

Climate Change Adaptation: **Transitioning to a Climate-Based (Forest Tree) Genetic Resource Conservation and Management System in British Columbia**

Climate-Based Seed Transfer (CBST)

Project Charter

July 2012

CBST: An action identified under the BC MFLNRO, Forest Stewardship Action Plan for Climate Change Adaptation (2012 - 2017)

Project Champion: Forest Genetics Council of British Columbia



Ministry of
Forests, Lands and
Natural Resource Operations

Climate Change Adaptation: Transitioning to a Climate-Based (Forest Tree) Genetic Resource Conservation and Management System in British Columbia

Over the next five to ten years, changes to British Columbia's forest tree genetic resource conservation and management system (GRM) will be adjusted to account for a changing climate.

These changes will support the Province's overarching components of GRM as described in the Forest Genetics Council of British Columbia (FGC) Strategic Plan (2009 -2014).¹ These components include *Conservation, Resilience* and *Value* of BC's forest genetic resources. Advancing climate-based seed transfer is a specific objective under the FGC strategic plan.

CBST is also an action identified under BC's Ministry of Forests, Lands and Natural Resource Operations, Forest Stewardship Action Plan for Climate Change Adaptation (2012-2017).²

The transition to a climate-based GRM system will unfold through the development of forest genetic and seed use science, policy and decision support tools; tree breeding and tree improvement programs, and genetic conservation strategies that support climate adaptation.

Changes will be managed through a phased approach to minimize impacts to GRM clients, stakeholders, First Nations and the broader GRM community. Projects to address GRM and climate change adaptation are expected to evolve over time as science and new information becomes available.

¹ See: [FGCStrategicPlan](#)

² BC MFLNRO Forest Stewardship Action Plan for Climate Change Adaptation; see, <http://www.for.gov.bc.ca/het/climate/index.htm>

Climate-Based Seed Transfer (CBST)

This project charter is specific to the **Climate-Based Seed Transfer (CBST) project**, a first step towards support for the transition to a climate-based Genetic Resource Conservation and Management (GRM) system.

The CBST project is comprised of four phases, with a target completion date of March 31, 2017:

Phase One **Science Foundation:** Phase 1 will evaluate a number of scientific methodologies, statistical and theoretical approaches and options for development of a science-based framework to support seed selection, transfer and deployment decisions aimed at managing forest tree genetic adaptation across BC's managed stands and landscapes under a changing climate. Phase 1 outputs will include recommendations and options for guiding and informing subsequent phases to transition from the current geographically-based seed transfer system to one that is climate-based.

Phase Two **Policy Development:** Phase 2 will develop the regulatory and policy framework required to implement CBST in forest regeneration, GRM and seed use decisions, including, where appropriate, the development of legislation, regulations (incl. Chief Forester Standards for Seed Use) and policy guidance. Elements such as compliance and enforcement monitoring, administrative guidance, effectiveness evaluation and monitoring, and professional reliance will also be examined within the proposed CBST policy framework. A cost/benefit, impact and risk assessment (e.g. tree improvement, seed use/seed inventories) and consultation process will also be undertaken as part of this phase.

Phase Three **Implementation:** Phase 3 will develop the decision support framework to support the development of strategies and plans for CBST implementation. A range of options to suit the needs of BC's GRM/Seed use clients will be explored, including consideration of both incremental (e.g. species or regionally-based pilots) and transformative approaches. Transition planning will be critical to the success of CBST implementation, with particular attention given to mitigating risks to tree improvement, orchard, seed and silviculture investments. Phase 3 outputs will also include the development of corporate information management systems, GIS-based toolsets, map products and spatial/aspatial data sets.

Phase Four **Monitoring and Revision:** Phase 4 will develop indicators, measures and protocols for monitoring effectiveness, outcomes and performance (accomplishments) to inform the development of new and/or revised actions for continuous improvement and/or adaptive management.

Climate-Based Seed Transfer

Project Name:
Climate-Based Seed Transfer

Date: July, 2012

Project Description:

In British Columbia, science-based seed transfer, enabled through forest genetic science and seed use policies and practices, is the foundation for the effective reforestation and genetic adaptation of stock planted as part of BC's sustainable forest management system. Seed transfer, a tool currently in use for managing regenerated forest stand and landscape level genetic diversity and adaptation, is ideally positioned to become an effective adaptation management option under a changing climate.

The aim of this forest stewardship climate change adaptation initiative and project is to transition British Columbia's genetic resource management (GRM) seed transfer system from a geographically-based science, policy and decision support framework to one that is climate based. In the interim, steps to support this transition over the next five to ten years are underway as part of BC's Forest Stewardship Action Plan for Climate Change Adaptation (2012-2017).³

The Climate-Based Seed Transfer project (CBST)⁴ is comprised of four phases: 1) **Science Foundation**, including data, methodologies and the underlying statistical and analytical framework; 2) **Policy Development**, including legislation, regulation, standards and policy guidance; consultation, risk and impact assessment; 3) **Implementation**, including, business analysis, transition planning, information management, decision support; extension and training; and communications; and 4) **Monitoring and Revision**, including performance measures, continuous improvement and adaptive management.

Decision support, extension and training, and communications are integral to the success of all four phases. Review and consultation will occur at each phase of the project. Periodic communications will inform project members, clients and stakeholders.

³ <http://www.for.gov.bc.ca/het/climate/index.htm>

⁴ CBST – includes selection, transfer and deployment data, methods, policy, decision support, results and strategies

BACKGROUND

Forest Stewardship Climate Change Adaptation

British Columbia's, **Climate Change Adaptation Strategy**⁵ as articulated by the Climate Action Secretariat envisions that "British Columbia is prepared for and resilient to the impacts of climate change. Towards this aim, the Ministry of Forests, Lands and Natural Resource Operations has recently developed an action plan (*MFLNRO Climate Change Adaptation: Forest Stewardship Action Plan (2012- 2017)*)⁶ to move forward on adapting our forest policies and practices for a changing climate.

Key actions for the ministry's '**Forest Stewardship Action Plan for Climate Change Adaptation**' fall under one of the following three goals:

Goal One – Foster Resilient Forests;

Goal Two – Maintain Future Options and Benefits; and

Goal Three – Build Adaptive Capacity.

Climate-Based Seed Transfer

Climate-Based Seed Transfer (CBST) is a key action identified under Goal One, Objective 1.1: Anticipate and manage for a changing climate. The primary goal of the CBST climate change adaptation project is to help BC's forest managers, stewards and practitioners adapt its genetic resource management (GRM) and seed use practices to achieve 'genetically adapted forests and landscapes to a changing climate. CBST project outcomes will transition BC from a geographically-based seed selection, transfer and deployment system to one that is climate-based. While key actions associated with CBST follow a three to five year timeframe, it is anticipated that full implementation of the CBST will roll out over the next five to ten years.

What is seed transfer?

A key goal of sustainable forest management in BC is the reforestation of forest stands and landscapes that are productive, healthy and resilient. Forest management objectives that support this goal require the establishment of plantations that can yield their optimum potential for forest productivity and growth, while still maintaining their genetic capacity to evolve and adapt to changing conditions and the environmental limits set by climate, weather and soil. To achieve this objective, we must ensure a 'match' of planting stock with environments where the trees will thrive, be well adapted, and able to respond to periodic and catastrophic abiotic and biotic disturbance events such as drought, wildfire, pests and disease infestations. Seed transfer standards⁷ are one tool that facilitates reaching this goal. Seed transfer is defined as the movement of seed beyond that which occurs naturally (i.e. from its point of origin to the location in which it is planted). The 'seed

⁵ Link for document see: http://www.livesmartbc.ca/attachments/Adaptation_Strategy.pdf

⁶ For links to the summary document and full report see: <http://www.for.gov.bc.ca/het/climate/index.htm>

⁷ Standards for seed transfer can be found in the Chief Forester's Standards for Seed Use (April, 2004).

transfer distance' is the geographic, ecological, genetic or climate distance a seedlot is moved from its origin to its planting location.⁸

What is climate-based seed transfer?

Climate-based seed transfer encompasses a range of seed use decisions, including: (1) selection (seed procurement and identification of seedlots that are climatically suitable), (2) transfer (matching seedlots to planting sites based on critical (safe) transfer distances that maximize productivity, while maintaining adaptation), and (3) ordering and/or planting seed/seedlings for reforestation within areas that have similar climate (deployment strategies across managed stands and landscapes aimed at maintaining genetic diversity and adaptation across the rotation) . Among management strategies proposed to mitigate the negative impacts of climate change in forests, climate-based seed selection, transfer, and deployment, together with climate change adaptation strategies such as assisted migration, offers a key solution. In addition, opportunities exist to streamline seed selection, transfer and deployment with forest regeneration and tree species selection and strategic planning decisions. This integration will help prioritize forest (GRM and tree improvement) harvest and regeneration activities in stands that exhibit symptoms of mal-adaptation, poor health, and low productivity; and are deemed most vulnerable to the impacts of a changing climate.

The broader aim of CBST is to allow forest stewards and resource managers to make more appropriate forest regeneration, tree species and seedlot choices based on underlying genetic diversity (adaptation, genetic variation) principles and seed selection, transfer and deployment decisions that consider a range of climates and potential site conditions for the full forest rotation (i.e. able to withstand both contemporary (early stand establishment) and projected climates (timber harvest, carbon sequestration and conservation)).

Climate-Based Seed Transfer and Assisted Migration

It is important, for clarity, to make the distinction between climate-based seed transfer (CBST); and, climate change adaptation strategies such as assisted migration (AM). In the first case, CBST guides seed selection (genetically suitable seedlots), transfer and deployment based on the scientific methodology and framework in which genetic adaptation and suitability is characterized by climatic gradients or climate envelopes, together with other genetic information (e.g. provenance data). In the latter case, assisted migration describes a (human facilitated) strategy that moves species, populations or provenances (genotypes) through artificial means such as planting (as opposed to migration outcomes that are the result of natural selection processes). CBST will be designed to accommodate a number of climate change adaptation strategies, including AM; as well as, consideration of both contemporary and future climates.

⁸ Personal communication, Greg O'Neill, Research Scientist, Tree Improvement Branch

Problem Statement

Climate change is expected to result in forests becoming increasingly maladapted in many regions as the climates they will be growing in over future rotations diverge from the climates in which they evolved. This will result in increasing losses to pests, poor growth, and the subsequent loss of productivity, economic and environmental services on which a large component of the provincial economy relies. Rural communities across British Columbia will be the hardest hit because of few economic diversification options. This problem will intensify over time as climate-change impacts increase, resulting in losses of economic activity and jobs, losses in environmental services provided by forests (water, recreation, etc.), and increasing costs to the public to maintain existing values and to protect communities from climate change-induced impacts. Operational planting programs (currently, an estimated 245 million per year⁹) will become less successful and cost increasingly more in the absence of climate-based seed transfer.

Adaptive measures and new climate change adaptation forest management solutions are available that will reduce these impacts and help maintain long-term productivity, value, and environmental services from BC's forest ecosystems, now and in the future. Effective solutions involve the development of CBST for British Columbia that will result in: 1) the effective matching of seedlots to the environments where the trees are planted; 2) a tool for guiding strategic and operational reforestation and harvest planning (planting of stock suited to a range of climates); and, 3) cost effective, feasible and practicable policy levers, information management systems and decision support tools to help forest managers leverage opportunities, mitigate risk and reduce impacts due to mal-adaptation.

⁹ Source: Seed Planning and Registry (SPAR); 238M seedlings ordered for planting in 2012; and, an estimated 7M from private land (J. Woods per. comm..)

PROJECT GOALS, OBJECTIVES and OUTCOMES

Project Goals:

Goal: Genetically adapted forest stands and landscapes in a changing climate

Project Objectives:

Objective One: A CBST system is available for use across contemporary (current) and future climates.

Objective Two: Opportunities are identified to manage the impacts and reduce risks of genetic maladaptation.

Objective Three: A (genetic) foundation is available to improve BC's forest regeneration strategies to achieve broader forest stewardship climate change adaptation and mitigation goals.

Objective Four: Capacity for climate-based genetic resource management associated with seed transfer decision-making is developed now and in the future.

Project Outcomes:

The outcome of the CBST climate change adaptation initiative and project is to enable resource stewards and forest managers to sustainably manage, protect and conserve BC's managed forest stands and landscapes that are genetically adapted, resilient and well suited to a changing climate by:

- Minimizing or reducing genetic maladaptation through the use of climate and scenario-based genetic resource management, seed use and seed transfer modeling and analysis;
- Maintaining or enhancing forest productivity through optimization and selection of climatically (and genetically) suitable planting stock, including high gain material, where available;
- Maintaining or enhancing forest resilience and health through climate-based seed transfer decisions that consider resilient and forest health related tree improvement choices (e.g. use of insect and disease-resistant/tolerant planting stock, where available).

Guiding Principles:

The CBST project will be guided by the following principles:

- Support of scientifically sound and informed GRM, including climate-based seed use (seed selection, transfer and deployment) decision-making;
- Implementation of CBST policy that provides for effective transition and minimal impact to GRM stakeholders and clients;
- Identification of opportunities for alignment of CBST with existing, new and emerging forest stewardship, silviculture and tree species selection decision-making frameworks and infrastructure (e.g. BEC); and,
- Provision of effective communications, engagement and outreach throughout the project.

SCOPE

In scope:

A. Checking compatibility with, alignment or consideration of modifications to:

- BC's Forest and Range Practices (FRPA) statutes and regulations, including the Forest Act, FRRPA, FPPR, WLPPR, Chief Forester's Standards for Seed Use, forest regeneration (tree species selection, forest stewardship, silviculture, and seed use policy guidance, compliance monitoring, FRPA tests; and evaluation and monitoring protocols;
- New and emerging government/ministry policy direction for climate change adaptation (BC Government Climate Adaptation Strategy, MFLNRO Forest Stewardship Action Plan);
- New and emerging government/ministry policy direction for land and resource management (e.g. Integrated Decision Making, Cumulative Effects);
- BC's genetic resource management (GRM) framework; and
- Existing, new and emerging classification systems and infrastructure (e.g. BEC).

B. Consideration, review and/or analysis of:

- Scientific theory, analysis and research results applicable to BC's seed transfer system, seed use policy framework, genetic adaptation, and climate change;
- Forest tree species indigenous to BC, and those tree species that are registered for use in BC or have the potential likelihood for suitability in BC under future climates;
- Natural stand, orchard and tree breeding genetic populations and seed¹⁰ sources (and classes);
- Existing and emerging policy framework (e.g. seed transfer and professional reliance); and
- Socio-economic analyses to measure and assess policy implications, risks and impacts Options that consider incremental and/or transformative CBST solutions for the short (near term), mid and long term, including interim measures.

Out of scope:

- Development of climate-based ecological suitability criteria, stocking and density standards;
- Development of climate change adaptation strategies for tree species range and population expansion (e.g. Assisted Migration) *per se*; although, the CBST will be designed to allow for implementation of adaptation strategies associated with forest regeneration, GRM, and seed use, including seed transfer; and
- Development of climate change genetic diversity policy (e.g. landscape level objectives) and conservation strategies (e.g. climate buffers, genetic refugia) *per se*; although, the CBST will be designed to allow for future consideration / implementation of policy and adaptation strategies associated with genetic diversity, conservation, and protection and management of genetic resources (biological legacies).

¹⁰ Seed includes vegetative material

PROJECT APPROACH

The CBST project will be undertaken using a phased approach. It is anticipated that the focus over the next 3 to 5 years will be on 'development'; with full implementation (design and build; transition planning, and policy and business re-tooling/transformation) rolling out over five to ten years.

CBST is comprised of the following phases:

- Phase 1: Science Foundation
- Phase 2: Policy Development
- Phase 3: Implementation, and
- Phase 4: Monitoring and Revision

For a description of each phase, [see Prologue \(page iii\)](#).

PROJECT MILESTONES and DELIVERABLES

Milestones

Phase	Description	Deliverable	Target
Project Initiation	Start-up	Project Charter (SIGN-OFF)	June 30, 2012
		Project Plan 2012/13 (DRAFT)	Sept 30, 2012
		Project Plan (PHASE 1)	March 31, 2013
Phase 1	Science Foundation	Scientific Methodology	TBD
		Interim Report (DRAFT)	March 31, 2013
		Technical Review	TBD
		Final Report	March 31, 2014
Phase 2	Policy Development	Policy Analysis	TBD
		Impact and Risk Assessment	TBD
		Policy (DRAFT)	March 31, 2015
		Consultation and Review	TBD
		Legs, Regulations and Standards	March 31, 2016
Phase 3	Implementation	Operational Pilots	TBD
		Extension and Training	TBD
		Decision Support & Info Mgmt	TBD
		Transition Strategy	TBD
		Implementation Plan	March 31, 2017
Phase 4	Monitoring and Revision		On-going

Project Deliverables¹¹

Phase 1 Science Foundation: Technical report describing the proposed scientific foundation for CBST, including the data, methods and description of the underlying statistical and theoretical framework; based on a comprehensive peer review and technical assessment of the proposed options, approach, and scientific rationale for a new CBST system.

Phase 2 Policy Development: Policy; including legislative and regulatory amendments, where applicable; and statutory and non-statutory policy and administrative guidance. Policy development will include an analysis of a full suite of options (e.g. voluntary versus mandatory requirements) and assessments (e.g. cost/benefit, risk and impact) An extensive consultation and review process will also be undertaken in this phase.

Phase 3 Implementation: Implementation, including the development of strategies and plans for transition (e.g. alignment of: (i) orchard design and production (capacity); (ii) parent tree/seed inventories; (iii) silviculture / tree improvement investments and (iv) information management). Implementation strategies may include a range of options (e.g. pilots and operational trials). Decision support tools, including corporate information management systems, GIS tools, map products and spatial/aspatial data sets. Extension and training will also play a large role in implementation.

Phase 4 Monitoring and Revision: Monitoring and revision, including the development of indicators and measures for monitoring effectiveness, performance and outcomes to inform the development of new and/or revised actions for continuous improvement and adaptive management.

¹¹ Project phases may overlap each other; deliverables and milestones to be refined in the project plan.

ASSUMPTIONS, CONSTRAINTS & SYNERGIES

Assumptions:

- The CBST project will continue to be an action identified within the MFLNRO, Forest Stewardship Action Plan for Climate Change Adaptation (2012-2017).
- The CBST initiative will continue to be championed by the Forest Genetics Council of BC and technical advice provided by FGC TACs.
- The Forest and Range Policy Act (FRPA) statutory framework will continue to identify provisions for seed use, including Chief Forester's Standards for Seed¹², and the provision for alternatives.
- Seed transfer and genetic adaptation are complex subjects. Broader dialogue and engagement relating to seed transfer climate change adaptation strategies may be required outside the CBST project for outreach to seek public input, including that of First Nations governments.
- A business case will reaffirm the proposal to move to a CBST system.
- Completion of project deliverables may require additional resources (financial or otherwise) to undertake this work.
- There will be a desire and an opportunity to pilot test the proposed CBST system.

Constraints:

- Climate-based ecological considerations, required for making forest regeneration tree species selection and stocking decisions, are not directly included as project deliverables in CBST. This poses a potential constraint to the development of a fully integrated interface between ecology, silviculture and genetic climate-based forest regeneration decisions.
- Forest certification requirements currently have a focus on 'natural' plantations; inclusion and consideration of a new CBST system and AM strategies may require alignment of forest certification indicators for successful implementation.
- Potential economic impacts and associated risks for transitioning to a CBST system may require broader policy analysis of opportunities for cost/risk sharing outside the scope of the CBST project.

Synergies:

- MFLNRO, Forest Stewardship Action Plan for Climate Change Adaptation
- MFLNRO, Genecology Research Strategy, Assisted Migration and Adaptation Trial (AMAT)
- UBC, CFGC and Genome BC AdapTree: project (Dr. S Aitken and Dr. A Hamann)
- UBC, CFGC forest genetics/ecological (BEC) climate modeling research (Dr. Tongli Wang)
- UVIC forest genetics/forest health climate modeling research (Dr. Laura Gray)
- Climate WNA (formerly Climate BC)
- Forest Genetics Council and its technical advisory committees' work
- MFLNRO corporate information management systems: GeoBC (Data Warehouse), RESULTS, SPAR, MapView, SeedMap, TSS (Tree Species Selection)

¹² The FRPA statutory and policy framework was developed without climate change in mind. Analysis of potential impediments or barriers within FRPA with regard to seed use, including seed transfer,

Risk Management

A CBST Risk Management Plan will be developed to help identify risks, impacts and consequences (of risk exposure) associated with the CBST initiative and project, including:

A. Regulatory Risk

Relates to risk associated with changes in the policy environment such as new or emerging policy direction and/or regulatory changes pertaining to climate change adaptation, Forest and Range Planning and Practices (FRPA); Chief Forester Standards for Seed Use, natural resource management ('one land, one manager'), resource stewardship, cumulative effects management (CEM), and professional reliance.

B. Domain Risk

Relates to risk associated with subject matter issues such as science-based errors, incomplete information (knowledge gaps), or missing data. Data dependencies (e.g., BEC) and information deemed critical or relevant to the project (e.g., climate-based tree species selection, stocking, and ecological suitability) will also be assessed in terms of associated risks.

C. Technical Risk

Relates to risk associated with implementation, and the decision support system itself. This includes access to critical information, data sets; computer programs; applications and tools (e.g., GIS analysis) needed to carry out the project.

D. Schedule Risk

Relates to risks associated with implementation and delivery, including the timely delivery of the CBST (e.g., potential delays) associated with each phase of the project, such as delays or time lags due to factors associated with project elements (e.g., consultation and review), or related to external factors (e.g., components linked from outside project, development and implementation of related policy).

E. Business Continuity Risk

Relates to risks associated with personnel, funding, and succession issues (reliance on key individuals to support or carry out completion of the work).

may require assessment of obligations and requirements more broadly related to seed use (e.g. FRPA tests, Forest Stewardship Plans, stocking standards) prior to CBST implementation.

RESOURCES

A CBST Resource Strategy and business plan will be developed to identify resource needs (budget, personnel), gaps (research, knowledge, information), issues (succession), and funding levers over the duration of the project.

People:

The CBST project will be led and primarily staffed by key personnel working in the ministry's Tree Improvement Branch, located in MFLNRO TIB headquarters in Victoria, and at Kalamalka and Cowichan Lake Research Stations.

Financial:

The CBST project will largely be funded through the MFLNRO, Tree Improvement Branch operations base budget; the MFLNRO, Land Base and Investment Program – Tree Improvement; and, through leveraging of funds from external agencies (e.g. Future Forest Ecosystem Scientific Council (FESC)), where available.

In-kind Support:

MFLNRO, Competitiveness and Innovation Branch, (Climate Change Technical Advisor)

Forest Genetics Council of BC and Technical Advisory Committees

University of British Columbia, Centre for Conservation Genetics: Research collaboration

University of Victoria: Research collaboration (Post doc)

University of Alberta: Research collaboration

RELATED DOCUMENTS

Forest Stewardship Action Plan for Climate Change Adaptation (2012 – 2017). Feb 2012. BC MFLNRO, <http://www.for.gov.bc.ca/het/climate/index.htm>

Jaquish, B. C. and G. E. Rehfeldt. 2010. Ecological Impacts and Management Strategies for Western Larch in the Face of Climate Change. *Mitigation and Adaptation Strategies for Global Change*, Vol. 15, No. 3, p 283-306.

Leech, S.M., P. Lara Almuedo, G. O'Neill. 2011. Assisted Migration: adapting forest management to a changing climate. *BC Journal of Ecosystems and Management* 12(3):18-34.

O'Neill, G.A., et. al. 2008. Assisted Migration to Address Climate Change in British Columbia: Recommendations for Interim Seed Transfer Standards. MFLNRO Forest Science Program, Technical Report 048: 1-28.

Ukrainetz, N. K., G. A. O'Neill, and B. Jaquish. 2011. Comparison of fixed and focal point seed transfer systems for reforestation and assisted migration: a case study for interior spruce in British Columbia. *Can. J. For. Res.* 41: 1452-1464.

Ying, C.C., and Yanchuk, A.D. 2006. The development of British Columbia's Tree Seed Transfer Guidelines: purpose, concept, methodology and implementation. *For Ecol. Manag.* 227(1-2): 1-13.

PROPOSED PROJECT ORGANIZATIONAL STRUCTURE

Function	Name	Role
Executive champion	ADM, Resource Stewardship / Chief Forester	Jointly champion the initiative and project at the ministry executive level.
Executive Steering	Climate Change Adaptation Steering Committee	Steer the project at the government senior management level including provision of strategic direction, cross agency linkages and communication of executive endorsement and commitment
Project Champion	Forest Genetics Council of BC	Champion the project including project promotion, marketing, funding procurement and/or leveraging; and, stakeholder engagement
Project Lead	Brian Barber	Lead; project leadership for the ministry
Project Manager	Lee Charleson	Manager; project management and liaison to project champion, sponsor(s), steering committee, teams and working groups
Stakeholder Group	TBD	Chair; stakeholder engagement, consultation; review and input
Project Steering Committee	Brian Barber	Chair; project level steering to ensure critical linkages are maintained between components, phases, org structures and integration with key agencies, business areas and disciplines
Science Foundation Working Group	Greg O'Neill	Lead; scientific and technical analysis for the development of Phase 1, Scientific Foundation
Policy Development Working Group	TBD	Lead: policy analysis, drafting, consultation and review, impact, vulnerability and risk assessment
Implementation Team / Working Group(s)	TBD	Lead: business mapping and analysis, decision support, information management, and extension and training; liaison to client/user working group(s)
Other	TBD	Subcommittees will be formed as needed

PROJECT SIGN-OFF

Signed By	Brian Barber, Director, Tree Improvement Branch	July, 2012

Appendix I

- A. GRM and SFM (Figures 1 and 2)
- B. GRM Strategic Framework (Logic Model)

A. Genetic Resource Management (GRM) and SFM (diagrams)

Figure 1

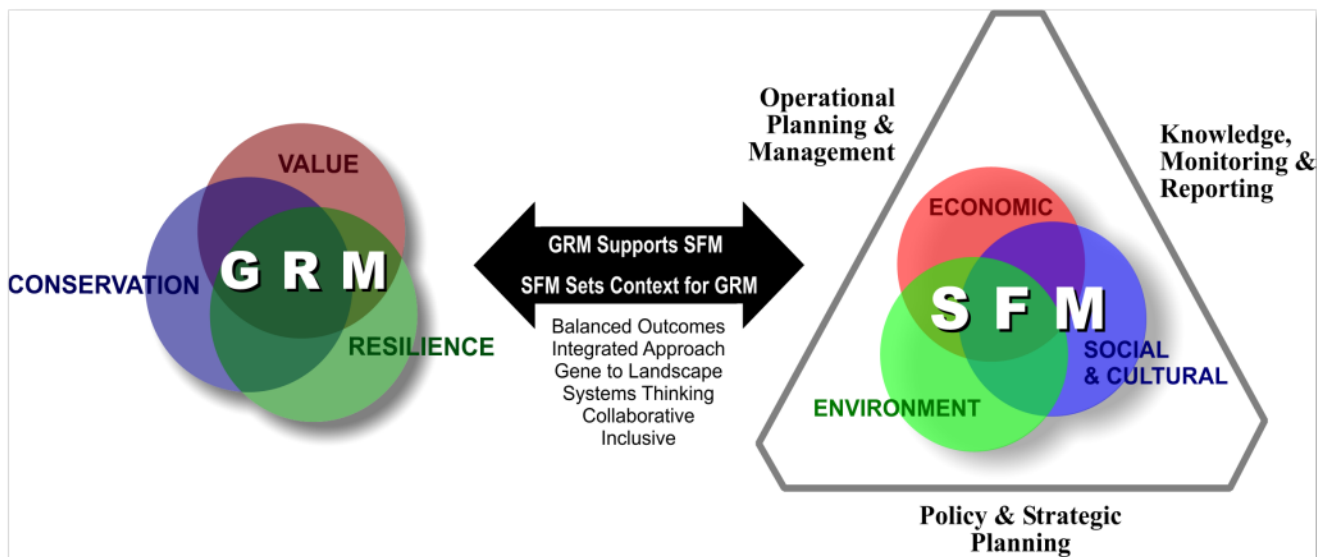
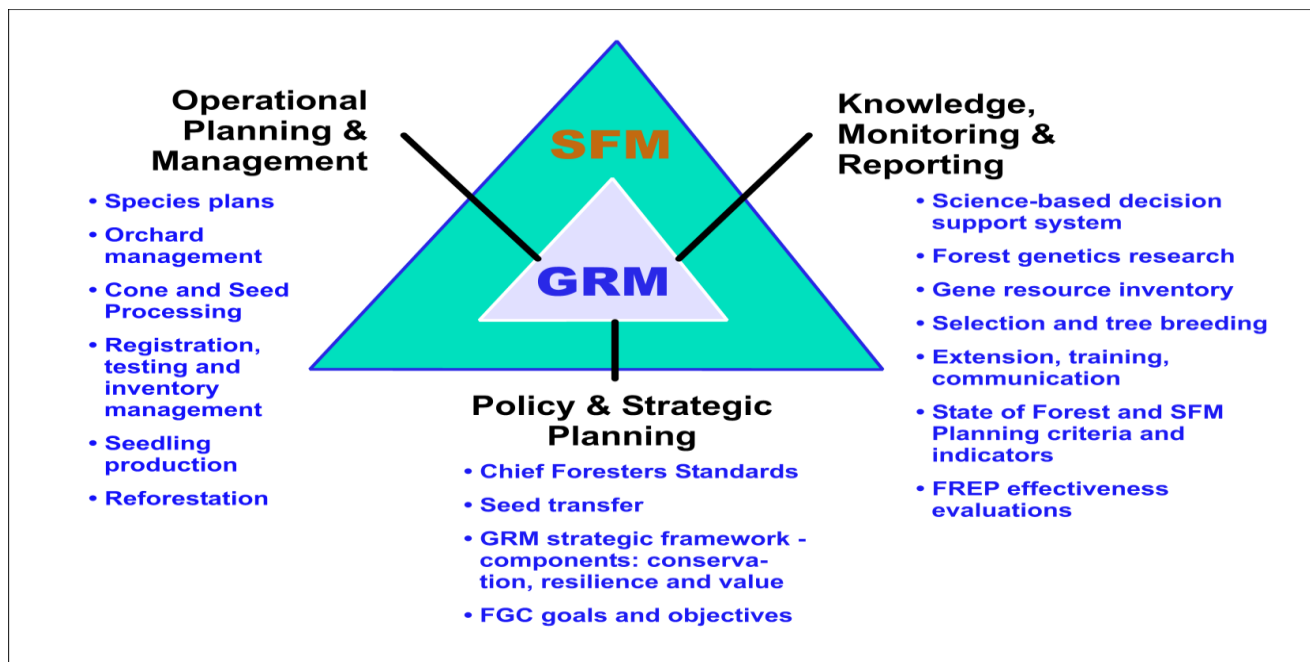


Figure 2



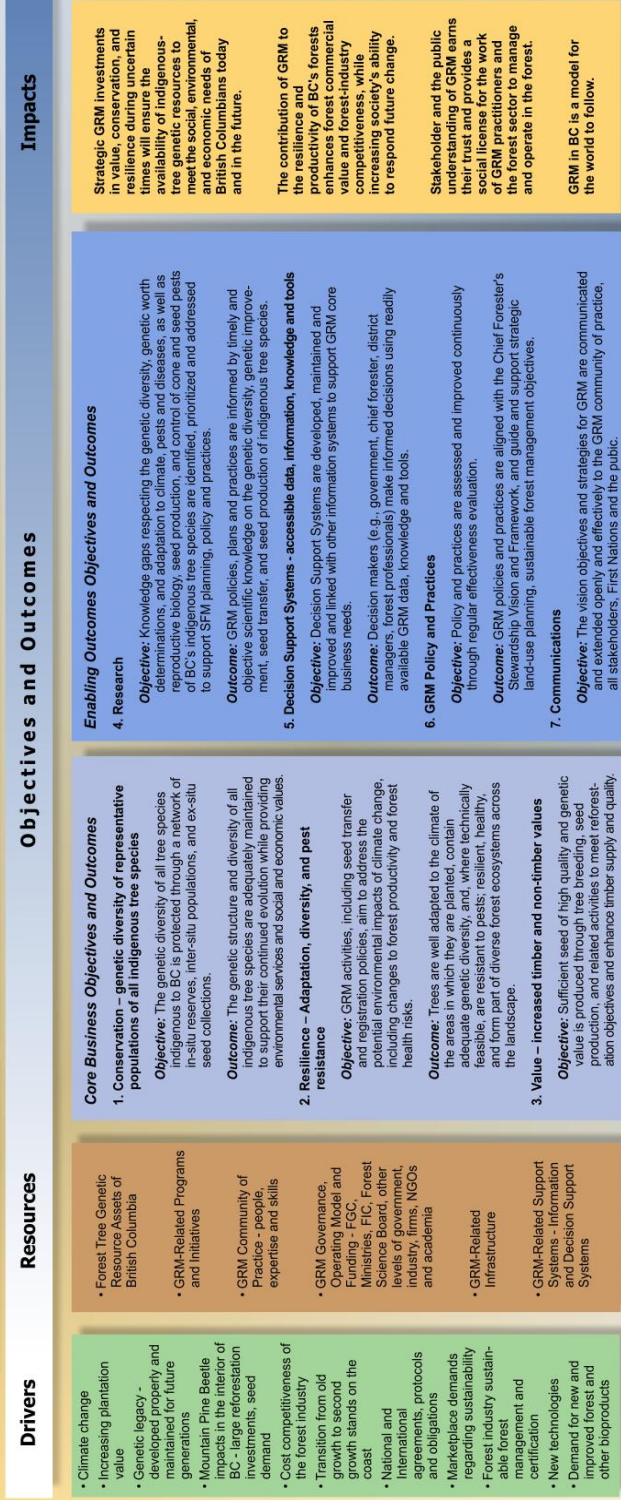
B. GRM Strategic Framework (Logic Model)



Forest Tree Genetic Resource Management – Strategic Framework (Logic Model)

Vision:
GRBC's forest genetic resources are diverse, resilient, and managed to provide multiple values for the benefit of present and future generations.

Guiding Principles:
 • Foster a cooperative management approach – address GRM components of conservation, resilience and value in a balanced and integrated manner through collaboration between government agencies, forest industry, professionals, First Nations, environmental groups and others
 • Recognize GRM as an integral element of sustainable forest management
 • Respond proactively to environmental, social, economic and technology changes
 • Pursue the best science
 • Nurture collaboration among stakeholders
 • Apply adaptive management
 • Exercise open inclusive communication
 • Measure and manage performance
 • Employ best practices



Assumptions that will influence how we chose to move forward with GRM to 2020:

- Future climatic conditions will be different and difficult to project with certainty, especially precipitation patterns as they impact forest ecosystems.
- Changing climate will require new research, tools, and decision-making approaches to manage risk, uncertainty, and complexity in a timely manner.
- The assisted migration of tree species and seed sources is a proactive forest management response to climate change, since populations will be less adapted to their current locations over time.
- GRM activities can be responsive to changing climate, new technologies, global markets and social values in order to maintain or enhance timber supply and non-timber values.
- Conservation strategies will need to change to address warming climates, since tree genetic resources may not be adequately protected in existing parks, ex situ reserves, etc.
- Responsive policies and practices, and new incentives will be required to support conservation, resilience, and value.
- Although new technologies and exotic species may offer some opportunities, they require extensive development, testing and evaluation in an appropriate biological and social context before they can be considered for broader applications.
- Although the Ministry of Forests and Range is steward of and accountable for forest resources, GRM activities are best coordinated and delivered as a collaborative effort with stakeholders.
- GRM is an integral part of sustainable forest management and biodiversity and needs to be aligned and linked with strategies and objectives for these and other government priorities and policies (e.g., climate change).
- The human resources and capacity needed to deliver conservation, resilience and value will require expanding partnerships with other organizations and initiatives.

Logic Model developed as part of the GRM Challenge Dialogue process
 Concept and Graphics by R. Arith, Jones & Associates – January 2008