

PIERRE STECKO, M.Sc., CCEP, RPBio
Aquatic Scientist / Principal
Updated Dec. 31, 2008

Education: M.Sc., Ecotoxicology/Sediment Geochemistry, Simon Fraser University, 1997
B.Sc., Biology/Ecology, University of British Columbia, 1992

Affiliations: Canadian Certified Environmental Practitioner (CCEP), 2002 - present

- Water Quality
- Fisheries and Wildlife
- Mining

Registered Professional Biologist (RPBio) of British Columbia, 2005 - present

Expertise: Aquatic assessment, ecotoxicology, aquatic biology, aquatic ecology, environmental behaviour and fate of contaminants, aquatic chemistry, sediment geochemistry

EXPERIENCE

MINING INDUSTRY

- 2008 Project Manager of the Xstrata Nickel - Raglan Mine Aquatic Baseline Studies for the Zone 5-8 Mine. This project involved the design and implementation of aquatic baseline data collection for the Zone 5-8 underground mine, which is projected to more than double the mine's rate of production (to approximately 2 million tonnes of nickel concentrate per year). The aquatic data collections included the characterization of water quality, sediment quality, physical (habitat) conditions, aquatic and riparian plant life, benthic invertebrate communities and arctic charr populations. Sampling designs for the collection of aquatic baseline data were optimized for consistency with existing monitoring at the Raglan Mine, including federally-mandated Environmental Effects Monitoring (EEM). The aquatic baseline studies were part of an integrated Social and Environmental Impact Assessment (SEIA) for the Zone 5-8 development. Xstrata Nickel Raglan Mine, Nunavik (Arctic Quebec).
- 2008 Project Manager of the Xstrata Nickel - Raglan Mine Aquatic Effluent Toxicity Treatment Evaluation. This project involved the provision of technical expertise on aquatic toxicity of effluents (and their constituents) as part of a team dedicated to the reduction and elimination of mine effluent toxicity. Responsibilities included coordinating toxicity testing and interpretation of results associated with various treatment processes. Xstrata Nickel Raglan Mine, Nunavik (Arctic Quebec).
- 2008 Project Principal of the Goldcorp - Red Lake Gold Mines Regional Chemical and Biological Investigations. This included several different projects, including a shallow lake habitat benthic survey (to complement Environmental Effects Monitoring), a benthic survey of Balmer Creek and a fish community/population assessment of Balmer Lake. Goldcorp Canada Inc. - Red Lake Gold Mines, Balmertown, Ontario.
- 2008 This monitoring program has been implemented annually since the inception of mining at the Musselwhite Mine in 1997. The annual program assesses the chemical condition of tissues of priority fish species and the health of sentinel fish species. Goldcorp Canada Ltd. - Musselwhite Mine, Northwestern Ontario.

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- 2008 Project Manager of an assessment of potential impact of groundwater-influenced seepage from a tailings impoundment area. The project involved the characterization of water quality, sediment quality and benthic invertebrate community condition of potential affected areas of a boreal lake. Goldcorp Canada Ltd. - Musselwhite Mine, Northwestern Ontario.
- 2008 Project Manager of the Goldcorp - Red Lake Gold Mines Evaluation of Treatment System Performance and Water Quality Impact. This project involved the use of water quality data (treatment system input, treatment system output and receiving environment) to evaluate both the effectiveness of water treatment as well as effects to receiving environment water quality under an increased discharge volume scenario. Goldcorp Canada Inc. - Red Lake Gold Mines, Balmertown, Ontario.
- 2007 Project Manager of the Goldcorp - Red Lake Gold Mines Cycle Two EEM Study Design. The project involved the completion of a Study Design Report meeting the technical requirements for Environmental Effects Monitoring under the Metal Mining Effluent Regulations of the *Fisheries Act*. The integrated study design accounts for discharge into a receiver influenced by more than 50 years of mine related discharges. Key issues included the consideration of confounding historical factors and building upon the results of the first EEM which documented improving conditions in Balmer Lake. Goldcorp Canada Inc. - Red Lake Gold Mines, Balmertown, Ontario.
- 2007 Project Principal of the Musselwhite Mine Cycle Two EEM Study Design. The project involved the completion of a Study Design Report meeting the technical requirements for Environmental Effects Monitoring under the Metal Mining Effluent Regulations of the *Fisheries Act*. Placer Dome Canada Ltd. - Musselwhite Mine, Northwestern Ontario.
- 2007 Project Manager of a project to develop Site-Specific Water Quality Objectives (SSWQOs) for the proposed Carmacks Mine in the Yukon. The project involved the assessment of a historical water quality monitoring database and its use to identify priority parameters and to determine the most effective means of identifying preliminary SSWQOs. Approaches applied in the development of SSWQOs included the Background Concentration Procedure and a procedure employing regression-relationships between metal concentrations and concentrations of suspended solids. Access Consulting Group, Whitehorse, Yukon.
- 2007 Project Manager of a project to evaluate technical issues at a proposed copper-gold mine in northern British Columbia. The project involved a review of an environmental assessment and the development of strategies for effectively meeting fish habitat compensation requirements and for developing objectives for water quality. Confidential Client, northern British Columbia.
- 2007 Joint Project Manager of the Minto Mine Cycle One EEM Study Design. The project involved the completion of a first Study Design Report, in conjunction with the Access Consulting Group, to meet the technical requirements for Environmental Effects Monitoring under the Metal Mining Effluent Regulations of the *Fisheries Act*. Minto Explorations Ltd. – A Division of Sherwood Copper Corp.
- 2007 Project Principal of the Wabush Mines Cycle Two EEM Study. The project involved the implementation of all field study and interpretive report preparation requirements for the Wabush Mine's Second EEM. The approved design included an innovative fish survey

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- using two small-bodied fish species as well as a benthic study in erosional habitat. Cleveland Cliffs - Wabush Mines' Scully Mine, Wabush, Newfoundland and Labrador.
- 2007 Project Principal of the Musselwhite Fall Monitoring Program. This monitoring program has been implemented annually since the inception of mining at the Musselwhite Mine in 1997. The annual program assesses the chemical condition of tissues of priority fish species and the health of sentinel fish species. Goldcorp Canada Ltd. - Musselwhite Mine, Northwestern Ontario.
- 2006 Project Manager of the Musselwhite Polishing Pond Removal Evaluation. This project involved a physical, chemical and biological characterization of a treatment wetland system, a detailed evaluation of the historical performance of the integrated treatment system and predictive modeling of the implications associated with removal of a settling pond (to access a newly characterized ore body). Substantial quantities of data were distilled to arrive at qualified predictions of the effect of pond removal on water quality. Predicted differences were assessed in relation to effect-based benchmarks applied to effluent (wetland outflow) and to the receiving environment. Goldcorp Canada Ltd. - Musselwhite Mine, Northwestern Ontario.
- 2006 Technical Advisor and Project Principal of a Walleye Incubation Study. This project involved the *in-situ* assessment walleye egg survival and early growth in mine-affected and reference waters in the vicinity of the Red Lake Gold Mines. This project involved the collection of ripe walleye, gamete stripping and egg fertilization and subsequent exposure within Bell Jars and natural substrate. Development was tracked over a period of one month (April-May 2006). A detailed report was prepared comparing results among exposure areas, systems and other studies. Goldcorp Canada Ltd. - Musselwhite Mine, Northwestern Ontario.
- 2006 Project Principal of the Musselwhite Fall Monitoring Program. This monitoring program has been implemented annually since the inception of mining at the Musselwhite Mine in 1997. The annual program assesses the chemical condition of tissues of priority fish species and the health of sentinel fish species. Goldcorp Canada Ltd. - Musselwhite Mine, Northwestern Ontario.
- 2006 Project Manager of the Wabush Mines' Scully Mine Second (Cycle Two) Environmental Effects Monitoring (EEM) Study Design Report. This project also involved the design of the second biological study to be conducted under EEM, including a fish survey, a benthic invertebrate community survey, supporting environmental variables, sublethal toxicity testing, effluent characterization and water quality monitoring. Cleveland Cliffs - Wabush Mines' Scully Mine, Wabush, Newfoundland and Labrador.
- 2006 Project Manager of a project to develop Site-Specific Water Quality Objectives (SSWQOs) for the Minto Creek Mine in the Yukon. The project involved the assessment of a historical water quality monitoring database and its use to identify priority parameters and to determine the most effective means of identifying preliminary SSWQOs. Approaches applied in the development of SSWQOs included the Background Concentration Procedure, the Water-Effect Ratio Procedures and a procedure employing regression-relationships between metal concentrations and concentrations of suspended solids. Access Consulting Group, Whitehorse, Yukon.

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- 2005-2007 Project Manager for a Ten-Year Summary of Environmental Monitoring Data Collected at the Raglan Mine. The project involved two components: 1) working with the mine to assess the quality of all environmental data and to format data to facilitate its use in interpretation (manipulation, summary and statistical evaluation); and 2) integrated interpretation of all environmental data to form concise conclusions on the Raglan Mine's influence on its local and regional environment over ten years of operation. Environmental monitoring data included: water, sediment, benthic invertebrates, fish, mussels, snow and air. Falconbridge Ltd. - Raglan Mine, Ungava Peninsula, Quebec
- 2005-present Project Manager of the "Technical Assessment" for a proposed effluent discharge under the Waste Discharge Regulation of British Columbia's *Environmental Management Act*. This project involved extensive consultation with regulators, the general public and first nations and the presentation of detailed scientific information supporting the assessment. Specific elements of the project included: baseline physical, chemical and biological characterization; development of Site-Specific Water Quality Objectives (SSWQOs) for priority parameters; evaluation of projected water quality with effluent mixing; evaluation of potential physical implications; development of a physical mitigation plan (to avoid a Harmful Alteration, Disruption or Destruction [HADD] of fish habitat); development of a chemical mitigation plan (to avoid chemical effects to any beneficial use); development of a discharge strategy consistent with the mitigation plans; and reporting/presentation of the technical assessment. Mount Polley Mining Corporation, Likely, British Columbia.
- 2005-2007 Project Manager of a Follow-up Study on the Productive Capacity (Natural Productivity) of a Watershed Subject to a *Fisheries Act* Authorization. The project involved the collection of defensible productivity data to demonstrate no net loss of natural productivity of fish habitat following the removal of a water diversion system and the implementation of fish habitat compensation initiatives in a large watershed diversion system that supplied water for use in a uranium mine and mill (now decommissioned). Effects of water diversion system removal on lake, stream and wetland habitats within the watershed were evaluated. This included determination of the natural productivity of fish habitat through fishing, fish habitat assessment, secondary productivity (of benthic macroinvertebrates), primary productivity and nutrient status. The effectiveness of habitat compensation was evaluated by chemical and biological assessment of constructed stream channels and lowered lakes. Rio Algom Limited - Stanleigh Mine, Elliot Lake, Ontario.
- 2005/2006 Project Manager of the characterization of nearshore areas of a northern lake potential impacted by groundwater-influenced seepage from a tailings impoundment area. The project involved the baseline characterization of water and sediment quality, benthic invertebrate community condition, fish community and fish tissue quality. These data will form a baseline against which data collected in the future can be compared. Furthermore, the report presented the results of a preliminary characterization of risk and provided recommendations for further assessment. Goldcorp Canada Ltd. - Musselwhite Mine, Northwestern Ontario.
- 2005/2006 Technical Advisor and Project Associated of the Cochenour Wilanour Mine Benthic Invertebrate Study. The project involved the completion of detailed benthic invertebrate community survey in exposed and reference of Red Lake adjacent to a former gold mine. A detailed interpretive report was prepared and submitted to the client for submission to the Ontario Ministry of Environment. Goldcorp Canada Ltd. - Red Lake Gold Mines.

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- 2005/2006 Project Manager of the Musselwhite Mine EEM Study. The project involved the completion of detailed monitoring program that included a fish population survey (non-lethal walleye and lethal white sucker) in exposed and reference lakes, a benthic invertebrate survey in exposed and reference erosional riverine habitat and water quality. A detailed interpretive report was prepared in accordance with regulatory requirements for EEM and submitted to Environment Canada. Goldcorp Canada Ltd. - Musselwhite Mine, Northwestern Ontario.
- 2005/2006 Project Manager of the Campbell Mine and Red Lake Mine EEM Study. The project involved the completion of detailed monitoring program that included a fish population survey (non-lethal pearl dace and lethal white sucker) in exposed and reference lakes, a benthic invertebrate survey in exposed and reference lakes, sediment quality monitoring and water quality monitoring. Both a pristine and a "historically-impacted" reference were included in the design. A detailed interpretive report was prepared in accordance with regulatory requirements for EEM and submitted to Environment Canada. Environment Canada were highly complementary of the overall quality of the implementation and reporting. Placer Dome Canada Ltd. - Campbell Mine and Goldcorp Inc. - Red Lake Mine, Balmertown, Ontario.
- 2005/2006 Project Manager of the Raglan Mine EEM Study. The project involved the completion of detailed monitoring program that included a fish population survey (lethal arctic charr) in exposed and reference areas of a northern river, a benthic invertebrate survey in exposed and reference of a northern river and water quality monitoring. A detailed interpretive report was prepared in accordance with regulatory requirements for EEM and submitted to Environment Canada. The findings of the study helped to clarify a number of questions that had not been previously resolved through many years of fish monitoring at the site. These questions included the rate of anadromy and the distinguishing characteristics of anadromous fish as well as the frequency of spawning.
- 2005/2006 Technical Advisor and Project Associate for the Brunswick Mine EEM Study. The project involved the completion of detailed monitoring program that included a quantitative fish community assessment in a historically-impacted river, a benthic invertebrate survey in exposed and reference of the river and water quality monitoring. A detailed interpretive report was prepared in accordance with regulatory requirements for EEM and submitted to Environment Canada.
- 2005 Project Manager of the Musselwhite Fall Monitoring Program. This monitoring program has been implemented annually since the inception of mining at the Musselwhite Mine in 1997. The annual program assesses the chemical condition of tissues of priority fish species and the health of sentinel fish species. Goldcorp Canada Ltd. - Musselwhite Mine, Northwestern Ontario.
- 2005 Project Manager of a small project evaluating the alternatives to a requested northern pike egg incubation study at the Musselwhite Mine. The project involved a detailed assessment of previous attempts at implementing a pike egg incubations study, the timing of first effluent discharge from the mine each year since start-up and the local timing of pike spawning. A brief letter report was provided to the mine and formed the basis for a request for a regulatory change. The request was accepted on the basis of scientific arguments made in the letter report.

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- 2005 Project Manager of Environmental Permitting for the Wilberforce Tailings Management Area (TMA) Development. The project involved participation on the tailings management working group and the production of a report that developed a strategy for environmental permitting and provided a complete description of regulatory requirements and technical information requirements (studies) to allow permitting. The scope of permitting included *Fisheries Act* Authorization, environmental assessment under the *Canadian Environmental Assessment Act*, Approval for Industrial Discharge under the *Ontario Water Resources Act*, a Permit to Take Water under the *Ontario Water Resources Act*, clearance under the *Navigable Waters Protection Act*, work permits under the *Ontario Lakes and Rivers Improvement Act* and material changes under the *Ontario Mining Act*. Placer Dome Canada Ltd. - Musselwhite Mine, Northwestern Ontario.
- 2004 Project Manager of the Raglan EEM Study Design. The project involved the completion of a Study Design Report meeting the technical requirements for Environmental Effects Monitoring under the Metal Mining Effluent Regulations of the *Fisheries Act*. The study design accounts for three effluent discharge into a major river system. Falconbridge Ltd. - Raglan Mine, Ungava Peninsula, Quebec.
- 2004 Project Manager of the Brunswick Mine EEM Study Design. The project involved the completion of a Study Design Report meeting the technical requirements for Environmental Effects Monitoring under the Metal Mining Effluent Regulations of the *Fisheries Act*. The integrated study design accounts for current discharge and historical effects upon a river system influenced by more than 40 years of mining activity. Key issues included the consideration of confounding historical factors and a recovering river system. Falconbridge Ltd. – Brunswick Mine, Bathurst, New Brunswick.
- 2004 Project Manager of the Campbell Mine and Red Lake Mine Joint EEM Study Design. The project involved the completion of a Study Design Report meeting the technical requirements for Environmental Effects Monitoring under the Metal Mining Effluent Regulations of the *Fisheries Act*. The integrated study design accounts for joint discharge into a common receiver influenced by more than 50 years of mine related discharges. Key issues included the consideration of confounding historical factors and achieving a design suitable to both mines. Placer Dome Canada Ltd. - Campbell Mine and Goldcorp Inc. - Red Lake Mine, Balmertown, Ontario.
- 2004 Project Manager of the Musselwhite Fall Monitoring Program. This monitoring program has been implemented annually since the inception of mining at the Musselwhite Mine in 1997. The annual program assesses the chemical condition of tissues of priority fish species and the health of sentinel fish species. Placer Dome Canada Ltd. - Musselwhite Mine, Northwestern Ontario.
- 2004 Project Manager of the Cart Lake Water and Sediment Quality Assessment. The project involved an assessment of the state of water and sediment quality in Cart Lake, which was historically influenced by mining activities, including tailings deposition, from the former Silverfields Cobalt Mine. The assessment included basic chemical analysis and selective chemical extraction of sediment to evaluate the mobility and bioavailability of sediment-associated metals. Teck-Cominco Ltd. - former Silverfields Mine, Cobalt, Ontario.

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- 2004 Field Crew Leader of the Porcupine Joint Venture/Falconbridge Kidd Creek integrated Porcupine River EEM Study. Led three crews of biologists in implementing a large EEM study in the Porcupine River watershed, which was influenced by three active mines and numerous closed mines. The project involved collection of large-bodied fish from lakes, small bodied fish from the river, benthic invertebrates and sediment from the river and supporting water samples and physico-chemical measurements. Porcupine Joint Venture and Falconbridge Ltd. Kidd Creek Operations, Timmins, Ontario.
- 2004 Project Manager of the Wabush Mines Cycle 1 EEM Field Study and Interpretive Report. The project involved the implementation of all field study and interpretive report preparation requirements for the Wabush Mine's First EEM. The approved design included an innovative fish survey using two small-bodied fish species as well as a benthic study in erosional habitat. Cleveland Cliffs - Wabush Mines' Scully Mine, Wabush, Newfoundland and Labrador.
- 2004 Project Manager of the Musselwhite Mine EEM Study Design. The project involved the completion of a Study Design Report meeting the technical requirements for Environmental Effects Monitoring under the Metal Mining Effluent Regulations of the *Fisheries Act*. Placer Dome Canada Ltd. - Musselwhite Mine, Northwestern Ontario.
- 2004 Project Manager of an Aquatic Effects Assessment of an accidental release of tailings from a historical tailings stack. The project involved assessing the physical extent of tailings dispersion, chemical properties of the tailings and the downstream receiving environment, and associated physical and chemical effects. Tailings distribution was carefully delineated relative to fish habitat values and a battery of chemical assessment tools were used to evaluate risk of significant chemical release to a downstream waterbody. Specifically, Sequential Extraction Analysis (SEA) was used to evaluate the chemical stability of tailings and a Synthetic Precipitation Leaching Procedure (SPLP) was used to evaluate current leachability of tailings-associated metals. The study found that risk of significant chemical release was limited under current conditions and that a significant pool of oxide-associated arsenic could be released if the tailings were to experience reducing conditions. Findings were used as a basis for assessing management options in discussion with regulatory agencies. Confidential Client, Ontario.
- 2004 Project Manager of the Evaluation of the Brunswick Smelter Benthic Monitoring Program. The project involved an evaluation of a benthic invertebrate monitoring program that had been implemented for 40 years. The program had been implemented the same way for the last 16 years and associated data were evaluated to form overall conclusions and to assess their ability to capture spatial and temporal differences. Due to limited standardization of critical habitat features, variability was very high and precluded any statistical significance. For this reason, and due to evolved operational conditions, a new program was designed, focused on assessing the condition of key areas against matched reference areas. Noranda Inc. - Brunswick Smelter, Belledune, New Brunswick.

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- 2004 Project Manager of the Westner Lake Dam Failure Natural Resource Damage Assessment (NRDA). The project involved assessing the physical, chemical and biological impact of the failure of a natural dam at the outlet of Westner Lake. The failure, which was caused by unusually heavy rains (150 year return), released approximately one million cubic metres of water into an area that had been influenced by nearly 40 years of uranium mining activity. The assessment involved documentation of physical and biological effects, water and suspended solids sampling and analysis and integrated interpretation of the physical, chemical and biological consequences of the failure. Rio Algom Ltd., a Division of BHP-Billiton, Elliot Lake, Ontario.
- 2003-2004 Project Manager of the Musselwhite Mine integrated, Year Six summary of environmental monitoring. The project involved summarizing and interpreting all environmental data collected in six years of monitoring conducted by the mine in compliance with a Memorandum of Intent signed by the mine and the Department of Fisheries and Oceans (DFO). A wide variety of data were included in the review, including water balance, effluent quality, drinking water quality, mine water flow, hydrogeology, air quality, climate, noise, acid rock drainage, geotechnical, reclamation, environmental management, First Nations agreements, contingency plans, hydrology, surface water quality, effluent mixing, fish spawning, metal levels in fish, benthic invertebrates, sediment quality, wildlife and metal bioaccumulation. The integrated report was submitted to the DFO to achieve compliance with a Memorandum of Intent. Placer Dome Canada Ltd. - Musselwhite Mine, Northwestern Ontario.
- 2003 Project Manager of the Wabush Mines' Scully Mine First Environmental Effects Monitoring (EEM) Study Design Report. The project involved the collection of field data to characterize the receiving environment downstream of the Scully Mine and a review of the site history, current operational data, effluent quality, receiving water quality, receiving habitat inventory and classification, characterization of fish and other aquatic resources and characterization of potential confounding factors in order to complete a Site Characterization as required in the Report. The project also involved the design of the first biological study to be conducted under EEM, including a fish survey, a benthic invertebrate community survey, supporting environmental variables, sublethal toxicity testing, effluent characterization and water quality monitoring. This represented the mine's first submission to Environment Canada under the (EEM) component of the Metal Mining Effluent Regulations (MMERs). The project included negotiation with Environment Canada on the scope of the first study. Cleveland Cliffs - Wabush Mines' Scully Mine, Wabush, Newfoundland and Labrador.
- 2003 Project Manager of the Musselwhite Mine EEM First Interpretive Biological Report. The project involved a review of all historical biological data and supporting data and preparation of the first submission to Environment Canada under the Environmental Effects Monitoring (EEM) component of the Metal Mining Effluent Regulations (MMERs). The project scope included consideration of options for study design such that a study design could be efficiently prepared as the subsequent submission under the program. Placer Dome Canada Ltd. - Musselwhite Mine, Northwestern Ontario.

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- 2003 Project Manager of the Brunswick Mine First Interpretive Biological Report. The project involved a review of all historical biological data and supporting data and preparation of the first submission to Environment Canada under the Environmental Effects Monitoring (EEM) component of the Metal Mining Effluent Regulations (MMERs). The project scope included consideration of options for study design such that a study design could be efficiently prepared as the subsequent submission under the program. Noranda Inc. - Brunswick Mine, New Brunswick.
- 2003 Project Manager of the Musselwhite Fall Monitoring Program. This monitoring program has been implemented annually since the inception of mining at the Musselwhite Mine in 1997. The program assesses the chemical condition of tissues of priority fish species, the health of sentinel fish species, benthic invertebrate community condition and sediment quality. Placer Dome Canada Ltd. - Musselwhite Mine, Northwestern Ontario.
- 2003 Project Manager of an update to the biological assessment component of the Closure Plan (under Part VII of the Ontario *Mining Act*) for the McIntyre Gold Mine. The Closure Plan for the McIntyre concentrate dump was updated to include several heavily impacted near-field stations. The assessment involved sediment quality, benthic macroinvertebrate community characterization and fish community characterization. Porcupine Joint Venture - Placer Dome Canada Ltd. and Kinross Gold Corp., Timmins, Ontario.
- 2003 Minnow Project Manager of the Wabush Mines' Scully Mine *Fisheries Act* Section 35 (Fish Habitat) planning. Participated as part of a team of consultants providing technical assistance to Cleveland Cliffs Inc. / Wabush Mines in developing a plan of approach for addressing a potential harmful alteration, disruption or destruction (HADD) of fish habitat. Specific issues addressed by the team included the development of options for maximally mitigating a potential HADD and a strategy for compensation for any residual HADD. Cleveland Cliffs - Wabush Mines' Scully Mine, Labrador.
- 2003 Project Manager of the Porcupine Joint Venture (PJV) McIntyre / Coniaurum discharge consolidation assessment. The project involved an assessment of historic discharge quality data and field assessment of water quality, sediment quality and benthic macroinvertebrate community assessment in a riverine receiver. The data were integrated to provide a complete characterization of conditions in support of a potential change to routine monitoring and for baseline for closure planning. Porcupine Joint Venture - Placer Dome Canada Ltd. and Kinross Gold Corp., Timmins, Ontario.
- 2003 Project Leader of the Voisey's Bay Nickel Company (VBNC) MMER monitoring design. The project involved a complete preliminary design of aquatic monitoring to be undertaken at the VBNC nickel mine, including the projected timing of monitoring to ensure compliance with MMER. Inco - Voisey's Bay Nickel Company, Newfoundland and Labrador.
- 2003 Project Leader of the study design for the aquatic components of the VBNC Undertaking Order Environmental Effects Monitoring study. The project involved designing a core aquatic monitoring program for the VBNC site integrating requirements stemming from the review of the environmental assessment. The study design was limited to a basic program of near-field monitoring but adopted triggers for increasing scope pending initial findings. Inco - Voisey's Bay Nickel Company, Newfoundland and Labrador.

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- 2002 Project Manager of the Musselwhite Aquatic Monitoring Review. This review of current environmental monitoring practice at the Musselwhite Mine was conducted to identify changes required to meet the terms specified in the new Metal Mining Effluent Regulations (MMERs). The review included effluent monitoring (chemical and toxicological), water quality monitoring and biological monitoring. Placer Dome Canada Ltd. - Musselwhite Mine, Northwestern Ontario.
- 2002 Project Manager of the Musselwhite Fall Monitoring Program. This monitoring program has been implemented annually since the inception of mining at the Musselwhite Mine in 1997. The program assesses the chemical condition of tissues of priority fish species, the health of sentinel fish species, benthic invertebrate community condition and sediment quality. Placer Dome Canada Ltd. - Musselwhite Mine, Northwestern Ontario.
- 2002 Field Team Leader of the Williams Mine Moose Lake Fisheries Investigation. This fisheries program was undertaken to characterize the fish community of a small lake adjacent to a mine and identify potential opportunities for habitat enhancement for the dominant sport fish. Williams Operating Corporation, Hemlo, Ontario.
- 2002 Field Team Leader of the AGRIMUM Inc. Kapuskasing Phosphate Fish Production Assessment. This fisheries program was undertaken to quantify the productive capacity of fish habitat within a lake that will likely be heavily impacted should mine expansion be undertaken. Quantitative estimates of fish population size were made using mark-recapture techniques and growth was assessed using previously marked fish. AGRIMUM Inc., Kapuskasing, Ontario.
- 2001-2002 Project Manager of the Dona Lake Mine Environmental Effects Monitoring (EEM) program. This program involved environmental assessment to investigate post-closure conditions in the Dona Lake Mine receiving environment and determine if changes have occurred with mine closure and rehabilitation. The program included examinations of water and sediment quality, toxicity, benthic invertebrate communities, fish habitat, fish communities, wildlife and vegetation. An interpretive report documenting the findings of these examinations is currently being prepared. Placer Dome Canada Ltd. - Dona Lake Mine, Pickle Lake, Ontario.
- 2001-2002 Project Manager of an assessment of the implications of a proposed watercourse diversion under the federal *Fisheries Act*. The watercourse diversion was proposed to ensure maintenance of water cover on a Tailings Management Area. Characteristics of the affected watersheds, fish habitat and fish communities were integrated in order to document conditions and to form the basis for regulatory review and discussions on approvals. BHP Billiton - Elliot Lake Division.
- 2001 Project Manager of the biological assessment component of a Closure Plan (under Part VII of the Ontario *Mining Act*) for the McIntyre Gold Mine. Closure planning was implemented in several parts, including closure of a concentrate dump and a tailings pond. The assessment involved water quality, sediment quality, benthic macroinvertebrate community characterization and fish community characterization. Kinross Gold Corporation - Timmins Operations.

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- 2001 Project Manager of an "Aquatic Environmental Effects Evaluation". This evaluation involves integration and assessment of many years of aquatic environmental data available from a century old mine. The objectives of the evaluation are to fully assess available data to determine the point at which the mine will enter into the MMEEM (Metal Mining Environmental Effects Monitoring) Program and to evaluate the significance of other influences on the receiving environment. Placer Dome - Dome Mine, Timmins, Ontario.
- 2001 Project Manager of a watershed-level evaluation of the net benefit or detriment of dam removal on an impounded watershed. Hydrological, chemical and biological features of the watershed are being integrated to arrive at a defensible proposal to deal with the 25-year old dams. BHP Billiton - Elliot Lake Division.
- 2001 Project Manager of an integrated study (habitat assessment, water quality, sediment quality, benthic macroinvertebrate community, fish community) designed to provide chemical and biological information to support a holistic evaluation of options for the discharge of mine water. Kinross Gold Corporation - Timmins Operations.
- 2001 Field Team Leader of the "Lost River Watershed Monitoring Program", a rationalized monitoring program designed to bring together the requirements of several regulatory agencies. The program includes assessment of water quality, sediment quality, primary productivity, secondary productivity, benthic macroinvertebrate community, fish community, fish health and fish tissue analysis. AGRIMUM Inc. - Kapuskasing Phosphate Operations.
- 2001 Field Team Leader of aquatic environmental studies in support of pit expansion. The studies included assessment of fisheries, benthic macroinvertebrate communities, sediment quality, water quality and habitat assessment. Williams Operating Corporation - Williams Mine, Hemlo Gold Camp, Ontario.
- 2001 Manager of the data presentation, analysis and reporting phase of a study assessing the potential impact of mine discharge upon a receiving tributary and the River body downstream. As phosphorus is a contaminant-of-concern in treated discharge, the study included assessment of nutrient and productivity status throughout the system. Study components included habitat assessment, water quality, sediment quality, primary production, benthic macroinvertebrate community and fish community. Univariate multivariate statistical techniques were applied, particularly in the integrated interpretation of benthic macroinvertebrate community characteristics and their relationship to physical and chemical conditions. AGRIMUM Inc. - Kapuskasing Phosphate Operations.
- 2001 Provided recommendations on accurate assessment of the productive capacity of fish habitat and fish habitat compensation options in association with pre-feasibility studies for the expansion of open pit operations at a mine site. Kinross Gold Corporation - Timmins Operations.

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- 1999 - 2001 Project Manager providing consulting services for *Fisheries Act* issues associated with removal of a substantial watershed diversion system that supplied water for use in a uranium mine and mill (now decommissioned). Services include assessment of "no net loss of the productive capacity of fish habitat" and development of a strategy to demonstrate the effectiveness of habitat compensation initiatives. Effects of dam removals on lake, stream and wetland habitats within the watershed were evaluated. This included determination of the productive capacity (of fish habitat) through fishing, fish habitat assessment, secondary productivity (of benthic macroinvertebrates), primary productivity and nutrient status. The effectiveness of habitat compensation was evaluated by chemical and biological assessment of constructed stream channels and lowered lakes. Rio Algom Limited - Stanleigh Mine, Elliot Lake, Ontario.
- 1998 - 2001 One of the principal scientists involved in the design, implementation, interpretation and reporting of the Serpent River Watershed and In-Basin Monitoring Program, which monitors the response of eight reclaimed waste management areas and the aquatic environment within the Serpent River Watershed (20 lakes, numerous creeks and the Serpent River) to decommissioning of uranium mining operations. This project is the largest integrated environmental effects monitoring program (habitat assessment, water quality, sediment quality, sediment toxicity, benthic macroinvertebrate community, fish community, fish health, fish tissue quality, trophic transfer) implemented to date in Canada. Rio Algom Limited and Denison Mines Limited, Elliot Lake, Ontario.
- 2000 Project Manager for the development of a "Terms of Reference" for an integrated chemical and biological study to assess potential effects of discharge of treated Open Pit Mine water on a river system. Kinross Gold Corporation - Timmins Operations.
- 2000 Provided recommendations for optimisation of a long-term water quality monitoring program in the vicinity of several gold mining operations. Kinross Gold Corporation - Timmins Operations.
- 2000 Project Manager for a "Study Design" for an expanded Aquatic Environmental Monitoring Program. The integrated program was designed to effectively monitor the aquatic environment in order to meet the information requirements of the expanding mine, current regulatory requirements and anticipated requirements under the federal Metal Mining Environmental Effects Monitoring Program. North American Palladium - Lac des Iles Mine, Thunder Bay, Ontario.
- 2000 Sub-consultant for a fish habitat and wetland habitat evaluation to support a regulatory application for the construction of a spill containment pond. Kinross Gold Corporation - Bell Creek Mill, Timmins, Ontario.
- 2000 Team Leader for design and implementation of environmental studies to assess productive capacity of a section of a river to be diverted for an open pit expansion. The work was conducted to meet the conditions of a *Fisheries Act* Authorization. The studies included fisheries assessment, benthic macroinvertebrate community assessment, sediment quality assessment and habitat characterization. AGRIMUM Inc. - Kapuskasing Phosphate Operations.
- 2000 Field Team Leader for implementation of an aquatic study to delineate the spatial extent of fish habitat and characterize aquatic environmental conditions in association with a planned expansion of a waste management area. North American Palladium, Thunder Bay, Ontario.

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- 2000 Project Manager for the development and application of an environmental model (nutrient assimilation model) to assess implications of a proposed expansion of a mine site on a local Lake. Predictions were used to evaluate effects and thereby assess feasibility. Mount Polley Mining Corporation, Likely, British Columbia.
- 1999 Project Manager for the management, design and implementation of the Mount Polley Biological Monitoring Program, an integrated chemical and biological monitoring program (habitat assessment, water quality, sediment quality, benthic macroinvertebrate community). The program monitored receiving environments (two lakes and several creek systems) in the vicinity of a copper/gold mine. Mount Polley Mining Corporation, Likely, British Columbia.
- 1999 Wrote a Standard Operating Procedures (SOP) manual for environmental monitoring for the Bajo de la Alumbrera Mine, Minera Alumbrera Limited (MAA), Belen, Northwest Argentina.
- 1999 Field Team Leader for the management and implementation of a month-long field investigation that included integrated environmental baseline studies, natural damage assessment, ecological risk assessment and staff training at the Bajo de la Alumbrera Mine. The study team, which included three Canadian scientists and three Argentine environmental specialists conducted these studies at the mine site and over a large area of Northwest Argentina through which concentrate was piped. The studies involved fisheries, benthic macroinvertebrate communities, habitat assessment, sediment quality, sediment toxicity and water quality. Studies provided quantitative and quality assured data to be applied in making environmental management at the mine. Minera Alumbrera Limited (MAA), Belen, Northwest Argentina.
- 1999 Project Manager for the provision of technical guidance on the development of site-specific objectives for water and sediment quality, Mount Polley Mining Corporation, Likely, British Columbia.
- 1999 Principal Investigator of a receiving water environmental assessment for the Willroy Mine Rehabilitation Plan. The program included the assessment of hydrology, fisheries, benthic macroinvertebrate communities, sediment chemistry and water chemistry. Data was integrated with the results of environmental modelling and available data from adjacent sites to evaluate the overall influence of the site on adjacent systems. Noranda Incorporated - Geco, Manitowadge, Ontario.
- 1998-1999 Principal Investigator for data assessment, data interpretation and report preparation on the efficacy of hypolimnetic oxygenation (bubbling) on the breakup of a chemocline in McCabe Lake. The lake had become meromictic through its receipt of treated effluent from mining operations. The core endpoints included dissolved oxygen and conductivity (profiles). Rio Algom Limited, Stanleigh Mine, Elliot Lake, Ontario.
- 1998 - 1999 Project Manager for the development of a "Terms of Reference" and "Protocols Manual" for the Mount Polley Biological Monitoring Program. Mount Polley Mining Corporation, Likely, British Columbia.
- 1998 Technical Specialist for the design and implementation of environmental experiments and sampling for the assessment of the environmental fate of a spill of uranium tailings contaminated water and provision of general consulting in support of permitting. COGEMA Resources Incorporated, Cluff Lake, Saskatchewan.

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- 1998 Principal Investigator for an environmental survey (benthic survey), including the assessment of water chemistry, fisheries and benthic macroinvertebrates in the Tomogonops River in support of operational licensing requirements and Closure Planning. Noranda Incorporated - Heath Steele, Miramichi, New Brunswick.
- 1998 Technical Specialist for metal uptake and toxicity reviews for the development of objectives for environmental assessment. Voisey's Bay Nickel Company (VBNC), Voisey's Bay, Newfoundland.
- 1998 Technical Specialist for a review and reorganization of the of the Brunswick Mining and Smelting Quality Assurance and Standard Operating Procedures Manual. Brunswick Mining and Smelting, Noranda Incorporated, Belledune, New Brunswick.

PULP AND PAPER INDUSTRY

- 2002-2004 Project Manager of the Domtar, Espanola Cycle 3 Environmental Effects Monitoring Program. The program involved implementation of a fish population survey, a benthic invertebrate survey (using an alternative design - artificial substrates), interpretation of biological data and integration of the field biological findings with information on effluent quality, water quality and toxicity to produce the Cycle 3 EEM Interpretive Report. Domtar Inc., Espanola, Ontario.
- 2003-2007 Technical Advisor for several Cycle 3 and 4 Environmental Effects Monitoring Program studies. These include EEMs implemented in Gatineau Quebec, Donnacona Quebec, Dalhousie New Brunswick and Liverpool Nova Scotia. This included providing technical advice on field-work, data analysis and report preparation, writing summary sections and conducting technical reviews. Bowater Canadian Forest Products Inc.

ENERGY

- 2002 Project Manager of the aquatic components of an Environmental Assessment for a proposed Power Generating Station. The project involves conducting a historical data review, collecting focussed baseline data and conducting an aquatic effects assessment. Endpoints assessed include water and sediment quality, benthic invertebrate communities and community production, fish habitat assessment and fish community assessment. Additional responsibilities include regulatory permitting (certificate of approval for effluent discharge, permit to take water and *Fisheries Act* authorization). Synfuel Technologies / Thunder Bay Hydro, Thunder Bay, Ontario.
- 2002 Project Manager of the aquatic components of an Environmental Assessment for a proposed transboundary transmission line. The project involves conducting a historical data review, collecting focussed baseline data and conducting an aquatic effects assessment. Endpoints assessed include fish habitat assessment, productive capacity of fish habitat, and fish communities. Additional responsibilities include regulatory permitting (*Fisheries Act* authorization). Thunder Bay Hydro, Thunder Bay, Ontario.

WATER AND SEDIMENT QUALITY

- 2000 Sub-Consultant for the design and implementation of a study to evaluate the chemical and biological implications of the development of a Golf Club on a site previously occupied by the Hollinger Mine and adjacent to a tailings management area. Hollinger Golf Club, Timmins, Ontario.

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- 1998 Project Manager for a study to assess the toxicity of sediments along a proposed tunnel route to the Toronto Municipal Airport. Toronto Harbour Commission, Toronto, Ontario.
- 1997 Contract Consultant retained to write fact sheets for the Canadian Sediment Quality Guidelines, Canadian Council of Ministers of the Environment (CCME) and Environment Canada, Winnipeg, Manitoba and Ottawa, Ontario.
- 1997 Contract Consultant retained to write the supporting documents for the Canadian Sediment Quality Guidelines for Copper and Zinc. Finalized the supporting document for the Canadian Sediment Quality Guidelines for Chromium. These documents contain reviews of the production, uses and sources of these metals to aquatic environments, their concentrations in Canadian sediments, and their environmental behaviour and fate. Bioavailability, bioaccumulation and toxicity were reviewed, and modifying factors discussed. The documents contain the recommended guidelines, rationale for the recommendation and guidance for their implementation. Canadian Council of Ministers of the Environment (CCME) and Environment Canada, Winnipeg, Manitoba and Ottawa, Ontario.
- 1997 Contract Consultant retained to write the supporting document for the Canadian Sediment Quality Guidelines for Chlordane, Dieldrin, Endrin, Heptachlor Epoxide and Lindane. This document follows a format similar to that of the Copper and Zinc documents. Additionally, it considers the unique chemical properties of these persistent organic compounds and the state of the science of predicting their global distribution, environmental behaviour, bioaccumulation and toxicity based on their chemical properties. Canadian Council of Ministers of the Environment (CCME) and Environment Canada, Winnipeg, Manitoba and Ottawa, Ontario.
- 1996 Contract Consultant retained to review the Canadian Sediment Quality Guidelines for Cadmium. Canadian Council of Ministers of the Environment (CCME) and Environment Canada, Winnipeg, Manitoba and Ottawa, Ontario.
- 1994 - 1997 Conducted M.Sc. research on the geochemistry of deposited and suspended sediments of the Fraser River Estuary and the bioavailability of sediment-associated metals. The focus of this research was on the nature in which geochemical, physical and biological factors interact to influence metal availability to sediment-consuming organisms. Simon Fraser University, Burnaby, British Columbia.

OTHER

- 2004 Technical Specialist contracted to review and comment on the fish habitat suitability of a stream restoration plan. This provided support for an application for a Fisheries Act Authorization under Section 35(2) of the *Fisheries Act*. Calder Engineering, Bolton, Ontario.



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EMPLOYMENT HISTORY

- 2000 - present Minnow Environmental Inc., Mississauga, Ontario / Victoria, British Columbia
Project Manager/Aquatic Scientist/Principal
- 1998 - 1999 Beak International Incorporated, Brampton, Ontario
Project Manager/Aquatic Scientist - Mining Group
- 1997 Environment Canada, Ottawa, Ontario (Contract)
Guidelines Specialist
- 1994 - 1996 Simon Fraser University, Burnaby, British Columbia
Research Assistant/Teaching Assistant
- 1992 - 1993 EVS Environment Consultants, North Vancouver, British Columbia
Project Biologist

SPECIALIZED TRAINING

- Certified Electrofishing Field Crew Leader. Malaspina University College. February 2006.
- Saint John's Ambulance Canada. Standard Level First Aid with Cardiopulmonary Resuscitation (CPR-C) and Automated Emergency Defibrillation (AED). July 2008
- NORCAT - Northern Centre for Advanced Technology Inc. Northeastern Ontario Occupational and Environmental Health and Safety Resource Centre. Workplace Hazardous Materials Information System (WHMIS) Training. August 2006 (annually since 2000).
- Joint Health and Safety Committee Training under the Ontario *Occupational Health and Safety Act*. Occupational Safety Group. April 2004.
- Boat Operator Accredited Training. Canadian Coast Guard Boating Safety Course Standard. May 2003.
- NORCAT - Northern Centre for Advanced Technology Inc. Northeastern Ontario Occupational and Environmental Health and Safety Resource Centre. Surface Induction Training. May 2001.
- Royal Ontario Museum (ROM) Centre for Biodiversity and Conservation Biology - Ichthyology Division. Ontario Fish Identification Workshop. March 2001.
- Professional Association of Diving Instructors (PADI) - Advanced Open Water Diver. First Certification October 1995. Refresher November 1997. Refresher September 2002.

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PUBLICATIONS

Journal Articles

Bendell-Young, L.I., C. Thomas, and J.R.P. Stecko. 2002. Contrasting the geochemistry of oxic sediments across ecosystems: a synthesis. *Appl. Geochem.* 17(12): 1563-1582. December 2002.

Stecko, J.R.P. and L.I. Bendell-Young. 2000. Uptake of ^{109}Cd from sediments by the bivalves *Macoma balthica* and *Protothaca staminea*. *Aquat. Toxicol.* 47(3-4): 147-159. January 2000.

Stecko, J.R.P. and L.I. Bendell-Young. 2000. Contrasting the geochemistry of deposited and suspended sediments in an estuary. *Appl. Geochem.* 15(6): 753-775. July 2000.

Conference Presentations

Assessment of the Net Effect of Watershed Alteration Using Productivity Endpoints. Stecko, P., C. Russel and D. Berthelot. Presented at the 34th Annual Aquatic Toxicity Workshop. Halifax, Nova Scotia, September 2007.

EEM study associated with eleven closed mine sites at Elliot Lake, Ontario. Stecko, P., C. Russel, D. Hart, D. Farara, R. Payne, A. Coggan and I. Ludgate. Presented at the 27th Annual Aquatic Toxicity Workshop. St. John's, Newfoundland, October, 2000.

Streamlining monitoring requirements at eleven closed mine sites near Elliot Lake, Ontario. Stecko, P., C. Russel, P. Orr and D. Hart. Presented at the 27th Annual Aquatic Toxicity Workshop. St. John's, Newfoundland, October, 2000.

Designing an effective watershed monitoring program for the Elliot Lake Mining Area post decommissioning. Russel, C., D.R. Hart, J.R.P. Stecko, G. Van Arkel and R. Payne. Presented at Sudbury '99 Mining and the Environment II, September, 1999.

Contrasting metal concentrations in selectively extracted suspended versus deposited sediments of the Fraser River Estuary. Stecko, J.R.P. and L.I. Bendell-Young. Presented at the 16th Annual meeting of the Society of Environmental Toxicology and Chemistry. Vancouver, B.C., November, 1995.

Distribution and biological effects of trace metals in creek sediments downstream from a landfill. Stecko, J.R.P. and L.I. Bendell-Young, P.M. Chapman, and L.A. Taylor. Presented at the 15th Annual meeting of the Society of Environmental Toxicology and Chemistry. Denver, CO, November, 1994.