

## **Rachel Speiran, M.A.** **Senior Community Development Specialist, Shared Value Solutions Ltd.**

### **Professional History**

01/2015 – present, Shared Value Solutions, Senior Community Development Specialist

05/2010 – 12/2014 Speiran Consulting, Socio-economic Impact Assessment and Community Engagement Consultant

2006 - 2010, Rescan Environmental Services Ltd., Socio-economic Scientist and Community Engagement Specialist

2004 - 2006, UBC Centre for Intercultural Communication, Program Manager; Curriculum Designer and Instructor

2002 - 2004, UBC Centre for Intercultural Communication, Instructor

2002 - 2004, UBC, Department of Educational Studies, Teaching Assistant

2000 - 2002, Canadian Outback Adventure Company, Guide; Program Coordinator and Corporate Business Development

### **Education**

MA, Adult Education, University of British Columbia (2004)  
BA, Psychology (Environmental Studies minor), University of Victoria (1998)

### **Years of Experience**

12

### **Professional Affiliations**

### **Overview**

For the last 12 years, Rachel's work has focused on socio-economic, cultural and community issues related to sustainable development. After an internship in South America working on an agro-forestry and stakeholder engagement program, Rachel worked for the University of British Columbia's Centre for Intercultural Communication as a program manager and trainer. Her Master's thesis explored the connections between intercultural relations, corporate social responsibility and cultural



sustainability in the Canadian mining industry. At Rescan Environmental Services Ltd., she worked as a socio-economic scientist, where she managed and supported community consultation programs; socio-economic impact assessments; and the integration of traditional ecological knowledge and community values into environmental assessments of major mining and energy projects across Canada, including the KSM Gold Mine, the Kitsault Gold Mine, the Northwest Transmission Line, the Mackenzie Green Energy Project in BC, and BHP Billiton's Jansen Project in Saskatchewan. In 2010, Rachel founded her own consultancy where she continued similar work, with a focus on the wind energy, hydro-electric power and mineral exploration sectors until she joined forces with SVS.

Currently, Rachel leads projects with the primary objective of creating community driven and owned studies; integrating traditional knowledge (TK) into project design, resource management and mitigation planning; conducting socio-economic and cultural impact assessments and developing training programs for community clients. This includes a multi-regional TK study summarization and integration for the Métis Nation of Ontario, and the design of a social impact assessment for the Aroland First Nation. Certified through the International Association of Public Participation; and active member of the International Association of Impact Assessment; and the Society of Intercultural Education, Training and Research, Rachel also teaches courses for the University of British Columbia's Certificate in Intercultural Studies and Certificate in International Development programs.

International Association for Public Participation (IAP2)

International Association for Impact Assessment (IAIA)

Society of Intercultural Education, Training and Research (SIETAR)

### Training and Certifications

International Association for Public Participation (IAP2) Certificate (2011)

Global Reporting Initiative (GRI) Sustainability Evaluation Certificate (2010)

Non-Violent Communication (NVC) Workshop (2010)

Certificate in Intercultural Studies (2003)

Diversity in the 21<sup>st</sup> Century Workshop (2003)

Conflict Resolution Workshop (2002)

### Workshops, Seminars and Presentations Delivered

Intercultural Competency: Working Effectively Across Cultures – Workshop for University of Concordia's Volunteer Abroad Program. Montréal, QC. Workshop Facilitator (2013)

Multi-stakeholder Engagement and Intercultural Competence: Working Effectively Across Cultures in Global Engineering and Society. Engineers Without Borders, University of Concordia. Montréal, QC. Presenter (2013)

Community Engagement and Community Driven Consulting – Beyond Business as Usual Symposium. McGill University Marcel Desautels Institute for Integrated Management. Montréal, QC. Panelist

### Specialities

Socio-economic and cultural impact assessments; cultural sustainability; traditional knowledge; intercultural communication; community wellbeing; mental health and wellbeing, community outreach, engagement and consultation; sustainable community development; adult education; workshop and course facilitation; program development and project management

### Selected Experience

**Energy East Pipeline Project EA Review and Traditional Knowledge Multi-Regional Study Summarization. Métis Nation of Ontario. Ontario.** Project Manager and Senior Reviewer. Coordinate an inter-disciplinary technical review of the inter-provincial oil pipeline on behalf of the Metis Nation of Ontario for the National Energy Boards' regulatory process; support TK study methodology development; facilitate the integration of multiple traditional knowledge studies. [01/2015-present]

**Back River Gold Project Socio-economic Impact Assessment Third Party Technical Review and Gap Analysis. Kitikmeot Inuit Association. Cambridge Bay, Nunavut.** Senior Report Reviewer. Conducted a gap analysis of the socio-economic impact assessment for a major mining development; identified issues and information requirements based on the Kitikmeot communities' socio-economic values and baseline study information; made recommendations for study modifications and proponent socio-economic monitoring plan commitments in preparation for public hearings. [03/2014]

**Aroland First Nation Socio-economic Impact Assessment, Aroland First Nation, Ontario.** Research study plan and methodology consultant. Supported the creation of study methodology and survey questions; conducted report review. [05/2014].

**Economics, Community and Services Baseline Study and Impact Assessment for the Meikle Wind Energy Project, Pattern Energy (via Hatfield Consultants). Tumbler Ridge, BC.** Researcher. Conducted research to identify economic, community and public services that would be potentially affected by the construction and operations of a wind energy development; assessed effects; developed recommendations for positive socio-economic effect enhancement plans and adverse effect mitigation plans. [2011; 2014]

**Inter-disciplinary Socio-economic Baseline study, Impact Assessment and Mitigation planning for the Narrows Inlet Run-of-River Hydroelectric Project (via Robertson Environmental Consulting). Sunshine Coast, B.C.** Study Coordinator and Senior Researcher. Coordinated an interdisciplinary team of social and environmental scientists to conduct a socio-economic and land use impact assessment; integrated the issues and interests identified by

(2013)

Community Engagement and Participatory Decision-Making: The Human Side of Sustainability – McGill University Marcel Desautels Business Conference on Sustainability. Montréal, QC Presentation (2012)

Aboriginal Engagement, Consultation and Traditional Knowledge in Environmental Assessments – Western Aboriginal Law Forum. Vancouver, BC. Presentation (2009)

Working Together Towards a Better Future – Minerals North Mining Conference. Smithers, BC. Workshop Facilitator (2008)

Exploring Community Engagement in the Mining Industry – Women in Mining Network. Vancouver, BC Workshop Facilitator (2008)

Global Model, Local Needs: Challenges and Opportunities – SIETAR Europa Congress. Nice, France. Presentation (2005)

Games and Experiential Learning: Professional Development for Intercultural Trainers – SIETAR BC. Vancouver, BC. Workshop Facilitator (2005)

## Languages

English (fluent)  
French (conversational)  
Spanish (functional)

regional communities into assessment and socio-economic mitigation and benefit enhancement planning. [2011-2012]

**Socio-economic and Land Use Due Diligence Study; Aboriginal and Regional Government Engagement Program Plan for the Larder Lake Mineral Exploration Project. Goldfields Abitibi Exploration Ltd. Larder Lake, Ontario.** Senior Researcher and Advising Consultant. Conducted socio-economic and land use research to identify social, economic and land use values; created Aboriginal, land owner and regional government engagement program; provided support for the development and negotiation of community - proponent exploration agreements. [2012-2013]

**Cultural Impact and Impact and Benefit Agreement (IBA) case study and literature review; Cultural Impact Assessment Report for the KSM and Kitsault Gold Mine project Environmental Assessments. (via Rescan Environmental Services / ERM Group) Northwest BC.** Senior Researcher and Contributing Report Writer. Reviewed focus group transcripts; identified themes, issues and values regarding Nisga'a Nation values and interests regarding cultural identity and connection to the land as it related to two proposed mining developments; provided third party review for IBA case study report. [2012]

**Economics Baseline Study and Impact Assessment for the Wildmare Wind Energy Project, Finavera Renewables (via Teco Natural Resources Group). Chetwynd, BC.** Researcher. Conducted research to identify regional economic profile and effects assessment related to the construction and operations of a wind energy development; developed recommendations for positive socio-economic effect enhancement plans and adverse effect mitigation plans. [2010]

**First Nations Environmental and Cultural Monitoring Program for Advanced Mineral Exploration Program. Goldfields Exploration Canada. North Central BC.** Program Developer, Coordinator and First Nations Liaison. Developed First Nations engagement program; acted as multi-party First Nation liaison; identified values and interests for three communities; developed and coordinated multi-First Nation environmental and cultural monitoring program which included a training and knowledge exchange component between Elders, youth and geologists. [2009]

**Community Engagement and Consultation Program Plan. Researcher and Program Plan for BHP Billiton's Jansen Potash Project. Saskatchewan. River Project.** Conducted community, land tenure and use research to support the development of the proponent's consultation program. [2009]

**Aboriginal-Public-Stakeholder Consultation Program Coordination; Socio-economic Baseline Study and Impact Assessment for BC Hydro's Northwest Transmission Line. Northwest B.C.** Consultation report and project information meeting material coordinator and researcher. Conducted social, economic, cultural and land use research for nine First Nation communities along the transmission

corridor; peer reviewed and conducted effects assessment reports; supported the integration of Traditional Knowledge studies and community consultation program results into the project's wider environmental assessment; acted as liaison with discipline leads; project management; proponent; partner consultants; Aboriginal impact and benefit agreement negotiators. [2007; 2009-2010]

**Third Party Technical Review of Environmental Assessment for Pristine Power's Mackenzie Green Energy Project (Biomass-powered electrical facility). Treaty 8 Tribal Association. Northeast BC.** Interdisciplinary Study and Report Coordinator, First Nations and Government Liaison. Coordinated multi-disciplinary technical review of project's environmental assessment; wrote gap analysis and project information requirement report; acted as liaison with Treaty 8 First Nations representatives, the Treaty 8 Tribal Association, and BC Environmental Assessment Office. [2008]

**Socio-economic and Land Use Baseline Studies and Impact Assessment; First Nations and Public Engagement Program for Seabridge Gold's Kerr-Sulphurets-Mitchell (KSM) Gold Project. Northwest BC.** Conducted social, economic, cultural and land use research for First Nations and non-Aboriginal communities surrounding the proposed project; developed and coordinated First Nations engagement and consultation program. [2008-2010]

**Socio-economic and Land Use Baseline Study and Impact Assessment; Community Engagement Program for Pacific Booker Minerals' Morrison Copper Gold Project. Northwest BC.** Conducted social, economic, cultural and land use research for First Nations and non-Aboriginal communities surrounding the proposed project; conducted effects assessment on identified socio-economic and cultural valued components; developed recommended socio-economic benefit enhancement and social management plans; developed and coordinated First Nations engagement and consultation program. [2007-2008]

**Design, Management and Facilitation of academic, corporate and community intercultural communication training courses for UBC Centre for Intercultural Communication. Vancouver, B.C.** Program Manager, Curriculum Designer, Instructor. Managed the Certificate in Intercultural Studies Program; Designed curriculum for, and facilitated, community intercultural and diversity training programs; coordinated corporate intercultural briefing programs for international assignments; facilitated teaching and communication skills courses international teaching assistants; instructed intercultural communication to international corporate executives [2003-2006]

**Culture, Communication and Development Course, Certificate in International Development. University of British Columbia's Centre for Intercultural Communication.** Course Facilitator. Facilitate course participants through intercultural, communication and critical theories and assignments; guide group discussion regarding the impact of cultural differences, worldviews and power dynamics in development projects and organizations. [2007 - Present]

Vivian Banci, M.Sc., R.P.Bio



21557 Campbell Ave.  
Maple Ridge B.C. V2X 3V6  
604-466-2645 Office  
604-809-2645 Cell  
banci@shaw.ca

**Wildlife Ecologist**

*Conservation, Research, Environmental Assessment, Traditional Knowledge*

**Profile**

I have 30 years' experience with wildlife - resource use issues in British Columbia, Alberta, Yukon, Northwest Territories, Nunavut, Labrador and Quebec. I have worked for provincial and federal government agencies, mining and forestry companies, Aboriginal organizations and their solicitors. My projects include:

- Terrestrial studies for forest and arctic wildlife and their habitats; barren-ground caribou, grizzly and black bears, carnivores and furbearers
- Assessment of impacts of resource extraction activities: forestry, hydro-electric development, mining, hunting and trapping
- Develop monitoring, management and mitigation plans for wildlife for use during advanced exploration activities, mine and winter road operations
- Project development and technical assistance to Aboriginal people in the collection and application of their Traditional Knowledge
- Bear and carnivore safety instruction (classroom and field) to students and environmental professionals; and assessment of bear hazards at remote camps

**Consulting - Clients and Selected Project Reports**

**I. Environmental Assessment & Monitoring of Impacts on Wildlife and Habitat**

- Mining and Linear Developments
  - + **2010-2012** Seabridge Gold Courageous Lake Project, NT (Rescan Environmental Services Ltd., Vancouver & Yellowknife)  
Baseline studies (wildlife and wildlife habitat, traditional knowledge) for a proposed gold mine, NWT.
  - + **2008-2005** Baffinland Iron Ore Mines Mary River Project NU (Knight Piésold Consulting, North Bay & Vancouver).  
Baseline studies (wildlife and wildlife habitat, traditional knowledge) for a proposed iron ore mine on North Baffin Island, Nunavut.  

Banci, V. 2006. 2005 Baseline Terrestrial Study Report.

Banci, V. 2008. Terrestrial Mammal Studies: 2006 Baseline Studies Report and 2007 Baseline Studies Report (issued together).
  - + **2008-2000** Tibbitt to Contwoyto Winter Road and proposed Seasonal Overland Route Northwest Territories & Nunavut. Undertaken for the Tibbitt to Contwoyto Winter Road Joint Venture. (EBA Engineering and Environmental Ltd., Vancouver & Yellowknife).  
Development of a wildlife/habitat management system for the Tibbitt to Contwoyto Winter Road and assessment of a proposed Seasonal Overland Route.  

EBA 2001. Tibbitt to Contwoyto Winter Road Project Description Report.

EBA 2001. Tibbitt to Contwoyto Winter Road Environmental Setting Report.

EBA 2002. Tibbitt to Contwoyto Winter Road Wildlife Habitat Assessment, 2001.



Banci, V., R. Jakimchuk, J. Matheson and S. Moore. 2004. Tibbitt to Contwoyto Winter Road Habitat Assessment. Revisiting Winter Habitat Ratings, April 2004 Field Report.

EBA 2007. Wildlife 2007 Baseline Studies Report – Seasonal Overland Road.

EBA 2007. 2007 Wildlife Habitat Assessment – Tibbitt to Contwoyto Winter Road, NT.

EBA 2008. Seasonal Overland Route Project Description Report.

EBA 2008. Wildlife 2007/2008 Baseline Studies Report – Seasonal Overland Road.

EBA 2008. Wildlife Habitat Assessment Baseline Studies Report – Tibbitt to Contwoyto Winter Road and Proposed Seasonal Overland Route.

- + **2008-2007** Bathurst Inlet Port and Road Project (Rescan). Advisor/reviewer of technical reports.

- + **2006-1994** BHP-Billiton EKATI Diamond mine Northwest Territories (Rescan).

Environmental impacts assessment and monitoring of wildlife and wildlife habitat

BHP Diamonds Inc. (BHP) 1995. NWT Diamonds Project Environmental Impact Statement. Submitted to the FEARO (Federal Environmental Assessment Review) Panel.

Banci, V. and S. Moore 1997. BHP Diamonds Inc. Lac de Gras, NWT. 1996 Wildlife studies.

BHP Diamonds Inc. (BHP) 2000. 1999 Wildlife Effects Monitoring Program (WEMP). Submitted to the Independent Environmental Monitoring Agency, Yellowknife NT.

- + **2002** BHP Billiton Island Copper mine, Port Hardy BC (Rescan).

Evaluate wildlife habitat after mine closure and reclamation

Banci, V. 2002. An Evaluation of wildlife and wildlife habitat at Island Copper Mine.

- + **2002-2001** De Beers Gachoo Kue Diamond project NT 2001-2002 (EBA).

- + **2001** De Beers Snap Lake Diamond project NT (EBA).

➤ Forestry

- + **2002 -1999** Weyerhaeuser Canada Ltd., northwest AB; Alpha Wildlife Research and Management Ltd., Edmonton. Monitor effects of forest harvesting on furbearers in boreal forests of Northwest Alberta

- + **1999** Western Forest Products Ltd.: mid-coast BC and islands – Genetic status of Kermode bears

- + **2006, 1998** Xeni Gwet'in First Nations BC: Woodward & Co., Victoria BC – Impact of logging on wildlife

- + **1998** Westbank First Nations BC: Woodward & Co.– Impacts of logging on furbearer habitat

## **II. Traditional Knowledge (TK)**

- + **Current** Naonaiyaotit Traditional Knowledge Project – Kitikmeot Inuit Association, Kugluktuk NU

- + **2005- 1996** Naonaiyaotit Traditional Knowledge Project - Project design, data collection, advisor and report editor with Kitikmeot Inuit Association

Banci, V., C.C. Hanks, R. Spicker and G. Atatahak (editors) 2006. Walking in the path of the caribou. Knowledge of the Copper Inuit. Naonaiyaotit Traditional Knowledge Project. Report Series (Placenames atlas and 3 vols. Comprising 13 reports); Kitikmeot Inuit Association, Cambridge Bay and Kugluktuk NU. Published by Rescan Environmental Services Ltd., Vancouver BC.

- + **2013-2011** TK studies with Dene groups re: traditional use of the Courageous Lake area NWT

- + **2013-2011** Traditional use and knowledge study with Tahltan First Nation, BC

- + **2008 – 2007:** Bathurst Inlet Port and Road Project Regional Traditional Knowledge

Banci V. 2007. Traditional knowledge of wildlife, fish and water quality. Prepared for the proposed Bathurst Inlet Port and Road Project. Rescan Environmental Services Ltd, Vancouver BC.

- + **2008 – 2005:** IQ (Inuit Qaujimajatuqangit) of North Baffin - Project design and technical advisor
- + **2008 – 2002:** Caribou and Roads - Application of scientific and traditional knowledge regarding caribou, roads and mine infrastructure in the wildlife monitoring program of EKATI Diamond Mine, NT

Banci, V. 2003 A Pilot Project; Results of the 2002 Field Program Submitted May 2003.

Banci, V with Walter Bolt and Tom Kokak, Kugluktuk Elders. 2003 Annual Report. Submitted May 2005.

Banci, V., Walter Bolt and Jimmy Hanak, Kugluktuk Elders. 2004 Annual Report (Technical and Plain Language Versions). Submitted May 2005.

Banci, V., Jimmy Hanak, Jack Ovilok and Helen Engoaloak, Kugluktuk NU. 2005 Annual Report (Technical and Plain Language Versions). Submitted May 2006.

Banci, V., Jimmy Hanak, Jack Ovilok and Helen Engoaloak, Kugluktuk NU. 2006-2007 Annual Report (Technical and Plain Language Versions). Submitted May 2008.

### **III. Wildlife Management, Conservation, Biodiversity**

- + **1996-2000** BC Ministry of Environment, Lands and Parks – Member B.C. Grizzly Bear Scientific Advisory Committee.
- + **1994-2004** Canadian Wildlife Service (Ottawa) - Member RENEW Eastern Canadian Wolverine Recovery Team.
- + **1993-2004** BC Ministry of Environment, Lands and Parks – Technical reviewer Habitat Conservation Fund proposals; management plans for grizzly bears; RIC survey standards for furbearers.
- + **1991, 2000** Committee on the Status of Endangered Wildlife in Canada (Ottawa) – author, national status plans for grizzly bears and wolverine.
- + **1995** Member Carnivore Expert Panel, East Columbia Ecosystem Study (USDA Forest Service, Washington State US).

### **Education**

**1987.** M.Sc., Simon Fraser University, Burnaby BC.

**1982.** B.Sc. (Hons), Simon Fraser University, Burnaby BC.

### **Positions (Pre-1996)**

**1994 -1996** Senior Wildlife Biologist - Rescan Environmental Services Ltd., Vancouver B.C.

**1993 - 1994** Consultant (Wildlife Biology) – Contracted to BC Ministry of Environment, Lands and Parks, Wildlife Branch, Victoria

**1989 - 1993** Furbearer/Carnivore Management Specialist - BC Ministry of Environment, Lands and Parks, Wildlife Branch, Victoria

**1987 – 1989** Wildlife Research Biologist - B.C. Conservation Foundation, Langley BC

### **Professional**

- + Registered Professional Biologist, B.C. (1990 - Present).
- + Director, Association of Professional Biologists of British Columbia (1994-1995).
- + Member, Wildlife Society.
- + Member, Arctic Institute of North America.

## **Selected Publications**

2005. Fortin, C., V. Banci, J. Brazil, M. Crête, J. Huot, M. Huot, R. Lafond, P. Paré, J. Schaefer and D. Vandal. National recovery plan for the wolverine (*Gulo gulo*) [Eastern Population]. National Recovery Plan No. 26. Recovery of Nationally Endangered Wildlife (RENEW). Ottawa, ON. 33pp.
2004. Krebs, J., E. Lofroth, J. Copeland, V. Banci, D. Cooley, H. Golden, A. Magoun, R. Mulders and B. Shults. Synthesis of survival rates and causes of mortality in North American wolverines. *Journal of Wildlife Management* 68(3):493–502.
2001. Atatahak, G., and V. Banci, editors. Traditional knowledge of polar bears. Department of Sustainable Development, Govt. of Nunavut, Kugluktuk NU. 15pp.
1999. Banci, V. Inventory methods for medium-sized territorial carnivores: coyote, red fox, lynx, bobcat, wolverine, fisher & badger (Version 2.0). Standards for Components of British Columbia's Biodiversity No. 25. Prepared by Ministry of Environment, Lands and Parks, Resources Inventory Branch for the Terrestrial Ecosystems Task Force Resources Inventory Committee (RIC).
1999. Banci, V. and G. Proulx. Resiliency of furbearers in Canada to trapping. Chapter 13 in Proulx, G. (editor). *Mammal Trapping*. Alpha Wildlife Research and Management, Edmonton AB.
1999. McLellan, B, and V. Banci. Status and management of the brown bear in Canada. Pages 46-50 in *Bears: Status Survey and Conservation Action Plan*. S. Servheen, C. Herrero, and B. Peyton, (editors). IUCN Publication Services Unit. Cambridge, U.K.
1994. Banci, V., D.A. Demarchi and W.R. Archibald. Evaluation of the population status of the grizzly bear in Canada. *Proceedings of the 9th International Conference on Bear Research and Management* . 9(1):129-142.
1994. Banci, V. Conservation assessment for wolverine in the Pacific Northwest. Chapter 5 in: L.F. Ruggiero et al., Eds. *The scientific basis for conserving forest carnivores: American marten, fisher, lynx and wolverine*. General Technical Report RM-254. USDA, Forest Service, Fort Collins CO.
1991. Banci, V. The status of the grizzly bear in Canada in 1990. Status report, Committee on the Status of Endangered Wildlife in Canada (COSEWIC), Ottawa Ontario. 170pp.
1989. Banci, V. A fisher management strategy for British Columbia. BC Environment, Victoria, Wildlife Bulletin No. B-63. 127pp.
1987. Banci, V. Ecology and behaviour of wolverine in Yukon. M.Sc. Thesis, Simon Fraser University, Burnaby. 178pp.

## **Selected Presentations, Workshops and Courses**

2006. Banci, V (invited speaker) and C. Hanks. Traditional Knowledge in Wildlife Monitoring at the Ekati Diamond Mine. Mining and Aboriginal Peoples in Canada (course). Norman B. Keevil Institute of Mining Engineering, University of British Columbia (UBC). May 18-19.
2005. Banci, V., C. Hanks and R. Spicker. Inuit Traditional Knowledge of kalvik (wolverine) in Nunavut, Canada. First International Symposium on Wolverine Research and Management. Swedish University of Agricultural Sciences. Jokkmokk, Sweden June 13-15.
2005. Banci, V., C. Hanks and R. Spicker. Inuit traditional knowledge of grizzly bears in Nunavut, Canada. International Bear Association Conference, Riva del Garda, Italy. September 27-October 1.
2003. Banci, V., C. Hanks and R. Spicker. Inuit traditional knowledge as a land-use planning tool. The Naonaiyaotit Traditional Knowledge Project. 7<sup>th</sup> International Symposium on Mining in the Arctic. Iqaluit NU March 30 – April 1.
2000. Atatahak, G., V. Banci, C. Hanks and R. Spicker. The role of traditional knowledge in mining. Canadian Aboriginal Minerals Association Conference, Sudbury ON November 12-14.





## Professional History

**Palmer Environmental Consulting Group Inc.**  
Senior Fisheries Biologist  
2014 - present

**AECOM**  
Manager of Natural Sciences,  
Ontario. Senior Fisheries Biologist  
and Project Manager.  
2010-2014

**University of Guelph**  
Post-Doctoral Research Fellow,  
Department of Integrative Biology  
2007 - 2010

**The Centre for Environment,  
Fisheries and Aquaculture  
Science (cefasc)**  
Fisheries Biologist and Project  
Manager  
1998-2007

## Summary

Dr. Nicola Lower is a Senior Aquatic Biologist and Project Manager with over 16 years professional experience in fisheries and natural resource management. Nicola has delivered project reports for a variety of clients and has work experience in the private, public and academic sectors. Nicola has published research on a range of factors affecting fish populations, including water quality; salmonid migration between freshwater and marine environments; barriers to migration; and invasive species in the Laurentian Great Lakes. Nicola has much practical experience in fisheries management and in the techniques used to assess and monitor habitat and fish populations, including telemetry; backpack and boat electrofishing; netting and trapping; as well as solid analytical skills for appropriate data analysis.

Nicola has successfully led multi-disciplinary programs in remote locations throughout Ontario, Labrador and Quebec for a variety of mine sites during advanced exploration and operation, as well as successfully obtaining permits and maintaining environmental regulatory compliance. Nicola often contributes to consultation activities with regulatory authorities, local communities and Aboriginal First Nations and Métis communities. Recently, Nicola designed and delivered an environmental monitor training program for First Nation employees for an ongoing ice-drilling program.

Nicola contributes technical and strategic advice to environmental assessments, environmental impact studies, environmental baseline studies, aquatic habitat assessments, species at risk screenings, environmental effects monitoring, fisheries compensation plans, permitting and approvals and technical peer-reviews.

Nicola is skilled and experienced in leading environmental teams to provide a comprehensive study integrated with all relevant disciplines and successfully navigating the environmental permitting process.

## Experience

**AECOM (2010- 2014)**  
**Manager, Natural Sciences, Ontario**  
**Guelph Office Manager**

- Team Lead for up to 20 staff across four offices, including specialists in terrestrial ecology, species at risk, fisheries, water quality, hydrogeology, fluvial geomorphology and ecological risk assessment.
- Provide day to day operations management for the Guelph Office (40 employees) and oversee the success of the office from both a technical practice and operational perspective.

**Senior Fisheries Biologist and Project Manager – select project experience.**

**Project Management and Strategic Direction**

- Probe Mines Limited – Borden Gold Project, northern Ontario.
- Billiken Management/Cadillac Ventures - Thierry Mine, northern Ontario.

**Environmental Baseline Studies**

- Probe Mines Limited – Borden Gold Project, northern Ontario
- Billiken Management/Cadillac Ventures - Thierry Mine, northern Ontario
- Labrador Iron Mines, Schefferville, Quebec.
- Regional Municipality of York, Upper York Sewage Solutions EA, Ontario.
- NextEra Energy Canada, Goshen, Bluewater and Jericho Wind Energy Centres, Huron County, Ontario

**Environmental Assessments – Aquatic/Natural Environment Technical Lead**

- Regional Municipality of York, Upper York Sewage Solutions EA, Ontario.
- Snow Island Salmon Aquaculture, Nova Scotia.
- NextEra Energy Canada, Goshen, Bluewater and Jericho Wind Energy Centres, Huron County, Ontario.
- City of London, Stanton Drain Remediation and Stormwater Management Facility, Ontario.
- City of Peterborough, Jackson Creek Diversion Project, Ontario.
- Regional Municipality of Halton, Trafalgar Road Improvements, Ontario.
- Municipality of Chatham-Kent, slope rehabilitation of Thames River, Ontario.
- City of Mississauga, Cooksville Creek Erosion Control Projects, Ontario.
- The Town of East Gwillimbury, new east-west road, Ontario.
- City of Mississauga, Culvert and Creek Improvements, Applewood and Serson Creeks, Ontario
- United Counties of Prescott and Russell, City of Ottawa, Improvements to Ottawa Road 174, Ontario
- Region of Peel, Mississauga Road Improvements from Bovaird to Mayfield Road, Ontario
- City of Kitchener and Grand River Conservation Authority, Schneider Creek Remediation, Ontario
- Tahgahoning Enterprises Inc., Agricultural Drainage Improvements, Walpole Island First Nation, Ontario

**Fisheries Biology/Natural Sciences – Technical Reviewer and Reports**

- Wek'èezhii Land and Water Board, Diavik Diamond Mine AEMP Study Design Technical Review, Northwest Territories.
- Taykwa Tagamou Nation, Detour Lake Gold Mine fish habitat compensation plan, Technical Review, Northeastern Ontario.
- Windsor-Essex Mobility Group and Ministry of Transportation. Fisheries Technical Reviewer for regulatory submissions to Department of Fisheries and Oceans, including fish habitat compensation plans, design drawings, and stormwater management reports related to the Design-Build of the Rt. Hon. Herb Gray Parkway, Windsor, Ontario.
- Métis Nation of Ontario, Métis Traditional Knowledge Study for the historic Sault Ste. Marie Traditional Territory, Reviewer.
- Métis Nation of Ontario, Lead author of report: Technical Assessment of Potential Impacts to Migratory Patterns of Species Traditionally Relied Upon by Métis Communities in Ontario.
- Shermal Development Inc., Hannon Creek Headwater Assessment Study, Ontario.

**Environmental Effects Monitoring**

- Quadra FNX Mining Company Inc., Podolsky Mine Environmental Effects Monitoring Cycle 1 (Metal Mining Effluent Regulations, MMER), Sudbury, Ontario.
- Liberty Mines, EEM Cycle 1 Report, McWatters Mine, Timmins, Ontario.
- Richmond Mines, Study Design for 3<sup>rd</sup> Cycle EEM Program, Island Gold Mine, Ontario.
- Region of Halton, Sheldon Creek monitoring, Burloak Water Purification Plant expansion, Ontario

### **Environmental Permitting**

- Elgin Area Primary Water Supply System (EAPWSS), *Conservation Authority Regulations, Fisheries Act*, and compliance monitoring during design-build, Elgin County, Ontario
- NextEra Energy Canada, three wind energy centres, *Renewable Energy Approval, Fisheries Act, Endangered Species Act*, and *Conservation Agency Regulations*.
- Probe Mines Limited, Permits to Take Water for Advanced Exploration activities (*Water Resources Act*), northern Ontario.
- GO Transit, East Rail Maintenance Facility, *Fisheries Act* Authorization and fish compensation design (wetland creation), Whitby, Ontario.
- GO Transit, Barrie rail corridor track expansion, *Fisheries Act* approval and *Conservation Authority Regulations*, Toronto, Ontario.
- City of St Thomas, Mill Creek culvert extension and channel modification, *Fisheries Act* approval and *Conservation Authority Regulations*, Ontario.
- Town of Markham, Overall Benefit permit under Clause 17(2)(c) of the *Endangered Species Act* (2007), bridge crossings in Redside Dace habitat, Rouge River, Ontario.
- City of Hamilton, Overall Benefit permit under Clause 17(2)(c) of the *Endangered Species Act* (2007), culvert replacement in Redside Dace habitat, Ontario.
- Region of Peel, Mississauga Road Improvements from Bovaird to Mayfield Road, Overall Benefit permit under Clause 17(2)(c) of the *Endangered Species Act* (2007), Redside Dace habitat, Ontario.
- Region of Peel, Queen Street improvements, Overall Benefit permit application under Clause 17(2)(c) of the *Endangered Species Act* (2007), five watercourse crossings in Redside Dace habitat, Ontario.
- Hydrostor/Toronto Hydro, *Fisheries Act* approval for demonstration facility of underwater compressed air energy storage, Lake Ontario.
- City of London, Stanton Drain Remediation and Stormwater Management Facility, *Fisheries Act* Authorization and fish compensation plan for channel relocation and rehabilitation and fish habitat improvements, Ontario.

### **Post-Doctoral Research Fellow**

*The University of Guelph, Ontario.*

- Fisheries biologist funded by the Great Lakes Fisheries Commission and Department of Foreign Affairs and International Trade.
- Planned and delivered innovative research on the habitat use and migration patterns of sea lamprey in streams to Lake Ontario. Research objective was to develop new management initiatives, such as effective portable trapping, to reduce reliance on in-stream barriers and therefore to minimize the impacts to non-target species. Successfully liaised with stakeholders (Great Lakes Fishery Commission, Department of Fisheries and Oceans, Ministry of Natural Resources, Conservation Authorities as well as landowners), and presented research results at meetings of the GLFC and the international scientific community.

### **Fisheries Biologist,**

*The Centre for Environment, Fisheries and Aquaculture Science (cefas), Lowestoft, UK.*

- Led multi-disciplinary monitoring and research projects investigating the factors regulating salmonid and freshwater fish populations, and provided advice to government and private clients on fisheries management.
- Project-manager for large, high profile program 'Diffuse pollution and freshwater fish populations'. Provided recommendations on the management of aquatic contaminants for the UK government client, the Department of Environment, Food and Rural Affairs.
- Conducted field and laboratory studies using radio and acoustic telemetry on the migratory behavior of salmonids. Provided recommendations on the management of aquatic contaminants and impacts on

survival and migratory behavior of fish for the UK government client, the Department of Environment, Food and Rural Affairs

- Unique insight into some of the world's largest fish farming facilities and practical experience of working alongside fishery managers, farmers, and government officials in a number of different countries.
- Awarded a prestigious Winston Churchill Memorial Trust Travel Fellowship to study some of the world's largest aquaculture industries. Visited a wide variety of different facilities including cod farms in Norway, shrimp ponds in Thailand and bluefin tuna farms in South Australia. Arranged meetings with farmers, scientists, government officials and policy makers for an exchange of knowledge and to set up collaborative research trials aimed at fish feeding and growth under aquaculture conditions. Presented with the Silver Churchill Medallion by HM The Queen at Buckingham Palace, June 2006.
- Successfully completed Part-Time PhD while in full-time employment on the effects of contaminants on various life cycle stages of salmonids. Included leading extensive field programs on characterizing water quality, and monitoring fish physiology and behaviour in coastal and freshwater environments, as well as in hatchery and aquaculture facilities.
- Professionally media-trained and represented cefas on local televised news reports, as well as in newspapers and magazines interviews. Assisted in drafting press releases and was Deputy Communications Manager for cefas-wide Disaster Recovery Plan.
- Scientific Consultant to cefas Joint Venture company Ultrabite Ltd./Kiotech Plc. 2000-2005. Joint inventor on a patent for a novel fish feeding pheromone that has been successfully developed for worldwide sale (Moore, A. & Lower, N. 2001. Fish Attractants. PCT/GB01/03351. European Patent Mp. 01984393.7). Key role in the research and development of feeding attractants for sports and commercial fishing and aquaculture, provision of information required for patent application, production of behavioural films, presentation of R&D to venture capitalists, marketing and sales teams.

## Professional Affiliations, Awards and Training

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- City of Guelph, River Systems Advisory Committee (2011-present)
- American Fisheries Society, Exec. Committee Ontario Chapter, newsletter editor (2014-present)
- Fisheries Assessment Specialist, Ministry of Transportation Registry Appraisal and Qualification System (2012-present)
- Canadian Commonwealth Post-Doctoral Research Fellowship from DFAIT (2007)
- Winston Churchill Memorial Trust, Travel Fellowship (2004). Research Fellowship on the aquaculture industry in Norway, Australia and Thailand. Presented with the silver Churchill Medallion by HM The Queen at Buckingham Palace, June 2006
- British Association Media Fellowship (2002). Two month secondment to the BBC and television program 'Countryfile' showcasing environmental and rural issues.
- Introduction to the Canadian Environmental Assessment Act, 2012 (Canadian Environmental Assessment Agency, 2014).
- Aboriginal Groups: Environmental Assessment (Canadian Environmental Assessment Agency, 2014).

## Education

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- **Doctor of Philosophy, Fisheries Biology.** Research thesis title: '*The effects of contaminants on various life-cycle stages of Atlantic salmon (Salmo salar L.)*'. The University of Portsmouth, UK (2007). (conducted part-time while in full-time employment at cefas).
- **Master of Sciences (with Distinction), Natural Resource Management.** Research thesis title: '*The effect of kinship and early familiarity on Arctic charr (Salvelinus alpinus)*'. The University of Leicester, UK (1998). Research conducted at the Finnish Government Game and Fisheries Research Institute, Enonkoski, Finland.
- **Bachelor of Science – Environmental Life Science** University of Nottingham, UK (1996)

## Publications and Presentations

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- Brewer, H.M., Coombs, A.W, Veerapeneni, S., **Lower, N.**, Smith, D.S. 2014. Between a rock and a hard place: microfiltration and reverse osmosis to achieve ultra-low total phosphorus concentrations. 87<sup>th</sup> Annual Water Environment Federation Technical Exhibition and Conference Proceedings.
- Stamplecoskie, K.M., Binder, T.R., **Lower, N.**, Cottenie, K., McLaughlin, R.L., McDonald, G.D., 2012. Effect of artificial lighting on the catchability of sea lamprey (*Petromyzon marinus*) in portable traps. North American Journal of Fisheries Management, 32: 563-572.
- Landsman, S.J., Gobin, J., Cook, K.V., Nguyen, V.M., Gutowsky, L.F.G., Binder, T.R., **Lower, N.**, McLaughlin, R.L., Cooke, S.J., 2011. A review of fish movement and migration studies in the Laurentian Great Lakes: historical perspectives, management issues, and future research opportunities. Journal of Great Lakes Research, 37-2.
- Riley, W.D., Ibbotson, A.T., **Lower, N.**, Maxwell, D.L., Russell, I.C. 2011. The impact of capture, handling, anesthesia and tagging on Atlantic salmon smolt physiology, migratory behavior and subsequent adult return rates. International Council for the Exploration of the Sea – North Atlantic Salmon Working Paper 2011.
- Moore, A., Cotter, D., Quayle, V., Rogan, G., Poole, R., **Lower, N.**, Privitera, L. 2008. The impact of a pesticide on the physiology and behaviour of hatchery-reared Atlantic salmon, *Salmo salar*, smolts during the transition from freshwater to the marine environment. Fisheries Management and Ecology, 15, 385-392.
- Riley, W.D., Ibbotson, A.T., **Lower, N.**, Cook, A.C., Moore, A., Mizuno, S., Pinder, A.C., Beaumont, W.R.C, and Privitera, L. 2008. Physiological seawater adaptation in juvenile Atlantic salmon, *Salmo salar* L., autumn migrants. Freshwater Biology 53, 745-755.
- **Lower, N.** and Moore, A. 2007. The impact of a brominated flame retardant on smoltification and olfactory function in Atlantic salmon (*Salmo salar* L.) smolts. Marine and Freshwater Behaviour and Physiology, 40(4), 267-284.
- Moore, A. **Lower, N.** Mayer, I. Greenwood, L. 2007. The impact of a pesticide on migratory activity and olfactory function in Atlantic salmon (*Salmo salar* L.) smolts. Aquaculture 273 (2-3), 350-359.
- Riley, W.D., Ibbotson, A.T., Pinder, A.C., **Lower, N.**, Cook, A.C., Beaumont, W.R.C., and Russell, I. 2007. An autumn downstream migration of juvenile Atlantic salmon *Salmo salar* L., in the UK: Possible implications for the assessment and management of stocks. Working Paper for ICES North Atlantic Salmon Working Group, April 2007.
- **Lower, N.**, Moore, A., Scott, A. P., Ellis, T., James, J. D., and Russell, I.C. 2005. A non-invasive method to assess the impact of electronic tag insertion on stress levels in fish. Journal of Fish Biology 67, 1202-1212.
- **Lower, N.** & Moore, A. 2005. The effect of *Paraergasilus longidigitus* on olfactory-mediated pheromone function in carp (*Cyprinus carpio*). Report to Environment Agency.
- **Lower, N.** 2005. Pheromone technology to increase the sustainability of aquaculture. Winston Churchill Memorial Trust Travelling Fellowship (2004).
- **Lower, N.**, Scott, A. P., & Moore, A. 2004. Release of sex steroids into the water by roach (*Rutilus rutilus* L.). Journal of Fish Biology 64, 16-33.
- **Lower, N.** & Moore, A. 2003. Exposure to insecticides inhibits embryo development and emergence in Atlantic salmon (*Salmo salar* L.). Fish Physiology and Biochemistry 28: 431-432.
- Moore, A., Scott, A.P., **Lower, N.**, Katsiadaki, I. & Greenwood, L. 2003. The effects of 4-nonylphenol and atrazine on Atlantic salmon (*Salmo salar* L.) smolts. Aquaculture.222, 253-263.
- Russell I.C., Cook A., Kinsman D.A., Ives M.J. & **Lower N.J.** 2003. Stomach contents analysis of cormorants at some different fishery types in England and Wales. In: Cormorants: Ecology and Management at the Start of the 21st Century, Proceedings of 5th European Cormorant Conference, (Eds T.M. Keller and D. Carss), Freising, pp.255-259.
- Moore, A., Olsen, K.H., **Lower, N.** & Kindahl, H. 2002. The role of F-series prostaglandins as reproductive priming pheromones in the brown trout (*Salmo trutta* L.). Journal of Fish Biology 60, 613-624.



- I.C. Russell, A. Cook, D. Kinsman, M.J. Ives and **N. Lower** (2002) Stomach contents analysis of cormorants at some different fishery types in England and Wales. Trout News, CEFAS Lowestoft, 34: 18-19
- Moore, A. & **Lower**, N. 2001. The impact of two pesticides on olfactory-mediated endocrine function in mature male Atlantic salmon (*Salmo salar* L.) parr. Comparative Biochemistry and Physiology Part B, 129, 269-276.
- Seppa, T., Laurila, A., Peuhkuri, N., Piironen, J. & **Lower**, N. 2001. Early familiarity has fitness consequences for Arctic charr (*Salvelinus alpinus*) juveniles. Canadian Journal of Fisheries and Aquatic Sciences 58, 1380-1385.
- Lahti, K. & **Lower**, N. 2000. Effects of size asymmetry on aggression and food acquisition in Arctic charr (*Salvelinus alpinus*). Journal of Fish Biology 56, 915-922.
- Russell, I., **Lower**, N. & Cook, A. 2000. Preventative measures to minimise cormorant predation in commercial fish ponds in the Mai Po and Deep Bay areas of Hong Kong. Report for Central Science Laboratory.
- Eyquem, J., and **Lower**, N. A tiered approach to watercourse crossing design: integrating fluvial geomorphology into the routine design toolbox. American Fisheries Society 144<sup>th</sup> Annual Meeting, Quebec City, August 2014.
- Landsman, S.J., Gobin, J., Cook, K.V., Nguyen, V.M., Gutowsky, L.F.G., Binder, T.R., **Lower**, N., McLaughlin, R.L., Cooke, S.J., A review of fish movement and migration studies in the Laurentian Great Lakes: historical perspectives, management issues, and future research opportunities. Annual Conference on Great Lakes Research, Toronto, May 2010.
- **Lower**, N. Use of refuge by sea lamprey and implications for control techniques. Sea Lamprey Annual Working Session, Petoskey, Michigan, February 2010.
- **Lower**, N., McDonald, D.G., McLaughlin, R.L. The use of refuge by sea lamprey *Petromyzon marinus*. Canadian Conference for Fisheries Research, Winnipeg, January 2010.
- **Lower**, N. Hide and Seek: The refuge-seeking behaviour of sea lamprey and implications for control techniques. The University of Guelph, Loaves and Fishes Seminar Series. November 2009. (Invited).
- **Lower**, N. Impacts of environmental levels of persistent aquatic contaminants on salmonids, The University of Hull, March 2007. (Invited).
- **Lower**, N. and Moore, A. The impact of a brominated flame retardant on olfactory function in Atlantic salmon smolts (*Salmo salar* L.) smolts. Chemical Ecology in Aquatic Systems Workshop, Florence, Italy, 16-18 October 2006.
- **Lower**, N., Riley, W.D., Ellis, T. & Moore, A. The effect of coded wire tagging on stress levels and seawater survival in Atlantic salmon smolts (*Salmo salar* L.) VII International Congress on the Biology of Fish, St John's, Newfoundland, Canada, 18-22 July 2006.
- **Lower**, N. & Moore, A. The effect of environmental levels of pesticides on salmonid fecundity and embryo development. VII International Congress on the Biology of Fish, St John's, Newfoundland, Canada, 18-22 July 2006.
- **Lower**, N. & Moore, A. Exposure to insecticides inhibits embryo development and emergence in Atlantic salmon (*Salmo salar* L.). Seventh International Symposium on the Reproductive Physiology of Fish, Mie, Japan, 18-23 May, 2003.
- **Lower**, N. Moore, A., Scott, A.P., & Ellis, T. A non-invasive method to assess the impact of electronic tag attachment techniques on stress levels in fish. Fifth Conference on Fish Telemetry held in Europe, Ustica, Italy, 9-13 June 2003.
- **Lower**, N. and Moore, A. The effect of environmental levels of freshwater contaminants on juvenile Atlantic salmon: Implications for marine survival. International Congress on the Biology of Fish, Vancouver, Canada, July, 2002.
- **Lower**, N., Scott, A.P. & Moore, A. Release of sex steroids into the water by roach (*Rutilus rutilus*). Sixth International Symposium on the Reproductive Physiology of Fish, Bergen, Norway, 4-9 July 1999.



## Professional History

### **Palmer Environmental Consulting Group Inc.**

Aquatic Biologist  
Vancouver, BC  
2012 – 2013  
Toronto, ON  
2013 - present

### **Fisheries and Oceans Canada**

Fish Habitat Biologist  
Burlington, ON  
2008 - 2009

### **Interior Reforestation**

Fisheries Technician  
Cranbrook, BC  
2008

### **Dr. Roy Turkington's Lab**

Botany Research Assistant  
Kluane Park, YT  
2007

### **Dr. Lance Barrett-Leonard's Laboratory**

Marine Mammal Behaviour Field  
Assistant  
Nuchatlitz, BC  
2006

## Summary

Alyssa Murdoch is an Aquatic Biologist with six years of diverse aquatic ecology experience including positions in academic research, government and environmental consulting. Alyssa holds an undergraduate degree in Marine Biology from the University of British Columbia (2007) and a Master of Science degree from the University of Waterloo (2012), where her research was focused on northern fisheries ecology. Alyssa is a Registered Professional Biologist (R.P. Bio.) in the province of British Columbia.

Alyssa specializes in fisheries ecology and management, fish habitat protection, aquatic study design and sampling, data analysis and technical report writing. Alyssa has been the lead author for several scientific and technical reports, including two peer-reviewed scientific publications, and several baseline and Effects Assessment reports for major mining projects in British Columbia and Yukon. In addition, Alyssa has experience conducting fish population and spawning surveys, fish habitat assessments, aquatic community sampling, environmental assessments and environmental monitoring activities.

## Experience

### **Palmer Environmental Consulting Group Inc. (PECG)**

*Aquatic Biologist (2012 - present)*

#### **1. Environmental Assessments**

#### **Casino Mining Corporation, Vancouver, BC**

*Casino Mine, Project Proposal, Yukon, Canada (2012-present)*

- Lead author of several technical reports used in the project proposal submission to the Yukon Environmental and Socio-economic Assessment Board including the Fish and Aquatic Resources Effects Assessment and Aquatic Baseline Reports
- Collaborating author on the Casino Fish Habitat Compensation Plan Report
- Conducted data analysis and organization for the Water Quality Baseline Report
- Crew lead during the 2013 fish and fish habitat field program
- Field crew member during several other baseline programs from 2012-2013, including: fisheries, in-stream flow, hydrology, hydrogeology, and dustfall

#### **Gold Mountain Mining Corporation, Vancouver, BC**

*Elk Gold Project, Baseline Program and Permit Application, BC, Canada (2012-present)*

- Designed and led the 2012 fisheries and aquatic resources field program
- Lead author of the Aquatic Environment Studies Report in support of the Elk Gold *Mines Act* permit amendment application
- Project manager for the 2013 Elk Gold Water Quality and Hydrology Program



**New Gold Inc., on behalf of AMEC Environment & Infrastructure, Vancouver, BC**

*Blackwater Project, Mathews Creek Watershed Fish and Fish Habitat Baseline Assessment and Offsetting Plan, BC (2013)*

- Contributing author to the Mathews Creek Watershed Fish and Fish Habitat Baseline Assessment and Offsetting Plan, which was developed in support of the Blackwater Environmental Assessment and project application

**NorthIsle Copper and Gold Corporation, Vancouver, BC**

*Hushamu Project, Environmental Baseline Program and EA Application, BC (2012)*

- Field crew member during the 2012 fisheries, limnology and hydrology baseline data collection programs

**2. Risk Assessment**

**Aurizon Mines Ltd, Vancouver, BC**

*Hecla Mining Company Due Diligence, USA (2013)*

- Contributed to a scoping-level environmental review of Hecla Mining Company's operational mines, including:
  - History of environmental permitting compliance
  - Operational and mine closure concerns
  - Potential and ongoing environmental litigation

**NWP Coal Canada, Vancouver, BC**

*Nordegg Project, Environmental Risk Assessment, Alberta (2012)*

- Lead author of an environmental risk assessment for a coal mine development region
- Completed a desk-top assessment of the region's environmental sensitivity with a focus on potential impacts to sensitive or at-risk species and habitats
- Assessed the regional protective environmental regulations for present and potentially present species

**3. Peer Review**

**Management and Solutions in Environmental Science (MSES), Calgary, AB**

*Site C Clean Energy Project proposal on behalf of the Saulteau First Nations legal counsel, Donovan & Company, BC (2013-present)*

- Co-ordinator of the Site C Clean Energy Project environmental assessment proposal review, with a focus on fisheries-related issues and priorities as identified by the Saulteau First Nations
- Prepared a technical memo and presentation outlining the identified top issues in support of a meeting with the Joint Review Panel

**Aquatera Utilities, Grande Prairie, AB**

*Wapiti River Basin and Upper Smoky River Watershed Environmental Scoping Studies, AB (2013)*

- Review co-ordinator of the scoping studies proposed in conjunction with the Wapiti River water management plan
- Provided critical feedback regarding the likely efficacy of the proposed program, and made suggestions based on reviews conducted by PECG's expert associates

**Kitikmeot Inuit Association, Kugluktuk, NU**

*Doris North Gold Mine Project, Hope Bay Mining Ltd., NU (2012)*

- Co-ordinator and main author of the Doris North Tail Lake Fish-Out Report review, completed as a requirement under Schedule 2 of the Metal Mining Effluent Regulations for the conversion of Tail Lake into a Tailings Impoundment Area
- Provided critical feedback surrounding study methods, modelling assumptions, inferred results, and adherence to DFO's General Fish-Out Protocol for Lakes and Impoundments in the Northwest Territories and Nunavut

**Previous Employment Experience:**

**Fisheries and Oceans Canada**

*Fish Habitat Biologist (2008-2009)*

- Conducted environmental assessment reviews of proposed development projects.
- Protected fishery resources and habitats in accordance with the *Fisheries Act* and the *Species at Risk Act*.
- Analyzed contingency plans, mitigation and habitat compensation measures to achieve no net loss of fish habitat.
- Applied knowledge of fish habitat protection requirements and methodologies, rare and endangered species, sedimentation and erosion control, hydrology, limnology, and environmental legislation.

**Interior Reforestation**

*Fisheries Technician (2008)*

- Fish Capture: angling, electrofishing, seining, trapping.
- Fish handling and processing.
- Water quality, sediment, benthos invertebrate and periphyton sampling.
- Fish population and spawning surveys.
- Fish habitat assessments.
- Data management and reporting to clients.

**Dr. Roy Turkington's Laboratory, University of British Columbia**

*Botany Research Assistant (2007)*

- Assisted with botany research projects in Kluane Park, Yukon as part of the Kluane Park Boreal Forest Ecosystem Project.

**Dr. Lance Barrett-Leonard's Laboratory, University of British Columbia**

*Marine Mammal Behaviour Field Assistant (2006)*

- Conducted field observations of sea otters in response to killer whale cues in Nuchatlitz, B.C.

**Technical Skills**

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- Aquatic field sampling design and execution
- Data analysis and interpretation skills using several statistical and graphical programs
- Experience collaborating with multi-disciplinary stakeholder groups to conduct fisheries research, environmental assessments and monitoring
- Scientific and technical report writing

**Professional Affiliations**

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- American Fisheries Society – Ontario Chapter
- ArcticNet Student Association
- College of Applied Biology – British Columbia

## Education

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- **Master of Science**  
University of Waterloo (2012)
- **Bachelor of Science (Marine Biology)**  
University of British Columbia (2007)

## Professional Development

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- Registered Professional Biologist, Association of Professional Biologists of BC (2013)
- Riparian Areas Regulation
- Crew Supervisor Electrofishing Certification
- SCUBA PADI Open Water Diver
- Pleasure Craft Operator License
- Firearms Possession & Acquisition License
- Safety training in grizzly, black and polar bear country
- Emergency First Aid & CPR
- WHMIS

## Publications and Presentations

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- Murdoch, A., Dempson, J. B., Martin, F., & Power, M. 2014. Temperature-growth patterns of individually tagged anadromous Arctic charr *Salvelinus alpinus* in Ungava and Labrador, Canada. Ecology of Freshwater Fish: DOI 10.1111/eff.12133.
- Murdoch, A., Doidge, B., Klein, G., & Power, M. 2013. Assessing the foodweb impacts of an anadromous Arctic charr introduction to a sub-Arctic watershed. Fisheries Management and Ecology 20(4): 302-314.
- Murdoch, A. & Power, M. 2013. The effect of lake morphometry on thermal habitat use and growth in Arctic charr populations: implications for understanding climate-change impacts. Ecology of Freshwater Fish 22(3): 453-466.
- Murdoch, A. & Power, M. 2012. The effect of lake morphometry on thermal habitat use and growth in Arctic charr populations: implications for understanding climate-change impacts. Oral presentation at the ArcticNet Annual Scientific Meeting, Vancouver, BC.
- Murdoch, A., Doidge, B., Klein, G., & Power, M. 2012. Assessing the foodweb impacts of an anadromous Arctic charr introduction to a sub-Arctic watershed. Oral presentation at the International Polar Year Conference, Montreal, QC.



## Professional History

### Palmer Environmental Consulting Group

President  
Vancouver, BC  
2010-present

### AECOM

Manager, Water and Natural  
Resource Practice Area Lead  
Vancouver & Whitehorse  
2008-2010

### Gartner Lee Limited

Manager, Natural Resource Team  
Vancouver, BC  
2006-2008

### Gartner Lee Limited

Senior Fisheries Biologist  
Toronto, ON  
2001-2006

## Summary

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**President and Senior Fisheries Biologist** – Responsible for technical, administrative, and financial management of the company, specializing in environmental impact assessments, technical baseline studies, environmental monitoring programs and peer review programs. Coordination and management of environmental permitting process for large-scale natural resource development projects. Registered Professional Biologist, with over 25 years of experience developing, managing and leading multidisciplinary teams in permitting projects across Canada. Technical areas of expertise include limnology and aquatic ecology, fisheries, in-stream flow modelling, environmental impact and risk. Provided technical expertise at public hearings for issues related to aquatic environments. Expert knowledge of the provincial and federal regulations in Canada.

## Key Skills

- **Team Management:** Strong connections within the Canadian and U.S.A consulting industry, extensive experience building, motivating, and supervising large, multidisciplinary and geographically dispersed teams.
- **Strategic Planning and Project Direction:** Strong track record in building business relationships with clients and other consultants, designing workshops for project strategy and direction. Extensive experience managing complex projects in challenging regulatory environments.
- **Government Relations:** Extensive experience with Environment Canada and Fisheries and Oceans Canada. Expertise in fisheries authorizations and developing/negotiating fish habitat compensation plans.
- **Areas of Technical Expertise:** Team assembly/leadership, project management, fish and fish habitat assessments, surface water-groundwater interactions, Instream flow assessments, fish habitat compensation.

## Project Experience

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### Mining

- NewGold, Blackwater Project, BC – Senior lead for Mathews Creek and Swanson Creek Fish Compensation Design, 2013 – present
- Gold Mountain Mining Corporation, Elk Gold Project, BC – Project Manager, Team Lead for Baseline Program and Permit Application, 2012 - present
- NorthIsle Copper and Gold Corporation, Hushamu Project, BC – Project Manager, Team Lead for Environmental Baseline Program and the EA Application, 2011 - present
- Canarc Resources Corporation, New Polaris Project, BC – Project Manager, Team Lead for Baseline Program, Exploration Permitting and EA Application, 2011 - present
- NWP Coal Canada, Nordegg ERA Project, Alberta – Project Lead, 2012
- Casino Mining Corporation, Casino Mine Project, Yukon - Air and Water Team Lead for the Casino Mine Project, 2008 - present
- Anglo American / Peace River Coal, Belcourt Saxon Project, BC – Fish and Aquatic Resource Lead, 2006 - 2009

- Barrick Gold, Cullaton Lake Project, Nunavut - Project Manager, Fish and Aquatic Discipline Lead, 2007 - 2009
- OzMinerals, High Lake Project, Nunavut - Fish and Aquatic Resource Discipline Lead, 2007 - 2008
- Doublestar Resources Ltd., Damoti Lake Project, Nunavut – Project Manager, Team Lead for Baseline Program, 2004 - 2006
- Peregrine Diamonds Ltd, DO-18 Project, NWT – Project Manager, Team Lead for Baseline Program, 2005-06
- Taseko Mine, Fish Lake Project, BC – Aquatic Field Biologist, 2004 - 2006

## Hydroelectric

- Yukon Energy Corporation, Gladstone Diversion Project, Yukon – Senior aquatic advisor and Fish and Aquatic Discipline Lead, 2009 - 2011
- Yukon Energy Corporation, Atlin Storage and Control Structure Project, Yukon - Senior aquatic advisor and Fish and Aquatic Discipline Lead, 2009 – 2011
- Yukon Energy Corporation, Marsh Lake Fall-Winter Storage Project - Senior aquatic advisor and Fish and Aquatic Discipline Lead, 2009 – 2011

## Water Management

- Aquatera Utilities, Wapiti River Projects, Alberta – Project Manager and Senior Advisor, 2007 - present
- Town of Devon, Saskatchewan River Study, Alberta – Project Manager, 2011 – present
- City of Guelph, Arkell Springs Project, Ontario - Fisheries Lead, 2002 - 06
- Town of Orangeville, Dudgeon Wells Project, Ontario – Fisheries Lead, 2002 - 06
- Regional Municipality of Halton, Lindsay Court Wells, Ontario – Fisheries Lead, 2004
- York Region, 9<sup>th</sup> Line and 16th Avenue Sanitary Sewer, Ontario – Fisheries Lead, 2002 - 05

## Peer Review

- Kitikmeot Inuit Association, Hope Bay Review, Nunavut - Fish and Fish Habitat Lead, 2011 – present
- MSES, Ivanhoe Project, Alberta – Fish and Fish Habitat Lead, 2011 – 2012
- William Lake Indian Band, Bootjack Creek Project, BC – Fish and Fish Habitat Lead, 2012
- MSES, Total A&P Project, Alberta – Fish and Fish Habitat Lead, 2013 – present
- Aurizon Mines Ltd., Hecla Due Diligence, USA – Project Manager and Aquatic Lead, 2013

## Corporate Experience

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### **Manager, Water and Natural Resource Practice Area (BC and Yukon) (2006 – 2010)**

*AECOM Canada (formerly Gartner Lee Limited), Vancouver, BC*

- Managed the Water and Natural Resource Practice Area for the BC/Yukon district. Responsible for all aspects of team performance. The practice area consisted of professionals in hydrology, water quality, fish biology, hydrogeology and mine water management.
- Project director for mining, hydroelectric and water supply projects in BC, Alberta, NWT, Nunavut and Alberta
- Chair of the scientific advisory committee for Yukon Energy Corporation's hydroelectric projects
- Provided management direction and key strategic advice on the permitting and regulatory approvals of large capital projects in the energy, resource extraction and power generation sectors.

### **Senior Project Manager and Aquatic Biologist (2001 – 2006)**

*Gartner Lee Limited, Vancouver, BC and Toronto, ON*

- Managed a multidisciplinary team of professionals with expertise in water supply and surface/groundwater interactions

- Managed water-taking projects for golf courses, gravel extraction, construction dewatering, water bottling and municipal water supply.
- Major Projects included:

**Senior Project Manager and Aquatic Biologist (1999-2000)**

*ARC Environmental Limited, Kamloops, BC*

- Managed several fish and fish habitat field programs as part of the Fish Habitat Inventory and Information Program (FHIP).
- Designed and built several fish habitat compensation projects from Forestry Impacts
- Designed and managed several First Nations fisheries training programs

## Education

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- **Master of Science (Fisheries)**  
*University of Waterloo, 2006*
- **Bachelor of Science (Biology)**  
*Simon Fraser University, 1996*
- **Fish and Wildlife Diploma**  
*British Columbia Institute of Technology, 1989*

## Professional Development

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- Registered Professional Biologist of British Columbia (College of Applied Biology 2003)
- Physical Habitat Simulation Modelling (PHABSIM) certificate (2004), USA
- Project Management boot camp, PSMJ Resources, Inc. (2005), ON
- Crew Supervisor Electrofishing Certification, BC
- SCUBA PADI Advanced Open Water Diver, Australia
- Pleasure Craft Operator License, BC
- Firearms Possession & Acquisition License, BC
- Safety training in grizzly, black and polar bear country
- Emergency First Aid & CPR, BC

## Presentations and Publications

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Over 100 technical reports completed, which are available on request. Rick has presented at scientific and engineering conferences and workshops across Canada and within the USA and Europe.



## DR. BEARS: EIA SPECIALIST AND WILDLIFE BIOLOGIST

I am a highly resourceful environmental impact assessment, wildlife, and wildlife habitat specialist, with additional technical expertise in fisheries toxicity, biostatistics, study design, and risk prevention. I am the owner of two sister companies: Zoetica Wildlife Research Services Inc. and Zoetica Environmental Consulting Services, which are dedicated to high quality consulting done by senior-level scientists. I am able to solicit the input of over 150 collaborating experts in environmental, engineering, statistical, legal, and social science fields, who work together as needed via the ZoeticaNet online portal ([www.zoeticanet.com](http://www.zoeticanet.com)). I have over 16 years of experience in research, consulting, and project management, including:

- Planning, implementing and managing large- and small- scale multidisciplinary terrestrial environmental programs for private clients (mining, energy, and land development), government agencies, and Aboriginal organizations throughout Canada;
- Scoping, writing, and reviewing environmental impact assessments to ensure they conform to requirements of the CEAA, NEB, NIRB/NLCA, BC EAA, YESAA, MVRMA, among others;
- Managing large (>1 million) and small (<\$5,000) projects, and ensuring that high quality deliverables are provided on time and on budget;
- Managing and liaising with large multidisciplinary teams including scientists, Aboriginal representatives, government regulators, and other stakeholders;
- Designing, managing, and leading terrestrial and marine field programs, environmental impact assessments, monitoring programs, large-scale statistical analyses, and third-party reviews backed by scientific and traditional knowledge;
- Assisting Aboriginal groups and municipalities in participating meaningfully in EIA processes, hearings, and reviews.

## EMPLOYMENT HISTORY

2011 to Now	Principal of Zoetica Wildlife Research Services Inc. and Zoetica Environmental Consulting Services, Vancouver, BC
2009 to 2011	Wildlife Biologist (Lead); PGL, Vancouver, BC
2007 to 2009	Terrestrial Services Team Lead; Rescan, Vancouver, BC
2002 to 2007	Instructor of Wildlife Ecology Courses, UBC
1997 to 2002	Research positions in N. Alberta and Jasper Park

## MEMBERSHIPS AND CERTIFICATION

Registered Professional Biologist (R.P.BIO #2033), 2007-Present  
 The Wild Sheep Society of BC  
 The Wildlife Society of North America  
 The College of Applied Biology, BC  
 Association of Professional Biologists, BC  
 IAIA, BC Chapter  
 AME and Women in Mining, BC

## EDUCATION

Ph.D. (Centre for Applied Conservation Research; Wildlife Focus) **University of BC**, Vancouver, BC, 2007

M.Sc. (Zoology) **University of BC**, Vancouver, BC, 2002

B.Sc. (Hons) Env. Biology **University of Alberta**  
 Edmonton, Alberta, 1999

**University of Groningen**  
 Honorary Visiting Post Doc Scholar, Netherlands, 2010

## PROF. DEVELOPMENT

IAIA 2015 Conference

Standard First Aid

Health Care Provider CPR

H2S Alive

WHIMIS, Transport of Dangerous Goods

Petroleum Safety Training, 2013

Wild Sheep Society of BC Conference, Kamloops, 2011

Slipstream Wilderness First Aid (50-hour course), 2010

Avian Power Line Interaction Committee (APLIC) Course at Wildlife Society Conference, Monterey, 2010

ANABAT (Bat ID) training, 2009

ATV and Bear safety courses, 1997, 1998



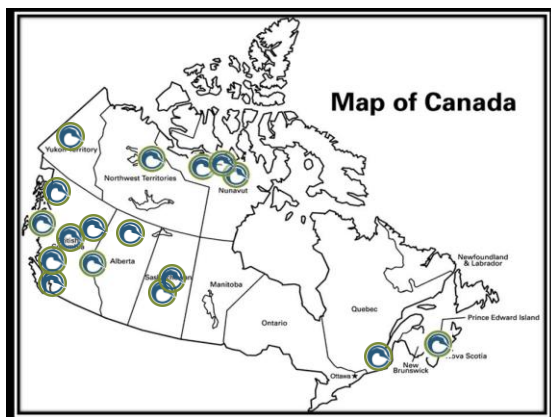
## SAMPLES OF RECENT PROJECTS BY ZOETICA \*Denotes ongoing work

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- **\*Metro Vancouver/Trans Mountain Pipeline, Canada (2014-2015)-** Reviewing the EIA and EPP documents and aiding the Metro Vancouver in preparing technical reviews and evidence documentation for Kinder Morgan's proposed Trans Mountain Expansion Pipeline Project.
- **\*Canadian Wildlife Service/Environment Canada (CWS/EC) (2014-2015)** - Zoetica was selected to establish a plan for the Vaseux-Bighorn National Wildlife Area, involving consultation, field work, and collation/analysis of existing ecological data to increase the ability of this NWA to connect Canadians to nature, while ensuring that the area meets the objectives of an NWA and supports the success of recovery plans for Species at Risk.
- **\*Tsleil-Waututh/FortisBC Eagle Mountain Woodfibre Gas Pipeline, Canada (2015)-** Technical review of environmental assessment and mitigation plans, wildlife baseline, and wildlife habitat models to aid the Tsleil-Waututh participating in wildlife technical meetings, and to ensure that wildlife values of the Nation are protected during project construction and operation.
- **\*City of New Westminster/Trans Mountain Pipeline, Canada (2014-2015)-** Reviewing EIA, EPP, and Emergency Response/Spill Response documents to aid the City of New Westminster in preparing information requests, technical reviews, and hearing evidence for the Trans Mountain Expansion Pipeline Project for the NEB.
- **\*Yorkton Tribal Council/Energy East Pipeline, Canada (2014-2015)-** Asked to Review documents (project description, EIA, EPPs) and aiding a Tribal Council in Saskatchewan in scientific reviews and participation in hearings. Zoetica will also be collecting TK/TU data to represent the Yorkton Tribal Council's concerns regarding the project.
- **\*Plastic Oceans Foundation, Hong Kong (2014-2020)-** Research partner in plastic oceans scientific network for BC and Nunavut regions. Group formed to tackle the problem of plastic accumulation and associated toxicity in marine environments and through marine food chains.
- **\*Kitikmeot Inuit Association (KIA), Nunavut, Canada (2011-2015)-** Team coordination and technical reviews of all wildlife and wildlife habitat reports, EIS documents, and monitoring reports for the Back River Project, Nunavut.
- **\*Kitikmeot Inuit Association (KIA), Nunavut, Canada (2011-2015)-** Team coordination and technical reviews of all wildlife and wildlife habitat reports, EIS documents, spill management plans and responses, and monitoring reports for the Hope Bay Project, Nunavut.
- **Environment Canada/Canadian Wildlife Service, BC (2013-2014)-** Research and report on the risk of diving seabirds to net entanglement associated with fisheries activity in central and NW British Columbia.
- **BHP Biliton EKATI Project, NWT (2013)-** Motion trigger camera analysis and statistical modeling of caribou population and behavioural responses to tundra mining roads.
- **\*Standing Offers, Provincial Government Projects (2012-2014)-** Work on variety of wildlife-related standing offers by provincial governments.
- **Upper Lillooet Hydro Project, Innergex, BC (2012)-** Wrote Environmental Impact Assessment, Cumulative Impact Assessment, and mitigation/monitoring/compensation plans for mule deer, moose, and wolverine populations associated with the project.
- **Kwoiek Hydro Project, Kwoiek Joint Venture Ltd, BC (2012)-** Conducted a field and noise modeling study to determine if hydraulic drilling noise had the potential to cause behavioural disturbances to mountain goats in neighboring habitat.
- **Quottoon Project (Cluster of 6 IPP projects), Sequoia Energy, NW Coastal BC (2011-2013)-**

Designed a field program and conducted all pre-feasibility wildlife research and reporting for the Quottoon IPP project.

- **Capstone, Kutcho Creek Mining Project, NW BC (2011-2012)**- Completed the baseline reports and the wildlife environmental setting of the EIA for the Kutcho Creek Project. Produced some portions of the EIA, including mitigation recommendations for woodland caribou, grizzly bear, moose, mountain goat, Stone's sheep, furbearers, and birds.
- **Culliton Creek, Syntaris, NW BC (2011-2012)**- Conducted wildlife surveys on red-legged frogs and produced an EIA for the project. Gave recommendations for mitigation of project impacts to mountain goats within nearby winter range.
- **Evaluating Effectiveness of Landscape Level Ecosystem Based Management (LLEBM)**. Zoetica Environmental Consulting Services/Institute for Coastal Research (2014)- Interviews for Evaluating effectiveness of Governance of Protected Areas within the Gulf Islands. The focus of the study assessing effectiveness of governance through stakeholder feedback.
- **\*Wind Power Projects, BC (2013-2014)**- Provide assistance on Scoping and EIA requirements to junior wind power development company in BC.
- **Land Development, Multiple Companies, Districts (2011-2014)**- Assistance in achieving environmental due diligence for construction projects.
- **\*Rotating Planet Productions, Montreal, QC (2014)**- Scientific writing, editing, and concept development for a 6-part Wildlife and Aging documentary series.
- **Eagle Gold, Victoria Gold, Yukon (2011)**- Produced a technical review of the biological sections of the EIA (written by Stantec) on behalf of the Na-Cho Nyak Dun Nation.



**Map of Zoetica Wildlife Research Services Projects and Select Site Photos**

## TECHNICAL REPORTS (SAMPLES)

- Review of Sensitive Ecosystems that Could be Impacted by the Trans Mountain Expansion Pipeline Project: Document supporting IRs and Technical Reviews. January, 2014. Prepared by Zoetica and Diamondhead Consulting for the City of New Westminster, BC.
- Technical Review of Draft Environmental Impact Statement of the Back River Project. October, 2014. Prepared by Zoetica and the Kitikmeot Inuit Association for the KIA and Nunavut Tunngavik Incorporated, Kugluktuk and Cambridge Bay, Nunavut.
- Bunsha, Dionne and Randall, Carleigh. 2014. Southern Gulf Islands, Canada: An Assessment of the

Governance System. Landscape-Level Ecosystem-Based Management Working Paper. [online] URL: <http://www.viu.ca/landscapelevel/>.

- Estimating Bycatch Risk of an Alcid Seabird, the Rhinoceros Auklet (*Cerorhinca monocerata*) due to Salmon Gillnet Fisheries in Coastal BC. February, 2014. Prepared by Zoetica Wildlife Research Services Inc. for the Canadian Wildlife Services and Environment Canada.
- Caribou Road Monitoring Program, Statistical Analysis, and Report, NWT. March 31, 2013. Prepared by Zoetica Wildlife Research Services Inc. for Rescan Environmental Services Ltd. to fulfill reporting requirements of the BHP Biliton EKATI Wildlife Effects Monitoring Program (WEMP).
- Cumulative Effects Assessment (CEA) for Kerr-Sulphurets-Mitchell (KSM) Project. January, 2013. Wildlife and Wildlife Habitat Sections Prepared by Zoetica Wildlife Research Services Inc. for Rescan Environmental Research Services for Seabridge Gold.
- Statistics Report: Analysis of Diversity and Behaviour in Birds at Different Distances from Commercial Gillnet Fisheries. March, 2013. Prepared by Zoetica Wildlife Research Services Inc. for Environment Canada (CWS). Authors: Heather Bears, Pamela Hengeveld.
- Determination of Potential Impacts of Noise from Hydraulic Rock Breaking Activities on Mountain Goats. June, 2012. Prepared by Zoetica Wildlife Research Services for Kwoiek Joint Venture (Kwoiek Hydroelectric Project). Authors: Heather Bears, Gary Mak, Mark Bliss, Rose Spicker.
- Review of the 2011 Wildlife Mitigation and Monitoring Program prepared by Rescan for the Doris North Project. April 29, 2012. Prepared by Zoetica Wildlife Research Services for the Kitikmeot Inuit Association (KIA), Nunavut. Author: Heather Bears.
- Review of Doris North Mine Modifications and Related Amendments to Project Certificate No. 3 and Type A Water License. January 27, 2012. Prepared by Zoetica Wildlife Research Services for the Kitikmeot Inuit Association (KIA), Nunavut. Author: Heather Bears..
- An overview of Wildlife and Wildlife Habitat Values for the Quottoon Cluster Hydroelectric Project. October 27, 2011. Prepared by Zoetica Wildlife Research Services for Sequoia Power, BC. Author: Heather Bears.
- Kutcho Creek Terrestrial Environmental Setting. April, 2011. Prepared by All North for Capstone Mining, BC. Author: Heather Bears.
- Upper Lillooet Hydro Project: Cumulative Effects Assessment. January, 2011. Prepared by Ecofish for Innergex Power, BC. Author(s): Heather Bears (Moose and Mule deer sections), Sally Leigh Spencer, Deborah Lacroix, Miranda Schulz, Alicia Newbury.
- Upper Lillooet Hydro Project: Wildlife Environmental Assessment. December, 2011. Prepared by Ecofish for Innergex Power, BC. VEC Author(s): Heather Bears (Mule deer, Moose, and Wolverine sections), Sally-Leigh Spencer, Deborah Lacroix.
- Statistical Analysis and Reports on Changes in Invertebrate Community Composition and Abundance Before and After the Construction and Operation of the Furry Creek Hydroelectricity Project. February, 2011. Prepared by Zoetica Wildlife Research Services for PGL, BC. Author: Heather Bears.
- Red-legged Frog Baseline: Culliton Creek Project. November, 2011. Prepared by Zoetica Wildlife Research Services for Syntaris Energy, BC. Author: Heather Bears.
- Detailed work program for assessment of red-legged frogs and tailed frogs for the Culliton Creek Project. November, 2011. Prepared by Zoetica Wildlife Research Services for Syntaris Energy, BC. Author: Heather Bears.
- Review of the Biological Components of the Eagle Gold Mine EIA. December 10, 2011. Prepared by Zoetica Wildlife Research Services for the Na-Cho Nyak Dun Nation, Yukon. Author: Heather Bears.

- Habitat use and range extent of Mountain Beaver in ASU Chilliwack. October, 2010. Prepared by PGL for Defense Construction Canada (DCC), Western Region, BC. Author: Heather Bears.
- Review of Draft EIA for the Gateway Enbridge Project (Disaster/Spill Response Plans, Terrestrial and Marine Sections). 2010-2011. Prepared by H. Bears for PGL, for the Gitxaala First Nation, BC.
- Environmental Impact Assessment for the Jamie Creek Hydroelectric Project. June, 2010. Prepared by PGL for Sequoia Energy, BC. Author: Heather Bears (Wildlife, Wildlife Habitat, and Environmental Setting Sections).
- Wildlife Baseline report and Environmental Impact Assessment for an alternative proposed transmission route from Santo Domingo to the Pueblo Viejo Mine. 2009. Prepared by Rescan for Barrick Gold Inc., Dominican Republic. Authors: Heather Bears, Greg Sharam (English Sections).
- Jansen Potash Mine: Wildlife Baseline Report (Vol. 1). 2009. Prepared by Rescan for BHP, Saskatchewan. Authors: Heather Bears, Julia Shewan, Leslie Bol, Shaun Freeman, Christine Kent.
- Hackett River Wildlife Baseline Report. 2008. Prepared by Rescan for Sabina Silver, Nunavut. Authors: Heather Bears, Greg Sharam, Julia Shewan.
- Environmental Impact Statement for the Proposed Bathurst Inlet Port and Road Project. 2008. Prepared by Rescan for the BIPR Joint Venture, Nunavut. Authors: Heather Bears, Greg Sharam, Julia Shewan, Christine Kent, Caroline Ames.
- Galore Creek Wildlife Effects Monitoring and Adaptive Management Program (Grizzly bear and Moose Sections). 2007. Prepared by Rescan/RTEC for NovaGold, BC. Author: Heather Bears.
- Technical Review of the Draft Environmental Impact Statement of the High Lakes Project (Wildlife and Marine Mammal Sections). 2007. Prepared by Rescan for the Kitikmeot Inuit Association, Nunavut Tunngavik Incorporated, Kugluktuk and Cambridge Bay, Nunavut. Author: Heather Bears
- Schaft Creek Bat Inventory Report. Prepared by Rescan for Copper Fox Metals Inc., BC. 2007. Authors: Heather Bears, Nicola Freeman, Leslie Bol, Odelia Dennis.
- Schaft Creek Avian Inventory Report. 2007. Prepared by Rescan for Copper Fox Metals Inc., BC. 2007. Authors: Heather Bears, Brandie Harding, Shaun Freeman.

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#### PEER REVIEWED PUBLICATIONS (SAMPLES)

- Bears, H, Wilson, L. and P. Hengeveld. In Prep. Estimating Bycatch Risk of an Alcid Seabird, the Rhinoceros Auklet (*Cerorhinca monocerata*) due to Salmon Gillnet Fisheries in Coastal BC, Canada.
- Bears H, White GC, and Martin KM (2009) Breeding in high-elevation habitat results in shift to slower life-history strategy within a single species. *J. Animal Ecol.*, 78: 365-375
- Mile High Strategy: Research of H. Bears Highlighted in *Nature* 456, 424 (27 November 2008) | doi: 10.1038/456424c; Published 26 November 2008.
- High, Low, Fast and Slow: Research of H Bears Highlighted in *Journal of Animal Ecology*, 78: 293-295.
- Bears H, Drever MC and Martin K (2008) Comparative morphology of a songbird breeding at two different elevations – a common aviary experiment. *J. Avian Biol.* 39(3): 152-162.
- Bears H, Camfield A, Davidson P, Wilson S and Martin K (2007) Birds in high places. *Bird Studies Canada*, Special Report. 41: 4-7.
- Bears H, Richards JG, and Schulte PM (2006) Arsenic exposure alters hepatic arsenic species composition and stress-mediated gene expression in the common killifish. *Aquatic Toxicology*, 77: 257-266.
- Bears H, Smith JNM, and Wingfield JC (2003) Adrenocortical sensitivity to stress in dark-eyed

juncos breeding in low and high elevation habitat. *Ecoscience*, 10: 127-133.

- Bears H, Pierre JP and Paszkowski CA (2001) Effect of forest harvesting on nest predation in cavity nesting waterfowl. *Auk*, 118(1): 224-230.

## DOCUMENTARIES

- Human-Animal Conflict. Heather Bears and Ari Cohen; Developer and Researcher Co-Writer: Rotating Planet Productions. To be released in 2017.
- Wildlife and Aging Documentary. Rotating Planet Productions. Researcher Script Consultant. To be released in 2016.

## GREEN ENERGY EXPERIENCE

Project	Client	Location	Work Program	Baseline Field work	Baseline & Analyses	EIA	Mitigation, Monitoring
Upper Lillooet Hydro	Innergex	Lillooet District				x (EIA & CEA)	x
Kwoiek Hydro	Kwoiek Joint Venture Ltd.	SW BC		x	x		x
Quottoon Cluster Hydro	Sequoia Energy	North Coast of BC	x	x	x	x	x
Jamie Creek Hydro	Sequoia Energy	Lillooet District	x	x	x	x	x
Pueblo Viejo Transmission Line	Barrick Gold	Dominican Republic	x	x	x	x	x
Clowhom Hydro	Fort Chicago	Southwest BC		x	x		
Phantom Lake Hydro	Enmax	Southwest BC	x	x	x		
Culliton Creek Hydro	Syntaris	Southwest BC		x	x	x	x
Cloudworks Hydro	Cloudworks Energy	Southwest BC					x
Northwest Transmission Line	BC Hydro	BC	x				
Fraser Richmond Soil & Fibre	FRSF	Richmond, BC	x				
Site C Hydro	BC Hydro	Hudson's Hope, BC	*Advised BGC Engineering on berm design for wildlife movement				
Talston Hydro	Deze Energy	NWT	x	x	x		
Furry Creek Hydro	Veresen	BC			x		x

## MINING EXPERIENCE

Project	Client	Location	Work Program	Baseline Field work	Baseline & Analyses	EIA/ EIS	Mitigation, Management, and/or Monitoring
Jay Pipe	Dominion Diamonds	NWT				SR of Terrestrial Work and Team management, KIA	
Doris North/Hope Bay	Newmont, Hope Bay Mining Ltd.	Nunavut				SR for KIA	SR for KIA
Eagle Gold	Victoria Gold	Yukon				SR for FN	SR for FN

<b>Kutcho Creek</b>	Capstone	NW BC			x	x	x
<b>Galore</b>	NovaGold	NW BC					x
<b>Schaft Creek</b>	Copperfox	NW BC			x		
<b>BIPR Project</b>	BIPR Joint Ventures	Nunavut	x	x	x	x	x
<b>Ferguson</b>	Starfield	Nunavut	x	x	x		
<b>Jansen</b>	BHP	Sask	x	x	x		
<b>Boulder and Young</b>	BHP	Sask	x				
<b>Hackett River</b>	Sabina Silver	Nunavut	x	x	x	x	x
<b>Pueblo Viejo</b>	Barrick Gold Corp.	Dominican Republic	x	x	x	x	x
<b>Ekati</b>	BHP	NWT					x 2013 Caribou Stats, Paper, Monitoring Program
<b>Gething</b>	Can. Dehua (Stantec)	BC		x			
<b>Kerr-Sulphurets-Mitchell</b>	Seabridge	BC				x (CEA Analysis)	
<b>Back River</b>	Sabina	Nunavut				SR of Terrestrial Work and Team Management, KIA	
<b>Monterde</b>	Kimber Resources	Mexico	x		x	x	x
<b>Sisson Brook</b>	Geodex	New Brunswick	x		x		
<b>Turnagain Creek</b>	Hard Creek Nickel	NW BC					S R
<b>Kitsault Project</b>	Avanti	Coastal BC	x				
<b>Mount Klappan</b>	Fortune Minerals	BC			SR		
<b>New Afton</b>	New Gold	BC			SR		

SR=Senior Review

## LAND DEVELOPMENT AND GOVERNMENT EXPERIENCE

Project	Client	Location	Work Program	Baseline Field work	Baseline & Analyses	EIA	Mitigation
<b>The Cape on Bowen</b>	The Cape on Bowen Comm. Development Ltd.	Bowen Island, BC	x	x	x	x	x
<b>Mountain Beaver Use of Army Training Areas</b>	Defense Construction Canada	ASU Chilliwack, BC	x	x	x	x	x



<b>Terra Nova Park Improvement</b>	City of Richmond	Terra Nova Park, Richmond, BC	x	x	N/A	N/A	x
<b>Statistical Analysis of Gillnet Entanglement</b>	Env. Canada	CWS Delta, BC	*Statistical analysis of government data and report for publication				
<b>T.R.O.L.S</b>	ALPAC, Weyerhaeuser, U of A	*Research on effect of forestry buffer strip widths around lakes on waterfowl					
Over 10 additional land development plans and projects across BC and the Islands, and on 3 government standing offer lists.							
Over 15 pre-construction bird nest and amphibian surveys across Canada.							

## FIRST NATION AND COMMUNITY EXPERIENCE

Project	Project Client	Location	First Nation	Nature of Work
<b>Gateway Oil and Gas Project</b>	Enbridge	BC	Gixtaala First Nation	Senior critique/expert opinion for draft EIA (wildlife, vegetation, marine and disaster/spill response plan sections) against the NEB requirements on behalf of First Nations.
<b>Kwoiek Hydro Project</b>	Innergex	BC	Kwoiek Nation	Integration of TK/TU into mountain goat noise mitigation plan.
<b>Hope Bay Mining Project</b>	Kitikmeot Inuit Association	Nunavut	Inuit (Kitikmeot)	Worked on all aspects of document review, consultation team coordination, site visits and meetings, and provided discipline specific advice.
<b>High Lake Mining Project</b>	MMG	Nunavut	Inuit (Kitikmeot)	Reviewed the dEIA produced for the High Lake Project. Participated in public hearings for the project following review.
<b>Back River Mining Project</b>	Sabina	Nunavut	Inuit (Kitikmeot)	Presently working closely with the KIA to orchestrate a team of multi-discipline reviewers for this project through each stage of the DEIS.
<b>Culliton Creek Hydro Project</b>	Syntaris	BC	Squamish First Nation	Worked in collaboration with members of the SFN in identifying traditional use sites and integration of traditional knowledge into survey design.
<b>Vancouver ASEP</b>	Vancouver Aboriginal Skills Employment Partnership	BC	Various (>8 First Nations represented)	Provided course in vegetation and wildlife monitoring as part of an Independent Power Plant Operation training module for Aboriginal operators.
<b>Mining Field Surveys</b>	Various Mining Clients (see CV)	BC, Nunavut	Tahltan, McLeod Lake, Squamish, Kaska, & numerous other First Nations)	During most field surveys conducted by mining clients, a First Nation assistant familiar with local wildlife and wildlife habitat in the areas is identified and directly assists with the surveys.
<b>Eagle Gold Mining Project</b>	Victoria Gold	Yukon	Na Cho Nyak Dun Nation	Conducted an extensive review of the biological components of the EIA.
<b>Northwest Stave Hydro Project</b>	Innergex	BC	Various	Provided training to First Nation mountain goat monitors required during road construction activity associated with the NW Stave project.
<b>Kutcho Creek Mining Project</b>	Capstone	BC	Tahltan and Kaska First Nations	Participated in meetings with the Tahltan First Nation and client to ensure that the baseline information and EIA will address and integrate First Nations concerns.



<b>LLEMB Gulf Islands</b>	UVI	BC	Gulf Island members	Evaluation of effectiveness of governance of Protected Areas within the Gulf Islands.
<b>Energy East ESA Reviews/TK</b>	Yorkton Tribal Council	Sask	Yorkton Tribal Council	Approached by Yorkton Tribal Council to review project EIA, and to collect TK/TU data.
<b>Eagle Mountain Woodfibre Gas Pipeline</b>	FortisBC	BC	Tsleil-Waututh	Reviews of wildlife studies, models, EA material, and proposed mitigation.

## OIL AND GAS EXPERIENCE

Project	Client	Location	Work Program	Baseline Field Work	Baseline & Analyses	EIA and EPP	Final Hearing
Energy East	Yorkton Tribal Council	Sask			x, Upcoming-critique of baseline on behalf of FN	x, Upcoming-Assessment of Project on FN land, TK/TU	Upcoming
Foster Creek Oil and Gas Extraction	Cenovus (Matrix)	Cold Lake, AB				x, Monitoring surveys	
Gateway	Enbridge	AB, BC			x, Critique of baseline on behalf of FN	x, Critique of EIA and EPPs on behalf of FN	x, Information Provided Used in Final Hearings
LNG Plant	Pacific Northwest LNG (Stantec)	Lelu Island, BC		x			
PR LNG	Pacific Northwest LNG (Stantec)	Across BC		x			
Kinder Morgan's Trans Mountain Expansion Project	City of New Westminster and Metro Vancouver	BC			x, Critique of baseline	x, Critique of EA, EPP and ERPs, Community Meeting Panelist	x, Preparation of evidence for final hearing
Fortis BC's Eagle Mountain-Woodfibre Gas Pipeline Project	Tsleil-Waututh First Nation	BC			x, Critique of baseline for Tsleil-Waututh	x, Critique of EIA and EPPs for Tsleil-Waututh	Upcoming

## RECENT PRESENTATIONS AND SYMPOSIA

Bears H (2014) Estimating Impacts of Construction Noise on Mountain Goats: Use of Noise Modeling and Proxy Simulations near Ungulate Winter Range and Wildlife Habitat Areas to Estimate Impacts. Association of Professional Biology Conference, 2014.

Bears H (2012) Understanding Statistical Power in Wildlife Biology: Current Issues. Wildlife Statistics Symposium, Green College, UBC (Organized by Zoetica Wildlife).

## CORPORATE AND PERSONAL REFERENCES

Available on request