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e-Bulletin

The Great Lakes Forestry Centre (GLFC)

Comings and Goings

GLFC congratulates Claudette Trudeau, who was the successful candidate for the Director for Partnerships, Planning and Operations and began her role in January 2023. Claudette was formerly GLFC's Policy Advisor and has over 31 years working in the Federal Public Service with various federal departments.

How large do intact forest landscapes need to be?

In a recently published paper, Dr. Lisa Venier and colleagues used computer modelling to examine this question for species such as caribou, that have large area requirements.

Conserving large intact forest landscapes (IFLs) is one forest management strategy to mitigate industrial impacts on the environment. Measuring how much IFL we have at the national level has also been proposed as a way to assess the conservation status at global scales. But how big does an intact forest need to be to provide conservation value to species with large area requirements like caribou? And how big does an intact forest need to be to provide a continuous supply of old forest habitat in a fire-prone landscape that is frequently burned?

These are the questions that Dr. Venier and her team set out to answer with a computer simulation experiment. The simulation showed that intact forest landscapes need to be bigger where there is more fire, and that larger landscapes are needed to maintain older habitat. Some of the most fire-prone landscapes in Canada are at high risk of not maintaining the 65% of forest >40 years old that research suggests that caribou need. The Annual Area Burned (AAB) is a common measure for how fire prone a landscape is, and this number is expected to go up almost everywhere as the climate warms. These simulations suggest that IFLs will need to be even bigger in the future to meet habitat targets, and there is an indication that some regions under climate change will not be able to meet habitat targets regardless of how big IFS are. This information should be useful in assigning priority to individual caribou ranges for conservation effort and should help identify regions that are susceptible to loss of old forest.

Read the complete article on Size requirements of intact forest landscapes for effective biodiversity conservation under regional fire regimes and climate change or contact Lisa Venier for more information.

Indigenous perspectives on the role of fire in the boreal forest of North America

GLFC's Heather Macdonald, an interdisciplinary social scientist, recently co-authored a report published by the Northern Forestry Centre that examined how Indigenous people used fire on the landscape.

Indigenous perspectives have often been overlooked in fire management in North America. With a focus on the boreal region of North America, this paper provides a review of the existing literature documenting Indigenous voices and the historical relationship of Indigenous peoples in northern North America to fire and landscapes that burn.

Early research on the topic explored how Indigenous people used fire in the boreal forest, with most research coming out of case studies in northern Alberta. Emerging research in the last two decades has broadened the geographic focus to include case studies in Alaska, Ontario, Labrador, and other regions in North America. This broadening of focus has shown that the diversity of Indigenous peoples in North America is reflected in a diversity of relationships to fire and landscapes that burn. Of note is an emerging interest in Indigenous fire knowledge in the wake of settler colonialism.

Indigenous peoples in the boreal forest have applied fire on their landscapes to fulfill numerous objectives for thousands of years. More than a tool, Indigenous peoples in the boreal view fire as an agent, capable of movement, destruction and creation, acting on the landscape to create order, within a living, connected environment. Unfortunately, restrictions on the application of Indigenous fire knowledge and practice initiated during early colonial times remains a contemporary challenge as well.

Read the full report on Centering Indigenous voices: The role of fire in the boreal forest of North America or contact Heather Macdonald for more information.

A case study to improve understanding of knowledge exchange for wildland fire management in Canada

Colin McFayden and colleagues recently completed a study to identify key factors in the successful implementation of the Canadian Forest Fire Danger Rating System (CFFDRS) to better understand how new innovations could be successfully integrated into current fire management operations.

The impacts of wildland fire are increasing and managing fire is growing in complexity. While there is recognition of the need for science and innovation to support fire managers in Canada, integrating science into operational fire management is not easy or straightforward. However, its adoption and successful integration is of increasing importance, given the high stakes of managing fire.

Knowledge exchange (KE) is critical to better understand fire management problems, design research, and tailor solutions to local needs. KE should be an overarching system where problems are understood, and knowledge is created and shared by both researchers and practitioners. Factors that help or hinder this process need to be identified and assessed. To improve understanding of these factors in the context of Canadian fire management, the KE team looked at one of the most successful implementations of wildland fire science in Canada, the Canadian Forest Fire Danger Rating System (CFFDRS).

Through a case study, semi-structured interviews with principal Canadian Forest Service researchers and Ontario fire management practitioners active in development and implementation of CFFDRS from the late 1960s to 2010s in Ontario were carried out. The findings showed that participants were most likely to associate successful implementation with informal facilitators such as personal relationships, shared field-based experiences, and opportunities for dialogue between researchers and practitioners. Critical to success were the credibility and soft skills of the knowledge brokers, early engagement, and consideration of training needs for end users in the design of products. Retrospectively looking at the CFFDRS success will inform the approaches taken to help wildland fire management deal with present and future challenges. Importantly, this study was a collaboration between the Ontario Ministry of Natural Resources and Forestry and the Canadian Forest Service, an undertaking of KE itself.

Read the full publication "A case-study of wildland fire management knowledge exchange: the barriers and facilitators in the development and integration of the Canadian Forest Fire Danger Rating System in Ontario". Contact Colin McFayden for more information.

GLFC hosts Waterlution workshop

In the summer of 2022 the Water Innovation Lab held a workshop focussed on the Great Lakes and selected Sault Ste. Marie as a highlight location.

Waterlution is a non-profit organization that aims to raise awareness about water issues. Water Innovation Labs are held to encourage innovation in water science and entrepreneurship. Dr. Erik Emilson hosted a team at the Great Lakes Forestry Centre, where he gave an overview of our water research and technology, taught participants about forest-water issues in Canada in general, and discussed how forest changes are affecting water and aquatic ecosystems in the Algoma region. The participants had a chance to tour the water laboratories and to meet scientists and technicians within the Watershed Ecology Team. Waterlution also created a video (English only, login required) as part of their World Water Journey Series that featured the Turkey Lakes Watershed Study.

Dr. Kara Webster narrated the video and provided a field tour to the Turkey Lakes Watershed to talk about the history behind the long-term monitoring project. The Turkey Lakes Watershed Study was established in 1979 to study the effects of acidic pollutants on the forest and water ecosystems. At that time, the location near Sault Ste. Marie was one of a series of watersheds studies that were set up across Canada. Initially intended to be a five-year study, 43 years later important data has been collected about the status and function of this ecosystem.

Kara talked specifically about one of the good news stories that has come out of the long-term monitoring and research at the watershed that has helped to inform environmental policy. Acid rain was identified as a major problem affecting our terrestrial and aquatic ecosystems in the 1970s. Monitoring at the Turkey Lakes Watershed and other watersheds across eastern Canada and the US showed the severe impacts of deposition of acidic pollutants on soil, water, vegetation and wildlife. At Turkey Lakes, the whole mass balance of what is happening in the forest ecosystem is measured: the inputs of precipitation and deposition of pollutants and how those nutrients transfer into the soils, cycle within the soils and are taken up by vegetation, and

finally the export of those nutrients and pollutants into the water, the lakes, and eventually into Lake Superior. The research findings synthesized across many watershed studies led to changes in environmental policy, specifically the establishment of the Clean Air Act. Since its implementation in 1971, requiring industries to put scrubbers and other emission abatement technologies on their towers, there has been a decline in acidic deposition.

Over the course of the study, deposition loads onto the ecosystem have decreased, but recovery within the forest and lakes takes a lot longer than what is happening in the atmosphere. Over the 43 years, the monitoring has enabled an examination of how the effects of acidification recovery interact with other changes happening in the environment, such as changes in the climate and changes in land use, including forest harvesting and other disturbances. Understanding recovery has been complicated by understanding how these other stressors or disturbances interact.

For more information contact Erik Emilson or Kara Webster and visit the Turkey Lakes website.

Forest Biosecurity in Canada – an Integrated Approach

At the 2022 Forest Pest Forum, Dr. Jeremy Allison gave a presentation that outlined the regulatory framework for forest biosecurity within Canada, including case studies of species that have invaded Canadian forests.

The Food and Agriculture Organization of the United Nations (FAO) defines biosecurity as "a strategic and integrated approach that encompasses the policy and regulatory frameworks for analyzing and managing relevant risks to human, animal and plant life and health, and associated risks to the environment". Canada's forest biosecurity policy and regulatory frameworks are governed under a number of international agreements, and federal and provincial legislation. For example, the Invasive Alien Species Strategy for Canada identifies four priorities for protecting domesticated plants and animals and conserving native species: (i) prevention of new invasions; (ii) early detection of invaders if prevention fails; (iii) rapid response to new invaders; and (iv) containment, eradication and control of established and spreading invaders.

Together, the CFS, CFIA, provincial and territorial governments, as well as municipal and indigenous governments, work to manage and protect Canada's forests with responsibilities at different levels. The federal government is responsible for international safe trade of forest products and federal lands and parks, the provincial and territorial governments are responsible for the management of forest pests, promoting forest health while managing sustainable harvest volumes and governing agreements with forest harvesting companies including mandating requirements for regeneration of harvested areas by harvesting companies. Municipal governments have a role in managing invasive species in urban environments, which is key to preventing the establishment of invasive forest pests in natural areas adjacent to cities. Given the breadth and diversity as well as the ecological and economic importance of Canada's forests, forest biosecurity in Canada is constantly evolving and improving.

As most non-native species in forest ecosystems have been introduced accidentally, invasive species management programs in Canada focus on prevention and emphasize pathways and commodities with historically high propagule pressure. One important pathway for invasive forest pests, particularly bark and woodboring insects, has been dunnage and wood packaging

material and it is thought that both the Asian longhorned beetle and emerald ash borer invaded North America this way. As a result, the International Plant Protection Convention implemented regulation ISPM-15 in 2009, requiring phytosanitary treatment of wood packaging material moving in international trade. Another high-risk pathway is imported live plants and in recognition of this many governments (including Canada) regulate this pathway.

Our knowledge of the pathways involved in the invasion of forest ecosystems in Canada is primarily based on border interception records, risk assessments for pests and pathways, surveillance programs, and participation in international research networks (e.g., the International Forest Quarantine Research Group). Although these are valuable sources of information, they have limited predictive power. For example, although the bark beetle *Ips typographus* L. has been intercepted hundreds of times by North American authorities, it has never established in North America. While policies developed for prevention have reduced propagule pressure, it is not possible to completely close all pathways and as a result, invasions continue to occur. Further, although these policies result in reductions in propagule pressure, concomitant increases in trade volume offset these reductions.

Two mechanisms that likely contribute to the success of many invasions of forest ecosystems are enemy release and lack of host resistance. Understanding which mechanism(s) contribute to the success of an invasive species has important management consequences. Classical biological control has clear potential as a management option when enemy release is involved.

Tree breeding for the development of resistance is the dominant management strategy when naïve hosts are involved. Both biological control and tree breeding are considered when the pest has become established and eradication is no longer possible (i.e., the emerald ash borer). The lack of resistance appears to be most common among species that have a close association with their host, like tree pathogens and bark and woodboring insects. For example, the emerald ash borer has caused significant damage to naïve ash trees in North America. The objective of classical biological control is often the establishment of lower equilibrium population densities of the invasive species, while the breeding and careful planting of resistant trees attempts to restore forest ecosystems.

Contact Jeremy Allison for more information.

Recent Publications

The most recent State of the Forest Report is now available. This annual report provides an accurate, comprehensive and authoritative source for information on Canada's forests and forest sector. Information published within the report is comparable to that reported by other countries participating in the Montréal Process. Canada also uses some of this information to report on United Nations Sustainable Development Goals and the United Nation Global Forest Goals.

Publications

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