally important fish", which will likely include most populations of lake trout. The development of an effective management plan will likely include supplementing existing fishing regulations with the establishment of protective measures such as access management, catch-and-release fisheries or fishing closures. In the absence of such management plans, it is inappropriate to comment on prospective outcomes.

LRMP strategies recommend coordinated access management planning in many RMZs in order to protect wildlife, recreation and fisheries values, which may result in a greater level protection for sensitive lake resident fish populations.

Kokanee salmon are a highly valued sportfish within the Plan Area and are susceptible to declines as a result of over-fishing. Most kokanee occur in large lakes (i.e. Stuart, Takla) where existing access limits protective measures to fishing regulations. Kokanee are tributary spawners and are expected to benefit from FPC riparian reserve and management zones, which function to provide increased protection in the form of temperature regulation and sediment control.

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APPENDIX 1: GLOSSARY OF TERMS IN ENVIRONMENTAL ASSESSMENT

Anadromous: Fish that breed in fresh water but live their adult lives in the sea. On the Pacific coast, anadromous fish include all the Pacific salmon, steelhead trout, some cutthroat trout and Dolly Varden char, lampreys and eulachons.

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 processes that link them.

Biogeoclimatic Classification System: A hierarchical system of ecological classification combining 3 classification themes: climatic, vegetation and site by utilizing climate, and vegetation/soils data to produce a classification of ecosystems at regional to local levels.

Biogeoclimatic Unit: Named units in this hierarchical classification of ecosystems represent unique combinations of climate and flora at regional to local levels. The main divisions in the hierarchy of ecosystem classification at the regional level are:

Zones - broad regional macroclimate and vegetation, e.g. Sub-Boreal Spruce Zone (SBS)

Subzones - regional climate/vegetation assemblages, e.g. Dry Warm Subzone - (SBSdw)

Subzone Variants - sub-regional climate, e.g. Stuart Variant (SBSdw3)

and at the local level are:

Site Series Units, i.e. sites with similar soil nutrient and moisture regimes that would support the same climax plant species association within sub-regional areas. Each site series unit is named using the dominant vegetation, e.g. Hybrid Spruce/Douglas Fir - Pinegrass (SBSdw3/01).

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 decline by their habitat or other requirements are such that they are sensitive to further disturbance. The blue-list also includes species that are generally suspected of being vulnerable, but existing information is inadequate to determine their status.

Browse: Shrubs, trees and herbs that provide food for wildlife.

Buffer Strip: A strip of land (often including undisturbed vegetation) where disturbance is not allowed or is closely regulated in order to preserve or enhance aesthetic values, fish or wildlife habitats along or adjacent to roads, trails, watercourses and recreation sites.

Capability Mapping: An interpretation of the level of capability of an area to provide optimal conditions for a given species, usually represented as High, Medium and Low.

Typically based on climate and broad vegetation patterns. The present habitat condition or successional stage is not considered.

Carrying Capacity: The maximum number of a given species that can be sustained within a given area through the least favourable conditions that will occur in a set amount of time. It is a function of numerous variables such as habitat quantity, quality, composition, species interactions management goals, and management intensity.

Clearcut: An area of forest land from which all merchantable trees have been recently harvested.

Coarse Woody Debris: Sound and rotting logs/stumps in a terrestrial environment that provide habitat for plants, animals, and insects, as well as nutrients for soil development.

Critical Wildlife Habitat: Part or all of a specific area occupied by a wildlife species or a population of such species and recognized as being essential for the maintenance of all or part of the population.

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

Deciduous: Term applied to trees, commonly broadleaf that usually shed their leaves annually. Also known commercially as "hardwoods".

Ecoregion Classification: The ecoregion classification system is used to stratify BC's unique terrestrial and marine ecosystems into discrete geographical units at five different levels. The two highest levels, Ecodomains and Ecodivisions, are very broad and place BC globally. The three lowest levels, Ecoprovinces, Ecoregions and Ecosections, describe progressively smaller areas of the Province with similar terrain, climate, vegetation and wildlife potential.

Ecosection: The finest level in the hierarchy of the Ecoregional Classification System, which describe areas with minor physiographic, climatic and oceanographic differences. Each ecosection has a unique subset of biogeoclimatic sub-zones and are at a level sufficient to capture the ranges of sub-populations of larger wildlife species.

Ecosystem: A functional unit consisting of all living organisms (plants, animals, and microbes) in a given area, together with the non-living physical and chemical features of their environment, which are inter-connected through nutrient cycling and energy flow. An ecosystem can be of any size - a log, pond, field, forest or the earth's biosphere. Ecosystems are commonly described according to the major type of vegetation, for example, forest ecosystem, old-growth ecosystem, or range ecosystem.

Ecosystem Integrity: The soundness or wholeness of the processes and organisms composing the ecosystem.

Ecosystem Management: A management practice and philosophy aimed at maintaining or enhancing the ecological integrity of an ecosystem in order to ensure continued ecosystem health while providing resources, products or non-consumptive values for people.

Ecotone: A transition area between two adjacent ecological communities that usually exhibits features that are intermediate between them, often with greater values than either adjacent community in isolation.

Edge: The point where two dissimilar plant communities (different vegetation types, successional stages) meet. The two main types are Inherent (soil, topography) and Induced (human).

Edge Effect: The effects caused by the penetration of light, wind or humidity into the forest interior from an adjacent open area.

Environmentally Sensitive Areas (ESA): Areas requiring special management attention to protect important scenic values, fish and wildlife resources, historical and cultural values, and other natural systems or processes. ESAs for forestry include potentially fragile, unstable soils that may deteriorate unacceptably after forest harvesting, and areas of high value to non-timber resources such as fisheries, wildlife, water, and recreation.

Equivalent Clearcut Area: The proportional area of forest within a watershed unit that is at an equivalent state of hydrologic recovery as a recent clear-cut, which is determined by applying a reduction factor based on stand age to account for hydrologic recovery due to forest regeneration.

Fisheries Sensitive Zone: Aquatic and riparian environments deemed important for the life history of fish. They may include side channels, flood channels, oxbows, wetlands, seasonally flooded depressions, lake littoral zones and spawning areas.

Forest Ecosystem Network (FEN): A planned landscape zone that serves to maintain or restore the natural connectivity within a landscape unit in an effort to meet the needs of native species and ecological processes. A forest ecosystem network consists of a variety of fully protected areas, sensitive areas, classified areas, and old-growth management areas.

Genetic Diversity: Variation among and within a species that is attributed to differences in number and relative abundance of alleles. The three basic levels are 1) within a breeding population, 2) between breeding populations and 3) within a species.

Habitat: The specific environmental conditions under which an organism lives, which is usually determined by the presence and relative abundance of a particular subset of dominant features (vegetation, water) on which it thrives.

Habitat Management: The manipulation of forest conditions to meet a desired set of criteria in order to create or maintain environments that will provide habitats (food, shelter) to meet the needs of a particular species or groups of species.

Inoperable Lands: Lands that are unsuitable for timber production now and in the foreseeable future by virtue of their: elevation; topography; inaccessible location; low value of timber; small size of timber stands; steep or unstable soils that cannot be harvested without serious and irreversible damage to the soil or water resources; or designation as parks, wilderness areas, or other uses incompatible with timber production.

Large Organic Debris (LOD): Entire trees or large pieces of trees in an aquatic environment. LOD functions to provide channel stability and increase substrate retention and habitat complexity in stream channels.

Movement Corridor: A band or strip of vegetation, usually older forest, which serves to connect larger areas of habitat on the landscape. Forest Ecosystem Networks (FEN) provide connectivity and permit the movement of plant and animal species between areas what would otherwise be isolated patches.

Natural Disturbance Type (NDT): Characterize areas with different cyclical natural disturbance regimes. These disturbances typically destroy mature forest and initiate secondary succession in a repeating cycle of forest regeneration. The disturbance agents are mostly wild fires, wind storms and to a lesser extent, insects and landslides. Five NDT's are identified within BC.

Non-Timber Resource Values: Values within the forest other than timber which include but are not limited to biological diversity, fisheries, wildlife, water quality and quantity, recreation and tourism, cultural and heritage values, and wilderness and aesthetic values.

Old Growth Forest: Several definitions are possible depending on the forest type and natural disturbance regime. Typical characteristics include: 1) moderate to high canopy closure, 2) a multi-layered, multi-species canopy, 3) a wide range in tree ages and sizes (including very large), 4) presence of large diameter standing dead and down-and-dead trees, and 5) the occurrence of decadence in the form of broken branches, limbs or tops, which create a variety of canopy openings. The Biodiversity Guidebook identifies age class targets by Natural Disturbance Type for old growth.

Operable Forests: The portion of the productive forest that, under the current market conditions, can be harvested economically.

Protected Areas (PAs): Land/water set aside from development by legislation in order to protect representative examples of the Province's natural diversity and special features.

Red-listed species: Threatened or endangered species as identified by the Ministry of Environment, Land and Parks. The taxa on the red-list are 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 British Columbia if factors are not reversed.

Regionally Important Species: Species not red or blue listed but require management practices that differ from standard integrated resource management guidelines in order to fulfill critical habitat needs; or locally or regionally threatened or declining species or those that may reasonably be expected to decline without protection of key habitats.

Reserve: An area of forest land that, by law or policy, is not available for harvesting. Areas of land and water set aside for ecosystem protection, outdoor and tourism values, preservation or rare species, gene pool, wildlife protection etc.

Reserve Zone: The inner portion of a Riparian Management Area situated adjacent to a stream, lake, or wetland where timber harvesting is not permitted in order to conserve and maintain the productivity of aquatic and riparian ecosystems.

Riparian: An area of land immediately adjacent to a stream, river, lake or wetland that contains vegetation that, due to the presence of water, is distinctly different from the vegetation of adjacent upland areas.

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 time needed from regeneration of trees through to harvestable timber.

Sedimentation: The process of subsidence and deposition by gravity of suspended matter carried in water; usually the result of the reduction of water velocity below the point at which it can transport the material in suspended form.

Sensitive Areas: Small areas designated to protect important values during forest and range operations. These areas, established by the Ministry of Forests district manager in consultation with a designated BC Environment official, guide operations on a site-specific basis and require a combination of forest practices. Sensitive areas will be mapped by resource agencies, and include regionally significant recreation areas, scenic areas of high visual quality objectives, and forest ecosystem networks.

Sensitive Soils: Forest land areas that have a moderate to very high hazard for soil compaction, erosion, displacement, mass wasting or forest floor displacement.

Sensitive/Vulnerable Species: Species identified on the blue-list by BC Environment. Blue-listed species are considered to be vulnerable and "at risk" but not yet endangered or threatened. Populations of these species may not be declined by their habitat or other

requirements are such that they are sensitive to further 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.

Sensitive Watershed: A watershed that is used for domestic purposes or that has significant downstream fisheries values, and in which the quality of water resource is highly responsive to changes in the environment. Typically, such watersheds lack settlement ponds, are relatively small, are located on steep slopes, and have special concerns such as extreme risk of erosion.

Seral Stage: Any stage in the development of a plant community from a disturbed, unvegetated state to a climax forest.

Snag: Any standing dead, partially dead, or defective tree at least 3 metres tall that provides habitat for a wide range of birds, animals and insects.

Species at Risk:

- a) Any wildlife species that, in the opinion of the Deputy Minister of Environment, Lands and Parks or a person authorized by the Deputy Minister is threatened, endangered, sensitive or vulnerable.
- b) Any threatened and endangered plants or plant communities identified by the Deputy Minister of Environment, Lands and Parks or any person authorized by that Deputy Minister, as requiring protection and
- c) Regionally important wildlife as determined by the Deputy Minister of Environment, Lands and Parks or a person authorized by that Deputy Minister.

Stream: A watercourse, having an alluvial sediment bed, formed by flows on a perennial or intermittent basis between continuous definable banks.

Suitability Mapping: An interpretation of the suitability of an area or habitat type to provide the greatest potential to support a given species. The present habitat condition or successional stage is considered.

Threatened or Endangered Species: 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 British Columbia if factors are not reversed. Species identified the Conservation Data Center red-list are candidates for legal designation as Endangered or Threatened.

Threatened or Endangered Plant Communities: Biogeoclimatic ecosystem units listed on the Conservation Data Center red-list for various reasons such as: 1) they are rare on the natural landscape (e.g., floodplains), restricted to a specific geographic area or a particular type of local environment, or 2) were previously widespread or common but mature representative examples now occur over a much smaller area due to extensive

disturbance or complete alienation by intensive silvicultural practices, grazing by introduced species, land development, and conversion for agriculture.

Viability: The ability of a wildlife or plant population to maintain a sufficient size such that it persists over time despite natural fluctuations in numbers OR the ability of a habitat or complete ecosystem to remain useable by species or groups of species.

Watershed: An area of land that collects and discharges water into a single main stream through a series of smaller tributaries.

Watershed Assessment: A systematic evaluation of the present conditions within watersheds with respect to hydrology, terrain, channel features and sensitivities, cumulative impact of proposed development on peak flows, suspended sediments, bedload, and stream channel stability within a watershed.

Wetland: A general term used to describe areas of land that are inundated by surface or groundwater for a long enough period of time to support vegetation that is distinct from adjacent upland areas and require saturated or seasonally saturated soils. Typical wetland types include swamp, marsh, bog and fen.

Wilderness: An area of land generally greater than 1000 hectares that predominately retains its natural character and on which the impact of man is transitory and, in the long run, substantially unnoticeable.

Wildlife: Any species of bird, fish, mammal, amphibian and reptile found in the wild living unrestrained and free-roaming and not domesticated.

Wildlife Habitat: Areas of land/water that support specific wildlife or groups of wildlife.

Wildlife Habitat Feature: Defined in the *Forest Practices Code of British Columbia Act* Operational Planning Regulation as a significant mineral lick or wallow, an active nest of a bald eagle, osprey or great blue heron, or any other feature agreed to by the district manager and a designated environment official.

Wildlife Management: The application of scientific and technical principles to wildlife populations and habitats to maintain such populations (particularly mammals, birds and fish) essentially for recreational and/or scientific purposes.

APPENDIX 2: LIST OF ACRONYMS IN ENVIRONMENTAL ASSESSMENT

Biogeoclimatic Ecosystem Units:

| | |
|-----------------|---|
| AT: | Alpine Tundra |
| ESSFwk1: | Cariboo Wet Cool Engelmann Spruce - Subalpine Fir |
| ESSFwk2: | Misinchinka Wet Cool Engelmann Spruce - Subalpine Fir |
| ESSFwc2: | Northern Monashee Wet Cold Engelmann Spruce - Subalpine Fir |
| ESSFwc3: | Caribou Wet Cold Engelmann Spruce - Subalpine Fir |
| ESSFmm1: | Moist Mild Engelmann Spruce - Subalpine Fir |
| ESSFmv1: | Nechako Moist Very Cold Engelmann Spruce - Subalpine Fir |
| ESSFmv2: | BullMoose Moist Very Cold Engelmann Spruce - Subalpine Fir |
| ESSFmv3: | Omineca Moist Very Cold Engelmann Spruce - Subalpine Fir |
| ICHwk2: | Wet Cool Interior Cedar - Hemlock |
| ICHwk3: | Wet Cool Interior Cedar - Hemlock |
| ICHwk4: | Wet Cool Interior Cedar - Hemlock |
| ICHvk2: | Very Wet Cool Interior Cedar - Hemlock |
| SBSwk1: | Willow Wet Cool Sub-Boreal Spruce |
| SBSvk: | Very Wet Cool Sub-Boreal Spruce |
| SBPSdc: | Dry Cold Sub-Boreal Pine - Spruce |
| SBSdw1: | Dry Warm Sub-Boreal Spruce |
| SBSdw2: | Blackwater Dry Warm Sub-Boreal Spruce |
| SBSdw3: | Stuart Dry Warm Sub-Boreal Spruce |
| SBSmh: | Moist Hot Sub-Boreal Spruce |
| SBSmw: | Moist Warm Sub-Boreal Spruce |
| SBSmk1: | Mossvale Moist Cool Sub-Boreal Spruce |
| SBSmc2: | Babine Moist Cold Sub-Boreal Spruce |
| SBSmc3: | Kluskus Moist Cold Sub-Boreal Spruce |

Ecosections:

| | |
|-------------|----------------------|
| BAU: | Babine Upland |
| BOV: | Bowron Valley |
| CAM: | Cariboo Mountains |
| FRR: | Front Ranges |
| HAR: | Hart Ranges |
| MCP: | McGregor Plateau |
| NAU: | Nazko Upland |
| NEL: | Nechako Lowland |
| NPK: | Northern Park Ranges |
| QUL: | Quesnel Lowland |
| UFT: | Upper Fraser Trench |

Biophysical Habitat Classes:

| | |
|------------|---|
| AM: | Alpine Meadow |
| AT: | Alpine Tundra |
| AU: | Alpine Unvegetated |
| AV: | Avalanche Track |
| CF: | Cultivated Field |
| DF: | Interior Douglas-fir |
| DL: | Douglas-fir - Lodgepole Pine |
| EF: | Engelmann Spruce - Subalpine Fir |
| FP: | Engelmann Spruce - Subalpine Fir Dry Parkland |
| FS: | Fast Perennial Stream |
| GL: | Glacier |
| IR: | Interior Western Hemlock - Western Redcedar |
| IS: | Interior Western Hemlock - Subalpine Fir |
| LL: | Large Lake |
| LP: | Lodgepole Pine |
| LS: | Small Lake |
| RO: | Rock |
| RR: | Western Redcedar - Black Cottonwood |
| SB: | Subalpine Grassland |
| SF: | White Spruce - Subalpine Fir |
| SL: | Sub-boreal White Spruce - Lodgepole Pine |
| SM: | Subalpine Meadow |
| SP: | Slow Perennial Stream |
| SU: | Subalpine Shrub/Grassland |
| UR: | Urban |
| WL: | Wetland |
| WR: | White Spruce - Black Cottonwood |

Resource Analysis:

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|--------------|---|
| BCE: | BC Environment |
| DFO: | Department of Fisheries and Oceans |
| ESA: | Environmentally Sensitive Area |
| FEN: | Forest Ecosystem Network |
| FPC: | Forest Practices Code of British Columbia |
| GIS: | Geographic Information System |
| GLB: | Gross Land Base |
| MELP: | Ministry of Environment, Lands and Parks |
| MOF: | The Ministry of Forests |
| NDT: | Natural Disturbance Type |
| PPA: | Proposed Protected Area |
| RMZ: | Resource Management Zone |
| THLB: | Timber Harvesting Land Base |

