

November 13, 2020

Our File: OWA 1120

Ed Malindzak: Summary of Expertise

American Eel

Ed has completed studies specifically targeting American eel (*Anguilla rostrata*) for hydroelectric dam facilities (e.g., Chaudière Falls, Fleet Street Pumping Station) on the Ottawa River in Ottawa and on Twelve Mile Creek related to the Shickluna Hydro Generating Station in St. Catherine's, Ontario. Sampling gears for American eels included backpack electrofishing and a novel trapping method using falling water to attract eels to a holding pen. Ed has sampled American eel with boat electrofishing gear while undertaking community level surveys (i.e., Index of Biotic Integrity surveys) in the south east United States.

The purpose of the studies varied and included: determination of eel presence/absence, assessing upstream / downstream passage, and eel relocation to allow dam maintenance activities. Ed has produced numerous deliverables regarding American eel habitat use, assessment of habitat potential, potential impacts to eels, and negotiated and provided suitable mitigation recommendations to avoid or limit impacts to the species.

Lake Sturgeon

Ed has collaborated on studies targeting sturgeon species including Lake Sturgeon (*Acipenser fulvescens*) in Ontario and. Sampling methods for sturgeon was limited to gill netting for the Long-Sault Rapids Generating Station and Yellow Falls Generating Station on the Mattagami River in Ontario. Ed has collaborated on a study gill netting and partnering with commercial fishermen to collect incidental catch of Shortnose Sturgeon (*Acipenser brevirostrum*) on the Neuse River (North Carolina).

The purpose of the studies included assessment of habitat potential, determination of habitat use, general population assessment, evaluation of dam passage capabilities, impacts of projects on Lake Sturgeon, and provided suitable mitigation recommendations to avoid impacts to the species.

Surface Water Quality Subject Matter Expert

Ed has extensive experience in the collection, interpretation, and reporting of surface water quality data as it relates to Ontario Provincial Water Quality Objectives and Canadian Council of Ministers of the Environment (CCME). Surface water quality implications vary by project from simple aquatic health parameters (e.g., temperature, dissolved oxygen, turbidity) to full spectrums of parameters (e.g., conventional, major ions, nutrients, organics, volatile). Ed has completed significant projects involving surface water quality for numerous Environmental Effects Monitoring programs for metal mining and pulp and paper.

Fish Sampling Subject Matter Expert

Edward's academic background includes a graduate thesis in stream fish ecology and 15+ years of planning and executing of aquatic sampling and monitoring programs as well as completing biological and surface water studies in lentic and lotic systems in the Energy, Mining, and Transportation sectors. related to. Ed has successfully coordinated fish/fish habitat, benthic

invertebrates, and surface water quality/quantity projects that included providing defensible study designs, completing comprehensive environmental field sampling using accepted protocols, data interpretation and analysis, producing and reviewing technical reports, and acquiring regulatory permissions and approvals.

Ed has performed in-field and laboratory tasks in support of numerous hydro projects, including sampling, fish surgery, radio telemetry, logistical coordination, and data analysis and interpretation. Ed has extensive experience operating and maintaining sampling equipment, marine electronics, electro-fishing gear and watercraft.

EXPERTISE and EXPERIENCE IN DEVELOPMENT OF MITIGATION, EFFECTS MONITORING and EFFECTIVENESS MONITORING PLANS

Every project Ed participates in involves fish and fish habitat in one form or another and developing appropriate mitigation measures is typically a requirement of each project. Ed has extensive experience in the development and application of mitigation measures include standard items such as timing windows, fish salvage for dewatering operations, sediment and erosion control measures, site restoration requirements, setbacks, details regarding materials and fuel storage, etc. as well as outside the box solutions for problems (e.g., using blast mat for energy dissipation at water pumping operations), and species specific mitigation and monitoring for species at risk. I have developed, negotiated, and completed construction and post construction effects monitoring plans for a wide variety of projects, including hydroelectric dams. Many of these projects included significant species at risk components, for which mitigation and monitoring was also completed.

EXPERTISE and EXPERIENCE in the HYDROELECTRIC SECTOR

Eds graduate thesis focused on the ecology of an introduced fish species and potential impacts to an endangered species post dam removal. Eds hydroelectric experience extends across the province and he has completed fish passage studies, post-construction monitoring studies, and re-negotiated fish compensation with DFO and MNRF for a new hydroelectric operation. Ed has provided technical guidance related to dam design / construction, operation, and maintenance works

Ed Malindzak, MSc

Fish Biologist

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Attachments: Curriculum Vitae



Edward Malindzak, MSc



Edward is a Biologist with a background in fisheries science and Species at Risk. Ed has experience in conducting environmental surveys, habitat assessments, and inventories for Environmental Assessments (EA), environmental impact statements (EIS), ecological risk assessments, and environmental baseline studies, in many industry sectors, including: Transportation, Energy, and Mining.

Edward's academic background includes a graduate thesis in stream fish ecology. His academic research experience is focused in fish biology in lentic and lotic systems. Edward has diverse technical experience that includes extensive experience completing fauna/flora inventories and habitat assessments on urban, rural, and remote environments in coastal, in-land, and mountain regions of North America and the Caribbean

He is experienced in the use and interpretation of descriptive, inferential, and non-parametric statistical analysis of biotic and abiotic data. He is very knowledgeable in Federal, Provincial, and regional regulations and associated permitting requirements for the Fisheries Act, Species at Risk Act, Endangered Species, Fish and Wildlife Conservation Act, 1997, Migratory Birds Convention Act, Navigation Protection Act, Conservation Authorities Act, and the National Parks Act.

EDUCATION

BSc, North Carolina State University, Fisheries and Wildlife Science, Raleigh, North Carolina, 2003

MSc, North Carolina State University, Fisheries and Wildlife Science with a minor concentration in Statistics, Raleigh, North Carolina, 2006

RECENT TRAINING AND COURSES

CPR and First Aid, Canadian Red Cross, Ottawa, Ontario, 2020

Working at Heights, February 2019

Certified Inspector of Sediment and Erosion Control (CISEC), Toronto Region Conservation Authority, Manotick, Ontario, 2017

Santé et sécurité générale sur les chantiers de construction (ASP Construction), Vanier College, Montreal, Quebec, 2017

Butternut Health Assessor, Ontario Ministry of Natural Resources and Forestry, Kemptville, Ontario, 2015

Class 2 Electrofishing Certification (Crew Leader and Boat Crew Member), Rideau Valley Conservation Authority, Ottawa, Ontario, 2018

Pleasure Craft Operator Card, Transport Canada, Ottawa, Ontario, 2009

Crew Leader - Ontario Stream Assessment Protocol, Ministry of Natural Resources, Kemptville, Ontario, 2010

PROFESSIONAL ASSOCIATIONS

American Fisheries Society (Member)

International Society of Arboriculture (Member)

EMPLOYMENT HISTORY

Kilgour & Associates, Ottawa, ON, Senior Project Manager (2020 to present)

Parsons Inc. Ottawa, ON, Senior Biologist / Project Manager (2016 to 2020)

Stantec Consulting, Ottawa, ON, Senior Biologist / Project Manager / Team Leader (2014 to 2016)

WSP Canada Inc. (formerly Genivar), Ottawa, ON, Fisheries Biologist / Project Manager (2012 to 2014)

Stantec Consulting, Ottawa, ON, Fisheries Biologist / Project Manager (2006 to 2012)

South Nation Conservation Authority, Berwick, ON, Contract Fisheries Technician (2006)

North Carolina State University, Raleigh, NC, Graduate Research Assistant (2000-2006)

Davey Tree Company, Columbus, OH, and Raleigh, NC, Arborist, (1996-1999)

RELEVANT PROJECT EXPERIENCE

ENERGY

Determination of Suitable Location for a Permanent American Eel Passage Structure at the Chaudière Falls Hydroelectric Facilities, Ottawa, Ontario: Installed, operated, and maintained three traps for American Eel (Endangered Provincially, Special Concern Nationally) at the Energy Ottawa and Domtar Hydroelectric facilities at Chaudière Falls to determine the most suitable location to install a permanent eel passage structure. Coordinated Endangered Species Act permit submissions to the Ontario Ministry of Natural Resources. Installed and maintained closed circuit video cameras to allow daily trap inspections to be completed remotely by hydro facility staff.

Evaluation of Fish Passage at Shikluna Hydroelectric Facility, St. Catharines, Ontario: Targeted sampling of headwaters, tailwaters, impoundments, and naturalized systems for Brook Trout, Brown Trout, White Sucker, and American Eel (Endangered Provincially, Special Concern Nationally) to evaluate the ability of fish to pass a barrier. Fish were captured using a variety of capture

methods (e.g., boat and backpack electrofishing, nets, angling) in coordination with the Ontario Ministry of Natural Resources. Coordinated and/or performed 95 radio telemetry transmitter and RFID PIT tag implantation surgeries.

Island Falls Hydroelectric Project, Smooth Rock Falls, Ontario: Biological and hydrological assessment of proposed dam construction and anticipated impacts to fish (e.g., Lake Sturgeon, American Eel), fish habitat, and upstream passage in preparation for compensation negotiations with Fisheries and Oceans Canada and Ontario Ministry of Natural Resources.

Year Ten Environmental Monitoring Program, Cochrane, Ontario: Conducted environmental monitoring program to evaluate existing environmental conditions including aquatic communities (e.g., Lake Sturgeon), habitat assessment, and potential impacts ten years since impoundment for hydroelectric power facility. Collected and analyzed data using Environment Canada biological protocols.

Evaluation of Fish Habitat Compensation Plan at the White Otter Falls Hydroelectric Facility, White Otter Falls, Ontario: Evaluated the existing environmental conditions and fish habitat compensation plan with respect to the compensation commitments outlined in the Fisheries Act Authorization related to the construction of one run-of-river Hydro-electric dam. Completed a site visit with the local Ontario Ministry of Natural Resources representative to discuss the project and known sensitive habitats, as well as to evaluate the observed existing terrestrial and aquatic features with respect to access and feasibility of construction. Developed and proposed alternative fish habitat compensation options to minimize potential impacts to existing sensitive fish habitat and terrestrial resources while satisfying the requirements of the Fisheries Act.

Shekak River Post Impoundment Environmental Monitoring for the Shekak-Nagagami Hydroelectric Development, Hearst, Ontario: Statistically analyzed and reported on fish mercury concentrations, according to Environment Canada biological monitoring protocols, to determine whether the impoundment has contributed to a fish community-level effect.

Trans-Northern Pipeline Inc. Environmental Impact Statements, Various Locations, Ontario and Quebec: Managed projects, provided Senior review, pre-screened for SAR species and species habitat, and completed aquatic and terrestrial field programs related to pipeline maintenance activities. Tasks included: analysis of background information, conducting natural feature inventories, managing and preparing habitat and impact assessments providing summaries of existing features, and liaison with regulatory agencies, identification of habitat

sensitivity and mitigate potential environmental impacts, and determine net effects on the environment. EIS experience extends across Ontario and into western Quebec numerous project sites.

Marine Pipeline Terminal, Saguenay, Quebec, Canada: Coordinated and lead a detailed multi-season field surveys to catalogue and evaluate existing terrestrial and aquatic resources at a proposed marine pipeline terminal located across a remote undeveloped geographic area on the shore of the fjords of the Saguenay River. Coordinated the collection of natural environment information by a diverse team of staff from across Canada. The information was compiled for inclusion in the federal EA process.

Enbridge Gas Distribution Pipeline Replacement, Ottawa, Ontario, Canada: Routine testing indicated the potential for compromised structural integrity in a 19.4 km section of pipeline in west Ottawa. Acquired permits and conducted interim and post construction environmental monitoring visits. Authored interim and final monitoring reports per the Ontario Energy Board Guidelines.

Enbridge Gas Pipeline Installation, Chalk River, Ontario, Canada: Undertook a comprehensive Environmental Report (ER) per the Ontario Energy Boards Environmental Guidelines for the Location, Construction and Operation of Hydrocarbon Pipelines and Facilities in Ontario for a new natural gas line to the Canadian Nuclear Laboratories. The ER included multi-disciplinary field studies and sub consultants, consultations (e.g., agencies, public, and First Nations), evaluation of alternatives and selection of preferred route, and construction and post-construction monitoring. The new 10.3 km pipeline extended from Chalk River to the Canadian Nuclear Laboratories and crossed multiple federal jurisdictions with unique environmental (e.g., Species at Risk, unexploded ordinance) and administrative (e.g., elevated security) concerns, creating many complex and challenging issues. Extensive consultations and negotiations were required to address these concerns prior to project completion.

Enbridge Gas Distribution Pipeline Replacement, Ottawa, Ontario: Routine testing indicated the potential for compromised structural integrity in the pipeline running through a PSW and under a watercourse. Acquired permits and conducted environmental monitoring for work related to the replacement of more than 500 m of gas pipeline in east Ottawa. Collected and analyzed background information from various sources and acted as primary liaison with environmental regulatory agencies. Conducted on-site environmental investigations twice a week and submitted field reports including observations, recommendations, and photographic records.

Enbridge Gas Distribution Pipeline Replacement, Cornwall, Ontario: Construction of a new bridge crossing of the St. Lawrence River from Cornwall to the Akwasasne First Nation Reservation required the movement of the existing pipeline mounted on the existing bridge structure. The project involved monitoring of two Horizontal Directional Drilling (HDD) sites concurrently in operation from each side of the river and meeting in the middle. Conducted continuous environmental monitoring while in operation at each of the drill sites, the surrounding terrestrial areas, as well as the waterway for signs of un-intentional returns. Documented on-site environmental conditions via inspection forms and photographic records following National Energy Board requirements. Provided immediate feedback to the contractors as well as senior Enbridge staff on-site. Jointly inspected the site with an NEB representative during an NEB site inspection.

Biologist. Hydro One Reconductoring (Hawthorne Transmission Station to Merivale Transmission Station), Ottawa, Ontario: Butternut, Bobolink, and Eastern meadowlark were identified as potentially occurring within the corridor. Completed Targeted Species at Risk (SAR) assessment surveys along 11 km of Hydro One corridor between the Hawthorne Transformer Station (TS) and the Merivale TS. Assessed the potential for these SAR to occur in the study area, identified constraints, and provided appropriate mitigation measures as may be necessary to undertake the reconductoring work.

Environmental Impact Studies for Power Projects, Various Sites Throughout Ontario: Collected fisheries data and assessed potential environmental impacts from power development projects following Renewable Energy Approval Regulations under the Environmental Protection Act. Conducted fish community inventories in watercourses, and prepared habitat and impact assessments providing summaries of existing fish communities, sensitivities of fish and fish habitat, mitigation solutions to minimize impacts to the natural environment, and net effects analyses. EIS experience includes:

David Brown Solar Project (Solar), Ingleside, ON

Suez Solar Project (Solar), Carleton Place, ON

Grand Renewable Energy Project (Wind and Solar), Haldimand and Norfolk Counties, ON

Fairview (Wind), near Stayner, ON

Springwood (Wind), Belwood, ON

Whittington (Wind), between Shelburne and Orangeville, ON

Bruce to Milton Transmission Reinforcement Project, Multiple Sites, ON

Ostrander Point Wind Energy Park, Near Picton, ON

NATURAL SCIENCES & HERITAGE RESOURCES

Determination of the Status of Shortnose Sturgeon of the Neuse River, North Carolina: Part of a multi-agency investigation to determine if Shortnose Sturgeon occur within the Neuse River, North Carolina. Participated in an intensive gillnet survey in order to determine the status of the Neuse River Shortnose Sturgeon population. Work was completed in compliance with the National Marine Fisheries Service Shortnose Sturgeon sampling protocol.

Environmental Effects Monitoring (EEM Program for Spruce Falls In.), Kapuskasing, Ontario: Assessed impact of pulp and paper operations on the aquatic environment. Statistically analyzed and reported on fisheries data, according to Environment Canada biological monitoring protocols, to determine whether the mill effluent was responsible for a fish community level effect.

Cycle 2-4 Environmental Effects Monitoring (EEM) Program for Hudson Bay Mining & Smelting Co. Ltd., Flin Flon, Manitoba, Canada. Conducted fish community inventories and collected tissue, benthic invertebrate, sediment, and water quality samples. Collected lethal and non-lethal fish tissue samples for aging structures, liver and gonad condition, and mercury analysis, according to Environment Canada Environmental Effects Monitoring Guidelines for Metal Mining. Statistically analyzed and authored technical reports summarizing fish effect endpoints to determine whether the mine effluent was having a community level effect on resident fish. Identified additional potential nearfield, mid-field, and far-field sampling locations as part of the investigation of cause (Cycle 4).

Environmental Effects Monitoring (EEM) Program for Kirkland Lake Gold Inc., Kirkland, Ontario, Canada. Statistically analyzed and reported on fisheries data, according to Environment Canada biological monitoring protocols, to determine whether mine effluent was responsible for a fish community level effect. Incorporated fisheries, benthic, and water quality investigation findings into the final long-term monitoring report.

Environmental Baseline Study for Premier Gold / Greenstone Gold, Geraldton Ontario, Canada. Coordinated and lead a detailed multi-season cataloging and evaluation of the existing aquatic resources at a developing gold mine site over a large remote undeveloped geographic area. The field study included multiple modes of site access (i.e., land, water) for collection of fish as well as tissue, water, and sediment samples for laboratory analysis. The study was completed with support from the local First Nation community and following the

Environment Canada Environmental Effects Monitoring Guidelines for Metal Mining. Participated in public consultations with local First Nations communities. This baseline data will be compared to the results of future monitoring programs to determine whether the mine is having a community level effect on the aquatic environment.

Lynn Lake Gold Environmental Baseline Study, Lynn Lake Manitoba, Canada. Participated in and provided technical guidance for intensive field studies to catalog and document the existing aquatic resources related to a developing gold mining operation over a large remote undeveloped geographic area in northern Manitoba. The field study included multiple modes of site access (i.e., land, water, air) for collection of fish as well as tissue, water, and sediment samples for laboratory analysis. The work was completed following Environment Canada Environmental Effects Monitoring Guidelines for Metal Mining. Field support was provided by members of the local First Nations community.

INCO Junction Creek Environmental Effects Monitoring Confirmatory Study Design, Sudbury, Ontario, Canada. Produced confirmatory study design conforming to Environment Canada biological protocols for an Environmental Effects Monitoring program related to INCO's Junction Creek mining operation.

Survival of Stocked Striped Bass, North Carolina: Participated in a technical investigation of habitat selection of stocked Striped Bass as a survival strategy in four Reservoirs in the Yadkin River system in central North Carolina. Collected habitat selection data for Striped Bass sandwiched between anoxic conditions at depth and high-water temperatures at the surface. Assisted in the performance of 15 in-field sonic transmitter implantation surgeries on Striped Bass and tracked their movements to determine habitat selection via movement patterns. Collected depth profiles of environmental variables (e.g., water temperature, dissolved oxygen).

Gananoque Docks Repair and Rehabilitation, Gananoque, Ontario: A structural investigation determined that the Docks were in a deteriorated state and required temporary repair measures and a more long-term rehabilitation solution. Collected and analyzed background information from various sources and acted as primary liaison with environmental regulatory agencies. Completed assessment of anticipated impacts to fish and fish habitat related to temporary repair works and permanent rehabilitation works on the Docks, developed comprehensive mitigation plan, and coordinated permit/approval submissions with associated conservation authority and Fisheries and Oceans Canada.

Stream Fish Community Sampling Project, Utuado, Puerto Rico: Collection of data to catalogue native and introduced fish species richness, distribution, population sizes and habitat utilization in the remote central mountain region of Puerto Rico.

Evaluation of the Impacts of Dam Removal and Subsequent Invasive Fish Species Introduction on the Endangered Cape Fear Shiner*, Carabotton, North Carolina: Lead a multi-agency investigation of the potential impacts to the Endangered Cape Fear Shiner as a result of the removal of the Carabotton Dam, on the Deep River, and subsequent upstream access of the Flathead Catfish, an invasive obligate carnivore. Planned, coordinated, and executed extensive fish and fish habitat sampling to quantify annual, seasonal, and diel habitat selection, temporal movement, growth patterns, population size, fish community composition, and diet analysis of Flathead Catfish. Performed 36 in-field radio transmitter implantation surgeries on Flathead Catfish and tracked their diel and weekly movements for 15 months. Habitat preferences (e.g., depth, substrate, cover, water velocity, water temperature) were recorded and statistically compared to habitat availability to calculate Habitat Suitability. Captured fish were aged and marked, allowing calculation of annual growth rates (i.e. length at age) and population size (i.e., mark-recapture analysis). Calculated Indices of Biotic Integrity (IBI) to identify fish community and individual species composition. Stomach contents were removed from fish and analyzed for content, identifying to the lowest taxonomic level.

Ecology and Biology of an Invasive Fish Species, North Carolina: Part of a multi-agency investigation of the impacts of the Flathead Catfish, an invasive obligate carnivore, on the native fish community in Contentnea Creek, the Lumber River and the Cape Fear River in Coastal North Carolina. Completed fish and fish habitat sampling to quantify annual and seasonal diel habitat selection, temporal movement, growth patterns, population size, fish community composition, and diet analysis of Flathead Catfish. Assisted in 90 in-field radio transmitter implantation surgeries on Flathead Catfish and tracked their weekly movements for 24 months. Habitat preferences (e.g., depth, substrate, cover, water velocity, water temperature) were recorded at each fish location and statistically compared to habitat availability to calculate Habitat Suitability. Captured fish were aged and marked, allowing calculation of annual growth rates (i.e. length at age) and population size (i.e., mark-recapture analysis). Calculated Indices of Biotic Integrity (IBI) to identify fish community and individual species composition. Stomach contents were removed from fish and analyzed for content, identifying to the lowest taxonomic level.

Preliminary Redhorse Investigations, North Carolina: Planned and participated in a preliminary habitat and site selection studies for two redhorse species, the rare Carolina Redhorse in central North Carolina and the undescribed Sicklefins Redhorse in western North Carolina. Collaborated with leading academic researchers and Federal and State agencies to identify and gain access to high value sites for future research efforts. Performed in-field radio transmitter surgeries and tracked fish movements for 5 months.

Strategic Review of Property Holdings and Permitting Requirements for Labrador Iron Mines Holdings Ltd., Schefferville, Quebec, Canada. Reviewed background documents and geotechnical reports to identify priority sites, locations for processing facilities, and environmental constraints and provincial and federal permitting requirements.

Indian Creek Fishway Project, Roebuck, Ontario: Designed and constructed an offline fishway in an intermittent stream to provide spawning fish upstream access to traditional spawning grounds. Completed hydrologic modeling and field surveys to assess existing habitat conditions, developed fishway design criteria, monitored, maintained sediment and erosion control measures.

ENVIRONMENTAL IMPACT ASSESSMENTS AND PERMITTING

Environmental Impact Studies for Land Development, Various Sites throughout Ontario: Collected and analyzed background information from various sources and acted as primary liaison with environmental regulatory agencies. Collected terrestrial and aquatic species habitat data and assessed potential environmental impacts from land development proposals. Conducted fish community inventories, and prepared habitat and impact assessments providing summaries of existing aquatic and terrestrial communities, sensitivities of fish and fish habitat, mitigation solutions to minimize impacts to the natural environment, and net effects analyses. EIS experience includes:

Loiselle Residential Development, Cornwall, ON

Northwoods Residential Development, Cornwall, ON

Public Works Yard Relocation, Peterborough, ON

Walton International Ottawa 300, Ottawa, ON

Ashcroft East Urban Lands, Ottawa, ON

La Cité collégiale, Ottawa, ON

Oxford Village Residential Development, Kemptville, ON

Richcraft Homes Residential Development, Stittsville, ON

U88 Climatic Chamber Facilities Extension, Ottawa, ON

Upper Feedmill Creek Development, Stittsville, ON

Calypso Water Park, Limoges, ON

6317 Herberts Corner Road Residential Development, Ottawa, ON

4711 Rockdale Road Residential Development, Ottawa, ON

530 Tremblay Road Residential Development, Ottawa, ON

East Urban Community Storm Water Management Pond 3, Ottawa, Ontario: Collected aquatic field data, assessed potential impacts of proposed work, and produced an existing conditions report related to the proposed lowering of EUC SWM Pond 3 outflow to improve drainage conditions and allow continuous flow to downstream areas.

Melfa Crescent Bank Stabilization Project, Ottawa, Ontario: Collected, compiled, and reported existing aquatic and terrestrial conditions in support of bank stabilization work on the Rideau River within the City of Ottawa. Collected and analyzed background information from various sources and acted as primary liaison with environmental regulatory agencies.

Barrhaven South Development, Ottawa, ON: Completed impact assessment and compensation plan related to the decommissioning of four municipal drains south of the Jock River within the City of Ottawa. Benefits of the proposed compensation measures to fish and fish habitat included an overall net gain in fish habitat quality and quantity due, in part, to habitat improvements at the mouths of the four drains. Additional gains in habitat were realized through the channel realignment and natural channel design principles coupled with extensive re-vegetation and the creation suitable fish habitats (i.e. pool/riffle sequences and linear wetlands). New fish habitat was created in a constructed pond with a total volume of 6500 m³. The construction of this pond and the proposed channel re-alignments increased the productive capacity of these waters, with the potential to increase fish biomass up to 10 times.

Rideau/Sanders Street Storm Sewer Outlet, Kemptville, Ontario: Collected background and natural environment field data related to the proposed alterations to a storm sewer outlet. Client: Municipality of North Grenville and the United Counties of Leeds and Grenville.

Harrington Lake (Lac Mousseau) Dock Replacement, Gatineau, Quebec: Compiled background information, completed agency consultations, collected aquatic species occurrence data, and prepared an impact assessment report providing mitigation measure recommendations to

protect species at risk and fish habitat related to a proposed dock replacement at the Harrington Lake estate located near Meech Lake in Gatineau Park.

RESEARCH

Review of Ammonia Toxicity to Fish in the Marine Environment. Researched, compiled, and summarized peer-reviewed scientific literature related to the toxicity of ammonia in the marine environment. Completed an assessment of the potential impacts associated with a marine discharge for INCO Limited.

Literature Search and Evaluation for Future Development of Canadian Water Quality Guidelines for Agricultural Uses. Researched, compiled, critically evaluated and summarized peer-reviewed scientific literature since the derivation of the current guideline describing physical and chemical properties, production, uses, sources, environmental fate, behavior, toxicology and effects and environmental levels of copper, manganese, boron, cadmium and E. coli as they relate to irrigation for Environment Canada.

Development of Nutrient Standards for Streams Draining Agricultural Land Uses. Performed statistical analysis of the nutrient data contained in the NAESI Freshwater Nutrient Database to explore relationships between nutrient concentrations and biological conditions (algal biomass) in rivers in agricultural areas. The purpose was to assist Environment Canada in the development of performance standards for nutrients in surface waters in Canadian agricultural regions.

Case Study Analysis for Impacted, Flowing Water Bodies for the CCME National Water Quality Index. Developed case studies to provide a comparison between the various statistical approaches to be used to determine site-specific natural background concentrations for impacted flowing water bodies, as applied in the context of the Canadian Water Quality Index.

TRANSPORTATION

Roadway Improvement Projects, Various Sites, Ontario and Quebec: Collected aquatic habitat field data and produced numerous existing conditions, habitat assessment reports, and mitigation measures related to roadway improvement works. Where required, Fisheries Act Authorization was obtained, and Fish Habitat Compensation Plans were developed. Collected and analyzed background information from various sources and acted as primary liaison with environmental regulatory agencies. Potential impacts to aquatic habitat were described for the following studies:

Baseline Road Bus Rapid Transit Corridor, Ottawa, ON

Leitrim Road Realignment and Widening (River Road to Bank Street) Environmental Assessment, Ottawa, ON

Albert and Slater Street Corridors (Empress to Waller) Functional Design Study, Ottawa, ON

Leitrim and River Road Functional Design Study, Ottawa, ON

Strandherd Road Realignment, Ottawa ON

City of Ottawa, Cumberland Transitway (Phase 1)

City of Ottawa, West Transitway

Township of Horton, Garden of Eden Road Widening

Defense Construction Canada, Re-alignment of Leitrim Road, Ottawa, ON

Defense Construction Canada, Roadside Drain Improvements, Farnham, QC

West Transitway, Ottawa, ON

Garden of Eden Road Widening, Township of Horton, ON

Defense Construction Canada, Roadside Drain Improvements, Valcartier, QC

Natural Environment Studies in Support of Environmental Assessments, Various Locations, Ontario, Canada: Lead and completed natural environment studies to document existing conditions, mitigate project effects, and assess impacts of the project on the environment through agency consultation, review of background information (e.g., on-line resources, previous studies), and field studies. Completed consultation with regulatory agencies with respect to the Endangered Species Act, 2007 and the Species at Risk Act to identify the need and requirements for permitting / approvals. Completed an assessment of potential for species specific habitat to occur based on species habitat preferences and observed existing conditions. Identified and confirmed significant natural heritage features as defined by the Government of Ontario and the City of Ottawa such as: Significant Woodlands, Significant Wildlife Habitat, habitat for Species at Risk, Areas of Natural or Scientific Interest. Produced a results summary that included the study findings, identification of sensitive features, recommendations for mitigation measures, identified permitting requirements, and next steps. These tasks were completed for the following projects:

Barrhaven Light Rail Planning and Environmental Assessment Study

Kanata Light Rail Planning and Environmental Assessment Study (Moodie Drive to Palladium Drive)

Ottawa River Outfalls Réhabilitation

Convent Glen North Collector Storm Sewer Rehabilitation

Natural Resources Canada Environmental Effects Evaluation for the District Thermal System at the Windmill Developments Groups Zibi Site

King- Liberty GO Station, Toronto ON

East Harbour GO Train Station, Toronto ON

St. Claire- Weston GO Train Station, Toronto ON

Spadina GO Train Station, Toronto ON

Rouge Hill GO Train Station, Toronto ON

Lakeshore West GO Station Renovations (10), Southern ON

Oriole GO Station Relocation, Toronto ON

West Eglinton LRT Extension, Toronto ON

Eglinton GO Station Renovations, Toronto ON

Existing Stations Renovations (22), Southern ON

West Toronto Railpath Extension, Toronto ON

Certified Arborist. Tree Inventory and Preservation Plan, various locations, Ontario, Canada: Completed detailed tree inventories consistent with the requirements of local tree protection by-laws and / or agency requirements. The tree inventories included identification and DBH measurement of relevant trees, analysis of tree community composition, general assessment of tree health, and recommendations to mitigate impacts to trees. Also identified endangered Butternut trees and completed Butternut Health Assessments where required:

King- Liberty GO Station, Toronto ON

East Harbour GO Train Station, Toronto ON

St. Claire- Weston GO Train Station, Toronto ON

Spadina GO Train Station, Toronto ON

Rouge Hill GO Train Station, Toronto ON

Lakeshore West GO Station Renovations (9), Southern ON

Oriole GO Station Relocation, Toronto ON

West Toronto Railpath Extension, Toronto ON

West Eglinton LRT Extension, Toronto ON

Eglinton GO Station Renovations, Toronto ON

North Don Collector Rehabilitation, Cities of Vaughn and Markham ON

Cyrville Station to Ogilvie Road Multi-Use Pathway, Ottawa ON

Carp Road Culvert Replacement, Ottawa ON

Albert Street and Slater Street Roadway Improvements, Ottawa ON

Light Rail Project, Ottawa, Ontario: Assessment of 17 cool and warm water watercourse crossings associated with the proposed rail project. Crossings included CSP culverts of various diameters, concrete box culverts (box and open bottom), and large bridge spans. Specific tasks included: collection of existing and archival fish and fish habitat data, create mitigation plan, development of a comprehensive fisheries compensation plan to facilitate DFO permits, coordination of federal, provincial, and regional permit applications for watercourse crossings as related to various Regulatory Acts.

VIA Infrastructure Improvements, Various locations in Ontario and Quebec: Conducted fish community inventories, habitat assessments, and environmental monitoring for construction activities at watercourse crossings and sensitive habitats (wetlands, woodlands, etc.) along CN's Right-of-Way (ROW) in support of a track expansion project to improve VIA Rail Service between Toronto and Montreal. Construction monitoring was completed as a condition of Fisheries Act Authorization of the infrastructure improvements project.

Ottawa Valley Railroad, Mattawa, Ontario, Canada. Completed a Department of Fisheries and Oceans Self-Assessment for an interprovincial railway bridge crossing the Ottawa River near Mattawa, ON for Genesee & Wyoming Canada Rail Line. The bridge required repairs to existing concrete piers and footings as well as foundation erosion. The assessment included a description of the proposed work, mitigation measures, and a determination of the residual impact of the project on the aquatic environment.

Hazeldean Tributary Realignment, Ottawa, Ontario: Completed assessment of anticipated impacts to fish and fish habitat related to a tributary realignment, developed comprehensive mitigation plan, coordinated submissions and negotiated mitigation to avoid compensation with associated conservation authority, Fisheries and Oceans Canada and Ontario Ministry of Natural Resources. Collected and analyzed background information from various sources and acted as primary liaison with environmental regulatory agencies.

Slope stabilization in West Ottawa, Ottawa, Ontario: Collected and analyzed background information from various sources and acted as primary liaison with regulatory agencies. Collected aquatic and terrestrial field data and produced an existing conditions report related to slope failures adjacent two roadways.

Addington Road Bridge Replacement, Quadeville, Ontario: Created a Fishery Protection Plan in support of a bridge replacement on Eneas Creek, County of Renfrew, ON. Eneas Creek

contains sensitive fish spawning habitat in the area of the project. Negotiated mitigation and protection measures with the Ontario Ministry of Natural Resources to allow in-water work with minimal impact to the aquatic environment.

Highway 7 / Highway 35 Culvert Replacements (GWP 4066-10-00), Kawartha Lakes, Ontario: Collected and analyzed background information from various sources and acted as primary liaison with environmental regulatory agencies. Collected terrestrial and aquatic habitat data in support of 6 bridge and culvert replacement/rehabilitations for the Ontario Ministry of Transportation.

Highway 69 Patrol Yard Site Selection (GWP-5094-06-00), Parry Sound/Sudbury, Ontario: Collected and analyzed background information from various sources and acted as primary liaison with environmental regulatory agencies. Collected aquatic habitat data and produced existing conditions report outlining potential impacts to aquatic habitat and mitigation recommendations for proposed works. Provided input during the site selection process during preliminary design to minimize impacts to fish habitat related to three new highway maintenance patrol yards for the Ontario Ministry of Transportation.

Highway 11 Access Review at the South Entrance to Powassan (GWP 323-00-00), Powassan, Ontario: Collected and analyzed background information from various sources and acted as primary liaison with environmental regulatory agencies. Collected aquatic habitat data and produced existing conditions report outlining potential impacts to aquatic habitat and mitigation recommendations for proposed works. Provided design input during preliminary design of a new highway interchange to minimize impacts to fish habitat related to a new highway interchange for the Ontario Ministry of Transportation.

Meadow Creek Bridge Replacement (GWP 181-92-00), Iroquois Falls, Ontario: Collected and analyzed background information from various sources and acted as primary liaison with environmental regulatory agencies. Collected aquatic habitat data and produced an impact assessment report outlining likely temporary and permanent impacts to aquatic habitat, provided mitigation recommendations and provided input during detail design and construction phases to minimize impacts to fish habitat related to a bridge replacement. Consulted and negotiated with regulatory agencies and submitted Form 1 "No HADD" and supporting documentation in support of the replacement of the Meadow Creek Bridge for the Ontario Ministry of Transportation. Submitted two revised Form 1 "No HADD" forms related to design changes during construction activities.

Key River Bridge Replacement (GWP 87-96-00), Parry Sound, Ontario: Collected aquatic habitat

data and produced an impact assessment report outlining likely temporary and permanent impacts to aquatic habitat, provided mitigation recommendations and provided input during detail design to minimize impacts to fish habitat related to a bridge replacement. Collected and analyzed background information from various sources and acted as primary liaison with environmental regulatory agencies. Consulted and negotiated with regulatory agencies and submitted Form 1 "No HADD" and supporting documentation in support of the replacement of the Key River Bridge for the Ontario Ministry of Transportation.

Environmental Construction Monitoring, Various Sites, Ontario: Completed site visits to infrastructure construction sites inspect project work as it related to fish and Species at Risk. The intent of the inspections was to ensure permitting requirements for mitigation measures were in place and appropriately functioning and maintained. Additionally, inspections included fish / mussel relocations at applicable sites.

Highway 17 MTO GWP-4066-16-00 Culverts (60)-between Renfrew and Petawawa ON.

Highway 17/ 60 MTO GWP-4076-13-00 Culverts (4)-between Renfrew and Douglas ON.

Highway 7A MTO GWP-4025-17-01 Culverts (2)-Bethany Easterly to Highway 115, ON.

Highway 15 MTO GWP-4036-16-01 Culverts (50)-Carleton Place to Kingston ON.

Upper Dwyer Hill Road Culvert Replacement City of Ottawa- Ottawa ON.

Greenbank Bridge Rehabilitation City of Ottawa- Jock River in Ottawa, ON.

West Ottawa Culverts (4) City of Ottawa- Ottawa ON.

Ashton Bridge Rehabilitation City of Ottawa- Jock River in Ashton ON.

Alberta Transportation Projects, Various Sites: Provided technical review of fisheries existing conditions, impact assessment, and post construction monitoring reports for road maintenance, watercourse crossing (i.e., bridge and culvert replacement), and fish habitat compensation projects for the Province of Alberta. Reviews were completed to ensure deliverables were compliant with Provincial (i.e., Water Act and associated Code of Practice for Watercourse Crossings) and Federal (i.e., Fisheries Act) legislative requirements. Projects included:

Highway 549 at Sheep Creek near Okotoks, AB, in the Municipal District of Foothills. Proposed is replacing the existing three span bridge with a wooden substructure (Bridge File 1006) with a similar bridge with a steel substructure (2012)

Hwy 520:02 at Willow Creek near the Town of Claresholm, AB, in the Municipal District of Willow Creek. Bridge replacement at bridge replacement at Bridge File 183 (2012)

Range Road 113 at an unnamed tributary to Rich Lake south of Goose Lake, AB, in Lac La Biche County. Culvert replacement and maintenance at Bridge File 294 (2012)

Hwy 633 at an unnamed tributary to the Sturgeon River near Darwell, AB, in Lac St. Anne County. Replacement of twin culverts at Bridge File 1924 (2012)

Range Road 240 at an unnamed creek draining into Coal Lake near the Town of Wetaskiwin in the County of Wetaskiwin. Replacement of vertically eclipsed SPCSP culvert at Bridge File 2482 (2012)

Range Road 233 at an unnamed watercourse near the City of Wetaskiwin, AB, in the County of Wetaskiwin. Culvert replacement at Bridge File 7490 (2012)

Township Road 731B at an oxbow to the Lesser Slave River near Slave Lake in the Municipal District of Lesser Slave River No. 124. Bridge replacement at Bridge File 13783 (2012)

Highway 31 at a tributary to Wabamun Lake in the Summer Village of Seba Beach, AB, in Parkland County. Bridge replacement at Bridge File 70112 (2012)

Local road at Yelling Creek near the Village of Mallaig, AB in the County of St. Paul. Culvert replacement at Bridge File 71154 (2012)

Highway 16 at an unnamed tributary to Maskuta Creek near Hinton, AB, in Yellowhead County. Culvert replacement at Bridge File 71333 (2012-2013)

Highway 64 at the Montagneuse River near Hines Creek, AB, in the Municipal District of Clear Hills. Culvert replacement at Bridge File 71824 (2012)

Secondary Highway 544 at Little Sandhill Creek near Patricia, AB, in the County of Newell. Twin culvert replacement at Bridge File 72027 (2012)

Township Road 770 over a tributary to Kakut Creek near the Village of Rycroft, AB, in the County of Birch Hills. Culvert replacement at Bridge File 72604 (2012)

Range Road 24-0 at Stowe Creek near the Town of Manning, AB, in the County of Northern Lights. Bridge replacement at Bridge File 75558 (2012)

Highway 35 at an unnamed drainage channel connecting Greenstreet Lake and Lower Mann Lake Bridge near the Village of Mallaig, AB, in the County of St. Paul. Bridge replacement at Bridge File 75654 (2012)

Highway 813 over The Wabasca River near Desmarais, AB, in the Municipal District of Opportunity. Bridge replacement at Bridge File 78633 (2012-2013)

Range Road 143 over Teepee Creek near La Crete, AB, in Mackenzie County. Culvert replacement at Bridge File 81125 (2012)

ENVIRONMENTAL ASSESSMENT

Nanisivik Naval Facility Decommissioning, Nanisivik, Nunavut: Completed background data review and reporting for EA sections to meet requirements of federal EA process.

Jones Falls Waste Weir Reconstruction, Township of Rideau Lakes, Ontario: Coordinated and executed baseline data collection, analysis and reporting for EA meet requirements of federal ES process.

Rideau Canal Skateway Operations, Ottawa, Ontario: Coordinated and executed baseline data collection, analysis and reporting for aquatic environment; prepared EA sections to meet requirements of federal EA process.

Chesterville Waterfront Development, Chesterville, Ontario: Collected existing information on the natural environment and completed impact assessment, provided design input to minimize impacts to fish and fish habitat, and consulted with federal, provincial, regional, and local agencies to coordinate and expedite approvals process.

TransCanada Pipelines Limited Petawawa Sales Meter Station, Petawawa, Ontario: Completed environmental assessment for proposed metering station in Petawawa, Ontario.

ENDANGERED SPECIES/SPECIES AT RISK ASSESSMENTS

Determination of Suitable Location for a Permanent American Eel Passage Structure at the Chaudière Falls Hydroelectric Facilities, Ottawa, Ontario: Installed, operated, and maintained three traps for American Eel (Endangered Provincially, Special Concern Nationally) at the Energy Ottawa and Domtar Hydroelectric facilities at Chaudière Falls to determine the most suitable location to install a permanent eel passage structure. Coordinated Endangered Species Act permit submissions to the Ontario Ministry of Natural Resources. Installed and maintained closed circuit video cameras to allow daily trap inspections to be completed remotely by hydro facility staff.

Evaluation of Fish Passage at Shikluna Hydroelectric Facility, St. Catharines, Ontario: Targeted sampling of headwaters, tailwaters, impoundments, and naturalized systems for Brook Trout, Brown Trout, White Sucker, and American Eel

(Endangered Provincially, Special Concern Nationally) to evaluate the ability of fish to pass a barrier. Fish were captured using a variety of capture methods (e.g., boat and backpack electrofishing, nets, angling) in coordination with the Ontario Ministry of Natural Resources. Coordinated and/or performed 95 radio telemetry transmitter and RFID PIT tag implantation surgeries.

Biologist. Species at Risk Assessments, Various Locations, Ontario, Canada: Consultation with regulatory agencies with respect to the Endangered Species Act, 2007 and the Species at Risk Act to identify the need and requirements for permitting / approvals. Collection and management of archival data and completion of field surveys to determine presence / likelihood of occurrence species at risk (e.g., American eel, Barn swallow, Blandings' turtle, Bobolink / Eastern meadowlark, Butternut, Least bittern). Completed an assessment of potential for species specific habitat to occur based on species habitat preferences and observed existing conditions. Produced a results summary that included the study findings, identification of sensitive features, recommendations for mitigation measures, and next steps. Completed Butternut Health Assessments and associated reporting and notification and approval processes, when applicable. The following projects contained significant Species at Risk components:

Albert and Slater Street Corridors (Empress to Waller) Functional Design Study, Ottawa, ON

Leitrim and River Road Functional Design Study, Ottawa, ON

King- Liberty GO Station, Toronto ON

East Harbour GO Train Station, Toronto ON

St. Claire- Weston GO Train Station, Toronto ON

Spadina GO Train Station, Toronto ON

Rouge Hill GO Train Station, Toronto ON

Lakeshore West GO Station Renovations (10), Southern ON

Oriole GO Station Relocation, Toronto ON

Existing Stations Renovations (22), Southern ON

West Toronto Railpath Extension, Toronto ON

Lemieux Island Pipe Bridge Rehabilitation, Ottawa, ON

Strandherd Road Realignment, Ottawa ON

Porters Island Bridge Rehabilitation, Ottawa, ON

McEwans Creek / Hunt Club Road Bridge Repair, Ottawa, ON

Mohrs Road Bridges (2) Renewals, Ottawa, ON

Fleet Street Pumping Station Cover Aquaduct Repairs, Ottawa, ON

McLean Bridge Rehabilitation, Ottawa ON

Booth Street Bridge and Pooley's Bridge Renewal, Ottawa ON

Main Street Renewal, Ottawa ON

East Urban Community Development, Ottawa, ON

Highway 7 – Extension of South Service Road from Westleigh Boulevard to Jinkinson Road

Cyrville Road Multi-use Pathway, Ottawa, ON

Union Bridge Rehabilitation, Ottawa, ON

Ottawa LRT O-Train Bridges Rehabilitation (2), Ottawa, ON

Natural Environment Inventory, Windsor Village, Ottawa, ON: Collection of species at risk, wetland and fish habitat data to identify important natural environment features and ecological function of a parcel of land, as well as preparation of a report providing recommendation of management measures to protect natural environment features.

Species at Risk Survey and Fish Habitat Assessment at CFS Leitrim, Ottawa, Ontario: Collection and management of archival data and completion of field inventories to determine presence / likelihood of occurrence species at risk (i.e., Bobolink and Butternut) and fish species as well as preparation of a report providing recommendation of mitigation measures to protect species at risk and fish habitat.

McIlraith Bridge Rehabilitation Project, Ottawa, Ontario: Identification of potential Species at Risk within the area of the proposed work and inventories to determine the presence or likelihood of occurrence of Species at Risk within the study area, including Barn Swallows, various turtle species, and Butternut. Assessment of archival and field data related to potential species at risk and/or their habitat. Provided mitigation measure recommendations to protect species at risk and fish habitat. Extensive discussion and consultation with the Ministry of Natural Resources was required to complete this project to avoid contravention of the Endangered Species Act.

March Road and Upper Dwyer Hill Roadway Improvement Project, Ottawa, Ontario: The improvement project involved alteration of the road alignment and widening of the intersection to allow for full signalization of the existing 2-way stop controlled intersection. The work occurred within protected general habitat for Blanding's Turtles during a peak migration period. Generally ensured the contractor conformed to the identified mitigation measures and monitored construction activities and mitigation measures. Extensive discussion and consultation with the Ministry of Natural Resources was required to complete this project to avoid contravention of the Endangered Species Act.

Bobolink and Butternut Surveys, East Urban Community, Ottawa, Ontario: Collection and management of archival data and completion of field inventories to determine presence / likelihood of occurrence of species at risk (i.e., Bobolink and Butternut). Provided mitigation measure recommendations to protect species at risk and fish habitat.

Highway 7 – Extension of South Service Road from Westleigh Boulevard to Jinkinson Road, Ottawa, Ontario: Collection and management of archival data and completion of field inventories to determine presence / likelihood of occurrence of turtle, snake, and avian (i.e., Least Bittern) species at risk. Provided mitigation measure recommendations to protect species at risk and their habitats.

PUBLICATIONS AND PRESENTATIONS

Heltsley, R.M., W.G. Cope, D. Shea, R.B. Bringolf, T.J. Kwak and E.G. Malindzak. "Assessing Organic Contaminants in Fish: Comparison of a Non-lethal Tissue Sampling Technique to Mobile and Stationary Passive Sampling Devices." *Environmental Science & Technology*, 2005, 39:7601-7608.

Cope, W.G., R.M. Heltsley, D. Shea, R.B. Bringolf, T.J. Kwak and E.G. Malindzak. Development of novel, non-lethal sampling techniques to assess organic contaminants in fish. Annual Meeting of the North Carolina Chapter of the American Fisheries Society. Greensboro, NC. January 31-February 1, 2006.

Kwak, T.J., E.G. Malindzak and J.R. Brewster. Catfish Ecology and Management Symposium. Invited speaker, introduced flathead catfish, dam removal and endangered species. Annual Meeting of the Southern Division of the American Fisheries Society. San Antonio, TX. February 8-12, 2006.

Malindzak, E.G. and T.J. Kwak. Movement and habitat use of introduced riverine flathead catfish: implications for imperiled fishes and dam removal. 135th Meeting of the American Fisheries Society. Anchorage, AK. September, 2005.