

Soren M. Brothers
Curriculum Vitae

Department of Watershed Sciences / Ecology Center
Utah State University
Logan, UT, USA
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EDUCATION

PhD Limnology (*magna cum laude*) (2013)

The University of Potsdam, Potsdam, Germany

Thesis title: Carbon gains, losses, and feedbacks in shallow, eutrophic lakes of phytoplankton and macrophyte dominance.

MSc Biology (2010)

Université du Québec à Montréal, Montreal, Canada

Thesis title: Greenhouse gas flux sources in a young boreal reservoir.

BSc Major in Biology (Option Conservation Biology), Minor in Political Science (2005)

University of British Columbia, Vancouver, Canada

Associate of the Royal Conservatory (ARCT) Performers Diploma (Piano) (2001)

Royal Conservatory of Music, Toronto, Canada

PROFESSIONAL EXPERIENCE

2017 to present

Assistant Professor of Limnology, Utah State University

My research examines carbon cycling, greenhouse gas dynamics, primary production, and regime shifts in aquatic systems.

2013 to 2017

Post-doctoral Fellow, University of Guelph (Dr. Paul Sibley)

My post-doctoral research examined long-term shifts in the Great Lakes, focusing on changes in ecological structure (especially autotrophic structure), carbon cycling, hypoxia formation in Lake Erie, and long-term oxygen dynamics in Lake Superior.

2013 to 2017

Program Manager, “Multiple Stressors and Cumulative Effects in the Great Lakes: An NSERC CREATE Program to Develop Innovative Solutions through International Training Partnerships”, University of Guelph

Dr. Soren Brothers, Utah State University

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I assisted in the planning and running of in-class and field courses, graduate student recruitment and mentoring, organizing a network of international researchers and Great Lakes conservation stakeholders, organizing internships for students, and managing program funds.

2014 to 2016

Field and Laboratory Assistant for Mitacs Project “The Effects of Natural and Anthropogenic Disturbance on Arctic Wildlife”, University of Guelph (Dr. Andrew Derocher and Dr. Paul Sibley)

Field and laboratory logistics, water sampling, macroinvertebrate and fish collection, benthic and pelagic metabolism experiments, and sample processing (including preparations for stable isotope analyses) in Nunavut, Canada. I also trained students in field techniques, and introduced them to fundamental and current topics in limnology and ecology.

2014

Field Research and Laboratory Assistant, Western University (Dr. Irena Creed)

Water sampling, profiling, and sample processing in 12 eastern Ontario lakes examining factors controlling harmful algal blooms.

2010 to 2013

Researcher, Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB) in Berlin, Germany (Dr. Ursula Gaedke, Dr. Jan Köhler, and Dr. Sabine Hilt)

As part of the TERRALAC research project examining the effects of terrestrial carbon on the resilience of lakes, I examined the impacts of regime shifts on primary production and carbon cycling in shallow lakes, providing the basis for my PhD dissertation. I also trained student interns and graduate students in field and laboratory sampling and analytical procedures.

2008 to 2010

MSc Candidate and Researcher, Université du Québec à Montréal (Dr. Yves Prairie and Dr. Paul del Giorgio)

Part of the CarBBAS (Carbon Biogeochemistry of Boreal Aquatic Ecosystems) group, I examined the carbon dioxide emissions from a flooded landscapes in a young boreal hydroelectric reservoir, comparing reservoir emissions to those of surrounding natural lakes.

2009

Field Research and Laboratory Assistant, Université du Québec à Montréal (Dr. Paul del Giorgio and Dr. Yves Prairie)

Assisted a post-doctoral fellow in water sampling, profiling, and sample processing at the Eastmain-1 hydroelectric reservoir in northern Quebec.

2006 to 2008

Independent Researcher, McGill University (Dr. Irene Gregory-Eaves)

Carried out a meta-analysis of global and regional patterns in lake sedimentation rates.

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2004 to 2005

Research Assistant, University of British Columbia (Dr. Roy Turkington)

Independently designed, set-up, and executed a laboratory experiment examining the relationships between different tree species and ectomycorrhizal fungi.

2004

Field Work Assistant, University of British Columbia (Dr. Judith Myers)

Prepared test plots on Iona Island, British Columbia, to determine the effects of biosolids on the growth of scotch broom.

SUCCESSFUL GRANTS AND FUNDING

2018

Henry's Fork Foundation: "Hydrological and Ecological Assessment of the Henry's Fork River and Island Park Reservoir to Support Multi-Stakeholder Management" (\$277,596.85 total, \$67,495.12 to me; PI: **Soren Brothers**, co-PIs: Phaedra Budy, Sarah Null)

2017

Utah State University office of Research and Graduate Studies Research Catalyst Seed Grant: "Assessing the effects of climate change on the net metabolism and carbon cycling of arctic lakes" (\$19,913, PI: **Soren Brothers**, co-PIs: Trisha Atwood, Janice Brahney, Phaedra Budy)

2013

NSERC Strategic Projects Grant: "Linking Regime Shifts to Carbon Dynamics in Lake Erie" (\$574,000 [CAD], PI: Dr. Marguerite Xenopoulos, Trent University, Canada) I assisted in project development and grant writing. Grant application was successful, but appointment (as a post-doctoral researcher) was not ultimately accepted.

GRANTS IN REVIEW

2018

The Nature Conservancy: "Reconstructing Utah Lake's Functional Ecology Shifts with Cultural Eutrophication" (\$7,569, PI: **S. Brothers**, co-PI: J. Brahney)

Central Utah Water Conservancy District: "Reconstructing Shifts in Utah Lake Littoral Habitats and Cladoceran Community Composition with Implications for the June Sucker" (\$9,203, PI: J. Brahney, co-PI: **S. Brothers**)

TEACHING

2019, Utah State University

WATS 4510 "Aquatic Ecology Practicum" (Course design and instructor, Aug. 29th – Dec. 4th)

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WATS 3700 “Fundamentals of Watershed Science” (Course design and instructor, Jan. 8th – May 4th)

WATS 6220 “Advanced Limnology” (Course design and instructor, Jan. 8th – Feb. 26th)

2018, Utah State University

WATS 3700 “Fundamentals of Watershed Science” (Course design and instructor, Jan. 8th – May 4th)

WATS Graduate Induction Course (Field limnology instructor, Aug. 23rd)

2017, Utah State University

WATS Graduate Induction Course (Field limnology instructor, Aug. 24th)

2014 to 2016, University of Guelph

ENVS 6470 “The Science and Management of Stressors in the Great Lakes Basin” (Course design, teaching assistant, and guest lecturer, Sept. 12th – 23rd, 2016; Sept. 21st – Oct. 2nd, 2015)

ENVS 6504 “Classification and Assessment of Aquatic Ecosystems” (Field assistant, June 13th-17th, 2016; June 16th-20th, 2014)

ENVS 3150 “Dead Lakes and Dead Zones: The Science and Management of Nutrient Pollution” (Guest lecturer, Jan. 29th, 2015)

2012, University of Potsdam

“Limnological Field Exercises for Bachelor’s and Master’s Students” (Field and laboratory assistant, June 8th-10th)

2008, Université du Québec à Montréal

BIO 1004 “Fondements et Notions Générales de Biologie pour l’Enseignements au Secondaire” (Field and laboratory teaching assistant, Sept. - Dec.)

GRADUATE STUDENTS

Jack McLaren, from Aug. 2018, *PhD in Ecology*. Topic: “Henry’s Fork water quality response to Island Park management”; Study Area: Henry’s Fork River, ID; Funding: Henry’s Fork Foundation. Co-supervisor: Dr. Phaedra Budy.

Leighton King, from Jan. 2018, *MS in Ecology*. Topic: “A paleolimnological history of water quality and eutrophication in Utah Lake since the 1800s”; Study Area: Utah Lake, UT; Funding: Brothers start-up funds. Co-supervisor: Dr. Janice Brahney.

UNDERGRADUATE STUDENTS

Dylan Anderson, June to September, 2018. Topic: “Assessing the effects of climate change on the net metabolism and carbon cycling of arctic lakes”; Study Area: Toolik Lake LTER, AK; Funding: USU RGS Research Catalyst Seed Grant.

Havaleh Rohloff, March to July, 2018. Topic: “Periphyton production in Utah Lake”; Study Area: Utah Lake, UT; Funding: USU J.S. Quinney College of Natural Resources (QCNR) Undergraduate Research Grant.

PUBLICATIONS

17. Epperly, J., A. Witt, J. Haight, S. Washko, T. B. Atwood, J. Brahney, **S. Brothers**, and E. Hammill, 2018. Relationships between borders, management agencies, and the likelihood of impairment. *PLOS One*, 13:e0204149
16. **Brothers, S.** and P. Sibley, 2018. Light may have triggered a period of net heterotrophy in Lake Superior. *Limnology and Oceanography*, doi:10.1002/lno.10808
15. Mehner, T., B. Lischke, K. Scharnweber, K. Attermeyer, **S. Brothers**, U. Gaedke, S. Hilt, and S. Brucet, 2018. Community size spectra from bacteria to fish confirm a transfer-efficiency correction of the energetic equivalence rule. *Ecology*, 99:1463-1472.
14. Hilt, S., **S. Brothers**, E. Jeppesen, A. Veraart, and S. Kosten, 2017. Translating regime shifts in shallow lakes into changes in ecosystem function. *BioScience*, 67:928-936.
13. Lischke, B., T. Mehner, S. Hilt, K. Attermeyer, M. Brauns, **S. Brothers**, H.-P. Grossart, J. Köhler, K. Scharnweber, and U. Gaedke, 2017. Benthic carbon is inefficiently transferred in the food webs of two eutrophic shallow lakes. *Freshwater Biology* doi: 10.1111/fwb.12979
12. **Brothers, S.**, Y. Vadeboncoeur, and P. Sibley, 2017. A decline in benthic algal production may explain recent hypoxic events in Lake Erie’s central basin. *Journal of Great Lakes Research*. 43: 73-78.
11. **Brothers, S.**, G. Kazanjian, J. Köhler, U. Scharfenberger, and S. Hilt, 2017. Convective mixing and high littoral primary production can establish systematic errors in lake diel oxygen curves in shallow, eutrophic lakes. *Limnology and Oceanography: Methods*. doi: 10.1002/lom3.10169
10. **Brothers, S.**, Y. Vadeboncoeur, and P. Sibley, 2016. Benthic algae compensate for phytoplankton losses in large aquatic ecosystems. *Global Change Biology*. doi:10.1111/gcb.13306
9. Mehner, T., K. Attermeyer, M. Brauns, **S. Brothers**, J. Diekmann, U. Gaedke, H. Grossart, J. Köhler, B. Lischke, N. Meyer, K. Scharnweber, J. Syväranta, M. Vanni, and S. Hilt, 2016. Weak response of animal allochthony and production to enhanced supply of terrestrial leaf litter in nutrient-rich lakes. *Ecosystems* doi: 10.1007/s10021-015-9933-2
8. Hilt, S., T. Wanke, K. Scharnweber, M. Brauns, J. Syväranta, **S. Brothers**, U. Gaedke, J. Köhler, B. Lischke, and T. Mehner, 2015. Contrasting response of two shallow lakes to a partial winterkill of fish. *Hydrobiologia*, doi: 10.1007/s10750-014-2143-7

7. **Brothers, S.**, J. Köhler, K. Attermeyer, H.P. Grossart, T. Mehner, N. Meyer, K. Scharnweber, and S. Hilt, 2014. A feedback loop links brownification to anoxia in a temperate, shallow lake. *Limnology and Oceanography*, 59(4): 1388-1398.
6. Scharnweber, K., J. Syväranta, S. Hilt, M. Brauns, M.J. Vanni, **S. Brothers**, J. Köhler, J. Knežević-Jarić, and T. Mehner, 2014. Whole-lake experiments trace added terrestrial particulate organic carbon in benthic food webs of shallow lakes. *Ecology*, 95:1496-1505. <http://dx.doi.org/10.1890/13-0390.1>
5. **Brothers, S.**, S. Hilt, K. Attermeyer, H.P. Grossart, S. Kosten, B. Lischke, T. Mehner, N. Meyer, K. Scharnweber, and J. Köhler, 2013. A regime shift from macrophyte to phytoplankton dominance enhances carbon burial in a shallow, eutrophic lake. *Ecosphere*, 4: art137. dx.doi.org/10.1890/ES13-00247.1
4. **Brothers, S.**, S. Hilt, S. Meyer, and J. Köhler, 2013. Plant community structure determines primary productivity in shallow, eutrophic lakes. *Freshwater Biology*, 58: 2264-2276. doi:10.1111/fwb.12207
3. **Brothers, S.**, P.A. del Giorgio, C.R. Teodoru, and Y.T. Prairie, 2012. Landscape heterogeneity influences carbon dioxide production in a young boreal reservoir. *Canadian Journal of Fisheries and Aquatic Sciences*, 69: 447-456.
2. **Brothers, S.**, Y.T. Prairie, and P.A. del Giorgio, 2012. Benthic and pelagic sources of carbon dioxide in boreal lakes and a young reservoir (Eastmain-1) in eastern Canada. *Global Biogeochemical Cycles*, 26. doi:10.1029/2011GB004074.
1. **Brothers, S.**, J. Vermaire, and I. Gregory-Eaves, 2008. Empirical models for describing recent sedimentation rates in lakes distributed across broad spatial scales. *Journal of Paleolimnology*, 40(4): 1003-1019.

GRADUATE STUDENT COMMITTEES

Nick Barrett (current). PhD studying the effects of climate change on arctic lakes at Utah State University (Supervisor: Phaedra Budy)

Leon Katona (current). PhD in Great Lakes' periphyton production at Wright State University (Supervisor: Yvonne Vadeboncoeur)

Dylan Bowes (2016-2017). MSc in subarctic freshwater food-web analysis at the University of Guelph (Supervisor: Paul Sibley)

AWARDS, HONORS, & MEDIA COVERAGE

2016 Society for Freshwater Science, "Making Waves" Podcast

Episode 18: Major Changes in the Production Pathways of the Great Lakes (May 15th)

2015 Early Career Travel Award, Association for the Sciences of Limnology and Oceanography

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INVITED TALKS

2018 University of Guelph, Guelph, Canada

“Eutrophication (and Oligotrophication) in the Context of Ecosystem Changes” (September 18th)

2018 Utah State University, Logan, USA

“Limnology in a Climate Change Context” (September 5th)

2018 Utah Lake Water Quality Study Steering Committee/Science Panel Meeting, Orem, USA

“Shallow Lake Ecology” (May 31st)

2017 Utah State University, Logan, USA

“Aquatic Ecosystems in a Changing World” (December 6th)

2017 Central Utah Water Conservancy District, Orem, USA

“A Paleolimnological History of Water Quality and Eutrophication in Utah Lake Since the 1800s” (November 23rd)

2017 Utah Division of Wildlife Resources, Salt Lake City, USA

“Shifting Winds: Sourcing Food and Oxygen in a Changing World” (October 3rd)

2017 University of Guelph, Guelph, Canada

“Eutrophication (and Oligotrophication) in the Context of Ecosystem Changes” (September 19th)

2017 University of Guelph, Guelph, Canada

“Thinking Big: Upscaling Carbon Cycling from Shallow Ponds to the Great Lakes” (February 3rd)

2016 Utah State University, Logan, Utah, USA

“Changing Winds: How Aquatic Carbon Cycles Respond to a Shifting World” (November 28th)

2016 Trent University, Peterborough, Canada

“Changing Winds: How Aquatic Carbon Cycles Respond to a Shifting World” (November 2nd)

2015 L’Université de Montréal, Montreal, Canada

“Le cyclage du carbone aux écosystèmes aquatiques dans une monde qui change” (April 28th)

2015 University of Guelph, Guelph, Canada

“Changing Winds: How Aquatic Carbon Cycles Respond to a Shifting World” (January 12th)

2014 Rensselaer Polytechnic Institute, Troy, New York, USA

“Changing Winds: How Aquatic Carbon Cycles Respond to a Shifting World” (November 20th)

2014 Wright State University, Dayton, Ohio, USA

“Changing Winds: How Carbon Cycles Respond to a Shifting World” (September 23rd)

2012 IGB Seminar Series, Berlin, Germany

“Regime Shifts Influence Carbon Fate in Small, Shallow Lakes” (August 16th)

2009 Hydro-Québec Eastmain-1 Workgroup meeting, Montreal, Canada

“Metabolic Differences between Boreal Lakes and a Young Boreal Reservoir in Quebec”

CONFERENCE PARTICIPATION

2018 Association for the Sciences of Limnology and Oceanography (ASLO), Victoria, Canada (oral presentation)

“Long-term declines in subarctic tundra lake CO₂ saturation: causes and effects” (June 10-15)

2017 International Association of Great Lakes Research (IAGLR), Detroit, USA (oral presentation)

“Long-term metabolic shifts in Lake Superior: a case of cumulative effects?” (May 16-19)

2017 ASLO, Honolulu, USA (oral presentation)

“Could a decline in benthic algae promote hypoxia in large aquatic systems?” (Feb 27 - March 3)

2016 IAGLR, Guelph, Canada (oral presentation)

“Could Lake Erie be experiencing a brownification-anoxia feedback loop?” (June 6-10)

2015 IAGLR, Burlington, USA (oral presentation)

“From the bottom up: Integrating the benthos for a fuller understanding of the Laurentian Great Lakes” (May 25-29)

2015 ASLO, Granada, Spain (oral presentation)

“Long-term patterns in primary productivity in the Laurentian Great Lakes: Multiple stressors and the increasing role of benthic productivity” (February 22-27)

2014 IAGLR, Hamilton, Canada (oral presentation)

“Long-term Patterns of Primary Production in the Laurentian Great Lakes: Tracing the Cumulative Effects of Eutrophication and Invasive Species” (May 26-30)

2014 Joint Aquatic Sciences Meeting (JASM), Portland, USA (oral presentation)

“A feedback loop linked brownification to anoxic conditions in a shallow, temperate lake” (May 18-23)

2012 ASLO, Otsu, Japan (oral presentation)

“A Tale of Two Lakes: Small-scale Carbon Economies and the Importance of Ecosystem Structure over Nutrient Availability” (July 8-13)

2011 der Deutschen Gesellschaft für Limnologie e.V. (DGL), Freising, Germany (oral presentation)

“The Effects of Plant Community Structure on Primary Production and Carbon Fate in Shallow Lakes” (September 12-16)

2009 Groupe de recherche interuniversitaire en limnologie et en environnement aquatique (GRIL), Quebec, Canada (oral presentation)

“La respiration pélagique et benthique d’un réservoir boréal et des lacs avoisinantes”

2007 GRIL, Quebec, Canada (poster)

“A Multi-Scale Analysis of Factors Affecting Changes in Lacustrine Sedimentation Rates”

SERVICE TO PROFESSION

2018

- **Freshwater Biology (manuscript review)**
- **Water Research (manuscript review)**
- **Serving as a member of Utah State University's Spring Runoff Conference Coordinating Committee**
- **Organized a Bear Lake field trip and was a guest speaker for the Native American Stem Mentorship Program**
- **Utah Lake Water Quality Study Science Panel member (Utah Department of Environmental Quality)**
- **Utah State University Undergraduate Research Committee Grant Review Board Member**
- **Proceedings of the Royal Society B (manuscript review)**

2017

- **National Science Foundation (grant proposal review)**
- **National Geographic Society (grant proposal review)**
- **National Geographic Society (grant proposal review)**
- **Utah State University Undergraduate Research Committee Grant Review Board Member**
- **Ecosystems (manuscript review)**
- **IAGLR Conference, Detroit, USA (Session co-chair, *The Science and Policy of Multiple Stressors and Cumulative Effects in the Great Lakes*)**
- **Science of the Total Environment (manuscript review)**
- **ASLO Conference, Honolulu, USA (Session co-chair, *Changes in Large Freshwater Ecosystems: Drivers, Responses, and Restoration*)**
- **ASLO Conference, Honolulu, USA (Mentor)**
- **Canadian Journal of Fisheries and Aquatic Sciences (manuscript review)**

2016

- **Limnology and Oceanography: Letters (manuscript review)**
- **Scientific Reports (manuscript review)**
- **Environmental Science & Technology (manuscript review)**
- **Ecology (manuscript review)**
- **IAGLR Conference, Guelph, Canada (Volunteer Coordinator)**
- **IAGLR Conference, Guelph, Canada (Session co-chair, *Biology and Ecology of Great Lakes Fish*)**

2015

- **IAGLR Conference, Burlington, USA (Session co-chair, *Multiple Stressors and Cumulative Effects: From Theory to Practice*)**
- **ASLO Conference, Granada, Spain (Mentor)**
- **Aquatic Sciences (manuscript review)**
- **Journal of Geophysical Research- Biogeosciences (manuscript review)**
- **Limnology and Oceanography (manuscript review)**

2014

- **Journal of Great Lakes Research (manuscript review)**
- **Freshwater Science (manuscript review)**

2013

- **Aquatic Botany (manuscript review)**
- **Hydrobiologia (manuscript review)**
- **Aquatic Biology (manuscript review)**

2007

- **International Society of Limnology (SIL) Conference, Montreal, Canada (“Green Team” volunteer)**

2005 - 2006

- **Citizen’s Alliance for Saving the Atmosphere and earth (CASA), Osaka, Japan (Language editor and general assistant)**

PROFESSIONAL MEMBERSHIPS

- **Association for the Sciences of Limnology and Oceanography (2013 to present)**
- **International Association of Great Lakes Research (2014 to 2018)**
- **Ecological Society of America (2016 to present)**
- **International Society of Limnology (2018 to present)**
- **Society for Advancement of Chicanos/Hispanics and Native Americans in Science (2018 to present)**