



**Forest  
Practices  
Board**

## **How much of British Columbia's forest is not satisfactorily restocked?**

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*And what should be done about it?*

*Special Report*

**FPB/SR/42**

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# Executive Summary

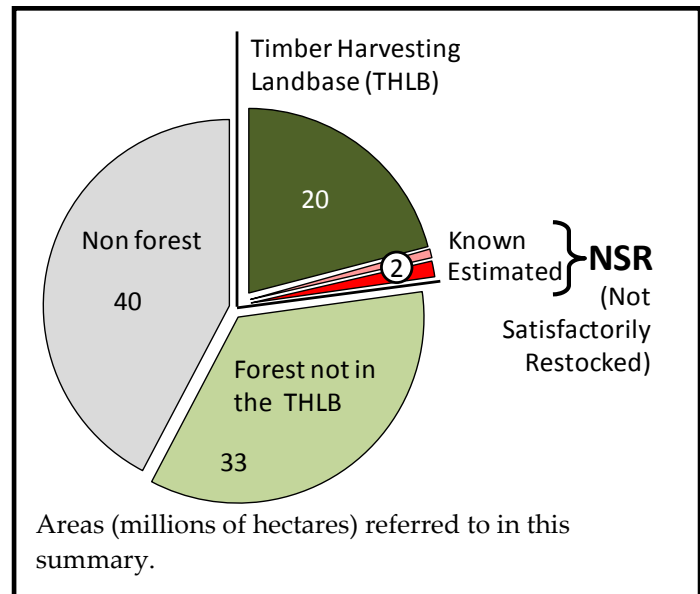
British Columbia is 95 million hectares in size and natural resource management responsibility falls to the provincial government for nearly all of that area. About 55 million hectares of British Columbia is forested and about 22 million hectares of the forest is known as the timber harvesting landbase (THLB); the area where government has expressed the intent to have the trees harvested. This report addresses the issue of restocking forests in the THLB.

Many British Columbians are concerned about forests that have been damaged recently by the mountain pine beetle epidemic (beetles) and large, severe wildfires. There has been substantial debate about what the full extent of this problem is and whether these forests will continue to provide the values we expect from them, now and into the future. This debate has become difficult to follow and part of the reason is that it has been cast in the context of the term 'not satisfactorily restocked' (NSR).

The term NSR has been used by some to describe all of the forests where there might not be a 'satisfactory' number and type of trees. However, government uses a much more constrained, administrative meaning of NSR. First, government only uses the term NSR to apply to the THLB. Beetles and fire have affected a substantial amount of forest in areas where there is no current intent to harvest, but government does not consider these areas when assessing the amount of NSR. Additionally, government only uses the term NSR to describe areas:

- that do not meet expectations because there are not enough live trees (based on a survey and comparison against a standard); and
- where there is some obligation or intent to correct the situation; that is, to restock the area.

Areas harvested by the forest industry (including by the government-run BC Timber Sales program) meet these criteria for NSR because trees have been removed and there is a legal obligation to restock after harvesting.<sup>1</sup> The forest industry fulfils its legal obligation. At any given time, some areas are being harvested and other areas are being restocked so the area that is NSR because of harvesting remains relatively stable at approximately half a million hectares.



<sup>1</sup> With minor exceptions; notably in the case of some small scale salvage harvesting.

In contrast, there is no specific legal obligation to restock areas affected by natural disturbances, such as beetles and fire.<sup>2</sup> Government only classifies forests damaged by natural disturbances as NSR if the area is part of the THLB and if they:

- conduct surveys in those areas and find that the area does not meet an approved standard (with respect to the number and type of trees); and
- determine that the area is feasible to treat (primarily based on a return on investment analysis).

Classification as NSR is an indication of government's management intent to restock the area. The amount of area affected by natural disturbances where there is a management intent to restock depends on policy decisions about the level of funding available to government-run reforestation programs. So, similar to industry's obligation, there is a 'rolling balance' of the area that government surveys and classifies as NSR (adding to the area) and subsequently restocks (subtracting from the area). That total amount has remained more-or-less unchanged for the last 10 years at approximately 200 000 hectares.

There is a large area in the THLB affected by natural disturbances, where there may be no viable crop of trees and where natural regeneration of commercially suitable species is expected to occur slowly. Until those areas are surveyed the actual stocking will not be known so they cannot yet be classified as NSR. The Board refers to those areas as 'estimated NSR.' Information provided by government indicates that there is likely on the order of one million hectares of beetle-affected forests that are estimated NSR. There are additional un-surveyed areas of estimated NSR resulting from fires, other natural disturbances and minor amounts of forest harvesting where there is no legal obligation to reforest.

The Board concludes that the combined total area of known NSR (industry's obligation and government's management intent) and estimated NSR (yet to be surveyed) may be as much as two million hectares.

Government has been encouraging the forest industry to harvest the areas affected by beetles and continues to do so. Over a million hectares has been harvested in beetle-affected areas and industry has a legal obligation to restock these areas. It remains to be seen how much more of the beetle-affected areas will be harvested. Government has been funding a reforestation program since 2005 that has treated an estimated total area of just over 50 000 hectares. Most of that treatment has been directed at areas affected by fires and at young managed forests (i.e. plantations) affected by beetles. There has been only a limited amount of reforestation effort directed at mature beetle-affected forests because those areas might still be harvested by the forest industry.

The current situation related to NSR clearly has implications for the future timber supply, particularly in the beetle-affected forests in the central interior of British Columbia. However, substantial work is required to adequately understand the magnitude and timing of those implications.

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<sup>2</sup> Although government has a legal responsibility under the *Ministry of Forest and Range Act* to "encourage maximum productivity of the forest" and to "manage, protect and conserve the forest."

## Board Commentary

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The recent mountain pine beetle epidemic has no precedent in the management of British Columbia's forests. The consequences of the epidemic go beyond central BC and are national, and perhaps international, in scope. The epidemic may be a bell-weather of things to come across the planet as a result of climate change. The Board is aware that reduced timber supply is only a part of the effect that the epidemic will have on people. Nevertheless, this is the immediate concern that the Board is addressing in this report.

Much of the current debate about the state of BC's forests, as a result of the recent mountain pine beetle epidemic, revolves around how much of the forest is 'not satisfactorily restocked' (NSR). Government is responsible for managing, protecting and conserving the entire public forest<sup>3</sup> but it uses the term NSR only in a constrained administrative sense to describe areas that will not meet our expectations for future timber supply because of insufficient stocking and where government has stated a management intent, or industry has an obligation to restock.

Confusion in the NSR debate arises, in part, because this narrow use of the term NSR does not capture the entire area of the forest that people are concerned about. In this report, the Board attempts to clarify the use of the term NSR; quantify the area that may not meet our expectations for future timber supply; identify what needs to be done to decide if it is a problem; and only then, offer suggestions about what to do about it.

Decisions about what to do about areas within the timber harvesting landbase where the mountain pine beetle and fires have killed most of the trees will have an impact on the future timber supply. At a minimum, if nature is left to take its course, the eventual crop of timber in those areas will be delayed, and will be less likely to meet optimum timber production standards.

There is little doubt that a very large area of forest affected by mountain pine beetles may not meet our expectations for future timber supply. However, there is substantial uncertainty about how much of that area will be salvage harvested and come under the forest industry's legal obligation to restock. Nevertheless, the cost of treating the entire remaining un-salvaged area will undoubtedly be significant. Restocking much of this area will require detailed site prescriptions and tree planting involving road building and site preparation, including snag removal. It is not unreasonable to expect a financial investment approaching \$3000 per hectare, not to mention any potential environmental costs due to these activities.

It is the Board's view that there is little value at this juncture in further refining what the 'actual' area of NSR might be. The important matter is whether it is good public policy to invest the money necessary to mitigate future timber supply impacts and, if so, how will the money be raised and invested? If action is to be taken, the Board believes it must be taken quickly.

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<sup>3</sup> *Ministry of Forests and Range Act*

[http://www.bclaws.ca/EPLibraries/bclaws\\_new/document/ID/freeside/00\\_96300\\_01](http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_96300_01)

The Board realizes that much of the public has come to think of restocking disturbed forest as 'the right thing to do' and in the case of logging, it is the law in BC. However, the decision to restock, and the appropriate way to restock, is much more complicated when dealing with beetle-attacked forests where the damage is variable, the area is extensive, and there are considerations other than the timber value, such as effects on wildlife habitat, scenic vistas, and the peak flow of rivers. An informed dialogue on the topic would be helpful. The Board hopes that this report will contribute to that dialogue.

## **Recommendations**

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The Forest Practices Board recommends that government:

1. confirm its assumptions about how much additional area will be salvage harvested by the forest industry and develop a monitoring system to track whether those assumptions are being borne out;
2. use the best information and projections currently available to conduct a broadly framed cost-benefit analysis of options to restock or not restock areas that may be NSR in the beetle affected region; and
3. carry out the survey and inventory work necessary to inform the future decisions that must be made; particularly those related to determination of the allowable annual cut in the beetle affected region.

The Board would appreciate a response from government, indicating how it will address these recommendations, by October 1, 2012.

# Detailed Report

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## Introduction

The forests that have been damaged recently by the mountain pine beetle epidemic (beetles) and large, severe wildfires are of concern to many. There has been substantial debate about whether these forests will provide the values we expect, now and into the future. Much of the debate on the topic revolves around very different statements about how much of the forest is not satisfactorily restocked (NSR).

The Forest Practices Board has prepared this special report in an effort to help promote an informed dialogue on the topic of the state of stocking in BC's forests. This report answers three questions:

- what is NSR;
- what is known and unknown about the area that is NSR; and
- what are government and the forest industry doing about NSR?

## What is NSR?

Government formalized the definition of 'not satisfactorily restocked' because of amendments to the *Forest Act*, made in 1987, that changed the requirements to restock (or reforest) areas that have been harvested. The current definition of an NSR area is:

“an area not covered by a sufficient number of well-spaced trees of desirable species.”<sup>4</sup>

A “stocking standard”<sup>5</sup> provides precise definitions of the words “sufficient,” “well-spaced” and “desirable.” The “area” referred to can be NSR for any reason (i.e., logging or natural disturbance) but the stocking standards were originally developed for use in the context of a logged cutblock.<sup>6</sup>

The definition is problematic because it does not include three pieces of context that are fundamental to the way in which government administers NSR. From an administrative perspective an area can only be NSR if:

1. it is in the timber harvesting landbase (THLB);
2. the area has been surveyed and the results have been compared to a stocking standard; and
3. industry has a legal obligation to restock the area or government has determined that the area is feasible to restock (based primarily on return on investment criteria).

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<sup>4</sup> <http://www.for.gov.bc.ca/hfd/library/documents/glossary/Glossary.pdf> (NOTE: all web links in the footnotes for this report were checked on June 1, 2012)

<sup>5</sup> Ibid. “The range of healthy, well-spaced, acceptable trees required to establish a free-growing stand ...”

<sup>6</sup> Although more than one stocking standard may apply within a single cutblock

These three administrative aspects of the meaning of the term NSR are discussed in some detail below.<sup>7</sup>

Government only uses the term NSR in the context of objectives for the timber value as defined in the *Forest Planning and Practices Regulation*. Therefore, the term NSR is only applicable to the portion of the forest where trees are harvested for commercial purposes, such as wood products like lumber and pulp; that is, the timber harvesting land base (THLB). There are about 55 million hectares of forest in British Columbia but the THLB is only 22 million hectares. In the remaining forest there is no current intent to harvest; in some cases because government has decided to not allow harvesting (e.g., in parks and old growth management areas) or because it is not economical to harvest the trees (e.g., because the trees are of low quality or are inaccessible).

Beetles and fire have affected a substantial amount of forest outside the THLB but government does not consider these areas when assessing the amount of NSR.

The forest industry has a legal obligation to restock areas it harvests and government has a legal obligation to restock areas harvested by the BC Timber Sales Program (BCTS).<sup>8</sup> In general, BCTS is subject to the same forest practices regulations as private licensees and, for the purposes of this report, the Board treats BCTS the same as licensees. However, with minor exceptions,<sup>9</sup> government has no other specific legal obligation to restock any area. Government uses the NSR classification to keep track of areas where it has a management-intent to restock. Currently, those areas are mainly areas affected by natural disturbances (primarily fires and beetles) where stocking is considered to be inadequate and an analysis has been done to demonstrate that the area is feasible to treat (primarily based on return on investment).

NSR is used to describe an area where there is either a legal obligation or management intent to restock; it is **not** used to indicate the state of stocking in the forest.

An area can be only classified NSR (or conversely, satisfactorily restocked) if it has been surveyed and compared to a stocking standard. For the forest industry this is not problematic; forest companies routinely conduct surveys of harvested areas. However, the notion that an area must be surveyed to be classified as NSR is problematic for government, as there are large areas that may be NSR because of the effects of beetles and fire, but these areas have not been surveyed.

Discussion about how much NSR area there is must be separated into amounts of **known NSR** (where surveys have been conducted) and amounts of **estimated NSR** (where it is likely that a survey would result in the classification of the area as NSR).

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<sup>7</sup> For those who are interested, a reasonably full discussion of the arcane nature of NSR can be found at: <http://www.wsca.ca/Media/Multimedia/Feb%203%20-%20NSR%20-%20FPB%20Backgrounder%20-%20Marvin%20Eng.pdf>

<sup>8</sup> Including those areas harvested under the former Small Business Enterprise Program.

<sup>9</sup> Those harvested areas harvested under *Forest Planning and Practices Regulation* s. 46, and areas where the silviculture obligation has been transferred to the district manager under *Forest and Range Practices Act* s. 30. Approximately 5 500 hectares of NSR fall into this category (Al Powelson, personal communication, 2012/05/09).



## What is known and unknown about the status of NSR areas?

Understanding that NSR is used administratively to keep track of surveyed areas where there are obligations and intentions to restock, rather than to keep track of the state of stocking in the forest, helps to explain what is reported by government about the amount of NSR and how it has changed over time (Figure 1). Government is reporting on the amount of known NSR. After the 1987 amendment to the *Forest Act*, when the forest industry began to take on the legal and financial obligation to restock harvested areas, government stated its intention to restock nearly 1.4 million hectares, which had been previously harvested but was still known NSR.

Industry's obligation grew in size for seven years because there is a lag between the time that areas are harvested and the time they are replanted or successfully regenerate naturally. This lag stabilized around 1993 and since then industry's obligation has fluctuated between 400 000 and 600 000 hectares. This represents a 'rolling inventory,' at any given time, of approximately two to four years of harvesting that is in the process of being restocked.

The area that government intended to restock in 1987 declined steadily from 1.4 million hectares to under 250 000 hectares around 1999. About half the decline was the result of provincial and federally funded reforestation programs<sup>10</sup> and the other half was the result of natural regeneration or reclassification of known NSR areas as non-productive areas (i.e., no longer part of the THLB). Since 1999, there has been little change in the area of known NSR that government has stated its management intention to restock. Additions due to the surveying and classifying of areas as NSR, because they were affected by fires and pests, reforestation failures and harvesting, have approximately equaled reductions due to planting, natural regeneration and reclassification (as non-productive areas).

The levels of additions and deletions show a strong correlation with funding for reforestation efforts, which 'bottomed out' in 2004, just prior to the advent of the current government reforestation program, Forest For Tomorrow (FFT) (Figure 2). Since the beginning of FFT, government's management intent to restock areas (i.e., that it has classified as known NSR) because of fires and pests, has risen from 34 000 hectares to 87 000 hectares. During the same time period, known NSR areas harvested prior to 1987 declined from 170 000 hectares to 89 000 hectares, mostly due to a re-evaluation of the condition of those areas (i.e., they were classified as satisfactorily restocked). Overall, government's stated management intent to restock known NSR has declined from 200 000 hectares on March 31, 2005, to 180 000 hectares on May 1, 2012.

The information presented in Figure 1 and Figure 2 is based on the data from government's Reporting Silviculture Updates and Land status Tracking System (RESULTS) database.<sup>11</sup> This system allows reasonably precise and timely statements about the amount of known NSR that is industry's legal obligation (including the BCTS obligation) and the area where government has stated a management intent to restock. On May 1, 2012, these areas were 510 000 hectares and 180 000 hectares, respectively.

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<sup>10</sup> Primarily the jointly funded Federal-Provincial Forest Resource Development Agreement program and the provincially funded Forest Renewal BC program.

<sup>11</sup> <http://www.for.gov.bc.ca/his/results/>

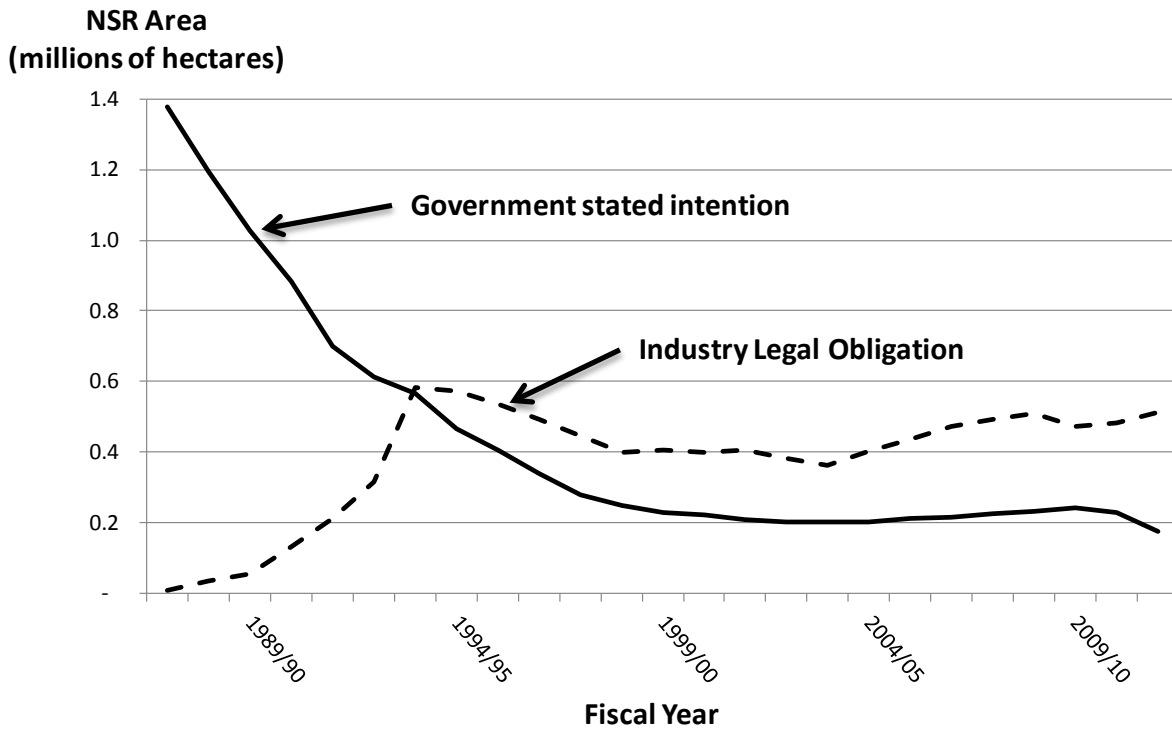


Figure 1. Area of known NSR (millions of hectares) showing separately industry's (including BCTS) legal obligation and government's stated management intention.

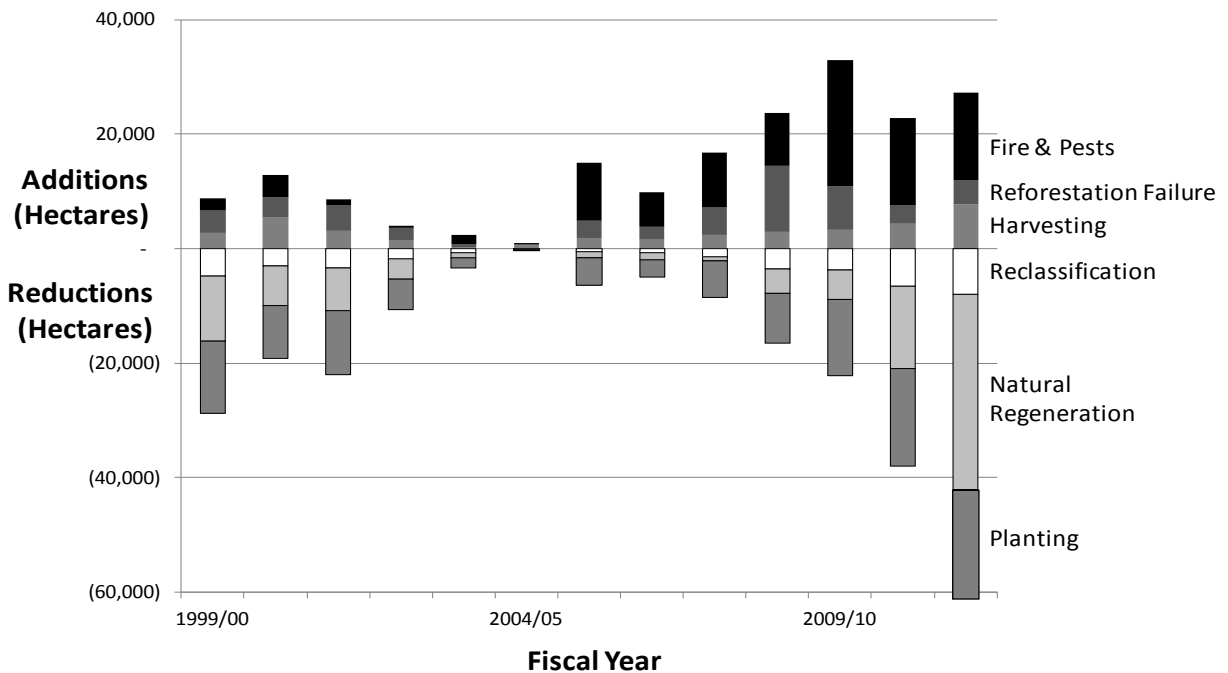


Figure 2. Additions and reductions to the amount of known NSR that government has stated a management intention to restock.

As stated previously, the fact that the amount of NSR has not changed much during the last 10 years is counter-intuitive, given that there have been very large areas disturbed by beetles and wildfires. Government is obviously aware that these disturbances have taken place, but until it completes the survey work and feasibility analysis required to classify the applicable areas as known NSR, it can only provide areas of estimated NSR.

According to government, the amount of estimated NSR caused by beetles in mature pine forest in the THLB is 0.7 to 1.1 million hectares.<sup>12</sup> The Board believes the order of magnitude of this estimate is correct, but is concerned that the precision of the estimate (nearest 100 000 hectares) substantially overstates the quality of the information that government has at its disposal. The estimate is based on:

- forest cover mapping that is substantially outdated for much of the province;<sup>13</sup>
- a model of the extent and impact of the beetles that is based on information not specifically collected for the purpose and, ever since its inception in 2004, has come with the caveat that “current mortality estimates are ... essentially unverified”;<sup>14</sup> and
- an assumption about the proportion of the area affected by beetles that is not NSR<sup>15</sup> that is based on a simple summary of available data that was not specifically collected for the purpose. The authors of that summary conclude that “generalizations about secondary structure abundance based solely on the pre-beetle dominance of merchantable pine are crude at best.”<sup>16</sup>

An analysis of the information provided by government leads the Board to conclude that the data is reliable only to the nearest million hectares; that is, there may be approximately one million hectares of estimated NSR caused by beetles in mature pine forests in the THLB.

The Board is also concerned that recent public statements by government do not provide explicit estimates for other sources of estimated NSR, some of which may be significant:

- **Wildfire:** There has been nearly 1.5 million hectares of forest affected by wildfire since 2000, both within and outside the THLB.<sup>17</sup> Government has stated that the nearly half million hectares of large fires that occurred in 2003 and 2004 have been surveyed and

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<sup>12</sup> [Chief forester’s presentation to the Western Canada Silvicultural Contractors Association in 2012](http://www.youtube.com/watch?v=r80tGI9Tbt8) (at minute 13) <http://www.youtube.com/watch?v=r80tGI9Tbt8>

<sup>13</sup> [http://www.abcfp.ca/publications\\_forms/publications/documents/Forest\\_Inventory\\_2012\\_FINAL2.pdf](http://www.abcfp.ca/publications_forms/publications/documents/Forest_Inventory_2012_FINAL2.pdf) at page 8; nearly 75 percent of the province was mapped prior to 1990

<sup>14</sup> This statement was made for the ninth time on page 11 at <http://www.for.gov.bc.ca/ftp/hre/external!/publish/web/bcmpb/year9/BCMPB.v9.BeatleProjection.Update.pdf>.

<sup>15</sup> [http://www.abcfp.ca/publications\\_forms/BCFORmagazine/documents/BCFORPRO-2011-5\\_AllArticles/BCFORPRO-2011-5\\_Snetsinger.pdf](http://www.abcfp.ca/publications_forms/BCFORmagazine/documents/BCFORPRO-2011-5_AllArticles/BCFORPRO-2011-5_Snetsinger.pdf) states that “70-80% of [beetle affected, pine leading stands on the timber harvesting landbase] have advanced regeneration in quantities that can regenerate these sites successfully.”

<sup>16</sup> Coates, D. and D. Sachs. 2012. Current State of Knowledge Regarding Secondary Structure in Mountain Pine Beetle Impacted Landscapes. Unpublished report; MFLNRO.

<sup>17</sup> <http://bcwildfire.ca/History/average.htm> 2011 estimated

restocked, where required.<sup>18</sup> This leaves just under one million hectares of fires, which occurred in other years, of which possibly 0.2 million hectares may be estimated NSR.<sup>19</sup>

- **Immature forest affected by beetles:** Survey work completed in 2006 showed highly variable damage by beetles in immature, free-growing stands. That damage was severe enough in some cases to render the stands NSR.<sup>20</sup> According to government, the amount of estimated NSR in young pine stands might be 80 000 hectares.<sup>21</sup> The FFT program has added approximately 20 000 hectares of known NSR due to pests (most of which is young stands damaged by beetles). This would leave approximately 60 000 hectares that may need treatment. While this is a relatively small area, compared to the total area of young stands, it may be important to the mid-term timber supply in some management units.
- **Small scale salvage:** “Small scale salvage has been used as a tool to salvage and utilize timber that would otherwise not have been harvested, as well as addressing forest health objectives for many years.”<sup>22</sup> One of the consequences for government, of the small scale salvage program, is that licences issued for timber volumes less than 500 cubic metres, under a forest licence to cut (FLTC) tenure carry no licensee obligation to restock. Unfortunately, until 2007, there was no requirement to submit information to the RESULTS database where harvesting was done under FLTC tenures (and it appears that submissions since that time have not been complete). As a consequence, there is an unknown area harvested under this tenure that government is responsible for restocking. Although the last publicly available estimate of the size of that area is 0.3 million hectares,<sup>23</sup> the Board has been informed that government has revised the amount of estimated NSR due to this source down to 0.1 million hectares.<sup>24</sup>
- **Other natural disturbances:** There are a variety of natural disturbances, other than beetles and fire, which may be severe enough to cause a forested stand to be classified as NSR (if it were surveyed). These disturbances are, with few exceptions,<sup>25</sup> native to

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<sup>18</sup> [http://www.abcfp.ca/publications\\_forms/BCFORmagazine/documents/BCFORPRO-2011-5\\_AllArticles/BCFORPRO-2011-5\\_Snetsinger.pdf](http://www.abcfp.ca/publications_forms/BCFORmagazine/documents/BCFORPRO-2011-5_AllArticles/BCFORPRO-2011-5_Snetsinger.pdf)

<sup>19</sup> Ibid. 10 percent to 25 percent of the fire affected area.

<sup>20</sup> [http://www.for.gov.bc.ca/rsi/foresthealth/PDF/Young%20Pine%20Report\\_CF\\_final.pdf](http://www.for.gov.bc.ca/rsi/foresthealth/PDF/Young%20Pine%20Report_CF_final.pdf)

<sup>21</sup> Unpublished Forest For Tomorrow Business Case unpublished; but see [http://www.google.ca/url?sa=t&rct=j&q=forest%20for%20tomorrow%20business%20case&source=web&cd=1&sqi=2&ved=0CB4QFjAA&url=http%3A%2F%2Fforestsfortomorrow.ca%2FProgramManagement%2FProgramReview%2FDocuments%2FBusiness\\_Case\(KellyOsbourne\).ppt&ei=8o9jT4iIJOjViAKfq2iDw&usg=AFQjCNHXo-JE782ccpOpH9\\_BKF6qAA3QoQ](http://www.google.ca/url?sa=t&rct=j&q=forest%20for%20tomorrow%20business%20case&source=web&cd=1&sqi=2&ved=0CB4QFjAA&url=http%3A%2F%2Fforestsfortomorrow.ca%2FProgramManagement%2FProgramReview%2FDocuments%2FBusiness_Case(KellyOsbourne).ppt&ei=8o9jT4iIJOjViAKfq2iDw&usg=AFQjCNHXo-JE782ccpOpH9_BKF6qAA3QoQ) slide 6.

<sup>22</sup> <http://www.for.gov.bc.ca/ftp/hth/external!/publish/Web/timber-tenures/small-scale-salvage/sss-3-year-strategic-plan-2007-08-to-2010-11.pdf>

<sup>23</sup> Page 23 at [http://www.google.ca/url?sa=t&rct=j&q=key%20silviculture%20statistics&source=web&cd=1&ved=0CCEQFjAA&url=http%3A%2F%2Fwww.for.gov.bc.ca%2Fhfp%2Fsilviculture%2Fdiscussion\\_paper%2FKey%2520Silviculture%2520Statistics%2520version%25202.ppt&ei=76tjT5vvD6ShiAKrzZ2jDw&usg=AFQjCNF8mS\\_ul6x7EjYTs72jKICT4H5uQ](http://www.google.ca/url?sa=t&rct=j&q=key%20silviculture%20statistics&source=web&cd=1&ved=0CCEQFjAA&url=http%3A%2F%2Fwww.for.gov.bc.ca%2Fhfp%2Fsilviculture%2Fdiscussion_paper%2FKey%2520Silviculture%2520Statistics%2520version%25202.ppt&ei=76tjT5vvD6ShiAKrzZ2jDw&usg=AFQjCNF8mS_ul6x7EjYTs72jKICT4H5uQ)

<sup>24</sup> Personal Communication; Jim Sutherland; May 1, 2012.

<sup>25</sup> E.g. white pine blister rust; Gypsy moth.

British Columbia and they have likely always experienced cycles in their effects on forests. However, the recent extent of some of these disturbances is thought to be an unprecedented result of climate change (e.g., *Dothistroma* needle blight<sup>26</sup>) and in other cases both climate change and forest management activities are implicated (e.g., western spruce budworm<sup>27</sup>). While government staff has recently expressed concerns about the effects of climate change on natural disturbances,<sup>28</sup> no estimates have been provided of the area that might have become NSR as a result of these effects. Substantial effort has been expended in dealing with the *Dothistroma* needle blight infestation in young pine stands in northwestern BC and some of that area remains as known NSR.

In summary, there are a number of sources of estimated NSR, but the area of those sources is poorly known. Given the uncertainty, the Board concludes that the total combined area of known NSR and estimated NSR may be on the order of two million hectares (Table 1).

*Table 1. known NSR and estimated NSR area (hectares) by source.*

Source	NSR area <sup>1</sup>
<b><u>Known NSR (from RESULTS<sup>2</sup>)</u></b>	
Government's Management Intention	180 000
Industry Legal Obligation	510 000
<b><u>Estimated NSR (see text for explanation)</u></b>	
Beetles in mature pine stands	1 000 000
Beetles in immature pine stands	60 000
Wildfire	20 000
Small Scale Salvage	100 000
Other natural disturbances	?
<b>Total NSR<sup>3</sup></b>	<b>2 000 000</b>

<sup>1</sup> zeros are not significant; they provided as placeholders only.  
<sup>2</sup> on May 1, 2012.  
<sup>3</sup> because of uncertainty in the areas of the estimated sources, the total must be presented with one significant digit.

This represents about 9 percent of the approximately 22 million hectares in the THLB. To place this in context, nearly 40 percent of the THLB (8 million hectares) is currently in 'managed' stands; resulting principally from forest harvesting. These stands are in one of three categories: known NSR, satisfactorily restocked immature stands, or free growing young stands (Figure 3). Note that industry is legally obliged, after harvesting, for both creating a satisfactorily restocked stand and seeing that stand through until it is free growing; when the responsibility reverts to

<sup>26</sup> Woods, A, K.D. Coates, and A Hamann. Is an Unprecedented Dothistroma Needle Blight Epidemic Related to Climate Change? Bioscience 55:761-769.

<sup>27</sup> Maclauchlan, L.E. and J.E. Brooks. 2009. Influence of past forestry practices on western spruce budworm defoliation and associated impacts in southern British Columbia. BC Journal of Ecosystems and Management 10(2):37-49.

<sup>28</sup> Woods, A., D. Heppner, H. Kope, J. Burleigh, L. Maclauchlan 2010. Forest health and climate change: A British Columbia perspective. The Forestry Chronicle, 2010, 86(4): 412-422.

government. Government estimates that approximately five million hectares of ‘unmanaged’ (i.e., not yet harvested) THLB area is in pine leading forest affected by beetles<sup>29</sup> and the Board concludes that perhaps one million hectares of that is estimated NSR. This leaves just over ten million hectares of ‘unmanaged’ (un-harvested) forest dominated by tree species other than pine, or pine dominated forests that are not yet affected by beetles.

It is important to remember three points about this estimate of the area of NSR and the context provided:

- The estimate is only applicable to the THLB. There is a large and un-quantified area of forest affected by recent natural disturbances that is outside the THLB where government has the responsibility to manage for forest values other than timber.
- The context is provincial in scope. The proportions of the forest affected are much higher in some regions.
- Both the estimate and the context are an assessment of the current situation. While it is possible to speculate on what might happen in the future, such speculation should be clearly separated from an assessment of the current situation.

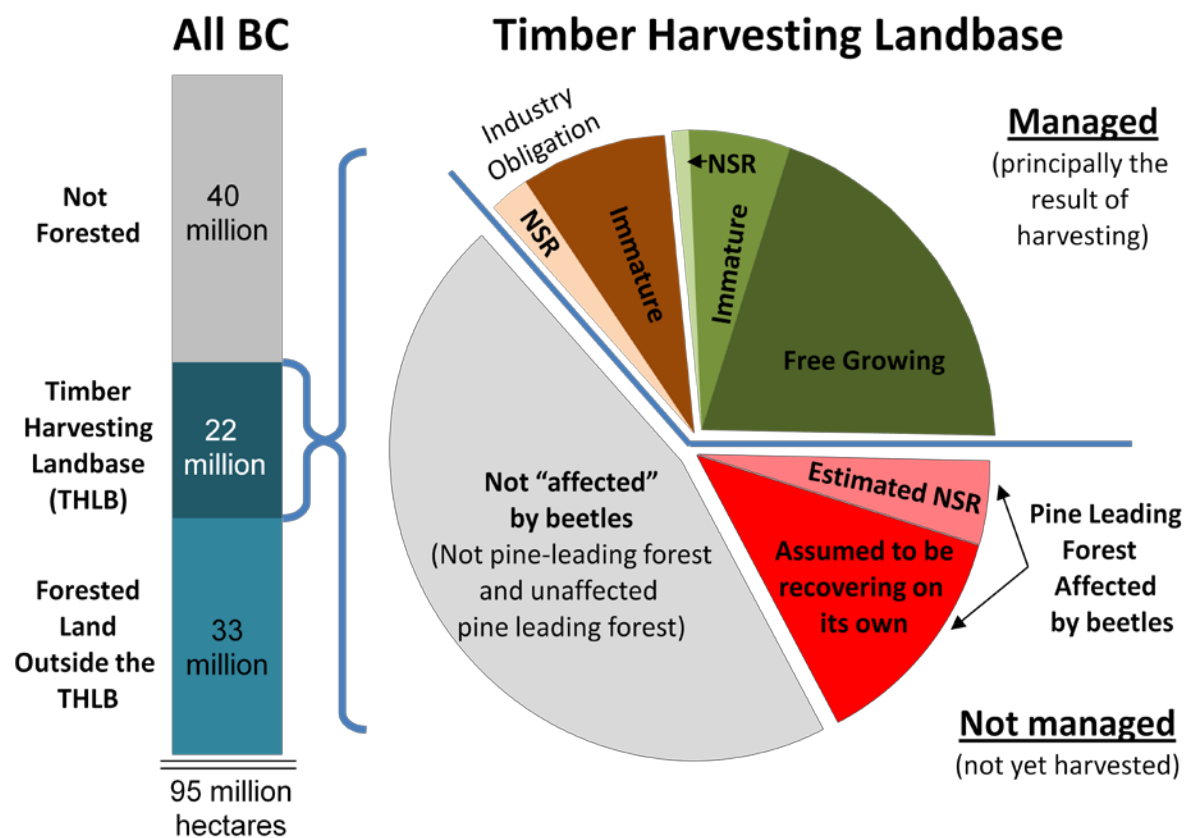


Figure 1. Proportions of the timber harvesting land base in categories relevant to questions about NSR (notes: minor sources of estimated NSR in Table 1 are not shown; industry obligation includes BCTS; government has a responsibility for that portion of the forest where there is no industry obligation).

<sup>29</sup> [Chief forester’s presentation to the Western Canada Silvicultural Contractors Association in 2012](http://www.youtube.com/watch?v=r80tGI9Tbt8) (at minute 11) <http://www.youtube.com/watch?v=r80tGI9Tbt8>.

## What are the Forest Industry and Government doing about NSR?

### The Forest Industry

The Board is confident that the forest industry is meeting the legal obligation to satisfactorily restock harvested areas. This confidence is based primarily on the results of the Board's audit program. However, there are two caveats in this context:

1. The Board has previously reported that government may not be fully aware of the extent of industry NSR because of late reporting to the RESULTS database.<sup>30</sup>
2. The Board is aware of concerns that restocking of harvested areas to stocking standards established<sup>31</sup> in forest stewardship plans may not be sufficient to create a resilient forest consistent with public expectations and assumptions. There are many other considerations such as tree species diversity, use of select seed versus natural regeneration, post-free growing performance of stands, etc.

The forest industry is continuing to harvest pine forests affected by beetles. During the 2011/2012 fiscal year, nearly 60 percent of the volume harvested in the interior of BC was pine.<sup>32</sup> If continued, this harvesting will reduce the area that is estimated NSR because of beetles, since the forest industry will assume the legal obligation to restock those areas. However, there are two sources of uncertainty:

- It is not clear whether the continued harvest of pine stands is being directed solely or principally at areas that would otherwise be classified NSR; that is, areas not 'recovering on their own,' although the *Forest Planning and Practices Regulation* does contain a section that attempts to prevent harvesting of pines stands affected by beetles that have sufficient stocking to contribute to the mid-term timber supply.<sup>33</sup>
- The amount of salvage harvesting that will occur in the future is very uncertain. There are indications that the salvaging of beetle affected timber to produce traditional products (e.g., lumber) is beginning to wind down.<sup>34</sup> Conversely, the Board is aware of instances of specific market conditions that have contributed to the continued salvage of beetle-affected pine. These include power co-generation opportunities and increased demand for wood pellets and pulp that have, in some cases, enabled the harvesting of otherwise uneconomical stands.

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<sup>30</sup> [http://www.fpb.gov.bc.ca/SIR33\\_Reporting\\_the\\_Results\\_of\\_Forestry\\_Activities.pdf](http://www.fpb.gov.bc.ca/SIR33_Reporting_the_Results_of_Forestry_Activities.pdf)

<sup>31</sup> These standards are usually default standards provided by government that are adopted by the authors of the Forest Stewardship Plans.

<sup>32</sup> Based on information obtained from the Harvest Billing System.

<sup>33</sup> Section 43.1 - Secondary structure retention in mountain pine beetle affected stands.

[http://www.bclaws.ca/EPLibraries/bclaws\\_new/document/ID/freeside/12\\_14\\_2004#section43.1](http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/12_14_2004#section43.1)

<sup>34</sup> Notably; declines of more than 10 percent in the contribution of pine to harvest in 2010, compared to the peak in pine contribution for 9 of 29 beetle impacted management units (average decline 23 percent). ([http://www.for.gov.bc.ca/hts/pubs/Monitoring%20Harvest%20activity%20AP\(July\\_20\\_2011\)\\_AN.pdf](http://www.for.gov.bc.ca/hts/pubs/Monitoring%20Harvest%20activity%20AP(July_20_2011)_AN.pdf)); allowable cut determinations for TFL 35 and TFL 49 where cuts have been decreased to pre-salvage levels; and the small number of active cutting permits in some areas most severely affected by beetles such as south of Ootsa Lake, the southern portion of the Prince George District.

## Government

For the past 12 years, government has used a variety of policy levers<sup>35</sup> to encourage the forest industry to harvest areas affected by beetles, and thus to take on obligations to restock those areas. Approximately 1.3 million hectares of pine leading stands have been harvested since the beginning of the outbreak in 1999.<sup>36</sup> However, it is unknown how much of this area would have been classified as NSR had it not been harvested.

As mentioned above, salvage harvesting for lumber production is beginning to decline. Government is attempting to encourage continued harvesting (and associated restocking obligations) for other purposes; specifically through a bioenergy industry,<sup>37</sup> partnerships in forest carbon restoration projects<sup>38</sup> and, more generally, through the promotion of a “bioeconomy.”<sup>39</sup> It remains to be seen how successful these endeavors will be.

Government is meeting its management intention to restock areas of known NSR through its Forests For Tomorrow (FFT) program, funded as a portion of the Landbase Investment Program.<sup>40</sup> The FFT program began operating in 2005. The 2007 FFT business case used an amount of 400 000 hectares of estimated NSR in mature beetle affected pine, young beetle affected pine and fire affected areas. A 20-year program of reforestation, that addressed 20 000 hectares per year, was proposed with an estimated cost of 60 million dollar per year. In the four intervening years<sup>41</sup> the FFT program has planted an average of 9 700 hectares and has been funded at an average of 41 million dollars. Planting tree seedlings is intended to produce a crop of trees suitable for harvest more quickly than natural regeneration would. The rate at which government is pursuing these activities means that much of the area of estimated NSR will regenerate naturally before it is treated.

To date, the FFT program has been largely focused on rehabilitating young (but free growing) forests affected by fires and beetles. The FFT program has also rehabilitated some areas of mature beetle affected forest through partnerships with the BCTS, where BCTS removes the timber and FFT undertakes the reforestation.<sup>42</sup> However, work on rehabilitating mature pine stands affected by beetles will not begin in earnest until it is clear that the forest industry will not be salvage harvesting the relevant areas.

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<sup>35</sup> The most obvious was increases in the allowable annual cut but various forms of “administrative relief” have also been used.

<sup>36</sup> <http://www.youtube.com/watch?v=r80tGI9Tbt8> at minute 13.

<sup>37</sup> <http://www.for.gov.bc.ca/pab/nfw/bioenergy-guide-2010.pdf>

<sup>38</sup> <http://www.newsroom.gov.bc.ca/2012/01/province-seeks-pine-beetle-reforestation-partners.html>

<sup>39</sup> [http://www.gov.bc.ca/jti/down/bio\\_economy\\_report\\_final.pdf](http://www.gov.bc.ca/jti/down/bio_economy_report_final.pdf)

<sup>40</sup> [http://www.for.gov.bc.ca/ftp/hfp/external/!publish/LBIS\\_web/2011/2011\\_12%20Prov%20LandBased%20Investm%20Progr%20REPORT%20final.pdf](http://www.for.gov.bc.ca/ftp/hfp/external/!publish/LBIS_web/2011/2011_12%20Prov%20LandBased%20Investm%20Progr%20REPORT%20final.pdf)

<sup>41</sup> 2008/09 to 2011/12 – last fiscal estimated. Estimated total area planted since the beginning of the program in 2005 is 51 000 hectares – source is RESULTS.

<sup>42</sup> Through collaboration in the use of Innovative Timber Sale Licences (ITSLs) in conjunction with FFT forest rehabilitation activities

[http://www.for.gov.bc.ca/ftp/hfp/external/!publish/fft\\_standards\\_on\\_cms\\_web/overstorey\\_removal/FFT\\_BCTS\\_MOU\[1\].pdf](http://www.for.gov.bc.ca/ftp/hfp/external/!publish/fft_standards_on_cms_web/overstorey_removal/FFT_BCTS_MOU[1].pdf)



Some FFT resources have been devoted to known NSR areas created by small scale salvage and some to the assessment (and reclassification) of known NSR areas created before 1987. Additionally, FFT resources are used where government has agreed to fund restocking of immature plantations, created by the forest industry, that have been affected by natural disturbances (under section 108 of the *Forest and Range Practices Act*). Finally, some FFT resources are required to maintain the stocking status of areas planted under the program (e.g., brush control activities).

Government has begun to engage in a number of projects that could provide some better information about the stocking status of the forests. These include:

- **MPB Impacted Stands Assessment Project.**<sup>43</sup> The goal of the project is to characterize the future growth potential of mature, beetle affected pine stands if left to naturally develop. A review of existing plot-based data has been completed. As part of this project, government intends to resample 60 beetle affected permanent sample plots during the summer of 2012 and another 500 plots over the next three years.
- **Framework for Implementing Young Stand Growth Monitoring In British Columbia.**<sup>44</sup> A sampling protocol has been developed to allow an assessment of the state of the free-growing forest relative to timber supply expectations. The protocol will be tested this coming year in the Morice and Kootenay Lakes Timber Supply Areas (TSA).
- **Pilot project to investigate a low cost forest cover inventory approach.** A project using satellite image interpretation, which has been completed for the western portion of the Quesnel TSA. An additional project in the portion of the Williams Lake TSA affected by beetles is planned for 2012.
- **Focused re-inventory of beetle affected management units.** This has been initiated in the Quesnel, Williams Lake, 100 Mile, and Lakes TSAs and the Vanderhoof Natural Resource Operations Districts.

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<sup>43</sup> Coates, K.D. and D.L. Sachs 2012. MPB Impacted Stands Assessment Project: Current State of Knowledge Regarding Secondary Structure in Mountain Pine Beetle Impacted Landscapes; unpublished MFLNRO document.

<sup>44</sup> [http://www.for.gov.bc.ca/hts/vri/monitoring/downloads/monitoring-framework\\_13Jan2012\\_ver2-2.pdf](http://www.for.gov.bc.ca/hts/vri/monitoring/downloads/monitoring-framework_13Jan2012_ver2-2.pdf)

## Conclusions and Implications

NSR was a useful indicator for government to track its progress in addressing a 25-year old problem that has now been largely solved: government's dissatisfaction with regeneration of the 1.4 million hectares of forest harvested before 1987. Tracking efforts to resolve that problem required an indicator (NSR) with a narrow and specific administrative meaning. While NSR continues to be a useful administrative tool for tracking current obligations and intentions to restock, we need indicators that actually track the status of the current problems in the forest, both within and outside the THLB.

Developing such indicators requires us to ask the question 'what is satisfactory?' That is, what are we trying to achieve with forest management specifically and, more generally, with natural resource management? These questions go directly to our objectives for timber and other values. The Auditor General of BC has recently concluded that government does not have clearly defined, provincial-scale objectives for the timber value.<sup>45</sup> In 2011, the Board raised concerns about the need for government to articulate natural resource management objectives for the entire landbase.<sup>46</sup> Articulating these objectives in the context of the NSR debate requires answering questions that include:

- Where in the forest do we expect to produce the timber (or perhaps the fibre) value?
- What amounts and qualities of timber can we reasonably expect to produce; in the short, medium, and long term?
- What are the risks that our expectations will not be met, and what is our risk tolerance and risk mitigation strategy?
- How should government measure or indicate sustainability of timber management?

There is no single, right answer to these questions. The best we can hope to achieve is a consensus that is acceptable to the people of BC. That consensus will not be static; it will require an ongoing process of engagement with those who have an active 'stake' in the forest.

In the meantime, the most pressing issue related to the topic of NSR is: what is the impact of the recent beetle outbreak on the future timber supply for the central interior of British Columbia? It is clear that if there is approximately one million hectares of NSR resulting from natural disturbances and if government intends to rehabilitate those areas at the current rate that the FFT program is operating (approximately 10 000 hectares per year) there will be substantial areas that will regenerate naturally before they are treated. Compared to replanting the entire area promptly, this will have negative consequences for the future timber supply in the area affected by beetles. What is not clear, however, is what, if anything, should be done to ameliorate the timber supply consequences?

Part of the problem with answering that question is the significant uncertainties related to the issue. Notably; what is the current state of the mature pine forest affected by beetles in the most severely impacted areas<sup>47</sup> and how might that forest perform in the future with respect to the

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<sup>45</sup> [http://www.bcauditor.com/files/publications/2012/report\\_11/report/OAGBC\\_FLNRO-Management-Timber.pdf](http://www.bcauditor.com/files/publications/2012/report_11/report/OAGBC_FLNRO-Management-Timber.pdf)

<sup>46</sup> [http://www.fpb.gov.bc.ca/SR39\\_Cumulative\\_Effects\\_From\\_Assessment\\_Towards\\_Management.pdf](http://www.fpb.gov.bc.ca/SR39_Cumulative_Effects_From_Assessment_Towards_Management.pdf)

<sup>47</sup> The Sub-Boreal Spruce, Sub-Boreal Pine Spruce and portions of the Montane Spruce Biogeoclimatic zones.

objective of producing timber? Resolving these uncertainties requires, at a minimum, a program of ground-based field sampling designed to meet the needs of the growth and yield models used by government in the timber supply review process. Government's proposal to re-measure permanent sample plots partly answers that question; however, the Board is concerned that, given the level of uncertainty and the immediacy of the question, the proposed program will be 'too little, too late.' Another principal uncertainty is how much beetle-affected forest will be harvested by the forest industry and therefore will not require rehabilitation by government. While these uncertainties cannot be completely resolved, reasonable efforts should be made to reduce them.

Finally, although this report is concerned with NSR, in the context of the timber value, there are many other values, both inside and outside the THLB, that need to be considered when making decisions about whether to rehabilitate areas. Monetary value (return on investment) is part of the Forests For Tomorrow program's decision-making process for each forested stand that is surveyed. However, making stand-level decisions alone leaves more general questions unanswered about how many public funds should be devoted to rehabilitation of forests damaged by natural disturbances. Such broader policy questions require broader cost-benefit analyses incorporating landscape level considerations about both timber and non-timber values, and a comprehensive risk-based approach designed to inform decision-making about whether treatment would be useful.



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