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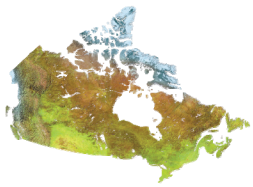
e-Bulletin

The Great Lakes Forestry Centre (GLFC)



Recently retired GLFC forest pathologist wants to "Rotstop" root rot

Overview

Over the course of GLFC scientist Mike Dumas' career, he studied pathogens that affect trees. His most recent work may contribute to the potential Canadian registration of Phlebiopsis gigantea (currently used in Europe and sold under the name Rotstop®) as a natural control agent for Annosus root rot in pine plantations. This pathogen, which causes root and butt decay, leads to tree mortality and is currently a concern in red pine plantations of eastern Canada. He has tested the effectiveness of this natural control agent under field conditions and developed methods for its long term storage.

Heterobasidion irregulare (formerly known as *Fomes annosus*) is a basidiomycete, a class of fungus that forms specialized spores called basidiospores to reproduce. Spores are released throughout the year and the disease is spread primarily by spores landing on freshly cut stumps after a stand is thinned. For this reason, a preventative stump treatment is recommended after thinning. Borax was used extensively as the control method in Ontario, but is no longer registered for use due to environmental concerns. There is interest in using a biological agent, such as the fungus *P. gigantea*, which is currently available as a commercial product in Europe for use in forestry to control *H. irregulare*.

P. gigantea is a saprophytic wood decay fungus that is widely distributed throughout coniferous forests and competes with *H. irregulare* for resources. It can be grown very easily on culture medium and produces oidia (a type of spore) that are used as inocula for stump treatment. Research by Dumas is contributing to the potential registration of *P. gigantea* as a control measure in Canada. He has tested its effectiveness under field conditions and developed methods for its long term storage. He found that the germination and growth of oidia were enhanced when formulated in an ammonium lignosulfonate solution, which was beneficial for its rapid establishment under field conditions. He also determined that the oidia inocula can be stored in dry Kaolin® over a saturated solution of lithium chloride with no appreciable loss in germination rate after 8 years.

H. irregulare is known to have other hosts in addition to red pine. Dumas, in collaboration with Laurentian Forestry Centre scientist Gaston Laflamme, has assessed the potential risk of *H. irregulare* to cause damage to jack pine. They conducted inoculation trials in southern Ontario to better assess this potential risk. In September 2010, freshly cut stumps of jack and red pine of variable diameters were inoculated within five minutes of felling. An evaluation eight weeks later indicated that jack pine is very susceptible to *H. irregulare* over a wide range of diameters, with success of infection ranging from 94 to 100%.

While researchers have not detected spores in jack pine stands of northeastern Ontario, their close proximity to infected areas means the probability for invasion is high**.** In the Eastern Townships of Québec, the current most northern extent of the disease is within 50 km of natural jack pine stands and the potential risk of it spreading and becoming established there, particularly during pre-commercial and commercial thinning, is of concern.

The early detection and control of this harmful disease will contribute to the protection of valuable commercial timber species.

For more information on this work please contact the GLFC or visit the CFS publications website for scientific reports and a Frontline Express Note, which will be available in the near future.

TreeAzin® now registered for control of Emerald Ash Borer in Canada

Overview

TreeAzin, a natural insecticide that is injected into individual trees, received full national registration for control of emerald ash borer (EAB) from the Pest Management Regulatory Agency in October 2012. The use of this botanically derived insecticide will help municipalities and homeowners in their efforts to slow the spread and limit damage by EAB.

TreeAzin is an effective tool for the control of EAB in individual, high value trees. Its development began in 2003 with the work of a team from the Great Lakes Forestry Centre led by scientists Blair Helson and Dean Thompson. Their research was based on the knowledge that azadirachtins, organic compounds that exist in seeds of the neem tree, had been used to protect crops from insect pests in India. The research team conducted laboratory and field trials to determine the key mechanisms of insecticidal activity and to develop a suitable formulation, as well as test its environmental fate, behaviour and efficacy. This research paid off when TreeAzin was granted emergency registration for control of EAB in Ontario and Quebec in 2008 before full national registration was granted on October 6, 2012.

Systemic injection was recognized early on as the application method of choice because of its suitability to urban environments. Working in partnership with a small local company, BioForest Technologies, the collaborative team developed the micro-injection system EcoJect®, which was based on an original prototype developed by Blair Helson, for the application of TreeAzin or other systemic pesticides. With this system, the formulation is pre-loaded into sealed canisters and injected directly into the tree, so that the probability of exposure to humans, pets, or other non-target organisms is exceedingly low.

TreeAzin works by inhibiting the feeding and moulting of EAB larvae. Trees are best treated via injections in early summer, just prior to peak adult emergence. This timing allows the active compounds to be translocated through the tree to where the larvae feed. Canopy foliage also harbours active ingredients of the insecticide that are inhibitory to reproduction of the adult beetles, which feed on foliage as part of their sexual maturation process. Adult beetles feeding on treated foliage produce very few viable eggs, thus providing two years of protection to the treated tree and reducing EAB populations in the immediate vicinity.

The cost per tree varies depending on its size and accessibility but is $150-250 for a larger (30 cm) tree at rates currently charged by independent applicators. Regular treatments every two years are likely to be required for a 6-10 year period while high EAB populations persist in a given area. The total cost of these treatments is likely to be less than the cost of tree removal and replacement, which can be as much as $1500 for an individual tree.

Scientific data is currently being generated that could support the inclusion of Asian longhorned beetle on the product label for TreeAzin. If accepted, this would provide an effective option for use in early and aggressive response programs that would be required if this highly destructive wood boring beetle, considered a looming threat, were to re-appear in Canada.

Although there is no doubt that EAB will continue to spread throughout the natural range of ash trees across the Canadian landscape, the development and recent national registration of TreeAzin now provides an efficacious, environmentally acceptable and non-destructive option for slowing the spread and managing this invasive alien pest.

For more information on this work please contact Dean Thompson or GLFC. Visit the CFS publications website for scientific reports and a Frontline Technical Note, which will be available in the near future.

Canadian Forest Service receives award from Tree Canada

Overview

The Canadian Forest Service (CFS), received an award from Tree Canada for its work on the Emerald Ash Borer (EAB).

Periodically, Tree Canada presents special awards for outstanding contributions in the field of urban forestry. At the 10th Canadian Urban Forest Conference in London, ON in October, 2012, the CFS was recognized for its innovative research. In particular, the work by Great Lakes Forestry Centre scientists on the development of TreeAzin for control of EAB in urban environments and branch sampling techniques, which have proven to be very effective for early detection, were mentioned. Presenter Marie-Paule Godin, Operations Manager with Tree Canada, said in her presentation:

> "Tree Canada recognizes all the efforts, great work and innovative research made by CFS with this special award and hopes that the CFS continues its efforts to support urban forests in Canada."

More details on the registration of TreeAzin appear in this edition of the e-Bulletin. For further information on other projects related to EAB contact the GLFC or visit the CFS publication website, where the Technical Note that describes branch sampling in urban environments can be found.

GLFC Webinar Reports

The fate of Canada's peatlands in a warmer world

This webinar about peatlands was presented by Dr. Kara Webster on November 20th, 2012.

Canada's peatlands cover 13% of our land area and provide numerous economic benefits and environmental services. These important ecosystems are a vast storehouse of carbon and release greenhouse gases such as methane and carbon dioxide at warmer temperatures. To understand their response to a warming climate, research was conducted in a variety of northern wetlands.

Examination of the biological, chemical and hydrological processes of wetlands was completed through field and lab research, including: a) a comparison of greenhouse gas production on a variety of wetlands, b) studies of the relationship between microbe biology and greenhouse gas production and c) examinations of how peat chemistry affects greenhouse gas production by microbes. Further to these efforts, high resolution LiDAR digital elevation models and remote sensing were used to review regional patterns of peat distribution and permafrost thaw.

The result of these efforts will be an increased understanding of local patterns, which will aid in modelling and risk assessments. These data will inform management decisions and policy development.

Birds and budworm: the long and short of it

The first webinar of 2013 was held on January 15th with Dr. Lisa Venier discussing the relationship between bird populations and budworm outbreaks, a timely topic given that eastern Canada is at the beginning of another outbreak cycle. Her examination of a number of bird studies as well as historical data showed that bird populations respond positively to budworm outbreaks. Historical data are particularly important given the infrequent periodicity of budworm outbreaks, a factor that has not previously been examined in the context of bird population trends. Species such as purple finches and evening grosbeaks eat large numbers of budworm and increase their numbers locally, consuming the abundant late instar larvae as well as pupae during a 30-day period, usually during June. Some species change their diet to include budworm and even change their patterns of feeding behaviour. Three species have been identified as budworm "specialists": the bay-breasted, Tennessee and Cape May warblers will move into budworm infested areas to feed and produce more young. This increased feeding behaviour does not, however, contribute directly to an overall budworm population decline.

Webinar participants questioned Lisa about the decline of the Canada warbler. Lisa indicated that many factors are likely at play, such as changes in wintering habitat and climate change and since the decline is not fully understood, forest management planners should continue to make special provisions to accommodate the bird's habitat requirements. Further studies are needed.

To access either of these presentations and audio files please go to the NRCan ftp site.

Next webinar: FireSmart Online: a wildfire hazard assessment tool for homeowners, May 14, 2013

Recent GLFC Publications

To order copies of these publications, please contact the Great Lakes Forestry Centre publications assistant.

Allen, D.; McKenney, D.W.; Yemshanov, D.; Fraleigh, S. 2013. The economic attractiveness of short rotation coppice biomass plantations for bioenergy in Northern Ontario. The Forestry Chronicle 89: 66-78.

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Newton, P.F. 2012. Development and utility of an ecological-based decision-support system for managing mixed coniferous forest stands for multiple objectives. pp. 115-172 In W.J. Zhang, ed. Ecological Modeling. Nova Science Publishers Inc.

Ryan, K.; de Groot, P.; Davis, C.; Smith, S.M. 2012. Effect of two bark beetle-vectored fungi on the on-host search and oviposition behavior of the introduced woodwasp, *Sirex noctilio* (Hymenoptera: Siricidae) on *Pinus sylvestris* trees and logs. Journal of Insect Behavior 25: 453-466.

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