Graduate Positions in Aquatic Ecosystem Services

We are seeking motivated graduate students with a keen interest in aquatic ecosystem services for a unique opportunity to participate in an NSERC Strategic Network – The Canadian Network for Aquatic Ecosystem Services (CNAES).

Students will improve conservation of aquatic ecosystem services across Canada by investigating the relationship between aquatic ecosystem services and environmental stressors.

“Healthy Forests, Healthy Aquatic Ecosystems” is the focus of Theme 2 of the CNAES and will investigate how forest ecosystem attributes regulate aquatic ecosystem services.

We are seeking PhD students; however, exceptional MSc students will be considered.
Theme 2 – Healthy Forests, Healthy Aquatic Ecosystems

Description

Funding is available for graduate students to join a dynamic, interdisciplinary network of researchers who are applying an integrative assessment of spatial and temporal drivers of catchment processes and their role in the sustainability of forest ecosystem health and their associated aquatic ecosystem services.

Students will be hosted and receive degrees from one of the partner universities (Western, Guelph, British Columbia (UBC), New Brunswick (UNB), Trent), but will receive value-added experience by interacting with academic, industry, government and non-governmental groups across Canada through meetings, workshops, laboratory exchanges, and collaborative research.

Each project will explore one or more of the challenges facing aquatic ecosystems experiencing various forms of forest disturbance using state-of-the-art techniques, coalescing with other projects to develop knowledge and tools for the management of aquatic ecosystem services in Canada.

These projects comprise one theme of the Canadian Network for Aquatic Ecosystem Services (CNAES), an NSERC Strategic Network investigating how aquatic ecosystem services respond to environmental stressors. For more information on the CNAES, go to www.cnaes.ca.

Qualified Applicants

The most qualified applicants will have a solid quantitative background, expertise in spatial analysis and/or statistics and a strong interest in stream and riparian systems, disturbance ecology, and ecosystem services. Applicants must have an MSc degree for entrance into the PhD program, although there may be opportunities for exceptional students to register for the MSc program and convert to the PhD program after their first year of study. For field-based projects, applicants should be willing to work in remote areas, sometimes under inclement conditions. Previous peer-reviewed scientific publications are highly desirable.

Applicants should send a resume, transcripts and cover letter describing research interests to Irena Creed (Western) at cnaes.forests@gmail.com.

Project Descriptions

Sub-Theme 1: Physical, chemical and biological indicators of aquatic ecosystem services from headwaters of forested landscapes

This sub-theme will develop an integrative assessment of spatial and temporal drivers of catchment processes and their role in the sustainability of forest ecosystem health and their associated aquatic ecosystem services using GIS, remote sensing, statistical and numerical models, and field studies.

There are three PhD projects related to this sub-theme:

1. Physical and chemical indicators of aquatic ecosystem services on forested landscapes. Supervised by Irena Creed at Western. Start date May 2013.
   - Using GIS/remote sensing and statistical techniques to explore the role of spatial and temporal heterogeneity on the provision of physical and chemical indicators or aquatic ecosystem services

   - Investigating organic matter dynamics as well as periphyton and macroinvertebrate community structure.

3. Distributed simulation modeling to predict indicators of aquatic ecosystem services from forested landscapes. Supervised by Irena Creed at Western. Start date September 2013 to May 2014.
   - Using distributed models (e.g., RHESSys) to identify controls on physical, chemical and biological indicators of aquatic ecosystem services

Sub-Theme 2: Experimental manipulations to test the effects of forest management activities on physical, chemical and biological indicators of aquatic ecosystem services from headwaters of forested landscapes

This sub-theme will investigate the effects of forest condition on aquatic ecosystem services (past and current watershed experiments) to determine effects of natural and anthropogenic disturbances on aquatic ecosystem services, including organic matter dynamics and associated periphyton and macroinvertebrate communities, as indicators of aquatic biodiversity and ecosystem integrity across Canada.

There are three PhD projects related to this sub-theme, all of which will investigate the cumulative effects of disturbances on regional watersheds:

1. Western Region. Supervised by John Richardson at UBC. Start date May 2013.
   - Research will involve using mesocosms and in situ experiments to manipulate variables including organic matter, fine sediment input and shading to investigate their impact on aquatic ecosystem services


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Theme 2 – Healthy Forests, Healthy Aquatic Ecosystems

CNAES Theme 2 Principal Investigators

Irena Creed – Western – Theme 2 Co-leader
Dr. Creed’s research characterizes watershed processes through innovative techniques in GIS, remote sensing and modelling. We conduct science that tracks the movement and fate of nutrients within and through watersheds, which are released to the atmosphere and aquatic systems.
www.uwo.ca/biology/Faculty/creed/index.html

John Richardson – UBC – Theme 2 Co-leader
Dr. Richardson studies the population and community ecology of streams and streamside systems using experimental approaches at multiple scales to test the mechanisms that control these systems. In particular the roles of connections across the water-land interface, and how land-uses can affect those processes.
http://faculty.forestry.ubc.ca/richardson/

James Buttle – Trent
Dr. Buttle’s research interests include runoff processes in forest, agricultural and urban landscapes, the hydrological effects of forest disturbance, and the hydrologic recovery of forest landscapes following disturbance.
www.trentu.ca/geography/faculty_buttle.php

Sarah Gergel – UBC
Dr. Gergel studies the relation of terrestrial and aquatic landscapes. She has developed tools for estimating the ecological services in aquatic systems and their control by riparian and landscape processes.
http://sarahgergel.net/iel/

Karen Kidd – UNB
Dr. Kidd studies how food web structure of aquatic systems is affected by human activities, and how energy flow to and trophic position of biota affect their concentrations of contaminants.
www.unb.ca/saintjohn/sase/research/kiddlab/

Paul Sibley – Guelph
Dr. Sibley’s research focuses on issues of water quality and environmental management, including disturbance ecology focusing on the impacts of forest harvesting on boreal aquatic systems.
www.uoguelph.ca/~bephilsey/home.html

Project Descriptions

Sub-Theme 3: Cumulative effects of catchment disturbances on downstream ecosystem services in forested landscapes

This sub-theme will link the physical, chemical and biological indicators of aquatic ecosystem services from the previous sub-theme to assess the cumulative effects of catchment disturbances on downstream ecosystem services in forested landscapes across Canada.

There are three PhD projects related to this sub-theme, all of which will investigate the cumulative effects of disturbances on regional watersheds:

1. Western Region. Supervised by Sarah Gergel at UBC. Start date September 2013 to May 2014.
2. Central Region. Supervised by James Buttle at Trent. Start date September 2013 to May 2014.

• Research will involve creating disturbance histories using aerial and remotely sensed imagery as well as archived and newly collected data, including stable isotope analysis, which will be used to construct simulations and perform statistical analyses to develop quantitative linkages between the indicators of aquatic ecosystem services.

Sub-theme 4: Addressing uncertainty using future scenarios: identifying desired futures for competing social, economic and aquatic ecosystem services outcomes in a changing forest landscape

This sub-theme involves developing scenarios and creating alternative futures of aquatic ecosystem services to assess economic and ecological risks of policy options under alternative futures.

There is one PhD project related to sub-theme 4.

1. Supervised by Irena Creed at Western, in collaboration with partners in Alberta. Start date September 2013 to May 2014.

• Research will use scenario analysis, which involves both social science and natural science expertise, to map out alternative futures. This project will also be closely related to Sub-theme 5.

Sub-theme 5: Policy implementation that integrates centralized and decentralized approaches to maintain aquatic ecosystem services on forest landscapes

This sub-theme involves developing models of land use change as well as frameworks and criteria for protection/compensation/mitigation options.

There is one PDF project related to this sub-theme:

1. 2-year PDF. Supervised by Irena Creed at Western, in collaboration with partners in Alberta. Start date 2016.

• Research will involve policy and software analysis (e.g., Marxan) to establish relationships between forest management techniques and aquatic ecosystem services.