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The Great Lakes Forestry Centre (GLFC)

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Canada

New look for GLFC e-bulletin

We have been publishing the GLFC e-bulletin for 10 years. Both the production and delivery methods have become outdated, which necessitated some changes. You will notice that we have a new masthead and that we are using MailChimp® as our delivery system. We hope you like our new look. We are committed to providing you with the latest news from the Great Lakes Forestry Centre and we hope you continue to enjoy receiving the newsletter as much as we enjoy providing it to you.

A Twitter-based tool to report tree pests

Overview

A new citizen science project makes it possible to report the presence of tree diseases and insects using TreeTaggr. The resulting information will be valuable to those studying urban forest pests, for which there is currently very limited data.

GLFC scientist Daniel Doucet collaborated with a colleague at the Laurentian Forestry Centre to create this user-friendly research tool. The approach is to send a picture of a diseased tree, accompanied by specific information, using Twitter. In its first year of implementation, detection of the spread of the emerald ash borer is being particularly targeted. To start, you will need to make sure you are following TreeTaggr on Twitter. For more information on how to report (such as making sure your GPS localisation is activated on your device) follow the TreeTaggr link. You will need to know the name of the tree species, but a key is provided. We look forward to hearing from you on Twitter!

GLFC 70th anniversary

Overview

For 70 years, Sault Ste. Marie has been the site of federal government-led forest research. Acknowledging this occasion allows us a chance to reflect on what we have accomplished. In this issue we look back at some of the key achievements from the last seven decades.

1940s - A spruce budworm outbreak prompts the establishment of the first laboratory.

A forest insect laboratory was opened in 1945 at the corner of Church St. and Queen St. E., north of what was then the Ontario Provincial Air Service Hangars. Its construction was 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 Forest build and maintain the laboratory while the federal government provided staff and equipment. The laboratory was the first of its kind in Canada and developed an international reputation for its pioneering research. Dr. Carl Atwood worked as the first Officer-in-Charge and had a major role in establishing the forestry research program in Sault Ste. Marie.

1950s - Important early work on insect pathogens as biocontrol agents begins.
In 1950, a laboratory for insect pathology was opened at the current location of GLFC. It had a unique design that provided protection against accidental infection from the ongoing experiments with insect pathogens. Construction of additional labs began in 1955 and the new facilities were opened in 1959. The laboratory was renamed the Insect Pathology Research Institute (referred to as IPRI). Scientists having global recognition in their fields were brought in to the lab to start research in the developing area of insect biocontrol. Important early work included demonstrating the potential of insect viruses as biocontrol agents (used against an infestation of European spruce sawfly) and the discovery of the crystal protein in *Bacillus thuringiensis* (Bt).

1960s - Research programs expand to include ecotoxicology, fire and silviculture.
In 1963, research was initiated on the environmental fate of pesticides and herbicides used in forestry, including biological and biorational agents. Novel research projects ranging from laboratory to whole watershed studies were conducted to examine both the direct and indirect effects on forests and the associated wildlife and their habitat.

Forest fire research began in 1968. Fire scientists were instrumental in the development of the Canadian Forest Fire Danger Rating System (CFFDRS), a national system for rating the risk of forest fires that is used by forest fire management agencies in Canada and has been transferred to many other countries.

In this decade, a number of silvicultural studies were initiated. These included the Black Spruce Ecosystem Project, hardwood plantation establishment on former agricultural lands in southern Ontario, white spruce ecology and the Black Sturgeon Boreal Mixedwood Research Project. In addition, the testing of seeding and containerized tree seedling techniques for reforestation of cutover areas in northern Ontario and jack pine ecosystem studies were carried out. This research led to a number of practices for plantation establishment and tree seedling production that are still followed today. There is also a wealth of knowledge in the numerous publications that resulted from this work.

1970s - The Turkey Lakes Watershed research area is established and Dutch elm disease is tackled.
The Turkey Lakes Watershed, a research area 60 km north of Sault Ste. Marie, 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 have continuously been collected there, helping evaluate influences of human activity on the watershed and surrounding forest and measure the effects of climate change.

A Dutch elm disease program began at the IPRI in 1976 at the time that the mortality rate of elms peaked in Sault Ste. Marie. Researchers developed a fungicide and successfully treated individual high value elm trees infested by the disease.

1980s - A virus product developed at the lab is registered for use and new facilities are opened.
In 1983, Lecontvirus®, developed at the Forest Pest Management Institute (FPMI), became the first virus product registered in Canada as a biological control agent. It was highly effective against the redheaded pine sawfly.

The 1980s was a time of expansion and new facilities were officially opened in 1986. A wide variety of projects were being managed at the centre, such as Forest Resource Development Agreements and Aboriginal Programs. As interest in the use of forest biomass was growing, projects on economics and energy from forest biomass began.

1990s - Biotechnology research and long-term soil productivity project begin.
In 1990, a biotechnology program was developed at FPMI, which was identified as one of 14 Centres of Excellence where research with a commercial potential could be carried out. FPMI scientists explored the possibility of using molecular techniques to make naturally occurring insect viruses more toxic and selective in their attack on forest insect pests. The research resulted in three international patents and the development of a safe, modified virus for use against the spruce budworm that was more effective than natural ones.

The long-term soil productivity project began in 1993, initially to determine the effects of biomass removals on soil nutrient budgets, tree growth and long-term productivity. Since then, extensive assessments of the potential impacts of forest management practices on the structure and function of forest ecosystems have been carried out. The holistic approach to assessing forest ecological integrity, and consideration of biodiversity, has 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.

2000s - GLFC scientists receive the Nobel Prize, plant hardiness maps are updated and important wildlife research begins.
In 2007, GLFC scientists who were co-authors of a seminal report by the Intergovernmental Panel on Climate Change (IPCC) received the Nobel Peace Prize for their work. Their research and expertise related to forest fires, insects and forest ecosystems formed part of the report prepared by the global panel.

Starting in the early 2000s, researchers began updating Canada's plant hardiness zones and developed new approaches to mapping the range limits of thousands of North American plant species. In 2014, the updated Canada's Plant Hardiness Zones map was released, significantly enhancing current knowledge of ideal locations for growing shrubs and trees, taking into account possible climate change impacts.

Wildlife studies that assessed the effects of human and natural disturbances on American marten and caribou populations were initiated. A large-scale field study allowed for martens to be captured, measured, and collared in both managed and unmanaged forests. Similarly, over 100 caribou and about 40 wolves were tracked with radio collars over a 3-year period to determine patterns of movement. The knowledge gained from these studies was useful for developing appropriate wildlife protection policy in forest management planning.

2010s - Important research into exotic invasive pests is carried out and new quarantine facilities are opened.

In more recent times, exotic invasive species such as the emerald ash borer (EAB) have become a serious issue. In 2012, the new Insect Production and Quarantine Laboratories (IPQL) were built so research could safely be carried out on exotic pests without risk of insect escape to the environment. GLFC scientists have conducted extensive research to detect the presence of EAB and prevent more damage from its infestation. Most notably TreeAzin®, a botanical pesticide based on extracts from the neem tree, was developed at GLFC and was registered for use against EAB in 2012.

A look at the future - Scientists work collaboratively to solve the problems facing Canadian forests.

What began as collaboration with the province of Ontario has expanded to include forest industry, First Nations, academic institutions, international agencies and others. These liaisons help GLFC researchers address the many challenges still facing Canadian forests, such as invasive pests, climate change, wildland fire risks to communities, characterizing, assessing and monitoring of ecosystem integrity and the responsible development of the bioeconomy. Research at GLFC will continue to concentrate on these and other problems, helping ensure Canada's forests provide social, economic and ecological benefits for its citizens.

Publications of interest

A field guide for vegetation managers now available

Overview

GLFC scientist Dean Thompson contributed to this guide. The GLFC librarian has agreed to take names of those interested in purchasing a copy of the interactive CD.

This field guide is intended to assist vegetation managers and field crews in the identification of plants commonly found on utility rights-of-way and species at risk that may be present. The guide provides vegetation traits, such as potential maximum growth height, to ensure vegetation is compatible with electrical system characteristics. The guide is an essential tool for ensuring the transmission of electricity in a safe, environmentally friendly and economically feasible manner. It will also serve to enhance the integrated vegetation management approaches used in sensitive habitats.

Patterns of human behaviour can improve fire prediction models

Overview

A recent journal article co-authored by GLFC fire scientist Mike Wotton described how factors such as whether it was a school holiday or weekend were used to create a fire prediction model for densely populated areas in Western Australia.

Fire scientists used data from bushfire incidents in the south-west of Western Australia to develop models to predict the number of human-caused bushfires occurring daily. They used weather-based fuel moisture content estimates, day types (e.g., school days, holidays) and data about recent fires to create the model. The model worked reasonably well to predict the incidence of fires, but showed enough day-to-day variability to be of practical use only in the more densely populated management areas, where deliberate ignitions occur. The findings of this study are expected to be of interest to fire managers in regions with Mediterranean-like climates, where fuels can be quite volatile and a variety of practices are used to manage wildfires.

GPS technology used to study caribou and wolves

Overview

Technological advances enable tracking of wildlife across remote landscapes. In recent studies, movement patterns of caribou and wolves were monitored with GPS technology and, for some caribou, also with video cameras.

The movement patterns of 60 adult female caribou fitted with GPS radio collars were monitored at each of two study areas in the boreal forests of northern Ontario. One area was commercially logged over the previous 50 years and the other was not. Researchers expected caribou movements to be influenced by the search for nutrition and avoidance of predators. Researchers found that forage abundance was the strongest influence. The avoidance of predators and moose (areas that

are favourable to moose may attract more wolves and increase caribou predation risk) also had a strong effect on movement, but not for all individuals. This research showed for the first time that caribou rely on sensory inputs from their surroundings as well as on long-term spatial memory to make informed decisions. This information improves our understanding of caribou behaviour.

GPS radio telemetry was used to study 34 wolf packs in winter in northern Ontario to determine which factors influenced their use of space. Researchers found that wolves most frequently used spaces near deciduous, mixed and disturbed stands favoured by moose (the predominant species of prey in their diet) that were in proximity to linear corridors such as shorelines and road networks. The results also suggest that wolves in boreal ecosystems alter their territory size rather than their pack size in response to local variations in habitat quality. This could be an adaptive strategy that balances the trade-offs between the cost of defending territory and the energy required to gain resources. Variation in pack size may be related to other factors such as competition between wolf packs.