

BLUENOSE EAST CARIBOU HEARING



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To the Registered Parties (see Distribution List appended)

Delivered via email, fax, and online Public Registry

February 15, 2016

RE: Notice Regarding Experts Engaged by the SRRB Bluenose East ᐱᕐᕈᕈᕐ ᑕᑦᕐᕐᕐ ᑕᑦᕐᕐᕐ Public Hearing March 1-3, 2016

The ᐱᕐᕈᕈᕐ ᑕᑦᕐᕐᕐ ᑕᑦᕐᕐᕐ ᑕᑦᕐᕐᕐ (Sahtu Renewable Resources Board - SRRB) has retained two technical advisors to assist the SRRB in the SRRB's Bluenose East Caribou Hearing. Ecologist Dr. Colin Macdonald and anthropologist Dr. Aalice Legat will be providing technical services to the SRRB.

The attached resumes provide details regarding the professional expertise of Drs. Macdonald and Legat. The SRRB also wishes to share information with the Parties and the public about role that the technical advisors are playing in the hearing.

The technical advisors are providing input within their respective areas of expertise by way of four tasks:

1. Assist in development of Information Requests to proponents (Déljᕐᕐ and NWT Environment and Natural Resources).
2. Prepare a written submission to the Board by February 24, providing an analysis of issues arising in the hearing. These written submissions will be posted on Board's Registry for the Hearing (<http://www.srrb.nt.ca>).
3. Attend the March 1-3 Public Hearing in Deline on the SRRB's behalf, including:
 - Question Parties at the public hearing on behalf of the Board as appropriate.
 - Make a presentation at the Public Hearing to provide the Board and the public with analysis of issues arising in the hearing.
 - Be available to be questioned by the Parties at the Hearing regarding their written submission and their public presentation.
4. Prepare a final report by March 29, including analysis of the evidence to assess the relevance and credibility of evidence on the key issues, identification of new issues that emerged during the hearing, and assisting the Board in understanding the evidence so that the Board can make its final decisions.

Please contact me at 867-588-4040 or info@srrb.nt.ca if you have any questions or concerns about the role of the Board's technical advisors in the hearing.

Máhsı cho,



Joe Hanlon
Program Coordinator

Enclosures

Dr. Colin Macdonald Curriculum Vitae
Dr. Allice Legat Curriculum Vitae

Distribution List

Walter Bayha, Deline Renewable Resources Council, Deline First Nation, and Deline Land Corporation

Angus Lennie, Tulita Renewable Resources Council

Chief Frank Andrew, Tulita Dene Band

Ruby McDonald, Norman Wells Renewable Resources Council

Roger Boniface, Fort Good Hope Renewable Resources Council

Grand Chief Wilfred McNeely Jr., K'asho Got'ine Community Council

Joseph Kochon, Colville Lake Renewable Resources Council

David Codzi, Ayoni Keh Land Corporation

Chief Wilbert Kochon, Behdzi Ahda First Nation

Irene Kodakin, Deline Resident

Hon. Wally Schumann, Minister, NWT Environment and Natural Resources (ENR)

Ernie Campbell, Deputy Minister, NWT Environment and Natural Resources (ENR)

Lynda Yonge, Director of Wildlife, NWT Environment and Natural Resources (ENR)

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Total number of citations = 1344

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Summary

Dr. Colin Macdonald has over thirty years of experience in environmental research and study design, data analysis and ecological risk assessment. His primary area of expertise is in the movement of chemicals to fish and wildlife through aquatic and terrestrial food webs, and in the fields of ecological risk assessment and toxicology. His experience in study design, monitoring and statistical analysis has led to strategic program reviews and assessments to evaluate monitoring program performance and the ability of a program to meet its objectives. He has led projects on spatial and temporal trends of chemicals in the environment and their uptake and exposure in fish and wildlife. After opening Northern Environmental Consulting in 1998, his research expertise led to projects involving the collection and analysis of contaminants in wildlife and traditional foods near contaminated sites in the northern Canada.

Dr. Macdonald has also worked extensively with private companies, federal departments (Environment Canada, Fisheries and Oceans, Aboriginal Affairs and Northern Development Canada (AANDC)), territorial agencies (Environment and Natural Resources, Nunavut Dept. of Health) and aboriginal organisations to design science-based field sampling programs and statistical analysis for ecological and human health assessment at northern contaminated sites and communities. He has used his northern experience to provide state of the environment reports for the GNWT and several regional groups, such as the NWT Protected Area Strategy. In 2004, he was commissioned by INAC to assess the effects of oil and gas development on terrestrial wildlife for the Arctic and Monitoring Assessment Program (AMAP - www.amap.no).

Dr. Macdonald has provided the design, sampling, analysis and interpretation of aquatic and terrestrial monitoring programs to INAC's Contaminant and Remediation Directorate at several abandoned mines in the NWT, including the Colomac gold mine, Port Radium, Echo Bay Properties, Silver Bear Mines, Contact Lake, El Bonanza, and others. He has earned the qualification of Environmental Professional through Eco Canada and been a member of the Society of Environmental Toxicology and Chemistry (SETAC) for 25 years, the Arctic Institute of North America for 15 years, is a member of the American Chemical Society and is the author of over 60 journal papers and reports.

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Education

1976 University of Guelph (B.Sc. Honours Fisheries Biology)
1979 University of Western Ontario (Masters of Engineering Science)
1986 University of Guelph (Ph.D. Zoology)

Work Experience

1998-pres. Principal Consultant/analyst with Northern Environmental Consulting & Analysis, Inc.
1996-1998 Adjunct faculty, Soil Science Department, University of Manitoba, Winnipeg, MB.
1991-1998 Research Scientist (Ecology/Environmental Toxicology), Whiteshell Laboratories, AECL, Pinawa, Manitoba.
1989-1991 Consultant, term biologist; National Wildlife Research Centre, Canadian Wildlife Service, Hull, Québec.
1986-1989 Post-doctoral fellow and adjunct professor, Environmental and Resource Studies, Trent University, Peterborough, Ont.

Professional Memberships and Experience

- Member of the Technical Review Panel for the Northern Contaminants Program for Aboriginal Affairs and Northern Development Canada (AANDC)
- Member of the American Chemical Society (ACS).
- Member of the Arctic Institute of North America.
- Member of the Society of Environmental Toxicology and Chemistry (SETAC) since 1989.
- Environmental Professional designation through Eco Canada
- Author and co-author of over 60 scientific papers, reports, conference papers.

Primary Areas of Expertise

- Ecological risk assessment
- Northern community science liaison
- Toxicology and environmental distribution of metals, organochlorine pesticides and radionuclides
- Statistical analysis and design of environmental surveys
- Coordination and delivery of collections for environmental quality surveys
- Report and publication preparation
- Report and program review

Recent Clients

- Oil and Gas Branch, Indian and Northern Affairs Canada (Ottawa)
- Parks Canada
- Arctic Monitoring and Assessment Programme (AMAP), Oslo, Norway
- Northern Contaminants Program, Aboriginal Affairs and Northern Development Canada (Ottawa)
- Contaminants and Remediation Directorate (CARD), Aboriginal Affairs and Northern Development Canada
- SENES Consultants (Richmond Hill, ON), AECOM (Winnipeg, Calgary), Dillon Consulting (Calgary)
- Environment and Natural Resources, Government of the Northwest Territories (Yellowknife, NT)

Project Experience

The following projects outline some specific examples of projects that Dr. Macdonald has completed during his career in environmental research (since 1982) and consulting (since 1998). Many of the projects overlap in the areas of monitoring and assessment in the terrestrial environment and evaluation of the spatial and temporal trends of chemicals of potential concern in the aquatic and terrestrial environments.

Program Performance Assessment and Review

Review of the Final Environmental Impact Statement for the Kiggavik Uranium Mine on behalf of the Nunavut Department of Health and Department of the Environment. Northern Environmental and Intrinsic Environmental Sciences were retained to review the human health and ecological risk assessment relating to the dispersion of material from the Kiggavik mine through air and water during the proposed operation, and the human health and ecological risk assessment. Northern Environmental conducted a review of the radiological components of the EIS and the potential impacts to humans and non-human species.

Performance assessment of temporal trend monitoring data for the Northern Contaminants Program (NCP). Client: Aboriginal Affairs and Northern Development Canada. This project involved an evaluation of the performance of the NCP to meet its objectives of being able to detect a 5% change in the concentrations of organochlorine pesticides in traditional food monitoring programs in the Canadian Arctic. The program objective is to eliminate man-made pesticides from traditional foods in northern Canada. This project examined the long-term monitoring programs for 5 representative compounds (DDE, α HCH, PCB153, PFOS and PBDE 47) in marine mammals and fish in the Arctic. Power analysis was used to determine how the monitoring programs were performing relative to program goals.

High-level strategic review and gap analysis of research priorities for the Arctic Monitoring and Assessment Program. Client: Aboriginal Affairs and Northern Development Canada. AMAP is developing a work plan for 2013-2015 based on the last 10 years of assessments on contaminant distribution (e.g., mercury, organic pollutants, and radiation), effects to human health and the environment, and climate change in the Arctic. Dr. Macdonald provided recommendations to AMAP for consideration on future comprehensive assessments after a review of technical assessments since 2001.

Comprehensive review of climate change impacts in the Canadian Arctic Archipelago, including Baffin Island (2012). Client: Fisheries and Oceans Canada. A comprehensive review of changes to the physical, chemical and biological systems in the central Arctic with the changing climate was conducted by C. Macdonald for Fisheries and Oceans Canada to highlight observed changes and to demonstrate gaps of knowledge. Positive changes could result in relation to fisheries and shipping. Areas of emphasis included changes to sea-ice, surface water chemistry and productivity, glacier and ice field melts, weather patterns, and the biological environment. Gaps in knowledge and areas of greatest uncertainty were identified.

The Environmental Effects of Oil and Gas Development in the Arctic. 2004-2007. Client: Oil and Gas Branch, AANDC. AMAP conducted an assessment of oil and gas activity in the Arctic in response to a request from the Arctic Council, which is comprised of Ministers from the 8 Arctic countries. The assessment provided advice to the Ministers regarding the extent of oil and gas development, the socioeconomic costs and benefits and the environmental effects of development. Dr. Macdonald was lo-lead author of the section of the report on environmental effects to the terrestrial ecosystem.

State of the Environment Reviews, NWT (2003 – 2011). Client: Various. Various agencies, including the

Cumulative Impact Monitoring Program (CIMP), Protected Area Strategy, Sahtu Renewable Resources Board, The West Kitikmeot Slave Study (WKSS), the community of Kakisa. In the last 10 years, NECA has contributed to several State of the Environment Reviews and Phase 1 and 2 environmental assessments. Dr. Macdonald contributed a major section on terrestrial systems to the NWT's environment audit and state of the environment reviews by SENES Consultants in 2005 and 2010. NECA has also worked for NWT co-management boards and agencies with a responsibility to review the status of the environment and natural resources (e.g., Protected Area Strategy) and to identify gaps and adjust management strategies accordingly.

Assessment of environmental liabilities at a mine in northern Manitoba. 2011. Client: AECOM. Dr. Macdonald reviewed several years of monitoring data and provided an assessment of environmental liabilities at a major mine site in northern Manitoba prior to the potential development of new projects. The review included the critical evaluation of 50 years of monitoring and research studies at the site by government and industry and an assessment of the potential for long-term environmental issues after remediation. Continuing concerns included acid mine drainage and long-term contamination of surface waters.

Program review of aquatic and terrestrial assessment and monitoring programs at Colomac mine, NWT (2001, 2003, 2012). Client: AANDC. Macdonald designed and implemented programs to assess contamination in the aquatic and terrestrial receiving environments at Colomac, NT in relation to CCME guidelines and contaminated sites criteria. Aquatic programs were designed to test metals and hydrocarbons in traditional foods of the Tlicho near Colomac. In 2012, Northern Environmental reviewed the monitoring program results in terms of site-specific objectives after remediation, and identified areas that needed improvement.

Development of a statistical guide for the design of environmental assessment and effectiveness monitoring studies (2010). Client: Parks Canada Parks Canada required a statistically rigorous guide for the design of field studies to support program objectives of documenting ecological integrity and environmental assessments in national parks. The guide provided detailed advice on sampling protocols to allow the agency to detect changes in environmental conditions and to determine if management objectives were being met.

Impact/Risk Assessment

Contaminants in the Port Radium and Great Bear Lake environment (1998-2012). Client: AANDC. Radionuclides and metals in sediments, fish, water, and soil from Port Radium on Great Bear Lake were analysed to characterize contamination from the mine site. Dr. Macdonald worked with members of Déline First nation to collect water and sediments at the mine site, then worked with SENES consultants on a comprehensive site assessment prior to remediation and post-remediation monitoring. Dr. Macdonald sampled soils and plants and conducted fisheries surveys for evidence of contamination by radionuclides and stable elements. The projects also included several summary reports to the community of Déline on the levels of chemicals of concern in the Great Bear Lake environment.

Ecological risk assessment of radioactivity at the Stark Lake mine. NWT. 2013. Client: AANDC. An ecological risk assessment was conducted on an abandoned mine site to the east of Lutsel K'e, NT. The mine consisted of waste rock with elevated gamma radiation, and surface waters with elevated uranium. The ecological risk assessment indicated significant risk to small mammals due to background radiation and elevated U-238 chain nuclides in vegetation adjacent to the waste rock.

Statistical and chemical analysis of environmental contaminants in northern large mammal populations (2012). Client: Environmental and Natural Resources, GNWT. Clients include regional and headquarters

Environment and Natural Resources biologists. The study consisted of the statistical analysis of metals, primarily cadmium and mercury, and radionuclides and stable isotopes (diet) in woodland caribou, moose, mountain goats, Dall's sheep in the DehCho region of the NWT. The project was initiated to explain high cadmium levels in some species which led to a food advisory by the GNWT. Outcome of the project has been a conference presentation and a manuscript for submission to a journal.

Tier III risk assessment of human health and the environment at a small contaminated site in Manitoba. 2013. Client: Atomic Energy of Canada, Ltd (AECL). Monitoring programs indicated high levels of naturally-occurring uranium in surface soils due to the release of holding pond waters. This project evaluated the risk of adverse health effects in humans and non-human species from contact with the soil with elevated uranium. Risk to human health was assessed with Health Canada exposure models while exposure in non-human species (plants, birds, small and large mammals) were assessed using the ERICA model framework from the IAEA.

Research programs on contaminant distribution and exposure in northern aquatic and wildlife species. (1992 – present). Client: Various (AANDC, GNWT). Projects included the assessment of organochlorines, metals and radionuclide exposure and effects in northern fish and wildlife species. Individual projects involved barren ground caribou herds in the NWT and Nunavut, woodland caribou, mountain goats and Dall's sheep and marine mammals (ringed seal, narwhal, beluga). The projects led to several technical reports, presentations at scientific conferences and papers published in scientific journals. Some examples are cited below.

Detailed multi-element analysis of the elemental composition of tissues and faecal ash in a moose (*Alces alces*) exposed to tailings at the abandoned Colomac gold mine, NWT. 2007. Client: Environmental and Natural Resources, GNWT. The study involved the detailed analysis of a moose trapped in the tailings area of the Colomac mine. The data were used to support the ecological and human health risk assessment for the mine.

Research on the distribution and dosimetry of naturally-occurring radionuclides in caribou in the NWT and Nunavut (1992-ongoing). Client: Environmental and Natural Resources, GNWT. A research project was conducted in conjunction with GNWT's Environment and Natural Resources to determine the concentrations of naturally-occurring radionuclides (Ra-226, Pb-210, Po-210) and cesium-137 in caribou tissues. Activities involved analysis of muscle, liver and kidney for alpha and gamma-emitting nuclides, estimation of dose to the animals, and statistical analysis of trends. The research concluded with a paper published in Science of the Total Environment (1996) and several reports to the Northern Contaminants Program (1996-2013). An additional paper on the accumulation of cesium-137 in Canadian and Alaskan caribou herds since the 1960's was published through Health Canada.

Multielement analysis of barren ground caribou faecal pellets from Colomac mine and near diamond mines in NWT. 2004. Client: Environmental and Natural Resources, GNWT. A research project was conducted with Environment and Natural Resources scientists on the levels of individual elements in the faecal pellets of caribou near major industrial developments as a means of identifying contamination of foods sources.

Ingestion rates and radionuclide transfer in birds and mammals of the Canadian Shield. 1997. A review of ingestion rates for wildlife species was conducted to determine suitable parameters to model the uptake and exposure of major species like white-tailed deer and moose at mine sites. The data were used for ecological risk assessments at mines on the Canadian Shield.

Radiation exposure and dose to small mammals in radon-rich soils. 1997. Small mammals burrowing in radium-rich soils in Manitoba provide a useful analogue for understanding the exposure of non-human species to

elevated levels of radiation. Artificial burrows in Pinawa, Manitoba showed that radon levels were significantly elevated in burrows and exposure to radon, especially at the cellular level in the lung were very high in burrowing animals. Atomic Energy of Canada Limited Technical Report TR-764, COG-96-550.

Report on the analysis of radionuclides in beluga from the western Canadian Arctic. 1994. Muscle samples from beluga from the western Canadian Arctic were surveyed by gamma spectrometry for anthropogenic and naturally-occurring radionuclides. The levels of all nuclides, including cesium-137, were very low in all samples.

An assessment of wildlife exposure and risk from metals at phytoremediated sites. 1998. An evaluation of exposure to chemicals of potential concern on phytoremediated sites was conducted for Environment Canada. The growth of vegetation on contaminated sites attracted wildlife that could be exposure to elevated levels of chemicals accumulated in the plants.

Contaminants in ecologically relevant samples at Contact Lake, Indore Hottah, North Inca, Silver Bear Mines, El Bonanza mines in the NWT (2001-2013). Client: AANDC. As part of Phase 1 and 2 assessments by SENES Consultants at these abandoned mines in the NWT, Dr. Macdonald designed and implemented soil/plant collection program to delineate spatial trends of contaminants at the respective mines to support human health and ecological risk assessments. Fisheries assessments were also conducted at several sites. Tasks involved sample collection, coordinating analysis for metal and radionuclide analysis, QA/QC, fish aging, statistical analysis and data interpretation mine and report submission.

Report of contaminants in traditional foods in Déline, NT. Client: Déline Renewable Resources Council. 2002/03 and 2011, 2012. Traditional foods were obtained from members of the community of Déline and analysed for radionuclides and stable elements. The data were used to determine if people in the community were exposed to higher levels of chemicals through the consumption of traditional foods. During the course of the program all major food types (barren ground and woodland caribou, fish, waterfowl) were sampled and analysed. The studies supported the view that traditional foods remain the best option for people in Déline. The project was repeated in 2011 and 2012 as part of a long-term monitoring program.

Radiological assessment of foods and the environment in Lutsel K'e and Baker Lake, NU (1998, 1999). Client: AANDC. Radiological exposure was estimated in two communities as part of an assessment of contaminants in traditional foods in the north. The community of Lutsel K'e was concerned about radiation from the COSMOS satellite which deposited radiation over Great Slave Lake in the late 1970s, and a local uranium exploratory mine (the Stark Lake mine). Background gamma radiation was measured in the communities, radon in some houses and community buildings and radionuclide levels in traditional foods.

Supplemental Services

Technical review of research and monitoring projects in the NWT and Nunavut for the Northern Contaminants Program (NCP). 2009 – present; ongoing. Client: AANDC. C. Macdonald is a member of a technical review committee that evaluates research projects for the NCP to ensure technical suitability. The objective of the NCP is to reduce or eliminate chemicals in traditional foods in Canada's North. Individual projects involve major issues such as climate change, mercury transport, toxicant levels in traditional foods like caribou, marine mammals (beluga, narwhal, ringed seal, polar bear), waterfowl and fish.

State of Knowledge of the Great Bear Lake (Sahtu) environment (from the perspective of the people of Deline, NT). 1999. Client: Cumulative Impact Monitoring Program, AANDC. Comprehensive interviews were

held with the elders of Déline, NT to record the changes in the Great Bear Lake environment that had occurred during the elders' lifetimes. The projects was part of the baseline studies for the Great Bear Lake Management Plan.

Review of environmental programs in the Fort McMurray region of Alberta for the Athabasca Tribal Council. 2003. Client: Athabasca Tribal Council. A program to communicate the results from monitoring programs of hydrocarbons in water, air and terrestrial monitoring programs of hydrocarbons was assembled for presentation to First Nations in the Fort McMurray area in conjunction with oil producers and First Nations in the region.

Country food monitoring workshop. 2001. Dr. Macdonald reported on the results of a Health Canada workshop on monitoring the safety and quality of country foods in Canada. Report for the Office of Ecosystem Initiatives and Health, Arctic Section, Ottawa, ON. February 2001.

Background documentation for Priority Substances List (PSL 2) assessment of uranium. 1998-2000. Dr. Macdonald extensively reviewed the literature on the toxicity of uranium to mammals, birds and fish to provide background data for the assessment of uranium toxicity. The review included the development of tolerable doses, hazard and risk to wildlife.

Examples of Recent Reports

Macdonald, C.R. 2015. Radionuclides and cadmium in caribou in Nunavut, Northern Saskatchewan and other northern jurisdictions, and human health risks related to consumption: a literature review (submitted section on natural radioactivity). Submitted to the Nunavut Department of Health in conjunction with Intrinsic Environmental Sciences, Inc. Iqaluit, NU. 68 pp.

Macdonald, C.R. 2014. Performance assessment of temporal trend monitoring data for the Northern Contaminants Program. Report submitted to the Northern Contaminants Program, Ottawa, ON.

Macdonald, C.R. 2014. Multi-element of wildlife and wetland plants at Colomac mine, NWT. Report submitted to AECOM, Calgary for site monitoring report.

Macdonald, C.R. 2014. Multi-element, radionuclide and stable isotope analysis of kidney and muscle in mountain goat (*Oreamnos americanus*) from the south Mackenzie Mountain region of the NWT. Report submitted to Environment and Natural Resources, Government of the Northwest Territories.

Macdonald, C.R. 2013. Activity report for the collection of wildlife at Colomac, September 2013. Report submitted to AECOM, Calgary as part of the summary of field activities.

Macdonald, C.R. 2013. Draft screening ecological risk assessment for Stark Lake mine. Assessment submitted to Dillon Consultants, Calgary for inclusion with Remedial Action Plan (RAP).

Macdonald, C.R. 2013. Metal and radionuclide concentrations in lake whitefish, lake trout and herring collected near Déline, NT in 2012. Report submitted to the Déline Renewable Resource Council. 36 pp.

Macdonald, C.R. 2013. Tier III risk assessment of human health and environmental protection in the URL holding pond discharge path. Project report submitted to ACSION Industries. 53 pp.

Macdonald, C.R. 2013. Strategic review of the environmental programs at the Colomac Mine site, NT 1999 – 2012. 71 pp.

Macdonald, C.R. 2012. Synthesis of climate change effects on the Canadian Arctic Archipelago (CAA) sub-basin. Submitted

to Fisheries and Oceans Canada, Winnipeg. 41 pp.

- Macdonald, C.R.** 2012. Strategic review of priorities and emerging issues for the AMAP work plan 2013-2015. Report submitted to the Arctic Monitoring Assessment Program. Oslo, Norway. 81 pp.
- Macdonald, C.R.** 2011. Statistical analysis of physical parameters and potential chemicals of concern in sediment and surface waters at several sites near Snow Lake, Manitoba. Report prepared for AECOM, Winnipeg. 30 pp.
- Macdonald, C.R.** 2011. Assessment of environmental liabilities at a mine in northern Manitoba. Report prepared for AECOM (Winnipeg).
- Macdonald, C.R.** 2011. Organochlorine, metal and radionuclide concentrations in lake whitefish, lake trout and herring collected near Déline, NT in 2009 and 2010. Report submitted to the Déline Renewable Resource Council.
- Macdonald, C.R.** 2010. Terrestrial environment. Review and status report submitted to SENES Consultants as part of the NWT Environmental Audit and State of the Environment Report. July 2010.
- Macdonald, C.R.** 2010. Guide on the design of environmental assessment follow-up and effectiveness monitoring studies. Final report and Powerpoint Presentation submitted to Ecological Integrity Branch, Parks Canada, Ottawa.
- Macdonald, C.R.** 2010. Field sampling in support of environmental risk assessment at abandoned mines in the NWT. Federal Contaminated Sites Workshop. Montreal Québec. May 11, 2010.
- Macdonald, C.R.** 2010. Phase 1 environmental assessment for the Five Fish Lakes area of the Deh Cho, NT. Submitted to SENES Consultants as part of the combined Phase 1 Ecological and Renewable Resource assessment for the Protected Area Strategy.
- Macdonald, C.R.** 2009. Organochlorine, metal and radionuclide concentrations in herring (*Coregonus artedii*) and lake trout (*Salvelinus namaycush*) collected near Déline, NT in February 2009. Submitted to the Déline Renewable Resource Council. Déline, NT.
- Macdonald, C.R.** 2009. Review of the terrestrial and aquatic environment near Giant Mine in the NWT. Submitted to SENES Consultants as part of an environmental submission to Indian and Northern Affairs Canada.
- Macdonald, C.R.** 2008. Monitoring of the terrestrial system around the Prairie Creek Mine. Submitted to SENES Consultants as part of review of the cumulative effects of the Prairie Creek Mine near Nahanni Park, NT.
- Macdonald, C.R.** 2008. Cumulative effects of oil and gas activities near Norman Wells, NT. Submitted to SENES Consultants as part of a review of the cumulative impacts in Bosworth Creek watershed near Norman Wells, NT.

Examples of Recent Published Papers and Conference Presentations

- Macdonald, C.R.** 2014. A critical review of the effects of oil and gas activity on caribou. U.S. – Canada Northern Oil and Gas research Forum. Yellowknife, NT. Canada.
- Larter, N., **C.R. Macdonald**, D. Muir and B.T. Elkin. 2014. Multi-element, radionuclide and stable isotope analyses of kidney and muscle tissue from mountain goats in Northwest Territories. Northern Wild Sheep and Goat Council's Proceedings (submitted).
- Larter, N.C., **C.R. Macdonald**, B.T. Elkin, X. Wang, M. Gamberg and D.C.G. Muir. 2013. Elemental and radionuclide concentrations in tissues from four ungulate species from the southern Mackenzie Mountains, NT. Prepared for Northern Contaminants Program Conference, Ottawa, Sept. 2013.
- Larter, N.C., **C.R. Macdonald**, B.T. Elkin, X. Wang, M. Gamberg and D.C.G. Muir. 2013. Elemental and radionuclide concentrations in tissues from four ungulate species from the southern Mackenzie Mountains, NT. Manuscript

prepared for journal. (currently in review).

- Larter, N.C., J.A. Nagy, B.T. Elkin and **C. Macdonald**. 2010. Differences in radionuclide and heavy metal concentrations found in the kidneys of barren-ground caribou over time. *Rangifer* 30: 61-66.
- Macdonald, C.R.** 2010. Radionuclide accumulation in barren-ground caribou in northern Canada: a review. 13th North American Caribou Workshop. Oct 25-28, 2010. Winnipeg, Manitoba.
- Gunn, A and **C. Macdonald**. 2010. Site-specific variability in dust uptake by caribou: an issue for environmental assessments. 13th North American Caribou Workshop. Winnipeg, Manitoba.
- Macdonald, C.R.** 2010. Field sampling in support of environmental risk assessment at abandoned mines in the NWT. Federal Contaminated Sites Workshop, Montreal, QC. May 2010.
- C.R. Macdonald**, B.T. Elkin and B.L. Tracy. 2007. Radiocesium in caribou and reindeer in northern Canada, Alaska and Greenland from 1958 to 2000. *Journal of Environmental Radioactivity* 95:1-25.
- Norstrom, R.J., Clark, T.P., Enright, M., Leung, B., Drouillard, K.G. and **C.R. Macdonald**. 2007. ABAM, a model for bioaccumulation of POPs in birds: validation for adult herring gulls and their eggs in Lake Ontario. *Environ. Sci. Technol.* 41:4339-4347.
- G.A. Stern, **C.R. Macdonald**, B. Dunn, C. Fuchs, L. Harwood, B. Rosenberg, D.C.G. Muir, D. Armstrong. 2005. Spatial trends and factors affecting variation of organochlorine contaminant levels in Canadian Arctic beluga (*Delphinapterus leucas*). *The Science of the Total Environment* 351-352:344-368.
- Gamberg, M., B. Braune, E Davey, B. Elkin, P.F. Hoekstra, D. Kennedy, **C. Macdonald**, D. Muir, A. Nirwal, M. Wayland and B. Zeeb. 2005. Spatial and temporal trends of contaminants in terrestrial biota from the Canadian Arctic. *Science of the Total Environment* 2005: 148-164.
- Hebert, C.E., R.J. Norstrom, J. Zhu and **C.R. Macdonald**. 1999. Historical changes in PCB patterns in Lake Ontario and Green Bay, Lake Michigan, 1971 to 1982, from herring gull egg monitoring data. *Journal of Great Lakes Research*. 25(1):220-233.
- Berti, P.R., H.M. Chan, O. Receveur and **C.R. Macdonald**. 1998. Population exposure to radioactivity from consumption of barrenland caribou in the Dene/Métis of the western Northwest Territories. *Journal of Exposure Analysis and Environmental Epidemiology*. Vol 8 (2):145-158.
- Bird, G.A., P.A. Thompson, **C.R. Macdonald** and S.C. Sheppard. 2002. Ecological risk assessment approach for the regulatory assessment of the effects of radionuclides released from nuclear facilities.
- Sheppard, S.C., W.G. Evenden and **C.R. Macdonald**. 1998. Variation among chlorine concentration ratios for native and agronomic plants. *J. Environ. Radioact.* 43:65-76.
- Macdonald, C.R.** and M.J. Laverock. 1998. Radiation exposure and dose in small mammals in radon-rich soils. *Archives of Environmental Contamination & Toxicology*. 35: 109-120.
- Macdonald, C.R.**, L.L. Ewing, B. Elkin and A.M. Wiewel. 1996. Regional variation of radionuclides and radiation dose in caribou (*Rangifer tarandus*) in the Canadian Arctic. *Sci. Total Environ.* 182: 53-73.

Alice Legat

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EDUCATION

PhD Anthropology, University of Aberdeen (2007)
Roberta Bondar Fellowship in Northern Studies and Polar Studies, Trent University (2012-2013)

PROFESSIONAL ASSOCIATIONS

American Anthropological Association
Anthropology, Aberdeen University (Honorary Research Fellow)
Arctic Institute of North America, University of Calgary (Research Associate)
Aurora Research Advisory Council, Aurora College
Canadian Anthropological Association
International Arctic Social Science Association
Royal Anthropological Institute of Great Britain and Ireland

CONSULTATION AND RESEARCH

Current	Acting as the research consultant for climate change and health adaptation project, K'atłodeeche First Nation, NWT. Funded by Climate Change and Health Adaptation in the North, Environmental Public Health Division, First Nations and Inuit Health Branch, Health Canada. Ongoing until March 2016.
Current	Acting as principle investigator for traditional knowledge of wolverine, Sahtu Renewable Resources Board, NWT. Ongoing until December 2015.
Current	Acting as principle investigator for traditional knowledge of boreal caribou and wildfires, Wek'eezhii Renewable Resources Board, NWT. Ongoing until October 2015.
Current	Developing traditional knowledge research guidelines with community research practitioners in the Sahtu Region, Sahtu Renewable Resources Board, NWT. Ongoing until December 2015.
2014–2015	Facilitated workshop and developed wildlife habitat reclamation research and monitoring guidelines for Cumulative Environmental Management Association, Alberta. Collaborated with facilitator from Shared Value Solutions, Ontario.
2014	Developed annotated table of contents on 'Indigenous Perspective on Biodiversity Change in Northern North America' for Conservation of Arctic Flora and Fauna, Arctic Council, Iceland.
2014	Reviewed and summarized Community Wellness Plans, and advised Aboriginal Health and Community Wellness, Department of Health and Social Services, Government of the Northwest Territories.
2012–2014	Acted as research consultant on climate change and health project, Rae-Edzo Friendship Centre, Behchokò, NWT.

- 2013 Acted as research consultant on Gahcho Kwe environmental assessment project, traditional knowledge and heritage component for North Slave Metis Association, NWT.
- 2012–2013 Acted as principal investigator on Tłıchq knowledge of boreal caribou project as Roberta Bondar Fellow in collaboration with the Wek'èezhì Renewable Resource Board and Tłıchq Government, NWT
- 2008–2012 Acted as principal investigator on Tłıchq knowledge research and monitoring program as mandated under the Tłıchq Land Claims and Self Government Agreement. Collaborative project with Wek'èezhì Renewable Resources Board and Tłıchq Government, NWT.
- 2007 Acted as principal investigator on Tłıchq rules and laws governing behaviour associated with caribou project for Tłıchq Government, NWT.
- 2007 Facilitated discussions, and advised staff and board on the pros and cons of developing a traditional caribou conservation program, Rae-Edzo Friendship Centre, Behchokò, NWT.
- 2004 Facilitated meeting between stakeholders impacted by the proposed expansion of Trans-Canada Highway in Banff National Park for Parks Canada, Alberta.
- 2003–2004 Interpreted cultural comments at hearing on proposed diamond mine at Drybones Bay, and advised board members of Mackenzie Valley Environmental Impact Review Board, NWT.
- 1996 Research consultant with community researchers and Snare Lake (Wekweetì) elders for the collection of traditional knowledge of Lac De Gras Area for the joint project of Dogrib Renewable Resource Committee, Dogrib Treaty 11 Council and Dene Cultural Institute, NWT.
- 1994 Research coordinator with community researchers and Gamètì elders for the collection of Tłıchq terms and concepts associated with Renewable Resources for Gamètì Community and Dene Cultural Institute, NWT.
- 1997–2001 Principal investigator on Tłıchq place names as indicators of bio-geographical knowledge project for Dogrib Treaty 11 Council, NWT.
- 1997–2001 Principal investigator on Tłıchq knowledge of the relationship between caribou migration and the state of the habitat within Tłıchq traditional territory project for Dogrib Treaty 11 Council, NWT.
- 1997 Research consultant on Tłıchq perspective on the Rayrock Uranium Mine project for Dogrib Renewable Resources Committee, Dogrib Treaty 11 Council, NWT.
- 1995 Principal investigator on traditional Tłıchq methods for harvesting caribou, Gamètì, Dogrib Treaty 11 Council and Dene Cultural Institute, NWT.
- 1993-1996 Principal investigator on traditional governance project, Gamètì Community and Dene Cultural Institute, NWT, and Arctic Institute of North America, University of Calga

TEACHING

Undergraduate

- 2016 *Introduction to Cultural Anthropology*. Nursing Department, Aurora College, Yellowknife, NT
- 2013 *Canada the North*. Four-week interdisciplinary field course in the sub-arctic of Northwest Territories, Canada. Canadian Studies, Trent University.

- 2005–2006 *Introductory Anthropology*. Seminar teaching six per week for Dr. Nancy Wackowich, University of Aberdeen, Aberdeen, Scotland
- 2002–2003 *Introductory Anthropology*. Seminar teaching three per week for Prof. Tim Ingold, University of Aberdeen, Aberdeen, Scotland
- 1994 *Traditional Knowledge*. Three-weeks within the Renewable Resources Technology Program, Northern Anthropology and Archaeology, Aurora College, Fort Smith.
- 1991–1992 One-year term position coordinating the Native Studies Program, Arctic College. Curriculum was accredited through Trent University. Through the same period taught: *Introduction to Native Studies, Land Claims, Self-Government, Introduction to Community Development, Introduction to Economic Development, Social Science Research, and Government and Politics in the NWT*.
- 1987 *Native People of Canada*. Athabasca University via Arctic College, GNWT, Yellowknife.
- 1987 *Introduction to Anthropology*. Renewable Resources Technology Program: Northern Anthropology and Archaeology Segment. Arctic College, Fort Smith.
- 1983 *Introduction to Race Relation*. Anthropology Department, University of Calgary.
- 1982–1983 *Contemporary Indian Issues*. Anthropology Department, University of Calgary Outreach Program, Blackfoot Reserve, Alberta.

Graduate Teaching

- Current Toban Leckie, Master candidate at School of Canadian Studies, Trent University. Focus on indigenous tourism in the NWT.
- 2012–2015 Jesse Lever, received Master of Arts, Frost Centre for Canadian Studies and Indigenous Studies, Trent University. Focus on caribou and the Dene perspective at environmental hearings.
- 2012–2013 *Ethnography Research*. Canadian Studies and Indigenous Studies, Trent University. Co-instructed with Professor Julia Harrison.

MANAGEMENT

- 2008–2011 Tłıchq Knowledge Co-ordinator. Wek'èezhì Renewable Resources Board. Yellowknife, NWT.
- 1996–2002 Program/Research Director. Whaèhdòò Nàowo (Traditional Knowledge and Heritage Program) for four Tłıchq Communities, Dene Cultural Institute and Dogrib Treaty 11 Council, NWT.
- 1992–1996 Research Director Whaèhdòò Nàowo (Traditional Knowledge and Heritage Program) in Gamètì, Dene Cultural Institute, NWT
- 1990–1991 Director, Policy and Planning Division, Culture and Communications, GNWT.
- 1989–1990 A/Assistant Deputy Minister: Culture, Culture and Communications, GNWT.
- 1988–1989 Manager, Cultural Affairs, Culture and Communications, GNWT.
- 1986–1988 Executive Director. Northern Heritage Society, Yellowknife, NT.

Committee Chair

- 1991 - 1992 Traditional Knowledge Committee, GNWT, Yellowknife.
- 1990 - 1991 Aboriginal Languages Committee, GNWT, Yellowknife.
- 1989 - 1990 Government and Non-Government Traditional Knowledge Working Group, GNWT.

INVITED ADDRESSES

- 2014 Keynote Speaker. *Traditional knowledge research methodology*. Cold Research Graduate Symposium, Wilfrid Laurier University.
- 2009 *Traditional Methods of Monitoring Wildlife*. Presentation to Arctic Indigenous People Secretariat workshop on community adaptations to climate change in the circumpolar north. Denmark, Copenhagen.

PUBLIC LECTURES

- 2013 *Story Behind the Book: Walking the Land, Feeding the Fire*. Frost Centre for Canadian Studies and Indigenous Studies. Peterborough, Ontario.
- 2012 *Walking the Land: The importance of traditional monitoring*. Trent University. Frost Centre for Canadian Studies and Indigenous Studies. Peterborough, Ontario
- 2005 *The Appropriation of the English Acronym 'PAR' to Maintain Harmony*, Department of Anthropology, University of Calgary, Calgary, Alberta
- 2004 *Tłıchq Elders, Place Names, Language and the GIS*. Department of Geography, University of Calgary, Calgary, Alberta
- 2004 *Participatory Action Research*. Canadian Studies, University of Trent, Peterborough, Ontario.
- 2004 *Sometimes the Caribou do not Come*, Canadian Studies, University of Trent, Peterborough, Ontario
- 2004 *Experiencing Stories: Jani, Moise and Georgina*, Native Studies, University of Trent, Peterborough, Ontario and International Indigenous Studies, University of Calgary.
- 2003 *Indigenous knowledge: A Tłıchq perspective of caribou migration and the state of the habitat*. Marshall Museum, University of Aberdeen, Aberdeen, Scotland.
- 1997 *Principles of Governing as heard in Tłıchq Oral Narratives*, Traditional Knowledge Round Table, Heritage Centre, GNWT.
- 1997 *Tłıchq Principles of Leadership*, Arctic Institute of North America, Theme School, University of Calgary, Calgary, Alberta
- 1996 *Exploring Traditional Knowledge*, Aurora College, Yellowknife, Northwest Territories
- 1996 *Using traditional knowledge*, Aurora College, Yellowknife, Northwest Territories
- 1995 *Using Indigenous Knowledge*, Polar Commission for Environmentalist, Yellowknife.

CONFERENCES

- 2010 *Using Traditional Methods to Monitor Caribou (and People Behavior)*. Sustaining Caribou and their Landscapes - Knowledge to Action, Winnipeg, Manitoba, October 25-28, 2010.
- 2008 *Whanikw'o, "The Woman who Discovered Whites"*. Ethnohistory Conference, Tulsa, Oklahoma, November 7-10, 2007.
- 2007 *Participatory Action Research: Are Community Goals Achieved?* CASCA Conference, Toronto, May, 2007
- 2007 *Participatory – Action – Research: Remembering Joan Ryan*. Session, CASCA, Toronto, May 2007.
- 2002 *Experiencing Stories: Knowledge and Skill*. Ninth International Conference on Hunting and Gathering Societies, Edinburgh, Scotland. June 7-11, 2002
- 2002 *Tłıchq Presenters on Land and Land Management, Wildlife Issues, Language and*

- Relationships with Elders*. Session, Ninth International Conference on Hunting and Gathering Societies, Edinburgh, Scotland.
- 2001 *Caribou Fences: Past, Present and Future*. 34nd Chacmool Conference, Calgary, Alberta.
- 1999 *Tłıchq Archaeology, Tłıchq Trails, Linguistics, Plants, Place Names, and Caribou*. Session, 32nd Chacmool Conference, Calgary, Alberta.
- 1998 *Tłıchq Traditional Leadership as told through Oral Narratives*. Northern Development and Sustainable Livelihoods” Towards a Critical Circumpolar Agenda. The Sixth Circumpolar Universities Cooperation Conference. Aberdeen, Scotland.
- 1998 *Caribou Fences: Past, Present and Future*. Archaeology and Indigenous People. 31st Annual Chacmool Conference, Calgary, Alberta
- 1997 *Governing Principles As Remember Through Oral Narratives*. The Entangled Past: Integrating History and Archaeology, 30th Annual Chacmool Conference, Calgary, Alberta
- 1994 *Participatory Action Research in Rae Lakes, NWT: The Traditional Governance Project*. Anthropology Conference, Calgary, Alberta
- 1993 *Participatory Action Research in Rae Lakes, NWT: The Traditional Government Project*. ACUNS Conference, Fort Smith, Northwest Territories.

PUBLICATIONS

2012. *Walking the Land; Feeding the Fire: Knowledge and Stewardship among the Tłıchq*. Tucson AZ: University of Arizona Press.
- 2009 Traditional Knowledge. In *Trails of Our Ancestors*. John B. Zoe (ed.). Tłıchq Government: Behchokq, NT.
2008. *Walking Stories; Leaving Footprints*. In *Ways of Walking: ethnographic practice and pedestrian movement*, J. Lee & T. Ingold (eds.). Aldershot, Hants, UK: Ashgate Publishers.
- 2007 *Walking the Land; Feeding the Fire: A Tłıchq Ethnography on Becoming and Being Knowledgeable*. Doctoral Thesis, Anthropology, University of Aberdeen.
1998. *Traveling Back Through Stories*. *More Boreal: Edinburgh Review*: 147-155.
- 1994 *Participatory Action Research in Rae Lakes, NT: The Traditional Government Project*. *Information North*:20:2:1-4. AINA. Calgary: University of Calgary.
- 1993 *Rae Lakes Tłıchq Traditional Government: a Report to the Royal Commission on Aboriginal People*. Ottawa: unpublished.

Peer Review Reports

- 2013 (with Rita Wetrade). *Boreal Caribou Habitat and Distribution in Wek'èezhì*. Yellowknife. The report is available at: [Web page] <http://www.wrrb.ca/content/boreal-caribou>
- 2008 (with Georgina Chocolate and Madelaine Chocolate) *Tłıchq Laws: Watching Caribou, Managing Humans*. Yellowknife: West Kitikmeot Slave Study Society. The report is available at: [Web page] <http://www.enr.gov.nt.ca/live/pags/wpPages>
- 2002 (with Leslie Saxon, Sally Anne Zoe, Georgina Chocolate) *Tłıchq knowledge on place names, caribou and habitat*. Yellowknife: West Kitikmeot Slave Study Society. The report is available at: [Web page] <http://www.enr.gov.nt.ca/live/pags/wpPages>
- 2001 (with Georgina Chocolate, Bobby Gon and Sally Anne Zoe) *Caribou Migration and the State of Their Habitat*. Yellowknife: West Kitikmeot Slave Study Society. The report is available at: [Web page] <http://www.enr.gov.nt.ca/live/pags/wpPages>

Non-Peer Reviewed Reports

- 2013 *Boreal Caribou Habitat and Disturbance in Wek'èezhìi: Tłı̨chų Knowledge Component.* Prepared for the Wek'èezhìi Renewable Resource Board in collaboration with the Land Protection Department and Tłı̨chų Research and Monitoring Division, Tłı̨chų Government.
- 2013 *Denison Ice Road Tłı̨chų Knowledge Study.* Prepared for Aboriginal Affairs and Northern Development Canada: Contaminants and Remediation Directorate, Great Bear Lake Project Management Team. Prepared in partnership with Albertine Eyakfwo, Lands Protection Department, Tłı̨chų Government.
- 2012 *New Research and Documentation Relating to Kwets'oot'àà.* Report Prepared for Protected Areas Strategy, Indian and Northern Affairs Canada in collaboration with the Land Protection Department and Tłı̨chų Knowledge Research and Monitoring Division, Tłı̨chų Government.
- 2012 *Boreal Caribou Habitat and Habitat Use in Wek'èezhìi: Tłı̨chų Knowledge Component.* Prepared for the Wek'èezhìi Renewable Resource Board in collaboration with the Land Protection Department, Tłı̨chų Government.
- 2001 (with Sally Anne Zoe) *Tłı̨chų Traditional Governance.* Hay River: Dene Cultural Institute.
- 1995 (with Madelaine Chocolate and Sally Anne Zoe) *Tłı̨chų Land: The Importance of Knowing.* Report Prepared for the Tłı̨chų Treaty 11 Council and BHP Diamonds Inc. Hay River: Dene Cultural Institute.
- 1997 (with Joan Ryan, Madelaine Chocolate, Mary Adele Rabesca and Sally Anne Zoe). *The Trees All Changed to Wood.* Report Prepared for the Arctic Environmental Strategy, Department of Indian Affairs and Northern Development. Rae: Tłı̨chų Treaty 11 Council.
- 1996 (with Sally Anne Zoe, Rita Blackduck and Celine Football) *We Know and Love Tłı̨chų Land: Comments and Concerns from the Snare Lake Elders to the Environmental Assessment Review Panel.* Rae: Tłı̨chų Treaty 11 Council.
- 1995 (with Celine Football and Sally Anne Zoe) *Traditional Methods Used by the Tłı̨chų to Harvest Caribou.* Report prepared for the Tłı̨chų Renewable Resources Committee, Tłı̨chų Treaty 11 Council and the Department of Renewable Resource, GNWT. Hay River: Dene Cultural Institute.
- 1994 (with Rita Blackduck and Sally Anne Zoe) *Terms and Concepts relating to Renewable Resources: An Interim Report for the Department of Renewable Resources, GNWT.* Hay River: Dene Cultural Institute
- 1991 (ed.) *Report of the Traditional Knowledge Working Group.* Yellowknife: Culture and Communications, GNWT.