

Arrow Timber Supply Area Timber Supply Review

Data Package

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District Manager
Arrow Forest District

Director
Timber Supply Branch

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1. Introduction

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

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

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

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

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

- 1) A short explanation of the data required;
- 2) Data table; and
- 3) The source of the data and comments.

This data package, while representing the best available knowledge and information today, is subject to change. As noted in several sections, until the timber harvesting land base is determined it is not possible to finalize the values shown in some of the tables in this package. In some cases the criteria are shown but the final value is not yet filled in. In these cases the columns show as gray shaded in the tables. In addition, if any major changes to management regimes occur over the next few months the timber supply analysis will attempt to capture these changes. The final timber supply analysis report will include a technical appendix that will highlight any changes made to this package.

2. Current Forest Management Considerations and Issues

2.1 Base case management assumptions

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

2.2 Statement of major forest management considerations and issues

The major forest management issues and considerations in the Arrow TSA are listed in Table 1 below. Where issues are defined within legislation, regulations or standards, a timber supply assessment will be made. If there are important uncertainties in defining current management, sensitivity analysis may assist in assessing the potential timber supply implications and assigning degrees of risk to timber supply during allowable annual cut (AAC) determination.

2. Current Forest Management Considerations and Issues

Table 1. Major forest management considerations

Consideration/issue	Description
Root rot	Growth of fir stands in the ICH and IDF biogeoclimatic zones is affected by root rot. This may make the volumes indicated by the managed stand yield tables (MSYT) optimistic. Partial cutting and commercial thinning initiatives may subject stands to additional risks. A sensitivity analysis will be conducted to review the potential effect of root rot on timber supply.
Operable land base	As part of a regional wood supply study, eight landscape units in the Arrow TSA were scrutinized for wood supply opportunities. This involved a review of existing operability assumptions under the Forest Practices Code (FPC) and current market conditions. Comparison of the existing with the proposed operability classification showed an increase in operable area. The additional areas will be assumed to contribute to timber supply in this analysis.
Kootenay-Boundary land use plan (KBLUP) implementation strategy	Government has approved the <i>Kootenay-Boundary Land Use Plan Implementation Strategy</i> as a policy statement. Forest practices designed to meet the objectives of this initiative, and that are current management will be represented in the base case.
Landscape-level biodiversity	Landscape unit boundaries and biodiversity emphasis objectives have been established by the Arrow Forest District Manager and approved by the Ministry of Environment, Lands and Parks (MELP) designated environment official. Contributions from all forested areas, including high elevation forests and national/provincial parks to meeting the objectives will be recognized.
Stand-level biodiversity	The wildlife tree requirements of the <i>Biodiversity Guidebook</i> will be addressed, as per current practice.
Wildlife	Forest cover guidelines will be applied to conserve and protect habitat for caribou and other ungulates.
Riparian habitats	The Arrow TSA has a substantial amount of riparian habitat. Riparian reserve and management zones have been established for these areas under the Forest Practices Code (FPC) and will be modelled in the analysis.
Community, domestic and regionally significant fish stream watersheds	Forest cover guidelines for these watersheds will be factored into the analysis.
Scenic landscapes, highway corridors and populated areas	Tourism and recreation are important commercial activities in the Arrow TSA. Visual quality objectives (VQO) and their associated forest cover guidelines will be factored into the analysis.

3. Inventories

3.1 Background information

Table 2 lists the inventories that will be used to define the timber harvesting land base, and the associated management themes to be used to model forest management activities. The data source and reliability, including any irregularities in the data and assumptions used in deriving the information, and quality assurance measures taken for non-standard data are also shown.

3. Inventories

Table 2. Inventory information

Data	Source	Vintage	Update	Scale
Arrow TSA forest cover (FC1) and road network files	Ministry of Forests (MoF) standard inventory files	1973	1997	1:20 000
Operability (Cutblocks identified above the operability line will be included in the operable area)	MoF Forest District non-standard inventory files	1991	1997	1:20 000
Biogeoclimatic classification	MoF standard inventory files	1991-1992	1998	1:50 000
Caribou habitat	MoF Forest District non-standard inventory files	1998	N/A	1:250 000
Ungulate winter habitat (non-caribou)	MoF Forest District non-standard inventory files	1998	N/A	1:50 000 plus some at 1:20 000
Dewdney Trail	MoF Forest Region	1997	N/A	1:20 000
Known wildlife stick nests	Ministry of Environment, Lands and Parks (MELP)	1998		1:20 000
Landscape units and biodiversity emphasis objectives (declared April 8, 1998)	MoF Forest District non-standard inventory files	1996-1997	1998	1:250 000
Visual landscape inventory	MoF non-standard inventory file	1995	1998	1:20 000
Watershed atlas (includes stream classification and community and domestic watersheds)	MoF Nelson Forest Region non-standard files	1997	N/A	1:20 000
Regionally significant fish streams	MELP	1998	N/A	1:20 000
Riparian management area mapping	MELP/MoF joint contract	1997	N/A	1:50 000
Slocan Valley pilot area	MoF Nelson Forest Region non-standard file	1991	N/A	1:20 000
Terrain hazard assessment	Arrow Forest District and licensees	1984-1998		Variable

3. Inventories

Data source and comments:

Forest cover

Map bases were shifted to UTM NAD83 datum and TRIM line features were incorporated in 1997. Disturbance update was done to October 1997. Ownership was updated where necessary.

Road systems

Existing road right-of-way was totalled for all roads within the Crown portion of the Arrow TSA not already accounted for by the forest cover inventory.

Operability

Operability lines were revised in 1991. As part of the analysis for the *Kootenay-Boundary Land Use Plan* (KBLUP) a total chance plan was created in 1997 for eight landscape units in the Arrow TSA. This project is considered to constitute a review of operable areas under current harvesting guidelines. The blocks located above the existing operability line will be added to the timber harvesting land base.

Biogeoclimatic subzones and natural disturbance types (NDT)

The biogeoclimatic inventory was completed in 1992 and was updated in 1998. Natural disturbance types have been derived from the biogeoclimatic ecosystem classification (BEC) and the *Biodiversity Guidebook* (e.g., ESSF south of the Arrow Lakes is NDT 2).

Caribou habitat

Defines the priority areas where Caribou habitat guidelines will apply.

Ungulate winter habitat

This non-standard overlay identifies important winter habitats for white tailed deer, mule deer and elk. Boundaries were based on elevation bands and the professional judgment of district and regional Ministry of Environment, Lands and Parks staff.

Known wildlife stick nests

These are historic goshawk nests, which have a 200-metre reserve zone around them, and great blue heron nests, which have a 100-metre reserve zone around them.

Landscape unit boundaries

Landscape unit boundaries and objectives, including biodiversity emphasis objectives have been established by the Arrow Forest District Manager. Thirty-one landscape units have been established for the forest district with twenty-one contained within the Arrow TSA and the remainder in the Tree Farm Licences (TFL).

3. Inventories

Visual landscape inventory

MoF/MELP regional staff recently reviewed this overlay for the entire Nelson Forest Region. New standards and management guidelines associated with this inventory have been made known and are incorporated into the timber supply review (TSR).

Watershed atlas

This non-standard layer contains streams, wetlands and lakes. It will be the source for determining areas in the riparian reserve zone. This overlay also contains the boundaries of community and domestic watersheds.

Riparian management

Riparian management area classifications are intended to be based upon detailed assessments carried out by qualified field personnel. However, the lack of quality assured inventory information and the need to incorporate this resource into the analysis necessitated the development of a surrogate. In cooperation with the Ministry of Environment, Lands and Parks, an automated approach for classification was developed using that ministry's watershed atlas and TRIM digital elevation model. Using this automated process, streams and lakes were classified for the Arrow, Golden and Revelstoke Forest Districts in May 1997 by Nanuq Consulting Ltd. This surrogate was acceptable to the Nelson Forest Region and Arrow Forest District staff.

Slocan Valley pilot area

The Commission on Resources and Environment (CORE) identified a significant portion of the Slocan Valley as a candidate for a local level CORE table. This area incorporates the valley bottom and the face watershed units of Slocan Lake and Slocan River. The timber supply contribution of this area in the context of the TSA will be examined.

Terrain hazard assessment

These surveys were carried out for operational planning. Where quality assurance standards have been met this inventory will replace the primary and secondary ESA soil inventory in the forest cover files.

Regionally significant fish bearing streams

The watersheds feeding these streams require management practices similar to domestic watersheds in order to protect the important fisheries.

This area represents about 14% of the timber harvesting land base but contributes only about 7% to the allowable annual cut. In a sensitivity analysis, the rate of cut for the first decade will be modelled at the rate considered more likely to occur in practice.

4. Division of the Area into Management Zones

4.1 Management zones and tracking of multiple objectives (grouping)

The concept of management zones is used to differentiate areas with distinct management emphasis and homogenous forest cover. For example, a zone may be based on a harvesting system, silviculture system, visual quality objective or wildlife consideration. The forest cover data can also be grouped by different variables. In addition, the non-contributing forest (land considered unavailable for timber harvesting) may be included for consideration in attaining forest cover objectives. Grouping enables constraints to apply to different combinations of variables or zones. Groups may be thought of as layers of different objectives to be tracked over time. A decision on whether to put an objective into a group or a mutually exclusive management zone will be made by the timber supply analyst after data assessment.

Further information on the forest cover requirements to be applied to these areas can be found in Section 6.4, "Integrated resource management."

4. Division of the Area into Management Zones

Table 3. Objectives to be tracked

Group	Description	Inventory definition	Function
1	Timber harvesting land base by landscape unit	Crown, forested, operable area where timber harvesting may occur.	Reporting purposes. Provide an assessment of the timber harvesting land base by landscape unit.
2	All forested land by landscape unit	Type id projected 1, 2, 3, 4 and 9.	Reporting purposes. Provide an assessment of the total forest by landscape unit. All Crown forest included.
3	Landscape-level biodiversity — all forest	Non-standard mapped layer.	Application of biodiversity targets at the landscape unit/emphasis/BEC zone-variant level. All Crown forest included.
4	Caribou — ESSF	Non-standard mapped layer.	Resource emphasis area — Caribou ESSF. Application of ESSF caribou guidelines by landscape unit for the core caribou areas 1 and 2. Operable forest with less than 80% slope included.
5	Caribou — ICH	Non-standard mapped layer.	Resource emphasis area — Caribou ICH. Application of ICH caribou guidelines by landscape unit for the core caribou areas 1 and 2. Operable forest with less than 80% slope included.
6	Visual quality	Non-standard mapped layer.	Resource emphasis area — visual quality. Application of visual quality objective (VQO) guidelines by landscape unit. Total forest included. Retention (R); Partial Retention (PR) and Modification (M) will be modelled.
7	Watersheds	Non-standard mapped layer.	Resource emphasis area — community, domestic and regionally significant fish-bearing stream watersheds. Application of watershed guidelines by landscape unit. All forested area included.
8	Ungulate winter range (UWR)	Non-standard mapped layer.	Resource emphasis area — ungulate winter range (mid and late winter). Application of UWR guidelines by landscape unit. Operable forest included.
9	Integrated resource management (IRM)	Crown, forested, operable area where timber production is the primary objective.	Resource emphasis area — integrated resource management (IRM). Application of adjacency criteria by landscape unit. Timber harvesting land base included.
10	Slocan Valley pilot area	Non-standard mapped layer.	Provide a means to do a sensitivity analysis on this area. Harvest rate will be constrained to match harvest level most likely to occur.

4. Division of the Area into Management Zones

Data source and comments:

See Section 3.1, "Background information," for the sources of mapping and zones referenced above.

4.2 Analysis units

An analysis unit represents a combination of stands dominated by specific tree species or a silvicultural regime with a specific timber growing capability — as indicated by the inventory type group and site index in the forest inventory file. Each analysis unit is assigned its own timber volume projections (yield tables) for existing and future stands. The following table identifies draft analysis units. After determining the timber harvesting land base, the timber supply analyst will determine the final analysis unit definitions.

Table 4. Definition of analysis units

Analysis unit	Species	Inventory type groups	Site index range ^a (metres)	Age (years)
Existing natural unmanaged stands				
11	F, L	1-8, 32-34	> 23	> 20
12	F, L	1-8, 32-34	17–23	> 20
21	F, L	1-8, 32-34	8 – < 17	> 20
31	C, H	9-17	> 18	> 10
32	C, H	9-17	13–18	> 10
41	C, H	9-17	7 – < 13	> 10
51	S	21-26	> 19	> 10 – ≤ 140
52	S	21-26	> 19	> 140
53	S	21-26	12–19	> 10 – ≤ 140
54	S	21-26	12–19	> 140
55	B	18-20	> 12	> 10
61	S	21-26	8 – < 12	> 10 – ≤ 140
62	S	21-26	8 – < 12	> 140
63	B	18-20	8 – < 12	> 10
71	P, Pa, Pw	27-31	> 19	> 10 – ≤ 140
72	P, Pa, Pw	27-31	> 19	> 140
73	P, Pa, Pw	27-31	12–19	> 10 – ≤ 140
74	P, Pa, Pw	27-31	12–19	> 140
81	P, Pa, Pw	27-31	7 – < 12	> 10 – ≤ 140
82	P, Pa, Pw	27-31	7 – < 12	> 140
Existing managed stands				
118	F, L	1-8, 32-34	≥ 8	≤ 20
138	C, H	9-17	≥ 7	≤ 10
158	S, B	18-26	≥ 8	≤ 10
178	Pl, Pa, Pw	27-31	≥ 7	≤ 10

(a) Reference age is 50 years.

4. Division of the Area into Management Zones

Data source and comments:

The site index ranges used to define the analysis units are approximate. The ranges are estimated natural breaks in the distribution of area by site index for each species. Once the timber harvesting land base has been defined a more detailed analysis will be performed to confirm the values shown.

5. Timber Harvesting Land Base Definition

5.1 Identification of the timber harvesting land base

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

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

Land may also be added to the timber harvesting land base:

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

The classification of "unavailable for timber harvesting" applies only to land where no harvesting is anticipated to occur. Any area in which some timber harvesting will occur remains in the timber harvesting land base, even if area will be subject to stringent constraints.

After all areas that do not contribute to the timber harvesting land base have been identified, any additional lands are added to the land base. The resulting productive forest land base is defined as the "current timber harvesting land base" for the Arrow TSA.

5.2 Details on land base classification

5.2.1 Land not administered by the British Columbia Forest Service

Ownership codes are generally used to identify whether the land can be considered to contribute to timber supply. Ownership codes 62C and 69C indicate Crown land in a forest management unit and miscellaneous reserves respectively. All areas with other ownership codes will be removed from the land base considered available for timber supply. These include areas under woodlot licences as their AACs are determined independently of the timber supply review process. Timber licence area — ownership code 70N — is considered under Section 5.2.12, "Timber licence reversions."

A review of the inventory file showed that some area is actually in the provincial forest (62C and 69C) but is incorrectly coded on the inventory file. This area will be included in the land base considered available for timber supply.

5.2.2 Land classified as non-forest

Type identity 6 areas such as alpine, lakes, rocks, etc. and type identity 8, where no typing is available will be excluded from the land base considered for timber supply.

5.2.3 Non-commercial cover

Type identity 5 represents areas that are classified as having non-commercial brush species growing on them. These areas are considered to be unlikely sites for timber production and are excluded from the area considered available for timber harvesting.

5. Timber Harvesting Land Base Definition

5.2.4 Environmentally sensitive areas

Some forest lands are environmentally sensitive and/or significantly valuable for other resources. These areas are identified and delineated during a forest inventory and are called environmentally sensitive areas (ESAs). The ESA system uses the following classification: soil (Es), forest regeneration problems (Ep), snow avalanche (Ea), recreation (Er), water (Eh), and wildlife (Ew). Two ESA categories are recognized: high (ESA1) and moderately (ESA2) sensitive.

In the context of timber supply analysis, ESAs may result in a reduction in the harvesting opportunity on these sites. Two strategies for accounting for this are: per cent area reductions, and the specific evaluation of individual ESA polygons for harvesting opportunity.

As noted previously it is important to ensure that only areas in which harvesting is expected to take place contribute to the timber harvesting land base. Thus it is important to separate the areas in which harvesting, even if limited, will take place from areas which are entirely excluded from harvesting. Table 5 deals with those areas in which harvesting will not occur.

Table 5. Description of environmentally sensitive areas

ESA category	ESA description	Outside community watersheds		Inside community watersheds	
		Reduction per cent ESA1	Reduction per cent ESA2	Reduction per cent ESA1	Reduction per cent ESA2
A	Avalanche	90	50	100	50
P	Regeneration	50	0	100	50
PR	Regeneration/recreation	50	0	100	50
R	Recreation	50	50	100	50
S	Soil	90	20	100	50
SA	Soil/avalanche	90	20	100	50
SP	Soil/plantation	90	20	100	50
SPW	Soil/plantation/wildlife	90	20	100	50
SR	Soil/recreation	90	20	100	50
SW	Soil/wildlife	90	20	100	50
	Terrain hazard survey Level A,B,C	80 Class V	25 Class IV	90 Class V	35 Class IV
	Level D	60 U (unstable)	20 P (potentially unstable)	90 U (unstable)	35 P (potentially unstable)

5. Timber Harvesting Land Base Definition

Data source and comments:

The percentage reductions are based on the history of harvesting activity carried on within the respective categories of ESAs.

Goshawk and great blue heron sites will be removed from the timber harvesting land base. Other wildlife habitat requirements will be represented by forest cover requirements rather than ESA exclusions (see Section 6.4.1, "Objectives that require forest cover requirements").

Watershed ESA (Eh) are not removed from the land base as the forest cover requirements for domestic and community watersheds and the land base reductions for soils and riparian areas adequately account for these concerns.

The Arrow Forest District has conducted terrain hazard surveys on portions of the TSA since 1984. Where available, these surveys will be used in addition to the soil sensitivity information of the ESA classification.

5.2.5 Areas considered inoperable

Operability codes are generally used to classify areas by the presence or absence of physical barriers or limitations to harvesting, logging methods (e.g., cable), and the merchantability of stands. Since physical and economic conditions are highly variable across British Columbia, interpretation and mapping of operability are highly variable and district dependent.

Table 6. Description of inoperable areas

Inventory description	Code	Reduction per cent (%)
Conventional harvesting practices	A	0
Blocks within inoperable areas	B	0
Inoperable areas	I	100
Not typed	N	100

Data source and comments:

In 1991 the operability lines were reviewed and updated for the Arrow TSA. Operability was determined by road chance associated with conventional harvesting practices.

As part of the analysis for the *Kootenay-Boundary Land Use Plan* (KBLUP) a total chance plan was created in 1997 for eight landscape units in the Arrow TSA. This project is considered to constitute a review of operable areas under current harvesting guidelines. The blocks located above the existing operability line will be included in the timber harvesting land base. Some areas below the operability line were identified as inoperable and they will be removed through other reductions such as ESAs and terrain stability.

5. Timber Harvesting Land Base Definition

5.2.6 Sites with low timber growing potential

Sites may have low productivity either because of inherent site factors (nutrient availability, exposure, excessive moisture, etc.), or because they are not fully occupied by commercial tree species. Typically, these stands are intermixed with other stands within the forested land base. As these stands are not considered to be harvestable, they need to be identified and removed from the timber harvesting land base.

Table 7. Description of sites with low timber growing potential

Species	Characteristics	SI limit	Per cent (%) excluded
Fir/larch	Existing stands greater than age 140 with volumes less than 150 cubic metres/hectare and sites projected not capable of producing 150 cubic metres/hectare by age 140.	8	100
Cedar	Existing stands greater than age 140 with volumes less than 150 cubic metres/hectare and sites projected not capable of producing 150 cubic metres/hectare by age 140.	7	100
Hemlock/balsam	Existing stands greater than age 140 with volumes less than 150 cubic metres/hectare and sites projected not capable of producing 150 cubic metres/hectare by age 140.	8	100
Spruce	Existing stands greater than age 140 with volumes less than 150 cubic metres/hectare and sites projected not capable of producing 150 cubic metres/hectare by age 140.	8	100
Pine	Existing stands greater than age 140 with volumes less than 150 cubic metres/hectare and sites projected not capable of producing 150 cubic metres/hectare by age 140.	7	100

Data source and comments:

Criteria were developed based on current performance and discussions with licensees in the Arrow TSA. The licensees' main concern is that harvested sites are productive enough to enable them to meet their silvicultural obligations in a timely manner, i.e., achieve free-growing status within 15 to 20 years. The minimum site index thresholds in Table 7 may be revised when the analysis units are finalized.

5. Timber Harvesting Land Base Definition

5.2.7 Problem forest types

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

Table 8. Problem forest types criteria

Species	Inventory type group	Age (years)	Per cent (%) reduction
C, H	11	> 140	50
H pure	12	> 140	40
H mixed	13-17	> 140	100
B, BH	18-19	> 140	10
B, BH	18-19	> 250	100
PI	28; Proj. Ht. Class 2 (10.5-19.4 m); Proj. Stocking Class > = 2; Site Class = P	> 100	90
Deciduous	35-42	All	100

Data source and comments:

Problem forest types are species and types currently not utilized in the Arrow TSA. Generally hemlock and balsam types greater than 140 years of age are not being harvested due to the high degree of decay.

5.2.8 Roads, trails and landings

Separate estimates are made to reflect the loss in productive forest land due to existing and future roads, trails and landings (RTL). Existing RTL estimates are applied as reductions to the current productive forest considered available for harvesting, and future RTL are applied after stands are harvested for the first time.

All highways and larger municipal roads are of a sufficient size to be mapped as polygons and classified as non-forest areas in the forest inventory file. These polygons are thus removed from the timber harvesting land base as non-forest area, as shown in Section 5.2.2, "Land classified as non-forest."

All other roads, trails and landings are depicted only as lines on forest cover maps, and have no associated polygons. These areas are accounted for as described in Table 9.

5. Timber Harvesting Land Base Definition

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

Location	Age (years)	Road length (km)	Road width (metres)	Reduction area (hectares) or per cent (%)
Existing RTLs				
Roads	Less than 40		15	
Trails	Less than 40		4	
Landings	Less than 40	N/A	N/A	3%
Future RTLs				
Roads	Greater than 40			3%
Trails	Greater than 40			3%
Landings	Greater than 40			2.4%

Data source and comments:

Existing road reductions are based on the length of road mapped in the forest inventory files (Forest Service, road permit and non-status roads) in the Arrow TSA. The Arrow Forest District staff estimate an average road right-of-way width of 15 metres is non-forested because of existing roads.

The existing skid trail length will be calculated using the geographic information system (GIS) data for the Arrow Forest District. The Arrow Forest District staff estimate that an average skid trail width of four metres is non-forested.

Existing landing reductions were estimated at 3% of the timber harvesting land base based on a review of year-end disturbance reports.

Future road, trails and landing reductions were projected to be similar to recent disturbances. These were calculated through a review of year-end disturbance reports. Reports for 1995 and 1996 from one licensee and from 1996 for another licensee were weighted by their portion of the combined AAC. The reductions apply to the timber harvesting land base.

5.2.9 Cultural heritage resource reductions

The Dewdney Trail has been established as a Heritage trail through portions of the Arrow TSA. In order to preserve the trail, consistent with *Kootenay-Boundary Land Use Plan*, timber within the trail corridor will not be available for regular scheduled harvesting, except in emergency situations such as disease, insect infestations, or fire. A 100-metre reserve on both sides of the trail (a 200-metre wide reserve in total) has been established. Archaeological overview and cultural heritage value inventories for the entire Arrow TSA are yet to be completed or are not comprehensive. Thus the extent of measures required to protect other cultural heritage resources remain uncertain at this time.

5. Timber Harvesting Land Base Definition

5.2.10 Riparian management

The riparian area indicated in Table 10 is part of the inventory data and will be excluded from the timber harvesting land base.

Table 10. Riparian areas

Stream class	Stream length (metres)	Reserve zone width (metres)	Management zone width (metres)	Retention in management zone (%)	Total riparian reduction area (metres)
S1		50	20	50	60
S2		30	20	50	40
S3		20	20	50	30
S4		0	30	25	8
S5		0	30	25	8
W1		10	40	25	20
W3		0	30	25	8
W5		10	40	25	20
L1		10	0	0	10

Data source and comments:

A Geographic Information System (GIS) analysis was performed to classify all streams, wetlands and lakes on the basis of slope and width. The resultant data was produced by stream class and length and added to the inventory file.

The riparian reduction area is applied to each side of the water course. The total riparian reduction area consists of the riparian reserve zone plus the riparian management zone. The total riparian reduction area is made up of the reserve zone plus the management zone multiplied by the retention percentage. For example:

Reserve zone width	50 metres	
Management zone width	20 metres	Total riparian reduction area
Retention in management zone	50%	= 50 + (20 * 0.5) = 60 metres

On average, the above listed riparian reserve zone widths are not logged. While there are some instances where the reserve zones have been logged, for various management reasons, there are approximately equal areas where the reserve zone has been extended.

5. Timber Harvesting Land Base Definition

5.2.11 Wildlife stick nests

Whenever goshawk or great blue heron nests are encountered in the Arrow TSA, a reserve zone is established to preserve the nesting habitat. For goshawks the reserve zone is 200 metres, and for great blue heron the reserve zone is 100 metres. Known nests are identified on a map overlay and the reserve zones will be removed from the timber harvesting land base.

5.2.12 Timber licence reversions

Timber licences (TLs) are old tenure arrangements that give a licensee exclusive rights to harvest merchantable timber within the licence area and do not contribute to the TSA allowable annual cut. Once these areas have been harvested, regenerated and have attained free-growing status, the timber licence area reverts to B.C. Forest Service jurisdiction. Accordingly, these areas are included in the timber harvesting land base after the first harvest and contribute to the TSA harvests in the medium- to long-term timber supply.

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

Table 11. Timber licence harvest schedule

Reverting timber licence area (hectares) by decade				
1998-2000	2000-2010	2010-2020	2020-2030	2030-2040
160	160	160	160	160

Data source and comments:

Since the last timber supply review all timber licences expired except To 467. This timber licence is administered by the Columbia Forest District, Revelstoke office. To 467 is held by Riverside Forest Products Ltd. and will revert to the Crown in 2045. This timber licence straddles the forest district boundary. Approximately 19% of the timber licence area falls within the Columbia Forest District with the remaining 81% falling within the Arrow Forest District. After expiration of the licence each respective forest district will administer the area within its boundaries.

The forest inventory file shows a total of 1309 hectares of timber licences in the Arrow TSA. After accounting for area removals such as ESAs and low site, Arrow Forest District staff estimate that To 467 covers approximately 800 hectares of harvestable area in the Arrow TSA. Of the 800 hectares, 160 hectares are expected to be harvested by the year 2000. It is assumed that the remainder of the area will be harvested proportionately over the next 40 years.

6. Current Forest Management Assumptions

6.1 Harvesting

6.1.1 Utilization levels

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

Table 12. Utilization levels

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

Data source and comments:

Table 12 reflects current regional standards, licence requirements and current performance.

6.1.2 Volume exclusions for mixed species stands

One or more species in mixed species stands may be unmerchantable. For example, the deciduous species in a predominantly coniferous stand may not be harvested, or may only be partially harvested. The unharvested portion should not contribute to the estimated stand volume. The species that do not contribute and that will be excluded from the estimation of stand volume are shown in Table 13 below.

Table 13. Volume exclusions for mixed species types

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

Data source and comments:

The exclusion pertains to only the deciduous timber volumes in coniferous leading types. The deciduous trees may contribute to biodiversity and coarse woody debris objectives at the stand level. Deciduous-leading stands do not contribute to the harvesting land base (see Section 5.2.7, "Problem forest types").

6. Current Forest Management Assumptions

6.1.3 Minimum harvestable age derivation

The minimum harvestable age is the time required for stands to grow to harvestable size, it defines the lower limit for harvesting. Harvesting may occur in stands at the minimum age to meet a harvest target for a short period of time or avoid large and abrupt changes in harvest levels. However, most stands will not be harvested until well past the minimum timber production ages because of management objectives for other resource values (e.g., requirements for the retention of older forest).

Table 14. Minimum harvestable age criteria

Analysis unit	Minimum volume (m ³ /hectare)	Minimum DBH (cm)	Minimum harvestable age-present stands	Minimum harvestable age-future stands
11 – F, L	150	25		
12 – F, L	150	25		
21 – F, L	150	25		
31 – C, H	150	25		
32 – C, H	150	25		
41 – C, H	150	25		
51 – S	150	25		
52 – S	150	25		
53 – S	150	25		
54 – S	150	25		
55 – B	150	25		
61 – S	150	25		
62 – S	150	25		
63 – B	150	25		
71 – P, Pa, Pw	150	25		
72 – P, Pa, Pw	150	25		
73 – P, Pa, Pw	150	25		
74 – P, Pa, Pw	150	25		
81 – P, Pa, Pw	150	25		
82 – P, Pa, Pw	150	25		
118 – F, L	150	25		
138 – C, H	150	25		
158 – S, B	150	25		
178 – Pl, Pa, Pw	150	25		

6. Current Forest Management Assumptions

Data source and comments:

The criteria listed in the table above are based on:

- a) the Arrow Forest District staff experience with present harvesting operations; and
- b) a review of yield tables for a range of site indices (10 to 36 metres @ 50 years in 2 metre increments) for the commercial species in the forest district. This review indicated that stands were generally harvestable when they have attained both of the criteria listed in Table 14.

Once the timber harvesting land base is defined and yield tables developed, the minimum harvestable ages will then be inferred.

6.1.4 Harvest scheduling priorities

For the Arrow TSA, the timber supply model will set first priority for harvest on stands furthest from their minimum harvestable age (relative oldest first).

6.1.5 Silvicultural systems

Table 15 below indicates the degree to which clearcut and alternate silvicultural systems are used in the Arrow TSA. The percentage breakdowns are for the total area actually harvested from 1991 to the end of 1997 and for the area proposed for harvest over the next five years, according to 1997 forest development plans.

Table 15. Silvicultural systems

Silvicultural system		Per cent (%) of total harvested in the Arrow TSA	
		Actual harvest (1991-1997)	Proposed harvest (1997-2001)
Clearcut	Clearcut no reserves	39.6	20.2
	Clearcut with wildlife tree reserves	13.5	44.5
Total clearcut		53.1	64.7
Alternate systems	Selection (group and single tree)	36.8	26.0
	Shelterwood	2.0	2.4
	Patch	2.1	5.9
Total alternate		46.9	35.3

Data source and comments:

The actual harvest was calculated from harvesting records retrieved and analysed using the Forest Tenure Administration System (FTAS) electronic database. The proposed harvest data are based on a review of all major licensee 1997 forest development plans for the Arrow TSA and for the 1998-2002 SBFEP forest development plan.

6. Current Forest Management Assumptions

The significant increase in clearcuts with wildlife tree reserves between past and proposed harvesting is due to the stand-level biodiversity requirements of the Forest Practices Code. Patch harvesting and group selection are considered by the Arrow Forest District operations staff to be alternate systems, although they remain even-aged stand management methods similar to clearcutting, except that they involve the harvesting of smaller areas. Group selection and single tree selection systems are combined in the selection category. The majority of the single tree selection harvesting is done in response to forest health problems. For this analysis all harvesting will be modelled as clearcut harvesting.

6.2 Unsalvaged losses

Table 16 shows the estimated average annual unsalvaged volume loss to catastrophic events such as insect epidemics, fires, wind or other agents, over the long term, from the timber harvesting land base. The unsalvaged loss column reflects only those areas in which the volume will not be recovered or salvaged.

Table 16. *Unsalvaged losses*

Cause of loss	Annual unsalvaged loss (m ³ /year)
Mountain pine bark beetle	14 200
Douglas-fir bark beetle	500
Disease (year 1)	5 720
Disease (year 95)	0
Wildfire	5 800
Windthrow/blowdown	2 500
Total loss	28 720

Data source and comments:

Information regarding unsalvaged losses was collected from Arrow Forest District Staff, licensees, the protection fire reporting system, Major License Silvicultural Information System (MLSIS) / Integrated Silviculture Information System (ISIS) (harvesting databases), annual reports, and Forest Insect Disease Survey (FIDS) reports. The best data available to estimate loss, and for the analysis often consisted of professional judgment. A permanent database has been constructed to update unsalvaged losses on an annual basis and to provide more accurate results for preparing future timber supply review data packages.

Insects

The mountain pine beetle is considered to be the major cause of insect damage. In 1997, the Arrow Forest District staff conducted aerial surveys over three key pine areas of the Arrow TSA to locate and map new outbreaks by the mountain pine beetle. The best detailed data available come from 1997, an average year in terms of beetle attack. This loss estimate of 14 200 cubic metres per year is based on data from 1997 plus information from the licensee (Riverside) ground surveys for 1997. Douglas-fir bark beetle data is also based on the 1997 aerial survey.

6. Current Forest Management Assumptions

Disease

The unsalvaged losses for disease in Table 16 are from white pine blister rust. Losses are to be applied as a "decreasing" deduction, starting out as 6150 cubic metres per year (in 1992) and decreasing incrementally to zero after 100 years. This assumption is based on disease dynamics, rate of salvage and replacement by disease resistant stock. The rationale for this approach is as follows:

- a) White pine blister rust was introduced to the area after many of the presently mature stands became established. Therefore it has attacked the white pine in these stands at a later point in their development than it will in the future. The opportunity for replacement of white pine volume loss by other species before harvest is less in presently mature stands than it will be in the future. Furthermore in artificially regenerated stands white pine will either not be planted at all or blister rust resistant varieties will be used. The total volume loss in existing stands due to white pine blister rust is much greater now than it will be in the future.
- b) In 1992, 3% of the net operable mature volume on the FIP file was white pine. However, a 1992 survey showed that the actual volume was 66% less than what was shown on the inventory file for undisturbed polygons. In this survey of the Arrow TSA, 25 stands were sampled over three public sustained yield units (PSYUs) — stands were chosen from a list of the largest 100 Pw polygons in the Arrow TSA and were sampled to provincial inventory standards.
- c) The unsalvaged losses for 1992 were calculated as follows:

$619\,000 \text{ current AAC} \times 0.03 = 18\,570$ (proportional white pine contribution).

$18\,570 \times 0.66 = 12\,256$ cubic metres per year gross loss.

$12\,256 \times 0.5 = 6150$ cubic metres per year unsalvaged loss. Assuming that 50% is salvaged based on current harvesting records.

- d) Finally, for 1999, the amount is adjusted to account for the decline in losses over 100 years, which for 7 years (1992 to 1999) amounts to 7%:

$6150 \times .93 = 5720$ cubic metres unsalvaged losses (for 1999).

No deductions were made for other diseases such as *Armellaria* root rot and black stain fungus because the data does not distinguish between endemic (included in yield projections) and epidemic infestations.

Fire

The unsalvaged loss estimate due to fire is based on 10 years of the Arrow Forest District fire reports. The total losses were reduced so that only volume loss that occurred in the timber harvesting land base that is not salvaged is included in the estimate.

Windthrow

Windthrow non-recoverable losses commonly occur around the edges of cutblocks. Salvage of this volume is difficult because access is restricted through the regenerating stands. By the time the adjacent stands are harvested the windthrown trees are unmerchantable. The volume estimate is based on discussions with field technicians.

6. Current Forest Management Assumptions

6.3 Silviculture

6.3.1 Silviculture and regeneration activities

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

The silviculture program reflects the mix of treatments currently carried out in the TSA. This level of activity assumes basic silviculture on all sites plus incremental silviculture on some sites. Table 17 shows the regeneration assumptions by analysis unit for future stands, existing operable not satisfactorily restocked (NSR) areas, and young plantations that have been managed for density.

6. Current Forest Management Assumptions

Table 17. Regeneration assumptions by analysis unit

Analysis unit	Species Composition	Regen delay (years)	OAFs (%)		Regen method	Regen species	Per cent (%)	Density initial
			1	2				
11, 12	F, L	2	15	5	Plant	F PI C	50 30 20	1200
21	F, L	2	15	5	Plant	F PI S	50 35 15	1200
31, 32, 41	C, H	2	15	5	Plant	F S	60 40	1200
51-63	S, B	2	15	5	Plant	S PI F	60 25 15	1200
71-82	P, Pa, Pw	2	15	5	Plant	PI F S	50 30 20	1200
118	F, L	2	15	5	Plant	F PI C	50 30 20	1200
138	C, H	2	15	5	Plant	F S	60 40	1200
158	S, B	2	15	5	Plant	S PI F	60 25 15	1200
178	PI, Pa, Pw	2	15	5	Plant	PI F S	50 30 20	1200

Data source and comments:

Operational adjustment factors (OAFs) are used to adjust timber yield estimates to account for operational factors. OAF1 is a constant percentage reduction to account for small unproductive areas within stands. OAF2 accounts for losses that increase with stand age, for example decay due to disease. In this case OAF2 increases from 0 at stand establishment and passes through 5% at 100 years of age. All values in the above table are based on current performance as estimated by the Arrow Forest District staff.

No thinning is expected based on the initial density values.

6. Current Forest Management Assumptions

Regeneration delays reflect current operational practice.

Provincial average operational adjustment factors (OAFs) values are applied to the managed stand yield curves as recommended by the Ministry of Forests, Research Branch — as no local values are available. It should be noted that there is concern that these OAFs underestimate the losses expected on some stands due to root rot disease and spruce terminal weevil. The impact of changing the OAFs will be examined through sensitivity analysis.

6.3.2 Immature plantation history

This section identifies areas of existing immature forest where the density (stems per hectare) was controlled and therefore justifies assigning the stands to managed stand yield tables (MSYT).

Table 18. Immature plantation history

Analysis unit	Composition	Area managed (%)	
		Age 1-10	Age 11-20
118	All Douglas-fir, larch	100	100
138	All cedar and hemlock	100	
158	All spruce and balsam	100	
178	All pine	100	

Data source and comments:

Douglas-fir stands less than 20 years old are considered managed stands due to the longer history of management (control of density at establishment and through stand tending) in these stands. Density control and tending has only occurred over the last 10 years in all other stand types in the Arrow TSA.

6.3.3 Not satisfactorily restocked (NSR) areas

Land classified in the Arrow TSA FIP file as type identity 4 or 9 is included in the current timber harvesting land base. These type identities indicate not satisfactorily restocked (NSR) land base. The purpose of this section is to identify the total area of NSR currently existing in the timber harvesting land base, and the estimated rate at which the NSR area will be restocked. The figures provided in this table (from the forest district silviculture records) will be prorated to match the inventory file NSR total area if there is a difference between the two figures.

Table 19. Not satisfactorily restocked (NSR) areas

Backlog, stocking < 400 stems per hectare	Backlog, stocking > 400 stems per hectare	Current NSR from silviculture records	Total NSR area (from FIP file)
1 135 hectares	866 hectares	2 012 hectares	

6. Current Forest Management Assumptions

Data source and comments:

Forest district silviculture records (ISIS and MLSIS) show 2001 hectares of backlog NSR (i.e., harvested prior to 1987) and 2012 hectares of current NSR. NSR will be restocked in proportion to the current area of each analysis unit in stands less than 20 years old on the assumption that the overall distribution of harvest within analysis units has not changed significantly over this period of time. In the analysis it will be assumed that 70% of the backlog will be restocked within 10 years and the remainder at a constant rate over the subsequent 60 years. Current NSR is assumed to regenerate within the regeneration delays provided in Table 17.

All NSR within the operable land base is included in the timber harvesting land base. Any NSR within the inoperable portion of the land base will be reviewed when the forest inventory file is available to determine if this area should contribute to the timber harvesting land base.

The amount of NSR in the forest inventory file will not be available until processing of the file is complete. Any discrepancy in area between the forest inventory files and district MLSIS/ISIS records (which are more up-to-date), aside from inoperable considerations, will be assumed to have already been restocked and assigned an age between 1 and 5 years old. This area will be assigned to analysis units in proportion to the distribution of analysis units by biogeoclimatic zone as the previous stand label is no longer available on the inventory file.

6.4 Integrated resource management

6.4.1 Objectives that require forest cover requirements

As noted in Section 4.1, "Management zones and tracking of multiple objectives (grouping)," forest cover requirements may be applied to a number of different types of areas including landscape units, wildlife areas, or visual quality areas. With the requirement to retain different forest characteristics across the landscape, it is important to realize that forest outside of the timber harvesting land base may contribute to forest cover requirements (i.e., maximum allowable disturbance or minimum area retention).

6. Current Forest Management Assumptions

Table 20a. Forest cover requirements

The following forest cover requirements will be applied to each resource emphasis group within each landscape unit.

Resource emphasis	Forest cover objectives			Minimum area of older age retained (%)	Land base constraints apply to
	Green-up height (metres)	Green-up maximum allowable disturbance %	Minimum older age (years)		
Caribou ESSF	2	25	140	37	Operable area below 80% slopes
Caribou ICH	2	25	140	40	Operable area below 80% slopes
Visual quality — retention	7	5	N/A	N/A	Crown forested area
Visual quality — partial retention	7	15	N/A	N/A	Crown forested area
Visual quality — modification	6	25	N/A	N/A	Crown forested area
Class 1 domestic watersheds	9	15	N/A	N/A	Crown forested area
Community and class 2 domestic watersheds	9	20	N/A	N/A	Crown forested area
Class 3 domestic watersheds	9	25	N/A	N/A	Crown forested area
Regionally significant fish streams	9	25	N/A	N/A	Crown forested area
Integrated resource management	2	25	40	70	Timber harvesting land base
Ungulate winter range	2	25	100	40	Operable area

Data source and comments:

The non-contributing forest (area outside the timber harvesting land base) within each landscape unit is assumed to age over time.

All stand heights shown in the table above refer to top heights (inventory definition).

Operable area is all land area below the operability line in the standard inventory file (operability class A or B).

6. Current Forest Management Assumptions

Caribou

Kootenay-Boundary Land Use Plan (KBLUP) caribou priority areas 1 and 2 cover constraints are intended to provide sufficient lichen production areas during the winter months. Telemetry data is being used to confirm these assumptions.

Visual quality objectives (VQO)

VQO constraints restrict the amount of harvesting within visual landscapes. The *Framework for Managing Visual Resources to Mitigate Impacts on Timber Supply* was used in determining the visually effective green-up (VEG) heights. The VEG heights by slope class were applied to the forested area within the Arrow TSA VQOs to determine the VEG height of seven metres for retention and partial retention, and six metres for modification VQOs.

Non-greened-up disturbance percentages are within the allowable ranges determined by current management.

Watersheds

The nine-metre height is based on the hydrologic recovery rates determined by provincial hydrologists. Nine metres provides 90% hydrologic recovery. The maximum non-greened-up percentages for the various classes of watersheds are forest district estimates of what will result from the application of hydrologic assessments and constraints.

Integrated Resource Management (IRM)

The integrated resource management group encompasses that portion of the timber harvesting land base not occupied by any other zone or group, aside from biodiversity emphasis.

The two cover constraints are intended to restrict harvesting levels in the areas without special management objectives. Because green-up has been reduced to two metres under the KBLUP (three metres previously) and other adjacency constraints have been removed as part of a move toward patch-size management, it is necessary to apply constraints to reduce non-greened up area. The objective is to limit peak flow events. These constraints will also ensure that landscape connectivity concerns are addressed.

Ungulate Winter Range (UWR)

The objective is to provide thermal and hiding cover for deer, elk and moose within the mid- and late-winter range areas.

6. Current Forest Management Assumptions

Table 20b. Forest cover requirements — biogeoclimatic zones and natural disturbance types (NDTs) within the Arrow TSA

Note: In order to ensure that the maintenance of older forests is spread out within the TSA the following forest cover requirements will be applied to the landscape units. These forest cover requirements are in accordance with the guidelines established in the *Biodiversity Guidebook* and they will be applied within each landscape unit at the BEC variant level. The old-seral requirement for the low emphasis variants will be built up over time to ensure full compliance with the *Biodiversity Guidebook* by the end of three rotations.

Biogeoclimatic unit	NDT	Biodiversity emphasis	Old-seral stage					
			Mature and old-seral stage		Minimum retention area (%)			Minimum age (years)
			Minimum retention area (%)	Minimum age (years)	Now	71 years	141 years	
ESSF	1	Low	19	120	6.3	12.7	19	250
ESSF	1	Medium	36	120	19	19	19	250
ESSF	1	High	54	120	28	28	28	250
ESSF	2	Low	14	120	3	6	9	250
ESSF	2	Medium	28	120	9	9	9	250
ESSF	2	High	42	120	13	13	13	250
ICH	1	Low	17	100	4.3	8.7	13	250
ICH	1	Medium	34	100	13	13	13	250
ICH	1	High	51	100	19	19	19	250
ICH	2	Low	15	100	3	6	9	250
ICH	2	Medium	31	100	9	9	9	250
ICH	2	High	46	100	13	13	13	250
ICH	3	Low	14	100	4.6	9.4	14	140
ICH	3	Medium	23	100	14	14	14	140
ICH	3	High	34	100	21	21	21	140
ICH/IDF	4	Low	17	100	4.3	8.7	13	250
ICH/IDF	4	Medium	34	100	13	13	13	250
ICH/IDF	4	High	51	100	19	19	19	250

6. Current Forest Management Assumptions

Table 20c. Biodiversity emphasis by landscape unit and biogeoclimatic variant for the Arrow Forest District

Note: For each landscape unit the following biodiversity emphases will be applied to the BEC variants.

Landscape unit	BEC variant	Biodiversity emphasis	Landscape unit	BEC variant	Biodiversity emphasis
N501	ICHdw ESSF ICHmw2	Medium Medium Low	N516	All	Low
N502	All	Low	N517	All	Low
N503	All	Low	N518	ICHdw Others	Medium Low
N504	All	Medium	N519	ESSF Other	Medium Low
N505	All	Low	N520	ESSF Other	Medium Low
N506	All	Medium	N521	All	Medium
N507	All	Low	N522	All	Medium
N508	ICHdw Others	Medium Low	N523	All	Medium
N509	All	Medium	N524	All	Medium
N510	All	Medium	N525	All	High
N511	All	Medium	N526	All	Low
N512	All	Low	N527	ESSF Other	Medium Low
N513	All	Medium	N528	ESSF Other	High Medium
N514	All	Medium	N529	ESSF Other	High Medium
N515	All	High	N530	All	High
			N531	All	Low

Data source and comments:

The process to establish landscape units and biodiversity objectives for each landscape unit is now completed and the landscape boundaries and emphasis options have been declared. Of the thirty-one landscape units in the Arrow Forest District, twenty-one are in the Arrow TSA; the remainder are in TFLs.

6. Current Forest Management Assumptions

6.4.2 Wildlife trees (WT) and tree patches (WTP)

Wildlife tree patches (WTPs) are the primary method used by major licensees to maintain mature stand structure elements over time. Plans are to maintain them for more than three rotations. If harvested before that time WTPs of comparable size and structure will be identified as replacements.

Table 21. Reductions to reflect volume retention in cutblocks for wildlife tree patches

Management zone	Analysis unit	Persistence	Per cent (%) recommended in applicable guidebook	Residual area estimate on the timber harvesting land base (%)
All	All	Long term	7	3.5

Data source and comments:

The figure of 3.5% shown in Table 21 is based on a review of the Arrow TSA land base by landscape unit and variant as per the *Forest Practices Biodiversity Guidebook*, Table 20a. The percentage of the timber harvesting land base logged since 1970 was calculated along with the percentage of the available timber harvesting land base and the appropriate wildlife tree patch retention number was selected from Table 20a. These percentages were prorated by landscape unit and variant area to arrive at the 7% figure for the Arrow TSA. The number was halved since up to 50% of the target can be met by forest outside of the timber harvesting land base.

An area reduction will be used to model wildlife tree patch requirements because it more accurately reflects current management and thus the area upon which harvesting will occur. These wildlife tree patches, in conjunction with other riparian reserves and area removals, are generally larger than two hectares in size and are left to maintain stand structure within the landscape over time. As the wildlife tree patches are larger than two hectares in size this area will contribute to meeting seral-stage forest requirements at the landscape level. It is assumed that these wildlife tree patches will not be economical to harvest at a later date, nor will they be harvested in subsequent harvesting of the stand.

7. Sensitivity Analyses to be Performed

Sensitivity analysis provides a measure of the timber supply impact of uncertainties in management assumptions and/or data. The magnitude of the increase or decrease in a particular variable should reflect the degree of uncertainty surrounding the assumption. For instance, minimum harvestable age may be developed based on some minimum stand attributes that currently appear to dictate the earliest time stands are eligible for harvest. Sensitivity analysis may indicate that a small reduction in these attributes may alleviate anticipated harvest level reductions in the future. By developing and testing a number of sensitivity analyses, it is possible to determine which variables most affect results. The first table (Table 22a), shows issues that are particular to the Arrow TSA. This is followed by a list of standard sensitivity analyses that are carried out in all TSAs.

Table 22a. Sensitivity issues specific to the Arrow TSA

Issue to be tested	Sensitivity levels
Root rot	Increase OAF 2 for MSYTs; 20% for analysis units in the ICH and IDF zones and 15% for other analysis units.
Slocan Valley pilot	Examine the timber supply contribution from the valley in the context of the whole TSA.
Landscape-level biodiversity	Assess implication of applying biodiversity seral stage requirements to the operable area within each landscape unit, as well as to all forested area (i.e., "proportional representation").
Domestic watersheds	Six metre green-up.
Minimum harvestable ages	Change criteria to 125 m ³ /hectare and 25 cm dbh.

7. Sensitivity Analyses to be Performed

Table 22b. Standard sensitivity analysis

Issue to be tested	Sensitivity levels
Land base	+/- 10 %
Existing stand yields	+/- 10%
Regenerated stand yields	+/- 10%
Minimum harvestable age	+/- 10 years
Old-growth site index adjustments	Old-Growth Site Index (OGSI) Project results
Harvest flow alternatives	
Green-up periods	+/- 5 years
Regionally significant fish-bearing streams	Change forest cover requirement +/- 10%
Harvest rules	Change to absolute oldest first and random
Age when forest achieves "old" forest characteristics	+/- 40 years
Age when forest achieves "mature" forest characteristics	+/- 20 years
Seral-stage distributions	Apply the early seral stage requirements
Visual quality objectives	High/low range % denudation