



# Timberwolf Wilderness Society

PO Box 398, Pincher Creek, Alberta T0K 1W0 Canada  
TimberwolfWildernessSociety.ca [info@timberwolfwildernesssociety.ca](mailto:info@timberwolfwildernesssociety.ca)

17 July 2020

*sent by email*

Joint Review Panel

Impact Assessment Agency of Canada & Alberta Energy Regulator

E-mail: IAAC.GrassyMountain.AEIC@canada.ca

## **Re: Application for full participation, Grassy Mountain Mine Hearing**

This letter responds to your notice of hearing dated 29 June 2020. Timberwolf Wilderness Society (Timberwolf) requests full participation in the hearing. From its articles of incorporation, Timberwolf's purposes are

- *to foster, promote and engage in advocacy for the conservation of the natural environment; and*
- *to participate in regulatory proceedings, & advance claims, if necessary, to prevent & preempt ecological degradation & to protect endangered species.*

Timberwolf has an extensive record of public engagement in these areas (partial list attached). The proposed mine threatens to cause considerable ecological degradation at a local and a regional scale, and will destroy legally protected critical habitat of a species listed as threatened under Canada's *Species At Risk Act*.

### ***Relevant information and expertise***

Timberwolf and its associates have considerable experience with, or can call on expertise in,

- protection and recovery of the Alberta populations of westslope cutthroat trout, listed as threatened under Canada's *Species At Risk Act (SARA)*, their critical habitat, and environmental impacts on that habitat (see attachment);
- existing and projected environmental impacts of human development on southwestern Alberta wildlife (see attachment);
- atmospheric emissions, including greenhouse gases, the implications for Canada's national and international obligations, its climate, and the effects of climate change on trout (see attachment); and
- local and regional cumulative environmental effects, and many of the principal incremental effects of the project (see attachment).

These matters are all directly relevant to the Panel's work, bearing directly on Canada's legislation, regulations, national and international obligations.

Timberwolf proposes to call experts to give evidence in written reports and presentations on the above matters, and to respond to questioning, as follows.

- Review and evaluate what is provided by the proponent on trout populations and their critical habitat in streams that will be impacted by the proposed mine, with a particular focus on westslope cutthroat trout, its critical habitat, effects of climate change, the proposed habitat offsetting scheme, cumulative effects on the subspecies, and the limits imposed on the project by the *Species At Risk Act* (David Mayhood, M.Sc.; CV attached)
- Critically review the proponent's wildlife documents to support a revised assessment of existing and projected environmental impacts of the proposed mine on selected wildlife, with a particular focus on grizzly bears and bighorn sheep. (Brian Horejsi, Ph.D.; CV attached)
- An assessment of carbon dioxide and methane emitted from coal mining and coal combustion, its effect on climate, and its relationship to Canada's national and international obligations. (Ann-Lise Norman, Ph.D.; CV attached)
- An assessment of selected regional and local cumulative environmental effects relevant to the mine. (Micheal Sawyer, M.Des., David Mayhood, M.Sc.; CV attached)

Timberwolf has been coordinating with other participants to avoid duplicating expertise and evidence, and will continue to do so. If in future it finds duplication on its part, or gaps in important coverage, it will seek permission from the Panel to drop experts or add the necessary expertise up to 31 August 2020 inclusive. Timberwolf reminds the Panel that experts in the same area of knowledge typically disagree, so it is important to capture such disagreement with evidence provided by separate experts in the same field, even among those appearing at the request of different intervenors.

### ***Timberwolf's role***

Timberwolf expects to file written submissions, summarize evidence orally in presentation format, cross-examine opposing experts, including government agency experts, and present final argument. Timberwolf will file a claim to cover experts' and advocate's costs at the conclusion of its participation in the hearing.

### ***Hearing dates and locations***

Timberwolf requests a start date of 19 October 2020. We have consulted with the Canadian Parks and Wilderness Society (CPAWS) as to location, electronic participation, and COVID-19 safety precautions. Timberwolf largely agrees with CPAWS on these points. Specifically, Timberwolf requests an in-person (direct participants only), safely-spaced hearing held in Calgary, and either Crowsnest Pass or Pincher Creek, with recorded live streaming online, the recording to be publicly posted permanently online after each day's session. Timberwolf requests that experts be permitted to appear via online communication at their request to avoid COVID-19 travel restrictions or, even if travel restrictions do not apply, to avoid undue

risks, in which case the personal appearance decision being at the sole discretion of the witnesses.

**Contact information**

*Advocate*

Micheal Sawyer, M.Des.  
Hayduke Associates Ltd.

<contact information removed>

*for Timberwolf*

David Mayhood, Director  
Timberwolf Wilderness Society

<contact information removed>

Address for service: <personal information removed>

Mr. Sawyer has considerable experience as an advocate for landowners and environmental groups in public hearings on well licence, pipelines and coal mine applications. He will conduct Timberwolf's intervention. Mr. Mayhood will act for Timberwolf as alternate.

Sincerely,

**Timberwolf Wilderness Society**

<Original signed by>

David W. Mayhood, Director

Attachments



# *Timberwolf Wilderness Society*

PO Box 398, Pincher Creek, Alberta T0K 1W0 Canada  
TimberwolfWildernessSociety.ca [info@timberwolfwildernesssociety.ca](mailto:info@timberwolfwildernesssociety.ca)

## ***Timberwolf's relevant experience and expertise***

Timberwolf and its associates have an extensive record of public engagement in areas relevant to the Grassy Mountain Mine hearing, some of them listed below. Lead Timberwolf members and associates are provided in parentheses. Related papers and reports, where available, are listed in the curriculum vitae for each.

### ***Projects in progress***

- With Public Interest Law Clinic lawyer Drew Yewchuk, Timberwolf is litigating in federal court with respect to Fisheries and Oceans Canada's (DFO) persistent, unlawful failure, under the *Species At Risk Act*, to publish recovery documents for numerous at-risk species, including threatened Alberta westslope cutthroat trout, until long after the statutory deadlines, if ever. (Mayhood)
- With Public Interest Law Clinic lawyer Drew Yewchuk, Timberwolf is preparing an analysis of issues with access to information legislation and practice concerning our experiences with documenting conservation management of westslope cutthroat trout by Alberta and Canada. (Mayhood)
- Timberwolf is conducting ongoing field monitoring of threats and damage to critical habitat and remnant populations of westslope cutthroat trout, Alberta population, including reporting of same to DFO's Fish and Fish Habitat Protection Program. (Mayhood)
- Timberwolf is monitoring and reviewing environmental assessment documents for the Grassy Mountain mine proposal as they relate to critical habitat designated under the *Species At Risk Act* for threatened westslope cutthroat trout, and has made contributions to the Panel review of the mine proposal with suggestions for requests for supplementary information, several adopted by Panel staff. (Mayhood, Norman, Horejsi, Sawyer)

### ***Projects completed***

Timberwolf and its associates have completed many projects of direct value to the Grassy Mountain Mine hearing. Some examples by category are listed here in reverse chronological order within category, most recent first.

#### *Environmental impact assessment, including cumulative effects assessment*

- A Timberwolf director submitted a brief to the Senate Standing Committee on Energy, the Environment and Natural Resources regarding Bill C-69, in particular the impact

assessment provisions, advocating for specific improvements in impact assessment (Mayhood)

- Timberwolf associates have produced and published several reports and papers on environmental assessment and cumulative effects of human development on watersheds, aquatic and terrestrial habitats, fish and wildlife. (Sawyer, Horejsi, Mayhood)

#### *Westslope cutthroat trout SARA listing and recovery*

- A Timberwolf director published, with Shaun Fluker of the University of Calgary Faculty of Law, a review documenting the failure of SARA protection for Alberta westslope cutthroat trout, and its root causes. (Mayhood)
- Timberwolf contributed a report commenting on, and providing detailed suggestions for improving, DFO's 2019 proposed recovery strategy and action plan for westslope cutthroat trout, Alberta population (Mayhood)
- Since 2015, with the assistance of the Public Interest Law Clinic, and initially including the Alberta Wilderness Association, Timberwolf applied for judicial review in the Federal Court of Canada on four occasions to force the DFO Minister to meet statutory obligations under SARA with respect to westslope cutthroat trout recovery. The obligations being ignored included issuing a critical habitat order, issuing a summary report on an overdue recovery action plan, issuing a 4-year overdue proposed action plan, and issuing an overdue final recovery strategy-action plan.
- Timberwolf submitted to DFO an emergency report on immediate threats to specific westslope cutthroat trout populations and critical habitat, requesting immediate action. (Mayhood)
- Timberwolf submitted to Alberta Environment and Parks (AEP) extensive comments and suggestions on the draft Castle parks management plan, emphasizing, but not restricted to, effects of plan proposals on threatened westslope cutthroat trout and threatened bull trout populations and critical habitat (Mayhood)
- Timberwolf conducted studies on suspended sediment loading to SARA-designated westslope cutthroat trout critical habitat from roads and off-highway vehicle trails in the Silvester Creek watershed, presenting results in a series of reports conveyed to AEP and DFO (Mayhood)
- Timberwolf produced and delivered to AEP and DFO a detailed conceptual framework with recovery guidelines for restoring westslope cutthroat trout populations in Alberta. (Mayhood)

- A Timberwolf director produced or co-authored several technical reports for AEP and DFO used in developing the Alberta recovery plan and the Canada recovery strategy for westslope cutthroat trout Alberta population. (Mayhood)

*Wildlife research*

- A Timberwolf director produced a professionally well-reviewed report in support of a wildlife sanctuary in an area of high-quality habitat in southwestern Alberta. (Judd)
- A Timberwolf associate produced a conceptual framework and plan to recover grizzly bears and their habitat in southwestern Alberta. (Horejsi)
- A Timberwolf associate authored or co-authored several papers and reports on grizzly bear conservation and habitat. (Horejsi)
- A Timberwolf associate co-authored a cumulative effects habitat model and assessment for grizzly bears, wolves and elk in the local and regional study area (Sawyer)

*Atmospheric chemistry, physics industrial contamination, and climate change*

- A Timberwolf director has written, spoken and published in the peer-reviewed literature extensively on greenhouse gases, industrial emissions, and climate change, particularly as they affect Alberta and Canada (Norman)
- A Timberwolf director has reported to AEP and DFO on the potential effects of climate change on westslope cutthroat trout populations, habitat, and subspecies recovery (Mayhood)
- A Timberwolf director led a project to identify effects of airborne industrial emissions, especially sulphur, on vegetation, soils, and water in southwestern Alberta and the Rocky Mountain East Slopes more generally. (Norman)
- Timberwolf directors conducted a study of acidification of streams and lakes downwind of a southern Alberta gas plant. (Mayhood, Norman)

## Curriculum Vitae

**Ann-Lise Norman (PhD)**  
**Professor**  
**Physics & Astronomy/Environmental Science Program**  
**The University of Calgary**

**Citizenship: Canadian**

<personal information removed>

### Education

**PhD** 1991 – 1994 The University of Calgary: Physics  
**MSc** 1989 - 1991 The University of Calgary: Physics  
**BSc** 1984 - 1989 The University of Calgary Physics Major, Double Minor (Math & Dance)

### Invited Lectures and Panels

**Climate Conundrum** Mensa Women's Social Club (Calgary), Lecture September 15, 2019  
**Size Matters: Crystals, Clouds, Climate**  
 NW American Physical Society Plenary Lecture, May 2019  
**A Changing Arctic Atmosphere**  
 Rothney Observatory, Calgary, March 2018  
**What's Cool about Climate Change**  
 Bow River Canoe Club, March 2018  
**Climate Change Challenges**  
 Lifelong Learners Association, March 2018  
**Shifting Challenges in Climate Science**  
 South Calgary Chapter of the Rotary Club, July 2017  
**Climate Change 2017: Fundamentals and Status**  
 Canadian Society for Petroleum Geologists short course, May 2017  
**Climate Change: Alberta's Challenge**  
 Strathcona Tweedsmuir High School, Mock UN, April 2017  
**Climate Challenge: Precautionary Principal or Wait and See?**  
 Guest Lecture, University of Calgary, Science 331, March, 2017  
**Climate Change: An Albertan's Perspective**  
 Centennial High School Outreach Event, March, 2017  
**Precipitation Formation and the Role of Sulfate: What Isotopes Tell Us**  
 Nuclear Science Week Outreach Rothney Observatory, Calgary, Oct. 2016  
**Sleuthing in the atmosphere: Isotope abundance ratios and the potential for optical detection.**  
 AMETHYST Workshop University of Lethbridge November 4, 2015.  
**Climate Change Discussion Panelist**  
 Telus Spark Center Calgary Alberta November 13, 2015  
**Isotopes and aerosols: Sleuthing in the air.**  
 Professional Development Day Seminar University of Calgary May 17, 2013  
**Sulfur aerosols and planetary albedo: What's all the stink about?**  
 University of Saskatchewan, Physics Seminar Series, March 21, 2013  
**Tracking the fate of atmospheric pollutants in a catchment of southern Alberta, Canada using S and B isotopes.**  
 Geological Nuclear Sciences Seminar New Zealand Luncheon Series, March 15, 2012  
**Up in the air: What is that S doing?**  
 Geography Seminar, Queen's University, October 21, 2011  
**Air dispersion modeling in complex terrain: Do models and apportionment measurements agree?**  
 CPANS Luncheon Speaker Series, December 15, 2010  
**Determining trace gas and aerosol origins: Can spectral analysis help?**  
 AMETHYST Workshop University of Lethbridge, November 19, 2010

**Aerosol sulfate: A missing link in climate change?***AINA Arctic Change Lecture, The University of Calgary, November 18, 2009***Climate challenge: Where are we today?***Teachers Convention Science Cafe, Telus Centre, February 12, 2009***Relationships between sulphur dioxide, sulphate aerosols & dimethylsulphide in the Arctic atmosphere.***Arctic Change Conference, Quebec City, Quebec, Dec 9-12, 2008***Climate and aerosols***NWAPS Meeting Portland, Oregon, May 15-17, 2008.***Global warming - true or false?***Calgary Chapter of Financial Executives International, CGCC, May 13, 2008.***A microbial influence on global climate?***Spring into UofC, Calgary, March 2007.***Aerosols, isotopes and their relation to albedo and the Arctic.***UofC Chemistry Dept. Seminar, March 2007.***Is it hot in here or is it just me?***Calgary Council for Advanced Technology, February 2007.***Air quality measurements near Calgary.***Parkland Airshed Management Zone Meeting. Red Deer, January 2007.***Air quality measurements in southern Alberta.***Air Quality Working Group Meeting, Edmonton, Alberta, November 2006.***Aerosol sulphate from DMS oxidation: A feedback to climate change?***Canadian Centre for Climate Modeling and Analysis. Victoria, B.C., July 2006.***Whither the weather***Knights of the Round Table, Calgary, Canada, May 2, 2006.***Atmospheric chemistry***Air Quality Workshop Training Course, Banff, Alberta, Canada, February 13, 2006.***Climate change - A human influence?***Calgary Skeptics Society, Calgary, Canada, December 15, 2005.***Characterisation of gaseous pollutants.***Closing Resource Cycles: Options for Gas Treatment.**EURO Summer School Programme, Wageningen, The Netherlands, June 26-July 1, 2005.***Global climate change: Bogus or not?***Calgary Rotary Club, April 28, 2005.***Ocean biota and their influence on the global radiation budget.***Contemporary Physics Colloquium University of Lethbridge, March 3, 2005.***Ocean atmosphere exchange: Do critters control global climate?***University of Calgary Biogeoscience Seminar Series, December 4, 2003.***A technique to identify and quantify NMHC emissions from individual oil and gas reservoirs: an update.***Petroleum Technology Alliance Canada Forum, Calgary, January 31, 2001.***A technique to identify and quantify NMHC emissions from individual oil and gas reservoirs.***Canadian International Petroleum Conference, Calgary, June 4-8, 2001.***Isotopic composition of atmospheric CO & CO<sub>2</sub>: indicators of carbon cycling.***Biogeomon '97, International Meeting of Isotope Biogeochemistry Villanova University, U.S.A, June 21-25, 1997.***The C and O isotope composition of atmospheric CO, CO<sub>2</sub> and organic aerosols.***Water and Climate Studies in Canada Using Isotope Tracers: Past, Present, Future. Waterloo, Canada, January 31-February 1, 1997.***Application of a method for microgram sulphur isotope analysis to a study of fractionation***5<sup>th</sup> Annual Meeting of the Canadian Chapter of the International Isotope Society, Toronto, May 16-17, 1996.***Development of a method for determination of the stable isotope composition of carbon dioxide in air.***5<sup>th</sup> Annual Meeting of the Canadian Chapter of the International Isotope Society, Toronto, May 16-17, 1996.***Applications of stable isotope techniques to atmospheric S transport.***Canadian Meteorological Service noon hour colloquium, Toronto, Jan18, 1996.***Inorganic sulphur analysis by CF-IRMS.***4<sup>th</sup> Canadian CF-IRMS and GC/Combustion workshop. Toronto, Sept 10-12, 1995.*



**Courses Taught Since 2012 (number of registrants in parentheses)**

**Phys 221 Mechanics:** 1<sup>st</sup> year kinematics and dynamics course for physics majors (160)  
**Phys 561 Stable and Radioactive Isotope Fundamentals:** senior undergraduate/graduate physics (3-14)  
**Phys 691.11 and Phys 691.21 Scientific Writing:** MSc and PhD students (30)  
**Phys 691.13 and Phys 691.23 Scientific Speaking:** MSc and PhD students (28)  
**ENSC 502 Special Problems in Environmental Management:** undergraduate ENSC (30-54)  
**ENSC 501 Environmental Field Course II:** senior undergraduate field course: industrial impacts (28-44)  
**ENSC 401 Environmental Field Course I:** 3<sup>rd</sup> yr ENSC field course (28-44)

**Academic and Research Positions**

<b>Director</b>	Environmental Science Program UofC	July 2016 – 2017
<b>Associate Head, Graduate</b>	Department of Physics & Astronomy	July 2016 – 2018
<b>Interim Director</b>	Environmental Science Program UofC	July 2015 – 2016
<b>Adjunct Professor</b>	Geography, Queen's University	Jan, 2013 – July 2014
<b>Director</b>	Environmental Science Program UofC	July, 2008 - 2011
<b>Isotope Chemist &amp; Consultant</b>	Atmospheric Environment Toronto, Ontario, Canada	Sept. 1995 - Jun. 1998
<b>Post Doctoral Fellow</b>	Physics and Astronomy UofC	Sept. 1994 - Sept. 1995
<b>Graduate Research Assistant</b>	Institute for Ecotoxicology, Braunschweig, Germany	Feb.1992 - Jan. 1993

**Contributions to the Research Community**

- Current HQP: 3 MSc, 1 PURE BSc
- Previous HQP: 13 M.Sc. (Physics, Chemistry, Earth Science, Civil Engineering, Geography), 6 PhDs (Chemistry, Physics, Geography), 19 research assistants, 35 undergraduate independent research projects, and 4 PDFs
- Awarded more than \$2,300,000 in research and equipment grants since 1998.
- Session Chair, Chemistry of Cold Environments, 101<sup>st</sup> Meeting of Canadian Institute for Chemistry, May 2018
- Local chair and organiser for NATO 27<sup>th</sup> International Technical Meeting on Air Pollution Modeling and Its Application 2004 (102 international participants)
- Editor of Air Pollution Modeling & Its Application XVII, papers given at the 27<sup>th</sup> ITM meeting, 744 pg
- Invited participant at International Atomic Energy Agency meeting on Isotope Aided Studies of Atmospheric CO<sub>2</sub> & other greenhouse gases 1996.
- Chair and organiser of the 8<sup>th</sup> CFIRMS Workshop, 2001, with more than 80 international participants.
- Chair/Instructor of a 2 day CFIRMS Short Course with 15 international participants.
- Environment Canada Baseline Station Advisory Group and Directions in Climate Measurements Workshop group. Committee member.
- International Technical Meeting on Air Pollution Modeling. Committee member.
- B.C. Oil and Gas Technical Advisory Panel. Committee member.
- CPANS AWMA Faculty Representative University of Calgary Student Association
- Over 38 interviews for regional, local, and national newspapers and television broadcasts
- Reviewer for Journal of Geophysical Research, PNAS, Science, Nature, Geophysical Research Letters, Atmospheric Chemistry, Atmospheric Science, Chemical Geology, Tellus, Environmental Science and Technology, Technology and Geochemistry, Exploration and Environment Analysis, Geochimica et Cosmochimica Acta, Isotopes in Environmental Health Studies, Atmospheric Chemistry and Physics
- Reviewer for NSERC, NSF, NERC, CFCAS, PERD and EU and Environment Canada proposals.

**Refereed Journal Publications (students bold and italicized)**

1. Abbatt, J., Leitch, R.W., Aliabadi, A.A., Bertram, A.K., Blanchet, J.-P., Boivin-Rioux, A., Bozem, H., Burkart, J., Chang, R., Charette, J., Chaubey, J.P., Christensen, R.J., Cirisan, A., Collins, D.B., Croft, B., Dionne, J., Evans, G., Fletcher, C., ***Ghahremaninezhad, R.***, Girard, E., Gong, W., Gosselin, M., Gourdal, M., Hannah, S.J., Hayashida, H., Herber, A.B., Hesaraki, S., Hoor, P., Huang, L., Husserr, R., Irish, V. Keita, S.A., Kodros, J.K., Kollner, F., Kolonjari, F., Kunkel, D., Ladino, L.A., Law, K., Lefvasseur, M., Libois, Q., Liggio, J., Lizotte, M., Macdonald, K.M., Mahmood, R., Martin, R.V., Mason, R.H., Miller, L.A., Moravek, A., Mortenson, E.,

- Mungall, E., Murphy, J., Namazi, M., Norman, A.L., O'Neill, N., Pierce, J.R., Russell, L.M., Schneider, J., Schutz, H., Sharma, S., Si, M., Staebler, R.M., Steiner, N.S., Gali, M., Thomas, J.L., von Salzen, K., Wentzell, J.B., Willis, M.D., Wentworth, G.R., Xu, J.W. Yakobi-Hancock, J.D.. New insights into aerosols and climate in the Arctic. *Atmospheric Chemistry and Physics*, 19, 2527-2560, doi.org/10.5194/acp-2018-995, February 28, 2019.
2. Mahmood, R., von Salzen, K., Norman, A.L., Gali, M., Lefebvre, M., (2019) Sensitivity of Arctic sulfate aerosol and clouds to changes in future surface seawater dimethylsulfide concentrations. *Atmospheric Chemistry and Physics*, 19 (9), 6419-6435. Doi.org/10.5194/acp-19-6419-2019, May 16, 2019.
  3. **Ghahremaninezhad, R.,** Gong, W., Gali, M., Norman, A.L., Beagley, S.R., Akingunola, A., Zheng, Q., Lupu, A., Lizotte, M., Lefebvre, M., Leaitch, W.R. (2019) Dimethyl sulfide and its role in aerosol formation and growth in the Arctic summer – a modelling study. *Atmospheric Chemistry and Physics* manuscript acp-2019-470. May 27 2019
  4. **Amiri, N., Ghahremaninezhadgharalar, R., Rempillo, O.,** Tokarek, T.W., Odame-Ankrah, C.A., Osthoff, H., Norman, A.L., Stable sulfur isotope measurements to trace the fate of SO<sub>2</sub> in the Athabasca oil sands region. *Atmospheric Chemistry and Physics*, 18, 7757-7780, June 4, 2018, doi.org/10.5194/acp-18-7757-2018.
  5. **Ghahremaninezhad, R.,** Norman, A.L., Croft, B., Martin, R.V., Pierce, J.R., Rempillo, O., Willis, M., Bozem, H., Kunkel, D., Thomas, J.L., Aliabadi, A.A., Wentworth, G.R., Lefebvre, M., Staebler, R.M., Sharma, S., Leaitch, W.R. (2017). Boundary layer and free tropospheric dimethyl sulfide in the Arctic spring and summer. *Atmospheric Chemistry and Physics*, 17(14), 8757-8770. July 18, 2017, doi.org/10.5194/acp-17-8757-2017
  6. Cristiciello, A., Marshall, S., Evans, M., Kinnard, C., Norman, A.L., Sharp, M. (2016) Marine aerosol source regions to Prince of Wales Icefield, Ellesmere Island, and influence from the tropical Pacific, 1979-2001. *Journal of Geophysical Research Atmospheres*, 121 (16), 9492-9507. August 2016. doi.org/10.1002/2015JD024457.
  7. **Pak, N., Rempillo, O.,** Norman, A.L., Layzell, D., (2016) Early atmospheric detection of CO<sub>2</sub> from carbon capture and storage sites. *Journal of Air and Waste Management Association*, 66 (8), 739-747. April 2016. UAWM-2015-0186 (2016).
  8. **Ghahremaninezhad, R.** Norman, A.L., Lefebvre, M., Abbatt, J., Thomas, J. (2016) Biogenic, anthropogenic and sea salt in size-segregated aerosols in the Arctic summer. *Atmospheric Chemistry and Physics*, April 2016. doi:10.5194/acp-16-5191-2016.
  9. **Wasiuta, V.,** Norman, A.L., Lafrenière, M., Hastings, M.G. (2015) Background atmospheric sulfate deposition at a remote alpine site in the Southern Canadian Rocky Mountains, *Journal of Geophysical Research Atmospheres*, **120**, (21) 11,352-11,367. November 2015. DOI: 10.1002/2015JD023835
  10. **Wasiuta, V.,** Lafrenière, M., Norman, A.L., (2015) Atmospheric deposition of sulfur and inorganic nitrogen in the Southern Canadian Rocky Mountains from seasonal snowpacks and summer precipitation, *Journal of Hydrology*, **523**, 563-573, April 2015.
  11. **Wasiuta, V.,** Lafrenière, M., Norman, A.L., Hastings, M. (2014) Summer deposition of sulfate and reactive nitrogen to two alpine valleys in the Canadian Rocky Mountains, *Atmospheric Environment*, **101**, 270-285, January.
  12. **Seguin, M.A.,** Norman, A.L., and Barrie, L.A. (2014) Evidence of sea ice source in aerosol sulphate loading and size distribution in the Canadian high Arctic from isotopic analysis. *Journal of Geophysical Research Atmospheres*, **119** (2), 1087-1096, January.
  13. Leaitch, W.R., Sharma, S., Huang, L., Toom-Sauntry, D., Chivalescu, A., Macdonald, A.M., von Salzen, K., Pierce, J.R., Bertram, A.K., Schroder, J.C., Shantz, N.C., Change, Y.-W., Norman, A.L., (2013) Dimethyl sulfide control of the clean summertime Arctic aerosol and cloud. *Elementa: Science of the Anthropocene*, **1**, doi.10.12952/journal.elementa.000017, December.
  14. Huang, L., Chivalescu, A., Ernst, D., Zhang, W., Norman, A.L., Lee, Y.S. (2013) Maintaining consistent traceability in high precision isotope measurements of CO<sub>2</sub>: a way to verify atmospheric trends in δ<sup>13</sup>C and δ<sup>18</sup>O. *Atmospheric Measurement Techniques* (2013) *Atmospheric Measurement Techniques* **6**, 1685-1705, July.
  15. Sharma, S., Chan, E., Ishizawa, M., Toom-Sauntry, D., Gong, S.L., Li, S.M., Leaitch, R., Norman, A.L., Quinn, P.K., Bates, T.S., Lefebvre, M., Barrie, L.A. (2012) Influence of transport and ocean ice extent on biogenic aerosol sulfur in the Arctic atmosphere. *Journal of Geophysical Research Atmospheres*. **117**(D12) 12209 – 12221 doi:10.1029/2011JD017074.
  16. **Rempillo, O., Seguin, A.M.,** Norman, A.L., Scarratt, M., Michaud, S., Chang, R., Sjøstet, S., Abbatt, J., Else, P., Papakyriakou, T., Sharma, S., Grasby, S. (2011) Dimethylsulfide air-sea fluxes and biogenic sulfur as a source of new aerosols in the Arctic fall. *Journal of Geophysical Research Atmospheres* **116** doi: 10.1029/2011JD016336.

17. **Seguin, A.M.**, Norman, A.L., **Eaton, S.J.**, Wadleigh, M.A. (2011) Seasonality in size segregated biogenic, anthropogenic and sea salt aerosols over the North Atlantic, *Atmospheric Environment*, **45** (11), 6947-6954.
18. **Seguin, A. M.**, Norman, A.L., **Eaton, S.J.**, Wadleigh, M.A., Sharma, S. (2010) Elevated biogenic sulphur dioxide concentrations over the North Atlantic. *Atmospheric Environment*, **44** (9), 1139-1144.
19. Norman, A.L., **Caldwell, E.**, **Chandrasekaran, C.**, **Eustace, J.**, **Farrelly, K.**, **Firla, H.**, **Hunt, R.**, **Jevne, A.**, **Li, S.**, **Matic, J.**, **Milner, A.**, **Morrice, B.**, **Nicoud, M.**, **Sappier, D.**, **Tarnoczi, T.**, **White, K.**, Staniaszek, P. (2010) Do models get it right? Tracking sulfur deposition in complex terrain: Comparing CALPUFF outputs to measurements. *ACE 2010, Air and Waste Management Association 2010A-1071* 12 p.
20. **Christensen, C.R.**, Staniaszek, P., & Norman, A.L. (2009) Difficulties in creating air dispersion models for accidental release in the event of nuclear PP failure 2009A-142-Air & Waste Management Association 9 p.
21. Holden, W.N., and A.L. Norman (2009) Public response to a student study of the feasibility of nuclear power: Distrust of science in a postmodern world. *The International Journal of Science in Society*. **1**, 79-92.
22. Rock, L., Ellert, B., Mayer, B., Norman, A.L. (2007) Isotopic constraints on tropospheric and soil N<sub>2</sub>O from various depths of five agricultural treatments with contrasting crops and nitrogen amendments. *Journal of Geophysical Research*, **D112**, D18303 doi:10.1029/2006JD008330.
23. Clark, I.D., Henderson, L., Chappellaz, J., Fisher, D., Koerner, R., Worthy, D.E., Kotzer, T., Norman, A.L., Barnola, J.M. (2007) CO<sub>2</sub> isotopes as tracers of firm air diffusion and age in an Arctic ice cap with summer melting. *Journal of Geophysical Research Atmospheres*. **D112**, D01301, doi:10.1029/2006JD007471.
24. **Wasiuta, V.**, Norman, A.L., and Marshall, S. (2006) Spatial patterns and seasonal variation of snowpack sulphate isotopes of the Prince of Wales Icefield, Ellesmere Island, *Journal of Glaciology* **43**, 390-396.
25. **Sanusi, A.**, Norman, A.L., **Burridge, C.**, Wadleigh, M.A., and **Tang, W.** (2006) Determination of the isotope composition of methanesulphonic acid. *Analytical Chemistry* **14**, 4964-4968.
26. Norman, A.L., Anlauf, K., Hayden, K., Thomson, B., Brook, J., Li, S.-M., Bottenheim, J. (2006) Aerosol sulphate and its oxidation on the Pacific NW coast: S and O isotopes in PM<sub>2.5</sub> from Pacific 2001. *Atmospheric Environment* **40**(15) 2676-2689. doi:10.1016/j.atmosenv.2005.09.085.
27. Peng, H., Mayer, B., Norman, A.L., and Krouse, H.R. (2005) Modeling of hydrogen and oxygen isotope ratios for local precipitation. *Tellus* **57B** 257-282.
28. Norman, A.L., Belzer, W., Barrie, L. (2004) Insights into the biogenic contribution to total sulphate in aerosol and precipitation in the Fraser Valley afforded by isotopes of sulphur and oxygen. *Journal of Geophysical Research* D. **109**, D05311, doi:10.1029/2002JD003072.
29. Sharma, S., Vingarzen, R., Barrie, L.A., Norman, A.L., Sirois, A., Henry, M., DiCenzo, C. (2003) Production of dimethylsulphide and its impact on the atmospheric sulfur budget on the Canadian West Coast. *Journal of Geophysical Research* D. **108**, D15, 4459 doi 10.1029/2002JD002447.
30. Norman, A.L., Gieseemann, A., Krouse, H.R. and Jäger, H.J. (2002) Sulphur isotope fractionation during sulphur mineralisation: results of an incubation-extraction experiment with two Black Forest soils. *Soil Biology and Biogeochemistry* **34**, 1425-1438.
31. Czapiewski, K.V., Czuba, E., Huang, L., Ernst, D., Norman, A.L., Koppmann, R., and Rudolph, J. (2002) Isotopic composition of non-methane hydrocarbons in emissions from biomass burning. *Journal of Atmospheric Chemistry* **43**, 45-60. doi:10.1023/A:1016105030624.
32. Rudolph, J., Czuba, E., Norman, A.L., Huang, L., and Ernst, D. (2002) Stable carbon isotope composition of nonmethane hydrocarbons in emissions from transportation related sources and atmospheric observations in an urban atmosphere. *Atmospheric Environment* **36**, 1173-1181.
33. Norman, A.L., Barrie, L.A., Toom-Sauntry, D., Sirois, A., Krouse, H.R., Li, S.M., and Sharma, S. (1999) Sources of aerosol sulphate at Alert: Apportionment using stable isotopes. *Journal of Geophysical Research* **104**, D9, 11,619-11,631.
34. Norman, A.L., Hopper, J.F., Blanchard, P., Ernst, D., Brice, K., Alexandrou, N. and Klouda, G. (1999) The stable isotope composition of atmospheric PAHs. *Atmospheric Environment* **33**, 2807-2814.
35. Gieseemann, A., Jäger, H.-J., Norman, A.L., Krouse, H.R. and Brand, W.A. (1994) Online sulphur-isotope analysis using an elemental analyzer coupled to a mass spectrometer. *Analytical Chemistry*, **66**, 2816-2819.

### **Book Chapters and Contributions**

1. Norman, A.L. and Rudolph, J. (2010) Isotope Ratio Measurements: Atmospheric Gases, In: Chapter 12, *Elemental and Isotope Ratio Mass Spectrometry*, Beauchemin, D. and Matthews, D.E. (eds.), *Encyclopedia of Mass Spectrometry*, Gross, M.L., and Caprioli, R.M. (eds.) Volume 5, 2010, 881-897.

2. Norman, A.L., *ENSC Class of 2006-2007*, Staniaszek, P., (2009) Tracking cumulative effects from sulfur deposition in the foothills of southern Alberta: An isotope approach. In: Environmental Forensics: Proceedings of the 2009 International Network of Environmental Forensics Conference. R.D. Morrison and G. O'Sullivan (eds.) ISBN: 978-1-84755-258-7.
3. Xie, J., Norman, A.L., Henley, S. and Wieser, M. (2009) Sulphur and boron isotope variations to track air pollutant deposition in the Castle River of Southern Alberta, Canada. In: Environmental Forensics: Proceedings of the 2009 International Network of Environmental Forensics Conference. R.D. Morrison and G. O'Sullivan (eds.) ISBN: 978-1-84755-258-7, 176-188.
4. Norman, A.L., M.A. Wadleigh, S. Eaton, C. Burrige, C. Zaganescu, J.P. Blanchette, M. Scarratt, S. Michaud, M. Levasseur, A. Merzouk, M. Lizotte, S. Sharma, R. Leaitch (2008) Chapter 6.3: Dimethylsulphide (DMS) flux and DMS oxidation over the North Atlantic: Comparison of a top-down & bottom-up approach., pgs 661-675 Borrego, C. and Renner, E. (eds), Developments in Environmental Science, Volume 6, Air Pollution Modeling and Its Application XVIII. Elsevier, 661-675.
5. Borrego, C. and Norman, A.L. (editors) (2007) Air Pollution Modeling and Its Application XVII. Kluwer Academic/Plenum Publishers, New York, 2005, 744 pgs.
6. Norman, A.L., and Wadleigh, M.A., (2007) Dimethylsulphide (DMS) and its oxidation to sulphur dioxide downwind during SERIES: A model for DMS flux over the Pacific Ocean. In: Air Pollution Modeling and Its Application XVII, Kluwer Academic, New York, 237-244.
7. Norman, A.L. Isotope characterisation of gaseous pollutants (2006) In: Closing Resource Cycles: Options for Gas Treatment, P. Lens, C. Kennes, P. Le Cloirec, M. Dehusses (eds), IWA Publishing, 107, Nov. 2006, 107-116.
8. Norman, A.L., Krouse, H.R., and MacLeod, J. (2004) Aerosol sulphate in Calgary, Alberta: An isotope study of atmospheric sulphur. In: Air Pollution Modeling and Its Application XVI. C. Borrego and S. Incecik (eds.) Kluwer/Plenum, NY, 107-125.

### **Other Refereed Publications and Reports**

1. Kolodziej, J., Norman, A.L. and Rempillo, O. (2014) No evidence for S isotope fractionation during SO<sub>2</sub> oxidation at a continental locations. *Journal of Undergraduate Research*, 4, 26-35, March.
2. Sharma, S., Chan, E., Leaitch, R., Toom-Sauntry, D., Chan, D., Barrie, L., Norman, A.L., Agnew, T. (2009) Is melting of Arctic Ocean increasing biogenic sulfur in the Arctic - trends in methanesulfonic acid? *Special Issue Geochimica et Cosmochimica Acta*, 75, A1204.
3. Huang, L., Higuchi, K., Shashkov, A., Norman, A.L., Ernst, D., Chivalescu, A., Worthy, D. (2003) Regional impact of terrestrial ecosystem on global carbon cycle: indicated by isotopic measurements of atmospheric CO<sub>2</sub> at a boreal forest (Fraserdale, Ontario). *Canadian Baseline Program Report*, Environment Canada, 6 pgs.
4. Norman, A.L., and the *ENSC 502 Class of 2000-2001* (2002) Air quality downwind of sour gas flaring and processing operations west of Calgary, Alberta, Canada. *Medical Geology Newsletter* 5, 7-8. (invited)
5. Huang, L., Norman, A.L., Allison, C.E., Francey, R.J., Ernst, D., Chivalescu, A., and Higuchi, K. (2001) Traceability-maintenance for high-precision stable isotope measurement (<sup>13</sup>C and <sup>18</sup>O) of air-CO<sub>2</sub> by lab carbonate standards at MSC: Application to the inter-comparison program (Alert-Canada) with CSIRO. *11<sup>th</sup> WMO/IAEA Meeting of Experts on CO<sub>2</sub> Concentration & Related Trace Measurement Techniques*. Sendai, Japan, 12 pgs.
6. Hopper, J.F., Norman, A.L., Ernst, D., Chivalescu, A., Worthy, D., Wallgren, E. and Ernst, M. (1999) Measurements of stable isotopes of CO<sub>2</sub>. *Canadian Baseline Program: Summary of Progress to 1998*, Environment Canada, 2-19.
7. Norman, A.L., and Ernst, D. (1999) Stable isotopes of CO<sub>2</sub>: Measurements and calibration protocols. *Canadian Baseline Program: Summary of Progress to 1998*, Environment Canada, 3-14, 3-15.
8. Hopper, J.F., Norman, A.L., Ernst, D., and Chivalescu, A. (1998) Stable isotopes of CO<sub>2</sub>. *Canadian Baseline Report*, Environment Canada, Section 2.1.4.
9. Hopper, J.F., Norman, A.L., and Ernst, D. (1997) CARD Stable isotope laboratory. *Directions in Climate Measurement Research Workshop*, Dec. 10-11, 1996. Environment Canada 9 pgs.
10. Norman, A.L., Giesemann, A., and Jager, H.J. (1995) Sulphur isotope fractionation during S-mineralization in two Black Forest soils. *European Network of Catchments Organized for Research on Ecosystems*. M. Hornung (ed.) Section 6.2, 3 pgs.

### **Non-Refereed Publications and Reports**

1. Norman, A.L. and *Amiri, N.* (2014) Formation of charged hydrocarbon particles and their distribution in the atmosphere. White Paper for Sky Hunter Inc., Nov. 29, 2014. 23 pgs.
2. Norman, A.L. (2011) Review of technical report: Assessment of hydrocarbon emissions from heated bitumen storage tanks. Report submitted to Coralee Beaulieu, Minnie Lake Conservation Society. for the ERCB Hearing: Several Well and Facility Applications of Canadian Natural Resources Limited for development in the Sugden Field near Minnie Lake. Feb. 9, 2011, 6 pgs.
3. Norman, A.L., & *ENSC 502 Class of 2006-2007* (2010) Cumulative impacts on air quality and ecosystems from sour gas emissions near Beaver Mines, Alberta. Report submitted to the ERCB Hearing for Shell Waterton Well Applications 1614134, 1614144, 1614145, 1614198, 1614210. Prepared Sept. 5, 2010. 18 pgs.
4. Norman, A.L. (2009) Sulphur isotope analysis of individual aerosol particles – a new tool for studying heterogeneous oxidation processes in the marine environment. Discussion. *Atmospheric Chemistry and Physics Discussion*. **9**, 3307-3365.
5. Lizotte, M., Norman, A.L., Randall, K., Lavoie, M. (2010) The Arctic ocean, creatures and climate. Magazine article. Prepared Dec. 9, 2009.
6. Norman, A.L., *Siauw, A.*, and the *ENSC Class of 2006-2007*. (2007) Cumulative impacts from sour gas emissions near Pincher Creek, Alberta. Report to the EUB, Shell Waterton 12-36-5-3 W5M/10-1-6-3 W5M, Prepared Aug. 27, 2007, 45 pgs.
7. Norman, A.L., and Wadleigh, M.A., (2004) Dimethylsulphide (DMS) and its oxidation to sulphur dioxide downwind during SERIES: A model for DMS flux over the Pacific Ocean. *27<sup>th</sup> International Technical Meeting on Air Pollution Modeling and Its Application*, October 25-29, 2004, 329-336.
8. Norman, A.L., Krouse, H.R., and *MacLeod, J.* (2003) Aerosol sulphate in Calgary, Alberta: An isotope study of atmospheric sulphur. *26<sup>th</sup> International Technical Meeting on Air Pollution Modeling and Its Application*, 8 p.
9. Norman, A.L. (2002) Sour gas processing impacts on pond water and grasses downwind of Shell-Waterton processing plant near Pincher Creek, Alberta. Prepared for Rooney Prentice, Barristers and Solicitors, Calgary, Alberta, October 8, 2002, 7 p.
10. Norman, A.L., Mayer, B., and *Bradley, E.* (2002) Assessment of atmospheric S deposition to, and proportion of S in surrounding ecosystems due to sour gas emissions. Report I: Background S and source characterisation. Prepared for B.C. Oil and Gas Commission, June 2002, 11 p.
11. Norman, A.L., Roth, S., and Krouse, H.R. (2001) A study to determine the feasibility of using natural abundance stable S isotope ratios to identify and characterise the distribution and metabolism of hydrogen sulphide (H<sub>2</sub>S) in blood: report on experimental results. Report to the American Petroleum Institute, April 12, 2001, 7 p.
12. Norman, A.L., Belzer, W., and Barrie, L. (2001) Atmospheric sulphur in the Fraser Valley: A source apportionment study. Report to Meteorological Service of Canada. October 18, 2001, 20 p.
13. Norman, A.L., and the *ENSC 502 Class of 2000-2001* (2001) Air quality and perceived health impacts from sour gas emissions at two locations west of Calgary, Alberta. Posted as an overview of the study on the web site [www.ucalgary.ca/~alnorman/airq/airquality.html](http://www.ucalgary.ca/~alnorman/airq/airquality.html), 18 p.
14. Norman, A.L., Ernst, D., and Hopper, J.F. (1998) Verification of a system for cryogenic extraction of CO from ambient air for stable isotope determinations. Atmospheric Environment Service Internal Technical Report: Report to AAIM Laboratory, April 1998, 13 p.
15. Norman, A.L. and Giesemann, A. (1992) Report on oxidation of organic sulfur in soils of the Black Forest region using stable sulfur isotopes. Report to the European Community. 15 p.

### **Refereed Proceedings**

1. *Alam, M.*, Norman, A.L., Layzell, D. (2017) Combined theoretical and experimental approach to build a new monitoring method for low detection CO<sub>2</sub> leaks from CCS storage sites. ACE 2017, Air and Waste Management Association 110<sup>th</sup> Annual Conference and Exhibition. Pittsburgh, Pennsylvania, June 5-8, 2017. Paper # 262960.
2. Huang, L., Norman, A.L., Allison, C.E., Francey, R.J., Ernst, D., Chivalescu, A., and Higuchi, K. (2001) Traceability-maintenance for high precision stable isotope measurement (<sup>13</sup>C and <sup>18</sup>O) of air-CO<sub>2</sub> by lab carbonate standards at MSC: Application to the inter-comparison program (Alert, Canada) with CSIRO. *6<sup>th</sup> International Carbon Dioxide Conference*, Oct. 1-5, 2001, Sendai, Japan, 12 pgs.
3. Huang, L., Norman, A.L., Ernst, D., Chivalescu, A., Shashkov, A., Chan, D., and Higuchi, K. (2001) Isotope compositions (<sup>13</sup>C and <sup>18</sup>O) of CO<sub>2</sub> in air and diurnal changes at a boreal forest site (Fraserdale, Canada):

- Implications of processes in a terrestrial ecosystem. *6<sup>th</sup> International Carbon Dioxide Conference*, Oct. 1-5, 2001, Sendai, Japan, 7 pgs.
4. Norman, A.L., Ernst, D., Rudolph, J., Blanchard, P. and Hopper, J.F. (2000) CF-MS-IRMS: A technique to identify and quantify the source of aerosols and VOCs. *Proceedings of the Air and Waste Management Association, Pacific Northwest Meeting: Recent Advances in the Science and Management of Air Toxics*, Banff, Alberta, Canada, P. Chu and L. Bates (eds.), April 9-12, 2000, 9 pgs.
  5. Norman, A.L., Hopper, J.F., and D. Ernst (1997) Isotopic composition of atmospheric CO and CO<sub>2</sub>: Indicators of carbon cycling. *Biogeomon '97, Journal of Conference Abstracts 2(2)*, Vile, M.A., Novak, M., and Cerny, J. (eds.) June 21-25, 1997, 258.
  6. Krouse, H.R., Norman, A.L., and Wieser, M. (1997) Isotope analysis of microgram quantities of sulphur. *Biogeomon '97, Journal of Conference Abstracts 2(2)*, Vile, M.A., Novak, M., and Cerny, J. (eds.) June 21-25, 1997, 223.
  7. Norman, A.L., and H.R. Krouse (1994) Fractionation during sulphur mineralization in two Black Forest Soils. *Proceedings of the Isotope Workshop II*, M.O. Jedrysek (ed.), May 25-27, Ksiaz Castle, Poland, 1994, 106-110.
  8. Norman, A.L. (1994) Atmospheric sulphate in snow near a sour gas processing plant, Crossfield, Alberta. *Proceedings of the Workshop on Recognition of Sulphate of Industrial Derivation in Groundwater*, I. Hutcheon and H.R. Krouse (eds.), March 10, Calgary, Alberta, 4pgs.
  9. Norman, A.L. (1994) Stable isotope analysis of microgram quantities of sulphur. *Proceedings of the Workshop on Recognition of Sulphate of Industrial Derivation in Groundwater*, I. Hutcheon and H.R. Krouse (eds.), Mar. 10, Calgary, Alberta, 3 pgs
  10. Norman, A.L., Giesemann, A., Jäger, H-J., Krouse, H.R. (1993) A study of sulphur mineralization in organic soil horizons: A batch experiment. *Proceedings of the Workshop for Sulphur Transformations in Soil Ecosystems*, M.J. Hendry and H.R. Krouse (eds.), November 5-7, Saskatoon, Saskatchewan, Canada, 1992, 261-294.
  11. Norman, A.L., and H.R. Krouse (1993) Isotope composition of atmospheric sulphate near sour (H<sub>2</sub>S-rich) gas processing facilities in Alberta, Canada. *Proceedings of the 1st International Symposium on Applied Isotope Geochemistry (AIG-1)*, August 29-September 3, 1993, Geiranger, Norway, 1 pp: IFE/KR/E-93/007.
  12. Norman, A.L., M. Wieser, H.R. Krouse, and A. Giesemann (1993) Isotope abundance measurements of microgram quantities of sulphur. *Proceedings of the 1st International Symposium on Applied Isotope Geochemistry (AIG-1)*, August 29-September 3, 1993, Geiranger, Norway, 2 pp: IFE/KR/E-93/007.
  13. Giesemann, A., Jäger, H-J., Norman, A.L., and H.R. Krouse (1993) On-line analysis of S-isotope distributions in small samples. *Proceedings of the Workshop for Sulphur Transformations in Soil Ecosystems*, M.J. Hendry and H.R. Krouse (eds.), November 5-7, Saskatoon, Saskatchewan, Canada, 1992, 73-85.
  14. Norman, A.L., and Krouse, H.R. (1992) Stable isotope studies of atmospheric sulphur: comparison of Calgary, Canada, and Bermuda. *Proceedings of the 9<sup>th</sup> Clean Air Congress, Montreal, Canada*, **IU-8.01**, 16 pp. (122)

### **Conference Abstracts, Posters, and Presentations**

15. **Mostafaei, M., Mohamed, F.**, Norman, A.L. Contribution of dimethyl sulphide (DMS) to atmospheric sulfur at Saturna Island, B.C., 27<sup>th</sup> International Meeting of the Union of Geodesy and Geophysics, Montreal, Quebec, July 8-18, 2019. (poster)
16. **Earl, D.**, Reid, M., Norman, A.L. The effects of SO<sub>2</sub> emissions on conifer growth in Alberta. 27<sup>th</sup> International Meeting of the Union of Geology and Geophysics, Montreal, Quebec, July 9-14, 2019. (poster)
17. **Ghahremaninezhad, R.**, Beagley, S., Norman, A.L., Gong, W. Biogenic source of sulfate aerosols in the Arctic summer. 27<sup>th</sup> International Meeting of the Union of Geodesy and Geophysics, Montreal, Quebec, July 8-18, 2019. (oral)
18. Norman, A.L., **Rempillo, O., Wasiuta, V., Ghahremaninezhad, R., Derksen, M. Ge, C., Amiri, N.** Size matters: Crystals, clouds, climate. 20<sup>th</sup> Annual meeting of the American Physical Society, Northwest Section, Western Washington University, Bellingham WA, USA, May 16-18, 2019 (plenary, invited).
19. Norman, A.L., **Seguin, M., Wasiuta, V.**, Sharp, M., Apportionment of marine and non-marine biogenic sulfate in an Arctic ice core: Pre-industrial versus modern-day sulfate and its role in climate forcing. European Geophysical Union Meeting, Vienna, Austria, April 7-12, 2019 (PICO presentation).

20. Norman, A.L., **Derksen, M., Ghahremaninezhad, R., Rempillo, O., Wasiuta, V.** S in IN, aerosols, rain and fog in the Arctic: Biogenic versus anthropogenic. Does it matter? British Antarctic Survey, Cambridge, UK, April 4-5 2019. (oral)
21. **Derksen, M., Ghahremaninezhad, R.,** Norman, A.L. Chemical and physical properties of ice nuclei in Arctic precipitation. *101<sup>st</sup> Meeting of the Canadian Chemistry Conference and Exhibition*, Edmonton, Alberta, May 28-31, 2018 (oral).
22. **Amiri, N., Ghahremaninezhad, R., Rempillo, O.,** Norman, A.L. The source and fate of SO<sub>2</sub> in the Athabasca oil sands region: Insights using stable isotopes. *101<sup>st</sup> Meeting of the Canadian Chemistry Conference and Exhibition*, Edmonton, Alberta, May 28-31, 2018 (oral).
23. Croft, B., Pierce, J.R., Wentworth, G., Moravek, A., Murphy, J., Leaitch, W.R., Juang, L., Chang, R., Hayes, P., Kodros, J.K., Hodshire, A., **Ghahremaninezhad, R.,** Norman, A.-L., Willis, M., Mungall, E., Collins, D., Abbatt, J. Martin, R.W. Processes controlling summertime Arctic aerosol size distributions. *CMOS meeting*, Halifax, NS, June 10-14, 2018. (oral)
24. **Ghahremaninezhad, R.,** Norman, A.L., **Derksen, M., Wasiuta, V.,** Sharma, S., Leaitch, R., Thomas, J. Sulfur isotope apportionment and DMS in the Arctic atmosphere. *NETCARE workshop*, Toronto, ON, Nov.13-14, 2017 (poster).
25. **Derksen, M.,** Norman, A.L., **Ghahremaninezhad, R.,** Toom-Saunty, D., Sharma, S. Biogenic sulfate in Arctic precipitation and its ice nucleation characteristics. *NETCARE workshop*, Toronto, ON, Nov.13-14, 2017 (poster).
26. **Hosseini, Z., Amiri, N.,** Norman, A.L. Source apportionment of sulfate using global atmospheric modelling. *Arctic and Marine Oil Spill Program meeting*, Calgary, Alberta, October 3-5. 2017 (poster).
27. **Alam, M.,** Norman, A.L., Layzell, D. Combined theoretical and experimental approach to build a new monitoring method for low detection CO<sub>2</sub> leaks from CCS storage sites. *ACE 2017, Air & Waste Management Association 110<sup>th</sup> Annual Conference & Exhibition*. Pittsburgh, Pennsylvania, June 5-8, 2017 (oral).
28. Norman, A.L., **Rempillo, O., Seguin, A.M., Ghahremaninezhadgharelar, Wasiuta, V., R., Ge, C., Derkson, M.** Atmospheric DMS measurements and oxidation products in the Arctic. *Netcare DMS Workshop*, Sidney, B.C., Jan. 16-18, 2017 (invited).
29. Hayashida, H., **Ghahremaninezhadgharelar, R.,** Gourdain, M., Levasseur, M., Lizotte, M., Norman, A.L., Steiner, N., Parameterization of DMS flux over Arctic melt ponds. *Netcare DMS Workshop*, Sidney, B.C., Jan. 16-18, 2017 (poster).
30. **Ghahremaninezhadgharelar, R.,** Norman, A.L., Croft, B., Martin, R.V., Pierce, J.R., Burkhart, J., Willis, M., Bozem, H., Kunkel, D., Wentworth, G., Levasseur, M., Staebler, R., Sharma, S., and Leaitch, W.R. Atmospheric dimethyl sulfide on board the Amundsen, above melt ponds and aboard the POLAR 6. *Netcare DMS Workshop*, Sidney, B.C., Jan. 16-18, 2017 (poster).
31. **Amiri, N.,** Norman, A.L., **Ghahremaninezhadgharelar, R., Rempillo, O.,** Significance of hydrocarbons in the formation of secondary sulfate aerosols in the Oil Sands region of Canada. *AGU Fall Meeting*, San Francisco, CA, Dec. 12-16, 2016, A33A-0198 (poster).
32. **Ge, C., Stenhouse, K., Beamish, S., Jansens, B.,** Xing, Z., Du, K., Norman, A.L. Carbonaceous source tracing using concentrations of particulate carbon and sulfate in precipitation in Calgary, Alberta, Canada. *AGU Fall Meeting*, San Francisco, CA, Dec. 12-16, 2016, A33E-0296 (poster).
33. **Stenhouse, K., Matheson, A., Ge, C., Beamish, S., Jansens, B.,** Norman, A.L., High volume rainfall events in Calgary, Alberta, Canada and their relationship to HYSPLIT back trajectories and chemical constituents. *AGU Fall Meeting*, San Francisco, CA, Dec. 12-16, 2016, ED31B-0885 (poster).
34. **Alam, M.,** Norman, A.L., Layzell, D. Leak monitoring of CO<sub>2</sub> at CCS sties by near-surface soil gas measurements. *AGU Fall Meeting*, San Francisco, CA, Dec. 12-16, 2016, GC21C-1104 (poster).
35. **Amiri, N., Rempillo, O., Ghahremaninezhadgharelar, R.,** Norman, A.L. Isotope evidence for rapid SO<sub>2</sub> oxidation in the oil sands region of Alberta. *TRIUMF Workshop*, Calgary, Nov. 28, 2016, (poster).
36. **Ghahremaninezhadgharelar, R.,** Norman, A.L., Levasseur, M., Abbatt, J. Soluble ice nucleation particles, aerosol size fractions and source of sulfate particles in precipitation/fog in the Arctic summer. *NETCARE workshop*, Toronto, ON, Nov.14-16, 2016 (poster).
37. **Ghahremaninezhadgharelar, R.,** Norman, A.L., Croft, B., Martin, R.A., Pierce, J.R., Burkart, J., Willis, M.D., Bozem, H., Kunkel, D., Thomas, J.L., Aliabadi, A.A., Wentworth, G.R., Levasseur, M., Staebler, R.M., Sharma, S., Abbatt, J., and Leaitch, W.R. Vertical DMS profiles aboard the POLAR 6: insights in the Arctic spring and summer. *NETCARE workshop*, Toronto, ON, Nov.14-16, 2016 (oral)
38. **Amiri, N.,** Norman, A.L., **Ghahremaninezhadgharelar, R., Rempillo, O.,** Osthoff, H., Tokorek, T. The role

- of hydrocarbons in SO<sub>2</sub> oxidation and formation of new particles in the Oil Sands region of Canada. *American Association for Aerosol Research.*, Portland OR, Oct. 14-17, 2016 (poster).
39. **Wasiuta, V.**, Norman, A.L., Marshall, S. Ion source attribution in snowpack from Ellesmere Island in the Canadian Arctic. *International Global Atmospheric Chemistry Conference*, Breckenridge CO, Sept. 26-30, 2016 (poster)
  40. **Ghahremaninezhadgharelar, R.**, Norman, A.L., Leaitch, R., Burkart, J., Wentworth, G.R., Murphy, J.G., Abbatt, J. Vertical distribution of atmospheric dimethyl sulfide in the Arctic summer and Spring. *International Global Atmospheric Chemistry Conference*, Breckenridge CO, Sept. 26-30, 2016 (poster).
  41. **Ge, C., Beamish, S., Jansens, B.**, Norman, A.L. Precipitation sulfate in Calgary Alberta: A study of its sources and relationship to ice nucleation over an annual cycle: 2014-2015 2016 *CPANS Conference*, Calgary, AB, May 3, 2016 (poster).
  42. **Ghahremaninezhadgharelar, R.**, Norman, A.L., Anthropogenic sources of sulfate aerosols in the Arctic summer-time, *CPANS Workshop*, Calgary, Canada, May 3, 2016 (poster).
  43. **Ghahremaninezhadgharelar, R.**, Norman, A.L., Abbatt, J., Levasseur, M., Sources of size segregated sulfate aerosol in the Arctic summer. *AGU Fall Meeting*, San Francisco CA, Dec. 14-18, 2015. A11C-0062 (poster)
  44. **Alam, M.**, Norman, A.L., Layzell, D. Soil surface leak detection from carbon capture and sequestration using  $\Delta(\text{CO}_2/\text{O}_2)$  measurements. *AGU Fall Meeting*, San Francisco CA, Dec. 14-18, 2015. H53H-1760 (poster)
  45. **Amiri, N.**, Norman, A.L. A natural abundance stable isotope tracer experiment to define SO<sub>2</sub> oxidation pathways and their fractionation during heterogeneous oxidation. *AGU Fall Meeting*, San Francisco CA, Dec. 14-18, 2015. A43G-0365 (poster)
  46. **Ghahremaninezhadgharelar, R.**, Norman, A.L., Wentworth, G., Burkhart, J., Leaitch, R., Sharma, S., Abbatt, J., Levasseur, M., Thomas, J., Atmospheric dimethyl sulfide on board the Amundsen, above melt ponds and aboard the POLAR 6. *NETCARE workshop*, Toronto, ON, Nov. 17, 2015. (poster)
  47. Norman, A.L. **Ghahremaninezhadgharelar, R.**, Abbatt, J., Levasseur, M., Thomas, J., Toom-Sauntry, D., Sulfate sources in precipitation and size-segregated sulfate aerosol in the Arctic summer. *NETCARE workshop*, Toronto, ON, Nov. 17, 2015. (oral)
  48. **Hosseini, Z.**, Norman, A.L., Reuten, C., Lundgren, J. Global air quality modelling: A more realistic approach to defining boundary conditions for regional air quality modelling. *PHAS Postdoctoral Workshop*, Calgary, AB, Nov. 9, 2015.
  49. **Amiri, N., Ghahremaninezhadgharelar, R., Rempillo, O.**, Norman, A.L., Isotopic composition of sulphur dioxide and size segregated sulphate aerosols in Athabasca oil sands regions. *Meeting of the Canadian Association of Physicists*, Edmonton AB, June 15-19, 2015. (poster)
  50. **Amiri, N., Ghahremaninezhadgharelar, R., Rempillo, O.**, Norman, A.L., Size-segregated sulfate aerosols: Concentration and isotopic composition during the oil sands campaign, summer 2013. *FOSSILS workshop*, Toronto, ON, May 20-21, 2015. (oral)
  51. **Ghahremaninezhadgharelar, R.**, Norman, A.L., Abbatt, J. Size segregated sulfate aerosols in the Arctic summer. *AWMA CPANS workshop*, Edmonton AB, May 26-27, 2015. (poster)
  52. Burkhart, J., Willis, M., Koellner, F., Schneider, J., Bozem, H., Hoor, P., **Ghahremaninezhadgharelar, R.**, Wentworth, G., Norman, A.L., Brauner, R., Konrad, C., Herber, A., Leaitch, R., Abbatt, J. Evidence for new particle formation in the summertime Arctic near Resolute Bay, Nunavut, Canada. *7<sup>th</sup> Symposium on aerosol-cloud-climate interactions of the American Meteorological Society*. Phoenix AZ, Jan. 4-8<sup>th</sup>, 2015, (oral)
  53. **Amiri, N., Ghahremaninezhadgharelar, R., Rempillo, O.**, Norman, A.L., Formation and growth of aerosols in the presence of hydrocarbons. *AGU Fall Meeting*, San Francisco, CA, Dec. 14-19, 2014, (poster).
  54. **Ghahremaninezhadgharelar, R.**, Norman, A.L., Wentworth, G., Burkart, J., Leaitch, W.R., Abbatt, J., Sharma, S., Toom-Sauntry, D., Atmospheric DMS and biogenic sulfur aerosol measurements in the Arctic. *AGU Fall Meeting*, San Francisco, CA, A23B-3238, Dec. 14-19, 2014, (poster).
  55. **Ghahremaninezhadgharelar, R.**, Norman, A.L., Abbatt, J., Sharma, S., Toom-Sauntry, Levasseur, M. Atmospheric DMS contribution in aerosol activation and growth in the Arctic. *Arctic Change Conference*, Ottawa, ON, Dec. 8-12, 2014, (poster).
  56. **Ghahremaninezhadgharelar, R.**, Norman, A.L. Atmospheric DMS from melt ponds and its vertical distribution in the atmosphere. *NETCARE workshop*, Toronto, ON, Nov. 3-4, 2014, (oral).
  57. Norman, A.L., **Ghahremaninezhadgharelar, R., Rempillo, O., Seguin, A., Siau, A., Toom-Sauntry, D., Sharma, S.** Atmospheric DMS, biogenic SO<sub>2</sub> and sulfate aerosol measurements in the Arctic. *NETCARE workshop*, Toronto, ON, Nov. 3-4, 2014, (oral).
  58. **Alam, M.**, Norman, A.L., Layzell, D. Modeling and analysis of near-surface soil O<sub>2</sub> and CO<sub>2</sub> for CCS leak



- detection. *Graduate Climate Conference*, Seattle WA, Oct. 31 – Nov. 2, 2014, (poster).
59. **Alam, M.**, Norman, A.L., Layzell, D.B. An early CCS leak detection method based on near surface soil gas concentrations. *107<sup>th</sup> Annual AWMA Conference*, Long Beach CA, June 24-27, 2014, (poster).
  60. **Rempillo, O.**, Norman, A.L., **Ghahremaninezhadgharelar, R.** Reduced S compound concentrations in the air in the oil sands region of Alberta. *Canadian Chemistry Conference*, Vancouver BC, June 1-5, 2014, (poster)
  61. **Rempillo, O.**, **Ghahremaninezhadgharelar, R.**, Norman, A.L. Cryogenic method for detection & quantification of reduced S compounds. *Canadian Chemistry Conference*, Vancouver BC, June 1-5, 2014, (poster)
  62. **Ghahremaninezhadgharelar, R.**, Norman, A.L. Dimethylsulfide storage with tenax. *CPANS Annual Conference*, Edmonton AB, May 21-22, 2014, (poster)
  63. Criscitiello, A., Marshall, S., Yackel, J., Norman, A.L., Evans, M. Ellesmere Island ice core record of recent sea ice behavior and North Water Polynya variability. *1<sup>st</sup> ArcTrain Annual Meeting*, Bremen, Germany, May 14, 2014, (oral)
  64. **Wasiuta, V.L.**, Norman, A.L., Lafreniere, M.J., Hastings, M.G. Background continental atmospheric deposition from a remote alpine site in the Canadian Rocky Mountains. *FM13-A32A-08 Fall AGU Meeting*, San Francisco, CA, Dec. 9-13, 2013, (oral)
  65. **Alam, M.**, Norman, A.L., Layzell, D.B. Soil gas diffusion and reaction model to build an early CCS leakage detection method. *1<sup>st</sup> Annual Energy & Environmental Systems Workshop*. Calgary, AB, Nov. 15, 2013, (oral)
  66. **Pak, N.**, **Rempillo, O.**, Norman, A.L., Layzell, D. Atmospheric leak detection from carbon capture and storage sites. *AWMA's 106<sup>th</sup> Annual Conference and Exhibition*, Chicago Ill., June 25-28, 2013, (abs only).
  67. **Wasiuta, V.**, Lafreniere, M., Norman, A.L. Characterization of summer precipitation in two alpine valleys in the Rocky Mountains. *ASITA Conference*, Calgary, AB, June 3-5, 2013, (oral).
  68. **Kolodziej, J.**, Norman, A.L., **Rempillo, O.** No S isotope fractionation during SO<sub>2</sub> oxidation at a continental location. *ASITA Conference*, Calgary, AB, June 3-5, 2013, (poster).
  69. **Seguin, A.M.**, Norman, A.L., **Rempillo, O.** The isotope composition of atmospheric aerosol nitrate and corresponding gaseous nitrogen compounds in the Arctic and over the Atlantic Ocean. *ASITA Conference*, Calgary, AB, June 3-5, 2013, (poster)
  70. Norman, A.L., **Rempillo, O.**, **Seguin, A.M.**, Sharma, S., Toom-Sauntry, D., Alam, K., Barrie, L.A. Sources of sulfate in Arctic aerosols and their relationship to cloud formation. *CMOS/CWRA/CGU Meeting*, Saskatoon, SK, May 25-29, 2013, (oral)
  71. Norman, A.L., Isotopes and aerosols: Sleuthing in the air. *Professional Development Day Seminar*, Calgary, AB, May 17, 2013, (oral).
  72. **Pak, N.**, **Rempillo, O.**, Norman, A.L., Layzell, D. Atmospheric leak detection of carbon dioxide from carbon capture and storage sites. *CANFORWest 2013 Conference*, Kananaskis Country AB, Apr. 18-21, 2013 (oral)
  73. Norman, A.L. **Rempillo, O.**, **Seguin, A.M.** Sulfur aerosols and planetary albedo: What's all the stink about? *University of Saskatchewan, Department of Physics Seminar Series*, Saskatoon, SK, March 21, 2013, (invited)
  74. Norman, A.L., **Rempillo, O.**, **Seguin, A.M.**, Sharma, S., Toom-Sauntry, D., Alam, K., Jackel, J., Howell, S. Barrie, L.A. Aerosol sulfate and ice nucleation: An exploration of experimental evidence in the Arctic atmosphere. *AGU Meeting*, San Francisco, CA, Dec. 7, 2012, (invited) Abs #1503718.
  75. Norman, A.L., **G. Xie**, M. Wieser, **ENSC 502 Class of 2006**. A slow burn: Ecosystem acidification and its effect on the Castle River in S Alberta, Canada using B, S and O isotopes., *8<sup>th</sup> ISOECOL Meeting*, Brest, France, Aug. 20-24, 2012, (poster).
  76. **Pak, N.**, Norman, A.L., Layzell, D. Early detection of CO<sub>2</sub> leakage from carbon storage sites. *2<sup>nd</sup> Annual Women in Physics Conference*, University of BC, BC, Aug.1-4, 2012, (oral).
  77. **Rempillo, O.**, **Seguin, A.M.**, Norman, A.L. Dimethyl sulfide as a source of aerosol sulfate in the Arctic atmosphere. *2<sup>nd</sup> Annual Women in Physics Conference*, University of BC, BC Aug.1-4, 2012, (poster).
  78. **Rempillo, O.**, **Seguin, A.M.**, Norman, A.L., Biogenic sulfate contribution to aerosol growth and nucleation. *Canadian Association of Physics Conference*, Calgary, AB, June 11-15, 2012, (poster).
  79. **Pak, N.**, Norman, A.L., Layzell, D. Atmospheric leak detection of carbon dioxide from carbon capture and storage sites., *Canadian Association of Physics Conference*, Calgary AB, June 11-15, 2012, (poster)
  80. Wieser, M., Norman, A.L., Mayer, B. Exploring the power of isotopic composition for use as environmental and forensic tracers. Forty years of isotope science at the University of Calgary. *Canadian Association of*

- Physics Conference*, Calgary, AB. June 11-15, 2012, (oral)
81. **Wasiuta, V.**, Lafreniere, Norman, A.L. Atmospheric deposition in the southern Canadian Rocky Mountains: Preliminary results from precipitation  $\delta^{34}\text{S}$  and  $\delta^{18}\text{O}$  analyses. *Goldschmidt 2012 Conference*, Montreal, QC June 22-24, 2012, (poster)
  82. Norman, A.L., **G. Xie, Bradley, E.**, Wieser, M., MacBeth, M., *ENSC 502 classes of 2006 & 2007*, Tracking the fate of atmospheric pollutants in a catchment of southern AB, Canada using S and B isotopes. *Geological Nuclear Sciences Seminar*, Wellington New Zealand, Mar. 15, 2012, (invited).
  83. **Seguin, A.M., Rempillo, O.** and Norman, A.L. Aerosol frost flower versus sea salt concentrations with the use of  $\delta^{34}\text{S}$  at Alert, Nunavut, Canada. *AGU Fall Meeting*, San Francisco, CA, Dec. 6-9, 2011, A21A-0028. (poster)
  84. **Seguin, A.M., Rempillo, O.**, Alam, K., Norman, A.L.  $\text{SO}_2$  in the Arctic fall atmosphere: source identification using isotope apportionment. *AGU Fall Meeting*, San Francisco, CA, Dec. 6-9, 2011, A21A-0027 (poster)
  85. Norman, A.L., **Rempillo, O., Seguin, A.M., Wasiuta, V. & the ENSC class of 2006 & 2007.** Up in the air: What is that S doing? Geography Department Fall 2011 *Seminar series*, *Queen's University*, Kingston, ON. Oct. 21, 2011, (oral).
  86. Sharma, S., E. Chan, M. Ishizawa, D. Toom-Sauntry, T. Agnew, S. L. Gong, S. M. Li, W. R. Leaitch, Norman, A.L., Quinn, P.S., Bates, T.S., Levasseur M., Barrie, L.A., and Maenhaut, W, Influence of transport and ocean ice extent on biogenic aerosol sulfur in the Arctic, Abstracts for the *30<sup>th</sup> American Association for Aerosol Research*, Orlando, FL Oct. 3-7, 2011 (oral).
  87. **Wasiuta, V.**, Lafreniere, M., Norman, A.L. Atmospheric deposition in the southern Canadian Rocky Mountains: Preliminary results from precipitation  $\delta^{34}\text{S}$  and  $\delta^{18}\text{O}$  analyses. *Advances in Stable Isotope Techniques and Applications*. Queen's University, Kingston, ON, June 12-15, 2011. (poster)
  88. **Rempillo, O., Seguin, A.M.**, Norman, A.L., Atmospheric DMS and its oxidation products in relation to aerosol growth and formation in the Arctic. *AGU Fall Meeting*, San Francisco, CA, Dec. 14-18, 2010, poster, Abstract 972225.
  89. **Wasiuta, V.**, Lafreniere, M., Kyser, K.T., Norman, A.L., Mayer, B., Wieser, M. Stable isotopes in alpine precipitation as tracers of atmospheric deposition. *AGU Fall Meeting*, San Francisco CA, Dec. 14-18, 2010. Abstract A41C-1:10.
  90. **Seguin, A.M., Rempillo, O.**, Norman, A.L. Sulfur isotopes of  $\text{SO}_2$  and aerosol sulfate during the onset of Arctic winter. *AGU Fall Meeting*, San Francisco, CA, Dec. 14-18, 2010, poster, Abstract 973452.
  91. Norman, A.L., **Seguin, A.M., Rempillo, O.**, Chang, R., Jostedt, S., Sharma, S., Levasseur, M., Michaud, S., Scarratt, M., Abbatt, J. Ocean-atmosphere interactions: Does life (and death) in the water influence Arctic climate? *Understanding Ecosystems in a Changing World, International Polar Year Conference*, Montreal, QC, Nov. 3-6, 2010 (oral).
  92. Langley, L., Leaitch, R., Levasseur, M., Lohmann, U., Norman, A.L., Shantz, N. Iron fertilization and aerosols: The potential of the SERIES experiment to inform aerosol geoengineering practices. *American Association of Aerosol Research Annual Conference*, Portland, OR. Oct.25-29, 2010. (abs #776 invited, oral).
  93. Norman, A.L., *ENSC Class of 2006-2007*, Staniaszek, P. Do models get it right? Tracking sulfur deposition in complex terrain: Comparing CALPUFF outputs to measurements. *ACE 2010, AWMA meeting*, Calgary, AB. June 21-23, 2010 (oral).
  94. **Rempillo, O., Seguin, M.**, Norman, A.L., Michaud, S., Scarratt, M., Levasseur, M. DMS flux and oxidation over the Canadian Arctic. *International Polar Year Oslo Conference 2010*. 8-12, June, 2010 (withdrawn).
  95. Sharma, S., Chan, E., Ishizawa, M., Toom-Sauntry, D., Norman, A.L., Agnew, T., Gong, S.L., Li, S.M., Quinn, P.K., Bates, T.S., Levasseur, M., Barrie, L.A., Leaitch, R. Impact of ocean ice extent and atmospheric transport on biogenic aerosol sulfur in the Arctic. *NOAA Global Monitoring Conference*, Boulder, CO, May 18-19, 2010.
  96. Scarratt, M., Abbatt, J., Gratton, Y., Leaitch, R., Levasseur, M., Norman, A-L., Rivkin, R., Tremblay, J-E., Xie, X. Canadian Arctic SOLAS (Surface Ocean Lower Atmosphere Study): Climate-active trace gases in seawater, air and ice. *Canadian IPY Early Results Workshop*, Ottawa, ON, Feb. 16-18 Feb. 2010 (oral)
  97. **Seguin, A.M.**, Norman, A.L. Sample artifacts in  $\delta^{15}\text{N}$  and  $\delta^{18}\text{O}$  of nitrate in the atmosphere. *AGU Fall meeting*, San Francisco. CA, Dec. 14-18, 2009. (poster)
  98. **Rempillo, O., Seguin, A.M.**, Norman, A.L. Shipboard measurements of atmospheric DMS and its oxidation products over the Canadian Arctic. *AGU Fall meeting*, San Francisco. CA, Dec. 14-18, 2009. (poster)
  99. Norman, A.L., **Seguin, M., Rempillo, O.**, Sharma, S. Relationship between  $\text{SO}_2$ ,  $\text{SO}_4$ , aerosols and DMS in

- the Arctic atmosphere. *Arctic SOLAS Workshop*, Quebec, QC, Oct. 18-19, 2009. (oral)
100. Norman, A.L., *ENSC Class of 2006-2007*, Staniaszek, P., Tracking cumulative effects from sulfur deposition in the foothills of southern Alberta: An isotope approach. *International Network of Environmental Forensics Conference*, Calgary, AB. Aug. 31- Sept. 2, 2009. (oral)
101. Xie, J., Norman, A.L., Henley, S. and Wieser, M. Sulphur and boron isotope variations to track air pollutant deposition in the Castle River of Southern Alberta, Canada. *International Network of Environmental Forensics Conference*, Calgary, Alberta. Aug. 31- Sept. 2, 2009. (poster - award)
102. Seguin, A.M., Norman, A.L. Isotope fractionation during oxidation of atmospheric sulfur dioxide. *8<sup>th</sup> International Applied Isotope Geochemistry Meeting*, La Malbaie, QC. Aug. 30-Sept. 4, 2009. (oral)
103. Rempillo, O., Seguin, A.M., Norman, A.L. DMS and aerosol sulphate in the Arctic: Apportionment using stable isotopes. *8<sup>th</sup> International Applied Isotope Geochemistry Meeting*, La Malbaie, QC. Aug. 30-Sept. 4, 2009. (poster)
104. F. Mohamed, Seguin, A.M., Norman, A.L. Trends in DMS oxidation products at Saturna Island, British Columbia, Canada. *8<sup>th</sup> International Applied Isotope Geochemistry Meeting*, La Malbaie, QC. Aug. 30-Sept. 4, 2009. (oral)
105. Holden, W., Norman, A.L. Public response to a student study of the feasibility of nuclear power: Distrust of science in a postmodern world. *International Conference on Science in Society*. Cambridge University, UK, Aug. 5-8, 2009. (oral)
106. Wasitua, V., Norman, A.L., and Marshall, S. Seasonal sulfate source contributions to the snowpack of a high Arctic icefield. *MOCA 2009*, Montreal, QC, July 19-29, 2009 J15.9/22208. (poster)
107. Christensen, C., Staniaszek, P., Norman, A.L. Difficulties in air dispersion models for accidental release in the event of a nuclear power plant failure. *AWMA 2009 conference*, Detroit, MI, June 23-26, 2009. (oral)
108. Sharma, S., Chan, E., Leitch, R., Toom-Saunry, D., Chan, D., Barrie, L., Norman, A.L., Agnew, T. Is melting of Arctic Ocean increasing biogenic sulfur in the Arctic - trends in methanesulfonic acid? *Goldschmidt Conference*. Davos, Switzerland, June 21-26, 2009. (oral)
109. Norman, A.L. Climate & aerosols. *NWAPS Meeting*, Portland, Oregon, May 15-17, 2008 (*invited*).
110. Rempillo, O., Seguin, A.M., Norman, A.L. Sources of aerosol sulfate in the Arctic atmosphere. *11<sup>th</sup> Annual Meeting of the PNWS of the American Physics Society*, Vancouver, BC, May 14-16, 2009. (oral)
111. Rempillo, O., Seguin, A.M., Norman, A.L. DMS and aerosol sulfate in the Arctic atmosphere. *CMOS 2008 Congress*, Kelowna, BC, May 25-28, 2008. (poster)
112. Taossi, A., Blanchet, J.P., Norman, A.L., le Clainche, Y., Lévassieur, M. Simulation and analysis of the DMS and sulfate during the C-SOLAS SABINA campaign. *CMOS/CGU Meeting*, Program Abstracts, 001-2DP.4, St. John's, NFL. May 28-Jun. 1, 2007. (poster)
113. Zdanowicz, C., Zheng, J., Fisher, D., Kinnard, C., Marschner, M., Dahl-Jensen, D., Nicholson, L., Sharp, M., Wasitua, V., Norman, A.L., Marshall, S. A new ice-core record from Prince of Wales icefield, Ellesmere Island: Initial results and paleoclimatic significance. *CMOS/CGU Meeting*, Program Abstracts, CO2-1B5.5, St. John's, NFL. May 28-Jun. 1, 2007. (oral)
114. Norman, A.L. A microbial influence on global climate? UofC Spring into UofC plenary lecture, Calgary, AB, Mar. 31, 2007. (*invited*)
115. Norman, A.L. Aerosols, isotopes and their relation to albedo and the Arctic. UofC Chemistry Seminar, Calgary, AB, Mar. 23, 2007. (oral)
116. Seguin, M., Norman, A.L., Wadleigh, M.A., Siau, A., Eaton, S., Pasyar, M. Seasonal influences on DMS oxidation over the NA Ocean. *SOLAS Open Science Conference*, Xiamen, China. Mar. 6-9, 2007. (poster)
117. Norman, A.L., Eaton, S., Wadleigh, M.A., Burridge, C., Seguin, M., Pasyar, M., Siau, A., Sharma, S., Blanchet, J.P., Zaganescu, C., Denman, K., Steiner, N., McFarlane, N., Wong, C.S., Wong, E., Lévassieur, M., Scarratt, M., Michaud, S. DMS oxidation and new aerosol formation: Insights from C-SOLAS. *SOLAS Open Science Conference*, Xiamen, China. Mar. 6-9, 2007. (oral)
118. Norman, A.L. Is it hot in here or is it just me? Calgary Council for Advanced Technology, Calgary, AB. Feb. 7, 2007. (*invited*)
119. Norman, A.L. and Siau, A. Air quality measurements near Calgary. Parkland Airshed Monitoring Zone (PAMZ) workshop. Red Deer, AB. Jan. 31, 2007. (*invited*)
120. Norman, A.L., Wadleigh, M.A., Zaganescu, C., Burridge, C., Eaton, S., Seguin, M., Siau, A., Sharma, S., Lévassieur, M., Scarratt, M., Michaud, S., Leitch, R., Blanchet, J.P., Steiner, N., McFarlane, N. The lifetime of DMS in northern latitudes: Results from four shipboard experiments. *EOS Trans. AGU 87(52) Fall Meeting Abstracts, AGU Fall Meeting*, San Francisco, CA. Dec. 10-15, 2006. (poster)

121. **Seguin, A.M.**, Norman, A.L., Wadleigh, M.A., **Siauw, A.**, **Eaton, S.** Biogenic sulphate, sulphur dioxide, and methansulphonic acid ratios over the North Atlantic. EOS Trans. AGU 87(52) Fall Meeting Abstracts, *AGU Fall Meeting*, San Francisco, CA. Dec. 10-15, 2006.(poster)
122. **Pasyar, M.**, Norman, A.L., **Seguin, A.M.**, Sulphur concentration over the Northwest Atlantic. EOS Trans. AGU 87(52) Fall Meeting Abstracts, *AGU Fall Meeting*, San Francisco, CA. Dec. 10-15, 2006.(poster)
123. **Siauw, A.**, Norman, A.L., Toom-Sauntry, D., Gong, S. The S isotope composition of methanesulfonic acid in Arctic aerosols. EOS Trans. AGU 87(52) Fall Meeting Abstracts, *AGU Fall Meeting*, San Francisco, CA. Dec. 10-15, 2006. (poster)
124. Norman, A.L. and Siauw, A. Air quality measurements in southern Alberta. Alberta Environment, *AQWG*, Edmonton AB. Nov. 15, 2006 (*invited*).
125. Norman, A.L., Wadleigh, M.A., **Burridge, C.**, **Eaton, S.**, **Seguin, M.**, **Siauw, A.**, Sharma, S., Zaganescu, C., Blanchet, J.P., Levasseur, M., Scarratt, M., Michaud, S., Chan, E., Steiner, N., McFarlane, N., Toom-Sauntry, D., Gong, S. Aerosol sulphate from DMS oxidation: A feedback to climate change? Canadian Centre for Climate Modeling and Analysis. Victoria, BC, Sept. 7, 2006 (*invited*).
126. Norman, A.L., Wadleigh, M.A., **Burridge, C.**, **Eaton, S.**, **Seguin, M.A.**, **Siauw, A.**, Shama, S., Levasseur, M., Scarratt, M., Michaud, S., Leitch, R. DMS oxidation to SO<sub>2</sub>, aerosol sulphate and MSA during C-SOLAS and the role of isotope apportionment. *40<sup>th</sup> Canadian CMOS Meeting*, Toronto, ON. May 29-Jun. 3, 2006. (oral)
127. **Seguin, M.A.**, Norman, A.L., Wadleigh, M.A., **Eaton, S.J.**, and Siauw, A. Radiative influences on sulphate, MSA & SO<sub>2</sub> formation via DMS oxidation. *40<sup>th</sup> Canadian CMOS meeting*, Toronto, ON. May 29-Jun. 3, 2006. (poster)
128. **Eaton, S.,J.**, Wadleigh, M.A., Norman, A.L., Source apportionment of SO<sub>4</sub> aerosols & SO<sub>2</sub> during the spring 2003 over the North Atlantic. *40<sup>th</sup> Canadian CMOS meeting*, Toronto, ON, May 29-Jun. 3, 2006. (oral)
129. Norman, A.L., Wadleigh, M.A., **Eaton, S.**, **Burridge, C.**, Zaganescu, C., Blanchet, J.P., Scarratt, M., Michaud, S., Levasseur, M., Merzouk, A., Lizotte, M., Sharma, S., and Leitch, R. DMS and its oxidation over the North Atlantic: Comparison of a top-down and bottom-up approach. *28<sup>th</sup> International Technical Meeting on Air Pollution Modeling and Its Application*. Leipzig, Germany. May 16-20, 2006. (oral)
130. Norman, A.L., and **Sanusi, A.** Air quality measurements during sour gas flaring events in southern Alberta. *AQ 2006 Workshop: Piecing the Puzzle*, Banff, AB. Feb. 14-16, 2006. (*invited*)
131. Norman, A.L., Atmospheric Chemistry *AQ 2006 Training Course: Piecing the Puzzle*. Banff, AB, Feb. 13, 2006 (*invited*)
132. Norman, A.L., Climate change - A human influence? *Meeting of the Calgary Skeptics Society*, Calgary, AB, Dec. 15, 2005. (*invited*)
133. **Wasiuta, V.L.**, Norman, A.L., Marshall, S. Moisture and sulphate sources in snow Prince of Wales Icefield. *Arctic Net Annual Scientific Meeting*, Banff, AB, Dec. 13-17, 2005. (poster)
134. Norman, A.L., **Sanusi, A.**, Toom-Sauntry, D., Gong, S.L., Barrie, L.A. Arctic aerosol biogenic sulphate using isotope apportionment techniques: 1993-2003, *American Geophysical Union Fall Meeting*, San Francisco, CA, Abstract # EOS Trans. 10648, Dec. 5-9, 2005.(poster)
135. **Sanusi, A.**, Norman, A.L., **Burridge, C.A.**, Wadleigh, M.A. The isotope composition of methanesulphonic acid for aerosols over the Pacific Ocean. *American Geophysical Union Fall Meeting*, San Francisco, USA., Abstract # EOS Trans. 10729, Dec. 5-9, 2005. (poster)
136. **Eaton, S.**, **Burridge, C.**, Norman, A.L., Wadleigh, M.A., Sharma, S., Leitch, R. Biogenic sulphate and sulphur dioxide over the North Atlantic: Spring 2003. *American Geophysical Union Fall Meeting*, San Francisco, CA, Abstract # EOS Trans. 10992, Dec. 5-9, 2005. (poaster)
137. **Wasiuta, V.**, Norman, A.L., and Marshall, S. Spatial and seasonal patterns in snowpack sulphate on the POW Icefield, Ellesmere Island. *International Symposium on High-Elevation Glaciers and Climate Records*, Lanzhou, China, Sept. 5-9, 2005. (oral)
138. **Eaton, S.**, Wadleigh, M.A., Norman, A.L. Determining sources of SO<sub>2</sub> and SO<sub>4</sub><sup>2-</sup> over the NW Atlantic using stable sulphur isotopes. *SOLAS International Summer School*, Corsica, France, Aug.29-Sept.10, 2005. (oral)
139. Norman, A.L., Gong, S.L., Toom-Sauntry, D., Barrie, L.A. DMS Oxidation to aerosol SO<sub>4</sub> in the Arctic: An isotope record 1993-2003. *Earth Systems Processes*, Calgary, Canada, # 51-1, 65, Aug. 8-11, 2005. (oral)
140. **Wasiuta, V.**, Norman, A.L., Marshall, S. Spatial and seasonal patterns in snowpack sulphate Canadian Arctic. *Earth Systems Processes*, Calgary, AB, # 52-5, 67, Aug. 8-11, 2005. (oral)
141. Norman, A.L., Characterisation of gaseous pollutants. *Closing Resource Cycles: Options for Gas Treatment. EURO Summer School Programme*, Wageningen, The Netherlands, Jun. 26-Jul.1, 2005 (*invited*).

142. Norman, A.L., M. Varner, **Lim, A.**, Tropospheric Be-7 Concentrations in aerosols from southern Alberta. 2005 *Canadian Association of Physicists Congress*, Vancouver, BC, MOP1010, 79, Jun. 5-8, 2005. (oral)
143. Norman, A.L., Wadleigh, M.A., **Eaton, S.**, Sharma, S., Scarratt, M., Mizouk, A., Lizotte, M., Michaud, S., Levasseur, M. Seasonal variations in atmospheric DMS over the North Atlantic during SABINA. *Sea to Sky, 39<sup>th</sup> CMOS Congress*, Vancouver, BC, 4E5.6, 179, May 31-Jun. 3, 2005. (poster)
144. **Eaton, S.**, Norman, A.L., Wadleigh, M.A. Source apportionment of sulphate aerosols and gaseous sulphur dioxide over the NW Atlantic Using Stable Sulphur Isotopes. *Sea to Sky, 39<sup>th</sup> CMOS Congress*, 4C5.6.,175, Vancouver, BC, May 31-Jun. 3, 2005.(oral)
145. Blanchette, J.P., Zaganescu, C., Levasseur, M., Le Clainche, Y., Shantz, N., Phinney, L., Norman, A.L. Comparative analysis of NARCAM simulations and measurements taken during CSOLAS-SERIES field campaign. *Sea to Sky, 39<sup>th</sup> CMOS Congress*, Vancouver, BC, 4B5.4., 160, May 31-Jun. 3, 2005.
146. Norman, A.L., Global Climate Change: Bogus or not? Lecture, Calgary Rotary Club, Calgary, AB, Apr. 28, 2005 (invited).
147. **Hammer, L., H.E. Maguire, G.O. Pelchat, J.R. Rempel, J.M. Talerico**, A.L. Norman, S in tree rings & conifer needles: An examination of pollutant S impacts in Southern Alberta, Canada. *37<sup>th</sup> Air Pollution Workshop & International Symposium*, Banff, AB, Apr. 25-28, 2005. (poster)
148. Norman, A.L., Gong, S.L., Toom-Sauntry, D., Barrie, L.A. Aerosol sulfate from DMS oxidation in the Arctic: 1993 – 2000. *Gordon Research Conference on Polar Marine Science*, Ventura, CA, Mar. 13-18. (poster)
149. Norman, A.L., Wadleigh, M.A., **Burridge, C., Eaton, S.**, Sharma, S. Ocean biota and their influence on the global radiation budget. *Contemporary Physics Colloquium* University of Lethbridge, Lethbridge AB, Mar. 3, 2005 (invited)
150. Rock, L., Ellert, B.H., Mayer, B., Norman, A.-L. Natural abundance N & O isotope ratios of nitrous oxide from agricultural soils in southern Alberta (Canada), *ASA-CSSA-SSSA-CSSS Annual Meetings*, Seattle, WA, Oct. 31 to Nov. 4<sup>th</sup>, 2004. (oral)
151. Norman, A.L. and Wadleigh, M.A., Isotope abundance ratios as pollutant tracers in a source apportionment model, *27<sup>th</sup> International Technical Meeting on Air Pollution Modeling and Its Application*, Banff, AB, Oct. 24-29, 2004. (oral)
152. **Sanusi, A.**, Norman, A.L., **Burridge, C.**, Wadleigh, M.A., Tang, W. The isotope composition of methane sulphonic acid, *SOLAS International Meeting*, Halifax, NS, Oct. 13-16, 2004. (oral)
153. **Eaton, S.** Wadleigh, M.A., Norman, A.L. Source apportionment of sulphate aerosols and sulphur dioxide using stable sulphur isotopes. *SOLAS International Meeting*, Halifax, NS, Oct. 13-16, 2004. (oral)
154. Norman, A.L., and the **ENSC 502 Class of 2003-2004**. Impacts of airborne pollution from the sour gas industry on southern Alberta, *PTAC Meeting*, Calgary, AB, Canada, Sept. 30, 2004. (invited).
155. Norman, A.L., K. Anlauf, K. Hayden, B. Thomson, J. Brook, S. M Li, J. Bottenheim. Biogenic sulphate in PM<sub>2.5</sub>: Results from a field campaign on Canada's west Coast, *American Geophysical Union Meeting*, Montreal, QC, May 17-22, 2004. (oral)
156. Wadleigh, M., **Burridge, C.**, Norman, A.L., Scarratt, M., Levasseur, M., Sharma, S. Atmospheric DMS and sea air flux. *C-SOLAS Atlantic Workshop*, McGill University, Montreal, QC, May 11-12, 2004. (oral)
157. **Eaton, S.**, Norman, A.L., Wadleigh, M. Distinguishing biogenic from anthropogenic aerosols over the NA using S stable isotopes. *C-SOLAS Atlantic Workshop*, McGill, Montreal, QC, May 11-12, 2004. (oral)
158. Norman, A.L., Wadleigh, M.A., **Burridge, C.** and Sharma, S. Sulphur dioxide, aerosol sulphate and methanesulphonic acid during SERIES *ASLO Meeting*, Hawaii, Feb. 15-20, 2004. (oral)
159. Wadleigh, M., **Burridge, C.**, Norman, A.L., Sharma, S. Trends in atmospheric dimethylsulphide during SERIES. *ASLO Meeting*, Hawaii, Feb. 15-20, 2004. (oral)
160. **Bradley, C.E.**, Norman, A.L., M.W. Wieser Use of sulphur and boron isotopes to identify natural gas processing emissions, *American Geophysical Union Meeting*, San Francisco, CA, Dec. 12-18, 2003. (poster)
161. Norman, A.L., Wadleigh, M.A., **Burridge, C.**, and Sharma, S. Ocean atmosphere exchange: Do critters control global climate? University of Calgary Biogeoscience Seminar, Calgary AB, Dec. 4, 2003 (invited).
162. Norman, A.L., Krouse, H.R., **MacLeod, J.M.** Apportionment of pollutant sulphur in an urban airshed: Calgary, Canada, a case study. Proceedings: *26<sup>th</sup> International Technical Meeting on Air Pollution Modelling*. Istanbul, Turkey, May 26-30, 2003. (oral)
163. Norman, A.L., Wadleigh, M., **Burridge, C.**, Sharma, S. Sulphur dioxide, aerosol sulphate and methanesulphonic acid during SERIES. *Canadian Meteorological and Ocean Sciences Meeting (CMOS)*, Ottawa, ON, Jun. 2-5, 2003. (oral)
164. Wadleigh, M., **Burridge, C.**, Norman, A.L., and Sharma, S. Trends in atmospheric dimethylsulphide during

- SERIES. *CMOS Meeting*, Ottawa, Ontario, Jun. 2-5, 2003.(oral)
165. **Comis, T.L.**, Norman, A.L., Huang, L., Rudolph, J. Source apportionment and quantification of organic pollutants from sour gas facilities in Alberta, Canada. *Canadian Institute for Chemistry Conference (CIC)*, Ottawa, ON, Aug. 18-22, 2003. (poster)
166. **Bradley, E.**, Norman, A.L., Wieser, M. Use of S and B isotopes to identify natural gas processing emission sources. *American Geophysical Union Meeting (AGU)*, San Francisco, CA, Dec. 8-12, 2003. (poster)
167. Huang, L., Tans, P., Higuchi, K., Shashkov, A., Norman, A.L., White, J., Chan, D., Worthy, D. Regional impact of terrestrial ecosystems on C cycle, *AGU Meeting*, San Francisco, CA, Dec. 8-12, 2003. (poster)
168. Norman, A.L., Belzer, W., Barrie, L.A., and Wang, D. Sulphate in PM<sub>2.5</sub>: Results from the Pacific 2001 field campaign. *American Geophysical Union Meeting*, San Francisco, CA, EOS Trans. AGU 83(47) A61-A-0068. Dec. 6-10, 2002. (poster)
169. Norman, A.L., Chen, J., Huang, L., Ernst, D., Chivalescu, A., Shashkov, A., Higuchi, K., Chan, D. Carbon balance estimation at Fraserdale, Canada: Measurement and modeling of soil CO<sub>2</sub> respiration. *Stable Isotopes and Biosphere-Atmosphere Interactions*, Banff, AB, May 12-14, 2002. (poster)
170. **Comis, T.**, Norman, A.L., Huang, L., Rudolph, J. Non-methane hydrocarbons downwind of sour gas processing facilities. *Canadian Geophysical Union Meeting*, Banff, AB., May 18-22, 2002. (poster)
171. Norman, A.L., Primary versus secondary sulphate in PM 2.5: What the S and O isotopes reveal. *Pacific 2001 Workshop*, Vancouver, BC, May 30-31, 2002. (invited)
172. Norman, A.L., Belzer, W., Barrie, L. Atmospheric sulphur and isotopic indicators: a source apportionment study in the Vancouver region. *Canadian Society for Chemistry Meeting*, Vancouver, BC, Jun. 1-5, 2002.
173. Norman, A.L., and the *ENSC 502 Class of 2000-2001*. Air quality downwind of sour gas processing and flaring operations at two sites west of Calgary, Alberta. *Toxic Substances Research Initiative Workshop*, Calgary, AB, Sept. 28-29, 2001. (invited)
174. Norman, A.L. Atmospheric sulphur and isotopic indicators: a source apportionment study in the Vancouver region. *Canadian Association of Physicists Conference*, Victoria, BC, Jun. 17-20, 2001. (oral)
175. Norman, A.L., A technique to identify and quantify NMHC emissions from individual oil and gas reservoirs: an update. *Petroleum Technology Alliance Canada Forum*, Calgary, AB, Jan. 31, 2001 (invited).
176. Norman, A.L., A technique to identify and quantify NMHC emissions from oil and gas reservoirs. *Canadian International Petroleum Conference*, Calgary, AB, Jun. 4-8, 2001, contribution # 2000 100 (invited).
177. Norman, A.L., Rudolph, J., Czuba, E., Ernst, D., Huang, L., Blanchard, P., Krouse, H.R. Source apportionment of aerosols and volatile organic compounds. *GeoCanada 2000-The Millenium Geoscience Summit*, Calgary, AB, May 29- Jun. 2, 2000 (poster and oral).
178. Czuba, E. Rudolph, J., v. Czapiewski, K., Norman, A.L, Huang, L., Ernst, D. Isotopic fractionation effects for the reaction of isoprene with OH-radicals and the potential use to study its atmospheric oxidation. *AGU Fall Meeting*, San Francisco CA, Dec. 13-17, 1999. (poster)
179. Norman, A.L., Atmospheric trace gases and aerosols: isotopes as indicators of anthropogenic influence? *Isotope Research Seminar Series*. The University of Calgary, Calgary AB, Nov.26, 1999. (oral)
180. Norman, A.L., Hopper, J.F., Rudolph, J., Ernst, D., Czuba, E., and Kieser, B. Variability in the C isotope composition of selected VOCs in an urban environment. *Applications of Stable Isotope Techniques to Ecological Studies*, Saskatoon, SK, Apr. 20-22, 1998. (oral)
181. Czuba, E., Thompson, A., Kieser, B., Rudolph, J., Norman, A.L., Ernst, D. Isotopic composition of volatile organic compounds in the atmosphere and characterisation of sources and air masses. *American Geophysical Union Fall Meeting*, San Francisco CA, Dec. 6-10, 1998. (poster)
182. Kieser, B., Rudolph, J., Czuba, E., Norman, A.L., Ernst, D. Use of isotopic composition of volatile organic compounds in the atmosphere by GC-CF-IRMS: Technical challenges and potential benefits. *The 5<sup>th</sup> Continuous-Flow Isotope Ratio Mass Spectrometry Workshop*. Ottawa, ON, Aug. 16-19, 1998 (invited).
183. Norman, A.L., Blanchard, P., Hopper, J.F., and Ernst, D. CF-IRMS analysis of carbonaceous gases and aerosols in the atmosphere. *Carrefour in Earth Sciences*, Quebec, QC, May 18-20, 1998. (oral)
184. Norman, A.L., Rudolph, J., Czuba, E., Ernst, D., Hopper, J.F., Kieser, B. Isotopic characterisation of atmospheric volatile organic compounds (VOC) by gas-chromatography-mass-spectrometry- isotope ratio mass spectrometry. *American Geophysical Union Spring Meeting*, Boston, MA, Sept. 8-12, 1998. (oral)
185. Norman, A.L., Allison, C.E., Hopper, J.F., and D.E. Ernst. A preliminary inter-comparison of stable isotope measurements for CO<sub>2</sub> from flask samples at Alert. *5<sup>th</sup> International Carbon Dioxide Conference*, Cairns, Australia, Sept. 8-12, 1997. (oral)
186. Norman, A.L., Hopper, J.F., Blanchard, P., and D. Ernst. The stable carbon isotope composition of

- atmospheric PAHs and n-alkanes. *6<sup>th</sup> International Conference on Carbonaceous Particles in the Atmosphere*, Vienna, Austria, Sept. 22-24, 1997. (oral)
187. Norman, A.L. and Hopper, J.F. Isotopic composition of atmospheric CO and CO<sub>2</sub>: indicators of carbon cycling *Biogeomon '97, Sponsored by Villanova University and the Czech Geological Survey*, Villanova University, PA, Jun. 21-25, 1997 (invited)
188. Norman, A.L. Hopper, J.F., Ernst, D.E. The C and O isotope composition of atmospheric CO, CO<sub>2</sub> and organic aerosols. *Water and Climate Studies in Canada Using Isotope Tracers: Past, Present, Future*. Waterloo, ON, Jan. 31-Feb. 1, 1997 (invited).
189. Norman, A.L. J.F. Hopper, Ernst, D.E. A comparison of three methods for extracting CO<sub>2</sub> from air for stable isotope measurements. *The 3<sup>rd</sup> Canadian Continuous-Flow Isotope Ratio Mass-Spectrometry Workshop*. Saskatoon, SK, Sept. 9-11, 1996. (oral)
190. Norman, A.L., H.R. Krouse, Giesemann, A., S Isotope fractionation during S mineralization in a Black Forest soil: Results of an incubation-extraction experiment. *Western Pacific American Geophysical Union Meeting*, Brisbane, Australia, Jul. 23-27, 1996. (oral)
191. Hopper, J.F. and A.L. Norman. Analysis of aerosol black carbon events in the Arctic and at a mid-continental site. *Western Pacific American Geophysical Union Meeting*, Brisbane, Australia, July 23-27, 1996. (oral)
192. Norman, A.L., H.R. Krouse, Giesemann, A. Application of a method for microgram sulphur isotope analysis to a study of fractionation during S mineralisation in forest soil. *The 5<sup>th</sup> Annual Meeting of the Canadian Chapter of the International Isotope Society*, Toronto, ON, May 16-17, 1996 (invited).
193. Hopper, J.F., Norman, A.L. Ernst, D.E. Development of a method for determination of the stable isotope composition of carbon dioxide in air samples. *5<sup>th</sup> Annual Meeting of the Canadian Chapter of the International Isotope Society*, Toronto, ON, May 16-17, 1996 (invited).
194. Norman, A.L., Applications of stable isotope techniques to atmospheric S transport. Canadian Meteorological Service noon hour colloquium, Toronto, ON, Jan. 18, 1996 (invited).
195. Hopper, J.F., Norman, A.L., Ernst, D.E., CARD stable isotope laboratory. *Directions in Climate Measurement Research Workshop*. Atmospheric Environment Service, Downsview, ON, Dec. 10-11, 1996.
196. Norman, A.L. Inorganic Sulphur Analysis by CF-IRMS. *4<sup>th</sup> Canadian CF-IRMS and GC/Combustion workshop*. Toronto, ON, Sept. 10-12, 1995 (invited).
197. Norman, A.L. and H.R. Krouse Reaction of SO<sub>2</sub> with snow: stable isotope evidence. *78<sup>th</sup> Conference and Exhibition for the Canadian Society for Chemistry*, University of Guelph, ON, May 29-June 1, 1995. (oral)
198. Norman, A.L. and H.R. Krouse Stable Isotope Mass Spectrometry of µg quantities of S. *78<sup>th</sup> Conference and Exhibition for the Canadian Society for Chemistry*, University of Guelph, Guelph, ON, May 29-Jun. 1, 1995.
199. Norman, A.L. and H.R. Krouse. Fractionation during sulphur mineralization in two Black Forest Soils. *2<sup>nd</sup> Isotope Workshop*, Lublin, Poland, May 28, 1994. (oral)
200. Norman, A.L. Atmospheric sulphate in snow near a sour gas processing plant, Crossfield, Alberta. *Workshop on Recognition of Sulphate of Industrial Derivation in Groundwater*, Calgary, AB, Mar. 10, 1994. (oral)
201. Norman, A.L. Stable isotope analysis of microgram quantities of sulphur. *Workshop on Recognition of Sulphate of Industrial Derivation in Groundwater*, Calgary, AB, Mar. 10, 1994. (oral)
202. Norman, A.L., Krouse, H.R., Giesemann, A., Jäger, H-J. Investigation of stable sulphur isotopes in sulphate from a Black Forest soil incubation-extraction experiment. *CEC/IFURO symposium on Nutrient Uptake and Cycling in Forest Ecosystems*, Halmstad, Sweden, Jun. 7-10, 1993. (oral)
203. Norman A.L., and H.R. Krouse Long range transport of atmospheric sulphur to Bermuda, *Canadian Geophysical Union Meeting*, Banff, AB, May 9-11, 1993. (oral)
204. Norman, A.L. and H.R. Krouse The isotope composition of atmospheric sulphate near sour (H<sub>2</sub>S rich) gas processing facilities in Alberta, Canada. *First International Symposium on Applied Isotope Geochemistry (AIG-1)*, Geiranger, Norway, Aug. 29-Sept. 3, 1993. (oral)
205. Norman, A.L., Wieser, M., Krouse, H.R., Giesemann, A. Isotope abundance measurements of microgram quantities of sulphur. *First International Symposium on Applied Isotope Geochemistry (AIG-1)*, Geiranger, Norway, Aug. 29-Sept. 3, 1993. (oral)
206. Norman, A.L., Giesemann, A., Jäger, H-J., Krouse, H.R. A study of sulphur mineralization in organic soil horizons: A batch experiment. *Workshop for Sulphur Transformations in Soil Ecosystems*, Saskatoon, SK, Nov. 5-7, 1992. (oral)
207. Giesemann, A., Jäger, H-J., Norman, A.L., H.R. Krouse On-line analysis of S-isotope distributions in small samples. *Workshop for Sulphur Transformations in Soil Ecosystems*, Saskatoon, SK, Nov. 5-7, 1992. (oral)
208. Norman, A.L. Stable isotope studies of atmospheric sulphur: a comparison of Alberta, Canada and Bermuda.

- Isotope Workshop*, Lublin, Poland, May 20-22, 1992. (oral)
209. Norman, A.L. and H.R. Krouse Stable isotope studies of atmospheric sulphur: Comparison of Calgary, Canada and Bermuda. *9<sup>th</sup> World Clean Air Congress*, Montreal, QC, Aug. 30-September 4, 1992. (oral)
210. Norman, A.L. The isotopic composition of atmospheric sulphur at Bermuda and Alberta, Canada., *Physics and Astronomy Colloquium*, Calgary, AB, Nov. 22, 1991. (oral)
211. Norman, A.L. and H.R. Krouse The isotopic composition of atmospheric sulphur on Bermuda. *American Geophysical Union Spring Meeting*, Baltimore, MA, May 28-31, 1991. (oral)
212. Norman, A.L. and H.R. Krouse Stable isotope studies of atmospheric S at Calgary and Crossfield, Alberta, Canada. *38<sup>th</sup> Pacific NW American Geophysical Union Meeting*, Tricities, WA, Sept. 18-20, 1991. (oral)
213. Norman, A.L. and H.R. Krouse Stable isotope studies of atmospheric sulphur and vegetation in Bermuda. *AEROCE Meeting*, Miami, FL, Sept. 15-16, 1989. (oral)

### **Professional Memberships/Development/Expertise**

Canadian Association of Physicists  
 Canadian Meteorological & Oceanographic Society  
 Canadian Geophysical Union  
 Chemical Society of Canada  
 American Geophysical Union

- CALPUFF Modeling: General Course, instructors J. Godfrey & J. Scire, Feb.12-16, 2007, MRC Calgary
- CALPUFF Modeling: Advanced Topics, instructors J. Godfrey & J. Scire, Feb. 17-18, 2007, MRC Calgary
- Expert Witness, Energy and Utilities Board Hearing on Sour Gas Well development in southern Alberta, September, 2007.
- Expert Witness, Energy Resources and Conservation Board Hearing on Sour Gas and Pipeline development in southern Alberta, October 2010.
- Expert Witness, Energy Resources and Conservation Board Hearing on Emissions from Heated Oil Tanks in northern Alberta, February 9, 2011.
- CMOS 2014 organizing committee member
- ACE 2010 organizing committee member
- CPANS 2013-on, Student Chapter Faculty Advisor
- Panel Member, BC Oil and Gas Data workshop Nov. 27-28, 2013
- Committee Member, Technical Advisory Group for Northeastern BC Air Quality Monitoring Project Phase II, Nov. 2014 – July 2016.



## David W. Mayhood

Aquatic Ecologist

<email address removed>

<https://www.fwresearch.ca>

### *Education*

M.Sc. Limnology 1978, University of Calgary

B.Sc. Honours Zoology 1969, University of Calgary

Graduate research projects: Production of trout and their food supplies in Alberta mountain lakes (thesis research); population dynamics of the zooplankton organism *Leptodiatomus sicilis* in four mountain lakes

### *Continuing Professional Development, Specialized Courses*

**Wildland Hydrology** Silva Forest Foundation, Slocan Park, British Columbia 1994

### *Professional Experience*

since 1981: Principal & President, FWR Freshwater Research Limited, Calgary

1979-1981: Senior Biologist, Aquatic Environments Limited, Calgary

1974-1978: Contract Biologist, Canadian Wildlife Service/Parks Canada (Banff National Park), Calgary, and graduate work, University of Calgary

1970-1973: Fisheries Technician & Project Biologist, Canadian Wildlife Service/Parks Canada, Calgary

1967-1969: Summer Research Assistant, Fisheries Research Board of Canada (Experimental Lakes Area, NW Ontario); Canadian Wildlife Service/Parks Canada, Calgary

### *Professional Memberships & Affiliations*

American Association for the Advancement of Science, American Fisheries Society, Ecological Society of America, International Society of Limnology, Society for Freshwater Science, Society for Conservation Biology, Society of Canadian Limnologists, Canadian Society of Zoologists

### *Honours*

Wilderness Defender Award, Alberta Wilderness Association, 23 November 2018.

<https://albertawilderness.ca/about-us/alberta-wilderness-defenders-awards/>

[https://albertawilderness.ca/wp-content/uploads/2018/10/20180900\\_archive\\_awa\\_wla-1.pdf](https://albertawilderness.ca/wp-content/uploads/2018/10/20180900_archive_awa_wla-1.pdf)

### *Areas of Special Interest*

- Ecology and conservation biology of western Canadian fishes, with emphasis on mountain trout
- Ecology and natural history of mountain lakes, streams and their watersheds
- Zoogeography and ecology of fishes, zooplankton and benthic invertebrates in lakes and streams of western Canada
- Aquatic biomonitoring and impacts of pipelines, oil & gas wells, roads, railways, strip mines, extraction plants, dams and agriculture on freshwater ecosystems

### *Representative Projects*

*Current Project: Alberta Wilderness Association, funded by Bow River Basin Council*

Independent researcher: Sediment loading to selected streams in the McLean Creek ATV area. With University of Calgary Environmental Science student Logan Boyer, identifying the principal sources of total suspended sediment (TSS) to Elbow River tributaries Silvester, McLean, Quirk, and Connop creeks; assessing the relative importance of each to sediment loading and fish habitat in those creeks; quantifying the TSS loading to the Elbow River from the creeks, and to the total TSS load in the Elbow River.

*Alberta Sustainable Resource Development, Fisheries & Oceans Canada*

Consulting Biologist: contributed 2 reviews as background references to the provincial recovery plan for threatened westslope cutthroat trout; coauthored background paper and recovery potential assessment for federal recovery program; developed reference parameters for headwater stream stocks of native cutthroat trout; contributed a conceptual framework and guidelines for westslope cutthroat trout recovery in Alberta

*Watershed analysis 1996-present – various clients*

Consulting Biologist: Analyzed ecosystem risks in 105 small watersheds in southwestern Alberta; recommended changes in land use and management to correct identified problems.

*Yellowstone to Yukon Conservation Initiative*

Consulting Biologist: Compiled information and prepared a technical report on the distribution and conservation status of the fishes of the Y2Y biogeographic region.

*Canadian Parks Service, Banff & Jasper National Parks*

Consulting Biologist: in-depth review and analysis of the regulatory and conceptual background for fish conservation and management in Canadian national parks; survey of fish conservation and management in North American parks and reserves; analysis of the origin, history and status of native fish stocks of JNP and BNP; draft of a fish management plan for JNP based on these studies.

*Canadian Wildlife Service/Parks Canada*

Project Biologist: eight years of research and management work on aquatic ecology and fisheries in the national parks of western Canada

- 3-year biophysical survey of lakes, streams and fish populations in the Lake Louise area of Banff National Park, Alberta, including habitat morphometry and hydrology, water chemistry, planktonic primary productivity (radiocarbon studies), zooplankton, benthic invertebrates, macrophytes, fish, estimates of fish food organism production, estimates of potential trout production based on the food supply; developed a fisheries management plan based on the estimates.
- 2-year biophysical survey of lakes and streams in southern Prince Albert National Park, Saskatchewan
- fishery management activities in the prairie national parks over a five-year period as a fisheries technician and biologist, including trapping, spawn-taking, marking, field hatchery operations, fry planting, population monitoring and analysis, creel census operation and analysis, and program evaluation

*Clients: Denison Mines Ltd., Petro-Canada*

Biologist & Project Biologist: baseline studies of Rocky Mountain streams in British Columbia's North-East Coal Block as a basis for assessing the potential impact of coal strip mining on fish and their habitats

*Client: Canadian Hunter Exploration Limited*

Project Biologist: baseline study of stream habitats and fish populations; assessment of potential impacts of gas pipeline construction on fish populations and fish habitat in the foothills region near Grande Prairie, Alberta; monitoring of stream crossings during installation.

*Clients: Alberta Wilderness Association, Diamond Hitch Outfitters, Beaver Mines Area Landowners Group, Rocky Mountain Ecosystem Coalition, other NGOs*

Expert witness: testimony on fishes and their habitats in the Rocky Mountain and Plains ecoregions at 10 public hearings on feedlot, pipeline, well licence, coal mine and dam applications before federal and provincial regulatory boards.

### ***Ongoing Self-directed Studies***

Studies of sediment delivery from roads and off-highway vehicle trails, chemistry of mountain waters, mountain stream temperatures, trout growth in mountain lakes, native cutthroat trout, mountain spring fauna

### ***Specialized Analytical Services***

- expert identification and sample analysis services on fish, benthic invertebrates and zooplankton organisms from throughout northwestern North America — numerous contracts with Environment Canada, Alberta Environment, Alberta Forestry, Lands and Wildlife, and several environmental consulting companies.
- computerized statistical analysis of salary data, analysis of student distribution data for the University of Calgary Faculty Association

### ***Teaching***

#### **University of Calgary**

##### Environmental Sciences Program

##### Supervised Students

- Logan Boyer: Environmental Science 505; **Road and off-highway vehicle trail total surface erosion and sediment delivery into McLean Creek assessed using the WEPP:Road model.** Research Project in Environmental Science, Environmental Sciences Program, University of Calgary, Calgary, AB. 2017 Fall Term
- Caitlin Gifford: Environmental Science 504; **Natural individual markings for studying fall movements, habitat use and population size in threatened westslope cutthroat trout, *Oncorhynchus clarkii lewisi*.** ENSC 504 Research Project in Environmental Science (unpublished), Environmental Sciences Program, University of Calgary, Calgary, AB. iii+20 p. 2010/2011 Fall/Winter Term. Parts of this work were published by Gifford & Mayhood (2014).
- Heidi Erdle: Environmental Science 504; **Effects of ATV use, cattle grazing, logging and petroleum development on westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) habitat in an Alberta foothills stream.** ENSC 504 Research Project

in Environmental Science (unpublished), Environmental Sciences Program, University of Calgary, Calgary, AB. iii+35 p. 2010/2011 Fall/Winter Term

Environmental Science 401 - Environmental Science Field Course

- August & September 2018: assisted students on stream ecology field course

Environmental Science 401 - Environmental Science Field Course

- September 2017: advised students on stream ecology and trout habitat

Environmental Science 401 - Environmental Science Field Course

- September 2015: advised students on stream ecology and trout habitat

Environmental Science 502 - Special Problems in Environmental Management, Guest lectures

- November 2011: *Green Science in a brown world: Interpretation hazard in value-based science*
- February 2011: *Bullshit in environmental science* An application of Harry Frankfurt's 2005 philosophical analysis to the field (Frankfurt, H. 2005. On bullshit. Princeton University Press, Princeton, NJ. 67 p.)
- January 2010: *Atmospheric, aquatic and terrestrial waste disposal: Issues for inland fish populations*
- November 2007: *Fish population loss, habitat damage and watershed degradation in southwestern Alberta, 1885 - 2007*
- December 2006: *Degradation of fish populations and their habitats in southwestern Alberta, 1885 - 2006*

Department of Biology

Biology 200 - Introductory Biology

1969: Teaching Assistant

**Mount Royal College, Calgary**

Department of Chemical, Biological and Environmental Sciences

Biology 1219 - Limnology

September to December 1989: As a sabbatical replacement instructor, developed, prepared and taught a credit lecture and field/laboratory course (6 hours weekly) required for the college's 2-year diploma in Environmental Technology/Water Pollution Studies.

various dates, 1988-96: guest lectures, lab and field instruction in aquatic ecology

## **Southern Alberta Institute of Technology, Calgary**

Guest lectures on watershed ecology to Environmental Technology students

- December 2008, November 2009: *Some effects of human development on watersheds: Problems and solutions*

## ***Related Volunteer Activities***

- Timberwolf Wilderness Society founding director, 2012 - present; President 2018-2019; Director 2019-2021
- Rocky Mountain Ecosystem Coalition founding director and treasurer, 1993 - 1999
- Alberta Wilderness Association Director 1991-92, 1978-79
- Organizer, Wild Rivers Forum, Alberta Wilderness Association Provincial Conference 1978
- Alternate Member, Public Advisory Committee of the Environment Council of Alberta 1978-79
- donated professional services (e.g., technical studies and advice, written and oral technical submissions to regulatory bodies, popular-style articles on fish conservation, computer consulting), various public interest groups including Timberwolf Wilderness Society, Friends of Mount Backus, Yellowstone to Yukon Conservation Initiative, Bragg Creek Environmental Coalition, Canadian Parks and Wilderness Society, Rocky Mountain Ecosystem Coalition, Alberta Wilderness Association, Speak Up for Wildlife Foundation, Trout Unlimited Canada and American Wildlands

## ***Publications and Reports***

### ***Technical Publications (Peer-reviewed)***

Fluker, S. C., and D. W. Mayhood. 2020. Environmental stewardship of public lands? The decline of westslope cutthroat trout along the eastern slopes of the Rocky Mountains in Alberta. *Public Land & Resources Law Review* 42:39-79. <https://scholarship.law.umt.edu/plrlr/>. Temporarily also available online at: [https://www.researchgate.net/publication/342978970\\_Environmental\\_Stewardship\\_of\\_Public\\_Lands\\_The\\_Decline\\_of\\_Westslope\\_Cutthroat\\_Trout\\_along\\_the\\_Eastern\\_Slopes\\_of\\_the\\_Rocky\\_Mountains\\_in\\_Alberta](https://www.researchgate.net/publication/342978970_Environmental_Stewardship_of_Public_Lands_The_Decline_of_Westslope_Cutthroat_Trout_along_the_Eastern_Slopes_of_the_Rocky_Mountains_in_Alberta)

Mayhood, D.W., M. D. Sawyer and W. Haskins. 2004. Historical risk analysis of watershed disturbance in the southern east slopes region of Alberta, Canada, 1910-1996. Pages 23-29 in G.J. Scrimgeour, G. Eisler, B. McCulloch, U. Silins and M. Monita, editors. *Forest-Land Fish Conference – Ecosystem Stewardship through Collaboration*. Proceedings of the Forest-Land-Fish Conference II, 26-28 April 2004, Edmonton, Alberta. x+212 p. <http://www.fwresearch.ca/Library.html>

Sawyer, M. D. and D. W. Mayhood. 1998. Cumulative effects analysis of land-use in the Carbondale River catchment: implications for fish management. pp. 429-444 in M. K. Brewin and D. M. A. Monita, technical coordinators. Proceedings of the Forest-Fish Conference: land management practices affecting aquatic ecosystems, Calgary, AB, May 1-4, 1996. Canadian Forest Service, Northern Forest Centre Information Report NOR-X-356, xiii+533 p. <http://www.fwresearch.ca/Library.html>

Mayhood, D. W. 1998. Is the greater ecosystem concept relevant for conserving the integrity of aquatic ecosystems in the Canadian Rocky Mountains? pp. 772-780. in Munro, N. W. P., and J. H. M. Willison, editors. Linking protected areas with working landscapes — conserving biodiversity. Science and Management of Protected Areas Association, Wolfville, NS. xvii + 1018 p. <http://www.fwresearch.ca/Library.html>

Mayhood, D. W., M. D. Sawyer and W. Haskins. 1998. British Columbia's level 1 watershed assessment procedure as a tool for monitoring potential impacts of development on aquatic ecosystems in Canada's Rocky Mountains. pp. 677-686. in Munro, N. W. P., and J. H. M. Willison, editors. Linking protected areas with working landscapes — conserving biodiversity. Science and Management of Protected Areas Association, Wolfville, NS. xvii + 1018 p. <http://www.fwresearch.ca/Library.html>

Donald, D. B., R. S. Anderson and D. W. Mayhood. 1994. Coexistence of fish and large *Hesperodiaptomus* species (Crustacea: Calanoida) in subalpine and alpine lakes. Canadian Journal of Zoology 72:259-261. doi: 10.1139/z94-035

Donald, D. B., R. S. Anderson and D. W. Mayhood. 1980. Correlations between brook trout growth and environmental variables for mountain lakes in Alberta. Transactions of the American Fisheries Society 109:603-610. doi: 10.1577/1548-8659(1980)109<603:CBBTGA>2.0.CO;2

Herzig, A., R. S. Anderson and D. W. Mayhood. 1980. Production and population dynamics of *Leptodiaptomus sicilis* in a mountain lake in Alberta, Canada. Holarctic Ecology (now Ecography) 3:50-63. doi: 10.1111/j.1600-0587.1980.tb00708.x

### ***Technical Publications (not peer-reviewed)***

Mayhood, D. W. 2014. Guerrilla ecology: Toward an effective strategy for monitoring Alberta's trout streams in a hostile climate. pp. 316-322. in R. F. Carline, and C. LoSapio, editors. Wild Trout IX: Sustaining wild trout in a changing world. Wild Trout Symposium, Bozeman, MT. 392 p. <http://www.wildtroutssymposium.com/proceedings-11.pdf>

Gifford, C. M., and D. W. Mayhood. 2014. Natural marks for identifying individual fish in small populations of at-risk westslope cutthroat trout. pp. 275-281. in R. F. Carline, and C. LoSapio, editors. Wild Trout IX: Sustaining wild trout in a changing world. Wild Trout Symposium, Bozeman, MT. 392 p. <http://www.wildtroutssymposium.com/proceedings-11.pdf>

Cleator, H., J. Earle, L. Fitch, S. Humphries, M. Koops, K. Martin, D. Mayhood, S. Petry, C. Pacas, J. Stelfox, and D. Wig. 2009. Information relevant to a recovery potential assessment of pure native westslope cutthroat trout, Alberta population. Canadian Science Advisory Secretariat Research Document 2009/036. iv+24 p. Available from: <http://www.dfo-mpo.gc.ca/csas/>

Mayhood, D. W. 2007. Fishes of the Yellowstone to Yukon region. Technical Report No. 3, Yellowstone to Yukon Conservation Initiative, Canmore, AB. vi+39 p. Available from: <http://www.y2y.net>

Mayhood, D. W. 2001. Conceptual framework and an action plan for conserving westslope cutthroat trout in Canada (Abstract). p. 265. in M. K. Brewin, A. J. Paul, and M. Monita, editors. Bull Trout II Proceedings: Ecology and Management of Northwest Salmonids. c/o Trout Unlimited Canada, PO Box 6270, Stn. D, Calgary, AB T2P 2C3. <http://www.fwresearch.ca/Library.html>

Mayhood, D. W. 2000. Provisional evaluation of the status of westslope cutthroat trout in Canada. pp 579-585. in L. M. Darling, editor. Proceedings of the Biology and Management of Species and Habitats At Risk, Kamloops, B.C., 15 - 19 Feb. 1999. Ministry of Environment, Lands and Parks, Victoria, BC, and University College of the Cariboo, Kamloops, BC. 974 p. Submitted version: <http://www.fwresearch.ca/Library.html>

Sawyer, M., and D. Mayhood. 1998. Cumulative effects of human activity in the Yellowstone to Yukon. pp. 61-63. in L. Willcox, B. Robinson and A. Harvey, editors. A sense of place: issues, attitudes and resources in the Yellowstone to Yukon Ecoregion. Yellowstone to Yukon Conservation Initiative, 710 Ninth Street, Studio B, Canmore, AB T1W 2V7. 138 p. <http://www.y2y.net>

Mayhood, D. W., R. Ament, R. Walker and W. Haskins. 1998. Selected fishes of Yellowstone to Yukon: distribution and status. pp. 77-91. *in* L. Willcox, B. Robinson and A. Harvey, editors. A sense of place: issues, attitudes and resources in the Yellowstone to Yukon Ecoregion. Yellowstone to Yukon Conservation Initiative, 710 Ninth Street, Studio B, Canmore, AB T1W 2V7. 138 p. <http://www.y2y.net>

Haskins, W., and D. W. Mayhood. 1997. Stream crossing density as a predictor of watershed impacts. Paper 457, Proceedings of the Seventeenth Annual ESRI User Conference, San Diego, CA, July 1997. <http://fwresearch.ca/Library.html>

### ***Peer-reviewed Technical Reports***

Boyer, L., and D. W. Mayhood. 2018. Erosion & suspended sediment delivery from off-highway vehicle trails & roads in the McLean Creek watershed, Alberta. Report prepared for Alberta Wilderness Association, Calgary, AB. Freshwater Research Limited Technical Report No. 2018/06-01. 92 p. Copy for public review available at <https://ln.sync.com/dl/c2311d1d0/744jprc-dynznjaw-g4ydkc5s-67g29dsi>

Mayhood, D. W., W. Haskins and M. D. Sawyer. 1997. Watershed assessment. pp. 43-74. *in* M. D. Sawyer, D. W. Mayhood, P. Paquet, R. Thomas, C. Wallis and W. Haskins. Southern East Slopes cumulative effects assessment. A report by Hayduke and Associates Ltd., Calgary AB, funded by Morrison Petroleum Ltd. Calgary AB. 207p. + appendices. <http://www.fwresearch.ca/Library.html>

Mayhood, D. W. W. Haskins and M. D. Sawyer. 1997. Cumulative effects on fish. pp. 173-187. *in* M. D. Sawyer, D. W. Mayhood, P. Paquet, R. Thomas, C. Wallis and W. Haskins. Southern East Slopes cumulative effects assessment. A report by Hayduke and Associates Ltd., Calgary AB, funded by Morrison Petroleum Ltd. Calgary AB. 207p. + appendices. <http://www.fwresearch.ca/Library.html>

Mayhood, D. W. 1995. Some effects of natural gas operations on fishes & their habitats on Canada's Rocky Mountain East Slopes. Rocky Mountain Ecosystem Coalition Technical Report 95/1:1-35. Reprinted with minor changes 1998. <http://www.fwresearch.ca/Library.html>

Mayhood, D. W. 1992. To keep every cog and wheel: regulatory and conceptual background for managing the fishes of Jasper National Park. Part 1 of a fish management plan for Jasper National Park. Prepared for Canadian Parks Service, Jasper National Park, Jasper, Alberta, by Freshwater Research Limited, Calgary, Alberta. 80 p. <http://www.fwresearch.ca/Library.html>

Mayhood, D. W. 1992. Approaches to managing freshwater fishes in North American parks and reserves. Part 2 of a fish management plan for Jasper National Park. Prepared for Canadian Parks Service, Jasper National Park, Jasper, Alberta, by Freshwater Research Limited, Calgary, Alberta. 118 p. <http://www.fwresearch.ca/Library.html>

Mayhood, D. W. 1992. A preliminary assessment of the native fish stocks of Jasper National Park. Part 3 of a fish management plan for Jasper National Park. Report prepared for the Canadian Parks Service, Jasper National Park, by Freshwater Research Limited. 296 p. + maps. doi: 10.13140/2.1.4015.9044 <http://www.fwresearch.ca/Library.html>

Walder, G. L., and D. W. Mayhood. 1985. An analysis of benthic invertebrate and water quality monitoring data from the Athabasca River. Alberta Environment Research Management Division Report L-91. 254 p. <http://hdl.handle.net/10402/era.23615>

McCart, P. J., and D. W. Mayhood. 1980. A review of aquatic biomonitoring with particular reference to its possible use in the AOSERP study area. Alberta Oil Sands Environmental Research Program (AOSERP) Project WS 3.5. 117 p. <https://era.library.ualberta.ca/downloads/7d278v16p>

Mayhood, D. W. 1980. Zooplankton, pp. 141-162. *in* P. J. McCart, (ed.) Effects of siltation on the ecology of Ya-Ya Lake, N. W. T. Environmental Studies No. 13, Northern Affairs Program, Indian and Northern Affairs Canada, Ottawa. Catalogue No. R71-19/13-1979. 286 p.

### ***Thesis***

Mayhood, D. W. 1978. Production of crustacean plankton, benthic macroinvertebrates and fish in six mountain lakes in Alberta. M.Sc. thesis, Department of Biology, University of Calgary, Calgary, Alberta. 219 p. <http://www.fwresearch.ca/Library.html>



*Conference Papers & Selected Presentations (presenter in bold)*

**Mayhood, D. W.** 2019. Recovering native cutthroats: What they need & what they're getting. FWR Freshwater Research Limited and Timberwolf Wilderness Society presentation to the Fish & Forests Roundtable Workshop, Alberta Wilderness Association, Calgary, AB, 14 June 2019.

Boyer, L., and **D. W. Mayhood**, 2018. Sediment loading from off-highway vehicle trails and roads to McLean Creek and its tributaries. FWR Freshwater Research Limited presentation to Bow River Basin Council Stewardship Forum, High River, AB, 12 December 2018.

**Mayhood, D. W.**, 2018. Clearcuts, linear disturbance, & trout habitat: New ways of thinking about forest-fish issues on Alberta's East Slopes. FWR Freshwater Research Limited presentation to Fish-Forest Roundtable Workshop, Alberta Wilderness Association, Calgary, Alberta, 6 December 2018.

**Boyer, L.**, and **D. W. Mayhood**. 2018. Sediment loading from off-highway vehicle trails and roads to McLean Creek and its tributaries. FWR Freshwater Research Limited presentation to Bow River Basin Council Science Forum, University of Calgary, 2 May 2018.

**Mayhood, D. W.**, and L. Boyer. 2018. Effects of roads & trails on critical habitat of threatened cutthroat trout, Silvester Creek, Alberta. FWR Freshwater Research Limited presentation to Bow River Basin Council Science Forum, University of Calgary, 2 May 2018.

**Mayhood, D. W.** 2018. Recovering Alberta's westslope cutthroat trout to secure status. FWR Freshwater Research Limited presentation to Canadian Council on Freshwater Fisheries Research, Edmonton, Alberta 6 January 2018.

**Mayhood, D. W.** 2017. Recovering Alberta's native trout. FWR Freshwater Research Limited presentation to Fish-Forest Roundtable Workshop 11, Alberta Wilderness Association, Calgary, Alberta, 9 November 2017.

**Mayhood, D. W.** 2017. Roads & OHV trails are destroying east slopes watersheds & streams. FWR Freshwater Research Limited presentation, News conference, Alberta Wilderness Association, Calgary, Alberta, 4 March 2017.

**Mayhood, D. W.** 2015. How much road can we fit on Alberta's eastern slopes? FWR Freshwater Research Limited and Timberwolf Wilderness Society presentation to Eastern Slopes Today & Tomorrow Workshop, Alberta Wilderness Association, Calgary, AB, 4 December 2015.

**Mayhood, D. W.** 2014. Guerrilla ecology: toward an effective strategy for monitoring Alberta's trout streams in a hostile climate. FWR Freshwater Research Limited presentation to Wild Trout XI, September 22-25, 2014. West Yellowstone, MT.

Gifford, C. M., and **D. W. Mayhood**. 2014. Natural marks for identifying individual fish in small populations of at-risk westslope cutthroat trout. University of Calgary B.Sc. Program in Environmental Science, and FWR Freshwater Research Limited presentation to Wild Trout XI Proceedings, September 22-25, 2014. West Yellowstone, MT.

**Mayhood, D. W.** 2014. Not just plumbing: A rationale for rewilding Alberta's rivers. FWR Freshwater Research Limited presentation to Forests, Fish and Floods Forum, Alberta Wilderness Association, Calgary, Alberta, 26 June 2014.

**Mayhood, D. W.** 2014. Watersheds as trout habitat: Sediment loading in Silvester Creek. FWR Freshwater Research Limited and Timberwolf Wilderness Society presentation to Westslope Cutthroat Trout Stakeholders Workshop, Municipal District of Ranchlands Administration Building, 26 February, 2014.

**Mayhood, D. W.** 2008. Cumulative impacts on native trout in Petro-Canada's Sullivan Project area. FWR Freshwater Research Limited presentation on behalf of Alberta Wilderness Association to Alberta Energy Resources Conservation Board hearing in the matter of Petro-Canada's Sullivan Pipeline Application, High River, Alberta, 9 December 2008.

**Mayhood, D.W.**, M. D. Sawyer and W.Haskins. 2004. Historical risk analysis of watershed disturbance in the southern east slopes region of Alberta, Canada, 1910-1996. Forest-Land Fish Conference – Ecosystem Stewardship through Collaboration. April 26-28, 2004, Edmonton, Alberta.

**Mayhood, D. W.** 2002. Ecological thresholds in inland fish populations and catchment ecosystems. Devon Canada Biological Thresholds Workshop, Blairmore, AB, 1 May 2002.

**Mayhood, D. W.** 2000. Westslope cutthroat trout in Canada: apparent status and a conceptual framework for conservation. British Columbia Cutthroat Trout Workshop, Harrison Hot Springs, BC, 3-4 February 2000.

**Mayhood, D. W.** 1999. Provisional evaluation of the status of westslope cutthroat trout in Canada. Paper presented at the Biology and Management of Species and Habitats at Risk Conference, Kamloops, BC, 15-19 February 1999.

**Mayhood, D. W.** 1998. A watershed perspective of environmental risk at pipeline water crossings: incorporating concepts of cumulative ecological damage. Presentation to the Meeting of the Canadian Pipeline Water Crossing Committee, Banff, AB 25-27 November 1998.

**Mayhood, D. W.** 1997. Is the greater ecosystem concept relevant for conserving the integrity of aquatic ecosystems in the Canadian Rocky Mountains? Paper presented at the Science and Management of Protected Areas Association (SAMPA III) Conference, Calgary, AB, May 1997.

**Mayhood, D. W., M. D. Sawyer and W. Haskins.** 1997. British Columbia's level 1 watershed assessment procedure as a tool for monitoring potential impacts of development on aquatic ecosystems in Canada's Rocky Mountains. Paper presented at the Science and Management of Protected Areas Association (SAMPA III) Conference, Calgary, AB, May 1997.

**Haskins, W., and D. W. Mayhood.** 1997. Stream crossing density as a predictor of watershed impacts. Paper presented at the Seventeenth Annual ESRI User Conference, San Diego, CA, July 1997.

**Sawyer, M. D. and D. W. Mayhood.** 1996. Cumulative effects analysis of land-use in the Carbondale River catchment: implications for fish management. Paper presented at the Forest-Fish Conference, Calgary, AB, May 1-4, 1996.

### ***Published Popular Articles***

Mayhood, D. W. 2018. The global extinction crisis, Alberta's native cutthroat trout, and wilderness. *Wild Lands Advocate* 26(4):10-12. <https://albertawilderness.ca/wp-content/uploads/2018/12/December-2018-Advocate-Web.pdf>

Mayhood, D. W. 2015. Thinking about rivers. *Wild Lands Advocate* 23:4-7. <http://albertawilderness.ca/archive/wla-archive/2015-10-00-vol-23-no-5-wild-lands-advocate>.

Mayhood, D. W. 2014. Floods are not a water management problem. *Wild Lands Advocate*. 22(3):11-12. [http://fwresearch.ca/Library\\_files/Mayhood%202014c.pdf](http://fwresearch.ca/Library_files/Mayhood%202014c.pdf)

Mayhood, D. W. 2014. Silvester Creek: Watershed condition, foothills roads, and native trout. *Preserving Our Lifeline* [Newsletter of the Bow River Basin Council] 14(6):6-7. <http://bit.ly/SYdmxG>

Mayhood, D. W. 2008. Exotic fishes in Alberta: paying the price. *Wild Lands Advocate* 16(4):9-11. Available from <http://www.albertawilderness.ca/AWRC/WLA.htm>

Mayhood, D., and C. Olson. 2008. Westslope cutthroat trout assessed as "threatened." *Wild Lands Advocate* 16(2):28. Available from <http://www.albertawilderness.ca/AWRC/WLA.htm>

Mayhood, D. W. 2005. Ottawa's paperless map plot: bad for libraries, bad for people. *CASLIS Special Issues* [newsletter of the Canadian Association of Special Libraries and Information Services]16(4):2-3. <http://www.fwresearch.ca/Library.html>

Mayhood, D. W. 1998. Following Silver City: westslope cutthroat trout in Canada. *On the Wild Side: The Journal of American Wildlands* 9(1):7-8. <http://www.fwresearch.ca/Library.html>

Mayhood, D. W., and M. D. Sawyer. 1997. Yellowstone to Yukon: real or imagined? pp.5-8. *in* B. Robinson and M. Sawyer, editors. *A sense of place: issues, attitudes and resources in the Yellowstone to Yukon bioregion*. Yellowstone to Yukon Conservation Initiative, Canmore, AB. 31 p. Available from: <http://www.y2y.net>

Mayhood, D. W., R. Ament and R. Walker. 1997. Fishes of the Yellowstone to Yukon. pp. 21-23. *in* B. Robinson and M. Sawyer, editors. *A sense of place: issues, attitudes and resources in the Yellowstone to Yukon bioregion*. Yellowstone to Yukon Conservation Initiative, Canmore, AB. 31 p. Available from: <http://www.y2y.net>

Mayhood, D. W. 1997. Do protected areas work? *Research Links* 5(1):15. <http://publications.gc.ca/site/eng/42057/issues.html>

Mayhood, D. W. 1997. How roads kill streams. *Rocky Mountain Ecosystem Coalition Home Page*.

Mayhood, D. W. 1996. Historical transformation of the fish fauna of the central Canadian Rockies. *Research Links* 4(2):21,6. <http://parkscanadahistory.com/series/rl/R61-16-4-2E.pdf>

- Mayhood, D. W. 1995. What good is the Earth? Review of Odum, E. P. 1993. Ecology and our endangered life-support systems. Sinauer Associates, Inc., Sunderland, MA. 301p. Wild Lands Advocate 3(1):18,25.
- Mayhood, D. W. 1994. Protected areas and conservation. Rocky Mountain News 1(1):3.
- Mayhood, D. W. 1992. It was my future: a conversation with Milton Born With A Tooth. Wilderness Alberta 22(1):7-9.
- Mayhood, D. W. 1992. A home without walls: ecological principles and proposals for the Canadian constitution. Wilderness Alberta 22(1):15.
- Mayhood, D. W. 1991. Keeping our eyes on the prize. Environment Network News 18:17.
- Mayhood, D. W. 1989. IJC flattens Flathead mine proposal. Wilderness Alberta 19(2):6.
- Mayhood, D. W. 1989. The case against Cabin Creek coal. Wilderness Alberta 19(2):7-8.
- Mayhood, D. W. 1989. Nudity on the North Fork. Wilderness Alberta 19(2):8.
- Mayhood, D. W. 1989. Restoring the crown. Wilderness Alberta 19(2):9.
- Mayhood, D. W. 1989. Going native: a search for roots among the lower vertebrates. pp. 41-52. Book chapter *in*: Norman, J. G., editor. Fish and tell and go to hell: Alberta flyfishing wisdom. Dirtwater Publications, Calgary. 172 p.
- Mayhood, D. W. 1987. Epitaph for an unknown fish. Wilderness Alberta 17(3):4-5.
- Mayhood, D. W. 1986. Southern Alberta's native trout — are they in trouble? The Riseform 2(2):23-25.
- Mayhood, D. W. 1986. Book review: J. R. Butler and R. R. Maw. 1985. Fishing Canada's mountain parks. Lone Pine Publishing, Edmonton. 125 p. The Riseform 2(1):24-25.

### ***Microcomputer Applications***

Mayhood, D. W., and H. B. N. Hynes. 1987-93. Hynes' Bibliography on the Ecology of Running Waters for MS-DOS. Microcomputer database translated from Macintosh, maintained, enhanced and marketed by FWR Freshwater Research Limited for the software package Q&A 3.0 running on MS-DOS computers. Over 15,000 references and 170+ subject keycodes in 4.3 mb, with 98-page operations manual.

### ***Technical Reports (unpublished)***

- Mayhood, D. W. 2019. Comments on the 2019 proposed recovery strategy & action plan for the Alberta population of westslope cutthroat trout. Freshwater Research Limited report prepared on behalf of Timberwolf Wilderness Society, Pincher Creek, Alberta, for Species At Risk Directorate, Department of Fisheries, Oceans and the Coast Guard, Ottawa, Ontario. FWR Technical Note No. 2019/07-1, iv+29 p. <https://ln2.sync.com/dl/69c601e10/uis7dkrz-bydcy9pe-axuzmnv4-enzd8jgw>
- Mayhood, D. W. 2019. Brief submitted to the Senate Standing Committee on Energy, the Environment and Natural Resources, regarding Bill C-69, specifically the *Impact Assessment Act* provisions. [https://sencanada.ca/content/sen/committee/421/ENEV/Briefs/DaveMayhood\\_e.pdf](https://sencanada.ca/content/sen/committee/421/ENEV/Briefs/DaveMayhood_e.pdf)
- Mayhood, D. W. 2017. Emergency report: Alberta native cutthroat trout populations & critical habitat at risk. Report prepared for Timberwolf Wilderness Society, Pincher Creek, AB, and Alberta Wilderness Association, Calgary, AB. Freshwater Research Limited Technical Note 2017/08-1. iii+32 p. <http://fwresearch.ca/Library.html>
- Mayhood, D. W. 2017. Comments on the Castle Management Plan Revised Draft: Effects on trout & their critical habitats. Report Prepared for Alberta Environment and Parks Edmonton, Alberta on behalf of Timberwolf Wilderness Society Calgary, Alberta. Freshwater Research Limited Technical Note 2017/04-1. 43 p. <http://fwresearch.ca/Library.html>
- Mayhood, D. W. 2016. Overview of alluvial river, riparian, & watershed ecological function, with comments on the effects of gravel mining. Report prepared for Lars Larsen, Fort Assiniboine, Alberta, by FWR Freshwater Research Limited. FWR Technical Note 2016/12-1. 12 p. <https://fwresearch.ca/Library.html>
- Mayhood, D. W. 2015. Upper Silvester Creek sediment source survey 5 August 2013. Freshwater Research Limited Technical Note 2015/10-2. i+40 p. <http://fwresearch.ca/Library.html>

- Mayhood, D. W. 2015. Notes on a proposal to permit off-highway vehicle use in the Castle wilderness parks. Interim report. FWR Freshwater Research Limited Technical Note 2015/10-1. 12 p.
- Erdle, H. and Mayhood, D. W. 2014. Anthropogenic effects on the habitat of a critical population of at-risk westslope cutthroat trout assessed using simple monitoring methods. FWR Freshwater Research Limited Technical Report 2014/06-1. v+17 p. <http://www.fwresearch.ca/Library.html>
- Mayhood, D. W. 2014. Conceptual framework and recovery guidelines for restoring westslope cutthroat trout populations in Alberta. Report prepared on behalf of Timberwolf Wilderness Society for Alberta Fish & Wildlife Division and Fisheries & Oceans Canada. Freshwater Research Limited Technical Report 2014/03-1. xii+90 p. doi: 10.13140/2.1.1931.6809 <http://www.fwresearch.ca/Library.html>
- Mayhood, D. W. 2013. Suspended sediment in Silvester Creek and its potential effects on the westslope cutthroat trout population. Report prepared for Timberwolf Wilderness Society. Freshwater Research Limited Technical Report 2013/07-1. iii+50 p. <http://www.fwresearch.ca/Library.html>
- Mayhood, D. W. 2013. Suspended sediment in Silvester Creek and its potential effects on the westslope cutthroat trout population: Photo appendix. Report prepared for Timberwolf Wilderness Society. Freshwater Research Limited Technical Report 2013/07-1 Appendix. 12 p. <http://www.fwresearch.ca/Library.html>
- Mayhood, D. W. 2012. Reference parameters for headwater stream populations of westslope cutthroat trout in Alberta. Report prepared for Fisheries & Oceans Canada, and Alberta Fish & Wildlife Division. Freshwater Research Limited Technical Report 2012/12-1. Calgary, AB. iii+34 p. <http://www.fwresearch.ca/Library.html>
- Mayhood, D. W. 2012. Cutthroat trout length conversion regressions. Report prepared for Fisheries & Oceans Canada, and Alberta Fish & Wildlife Division. Freshwater Research Limited Technical Note 2012/06-1. Calgary, AB. ii+32 p. <http://www.fwresearch.ca/Library.html>
- Mayhood, D. W. and E. B. Taylor. 2011. Contributions to a recovery plan for westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) in Alberta: distribution, population size and trends. Report prepared for Alberta Fish & Wildlife Division. Freshwater Research Limited Technical Report No. 2011/06-1, Calgary, AB. vi+45 p.+appendix. <http://www.fwresearch.ca/Library.html>
- Mayhood, D. W. 2010. An overview of river ecology and its implications for simplified hydropower approvals in Alberta. Report prepared by Freshwater Research Limited for the Alberta Wilderness Association. 38 p.
- Mayhood, D. W. 2010. Testing the  $H_{60}$  calculations in the 1998 Carbondale basin Interior Watershed Assessment Procedure. Freshwater Research Limited Technical Note 2010/01-1. 12 p. <http://www.fwresearch.ca/Library.html>
- Mayhood, D. W. 2009. Contributions to a recovery plan for westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) in Alberta: Threats and limiting factors. Report prepared for Alberta Fish & Wildlife Division. Freshwater Research Limited Technical Report No. 2009/05-1, Calgary, AB. ix+68 p. <http://www.fwresearch.ca/Library.html>
- Mayhood, D. W. 2008. Watershed assessments for the southern portion of Petro-Canada's Sullivan Field project. Prepared for Big Loop Landowners Group, Longview, AB, by FWR Freshwater Research Limited, Calgary, AB. 10p.
- Mayhood, D. W. 2008. Cumulative human impacts on native trout stocks in relation to Petro-Canada's Sullivan Field development project. Report prepared for Alberta Wilderness Association and Big Loop Landowners Group, by FWR Freshwater Research Limited, Calgary, AB. 19p. including responses to Petro-Canada's information requests. 5 p. + 3 maps.
- Mayhood, D. W. 2004. Fishes of Yellowstone to Yukon: overview. FWR Freshwater Research Limited report to the Yellowstone to Yukon Conservation Initiative, Canmore, AB. 44 p.
- Mayhood, D. W. 2001. Potential effects of a proposed feedlot on fish and their habitats in Onetree Creek and the Red Deer River, Alberta. Report prepared for the Newell Clean County Coalition, Brooks, AB, by FWR Freshwater Research Limited. 18 p. including addendum. <http://www.fwresearch.ca/Library.html>
- Mayhood, D. W., R. Ament and R. Walker. 1997. The fishes of Yellowstone to Yukon: distribution and status. Interim report submitted to the First Conference of the Yellowstone to Yukon Conservation Initiative, Waterton Lakes National Park, AB, 2-5 October 1997. 21 p.

- Mayhood, D. W. 1997. Notes on the proposed Cheviot Mine: effects on biota and their habitats. Submitted to the Cheviot Mine Review Panel on behalf of the Rocky Mountain Ecosystem Coalition. 7 p.
- Mayhood, D. W. 1996. Impact of the proposed Express pipeline on fish populations. Report prepared for the Rocky Mountain Ecosystem Coalition by FWR Freshwater Research Limited, Calgary, AB. 33 p. + map.
- Mayhood, D. W. 1995. The fishes of the Central Canadian Rockies Ecosystem. FWR Freshwater Research Limited Report No. 950408 prepared for Parks Canada, Banff National Park, P.O. Box 900, Banff, AB T0L 0C0. 59 p. <http://www.fwresearch.ca/Library.html>
- Mayhood, D. W., and J. Paczkowski. 1993. Preliminary fall survey of the fishes of the upper Bow River, Banff National Park. Prepared for Banff National Park, Banff, Alberta, by Freshwater Research Limited, Calgary, Alberta. 39 p.
- Mayhood, D. W. 1991. Fishes threatened, vulnerable or of special concern in relation to the Oldman River dam. Oldman River Dam Environmental Assessment Review Panel submission FWR 1-NC-30/11/91, Federal Environmental Assessment Review Office, Panel Secretariat, Suite 1150, 555 West Hastings Street, P.O. Box 12071, Harbour Centre, Vancouver, B.C., by Freshwater Research Limited, Calgary. 50 p.
- Mayhood, D. W. 1991. Managing the fishes of Jasper National Park 1991-2000. Report prepared for the Canadian Parks Service, Jasper National Park, by Freshwater Research Limited. 52 p. + appendix. (draft)
- Mayhood, D. W. 1988. Fisheries and water quality aspects. pp. 19-26. *in* Submission on behalf of the Beaver Mines Area Land Owners Group, intervenors in respect of Energy Resources Conservation Board Application No. 880983, surface location 11-8-6-2-W5M. Submission prepared by Atkinson McMahon Barristers and Solicitors, Calgary. 48 p. + appendix.
- Mayhood, D. W. 1988. Fisheries. Section V.B.2, Concerns of the Alberta Wilderness Association respecting ... ERCB Application - Shell Waterton 6-30-4-1 (Whitney Creek). Intervenor's submission to the Alberta Energy Resources Conservation Board, Calgary, AB. 7 p.
- Mayhood, D. W. 1988. Trout populations and streambed condition in Whitney and Mill creeks, Alberta, July 1988. Report prepared for Alberta Wilderness Association, Calgary, by FWR Freshwater Research Limited. 34 p.
- Mayhood, D. W. 1987. Preliminary investigation of a fish kill at the Bearspaw Country Club trout pond. Report prepared for Bearspaw Country Club, Calgary, Alberta by FWR Freshwater Research Limited. 10 p.
- Mayhood, D. W. 1986. Fisheries. pp. 28-37. *in* Intervenor's submission. Submission of the Alberta Wilderness Association to the Energy Resources Conservation Board in the matter of Shell Canada Ltd. Jutland well application No. 851037. 75 p.
- Mayhood, D. W. 1985. Potential impact of a proposed new highway crossing on fish in Altrude Creek, Banff National Park, and possible mitigation measures. Report prepared for Underwood McLellan Limited, Calgary, by FWR Freshwater Research Limited. 25 p.
- Mayhood, D. W. 1983. Preliminary report on the invertebrates and cutthroat trout of twelve mountain lakes sampled by the Alberta Fish and Wildlife Division, summer 1981 and 1982. Report prepared for Fish and Wildlife Division, Alberta Energy and Natural Resources, Rocky Mountain House, by FWR Freshwater Research Limited, Calgary. 14 p.
- Mayhood, D. W. 1982. Observations on selected stream crossings during installation of the South Wapiti gas gathering system. Report prepared for Western Wildlife Environments Consulting Ltd., Calgary, by FWR Freshwater Research Limited, Calgary. 38 p. + appendix.
- Mayhood, D. W. 1981. Late autumn stream habitats and fish populations in the vicinity of the proposed South Wapiti gas gathering system. Report prepared for Canadian Hunter Exploration Limited, Calgary, by Western Wildlife Environments Consulting Ltd., Calgary. 112 p.
- Horejsi, B. L., D. Mayhood and P. McNichol. 1981. Environmental report, pipeline development and reclamation application for the South Wapiti gas gathering system. Canadian Hunter Exploration Limited report. 83 p + appendix.
- Mayhood, D. W. 1981. An ecological baseline study of Lake Bonavista, Calgary. Report prepared for the Lake Bonavista Homeowners' Association by Aquatic Environments Limited, Calgary. 67 p.

- Mayhood, D. W., R. D. Saunders and P. J. McCart. 1981. Aquatic habitats and fish populations in the vicinity of Petro-Canada's Monkman coal project. Report prepared for Petro-Canada, Calgary, by P. McCart Biological Consultants Limited, Nanaimo, B. C. 163 p.
- Mayhood, D. W., and L. D. Corkum. 1981. Chemical and biological monitoring of muskeg drainage at the Alsands project site. Volume 1: Review of available data on the Muskeg River. Alberta Environment Research Management Division Report OF-37. 76 p. + appendix. <http://hdl.handle.net/10402/era.25523>
- Mayhood, D. W., G. L. Walder, T. Dickson, R. B. Green, D. E. Reid and R. Stushnoff. 1981. Chemical and biological monitoring of muskeg drainage at the Alsands project site. Volume 2: Monitoring and fish studies. Alberta Environment Research Management Division Report OF-38. 247 p. + appendices. <http://hdl.handle.net/10402/era.25542>
- Mayhood, D. W. 1981. Chemical and biological monitoring of muskeg drainage at the Alsands project site. Volume 3: Program evaluation and suggestions for continued monitoring. Alberta Environment Research Management Division Report OF-39. 25 p. + appendix. <http://hdl.handle.net/10402/era.25532>
- Mayhood, D. W. 1980. Aquatic analysis, pp. 79-97. *in* Hardy Associates (1978) Ltd. An evaluation of the twinning of the CNR line in Mount Robson Provincial Park. Report prepared for Canadian National Railways, Edmonton. 107 p + appendices.
- Mayhood, D. W. 1980. Aquatic analysis, pp. 134-168. *in* Hardy Associates (1978) Ltd. An environmental evaluation of the twinning of the CNR line in Jasper National Park. Report prepared for Canadian National Railways, Edmonton. 172 p. + appendices.
- Saunders, R. D., and D. W. Mayhood. 1980. Biological survey of a pond affected by an oil spill near Hussar, Alberta. Report prepared for Sundance Oil (Canada) Limited, Calgary, by Aquatic Environments Limited, Calgary. 21 p.
- Mayhood, D. W., and P. J. McCart. 1980. A design for biological monitoring of aquatic habitats in the Cold Lake area. Report prepared for Esso Resources Canada Limited, Calgary, by Aquatic Environments Limited, Calgary. 62 p.
- McCart, P. J., D. W. Mayhood, M. L. Jones and G. J. Glova. 1980. Stikine - Iskut fisheries studies. Report prepared for British Columbia Hydro and Power Authority, Vancouver, by P. McCart Biological Consultants Limited, Nanaimo, B. C. 136 p.
- Cross, P. M., R. D. Saunders, R. B. Green, D. W. Mayhood and P. J. McCart. 1979. Aquatic habitats and acidification of waters in the vicinity of the Kaybob gas plant. Aquatic Environments Limited report to Hudson's Bay Oil and Gas Limited, Calgary. 163 p.
- Mayhood, D. W. 1979. Zooplankton, pp. 136-161, and benthic invertebrates, pp. 162-195. *in* P. J. McCart (ed.) Limnological and fisheries surveys of the aquatic ecosystems at Esso Resources' Cold Lake lease. Report prepared for Esso Resources Canada Limited, Calgary, by Aquatic Environments Limited, Calgary. 267 p.
- McCart, P. J., and D. W. Mayhood. 1979. Summary of biological data for the Beaver River in the vicinity of Cold Lake. Report prepared for Esso Resources Canada Limited, Calgary, by Aquatic Environments Limited, Calgary. 41 p.
- Den Beste, J., D. Mayhood and S. Olson. 1979. Preliminary fisheries and wildlife investigations of Denison Mines Limited's Belcourt lease. Report prepared for Denison Mines Limited, Vancouver, by Aquatic Environments Limited, Calgary. n. p.
- Mayhood, D. W., and R. S. Anderson. 1977. An introductory bibliography of whole-lake, secondary and fish productivity studies. Canadian Wildlife Service Report, Edmonton. 28 p.
- Mayhood, D. W., and R. S. Anderson. 1976. Limnological survey of the Lake Louise area, Banff National Park. Part 1: General section. Canadian Wildlife Service Report to Parks Canada, Calgary. 81 p.
- Mayhood, D. W., and R. S. Anderson. 1976. Limnological survey of the Lake Louise area, Banff National Park. Part 2: The lakes. Canadian Wildlife Service Report to Parks Canada, Calgary. 273 p. doi:10.13140/2.1.3848.4802
- Mayhood, D. W., R. S. Anderson, D. B. Donald and R. B. Green. 1976. Limnological survey of the Lake Louise area, Banff National Park. Part 3: The streams. Canadian Wildlife Service Report to Parks Canada, Calgary. 90 p.
- Mayhood, D. W., and R. S. Anderson. 1976. Limnological survey of the Lake Louise area, Banff National Park. Part 4: Production estimates and recommendations. Canadian Wildlife Service Report to Parks Canada, Calgary. 76 p.

Mayhood, D. W. 1974. The limnology and fisheries of Prince Albert National Park, Saskatchewan. 80 p. *in* R. E. Scace (ed.) Prince Albert National Park: a literature review. Report prepared for Parks Canada, Calgary, by R. E. Scace and Associates, Calgary. [http://fwresearch.ca/Library\\_files/Mayhood%201974.pdf](http://fwresearch.ca/Library_files/Mayhood%201974.pdf)

Mayhood, D. W., A. H. Kooyman, R. L. Hare and R. D. Saunders. 1973. A limnological survey of some waters in southern Prince Albert National Park, Saskatchewan. Canadian Wildlife Service Report. 101 p. + appendices.

Mayhood, D. W., and R. E. Smith. 1972. Biological sampling on the Bow and Pipestone rivers near Lake Louise, Banff National Park, Alberta. Canadian Wildlife Service Report. 43 p.

Kooyman, A. H., and D. W. Mayhood. 1971. A limnological survey of Chiniki Lake, Alberta. Canadian Wildlife Service Report. 17 p.

### ***Derivative Publications***

Technical publications by corporate authors and others substantially based on my published and unpublished work.

DFO. 2014. Recovery strategy for the Alberta populations of westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) in Canada [Final]. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada, Ottawa, ON. 28 p. [http://publications.gc.ca/collections/collection\\_2014/mpo-dfo/En3-4-182-2014-eng.pdf](http://publications.gc.ca/collections/collection_2014/mpo-dfo/En3-4-182-2014-eng.pdf)

Cove, T., J. E. Earle, L. Fitch, M. Holder, S. Humphries, E. Kulcsar, B. E. Meagher, C. Pacas, M. Percy, S. Petry, S. Rogers, R. Staniland, D. Wig, and L. Winkel. 2013. Alberta westslope cutthroat trout recovery plan 2012 – 2017. Publication No: I/604, Alberta Environment and Sustainable Resource Development, Alberta Species at Risk Recovery Plan No. 28, Edmonton, AB. ix+77 p. <http://srd.alberta.ca/FishWildlife/SpeciesAtRisk/SpeciesAtRiskPublications-WebResources/Fish/documents/SAR-WestslopeCutthroatTrout-RecoveryPlan-A-Mar2013.pdf>

DFO. 2009. Recovery potential assessment of pure native westslope cutthroat trout, Alberta population. Department of Fisheries and Oceans Canadian Science Advisory Secretariat, Science Advisory Report 2009/050. Available from: [www.dfo-mpo.gc.ca/csas](http://www.dfo-mpo.gc.ca/csas)

Anonymous. 2005. The waters of Y2Y. Yellowstone to Yukon Conservation Initiative, Canmore, AB. Map. 1 p. Available from: <http://www.y2y.net>

Mahr, M. 1999. Y2Y aquatics strategy workshop. Flathead Lake Biological Station, MT USA. 20-22 August, 1999. Yellowstone to Yukon Conservation Initiative, 710 Ninth Street, Studio B, Canmore, AB T1W 2V7. 37 p. Available from: <http://www.y2y.net>

Anonymous. 1995. Fish. pp. 23-26. *in* White, C., D. Gilbride, M. Scott-Brown. and C. Stewart. Atlas of the Central Rockies Ecosystem: towards an ecologically-sustainable landscape. Status report to the Central Rockies Ecosystem Interagency Liaison Group (CREILG) prepared by Komex International Ltd., Calgary, AB. ii+49 p.

Pharis, V. 1994. A glacial relict with a preglacial fish assemblage: Tutizzi Lake. *Global Biodiversity* 3(4):26–27.

## ***Appendix – Westslope Cutthroat Trout & Their Critical Habitat: DW Mayhood Projects directly relevant to this application***

For more convenient reference, I have aggregated a list of my work specifically related to the present application here.

### ***Projects in Progress***

#### ***For Timberwolf Wilderness Society***

With University of Calgary's Public Interest Law Clinic lawyer Drew Yewchuk, preparing an analysis of issues with access to information legislation and practice concerning our experiences with documenting conservation management of westslope cutthroat trout by Canadian and Alberta authorities.

Ongoing monitoring of threats and damage to critical habitat and remnant populations of westslope cutthroat trout, Alberta population.

Monitoring and review of environmental assessment documents for the Grassy Mountain mine proposal as they relate to critical habitat of SARA-designated threatened westslope cutthroat trout, and contributions to the IAA-AER joint review panel review of the mine proposal.

#### ***For Alberta Wilderness Association, funded by Bow River Basin Council***

Independent researcher: Assessing sediment loading to selected streams in the McLean Creek ATV area. With Logan Boyer, B.Sc., identifying the principal sources of total suspended sediment (TSS) to Elbow River tributaries Silvester, McLean, Quirk, and Connop creeks; assessing the relative importance of each to sediment loading and fish habitat in those creeks; quantifying the TSS loading to the Elbow River from the creeks, and to the total TSS load in the Elbow River. Silvester Creek is SARA-designated critical habitat for a rare genetically pure population of westslope cutthroat trout that has been affected by industrial and recreational road and trail construction and use, one of the main threats to critical habitat in most of their native range in Alberta.

Accepted proposal and research plan:

FWR. 2017. **Sediment loading to selected streams in the McLean Creek ATV Area**. FWR Freshwater Research Limited research proposal submitted to Alberta Wilderness Association and Bow River Basin Council, Calgary, AB, April 2017. 23 p.+appended resumés & CVs.

First report for public technical review:

Boyer, L., and D. W. Mayhood. 2018. **Erosion & suspended sediment delivery from off-highway vehicle trails & roads in the McLean Creek watershed, Alberta**. Report prepared for Alberta Wilderness Association, Calgary, AB. Freshwater Research Limited Technical Report No. 2018/06-01. 96 p. <https://ln.sync.com/dl/c2311d1d0/744jprc-dynznjaw-g4ydkc5s-67g29dsi>



## **Completed Projects**

### *For Alberta Sustainable Resource Development, Fisheries & Oceans Canada*

Consulting Biologist: contributed 2 technical reviews as background studies to the provincial recovery plan for threatened westslope cutthroat trout; coauthored background paper and recovery potential assessment for federal recovery program; developed reference parameters for headwater stream stocks of native cutthroat trout; on behalf of Timberwolf Wilderness Society, contributed to these agencies a conceptual framework and guidelines for westslope cutthroat trout recovery in Alberta. Reports available as:

- Mayhood, D. W. 2014. **Conceptual framework and recovery guidelines for restoring westslope cutthroat trout populations in Alberta**. Report prepared on behalf of Timberwolf Wilderness Society for Alberta Fish & Wildlife Division and Fisheries & Oceans Canada. Freshwater Research Limited Technical Report 2014/03-1. xii+90 p. doi:10.13140/2.1.1931.6809 <http://www.fwresearch.ca/Library.html>
- Mayhood, D. W. 2012. **Reference parameters for headwater stream populations of westslope cutthroat trout in Alberta**. Report prepared for Fisheries & Oceans Canada, and Alberta Fish & Wildlife Division. Freshwater Research Limited Technical Report 2012/12-1. Calgary, AB. iii+34 p. <http://www.fwresearch.ca/Library.html>
- Mayhood, D. W. 2012. **Cutthroat trout length conversion regressions**. Report prepared for Fisheries & Oceans Canada, and Alberta Fish & Wildlife Division. Freshwater Research Limited Technical Note 2012/06-1. Calgary, AB. ii+32 p. <http://www.fwresearch.ca/Library.html>
- Mayhood, D. W. and E. B. Taylor. 2011. **Contributions to a recovery plan for westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) in Alberta: distribution, population size and trends**. Report prepared for Alberta Fish & Wildlife Division. Freshwater Research Limited Technical Report No. 2011/06-1, Calgary, AB. vi+45 p.+appendix. <http://www.fwresearch.ca/Library.html>
- DFO. 2009. **Recovery potential assessment of pure native westslope cutthroat trout, Alberta population**. Department of Fisheries and Oceans Canadian Science Advisory Secretariat, Science Advisory Report 2009/050. Available from: [www.dfo-mpo.gc.ca/csas](http://www.dfo-mpo.gc.ca/csas) Much of this document reproduces, and relies upon, Cleator *et al.* 2009, below.
- Cleator, H., J. Earle, L. Fitch, S. Humphries, M. Koops, K. Martin, D. Mayhood, S. Petry, C. Pacas, J. Stelfox, and D. Wig. 2009. **Information relevant to a recovery potential assessment of pure native westslope cutthroat trout, Alberta population**. Canadian Science Advisory Secretariat Research Document 2009/036. iv+24 p. Available from: <http://www.dfo-mpo.gc.ca/csas/>
- Mayhood, D. W. 2009. **Contributions to a recovery plan for westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) in Alberta: Threats and limiting factors**. Report prepared for Alberta Fish & Wildlife Division. Freshwater Research Limited Technical Report No. 2009/05-1, Calgary, AB. ix+68 p. <http://www.fwresearch.ca/Library.html>

Much of the above work contributed substantially to the Alberta westslope cutthroat trout recovery plan, and the federal recovery strategy for the species:

- DFO. 2014. **Recovery strategy for the Alberta populations of westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) in Canada [Final]**. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada, Ottawa, ON. 28 p. [http://publications.gc.ca/collections/collection\\_2014/mpo-dfo/En3-4-182-2014-eng.pdf](http://publications.gc.ca/collections/collection_2014/mpo-dfo/En3-4-182-2014-eng.pdf)

Cove, T., J. E. Earle, L. Fitch, M. Holder, S. Humphries, E. Kulcsar, B. E. Meagher, C. Pacas, M. Percy, S. Petry, S. Rogers, R. Staniland, D. Wig, and L. Winkel. 2013. **Alberta westslope cutthroat trout recovery plan 2012 – 2017**. Publication No: I/604, Alberta Environment and Sustainable Resource Development, Alberta Species at Risk Recovery Plan No. 28, Edmonton, AB. ix+77 p. <http://srd.alberta.ca/FishWildlife/SpeciesAtRisk/SpeciesAtRiskPublicationsWebResources/Fish/documents/SAR-WestslopeCutthroatTrout-RecoveryPlan-A-Mar2013.pdf>

*For Timberwolf Wilderness Society, Alberta Wilderness Association, & Other Environmental Non-Government Organizations*

Consulting Biologist to Timberwolf Wilderness Society (bulleted in red), Alberta Wilderness Association, or both; conducted research on industrial and recreational damage to designated critical habitat of westslope cutthroat trout, or on potential damage to that habitat and the cutthroat populations using it, and conservation of the species. Reports on this work are:

- Fluker, S. C., and D. W. Mayhood. 2020. **Environmental stewardship of public lands? The decline of westslope cutthroat trout along the eastern slopes of the Rocky Mountains in Alberta**. Public Land & Resources Law Review 42:39-79. <https://scholarship.law.umt.edu/plrlr/> Temporarily also available online at: [https://www.researchgate.net/publication/342978970\\_Environmental\\_Stewardship\\_of\\_Public\\_Lands\\_The\\_Decline\\_of\\_Westslope\\_Cutthroat\\_Trout\\_along\\_the\\_Eastern\\_Slopes\\_of\\_the\\_Rocky\\_Mountains\\_in\\_Alberta](https://www.researchgate.net/publication/342978970_Environmental_Stewardship_of_Public_Lands_The_Decline_of_Westslope_Cutthroat_Trout_along_the_Eastern_Slopes_of_the_Rocky_Mountains_in_Alberta)
- Mayhood, D. W. 2019. **Comments on the 2019 proposed recovery strategy & action plan for the Alberta population of westslope cutthroat trout**. Freshwater Research Limited report prepared on behalf of Timberwolf Wilderness Society, Pincher Creek, Alberta, for Species At Risk Directorate, Department of Fisheries, Oceans and the Coast Guard, Ottawa, Ontario. FWR Technical Note No. 2019/07-1, iv+29 p. <https://ln2.sync.com/dl/69c601e10/uis7dkrz-bycyx9pe-axuzmnnv4-enzd8jgw>
- Mayhood, D. W. 2017. **Emergency report: Alberta native cutthroat trout populations & critical habitat at risk**. Report prepared for Timberwolf Wilderness Society, Pincher Creek, AB, and Alberta Wilderness Association, Calgary, AB. Freshwater Research Limited Technical Note 2017/08-1. iii+32 p. <http://fwresearch.ca/Library.html>
- Mayhood, D. W. 2017. **Comments on the Castle Management Plan Revised Draft: Effects on trout & their critical habitats**. Report Prepared for Alberta Environment and Parks Edmonton, Alberta on behalf of Timberwolf Wilderness Society Calgary, Alberta. Freshwater Research Limited Technical Note 2017/04-1. 43 p. <http://fwresearch.ca/Library.html>
- Mayhood, D. W. 2015. **Upper Silvester Creek sediment source survey 5 August 2013**. Freshwater Research Limited Technical Note 2015/10-2. i+40 p. <http://fwresearch.ca/Library.html>
- Mayhood, D. W. 2014. **Conceptual framework and recovery guidelines for restoring westslope cutthroat trout populations in Alberta**. Report prepared on behalf of Timberwolf Wilderness Society for Alberta Fish & Wildlife Division and Fisheries & Oceans Canada. Freshwater Research Limited Technical Report 2014/03-1. xii+90 p. doi:10.13140/2.1.1931.6809 <http://www.fwresearch.ca/Library.html> (Also listed under *For Alberta Sustainable Resource Development, Fisheries & Oceans Canada*, above.)
- Mayhood, D. W. 2013a. **Suspended sediment in Silvester Creek and its potential effects on the westslope cutthroat trout population**. Report prepared for Timberwolf Wilderness Society. Freshwater Research Limited Technical Report 2013/07-1. iii+50 p. <http://www.fwresearch.ca/Library.html>
- Mayhood, D. W. 2013b. **Suspended sediment in Silvester Creek and its potential effects on the westslope cutthroat trout population: Photo appendix**. Report prepared for Timberwolf Wilderness Society. Freshwater Research Limited Technical Report 2013/07-1 Appendix. 12 p. <http://www.fwresearch.ca/Library.html>

Mayhood, D. W. 2008. **Watershed assessments for the southern portion of Petro-Canada's Sullivan Field project.** Prepared for Big Loop Landowners Group, Longview, AB, by FWR Freshwater Research Limited, Calgary, AB. 10p. Reproduces the analyses of watersheds relevant to this project from Mayhood *et al.* 1997, listed under *For Corporate Clients*, below.

Mayhood, D. W. 2008. **Cumulative human impacts on native trout stocks in relation to Petro-Canada's Sullivan Field development project.** Report prepared for Alberta Wilderness Association and Big Loop Landowners Group, by FWR Freshwater Research Limited, Calgary, AB. 19p., including responses to Petro-Canada's information requests, 5 p. + 3 maps. Submission on behalf of Alberta Wilderness Association to Alberta Energy Resources Conservation Board hearing in the matter of Petro-Canada's Sullivan Pipeline Application, High River, Alberta, 9 December 2008.

Mayhood, D. W. 1986. **Fisheries.** pp. 28-37. in Intervenor's submission. Submission of the Alberta Wilderness Association to the Energy Resources Conservation Board in the matter of Shell Canada Ltd. Jutland well application No. 851037. 75 p.

As a Consulting Biologist to Yellowstone to Yukon Conservation Initiative (Y2Y): Compiled information and prepared technical reports on the distribution, conservation status and habitat threats of the fishes of the Y2Y biogeographic region, including westslope cutthroat trout within the native range in Alberta. Reports on this work are:

Mayhood, D. W. 2007. **Fishes of the Yellowstone to Yukon region.** Technical Report No. 3, Yellowstone to Yukon Conservation Initiative, Canmore, AB. vi+39 p. Available from: <http://www.y2y.net>

Mayhood, D. W., R. Ament, R. Walker and W. Haskins. 1998. **Selected fishes of Yellowstone to Yukon: distribution and status.** pp. 77-91. in L. Willcox, B. Robinson and A. Harvey, editors. A sense of place: issues, attitudes and resources in the Yellowstone to Yukon Ecoregion. Yellowstone to Yukon Conservation Initiative, 710 Ninth Street, Studio B, Canmore, AB T1W 2V7. 138 p. Available from: <http://www.y2y.net>

### ***For Parks Canada***

As a consulting Biologist to Banff National Park, and as a contract biologist to the Canadian Wildlife Service seconded to the park, initiated research to be used in support of a fish management & conservation plans for the park, including assessments and sampling of westslope cutthroat trout populations.

Mayhood, D. W. 1995. **The fishes of the Central Canadian Rockies Ecosystem.** FWR Freshwater Research Limited Report No. 950408 prepared for Parks Canada, Banff National Park, P.O. Box 900, Banff, AB T0L 0C0. 59 p. <http://www.fwresearch.ca/Library.html>

Mayhood, D. W., and J. Paczkowski. 1993. **Preliminary fall survey of the fishes of the upper Bow River, Banff National Park.** Prepared for Banff National Park, Banff, Alberta, by Freshwater Research Limited, Calgary, Alberta. 39 p.

Mayhood, D. W., and R. S. Anderson. 1976. **Limnological survey of the Lake Louise area, Banff National Park. Part 2: The lakes.** Canadian Wildlife Service Report to Parks Canada, Calgary. 273 p. [dx.doi.org/10.13140/2.1.3848.4802](http://dx.doi.org/10.13140/2.1.3848.4802)

Mayhood, D. W., R. S. Anderson, D. B. Donald and R. B. Green. 1976. **Limnological survey of the Lake Louise area, Banff National Park. Part 3: The streams.** Canadian Wildlife Service Report to Parks Canada, Calgary. 90 p.

As Consulting Biologist to Jasper National Park, reviewed and summarized the legislative and policy framework, and the fundamental concepts of conservation biology involved in conserving and managing native fish populations in Canadian national parks; surveyed the fish management and conservation methods used in parks and reserves of

North America, including those within the native range of westslope cutthroat trout in Alberta, and summarized in depth the Pleistocene and postglacial history determining the distribution of Alberta's East Slopes native fishes, including westslope cutthroat trout.

Mayhood, D. W. 1992. **To keep every cog and wheel: regulatory and conceptual background for managing the fishes of Jasper National Park. Part 1 of a fish management plan for Jasper National Park.** Prepared for Canadian Parks Service, Jasper National Park, Jasper, Alberta, by Freshwater Research Limited, Calgary, Alberta. 80 p. <http://www.fwresearch.ca/Library.html>

Mayhood, D. W. 1992. **Approaches to managing freshwater fishes in North American parks and reserves. Part 2 of a fish management plan for Jasper National Park.** Prepared for Canadian Parks Service, Jasper National Park, Jasper, Alberta, by Freshwater Research Limited, Calgary, Alberta. 118 p. <http://www.fwresearch.ca/Library.html>

Mayhood, D. W. 1992. **A preliminary assessment of the native fish stocks of Jasper National Park. Part 3 of a fish management plan for Jasper National Park.** Report prepared for the Canadian Parks Service, Jasper National Park, by Freshwater Research Limited. 296 p. + maps. [dx.doi.org/10.13140/2.1.4015.9044](http://dx.doi.org/10.13140/2.1.4015.9044)

### *For Corporate Clients*

As a Consulting Biologist to Morrison Petroleum Limited, assessed risks from industrial, agricultural, urban, and recreational development to 90 watersheds within the native range of westslope cutthroat trout, many of them now known to hold designated and as-yet undesignated critical habitat of westslope cutthroat trout. Reports and publications on this work are:

Mayhood, D.W., M. D. Sawyer and W. Haskins. 2004. **Historical risk analysis of watershed disturbance in the southern east slopes region of Alberta, Canada, 1910-1996.** Pages 23-29 in G.J. Scrimgeour, G. Eisler, B. McCulloch, U. Silins and M. Monita, editors. Forest-Land Fish Conference – Ecosystem Stewardship through Collaboration. Proceedings of the Forest-Land-Fish Conference II, 26-28 April 2004, Edmonton, Alberta. x+212 p. <http://www.fwresearch.ca/Library.html>

Mayhood, D. W., M. D. Sawyer and W. Haskins. 1998. **British Columbia's level 1 watershed assessment procedure as a tool for monitoring potential impacts of development on aquatic ecosystems in Canada's Rocky Mountains.** pp. 677-686. in Munro, N. W. P., and J. H. M. Willison, editors. Linking protected areas with working landscapes conserving biodiversity. Science and Management of Protected Areas Association, Wolfville, NS. xvii + 1018 p. <http://www.fwresearch.ca/Library.html>

Mayhood, D. W., W. Haskins and M. D. Sawyer. 1997. **Watershed assessment.** pp. 43-74. in M. D. Sawyer, D. W. Mayhood, P. Paquet, R. Thomas, C. Wallis and W. Haskins. **Southern East Slopes cumulative effects assessment.** A report by Hayduke and Associates Ltd., Calgary AB, funded by Morrison Petroleum Ltd. Calgary AB. 207p. + appendices. <http://www.fwresearch.ca/Library.html>

Mayhood, D. W. W. Haskins and M. D. Sawyer. 1997. **Cumulative effects on fish.** pp. 173-187. in M. D. Sawyer, D. W. Mayhood, P. Paquet, R. Thomas, C. Wallis and W. Haskins. **Southern East Slopes cumulative effects assessment.** A report by Hayduke and Associates Ltd., Calgary AB, funded by Morrison Petroleum Ltd. Calgary AB. 207p. + appendices. <http://www.fwresearch.ca/Library.html>

Haskins, W., and D. W. Mayhood. 1997. **Stream crossing density as a predictor of watershed impacts.** Paper 457, Proceedings of the Seventeenth Annual ESRI User Conference, San Diego, CA, July 1997. <http://gis.esri.com/library/userconf/proc97/proc97/to500/pap457/p457.htm>

### *Independent Research*

As an independent researcher, conducted a wide variety of scientific investigations into westslope cutthroat trout and their critical habitats within the Alberta native range, including the first scientific conservation assessment of Alberta populations of the species. For example:

- Mayhood, D. W. 2010. **Testing the  $H_{60}$  calculations in the 1998 Carbondale basin Interior Watershed Assessment Procedure.** Freshwater Research Limited Technical Note 2010/01-1. 12 p. <http://www.fwresearch.ca/Library.html>
- Mayhood, D. W. 2001. **Conceptual framework and an action plan for conserving westslope cutthroat trout in Canada (Abstract).** p. 265. *in* M. K. Brewin, A. J. Paul, and M. Monita, editors. Bull Trout II Proceedings: Ecology and Management of Northwest Salmonids. c/o Trout Unlimited Canada, PO Box 6270, Stn. D, Calgary, AB T2P 2C3. <http://www.fwresearch.ca/Library.html>
- Mayhood, D. W. 2000. **Provisional evaluation of the status of westslope cutthroat trout in Canada.** pp 579-585. *in* L. M. Darling, editor. Proceedings of the Biology and Management of Species and Habitats At Risk, Kamloops, B.C., 15 - 19 Feb. 1999. Ministry of Environment, Lands and Parks, Victoria, BC, and University College of the Cariboo, Kamloops, BC. 974 p. Submitted version: <http://www.fwresearch.ca/Library.html>
- Sawyer, M. D. and D. W. Mayhood. 1998. **Cumulative effects analysis of land-use in the Carbondale River catchment: implications for fish management.** pp. 429-444 *in* M. K. Brewin and D. M. A. Monita, technical coordinators. Proceedings of the Forest-Fish Conference: land management practices affecting aquatic ecosystems, Calgary, AB, May 1-4, 1996. Canadian Forest Service, Northern Forest Centre Information Report NOR-X-356, xiii+533 p. <http://www.fwresearch.ca/Library.html>
- Mayhood, D. W. 1995. **Some effects of natural gas operations on fishes & their habitats on Canada's Rocky Mountain east slopes.** Rocky Mountain Ecosystem Coalition Technical Report 95/1:1-35. Reprinted with minor changes 1998. <http://www.fwresearch.ca/Library.html>
- Mayhood, D. W. 1991. **Fishes threatened, vulnerable or of special concern in relation to the Oldman River dam.** Oldman River Dam Environmental Assessment Review Panel submission FWR 1-NC-30/11/91, Federal Environmental Assessment Review Office, Panel Secretariat, Suite 1150, 555 West Hastings Street, P.O. Box 12071, Harbour Centre, Vancouver, B.C., by Freshwater Research Limited, Calgary. 50 p.
- Mayhood, D. W. 1978. **Production of crustacean plankton, benthic macroinvertebrates and fish in six mountain lakes in Alberta.** M. Sc. thesis, Department of Biology, University of Calgary, Calgary, Alberta. 219 p. <http://www.fwresearch.ca/Library.html> Includes in-depth study of secondary invertebrate and fish production in Lower Consolation Lake, Banff National Park, which probably serves at least seasonally as critical habitat for the SARA<sup>1</sup>-designated westslope cutthroat trout population in Babel Creek, the outlet of the lake.

### *Student Projects Supervised*

As a visiting scientist to the Environmental Sciences B.Sc. Program at the University of Calgary, I directed the research of two students on westslope cutthroat trout and their critical habitats now protected under the federal Species At Risk Act.

Caitlin Gifford: Environmental Science 504; **Natural individual markings for studying fall movements, habitat use and population size in threatened westslope cutthroat trout, *Oncorhynchus clarkii lewisi*.** ENSC 504 Research Project in Environmental Science (unpublished), Environmental Sciences Program, University of Calgary, Calgary, AB. iii+20 p. 2010/2011 Fall/Winter Term. Parts of this work were published in a conference proceedings volume as:

Gifford, C. M., and D. W. Mayhood. 2014. **Natural marks for identifying individual fish in small populations of at-risk westslope cutthroat trout.** pp. 275-281. in R. F. Carline, and C. LoSapio, editors. Wild Trout IX: Sustaining wild trout in a changing world. Wild Trout Symposium, Bozeman, MT. 392 p. <http://www.wildtroutsymposium.com/proceedings-11.pdf>

Heidi Erdle: Environmental Science 504; **Effects of ATV use, cattle grazing, logging and petroleum development on westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) habitat in an Alberta foothills stream.** ENSC 504 Research Project in Environmental Science (unpublished), Environmental Sciences Program, University of Calgary, Calgary, AB. iii+35 p. 2010/2011 Fall/Winter Term. Updated report available as:

Erdle, H. and Mayhood, D. W. 2014. **Anthropogenic effects on the habitat of a critical population of at-risk westslope cutthroat trout assessed using simple monitoring methods.** FWR Freshwater Research Limited Technical Report 2014/06-1. v+17 p. <http://www.fwresearch.ca/Library.html>

### *Selected Technical Talks & Presentations on My Research (presenter italicized)*

**Red bullets** indicate talks on behalf of Timberwolf, or based on work done for Timberwolf.

- *Mayhood, D. W.* 2019. Recovering native cutthroats: What they need & what they're getting. FWR Freshwater Research Limited and Timberwolf Wilderness Society presentation to the Fish & Forests Roundtable Workshop, Alberta Wilderness Association, Calgary, AB, 14 June 2019.
- *Mayhood, D. W.,* 2018. **Clearcuts, linear disturbance, & trout habitat: New ways of thinking about forest-fish issues on Alberta's East Slopes.** FWR Freshwater Research Limited presentation to Fish-Forest Roundtable Workshop 11, Alberta Wilderness Association, Calgary, Alberta, 6 December 2018.

*Mayhood, D. W.,,* and L. Boyer. 2018. **Effects of roads & trails on critical habitat of threatened cutthroat trout, Silvester Creek, Alberta.** FWR Freshwater Research Limited presentation to Bow River Basin Council Science Forum, University of Calgary, 2 May 2018.

- *Mayhood, D. W.,* 2018. **Recovering Alberta's westslope cutthroat trout to secure status.** FWR Freshwater Research Limited presentation to Canadian Conference on Freshwater Fisheries Research, Edmonton, Alberta 6 January 2018.
- *Mayhood, D. W.* 2017. **Recovering Alberta's native trout.** FWR Freshwater Research Limited presentation to Fish-Forest Roundtable Workshop 11, Alberta Wilderness Association, Calgary, Alberta, 9 November 2017.
- *Mayhood, D. W.* 2017. **Roads & OHV trails are destroying east slopes watersheds & streams.** FWR Freshwater Research Limited presentation, News conference, Alberta Wilderness Association, Calgary, Alberta, 4 March 2017.

*Mayhood, D. W.* 2015. **How much road can we fit on Alberta's eastern slopes?** FWR Freshwater Research Limited and Timberwolf Wilderness Society presentation to Eastern Slopes Today & Tomorrow Workshop, Alberta Wilderness Association, Calgary, AB, 4 December 2015.

- *Mayhood, D. W.* 2014. **Watersheds as trout habitat: Sediment loading in Silvester Creek.** FWR Freshwater Research Limited and Timberwolf Wilderness Society presentation to Westslope Cutthroat Trout Stakeholders Workshop, Municipal District of Ranchlands Administration Building, 26 February, 2014.

*Mayhood, D. W.* 2008. **Cumulative impacts on native trout in Petro-Canada's Sullivan Project area.** FWR Freshwater Research Limited presentation on behalf of Alberta Wilderness Association to Alberta Energy Resources Conservation Board hearing in the matter of Petro-Canada's Sullivan Pipeline Application, High River, Alberta, 9 December 2008.

- Mayhood, D.W., M. D. Sawyer and W.Haskins. 2004. **Historical risk analysis of watershed disturbance in the southern east slopes region of Alberta, Canada, 1910-1996.** Forest-Land Fish Conference – Ecosystem Stewardship through Collaboration. April 26-28, 2004, Edmonton, Alberta.
- Mayhood, D. W. 2002. **Ecological thresholds in inland fish populations and catchment ecosystems.** Devon Canada Biological Thresholds Workshop, Blairmore, AB, 1 May 2002.
- Mayhood, D. W. 2000. **Westslope cutthroat trout in Canada: apparent status and a conceptual framework for conservation.** British Columbia Cutthroat Trout Workshop, Harrison Hotsprings, BC, 3-4 February 2000.
- Mayhood, D. W. 1999. **Provisional evaluation of the status of westslope cutthroat trout in Canada.** Paper presented at the Biology and Management of Species and Habitats at Risk Conference, Kamloops, BC, 15-19 February 1999.
- Mayhood, D. W. 1998. **A watershed perspective of environmental risk at pipeline water crossings: incorporating concepts of cumulative ecological damage.** Presentation to the Meeting of the Canadian Pipeline Water Crossing Committee, Banff, AB 25-27 November 1998.
- Mayhood, D. W., M. D. Sawyer and W. Haskins. 1997. **British Columbia's level 1 watershed assessment procedure as a tool for monitoring potential impacts of development on aquatic ecosystems in Canada's Rocky Mountains.** Paper presented at the Science and Management of Protected Areas Association (SAMPA III) Conference, Calgary, AB, May 1997.
- Haskins, W., and D. W. Mayhood. 1997. **Stream crossing density as a predictor of watershed impacts.** Paper presented at the Seventeenth Annual ESRI User Conference, San Diego, CA, July 1997.
- Sawyer, M. D. and D. W. Mayhood. 1996. **Cumulative effects analysis of land-use in the Carbondale River catchment: implications for fish management.** Paper presented at the Forest-Fish Conference, Calgary, AB, May 1-4, 1996.

***Published Popular-style Articles on or including my Westslope Cutthroat Trout Work***

Red bullets indicate articles written on behalf of Timberwolf, or based on work done for Timberwolf.

- Mayhood, D. W. 2018. **The global extinction crisis, Alberta's native cutthroat trout, and wilderness.** Wild Lands Advocate 26(4):10-12. <https://albertawilderness.ca/wp-content/uploads/2018/12/December-2018-Advocate-Web.pdf>
  - Urquhart, I. 2018. **From rotifers to westslope cutthroat trout: Honouring a social contract.** Wild Lands Advocate 26(3):26-28. [https://albertawilderness.ca/wp-content/uploads/2018/10/20180900\\_archive\\_awa\\_wla-1.pdf](https://albertawilderness.ca/wp-content/uploads/2018/10/20180900_archive_awa_wla-1.pdf)
  - Sullivan, A. 2017. **Studying sedimentation to protect native trout.** Elbow River Watershed Partnership Newsletter online. <https://erwp.org/index.php/newsletters/113-newsletter-dec-2017-article/file>
  - Mayhood, D. W. 2014. **Silvester Creek: Watershed condition, foothills roads, and native trout.** Preserving Our Lifeline [Newsletter of the Bow River Basin Council] 14(6):6-7. <http://bit.ly/SYdmxG>
- Mayhood, D. W. 2008. **Exotic fishes in Alberta: paying the price.** Wild Lands Advocate 16(4):9-11. Available from <http://www.albertawilderness.ca/AWRC/WLA.htm>
- Mayhood, D., and C. Olson. 2008. **Westslope cutthroat trout assessed as "threatened."** Wild Lands Advocate 16(2):28. Available from <http://www.albertawilderness.ca/AWRC/WLA.htm>
- Mayhood, D. W. 1998. **Following Silver City: westslope cutthroat trout in Canada.** On the Wild Side: The Journal of American Wildlands 9(1):7-8. <http://www.fwresearch.ca/Library.html>
- Mayhood, D. W. 1996. **Historical transformation of the fish fauna of the central Canadian Rockies.** Research Links 4(2):21,6. <http://parkscanadahistory.com/series/rl/R61-16-4-2E.pdf>
- Mayhood, D. W. 1989. **Going native: a search for roots among the lower vertebrates.** pp. 41-52. Book chapter in: Norman, J. G., editor. Fish and tell and go to hell: Alberta flyfishing wisdom. Dirtwater Publications, Calgary. 172 p.

Mayhood, D. W. 1986. **Southern Alberta's native trout — are they in trouble?** *The Riseform* 2(2):23-25.



## **Brian L. Horejsi, PhD. Behavioral ecology Curriculum Vitae short version**

Dr. Brian L. Horejsi is a wildlife scientist and forester. He earned a bachelor of science in Forestry with a major in wildlife management from Montana State University and then a PhD in the behavioral Ecology of large mammals from the University of Calgary based on his study of bighorn sheep.

He began his professional career as a land use Forester with the Alberta Forest Service, then moved on to research biologist with what became the Yukon Wildlife Branch, studying industrial and human impacts on the Porcupine caribou herd. Since then his research activities include an extended field study (7 years) of the impact of the oil and gas industry on grizzly bears, black bears and moose in the boreal forest, separate analyses of the status of the grizzly bear population and its habitat in southwest Alberta, the endangered international Granby grizzly bear population and the Purcell Grizzly bear population endangered by the Jumbo ski resort proposal.

He has also conducted research on the impact of industrialization, motorized access, and recreational and agricultural activities on bighorn and Dall Sheep, moose, caribou and black bears.

Graduating from field research to conservation planning and activism, he continues to work with the public and non government organizations and government as an advisor and analyst regarding the impact of government decisions and industry land use practices on large mammal populations and their habitat. For example, he wrote, for the government of the Yukon, the initial Land Use Guidelines for the protection of bear populations and habitat in the Yukon and then later completed a revision of those guidelines.

He is active as an advocate for protecting the ecological viability of all public land ecosystems and the reform of public land management, and for full and open public involvement and use of the best-available-science in legislated regulatory decision making processes.

These kinds of things don't fully embrace the "meat" of a persons pursuits; for example, my participation as an expert analyst / witness in several dozen legal proceedings and over 100 formal administrative and consultation processes in western North America.

### **Selected Publications and Reports Relevant to the Application**

Horejsi, B.L. 2020. [The Status of the Grizzly Bear and Conservation of Biological Diversity in the Northern Rocky Mountains. A Compendium of Expert Statements.](#) Flathead-Lolo-Bitterroot Citizen Task Force.

- Horejsi, B.L. 2018. Reforming British Columbia’s environmental impact assessment process in the context of an ecosystem resource management and conservation regulatory system. Comments submitted to the Ministry of Environment and climate change, Environmental Assessment “revitalization” process. Speak Up For Wildlife Foundation.
- Horejsi, B.L. 2018. Comments in Opposition to tenure Application #4405893 RETALLACK “adventure tourism” application to lease parts of the Purcell Mountains as revealed in their Multiple Use Management Plan, Purcell Mountains, 2018 AND ADDENDUM. Submission to Forest Land Natural Resource operations, Kootenay Boundary Region, B.C.
- Horejsi, B.L. 2018. Professionals: qualified for what role? We must abolish “professional reliance” as a failed regulatory tool. Comments submitted to Government of British Columbia, Speak Up For Wildlife Foundation.
- Horejsi, B.L. 2017. Submission to Expert Panel, (Federal) Review of Environmental Assessment Processes (Legislation and Regulation). Speak Up For Wildlife Foundation, Penticton, British Columbia.
- Horejsi, B.L. 2016. 500 Grizzly Bears; an effective population size (EPS) and minimum viable population (MVP) requires 500 bears. Report submitted to Auditor General of British Columbia, Speak Up For Wildlife Foundation.
- Horejsi, B.L. 2016. Submission to EA Review Panel C/O Canadian Environmental Assessment Agency. Speak up for Wildlife Foundation.
- Horejsi, B. L. 2011. The Keystone XL Pipeline: buried by bad decisions. Counterpunch 2011.08.09
- Horejsi, B. L., and B. K. Gilbert. 2006. Conservation of grizzly bear populations and habitat in the northern Great Bear Rainforest. *Biodiversity* 7:3-10.
- Horejsi, B. L. 2004. Science-based habitat and population protection thresholds; access induced displacement and access management standards for grizzly bears (*Ursus arctos*). pp. 67-76. *in* H. Epp, editor. Access management: policy to practice. Proceedings of the Alberta Society of Professional Biologists Conference, Calgary, AB. [http://a100.gov.bc.ca/appsdata/epic/documents/p18/d18443/1082568071921\\_8a265edf61ee4ac9862b84ebf369abd8.pdf](http://a100.gov.bc.ca/appsdata/epic/documents/p18/d18443/1082568071921_8a265edf61ee4ac9862b84ebf369abd8.pdf)
- Horejsi, B. L. 2004. Grizzly bears in southwest Alberta: a vision and plan for population and habitat recovery. Western Wildlife Environments Consulting Ltd., Calgary, AB. vi+124 p. <http://www.cwc.ab.ca/p/document-archive.html>

- Horejsi, B. L. 2002. Losing Ground: The decline in fish and wildlife law enforcement capability in British Columbia and Alaska. Raincoast Conservation Society, Victoria, BC. 45 p. <http://www.raincoast.org/files/publications/reports/losingGround.pdf>
- Horejsi, B.L. 1999. The proposed Tulsequah Chief mine road in northwest British Columbia; its expected impacts on wildlife and prospects for mitigation. Western Wildlife Environments Consulting Ltd., Calgary, Alberta, Canada.
- Horejsi, B. L. 1990. The grizzly bear management plan for Alberta: fraud or folly? Speak Up for Wildlife Foundation, Box 506, Station G, Calgary, AB, Canada T3A 2G4.
- Horejsi, B. L. 1990. American gas consumers “burning up” western Canada’s wildlife habitat. Speak Up for Wildlife Foundation, Box 506, Station G, Calgary, AB, Canada T3A 2G4.
- Horejsi, B. L. 1989. Uncontrolled land-use threatens an international grizzly bear population. *Conservation Biology* 3:220-226. doi:10.1111/j.1523-1739.1989.tb00080.x