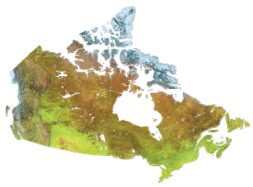
Natural Resources Canada | Ressources naturelles Canada

Issue 18, Summer 2012

e-Bulletin

The Great Lakes Forestry Centre (GLFC)



Declining Canada warbler populations not related to spruce budworm

Overview

Spruce budworm outbreaks affect many forest bird species. It was previously hypothesized that the decline in Canada warbler populations was linked to a decline in the spruce budworm. However, joint research by the CFS and an environmental consultant has revealed that there is little evidence to suggest that Canada warbler populations are influenced by spruce budworm outbreaks. This new information demonstrates the need to further explore the causes of this and other bird species declines, which may have implications for forest management activities in Canada.

The Canada warbler is a neotropical migrant, meaning that it spends its winters in South America and migrates to North America to breed in the summer. The species has experienced an 85% decline in its population and has therefore been designated as a threatened species in Canada (Committee on the Status of Endangered Wildlife in Canada 2008) and a species of special concern in Ontario under the Species at Risk Act 2009. This species of bird is of special concern to Canada because a large percentage of their global population overlaps with widespread forestry operations in the boreal forest in this country.

In 2009, a researcher (Sleep et al. 2009) interpreted 30 years (1975-2005) of data from the Breeding Bird Survey (BBS) in Canada to suggest that there was a positive relationship between declining spruce budworm populations and declining Canada warbler populations at the national level. Joint research by the Canadian Forest Service (CFS) at the Great Lakes Forestry Centre (GLFC) and an environmental consultant re-examined this theory by reviewing 40 years (1968 – 2008) of BBS data in Canada (Venier et al. 2012). To further improve their analysis they used only Canada warbler observations that occurred within 100 kilometres of a spruce budworm outbreak. The 100 kilometre distance was chosen because it represented a very conservative distance from which a spruce budworm infestation could influence a Canada warbler population. The defoliation data came from CFS and provincial reports; gaps in the data were filled in by using Geographical Information System data obtained from provincial sources. The researchers discovered that there were insufficient Canada warbler observations to analyze in the western provinces because many sightings occurred at a considerable distance from the spruce budworm outbreaks. The analysis also revealed that there was no significant relationship at the national level between Canada warbler population decreases and spruce budworm decline. Based on these results the researchers concluded there was little analytical evidence to support the theory that a relationship exists between Canada warbler populations and spruce budworm outbreaks.

There could be many reasons for the decline in Canada warbler populations such as loss of wintering habit, agricultural activity, road development in the boreal forest, conversion of swamp forests and climate change. Our inability to determine the reason or reasons for the decline demonstrates the need to increase monitoring of many bird species to improve the accuracy of the data and to further explore their population dynamics. The researchers also suggest that until this decline is explained forest management practices should accommodate the Canada warbler's habitat requirements because forestry operations in Canada tend to occur where this

species lives. For more information please visit the CFS publication website to read the full report or contact the Great Lakes Forestry Centre.

References:

Sleep, D.J.H.; Drever, M.C.; Szuba, K.J. 2009. Potential role of spruce budworm in range-wide decline of Canada Warbler. Journal of Wildlife Management 73:546-555.

Venier, L.A.; Holmes, S.B.; Pearce, J.L.; Fournier, R.E. 2012. Misleading correlations: The case of the Canada warbler and spruce budworm. The Journal of Wildlife Management 76(2): 294-298.

Emulating natural disturbance in forest riparian areas

Overview

Canadian forest management practices are evolving towards the emulation of natural processes, such as fire, in the boreal forest to maintain forest health. Forest management practices that leave unnatural patches around riparian zones (shoreline) do not emulate the effect forest fires have on the boreal forest landscape. Research has demonstrated that partial harvesting in riparian zones in the winter increased habitat complexity and had minimal short-term effects on aquatic invertebrate populations, sedimentation in the water bodies, and stream temperatures and was economically viable.

As forest management practices evolve in Canada, the need for managing the forest to emulate natural disturbances has been recognized as an important element in maintaining forest health. Fire is one of the primary natural disturbances in the boreal forest; forestry practices need to be adapted accordingly. In forest management, riparian zones (areas adjacent to water) are given special consideration because of their importance in protecting aquatic ecosystems. The vegetation in riparian zones assists in regulating water flow, nutrient cycling, and protecting water quality while providing habitat for terrestrial and semi-aquatic organisms. Until recently these riparian zones were given no-cut prescriptions or regulated buffers to protect the water bodies from excess water and nutrient export or sediment inputs from forest harvesting operations. As a result of this forest management practice these riparian areas would be surrounded by unnatural patches of forest, which does not emulate the effect forest fires would have on the landscape. Forest fires often burn through riparian zones, although they usually burn less intensely and in patches leaving overstorey trees and various sized gaps in the forest.

Forest researchers identified a knowledge gap about how best to manage riparian zones to emulate natural disturbances. Great Lakes Forestry Centre staff in cooperation with the Ontario Ministry of Natural Resources, forest industry, and universities have been involved in conducting research to provide sound data that will support the emulation of natural disturbances in riparian zones, including the use of partial forest harvesting. The research included studying the ecological effects and economic feasibility of forest harvesting in riparian areas of the boreal forest.

This research demonstrated that partial harvesting in riparian zones in the winter increases riparian forest habitat complexity but has minimal short-term effects on aquatic invertebrate populations, sedimentation in the water bodies, and stream temperatures. In addition, it was proven to be economically feasible to conduct partial harvesting because the reduced amount of harvest (compared to a typical clearcut harvest operation in the boreal forest) was offset by larger diameter trees that are often found in riparian zones. These results demonstrate that

protecting forest ecosystems in riparian zones while permitting some harvesting is a sound approach to emulating natural disturbances in the boreal forest. These research results are being used to make policy decisions to guide forest managers in the development of their forest management plans and their subsequent harvesting operations.

For more information please refer to the publications below or contact Great Lakes Forestry Centre.

Recommended Reading

Kreutzweiser, D. 2012. The effects of logging in riparian areas. Natural Resources Canada. Canadian Forest Service. Great Lakes Forestry Centre. Sault Ste. Marie, Ontario. Frontline Express 56. 2p.

Kreutzweiser, D. P. 2012. Forest management practices based on emulation of natural disturbances (END): implications for aquatic ecosystems. Freshwater Science 31:222-223.

Kreutzweiser, D. P.; Sibley, P.K.; Richardson, J.S.; Gordon, A. M. 2012. Introduction and a theoretical basis for using disturbance by forest management activities to sustain aquatic ecosystems. Freshwater Science 31:224-231

Naylor, B.J.; Mackereth, R. W.; Kreutzweiser, D.P.; Sibley, P.K. 2012. Merging END concepts with protection of fish habitat and water quality in new direction for riparian forest in Ontario: a case study of science guiding policy and practice. Freshwater Science 31:248-257.

Sibley, P.K.; Kreutzweiser, D.P.; Naylor, B.J.; Richardson, J. S.; Gordon, A.M. 2012. Emulation of natural disturbance (END) for riparian forest management: synthesis and recommendations. Freshwater Science 31:258-264.

GLFC Webinar Report

On May 8th, 2012 the Great Lakes Forestry Centre (GLFC) presented the fourth in its webinar series. Dr. Kees van Frankenhuyzen presented a seminar called "Forest protection during a new spruce budworm outbreak: can *Bacillus thuringiensis* (Bt) do the job?" We learned that spruce budworm (*Choristoneura fumiferana* Clemens) (SBW) populations are increasing in Quebec and that Bt will be the predominant tool for managing the outbreak. New technology developments such as the SBW Protection Planning System, BioSim Phenology Model and Bt Efficacy Model will greatly improve the prioritization and timing of protection as well predicting the efficacy of the spray efforts. We also learned that new technologies such as AG-NAV, AG-FLO and AIMMS will reduce the amount of Bt needed because the affected areas will be better targeted and spray drift will be minimized. To access his presentation and the audio file please go to the NRCan ftp site: ftp://ftp.nrcan.gc.ca/cfs/glfc/ .

For more information on the Bt work please contact the Great Lakes Forestry Centre and visit the CFS publications database.

TOPIC Network: A Canadian network of plant functional trait data

Overview

The increasing challenges of managing ecosystems in Canada have made it necessary to bring together information from many sources into portals or databases that facilitate research via data sharing. They can provide a broad range of data that can be used to protect biodiversity, provide risk assessments and to prioritize mitigation and restoration efforts. The TOPIC Network (Traits of Plants in Canada) was developed to respond to this need.

The unprecedented changes that face forest ecosystems challenge us to develop new approaches and diagnostic tools requiring large amounts of data. This information will improve our understanding of ecological patterns and allow us to predict future changes. The functional trait approach is one of these new integrative research approaches that searches for global patterns of species response to human disturbance. Based on plant characteristics that matter for key ecosystem functions and processes, this innovative approach provides an integrated view of species communities and shows a direct link between species distribution and ecosystem processes. In a functional trait approach, species characteristics such as seed mass and plant height are used as an alternative to taxonomic classification. Based on universal vegetation traits rather than on site-specific vegetational composition, this trait-related tool also facilitates inter-regional and other large scale comparisons. For instance, it makes it possible to compare ecosystems that differ in composition but possess similar underlying ecological processes and functions. This approach also provides a major step in risk assessments on many issues such as forecasting the impact of invasive species, on the evaluation of management options to protect Canada's biodiversity as well as for setting priorities for mitigation and restoration activities.

The use of this approach requires large amounts of data from a wide spectrum of sources (i.e., scientific publications, reports, field or greenhouse data from federal, provincial and university sources) and disciplines (i.e., ecophysiology, autecology, etc.). Until recently, this approach has been underexploited in Canada, mainly because of the gaps in knowledge, the fragmentation of available information and the lack of a database (referred to as an ecoinformatics structure or platform).

A Canadian network of plant functional trait data, the TOPIC Network (Traits of Plants in Canada), was created to facilitate trait data integration and sharing in Canada. TOPIC is a network of research scientists aiming to stimulate, promote and facilitate research involving the plant functional trait approach in Canada via the integration of trait data into an ecoinformatics platform. Created at the Université de Montréal in 2004 to document functional traits of the vascular flora of Québec, TOPIQ, renamed Traits of Plants in Canada (TOPIC) in 2011, is now managed by the Canadian Forest Service of Natural Resources Canada at the Great Lakes Forestry Centre (GLFC). Members of the network include representatives from universities, provincial and national agencies and the forest industry. The core of the network is an ecoinformatics platform that contains data about functional traits of the vascular flora of Canada. Data are provided by the members of the network and are available to anyone interested in contributing to the network.

Plant ecophysiology and autecology data are integrated into TOPIC database to facilitate their use in broad scale research in various fields such as biodiversity and ecosystem functioning, restoration, invasive species, vegetation management and climate change. TOPIC has been used in over 30 research projects so far.

The TOPIC ecoinformatics platform contains data organised in two modules: the Literature Review module that contains data from the scientific literature and the Empirical Measurements module that contains data coming from measurements made in the field,

laboratory, greenhouse, garden or herbarium. More than 950 vascular plant species and 40 functional traits are documented in the database. TOPIC is still in development as members contribute new data. TOPIC is also actively working on data acquisition via cooperative field campaigns.

For more information please consult the TOPIC website at http://topic.nrcan.gc.ca/, see Frontline Express 57 or contact the Great Lakes Forestry Centre.

Upcoming 2012 – 2013 webinars

Mark your calendars for these upcoming presentations.
Subscribers to the GLFC e-Bulletin will receive an e-mail notification with complete details in advance of the webinar.

Date	Time	Title	Presenter
September 18, 2012	1:30 p.m. Eastern	The role of environmental variables in predicting jack pine budworm outbreaks in Northern Ontario	Dr. Chris MacQuarrie
November 20, 2012	1:30 Eastern	The function and fate of peatlands in a warmer world	Dr. Kara Webster
January 22nd, 2013	1:30 p.m. Eastern	Misleading correlations: the case of the Canada warbler and spruce budworm	Dr. Lisa Venier

Recent GLFC Publications

If you would like to order any of the publications listed below, please contact Publications at the following e-mail address: glfc.publications@nrcan.gc.ca

Allison, J.D.; McKenney, J.L.; Miller, D.R.; Gimmel, M.L. 2012. Role of Ipsdienol, Ipsenol, and *cis*-Verbenol in chemical ecology of *Ips avulsus*, *Ips calligraphus*, and *Ips grandicollis* (Coleoptera: Curculionidae: Scolytinae). Journal of Economic Entomology 105: 923-929.

Cooke, B. J.; MacQuarrie, C. J. K.; Lorenzetti, F. 2012. The dynamics of forest tent caterpillar outbreaks across east-central Canada. Ecography 35: 422–435. doi: 10.1111/j.1600-0587.2011.07083.x

Gordon, A.; Wintle, B.A.; Bekessy, S.A.; Pearce, J.L.; Venier, L.A.; Wilson, J.N. 2012. The use of dynamic landscape metapopulation models for forest management: A case study of the red-backed salamander. Canadian Journal of Forest Research 42: 1091-1106.

Johny, S.; Kyei-Poku, G.; Gauthier, D.; van Frankenhuyzen, K.; Krell, P.J. 2012. Characterization and virulence of *Beauveria* spp. recovered from emerald ash borer in southwestern Ontario, Canada. Journal of Invertebrate Pathology 111: 41-49.

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Kirk, D.A.; Welsh, D.A.; Baker, J.A.; Thompson, I.D.; Csizy, M. 2012. Avian assemblages differ between old-growth and mature white pine forests of Ontario, Canada: A role for supercanopy trees? (Différence d'assemblage aviaire entre les forêts matures et les vieilles forêts de pins blancs en Ontario, Canada : un rôle pour les arbres de très grande taille?). Avian Conservation and Ecology 7:4 [http://dx.doi.org/10.5751/ACE-00503-070104]

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Leal, I.; Foord, B.; Davis, C.; de Groot, P.; Mionyeni, X.O.; Slippers, B. 2012. Distinguishing isolates of *Deladenus siricidicola*, a biological control agent of *Sirex noctilio*, from North America and the Southern Hemisphere using PCR-RFLP. Canadian Journal of Forest Research 42: 1173-1177.

Letang, D. 2012. The forest bioeconomy: Balancing economic opportunity with ecological sustainability. (La bioéconomie forestière : Équilibrer les possibilités économiques et la durabilité écologique). Natural Resources Canada, Canadian Forest Service, Great Lakes Forestry Centre, Sault Ste. Marie, Ontario, Frontline Policy Perspectives Note 5.

McKenney, D.W.; Pedlar, J.H. 2012. To treat or remove: An economic model to assist in deciding the fate of ash trees threatened by emerald ash borer. Arboriculture & Urban Forestry 38: 121-129.

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Ryan, K.; de Groot, P.; Smith, S.M. 2012. Evidence of interaction between *Sirex noctilio* and other species inhabiting the bole of *Pinus*. Agricultural and Forest Entomology 14: 187-195.

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Thompson, D.; Leach, J.; Noel, M.; Odsen, S.; Mihajlovich, M. 2012. Aerial forest herbicide application: Comparative assessment of risk mitigation strategies in Canada. The Forestry Chronicle 88: 176- 184.

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Great Lakes Forestry Centre
Canadian Forest Service
1219 Queen Street East
Sault Ste. Marie, Ontario P6A 2E5
email: glfc.ebulletin@nrcan.gc.ca