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The Great Lakes Forestry Centre (GLFC)

Comings and Goings

New to GLFC is Forest Fire Research Scientist, Dr. Dan Thompson, who came to us from the Northern Forestry Centre in Edmonton, while Forest Fire Research Scientist, Dr. Xianli Wang moved to the Northern Forestry Centre. Recent retirements include Dr. Larry Gringorten, Research Scientist, Physiological Interactions, and Pia Papadopol, who worked on spatial climate modeling and associated data products. In addition, Diana Callaghan has also retired. Diana worked in a variety of areas at GLFC such as the Northern Ontario Development Agreement (NODA) program, the Indigenous Forestry program and assisted in coordination of memorandum of understandings.

GLFC Fire Research Team on fire

Forest Fire Research Specialist Lynn Johnston's journal article in Environmental Reviews received an Editor's choice award in 2020 for her paper on wildland fire risk research. Dr. Xianli Wang's 2017 journal article in Ecological Processes on the "Canadian Forest Fire Danger Rating System R package" received the Highly Cited Paper Award for 2019.

Lynn Johnston's work on wildfire risk is the result of collaboration between researchers from four Canadian Forest Service centres: (Great Lakes, Pacific, Northern, and Laurentian), three universities (Université du Québec à Rimouski, University of Toronto, and University of Alberta), and the Ontario Ministry of Natural Resources and Forestry.

Destructive wildland fire events have been experienced around the world. Effective management of future disasters requires a more comprehensive consideration of wildfire risk.

Despite increasing concern about wildland fire risk in Canada, there is little synthesis of knowledge that could contribute to the development of a comprehensive risk framework for a wide range of values, which is an essential need for the country. With dramatic variability in costs and losses from this natural hazard, there must be more support for complex decision-making under the uncertainty of how to assess and manage risk to coexist with wildland fire. A long history of Canadian wildland fire research offers solid foundational knowledge related to risk, but the key knowledge gaps must be addressed to fully consider risk in a comprehensive manner. Lynn's article, "Wildland fire risk research in Canada", provides a review of the current context in which risk is variably defined, and recommends use of the general paradigm where risk is the product of both the likelihood and the potential impacts of wildland fire. Research related to wildland fire risk is synthesized from the Canadian scientific literature.

Xianli Wang's paper "cffdrs: An R package for the Canadian Forest Fire Danger Rating System" presents an overview of Canadian Forest Fire Danger Rating System (CFFDRS) and highlights some of its functionality.

The CFFDRS is a globally known wildland fire risk assessment system and two major components, the Fire Weather Index (FWI) System and Fire Behavior Prediction (FBP) System, have been extensively used both nationally and internationally to aid operational wildland fire decision-making and studying the relationship between fire and climate change and carbon emissions.

The CFFDRS package provides a portal for R functions supplying all available components in CFFDRS as well as a platform for several other additional developments that are useful for the understanding of fire occurrence and behavior. This is the first time that all relevant CFFDRS methods are incorporated into the

same platform, which can be accessed by both the management and research communities. In particular, the paper demonstrates how these functions could be used for large data analysis.

Other members of the GLFC fire group, namely Alan Cantin and Dr. Mike Wotton, contributed greatly to the publication as well as the R package.

Have decades of fire suppression increased fire risk to Boreal Forest communities?

Researcher Dr. Sandy Erni and colleagues recently published a journal article that evaluated the risk of forests burning near communities.

Recently burned forests are usually less flammable than older forests, but if communities are surrounded by forests that have not burned within the last 30 years, they may be more susceptible to wildfire. In this study, researchers calculated the percentage of recently burned fires within a 25-km radius of communities and compared it to the surrounding regional fire regime zone. An analysis of 160 communities across boreal Canada showed more than half were surrounded by a low proportion of recently burned fires.

The top priority of fire management agencies in Canada is to protect human life and property. In the last 50 years, Canadian forests have experienced changes in fire activity due to several natural and human factors including changing climate, human land use, as well as fire management practices. Each year in Canada approximately $1 billion is spent on forest fire suppression activities. Not all fires can be extinguished, so agencies need to choose which fires to suppress. Some may be left to burn for the benefit of the forest, but can still create issues with smoke, impacting human health.

It is becoming increasingly important to emphasize the use of proactive mitigation strategies to complement the fire suppression system. Education is important and homeowners can practice prevention strategies such as keeping roofs clear, cleaning up brush and pruning. Prescribed burning, with small, low intensity fires in the spring and fall can reduce the risk of fire spread and large fire breaks can also be a way to avoid large fires advancing into communities. In some areas, introducing more deciduous trees in boreal forest communities can be helpful.

The study confirms the need for a more comprehensive wildland fire management strategy that focuses not only on protecting human life and property, but takes into account community vulnerability to wildland fire. For the complete study, "Fire deficit increases wildfire risk for many communities in the Canadian boreal forest", or contact Sandy Erni for more information.

Cumulative effects research

GLFC researcher Dr. Lisa Venier was one of the speakers for a special, national e-lecture series to celebrate the 100th anniversary of National Forest Week in September. She gave a presentation on Scientific Considerations and Challenges for Addressing Cumulative Effects in Forest Landscapes in Canada.

The goal of the Cumulative Effects research program is to understand the impacts that multiple resource development activities (forestry, oil and gas, mining) are having on forest ecosystems, and improving the environmental performance of natural resource sectors. Traditionally, forest management has focused on forestry-related practices while other industries have been managed separately. Forest management requires the integration of all natural resource development activities, along with other anthropogenic

and natural forest disturbances (e.g., climate change, pollution, wildfire, pest disturbance) to understand how human activities can change forested ecosystems. The term cumulative effects has been used to describe these attempts to integrate all disturbances to develop an understanding of past, current and future impacts on environmental, social and economic components of the system.

Cumulative effects science is a simple concept but extremely difficult to implement due a lack of ground-based environmental response data at large scales. Open data, large scale monitoring, data integration, citizen science, new technologies and expert knowledge can all help to address this limitation. A multidisciplinary approach that allows for continuous improvement will be necessary to enhance cumulative effects science.

For further information, contact Lisa Venier. To access her talk, "Scientific Considerations and Challenges for Addressing Cumulative Effects in Forest Landscapes in Canada" or her paper "Early avian functional assemblages after fire, clearcutting, and post-fire salvage logging in North American forests" on our publications website.

How do small lakes regulate flow of forested streams?

Forest hydrologist, Dr. Jason Leach carried out a study to better understand how small lakes influence downstream flow and what this means for water quality of forested catchments.

There are an estimated 110 million small lakes in the world and these lakes are known to influence downstream water quality; however, few studies have addressed the underlying hydrology of these systems and how small lakes influence downstream flow or how far downstream these influences persist. A better understanding of forest hydrology, including the role of small lakes, is crucial for developing effective management strategies for forest ecosystems and their water resources.

The study showed that catchments with small lakes sustain baseflows compared to catchments without lakes. Small lakes also have limited influence on the magnitude and timing of flood events, except for immediately downstream of the lake where floods are characterized by low magnitude but long duration. In terms of lake influence on water quality, they found that streamflow contributions from the small lakes can persist many kilometers downstream and be detectable when the lake makes up less than 1% of the catchment area. In addition, lake influences on downstream discharge can vary considerably over time; therefore, it is important to consider the influence of small lakes when interpreting water quality observations made downstream of these waterbodies.

For more information, contact Jason Leach or read the full article "Headwater lakes and their influence on downstream discharge" on our publications website.

Forest tent caterpillar population starting to show decline in northern Ontario

Forest tent caterpillar is a native defoliator that causes extensive damage to hardwoods throughout Canada. During an infestation, the large number of caterpillars can be a nuisance but populations collapse naturally after a few years.

Forest tent caterpillars defoliated 4.8 million hectares of Canadian forest in 2015. In particular, there were large outbreaks recorded in aspen stands in the provinces of Alberta, Ontario and Quebec. This insect can cause serious damage through the widespread eating of leaves and shoots. Repeated defoliation can weaken trees and make them more vulnerable to various stresses, such as drought or infestation by other insects.

Communities in northern Ontario have been overwhelmed by forest tent caterpillars since 2016. However, according to the Ministry of Natural Resources and Forestry provincial monitoring officials, 2020 will likely be the last year that this region sees the native insects in such numbers. There is a natural collapse of the population starting to happen. Forest tent caterpillar outbreaks occur every 9-13 years. They typically last 1-2 years, but tree mortality only occurs when outbreaks occasionally last for up to six years before going dormant for a decade.

GLFC entomologist Dr. Amanda Roe spoke to local media and explained how forest tent caterpillar outbreaks are an expected part of boreal forest ecology and are considered a natural disturbance, just like fire. Widespread outbreaks have been recorded in much of the boreal forest since the 1930s. For more information on this insect read our publication, "Forest Tent Caterpillar" that explains the life cycle, natural control mechanisms, and suggest what can be done by homeowners or forest managers. Photos to aid in identifying the three native tent caterpillar species are included.

World on Fire podcast

The Canadian Broadcasting Corporation (CBC) ran a series of podcasts with the title "World on Fire" that looked at new innovations at the forefront of wildfire management.

The CBC ran a series of podcasts with the title "World on Fire" that looked at new innovations at the forefront of wildfire management. GLFC fire scientist, Dr. Josh Johnston discussed WildfireSat, the mission that will be launched sometime in 2025 by the Canadian Forest Service in collaboration with the Canadian Space Agency and Environment Canada. The satellites will monitor and relay information about fires in real time. Visit World on Fire to listen and look under "bonus content".

Recent Publications

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