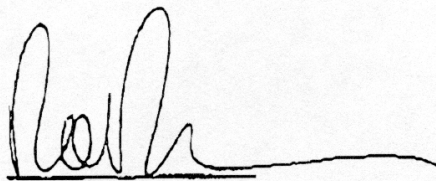


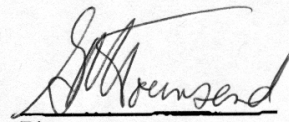
Okanagan Timber Supply Area Timber Supply Review

Data Package

June 1999



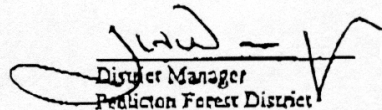
District Manager
Salmon Arm Forest District



Director
Timber Supply Branch



District Manager
Vernon Forest District



District Manager
Penticton Forest District

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THE PURPOSE OF THIS DATA PACKAGE

The purpose of this data pack is twofold.

The primary purpose of this package is to provide a description of current forest management, to be used to determine a base case timber supply forecast for TSR2, which is scheduled for completion during the year 2000. This base case will be used as the baseline against which sensitivity analyses can be compared.

Secondly, it is intended to be used by the *Okanagan / Shuswap Land and Resource Management Plan* (LRMP) as a method of determining a base case harvest forecast which in turn will be used as a baseline term of reference for those scenarios which are developed by the LRMP table and are to be modelled to determine possible timber supply impacts. Although the LRMP encompasses the Okanagan TSA and TFLs 15, 33 and 49, only the Okanagan TSA will be evaluated through this process.

1. Introduction

This data package is an organized and consistent format for supplying the basic inputs required for a timber supply analysis.

The completed data package contains those inputs that are a part of current performance for LRMP area. For the purpose of the LRMP timber supply analysis, "current performance" can be defined by:

- the current forest management regime (the productive forest land available for timber harvesting, the silviculture treatments, the harvesting systems and the integrated resource management guidelines used in the area);
- the standards used to evaluate forest development (5-year development) plans;
- approved higher level plans under the Forest Practices Code (FPC); and,
- other approved B.C. Forest Service and joint agency forest management practices and policy.

Changes in forest management objectives and data as a result of the LRMP will be captured in the "impact analysis" undertaken when the LRMP table has completed its negotiations.

Each section of this data package is organized in the following way:

- 1) A short explanation of the data needed to model the specified forest management practices.
- 2) Data table.
- 3) Additional comments, including the source of the data.

Tables with shading indicate the columns to be filled in by the timber supply analyst upon receiving the full resultant data set (GIS/FIP file) for the Okanagan TSA.

This data package, while representing the best available knowledge and information today, is subject to change. In some cases the criteria are shown but the final value is not yet filled in. In these cases the table columns are shaded gray. In addition, if any major changes to management regimes occur over the next few months, an attempt will be made to incorporate them into the timber supply analysis. The final timber supply analysis report will include a technical appendix that highlights any changes made to this package.

2. Current Forest Management Considerations and Issues

2.1 Base case management assumptions

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

2.2 Statement of major forest management considerations and issues

The major forest management issues and considerations are listed in the table below. Where issues are defined within legislation, regulations or standards, a timber supply assessment will be made. If there are important uncertainties in defining current management, sensitivity analysis may assist in assessing the potential timber supply implications and assigning degrees of risk to timber supply during allowable annual cut (AAC) determination.

2. Current Forest Management Considerations and Issues

Table 1. Major forest management considerations

Consideration/issue	Description
Landscape unit planning	The Forest Practices Code (FPC) describes landscape units which are to be established by the forest district manager and the designated environment official. Although landscape units have not been finalized, draft landscape units will be used in the base case.
Stand and landscape level biodiversity	The FPC <i>Biodiversity Guidebook</i> provides recommended management practices to maintain biodiversity values at both the stand and landscape level. These guidelines, together with direction from letters regarding the implementation of biodiversity management, are employed in the TSA.
Community watersheds	To protect the drinking water which originates in designated community watersheds, disturbance is limited to a maximum in each community watershed (CWS), which will be modelled in the analysis.
Scenic areas with known visual quality objectives	Scenic areas with known visual quality objectives (VQO) will be modelled in order to maintain the scenic resource.
Ungulate winter range	Defined areas are managed in order to maintain the ungulate winter range. These areas are known to licensees, were included in the <i>Okanagan Timber Harvesting Guidelines</i> (Ok THG) and incorporated into TSR1. They will be managed with appropriate forest cover requirements.
Lakes management plan	The recently completed <i>Lakes Management Plan</i> has been signed off by the three district managers and is known information for FDP preparation and timber supply modelling.
Riparian management areas (RMA)	The FPC regulates management practices within RMAs. Management in RMAs will be represented with a land base deduction in the analysis, which will incorporate the reserve and management zones.
Protected areas	Protected areas are being discussed at the LRMP table, however none have been granted Order-in-Council (OIC) status therefore they cannot yet be considered current practice, and will not be included in the base case.

3. Inventories

3.1 Background information

The inventories which will be used to determine the timber harvesting land base and the associated management themes to be used in defining forest management activities are listed in Table 2.

Table 2. Inventory information

Data	Source	Vintage	Update	Scale
Forest cover inventoried by PSYU	FC1 files			1:20,000
Penticton Forest District	NAD 27 FC1 files		1995	
Salmon Arm Forest District	NAD 27 FC1 files		1996	
Vernon Forest District	NAD 83 FC1 files		1996	
Adams PSYU		1968	(Depletion) ^a	
Ashnola PSYU		1969	(Depletion)	
Barton Hill PSYU		1970	(Depletion)	
Eagle PSYU		1971	(Depletion)	
Spallumcheen PSYU		1972	(Depletion)	
Okanagan PSYU		1975	(Depletion)	
Kamloops PSYU		1977	(Depletion)	
Kettle PSYU		1977	(Depletion)	
Salmon Arm PSYU		1978	(Depletion)	
Shuswap PSYU		1979	(Depletion)	
Operability lines (Vernon, Penticton FD)	Ministry of Forests (MoF)	1994	Current	1:50,000
Operability lines (Salmon Arm FD)	MoF	1997	Current	1:30,000
Biogeoclimatic zones, subzones, variants	Ministry of Environment, Lands and Parks (MELP)		1997	1:100,000
	Web			
Streams and lakes — Vernon/Salmon Arm	TRIM I		early 1990s	1:20,000
Streams and lakes — Penticton	TRIM II		1997	1:20,000
Roads — Vernon/Salmon Arm	TRIM I		early 1990s	1:20,000
Roads — Penticton	TRIM II		1997	1:20,000
Community watershed boundaries	MELP (Water Management Branch)	N/A	1997	1:20,000
Ownership	Cadastral Data Management System (& FC1)	N/A	1997 (early 1990s)	1:20,000
Recommended visual quality class (RVQC) coverage	MoF (GIS)		1998	1:20,000
Ungulate winter range	MoF (Ok THG)			
Draft landscape units	MoF (GIS)		1997	1:20,000
Lakes classification	GIS (TRIM I)		1997	Buffer
Riparian reserves	GIS (TRIM I)	N/A	1997	Buffer

(a) PSYU inventories have been updated for depletion to the years indicated for the corresponding districts (1995 or 1996).

Data source and comments:

All information was collected in digital format from the responsible custodian. It was merged together in ArcInfo by the Okanagan TSA data centre and appropriate overlays and resultants were produced in order to create a data set suitable for timber supply analysis.

4. Division of the Area Into Management Zones

4.1 Management zones and tracking of multiple objectives (grouping)

Management zones represent areas with distinct management emphasis. For example, a zone may be based on a harvesting system, silviculture system, visual quality objective or wildlife consideration. Sometimes one area of forest is subject to more than one management objective. In the simulation model, groups can be used to represent and track different combinations of areas, and thereby allow application of overlapping management objectives. The timber supply analyst will decide whether to put an objective into a group or a mutually exclusive management zone after data assessment. The non-contributing forest (land considered unavailable for timber harvesting) can assist in achieving forest cover requirements in some areas, and will be incorporated into the analysis.

Section 6.4, "Integrated resource management," contains further information on the forest cover requirements to be applied to these areas.

Table 3. Objectives to be tracked

Objectives	Inventory definition
Landscape-level biodiversity	Draft landscape units; biogeoclimatic ecosystem classification (BEC) variant
Watershed/water quality protection	Community watershed; MELP
Visual quality	RVQOs coverage
Ungulate winter range	GIS overlay
Lake management plan zone	A 210 metre wide zone around lakes in the <i>Lake Management Plan</i> and managed to a recommended RVQO.

Data source and comments:

Using GIS data allows the timber supply analysis for the LRMP area to more closely track the, zones and groups than would be possible through use of the MoF FIP files and a series of non-spatial assumptions.

4.2 Analysis units

An analysis unit represents a combination of stands dominated by specific tree species or silvicultural regime with a specific timber growing capability — as indicated by the inventory type group and site index in the forest inventory file. Each analysis unit is assigned timber volume projections (yield tables) for both existing and future stands. Yield tables for existing natural stands are derived using the variable density yield prediction (VDYP) growth and yield model. Yield tables for recent plantations and future stands are derived using the table interpolation program for stand yields (TIPSY).

4. Division of the Area Into Management Zones

Table 4. Definition of analysis units

Id #	Analysis unit description	Inventory type groups	Age (years)	Other (biogeoclimatic units)	Site index (m @ 50 years)
11	Fir (Fd) / dry — selection	1-8, 32	All	PPxh, IDFxh, IDFdK1, BG	All
12	Fir (Fd) / dry — small patch	1, 6, 32	All	IDFdK2, IDFdM, MSxk	All
13	Fir (Fd) / wet — younger, better sites	1-8, 27, 32-34	< 141	All BECs with exceptions of analysis unit (AU) 1 and AU2	> = 14.5
14	Fir (Fd) / wet — younger, poorer sites	1-8, 27, 32-34	< 141	All BECs with exceptions of AU1 and AU2	< 14.5
15	Fir (Fd) / wet — older, better sites	1-8, 27, 32-34	≥ 141	All BECs with exceptions of AU1 and AU2	> = 14.5
16	Fir (Fd) / wet — older, poorer sites	1-8, 27, 32-34	≥ 141	All BECs with exceptions of AU1 and AU2	< 14.5
17	Cedar (Cw) — younger, better sites	9-11	< 141	Entire TSA	> = 16
18	Cedar (Cw) — younger, poorer sites	9-11	< 141	Entire TSA	< 16
19	Cedar (Cw) — older, better sites	9-11	> 140	Entire TSA	> = 16
20	Cedar (Cw) — older, poorer sites	9-11	> 140	Entire TSA	< 16
21	Hemlock (Hw) — younger, better sites	12-17	< 141	Entire TSA	> = 15
22	Hemlock (Hw) — younger, poorer sites	12-17	< 141	Entire TSA	< 15
23	Hemlock (Hw) — older, better sites	12-17	> 140	Entire TSA	> = 15
24	Hemlock (Hw) — older, poorer sites	12-17	> 140	Entire TSA	< 15
25	Balsam (B) — younger, better sites	18-20	< 141	Entire TSA	> = 13
26	Balsam (B) — younger, poorer sites	18-20	< 141	Entire TSA	< 13
27	Balsam (B) — older, better sites	18-20	> 140	Entire TSA	> = 13
28	Balsam (B) — older, poorer sites	18-20	> 140	Entire TSA	< 13
29	Spruce — younger, better sites	21-26	< 141	Entire TSA	> = 12.5

continued

4. Division of the Area Into Management Zones

Table 4. Definition of analysis units (concluded)

Id #	Analysis unit description	Inventory type groups	Age (years)	Other (biogeoclimatic units)	Site index (m @ 50 years)
30	Spruce — younger, poorer sites	21-26	< 141	Entire TSA	< 12.5
31	Spruce — older, better sites	21-26	> 140	Entire TSA	> = 12.5
32	Spruce — older, poorer sites	21-26	> 140	Entire TSA	< 12.5
33	Lodgepole pine — younger, better sites	28-31	< 141	Entire TSA	> = 13.5
34	Lodgepole pine — younger, poorer sites	28-31	< 141	Entire TSA	< 13.5
35	Lodgepole pine — older, better sites	28-31	> 140	Entire TSA	> = 13.5
36	Lodgepole pine — older, poorer sites	28-31	> 140	Entire TSA	< 13.5

Data source and comments:

Analysis units are broken into two site index categories for each leading species type. The break is located approximately where the old site class field would have differentiated between poor and medium sites.

5. Timber Harvesting 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 Okanagan TSA. Land may be unavailable for timber harvesting for three principle reasons:

- it is not administered by the British Columbia Forest Service for timber supply (e.g., private land, parks, etc.);
- it is not suitable for timber production;
- it is required to achieve objectives for other forest values.
- Land may also be added to the timber harvesting land base:
 - by management activities that improve productivity or operability (e.g., stocking of land currently classified as non-commercial brush);
 - by the acquisition of productive forest land (e.g., timber licence reversions).

The timber harvesting land base for the LRMP area is determined by separating out the following categories of area which do not contribute to timber harvesting in the area.

1. Land not administered by the forest service for the purpose of timber supply;
2. Non-forested land;
3. Inoperable forest (as defined in current forest cover — FC1 — maps);
4. Sites with low timber growing potential (below minimum site index values);
5. Unmerchantable forest types or problem forest types;
6. Roads, trails and landings;
7. Riparian reserve areas;
8. Timber Licence reversions.

The classification "unavailable for timber harvesting" is usually applied only to land where no harvesting is anticipated to occur. Forest cover requirements will be used to represent practices employed in areas where timber harvesting is forecast to occur, but is restricted in some way to achieve non-timber forest management objectives.

After all areas that do not contribute to the timber harvesting land base have been identified and deducted, appropriate additions will be made. The resulting productive forest area is defined as the "current timber harvesting land base" for the Okanagan TSA.

5.2 Details on land base classification

5.2.1 Land not administered by the British Columbia Forest Service for timber supply purposes

Ownership codes are used to identify whether the land will contribute to timber supply. Ownership codes 61, 62 and 69 indicate Crown land in a UREP (use, recreation and enjoyment of the public), forest management unit and miscellaneous reserves respectively. These are generally the only ownership codes that are considered to contribute to Okanagan TSA timber supply. Ownership code 70N, timber licence land in a TSA, is considered under Section 5.2.10, "Timber licence reversions."

5. Timber Harvesting Land Base Definition

Forested areas in ecological reserves (ownership code 60) and provincial parks (codes 63-68) can assist in achieving objectives for both stand- and landscape-level biodiversity, and will be factored into evaluations of forest cover requirements.

5.2.2 Land classified as non-forest

Areas classified as type identity 6, such as alpine, lakes, rocks, etc., and type identity 8 (untyped) will be excluded from the land base considered for timber supply.

5.2.3 Non-commercial cover

Type identity 5 represents areas occupied by non-commercial brush species. These areas are considered to be unlikely sites for timber production, and are excluded from the area considered available for timber harvesting.

5.2.4 Inoperable areas

Operability and inoperability codes are generally used to indicate the presence or absence of physical barriers or limitations to harvesting, the logging methods appropriate for use on the area (e.g., cable), and the merchantability of stands.

Table 5. Description of inoperable areas

Inventory description	Code	Reduction per cent (%)
1993 operability project	I	100
Salmon Arm Forest District updated in 1997	I	100

Data source and comments:

Operability lines were established in the Okanagan TSA in 1993 using the following process:

1. TRIM data (contour information) was processed and overlaid onto forest cover maps.
2. TRIM data was used to place areas into one of four slope classes:

0% — 30%

31% — 50%

51% — 70%

71%+

3. Areas with soil instability (Es), avalanche concerns (Ea) and swamps were identified.
4. Using the above information and aerial photographs, preliminary operability lines were established
5. Operability lines were reviewed by the B.C. Forest Service and forest industry staff and adjustments were made where necessary.

5. Timber Harvesting Land Base Definition

5.2.5 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. Low productivity stand types that are not considered harvestable, as listed in Table 6, will be excluded from the timber harvesting land base.

Table 6. Description of sites with low timber growing potential

Analysis unit	Inventory type group	Site index (m@50 years)	Reduction %
Dry-belt fir	1-8, 32	< 8.5	100
Wet-belt fir	1-8, 33, 34	< 8.5	100
Cedar	9-11	< 9	100
Hemlock	12-17	< 8	100
Balsam	18-20	< 8	100
Spruce	21-26	< 7.5	100
Lodgepole pine	28-31	< 7.5	100

Data source and comments:

The site index value to differentiate sites with low timber growing potential from sites with higher potential approximates the upper SI limit of the old low site class. This value is based upon the table "Site Class-Site Index Relationships Used in VDYP Batch Application" (*VDYP Batch Application User Guide Version 6.4*). All stands with a site index lower than those indicated in Table 6 will be excluded from the timber harvesting land base.

5.2.6 Environmentally sensitive areas — areas with regeneration problems (Ep)

In the Okanagan TSA, areas on the FC1 maps with an ESA designation of Ep are, assigned a 100% area reduction. In most cases these areas are high elevation stands where the establishment of new stands is hindered by the unpredictable and severe climate.

Table 7. Land base deduction for areas with regeneration difficulties

ESA category	ESA description	Reduction per cent (%)
Ep	Regeneration problems	100

5. Timber Harvesting Land Base Definition

Data source and comments:

In this analysis Ep areas will not contribute to the timber harvesting land base however they will contribute to the seral stage requirements for biodiversity and other non-timber values.

Monitoring should will be undertaken completed to see if any harvesting is ongoing in these types.

Forest values sometimes addressed through ESA deductions are discussed in other sections (soils and avalanche in Section 5.2.4, "Inoperable areas," watersheds, wildlife and recreation [visual quality] in Section 6.4.1, "Objectives achieved through forest cover requirements").

5.2.7 Problem forest types

Problem forest types are stands which are physically operable and exceed low site criteria yet are not currently utilized or have marginal merchantability. Examples of these types of stands are, balsam, cedar and hemlock stands that contain a high proportion of decadent wood, or pine stands with very high stand density or low volumes.

Table 8. Problem forest types

Inventory type group or species	Site index range	Criteria					% area excluded
		Stocking class	Age class	Height class	Height (metres)	Volume/ hectare (m ³)	
35-42 all deciduous	—	—	—	—	—	—	100
9-34	10-13	R	—	—	—	—	100
12-17 Hemlock leading (H volume > 70% of total volume)	—	—	8 and 9 (> 140 years)	—	—	—	100
1-27, 32-34 all species. Except PI	—	—	≥ 6 (≥ 101 years)	1 and 2	—	—	100
28-31 (PI leading)	—	4	—	—	—	< 145	100
28-31	—	—	5 (≥ 81 years)	—	< = 18.5	—	100
28-31	—	—	4 (61-80 years)	—	< = 12.7	—	100
28-31	—	—	3 (41-60 years)	—	≤ 9.5	—	100
28—31	—	—	2 (21-40 years)	—	≤ 5.0	—	100

5. Timber Harvesting Land Base Definition

Data source and comments:

An audit of lodgepole pine stands designated as problem forest types (PFTs) was undertaken during 1996 and 1997, and found that forest cover in many of those stands was mislabeled. Based on the audit results, the inventory file has been adjusted and many polygons that previously would have been classified as PFTs no longer are. Stands that exhibit characteristics shown in Table 8, which indicate a stand is not merchantable, will be excluded from the timber harvesting land base.

5.2.8 Roads, trails and landings

Past timber harvesting operations have resulted in a loss of productive forest land however, many of the existing roads, trails, landings and related disturbances are too small to meet inventory typing criteria and therefore are not accounted for in the inventory file. To account for this reduction in the area available for timber production and harvesting, a reduction will be applied to all areas assumed to have a timber harvesting history. This reduction will be applied to all areas younger than 40 years of age.

A separate percentage area reduction will be applied to all areas older than 40 years of age to account for roads established in these areas to access areas that have been harvested.

As areas are accessed and harvested in the future, there will be associated losses in productive area due to roads, trails and landings. All existing stands currently over 40 years old will be subject to a percentage area reduction to account for these future losses.

The following deductions will be used in the analysis to account for productivity losses due to roads, trails and landings in the Okanagan TSA, and are based on a report by the Kamloops Forest Region research pedologist.

Table 9. *Estimates for existing and future roads, trails, and landings*

	Age class	Reduction per cent (%)
Existing RTLs		
	1-2 (0-40 years)	5.4
	> 2 (> 40 years)	0.6
Future RTLs		
	1-2	0
	> 2	4.9

Data source and comments:

These reductions are based on work done in the Okanagan TSA by Graeme Hope, Kamloops Forest Region Research Pedologist (see Appendix B), and Dan McAllister (*Road and Landing Inventory Project: Okanagan TSA*).

5. Timber Harvesting Land Base Definition

5.2.9 Riparian reserve zones

No information is currently available regarding the width of streams found on the forest cover inventory (FC1) or TRIM digital maps therefore the appropriate classification (S1-S6) cannot be assigned to each stream. However, the results of the Wildstone Report, completed in order to assess possible impacts of riparian management practices and used in the *FPC Timber Supply Analysis*, plus additional assumptions, were used to derive an overall average streamside riparian reserve of 12.4 metres for all streams. The assumptions and calculations used to derive this value are found in Appendix A. Reserve buffers have been applied to the forest cover files along stream lines, and are therefore available as spatially explicit information.

The *Riparian Management Area Guidebook*, December 1995 defines the riparian reserves and the riparian management zones for different classes of streams, lakes and wetlands. These reserves are also listed in the *Operational Planning Regulations*. As individual lakes and wetlands can be classified using a geographic information system (GIS) process to determine their size and the biogeoclimatic ecosystem classification (BEC) unit which they occupy, the base case data file will include spatial information for each of these reserve zones.

Table 10. Lakes and wetlands riparian reserve zones

Size and BEC	Class	Riparian guidebook reserve width (metres)	Riparian guidebook management zone width (metres)	Per cent (%) retention	Modelled reserve width (metres)
Lakes					
> 5 hectares	L1	10	0		10
1-5 hectares BG, PP, IDFxh, xw, xm	L2	10	20	25	15
1-5 hectares not in above BEC	L3	0	30	25	7.5
0.25-1 hectares BG, PP, IDFxh, xw, xm	L4	0	30	25	7.5
Wetlands					
Wetland complex	W5	10	40	25	20
> 5 hectares	W1	10	40	25	20
1-5 hectares BG, PP, IDFxh, xw, xm	W2	10	20	25	15
1-5 hectares	W3	0	30	25	7.5
0.25-1 hectares BG, PP, IDFxh, xw, xm	W4	0	30	25	7.5

5. Timber Harvesting Land Base Definition

Table 11. Stream riparian reserve zones

Stream class	Stream length	Reserve width	Reduction per cent (%)
All	All	12.4 metre (each side)	100

Data source and comments:

For an explanation of how the stream reserve width was calculated see Appendix A of this data package.

5.2.10 Timber licence reversions

Timber licences (TLs) are old tenure arrangements that give the holder exclusive rights to harvest merchantable timber within the licence area and do not contribute to the TSA allowable annual cut (AAC). Once these areas have been harvested, and achieve conditions described in the licence (usually related to reforestation and free-growing status), the timber licence area reverts to B.C. Forest Service jurisdiction, and is managed as part of the TSA. Accordingly, these areas are included in the timber harvesting land base after the first harvest and contribute to the harvests in medium- to long-term timber supply.

Timber licence areas need to be accounted for from the time the stands have been harvested, and/or from the estimated time stands are projected for harvest. Time of harvest is used as the reference point so that impact of these harvests on forest cover requirements is given full consideration in the timber supply analysis. In some cases stands have been harvested and legally reverted, but have not had the necessary ownership change on the inventory file (e.g., change from 70-N to 62-C). These reversions are included in the following table.

Table 12. Timber licence reversion schedule

Lead species	Area of timber licences harvested (hectares) (year of harvest)			Total
	1998-2008	2009-2018	2019-2030	
B	328	328	394	1 050
Cw	867	867	1 041	2 775
Fd	463	463	556	1 482
Hw	935	935	1 121	2 991
PI	14	14	16	44
Se	260	260	312	832
Total	2 867	2 867	3 440	9 174

6. Current Forest Management Assumptions

6.1 Harvesting

6.1.1 Utilization levels

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

Table 13. Utilization levels

Analysis unit	Minimum dbh (cm)	Maximum stump height (cm)	Minimum top dib (cm)
Lodgepole pine	12.5	30	10
All others	17.5	30	10

Data source and comments:

These levels are based on licence requirements and current performance.

6.1.2 Volume exclusions for mixed species stands

One or more species in mixed species stands may be unmerchantable. For example, the deciduous species in a predominantly coniferous stand may not be harvested, or may only be partially harvested. The non-harvested portion should not contribute to the estimated stand volume. Volume left on-site may contribute to stand-level biodiversity objectives.

Table 14. Volume exclusions for mixed species types

Inventory type group	Species	Volume exclusion (%)
1-34 (coniferous leading stands)	Deciduous volume component	100
1-34	Pa (whitebark pine) volume	100

Data source and comments:

In the last timber supply review (TSR), the volume for hemlock age class 8 and 9 (older than 140 years), where the hemlock component was less than 60% of the total volume, was excluded. In this analysis, the hemlock volume will be included.

6. Current Forest Management Assumptions

6.1.3 Minimum harvestable age

Analysis units are developed to represent groups of stands that have similar species associations, levels of productivity and growth characteristics, and similar management regimes. Minimum harvestable ages can be defined according to objectives for certain products (e.g., stem size) or by volume production (mean annual increment). While harvesting may occur in stands when the minimum requirements are achieved, — for example, to meet a harvest level objective for a short period of time or avoid large inter-decadal changes in harvests — some stands may be not be harvested until well past the minimum ages when management of other resource values takes precedence (e.g., requirements for the retention of older forest).

Table 15. Minimum harvestable ages

Species group	Minimum harvestable age (years)
Wet-belt fir	100
Cedar / hemlock	100
Balsam / spruce	100
Lodgepole pine	80

Data source and comments:

These criteria apply to both existing and regenerated stands.

6.2 Unsalvaged losses

This section provides an estimate of average annual unsalvaged volume losses to insect and disease epidemics, fires, wind damage or other agents over the long term on the timber harvesting land base. The unsalvaged loss column reflects only those areas where volume will not be recovered or salvaged.

Table 16. Unsalvaged losses

Cause of loss	Annual unsalvaged loss (m ³ /year)
Insects	25 425
Wind	9 560
Fire	39 525
Total	74 510

6. Current Forest Management Assumptions

Data source and comments:

Information was collected from the Ministry of Forests protection, timber and silviculture corporate databases and further analysed using assumptions found in the documents: *Method to Estimate Non-recoverable Losses for Timber Supply Reviews* (Timber Supply Branch), and *Methodology to Estimate the Volume of Unsalvaged Losses in the Kamloops Timber Supply Area*. January 1998, Daniel K. Lux, consulting entomologist.

6.3 Silviculture

6.3.1 Regeneration activities in managed stands

Growth of recent plantations and future stands will be projected using managed stand yield tables (MSYTs) produced using the Forest Service table interpolation for stand yields (TIPSY) growth and yield model. The table below contains 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 for stand types within an analysis unit. When this is the case, tables are produced for the different regeneration methods (each method and species combination) and are then combined into one table.

6. Current Forest Management Assumptions

Table 17. Regeneration assumptions by analysis unit

Analysis unit # (initial/regen)	Leading species	Site index (m @ 50 years)	Age (years)	Regen delay (years)	Regen species	Plant to (stems/ha)	OAF ^a 1 (%)	OAF ^a 2 (%)
11/61	Dry-belt fir (selection)	All	All	4	75% Fd 25% PI	1400		
12/62	Dry-belt fir (small patch)	All	All	4	75% Fd 25% PI	1400	15	5
13/63	Wet-belt fir	> = 14.5	< 141	4	50% Fd 30% PI 10% Sx/BI 10% Cw/Hw	1400	33	14
14/64	Wet-belt fir	< 14.5	< 141	4	50% Fd 30% PI 10% Sx/BI 10% Cw/Hw	1400	20	20
15/65	Wet-belt fir	> = 14.5	≥ 141	4	50% Fd 30% PI 10% Sx/BI 10% Cw/Hw	1400	33	14
16/66	Wet-belt fir	< 14.5	≥ 141	4	50% Fd 30% PI 10% Sx/BI 10% Cw/Hw	1400	33	20
17/67	Cedar	> = 16	< 141	4	50% Fd 20% Sx/BI 20% PI 10% Cw/Hw	1400	19	20
18/68	Cedar	< 16	< 141	4	50% Fd 20% Sx/BI 20% PI 10% Cw/Hw	1400	0	20
19/69	Cedar	> = 16	≥ 141	4	50% Fd 20% Sx/BI 20% PI 10% Cw/Hw	1400	3	20
20/70	Cedar	< 16	≥ 141	4	50% Fd 20% Sx/BI 20% PI 10% Cw/Hw	1400	1	20
21/71	Hemlock	> = 15	< 141	4	50% Fd 20% Sx/BI 20% PI 10% Cw/Hw	1400	13	20

(a) OAF is operational adjustment factor. OAF 1 is a constant percentage reduction to account for small stocking gaps in stands. OAF 2 accounts for losses that increase with age, for example, due to disease. The value of OAF 2 increases from zero and passes through the shown value when the stand is 100 years old.

continued

6. Current Forest Management Assumptions

Table 17. Regeneration assumptions by analysis unit (concluded)

Analysis unit # (initial/regen)	Leading species	Site index (m @ 50 years)	Age (years)	Regen delay (years)	Regen species	Plant to (stems/ha)	OAF ^a 1 (%)	OAF ^a 2 (%)
22/72	Hemlock	< 15	< 141	4	50% Fd 20% Sx/BI 20% PI 10% Cw/Hw	1400	-7 ^b	20
23/73	Hemlock	> = 15	≥ 141	4	50% Fd 20% Sx/BI 20% PI 10% Cw/Hw	1400	2	20
24/74	Hemlock	< 15	≥ 141	4	50% Fd 20% Sx/BI 20% PI 10% Cw/Hw	1400	-12 ^b	20
25/75	Balsam	> = 13	< 141	4	90% Sx/BI 10% PI	1400	20	0
26/76	Balsam	< 13	< 141	4	90% Sx/BI 10% PI	1400	15	5
27/77	Balsam	> = 13	≥ 141	4	90% Sx/BI 10% PI	1400	20	0
28/78	Balsam	< 13	≥ 141	4	90% Sx/BI 10% PI	1400	15	5
29/79	Spruce	> = 12.5	< 141	4	90% Sx/BI 10% PI	1400	20	0
30/80	Spruce	< 12.5	< 141	4	90% Sx/BI 10% PI	1400	15	5
31/81	Spruce	> = 12.5	≥ 141	4	90% Sx/BI 10% PI	1400	20	0
32/82	Spruce	< 12.5	≥ 141	4	90% Sx/BI 10% PI	1400	15	5
33/83	Lodgepole pine	> = 13.5	< 141	2	90% PI 10% Fd	1400	15	5
34/84	Lodgepole pine	< 13.5	< 141	2	90% PI 10% Fd	1400	15	5
35/85	Lodgepole pine	> = 13.5	≥ 141	2	90% PI 10% Fd	1400	15	5
36/86	Lodgepole pine	< 13.5	≥ 141	2	90% PI 10% Fd	1400	15	5

(a) OAF is operational adjustment factor. OAF 1 is a constant percentage reduction to account for small stocking gaps in stands. OAF 2 accounts for losses that increase with age, for example, due to disease. The value of OAF 2 increases from zero and passes through the shown value when the stand is 100 years old.

(b) OAF1 values for analysis units 22 and 24 are negative, meaning effectively that the OAF1 increases rather than decreases the predicted yield. OAFs were used to create yield curves that reflect regional staff expectations regarding the effects of root rots, which are prevalent in ICH stands in the Okanagan TSA. Regional staff determined that volumes in regenerated stands on these sites would be approximately 10% higher at age 100 than projected in VDYP for existing natural stands, and 10% less at age 200. Yield curves were generated using TIPSy, and adjusted by first applying an OAF2 to generate the expected curve shape, and then working backwards to determine the OAF1 that resulted in appropriate yield projections. Sometimes a negative OAF1 was required. This methodology was reviewed by growth and yield staff from the Ministry of Forests, Research Branch and Kamloops Forest Region.

6. Current Forest Management Assumptions

6.3.2 Immature plantation history

Existing immature forest where density (stems per hectare) has been controlled will be assigned to managed stand yield curves generated using TIPSYS. For the Okanagan / Shuswap LRMP base case all stands less than 21 years of age will be assigned to TIPSYS curves.

6.3.3 Not satisfactorily restocked (NSR) areas

Land classified in the TSA forest inventory (FIP) file as type identity 4 or 9 is included in the current timber harvesting land base. These type identities indicate not satisfactorily restocked land base. The table below identifies the total area of NSR currently existing in the timber harvesting land base, from based on Major Licensee Silviculture Information System (MLSIS) and Integrated Silviculture Information System (ISIS) records provided by the Ministry of Forests silviculture staff, and the estimated rate at which the NSR area will be restocked.

Table 18. Not satisfactorily restocked (NSR) areas

Analysis unit	Total area (hectares)	Area of NSR restocked now (hectares)	Area of NSR restocked in 1 – 10 years (hectares)
26. Balsam, lower	1 420	980	440
28. Balsam, lower, age class 8+	8	6	2
25. Balsam, upper	3 793	2 617	1 176
18. Cedar, lower	244	168	76
17. Cedar, upper	945	652	293
11. Fir (selection)	2 316	1 598	718
14. Fir wet, lower	597	412	185
13. Fir wet, upper	3 560	2 456	1 104
15. Fir wet, upper, 8+	30	21	9
12. Fir, (small patch)	96	66	30
22. Hemlock, lower	428	295	133
21. Hemlock, upper	843	582	261
34. Pine, lower	4 539	3 132	1 407
33. Pine, upper	25 472	17 576	7 896
35. Pine, upper, 8+	1	1	0
30. Spruce, lower	967	667	300
29. Spruce, upper	4 267	2 944	1 323
Total	49 526	34 173	15 353

6. Current Forest Management Assumptions

6.4 Integrated resource management

6.4.1 Objectives achieved with forest cover requirements

As noted in Section 4.1, "Management zones and tracking of multiple objectives (grouping)," the discussion on multiple objectives, forest cover requirements may be examined at a number of different levels. These may be considered in GIS terms as layers or coverages.

One possible layer may be landscape units, another may be wildlife areas, while another may be resource emphasis. With the requirement to retain different forest characteristics across the landscape, it is important to identify how non-contributing forest (productive forest which does not contribute to the timber harvesting land base) may be considered in the forest cover requirements (i.e., maximum allowable disturbance or minimum area retention).

Table 19. Objectives and related forest cover requirements

Objective	Maximum allowable disturbance (% area)	Green-up height (metres)	Minimum retained area (%)	Minimum age or height for retention	Forest land contributing to objective
Landscape-level biodiversity (BEC variant within each LU) (Section 6.4.1.1)	—	—	See Table 20	—	—
Community watersheds (Section 6.4.1.2)	30% (gross)	6	—	—	All forest
Visual quality (Section 6.4.1.3)	—	—	See Table 21	—	—
Classified lakes (see Section 6.4.1.5)	—	—	—	—	—
Ungulate winter range (Section 6.4.1.4)	20% (net)	3	40% (gross)	75 years	Timber harvesting land base only for green-up; all forest for mature
Integrated resource management	30% (net)	3	—	—	Timber harvesting land base

6. Current Forest Management Assumptions

6.4.1.1 Landscape-level biodiversity

Landscape-level biodiversity will be modelled through seral stage requirements based on direction in the FPC *Biodiversity Guidebook*, and letters from the Deputy Ministers of Forests and the Environment, Lands and Parks, released August 25, 1997 regarding *Achieving Acceptable Biodiversity Timber Impacts*, and the Ministry of Forests, Timber Supply Branch dated December 1997, regarding *Incorporating Biodiversity and Landscape Units in the Timber Supply Review*.

This direction can be summarized as follows:

- base case will model landscape-unit specific biodiversity emphasis options only if they are legally established (they are not legally established within the LRMP area);
- seral stage requirements from the *Biodiversity Guidebook* will be weighted based on the target that higher, intermediate, and lower emphasis options will cover 10% / 45% / 45% of the land base, respectively;
- only old seral stage requirements will be included in the base case;
- for lower emphasis areas, the *Biodiversity Guidebook* and the deputies' letter state that old seral stage requirements can be "drawn down" to one-third of the guidebook value for first rotation (70 years), two-thirds for the next rotation and the full requirement after that;
- sensitivity analyses will be done to assess if mature-plus-old seral stage requirements affect timber supply.

Table 20 below lists the BEC variant, the minimum age that a stand must be before it is considered "old" according to the *Biodiversity Guidebook*, and the minimum area (expressed as a percentage of the total BEC variant area in an individual landscape unit) of old forest that must be reserved. The increasing percentage requirement reflects the increasing application of the old-seral requirements in the lower emphasis option portions of the TSA, as noted in fourth bullet point, above.

6. Current Forest Management Assumptions

Table 20. Forest cover requirements over time for biogeoclimatic ecosystem classification (BEC) variants in each landscape unit

BEC variant	Minimum age (years)	Minimum retained area (%)		
		0-70 years	71-140 years	141+ years
Variants in NDT 1				
ESSF wc2	250	14.2	17.0	19.9
ESSFwc4	250	14.2	17.0	19.9
ESSFvc	250	14.2	17.0	19.9
ICHwk	250	9.7	11.6	13.6
ICHvk	250	9.7	11.6	13.6
Variant in NDT 2				
ICHmw2	250	6.7	8.0	9.4
Variants in NDT 3				
ESSFxc	140	10.5	12.6	14.7
ESSFdc1	140	10.5	12.6	14.7
ESSFdc2	140	10.5	12.6	14.7
ICHmk1	140	10.5	12.6	14.7
ICHmk2	140	10.5	12.6	14.7
ICHmw3	140	10.5	12.6	14.7
MSxk	140	10.5	12.6	14.7
MSdm1	140	10.5	12.6	14.7
MSdm2	140	10.5	12.6	14.7
Variants in NDT 4				
IDFxh1	250	9.7	11.6	13.6
IDFxh2	250	9.7	11.6	13.6
IDFdk1	250	9.7	11.6	13.6
IDFdk2	250	9.7	11.6	13.6
IDFdm1	250	9.7	11.6	13.6
IDFmw1	250	9.7	11.6	13.6
IDFmw2	250	9.7	11.6	13.6
PPxh	250	9.7	11.6	13.6
PPdh	250	9.7	11.6	13.6

6. Current Forest Management Assumptions

As an example, the old-seral forest cover requirements for the ESSFwc2 subzone, for each of the time periods, were calculated as follows (see *Biodiversity Guidebook*, page 17):

First, a single weighted forest cover requirement for the old-seral stage was calculated based on the anticipated distribution of 45% low-, 45% intermediate- and 10% high-emphasis, as explained above. The old-seral requirement within low emphasis biodiversity areas was calculated assuming achievement of one-third of the guidebook requirement in the first rotation, two-thirds in the second rotation, and full old-seral representation by the end of the third, and in subsequent rotations.

$$0-70 \text{ years:} \quad \text{old forest \%} = 19\% * 0.33 = 6.27$$

$$71-140 \text{ years:} \quad \text{old forest \%} = 19\% * 0.67 = 12.73$$

$$141 \text{ years+:} \quad \text{old forest \%} = 19\% * 1.00 = 19.00$$

This increase in older forest cover requirements applies only to low-emphasis biodiversity areas. Given the weighted-average approach being taken in the absence of designated landscape units for the Okanagan area, a further calculation must be performed:

$$\begin{aligned} \text{Older forest requirement} &= (0.45 * \text{low emphasis older forest requirement}) \\ &+ (0.45 * \text{medium emphasis requirement}) + (0.10 * \text{high emphasis requirement}) \end{aligned}$$

So, for example, over time, the old-forest cover requirements for ESSFwc2 would be calculated as follows:

$$\begin{aligned} 0-70 \text{ years:} \quad \text{old forest \%} &= (19\% * 0.45) * 0.33 \\ &+ 19\% * 0.45 \\ &+ \underline{28\% * 0.10} \\ &14.2\% \end{aligned}$$

$$\begin{aligned} 71-140 \text{ years:} \quad \text{old forest \%} &= (19\% * 0.45) * 0.67 \\ &+ 19\% * 0.45 \\ &+ \underline{28\% * 0.10} \\ &17.0\% \end{aligned}$$

$$\begin{aligned} 141 \text{ years+:} \quad \text{old forest \%} &= (19\% * 0.45) * 1.00 \\ &+ 19\% * 0.45 \\ &+ \underline{13\% * 0.10} \\ &19.9\% \end{aligned}$$

6.4.1.2 Community watersheds

As listed in Table 19, in community watersheds a forest cover requirement will limit the area with stand height less than 6 metres to a maximum of 30% of the total forested area. This requirement reflects the maximum allowable equivalent clearcut area (ECA) for community watersheds. ECA refers to the amount of harvested forest land within a watershed which behaves hydrologically like a clearcut. Based on work completed for the 1993 Timber Supply Review, 8 metres is estimated as the tree height necessary for a stand to reach hydrological recovery. Hydrological recovery is only a concern on the snow pack portion of a watershed which in the Okanagan constitutes, on average, 60% of the watershed areas. On the remaining 40% of the watershed (non-snow pack), stands must achieve a green-up height of 3 metres before adjacent areas can be harvested. For the purpose of modelling, a weighted average of 6 metres $[(0.6 \times 8\text{m}) + (0.4 \times 3\text{m})]$ will be used as the tree height that represents both adjacency and hydrological recovery on all community watersheds.

6. Current Forest Management Assumptions

6.4.1.3 Visual quality

Visual quality objectives are tracked through a visual landscape inventory consisting of polygons with values for Visual Sensitivity Rating (VSR), Visual Absorption Capability (VAC), Existing Visual Condition (EVC) and Recommended Visual Quality Class (RVQC).

For the analysis, forest management will be modelled by placing a maximum percentage limit on the area within each visual landscape polygon that can be below a visually effective green-up (VEG) height.

The percentage area that can be below VEG height is a function of the RVQC, the VAC rating for each visual landscape polygon, and the silviculture system being used. The VEG height was determined through analysis of the slope class profile for those polygons with similar VAC ratings. The *Procedures for Factoring Visual Resources into Timber Supply Analyses* (Ministry of Forests, Forest Practices Branch publication REC-029) contains information on tree height required to meet VEG for different slope classes. Table 21 shows the maximum per cent visible alteration and green-up heights for different RVQC/VAC combinations.

The per cent alteration and visual green-up height values are based on a matrix created through the LRMP process (Appendix C, "Harvest per cent for visual quality objectives in plan view for various silvicultural systems"). The values are consistent with the *Mitigation Strategy for Visual Resources* carried out in 1998.

The matrix shows ranges of per cent alteration based upon silvicultural system and visual quality objectives, with the values increasing as one moves from large scale clearcutting through to single tree selection. The assumption is that a greater percentage of area can be harvested with the same visual impact by harvesting smaller openings and/or leaving increasing numbers of trees and patches. The matrix identifies preferred silvicultural systems to meet each VQO, and these numbers are averaged since a mixture of systems is being used in the Okanagan TSA. The per cent alteration limits are further refined by VAC.

Visually effective green-up (VEG) age will be determined for each visual management polygon by determining the analysis unit (AU) distribution for each polygon; determining age at which each regenerated analysis unit will achieve the three different VEG heights; and calculating the weighted average age for each polygon.

6. Current Forest Management Assumptions

Table 21. Forest cover requirements for visual quality objectives

RVQC	VAC	RVQC/VAC	% visible alteration	VEG height (metres)
P	L	P // L	3.5	6.5
P	M	P // M	4	5.5
P	H	P // H	4.5	4.5
R	L	R // L	7.5	6.5
R	M	R // M	10	5.5
R	H	R // H	12.5	4.5
PR	L	PR // L	12.5	6.5
PR	M	PR // M	15	5.5
PR	H	PR // H	17.5	4.5
M	L	M // L	13.8	6.5
M	M	M // M	17.5	5.5
M	H	M // H	21.3	4.5

6.4.1.4 Ungulate winter range

The ungulate winter range, as defined in the *Okanagan Timber Harvesting Guidelines*, will be modelled with a three-metre minimum tree height for green-up and a 20% ECA applied to the timber harvesting land base in order to reflect timber harvesting guidelines.

6. Current Forest Management Assumptions

6.4.1.5 Lakeshore management plan

Guided by the FPC and the *Lake Classification and Lakeshore Management Guidebook*, Kamloops Forest Region, lakes within the Salmon Arm, Vernon and Penticton Forest Districts were classified. The Lakeshore management zone will be modelled according to the VQO that is associated with the class of the lake (i.e., Class B is Retention, Class C is Partial Retention and Class D is Modification). Management around Class A Lakes will be modelled with a 210-metre wide no harvest zone around the entire lake. The percentage visible disturbance values for the moderate (M) VAC from Table 21 for the appropriate VQO will be used in the analysis.

6.4.2 Volume reductions to reflect retention of wildlife trees (WTs) and tree patches (WTPs)

Wildlife trees and wildlife tree patches are retained to maintain stand structures that are valuable for wildlife. In general, WTs and WTPs are retained permanently and are assumed not to be available for future harvest. Consideration was given to the contribution of forest outside the timber harvesting land base — for example, in riparian management zones — to requirements for WTs and WTPs.

For the timber supply analysis, it will be assumed that 1.5% of the harvestable volume is unavailable for harvest over the long term to account for stand-level biodiversity (WT and WTP) requirements specified in the *Biodiversity Guidebook*. This figure is derived based upon approximately 70% of the Crown forest area in the TSA being available for harvest and 20% of the area already being harvested without recommended retention of WTP (from the *FPC Timber Supply Analysis*, February 1996).

Since landscape-level biodiversity objectives are being modelled in the analysis, Table 20a of the guidebook was used to derive a wildlife tree patch target of 6% of each cutblock. This figure was reduced by 50% to 3% based on assumptions in the *Biodiversity Guidebook* and the *FPC Timber Supply Analysis* that up to 50% of the wildlife tree patch requirements will be met in riparian management areas and other constrained areas.

In two of the 26 draft landscape units in the Okanagan TSA, 250-metre buffers were placed around riparian reserves, problem forest types (PFT), inoperable areas, and Ep polygons. The intent was to determine the proportion of the timber harvesting land base in each landscape unit that was within 250 metres of the buffers ("...distances between patches [or other suitable leaves areas outside the block] not to exceed 500 metres." page 63 of *Biodiversity Guidebook*). The result showed that about 80% of the land base was within the buffers (Cherryville landscape unit has 70 023 hectares of which 80.2% is within the 250-metre buffer; OK West landscape unit has 68 200 hectares of which 78.1% is within the 250-metre buffer). Based on these findings, the 3% target was reduced a further 50% to 1.5%. This reduction is somewhat conservative (an 80% overall reduction would results in 1.2%) given the small sample size (2 of 26 landscape units).

Table 22. Reductions to reflect retention of wildlife trees and wildlife tree patches

Management zone	Analysis unit	Persistence	% recommended in Biodiversity Guidebook	Residual volume on the timber harvesting land base (%)
All	All	Permanent	6	1.5

7. Sensitivity Analyses to be Performed

Sensitivity analysis can provide a measure of the timber supply impact of uncertainties in management assumptions and/or data. Through a number of sensitivity analyses, it is possible to determine which variables most affect timber supply. The following table includes some standard sensitivity analysis which are generally performed in all analysis. For the analysis, attempts will be made to make adjustments to inputs that reflect the degree of uncertainty surrounding the assumption.

Table 23. *Sensitivity issues*

Issue to be tested
Minimum harvestable age
Existing stand yields
Regenerated stand yields
Site index estimate for older stands (OGSI)
Harvest flow alternatives
Green-up periods
Land base available for harvest
Landscape-level biodiversity
Problem forest type and low site definitions
Visual quality objectives, watershed, wildlife forest cover requirements
Species mix of harvests
Wildlife and riparian issues associated with LRMP

Appendix A Riparian Reserve Buffer Calculation

Riparian management areas defined in *FPC Guidebook*.

Community watersheds or fish	Stream width (metres)	Class	Reserve width (metres)	Management zone width (metres)	% retention
Yes	> 20	S1	50	20	50
Yes	> 5-20	S2	30	20	50
Yes	1.5-5	S3	20	20	50
Yes	< 1.5	S4	0	30	25
No	> 3	S5	0	30	25
No	< = 3	S6	0	20	5

Data from Wild Stone report used in the FPC impact analysis.

Wildstone class	FPC class	Total length (km)	% total length
R1c > 20 metres	S1	4 000	2.9
R1b 7-20 metres	S2	3 100	2.2
R1a 3-7 metres	S3	11 987	8.6
R2	S4	14 433	10.4
R3	S5	9 479	6.8
R4	S6	96 173	69.1
Total		139 172	100.00

The following assumptions are used to determine the width of the reserve.

1. All streams have fish (this will be refined in assumption 4).
2. S5 now become S3.
3. 90% of S6 becomes S4 and 10% of S6 becomes S3 (this is based on TSR1 assumption that 90% of streams on maps have a width greater than 0.6 metres).
4. 50% of S4 streams have no fish therefore are reclassified as S6 (based on MELP estimates).

Appendix A Riparian Reserve Buffer Calculation

Riparian class	Total length (km)	% total length	(a) reserve width (metres)	(b) management zone width (metres)	(c) % retention	d ^d (=b*c) (metres)	a+d ^e (metres)	Weighted average reserve width (metres)
S1	4 000	3	50	20	50	10	60	1.7
S2	3 100	2	30	20	50	10	40	0.9
S3 ^a	31 083	22	20	20	50	10	30	6.7
S4 ^b	50 494	36	0	30	25	7.5	7.5	2.7
S6 ^c	50 494	36	0	20	5	1	1	0.4
Total	139 172	100						12.4

(a) S3 plus S5 plus 10% of S6 = 11987 + 9479 + 0.10 * 96173 = 31083.

(b) 50% of (S4 plus 90% of S6) = 0.50 *(14433 + 0.9*96173) = 50494 (see assumption 3).

(c) 50% of (S4 plus 90% of S6) = 0.50 *(14433 + 0.9*96173) = 50494.

(d) d is the management zone width times the % retention which approximates the area reserved.

(e) a+d is the total reserve width.

Appendix B Roads, Landings and Trails for Timber Supply Review — Okanagan TSA

1. Inventory of roads and landings — 1996 and 1997

The report on the project to inventory road and landing areas in selected watersheds of the Okanagan TSA is currently being printed. I will give a brief summary of the results and some recommendations for the figures used in the LRMP process.

Seven areas, primarily whole watersheds were inventoried throughout the timber supply area, two in Penticton (Ellis and Peachland Creeks), two in Vernon (Duteau and Tsuius Creeks), and three in Salmon Arm (Blurton Creek, Humamilt Lake, and Fly Hills). In total, 89 623 hectares were inventoried, with an average study site area of 14 509 hectares.

We discussed the results with Dr Peter Marshall of UBC, and following his recommendations, the numbers from the survey that are most appropriate to use are the weighted averages. These weighted averages are used because of the unequal sizes of study areas.

The data presented in the report give final road and landing areas as a percentage of either logged area, or total watershed area (excluding private land only). After discussions with Dan Peterson and Ted McRae, we attempted to partition the data into areas within logged areas, and road area to access blocks. This can only be done for the 1997 samples, because sufficient information was not collected in 1996. Unfortunately, all three areas in 1997 were in the north of the timber supply area, in the Salmon Arm Forest District, but that is the best information we have.

From the data of Table 10 in the report, the percentage of total roads within logged areas is 66%, that outside logged areas is 33%. These numbers are used in Table 1 to calculate the final percentages.

2. Recommended disturbance numbers

A. Roads and landings

From the road and landing inventory data:

Roads and landings as % of cutblock area = 3.5%.

Access roads as % of non-cutblock area = 0.6%.

(Note: non-cutblock area = total watershed area minus cutblock area).

Appendix B Roads, Landings and Trails for Timber Supply Review — Okanagan TSA

B. Trails

In the last timber supply review, we used data for timber harvesting disturbance only. In this review, soil disturbance during site preparation should also be used.

Recommended percentages:

Timber harvesting: 9.0% (from regional soil disturbance surveys).

Mechanical site preparation:

There is a limited database for these disturbances, however I will provide a best estimate.

For 1991 surveys in the Kamloops region: mean = 4.8%.

This is comparable to data of Von der Gonna in 1995 for benchmark surveys across the province on a range of MSP equipment.

However, not all logged areas have mechanical site preparation, and mechanical site preparation has only been a dominant site preparation tool since the late 1980s. I will assume that it has been in effect for 10 years and has occurred on 25% of sites in those 10 years. Therefore, for sites less than 40 years, average disturbance from msp

$$= 4.8 \times .25 \times .25$$
$$= 0.3 \%$$

Total disturbance for trails = 9.3%.

3. Growth and netdowns

- a) For the present, I recommend that we continue the assumption that netdown on roads and landings is 100% (we will have some data later in the year);
- b) assume that netdown on trails is 20% (this assumption was used in the Kamloops TSA).

Net loss in site due to roads, trails, and landings = $3.5 + (9.3 \times 0.2)$

(on polygons < 40 years) = 5.4 %

Net loss for roads on areas > 40 years = 0.6%
(as a percentage of total area minus private land only).

Appendix B Roads, Landings and Trails for Timber Supply Review — Okanagan TSA

4. Future losses

I do not have any specific information on current practices because the majority of disturbance surveys that are now being carried out are for compliance reasons. These are often where excess disturbance has occurred, not average situations. However, I feel that we can use the results from the inventory to give an estimated future use figure.

I make the following assumptions:

- a) Road percentages on logged areas will not decrease (the report shows that road widths, for example, increased steadily from the 60's to the 90's. It is unlikely these will decrease in the future.).
- b) Average landing size and the number of landings per block will stay the same (the average landing in surveyed areas was 0.25 hectares, very close to current practices).
- c) Rehabilitation: assume one-third of landings, and 5% of roads will be rehabilitated to full productivity.
- d) Soil disturbance within the NAR: assume that 33% of blocks have high sensitivity, with an allowable disturbance of 5%, and 66% have lower sensitivity with an allowable disturbance of 10%. Assume soil disturbances will be at the maximum allowed.

Calculations:

Road area = 2.9% minus 5%
 = 2.8%

Landing area = 0.6% minus 33%
 = 0.4%

Trails = (10% x .667 plus 5% x .333) x (20% loss in productivity)
 = 1.7%

Total future losses = 4.9%

Appendix B Roads, Landings and Trails for Timber Supply Review — Okanagan TSA

Table B-1. Road and landing areas in selected watersheds of the Okanagan TSA

Average study site area	= 14 509 hectares
Average logged area	= 4 195 hectares
Average road and landing area	= 207 hectares
Average landing area	= 26.7 hectares
Average road area	= 180.3 hectares
Assuming a ratio of 2:1 for road area with blocks: access road area	
Average road area within cutblocks	= 119.0 hectares
Average access road area	= 59.5 hectares
Average road and landing area within blocks	= 119 +26.7 hectares
	= 145.7 hectares
Therefore, road and landing area within blocks	= 145.7 / 4195
	= 3.5%
Average landing area	=26.7 /4195 = 0.6%
Roads outside cutblocks	= 59.5 / 10314
	= 0.6%

Graeme Hope
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 Kamloops Forest Region

February 11, 1998

Appendix C Harvest per cent for visual quality objectives in plan view for various silvicultural systems

Silvicultural system	Preservation			Retention			Partial retention			Modification		
	Harvest % ^a	Reserve area ^b	Green-up ^c	Harvest % ^a	Reserve area ^b	Green-up ^c	Harvest % ^a	Reserve area ^c	Green-up ^c	Harvest % ^a	Reserve area ^b	Green-up ^c
Single tree and group selection ^e	100	> 66% basal area ^d	N/A	100	> 66% basal area	N/A	100	> 66%	N/A	100	> 66%	N/A
Patch cuts ^f 0.1-1.0 ha	5-10	N/A	3-5	10-25	N/A	3-5	15-30	N/A	3-5	25-35	—	3-5
Clearcuts 1.1-5.0 ha				10-20	N/A	3-5	15-25	N/A	3-5	25-35	—	3-5
Clearcuts with reserves ^g 5.1-10.0 ha				5-15	5-10%	3-5	10-25	5-10%	3-5	20-30	5+%	3-5
Clearcuts 5.1-10.0 ha							10-20	N/A	3-5	20-30	N/A	3-5
Clearcuts with reserves ^g 10.1-20 ha							10-20	5-10%	3-5	20-30	5+%	3-5
10.1-20 ha										15-25	—	3-5
Clearcuts 10.1-40.0 ha												

Shading indicates silvicultural systems which are not normally permitted for a given VQO. Any variance from the table must be accompanied by a rationale statement, e.g. salvage harvesting resulting from natural disturbances such as fire, insects, disease, or blowdown.

- (a) Harvest per cent refers to the allowable range in plan view of visible area harvested in a visual landscape unit as defined from a key viewpoint.
- (b) Reserve area refers to the minimum required area or pre-harvest basal area (per cent) remaining in the cutblock.
- (c) Green-up refers to the tree height in metres necessary to meet visual green-up requirements.
- (d) Basal area (BA) refers to per cent remaining in m².
- (e) Single tree and group selection is intended as a three or more entry system with minimum 20 years between entries.
- (f) Patch cuts are defined by the OPR as a silvicultural system that creates openings less than one hectare in size and is designed to manage each opening as an even-aged stand.
- (g) Clearcuts with reserves are defined by the OPR as a variation of clearcutting in which trees are retained, either uniformly or in small groups, for purposes other than regeneration. The Ministry of Forests further clarifies that the reserve trees must comprise at least 5% of the area or pre-harvest basal area to be classed as clearcuts with reserves.

Appendix C Harvest per cent for visual quality objectives in plan view for various silvicultural systems

The matrix lists visual green-up heights as ranging between 3 and 5 metres. The heights would be further refined by VAC, which to a large extent depends on slope. For the Okanagan TSA analysis, VEG heights were determined based on sampling of slope classes and VACs, and a table correlating slope class and VEG height, from *Procedures for Factoring Visual Resources into Timber Supply Analyses* (Ministry of Forests, Forest Practices Branch publication REC-029). As slope increases, the tree height required for VEG also increases. For example, 3-metre trees would provide VEG on slopes of 0-5%, while 5.5-metre trees would be required on slopes of 26-30%.