Comings and Goings

We welcome research scientist Dr. Jason Leach, who will be working in the area of forest ecohydrology. He comes to us from Simon Fraser University in Burnaby, BC, where he taught and conducted research on forest hydrology and water quality issues. Jason obtained his doctoral degree in Geography (Hydrology) from the University of British Columbia. He also completed a Postdoctoral Fellowship in the Department of Forest Ecology and Management at the Swedish University of Agricultural Sciences, Umeå, Sweden.

Some 20-year results from the Long Term Soil Productivity network

Overview

Site productivity and tree growth results from jack pine planted 20 years ago on sites with a range of biomass removal levels have recently been analyzed.

Organic matter removal and soil compaction are two key soil properties related to forest productivity that are readily influenced by harvest-related activities. Rising demands for forest biomass, including bioenergy uses, have raised concerns that increased removal of organic residues may reduce longer-term site productivity. As part of the Long Term Soil Productivity network (which includes study sites across North America), a study was designed to examine the effects of increasing levels of harvest-related forest biomass removal on jack pine stands growing on infertile, coarse-textured soils in northeastern Ontario. The levels of harvest removal included stem-only harvest, whole-tree harvest, whole-tree harvest with forest-floor removal by blading, and blading followed by site compaction. Researchers also studied the effects of disc trenching and vegetation control using glyphosate.

Stand development has been monitored at 5-year intervals, and 20-year results are now available. On sites where there was complete forest floor removal, there was a slight increase in survival of planted trees, but a reduction in stand productivity over the long term. Compaction following forest floor removal had no additional effects on stand development. The effects of whole tree harvesting on stand development were similar to the stem-only harvesting. The use of herbicide markedly increased stand growth initially, but the effects lessened substantially over time. The ingress of natural regeneration was greater with harvest and site preparation treatments that maintained cone-bearing logging slash on-site, but was not significantly affected by vegetation control.

The importance of these results lies in the longer-term (20-year) responses that are now evident. Forest floor removal on similar sites is likely to have substantial negative impacts on longer-term stand productivity despite showing little evidence of this in the short term. By contrast, positive vegetation control effects on future stand productivity of similar site types can be substantially overestimated when based on short-term results. At this point, there is also no strong evidence that operational whole-tree harvesting, as was practiced on these sites, reduces stand productivity compared with stem-only harvesting.

Stand growth, together with soil nutrient dynamics and foliar nutrition will continue to be monitored at these sites to allow for further analysis of long term effects. More details on this study have been published in the Canadian Journal of Forest Research. Related studies are also ongoing and include the use of wood ash as a soil amendment and the effects of harvesting levels on soil microbial communities.

Forest Vulnerability Assessment Tool

Overview

Interactive maps are now available that highlight potential forest vulnerability of two climate change impacts: exposure to drought mortality and migration failure.

As part of the Forest Change Initiative, Dr. Isabelle Aubin and her collaborators recently developed an online forest vulnerability assessment tool to aid natural resource managers in developing forest adaptation strategies to mitigate climate change. The interactive site generates maps at a resolution of 2.5 × 2.5 km, a format relevant to decision makers. The maps combine information on stand composition, climate change projections and species-specific indicators of sensitivity. A species' vulnerability depends on its degree of exposure to environmental change, its sensitivity to altered growing conditions and its adaptive capacity (i.e. its ability to accommodate or cope with those environmental changes).

The maps are based on data from several Canadian Forest Service researchers including Dr. Dan McKenney, Dr. André Beaudoin and Dr. Ted Hogg, who collectively have expertise in spatial modelling, vegetation climate interactions and remote sensing. Zones of exposure were determined by cross-referencing tree species' current distribution with the Climate Moisture Index (for drought vulnerability) and species' projected climate envelopes (for migration failure). A trait-based index was used to characterize stand sensitivity to drought and relative migration capacity.

The interactive format of the tool provides information on the overall stand and on the individual species considered exposed. Integrating these layers of biophysical and ecological data highlights potential vulnerability hotspots of drought mortality and migration failure, predicted over the next 30, 60 or 90 years. Identification of the regions of special concern will be crucial to establish baselines, monitor longer-term trends and detect early signs of species maladaptation.

Implementation of sustainable management principles in Canadian forest landscapes is a significant challenge for natural resource managers because not all trees species will react the same to rapid environmental change. Given the complex and varied implications of climate change for biological systems, informed decisions require a wide array of information, spanning a broad range of time periods and geographic areas and originating from a variety of disciplines. Tools to assess and visualize the different impacts of climate change are needed for science-based decision-making, and maps can help communicate such risk to a wide diversity of stakeholders.

The scientific article detailing this work is available from the Canadian Forest Service publications website. For more information about this work, contact Dr. Isabelle Aubin.

Standard naming convention proposed for laboratory-reared insects

Overview

A recently published article proposes a standardized naming convention for laboratory-reared insects that would allow researchers to accurately document and track the insects within their facilities and through the scientific literature.

Laboratory insect colonies are an essential part of experimental insect science as they provide disease-free organisms with a known rearing history, thereby reducing experimental variability. The Insect Production Services at GLFC has raised insects for research purposes since the 1940's. Research scientist Dr. Amanda Roe, scientific lead of these services at GLFC, has proposed a standardized naming convention for laboratory insect stocks and suggests that similar facilities should follow suit. Standard naming eliminates confusion and allows for more accurate description of which organisms are used in an experiment. Other organisms used in testing, such as fruit flies and mice, have a standardized naming convention but none exists for other insects. Following that convention, the proposed information would include codes for the laboratory where it was reared, the stock and species, as well as geographic origin and family number, as show in the example below.

Glfc:IPQL:AglaWMA01

laboratory code | stock code | species code | geographic origin | family number

Glfc: Great Lakes Forestry Centre
IPQL: Insect Production and Quarantine Laboratory
Agla: *Anoplophora glabripennis*
WMA: Worcester, MA
01: family number 1

The advantages of using laboratory colonies over wild-caught organisms are numerous. Lab-reared insects are largely uniform, whereas field-collected material can be highly variable in age, nutritional condition, health, and genetic diversity. These differences can confound experimental results. Lab colonies can provide insects to researchers all year long, accelerating research programs that would otherwise be limited by the availability of insect life stages that are transient or dormant for large portions of the year.

When new laboratory colonies are established, it is important to document and publish the details of where and when founding individuals were collected. While these details may not seem important at the time, their value may arise unexpectedly in the future. This data can easily be lost as personnel change over time, making it difficult to track down the information at a later date. The Insect Production and Quarantine Laboratories at GLFC currently maintain stocks of eight different insect species, including the spruce budworm and quarantined invasive species such as the Asian longhorned beetle. The full article documents the history of the IPQL colonies and the newly proposed naming scheme for all IPQL stocks.

The Petawawa Research Forest Celebrates 100

Overview

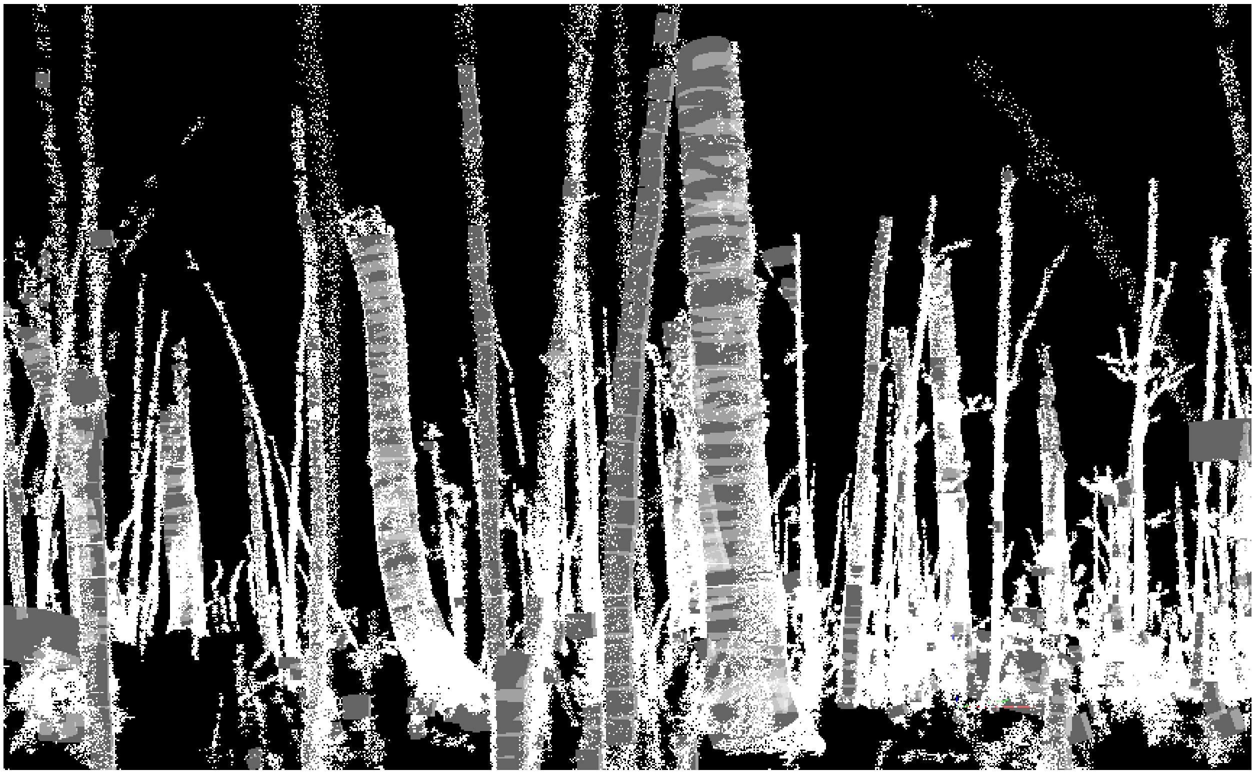
2018 marks the 100th Anniversary of the Petawawa Research Forest (PRF) – Canada's renowned "living laboratory" located in Chalk River, northwest of Ottawa, ON.

The PRF was designated Forest Capital of Canada by the Canadian Institute of Forestry as it marks its 100th Anniversary this year. PRF is Canada's longest-operating research forest and is managed by the Canadian Forest Service through the Canadian Wood Fibre Centre (CWFC).

From its beginnings as a singularly measured stand of white and red pine, the forest has become a significant source of information and a legacy of knowledge for researchers and forest practitioners. Today the PRF brings together federal researchers and provincial, industrial, and academic collaborators to answer current forest management and policy questions.

With an early focus on silviculture, the research forest evolved to encompass forest genetics and provenance trials, applications of remote sensing, and forest fire science, playing a role in the Canadian Forest Fire Danger Rating System, still widely used today. Current research focuses on assessing vulnerability to climate change, testing options for the supply of forest biomass for the bioeconomy, applying new silvicultural techniques, and developing tools such as digital soil maps, enhanced forest inventories, and habitat predictors based on aerial LiDAR coverage (a form of remote sensing using lasers).

Forest fire danger: experimental fires conducted at Petawawa were instrumental in the development of Canada's Forest Fire Danger Rating System.



A ground-based image captured by LiDAR (Light detection and ranging), used for precise estimates of forest parameters such as volume, stem form, and stand density.

This year's centennial is an opportunity to commemorate Natural Resources Canada's time-honoured research forest and its future role in Canada's forest innovation system. The CWFC is working with partners on tours and activities to mark the occasion. Thousands of researchers and visitors have found themselves at the PRF – please join us as the PRF celebrates 100 years of forest research as Canada's "living laboratory"!

For more information about upcoming events, follow us on Facebook© at Petawawa Research Forest Science or on Twitter at @PRF_CFS, or visit us at the PRF's webpage.

Publications of interest

- To order copies of these publications, please contact the Great Lakes Forestry Centre publications assistant.
- Publications are available in English unless otherwise indicated.

Overview

Was forest tent caterpillar a problem in your area? Read the latest on coping with the current outbreak in this 2-page publication.

In the recently updated Frontline Express, you can find information on the forest tent caterpillar, a native defoliator that causes extensive damage to hardwoods throughout Canada. Outbreaks occur every 9-13 years and usually last 1-2 years. Tree mortality only occurs when outbreaks occasionally last for up to six years. During an infestation, the large number of caterpillars can be a nuisance. Here we explain the life cycle, natural control mechanisms, and suggest what can be done by homeowners or forest managers. We also include photos to identify the three native tent caterpillar species, as well as the "friendly fly", which is associated with outbreaks because it feeds on tent caterpillar larvae.

Overview

The ability to accurately predict spruce budworm phenology (the study of seasonal and climate-variated life cycle events) is important in many aspects of the management of this insect.

This information report presents the results of an ongoing investigation into the variability of spruce budworm development rates over its geographic distribution. The first phase of the project used laboratory-raised insects (colonies that had been kept in isolation from wild populations for many generations) raised at seven constant temperatures between 5-35°C. Rearing protocols were tested and the accuracy of the BIOSIM Spruce Budworm Biology Model currently in use was assessed. In a second phase, new laboratory colonies were reared using samples from wild budworm populations collected from five locations from Inuvik to northern Quebec and a similar set of temperature experiments were carried out.

Overview

The Hemlock Woolly Adelgid (HWA) Management Plan for Canada summarizes the risks and potential impacts associated with HWA in eastern Canada and suggests potential management strategies.

HWA is an aphid-like invasive pest from Asia threatens hemlock survival. This report outlines the components for a HWA management plan in all eastern provinces that are at risk to HWA (i.e. Ontario, Quebec, New Brunswick, Nova Scotia, and Prince Edward Island). It also summarizes the research and management tactics that have been explored and implemented in the eastern US.

Recent Publications

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