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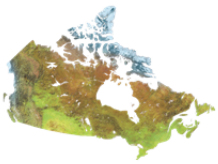
The Great Lakes Forestry Centre (GLFC)



Phil Reynolds obituary

Overview

GLFC is sorry to lose one of the scientists from the Fire and Climate Change team.

We regret to report that Dr. Phil Reynolds passed away December 19, 2013. The late Dr. Reynolds worked for the Great Lakes Forestry Centre as a research scientist for over 30 years. A native of Ohio, he completed his Bachelor of Arts degree at Ohio Wesleyan University and his Doctor of Philosophy from Yale University's School of Forestry & Environmental Studies. He joined the Canadian Forest Service as a research scientist in 1983. His career with the federal government began with the study of herbicides. Since 2004 he was involved in climate change research, examining the exchange of carbon dioxide between trees and the atmosphere. His work involved measuring the sapflow in trees of various ages and species to help understand how forest management affected net carbon dioxide in the forest environment. Visit the publications website to learn more about his work.

Webinar Report: Turkey Lakes Watershed

Overview

Scientist Fred Beall reported on 30 years of ecosystem monitoring at the Turkey Lakes research site.

On November 19, 2013 Dr. Fred Beall presented a seminar entitled: "Lessons from the long-term: forest ecosystem change at Turkey Lakes Watershed". He outlined the collaborative research, involving government, industry and academia, that has been taking place for the last 30 years at the site, documenting environmental change in a "living laboratory". The site was originally established to study the effects of acid rain, but it has also been used to monitor climate change and effects of forest harvesting. Such research and monitoring is necessary to identify long-term trends and understand ecosystem response to multiple influences.

Climate observations show that the temperature has been increasing at the rate of about 1°C per decade, precipitation and runoff are declining, days with no streamflow are increasing and the duration of ice cover on lakes is decreasing. These changes have resulted in decreased forest growth overall, but the strength of the effect varies by topographic position. Considerable work is still required to understand how ecosystem components and processes are responding to the individual impacts and their collective effects.

The results of this work have been instrumental in the development of environmentally responsible Forest Management Guidelines in Ontario. In addition, they have been used to inform government of Canada policy on air quality issues and climate change impacts.

To access the presentation go to the NRCan ftp site.

Webinar Report: TreeAzin for ALB

Overview

Researcher Dean Thompson brings us up to date on the research being carried out to support the registration of TreeAzin for control of Asian longhorned beetle.

On January 21, Dr. Dean Thompson presented a webinar entitled: TreeAzin versus ALB – what we know and what we don't know. Dean outlined the work his team has been doing on testing TreeAzin on larvae and adults of Asian longhorned beetle (ALB) under quarantine laboratory conditions. TreeAzin is a natural systemic insecticide derived from the neem tree that can be injected into trees to control wood boring insects. It has recently been registered for use against emerald ash borer and shown to be effective in protecting high value ash trees. Scientific research is now focused on investigating whether similar potential exists for ALB with a view to obtaining a label expansion that would allow use within integrated pest management programs for ALB should it become established in Canada. This invasive alien pest was reported in Canada for the first time just outside of Toronto in 2003, and a large-scale eradication program was undertaken at that time. Infested trees and those at risk were removed to contain the infestation. In 2013 it was considered eradicated as there had been no reports of ALB for five years. However, recent reports indicate a new infestation has arisen. Since ALB attacks many species of hardwoods, most notably maples, the ecological and economic consequences would be devastating if this invasive insect became established and began to spread through our southern deciduous forests. Having a botanical insecticide available to integrate with other potential control and mitigation techniques could assist in both early intervention aimed at containment and protection of high value trees in urban forests, parks, conservation areas, etc. As a non-persistent systemic insecticide with relative safety to non-target organisms, TreeAzin represents the tool with the greatest likelihood of success in mitigating at least some of the potential negative impacts from this potentially devastating pest in Canada. Laboratory results demonstrate significant growth inhibitory effects on ALB larvae as well as inhibitory effects on reproduction of mating adult pairs. Field testing under typical use scenarios is now required to see if these results would translate into localized population control and protection of high value trees under real world conditions. To access the presentation go to the NRCan ftp site.

Webinar announcement

The next webinar in the series will take place May 13, 2014 at 1:30pm. Dan McKenney will speak about recent updates to the Plant Hardiness Zones. (See related article in this issue.) Subscribers to the GLFC e-Bulletin will receive an e-mail notification with complete details in advance of the webinar.

Updated plant hardiness map

Overview

The Economic Analysis and Geospatial tools group at GLFC recently released a revised Plant Hardiness map. Check out the new map to see if your community has experienced a shift in its hardiness zone.

A new map of the plant hardiness zones of Canada has been developed using climate data for the 1981-2010 period. In comparison to the original hardiness zone map, which was developed about

50 years ago, many locations have experienced an increase of one or more hardiness zone designations (e.g., from zone 3a to zone 4a) – with the largest shifts occurring in western Canada. A new version of the USDA plant hardiness map, which is based on extreme minimum temperature, has also been developed for Canada. Here again, shifts toward warmer hardiness zones were observed over western Canada, with little change (or even declines) in parts of eastern Canada. These maps, and the implications of shifting hardiness zones for human and natural systems, are discussed in a recent article in the journal BioScience, which can be found on the publications website.

Could mountain pine beetle survive in Ontario?

Overview

Entomologist Chris MacQuarrie has initiated a study to determine the likelihood of survival of mountain pine beetle (MPB) in northwestern Ontario.

The study area lies in the most likely path of the insect, if it were able to spread that far east. Sensors have been placed beneath the bark of the bark of red, white and jack pine trees to monitor minimum winter temperatures, which are expected to be a good indicator of survival of MPB. Temperatures that fall below a threshold level will likely prevent the insect from becoming established in Ontario. The data collected will be used in modelling exercises to predict potential insect spread. The information may also be useful in studies of future scenarios under climate change. For more information contact GLFCweb@nrcan.gc.ca.

GLFC scientists contribute to assessing the state of Canada's boreal zone

Overview

A comprehensive review of the effects of natural resource development activities on aquatic biodiversity has recently been published.

In 2010, the CFS initiated a review to assess the current state and future projections for the Canadian boreal zone. The intent of the review, which involved more than 60 CFS scientists, was to create a body of sound scientific literature which could be used to guide policy decisions and investment in future programs. The work will culminate in 12 review papers, the first five of which have been published on-line by Environmental Reviews. GLFC scientists collaborated on a paper that reviewed and offered a prognosis of the impacts of natural resource development on aquatic biodiversity. The comprehensive review summarized the literature on recent and current impacts of forest management, pulp and paper production, metal and mineral mining, hydroelectric generation, oil and gas development, and peat mining on organisms living in streams, ponds, and wetlands across boreal Canada. The reviewers identified several activities that continue to pose risks of harm to aquatic organisms by habitat alterations and contamination of water bodies from sediments, effluents, toxic seepages, and emissions. Some problem areas identified include some pulp mills, older and abandoned metal mines, large hydroelectric installations, continuing emission-related acidification, and oil sands development. While many of these risks can be reduced by the use of new, greener technologies and conservation regulations, the effectiveness of those mitigation efforts cannot yet be evaluated from the published literature. The authors recognized that an improved understanding of the risks to aquatic biodiversity posed by resource

development activities, especially the cumulative impacts of resource development, is needed as well as more reliable information on the recent status of various indicator species. Forecasting the future state of aquatic biodiversity across the boreal zone is challenged by increasing natural resource development and its interactions with other stressors, especially climate change. Ecological thresholds (that is, the point at which aquatic ecosystems and their biodiversity cannot recover to a desired state within a reasonable time frame) are also unknown and remain gaps in our knowledge. To read this review and associated articles, visit the publications website.

Research collaboration between Forestry and the Oil and Gas sector

Overview

A unique collaboration is taking place between NRCan scientists and the oil and gas sector. This collaboration also involves academia, other government agencies and a variety of stakeholders. Specifically, the expertise of soil scientists and ecologists from GLFC is being sought to enhance land reclamation activities in the Alberta oil sands.

One of the regulatory requirements of oil sands mining is that land be restored to "equivalent land capability". Much of the area that makes up the oil sands of northern Alberta is within the boreal forest, so the Canadian Forest Service, as a world leader in boreal ecosystem science, is interested in contributing to improved environmental performance of resource development occurring in this area. Currently over 70,000 ha of land has been disturbed by surface mining for bitumen, which is a heavy, viscous form of crude oil, and will require reclamation before mine closure. Surface mining of bitumen requires that areas of land are cleared of trees and brush; the top soil and clay are then removed to expose the oil sand. This method is applicable to only a small portion of the total bitumen deposit (3%), where the bitumen is close to the surface. Where the bitumen is buried more deeply (~97% of bitumen deposits), *in situ* extraction techniques are used, whereby steam is injected into the bitumen deposits to separate the viscous bitumen from the sand and allow it to be pumped to the surface. While *in situ* techniques do not require the intensity of disturbance to the environment that surface mining does, it is occurring over a large area and creating a pattern of linear disturbances and small cleared patches on the landscape. The impacts of these extensive disturbances are not clearly known and mitigation measures are needed. There is a currently a need for reclamation of greater than 50,000 ha from this technique and this number is expected to increase rapidly as *in situ* extraction becomes the dominant form of bitumen extraction.

Some of the projects that GLFC scientists will be involved in include: the establishment of baselines to quantify the key characteristics of natural ecosystems (such as vegetation community structure, soil processes and biodiversity) to assess reclamation progress; the identification of key indicators to assess ecosystem structure and function at the landscape scale; and developing knowledge and tools to assess cumulative effects at the regional scale.

Some of the expected outcomes of this work include: demonstration sites of best practices (for uplands, riparian zones and wetlands); improved production of a greater diversity of planting stock, including herbs, shrubs and trees; decision support tools for landscape design; and ecosystem trajectory predictions for different practices as well as for a changing climate.

Another aspect of this collaboration is to encourage greater use of forest bioproducts by the oil and gas industry, which will serve to enhance forest sector competitiveness and reduce GHG emissions. For more information contact GLFCweb@nrcan.gc.ca.