

# **Kalum Timber Supply Area Timber Supply Review**

Data Package

May 2009

  
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# 1. Introduction

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This data package summarizes the information and assumptions that are required to conduct timber supply analysis for the Kalum Timber Supply Area (TSA). The information and assumptions represent current performance, which is 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 practices used in the area, including objectives and practice requirements contained in the *Forest and Range Practices Act*;
- land-use plans approved by Cabinet (i.e., Kalum Land and Resource Management Plan);
- legal objectives established under the *Forest and Range Practices Act* and the *Land Act* (i.e., Kalum Sustainable Resource Management Plan, wildlife habitat areas, and ungulate winter ranges).

The purpose of the timber supply review program is to model “what is”, 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 contains:

- 1) a short explanation of the data required;
- 2) a data table or list of modelling assumptions;
- 3) a description of data sources and other comments.

The information in this data package represents the best available knowledge at the time of publication, but is subject to change. A public review period has been established to allow submission of comments and concerns about the data package to the Ministry of Forests and Range (MFR). Submission and new information made available prior to the analysis may lead to changes in the data listed in this package. Until the timber harvesting land base (THLB) is determined, it is not possible to finalize the values shown in some of the tables in this document. Where the final value is not yet available, the applicable columns are shaded grey. In addition, should any major changes to management practices occur during the next few months, the timber supply analysis will attempt to capture them. 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 assumptions described in this data package reflect current performance with respect to the status of forest land, forest management practices and knowledge of timber growth and yield. The harvest forecast developed from these assumptions is termed the base case harvest forecast and is used as a baseline for assessing the impacts of uncertainties. Section 7, “Sensitivity Analyses” identifies areas of uncertainty in the data and assumptions and outlines intended sensitivity analyses.

### 2.2 Major forest management considerations and issues

Table 1 lists major forest management issues and considerations. Where possible, the issues will be assessed directly in the timber supply analysis. If the issue does not fall within the definition of current management as described in Section 1, “Introduction”, the related timber supply impacts will be assessed in a sensitivity analysis. There may be significant uncertainties in data and defining some current management issues. In such cases, sensitivity analysis can assist in assessing the timber supply implications and assigning degrees of risk to timber supply during allowable annual cut determination.

Table 1. Major forest management considerations

| Consideration/issue | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Land use zones      | The Kalum Land and Resource Management Plan (LRMP) received final approval in May 2002. It recommended the establishment of new protected areas, which were legally established in May 2004. The Kalum LRMP also recommended land use zones that were legally established in the Kalum Sustainable Resource Management Plan (SRMP) in April 2006 as orders under the <i>Land Act</i> or the <i>Forest and Range Practices Act</i> . These include special resource management zones and community watersheds. |
| Biodiversity        | The Kalum SRMP was approved on April 28, 2006. It established legal objectives and targets for: seral stage distribution; old forest retention; wildlife tree retention; species composition; temporal and spatial distribution of cutblocks; landscape connectivity; and rare ecosystems on the Skeena Islands.                                                                                                                                                                                              |
| Wildlife habitat    | The Kalum SRMP established an objective and targets for grizzly bear habitat in specific watersheds. Ungulate winter ranges for mountain goat and wildlife habitat areas for tailed frog have been established under the <i>Forest and Range Practices Act</i> . These are included as appendices of the Kalum SRMP.                                                                                                                                                                                          |
| Visual resources    | <p>The Kalum SRMP describes the goal and summarizes the guidelines for managing visual resources.</p> <p>The visual landscape inventory has been expanded according to recommendations from the Kalum LRMP. The new areas have not yet been legally established as scenic areas with visual quality objectives. The impact of these new areas will be tested in sensitivity analysis.</p>                                                                                                                     |

(continued)

## 2. Current Forest Management Considerations and Issues

Table 1. Forest management considerations (concluded)

| Consideration/issue         | Description                                                                                                                                                                                                                                                                                                      |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operability                 | A new operability study delineates which areas are considered operable by harvest method and stand quality.                                                                                                                                                                                                      |
| Riparian areas              | Riparian reserve and management zones have management requirements under the <i>Forest and Range Practices Act</i> .                                                                                                                                                                                             |
| Insects and diseases        | Dothistroma is killing young pine stands in the Kalum TSA. The analysis will address the changes in species composition and stand ages that are predicted to occur.<br><br>Mountain pine beetle is beginning to kill older pine stands in the TSA. Loss figures are estimated and reported as unsalvaged losses. |
| Site productivity           | The site productivity of old growth stands has been shown to underestimate the productivity of regenerated stands. Site index adjustments will be applied to existing old-growth hemlock stands following harvest in the timber supply model.                                                                    |
| Wood quality                | Forests in the Kalum TSA contain a high proportion of pulpwood, but pulpwood markets have been poor in recent years. This can lead to sustainability issues when harvesting activities focus on sawlogs. A potential partition of the AAC into sawlog stands and non-sawlog stands will be explored.             |
| Transition to second growth | In response to current economic conditions and the low availability of sawlog stands, there is considerable interest in harvesting second growth stands. This affects the stands targeted for harvest in the model. This issue will also be explored in sensitivity analysis.                                    |
| Harvest availability        | The availability of harvest volumes within landscape units will be reported.                                                                                                                                                                                                                                     |
| Cedar                       | There are concerns about the sustainability of cedar harvesting and the amount of cedar being regenerated. The forest cover inventory data will be explored to determine if cedar harvesting can be tracked in the timber supply model.                                                                          |

### 3. Inventories

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#### 3.1 Background information

Table 2 lists the inventories that will be used to determine the timber harvesting land base and to model forest management activities. These inventories are listed in the order in which they are first used in this document.

Table 2. *Inventory information*

| Data                                                                                             | Source                                            | Vintage | Update |
|--------------------------------------------------------------------------------------------------|---------------------------------------------------|---------|--------|
| Timber supply area boundary                                                                      | LRDW <sup>1</sup>                                 | 2009    |        |
| Nisga'a Final Agreement boundaries                                                               | MFR <sup>2</sup> , Aboriginal Affairs Branch      | 2000    |        |
| Ownership, including woodlot licences, community forest agreement, and parks and protected areas | MFR, Forest Analysis and Inventory Branch         | 2008    |        |
| Research installations and growth & yield plots                                                  | MFR                                               | 2008    |        |
| Forest cover                                                                                     | MFR                                               | 1992/99 | 2005   |
| Depletion layer                                                                                  | LRDW and MFR Forest Analysis and Inventory Branch | 2007    |        |
| Environmentally sensitive areas                                                                  | ILMB <sup>3</sup> data warehouse                  | 1976    | 1989   |
| Terrain stability mapping                                                                        | MFR Kalum District                                | 2000's  |        |
| Zones without terrain stability mapping                                                          | MFR Kalum District                                | 2006    |        |
| UREP/recreation reserves                                                                         | LRDW                                              | 2008    |        |
| Harvest method mapping                                                                           | MFR Kalum District                                | 2006    |        |
| Inaccessible areas                                                                               | MFR Kalum District                                | 2006    |        |
| Forest inventory zone                                                                            | ILMB data warehouse                               | 2009    |        |
| Wildlife habitat areas – tailed frog                                                             | MoE <sup>4</sup>                                  | 2004-6  |        |
| Wildlife habitat areas (proposed) – grizzly bear                                                 | MoE                                               | 2008    |        |

(continued)

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<sup>1</sup> LRDW – Land and Resource Data Warehouse.

<sup>2</sup> MFR – Ministry of Forests and Range.

<sup>3</sup> ILMB – Integrated Land Management Bureau.

<sup>4</sup> MoE – Ministry of Environment.

### 3. Inventories

Table 2. Inventory information (concluded)

| Data                                                  | Source                       | Vintage | Update |
|-------------------------------------------------------|------------------------------|---------|--------|
| Ungulate winter ranges – mountain goat                | MoE                          | 2008    |        |
| Kalum SRMP special resource management zones          | ILMB data warehouse          | 2006    |        |
| Kalum SRMP landscape connectivity corridors           | ILMB data warehouse          | 2006    |        |
| Riparian stream classification mapping                | MFR Kalum District           | 2000's  |        |
| Areas with no stream classification                   | MFR Kalum District           | 2009    |        |
| Community watersheds – existing and new               | LRDW                         | 2006    |        |
| Visual landscape Inventory                            | LRDW                         | 2008    |        |
| Slope map in 5% classes                               | MFR                          | 2008    |        |
| Kalum SRMP grizzly bear identified watersheds         | ILMB data warehouse          | 2006    |        |
| Kalum SRMP landscape units and undeveloped watersheds | ILMB data warehouse          | 2006    |        |
| Biogeoclimatic zones, subzones and variants           | LRDW                         | 2009    |        |
| Old growth management areas                           | ILMB data warehouse          | 2008    |        |
| Skeena Islands rare ecosystems                        | MOE Skeena Region            | 2004    |        |
| First Nations house boundaries and house territories  | MFR Northern Interior Region | 2009    |        |
| Fish sensitive watershed boundaries                   | MoE                          | 2009    |        |
| Dothistroma risk mapping                              | MFR Kalum                    | 2006    | 2008   |
| Potential power line corridor for Highway 37          | TBD                          |         |        |

#### Data source and comments:

Ownership is a custom layer created by Forest Analysis and Inventory Branch using information from the Crown land Registry and the Integrated Cadastral Information Society. It includes woodlot licences and community forest agreements, which have their AACs set outside of the timber supply review process for TSAs.

Parks and protected areas include 22 new protected areas created since the last timber supply review as a result of the Kalum LRMP.

Forest cover inventory has been statistically adjusted using the results of the net volume adjustment factor sampling conducted in 2005.

### 3. Inventories

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A forest cover depletion layer is used to update the forest cover for recent harvesting and other depletions. It is created from RESULTS openings and harvest history and a remote sensing change detection layer.

ESA mapping was generated as part of forest cover in 1976 and updated in 1989.

Terrain stability mapping is an amalgamation of projects completed in Arc/Info or similar format. Other projects completed in earlier formats (such as Pamap or Microstation) are not included in the amalgamation. The amalgamated map was used to identify areas with no TSM, where ESA mapping for sensitive soils will be used.

UREP/recreation reserves are identified in the Tantalus Gator database maintained by Crown Land Registry Services. Other recreation reserves administered by the Ministry of Tourism, Culture and the Arts for forest recreation sites and trails are included. Linear features are converted to polygons with a width of 20 metres.

Harvest method mapping is used to identify which areas are operable. Associated with this data set is the buffered stream data used to determine riparian land base reductions. A separate data layer identifies areas that are inaccessible due to isolation, distance, physical barriers or the scattered nature of operable timber.

Forest inventory zone is used to apply volume criteria for problem forest types.

Wildlife habitat areas and ungulate winter ranges are mapped and established by Ministry of Environment.

The Kalum Sustainable Resource Management Plan (SRMP) was approved on April 28, 2006. It legally implements some of the recommendations from the Kalum Land and Resource Management Plan (LRMP). Its' mapping products and objectives are used to determine the timber harvesting land base or to apply forest management requirements.

Riparian stream classification mapping is an amalgamation of all of the stream classifications produced to date by licensees as part of their operational planning under the *Forest Practices Code Act* and the *Forest and Range Practices Act*. An additional map was created from this data to identify those areas which do not have stream classifications.

Community watersheds are established to protect licensed water works.

Visual landscape inventory identifies areas to be managed using visual quality objectives. A slope map is used to determine the maximum allowable disturbance for each area.

Old growth management areas were established in 2006 as a spatial implementation of the old seral requirements for the Kalum SRMP. They were amended in May 2007.

Skeena Islands rare ecosystems mapping classifies stands into stand types and conservation ranks.

First Nations boundaries are used for reporting harvest levels.

Fish sensitive watershed boundaries are proposed by Ministry of Environment.

Dothistroma risk mapping was completed in 2006 and updated in 2008.

## 4. Division of the Area into Management Zones

### 4.1 Management zones and objectives

Management zones are used to differentiate areas with distinct management emphasis. For example, a zone may be based on a harvesting or silviculture system, visual quality objective or wildlife consideration. Sometimes, an area of forest is subject to more than one management objective. Areas subject to each objective will be placed into a management zone appropriate for the specific situation. Forest land that is unavailable for timber harvesting will contribute to meeting objectives for other forest values.

Table 3 outlines the zones or objectives to be incorporated into the timber supply model. Further information on the forest cover requirements to be applied to these areas can be found in Section 6.6, “Integrated resource management.”

Table 3. Objectives to be tracked

| Objectives                                     | Inventory definition                                                             |
|------------------------------------------------|----------------------------------------------------------------------------------|
| Grizzly bear habitat                           | Forested land base by grizzly bear identified watershed mapping from Kalum SRMP. |
| Patch size distribution                        | Number of harvest passes by landscape unit in the timber harvesting land base.   |
| Community watersheds                           | Forested land base of community watersheds.                                      |
| Lakelse River special resource management zone | Forested land base of the Lakelse River SRMZ.                                    |
| Visual quality objectives                      | Forested land base in each visual unit.                                          |
| Old forest retention in undeveloped watersheds | Forested area by BEC variant. In the Jesse-Emsley watershed.                     |
| Mature+old and early seral stage distributions | Forested area by landscape unit and BEC variant.                                 |
| Rare ecosystems around the Skeena Islands      | Mapped zones from Skeena Islands project.                                        |
| Harvest by stand quality class                 | Stand quality classes from harvest method mapping.                               |
| Harvest by age class                           | Standard 20-year inventory age classes.                                          |
| Harvest by landscape unit                      | Landscape units.                                                                 |

Data source and comments:

See Section 3, “Inventories”, for the sources of mapping and zones referenced above. Information on the forest cover requirements to be applied to these areas can be found in Section 6.6, “Integrated resource management.”

Harvest by age class and landscape unit will be used to track the availability of timber.

## 4. Division of the Area into Management Zones

### 4.2 Analysis units

An analysis unit is composed of forest stands with similar tree species composition, timber growing potential and treatment regimes. Each analysis unit is assigned its own timber volume projections (yield tables) for existing and future stands. Yield table for existing natural stands will be derived using the Variable Density Yield Prediction (VDYP) model. Yield tables for recent plantations and future stands will be derived using the Table Interpolation Program for Stand Yields (TIPSY).

Table 4 shows the criteria for defining the analysis units for existing natural stands. After determining the timber harvesting land base, the timber supply analyst will determine the site index ranges for analysis units. Analysis units may not be required if a spatial timber supply model is used.

Table 4. Definition of analysis units for existing natural stands

| Analysis unit (leading species) | Criteria              |                                 |
|---------------------------------|-----------------------|---------------------------------|
|                                 | Inventory type groups | Site index range (m @ 50 years) |
| 1. Hemlock – good site          | 12 – 17               |                                 |
| 2. Hemlock – medium site        | 12 – 17               |                                 |
| 3. Hemlock – poor site          | 12 – 17               |                                 |
| 4. Balsam – good site           | 18 – 20               |                                 |
| 5. Balsam – medium site         | 18 – 20               |                                 |
| 6. Balsam – poor site           | 18 – 20               |                                 |
| 7. Spruce/cedar – good site     | 9 – 11, 21 – 26       |                                 |
| 8. Spruce/cedar – medium site   | 9 – 11, 21 – 26       |                                 |
| 9. Spruce/cedar – poor site     | 9 – 11, 21 – 26       |                                 |
| 10. Pine – good site            | 28 – 31               |                                 |
| 11. Pine – medium site          | 28 – 31               |                                 |
| 12. Pine – poor site            | 28 – 31               |                                 |
| 13. Cottonwood – all sites      | 35, 36                |                                 |

Data source and comments:

Hemlock-leading stands account for most of the area. All other leading species occupy small proportions of the timber harvesting land base (i.e., less than 10% each). Cedar occupies only about one percent, so it is combined with spruce which occupies about 6%. The timber supply analyst may decide to split analysis units where there are significant differences in site productivity, or to represent different treatment regimes. Analysis units may be combined where yield tables are similar, or if areas in individual analysis units are small.

## 4. Division of the Area into Management Zones

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Existing stands that have been spaced will be identified and assigned to separate analysis units.

Existing natural stand analysis units will regenerate to corresponding managed stand analysis units using the criteria described in Section 6.5.1, “Silviculture and regeneration activities in managed stands”.

Site index ranges will be based on the distribution of site index values for the timber harvesting land base for each leading species.

Coniferous analysis units will be subdivided by age into two categories to facilitate the application of site index adjustments for existing old-growth stands following harvest. The two age categories are: 140 years and younger; and older than 140 years. The subdivision will use the original inventory age, not the projected (i.e., current) age, because the inventory site index is considered reliable when the inventory age is 140 years or younger. In other words, the site index adjustment is only required for stands whose original inventory age is older than 140 years. In the base case analysis, the site index of managed stands of western hemlock will be adjusted according to the findings of the publication *Site index adjustment for old-growth coastal western hemlock stands in the Kalum Forest District* by G.D. Nigh and B. Love, 1997. See Section 6.5.1., “Silviculture and regeneration activities in managed stands”, for further details. Sensitivity analysis will apply other site index adjustments to other components of the forest.

## 5. Timber Harvesting Land Base Definition

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This part of the data package outlines the steps used to identify the Crown forested land base and the timber harvesting land base (THLB). The Crown forested land base consists of provincial Crown land with forest cover that is managed by the BC Forest Service for TSA timber supply. The Crown forested land base excludes:

- community forests;
- tree farm licences;
- woodlot licences; and
- private lands.

The THLB is that portion of the Crown forested land base that is available for timber harvesting. The THLB excludes:

- parks and protected areas;
- areas that are not suitable for timber production; and
- areas where timber harvesting is incompatible with management objectives for other resource values.

Land is considered outside the THLB only where no harvesting is anticipated to occur. Any area in which some timber harvesting will occur will remain in the THLB, even if the area will be subject to other management objectives, such as wildlife habitat and biodiversity. Such objectives will be modelled in the timber supply analysis. The Crown forested land base outside of the THLB will contribute to these other objectives.

Land may also be added to the THLB by:

- management activities that improve productivity or operability (e.g., the stocking of land currently classified as non-commercial brush with commercial tree species);
- the acquisition of productive forest land (e.g., timber licence reversions).

After identifying all areas that are not part of the THLB, any additional lands are added to the THLB. The result defines the current timber harvesting land base

Some of the following descriptions rely on attributes from Forest Inventory Planning (FIP) files that are not available in Vegetation Resource Inventory (VRI) files. If VRI files are used then the timber supply analyst will develop and document alternate ways to identify the land described in each section.

### 5.1 Non-forest, non-productive forest and non-commercial cover

Areas with projected type identity 6 are non-forest or non-productive forest, and areas with projected type identity 8 have no typing available. These categories include alpine areas, lakes, swamps, rivers, rock, ice, and roads. Areas with projected type identity 5 are occupied by non-commercial brush species. They are considered to be unlikely sites for timber production. All of these areas are excluded from both the Crown forested land base and the THLB; they do not contribute to objectives for wildlife habitat or biodiversity.

## 5. Timber Harvesting Land Base Definition

### 5.2 Land not administered by the BC Forest Service for TSA timber supply

Land not administered by the BC Forest Service for timber supply in the TSA includes private land (including Nisga'a private land), municipal land, federal land, Indian Reserves, tree farm licences, community forest agreement areas, and woodlot licences. These areas are all excluded from both the Crown forested land base and the THLB; they do not contribute to objectives for wildlife habitat or biodiversity. Timber licences are normally also removed, but all timber licences in the Kalum TSA have reverted to the TSA.

Parks and protected areas are part of the Crown forested land base and contribute to objectives for biodiversity and wildlife. However, they are not administered by the BC Forest Service for timber supply, so they are excluded from the THLB. New parks and protected areas were created as a result of the Kalum LRMP, including: Brim River, Coste Rocks, Dala/Kildala River Estuary, Eagle Bay, Exchamsiks River Park Expansion, Foch-Giltoyees, Gitnadoiks, Hai Lake – Mount Herman, Jesse Falls, Kitimat River Ecological Reserve Proposal, Kitsumkalum Lake North, Lakelse Lake Wetlands, Lower Skeena River – Exstew, Lower Skeena River – Kasiks, Lundmark Bog, Nalbeelah Creek Wetlands, Owyacumish River, Sleeping Beauty Mountain, Sue Channel / Hawkesbury Island, Sue Channel / Loretta Island, Swan Creek, and Weewanie Hotsprings.

A spatial data set has been developed that identifies the areas to be removed using information from the Crown Land Registry and the Integrated Cadastral Information Society.

### 5.3 Environmentally sensitive areas

Some forest lands are environmentally sensitive or significantly valuable for other resources. These areas are identified and delineated during a forest inventory and are called environmentally sensitive areas (ESAs). The ESA system uses the following classification: sensitive or unstable soil (S), forest regeneration problems (P), snow avalanche (A), recreation I, wildlife (W) and watersheds (H). With the exception of avalanche, two sensitivity categories are used: 1-high and 2-moderate.

Terrain stability mapping (TSM) provides a more accurate assessment of slope stability than ESA mapping for sensitive soils (Es), so TSM will be used in place of Es mapping where available.

Environmental sensitivity may reduce or preclude harvesting on identified sites. This can be accounted for through percent area reductions, or specific evaluation of individual ESA polygons for harvesting opportunity. Table 5 shows the proportion of ESAs in various categories that are excluded from the THLB.

Table 5. Description of environmentally sensitive areas

| ESA category | ESA description                                                                                                            | Reduction (%) |
|--------------|----------------------------------------------------------------------------------------------------------------------------|---------------|
| A            | Avalanche — highly sensitive                                                                                               | 100           |
| S1           | Soil — highly sensitive                                                                                                    | 50            |
| S2           | Soil — moderate sensitive                                                                                                  | 30            |
| TSM class V  | Unstable slopes – high likelihood of landslide initiation following timber harvesting or road construction                 | 90            |
| TSM class IV | Potentially unstable slopes – moderate likelihood of landslide initiation following timber harvesting or road construction | 10            |

## 5. Timber Harvesting Land Base Definition

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Data source and comments:

Land base exclusions for regeneration ESAs (P) are not used because the classifications are outdated. These areas overlap almost completely with inoperable areas or areas with low timber growing potential.

Land base exclusions for ESAs for watersheds (H), recreation (R), and wildlife (W) are not used because they are outdated. They are replaced by mapping for community watersheds, recreation reserve mapping, and specific habitat mapping for mountain goat, grizzly bear and tailed frog. They are addressed in later sections.

Watersheds where TSM exists have been delineated. TSM will replace ESAs for sensitive soils (S) in these watersheds. ESAs for sensitive soils will be used in watersheds where TSM has not been completed.

Areas classified in TSM as class V terrain (unstable slopes) are generally unsuitable for harvest. However, TSM tends to overestimate the amount of class V terrain because of limited field sampling for some survey intensities, and because TSM is inherently conservative to ensure that all unstable areas are identified and subjected to field assessment. Forest licensees, BC Timber Sales Staff and district staff estimate that 90% of mapped class V terrain is considered unavailable for harvest.

Areas classified in TSM as class IV terrain (potentially unstable slopes) are generally not limiting to harvest activities. However, it does require more expensive road construction techniques to mitigate the potential for landslides due to road construction. Where construction costs are prohibitive and alternative road locations are not available (i.e., either above or below the Class IV terrain), areas may become unavailable for harvesting due to access limitations. In the Kalum TSA, the impact of Class IV terrain on the THLB cannot be accurately quantified at this time because harvesting has not occurred in all areas where TSM exists. Experience of BC Timber Sales staff in the adjacent Kispiox TSA showed a reduction of 5% in areas planned for harvest. This came from the first pass of harvest development, which may have occurred on somewhat easier terrain, and subsequent passes may be more limited by Class IV terrain. Therefore 10% of class IV terrain is considered unavailable for harvest due to cost-prohibitive mitigating measures for access.

Operational findings from the previous timber supply review indicated that ESA mapping overestimates the amount of area with sensitive soils (S1 and S2). The typical land base removal of 100% for S1 was reduced to 50% to account for this overestimate. The typical land base removal of 50% for S2 was reduced to 30%. No new information is available so this analysis will also use these lower reductions for ESAs for sensitive soils.

### 5.4 Areas with high recreation values

Some areas with high recreation value have been designated for protection as recommended by the Kalum LRMP. These areas are addressed in Section 5.2, “Land not administered by the BC Forest Service for TSA timber supply”. Areas designated as Use, Recreation and Enjoyment of the Public (UREP/recreation reserves) will be excluded from the THLB. Other recreation reserves administered by the Ministry of Tourism, Culture and the Arts for forest recreation sites and trails will also be removed from the THLB. Any linear features will be converted to polygons with a total width of 20 metres.

### 5.5 Inoperable areas

Areas are considered inoperable when there are physical barriers or limitations to harvesting, appropriate logging methods (e.g. cable) are not available or too costly, or stands are not merchantable (low value or high cost). The first factor listed is an example of physical operability or accessibility. The last two factors listed are examples of economic operability. Changing technology and economic conditions can affect both physical and economic operability. Table 6 lists the operability classes that will be excluded from the THLB.

## 5. Timber Harvesting Land Base Definition

Table 6. Description of inoperable areas

| Accessible | Logging history | Harvest method | Stand quality | Reduction (%) |
|------------|-----------------|----------------|---------------|---------------|
| No         |                 | All            | All           | 100           |
| Yes        | No              | I – inoperable | All           | 100           |
| Yes        | No              | A – aerial     | P             | 100           |

Data source and comments:

A harvest method mapping (HMM) project was undertaken in 2006 to re-define operability in the Kalum TSA. Operability is defined based on physical accessibility and economic feasibility of harvest. The methods, parameters and results of the project are documented in a report entitled “Kalum TSA and Nass TSA Operability Study” produced by Magellan Digital Mapping. A digital elevation model was classified by slope classes to produce harvest method polygons. Forest stands were classified by stand attributes to produce stand quality classes. The following codes were used:

Harvest method: G – ground, C – cable, A – aerial, I – inoperable

Stand quality: S – sawlog, M – marginal sawlog, P – pulplog, D – deciduous, L – low site, T – density problems

The HMM did not identify isolated or inaccessible areas that would be uneconomic to harvest. Additional mapping identifies the following areas that are considered to be inaccessible:

- Exchamsiks landscape unit isolated by the Exchamsiks River Park Expansion;
- area in the upper Clore River that is not economic to harvest;
- area north of the Nisga’a private land that was transferred from the North Coast TSA;
- scattered sawlog and marginal sawlog stands at the heads of various drainages.

It is assumed that if an area has already been logged (i.e., if it has a logging history) then it will remain operable regardless of the HMM result, as long as the area is accessible.

Pulplog stands have insufficient value to warrant harvesting by the aerial method. Therefore, only sawlog and marginal sawlog stands will remain in the THLB for the aerial harvest method in the base case.

There is uncertainty about the economic viability of marginal sawlog and pulplog stands. There has been very little harvesting in these low quality stands in the past 5 years. The impact of removing all or part of this area will be tested in sensitivity analysis. It will also be considered in the development of a potential partition for low quality stands.

### 5.6 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. As these stands are not considered to be harvestable, they will be removed from the timber harvesting land base using the criteria listed in Table 7.

## 5. Timber Harvesting Land Base Definition

Table 7. Description of sites with low timber growing potential

| Inventory type group | Characteristics     |                                     |                    |                             |                                              |            |               |
|----------------------|---------------------|-------------------------------------|--------------------|-----------------------------|----------------------------------------------|------------|---------------|
|                      | Current age (years) | Current volume (m <sup>3</sup> /ha) | Current height (m) | Height at age 200 years (m) | Volume at age 200 years (m <sup>3</sup> /ha) | Site index | Reduction (%) |
| All                  | > 200               | FIZ A: < 300<br>FIZ J: < 250        | < 19.5             |                             |                                              | N/A        | 100           |
| 9-11 Cedar           | ≤ 200               |                                     |                    | < 19.5                      | FIZ A: < 300<br>FIZ J: < 250                 |            | 100           |
| 12-17 Hemlock        | ≤ 200               |                                     |                    | < 19.5                      | FIZ A: < 300<br>FIZ J: < 250                 |            | 100           |
| 18-20 Balsam         | ≤ 200               |                                     |                    | < 19.5                      | FIZ A: < 300<br>FIZ J: < 250                 |            | 100           |
| 21-26 Spruce         | ≤ 200               |                                     |                    | < 19.5                      | FIZ A: < 300<br>FIZ J: < 250                 |            | 100           |
| 28-31 Pine           | ≤ 200               |                                     |                    | < 19.5                      | FIZ A: < 300<br>FIZ J: < 250                 |            | 100           |
| 35-36 Cottonwood     | ≤ 200               |                                     |                    | < 19.5                      | < 250                                        |            | 100           |

Data source and comments:

The previous timber supply review used site index limits based on a minimum mean annual increment of one cubic metre per hectare. The 1999 allowable annual cut (AAC) rationale recognized that those site index limits may have been too low.

Current practice indicates that stands that do not meet minimum volume or height criteria are not suitable for harvest. These criteria are applied in two different ways.

- Stands currently older than 200 years that do not meet both the minimum volume and minimum height criteria will be removed from the THLB.
- Stands currently 200 years old or younger that will not meet the minimum volume and height criteria in the future will be removed from the THLB. The minimum site index that produces both the minimum volume and height criteria by age 200 will be calculated for each set of inventory type groups shown in Table 7.
- Stands in this age range whose site index is lower than the calculated minimum site index will be removed from the THLB. However, stands that have previously been harvested will not be removed.

## 5. Timber Harvesting Land Base Definition

The criteria described here are consistent with to the criteria for minimum harvestable ages described in Section 6.1.3. They are also similar to those used to assign the stand quality code of L – Low Site in the harvest method mapping (HMM). The volume criteria vary by forest inventory zone (FIZ) as a result of iterative testing of the HMM to produce mapped results using forest cover inventory attributes that agree with local knowledge of the licensees. The HMM differed from this data package in the following ways:

- HMM assessed volume at age 140 years instead of at 200 years. Age 140 was judged to be too low to remove stands from the THLB due to low volume or height. Using 200 years allows time for existing natural stands to reach these minimum criteria.
- HMM set a minimum site index of 10 for all stands, instead of a minimum site index for stands age 61 to 200 years old based on meeting producing minimum volume and height. Using site index for younger stands based on achieving minimum height and volume is less arbitrary than using site index 10 for all stands.

### 5.7 Problem forest types

Problem forest types are stands that are physically operable and exceed low site criteria yet are not currently utilized or have marginal merchantability. These types are wholly or partially excluded from the timber harvesting land base according to the criteria listed in Table 8.

Table 8. Problem forest types criteria

| Description                                    | Inventory type groups | Age  | Crown closure (%) | Stocking class | Reduction (%) |
|------------------------------------------------|-----------------------|------|-------------------|----------------|---------------|
| Deciduous stands other than cottonwood-leading | 37-42                 |      |                   |                | 100           |
| Low crown closure (open-grown)                 | All                   | > 60 | 0-25              |                | 100           |
| Stocking problems                              | All                   |      |                   | 2, 3, 4        | 100           |

Data source and comments:

Currently, deciduous-leading stands other than cottonwood-leading stands, open-grown stands, stands with low volume, and stands with stocking problems (low or high) are not targeted for harvest.

The criteria for deciduous stands corresponds approximately with stand quality code D – deciduous in the harvest method mapping. However code D in HMM does not differentiate between cottonwood-leading stands and other deciduous-leading stands. Code D in HMM also only includes deciduous-leading stands with less than 30% coniferous content. Interest has been expressed in harvesting cottonwood stands, so these stands will not be excluded from the THLB, regardless of coniferous content.

Stocking class 2 represents mature stands with low stocking. Stocking classes 3 and 4 represent lodgepole pine-leading stands that are stagnant. There may be overlap between open-grown, low volume and low stocking criteria. These correspond with stand quality code T – density problems in the harvest method mapping.

Not satisfactorily restocked (NSR) areas will not be excluded using these problem forest type criteria because of uncertain species composition information.

## 5. Timber Harvesting Land Base Definition

### 5.2 Wildlife habitat reductions

Wildlife habitat may be identified and managed through several processes including the *Identified Wildlife Management Strategy*, identification and approval of ungulate winter range (UWR), and management practices specified in plans that establish legal objectives, such as the Kalum SRMP. Management may include “no harvesting” in core areas around nesting sites or other valuable habitats for endangered species, as well as modified harvesting in management areas outside of the core areas. Table 9 describes the areas to be removed from the timber harvesting land base for wildlife.

Table 9. Wildlife habitat exclusions

| Wildlife species | Inventory description                                                           | Reduction (%) |
|------------------|---------------------------------------------------------------------------------|---------------|
| Tailed frog      | Wildlife habitat areas #6-058 and 6-059 – core area and special management zone | 100           |
| Tailed frog      | Wildlife habitat areas #6-060 to 6-067 – core area                              | 100           |
| Tailed frog      | Wildlife habitat areas #6-060 to 6-067 – special management zone                | 70            |
| Mountain goat    | Mountain goat ungulate winter ranges                                            | 100           |

Data source and comments:

Ungulate winter ranges for mountain goat and wildlife habitat areas for tailed frog have been legally established under the *Forest and Range Practices Act*. They are also documented in the Kalum SRMP. Harvest requirements are specified in the legal orders. The management requirement for the special management zone of tailed frog WHAs #6-060 to #6-067 specifies a silviculture system that maintains 70% residual stand volume and attributes of the natural stand structure profile, evenly dispersed. The areas involved are small and the requirement has been converted to a 70% land base reduction because it will likely be uneconomic for harvesting returns in these small areas.

There are currently no habitat exclusions for grizzly bear. Management requirements for grizzly bear are described in Section 6.6.1, “Forest cover requirements”. Wildlife habitat areas for grizzly bear will be established in the near future. A sensitivity analysis will test their impact on timber supply.

Licensees are also required to manage for other red- and blue-listed species and plant communities. In most cases these are being addressed at an operational level using wildlife tree patches and other reserves, or by managing access construction. Where additional reserves are required, they are generally small and have insignificant impacts.

## 5. Timber Harvesting Land Base Definition

### 5.9 Cultural heritage resources

Archaeological overview and cultural heritage inventories for the entire Kalum TSA have been completed. Within the Kalum TSA, there are 2512 hectares which are identified for high archaeological potential. Some cultural heritage resources are very close to lakes, rivers and streams and will lie within riparian reserve zones and riparian management areas. Some features can be incorporated into wildlife tree patches. Current practice by licensees to address any cultural heritage resources that fall outside of riparian areas and wildlife tree patches is to assess the areas and acquire site alteration permits under the *Heritage Conservation Act*. This generally affects the timing of logging but does not prevent it.

One old-growth area of approximately 132 hectares has been identified with an abundance of culturally modified trees that will likely result in only half of the area being available for harvest. Therefore, 50% of this area will be removed from the THLB. This area is located in the vicinity of the mouth of the Lakelse River, outside of the Lakelse River special resource management zone. It is identified as forest cover polygon 360 in mapsheet 103I047.

### 5.10 Exclusion of specific, geographically defined areas

Table 10 describes additional areas to be excluded from the timber harvesting land base to account for area exclusions not discussed in previous sections.

Table 10. *Exclusion of specific, geographically defined areas*

| Inventory source                      | Area description                                                                                                                                    | Excluded area | Reason for exclusion  |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|
| Kalum SRMP                            | Lakelse River Special Resource Management Zone – Subzone 1                                                                                          | All           | No harvest or salvage |
| Kalum SRMP                            | Kiteen-Cedar landscape connectivity corridor – polygon A                                                                                            | All           | No harvest            |
| Kalum SRMP                            | Old growth management areas                                                                                                                         | All           | No harvest            |
| Research installations                | Research installations and growth & yield plots                                                                                                     | All           | No Harvest            |
| Skeena Islands rare ecosystem mapping | All old-mature coniferous stands, all secondary deciduous stands in conservation rank, 700 ha of secondary deciduous stands in conservation rank B2 | All           | No harvest            |

Data source and comments:

The Kalum SRMP established the Lakelse River Special Resource Management Zone and polygon A of the Kiteen-Cedar landscape connectivity corridor. They will be removed from the THLB. The Kalum SRMP established two additional landscape connectivity corridors: polygon B of the Kiteen-Cedar corridor and the Williams – Thomas/Clore corridor. These areas require partial harvesting or maintenance of stand structure and function. These requirements do not preclude timber harvesting so they are not removed from the THLB.

The Kalum SRMP designated old-growth management areas. They will be removed from the THLB.

A process is underway to identify and designate research installations and growth and yield plots under the *Government Actions Regulation*. These areas will be removed from the THLB.

## 5. Timber Harvesting Land Base Definition

The Kalum SRMP requires conservation of rare plant communities on the Skeena Islands. Rare plant communities include: high bench Sitka Spruce – Salmonberry (CWHws1/07, CWHvm1/09) and middle bench Black Cottonwood – Red-osier Dogwood (CWHws1/08, CWHvm1/10). The Kalum SRMP does not specify how to achieve this objective. A draft refinement of the Kalum SRMP objective proposes targets to retain or recruit 70% of the amount of each plant community that existed prior to logging in 1947. Table 11 shows the existing condition of the Skeena Islands in terms of the area in each stand type by conservation rank. It also shows the priorities for conservation and the conservation targets.

To model the effect of the conservation targets in Table 11, it is assumed that the target of retaining 2950 hectares of old-mature coniferous stands for the red-listed plant community requires removal from the THLB of all of the old-mature coniferous stands, all secondary deciduous stands in conservation rank B1, and 700 hectares of the secondary deciduous stands in conservation rank B2. Stand types and conservation ranks are mapped by the Skeena Islands rare ecosystems project and the terms are defined below the area summary.

It is assumed that recruitment and retention for the blue-listed plant community will permit harvesting using best management practices being developed by the Skeena Islands rare ecosystems project. No removals from the THLB will be made for the blue-listed plant community.

*Table 11. Skeena Islands area summary and priority for conservation*

| Conservation rank         | Stand type (hectares) |                     |                       | Total |
|---------------------------|-----------------------|---------------------|-----------------------|-------|
|                           | Primary deciduous     | Secondary deciduous | Old-mature coniferous |       |
| A Excellent condition     | 342                   | 0                   | 1,009                 | 1,351 |
| B1 Good condition         | 1,051                 | 1,241               | 0                     | 2,292 |
| B2 Good condition         | 1,549                 | 847                 | 0                     | 2,396 |
| B3 Good condition         | 1,350                 | 262                 | 0                     | 1,612 |
| B4 Good condition         | 427                   | 84                  | 0                     | 511   |
| C Marginal condition      | 121                   | 157                 | 0                     | 278   |
| D Non-forested            | 131                   | 151                 | 0                     | 282   |
| Total forested area       | 4,840                 | 2,591               | 1,009                 | 8,440 |
| Minimum conservation area |                       | 2,819               | 2,950                 |       |

Highest priority for conservation and recruitment, and at or near future desired condition.

Mid priority for conservation and recruitment, and focus area for management decisions and best-management plan development.

Lowest priority for conservation and recruitment, and longest time and potential for recruitment.

## 5. Timber Harvesting Land Base Definition

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### Conservation Rank Definitions:

|                               |                        |                                                                                                                                                                                    |
|-------------------------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A<br>(natural and<br>managed) | Excellent<br>condition | No previous harvest history or < 25% selective cut, with<br>old-growth conifers and few exotic species.                                                                            |
| B1                            | Good condition         | Similar to original stand, with conifers in understory and previous<br>harvest history > 25%.                                                                                      |
| B2 – B4                       | Good condition         | Decreasing value based on ranking criteria (size, amount of<br>conifers and/or old-growth structure remnants)                                                                      |
| C                             | Marginal<br>condition  | Previously harvested. Forested state but where original stand<br>characteristics not maintained. Understory conifer not visible on<br>air photo, or high number of exotic species. |
| D                             | Poor condition         | Being maintained in non-forested state.                                                                                                                                            |

### Stand Class Definitions

|                        |                                                                                                                                |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Primary deciduous      | Deciduous cover on young islands.                                                                                              |
| Secondary<br>deciduous | Deciduous cover as a successional stage on mid- or high-bench where original<br>conifer stands have been previously harvested. |
| Mature conifer         | Original or mature stands.                                                                                                     |

Source: Landscape and Stand Scale Structure and Dynamics, and Conservation Ranking of Skeena River Floodplain Forests (de Groot, A, S. Haeussler, D.Yole 2005). Areas from Table 21, page 45. Definitions from Appendix 5, page 74.

## 5. Timber Harvesting Land Base Definition

### 5.11 Riparian reserve and management areas

Table lists the area reductions to be applied to account for riparian reserve zones and riparian management zones along streams and around lakes and wetlands.

Table 12. Riparian management areas

| Stream, wetland or lake class | Reserve zone width (metres) | RRZ reduction (%) | Management zone width (metres) | RMZ reduction (%) |
|-------------------------------|-----------------------------|-------------------|--------------------------------|-------------------|
| S1-A (width ≥ 100 m)          | 0                           | N/A               | 100                            | 20                |
| S1-B (width < 100 m)          | 50                          | 100               | 20                             | 20                |
| S2                            | 30                          | 100               | 20                             | 20                |
| S3                            | 20                          | 100               | 20                             | 20                |
| S4                            | 0                           | N/A               | 30                             | 10                |
| S5                            | 0                           | N/A               | 30                             | 10                |
| S6                            | 0                           | N/A               | 20                             | 0                 |
| W1                            | 10                          | 100               | 40                             | 10                |
| W3                            | 0                           | N/A               | 30                             | 10                |
| W5                            | 10                          | 100               | 40                             | 10                |
| L1-A (area ≥ 1,000 ha)        | 0                           | N/A               | 0                              | N/A               |
| L1-B (area < 1,000 ha)        | 10                          | 100               | 0                              | N/A               |
| L3                            | 0                           | N/A               | 30                             | 10                |

Data source and comments:

The harvest method mapping project collected all of the stream classifications produced to date by licensees as part of their operational planning under the *Forest Practices Code Act* and the *Forest and Range Practices Act*. These streams have been mapped and buffered with the appropriate riparian reserve and management zones for their stream class. Approximately 7,058 km of streams have been classified out of a total of 9,929 km in the Kalum TSA, or approximately 71%. An additional map was created from this data to identify those areas which do not have classified mapped streams.

For those areas where classified stream mapping exists, the buffers will be used explicitly in removing land from the timber harvesting land base. The timber supply analyst will determine the proportion of area in riparian reserve and management zones for the area with classified mapped streams. That proportion will be applied as the riparian reduction in the area without classified mapped streams.

Full retention of riparian reserves is required under the *Forest Planning and Practices Regulation*. Current practice for retention in riparian management zones, which is defined by Forest Stewardship Plans in the Kalum TSA. There is a slight variation among these Forest Stewardship Plans; Table 12 reflects the common elements.

## 5. Timber Harvesting Land Base Definition

### 5.12 Roads, trails and landings

Separate estimates are made to reflect the loss in productive forest land due to existing and future roads, trails and landings (RTL). Existing RTL estimates are applied as reductions to the current THLB. Future RTL reductions are applied after stands are harvested for the first time in the timber supply model. Table13 shows the reductions to be made for existing and future RTL.

Table13. *Estimates for existing and future roads, trails and landings*

| Roads, trails and landings | Age (years) | Logged | Total Reduction (%) |
|----------------------------|-------------|--------|---------------------|
| Existing                   | ≤ 45        | Yes    | 8.8                 |
| Future                     | > 45        | –      | 8.8                 |

Data source and comments:

Studies from 1992 for a previous timber supply review for Tree Farm Licences (TFLs) 1 and 41, and forest licences in the Kalum TSA determined a weighted average of 8.8% of cutblock area is lost to roads, trails, landings and major debris piles. More recent information for the Kalum TSA from the RESULTS database indicates that an average of 6.3% of the gross cutblock area is occupied by non-productive roads for blocks harvested from 1997 to present. Significant additional area is lost as a result of the continued practice of retaining large debris piles in roadside work areas that are not burned or otherwise removed. In the absence of more detailed estimates of the area lost to these debris piles, the previous estimate of 8.8% will be used in this analysis as the estimate of the total area lost to roads, trails, landings and debris piles.

The reduction for existing roads will only be applied to areas 45 years and younger (consistent with immature plantation history criteria in Table 20) that have been logged (activity\_cd = 'L').

The same reduction will be applied in the timber supply model to stands harvested in the future.

### 5.13 Timber licence reversions

Timber licences are a form of timber tenure that gives the holder exclusive right to harvest merchantable timber from defined areas of Crown land. After the area is harvested and reaches a free-growing condition the land reverts to Forest Service jurisdiction. The timber cut from timber licences is not part of the allowable annual cut of a TSA. All timber licences in the Kalum TSA expired on March 4, 2002 and have reverted to Forest Service jurisdiction. There is no need to account for any further timber licences reversions.

## 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 (inside bark) and minimum diameter at breast height by species. Table 14 shows the utilization levels used in the analysis to calculate merchantable volume.

Table 14. Utilization levels

| Analysis unit | Utilization                 |                                |                           |                      |
|---------------|-----------------------------|--------------------------------|---------------------------|----------------------|
|               | Minimum stump diameter (cm) | Corresponding minimum DBH (cm) | Maximum stump height (cm) | Minimum top dib (cm) |
| Pine          | 15                          | 12.5                           | 30                        | 10                   |
| Cedar         | 20                          | 17.5                           | 30                        | 15                   |
| All other     | 20                          | 17.5                           | 30                        | 10                   |

Data source and comments:

Table 1-2 Interior Timber Merchantability Specifications of the *Provincial Logging Residue and Waste Measurement Procedures Manual* specifies the utilization levels for billing of harvested timber. These levels are also used in assessing cut control for licence AACs.

The specifications for minimum stump diameter are converted to the nearest corresponding breast height diameter for use with yield models.

#### 6.1.2 Volume exclusions for mixed-species stands

Table 15 identifies any species in mixed-species stands that are unmerchantable and will not be harvested. The unharvested portion of a stand does not contribute to estimated stand volumes (timber yield curves).

Table 15. Volume exclusions for mixed-species types

| Species                         | Volume exclusion (%) |
|---------------------------------|----------------------|
| All deciduous except cottonwood | 100                  |

Data source and comments:

Forest district staff reviewed the harvest levels of deciduous tree species. The small contribution made by such components is negligible, except for cottonwood. For example, a small amount of alder (approximately 500 cubic metres) has been harvested in the past five years.

## 6. Current Forest Management Assumptions

### 6.1.3 Minimum harvestable ages

The minimum harvestable age is the age at which a stand is considered to be harvestable. While harvesting may occur in stands at the minimum ages in order to meet forest level objectives (e.g., maintaining overall harvest levels for a short period of time or avoiding large inter-decadal changes in harvest levels), most stands will not be harvested until well past the minimum harvestable ages because management objectives for other resource values (e.g., requirements for the retention of older forest). Table 16 shows the criteria to determine minimum harvestable ages.

Table 16. Minimum harvestable age criteria

| Analysis unit         | Minimum criteria |                                  |                                   |
|-----------------------|------------------|----------------------------------|-----------------------------------|
|                       | Height (metres)  | Volume (m <sup>3</sup> /hectare) | Average diameter – all stems (cm) |
| All except cottonwood | 19.5             | 250                              | 25                                |
| Cottonwood            |                  | 250                              |                                   |

Data source and comments:

All stands except cottonwood are expected to meet all three criteria before being eligible for harvest. The minimum height criterion refers to top height (i.e., average of the tallest tree in each 1/100<sup>th</sup> hectare plot in a survey), not average height. It is required to produce an adequate log length of 7 to 10 metres. The minimum diameter is a critical element and will be based on all trees, not just the largest 250 trees per hectare. The minimum diameter criterion is based on “*Potential financial returns from alternative silvicultural prescriptions in second-growth stands of coastal British Columbia*” by A.F. Howard and H. Temesgen, 1997, Canadian Journal of Forest Research, 27: 1483-1495. Minimum harvestable ages may be adjusted if large differences result from the height and volume criteria. Cottonwood will only use the minimum volume criteria.

### 6.1.4 Harvest scheduling priorities

Records on harvesting from 2000 to 2006 indicate that approximately 90% of blocks harvested were older than 250 years, and 8% were between 141 and 250 years old. A small number of blocks were between 101 and 140 years old. This pattern has changed recently as a result of poor economic conditions and mill closures. All licensees are now targeting the most valuable stands for harvest as a way to maintain the viability of their operations. Harvesting is favouring thrifty sawlog stands, which can be identified using stand quality classes in the harvest method mapping. There is also a strong desire to harvest stands younger than 140 years, including any second-growth stands that are available because they occur on favourable terrain and have ready access.

Harvesting in the base case will follow a group priority rule. Harvesting will be random within each priority group. Harvesting will start with the highest priority group and will move to the next priority group only when there is no timber available in the current priority group. The priorities are:

- (1) Sawlog stands 140 years old or younger and sawlog stands older than 140 years that are non-hemlock leading;
- (2) Sawlog stands older than 140 years that are hemlock leading;
- (3) Marginal sawlog stands;
- (4) Pulplog stands.

## 6. Current Forest Management Assumptions

### 6.1.5 Silvicultural systems

The majority of the Kalum TSA is being harvested using clearcut harvesting methods. Forest district staff anticipate some increased use of partial or selection harvest systems. However, there is little current performance and factoring partial or selection harvest silvicultural systems into the TSA timber supply is not reasonable at this time.

The Kalum SRMP requires special harvesting in several areas. At least 50% of the volume harvested in any five year planning cycle in subzone 2 of the Lakelse River Special Resource Management Zone must be selection harvested. Partial harvesting is also required in part of the Kiteen-Cedar landscape connectivity corridor. Stand structure and function must be maintained in the Williams – Thomas/Clore landscape connectivity corridor. All of these areas are relatively small and only the timing of the timber harvest volume is affected, so they will all be modelled using clearcut methods.

No commercial thinning has been carried out within the Kalum TSA in the past 5 years and none is forecast to be carried out based on current development planning. Limited commercial thinning has been carried out within the Kalum Forest District, but mostly outside of the Kalum TSA. Considering the poor local market for small wood, the cost of commercial thinning, and the supply of larger mature wood for conventional harvesting, it is unlikely that the application of this harvest method will increase significantly in the near future.

### 6.2 Unsalvaged losses

Table 17 shows the estimated average annual unsalvaged volume loss to insect and disease epidemics, fires, wind damage or other agents on the timber harvesting land base. The unsalvaged loss column only reflects those areas in which the volume will not be recovered or salvaged.

Table 17. Unsalvaged losses

| Cause of loss          | Annual total loss<br>(m <sup>3</sup> /year) | Annual unsalvaged loss<br>(m <sup>3</sup> /year) |
|------------------------|---------------------------------------------|--------------------------------------------------|
| Fire                   | 2 500                                       | 2 500                                            |
| Wind                   | 7 000                                       | 2 500                                            |
| Mountain pine beetle   |                                             |                                                  |
| - first 5 year period  | 12 200                                      | 12 200                                           |
| - second 5 year period | 116 500                                     | 116 500                                          |
| Total                  | 21 700 to 126 000                           | 14 800 to 894 200                                |

Data source and comments:

Estimated annual loss due to wind from the last timber supply review has been reduced from 14 000 m<sup>3</sup> to 7000 m<sup>3</sup>. The estimated annual loss for fire is the same as for the last timber supply review. The popularity of the salvage program has reduced the total unsalvaged loss to 1500 to 3500 m<sup>3</sup> (average of 2500 m<sup>3</sup>). There is currently no other information available.

The unsalvaged loss for Mountain Pine Beetle is explained in the next section.

## 6. Current Forest Management Assumptions

### 6.3 Mountain pine beetle

The Mountain Pine Beetle entered the Kalum TSA in 2007. Surveys in 2008 identified 13,047 red-attack trees and a spread ratio of red-attack to green-attack of 1:1.57. Assuming an average of 800 trees per hectare with an average yield of 250 cubic metres per hectare, the volume of red-attack trees amounts to approximately 4077 cubic metres. Applying the estimated spread rate of 1.57 to the next 4 years produces a total attacked volume of approximately 61 000 cubic metres, or an average of 12 200 cubic metres per year for the first 5-year period. Similarly, the estimated volume of attacked timber in the second 5-year period is 116 500 cubic metres per year. It is assumed that the small area of pine in the TSA will be completely attacked in 10 years. The amount of pine will be verified at the start of the analysis. Under current market conditions, which are not expected to change, all of this volume will be an unsalvaged loss.

Mountain pine beetle will be simulated by targeting pine stands to be “harvested” by the beetle up to the amount of the unsalvaged loss. Pine stands will be converted to the corresponding natural hemlock analysis unit (i.e., same site productivity class) with an age of 20 years. This reflects the existence of younger conifers below the main pine canopy that will form new stands after the pine dies.

Pine stands in the Copper River watershed have been heavily attacked, and were not included in the estimate of unsalvaged losses. These areas will be converted in the model to hemlock analysis units, as described above.

### 6.4 Dothistroma needle blight

Dothistroma needle blight (*Dothistroma septosporum*) is affecting lodgepole pine plantations in the Kalum TSA. This disease causes pine trees to lose their needles, which can reduce growth and cause plantation failure. Spread of the disease has been facilitated by a series of wet summers. There is a risk that some of these stands will die completely and be replaced by naturally regenerated, younger stands.

Surveys in 2006 and 2008 classified the condition of stands according to the level of Dothistroma infection and stocking level of pine and other species. Stands were then assigned to management classes according to their condition. In 2008, 1090 hectares of regenerated pine stands were surveyed. The results by management class are summarized in Table 18.

Table 18. *Dothistroma management summary of surveyed pine stands*

| Management class             | Description                                                                                            | Area (ha) |
|------------------------------|--------------------------------------------------------------------------------------------------------|-----------|
| Stocking likely without pine | Adequate stocking of conifers other than pine, no planting required                                    | 304       |
| Wait and see                 | Marginal stocking of conifers other than pine or located at higher elevation, and low to moderate risk | 703       |
| Action imperative            | Insufficient stocking of conifers and high risk, requires planting                                     | 79        |
| Total                        |                                                                                                        | 1 086     |

## 6. Current Forest Management Assumptions

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The surveyed stands in each management class will be modelled as follows:

- “Stocking likely with pine” will be assigned to the corresponding natural hemlock analysis unit (i.e., same site productivity class) but with their age reduced by 10 years. This reflects the existence of younger conifers below the main pine canopy that will form new stands after the pine dies.
- “Wait and See” will maintain their current analysis unit and age. This represents normal growth.
- “Action Imperative” will be assigned to the corresponding planted hemlock analysis unit but with age reduced by 20 years to a minimum age of 0 years. This represents immediate fill planting to boost stocking of existing understocked conifers in these stands.

### 6.5 Silviculture

#### 6.5.1 Silviculture and regeneration activities in managed stands

Recent plantations and future stands will be projected using managed stand yield tables (MSYTs) produced using the B.C. Forest Service TIPSy growth and yield model. Table 19 shows the inputs required to produce MSYTs for the analysis. A MSYT may be built from a number of tables if more than one regeneration method is used within an analysis unit. When this is the case, tables are produced for the different regeneration methods (each method x species combination) are then aggregated into one table.

## 6. Current Forest Management Assumptions

Table 19. Regeneration assumptions by analysis unit

| Analysis unit              | Regen delay <sup>a</sup><br>(years) | OAFs <sup>b</sup><br>(%) |   | Method  |     | Species  |          | Density (sph) |       |
|----------------------------|-------------------------------------|--------------------------|---|---------|-----|----------|----------|---------------|-------|
|                            |                                     | 1                        | 2 | Type    | %   | Code     | %        | Initial       | Space |
| Hemlock – good site        | 1                                   | 15                       | 5 | Plant   | 100 | Hw       | 100      | 4500          |       |
| Hemlock – medium site      | 2                                   | 15                       | 5 | Natural | 100 | Hw       | 100      | 4500          |       |
| Hemlock – poor site        | 2                                   | 15                       | 5 | Natural | 100 | 100      | 100      | 4500          |       |
| Balsam – good site         | 1                                   | 15                       | 5 | Plant   | 100 | Ba       | 100      | 4500          |       |
| Balsam – medium site       | 2                                   | 15                       | 5 | Natural | 100 | Ba       | 100      | 4500          |       |
| Balsam – poor site         | 2                                   | 15                       | 5 | Natural | 100 | Ba       | 100      | 4500          |       |
| Spruce/cedar – good site   | 1                                   | 15                       | 5 | Plant   | 100 | Sx<br>Cw | 50<br>50 | 2000<br>2000  |       |
| Spruce/cedar – medium site | 1                                   | 15                       | 5 | Plant   | 100 | Sx<br>Cw | 50<br>50 | 2000<br>2000  |       |
| Spruce/cedar – poor site   | 2                                   | 15                       | 5 | Natural | 100 | Sx<br>Cw | 50<br>50 | 2000<br>2000  |       |
| Pine – good site           | 1                                   | 15                       | 5 | Plant   | 100 | PI       | 100      | 1400          |       |
| Pine – medium site         | 1                                   | 15                       | 5 | Plant   | 100 | PI       | 100      | 1400          |       |
| Pine – poor site           | 1                                   | 15                       | 5 | Plant   | 100 | PI       | 100      | 1400          |       |
| Cottonwood – all           | 1                                   | 15                       | 5 | Natural | 100 | Ac       | 100      | 800           |       |

(a) Regeneration delay reflects current operational practice and is defined as the time after harvest but before planting or seed germination occurs. Regeneration delays will be applied in the FSSIM forest estate model, not in the TIPSy yield model.

(b) Operational adjustment factors (OAFs) are used to adjust timber yield estimates to account for operational factors. OAF 1 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. OAF 2 accounts for losses that increase with stand age, for example decay due to disease. In this case OAF 2 increases from 0 at stand establishment and passes through 5% at 100 years of age.

### Data source and comments:

Although mixed planting and natural regeneration does occur, analysis units are assumed to regenerate to the leading species of the analysis unit. Records show that, traditionally, 63% of good sites are planted, 65% of medium sites are planted, and 80% of low sites are planted. However, practices have changed to rely more on natural regeneration. Planting is generally focused on good sites while medium and poor sites regenerate naturally with fill planting as necessary. Regeneration delay is 1 year for planted sites and naturally regenerated cottonwood sites, and 2 years for other naturally regenerated sites. Very little Class A seed is available. Density at regeneration delay is about 4500 stems/hectare (range is 4300 to 5600). Spruce/cedar sites have lower densities. The densities at the lower end of the range also account for lower stocking requirements specified by the Kalum SRMP for specific sites within identified grizzly bear watersheds. Pine stands have lower density (1400 stems per hectare) because of lower ingress of natural regeneration. Historically, very little spacing has been done, although spacing has been initiated with funding under the Northwest Strategy and the Forest Investment Account. The effect of a continued spacing program will be tested in sensitivity analysis.

## 6. Current Forest Management Assumptions

A “paired plot” old-growth site index study – *Site index adjustment for old-growth coastal western hemlock stands in the Kalum Forest District* by G.D. Nigh and B. Love, 1997 — confirmed that site index is underestimated by 10 metres when hemlock-leading stands currently greater than 140 years of age are harvested and replaced with managed hemlock stands. A site index adjustment of 10 metres will be applied in the base case to all species components of hemlock-leading stands currently older than 140 years in the CWH biogeoclimatic zone after they are harvested in the model. Information from site index by biogeoclimatic ecosystem classification (SIBEC) cannot be used because it requires acceptable predictive ecosystem mapping (PEM) which does not exist for the Kalum TSA.

### 6.5.2 Immature plantation history

Table 20 identifies areas of existing immature forest where the density (stems per hectare) was controlled and therefore should be assigned to a managed stand yield table (MSYT). All NSR and future harvested stands will be managed under MSYTs.

Table 20. Immature plantation history

| Analysis unit | Area managed (%) |             |             |             |             |
|---------------|------------------|-------------|-------------|-------------|-------------|
|               | Age 1 — 10       | Age 11 — 20 | Age 21 — 30 | Age 31 — 40 | Age 41 — 50 |
| All           | 100              | 100         | 100         | 70          | 30          |

Data source and comments:

The proportion of immature stands that are considered “managed” is based on the best professional estimate of forest district silviculture staff. Density levels will be reviewed in the inventory file. Note — ages were calculated by adding 10 years to the ages in the 1998 data package.

Approximately 13 000 hectares of young stands have been spaced. If these can be identified in the inventory file, they will be assigned to a separate analysis unit using a spaced managed stand yield table.

### 6.5.3 Not satisfactorily restocked (NSR) areas

Land classified in the Kalum TSA FIP file as type identity 4 or 9 is included in the current timber harvesting land base, unless it is considered to be inoperable. These type identities indicate not satisfactorily restocked (NSR) land. The purpose of this section is to identify the total area of NSR currently existing in the timber harvesting land base, and the estimated rate at which the NSR area will be restocked.

The amount of NSR in the forest inventory file will not be available until processing of the file is complete. Any discrepancy between the forest inventory files and RESULTS records (which are more up-to-date), aside from those outside the operable land base, will be assumed to have already been restocked and is currently about 1 to 5 years old. Where species information is not available, the analysis unit will be assigned based on planting history or in proportion to the analysis unit distribution in the various geographic units.

All NSR within the operable land base will be included in the timber harvesting land base. Any NSR within the inoperable portion of the land base will be reviewed when the forest inventory file is available. NSR is restocked in proportion to the current area of each analysis unit in stands less than 20 years old on the assumption that the overall distribution of harvest within analysis units has not changed significantly over this period of time.

## 6. Current Forest Management Assumptions

### 6.6 Integrated resource management

#### 6.6.1 Forest cover requirements

Forest cover requirements may be examined at a number of different levels, including landscape units, wildlife areas, and visual quality areas. With the requirement to retain different forest characteristics across the landscape, it is important to identify how forest outside of the THLB may be considered in the forest cover requirements (i.e., maximum allowable disturbance or minimum area retention). Table 21 describes the forest cover requirements to be applied.

Table 21. Forest cover requirements

| Resource emphasis                                                                                            | Maximum allowable disturbance (% area)       | Green-up height (metres) or age (years) | Minimum retained area (%) | Minimum age for retention (years) | Land base to which requirements apply                                                                         |
|--------------------------------------------------------------------------------------------------------------|----------------------------------------------|-----------------------------------------|---------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------|
| Patch size distribution                                                                                      | 35                                           | 3 m                                     |                           |                                   | THLB by landscape unit                                                                                        |
| Community watersheds                                                                                         | 30                                           | 5 m                                     |                           |                                   | Crown forested land base by community watershed for watersheds > 250 ha                                       |
| Lakelse River SRMZ – subzone 2                                                                               | 27%                                          | 40 years                                |                           |                                   | Crown forested land base                                                                                      |
| Grizzly bear                                                                                                 | 30%                                          | Between 25 and 100 years                |                           |                                   | Coniferous Crown forested land base in each of the McKay-Davies and Copper identified grizzly bear watersheds |
| Visual quality objectives                                                                                    |                                              |                                         |                           |                                   | Crown forested land base for each visual unit                                                                 |
| <ul style="list-style-type: none"> <li>Retention</li> <li>Partial retention</li> <li>Modification</li> </ul> | See text and Table 22                        | 5 m                                     |                           |                                   |                                                                                                               |
| Seral stage distributions                                                                                    | See text and Table 24, Table 25 and Table 26 |                                         |                           |                                   | Crown forested land base by landscape unit and BEC variant                                                    |
| Old forest in undeveloped watersheds                                                                         |                                              |                                         | See Table 27              |                                   | Crown forested land base by watershed and BEC variant                                                         |

## 6. Current Forest Management Assumptions

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Data source and comments:

### Patch size distribution

The patch size distribution requirements will be modelled using a proxy for cutblock adjacency. This will be applied to the integrated resource management area outside of special management zones, community watersheds and VQOs. IRM areas are generally large contiguous patches of harvestable forest and the maximum disturbance of 35% adequately describes the cutting pattern used at this time. The timber supply analyst will convert green-up heights to a unique age for each landscape unit according to the distribution of species and site productivity within each landscape unit.

### Community watersheds

All or part of 5 existing community watersheds (Deep Creek, Wathl Creek, Drake Creek, Eneeksgilaguaw Creek, Virginia Creek) are located within the Kalum TSA. Only the first two of these are larger than 250 hectares. The Kalum SRMP established an additional five community watersheds Rosswood (Clear Creek), Kleanza (Singlehurst Creek), Hatchery Creek, Usk (Skovens Brook) and Gossen (Gossen Creek). All of these new community watersheds lie within the Kalum TSA but only the first three are larger than 250 hectares. The Kalum SRMP requires a clearcut equivalency of less than 20% of the total area for each watershed larger than 250 hectares. The forest cover requirements shown in Table 21 for community watersheds are interpreted from the *Forest Practices Code Community Watershed Guidebook*.

### Lakelse River SRMZ

The previous timber supply review accounted for the management requirements of the Thunderbird Integrated Resource Management Plan (IRMP). That plan has since been incorporated into the Kalum LRMP and Kalum SRMP. The old forest requirements of the Thunderbird IRMP are now part of the old-seral stage requirements shown in Table 21. The early seral stage requirement is now the requirement for the Lakelse River SRMZ in Table 21.

### Grizzly bear

The Kalum SRMP specifies mid-seral requirements for grizzly bear habitat in the McKay-Davies and Copper watersheds.

### Visual quality objectives

Scenic areas and visual quality objectives (VQO) have been legally established or grandparented under the *Forest and Range Practices Act*. Each visual polygon will be modelled individually. This is different from the approach in the last timber supply review, which aggregated all visual units by VQO and landscape unit. Table 22 shows the maximum allowable alteration for each VQO in perspective view.

## 6. Current Forest Management Assumptions

Table 22. Assignment of visual quality objectives

| Recommended VQO   | % alteration by VAC <sup>a</sup><br>(perspective view) |        |      |
|-------------------|--------------------------------------------------------|--------|------|
|                   | Low                                                    | Medium | High |
| Retention         | 0.1                                                    | 0.7    | 1.5  |
| Partial retention | 1.6                                                    | 4.3    | 7.0  |
| Modification      | 7.1                                                    | 12.5   | 18.0 |

<sup>a</sup>VAC = visual absorption capacity.

Area-weighted Plan to Perspective (P2P) ratios and visually effective green-up (VEG) heights will be determined for each individual scenic area polygon using the data in Table 23. The maximum allowable alteration in perspective view for each visual unit according to Table 22 will be multiplied by the area-weighted P2P ratio to calculate the maximum allowable alteration in plan view for use in the timber supply model. VEG heights refer to top height (average height of tallest 10% of trees).

Table 23. Slope classes for calculating P2P ratio and VEG height

|                         | Slope Classes <sup>1</sup> (%) |          |           |           |           |           |           |           |           |           |           |           |           |           |       |
|-------------------------|--------------------------------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------|
|                         | 0 - 5                          | 5.1 - 10 | 10.1 - 15 | 15.1 - 20 | 20.1 - 25 | 25.1 - 30 | 30.1 - 35 | 35.1 - 40 | 40.1 - 45 | 45.1 - 50 | 50.1 - 55 | 55.1 - 60 | 60.1 - 65 | 65.1 - 70 | 70.1+ |
| P2P Ratios <sup>2</sup> | 4.68                           | 4.23     | 3.77      | 3.41      | 3.04      | 2.75      | 2.45      | 2.22      | 1.98      | 1.79      | 1.6       | 1.45      | 1.29      | 1.17      | 1.04  |
| VEG Height (m)          | 3.0                            | 3.5      | 4.0       | 4.5       | 5.0       | 5.5       | 6.0       | 6.5       | 6.5       | 7.0       | 7.5       | 8.0       | 8.5       | 8.5       | 8.5   |

<sup>1</sup> Adapted from *Procedures for Factoring Visual Resources into Timber Supply Analysis* (1998) and *Modelling Visuals in TSR III* (2003) by Luc Roberge, Visual Resource Specialist, NIFR - December 2007.

<sup>2</sup> A recent study shows a first approximation of the predicted P2P ratios for absolute slope classes in 10% increments. Although P2P ratios and slope classes did not show a linear relationship, the median value was used in this table to determine the ratios for slope classes in 5% increments.

### Seral stage requirements

The Kalum LRMP incorporates the management requirements of the 1992 Thunderbird Integrated Resource Management Plan (IRMP), including the seral stage requirements. These requirements were established as legal objectives in the Kalum Sustainable Resource Management Plan (SRMP).

## 6. Current Forest Management Assumptions

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The Fiddler Creek Total Resource Plan (approved by the Kalum Forest District Manager in December 1995) also specifies some management requirements. This plan was not legally established under the *Forest Practices Code Act* or the *Forest and Range Practices Act*. Only two requirements of this plan do not overlap explicitly with requirements in the Kalum SRMP. They are the forest cover requirements of Zone 1 Critical Habitat Zone and Zone 2 Fish/Wildlife Special Management Zone. Zone 1 requirements will largely be met by the current riparian management practices for the Skeena River and Fiddler Creek, which are accounted for in this data package. Zone 2 lies almost entirely outside of the area that is operable for timber harvesting, so its requirements are met automatically. Therefore, the requirements of this plan are not explicitly addressed in this data package.

The seral stage requirements established by the Kalum SRMP are duplicated here in Table 24 through Table 27 for the landscape units that cover the Kalum TSA. Table 24 defines the age ranges for each seral stage, based on the *Biodiversity Guidebook*.

Table 25 defines the seral stage distribution for early, mature plus old, and old forest. Old seral stage requirements have been fully implemented by legally established Old Growth Management Areas (OGMAs). These OGMAs will be used instead of the old seral stage requirements. They are removed from the THLB in Section 5.10, "Exclusion of specific, geographically defined areas". The effect of forest aging in OGMAs is discussed in Section 6.6.2, "Disturbance outside of the timber harvesting land base".

The Kalum SRMP contains a transition strategy for meeting early and mature + old seral stage targets. It does not specify a time frame other than "as soon as possible", so it is assumed to be 10 years. Table 26 identifies the Kalum SRMPs adjusted early seral stage targets for the transition strategy.

Footnotes to the tables in the Kalum SRMP that correspond with Table 25 and Table 26 indicate that:

- the early seral requirements of the Lakelse landscape unit do not apply to subzone 2 of the Lakelse River Special Resource Management Zone. This area is addressed in Table 21.
- the old seral stage requirements for the Hirsch landscape unit do not apply to and the Jesse and Emsley watersheds. This area is addressed in Table 27.

This is interpreted to mean that the special requirements for these two areas apply in addition to the requirements specified for each landscape unit in Table 25. The Kalum SRMP confirms this for the Jesse and Emsley watersheds.

The Kalum SRMP identifies several undeveloped watersheds, one of which is located in the Kalum TSA – the Jesse Emsley watershed in the Jesse Bish landscape unit. Table 27 shows the old forest retention targets for this watershed. These targets are specified by site series, but there is no accurate mapping of site series for the Kalum TSA. The most recent predictive ecosystem mapping did not meet the accuracy standards set by the chief forester. OGMAs have not been established in this undeveloped watershed. The timber supply analysis will determine appropriate retention targets by BEC variant for these watersheds.

## 6. Current Forest Management Assumptions

Table 24. Seral stage definitions

| BEC unit             | NDT <sup>a</sup> | Forest stand age (years) |        |       |
|----------------------|------------------|--------------------------|--------|-------|
|                      |                  | Early                    | Mature | Old   |
| CWHvh2, vm, vm1, vm2 | 1                | < 40                     | > 80   | > 250 |
| ESSFwv, MHmm1, mm2   | 1                | < 40                     | > 120  | > 250 |
| CWHws1, ws2          | 2                | < 40                     | > 80   | > 250 |
| ESSFmk               | 2                | < 40                     | > 120  | > 250 |
| ICHmc1, mc2          | 2                | < 40                     | > 100  | > 250 |

(a) Natural disturbance type

Table 25. Target seral stage distribution

| Landscape unit | BEO <sup>1</sup> | BEC variant   | Seral stage distribution<br>(% of forested land base) |                 |     |
|----------------|------------------|---------------|-------------------------------------------------------|-----------------|-----|
|                |                  |               | Early                                                 | Mature<br>+ old | Old |
| Beaver         | I                | CWHws1/ws2    | <36                                                   | >34             | >9  |
|                |                  | MHmm2         | <22                                                   | >36             | >19 |
| Clore          | I                | CWHws1/ws2    | <36                                                   | >34             | >9  |
|                |                  | ESSFmk        | <36                                                   | >28             | >9  |
|                |                  | ESSFwv, MHmm2 | <22                                                   | >36             | >19 |
| Dasque         | L                | CWHws1/ws2    | n/a                                                   | >17             | >9  |
|                |                  | MHmm2         | n/a                                                   | >19             | >19 |
| Exchamsiks     | L                | CWHvm         | n/a                                                   | >18             | >13 |
|                |                  | MHmm1         | n/a                                                   | >19             | >19 |
| Exstew         | I                | CWHws1/ws2    | <36                                                   | >34             | >9  |
|                |                  | MHmm2         | <22                                                   | >36             | >19 |
| Falls          | L                | CWHvm/vm1     | n/a                                                   | >18             | >13 |
|                |                  | MHmm1         | n/a                                                   | >19             | >19 |
| Hirsch         | I                | CWHvm         | <30                                                   | >36             | >13 |
|                |                  | CWHws1/ws2,   | <36                                                   | >34             | >9  |
|                |                  | MHmm1         | <22                                                   | >36             | >19 |
| Hot Springs    | L                | CWHws1/ws2    | N/A                                                   | >17             | >9  |
|                |                  | MHmm2         | N/A                                                   | >19             | >19 |

(continued)

(1) Biodiversity emphasis option: H-higher; I-Intermediate; L-Lower.

## 6. Current Forest Management Assumptions

Table 25. Target seral stage distribution (concluded)

| Landscape unit            | BEO <sup>1</sup> | BEC variant | Seral stage distribution<br>(% of forested land base) |                 |     |
|---------------------------|------------------|-------------|-------------------------------------------------------|-----------------|-----|
|                           |                  |             | Early                                                 | Mature<br>+ old | Old |
| Ishkheenickh (Ksi Hlginx) | I                | CWHvm,      | <30                                                   | >36             | >13 |
|                           |                  | CWHws1/ws2  | <36                                                   | >34             | >9  |
|                           |                  | MHmm1       | <22                                                   | >36             | >19 |
| Jesse Bish                | L                | CWHvm       | n/a                                                   | >18             | >13 |
|                           |                  | MHmm1       | n/a                                                   | >19             | >19 |
| Kalum                     | I                | CWHws1/ws2  | <36                                                   | >34             | >9  |
|                           |                  | MHmm2       | <22                                                   | >36             | >19 |
| Kasiks                    | I                | CWHvm       | <30                                                   | >36             | >13 |
|                           |                  | MHmm1       | <22                                                   | >36             | >19 |
| Kiteen (Ksi Gahl't'in)    | L                | CWHws2      | n/a                                                   | >17             | >9  |
|                           |                  | ICHmc1/mc2  | n/a                                                   | >15             | >9  |
|                           |                  | MHmm2       | n/a                                                   | >19             | >19 |
| Kitimat                   | L                | CWHvm       | n/a                                                   | >18             | >13 |
|                           |                  | CWHws1/ws2  | n/a                                                   | >17             | >9  |
|                           |                  | MHmm1/mm2   | n/a                                                   | >19             | >19 |
| Kleanza Treasure          | L                | CWHws1/ws2  | n/a                                                   | >17             | >9  |
|                           |                  | ICHmc2      | n/a                                                   | >15             | >9  |
|                           |                  | MHmm2       | n/a                                                   | >19             | >19 |
| Lakelse                   | I                | CWHws1/ws2  | <36                                                   | >34             | >9  |
|                           |                  | MHmm2       | <22                                                   | >36             | >19 |
| Nelson Fiddler            | L                | CWHws1/ws2  | n/a                                                   | >17             | >9  |
|                           |                  | ICHmc2      | n/a                                                   | >15             | >9  |
|                           |                  | MHmm2       | n/a                                                   | >19             | >19 |
| Skeena River Kalum        | H                | CWHvm       | <23                                                   | >54             | >19 |
|                           |                  | CWHws1/ws2  | <27                                                   | >51             | >13 |
|                           |                  | ICHmc2      | <27                                                   | >46             | >13 |
|                           |                  | MHmm1/mm2   | <17                                                   | >54             | >28 |
| Tseax (Ksi Sii Aks)       | I                | CWHws1/ws2  | <36                                                   | >34             | >9  |
|                           |                  | ICHmc1/mc2  | <36                                                   | >31             | >9  |
|                           |                  | MHmm2       | <22                                                   | >36             | >19 |
| Wedeeene                  | I                | CWHvh2/vm   | <30                                                   | >36             | >13 |
|                           |                  | CWHws1/ws2  | <36                                                   | >34             | >9  |
|                           |                  | MHmm1/mm2   | <22                                                   | >36             | >19 |

(1) Biodiversity emphasis option: H-higher; I-Intermediate; L-Lower.

## 6. Current Forest Management Assumptions

Table 26. Allowable deviations from the early seral stage targets

| Landscape unit            | BEC variant    | Maximum early seral forest<br>(% of forested land base) |
|---------------------------|----------------|---------------------------------------------------------|
| Beaver                    | CWHws1         | <51                                                     |
|                           | CWHws2         | <46                                                     |
|                           | MHmm2          | <32                                                     |
| Clare                     | CWHws1         | <51                                                     |
|                           | CWHws2, ESSFmk | <46                                                     |
|                           | ESSFwv, MHmm2  | <32                                                     |
| Exstew                    | CWHws1         | <51                                                     |
|                           | CWHws2         | <46                                                     |
|                           | MHmm2          | <32                                                     |
| Hawkesbury Island West    | CWHvh2         | <40                                                     |
|                           | MHwh1          | <32                                                     |
| Hirsch                    | CWHvm          | <40                                                     |
|                           | CWHws1         | <51                                                     |
|                           | CWHws2         | <46                                                     |
|                           | MHmm1          | <32                                                     |
| Ishkheenickh (Ksi Hlginx) | CWHvm          | <40                                                     |
|                           | CWHws1, CWHws2 | <46                                                     |
|                           | MHmm1          | <32                                                     |
| Kalum                     | CWHws1         | <51                                                     |
|                           | CWHws2         | <46                                                     |
|                           | MHmm2          | <32                                                     |
| Kasiks                    | CWHvm          | <30                                                     |
|                           | MHmm1          | <32                                                     |

(continued)

## 6. Current Forest Management Assumptions

Table 26. Allowable deviations from the early seral stage targets (concluded)

| Landscape unit                            | BEC variant        | Maximum early seral forest<br>(% of forested land base) |
|-------------------------------------------|--------------------|---------------------------------------------------------|
| Kemano                                    | CWHvm, CWHvm1, vm2 | <40                                                     |
|                                           | CWHws2, ESSFmk     | <46                                                     |
|                                           | MHmm1, MHmm2       | <32                                                     |
| Lakelse                                   | CWHws1             | <51                                                     |
|                                           | CWHws2             | <46                                                     |
|                                           | MHmm2              | <32                                                     |
| Nass River (K'alii Aksim<br>Lisims) Kalum | ICHmc1             | <42                                                     |
|                                           | ICHmc2             | <37                                                     |
| Skeena River Kalum                        | CWHvm              | <33                                                     |
|                                           | CWHws1             | <42                                                     |
|                                           | CWHws2, ICHmc2     | <37                                                     |
|                                           | MHmm1, MHmm2       | <27                                                     |
| Tseax (Ksi Sii Aks)                       | CWHws1             | <51                                                     |
|                                           | CWHws2, ICHmc1     | <46                                                     |
|                                           | ICHmc2             | <51                                                     |
|                                           | MHmm2              | <32                                                     |
| Wedeene                                   | CWHvh2, CWHvm      | <40                                                     |
|                                           | CWHws1             | <51                                                     |
|                                           | CWHws2             | <46                                                     |
|                                           | MHmm1, MHmm2       | <32                                                     |

## 6. Current Forest Management Assumptions

Table 27. Target old seral stage forest within undeveloped watersheds

| Undeveloped watershed | BEC variant | Site series | % of old forest predicted by natural disturbance | Old seral forest target (% of forested land base) |
|-----------------------|-------------|-------------|--------------------------------------------------|---------------------------------------------------|
| Jesse Emsley          | CWHvm1      | 01          | 89                                               | 27                                                |
|                       |             | 03          | 93                                               | 28                                                |
|                       |             | 05          | 73                                               | 22                                                |
|                       |             | 06          | 88                                               | 26                                                |
|                       |             | 08          | 73                                               | 22                                                |
|                       |             | 09          | 70                                               | 21                                                |
|                       |             | 12          | 93                                               | 28                                                |
|                       |             | 13          | 93                                               | 28                                                |
|                       |             | 14          | 78                                               | 23                                                |
|                       | CWHvm2      | 01          | 89                                               | 27                                                |
|                       |             | 03          | 93                                               | 28                                                |
|                       |             | 05          | 73                                               | 22                                                |
|                       |             | 06          | 88                                               | 26                                                |
|                       |             | 08          | 73                                               | 22                                                |
|                       |             | 09          | 70                                               | 21                                                |
|                       |             | 10          | 70                                               | 21                                                |
|                       | MHmm1       | 01          | 86                                               | 26                                                |
|                       |             | 02          | 93                                               | 28                                                |
|                       |             | 03          | 86                                               | 26                                                |
|                       |             | 04          | 93                                               | 28                                                |
|                       |             | 06          | 93                                               | 28                                                |

### 6.6.2 Disturbance outside of the timber harvesting land base

Some forest cover requirements described in Table 21 apply to the Crown productive forest, which includes forest outside of the THLB. Forest outside of the THLB undergoes natural disturbance that affects its age class distribution and its contribution to forest cover requirements. This natural disturbance outside the THLB must be accounted for, to prevent this forest from aging continuously and contributing inappropriately to forest cover requirements.

Forest ecosystems in the Kalum TSA lie within natural disturbance types (NDT) 1 and 2 (Table 24). In NDT 1, small gap disturbances are created by the death of individual trees or small patches of trees. When disturbances such as wind, fire, and landslides occur, they are generally small and result in irregular edge configurations and landscape patterns. In NDT 2, infrequent fires disturb areas in a range from 20 to 1000 hectares.

The forest ecosystems in the Kalum TSA experience relatively low levels of natural disturbance and are dominated by old forest. For these reasons, this analysis will freeze the age of the forest stands outside the THLB, i.e., these stands are not permitted to age further. This means that the current age distribution of these stands will represent the average distribution over time. An alternative approach, particularly in NDT 2 where natural disturbance is larger in scale, would be to calculate the amount of disturbance required to produce the natural amount of forest older than 250 years in each NDT. However, this would result in an even age distribution outside of the THLB, which is less realistic than the frozen age distribution proposed for this analysis.

## 6. Current Forest Management Assumptions

### 6.6.3 Wildlife trees

The Kalum SRMP established an objective to maintain structural diversity in managed stands by retaining wildlife tree patches in each cutblock. Retention amounts are specified by landscape unit and BEC variant. Table 28 shows the reductions that will be applied for wildlife tree retention.

Table 28. Reductions for wildlife tree retention in cutblocks

| Landscape unit            | Biogeoclimatic subzone | Residual area or volume estimate on the timber harvesting land base (%) |
|---------------------------|------------------------|-------------------------------------------------------------------------|
| Beaver                    | CWHws                  | 8                                                                       |
|                           | MHmm                   | 0.5                                                                     |
| Clore                     | CWHws                  | 6                                                                       |
|                           | ESSFmk                 | 3                                                                       |
|                           | ESSFwv                 | 1                                                                       |
|                           | MHmm                   | 3                                                                       |
| Dasque                    | CWHws                  | 7                                                                       |
|                           | MHmm                   | 0                                                                       |
| Exchamsiks                | CWHvm                  | 0                                                                       |
|                           | MHmm                   | 0                                                                       |
| Exstew                    | CWHws                  | 6                                                                       |
|                           | MHmm                   | 3                                                                       |
| Falls                     | CWHvm                  | 1                                                                       |
|                           | MHmm                   | 0                                                                       |
| Hirsch                    | CWHvm                  | 5                                                                       |
|                           | CWHws                  | 11                                                                      |
|                           | MHmm                   | 0                                                                       |
| Hot Springs               | CWHws                  | 7                                                                       |
|                           | MHmm                   | 0.5                                                                     |
| Ishkheenickh (Ksi Hlginx) | CWHvm                  | 2                                                                       |
|                           | CWHws                  | 2                                                                       |
|                           | MHmm                   | 0                                                                       |
| Jesse Bish                | CWHvm                  | 1                                                                       |
|                           | MHmm                   | 0                                                                       |
| Kalum                     | CWHws                  | 10                                                                      |
|                           | MHmm                   | 5                                                                       |
| Kasiks                    | CWHvm                  | 0                                                                       |
|                           | MHmm                   | 0                                                                       |

(continued)

## 6. Current Forest Management Assumptions

Table 28. Reductions for wildlife tree retention in cutblocks (concluded)

| Landscape unit         | Biogeoclimatic subzone | Residual area or volume estimate on the timber harvesting land base (%) |
|------------------------|------------------------|-------------------------------------------------------------------------|
| Kiteen (Ksi Gahl't'in) | CWHws                  | 3                                                                       |
|                        | ESSFwv                 | 1                                                                       |
|                        | ICHmc                  | 7                                                                       |
|                        | MHmm                   | 1                                                                       |
| Kitimat                | CWHvm                  | 5                                                                       |
|                        | CWHws                  | 7                                                                       |
|                        | MHmm                   | 0                                                                       |
| Kleanza Treasure       | CWHws                  | 7                                                                       |
|                        | ICHmc                  | 6                                                                       |
|                        | MHmm                   | 2                                                                       |
| Lakelse                | CWHws                  | 7                                                                       |
|                        | MHmm                   | 0                                                                       |
| Nelson Fiddler         | CWHws                  | 8                                                                       |
|                        | ICHmc                  | 5                                                                       |
|                        | MHmm                   | 2                                                                       |
| Skeena River Kalum     | CWHvm                  | 5                                                                       |
|                        | CWHws                  | 5                                                                       |
|                        | ICHmc                  | 4                                                                       |
|                        | MHmm                   | 0                                                                       |
| Tseax (Ksi Sii Aks)    | CWHws                  | 4                                                                       |
|                        | ICHmc                  | 8                                                                       |
|                        | MHmm                   | 0                                                                       |
| Wedeeene               | CWHvm                  | 3                                                                       |
|                        | CWHvh                  | 2                                                                       |
|                        | CWHws                  | 10                                                                      |
|                        | MHmm                   | 3                                                                       |

Data source and comments:

The values in Table 28 are the result of detailed calculations for each combination of landscape unit and biogeoclimatic subzone according to the procedures set out in the *Landscape Unit Planning Guide*. They account for the proportion of each landscape unit and subzone that is in the THLB, and the proportion of this THLB that has been harvested without any wildlife tree retention. The Kalum SRMP states that wildlife tree patches may be internal or external to a cutblock. Retention outside of cutblocks may overlap with riparian reserves or other areas outside of the THLB. Most current operations occur in higher elevation areas where there are no streams require riparian reserves.

The predominant biogeoclimatic subzone in the Kalum TSA is CWHws, which has an average required retention of 6.8%. In comparison, the RESULTS database for the period 2001 – 2006 shows that licensees left an average of 8.1% of each cutblock for wildlife tree retention. This is higher than the required level of retention because it includes some riparian reserves that were reported as wildlife tree patches. This indicates that the retention levels specified in Table 28 can be used without double-counting for riparian reserves.

Most wildlife tree retention is left in the form of wildlife tree patches (WTP). Most of the area in WTPs is in patches 2 hectares or more, which are assumed to contribute to old forest representation. WTPs are assumed to be persistent and will not be economic to harvest in the future.

## 7. Sensitivity Analyses

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Sensitivity analysis can assess the timber supply impact of uncertainty in data and management assumptions. It can also determine which variables most influence the harvest forecast. Table 29 lists the sensitivity analyses to be performed.

Table 29. *Sensitivity analyses*

| Issue to be tested                     | Sensitivity levels                                                                                                                                                                                                                |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Harvest flow alternatives              | Various alternatives to the base case, including immediate harvesting of second growth.                                                                                                                                           |
| Harvest priorities                     | Test priority that avoids age class 9 stands, and report on area of each age class harvested in the forecast.<br>Test youngest first priority.                                                                                    |
| Site productivity for older stands     | Adjust site index of old stands following harvest using the results of the provincial old growth site index (OGSI) studies using paired plots and veteran trees or PEM/SIBEC, other than those already adjusted in the base case. |
| Operability                            | Test partition of AAC into sawlog and pulplog components.                                                                                                                                                                         |
| Minimum harvestable age                | - 10 and - 20 years, alone and in conjunction with youngest-first harvest rule                                                                                                                                                    |
| Time to achieve green-up               | Test effect of applying ECA limits in the Kitimat River watershed                                                                                                                                                                 |
| Management for patch size distribution | Find the threshold for maximum disturbed area that disrupts timber supply when using the proxy for cutblock adjacency.                                                                                                            |

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Data source and comments:

If additional issues become apparent or preliminary analysis results suggest the need, changes to these analyses may be made.