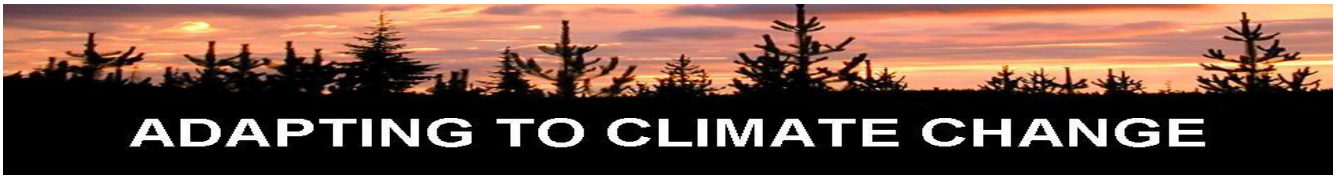

Future Forest Ecosystems Scientific Council
2009-10 Year End Report

I INTRODUCTION

The B.C. Ministry of Forests and Range (MFR)[1] established the Future Forest Ecosystems Scientific Council (FFESC) in March 2008 to guide the allocation of a $5.5 million grant-in-aid to research that supports the objectives of the Future Forest Ecosystems Initiative (FFEI).

FFEI was established by the MFR's Chief Forester in 2006 to start the process of adapting B.C.'s forest and range management framework[2] to a changing climate. The objectives of FFEI are:

- to increase our understanding of ecological changes associated with climate change, and consequent risks to ecosystem services and products (through research, modeling, monitoring, and impact and vulnerability assessments); and,
- to use that knowledge to adapt the forest and range management framework to changing ecological conditions (through policy analysis and adaptation).

The FFESC is a cooperative council comprising representatives of the MFR, the University of British Columbia (UBC), and the University of Northern British Columbia (UNBC).

For more information on the FFESC's mandate, refer to the *FFESC Terms of Reference and Charter* on the FFESC web site: (http://www.for.gov.bc.ca/hts/future_forests/council/index.htm).

II FFESC MEMBERSHIP

Members of the FFESC and the FFESC secretariat during 2009-10 are identified in the following tables.

Council

Affiliation	Role	Member	Title
MFR	Chair	Jim Snetsinger	Chief Forester
	A/Chair	Gerry Still	Director, Research Branch (*April to November 2009*)
	A/Chair	Winn Hays-Byl	A/Director, Research Branch (*December 2009 to March 2010*)
	Member	Evelyn Hamilton	Manager, Ecology and Earth Sciences, Research Branch
	Member	Tom Niemann	Manager, Climate Change & Forest Carbon, Forest Practices Branch
UBC	Member	Dr. Jack Saddler	Dean of Forestry
	Member	Dr. Cindy Prescott	Associate Dean of Forestry
UNBC	Member	Dr. William McGill	Dean of College of Science and Management
	Member	Dr. Kathy Lewis	Chair, Ecosystem Science and Management Program

[1] The MFR became the Ministry of Forests, Mines and Lands on October 25, 2010; however, for the purposes of this report (which reflects activities that took place between April 1, 2009 and March 31, 2010), references to the ministry will remain MFR.

[2] The forest and range management framework includes legislation, policies, procedures and systems under the MFR's jurisdiction that support: biogeoclimatic classification; timber supply planning; and, management and conservation of ecosystem services, biodiversity, wildlife, fish, riparian, water, soil, terrain, tree species and genes, forage and rangeland plant communities, biotic and abiotic agents, exotic and invasive species, and fire. The framework applies to lands subject to the *Forest Act* and the *Range Act* (primarily provincial forests and Crown range).

Secretariat

Affiliation	Role	FFESC Secretariat
MFR	FFESC Secretary	Kristine Weese
UBC	Financial Administrator	Wendy Johnston
	Research Administrator	Suzi Malan
UNBC	Research Coordinator	Sybille Haeussler

IV 2009-10 ACCOMPLISHMENTS

During 2009-10, the FFESC completed a competitive process to solicit, select, and allocate funds to research projects that support FFESC objectives. This included a call for expressions of interest (EOIs), a collaborative planning workshop with successful EOI proponents, an invitation to submit letters of intent (LOIs), and an invitation to successful LOI proponents to submit full proposals. By mid December 2009, the FFESC had approved and allocated funds to 16 research projects through this competitive process.

In 2009-10, the FFESC also allocated funds to four MFR-led FFEI research projects in lieu of the MFR's in-kind administrative support to the FFESC.

In fall 2009, the FFESC research coordinator began efforts to encourage information sharing and collaboration among FFESC-funded project teams. In September 2009, a conference call with project leaders was held and, in early 2010, an FFESC sharepoint site was established to enable postings of project plans, methodologies, newsletters and events, and to enable discussion among research teams.

And, lastly, by the end of March 2010, three FFESC-funded research projects started in 2008 were completed.

The FFESC's accomplishments for 2009-10 are outlined below, with reference to links on the FFESC web site (http://www.for.gov.bc.ca/hts/future_forests/council/index.htm) for more information.

1. Competitive process to select research projects

The FFESC's competitive process for soliciting and selecting research projects was guided by the *2009 Program Overview: Interdisciplinary Climate Change Adaptation Research*, which is posted to the FFESC web site, at: http://www.for.gov.bc.ca/ftp/hts/external/!publish/web/ffesc/FFESC_2009ProgramOverview.pdf.

a) Expressions of interest

In March 2009, the FFESC issued a 'call for expressions of interest (EOIs)' from research teams to undertake interdisciplinary research projects that support adaptation of the forest and range management framework to climate change. 168 EOIs were received by the mid-April deadline.

The EOIs represented project teams comprising 556 individuals from the B.C. government, universities, the consulting community, federal agencies, non-government organizations, local governments, First Nations, industry, and individuals from outside British Columbia.

The EOIs were evaluated against four criteria: consistency of the research topic with FFESC objectives and research scope; capacity of the research team to carry out the work; inter-disciplinary composition of the team (favouring projects that incorporate both natural and social sciences); and, willingness of the team to engage decision-makers and communities as part of the research project.

95 EOIs passed the evaluation test and were invited to submit letters of intent (LOIs).

b) Collaborative planning workshop

Project leaders from the 95 EOIs selected to advance to the LOI stage were invited to a collaborative planning workshop that took place April 29, 2009 in Richmond, B.C. Participants at the workshop also included FFESC representatives and policy/practice specialists in selected climate change adaptation disciplines and topics. In total, 107 individuals participated in the workshop.

The intent of the workshop was to facilitate information sharing, collaboration, and the development of well-integrated LOI proposals from the successful EOI project teams.

The workshop included:

- overviews of the Future Forest Ecosystems Initiative (FFEI), the purpose and objectives of the FFESC, results of a FFESC climate change adaptation research gap analysis, and the EOI process and outcomes;
- group discussions of the benefits and challenges of interdisciplinary research/teamwork and client-based research, as well as practices/techniques to overcome those challenges;
- group discussions of climate change adaptation issues associated with 12 themes: range; forest health, fire, tree species; forest estate planning; timber supply analysis; watershed stewardship; community forests; strategic policy; socio-economic analysis; vulnerability assessment; and, inventory and monitoring; and,
- an overview of the LOI and full proposal process, and questions and answers related to that process.

c) Letters of intent

The FFESC received 69 letters of intent (LOIs) by the June 1, 2009 deadline. The majority proposed high-quality, integrated, client-oriented research projects.

Of the 69 LOIs received, the FFESC selected 16 to advance to the full proposal stage. These LOIs ranked the highest in meeting the evaluation criteria (relevance of the research topic, technical/scientific merit, expected benefits, and value for money), and met the FFESC's objective to achieve a balance among research topics, geographic areas, and scope.

d) Full proposals

In September 2009, the FFESC received full proposals from the 16 successful LOI project teams, and facilitated two to three external peer reviews of each proposal. Based on the peer reviews and FFESC reviews, the FFESC approved most of the proposals as submitted, but requested revisions to several proposals to ensure they fully met the objectives of the FFESC research program before they were approved. Evaluation criteria at this stage focused primarily on technical/scientific merit and value for money.

By December 31, 2009, all 16 proposals had been approved with funds allocated to the project teams.

2. Projects approved through competitive process

The 16 research projects approved through the FFESC's competitive process include four provincial-scope projects and 12 regional projects, with a total research budget of $4,135,652.

The provincial-scope projects include:

- design of a decision support model that identifies adaptation strategies in response to shifting natural disturbance regimes (wildfire, insects, drought, extreme weather);

- completion of a watershed sciences compendium that captures over 30 years of B.C. watershed research and addresses how climate change will affect watershed processes;
- development of high resolution spatial climate data for climate change research; and,
- development of a stand-level climate change risk assessment and decision support tool to enable forest investments that minimize tree mortality.

The 12 regional-scope projects include comprehensive assessments of the implications of climate change for the geographic areas being assessed (including impact and vulnerability assessments) as well as development of adaptation strategies to assist communities and the MFR in adapting local and provincial forest and range management approaches. Geographic regions covered by these projects include Northwest B.C., Central Interior, Southern Interior, Kootenay, and Vancouver Island.

The results of all 16 research projects will be used to inform adaptation of provincial forest and range management legislation, policies, procedures and systems.

The following table identifies the titles of the 16 approved projects, the project leads, and the funding allocated to each project.

#	Project Title	Project Lead	Budget
1	Reducing vulnerabilities and promoting resilience of B.C.'s natural and human systems through adaptation of post-disturbance land management options	Alan Wiensczyk, FORREX	339 150
2	Climate change adaptation plan for Northwest Skeena communities	Dirk Brinkman, Coast Tsimshian Resources LLP	381 920
3	Integrating climate change adaptation strategies with sustainability and socioeconomic objectives for the Quesnel timber supply area	Ann Chan-McLeod, UBC	183 668
4	Climate change vulnerability of old-growth forests in B.C.'s inland temperate rainforest	Darwyn Coxson, UNBC	357 000
5	Risk analysis and decision support tool	Craig Delong, MFR	183 225
6	Using red alder as an adaptation strategy to reduce environmental, social and economic risks of climate change in coastal B.C.	Louise deMontigny, MFR	319 884
7	Managing for the ecological and socioeconomic effects of climate change on B.C. rangelands	Lauchlan Fraser, TRU	413 700
8	Resilience and climate change: adaptation potential for management and ecological systems in the West Kootenays	Rachel Holt, Consultant	206 000
9	Climate change adaptation research for forest and rangeland ecosystems: resiliency implications at the landscape level	John Innes, UBC	346 693
10	Uncertainty in adaptation to climate change in forest management: selected case studies in British Columbia	Emina Krcmar, UBC	127 710
11	A multi-scale trans-disciplinary vulnerability assessment	Don Morgan, Bulkley Valley Research Centre	120 225
12	Validating impacts, exploring vulnerabilities, and developing robust adaptive strategies under the Kamloops Future Forest Strategy	Harry Nelson, UBC	700 000
13	Comprehensive synthesis of forested watershed science and climate change impacts	Todd Redding, FORREX	76 125
14	High resolution spatial climate data for climate change research in B.C.	Dave Spittlehouse, MFR	160 650
15	Integrating FFEI scientific predictions into community planning and governance	Tracy Summerville, UNBC	98 952
16	The effects of climate and forest cover change on snowmelt-dominated water supplies in the Okanagan	Rita Winkler, MFR	120 750
			4 135 652

These 16 projects will be completed over two years (December 2009 to December 2011). Year-one progress reports and final reports on these projects will be posted to the FFESC web site.

For details on these projects, refer to the *Summary of FFESC Climate Change Adaptation Research Projects* on the FFESC web site: http://www.for.gov.bc.ca/hts/future_forests/council/index.htm.

3. Funding of MFR-led FFEI research projects

In fall 2009, the FFESC agreed to fund four MFR-led FFEI projects, totalling $160,000, to compensate for the MFR's in-kind administrative support to the FFESC.

#	Project title	Project lead	Budget
1	BEC modelling to support regional vulnerability assessments and assisted migration	Will Mackenzie, Chuck Bulmer, MFR	$60 000
2	Climate-based seed transfer modelling	Greg O'Neill, MFR	$10 000
3	FFEI climate change monitoring strategy (Phase 3)	Peter Bradford, MFR	$50 000
4	Provincial vulnerability assessment (Phase 2)	Don Morgan, MFR	$40 000
	TOTAL		**$160 000**

For details on these projects, refer to the *Summary of FFESC Climate Change Adaptation Research Projects* on the FFESC web site: http://www.for.gov.bc.ca/hts/future_forests/council/index.htm.

4. Research coordination

In early fall 2009, the FFESC research coordinator initiated efforts to coordinate project approaches and methodologies, and to encourage information-sharing and collaboration among FFESC-funded project teams. The FFESC views these efforts as important to maximize the value and utility of FFESC research outcomes.

In September 2009, an introductory conference call among project leaders was held to:

- give project leaders an overview of all 16 project proposals;
- discuss the information needs of project teams related to climate change scenarios;
- share information on other climate change adaptation research completed and underway; and,
- discuss opportunities for ongoing information sharing and collaboration among the project teams.

One of the key opportunities for ongoing information sharing and collaboration advocated by the project leaders was a central repository for project teams to post project plans, methodologies and data sets, project schedules, progress newsletters, and other types of sharable information. To fulfill this need, the research coordinator established an FFESC sharepoint site, accessible to all FFESC researchers, in January 2010.

The FFESC will continue to encourage information sharing and collaboration among FFESC research teams, and to share new climate change adaptation information with researchers, until the FFESC's term ends in March 2012.

5. Completion of three direct-award research projects

Three FFESC-funded direct-award research projects started in 2008 were completed in 2009-10:

- Potential impacts of climate change on the distribution of ecosystems and tree species in B.C.;
- Regeneration vulnerability assessment for dominant tree species throughout the central interior of B.C.; and,
- A study of tree species vulnerability and adaptation to climate change.

These projects are summarized below, with links to final reports included.

1) Impacts of climate change on the distribution of ecosystems and tree species

Project title	Potential impacts of climate change on the distribution of ecosystems and tree species in British Columbia
Lead Researchers	Sally Aitken and Tongli Wang, Centre for Forest Conservation Genetics, Dept. of Forest Sciences, UBC
Project term	Two years
Grant	2008-09: $40 000; 2009-10: $40 000; total $80 000
Purpose	To better quantify the potential impacts of climate change on the distribution of the climate niches of ecosystems and tree species in B.C. using a modelling approach based on the Random Forest classification algorithm
Project outcomes	Using Random Forest, the project team developed a model to predict climate envelopes matching mapped BEC zones with 84% precision (mismatches were primarily associated with high elevation ecosystems). Shifts, expansion or contraction of climate envelopes of the BEC zones were predicted for scenarios representing minimal, moderate and high levels of climate change for three future periods (2020s, 2050s, and 2080s). Predicted changes were found to be dramatic: BEC zones at higher elevations and in northern B.C. will shrink by up to 90% in area by the 2050s; in contrast, some BEC zones in southern B.C. will expand by 30 to 300% in the same period. These predictions will guide interim policy adjustments and generate hypotheses about climate impacts that can be further tested with well-designed field experiments. Over the long term, these research results and experimental testing of model projections can be used to adapt the forest management framework to climate change. Predictions of climate envelopes for major tree species ranges were conducted using two approaches: associating species occurrence frequencies in each BEC variant with shifts of climate envelopes; and, conducting ecological plot data-based modelling using Random Forest. A species distribution database was constructed that incorporates over 35,000 sample plots across B.C. and the western United States, and Random Forest models were built for several species including Douglas-fir, ponderosa pine, and whitebark pine. However, the team identified and corrected errors in the plot data, requiring about 5000 plots to be discarded from the dataset. A new approach to constructing the dataset was tested but made predictions more tedious to complete. The team presented a proposal to continue this research work in 2010-11 to the Forest Genetics Council of B.C.
For more information	The final report, *Biogeoclimatic zone shifts under climate change and implications of forecast uncertainty for forest management,* is currently under peer review and is expected to be published (and posted to the FFESC web site) in early 2011.

2. Regeneration vulnerability assessment for dominant tree species in central B.C.

Project title	Regeneration vulnerability assessment for dominant tree species throughout the central interior of British Columbia
Lead Researcher	Dr. Craig Nitschke, Bulkley Valley Research Centre
Project term	Two years
Grant	2008-09: $40 000; 2009-10: $40 000; total $80 000
Purpose	To understand the response of dominant tree species within their regeneration phase in B.C.'s central interior ecosystems to predicted climate change

Project outcomes	The project team assessed the vulnerability and risk of dominant tree species in the central interior ecosystems in B.C. to climate change using the TACA model. Assessment results showed mixed risk response both between species and ecosystems and between site types. Lodgepole pine, black spruce and trembling aspen were found to be quite resistant to climate change across all sites they typically occur in with the exception of the southernmost IDF ecosystems. Interior spruce and paper birch were found to exhibit vulnerability on dry sites but resistance on mesic and moist sites, while sub-alpine fir and black cottonwood exhibited resistance on moist sites throughout the region except in the southernmost ecosystems. The majority of species responded to modelled climate change favourably in the ESSF, BWBS, and wet and cool SBS ecosystems with the exception of interior spruce, which was modelled to be at the highest risk to climate change. Species were affected in the ICH ecosystems due to a decline in winter chilling but establishment coefficients remained sufficiently high. The mesic to moist sites within the majority of the region's ecosystems may offer managers the ability to continue management under a 'business as usual' scenario whereas new policies may be required to ensure that dry (xeric to submesic) sites are able to be reforested successfully under climate change, particularly in southernmost portions of the central interior. Further research is required to examine the interaction between changes in establishment potential with changes in species productivity, inter-species competition and disturbance agents.
For more information	Refer to final report, *Regeneration vulnerability assessment for dominant tree species in the central interior of British Columbia: final technical report,* on FFESC web site: http://www.for.gov.bc.ca/hts/future_forests/council/index.htm

3. Canadian trees species vulnerability and adaptation to climate change study

Project title	A study of tree species vulnerability and adaptation to climate change
Lead Researcher	Mark Johnston, Saskatchewan Research Council
Project term	Two years
Grant	2008-09: $157 143; 2009-10: $42 857; total $200 000
Purpose	To organize and summarize what is currently known about the vulnerability and adaptation potential of the primary commercial tree species in Canada
Project outcomes	This project culminated in a 40-page report (see link below) that discusses the major tree species in Canada and how climate change causes trees to become maladapted to their environment. Maladapted trees are more susceptible to insects and diseases, which become more active under climate change. The report also discusses climate trends and projections, assesses corresponding threats to tree species, and includes 23 management options to reduce the vulnerability of tree species to climate change. The management options cover reforestation, genetic diversity, species productivity, forest health, and adaptive capacity. The report concludes with 16 knowledge gaps that require research attention to address key uncertainties associated with tree species adaptation decision-making.
For more information	Refer to final report, *Vulnerability of Canada's Tree Species to Climate Change and Management Options for Adaptation: An Overview for Policy Makers and Practitioners,* on CCFM web site: http://www.ccfm.org/English/index.asp

VI FFESC BUDGET AND EXPENDITURES FOR 2009-10

Item	Allocation	Expenditures	Balance
One time budget allocation for FFESC	$5,500,000		
Expenditures in 2009-10			
Collaborative planning workshop – expenses; travel		-30 000	
Collaborative planning workshop – facilitation		-11 000	
Grant to Saskatchewan Research Council (Dr. Mark Johnston)		-$42,857	
Grant to Bulkley Valley Centre for Natural Resources Research and Management (NRRM) (Dr. Craig Nitschke)		-$40,000	
Grant to UBC (Dr. Sally Aitken)		-$40,000	
Grant to University of Lethbridge (Dr. Rita Winkler)		-$64,050	
Grant to Thompson Rivers University (Dr. Lauchlan Fraser)		-$222,600	
Grant to Coast Tsimishian Resources LLP (Mr. Dirk Brinkman)		-$190,960	
Grant to FORREX (Dr. Todd Redding)		-$68,250	
Grant to Bulkley Valley Centre for NRRM (Mr. Don Morgan)		-$60,375	
Grant to University of Victoria (Dr. Dave Spittlehouse)		-$91,350	
Grant to UNBC (Dr. Tracy Summerville)		-$49,476	
Grant to UNBC (Dr. Craig Delong)		-$67,200	
Grant to UNBC (Dr. Darwyn Coxson)		-$178,500	
Grant to Veridian Ecological Consulting Ltd. (Dr. Rachel Holt)		-$109,000	
Grant to FORREX (Ms. Chris Hollstead)		-$155,925	
Grant to Russell Klassen (Dr. Chuck Bulmer)		-$20,000	
Grant to John Innes and Associates (Ms. Alanya Smith)		-$50,000	
Grant to Bulkley Valley Centre for NRRM (Mr. Don Morgan)		-$40,000	
Grant to UBC (Dr. Bruce Larson)		-$159,935	
Grant to UBC (Dr. Harry Nelson)		-$369,470	
Grant to UBC (Dr. Emina Krcmar)		-$55,723	
Grant to UBC (Dr. Ann Chan-McLeod)		-$85,655	
Grant to UBC (Dr. John Innes)		-$83,926	
TOTAL	**$5,500,000**	**-$2,286,252**	
Minus expenditures in 2008-09		*-713 851*	
***Balance available at March 31, 2010**			$2,499,897

*The bulk of this balance will be allocated to already-approved FFESC research projects in January 2011 to support year two of their projects. Remaining funds will support direct-award research projects initiated in 2010-11 and FFESC administration costs up to March 31, 2012.

VII FFESC PLANS FOR 2010-11

In 2010-11, the FFESC plans to allocate the remainder of its discretionary funds ($250,000) to three research projects that support FFEI objectives:

1. An assessment of the implications of climate change on major forest insect disturbance agents in B.C. (Project leader, Allan Carroll, UBC) – $150,000;
2. An FFEI climate change monitoring strategy (Phase 4) (Project leader, John Innes, UBC) - $50,000; and,
3. An assessment of the implications of climate change on national sustainable forest management indicators (Project leader, Peter Duinker, Dalhousie University) - $50,000.

As well, in 2010-11, the primary focus of the FFESC will be coordination of ongoing FFESC research projects and communication on FFESC-funded research (project overviews, progress and outcomes) to a broad provincial, national and international audience. These efforts will help maximize the value and benefits of FFESC-funded

research projects so they engage and inform policy decision-makers and communities in the ongoing adaptation of forest and range management policies and practices at both local and provincial levels.

And lastly, in 2010-11, FFESC research coordinator, Sybille Haeussler, will complete and/or publish three research review reports:
(For publication in 2010-11)

1. *Climate Change Adaptation Research Needs for British Columbia Forest and Range Ecosystems: A Gap Analysis and Reassessment*; this report reflects work over the past two years to complete a preliminary gap analysis (2008-09) and assess how well the FFESC research program met knowledge gaps identified in the gap analysis (2009-10); the report will help the MFR and other research institutions establish future research priorities to inform adaptation of forest and range management to climate change;
2. A short non-technical summary of recent research trends in ecology related to the impacts of climate change; and,

(Draft reports expected in 2010-11)

3. An analysis of fundamental changes to the BEC system that could help it remain robust under a changing climate.

All FFESC-funded research projects will be completed by December 2011. The FFESC has set aside $40,000 to conduct a wrap-up project in early 2012 that will synthesize FFESC research outcomes and match them to appropriate legislation and policy. This project will ensure policy specialists and decision-makers responsible for the forest and range management framework are fully informed of FFESC research findings and their policy implications. The FFESC will end its term on March 31, 2012.

VIII FFESC Website

For more information on the Future Forest Ecosystems Scientific Council and its activities and reports, visit the FFESC web site at http://www.for.gov.bc.ca/hts/future_forests/council/index.htm.