

# Timber Growth and Value Program

## Eligible Research Topics 2009/10

August 2008

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NOTE: The 2009/10 Call for Proposals is focused on a subset of the Timber Growth and Value Program themes and topics. Although the complete set of themes and topics is provided in Appendix 1 of this document, only those identified as eligible for funding are included in the 2009/10 Call for Proposals.



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## Timber Growth and Value Program Eligible Research Topics 2009/10

### Introduction

The research topics and issues described in this document are those eligible for funding under the Timber Growth and Value funding category of the Forest Investment Account Forest Science Program (FIA-FSP) in 2009/10. For simplicity of presentation, this document includes only the research topics and issues eligible for funding in 2009/10<sup>1</sup>. Other information related to the Call for Proposals is available from the PricewaterhouseCoopers website ([www.bcfsp.com](http://www.bcfsp.com)).

Research issues are organized by theme and topic, with the eligibility of each research issue specified by geographic region. The regions used are those of the Ministry of Forests and Range: Coast (C), Northern Interior (NI), and Southern Interior (SI). A map showing these regions is available at: <http://www.for.gov.bc.ca/mof/maps/regdis/>

The ten-year research strategy of the TPAC, *Timber Growth and Value Program Research Strategy 2008-2018*, will contain the complete list of research topics and will provide context for understanding research priorities. The Strategy is currently being updated and the final version will be available in December 2008. The complete list of themes, topics, and research issues considered in preparation for this Call for Proposals is presented in Appendix 1.

### Submitting proposals

Proposals for research must be submitted using the appropriate proposal templates and guidelines, which are available at [www.bcfsp.com](http://www.bcfsp.com).

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<sup>1</sup> Note that the numbering of research topics does not imply ranking.

## Eligible Topics and Research Issues for 2009/10

This list of research issues eligible for funding in 2009/10 are a subset of those identified in the Timber Growth and Value Program ten-year strategy and is provided by the TPAC at the request of the FIA-FSP Forest Science Board (FSB). The FSB made this request to identify the highest priority research issues as a means of ensuring that the FIA-FSP funds are used efficiently and effectively.

### Theme 1.0 Basic research on tree growth and stand development

Improve the understanding of basic biological processes such as competition for light, nutrients, and moisture, and the resulting allocation of carbon that regulates tree growth and stand development. This information is needed to improve operational models and decision-support tools.

#### 1.1 Complex stands, including partial cutting, variable-retention harvesting

Complex stands encompass stands with multiple species including broadleaves, and stands with structural diversity.

Areas of research eligible for funding in 2009/10 include:

| Research issues for topic 1.1 |  | C | NI | SI |
|-------------------------------|--|---|----|----|
| 2                             | Microclimate effects related to tree and stand growth in multi-storied stands. | ✓ | ✓  | ✓  |
| 4                             | Natural regeneration processes in multi-storied stands                         |   | ✓  | ✓  |

### Theme 2.0 Design and analysis of silvicultural systems

Compare silvicultural systems and management regimes at the stand, forest, and landscape levels with the aim of choosing systems that provide timber volume and value at high levels while also providing specific non-timber values of interest.

#### 2.1 Complex stands including partial cutting, variable-retention

Development and monitoring of silvicultural systems for complex stands (multi-species, structurally complex) at multiple scales (stand, forest, and landscape,).

Areas of research eligible for funding in 2009/10 include:

| Research issues for topic 2.1 |   | C | NI | SI |
|-------------------------------|---|---|----|----|
| 2                             | The relationship between residual stand structure and understory recruitment and development; evaluation of the results of partial cuts and the effects on stand establishment, early growth and yield, and response to management practices. | ✓ | ✓  | ✓  |
| 3                             | Experiments and analysis of various stand treatment regimes on regeneration.  | ✓ | ✓  | ✓  |

**Theme 3.0 Growth and yield modeling/predictions**

Develop and improve models and decision-support tools that predict tree and stand characteristics related to the production of timber volume and value and to specific non-timber values of interest, with priority given to models that support the provincial Timber Supply Review. This research may also include estimating and evaluating the impacts of management decisions on timber at multiple scales (stand, forest, and landscape). Research should address novel ideas and ways to improve existing approaches for accurately predicting growth and yield (volume, value, and stand structure) of BC’s forests under any resource management or natural disturbance regime. Funding for existing modeling approaches (e.g., TASS, Prognosis) is provided separately through the Growth and Yield Modeling Subprogram (GYMS).

3.1 Complex stands including partial cutting, variable retention (excluding site productivity)

Models of complex stands, including those with multiple species and stands with structural diversity.

Areas of research eligible for funding in 2009/10 include:

| Research issues for topic 3.1 |   | C | NI | SI |
|-------------------------------|---|---|----|----|
| 9                             | Research conducted in the following interior (ESSF, IDF, MS, ICH, SBS, SBPS, BWBS, PP) and coastal (MH, CDF, CWH) BEC zones | ✓ | ✓  | ✓  |

**Theme 4.0 Timber losses to environmental and biotic factors (wind, drought, insects <including mountain pine beetle>, disease, animal damage, fire)**

Find methods to predict and mitigate timber losses due to environmental factors.

4.1 Stand and forest dynamics following mountain pine beetle (MPB)

Research should be aimed at understanding and quantifying how stands will develop following MPB attack, including post-attack stand dynamics and succession. Research under this topic may involve the use of growth and yield models, but should not be mainly about growth and yield model development.

Areas of research eligible for funding in 2009/10 include:

| Research issues for topic 4.1 |  | C | NI | SI |
|-------------------------------|--|---|----|----|
| 1                             | Growth, development, and health of residual stands following MPB attack including younger stands (e.g., 25-30-year-old plantations). Includes timber supply implications, species interactions related to the scale and pattern of harvesting, and actions to mitigate MPB losses. Where absence of information can be demonstrated, efforts to estimate the extent and intensity of MPB impacts on younger stands will be considered. |   | ✓  | ✓  |
| 4                             | Mitigating MPB losses: silvicultural treatments and regimes, such as fertilization of non-lodgepole pine stands, treatment of repressed lodgepole pine stands, mixedwood management, broadleaved species management, and underplanting, to accelerate operability, enhance mid-term timber supply, and reduce future risks.  |   | ✓  | ✓  |

4.2 Estimating and/or mitigating stand-level losses

Research may involve the use of growth-and-yield models, but should not be mainly about growth-and-yield model development.

Areas of research eligible for funding in 2009/10 include:

| Research issues for topic 4.2 |  | C | NI | SI |
|-------------------------------|--|---|----|----|
| 3                             | Spruce bark beetle   |   | ✓  | ✓  |
| 8                             | Dwarf mistletoe. New research projects are limited to studying infection processes and rates in the understory of MPB affected stands. |   |    | ✓  |

4.4 Site productivity impacts

Recent large wildfires and the current MPB infestation have significantly impacted hydrologic processes and productivity at the site level. The possibility of increases in the frequency of such events due to climate change is creating concern. Forest policy makers and managers have little information about how major disturbances impact these site factors, and therefore, how they impact stand establishment, growth and health. Research under this topic aims to understand and assess the impacts of disturbance (especially extensive disturbance such as MPB mortality and salvage) on site hydrology and productivity.

Areas of research eligible for funding in 2009/10 include:

| Research issues for topic 4.4 |  | C | NI | SI |
|-------------------------------|--|---|----|----|
| 1                             | Impacts of changes to site hydrology due to major disturbance (e.g., MPB mortality/salvage, fires) on productivity and growing conditions. |   | ✓  | ✓  |

**Theme 5.0 Analytical techniques and models for strategic analysis**

Development of new tools and the improvement of existing tools to support analysis of timber and NTFP supply, or the joint production of timber and non-timber values for resource analysis or local land-use planning.

5.1 Development of novel methods to integrate data and models across scales

Research under this topic will involve developing techniques for integrating various data sources and models for strategic analyses.

Areas of research eligible for funding in 2009/10 include:

| Research issues for topic 5.1 |  | C | NI | SI |
|-------------------------------|--|---|----|----|
| 1                             | Techniques for integrating various data sources for strategic analyses (e.g., forest inventory, remote sensing, growth and yield, and non-conventional data layers such as NTFP and tourism) | ✓ | ✓  | ✓  |

5.2 Development of novel methods to link GY models to process, climate, hydrology, wildlife and other models

Development of new tools, and the improvement of existing tools to support analysis of timber and NTFP supply, or the joint production of timber and non-timber values for resource analysis or local land-use planning.

Areas of research eligible for funding in 2009/10 include:

| Research issues for topic 5.2 |   | C | NI | SI |
|-------------------------------|---|---|----|----|
| 2                             | Linking GY models with other resource models (e.g., climate, hydrology, wildlife habitat supply, and other models). | ✓ | ✓  | ✓  |

**Theme 6.0 Marketable resources other than timber**

Effects of silvicultural systems on Non-Timber Forest Products (NTFPs), and the values derived from non-timber forest products. Non-Timber Forest Products include products for cultural, subsistence, recreational, and commercial uses.

6.2 Non-timber forest products (NTFP)<sup>2</sup>

Research on the interactions of both forest management and traditional First Nations (FN) management on NTFP, and techniques for enhancing NTFP and overall stand value, with the objective of developing better co-management practices by combining silviculture with botanical, experiential, and traditional-use knowledge. Researchers must explain their choice of species, and must demonstrate a high level of FN community involvement and participation for species of that are of particular significance to FN.

Areas of research eligible for funding in 2009/10 include:

| Research issues for topic 6.2 |  | C | NI | SI |
|-------------------------------|--|---|----|----|
| 5                             | Ecological research (autecology, synecology, NTFP harvest effects) on key NTFPs or suites of NTFP species. Research proposals are particularly invited on heavily utilized and impacted NTFP species, and those affected by MPB. | ✓ | ✓  | ✓  |

<sup>2</sup> Non-timber forest products are all of the botanical and mycological resources and associated services of the forest other than conventional timber and wood fibre products. Based on the definition provided by the Centre for Non-Timber Resources at Royal Roads University ([http://cntr.royalroads.ca/about\\_ntfp\\_sector/definition\\_overview](http://cntr.royalroads.ca/about_ntfp_sector/definition_overview)).

**Theme 7.0 Climate change**

Effects of climate change on tree and stand growth at multiple scales ranging from individual tree to forest and landscape scales.

7.1 Predicting effects of climate change on forest health and condition (e.g., insects, disease, fire)

Research will involve developing an understanding of the key controlling variables affecting how natural disturbance agents will respond to a changing climate, and the associated effects on forest productivity, health, and condition under alternate natural disturbance regimes.

Areas of research eligible for funding in 2009/10 include:

| Research issues for topic 7.1 |  | C | NI | SI |
|-------------------------------|--|---|----|----|
| 1                             | Determining how insects and disease (as biotic agents of change) will respond to climate change, and the controlling variables in the response.      |   |    | ✓  |
| 2                             | Methods for forecasting the effects of climate change on forest productivity, susceptibility to pests and pathogen outbreaks, and plantation health. |   |    | ✓  |

7.2 Predicting effects of climate change on growth and productivity

Research on the effects of predicted changes in climate on growth and productivity of forest ecosystems.

Areas of research eligible for funding in 2009/10 include:

| Research issues for topic 7.2 |   | C | NI | SI |
|-------------------------------|---|---|----|----|
| 1                             | Predicting the effects of climate change on the management and growth and yield of current and future stands. | ✓ | ✓  | ✓  |

7.4 Physiological and adaptive responses of species and seedlots

Research will involve developing an understanding of physiological and adaptive responses of tree species used to produce seeds for reforestation under various climatic conditions.

Areas of research eligible for funding in 2009/10 include:

| Research issues for topic 7.4 |   | C | NI | SI |
|-------------------------------|---|---|----|----|
| 1                             | Quantifying plant-climate relationships and estimating the future range and deployment of BC tree species and genotypes, including bio-climatic modeling and opportunities for facilitated migration to match genotypes with future environments. |   | ✓  | ✓  |

## Appendix 1 2009/10 Timber Growth and Value Program research strategy themes, topics and research issues

This appendix contains the complete set of themes, topics, and research issues considered for the 2009/10 Call for Proposals, and represents an interim position between historic (2006-2016) and new (2008-2018) versions of the Timber Growth and Value Program research strategy. Only a subset of this list is eligible for funding, as outlined in the main body of this document.

**Table A1 2009/10 Complete list of Timber Growth and Value Program themes, topics, and research issues.**  
Columns 4 to 6 indicate relevance to the Future Forest Ecosystem Initiative (FFEI), identified First Nations interests (FN), and Mountain Pine Beetle (MPB). Research issues are scored regionally with values ranging from 1 to 8 (high to low priority). Numbers missing from the sequence in columns 1 and 3 indicate that the associated topic or research issue has been retired, or moved to another section of the hierarchy.

| #          | Theme/Topic  | Research Issue | FFEI  | FN | MPB | Score |         |         |   |
|------------|--|----------------|---|----|-----|-------|---------|---------|---|
|            |  |                |   |    |     | Coast | N. Int. | S. Int. |   |
| <b>1.0</b> | <b>Basic research on tree growth and stand development</b>   |                |   |    |     |       |         |         |   |
| 1.1        | Complex stands including partial cutting, variable retention | 1              | Species interactions  |    |     |       | 5       | 4       | 4 |
|            |  | 2              | Microclimate effects related to tree and stand growth in multi-storied stands   |    |     |       | 2       | 2       | 2 |
|            |  | 3              | Natural regeneration processes in multi-storied stands  |    | FN  | MPB   | 3       | 1       | 1 |
|            |  | 6              | Mortality in seedling, sapling and pole stages  |    |     |       | 4       | 3       | 3 |
| 1.2        | Early stand growth   | 1              | Subalpine fir ( <i>Abies lasiocarpa</i> )   |    |     | MPB   | 8       | 4       | 4 |
|            |  | 2              | Western redcedar ( <i>Thuja plicata</i> )   |    | FN  |       | 4       | 5       | 5 |
|            |  | 3              | Yellow-cedar ( <i>Chamaecyparis nootkatensis</i> )  |    | FN  |       | 4       | 8       | 8 |
| 1.3        | Old trees and stands   | 1              | Stand dynamics (e.g., volume loss, decay, succession, stand breakup, mortality). Includes, cedar, hemlock, aspen, true fir stands |    | FN  |       | 4       | 5       | 4 |
|            |  | 2              | Mortality   |    |     |       | 4       | 5       | 5 |
|            |  | 3              | Succession and stand dynamics   |    |     |       | 5       | 4       | 4 |

| #   | Theme/Topic  | Research Issue | FFEI | FN   | MPB | Score |         |         |   |
|---|--|----------------|------|------|-----|-------|---------|---------|---|
|   |  |                |      |      |     | Coast | N. Int. | S. Int. |   |
| <b>2.0 Design and analysis of silvicultural systems</b> |  |                |      |      |     |       |         |         |   |
| 2.1   | Complex stands including partial cutting, variable retention                               | 2              |      | FN   |     | 2     | 2       | 2       |   |
|   |  | 3              |      |      |     | 2     | 2       | 2       |   |
|   |  | 4              |      |      |     | 5     | 5       | 5       |   |
|   |  | 5              |      | FFEI | FN  |       | 7       | 5       | 4 |
|   |  | 6              |      |      | FN  |       | 5       | 5       | 5 |
| 2.2   | Even-aged stands   | 1              |      |      |     | 4     | 4       | 4       |   |
|   |  | 3              |      |      |     | 5     | 5       | 5       |   |
|   |  | 4              |      |      |     | 8     | 7       | 6       |   |
|   |  | 5              |      |      |     | 8     | 7       | 8       |   |
|   |  | 6              |      |      |     | 6     | 6       | 6       |   |
| <b>3.0 Growth and yield modeling/predictions</b>        |  |                |      |      |     |       |         |         |   |
| 3.1   | Complex stands including partial cutting, variable retention (excluding site productivity) | 8              |      |      |     | 5     | 5       | 5       |   |
|   |  | 9              |      |      | FN  | 2     | 2       | 2       |   |
| 3.2   | Wood quality   | 1              |      |      |     | 4     | 4       | 4       |   |

| #   | Theme/Topic   | Research Issue | FFEI  | FN | MPB | Score |         |         |   |
|-----|---|----------------|---|----|-----|-------|---------|---------|---|
|     |   |                |   |    |     | Coast | N. Int. | S. Int. |   |
| 4.0 | <b>Timber losses to environmental and biotic factors (wind, drought, insects &lt;incl. MPB&gt;, disease, animal damage, fire)</b> |                |   |    |     |       |         |         |   |
| 4.1 | Stand and forest dynamics following MPB   | 1              | Growth, development, and health of residual stands following MPB attack including younger stands (e.g., 25-30-year-old plantations). Includes timber supply implications, species interactions related to the scale and pattern of harvesting, and actions to mitigate MPB losses. Where absence of information can be demonstrated, efforts to estimate the extent and intensity of MPB impacts on younger stands will be considered |    | FN  | MPB   | 8       | 2       | 2 |
|     |   | 4              | Mitigating MPB losses: silvicultural treatments and regimes, such as fertilization of non-lodgepole pine stands, treatment of repressed lodgepole pine stands, mixedwood management, broadleaved species management, and underplanting, to accelerate operability, enhance mid-term timber supply, and reduce future risks.   |    |     | MPB   | 8       | 2       | 2 |
| 4.2 | Estimating and/or mitigating stand-level losses   | 1              | Windthrow   |    |     |       | 4       | 6       | 7 |
|     |   | 2              | Ips beetles   |    |     |       | 8       | 3       | 3 |
|     |   | 3              | Spruce bark beetle  |    |     |       | 8       | 2       | 2 |
|     |   | 4              | Root disease (Armillaria, Phellinus)  |    |     |       | 4       | 4       | 4 |
|     |   | 5              | Rusts ( Dothistroma, Commandra, Western gall)   |    |     |       | 8       | 3       | 5 |
|     |   | 6              | Spruce leader weevil  |    |     |       | 6       | 4       | 6 |
|     |   | 7              | Spruce budworm  |    |     |       | 8       | 7       | 3 |
|     |   | 8              | Dwarf mistletoe. New research projects are limited to studying infection processes and rates in the understory of MPB affected stands   |    |     |       | 5       | 6       | 2 |
|     |   | 9              | Wildlife and grazing impacts  |    |     |       | 7       | 6       | 6 |
|     |   | 10             | Growth and yield implications of stand management at the urban interface for fire hazard protection   |    |     |       | 7       | 6       | 6 |
|     |   | 11             | Root collar weevil  |    |     |       | 8       | 4       | 4 |
| 4.4 | Site productivity impacts   | 1              | Impacts of changes to site hydrology due to major disturbance (e.g., MPB mortality/salvage, fires) on productivity and growing conditions   |    |     |       | 8       | 1       | 1 |

| #          | Theme/Topic   | Research Issue |   | FFEI | FN | MPB | Score |         |         |
|------------|---|----------------|---|------|----|-----|-------|---------|---------|
|            |   |                |   |      |    |     | Coast | N. Int. | S. Int. |
| 4.5        | Understanding the basis of genotypic preference, and the basis for genetic resistance to insect and disease attacks | 1              | Mountain pine beetle (Lodgepole pine)   |      |    | MPB | 8     | 4       | 4       |
|            |   | 2              | Leader weevils (spruces)  |      |    |     | 6     | 5       | 6       |
|            |   | 3              | Rusts (lodgepole pine)  |      |    |     | 8     | 3       | 3       |
| <b>5.0</b> | <b>Analytical techniques and models for strategic analysis</b>  |                |   |      |    |     |       |         |         |
| 5.1        | Development of novel methods to integrate data and models across scales   | 1              | Techniques for integrating various data sources for strategic analyses (e.g., forest inventory, remote sensing, GY, and non-conventional data layers such as NTFP and tourism)  |      |    |     | 3     | 3       | 3       |
| 5.2        | Development of novel methods to link GY models to process, climate, hydrology, wildlife and other models            | 1              | Hybrid, empirical and process GY modeling   | FFEI |    |     | 4     | 4       | 4       |
|            |   | 2              | Linking GY models with other resource models (e.g., climate, hydrology, wildlife habitat supply, and other models)  |      |    |     | 3     | 3       | 3       |
| <b>6.0</b> | <b>Marketable resources other than timber</b>   |                |   |      |    |     |       |         |         |
| 6.2        | Non-timber forest products (NTFP)   | 5              | Ecological research (autecology, synecology, NTFP harvest effects) on key NTFPs or suites of NTFP species. Research proposals are particularly invited on heavily utilized and impacted NTFP species, and those affected by MPB |      |    |     | 1     | 1       | 1       |
|            |   | 7              | Initiate new trials to assess impacts of integrated forest management on NTFPs  |      |    |     | 5     | 4       | 5       |
|            |   | 8              | Explore the potential of species not currently used as NTFPs  |      |    |     | 6     | 6       | 6       |
| <b>7.0</b> | <b>Climate change</b>   |                |   |      |    |     |       |         |         |
| 7.1        | Predicting effects of climate change on forest health and condition (e.g., insects, disease, fire)                  | 1              | Determining how insects and disease (as biotic agents of change) will respond to climate change, and the controlling variables in the response  | FFEI |    |     | 4     | 3       | 1       |
|            |   | 2              | Methods for forecasting the effects of climate change on forest productivity, susceptibility to pests and pathogen outbreaks, and plantation health   | FFEI |    |     | 5     | 3       | 1       |
|            |   | 3              | Effects of climate change on fire risk and behaviour  | FFEI |    |     | 5     | 4       | 5       |
|            |   | 4              | Methods for assessing and managing the risk and uncertainty associated with climate change  | FFEI |    |     | 4     | 4       | 4       |

| #          | Theme/Topic   | Research Issue |  | FFEI | FN | MPB | Score |         |         |
|------------|---|----------------|--|------|----|-----|-------|---------|---------|
|            |   |                |  |      |    |     | Coast | N. Int. | S. Int. |
| 7.2        | Predicting effects of climate change on growth and productivity | 1              | Predicting the effects of climate change on the management and growth and yield of current and future stands   | FFEI |    |     | 3     | 3       | 3       |
|            |   | 2              | Predicting effects of climate-change on key NTFP species   | FFEI |    |     | 5     | 5       | 5       |
| 7.3        | Responding to ecosystem shifts                                  | 1              | Determine how the management of timber species can incorporate effective responses to changing climate and associated ecological changes   | FFEI |    |     | 4     | 4       | 4       |
|            |   | 2              | Mitigating timber supply losses due to climate-change effects  | FFEI |    |     | 4     | 4       | 5       |
|            |   | 3              | Timber supply and environmental implications of introducing exotic tree species  | FFEI |    |     | 5     | 5       | 6       |
| 7.4        | Physiological and adaptive responses of species and seedlots    | 1              | Quantifying plant-climate relationships and estimating the future range and deployment of BC tree species and genotypes, including bio-climatic modeling and opportunities for facilitated migration to match genotypes with future environments | FFEI |    |     | 4     | 3       | 3       |
|            |   | 2              | Quantifying the adaptation and productivity of select seed from B.C. and neighbouring jurisdictions when grown in current and forecast future B.C. climates  |      |    |     | 5     | 4       | 4       |
|            |   | 3              | Tracking vegetation changes due to climate change through the evaluation of older vegetation survey plots  |      |    |     | 5     | 5       | 5       |
|            |   | 4              | Understanding the physiological stress response of trees to changing environments, with linkages to species and seed zone ranges   |      |    |     | 5     | 4       | 3       |
| <b>8.0</b> | <b>Forest harvesting and engineering studies</b>                |                |  |      |    |     |       |         |         |
| 8.1        | Salvaging MPB-killed timber                                     | 1              | Forest engineering studies relating to designing efficient, cost-effective, and environmentally appropriate methods of harvesting and hauling MPB-killed trees (i.e., as logs, chips, etc)   |      |    | MPB | 7     | 3       | 3       |
|            |   | 2              | Studies to quantify the rates and amount of deterioration of MPB-killed timber for forest product use in relation to timber supply, harvest scheduling, and salvage operations   |      | FN | MPB | 7     | 4       | 4       |
| 8.2        | Harvesting systems for biomass (co)production                   | 1              | Harvesting systems for biomass (co)production  |      |    |     | 6     | 5       | 5       |