

Craig A. Emmerton, Ph.D.

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Education

Ph.D. – Biological Sciences University of Alberta, Edmonton, AB	2010-2015
M.Sc. – Physical Geography Simon Fraser University, Burnaby, BC	2003-2006
B.Sc. (Hon.) – Environmental Science (Co-op) McMaster University, Hamilton, ON	1997-2002

Professional experience

Aquatic Scientist Government of Alberta, Edmonton, AB	2017-present
Adjunct Faculty Biological Sciences-University of Alberta, Edmonton, AB	2018-present
Post Doctoral Researcher University of Alberta, Edmonton, AB	2016
Post Doctoral Researcher IISD-Experimental Lakes Area, Winnipeg, MB/Kenora, ON	2015-2016
Post Doctoral Researcher University of Alberta, Edmonton, AB	2015
Mitacs-Accelerate Intern Campbell Scientific (Canada) Corp., Edmonton, AB	2011-2012
Water Quality Scientist (Contract) University of Alberta, Edmonton, AB	2010-2011
Linnologist Government of Alberta, Spruce Grove, AB	2007-2010
Hydrometric technologist Water Survey of Canada, Calgary, AB	2006
Co-op student\Research Associate NRCan, DFO-ELA, Diagnostic Chemicals	2000-2002

Current scientific programs and collaborations

Project	Collaborators	Affiliation
Development of a geospatial tool for assessing watershed integrity and aquatic ecosystem health in the North Saskatchewan River basin	Dr. C. Buendia	Government of Alberta
	Dr. F. Wyatt	Government of Alberta
	Dr. R. Vinebrooke	University of Alberta
	Dr. S. Green	University of Alberta
	Dr. M. Bhatia	University of Alberta
Geospatial patterns of mercury in fish of Alberta lakes	Dr. J. Graydon	Government of Alberta
	Dr. P. Drevnick	Government of Alberta
	M. Reichert	Government of Alberta
	C. Donadt	Government of Alberta
From the mountains to our tables: freshwater security in three Canadian Eastern Rocky Mountain watersheds	Dr. V. St. Louis	University of Alberta
	J. Serbu	University of Alberta
Effects of wildfire on carbon fluxes from Boreal peatlands of northwestern Canada	Dr. D. Olefeldt	University of Alberta
	C. Schulze	University of Alberta
Mercury and methylmercury in water of a peatland-dominated boreal river	Dr. D. Olefeldt	University of Alberta
	R. Shewan	University of Alberta
Tracking and forecasting of harmful algal blooms in Alberta using remote-sensing techniques under a changing climate	Dr. R. Vinebrooke	University of Alberta
	Dr. R. Zurawell	Government of Alberta
	Dr. C. McClain	Alberta Biomonitoring Inst.
Coal mining impacts on surface waters of Alberta's Rocky Mountain headwater regions	Dr. C. Cooke	Government of Alberta
	Dr. P. Drevnick	Government of Alberta

Publications

a. Peer-reviewed publications (Publication profiles: [Google scholar](#); [Scopus/ORCID](#); [Web of Science](#))

31. See, C.R., Virkkala, A.-M., Natali, S.M.,...,**Emmerton, C.A.**,..., Schuur, E.A.G. (2024). Decadal increases in carbon uptake offset by respiratory losses across northern permafrost ecosystems. *Nature Climate Change*, in press.
30. Cooke, C.A., Holland, K.M., **Emmerton, C.A.**, Drevnick, P.E., Criscitiello, A.S., Newton, B. (2024). Mountaintop removal coal mining contaminates snowpack across a broad region. *Environmental Science & Technology*, 58(26): 11718-11726.
29. St. Louis, V.L., St. Pierre, K., **Emmerton, C.A.**, Serbu, J., Talbot, C., Szostek, L., Lehnherr, I., Muir, D. (2024) High Arctic dust storms greatly impact local freshwater ecosystems. *Environmental Science & Technology*, 58, 7415-7424.
28. Cooke, C.A., **Emmerton, C.A.**, Drevnick, P.E. (2024). Legacy coal mining impacts downstream ecosystems for decades in the Canadian Rockies. *Environmental Pollution*, 344, 123328. (IF: 8.900)
27. Serbu, J. A., St. Louis, V. L., **Emmerton, C. A.**, Tank, S.E., Criscitiello, A.S., Silins, U., Bhatia, M.P, Cavaco, M.A., Christenson, C., Cooke, C.A., Drapeau, H.P. , Enns, S.J.A., Flett, J.E., Holland, K.M., Lavallee-Whiffen, J., Ma, M., Muir, C.E., Poesch, M., Shin, J. (2024) A comprehensive biogeochemical assessment of the headwaters of three major glacier-fed rivers on the eastern slopes of the Canadian Rocky Mountains under the threat of climate change. *Journal of Geophysical Research: Biogeosciences*, 129(1): 1-24. (IF: 4.900)
26. **Emmerton, C.A.**, Drevnick, P.E., Serbu, J.A., Cooke, C.A., Graydon, J.A., Reichert, M., Evans, M.S., McMaster, M.E. (2023). Downstream modification of mercury in diverse river systems underscores the role of local conditions in fish bioaccumulation. *Ecosystems*, 26(1): 114-133. (IF: 4.345)
25. Van Mierlo, V. A., Green, S.J., **Emmerton, C.A.**, Nasr, M., Buendia, C., Wyatt, F.R., Poesch, M.S. (2022). Occupancy of invasive Northern Crayfish (*Faxonius virilis*) in northern streams is associated primarily with water temperature. *Freshwater Science*, 41(4): 000-000. (IF: 2.034)
24. Cooke, C.A., **Emmerton, C.A.**, Yi, Y., Levesque, L., Glozier, N. (2022). Polycyclic aromatic compounds in rivers dominated by petrogenic sources after a Boreal megafire. *Environmental Science & Technology*, 56(13), 9408-9416. (IF: 11.357)
23. Virkkala, A. M., Natali, S. M., Rogers,...**Emmerton, C.A.**,...Zyryanov, V. I. (2022). The ABCflux database: Arctic-Boreal CO₂ flux observations and ancillary information aggregated to monthly time steps across terrestrial ecosystems. *Earth System Science*, 14, 179-208. (IF:11.815)
22. Virkkala, A. M., Aalto, J., Rogers, B. M.,...,**Emmerton, C.A.**,...Luoto, M. (2021). Statistical upscaling of ecosystem CO₂ fluxes across the terrestrial tundra and boreal domain: regional patterns and uncertainties. *Global Change Biology*, 27, 4040-4059. (IF: 13.211)
21. **Emmerton, C.A.**, Cooke, C.A., Hustins, S., Silins, U., Emelko, M., Lewis, T., Kruk, M., Taube, N., Zhu, D., Jackson, B., Stone, M., Kerr, J., Orwin, J. (2020). Severe western Canadian wildfire affects water quality even at large basin scales. *Water Research*, 183, 116071. (IF: 13.400)
20. Wang, R., Gamon, J.A., **Emmerton, C.A.**, Springer, K.R., Yu, R, Hmimina, G. (2020). Detecting intra- and intr-annual variability in gross primary productivity of a North American grassland using MODIS MAIAC data. *Agricultural and Forest Meteorology*, 281, 107859. (IF: 6.424)
19. St. Louis, V.L., Graydon, J.A., Lehnherr, I., Amos, H.M., Sunderland, E.M., St. Pierre, K.A., **Emmerton, C.A.**, Sandilands, K., Tate, M., Steffen, A., Humphreys, E.R. (2019). Atmospheric concentrations and wet/dry loadings of mercury at the remote Experimental Lakes Area, Northwestern Ontario, Canada. *Envir. Sci. Technol.*, 53, 8017-8026. (IF: 11.357)

18. **Emmerton, C.A.**, Beaty, K.G., Casson, N.J., Graydon, J.A., Hesslein, R.H., Higgins, S.N., Osman, H., Paterson, M.J., Park, A., Tardif, J. (2019) Long-term responses of nutrient budgets to concurrent climate-related stressors in a Boreal watershed. *Ecosystems*, 22, 363-378. (IF: 4.345)
17. Hall, B.D., Hesslein, R.H., **Emmerton, C.A.**, Higgins, S.N., Ramlal, P., Paterson, M.J. (2019) Multi-decadal carbon sequestration in a headwater boreal lake. *Limnol. Oceanogr.*, 64, S150-S165. (IF: 5.019)
16. **Emmerton, C.A.**, Cooke, C.A., Wentworth, G.R., Graydon, J.A., Ryjkov, A., Dastoor, A. (2018). Total mercury and methylmercury in lake water of Canada's oil sands region. *Envir. Sci. Technol.* 52, 10946-10955. (IF: 11.357)
15. Lehnherr, I., St. Louis, V.L., Sharp, M., Gardner, A.S., Smol, J.P., Schiff, S.L., Muir, D.C.G., Mortimer, C.A., Michelutti, N., Tarnocai, C., St. Pierre, K.A., **Emmerton, C.A.**, Wiklund, J.A., Köck, G., Lamoureux, S.F., Talbot, C.H. (2018) The world's largest High Arctic lake responds rapidly to climate warming. *Nat. Commun.*, 9, 1290. (IF: 17.694)
14. **Emmerton, C.A.**, St. Louis, V.L., Lehnherr, I., Graydon, J.A., Kirk, J.L., Rondeau, K.J. (2016) The importance of freshwater systems to the net exchange of atmospheric carbon dioxide and methane with high Arctic landscapes. *Biogeosciences*, 13, 5849-5863. (IF: 5.092)
13. Oh, Y., Stackhouse, B., Lau, M., Xu, X., Trugman, A., Moch, J., Onstott, T., Jørgensen, C., D'Imperio, L., Elberling, B., **Emmerton, C.A.**, St. Louis, V. (2016) A scalable model for methane consumption in arctic mineral soils. *Geophys. Res. Lett.*, 43, 5143-5150. (IF: 5.576)
12. Nestola, E., Calfapietra, C., **Emmerton, C.A.**, Wong, C.Y.S., Thayer, D.R., Gamon, J.A. (2016) Monitoring grassland seasonal carbon dynamics, by integrating MODIS NDVI, proximal optical sampling, and eddy covariance measurements. *Remote Sens.*, 8, 260. (IF: 5.349)
11. Wang, R., Gamon, J.A., **Emmerton, C.A.**, Li, L., Nestola, E., Pastorello, G.Z., Menzer, O. (2016) Integrated analysis of productivity and biodiversity in a southern Alberta prairie. *Remote Sens.*, 8, 214. (IF: 5.349)
10. **Emmerton, C.A.**, St. Louis, V.L., Humphreys E.R., Gamon, J.A., Barker, J.D., Pastorello, G.Z. (2016) Net ecosystem exchange of CO₂ with rapidly changing high Arctic landscapes. *Glob. Change Biol.*, 22, 1185-1200. (IF: 13.211)
9. Chételat, J., Amyot, M., Arp, P., Blais, J.M., Depew, D., **Emmerton, C.A.**, Evans, M., Gamberg, M., Gantner, N., Girard, C., Graydon, J., Kirk, J., Lean, D., Lehnherr, I., Muir, D., Nasr, M., Poulain, A.J., Power, M., Roach, P., Stern, G., Swanson, H., van der Velden, S. (2015) Mercury in freshwater ecosystems of the Canadian Arctic: recent advances on its cycling and fate. *Sci. Total Environ.*, 509-510, 41-66. (IF: 10.753)
8. **Emmerton, C.A.**, St. Louis, V.L., Lehnherr, I., Humphreys, E.R., Rydz, E., Kosolofski, H. (2014) The net exchange of methane with high Arctic landscapes during the summer growing season. *Biogeosciences*, 11, 3095-3106. (IF: 5.092)
7. **Emmerton, C.A.**, Graydon, J.A., Gareis, J.A.L., St. Louis, V.L., Lesack, L.F.W., Banack, J.K.A., Hicks, F., Nafziger, J. (2013) Mercury export to the Arctic Ocean from the Mackenzie River, Canada. *Envir. Sci. Technol.*, 47, 7644-7654. (IF: 11.357)
6. Lehnherr, I., St. Louis, V.L., **Emmerton, C.A.**, Barker, J.D., Kirk, J.L. (2012) Methylmercury Cycling in High Arctic Wetland Ponds: Sources and Sinks. *Envir. Sci. Technol.*, 46, 10514-10522. (IF: 11.357)
5. Graydon, J.G., St. Louis, V.L., Lindberg, S.E., Sandilands, K.A., Rudd, J.W.M., Kelly, C.A., Harris, R., Tate, M.T., Krabbenhoft, D.P., **Emmerton, C.A.**, Asmath, H., Richardson, M. (2012) The role of terrestrial vegetation in atmospheric Hg deposition: pools and fluxes of spike and ambient Hg from the METAALICUS experiment. *Global Biogeochem. Cy.*, 26, GB1022. (IF: 6.500)
4. Graydon, J.A., **Emmerton, C.A.**, Lesack, L.F.W., and Kelly, E. (2009) Mercury in the Mackenzie River delta and estuary: concentrations and fluxes during open-water conditions. *Sci. Total Environ.* 407, 2980-2988. (IF: 10.753)

3. **Emmerton, C.A.**, Lesack, L.F.W., and Vincent, W.F. (2008b) Nutrient and organic matter patterns across the Mackenzie River, estuary and shelf during the seasonal recession of sea-ice. *Journal of Marine Systems*. 74, 741-755. (IF: 3.010)
2. **Emmerton, C.A.**, Lesack, L.F.W., and Vincent, W.F. (2008a) Mackenzie River nutrient delivery to the Arctic Ocean and effects of the Mackenzie Delta during open-water conditions. *Global Biogeochem. Cy.* 22, GB1024. (IF: 6.500)
1. **Emmerton, C.A.**, Lesack, L.F.W., and Marsh, P. (2007) Lake abundance, potential water storage, and habitat distribution in the Mackenzie River Delta, western Canadian Arctic. *Water Resour. Res.* 43, W05419. (IF: 6.159)

***Submitted:**

1. See, C.R., Virkkala, A.-M.,...**Emmerton, C.A.**, et al. Decadal increases in carbon uptake offset by respiratory losses across northern permafrost ecosystems. Submitted to *Nature Climate Change*, August 2023.
2. Virkkala, A.M., Rogers, B.M...**Emmerton, C.A.**,...,Zona, D., Natali, S.M. An increasing Arctic-Boreal CO2 sink despite strong regional sources. Submitted to *Nature Climate Change*, February 2024.

b. Government reports, theses

11. **Emmerton, C.A.**, Cooke, C.A., Kerr, J.G., Laceby, J.P., Taube, N. (2023). Looking upstream: a 5-year review of Alberta's monitoring, evaluation, and reporting (MER) plan for lotic systems. Government of Alberta, Ministry of Environment and Protected Areas. ISBN 978-1-4601-5874-6.
10. **Emmerton, C.A.**, Taube, M., Laceby, J.P., Buendia, C., Orwin, J., Jackson, B., Ware, C., Murray, E., Pickering, R., Ozipko, R. (2023). The WaterSHED monitoring program – technical progress report 2018-21. Government of Alberta, Ministry of Environment and Protected Areas. ISBN 978-1-4601-5680-3.
9. Buendia-Fores, C., **Emmerton, C.A.** (2021). The WaterSHED monitoring program – technical progress report 2018-19. Government of Alberta, Ministry of Environment and Parks. ISBN 978-1-4601-4971-3.
8. Wabasca Lake monitoring project results report. (2019). Government of Alberta. ISBN 978-1-4601-3723-9. (Contributing author).

+ 7 more

Supervisory and scientific service

Current supervision and supervisory committees

- Ph.D. Committee: J. Serbu, B. Stuparyk; University of Alberta
- M.Sc. Committee: R. Shewan; University of Alberta

Former supervision and supervisory committees

- Ph.D. Candidacy Examination: M. Taskovic; University of Alberta
- Co-supervisor: J. Lightbown (M.Sc. student); University of Alberta.
- Co-supervisor: A. Mohamed (Mitacs Internship); University of Alberta and NSW
- Co-supervisor: A. Mohamed (Postdoctoral Fellow); University of Alberta
- M.Sc. Committee Member (V. Van Mierlo, University of Alberta).
- Field/Lab Assistants: A. Lake (Summer 2017), H. Kosolofski (Summer 2012), E. Rydz (Summer 2011), C. Zhang (Summer 2010), S. Turvey (Summer 2004), N. Van der Wal (Summer 2003).

Invited reviewer

National Science Foundation, Science Reports, Nature Climate Change, Water Research, Geophysical Research Letters, Biogeosciences, Environmental Science & Technology, Science of the Total Environment, Global Biogeochemical Cycles, Environmental Technology, Chemistry and Ecology, Estuaries and Coasts, Canadian J. of Fisheries and Aquatic Sciences, Arctic Science, Environ. Poll.

Research funding

Alberta Innovates Water Innovation Program. 2023-26 Harmful algae blooms	\$740,000
Alberta Innovates Water Innovation Program. Watershed Integrity project 2019-23	\$750,000
Circumpolar/Boreal Alberta Research Institute (University of Alberta). 2011-14	\$6,000
Northern Scientific Training Program (Aboriginal Affairs and Northern Development Canada). 2011-14	\$11,400
Northern Contaminants Program (Aboriginal Affairs and Northern Development Canada). Mercury Input to the Beaufort Sea from the Mackenzie River. 2010-11	\$13,708
Northern Scientific Training Program, (Aboriginal Affairs and Northern Development Canada). 2003-04	\$7,400

Conference presentations

56. Cooke, C.A., **Emmerton, C.A.**, Drevnick, P.E. Legacy coal mining impacts downstream ecosystems for decades in the Canadian Rockies. Canadian Chemistry Conference and Exhibition 2-6 Jun 2024, Winnipeg, Canada.
55. St. Louis, V.L., St. Pierre, K., **Emmerton, C.A.**, Talbot, C., Serbu, J.A., Szostek, L., Lehnher, I., Muir, D. High Arctic dust storms greatly impact freshwater ecosystems. American Geophysical Union Fall Meeting 11-15 December 2023, San Francisco, U.S.A.
55. Lightbown, J., **Emmerton, C.A.**, Cavaco, M., Nasr, M., Holzer, H., Buendia-Fores, C., Tank, S., Wyatt, F., Bhatia, M. Stream microbial communities at the base of aquatic food webs are shaped by water quality across a land-use gradient in western Canada. ASLO Aquatic Sciences Meeting, 4-9 June 2023, Palma de Mallorca, Spain.
54. Shewan, R., Thompson, L., Munson, M., **Emmerton, C.A.**, Cunada, C., Swanson, H., Olefeldt, D. Tracing landscape sources of methylmercury in permafrost peatland catchments. CGU Annual Meeting. 7-10 May 2023, Banff, Canada.
53. Schulze, C., Olefeldt, D., **Emmerton, C.A.**, Harris, L., Kljun, N., Chasmer, L., Hopkinson, C., Detto, M., Helbig, M., Gosselin, G.H., Sonnentag, O. Effects of wildfire and permafrost thaw on ecosystem fluxes from boreal peatland complexes in northwestern Canada. CGU Annual Meeting. 7-10 May 2023, Banff, Canada.
52. Serbu, J., St. Louis, V.L., **Emmerton, C.A.**, Tank, S., Venkiteswaran, J., Criscitiello, A.S., Bhatia, M., Cavaco, Drapeau, H., Cooke, C.A., Enns, S., Flett, J. Water quality, aquatic metabolism, and geochemical weathering in proglacial rivers on the eastern slopes of the Canadian Rocky Mountains. American Geophysical Union Fall Meeting 12-16 December 2022, Chicago, U.S.A.
51. Usoof, A.M., **Emmerton, C.A.**, Nasr, M., Wyatt, F., Buendia-Fores, C., Roberts, D., Stenerson, S., Stuparyk, B., Lightbown, J., Van Mierlo, V., Green, S., Bhatia, M., Poesch, M., Vinebrooke, R. Assessing watershed integrity of a northern plains river basin: a paired geospatial modelling and monitoring approach. Joint Aquatic Sciences Meeting 14-20 May 2022, [online].

+ 50 more

Awards and honours

Spring Convocation Governor General's Gold Medal Nominee: Biological Sciences, 2015	Honorary
University of Alberta Dissertation Fellowship, 2014	\$22,000
Queen Elizabeth II Graduate Scholarship. University of Alberta, 2013	\$15,000
Steve and Elaine Antoniuk Graduate Scholarship, University of Alberta, 2013	\$6,000
AAAS/Science Program for Excellence in Science, Membership award, 2012	\$300
Canadian Polar Commission Scholarship, ACUNS, 2012	\$10,000
President's Doctoral Prize of Distinction, University of Alberta, 2012	\$5,000
Mitacs-Accelerate Internship (Mitacs, Campbell Scientific Canada), 2011-2012	\$15,000
President's Doctoral Prize of Distinction, University of Alberta, 2011	\$5,000
Alexander Graham Bell Canada Graduate Scholarship, NSERC, 2010-2013	\$105,000
+ 6 more	

Teaching experience

Guest lecturer University of Alberta, Edmonton, AB Water resource management (RENR 250)	2023, 2024
Guest lecturer Lakehead University Thunder Bay, ON Experimental Limnology and Aquatic Ecology (Biology 4152)	2015-16
Guest lecturer University of Alberta, Edmonton, AB Ecosystem Physiology	2014
Graduate Teaching Program University of Alberta, Edmonton, AB Level 1&2 completion of Faculty of Graduate Studies and Research Graduate Teaching Program consisting of 25 hours of teaching training, 72 hours of practical experience and completion of a teaching dossier	2010-2015
Teaching Assistant University of Alberta, Edmonton, AB Experimental Biology; Principles of Ecology	2013-2014
Teaching Assistant Simon Fraser University, Burnaby, BC Limnology, Biogeochemistry, Geomorphology II, Physical Geography	2003-2005

Technical skills

Computing	ArcGIS v10.7, SPSS 26, SigmaPlot v13, Microsoft Office 365, Google Earth Engine, Mendeley, R/R studio (working knowledge)
Environmental sampling	-water quality: chemistry, nutrients, trace organics/metals, pesticides and bacteria -air quality/gas exchange: Eddy Covariance CO2 flux tower; CAPMoN station -sediment quality: ¹⁴ C soil dating, Ekman dredge, Siple and gravity corers -water quantity: operation of Water Survey of Canada stream/lake stations -meteorological: operation of long-term ECCC meteorological station -biological: plant biomass, zooplankton/phytoplankton/periphyton minnows -technical: dataloggers, various environmental probes

Laboratory Gas chromatography, ion chromatography, TOC analysis, spectrophotometry, fluorometry, trace mercury analysis (CVAFS), general water and soil quality

General Safe boating, Emergency First Aid, WHMIS, Radiation safety, Class 5 driver's license, AMA & Young Drivers Defensive Driving, Collision avoidance, trailering, outboard operation/maintenance, ATVs, snowmobiles, chainsaws, canoeing/kayaking, 1-ton trucks, general construction