Comings and Goings

We welcome Drs. Sonja Kosuta, Effah Antwi and Trevor Jones to the Great Lakes Forestry Centre (GLFC).

Dr. Sonja Kosuta joined the GLFC as Director of the Forest Ecology Division, effective February 4, 2019. Sonja comes to us from the Office of the Chief Scientist (OCS) of NRCan in Ottawa. She holds a Ph.D. in molecular biology from Université Paul Sabatier (Toulouse, France), an MSc in environmental sciences from McGill University and a BSc in chemistry from McMaster University.

Dr. Effah Antwi started working as a research scientist in forest ecosystems ecology at GLFC on April 1st. Effah has a Ph.D. in Environmental Science and a M.Sc. in Environmental and Resource Management from the Brandenburg University of Technology, Germany. He completed Japan Society for Promotion of Science Postdoctoral Fellowship with the United Nations University, Institute for the Advanced Study of Sustainability, Tokyo, Japan. His overarching research interest lies in environmental and resource management, climate resilience and ecosystem change, landscape ecology and sustainability assessment. Effah's research will focus on the cumulative effects program particularly as it relates to risks and impacts of cumulative effects of resource development.

Dr. Trevor Jones, who joined the Canadian Wood Fibre Centre (CWFC) in Sault Ste. Marie in November 2018. Trevor received a B.Sc. in biology from Laurentian University, a M.Sc. in Biology from Acadia University, and a Ph.D. in Forestry from the University of Toronto. Before joining the CWFC, he was a research scientist for the Ontario Ministry of Natural Resources and Forestry, where he studied hardwood ecosystems. Over his career, his research has broadly focused on the effects of partial-harvest silviculture systems on residual stand structure, species diversity and site productivity, as well as the restoration and recovery of degraded forests. In his new position in, he will contribute to the bioeconomy and silviculture files.

We would also welcome the following people that have recently become indeterminate employees:

Kenneth Boissoneau – Insect Production Technologist, Insect Production Services, February 20, 2019

Benoît Hamel, Terrestrial Ecosystem Specialist, Forest Ecosystem Research Team, November 20, 2018

Ashlyn Wardlaw – Insect Production Technologist, Insect Production Services, March 29, 2019

We wish Ken Baldwin all the best in his retirement. Ken was instrumental in the development of the Canadian National Vegetation Classification System (CNVC): http://cnvc-cnvc.ca/, including chairing the CNVC Technical Committee from 2000-2018. He also led the development of the Vegetation Zones of Canada: A Biogeoclimatic Perspective national map and descriptions of Canada's Vegetation Zones.

Do extreme cold winter temperatures affect emerald ash borer (EAB)?

EAB populations appear to have developed adaptation strategies that allow it to survive the cold and while affected, they are not eradicated.

During a recent cold snap in the city of Winnipeg, GLFC research scientist Dr. Chris MacQuarrie was questioned by media, asking whether the extreme cold temperatures would kill off the emerald ash borer. Winnipeg, a city with 350,000 green ash trees is the western-most city in Canada to be hit by EAB, where it was discovered in 2017. This alien invasive pest has the potential to wipe out the city's entire ash population.

A new research collaboration between GLFC and Western University on the effects of cold temperature on EAB began in 2018 with samples from populations collected in Winnipeg. In southern Canada and the US, most EAB spend the winter under the bark in the pupal stage. However, research has shown that in some existing EAB populations in northern Ontario and elsewhere in Canada a large percentage of EAB spend the winter as larvae, rather than as pupae. This phenomenon of a 2-year life cycle may be a result of shorter, cooler summers that don't allow larvae to complete their growth stages in one season. If the larval stage has a different susceptibility to cold, then that has implications for how fast EAB will kill trees, how fast the population will grow and how it should be managed. Data from the Winnipeg EAB population will help GLFC researchers to answer these questions.

It appears that during a typical Canadian winter, EAB populations may be impacted, but not eradicated. The insect is able to survive by making proteins that protect it from freezing. Even with temperatures as cold as -30 Celsius, some insects may be killed but the population will not be wiped out completely. Even if 90% of the beetles were wiped out due to the cold, there would be enough insects left on the landscape to keep that population going and to keep killing trees. Predictions on the effect of cold winter temperatures on EAB populations come springtime are useful for cities, where combatting EAB can be a very costly endeavour. Cost estimates for dealing with EAB in Winnipeg are over $100 million over 10 years.

Lessons learned from 10-year experiments in regenerating eastern white pine

Researchers examined a variety of vegetation suppression treatments in experimental white pine plantations to determine which best suited white pine survival and growth while conserving understory plant diversity.

Eastern white pine has experienced a decline since European settlement due to harvesting, fire and pest damage and despite significant efforts, achieving successful regeneration still remains a challenge. To help young white pine succeed, a standard practice is to supress vegetation that competes with young pine seedlings, but there are concerns this can have negative impacts on the diversity of understory plants, which play a key role in promoting ecosystem stability.

A recently published paper by Kieran Santala, Dr. Isabelle Aubin (GLFC), Michael Hoepting (Canadian Wood Fibre Centre) and colleagues compared white pine performance to understory development for 10 years following planting. The study included five vegetation suppression treatments in three experimental white pine plantations in Ontario and New Brunswick, with one clearcut site and two sites managed under a uniform shelterwood system. Treatments included controlling only woody or non-woody competitive plants, or both, for different lengths of time.

Results showed that at shelterwood sites, plots with either one or four years of annual vegetation control of all competitive plants had good white pine growth and tended to have more plants typical of mature

forests. Controlling only woody or only non-woody plants caused competitive plants to dominate these treatments. The clearcut site tended to have more competing vegetation.

Impacts of treatments on tree performance and understory development have important implications for forest management. Some treatments might create problems in the long-term by delaying understory maturation, while others appear capable of balancing multiple management objectives. Results from this study indicate that one time early control of plant competition and maintaining a portion of forest canopy cover is necessary to favour white pine survival and growth and to conserve understory plant diversity.

Carbon stocks and sequestration in mixedwoods typically higher than other boreal forest ecosystems

Results of research under the auspices of the Fluxnet Canada network were recently published online, providing insights into the utility of the boreal mixedwood biome for climate change amelioration.

Fluxnet monitoring stations were set up in various forest types across Canada to measure carbon uptake and release. In Ontario, data were collected from three boreal mixedwood sites since 2003. The recent publication provides field measurements of carbon stocks and net primary productivity (NPP), i.e., rate of carbon sequestration, in boreal mixedwood forest stands of various ages. The objective was to provide information to inform boreal forest management decisions, with the goal of ameliorating climate change by increasing boreal forest carbon sequestration and storage. An analysis was made of the present results and published carbon stocks and NPP data from various boreal forest biomes, to provide a comparison for mixedwood, coniferous and deciduous stands of various ages and basal areas.

The comparison showed that carbon stocks in mature boreal mixedwood stands were typically at or above those found in other mature boreal forest ecosystems. In addition, at all ages the detritus and soil carbon represented a large and stable fraction of carbon stocks. NPP was typically higher in juvenile stands than in mature boreal forest. In addition, for stands of a given basal area, carbon stocks and sequestration were generally higher in mixedwood and deciduous stands compared to coniferous ones.

These findings are of use in guiding forest management decision making and in developing computer models of carbon stocks and NPP for application in reaching those decisions. Forests are a large and important global sink and reservoir for atmospheric carbon and should be managed to take advantage of these characteristics to ameliorate climate change, for the benefit of Canadians and the global community.

In addition to being an important sink and repository for atmospheric carbon, the boreal mixedwood biome is of value for its ecological diversity and as a commercial source of conifers and aspen. For more information, contact Dr. Nick Payne.

Applying wood ash waste to forest soils

GLFC recently hosted the 4th annual AshNet Network meeting to discuss recent developments in the application of wood ash waste to forest soils.

AshNet is a network of scientists, foresters, industry and government (federal and provincial) representatives who are actively investigating the potential for reducing waste and improving forest health by applying wood ash from bioenergy production to forest soils.

One part of Canada's strategy to fight climate change is a movement to renewable energy to reduce fossil fuel usage. Although still a small part of Canada's energy capacity, electricity generation using biomass has almost doubled in the last decade. The deployment of biomass heating systems and combined heat and power systems across Canada is also increasing. In addition to GHG mitigation, using biomass for energy can result in increased energy security, and rural development including development in remote Indigenous communities. Increasing our use of biomass energy increases the production of wood ash, a final product of wood combustion.

More complete utilization of tree biomass is one possible source of fuel for energy production, however more intensive harvesting has the potential to decrease soil nutrients and forest productivity and put a strain on long-term fibre supplies. Currently 2/3 of the wood ash produced in Canada is landfilled, although this varies by province. Quebec has passed a law with a goal of zero landfilling or incineration of organic waste by 2020. Wood ash applications to appropriate sites would return nutrients to soil that were removed during forest harvesting, especially Ca, Mg, K, and P, thereby maintaining soil fertility.

On February 27th Dr. Paul Hazlett and Caroline Emilson presented a Canadian Institute of Forestry (CIF) e-lecture, "Applying Wood Ash Waste to Soil: Contributing to Sustainable Forest Management in Canada" that highlighted experimental results and future research projects. Links to the e-lecture pdf and recording are available at the CIF website.

On March 5th and 6th GLFC hosted the 4th annual AshNet Network meeting that included presenters from all across Canada and a participant from the Netherlands. Joint network projects, research trial updates and opportunities for future collaborations were part of the meeting agenda. More information on AshNet including publications and presentations are available at the AshNet website.

New study to investigate best forestry practices to protect water quality

Research trials will be established to ensure the risk of mercury mobilization from forest soils to water resources is minimized.

GLFC researcher Dr. Erik Emilson is part of a project funded under an NSERC-Strategic Grant to investigate emerging water quality concerns in forestry practises in Ontario. A recent meeting brought together collaborators from three universities: Toronto, McMaster and Ryerson, as well as scientists from the Ontario Ministry of Natural Resources and Forestry (OMNRF) to meet with Canadian Forest Service counterparts. A collaborator from the Swedish University of Agricultural Sciences also attended to share her experience with similar studies in Sweden. Also present were representatives from four partnering forest management companies who will be involved in the design and implementation of the study.

The plan is to take samples from soil, water and aquatic organisms in streams draining from harvested forests under existing management practices and analyzing them for mercury. While forest harvesting practices do not directly augment mercury inputs to ecosystems via discharges, biogeochemical changes can indirectly increase mercury methylation, mobilize legacy soil mercury pools, and/or augment mercury bioaccumulation in fish and other aquatic organisms. Study participants are determining which practices may be effective at minimizing mercury release and methylation and designing experimental harvests to test this. OMNRF and the harvest companies are involved in discussions to ensure that the proposed test practices would be implementable in forest harvesting operations.

Next steps in the planning stages include:

1) developing a spatial model that identifies the forest landscapes most at risk for increased mercury runoff related to forestry;

2) evaluating the effectiveness of different management strategies at reducing this risk;

3) determining the mechanistic links between forest management practices and mercury dynamics to inform management decisions; and

4) producing guidance for forest managers to plan and carry out harvest operations sustainably and in ways that reduce the risk of mercury mobilization from forest soils to water resources.

GLFC contributes to Ontario's seed zone policy

GLFC researchers have provided important data on climate change and its impact on the adaptation and distribution of tree populations to support the update of Ontario's seed zone policy.

The Ontario Ministry of Natural Resources and Forestry (OMNRF) has been collaborating with Canadian Forest Service scientists, using advances in science to develop a modernized seed transfer approach for Ontario. The Geospatial Tools and Economic Analysis group at GLFC has provided expertise in the field of climate change and its impact on the adaptation and distribution of tree populations. This team has collected and analyzed provenance data, developed seed transfer software (Seedwhere), modeled climatic similarity for multiple carbon emission scenarios and published peer-reviewed research and analysis. This research and analysis has provided critical information to support the update of Ontario's seed zone policy.

For more information, please view the Forest Change adaptation tools page.

CFS signs tri-lateral memorandum of understanding with Lakehead University and Confederation College

The Canadian Forest Service, Lakehead University and Confederation College signed a five-year Memorandum of Understanding for Forest Science Research and Education.

On February 26, GLFC Director General Dr. David Nanang signed a five-year Memorandum of Understanding (MOU) with the two post-secondary institutions in Thunder Bay, Ontario. The MOU will increase opportunities for the organizations to share expertise and resources in forest science and related research, collaboration and education initiatives. There will be increased sharing of intellectual and technical resources and the development of collaborative research projects, including more competitive grant proposals. As well, there will be an increased participation of CFS researchers as adjunct professors, contributing to active mentoring of undergraduate and graduate students.

Publication Statistics

In 2018, GLFC researchers published in close to 50 scientific journals and their work has been cited widely.

A recent analysis showed that in 2018, researchers at GLFC published 84 scientific papers that were cited more than 3,000 times in over 2,100 documents. At the close of the first quarter of 2019, GLFC research papers have cited over 960 times. The most common scientific journals published in during 2018 were Forests, Ecosphere, and Forest Ecology and Management. The most cited author during 2018 was Dr. David Kreutzweiser (currently scientist emeritus), a researcher in Aquatic Ecotoxicology. Over the past few years, GLFC researchers have been choosing to publish more frequently in open-access journals, accounting for roughly 45% of the scientific articles published in 2018, up from 31% in 2016.

Recent Publications

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

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