Ph.D. Candidate

Bernhard Wegscheider

Graduate Academic Unit

Biology

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August 25, 2020

10:00 a.m. (Atlantic)

Virtual Defence

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Examining Board:
Dr. Brian Hayden (Biology)
Dr. Wendy Monk (Forestry & Environmental Mgt.)
Dr. Kerry MacQuarrie (Civil Eng.)
Dr. Tommi Linnansaari (Biology) Supervisor

External Examiner: Dr. Knut Alfredsen
Dept. of Civil and Environmental Engineering
Norwegian University of Science and Technology

The Oral Examination will be chaired by:
Dr. Kevin Englehart, Associate Dean of Graduate Studies

BIOGRAPHY

Universities attended (with dates & degrees obtained):

2015 – present	PhD candidate, University of New Brunswick
2015	Master of Science (Ecology and Biodiversity), University of Innsbruck
2012	Bachelor of Science (Biology), University of Innsbruck

Publications:

Wegscheider, B., MacLean H. O., Linnansaari T., & Curry R. A., 2019. Freshwater mussel abundance and species composition downstream of a large hydroelectric generating station. Hydrobiologia 836: 207–218.

Wegscheider B, Linnansaari T, Curry RA., (2020). Mesohabitat modelling in fish ecology: A global synthesis. Fish and Fisheries; 00: 1–13. https://doi.org/10.1111/ faf.12477

Wegscheider, B., Linnansaari, T., Wall, C. C., Gautreau, M. D., Monk, W. A., Dolson-Edge, R., Samways, K. M., & Curry, R. A. (2020). Diel patterns in spatial distribution of fish assemblages in lentic and lotic habitat in a regulated river. River Research and Applications, 1–10. https://doi.org/10.1002/rra.3615

Wegscheider B, Linnansaari T, Monk W, Curry RA (2020). Linking fish assemblages to hydro-morphological units in a large regulated river. Ecohydrology. https://doi.org/10.1002/eco.2233

Wegscheider, B., Linnansaari, T., Ndong, M., Ogilvie, J., Schneider, M., Kopecki, I., Dolson-Edge, R., Samways, K., Haralampides, K., and Curry, R.A. 2018. Preliminary fish habitat and community assessment related to the future options for the Mactaquac Generating Station. Mactaquac Aquatic Ecosystem Study Report Series 2018-033. Canadian Rivers Institute, University of New Brunswick. vi + 52 p.

MacLean, H., Linnansaari, T., **Wegscheider, B.:** Presence and abundance of freshwater mussels in the vicinity of the Mactaquac Generating Station. Mactaquac Aquatic Ecosystem Study Report Series 2016-052, Canadian Rivers Institute, University of New Brunswick. iii + 18p.

Selected Conference Presentations:

Wegscheider, B., Linnansaari, T., Curry, R.A., Schneider, M. (2019): Modelling existing and future fish habitat under variable management scenarios in a large regulated river. ISRS 2019, 6th Biennial Symposium of the International Society for River Science. September 8- 13, 2019, Vienna, Austria.

Wegscheider, B., Linnansaari, T., Curry, R.A., Schneider, M. (2019): Modelling habitat suitability for fish communities with implications for river management. CSEE 2019, Canadian Society for Ecology and Evolution. August 19- 21, 2019, Fredericton, Canada.

Wegscheider, B., Linnansaari, T., Curry, R.A., Schneider, M. (2019): Quantitative modelling of existing and future fish habitats in the Saint John River. Ecology Meets Ingenieur: EcoMeetIng 2019. February 21- 23, 2019, Stuttgart, Germany.

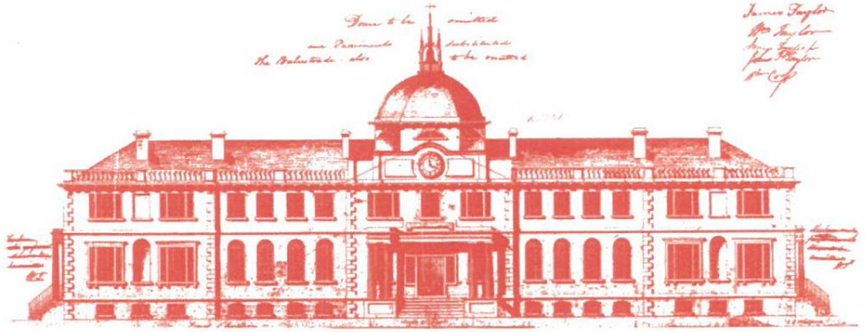
Several Other Conference Presentations

QUANTITATIVE MODELLING OF EXISTING AND FUTURE FISH HABITAT IN THE SAINT JOHN RIVER, NB, CANADA

Abstract

The aging Mactaquac Hydroelectricity Generating Station (MGS) is one of Canada's largest dams and it has reached the end of its service life. My research focused on quantifying existing and future fish habitat downstream the MGS, considering current management options to renew the infrastructure in the short-term with a longer-term solution of rebuilding or removing. In detail, my project applied a hydraulic-habitat model to assess habitat change and predicted effects on fish communities for future regulated and climate-induced flow regimes. Fish communities were surveyed and related to habitat characteristics up- and downstream the facility, and habitat requirements were defined for three distinct fish assemblages based on meso-scale habitat use and expert opinion. Modelling predictions suggest that dam operation and flow regulation resulted in a general decrease in habitat availability for each fish assemblage when being compared to the historic flow regime prior to the construction of the MGS. Furthermore, under the current dam operation scheme, rheophilic species were predicted to be limited in habitat conditions during the critical summer low flow period, with habitat availability averaging below 20% and never exceeding 30% of the wetted channel area at any day in the time record (1968 to 2015). The implementation of environmental flows ranging around the proposed Q50 flow rate was predicted to be minimizing duration of stress events and increasing availability of suitable habitats on a community scale. Similarly, a future climate induced flow regime under a dam removal scenario was predicted to result in improved conditions for fish species.

Recommendations informed by this thesis aim to improve habitat conditions for multiple species and are given to hydropower and fisheries managers. Proposed strategies include: i) implementing environmental flows ranging around a Q50 flow rate for the SJR, including flow rules that mitigate the effects of hydropeaking; ii) continuing fish community monitoring in the SJR and extending surveys to seasons other than the summer period to gain better insights into flow-ecology relationships of imperiled species, and iii) constructing an effective bypass for multiple species at the MGS to improve fish passage and connect migration pathways to hydraulic and thermal refugia as well as spawning and nursery grounds in the SJR watershed.



Home of the School of Graduate Studies, Sir Howard Douglas Hall was designed by J.E. Woolford in 1825 and is the oldest university building in Canada still in use.

The University of New Brunswick recognizes that the university sits on traditional Wolastoqey territory. The river that runs right by our university – the St. John River – is also known as Wolastoq, along which live the Wolastoqiyik -- the people of the beautiful and bountiful river.

UNIVERSITY OF NEW BRUNSWICK

SCHOOL OF GRADUATE STUDIES

ORAL EXAMINATION

Bernard Wegscheider

IN PARTIAL FULFILMENT
OF THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY