TimberWest

Management Plan No. 3, TFL No. 47
Johnstone Strait
and
Bonanza Lake Management Units

Timber Supply Analysis
Information Package

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TimberWest

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1 Introduction

This timber supply information package documents the summary of inputs and assumptions made in preparation of the Timber Supply Analysis for the Bonanza Lake (Block 17) and Johnstone Strait Management Units (Blocks 1-12) of TFL 47.

This information package documents the assumptions and modeling procedures that are used in preparing the timber supply analysis. The Information package presents, in a series of tables, summaries of timber and non-timber inventories, land base summaries, growth and yield information and management assumptions. This information was prepared in accordance with Ministry of Forest guidelines as described in:

> Provincial Guide for the Submission of Timber Supply Analysis Information Package, version 3, February, 1998.

Separate timber supply analyses will be carried out for the Bonanza Lake and Johnstone Strait management units.

1.1 General History of the Licence

Tree Farm Licence 47 was granted to predecessor companies of TFL Forest Ltd. (TimberWest) in 1949. Initially the licence consisted of vacant Crown lands in Johnstone Strait (schedule "B" lands) plus four large blocks of Crown-granted (fee simple) lands in the Ladysmith and Courtenay areas of southeast Vancouver Island.

Under the terms of the 1949 TFL licence agreement, TimberWest did not commence harvesting on the schedule "B" vacant Crown Lands in the Johnstone Strait Management Unit until 1974. Initially, mature timber did not form part of the TFL. For the 25 year period from 1949 to 1974, the Crown disposed of the mature timber in Johnstone Strait through sale by public competition for Timber Sale Licences. These sales expired in 1984 and all the land and remaining old growth timber was included in the TFL licence.

As a result of a major amendment of the licence agreement in 1971, the Bonanza Lake Management Unit near Beaver Cove on Northern Vancouver Island and the Moresby Management Unit in the Queen Charlotte Islands were included in the TFL. These lands were composed of company owned timber licences and pulp licences (schedule "A") and adjacent Crown lands (schedule "B").

The Crown-granted land in Nanaimo Lakes Management Unit (Ladysmith) and Courtenay Management Unit were removed from the TFL in 1999.

Under a 1999 agreement between J.S. Jones Ltd. (J.S. Jones) and TimberWest, the Moresby Management Unit of TFL 47 is now managed by J. S. Jones Sandspit Ltd. - they will prepare a separate information package and Timber Supply Report for that area.

2 Process

Following acceptance, this report will be included as an appendix to the Timber Supply Report for TFL 47.

2.1 Growth and Yield

The procedures used to development of natural and managed stand yield tables are discussed in section 8.0 – Growth and Yield.

2.2 Missing Data

All data required for the timber supply analysis information package is included in this document.

3 Timber Supply Forecasts/Options/Sensitivity Analyses

3.1 Base case

The base case models current performance and requirements[1] in effect when applying for a cutting permit, using harvesting systems and silviculture management regimes currently used by TimberWest.

Specifically, this includes all provisions of the Forest Practices Code[2] (FPC). In the case of the requirements for landscape-level biodiversity provisions, where some uncertainty exists in the timber supply implications, the Ministry of Forest guideline[3] for incorporating biodiversity and landscape units in timber supply analysis will be followed.

3.2 Sensitivity Analysis

The sensitivity analyses investigate the timber supply implications of uncertainty around data and modeling assumptions.

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[1] As of April 30, 1999, four months prior to the submission of the Information Package.
[2] Forest Practices Code of British Columbia Regulations, April 12, 1995 and the Forest Practices Code of British Columbia Act, June 15, 1995.
[3] Incorporating Biodiversity and Landscape units in Timber Supply, memorandum from G. Townsend, Director, Timber Supply Branch, July 27, 1998, with attachment "Timber Supply Review Base Case Modeling Assumptions for Biodiversity and Landscape Units".

Table 1. Sensitivity Analyses

Option	Sensitivity Analysis	Magnitude of Change
1. Minimum harvest age	Impact of changing first entry ages.	a) First entry age set equal to culmination age b) first entry ages ± 10 years
2. Green-up/Adjacency	Impact of meeting forest cover requirements.	a) Cut block adjacency ± 1 metres in height. b) Mapped visual landscape polygons ± 1 metres in height
3. Growth and yield	Impact of modifying the yields of existing and regenerated stands.	a) Yields existing stands - (M3/ha) ± 10% b) Yields managed stands - (M3/ha) ± 10%
4. Site Index	Use TEM derived site indices for the Bonanza Lake management unit.	a) Modified yield curves derived using TEM derived weighted average site indices are used to project future growth.

3.3 Alternative Harvest Flows Over Time

In the base case, harvest targets are set to approximate the maximum level that can be achieved without significant fluctuations in harvest levels over time. This is modeled by not allowing the harvest levels to change more than 10% per decade.

Alternate harvest flows that will be evaluated include an even-flow non-declining harvest rate for both the Johnstone Strait and Bonanza Lake management units. In addition, a maximum harvest for the first decade with a possible 15% per decade decline in harvest will be tested.

3.4 Other Option

The timber supply impacts of pursuing management directions that are different than current management will be identified through a series of alternative timber supply analyses. These alternatives are identified in table 2.

Table 2. Options

Option Title	Issue to be Tested	Range to be Tested
1. Base case (current performance)	Harvest forecast based on current management practices, performance and currently enforced guidelines	
2. Biodiversity (Section 10.2.1.6)	Impact of meeting anticipated seral stage and within stand biodiversity objectives arising from the Vancouver Island Land Use Planning (VILUP) and Central Coast Land and Coastal Resource Management Planning (CCLCRMP) processes.	a) No seral stage targets. b) Seral stage targets as indicated by draft biodiversity emphasis c) Mature plus old seral stage and full old seral stage targets at time 0.
3. Johnstone Strait Old Growth Depletion (Section 10.3.4)	Impact of depleting Johnstone Strait old-growth over an extended period.	a) Limit the harvest of Johnstone Strait old-growth to ensure it lasts a minimum of 50 years.
4. Variable Retention (Section 10.3.7.1)	Impact of TimberWest's recently announced commitment to phase out clearcut harvesting over the next 4 years.	a) Decrease future yields to reflect anticipated reductions in yield from dispersed retention.
5. Timber Harvesting Land Base (THLB)	Confirm that the sustainable harvest rate is proportional to the harvestable land base by increasing and decreasing the THLB by 10%.	a) Adjust THLB of each stand ±10%.

4 Model

Model: COMPLAN

Developed by: Olympic Resource Management (formerly Simons Reid Collins)

Type: Simulation (deterministic)

Description:

COMPLAN is a forest estate model that schedules harvests at the cutblock or stand level subject to adjacency (green-up) and non-timber resource constraints (cover constraints). There is a great deal of flexibility built into the model so it is possible to evaluate many different scenarios with a large degree of realism.

Tests have been completed which compare results of COMPLAN with those from the B.C. Ministry of Forests' model FSSIM. These tests, done in cooperation with the MoF, showed that COMPLAN can produce results which are consistent with those produced by the Forest Service model – FSSIM

COMPLAN offers a number of key features that make it ideally suited for both strategic and operational planning:

- Annual internal time increment allows accurate representation of growth, harvest, adjacency and constraint status.
- Yield table structures allow for many additional variables other than volume to be modeled..
- Constraints are localized to site-specific conditions (e.g. green-up time will be longer for cutblocks on poor sites compared with cutblocks on good sites).
- Cover constraints that address non-timber values can overlap so that it is not necessary to divide the area into management zones according to which constraint is most restrictive.
- The entire forested land base is retained in the simulation and contributes to cover requirements even if it is not part of the timber harvesting land base.
- Several different prioritization algorithms are available, including minimize growth loss[4], oldest first, geographic priority and analysis unit priority.

[4] The minimize growth loss algorithm in COMPLAN orders the harvest queue such that stands with the lowest current annual increment (m^3/ha/year) are harvested first. For TFL 47 MP 3 timber supply analysis, an oldest first harvest priority algorithm will be used.

5 Current Forest Cover Inventory

5.1 Johnstone Strait Forest Cover

Field work for the Johnstone Strait Management Unit was undertaken in 1969, mapping and compilation in 1970. One of the objectives of this inventory was to improve the timber yield estimates over a range of species, ages and sites. Stands younger than age 25 were classified but not sampled for volume, older stands were classified and sampled for volume.

Prior to commencement of field work the areas were pre-typed on aerial photos. Volume samples and code points were randomly selected and photo-located within the desired types. Sufficient plots were located within a specific stratum to adequately sample the variability.

Data for both the volume samples and classification points was collected using a Spiegel Relaskop. Sample trees were measured to determine site and age. Site classification was determined from relationships between average stand age and average heights of the co-dominant and dominant trees. Ages were determined from increment borings. Heights were measured with a chain and percent scale (Spiegel Relaskop)

The productive land base was classified by species composition, 10 year age classes, and six site classes (I to VI). The site classes were converted to the MoF standard site indices in 1995, prior to MP #2.

The forest cover inventory was audited by the Ministry of Forests, Resource Inventory Branch, in 1995.

5.2 Bonanza Lake Forest Cover

A re-inventory of the Bonanza Lake Management Unit initiated in 1988. This inventory was loaded into TimberWest's GIS in 1998.

An audit of the forest cover inventory by the Ministry of Forests is to be completed in 2000.

6 Description of Land Base

6.1 *Timber Harvesting Land Base Determination*

The area deductions made to the land base to arrive at the harvestable land base are summarized in table 3.

The details of each netdown are found in the sections noted in the table.

Table 3. Timber Harvesting Land Base Determination

	Total Mapped Area[5]	Area Removed Schedule A	Area Removed Schedule B	Total Area Removed	Harvestable Land Base
Johnstone Strait					
Total Area	101,847	1,107	100,740		101,847
Park (Sec. 6.16)	2,685		2,685	2,685	99,162
Non-forest (Sec 6.3/4)	7,982	73	7,681	7,754	91,408
Road (Sec. 6.15.2)	1,147	28	1,092	1,120	90,288
Inoperable (Sec 6.5)	4,370	-	3,168	3,168	87,120
Problem forest types (Sec 6.14)	1,728	8	1,161	1,168	85,952
Low sites (Sec 6.7)	2,486	5	1,401	1,406	84,546
Recreation (Sec. 6.13.1)	2,631	26	967	992	83,554
Wildlife habitat (6.11)	36		18	18	83,536
ESAs (Sec 6.8)	15,517	28	2,081	2,109	81,427
Marine Buffer (Sec 6.17.1)	1,635	19	959	978	80,449
Riparian (Sec 6.9 & 6.10)	12,688	59	6,542	6,601	73,848
Wildlife Tree Patches (Sec 6.17.5)	632	7	625	632	73,216
Total Current Harvestable Land Base					**73,216**
Future roads (Sec 6.15.3)				1,956	
Long Term Harvestable Land Base					**71,260**
Bonanza Lake					
Total Area	38,020	7,195	30,825		38,020
Non-forest (Sec 6.3/4)	5,498	364	5,134	5,498	32,522
Road (Sec. 6.15.2)	622	174	435	609	31,913
Inoperable (Sec 6.5)	8,376	731	3,929	4,660	27,253
Problem forest types (Sec 6.14)	55		28	28	27,225
Low sites (Sec 6.7)	3,628	90	424	514	26,710
Recreation (Sec. 6.13.1)	2,236	159	168	327	26,383
Wildlife habitat (6.11)	2,120	397	664	1,061	25,322
ESAs (Sec 6.8)	13,441	395	1,424	1,819	23,503
Riparian (Sec 6.9 & 6.10)	7,658	235	871	1,106	22,397
Wildlife Tree Patches (Sec 6.17.5)	311	65	246	311	22,086
Total Current Harvestable Land Base					**22,086**
Future roads (Sec 6.15.3)				410	
Long Term Harvestable Land Base					**21,676**

The age class and species distribution distribution for the two management units is shown below.

[5] Area removed may not equal total area mapped due to overlap

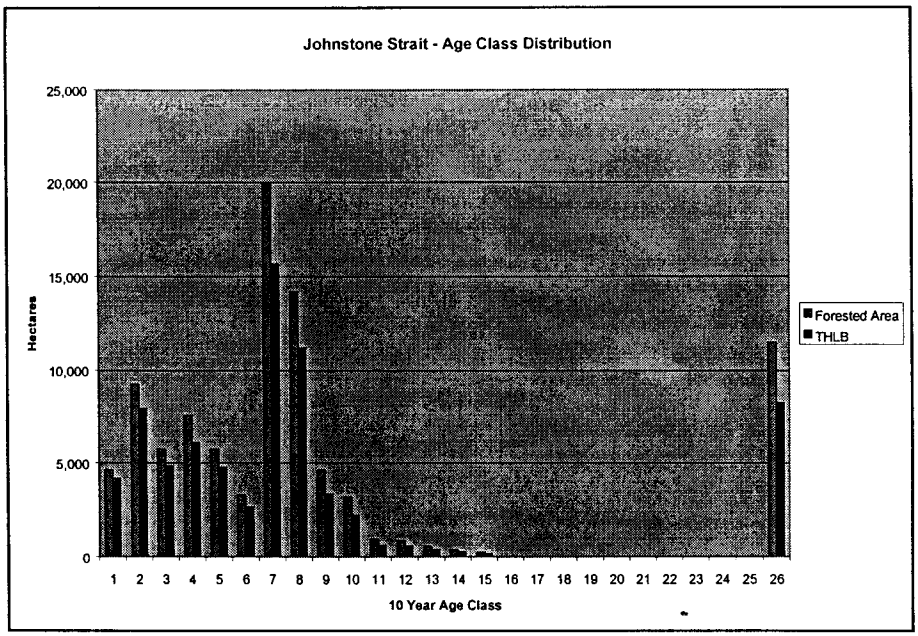


Figure 1. Johnstone Strait Age Class Distribution

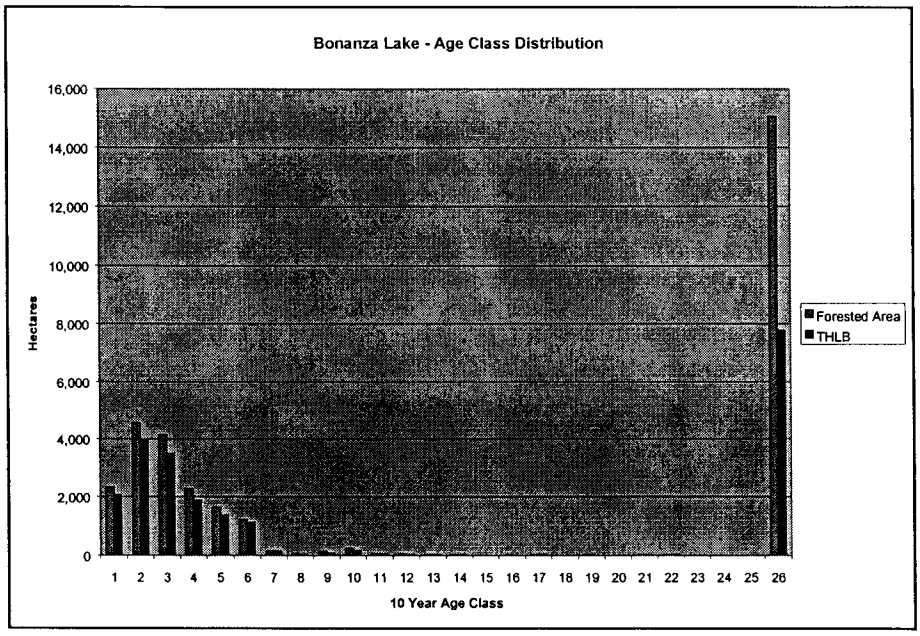


Figure 2. Bonanza Lake Age Class Distribution

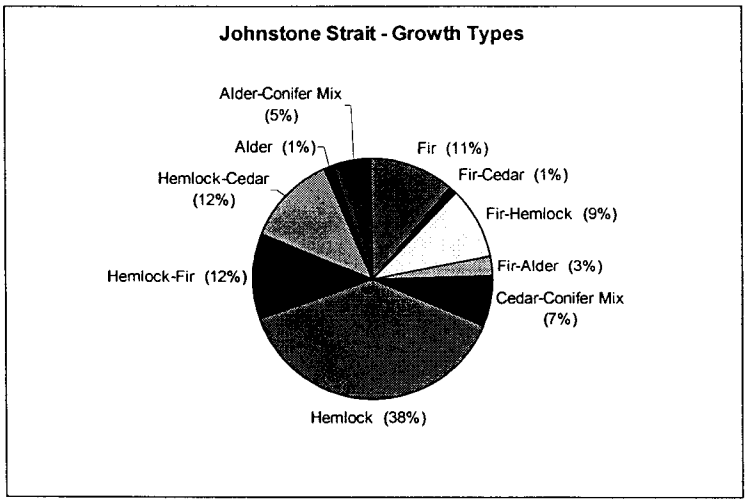


Figure 3. Percent distribution of Johnstone Strait growth types.

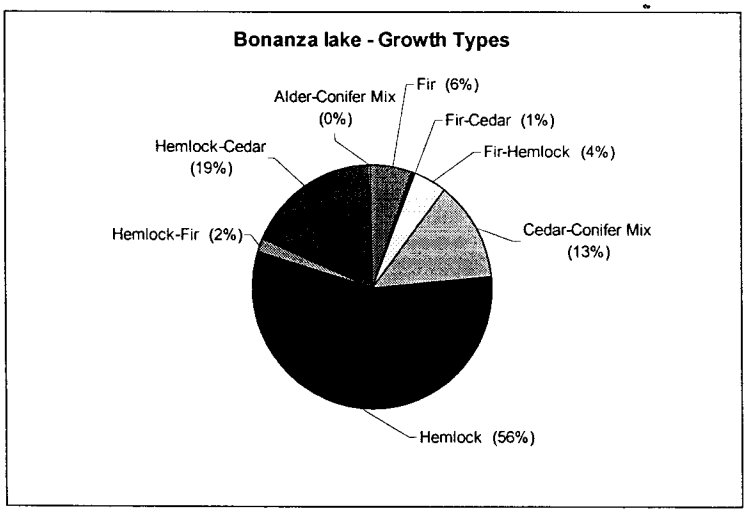


Figure 4. Percent distribution of Bonanza Lake growth types.

6.2 Total Area

The mapped areas of the TFL are:

Johnstone Strait Management Unit:	101,847 ha.
Bonanza Lake	38,020 ha.

6.3 *Non-Forest*

The following areas have been classified as non-forest in the forest cover inventory:

Table 4. Non-Forest Area.

Management Unit	Description	Total Area (ha.)	Area Removed
Johnstone Strait	AL – Alpine	230	230
	BR – Brush	3	3
	CL – Clearing	89	86
	GB – Gravel Bar	-	-
	IS – Island	5	5
	LA – Lake	2,560	2,506
	NC – Non-commercial cover	2	2
	NP – Non-productive	1,794	1,767
	RD – Road	7	7
	RI – River	5	5
	RK – Rock	2,266	2,146
	SL – Slide	47	45
	SW – Swamp	1,060	1,036
	TL – Transmission Line R/W	7	7
Total – Johnstone Strait		**7,982**	**7,753**
Bonanza Lake	AF – Alpine Forest	1,484	1,484
	AL – Alpine	1,872	1,872
	CK – Creek	10	10
	CL – Clearing	4	4
	GBAR – Gravel bar	1	1
	GPIT – Gravel Pit	27	27
	LA – Lake	1,136	1,136
	NC – Non-commercial	3	3
	NPBR – Non-prod. Brush	49	49
	NPFO – Non-Prod. Forest	429	429
	RI – River	90	90
	RK – Rock	79	79
	RR – Railway R/W	19	19
	SW – Swamp	172	172
	TL – Transmission R/W	119	119
	UR – Urban	4	4
Total – Bonanza lake		**5,498**	**5,498**

6.4 *Non-Productive Forest*

The forest inventory includes minor areas classified as non-productive. These areas have been included in table 4 - non-forest.

6.5 *Inoperable/Inaccessible*

Within TFL 47 operability was mapped from aerial reconnaissance and digitized into TimberWest's GIS. The criteria for delineating the operability line was defined in the "TFL 46 Operability Terms of Reference" :

> *"Marginal timber types were assessed for merchantability by aerial reconnaissance. Each forest type was classified as economic or uneconomic based on stand structure and visible defect. During the same helicopter flight all inaccessible areas were mapped and the accessible areas classified as conventional, helicopter and longline yarding systems. The accessibility line was integrated with terrain stability mapping and ESA mapping, where available,*
>
> *Economic operability was assumed if:*
>
> 1. *the stand had a volume of more than 250 m^3/ha,*
> 2. *the majority of the stand is of "J" grade or better, i.e. a pure pulp stand is not economic.*
> 3. *some stands of less than 250 m^3/ha where adjacent to better stands,*
> 4. *isolated stands were evaluated on an individual basis given their value (size of the area, volume, species, grade) and their associated logging cost including road construction".*

Table 5. Inoperable Land Base

Management Unit	Criteria	Total Area (ha)	Area Removed (ha)
Johnstone Strait	See above	4,370	3,168
Bonanza Lake	See above	8,376	4,660

6.6 *Non-Commercial (NC)*

The forest cover inventory classifies approximately 15.0 ha as non-commercial brush. This area is included in the area of problem forest type types and is excluded from the harvestable land base. (Section 6.14).

Table 6. Non-Commercial Cover

Management Unit	Description	Total Area (ha)	Reduction (ha)
See section 6.14			

6.7 *Low Site*

Low site areas within the two management units are characterized, for both mature and immature stands as having low timber growing potential. The majority of the "low site" stands were identified and excluded from harvest in section 6.5 – Inoperable/ Inaccessible. The areas identified in this section, as being removed because of low productivity ("low site"), are usually smaller, isolated stands lying within the broader area delineated as "accessible".

Stands[6] which fail to achieve a minimum yield of 250 m^3/ha (net volume12.5+ DBH) at culmination age have been classified as low site (see section 6.5). The profile of these stands is shown in Table 7.

Table 7. Low Site.

Johnstone Strait							
Species Mix	**Site Index Upper Limit**	**Avg. DBH (cm)**	**Avg. M^3/ha @ cul. Age**	**Total Area (ha)**	**Total Area (ha) Removed**	**Volume (m^3) Removed**	**Avg. M^3/ha Removed**
Fir	14	23	233				
Fir-Cedar	12	21	196				
Fir-Hemlock	12	21	215				
Fir-Alder	12	20	132				
Cedar-Conifer Mix	10	24	223				
Hemlock	9	25	245				
Hemlock-Fir	9	24	245				
Hemlock-Cedar	9	25	233				
Alder-Conifer Mix	14	21	194				
Total				**2,486**	**1,406**		

Bonanza lake							
Species Mix	**Site Index Upper Limit**	**Avg. DBH (cm)**	**Avg. M^3/ha**	**Total Area (ha)**	**Total Area (ha) Removed**	**Volume (m^3) Removed**	**Avg. M^3/ha Removed**
Fir	13	22	198				
Fir-Cedar	9	23	195				
Fir-Hemlock	12	22	217				
Cedar-Conifer Mix	10	24	224				
Hemlock	8	24	230				
Hemlock-Fir	5	21	156				
Hemlock-Cedar	9	25	236				
Total				**3,628**	**514**		

[6] Stand statistics have been determined from VDYP generated, natural stand yield tables.

6.8 *Environmentally Sensitive Area*

Forested lands which have been identified as environmentally sensitive and/or having significant non-timber values are accounted for as a percent area reduction by ESA classification.

E.S.A. inventories for Johnstone Strait and Bonanza Lake were completed to MoF standards in 1992 to 1993

Table 8. Area reductions for ESAs

Unit	ESA Category	Total Mapped Area	% Reduction	Area (ha) removed from the harvestable land base
Johnstone Strait	E2p	2,008	20%	150
	E2s	10,944	20%	1,429
	Ep	1,032	90%	107
	Es	1,497	90%	423
	Ew	36	50%	-
Total Johnstone Strait		**15,517**		**2,109**
Bonanza Lake	E2p	2,377	20%	38
	E2s	3,964	20%	572
	E2w	1,005	50%	15
	Ea	203	20%	5
	Eh	130	20%	18
	Ep	2,045	90%	43
	Es	2,918	90%	1,081
	Ew	799	75%	47
Total Bonanza Lake		**13,441**		**1,819**

6.9 *Riparian Reserves and Management Zones - Streams*

Prior to the establishment of the BC Forest Practices Code (FPC), TimberWest classified the majority of the creeks in the Bonanza Lake and Johnstone Strait Management Units of TFL 47 according to the 1988 BC Coastal Fish Forestry Guideline. This stream data was captured at 1:20,000 and stored in TimberWest's GIS.

In order to account for the impact on timber supply of the riparian reserves and management zones required under the BC Forest Practices Code, the 1998 classification system was converted to the FPC S1-S6 stream classification. (See Appendix I). While it is acknowledge that the conversion process from the 1988 BC Coastal Fish Forestry Guidelines to the FPC guidelines is an imprecise process, the results are suitable for timber supply modeling.

While a number of the streams under the FPC have reserve management areas, they are all being modeled with a single management zone. The percent reductions applied to the individual riparian classes were derived on the assumption that some portions of the riparian management areas include reserve areas.

Table 9. Riparian reserve zones - streams

Unit	Rip. class	Reserve Width	Mngmnt Zone Width	Total Buffer Width	Total Area	Reduction %	Area Removed
Johnstone Strait	S2	30	20	50		90%	
	S3	20	20	40		75%	
Sub-Total S2-S3					**7,787**		**6,101**
	S5		30	30		10%	
	S6		30	30		10%	
Sub-Total S5-S6					**4,256**		**313**
Total – Johnstone Strait					**12,043**		**6,414**
					-		
Bonanza	S1	50	20	70		93%	
	S2	30	20	50		90%	
	S3	20	20	40		75%	
Sub-Total S1-S3					**958**		**722**
	S5		30	30		10%	
	S6		30	30		10%	
Sub-Total S5-S6					**6,572**		**356**
Total – Bonanza lake					**7,530**		**1,078**

6.10 Riparian Reserves and Management Zones – Wetlands and Lakes

In order to account for wetland management areas in the timber supply analysis, lakes and swamps mapped at 1:20,000 were assigned an FPC wetland classification. Wetland management buffers were then generated. (see Appendix I)

Table 10. Riparian reserve zones - wetlands and lakes

Unit	Rip. Class	Reserve Width	Mngmnt Zone Width	Total Buffer Width	Total Area	Reduction %	Area Removed
Johnstone Strait	L1	10		10	167	100%	113
	L3		30	30	170	40%	35
	W1	10	40	50	157	28%	29

Unit	Rip. Class	Reserve Width	Mngmnt Zone Width	Total Buffer Width	Total Area	Reduction %	Area Removed
	W3		30	30	151	10%	10
Total – JS					**645**		**187**
Bonanza	L1	10		10	37	100%	23
	L3		30	30	47	40%	3
	W1	10	40	50	25	28%	-
	W3		30	30	19	10%	1
Total – BL					**128**		**27**

6.11 Wildlife Habitat Deductions

In the previous management plan[7], the majority of mapped wildlife areas were ungulate winter ranges in the Bonanza Lake management unit but included a heron rookery in Johnstone Strait plus Marbled Murrelet[8] habitat in Bonanza Lake (see table 11)

TimberWest has been working with the Ministry of Forest and Ministry of Environment and Parks to refine all ungulate winter ranges to 100% netdowns from the current mix of 100% and partial netdowns. TimberWest has requested[9] that these revised ungulate winter ranges be used for Management Plan #3.

Pending approval of the revised ungulate winter ranges, the Management Plan #2 ungulate winter ranges with their unique netdown percentages are used in the base case (Table 11). These mapped wildlife areas are used in addition to the ESA wildlife mapping discussed in section 6.8.

Table 11. Mapped wildlife habitat areas.

Unit	Wildlife Unit	Wildlife Unit Name	Elevation Range (m)	Snow Zone	Ew Rating	Species	% Net down	Total Area (ha)	Area Removed (ha)
Johnstone Straits	3WU001	Knox Bay	200-250	Shallow	Ew2	Heron	50%	36	18
Total – JS								**36**	**18**
Bonanza Lake	8W001	Upper Bonanza Lk.	250	Shallow	Ew2	Elk	50%	125	36
	8W002	Steele Creek	400-800	Mod-Deep	Ew/Ew2	Deer	80%	82	54
	8W003	BR 42-1	450-1200	Mod.-Very Deep	Ew	Deer	100%	178	130
	8W004	BR 42-2	750-1150	Deep-Very Deep	Ew	Deer	60%	111	63

[7] Ungulate winter range areas in Bonanza Lake have been grandparented under the operational planning regulations of the forest practices code.
[8] The final location of the Marbled Murrelet habitat reserve noted in table 11 is subject to ongoing discussions with the Ministries of Forests and Environment. The 71 ha. excluded from the harvestable landbase is appropriate for timber supply modeling.
[9] May 14, 1999 letter from G. Glover, TimberWest to District Manager, Port McNeill Forest District.

Unit	Wildlife Unit	Wildlife Unit Name	Elevation Range (m)	Snow Zone	Ew Rating	Species	% Net down	Total Area (ha)	Area Removed (ha)
	8W005	East Bonanza Lake	250-900	Shallow-Deep	Ew/Ew2	Deer	75%	168	73
	8W007	West Bonanza Lake	450-800	Mod-Deep	Ew	Deer	90%	52	46
	8W008	West Bonanza Lake B	450-800	Mod-Deep	Ew/Ew2	Deer	80%	31	16
	8W009	Steele Lake 95-8	450-800	Shallow-Deep	Ew	Deer	90%	100	88
	8W010	Ida Lake	250	Shallow	Ew2	Elk	50%	342	108
	8W011	BR 250 FB	400-800	Mod-Deep	Ew/Ew2	Deer	75%	138	97
	8W012	BR 256	700-1100	Deep-Very Deep	Ewz	Deer	50%	99	40
	8W013	Upper East Fork Kokish	600-900	Deep-Very Deep	Ewz	Deer	50%	137	68
	8W014	East Main	550-800		Ewz	Marbled Murrelet	100%	83	71
	8W015	Tsulton River	50	Shallow	Ew2	Elk	50%	29	10
	8W016	Tsolton River B	50	Shallow	Ew2	Elk	50%	138	38
	8W017	Lower Kokish River	200-750	Shallow-Moderate	Ew2	Deer	50%	197	85
	8W018	Steel Lake	250	Moderate	Ew2	Elk	50%	109	34
Total –BL								2,120	1,057

6.12 Cultural Heritage Resource Reductions

The majority of culturally significant areas which might impact forest management are culturally modified trees (CMTs). Historically in the Johnstone Strait or Bonanza Lake management units the development planning processes have identified[10] very few CMTs.

No CMT have been encountered in the Bonanza Lake management unit (block 17). In TFL 47, Block 1 of the Johnstone Strait management unit there is no recent history of harvesting. In the remaining Johnstone Strait blocks less than 20 CMT's have been encountered. Of these 20, only 2 have a 1 tree length radius buffer (2 CMT's x approx. 0.5 ha each = 1.0 ha in total reserved for CMT's). Most of the remaining CMT's were stumps.

In order to quantify the potential extent and implications of CMTs on Block 1, a total of 357 hectares of older stands (> 120 years) with a redcedar leading or secondary component within 2,000 meters of the ocean were identified (table 12).

[10] When culturally significant features are identified or anticipated, appropriate Archeological Impact Assessments are undertaken where required.

Table 12. Cultural heritage resouces - CMTs.

Description	Total Area (ha)	Percent Deduction	Excluded Area (ha.)	Comment
Cedar leading species	101	0%	0.0	TFL 47 Block 1
Cedar secondary species	256	0%	0.0	TFL 47 Block 1
Total	**357**		**0.0**	

It is felt that within this relatively small area, any CMTs encountered can be accommodated in existing requirements for protection of other resources such as riparian areas, ESA's and wildlife tree patches. Consequently, no additional area or volume reductions are modeled to account for the future impact on timber supply of having to manage for Culturally Modified Trees (CMT's) or other archaeological significant features.

6.13 Other Sensitive Site Reductions

6.13.1 Recreation

A new recreation inventory, meeting the 1998 RIC[11] standard, was completed for Blocks 4-12 (Campbell River Forest District) of TFL 47 in 1999. That portion of the TFL within the Port McNeill Forest District, Blocks 1-3 and 17, was inventoried in 1993/94 to 1991 MoF standards.

Recreation was modeled as an area reduction (see table 13).

Table 13. Other sensitive site reductions – recreation.

Management Unit	Feature[12] Significance	Feature Sensitivity	Management Class	Total Area Mapped (ha)	Percent Deduction	Excluded Area (ha.)
Johnstone	A		0	75	100%	68
Strait	B		0	154	100%	123
	B		1	394	50%	140
	VH	H		547	100%	136
	H	H		298	100%	204
	M	H		183	50%	46
	VH	M		41	50%	10
	H	M		938	50%	265
				2,631		**992**

[11] Resource Inventory Committee (RIC)
[12] Under the 1991 Recreation Inventory standard, Feature Significance A = Very High, B = High; Management Class 0 = Managed exclusively for recreation, 1 = special management.

Management Unit	Feature[12] Significance	Feature Sensitivity	Management Class	Total Area Mapped (ha)	Percent Deduction	Excluded Area (ha.)
Bonanza	B		0	532	100%	7
Lake	B		1	1,704	50%	321
				2,236		**327**

6.14 Problem Forest Types

Problem forest types are physically operable and exceed low site criteria but are not currently utilized or are marginally merchantable. As discussed below, these problem forest types have been excluded from the harvestable land base.

6.14.1 Problem Forest Types Excluded from the Timber Harvesting Land Base

Pine and maple-leading stands will be excluded from the timber harvesting land base (table 14).

Table 14. Problem forest types.

Management Unit	Criteria	Total Area (ha)	Reduction Percent	Reduction (ha)
Johnstone Strait	Pine & Maple leading	1,728	100%	1,168
Bonanza lake	Pine & Maple leading	55	100%	28

6.15 Roads, Trails and Landings

6.15.1 Classified Roads, Trails and Landings

Within TimberWest's forest inventory system, roads are stored as a separate GIS overlay. The impact of roads on the harvestable land base is discussed in section 16.15.2 - Unclassified Roads, Trails and Landings).

Table 15. Classified Roads, trails and landings.

Management Unit	Classified Roads	Total Area (ha.)
Johnstone Strait	Road	n/a
Bonanza Lake	Road	n/a

6.15.2 Unclassified Roads, Trails and Landings

Roads are dealt with as a separate coverage in TimberWest's GIS. In order to account for reductions to the net harvestable land base, the road segments are buffered, using a 10 metre (5.0 metres on either side of the road centerline) right-of-way width.

It is assumed that all timber within 200 meters of an existing road is considered currently "roaded" and can be harvested without building any additional permanent road.

Although TimberWest deactivates a significant amount of road each year, the deactivation process does not return this land to a productive growing state. Therefore the area of road in table 16, includes both active and de-activated road.

Table 16. Unclassified, roads, trails and landings.

Management Unit	Total Area of Roads (Active & De-actived) (ha)	Area Deducted	'Roaded' Area within the Harvestable Land Base (ha)	% of 'Roaded' Area Deducted
Johnstone Strait	1,147	1,120	26,740	4.2%
Bonanza Lake	622	609	13,326	4.6%

6.15.3 Future Roads, Trails and Landings

The percentage calculated for classified roads, trails and landings in Table 16 is used to calculate the area removed for future roads, trails and landings. Those stands not currently roaded are considered to be all stands greater than 200 meters of an existing road.

All forest stands not currently "roaded" will have their net productive area reduced by this future percentage once the current stand is harvested. Once harvested these future roads will be excluded from the harvestable land base and no further reduction for roads will be made.

Table 17. Future Roads, Trails and Landings

Management Unit	Harvestable Land Base Area Not Currently Roaded	Reduction Percent	Area Deducted for Future Roads
Johnstone Strait	46,583	4.2%	1,956
Bonanza Lake	8,915	4.6%	410

6.16 Exclusion of Specific, Geographically Defined Areas

The Johnstone Strait management unit of TFL 47 includes four areas passed by an order-in-council as parks. In addition there are three areas proposed as parks under the Central Coast Land and Coastal Resource Management Plan (CCLRMP). The parks identified in table 18 have been excluded from the harvestable land base for the base case.

Table 18. Parks and protected areas excluded from the harvestable land base within the Johnstone Strait management unit.

Protected Areas	Status	Total Area (ha)
PARK-OCTUPUS ISLANDS	Order-in-Council	229
PARK-SMALL INLET	Order-in-Council	751
PARK-SURGE NARROWS	Order-in-Council	41
PAS-MAIN LAKES	Order-in-Council	1,664
	Sub-Total	**2,685**

The above areas have been mapped in TimberWest's GIS system.

There are no areas to be excluded in the Bonanza Lake Management Unit.

6.17 Other Land Base Exclusions

In addition to the land base deductions discussed above, a number of other deductions are made to account for a marine foreshore buffer in Johnstone Strait and wildlife tree patches within cut-blocks.

The area deductions are summarized below.

Management Unit	Description	Total Area	Reduction %	Area Excluded
Johnstone Strait	Quadra – SMZ	13,319	0%	0
	Marine Buffer	1,635	90%	978
	WTP	632	100%	632
Total – JS		**15,586**		**1,610**
Bonanza Lake	WTP	311	100%	311
Total – BL		**311**		**311**

The rationale for the deductions or in some cases for not reducing the land base is discussed in sections 6.17.1 – 6.17.6.

6.17.1 Marine Foreshore Buffer

Johnstone Straits has a significant interface with the ocean. Over the majority of this interface, a minimum 30 meter management zone is be retained. Some thinning may occur within this zone. This marine foreshore management zone is modeled as a mapped 30 metre wide buffer with a 90% netdown.

6.17.2 Forest Ecosystem Network

Forest Ecosystem Networks (FENs) are currently not a requirement under the forest practices code, consequently no areas are deducted from the harvestable land base to account for FENs.

6.17.3 Quadra – Special Management Zone

It is expected that under the Vancouver Island Land Use Planning (VILUP) process, a significant portion of Quadra Island in the Johnstone Strait management unit will be designated as a special management zone (SMZ).

The SMZ areas are not intended to be future protected areas, and are available for a variety of extractive and non-extractive activities. As noted in the Special Management Zone, Information Report[13] prepared by the Land Use Coordination Office the

> *"... management objectives for Low Intensity Areas (LIAs)[14] should not exceed an average reduction to the long-run harvest level of 10 percent over the effect of the Forest Practices Code and other forest practices."*

Since the Quadra SMZ has not been legally established, the potential impact of the SMZ on future yields will not be considered in the base case. However, the impact of the of the likely 10% reduction in the harvest contribution from the Quadra SMZ on the long-term harvest rate will be quantified[15] in the timber supply analysis report.

6.17.4 Karst Features

[13] Special Management Zone Project, Information Report, June, 1998, Land Use Co-ordination Office, B.C. Government, (www.luco.gov.bc.ca/smz/info.htm)
[14] LIAs – Low Intensity Areas are now known as SMZs – Special Management Zones
[15] The potential impact of the Quadra SMZ will be quantified through an analysis of a 10% reduction in yield from stands within the SMZ. The Quadra SMZ will not be subject to a separate "sensitivity timber supply analysis".

Karst features are found on the Quadra Island portion of Johnstone Strait and within the Bonanza lake management units. These features have been accounted for in the recreation inventory[16].

Operationally, karst features are often incorporated into wildlife tree patches and other cutblock level retention areas. Therefore, it is felt that other area reductions adequately account for the management of karst features in the timber supply model. No other area reductions or harvesting constraints are applied to specifically model the long-term harvesting impact of managing for karst features.

6.17.5 Wildlife Tree Patches – Stand Level Biodiversity.

The majority of the requirements for stand level biodiversity are currently accommodated in low volume stands and existing requirements for protection of other resources such as riparian areas, ESA's, ungulate winter ranges and marine foreshore buffers.

To account for FPC requirements for wildlife trees and wildlife tree patches within cutblocks the harvestable land base was reduced by 1.0% in the Johnstone Strait Management Unit and 2.0% in the Bonanza Lake Management Unit[17].

6.17.6 Other Identified Wildlife

Other than the reductions for the mapped wildlife habitat 9section 6.11), no additional area reductions are explicitly made to account for other identified wildlife.

6.18 Area Additions

There is no area to be added to the harvestable land base of TFL 47.

Table 19. Area additions.

Description	Area to be Added (ha)
N/A	0.0

6.19 Alder Types

Alder-leading stands have been, and will continue to be specifically targeted[18] for harvest in Johnstone Straits. In the Bonanza Lake Management Unit, minor volumes of

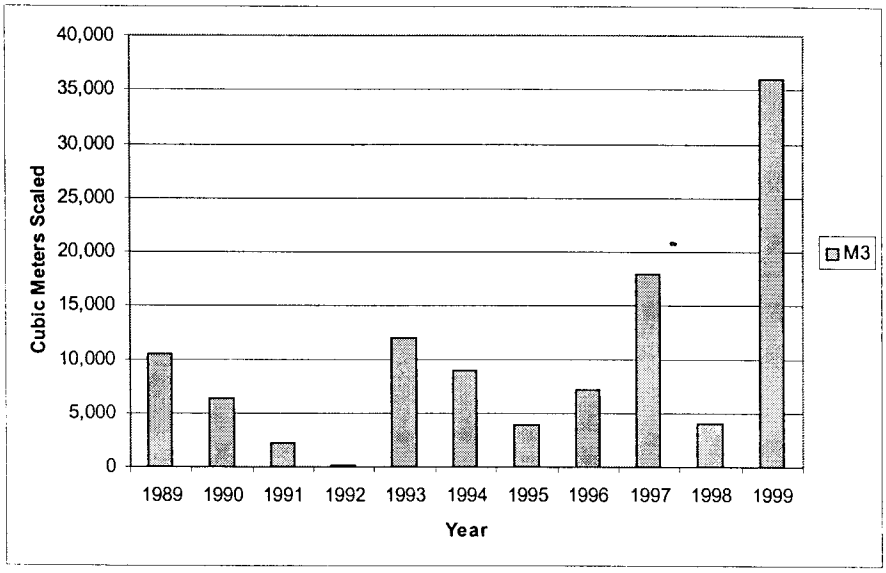
[16] Of the 3,641 ha. in Johnstone Strait identified as having a biophysical feature/sub-feature of "L5" – karst (1991 recreation inventory standard), 2,869 ha. are in the THLB. For Bonanza Lake a total of 1,780 ha. are mapped of which 560 ha. are in the THLB.

[17] The additional 1% area reduction was applied to stands not previously subject to a netdown such as ESAs, ungulate winter range, recreation, riparian or marine buffers.

alder are harvested with adjacent coniferous stands or as a component of coniferous stands. In both management units, the alder leading stands contribute to the harvestable land base in the base case.

The harvesting of deciduous species is sensitive to greater fluctuations in log prices than other species and is only available for harvest during favourable economic conditions. The recent harvesting history of alder in Johnstone Strait is shown in figure 5.

Figure 5. Alder harvest. Johnstone Strait - 1989 to August, 1999



7 Inventory Aggregation

7.1 Management Zones and Multi-Level Objectives (Groups)

The majority of non-timber resources (e.g. ESA's, wildlife habitat, recreation opportunities etc.) are modeled as reductions to the harvestable land base.

For the base case, forest cover constraints are used to model visual landscape (VQO's) (section 10.2.1.1) and cut block adjacency (Section 10.2.1.5).

The seral stage targets used in both the base case and the biodiversity sensitivity analysis (section 3.4) specify minimum percentages of older forest to be retained in each BEC variant (section 10.2.1.6). Within COMPLAN these "seral stage constraints" will overlap the visual landscape and adjacency zones described in table 20.

[18] Under current market conditions, TimberWest expects to harvest an average of 30,000 cubic metres of alder per year for the next 5 to 10 years.

Table 20. "Zones" to which forest cover constraints are applied.

Zone/Group	Description	Total Area
Johnstone Strait		
1. Areas within mapped visual landscape polygons.	Mapped visual landscape inventory polygons are grouped by Visual Quality Class (VQC) and Visual Absorption Capability (VAC) and given a constraint specifying the percentage of area that can be less than a specified green-up height. (section 10.2.1.1)	47,519
2. Cut block adjacency.	A single constraint specifying the maximum percent of all area not covered by the constraint described above that can be less than a specified height. (section 10.2.1.5).	53,773
Bonanza lake		
1. Areas within mapped visual landscape polygons.	Mapped visual landscape inventory polygons are grouped by Visual Quality Class (VQC) and Visual Absorption Capability (VAC) and given a constraint specifying the percentage of area that can be less than a specified green-up height. (section 10.2.1.1)	896
2. Cut block adjacency.	A single constraint specifying the maximum percent of all area not covered by the constraint described above that can be less than a specified height. (section 10.2.1.5).	37,223

7.2 Analysis Units

Analysis units are created by combining similar species into 5 metre site classes (table 21).

The average site index is the area weighted site index (BHA 50) for the forested land base. The 5 metre site class value represents the mid-point of the site.

Table 21. Analysis Units.

Management Unit	Analysis Unit	Species Group	Description	Site Class (5 metre)	Avg. Site Index	THLB	Forested Ha
Johnstone	1- 10	1	Fir	10	11.1	-	1,082
Strait	1- 15	1	Fir	15	15.9	233	366
	1- 20	1	Fir	20	20.3	1,513	2,667

Management Unit	Analysis Unit	Species Group	Description	Site Class (5 metre)	Avg. Site Index	THLB	Forested Ha
	1- 25	1	Fir	25	27	4,393	5,403
	1- 30	1	Fir	30	32	237	271
	1- 35	1	Fir	35	33	1,621	2,063
	1- 40	1	Fir	40	39	303	382
	2- 10	2	Fir-Cedar	10	11.4	-	139
	2- 15	2	Fir-Cedar	15	16	192	239
	2- 20	2	Fir-Cedar	20	20.5	289	461
	2- 25	2	Fir-Cedar	25	27	187	248
	2- 35	2	Fir-Cedar	35	33	115	148
	2- 40	2	Fir-Cedar	40	39	30	39
	3- 10	3	Fir-Hemlock	10	11.8	-	263
	3- 15	3	Fir-Hemlock	15	16	619	765
	3- 20	3	Fir-Hemlock	20	20.6	1,085	1,465
	3- 25	3	Fir-Hemlock	25	27	1,749	2,262
	3- 30	3	Fir-Hemlock	30	32	20	23
	3- 35	3	Fir-Hemlock	35	33	2,595	3,233
	3- 40	3	Fir-Hemlock	40	39	852	1,047
	4- 10	4	Fir-Alder	10	11.8	-	17
	4- 20	4	Fir-Alder	20	20	0	6
	4- 25	4	Fir-Alder	25	27	220	308
	4- 35	4	Fir-Alder	35	33	1,396	1,917
	4- 40	4	Fir-Alder	40	39	330	416
	5- 10	5	Cedar-Conifer Mix	10	11.5	695	925
	5- 15	5	Cedar-Conifer Mix	15	15.2	2,272	2,693
	5- 20	5	Cedar-Conifer Mix	20	20	668	820
	5- 25	5	Cedar-Conifer Mix	25	24	985	1,142
	5- 30	5	Cedar-Conifer Mix	30	29.4	17	19
	5- 35	5	Cedar-Conifer Mix	35	33	374	425
	6- 10	6	Hemlock	10	9.9	69	183
	6- 15	6	Hemlock	15	15.2	2,434	2,890
	6- 20	6	Hemlock	20	19	2,104	2,477
	6- 25	6	Hemlock	25	24.1	9,142	10,683
	6- 30	6	Hemlock	30	29	11,481	13,558
	6- 35	6	Hemlock	35	34.9	2,344	2,747
	6- 40	6	Hemlock	40	41.6	245	281
	7- 10	7	Hemlock-Fir	10	10.3	177	350
	7- 15	7	Hemlock-Fir	15	15.4	1,660	2,111
	7- 20	7	Hemlock-Fir	20	19	270	376
	7- 25	7	Hemlock-Fir	25	24	2,691	3,409
	7- 30	7	Hemlock-Fir	30	29	3,056	3,849

Management Unit	Analysis Unit	Species Group	Description	Site Class (5 metre)	Avg. Site Index	THLB	Forested Ha
	7- 35	7	Hemlock-Fir	35	35	769	918
	8- 10	8	Hemlock-Cedar	10	9.4	79	858
	8- 15	8	Hemlock-Cedar	15	14.7	2,521	3,145
	8- 20	8	Hemlock-Cedar	20	19	857	1,074
	8- 25	8	Hemlock-Cedar	25	24	3,029	3,502
	8- 30	8	Hemlock-Cedar	30	29	2,246	2,579
	8- 35	8	Hemlock-Cedar	35	35	305	334
	9- 25	9	Alder/Decid.	25	23.1	101	134
	9- 30	9	Alder/Decid.	30	30	605	817
	9- 35	9	Alder/Decid.	35	36.8	252	387
	10- 15	10	Alder-Conifer Mix	15	16.8	11	14
	10- 20	10	Alder-Conifer Mix	20	18.4	5	6
	10- 25	10	Alder-Conifer Mix	25	23.7	344	462
	10- 30	10	Alder-Conifer Mix	30	29.5	2,263	2,933
	10- 35	10	Alder-Conifer Mix	35	36.2	1,159	1,399
Bonanza Lake	1- 15	1	Fir	15	13.0	-	2
	1- 20	1	Fir	20	22.0	103	123
	1- 25	1	Fir	25	27.0	618	681
	1- 30	1	Fir	30	32.0	13	13
	1- 35	1	Fir	35	33.0	463	626
	1- 40	1	Fir	40	39.0	35	36
	2- 10	2	Fir-Cedar	10	9.0	-	12
	2- 15	2	Fir-Cedar	15	16.0	-	22
	2- 20	2	Fir-Cedar	20	22.0	14	14
	2- 25	2	Fir-Cedar	25	27.0	87	98
	2- 30	2	Fir-Cedar	30	31.8	24	33
	3- 10	3	Fir-Hemlock	10	12.0	-	5
	3- 20	3	Fir-Hemlock	20	21.8	52	58
	3- 25	3	Fir-Hemlock	25	27.0	504	605
	3- 30	3	Fir-Hemlock	30	31.9	122	149
	3- 35	3	Fir-Hemlock	35	33.0	283	321
	3- 40	3	Fir-Hemlock	40	39.0	26	32
	5- 5	5	Cedar-Conifer Mix	5	7.0	-	8
	5- 10	5	Cedar-Conifer Mix	10	10.5	673	2,789
	5- 15	5	Cedar-Conifer Mix	15	14.8	1,325	2,056
	5- 20	5	Cedar-Conifer Mix	20	19.5	663	904
	5- 25	5	Cedar-Conifer Mix	25	24.2	146	200
	5- 30	5	Cedar-Conifer Mix	30	30.0	29	31
	5- 40	5	Cedar-Conifer Mix	40	40.0	7	7
	6- 5	6	Hemlock	5	6.9	-	104

Management Unit	Analysis Unit	Species Group	Description	Site Class (5 metre)	Avg. Site Index	THLB	Forested Ha
	6- 10	6	Hemlock	10	10.5	317	629
	6- 15	6	Hemlock	15	15.2	1,480	1,857
	6- 20	6	Hemlock	20	19.3	2,756	3,336
	6- 25	6	Hemlock	25	24.3	3,020	3,579
	6- 30	6	Hemlock	30	29.7	3,168	3,697
	6- 35	6	Hemlock	35	34.5	1,618	1,793
	6- 40	6	Hemlock	40	38.5	25	31
	7- 5	7	Hemlock-Fir	5	5.0	-	4
	7- 10	7	Hemlock-Fir	10	10.5	6	14
	7- 15	7	Hemlock-Fir	15	14.5	20	50
	7- 20	7	Hemlock-Fir	20	19.1	55	67
	7- 25	7	Hemlock-Fir	25	24.0	91	133
	7- 30	7	Hemlock-Fir	30	29.4	170	196
	7- 35	7	Hemlock-Fir	35	35.0	10	10
	8- 5	8	Hemlock-Cedar	5	6.7	-	163
	8- 10	8	Hemlock-Cedar	10	10.3	726	2,211
	8- 15	8	Hemlock-Cedar	15	15.0	1,490	2,403
	8- 20	8	Hemlock-Cedar	20	19.3	895	1,288
	8- 25	8	Hemlock-Cedar	25	24.3	636	899
	8- 30	8	Hemlock-Cedar	30	29.2	249	303
	8- 35	8	Hemlock-Cedar	35	34.3	44	61
	8- 40	8	Hemlock-Cedar	40	39.9	50	81
	9- 20	9	Alder	20	19.0	1	3
	9- 25	9	Alder	25	23.7	2	23
	9- 30	9	Alder	30	30.2	11	25
	9- 35	9	Alder	35	37.0	8	11
	10- 20	10	Alder-Conifer Mix	20	22.0	-	-
	10- 25	10	Alder-Conifer Mix	25	24.0	23	51
	10- 30	10	Alder-Conifer Mix	30	29.6	16	33
	10- 35	10	Alder-Conifer Mix	35	34.0	10	20

7.3 Detailed Land Base Information Requirements

If requested, TimberWest will provide the Ministry of Forests with all input files used to run COMPLAN. This data can be provided once the base case timber supply runs have been completed.

8 Growth and Yield

8.1 Site Index Assignments

The site indices for the Johnstone Strait management unit were converted to the MoF approved site index curves prior to Management Plan #2. The Bonanza Lake site indices are a combination of converted sites for immature stands plus new inventoried sites from the recently completed inventory of mature timber. These site indices were compared to average site index estimates for site units of the Biogeoclimatic Ecosystem Classification (BEC)[19]. The BEC site series classification came from the Terrestrial Ecosystem Mapping recently completed by B. A. Blackwell and Associates on both the Johnstone Strait and Bonanza Lake management units of TFL 47.

Average BEC site indices were calculated based on the primary site series within BGC units. Both the inventory and BEC site indices were weighted by area[20]. Species is the leading species within a stand.

For the Johnstone Strait management unit, the average inventory site index was almost identical to the average BEC site index. For the Bonanza Lake management unit, the average inventory site index was 2.7 metres (approximately 10%) less the BEC estimate (see table below)

Average inventory site indices compared to average site indices for site units of the Biogeoclimatic Ecosystem Classification system.

Management Unit	Leading Species	BGC unit	Ha	Ratio	Avg. Inventory Site Index	Avg. BEC Site Index
Johnstone Strait	Ba	CWHmm1	3	0.946	26.5	28.0
	Ba	CWHvm1	87	0.888	24.6	27.7
	Ba	CWHvm2	23	0.654	18.1	27.6
	Ba	MHmm1	51	1.252	13.9	11.1
		Wt. Avg.	164	**0.905**	**20.4**	**22.5**
	Cw	CWHdm	601	0.912	23.0	25.2
	Cw	CWHmm1	449	0.717	14.9	20.8
	Cw	CWHvm1	2,295	1.030	20.1	19.6
	Cw	CWHvm2	104	1.091	19.5	17.9
	Cw	CWHxm	691	0.822	17.6	21.4
		Wt. Avg.	4,140	**0.941**	**19.5**	**20.8**
	Fd	CWHdm	4,481	0.984	30.1	30.6
	Fd	CWHmm1	290	0.649	19.4	30.0

[19] Site Index Estimates by Site Series for Coniferous Tree Species in British Columbia, Forest Renewal BC and Ministry of Forests, 1997.
[20] Ratios were only calculated for the species/ecosystem combinations where site index estimates are available.

Management Unit	Leading Species	BGC unit	Ha	Ratio	Avg. Inventory Site Index	Avg. BEC Site Index
	Fd	CWHmm2	23	1.658	26.5	16.0
	Fd	CWHvm1	5,214	0.834	27.1	32.5
	Fd	CWHvm2	109	0.987	23.5	23.8
	Fd	CWHxm	11,479	0.970	27.5	28.4
		Wt. Avg.	21,597	**0.933**	**27.8**	**29.8**
	Hw	CWHdm	4,114	0.892	28.5	32.0
	Hw	CWHmm1	799	1.062	25.6	24.1
	Hw	CWHmm2	12	0.920	22.1	24.0
	Hw	CWHvm1	23,095	1.103	25.1	22.7
	Hw	CWHvm2	1,509	0.819	17.5	21.3
	Hw	CWHxm	7,257	1.138	27.5	24.1
		Wt. Avg.	36,786	**1.067**	**25.6**	**24.0**
	Pl	CWHdm	121	0.876	14.0	16.0
	Pl	CWHmm1	5	0.563	11.3	20.0
	Pl	CWHvm1	146	0.881	11.9	13.5
	Pl	CWHvm2	22	0.618	11.0	17.8
	Pl	CWHxm	1,049	0.718	15.5	21.5
		Wt. Avg.	1,343	**0.740**	**14.9**	**20.1**
	Ss	CWHdm	2	0.929	26.0	28.0
	Ss	CWHvm1	30	1.067	30.8	28.8
		Wt. Avg.	32	**1.057**	**30.4**	**28.8**
	Yc	CWHvm2	588	0.896	14.0	15.7
		Wt. Avg.	588	**0.896**	14.0	15.7
Weighted Avg.Johnstone Strait			64,651	**1.002**	**25.6**	**25.6**

Bonanza Lake	Ba	CWHvm1	290	0.828	23.2	28.0
	Ba	CWHvm2	800	0.708	19.7	27.9
	Ba	MHmm1	1,440	1.258	14.8	11.8
		Wt. Avg.	2,530	**0.925**	**17.3**	**18.7**
	Cw	CWHvm1	536	0.945	20.4	21.6
	Cw	CWHvm2	131	1.010	19.7	19.5
		Wt. Avg.	668	**0.957**	**20.2**	**21.2**
	Fd	CWHvm1	2,016	0.833	29.5	35.4
	Fd	CWHvm2	37	1.117	26.7	23.9
		Wt. Avg.	2,053	**0.836**	**29.4**	**35.2**
	Hw	CWHvm1	9,508	0.997	27.1	27.2
	Hw	CWHvm2	6,115	0.744	19.6	26.4
		Wt. Avg.	15,623	**0.900**	**24.2**	**26.9**
	Pl	CWHvm2	13	0.994	11.9	12.0
		Wt. Avg.	13	**0.994**	**11.9**	**12.0**
	Ss	CWHvm1	127	1.047	32.3	30.8
		Wt. Avg.	127	**1.047**	**32.3**	**30.8**

Management Unit	Leading Species	BGC unit	Ha	Ratio	Avg. Inventory Site Index	Avg. BEC Site Index
	Yc	CWHvm2	437	0.929	12.6	13.6
		Wt. Avg.	437	0.929	12.6	13.6
Weighted Avg. Bonanza Lake			21,451	**0.897**	**23.6**	**26.3**
Weighted Avg. Johnstone Strait & Bonanza Lake Management Unit			86,102	**0.975**	**25.1**	**25.8**

The lower ratio of inventory site index to the BEC averages in Bonanza Lake is thought to result from the higher proportion of older timber.

The inventory site indices will be used for the base case. One of the sensitivity analysis runs for Bonanza Lake will be to test the impact on yields of using the TEM derived site indices.

Table 22. Site Index assignments - all ages.

Leading Species	*Site Index Equation*
Douglas fir	*Bruce (1981)*
Sitka Spruce	*Goudie (1987)*
Balsam	*Kurucz (1982)*
Hemlock	*Wiley (1978)*
Cedar, Cypress	*Kurucz (1985)*
Alder (all deciduous)	*Harrington & Curtis (1986)*

8.2 Utilization Level

Existing stands greater than 200 years old use average line stratum volumes derived from inventory data. These net volumes were compiled using 17.5 cm DBH utilization levels. Yields for stands less than 200 years old and yields for all regenerated stands are developed using VDYP and TIPSY. These volumes are derived using a 12.5 cm DBH utilization standard.(see Table 20).

Table 23. Utilization Levels

Management Unit	Age Years	Spp	DBH (cm)	Stump Ht. (cm)	Top DIB (cm)	Firm-wood %
All Management Units	Existing Stands > 200	All	17.5	30.0	15.0	50%
All Management Units	1 - 200	All	12.5	30.0	10.0	50%

These utilization standards are consistent with current practices. The Ministry of Forests cutting permit approval process requires volumes to be compiled to 12.0 cm DBH for stands less than 120 years and 17.5 cm DBH for stands greater than 120 years. It is anticipated that the harvest ages for the majority of stands currently immature will be less than 120 years.

8.3 Decay, Waste and Breakage for Unmanaged Stands

The Waste and Breakage factors applied to the VDYP yield curves were obtained from the Ministry of Forests, Inventory Branch. These alternate waste and breakage factors are shown in Table 24. The volumes reported by the VDYP yield model are net of decay, waste and breakage.

Since there are no "MoF approved" coastal W2B factors based on a 12.5 cm utilization level, the W2B factors for the 17.5 utilization level have been used in generating the VDYP yield tables.

Table 24. Waste and Breakage factors applied to VDYP yield curves.

Utilization Level cm DBH	Age	Spp	W2B % Johnstone Strait	W2B % Bonanza Lake	MoF Loss Table
12.5+ cm.	Imm.	Fd	4.0%	4.0%	VDYP - MoF
		Cw	5.1%	5.1%	Resource
		Hw	4.1%	4.1%	Inventory
		Ba	4.1%	4.1%	Branch
		Ss	4.0%	4.0%	
		Cy	5.2%	5.2%	
		Pl	2.0%	2.0%	
		Dr	5.1%	5.1%	
12.5+ cm.	Mat.	Fd	5.7%	5.8%	VDYP - MoF
		Cw	9.7%	9.7%	Resource
		Hw	5.9%	5.9%	Inventory
		Ba	5.9%	6.5%	Branch
		Ss	7.0%	6.1%	
		Cy	7.5%	7.5%	
		Pl	2.0%	2.0%	
		Dr	5.1%	5.1%	

These factors are consistent with the individual tree factors specified by the Ministry of Forests for the compilation of cutting permit cruises. While the DWB factors used for the yield tables are consistent with MoF policy, it could be argued that the factors are conservative estimates. The above factors were developed for a utilization level of 17.5 cm DBH - a utlization of 12.5 cm DBH was used in VDYP to develop the yield curves.

Table 25. Sources for decay, waste and breakage factors.

Factor	Species	Source
See table 24 above		

The W2B percentages, identified in Table 24, were applied by the VDYP yield model to immature stands established prior to 1974 (section 8.9.1). Mature timber, age 200+ use average volume line (AVL) volumes compiled using MoF local or zonal loss factors (section 8.7.1). Stands established 1974 and later are considered managed, and use TIPSY yield curves with Operational Adjustment Factors (section 8.4).

8.4 Operational Adjustment Factors for Managed Stands

The TIPSY yield mode uses operational adjustment factors to reduce potential stand yields to expected operational yields. OAF1 is a constant percentage reduction to account for small unproductive areas within stands. OAF2 accounts for losses that increase with age, for example decay due to disease. OAF2 increases from 0 at stand establishment and is reduced to the specified percentage at age 100.

An OAF1 of 15% and OAF2 of 5% were used for all managed stand yield tables.

8.5 Volume Deductions

Other than deductions for Problem Forest Types (6.14), Operational Adjustment Factors (8.4), and Decay, Waste and Breakage Factors (8.3) no other volume deductions are made.

Table 26. Volume deductions.

Problem Species	Volume	Percent
Not applicable		

8.6 Yield Table Development

8.6.1 Base Yield tables

There is one yield table created for each analysis unit. As noted in section 7.2 the analysis units were created by combining similar species into 5 metre site classes.

The area-weighted, average species composition and average site index was calculated for each analysis units, The Variable Density Yield Projection model (batch version 6.4a August, 1996) was used to generate a base yield curve for each analysis unit.

8.6.2 Aggregated Yield tables

8.7 Yield tables for Unmanaged Stands

No additional aggregation beyond that described for the base yield tables (section 8.6.1) was used.

8.7.1 Existing Mature Timber Volumes

All existing mature stands (age 200+) use strata volume estimates derived from inventory plot volumes. The plot volumes were compiled using appropriate MoF local or zonal loss factors.

Mature strata volumes are compiled by grouping plots established in stands, classified by similar species type, age class and height class.

Net volumes by strata are based on all sample plots established at the time the original forest cover was classified. The fieldwork for the Johnstone Strait inventory was done in 1965. The Bonanza Lake old growth was inventoried in 1988.

The MoF audited the inventory in the Johnstone Strait Management Unit in 1995 and is currently undertaking an audit of the inventory in the Bonanza Lake Management Unit.

8.7.2 Yield Tables for Unmanaged Immature Stands

Unmanaged immature stands use the VDYP base yield tables (Sec. 8.6.1)

8.7.3 Existing Timber Volume Check

The Ministry of Forests compared TimberWest's analysis unit volumes to inventory volumes generated from individual stands using VDYP and found that on average the analysis unit volumes were 0.14% less.

Table 27. Volume Comparison Analysis Unit vs. Inventory Polygon (VDYP) by MoF Age Class - Bonanza Lake and Johnstone Strait Management Units.

MoF Age Class	Net Ha.	AU Volume (m3)	Inventory Volume (m3)	Difference (m3)	Percent Difference
1	18,602	15,784	15,724	60	0.38%
2	16,215	2,482,998	2,375,802	107,196	4.51%
3	9,625	3,675,243	3,559,425	115,818	3.25%
4	27,258	15,859,952	15,043,795	816,157	5.43%
5	5,927	4,072,354	3,885,810	186,543	4.80%

MoF Age Class	Net Ha.	AU Volume (m3)	Inventory Volume (m3)	Difference (m3)	Percent Difference
6	1,245	926,382	890,010	36,372	4.09%
7	756	538,975	562,589	(23,614)	-4.20%
8	193	123,193	136,038	(12,845)	-9.44%
9	15,671	9,536,165	10,814,607	(1,278,441)	-11.82%
Total	95,492	37,231,046	37,283,799	(52,754)	-0.14%

8.8 Yield Tables for Managed Stands

Managed stand yield tables were developed using the batch version of the Table Interpolation Program for Stand Yields (batch TIPSY version 2.1 alpha 5)

A managed stand yield table was developed for all analysis units except deciduous and deciduous-conifer species groups (Section 7.2)

The same weighted average site index used for the VDYP generated unmanaged yield curves was used for the managed yield curves. The same species composition used for the unmanaged yield curves was used for the managed stand yield curves except the managed stands were assumed not to have any deciduous component.

8.8.1 Silviculture Management Regimes

The silviculture assumptions listed in table 28 were used to develop the managed stand yield tables.

Table 28. Managed Stand Yield Tables - Silviculture Assumptions.

Analysis Units	Site Index	Establishment Density	Natural (N) or Planted (P)	Spacing	Source
All	Area-weighted average	1,200 stems/ha.	Planted	None	Batch TIPSY

8.8.2 Aggregated Yield Tables

No additional aggregation beyond that described for the base yield tables (section 8.6.1 and 8.8) was used.

Table 29. Managed stand yield tables.

Analysis Unit	Aggregated yield Table Number
Not applicable	

8.8.3 Regeneration Delay

TimberWest has an aggressive program of re-stocking after harvest in both the Johnstone Strait and Bonanza Management Unit. In the Johnstone Straits Management Unit it is estimated that 95% of all harvested areas are planted within one growing season of harvest.

TimberWest's reforestation program meets a number of needs including - slope stability, visual green-up and yield improvement. In the timber supply analysis it is assumed that all sites are restocked within 2 years of harvest.

The two year regeneration delay is incorporated as a parameter in the COMPLAN timber supply model.

8.8.4 Regeneration Assumptions

All regenerated stands are assumed to be planted and use TIPSY yield curves. Site indices are assumed to be unchanged following harvest.

Table 30. Regeneration after harvest.

Management Unit	Analysis Unit	Description	Base Yield Table	Regenerated Yield Table
Johnstone	1- 10	Fir	JS0110	JS0110T
Strait	1- 15	Fir	JS0115	JS0115T
	1- 20	Fir	JS0120	JS0120T
	1- 25	Fir	JS0125	JS0125T
	1- 30	Fir	JS0130	JS0130T
	1- 35	Fir	JS0135	JS0135T
	1- 40	Fir	JS0140	JS0140T
	2- 10	Fir-Cedar	JS0210	JS0210T
	2- 15	Fir-Cedar	JS0215	JS0215T
	2- 20	Fir-Cedar	JS0220	JS0220T
	2- 25	Fir-Cedar	JS0225	JS0225T
	2- 35	Fir-Cedar	JS0235	JS0235T
	2- 40	Fir-Cedar	JS0240	JS0240T
	3- 10	Fir-Hemlock	JS0310	JS0310T
	3- 15	Fir-Hemlock	JS0315	JS0315T
	3- 20	Fir-Hemlock	JS0320	JS0320T
	3- 25	Fir-Hemlock	JS0325	JS0325T

Management Unit	Analysis Unit	Description	Base Yield Table	Regenerated Yield Table
	3- 30	Fir-Hemlock	JS0330	JS0330T
	3- 35	Fir-Hemlock	JS0335	JS0335T
	3- 40	Fir-Hemlock	JS0340	JS0340T
	4- 10	Fir-Alder	JS0410	JS0410T
	4- 20	Fir-Alder	JS0420	JS0420T
	4- 25	Fir-Alder	JS0425	JS0425T
	4- 35	Fir-Alder	JS0435	JS0435T
	4- 40	Fir-Alder	JS0440	JS0440T
	5- 10	Cedar-Conifer Mix	JS0510	JS0510T
	5- 15	Cedar-Conifer Mix	JS0515	JS0515T
	5- 20	Cedar-Conifer Mix	JS0520	JS0520T
	5- 25	Cedar-Conifer Mix	JS0525	JS0525T
	5- 30	Cedar-Conifer Mix	JS0530	JS0530T
	5- 35	Cedar-Conifer Mix	JS0535	JS0535T
	6- 10	Hemlock	JS0610	JS0610T
	6- 15	Hemlock	JS0615	JS0615T
	6- 20	Hemlock	JS0620	JS0620T
	6- 25	Hemlock	JS0625	JS0625T
	6- 30	Hemlock	JS0630	JS0630T
	6- 35	Hemlock	JS0635	JS0635T
	6- 40	Hemlock	JS0640	JS0640T
	7- 10	Hemlock-Fir	JS0710	JS0710T
	7- 15	Hemlock-Fir	JS0715	JS0715T
	7- 20	Hemlock-Fir	JS0720	JS0720T
	7- 25	Hemlock-Fir	JS0725	JS0725T
	7- 30	Hemlock-Fir	JS0730	JS0730T
	7- 35	Hemlock-Fir	JS0735	JS0735T
	8- 10	Hemlock-Cedar	JS0810	JS0810T
	8- 15	Hemlock-Cedar	JS0815	JS0815T
	8- 20	Hemlock-Cedar	JS0820	JS0820T
	8- 25	Hemlock-Cedar	JS0825	JS0825T
	8- 30	Hemlock-Cedar	JS0830	JS0830T
	8- 35	Hemlock-Cedar	JS0835	JS0835T
	8- 40	Hemlock-Cedar	JS0840	JS0840T
	9- 25	Alder/Decid.	JS0925	JS0225T
	9- 30	Alder/Decid.	JS0930	JS0230T
	9- 35	Alder/Decid.	JS0935	JS0235T
	10- 15	Alder-Conifer Mix	JS1015	JS0215T
	10- 20	Alder-Conifer Mix	JS1020	JS0220T
	10- 25	Alder-Conifer Mix	JS1025	JS0225T
	10- 30	Alder-Conifer Mix	JS1030	JS0230T

Management Unit	Analysis Unit	Description	Base Yield Table	Regenerated Yield Table
	10- 35	Alder-Conifer Mix	JS1035	JS0235T
	10- 40	Alder-Conifer Mix	JS1040	JS0240T
Bonanza Lake	1- 15	Fir	BL0115	BL0115T
	1- 20	Fir	BL0120	BL0120T
	1- 25	Fir	BL0125	BL0125T
	1- 30	Fir	BL0130	BL0130T
	1- 35	Fir	BL0135	BL0135T
	1- 40	Fir	BL0140	BL0140T
	2- 10	Fir-Cedar	BL0210	BL0210T
	2- 15	Fir-Cedar	BL0215	BL0215T
	2- 20	Fir-Cedar	BL0220	BL0220T
	2- 25	Fir-Cedar	BL0225	BL0225T
	2- 30	Fir-Cedar	BL0230	BL0230T
	3- 10	Fir-Hemlock	BL0310	BL0310T
	3- 20	Fir-Hemlock	BL0320	BL0320T
	3- 25	Fir-Hemlock	BL0325	BL0325T
	3- 30	Fir-Hemlock	BL0330	BL0330T
	3- 35	Fir-Hemlock	BL0335	BL0335T
	3- 40	Fir-Hemlock	BL0340	BL0340T
	5- 5	Cedar-Conifer Mix	BL0505	BL0505T
	5- 10	Cedar-Conifer Mix	BL0510	BL0510T
	5- 15	Cedar-Conifer Mix	BL0515	BL0515T
	5- 20	Cedar-Conifer Mix	BL0520	BL0520T
	5- 25	Cedar-Conifer Mix	BL0525	BL0525T
	5- 30	Cedar-Conifer Mix	BL0530	BL0530T
	5- 40	Cedar-Conifer Mix	BL0540	BL0540T
	6- 5	Hemlock	BL0605	BL0605T
	6- 10	Hemlock	BL0610	BL0610T
	6- 15	Hemlock	BL0615	BL0615T
	6- 20	Hemlock	BL0620	BL0620T
	6- 25	Hemlock	BL0625	BL0625T
	6- 30	Hemlock	BL0630	BL0630T
	6- 35	Hemlock	BL0635	BL0635T
	6- 40	Hemlock	BL0640	BL0640T
	7- 5	Hemlock-Fir	BL0705	BL0705T
	7- 10	Hemlock-Fir	BL0710	BL0710T
	7- 15	Hemlock-Fir	BL0715	BL0715T
	7- 20	Hemlock-Fir	BL0720	BL0720T
	7- 25	Hemlock-Fir	BL0725	BL0725T
	7- 30	Hemlock-Fir	BL0730	BL0730T
	7- 35	Hemlock-Fir	BL0735	BL0735T

Management Unit	Analysis Unit	Description	Base Yield Table	Regenerated Yield Table
	8- 5	Hemlock-Cedar	BL0805	BL0805T
	8- 10	Hemlock-Cedar	BL0810	BL0810T
	8- 15	Hemlock-Cedar	BL0815	BL0815T
	8- 20	Hemlock-Cedar	BL0820	BL0820T
	8- 25	Hemlock-Cedar	BL0825	BL0825T
	8- 30	Hemlock-Cedar	BL0830	BL0830T
	8- 35	Hemlock-Cedar	BL0835	BL0835T
	8- 40	Hemlock-Cedar	BL0840	BL0840T
	9- 20	Alder	BL0920	BL0220T
	9- 25	Alder	BL0925	BL0225T
	9- 30	Alder	BL0930	BL0230T
	9- 35	Alder	BL0935	BL0235T
	9- 40	Alder	BL0940	BL0240T
	10- 20	Alder-Conifer Mix	BL1020	BL0220T
	10- 25	Alder-Conifer Mix	BL1025	BL0225T
	10- 30	Alder-Conifer Mix	BL1030	BL0230T
	10- 35	Alder-Conifer Mix	BL1035	BL0235T

8.8.5 Species Conversion

With the exception of alder leading stands in Johnstone Strait, TimberWest does not have an explicit silviculture program to convert less-desirable forest types to more desirable forest types.

Alder stands are currently included in Development Plans and are harvested according to economic opportunity (see Section 6.14.1). Species conversion generally occurs following harvest. Alder leading stands are assumed to regenerate to into a Fir-cedar stand. This assumption is consistent with TimberWest's operational experience in Johnstone Strait. Site indices remain unchanged.

Table 31. Species conversion.

Existing Analysis Unit	Area to be Treated	Analysis Unit Regenerated To	Yield Table Regenerated To
9- 20 – Alder	All areas harvested	Fir – Cedar	JS0220T
9- 25 – Alder	All areas harvested	Fir – Cedar	JS0225T
9- 30 – Alder	All areas harvested	Fir – Cedar	JS0230T
9- 35 – Alder	All areas harvested	Fir – Cedar	JS0235T
9- 40 – Alder	All areas harvested	Fir – Cedar	JS0240T
10- 20 - Alder Conifer Mix	All areas harvested	Fir – Cedar	JS0220T

Existing Analysis Unit	Area to be Treated	Analysis Unit Regenerated To	Yield Table Regenerated To
10- 25 - Alder Conifer Mix	All areas harvested	Fir – Cedar	JS0225T
10- 30 - Alder Conifer Mix	All areas harvested	Fir – Cedar	JS0230T
10- 35 – Alder Conifer Mix	All areas harvested	Fir – Cedar	JS0235T

8.8.6 Genetic Gain

As noted in section 8.9.1, TimberWest maintains the Mount Newton seed orchard which provides genetically improved seed for TFL 47.

A report[21] prepared for TimberWest's private timberlands suggested the following gains were currently achievable:

Douglas-fir	8%
Cedar	5%

The genetic gains assume that 15%[22] of the yield at time of harvest will be from unimproved seed.

The above yield increase are applied as parameters in the COMPLAN timber supply model to all Douglas-fir and cedar leading stands regenerated after 1999. The genetic gain applied to the yield curves will be prorated according to the percentage of Douglas-fir and redcedar within these stands.

8.9 Silviculture History

8.9.1 Existing Managed Immature

TimberWest maintains the Mount Newton seed orchard in Saanich on southern Vancouver Island. The seed orchard produces improved seed for TimberWest's Crown timber tenures and private timberlands. The company established its first clone banks in 1961.

As noted in the TFL annual report for 1970, the first artificial regeneration was carried out by the company in Johnstone Strait and Bonanza Lake management units in 1969..

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[21] Projected Incremental Volumes from Genetic Improvement for Private Lands of TimberWest Forest – 1998 to 2038, D.T. Lester, Genetic Resource Management Consulting, pp 8.

[22] The genetic gain is only applied to the fir and cedar component of a stand. For example, a "typical" fir-hemlock stand might have 70% fir, 25% hemlock and 5% cedar. The genetic gain is applied to 75% of the stand (the fir & cedar). Therefore the assumption is that 75% x 85% = 64% of the future crop from this stand will originate from superior (genetically improved) seed.

"The first planting in the Johnstone Strait and Bonanza lake blocks was carried out in 1969; 100 acres on Quadra Island, 738 acres along Bonanza Lake."[23]

Based on the management history of the Johnstone Strait and Bonanza Lake units (table 32) it is felt that the majority of stands established after 1973 were fully stocked. For this reason existing immature stands established prior to 1974 use VDYP natural stand yield curves. Stands established 1974 and later use TIPSY generated managed stand yield curves.

Table 32. Immature management history TFL 47 1974-1998.

Activity	Johnstone Strait	Bonanza Lake	Total[24]
Planting	12,440	6,859	19,299
Pre-Commercial Thinning	3,867	4,397	8,264
Fertilization	1,314	0	1,314
Total Area Treated	**17,621**	**11,256**	**28,877**
Area harvested 1974- 1998	12,425	9,435	21,860

The areas reported in table 32 are summarized from the TFL annual reports.

8.9.2 Backlog and Current Non-Stocked Areas (NSR)

There are no areas in Johnstone Strait or Bonanza Lake classified as backlog NSR. All areas of NSR are considered to be current NSR and will be stocked within two years. Table 33 shows the area of current (1998) NSR by management units.

Table 33. Backlog and current NSR

Management Unit	Backlog Area (ha)	Backlog Years Until Stocked	Current (1998) NSR Area	Current Years Until Stocked	Total Area
Johnstone Strait	0	0	500	2	500
Bonanza Lake	0	0	270	2	270

[23] Tree Farm Licence No. 2, Management Plan No. 4, Crown Zellerbach Canada Limited, Section 1.4323, June, 1970.
[24] Areas may overlap.

9 Protection

9.1 Unsalvaged Losses

A reduction of 1.0% will be made to the gross harvest rate to account for unrecoverable losses from fire, possible epidemic infestations, windthrow and other factors not accounted for in the volume estimates.

Fire

There is no long term history of fire in TFL 47 as a significant factor in contributing to unsalvageable volume loss. Over the past 24 years, Johnstone Strait has lost approximately 8 ha. to fire (0.3 ha/year – approx. 0.0003%) , Bonanza Lake approximately 25 ha. (1 ha/year – approx. 0.003%). Therefore, no direct reduction is made.

Insect and Disease

Generally, there is a low incidence of forest health factors that may influence future timber yields in Johnstone Strait or Bonanza Lake.

There are low occurrences of Balsam Woolly Aphid in Bonanza lake and minor occurrences, in older second growth balsam (Abies species) stands on East and West Thurlow islands in Johnstone Strait.. These infestations are dealt with by targeting infested stands for harvest and limiting the planting of balsam in areas expected to have a moderate to high risk of infestation.

There are low occurrences of hemlock sawfly in the Bonanza Lake. The sawfly has yet to be detected on TFL lands within the Johnstone Strait management unit.

Both the hemlock sawfly and Balsam Wooly Aphid are monitored through on-going reconnaissance.

Root diseases within the TFL are not normally a concern. Incidence of root rot is greatest on Quadra Island. Both Phellinus and Armellaria occur, but are generally restricted to small, isolated pockets. Infected areas greater than 0.1 hectare within a proposed block are generally targeted for clearcutting followed by stump removal.

Windthrow and Modified Harvest Blocks

Blowdown of timber occasionally occurs in small pockets or on exposed edges created by harvesting. This is usually a result of severe winter, wind storms. TimberWest's currently salvages blowdown dependent on accessibility and economics. Situations may occur where blowdown is left to enhance biodiversity.

Losses due to windthrow and/or modified harvest blocks will be incorporated into the 1.0% reduction identified above.

Table 34. Unsalvaged losses for Johnstone Strait and Bonanza Lake.

Management Unit	Cause	Gross Losses Percent	Volume Salvaged Percent	Unsalvaged Percent
Johnstone Srait	Fire	<0.01%	0%	<0.01%
	Insect/Windthrow	Nil	Nil	Nil
	Windthrow	1%	0%	1%
	Other	Nil	Nil	Nil
	Total Unrecovered losses	**1%**	**0%**	**1%**
Bonanza Lake	Fire	<0.01%	0%	<0.01%
	Insect/Windthrow	Nil	Nil	Nil
	Windthrow	1%	0%	1%
	Other	Nil	Nil	Nil
	Total Unrecovered losses	**1%**	**0%**	**1%**

10 Integrated Resource Management

10.1 Forest Resource Inventories

The non-timber inventories listed by management unit in the table following are mapped in our GIS and considered in the determination of the timber harvesting land base (Section 6.1) and forest cover requirements (Section 10.2).

Table 35 Non-Timber Resource Inventory Status.

Unit	Non-Timber Resource Inventory	Standard/Source	Mapped Scale	Inventory Year	Date Accepted By
Johnstone Strait	Recreation	Chapter Six of Ministry of Forests Recreation Manual MOF July 1988 Mapped by Jeremy B. Webb, Recreation Resource Consultant 3156 Cobble Hill Road Cobble Hill, B.C.	1:20,000	1993/94	Mar. 23/95 K.Collingwood Mgr Van. Region
	Soils Es	Terrain Classification System for BC, MOE Manual December 1988 Mapped by Denny Manard, P. Geo.	1:20,000	1992	Mar. 23/95 K.Collingwood Mgr Van. Region
	Plantation Ep	Mapped by A.N. Chatterton, RPF P. Geo., Forest Pedologist, IRAS of TimberWest Forest Limited	1:20,000	1993	Mar. 23/95 K.Collingwood Mgr Van. Region
	Avalanche Ea	Forest Inventory Manual Chapter 2 1984 MOF Mapped by A.N. Chatterton, RPF,	1:20,000	1993	Mar. 23/95 K.Collingwood Mgr Van.

Unit	Non-Timber Resource Inventory	Standard/Source	Mapped Scale	Inventory Year	Date Accepted By
		P. Geo, IRAS of TimberWest Forest Limited			Region
	Wildlife Ew	Mapped by D.J. Lindsay, R.P. Bio. Fish and Wildlife Biologist, IRAS of TimberWest Forest Limited	1:20,000	1993	Mar. 23/95 K.Collingwood Mgr Van. Region
	Watershed Eh	MOE Water Management Branch Water Licence Master List Mapped by A.N. Chatterton, RPF, P. Geo, IRAS of TimberWest Forest Limited	1:20,000	1993	Mar. 23/95 K.Collingwood Mgr Van. Region
	Viewscape	Visual Landscape Inventory Procedures and Standards Manual, MoF, May, 1997. Mapped by Jeremy B. Webb, Recreation Resource Consultant 3156 Cobble Hill Road Cobble Hill, B.C.	1:20,000	1999	K.Collingwood Mgr Van. Region
	Accessible/ Operability	Mapped as per TFL 46 Terms of Reference. Operability mapping submitted to MoF as per letter dated February 12, 1992 by Alec Orr-Ewing, Gilbert Brennenstuhl and Rory Hill of TimberWest Forest Limited	1:20,000	1993	Aug 23, 1995 (Blks 1-3), Blks 4-12 Nov. 15, 1995, K.Collingwood Mgr Van. Region
Bonanza Lake	Recreation	Chapter Six of Ministry of Forests Recreation Manual MOF July 1988 Mapped by Jeremy B. Webb Recreation Resource Consultant 3156 Cobble Hill Road Cobble Hill, B.C.	1:20,000	1993/94	Mar. 23/95 K.Collingwood Mgr Van. Region
	Terrain Stability & Es	Terrain Classification System for BC, MOE Manual December 1988 Mapped by Denny Manard, P. Geo.	1:20,000	1992	Mar. 23/95 K.Collingwood Mgr Van. Region
	Plantation Ep	Mapped by A.N. Chatterton, RPF P. Geo., Forest Pedologist, IRAS Of TimberWest Forest Limited	1:20,000	1993	Mar. 23/95 K.Collingwood Mgr Van. Region
	Avalanche Ea	Forest Inventory Manual Chapter 2 1984 MOF Mapped by A.N. Chatterton, RPF, P. Geo, IRAS of TimberWest Forest Limited	1:20,000	1993	Mar. 23/95 K.Collingwood Mgr Van. Region
	Wildlife Ew	Mapped by D.J. Lindsay, R.P. Bio. Fish and Wildlife Biologist, IRAS Of TimberWest Forest Limited	1:20,000	1993	Mar. 23/95 K.Collingwood Mgr Van. Region
	Watershed Eh	MOE Water Management Branch Water Licence Master List	1:20,000	1993	Mar. 23/95 K.Collingwood

Unit	Non-Timber Resource Inventory	Standard/Source	Mapped Scale	Inventory Year	Date Accepted By
		Mapped by A.N. Chatterton, RPF, P. Geo, IRAS of TimberWest Forest Limited			Mgr Van. Region
	Viewscape	"Visual Landscape Inventory: Procedures and Standards, May, 1997. Mapped by W. Matkoski , V.M. Resource Consulting.	1:20,000	1999	
	Accessibility /Operability	Mapped as per TFL 46 Terms of Reference. Operability mapping submitted to MoF as per letter dated February 12, 1992 by Alec Orr-Ewing, Gilbert Brennenstuhl and Gary Lawson, of TimberWest Forest Limited	1:20,000	1993	Aug. 23/95 K.Collingwood Mgr Van. Region

10.2 Forest Cover Requirements

10.2.1 Forest Cover Objectives - Rationale

For the base case, forest cover requirements are used to constrain harvesting to meet visual quality objectives (section 10.2.1.1)

10.2.1.1 Visual Quality Objectives

The visual landscape inventories were updated in 1999 for the Johnstone Strait and Bonanza Lake management units of TFL 47.

The mapped visual inventory polygons were grouped by the recommended Visual Quality Class (VQC) and Visual Absorption Capability (VAC) and assigned a maximum percent denudation according to table 3 of the MoF publication "Procedures for Factoring Visual Resources into Timber Supply Analysis", Ministry of Forests, March, 1998. The maximum of the denudation range was selected since it was felt this best reflected the current visual management practices.

A digital terrain model was then used to assign an average slope to each VQC/VAC combination and the tree height required to meet Visual Effective Green-up (VEG) calculated (table 36). The VEG tree height was determined from table 6, "Tree height required to meet VEG by percent slope for well stocked stands" in the previously mentioned publication.

The maximum denudation percentages have not been increased to account for the Chief Forester's recent VQO "buyback" initiative.

Table 36. Maximum denudation percentages for visual landscape polygons

Management Unit	VQC	VAC	Total Area	Forest Area	Avg. Slope	Percent Denudation	VEG ht.
Johnstone Strait	R	L	416	386	71%	5%	8.5
	R	M	3,571	3,302	33%	5%	6.0
	R	H	852	640	25%	5%	5.0
	PR	L	700	672	50%	15%	7.5
	PR	M	21,193	19,925	37%	15%	6.5
	PR	H	5,104	4,923	32%	15%	6.0
	M	L	755	697	56%	25%	8.0
	M	M	8,470	7,975	43%	25%	6.5
	M	H	5,961	5,770	32%	25%	6.0
	MM	M	453	431	50%	40%	7.0
	MM	H	459	448	33%	40%	6.0
			47,934	**45,169**			
Bonanza Lake	PR	M	896	875	33%	15%	6.0
			896	**875**			

Visually Effective Green-up (VEG) is assumed to occur when the stand height reaches the VEG height. The percent denudation specifies the maximum area of the mapped visual polygon that can be less than green-up (VEG) height. Harvesting is restricted until VEG ht. has been achieved. The time required for the regenerated stands to reach this height is based on TIPSY height/age relationship, for the stands within the visual polygon. The site indices used in these calculations are forest stand specific.

10.2.1.2 Recreation Opportunity Spectrum

Recreation was modeled as a reduction to the harvestable land base (section 6.13.1).

10.2.1.3 Winter Range

Ungulate winter range is modeled as area deductions for the mapped wildlife areas (section 6.11) and the mapped wildlife ESA area - Ew1, Ew2, Ewz. (section 6.8)

10.2.1.4 Forest Ecosystem Network - FEN

As discussed in section 6.17, the mapped forest ecosystem network (FEN) is not considered a constraint to harvesting

10.2.1.5 Adjacent Cutblock Green-up

The requirement that a cutblock cannot be harvested until the adjacent blocks are greened-up is modeled by applying the "four pass" rule. This rule requires that a maximum of 25% of the forested area can be occupied by trees less than 3.0 meters in height. This constraint will be applied to all areas outside mapped visual landscape polygons. This assumption is tested in the "Green-up /Adjacency" sensitivity analysis (table 1).

10.2.1.6 Landscape Level Biodiversity

Landscape level biodiversity is modeled according to Appendix II of the Provincial Guide for the Submission of Timber Supply Analysis Information Packages for Tree Farm Licences, "*Incorporating Biodiversity Landscape Units in the Timber Supply Review*". Seral stage constraints are applied to the "old" timber component using a weighted target from the Biodiversity Guide Book on the proportional emphasis of 10% high, 45% intermediate and 45% low.

Digital draft landscape unit boundaries obtained from the Ministry of Forests in November, 1998 are used to define the landscape units. BEC variants are determined from the Terrestrial Ecosystem Mapping (TEM) recently complete for the two management units. The resulting seral stage constraints are summarized in Appendix V.

TimberWest's estimate of the most likely biodiversity emphasis that will be assigned to individual landscape units as a result of the Vancouver Island Land Use Planning (VILUP) and Central Coast Land and Coastal Resource Management Planning (CCLCRMP) processes is modeled as a sensitivity analysis.

10.2.1.7 Reductions to Reflect Volume Retention in Cutblocks

It is estimated that under the Forest Practices Codes, over the longer term, approximately 7% of the stand volume will be retained for "in-stand" biodiversity. The majority of this will be accounted for by existing area deductions for riparian management, ungulate winter range, foreshore buffers, environmentally sensitive mapping etc.

An area reduction was made to account for wild life trees and wild life tree patches (section 6.17.5). No additional volume deduction is made.

10.2.1.7.1 Riparian Management Zones (RMZ)

As discussed in section 6.9, riparian management zones are modeled as a reduction to the harvestable land base. No additional reductions are made to reflect volume retention in cutblocks.

Table 37. Riparian management zone - forest cover requirements.

Riparian Class	Length	RMZ Width	RMZ Area	Maximum Disturbance	Minimum Retention	Volume retention
Not applicable – see section 6.9						

10.2.1.7.2 Wildlife Trees (WT) and Patches (WTP)

Managing for wildlife trees and tree patches is modeled as a reduction to the harvestable land base (section 6.17.5). No further volume deductions are made.

10.2.1.8 Managing Identified Wildlife

Managing for wildlife habitat is modeled as a reduction to the harvestable land base (section 6.11). No additional forest cover constraints or volume reductions to future yields are applied to account for identified wildlife.

A summary of the Ministry of Environment, Lands and Park's identified wildlife strategy for the Campbell River and Port McNeill Forest Districts is given in appendix VI.

10.2.1.9 Community Watersheds

There are no community watersheds designated under the Forest Practices Code in either the Johnstone Strait or Bonanza Lake Management Units.

10.2.1.10 Higher Level Plans

Currently there are no higher level plans, under the Forest Practices Code, in place for the Johnstone Strait or Bonanza Lake management units of TFL 47.

It is anticipated that during the term of MP 3, that as a result of the Vancouver Island Land Use Planning (VILUP) and Central Coast Land and Coastal Resource Management Planning (CCLCRMP) planning process, higher level plans will be implemented to meet biodiversity emphasis targets. The potential impact of these plans is modeled as a sensitivity option.

10.2.1.11 Other Resource Emphasis

No other resource issues are modeled in the timber supply analysis.

10.3 Timber Harvesting

10.3.1 Minimum Harvestable Age/Merchantability Standards

First entry ages used in the timber supply analysis are approximations of financial rotation. In practice financial rotation is stand-specific and varies depending on economic conditions such as log markets and interest rates, logging chance and log quality.

For purposes of timber supply modeling, first entry ages have been determined on the basis of a minimum average stand DBH of 30 cm and minimum volume of 300 m3/ha (12.5+ DBH, net of DWB). In the event that these criteria are not met prior to culmination age, culmination age is used.

Forest cover requirements will also result in many stands being harvested beyond the proposed first entry ages.

Table 38. Minimum merchantability standards.

Management Unit	Species Mix	AU	First Entry Age	M^3/ha @ first entry	Avg. Stand DBH @ first entry	Culmin. Age	M^3/ha @ culmin. Age	Avg. Stand DBH @ culmin. Age
Johnstone Strait	Fir	01-15	107	275	25	107	275	25
		01-20	88	353	27	88	353	27
		01-25	75	484	30	76	491	30
		01-30	62	522	30	71	603	33
		01-35	59	522	30	67	598	33
		01-40	50	561	30	64	739	36
	Fir-Cedar	02-15	107	305	25	107	305	25
		02-20	88	395	26	88	395	26
		02-25	75	524	29	75	524	29
		02-35	65	600	30	70	647	32
		02-40	60	603	30	62	623	31
	Fir-Hemlock	03-15	96	306	24	96	306	24
		03-20	80	394	26	80	394	26
		03-25	68	522	28	68	522	28
		03-30	63	629	30	63	629	30
		03-35	60	623	30	62	644	31
		03-40	52	676	30	60	788	33
	Fir-Alder	04-25	60	328	27	60	328	27

Management Unit	Species Mix	AU	First Entry Age	M^3/ha @ first entry	Avg. Stand DBH @ first entry	Culmin. Age	M^3/ha @ culmin. Age	Avg. Stand DBH @ culmin. Age
		04-35	58	429	30	60	444	31
		04-40	51	464	30	57	521	32
	Cedar -	05-10	126	262	26	126	262	26
	Conifer Mix	05-15	110	354	29	110	354	29
		05-20	89	431	30	102	497	33
		05-25	74	452	30	93	580	36
		05-30	59	443	30	85	673	41
		05-35	57	487	30	79	698	39
	Hemlock	06-10	117	274	26	117	274	26
		06-15	93	358	27	93	358	27
		06-20	80	418	28	80	418	28
		06-25	68	489	30	69	496	30
		06-30	55	513	30	59	552	31
		06-35	44	525	30	51	614	33
		06-40	44	537	30	50	615	33
	Hemlock-	07-10	127	301	26	127	301	26
	Fir	07-15	107	413	29	107	413	29
		07-20	91	479	30	94	495	31
		07-25	72	531	30	75	553	31
		07-30	58	550	30	62	590	31
		07-35	47	577	30	54	670	33
	Hemlock-	08-10	127	283	27	127	283	27
	Cedar	08-15	110	363	29	110	363	29
		08-20	89	430	29	89	430	29
		08-25	71	469	30	75	496	31
		08-30	58	490	30	64	542	32
		08-35	48	508	30	53	564	32
	Alder	09-20	59	204	25	59	204	25
		09-25	39	187	24	39	187	24
		09-30	26	214	24	26	214	24
		09-35	20	239	24	20	239	24
	Alder-	10-15	68	257	25	68	257	25
	Conifer	10-20	60	264	25	60	264	25
		10-25	60	320	28	60	320	28
		10-30	40	374	27	40	374	27
		10-35	34	432	27	34	432	27
Bonanza Lake	Fir	01-20	86	390	28	86	390	28
		01-25	75	481	30	75	481	30
		01-30	62	522	30	71	603	33
		01-35	60	531	30	69	617	33
		01-40	50	565	30	66	769	37

Management Unit	Species Mix	AU	First Entry Age	M^3/ha @ first entry	Avg. Stand DBH @ first entry	Culmin. Age	M^3/ha @ culmin. Age	Avg. Stand DBH @ culmin. Age
	Fir-Cedar	02-15	104	380	30	111	409	32
		02-20	87	446	28	87	446	28
		02-25	77	548	30	77	548	30
		02-30	67	601	30	74	667	32
	Fir-Hemlock	03-20	77	422	26	77	422	26
		03-25	67	517	28	67	517	28
		03-30	62	626	30	63	637	30
		03-35	60	630	30	62	651	31
		03-40	51	669	30	61	811	34
	Fir-alder	04-40	34	339	30	48	509	38
	Cedar-Conifer	05-10	124	267	26	124	267	26
		05-15	110	351	28	110	351	28
		05-20	91	423	30	107	501	34
		05-25	72	453	30	92	593	37
		05-30	59	455	30	106	904	53
		05-40	56	520	30	79	763	40
	Hemlock	06-10	124	299	26	124	299	26
		06-15	94	376	27	94	376	27
		06-20	79	427	28	79	427	28
		06-25	67	497	30	67	497	30
		06-30	54	525	30	58	566	31
		06-35	46	543	30	52	618	32
		06-40	46	555	30	51	619	32
	Hemlock-Fir	07-10	131	299	26	131	299	26
		07-15	110	353	28	110	353	28
		07-20	90	485	30	90	485	30
		07-25	72	533	30	75	556	31
		07-30	60	580	30	66	640	32
		07-35	46	587	30	54	697	33
	Hemlock-Cedar	08-10	129	294	27	129	294	27
		08-15	104	398	28	104	398	28
		08-20	84	469	29	84	469	29
		08-25	72	547	30	72	547	30
		08-30	59	514	30	64	560	32
		08-35	48	517	30	54	585	32
		08-40	45	495	30	52	576	33
		08-50	31	429	30	45	666	38
	Alder	09-20	48	194	24	48	194	24
		09-25	37	205	24	37	205	24
		09-30	24	206	23	24	206	23
		09-35	21	247	24	21	247	24

Management Unit	Species Mix	AU	First Entry Age	M^3/ha @ first entry	Avg. Stand DBH @ first entry	Culmin. Age	M^3/ha @ culmin. Age	Avg. Stand DBH @ culmin. Age
	Alder-Conifer Mix	10-25	57	376	28	57	376	28
		10-30	33	321	25	33	321	25
		10-35	48	454	30	49	464	30

The merchantability standards shown in table 39 represent natural (unmanaged) stands. Standards for managed stands are given in appendix VII.

The impact of first entry ages on long-term harvest rates is explored in the "minimum harvest age" sensitivity analysis (table 1).

10.3.2 Operability

Operability is discussed in Section 6.5.

Table 39. Operability Approved

Management Unit	Date Approved	Approved By:
Johnstone Strait	Blocks 1 – 3, Aug 23, 1995 Blocks 4-12, Nov. 15, 1995	K.Collingwood, Manager Van. Region, MoF
Bonanza Lake	Aug. 23, 1995	K.Collingwood Manager Van. Region, MoF

Table 40. Harvest methods.

Management Unit	Harvest Method	Area (harvestable)
Johnstone Strait	Conventional	73,136
	Helicopter	183
Beaver Cove	Conventional	21,183
	Helicopter	1,059

10.3.3 Initial Harvest rate

The initial harvest rate for all timber supply options is the currently approved AAC.

10.3.4 Harvest Rules

Harvest priority is modeled using an "oldest first" harvesting rule. However, there is some concern that for the Johnstone Strait management unit, the "oldest first" rule may not be completely realistic. The harvesting history of this unit with its many islands has resulted in patches of older timber that would best be logged after adjacent immature stands have reached merchantability. The sensitivity of the Johnstone Strait timber supply to the "oldest first" rule is tested in the "Johnstone Strait Old Growth Depletion" sensitivity analysis (table 2).

Table 41 . Harvest rule.

Harvest Rule	Description
Oldest first	

10.3.5 Harvest Profile

TimberWest's stated management objective for the TFL is to "*to manage the TFL .. for the production of pulp and sawlogs*[26]" The current management objectives are not linked to a specific species profile over time.

For the first two decades of the planning horizon, the model will harvest the volumes specified in the twenty year development plan. Over the medium to longer term the objective will be to reach sustainable harvest levels while meeting forest cover constraints and harvest flow objectives.

Table 42. Harvest profile

Analysis Unit	% of Harvest Volume by Decade
Not applicable	

10.3.6 Silvicultural Systems – Base Case

Currently the TFL is primarily harvested by clearcutting and "clearcutting with reserves". While operationally there are some alternate harvesting systems used to manage special areas such as, riparian areas, visually sensitive sites, and ungulate winter ranges, these special management areas have been modeled in the timber supply analysis as either reductions to the harvestable land base or as forest cover constraints. Therefore, the effect of TimberWest's operational use of alternate silviculture treatments has been accounted for in the timber supply model.

No additional, non-clearcut harvesting systems have been modeled in the base case or related sensitivity analyses.

[26] Statement of Management Objectives, Options and Procedures (SMOOP) , TFL 47 MP #3, 1999.

10.3.6.1 Silvicultural Systems – Variable Retention

TimberWest's recently announced a commitment to phase out clearcut harvesting over the next four years. It is expected that clearcutting on TFL 47[27] will be eventually replaced by aggregate and dispersed retention.

TimberWest does not anticipate that moving to variable retention will reduce the current program of planting with genetically improved stock.

The impact of variable retention on long-term timber supply is analyzed as a timber supply option (Table 2 – Variable Retention).

10.3.6.2 Variable Retention – Dispersed

Under dispersed retention, 95% of the stems are harvested, the remaining 5% of the stems are retained for at least one rotation, randomly distributed across the harvested block.

The total impact on yield needs to consider reserving part of the stand (the leave trees) for at least twice the normal rotation age and the impact of the leave trees on the yield of the newly regenerating stand. The impacts on future yields will likely vary by species with less tolerant shade species such a Douglas-fir being impacted more and shade tolerant species such as western hemlock, redcedar and amabalis-fir being less impacted.

MacMillan Bloedel in their analysis[28] of the yield impacts of variable retention suggested that the yield beneath a residual stand is reduced proportional to the volume retained in the overstory.

For TimberWest's implementation of dispersed variable retention, this would mean that 95% of the trees are harvested on their normal rotation and 5% of the trees would be managed on an extended rotation – twice the normal rotation. Extending the harvest age reduces yield (m^3/ha/year) by approximately 15%. The trees regenerating beneath the residual stand would be managed on a normal rotation. It is estimated that these regenerating trees would suffer a 5% reduction in yield due to shading and competition for nutrients and water from the leave trees.

The resulting yield implications of dispersed retention can be summarized as follows:

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[27] TimberWest's intention to end clearcutting on TFL 47, does not include the Moresby Management Unit of TFL 47.

[28] A Forest Management Strategy for the 21st Century. Effects of Alternative Silviculture on Yield: Coastal BC Forests, N. Smith Senior Analyst (Growth and Yield), MacMillan Bloedel Nanaimo Woodlands, Draft, March 31, 1999, pp 68

	Yield Reduction
Leave trees - 15% growth loss on 5% of the stand	0.8%
Regenerating stems – 5% growth loss on 95% of the stand	4.8%
Total Impact of Dispersed Retention on Future Yields	**5.6%**

Details of this calculation are given in Appendix III – Dispersed retention harvest sequence)

This reduction in future yield is at least partially off-set by the reduction in the need to retain trees to meet FPC requirements for stand-level biodiversity.

10.3.6.3 Variable Retention – Aggregate

Under TimberWest's program of variable retention, the majority of the areas will be managed under aggregate retention. The intent is to maintain a maximum of 10% of the area in aggregate retention reserves.

As compared to clear-cutting, aggregate retention will increase the amount of "edge" within a cutblock. However, under TimberWest's proposed implementation of aggregate retention, a maximum of 10% of the area in aggregate retention blocks will be left in retention areas. It is assumed that for aggregate retention of 10% or less no yield reduction in the regenerating crop occurs. This assumption appears consistent with how future yields are currently handled under the BC Forest Practices Code – we currently assume that reserves such as riparian buffers, wildlife tree patches etc. within cutblocks under the FPC on TFLs have no impact on the yield of regenerating stands.

Table 43. Silviculture Systems.

Silviculture System	Analysis Units	% Retention	# of Entries	Time between Entries
Not applicable				

10.3.7 Harvest Flow Objectives

The harvest flow objectives are to:

- achieve an orderly transition from the current rate of harvest to the long term sustainable harvest. (modeled by not allowing the harvest levels to change more than 10% per decade)
- maintain the harvest levels identified in the 20 year development plan.

Table 44. Harvest flow objectives.

Management Unit	Harvest flow objectives for option:
Johnstone Strait and Bonanza Lake	A maximum change in harvest rate of ±10% per decade all options.

10.4 Other

There are no other timber supply issues being considered in the MP#3 timber supply analysis report.

11 Option Assumptions

Table 2, documents the Option timber supply analyses. The management assumptions and the intent of the options are described elsewhere in this document.

TimberWest

Appendix I

Conversion of pre-Forest Practices Code Stream Reach Classification to the Forest Practices Code Classification System. - TFL 47

TimberWest

Conversion of pre-Forest Practices Code Stream Reach Classification to the Forest Practices Code Classification System. - TFL 47

Introduction

Prior to the establishment of the BC Forest Practices Code (FPC), TimberWest classified the majority of the creeks in the Bonanza Lake and Johnstone Strait Management Units of TFL 47 according to the 1988 BC Coastal Fish Forestry Guideline. (See table 1).

The classified streams were coded on TimberWest's digital base maps. The base maps are used for both operational planning purposes at a scale of 1:5,000 and for landscape level planning at a scale of 1:20,000.

Table 1. Stream Classification - Fish Forestry Guidelines

Class	Description
I	Andromous salmonids or moderate to high levels of resident sports fish are present. Stream gradient is usually less than 8%.
II	Low level of resident sports fish are present. Stream gradient is usually 8% - 12%.
III	Resident non-sport fish are present. Stream gradient is usually 8%-20%.
IV	No fish are present and stream gradient is usually greater than 20%

Under the FPC, stream classes are essentially defined by the presence/absence of fish and stream width. (See Table 2)

Table 2. FPC Stream Classification and Riparian Buffers.

	Riparian Class	Channel Width (m)	Riparian Reserve Zone Width[29] (m)	Riparian Management Zone Width (m)	Total Riparian Management Area (m)[30]
Fish	S1	> 100	0	100	100
Streams	S1	> 20 ≤ 100	50	20	70
	S2	> 5 ≤ 20	30	20	50
	S3	≥ 1.5 ≤ 5	20	20	40
	S4	< 1.5	0	30	30
Non-fish	S5	> 3	0	30	30
Streams	S6	≤ 3	0	20	20

[29] In the field widths are minimum slope distance. For the purposes of this project the distances are mapped as horizontal distance.

[30] Riparian buffer widths are to be applied to each side of the stream. (i.e. the buffer widths are double those shown in table 2).

Conversion Process.

The FPC stream classification system requires data on stream widths, plus the presence or absence of fish.

The presence or absence of fish was included in the original classification system - classes I, II and III are fish bearing; class IV is non-fish bearing.

Within TimberWest's GIS, a "feature code" is attached to each stream segment. The feature are coded "CREEKDEF" 1 ..4 and "CREEKINDEF" 1 ..4. The "CREEKINDEF" refers to streams which appear as a non-continuous or indefinite features on the original source photography.

In the Bonanza Management Unit, a small number of streams were not classified (<1%). In the Johnstone Strait Management Unit, approximately 54% of the streams were not classified. Hence the presence or absence of fish is unknown. As an approximation for the presence or absence of fish, the digital stream data was overlayed on slope polygons generated from a TRIM, digital elevation model (DEM). Those unclassified streams on slopes > 20% where assumed to be non-fish bearing.

Stream width is not directly available, but can be implied from the map representation. Streams represented a single line on the base maps are likely < 20 meters in width. Features wider than this are most likely featured as double line rivers. Similarly, at the risk of overestimating, the amount of riparian area, all definite fish bearing steams can be classes as S2 (> 5 m < 20 m) and all non-fish bearing streams S5 (> 3 m).

Applying these rules to the Bonanza Management Unit, gives an estimated 7,177 ha. of riparian management area (see table 3). This represents approximately 18.9% of the total land base of the management unit.

Table 3. TFL 47 - Bonanza Lake Management Unit[31]

Feature Code	Slope Class from DEM	Stream Length within TFL 47 (Km)	Riparian Class	Riparian Reserve Zone (ha)	Riparian Management Zone (ha)	Total Riparian Area
CREEKDEF	<20%	1.1	S2	7	4	11

[31] The final implementation of the conversion process for the MP3 Information Report resulted in slightly different area estimates.

Feature Code	Slope Class from DEM	Stream Length within TFL 47 (Km)	Riparian Class	Riparian Reserve Zone (ha)	Riparian Management Zone (ha)	Total Riparian Area
	>20%	5.1	S5	-	30	30
CREEKDEF1	<20%	5.7	S2	34	23	57
	>20%	1.6	S2	10	6	16
CREEKDEF2	<20%	2.6	S2	16	10	26
CREEKDEF3	<20%	6.6	S2	40	26	66
	>20%	1.4	S2	8	6	14
CREEKDEF4	<20%	226.0	S5	-	1,356	1,356
	>20%	614.7	S5	-	3,688	3,688
CREEKINDEF	<20%	0.9	S3	4	4	8
	>20%	4.0	S6	-	16	16
CREEKINDEF1	< 20%	0.1	S3	1	1	1
CREEKINDEF4	<20%	113.5	S6	-	454	454
	>20%	348.2	S6	-	1,393	1,393
Sub-Total		**983.4**		**118**	**5,625**	**5,743**
RIVER1		41.7	S1 (> 20 m)	417	167	584
RIVER2		7.9	S1 (> 20 m)	79	32	111
RIVER3		45.0	S1 (> 20 m)	450	180	630
RIVER4		18.1	S5	-	109	109
Sub-Total		**112.8**		**946**	**487**	**1,434**
Total		**1,096.1**		**1,065**	**6,112**	**7,177**

Applying these rules to the Johnstone Strait Management Unit, gives an estimated 12,072 ha. of riparian management area (see table 4). This represents approximately 11.8% of the total land base of the management unit.

Table 4. TFL 47 - Johnstone Strait Management Unit[32]

Feature Code	Slope Class from DEM	Stream Length within TFL 47 (Km)	Riparian Class	Riparian Reserve Zone (ha)	Riparian Management Zone (ha)	Total Riparian Area
CREEKDEF	< 20%	397.4	S2	2,384	1,589	3,974
CREEKDEF	> 20%	423.5	S5	-	2,541	2,541
CREEKDEF1	<20%	115.5	S2	693	462	1,155
	>20%	39.9	S2	240	160	399
CREEKDEF2	<20%	7.5	S2	45	30	75
	>20%	1.2	S2	7	5	12

[32] The final implementation of the conversion process for the MP3 Information Report resulted in slightly different area estimates.

Feature Code	Slope Class from DEM	Stream Length within TFL 47 (Km)	Riparian Class	Riparian Reserve Zone (ha)	Riparian Management Zone (ha)	Total Riparian Area
CREEKDEF3	<20%	71.0	S2	426	284	710
	>20%	30.1	S2	180	120	301
CREEKDEF4	<20%	185.3	S5	-	1,112	1,112
	>20%	276.4	S5	-	1,658	1,658
CREEKINDEF	<20%	0.1	S3	1	1	1
CREEKINDEF1	<20%	9.5	S3	38	38	76
	>20%	2.2	S3	9	9	18
CREEKINDEF3	<20%	0.5	S3	2	2	4
	>20%	0.7	S3	3	3	6
CREEKINDEF4	<20%	7.9	S6	-	32	32
	>20%	6.6	S6	-	26	26
		1,568.7		**4,027**	**8,045**	**12,072**

-

Lakes and Wetlands

Under the FPC, lakes are classified L1-L4 based on size and biogeoclimatic zone (table 5).

Table 5. FPC Lake Classification - Coastal Forests

Lake Classification	Size (hectares)	Coastal Biogeoclimatic Zone
L1	> 5 ha.	All
L2	1-5 ha.	CWHxm, dm or ds
L3	1-5 ha.	Not CWHxm, dm, ds
L4	0.5 – 1 ha.	CWHxm, dm or ds
Not Classified	< 0.5 ha	Not CWHxm, dm, ds

Table 6. Riparian Management Area (RMA) - Lakes

Lake Riparian Class	Reserve Zone Width (m)	Management Zone Width (m)	Total RMA Width (m)
L1 (> 1,000 ha.)	0	0	0
L1 (< 1,000 ha.)	10	0	10
L2	10	20	30
L3	0	30	30
L4	0	30	30

Table 7. FPC Wetland Classification – Coastal Forests

Wetland Classification	Size (hectares)	Coastal Biogeoclimatic Zone
W1	> 5 ha.	All
W2	1-5 ha.	CWHxm, dm or ds
W3	1-5 ha.	Not CWHxm, dm, ds
W4	0.5 – 1 ha.	CWHxm, dm or ds
Not Classified	< 0.5 ha	Not CWHxm, dm, ds
W5	Wetland complex	All

Table 8. Riparian Management Areas (RMA) - Wetlands

Wetland Riparian Class	Reserve Zone Width (m)	Management Zone Width (m)	Total RMA Width (m)
W1 (< 1,000 ha.)	10	40	50
W2	10	20	30
W3	0	30	30
W4	0	30	30
W5 (< 1,000 ha.)	10	40	50

The biogeoclimatic zones for TFL 47 were identified in recent TEM mapping:

Management Unit	TFL	Biogeoclimatic Zone	Total (ha.)	Percent
Johnstone Strait	47	Atc	52	0%
Johnstone Strait	47	CWHdm	18,010	18%
Johnstone Strait	47	CWHmm1	4,652	5%
Johnstone Strait	47	CWHmm2	143	0%
Johnstone Strait	47	CWHvm1	36,746	36%
Johnstone Strait	47	CWHvm2	3,386	3%
Johnstone Strait	47	CWHxm	37,205	37%
Johnstone Strait	47	CWHxm1	49	0%
Johnstone Strait	47	CWHxm2	249	0%
Johnstone Strait	47	MHmm1	1,139	1%
Johnstone Strait	47	MHmmp	80	0%
Johnstone Strait	47		199	0%
Johnstone Strait Total			**101,910**	**100%**
Bonanza Lake	47	AT	1,158	3%
Bonanza Lake	47	ATp	33	0%
Bonanza Lake	47	CWHvm1	14,507	38%
Bonanza Lake	47	CWHvm2	10,639	28%

Management Unit	TFL	Biogeoclimatic Zone	Total (ha.)	Percent
Bonanza Lake	47	CWHxm2	3	0%
Bonanza Lake	47	MHmm1	8,934	23%
Bonanza Lake	47	MHmmp	1,513	4%
Bonanza Lake	47		1,233	3%
Bonanza Lake Total			**38,020**	**100%**

For purposes of timber supply modeling, the following buffers were generated.

Riparian Class	Buffer Width (metres each side of water feature)
L1	10
L2	30
L3	30
L4	30
S1	70
S2	50
S3	40
S4	30
S5	30
S6	20
W1	50
W2	30
W3	30
W4	30
W5	50

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Appendix II

Yield Tables Submitted Digitally to Ministry of Forests, Research Branch

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Appendix II

Yield Tables Submitted Digitally to Ministry of Forests, Research Branch

Input data files used to generate yield tables with VDYP and TIPSY.

Yield table	Source	TFL 47 - Management Unit	File name	Description
Managed Stand Yield Tables	BatchTIPSY Version 2.1 Alpha5	Bonanza Lake & Johnstone Strait	TW01.BTP	TIPSY Batch processing file
			TWTIP.DAT	Input data file for TW01.BTP
Natural Stands	VDYP Batch Version 6.4	Bonanza Lake & Johnstone Strait	TWDEF.TXT	VDYP line definition file
			TW.IDF	Input data file
			WBS47.dat	Waste and breakage factor file for TFL 47

The batch VDYP command used was of the form:

```
VDYPBAT -i tw.idf -o tw.odf -e tw.err -wbs wbs47.dat -
BATCHPROCESS TWDEF.txt
```

The resultant output tables are:

Yield table	File Name	Description
Natural Stands – Johnstone Strait & Bonanza Lake	TWVDYP.CSV	Comma separate file of stand yields (m3/ha) by age.
	TWVDYPHDR.CSV	Comma separate file providing first entry age, culmination age, MAI for each yield curve in TWVDYP.CSV
Managed Stands – Johnstone Strait & Bonanza Lake	TWTIP.CSV	Comma separate file of stand yields (m3/ha) by age.
	TWTIPHDR.CSV	Comma separate file providing first entry age, culmination age, MAI for each yield curve in TWTIP.CSV

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Appendix III

Dispersed Retention – Hypothetical Harvest Sequence

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Appendix III - Dispersed Retention

Nominal Stand:

m3/ha @ harvest	600 m3/ha
Harvest age	60 years
MAI	10.0 (m3/ha/year)
Dispersed Retention	95% of the stand volume is harvested - 5% of the volume is left as "leave trees"

Hypothetical Harvest Sequence Dispersed Retention

	Scenario # 1 Clearcut Harvest	Scenario # 2 VR – Dispersed Harvest	Leave Tree Standing Volume	Growth[3] on Regen.	Growth[4] on Leave Trees	Inventory[5] [m3] (Growth + Leave Trees) Immediately prior to next harvest	VR Harvest % of Clearcut	Reduction In Yield
MAI	10.0	9.5[1]	8.5[2]					
Hectares	1.00	0.95	0.05					
First Harvest 0 yrs	600	570					95.0%	**5.0%**
			30	541.5	25.5	597		
2nd Harvest + 60 yrs	600	567					94.5%	**5.5%**
			30	541.5	25.5	597		
3rd harvest +120 yrs	600	567					94.5%	**5.5%**

MAI:

[1]Under dispersed rotation the yield of the regenerating stand is assumed to be 95% of an equivalent non-shaded stand. 95% x 10 m^3/ha/year = 9.5 m^3/ha/year

[2]The "leave trees" are managed on an extended rotation (e.g. 120 years). The MAI over this extended rotation is assumed to be 15% less than the yield from a 60 year rotation = (100% - 15%) * 10 m^3/ha/year = 8.5 m^3/ha/year

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Growth:

[3]Growth on regeneration = MAI * Years * Hectares = 9.50 m^3/ha/year * 0.95 hectares * 60 years = 541.5 m^3

[4]Growth on leave trees = MAI * Years * Hectares = 8.50 m^3/ha/year * 0.05 hectares * 60 years = 25.5 m^3

[5]Inventory = Growth + leave Tree Volume = (541.5m^3 + 25.5 m^3) + 30.0 m3 = 597 m^3

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Appendix IV

Projected Incremental Volumes from Genetic Improvement for Private Lands of TimberWest Forest – 1998 to 2038

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Appendix V

Seral Stage Summary TFL 47 - Johnstone Strait and Bonanza Lake Management Units

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Seral Stage Summary for TFL 47 – Bonanza Lake and Johnstone Strait Management Units.

Landscape Unit	Draft BEO	NDT	BEC Variant	Seral Stage[33]	Forest ha.[34]	THLB	Non-Cont	Percent Non-Cont.	Target Draft BEO[35]	Draft BEO Target Mature + Old	TSA Blended Target[36]	TSA Blended Target Mature + Old
Bonanza	Interm.	NDT1	CWHvm1	Early	8,853	7,602	1,251	9%				
Bonanza		NDT1	CWHvm1	EarlyMature	3,005	2,648	357	3%				
Bonanza		NDT1	CWHvm1	Mature	409	306	103	1%	23%		16%	
Bonanza		NDT1	CWHvm1	Old	1,529	937	593	4%	13%	36%	14%	30%
			CWHvm1 Total		**13,797**	**11,492**	**2,304**					
Bonanza		NDT1	CWHvm2	Early	4,028	3,484	544	5%				
Bonanza		NDT1	CWHvm2	EarlyMature	16	13	3	0%				
Bonanza		NDT1	CWHvm2	Mature	121	80	41	0%	23%		16%	
Bonanza		NDT1	CWHvm2	Old	5,783	3,561	2,222	22%	13%	36%	14%	30%
			CWHvm2 Total		**9,947**	**7,137**	**2,809**					
Bonanza		NDT1	MHmm1	Early	345	278	67	1%				
Bonanza		NDT1	MHmm1	EarlyMature	18	3	15	0%				
Bonanza		NDT1	MHmm1	Mature	10	2	9	0%	17%		10%	
Bonanza		NDT1	MHmm1	Old	7,046	3,193	3,853	52%	19%	36%	20%	30%
			MHmm1 Total		**7,419**	**3,476**	**3,943**					
Bonanza		NDT5	AT	Old	29	1	27	96%	85%	85%	85%	85%

[33] Seral stages are defined by stand age - other stand level attributes were not considered.
[34] Forested area is only area within TFL 47.
[35] For "Low" Biodiversity Emphasis, targets can be phased in over two rotations. 33% of the target is to be achieved immediately, 66% after one rotation (70 years) and 100% after two rotations (140 years). The percent targets in the table represent 100% compliance after two rotations.
[36] The TSA blended target is weighted based on the target profile that 10% of the landscape units will be designated for High Biodiversity Emphasis (BEO), 45% Intermediate BEO and 45% Low BEO. The low component of the blended target is phased in over two rotations. The "blended targets" in the table represent 100% compliance after two rotations.

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Landscape Unit	Draft BEO	NDT	BEC Variant	Seral Stage[33]	Forest ha.[34]	THLB	Non-Cont	Percent Non-Cont.	Target Draft BEO[35]	Draft BEO Target Mature + Old	TSA Blended Target[36]	TSA Blended Target Mature + Old
			AT Total		**29**	**1**	**27**					
Broughton	Low	NDT1	CWHvm1	Early	171	152	18	1%				
Broughton		NDT1	CWHvm1	EarlyMature	506	445	60	5%				
Broughton		NDT1	CWHvm1	Mature	376	282	94	7%	5%		16%	
Broughton		NDT1	CWHvm1	Old	275	214	61	5%	13%	18%	14%	30%
			CWHvm1 Total		**1,328**	**1,094**	**234**					
Fulmore	Low	NDT1	CWHvm1	Early	4,900	4,230	669	4%				
Fulmore		NDT1	CWHvm1	EarlyMature	8,504	7,267	1,237	7%				
Fulmore		NDT1	CWHvm1	Mature	2,676	1,887	789	4%	5%		16%	
Fulmore		NDT1	CWHvm1	Old	2,076	1,452	624	3%	13%	18%	14%	30%
			CWHvm1 Total		**18,155**	**14,836**	**3,319**					
Fulmore		NDT1	CWHvm2	Early	292	253	38	2%				
Fulmore		NDT1	CWHvm2	EarlyMature	83	48	35	2%				
Fulmore		NDT1	CWHvm2	Mature	57	16	41	3%	5%		16%	
Fulmore		NDT1	CWHvm2	Old	1,208	895	313	19%	13%	18%	14%	30%
			CWHvm2 Total		**1,640**	**1,212**	**428**					
Fulmore		NDT1	MHmm1	Early	43	33	10	3%				
Fulmore		NDT1	MHmm1	EarlyMature	6	-	6	2%				
Fulmore		NDT1	MHmm1	Old	333	144	189	50%	19%	19%	20%	20%
			MHmm1 Total		**381**	**177**	**205**					
Fulmore		NDT2	CWHdm	Early	1,174	1,014	160	2%				
Fulmore		NDT2	CWHdm	EarlyMature	7,137	6,051	1,087	12%				
Fulmore		NDT2	CWHdm	Mature	524	358	167	2%	8%		19%	
Fulmore		NDT2	CWHdm	Old	381	300	81	1%	9%	17%	9%	28%
			CWHdm Total		**9,217**	**7,723**	**1,495**					
Gilford	Low	NDT1	CWHvm1	Early	3,260	2,826	434	6%				
Gilford		NDT1	CWHvm1	EarlyMature	2,914	2,528	386	5%				

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Landscape Unit	Draft BEO	NDT	BEC Variant	Seral Stage[33]	Forest ha.[34]	THLB	Non-Cont	Percent Non-Cont.	Target Draft BEO[35]	Draft BEO Target Mature + Old	TSA Blended Target[36]	TSA Blended Target Mature + Old
Gilford		NDT1	CWHvm1	Mature	1,024	831	193	3%	5%		16%	
Gilford		NDT1	CWHvm1	Old	498	417	82	1%	13%	18%	14%	30%
			CWHvm1 Total		**7,695**	**6,601**	**1,094**					
Gray	Low	NDT1	CWHvm1	Early	1,004	879	125	7%				
Gray		NDT1	CWHvm1	EarlyMature	665	598	67	3%				
Gray		NDT1	CWHvm1	Mature	22	19	3	0%	5%		16%	
Gray		NDT1	CWHvm1	Old	226	153	73	4%	13%	18%	14%	30%
			CWHvm1 Total		**1,917**	**1,649**	**268**					
Gray		NDT1	CWHvm2	Early	408	343	64	5%				
Gray		NDT1	CWHvm2	EarlyMature	28	26	1	0%				
Gray		NDT1	CWHvm2	Old	823	671	152	12%	13%	13%	14%	14%
			CWHvm2 Total		**1,258**	**1,041**	**218**					
Gray		NDT1	MHmm1	Old	168	118	49	29%	19%	19%		
			MHmm1 Total		**168**	**118**	**49**					
Gray		NDT2	CWHdm	Early	1,016	905	111	3%				
Gray		NDT2	CWHdm	EarlyMature	2,345	2,057	288	8%				
Gray		NDT2	CWHdm	Mature	213	158	55	1%	8%		19%	
Gray		NDT2	CWHdm	Old	140	122	18	0%	9%	17%	9%	28%
			CWHdmTotal		**3,714**	**3,242**	**472**					
Quadra	Interm.	NDT2	CWHmm1	Early	367	296	71	13%				
Quadra		NDT2	CWHmm1	EarlyMature	90	74	16	3%				
Quadra		NDT2	CWHmm1	Mature	5	-	5	1%	25%		19%	
Quadra		NDT2	CWHmm1	Old	105	93	12	2%	9%	34%	9%	28%
			CWHmm1Total		**566**	**463**	**104**					
Quadra		NDT2	CWHxm		279	262	16	0%				
Quadra		NDT2	CWHxm	Early	2,655	1,887	768	6%				
Quadra		NDT2	CWHxm	EarlyMature	8,315	5,034	3,281	25%				

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Landscape Unit	Draft BEO	NDT	BEC Variant	Seral Stage[33]	Forest ha.[34]	THLB	Non-Cont	Percent Non-Cont.	Target Draft BEO[35]	Draft BEO Target Mature + Old	TSA Blended Target[36]	TSA Blended Target Mature + Old
Quadra		NDT2	CWHxm	Mature	1,328	813	516	4%	25%		19%	
Quadra		NDT2	CWHxm	Old	645	420	225	2%	9%	34%	9%	28%
			CWHxmT otal		**13,222**	**8,417**	**4,806**					
Thurlow	Low	NDT1	CWHvm1	Early	1,651	1,350	301	6%				
Thurlow		NDT1	CWHvm1	EarlyMature	2,244	1,866	378	8%				
Thurlow		NDT1	CWHvm1	Mature	99	87	12	0%	5%		16%	
Thurlow		NDT1	CWHvm1	Old	640	504	135	3%	13%	18%	14%	30%
			CWHvm1Total		**4,634**	**3,807**	**826**					
Thurlow		NDT1	CWHvm2	EarlyMature	3	1	3	6%				
Thurlow		NDT1	CWHvm2	Mature	2	0	2	4%	5%		16%	
Thurlow		NDT1	CWHvm2	Old	41	37	4	8%	13%	18%	14%	30%
			CWHvm2Total		**46**	**38**	**8**					
Thurlow		NDT2	CWHdm	Early	165	147	18	1%				
Thurlow		NDT2	CWHdm	EarlyMature	1,574	1,335	239	11%				
Thurlow		NDT2	CWHdm	Mature	224	187	37	2%	8%		19%	
Thurlow		NDT2	CWHdm	Old	265	206	59	3%	9%	17%	9%	28%
			CWHdmTotal		**2,228**	**1,874**	**354**					
Thurlow		NDT2	CWHmm1	Early	1,500	1,280	220	6%				
Thurlow		NDT2	CWHmm1	EarlyMature	686	600	85	2%				
Thurlow		NDT2	CWHmm1	Mature	140	78	62	2%	8%		19%	
Thurlow		NDT2	CWHmm1	Old	1,389	961	428	12%	9%	17%	9%	28%
			CWHmm1Total		**3,714**	**2,919**	**795**					
Thurlow		NDT2	CWHmm2	Early	14	12	2	3%				
Thurlow		NDT2	CWHmm2	Mature	23	14	8	12%	8%		19%	
Thurlow		NDT2	CWHmm2	Old	35	14	21	29%	9%	17%	9%	28%
			CWHmm2Total		**71**	**40**	**31**					
Thurlow		NDT2	CWHxm		568	509	58	0%				

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Landscape Unit	Draft BEO	NDT	BEC Variant	Seral Stage[33]	Forest ha.[34]	THLB	Non-Cont	Percent Non-Cont.	Target Draft BEO[35]	Draft BEO Target Mature + Old	TSA Blended Target[36]	TSA Blended Target Mature + Old
Thurlow		NDT2	CWHxm	Early	5,955	5,094	861	4%				
Thurlow		NDT2	CWHxm	EarlyMature	8,472	6,659	1,814	9%				
Thurlow		NDT2	CWHxm	Mature	3,146	2,240	906	4%	8%		19%	
Thurlow		NDT2	CWHxm	Old	2,091	1,448	644	3%	9%	17%	9%	28%
			CWHxmTotal		**20,232**	**15,949**	**4,283**					

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Appendix VI

Identified Wildlife Strategies in the Campbell River and Port McNeill Forest Districts

IMPLEMENTATION CHART[37]
IDENTIFIED WILDLIFE STRATEGY JUNE 1, 1999 - JUNE 1, 2000

Identified Wildlife Species	Campbell River Forest District	Port McNeill Forest District
Tailed Frog	-Occurs on Mainland portion of district. -Sites may be investigated if they are brought forward	N.A.
American Bittern	NA	N.A.
Northern Goshawk	May occur in Mainland portion of district no information on distribution at present	N.A.
Queen Charlotte Goshawk	Priority species as this area appears to be central part of QC Goshawk breeding distribution - working with Don Doyle to establish priority site for the 1-2 WHA's allowed in this district	Priority species as this area appears to be central part of QC Goshawk breeding distribution -working with Don Doyle to establish priority site for the 1-2 WHA's allowed in this district
Marbled Murrelet	Priority for Landscape Unit planning and IWMS - survey of NW Van. Is to determine distribution and abundance. -WHA planning for MAMU is not as advanced in this district, therefore not expecting many proposals until LU planning gets underway	Priority for Landscape Unit planning and IWMS - working with Canfor in Lower Nimpkish Landscape Unit to conduct habitat assessments -will undertake planning by Landscape Unit to identify potential OGMA's
Cassin's Auklet	Occurs on offshore rocky islets that are generally protected -not a priority	Occurs on offshore rocky islets that are generally protected -not a priority
Sandhill Crane	NA	-nests in bogs on north Vancouver Is. -not likely to conflict with forestry
Keen's Long-eared Myotis	Work towards processing Knoll Cave WHA for MYKE maternity site near Tahsis -conduct further research into other potential hibernacula and roosts	-investigation of potential hibernacula
Vancouver Island Marmot	One colony exists on Mt. Washington ski development -IWMS will not provide protection for this species at this time	
Fisher	NA	No information at this time
Grizzly Bear	Occurs in Mainland portion of district - work with Tony Hamilton to determine priority areas -await direction from CCRMLP planning table	Occurs in Mainland portion of district - work with Tony Hamilton to determine priority areas -await direction from CCRMLP planning table
Mountain Goat	Occurs in Mainland portion of district - low probability of WHA work on this species as winter range is not contained in IWMS	Occurs in Mainland portion of district - low probability of WHA work on this species as winter range is not contained in IWMS

[37] From e-mail correspondence, Ian McDougall, Ministry of Environment Lands and Parks, April 5, 2000

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Identified Wildlife Species	Campbell River Forest District	Port McNeill Forest District
Douglas-fir/Garry oak-oniongrass	NA	NA

In addition, TimberWest has identified three Queen Charlotte Goshawk nests in the Johnstone Strait Management Unit of TFL 47, on Quadra, East Thurlow and West Cracroft islands. All in second growth forests.

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Appendix VII

Merchantability Standards Used to Model Managed Stands

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Minimum merchantability standards – managed stands. Derived from TIPSY

Management Unit	Species Mix	AU	First Entry Age	M3/ha @ First Entry	Avg. Stand DBH @ first entry	Culmin. Age	M^3/ha @ Culmin. Age	Avg. Stand DBH @ Culmin. Age
Bonanza Lake	Fir	01-15	120	147	20	120	147	20
		01-20	100	440	28	100	440	28
		01-25	76	513	30	80	541	31
		01-30	57	517	30	70	663	34
		01-35	55	527	30	70	704	35
		01-40	43	523	30	60	813	39
	Fir-Cedar	02-15	130	487	29	130	487	29
		02-20	100	521	30	100	521	30
		02-25	70	542	30	90	719	34
		02-30	54	542	30	80	884	38
	Fir-hemlock	03-10	150	210	22	150	210	22
		03-20	100	475	28	100	475	28
		03-25	76	557	30	90	672	33
		03-30	59	561	30	80	802	36
		03-35	55	556	30	70	754	35
		03-40	44	557	30	60	840	38
	Cedar-Conifer	05-10	170	251	23	170	251	23
		05-15	140	455	28	140	455	28
		05-20	100	568	30	110	633	31
		05-25	72	579	30	100	864	36
		05-30	52	558	30	90	1167	42
		05-40	37	604	30	70	1425	49
	Hemlock	06-10	180	297	24	180	297	24
		06-15	140	515	28	140	515	28
		06-20	107	614	30	120	699	32
		06-25	75	627	30	100	883	35
		06-30	57	648	30	70	857	34
		06-35	46	655	30	80	1259	44
		06-40	39	658	30	70	1334	46
	Hemlock-Fir	07-10	170	252	23	170	252	23
		07-15	140	425	27	140	425	27

TimberWest

Management Unit	Species Mix	AU	First Entry Age	M3/ha @ First Entry	Avg. Stand DBH @ first entry	Culmin. Age	M^3/ha @ Culmin. Age	Avg. Stand DBH @ Culmin. Age
		07-20	111	583	30	120	632	31
		07-25	76	595	30	100	814	35
		07-30	57	617	30	80	932	37
		07-35	45	640	30	70	1097	41
	Hemlock-Cedar	08-10	180	272	24	180	272	24
		08-15	140	488	28	140	488	28
		08-20	106	603	30	120	693	32
		08-25	74	608	30	100	872	35
		08-30	57	618	30	80	952	37
		08-35	43	599	30	70	1129	42
		08-40	36	627	30	60	1221	45
		08-50	24	540	30	40	1189	45
Johnstone Strait	Fir	01-10	150	114	18	150	114	18
		01-15	100	205	22	100	205	22
		01-20	100	367	26	100	367	26
		01-25	76	513	30	80	541	31
		01-30	57	517	30	70	663	34
		01-35	55	528	30	70	705	35
		01-40	43	523	30	60	813	39
	Fir-Cedar	02-10	160	167	20	160	167	20
		02-15	120	311	25	120	311	25
		02-20	100	443	28	100	443	28
		02-25	72	539	30	90	689	34
		02-35	53	548	30	70	784	36
		02-40	42	564	30	70	1084	44
	Fir-hemlock	03-10	150	171	21	150	171	21
		03-15	140	349	26	140	349	26
		03-20	110	461	28	110	461	28
		03-25	75	538	30	90	655	33
		03-30	57	543	30	80	810	37
		03-35	55	550	30	70	747	35
		03-40	44	563	30	60	850	38
	Fir-Alder	04-10	150	157	20	150	157	20
		04-20	110	425	28	110	425	28
		04-25	76	519	30	80	548	31
		04-35	55	529	30	70	709	35
		04-40	43	529	30	60	823	38

TimberWest

Management Unit	Species Mix	AU	First Entry Age	M3/ha @ First Entry	Avg. Stand DBH @ first entry	Culmin. Age	M^3/ha @ Culmin. Age	Avg. Stand DBH @ Culmin. Age
	Cedar-Conifer	05-10	160	283	24	160	283	24
		05-15	140	469	28	140	469	28
		05-20	98	566	30	110	645	32
		05-25	74	577	30	110	911	37
		05-30	56	575	30	90	1047	40
		05-35	48	595	30	80	1163	43
	Hemlock	06-15	140	517	28	140	517	28
		06-20	110	615	30	130	736	32
		06-25	76	628	30	100	872	35
		06-30	58	630	30	80	943	36
		06-35	45	648	30	80	1281	45
		06-40	35	670	31	60	1313	45
	Hemlock-Fir	07-10	170	231	22	170	231	22
		07-15	130	445	27	130	445	27
		07-20	111	571	30	120	618	31
		07-25	76	595	30	100	816	35
		07-30	58	608	30	80	899	37
		07-35	44	607	30	70	1079	42
	Hemlock-Cedar	08-15	140	458	28	140	458	28
		08-20	109	592	30	120	658	31
		08-25	75	604	30	100	852	35
		08-30	58	622	30	80	933	37
		08-35	44	615	30	80	1272	46
		08-40	34	649	30	60	1336	45

BRITISH COLUMBIA

C.C. Jim McPhalen
Bruce Storry
Dave Simpson

File: 19710-40/47

October 13, 2000

Gilbert Brennenstuhl
Manager, Forest Tenures
TFL Forest Ltd.
Suite 2300, 1055 West Georgia Street
P.O. Box 11101.
Vancouver, BC V6E 3P3

Dear Gibert Brennenstuhl:

Ministry of Forests staff have reviewed the information package submitted in preparation for the timber supply analysis for Management Plan No. 3 (MP No. 3) of Tree Farm Licence 47 (TFL 47).

The information package was submitted in two sections. The final version of the section concerning the Johnstone Straits and Bonanza Lakes Management Units was submitted by TFL Forest Ltd. and is dated April 2000. The final version of the section concerning the Moresby Island Management Unit is dated September 2000 and was prepared by Olympic Resource Management on behalf of J.S. Jones Sandspit Ltd. who is acting as an agent for TFL Forest Ltd.

I accept the information package for use in the TFL 47 timber supply analysis, subject to the following comments and conditions:

Johnstone Straits and Bonanza Lakes Management Units

For the Johnstone Straits Management Unit the inclusion in the area contributing to timber supply of alder stands is still an issue. In the timber supply analysis, please provide information showing the contribution to timber supply over time of each of the Fir-Alder, Alder/Decid., and Alder-conifer Mix analysis units.

Ministry of Forests Timber Supply Branch
Location: 3rd Floor, 595 Pandora Avenue Victoria, British Columbia
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Research Branch staff believe that the approach proposed for modelling variable retention likely underestimates the impact of variable retention on yield and this will be conveyed to the deputy chief forester at the AAC determination information session.

Moresby Island Management Unit

Please provide me with a hard copy of the information package with the appendices and yield tables attached.

In an appendix to the information package, please provide a table summarizing the input information used to generate the VDYP and TIPSY yield tables for each analysis unit.

The AVLs are based on old information. They have not been updated to account for areas that were harvested over the last approximately twenty years. This usually leads to an overestimate in volume. However, factors concerning outdated information used to generate the AVLs compensate for the overestimate so that the resulting AVLs likely approximate the actual volume of the old growth stands. Nevertheless, this issue introduces a source of uncertainty into the volume estimates that will be discussed at the AAC determination information session.

As discussed with Dwight Crouse of Olympic Resource Management:

- under Section 8.8.1, Silviculture Management Regimes, adjusted site indexes for the OLD analysis units will be applied in a sensitivity analysis, not in the base case.

- for sensitivity analysis #9 described in Table 29 on page 35, the percentage for the CWH should be 13.6 for all three rotations. For the MH it should be 19.9 percent. These are the same as the old seral requirement in the third rotation in the base case (i.e. after recruitment) and are the full requirement.

- for sensitivity analysis #10 described in Table 30 on page 36, the mature plus old seral targets should not be applied in the model.

- minimum merchantability standards proposed in the September 2000 version of the information package result in a considerable reduction compared to earlier versions in the volume per hectare at the minimum merchantable age for many of the AUs. Stirling Angus of J.S. Jones Ltd. agreed to review this issue. Please report to me what the outcome of this review revealed. Depending on the information provided, I may require additional sensitivity analysis to, in conjunction with sensitivity analysis #5, further clarify the sensitivity of the timber supply to changes in minimum merchantability standards.

I acknowledge that there may be differences of opinion over the information or approach used to derive the estimates in the information package. While neither the Ministry of Forests nor the Ministry of Environment, Lands and Parks endorse every aspect of the information presented in the information package, these differences can be addressed through the proposed sensitivity analyses and will be considered during the AAC determination.

Should issues arise during the subsequent timber supply analysis and related review process, or if the Deputy Chief Forester requires additional information for his determination, I may request further documentation and/or analysis.

Yours truly,

John B. Koch
Senior Analyst – Tree Farm Licences
Timber Supply Branch

pc: Stirling Angus, J.S. Jones Sandspit Ltd.
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Robert Stewart, Ministry of Environment, Lands and Parks Port

Charlie Klasen, Resource Tenures and Engineering Branch
Greg Gage, Vancouver Forest Region
Bud Koch, Timber Supply Branch
Rob Drummond, Resources Inventory Branch
Albert Nussbaum, Research Branch