Sunshine Coast Timber Supply Area Analysis Report

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Preface

This report contains a timber supply analysis and socio-economic analysis and is part of the provincial Timber Supply Review carried out by the British Columbia Forest Service. The purpose of the review is to examine the short- and long-term effects of current forest management practices on the availability of timber for harvesting in timber supply areas (TSAs) and tree farm licences (TFLs) throughout British Columbia. A review of each TSA and TFL is completed at least once every five years.

To determine allowable timber harvesting levels, the chief forester must have an up-to-date assessment of the timber supply based on the best available information and reflecting current management direction. **The report that follows provides this assessment but should not be construed as a recommendation for any particular AAC.**

This report focuses on a single forest management alternative — current management practices. Current management practices are defined by the specifications in management plans for the timber supply area including guidelines for the protection of forest resources, the *Forest Practices Code (FPC) of B.C. Act* and official land-use decisions made by Cabinet.

Focussing the assessment on the implications of current practices rather than looking at a number of different management schemes expedites the analysis process, allowing analysis of all TSAs in the province every five years. An important part of these analyses is an assessment of how results might be affected by uncertainties — a process called sensitivity analysis. Together, the sensitivity analyses and the assessment of the effects of current forest management on the timber supply form a solid basis for discussions among stakeholders about alternative timber harvesting levels.

In addition to having an up-to-date assessment of timber supply when setting the allowable annual cut (AAC) the chief forester considers short- and long-term implications of alternative harvest levels, capabilities and requirements of existing and proposed processing facilities, and the social and economic objectives of the Crown. The socio-economic analysis provides the chief forester with some of the information necessary for these considerations.

Executive Summary

As part of the provincial Timber Supply Review, the British Columbia Forest Service has examined the availability of timber in the Sunshine Coast Timber Supply Area (TSA). The analysis assesses how current forest management practices affect the supply of wood available for harvesting over both the short- (next 20 years) and long- (next 250 years) term. It also examines the potential changes in timber supply stemming from uncertainties about forest growth and management actions. **It is important to note that the various harvest forecasts included in the report indicate only the timber supply implications of current practices and uncertainty. As such, the forecasts should be used for discussion purposes only; they are not allowable annual cut (AAC) recommendations.**

The Sunshine Coast TSA covers about 1 555 100 hectares of area on the south coast of British Columbia. About 224 000 hectares (14% of the total area) are considered available for timber production and harvesting under current management practices. These practices follow the standards and legislation set out by the *Forest Practices Code* and various agreements and plans which guide current operational management. In the area available for timber harvesting, most of the forest is dominated by Douglas-fir, hemlock, and balsam. Alder, western redcedar, cypress, and cottonwood dominate smaller areas. Douglas-fir, hemlock, alder and western redcedar are the tree species most commonly used by the forest industry in the area.

The results of this timber supply analysis suggest that, given data and management assumptions reflecting current information and practices, the current AAC of 1 140 000 cubic metres per year can be maintained for 250 years (referred to as "current AAC even-flow"). As well, the analysis shows that a harvest level of 1 233 000 cubic metres per year (8% higher than the current AAC) can also be maintained for 250 years ("maximum even-flow"). With either approach, a harvest level of 95 000 cubic metres per year can be maintained for 40 years in forests dominated by alder.

These results reflect current knowledge and information on forest inventory, growth, and management. However, uncertainty exists about several factors important in defining timber supply. A series of sensitivity analyses were completed and compared to maximum even-flow, showing that data and management uncertainties affect timber supply projections to varying degrees. The sensitivity analyses show that within the ranges examined, most areas of uncertainty have little or no impact on timber supply in the short term (the next 20 years).

Short-term timber supply is sensitive to changes that influence the amount of timber available from existing natural stands, because these stands support harvest levels for the next 80 to 100 years. The only sensitivity analysis that showed a negative impact on short-term timber supply was removal of the inventory adjustment. An inventory adjustment was incorporated into both maximum even-flow and current AAC even-flow on the basis of inventory work completed in the Sunshine Coast TSA. This work concluded that forest cover volumes were under estimated by 13%. If the inventory were not adjusted to reflect the underestimation of stands volumes, a harvest level of 1 157 789 cubic metres per year (1% above the current AAC) could be maintained for 250 years. No other areas of uncertainty examined resulted in a decrease in short-term harvest levels. Thus, timber supply is quite stable in the short term. As shown in Figure 5, 76% of the timber harvesting land base is covered by stands between 0 and 100 years of age. This means that there is a large volume of existing stands that are presently of merchantable age and an abundance of regenerated stands that will become available over the next several decades which enable the maintenance of a steady, sustainable harvest forecast.

Medium-term timber supply (21 to 100 years from now) is affected by only a few of the areas of uncertainty examined. Because the initial harvest forecasts presented in this report are non-declining harvest forecasts, changes in assumptions tend not to affect the harvest forecast in the medium term. Significant changes like large reductions in the size of the timber harvesting land base or uncertainty around existing stand volume estimates can potentially reduce timber supply in the medium term. To a lesser extent, medium-term timber supply is affected by changes in old-growth site index estimates and forest cover requirements for management of visual quality. If the amount of disturbance allowed in visually sensitive areas is limited to the mid-point of the disturbance range, timber supply is decreased from 80 years onward.

Another area of uncertainty with potential impact on medium- and long-term timber availability is the rule used to set harvest priority. Maximum and current AAC even-flow alternatives are based on the 'relative oldest first' harvest rule, which attempts to maximize long-term timber supply by prioritizing the oldest stands for harvest. Using this harvest rule may prevent stands from aging too far beyond their optimal harvest age. A 'random' harvest rule selects randomly for harvest from stands that are older than minimum harvestable age. Therefore, some stands may be harvested close to an optimum harvest age and others may age far beyond their optimal age. As a result, a random harvest rule generally results in lower stand yields over the long term compared to the relative oldest first rule, causing decreased timber supply in the medium term and long term.

Long-term timber supply (over 100 years from now) is affected by uncertainties in all the above factors. Changes to the size of the land base available for timber harvesting, managed stand volume estimates, and assumptions about visual quality management each have impacts on the long-term harvest level.

The socio-economic analysis for the Sunshine Coast TSA indicates that the current AAC of 1 140 000 cubic metres can support a provincial total of approximately 1,325 person-years of direct employment. Residents of the TSA account for approximately 47% of this direct employment. Direct forestry sector activity in the TSA supports a further 1,680 person-years of indirect and induced employment across the province.

The maximum even-flow forecast indicates that the current timber supply can be maintained. This will help to provide security for local processors and employees, and communities of Sunshine Coast. Local access to timber by local processors has been raised as an issue in the Sunshine Coast TSA.

The current AAC has provided the provincial government with average annual revenues of $32.9 million.

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Introduction

Timber supply* is the quantity of timber available for harvest over time. Timber supply is dynamic, not only because trees naturally grow and die, but also because conditions that affect tree growth, and the social and economic factors that affect the availability of trees for harvest, change through time.

Assessing the timber supply involves considering physical, biological, social and economic factors for all forest resource values, not just for timber. Physical factors include the land features of the area under study as well as the physical characteristics of living organisms, especially trees. Biological factors include the growth and development of living organisms. Economic factors include the financial profitability of conducting forest operations, and the broader community and social aspects of managing the forest resource.

All of these factors are linked: the financial profitability of harvest operations depends upon the terrain, as well as the physical characteristics of the trees to be harvested. Determining the physical characteristics of trees in the future requires knowledge of their growth. Decisions about whether a stand is available for harvest often depends on how its harvest could affect the growth and development of another part of the forest resource, such as wildlife or a recreation area.

These factors are also subject to both uncertainty and different points of view. Financial profitability may change as world timber markets change. Unforeseen losses due to fire or pest infestations will alter the amount and value of timber. The appropriate balance of timber and non-timber values in a forest is an ongoing subject of debate, and is complicated by changes in social objectives over time.

Thus, before an estimate of timber supply is interpreted, the set of physical, biological and socio-economic conditions on which it is based, and which define current forest management — as well as the uncertainties affecting these conditions — must first be understood. Timber supply analysis is the process of assessing and predicting the current and future timber supply for a management unit (a geographic area). For a timber supply area (TSA)*, the timber supply analysis forms part of the information used by the chief forester of British Columbia in determining an allowable annual cut (AAC)* — the permissible harvest level for the area.

Timber supply projections made for TSAs look far into the future — 250 years or more. However, because of the uncertainty surrounding the information and because forest management objectives change through time, these projections should not be viewed as static prescriptions that remain in place for that length of time. They remain relevant only as long as the information upon which they are based remains relevant. Thus, it is important that re-analysis occurs regularly, using new information and knowledge to update the timber supply picture. Indeed, the *Forest Act* requires that the timber supply for management units throughout British Columbia be reviewed at least every five years. This allows close monitoring of the timber supply and of the implications for the AAC stemming from changes in management practices and objectives.

**Throughout this document, an asterisk after a word or phrase indicates that it is defined in a box at the foot of the page, as well as in the glossary.*

Timber supply
The amount of timber that is forecast to be available for harvesting over a specified time period, under a particular management regime.

Timber supply area (TSA)
An integrated resource management unit established in accordance with Section 7 *of the* Forest Act.

Allowable annual cut (AAC)
The rate of timber harvest permitted each year from a specified area of land, usually expressed as cubic metres of wood per year.

Introduction

Timber supply analysis involves three main steps. The first is collecting and preparing information and data. The B.C. Forest Service forest inventory* plays a major role in this. The second step is using this data along with a timber supply computer model or models* to make projections or estimates of possible harvest levels over time. These projections are made using different sets of assumed values or conditions for the factors discussed above. The third step is interpreting and reporting results.

The following sections outline the timber supply analysis for the Sunshine Coast TSA. Following a brief description of the area in Section 1, data preparation and formulation of assumptions are discussed in Section 2. Timber supply analysis methodology and results are presented in Sections 3 and 4. Section 5 examines the sensitivity of the results to uncertainties in the data and assumptions used. This is followed by a summary and conclusions for the timber supply analysis. Section 7 shows results of a socio-economic analysis for the Sunshine Coast TSA. Appendixes A and B contain further details about the data and assumptions used in the analysis.

As part of the timber supply review (TSR), information is gathered on the short- and long-term implications of alternative harvest levels, and the capabilities and requirements of existing and proposed processing facilities. The socio-economic analysis provides information for the chief forester and the local community to better understand the potential magnitude of impacts associated with any harvest level changes.

The socio-economic analysis considers the current and projected levels of forestry activity associated with the Sunshine Coast TSA within the context of regional timber supplies and production capacity. It does this by examining the profile of the region and the local forest industry; and by assessing employment and income implications of the timber harvesting level projected in maximum even-flow.

The socio-economic analysis includes an estimate of the employment and income impacts associated with timber supply analysis projections by three main sectors: harvesting and other woodlands-related activities, processing, and silviculture. Employment is measured in terms of person-years*. Employment income is calculated using average industry income estimates.

Forest inventory
An assessment of British Columbia's timber resources. It includes computerized maps, a database describing the location and nature of forest cover, including size, age, timber volume, and species composition, and a description of other forest values such as recreation and visual quality.

Model
An abstraction and simplification of reality constructed to help understand an actual system or problem. Forest managers and planners have made extensive use of models, such as maps, classification systems and yield projections, to help direct management activities.

Person-year(s)
One person working the equivalent of one full year, defined as at least 180 days of work. Someone working full-time for 90 days accounts for 0.5 person-years.

1 Description of the Sunshine Coast Timber Supply Area

The Sunshine Coast Timber Supply Area (TSA) is situated along the southwest coast of British Columbia, extending from Howe Sound in the south to the head of Bute Inlet in the north. The TSA covers approximately 1.5 million hectares and is part of the Sunshine Coast Forest District, one of eight districts in the Vancouver Forest Region. The forest district also includes Tree Farm Licence (TFL)* 10 and parts of TFLs 39 and 43. The TSA is administered by the Sunshine Coast Forest District office in Powell River and a field office in Sechelt.

The population of the Sunshine Coast TSA is 45,878 according to the 1996 census, a 14.5% increase since 1991. More than half of the population lives in the three major centres of Powell River, Sechelt and Gibsons. Other smaller communities include Halfmoon Bay, Pender Harbour, Lund and the communities on Texada, Cortes and Lasqueti islands.

The mountainous topography and associated high rainfall in the Sunshine Coast TSA produce a diverse climate and ecology. The landscape ranges from rocky shorelines and coastal plains to rugged ice-capped mountains. The Coast Mountains dominate the TSA, with nutrient-rich, moist floodplains in valley bottoms and alpine meadows at higher elevations. Several significant coastal fjords, most notably Bute, Toba and Jervis inlets occur in the TSA.

The forests of the Sunshine Coast TSA are diverse. Within the land base currently considered available for timber harvesting, Douglas-fir, hemlock and balsam are the major tree species, while western redcedar, spruce, pine, alder, cottonwood and maple also occur. Douglas-fir, hemlock, alder and western redcedar are the tree species most commonly used by the forest industry in the area. The TSA has a long history of harvesting activity, resulting in younger forests on better quality, more accessible growing sites, and older forests on the poorer and less accessible areas.

The current allowable annual cut (AAC) in the Sunshine Coast TSA is 1.14 million cubic metres (not including woodlot licences*). This level was set by the chief forester effective July 1, 1996, and was an increase of about 3.6% from the previous AAC. The chief forester also specified that 1.045 million cubic metres be attributed to harvesting coniferous* forests and 95 000 cubic metres to harvesting deciduous* forests.

About 28% of the TSA land base is considered productive forest land managed by the B.C. Forest Service (approximately 428 000 hectares). Currently about 52% of this forested land base is considered available for harvesting (14% of the total TSA land base).

Significant changes that influence forest management have occurred since the last timber supply review was completed. These changes include:

- implementation of the *Forest Practices Code (FPC)**;
- revisions to scenic areas* and visual quality classes; and,
- vegetation resources inventory work to improve estimates of existing stand volumes.

Tree farm licence (TFL)
Provides rights to harvest timber, and outlines responsibilities for forest management, in a particular area.
Woodlot licence
An agreement entered into under the Forest Act. *It allows for small-scale forestry to be practised in a described area (Crown and private) on a sustained yield basis.*
Coniferous
Coniferous trees have needles or scale-like leaves and are usually 'evergreen'.

Deciduous
Deciduous trees shed their leaves annually and commonly have broad-leaves.
Forest Practices Code
Legislation, standards and guidebooks that govern forest practices and planning, with a focus on ensuring management for all forest values.
Scenic area
Any visually sensitive area or scenic landscape identified through a visual landscape inventory or planning process carried out or approved by a district manager.

1 Description of the Sunshine Coast Timber Supply Area

The provincial Landscape Unit Planning process is currently well underway in the Sunshine Coast TSA. In addition, several small local plans have been completed that reflect integrated multiple-resource use in the planning areas. Since the last timber supply review, 16 new protected areas* have been designated. The protected areas are excluded from the timber harvesting land base*.

The forests of the Sunshine Coast TSA provide a wide range of forest land resources, including forest products (timber and non-timber, such as wild mushrooms), recreation and tourism amenities, and fishery and wildlife habitats. Residents and visitors make extensive use of the forests of the TSA for recreational activities. Parks, recreation sites and trails, and roaded and non-roaded areas in the TSA provide opportunities for numerous outdoor activities such as hiking, camping, skiing, mountain biking, horseback riding, mountaineering, hunting, canoeing and kayaking, as well as more passive activities such as wildlife or forest viewing. Recreational fishing is popular in the many lakes of the TSA.

Protected area
A designation for areas of land and water set aside to protect natural heritage, cultural heritage or recreational values (may include national park, provincial park, or ecological reserve designations).

Timber harvesting land base
Crown forest land within the timber supply area where timber harvesting is considered both acceptable and economically feasible, given objectives for all relevant forest values, existing timber quality, market values and applicable technology.

1 Description of the Sunshine Coast Timber Supply Area

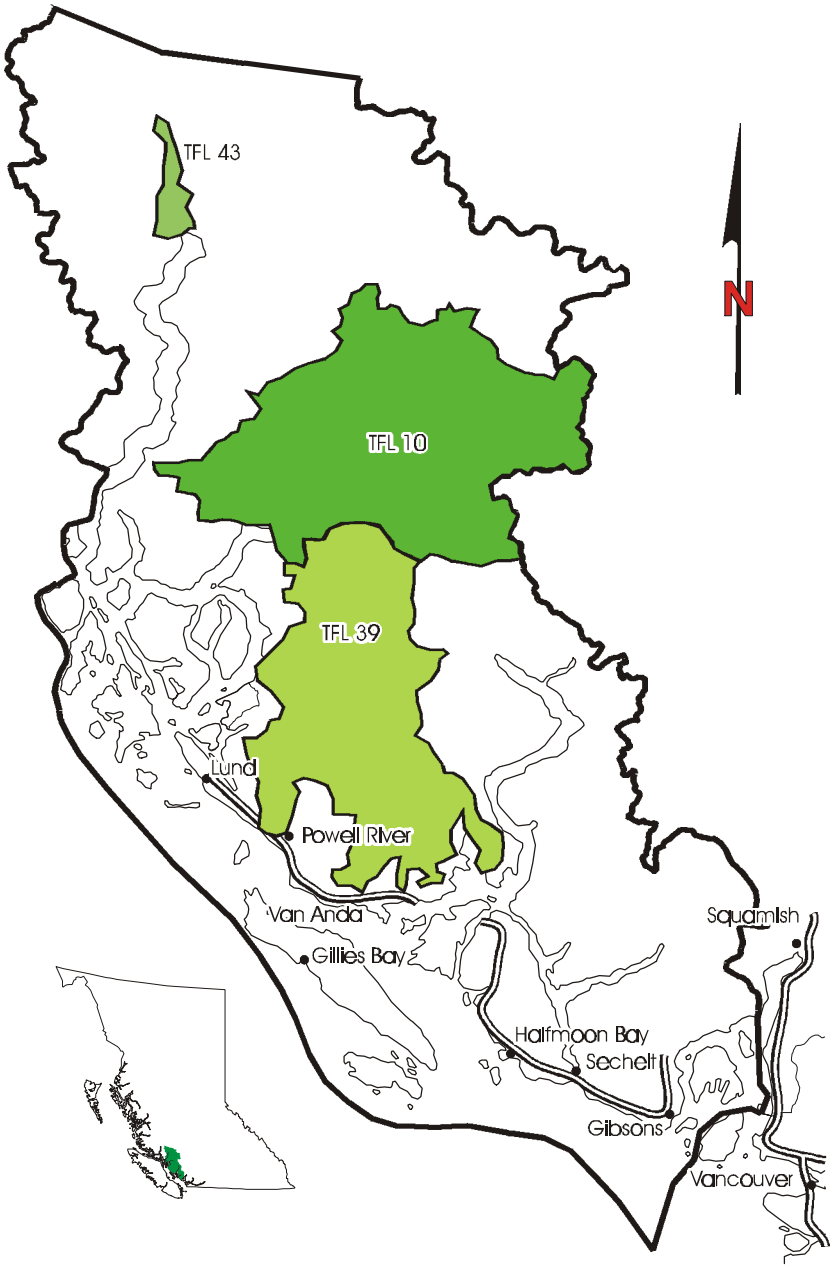

Figure 1. Map of the Sunshine Coast forest district showing tree farm licence areas and the timber supply area.

1 Description of the Sunshine Coast Timber Supply Area

1.1 The environment

The Sunshine Coast TSA includes four major biogeoclimatic zones*, ranging from temperate rainforests in the valleys and on mountain slopes, to alpine tundra on ridges and mountain tops. The varied ecological features and unique nature of the area contribute to the high biodiversity* values found in this TSA.

The Coastal Douglas-fir (CDF) zone has a limited occurrence and is found mainly on islands in the southern portion of the TSA. Lying in the rain shadow of Vancouver Island, the CDF zone is characterized by warm, dry summers and mild, wet winters. The dominant tree species are Douglas-fir, arbutus, western redcedar and grand fir. Less common trees include shore pine, Sitka spruce, dogwood, bigleaf maple, bitter cherry, and black cottonwood on floodplain sites.

Almost all of the valley floors and lower mountainsides of the TSA lie within the Coastal Western Hemlock (CWH) zone, one of the largest of the four zones in this TSA. The CWH zone occupies elevations from sea level to about 1000 metres and is the wettest zone in B.C., characterized by cool summers and mild winters. The dominant tree species are western hemlock and amabilis fir, with less common occurrences of western redcedar and Douglas-fir.

The Mountain Hemlock (MH) zone lies above the CWH zone, up to about 2200 metres, and is characterized by short, cool summers and long, cool, wet winters with heavy snow cover for several months. Mountain hemlock, yellow-cedar and amabilis fir are the dominant tree species. Other species include western hemlock, western redcedar, Douglas-fir and western white pine.

The Alpine Tundra (AT) zone occurs at high elevations above the MH zone. The climate is cold, windy and snowy with a short, cool growing season. By definition this zone is treeless, although trees in stunted form are common at lower elevations. Vegetation is dominated by shrubs, herbs, mosses and lichens. Much of the alpine landscape lacks vegetation and is the domain of rock, ice and snow.

The varied topography and forests of this TSA are home to many species of wildlife. Large mammals include grizzly and black bear, black-tailed deer, Roosevelt elk, mountain goat, cougar and wolf, as well as isolated populations of moose. Small mammals are diverse and abundant. The nutrient-rich, protected waters of the various estuaries in the TSA provide shelter and food for many waterfowl species, from ducks, Canada geese and gulls to eagles and ospreys. Large wintering congregations of Harlequin duck, bald eagle, trumpeter swan and Barrow's goldeneye duck also occur in coastline waters throughout the TSA. Several species of raptor are found within the TSA, including pygmy owl, saw-whet owl, barred owl, western screech owl, Cooper's hawk, red-tailed hawk, sharp-shinned hawk, merlin, kestrel and golden eagle in remote valleys.

The mature original forests of the Sunshine Coast TSA contain some wildlife species that are highly dependent on the qualities of an old-growth forest (e.g., marbled murrelets, Keen's long-eared myotis, grizzly bears). Waterfowl such as goldeneyes, wood ducks, bufflehead ducks, mergansers and herons also rely on large-diameter timber adjacent to lakes and wetlands.

Under the *Forest Practices Code*, a process exists for identifying species at risk and designating wildlife habitat areas (WHA) with specific management practices. The wildlife species that have been identified in *Volume 1* of the *Provincial Identified Wildlife Management Strategy* in the five ecosections of the Sunshine Coast Forest District are presented in Table 1.

Biogeoclimatic zones
A large geographic area with broadly homogeneous climate and similar dominant tree species.

Biodiversity (biological diversity)
The diversity of plants, animals and other living organisms in all their forms and levels of organization, including the diversity of genes, species and ecosystems, as well as the evolutionary and functional processes that link them.

Table 1. Species at risk as identified under the Forest Practices Code (February 1999)

Common names of identified wildlife	Ecosection				
	Northern Pacific Ranges	Outer Fiordland	Southern Pacific Ranges	Georgia Lowland	Strait of Georgia
Bull trout	X		X		
Tailed frog	X	X	X	X	
Northern goshawk *atricapillus*	X	X	X	X	X
Marbled murrelet	X	X	X	X	X
Keen's long-eared myotis	X	X	X	X	X
Fisher	X				
Grizzly bear	X	X	X		
Mountain goat	X	X (limited)	X		

Source: Managing Identified Wildlife, Volume 1, February 1999.

The many rivers, streams and lake systems in the TSA support significant fish populations, including almost all species of salmon, steelhead trout, cutthroat trout, Dolly Varden char, bull trout, rainbow trout, lamprey, sculpin and stickleback. High elevation lakes in the area were largely barren historically, but stocking programs have spread rainbow and cutthroat trout throughout the area. Water resources for human uses are also under pressure as a result of increases in population and development in the TSA.

Current forest management practices follow the legislation and guidelines set out by the *Forest Practices Code*. Consequently, the protection of wildlife and the environment will be managed through the *Code*. In addition, several Land and Resource Use Plans (LRUP) provide further management direction for public forest lands in the Sunshine Coast TSA, as well as for wildlife species not included in the above list.

1.2 First Nations

Eight First Nations have traditional territory in the Sunshine Coast TSA. Four of the First Nations also have reserve lands (the Sechelt Indian Band, Sliammon Indian Band, Homalko Indian Band and Klahoose Indian Band). The other four First Nations with traditional territory are the Squamish Nation, the Comox Indian Band, the Campbell River Band and the Cape Mudge Band.

The Sechelt Indian Band has traditional territory covering Jervis and Sechelt inlets, and the majority of the members reside in Sechelt. The Sliammon Indian Band has six reserves and traditional territory located near Powell River. The Homalko Indian Band has 11 reserves and traditional territory around Bute Inlet, but the majority of its members reside in Campbell River. The Klahoose Indian Band has a reserve and office in Squirrel Cove on Cortes Island and traditional territory extending into the head of Toba Inlet. These four First Nations have a population of about 2,150 people living in the TSA.

Archaeological Overview Assessments (AOA) have been completed for portions of the Sunshine Coast TSA. Archaeological Overview Assessments are the basis for determining areas and sites that may require further assessment in the form of an Archaeological Impact Assessment (AIA). Archaeological Impact Assessments are carried out as part of operational planning. Known archaeological sites are considered in this timber supply review.

Many First Nations members participate in the forest sector and First Nations have a strong interest in obtaining forest tenure, in order to provide economic opportunities for their members. First Nations have also expressed concern about the impact of logging on water and fishery resources, heritage resources and spiritual ceremonial sites in their traditional territories. The Sunshine Coast Forest District attempts to address these concerns through cooperative planning processes, heritage resource inventories, and consultation on five year development plans.

2 Information Preparation for the Timber Supply Analysis

Timber supply analysis requires three general categories of information: land base inventory; timber growth and yield; and management practices. These three categories are discussed below. Also, in preparation for the analysis, a number of changes since the 1995 Sunshine Coast TSA timber supply analysis were noted, and are described in Section 2.4, "Changes since the 1995 Sunshine Coast TSA analysis."

2.1 Land base inventory

Land base information used in this analysis was compiled in 2000 by the B.C. Forest Service. The computer file contains information on the forest land in the Sunshine Coast TSA including general geographic location, area, nature of forest cover (such as presence or absence of trees, species, number of trees, age, and timber volume), and other characteristics such as environmental sensitivity and physical accessibility (operability*). Stand attributes such as tree height, stocking* and age have been projected to January 2000. The inventory file has been updated to account for timber harvesting up to August 1999.

The inventory file represents the land base for the entire TSA. It includes information on land that does not contain forest, and other areas where timber harvesting is not expected to occur. Examples are land set aside for parks, areas needed to protect wildlife habitat, areas in utility and transportation corridors, and residential and industrial development. A description of these areas specific to the Sunshine Coast TSA is provided below. These types of areas do not contribute to the timber harvesting land base of the Sunshine Coast TSA. Before assessing timber supply, these non-contributing areas are identified and separated from the timber harvesting land base. When deriving this data file, care is taken to make only a single reduction for areas that overlap (for example, where an inoperable area* is also wildlife habitat).

Identifying areas as not contributing to timber supply does not mean the area is removed from the Sunshine Coast TSA. The B.C. Forest Service still manages the entire area of the TSA (except for designated areas under the jurisdiction of other agencies) as a land unit that contributes a mix of timber and non-timber values. The timber supply is managed within this integrated resource context, and the analysis described here is consistent with this philosophy.

The following section describes the types of areas not contributing to the timber harvesting land base. Use of the term timber harvesting land base in this report does not mean the area is open to unrestricted logging. Rather, it implies that forests in the area contain accessible timber of sufficient economic value — on sites of adequate environmental resilience — to accommodate timber harvesting with due care for other resources.

Operability
Classification of an area considered available for timber harvesting. Operability is determined using the terrain characteristics of the area as well as the quality and quantity of timber on the area.

Stocking
The proportion of an area occupied by trees, measured by the degree to which the crowns of adjacent trees touch, and the number of trees per hectare.

Inoperable areas
Areas defined as unavailable for harvest for terrain-related or economic reasons. Characteristics used in defining inoperability include slope, topography (e.g., the presence of gullies or exposed rock), difficulty of road access, soil stability, elevation and timber quality. Operability can change over time as a function of changing harvesting technology and economics.

2 Information Preparation for the Timber Supply Analysis

For the Sunshine Coast TSA, the following types of areas were excluded from the timber harvesting land base.

- not managed by the B.C. Forest Service — these are non-Crown areas (such as private land and Indian Reserves) and parks. The forested portions of parks and ecological reserves contribute towards biodiversity.
- archaeology sites — a 50-metres no-harvest buffer has been applied to all culturally modified trees (CMT)* and areas identified as archaeological sites.
- environmentally sensitive areas (ESAs)* and unstable terrain areas — areas with sensitive soils, high wildlife values, watershed* values, recreation values, avalanche hazards, and tree regeneration problems.
- high value recreation features — all areas identified as having high recreation value.
- goat winter range — stands which are required for the safe wintering of mountain goats.
- riparian reserve, riparian management and gully management areas — areas assumed to be unavailable for harvesting to provide protection for riparian and stream ecosystems.
- wildlife tree patches (WTP) — areas reserved within and along the edges of cutblocks* for the maintenance of stand-level biodiversity* (stand structure), primarily for conservation or enhancement of wildlife.
- future roads, trails and landings — future losses of productive forest land to access development. These areas will be removed from the timber harvesting land base as part of the first harvest.
- non-forested and non-productive forested areas — areas not occupied by productive forest cover (e.g., rock, swamp, alpine areas and water bodies).
- existing roads, trails and landings (RTL) — areas of forest land that have been removed from timber production due to access development and harvesting to date.
- non-commercial cover areas — areas occupied by non-commercial tree or brush species.
- inoperable areas — areas classified as unavailable for harvest for terrain-related reasons.
- sites with low timber productivity — areas occupied by forest with low timber-growing potential.
- non-merchantable forest types* — stands which are physically operable and exceed low site criteria yet are not currently utilized or have marginal merchantability, including most pine-leading stands and some deciduous species.

Culturally modified tree
A tree or a remnant of a tree with evidence of traditional aboriginal forest use.
Environmentally sensitive areas
Areas with significant non-timber values, fragile or unstable soils, impediments to establishing a new tree crop, or high risk of avalanches.
Watershed
An area drained by a stream or river. A large watershed may contain several smaller watersheds.

Cutblock
A specific area, with defined boundaries, authorized for harvest.
Stand-level biodiversity
A stand is a relatively localized and homogeneous land unit that can be managed using a single set of treatments. In stands, objectives for biodiversity are met by maintaining specified stand structure (wildlife trees or patches), vegetation species composition and coarse woody debris levels.
Non-merchantable forest types
Stands that are accessible and otherwise available for harvesting but are assumed to be non-merchantable due to stand characteristics such as small piece size, incidence of decay, species composition and low stocking.

A more detailed description of these categories, including specific criteria for removal is located in Appendix A, "Description of Data Inputs and Assumptions for the Timber Supply Analysis." Table 2 summarizes the areas in each category, and shows the area of the timber harvesting land base.

The current timber harvesting land base in the Sunshine Coast TSA represents about 14.4% of the total TSA area and about 52.3% of the productive forest. Most of the excluded area is in three categories: inoperable areas (31.6% of the productive forest), unstable terrain (6.4%) and low timber productivity / non-merchantable species (3.8%). The remaining categories, such as riparian areas*, represent 5.8% of the productive forest. The percentages provided depend on the order in which each category is considered. For instance, riparian areas would constitute a larger proportion of the reduction if they were netted out prior to inoperable areas.

Riparian area
Areas of land adjacent to wetlands or bodies of water such as swamps, streams, rivers or lakes.

2 Information Preparation for the Timber Supply Analysis

Table 2. Determination of the timber harvesting land base for the Sunshine Coast TSA

Classification	Area (hectares)	Per cent (%) of total TSA area	Per cent (%) of Crown forest area
Total area	1 555 092	100.0	
Not managed by B.C. Forest Service	555 615	35.7	
Non-forest and non-productive forest	566 645	36.4	
Existing roads	5 238	0.3	
Total productive forest land	427 594[a]	27.5	100.0
Non-commercial brush	76	0.0	0.0
Inoperable	135 245	8.7	31.6
Low timber productivity / non-merchantable stands	16 223	1.0	3.8
Archaeology sites	43	0.0	0.0
Unstable terrain	27 558	1.8	6.4
Environmentally sensitive	7 085	0.5	1.7
High value recreation features	263	0.0	0.1
Goat winter range	2 849	0.2	0.7
Riparian[b]	9 568	0.6	2.2
Wildlife tree patches[c]	4 878	0.3	1.1
Total current reductions	203 788	13.1	47.7
Current timber harvesting land base (includes 1545 hectares of timber licences	223 806	14.4	52.3
Future roads	3 916	0.3	0.9
Future timber harvesting land base	219 890	14.1	51.4

(a) The total Crown forested land base in the Sunshine Coast analysis area, which includes some protected areas not managed by the B.C. Forest Service, is approximately 452 512 hectares. Although protected areas are not managed for timber supply, the forested areas within them contribute to non-timber objectives such as requirements for old-seral forest to maintain landscape-level biodiversity.

(b) Through an examination of silviculture prescriptions in the TSA, it was found that only 36% of riparian reserve/management zones are > 2 hectares in size. Therefore, as outlined in the *Landscape Unit Planning Guide (LUPG)*, only 36% of the riparian reduction area may contribute to landscape-level biodiversity requirements.

(c) Through an examination of silviculture prescriptions in the TSA, it was found that only 85% of wildlife tree patches are > 2 hectares in size. Therefore, only 85% of the area excluded from the timber harvesting land base for wildlife tree patches may contribute to landscape-level biodiversity requirements.

2 Information Preparation for the Timber Supply Analysis

Figure 2 represents both the total Sunshine Coast TSA area, and the productive forest land base. The total area chart shows that about 35.7% of the total land base is classified as not managed by the B.C. Forest Service (BCFS), and 36.4% is classified as non-forest or non-productive forest (i.e., having very few trees). The productive crown forest chart details the categories of forested land managed by the BCFS as well as some additional forested park areas not managed by the BCFS but important for landscape-level biodiversity*. Together, these two types of forest land, hereafter referred to as the 'productive crown forest', comprise 452 512 hectares, all of which is considered in assessments of landscape-level biodiversity. Figure 2 shows that almost 50% of the productive crown forest in the Sunshine Coast TSA is considered to be part of the timber harvesting land base, including not satisfactorily restocked (NSR)* stands and timber licences (TL).

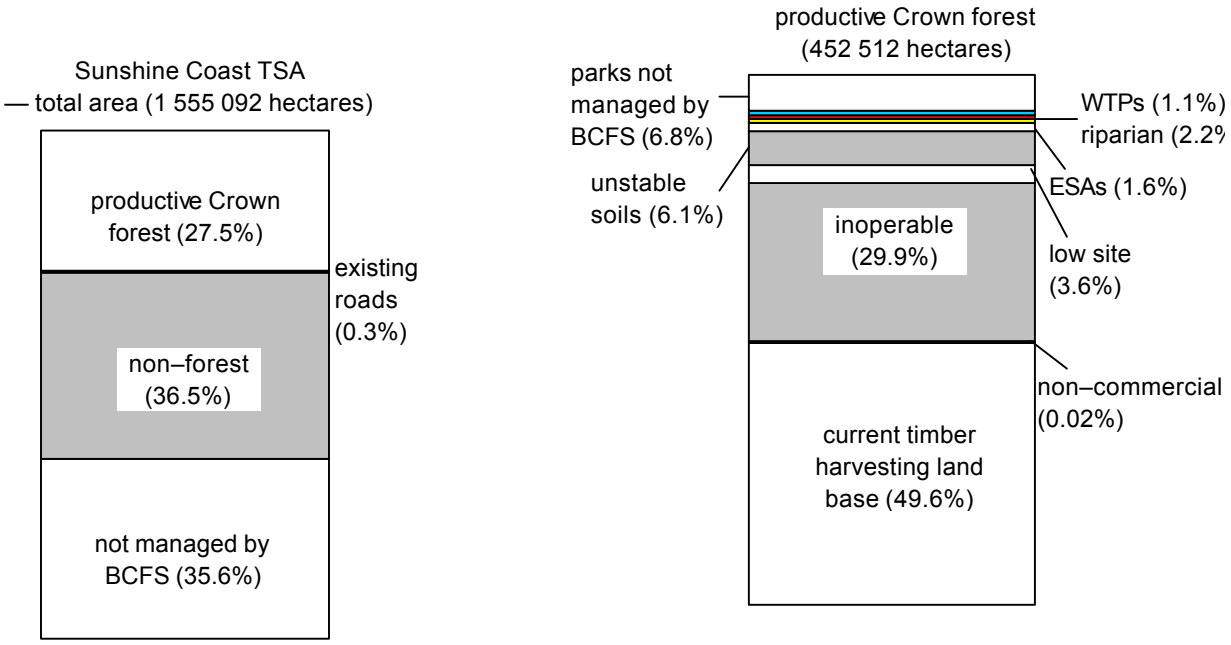

Figure 2. Composition of the total land base and productive crown forest land base — Sunshine Coast TSA, 2001.

Landscape-level biodiversity
The Landscape Unit Planning Guide *provides objectives for maintaining biodiversity at both the landscape level and the stand level. At the landscape level, guidelines are provided for the maintenance of seral stage distribution, patch size distribution and landscape connectivity.*

Not satisfactorily restocked (NSR) areas
An area not covered by a sufficient number of well-spaced tree stems of desirable species. Stocking standards are set by the B.C. Forest Service. Areas harvested prior to October 1987 and not yet sufficiently stocked according to standards are classified as backlog NSR. Areas harvested or otherwise disturbed since October 1987 are classified as current NSR.

2 Information Preparation for the Timber Supply Analysis

Figure 3 shows the current composition of the timber harvesting land base by dominant tree species groups. Stands mainly composed of hemlock, balsam and spruce cover 43.6% of the timber harvesting land base. Douglas-fir stands similarly dominate the landscape, covering 42.3% of the timber harvesting land base. Cedar- and alder-dominated stands occupy 7.8% and 4.7% of the timber harvesting land base, respectively. Other deciduous species occupy 1.2% of the timber harvesting land base. A very small area of the timber harvesting land base (0.4%) is occupied by pine stands. After harvest, most stands are expected to be regenerated to stands as described in Appendix A, "Description of Data Inputs and Assumptions for the Timber Supply Analysis."

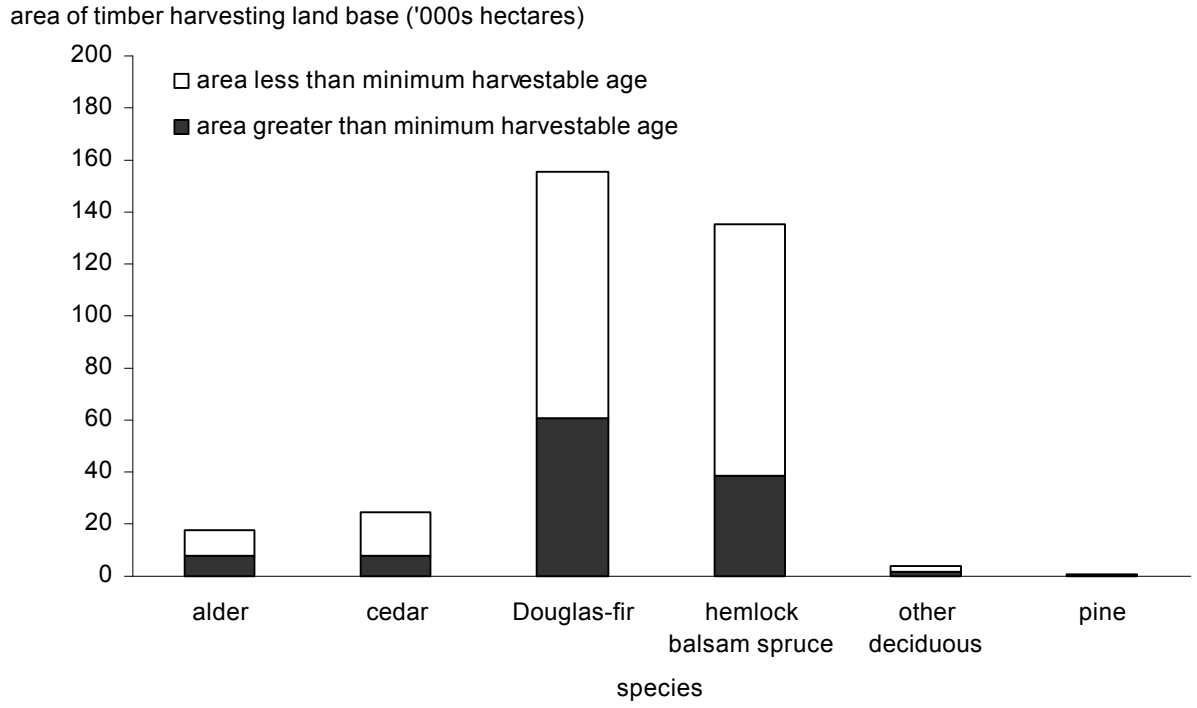

Figure 3. Area by dominant species — Sunshine Coast TSA timber harvesting land base, 2001.

Figure 3 also shows the proportion of area of each species that is either younger or older than the minimum harvestable age (MHA) for existing forests (see Appendix A, "Description of Data Inputs and Assumptions for the Timber Supply Analysis" for details on the minimum harvestable age for each species). In total, about 48% of stands in the timber harvesting land base are at or above the minimum harvestable age. This proportion varies among the species groupings: 71% of alder stands, 43% of cedar stands, 65% of Douglas-fir stands, 40% of hemlock, balsam, spruce stands, 55% of other deciduous stands, and 0% of pine stands are currently older than the minimum harvestable age.

2 Information Preparation for the Timber Supply Analysis

Figure 4 provides an overview of the distribution of site productivity of the dominant stand types within the timber harvesting land base. The site classes in Figure 4 are groupings of site index (SI)* (metres in height at age 50 years) based on the analysis unit* definitions described in Appendix A, "Description of Data Inputs and Assumptions for the Timber Supply Analysis."

Over 50% of the stands are in the 'poor' site class, while stands with a site class of 'medium' occupy 31% of the area, and those with a site class of 'good', cover 19% of the timber harvesting land base. As described above in Section 2.1, "Land base inventory," sites with very poor productivity are excluded from the timber harvesting land base.

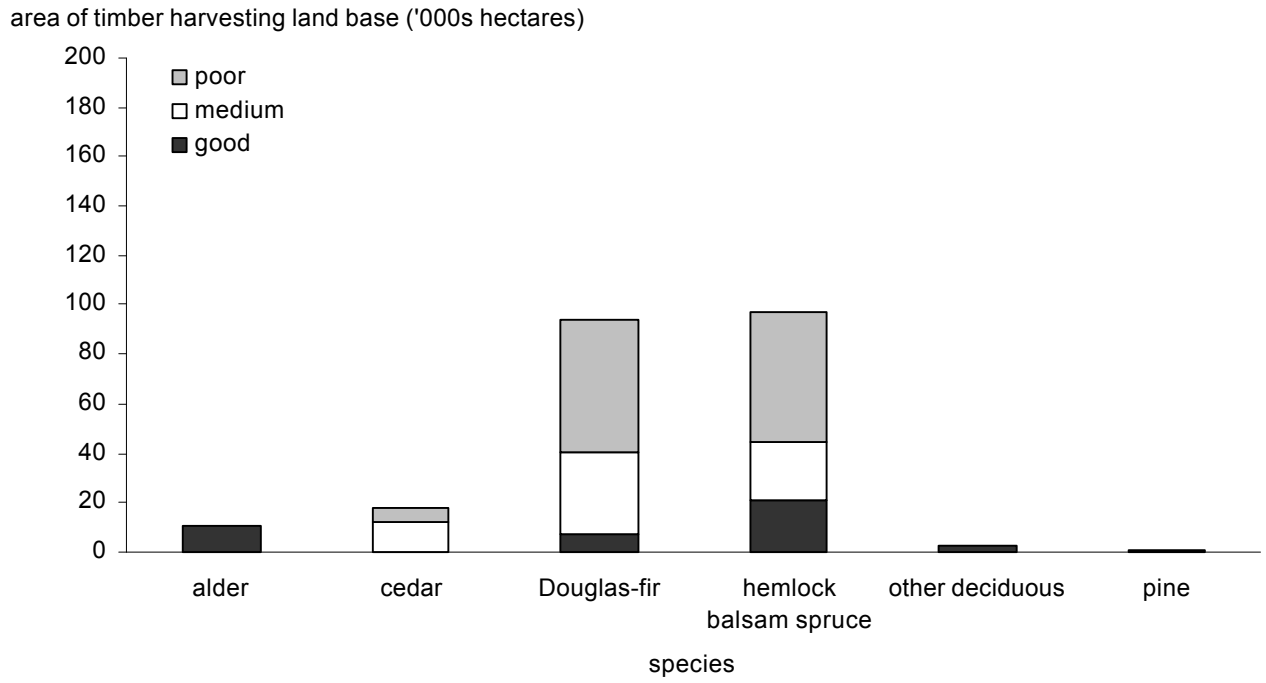

Figure 4. Area by dominant species and site class — Sunshine Coast TSA timber harvesting land base, 2001.

Site index
A measure of site productivity. The indices are reported as the average height, in metres, that the tallest trees in a stand are expected to achieve at 50 years (age is measured at 1.3 metres above the ground). Site index curves have been developed for British Columbia's major commercial tree species.

Analysis unit
A grouping of types of forest — for example, by species, site productivity, silvicultural treatment, age, and or location — done to simplify analysis and generation of timber yield tables.

Figure 5 shows the current age composition of forested stands in the Sunshine Coast TSA. About 11% of the timber harvesting land base is occupied by stands older than 250 years. About 29% of the area is covered with stands 20 years or younger, 47% is between 21 and 100 years old, and 13% is between 101 and 250 years of age. Figure 5 illustrates that the age class distribution of the timber harvesting land base is quite evenly distributed between 0 and 100 years of age, reflecting a long harvesting history in the Sunshine Coast TSA.

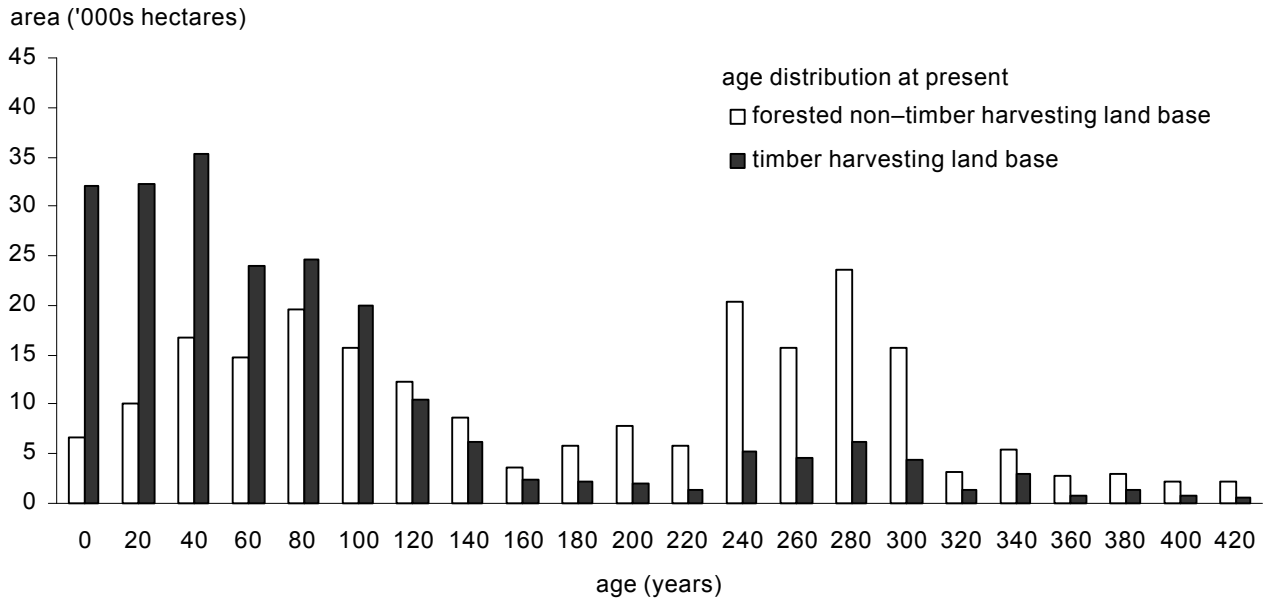

Figure 5. Current age class composition — Sunshine Coast TSA productive forest land base, 2001.

The age class distribution of forested stands excluded from the timber harvesting land base also affects timber supply. Although they do not contribute directly to timber supply, these areas can affect how much harvesting can be conducted and the pattern of the harvesting within the TSA by providing old-forest and biodiversity attributes. The productive crown forest land base in the Sunshine Coast TSA, which includes some land not managed by the B.C. Forest Service, is approximately 452 512 hectares. A significant portion of the productive crown forest area — 50.4% — does not contribute to the timber harvesting land base. This area is referred to as the 'non-timber harvesting land base,' and is shown by the white columns, in Figure 5. A significant portion of the non-timber harvesting land base is between 40 and 100 years of age. Over 42% of the non-timber harvesting land base is currently at or near the age at which stands are considered old (250 years).

Over time, the non-timber harvesting land base will be able to provide much of the area needed to meet old-forest biodiversity requirements as set out in the *Landscape Unit Planning Guide* (LUPG). However, some old-forest timber harvesting land base will likely need to be reserved from harvesting into the medium term while forests in the non-timber harvesting land base age sufficiently to achieve old-forest conditions.

2 Information Preparation for the Timber Supply Analysis

2.2 Timber growth and yield

Two growth and yield models were used to estimate timber volumes for the Sunshine Coast TSA analysis. The variable density yield prediction (VDYP) model* developed by the B.C. Forest Service, Resources Inventory Branch, was used for estimating volumes in unmanaged/natural coniferous and deciduous stands. Managed deciduous stand volumes were also assigned using VDYP volume estimates*. The table interpolation program for stand yields (TIPSY)*, developed by the B.C. Forest Service, Research Branch, was used to estimate yields for managed coniferous stands. TIPSY was also used to estimate yields from stands that were harvested in the past but managed to current standards. Depending on the species, these stands may be as old as 21 years of age.

Timber volume estimates assume a specific utilization level, or set of dimensions, which establish the minimum tree and log sizes that are removed from a site. Utilization levels used in estimating timber volumes specify minimum diameters both near the base and the top of a tree as well as a maximum stump height.

Appendix A, "Description of Data Inputs and Assumptions for the Timber Supply Analysis" contains details on the definition of managed stands, utilization standards and the specific model versions used.

Volume estimation and prediction are subject to uncertainty due to uncertainties in inventories which form the basis for estimating site productivity, limited experience with second-growth in British Columbia, and the long-time frame over which trees grow.

Variable Density Yield Prediction model
An empirical yield prediction system supported by the B.C. Forest Service, designed to predict average yields and provide forest inventory updates over large areas (i.e., Timber Supply Areas). It is intended for use in unmanaged natural stands of pure or mixed composition.

Volume estimates (yield projections)
Estimates of yields from forest stands over time. Yield projections can be developed for stand volume, stand diameter or specific products, and for empirical (average stocking), normal (optimal stocking) or managed stands.

Table Interpolation Program for Stand Yields
A B.C. Forest Service computer program used to generate yield projections for managed stands based on interpolating from yield tables of a model (TASS) that simulates the growth of individual trees based on internal growth processes, crown competition, environmental factors and silvicultural practices.

2 Information Preparation for the Timber Supply Analysis

In 1997, a Vegetation Resources Inventory (VRI) was initiated for the Sunshine Coast TSA. The inventory was completed over three years, and used ground sampling throughout the district to measure, among other things, the quantity and quality of timber, coarse woody debris*, plants, soils, and biogeoclimatic site series. In general, the Vegetation Resources Inventory revealed that the forest cover inventory used in the previous analysis was underestimating timber volumes in the TSA by about 13%. Prior to commencing this timber supply analysis, adjustments were made to the forest cover inventory to correct ages, heights and volumes in the analysis file. Figure 6 shows the total volume in the Sunshine Coast TSA, before adjusting the inventory and after adjusting it. Volume estimates for stands dominated by Douglas-fir were most affected by the inventory adjustment, with a 17% increase in total volume. Volume estimates for hemlock stands increased by about 10%. The technical details of the inventory adjustment are available in the document *Sunshine Coast Forest District — Documentation of Vegetation Resources Inventory Preliminary Analysis* available from the Ministry of Forests, Resources Inventory Branch.

Sensitivity analysis* described in Section 5, "Timber Supply Sensitivity Analyses," addresses uncertainty around estimates for existing stand yields.

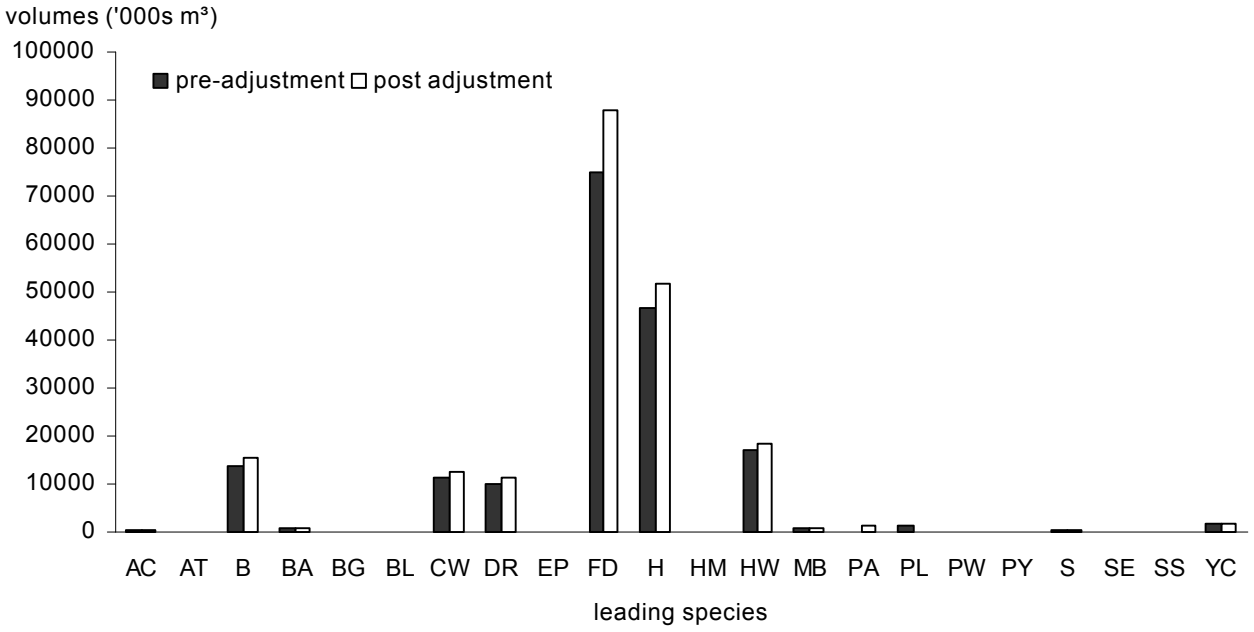

Figure 6. Total volume by leading species, before and after the inventory adjustment — Sunshine Coast TSA total forested land base, 2001.

Coarse woody debris
Logs and stumps that provide habitat for plants, animals and insects, and a source of nutrients for soil development.

Sensitivity analysis
A process used to examine how uncertainties about data and management practices could affect timber supply. Inputs to an analysis are changed, and the results are compared to a baseline or base case.

Based on the adjusted volume estimates, the current timber inventory on the timber harvesting land base is approximately 76 million cubic metres. About 66 million cubic metres, or 85%, of the volume on the timber harvesting land base are currently older than the minimum harvestable age (see Figure 10).

2.3 Management practices

Timber supply depends directly on how the forest is managed for both timber and non-timber values. Therefore, levels of management activity must be defined for the timber supply analysis. The *Forest Practices Code of British Columbia Act* and associated regulations guide forest management practices in the Sunshine Coast TSA. The focus of the timber supply review is to assess timber supply based on current management practices as implemented in plans for the area. Current management is described in section Appendix A, "Description of Data Inputs and Assumptions for the Timber Supply Analysis"). Staff in the Sunshine Coast Forest District provided information for the following management practices:

- Cutblock adjacency* and green-up* — in the Sunshine Coast TSA, approval of harvesting activities is contingent on previously harvested stands reaching a desired condition, or green-up, before adjacent stands may be harvested. This green-up condition is 3 metres in height for integrated resource management (IRM)* areas, islands and helicopter harvest areas, and 5 metres in height for visual quality management and community interface areas. The purpose of the cutblock adjacency guidelines is to prevent timber harvesting from becoming overly concentrated in an area at any one time. In the integrated resource management (IRM) zone, these guidelines were modelled by limiting the area within each landscape unit (LU)* that does not meet green-up conditions to a maximum of 33%.
- Helicopter harvest zone — within helicopter harvest areas, approval of harvesting activities is contingent on previously harvested stands reaching a desired condition, or green-up (3 metres in height). Helicopter logging generally occurs in a geographically distinct zone, on slopes above the conventionally harvestable zone. The area that does not meet green-up conditions in helicopter harvest areas within each landscape unit has been limited to 33%.

Cutblock adjacency
The desired spatial relationship among cutblocks. Most adjacency restrictions require that recently harvested areas must achieve a desired condition (green-up) before nearby or adjacent areas can be harvested. Specifications for the maximum allowable proportion of a forested landscape that does not meet green-up requirements are used to approximate the timber supply impacts of adjacency restrictions.
Green-up
The time needed after harvesting for a stand of trees to reach a desired condition (usually a specific height) — to ensure maintenance of water quality, wildlife habitat, soil stability or aesthetics — before harvesting is permitted in adjacent areas.

Integrated resource management (IRM)
The identification and consideration of all resource values, including social, economic and environmental needs, in resource planning and decision-making.
Landscape unit
A planning area based on topographic or geographic features, that is appropriately sized (up to 100 000 hectares), and designed for application of landscape-level biodiversity objectives.

- Community interface areas — forested areas adjacent to communities along the Strait of Georgia are subject to a slower rate of timber harvesting than forested land in the northern portion of the district. This management was modelled by limiting the area within the community interface zone that does not meet green-up conditions to 25%. In addition, partial harvesting techniques were modelled for Douglas-fir stands on sites with good or medium productivity.
- Islands zone — forested areas on some of the Gulf Islands is subject to a slower rate of timber harvesting than forested land in the northern portion of the district. To model this slower rate of disturbance, the area that does not meet a 3-metre green-up requirement was limited to 25%.
- Goat winter range — to provide goats with acceptable winter cover and forage, critical goat winter range areas were excluded from the timber harvesting land base, as described above in Section 2.1, "Land base inventory."
- Protection of environmentally sensitive areas — areas where hazardous terrain, sensitive soils, avalanche hazards, regeneration problems and high values for recreation, wildlife, and watersheds have been identified. To maintain ecological or other resource values, portions or all of these areas have been excluded from the timber harvesting land base, as detailed in Appendix A, Section 3.2.4, "Environmentally sensitive areas."
- Community watersheds — management in community watersheds was accounted for by limiting harvesting in each watershed to 1% of the forest area per year. Designated community watersheds cover 23 860 hectares, or 10.6% of the timber harvesting land base.

Free-growing
An established seedling of an acceptable commercial species that is free from growth-inhibiting brush, weed and excessive tree competition.
Unsalvaged losses
The volume of timber killed or damaged annually by natural causes (e.g., fire, wind, insects and disease) and not harvested.

- Silviculture — reforestation activities required to establish free-growing* stands of acceptable tree species.
- Incremental silviculture — where necessary, stands are spaced early in their development to ensure young trees are well distributed to maximize growth. In addition, improved seed from seed orchards is used when possible to increase productivity. In the Sunshine Coast TSA, some Douglas-fir, hemlock and redcedar seedlings come from 'Class A' improved seed. This has been accounted for in the analysis by increasing managed stand volume estimates for Douglas-fir stands by 3.6% at 80 years, and hemlock and redcedar by 1.9% and 1.3% respectively. The percentage gain decreases after 80 years, and also differs depending on site productivity.
- Forest health and unsalvaged losses* — unharvestable timber losses to fire, wind, insect and other sources are expected to average 12 211 cubic metres per year.
- Utilization levels — minimum sizes of trees, and logs to be removed during harvesting.
- Minimum harvestable ages (MHA) — the time it takes for stands to grow to a merchantable condition. These were based on the age at which 300 cubic metres per hectare was achieved, and achievement of 95% of culmination mean annual increment (CMAI)*. Actual harvest ages may be greater but not less than the minimums, and will depend on ages of other available stands, forest cover objectives* and overall timber harvest targets.

Mean annual increment (MAI)
Stand volume divided by stand age. The age at which average stand growth, or MAI, assumes its maximum is called the culmination age. Harvesting all stands at this age results in a maximum average harvest over the long term.
Forest cover objectives
*Specify desired distributions of areas by age or size class groupings. These objectives can be used to reflect desired conditions for wildlife, watershed protection, visual quality and other integrated resource management objectives. General adjacency and green-up guidelines are also specified using forest cover objectives (see **Cutblock adjacency** and **Green–up**).*

- Maintenance of scenic values — maintaining important scenic values requires that visible evidence of harvesting be kept within limits in designated areas of the Sunshine Coast TSA. The maximum proportion of the total forest in each scenic area that may be covered by young stands that do not meet visual green-up requirements (less than 5 metres in height) varies depending on the forest characteristics and the visual quality objectives (VQO)* for each area, ranging between 1% and 25%. See Section A.4.4.1, "Forest cover requirements" in Appendix A for more details. Scenic areas have been revised since the previous timber supply analysis (completed in 1995) and the changes are reflected in this analysis report.
- Landscape-level biodiversity — to maintain biological diversity throughout a landscape unit, the *Forest Practices Code* contains targets for the proportion of the area in each biogeoclimatic variant* that should be covered by stands with old-forest characteristics. In the Sunshine Coast TSA, stands older than 250 years are considered old forest. Since landscape unit objectives and biodiversity emphasis options (BEO) have not been established for each landscape unit, a weighted-average old-forest requirement was applied to all draft landscape units. See Section A.4.4.1, "Forest cover requirements" in Appendix A for details.
- Stand-level biodiversity — to maintain biological diversity in forest stands, wildlife tree patches are retained after harvesting. In the Sunshine Coast TSA, retention of wildlife tree patches has been modelled by reducing the size of the timber harvesting land base, as described above in Section 2.1, "Land base inventory." Further details on how stand level biodiversity was accounted for in the analysis are described in Appendix A, Section 3.2.14, "Wildlife tree patches."
- Harvest systems — both clearcut with reserves* and partial harvesting systems are used in the Sunshine Coast TSA.
- Timber licence reversions — Timber Licences provide the holder rights to harvest mature timber from the licence area. These areas revert to the TSA when they have been harvested and satisfactorily restocked by the licensee. Timber licences were included in the timber harvesting land base, but were only allowed to contribute to timber supply following their harvest and regeneration, which is modelled to occur during the first 20 years of the planning horizon.
- Natural disturbances — natural disturbances of fire and wind do occur within the forests of the Sunshine Coast TSA, causing some old-seral* forests to revert to a younger seral stage* after disturbance. In an effort to emulate the effect that natural disturbances have on projected harvest forecasts*, 311 hectares per year of old non-contributing forests were reverted to regenerated forests in the model.

Visual quality objective (VQO)
Defines a level of acceptable landscape alteration resulting from timber harvesting and other activities. A number of visual quality classes have been defined on the basis of the maximum amount of alteration permitted.
Biogeoclimatic (BEC) variant
A subdivision of a biogeoclimatic subzone. Variants reflect further differences in regional climate and are generally recognized for areas slightly drier, wetter, snowier, warmer or colder than other areas in the subzone.
Clearcutting with reserves
A variation of the clearcut silvicultural system in which trees are retained, either uniformly or in small groups, for purposes other than regeneration.

Old seral
Old seral refers to forests with appropriate old forest characteristics. Ages vary depending on forest type and biogeoclimatic variant.
Seral stages
Sequential stages in the development of plant communities that successively occupy a site and replace each other over time.
Harvest forecast
The flow of potential timber harvests over time. A harvest forecast is usually a measure of the maximum timber supply that can be realized over time for a specified land base and set of management practices. It is a result of forest planning models and is affected by the size and productivity of the land base, the current growing stock, and management objectives, constraints and assumptions.

2 Information Preparation for the Timber Supply Analysis

The data package for the Sunshine Coast Timber Supply Area (TSA) was released in May 2000. As a result of public input, changes were made to the data package. The revised data package, which includes detailed descriptions of the management practices and the assumptions used to incorporate them into the analysis, is presented in Appendix A, "Description of Data Inputs and Assumptions for the Timber Supply Analysis" of this document.

Figure 7 shows the proportions of the forested land base and the timber harvesting land base subject to management for scenic values, visual quality class (VQC), designated community watersheds, and cutblock adjacency constraints in the integrated resource management (IRM), community interface, islands, and helicopter zones. Often several management objectives are applied to the same area; for example, all or part of a visual quality area may also be managed as a community watershed. In such a case, the area is required to meet all of the management objectives. The bar charts show the total forested area in each management emphasis area.

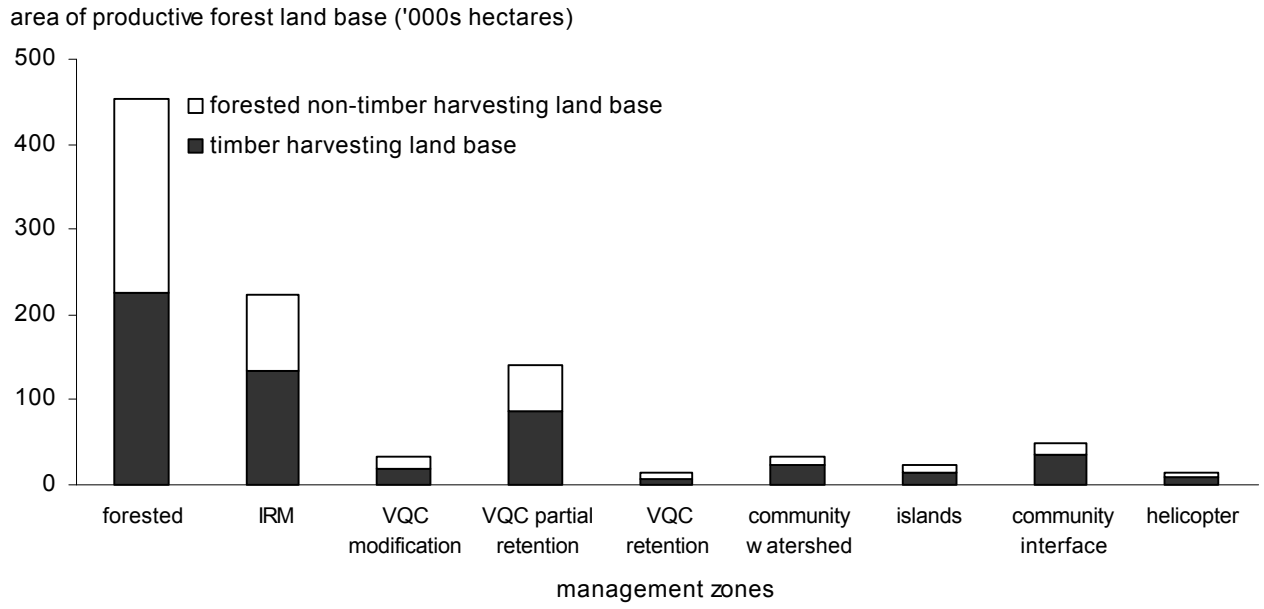

Figure 7. Management zones — Sunshine Coast TSA forested land base, 2001.

2 Information Preparation for the Timber Supply Analysis

Figure 8 shows the distribution of the land base by biogeoclimatic (BEC) variant. Also shown is the proportion of the total forest area in each BEC variant that is part of the timber harvesting land base. Table 3 provides a summary of the proportion of the timber harvesting land base and non-timber harvesting land base in each BEC variant. The proportion of non-timber harvesting land base is important because it provides some indication of the likelihood that forest outside the timber harvesting land base will be sufficient to meet old-forest requirements. The table shows that for the variants that make up most of the forest area approximately 37% of CWHdm, 53% of CWHvm2, 40% of CWHvm1 and 29% of CWHxm1 forest is outside the timber harvesting land base. While the percentages range among the rest of the variants from 24% to 99%, overall the figures suggest that forest outside the timber harvesting land base is sufficient to meet old-forest requirements.

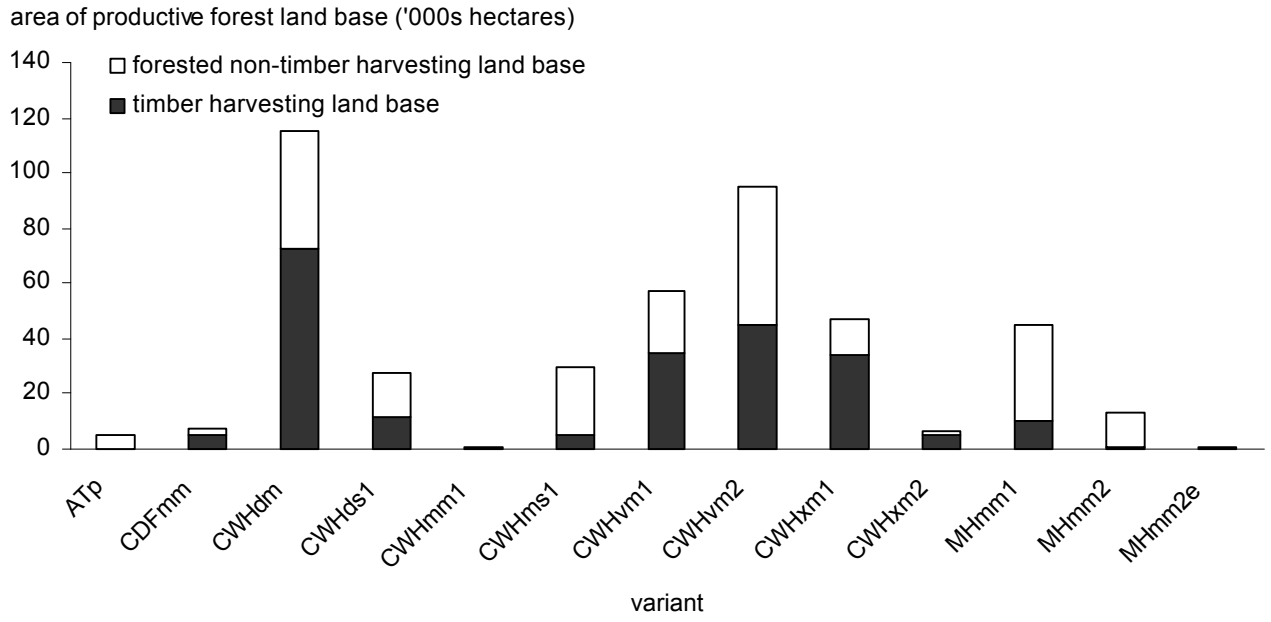

Figure 8. Forested area by biogeoclimatic classification — Sunshine Coast TSA, 2001.

Table 3. Summary of biogeoclimatic variant areas — Sunshine Coast TSA, 2001

Biogeoclimatic ecosystem classification (BEC) variant	Per cent (%) of total forest area in BEC variant	Per cent (%) of timber harvesting land base in BEC variant	Per cent (%) of total BEC variant area in timber harvesting land base
AT p[a]	1.2	0.1	5.6
CDF mm	1.7	2.2	64.8
CWH dm	25.6	32.6	63.1
CWH ds 1	6.1	5.1	41.6
CWH mm 1	0.1	0.1	81.6
CWH ms 1	6.5	2.4	18.1
CWH vm 1	12.7	15.4	60.1
CWH vm 2	21.1	20.1	47.1
CWH xm 1	10.5	15.1	71.5
CWH xm 2	1.5	2.3	76.1
MH mm 1	9.9	4.4	21.9
MH mm 2	2.9	0.2	4.1
MH mm 2e	0.2	0.0	0.1
Total	100.0	100.0	Not applicable

(a) A small portion of area classified as AT (Alpine Tundra) corresponds to forested area due to combining information from different map bases and resolutions.

2.4 Changes since the 1995 Sunshine Coast TSA analysis

The size and availability of the timber harvesting land base, management practices, and modelling capabilities have changed since the last analysis for the Sunshine Coast TSA. This section presents the major changes to the land base and forest management assumptions* since the last analysis.

- In the last analysis the productive forested area considered in the Sunshine Coast timber supply analysis was 447 505 hectares. For this analysis, the area managed by the BCFS has decreased to 427 594 hectares, due primarily to the creation of various parks. However, the area of productive crown forest included in the timber supply analysis has increased to about 452 512 hectares, mostly due to the inclusion of productive forest in parks which can contribute to biodiversity considerations, but is not available for harvesting.
- The total size of the timber harvesting land base has not changed significantly since the last analysis (224 349 hectares in the previous analysis, compared to 223 806 hectares in this analysis). However, the composition of the timber harvesting land base has changed. The current timber harvesting land base contains over 10 000 hectares of red alder stands that were not included in the timber harvesting land base in the previous analysis because at that time they were considered non-merchantable. The area excluded for low timber productivity or non-merchantable stands has decreased from 39 963 hectares to 16 223 hectares in the current analysis. The addition of red alder stands to the timber harvesting land base was offset by the withdrawal of park land since the last analysis, so the total change in the timber harvesting land base is quite small.
- Results of the Vegetation Resources Inventory indicated that volumes in the forest cover inventory were underestimated in the previous analysis. As a result of adjusting stand volume estimates for this analysis, the estimate of the total volume in the TSA has increased. Figure 10 shows that the initial total volume in the timber harvesting land base is about 76 million cubic metres. In the previous analysis, the initial total volume was approximately 70 million cubic metres.
- Implementation of the *Forest Practices Code* has increased land base reductions for riparian reserves and wildlife tree patches. Requirements to maintain or recruit suitable areas of old forest for landscape-level biodiversity also limit the availability of timber on the timber harvesting land base in some landscape units with a longer harvesting history.
- The use of a computer-based geographic information system (GIS) in this analysis has allowed for application of management requirements at a finer level than was achievable in the last analysis.
- Reductions to the productive forest land base to account for roads were applied to specific areas in this analysis. In the previous analysis, a general percentage reduction was applied to all stands.

Management assumptions
Approximations of management objectives, priorities, constraints and other conditions needed to represent forest management actions in a forest planning model. These include, for example, the criteria for determining the timber harvesting land base, the specification of minimum harvestable ages, utilization levels, integrated resource guidelines and silviculture and pest management programs.

- Since the previous analysis, the area subject to visual quality objectives (VQO) has decreased from about 55% of the timber harvesting land base to 50%. As well, the visual quality objectives on some areas have shifted and there is now less area in retention VQOs*. Scenic areas are also being modelled differently in this analysis. Whereas in the previous analysis, an average amount of allowable disturbance was modelled within a given VQO type, in this analysis, it is assumed that the visual impact of harvesting will be carefully planned. As a result, the maximum of the disturbance range for allowable disturbance in a VQO is modelled. For example, in partial retention VQOs*, the maximum area below visually effective green-up height (5 metres) is 15%, as opposed to 11% in the previous analysis.
- Some changes to the method of estimating the soil sensitivity of sites has slightly increased the reduction for unstable terrain. The method used in this analysis incorporates existing terrain stability class mapping and will continue to be refined over time.
- In this analysis, goat winter range areas were excluded from the timber harvesting land base. Goat winter range management was not modelled in the previous analysis.

In summary, the net timber harvesting land base has not significantly changed in size, but a number of modelling assumptions have changed since the last analysis. Given the extent of these changes, direct comparisons between this and the previous analysis are difficult. Each analysis needs to be evaluated in the context of the management regime and related data inputs and assumptions that are applied at the time. As noted in the introductory section, there is uncertainty surrounding information used in analyses, and forest management objectives change over time, which is why the *Forest Act* requires the chief forester to review the timber supply and AAC for each TSA periodically.

Any changes to the land base or management assumptions that occur or become effective after the completion of this timber supply analysis will be presented to the chief forester for consideration during the AAC determination.

In order to better understand the most significant differences between the 1995 and 2001 analyses, a comparative analysis is available in Appendix C, "Analysis of Significant Changes since 1995."

Retention VQO
*Alterations are not easy to see. Up to 5% of the visible landscape can be altered by harvesting activity (see **Visual quality objective**).*

Partial retention VQO
*Alterations may be visible but not conspicuous. Up to 15% of the area can be visibly altered by harvesting activity (see **Visual quality objective**).*

3 Timber Supply Analysis Methods

The purpose of this analysis is to examine both the short- and long-term timber harvesting opportunities in the Sunshine Coast TSA, in light of current forest management practices. A timber supply computer simulation model developed by the B.C. Forest Service (FSSIM version 3.0) was used to aid in the assessment. A timber supply model, as distinct from a growth and yield model, assists the timber supply analyst in determining how a whole forest (collection of stands) could be managed to obtain a harvest forecast or supply of timber over time. The simulation model uses information about the timber harvesting land base, timber volumes and the management regime to represent how trees grow and area is harvested over a long period of time. Generally, only the results for the first 250 years are shown graphically in this report because the harvest level remains constant after that time.

Similar to other models, the B.C. Forest Service model assumes that trees grow according to provided yield projections and are harvested according to either a volume target or a specified objective set by the analyst. The Forest Service model also allows the use of forest cover guidelines that specify the desired age composition of the forest. These guidelines can be used to examine the effects of green-up and old-forest prescriptions. For example, guidelines might specify that no more than some maximum percentage of the forest can be younger than a specified green-up age or that some minimum percentage of the forest must be in older age classes to provide wildlife habitat. The B.C. Forest Service simulation model facilitates examination of the effects of such guidelines on timber supply.

This type of analysis is used to determine the timber supply implication of a particular management regime. The results of the analysis are especially important in determining allowable cuts that will not restrict options of future resource managers, and that will assist local B.C. Forest Service staff to administer their programs according to relevant guidelines and principles. However, the results of the analysis are not meant to be taken as recommendations for any particular AAC.

The main results of the analysis are forecasts of potential timber harvests and timber inventory changes (ages and volumes) over time. Although this information gives field staff only very limited guidance in the design of operational activities such as harvesting block location and silviculture planning, it does help ensure that the timber harvest level supports sustainable forest management in the field.

4 Results

This section presents results of the timber supply analysis for the Sunshine Coast TSA. Two forecasts have been explored — a "current AAC even-flow" which projects the impacts of continuing to harvest at the current AAC, and the "maximum even-flow" which projects a sustainable harvest at the highest level. Both forecasts use the most recent assessments of current forest management, the land available for timber harvesting, and timber yields as described in Section 2, "Information Preparation for the Timber Supply Analysis." Because forest management is inherently a long-term venture, uncertainty surrounds much of the information important in determining timber supply. This uncertainty will be discussed in Section 5, "Timber Supply Sensitivity Analyses." Maximum and current AAC even-flow approaches provide only a part of the timber supply picture for the Sunshine Coast TSA, and should not be viewed in isolation of the sensitivity analyses.

Section 2.4, "Changes since the 1995 Sunshine Coast TSA analysis," provides an overview of the major changes to the land base and management assumptions since the last analysis. As noted in that section, any comparison between this and the last analysis should be made with recognition of the extent and nature of those changes. Each analysis should be evaluated in the context of the management regime and related data inputs and assumptions that applied at the time. Finally, one of the major reasons the chief forester is required under the *Forest Act* to periodically review the timber supply and AAC is to account for changes in management, information, and knowledge.

4.1 Maximum and current AAC even-flow approaches

In this section, two potential harvest forecasts are presented for discussion purposes. Both harvest forecasts represent current management within the Sunshine Coast Forest District as described in Appendix A of this report. The two approaches differ only in the assumptions around managing harvest rates.

Figure 9 shows two forecasts for the Sunshine Coast TSA representing current management. In maximum even-flow, the initial harvest level is 1 233 000 cubic metres per year, or 8% above the current AAC. This harvest level can be maintained into the long term without incurring future timber supply shortages, since given the data inputs and assumptions of current management, the long-term harvest level* is also 1 233 000 cubic metres per year. Maximum even-flow reflects the timber supply implications of harvesting immediately at this long-term harvest level.

Long-term harvest level
A harvest level that can be maintained indefinitely given a particular forest management regime (which defines the timber harvesting land base, and objectives and guidelines for non-timber values) and estimates of timber growth and yield.

4 Results

In current AAC even-flow, the initial harvest level is 1 140 000 cubic metres per year, which is the same as the current AAC. This forecast shows a harvest forecast with a constant harvest level at the current AAC of 1 140 000 cubic metres per year, which is 8% below the long-term harvest level of 1 233 000 cubic metres per year.

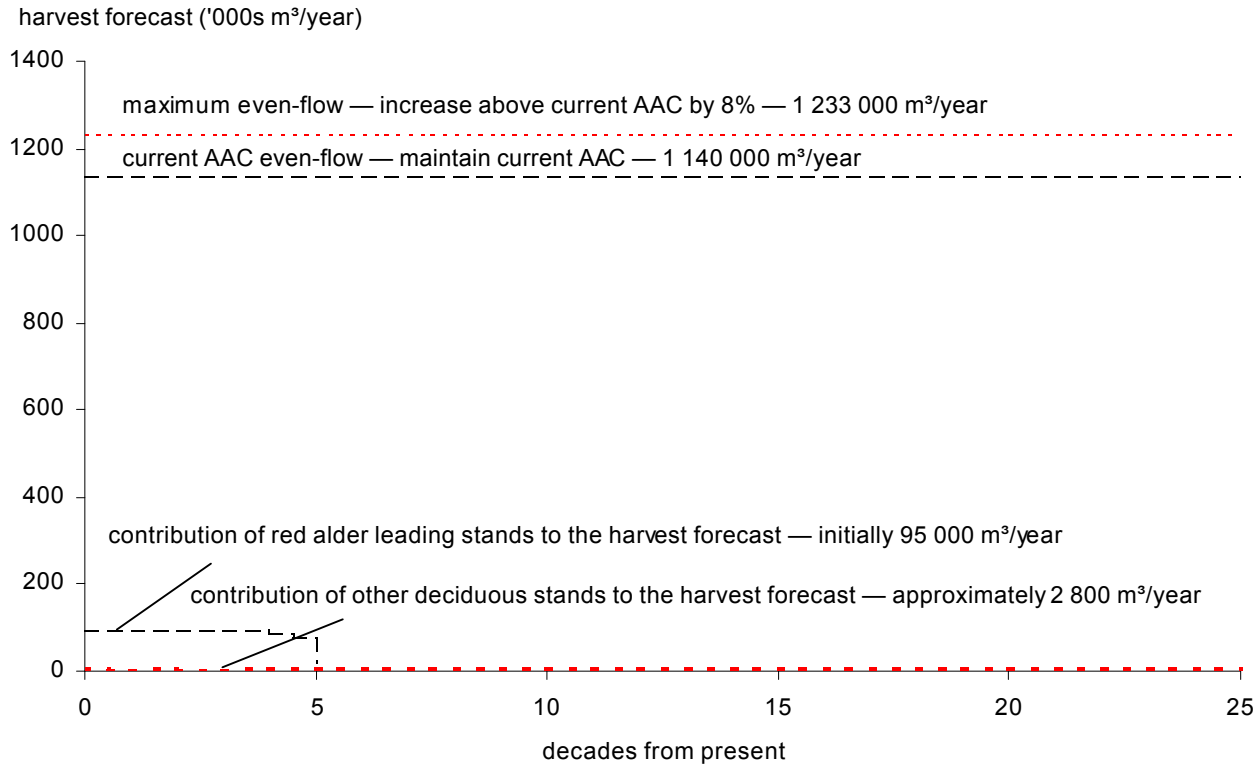

Figure 9. Two harvest forecasts — maximum even-flow — maintain at 8% above the current AAC; current AAC even-flow — maintain the current AAC — Sunshine Coast TSA, 2001.

In both of these forecasts, a portion of the total harvest comes from deciduous-leading stands. Harvesting of red alder stands in both alternatives is maintained at 95 000 cubic metres per year for the first 40 years of the harvest forecast, decreasing to 85 000 cubic metres per year for one more decade before declining to zero after 50 years. The harvest level declines in red alder stands over time because as red alder stands are harvested, reforestation is guided by current regional policy which allows a maximum of 35 hectares per year to be planted with red alder (about 16% of the stands harvested). The remaining stands are reforested with mostly coniferous species. Harvesting in other deciduous leading stands (cottonwood and maple) contribute up to 2800 cubic metres per year to the total harvest throughout the planning horizon, with substantially less volume harvested in some decades early in the planning horizon.

4 Results

Unsalvaged losses due to natural forces such as insects, wind and fire are estimated to be 12 211 cubic metres per year for the entire 250-year horizon and have been subtracted from all harvest forecasts shown in this report.

The long-term harvest level was defined as the maximum harvest rate at which the total timber growing stock* is maintained at an even level, on average, indicating that harvesting can continue at that level in perpetuity. A continually declining growing stock would signify that timber is being harvested above the productive capability of the land. Figure 10 shows the change of growing stock over time for maximum and current AAC even-flow alternatives. In the maximum even-flow approach, the total growing stock on the timber harvesting land base declines over the next 11 decades from an initial level of 76 million cubic metres as the oldest of the existing mature stands are harvested and replaced by younger managed stands. Over the long term, the average total growing stock for maximum even-flow is 61 million cubic metres. The merchantable growing stock volume on the timber harvesting land base is also shown in Figure 10. Merchantable growing stock is defined as that volume of timber older than the minimum harvestable age, as defined in Appendix A. In maximum even-flow, the merchantable growing stock is reduced from an initial level of 68 million cubic metres to an average of approximately 40 million cubic metres in the long term.

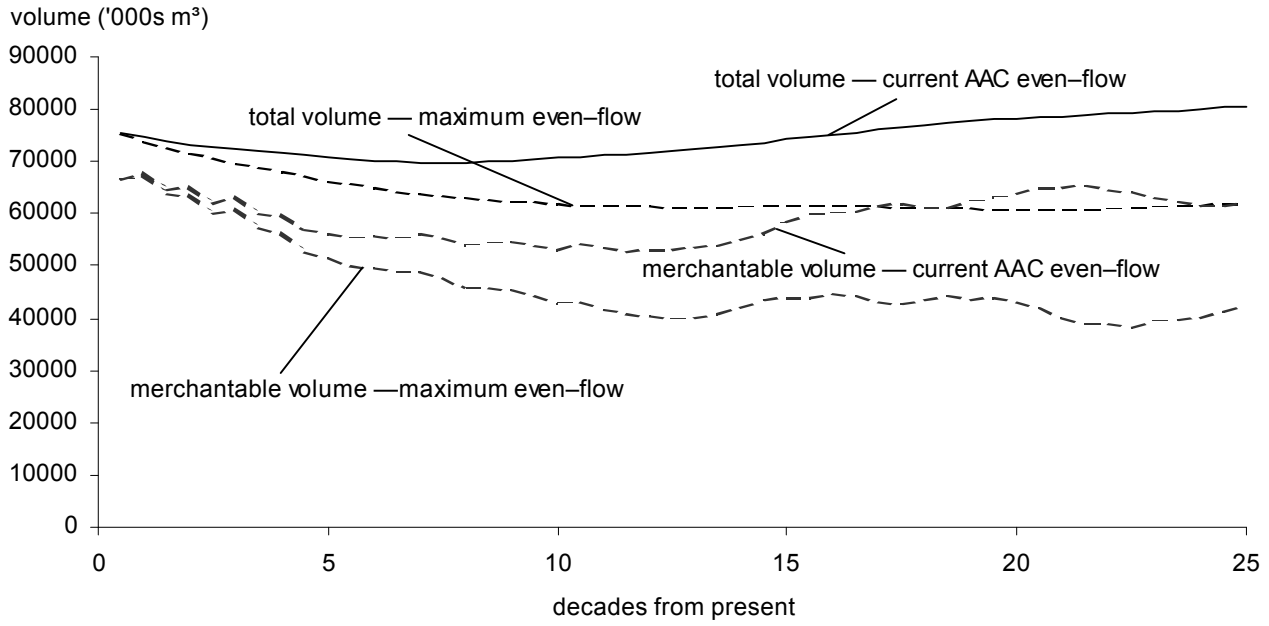

Figure 10. Total and merchantable growing stock for maximum and current AAC even-flow alternatives — Sunshine Coast TSA timber harvesting land base, 2001.

In current AAC even-flow, the total growing stock on the timber harvesting land base initially declines from 76 million cubic metres as the oldest of the existing mature stands are harvested and replaced by younger managed stands. After eight decades, the total growing stock increases, and reaches 80 million cubic metres after 25 decades. The merchantable growing stock is reduced from an initial level of 68 million cubic metres to approximately 53 million cubic metres in 12 decades. Then, because stands are not harvested as soon after they grow to a merchantable condition, the merchantable growing stock increases to about 65 million cubic metres after 25 decades.

Growing stock
The volume estimate for all standing timber at a particular time.

4 Results

Figure 11 shows the transition of harvesting from existing natural stands to managed stands, and the amount that each makes up in the maximum even-flow forecast. For the first eight decades the harvest depends fully on existing natural stands. During decades 9 and 10 the harvest becomes dependent on managed stands. By decade 11 onward, the harvest is projected to come predominantly from managed stands. At the same time, the growing stock for the timber harvesting land base (shown in Figure 10) stabilizes at an even level.

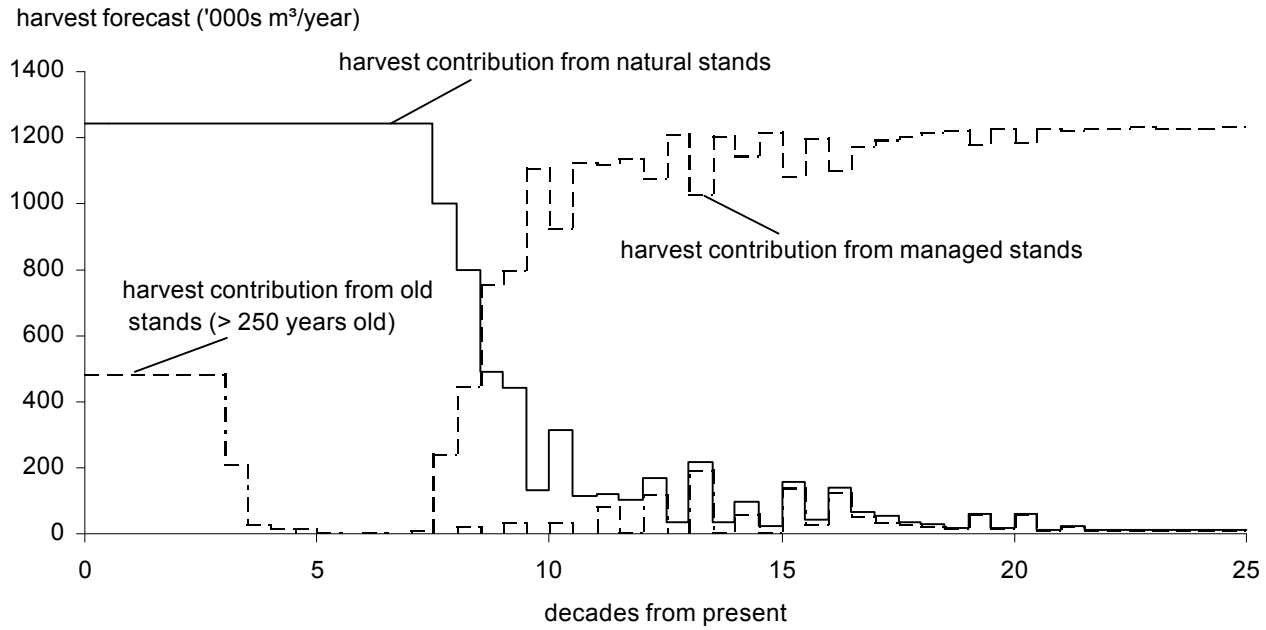

Figure 11. Harvest contribution from unmanaged stands, managed stands, and old forest, maximum even-flow — Sunshine Coast TSA, 2001.

Figure 11 also shows the volume that existing stands older than 250 years contribute to the harvest forecast. Harvest from old stands was limited in this analysis to a maximum of 40% of the harvest forecast, reflecting current harvesting practice in the Sunshine Coast TSA. In maximum even-flow, the contribution of existing old stands to the harvest forecast remains at about 40% of the harvest for the first 3 to 4 decades. After 40 years, almost no old forest is harvested. In decades 10 through 25, an intermittent harvest of old stands is projected. This pattern of harvest is projected because earlier in the planning horizon, a significant area of old forest must be retained to meet landscape-level biodiversity requirements for old forest. However, as adjacent non-timber harvesting land base areas age and fulfill these old forest requirements, the older stands on the timber harvesting land base portion are made available for harvest.

Under the current AAC even-flow approach, the transition to managed stands occurs one decade later.

4 Results

The average growth rate projected for managed stands over the long term is about 5.6 cubic metres per hectare per year (the total timber supply, including unsalvaged losses, divided by the future timber harvesting land base). As noted in Appendix A, site productivity estimates vary significantly within the Sunshine Coast TSA. If all stands were harvested at the age of maximum productivity, an annual harvest rate of approximately 1 409 000 cubic metres could be achieved in the long term with an average growth rate of about 6.4 cubic metres per hectare per year. However, the long-term harvest level is below this theoretical maximum productive capacity of the timber harvesting land base. The maximum is not achievable since all stands cannot be harvested at the time of maximum productivity due to other management considerations on the land base and the objective of maintaining a steady harvest flow over time.

4.2 Area, average volume and average age harvested

Figure 12 shows the annual area harvested over the next 250 years for both maximum and current AAC even-flow alternatives. These areas have not been adjusted by deducting those areas attributable to the volumes lost to unsalvaged losses.

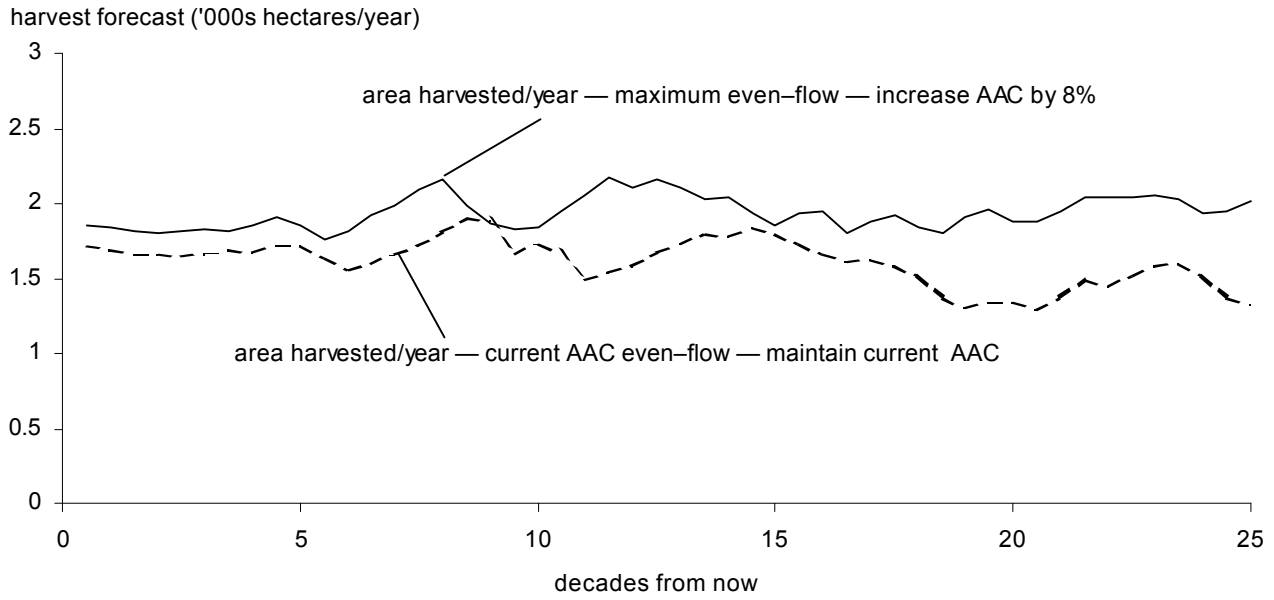

Figure 12. Average area harvested over time — Sunshine Coast TSA maximum and current AAC even-flow alternatives, 2001.

In maximum even-flow, the average area harvested is initially 1800 hectares per year, and increases to over 2000 hectares per year at 80 years. After 80 years, the amount of area harvested fluctuates between 2200 hectares per year to 1700 hectares per year, with an average of approximately 2000 hectares per year for the remainder of the 250-year planning horizon. In current AAC even-flow, the initial harvested area is 1700 hectares per year. The harvested area then fluctuates over the next 15 decades, averaging approximately 1700 hectares per year. After 15 decades, the harvested area begins to decline on average to less than 1500 hectares per year by the end of the planning horizon. In current AAC even-flow, this reduction in the annual area harvested is observed because stands grow longer before they are harvested. Stands accumulate greater total volume, and progressively less area is required to obtain the same amount of timber volume (1 140 000 cubic metres per year).

4 Results

Figure 13 shows the average timber volume per hectare harvested over the next 250 years from the two alternative harvest forecasts. In both alternatives, the volume per hectare harvested is quite similar for the first 6 decades, averaging approximately 680 cubic metres per hectare. After 60 years, average harvested volume differs for the two alternatives. In maximum even-flow, the average harvested volume decreases and then fluctuates around an average of 600 cubic metres per hectare until the end of the planning horizon. In current AAC even-flow, the average harvested volume increases after the first 60 years, reaching an average of approximately 800 cubic metres per hectares by the end of the planning horizon. This figure shows that for current AAC even-flow, stands are allowed to grow longer, and therefore yield higher volume per hectare upon harvest.

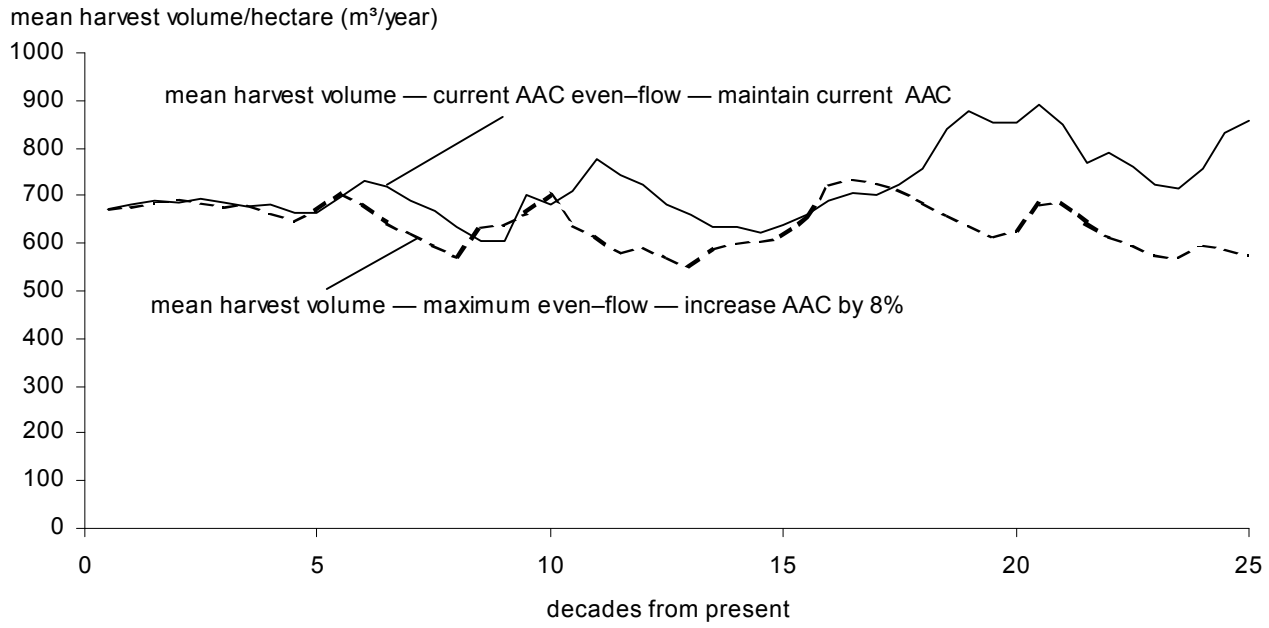

Figure 13. Average volume per hectare harvested over time — Sunshine Coast TSA maximum and current AAC even-flow alternatives, 2001.

4 Results

Figure 14 shows the change in the area-weighted average harvest age resulting from the harvest forecasts for maximum and current AAC even-flow alternatives. Initially, as much as 40% of the timber supply comes from stands older than 250 years. In maximum and current AAC even-flow alternatives, the average harvested age decreases from an average of approximately 240 years to approximately 125 years in 50 years. After 50 years, the average harvested age in maximum even-flow then fluctuates slightly around an average of approximately 113 years until the end of the planning horizon. In current AAC even-flow, average harvested age increases after 50 years, averaging approximately 130 years by the end of the planning horizon. This demonstrates that stands are allowed to age longer than in maximum even-flow before they are harvested.

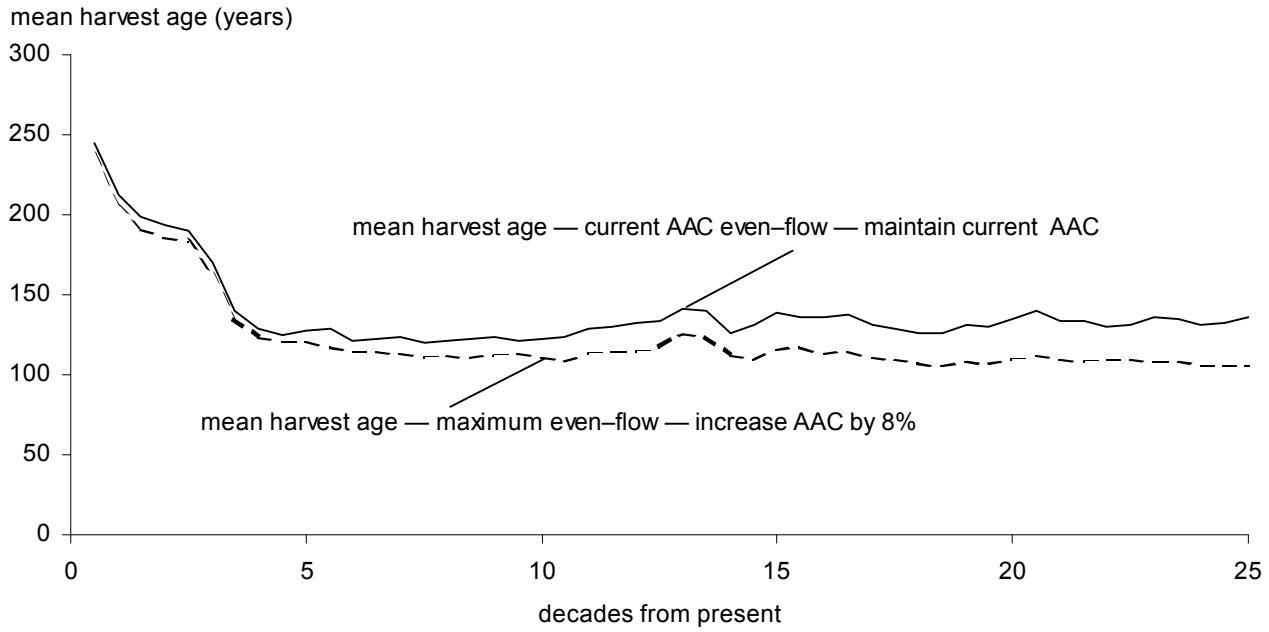

Figure 14. Average age of stands harvested over time — Sunshine Coast TSA maximum and current AAC even-flow alternatives, 2001.

4.3 Age class profile over time

The charts in Figure 15 show how the age composition of the Sunshine Coast TSA productive forest land base is predicted to change over the next 250 years under the maximum even-flow harvest forecast.

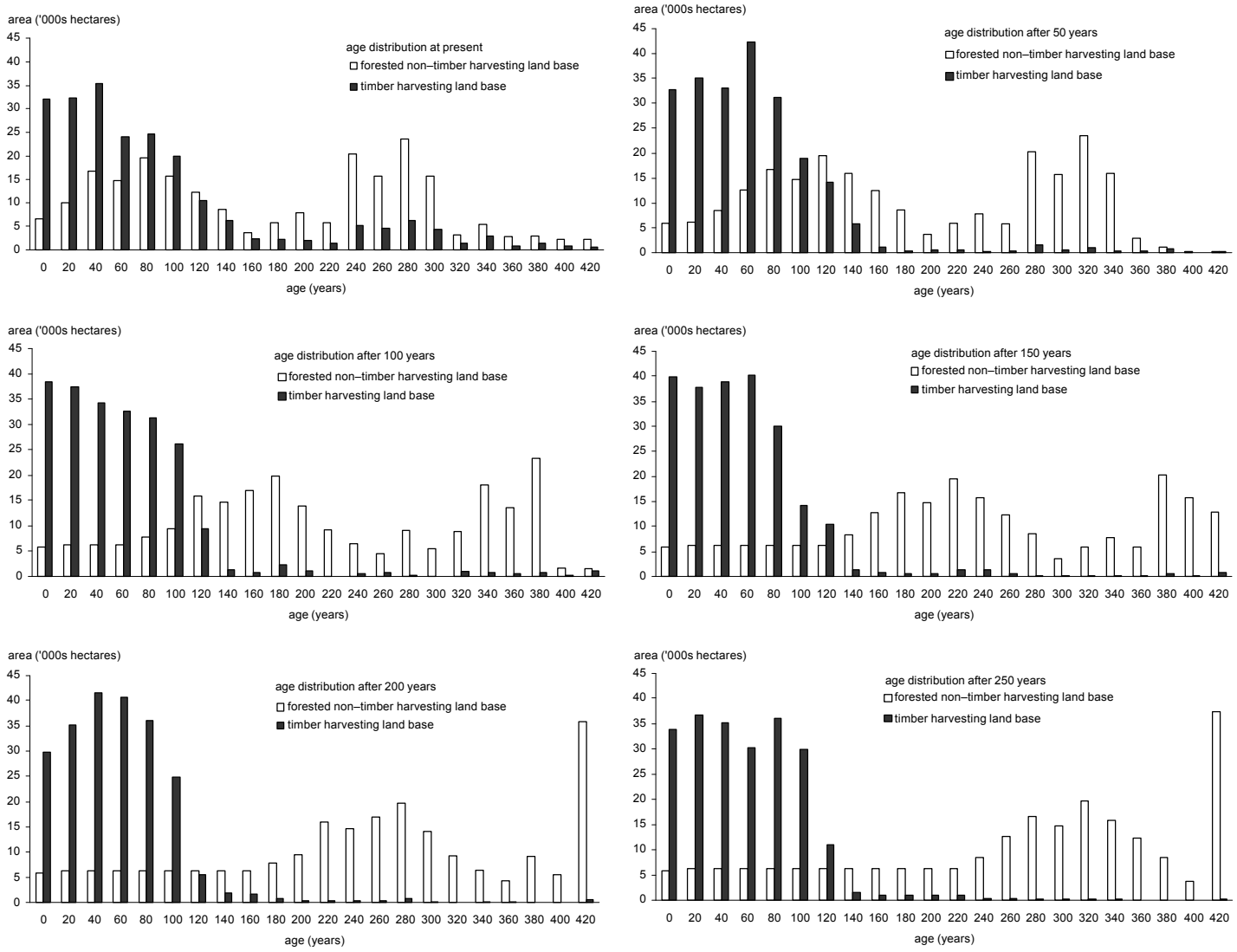

Figure 15. Changes in age composition on the productive crown forest over time — Sunshine Coast TSA maximum even-flow, 2001.

4 Results

There are approximately 452 512 hectares of productive crown forest within the Sunshine Coast TSA analysis area, of which 223 806 hectares makes up the current timber harvesting land base. The current age class distribution shows that much of the timber harvesting land base is comprised of stands distributed fairly evenly between 0 and 100 years. This is due to the long history of timber harvesting in the Sunshine Coast TSA. Approximately 11% of the timber harvesting land base is currently occupied by stands older than 250 years, which are considered to meet old-seral conditions for landscape-level biodiversity. The productive crown forest land base also contains stands that have been excluded from the timber harvesting land base. Of these 'non-timber harvesting land base' stands, 62% are older than 140 years. Approximately 5% of the non-timber harvesting land base is made up of stands older than 250 years. In total, almost 8% of the productive crown forest is comprised of stands greater than 250 years of age.

One consequence of the large proportion of forested stands outside the timber harvesting land base (228 706 hectares) is that a relatively small proportion of the timber harvesting land base needs to be reserved from harvest to meet old seral landscape-level biodiversity objectives until stands outside the timber harvesting land base age. In addition, because 48% of the stands on the timber harvesting land base are at or above the minimum harvestable age, there remains a great deal of timber harvest opportunity, even if older stands must be reserved to meet old-seral objectives.

Figure 15 also shows that the area on the non-timber harvesting land base is comprised of stands distributed fairly evenly between 0 and 120 years of age. The presence of younger stands in the non-timber harvesting land base suggests that natural disturbance is reverting stands to an early age. To reflect this disturbance in the analysis, all alternatives shown incorporate a disturbance rate of 311 hectares per year within the non-timber harvesting land base that results in the reversion of these stands from an old age to a young age. This ensures that all age classes are represented in the non-timber harvesting land base throughout the planning horizon, and not all of the non-timber harvesting land base will contribute to meeting old-seral objectives. As a result, some older forest must be retained on the timber harvesting land base until 100 to 150 years from now, when there is sufficient non-timber harvesting land base to meet old-seral objectives.

5 Timber Supply Sensitivity Analyses

The best available information on forest inventories and management practices is used to analyse the timber supply implications of continuing with current management. However, forest management is complicated since it must account for diverse and changing human values, the dynamics of complex ecosystems, and fluctuating and uncertain economic factors. As well, forests grow quite slowly in terms of human time spans, so that decisions we make today have not only short-term but also long-term effects beyond the life spans of current decision makers. In such a context, we cannot be certain that all the data accurately reflect the current state of all values in the forest, of how the forest will change, or of how our management activities will affect the forest.

One important way to deal with this uncertainty is to revise plans and analyses frequently to ensure they incorporate up-to-date information and knowledge. Frequent planning and decision-making can help minimize any negative effects that may occur if decisions are based on inaccurate information. Frequent revision can also ensure that opportunities that become apparent from new information are not missed.

Another important way of dealing with uncertainty is to assess how values of interest, for example, timber supply, could change if the information used in the analysis is not accurate. Sensitivity analysis is one way of evaluating how uncertainty could affect analysis results, and ultimately decision-making. Sensitivity analysis can highlight that fairly small uncertainties about some variables could have large effects on timber supply projections, or conversely that fairly large inaccuracies in others could have negligible effects. Also, sensitivity analysis could show that some variables affect timber supply more in the short term than in the long term, while others have the opposite effect. Sensitivity analysis can highlight priorities for collecting information for future analyses, and show which variables, and associated uncertainties, have the most significance for decisions. It can clarify whether current best estimates provide a safe basis for decisions, or whether high uncertainty about important variables means more conservative decisions may be wiser.

In this section, results of several sensitivity analyses are discussed. In Section 4, the results based on current forest management assumptions (Figures 9 through 15) are presented as two potential alternatives for harvest forecasts. In Section 5, the timber supply sensitivity analyses will show a range of analyses that are compared to the maximum even-flow of 1 233 000 cubic metres per year, or 8% above the current AAC. Maximum even-flow was chosen as a basis for conducting sensitivity analysis since it projects the largest harvest, and therefore is most susceptible to impacts associated with uncertainties. Any uncertainty that results in a decrease in timber supply as described in the following sensitivity analyses can be interpreted as having less of an impact on current AAC even-flow since the harvest forecast in current AAC even-flow is already 8% below that of maximum even-flow.

Unsalvaged losses to natural forces such as insects, fire, and wind are estimated to be 12 211 cubic metres per year for the entire 250-year horizon, and have been subtracted from all harvest forecasts shown in this report.

5.1 Alternate harvest flows over time

The initial harvest forecast for maximum even-flow shown in Figure 9 was developed subject to several assumptions. Primarily, the initial harvest level was selected not to exceed the long-term harvest level. The result was a harvest level of 1 233 000 cubic metres per year maintained for the 250-year planning horizon.

5 Timber Supply Sensitivity Analyses

Figure 16 compares a maximum initial harvest forecast to maximum even-flow. All assumptions related to land base, growth and yield, and management remain consistent to those of maximum and current AAC even-flow alternatives.

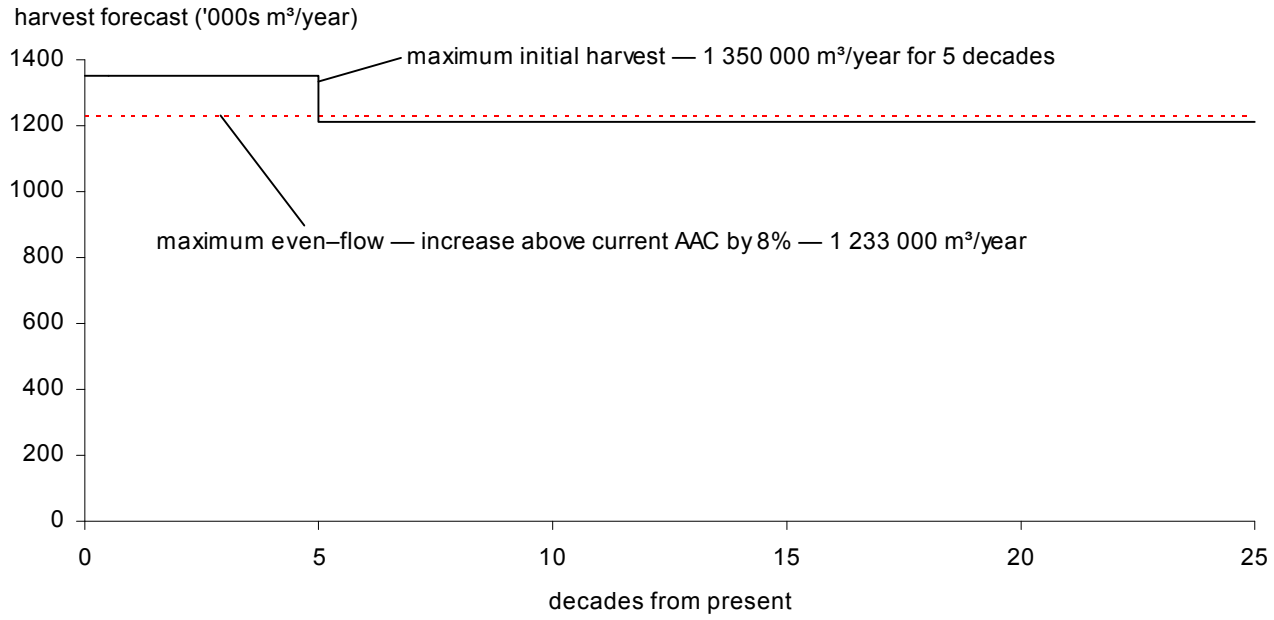

Figure 16. Alternate harvest forecast — Sunshine Coast TSA, 2001.

Maximum initial harvest level forecast

- An initial harvest level of 1 350 000 cubic metres per year can be maintained for 5 decades before declining to a long-term harvest level of 1 213 000 cubic metres per year.
- Initial harvest is 9% above the maximum even-flow harvest level.
- Long-term harvest level is about 2% lower than in maximum even-flow.
- Total growing stock decreases to approximately 53 million cubic metres in the long term, compared to 61 million cubic metres in maximum even-flow.

5.2 Maintenance of the alder harvest

The harvest forecasts for maximum and current AAC even-flow alternatives both include an initial harvest rate of 95 000 cubic metres per year from alder stands. This rate is maintained for the first 40 years of the harvest forecast, decreasing at 85 000 cubic metres per year for one more decade before declining to zero. In both alternatives, the alder harvest declines as alder stands are gradually converted mainly to stands dominated by Douglas-fir following harvest. A sensitivity analysis was conducted to assess the timber supply implications of regenerating the 10 500 hectares of alder stands on the timber harvesting land base as alder-leading stands and maintaining the alder harvest throughout the planning horizon. Figure 17 presents the resulting harvest forecast.

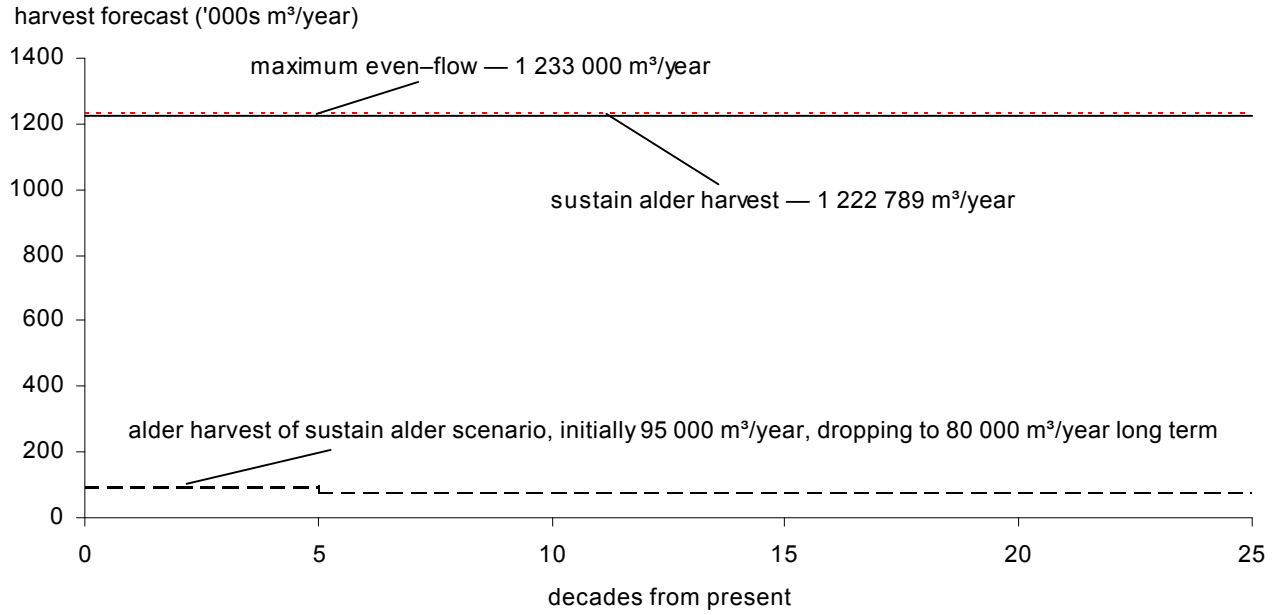

Figure 17. The effect of maintaining alder stands and the alder harvest level — Sunshine Coast TSA, 2001.

Maintain alder harvest levels

- The harvest level of 1 222 789 cubic metres per year is less than 1% below that of the maximum even-flow forecast (1 233 000 cubic metres per year).
- The alder harvest is initially 95 000 cubic metres per year and after 5 decades declines to 80 000 cubic metres per year for the remainder of the planning horizon.

5.3 Uncertainty in the land base available for timber harvesting

Uncertainty in the estimated size of the timber harvesting land base is due to factors such as fluctuations in timber prices, changes in the definition of non-merchantable forest types, changes in harvesting and milling technology and land-use decisions.

The timber harvesting land base has not changed significantly since the last timber supply analysis for the Sunshine Coast TSA. While the land base was reduced somewhat for factors such as protected areas, the inclusion of red alder stands in the timber harvesting land base has resulted in a land base similar in size to that of the previous timber supply analysis.

Currently there is no indication that the timber harvesting land base has been significantly over- or underestimated. However, two sensitivity analyses were done to provide general information that might help evaluate the implications of any new information that becomes available before the AAC determination. The first evaluates the outcome of decreasing the timber harvesting land base by 10%. The second evaluates the outcome of increasing the timber harvesting land base by 10%. The results are shown below, in Figure 18.

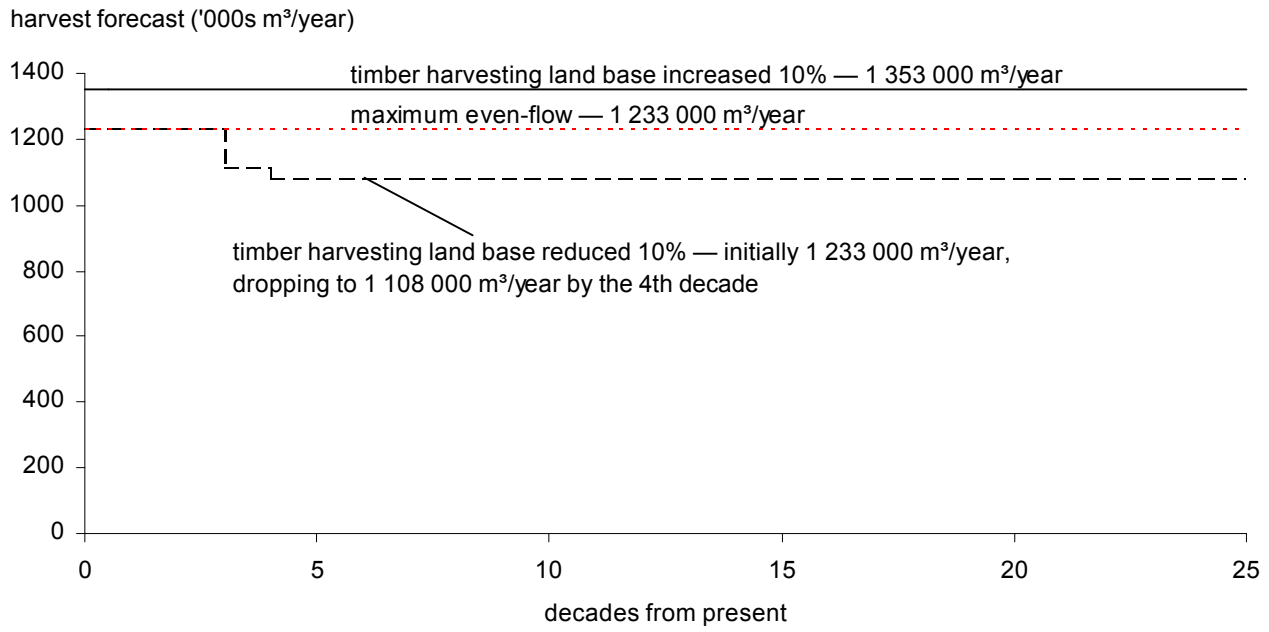

Figure 18. Land base sensitivity analysis — Sunshine Coast TSA, 2001.

Timber harvesting land base 10% smaller than in maximum even-flow

- The maximum even-flow harvest level of 1 233 000 cubic metres per year can be maintained for three decades.
- After three decades, the harvest decreases by 10%.
- Long-term harvest level of 1 108 000 cubic metres per year (approximately 11% below that of maximum even-flow) reached in decade 5.

Timber harvesting land base 10% larger than in maximum even-flow

- Harvest forecast of 1 353 000 cubic metres per year can be maintained for 25 decades since it is the long-term harvest level.
- Timber supply is increased by 10% from the maximum even-flow harvest forecast.

5.4 Uncertainty in the estimated existing stand yields

Timber volume estimates for existing unmanaged stands are subject to uncertainties in the forest inventory used to estimate timber volumes (i.e., estimated tree heights and stand ages), and the statistical process used to develop the equations for predicting forest growth and yield. Timber volumes are normally accurate when averaged over large areas, but may not reflect actual volumes within individual stands. Uncertainty may also arise in the estimates of the volume lost both to decay in older trees, and to waste and breakage during harvest, and of the utilization levels practiced during harvesting.

During the last several years, Resources Inventory Branch has performed audits of the standing volume of trees within TSAs and TFLs across the province. These audits provide an indication of how confident we can be that the estimates of volume are close to the actual volumes in the management unit. The Vegetation Resources Inventory project was completed in 1999 for the Sunshine Coast Forest District. Analysis of the ground sampling data from 111 samples taken for the Vegetation Resources Inventory indicates that the existing stand volume estimates used in the previous timber supply analysis were underestimated by approximately 13%. Prior to commencing the present timber supply analysis, adjustments were made to the inventory file to correct age, height and volume estimates, as discussed above in Section 2.2, "Timber growth and yield." Given the uncertainty associated with existing stand volumes, a sensitivity analysis was done to examine the timber supply effect if existing stand volumes had not been adjusted as indicated in the Vegetation Resources Inventory. Figures 19 and 20 display the results of this sensitivity analysis.

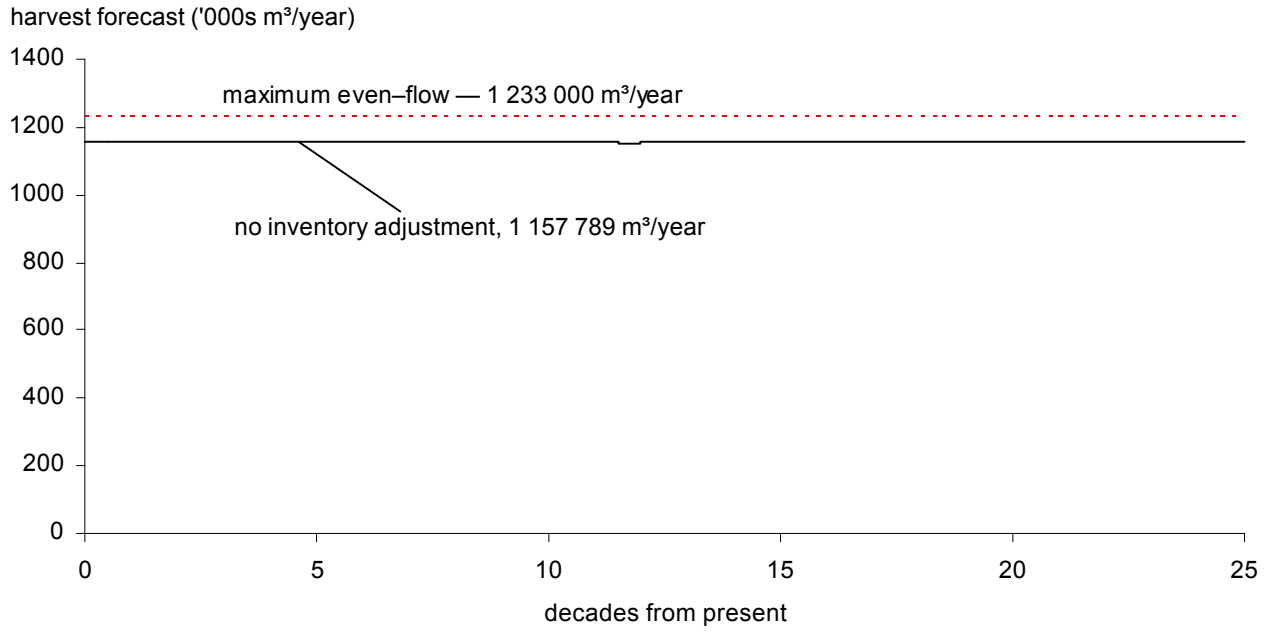

Figure 19. The effect on the harvest forecast of applying no inventory adjustment — Sunshine Coast TSA, 2001.

No adjustment to existing stand volume estimates to account for the results of the Vegetation Resources Inventory

- A harvest level of 1 157 789 cubic metres per year can be maintained throughout the planning horizon.
- The harvest level is 6% below that of the maximum even-flow harvest forecast.

5 Timber Supply Sensitivity Analyses

Figure 20 shows that the total volume is initially approximately 65 million cubic metres, approximately 10 million cubic metres below the adjusted total volume for maximum even-flow. The merchantable volume is initially approximately 58 million cubic metres, or 7 million cubic metres below the adjusted merchantable volume for maximum even-flow.

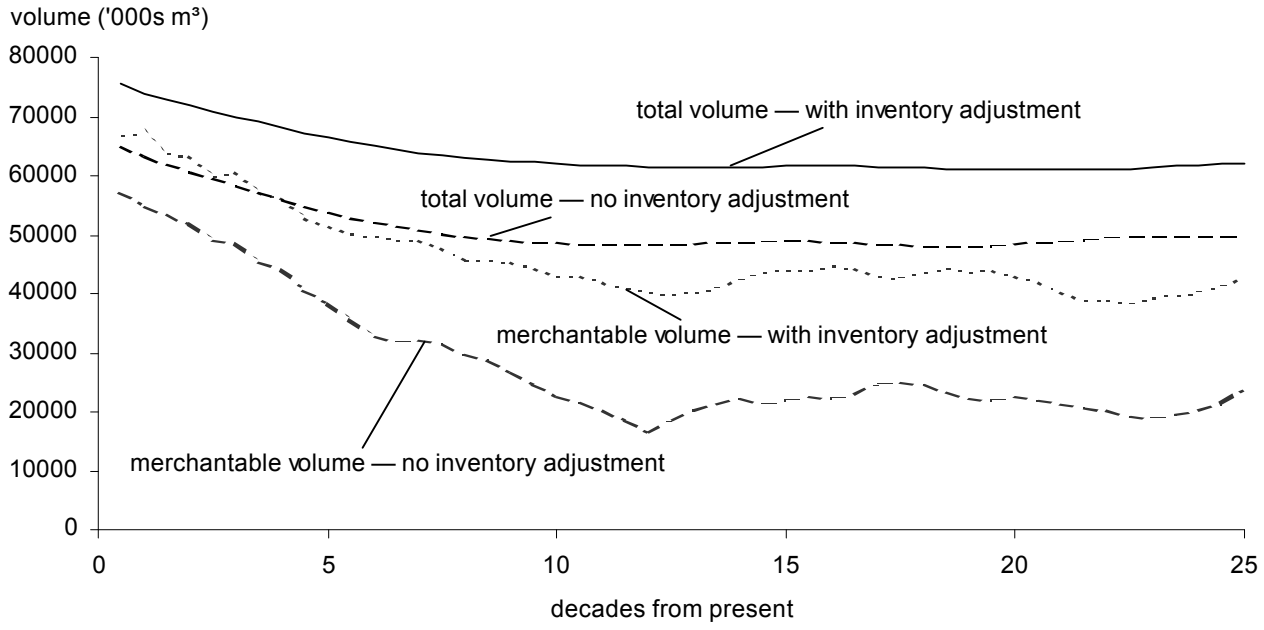

Figure 20. Total and merchantable growing stock with no inventory adjustment — Sunshine Coast TSA, 2001.

5 Timber Supply Sensitivity Analyses

5.5 Uncertainty in the estimated managed stand yields

Uncertainty in volume estimates for managed stands exists for the same reasons listed for estimated existing stand yields (inaccuracies in the forest inventory and the growth and yield models), but also because of the limited experience and data that is available for regenerated managed stands in B.C. In this section, the timber supply effects of uncertainty associated with predicting volumes in regenerated stands are examined.

Figure 21 shows the harvest forecasts that results when managed stand volumes are increased and decreased by 10%.

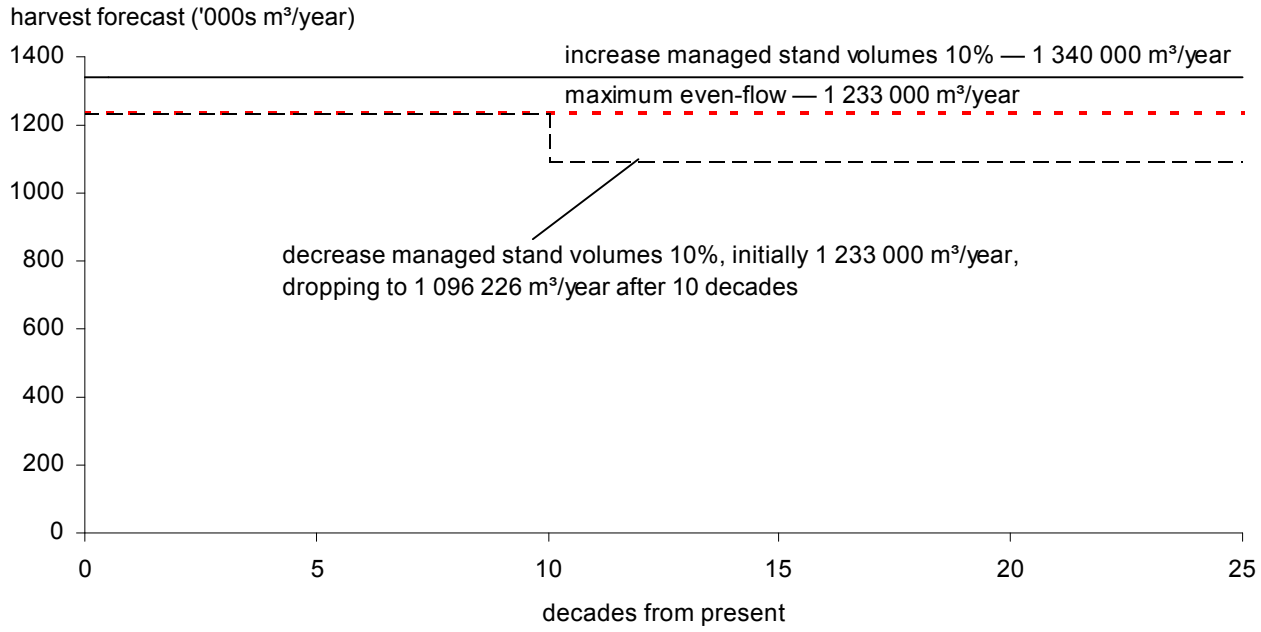

Figure 21. Effect on the harvest forecast increasing and decreasing volume estimates for managed stands by 10% — Sunshine Coast TSA, 2001.

Managed stand volume estimates decreased by 10%

- A harvest level of 1 233 000 cubic metres per year can be maintained for 10 decades, followed by a decrease of 12% after decade 10 to the long-term harvest level of 1 096 226 cubic metres per year.
- Long-term harvest level is 12% below the maximum even-flow long-term level.

Managed stand volume estimates increased by 10%

- The harvest level of 1 340 000 cubic metres per year is 8% higher than in the maximum even-flow forecast.
- Timber supply is immediately increased since there is sufficient merchantable volume from existing stands available in the short term to immediately support the increased long-term harvest level.

Increases to managed stand volumes could potentially increase the short-term harvest forecast for the Sunshine Coast TSA. However, if managed stand volumes are overestimated, the large quantity of available volume* in the TSA could negate any short-term impact.

Available volumes
The portion of total inventory volumes that is available for harvesting after all management constraints on timber harvesting have been considered, including definition of the timber harvesting land base, age of tree merchantability, deferrals, and any other priorities or constraints on timber harvesting.

5.6 Uncertainty about management requirements in visually sensitive areas

In the Sunshine Coast TSA, areas determined to be visually sensitive to timber harvesting occupy approximately 49% of the timber harvesting land base. Where visual quality objectives apply, limits are placed on the percentage of the area where harvesting-related disturbance may be visible. When a newly established forest reaches a specified height, usually averaging 5 metres, the disturbance is no longer visible. Uncertainties are associated with both the allowable disturbance percentages and achievement of visually effective green-up.

Percentage limits on visible disturbance

The level of harvest from visually sensitive areas is a function of the visual absorption capacity, the visual quality rating, and the current visual condition of each area. Uncertainty about forest cover and green-up objectives for visual quality may arise from inventory and classification of land into visual quality classes, from estimates of how well different disturbance limits may meet visual objectives, and from estimates of how the non-timber harvesting land base may contribute to visual quality.

In maximum and current AAC even-flow alternatives, the maximum of the applicable range of allowable visible disturbance was applied to each visual quality class within a landscape unit. Sensitivity analyses were performed to assess the impacts of reducing the amount of visual disturbance allowed within visually sensitive areas by applying the mid-point of the applicable range for allowable visual disturbance for each visual quality class. Figure 22 shows the results.

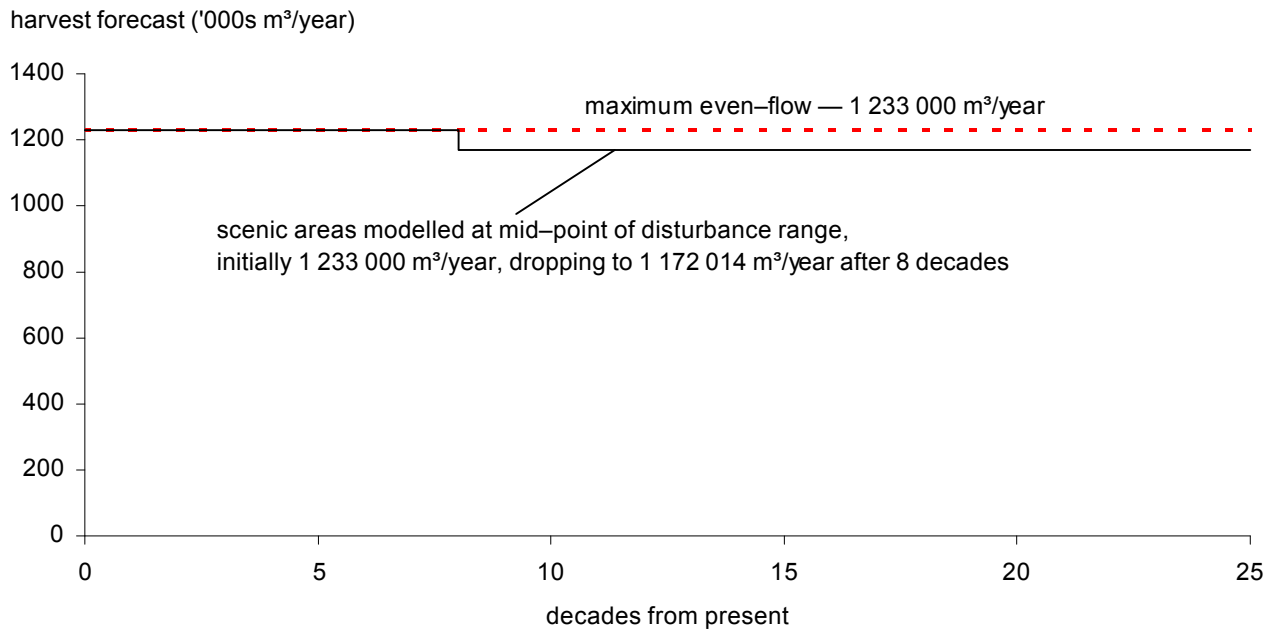

Figure 22. Effects on the harvest forecast of decreasing the allowable disturbance to the mid-point of the range — Sunshine Coast TSA, 2001.

Decreasing the allowable disturbance in visual areas to the mid-point of the range

- Harvest forecast same as maximum even-flow for the first 8 decades.
- After 8 decades, the harvest level declines by 5% to the long-term harvest level of 1 172 014 cubic metres per year.
- Long-term harvest level is 5% lower than in maximum even-flow.

Visually effective green-up

Within visually sensitive areas, the regenerated stand in previously harvested cutblocks must reach a specified height (visually effective green-up) before adjacent areas may be harvested. In the Sunshine Coast TSA, an average height of 5 metres must be achieved within visually sensitive areas prior to harvest of adjacent areas. The green-up period required to reach the specified height varies from 16 to 17 years in the Sunshine Coast TSA. Both uncertainty around estimates of site index, and different silvicultural treatments* may result in trees reaching the appropriate visually effective green-up height sooner or later than assumed.

Increasing and decreasing visually effective green-up ages by five years

- No effect on timber supply compared to maximum even-flow, in either the short- or long-term. The harvest forecast of 1 233 000 cubic metres per year can be maintained for 25 decades.

5.7 Uncertainty in minimum harvestable ages

Minimum harvestable ages are an estimate of the time needed for stands to reach a merchantable condition. The time at which stands will become merchantable is not known with precision because of uncertainty about the growth of regenerated stands, and an inability to foresee future conditions that will determine merchantability. In the Sunshine Coast TSA, minimum harvestable ages have been chosen to maximize long-term volume yield.

For this analysis, minimum harvestable ages for existing and managed stands were determined based on achieving approximately 95% of the culmination of mean annual increment, and a minimum volume of 300 cubic metres per hectare. The resulting minimum harvestable ages range from 40 to 130 years, depending on species and site index, and are described by leading species in Appendix A, "Description of Data Inputs and Assumptions for the Timber Supply Analysis." Approximately 48% of the existing timber harvesting land base in the Sunshine Coast TSA is currently at or above the minimum harvestable age applicable to the stand. The minimum harvestable ages are minimums; in this analysis stands may be harvested at older, but not younger, ages. Minimum harvestable ages are meant to approximate the timing of merchantability and are not legal or policy requirements.

Sensitivity analysis was undertaken to assess the timber supply implications of uncertainty about these minimum harvestable ages.

Increasing and decreasing minimum harvestable ages by 10 years

- No effect on timber supply compared to maximum even-flow, in either the short- or long-term.

Silvicultural treatments
Activities that ensure the regeneration of young forests on harvested areas, enhance tree growth or improve wood quality in selected stands. Activities include: site rehabilitation and preparation, planting, spacing, fertilization and pruning.

5.8 Uncertainty in green-up requirements

The Forest Practices Code requires that trees in a harvested area must reach a specific green-up height before adjacent areas are harvested. To ensure that harvesting-related disturbance does not become overly concentrated in any area, a maximum limit was set in this analysis on the overall area that has not reached the green-up conditions. For maximum and current AAC even-flow alternatives, it was assumed that no more than 33% of the timber harvesting land base within the helicopter harvest and IRM portions of each landscape unit (LU), could be less than 3 metres in height (11 to 14 years of age). These forest cover requirements* are used in the analysis to approximate adjacency requirements. These requirements have some uncertainty because they are approximations of the effects of cutblock-level decisions and it is difficult to define the exact forest structure needed to meet the adjacency objectives for a particular area.

Furthermore, there is uncertainty about how adjacency requirements will be implemented in the field. To address this uncertainty, the maximum allowable disturbance was decreased to 20%. In addition, the uncertainty about the green-up period was assessed to by increasing and decreasing it by two years.

Maximum amount of disturbance allowed below green-up age

Maximum of 20% below green-up

- No effect on timber supply compared to maximum even-flow, in either the short- or long-term.

Green-up age increased and decreased by two years

- No effect on timber supply compared to maximum even-flow, in either the short- or long-term.

Forest cover requirements
Specify desired distributions of areas by age or size class groupings. These objectives can be used to reflect desired conditions for wildlife, watershed protection, visual quality and other integrated resource management objectives. General adjacency and green-up guidelines are also specified using forest cover objectives (see ***Cutblock adjacency*** *and* ***Green–up****).*

5.9 Uncertainty in the productivity of current old-growth sites after harvest

The productivity of a site largely determines how quickly trees will grow. It therefore affects the timber volumes in regenerated stands, the time to reach green-up and the age at which those stands will reach merchantable size. The most accurate estimates of site productivity come from stands between 30 and 150 years old. At ages less than about 30 years a temporary increase or decrease in growth due to factors such as a post-harvest flush of nutrients or an unusual drought year can affect the overall productivity estimated for the stand. Site productivity estimates derived for older stands may be incorrect because tree heights do not represent actual productivity — for example, due to top breakage — and it is very difficult to determine ages of old trees accurately.

The results of recent province-wide research suggest that the estimated post-harvest productivity of sites currently occupied by old-growth stands may be significantly underestimated. Two *Old-Growth Site Index* (OGSI) studies applicable to timber supply forecasting are:

- *Site index adjustments for old-growth stands based on paired plots* (Nussbaum 1998). Data were obtained from paired plots installed in old-growth stands and adjacent logged and regenerated stands of the same productivity. Site index was estimated for both and comparisons were made. Results are available for lodgepole pine, interior spruce and coastal Douglas-fir.
- *Site index adjustments for old-growth stands based on veteran trees* (Nigh 1998). The objective of the study was to develop site index adjustments for species not covered by the paired-plot project. The data for this study came from temporary and permanent plots with a veteran and main stand component. The site indices for the two components were estimated and an adjustment equation for each species was derived using linear regression analysis. The results of the study are considered less reliable than those from the paired-plot study.

The results of these studies may be of some interest in the Sunshine Coast TSA since stands older than 140 years comprise nearly 18% of the timber harvesting land base. To test the sensitivity of the maximum even-flow harvest forecast to uncertainty about site productivity estimates, an analysis was performed that incorporated adjustments to site indices.

Site indices of stands older than 140 years were adjusted using either the paired-plot or veteran-tree results, whichever was applicable. Paired-plot results were applied to coastal Douglas-fir stands older than 140 years within the CWH biogeoclimatic zone. Veteran tree results were applied to hemlock stands older than 140 years, also within the CWH Zone. Managed stand volume estimates for those analysis units affected by changes in estimated future productivity were recalculated based on the average adjusted site productivity. Green-up ages and minimum harvestable ages were also recalculated. Table 4 compares the average forest inventory-based site index for each tree species group to those defined using each of the adjustments. Since the majority of stands older than 140 years have been assigned to poor site productivity analysis units, the adjustments were applied only to the analysis units shown in Table 4.

5 Timber Supply Sensitivity Analyses

Table 4. Average analysis unit site index based on forest inventory and OGSI information — Sunshine Coast TSA, 2001

Analysis unit	Timber harvesting land base area (hectares)	Inventory site index	Adjusted site index
Fir – poor	53 766	21.1	23.0
Hemlock/balsam/spruce— poor[a]	53 602	15.7	20.7

(a) For the Hemlock/balsam/spruce analysis unit, only site indices for the hemlock-leading stands were adjusted.

Table 4 shows only the average site index adjustments for the analysis units as a whole. The average site index for stands older than 140 years (which comprise a portion of the analysis units) increased from 21.0 to 29.0 for Douglas-fir stands, and 14.0 to 25.4 for hemlock stands, however the table shows the reduced effect as a result of including stands of all ages in the analysis units.

OGSI adjustments

- Harvest forecast is 1 318 000 cubic metres per year, maintained throughout the planning horizon.
- The harvest level of 1 318 000 cubic metres per year is 7% higher than in the maximum even-flow forecast.

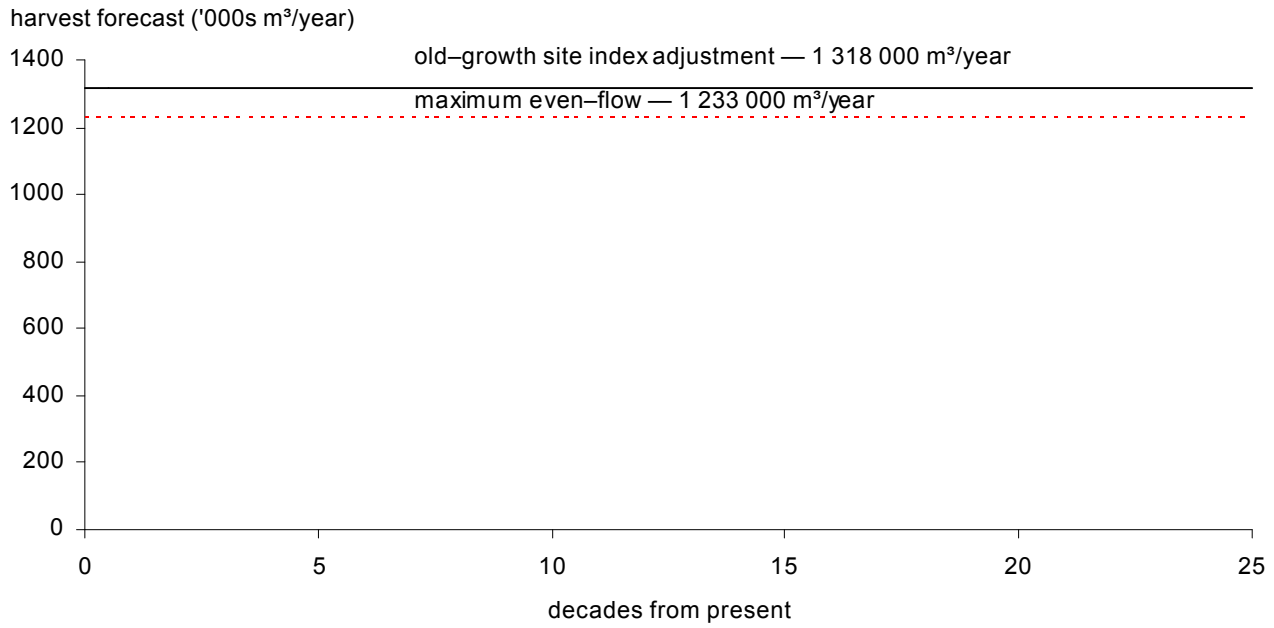

Figure 23. Harvest forecast based on OGSI (paired plot and veteran studies) site index adjustments — Sunshine Coast TSA, 2001.

Site index adjustments were not included in maximum and current AAC even-flow alternatives since there is little local site productivity data or long-term monitoring of regenerated stands to validate the adjustments. However, the results of the sensitivity analysis do provide insight into the trends associated with possible adjustments to site productivity estimates for the Sunshine Coast TSA.

5.10 Alternative harvest queue rules

In the two initial alternatives, the highest priority for harvest was given to stands that were the oldest relative to their minimum harvestable age. This 'relative oldest first' rule was applied only after other requirements and priorities (e.g., forest cover requirements) were taken into account. This rule reflects the practice of favouring older stands, but not necessarily the oldest, for harvest when all other considerations have been met.

Besides the relative oldest first rule, the Forest Service Simulator (FSSIM) model permits use of absolute oldest first, absolute youngest first, and random scheduling rules. These other rules may better reflect practices in some instances, given unforeseeable operational constraints that may affect when stands are chosen for harvest. Figure 24 shows how timber supply is affected by changing the way stands are prioritized for harvest.

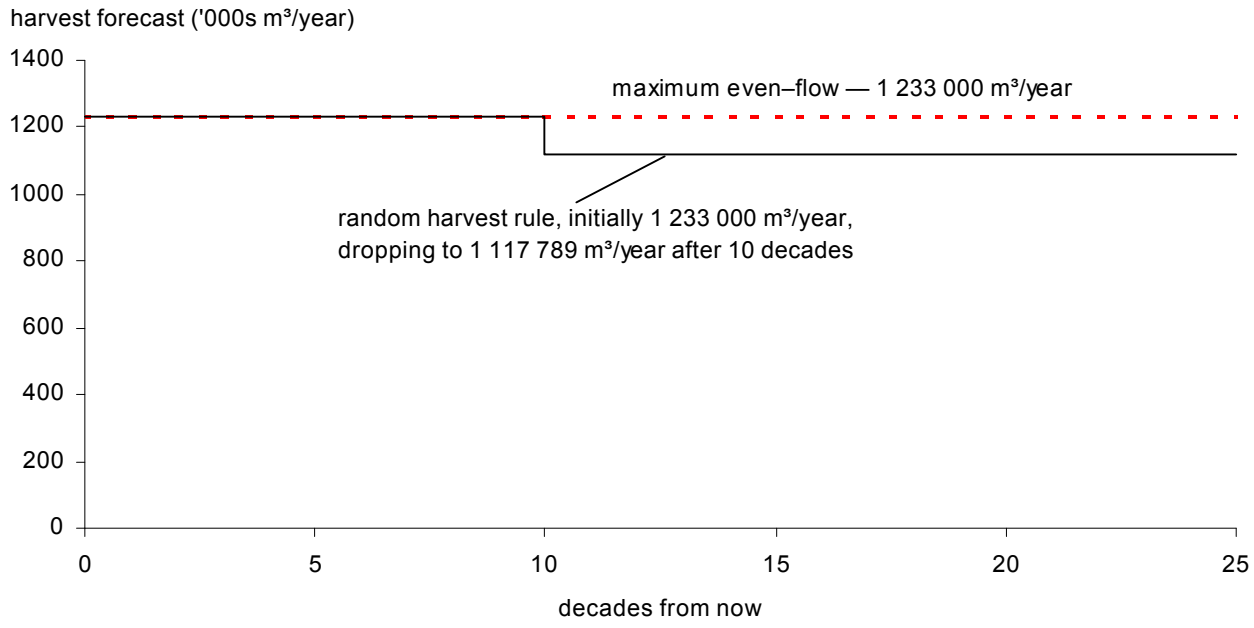

Figure 24. Effects of alternative harvest queue rules — Sunshine Coast TSA, 2001.

Random harvest schedule

- Harvest forecast same as maximum even-flow for the first 10 decades
- After 10 decades, the harvest level decreases to the long-term harvest level of 1 117 789 cubic metres per year.
- The long-term harvest level is 10% below the maximum even-flow harvest forecast.

The 'random harvest scheduling' rule chooses stands that are older than the minimum harvestable age in a random order for harvesting. Using this rule, there is a potential that long-term timber supply will not be optimized since some stands may grow far beyond their minimum harvest age, which is determined in part by the age of maximum timber growth.

5.11 Uncertainty in application of landscape-level biodiversity requirements

The *Forest Practices Code Act of British Columbia* (FPC) establishes the conservation of biodiversity as an essential component of sustainable forest use. The *FPC Landscape Unit Planning Guide* provides recommendations for maintaining biodiversity at both the stand- and landscape-levels. Stand-level biodiversity has been addressed in this analysis by removing portions of each stand from the timber harvesting land base for wildlife trees (WT)*. Therefore, uncertainty about stand-level biodiversity can be assessed through sensitivity analysis that examines the changes to the size of the land base available for timber harvesting.

Management for landscape-level biodiversity was modelled in this analysis through the use of forest cover requirements applied to each combination of natural disturbance type (NDT)*, biogeoclimatic subzone, and variant within each landscape unit. In maximum and current AAC even-flow alternatives, old-seral requirements, as found in the *Landscape Unit Planning Guide*, were applied at the biogeoclimatic variant level within each draft landscape unit. These requirements were modelled using a single weighted constraint based on the anticipated distribution of 45% low-, 45% intermediate- and 10% high-biodiversity emphasis. The low emphasis portion of the old-growth forest cover requirement is phased in over time, allowing for an initial two-thirds reduction of the old-forest requirement in low-emphasis portions of landscape units, as directed by provincial policy.

While the approach used initially represents current policy for managing and modelling landscape-level biodiversity, there is uncertainty about how the recommendations in the *Landscape Unit Planning Guide* will be applied once landscape units and biodiversity emphasis options (BEOs) are declared.

Four sensitivity analyses were performed to evaluate the potential timber supply impacts associated with uncertainty about landscape-level biodiversity management.

<u>Old-seral requirements applied based on draft BEOs for each landscape unit</u>

- No effect on timber supply compared to maximum even-flow, in either the short- or long-term.

<u>Full-old-seral requirements applied immediately based on draft BEOs for each landscape unit</u>

- No effect on timber supply compared to maximum even-flow, in either the short- or long-term.

<u>Mature- and full-old-forest requirements applied immediately based on draft BEOs for each landscape unit</u>

- No effect on timber supply compared to maximum even-flow, in either the short- or long-term.

<u>Early-, mature- and full-old-seral requirements applied immediately based on draft BEOs for each landscape unit</u>

- No effect on timber supply compared to maximum even-flow, in either the short- or long-term.

Immediate, full application of all the seral stage targets in the *Landscape Unit Planning Guide* has no additional timber supply impact. This is due in part to the large amount of available timber of harvestable age in the Sunshine Coast TSA, as well as the relatively large amount of forests outside the timber harvesting land base that can be used to meet some of these seral stage targets.

Wildlife tree
A standing live or dead tree with special characteristics that provide valuable habitat for conservation or enhancement of wildlife.

Natural disturbance type (NDT)
An area that is characterized by a natural disturbance regime, such as wildfires, which affects the natural distribution of seral stages. For example areas subject to less frequent stand-initiating disturbances usually have more older forests.

5 Timber Supply Sensitivity Analyses

5.12 Summary of sensitivity analyses

Table 5 summarizes all sensitivity analyses. Sensitivity analyses showing an increase relative to maximum even-flow harvest forecast are presented first, followed by those showing a decrease. Sensitivity analyses showing no impact relative to maximum even-flow are presented last.

Table 5. Summary of sensitivity analysis — Sunshine Coast TSA, 2001

Report section	Description	Impact of sensitivity analysis relative to maximum even-flow		
		Short term	Medium term	Long term
5.3	Increase timber harvesting land base by 10%	+	+	+
5.5	Increase managed stand volumes by 10%	+	+	+
5.9	Old-growth site index adjustments	+	+	+
5.1	Maximum initial harvest level	+	–	–
5.4	No inventory adjustment for VRI	–	–	–
5.3	Decrease timber harvesting land base by 10%		–	–
5.5	Decrease managed stand volumes by 10%		–	–
5.6	Decrease allowable visual disturbance		–	–
5.10	Random harvest scheduling		–	–
5.2	Maintain alder harvest levels			
5.6	Decrease visual green-up by 5 years			
5.7	Decrease minimum harvestable ages by 10 years			
5.6	Increase visual green-up by 5 years			
5.7	Increase minimum harvestable ages by 10 years			
5.8	Maximum 20% below green-up in IRM/helicopter zones			
5.8	Increase green-up ages by 2 years			
5.8	Decrease green-up ages by 2 years			
5.11	Draft BEOs used for landscape-level biodiversity			
5.11	Full old-seral requirement, draft BEOs			
5.11	Mature- and full-old-seral requirements, draft BEOs			
5.11	Early, mature, and full old seral requirements, draft BEOs			

6 Summary and Conclusions of the Timber Supply Analysis

The results of this timber supply analysis suggest that, given data and management assumptions that reflect current information and practices, the current allowable harvest level in the Sunshine Coast TSA of 1 140 000 cubic metres per year can be maintained for 250 years (current AAC even-flow). The results also show that a harvest forecast that is 8% higher, or 1 233 000 cubic metres per year, can be maintained for 250 years (maximum even-flow). In both of these approaches, a harvest level of 95 000 cubic metres per year can be maintained for 40 years from stands dominated by red alder.

The results reflect current knowledge and information on forest inventory, growth and yield, and management. However, uncertainties about several factors important in defining timber supply have the potential to affect the harvest forecast to varying degrees.

A series of sensitivity analyses compared to maximum even-flow, a harvest forecast of 1 233 000 cubic metres per year for 250 years, showed that data and management uncertainties affect timber supply projections to varying degrees, some with positive impacts, some with negative impacts, but most with little or no impact. The sensitivity analyses show that within the ranges examined, most areas of uncertainty have little or no impact on timber supply in the short term (the next 20 years).

Short-term timber supply is sensitive to changes that influence the amount of timber available from existing natural stands, because these stands support harvest levels for the next 80-100 years. The only sensitivity analysis that showed a negative impact on short-term timber supply was removal of the inventory adjustment. If the inventory was not adjusted as indicated in the Vegetation Resource Inventory, a harvest level of 1 157 789 cubic metres per year (1% above the current AAC) could be maintained. No other areas of uncertainty examined resulted in a decrease in short-term harvest levels. Thus, timber supply is quite stable in the short term.

Medium- and long-term timber supply (over 21 years from now) is affected by only a few of the areas of uncertainty examined. Because the initial harvest forecasts presented in this report are non-declining harvest forecasts, changes in assumptions tend not to affect the harvest forecast in the medium term. The timber harvesting land base consists of stands that are currently well distributed between 0 and 100 years of age; thus, over the next several decades, sufficient volume will be attaining a harvestable age to provide medium-term stability. Significant changes like large reductions in the size of the timber harvesting land base or uncertainty around existing stand volume estimates can potentially reduce timber supply in the medium- and long-term. To a lesser extent, medium- and long-term timber supply is affected by changes in old-growth site index estimates and forest cover requirements for management of visual quality. If the amount of disturbance allowed in visually sensitive areas is limited to the mid-point of the disturbance range, timber supply is decreased from 80 years onward.

Another area of uncertainty with potential impact on medium- and long-term timber availability is the rule used to set harvest priority. Maximum and current AAC even-flow alternatives are based on the 'relative oldest first' harvest rule, which attempts to maximize long-term timber supply by prioritizing the oldest stands for harvest. If stands older than minimum harvestable age are selected randomly for harvest, stand yields are generally lower in the long term compared to the relative oldest first rule, causing decreased timber supply in the medium term and long term.

In conclusion, this analysis indicates that based on current inventory, growth and yield, and forest management information, timber harvests in the Sunshine Coast TSA can be increased by 8% and maintained as a steady harvest flow for 250 years. Due to the age class distribution and large volume of available timber, few areas of uncertainty examined in the analysis indicate significant risk to the projected timber supply. However, with the exception of underestimating site indices for old-growth stands, there is no strong evidence to suggest that significant inaccuracies exist in the information used in this analysis.

7 Socio-Economic Analysis

The impact of timber supply adjustments on local communities and the provincial economy is an important consideration in the timber supply review. The socio-economic analysis compares the level of forestry activity currently supported by timber harvested from the Sunshine Coast TSA to the level of activity that the TSA could support as the timber supply moves towards its long-term harvest level. The socio-economic analysis examines harvest levels as projected in the maximum even-flow forecast and is not intended to examine alternative management scenarios.

The socio-economic analysis consists of the following:

- a profile of the current socio-economic setting;
- a description of the Sunshine Coast TSA forest industry; and
- an analysis of the socio-economic implications of the maximum even-flow forecast.

7.1 Current socio-economic setting

7.1.1 Current population and demographic trends

The Sunshine Coast TSA is part of the Sunshine Coast Forest District, which also consists of Tree Farm Licence (TFL) 10, and portions of TFLs 39 and 43. In 2000, the population of the Sunshine Coast Forest District was approximately 48,200 people[1]. The largest community in the Sunshine Coast Forest District is Powell River with an estimated population of 13,837 people in 2000. The population of Powell River peaked in 1997 at 13,965 and has since declined. Other smaller communities located in the forest district include Sechelt and Gibsons with 2000 populations of 8,499 and 3,895, respectively. Sechelt is the largest community to show consistent population gains since the 1996 Census of Canada.

The majority of the population growth in the region has occurred in Sechelt, where the population increased by 12% between 1996 and 2000. The population of the forest district is expected to increase by approximately 8% between 2000 and 2005, mainly due to growth in the Sunshine Coast Regional District, which forms the southern portion of the Sunshine Coast Forest District. Table 6 shows the population levels for the Sunshine Coast Forest District, regional districts and communities where data is available.

Table 6. Sunshine Coast forest district population statistics, 1991-2005

	1991	1996	2000	2005	% change 1991-2000
Powell River	13,326	13,637	13,837	N/A	3.8
Sechelt	6,268	7,611	8,499	N/A	35.6
Gibsons	3,215	3,875	3,895	N/A	21.1
Sunshine Coast Forest District	40,066	45,878	48,200	52,100	20.3
Powell River Regional District	19,689	20,698	21,060	20,904	7.0
Sunshine Coast Regional District	21,334	25,833	27,838	31,931	30.5
British Columbia	3,282,910	3,882,043	4,023,100	4,489,537	22.5

Source: Census of Canada 1991, 1996. BC Stats Population Section.

(1) B.C. Stats, Population Section, B.C. Ministry of Finance and Corporate Relations. Estimate for 2000 based on 1996-2000 population growth rates for the Sunshine Coast and Powell River Regional Districts.

Table 6 illustrates some differences between the northern and southern portion of the Sunshine Coast Forest District. The Sunshine Coast Regional District to the south has experienced substantial population growth over the past decade. From 1991 to 2000, the population of the Sunshine Coast Regional District grew by 30.5%, ahead of growth in the Greater Vancouver Regional District, but behind that of the Squamish Lillooet Regional District, which includes Whistler. In contrast, the population of the Powell River Regional District to the north grew by only 7% from 1991 to 2000. The differing growth rates between the Powell River and Sunshine Coast Regional Districts can be attributed to their different economic strengths. As discussed more in the following section, Powell River is more tied to the forestry sector, which has experienced mill closures and employment declines, compared to the Sunshine Coast, which has benefited from the growing economy of Vancouver and other non-employment sources of income such as pensions. This growth attracts other service-related business, which has further growth impacts on the local economy.

7.1.2. Economic profile

From 1991 to 1996, the total experienced labour force in the Sunshine Coast Forest District increased by 12% to 21,380 from 19,035.[2] In comparison, the provincial experienced labour force increased by 14% over the same period. The unemployment rate in the Sunshine Coast TSA was 9.1% in 1996 compared to 11.5% in 1991. The labour force will increase as the population increases; however, similar to the concentration of population growth, it is likely that much of the growth will occur in the Sunshine Coast Regional District.

Census data, which is the basis for the regional labour force data is based on place of residence, which is not necessarily the same as the place of work. The Sunshine Coast corridor along the Sechelt Peninsula is within commuting distance from Vancouver and many of the area's residents travel daily to Vancouver. Ferry statistics show this trend. The busiest sailings are the 06:20 and 08:20 departing Langdale and the 15:30 and 17:30 sailings departing Horseshoe Bay.[3] From 1998-2000, the average number of passengers per month, not including the summer months of May through September, was over 86,000, or roughly 2,800 per day.[4] Other differences between the northern and southern portion of the Sunshine Coast Forest District are discussed in the following sections.

(2) Census of Canada, 1991, 1996.

(3) B.C. Ferry Corporation. monthly traffic statistics.

(4) This figure is the average monthly rate divided by 30 days and may not accurately reflect weekday *versus* weekend travel , but is used here simply to illustrate the volume of traffic.

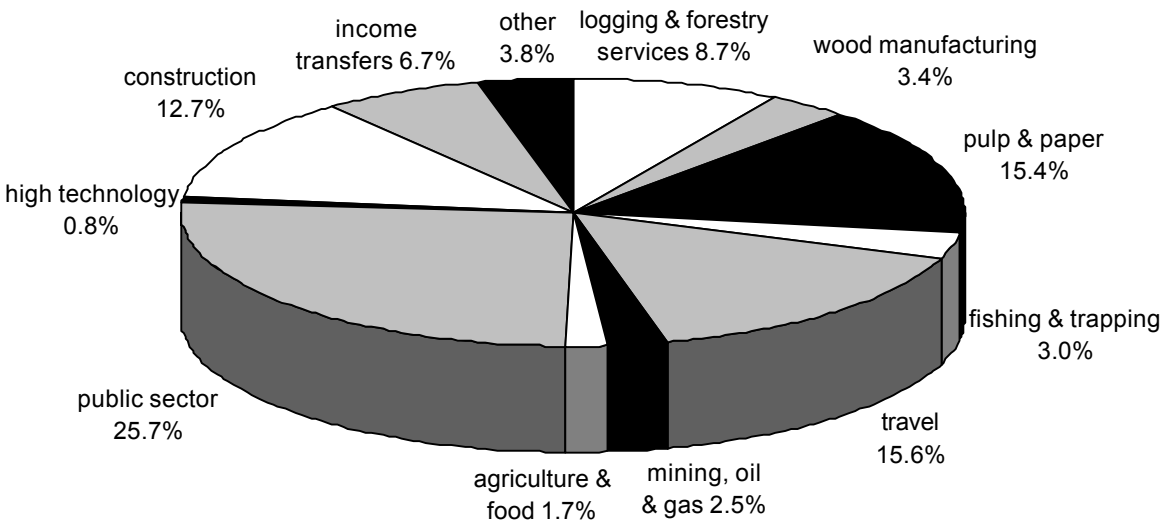

Figure 25. Sunshine Coast TSA experienced labour force by sector, 1996.

Source: B.C. Ministry of Finance and Corporate Relations. 1999. The 1996 Forest District Tables.

In 1996, the forest sector supported the largest percentage of the workforce in the forest district, despite declines in direct forestry employment from 1991 to 1996. Statistics from 1996 indicate that the forest sector, which includes harvesting, silviculture, and forest products manufacturing, supported about 28% of the total (direct, indirect and induced) labour force and 27% of the district's income.[5] The forest industry accounted for 34% of the income flowing into the Powell River area, while in the Sechelt – Gibsons area forestry accounted for 20% of the income.

Since 1996, the forest industry in the Sunshine Coast has experienced further declines in manufacturing employment, mainly reflecting the closure of the MacMillan Bloedel sawmill in Powell River and lower employment levels at the Pacifica Papers Inc. pulp and paper mill in Powell River.

The public sector is the second largest employer in the Sunshine Coast TSA. The public sector includes municipal, provincial and federal government employment, including education and health services. In 1996, this sector supported 26% of the total labour force and 19% of the total income. In comparison, provincially the public sector accounts for an average of 23% of employment in forest districts. Public sector employment in the Sunshine Coast TSA increased by 22% from 1991 to 1996, with the largest increase occurring in the health services sub-sector.

The travel sector as reported in Figure 25 includes both business and tourism travel. In 1996, this sector supported almost 16% of the total labour force and approximately 7% of the total income flowing within the region. This difference between the percentage employed and the income indicates the below average business spending and wages earned by the average travel sector worker, in relation to the total income flowing into the region and the high level of income transfers (pensions and employment insurance for example). The travel sector includes accommodation, food and beverages, and a portion of the retail and personal services trades. The accommodation, food and beverages portion of the travel sector increased by 19% between 1991 and 1996.

The remaining employment (other) in the Sunshine Coast TSA is supported by construction employment not allocated to one of the major sectors, agriculture, mining, and other transportation and manufacturing activities not associated with the major sectors.

(5) The 1996 Forest District Tables. April 1999. Ministry of Finance and Corporate Relations.

7 Socio-Economic Analysis

The preceding discussion focused on employment; however, non-employment related spending from, for example pensions, investment income and social assistance payments, also support jobs in the region. The induced employment supported by this income is indicated by "income transfers" in Figure 25. This source of income supports only 6.7% of the employment (all of which is induced) in the forest district, although it represents about 33% of the total income flowing into the region (those receiving the income are not counted as employed). The Sunshine Coast and Powell River Regional Districts are both above average in terms of the percentage of income coming from non-employment sources. The level of non-employment income flowing into the region also differs between the north and south. In the Powell River area non-employment income accounts for 28% of total income, while in the southern portion non-employment income accounts for 38% of total income.

The indirect and induced employment included in Figure 25 reflects the income spent by companies and employees and the number of jobs that depend on those expenditures. Employment multipliers* illustrate this spending effect: a larger multiplier indicates that each job of a particular sector will support more business activity at supply and service companies, due to higher company revenues, supply requirements and wages. For example, the B.C. Ministry of Finance and Corporate Relations (1999) indicate that every 100 full-time direct forestry jobs in the Sunshine Coast TSA support an additional 44 to 87 indirect and induced full-time jobs, depending on the forestry activity (harvesting or processing). In comparison, every 100 full-time direct jobs in the tourism and business travel sector support an estimated 15 indirect and induced jobs*, and every 100 jobs in the public sector support an additional 25 indirect and induced jobs. The differences are due to larger spending patterns by forestry sector businesses and their employees, which tend to have higher revenues, incomes, and spending patterns. The multipliers indicate how a change to a particular sector could affect the broader economy. Table 7 compares employment multipliers for sectors of the Sunshine Coast TSA economy.

Table 7. Employment multipliers, by sector Sunshine Coast Forest District, 1996

Basic sector*	Employment multiplier
Forestry: logging and manufacturing	1.44 – 1.87
Agriculture and food	1.22
Travel and tourism	1.15
Public sector	1.25
Mining	1.65
High tech	1.33

Source: B.C. Ministry of Finance and Corporate Relations. 1999. *The 1996 Forest District Tables.*

Employment multiplier
An estimate of the total employment supported by each direct job, for example a multiplier of 2.0 means that one direct job supports one additional indirect and induced job.
Indirect and induced jobs
Indirect jobs are supported by direct business purchases of goods and services. Induced jobs are supported by employee purchases of goods and services; for example, at retail outlets.

Basic sector
Sectors of the economy, such as forestry, tourism and mining, that create flows of income into the region and are assumed to be drivers of the local economy. Non-basic sectors, such as retail outlets, are supported by basic sectors.

7.2 Sunshine Coast TSA forest industry

7.2.1 Current allowable annual cut

The current (effective July 1996) allowable annual cut (AAC) for the Sunshine Coast TSA is 1 140 000 cubic metres, including a deciduous volume of 95 000 cubic metres. Table 8 provides a breakdown of the AAC by tenure type. Prior to the current level, the AAC was 1.1 million cubic metres.

Table 8. Sunshine Coast TSA allowable annual cut, by licence type

	AAC (cubic metres)	Per cent (%) of total AAC
Forest Licences — replaceable	831 598	73
Small Business Forest Enterprise Program (SBFEP)	156 266	14
Timber sale licences < = 10 000 m^3	36 416	3
Forest Service Reserve	10 720	1
Woodlot Licences	10 000	1
Forest Licences — non-replaceable	95 000	8
Total	1 140 000	100

Source: Ministry of Forests.

7.2.2 Sunshine Coast TSA harvest history

Table 9 summarizes the volume of timber harvested in the Sunshine Coast TSA from 1993 to 2000. The actual volume of timber harvested is an important indicator of forestry activity in the TSA. While the AAC is the maximum allowable annual harvest level, the actual volume of timber harvested in a particular year determines the level of economic activity. Differences in annual harvest levels are the result of provisions for cut-control[6] variations that allow licensees to vary their harvests based on operating and market conditions. If actual annual harvest levels are consistently less than the AAC, then forestry activity is below its full potential.[7]

In 2000, approximately 1.2 million cubic metres were harvested from the Sunshine Coast TSA (see Table 9). During the 1993 to 1997 cut-control period, the full allocation of timber was harvested from the TSA. The latest cut-control period runs from 1998 to 2002 and a similar level of harvesting activity is expected.

(6) Cut control allows licensees to vary the volume between annual harvest and AAC by +/– 50 % per year, and by +/– 10 % over a 5-year cut-control period.

(7) Full potential referred to here is based on the allocated volumes of the AAC, and is not necessarily the same as full economic potential which is based on the international market for wood products.

Table 9. Sunshine Coast TSA volumes billed, by licence type, 1993 to 2000

Tenure	Cubic metres (m^3)							
	1993	1994	1995	1996	1997	1998	1999	2000
Forest Licences	835 714	716 052	955 674	847 640	797 375	666 349	983 060	1 048 201
Small Business Forest Enterprise Program (SBFEP)	180 687	159 799	94 416	69 154	166 251	147 958	286 599	114 422
Timber sale licence (TSL)	48 950	18 746	38 872	36 717	27 385	19 694	26934	50 070
Other[a]	12 245	11 577	8 628	2 416	8 875	3 908	3 329	6 141
Total	1 077 596	906 174	1 097 590	955 927	999 886	837 909	1 299 922	1 218 834
AAC[b]	1 100 000	1 100 000	1 100 000	1 140 000	1 140 000	1 140 000	1 140 000	1 140 000
Average harvest 1993–1997:	1 007 435							
Average harvest 1998–2000:	1 118 888							

(a) "Other" consists of cutting permits such as rights-of-way, road permits, and other small temporary permits.

(b) The AAC was increased by adding the deciduous portion in 1996.

Source: Ministry of Forests.

7.2.3 Sunshine Coast TSA major licensees and processing facilities

International Forest Products Ltd.

International Forest Products Ltd. (Interfor) has a replaceable forest licence in the Sunshine Coast TSA to harvest 513 731 cubic metres per year. Interfor has a second forest licence in the TSA held jointly with Terminal Forest Products Ltd. Details of this second licence are presented in the Terminal Forest Products discussion. In 2000, Interfor harvested 492 342 cubic metres. Table 10 outlines Interfor's recent harvest activity and 1998-2000 average employment levels associated with its Sunshine Coast TSA operations.

Table 10. Interfor volumes billed and provincial employment statistics

Allowable annual cut (AAC)	513 731 cubic metres
2000 harvest[a]	492 342 cubic metres
1998-2000 average annual volumes billed	476 306 cubic metres
Employment[b] (1998-2000 person-years)	
Harvesting, administration and silviculture	87
Processing	390
Total	477

(a) Harvest levels include forest licence and cutting permit volumes.

(b) The employment figures relate to the 1998-2000 average volume of 476 306 cubic metres harvested from the Sunshine Coast TSA only and processed in BC.

Interfor currently operates six lumber mills in the province, none of which are located in the Sunshine Coast TSA. Five of Interfor's mills are located in the Squamish-Vancouver area and one is located at Adams Lake, northeast of Kamloops. From 1998 to 2000, the sawmills processed an average of about 2.6 million cubic metres per year. In April 2001, Interfor announced that by the end of October it will close its Fraser Mills facility in Coquitlam, reducing the number of lumber mills Interfor operates in the Lower Mainland to three. The Sunshine Coast represents approximately 20% of Interfor's total consumption.

Canadian Forest Products Ltd.

Canadian Forest Products Ltd. (Canfor) has a replaceable forest licence in the Sunshine Coast TSA to harvest 76 906 cubic metres per year. In 2000, Canfor harvested 109 936 cubic metres. Table 11 outlines Canfor recent harvest activity and 1998-2000 average employment levels associated with its Sunshine Coast TSA operations.

Table 11. Canfor volumes billed and provincial employment statistics

Allowable annual cut (AAC)	76 906 cubic metres
2000 harvest[a]	109 936 cubic metres
1998-2000 average annual volumes billed	73 296 cubic metres
Employment[b] (1998-2000 person-years)	
Harvesting, administration and silviculture	37
Processing	60
Total	97

(a) Harvest levels include forest licence and cutting permit volumes.

(b) The employment figures relate to the 1998-2000 average volume of 73 296 cubic metres harvested from the Sunshine Coast TSA only and processed in B.C.

Canfor operates 11 sawmills in the province, a veneer and plywood mill, four pulp mills, two paper mills and two chip mills. One of Canfor's pulp and paper mills, Howe Sound Pulp and Paper, is located in the Sunshine Coast TSA. From 1998 to 2000, Canfor's solid wood mills consumed about 8.3 million cubic metres per year. The pulp and paper mill located in the TSA consumes an average of approximately 900 000 bone-dry units (BDUs) of wood chips per year during the same period. A small portion of timber processed at Howe Sound Pulp and Paper comes from the Sunshine Coast TSA.

Doman-Western Lumber Ltd.

Doman-Western Lumber Ltd. (Doman-Western) has a replaceable forest licence in the Sunshine Coast TSA to harvest 33 545 cubic metres per year. In 2000, Doman-Western harvested 45 691 cubic metres. Table 12 outlines Doman-Western's recent harvest activity and 1998-2000 average employment levels associated with its Sunshine Coast TSA operations.

Table 12. Doman-Western volumes billed and provincial employment statistics

Allowable annual cut (AAC)	33 545 cubic metres
2000 harvest[a]	45 691 cubic metres
1998-2000 average annual volumes billed	44 105 cubic metres
Employment[b] (1998-2000 person-years)	
Harvesting, administration and silviculture	10
Processing	36
Total	46

(a) Harvest levels include forest licence and cutting permit volumes.

(b) The employment figures relate to the 1998-2000 average volume of 44 105 cubic metres harvested from the Sunshine Coast TSA only and processed in B.C.

Doman-Western operates nine sawmills, a chip mill and two pulp mills, all of which are not in the Sunshine Coast TSA. From 1998 to 2000, the solid wood mills processed an average of close to 3.6 million cubic metres per year. The TSA represents approximately one per cent of Doman's timber supply requirements.

Terminal Forest Products Ltd.

Terminal Forest Products Ltd. (Terminal) has two replaceable forest licences in the Sunshine Coast TSA. One held solely by Terminal, has a volume of 125 966 cubic metres per year, and the second held jointly with Interfor, has a volume of 81 450 cubic metres per year. In 2000, Terminal harvested 135 722 cubic metres under its own licence and 85 720 cubic metres under its joint licence. Terminal operates two sawmills in the Vancouver Lower Mainland. Table 13 outlines Terminal's recent harvest activity and 1998-2000 average employment levels associated with its Sunshine Coast TSA operations.

Table 13. Terminal volumes billed and provincial employment statistics

Allowable annual cut (AAC)	207 416 cubic metres
2000 harvest[a]	221 442 cubic metres
1998-2000 average annual volumes billed	189 943 cubic metres
Employment[b] (1998-2000 person-years)	
Harvesting, administration and silviculture	53
Processing	155
Total	208

(a) Harvest levels include forest licence and cutting permit volumes.

(b) The employment figures relate to the 1998-2000 average volume of 189 943 cubic metres harvested from the Sunshine Coast TSA only and processed in B.C.

Northwest Hardwoods Ltd.

Northwest Hardwoods Ltd. (Northwest) is owned by Weyerhaeuser and has a non-replaceable forest licence in the Sunshine Coast TSA to harvest 95 000 cubic metres per year from deciduous-leading stands. In 2000, Northwest harvested 178 619 cubic metres. Northwest operates a sawmill in the Vancouver Lower Mainland. Northwest, formerly Coast Mountain Hardwoods, was purchased by Weyerhaeuser in June 2000. Table 14 outlines Northwest's recent harvest activity and 1998-2000 average employment levels associated with its Sunshine Coast TSA operations.

Table 14. Northwest volumes billed and provincial employment statistics

Allowable annual cut (AAC)	95 000 cubic metres
2000 harvest[a]	178 619 cubic metres
1998-2000 average annual volumes billed	116 598 cubic metres
Employment[b] (1998-2000 person-years)	
Harvesting, administration and silviculture	60
Processing	95
Total	155

(a) The total harvest of the licence from 1997 to 2000 (the first four years of operation) has been 396 369 cubic metres, which is 4% above the AAC and within 10% of five-year cut control.

(b) The employment figures relate to the 1998-2000 average volume of 116 598 cubic metres harvested from the Sunshine Coast TSA only and processed in B.C.

Other licensees and processing facilities

The remainder of the Sunshine Coast TSA timber supply is harvested under the Small Business Forest Enterprise Program (SBFEP) and under replaceable minor timber sale licences (tenures with an AAC of less than or equal to 10 000 cubic metres). From 1998 to 2000, the average volume harvested under the SBFEP was 182 993 cubic metres per year. The average volume of timber harvested under replaceable timber sale licences over the same period was 32 233 cubic metres per year.

There are two pulp and paper mills operating in the Sunshine Coast TSA: Pacifica Papers Inc. located in Powell River and Howe Sound Pulp and Paper Ltd. located at Port Melon. The Pacifica pulp and paper mill has a capacity to produce approximately 630 metric tonnes of pulp and 440 metric tonnes of paper per year, and in 2000 employed approximately 1,000 people. Howe Sound Pulp and Paper has the capacity to produce about 500 metric tonnes of pulp and 195 metric tonnes of paper per year. In 2000, it employed approximately 600 people.

Also in the Sunshine Coast TSA are two medium to small lumber mills — Bayside Sawmills Ltd. and Lois Lumber Ltd. — and one shake and shingle mill — Goat Lake Forest Products. From 1998 to 2000, these mills processed a combined average of 150 000 cubic metres per year and employed about 140 people. Access to a sufficient volume of timber to allow the processors to operate at capacity has been raised as an issue facing local processors. The majority of the timber supply for these mills comes from surrounding TFLs and private sources, not the Sunshine Coast TSA.

7.2.4 Forestry sector employment and employment coefficients

The preceding harvesting and employment information is used to develop employment coefficients*, which are used to project future employment levels in the forestry sector. For this purpose, the forestry sector has been divided into three sub-sectors:

- harvesting and other woodlands-related employment including falling, log salvage, log scaling, log transport, harvest planning and administration;
- silviculture employment such as planting, surveying and other basic and intensive silviculture activities, such as spacing, fertilization and pruning*; and
- primary timber processing employment at lumber mills, veneer and plywood mills, shake and shingle mills, chip mills, log home mills and pulp and paper mills.

Employment coefficient
The number of person-years of employment supported by every 1000 cubic metres of timber harvested; for example, a coefficient of 1.0 indicates that every 1000 cubic metres harvested supports one person-year, or 500 000 cubic metres supports 500 person-years.

Harvesting and silviculture employment

The harvesting sub-sector of the forest industry includes both company and contract loggers and is the first sub-sector that would be affected by a change in the AAC. The predominant silvicultural system used in the Sunshine Coast TSA is clearcutting using ground-based (hoe forwarding and skidding), cable-based systems (grapple yarding) and helicopters. The active logging season generally runs all year, but varies by company and weather conditions. Local residents account for an average of about 70-90% of the harvesting workforce.

The silviculture sub-sector is perhaps the least tied to the current level of harvest, given that silviculture activities are ongoing for as much as 10-15 years following harvesting. Basic silviculture consists of pre- and post-harvest surveys, site preparation, planting, brushing, cone collecting and some spacing. Enhanced, or intensive silviculture includes spacing, fertilization, and pruning. In the TSA, major licensees are responsible for basic silviculture on areas harvested under major licences. The provincial government is responsible for the remaining basic and all enhanced silviculture on Crown land, which is completed by silviculture contractors.

Employment data compiled for this timber supply review indicate that from 1998 to 2000, the average TSA harvest of 1.11 million cubic metres per year supported about 419 person-years annually of direct harvesting and silviculture employment across the province. About 87% of this workforce resides in the Sunshine Coast.

Pruning
The manual removal of the lower branches of crop trees to a predetermined height to produce clear, knot-free wood.

7 Socio-Economic Analysis

Processing employment

The timber processed at local mills comes not only from the Sunshine Coat TSA but also from adjacent TFLs and other southwestern B.C. sources. The Sunshine Coast TSA accounts for an average of approximately 12% of the timber requirement for local TSA mills. The smaller solid wood mills tend to rely to a greater extent on local sources of timber than do the pulp mills. The timber supply from the TSA also supports processing activity in the Lower Mainland and on Vancouver Island.

Employment data compiled for this timber supply review indicate that from 1998 to 2000, the TSA harvest of 1.11 million cubic metres per year supported approximately 880 person-years of direct processing employment across the province. About 23% of this processing employment is associated with operations in the Sunshine Coast TSA.

Forest Service employment

The Sunshine Coast Forest District office located in Powell River administers the Sunshine Coast TSA. Currently, 57 people work in the forest district office. Forest Service staff are involved in administration, enforcement of government policy, and SBFEP-related planning for the Sunshine Coast TSA.

Sunshine Coast TSA employment coefficients

Table 15 summarizes the employment supported by the 1998–2000 average harvest in the Sunshine Coast TSA and the corresponding employment coefficients. These coefficients have been calculated for the TSA and province to highlight the level of forestry activity within the Sunshine Coast TSA and to identify the contribution that the Sunshine Coast TSA's forestry sector makes to the provincial economy. The two employment levels are defined as follows:

- TSA employment and employment coefficients, which comprise residents of the Sunshine Coast TSA who are employed in the forestry sector within the Sunshine Coast TSA and who rely on the Sunshine Coast TSA timber supply; and
- Provincial employment and employment coefficients, which comprise all forestry sector employment in the province that relies on the Sunshine Coast TSA timber supply, including both residents of the Sunshine Coast TSA and those who live elsewhere.

Employment is divided into direct, indirect and induced components; the sum of the components is the total impact. The coefficients are expressed as the number of full-time jobs, or person-years, per 1000 cubic metres of timber harvested. Indirect and induced employment figures were derived using employment multipliers, see B.C. Ministry of Finance and Corporate Relations (1999).

More detailed information regarding employment coefficients and multipliers is presented in Appendix B, "Socio-Economic Analysis Background Information."

Table 15. Sunshine Coast TSA employment and employment coefficients, average 1998–2000

Forest industry activity	TSA employment (person-years)	TSA coefficients (person-years/'000s m³)	Provincial employment (person-years)	Provincial coefficients (person-years/'000s m³)
Harvesting	259	0.23	341	0.30
Silviculture	34	0.03	78	0.07
Processing	215	0.19	881	0.79
Total direct	508	0.45	1,300	1.16
Indirect + Induced	315	0.28	1,655	1.48
Total employment	823	0.74	2,955	2.64

Note: Employment estimates are reported in person-years based on average 1998-2000 employment levels and the average 1998–2000 Sunshine Coast TSA harvest of 1 118 888 cubic metres per year. Figures may not be exact due to rounding.

Other employment coefficients may be found in other documents for the same or similar areas. A difference in ratios can occur for several reasons, such as using different sources of employment data and rounding of estimates, dividing employment by a different harvest level, using a different definition of a full-time position and changing the definition of forestry sub-sectors. However, the size of impacts associated with a timber supply change should illustrate similar effects.

7.2.5 Sunshine Coast TSA employment income

From 1998 to 2000, the average income for forestry sector employees associated with the Sunshine Coast TSA was $48,550, based on average provincial income levels for logging and forestry services, solid wood manufacturing and pulp and paper manufacturing (see Appendix B). Average income for indirect and induced sector employees was $30,800. The total direct income associated with the forestry sector in the Sunshine Coast TSA averaged $63.1 million per year and total income for indirect and induced employment averaged $51.0 million per year (incomes are reported in 1999 dollar values). Combined, total employment income in the Sunshine Coast TSA averaged $114.1 million per year. Table 16 shows income levels, average wages and salaries, and total income per 1000 cubic metres of harvested timber.

Table 16. Average direct and indirect and induced incomes and total employment income, 1998–2000

	Average wage (1999 dollar value)	Total income ($ millions)	Total income ($/'000s m^3)
Direct	48,550	63.1	56,410
Indirect + Induced	30,800	51.0	45,560
Total income		114.1	101,970

Source: Statistics Canada. Annual estimates of employment, earnings and hours. Catalogue # 10-3009XKB.
Statistics Canada. Labour Force Survey, Average weekly wage rate.

7.2.6 Provincial government revenues

The provincial government receives various taxes and other revenues from the forest industry. The forest industry pays stumpage, royalties and rents to the provincial government for the rights to timber and its use, and other industry operating taxes such as corporate income, property, and sales taxes. The provincial and federal governments also receive revenues from forestry employees directly through income taxes.

From 1998 to 2000, forest industry activity in the Sunshine Coast TSA provided an average of about $12.3 million in annual stumpage, royalty and rent payments to the provincial government. Other government revenues from forest industry taxes accounted for $10.1 million per year. Total employment supported by the Sunshine Coast TSA harvest generated total annual provincial and federal income taxes worth $29.9 million. About one-third of the total income tax, or $9.9 million per year goes to the provincial government. Table 17 shows average annual provincial government revenues for 1998–2000.

Table 17. Average annual provincial government revenues, 1998-2000

	Average annual revenue 1998-2000 ($1999 millions)	Average revenue ($/'000s m^3)
Stumpage, rents and royalties	12.3	11,008
Industry taxes	10.1	9,037
Provincial income tax	9.9	8,889
Total provincial government revenues	32.3	28,934

Sources: Ministry of Forests, Revenue Branch; PricewaterhouseCoopers; Revenue Canada.

7.3 Socio-economic implications of the maximum even-flow

The socio-economic analysis focuses on harvest level changes in the short- to mid-term of 10-30 years as shown in the maximum even-flow forecast and considers:

- the implications of alternative harvest levels for both the Sunshine Coast TSA and the province;
- possible impacts on communities within the TSA;
- timber requirements of processing facilities within the Sunshine Coast TSA; and
- regional timber supply implications.

The socio-economic analysis considers average levels of forest industry related activity that the maximum even-flow forecast could support. Impacts associated with future harvest levels are calculated using employment, income and revenue coefficients (per 1000 cubic metres). This method assumes that the current role of the forest industry in the provincial economy and labour productivity will not change. For example, employment levels in the future can be predicted based on today's relationship between employment and the volume of timber harvested and processed. The analysis also assumes that the proportions of harvesting, silviculture and timber processing employment will remain constant and that the types and proportions of wood products manufactured will remain the same.

While this method is reasonably accurate for short-term forecasts (within the next five years), employment coefficients 20 years from now may differ due to changes in market conditions, timber processing technologies, etc. The analysis indicates the magnitude of impacts to employment, employment income and provincial government revenues, within a constantly changing socio-economic environment.

7.3.1 Short- and long-term implications of alternative harvest levels

Employment and income impacts in the Sunshine Coast TSA

Sunshine Coast TSA employment and income impacts focus on those workers who are supported by the TSA harvest and who reside within the TSA. Workers who come to the TSA to work but who reside outside the TSA are included in the provincial impact section, as are those supported by Sunshine Coast TSA timber processed at mills located outside the forest district. Table 18 indicates the employment and income that the current AAC and maximum even-flow forecast could support if the timber is fully harvested and processed.

The current AAC of 1 140 000 cubic metres, if fully harvested, can support about 517 person-years of direct employment and a further 321 person-years of indirect and induced employment within the TSA. This level of employment would result in about $35.0 million in annual total employment income.

From 1998 to 2000, the average harvest level was 1 118 888 cubic metres per year and is expected to approximate the AAC over the remaining cut-control period. The average harvest level is well within the cut-control allowance. As such, the Sunshine Coast TSA AAC is assumed to be at its full employment potential, in terms of current harvesting productivity levels and milling structure. Within the TSA, processing employment could increase if more milling capacity were added; however, given the existing supply constraints in the Vancouver Region and where there is an expected longer term decline in timber supplies, adding milling capacity, unless meeting some niche market may not be practical.

Given the long-term stability of the timber supply as indicated by the timber supply forecast, it is assumed that employment associated with the Sunshine Coast TSA will remain at or near its current level, as indicated by the employment ranges in Table 18. Annual employment will experience marginal fluctuations as harvest levels rise and fall to market conditions. Any change in the demand for wood products or manufacturing productivity will also affect the total employment supported by the forest sector.

Provincial employment and income impacts

Provincial employment and income impacts include all the activity supported by the Sunshine Coast TSA harvest, regardless of processing location and place of residence.

The current AAC of 1 140 000 cubic metres can support about 1,325 person-years of direct employment and a further 1,683 person-years of indirect and induced employment across the province. This level of employment results in $135.2 million in annual total provincial employment income.

As with the TSA assessment, given the long-term stability of the timber supply, it is assumed that employment levels will remain approximately the same, or within the range presented in Table 18.

7 Socio-Economic Analysis

Table 18. Sunshine Coast TSA socio-economic impacts: maximum even-flow forecast

	Current harvest rate	Maximum even-flow	Current AAC even-flow
Timber supply	1 140 000	1 233 000	1 140 000
Harvest level (1998-1999 average)	1 118 888		
Difference from current AAC	21 112	93 000	0
Sunshine Coast TSA			
Employment		**(person-years)**	
Direct	508	560	517
Indirect + induced	315	347	321
Total	823	907	838
Employment income		**($1999 million per year)**	
Direct	24.6	27.1	25.1
Indirect + induced	9.7	10.7	9.9
Total	34.3	38.8	35.0
Province[a]			
Employment		**(person-years)**	
Direct	1,300	1,435	1,325
Indirect + induced	1,655	1,820	1,683
Total	2,955	3,255	3,008
Range of employment gain (loss)			
Employment income		**($1999 million per year)**	
Direct	63.1	69.5	64.3
Indirect + induced	50.9	56.1	51.8
Total	114.0	125.6	116.1
Provincial government revenues		**($1999 million per year)**	
Stumpage and related payments	12.3	13.6	12.5
Forest industry taxes	10.1	11.1	10.3
Employee income taxes	9.9	11.0	10.1
Total	32.4	35.7	32.9

(a) TSA employment and income estimates are included in the provincial employment and income estimates.

Provincial government revenue impacts

Provincial government revenues from the forest industry include stumpage, royalties and rent payments; other taxes such as logging, corporate income, sales, property and electricity taxes; and income taxes from direct, indirect and induced employees. Under the existing tax and stumpage regimes, the current AAC of 1 140 000 cubic metres, if fully harvested, would provide on average about $32.9 million annually to the provincial government.

7.3.2 Community-level impacts

The impacts related to changes in the timber supply can affect the socio-economic environment of a community. A reduction in employment and income could affect various socio-economic conditions in communities: for example, population growth rates, the size of the labour force, economic development opportunities and government-funded services. These changes would have a greater effect on an economy dependent on a single industry than on one that is more diversified and experiencing growth in other sectors.

The Sunshine Coast TSA has experienced declines in forestry activity through the 1990s, mainly affecting the Powell River region. The southern portion of the TSA along the Sechelt Peninsula has benefited from a more diverse economy and reliance on the Vancouver economy as a source of income. Given the stable timber supply forecast for the Sunshine Coast TSA, the forest dependent areas of the TSA should continue to benefit from and rely on forestry for a substantial portion of the income flowing into the region.

7.3.3 Nature, production capabilities and timber requirements of processing facilities

The current milling structure of the Sunshine Coast TSA consists of two medium to small lumber mills, two pulp and paper mills, and a shake and shingle mill. There are also a number of smaller producers of chips, lumber and other value-added products. From 1998 to 2000, the average annual volume of logs processed by solid wood processors located in the TSA was approximately 150,000 cubic metres, much of which came from TFLs. The current timber supply is sufficient to continue this level of supply, although operators did comment on the availability of Sunshine Coast TSA timber for local processors. Pulp operations require fibre from outside the TSA to augment local supplies and are part of a broader regional balance in chip and fibre supply usage.

7.3.4 Regional timber supply issues

The regional timber supply is an important consideration when examining potential future impacts associated with timber supply changes. The Vancouver Forest Region supplies timber to mills throughout the southwestern portion of the province. From 1998 to 2000, solid wood mills in the Vancouver Forest Region processed an average of 17.5 million cubic metres per year. Timber from the Sunshine Coast TSA accounts for about 6.5% of the region's consumption.

Over the next 25 years, timber supply forecasts indicate that the average annual harvest in the Vancouver Forest Region could decline by up to 20%, or 4 million cubic metres[8]. Given a change of this size, the current processing structure of southwestern British Columbia could not be maintained. The Sunshine Coast TSA could provide some stability to the region if the timber supply were maintained as suggested in the maximum even-flow forecast.

(8) This reduction is based on moving from the current Vancouver Forest Region timber supply of about 20 million cubic metres per year to 16 million cubic metres.

7.4 Summary

The forest industry in the Sunshine Coast TSA is the leading source of employment and income for local residents. The public sector is the second-leading employer in the TSA, but is dependent on the population and service requirement levels of the community. As such, the public sector is also tied to forestry as well as other sectors of the economy.

The current AAC of 1 140 000 cubic metres, if fully harvested and processed, can support about 1,325 person-years of direct forestry employment and a further 1,683 person-years of indirect and induced employment across the province. Residents of the Sunshine Coast TSA account for about 47% of the direct employment. The employment income associated with this direct, indirect and induced employment would be about $116 million per year. The employment and income levels can be expected to continue, given the stable timber supply indicated by the timber supply forecast.

Based on the average 1998–2000 harvest, the provincial government currently collects about $32.9 million per year in stumpage and related payments, other industry taxes and provincial income taxes.

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9 Glossary

Allowable annual cut (AAC)	The rate of timber harvest permitted each year from a specified area of land, usually expressed as cubic metres of wood per year.
Analysis unit	A grouping of types of forest — for example, by species, site productivity, silvicultural treatment, age, and or location — done to simplify analysis and generation of timber yield tables.
Available volumes	The portion of total inventory volumes that is available for harvesting after all management constraints on timber harvesting have been considered, including definition of the timber harvesting land base, age of tree merchantability, deferrals, and any other priorities or constraints on timber harvesting.
Basic sector	Sectors of the economy, such as forestry, tourism and mining, that create flows of income into the region and are assumed to be drivers of the local economy. Non-basic sectors, such as retail outlets, are supported by basic sectors.
Biodiversity (biological diversity)	The diversity of plants, animals and other living organisms in all their forms and levels of organization, including the diversity of genes, species and ecosystems, as well as the evolutionary and functional processes that link them.
Biogeoclimatic (BEC) variant	A subdivision of a biogeoclimatic subzone. Variants reflect further differences in regional climate and are generally recognized for areas slightly drier, wetter, snowier, warmer or colder than other areas in the subzone.
Biogeoclimatic zones	A large geographic area with broadly homogeneous climate and similar dominant tree species.
Clearcutting with reserves	A variation of the clearcut silvicultural system in which trees are retained, either uniformly or in small groups, for purposes other than regeneration.
Coniferous	Coniferous trees have needles or scale-like leaves and are usually 'evergreen'.
Coarse woody debris	Logs and stumps that provide habitat for plants, animals and insects, and a source of nutrients for soil development.
Culturally modified tree	A tree or a remnant of a tree with evidence of traditional aboriginal forest use.

9 Glossary

Cutblock

A specific area, with defined boundaries, authorized for harvest.

Cutblock adjacency

The desired spatial relationship among cutblocks. Most adjacency restrictions require that recently harvested areas must achieve a desired condition (green-up) before nearby or adjacent areas can be harvested. Specifications for the maximum allowable proportion of a forested landscape that does not meet green-up requirements are used to approximate the timber supply impacts of adjacency restrictions.

Deciduous

Deciduous trees shed their leaves annually and commonly have broad-leaves.

Employment coefficient

The number of person-years of employment supported by every 1000 cubic metres of timber harvested; for example, a coefficient of 1.0 indicates that every 1000 cubic metres harvested supports one person-year, or 500 000 cubic metres supports 500 person-years.

Employment multiplier

An estimate of the total employment supported by each direct job, for example a multiplier of 2.0 means that one direct job supports one additional indirect and induced job.

Environmentally sensitive areas

Areas with significant non-timber values, fragile or unstable soils, impediments to establishing a new tree crop, or high risk of avalanches.

Forest cover objectives

Specify desired distributions of areas by age or size class groupings. These objectives can be used to reflect desired conditions for wildlife, watershed protection, visual quality and other integrated resource management objectives. General adjacency and green-up guidelines are also specified using forest cover objectives (see **Cutblock adjacency and Green–up**).

Forest cover requirements

Specify desired distributions of areas by age or size class groupings. These objectives can be used to reflect desired conditions for wildlife, watershed protection, visual quality and other integrated resource management objectives. General adjacency and green-up guidelines are also specified using forest cover objectives (see **Cutblock adjacency and Green–up**).

Forest inventory

An assessment of British Columbia's timber resources. It includes computerized maps, a database describing the location and nature of forest cover, including size, age, timber volume, and species composition, and a description of other forest values such as recreation and visual quality.

9 Glossary

Forest Practices Code	Legislation, standards and guidebooks that govern forest practices and planning, with a focus on ensuring management for all forest values.
Free-growing	An established seedling of an acceptable commercial species that is free from growth-inhibiting brush, weed and excessive tree competition.
Green-up	The time needed after harvesting for a stand of trees to reach a desired condition (usually a specific height) — to ensure maintenance of water quality, wildlife habitat, soil stability or aesthetics — before harvesting is permitted in adjacent areas.
Growing stock	The volume estimate for all standing timber at a particular time.
Harvest forecast	The flow of potential timber harvests over time. A harvest forecast is usually a measure of the maximum timber supply that can be realized over time for a specified land base and set of management practices. It is a result of forest planning models and is affected by the size and productivity of the land base, the current growing stock, and management objectives, constraints and assumptions.
Indirect and induced jobs	Indirect jobs are supported by direct business purchases of goods and services. Induced jobs are supported by employee purchases of goods and services; for example, at retail outlets.
Inoperable areas	Areas defined as unavailable for harvest for terrain-related or economic reasons. Characteristics used in defining inoperability include slope, topography (e.g., the presence of gullies or exposed rock), difficulty of road access, soil stability, elevation and timber quality. Operability can change over time as a function of changing harvesting technology and economics.
Integrated resource management (IRM)	The identification and consideration of all resource values, including social, economic and environmental needs, in resource planning and decision-making.
Landscape-level biodiversity	The *Landscape Unit Planning Guide* provides objectives for maintaining biodiversity at both the landscape level and the stand level. At the landscape level, guidelines are provided for the maintenance of seral stage distribution, patch size distribution and landscape connectivity.

9 Glossary

Landscape unit

A planning area based on topographic or geographic features, that is appropriately sized (up to 100 000 hectares), and designed for application of landscape-level biodiversity objectives.

Long-term harvest level

A harvest level that can be maintained indefinitely given a particular forest management regime (which defines the timber harvesting land base, and objectives and guidelines for non-timber values) and estimates of timber growth and yield.

Management assumptions

Approximations of management objectives, priorities, constraints and other conditions needed to represent forest management actions in a forest planning model. These include, for example, the criteria for determining the timber harvesting land base, the specification of minimum harvestable ages, utilization levels, integrated resource guidelines and silviculture and pest management programs.

Mean annual increment (MAI)

Stand volume divided by stand age. The age at which average stand growth, or MAI, assumes its maximum is called the culmination age. Harvesting all stands at this age results in a maximum average harvest over the long term.

Model

An abstraction and simplification of reality constructed to help understand an actual system or problem. Forest managers and planners have made extensive use of models, such as maps, classification systems and yield projections, to help direct management activities.

Natural disturbance type (NDT)

An area that is characterized by a natural disturbance regime, such as wildfires, which affects the natural distribution of seral stages. For example areas subject to less frequent stand-initiating disturbances usually have more older forests.

Non-merchantable forest types

Stands that are accessible and otherwise available for harvesting but are assumed to be non-merchantable due to stand characteristics such as small piece size, incidence of decay, species composition and low stocking.

Not satisfactorily restocked (NSR) areas

An area not covered by a sufficient number of well-spaced tree stems of desirable species. Stocking standards are set by the B.C. Forest Service. Areas harvested prior to October 1987 and not yet sufficiently stocked according to standards are classified as backlog NSR. Areas harvested or otherwise disturbed since October 1987 are classified as current NSR.

9 Glossary

Old seral	Old seral refers to forests with appropriate old forest characteristics. Ages vary depending on forest type and biogeoclimatic variant.
Operability	Classification of an area considered available for timber harvesting. Operability is determined using the terrain characteristics of the area as well as the quality and quantity of timber on the area.
Partial retention VQO	Alterations may be visible but not conspicuous. Up to 15% of the area can be visibly altered by harvesting activity (see **Visual quality objective**).
Person-year(s)	One person working the equivalent of one full year, defined as at least 180 days of work. Someone working full-time for 90 days accounts for 0.5 person-years.
Protected area	A designation for areas of land and water set aside to protect natural heritage, cultural heritage or recreational values (may include national park, provincial park, or ecological reserve designations).
Pruning	The manual removal of the lower branches of crop trees to a predetermined height to produce clear, knot-free wood.
Retention VQO	Alterations are not easy to see. Up to 5% of the visible landscape can be altered by harvesting activity (see **Visual quality objective**).
Riparian area	Areas of land adjacent to wetlands or bodies of water such as swamps, streams, rivers or lakes.
Scenic area	Any visually sensitive area or scenic landscape identified through a visual landscape inventory or planning process carried out or approved by a district manager.
Sensitivity analysis	A process used to examine how uncertainties about data and management practices could affect timber supply. Inputs to an analysis are changed, and the results are compared to a baseline or base case.
Seral stages	Sequential stages in the development of plant communities that successively occupy a site and replace each other over time.
Silvicultural treatments	Activities that ensure the regeneration of young forests on harvested areas, enhance tree growth or improve wood quality in selected stands. Activities include: site rehabilitation and preparation, planting, spacing, fertilization and pruning.

9 Glossary

Site index	A measure of site productivity. The indices are reported as the average height, in metres, that the tallest trees in a stand are expected to achieve at 50 years (age is measured at 1.3 metres above the ground). Site index curves have been developed for British Columbia's major commercial tree species.
Stand-level biodiversity	A stand is a relatively localized and homogeneous land unit that can be managed using a single set of treatments. In stands, objectives for biodiversity are met by maintaining specified stand structure (wildlife trees or patches), vegetation species composition and coarse woody debris levels.
Stocking	The proportion of an area occupied by trees, measured by the degree to which the crowns of adjacent trees touch, and the number of trees per hectare.
Table Interpolation Program for Stand Yields	A B.C. Forest Service computer program used to generate yield projections for managed stands based on interpolating from yield tables of a model (TASS) that simulates the growth of individual trees based on internal growth processes, crown competition, environmental factors and silvicultural practices.
Timber harvesting land base	Crown forest land within the timber supply area where timber harvesting is considered both acceptable and economically feasible, given objectives for all relevant forest values, existing timber quality, market values and applicable technology.
Timber supply	The amount of timber that is forecast to be available for harvesting over a specified time period, under a particular management regime.
Timber supply area (TSA)	An integrated resource management unit established in accordance with *Section 7* of the *Forest Act*.
Tree farm licence (TFL)	Provides rights to harvest timber, and outlines responsibilities for forest management, in a particular area.
Unsalvaged losses	The volume of timber killed or damaged annually by natural causes (e.g., fire, wind, insects and disease) and not harvested.
Variable Density Yield Prediction model	An empirical yield prediction system supported by the B.C. Forest Service, designed to predict average yields and provide forest inventory updates over large areas (i.e., Timber Supply Areas). It is intended for use in unmanaged natural stands of pure or mixed composition.

9 Glossary

Visual quality objective (VQO)	Defines a level of acceptable landscape alteration resulting from timber harvesting and other activities. A number of visual quality classes have been defined on the basis of the maximum amount of alteration permitted.
Volume estimates (yield projections)	Estimates of yields from forest stands over time. Yield projections can be developed for stand volume, stand diameter or specific products, and for empirical (average stocking), normal (optimal stocking) or managed stands.
Watershed	An area drained by a stream or river. A large watershed may contain several smaller watersheds.
Wildlife tree	A standing live or dead tree with special characteristics that provide valuable habitat for conservation or enhancement of wildlife.
Woodlot licence	An agreement entered into under the *Forest Act*. It allows for small-scale forestry to be practised in a described area (Crown and private) on a sustained yield basis.

Appendix A

Description of Data Inputs and Assumptions for the Timber Supply Analysis

Introduction

In May of 2000 a data package for the Sunshine Coast Timber Supply Area timber supply review was released for public review. As a result of public input a number of data and management assumptions have been revised. This appendix presents the revised data package used to produce the timber supply analysis.

The following tables and commentary outline the methods and inputs used to derive the timber harvesting land base, and to construct the timber supply model for the Sunshine Coast TSA timber supply analysis. This information represents current forest management in the area.

Current management is defined as the set of land-use decisions and forest and stand management practices currently implemented and enforced. Future forest management objectives that may be intended, but are not currently implemented and enforced, are not included in this appendix.

The purpose of the timber supply review is to provide information on the effects of current management on both short- and long-term timber supply in each timber supply area in the province. Any changes in forest management objectives and practices, and any improvements to the data will be included in subsequent timber supply analyses.

A.1 Inventory Information

The inventories that provide the basis for determining the timber harvesting land base and representing forest management activities are listed in Table A-1.

Table A-1. Inventory information

Data	Source	Vintage	Update	Scale
Forest cover	Ministry of Forests (MoF)	1991–1993	To 1999 with Vegetation Resources Inventory (VRI) adjustments done as part of TSR file. The VRI analysis is published as a separate report.	1:20 000
Biogeoclimatic subzones	Ministry of Environment, Lands and Parks (MELP)	1987	1994	1:250 000
Draft landscape units	LU mapping has been a joint venture between MoF and MELP	1999	LU boundaries are currently draft.	1:250 000
Visual landscape inventory	Done by consultant for MoF	1991	Continuous to 1999.	1:20 000
Recreation features inventory	Done for the Upper Sunshine Coast and Lower Sunshine Coast by consultants for MoF — done in IGDS format, “tagged” to fc-1 / FIP files	1991	Both Upper and Lower Sunshine Coast updated in 1995.	1:20 000
ESA mapping	MoF	Mid- to late-‘70s	None.	1:20 000
Community watersheds	MELP (TRIM base in Arc/Info)	1997	McNab Ck (# 900.101) was deleted in 1998, leaving the TSA with 26 CWs.	1:20 000
Goat winter range	MELP — lower mainland region	1999	Covers entire district.	1:20 000
Known archaeological sites	Ministry of Aboriginal Affairs	1998	None	1:250 000
Operability mapping	MoF — Sunshine Coast	1994	1998 – Update from licensee review.	1:20 000
Terrain stability and slope mapping	Terrain stability mapping has been completed for approximately 1/3 of the TSA’s steep slopes. TRIM derived slope class mapping will be used as a proxy for terrain stability in the remaining portion of the district	1998		1:20 000

A.2 Zone and Analysis Unit Definition

A.2.1 Management zones (groups)

For the purpose of modelling current forest management, several resource emphasis groupings were defined for this analysis based on the following forest management objectives:

Table A-2. Group definition

Objectives	Inventory definition
1. Integrated resource management zone (IRM)	Timber harvesting land base in each landscape unit outside of VQOs
2. VQO — preservation	Inventory code: 'P'
3. VQO — retention	Inventory code: 'R'
4. VQO — partial retention	Inventory code: 'PR'
5. VQO — modification	Inventory code: 'M'
6. Community watersheds	Watersheds are uniquely identified in the community watershed layer maintained by MELP
7. Islands	Includes Maurelle, Read, Anvil, Stuart and West Redonda Islands. Inventory region (R) and compartment (C) codes from FC1: R28, C2; R30, C2, C10, C11; R31 C1
8. Helicopter harvest	Operability code: "C"
9. Landscape units	Seral stage representation in landscape unit and biogeoclimatic ecological classification (BEC) variant combinations will be tracked
10. Community interface zone	Non-standard overlay delineates a zone adjacent to the communities and settlement areas along the Strait of Georgia and in the Gulf Islands

A.2.2 Analysis unit characteristics

An analysis unit represents a combination of stands dominated by specific tree species, a silvicultural regime, or a specific timber growing capacity — as indicated by the inventory type group (ITG) and site index in the forest inventory file.

A.2 Zone and Analysis Unit Definition

Table A-3. shows the variables used to define each analysis unit. A separate timber volume projection was generated for each analysis unit (see Table A-25. for existing natural stands and Table A-26. for managed stands). The analysis units are not management zone specific; that is, an analysis unit can be in one or more of the management zones described in Section A.2.1, "Management zone (groups)."

Table A-3. Definition of analysis units

Analysis unit	Area of timber harvesting land base (hectares)	Criteria	
		Inventory type groups	Site index range (height in metres, at age 50 years)
1. Fir — good	4 270		
1a. Fir — good — CWHxm	796		
1b. Fir — good — partial harvest — in community interface	1 043	1-8	> 32
1c. Fir — good — CWHxm — partial harvest — in community interface	1 480		
2. Fir — medium	19 590		
1a. Fir — medium — CWHxm	4 325		
1b. Fir — medium — partial harvest — in community interface	3 024	1-8	26-32
1c. Fir — medium — CWHxm — partial harvest — in community interface	5 739		
3. Fir — poor	53 766	1-8	< 26
4. Cedar — good / medium	12 144	9-11	≥ 17
5. Cedar — poor	5 591	9-11	< 17
6. Hemlock/balsam/spruce — good	20 775	12-26	> 25
7. Hemlock/balsam/spruce — medium	23 687	12-26	22-25
8. Hemlock/balsam/spruce — poor	53 602	12-26	< 22
9. Pine — good/medium/poor (and all other non-merchantable species)	885	27-34, 40-42	All
10 Red alder (leading in stands ≥ 50% deciduous by volume)	10 469	37-38	All
11. Other merchantable deciduous (i.e., maple and cottonwood) leading	2 614	39 (maple) 35-36 (cottonwood)	All

Timber is harvested from only a portion of the total Sunshine Coast TSA area. One of the first steps in this timber supply analysis was to define the timber harvesting land base. This land base was derived by identifying certain types of land and forest where timber harvesting is not likely to occur under current management. The characteristics of each of these types are discussed below in the order in which they were excluded from the timber harvesting base. Also described in this section are the types of forest where timber harvesting will not occur but the land base contributes to meeting other objectives such as landscape-level biodiversity.

A.3 Definition of the Timber Harvesting Land Base

A.3.1 Land not administered by the B.C.F.S. for timber supply

Ownership codes are generally used to identify whether or not the land can be considered to contribute toward timber supply. Ownership codes 62C and 69C indicate crown land in a forest management unit and miscellaneous reserves respectively. Ownership code 70N refers to timber licences, which will revert to BCFS management after harvesting of mature timber and achievement of free-growing status (see Section 3.12). These are generally the only ownership codes that are considered to contribute to timber supply. Other suitable crown ownership types (parks and reserves) will contribute only to biodiversity objectives for the timber supply analysis. These ownership types include 51, 60, 61, and 63-68.

A.3.2 Land classified as non-forest

Type identity 6 (non-productive land) and 8 (no typing available) areas such as alpine, lakes and rocks, are removed from the land base considered for timber supply.

A.3.3 Non-commercial cover

Type identity 5 represents those areas that were inventoried to have 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.

A.3 Definition of the Timber Harvesting Land Base

A.3.4 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 categories: soil (Es), forest regeneration problems (Ep), snow avalanche (Ea), recreation (Er), wildlife (Ew), and water (Eh). With the exception of avalanche, two ESA categories are recognized in the Sunshine Coast TSA analysis: high and moderately sensitive. Where more recent information than the ESA classifications was available for portions of the TSA — specifically, wildlife, soils, and watersheds — that new information was used in the analysis.

Table A-4. Description of environmentally sensitive areas

ESA category	ESA description	Reduction per cent (%)	Area excluded from the timber harvesting land base (hectares)
R1	Recreation — high sensitivity and not within a VQO polygon	90	
R2	Recreation — moderate sensitivity and not within a VQO polygon	50	
Total R			**927**
W1	Wildlife critical habitat	90	
W2	Wildlife values	40	
Total W			**929**
P1 or P2	Difficult regeneration	100	
Total P			**1 518**
A1	Avalanche buffer	100	
Total A			**316**
H1 or H2	Watershed values	90	
Total H			**5**
TS = V	Terrain stability class V	100	
TS = IV	Terrain stability class IV TS = IV	30	
Slope_code = 2 and TS is empty	Slopes > 60%, outside of terrain stability class mapping, inside operable area	32.3	
Total slope/terrain			**27 558**
S1 (where no slope or terrain mapping exists)	Unstable soils, from ESA mapping where neither slope mapping or terrain stability mapping currently exists	90	
S2 (where no slope or terrain mapping exists)	Unstable soils, from ESA mapping where neither slope mapping or terrain stability mapping currently exists	50	
Total S			**3 390**
Total			**36 187**

P1 = geomorphological regeneration problems. P2 = biotic regeneration problems.

A.3 Definition of the Timber Harvesting Land Base

A.3.5 Inoperable areas

Operability and inoperability codes are generally used to describe the presence or absence of physical barriers or limitations to harvesting, appropriate logging methods (e.g., helicopter), and the merchantability of stands.

Current operability for most of the Sunshine Coast TSA is based on mapping completed by the British Columbia Forest Service in 1992. This mapping was updated for some areas of the TSA in 1998 when licensees were asked to review their chart areas and identify where significant changes in operability had occurred. Proposed operability changes were reviewed by the Sunshine Coast Forest District staff and added to the existing operability map. Overall, changes to operability were minor.

Table A-5. Description of inoperable areas

Inventory description	Code	Reduction per cent (%)
Operability overlay	I or N	100
Operability overlay	A or C	0

I = inoperable;

N = inoperable (not reported);

A = conventionally accessible;

C = helicopter accessible.

A.3.6 Areas with high recreation values

Recreation areas such as campgrounds, trails and lookout sites are identified in the inventory file through the recreation feature significance and recreation management class variables. These variables are more current than the ESA designations for areas with high recreation value, and were used in addition to those ESA designations for the purpose of excluding areas from the timber harvesting land base. Areas with a recreation management class code of '0' are areas with high recreational, educational, scientific or heritage value that are more appropriately managed exclusively for recreational values. The amounts that the timber harvesting land base was reduced for areas with high recreation value are listed in the following table.

Table A-6. Description of areas with high recreation value

Recreation value description	Recreation management class code	Reduction per cent (%)
High, identified, recreation value	0	100

A.3 Definition of the Timber Harvesting Land Base

A.3.7 Sites with low timber productivity and non-merchantable stands

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. As these stands are not considered to be harvestable, they need to be identified and removed from consideration for the timber harvesting land base.

Non-merchantable stands are those that are physically operable and exceed low site criteria yet are not currently utilized or have marginal merchantability. These types are excluded from the timber harvesting land base. Table A-7. lists the stand types excluded due to non-merchantability and productivity.

Table A-7. Description of sites with low timber productivity and non-merchantable stands[a]

Analysis unit	Type group	Minimum current volume[b] (m^3/hectare)	[c]	Minimum site index[d]	Reduction per cent (%)
Fir	1-8	< 300	And	< 15.5	100
Cedar	9-11	< 300	And	< 13.5	100
Hemlock/balsam/spruce	12-26	< 300	And	< 12.0	100
Pine (and group in all other non-merchantable species)	27-34 40-42	All	And	All	100
Alder, red (leading in stands ≥ 50% deciduous by volume)	37-38	< 300	And	< 31	100
Other merchantable deciduous (i.e., maple and cottonwood) leading	39 (maple) 35-36 (cottonwood)	< 300	And	< 35	100

(a) All stands were first examined for prior logging history. All stands with 'Activity' = 'L' were not removed from the timber harvesting land base for low site or problem forest type (PFT) considerations. It was assumed that since these sites were logged once, they could be logged again.

(b) Minimum current volume/hectare is often equal to minimum operable volume/hectare.

(c) For a stand to be excluded it must fail to meet both the minimum volume requirement and the minimum SI requirement.

(d) Minimum site index is based on stands that can achieve 300 cubic metres per hectare by age 150.

A.3 Definition of the Timber Harvesting Land Base

A.3.8 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 were applied as reductions to the current productive forest considered available for harvesting.

Existing single-line roads were buffered to a 12-metre width (6 metres each side of the centre line) in the geographic information system (GIS) data set prior to analysis. The road buffers were then netted out of the timber harvesting land base directly.

A district examination of silvicultural prescriptions found that the percentage site degradation to account for future roads was estimated at 4.6%. This percentage reduction was applied following initial harvest in the analysis to stands older than 80 years.

Table A-8. Estimates for existing and future roads, trails, and landings

Location	Analysis unit	Road width	Reduction per cent (%)
Existing roads (applied as a netdown to the current timber harvesting land base)			
Logging roads, trails and landings	All	12 metres — buffered around single-line roads in data set	100% of buffer
Future roads (applied as an area reduction at time of initial harvest)			
Logging roads, trails and landings	All	As prescribed by *Forest Practices Code (FPC)*.	4.6%

A.3.9 Wildlife habitat reductions

Table A-9. Estimates for wildlife habitat reductions to timber harvesting land base

Habitat under consideration	Identifying inventory variables (location descriptors)	Netdown (%)	Reduction factor
Goat — winter range	GOAT_KEY not 'BH00'	90%–100%	0.69

Data source and comments:

The expectation was that the total reduction to the timber harvesting land base for ungulate winter range (UWR) in the analysis would be similar to that used in the previous analysis (approximately 2800 hectares). To achieve this, the netdown (%) was further multiplied by the reduction factor, to arrive at the approximately 2800 hectares excluded from the timber harvesting land base.

A.3 Definition of the Timber Harvesting Land Base

A.3.10 Cultural heritage resource reductions

Cultural heritage values include traplines, and sites of archaeological or traditional use. When these are known, the areas and appropriate protection or management measures can be accounted for in the analysis (as shown in the table below), if the measures are not already accounted for through riparian, wildlife tree patch or other suitable reductions.

Table A-10. Cultural heritage resources

Feature under consideration	Code	Excluded area (hectares)
Archaeological sites and culturally modified trees	From non-standard overlay	50 metres radius buffer around each feature

A.3.11 Riparian management areas

The Sunshine Coast Forest District conducted an in-district review of riparian, gully and wildlife tree patch (WTP) areas. Ninety-six randomly selected post-Code silviculture prescriptions from various licensees and cutting permits were reviewed and sampled. The net area of cutblocks was compared to the area of uncut reserves and areas otherwise avoided by licensees during cutblock layout. The net results of this study are shown in Table A-11. Corresponding reductions were made to the net timber harvesting land base for the riparian management areas as well as the gully management areas.

Table A-11. Riparian management considerations

Management consideration	Reduction of timber harvesting land base (%)
Riparian reserve zone and riparian management area	3.3
Gully management	0.8

A.3.12 Wildlife tree patches

Table A3.1 of the *Landscape Unit Planning Guide (LUPG)*, which is to be used when biodiversity emphasis has been assigned to a landscape unit, has been used for deriving the wildlife tree patch targets, since landscape-level biodiversity management has been modelled in the analysis.

In Table A-12., the required wildlife tree retention was calculated based on the BEC subzones within the Sunshine Coast TSA. The recommended percentage from Table A3.1 of the *LUPG* is shown in the second column. This figure was reduced by 75% following assumptions used in the *Forest Practices Code Timber Supply Analysis,* February 1996, that 75% of the wildlife tree patch requirements will be met by riparian reserves, management zones, non-merchantable stands, inoperable areas, steep slopes and unstable soils.

A.3 Definition of the Timber Harvesting Land Base

An area reduction was used to model wildlife tree patch requirements rather than a volume reduction because it more accurately reflects the area upon which harvesting will occur. These wildlife trees, in conjunction with other riparian reserves and area removals, are often larger than two hectares in size and are left to maintain stand structure within the landscape over time. Those wildlife tree patches that are larger than two hectares in size this area may contribute to meeting old-seral stage forest requirements at the landscape level. Through an examination of silviculture prescriptions in the TSA, it was found that 85% of wildlife tree patches are larger than two hectares in size. Therefore, only 85% of the area excluded from the timber harvesting land base for wildlife tree patches may contribute to landscape-level biodiversity requirements. It is assumed that these wildlife tree patches will not be economical to harvest at a later date, nor will they be available to harvest in subsequent harvesting of the stand.

Table A-12. Reductions to reflect volume retention in cutblocks

BEC sub-zone	Per cent (%) recommended in *Landscape Unit Planning Guide* — Table A3.1	Residual area of wildlife tree patches on the timber harvesting land base (%)
CDFmm	7	1.8
CWHdm	8	2.0
CWHds	6	1.5
CWHmm	8	2.0
CWHms	3	0.8
CWHvm	9	2.3
CWHxm	10	2.5
MHmm	2	0.5

A.3 Definition of the Timber Harvesting Land Base

A.3.13 Timber licence reversions

Timber Licences 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 attain free-growing status, the areas revert to Forest Service jurisdiction. Accordingly, these areas are included in the timber harvesting land base after their first harvest and contribute to the timber supply in the medium- and long-term.

Timber Licence areas need to be accounted for from the time the stands have been harvested, 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). These past reversion are accounted for in the following table showing the reversion schedule for remaining timber licences. Note that these reversions have not been formally scheduled; rather, this is a projected average reversion rate for 5-year periods.

Table A-13. Reversion schedule of remaining timber licences

Area of currently remaining timber licences (hectares)	Projected area of timber licences to be harvested (hectares) per period of harvest			
	1998-2002	2003-2007	2008-2012	2013-2017
1 545	289	289	289	289

A.4 Current Forest Management Assumptions

A.4.1 Utilization levels

Timber utilization levels define the maximum stump height, minimum top diameter (inside bark) and minimum diameter at breast height (dbh) by species, and are used in the analysis to calculate merchantable volume. Table A-14. shows the standards currently in place for wood utilization in the Sunshine Coast TSA.

Table A-14. Utilization levels

Analysis unit(s)	Utilization		
	Minimum diameter at breast height (dbh) (cm)	**Utilization maximum stump height (cm)**	**Minimum top dib (cm)**
For all coniferous analysis units except “Pine — Good/medium/poor”:			
All stand types older than 120 years.	17.5	30	10
All stand types 120 years and younger.	12.5	30	10
Pine (and group in all other non-merchantable coniferous species).	17.5	30	10
Alder, red (leading in stands ≥ 50% deciduous).			
All stand types older than 40 years.	17.5	30	10
All stand types 40 years and younger.	12.5	30	10
Other merchantable deciduous- (i.e., maple and cottonwood) leading.			
All stand types older than 40 years.	17.5	30	10
All stand types 40 years and younger.	12.5	30	10

A.4 Current Forest Management Assumptions

A.4.2 Volume exclusions for mixed species stands

In the Sunshine Coast TSA, all merchantable coniferous and deciduous species contribute to the timber supply when they occur within a cutblock. Aspen and birch are the only non-merchantable deciduous species within the Sunshine Coast TSA.

Table A-15. Volume exclusions for mixed species types

Species	Volume exclusion (%)
Aspen	100
Birch	100

A.4.3 Minimum harvestable age derivation

Minimum harvestable ages provide an estimate of the minimum age a stand must reach before it can be harvested. They define the lower limit for harvesting. Harvesting may occur in stands at the minimum requirements (for example, to maintain harvest levels for a short period of time or avoid large disruptions in harvest levels). However, most stands will not be harvested until well past the minimum timber production ages since the management of other resource values often takes precedence (e.g., requirements for the retention of older forest).

The minimum harvestable age for stands in each analysis were established based on the greater of:

a) the estimated age for the stand to reach 300 cubic metres per hectare; or,

b) the age at which the stand achieves 95% of the maximum mean annual increment (MAI). The resulting minimum harvestable ages are shown in Table A-16.

Table A-16. Minimum harvestable age criteria

Analysis units		Natural stands harvestable age	Managed stands harvestable age
1	Fir/G	55	55
2	Fir/M	60	60
3	Fir/P	80	80
4	Cw G/M	70	70
5	Cw P	110	110
6	Hw/Ba/S/G	50	70
7	Hw/Ba/S/M	60	80
8	Hw/Ba/S/P	90	100
9	Pine	130	130
10	Dr	40	40
11	Other deciduous	50	50

A.4 Current Forest Management Assumptions

A.4.4 Harvest scheduling priorities

No specific harvest scheduling priorities have been identified in the Sunshine Coast TSA. However, the timber supply implications of the recent award of a non-replaceable forest licence for an annual harvest of 95 000 cubic metres of alder was modelled by tracking the harvest of the partition separate from the rest of the timber supply.

Table A-17. Modelling priorities for harvest scheduling

Management zone	Analysis unit	Period (10 year increments)	Priority 1-100 or minimum harvest level
All	Alder leading	1	1

A.4.5 Silvicultural systems

In the Sunshine Coast TSA, the majority of the area harvested is under a clearcut silvicultural regime. Adjacent to communities along the Strait of Georgia, alternative silvicultural systems are now being utilized to minimize the visual impact of timber harvesting. On good fir sites within the community interface zone, a shelterwood system was modelled.

Table A-18. Silvicultural systems

Silvicultural system	Eligible analysis units or locations	Per cent (%) retention	# of entries	Time between entries
Clearcut	All zones outside the community interface zone and all analysis units other than Fir-good inside the community interface zone.	WTP retention as required by the *Forest Practices Code*	1	N/A
Partial cutting systems (shelterwood)	Community interface zone on Fir-good/medium sites.	15%	2	12 years

A.4 Current Forest Management Assumptions

A.4.6. Unsalvaged losses

The purpose of this section is to provide an estimate of average annual unsalvaged volume loss to insect and disease epidemics, fires, wind damage or other agents on the timber harvesting land base. The unsalvaged loss column only reflects those areas in which the volume will not be recovered or salvaged. In the Sunshine Coast TSA, no information is currently available for the amount of unsalvaged loss beyond operability lines. Losses outside of operability potentially impact on biodiversity assumptions for old seral retention. Areas of disturbance outside of operability lines were estimated from the age classes within the forest cover inventory, and used in the analysis. To model this disturbance, a disturbance rate of 311 hectares per year was applied to non-timber harvesting land base areas.

Table A-19. Unsalvaged losses

Cause of loss	Annual unsalvaged loss (m^3/year)
Wind	5 490
Fire	5 946
Mountain pine bark beetle, Douglas-fir bark beetle, Spruce beetle	200
Conifer sawfly	250
Balsam Wooly Adelgid	100
Mammal damage and abiotic damage	225
Total	12 211

A.4.7 Regeneration activities in managed stands

The growth of recent plantations and future stands was modelled using managed stand yield tables (MSYTs) produced using the Forest Service TIPSY growth and yield model. The table below contains the inputs required to produce MSYTs for this analysis.

Table A-20. Regeneration assumptions by analysis unit

Analysis unit	Site index (range)	Planting delay (years)	Age of stock (years)	OAFs %		Method type %		Species		Density (stems/hectare)	
				1	2	Planted	Natural	Code	%	Initial	Thin
Fir-good[a]	> 32	2	1+0	15	12	100	0	Fd	100	1200	700
Fir-good CWH xm	> 32	2	1+0	15	12.5	100	0	Fd	100	1200	700
Fir-med[a]	26-32	2	1+0	15	12	100	0	Fd	100	1200	700
Fir-med-CWH xm	26-32	2	1+0	15	12.5	100	0	Fd	100	1200	700
Fir-poor	< 26	2	1+0	15	5	100	0	Fd	100	1200	N/A
Cedar-(good/med)	≥ 17	2	1+0	15	5	90	10	Cw	100	1200	700
Cedar-poor	< 17	2	1+0	15	5	60	40	Cw	100	1200	N/A
Hemlock/balsam/spruce-good	> 25	2	1+0	15	5	70	30	Hw	100	1200	700
Hemlock/balsam/spruce-med	22-25	2	1+0	15	5	60	40	Hw	100	1200	NA
Hemlock/balsam/spruce-poor	< 22	2	1+0	15	5	50	50	Hw	100	1200	N/A
Pine-good/med/poor (and group in all other non-merch. Conif. species)	N/A	2	1+0	15	5	0	100	Pl	100	1200	700
Alder red (the 35 ha/yr being planted to alder)-leading in stands ≥ 50% decid.	N/A	2	1+0	15	5	100	0	Dr	100	1600	900 sph @ 12 yrs.

(continued)

(a) Disease — All regenerated stands have an operational adjustment factor (OAF 2) of 5% applied to model the impact of decay, waste and breakage (note that epidemic outbreaks of insects and disease are not part of this 5% reduction — see *Operational Adjustment Factors For Use In TIPSY*, September. 30, 1998). In TSR1, all regenerated stands of Douglas-fir (analysis units 1, 2 and 3) were given an additional adjustment factor of 7% to model the losses expected due to laminated root rot. This 7% volume adjustment was in addition to the 5% OAF 2. In TSR2, the OAF 2 in Douglas-fir stands was estimated from empirical data in Teresa White's report, *Impact of Phellinus weirii Root Disease in the Sunshine Coast TSA*. This report measured actual root rot loss from several permanent sample plots in the CWH xm1 biogeoclimatic variant. This new additional OAF 2 of 7.5% for Douglas-fir (total OAF 2 of 12.5%) was incorporated into analysis units within the CWH xm1.

A.4 Current Forest Management Assumptions

Table A-20. Regeneration assumptions by analysis unit (concluded)

Analysis unit	Site index (range)	Planting delay (years)	Age of stock (years)	OAFs %		Method type %		Species		Density (stems/hectare)	
				1	2	Planted	Natural	Code	%	Initial	Thin
Alder red (other than the 35 ha/year being planted to alder)—leading in stands ≥ 50% deciduous	N/A	2	1+0	15	5	100	0	Fd	100	1200	600
Other merch. Deciduous (i.e. maple and cotton-wood) leading	N/A	2	1+0	15	5	100	0	Act	100	1200	N/A

A.4 Current Forest Management Assumptions

A.4.8 Tree improvement

Through the current use of Class A seed within the TSA, modest increases to yield are expected from this Class A stock at harvest age. Adjustments to managed stand yield tables were done to account for yield gains from Class A seed, based on the current use and quality of this seed. No projections for additional future use or volume gains were made.

Table A-21. Tree Improvement gains

Species	Volume gain at 80 years
Douglas-fir	3.6%
Hemlock	1.9%
Redcedar	1.3%

A.4.9 Immature plantation history

This section identifies areas of existing immature forest where stand density (stems per hectare) has been controlled and therefore should be assigned to a managed stand yield table (MSYT). All NSR and future harvested stands will be projected using MSYTs. The table below lists the percentage of immature forest in each analysis unit where density is controlled.

Table A-22. Immature plantation history

	Area managed (hectares or %)	
Analysis unit	Age 1-20 (age class 1)	Age 21 and greater (age class ≥ 2)
Fir – good	100%	0%
Fir – medium	100%	0%
Fir – poor	100%	0%
Cedar – good / medium	100%	0%
Cedar – poor	100%	0%
Hemlock/balsam/spruce – good	100%	0%
Hemlock/balsam/spruce – medium	100%	0%
Hemlock/balsam/spruce – poor	100%	0%
Pine – good/medium/poor (and group in all other non-merchantable coniferous species)	0%	0%
Alder, red (leading in stands ≥ 50% deciduous)	0%	0%
Other merchantable deciduous (i.e., maple and cottonwood) leading	0%	0%

A.4 Current Forest Management Assumptions

A.4.9 Forest cover requirements — resource management zones

As noted in Section 4.1, the discussion on multiple objectives, forest cover requirements were applied to model management for a number of objectives. These forest cover requirements, and the portion of the TSA to which they apply, are described in Table A-23.

Table A-23. Forest cover requirements

Zone or group	Maximum allowable disturbance (% area)	Green-up height (metres)	Area to apply constraint	Source of prescription
Integrated resource management (IRM)	33	3	Timber harvesting land base per landscape unit (LU)	Cutblock adjacency
Visual quality objective (VQO) — preservation	1	5	VQO area per LU	Visually effective green-up
VQO — retention	5	5	VQO area per LU	Visually effective green-up
VQO — partial retention	15	5	VQO area per LU	Visually effective green-up
VQO — modification	25	5	VQO area per LU	Visually effective green-up
Community watershed	1% / 1 year		Productive forest per watershed	Hydrological green-up
Islands	25	3	Timber harvesting land base	Current management — beyond the *Forest Practices Code*
Helicopter harvest	33	3	Timber harvesting land base per LU	Cutblock adjacency
Community interface	25	5	Timber harvesting land base	Current management — beyond the *Forest Practices Code*

Data source and comments:

All stand heights shown in Table A-23. refer to top heights (inventory definition), not average stand height (top height being defined as "the average height of the 100 largest-diameter trees per hectare").

A.4 Current Forest Management Assumptions

A.4.10 Forest cover requirements — landscape-level biodiversity

Management for biodiversity is a requirement under the *Forest Practices Code Act*. To protect biodiversity at the landscape level, old forest is retained in every landscape unit and natural disturbance type (NDT).

In order to ensure that the maintenance of older forests is spread out within the TSA the following forest cover requirements (in Table A-24.) will be applied to the draft landscape units. The landscape units are used to simulate the geographic retention of older forest characteristics across the Sunshine Coast TSA. This does not imply these units are final. The numbers in the minimum retention area column coincide with the per cent requirement in the first, seventh and fourteenth decades respectively.

Table A-24. Old-seral forest cover requirements for biogeoclimatic units and natural disturbance types (NDTs) within the Sunshine Coast TSA (based on gross productive forest)

		Old seral stage			
		Minimum retention area by decade (%)			
Biogeoclimatic zone	NDT	1	7	14	Minimum age (years)
CWH	1	10	12	14	250
MH	1	14	17	20	250
CWH	2	7	8	9	250
CDF	2	7	8	9	250

Biodiversity guidelines were modelled using information from the *Forest Practices Code Landscape Unit Planning Guide.* A single, weighted constraint for the old-seral stage was developed based on the required distribution of 45% low-, 45% intermediate- and 10% high-emphasis. The values shown in Table A-24. reflect the weighted *Landscape Unit Planning Guide* values, assuming a two-thirds reduction of the old-forest requirement is allowable in the first rotation, to be phased to a full target over three rotations in the 'low' biodiversity emphasis option (BEO) portions of landscape units. The modelling process of weighted biodiversity emphasis options will ensure the full requirement of old seral will be achieved by the third rotation.

A.5 Volume Estimates for Existing Stands

The variable density yield prediction(VDYP) model, version 6.4a developed and supported by the B.C. Ministry of Forests, Resources Inventory Branch, was used to estimate timber volumes for existing natural stands. Table A-25. shows the volume estimates by analysis unit for existing natural stands.

Table A-25. Projected volumes for natural stands using VDYP (cubic metres)

Table	1	2	3	4	5	6	7
Age	Fir good	Fir medium	Fir poor	Cedar good/medium	Cedar poor	Hemlock/ balsam/ spruce good	Hemlock/ balsam/ spruce medium
10	0	0	0	0	0	0	0
20	2	0	0	0	0	11	0
30	156	76	8	44	0	164	62
40	314	206	72	141	16	322	196
50	447	315	148	237	64	457	313
60	562	409	214	327	119	574	416
70	659	487	270	407	169	673	504
80	745	556	319	481	216	759	582
90	818	615	362	540	256	830	647
100	882	666	399	590	290	890	704
110	939	712	433	634	321	943	754
120	988	752	463	667	345	986	795
130	1 029	785	487	709	373	1 032	839
140	1 065	813	507	748	398	1 074	879
150	1 093	835	523	782	420	1 110	914
160	1 114	851	534	810	438	1 141	945
170	1 129	861	541	834	454	1 167	972
180	1 138	868	544	858	470	1 191	997
190	1 153	879	551	882	486	1 215	1 021
200	1 169	890	558	905	501	1 238	1 044
210	1 184	901	565	927	515	1 259	1 065
220	1 199	912	572	955	532	1 278	1 085
230	1 214	922	579	981	548	1 296	1 104
240	1 227	932	585	1 007	564	1 313	1 121
250	1 241	942	591	1 032	580	1 329	1 137
260	1 242	943	592	1 035	583	1 335	1 145
270	1 242	944	593	1 037	586	1 341	1 152
280	1 243	944	594	1 039	588	1 346	1 159
290	1 243	945	594	1 041	591	1 350	1 165
300	1 244	945	595	1 043	593	1 354	1 170
310	1 244	946	596	1 045	595	1 357	1 174
320	1 244	946	597	1 046	597	1 359	1 178
330	1 244	947	597	1 048	599	1 362	1 182
340	1 244	947	598	1 049	601	1 363	1 185
350	1 244	947	598	1 050	602	1 364	1 188

(continued)

A.5 Volume Estimates for Existing Stands

Table A-25. Projected volumes for natural stands using VDYP (cubic metres) (concluded)

Table	8	9	10	11
Age	Hemlock/ balsam/spruce poor	Pine	Alder	Other merchantable deciduous
10	0	0	18	10
20	0	1	118	64
30	4	6	238	170
40	39	30	319	252
50	103	64	378	319
60	170	99	419	372
70	233	134	447	413
80	289	170	472	448
90	338	202	493	477
100	381	231	511	502
110	420	258	528	524
120	454	283	542	543
130	488	306	556	561
140	519	323	568	577
150	546	336	579	591
160	571	346	588	602
170	593	352	595	610
180	613	356	601	619
190	632	359	608	627
200	651	363	615	636
210	669	368	622	644
220	685	372	629	653
230	700	375	635	662
240	715	379	642	670
250	729	382	648	678
260	736	384	649	679
270	743	385	650	681
280	750	387	651	682
290	756	388	652	683
300	761	388	653	684
310	766	389	654	685
320	771	389	655	685
330	775	389	656	686
340	779	389	656	687
350	783	389	657	687

A.6 Volume Estimates for Managed Stands

WinTIPSY (Windows™ version of the Table Interpolation Program for Stand Yields) version 1.4, supported by the B.C. Ministry of Forests, Research Branch, was used to estimate growth and yield for existing and future managed stands. The area-weighted site index and regeneration assumptions for each analysis unit shown in Table A-20. were used as inputs to TIPSY.

Table A-26. displays the volume tables for managed stands. These volume tables are generated from TIPSY for ages where TIPSY data exists, and estimated for ages beyond the TIPSY data set.

Table A-26. Projected volumes for managed stands using TIPSY (cubic metres)

Table	101	101a	102	102a	103	104	105
Age	**Fir good**	**Fir good CWH xm**	**Fir medium**	**Fir medium CWH xm**	**Fir poor**	**Cedar good/medium**	**Cedar poor**
10	0	0	0	0	0	0	0
20	37	36	9	9	0	3	0
30	168	168	86	86	30	48	1
40	329	328	189	189	91	151	12
50	489	488	293	292	159	278	41
60	629	627	399	398	214	393	88
70	745	742	481	479	264	522	135
80	838	834	556	553	313	637	181
90	912	908	621	618	357	727	233
100	972	967	672	668	398	837	278
110	1 017	1 010	713	708	435	937	315
120	1 056	1 048	749	744	464	1016	345
130	1 085	1 077	778	772	487	1087	374
140	1 115	1 105	801	794	511	1154	408
150	1 137	1 126	820	813	532	1213	437
160	1 145	1 134	837	828	550	1264	462
170	1 150	1 138	846	837	566	1307	487
180	1 133	1 120	854	845	581	1349	510
190	1 116	1 102	861	850	595	1390	528
200	1 098	1 084	865	854	607	1424	547
210	1 081	1 066	866	854	617	1459	562
220	1 064	1 048	866	853	627	1500	581
230	1 046	1 030	865	851	636	1531	598
240	1 029	1 012	863	848	643	1563	613
250	1 012	993	859	844	651	1590	627
260	994	975	854	838	655	1618	638
270	977	957	849	832	660	1642	648
280	959	939	843	825	667	1665	658
290	942	921	835	816	671	1688	668
300	925	903	819	800	667	1678	670
310	907	885	804	784	663	1668	667
320	890	867	789	768	659	1659	663
330	873	849	773	752	655	1649	659
340	855	831	758	736	651	1639	655
350	838	813	742	720	647	1629	651

(continued)

A.6 Volume Estimates for Managed Stands

Table A-26. Projected volumes for managed stands using TIPSY (cubic metres) (concluded)

Table	106	107	108	109	110	111
Age	Hemlock/ balsam/ spruce good	Hemlock/ balsam/ spruce medium	Hemlock/ balsam/ spruce poor	Pine	Alder	Other merchantable deciduous
10	0	0	0	0	18	10
20	13	2	0	1	118	64
30	109	48	0	6	238	170
40	248	152	6	30	319	252
50	411	266	48	64	378	319
60	571	383	106	99	419	372
70	729	501	166	134	447	413
80	865	603	223	170	472	448
90	987	706	279	202	493	477
100	1 106	801	331	231	511	502
110	1 217	879	386	258	528	524
120	1 302	947	437	283	542	543
130	1 373	1 013	479	306	556	561
140	1 449	1 074	519	323	568	577
150	1 517	1 136	559	336	579	591
160	1 570	1 194	595	346	588	602
170	1 617	1 236	631	352	595	610
180	1 661	1 270	663	356	601	619
190	1 707	1 303	694	359	608	627
200	1 747	1 335	724	363	615	636
210	1 783	1 367	750	368	622	644
220	1 812	1 397	772	372	629	653
230	1 839	1 423	792	375	635	662
240	1 862	1 447	810	379	642	670
250	1 884	1 465	827	382	648	678
260	1 907	1 481	842	384	649	679
270	1 927	1 497	855	385	650	681
280	1 947	1 509	870	387	651	682
290	1 964	1 521	882	388	652	683
300	1 961	1 521	886	388	653	684
310	1 950	1 512	881	389	654	685
320	1 938	1 504	876	389	655	685
330	1 926	1 495	871	389	656	686
340	1 915	1 486	865	389	656	687
350	1 903	1 477	860	389	657	687

Appendix B

Socio-Economic Analysis Background Information

B.1 Limitations of Economic Analysis

The socio-economic analysis identifies employment and income impacts, changes in government revenues and community impacts at various harvest levels and times in the future. Some of the assumptions used in the analysis are as follows:

- **Employment multipliers** — these multipliers are used to estimate indirect and induced employment impacts of a change in direct industry activity. Employment multipliers are calculated based on analytical assumptions and data collected at a specific time. Consequently, the multipliers reflect industry and employment conditions at that time and may not accurately reflect future industry conditions. While generally good indicators when based on fairly recent information, older multipliers can be dated and may not reflect industry conditions at the time of analysis. In any impact analysis, the information should be considered as indicators of magnitude.
- **Employment coefficients** — employment impacts associated with future harvest levels are calculated using employment coefficients (person-years per 1000 cubic metres). This approach assumes that the industry structure will be the same in future as it is today. While reasonably accurate in the short term, employment coefficients may change in future as a result of changing market conditions or production technologies, for example.
- **Timing of impacts** — employment impacts are shown to occur simultaneously with a change in the harvest level. While fairly accurate for the harvesting sub-sector, this may not be the case for the processing and silviculture sub-sectors of the forest industry. Also, indirect and induced impacts will likely occur over a longer period, as business and consumer spending levels adjust to changes in harvest levels.
- **Processing thresholds** — processing job impacts are unlikely to occur in direct proportion to harvest changes (i.e., a 10% harvest reduction may not lead to a 10% processing employment reduction). Impacts are more likely to occur stepwise related to processing thresholds. A processing threshold is the level of a mill's timber supply where, when reached, will cause a mill to either lay off a shift or shut down the mill, temporarily or permanently. Accurately predicting a mill's threshold level is impossible. As a result, the analysis may overestimate processing impacts if mills continue to operate the same number of shifts, but perhaps at lower production levels, or alternatively could underestimate impacts if a mill were to eliminate a shift. Over the medium- to long-term the impact figures should be reasonably accurate, however.
- **Government expenditures** — provincial government expenditures are more related to population levels than to industry activity. As such, expenditures on education, health care and other government services are assumed to remain unchanged despite harvest changes and any subsequent change in government revenues. However, public expenditures would likely change if community population levels change sufficiently. This would amplify the community impacts of forestry job losses or gains.
- **Proportional harvest reductions** — harvest reductions are assumed to be spread proportionately among all licensees and all forms of tenure.

B.2 Economic Impact Analysis Methodology

Data sources

Data for the socio-economic analysis were obtained from several sources. Harvest volume and stumpage data are from the Ministry of Forests. Timber flow and employment data are from responses to questionnaires that were sent to licensees, operators and processing facilities in the TSA. Other general economic data are from B.C. Statistics, Statistics Canada and local communities.

Person-year of employment

The unit of measurement for employment is a person-year. A person-year of employment is defined as a full-time job, which lasts at least 180 days per year. Part-time jobs were converted to equivalent full-time person-years of employment.

To estimate employment and income impacts associated with changes in TSA timber harvest levels, the forestry sector was divided into three sub-sectors:

1. harvesting;
2. silviculture; and
3. timber processing.

Estimating employment and income impacts involves several steps. First, the current activity in each of the three sub-sectors was assessed. Then, indirect and induced employment and employment income impacts were estimated, using data from B.C. Statistics, and Statistics Canada. Next, employment coefficients were calculated and applied to the maximum even-flow forecast. Other indicators of the forestry sector's contribution to the provincial economy, such as government revenues and industry taxes, were also calculated, using Ministry of Forests stumpage estimates and other data sources.

Employment — harvesting

Direct employment in harvesting consists of all woodlands-related jobs including harvesting, log transport, log salvage, planning and administration functions. The employment multipliers used in this analysis define road building and maintenance work as indirect rather than direct employment. Including this employment in direct estimates would result in double counting.

Data on employment, place of residence and timber flows were obtained through a survey of licensees and operators in the TSA. The information was then used to estimate employment averages associated with harvest changes and the proportion of resident *versus* non-residents who work in the TSA.

Two estimates of direct employment in harvesting were calculated:

1. TSA direct employment in harvesting consists of employees who are engaged in harvesting and related activities within the TSA and who reside in communities within the TSA; and
2. Provincial direct employment in harvesting consists of employees who are engaged in harvesting, as above, plus those workers who reside outside the TSA, but who come to the TSA to work in harvesting and harvesting-related activities.

The estimates of TSA and provincial direct employment in harvesting were used to calculate employment coefficients per 1000 cubic metres. These employment coefficients were then used to estimate harvesting employment associated with the different harvest levels in the maximum even-flow forecast.

Employment — silviculture

Silviculture employment consists of all basic and intensive reforestation activities, including surveys, site preparation, planting, fertilization, pruning and spacing. Silviculture employment data were collected from the Ministry of Forests and licensees whose tenures require post-harvest silviculture work. Most silviculture work is seasonal and silviculture employees usually only work part-time during the year. Because of this, silviculture jobs were converted into equivalent full-time person-years of employment. Respondents were also asked to estimate the percentage of their silviculture employees who resided within the TSA and outside the TSA.

As with the harvesting sub-sector, two estimates of direct employment in silviculture were calculated: one for the TSA and another for the province. These employment figures were used to calculate employment coefficients for silviculture employment in the same manner as the employment coefficients for harvest employment.

Employment — timber processing

Information about employment, production and sources of timber was gathered from TSA mills. Information was also gathered as to whether timber harvested from the TSA was processed within the TSA or outside the TSA. This information indicates the degree of dependence the mills have on timber harvested within the TSA. To estimate the share of processing employment supported by TSA timber, mill employment was prorated by the relative contribution of timber from the TSA to a mill's total timber requirement. For example, if 80% of a plant's timber requirement was supplied by the harvest from the TSA, then 80% of the employment in the plant would be attributable to the TSA harvest.

Employment figures were also adjusted to reflect the residences of workers: those who lived within the TSA and those who lived outside the TSA. Employment in timber processing which is supported by chip by-products from milling operations was also estimated similarly.

As with the harvesting sub-sector, two estimates of direct employment in timber processing were calculated: one for the TSA and another for the province. These employment figures were used to calculate employment coefficients for timber processing employment in the same manner as the employment coefficients for harvest employment.

Indirect and induced employment estimates

Indirect employees associated with the forestry sector are those who supply goods and services to firms directly engaged in the basic forestry sector; for example, those who provide road maintenance services, fuel and office equipment and products. Induced employment consist of those who supply goods and services purchased by employees who are directly and indirectly engaged in the industry; for example, those who work in retail outlets. Indirect and induced employment figures were calculated using TSA and provincial employment[9].

Two sets of employment multipliers were used for this report: migration multipliers and no-migration multipliers. The migration multipliers assume that displaced workers will leave the region, reducing total income in the region by their full wage. The no-migration multipliers assume that a displaced worker remains in the area, at least in the short term, and unemployment and other social safety net payments temporarily offset some of the income loss. Using the no-migration multipliers diminishes the induced impacts associated with a change in direct employment.

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(9) B.C. Ministry of Finance and Corporate Relations (1999) and Horne, G., R. Riley, L. Ransom, and S. Kosempel. 1996. A provincial impact estimation procedure for the British Columbia forest sector. B.C. Ministry of Finance and Corporate Relations.

B.2 Economic Impact Analysis Methodology

The TSA and provincial employment multipliers used in the Sunshine Coast TSA analysis are shown in Table B-1.

Table B-1. Total employment multipliers

Forest sub-sector	TSA migration multiplier	TSA no-migration multiplier	Provincial coastal migration multiplier	Provincial coastal no-migration multiplier
Harvesting	1.52	1.35	2.02	1.72
Solid wood processing	1.44	1.30	2.31	1.94
Pulp	1.87	1.66	2.54	2.13

Sources: Horne, G., R. Riley, L. Ransom, and S. Kosempel. 1996. A provincial impact estimation procedure for the British Columbia forest sector.
Ministry of Finance and Corporate Relations. 1999. *The 1996 Forest District Tables*.

Employment estimates of alternative timber supply levels

To estimate employment generated by alternative timber supplies, the forecast harvest level is multiplied by the calculated employment coefficients. Note that employment coefficients are based on current industry productivity, harvest practices and forest management assumptions and will not likely reflect industry operating conditions in the future. Therefore, the employment estimates should be viewed as indicators of the magnitude of change rather than as precise estimates of changes in employment levels.

Estimates of employment income

Employment income was calculated using average income estimates for workers in the forest industry. Income data are from Statistics Canada annual estimates of employment, earnings and hours. From 1998 to 2000, the average pre-tax annual income (less benefits) for sub-sectors of the forestry sector associated with the Sunshine Coast TSA was about $48,380 for logging and forestry services; $44,900 for solid wood manufacturing; and $56,400 for the pulp and paper sector. The weighted average annual income for direct forestry workers in the Sunshine Coast TSA was $48,550. The average annual income for indirect and induced employees averaged about $30,800. This figure is based on data for all service producing industries from the Statistics Canada Labour Force Survey, B.C. Industrial Comparison, average weekly wage rates. Income taxes were calculated based on marginal tax rates of 23–28% with one-third of the total income tax accruing to the province.

B.2 Economic Impact Analysis Methodology

Provincial government revenues

Except for stumpage, royalty and rents, which are specific to the TSA, provincial government revenue impacts were estimated by using industry averages. Revenues per 1000 cubic metres of harvest, expressed as dollars per 1000 cubic metres, were calculated and applied to the harvest levels in the maximum even-flow forecast in a manner similar to how employment impacts were estimated. Table B-2. summarizes provincial government revenue estimates.

Table B-2. Estimates of provincial government revenue, Sunshine Coast TSA

	Average annual revenue 1998–2000 ($1999 millions)	Average revenue ($/'000s m^3)
Stumpage, rents and royalties[a]	12.3	11,008
Industry taxes[b]	10.1	9,037
Provincial income tax[c]	9.9	8,889
Total provincial government revenues	32.3	28,934

(a) Ministry of Forests.

(b) PricewaterhouseCoopers.

(c) Based on marginal tax rates from Revenue Canada.

Appendix C

Analysis of Significant Changes since 1995

C.1 Summary of changes to the timber supply assumptions since 1995

Since the previously completed timber supply analysis for the Sunshine Coast TSA, a number of key assumptions and inputs into the analysis have changed that influence the projected timber supply forecast. The three largest of these factors are explained below in order to highlight how timber supply projected in the current 2001 analysis report has changed since the August 1995 analysis report (which was developed for the 1996 allowable annual cut determination).

Addition of deciduous harvest

In the August 1995 analysis, predominantly deciduous stands were not part of the timber harvesting land base and were not part of the harvest forecast. That analysis showed that coniferous harvest of 1 100 000 cubic metres per year could be maintained for one decade, before dropping in 10% increments. The long-term harvest level was 986 000 cubic metres per year. In the AAC determination, the coniferous harvest was set at 1 045 000 cubic metres per year in consideration of other factors outside of the analysis. An alder partition, allowing for the harvest of predominantly alder stands, was added to create a total AAC of 1 140 000 cubic metres per year in 1996. When analysed in 2001, the predominantly alder stands were included in the analysis, adding over 10 000 hectares to the timber harvesting land base.

Changes to scenic areas, visual quality classes and modelling assumptions

Since the 1995 analysis of the Sunshine Coast TSA there have been four major changes to how visually sensitive areas are managed on the land base and/or modelled in the analysis.

Scenic area

In 1995, over 55% of the timber harvesting land base, or 124 000 hectares, were considered scenic areas and had a visual quality objective. Since implementing the 1998 *Strategy for Managing Visual Resources to Mitigate Impacts on the Timber Supply* (Mitigation Strategy), the amount of scenic area in the Sunshine Coast Forest District has been reduced. Currently less than 50%, or 111 000 hectares of timber harvesting land base, are now considered scenic areas and have a visual quality objective (see Figure C-1.).

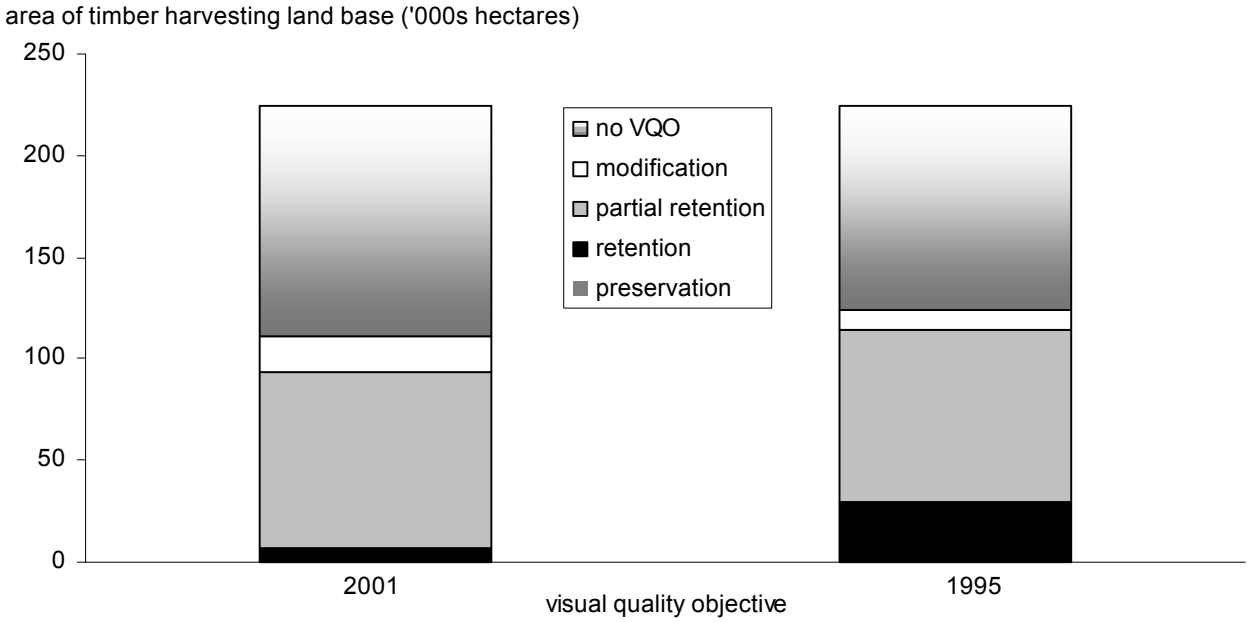

Figure C-1. Area with visual quality objectives, 1995 to 2001 — Sunshine Coast TSA, 2001.

C.1 Summary of changes to the timber supply assumptions since 1995

Visual quality classes

Also as a part of the Mitigation Strategy (mentioned above), the classes of some visual quality polygons were shifted to a less restrictive one. Some retention areas became partial retention, and some partial retention areas became modification. For example, in 1995, there was over 26 000 hectares of retention VQO's on the timber harvesting land base. In 2001, there are less than 7000 hectares of retention VQO's.

Per cent harvesting disturbance

In a visually sensitive area, the assigned visual quality class limits the amount of area disturbed by harvesting. As part of the Mitigation Strategy, the district made a commitment to carry out visual planning of cutblocks within scenic areas. Good visual design can reduce the visual impact of each cutblock, therefore, for analysis purposes, we can assume the maximum allowable per cent disturbance within a visually sensitive unit. For example, in 1995, partial retention areas were modelled with a mid-point value of 10% allowable disturbance. In 2001, partial retention is modelled to the maximum of 15% allowable disturbance.

Modelling assumptions

In 1995, limitations to the timber supply model prevented the inclusion of forested areas outside of the timber harvesting land base in the analysis. To compensate for this in visually sensitive areas, a "green to operable" ratio was calculated that adjusted the maximum allowable per cent disturbance within a visual quality class polygon. In 1995, partial retention areas were ratio-adjusted from 10% allowable disturbance to 11% allowable disturbance. In 2001, model improvements now allow for productive forest outside of the timber harvesting land base, while not contributing to harvest volumes, to contribute to objectives for visual quality and other values, which can have a positive effect on projected timber supply.

Inventory adjustment as a result of Vegetation Resources Inventory (VRI)

From 1997 through 1999 a Vegetation Resources Inventory was conducted in the Sunshine Coast Forest District. The inventory measured, among other things, forest stand heights, ages, and volumes. Results of the Vegetation Resources Inventory indicated that volumes in the forest inventory were underestimated. As a result, the inventory volumes in the forest inventory were adjusted and the standing volume in the TSA has increased. After the inventory adjustment, the standing volume in the timber harvesting land base is approximately 76 million cubic metres. In the 1995 analysis, the initial total volume was approximately 70 million cubic metres.

Impact of changes to land base and modelling assumptions — 1995-2001

In Figure C-2, each of the above factors are applied one at a time, to demonstrate some of the differences between the 1995 analysis and the 2001 analysis.

Forecast 1

Conifer-leading stands only are included in the timber harvesting land base, without the visual management changes or the VRI adjustment. The forecast starts at the current conifer AAC of 1 045 000 cubic metres per year, dropping in 10% increments and then rising back up to the long-term level of 918 000 cubic metres per year. This forecast is similar to the 1995 analysis.

C.1 Summary of changes to the timber supply assumptions since 1995

Forecast 2

Alder-leading stands are added into the timber harvesting land base. Forecast 2 starts at the current AAC of 1 140 000 cubic metres per year, dropping in 10% increments per decade, then rising back up to a long-term level of 958 000 cubic metres per year.

Forecast 3

All of the changes to visually sensitive areas as described above are made. A harvest level of 1 157 789 cubic metres per year can be sustained for 25 decades, which is 1.5% higher than the current AAC of 1 140 000 cubic metres per year.

Forecast 4

The inventory adjustments are made as per the Vegetation Resources Inventory. A harvest level of 1 233 000 cubic metres per year can be sustained for 25 decades, which is 8% higher than the current AAC.

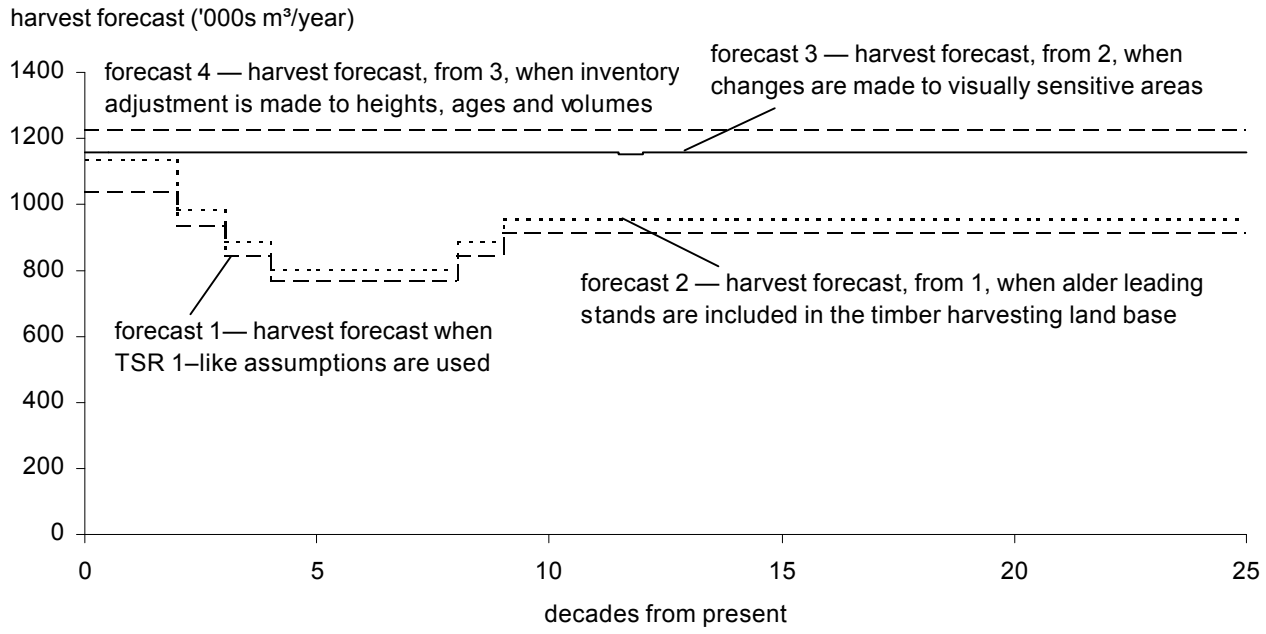

Figure C-2. Changes to key land base and modelling assumptions since 1995 TSR 1 analysis — Sunshine Coast TSA, 2001.