Nass Timber Supply Area
Timber Supply Review

Data Package

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1. Introduction

This data package outlines the basic information and assumptions that are required for the Nass Timber Supply Area (TSA) timber supply analysis.

The data package contains information on inputs that that represent current performance for the timber supply area. For the timber supply review, "current performance" can be defined by:

- the current forest management regime — the productive forest land available for timber harvesting, the silviculture treatments, the harvesting systems and the integrated resource management guidelines used in the area;
- the standards used to approve or reject forest development (5-year development) plans;
- fully implemented land-use plans;
- land-use decisions approved by Cabinet;
- approved higher level plans under the Forest Practices Code; and
- other approved B.C. Forest Service and joint agency forest management practices and policies.

The purpose of the timber supply review program is to model "what is" and not "what if." Changes in forest management objectives and data, when and if they occur, will be captured in future timber supply analyses.

Each section of this data package includes:

1) a short explanation of the information in the data table;
2) a data table; and
3) a discussion of data sources and other relevant information.

Throughout the data package we refer to species by names in common usage and abbreviations as defined under Forest Inventory Planning (FIP) protocol (*see Ministry of Forests 1992. Forest Inventory Manual. or http://www.for.gov.bc.ca/resinv/reports/Rdd/Rdd.htm*). Species may also be lumped into a general group name in which there may be one or more species considered (e.g., Balsam = Subalpine Fir and Amabalis Fir, Hemlock = Western Hemlock and Mountain Hemlock, Spruce = Engelmann Spruce, White Spruce, Sitka Spruce and Mixed Spruce Crosses, Deciduous = Aspen, Cottonwood, Birch and Alder).

This data package includes the best available knowledge and information at the time of publication, but is subject to change. A public review period has been established to allow submission of comment and concerns about the data package to the Ministry of Forests. Submissions and new information made available prior to the analysis may lead to changes in the data package. As noted in some sections, until the timber harvesting land base is determined during the timber supply analysis the values shown in some of the tables cannot be finalized. In some cases the criteria are shown but the final value is not yet filled in. In these cases the columns are shaded gray. Finally, if any major changes to management regimes occur over the next few months, attempts will be made to incorporate them into the timber supply analysis. The final timber supply analysis report will include a technical appendix that highlights any changes made to this package.

2. Current Forest Management Considerations and Issues

2.1 Base case management assumptions

The base case management assumptions reflect current performance with respect to the status of forest land, forest management practices and knowledge of timber growth and yield. A base case harvest forecast will be developed from these assumptions and will be used as a baseline reference. Section 7, "Sensitivity Analyses", identifies uncertainties with the data and assumptions, and outlines intended sensitivity analyses.

2.2 Major forest management considerations and issues

The table below lists the major forest management issues and considerations in the Nass TSA. Issues that are defined within legislation, regulations or standards, and can be represented in a computer model will be incorporated into the analysis. If there are important uncertainties in defining current management, critical issues analysis may be done. For example, proposed parks (i.e., not yet formally designated) would not be excluded from the timber harvesting land base; as such, a critical issues analysis would look at the impact of excluding these proposed parks. Also, it may be difficult to quantify some issues for modeling, in which case, sensitivity analysis may assist the Chief Forester in assessing the timber supply impacts and risks. For example, the potential timber supply impacts of uncertainties in the forest cover inventory can be examined through a sensitivity analysis in which predicted yields are increased and decreased.

Table 1. Major forest management considerations

Consideration/Issue	Description
Nisga'a Lands	The Nisga'a Treaty was fully ratified in April 2000. Lands identified in the Nisga'a Final Agreement are excluded from the Nass TSA in the base case of the timber supply analysis. (Section 5.2.1)
Upper Nass	The economic viability of Upper Nass harvesting operations is in question. Harvesting the wood profile in less remote areas of the TSA is costly and returns on investment are highly sensitive to market fluctuations. Funding of large infrastructure investments (roads and bridges) is uncertain. The base case will exclude marginally operable areas. The extent to which the Upper Nass is marginally operable is being examined. Physical operability within the Upper Nass was studied in 1997 using reconnaissance flight observations, air-photo interpretation and ground samples. The study re-mapped the physically operable area, resulting in a 62% increase in the estimate of the physically operable area. The District is re-examining this physical operability and will exclude the marginally operable areas. (Section 5.2.5)

(continued)

Table 1. Major forest management considerations (continued)

Cable harvesting	Operability lines within the Nass TSA recognize cable harvesting systems on steep and broken terrain within portions of the Nass TSA. To date, full employment of cable harvesting has not occurred (Section 5.2.5). A critical issues analysis considers excluding 20% of the cable harvesting operable zone.
Undercuts	Low log prices from 1996 to the present have resulted in harvesting costs in many areas exceeding revenues. Nass TSA licensees asked for and received consideration to be temporarily relieved from meeting annual cut control requirements. From 1996 to 1998, the average annual volume harvested was 46% (528,150 m^3) of the current AAC (1,150,000 m^3). Base case harvest flow projections, if possible, will be initiated from the current AAC level.
Hemlock looper infestation	A large area of old-growth hemlock has been killed as a result of attack by the hemlock looper. Harvesting has been directed towards salvaging value from these forests, but it will not be possible to salvage all killed trees. The volume of hemlock leading stands will be reduced to reflect the degree of attack in affected zones (Section 6.2).
Problem forest types	Some sites within the operable land base would be difficult to regenerate once harvested. Other sites are occupied by timber of sub-marginal merchantability. These sites are avoided during harvesting and will be excluded from the timber harvesting land base (Section 5.2.7).
Pine mushrooms	Pine mushrooms are considered economically significant but no forest management practices address pine mushroom habitat (Section 6.4.6). A critical issues analysis will considered maintaining prime mushroom producing areas (Section 7).
Landscape-level biodiversity	Landscape unit boundaries and biodiversity emphasis options have been defined but are in draft form. The draft boundaries will be used in the analysis but the emphasis options will be applied only as a critical issues analysis. The base case will incorporate weighted average requirements for old-seral forest cover that represent anticipated establishment of lower, intermediate and higher BEOs on 45%, 45% and 10% of the area, respectively (Section 6.4.3).
Nass TSA boundary changes	A provincial initiative to rationalize timber supply area (TSA) heights of land boundaries using MELP's watershed atlas boundaries is underway. New Nass TSA boundaries may occur during this timber supply review. These changes will not be incorporated into the analysis but will be considered through sensitivity analysis of land base changes (Section 7).

3. Inventories

3.1 Background information

Table 2 lists the inventories that will be used to define the timber harvesting land base, and to model forest management activities.

Table 2. Inventory information

Data	Source	Vintage	Update	Scale
Forest Cover	MoF standard inventory file			
Original Inventory		1973	Continuous from 1990+	1:20 000
Re-Inventory		1990	Continuous from 1990+	1:20 000
Environmentally sensitive areas	MoF standard inventory file	1973 and 1989	N/A	1:20 000
Operability				
Upper Nass	Sterling Wood Group	1997	N/A	1:20 000
Nass/Bell Irving Area	MoF standard inventory file	1989	N/A	1:20 000
Biogeoclimatic ecosystem classification	MoF standard inventory file	1988	N/A	1:50 000
Recreation inventory	MoF standard inventory file	1995	1998	1:50 000
Visual quality objectives	MoF standard inventory file	1995	1998	1:50 000
The following inventories are all Nass TSA non-standard inventory files				
Nisga'a Lands, as identified by Nisga'a Final Agreement map	MoF Aboriginal Affairs Branch	1998	N/A	1:20 000
Riparian buffer analysis	MoF District	1999	N/A	1:20 000
Draft landscape unit boundaries	MoF District	1999	N/A	1:20 000
Hemlock looper satellite image	MoF District	1997	1999	1:50 000
Balsam bark beetle satellite image	MoF District	1999	N/A	1:50 000
Pine mushroom inventory	MoF Region	1999	N/A	1:15 000

3. Inventories

Data Source and Comments:

Forest Cover Information
The first inventory of the Nass TSA was conducted in 1973. In 1990, a re-Inventory was conducted within the Nass and Bell Irving River systems, where current harvesting occurs. The only portion of the 1973 inventory that still applies is in the Upper Nass and inoperable areas west of Meziadin and Bowser Lakes.

Forest cover information describes the forest resources. Forest inventory polygons organize individual trees into homogenous groups (stands) based on tree species, age, height and density information. The Variable Density Yield Prediction (VDYP) model is used to predict volume (net decay) and diameters at current utilization levels using the stand height, age and density data identified in the forest cover inventory.

Environmentally Sensitive Areas
For further information, see Section 5.2.4.

Operability
For further information, see Section 5.2.5.

Recreation Inventory
The Nass TSA recreation inventory has three components: (1) The Recreation Feature Inventory (RFI); (2) The Visual Landscape Inventory (VLI); and (3) The Recreation Opportunity Spectrum (ROS).

The RFI provides both mapped and written information. It identifies recreation features (i.e., waterfalls, thermal springs, hiking trails) and describes their significance. The VLI identifies the visible portion the landscape from a particular viewpoint (community / recreation site) or travel corridor (highway / river). The visible landform is assessed for its diversity, uniqueness, presence of physical features, number of viewers, and expectation of viewers. The VLI also includes information on visual sensitivity and visual absorption capability that are useful when prescribing area specific Visual Quality Objectives (VQO). The ROS assists strategic planning initiatives that do not affect timber supply therefore the data package does not describe any ROS factors.

The recreation inventory was completed in 1995, with one minor update in 1998 (provincial recreation inventory rollover project). The District recently discovered that some of the recreation inventory has been deleted from the digital files (fc1). The magnitude of the problem is small, as the problem maps are located along adjacent District boundaries in remote locations with little recreation or VQO value.

Visual Quality Objectives
For further information, see Section 6.4.1

Riparian Buffer Maps
For further information, see Section 5.2.10

Hemlock Looper Satellite Image
For further information, see Section 6.2

Balsam Bark Beetle Satellite Image
For further information, see Section 6.2

Pine Mushroom Inventory
For further information, see Section 6.4.6

4. Division of the Area into Management Zones

4.1 Management zones, groups and multiple objectives

Management zones represent areas with distinct management emphasis. For example, a zone may be based on a harvesting system, silviculture system, visual quality objective or wildlife consideration. For simulation modeling, a ”grouping” function enables application of overlapping constraints. After assessing the inventory data and management regimes, the analysts will determine whether to put an objective into a group, or a non-overlapping zone.

Further information on the management requirements to be applied to these areas can be found in Section 6.2, “Unsalvaged losses” and Section 6.4, "Integrated resource management."

Table 3. Objectives and issues to be tracked

Objective / issue	Inventory Definition
Upper Nass timber supply contribution	Area identified in data file by variable ZONE="A"
Taylor River timber supply contribution by degree of hemlock looper attack:	Area identified in data file by variable ZONE="B"
High Attack Zone (B1)	B1 - Area within Zone B Mapsheet 104A027
Moderate / Low Attack Zone (B2)	B2 - Area within Zone B Mapsheets 104A037 and 104A038
Nil Attack Zone (B3)	B3 - All remaining Zone B area mapsheets
Kwinageese Hemlock looper zone timber supply contribution	Area identified in data file by variable ZONE="C"
Visual quality objectives (retention, partial retention, modification) by landscape unit	VQO objectives for retention, partial retention, and modification, as approved in the Recreation Inventory, are identified in forest cover inventory files and data file by variable VQO="2","3","4" respectively.
Old-seral forest retention by draft landscape unit	District draft landscape units as mapped and identified in data file by variable LU_NO
Integrated resource management green-up requirements	Timber harvesting land base by landscape unit.

Data Source and Comments:

See Section 3.1, “Background Information” for the sources of mapping and zones referenced above.

4. Division of the Area into Management Zones

4.2 Analysis Units

An analysis unit represents a combination of stands that grow or are treated similarly. In general each analysis unit is composed of groups of forest stands that have similar tree species composition (as indicated by the inventory type group), and similar timber growing capability (as indicated by the site index). Analysis units may be further split or grouped based on information on yield trajectories or modeling considerations.

The separation of analysis units into existing and managed stand analysis units is based on the influence of current management activities on stand development. Yield tables for existing natural stands are derived using the Variable Density Yield Projection (VDYP) growth and yield model. Yield tables for recent plantations and future stands are derived using the Table Interpolation Program for Stand Yields (TIPSY) model.

Existing natural stand analysis units may also be separated based on stand age into old and thrifty stands. This separation enables investigation of the effects of making adjustments to reflect an observed underestimation of site index in the forest inventory files for old-growth stands (e.g., old growth site index (OGSI) study results).

To explicitly account for reduced volume yields due to extensive pest damage for green-striped forest looper in the Taylor and Kwinageese River areas, and balsam bark beetle in the Upper Nass, separate pest analysis units have been created.

Managed stand analysis units are primarily separated by similar site index groupings as used for existing stands and by species composition. Existing managed stand analysis units have similar identifying characteristics as the existing natural stand analysis units. For yield curve determination, model inputs for existing managed stands are based on inventory stand information and model input for future analysis units is based on regeneration assumptions proposed for existing stand analysis units (see Table 12).

For modeling efficiencies, different forest types that occupy a small area in the timber harvesting land base may be grouped with other forest types. This grouping should not affect timber supply significantly. The analysis units identified in the data package in Table 4 (existing stands) and Table 12 (managed stands) may be further modified to reflect such modeling considerations identified during the timber supply analysis.

The following abbreviations are used within the table for tree species Hw – western hemlock (*Tsuga heterophylla*), Hm – mountain hemlock (*Tsuga mertensiana*), B – Balsam (*Abies* spp.), Ba – amabalis fir (*Abies amabalis*), Bl- subalpine fir (*Abies lasiocarpa*), Pl – lodgepole pine (*Pinus contorta*), Cw – western redcedar (*Thuja plicata*), S – Spruce (*Picea* spp) and for site description P-poor, M-medium, G-good.

Species and Inventory Type Group codes are defined in *Forest Inventory Manual. Ministry of Forests 1992* or at the web site http://www.for.gov.bc.ca/resinv/reports/Rdd/Rdd.htm.

4. Division of the Area into Management Zones

Table 4a. Definition of proposed analysis units for existing natural stands

Analysis Unit #	Name (species, site quality, age group)	Criteria		
		Inventory type groups	Site index range (m @ 50 yrs)	Age (yrs)
	GENERAL AUs			
1	Pure Hw/Hm – Poor/Med Thrifty	12	9-15	21 to 140
2	Pure Hw/Hm – Poor/Med Old	12	9-15	>140
3	Pure Hw/Hm – Good Thrifty	12	16+	21 to 140
4	Pure Hw/Hm – Good Old	12	16+	>140
5	Pure Ba/Bl - Poor/Med Thrifty	18	9-15	21 to 140
6	Pure Ba/Bl – Poor/Med Old	18	9-15	>140
7	Pure Ba/Bl – Good Thrifty	18	16+	21 to 140
8	Pure Ba/Bl - Good Old	18	16+	>140
9	Pure Pine – Poor/Med Thrifty	28	9-15	21 to 140
10	Pure Pine – Poor/Med Old	28	9-15	>140
11	Pure Pine – Good Thrifty	28	16+	21 to 140
12	Pure Pine – Good Old	28	16+	>140
13	H/B/Cw - Poor/Med Thrifty	9,10,11,13-17,19,20	9-15	21 to 140
14	H/B/Cw - Poor/Med Old	9,10,11,13-,17,19,20	9-15	>140
15	H/B/Cw - Good Thrifty	9,10,11,13-17,19,20	16+	21 to 140
16	H/B/Cw - Good Old	9,10,11,13-17,19,20	16+	>140
17	Spruce mix - P/M/G Thrifty	21,22,23,24,26	All	21 to 140
18	Spruce mix - P/M/G Old	21,22,23,24,26	All	>140
19	Pine mix - P/M/G Thrifty	5,25,30,31	All	21 to 140
20	Pine mix - P/M/G Old	5,25,30,31	All	>140
	PEST DAMAGED AUs			
21	Beetle Zone A Poor/Med Thrifty	18,19	9-15	21 to 140
22	Beetle Zone A Poor/Med Old	18,19	9-15	>140
23	Beetle Zone A Good Thrifty	18,19	16+	21 to 140
24	Beetle Zone A Good Old	18,19	16+	>140
25	Looper Zone B/C Poor/Med Thrifty	12-17	9-15	21 to 140
26	Looper Zone B/C Poor/Med Old	12-17	9-15	>140
27	Looper Zone B/C Good Thrifty	12-17	16+	21 to 140
26	Looper Zone B/C Good Old	12-17	16+	>140

4. Division of the Area into Management Zones

Table 4b. Definition of proposed analysis units for existing managed stands

Analysis Unit	Criteria			
	Name	Inventory Type Groups	Site Index Range (m @ 50 yrs)	Age (yrs)
201	Pure Hw/Hm - Poor/Med Managed	12	9-15	<=20
203	Pure Hw/Hm - Good Managed	12	16+	<=20
205	Pure Ba/Bl - Poor/Med Managed	18	9-15	<=20
207	Pure Ba/Bl - Good Managed	18	16+	<=20
209	Pure Pine - Poor/Med Managed	28	9-15	<=20
211	Pure Pine - Good Managed	28	16+	<=20
213	H/B/Cw - Poor/Med Managed	9,10,11,13-17,19,20	9-15	<=20
215	H/B/Cw - Good Managed	9,10,11,13-17,19,20	16+	<=20
217	Spruce mix - P/M/G Managed	21,22,23,24,26	All	<=20
219	Pine mix - P/M/G Managed	5,25,30,31	All	<=20

5. Timber Harvesting Land Base Definition

5.1 Identification of the timber harvesting land base

The timber harvesting land base for the Nass TSA is determined by separating out categories of land that do not contribute to timber harvesting. This section outlines the steps used to identify the timber harvesting land base (the productive forest expected to support timber harvesting) within the Nass TSA. Land may be unavailable for timber harvesting for three principle reasons:

- it is not administered by the British Columbia Forest Service for timber supply (e.g., Nisga'a Lands, other private land, parks);
- it is not currently suitable for timber production; and
- it is required for other forest values.

Land that it is not currently suitable for timber production may also be included in the timber harvesting land base if management activities are planned to improve productivity or operability (e.g., the stocking of land currently classified as non-commercial brush). The classification of "unavailable for timber harvesting" applies only to land where no harvesting is anticipated to occur. Any area in which some timber harvesting will occur remains in the timber harvesting land base, even if the area will be subject to stringent constraints. Any such constraints will be reflected in the analysis.

After all areas that do not contribute to the timber harvesting land base have been excluded, the resulting productive forest land base is defined as the "current timber harvesting land base" for the Nass TSA.

5.2 Details on land base classification

5.2.1 Land not administered by the BCFS for timber supply

Ownership codes within the Ministry of Forest forest cover inventory file identify whether the land can be considered to contribute to timber supply. In the Nass TSA, only lands with ownership codes that indicate Crown land in a forest management unit (code 62C, 69C) are included in the timber harvesting land base. All areas with other ownership codes will be removed from the land base considered available for timber supply.

5.2.2 Land classified as non-forest

Lands that fall under the categories of alpine areas, rock and ice, lakes, swamps and rivers do not contribute to timber supply and are excluded from the area considered available for timber harvesting. These excluded areas are identified within the Ministry of Forest forest cover inventory file as projected type identity 6 (non-forested). Areas where no typing is available (projected type identity 8) are also excluded.

5.2.3 Non-commercial cover

Areas occupied by non-commercial brush species are considered to be unlikely sites for timber production and are excluded from the area considered available for timber harvesting. These areas are identified within the Ministry of Forest forest cover inventory file as projected type identity 5.

District staff have also observed that non-commercial brush sites too small to identify on 1:20,000 forest cover maps can be identified on silviculture prescription maps. District staff believe that these non-productive areas are captured within yield estimates for existing stands and operational adjustments factors applied to yield estimates that account for stocking gaps in managed stands. The potential impact of uncertainty regarding the extent of unmapped non-commercial brush sites will be assessed in sensitivity analysis by a 10 % increase and decrease to the managed stand yield operational adjustment factors.

5.2.4 Environmentally sensitive areas

Some forest land is environmentally sensitive and/or significantly valuable for other resources. These areas are identified and delineated during a forest inventory as environmentally sensitive areas (ESAs). The ESA system uses the following classification: sensitive soils (Es); forest regeneration problems (Ep); snow avalanche risk (Ea); recreation value (Er); wildlife habitat (Ew); watershed concerns (Eh); and fisheries (fisheries symbols). With the exception of avalanche and fisheries, two ESA categories are recognized: high and moderately sensitive. For abbreviation purposes these are coded as 1 and 2 respectively and appended to the ESA class (e.g., Es1 is a highly sensitive soil ESA).

ESAs may result in a reduction in the harvesting opportunities. Two strategies for accounting for management of ESAs are: percent area reductions, and evaluation of individual ESA polygons for harvesting opportunity. In the timber supply analysis, only percent area reductions are applied.

The Prince Rupert Forest Region research geomorphologist recently reviewed the forest cover inventory ESA soil classifications on 10 randomly selected Nass TSA mapsheets. The review considered the current management implications of mapped forest cover polygons with an Es designation in terms of the encompassed terrain and active geomorphic process within the terrain unit. For Es1 terrain (highly sensitive) a 100% reduction factor was recommended to account for harvesting limitations caused by the observed terrain features (active landslides, highly unstable terrain, snow avalanche initiation zones). For Es2 terrain (moderately sensitive) a 50% reduction factor was recommended to account for the observed terrain features which may preclude harvesting within these areas.

As noted previously only areas where harvesting is expected to take place contribute to the timber harvesting land base. Thus it is important to separate the areas in which some harvesting will take place from those areas which are completely unavailable. Table 5 identifies the proportion of areas in each ESA category where harvesting is not expected to occur.

Table 5. Description of environmentally sensitive areas

ESA Category	ESA Description	Reduction percent
Es1	Extreme soil sensitivity	100
Es2	Moderate soil sensitivity	50
Ew1	High wildlife importance	100
Ew2	Moderate wildlife importance	50
Er1	High recreation value	100
Er2	Moderate recreation value	50
Ep1	Severe regeneration problem	100
Ep2	Moderate regeneration problem	50
Ea	High avalanche problems	100
Ec	High management difficulties	100
Eh1	High water quality values	100

5.2.5 Areas considered inoperable

Operability is based on the presence or absence of physical barriers or limitations to harvesting, applicable logging methods (e.g., cable) and the merchantability of stands. Two operability inventories will be applied: (1) 1997 operability study for the Upper Nass; (2) 1989 operability study for the entire Nass TSA except the Upper Nass. Table 6 lists the codes used to identify areas to be excluded due to operability considerations.

Table 6. Description of inoperable areas

Inventory Description	Code	Reduction percent
Operability label inoperable	I	100
Operability label not reported	N	100

Data source and comments:

The 1997 Upper Nass operability study focussed on terrain accessibility and the cost of 3 different access routes. The Upper Nass is considered to be marginally operable, particularly in light of uncertain funding for developing costly infrastructure (roads and bridges) into the Upper Nass. District staff are re-examining the Upper Nass operability. Marginally operable areas will be excluded from the timber harvesting land base.

District staff observe that, while performance on cable terrain has increased over the last 5 years, use of back hoes to harvest some cable areas is isolating small patches of terrain that will be infeasible or uneconomic to harvest in the future. District staff estimate that 20% of the cable terrain is being isolated by this practice. Sensitivity analysis will be conducted to examine the potential timber supply impacts.

5.2.6 Sites with low timber growing potential

Sites may have low productivity either because of inherent site factors (nutrient availability, exposure, excessive moisture, etc.), or because they are not fully occupied by commercial tree species. Typically, these stands are intermixed with other stands within the forested land base. All forest cover inventory stands with an indicated site index (height @ 50 years) less than 9 metres are not considered to be productive, and therefore will be removed from the timber harvesting land base.

5.2.7 Problem forest types

Problem forest types are stands that are physically operable and exceed low site criteria yet are not currently utilized, have marginal merchantability, or are avoided due to regeneration difficulties. In the Nass TSA these types are excluded from the timber harvesting land base. Areas with reduced merchantability related to damage caused by insects are described under section 6.2 “Unsalvaged Losses.”

Table 7. Problem forest types criteria

Type Group or Species	Characteristics			
	Age class	New stocking class	Crown closure class	Reduction percent (%)
9-26 (C, H, B, S)		2		100
All	> = 4 (>80 yrs)		00,01,02,03 (<=35%)	100
35-42 (Deciduous)				100
28-31 (Pine)		3,4		100

5.2.8 Roads, trails and landings

In March 1999, the District hired a GIS consulting firm to conduct an analysis of the existing road network using 1:20,000 forest cover maps. A report was produced which identified how various existing linear features (i.e., roads) intersected different categories of land ownership and forest status.

The report identified the length in kilometres for five linear features categories: highways, secondary roads, logging roads, trails, and seismic lines. Each of these five categories was then identified as to its land status: cutblock (Crown), forested (Crown, private and protected) and non-forest (Crown, private and protected). District review of the data indicted that the information provided regarding highways, secondary roads, trails and seismic lines was appropriate. For the “logging road” linear features, the District conducted further analysis to differentiate this feature into mainline logging road, branch logging road and stub logging road categories. These three different logging road types have different intensities and duration of use, which result in different final construction road widths. The width, as well as the length, of the logging road feature was considered in the District’s calculation of the area currently occupied by existing logging roads.

Highways, secondary roads and logging roads within private lands, parks and non-productive forests were excluded from District analysis, because these categories of land are excluded from the timber harvesting land base.

Based on the above analysis, an equivalent area for existing roads (1 343 ha) plus 4% for landings will be removed from existing logged polygons within the productive land base. Based on existing the infrastructure estimates and Forest Practices Code requirements, the District estimates that an average 7% land base reduction for future roads, trails, and landings should be applied. This 7% future percentage will be applied to each stand following its initial projected harvest in the timber supply analysis.

Table 8. Road, trail, and landing estimates and reductions

Road Description	Length (km)	Width (m)	Area (ha)
Main Line	528.7	10.5	555.1
Branch	409.3	8.0	327.4
Stub	767.5	6.0	460.5
Total	1705.6		1343.0
Existing Roads Reduction	1 343 ha		
Existing Landing Reduction	4 percent		
Future Road, Trail, Landing Reduction	7 percent		

Data Source and comments:

RHF Systems Ltd. 1999. Nass TSA Existing Roads Assessment, prepared for the Kalum Forest District.

5.2.9 Cultural Heritage Resource Reductions

Cultural heritage assessments, including an archaeological overview inventory and traditional use studies on defined geographic areas are used for operational forest planning. Operational forest plans have thus far avoided archaeological site conflicts without any timber supply impacts and will do so in the future.

5.2.10 Riparian Areas

The Nass TSA does not have a completed stream inventory and classification. In order to consider riparian areas appropriately, the riparian reserve and management areas were determined for a sample of 12 representative maps, with the results then extrapolated to the whole TSA.

A fisheries biologist was tasked with classifying streams, wetlands and lakes within the Nass TSA. District staff, in conjunction with MELP staff, stratified the Nass TSA into 3 geographic zones for the riparian analysis. The 3 geographic zones were identified due to differing amounts of streams, wetlands and lakes within each geographic zone. The southwest lower Nass zone contains two large lakes (Bowser and Meziadin) as well as numerous fish bearing streams tributary to the Nass River. The southeast lower Nass zone contains numerous small lakes as well as fish bearing streams tributary to the Nass River. The north Bell Irving zone has fewer lakes and fish bearing streams in comparison to the other two zones.

Representative maps were selected for each of the 3 geographic zones, and the Forest Practice Code requirements for riparian reserve zones and riparian management zones were determined for each stream, wetland and lake. The riparian buffer areas within each geographic zone will be calculated so that an appropriate reduction can be applied to each map outside of the sample area.

Data Source and comments:

Triton Environmental Consultants Ltd. 1999. Nass TSA Stream Classification and Mapping Project March 1999. Laing and McCulloch Forest Management Services Ltd.

5.2.11 Exclusion of specific, geographically defined areas

Most of the area west of Meziadin and Bowser Lakes will be excluded from the timber harvesting land base due to inoperability, environmental sensitivity and presence of unmerchantable forest types. The remaining area (approximately 300 ha) is uneconomical to harvest, and as such will be excluded from the timber harvesting land base.

Two goal 1 cabinet approved official protected area strategy study areas occur within the Nass TSA: Damdochax / Slamgeesh and Mount Bell Irving / Hanna Ridge. Because a final land use decision has not been made, these study areas continue to contribute to the timber harvesting land base, but a critical issues analysis will be conducted to assess the impact of their exclusion.

One UREP (Use, Recreation, Enjoyment of the Public) map notation interest (ownership code 61C) occurs within the Nass TSA. The UREP surrounds Bear Glacier and Strohn Lake. A portion of the UREP area will become a Class A Provincial Park, as outlined in the Nisga'a Final Agreement. The UREP area is dominated by icefields and alpine forests. There are no current or proposed logging operations within the UREP area. The productive forest outside of the proposed Class A Provincial Park, is environmentally constrained, and although visual quality objectives have not yet been established, future operations would be visually constrained due to the high recreational interest of the Bear Glacier and proposed Class A Provincial Park. Therefore, the UREP area will be excluded from the productive land base.

6. Current Forest Management Assumptions

6.1 Harvesting

6.1.1 Utilization levels

The utilization levels define the maximum stump height, minimum top diameter inside bark (dib) and minimum diameter at breast height (dbh) by species, and are used in the analysis to calculate merchantable volume.

Table 9. Utilization levels

Species	Utilization levels		
	Minimum dbh (cm)	Maximum stump height (cm)	Minimum top dib (cm)
All	17.5	30	10

Data Source and Comments:

Table 9 reflects current regional standards, licence requirements and current performance.

6.1.2 Volume exclusions for mixed species stands

The deciduous species in a predominantly coniferous stand is unmerchantable and is not harvested in the Nass TSA. This unharvested portion will be removed from the estimated stand volume.

Table 10. Volume exclusions for mixed species types

Inventory type group	Species	Volume exclusion (%)
All coniferous leading	Deciduous	100

Data source and comments:

The exclusion pertains to only the deciduous timber volumes in coniferous leading stands. Deciduous-leading stands are excluded completely from the timber harvesting land base (see section 5.2.7 “Problem forest types”). The deciduous trees may contribute to biodiversity and coarse woody debris objectives at the stand level.

6.1.3 Minimum harvestable age derivation

The minimum harvestable age is the time required for a stand to grow to a harvestable size. Minimum harvestable ages are minimum criteria. While harvesting may occur in stands at the minimum ages to meet forest level objectives (e.g., maintaining overall harvest levels for a short period of time, or avoiding large changes in harvest levels), most stands will not be harvested until past the minimum ages.

Minimum harvestable age will be determined by setting a minimum harvest volume requirement. District staff believe the minimum net merchantable harvest volume within the Nass TSA is 300 cubic metres per hectare. The aggregated existing stand yield curves for each analysis unit will be used to determine minimum harvest ages. Sensitivity analysis will be conducted on minimum harvest ages using minimum net merchantable harvest volumes of 250 cubic metres per hectare and 350 cubic metres per hectare.

6.1.4 Harvest scheduling priorities

Harvest profile restrictions will not be applied. Local mills are adapted to utilize the Nass TSA forest species profile which is dominated by hemlock/balsam stands. Nevertheless, timber supply analysis output will be monitored for any wood supply anomalies – such as large spruce or pine harvests during a period.

6.1.5 Silviculture systems

Clearcuts and clearcuts with reserves are the most frequent silviculture systems used in the Nass TSA. Under these systems, a range of opening sizes (10 ha to 250 ha) containing even-aged forests is produced. Cutting of adjacent blocks is restricted until green-up conditions are met. A characteristic of the clearcut with reserve system is the maintenance of older forest patches within harvest blocks. These remnants are intended as wildlife tree patches, riparian reserve and management zones, and island remnants to conserve old growth characteristics.

In response to direction in the Chief Forester's 1995 Allowable Annual Cut determination, the District completed a 1998 review of silviculture practices and accomplishments in the northern portion of the Nass TSA to examine the extent to which climatic and soil conditions hinder prompt and successful regeneration (J.C. Bartlett and Associates and Craigievar Forest Services Ltd. 1998. ICHvc1 Silviculture Practices and Timber Supply Review Report). The review indicated that the current silviculture systems, along with prompt planting and follow up brush control, were achieving successful regeneration and free growing stocking standards. The regeneration assumptions outlined in Table 12 (section 6.3.2 "Regeneration activities in managed stands") reflect the 1998 review results.

6.2 Unsalvaged losses

Timber that is killed through catastrophic events such as fire, insect and disease epidemics or other damaging agents is salvaged where possible. However, due to many reasons (e.g., accessibility, merchantability of damaged wood, timing) merchantable volume that is predicted from yield tables is lost. This lost is accounted for by 2 methods: (1) a volume reduction is applied to a specified stand type or (2) a general average annual non-salvaged loss is estimated for a specific mortality source. Both methods are used in Table 11 below.

Table 11. Unsalvaged losses removed from the total harvest flow

Cause of loss	Location	Analysis units	Unsalvaged losses removed from total timber supply forecast (m^3)	Volume table reduction
Fire	Nass TSA	All	25,000	
Hemlock looper	Kwinageese	H leading		20%
	Taylor River Zone	H leading		100% (high attack) 20% (moderate/low attack)
Balsam bark beetle	Upper Nass	B leading		see comments
Mountain pine beetle	All	P leading (>100 yrs)		50%
Total			**25,000**	

6. Current Forest Management Assumptions

Data Source and Comments:

Unsalvaged losses removed from the total harvest flow are stated for the base case, including the Upper Nass. This value will be proportionately reduced for any forecasts that exclude areas (e.g., Upper Nass, Nisga'a Lands)

Fire
For the 1993 (TSR1) analysis report , 10-year fire history records and harvest salvage activities were analyzed to estimate the annual volume losses due to fire. District staff reviewed the TSR1 estimate and believe the estimate continues to be appropriate for this analysis.

Hemlock looper
In the summer of 1996, a large infestation of the green-striped forest looper, a defoliating insect, was discovered in the Nass TSA. A thematic coloured satellite image (1996 imagery) was used to delineate areas of heavy, moderate and light attack and to plan salvage harvesting operations. Salvage harvesting commenced in the summer of 1997 and has continued throughout 1999 with approximately 270 000 cubic metres of damage timber being recovered to date.

Two unique hemlock looper attack areas have been identified:
1. The Kwinageese River Area (labelled Zone C in the data file). Extensive road development and salvage harvesting operations have occurred. Currently 20% of the hemlock remaining in this area is unmerchantable in addition to areas retained in patches to meet biodiversity objectives within the salvage harvesting area. A twenty percent (20 %) volume reduction will be applied to the volume tables for existing hemlock-leading timber types within the Kwinageese area.

2. The Taylor River Area (labelled Zone B in data file). There are no roads within the Taylor River area, therefore salvage harvesting of attacked and dead hemlock has not occurred. Access to this area requires the construction of a major bridge across the Nass River (estimated to cost at least $2 million dollars). Given the poor wood quality, access difficulties and short timeframe before the hemlock becomes unmerchantable (3 years), immediate hemlock salvage opportunities are not anticipated. Within high attack areas (B1) a one hundred percent (100%) volume reduction will be applied to the hemlock-leading timber types. Within the moderate / low attack areas (B2) a 20% volume reduction will be applied to the hemlock-leading timber types. Within the nil attack zone in the Taylor River area, balsam timber types were not damaged by the hemlock looper and will contribute full volumes.

Balsam bark beetle
Forests within the Upper Nass area are dominated by subalpine fir (balsam), which is susceptible to balsam bark beetle attack. Historically, the attack levels have been low. However, the 1996 hemlock looper satellite image indicated that increased balsam mortality was occurring. A January 1998 report estimated that 11% of the balsam were about to die or were already dead (4.7% red attack and 6.1% gray attack).

From overview monitoring flights conducted in 1999 it has been observed that balsam bark beetle attack continues to occur. New 1999 satellite imagery will be prepared similar to the 1996 thematically coloured hemlock looper image. This new satellite image will help to quantify the size of the balsam bark beetle infestation and to locate the areas of high, moderate and low attack. Field samples will be used to ground truth the satellite image results and provide better merchantability information. If available, the satellite image and field samples results will be used during this timber supply analysis.

Mountain pine beetle
It is estimated that about 50% of lodgepole pine-leading stands greater than 80 years old will be lost to mountain pine beetle. It is expected that over the next 50 years as a more extensive road network is developed almost all timber from this mortality source will be salvageable. As such, all existing lodgepole pine leading stands will be reduced in volume by 50% whereas no reduction will be applied to managed stands.

Pine pitch moth
Monitoring of pine pitch moth damage is ongoing in pine stands less than 20 years old. Stocking reductions and stem deformations have been observed. The extent to which this damage will effect yields is currently unknown; therefore no specific timber supply reduction will be applied during this timber supply review.

Future catastrophic insect / disease losses
District staff believe the unique conditions which contributed to recent green striped forest looper and balsam bark beetle losses are unlikely to re-occur in the future. Harvesting activities and reforestation efforts will modify the previously homogenous, over mature forest pattern. Increased access will improve ability to respond to natural disturbances. District staff acknowledge that endemic-level losses will continue to occur, and believe that these losses are accounted for in the existing inventory volume estimates and managed stand yield operational adjustment factors. Therefore, non-recoverable losses for hemlock looper, balsam bark beetle, and mountain pine beetle are applied only to existing stands and only fire non-recoverable losses are included in the general average annual non-salvaged loss factor.

6.3 Silviculture

6.3.1 Site productivity estimates for managed stands

A provincial study on the determination of site index for sites occupied by old-growth stands (OGSI) has been completed. The results of this provincial study show that some adjustment of site productivity estimates from forest cover inventory should be made when stands currently greater that 140 years of age are harvested and replaced with managed stands. No specific studies have been conducted on the Nass TSA. The results of the provincial OGSI study will be applied as a critical issues analysis.

6.3.2 Regeneration activities in managed stands

The silviculture program reflects a mix of treatments expected to be carried out according to the Nass TSA Plan. This level of activity assumes basic silviculture on all sites. Table 12 shows the regeneration assumptions by existing stand analysis unit.

Growth and yield in recent plantations and future stands will be modelled based on managed stand yield tables (MSYTs) from the B.C. Forest Service table interpolation program for stand yields (TIPSY) model. A MSYT may be built from a number of tables if more than one regeneration method is used within an analysis unit. (See above section for discussion on analysis units). When this is the case, tables are produced for the different regeneration methods (each method and species combination) and then aggregated into one table.

Regenerated pine stand will be divided into two categories:
(1) stands less than 20 years of age resulting from harvesting and subsequent reforestation density control will be placed on the managed stand yield curves identified in Table 12 (analysis units 109, 110, and 111); and
(2) stands less than 20 years of age resulting from fire with natural regeneration and no density control will be placed on existing stand yield curves according to Table 4b (analysis units 209 and 211).

6. Current Forest Management Assumptions

Table 12. Regeneration assumptions by existing stand analysis unit

Existing analysis units	Regen delay (yrs)	OAFs (%)		Regen method		Regeneration results		Free growing density (sph)	Regen analysis unit
		1	2	Type	%	Species	%		
1, 201	3	15	5	Plant	100	H Pl	50/50	900	101
2	3	15	5	Plant	100	H B S Pl	40/40/10/10	900	102
3, 203	3	15	5	Plant	100	H B S Pl	40/40/10/10	900	103
4	3	15	5	Plant	100	H Pl	50/50	900	104
5, 21, 205	3	15	5	Plant	100	B H S	40/40/20	850	105
6, 22	3	15	5	Plant	100	B H S	40/40/20	850	105
7, 23, 207	3	15	5	Plant	100	B S H	40/40/20	850	107
8, 24	3	15	5	Plant	100	B S H	40/40/20	850	107
9, 209	3	15	5	Plant	100	Pl S	50/50	1000	109
10	3	15	5	Plant	100	Pl	100	1000	110
11, 211	3	15	5	Plant	100	Pl H S	40/40/20	1000	111
12	3	15	5	Plant	100	Pl H S	40/40/20	1000	111
13, 25, 213	3	15	5	Plant	100	H B	50/50	900	113
14, 26	3	15	5	Plant	100	H B	50/50	900	113
15, 27, 215	3	15	5	Plant	100	H B S	40/40/20	900	115
16, 28	3	15	5	Plant	100	H B S	40/40/20	900	115
17, 217	3	15	5	Plant	100	S B	50/50	900	117
18	3	15	5	Plant	100	S B	50/50	900	117
19, 219	3	15	5	Plant	100	S B H	40/40/20	900	119
20	3	15	5	Plant	100	S B	50/50	900	117

(a) Operational adjustment factors (OAFs) are used to adjust timber yield estimates to account for operational factors. OAF1 is a constant percentage reduction to account for small unproductive areas within stands, uneven stem distribution and endemic losses that do not increase with age. OAF2 accounts for losses that increase with stand age, for example decay due to disease. In this case OAF2 increases from 0 at stand establishment and passes through 5% at 100 years of age.

Data Source and Comments:

The densities reported in Table 12 are free growing densities. While very few free growing surveys have been completed in the Nass TSA due to the relatively recent harvest history, surveys close to the free growing dates have been conducted. These surveys capture the fill planting and natural ingress stocking changes which occur after initial planting. District staff have identified stocking differences between the south and north portions of the Nass TSA based on local knowledge and a review of District silviculture records. However, the free growing densities outlined in Table 12 are an average of the north and south stocking as for analysis purposes the differences are not significant.

Provincial average operational adjustment factors are applied to the managed stand yield curves as recommended by the Ministry of Forests, Research Branch, as no local factors are available.

6.3.3 Immature plantation history

The existing immature plantation forest within the Nass TSA has received basic silviculture density control. An initial density of 1,000 stems per hectare is established at the first planting. Limited incremental silviculture activities have occurred in the Nass TSA and they are expected to remain limited in the future. Therefore, for the Nass TSA, managed stand yield tables have been derived using basic silviculture management practices.

Basic silviculture density control has occurred on all of the areas harvested within the Nass TSA. The existing immature plantation forests with ages between 1 and 20 years will be modelled using TIPSY yield curves.

6.3.4 Not satisfactorily restocked (NSR) areas

Land classified as not satisfactorily restocked is present in the Nass TSA. Not satisfactorily restocked land can be divided into two general categories: (1) areas that have been recently harvested or disturbed through natural causes that are scheduled but have not yet been reforested or are in the process of being restocked (current NSR); and (2) areas that have been in an NSR condition for a considerable time (>20 years ago) and have failed to become satisfactorily restocked. In the Nass TSA some old large fire disturbed areas are not expected to be restocked

Any lands recorded as NSR (identity type 9) and already restocked but not recorded as such in the data file will be identified and an estimate of their area added into the timber harvesting land base.

6.3.5 Tree improvement

Through selection breeding procedures, improvements on current tree growth, and insect and disease resistance is expected. The current amount of improved seedlings planted within the Nass TSA and estimates of the percent improvement (genetic worth) will be applied to the base yield estimates of managed stands. The effects of future improvements will be incorporated into future analyses when use levels are known and yield impacts become clearer.

6.4 Integrated resource management

Forest cover requirements may be applied to a number of different types of areas including landscape units, wildlife habitat, or visual quality areas. Forest cover requirements reported in this data package represent the District's current management practices.

6.4.1 Visual quality and general IRM objectives

Harvesting in areas with visual quality objectives is subject to constraints on the maximum area that is allowed to be disturbed (i.e., harvested). Land is considered to be free from visible disturbance after it reaches a pre-determined green up height. Three visual quality objectives (VQO) are considered in the Nass TSA: retention (R); partial retention (PR); and modification (M). Harvesting in areas outside of visually sensitive areas is required to meet general integrated resource management (IRM) objectives, and maximum disturbance requirements are assigned within the IRM zone. Two VQO classes, preservation and maximum modification, are not present in the operable land base of the Nass TSA.

Disturbance percentages for VQO are described differently depending on their use. Timber supply reviews apply plan view percentages while operational harvesting plans apply perspective view percentages. Perspective view percentages are roughly half of the plan view. These percentages come from studies completed by the Ministry of Forests on the public perception of visual impacts of clearcuts. *(*see, *Clearcutting and Visual Quality, A Public Perception Study, November 1996*).

6. Current Forest Management Assumptions

To enable visual resource management under the Forest Practices Code, VQOs must become established and scenic areas made known. For the Nass TSA, the Kalum Forest District Manager has established VQOs and made scenic areas known.

Within the IRM zone, current management practice is to develop forests using a 3 pass harvest system. The results of a study by Middleton and Orbay (1999) suggest that current harvesting operations are constrained to taking no more than 22% of the operable volume over a 20 year period within the SBFEP Arbor Lake planning area. This harvest level is more typical of a 5 pass harvesting pattern. Sensitivity analysis will be conducted to determine the timber supply impact of a 5 pass harvest system.

Table 13. Forest cover requirements.

	Green-up height (metres)	Green-up maximum allowable disturbance (% area)	Application
IRM Areas	3	35	Timber harvesting land base
VQO = R	5	5	Productive forest
VQO = PR	5	15	Productive forest
VQO = M	5	25	Productive forest

Data Source and Comments:

Middleton, G.R. and Orbay, L. 1999. Methods to more effectively utilize problem hem-bal stands in the Prince Rupert Region. Forintek Canada Corporation.

6.4.2 Kwinageese Integrated Resource Management Plan

The Kwinageese IRM Plan was approved on July 28, 1993 by the Kalum Forest District Manager. The plan was prepared with considerable input from other resource agencies, stakeholders, First Nations groups and the general public. Special management zones are been prescribed which address non-timber values, including biodiversity, fish and wildlife habitat and recreation opportunities. The plan guides current operational plans and, in some cases, exceeds Forest Practices Code requirements. The base case assumptions will model the Kwinageese IRM Plan objectives by ensuring that the amount of area excluded from the timber harvesting land base in the analysis is not less than that identified in the previous timber supply analysis.

6.4.3 Forest cover requirements for landscape-level biodiversity

Landscape-level biodiversity is considered through the application of constraints on the amount of productive land base in 3 seral stages: young, mature, and old. However, current policy requires that only the old seral requirements be implemented, and that this requirement may be drawn down to one third of the requirement for the lower BEO and phased in over three rotations. Requirements are specified by biogeoclimatic variant within each landscape unit. Current policy requires a 45/45/10 distribution of lower, intermediate and higher biodiversity emphasis. Critical issue analysis will be conducted on the draft BEO emphasis options proposed for use in the Kalum Forest District. The old seral requirements listed in Table 14a are based on the Landscape Unit Planning Guide, and are weighted according to the 45/45/10 distribution, and adjusted according to the phase-in policy applicable to lower biodiversity emphasis areas (45% of the land base).

6. Current Forest Management Assumptions

Table 14a. Old seral requirements by biogeoclimatic variant.

Biogeo-climatic Variant	Natural disturbance Type	Old seral requirement (%) starting in year 1	70	140	Minimum Age (yrs)	Land base to which constraints apply
ESSFwv	1	14.2	17.1	19.9	250	Productive forest
ICHvc	1	9.7	11.7	13.6	250	Productive forest
MHmm1	1	14.2	17.1	19.9	250	Productive forest
MHmm2	1	14.2	17.1	19.9	250	Productive forest
CWHws2	2	6.7	8.1	9.4	250	Productive forest
ESSFmc	2	6.7	8.1	9.4	250	Productive forest
ICHmc1	2	6.7	8.1	9.4	250	Productive forest
ICHmc2	2	6.7	8.1	9.4	250	Productive forest
SBSmc2	3	8.2	9.9	11.5	140	Productive forest

Although current policy is not to apply the mature plus old-seral requirement, a critical issues analysis will examine the impact on timber supply of applying this requirement. An average mature plus old seral requirement, developed using the *Biodiversity Guidebook* will be applied by biogeoclimatic variant within each landscape unit. This will be calculated in the same manner as the old seral requirement, except that the entire requirement will apply immediately.

Table 14b. Mature+old seral requirements by biogeoclimatic variant.

Biogeoclimatic variant	Natural disturbance type	Mature+old seral requirement (%) (starting in year 1)	Age (yrs)	Land base to which constraints apply
ESSFwv	1	30.2	120	Productive forest
ICHvc	1	28.1	100	Productive forest
MHmm1	1	30.2	120	Productive forest
MHmm2	1	30.2	120	Productive forest
CWHws2	2	28.1	80	Productive forest
ESSFmc	2	23.1	120	Productive forest
ICHmc1	2	25.3	100	Productive forest
ICHmc2	2	25.3	100	Productive forest
SBSmc2	3	18.7	100	Productive forest

6. Current Forest Management Assumptions

For a critical issues analysis, the old-seral requirements recommended in the *Landscape Unit Planning Guide* will be applied according to the draft BEOs outlined in Table 14c, instead of a weighted average BEO for each landscape unit.

Table 14c. Biodiversity emphasis options by draft landscape unit.

Landscape unit code	Landscape unit name	Biodiversity emphasis option
1	Craven	Intermediate
2	Muskaboo	Lower
3	Nass Headwaters	Intermediate
4	Owegee	Lower
5	Taylor-Damdochax	Intermediate
6	Wildfire	Intermediate
7	Sallysout	Lower
8	Tintina	Lower
9	Bowser	Lower
10	Madely	Intermediate
11	Bear	Intermediate
12	Cambria Icefield	Lower
13	White	Intermediate
14	Kinskuch	Intermediate
15	Brown Bear	Lower
16	Tchitin	Higher
17	Kwinamuck	Lower
18	Nass River Kalum	Higher
19	Tseax	Intermediate
21	Greenville	Intermediate

6.4.4 Wildlife trees and wildlife tree patches

The *Landscape Unit Planning Guide* describes two methods for maintaining stand structure over time: individual wildlife trees (WT) and wildlife tree patches (WTP). Under different silvicultural systems the planned persistence of WTs and WTPs may vary; for example, in partial cutting systems, the trees that are retained may be planned for harvest at later date. Therefore, in estimating the effects of WTs and WTPs, consideration should be given to whether the trees will ever be harvested. In addition, the contribution to WT and WTP requirements of riparian management zones and other productive lands excluded from the timber harvesting land base should be considered.

As indicated in Table 15, the final adjustments to be made to account for WTs and WTPs are not yet available. Individual landscape unit percentages will be determined after identification of the timber harvesting land base is complete.

Table 15. Volume reductions to reflect retention of wildlife tree patches in cutblocks

Landscape Unit	Analysis unit	Persistence	Per cent (%) recommended in guidebook	Residual area estimate on the timber harvesting land base (%)
	All	Long term		

Data source and comments:

District staff estimate that about 50% of non-contributing forest (e.g., riparian management zones, inoperable forest) could contribute to WTP requirements. Where WTP requirements are not met by non-contributing forest, the remaining requirement will be removed from the timber harvesting land base. These WTPs will be larger than two hectares and considered (if appropriate age) to meet old-growth seral requirements. The WTP reduction will be assumed to be located in the integrated resource management (IRM) and modification visual quality objective (VQO) zones only, as forest district staff feel that only these areas will require some management activity to retain stand structure. Retention and partial retention VQO zones are expected to have sufficient stand structure present to meet WTP requirements. It is assumed that wildlife tree patches will not be economical to harvest at a later date, nor will they be available to harvest in subsequent harvesting of the stand.

The percentage of area recommended for WTP retention will based upon Table *A3.1 of the Landscape Unit Planning Guide*. This percentage will be derived based upon the percentage of area that the timber harvesting land base occupies within a landscape unit and the percentage of area that has already been harvested. As these percentages vary among landscape units in the Nass TSA, individual landscape unit percentages will be developed for the timber supply analysis. Preliminary analysis indicates that only the ICHmc sub-zone in the Tintina Landscape Unit requires additional (3.8%) retention for WTPs from the timber harvesting land base.

6.4.5 Identified wildlife management strategy

Habitat for certain wildlife species will be managed through implementation of the Identified Wildlife Management Strategy (IWMS). Currently, there are no wildlife habitat areas established under the IWMS within the Nass TSA and no higher level plans that identify other wildlife management practices. Therefore in this timber supply analysis, IWMS wildlife habitat areas will not be considered. If any WHAs are declared prior to the AAC determination for the Nass TSA, they will be considered.

Table 16 outlines the species identified under the IWMS which may occur in the Nass TSA.

Table 16. IWMS wildlife species within the Nass TSA

Endangered/Threatened (Red-Listed)	Vulnerable (Blue-Listed)	Regionally Significant (Yellow-Listed)
Marbled murrelet	Bull trout Tailed frog Trumpeter Swan Fisher Grizzly Bear	Northern goshawk ssp. Atricapillus Mountain goat

Data Source and Comments:

Ministry of Environment, Lands, and Parks and Ministry of Forests. 1999. Identified Wildlife Management Strategy Volume 1. Appendix 1.

6.4.6 Pine mushrooms

The pine mushroom (*Tricholoma magnivelare*) is considered the most economically significant mushroom species in the province. The pine mushroom habitat is associated with well-drained, coarse textured and nutrient poor soils under hemlock forests (Northwest Institute 1999) and a recent study also suggests that pine mushroom production is maximized in mature stands between 60 and 160 years of age on these sites.

Within the Nass TSA, prime mushroom producing sites frequently occur on terrain classified as submesic (dry-moderate moisture regime) site series (01b Western Hemlock – Step Moss), in the Interior Cedar Hemlock Zone (ICHmc1 variant). Logging and road building activities that occur on submesic sites often conflict with mushroom picking opportunities. Currently, mushroom picking occurs within forested stands not selected for harvest in 5-year development plans. Pine mushroom habitats that occur within marginal timber stands are avoided in 5-year development plans. The application of Forest Practices Code requirements also provides pine mushroom habitat (i.e., sensitive areas excluded from harvest, riparian areas, wildlife tree patches). Currently there are no specific pine mushroom forest management practice requirements in the Code nor practiced in the TSA.

The timber supply impact of extending hemlock rotation ages on identified pine mushroom habitat sites will be analyzed during critical issues analyses. Two landscape units within the Nass TSA (Brown Bear and Kinskuch) have been identified as prime mushroom producing areas. Within these two landscape units, air photo interpretation will be used to identify the relative extent of the submesic site series. Mushroom habitat identified by similar photo interpretation work has been confirmed by experienced mushroom pickers. The results from this timber supply analysis might assist further studies outside of the timber supply review process. If specific pine mushroom forest management practices are developed, they will be considered in future timber supply reviews.

Data Source and comments:

Northwest Institute. 1999. Studies of the pine mushroom (*Tricholoma magnivelare*) in the Skeena-Bulkley Region. Northwest Institute for Bioregional Research, Smithers, BC.

7. Sensitivity / Critical Issues Analysis

Sensitivity analysis can provide a measure of the timber supply impact of uncertainties in management assumptions and/or data. By developing and performing a number of sensitivity analyses, it is possible to determine which variables most affect results.

Table 17a. Sensitivity analysis issues

Issue to be Tested	Sensitivity Analysis
Minimum harvest age	+ / - 50 m^3 / ha
Existing stand yields	+ / - 10 %
Regenerated stand yields	+ / - 10 %
Land base changes	+ / - 10%
Visual Quality Objectives	Apply mid range % denudation
Green-up periods	+ / - 10 years
IRM disturbance level	+ / - 15% IRM 3m disturbance
Balsam volumes in Upper Nass	+ / - 10%
Non-commercial cover	Adjust OAF1 + / - 10 %

Critical issues analyses can provide a measure of the timber supply impact of critical management issues that may affect timber supply. The critical issues may represent uncertainties in current management or information, or practices or land use decisions that are not yet applied, but that may become current management practice before the next timber supply review. By performing a critical issues analyses, the timber supply effects can be estimated, anticipated and considered during this timber supply review.

Table 17b. Critical analysis issues

Issue to be Tested	Critical Issue Analysis
Operability	Exclude 20% of the cable terrain.
Provincial OGSI Study	Apply OGSI results to managed stand yield tables.
Goal 1 cabinet approved official study areas	Exclude from land base
Pine mushroom habitat	Apply extended rotation lengths on an estimate of the submesic terrain in the ICHmc1.
Landscape level biodiversity	Apply District draft BEO's
Seral stage distributions	Apply the early and mature + old-seral stage requirements

Data Source and Comments:

Tables 17(a) and Table 17(b) show the sensitivity and critical issues analyses that are intended at this time. If additional issues become apparent or preliminary analysis results suggest the need, changes to these analyses may be made.