

## **CONFORGEN: a Canadian Program for Conservation of Forest Genetic Resources**

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### **Abstract**

Initiation of a program to conserve forest genetic resources in Canada is proposed. The proposal is the fruit of many discussions and two workshops involving representatives from provincial governments and other federal government departments. The program, as envisioned, would be cooperative and collaborative, building on the strengths of those provinces that have already undertaken such work, and extending the work across provincial boundaries, and across departmental mandates.

### **Résumé**

On propose la mise en œuvre d'un programme de lutte pour la conservation des ressources génétiques forestières au Canada. Cette proposition est le cœur de plusieurs discussions et de deux ateliers mettant en contact des représentants de ministères provinciaux et fédéraux. Le programme envisagé serait coopératif et collaboratif et fondé sur les atouts des provinces qui ont déjà entrepris de telles démarches, tout en s'étendant au-delà des frontières provinciales et des mandats ministériels.

### **Why Does Canada Need a Program for Conservation of Forest Genetic Resources?**

After discussions with representatives from federal government departments and various provincial governments, we propose that a national program be established to conserve forest genetic resources. This program would be called the "Canadian Program for Conservation of Forest Genetic Resources," or CONFORGEN. The rationale for the establishment of such a program is as follows.

1. Forest genetic resources have important current and future economic values.
2. There are significant threats to Canada's forest genetic resources.
3. A survey, conducted in 2003 by the Canadian Forest Service (CFS), indicates that 60% (75 species) of trees identified in one province or territory required either some level of gene conservation, or additional information to determine the need for conservation efforts.
4. Currently, work to understand and conserve forest genetic resources is fragmented, with strong programs underway in some provinces, but little cooperation across provincial borders and no national coordination.
5. Coordinated efforts could assist provinces by developing species-level guidelines for conservation and sustainable use of forest genetic resources, monitoring and reporting, and identifying emerging issues to prioritize research.

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Threats to forest genetic resources include invasive alien species (IAS; especially insect pests and pathogens), climate change, habitat loss, and disturbance as a result of human activities. Dramatic current examples of the threat to forest tree genetic resources posed by IAS are the assault on butternut (*Juglans cinerea*) by butternut canker (*Sirococcus clavigignenti-juglandacearum*) and on ash species (*Fraxinus* spp.) by emerald elm borer (*Agrilus planipennis*). In both cases, populations are in danger of extirpation, and entire species could face extinction. When populations are extirpated, locally adapted genes are lost. As well, climate change threatens population extirpation in cases where species ranges are near their northern limit in southern Canada. Adaptation to IAS and to climate change depends on availability of genetic diversity in affected species.

## What Would CONFORGEN Do?

The program will:

1. Promote conservation of forest genetic resources.
2. Define national science-based guidelines for conservation and sustainable use of forest genetic resources.
3. Monitor and report on forest genetic resources, and ensure that national level reporting is consistent and jurisdictionally representative.
4. Contribute to Canada's national and international reporting requirements.
5. Identify emerging issues and prioritize research.

## Examples of CONFORGEN's Potential Contributions

1. The Canadian Forest Genetic Resources Information System (CAFGRIS) (<https://cfsnet.nfis.org/cafgris/index.html>) is a CFS initiative intended to provide information necessary for assessing gene conservation requirements of native tree species of Canada in the face of threats to genetic diversity posed by IAS, species biology, and ecology. It is envisioned that CONFORGEN will work closely with the CFS to populate CAFGRIS with consistent and accurate content.
2. The Forest Gene Conservation Association (FGCA) in Ontario is an example of a provincial initiative that could benefit from interaction with other provincial and pan-Canadian efforts to conserve forest genetic resources. The FGCA has developed brochures and articles that could be modified to be applicable to other regions, promoting gene conservation for species that are threatened in Ontario and other provinces.
3. The CFS carried out a survey in 2003 to identify the need and role for gene conservation (Beardmore et al. 2006). The survey provided data for the Canadian Council of Forest Minister's Criteria & Indicators reporting process, and it is anticipated that the survey will be repeated for each reporting cycle. Survey results will be strengthened through the involvement of CONFORGEN. Collection and compilation of data by a Canada-wide organization with

representation from most if not all jurisdictions, will improve the data consistency and the acceptance of results.

4. Two articles recently published in *The Forestry Chronicle* in 2007, detail status and gene conservation guidelines for tree species of concern in New Brunswick (Loo et al. 2007a, b). Tables 1 and 2 provide excerpts from these papers, showing the level of information compiled for each of four species that were determined to be in need of gene conservation measures by the New Brunswick Forest Tree Gene Conservation Working Group. Information presented in the articles includes the relative effort required for different categories of gene conservation methods, the potential for restoration, education targets and messages, monitoring, and research required. This is an example of a small-scale initiative that could be expanded to encompass the Canadian ranges of all tree species of concern. Various provincial and other organizations have developed guidelines for species of concern, but with little or no coordination across provincial borders. Butternut canker is a growing problem in three provinces, and CONFORGEN would provide a means for bringing together and standardizing guidelines for gene conservation across provincial boundaries. Butternut will receive attention from provinces in a coordinated way because the species has been designated as endangered under Canada's Species At Risk Act, but other species (e.g., all native ashes) are under serious threat, and there is currently no coordinated effort to develop conservation guidelines across provincial borders.

**Table 1.** *Elements of gene conservation guidelines for butternut in New Brunswick.*

Target populations to conserve	Relative effort: <i>in situ</i> vs. <i>ex situ</i>	<i>In situ</i> conservation focus	<i>Ex situ</i> potential methods, collections	Restoration
Individual trees showing putative resistance	High <i>ex situ</i> effort required	All trees that do not show disease symptoms should be maintained; will require survey to establish location and disease status of individual trees and populations	Seed cannot be stored using conventional seed storage methods, but cryogenic storage of the embryo axis has proved successful	Poor, at present; need to develop genetically resistant stock

**Table 2.** *Education, monitoring and research requirements as elements of conservation guidelines for butternut in New Brunswick.*

Education targets	Main messages	Monitoring	Research required
Woodlot owners; other rural and urban dwellers; horticultural nursery managers	1. Species is endangered. 2. How to identify tree and canker. 3. Avoid cutting healthy trees. 4. Avoid importing nursery stock. 5. Monitor and report on condition.	Evaluate populations and individual trees in affected areas, at the edge and in areas that are still disease-free to monitor progress of the disease annually, and identify possible resistance	1. Does resistance to the canker exist? 2. Somatic embryogenesis and marker development to select resistant genotypes 3. Most efficient <i>ex situ</i> storage method for long-term viability of genetic material.

5. Another example of a local initiative that could be expanded to other parts of the country is the modeling work undertaken in British Columbia (BC) by Andreas Hamann and others to determine where, under various climate change scenarios, climatic optima may shift over the next 100 years for seed sources of species for which data are available. Similar work has been undertaken with other species in BC and has been initiated in Alberta during the past year. The biggest challenge in extending this and other work beyond the current provincial limits will be dealing with data gaps and discrepancies. Application of a similar approach to white pine throughout its Canadian range, for example, would necessitate using data collected at different scales and would result in varying levels of precision from province to province, but as more data is made available, the precision and consistency across provinces would be improved. Application of such a model across species' ranges will help identify populations needing special attention, even when the species as a whole appears to be secure.

## Who Will be Involved in CONFORGEN?

Our vision is that "membership" in CONFORGEN will be open to government departments at both levels (provincial and federal), as well as to any other interested stakeholders. We expect CONFORGEN to be of interest to a wide array of resource users, land managers, and conservation advocates. It will be of value to those responsible for measuring and reporting on the biodiversity of Canada's forests at both the federal and provincial levels, as well as those responsible for conserving diversity.

Potential members of CONFORGEN may include representatives from provincial and federal government departments; First Nations; industry; woodlot owner associations; universities; and environmental non-government organizations (ENGOS).

## Proposed Structure for CONFORGEN

CONFORGEN will be structured to include a secretariat, a steering committee, one or more technical committees, and a research advisory committee. The CFS is prepared to provide the secretariat role for at least 2 years. A description of the composition and function of each body within CONFORGEN follows.

<i>Secretariat:</i>	Make and maintain contacts, facilitate information exchange, and organize an annual forum.
<i>Steering Committee:</i>	Identify relevant forest genetic resource conservation issues and prioritize responses; develop and approve business plans; and provide direction to the Secretariat and Technical Committees.
<i>Technical Committees:</i>	Struck in response to relevant issues and priorities.
<i>Research Advisory Committee:</i>	Identify important research questions, seek collaboration and funding, and facilitate cross-jurisdiction projects.

Table 3 presents a proposed timeline. Provincial and federal government “buy-in” will be sought by the present forum organizing committee and interested provincial representatives. The Steering Committee will consist of representatives from various jurisdictions and potentially other government departments and industry. Technical committees will consist of the people who are currently addressing or who have the capacity to and are interested in addressing those issues for which the committees will be created. It is expected that the technical committees will be hands-on working committees. The Research Advisory Committee will consist of scientists, who will guide the Steering Committee in identifying priorities and approaches for responding to them.

**Table 3.** *Timeline for establishing the structure of CONFORGEN*

Goal	Timeframe for completion
Achieve provincial and federal buy-in	Winter 2006
Establish Steering Committee	Spring 2007
Identify issues, establish technical committees	Summer 2007
Second Annual Forum	Summer 2007
Establish Research Advisory Committee	Fall 2008

## Literature Cited

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