
Assessment of the Status of Forest Inventories in British Columbia: An Update to the 2006 ABCFP Review

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REPORT



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Overview

The purpose of this review is to update the 2006 Association of BC Forest Professionals (ABC FP) “Assessment of the Status of Forest Inventories in British Columbia.” This update was based on a review of the 19 recommendations made in the 2006 report. Following from interviews and reference to published material detailed findings and comments are produced in an accompanying report¹. This report highlights several important issues and a series of recommendations to address them.

Overall the findings are positive. The BC ministry responsible for forests recognized the importance of the 2006 ABCFP inventory review and responded by dedicating resources to implementing its main recommendations. While the ministry have made progress towards addressing a number of difficult challenges, more needs to be done as outlined below.

To provide some background, the ministry has been faced with immense challenges. Starting in October 2010, the Ministry was split into the Ministry of Forests, Mines and Lands, and the Ministry of Natural Resource Operations, and then reorganized in March, 2011 as a whole back into one ministry under the name of Ministry of Forests, Lands and Natural Resource Operations (FLNRO). It has also had to deal with reductions in staff and the closure of the Research Branch. Like other government departments and industry, its operations have been curtailed in response to the US subprime mortgage crisis and collapse of the housing construction sector in the US. In the meantime, the mountain pine beetle (MPB) continues to have dramatic effects on forest landscape, having impacted an estimated 17.5 million hectares as of 2010. This is a matter that has a direct impact on the forest inventory and the need for inventory updates on an unprecedented scale.

FLNRO is focused on maintaining a budget sufficient to maintain up-to-date inventories in regards to harvesting and silviculture activities. They are also committed to ensuring staffing levels necessary to address the re-inventory backlog. FLNRO recognize the need for more comprehensive updates to inventories affected by mountain pine beetle and have a number of initiatives in this area. They have used a risk management approach to allocate resources to the highest priorities, be that related to MPB and forest fire disturbances, to ensuring that harvesting and silviculture updates are being entered in an accurate and timely sort of way, or alternatively, to completing re-inventories for areas predating the 1980s. They have identified Phase I inventories as taking precedence over Phase II inventories, in an effort to spread their limited resources more widely. Additionally, inventory data is more accessible to the public and quality control and ‘Change Management’

¹ Moss, I. 2011. A progress report on the 2006 ABCFP status of forest inventory recommendations: Detailed findings and comments. Association of BC Forest Professionals, Vancouver, BC.

procedures are being employed to ensure the inventory is meeting current demands.

The main deficiency is with respect to the recommendations for stable and adequate funding, and related to this issue, the need for adequate staffing levels. This year's level of funding is \$8.4 million dollars. This is significantly below the long-term average of \$15 million dollars per year. While staffing levels are sufficient to meet the demands of the current program and budget, the levels are stretched to their limit with respect to the current budget. The primary concern is that budget allocation is not sufficient to maintain a reasonably current inventory required to underwrite the mandate of the Chief Forester as discussed below. A risk management approach to allocation of inventory dollars has been adopted by FLNRO in an effort to ensure that the inventory is sufficient for this purpose. Finally, this review was limited by the need for a more systematic approach to estimating the appropriate level of a long-term, stable level of funding, rather than relying on a highly variable or periodic long-term average.

The question of whether or not the inventory is sufficient "for the Chief Forester's mandate of sustainable forest management at the provincial level" could not be fully addressed in this review. This question extends beyond the inventory into areas of how inventories are utilized, and whether or not the results are sufficient to ensure sustainability with a reasonable degree of confidence. Essentially what matters is not just the inventory, but more broadly, "How is the inventory organized and connected for the purpose of fulfilling the provincial goals associated with forest and land management?" This question requires a more comprehensive review. The dimensions of this question and potential reasons for concern are discussed in more detail below.

Permanent sample plots (PSPs) are being maintained in terms of tree tags and reference points but only a small number of plots have been re-measured in the last two years and there is no commitment to regular periodic re-measurements. It is suggested that these plots have important applications, not the least of which is monitoring changing stand conditions relative to climate change. The role of PSPs in ensuring sustainability of forest resources suggests that routine, periodic re-measurement deserves consideration of higher priority. Some suggestions are also made as to how these data might be used more effectively for the purpose of maintaining sustainability.

Lastly an Appendix is included to discuss some overarching issues relating to forest inventory and the practice of professional forestry. This is a personal point of view. As the person responsible for this review, I am aware that any criticism or statement of concern can cause unintended consequences to those who hold office and others throughout the system. The intent here is to encourage people who are already striving to make things work, to continue in their efforts, and in so doing, recognize

them as making important contributions to forest and land management in British Columbia, often under difficult circumstances that are beyond their control. The intent is to highlight some issues as being important, perhaps underlined by some concerns, so that as forestry professionals we can fulfill our responsibilities in an efficient, effective and responsible manner. The right tools must be available at the right time to match with the necessary inventory tasks and demands. If the tools are not well adapted to the job, or they are not available when and where they are needed, then we have a problem. It is our responsibility to inform ourselves and others of this situation even if some may object, and to do so in a respectful and open sort of way, without threat or accusation. Only then will progress be made. The nature of the forest inventory impacts on the ability of every member of the forestry profession to fulfill their responsibilities, roles, and expectations.

1. Achievements

1. 1. Clear Lines of Responsibility

- a) The Chief Forester has sole responsibility for inventory in the province. This is not “protected” under legislation. The Chief Forester previously indicated that legislation does not provide significant additional protection of this desired line of authority in response to the 2006 BC Inventory Review and therefore decided not to pursue this option.

- b) Funding and management of inventories is now the direct responsibility of the government under the Chief Forester in the Ministry of Forest Lands and Natural Resource Operations. This is a change from the past when funding allocations and associated projects were developed via the Land Based Investment Program (LBIP) of the Forest Investment Account (FIA), administered by PriceWaterhouseCoopers.

1. 2. Stable and Adequate Funding

- c) In 2006/07 the funding was \$13.3 million. This year’s budget was \$8.4 million. This is above a minimum of \$4.6 million allocated in 2009/10 and the \$6.1 million allocated in 2010/2011, but below the average of \$15.4 million for the period from April 1989 to March 2012, inclusive. This average figure is taken as a rough estimate of the long term stable level of funding necessary to maintain the inventory to the Phase II Vegetation Resource Inventory standard. The current funding level is identified as a success in recognition of Forest Analysis and Inventory Branch (FAIB) efforts to keep this program as a high priority given the regional economic circumstances referred to above.

1. 3. Accessibility of Data and Products

d) Public access to inventory products has improved however it was not determined whether this was sufficient to meet demands.

1. 4. Effective Quality Assurance System

e) There is an effective quality assurance system in place.

f) The FAIB has a formal process for inventory change management that has been implemented and was currently underway at the time of writing this report.

1. 5. Reporting

g) Provincial level “State of the Forest Reports” were produced in 2004, 2006 and 2010.

1. 6. Support of Innovation and Research

h) A number of innovations are being explored including the following:

i. The FLNRO continues to support the development and implementation of the Tree And Stand Simulator (TASS III) for application in complex stands. This task was transferred from Research Branch to FAIB.

ii. There has been development and application of the low elevation digital camera system (DCS; replacing 70 mm photography) for use as an inventory sampling tool. In particular it can be used to identify well-established understories in MPB affected stands.

iii. There has been development and testing of Landscape Vegetation Inventory (LVI) as an alternative to Vegetation Resource Inventory (VRI). The LVI uses Landsat as well as other kinds of imagery, in combination with DCS as an inventory sampling tool, for the purpose of producing a VRI-like inventory.

iv. Landsat has been used to estimate proportion of stands impacted by MPB on an annual basis.

v. FLNRO supported an investigation in 2007 into the use of LiDAR (light detection and ranging) as an inventory tool on TFL 18.

vi. The FLNRO recently published a draft discussion paper on, “A framework for implementing second growth stand monitoring in British Columbia.”

1. 7. Currency

i) There is a continued effort to clear the backlog of areas inventoried prior to 1990 through re-inventory.

1. 8. Coverage and Sufficiency

j) The Vegetation Resource Information Management System (VRIMS) is now undergoing final testing and will be operational this year. It will incorporate depletion data provided by licensees to update the inventory on an annual basis. The currency and quality of the updates will be dependent on data submissions into RESULTS, new Landsat imagery, and all other available sources. Quality assurance mechanisms are in place to maintain data integrity. Over the coming year, FLNRO will be developing criteria for inventory replacement or enhancement.

1. 9. Forecasting and Linking Historical Spatial Data

k) Developments relating to the forecasting of inventory attributes and stand conditions continue to be part of the inventory program, particularly VDYP7 (Variable Density Yield Program 7), and also TASS II and III following the closure of Research Branch and transfer of personnel to Forest Analysis and Inventory Branch.

l) Permanent Sample Plots (PSPs) are being maintained through inspection to ensure that tree tags and reference posts remain in place. The data is being stored in a secure location and is being used for model validation purposes (TASS III, VDYP7, PrognosisBC). The Ministry is initiating a PSP program targeting young stands in MPB affected areas (note that this is an adaptation of the Change Monitoring Inventory system which is distinct from the original PSP program for monitoring the growth and yield of 'Natural Stands'). The primary focus of this new program is on stands under 50 years old.

m) The inventory is linked to RESULTS (an electronic data transfer system for recording fulfillment of licensee harvesting and reforestation obligations), as well as to the Forest Tenure Administration (FTA) and to the Electronic Commerce Appraisal System (ECAS).

n) Forest inventories have been archived annually since 2002 with the earliest archive established in 1990. The change management procedures document changes in inventory standards and procedures. Ground sample data is stored dating back to 1936.

2. Potential Areas for Improvement

2.1. Stable and Adequate Funding

- a) Stable funding has not been achieved and based on first approximation the level of funding is below the long-term level needed to sustain a current inventory of \$15 million.

- b) Full time equivalent staff has been reduced from 40 full-time equivalents in 2006 to 27 in 2011. The ability of staff to manage and run the program is limited by the degree of control they have over information technology (IT) resources. To be efficient and effective, forest inventory specialists require a high level of control over the acquisition, adaptation and development of IT resources to fulfill requirements specific to maintaining and updating forest inventory. At the same time the inventory staff has increased responsibilities for direct, operational delivery of inventories that previously were delivered with third-party support under the Land Based Investment Program.

2.2. Reporting

- c) There is no formal, routine, periodic regional or sub-regional (e.g. TSA) inventory reconciliation reports on estimated and ground verified changes due to growth and depletion by various agents, and due to re-inventory and changes in inventory standards.

2.3. Coverage and Sufficiency

- d) Approximately 41.9% of the province is represented by inventories that were completed prior to 1990 and 29.9% prior to 1980. Some of these areas are in remote parts of the province. The focus continues to be on updating these inventories using a combination of LVI and Phase I VRI with priority being given to more intensively used forest areas. Inventory gaps remain in Tree Farm Licenses and private lands.

- e) The Forest Practices Board (2011) undertook a special investigation into, "Reporting the results of forestry activities" as an issue of compliance with Section 86 of the Forest Planning and Practices Regulation. Their findings identify, "late, missing and incorrect information" associated with the update of forest cover maps, lack of information on the locations and extents of wildlife tree patches, and lack of information regarding road construction and deactivation outside of cutblocks since 2008. Several recommendations were made to address these deficiencies.

2. 4. Currency

The MPB epidemic has caused significant changes, even in areas where the inventory might otherwise be considered current. This poses a significant challenge.

2. 5. Forecasting and Linking Historical and Spatial Data

- f) PrognosisBC is no longer being supported beyond its current stage of development.

- g) A very few permanent sample plots have been re-measured according to a defined schedule. Only a very small number of PSP's have been re-measured in the last two years.

- h) Cruise plots and other kinds of survey data that are collected on a routine basis are not stored in a consolidated database and not available for linking to the inventory.

2. 6. Scalability

- i) The recommendation that, "A commitment to moving towards higher resolution of inventory information should be included in the mandate of the inventory program" has not been adopted. This is discussed in more detail below.

3. Comments

3. 1. Staffing and Stable Funding

Recommendation # 2: To ensure continuity and to develop expertise in the full range of inventory activities, including field measurements, photo interpretation and data storage, analysis and reporting, additional permanent staff should be hired within government.

The current staff is (barely) sufficient to manage the VRI program. However, a reduction of only one member would lead to a significant gap in inventory capacity – when it is strategically needed. The need for continuous recruitment, development and training of personnel in the art and science of inventory led to the 2006 report recommendation for adequate and stable levels of funding. None of these have been achieved. However, it is clear that every effort has been made by FAIB to acquire the necessary funds under difficult economic circumstances. Although it was not possible to quantify, it also appears that there is a significant reduction in trained photo interpreters amongst forest consulting and contractor firms when compared with 2006. Some of this concern may be offset by the deployment of new technologies that may be less demanding in terms of the need for trained personnel, but until these technologies are fully developed and deployed for this purpose the concern remains a high priority. Another area of investigation that was not pursued,

but is of concern, is the availability of individuals trained in the art and science of inventory in undergraduate and graduate level university programs. This training also pertains to the advancement of new technologies. These concerns potentially pose a significant threat to the longer term ability to maintain the future of forest inventories and this extends well beyond vegetation inventories to other kinds of inventories as well.

3. 2. Stable and Adequate Funding

Recommendation # 1: Secured, multiyear funding sufficient to support annual inventory costs should be sought, preferably from BC Treasury Board.

Long-term, stable and adequate funding has been estimated at \$15 million per year based on the long-term average level of funding. However, this figure should be underwritten by a proper evaluation relative to the requirements of an inventory to meet specific goals (discussed in more detail below) and fulfill specific requirements, including the following:

- a) Inventory updates (disturbances and landscape dynamics),
- b) Re-inventory,
- c) Tree, stand and landscape dynamics (permanent sample plots, volume and biomass estimation, carbon flux and balance estimation, growth and yield, site productivity and climate change, multilayer and complex tree and stand dynamics, species and species-x-site interactions, regeneration and understory characteristics, stand damaging agents and the potential for further natural disturbances, habitat and biodiversity and water conservation).
- d) Monitoring (comparison of strategic versus operational outcomes on the scale of individual Timber Supply Areas (TSAs) or operating units underwritten by proper ground sampling and measurement/re-measurement protocols as is common in many jurisdictions in Canada and throughout the world),
- e) Routine (5 year) reporting (change in inventory due to growth and depletion, including sources of depletion, and inventory accounting procedures, on the scale of TSAs and the province as a whole and accompanied by maps indicating where the changes have taken place), and
- f) Research and development.

While some of these detailed activities reach beyond the traditional definition of inventory, there is a need to ensure that the inventory is sufficient to underwrite

evaluation of all forest resources, not just timber. The focus on trees is based on the central role that these play in resource evaluations, but other vegetation types including for example grasslands and wetlands are also important. This issue requires a more comprehensive analysis that is well beyond the scope of this evaluation.

The question of, “What is an adequate, stable level of funding” should be addressed more specifically and include the following components:

- a) Comparison of inventory components, costs and benefits of inventory procedures in different jurisdictions.
- b) Identification of specific requirements to fulfill inventory needs in the different forest types and geographic regions of the province necessary to fulfill both strategic and tactical needs.
- c) Estimation of associated costs and benefits of fulfilling the needs in b).
- d) Recommendation regarding the level of stable and adequate funding.

3.3. Basic Inventory Sufficiency for Sustainable Forest Management

The issue of whether or not current inventory standards are sufficient to meet the Chief Forester’s requirements for sustainable forest management is addressed below. However, there are four recommendations that can be interpreted as being in conflict; these must be resolved before progressing to this major topic, as follows:

- Recommendation # 3: Higher priority should be placed on obtaining current, complete coverage of all forest lands, using VRI standards at least at a basic level of forest inventory information. The basic level inventory information should be sufficient for the Chief Forester’s mandate of sustainable forest management at the provincial level.
- Recommendation # 4: For all areas currently under development, complete and current inventory information at a more detailed level should be available that allows the Chief Forester to minimize the risks of decisions at a management unit level.
- Recommendation # 5: Inventory information requirements for specific local areas, requiring a high level of spatial resolution and detail, should be outside of the base funding for the inventory program.
- Recommendation # 14: A commitment to moving towards higher resolution of inventory information should be included in the mandate of the inventory program.

Recommendation # 3 places a high priority on complete inventory coverage. It includes the statement that “The basic level inventory information should be sufficient for the Chief Forester’s mandate of sustainable forest management at the provincial level.” This recommendation was identified as a requirement that should be met. The key to its interpretation rests on determining: What is “sustainable forest management?”; what kind of an inventory is necessary?; and what level of resourcing is sufficient to ensure that it is being practiced and fulfilled? “The provincial level” may be interpreted a number of different ways. If the inventory is found to be sufficient to underwrite sustainability with respect to some areas and not others then the interpretation herein is that the requirements are not being met “at the provincial level.” Consideration might be given to limiting the lower bounds to areas of certain minimum size, but this may be a mistake insofar as smaller areas make proportionately larger contributions toward sustainability than others.

Recommendation # 4 specifically refers to instances where more detailed information may be required to fulfill the second part of Recommendation # 3. However, recommendation # 5 seems to be contrary to recommendation # 4 when the scale being addressed is a “local scale.” For practical purposes a “local scale” could be interpreted as being contained within a smaller portion of a Timber Supply Area or Tree Farm License.

Recommendation # 14 re-enforces the need to evolve the inventory toward “higher resolution.” Again this is open to interpretation, but the “level of resolution” generally refers to having certain kinds of attributes registered on a smaller scale with the same level of accuracy or with improvement – say on the scale of 1 to 0.5 hectare polygons (i.e. microstands) instead of 10 to 20 hectare polygons as is normal for traditional aerial photo interpreted inventories. Improvements at this scale may be possible using advanced remote sensing technologies in combination with photo plot (e.g. DCS) and ground plot information.

Now to the primary question: “Is the inventory sufficient for the Chief Forester’s mandate of sustainable forest management at the provincial level?” This is a complicated question and the answer partly depends on the forest conditions and landscape conditions and the potential for conflict in access to ecosystem goods and services. This question is deserving of much more discussion and intensive review perhaps by a panel of experts, including some from outside the province. There are some issues that seem to suggest concern that the answer is not affirmative in all cases. The elements of this discussion can perhaps be more fully exposed by asking a more detailed question:

- a) Are inventory and associated growth and yield attributes and data sufficient and adequately integrated with forest estate planning, forest practices implementation, monitoring and reporting to deliver the desired sustainable forest outcomes?

Clearly this question extends beyond inventory to include the manner of integration with strategic and operational planning, implementation and monitoring within what would be considered an adaptive management cycle. Once again, the purpose here is not to answer this question directly. To do so is beyond the means of this review. Numerous concerns have been raised in the past regarding the sufficiency and adequacy of attributes, data quality, and integration. A few of examples of these are as follows:

- a) The inventory is generally considered to be adequate for strategic purposes but not tactical, operational planning purpose. Part of the reason for this is that the inventory is not considered to be accurate (reasonably precise) when it comes to representation of individual polygons, but is considered to be reasonably accurate on the scale of forest management units, be these Timber Supply Areas or Tree Farm Licenses. On the broader scale, accuracy can also be checked (inventory audits) and adjusted for (Phase II adjustments). The impact of this imprecision at a polygon scale is not well understood in terms of spatial planning involving certain objectives (e.g. to produce a certain level of annual cut or maintain a certain level of habitat) and constraints (e.g. adjacency rules, watershed management guidelines, etc.). For example, circumstances have arisen where Timber Supply Analysis suggested that a certain level of harvest was available and yet this level of harvest was difficult to find on the ground given the various ground rules for cutblock location. There are many potential sources of error under this scenario. The inventory is only one of them. There are also difficulties in reconciling what is being done on the ground with what is to be done from a strategic planning point of view where spatial relations may be critical to meeting a desired outcome, particularly on smaller scales.
- b) The first issue above is perhaps of greatest concern in areas that have been utilized intensively in the past (perhaps demanding some elements of ecosystem restoration) and/or where there are many overlapping and competing demands from the same areas of land for the production of a wide variety of goods and services. There is no systematic way of identifying where these areas are, and what kinds of additional inventory data would be required beyond the basic data already collected in order to better ensure sustainability, and more specifically what is the cost of obtaining better data versus the risk associated with not producing it.

c) The distributions of trees by diameter and species composition are important to forecasting future stand and forest conditions. This is recognized in the continued focus on developing TASS III for multi-layered and complex stands, as well as single layered stands, in contrast to TASS II that was developed only for the latter stand types. PrognosisBC was also developed for this purpose. For these kinds of individual tree models to be most useful they must be linked to the inventory. Each polygon or stratum (group of polygons) would require a tree list or stand and stock table to provide the basic inputs necessary to make reasonably precise forecasts of future stand conditions. This issue is thought to be particularly acute in the dry Interior Douglas-fir (IDF) zone, and in the so called wet-belt (ICH) stand types that have high structural and species diversity, as well as in some subalpine fir and Interior spruce stands, particularly those that were subjected to “selection” or intermediate utilization harvesting prior to 1970. Mixed hardwood-conifer stands can also have complex dynamics.

d) The distributions of trees by diameter and species composition are also important to forecasting future habitat supplies for wildlife species, some of which are at risk or may be key indicators of wildlife species habitat conditions from a broader perspective. The distributions are also important for estimating carbon storage and dynamics, as well as for investigating different wood product allocations (e.g. for sawlogs, pulp production, oriented strand board, or bioenergy production).

e) MPB has had a significant impact in the province. The structural diversity of these stands has increased and understory characteristics play a much bigger role in the estimation of future wood supplies. The plot data used to calibrate VDYP can no longer be considered representative of the variety of MPB residual stand conditions that currently exist in the province.

3. 4. Permanent Sample Plot (PSP) Re-Measurement

Recommendation # 8. The program to maintain and measure a system of repeatedly measured ground plots (permanent sample plots) must be continued and augmented as part of the forest inventory program to support the development of forecast models and to monitor stand dynamics.

Routine periodic measurement of PSPs has been postponed indefinitely. The primary use of the PSP program has been for the purpose of growth and yield model development, calibration and validation. The plots have generally been established for the purpose of representing a range of “undisturbed natural” stand conditions. The PSPs are not established to be representative of the population of stands within an inventory. Nevertheless, they represent a valuable source of past and present

information and were they to be re-measured, they would also represent future stand conditions from today's perspective.

Notwithstanding the limitations of these plots, maintaining continuity with respect to the historical record of stand development patterns would be useful. In particular these plots could be of considerable help in assessing impacts of climate change from a stand dynamic perspective. They are a major source of information on growth, mortality (due to various causes) and ingress of trees and tree species composition over time. Added to this is the potential to periodically re-measure non-tree vegetation along with additional structural attributes, and to evaluate impacts of insect and disease as well as other stand damage agents. Understanding the interactions of these ecosystem components is important to understanding stand dynamics and they can be used to explain differences between actual patterns and rates of stand development versus forecasts using models calibrated for this purpose. Long-term monitoring plots are useful for this purpose particularly where there are lags in time between the expression of causal agents and factors versus impacts. While the decision to not re-measure these plots can be justified on the basis of historic use of the data; over the longer term this may well prove to be short sighted. The argument here is that plots could be put to better use in terms of routine monitoring of growth and yield of different forest types in the province, reporting of forecast versus actual growth and mortality patterns, and analyzing the data to determine possible/probable explanations as to why differences have occurred. It is suggested that while it is useful to know what is likely to happen in the future regarding stand dynamics and expected impacts of climate change, it is equally important to understand what has actually happened in the past; the two activities should be done in tandem.

There are other PSP programs in the province that might also contribute to this, three of which will be mentioned here:

- a) National Forest Inventory (NFI)
- b) Experimental Plots (EPs)
- c) Change Monitoring Inventory (CMI)

The FLNRO recently published a draft discussion paper on, "A framework for implementing second-growth stand monitoring in British Columbia," that is a proposed adoption and adaptation of CMI for broader application. It is too soon to comment on this paper. PSPs help to ensure that forecasts of future forest and stand dynamics are grounded in reality. This is central to ensuring sustainability of ecosystem goods and services critical to the well-being of BC's communities.

3. 5. Inclusion of All Lands in the Provincial Forest Inventory

Recommendation # 3: Higher priority should be placed on obtaining current, complete coverage of all forest lands, using VRI standards at least at a basic level of forest inventory information. The basic level of inventory should be sufficient for the Chief Forester's mandate of sustainable forest management at the provincial level.

A high priority remains with respect to having a complete BC Land Cover classification and forest inventory for all public lands, including Tree Farm Licenses and also private lands, as well as parks. This priority is highlighted because of the need to understand impacts of adjacent land owners or tenure holders on resource values and provision of ecosystem services that are vital to sustainable living and well-being on broader scale. It is also recognized that there are additional rights, particularly amongst private land owners, that pose a challenge to implementing this recommendation. Further investigation would be required to determine the feasibility of respecting these rights while at the same time enabling access to inventory data that is necessary for more complete social, economic and environmental resource valuations and impact assessments.

The lack of integration of Tree Farm Licensee inventories into the provincial inventory is more difficult to comprehend given that these inventories pertain to public lands, and in some cases private lands that were originally placed under this form of tenure as a means of getting greater access to, and more control over, public lands. Under section 35.1 of the *Forest Act* ([RSBC 1996] Chapter 157, Part 3, Division 6; November 23, 2011) the following stipulations apply:

(2) If, having regard to the factors listed in subsection (5), the chief forester determines that a management plan for a tree farm license does not satisfactorily provide for an inventory of the forest, recreation and cultural heritage resources of the tree license area, the chief forester may give notice to the holder of the license requiring the holder of the license to compile and submit the inventories set out in the notice.

(3) The notice given under section (2) may specify the following requirements:

- a) the manner in which the inventories are prepared;
- b) the format in which the inventories are presented;
- c) the specifications the inventories must meet;
- d) the date the inventories must be submitted to the chief forester.

(4) In addition to compiling any inventories required under the management plan, the holder of the tree farm license must compile and submit inventories in the notice given under subsection (2) and comply with any requirements referred to in subsection (3) that are set out in the notice.

(5) The chief forester may determine that a management plan for a tree license does not satisfactorily provide for an inventory of the forest, recreation and cultural resources of the tree farm license area if, in the opinion of the chief forester, inventories prepared in accordance with the management plan would not provide sufficient information to adequately

- a) establish and carry out objectives by government,
- b) prepare and carry out operational plans,
- c) manage and conserve the forest, recreation and cultural heritage resources of the tree license area, and
- d) assess the impact that managing the resources referred to in paragraph (c) would have on the timber supply for the tree farm license area.

This process should be fully transparent to the public, and to public stakeholders who have an interest in ensuring that the inventory is reasonably correct, in better understanding the inventory for the purpose of making their own interpretations and for the purpose of reviewing the Chief Forester's decisions with regard to these interests. However, there are potentially legitimate reasons why some Tree Farm License inventories have not been integrated into the provincial inventory including, for example, who paid the cost of collecting and compiling the data?

A more complete assessment is required to determine how the province could proceed with assembly of a province-wide Land Cover and Forest Inventory, continue to maintain such an inventory up to date, and use the data to assist with social, economic, and environmental policy development and land use decisions, while at the same time respecting individual and property rights. This recommendation is in recognition of the need to better understand current and potential private land management impacts on public lands and public land management on private lands, in terms of costs and benefits to both parties, so that property development and management may proceed in a responsible manner.

Appendix I: Forest Inventory and The Practice of Professional Forestry

In order for forestry professionals to do their job effectively they depend on a complete knowledge of the inventory (strengths and weaknesses), the ability to use it to fulfill strategic and tactical level outcomes on the ground, the ability to verify that these outcomes have been met in both substance and intent on strategic level scales, if the promises of sustainability and stewardship are to be met. This has been at the heart of the forestry profession since its earliest beginnings in Germany in the 18th century. To the extent that the tools are not available to do this, the profession is prevented from adequately fulfilling its responsibilities to society. If anything, threats to proficient forest management have increased rather than decreased. The sources of these increased uncertainties are as follows:

- a) Continued indecision in how best to distribute forest management responsibilities amongst public and private interests founded on questions as to: who should pay, who benefits and by how much, how should these be allocated and executed through a combination of public and private agencies and processes, and what mechanisms should be used to pay for it.
- b) The impacts of climate change on forest dynamics and the need to ensure long-term sustainability and viability of communities through continued access to forest resources and the environment.
- c) Fluctuations in forest revenues, especially lumber commodity prices and the potential for/utilization of other sources of revenues to pay for forest management and associated ecosystem services.

Some of these things we have control over, many we do not and therefore must adapt. Within the context of inventory, the question is, "What is needed to better address these concerns from either a control or adaptive point of view?" This question is often further simplified to one of making progress toward some needed outcome since it often becomes quickly apparent that what is needed cannot be obtained (but we must understand the target before reaching for it). So the next questions are: what are the opportunities that we have to address these issues within the context of inventory? What should be done about them? How much will they cost? What benefits would accrue? Why should anyone, including the government care? What are the potential implications of not supporting an up-to-date provincial forest inventory to help support decision makers with their decisions? Somehow the sense is we are doing as well as we can as professionals with the resources available to us, but that is not good enough to support our role as stewards, and accordingly not good enough to fulfill our obligations to society. Professionals themselves need

to demonstrate they care and understand the issues before change will take place. The challenge is to move from criticism about what is holding us back toward more positive action in building solutions. Ultimately we need to do this – and do it in a way that prevents us from taking one step forward and two steps backwards as has seemed to be the case for many of us who have been in forestry for 20 years or more. Rendering a critique is a good beginning, but not a good end.



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