Advancing Canadian forest science for 70 years

Canadian Forest Service - Great Lakes Forestry Centre

1945

The Forest Insect Laboratory opens at the corner of Church Street and Queen Street East under the direction of Dr. Carl Atwood.

1947

An electron microscope is purchased, enhancing the capacity to study forest insects.

1949

The *Canada Forestry Act* is passed, enabling the first federal-provincial agreements in support of enhanced forest management.

1950

The Laboratory of Insect Pathology opens at 1219 Queen St. E.

Dr. Gernot Bergold, one of the world's leading virologists, is recruited from Tübingen University, Germany, and helps advance knowledge of insect viruses.

Canadian scientist Dr. Ted Bird is recruited because of his pioneering research that used a virus for the first time to effectively control a forest insect pest.

1951

A newly developed Beaver aircraft is purchased jointly by the Ontario and Canadian governments to facilitate experimental studies on the chemical control of forest insects.

1952

Dr. Gerard Wyatt is recruited from Cambridge University, United Kingdom, and helps to advance knowledge of DNA content and structure.

1958

Dr. Tom Angus discovers a toxin-producing bacteria that leads to the development of Bacillus thuringiensis (Bt) for pest control in forestry and agriculture.

The Laboratory of Insect Pathology is renamed the Insect Pathology Research Institute and assumes a greater national profile.

1959

An addition to the Forest Insect Laboratory opens.

1962

The first artificial diet is developed for rearing forest insects, helping advance insect research.

1963

Roberta Bondar is hired as a student to work on forest tent caterpillar studies.

1966

The Forest Research Laboratory opens at the new Queen Street East site, east of Pine Street. Researchers move from Richmond Hill and Maple, Ontario, to join insect researchers in Sault Ste. Marie.

Silvicultural research programs start, focusing on techniques for establishing northern coniferous and southern deciduous plantations and containerized seedling production.

1968

The forest fire research program begins, resulting in major advances in the understanding of fire behaviour, effects and ecology.

1969

The Dutch elm disease research program starts, leading to the development of a fungicide and the isolation of the toxin responsible for the disease.

A black spruce ecosystem program begins, producing knowledge about the regeneration and sustainable management of this tree species.

1973

The first of 18 Canada-Ontario Joint Forestry Research Committee symposia is held in Sault Ste. Marie, bringing together researchers and forest managers.

1975

The new Great Lakes Forest Research Centre building opens.

1977

The Forest Pest Management Institute is formed by amalgamating the Insect Pathology Research Institute and the Ottawa-based Chemical Control Research Institute.

1979

The Turkey Lakes Watershed is established to evaluate the impact of acid rain on terrestrial and aquatic ecosystems in collaboration with Environment Canada. The mandate is later expanded.

1981

An economic study of energy from forest biomass is initiated.

1983

Under the direction of Dr. John Cunningham, the first virus biological control product, Lecontvirus®, is registered for use in forestry, setting the stage for many other such insect pest control registrations.

1985

The Great Lakes Forest Research Centre is renamed the Great Lakes Forestry Centre.

Fire research focus expands to examine smoke and carbon emissions, with global collaboration, leading to improved estimates of greenhouse gases from fire.

1986

A major three-storey addition to the Great Lakes Forestry Centre opens.

1990

Sault Ste. Marie is recognized as the Forestry Capital of Canada in honour of its long history of forest protection and research in the community.

1992

The first Canadian Forest Fire Behavior Prediction System, developed largely from Ontario experimental fire data gathered since 1970, is released.

Canada's Model Forest Program is launched to help facilitate partnership-based approaches for addressing forest resource management issues.

1993

The Long Term Soil Productivity study begins as part of a North American project to examine the impact of forest harvesting practices.

1995

The Forest Pest Management Institute is integrated into the Great Lakes Forestry Centre.

1996

The First Nations Forestry Program is launched to help stimulate forest resource-based economic opportunities in First Nations communities.

2000

The Canadian Forest Ecosystem Classification project begins, creating a common system for describing ecosystems across Canada.

The Canadian Forest Service, the Ontario Ministry of Natural Resources and the University of Guelph initiated a large-scale field study of pine marten populations in northern Ontario.

2001

GLFC researchers produce an updated map of Canada's plant hardiness zones to support studies on climate change impacts within and outside the forest sector.

2002

Genome Canada gives a $4.2 million grant to genomics researchers, which leads to the development of a modified virus to combat the spruce budworm.

2003

The Emerald Ash Borer research program starts, leading to the development of TreeAzin®, the world's first biological control product registered to protect ash trees.

2006

The Canadian Wood Fibre Centre is created as a research unit in support of the new innovation strategy for Canada's forest sector.

2007

Scientists share a piece of the Nobel Peace Prize for their contributions to the Intergovernmental Panel on Climate Change.

2009

The Canadian Forest Service, the Ontario Ministry of Natural Resources and the University of Guelph initiated a large-scale field study of woodland caribou populations in northern Ontario.

2012

The Insect Production and Quarantine Laboratories open – a state-of-the-art facility for the rearing and study of native and exotic forest insect pests.

2015

2015 marks the 70th anniversary of federal forest research in Sault Ste. Marie.

1940s 1950s 1960s 1970s 1980s 1990s 2000s 2015

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Canada

Introduction

2015 marks 70 years of federal forestry research in Sault Ste. Marie, Ontario, and gives us an opportunity to reflect on our accomplishments. This brochure reminds us of the significance of some notable achievements and the importance of work done at the Natural Resources Canada (NRCan) Great Lakes Forestry Centre (GLFC). Today, the GLFC continues to contribute to the government's vision of an innovative, globally competitive forest sector that is rooted in sustainable forests, creating prosperity for Canadians.

Origins of federal forestry research in Sault Ste. Marie

The Forest Insect Laboratory opened in 1945 at the corner of Church Street and Queen Street East in Sault Ste. Marie, near what was then the Ontario Provincial Air Service Hangars. The laboratory was built in response to a massive outbreak of spruce budworm that was causing major defoliation of forests. A joint research agreement had the Ontario Department of Lands and Forests build and maintain the laboratory while the federal government provided staff and equipment.

Half a century of expansion

Current operations started as the national Laboratory for Insect Pathology in 1950. Various expansions have taken place over the years as amalgamations occurred or newer facilities were required.

Between 1965 and 1977:

- Forest researchers from southern Ontario moved to join the group in Sault Ste. Marie.
- The Great Lakes Forest Research Centre (GLFRC) was established.
- A new building was opened.
- The Chemical Control Research Institute from Ottawa merged with the Insect Pathology Research Institute and moved to become the Forest Pest Management Institute (FPMI) in Sault Ste. Marie.

In 1985, the GLFRC organization and its facilities were renamed the Great Lakes Forestry Centre, a name that has stood for 30 years and reflects the variety of programs that are administered here.

The Forest Pest Management Institute (FPMI) was integrated into the GLFC in 1995, and the most recent expansion in 2012 added the Insect Production and Quarantine Laboratories.

Key achievements

Early biocontrol research

The first and most successful use of an insect virus in the world occurred in the mid-1950s. An insect virus introduced into an infestation of the European spruce sawfly caused the collapse of the entire population within two years.

Development of Bt

Much of the research behind the development of *Bacillus thuringiensis* (Bt) as a biopesticide was carried out in the early years at these laboratories. The Bt bacterium occurs naturally in soil and in 1958, scientists showed that the insecticidal toxicity of Bt resides in a crystalline protein. This significant discovery culminated in the most widely used biological insecticide in the world. Its success in forestry and its environmental safety led to its worldwide use in agriculture and other markets.

Forest insect and disease survey

What began as surveys to assess the impact of a 1936 outbreak of European spruce sawfly in eastern Canada expanded to include other forest insects and diseases and became the Forest Insect and Disease Survey Unit (FIDS) in 1962. Eventually FIDS became the national survey unit and also carried out research related to surveying. An extensive knowledge base of forest pests and diseases was built and has been an invaluable resource to many Canadian and international scientists.

Silvicultural research

Silvicultural research began in 1966 and included:

- Seeding and containerized tree seedling techniques for reforestation of cutover areas in northern Ontario.
- White spruce plantation establishment and management methods.
- Establishment of hardwood plantations on former agricultural lands in southern Ontario.

This research led to numerous recommendations for plantation establishment and tree seedling production that are still followed today.

Fire research

Beginning in 1968, NRCan scientists were instrumental in developing the Canadian Forest Fire Danger Rating System. This national system for rating the risk of forest fires is used by forest fire management agencies in Canada and many other countries. The ongoing work has been carried out to better understand fire ecology, behaviour, management and climate change implications, along with advanced technologies for fire detection and evaluation, such as satellite monitoring.

Dutch elm disease

Research that began in 1969 at the GLFC identified the toxin in the fungus that causes Dutch elm disease, which was killing elm trees across eastern North America. The GLFC developed a fungicide that protected individual high-value trees. This work garnered international recognition in the early 1970s. The treatment methods were used by agencies across Canada.

Canadian forest ecosystem classification

Ecosystem classification work began in the late 1970s in Ontario; the team is now focussed on completing a Canadian National Vegetation Classification System. Ecologists at the GLFC are leading the development of a series of fact sheets that provide a common language for comparing ecosystem classifications across all provinces and territories. This system will be invaluable in several practical applications to improve forestry decision-making and in research areas such as climate change. Furthermore, information from this project is being used by other boreal countries to refine their own forest classifications.

Turkey Lakes Watershed

The Turkey Lakes Watershed is a research area 60 kilometres north of Sault Ste. Marie. It was established in 1979 to evaluate the impact of acid rain on terrestrial and aquatic ecosystems as part of a national monitoring program. Since then, a wealth of climate, soil, water quality, stream flow and forest growth data has been collected continuously there, helping to evaluate influences of human activity on the watershed and surrounding forest and measure the effects of climate change.

Registration of the first virus

The discovery that other sawfly viruses can be used as safe and effective biocontrol agents led to the development of a highly efficient virus for controlling the redheaded pine sawfly. The virus was registered with the Health Canada Pest Management Regulatory Agency (PMRA) as a pest control product in 1983 under the name Lecontvirus®. This pioneering work led to the registration of many other viruses for pest control in Canada; much of the research was done by GLFC scientists.

Mapping plant hardiness zones

Starting in the early 2000s, researchers have updated Canada's plant hardiness zones twice and begun developing thousands of species range maps, which include possible climate change impacts. This work is also capitalizing on the development of continent-wide climate maps that are being used within and outside the forest sector.

Genomics of spruce budworm

Building on three international patents, scientists secured a $4.2 million research grant in 2002. The research lead to greater understanding of the molecular basis for the interactions between economically important forest insect pests and many of the forest's naturally occurring viruses. The work resulted in the development of a safe, modified virus that is more effective than natural ones against the spruce budworm.

Climate change and the Nobel Prize

GLFC scientists were members of the Intergovernmental Panel on Climate Change that was awarded the Nobel Peace Prize in 2007 for its work. Their research and expertise related to forest fires, insects and forest ecosystems formed part of the report prepared by the international panel that helped improve knowledge about man-made climate change and lay the foundations for measures needed to counteract such change.

Forest insect entomology

Over the years, entomologists have examined forest insects of economic concern. Most recently, this has included invasive exotic insects such as the emerald ash borer (EAB) and Asian longhorned beetle. GLFC entomologists designed branch sampling techniques for the EAB and worked on finding the most effective lures for traps, which have contributed to improved early detection in urban environments. TreeAzin® Systemic Insecticide, a botanical pesticide based on extracts from the neem tree, was developed at the GLFC to minimize damage to high-value trees and was registered with the PMRA for commercial use against the EAB in 2012.

Vegetation management

The judicious use of herbicides to control competing vegetation is an important silvicultural tool in the regeneration of Canada's forests. A research program on the use of herbicides in forest plantations has been ongoing at the GLFC for 30 years, with a focus on the effectiveness of the products and potential effects on wildlife species or their habitat that might be detrimental to ecological integrity. This research has led to improved forest plantation growth and reduced environmental impacts, and biochemistry studies have supported the registration of glyphosate herbicide with the PMRA for forestry use.

Forest ecosystem integrity

Scientists at the GLFC have extensively assessed the potential impacts of forest management practices on the structure and function of forest ecosystems. Their holistic approach to assessing forest ecological integrity and consideration of biodiversity have contributed to a major shift from sustained yield forest management to forest ecosystem management – something that will ensure the long-term ecological integrity of our forests.

A look at the future

Collaboration that began 70 years ago between the federal forest service and the province of Ontario has expanded to include the forest industry, First Nations, academic institutions, international agencies and others.

These partnerships have helped NRCan researchers address the many challenges still facing Canadian forests, such as:

- invasive and native pests
- climate change
- wildland fire risks to communities
- characterizing, assessing and monitoring ecosystem integrity
- responsible development of the bio-economy

Research at the GLFC will continue to concentrate on these and other problems, helping to ensure that Canada's forests provide ongoing social, economic and ecological benefits for its citizens.

For more information on the projects at the GLFC, visit cfs.nrcan.gc.ca/glfcprojects.

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