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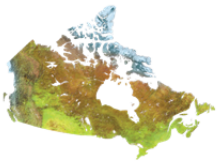
The Great Lakes Forestry Centre (GLFC)



Trends toward more extreme fire seasons in northwestern Ontario detected

Overview

Fire and weather are strongly linked; day to day changes in weather can strongly affect fire activity. Over the long term, changes in weather patterns and climate will influence fire activity. A recent study by a group of statisticians and forestry researchers (including scientists from GLFC) examined trends in fire activity over the past 4 decades for a region of northwestern Ontario. They found an increase in moderate and extreme fire activity, which was correlated with changes in soil moisture and overall atmospheric temperature.

Fire is a frequent occurrence across Canada, burning 2 million hectares of forest annually. The amount of fire activity in a region is strongly linked to the weather. Hot and dry weather will lead to heightened fire activity. Many studies have examined links between climate change and fire and made inferences about the future. Historical fire activity is often studied to look for early impacts of a changing climate; however conclusions from such studies can be convoluted because of changes in land and recreation use patterns (and their influence on fire ignitions), fire detection effectiveness and fire management zoning.

In this study, researchers examined lightning occurrence over the previous 47 years for an area of northwestern Ontario (portions of the Rainy River and Lake of the Woods ecoregions) that has seen active detection and suppression of fires since the early 1900s. Researchers focussed only on the 50% of fires caused by lightning and the study was designed to limit the effect of any trends in ignitions due to changing human use of the forest. The study examined risk of lightning fire and divided weekly fire activity into three risk categories: no risk, regular and extreme.

Analysis showed that there has been an overall decrease in the occurrence of the lowest risk (nil) category and a corresponding increase in the likelihood of the occurrence of regular and extreme risk of lightning fire occurrence. Overall, the risk of lightning fire occurrence has increased by about 15% over the study period. The study also explored some of the known causal drivers of lightning fire occurrence using weather data from an Ontario Ministry of Natural Resources and Forestry fire weather station at Kenora. Frequency of occurrence of the extreme risk category in a year was positively correlated with anomalies in both seasonal air temperature (average air temperature is a rough indicator of lightning activity - a warmer atmosphere leading to increased lightning) and Duff Moisture Code (an indicator of the receptivity of the forest floor to ignition from a lightning strike, estimated from the Canadian Forest Fire Danger Rating System).

One of the unique aspects of this study was a “power study” which looked at how much confidence there should be in the statistically significant results. This is an important but often overlooked component of studies. Power is a measure of how confident one is that a statistically significant result is in fact significant and thus potentially physically meaningful. While the trends to fewer nil risk days and more regular and extreme risk days were marginally statistically significant, the power of the test was relatively low (about 20%). Further analysis revealed that in about 15 years, there will be enough data collected that the power of this test should be closer to 80%.

Collaboration between the Canadian fire research community (both academia and the CFS) and the statistical community has been ongoing since about 2005 and has seen an increased application of modern statistical techniques onto practical forestry and fire related problems. It has received significant multi-year funding from sources such as the National Program for Complex Data Structure, and the GEOIDE (GEOmatics for Informed DEcisions) and MITACS (Mathematics of Information Technology and Complex Systems) networks within the Canadian National Centres of Excellence program. Through this sponsorship, the research group has held numerous funded workshops at locations such as the Fields Institute in Toronto and the Banff International Research Station (BIRS) in Alberta. The most recent of these was a weeklong workshop at BIRS on "Managing fire on populated forest landscapes" in the fall of 2013. The overall goal of this initiative is to bring scientists from these two disciplines together, along with fire and forest managers, to address relevant problems. It has provided the opportunity for fire scientists and managers to learn about and begin to use state of the art statistical methodologies in the development of new models and decision support tools, and has also allowed a sizeable group of statisticians to gain domain knowledge of forestry and fire related systems. It has also provided advanced training in both forest and statistical science to numerous graduate students.

For more information about this study or the ongoing collaboration with the statistical community please contact Mike Wotton.

Hemlock woolly adelgid recently discovered in Ontario

Overview

Several eastern hemlock trees infested by the hemlock woolly adelgid were recently discovered at two locations in Ontario. CFS research efforts currently underway focus on the development and improvement of early detection tools and delimitation protocols for this alien invasive insect.

The discovery of hemlock woolly adelgid in Etobicoke and in the Niagara Gorge is important because it could signal the early phase of a natural range expansion from populations observed in New York and northern New England. This insect can kill eastern hemlock in the understory of riparian habitats in as little as four years. These detections highlight the need to prepare for the eventual establishment of hemlock woolly adelgid in eastern Canada. CFS research efforts will likely include risk analysis (to identify potential points-of-entry) and may help determine the long-term costs and benefits of early detection of and intervention against new invasions. To learn more about this insect, read the soon-to-be published HWA Frontline Technical Note, where information on its life cycle, signs and symptoms of injury, impact on ecosystems, control options, dispersal and detection is presented.

GLFC scientist contributes to neonicotinoid study

Overview

GLFC research scientist Dave Kreutzweiser contributed to a series of papers on behalf of the Worldwide Integrated Assessment (WIA) on Systemic Insecticides. He was part of a group of independent scientists that examined the environmental effects of neonicotinoids (commonly referred to as "neonics"). There has been a lot of interest in this review due to the possible link between the use of neonics and the decline of honeybee populations.

Dr. Kreutzweiser is an ecotoxicologist whose expertise was sought due to his research on the effects of various pesticides on ecosystem functioning and specifically his work on assessing environmental effects of the neonicotinoid insecticide imidacloprid, which is registered for use against emerald ash borer in Canada but not presently used He is one of four Canadians on this special task force and the only one from the Government of Canada. In this intensive study, a group of 29 independent scientists from 10 countries completed a comprehensive analysis of 800 peer-reviewed studies on neonics. This group of pesticides is one of the world's most widely used classes of insecticides, particularly in agriculture, and is approved for use in 120 countries.

Major findings of the study are:

1. The use of neonicotinoid insecticides has increased rapidly over the last decade and currently accounts for about one-third of the total global insecticide use.
2. Neonics are regularly found in many environmental compartments (e.g., dust, soils, water, plants, pollen and nectar) and are often persistent for months to years, especially in agricultural areas.
3. There is a growing body of evidence showing that this contamination poses a high risk of ecological impacts. While considerable media attention has been paid to the effects of neonics on honeybees, the WIA shows that there are serious environmental risks beyond the issue of honeybee decline.
4. Because neonics are widely used, highly toxic to a broad range of non-target organisms and often persistent, they cause negative effects on critical ecosystem functions such as pollination services to food crops and nutrient cycling in soils and water bodies.

The authors recommend that policy makers recognize potential risks to biodiversity and consider applying precautionary principles to further tighten regulations on theses pesticides, which are routinely applied as a precautionary measure rather than in response to a pest outbreak or a potential economic threat.

There is one neonicotinoid insecticide – imidacloprid – registered for forestry use in Canada, but its use in forest pest control is currently very limited and therefore the environmental exposure and risk from the forestry use of this neonicotinoid in Canada is negligible.

Dr. Kreutzweiser has co-authored six papers that will be published in the Environmental Science and Pollution Research journal. To learn more about the results of the study, read the concluding article: Conclusions of the Worldwide Integrated Assessment on the risks of neonicotinoids and fipronil to biodiversity and ecosystem functioning".

New biological control product for annosus root and butt rot

Overview

The Pest Management Regulatory Agency has just accepted the registration of the biological control product "Rotstop C" for annosus root and butt rot in Canada, thanks to the work of Canadian Forest Service scientists.

Retired research scientist Mike Dumas and his colleague Gaston Laflamme of the Laurentian Forestry Centre spent many years investigating annosus root and butt rot (*Heterobasidion irregular* - formerly known as *Fomes annosus*). Their work to develop a biological control product has paid off with the registration of Rotstop C (Canadian isolate), based on the naturally found fungus *Phlebiopsis gigantea*. In the past, freshly cut stumps were treated with borax or urea to discourage spread of the disease, but due to environmental concerns this practice has been discontinued. Rotstop C will help protect pine plantations from this aggressive pathogen. To learn more about annosus root rot, read the GLFC Frontline Express Note on this topic.

An uneven-aged management approach to black spruce

Overview

In certain black spruce stands, uneven-aged management may be a suitable management method. Art Groot, scientist with the Canadian Wood Fibre Centre, has been experimenting with this approach for the past 15 years.

Experience with uneven-aged management in Canadian boreal forests is very limited, but it has been successfully carried out in Europe. Certain black spruce stands on peatland sites may be suited to uneven-aged management due to their irregular structure. In 1994, an uneven-aged silviculture experiment was established in second-growth peatland black spruce stands in the boreal forest of northeastern Ontario. Three levels of harvesting intensity were tested. Fifteen-year results indicate that light- and medium-intensity harvest treatments (35-50% basal area removal) maintain a stand structure that is suitable for continued uneven-aged management. A cutting cycle of 20–25 years is recommended to maintain this type of harvest. Future harvests are expected to yield a higher proportion of larger diameter trees with a greater value, which will increase the financial return of uneven-aged management over time. These results indicate that uneven-aged silviculture is applicable in peatland forests with irregular structure. For more information read Art's most recent journal article:

Fifteen-year results of black spruce uneven-aged silviculture in Ontario, Canada.

Upcoming Webinars

On September 23, 2014 scientist Krista Ryall will talk about advances in knowledge regarding the pheromone ecology of emerald ash borer, which can be used to improve early detection and management programs for this invasive insect.

On November 18, 2014 ecologist Ken Baldwin will present a webinar entitled: "A new classification of boreal forests in Canada: an update on the Canadian National Vegetation Classification".

Subscribers to the GLFC e-Bulletin will receive an e-mail notification with complete details in advance of these webinars. Both presentations will take place at 1:30pm EST.