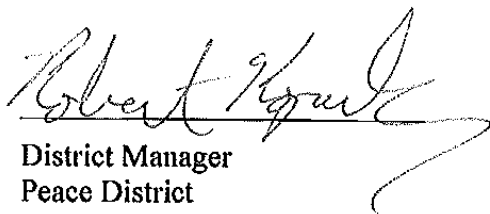# Dawson Creek Timber Supply Area
Timber Supply Review

Data Package

September 2011

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Ministry of Forests, Lands and
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BRITISH COLUMBIA | Ministry of
Forests, Lands and
Natural Resource Operations

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1. Introduction

This data package summarizes the basic information and assumptions required for the Dawson Creek Timber Supply Area (TSA) timber supply analysis.

The completed data package contains those inputs that represent current performance for the TSA. For the purpose of the timber supply review (TSR), "current performance" can be defined by:

- the current forest management regime — the productive forest land available for timber harvesting, the silviculture treatments, the harvesting systems and the integrated resource management practices used in the area;

- fully implemented land-use plans;

- land-use decisions approved by Cabinet;

- orders issued through the Government Actions Regulation (GAR) of the *Forest and Range Practices Act (FRPA)* for ungulate management*;*

- orders establishing Land Use Objectives under the *Land Act*; and,

- approved higher level plans under the *Forest Practices Code of British Columbia Act.*

The primary 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 includes:

1) A short explanation of the data required;

2) A data table or lists 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, Lands and Natural Resource Operations (FLNR). Submissions 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 in management practices occur during the next few months, the timber supply analysis will attempt to capture them. When the Public Discussion Paper (PDP) is released, a technical documentation of the assumptions will be available upon request.

2. Current Forest Management Considerations and Issues

2.1 Base case management assumptions

The assumptions described in this section 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 reference when examining the effects of uncertainties. Section 7, "Sensitivity Analyses", identifies areas of uncertainty in the data and assumptions and outlines intended sensitivity analyses.

2.2 Statement of major forest management considerations and issues

The following table 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, the related timber supply impacts will be assessed in a sensitivity analysis. There may be significant uncertainties in defining some current management issues. In such cases, sensitivity analysis can assist in assessing the potential timber supply implications and assigning degrees of risk to timber supply during the allowable annual cut determination.

Table 1.   Forest management considerations

Consideration/issue	Description
Mountain Pine Beetle (MPB)	The Mountain Pine Beetle (MPB) infestation has been in the salvage mode for the last four years, with harvesting focused on recovery of dead trees prior to deterioration. The implications of this major issue, including a potential AAC uplift and strategies to mitigate unnecessary decline in mid-term harvest levels, will be determined in this analysis.
Oil, gas, mining and wind	The Dawson Creek TSA contains important energy resources including oil, natural gas, coal and wind. Reductions to the productive forest land base associated with exploration and development will be considered in the analysis.
Tomentosus root rot	*Innonotus tomentosus* root disease is present in the TSA. For areas with an elevation of less than 500 metres there is a very high risk of loss due to this disease. Loss figures are estimated and reported in unsalvaged losses.
Dawson Creek Land and Resource Management Plan (LRMP)	The LRMP was approved by Cabinet in March 1999. Currently, no portions have been declared as an approved higher level plan. Implemented forest practices designed to meet the objectives of the LRMP will be represented in the analysis.
Proposed protected areas	An Order in Council (OIC) is required before approved protected areas can be considered permanently unavailable for timber harvesting. For the analysis, only officially designated protected areas will be excluded from the timber harvesting land base. Sensitivity analyses will examine the impact of excluding the Peace River/Boudreau Lake proposed protected area.
Small diameter pine stands	The current AAC includes a 100 000 cubic metres per year partition for small diameter pine (height class 2) stands. The timber supply analysis will examine the contribution of these stands to timber supply.
Visual landscape inventory	The visual quality objectives (VQO), based from the 2005 consolidation of visual landscape inventory, were established under GAR in 2005 and 2006. Since then new inventories have been created (e.g., around Moberly Lake and on the highway heading west out of Chetwynd) and will be used in sensitivity analysis.
Recreation features	The recreation features inventory used in TSR 2 has been updated and only the features with 100 percent exclusion will be taken out of the THLB in this analysis.

(continued)

2. Current Forest Management Considerations and Issues

Table 1.   Forest management considerations (continued)

Consideration/issue	Description
Spatial old growth objectives	An order establishing spatial provincial old forest growth objectives came into effect May 29, 2009 and will be reflected in the analysis.
Stand-level biodiversity	Current wildlife tree management practice will be accounted for in the base case by using 50% of the wildlife tree patch (WTP) requirements in each landscape unit as noted in the Assistant Deputy Ministers' memorandum of May 15th, 2000.
Site productivity	Provincial studies have indicated that estimates for site productivity may be underestimated for regenerating stands. A Predictive Ecosystem Mapping (PEM) is underway for the TSA but will not be available for the chief forester's AAC determination. Sensitivity analysis will done using provincial estimates.
Geographically isolated areas	Since TSR 2, district staff have reviewed physical operability for the TSA. This review has resulted in new line work for isolated areas based on current practice using primarily location, existing road access, and slope information. These inaccessible areas will not be included in the timber harvesting land base.
Impacts of livestock grazing	District staff have gathered and evaluated some information on the impacts of grazing, however the information is incomplete. Preliminary findings suggest an area impact of approximately 10% within grazing tenures. Final results will be considered in this timber supply review (TSR).
Mixed-wood management	Mixed-wood stands comprise a large proportion of the productive forest within the Dawson Creek TSA. These stands contribute to the coniferous or the deciduous harvest depending on the species composition. Limited information is currently available on the dynamics and growth and yield of mixed-wood stands. There is also uncertainty in the economics of these stands. The chief forester may utilize partitions to reduce the risks associated with this limited information.
Ungulate winter range (UWR)	The Ungulate Winter Range (UWR) # U-9-001 order was established in 2005 for Elk, Mule Deer and Moose. The UWR order # U-9-002 was established in 2006 for Caribou, Bighorn Sheep and Mountain Goat. Associated prescribed management practices or general wildlife measures will be included in the base case.
Grizzly Bear management	The TSA includes important habitat for Grizzly Bear. Early seral forest cover requirements will be represented using the same assumptions used in TSR 2 in the base case to simulate management objectives for priority Grizzly Bear habitat.
Wildlife habitat areas and Identified wildlife	One Bull Trout and four Mountain Goat wildlife habitat areas were established in 2002 (9-003 & 9-004). Other identified wildlife species in the TSA include Caribou, Trumpeter Swan, Northern Goshawk, Fisher and Grizzly Bear. A complete list of identified wildlife species in the TSA can be found at: www.env.gov.bc.ca/cgi-bin/apps/faw/wharesult.cgi?search=wlap_region&wlap=Peace. Other potential wildlife habitat areas or identified wildlife may be assessed through a sensitivity analysis.
Riparian management	Based on current management, the assumptions for riparian management used in TSR 2 will be used in this analysis. However, riparian reserves for some features are overestimated and underestimated for others. The potential impact of riparian reserves estimates to timber supply will be considered in this analysis.

(continued)

2. Current Forest Management Considerations and Issues

Table 1.   Forest management considerations (concluded)

Consideration/issue	Description
Vegetation resources inventory (VRI)	A VRI inventory has been completed for the TSA. Inventory adjustment factors for height, age and volume have been developed for inventory (phase II) and will be applied in the analysis.
Community forests	Chetwynd and Tumbler Ridge community forests have been approved. The area associated with the community forests will be removed from the TSA.
First Nations/Treaty 8 issues	In 1998, the Twin Sisters Special Management Area Plan recommendations were developed and incorporated into the Dawson Creek LRMP. To date, there have been no operational guidelines identified for this area.
	A sustainable resource management plan (SRMP) was developed between Saulteau and West Moberly First Nations, and the provincial government for the Peace Moberly Tract. This plan has not been approved by all parties. A sensitivity analysis will be carried out to determine the impact of the plan.
	The West Moberly First Nations is now a party to the Economic Benefits Agreement and several CMAs.
Known archaeological sites	Known archaeological site information recently provided by the Archaeology Branch of the Ministry of Forests, Lands and Natural Resource Operations will be used in the base case.

3. Inventories

3.1 Background information

Inventories that will be used in determining the timber harvesting land base and representing current forest management activities are listed in Table 2. Comments on how the information is being used in forest management are also provided.

Table 2.   Inventory information

Data	Inventory source	Vintage	Update	Input scale
Vegetation Resource Inventory (VRI) with Phase 2 adjustments	FLNR[a]	'91 &'03	Projected to 2011	1:20 000
Inventory disturbance update — non-standard overlay for update	FLNR	2004-2006	2006	1:20 000
MPB infestation (2010 MPB flight)	FLNR	2004	2010	
Known archaeological sites	FLNR	various	Download from RAAD	1:50 000
			2006	
Proposed mines	MEM[a]	2006		1:20 000
Riparian — stream classification	FLNR– TRIM[a] II	1996	—	1:20 000
Riparian — wetland classification	FLNR – FC1/FIP[a]	1970-1988	—	1:20 000
Riparian — lake classification	FLNR – FC1/FIP	1970-1988	—	1:20 000
Visual landscape Inventory	FLNR	2005-2006	—	1:50 000
Recreation features	FLNR	1992/93	2006	1:50 000
Grazing areas — standard overlay	FLNR – Dawson Creek TSA range tenure maps	1970-1988 2006	2006	1:20 000
Ungulate winter range (UWR) — standard overlay	FLNR	2004, 2006	—	1:250 000
WHAs 9003,9004	FLNR	2002	—	
Grizzly Bear management zone — non-standard overlay	FLNR	1999	—	1:250 000
Land type ownership — non-standard layer	Tantalis and ICI[a]	Unknown	—	1:250 000
LRMP resource management zone (RMZ) boundaries	Dawson Creek LRMP[a]	1999		1:20 000 1:250 000
Parks and protected areas	MoE	2004		
Peace River Boudreau Lake Proposed Protected Area (ELUA area)	FLNR	2006		
Woodlots (from LRDW, ILRR, under managed licenses)	FLNR	2006	—	1:20 000

(continued)

3. Inventories

Table 2. Inventory information (concluded)

Data	Inventory source	Vintage	Update	Input scale
Proposed community forest agreement areas	FLNR	2006		1:250 000
Landscape units	FLNR	2004		1:20 000
Spatial old forest retention order maps 1 & 2	FLNR	2007		1:20 000
Planning cells (updated with reallocation areas)	FLNR	1999	—	1:20 000
Peace Moberly Tract planning area	FLNR	2006		1:20 000
Dawson Creek Timber Supply Area (TSA) 41	FLNR	2004	—	1:20 000
Pulpwood Agreements 7, 10, 13	FLNR	PA 10, 1985 PA 13, 1989 PA 7,	—	1:250 000
Tree Farm Licence (TFL) 48	FLNR	1992	2005	1:20 000
Transportation and transmission	FLNR–TRIM II, FLNR–FTEN[a], OGC–PDR[a]	various	2006	1:20 000-1:250 000
Oil and gas development: Seismic, wells, pipelines, other	Oil & Gas Commission	Download OGC Feb. 2007[b]	—	1:20 000
Biogeoclimatic ecosystem classification (BEC)	FLNR	2006	—	1:20 000
Geographically isolated areas — non-standard layer contours/slope	FLNR FLNR – TRIM II	2006 1996	 1999	1:250 000 1:20 000
Agricultural land reserve	MAL[a]	1990	2006	1:20 000
Physical operability — non-standard layer:				
Surficial geology 93I block	MEM[a]	1959	1999	1:50 000
Surficial geology 93P & 94A blocks	GSC[a]			
Lacustrine inventory 930 & 94B blocks	FLNR	1970	1999	1:250 000
Slope	FLNR — TRIM II			
		1998	1999	1:250 000
		1996	1999	1:20 000
Pending Category A cutblocks — non-standard layer	FLNR	2006	—	1:20 000
Kiskatinaw watershed	FPB	2011	2011	Unknown

(a) FLNR – Ministry of Forests, Lands and Natural Resource Operations;
MEM = Ministry of Energy and Mines;
MoE = Ministry of Environment;
FC1/FIP[a] = Forest Cover version 1/Forest Inventory Planning data model;
TRIM = Total Records and Information Management;
ICI = Integrated Cadastral Initiative;
LRMP = Local Resource Management Plan;
FLNR-FTEN = Ministry of Forests, Lands and Natural Resource Operations – Forest Tenures;
OGC-PDR = Oil and Gas Commission – Petroleum Development Roads;
MAL = Ministry of Agriculture and Lands;
GSC = Geological Survey of Canada;
FPB = Forest Practices Board;
RAAD = Remote Access to Archaeological Data.

(b) Additional information will be used in an attempt to update for oil and gas activity to July 5, 2011.

3. Inventories

Data source and comments:

Vegetation resource inventory (VRI)

A phase I and phase II VRI has been completed for the TSA. Phase II adjustment factors will be applied to the base case phase I volume estimates.

Inventory disturbance update

Remote sensing has been used to create a disturbance map coverage for logging and fire. The coverage is current to September 2010.

Mountain Pine Beetle infestation

The 2010 MPB flight information collected for FLNR will be used to determine the current level of infestation in the TSA as well as future projected levels.

Known archaeological sites

Known archaeological sites are represented as point features across the Dawson Creek TSA. Data has been provided in 1:250 000 scale digital map files by the Archaeology Branch of the Ministry of Forests, Lands and Natural Resource Operations, and include paleontological, prehistoric and historic features.

Existing and proposed mine sites

Existing mine sites will be removed from the timber harvesting land base, and approximate locations of proposed mine sites will be removed in a sensitivity analysis using digital information supplied by the Ministry of Energy and Mines, Mines and Mineral Resources Division.

Riparian areas

Three inventories are used to represent riparian features across the Dawson Creek TSA. Streams and rivers are represented using TRIM II data at 1:20 000 scale while lakes and wetlands are represented using forest cover at 1:20 000 scale. Reserve zones for each feature have by in large been buffered according to criteria described in the FPC *Riparian Management Area Guidebook*, and subsequently merged into one map coverage to facilitate analysis (same as in TSR 2).

Visual landscape

The VQOs, which are based from the 2005 visual landscape inventory, were established under GAR in 2005 and 2006. Since then new inventories have be created (e.g., around Moberly Lake and on the highway heading west out of Chetwynd) and will be used in sensitivity analysis.

Recreation features

The recreation features inventory represents recreation features across the Dawson Creek TSA at 1:50 000 scale. The updated inventory (2006) reflects electronic reformatting of the original inventory to RIC standards.

Grazing areas

A standard overlay was used to represent the grazing areas current to 2006.

Ungulate winter ranges (UWR)

An order (U-9-001) was declared in 2004 for Elk, Mule Deer and Moose winter range. An order (U-9-002) was subsequently declared in October of 2006 for Caribou, Mountain Goat and Bighorn Sheep.

3. Inventories

Grizzly Bear management zone

The Grizzly Bear zone is represented within the Dawson Creek TSA as a non-standard inventory at 1:250 000 scale. The zone occurs within natural disturbance types (NDT) 1 and 2, in mountainous terrain along the western portion of the TSA. The inventory is based on forest cover and TRIM II data and has not changed from TSR 2.

Land type ownership

Ownership is represented within the Dawson Creek TSA at 1:250 000 scale. The land type ownership map coverage was developed by FLNR using cadastral information available from the Crown land Registry and the Integrated Cadastral Information Society. This coverage shows the location of parks and protected areas, Indian reserves, private land, TFL 48 and woodlots for exclusion from the timber harvesting land base; and provincial crown land available for contribution to the timber harvesting land base.

Dawson Creek Land and Resource Management Plan (LRMP) Resource Management Zone (RMZ) boundaries

RMZs within the approved LRMP are represented at 1:250 000 scale. RMZ boundaries are based on TRIM II water features, heights of land, and roads. Protected areas and community pastures are identified as separate RMZs within this inventory.

Parks and protected areas

This map coverage shows all established parks and protected areas in the Dawson Creek TSA as of summer 2006.

Peace River/Boudreau Lake proposed protected area

Ministry of Forests, Lands and Natural Resource Operations has provided a map coverage for the Peace River/Boudreau Lake proposed protected area. This area will be removed from the timber harvesting land base in a sensitivity analysis unless the area becomes established prior to the analysis, in which case it will be removed in the base case.

Woodlots

This standard inventory represents current district woodlot tenure information. Woodlots are excluded from the timber harvesting land based.

Community forest agreement areas

Community forest agreement areas for Chetwynd and Tumbler Ridge are approved. These areas will be removed from the timber harvesting land base in the base case.

Landscape unit boundaries

In June 2004, landscape units and their respective biodiversity emphasis were established.

Landscape biodiversity

The spatially identified old growth management areas represent "current management" are provided in a separate map coverage.

Planning cells

Planning cells within the Dawson Creek TSA are based on TRIM I and TRIM II water features, heights of land, and roads, and also forest cover, and exclude land within TFL 48 and land not administered by FLNR.

3. Inventories

Pulpwood agreement areas

Pulpwood agreement (PA) boundaries delineate areas in two deciduous pulpwood agreements and one coniferous pulpwood agreement within the Dawson Creek TSA. The coverage, mapped at 1:250 000 scale, was provided by the Ministry of Forests and Range, Resource Tenures and Engineering Branch in 2006.

Transportation and transmission

A non-standard layer of transportation and transmission lines including tenured forest roads, petroleum development roads, and TRIM II base mapping was developed by FLNR in 2006 using information provided by FLNR Forest Tenures Branch, MoE, and the OGC.

Oil and gas development

FLNR has developed a non-standard map coverage of oil and gas development at a scale of 1:250 000 scale. The digital information for this coverage was obtained largely from the OGC, and is as current to 2007.

Biogeoclimatic ecosystem classification (BEC)

The Biogeoclimatic Ecosystem Classification is represented to the variant level within the Dawson Creek TSA at 1:20 000 scale.

Geographically isolated areas

Since TSR 2, district staff have reviewed physical operability for the TSA, and developed new line work for isolated areas based on current practice using location, existing access, and slope information. These isolated areas will not contribute to the timber harvesting land base.

Agricultural land reserve

Agricultural land reserve within the Dawson Creek TSA was digitized by the Agricultural Land Commission in 1990 at 1:50 000 scale, and subsequently revised using TRIM I water features, heights of land, and roads, and cadastral data (CDMS) at 1:20 000 scale. The inventory is current to January 31, 1999.

Physical operability

Physical operability represents a compilation of terrain and slope data for the Dawson Creek TSA. The compilation is based on four principal data sources: For forest cover mapsheets within 93I letter block, 1959 surficial geology data from MEM were digitized at a scale of 1:50 000; for mapsheets within 93P and 94A letter blocks, 1970 surficial geology data from the Geological Survey of Canada were digitized at a scale of 1:250 000; and for mapsheets within 93O and 94B letter blocks, 1998 aerial photo-interpreted parent material classifications from FLNR were digitized at a scale of 1:250 000. Slope data from TRIM II are represented at a scale of 1:20 000 using slope classes that reflect the current technological capabilities of harvesting systems used in the district.

4. Division of the Area into Management Zones

4.1 Management zones, groups and multiple objectives

Management zones represent areas with distinct management emphasis. For example, a zone may be based on a harvesting system, silvicultural system, visual quality objective, or wildlife consideration. Sometimes one area of forest is subject to more than one management objective. For simulation modelling, a "group" function enables application of overlapping objectives. The timber supply analyst and operational staff will decide whether to put an objective into a group or a mutually exclusive management zone following data assessment. In addition, the non-contributing forest (land considered unavailable for timber harvesting) will be included for consideration in achieving forest cover objectives.

Further information on the forest cover requirements to be applied to these areas can be found in Section 6.11, "Forest cover requirements—Integrated resource management".

Table 3.   Objectives to be tracked

Objectives	Inventory definition	Function
MPB infestation	2010 MPB flight mapped in a non-standard layer.	To present the level of current MPB infestation and facilitate the projection of potential mortality. The implications of a possible uplift to the AAC will be assessed.
Twin Sisters Special Management Zone and proposed Peace Moberly Tract	LRMP and FLNR map coverages.	Apply specified management practices that are identified through discussions with First Nations in this area.
General integrated resource management (IRM)	Operable area not subject to specific non-timber management objective.	Application of adjacency criteria by landscape unit, applied to THLB.
UWR	Map layers showing UWRs. Forest cover objectives for UWRs as per GAR orders.	To provide protection of sensitive habitat used by ungulates as per UWR orders including general wildlife measures.
Grizzly Bear management	Non-standard mapped layer developed for TSR 2.	Forest cover objectives associated with priority Grizzly Bear habitat will be examined in the base case using the early seral retention target for an intermediate biodiversity emphasis in natural disturbance types 1 and 2 (*Biodiversity Guidebook*).
Visual landscape objectives	Standard mapped layer (visual quality classes include: preservation, retention, partial retention, modification, maximum modification).	Provincial guidelines for factoring visual resources into timber supply analysis.
Mixed-wood management	Coniferous mixed wood and deciduous mixed wood, respectfully defined as forest types 2 and 3 in Table 4.	Areas supporting boreal mixed woods will be removed from the timber harvesting land base in a sensitivity analysis.

4. Division of the Area into Management Zones

4.2 Analysis units

An analysis unit is a grouping of similar forest area with the intent of simplifying the analysis and its interpretation.

In this analysis, the analysis unit is a four digit number representing forest stands with similar tree species, similar forest management approaches and similar timber growing capability. As noted in Table 4, the first digit reflects the most abundant tree species; the second digit reflects whether the stand is coniferous, deciduous or mixed wood; the third digit reflects the site productivity of the stand; and the fourth digit reflects whether the stand is an existing unmanaged natural stand or a managed stand. For example analysis unit 3211 represents an unmanaged natural pine-leading coniferous mixed-wood stand with good growth potential.

Analysis Unit: [leading species]   [forest type]   [growth potential]   [managed]

Table 4.   Analysis unit identifiers

Leading species	Forest type	Growth potential	Managed
1 – spruce	0 – all	1 – good	1 – not managed
2 – subalpine fir	1 – pure coniferous[1]	2 – moderate	2 – managed
3 – pine	2 – coniferous mixed wood[2]	3 – poor	
4 – small pine	3 – deciduous mixed wood[3]		
5 – other coniferous	4 – pure deciduous[4]		
6 – aspen/birch			
7 – other deciduous			

[1] 75% to 100% coniferous; [2] 50% to 74% coniferous; [3] 51% to 74% deciduous; and [4] 75% to 100% deciduous.

Silvicultural practices, regeneration assumptions and management objectives may be vary among analysis unit within the model. While growth, harvest and the meeting of management objectives is tracked within the model at the stand level, the analysis results will be reported by analysis unit.

Yield tables for existing natural stands are derived using the Variable Density Yield Prediction (VDYP) version 7 yield model. Yield tables for recent plantations and future managed stands are derived using the Table Interpolation Program for Stand Yields (TIPSY).

Assumptions for regeneration of these stands are noted in Section 6.8, "Silviculture and regeneration activities".

5. Land Base Definition

5.1 Identification of the timber harvesting land base

This section outlines the steps used to identify the timber harvesting land base (the productive forest expected to support timber harvesting) within the timber supply area. Land may be unavailable for timber harvesting for three principle reasons:

- it is not administered by the B.C. Forests, Lands and Natural Resource Operations for timber supply (e.g., private land, parks, etc.);

- it is not suitable for timber production; or

- it is required entirely for meeting other values.

Land that is currently unavailable for harvesting or not producing timber may also be added to the timber harvesting land base:

- by management activities which improve productivity or operability (e.g., the stocking of land currently classified as non-commercial brush); or

- by the acquisition of productive forest land (e.g., timber licence reversions).

After all areas that do not contribute to the timber harvesting land base have been identified the resulting area is defined as the "current timber harvesting land base" for the Dawson Creek TSA.

5.2 Details on land base classification

5.2.1   Land not administered by the FLNR for timber supply purposes

A spatial ownership/tenure map coverage has been developed. Excluded from the timber supply analysis are land not administered by the FLNR for timber production. These include private lands, municipal lands, parks, Indian reserves, tree farm licences, woodlots and community forests.

Although they are not part of the crown forest land base, parks and areas constrained for wildlife do contribute towards meeting biodiversity forest cover objectives.

5.2.2   Land classified as non-forested land

Areas classified as "non-treed and vegetated" as well as alpine, lake, rock and cultivated field are removed from the land base considered available for timber supply. The designations are captured in the vegetation resource inventory field entitled 'Forest Management Land Base Indicator' (FMLB).

5.2.3   Non-commercial cover

Unless previously harvested, area with a crown closure of less than 10% or a site index of less than five metres is considered to be non-forest. Though trees are growing on these areas, it is unlikely the old forest, biodiversity or wildlife forest habitat values will be fully realized.

5.2.4   Land considered available for timber supply

Productive forest in ownership codes 62C (forest management unit) and 69C (forest reserves) are the principle land bases contributing to timber supply.

Crown grazing lease, grazing permit area, community pasture and agricultural land reserve (ALR) area are identified through additional standard map overlays. Unless known, area under crown grazing lease, grazing permit area and community pasture are considered to be forested. Agricultural land reserve area is considered to be forested until the area has been harvested, at which time it is removed from the analysis as having been converted to agricultural status.

5. Land Base Definition

5.2.5   Transportation and transmission

A digital map layer of existing roads, trails, railway and transmission lines was developed using information obtained from the BC Spatial Data Warehouse. The criteria for buffering these lineal features are described in Table 5. These buffered areas are considered to be non-forest area.

Table 5.   Transportation and transmission features buffering criteria

Feature	Total disturbance width (m)
Paved road	50
Double-lane gravel road (secondary/logging)	25
Single-lane gravel roads	20
Petroleum development roads	25
Trails	5
Railway	35
Transmission lines/major pipelines	75

A planning module within the Forest Service Spatial Analysis Model (FSSAM), the forest estate model to be used in this analysis, will approximate the future development of new roads, trails and landings necessary for harvesting the undeveloped areas. Harvesting within the forest estate model is restricted to areas that are within close proximity of constructed roads. As accessible volume becomes limited the planning module is activated to approximate the future development of new roads, thus influencing the sequence of harvesting throughout the entire Dawson Creek TSA. Ideally, the forest estate model would permit the volume from area occupied by future roads and trails to be available for an initial harvest and not available for later harvests. As FSSAM is unable to explicitly accommodate this temporal change of timber harvesting land base with the development of future roads, the chief forester will be presented information on the likely impact of future development of roads, trails and landings for consideration in making his allowable annual cut determination.

As it is not possible to accurately estimate the extent and location of future changes in the area of non-forestry transportation and transmission features, such future changes are not reflected in this analysis. Rather, such future changes will be reflected in subsequent timber supply reviews.

5.2.6   Oil and gas

A disturbance map coverage was developed using information obtained from the Oil and Gas Commission in early 2007 using the criteria described in Table 6. The pipeline and well site area is considered to be non-forest area, while the area of seismic line remains as forest area. Additional information will be used in an attempt to update this oil and gas disturbance map coverage for activity to July 5, 2011

Although future forest depletion due to seismic activity is likely, it is not possible to accurately estimate the extent and location of these losses. Nor is it possible to predict when and to what extent existing seismic line area will begin growing a fully functioning forest. For this analysis, it is assumed the area of new seismic activity is equal to the existing seismic area beginning to grow a fully functioning forest. This is accomplished by maintaining all existing seismic line area in a young forest condition within the timber supply model.

5. Land Base Definition

Table 6.   Oil and gas features and buffers

Oil and gas feature	Total disturbance width (m)
Pipelines	20 m
Seismic lines	7 m
Well sites (includes sumps, borrow pits)	5.1 ha per site

Forest district staff advise there is uncertainty as to how comprehensive and up-to-date the oil and gas feature information is. Improved information will be incorporated in subsequent timber supply reviews.

5.2.7   Riparian reserve and management zones

Areas of land adjacent to wetlands, or bodies of water such as swamps, streams, rivers or lakes are known as riparian area. Riparian areas excluded from timber supply are riparian reserve zones whereas riparian areas where constrained harvesting may occur are known as riparian management zones.

Summaries of stream, lake and wetland classifications and the corresponding widths of riparian buffers for the Dawson Creek TSA are included in Table 7.

Table 7.   Riparian buffers for Dawson Creek TSA

Feature	Class	Description	No harvest zone[1]
Double-line river	S1	Non_prod_descrip = 'RIV'	75 m buffer on each side of stream
Major stream	S2 & S3	Fcode = GA24850000	35 m buffer on each side of stream
Lake	L1A ,L1B	Non_prod_descrip = 'L'; > 5 ha	30 m
Wetland	W1 > 5 ha	Non_prod_descript = 'SWAMP'; > 5 ha	10 m

[1]The following assumptions were used to develop the criteria for rivers and major streams:

- The double-line river buffer represents a 50 m reserve and a 50 m management zone. On average, half the management zone will be retained as part of the reserve for an average of 75 m buffer.

- The major stream buffer represents a 30 m reserve and 20 m management zone. On average 25% of the management zone was retained for an average 35 m buffer.

- Lakes (L1-A & L1-B) are modelled with a 30 m buffer following the Prince George Region buffering methodology previously used in TSR 2.

- Wetlands (W1) have a 10 m reserve and rarely get much retention within the management zone. W2 wetlands are not found in this TSA.

- The minor stream classes (S4, S5, and S6s) do not require a reserve zone. Therefore, minor streams have not been buffered in this analysis.

The riparian objectives are maintained through the current practice of reaching in with machinery to harvest the majority of the merchantable volume within the management zones while keeping machinery out of the riparian and management zones. As such, the above buffering assumptions result in more area being removed from the timber harvesting land base than supported by current practice. The magnitude of the underestimation of the timber harvesting land base will be assessed in the analysis.

5. Land Base Definition

5.2.8   Identified wildlife and wildlife habitat areas

Identified wildlife species in the TSA include Bull Trout, Trumpeter Swan, Northern Goshawk, Fisher, Grizzly Bear, Mountain Goat and Caribou. The approved management objectives for each established WHA will be reflected in the analysis.

5.2.9   Cultural heritage resource reductions

Cultural heritage values include trapping areas, and sites of archaeological or traditional use. Known archaeological sites are provided in an inventory supplied by the Archaeology Branch, Ministry of Forests, Lands and Natural Resource Operations. Table 8 provides a summary of cultural heritage resources identified within the Dawson Creek TSA. To date, there have been no traditional land use areas determined or delineated. Two First Nations bands (West Moberly First Nations and Saulteau First Nations) within the district have entered the Treaty Land Entitlement claim process.

Peace Moberly Tract

A sustainable resource management plan (SRMP) was developed among Saulteau First Nations, West Moberly First Nations, and the provincial government for the Peace Moberly Tract. The completed plan has not been approved by all the parties. A sensitivity analysis will be carried out during the analysis to determine the impact of the plan.

Twin Sisters Special Management Zone (TSSMZ)

The TSSMZ was reviewed for developing management guidelines acceptable to tenure holders and First Nations. There was an expectation that co-ordinated access and road deactivation plans would be developed between forest licensees and oil and gas firms operating within the zone. To date, no access or deactivation plans have been developed. Salvage, silviculture and road maintenance are currently permitted activities within the Twin Sisters SMZ. Once agreement is reached, development will proceed.

Table 8.   Cultural heritage resources

Identifying inventory variables (location descriptors)	Excluded area (hectares)	Reason for exclusion
Known archaeological sites	1.83 hectares per site	Known feature (FPC)
➢ **Paleontological**		
➢ **Prehistoric** (lithics, petroglyph, cairn, earthwork, mound, fire-broken rock, calcined bone, bone, hearth, land mammal, cache, rock shelter, cave, burial)		
➢ **Historic** (industrial, farming, governmental, commercial, culturally modified tree, log cabin, depression/circular habitation, trail, human remains, cemetery, root cellar, fishing station, tepee, camp, refuse)		

Known archaeological sites are considered as not harvestable area. In the analysis, the area identified as not harvestable will be the product of the number of archaeological sites per forest inventory polygon and the average site area (1.83 hectares). The area associated with sites occurring within riparian reserves and identified wildlife and wildlife habitat areas has already been classified as not harvestable area as described in Sections 5.3.1 and 5.3.2.

5. Land Base Definition

5.2.10   Physical operability types

Physical operability types or harvesting systems are spatially represented using slope classes and soil parent material types listed below in Table 9. Unless previously harvested, areas denoted as inoperable are classified as opportunity land base as these areas are not currently economic or physically accessible to harvest.

Table 9.   Description of physical operability types

Operability type	Operability code	Slope (%)	Soil parent material
Conventional (ground)	A	0-30	Lacustrine
Conventional (ground)	A	0-40	Moraine
Cable[a]	C	> 30-80	Lacustrine
Cable[a]	C	> 40-100	Moraine
Aerial[b]	H	> 100	Moraine
Inoperable	I	> 80	Lacustrine

(a)   Cable includes mixed-conventional/cable harvesting systems.

(b)   Aerial includes mixed-aerial/cable harvesting systems.

Classification of soil parent materials within the Dawson Creek TSA is based on the three sources of terrain data identified earlier in the inventory information table under physical operability types. The classification reflects improved slope and soils information and current harvesting practices.

Slope classes are derived using the TRIM inventory and reflect harvest equipment capability and environmental suitability. Safety guidelines for machine operability have been incorporated. Soil/parent material types have been categorized according to their sensitivity to disturbance. Generally, fine-textured aeolian, alluvial/fluvial, and lacustrine parent materials are considered to be more sensitive soil types.

This approach is an improvement to the previous approach which utilized ESA soils information.

The magnitude of area and volume for which cable and helicopter area contributes to the harvest forecast will be assessed in the analysis. The operability classification is utilized in Section 5.2.11, "Non-merchantable forest types" for assessing the economic viability of harvesting various areas.

5.2.11   Non-merchantable forest types

Sites may have low productivity either because of inherent site factors (e.g., nutrient availability, exposure, excessive moisture), or because they are not fully occupied by commercial tree species. These stands are not considered to be economically viable to harvest and classified as opportunity land base.

5. Land Base Definition

Table 10 lists the harvesting systems and the associated percent reduction for mature stands in the Dawson Creek TSA.

Table 10.   Percent area reductions for mature stands based on harvesting system and volume per hectare

Harvesting system	Percent area reduction by stand volume class		
	< 120 m³/ha	120-200 m³/ha	> 200 m³/ha
Conventional	97	0	0
Cable[a]	100	100	0
Aerial[b]	100	100	0
All	N/A	N/A	N/A

(a) Cable includes mixed-conventional/cable harvesting systems.

(b) Aerial includes mixed-aerial/cable harvesting systems.

Table 11 lists the criteria for including immature stands in the timber harvesting land base. The criteria are listed by leading species. Small pine, aspen and balsam poplar stands are typically harvested only on sites that are operable with conventional harvesting technology.

Table 11.   Inclusion criteria for immature stands

Leading species	Harvesting system	Age at maturity (years)	Minimum volume at maturity age
Spruce	All	120	120
Subalpine fir	All	120	120
Pine	All	100	120
Small pine	Conventional	80	120
Aspen	Conventional	80	120
Balsam poplar	Conventional	80	120

For low productivity sites, VDYP will be used to determine the minimum site index required by a stand to achieve a volume at a specified minimum age.

Immature small pine, aspen and balsam poplar stands on cable or aerial ground are classified as opportunity land base.

5.2.12   Problem forest types

Problem forest types (PFT) are stands that are physically operable and exceed low site criteria yet are not currently utilized or have marginal merchantability.

5. Land Base Definition

Table 12 lists the problem forest types that were excluded from the timber harvesting land base and classified as opportunity land base.

Table 12.   Problem forest types criteria

Leading species	Stocking class	Reduction (%)
Black spruce		100
Lodgepole pine (stocking class 4)	4	100
Cedar, hemlock, larch, fir		100
Alder, maple, birch		100

5.2.13   Non-commercial deciduous species

In the past there have been large wildfires in the Dawson Creek TSA. Many of the burn areas were mapped as not-satisfactorily restocked (NSR) polygons, and are presently occupied by non-commercial deciduous species, according to local silvicultural knowledge. In TSR 2 these areas (which totalled 16 310 hectares) were identified as backlog NSR on the old forest cover inventory file and removed from the timber harvesting land base under the heading of non-commercial deciduous species. A recent review of district backlog NSR data determined that 15 255 hectares of backlog NSR (pre-1987) had a disturbance history that matched one of the following classifications; burned, burned and logged, wind, or fume-kill. A spatial approximation of these areas has been developed. If resources permit district staff will undertake a high-level survey to determine if these areas should still be removed from the timber harvesting land base as non-commercial deciduous species.

5.2.14   Recreation

Management for recreation values across the Dawson Creek TSA is addressed through the recreation features inventory. The recreation features inventory was originally completed in 1992/3 using procedures described in the *Ministry of Forests Recreation Manual* and has since been updated. A combination of local knowledge, public input, field reconnaissance, air photo interpretation, topographic maps, and other resource agency information was used in preparing the inventory.

Managing for recreation and recreation features is not guided by legislation and harvesting does occur within these areas. No exclusions to the timber harvesting land base or volumes are accounted for in this analysis.

The magnitude of area and volume for which recreation values apply will be assessed in the analysis.

5.2.15   Geographically isolated areas

Since the last timber supply review, district staff have reviewed physical operability for the TSA. This review has resulted in new line work for isolated areas based on current practice using primarily location, road access and slope information. These isolated areas will not be included in the timber harvesting land base and instead be classified as opportunity land base. The magnitude of these excluded areas will be assessed in the analysis.

6. Current Forest Management Assumptions

6.1 Utilization levels

Utilization levels define the maximum stump height, minimum top diameter (inside bark) and minimum diameter at breast height (dbh) by species and are used as inputs to the yield projections that were used in the timber supply analysis.

Table 13.   Utilization levels

Species	Minimum dbh (cm)	Maximum stump height (cm)	Minimum top dib (cm)
Spruce	17.5	30	10.0
Subalpine fir	17.5	30	10.0
Pine[1]	12.5	30	10.0
Pine (height class 2)	12.5	30	10.0
Other conifer	17.5	30	10.0
Aspen/birch	12.5	30	10.0
Other deciduous	12.5	30	10.0

[1] Utilization reflects provincial standard while actual utilization to dbh of 9.0 cm is realized.

6.2 Volume exclusions for mixed-species stands

In the Dawson Creek TSA, unlike other areas of the province, all tree species of merchantable size within a cutblock are charged to cut control and therefore contribute to timber supply under current management. Therefore, no reductions to yield estimates to account for unused secondary species will be made.

6.3 Minimum harvestable age derivation

The minimum harvestable age is the age at which a stand is estimated to be available for harvest. Harvesting may occur in stands at the minimum harvestable age to meet a harvest target for a short period of time or to avoid large and abrupt changes in harvest levels. However, most stands will not be harvested until past the minimum harvestable ages because of management objectives for other resource values (e.g., requirements for the retention of older forest). Table 14 lists the criteria to be used in defining minimum harvestable ages by leading species.

6. Current Forest Management Assumptions

Table 14.   Minimum harvestable age criteria

Leading species	Minimum criteria		
	Height class	Dbh (cm)	Volume (cubic metres per hectare)
Small pine	2	12.5	120
Other pine	3	12.5	120
Spruce	3	17.5	120
Subalpine fir	3	17.5	120
Other conifer	3	12.5	120
Aspen/birch	3	12.5	120
Other deciduous	3	17.5	120

The above criteria are based on local knowledge.

6.4 Log grade changes

On April 1, 2006 new log grades were implemented for the BC Interior. Under this system, grades are based on a log's size and quality at the time it is scaled without regard to whether it was alive or dead at harvest. Standard yield tables generated by both VDYP and TIPSY do not incorporate the now included grade 3 endemic and grade 5 log volumes. Information will be presented to the chief forester for use in his AAC determination from several studies including inventory audits about these dead potential grades.

Data source and comments:

FLNR 2006. Summary of dead potential volume estimates for management units within the Northern and Southern Interior Forest Regions.

6.5 Harvest scheduling priorities

Prior to the advent of the mountain pine beetle infestation, the desire was to harvest the timber profile within the Dawson Creek TSA. In response to the mountain pine beetle infestation, this objective has changed for the next two decades to have at least 70% of the coniferous licensee harvest to be pine volume. To achieve this pine volume objective, the model will harvest stands in the following priority:

1) pine and small pine-leading MPB infested stands;

2) pine and small pine-leading susceptible stands;

3) mixed wood with a high proportion of infested pine;

4) mixed wood with a high proportion of susceptible pine;

5) other conifer (spruce and subalpine fir).

The model will be set to harvest the district's timber profile following the second decade when it is assumed the mountain pine beetle infestation will have subsided. The model will harvest the deciduous timber profile throughout the entire harvest forecast.

6. Current Forest Management Assumptions

6.6 Silviculture systems

Harvesting is predominantly by even-aged silvicultural systems. Shelterwood systems have been utilized to a limited extent in some coniferous mixed-wood stands in this TSA. However, the use of even-aged silviculture systems is anticipated to increase due to the mountain pine beetle infestation.

6.7 Unsalvaged losses

Table 15 shows the estimated average annual unsalvaged volume loss to catastrophic events such as insect epidemics, fires, wind and root disease on the timber harvesting land base. The volume indicated will be removed from the modelled harvest forecasts and is intended to reflect only those volumes that will not be recovered or salvaged.

Table 15.   Annual unsalvaged losses

Stand type grouping	Cause of loss (m^3)						
	Fire	**Wind**	**Oil & gas**	**Tomentosus root rot**	**Spruce beetle**	**Mountain pine beetle[1]**	**Total**
Coniferous stands		3 246	TBD				
Pine (as per BC MPB model to be determined)							
Spruce	3 991	3 459		4 698	58 033		
Small pine	728	631					
Deciduous-leading	4 690	4 064					
Mixed wood (with significant pine component)							
Total (excluding pine)	13 154	11 400		4 698	58 033		

[1] Current and projected mortality from the mountain pine beetle is spatially reflected in the timber supply model.

If data and time permit, the unsalvaged loss assumptions will be updated during the analysis**.**

Data source and comments:

The Northern Interior Regional pathologist and entomologist provided estimates of total losses using forest health data specific to the Dawson Creek TSA; unsalvaged losses were estimated using data from scale returns and GIS queries. This information was supplemented with estimates in the *Forest Insect and Disease Survey, Canadian Forest Service*.

For fire and wind, the total losses were prorated to each applicable stand type based on the current area within the associated species groupings. Annual average loss associated with wind was estimated using anecdotal data over a 10-year period. Annual average loss associated with fire was determined using disturbance data over a 10-year period.

6. Current Forest Management Assumptions

Losses from Tomentosus root rot typically occur in spruce stands less than 700 metres elevation with an age greater than 100 years. The total loss of 4698 cubic metres per year was based on an estimated annual loss of 2.5 cubic metres per hectare per year multiplied by the current area considered susceptible (1879 hectares).

Access to timber for salvage within the Dawson Creek TSA is dependent on costs associated with development or road reactivation. Where development costs outweigh the value of damaged timber, volumes are deemed economically inaccessible and considered an unsalvaged loss.

MPB losses will be estimated using the MPB spread model during the analysis.

Losses associated with oil and gas development will be determined as discussed in Section 5.2.6, "Oil and Gas".

6.8 Silviculture and regeneration activities

The silviculture program consists of the mix of treatments expected to be carried out to achieve basic silviculture on all sites. Table 16 contains the site index, regeneration delay, well spaced stems and species composition assumptions to produce the regeneration yield tables of stands following harvest. These regeneration assumptions are based upon actual regeneration performance as reported in the Reporting Silviculture Updates and Land status Tracking System (RESULTS).

Table 16.   Regeneration assumptions by analysis unit

Unmanaged AU	Regenerated AU[2]	Regeneration assumptions[1]			
		Site index[3]	Regen delay	Well-spaced stems per hectare[4]	Species composition (%)
Spruce leading					
1111	1112				
1121	1122	14.9	1	1335	spruce 63% pine 21% subalpine fir 15% deciduous 1%
1131	1132				
1211	3112				pine 50%
1221	3122	15.3	1	1212	subapline fir 22%
1231	3132				spruce 16% deciduous 12%
1311	6312				deciduous 69%
1321	6322	20.3	1	1073	pine 21% spruce 8%
1331	6332				subalpine fir 2%
Subalpine fir leading					
2111	1112				spruce 64%
2121	1122	14.3	1	1064	subalpine fir 29%
2131	1132				pine 6% deciduous 1%
2211	2112				subalpine fir 91%
2221	2122	15.0	1	1022	pine 3%
2231	2132				deciduous 6%

(continued)

6. Current Forest Management Assumptions

Table 16.   Regeneration assumptions by analysis unit (concluded)

		Regeneration assumptions[1]			
Unmanaged AU	Regenerated AU[2]	Site index[3]	Regen delay	Well-spaced stems per hectare[4]	Species composition (%)
Pine leading					
3111 / 4111	3112				pine 63% spruce 27%
3121/ 4121	3122	15.2	1	1219	subalpine fir 8%
3131 / 4131	3132				deciduous 2%
3211 / 4211	3112				pine 67% s deciduous 16%
3221 / 4221	3122	15.2	1	1189	spruce 12%
3231/ 4231	3132				subalpine fir 5%
3311/ 4311	6312				deciduous 60% pine 27%
3321/ 4321	6322	23.2	1	1115	spruce 12%
3331 / 4331	6332				subalpine fir 1%
Other conifer leading					
5011	1112				spruce 60% pine 34%
5021	1122	17.0	3	1283	deciduous 5%
5031	1132				subalpine fir 1%
Aspen/birch leading					
6211	1212				spruce 36% deciduous 30%
6221	1222	17.0	4	859	pine 33%
6231	1232				subalpine fir 1%
6311	6412				deciduous 85%
6321	6422	19.0	5	1272	spruce 2%
6331	6432				pine 13%
6411	6412				
6421	6422	18.6	1	3134	deciduous 100%
6431	6432				
Other deciduous leading					
7011	7412				deciduous 95%
7021	7422	20.1	1	2235	pine 4% spruce 1%
7031	7432				

[1] Regeneration assumptions are based upon actual performance as documented in RESULTS data;

[2] Regenerated stands regenerate to the same analysis unit;

[3] Site index will be updated to reflect actual site productivity of harvested areas;

[4] While recognizing not all area is regenerated through planting, the predicted future volume growth is most reliably derived utilizing TIPSY, well-spaced stems per hectare and assuming planted stock.

Volumes for existing unmanaged stands are projected using the Variable Density Yield Prediction (VDYP) version 7 yield model. Timber volumes for regenerated managed stands are estimated using the B.C. Forest Service Table Interpolation Program for Stand Yields (TIPSY) version 4.1 growth and yield model.

6. Current Forest Management Assumptions

Operational adjustment factors (OAF) are used to adjust TIPSY timber yield estimates to account for operational factors. OAF 1 is a constant percentage reduction to account for small stocking gaps within stands. OAF 2 accounts for losses that increase with stand age, for example decay due to disease. Provincial average values of 15% for OAF 1 and 5% for OAF 2 will be applied to the managed stand yield curves in the base case.

Use of Class A seed is limited to silviculture trials within the ESSFwk2. Therefore no genetic gain will be assumed in the analysis.

6.9 Immature plantation history

All stands established since 1987 in the Dawson Creek TSA have had some form of density control (i.e., brushing) or plantability/stocking survey which indicates the stands are well-spaced or free-growing, and therefore are considered to be managed.

All stands harvested prior to 1987 are considered to be unmanaged. Stands harvested were either clearcut or partially harvested using diameter-limit selection systems, and were allowed to regenerate naturally.

6.10   Not satisfactorily regenerated (NSR) areas

Stands not growing to their potential due to insufficient stocking of preferred and or acceptable tree species are classified as NSR. This NSR is considered to be either "current NSR" or "backlog NSR". Current NSR is recently harvested area that is promptly re-established following harvest. Backlog NSR are insufficiently restocked areas that were harvested prior to 1987, or insufficiently restocked areas resulting from wildfire, pests or other damage.

A combination of VRI, RESULTS and NSR data will be utilized to identify NSR area. Current NSR areas are assumed to regenerate on the timber harvesting land base with the regeneration delay assumptions noted in Table 16. The backlog NSR areas on productive sites with a logging history will be modelled as very young natural regeneration and grown using natural stand yield curves within the timber harvesting land base. All other unplanted NSR are removed from the timber harvesting land base as non-commercial.

6.11   Forest cover requirements — integrated resource management

The forest cover requirements that specify both the maximum proportion of an area allowed in a disturbed condition and the minimum required area of old forest can be incorporated into the timber supply model. As noted in Section 4.1, "Management zones, groups and multiple objectives", forest cover requirements will be applied to model management for a number of objectives.

Table 17 lists the forest cover requirements that will be applied in the various zones to represent current management. The forest cover requirements will be applied to each zone within each landscape unit. Where a management zone (e.g., retention VQO) spans more than one landscape unit, the forest cover requirements will be modelled at the landscape unit level.

6. Current Forest Management Assumptions

Table 17.   Forest cover requirements

Zone	Maximum allowable disturbance (% area)	Green-up height (m)	Minimum retained area (%)	Minimum age or height for retention	Area of application	Source of prescription
Integrated resource management areas	33	3		Age to achieve green-up heights were generated using SiteTools version 3.2i	Timber harvesting land base (THLB) by landscape unit	Application of cutblock adjacency requirements for TSA by landscape unit
VQO: Preservation Retention Partial retention Modification Maximum modification	1 5 10 20 33	4.9 4.9 4.9 4.9 4.9		Age to achieve green-up heights were generated using SiteTools version 3.2i	Crown forested area by visual polygon	MoF *Procedures for Factoring Visual Resources into Timber Supply Analyses*
UWR for Elk, Mule Deer, Moose			20%of UWR polygon in mature/old coniferous leading forest with a canopy closure of at least 40%		Crown forested area within U-9-001	
UWR for Caribou, Mountain Goat, and Bighorn Sheep			100% (except Cat A)		Crown forested area by Spc-001-008, 010,011,013-017,019-032,034-048 and OVCA-1-7	
Caribou-low elevation winter range	33	3			SPC-009 (Redwillow)	
Caribou-low elevation winter range			60% of pine-leading stands > 60 years of age (min 100 year rotation for pine-leading stands)		Crown forested area within SPC-18 (Chinook Ridge)	

(continued)

6. Current Forest Management Assumptions

Table 17.   Forest cover requirements (concluded)

Zone	Maximum allowable disturbance (% area)	Green-up height (m)	Minimum retained area (%)	Minimum age or height for retention	Area of application	Source of prescription
Mountain Goat: low elevation winter range			100%		Crown forested area within SPC-033	
Grizzly Bear management zone	33	3	Early seral retention % for Intermediate biodiversity emphasis in NDTs 1 and 2	Early seral age for Intermediate biodiversity emphasis in NDTs 1 and 2	Crown forested area	Expert advice from Dale Seip (FLNR) and Dave King, (FLNR); Darwin Coxyn (UNBC)
Mountain Goat WHAs 9003 and 9004			100%		Crown forested area within 9-003 & 9-004	

Data source and comments:

Habitat requirements for Caribou and Grizzly Bear are consistent with the Dawson Creek LRMP, and also with the Caribou Recovery Plan recommendations. In addition to the forest cover objectives provided in the table above for Elk, Mule Deer, Moose, Caribou, Mountain Goat and Bighorn Sheep, the General Wildlife Measures (GWM) for these areas are expected to provide management guidance at the operational level.

Grizzly Bear habitat is managed to retain early seral forest based on percentages specified in the *Biodiversity Guidebook* for an intermediate biodiversity emphasis in NDTs 1 and 2. Early seral conditions are important to ensure adequate foraging habitat for Grizzly Bears. Interim strategies for managing Grizzly Bear habitat include vegetation management, one-sided drainage development, and seasonal access constraints.

Green-up was modelled as the age at which the associated green-up height is estimated to be achieved. The BC Forest Service SiteTools model will be used to estimate green-up age of each stand. The average area-weighted age by VQO and landscape unit will be calculated and used in the timber supply analysis.

6.12 Ungulate management

An order (U-9-001) was declared in 2004 for elk, mule deer and moose winter range. An order (U-9-002) was subsequently declared in October of 2006 for Caribou, Mountain Goat and Bighorn sheep. General wildlife measures described in Section 6.11 will be applied to these UWRs.

6. Forest Management Assumptions

6.13 Landscape biodiversity

Over 250 000 scale hectares were spatially established as old growth management areas in June 2008. These spatial old growth management areas will be reflected in the base case as areas of no harvest, replacing the non-spatial old growth objectives reflected in the previous analysis.

For information purposes, a sensitivity analysis will assess the old forest retention and patch size objectives in Table 18.   These objectives reflect the natural range in occurrence of old forest retention and patch size as documented in Technical Report 059, *Land Units and Benchmarks for Developing Natural-disturbance Based Forest Management Guidance for Northeastern British Columbia*, 2010 by Craig DeLong.

Table 18.   Science based old forest retention requirements and patch size distribution

Natural disturbance unit (NDU)	Total area (ha)	Minimum age of old forest (years)	Minimum old forest retention (%)	Maximum young forest retention (%)	Patch size (ha)		
					>1000 (ha)	101–1000 (ha)	<101 (ha)
Boreal Foothills-Mountain	551 021	140	33	36	40	30	30
Boreal Plains-Upland	1 291 580	140	17	50	70	20	10
Boreal Foothills-Valley	329 393	140	23	45	40	30	30
Omineca-Valley	257 155	140	23	45	60	30	10
Omineca-Mountain	14 416	140	58	22	40	30	30
Wet Mountain	325 181	140	84	7	10	60	30
Northern Boreal Mountains	0	140	37	34	60	30	10
Alpine and subalpine	221 187	No harvesting					

6.14 Wildlife tree patches (WTP)

The current practice in the Dawson Creek TSA involves the retention of wildlife tree patches (WTP). The retention of individual wildlife trees is uncommon in the Dawson Creek TSA because of an extensive wind throw hazard.

The total WTP retention targets for each landscape unit, as shown in column three of Table 19, are consistent with the *Dawson Creek Draft Landscape Unit Planning Strategy* (June 1999) and Table A3.1 of the provincial *Landscape Unit Planning Guide*. In accordance with the Assistant Deputy Ministers' memorandum (May 15th, 2000)[1], it is assumed that half of the total WTP requirements for each landscape unit will be represented in the timber harvesting land base in the base case.

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[1] Assistant Deputy Ministers' Memorandum regarding Provincial Wildlife Tree Patch recommendations, Ministry of Forests and Ministry of Environment, Lands and Parks, May 15, 2000.

6. Forest Management Assumptions

Table 19.   Reductions to reflect volume retention in cutblocks

Landscape unit (LU)		Total estimated WTP requirement (%)	% reduction[a] applied in the analysis
Number	**Name**		
1	Eastpine	7.0	3.5
2	Martin Creek	7.0	3.5
3	Bearhole	6.0	3.0
4	Highhat	7.0	3.5
5	Boucher	6.0	3.0
6	Septimus	7.0	3.5
7	Kiskatinaw	7.0	3.5
8	Dawson Creek	7.0	3.5
9	Pine River	7.0	3.5
10	Upper Moberly	7.0	3.5
11	Puggins	6.0	3.0
12	One Island	6.0	3.0
13	Gwillim	6.0	3.0
14	Wolverine	7.0	3.5
15	Redwillow	4.0	2.0
16	Kinuseo	4.0	2.0
17	Imperial-Monkman	3.0	1.5
18	Wapiti	4.0	2.0
19	Dunlevy	6.0	3.0
20	Lower Moberly	6.0	3.0
21	Gething	8.0	4.0
22	Carbon	8.0	4.0
23	Pine Pass	6.0	3.0
24	Burnt-Lemoray	8.0	4.0
25	Upper Sukunka	5.0	2.5
26	Belcourt	4.0	2.0
27	Narraway	5.0	2.5
28	Hudson's Hope	6.0	3.0

(a) The Landscape Unit Planning Strategy recommendations will be employed in the analysis, with the assumption that half of the requirement would be achieved within the timber harvesting land base.

6.15 Livestock grazing

Livestock grazing is an important activity within the Dawson Creek TSA. Grazing activities occur on areas subject to Crown grazing leases, grazing permits and community pastures. Tree productivity loss associated with cattle grazing has not been quantified for the Dawson Creek TSA, and yield projections cannot be confidently adjusted to reflect cattle grazing impacts. Similarly, the relative gain in tree productivity associated with deferring cattle grazing in the short term is unknown.

Peace District staff are attempting to quantify the impact, and will provide information to support a sensitivity analysis on grazing impacts.

6. Forest Management Assumptions

6.16 Disturbance of non-timber harvesting land base

As described in this data package, management objectives for forest values such as biodiversity and wildlife will be modelled in the timber supply analysis. Objectives applied to address these values apply to the entire forest area (both timber harvesting land base and non-timber harvesting land base). As a result non-timber harvesting land base areas will also be factored into the analysis. Various modelling assumptions are made to simulate the role of natural disturbance in altering non-timber harvesting land base forest conditions. This is done so that non-timber harvesting land base areas do not overly contribute to meeting the requirements of non-timber values.

7. Sensitivity Analyses

Sensitivity analysis provides a perspective on the timber supply impact of uncertainty in management assumptions and/or data. By developing and testing a number of sensitivity analyses, it is possible to determine which variables most influence the results.

Table 20 includes some standard sensitivity analyses as well as some aimed at exploring issues particular to the Dawson Creek TSA.

Table 20.   Sensitivity analyses

Issue to be tested	Sensitivity levels	Data source/comments
Existing timber harvesting land base	+/– THLB based on economic uncertainties	Opportunity to provide volume for producing new products of interest
Minimum harvestable age	Model age at which 95% of culmination volume is achieved; model age at which culmination volume is achieved Model +/– 20 years	Table 14 Minimum Harvestable Age Criteria
Regeneration delay	Set all regeneration delays to one year	Table 16 Regeneration Delay Criteria
Visual quality objectives (VQO)	Do not permit harvesting within area with visual objectives Assume pine mortality goes against meeting visual objectives Facilitate increased harvesting by not managing for visual objectives	2005 Visual landscape inventory, TRIM slope data; and slope classes identified in Table 6, *Factoring Visual Resources into Timber Supply Analysis*
Mixed woods	Remove mixed woods from timber harvesting land base	Table 4. Forest type 2 – coniferous mixed wood and 3 – deciduous mixed wood
Subalpine fir	Remove subalpine fir-leading stands from timber harvesting land base	Table 4. Leading species 2 – subalpine fir
Balsam poplar	Remove balsam poplar-leading stands from timber harvesting land base	A portion of Table 4. Leading species 7 – balsam poplar
Domestic grazing	Reduce timber harvesting land base in range tenure areas by 10%	Grazing lease, grazing permit area, community pasture from grazing area standard overlay
Mines	Remove proposed mine sites from timber harvesting land base	Mines map coverage non-standard layer

(continued)

7. Sensitivity Analyses

Table 20.   Sensitivity analyses (concluded)

Issue to be tested	Sensitivity levels	Data source/comments
Peace River (flood area from Site C proposal) / Boudreau Lake (ELU) Area / Peace Moberly Tract / Twin Sisters Special Management Area	Remove area from timber harvesting land base	2006 map coverage from FLNR and LRMP RMZ
Oil & gas	Increase the area impacted by oil and gas features	Oil and gas features map coverage, 2007
Mountain pine beetle	Assess impact of 80% mortality of pine stands by the mountain pine beetle	Pine component in the inventory file of stands older than 30 years
Caribou	No harvesting within the Kiskatinaw River watershed to sustain the Caribou herd	Forest Practices Board Special Report, *Cumulative Effects: From Assessment Towards Management*, March 2011
Old forest	Recent research on the natural range of occurrence of old forest	Craig Delong's natural range of variability research