Kilgour & Associates Ltd.
Environmental Consultants

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Our File: OWA 1120

Catherine Proulx: Summary of Expertise

Turtles

Ms. Proulx has conducted numerous surveys for various turtle species including Blanding's Turtles (*Emydoidea blandingii*), Snapping Turtles (*Chelydra serpentina*), and Painted Turtles (*Chrysemys picta*). The surveys have been completed in surface waters in and around Ottawa and Sudbury for a variety of sectors including hydropower, mining and land development. Ms. Proulx's undergraduate research involved investigating the impact of road networks on the movement patterns of two Blanding's Turtle populations; the first in Québec (Gatineau Park to Clarendon) and the second in Ontario (Kanata). Individual turtles were monitoring via radiotelemetry and road avoidance for unpaved and paved roads was quantified using random walk movement analysis through the incorporation of habitat bias. The research was published in two scientific papers (J. Herpetol 48:267-271, Ecol Modell 269:18-20).

Surface Water Quality Subject Matter Expert

Ms. Proulx has both helped with the design as well as the delivery of numerous projects involving the analysis of surface water quality. Projects have included the analysis of water chemistry from numerous Environmental Effects Monitoring (EEM) programs carried out for the mining community in Ontario and Saskatchewan and well as the analysis of water chemistry from oil sands operations near Fort McMurray, Alberta. Ms. Proulx also been involved with ongoing water quality monitoring programs for Heney Lake in Québec and for various subwatershed studies in Sudbury, Ontario. For Environment and Climate Change Canada, Ms. Proulx has helped (1) in the development of a GIS model for assessing water purification potential (i.e. ecosystem service), (2) in updating CESI's water quality indicator for freshwater quality in Canadian rivers, and (3) in the collected and characterization of background concentrations ranges across Canada to inform chemical risk assessment. As part of this last project, Ms. Proulx demonstrated that a conductivity-alkalinity relationship could be used as a tool to identify surface waters in reference condition across Canada (Water Qual Res J Can 53:231–240). Ms. Proulx has completed a literature review and recommended indicators of surface water connectivity for the Lower Athabasca Region in Alberta. Ms. Proulx is knowledgeable on various quantitative statistical methods to analysis surface water quality data, including mixed-effects models, multivariate analyses, general linear models, and the use of normal ranges and tolerance limits.

Fish Sampling Subject Matter Expert

Ms. Proulx has both designed and carried out numerous fish sampling programs for the hydropower, mining, and land development sectors, as well as for all levels of government (municipal, provincial, federal). These have included both non-lethal and lethal fish sampling programs, for both small and large bodied fish. The fish sampling programs have aimed at assessing either the status of sentinel fish populations (i.e. via endpoints such as condition, GSI, LSI), the usability of fish (i.e. via analysis of metals in fish tissue), fish community composition, the presence of species at risk (e.g. Deepwater Sculpin (*Myoxocephalus thompsonii*) in lakes, Channel Darter (*Percina copelandi*) in rivers), or critical habitat designation. Ms. Proulx is familiar with various gear

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types for fish sampling, including boat electrofishing, backpack electrofishing, minnow trapping, fyke netting, and gill netting.

Expertise and Experience in the hydroelectric sector
Ms. Proulx has participated in ecological studies for hydroelectric facilities in Sudbury, Ontario. Field programs have included those to develop detailed inventories of aquatic species and habitats Generating Stations. Water quality, sediment quality, fish communities and fish habitat suitability studies have been completed as part of these field programs.

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Attachments: Curriculum Vitae

Catherine L Proulx, MSc

Catherine is a senior biologist with a background in aquatic ecology. Catherine completed her BSc and MSc at the University of Ottawa. As part of her undergraduate thesis she investigated the impact of road networks on the movement patterns of the endangered Blanding's Turtle (*Emydoidea blandingii*). Individual turtles were monitoring via radiotelemetry and road avoidance for unpaved and paved roads was quantified using random walk movement analysis through the incorporation of habitat bias. As part of her graduate thesis she studied the growth, habitat use, and distribution of several species, including the endangered Channel Darter (*Percina copelandi*). Prior to joining Kilgour & Associates Ltd. in 2015, Catherine worked at Environment Canada where she led the development of conceptual models for assessing the potential of Canada's watersheds to purify water, an ecosystem service. Since joining Kilgour & Associated Ltd. she has worked on numerous projects involving environmental monitoring, ecological inventories, and the analysis of environmental data. Catherine has experience related to literature reviews, collecting and compiling data, environmental indicators and trend assessment. To date, Catherine has published five peer-reviewed papers from leading scientific journals.

EDUCATION

BSc Hon, Biology, University of Ottawa, 2012

MSc, Biology, University of Ottawa, 2014

RECENT TRAINING AND COURSES

Swift Water Rescue Training, 2017
CABIN Project Manager 2017
CABIN Field Certification 2016
Backpack Electrofishing 2016
Pleasure Craft Operator Card 2015

EMPLOYMENT HISTORY

Biologist, Kilgour & Associates, Ottawa, ON, (2015 to present)

Ecosystem Services Researcher, Environment Canada, Ottawa, ON (2014-2015)

RELEVANT PROJECT EXPERIENCE

Environmental Effects Monitoring

Manitoba Operations EEM (Vale) 2020- Present

Project scientist responsible for the Study Designs for Vale's Phase 7 EEM for its discharges from the Thompson Mine and Birchtree Mine in Manitoba.

Totten Mine (Vale) 2017- Present

Project scientist responsible for the collection of data, analysis and reporting for the Phase 4 Investigation of Cause (2018), and Study Design for the Phase 5 Routine Monitoring (2020).

Sudbury INO EEMs (Glencore), 2017-Present

Project scientist/Project manager responsible for the study design, data collection, data analysis and reporting for Glencore's Phase 3 Investigation of Cause (2018) and Phase 4 Routine Monitoring (2020).

Seabee Gold Mine (SSR Mining), 2017- Present

Project biologist for the Seabee Gold Mine Phase 6 (2019) and Phase 7 (2020) EEMs.

McClean Lake EEM (Orano), 2019-20

Project scientist/Project manager responsible for the study design, data collection (including a novel wild bivalve study), data analysis and reporting for McClean Lake's Phase 6 EEM.

Strathcona EEM (Glencore), 2018-20

Project scientist/Project manager responsible for the study design, data collection, data analysis and reporting for Glencore's Strathcona Phase 6 EEM.

Junction Creek Cycle 5 EEM (Vale), 2017-20

Project manager and field crew lead responsible for the Study Design, data collection and reporting on Vale's three discharges into Junction Creek: Garson Mine WWTS, Copper Cliff WWTP and Nolin Creek WWTP (2019).

Crean Hill EEMs (Vale), 2015-19

Project scientist/Project manager responsible for the Study Design, data collection, data analysis and reporting for Phase 2 (2016) and Phase 3 (2019) EEM programs.

Timmins West EEM (Parks Environmental) 2018

Project scientist – Assist with the Study Design and data collection.

Taylor Mine EEM (Parks Environmental) 2018

Project scientist – Assist in the analysis and reporting.

Wally Lake EEM (C Portt & Associates) 2018

Project scientist – Assist with the analysis and reporting on benthic invertebrate communities.

Holt Mill EEM (Parks Environmental) 2017-18

Project biologist – Assist with the fish dissections and reporting.

Labrador Iron Mine EEM (Parks Environmental) 2017-18

Project biologist – Assist with the analysis and reporting.

Hislop Mine EEM (Parks Environmental) 2017-18

Project biologist – Assist with the analysis and reporting.

Whistle Creek EEM (Vale), 2017

Project biologist – Assist with the analysis and reporting.

Nolin Creek Cycle 4 EEM (Vale), 2015-17

Project biologist – Assist in the collection of data, fish dissections, data analysis and reporting.

Victoria Advance Exploration Project EEM (KGHM), 2016

Project biologist and field crew lead responsible for the collection of data and reporting.

Regional Aquatics Monitoring Program (Hatfield), 2015-16

Project biologist – Assist with the collection, analysis and reporting on measurement endpoints of benthic invertebrate communities from various baseline and test reaches from several rivers surrounding the oil sands in Fort McMurray AB as part of the Joint Oil Sands Monitoring Program (JOSMP).

Totten Mine EEM (Vale), 2015

Project biologist – Assist with the processing of benthic invertebrates; sorted and identified to order.

Government Science Policy

Peace-Athabasca Trout-perch Analysis (AEP), 2020

Statistical analysis of Trout-perch analysis and development of site-specific normal ranges.

Groundwater Data Trends (ECCC), 2018

Statistical analysis report to guide mandatory reporting on the state of the Great Lakes and groundwater science.

Lower Athabasca Triggers (COSIA), 2017

Establishing normal ranges of variation for water, sediment, benthos and fish collected from sites on the Athabasca River, AB

Effectiveness Monitoring Programs (DFO), 2017

Review of existing regulatory regimes that have effectiveness monitoring requirements in Canada and internationally.

Lotic Connectivity Index (ABMI), 2017

Literature review and recommendation of lotic connectivity indexes and development of a monitoring program for the Lower Athabasca Region in Alberta.

Freshwater quality in Canadian Rivers Indicator (ECCC), 2016

Updating CESI's water quality indicator; trend assessment and reporting.

Geochemical Background Concentrations (ECCC), 2016

Collect, evaluate and characterize background concentration ranges to inform chemical risk assessments.

Alberta Environmental Performance Indicator (Alberta Energy Regulator), 2015

Helped develop a set of environmental performance metrics for the Alberta Energy Regulator

Landscape Aesthetic Quality (ECCC), 2015

Aided in the development of a conceptual model, Visual Quality Index (VQI), for assessing aesthetic beauty potential in the Boreal forest, Canada

Saugeen Shores Urban Forestry Operational Plan

Literature review to help in the development of a forest management plan for the Town of Saugeen Shores

Freshwater Monitoring Program - Ring of Fire (Wildlife Conservation Society Canada), 2015

Assisted in the development of a freshwater monitoring program for Northern Ontario`s Ring of Fire. Reviewed statistical design options such as BACI and RCA.

Ecosystem Potential Index for Canada (ECCC), 2014-15

Assisted in the development of national strategy for assessing water purification potential, an ecosystem service, using GIS modelling

Fish & Fish Habitat Assessments

Heney Lake (Heney Lake Foundation), 2016-20

Collection of water samples, sediment samples, sonar data and aquatic vegetation grabs to access phosphorus levels, vegetation density and community in the lake and surrounding watershed lakes.

Nairn Falls Generating Station Replacement Project (Vale), 2017-18

Complete environmental studies in support of options selection and development for Nairn, including the collection of bathymetric, topographic, flow velocity, depth and sediment data.

Whitson River Subwatershed Studies (Aquafor Beech), 2017-18

Collect and compiled historical data of watershed conditions and analyse and report on existing condition (i.e. water quality, phytoplankton, sediment chemistry).

Wabagishik Generating Station Spillway Replacement (Vale), 2017-18

Complete environmental studies in support of options selection and development for Wabagishik, including the collection of fish, water quality and bathymetric data.

Jock River Restoration Aquatic and Ecological Site Assessment, 2018

Modelling of anticipated peak spawning dates for Walleye and Northern Pike in the Jock River over the past 20 years.

Whitewater Subwatershed Studies (Aquafor Beech), 2017-18

Collect and compiled historical data of watershed conditions and analyse and report on existing condition (i.e. water quality, phytoplankton, sediment chemistry).

Assimilative Capacity Study (KGHM), 2017

Characterization of the fish littoral habitat and riparian habitat on Ethel Lake.

Whitson River Fisheries Study (City of Greater Sudbury), 2017

Determine the presence or absence of Brook Trout in the Whitson River.

Deepwater Sculpin (Fisheries and Oceans Canada), 2016

*Assessment of the presence of Deepwater Sculpin (*Myoxocephalus thompsonii*), a species of concern, in its historical range in Québec.*

Aquatic Baseline Study (Wahnapitae First Nation), 2016

Collection of water, sediment, benthos and fish to support site exploration by Wallbridge Mining Company.

Brook Trout Re-Introduction Study (Wahnapitae First Nation), 2016

Collection of Brook Trout for biomass estimation in support of possible re-introduction.

Smallmouth Bass (*Micropterus dolomieu*) Collection (MNRO), 2015

Boat electrofishing in target habitats for the collection of over 120 smallmouth bass ranging from 2 to 8 inches for mussel rearing by the Ministry of Natural Resources and Forestry, Ontario

Analysis of Process Water Chemistry (Shell Canada), 2015

Data entry and management of large database

Terra Nova Offshore Oil Benthos and Sediment Monitoring Program (Stantec), 2015

Provided support related to data analysis and report generation to Project Manager.

Ecology & Environmental Assessment

Environmental Impact Statement (Various), 2017

Complete environmental studies (Headwater Drainage Feature Assessment, Frog Survey, Whippoorwill Survey, Fish Survey) on properties to be developed.

Cranberry Creak Request for Review (Robinson Consultants), 2015

*Assessed potential impact of proposed dyke installation on Northern Pike (*Esox lucius*) spawning through the analysis of water temperature data.*

Monahan Stormwater Management Pond Retrofit (South Kanata Development Corp), 2015

Fish and turtle removal and relocation from an online stormwater pond using various techniques (e.g. seining and e-fishing).

Stormwater Management Pond Retrofit (Mattamy), 2015

Fish removal for Carp River channel re-alignment and Pond 4 retrofitting. Water quality and species at risk monitoring.

Peterborough Municipal Airport Mitigation Measures (City of Peterborough), 2015

Drafted documents outlining mitigation measures for all four phases of the airport expansion

Species at Risk Survey Ottawa International Airport (Macdonald-Cartier Airport Authority), 2015

Surveyed property for SAR (bats, frogs, toads)

Routine Water Quality Monitoring, Stormwater Ponds (Mattamy, Richcraft), 2015

Catherine L Proulx, MSc

Weekly water quality monitoring (e.g. pH, conductivity, turbidity, TSS, DO) of various stormwater ponds in the City of Ottawa

PUBLICATIONS

Kilgour, B.W., Munkittrick, K.R., Hamilton, L, Proulx, C.L., Somers, K.M., Arciszewski, T. and McMaster, M. Developing triggers for Environmental Effects Monitoring Programs for Trout-perch in the Lower Athabasca River. Environmental Toxicology and Chemistry (under review).

Proulx, C.L, Kilgour, B.W., Francis, A.P., Bouwhuis, R.F., and Hill, J.R. 2018. Using a conductivity-alkalinity relationship as a tool to identify surface waters in reference condition across Canada. Water Quality Research Journal of Canada, 53. DOI: 10.2166/wqrj.2018.030

Chapman, J.M., Proulx, C.L., Veilleux, M.A.N, Levert, C., Bliss, S., Lapointe, and Cooke, S.J. 2014. Clear as mud: A meta-analysis on the effects of sedimentation on freshwater fish and the effectiveness of sediment-control measures. Water Research, 56: 190-202.

Proulx, CL., Fortin, G., and Blouin-Demers, G. 2014. Blanding's turtles (*Emydoidea blandingii*) avoid crossing unpaved and paved roads. Journal of Herpetology, 48: 267-271.

Proulx, C.L., Proulx, L., and Blouin-Demers, G. 2013. Improving the realism of random walk movement analyses through the incorporation of habitat bias. Ecological Modelling, 269: 18-20.

PRESENTATIONS

Proulx, C.L., B. Kilgour, A. Francis, R. Bouwhuis, J. Hill. 2018. Applications of a conductivity-alkalinity relationship as a tool to identify surface waters in reference condition for environmental monitoring. Saskatchewan Mining Association (SMA), Saskatoon, SK.

Proulx, C.L., B. Kilgour, A. Francis, R. Bouwhuis, J. Hill. 2016. Assessing reference condition using water chemistry. Stream Monitoring, Assessment & Research Team Eastern Region (SMARTER), Manotick, ON.

Proulx, C.L., B. Kilgour, A. Francis, R. Bouwhuis, J. Hill. 2016. Collecting background concentration data to inform chemical risk assessment. Laurentian SETAC, Waterloo, ON.

Proulx, C.L. 2015. Channel darter (*Percina copelandi*) distribution, habitat use, reproduction and growth in several tributaries of the Ottawa River, Québec. Stream Monitoring, Assessment & Research Team Eastern Region (SMARTER), Manotick, ON.

Proulx, C.L. 2013. Study of darters (Percidae) in several tributaries of the Ottawa River, Québec. Rencontre de l'équipe de rétablissement des Cyprins et petits percidés, Montréal, QC.

Proulx, C.L., Kohlman, M., Schmidt, B.C. 2010. Native insects of invasive plants: Lepidoptera on Glossy Buckthorn (Frangula alnus). Ottawa Entomological Club Meeting, Ottawa, ON.