

Timber Supply Analysis Standards for Innovative Forest Practices Agreements

Purpose

The purpose of this document is to provide standards for timber supply analysis to inform regional executive director's decisions regarding allowable annual cuts (AACs) for Innovative Forest Practices Agreements (IFPAs) under Section 59.1 of the *Forest Act*.

General Discussion

The standards included in this document frequently do not provide precise procedures, given the complexities involved in timber supply analysis associated with describing the land base, relevant biological and physical processes and the forest management regime in different areas. The process can be guided by general principles—which are outlined below—however, the detailed aspects must be developed using case specific professional judgement. While the general ideas discussed in this document apply in almost all cases, each case must be viewed as unique: some cases may require additional analysis to that outlined, while others may be assessed satisfactorily with less detail than suggested here.

These standards relate to timber supply analysis, not to collection or compilation of inputs used in analysis. Hence, the discussion here does not address information quality. Nevertheless, the results of any analysis depend heavily on the quality of the information used in the analysis; that is, information about the forest land base, growth and yield, and management objectives. If there are standards for information collection and compilation for factors relevant to a timber supply analysis, they should be procured from the relevant office.

Standards

These standards cover the following general topics:

- Data inputs (Information Package)
Data requirements for timber supply analysis are outlined in the **Provincial Guide for the Submission of Timber Supply Analysis Information Packages for Tree Farm Licences** ("Information Package Guide for TFLs"). Further details are discussed below.
- Reporting results (Analysis Report):
 - Summary of inputs
 - Base case
 - Sensitivity analysis
- Choice of timber supply model

While there is no requirement for formal approval by government of either the Information Package or the Analysis Report, consultation between the IFPA holder and relevant government staff early in the analysis process can avoid problems later on by ensuring all involved understand the basic inputs and approach.

Contact Forest Analysis Branch (Christine Fletcher, 250 356-5959, Christine.Fletcher@gem7.gov.bc.ca) for information on individuals who will co-ordinate the review of data and analysis for specific IFPAs.

Data inputs

The analysis report, should be accompanied by an information package or appendix that contains clear descriptions of issues, information sources, assumptions, and any relevant data manipulations or adjustments related to the land base, growth and yield, and management objectives and practices. The Information Package Guide for TFLs provides a template for providing this information.

Land base:

- The information package should contain descriptions of issues, information sources, assumptions, and a detailed description of the criteria employed in deriving the land base available for timber harvesting, including any relevant data manipulations or adjustments related to the defining the land base. This description should follow a format similar to the Information Package Guide for TFLs.

Growth and yield:

The data package should contain clear descriptions of issues, information sources, assumptions, and any relevant data manipulations or adjustments related to growth and yield.

- A description of the models and methods used in generating timber yield tables for existing and regenerated stands.
- The yield tables used for each group used for growth and yield projections (normally species and site quality group and silvicultural regime).
- Detailed descriptions of methods, principles, and information sources underlying site productivity estimates and yield tables that reflect any planned innovative management.
- Notice of acceptance by appropriate BC government staff of site productivity or yield estimates or adjustments corresponding to both baseline and innovative practices, and of any sampling or study methods related to deriving the estimates. Contact Forest Analysis Branch (Christine Fletcher, (250) 356-5959, Christine.Fletcher@gem7.gov.bc.ca) for information on individuals who will co-ordinate the review of growth and yield-related data for specific IFPAs.

Management objectives and practices:

The data package should contain clear descriptions of issues, information sources, assumptions, and any relevant data manipulations or adjustments related to management objectives and practices.

- A description of the various management objectives that apply to the area and the methods used to represent actions used to achieve the objectives (e.g., silvicultural regimes, utilization levels, seral forest cover requirements, extended “rotations,” alternative harvesting systems). The description should specify the component of the land base to which the objective applies; for example, timber harvesting land base, or Crown forested area. The tables in Appendix 1 and in the Information Package Guide for TFLs provide examples for describing the management regimes (forest cover requirements) and the areas subject to the requirements. All information would not necessarily have to be in a single table.

Results and reporting

The analysis report and related appendices should include sufficient output information to allow understanding of the main factors determining timber supply, and if applicable, reasons behind timber supply changes due to proposed innovative practices. Management, land base and growth and yield assumptions are to be documented in an Information Package. The timber supply analysis should demonstrate how those assumptions affect timber supply.

Summary of inputs

- A tabular description of the categories of land and forest that are excluded from the timber harvesting land base, and the area excluded in each category. Such tabular descriptions are included in all timber supply analysis reports published for TSAs as part of the Timber Supply Review (TSR).
(see: <http://www.for.gov.bc.ca/hts/tsas.htm>)
- Descriptions (text, table, chart) of the composition of the timber harvesting land base and the total forested land base in terms of species, site quality, stand age, and any other features relevant in the area. Again, TSR analysis reports serve as reasonable examples of possible formats for required information.

Base case

The analysis report should include a “base case” harvest forecast. The base case is useful as a reference point both for examining the potential impacts of uncertainties, and for assessing the potential timber supply increases associated with innovative practices.

Additional outputs corresponding to the base case include:

- Information to allow examination of relevant forest management objectives; for example, areas in seral stages by landscape unit, or area achieving visually effective green-up in visual management zones.
- Timber inventory levels (growing stock), areas and average volumes harvested, average age of harvested stands, and age class distributions over time. Such information assists in understanding timber supply dynamics and evaluating the feasibility and realism of analysis results.

Harvest flow—the pattern of timber supply over time—is usually an important consideration in defining the base case and other forecasts. The next section contains a brief discussion of harvest flow.

Harvest flow

Timber supply forecasts employing assumptions/estimates of both current and proposed innovative practices must follow reasonable flow patterns over time. In general, a reasonable flow pattern provides for a controlled and gradual transition from short-term to medium- and long-term harvests, and avoids large and abrupt disruptions in supply. Considerations include: rate of harvest level decline if any is necessary; the degree to which mid-term timber supply may appropriately drop below the long-term sustainable harvest level; and the timing of increase to the long-term sustainable timber supply if it is higher than mid-term levels.

A difference between mid-term and long-term levels may be justified because mid-term supply

depends most on the existing stock of timber and the timing of availability of regenerated stands, while long-term timber supply is based on timber growth, which is affected by site productivity and forest management practices. Maintaining mid-term levels above or equal to the long-term level could in some circumstances delay the achievement of, or lead to failure to achieve the maximum long-term level, or cause timber supply disruptions, because of limited supply of existing timber. Likewise, a decline in timber supply from a higher short-term level to a lower mid-term may be appropriate if it can be shown that such a strategy assists in achieving maximum long-term productivity as soon as possible, and that the associated harvests do not jeopardize or cause disruptions in long-term timber supply.

The analysis should include different harvest flows that examine each of the considerations discussed above, which to summarize, are:

- transition from short-term to medium- and long-term harvests, avoidance of large and abrupt disruptions in supply
- the degree to which mid-term timber supply drops below the long-term sustainable harvest level; and
- the timing of increase to the long-term sustainable timber supply if it is higher than mid-term levels

A "base case" harvest flow for current practices must be chosen from the range of possibilities. The choice should be explained. In most cases this explanation can be brief, and consist primarily of reference to alternative harvest flow patterns. The IFPA base case harvest flow should reflect that used in the Timber Supply Review base case, if relevant. This will ensure that any change in short-term timber supply is due to changes in management, not harvest flow.

The analysis report should describe the criteria used to determine:

- the long-term harvest level and growing stock (criteria for sustainability);
- the harvest flow (e.g., maintain current harvest level for as long as possible, maximize volume harvested over a specified time frame, control the rate of decline);
- the minimum harvest level allowed in the medium term.

Sensitivity analysis

The analysis report must include results of sensitivity analyses that examine a reasonable range of uncertainty around management, land base and growth and yield assumptions and proposed innovative practices. The implications of changes in available funding to undertake planned innovative practice may be an important consideration for sensitivity analysis.

A list of specifically required sensitivity analyses is not provided in this document since each management unit in the province differs with respect to issues and related uncertainties.

“Standard” sensitivity analysis

Experience with AAC determination has shown that “standard” sensitivity analyses — that is, those in which a variable is altered by a somewhat arbitrary amount such as 5, 10 or 20 percent — can prove very useful during AAC determinations when assessing the implications of uncertainties that have not been evaluated specifically in an analysis.

Common sensitivity analyses include:

- *Timber harvesting land base* –
 - ⇒ increased/decreased by 5,10, or 20 percent
(percentage can relate to general sense of uncertainty in the area)
 - ⇒ changes related to specific uncertainties; e.g., related to marginal types, operability
- *Existing stand timber yields* increased/decreased by 5,10, or 20 percent
 - ⇒ changes related to specific uncertainties; e.g., audit or decay-study findings.
- *Site productivity estimates* adjusted to reflect new research and sampling (if not included in base case) — involves changes to volumes, green-up ages and minimum harvestable ages
- *Minimum harvestable ages* (MHAs) increased/decreased by 10/20 years, or changed according to an alternative defining criterion (e.g., if base case MHAs derived using a minimum volume per hectare threshold, a sensitivity analysis could examine the effect of culmination-based MHAs)
- *Green-up ages* increased/decreased by 5 or 10 years, or by some percentage
- *Forest cover requirements* increased/decreased by some percentage; altered to upper and lower ends of a possible range (e.g., cover requirements for a given visual quality objective vary according to visual sensitivity and degree of visual design); or altered to reflect uncertainties in policy and implementation (e.g., landscape-level biodiversity requirements can be phased in, or applied immediately. Effect of different biodiversity emphasis levels could be assessed)
- *Disturbance in area outside the timber harvesting land base (non-contributing forest)* — impacts of different disturbance assumptions (e.g., no disturbance, maintain existing age distribution, disturbance according to average natural disturbance cycles)
- *Unsalvaged losses* — different levels of losses reflecting level of uncertainty

This list is not exhaustive. Not all types of sensitivity analyses may be required, and specific local conditions may warrant a type of analysis not mentioned above. The choice of sensitivity analyses should reflect local conditions and knowledge. It may be useful to consult with local staff from the Ministry of Forests or other agencies to develop a list of sensitivity analyses to perform.

Choice of timber supply model: review and benchmarking.

There are no specific requirements or limitations on which analysis models may be used. However, interpretation of results and confidence that timber supply effects can be attributed to innovative practices rather than model differences requires a detailed understanding of assumptions made in the model about relevant processes and features. The best method of gaining this understanding is to benchmark the model with FSSIM, or other models used and understood by Forest Analysis Branch staff. This is not to imply that FSSIM is a better model, or produces more accurate results than other models. It is simply the case that Ministry of Forests staff understand how FSSIM works, and can therefore use it as a basis for understanding how other models work. If the model to be used has not been benchmarked and the benchmark reviewed by Ministry of Forests staff, the agreement holder should develop a review process in cooperation with Forest Analysis Branch or a regional timber supply analyst.

The following timber supply models have undergone benchmarking with FSSIM, or have undergone sufficient review to allow for understanding of model functionality:

- CASH6 (Timberline Forest Inventory Consultants)
- TREEFARM (Sterling Wood Group)
- Complan (Olympic Resource Management)
- FSOS – simulation mode only (Forest Ecosystem Solutions)
- MacGregor Scheduling Model (MacGregor Model Forest)
- ATLAS/FPS (University of BC, Dr. John Nelson)
- OPTIONS (DR Systems)
- Woodstock (Remsoft)

Please note that inclusion on or exclusion from the above list does not imply an evaluation of the quality of a model; the list is provided as a reference to indicate which models are sufficiently well understood that further benchmarking is most likely not required.

Even if a model has been benchmarked, relevant details of model functionality (e.g., utility weights in a simulated annealing model) still require documentation and explanation in the analysis report or supporting materials.

If the model being benchmarked produces different results from FSSIM (or other models used and understood by Forest Analysis Branch staff), the agreement holder or its representative is responsible for explaining the differences, in detail, in a technical document.

Even with a benchmarked model, the potential to increase harvest levels based on innovative practices should be evaluated using the same model for both current and innovative practices. For example, a timber supply forecast corresponding to an innovative management regime and generated with a model other than FSSIM should not be compared directly to a forecast derived using FSSIM and the current management regime. Using results generated with the same model will help ensure any timber supply increase is based on management not model differences.

Other considerations

Operational feasibility

For AAC-increase proposals, the analysis should examine any issues that may affect the operational feasibility of harvesting at the increased levels proposed. The most common issue involves the ability to locate harvest opportunities spatially.

Interactions between IFPA area and the TSA

IFPA timber supply analysis should demonstrate that any harvest level increases related to IFPAs will not disadvantage timber supply at the TSA level, or timber supply available to other operators in the TSA. An IFPA area may not be representative of the forest and management conditions for the TSA, and hence analysis results for the IFPA area should not be extrapolated and assumed to apply to the whole TSA.

Administration of IFPAs is the purview of the regional executive director, and it is the regional executive director's prerogative to require or request any analysis that s/he believes will assist in

clarifying matters regarding IFPA AACs. It may be appropriate to investigate, using timber supply analysis, the advantages and disadvantages of different approaches to administering timber supply in the IFPA in the context of the TSA. For example, benefits may be gained by administering timber supply flexibly at the TSA level (e.g., allowing for harvesting of an IFPA increase from throughout the TSA not only the IFPA area) rather than combining timber supplies that have been assessed separately for spatial sub-units of the TSA. Ultimately, the regional executive director will decide on the administrative approach, and the analysis must be consistent with that approach.

The intent here is to highlight that analysis must show that timber supply benefits for IFPAs will not come at the cost of supply at the TSA level or to other operators in the area.

Allowable cut increases.

Harvest forecasts for many management units in B.C. show declining timber supply over a period of decades. The general approach in cases of declining timber supply is that short-term allowable cuts are not usually increased unless there is a sound demonstrated forest management reason. This approach ensures that allowable cuts are not increased in the short term only to force reductions in the near future. There may be sound forest management reasons, such as existence of high risk of loss of stands to fire, insects or disease due to current or developing stand attributes (e.g., age or diameter distribution favourable to beetle attack, etc.).

An AAC increase in the short term should not decrease future timber supply below the level forecast without the increase, unless there is a documented and compelling reason to do so.

The general approach described above for TSA and TFL AAC determinations with respect to potential increases leads to some issues for IFPAs. One of the explicit aims of the IFPA initiative is to allow AAC increases for IFPA holders. However, one stipulation of an increase is that other license holders will not be negatively affected by any AAC increases for the IFPA. In this context, important considerations in designing and interpreting an IFPA timber supply analysis include:

- what are the forest management reasons that justify an AAC increase?
- what effects would an increase have on future timber supply?
- would a boost in AAC increase the sensitivity of future timber supply to uncertainties?
- if the forecast is for a temporary short-term increase (that is, timber supply is forecast to decline from the higher level) what actions will be taken to mitigate or avoid future socio-economic impacts? In other words: in the absence of a forest management objective for increasing the AAC, how will a temporary increase assist in strengthening the long-term role of timber harvesting and processing in the area (capacity-building, diversification, etc.)?

Consistency with legislation and policy

The land base, growth and yield and management regime modeled in the analysis should be consistent with current legislation and policy. While the need for consistency with laws and policy is perhaps self-evident, it must be acknowledged that one of the goals of IFPAs is to move management in new directions. Therefore, it is imperative that modeling of proposed innovative management does not imply conflicts with legislation and policy. This analytical consideration

differs from the approval of innovative management that is the regional executive director's responsibility as part of forestry plan approval. The intent here is to highlight the need to evaluate analysis inputs and results to ensure that they do not create or imply conflicts. If a timber supply forecast is based on conflicts with designations or objectives that are the responsibility of other statutory decision makers under existing laws or policies, that forecast cannot reasonably be accepted as a basis for harvest level determination.

Appendix 1: Examples of tables for describing non-timber management objectives

These tables are provided as examples only. Specific information will vary depending on management objectives and ecosystems in different areas.

Example table describing management for non-timber objective

Zone or group	Total Crown productive forest area (ha)	Timber harvesting land base (ha)	Green-up maximum allowable disturbance (%)	Green-up height (metres) or age (years)	Minimum older area (years)	Minimum area of older age retained (%)	Constraints applied to
VQO — preservation			1	5	—	—	Crown forested area in the zone
VQO — retention			3	5	—	—	Crown forested area in the zone
VQO — partial retention			10	5	—	—	Crown forested area in the zone
VQO — modification			20.5	5	—	—	Crown forested area in the zone
Integrated resource management			40	3	—	—	Timber harvesting land base
Caribou habitat			—	—	140	40	Crown forested area within the zone
Landscape-level biodiversity—			40	3	—	—	Timber harvesting land base

Example table for landscape unit biodiversity requirements

Biogeoclimatic unit	NDT	Biodiversity emphasis	Total Crown productive forest area (ha)	Timber harvesting land base (ha)	Old-seral stage			Minimum age (years)
					Minimum retention area (%)			
					Now	71 years	141 years	
ESSF	1	Low			19	19	19	250
		Intermediate			19	19	19	250
		High			28	28	28	250
		45/45/10 L/I/H			14.2	17.1	19.9	250
BWBS (conifer species prominent)	3	Low			11	11	11	140
		Intermediate			11	11	11	140
		High			16	16	16	140
		45/45/10 L/I/H			8.2	9.9	11.5	140