

# Synopsis of FIA-FSP Research Projects (2004-2006)

**FIA** Forest Investment Account  
Forest Science Program

PrognosisBC

3172 degree days

CWD

critical habitat

128 stems/ha

beetle proofing

*Thuja plicata*



# Synopsis of FIA-FSP Research Projects (2004-2006)

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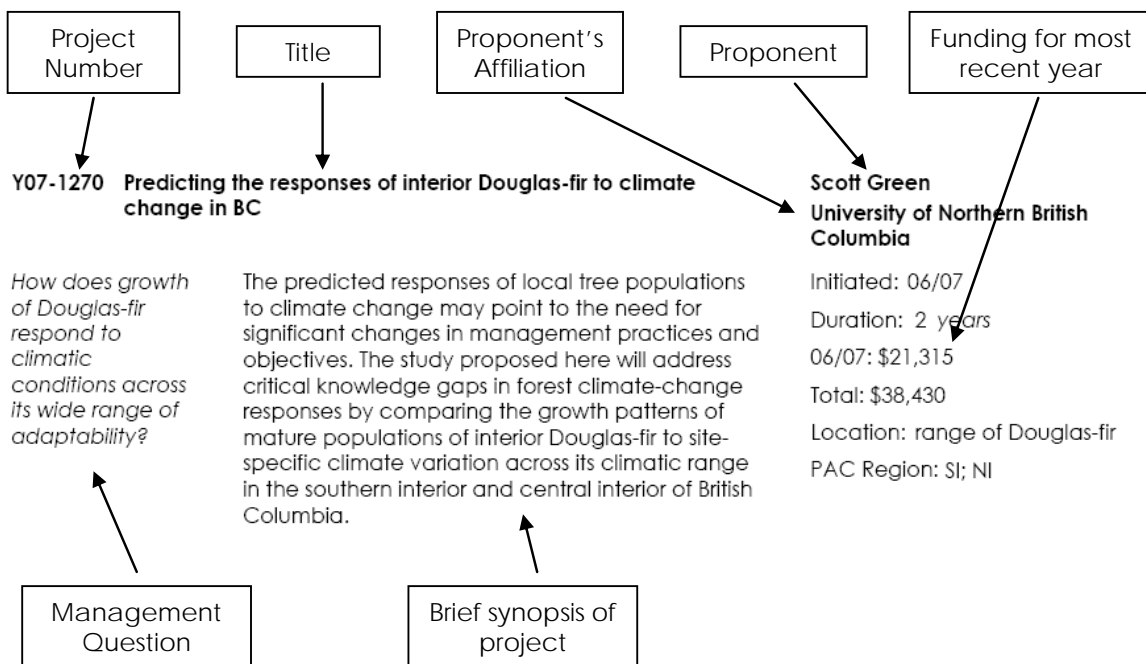
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## Document Overview

This document provides members of both the Sustainability Program Advisory Committees (SPAC) and Timber Growth and Value Program Advisory Committee (TPAC) with a synopsis of research projects funded under the FIA-Forest Science Program. Other categories of projects, including long-term research installations, research extensions, and graduate awards, are not considered in this document. In addition, this document only covers projects that were initiated between 2004 and 2006. Additional project information is available in the Forest Investment Account report and publication repository at <http://www.for.gov.bc.ca/hcp/fia/searchreports.htm>.

The first section contains summary tables showing allocations of funding and numbers of projects funded in each research topic. The second section lists the current classification of research themes, topics, and priorities under each program category, for all completed and ongoing categories. Where possible, projects begun before the current classification have been reclassified. Projects where it was not possible to reclassify within the current classification are labeled “unclassified.” This list is a subset of the classification presented in the 2005/06 SPAC and TPAC strategy documents, and includes only those topics and priorities with projects.

The final section consists of project summaries providing information on all research projects funded by the FIA-FSP since 2004. Projects summaries are organized according to current theme, topic, and priority classification as specified in the 2005/06 TPAC and SPAC strategy documents. Themes, topics, and priorities without topics are excluded from the project summary heading structure. Figure 1 shows an example of a project summary, including further explanation of some fields. Information contained within project summaries is current to the date the project was initiated (e.g., the current names of some government agencies are different than those listed in the project summaries).



## Program Overview

**Table 1: Funding allocation and numbers of projects in each year for all themes and topics in the Sustainability category. Total funding allocated and numbers of unique projects are summarized in each year and for each topic. Row totals for numbers of projects in each topic are counted for unique projects only. Themes and topics without associated projects have been excluded from this table.**

Theme (bold) and Topic	2004/05		2005/06		2006/07		2007/08		2008/09		Total	
	No.	(\$)	No.	(\$)	No.	(\$)	No.	(\$)	No.	(\$)	No.	(\$)
<b>S 1.0 Ecosystem structure, function, and processes, and biodiversity related to forest management</b>	<b>37</b>	<b>\$2,728,150</b>	<b>38</b>	<b>\$2,317,306</b>	<b>36</b>	<b>\$2,573,181</b>	<b>12</b>	<b>\$493,911</b>	<b>3</b>	<b>\$109,788</b>	<b>59</b>	<b>\$8,222,337</b>
S 1.00 Unclassified	1	\$85,388	1	\$80,000	1	\$79,979					1	\$245,367
S 1.1 Riparian ecology and management	2	\$207,952	5	\$254,910	3	\$258,494	1	\$67,562			8	\$788,919
S 1.2 Soil biology, ecology, and productivity	5	\$513,196	5	\$480,161	4	\$406,793					5	\$1,400,149
S 1.3 Coarse filter approaches to maintaining biodiversity at the landscape scale	3	\$191,388	5	\$225,016	7	\$434,207	4	\$132,626	1	\$42,105	9	\$1,025,341
S 1.4 Effectiveness of stand-level structures in maintaining biodiversity and rangeland habitats typified by grass and shrub cover	7	\$357,393	8	\$371,944	10	\$457,417	6	\$267,057	2	\$67,683	15	\$1,521,494
S 1.5 Natural disturbance ecology	2	\$109,876	1	\$69,799							2	\$179,675
S 1.6 Watershed function	16	\$1,247,102	12	\$825,913	10	\$922,175	1	\$26,666			18	\$3,021,856
S 1.8 Ecological restoration	1	\$15,855	1	\$9,564	1	\$14,117					1	\$39,537
<b>S 2.0 Decision support tools for sustainable forest management</b>	<b>1</b>	<b>\$78,787</b>	<b>1</b>	<b>\$120,942</b>	<b>2</b>	<b>\$187,818</b>	<b>1</b>	<b>\$66,203</b>			<b>2</b>	<b>\$453,750</b>
S 2.1 Habitat supply modeling	1	\$78,787	1	\$120,942	2	\$187,818	1	\$66,203			2	\$453,750
<b>S 3.0 Sustainable forest management indicators, targets, and monitoring systems</b>	<b>7</b>	<b>\$291,645</b>	<b>15</b>	<b>\$734,807</b>	<b>18</b>	<b>\$867,553</b>	<b>9</b>	<b>\$358,540</b>	<b>3</b>	<b>\$153,777</b>	<b>29</b>	<b>\$2,406,322</b>
S 3.1 Development of indicators and monitoring systems	6	\$244,982	12	\$580,018	14	\$693,867	7	\$282,708	3	\$153,777	22	\$1,955,352
S 3.2 Indicator thresholds of sustainability	1	\$46,663	3	\$154,789	3	\$140,611	2	\$75,832			6	\$417,895
S 3.3 Indicators for economic and social sustainability					1	\$33,075					1	\$33,075

Theme (bold) and Topic	2004/05		2005/06		2006/07		2007/08		2008/09		Total	
	No.	(\$)	No.	(\$)	No.	(\$)	No.	(\$)	No.	(\$)	No.	(\$)
<b>S 4.0 Scientific information to inform policy, regulations, and standards development and refinement</b>	9	\$839,958	12	\$780,394	14	\$848,779	5	\$222,495	1	\$84,000	17	\$2,775,626
S 4.1 Species at Risk recovery research	9	\$839,958	12	\$780,394	14	\$848,779	5	\$222,495	1	\$84,000	17	\$2,775,626
<b>S Proponent</b>					2	\$46,725	2	\$39,375	1	\$10,500	2	\$96,600
S Proponent Unclassified					2	\$46,725	2	\$39,375	1	\$10,500	2	\$96,600
<b>Totals</b>	<b>54</b>	<b>\$3,938,540</b>	<b>66</b>	<b>\$3,953,450</b>	<b>72</b>	<b>\$4,524,056</b>	<b>29</b>	<b>\$1,180,524</b>	<b>8</b>	<b>\$358,065</b>	<b>109</b>	<b>\$13,954,635</b>

Table 2: Funding allocation and numbers of projects in each year for all themes and topics in the Timber Growth and Value category. Total funding allocated and numbers of unique projects are summarized in each year and for each topic. Row totals for numbers of projects in each topic are counted for unique projects only.

Theme (bold) and Topic	2004/05		2005/06		2006/07		2007/08		2008/09		Total	
	No.	(\$)	No.	(\$)	No.	(\$)	No.	(\$)	No.	(\$)	No.	(\$)
<b>T 1.0 Basic research on tree growth and stand development</b>	11	\$733,346	16	\$758,644	17	\$817,750	4	\$213,486	1	\$38,220	23	\$2,561,446
T 1.00 Unclassified	3	\$174,669	3	\$117,162	3	\$118,394					3	\$410,225
T 1.1 Complex stands (including partial cutting, variable retention)	8	\$558,677	13	\$641,481	12	\$635,255	3	\$159,359			18	\$1,994,772
T 1.3 Old stands					2	\$64,102	1	\$54,127	1	\$38,220	2	\$156,449
<b>T 2.0 Design and analysis of silvicultural systems</b>	15	\$1,172,511	14	\$1,033,434	15	\$1,015,961	4	\$121,118	1	\$52,500	22	\$3,395,523
T 2.00 Unclassified	7	\$721,161	7	\$569,707	6	\$417,168					7	\$1,708,036
T 2.1 Complex stands (including partial cutting, variable retention)	6	\$386,101	6	\$446,477	9	\$598,793	4	\$121,118	1	\$52,500	13	\$1,604,988
T 2.2 Even-aged stands	2	\$65,249	1	\$17,249							2	\$82,499
<b>T 3.0 Growth and yield modeling/predictions</b>	8	\$493,517	8	\$515,618	6	\$465,437	3	\$141,645	1	\$55,650	14	\$1,671,866
T 3.00 Unclassified	2	\$137,385			1	\$71,400	1	\$71,400	1	\$55,650	3	\$335,835
T 3.1 Complex stands including partial cutting, variable retention	6	\$356,131	8	\$515,618	5	\$394,037	2	\$70,245			11	\$1,336,031

Theme (bold) and Topic	2004/05		2005/06		2006/07		2007/08		2008/09		Total	
	No.	(\$)	No.	(\$)	No.	(\$)	No.	(\$)	No.	(\$)	No.	(\$)
<b>T 4.0 Timber losses to environmental and biotic factors (wind, drought, insects, disease, animals, fire)</b>	<b>11</b>	<b>\$573,706</b>	<b>18</b>	<b>\$889,137</b>	<b>22</b>	<b>\$1,109,804</b>	<b>13</b>	<b>\$731,161</b>			<b>33</b>	<b>\$3,303,808</b>
T 4.00 Unclassified	1	\$35,652	1	\$27,724	1	\$30,001					1	\$93,377
T 4.1 Stand and forest dynamics following MPB	2	\$118,463	9	\$453,831	14	\$794,628	10	\$604,269			18	\$1,971,192
T 4.2 Estimating stand-level losses (other than MPB)	8	\$419,591	8	\$407,581	4	\$165,329					11	\$992,501
T 4.3 Mitigating losses (other than MPB)					3	\$119,846	3	\$126,892			3	\$246,738
<b>T 5.0 Analytical techniques and models for strategic analysis</b>					<b>3</b>	<b>\$188,470</b>	<b>1</b>	<b>\$75,910</b>			<b>3</b>	<b>\$264,380</b>
T 5.3 Techniques for scheduling harvesting after MPB attack					3	\$188,470	1	\$75,910			3	\$264,380
<b>T 6.0 Marketable resources other than timber</b>					<b>3</b>	<b>\$110,670</b>	<b>1</b>	<b>\$22,365</b>	<b>1</b>	<b>\$50,085</b>	<b>3</b>	<b>\$183,120</b>
T 6.1 Collect, synthesize, and assess existing knowledge; and identify critical knowledge gaps					3	\$110,670	1	\$22,365	1	\$50,085	3	\$183,120
<b>T 7.0 Climate change</b>	<b>2</b>	<b>\$64,998</b>	<b>2</b>	<b>\$66,640</b>	<b>2</b>	<b>\$57,750</b>					<b>3</b>	<b>\$189,388</b>
T 7.0 Unclassified	2	\$64,998	2	\$66,640	2	\$57,750					3	\$189,388
<b>T 8.0 Forest harvesting and engineering studies on salvaging MPB-killed timber</b>			<b>2</b>	<b>\$76,846</b>	<b>3</b>	<b>\$213,056</b>	<b>3</b>	<b>\$213,830</b>			<b>5</b>	<b>\$503,732</b>
T 8.00 Unclassified			2	\$76,846	3	\$213,056	3	\$213,830			5	\$503,732
<b>T Proponent</b>			<b>4</b>	<b>\$127,215</b>	<b>2</b>	<b>\$36,015</b>	<b>1</b>	<b>\$17,115</b>			<b>5</b>	<b>\$180,345</b>
T Proponent Unclassified			4	\$127,215	2	\$36,015	1	\$17,115			5	\$180,345
<b>T Unclassified</b>	<b>8</b>	<b>\$389,023</b>	<b>3</b>	<b>\$182,527</b>	<b>4</b>	<b>\$195,975</b>					<b>8</b>	<b>\$767,525</b>
T Unclassified	8	\$389,023	3	\$182,527	4	\$195,975					8	\$767,525
<b>Totals</b>	<b>55</b>	<b>\$3,427,101</b>	<b>67</b>	<b>\$3,650,060</b>	<b>77</b>	<b>\$4,210,887</b>	<b>30</b>	<b>\$1,536,630</b>	<b>4</b>	<b>\$196,455</b>	<b>119</b>	<b>\$13,021,133</b>

## List of Themes, Topics, and Priorities

The following list contains all of the themes and topics used to classify projects in both the SPAC and TPAC research programs. In addition, for each theme/topic combination, priorities are listed for ongoing or completed FIA-FSP projects. This list is based on the FIA-FSP project classification. It is a subset of the complete list that appears in the 2005/06 SPAC and TPAC strategy documents, since only priorities with projects are included. The hierarchy of Category→Theme→Topic→Priority is indicated by indentation and font format. Theme and topic headings are prefaced by a single character to indicate the project category (P – Proponent, S – Sustainability, T – Timber).

Where it was not possible to completely classify a project within the hierarchy, projects were assigned an “unclassified” label and placed below the lowest level of classification possible. Where it was not possible to assign a priority, the project was listed under “No priority assigned” within the appropriate category, theme, and topic.

### *Sustainability Program*

#### **S 1.0 Ecosystem structure, function, and processes, and biodiversity related to forest management**

##### S 1.00 Unclassified

- *No priority assigned*

##### S 1.1 Riparian ecology and management

- *Sensitivity of small stream ecosystems to alternative riparian management strategies including livestock use (e.g., water quality, channel morphology, biological effects)*
- *No priority assigned*

##### S 1.2 Soil biology, ecology and productivity

- *Evaluating the effects of management on soil biology/ecology, site hydrology, and productivity*

##### S 1.3 Coarse filter approaches to maintaining biodiversity at the landscape scale

- *Can current management practices, such as MPB salvage operations, retention, and partial cutting, create or maintain structures and processes that effectively maintain key elements of biodiversity at landscape?*
- *How do different landscape-level management approaches affect different species?*
- *Are there species or groups of species that can be used to infer habitat condition for a variety of other species? If so, which ones?*
- *No priority assigned*

##### S 1.4 Effectiveness of stand-level structures in maintaining biodiversity and rangeland habitats typified by grass and shrub cover

- *How effective are management strategies in creating and maintaining stand-level attributes or structures needed by wildlife or for biodiversity?*
- *What are appropriate stand-level targets and configurations of stand-level structures in cutblocks to maintain biodiversity (e.g., in MPB-attacked areas)?*
- *How do riparian buffers and their design contribute to maintenance of stand-level wildlife habitat and biodiversity (aquatic, riparian, and upland)?*
- *No priority assigned*

##### S 1.5 Natural disturbance ecology

- *What is the dominant type, intensity, frequency, pattern, and scale at which historic natural disturbances occur in different areas of the province (including rates of tree mortality, tree fall-down, and tree decomposition for those dominant disturbances)?*

### S 1.6 Watershed function

- *Evaluating the physical, biological and cumulative effects of forest management (incl. salvage harvesting), natural disturbance (e.g., fire, mass wasting, MPB), and range practices on watershed processes (e.g. streamflow quantity and timing, water quality, water table response), channel morphology, and aquatic habitat (e.g., salmon spawning grounds)*
- *Connectivity and linkages between upslope disturbances and stream channel response*
- *How large woody debris recruitment relates to stream channel type and state*
- *No priority assigned*

### S 1.7 Invasive species (plants, animals, pathogens)

### S 1.8 Ecological restoration

- *Evaluating the effectiveness of restoration techniques on mitigating forest encroachment and in-growth in NDT4 ecosystems*

## S 2.0 Decision support tools for sustainable forest management

### S 2.1 Habitat supply modeling

- *Developing, calibrating, and validating habitat models related to priorities identified in Theme 1.0 (Ecosystem structure and processes, and biodiversity related to forest management), in Topic 3.2 (Indicator targets and thresholds of sustainability), and for decision support related to priorities in Theme 4.0 (Scientific information to inform policy, regulations, and standards development). Non-timber forest products may also be treated in this manner*

### S 2.2 Population viability and spatially explicit population models

### S 2.3 Watershed response

### S 2.4 Refine ecological classification system

### S 2.5 Watershed stewardship tools

### S 2.6 Ecological risk assessment framework

## S 3.0 Sustainable forest management indicators, targets, and monitoring systems

### S 3.1 Development of indicators and monitoring systems

- *Indicators and monitoring systems are needed for each of the 11 FRPA values (i.e., soils, visual quality, timber, forage and associated plant communities, water, fish, wildlife, biodiversity, recreation resources, resource features, cultural heritage values). A non-restrictive list of example includes riparian function, watershed function, ecological representation, habitat quality*
- *What aquatic species (benthic invertebrates, algae, fish, etc.) can be used as indicators of watershed health?*
- *Developing and evaluating uses of remote sensing, information systems, and innovative technology to assess landscape- and stand-level characteristics*
- *No priority assigned*

### S 3.2 Indicator thresholds of sustainability

- *Define the response curves for biodiversity indicators to assist in identifying thresholds for maintaining ecological resilience*
- *Defining criteria suitable for assessing the ecological representation, landscape, and site attributes needed to maintain wildlife and biodiversity, and how best to allocate them across the landscape*
- *No priority assigned*

### S 3.3 Indicators for economic and social sustainability

- *Mechanisms for aggregating social and economic data for use in land-use planning processes*

### S 3.4 Methods for balancing social, environmental, and economic indicators of social sustainability

## S 4.0 Scientific information to inform policy, regulations, and FRPA practice requirements

### S 4.1 Species at Risk – recovery research

- *Determining critical habitat requirements for species at risk, defined at the appropriate scale*
- *Clarifying and/or assessing threats to species or ecosystems at risk, particularly those with cumulative effects or where evidence is conflicting*

- *Understanding the effects of management practices (particularly forest roads, harvesting, livestock use, exclusion/re-introduction of fire, large-scale salvage) on the ecology of species at risk*
- *Determining how specific threats may be mitigated or mechanisms developed to assist recovery*
- *No priority assigned*

S 4.2 Resilience of communities that are heavily dependent on the forest industry

S 4.3 Ecosystem-based management

### **S Proponent**

S Proponent Unclassified

- *No priority assigned*

## *Timber Growth and Value Program*

### **T 1.0 Basic research on tree growth and stand development**

T 1.00 Unclassified

- *No priority assigned*

T 1.1 Complex stands (including partial cutting, variable retention)

- *Microclimate effects related to tree and stand growth in multi-storied stands*
- *Mortality*
- *Species interactions*
- *No priority assigned*

T 1.2 Early stand growth

T 1.3 Old stands

- *Volume loss*

### **T 2.0 Design and analysis of silvicultural systems**

T 2.00 Unclassified

- *No priority assigned*

T 2.1 Complex stands (including partial cutting, variable retention)

- *The relationship between residual stand structure and understorey 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*
- *Development and monitoring of the impact of various stand treatment regimes on regeneration*
- *No priority assigned*

T 2.2 Even-aged stands

- *No priority assigned*

### **T 3.0 Growth and yield modeling/predictions**

T 3.00 Unclassified

- *No priority assigned*

T 3.1 Complex stands including partial cutting, variable retention

- *Interior BEC zones (ESSF, MH, SBS)*
- *Boreal mixedwood (spruce-pine--aspen)*
- *Interior BEC zones (ICH, IDF)*
- *No priority assigned*

### T 3.2 Wood quality

## T 4.0 Timber losses to environmental and biotic factors (wind, drought, insects, disease, animals, fire)

### T 4.00 Unclassified

- *No priority assigned*

### T 4.1 Stand and forest dynamics following MPB

- *Quantification of stand and forest change and development following MPB attack, including GY modeling, and impacts on timber supply; evaluating and estimating timber growth implications on residual trees and regenerated stands, in the understorey, and in clearcut openings; includes species interactions related to the scale and pattern of harvesting*
- *Residual stand development with and without treatments (including small- and large-scale salvage) under various levels of attack; includes mitigating losses*
- *Growth, development, and health of residual stands (overstorey and understorey) across a wide range of post-attack stand types and conditions (i.e., mixed species – salvaged; mixed species – unsalvaged; pine dominant – unsalvaged) in different BEC zones*
- *No priority assigned*

### T 4.2 Estimating stand-level losses (other than MPB)

- *Spruce bark beetle*
- *Root disease (Armillaria, Phellinus)*
- *Windthrow*
- *Dothistroma*
- *No priority assigned*

### T 4.3 Mitigating losses (other than MPB)

- *Mountain pine beetle losses: Silvicultural treatments and regimes, such as fertilization of non-lodgepole pine stands and treatment of repressed lodgepole pine stands, to accelerate operability and enhance mid-term timber supply*

## T 5.0 Analytical techniques and models for strategic analysis

### T 5.1 Integration of data and models across scales

### T 5.2 Development of novel methods to link process and empirical GY models

### T 5.3 Techniques for scheduling harvesting after MPB attack

- *Design of retention and salvage harvesting at scales ranging from individual cutblocks through landscape units to entire management units*
- *No priority assigned*

## T 6.0 Marketable resources other than timber

### T 6.1 Collect, synthesize, and assess existing knowledge; and identify critical knowledge

- *Non-timber forest products (NTFP)*

### T 6.2 Development and assessment of techniques for producing other resources in conjunction with timber production under various silvicultural systems

### T 6.3 Assess impacts of environmental factors on marketable non-timber resources

## T 7.0 Climate change

### T 7.00 Unclassified

- *Forest health*
- *No priority assigned*

## T 8.0 Forest harvesting and engineering studies on salvaging MPB-killed timber

### T 8.00 Unclassified

- *Forest engineering studies relating to designing efficient, cost-effective, and environmentally appropriate methods of harvesting and hauling MPB-killed timber*

- *Studies to quantify the rates and amount of deterioration of MPB-killed timber, and to mitigate potential losses*

**T Proponent**

T Proponent Unclassified

- *No priority assigned*

**T Unclassified**

T Unclassified Unclassified

- *No priority assigned*

## Summaries of current and historic FSB research projects

### *Sustainability Program*

#### **S 1.0 Ecosystem structure, function, and processes, and biodiversity related to forest management**

##### S 1.00 Unclassified

*No priority assigned*

<p><b>Y073062 Cumulative watershed effects of forestry practices on stream ecosystems</b></p> <p><i>What are the relationships between physical and ecological processes that result from cumulative watershed effects of forestry practices?</i></p>	<p>Potential negative and landscape-level cumulative watershed effects (CWEs) have not been well examined and studies of cumulative impacts of forestry practices on biodiversity and ecosystem processes remain a vital area of research. A metacommunity is a network of ecological communities linked by dispersal, in which each community acts as a source of immigrants for other communities in a region or drainage. Through the definition of metacommunity models, this project aims to identify relationships between physical and ecological processes that are determined by CWEs of forestry practices.</p>	<p><b>Yixin Zhang</b> <b>University of British Columbia</b></p> <p>Initiated: 04/05 Duration: 3 years 06/07: \$79,979 Total: \$245,367 Location: coast PAC Region: C</p>
<h4>S 1.1 Riparian ecology and management</h4> <p><i>Sensitivity of small stream ecosystems to alternative riparian management strategies including livestock use (e.g., water quality, channel morphology, biological effects)</i></p>		
<p><b>Y051038 Stream habitat and rainbow trout responses to clearcut logging in north-central British Columbia</b></p> <p><i>What are the medium- and long-term responses of riparian systems to logging treatments?</i></p>	<p>Medium- and long-term case studies examining the effects of streamside harvesting on small stream ecosystems are rare in coastal regions, and virtually non-existent in boreal and sub-boreal regions. None focus on lake-headed streams. A prior research project looked at short-term (1-2 yrs) effects of alternate logging treatments in riparian reserve zones on stream temperatures and on rainbow trout populations. This study aims to re-visit previously sampled streams to assess medium-term (6 yrs) responses to logging treatments.</p>	<p><b>Scott G. Hinch</b> <b>University of British Columbia</b></p> <p>Initiated: 04/05 Duration: 1 year 06/07: \$0 Total: \$67,032 Location: north-central interior PAC Region: NI</p>
<p><b>Y061038 Rainbow trout bioenergetic and stream dissolved oxygen responses to clearcut logging in north-central British Columbia</b></p> <p><i>What are the effects of streamside harvesting on streams and their resident fish populations in BC's interior?</i></p>	<p>The work description in the database was too truncated to summarize this project.</p>	<p><b>Scott Hinch</b> <b>University of British Columbia</b></p> <p>Initiated: 05/06 Duration: 1 year 06/07: \$0 Total: \$51,005 Location: SBS zone PAC Region: NI</p>

<b>Y061049</b>	<b>Headwater stream temperature response to alternative riparian management strategies: an experimental and modelling approach</b>	<b>Dan Moore</b> <b>University of British Columbia</b>
<i>Are there effective alternatives to riparian buffers for maintaining stream temperature?</i>	Retaining riparian forest in linear buffers can minimize the impact of forest harvesting on stream temperature, but may also incur opportunity costs to licensees. This study tests the ability of alternative riparian management strategies to minimize stream temperature impacts. Part of the study tests an existing model that predicts stream temperature response to different management approaches.	Initiated: 05/06 Duration: 1 year 06/07: \$0 Total: \$18,710 Location: south coast and central interior PAC Region: P
<b>Y071039</b>	<b>A broad-scale investigation of the effects of streamside clearcut timber harvesting on small stream ecosystems in British Columbia: analyzes of large-scale databases to forecast impacts on physical and thermal habitats and their salmonid populations</b>	<b>Dr. Scott G. Hinch</b> <b>University of British Columbia</b>
<i>What are the impacts of clearcutting on small stream ecosystems and their salmonid populations?</i>	The project will produce a broad-scale synthesis and analysis of existing scientific data related to the impacts of forestry operations on small stream ecosystems. It uses two complementary approaches to bridge this knowledge gap: a meta-analysis of existing, published scientific fish-forestry data; and the application of a predictive stream temperature model using existing stream temperature and fish inventory data that have been collected throughout BC.	Initiated: 06/07 Duration: 1 year 06/07: \$45,192 Total: \$45,192 Location: province-wide PAC Region: P
<b>Y073027</b>	<b>The effects of riparian harvesting on fish habitat and ecology of small headwater streams</b>	<b>David Maloney</b> <b>Ministry of Forests and Range</b>
<i>What are the effects of variable retention management strategies on changes in water quality, channel morphology, and stream biology?</i>	This project investigates and verifies SFM practices for headwater stream management in a range of sub-boreal forest types. Using a before-after-control-impact paired study design, the project evaluates the effects of variable retention management strategies on changes in water quality, channel morphology, and stream biology. It also quantifies the biodiversity value of the riparian zones of small streams, and the significance of small streams as sources of material and energy to downstream reaches.	Initiated: 04/05 Duration: 3 years 06/07: \$145,740 Total: \$437,337 Location: north-central interior PAC Region: NI
<i>No priority assigned</i>		
<b>M065007</b>	<b>Compendium of fish/forestry reports</b>	<b>David Maloney</b> <b>Ministry of Forests and Range</b>
<i>How will accelerated harvesting and forest defoliation affect interior riparian zones and fish habitat?</i>	Accelerated harvesting and forest defoliation resulting from the MPB infestation will have consequences for interior riparian zones and fish habitat. Over the last 30 years a large amount of fish / forestry research has been conducted with the province, which allows identification of where and why mistakes were made. This project makes this knowledge available through the fish / forestry website.	Initiated: 05/06 Duration: 1 year 06/07: \$0 Total: \$15,519 Location: interior PAC Region: P

<b>Y061091</b>	<b>Small streams on fans: recognition of hydrogeomorphic hazards</b>	<b>David Wilford</b> <b>Ministry of Forests and Range</b>
<i>Extension project</i>	This project will complete the province-wide extension on the fan project. Specifically, current workshop materials will be modified to make them more applicable to their regions (coast and southern interior). These modified materials will also be used in presentations to managers and policy makers.	Initiated: 05/06 Duration: 1 year 06/07: \$0 Total: \$18,999 Location: province-wide PAC Region: P
<b>Y071276</b>	<b>Effect of stand structure and riparian buffer design on wind damage susceptibility and large woody debris recruitment</b>	<b>Dr. Steve Mitchell</b> <b>University of British Columbia</b>
<i>What are the risks and impacts of windthrow on management of riparian reserves, and appropriate management options?</i>	This project aims to address underdeveloped components of LWD recruitment modeling for adapting an existing windthrow risk model (ForestGALES) for BC conditions. Field studies will be conducted to answer what factors affect the quantity and condition of LWD that enters the stream channel in the years after a windthrow event; what factors affect the volume of sediment exposed; and how do management actions affect the volume of windthrow and sediment exposure. The riparian management refinements will be made available to practitioners through the ForestGALES_BC -TASS interface.	Initiated: 06/07 Duration: 2 years 06/07: \$67,562 Total: \$135,124 Location: coast PAC Region: C

## S 1.2 Soil biology, ecology, and productivity

*Evaluating the effects of management on soil biology/ecology, site hydrology, and productivity*

<b>Y062093</b>	<b>Ten-year soil fauna responses to soil compaction and organic matter removal at Sub-Boreal Spruce LTSP</b>	<b>Shannon Berch</b> <b>Ministry of Forests and Range</b>
<i>How do soil mesofauna and macrofauna communities respond to different levels of soil disturbance?</i>	Timber harvesting and site preparation modify a variety of physical and chemical properties in the soil, consequently affecting soil pore space, composition, and amount of organic matter, soil temperatures, and soil moisture. This project, part of the Long Term Soil Productivity Study, examines changes to and responses of soil mesofauna and macrofauna communities to different levels of soil disturbance applied 10 years earlier.	Initiated: 04/05 Duration: 2 years 06/07: \$0 Total: \$48,042 Location: Topley, Prince George, Williams Lake PAC Region: NI
<b>Y073049</b>	<b>Green tree retention: a tool to maintain ecosystem health and function</b>	<b>Dr. Sue Grayston</b> <b>University of British Columbia</b>
<i>What is the potential of green-tree retention as a tool for maintaining soil communities?</i>	This project examines the potential of green-tree retention as a tool for maintaining soil communities. The research will use the existing STEMS installation at Elk Bay, Vancouver Island, to observe the effect of different retention strategies on the diversity and functioning of soil communities. The results will be used to revise forest management guidelines in relation to management of soil resources, and to inform decisions related to the size and dispersion of green-tree "islands" used in management.	Initiated: 04/05 Duration: 3 years 06/07: \$189,793 Total: \$518,519 Location: Elk Bay, Vancouver Island, site of STEMS 2. PAC Region: C

<p><b>Y073064 Ectomycorrhizae and networks: their role in facilitating Douglas-fir regeneration under water, site, and climatic stresses</b></p> <p><i>What is the role of ectomycorrhizae (ECM) and common mycorrhizal networks (CMNs) in facilitating Douglas-fir regeneration, growth, and young stand development in the Interior Cedar-Hemlock and Interior Douglas-fir zones?</i></p>	<p>This project investigates the role of ectomycorrhizae (ECM) and common mycorrhizal networks (CMNs) in facilitating Douglas-fir regeneration, growth and young stand development in the Interior Cedar-Hemlock and Interior Douglas-fir zones of British Columbia. It involves four graduate student studies investigating (1) the role of common mycelial networks in facilitating artificial and natural regeneration of Douglas-fir; (2) the role of ectomycorrhizal fungi in interspecific carbon transfer between birch and Douglas-fir; (3) the influence of birch on the ectomycorrhizal fungal community in Douglas-fir stands of different ages; and (4) the role of ectomycorrhizal fungi in establishment of Douglas-fir across a wide range of sites that vary in soil moisture regime.</p>	<p><b>Dr. Suzanne Simard</b> University of British Columbia</p> <p>Initiated: 04/05 Duration: 3 years 06/07: \$30,000 Total: \$186,134 Location: ICH zone PAC Region: SI</p>
<p><b>Y073084 Long Term Soil Productivity study</b></p> <p><i>What are the impacts of soil compaction and organic matter removal on near-term and long-term soil and forest productivity over a full timber rotation?</i></p>	<p>The BC Long Term Soil Productivity (LTSP) study is designed to investigate the impacts of soil compaction and organic matter removal on near-term and long-term soil and forest productivity over a full timber rotation. Measurement of soil properties, understorey vegetation, microclimate, and tree productivity occur at scheduled periods throughout the rotation. The LTSP project results are used in the development and application of indicators, such as standards for soil disturbance and retention of woody debris, used in the FRPA soils value regulations and effectiveness evaluation.</p>	<p><b>Shannon M. Berch</b> Ministry of Forests and Range</p> <p>Initiated: 04/05 Duration: 3 years 06/07: \$87,000 Total: \$343,650 Location: southern and northern interior PAC Region: SI; NI</p>
<p><b>Y073250 Soil conditions and tree growth in BC's forests: factors affecting ecosystem response to forest practices</b></p> <p><i>What are the soil parameters that are consistent with productive forest growth in a variety of ecosystems?</i></p>	<p>Soil-based parameters are very useful for evaluating forestry practices such as access development and harvesting because they underpin many important ecosystem processes, are relatively resistant to change in natural systems, yet can be strongly affected by forest management. This project will identify soil parameters that are consistent with productive forest growth in a variety of ecosystems, develop tools for rapid evaluation of soil parameters, and describe physical factors affecting the growth of tree roots throughout the growing season. This study will improve management of BC's soils by increasing our knowledge of soil processes, and providing improved tools for evaluating the effects of compaction.</p>	<p><b>Chuck Bulmer</b> Ministry of Forests and Range</p> <p>Initiated: 04/05 Duration: 3 years 06/07: \$100,000 Total: \$303,805 Location: southern interior PAC Region: SI</p>

## S 1.3 Coarse filter approaches to maintaining biodiversity at the landscape scale

*Can current management practices, such as MPB salvage operations, retention, and partial cutting, create or maintain structures and processes that effectively maintain key elements of biodiversity at landscape?*

<b>M075006</b>	<b>Landscape strategies for mountain pine beetle management: some stewardship implications</b>	<b>J. Douglas Steventon Bulkley Valley Centre for Natural Resources Research and Management</b>
<i>How should salvage harvesting of MPB-attacked and at-risk stands be done to best respect stewardship goals?</i>	This project examines stand- and landscape-scale management principles related to the salvage harvesting of MPB-caused mortality. It uses existing spatially explicit simulation models to simulate several different management criteria such as harvest rate and distribution of cutblocks to examine different MPB management scenarios. Stewardship implications of these potential future landscapes are then assessed through a series of assessment models to examine impacts on species of varying life history attributes.	Initiated: 06/07 Duration: 2 years 06/07: \$49,350 Total: \$59,850 Location: Nadina Forest District PAC Region: NI
<b>M075037</b>	<b>Implications on grizzly bears and moose of forest management in response to the 1970s mountain pine beetle infestations in the Flathead Drainage</b>	<b>Dr. Bruce McLellan Ministry of Forests and Range</b>
<i>How do grizzly bears respond to different MPB salvage options?</i>	Changes in forest structure and management resulting from the current MPB infestation will have significant implications for grizzly bears and moose. This project uses field investigations of populations and habitat to investigate the response by grizzly bears and moose to the development of the study area for salvage logging. A significant outcome of the project is an information package that will allow what has been learned in the study area to be applied elsewhere in the province.	Initiated: 06/07 Duration: 2 years 06/07: \$93,219 Total: \$149,037 Location: Flathead Valley PAC Region: SI
<b>Y071014</b>	<b>Evaluating effectiveness of forest management practices at sustaining biological diversity in northeastern British Columbia</b>	<b>Fred Bunnell University of British Columbia</b>
<i>Can current management practices maintain key elements of biodiversity at landscape scales?</i>	The project focuses on aquatic and terrestrial vertebrates and defines species that likely will be sustained by current management practices, and those with specialized needs that are unlikely to be sustained by existing coarse-filter approaches. It also proposes efficient changes to practices that would sustain native species richness.	Initiated: 06/07 Duration: 3 years 06/07: \$41,475 Total: \$125,370 Location: northern interior PAC Region: NI
<b>Y072044</b>	<b>Ecologically based connectivity indices for landscape monitoring</b>	<b>David Huggard Consultant</b>
<i>How can connectivity planning be improved?</i>	While connectivity is seen as a critical component for maintaining landscape biodiversity, current methods for addressing connectivity are inadequate. This project develops two indices of connectivity based on individual dispersal costs and potential genetic connectedness. The outcomes include two meaningful connectivity indices for operational users, a demonstration of these indices on a real landscape, a report on approaches to indexing connectivity, and potentially a set of user-friendly tools for use by land planners and groups monitoring landscape-level effectiveness.	Initiated: 05/06 Duration: 2 years 06/07: \$15,750 Total: \$33,600 Location: Haida Gwai'i PAC Region: C

<b>Y072062</b>	<b>Coarse filter approaches for the conservation biology of canopy lichens in wet cedar-hemlock and Sub-Boreal Spruce forests of central-interior BC</b>	<b>Darwyn Coxson University of Northern British Columbia</b>
<i>How can alternative silvicultural practices mitigate detrimental impacts of timber harvesting on sensitive lichen species?</i>	In wetbelt forests (e.g., ICHvk2 and SBSvk) lichens are particularly sensitive to changes in canopy structure associated with forest harvesting, but we have little understanding of how alternative silvicultural practices could mitigate these impacts. This project involves collection of data from the field and the literature on the relationships between attributes of stand structure and lichen diversity. The outcomes of the research include development of a set of coarse filter attributes associated with the occurrence of sensitive lichen species, and further understanding of the efficacy of current management practices (e.g., VR) for maintaining lichen diversity.	Initiated: 05/06 Duration: 3 years 06/07: \$58,800 Total: \$133,193 Location: Upper Fraser River Valley, in Prince George FD PAC Region: NI
<i>How do different landscape-level management approaches affect different species?</i>		
<b>Y073005</b>	<b>Evaluating large-scale forest zoning to improve the efficiency of timber production and biodiversity objectives</b>	<b>Fred Bunnell University of British Columbia</b>
<i>Is strategic zoning an effective tool for maintaining biodiversity at the landscape scale?</i>	Strategic zoning, an important coarse filter approach to maintaining biodiversity at the landscape scale, distributes the production of groups of forest objectives into separate areas. Zone types are designed to divide competing objectives into separate areas on the landbase where they will have less impact on each other. This project aims to develop a zone allocation model that uses ecological, economic, and social indicators to locate zones over large landscapes. Ecological indicators will be created that are appropriate for zone creation, that also contain stand structural elements; and the zoning model will be modified to allow for inclusion of indicators with temporal components.	Initiated: 04/05 Duration: 3 years 06/07: \$82,688 Total: \$231,224 Location: Chetwynd/Fort St. John PAC Region: NI
<b>Y073006</b>	<b>Group selection systems to maintain caribou habitat in high elevation forests (ESSFwc3) in central BC</b>	<b>Michaela Waterhouse Ministry of Forests and Range</b>
<i>How effective are different silvicultural systems at maintaining mountain caribou habitat?</i>	This project continues testing silvicultural systems that can be used to maintain mountain caribou habitat. Specifically, it involves monitoring arboreal lichens, vegetation, and stand structure. A focus of this project is providing relevant and timely information and extension products to support sustainable forest management.	Initiated: 04/05 Duration: 3 years 06/07: \$92,925 Total: \$195,517 Location: Quesnel Highland PAC Region: NI

*Are there species or groups of species that can be used to infer habitat condition for a variety of other species? If so, which ones?*

**Y051058 Evaluating a structural basis for monitoring biodiversity**

**Michael Gillingham**  
**University of Northern British**  
**Columbia**

*What indicator species are suitable for monitoring species diversity in the IDF?*

Use of single indicator and umbrella species to monitor population trends and to assess the magnitudes disturbances have had mixed results. This project assembled groups of vertebrate species that share similarities in habitat used for breeding and feeding, and developed specific species-structure models for measuring and monitoring species diversity in IDF subzones. Model performance is evaluated against field observations, and the effects of temporal variation on reliability are assessed.

Initiated: 04/05

Duration: 1 year

06/07: \$0

Total: \$49,271

Location: Williams Lake

PAC Region: SI

*No priority assigned*

**Y061116 Refinement of the BEC classification for selected subzones of the former Nelson Forest Region**

**Dennis Lloyd**  
**Ministry of Forests and Range**

*How can classification of BEC subzones & variants be improved?*

A large number of subzones/variants within the provincial biogeoclimatic classification system (BEC) do not have adequate site series classification. This project will use an expanded database to create a revised preliminary classification for some of these subzones/variants, and will collect ecological plot data to fill data gaps at the extremes of the moisture gradient. This will increase the utility of BEC as a common language to identify, describe, and distinguish ecosystems.

Initiated: 05/06

Duration: 1 year

06/07: \$0

Total: \$48,279

Location: former Nelson  
 Forest Region

PAC Region: SI

**S 1.4 Effectiveness of stand-level structures in maintaining biodiversity and rangeland habitats typified by grass and shrub cover**

*How effective are management strategies in creating and maintaining stand-level attributes or structures needed by wildlife or for biodiversity?*

**M075047 Effects of a mountain pine beetle epidemic on northern caribou habitat use, migration, and population status**

**Deborah Cichowski**  
**Bulkley Valley Centre for**  
**Natural Resources Research**  
**and Management**

*How is caribou winter range and habitat use affected by extensive mountain pine beetle attack?*

The current mountain pine beetle (MPB) infestation is having an extensive impact on the Tweedsmuir-Entiako caribou population. This project focuses on how caribou winter range and habitat use will be affected by the MPB attack. Information collected in this study will aid in directing MPB management and salvage efforts to minimize impacts on this species at risk.

Initiated: 06/07

Duration: 2 years

06/07: \$38,850

Total: \$77,700

Location: Tweedsmuir-Entiako

PAC Region: NI

<b>Y051034</b>	<b>Distributional ecology of alectorioid lichens in the ICH</b>	<p><i>What factors affect hair-lichen distribution and abundance in the ICH and ESSF?</i></p>	<p>There is a knowledge gap regarding the winter use of hair lichens by mountain caribou. Hair-lichens may be unable to withstand prolonged burial by snow, especially in the ICH, and years with heavy snow fall oblige caribou to spend more time at lower elevations, leading to increased vulnerability to predation, and decreased availability of hair-lichens. This study aims to examine stand-scale patterns of hair-lichen distribution in the ICH and to test hypotheses around their occurrence. It will provide information to land managers responsible for maintaining suitable mountain caribou habitat in ICH (and lower ESSF) ecosystems.</p>	<p><b>Trevor Goward</b> <b>Enlivened Consulting Ltd.</b></p>	<p>Initiated: 04/05 Duration: 1 year 06/07: \$0 Total: \$39,447 Location: Wells Gray Park PAC Region: SI</p>
<b>Y051073</b>	<b>Understanding and predicting snag and CWD dynamics in Sub-boreal Spruce and Engelmann Spruce– Subalpine Fir forests</b>	<p><i>How do different forest management strategies affect the supply of snags and CWD?</i></p>	<p>Snags and coarse woody debris (CWD) are important habitat elements, but it is difficult to set measurable benchmarks for their distribution and abundance based on current knowledge. This project will improve an existing spatio-temporal forest dynamics and management model (including a snag and CWD dynamics model) to project the impacts of different forest management strategies on the distribution and supply of snags and CWD over time.</p>	<p><b>Craig DeLong</b> <b>Ministry of Forests and Range</b></p>	<p>Initiated: 04/05 Duration: 1 year 06/07: \$0 Total: \$46,411 Location: McGregor Plateau and Rocky Mountains PAC Region: NI</p>
<b>Y062053</b>	<b>Implications of landscape composition and pattern in managed sub-boreal forests</b>	<p><i>What are the effects of alternative timber harvesting rates and patterns on dilution of marten and northern flying squirrel habitats?</i></p>	<p>This project examines potential implications to wildlife related to the rates and spatial patterning of harvest. A spatio-temporal model is used to project alternative timber harvesting rates and patterns, and is linked to species response models to assess the effects of habitat dilution on marten (<i>Martes americana</i>) and the northern flying squirrel (<i>Glaucomys sabrinus</i>). Model projections are field-tested, and the feasibility and cost of a long-term management effectiveness-monitoring program are assessed.</p>	<p><b>Douglas Steventon</b> <b>Bulkley Valley Centre for Natural Resources Research and Management</b></p>	<p>Initiated: 04/05 Duration: 2 years 06/07: \$0 Total: \$98,213 Location: Morice and Lakes TSAs PAC Region: NI</p>
<b>Y071256</b>	<b>Retention patches: windthrow and recruitment of habitat structure</b>	<p><i>What is the effect of residual trees on the persistence of structural retention and its contribution to structural diversity through the life of the regenerating stand?</i></p>	<p>This project re-measures selected habitat attributes of retention patches first measured in 1994–1998 (Bulkley and Morice) and 1996 (Kispiox), and the rates and correlates of windthrow within patches. The objectives are to quantify the recruitment and fate of trees, snags, and coarse woody debris in retention patches; assess windthrow rates relative to patch characteristics; and provide data to parameterize stand and landscape habitat projection models.</p>	<p><b>J. Douglas Steventon</b> <b>Ministry of Forests and Range</b></p>	<p>Initiated: 06/07 Duration: 2 years 06/07: \$42,000 Total: \$84,000 Location: Bulkley-Stikine and Nadina FDS PAC Region: NI</p>

**Y071268 Fisher habitat ecology in the Peace River region**

*What are the habitat requirements of fisher in the Peace Region, and how do those differ from habitat management guidelines elsewhere in the province?*

This project addresses two primary objectives to further the understanding of fisher habitat needs in the Peace River Region. These are to identify the characteristics of maternal denning habitat to provide increased and appropriate protection under the *Forest and Range Practices Act*, and to describe and identify habitat use patterns for fisher in this region to provide applicable and valuable information to land management planning processes and habitat supply analyzes. By March 31, 2007, the project will have completed two field seasons of monitoring radio-tagged fisher to identify maternal dens of reproductive females and will have two winter field seasons of data on habitat use and ecology.

**Eric Lofroth**  
**Ministry of Environment**

Initiated: 06/07  
Duration: 3 years  
06/07: \$38,850  
Total: \$106,575  
Location: Kiskatinaw River  
near Dawson Creek  
PAC Region: NI

**Y072008 Stand structure and maintenance of biodiversity in green-tree retention stands at 30 years after harvest: a vision into the future**

*How do mixed-species stands salvaged following MPB infestation compare to uncut stands in terms of stand structure and development of late seral forest conditions?*

This project will examine how mixed-species stands salvaged following MPB infestation compare to uncut stands in terms of stand structure and development of late seral forest conditions. The authors will address this question by studying mixed-species stands that were salvage-logged 30 years ago. Stand structure and the responses of several mammal groups will be used as indicators of sustainability and biodiversity.

**Thomas P. Sullivan**  
**University of British Columbia**

Initiated: 05/06  
Duration: 3 years  
06/07: \$54,600  
Total: \$166,946  
Location: Summerland  
PAC Region: SI

**Y072183 Assessment of the effectiveness of green tree retention in maintaining the diversity of and promoting the recolonization by ectomycorrhizal fungal species into harvested areas of coastal forest**

*How quickly do ectomycorrhizal fungi within retained patches in variable retention systems re-colonize the regenerating forest?*

While significantly lower abundance and diversity of EM fungi have been observed with increased distance from retained forest patches, it is unknown how quickly the fungi within the retained patches re-colonize the regenerating forest. This project will examine the rate of re-colonization in regenerating stands of different ages, and in experimental sites with differing levels of green-tree retention. The results of this research will allow managers to devise prescriptions that facilitate the maintenance and recovery of EM fungi in harvested stands.

**Tony Trofymow**  
**Natural Resources Canada**

Initiated: 05/06  
Duration: 3 years  
06/07: \$33,474  
Total: \$98,490  
Location: South Vancouver  
Island and the  
Sunshine Coast  
PAC Region: C

**Y073001 Beetle families of British Columbia**

*How effective are forest management actions in protecting arthropod diversity?*

To understand the effectiveness of forest management actions in protecting arthropod diversity, it is essential to be able to identify the elements of this diversity. This project aims to develop illustrated keys to all families of insects in the province. Previous funding from FRBC, FII, and FSP has supported description of 263 families, and an additional two years of funding should bring the project to completion.

**Geoffrey G.E. Scudder**  
**University of British Columbia**

Initiated: 04/05  
Duration: 3 years  
06/07: \$51,055  
Total: \$151,366  
Location: province-wide  
PAC Region: P

<b>Y073363</b>	<b>VR emulating canopy gaps in coastal forests: an operational trial and experiment</b>	<b>Lori D. Daniels</b> <b>University of British Columbia</b>
<i>How can variable retention (VR) silviculture be used to create and maintain forest structure, function, and processes?</i>	The broad context for this project is to better understand how to use variable retention (VR) silviculture to create and maintain forest structure, function, and processes. Specifically, this project uses a replicated field experiment to test for differences between natural gaps and gaps created by VR silviculture. Ultimately, these empirical data will be used to develop criteria and guidelines to predict/assess the impacts of VR silviculture on composition, structure, and stand dynamics of forests in the very wet hypermaritime Coastal Western Hemlock (CWHvh) biogeoclimatic subzone.	Initiated: 04/05 Duration: 3 years 06/07: \$30,000 Total: \$148,126 Location: near Bamfield PAC Region: C
<i>What are appropriate stand-level targets and configurations of stand-level structures in cutblocks to maintain biodiversity (e.g., in MPB-attacked areas)?</i>		
<b>Y071167</b>	<b>Coarse woody debris in the East Kootenays: understanding sources and dynamics to guide targets for sustainable forest management</b>	<b>Dr. Lori Daniels</b> <b>University of British Columbia</b>
<i>What is the natural range in variation of coarse woody debris in the absence of human-induced fires and fire suppression?</i>	This project will create knowledge of the processes that historically generated CWD and the age, decay rates, and residence time of snags and logs of different species. This information is critical to ensure that appropriate quantities of CWD suitable for wildlife use are maintained in managed stands over the short and long terms. It is part of an ongoing investigation of CWD dynamics in the context of the fire regimes of mixed-conifer, mountain forests of southeastern British Columbia.	Initiated: 06/07 Duration: 3 years 06/07: \$64,638 Total: \$161,868 Location: East Kootenays and Southern Rocky Mountain Trench PAC Region: SI
<i>How do riparian buffers and their design contribute to maintenance of stand-level wildlife habitat and biodiversity (aquatic, riparian, and upland)?</i>		
<b>Y062114</b>	<b>Implications of static riparian reserve zones for long-term function of naturally migrating river channels</b>	<b>Jordan Rosenfeld</b> <b>Ministry of Water, Land, and Air Protection</b>
<i>How effective are fixed-width riparian buffers for maintaining natural LWD loadings in streams?</i>	Present fixed-width riparian buffers may not ensure natural/adequate levels of LWD recruitment from riparian zones when erosion rates are high. This project models stream channels in different geomorphic contexts to determine how channel migration rate affects the long-term adequacy of present fixed-width buffers for maintaining natural LWD loadings in streams.	Initiated: 04/05 Duration: 2 years 06/07: \$0 Total: \$78,918 Location: province-wide PAC Region: P
<b>Y072027</b>	<b>Amphibians as indicators of wetland habitat conservation under variable retention harvesting practices</b>	<b>Bill Beese</b> <b>Western Forest Products</b>
<i>Does variable retention provide sufficient wetland buffering to maintain amphibian populations?</i>	This study investigates the effects of variable retention patches on buffering small wetlands, and the implications for hydroperiod and amphibian survival rates to metamorphosis.	Initiated: 06/07 Duration: 1 year 06/07: \$31,920 Total: \$31,920 Location: TFLs 39 and 44 PAC Region: C

**Y073151 Does logging elevated ultraviolet radiation exposure of streams impact juvenile coho?**

*What is the effect of increased exposure to ultraviolet radiation (UVR) received by timberland streams on juvenile coho?*

A significant impact of logging is increased exposure to ultraviolet radiation (UVR) received by timberland streams, which has a demonstrably negative effect on juvenile coho. This project will develop a bioassay technique for UV exposure of juvenile coho based upon the amount of photo-protective sunscreen compounds in their skin. This bioassay will allow assessment of how different logging situations impact UVR conditions in adjacent streams.

**Max L. Bothwell**  
**Environment Canada**

Initiated: 04/05  
Duration: 3 years  
06/07: \$72,030  
Total: \$215,333  
Location: Vancouver Island  
PAC Region: C

*No priority assigned*

**Y061085 Impact of retaining woody debris and forest floor habitats on stand-level diversity of soil collembola**

*What are the effects of forest practices on soil organisms (esp. collembola)?*

A previous study by the authors indicated that soil compaction and organic matter removal had reduced the density of soil mesofauna, specifically oribatid mites. This project will further investigate this problem by looking at the effects of forest harvesting on collembola, another taxa of soil mesofauna with a life-history different from mites. Since the collembola specimens were collected as part of the previous study, this project represents an inexpensive addition of value to an existing investment.

**Shannon Berch**  
**Ministry of Forests and Range**

Initiated: 05/06  
Duration: 1 year  
06/07: \$0  
Total: \$16,182  
Location: SBS zone near Prince George, Topley, Williams Lake.  
PAC Region: P

## S 1.5 Natural disturbance ecology

*What are the dominant type, intensity, frequency, pattern, and scale at which historic natural disturbances occur in different areas of the province (including rates of tree mortality, tree fall-down, and tree decomposition for those dominant disturbances)?*

**Y051202 Quantification of disturbance processes along a temperature and moisture gradient in sub-boreal forests**

*What are the natural disturbance regimes in a variety of ecosystems and how can alternative silvicultural systems emulate these disturbances?*

Currently, a key approach for promoting healthy ecosystems is to use forest practices that emulate natural disturbance regimes. This project will compare the frequency and impact of biotic versus abiotic disturbance agents along an ecological gradient of sub-boreal, dry warm to wet cold ecosystems. This research will quantify the disturbance regimes in these ecosystems, and provide guidelines for alternative silvicultural systems that are meant to emulate natural disturbance processes.

**Kathy J. Lewis**  
**University of Northern British Columbia**

Initiated: 04/05  
Duration: 1 year  
06/07: \$0  
Total: \$20,627  
Location: interior plateau to McGregor Foothills  
PAC Region: NI

**Y062233 Development and analysis of a British Columbia natural disturbance database**

*How can natural disturbance probabilities be incorporated into forest management?*

Several types of natural disturbance, including fire, insects, and disease, have been mapped in BC since the 1920s, but these records have not previously been readily accessible. This project digitized all available historical disturbance data into a commonly used format, and began development of different ways to incorporate natural disturbance probabilities into forest management.

**Stephen Taylor**  
**Natural Resources Canada**

Initiated: 04/05

Duration: 2 years

06/07: \$0

Total: \$159,048

Location: province-wide

PAC Region: P

## S 1.6 Watershed function

*Evaluating the physical, biological and cumulative effects of forest management (incl. salvage harvesting), natural disturbance (e.g., fire, mass wasting, MPB), and range practices on watershed processes (e.g., streamflow quantity and timing, water quality, water table response), channel morphology, and aquatic habitat (e.g., salmon spawning grounds)*

**Y051047 Debris flow occurrence and mayor storm cycles, Kalum Forest District**

*What are the climate-debris flow interactions in logged watersheds?*

This project aims to link major storm cycles to debris flows with the goal to develop reliable forestry operation shutdown guidelines and to understand climate-debris flow interactions. A hydroclimatic threshold will be established to quantify the likelihood of landslide initiation during intensive rainfall in both old-growth forest and clearcuts. Synoptic meteorology will be used to determine if an approaching storm has the right combination of meteorological characteristics to trigger widespread debris flow activity.

**James W. Schwab**  
**Ministry of Forests and Range**

Initiated: 04/05

Duration: 1 year

06/07: \$0

Total: \$88,200

Location: Lower Skeena and  
Nass River  
watersheds

PAC Region: C

**Y051077 Forest management on alluvial and colluvial fans**

*What are the effects of logging practices on the hydrogeomorphic processes that influence alluvial and colluvial fans?*

This study will examine forest management on alluvial and colluvial fans to determine the spatial and temporal characteristics of the hydrogeomorphic processes that influence fans, and determine site and watershed factors that can be used to identify hydrogeomorphic processes that pose hazards to fan stability and forest land use. In addition, the project will develop a compendium of forestry experience on fans and extension materials that provide guidance for sustainable forest management practices.

**David John Wilford**  
**Ministry of Forests and Range**

Initiated: 04/05

Duration: 1 year

06/07: \$0

Total: \$23,731

Location: province-wide

PAC Region: P

<b>Y051293</b>	<b>Hydrologic decision making tools for sustainable forest management in rain-dominated coastal BC watersheds</b>	<b>Younes Alila University of British Columbia</b>
<i>Which current forest practices maintain watershed processes and enable sustainable management of water quantity?</i>	The overriding objective of this project is to extend the value of the Carnation Creek field experiment by answering key operational questions related to forest management scenarios other than the actual management scenario implemented at the site. Specifically, the project evaluates which current forest practices effectively maintain watershed processes and identifies which practices will allow us to sustainably manage water quantity and associated risks within the context of natural hydro-climatic variability. The project will provide quantitative information to guide managers in developing best management practices, and strengthening sustainable forest management and environmental stewardship.	Initiated: 04/05 Duration: 1 year 06/07: \$0 Total: \$59,850 Location: Carnation Creek, Vancouver Island PAC Region: C
<b>Y073017</b>	<b>Ecology and management of riparian - stream ecosystems: a large-scale experiment using alternative streamside management techniques</b>	<b>Dr. John S. Richardson University of British Columbia</b>
<i>What are the effects of alternative management regimes on aquatic organisms, aquatic habitat, riparian organisms, and water quality?</i>	This study uses a before-after control-impact (BACI) design to assess the effects of four treatments (clearcut with 0-, 10-, and 30-m buffers, and 50% partial cut to streambank) on aquatic organisms, aquatic habitat, riparian organisms, and water quality. After 5 years there is still broad divergence of conditions for treated streams and riparian areas, even with 30-m reserves, from the controls and pre-treatment conditions. Results will be used to establish indicators and to set parameters existing stream-riparian models to evaluate alternative management regimes and trajectories through time.	Initiated: 04/05 Duration: 3 years 06/07: \$195,727 Total: \$591,130 Location: coastal BC PAC Region: C
<b>Y073115</b>	<b>Snow, road, soil moisture, and harvest distribution effects on streamflow at Upper Pentiction Creek</b>	<b>Rita Winkler Ministry of Forests and Range</b>
<i>What are the effects of various harvesting and road building practices on watershed hydrology and riparian systems in the southern interior?</i>	This project is a continuation of the long-term Upper Pentiction Creek (UPCr) Watershed Experiment. The current funding contributes to projects examining the basic hydrology of the watershed, investigating the effects of various harvesting and road building practices on riparian systems, and extending the results of completed research including the provision of operational interpretations. The UPCR is the only experiment of its kind in the interior of BC, with both pre- and post-disturbance data in treated and control basins, and only one of eight paired-watershed experiments in Canada.	Initiated: 04/05 Duration: 3 years 06/07: \$99,855 Total: \$287,678 Location: Upper Pentiction Creek PAC Region: SI

<p><b>Y073222</b>    <b>Carnation Creek: forestry impacts and watershed recovery processes in a small coastal drainage</b></p> <p><i>What are the mechanisms, rates, and levels of natural resource recovery in a harvested coastal drainage?</i></p>	<p>This study is part of the of the larger Carnation Creek project, which has the objective of determining the mechanisms, rates, and levels of natural resource recovery in a harvested coastal drainage by quantifying long-term changes in biological and physical watershed processes. Specifically, this project will support continued collection and analysis of annual data, examine trends in fish populations, examine the use of alternative riparian forestry treatments, and support derivative studies that make use of the study area and project data. The Carnation Creek project is a classic example of validation monitoring, and provides intensive, quantitative process information in support of many projects.</p>	<p><b>Dr. Peter J. Tschaplinski</b> <b>Ministry of Forests and Range</b></p> <p>Initiated: 04/05 Duration: 3 years 06/07: \$171,050 Total: \$503,593 Location: South Island FD PAC Region: C</p>
<p><b>Y073294</b>    <b>Forest management in interior British Columbia: moving beyond equivalent cut area (ECA)</b></p> <p><i>What are the effects of forest management on hydrology and channel morphology in a forested, subalpine watershed?</i></p>	<p>A clear understanding of how forest disturbances affect the hydro-geomorphic regimes of watersheds is necessary for managers to make decisions regarding optimal harvesting and sustainable forest management. This project quantifies the effects of forest management on hydrology and channel morphology in a forested, subalpine watershed, and combines the results of this study with other similar studies. The results of this project will improve current management tools by providing quantitative information on the relationship between harvesting and hydro-geomorphology.</p>	<p><b>Younes Alila</b> <b>University of British Columbia</b></p> <p>Initiated: 04/05 Duration: 3 years 06/07: \$95,000 Total: \$289,760 Location: Cotton Creek, south Kootenays PAC Region: SI</p>
<p><b>Y073367</b>    <b>Effects of logging on export of organic matter from headwater streams</b></p> <p><i>What is the contribution of fish food and organic matter from fishless headwater streams to lower, fish-bearing streams?</i></p>	<p>Concern has been expressed that clearcut logging of headwater streams may be depriving downstream fish populations of food. This project assesses the contribution of fish food and organic matter from fishless headwater streams to lower, fish-bearing streams. The outcomes of this project will reduce the uncertainty for managers defining parameters of sustainable forest management and provide recommendations for improving policy on riparian buffer zones.</p>	<p><b>Dr. Brian Heise</b> <b>Thompson Rivers University</b></p> <p>Initiated: 04/05 Duration: 3 years 06/07: \$86,932 Total: \$251,491 Location: ESSF BEC zone PAC Region: SI</p>
<p><i>Connectivity and linkages between upslope disturbances and stream channel response</i></p>		
<p><b>Y062324</b>    <b>Coastal fan destabilization and forest management</b></p> <p><i>What is the extent of forestry-related fan destabilization in coastal BC and how can watershed be ranked for hazard and risk?</i></p>	<p>Forest harvesting and roads may disturb alluvial/colluvial fans, with consequent environmental and safety hazards. This project characterizes coastal fans, determines their sensitivity to destabilization, assesses the extent of forestry-related fan destabilization in coastal BC, and determines the factors causing the disturbance. A primary outcome of the project is development of a method for ranking hazard and risk on fans appropriate for forest management.</p>	<p><b>Tom Millard</b> <b>Ministry of Forests and Range</b></p> <p>Initiated: 04/05 Duration: 2 years 06/07: \$0 Total: \$35,150 Location: province-wide PAC Region: P</p>

*How large woody debris recruitment relates to stream channel type and state*

<b>Y051107</b>	<b>Simulation of large woody debris recruitment and dynamics associated with wildfire disturbance and harvesting in headwater streams of the BC interior</b>	<b>Adam Wei</b> <b>Okanagan University College</b>
<i>What are the processes involved in riparian LWD recruitment and in-stream dynamics?</i>	Although large woody debris (LWD) has been recognized as a critical component of many headwater streams, little is known about the processes involved in riparian LWD recruitment and in-stream dynamics. This project develops a riparian LWD recruitment and dynamics model that will be used to evaluate the impacts of wildfire disturbance and harvesting scenarios on LWD recruitment processes and dynamics in the headwater streams. The results will support designing riparian management strategies for maintenance of in-stream LWD supply and protection of aquatic habitat.	Initiated: 04/05 Duration: 1 <i>year</i> 06/07: \$0 Total: \$45,380 Location: southern and central interior PAC Region: SI
<b>Y051108</b>	<b>In-stream LWD as a sustainability indicator at spatial and temporal scales for headwater streams of the BC interior?</b>	<b>Adam Wei</b> <b>Okanagan University College</b>
<i>What are the processes involved in riparian LWD recruitment and in-stream dynamics?</i>	Although there is concern over the potential impacts of forest practices on fish habitat due to reduction of large woody debris (LWD) being recruited to fish-bearing streams, little is known about the characteristics and variability of LWD in forested streams within the BC interior. This project examines the relationship between in-stream LWD, channel morphology, and aquatic habitat across various spatial and temporal scales in headwater streams. The results from this study will have significant implications for selecting suitable stream ecological indicators that can be used in the design of riparian management strategies.	Initiated: 04/05 Duration: 1 <i>year</i> 06/07: \$0 Total: \$68,250 Location: southern interior PAC Region: SI
<b>Y062170</b>	<b>Functional large woody debris in small streams: what is it?</b>	<b>Dan Hogan</b> <b>Ministry of Forests and Range</b>
<i>What are the best management practices for supplying functional LWD from riparian areas adjacent to small riffle-pool and step-pool streams?</i>	The lack of an operational and physically meaningful definition of large woody debris (LWD) prevents us from designing effective riparian management prescriptions. This research develops a process-based definition of LWD scaled to the size of a channel. The new definition will be used to establish best management practices for the supply of functional LWD from riparian areas adjacent to small riffle-pool and step-pool streams.	Initiated: 04/05 Duration: 2 <i>years</i> 06/07: \$0 Total: \$79,049 Location: province-wide PAC Region: P

**Y073127 An experimental approach to evaluate impacts of the recent Okanagan Mountain Park Fire and other disturbances on large woody debris recruitment and transportation processes**

*What is the annual budget (i.e., input-outputs) of LWD in aquatic/riparian ecosystems and the dynamic properties of LWD as structures and aquatic habitat?*

Given the importance of large woody debris (LWD) in streams as structures and aquatic habitat, understanding the dynamic properties of LWD has become an important issue in riparian and watershed management. This project will examine the influence of various disturbances on LWD input, output and transfer processes by collecting field data to construct an annual budget (i.e., input-outputs) of LWD in the aquatic/riparian ecosystems of the study area. The results of this project will provide necessary scientific information regarding the role that forest disturbance plays in stream environments in the southern interior of BC.

**Dr. Adam Wei**  
University of British Columbia

Initiated: 04/05  
Duration: 3 years  
06/07: \$25,473  
Total: \$82,906  
Location: southern and central interior  
PAC Region: SI

*No priority assigned*

**M065006 Determining the impact of MPB-killed forest and elevated harvesting on snow accumulation, and the projected impacts on melt and peak flow**

*Will reduced forest cover resulting from MPB infestation and salvage harvesting reduce snow accumulation and alter peak flows?*

There is concern that reduced forest cover resulting from MPB infestation and salvage harvesting may reduce snow accumulation, and in turn affect the onset of peak flow during seasonal melt. This project will measure snow water equivalence and canopy cover in non-infested, infested, and salvaged basins within the Quesnel watershed. The primary outcome will be projections of the potential impacts of MPB on melt and peak flow from these basins.

**Sarah Boon**  
University of Northern British Columbia

Initiated: 05/06  
Duration: 1 year  
06/07: \$0  
Total: \$18,902  
Location: Quesnel watershed  
PAC Region: SI

**M075035 Measurement and modelling of mountain pine beetle impacts on the annual forest water balance**

*What are the effects of stand attributes and management practices on stand water balance in MPB-infested forests?*

The impact of MPB on hydrology is determined by the complex interaction of a wide range of variables. The research examines how different stands affected by MBP infestations, as well as management practices such as clearcutting, understorey retention, and juvenile stand management, affect the stand water balance. This research will support the calibration of forest hydrology models that predicatively link changes in hydrologic processes.

**Darryl Carlyle-Moses**  
Thompson Rivers University

Initiated: 06/07  
Duration: 2 years  
06/07: \$56,389  
Total: \$83,055  
Location: Thompson Plateau  
PAC Region: SI

**Y073273 Tsitika River sediment budget project**

*How do the effects of coastal forest management practices affect road drainage, and sediment production and transport processes?*

Previous work by the authors suggests road deactivation measures that may reduce sediment yield from stream crossings. The current project involves collecting relevant field data and developing a physically based model to integrate the effects of forest management practices related to road drainage, and sediment production and transport processes. A primary goal of the project is to extend the results to other areas by using a method that is firmly rooted in hydrologic and geomorphic processes.

**Rod Hudson**  
Ministry of Forests and Range

Initiated: 04/05  
Duration: 3 years  
06/07: \$120,750  
Total: \$329,364  
Location: Tsitika River, Vancouver Island  
PAC Region: C

**Y073327 Evaluation of fire site rehabilitation methods in terms of controlling erosion and sedimentation**

*How cost-effective are hillslope rehabilitation methods for severely burned forest watersheds, including various mulches and seeding?*

This project evaluates the functional and cost-effectiveness of the several hillslope rehabilitation methods for severely burned forest watersheds, including various mulches and seeding. Specifically, the project examines the impact of precipitation and site variables on the amount of soil lost from the study sites.

**David Findlay Scott**  
**University of British Columbia**

Initiated: 04/05

Duration: 3 years

06/07: \$38,000

Total: \$101,077

Location: Okanagan Mountain, Cedar Hills, Curry Creek, north of Cherryville, Barriere area

PAC Region: SI

**Y073328 Testing the H60 concept in the Interior Watershed Assessment Procedure by process hydrology studies**

*Which zone in a watershed makes the dominant contribution to the water in the peak flows?*

The current approach to tracking water through a watershed assumes a direct and immediate link between snowmelt and surface flow, with little lag in delivery of water from the snowpack to the stream. This project uses tracers and water chemistry to determine the zone in the watershed that makes the dominant contribution to the water in the peak flows. This will lead to a better understanding of the travel times of water in the watersheds and the contributions of different zones and altitudinal belts to the important peak flows.

**David Findlay Scott**  
**University of British Columbia**

Initiated: 04/05

Duration: 3 years

06/07: \$32,999

Total: \$83,289

Location: southern interior

PAC Region: SI

## S 1.8 Ecological restoration

*Evaluating the effectiveness of restoration techniques on mitigating forest encroachment and in-growth in NDT4 ecosystems*

**Y073069 Understorey succession following ecosystem restoration of ingrown dry forests**

*How will understorey grassland and open forest vegetation recover following different levels of thinning and prescribed burning in overstocked stands of IDF and PP forests?*

This project assesses the recovery of understorey grassland and open forest vegetation following different levels of thinning and prescribed burning in overstocked stands of IDF and PP forests in the Rocky Mountain Forest District. The objective is to determine the effect of harvesting, slashing, and spring burning on the composition of the understorey herbaceous and shrub layer over time. Results will provide knowledge and information needed to support science-based sustainable management of BC's dry forest ecosystems.

**Dr. Reg Newman**  
**Ministry of Forests and Range**

Initiated: 04/05

Duration: 3 years

06/07: \$14,117

Total: \$39,537

Location: southern interior

PAC Region: SI

## S 2.0 Decision support tools for sustainable forest management

### S 2.1 Habitat supply modeling

*Developing, calibrating, and validating habitat models related to priorities identified in Theme 1.0 (Ecosystem structure and processes, and biodiversity related to forest management), in Topic 3.2 (Indicator targets and thresholds of sustainability), and for decision support related to priorities in Theme 4.0 (Scientific information to inform policy, regulations, and standards development). Non-timber forest products may also be treated in this manner*

<p><b>Y071027</b>    <b>Incorporation of wildlife habitat capability into the multi-value, spatially explicit, complex cutblock ecosystem management model LLEMS</b></p> <p><i>How can wildlife habitat be modeled effectively at the cutblock level?</i></p>	<p>This project is part of a long-term initiative to add wildlife habitat supply capability to the local landscape, ecosystem management decision support model LLEMS. The model will be applied to assessments of the implications for selected wildlife species and other forest values of alternative stand and local landscape management alternatives, interacting with natural disturbances and climate-change scenarios.</p>	<p><b>Dr. J.P. (Hamish) Kimmins</b> <b>University of British Columbia</b></p> <p>Initiated: 06/07 Duration: 2 years 06/07: \$67,279 Total: \$133,482 Location: Central Cariboo FD PAC Region: NI</p>
<p><b>Y073348</b>    <b>An ecosystem approach to planning for sustainable management of mountain goat resource values and timber supply</b></p> <p><i>What are the habitat requirements of mountain goats, and how are they affected by forest management?</i></p>	<p>Development of BC's forests may have a negative impact on mountain goat populations due to the apparently static nature of their resource use. This project uses a habitat supply model to identify knowledge gaps, establish research hypotheses, and develop transparent and measurable management strategies for mountain goats. Furthermore, the project will provide extension of adaptive management results to a higher-level planning context (i.e., landscape and population).</p>	<p><b>Dr. R. Scott McNay</b> <b>McGregor Model Forest Association</b></p> <p>Initiated: 04/05 Duration: 3 years 06/07: \$120,539 Total: \$320,268 Location: Mackenzie TSA PAC Region: NI</p>

## S 3.0 Sustainable forest management indicators, targets, and monitoring systems

### S 3.1 Development of indicators and monitoring systems

*Indicators and monitoring systems are needed for each of the 11 FRPA values (i.e., soils, visual quality, timber, forage and associated plant communities, water, fish, wildlife, biodiversity, recreation resources, resource features, cultural heritage values). A non-restrictive list of examples includes riparian function, watershed function, ecological representation, habitat quality*

<p><b>Y051112</b>    <b>Development of sustainability indicators for turbidity impacts on stream ecosystems</b></p> <p><i>What are the effects of low levels of turbidity on aquatic ecosystem health and stream condition?</i></p>	<p>Turbidity is a key indicator of water quality and stream condition due to its direct negative effects on fish growth. This project will use a drift-foraging bioenergetics model to quantitatively predict the impact of turbidity on juvenile salmon growth rates. The results of this project will provide a direct indicator of the effects of low levels of turbidity on aquatic ecosystem health and stream condition.</p>	<p><b>Jordan Rosenfeld</b> <b>Ministry of Water, Land, and Air Protection</b></p> <p>Initiated: 04/05 Duration: 1 year 06/07: \$0 Total: \$14,280 Location: Lower Mainland PAC Region: C</p>
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<p><b>Y061025</b>    <b>Effects of forest practices on the native signal crayfish, <i>Pacifastacus leniusculus</i>, in BC</b></p> <p><i>Are signal crayfish affected by forest harvesting and are they a sensitive indicator of forest disturbance?</i></p>	<p>As a long-lived species inhabiting streams, the signal crayfish is subject to all of the same concerns surrounding forestry impacts expressed for salmonids and other fish. A series of field surveys will test the hypothesis that crayfish population densities and age structure are affected by forest harvesting. In addition to better understanding the impact of forest harvesting on this species, the research will identify whether this species can provide an additional sensitive indicator of the effects of forest practices on streams.</p>	<p><b>John Richardson</b> <b>University of British Columbia</b></p> <p>Initiated: 05/06 Duration: 1 year 06/07: \$0 Total: \$25,571 Location: Lower Mainland PAC Region: C</p>
<p><b>Y061074</b>    <b>Development and testing of extensive-level field indicators and methods to determine whether current forestry practices are sustainably managing riparian, aquatic ecosystem, and fish habitat values</b></p> <p><i>Can proposed indicators of riparian functioning be validated in the field?</i></p>	<p>A list of indicators for the effects of forestry practices on riparian systems was previously developed using an expert-rules process. The intent of this project is to validate these indicators in the field, and refine the indicators for operational use in forest practices monitoring.</p>	<p><b>Peter Tschaplinski</b> <b>Ministry of Forests and Range</b></p> <p>Initiated: 05/06 Duration: 1 year 06/07: \$0 Total: \$60,036 Location: NE Vancouver Island, Prince George FD PAC Region: P</p>
<p><b>Y062031</b>    <b>Linking multiple indicators of biological diversity to forest management decisions</b></p> <p><i>What are potential indicators of habitat structures and other key stand attributes in variable retention harvesting systems?</i></p>	<p>This project aims to develop and model indicators for identifying the location and amount of unmanaged land and different types of forest harvesting, important habitat structures, and other key stand attributes. New indicators will be used in conjunction with existing GIS-based tools that project management scenarios and with models that project attributes of variable retention at the stand level.</p>	<p><b>Fred Bunnell</b> <b>University of British Columbia</b></p> <p>Initiated: 04/05 Duration: 2 years 06/07: \$0 Total: \$101,905 Location: Vancouver Island PAC Region: C</p>
<p><b>Y071010</b>    <b>Developing indicators of soil productivity, function, and biodiversity through soil biotic communities</b></p> <p><i>Are there biological indicators of soil condition that can be used to assess sustainability of soil productivity and to identify site-degrading forest practices?</i></p>	<p>This project will establish the ecological relationships that are needed to develop a biological indicator system for soil health, including indicator lists for species that are generalists and widely distributed, or specialists and narrowly distributed to well-defined soil conditions.</p>	<p><b>Marty Kranabetter</b> <b>Bulkley Valley Centre for Natural Resources Research and Management</b></p> <p>Initiated: 06/07 Duration: 3 years 06/07: \$36,225 Total: \$89,775 Location: boreal PAC Region: NI</p>

<b>Y071020</b>	<b>Indicators of biodiversity within aspen stands of the Interior Douglas-fir zone</b>	<b>Dr. Karl Larsen Thompson Rivers University</b>
<i>What is the relative importance of each sub-component of the IDFdK zone, particularly the aspen-dominated stands, in meeting biodiversity objectives?</i>	This project surveys species richness and community assemblages with reference to carabid beetles, small mammals, and bird communities within IDFdK (Interior Douglas-fir, dry cool subzone). The intent is to quantify the diversity patterns of the three indicator species across forest types, and to identify which to use as bioindicator species in a long-term biomonitoring project.	Initiated: 06/07 Duration: 2 years 06/07: \$43,890 Total: \$60,690 Location: Kamloops PAC Region: SI
<b>Y071040</b>	<b>Alternative indicators of the integrity of stream function as an assessment of sustainable forest management</b>	<b>Dr. John S. Richardson University of British Columbia</b>
<i>What potential indicators of stream integrity might be applied in streams that have few or no fish species?</i>	The project examines three alternative measures of stream condition, and compares these with each other for their concordance, and also with stream benthic invertebrate assemblages (which will be collected as part of other projects). The measures include algae, aquatic fungi associated with the decomposition of leaf litter (primarily hyphomycetes), and rates of breakdown of leaf litter.	Initiated: 06/07 Duration: 3 years 06/07: \$74,283 Total: \$207,318 Location: coast PAC Region: C
<b>Y071075</b>	<b>Stand-level vegetation indicators for boreal mixedwood forests</b>	<b>Dr. Sybille Haeussler Bulkley Valley Centre for Natural Resources Research and Management</b>
<i>How can production of black huckleberries be integrated with forest management practices?</i>	The objective of this project is to develop management guidelines and disseminate information on the best practices for the management of black huckleberry within the forests of British Columbia. Information collected for black huckleberry will be analyzed to determine the light requirements, effects of competition removal, and impacts of invigoration through light fire or pruning. The research project will likely include identifying existing good berry producing sites and determining what factors make them good berry producers. This hypothesis will be tested by identifying other sites with a similar history and ecological properties, and determining if they are also good berry sites.	Initiated: 06/07 Duration: 1 year 06/07: \$14,314 Total: \$14,314 Location: northern interior PAC Region: NI

<b>Y071160</b>	<b>The implications of management practices for mitigating mountain pine beetle on soil-based indicators of SFM</b>	<b>Steven Day</b> <b>Canadian Forest Products Ltd.</b>
<i>Do soil-based indicators of SFM provide reliable measures of soil conditions and ecosystem recovery when applied to management practices for mountain pine beetle mitigation?</i>	The long-term objective of the project is to ensure that indicators of SFM are meaningful, reliable, and cost-effective to measure. As yet, there is no generally accepted method for quantifying the impacts of management activities on soil function and, hence, ecosystem recovery. This proposal provides a solution by linking empirical estimates of a given indicator (forest floor and soil organic matter) with an ecosystem model to project targets for that indicator and compare them against thresholds derived from a previous (2005) FSP-funded study in this region (project Y061143). The thresholds represent an early warning that practices are compromising a given SFM indicator such that, when measures violate threshold boundaries, they should trigger remedial actions.	Initiated: 06/07 Duration: 1 year 06/07: \$53,550 Total: \$53,550 Location: Quesnel TSA PAC Region: SI; NI
<b>Y071172</b>	<b>Development of a microbial indicator database for validating measures of sustainable forest soils</b>	<b>Dr. Richard S. Winder</b> <b>Natural Resources Canada</b>
<i>How can microbial indicators validate soil health measurements for sustainable forest management?</i>	This project develops a publicly accessible database to expedite the use of microbial indicators in validation of soil health measurements for sustainable forest management. The objective is to validate forest soil health measures using microbial indicators of common soil disturbances and key functions. The project will develop a microbial indicator database using MS Access, and a suitable interface for database query and data deposit.	Initiated: 06/07 Duration: 2 years 06/07: \$52,500 Total: \$89,250 Location: coast PAC Region: C
<b>Y072030</b>	<b>Terrestrial gastropods as indicator species for monitoring biodiversity effects from variable retention harvesting practices</b>	<b>Bill Beese</b> <b>Western Forest Products</b>
<i>What are the effects of variable retention options on gastropod abundance?</i>	Terrestrial gastropods are sensitive to changes in moisture and temperature regimes of a forest, and thus may be good indicators of the disturbance history of a forest stand. This project builds on initial studies by collecting post-logging data on gastropod diversity and abundance to supplement previously collected pre-logging data at the same sites. This will allow the researchers to assess the effects of different variable retention logging practices during the first few years after logging.	Initiated: 05/06 Duration: 2 years 06/07: \$47,250 Total: \$94,500 Location: coastal BC; specific study sites are within TFLs 39 and 44 (Van. Is. & Mainland) PAC Region: C
<b>Y073045</b>	<b>A species accounting system to integrate indicators of biological diversity</b>	<b>Fred Bunnell</b> <b>University of British Columbia</b>
<i>How can economic and ecological values be incorporated in an integrated measure of success in sustaining biodiversity?</i>	This project extends a decision-support tool for exploring different approaches to forest planning and their consequences to economic values and ecological values, by providing an integrated measure of success in sustaining biodiversity. This integrated measure combines the indicators of biodiversity assessed at three scales: ecosystem representation; habitat amount, structure, and distribution; and organisms.	Initiated: 04/05 Duration: 3 years 06/07: \$85,680 Total: \$225,935 Location: East Kootenays PAC Region: SI

**Y073128 Benthic macroinvertebrate sustainability indicator development for SFMP and LRMP applications****Ian Sharpe**  
**Ministry of Environment***What is an effective indicator of aquatic ecosystem health?*

This project will develop a sustainability indicator of aquatic ecosystem health for use in Forest Stewardship Plans. The indicator will be developed using models based on real landscapes that explain relationships between human stressors and benthic invertebrate assemblages found in streams. The product will include general protocols for generating and using statistically derived sustainability indicator models.

Initiated: 04/05  
 Duration: 3 years  
 06/07: \$74,970  
 Total: \$222,810  
 Location: New Nadina and Bulkley Stikine FDs  
 PAC Region: NI

*What aquatic species (benthic invertebrates, algae, fish, etc.) can be used as indicators of watershed health?*

**Y051116 "EpHects" - a cumulative effects analysis method using automated continuous pH measurements in streams****Edward J. Quilty**  
**University of British Columbia***Can analysis of pH cycles provide an indicator of cumulative effects of forest harvesting on stream ecology?*

Changes to aquatic life caused by disturbances to forest streams may cause deviations in the streams' diurnal pH cycle. This project will test the utility of using detailed analysis of pH cycles for assessment of cumulative effects of forest harvesting on stream ecology. If effective, this new technique will reduce the substantial effort and expense of existing monitoring programs.

Initiated: 04/05  
 Duration: 1 year  
 06/07: \$0  
 Total: \$28,603  
 Location: Maple Ridge  
 PAC Region: C

**Y073113 Development of indicators of stream condition, function, and capacity for juvenile salmon****Dr. Jordan Rosenfeld**  
**Ministry of Environment***What are the best physical and biological indicators of stream conditions for rearing juvenile salmon?*

The goal of this project is to determine the best physical and biological indicators of stream conditions. The project will use field sampling, laboratory analysis, and statistical approaches to develop a rapid assessment protocol for assessing stream capacity for rearing juvenile salmon. The final result could be used to develop regional inventory and monitoring protocols.

Initiated: 04/05  
 Duration: 3 years  
 06/07: \$34,858  
 Total: \$77,696  
 Location: Lower Mainland and southern interior  
 PAC Region: C: SI

*Developing and evaluating uses of remote sensing, information systems, and innovative technology to assess landscape- and stand-level characteristics*

**Y071062 Integration of airborne LiDAR and hyperspectral remote sensing data to support the Vegetation Resources Inventory and sustainable forest management****Dr. K. Olaf Niemann**  
**University of Victoria***How can an approach that integrates LiDAR and hyperspectral RS best support current and anticipated future requirements of the VRI at the management unit level?*

This project implements a medium-scale (75,000 ha), proof-of-concept study to evaluate the capability of integrated (fused) high-spatial-resolution (< 1 m) LiDAR and hyperspectral RS datasets to support Phase I and II stages of the VRI. It will develop site-specific, LiDAR-based calibration equations for Phase I estimates of stand height, gross volume, crown cover, basal area, and stem density using Phase II ground-reference data, and determine whether high-spatial-resolution (< 1 m) airborne hyperspectral data can accurately identify tree species composition and diversity at the stand level, and which VRI attributes can be accurately measured using an integrated LiDAR/hyperspectral RS approach.

Initiated: 06/07  
 Duration: 3 years  
 06/07: \$70,875  
 Total: \$210,000  
 Location: southern interior  
 PAC Region: SI

*No priority assigned*

<p><b>Y061118</b> <b>Spatial and temporal response of bryophytes to silvicultural and site preparation treatments in high-elevation forests at Sicamous Creek</b></p> <p><i>What are the effects for forest management practices on bryophytes?</i></p>	<p>Several studies have shown that the effect of forest harvesting on bryophytes can be both severe and long lasting, but little research has been done in BC. This study will re-measure the bryophyte response to silvicultural and site treatments 11 years post-harvest, at an existing long-term research installation. Preliminary results from the 1999 sampling period showed significant differences in the bryophyte community among both silvicultural and site preparation treatments.</p>	<p><b>Dennis Lloyd</b> <b>Ministry of Forests and Range</b></p> <p>Initiated: 05/06 Duration: 1 <i>year</i> 06/07: \$0 Total: \$37,490 Location: Sicamous Creek Silvicultural Systems Research Site PAC Region: SI</p>
<p><b>Y061171</b> <b>Assessment of data requirements and development of multi-scale habitat classification methods for refining strategic habitat</b></p> <p><i>Can fine-scale habitat attributes for Spotted Owl be inferred from existing inventory data and remote sensing?</i></p>	<p>Current inventory data for BC's forests contain limited information on fine-scale habitat attributes that are critical for describing the habitat of the Northern Spotted Owl (SPOW). This study will assess the feasibility of using statistical relationships among readily available inventory data (including maps and remotely sensed imagery) to infer the occurrence of fine-scale habitat elements. Outcomes of the project include assessment of potential data sources, a protocol for estimating fine-scale structural attributes using extant data, and a pilot application of this protocol.</p>	<p><b>Louise Waterhouse</b> <b>Ministry of Forests and Range</b></p> <p>Initiated: 05/06 Duration: 1 <i>year</i> 06/07: \$0 Total: \$40,541 Location: Chilliwack, Squamish, and Cascade Forest Districts PAC Region: C</p>
<p><b>Y061173</b> <b>Replacement of fire damaged LTSP plots: Rover Creek ICH installation</b></p> <p><i>No question - plot replacement</i></p>	<p>Three plots from the province-wide Long Term Soil Productivity (LTSP) study were burned in wildfires, leaving the experimental design incomplete. This project will replace these plots on new sites. This replacement is critical to the successful interpretation of data from the ICH replicates.</p>	<p><b>Shannon Berch</b> <b>Ministry of Forests and Range</b></p> <p>Initiated: 05/06 Duration: 1 <i>year</i> 06/07: \$0 Total: \$49,295 Location: Rover Creek, near Nelson PAC Region: SI</p>
<p><b>Y071154</b> <b>Linking range health assessment methodology with science</b></p> <p><i>Do forest health assessment methods provide adequate assessments of ecosystem function and condition of rangelands?</i></p>	<p>The proposed project will provide links between range health assessment methods (visual) and quantitative measures such as water infiltration, soil aggregate stability, soil bulk density, and above-ground biomass. The intent is to determine the confidence that can be placed in range health assessments, and to provide data that can be used to refine the boundaries of the range health categories. Range health assessments using the two methods will be conducted at the same sites, separately by at least three trained individuals. Analysis will include correlation between health assessments and quantitative measures.</p>	<p><b>Reg Newman</b> <b>Ministry of Forests and Range</b></p> <p>Initiated: 06/07 Duration: 1 <i>year</i> 06/07: \$49,613 Total: \$49,612 Location: southern interior PAC Region: SI</p>

<b>Y072029</b>	<b>Utility of carabid beetles as indicator species for monitoring biodiversity effects from variable retention harvesting practices</b>	<b>Bill Beese</b> <b>Western Forest Products</b>
<i>What are the effects of patch size in variable retention systems on carabid beetle populations?</i>	Carabid beetles have been shown to be good indicators of old-growth communities and edge conditions. To improve our understanding of this relationship in variable retention (VR) harvesting systems, the authors will examine the effect of patch size on carabid beetle communities. The results of this work will help to differentiate the effects of patch size and proximity of patches on carabid beetles in a VR cutblock, which may lead to the development of more effective VR layouts.	Initiated: 05/06 Duration: 3 years 06/07: \$48,300 Total: \$143,324 Location: coastal BC; specific study sites are within TFLs 39 and 44. PAC Region: C
<b>Y072093</b>	<b>Recovery of soil carbon and nitrogen ten years after harvesting and site preparation at Sicamous Creek</b>	<b>Graeme Hope</b> <b>Ministry of Forests and Range</b>
<i>How do harvesting and site preparation affect soils in high-elevation sites?</i>	There have been no published studies investigating medium-term changes in soil properties in the high elevation forests of interior BC. This project will use a field sampling program to expand the timeline of previously collected and published data on changes in soil properties following harvesting. The intent of this research is to understand how different harvesting and site preparation disturbances affect soil productivity in the medium term.	Initiated: 05/06 Duration: 3 years 06/07: \$7,560 Total: \$58,856 Location: Sicamous PAC Region: SI

### S 3.2 Indicator thresholds of sustainability

*Define the response curves for biodiversity indicators to assist in identifying thresholds for maintaining ecological resilience*

<b>Y071015</b>	<b>Developing thresholds for within-stand biodiversity indicators</b>	<b>Fred Bunnell</b> <b>University of British Columbia</b>
<i>What can existing data tell us about thresholds for within-stand biodiversity?</i>	This project collates relevant data and analyzes to extract apparent thresholds for within-stand biodiversity indicators (medium to coarse filter). In-stand indicators of biodiversity include large live trees, canopy cover, snags, downed wood (CWD), hardwoods, and shrub and ground cover layers.	Initiated: 06/07 Duration: 2 years 06/07: \$41,990 Total: \$83,980 Location: province-wide PAC Region: P

*Defining criteria suitable for assessing the ecological representation, landscape, and site attributes needed to maintain wildlife and biodiversity, and how best to allocate them across the landscape*

<b>Y051023</b>	<b>Refining conservation priorities in British Columbia</b>	<b>Fred Bunnell</b> <b>University of British Columbia</b>
<i>What are the conservation priorities for BC?</i>	This project develops a scientifically credible system for assigning conservation priorities in BC around criteria that reflect stewardship responsibility. The project develops systems and lists evaluating the criteria for vascular plants, mosses, lichens, damselflies and dragonflies, butterflies, freshwater fish, amphibians, reptiles, birds, and mammals. It also develops a system for dealing with peripheral species (less than 10% of their range in BC), noting features documented in the literature that can guide conservation efforts for peripheral species.	Initiated: 04/05 Duration: 2 years 06/07: \$0 Total: \$96,242 Location: province-wide PAC Region: P

<b>Y071069</b>	<b>Effective landscape-level planning approaches to sustain biodiversity in the managed forests of southeastern British Columbia</b>	<b>Ralph W. Wells University of British Columbia</b>
<i>How can planning processes at the landscape level be improved to sustain biodiversity and balance trade-offs between biodiversity and economic objectives?</i>	Objectives of the project are to develop tools and approaches that provide decision support for landscape-level spatial planning. Applications include sustaining biodiversity at the landscape level; helping to integrate multiple objectives such as ecosystem representation, OGMA's and species objectives at the landscape level; helping to balance competing biodiversity objectives such as representation and "intact" landscapes, as well as between biodiversity and economic objectives; and providing a systematic planning basis to support development of future monitoring priorities for biodiversity. Outcomes include significant improvements to the understanding of landscape-level strategies for sustaining biodiversity and understanding associated economic trade-offs.	Initiated: 06/07 Duration: 2 years 06/07: \$35,621 Total: \$69,463 Location: Rocky Mountains PAC Region: SI
<i>No priority assigned</i>		
<b>Y061046</b>	<b>Developing thresholds for a key hydrologic indicator of watershed function: equivalent cut area</b>	<b>Younes Alila University of British Columbia</b>
<i>Does ECA provide an accurate estimate of watershed hydrology as affected by timber harvesting?</i>	Current use of equivalent cut area (ECA) may overestimate the impact of forest harvesting on the hydrology of watersheds, with possibly high costs to industry. This project uses a pre-existing model to conduct long-term hydrologic simulations on two experimental watersheds to evaluate streamflow responses to forest management, and to explore the relationship between ECA and potential hydrologic effects. The outcomes of this project can be used to inform guidelines, tools, and models related to watershed hydrology and forest management.	Initiated: 05/06 Duration: 1 year 06/07: \$0 Total: \$59,850 Location: southern interior PAC Region: SI
<b>Y061143</b>	<b>Deriving and measuring the soil-based thresholds required for maintaining ecosystem productivity under a Sustainable Forest Management Plan</b>	<b>Steven Day Canadian Forest Products Ltd.</b>
<i>Is soil organic matter an effective indicator of ecosystem productivity?</i>	Maintaining ecosystem productivity is fundamental to the principles of sustainable forest management (SFM), and yet there is still no effective method for measuring and monitoring the impacts of management activities on ecosystem productivity. This project combines field measures of soil organic matter (SOM) with an ecosystem management model to derive threshold values for SOM and evaluate the practicality of implementing an SFM monitoring program around this indicator.	Initiated: 05/06 Duration: 1 year 06/07: \$0 Total: \$45,360 Location: Quesnel TSA PAC Region: SI

**Y071269 Range of natural variation in structural attributes of young stands: refining current indicators**

*What portion of harvested stands should be included within wildlife tree patches to minimize the impacts of forestry on biodiversity?*

The project characterizes the range of natural variability in density, size-class distributions, and cover (as appropriate) of snags, downed wood, large live trees, shrubs, and forest floor conditions in young and immature (< 60 yr), naturally disturbed stands of different disturbance origin in the SBS and the ESSF. Samples will be stratified by site series to control for site productivity, and hence, tree/snag/downed wood size. The data will also be used to test a disturbance classification system that considers the amount and dispersion of overstorey removal, understorey removal, and forest floor disturbance.

**Ruth Lloyd**  
Bulkley Valley Centre for  
Natural Resources Research  
and Management

Initiated: 06/07

Duration: 1 year

06/07: \$63,000

Total: \$63,000

Location: Babine River  
Watershed

PAC Region: NI

### S 3.3 Indicators for economic and social sustainability

*Mechanisms for aggregating social and economic data for use in land-use planning processes*

**Y071036 A synthesis of BC public perception survey results and techniques for quantifying social indicators in forest planning**

*What are the public's social preferences regarding management of forest resources in BC?*

Current year objectives for the project include making available to practitioners and the public the combined results (overall patterns) from several recent studies eliciting public/stakeholder preferences in BC; and providing initial precedents and recommendations to practitioners on promising techniques to quantify and project key preference-based social indicators. The long-term objectives are to contribute to an improved understanding among practitioners, researchers, and the public about the patterns of social preferences in achieving sustainable forest management (SFM), the relative importance of these perceived values, and methods for integrating these values into forest and land-use planning.

**Stephen R.J. Sheppard**  
University of British Columbia

Initiated: 06/07

Duration: 1 year

06/07: \$33,075

Total: \$33,075

Location: province-wide

PAC Region: P

## S 4.0 Scientific information to inform policy, regulations, and standards development and refinement

### S 4.1 Species at Risk recovery research

*Determining critical habitat requirements for species at risk, defined at the appropriate scale*

<p><b>Y062035</b>    <b>Ecological relationships between threatened caribou herds and their habitat in the central Rocky Mountains Ecoregion</b></p> <p><i>What are critical habitat requirements for caribou in the transition zone between the northern and mountain ecotypes?</i></p>	<p>Northern and mountain ecotype caribou have very different habitat-use patterns, and require very different habitat management practices. This project will analyze and report on 3 years of telemetry and habitat sampling data to determine habitat requirements of threatened caribou herds in the central Rocky Mountains ecoregion, which is the transition zone between the two ecotypes. This information will be used by Recovery Implementation Groups to delineate critical habitat in the area.</p>	<p><b>Dale Seip</b> <b>Ministry of Forests and Range</b></p> <p>Initiated: 04/05 Duration: 2 years 06/07: \$0 Total: \$187,494 Location: Prince George, Mackenzie, and Peace Forest District FDs PAC Region: NI</p>
<p><b>Y062309</b>    <b>Identification of critical habitat of breeding Marbled Murrelets</b></p> <p><i>What is the cost-effectiveness of various survey methods for Marbled Murrelet habitat?</i></p>	<p>Three methods that vary in cost and effectiveness are currently used for assessing Marbled Murrelet habitat, but the trade-offs among these approaches are not fully understood. This project will better define which stand attributes best predict nest habitat for each assessment method, test the reliability of the three methods, and detail particular habitat relationships. A primary outcome of the project is to allow more accurate cost/benefit trade-offs when selecting particular areas for conservation.</p>	<p><b>Ronald Ydenberg</b> <b>Simon Fraser University</b></p> <p>Initiated: 04/05 Duration: 2 years 06/07: \$0 Total: \$121,348 Location: Desolation Sound, Sunshine Coast, and Clayoquot Sound PAC Region: C</p>
<p><b>Y071019</b>    <b>Identification of critical habitat requirements for interior Western Screech-Owls</b></p> <p><i>What are the critical habitat requirements for Western Screech-Owls, and what is the importance of riparian habitat?</i></p>	<p>The purpose of this project is to collect information on the ecology of this species, including critical habitat requirements, so that the twin goals of sustainable forest management and population recovery can be attained.</p>	<p><b>Richard D. Weir</b> <b>Artemis Wildlife Consultants</b></p> <p>Initiated: 06/07 Duration: 2 years 06/07: \$18,900 Total: \$43,470 Location: Shuswap River, northeast of Lumby PAC Region: SI</p>

<b>Y071051</b>	<b>Integration and extension of Marbled Murrelet habitat data collected at different scales</b>	<b>Dr. D.B. Lank</b> <b>Simon Fraser University</b>
<i>How do different methods of Marbled Murrelet habitat assessments compare in terms of reliability and cost?</i>	This project will prepare manuscripts and related extension materials that identify stand attributes that best predict nesting habitat quality for Marbled Murrelets for each of three assessment methods (air photo interpretation, helicopter reconnaissance, and ground visits). An additional manuscript will present the relationships between and reliability of the three methods, contrasting the reliability and application of ground, helicopter, and air photo assessment methods to better inform on cost/benefit trade-offs when defining areas of habitat available at different scales and selecting particular areas for conservation.	Initiated: 06/07 Duration: 1 year 06/07: \$21,525 Total: \$21,525 Location: coast PAC Region: C
<b>Y073061</b>	<b>Habitat use by marbled murrelets on southwest Vancouver Island and implications for forest management</b>	<b>Alan E. Burger</b> <b>University of Victoria</b>
<i>What are the parameters of habitat use and spatial distributions of Marbled Murrelet nests in old seral forests?</i>	This project uses a combination of radar counts, forest cover and other inland habitat data, and marine parameters to explain habitat use and spatial distributions of the threatened Marbled Murrelet nesting in old seral forests on southwest Vancouver Island, and applies these results to the entire BC range of murrelets.	Initiated: 04/05 Duration: 3 years 06/07: \$82,950 Total: \$244,925 Location: Vancouver Island PAC Region: C
<i>Clarifying and/or assessing threats to species or ecosystems at risk, particularly those with cumulative effects or where evidence is conflicting</i>		
<b>Y071026</b>	<b>Evaluating the potential threat of Barred Owls on Northern Spotted Owl population recovery and habitat management strategies</b>	<b>F. L. Waterhouse</b> <b>Ministry of Forests and Range</b>
<i>Does the Barred Owl represent a threat to recovery of Spotted Owl populations?</i>	The project identifies and collates available information on the distribution of Barred Owls within the Spotted Owl range in BC, and through population modeling tests hypothesized mechanisms of interaction between the two species to assess the potential threat on the Spotted Owl population and its potential for recovery	Initiated: 06/07 Duration: 2 years 06/07: \$16,800 Total: \$19,950 Location: boreal forest PAC Region: C
<b>Y073342</b>	<b>Experiments on edge effects in marbled murrelets: incorporating reproductive performance into habitat quality</b>	<b>Ronald Ydenberg</b> <b>Simon Fraser University</b>
<i>What is the relative value of "edge" versus "interior" habitat for nesting Marbled Murrelets with respect to edge type and larger landscape variables?</i>	Marbled Murrelet biologists do not agree on the value as habitat of different types of forest edges. This project will evaluate the relative value of "edge" versus "interior" habitat for nesting marbled murrelets with respect to edge type and larger landscape variables. The outcomes of this project will assist managers in making trade-offs between setting aside a few large patches of habitat, or several small patches.	Initiated: 04/05 Duration: 3 years 06/07: \$75,000 Total: \$244,110 Location: Sunshine Coast and SW Vancouver Island PAC Region: C

*Understanding the effects of management practices (particularly forest roads, harvesting, livestock use, exclusion/re-introduction of fire, large-scale salvage) on the ecology of species at risk*

<b>M075048</b>	<b>Assessing the threat of mountain pine beetle outbreaks to whitebark pine in British Columbia</b>	<b>Elizabeth Campbell Natural Resources Canada</b>
<i>Does the severity of the current MPB infestation pose risks to the future of whitebark pine in BC?</i>	Due to increased pressure from the extensive mountain pine beetle (MPB) infestation at lower elevations, the whitebark pine may be under greater threat than previously thought. This project will assess and quantify past and current impacts of MPB outbreaks and use simulation models to predict the threat of future MPB outbreaks to whitebark pine in BC. Given the importance of whitebark pine to upper elevation ecosystems, it is integral that the extent of the current threat be fully understood.	Initiated: 06/07 Duration: 2 years 06/07: \$68,250 Total: \$134,400 Location: southern interior and coast PAC Region: P
<b>Y062074</b>	<b>Landscape analysis of habitat supply and effects on populations of the northern spotted owl in BC</b>	<b>Louise Waterhouse Ministry of Forests and Range</b>
<i>What is the influence of structure and configuration of habitat on dispersal and regional movement patterns of the Northern Spotted Owl?</i>	The Northern Spotted Owl (SPOW) is an old growth dependent species that is facing extirpation from BC. This project develops a management/habitat-focused modeling tool for the SPOW that evaluates the influence of structure and configuration of habitat on dispersal and regional movement patterns, and provides a framework to evaluate management options for SPOW recovery in BC. The final product could be used for guiding the implementation of the Recovery Plan, for guiding research designs of habitat inventories, and for evaluating likely impacts of innovative management options.	Initiated: 04/05 Duration: 2 years 06/07: \$0 Total: \$87,110 Location: Squamish, Chilliwack, and Cascade FDs PAC Region: C
<b>Y072042</b>	<b>Evaluating and refining guidelines for forested buffers for grizzly bear habitat management</b>	<b>Bruce McLellan Ministry of Forests and Range</b>
<i>Do grizzly bears use buffers around avalanche chutes and riparian areas?</i>	Current guidelines for maintaining buffers adjacent to grizzly bear habitat may not be achieving the intended ecological and economic objectives. This project will examine use by grizzly bears of forest adjacent to avalanche chutes and riparian areas to better understand the stand attributes and spatial configuration of these habitats. The outcome of the project will be information to help guide managers in designing buffer guidelines, including an avalanche chute and riparian area ranking system.	Initiated: 05/06 Duration: 2 years 06/07: \$57,750 Total: \$123,260 Location: East and West Kootenays, with emphasis in the Elk Valley PAC Region: SI
<b>Y072071</b>	<b>Forecasting forest vegetation response to management activities aimed at reducing ungulate browse in mountain caribou winter range</b>	<b>Alan Vyse Thompson Rivers University</b>
<i>How can predation on mountain caribou be reduced through forest management practices?</i>	Abundance of early-seral stands may lead to reductions in local populations of mountain caribou due to increased predation. This project involves development of a spatially explicit model that predicts vegetation response to management activities based on a field sampling program and review of existing literature. The results of these efforts will aid managers in developing a vegetation management plan aimed at reducing the availability of ungulate browse in the Columbia Valley.	Initiated: 05/06 Duration: 2 years 06/07: \$14,700 Total: \$61,420 Location: Columbia Valley between Arrow Lakes and Mica Dam PAC Region: SI

<p><b>Y073007</b>   <b>Silvicultural systems to maintain northern caribou habitat in lodgepole pine forests in central BC</b></p> <p><i>Which silvicultural systems are effective in maintaining northern caribou habitat, including terrestrial and arboreal forage lichens, while extracting timber, achieving regeneration, and maintaining biodiversity?</i></p>	<p>This project is a long-term experimental trial to develop and test silvicultural systems that maintain northern caribou habitat, including terrestrial and arboreal forage lichens, while extracting timber, achieving regeneration, and maintaining biodiversity. Results from this work will provide a sound scientific basis for the "modified harvesting options" under the Cariboo-Chilcotin Land Use Plan and support and update the CCLUP Northern Caribou Strategy. This experimental trial supports the operational implementation of adaptive management.</p>	<p><b>Michaela Waterhouse</b> <b>Ministry of Forests and Range</b></p> <p>Initiated: 04/05 Duration: 3 years 06/07: \$55,775 Total: \$191,609 Location: Cariboo-Chilcotin PAC Region: SI</p>
<p><b>Y073086</b>   <b>Quantifying forest stand and landscape attributes that influence mountain caribou habitat fragmentation and predation rates</b></p> <p><i>What are the needs for connectivity of mountain caribou habitat, both within home ranges and among populations?</i></p>	<p>The conditions needed for connectivity of mountain caribou habitat, both within home ranges and among populations, are poorly understood. This project will examine movement of caribou through young forest, determine how levels of inter-population movement affect viability, investigate the effect of fragmentation on the foraging efficiency of predators, and work closely with managers to implement what has been learned of mountain caribou ecology. In addition, this project will maintain a sample of radio-collared caribou.</p>	<p><b>Dr. Bruce McLellan</b> <b>Ministry of Forests and Range</b></p> <p>Initiated: 04/05 Duration: 3 years 06/07: \$146,055 Total: \$434,771 Location: southern interior PAC Region: SI</p>
<p><b>Y073177</b>   <b>Dispersal and habitat selection by juvenile Northern Goshawks in a managed forest landscape</b></p> <p><i>How do current management practices affect post-fledging habitat selection and behaviour of juvenile Northern Goshawks?</i></p>	<p>Although the Northern Goshawk (NOGO) is known to be associated with attributes of stand structure found in mature forest, further information is required to properly manage for NOGO habitat, and potentially use the species as an indicator of mature forest. This project will examine post-fledging habitat selection of juvenile NOGOs, and determine how current forest practices around NOGO nest areas influence post-fledging habitat selection and behaviour of juvenile animals. These data are required to better define the management actions necessary for maintaining NOGOs on the landscape.</p>	<p><b>Dr. Karl Larsen</b> <b>Thompson Rivers University</b></p> <p>Initiated: 04/05 Duration: 3 years 06/07: \$55,965 Total: \$162,540 Location: southeastern interior PAC Region: SI</p>
<p><b>Y073365</b>   <b>Development of analytic and decision models for assessing grizzly bear needs from forest management objectives</b></p> <p><i>What are the effects of forestry activities and landscape conditions on grizzly bear habitat and mortality?</i></p>	<p>Currently, we are not very good at linking human activities and landscape conditions to grizzly bear mortality. This project will develop a series of predictive models relating effects of forestry activities and landscape conditions to grizzly bear habitat and mortality. These models will be designed to link to forest harvesting/natural disturbance models so that trade-offs between timber supply, habitat supply, and mortality risks to bears can be evaluated under differing scenarios of timber management and land planning.</p>	<p><b>Fred Hovey</b> <b>Ministry of Forests and Range</b></p> <p>Initiated: 04/05 Duration: 3 years 06/07: \$97,125 Total: \$289,516 Location: southeastern interior PAC Region: SI</p>

*Determining how specific threats may be mitigated or mechanisms developed to assist recovery*

<b>Y071065</b>	<b>Use of adaptive management to mitigate risk of predation for woodland caribou in north-central British Columbia</b>	<b>Dr. R. Scott McNay McGregor Model Forest Association</b>
<i>Is predation a major factor in the recovery of woodland caribou populations? If so, how can these impacts be mitigated?</i>	This project will undertake a science-based assessment of predator control to mitigate caribou mortality. The work capitalizes on the legal trapping of wolves that has occurred in one study but not the other, creating an opportunity to compare the caribou response using a combination of habitat supply modeling and adaptive management. Additional directed trapping of wolves in the areas of high predation risk may be used as part of the adaptive management study.	Initiated: 06/07 Duration: 3 years 06/07: \$83,109 Total: \$251,109 Location: northern caribou recovery planning areas PAC Region: NI

*No priority assigned*

<b>Y072136</b>	<b>Establishing a science basis for recovery of woodland caribou in north-central British Columbia</b>	<b>Scott McNay McGregor Model Forest Association</b>
<i>What do we really know about mountain caribou?</i>	A large amount of data collection and modeling effort has been expended for mountain caribou in BC. This project will synthesize these data and publish the results via 10 publications in the peer-reviewed literature, which is essential to establishing a scientific basis for recovery planning and ongoing modeling.	Initiated: 05/06 Duration: 3 years 06/07: \$54,875 Total: \$157,069 Location: Mackenzie TSA, Ft. St. James TSA PAC Region: NI

## S Proponent

S Proponent Unclassified

*No priority assigned*

<b>Y071046</b>	<b>Book preparation: ecology, conservation, and management of British Columbia's inland rainforest</b>	<b>Dr. Darwyn Coxson University of Northern British Columbia</b>
<i>What is the best available scientific information regarding management of the cedar-hemlock stands in the wet ICH?</i>	This project will produce a major publication that brings together the best possible scientific information to inform management of old cedar-hemlock stands in British Columbia's inland rainforest (wet ICH), describes management options for this unique ecosystem, and identifies their likely consequences. Currently, much of the emerging literature on the natural disturbance regime, ecology, and silviculture of the wet ICH is fragmented and dispersed, and other valuable information (e.g., internal MoFR landbase data) is unpublished or otherwise unconsolidated and difficult to access. It will be completed and available to inform forest policy and practices in the wet ICH when the forest industry and forestry-dependent communities complete pine salvage programs and examine the options for future timber supply in other areas of the timber harvesting landbase.	Initiated: 06/07 Duration: 3 years 06/07: \$30,975 Total: \$65,100 Location: ICH zone PAC Region: SI; NI

**Y071280 Studying mountain pine beetle dispersal patterns through analysis of genetic markers: investigation of population structure and examining current dispersal assumptions**

*What are the sources and patterns of dispersal for mountain pine beetle epidemics?*

The overall objective of this research is to assess genetic variation in MPB populations over large geographic distances in British Columbia and Alberta by the use of microsatellite DNA markers. Subsequent analyzes of relatedness and gene flow will allow inferences to be made about the relative amounts of dispersal among populations and the origins of outbreak populations at different locations in BC and Alberta.

**Brent W. Murray**  
University of Northern British Columbia

Initiated: 06/07  
Duration: 2 years  
06/07: \$15,750  
Total: \$31,500  
Location: province-wide  
PAC Region: P

## Timber Program

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

#### T 1.00 Unclassified

*No priority assigned*

**Y073156 Stand Management Cooperative - growth and yield installations in BC**

*What are the critical processes and dynamics of early stand establishment and growth that affect crop tree performance?*

As a member of the Stand Management Cooperative (SMC), the Ministry of Forests is required to maintain 22 research installations, including 9 espacement trials. This project will fund tree re-measurement at these espacement trials. The data will be used to assess both the short- and long-term effects of espacement on stand and individual tree responses, thus meeting the need for understanding critical processes and dynamics of early stand establishment and growth that affect crop tree performance.

**Louise de Montigny**  
Ministry of Forests and Range

Initiated: 04/05  
Duration: 3 years  
06/07: \$55,000  
Total: \$164,639  
Location: province-wide  
PAC Region: P

**Y073159 Management regimes for red alder plantations**

*What are the effects of spacing, thinning, and pruning on growth and wood quality in hardwoods, and the effects of phosphorous supply on long-term growth, site fertility, and water use efficiency?*

This experiment is part of a larger project initiated by the Hardwood Silviculture Cooperative with trial locations in BC, Washington, and Oregon. Specifically, the project addresses the effects of spacing, thinning, and pruning on growth and wood quality, and the effects of phosphorous supply on long-term growth, site fertility and water use efficiency.

**Paul Courtin**  
Ministry of Forests and Range

Initiated: 04/05  
Duration: 3 years  
06/07: \$59,955  
Total: \$170,718  
Location: coast  
PAC Region: C

<b>Y073210</b>	<b>Sulphur fertilization of lodgepole pine: a stable isotope tracer study</b>	<b>Rob Brockley</b> <b>Ministry of Forests and Range</b>
<i>How does lodgepole pine respond to sulphur and sulphate fertilization?</i>	Sulphur (S) deficiencies in lodgepole pine are widespread in the BC central interior, but there is an insufficient basis for prescribing fertilization treatments. This study will compare the fate of both elemental S and more immediately plant-available sulphate-S forms, at operationally realistic addition rates and in combination with nitrogen fertilization. This research will give silviculturists a credible scientific foundation for making better fertilization decisions, as well as improve our basic understanding of fertilizer S behaviour in BC forest soils.	Initiated: 04/05 Duration: 3 years 06/07: \$3,439 Total: \$74,868 Location: Vanderhoof and Prince George FDs PAC Region: NI

### T 1.1 Complex stands (including partial cutting, variable retention)

*Quantification of stand and forest change and development following MPB attack, including GY modeling, and impacts on timber supply; evaluating and estimating timber growth implications on residual trees and regenerated stands, in the understorey, and in clearcut openings; includes species interactions related to the scale and pattern of harvesting*

<b>Y061151</b>	<b>Improving juvenile tree growth prediction for complex mountain pine beetle damaged stands</b>	<b>David Coates</b> <b>Bulkley Valley Centre for Natural Resources Research and Management</b>
<i>How do juvenile trees grow under a range of management conditions in MPB-damaged stands?</i>	Forest managers require robust, unbiased predictive equations of juvenile tree growth under a range of management conditions in MPB-damaged stands. This project develops and tests new juvenile tree growth equations that build upon previous detailed research in northern BC forests. Understanding the response of individual juvenile trees to variation in light is fundamental to predicting future growth under a range of management options	Initiated: 05/06 Duration: 1 year 06/07: \$0 Total: \$33,997 Location: Sub-boreal zone of north central and northwestern BC PAC Region: NI
<b>Y062066</b>	<b>Improving predictions of juvenile tree growth in complex mixtures for sustainable forest management</b>	<b>Suzanne Simard</b> <b>University of British Columbia</b>
<i>What are the growth responses of subalpine fir to variation in residual canopy cover, site quality and crowding?</i>	This project examines growth responses of subalpine fir to variation in residual canopy cover, site quality, and crowding. The study examines the relative strength of different factors affecting juvenile tree growth, including light, water, nutrient availability and neighbourhood crowding. Results will be linked to SORTIE-BC to examine how complex stands respond to a wide range of silvicultural strategies, at different spatial scales and over different time periods.	Initiated: 04/05 Duration: 2 years 06/07: \$0 Total: \$69,321 Location: ICH zone PAC Region: SI

Y071012	<b>Complex stand management: extension of recent research to forest managers</b>	<b>Kevin Kriese Bulkley Valley Centre for Natural Resources Research and Management</b>
<i>How can the ecology and succession of complex stands in northern British Columbia be understood and modeled?</i>	This project extends results of advances in knowledge about tree growth and succession in complex stands and trains analysts and researchers in the use of SORTIE-BC.	Initiated: 06/07 Duration: 1 year 06/07: \$21,000 Total: \$21,000 Location: SBS and BWBS zones PAC Region: SI; NI
Y071254	<b>Effect of site type on competitive interactions among trees in complex-structured mixed-species sub-boreal forests</b>	<b>Dr. K. David Coates Bulkley Valley Centre for Natural Resources Research and Management</b>
<i>How do individual trees respond to microclimates within complex mixedwood stands?</i>	This project will result in an innovative approach to quantify microclimate effects on individual tree growth in complex mixed-species stands. A new cost-effective method will be developed for parameterization of growth functions in individual-tree models, as will empirical functions that predict radial growth of individual aspen, spruce, pine, and subalpine fir in different complex-stand conditions on different site types. The results will be used for parameterization of SORTIE-ND for additional site types in the SBS zone.	Initiated: 06/07 Duration: 2 years 06/07: \$99,488 Total: \$185,851 Location: northern interior PAC Region: NI
Y071255	<b>Regeneration recruitment and early stand growth in partially cut and burned IDFww stands</b>	<b>Roderick W. Negrave Ministry of Forests and Range</b>
<i>How effective is the combined treatment of partial cutting with prescribed under burning regime for restoration of dense Douglas-fir stands to more typical, pre-contact ecological conditions?</i>	This study will document the occurrence of natural regeneration and investigate factors affecting its growth and the early development of stands under a combined partially cut and burned treatment regime. Knowledge from this study will be used to guide policy, support decision makers, and set objectives for improved forest resources management in coast-interior transition areas.	Initiated: 06/07 Duration: 1 year 06/07: \$22,155 Total: \$22,155 Location: Squamish and Chilliwack FDs PAC Region: C

<b>Y071267</b>	<b>Effects of variable retention silvicultural systems on microclimate, survival, and growth of trees in west coast forests: enhanced development and validation of a forest growth model</b>	<b>T.A. Black</b> <b>University of British Columbia</b>
<i>What are the effects of variable retention on growth and survival of planted seedlings?</i>	This project studies the effects of the type and extent of variable retention (VR) on microclimate and, hence, on the growth and survival of planted seedlings in west coast forests. The purpose is to help select the VR system that optimizes seedling survival and growth while preserving biodiversity and wildlife habitat. The project will validate the light model of the forest growth model FORGE and modify the model to more accurately describe the photosynthetic response of Douglas-fir seedlings growing in VR systems, and to include the effects of energy (solar and longwave radiation) and water (precipitation and evaporation) fluxes on seedling microclimate (temperature and moisture). This research will continue to provide quantitative information on the impact of the VR silvicultural system on stand microclimate and its influences on the establishment and growth of planted seedlings.	Initiated: 06/07 Duration: 2 years 06/07: \$12,600 Total: \$22,050 Location: coast PAC Region: C
<b>Y072028</b>	<b>Improving predictions of juvenile tree growth in complex mixtures for sustainable forest management</b>	<b>Suzanne Simard</b> <b>University of British Columbia</b>
<i>How do juvenile trees grow in low light, dense understories?</i>	Current tree population models are unable to accurately predict juvenile tree growth at low light levels and in dense neighbourhoods of seedlings and saplings. The funding for this project will be used to increase sample sizes and allow for more detailed stand census methods in current field trials. This research will improve our understanding of the factors affecting juvenile tree growth, enhance our ability to make accurate growth predictions, and provide further information for developing stand management guidelines.	Initiated: 05/06 Duration: 2 years 06/07: \$19,999 Total: \$46,249 Location: southern interior PAC Region: SI
<b>Y072080</b>	<b>Interactions between light and nitrogen availability on juvenile tree growth in partial cut forests</b>	<b>Marty Kranabetter</b> <b>Ministry of Forests and Range</b>
<i>What is the relationship between light and nitrogen availability in development of partially cut stands?</i>	Currently, simulations of juvenile tree growth in partially harvested stands are able to account for species-specific growth relationships with light conditions, but do not yet allow for the interactive effect of differences in nitrogen availability. The proposed experiment will manipulate nitrogen availability for juvenile trees under a range of canopy openings and measure growth responses. This research will offer guidance on management issues such as the choice of silvicultural systems for different site series, and choice of appropriate tree species for reforestation in partial cut stands.	Initiated: 05/06 Duration: 3 years 06/07: \$26,408 Total: \$111,655 Location: Date Creek Research Forest in the Kispiox Valley PAC Region: NI

<b>Y072141</b>	<b>Effects of the variable retention silvicultural systems on microclimate, establishment and growth of trees in west coast forests</b>	<b>Andy Black</b> <b>University of British Columbia</b>
<i>What are the effects of variable retention silvicultural systems on microclimate and the establishment, and growth of trees?</i>	Microclimatic information on variable retention systems is needed to identify the best type and extent of tree retention for optimal seedling survival and growth. This project will modify the forest photosynthetically active radiation (PAR) model of Chen et al. (1993) to calculate the spatial distribution of soil temperature, soil water content, and direct and diffuse PAR. This new PAR model can be used to test and improve an existing forest growth model (FORGE) that links tree and stand growth to modifications in climate.	Initiated: 05/06 Duration: 2 years 06/07: \$42,000 Total: \$88,200 Location: coastal BC PAC Region: C
<b>Y072148</b>	<b>Regeneration and stand structure following mountain pine beetle infestation in the Sub-Boreal Spruce zone</b>	<b>David Coates</b> <b>Bulkley Valley Centre for Natural Resources Research and Management</b>
<i>How will different management choices affect regeneration in MPB-infested stands?</i>	A variety of modeling tools are available to assist managers with decisions on how to manage MPB-infested stands, but these modeling efforts face two barriers: incomplete data on regeneration and stand structure following mountain pine beetle attack, and models are not available for these ecosystems to predict growth and yield in complex stands. This project will use field sample plots across the full range of stands affected by MPB to collect data on stand regeneration. The outcome of this project will be empirical recruitment relationships that can be used in stand-level models such as SORTIE-BC.	Initiated: 05/06 Duration: 2 years 06/07: \$69,888 Total: \$145,771 Location: SBS zone PAC Region: NI
<i>Mortality</i>		
<b>Y061012</b>	<b>Modeling individual tree mortality for northern mixed-species stands</b>	<b>Bruce Larson</b> <b>University of British Columbia</b>
<i>What are the mortality functions for individual trees in mixed-species stands?</i>	Our understanding of species competition and mortality for mixed-species stands is less developed than for even-aged, single-species stands, which can impede development of operational tools and decision support tools related to stand management. This aim of this project is to develop an individual tree mortality function that can be used in mixed-species stands. One of the outcomes of the project is to make this mortality function easily available in a decision support tool by incorporating it into SORTIE/BC.	Initiated: 05/06 Duration: 1 year 06/07: \$0 Total: \$29,398 Location: SBS and BWBS zones PAC Region: NI
<b>Y073266</b>	<b>Coastal stand management growth and yield field experiments</b>	<b>Louise de Montigny</b> <b>Ministry of Forests and Range</b>
<i>In variable retention systems, what are the causes of mortality and rate of deterioration of trees once they have died, including the decay and fall-down rates?</i>	This project builds on data collected through the Coastal Stand Management Growth and Yield Field Experiments Program. Specifically, this study looks at the causes of mortality and rate of deterioration of trees once they have died, including the decay and fall-down rates. This information is important for understanding mortality rates in natural and managed stands and can be used to predict wildlife tree recruitment in variable retention residual patches.	Initiated: 04/05 Duration: 3 years 06/07: \$148,200 Total: \$437,854 Location: coast PAC Region: C

*Species interactions*

<b>Y062304</b>	<b>Managing for intimate species mixtures in BC's boreal forest</b>	<b>Chris Hawkins</b> <b>University of Northern British Columbia</b>
<i>What is the effect of stand density and age on understorey recruitment?</i>	The aim of this project is to describe understorey recruitment (both natural and planted) with respect to stand density and age. Specifically, the project involves remeasuring stands that are part of a multi-year study of different density treatments. The data collected will be used to calibrate growth and yield models and to assess the economic implications of the treatments.	Initiated: 04/05 Duration: 2 years 06/07: \$0 Total: \$85,730 Location: Fort St John and Dawson Creek TSAs PAC Region: NI
<b>Y073065</b>	<b>Effects of young stand silviculture on conifer/broadleaf mixtures in seral ICH forests of southern interior BC</b>	<b>Dr. Suzanne Simard</b> <b>University of British Columbia</b>
<i>What are the effects of management practices on interspecific interactions, growth and yield, stand development, and ecosystem function in conifer/broadleaf forests of the southern interior wet-belt?</i>	This project involves four integrated studies on the effects of management practices on interspecific interactions, growth and yield, stand development, and ecosystem function in conifer/broadleaf forests of the southern interior wet-belt. These studies examine (1) relationships between soil properties altered by disturbance and long-term growth of different species; (2) effects of soil transfers from different forest tree species on growth and survival of planted Douglas-fir and paper birch; (3) crop-tree response to manual and chemical brushing at various radii on survival, growth, and disease or insect incidence of lodgepole pine; (4) paper birch density reduction effects on the growth, nutrition, and Armillaria infection of understorey Douglas-fir.	Initiated: 04/05 Duration: 3 years 06/07: \$11,277 Total: \$129,581 Location: ICH zone PAC Region: SI
<b>Y073090</b>	<b>Sustainable mixedwood management in the Sub-Boreal Spruce zone of British Columbia</b>	<b>Dr. Chris Hawkins</b> <b>University of Northern British Columbia</b>
<i>What are optimal deciduous levels in mixed-species stands (spruce/birch)?</i>	Although interest in managing broadleaves and mixedwoods has increased, these stands tend to be managed poorly due to a limited understanding of their dynamic processes and a lack of predictive models. This study uses growth measurements, quality assessments, and models to determine optimal deciduous levels in mixed-species stands, the influence of deciduous species in areas of White Pine Weevil (WPW) attack, timber quality of fast-grown spruce and birch, growth and yield of variable density, fast-growing mixed-species stands, and the wood quality of spruce developed under open-grown/high WPW attack and under aspen/low WPW attack. The results from this project will likely lead to new provincial policies, standards, and best management practices.	Initiated: 04/05 Duration: 3 years 06/07: \$72,000 Total: \$223,291 Location: Prince George and Williams Lake TSAs PAC Region: NI

*No priority assigned*

**Y051131 Quantifying the dynamics of stands under selection management for mule deer winter range**

*What are the stand dynamics with uneven-aged stands of interior Douglas-fir?*

This project will further our understanding of the dynamics of uneven-aged interior Douglas-fir stands by examining the relationship between stand structure and both (1) individual tree height and growth, and (2) mortality and recruitment. The study is designed to use two existing projects, comprised of 30 permanent sample plots in the UBC/Alex Fraser Research Forest. The results of the project will be applicable to dry Douglas-fir stands throughout the southern interior of BC and western states, and will also provide some insight into the general dynamics of mixed-species stands in dry forests.

**Ken Day  
University of British Columbia**

Initiated: 04/05

Duration: 1 *year*

06/07: \$0

Total: \$46,565

Location: UBC/Alex Fraser  
Research Forest

PAC Region: SI

**Y062209 Management of complex coastal mixedwoods in BC for productivity and free-growing**

*What are the competitive effects of alder on conifers in mixed alder-conifer plantings?*

While red alder often overtops juvenile conifers resulting in difficulties meeting "free-growing" obligations, some research suggests low densities of red alder may enhance conifer growth. This project uses mixed alder-conifer plantings to study the competitive effects of red alder on conifers, and is now old enough to assess the 11-yr "free-growing" window. The results of this project will provide much needed credible, scientific support to refine "free-growing" standards for coastal forests, and guide decisions around policy and timber supply.

**Keith Thomas  
Ministry of Forests and Range**

Initiated: 04/05

Duration: 2 *years*

06/07: \$0

Total: \$48,174

Location: CWH zone

PAC Region: C

**Y073305 Managing northern mixedwood stands to sustainably maximize productivity and minimize costs**

*What is the optimum proportion of broadleaf stems in mixedwood stands to cost-effectively meet free-growing objectives?*

The aim of this project is to determine the density of broadleaf stems that maximizes complex stand productivity, and minimizes costs associated with achieving free-growing objectives. This involves collection of field data that will be used to develop models for evaluating brushing needs, impacts of management activities, and short- to long-term timber supply and quality. This project will assist in identifying parts of the province where the cost of carrying out brushing treatments to meet free-growing guidelines may be unjustified.

**Dr. Chris Hawkins  
University of Northern British  
Columbia**

Initiated: 04/05

Duration: 3 *years*

06/07: \$90,240

Total: \$247,929

Location: Fort Nelson,  
Mackenzie, and  
Fort St John TSAs

PAC Region: NI

## T 1.3 Old stands

*Volume loss*

<p><b>Y071017 Rates of mortality and dead tree dynamics in old coastal forest stands</b></p> <p><i>What are the dynamics of old trees and snags in remnants of old-growth forests?</i></p>	<p>The project provides information needed to manage remnants of old forests, including information on rates of mortality and rates of transition from standing snags to fallen logs. That information is derived from the rate of mortality of common coastal tree species across a range of site conditions, and the interaction among cause of death, size, and site condition on the length of time dead trees remain standing.</p>	<p><b>Roberta Parish</b> <b>Ministry of Forests and Range</b></p> <p>Initiated: 06/07 Duration: 3 years 06/07: \$54,127 Total: \$146,474 Location: Malcolm Knapp Research Forest, Maple Ridge PAC Region: C</p>
<p><b>Y071034 Growth patterns prior to mortality of mature subalpine fir in the southern interior</b></p> <p><i>Does mortality of old spruce-fir forests typically occur abruptly, or is mortality the end result of a gradual decline?</i></p>	<p>During a detailed series of studies of the dynamics of old spruce-fir forests in the Southern Interior using dendrochronological procedures, ring patterns for dead trees were obtained at three sites: Sicamous Creek, Adams Lake, and Damfino Creek. The objectives of this project are to determine the pattern of ring growth before death, including how this varies among trees; and to interpret these patterns in terms of the possible factors that could be leading to tree mortality.</p>	<p><b>Joseph A. Antos</b> <b>Consultant</b></p> <p>Initiated: 06/07 Duration: 1 year 06/07: \$9,975 Total: \$9,975 Location: Sicamous Creek, Adams Lake, and Damfino Creek PAC Region: SI; NI</p>

## T 2.0 Design and analysis of silvicultural systems

## T 2.00 Unclassified

*No priority assigned*

<p><b>Y062218 Planning methods to reduce costs and enhance value recovery in sustainably managed forests</b></p> <p><i>Can mill requirements for log supply be met through SFM land management regimes and silvicultural practices?</i></p>	<p>This project develops a state of the art, decision support system (DSS) that integrates mill requirements for log supply with the new land management regimes and silvicultural methods required by sustainable forest management (SFM). Following development of the DSS, scenarios will be analyzed based on SFM, technology issues, and financial issues. The benefits of this research include prediction of the effects of silvicultural prescriptions on production, development of production strategies that are consistent with available timber, and the ability to gauge the overall impact of new product ideas and value added processing in the region while meeting SFM criteria.</p>	<p><b>Darrell Regimbald</b> <b>Canadian Forest Products Ltd.</b></p> <p>Initiated: 04/05 Duration: 2 years 06/07: \$0 Total: \$252,094 Location: northern interior PAC Region: NI</p>
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<b>Y073021</b>	<b>Expert system for making site preparation and vegetation management decisions in southern interior BC</b>	<p><i>How should the new expert system be applied to select appropriate site preparation and brushing treatments?</i></p>	<p>This project involves maintenance and a training workshop for an expert system (ES) for making site preparation and vegetation management decisions in southern interior BC (developed under a separate FSP project). The ES is an interactive, publicly available, Web-based tool to assist practitioners to select appropriate site preparation and brushing treatments as they develop site prescriptions.</p>	<p><b>Dr. Donald Sachs Consultant</b></p> <p>Initiated: 04/05 Duration: 3 years 06/07: \$10,000 Total: \$97,510 Location: Williams Lake PAC Region: SI</p>
<b>Y073024</b>	<b>Long-term effects of vegetation management treatments on growth and yield and stand development</b>	<p><i>What are the long-term effects of brushing on conifer growth and yield, stand dynamics, and plant community development and diversity?</i></p>	<p>PROBE (PProtocol for Operational Brushing Evaluations) sites that have already yielded 10 years of data now have the potential to provide valuable information about the long-term effects of brushing on conifer growth and yield, stand dynamics, and plant community development and diversity at relatively low cost. This project will install permanent measurement plots on existing PROBE sites, and remeasure PROBE sites with priority for sites dominated by broadleaf complexes, many of which are now yielding 10-year data.</p>	<p><b>W. Jean Mather Skyline Forestry Consultants Ltd.</b></p> <p>Initiated: 04/05 Duration: 3 years 06/07: \$73,500 Total: \$236,410 Location: southern interior PAC Region: SI</p>
<b>Y073101</b>	<b>Effects of intensive fertilization on timber and non-timber resources</b>	<p><i>What are the effects of various rates and frequencies of fertilization on the foliar nutrition, growth, and development of lodgepole pine and spruce managed forests?</i></p>	<p>This project documents the effects of various rates and frequencies of fertilization on the foliar nutrition, growth, and development of lodgepole pine and spruce managed forests, and determines the effects of repeated fertilization on above- and below-ground timber and non-timber resources. Specifically, the project will conduct a scheduled assessment of growth, leaf area development, and soil characteristics at existing research installations.</p>	<p><b>Robert Brockley Ministry of Forests and Range</b></p> <p>Initiated: 04/05 Duration: 3 years 06/07: \$79,882 Total: \$287,148 Location: central interior PAC Region: SI</p>
<b>Y073102</b>	<b>Stand management growth and yield field experiments in the BC interior</b>	<p><i>What are the impacts of harvesting and stand management treatments (partial cutting, thinning, fertilization) and regimes (planting and post-thinning density, fertilizer regimes) on the growth and development of interior forests?</i></p>	<p>This project documents the impacts of a variety of harvesting and stand management treatments (partial cutting, thinning, fertilization) and regimes (planting and post-thinning density, fertilizer regimes) on the growth and development of interior forests. Specifically, the project will re-measure, analyze, and report on an extensive network of previously established research installations. This data will be used to calibrate/validate growth and yield models such as TASS and TIPSy.</p>	<p><b>Robert Brockley Ministry of Forests and Range</b></p> <p>Initiated: 04/05 Duration: 3 years 06/07: \$148,997 Total: \$334,943 Location: southern and central interior PAC Region: SI</p>

<b>Y073190</b>	<b>SCHIRP: ecology and management of ericaceous shrub-dominated ecosystems in coastal BC</b>	<b>Dr. Cindy Prescott</b> <b>University of British Columbia</b>
<i>How can conifer regeneration and tree growth be improved on sites dominated by ericaceous shrubs?</i>	This project is an extension of the Salal Cedar Hemlock Integrated Research Program (SCHIRP), which uses silvicultural trials to understand poor conifer regeneration on sites dominated by ericaceous shrubs and recommends best practices for improving tree growth. Specifically, this project will remeasure several ongoing trials examining the effects of fertilization, stand density, mechanical preparation, and mycorrhizal fungi on hemlock and salal.	Initiated: 04/05 Duration: 3 years 06/07: \$79,799 Total: \$238,296 Location: coast PAC Region: C
<b>Y073220</b>	<b>Harvesting and site preparation treatments to develop and maintain open canopy conditions in dry-belt Douglas-fir forests: The Isobel Project</b>	<b>Dr. Walt Klenner</b> <b>Ministry of Forests and Range</b>
<i>What is the optimum way to maintain open canopy conditions in dry Douglas-fir forests?</i>	The main objective of this project is to develop and apply prescriptions to maintain prolonged open canopy conditions in dry Douglas-fir forests in a cost-effective manner, while maintaining timber, forage, and ecological values. Several different stand management treatments have been applied to forests in the study area, and the responses of a wide range of attributes are being monitored using permanent sample plots and vegetation plots. The monitoring addresses five key dry-belt management issues: conifer regeneration, understorey composition and abundance, understorey productivity, fuel loading, and timber attributes.	Initiated: 04/05 Duration: 3 years 06/07: \$24,990 Total: \$261,637 Location: Isobel Lake, north of Kamloops PAC Region: SI

## T 2.1 Complex stands (including partial cutting, variable retention)

*The relationship between residual stand structure and understorey 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*

<b>Y051161</b>	<b>Growth and yield implications of alternate silvicultural strategies in mountain pine beetle damaged stands</b>	<b>David Coates</b> <b>Bulkley Valley Centre for Natural Resources Research and Management</b>
<i>How do different harvesting regimes and regeneration methods affect future stand structure and timber supply in the complex stand conditions associated with MPB infestation?</i>	Traditional growth and yield models have considerable difficulty predicting stand development in complexly structured mixed-species stands. This project uses the spatially explicit, individual tree model SORTIE/BC to assess the implications of traditional and alternate partial retention silvicultural strategies in MPB-damaged stands. The outcomes of this project will provide managers with information to assess the trade-offs among different silviculture components such as harvesting regimes and regeneration methods on future stand structure and timber supply in the complex stand conditions associated with MPB infestation.	Initiated: 04/05 Duration: 1 year 06/07: \$0 Total: \$40,950 Location: province-wide PAC Region: P

<b>Y061094</b>	<b>Long term Research Installation Number 042 ; EP 1151: dispersed retention in the coast-interior transition. Evaluation of a range of overstorey densities for harvesting and managing Douglas-fir dominated stands (Boston Bar)</b>	<b>Brian D'Anjou</b> <b>Ministry of Forests and Range</b>
<i>What are the implications of dispersed retention and broadcast burning on longer-term stand structure?</i>	This project involves remeasurement of residual stand structure in a LTRI originally established to investigate the effects of retention of overstorey trees on establishment of growth of regeneration. This monitoring will provide on-going science-based information on which to assess implications of dispersed retention and broadcast burning on longer-term stand structure.	Initiated: 05/06 Duration: 1 year 06/07: \$0 Total: \$40,542 Location: confluence of East Anderson River and Utzius Creek PAC Region: SI
<b>Y071011</b>	<b>Forest regeneration, growth, and development under seven silvicultural systems</b>	<b>Louise de Montigny</b> <b>Ministry of Forests and Range</b>
<i>How much are forest yields reduced by variable retention silvicultural systems?</i>	This project will determine how stand growth, regeneration, and development are affected by residual stand structures and the corresponding light availability under 7 different silvicultural systems 5 years after harvesting.	Initiated: 06/07 Duration: 2 years 06/07: \$86,570 Total: \$107,570 Location: coast PAC Region: C
<b>Y071258</b>	<b>Partial cutting on steep slopes, Queen Charlotte Islands: treatment regime effects on residual stand mortality and growth; recruitment, growth, and dynamics of regeneration; and non-timber understorey composition</b>	<b>Roderick W. Negrave</b> <b>Ministry of Forests and Range</b>
<i>What are the dynamics of mortality and growth in regeneration and residual trees, including old trees and snags, in partial cut stands?</i>	This project will be conducted at a partial cutting installation established in 1992. The objectives are to document and compare treatments 14-year post-logging stand conditions including: residual stand health and radial growth, loss of residual stand to windthrow, growth of planted regeneration, recruitment and growth of natural regeneration, structure and composition of the non-timber understorey, and use of data and growth relationships to calibrate and test growth and yield models, such as TASS.	Initiated: 06/07 Duration: 1 year 06/07: \$73,412 Total: \$73,412 Location: Queen Charlotte Islands PAC Region: C
<b>Y071262</b>	<b>Effects of partial retention and common mycorrhizal networks on seedling recruitment in Douglas-fir forests across British Columbia</b>	<b>Dr. Suzanne Simard</b> <b>University of British Columbia</b>
<i>What are the factors affecting seedling recruitment in partially cut, complex Douglas-fir forests?</i>	This project examines basic competitive and facilitative processes underlying seedling recruitment in partially cut, complex Douglas-fir forests. It examines residual tree competition for resources and facilitation through common mycorrhizal networks, to determine relationships between residual stand structure and seedling recruitment. These relationships will be examined in Douglas-fir forests across a range of climatic regions (biogeoclimatic (BGC) units) in the southern interior and coast to determine variation in response across multiple scales, and to forecast the effects of changing climate and partial retention on forest establishment.	Initiated: 06/07 Duration: 3 years 06/07: \$52,500 Total: \$157,500 Location: southern interior and coast PAC Region: C; SI

<b>Y072079</b>	<b>A study of stand growth, development, and structural biodiversity in complex and even-aged ESSF spruce-subalpine fir forests, 14 years after treatment (EP 1119.01 Lucille Mountain Project)</b>	<b>Mike Jull</b> <b>University of Northern British Columbia</b>
<i>What is the long-term response of ESSF stands under various silvicultural systems?</i>	The Lucille Mountain ESSF Silvicultural Systems study is the oldest active ESSF silvicultural trial in BC and has resulted in numerous peer-reviewed publications. This project will support remeasurement of several stand attributes to update the time series dataset. This remeasurement and supplementary data collection will allow an opportunity to examine current post-harvest treatment response trends and silvicultural outcomes to date.	Initiated: 05/06 Duration: 2 years 06/07: \$11,445 Total: \$37,313 Location: vicinity of McBride, BC; Headwaters Forest District PAC Region: NI
<b>Y073022</b>	<b>Competitive effects of broadleaf trees on conifer performance over a range of ecosystems</b>	<b>Teresa Newsome</b> <b>Ministry of Forests and Range</b>
<i>What are the competitive relationships between lodgepole pine and trembling aspen in IDF and SBS subzones?</i>	This project investigates competitive relationships between lodgepole pine and trembling aspen in some of the IDF and SBS subzones. The objectives are to investigate and quantify the effects of trembling aspen competition on lodgepole pine growth and performance by assessing established stands, and manipulating aspen densities and spatial arrangement within young stands. Results will be used to produce scientifically based guidelines for developing silviculture prescriptions and implementing operational treatments for mixed stands, and to calibrate and/or verify tree growth models.	Initiated: 04/05 Duration: 3 years 06/07: \$67,872 Total: \$240,849 Location: Cariboo-Chilcotin PAC Region: SI
<b>Y073286</b>	<b>Montane Alternative Silvicultural Systems (MASS): growth limitations on regeneration</b>	<b>Alan K. Mitchell</b> <b>Canadian Forest Service</b>
<i>How are regeneration, growth, and yield affected by silvicultural systems employing overstorey retention?</i>	The overall objective of this project is to assess the influence of aggregate and dispersed retention systems on growth limitations to conifer regeneration in montane forests. The project will build on previous data collected at the Montane Alternative Silviculture Systems (MASS) field site to determine adjustment factors for seedling productivity under retention harvesting systems, and to examine how variable retention harvesting can mitigate long-term changes in nutrient process rates. This research will provide managers with estimates of regeneration growth and yield that are specific to silvicultural systems employing overstorey retention, rather than relying solely on clearcut-based data.	Initiated: 04/05 Duration: 3 years 06/07: \$45,045 Total: \$131,706 Location: central Vancouver Island PAC Region: C

*Development and monitoring of the impact of various stand treatment regimes on regeneration*

<b>Y072075</b>	<b>Natural and artificial regeneration response to opening size and site preparation in a high elevation fir-spruce stand at Sicamous Creek</b>	<b>Alan Vyse</b> <b>Thompson Rivers University</b>
<i>Is natural regeneration a feasible option in high-elevation fir-spruce stands?</i>	This project takes advantage of previously established and measured plots at the Sicamous Creek Silvicultural Systems Project to re-evaluate old and current silvicultural options and to design new options for future application in this forest type. Data on natural regeneration from field plots, combined with other data previously collected at the study site, will allow the proponent to forecast future stand development following alternative combinations of harvesting and site preparation. This will allow conclusions to be drawn about the feasibility of natural regeneration in high elevation fir-spruce stands and make recommendations for the prescription of natural regeneration.	Initiated: 05/06 Duration: 3 years 06/07: \$34,650 Total: \$133,424 Location: south-central interior PAC Region: SI
<i>No priority assigned</i>		
<b>Y051089</b>	<b>An evaluation of Douglas-fir leave-tree retention practices in central British Columbia</b>	<b>Chris Hawkins</b> <b>University of Northern British Columbia</b>
<i>What are the factors affecting the survival of Douglas-fir leave trees in variable retention harvesting?</i>	At the northern extent of the species' range, mature Douglas-fir leave-trees display inconsistent survival within "variable retention" or "clearcut-with-reserves" silvicultural systems. This study attempts to explain this phenomenon by examining the difference in water relations between pre- and post-harvest treatments. The results can be used to define water potential categories that can be applied at stand and possibly landscape levels in the form of a leave-tree risk index (LRI).	Initiated: 04/05 Duration: 1 year 06/07: \$0 Total: \$68,715 Location: dry warm variants of the SBS zone PAC Region: NI
<b>Y051255</b>	<b>Mixed-species stands grown at high densities for the production of high value wood</b>	<b>Bruce C. Larson</b> <b>University of British Columbia</b>
<i>How do different sets of management treatments affect the production of high value wood in mixedwood stands?</i>	This study will investigate the desirability of using mixed-species stands (especially those using a combination of hardwood and conifer species) managed at high densities for the cost-effective production of high value wood. The main goal of this project is to predict the product effects of producing wood under a different set of management treatments.	Initiated: 04/05 Duration: 1 year 06/07: \$0 Total: \$47,524 Location: Malcolm Knapp Research Forest PAC Region: SI
<b>Y071285</b>	<b>Pothole Creek Study Area – Interior Douglas-fir uneven-aged stand development</b>	<b>Catherine Bealle Statland</b> <b>Ministry of Forests and Range</b>
<i>What are the stand dynamics in an unmanaged, uneven-aged IDF stand?</i>	The Pothole Creek Study Area contains a permanent sample plot that is periodically re-measured to provide data for calibration of a light model and for retrospective analysis of stand development. These data are used to support spatial growth and yield modeling. This project will do a complete re-measurement of the plot. A primary outcome of the project will be a report that synthesizes previous results.	Initiated: 06/07 Duration: 2 years 06/07: \$27,300 Total: \$32,918 Location: Merritt PAC Region: SI

**Y073299 The ecology and management of dry Douglas-fir forests: the Opax Mountain Silvicultural Systems Study**

*What are the effects of different harvesting and site preparation treatments on selected ecological variables?*

The Opax Mountain Silvicultural Systems Study was set up to monitor a number of ecological variables after the application of different harvesting and site preparation treatments. This project involves re-measurement of several ongoing experiments, completion of some studies, and integration and extension of various project elements.

**Dr. Andre Arsenault**  
**Ministry of Forests and Range**

Initiated: 04/05  
Duration: 3 *years*  
06/07: \$199,999  
Total: \$492,568  
Location: N of Kamloops  
PAC Region: SI

## T 2.2 Even-aged stands

*No priority assigned*

**Y051025 Old-growth attributes in managed forests: integrating stand productivity with mammal diversity**

*How do young lodgepole pine stands respond to thinning?*

This project involved conducting analyzes and preparing management guidelines and extension products based on data included (1) the diameter, height, and crown volume growth responses of lodgepole pine crop trees at 15 years since thinning; (2) the responses of understorey vegetation and overall stand structure; and (3) the relative habitat use by mule deer and moose, in low, medium, and high densities of lodgepole pine compared with unthinned young pine and old-growth pine.

**Thomas P. Sullivan**  
**University of British Columbia**

Initiated: 04/05  
Duration: 1 *year*  
06/07: \$0  
Total: \$39,900  
Location: southern and central interior  
PAC Region: SI

**Y062240 Optimum nutrition and nutrient loading in Douglas-fir**

*Does heavy fertilization of Douglas-fir seedlings in the nursery improve outplanting performance?*

An alternative to fertilizing Douglas-fir seedlings at the time of planting is to "load" the seedlings with nutrients in the nursery. This project will compare the field performance of these "loaded" seedlings with conventionally grown seedlings planted with and without fertilizer. Production of optimally conditioned, fast-growing Douglas-fir seedlings for reforestation will reduce the time to green-up, reduce costs of timber production, increase available timber volume, and enhance economic viability.

**Barbara Hawkins**  
**University of Victoria**

Initiated: 04/05  
Duration: 2 *years*  
06/07: \$0  
Total: \$42,599  
Location: Kamloops FD  
PAC Region: SI

### T 3.0 Growth and yield modeling/predictions

#### T 3.00 Unclassified

*No priority assigned*

##### **Y051325 New models of regenerated forest stands**

*How can stands regenerated under various operational conditions be linked to realistic long-term growth and yield predictions?*

This project will build early stand computer simulation models that can be used to initialize stand conditions for long-term stand models like TIPSY and PROGNOSIS. The outcome of the project will allow stands regenerated under various operational conditions to be linked to realistic long-term growth and yield predictions.

**Peter Forsythe**  
**Northern Interior Vegetation Management Association**

Initiated: 04/05  
Duration: 1 year  
06/07: \$0  
Total: \$64,158  
Location: province-wide  
PAC Region: P

##### **Y051355 Implementing a PrognosisBC regeneration submodel for the complex stands of southeastern and central British Columbia**

*How can stands regenerated under various operational conditions be linked to realistic long-term growth and yield predictions?*

In the past, the ability of the PrognosisBC stand development model to make long-term projections in partially cut stands has been limited by the lack of a natural regeneration component. This project will assess predictions of a regeneration component currently under development for PrognosisBC against long-term regeneration data from MPB-affected stands, and will study how the model responds to different partial cutting regimes. A primary outcome of the project will be an enhanced version of PrognosisBC.

**Abdel-Azim Zumrawi**  
**Ministry of Forests and Range**

Initiated: 04/05  
Duration: 1 year  
06/07: \$0  
Total: \$73,227  
Location: southeastern and central interior  
PAC Region: SI

##### **Y071286 Defining boreal mixedwoods and exploring their response to management and natural disturbance (fire, MPB) through spatially explicit ecosystem management modeling**

*What type of mixedwood mosaic should management attempt to achieve (maximum spatial and temporal complexity or targeted forest conditions)?*

Management of multi-species stands is complicated by their diversity, complex temporal dynamics, large spatial scales, and long time frames. This project will use a spatial modeling approach to address the question "at what spatial scale of mixing are the various biological, ecological, economic and management costs and benefits of mixedwoods achieved?". The time when individual forest values could be considered in isolation is over, and making wrong choices about management can be very costly — environmentally, socially, and economically.

**Dr. J.P. (Hamish) Kimmins**  
**University of British Columbia**

Initiated: 06/07  
Duration: 3 years  
06/07: \$71,400  
Total: \$198,450  
Location: interior  
PAC Region: P

## T 3.1 Complex stands including partial cutting, variable retention

*Interior BEC zones (ESSF, MH, SBS)*

<p><b>Y051055</b>    <b>Quantifying growth of spruce saplings in spruce–birch stands under different environmental conditions in the SBS zone</b></p> <p><i>What are the relationships between deciduous tree density, growth of conifer crop trees, and key environmental gradients?</i></p>	<p>This project examines dynamics between deciduous and coniferous trees in mixed-species stands across a range of different environmental conditions. The goal is to identify relationships between deciduous-tree density, growth of conifer crop trees, and key environmental gradients. Results will be directed toward the development of a general model to predict site-specific conifer performance in mixed stands in the SBS zone.</p>	<p><b>Scott Green</b> <b>University of Northern British Columbia</b></p> <p>Initiated: 04/05 Duration: 1 <i>year</i> 06/07: \$0 Total: \$31,192 Location: Sinclair Mills PAC Region: NI</p>
<p><b>Y051356</b>    <b>Calibrating PrognosisBC in the Sub-Boreal Spruce and the Sub-Boreal Pine–Spruce biogeoclimatic zones</b></p> <p><i>How will new silvicultural systems affect both growth and yield and tree species composition in SBS and SBPS stands?</i></p>	<p>PrognosisBC is a very versatile growth and yield model that is able to simulate almost any form of harvesting, but it has not been calibrated for use in many parts of the province. This project calibrates the main components of PrognosisBC to extend the model to the SBS and SBPS BEC zones. The results of this project will improve predictions of how new silvicultural systems being used in BC will affect both growth and yield and tree species composition.</p>	<p><b>Abdel-Azim Zumrawi</b> <b>Ministry of Forests and Range</b></p> <p>Initiated: 04/05 Duration: 1 <i>year</i> 06/07: \$0 Total: \$63,986 Location: Cariboo FD PAC Region: SI</p>
<p><b>Y061033</b>    <b>Evaluation of an ecosystem-based approach to mixedwood modelling</b></p> <p><i>How effective is FORECAST in simulating mixedwood stand dynamics and for supporting timber supply analysis?</i></p>	<p>Current approaches to modeling tree growth in mixed-species stands use projections based on past observations of diameter and height growth, which do not adequately allow for the ever-changing management objectives and environmental conditions in our forests. The stand development model FORECAST includes an explicit representation of the key ecosystem processes regulating growth dynamics and competition for limited resources. This study evaluates the performance of FORECAST in simulating mixedwood stand dynamics and its potential for supporting timber supply and certification analyzes.</p>	<p><b>Brad Seely</b> <b>University of British Columbia</b></p> <p>Initiated: 05/06 Duration: 1 <i>year</i> 06/07: \$0 Total: \$46,504 Location: BWBS, SBS, and ICH zones PAC Region: P</p>

*Boreal mixedwood (spruce–pine–aspen)*

<p><b>Y051256</b>    <b>Evaluation of the simulation model SORTIE for prediction of growth and yield in mixed aspen–spruce stands</b></p> <p><i>What is the growth &amp; yield response of mixed aspen–spruce stands?</i></p>	<p>This focus of this project is to improve SORTIE, a growth and yield model used in BC. Specifically, this study will use recent research to perform rigid parameterization, will add the ability for the model to predict tree volume, and will perform a formal validation of the model for mixed aspen–spruce stands.</p>	<p><b>Bruce C. Larson</b> <b>University of British Columbia</b></p> <p>Initiated: 04/05 Duration: 1 <i>year</i> 06/07: \$0 Total: \$34,650 Location: northern interior PAC Region: NI</p>
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<b>Y072051</b>	<b>Modelling boreal mixedwoods (spruce–aspen–pine) with TASS</b>	<b>George Harper</b> <b>Ministry of Forests and Range</b>
<i>How can growth simulation of aspen–spruce and aspen–pine stands be improved?</i>	This project will develop understory spruce and pine height and diameter growth relationships to enable the Tree and Stand Simulator (TASS) to simulate aspen–spruce and aspen–pine boreal mixedwoods. This work will be based on a review of literature from published and unpublished sources, followed by the collection of field data that relates tree growth and light levels. Outcomes include better information for aspen management, improved understanding of boreal mixedwood dynamics, and the development of biologically defensible growth and yield estimates for boreal mixedwoods and complex stands.	Initiated: 05/06 Duration: 3 years 06/07: \$44,100 Total: \$124,450 Location: Research Branch, Victoria, BC PAC Region: C
<i>Interior BEC zones (ICH, IDF)</i>		
<b>Y061132</b>	<b>Development of the PrognosisBC growth and yield simulator in the southern and central BC: model validation</b>	<b>Abdel-Azim Zumrawi</b> <b>Ministry of Forests and Range</b>
<i>Is the ICH version of Prognosis ready for release?</i>	The ICH version of the stand simulation model PrognosisBC 3.0 has yet to be validated or released. This project consists of a full validation of the simulator using various sources of independent data. The project will complete and document the 10-year model development work on PrognosisBC, testing and validating the different components and BEC versions to a common standard.	Initiated: 05/06 Duration: 1 year 06/07: \$0 Total: \$82,131 Location: IDF, ICH, MS, SBS, and SBPS PAC Region: SI
<b>Y073067</b>	<b>Predicting development and productivity of southern interior mixed-species stands through calibration and modeling with SORTIE-BC</b>	<b>Dr. Suzanne Simard</b> <b>University of British Columbia</b>
<i>What is the growth response of juvenile paper birch, Douglas-fir, and western larch trees growing under a range of light environments?</i>	Mixed-species forest models can examine how complex stands respond to a wide range of silvicultural strategies, at different spatial scales and over different time periods, which is an impossible undertaking for traditional field-based research. This study quantifies the growth response of juvenile paper birch, Douglas-fir, and western larch trees growing under a range of light environments, characterizing the probability of juvenile tree mortality, and investigating the effects of competition on the growth and survival of adult trees. Results will be used to calibrate the SORTIE-BC model for stand dynamics in southern interior mixed stands.	Initiated: 04/05 Duration: 3 years 06/07: \$46,998 Total: \$153,473 Location: southern interior PAC Region: SI
<b>Y073092</b>	<b>Light and tree growth in complex forest stands</b>	<b>David G. Simpson</b> <b>Ministry of Forests and Range</b>
<i>What are the relationships between tree height increment and light levels in interior Douglas-fir partially cut stands?</i>	The objective of this project is to aid the development of the TASS-III tree and stand model determining relationships between tree height increment and light levels, and evaluating model estimates of light and tree growth in real forests. Specifically, the project will sample young saplings growing at varying distances from stand edges to obtain growth measurements, and collect light data from an interior Douglas-fir partially cut stand.	Initiated: 04/05 Duration: 3 years 06/07: \$59,850 Total: \$201,894 Location: southern interior and south coast PAC Region: C; SI

*No priority assigned*

<p><b>Y061168</b>    <b>Incorporating variable retention harvesting functionality into the Forest Service Spatial Analysis Model (FSSAM)</b></p> <p><i>How can variable retention be reflected in forest growth models?</i></p>	<p>The objective of this project is to incorporate variable retention harvesting functionality into FSSAM. This will improve the model's ability to predict the impact of variable retention harvesting at the forest level for provincial timber supply analysis applications.</p>	<p><b>C. Mario Di Lucca</b> <b>Ministry of Forests and Range</b></p> <p>Initiated: 05/06 Duration: 1 <i>year</i> 06/07: \$0 Total: \$26,647 Location: province-wide PAC Region: P</p>
<p><b>Y072088</b>    <b>TASS III: Simulating the management, growth and yield of complex stands</b></p> <p><i>How can TASS and TIPSY be improved for application to uneven-aged, multi-storied stands?</i></p>	<p>Currently, the potential of TASS II and TIPSY to address complex stands is limited to certain applications (e.g., variable retention in even-aged stands). This project will integrate new and revised modules into TASS including support for multi-layered structures, a raster-based light model, a 3-D visualization tool, and a more user-friendly graphical user interface. The outcome is a new version of TASS designed specifically for the complex structures found in uneven-aged and mixed-species stands, and the ability to have TIPSY retrieve information directly from TASS instead of a database of TASS yield tables</p>	<p><b>Jim Goudie</b> <b>Ministry of Forests and Range</b></p> <p>Initiated: 05/06 Duration: 3 <i>years</i> 06/07: \$146,594 Total: \$302,056 Location: Victoria, Kamloops PAC Region: P</p>
<p><b>Y073071</b>    <b>SIBEC site index estimates</b></p> <p><i>How can SIBEC estimates be improved for selected BEC site series?</i></p>	<p>SIBEC estimates of site index are based on relationships between site index and environmental factors such as soil moisture and nutrient regimes. This project collects additional data for priority BEC site series to achieve second-generation estimates that report mean site index and standard error.</p>	<p><b>Shirley Mah</b> <b>Ministry of Forests and Range</b></p> <p>Initiated: 04/05 Duration: 3 <i>years</i> 06/07: \$96,495 Total: \$269,049 Location: province-wide PAC Region: P</p>

## T 4.0 Timber losses to environmental and biotic factors (wind, drought, insects, disease, animals, fire)

### T 4.00 Unclassified

*No priority assigned*

<p><b>Y073184</b>    <b>New egg survey method for population assessments of the western hemlock looper (<i>Lambdina fiscellaria lugubrosa</i>) (Lepidoptera: Geometridae)</b></p> <p><i>How effective is new sampling technology for predicting the location and severity of western hemlock looper outbreaks?</i></p>	<p>Although the western hemlock looper (WHL) is seriously disrupting normal economic and operational planning in parts of BC, current methods of estimating population trends are expensive, which limits the ability of managers to respond with appropriate interventions. This project will test the effectiveness of a new sampling technology for predicting the location and severity of WHL outbreaks, and compare the efficacy and cost-effectiveness of the new sampling technology against current sampling technologies for WHL. It is anticipated that this research will lead to similar possibilities for other defoliators.</p>	<p><b>Art Stock</b> <b>Ministry of Forests and Range</b></p> <p>Initiated: 04/05 Duration: 3 years 06/07: \$30,001 Total: \$93,377 Location: ICH zone PAC Region: SI</p>
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### T 4.1 Stand and forest dynamics following MPB

*Quantification of stand and forest change and development following MPB attack, including GY modeling, and impacts on timber supply; evaluating and estimating timber growth implications on residual trees and regenerated stands, in the understorey, and in clearcut openings; includes species interactions related to the scale and pattern of harvesting*

<p><b>M065002</b>    <b>Success rate of MPB attack in young stands</b></p> <p><i>What is the impact of MPB in younger stands?</i></p>	<p>The high level of MPB attack observed in young stands could have a significant effect on timber supply. This project will focus on sampling young stands for information on MPB attack and mortality, as well as regeneration. The outcomes of the project will include the ability to better estimate the impact of MPB in younger age classes, and economic assessment of various strategies to mitigate the impact of MPB attack in younger stands.</p>	<p><b>Chris Hawkins</b> <b>University of Northern British Columbia</b></p> <p>Initiated: 05/06 Duration: 1 year 06/07: \$0 Total: \$32,499 Location: Prince George and Vanderhoof Forest Districts PAC Region: NI</p>
<p><b>M075015</b>    <b>Modeling natural regeneration in mountain pine beetle impacted stands</b></p> <p><i>What is the outcome of natural regeneration of MPB-killed stands?</i></p>	<p>Since not all MPB-infected stands will be salvage-logged and planted, accurate projection of future timber production in MPB-affected stands will depend on our ability to estimate natural regeneration following MPB disturbances. The focus of this study is to gather necessary data and to estimate the amount of natural regeneration that has occurred in stands that have not been salvage-logged. These estimates can then be used in PrognosisBC and other growth and yield models to project future stand development in MPB-affected stands.</p>	<p><b>Peter Marshall</b> <b>University of British Columbia</b></p> <p>Initiated: 06/07 Duration: 2 years 06/07: \$75,915 Total: \$151,830 Location: southern and central interior PAC Region: SI</p>

<b>M075020</b>	<b>Predicting development and productivity of southern interior mixed-species stands following mountain pine beetle attack</b>	<b>Dr. Suzanne Simard University of British Columbia</b>
<i>What are the timber growth implications of MPB on residual trees and regenerated stands in the understorey and in clearcut openings, and what is the residual stand development with and without treatment under various levels of attack?</i>	The SORTIE-BC stand dynamics model is not adequately parameterized for mature lodgepole pine stands, which are rapidly disappearing due to the current MPB infestation. This project will collect field data necessary to parameterize SORTIE-BC for these disappearing stands and link this data to the model. The work will allow the future of infested stands to be modeled, with important implications for evaluating future management actions.	Initiated: 06/07 Duration: 2 years 06/07: \$57,855 Total: \$125,738 Location: MS zone PAC Region: SI; NI
<b>M075024</b>	<b>Mountain pine beetle impacts on young age-class, pine-leading stands in the SBS biogeoclimatic zone</b>	<b>Chris Hawkins University of Northern British Columbia</b>
<i>What is the extent of MPB attack in young stands, and what are the implications for mid-term timber supply?</i>	The level of MPB infestation in young stands is exceeding expectations, which could have significant impacts on timber supply estimates. This project will collect data on MPB dynamics and regeneration in young stands. This information is crucial for assessing timber supply, planning for restoration activities on unlogged stands, and determining and planning for social impacts on affected communities.	Initiated: 06/07 Duration: 2 years 06/07: \$56,763 Total: \$106,651 Location: central interior PAC Region: NI
<b>M075044</b>	<b>Stand dynamics following mountain pine beetle outbreaks in central British Columbia</b>	<b>Dr. René Alfaro Natural Resources Canada</b>
<i>What is the effect of MPB infestation on subsequent stand dynamics?</i>	While reliable decision support tools are fundamental to properly managing areas infested by mountain pine beetle, we still lack information necessary to reliably implement these tools in some forests, particularly uneven-aged lodgepole pine forests. This study combines existing knowledge with data from intensive field studies and model simulations to study beetle impacts on future stand dynamics. Specifically, this project aims to fill in current gaps in the information required to reliably implement stand modeling tools such as TASS.	Initiated: 06/07 Duration: 2 years 06/07: \$66,150 Total: \$129,150 Location: extent of MPB infestation PAC Region: SI; NI
<b>M075049</b>	<b>Response of woodland caribou to partial retention logging of winter ranges attacked by mountain pine beetle</b>	<b>Dr. Dale Seip Ministry of Forests and Range</b>
<i>Are prescribed UWR management practices effective in maintaining caribou use in stands that are severely attacked by MPB?</i>	The mountain pine beetle (MPB) infestation and associated salvage logging may have a negative effect on the Kennedy Siding caribou. This project will monitor the response of the caribou to MPB, and evaluate if current Ungulate Winter Range (UWR) management practices are effective in maintaining caribou use of the area. Because the Kennedy Siding UWR is very accessible, it is probably the most cost-effective and efficient location in all of BC to evaluate caribou use of MPB-killed stands	Initiated: 06/07 Duration: 2 years 06/07: \$91,350 Total: \$169,050 Location: Mackenzie PAC Region: NI

<p><b>Y061021</b>    <b>Stand- to landscape-level effects of the mountain pine beetle (MPB) outbreak in central British Columbia</b></p> <p><i>What are the stand dynamics following MPB infestation?</i></p>	<p>The current MPB infestation will affect several aspects of stand dynamics in infested regions. This study will characterize stand dynamics and landscape patterns temporally and spatially across the affected area. This information will identify the key variables (assumptions) needed to perform up-to-date timber supply analyzes in the central BC interior.</p>	<p><b>Chris Hawkins</b> <b>University of Northern British Columbia</b></p> <p>Initiated: 05/06 Duration: 1 year 06/07: \$0 Total: \$36,543 Location: Lakes, Morice, and Prince George TSAs PAC Region: NI</p>
<p><b>Y061134</b>    <b>Regeneration and stand structure in stands in the east Ootsa and Entiako areas after infestation by the mountain pine beetle</b></p> <p><i>Does stand structure respond following MPB infestation?</i></p>	<p>At the beginning of the current mountain pine beetle (MPB) epidemic, research plots were established to measure and monitor vegetation responses to the outbreak. The purpose of this project is to remeasure these research plots within MPB stands and to address knowledge gaps relating to advanced regeneration, ingress, stand structure, and coarse woody debris.</p>	<p><b>Deborah Cichowski</b> <b>Bulkley Valley Centre for Natural Resources Research and Management</b></p> <p>Initiated: 05/06 Duration: 1 year 06/07: \$0 Total: \$52,489 Location: East Ootsa area at the south end of the Lakes portion of the Nadina MOF District, and Entiako Park and Protected Area PAC Region: NI</p>
<p><b>Y072003</b>    <b>Determining susceptibility of young pine plantations to the mountain pine beetle, <i>Dendroctonus ponderosae</i>, and manipulating future stands to mitigate losses</b></p> <p><i>How susceptible are young pine stands to MPB attack, and what are the future risks to these stands?</i></p>	<p>The recently observed infestation of young pine stands by MPB threatens both previous investments in these stands and future harvests. This project will use controlled, replicated experiments in pine plantations to determine: (1) key attributes of susceptibility in pine plantations, (2) the best methods to manipulate stand and tree conditions to mitigate potential losses from MPB, and (3) the risk of incipient populations of MPB building in future young pine plantations once this current outbreak has subsided. Results from this study will provide the basis for a susceptibility rating system for present and future plantations and will enhance existing management strategies in shaping our future forests.</p>	<p><b>Lorraine Maclauchlan</b> <b>Ministry of Forests and Range</b></p> <p>Initiated: 05/06 Duration: 2 years 06/07: \$80,197 Total: \$172,282 Location: southern interior PAC Region: SI</p>

**Y072072 A framework for documenting the effects of the mountain pine beetle outbreak in sub-boreal forests of northern BC**

*What is the ecosystem response to severe MPB infestation?*

The aim of this project is to better understand ecosystem changes over time in response to MPB. To achieve this objective, permanent sample plots will be set up in severely attacked stands and a wide range of baseline measurements will be recorded including stand structure attributes, stem mapping, snag and CWD attributes, and RIC vegetation assessment. These plots will provide much-needed understanding of ecological changes, forest regeneration, timber supply, and other stand management information for MPB-infested stands.

**Craig Delong**  
Ministry of Forests and Range

Initiated: 05/06

Duration: 3 years

06/07: \$31,185

Total: \$197,210

Location: Nadina,  
Vanderhoof, and  
Prince George FDs

PAC Region: NI

**Y073043 Shelterwood silvicultural systems to address integrated resource management issues**

*What are the stocking levels after MPB salvage, and how does root disease affect the productivity, regeneration, and future health of forests?*

By linking the results of two long-term, shelterwood silvicultural systems trials in BC in the SBS and ICH zones, this project aims to address management questions about stocking levels after MPB salvage, and the productivity, regeneration, and future health of forests affected by root disease. Relationships between residual stand structure, understorey development, and non-timber values will be determined by evaluating various levels of basal area retention and harvesting systems.

**Michaela Waterhouse**  
Ministry of Forests and Range

Initiated: 04/05

Duration: 3 years

06/07: \$50,085

Total: \$202,461

Location: southern interior

PAC Region: SI

*Residual stand development with and without treatments (including small- and large-scale salvage) under various levels of attack; includes mitigating losses*

**Y072184 Predicting advanced regeneration density in lodgepole pine stands in the northern interior of British Columbia**

*Which unsalvaged MPB-attacked stands will require rehabilitation?*

Following the current mountain pine beetle (MPB) outbreak, it is unknown which unsalvaged stands, or portions of stands, should be rehabilitated to assure adequate stocking and a continued timber supply. This study takes a ground-truthed, landscape-level approach to predicting, mapping, and prioritizing stands according to their need for salvage or rehabilitation.

**Philip Burton**  
Natural Resources Canada

Initiated: 05/06

Duration: 2 years

06/07: \$52,920

Total: \$95,340

Location: Nadina,  
Vanderhoof, and  
Prince George FDs

PAC Region: NI

*Growth, development, and health of residual stands (overstorey and understorey) across a wide range of post-attack stand types and conditions (i.e., mixed-species – salvaged; mixed-species – unsalvaged; pine dominant – unsalvaged) in different BEC zones*

<b>M065004</b>	<b>Current/critical research on species-specific responses to climate/microenvironment change, making specific applications for MPB stands under different scenarios: Literature review</b>	<b>Scott Green University of Northern British Columbia</b>
<i>What are the species-specific responses to climate / microenvironment change in MPB-attacked stands?</i>	The growth and health response of trees to the altered climatic conditions in forest understoreys following MPB attack varies by species. The aim of this project is to conduct a detailed literature review to outline current knowledge and critical areas of research related to these species-specific responses to climate/microenvironment change. The review will focus on applications to MPB stands under different scenarios (e.g., salvaged vs. unsalvaged).	Initiated: 05/06 Duration: 1 year 06/07: \$0 Total: \$21,889 Location: province-wide PAC Region: P
<b>M075001</b>	<b>Density and distribution of advance regeneration in the MS biogeoclimatic zone in relation to site moisture and overstorey density</b>	<b>Gordon Nigh Ministry of Forests and Range</b>
<i>Which MPB-damaged stands do we treat (and how do we treat them), and which stands can be left to regenerate on their own?</i>	Due to the wide extent of the current MPB infestation, managers need to determine which stands need treatment to ensure adequate regeneration, and which stands can be left alone to regenerate by advance regeneration. This project involves collection of field data and subsequent development of equations that predict the amount and spatial distribution of advance regeneration. These equations can be used to determine the potential for successful development of a particular stand following the MPB outbreak.	Initiated: 06/07 Duration: 2 years 06/07: \$51,503 Total: \$79,906 Location: Merritt TSA PAC Region: SI
<b>M075010</b>	<b>Development of residual trees and regeneration following MPB attack in thinned lodgepole pine stands</b>	<b>Robert P. Brockley Ministry of Forests and Range</b>
<i>Does "beetle proofing" in younger lodgepole pine stands by thinning produce benefits at either endemic or epidemic beetle population levels?</i>	Development of mixed-species stands post-MPB infection has been poorly documented. This study documents post-attack stand dynamics in unsalvaged, thinned, pine-dominant lodgepole pine stands, and examines advance regeneration in these stands. This information will help ensure that the productivity of unharvested, beetle-infected stands is maintained or rehabilitated as quickly as possible.	Initiated: 06/07 Duration: 2 years 06/07: \$37,800 Total: \$57,750 Location: southern interior PAC Region: SI
<b>M075045</b>	<b>Balancing disturbances in forest management</b>	<b>V.G. Nealis Natural Resources Canada</b>
<i>Does salvage of lodgepole pine in mixed-species stands increase the susceptibility of Douglas-fir to attack by western spruce budworm?</i>	Removal of lodgepole pine from a mixed-species stand may lead to a change in the susceptibility of remaining Douglas-fir to western spruce budworm. This project examines the response of spruce budworm in terms of outbreak characteristics of direct importance to forest health, following selective removal of lodgepole pine. There are reasons to hypothesize both increased or decreased risk of budworm outbreaks following selective harvesting of lodgepole, but no way of providing usable guidelines without stand-level measurements.	Initiated: 06/07 Duration: 2 years 06/07: \$44,100 Total: \$94,500 Location: southern interior PAC Region: SI

**M075046 Stand and forest dynamics following MPB: how spatial patterns of salvage harvesting affect Warren root collar weevil pressure in regenerating stands**

*How will the spatial patterns of salvage logging affect recruitment and success of both planted and naturally regenerating stands, with particular reference to impacts of Warren root collar weevil?*

Salvage logging following mountain pine beetle (MPB) infestation may create conditions favourable to a subsequent infestation of Warren root collar weevil. This project will examine the spatial distribution of weevil infections relative to MPB outbreaks to better understand the relationship between the two pests. Understanding this relationship may inform future management strategies, such as non-host species selection for harvesting on high-risk sites, deployment of potential chemical or visual attractants and traps, or creation of buffer-habitat unsuitable for migration.

**Brian H. Aukema**  
University of Northern British Columbia

Initiated: 06/07  
Duration: 2 years  
06/07: \$50,505  
Total: \$101,010  
Location: extent of MPB infestation  
PAC Region: NI

No priority assigned

**Y073138 Vole population and seedling damage monitoring with diversionary feeding methods**

*What is the efficacy of diversionary food supplies in decreasing mortality of plantation trees from winter vole damage?*

Feeding damage by voles may limit regeneration of some tree species in certain forest ecosystems, increasing reforestation costs and decreasing net productive forested area. This project will monitor vole populations and test the efficacy of diversionary food supplies in decreasing mortality of plantation trees from winter vole damage. This method could result in increased plantation survival, thereby directly providing positive benefits to sustainable forest management.

**Thomas P. Sullivan**  
University of British Columbia

Initiated: 04/05  
Duration: 3 years  
06/07: \$48,300  
Total: \$144,894  
Location: Glenogle Creek east of Golden  
PAC Region: SI

#### T 4.2 Estimating stand-level losses (other than MPB)

*Spruce bark beetle*

**Y071173 Spruce beetle risk modeling in a changing climate**

*What are the risks of spruce beetle attack in the face of climate change?*

This project develops a spatially explicit model of spruce beetle risk using a logistic regression approach. A province-wide coverage of spruce stands will be extracted from the seamless forest inventory and gridded into cells (approx 400 x 400 m) to define the population at risk. Then coverages of spruce beetle outbreak history and explanatory variables will be gridded at the same scale and geo-referenced including: stand species composition, age class, site class, stocking class, elevation, wind and windthrow risk, and climate norms. The resulting models will then be applied to determine the annual risk of loss in the host (spruce) population.

**Stephen Taylor**  
Natural Resources Canada

Initiated: 06/07  
Duration: 1 year  
06/07: \$79,800  
Total: \$79,800  
Location: northern and southern interior  
PAC Region: SI: NI

*Root disease (Armillaria, Phellinus)***Y062041 Reducing the impact of Armillaria root disease via mixed-species plantations including western redcedar**

*Is western redcedar more resistant to root rot than other conifers, and does it convey protection to other trees in the stand?*

Previous studies suggest that in the ICH, western redcedar is more resistant to Armillaria root disease than other common conifers including western hemlock and Douglas-fir. The objective of this ongoing project is to determine differential resistance among 20- to 30-year old western redcedar, western hemlock, and Douglas-fir trees to Armillaria root disease in the southern interior. Results will elucidate mechanisms of resistance in western redcedar and provide information about the relative susceptibility of other host species, and whether inclusion of western redcedar among susceptible conifers like Douglas-fir, in natural or artificially regenerated clearcuts will reduce the overall impact of Armillaria root disease.

**Bart van der Kamp**  
University of British Columbia

Initiated: 04/05  
Duration: 2 years  
06/07: \$0  
Total: \$101,203  
Location: southern interior  
PAC Region: SI

**Y062143 Evaluation of Hypophloeum trials**

*How effective is a new technique for controlling Armillaria root disease?*

A new technique for mitigating the losses to Armillaria root disease has been developed, but it must be registered with the Pest Management Regulatory Agency (PMRA) before it can be used operationally. In addition, trials of the technique must be monitored to determine the longer-term efficacy of the treatment. This project funds monitoring of the existing trials and continuing the registration process.

**Bill Chapman**  
Ministry of Forests and Range

Initiated: 04/05  
Duration: 2 years  
06/07: \$0  
Total: \$54,190  
Location: southern interior  
PAC Region: SI

**Y062223 Impacts of Armillaria root disease on stand productivity in the southern interior of BC**

*What is the growth loss attributable to sublethal Armillaria infection in Douglas-fir plantations in the ICH?*

Armillaria root disease of conifers is present in most lower elevation stands in the southern interior and can affect stand productivity, but is generally not lethal. This project collects field data to quantify the growth loss attributable to sublethal Armillaria infection in Douglas-fir plantations in the ICH. The results of this study will be incorporated into growth and yield models to allow managers to evaluate the economics of remedial treatments.

**Mike Cruickshank**  
Natural Resources Canada

Initiated: 04/05  
Duration: 2 years  
06/07: \$0  
Total: \$224,377  
Location: Headwaters FD  
PAC Region: SI

*Windthrow***Y051298 Predicting wind damage in mixed-species complex structured stands**

*What are the factors that influence the extent of wind damage in mixedwood stands?*

Wind damage in forest stands is affected by internal stand characteristics, internal stand treatment history, adjacent stand history, site conditions, and storm characteristics. This study will examine wind damage risk in mixed-species partially cut forests at the Date Creek silvicultural systems study. Knowledge of species risk to wind damage as a function of site, species, cutting history, and storm intensity will aid prescription development for structurally complex managed stands.

**David Coates**  
Ministry of Forests and Range

Initiated: 04/05  
Duration: 1 year  
06/07: \$0  
Total: \$20,925  
Location: northwestern BC  
PAC Region: NI

**Y062276 Numerical modelling of wind flow in retention system openings**

*What are the windthrow risks in complex stands created by partial cutting scenarios?*

Given BC's windy climate and the susceptibility of partially harvested stands to windthrow, forest managers need tools to design harvesting regimes that reduce windthrow risk to acceptable levels. Using a simulation model, this study characterizes wind behaviour in harvested openings of various shapes and sizes, with and without residual trees, in simple and in complex terrain. Results of these simulations will be used to improve the ForestGALES mechanistic windthrow risk model and enable prediction of windthrow risk for complex partial cutting scenarios.

**Stephen Mitchell**  
**University of British Columbia**

Initiated: 04/05  
Duration: 2 years  
06/07: \$0  
Total: \$134,101  
Location: Vancouver Island  
PAC Region: C

**Y072169 Incorporating the effects of windthrow after variable retention harvesting into TASS and TIPSYS**

*How can TIPSYS and TASS be upgraded to account for windthrow losses?*

Windthrow losses in variable retention (VR) harvesting systems will affect growth and yield projections for overstorey trees, but are currently not accounted for in TASS and TIPSYS (growth and yield models). This project will incorporate preliminary windthrow data from VR blocks, a currently existing windthrow model, and the results from former subprojects into an upgraded version of TIPSYS and TASS.

**Mario Di Lucca**  
**Ministry of Forests and Range**

Initiated: 05/06  
Duration: 2 years  
06/07: \$53,960  
Total: \$141,099  
Location: province-wide  
PAC Region: P

*Dothistroma***Y073203 Genetic variation in the foliar pathogen *Dothistroma septospora* and relationship to toxin production**

*What is the genetic makeup of *Dothistroma* in BC, and is there a relationship between genotype and production of the toxin dothistromin?*

To avoid future epidemics of *Dothistroma*, and to develop comprehensive strategies for management of lodgepole pine, such as genetic resistance, it is critical that the biology of the fungus and the factors leading to outbreaks are understood. This project will examine the genetic makeup of *Dothistroma* in BC, and determine if there is a relationship between genotype and production of the toxin dothistromin. In New Zealand, knowledge of the lack of genetic diversity in the fungus facilitated development of resistant pine stock.

**Kathy J. Lewis**  
**University of Northern British Columbia**

Initiated: 04/05  
Duration: 3 years  
06/07: \$7,800  
Total: \$69,320  
Location: northwestern BC  
PAC Region: NI

<p><b>Y073204 Relationships between climate, forest practices, and incidence of <i>Dothistroma septospora</i></b></p> <p><i>What are the influences of weather patterns and forest management-caused changes in host abundance on the extent and nature of current and historic severity of Dothistroma?</i></p>	<p>The objectives of this project are to determine the influence of weather patterns and forest management-caused changes in host abundance on the extent and nature of current and historic severity of red band needle blight. Specifically, this study will set up and monitor spore traps and simple weather stations to ascertain current conditions, use historical records and dendrochronological analyzes to re-construct past conditions, and conduct stand surveys to assess microclimate factors. A better understanding of the epidemiology of red band needle blight will help recognize high-risk situations and aid in the development of management practices to prevent future outbreaks.</p>	<p><b>Kathy J. Lewis</b> <b>University of Northern British Columbia</b></p> <p>Initiated: 04/05 Duration: 3 years 06/07: \$23,770 Total: \$93,999 Location: ICH zone, northwestern BC PAC Region: NI</p>
<p><i>No priority assigned</i></p>		
<p><b>Y051207 Predicted impacts of hard pine rusts in lodgepole pine dominated juvenile stands in central BC</b></p> <p><i>What are the incidence and impact of hard pine rusts in juvenile lodgepole pine stands?</i></p>	<p>This project examines hard pine rusts in juvenile lodgepole pine stands. Specifically, the project will determine the current incidence of lethally infected trees, refine estimates of annual mortality rates, and examine regeneration in gaps created by dying trees.</p>	<p><b>Alex Woods</b> <b>Bulkley Valley Centre for Natural Resources Research and Management</b></p> <p>Initiated: 04/05 Duration: 1 year 06/07: \$0 Total: \$23,090 Location: Lakes TSA PAC Region: NI</p>
<p><b>Y061188 Conifer defoliating insects of British Columbia: an identification and information guide</b></p> <p><i>How can defoliating insects be identified?</i></p>	<p>Estimating timber losses caused by defoliating insects depends on accurate identification of the causal agent, yet forest practitioners currently lack the necessary tools to accurately identify this important group of insects. The intent of this project is to develop and publish a comprehensive full colour identification guide and information source for the conifer feeding defoliators of BC.</p>	<p><b>Robert Duncan</b> <b>Natural Resources Canada</b></p> <p>Initiated: 05/06 Duration: 1 year 06/07: \$0 Total: \$50,400 Location: province-wide PAC Region: P</p>

## T 4.3 Mitigating losses (other than MPB)

*Mountain pine beetle losses: Silvicultural treatments and regimes, such as fertilization of non-lodgepole pine stands and treatment of repressed lodgepole pine stands, to accelerate operability and enhance mid-term timber supply*

<b>M075004</b>	<b>Enhancing early stand growth through the use of vegetation management – 15-year post-treatment results</b>	<b>George Harper Ministry of Forests and Range</b>
<i>What are the impacts of vegetation management treatments on the growth &amp; survival of Engelmann spruce?</i>	This project remeasures a vegetation management research trial. The trial was established in 1991 to provide short- and long-term information on the impacts of a variety of manual brushing treatments, glyphosate application, and no treatment (doing nothing). Remeasurement during 2006 will document vegetation competition and the growth and survival of Engelmann spruce 15 years post-treatment.	Initiated: 06/07 Duration: 2 years 06/07: \$13,755 Total: \$16,905 Location: Columbia FD PAC Region: SI
<b>M075009</b>	<b>Identification of young pine stands at high risk to mountain pine beetle through an integration of GIS analysis and field evaluation techniques</b>	<b>Lorraine Maclauchlan Ministry of Forests and Range</b>
<i>How can young (less than 45 year) pine stands be managed to minimize risk to MPB?</i>	As the current MPB infestation continues, concern for impacts on younger stands is rising. This project identifies young stands at risk for MPB infection and describes residual stand structure and regeneration after MPB attack and MPB attack levels. This research will provide information to managers on the risk to the future timber inventory from the current MPB epidemic.	Initiated: 06/07 Duration: 2 years 06/07: \$47,500 Total: \$86,875 Location: range of MPB infestation PAC Region: SI, NI
<b>M075012</b>	<b>Treatment of repressed lodgepole pine stands</b>	<b>Teresa Newsome Ministry of Forests and Range</b>
<i>Do thinning and fertilization effectively release suppressed lodgepole pine?</i>	In many lodgepole pine stands, poor growth is associated with high densities of pine establishing after wildfires and persisting over time. This project is a continuation of field trials examining different stand treatment methods for increasing the productivity of these stands. This project is designed to collect data that can be used in growth and yield models that project future stand development.	Initiated: 06/07 Duration: 2 years 06/07: \$58,591 Total: \$142,958 Location: Chilcotin Plateau in the SBPS zone PAC Region: SI

## T 5.0 Analytical techniques and models for strategic analysis

### T 5.3 Techniques for scheduling harvesting after MPB attack

*Design of retention and salvage harvesting at scales ranging from individual cutblocks through landscape units to entire management units*

#### M075023 Rating options for post-attack cutting on affected stands

*How can better decisions be made regarding what to do after MPB attack, especially in mixed-species stands?*

Different management actions following MPB infestation (e.g., clearcut, partial harvest) can be evaluated by several different metrics (e.g., NPV, MAI). This project investigates the trade-offs between these different metrics for a range of management actions. The outcome of the project is a decision support tool that presents different actions in terms of the three main metrics used in forest decision making and addresses the probabilities of changing conditions.

**Bruce C. Larson**  
University of British Columbia

Initiated: 06/07  
Duration: 1 year  
06/07: \$43,260  
Total: \$43,260  
Location: Alex Fraser  
Research Forest  
PAC Region: SI

#### M075025 A strategic analysis framework for managing forests under the mountain pine beetle outbreak

*What are the options for mitigating the effects of MPB outbreaks on a stand's loss of resilience to absorb further perturbation, and reduced capacity to provide key ecological services, such as wildlife habitat, mid- to long-term timber supply, and jobs?*

The extent and severity of the current MPB outbreak are creating uncertainty that hampers the ability of managers to meet their objectives. This project develops an analysis framework for assessing timber and non-timber values, trade-offs, and interactions, with explicit accounting for uncertainty. A primary outcome is a report that evaluates current policy, presents alternative options, and guides MPB-related decisions.

**Don Morgan**  
Ministry of Forests and Range

Initiated: 06/07  
Duration: 2 years  
06/07: \$75,910  
Total: \$151,820  
Location: East Kootenays  
PAC Region: SI

*No priority assigned*

#### M075040 Moving towards a desirable future: developing and evaluating alternative MPB salvage strategies in the Prince George Forest District

*Not clear from the LOI.*

It is a complex undertaking to plan and develop strategies that account for short- and long-term patterns of change in stand attributes and landscape patterns associated with the current MPB infestation. This project reviews these complexities, considering them in the context of the wide range of values and decision-support tools with which managers have to work.

**Kerry Deschamps**  
Canadian Forest Products Ltd.

Initiated: 06/07  
Duration: 1 year  
06/07: \$69,300  
Total: \$69,300  
Location: Prince George FDs  
PAC Region: NI

## T 6.0 Marketable resources other than timber

### T 6.1 Collect, synthesize, and assess existing knowledge; and identify critical knowledge gaps

#### *Non-timber forest products (NTFP)*

#### **Y071021 Timber/NTFP compatible management extension**

*How can forests be managed for compatible production of timber and non-timber forest products?*

This extension project summarizes current knowledge and makes recommendations for specific timber management practices that are compatible with NTFP production

**Dr. Darcy Mitchell**  
**Royal Roads University**

Initiated: 06/07  
Duration: 1 year  
06/07: \$51,450  
Total: \$51,450  
Location: southern interior  
PAC Region: P

#### **Y071045 Incremental silviculture of lodgepole pine and non-timber forest products (NTFPs)**

*How can incremental silviculture treatments in lodgepole pine stands be designed to optimize wood fibre and NTFP benefits?*

Thinning and fertilization are tools that could dramatically alter stand structure and the rate and direction of ecological succession. Hence, diversification of thinning prescriptions could have profound implications for wood fibre and NTFPs (berry crops, medicinal plants, herbs, and mushrooms). This project determines the influence of a range of stand densities and repeated fertilization on incidence and utility of NTFPs in the understorey vegetation in relation to stand productivity, and compares NTFPs in these young intensively managed stands with mature and old-growth stands.

**Thomas P. Sullivan**  
**University of British Columbia**

Initiated: 06/07  
Duration: 1 year  
06/07: \$31,500  
Total: \$31,500  
Location: Summerland, Kelowna, Cariboo  
PAC Region: SI

#### **Y071163 Chanterelle mushroom habitat modeling and inventory**

*What are the most productive sites for chanterelles, and how can their potential be realized?*

This project will produce a chanterelle habitat supply model for coastal forest ecosystems needed for valuing the resource and incorporating chanterelle production into sustainable forest management plans. The project will provide guidelines for co-management of timber and chanterelles and examine long-term chanterelle habitat supply issues under varying forest management regimes. Chanterelle productivity from commercially productive habitats will be monitored to determine the total potential economic value of chanterelle harvests and establish baseline indicators for evaluating forest practices designed to sustain or enhance stand-level chanterelle production. Silvicultural practices that optimize the production of timber and chanterelles will be identified.

**Tyson Ehlers**  
**Tysig Ecological Research**

Initiated: 06/07  
Duration: 3 years  
06/07: \$27,720  
Total: \$100,170  
Location: northern Vancouver Island  
PAC Region: C

## T 7.0 Climate change

### T 7.00 Unclassified

#### Forest health

<p><b>Y071030</b> <b>Determining forest health impacts of root disease, fuels, and fires for use by the CBM-CFS3 carbon accounting model</b></p> <p><i>How can carbon accounting models (such as the CBM-CFS3) be improved to incorporate effects of root disease, fuels, and fires?</i></p>	<p>In this project, PrognosisBC, in conjunction with the Western Root Disease Model or the Fire and Fuels Extension, will explore effects of root disease (including changes in growth curves and increases in mortality) in different stand types with different management options; and fire severity, emissions, and fuel consumption in different stand types with different fuel and stand management options. Results from these simulations will be transformed into new parameters and rules that can be used by the CBM-CFS3 so that it can scale this stand-level information up to the regional level. The CBM-CFS3 can then be used to evaluate the carbon impacts of differing assumptions about root disease levels, levels of other pathogens that may have a similar overall impact, and alternative fuel treatment strategies.</p>	<p><b>David Spittlehouse</b> <b>Ministry of Forests and Range</b></p> <p>Initiated: 06/07 Duration: 1 year 06/07: \$15,750 Total: \$15,750 Location: southern and northern interior PAC Region: SI; NI</p>
<i>No priority assigned</i>		
<p><b>Y062149</b> <b>Spatial climate data and assessment of climate change impacts on forest ecosystems</b></p> <p><i>What is the expected response of species and ecosystems in BC to climate change?</i></p>	<p>Weather and climate are major drivers of ecosystem functioning and distribution, and we need to be able to assess the influence of climate variability and future climate change on forest ecosystems. This project will produce a spatially high-resolution data set of climate variables for BC under present and future climate scenarios, use these data to describe current ecosystem units in BC, and assess the response of species and ecosystems to climate change. A major outcome of this project will be a program for obtaining point climate data and derived variables under current and future climates.</p>	<p><b>David Spittlehouse</b> <b>Ministry of Forests and Range</b></p> <p>Initiated: 04/05 Duration: 2 years 06/07: \$0 Total: \$47,234 Location: province-wide PAC Region: P</p>
<p><b>Y073026</b> <b>Effects of climate change on avian communities and implications for sustainable forest management</b></p> <p><i>What will be the impacts of future climate conditions on bird communities in BC's boreal forests?</i></p>	<p>Bird species are being considered as sustainability indicators in forest monitoring programs, however certain indicators may collapse if interspecific interactions are altered by a changing climate. This study aims to identify climate-change impacts on bird communities in BC. Using a hindcasting approach with historical bird data, broad relationships between climate and birds in BC's boreal forest will be identified, and used to quantify historical climate effects on birds. Projections will be made on likely scenarios of future climate conditions.</p>	<p><b>Ann Chan-McLeod</b> <b>University of British Columbia</b></p> <p>Initiated: 04/05 Duration: 3 years 06/07: \$42,000 Total: \$126,404 Location: boreal forest PAC Region: NI</p>

## T 8.0 Forest harvesting and engineering studies on salvaging MPB-killed timber

### T 8.00 Unclassified

*Forest engineering studies relating to designing efficient, cost-effective, and environmentally appropriate methods of harvesting and hauling MPB-killed timber*

<p><b>M065003 Maximizing log truck efficiency when transporting logs from mountain pine beetle killed stands</b></p> <p><i>Are logging trucks loaded with MPB salvage carrying less than optimal weight?</i></p>	<p>Previous studies in the Quesnel TSA indicate that short-axle logging trucks are unable to reach their maximum load when hauling dry MPB-killed wood, which leads to high hauling costs. This project will collect detailed loaded vehicle weights and load measurements for trucks coming into Quesnel mills. These data can be used to estimate the additional load carrying volume required in cases where trucks are unable to reach their maximum weight.</p>	<p><b>Rob Jokai</b> Forest Engineering Research Institute of Canada</p> <p>Initiated: 05/06 Duration: 1 year 06/07: \$0 Total: \$50,853 Location: Quesnel TSA PAC Region: SI</p>
<p><b>M065005 Monitoring soil disturbance on MPB-harvested areas</b></p> <p><i>Is salvage logging causing soil degradation?</i></p>	<p>There is concern that the accelerated timber harvest in the MPB epidemic area could compromise long-term forest productivity if soils are unduly disturbed. This project will assess soil disturbance using ground- and air-based methods developed as part of the FRPA Resource Evaluation Program. The overall goals are to assess the extent of soil disturbance on MPB-harvested cutblocks and to determine whether MPB harvesting is causing detrimental soil disturbance.</p>	<p><b>Shannon Berch</b> Ministry of Forests and Range</p> <p>Initiated: 05/06 Duration: 1 year 06/07: \$0 Total: \$25,993 Location: central interior PAC Region: SI; NI</p>
<p><b>M075019 Evaluating forest road construction techniques to improve access to stands affected by mountain pine beetle</b></p> <p><i>How can road construction methods be made more efficient and timely for access development in stands affected by mountain pine beetle?</i></p>	<p>Given the pressing nature of the MPB infestation, forest managers must build roads to allow for immediate use by crews and equipment, which has proved challenging. This project deals with issues faced by managers when accessing MPB-infested stands including maximizing efficiency, organizing equipment throughout the operation, and deciding what type of equipment to use at various road construction stages.</p>	<p><b>Doug Bennett</b> Forest Engineering Research Institute of Canada</p> <p>Initiated: 06/07 Duration: 2 years 06/07: \$38,010 Total: \$76,020 Location: extent of MPB infestation PAC Region: SI; NI</p>
<p><b>M075032 Developing new techniques, systems, and equipment for harvesting post mountain pine beetle stands</b></p> <p><i>How can harvesting and milling be optimized for processing MPB-killed timber?</i></p>	<p>The current shift in harvesting, from green stems to large areas of dead and dying MPB-infested trees, requires changes in harvesting systems and techniques. This project will examine some of these changes and compare this information to data collected on the productivity of harvesting operations. Based on this work operational scenarios can be modeled using the INTERFACE software tool to examine existing and potential systems and compare their productivity and results.</p>	<p><b>Tony Sauder</b> Forest Engineering Research Institute of Canada</p> <p>Initiated: 06/07 Duration: 2 years 06/07: \$102,596 Total: \$205,966 Location: extent of MPB infestation PAC Region: SI; NI</p>

*Studies to quantify the rates and amount of deterioration of MPB-killed timber, and to mitigate potential losses*

**M075016 Mountain pine beetle red attack shelf life discriminations**

*Can multispectral imagery be used to detect various stages of MPB attack?*

The ability to discriminate trees recently killed by MPB across large portions of the landscape has important implications for determining shelf life of dead timber. This study will collect multispectral aerial photography from infected stands, and analyze it using previously developed procedures for reliable discrimination of newly attacked trees. These mapped mortality discriminations will assist with harvest planning and scheduling and will have implications for decisions involving timber yield and cost-effective recovery of dead timber

**Arthur Roberts  
Simon Fraser University**

Initiated: 06/07  
Duration: 2 years  
06/07: \$72,450  
Total: \$144,900  
Location: W and SW of Prince George  
PAC Region: NI

**T Proponent**

T Proponent Unclassified

*No priority assigned*

**M065001 Regeneration and stand structure following mountain pine beetle infestation in the Sub-Boreal Spruce zone**

*What is the status of advanced regeneration in pine stands before MPB attack?*

This project will compile available information on the density of advanced regeneration and non-commercial trees under pre-harvest conditions in pure (>80%) lodgepole pine stands of the Nechako Plateau. This work will look at all lodgepole pine stands for which data can be assembled, not just those standing today or suffering from mountain pine beetle attack.

**Kirsteen Laing  
Bulkley Valley Centre for  
Natural Resources Research  
and Management**

Initiated: 05/06  
Duration: 1 year  
06/07: \$0  
Total: \$13,999  
Location: Nechako Plateau  
PAC Region: NI

**Y061034 Synthesis and extension of research on the nutritional sustainability of variable retention harvesting**

*How does VR harvesting affect ecosystem processes and nutrient status?*

While many field trials of variable retention (VR) harvesting have been conducted throughout BC, we need a better understanding of the common trends and important differences between VR treatments in a range of ecosystems across BC. This study examines and synthesizes information on how VR impacts nitrogen cycling and ecosystem processes.

**Cindy Prescott  
University of British Columbia**

Initiated: 05/06  
Duration: 1 year  
06/07: \$0  
Total: \$29,400  
Location: province-wide  
PAC Region: P

<b>Y061065</b>	<b>Critical information for policy development and management of non-timber forest products in British Columbia: baseline studies on economic value and compatible management</b>	<b>Darcy A. Mitchell Royal Roads University</b>
<i>How can timber and NTFP be managed for optimum value?</i>	Little is known about the non-timber forest products (NTFPs) sector, especially how its economic value can be increased through compatible management strategies that benefit both timber and non-timber species. The objective of this study is to compile and synthesize economic data and management data related to NTFPs and timber. The primary outcome will be to extend the results of this synthesis to the forestry sector to stimulate thought on how to increase total forest value by enhancing both tree growth and NTFPs.	Initiated: 05/06 Duration: 1 year 06/07: \$0 Total: \$64,732 Location: province-wide PAC Region: P
<b>Y071270</b>	<b>Predicting the responses of interior Douglas-fir to climate change in BC</b>	<b>Scott Green University of Northern British Columbia</b>
<i>How does growth of Douglas-fir respond to climatic conditions across its wide range of adaptability?</i>	The predicted responses of local tree populations to climate change may point to the need for significant changes in management practices and objectives. The study proposed here will address critical knowledge gaps in forest climate-change responses by comparing the growth patterns of mature populations of interior Douglas-fir to site-specific climate variation across its climatic range in the southern interior and central interior of British Columbia.	Initiated: 06/07 Duration: 2 years 06/07: \$21,315 Total: \$38,430 Location: range of Douglas-fir PAC Region: SI; NI
<b>Y072107</b>	<b>Predicting the growth responses to climate change among co-occurring, major tree species in BC</b>	<b>Scott Green University of Northern British Columbia</b>
<i>How will regenerating forests respond to climate change?</i>	There is considerable uncertainty about how regeneration and growth from both improved and wild seedlots may respond to future climate change in BC. This study will examine tree growth responses to climate change by sampling mature populations of major co-occurring, ecologically distinct tree species across a climate gradient (i.e., elevation). Preliminary data suggest that pine may increase in abundance and productivity at mid- to higher-elevation sites where subalpine fir currently dominates (ESSF zones).	Initiated: 05/06 Duration: 2 years 06/07: \$14,700 Total: \$33,785 Location: central interior PAC Region: SI
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T Unclassified		
<i>No priority assigned</i>		
<b>Y051078</b>	<b>Load sharing between log stringers in gravel-decked log bridges</b>	<b>C. Kevin Lyons University of British Columbia</b>
<i>What are the load-bearing characteristics of gravel-decked log stringer bridges?</i>	As forestry operations move into smaller second-growth timber, load sharing between the individual logs of gravel-decked log stringer bridges becomes an important consideration. This study uses an existing dataset to examine the trade-off between increased dead load and increased load-sharing for thicker gravel decks on log bridges.	Initiated: 04/05 Duration: 1 year 06/07: \$0 Total: \$21,085 Location: province-wide PAC Region: P

<b>Y051178</b>	<b>Extension of results: in-woods chipping of trembling aspen (<i>Populus tremuloides</i> Michx.)</b>	<b>Timothy Conlin Forested Ecosystems Research</b>
<i>How does in-woods chipping of aspen residues affect regeneration and growth?</i>	This project is an extension of an FRBC project to study the impact of in-woods chipping of aspen stands for pulp chips on the subsequent regeneration and growth of aspen cutblocks in northeastern BC. Specifically, the current project will publish updated results from the original FRBC project, based on subsequent data collection and analysis.	Initiated: 04/05 Duration: 1 <i>year</i> 06/07: \$0 Total: \$1,838 Location: northeastern BC PAC Region: NI
<b>Y051225</b>	<b>Susceptibility of weevil-resistant spruce to damage by other insect pests</b>	<b>René Alfaro Natural Resources Canada</b>
<i>Do weevil-resistant spruce stocks have increased susceptibility to other pests and pathogens?</i>	To protect the investment made in identifying and propagating weevil-resistant spruce, and to effectively use these genotypes in reforestation programs, it is necessary to determine the susceptibility of weevil-resistant spruce to incidence of damage by other insect pests. This study surveys weevil-resistant stock for damage by other insect pests to provide guidelines for the selection of weevil-resistant material for inclusion in breeding programs and seed orchards.	Initiated: 04/05 Duration: 1 <i>year</i> 06/07: \$0 Total: \$32,550 Location: Vancouver Island, southern interior, and Prince George PAC Region: P
<b>Y051244</b>	<b>Modelling of subalpine fir trees using industrial CT imaging and simulated X-ray scanning</b>	<b>Sencer Alkan Forintek Canada Corp.</b>
<i>How can the new surface-volume integrated tree stem model, CTSTEM, be applied to subalpine fir?</i>	A 3D representation of tree stems has applications for both research purposes and for ensuring optimal utilization of the raw material in a sawmill. This report describes the design and implementation of a new surface-volume integrated tree stem model, CTSTEM, for measuring and visualization of 3D properties of subalpine fir stems from X-ray images. While the results of CTSTEM are currently not intended to be part of industrial applications, it is a demonstration research tool that can illustrate potential benefits of modeling and simulation, based on CT scan data.	Initiated: 04/05 Duration: 1 <i>year</i> 06/07: \$0 Total: \$45,584 Location: province-wide PAC Region: P
<b>Y073110</b>	<b>Evaluating the protocol for quantifying the effect of pollen contamination on the genetic worth of conifer seed orchards</b>	<b>Dr. John (Joe) E. Webber ProSeed Consulting</b>
<i>What is the accuracy of current pollen monitoring techniques, and what are the levels of contamination experienced in current seed orchard practices?</i>	Contaminated pollen in seed orchards has a negative effect on both the orchard's estimate of the improved trait and the adaptive potential of seed orchard progeny. This project assesses the accuracy of current pollen monitoring techniques by examining how pollen is trapped and expressed as a pollen density cloud, as well as confirming levels of contamination using DNA paternity analyzes. The results of this research will improve estimates of a seedlot's genetic worth.	Initiated: 04/05 Duration: 3 <i>years</i> 06/07: \$30,000 Total: \$89,484 Location: southern Vancouver Island, and Rover Creek near Nelson PAC Region: C; SI

<p><b>Y073183 Identification and propagation of novel value-added hardwood varieties</b></p> <p><i>How can special characteristics of hardwoods, such as figured patterns, be propagated?</i></p>	<p>Trees with figured wood varieties are rare and can fetch up to 100 times more than corresponding non-figured wood. This project will identify novel and valuable hardwood varieties for the BC plantation industry and apply micro-propagation technology on known hardwood lines that are difficult to propagate by traditional methods. This work may provide an entirely new and unique market for BC forestry, and a welcome diversification in face of increasing competition from countries such as Brazil and New Zealand.</p>	<p><b>Jim Mattsson</b> <b>Simon Fraser University</b></p> <p>Initiated: 04/05 Duration: 3 years 06/07: \$35,000 Total: \$101,832 Location: province-wide PAC Region: P</p>
<p><b>Y073290 Modelling the impact of stand management regimes on the wood characteristics of lodgepole pine</b></p> <p><i>How are specific wood characteristics and tree knot populations for lodgepole pine affected by management practices?</i></p>	<p>The overall objective of this project is to improve knowledge-based science to support improving timber growth and value. Specifically, the project uses field data to improve the ability of the TASS timber growth model to predict specific wood characteristics and tree knot populations for lodgepole pine. The results are used to recommend appropriate management regimes to enhance stand values.</p>	<p><b>Jim Goudie</b> <b>Ministry of Forests and Range</b></p> <p>Initiated: 04/05 Duration: 3 years 06/07: \$121,000 Total: \$434,651 Location: central interior PAC Region: SI</p>
<p><b>Y073364 Comandra rust screening in Bulkley Valley lodgepole pine</b></p> <p><i>Is there genetic variation in lodgepole pine orchard parents for resistance to comandra rust?</i></p>	<p>There is evidence of genetic variation in lodgepole pine for resistance to comandra rust. This project will rank orchard parents so that custom seedlots with high rust resistance can be produced for deployment on high-risk sites.</p>	<p><b>Jeff Gillanders</b> <b>Babine Forest Products</b></p> <p>Initiated: 04/05 Duration: 2 years 06/07: \$9,975 Total: \$40,500 Location: Bulkley Valley PAC Region: NI</p>