

## Michael W. Murray, Ph.D.

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### Education

**Ph.D., Water Chemistry**, 1996

Minor: Atmospheric and Oceanic Sciences. University of Wisconsin, Madison, WI

**M.S., Water Chemistry**, 1987

University of Wisconsin, Madison, WI

**Graduate Program in Environmental Sciences**

University of Virginia, Charlottesville, VA, 1983-84

**Diplôme, French Language and Civilization Program**, 1983

Université de Paris-IV, Paris, France

**B.S., Geological Engineering**, 1982

Colorado School of Mines, Golden, CO

### Experience

**Instructor/Lecturer**, Department of Biological Sciences, Augusta University, Augusta, GA  
August 2013 – present

- Teach environmental biology for non-science majors, with lab (details below)

**Instructor**, Master of Public Health Program, Augusta University, Augusta, GA  
January 2016 – May 2018; 2023

- Teach environmental health courses in online MPH program (details below)

**Adjunct Associate Professor**, University of Michigan School for Environment and Sustainability  
February 2011 – present (non-salaried)

- Collaborate with faculty, advise students (details below)

**Staff Scientist**, National Wildlife Federation, Great Lakes Regional Center, Ann Arbor, MI  
May 1997 – September 2021 (remotely from Georgia, 2013-2021)

- Served as principal NWF scientist addressing toxic chemicals at state, regional, national and international levels, with extensive involvement in other environmental issues
- Carried out and managed scientific and science-policy research and education work on multiple Great Lakes topics, including through supervision of over 50 interns, research assistants and volunteers, and collaborations with other Great Lakes researchers
- Significant involvement in International Joint Commission (IJC) work groups and committees over two decades (details below)

**Adjunct Lecturer**, University of Michigan School of Public Health (SPH); **Intermittent Lecturer**, University of Michigan School of Natural Resources and Environment  
September 1998 – May 2013; January – May, 2011, 2013

- Taught/team taught four graduate level courses (details below)

**Research Assistant/Student/Honorary Fellow, 1984 – 1997**

Water Chemistry Program, University of Wisconsin-Madison.

- Extensive laboratory and field studies on polychlorinated biphenyls (PCBs), in particular involving physical-chemical properties and mass transfer in the environment

**Aquatic Sciences and Science-Policy Leadership**

- Member of IJC Science Advisory Board, Science Priority Committee (2012 – 2023); Leadership roles and other active involvement:
  - Co-Chair of Nutrients Synthesis Work Group (2019 – present)
  - Co-Chair of Fertilizer Application Work Group (2015-2019)
  - Co-Chair of Energy Transport and Water Quality Work Group (2015-2018)
  - Member of Toward Implementation of a Manure Management Framework Work Group, Community Science Work Group, and Institutional Arrangement of Great Lakes Nutrient Adaptive Management Work Group (2021 – present)
  - Member of former work groups, including Stressor Interactions Work Group, Great Lakes Early Warning System Work Group, Harmonized Fish Consumption Advisory Framework Work Group, and several environmental indicators work groups (including co-lead of three subgroups)
- Chair, Past Chair of Society of Environmental Toxicology and Chemistry (SETAC), North America Science Committee (2021 - 2022); Advance development of innovative annual meeting session proposals, pursue efforts to diversity in committee membership, carry out workshop proposal reviews
- Co-organizer of five conference technical sessions in 2022-2023:
  - State of Lake Erie Conference, Lake Erie Harmful and Nuisance Algal Blooms and Panel, Cleveland, OH, March 16-17, 2022
  - Joint Aquatic Sciences Meeting (JASM), Spatial and Temporal Scales of Stressor Effects on Ecosystems; and Per- and Polyfluoroalkyl Substances (PFAS) Contamination in Aquatic Systems, Grand Rapids, MI, May 14-20, 2022. (Served as a moderator in both sessions)
  - SETAC North America 43<sup>rd</sup> Annual Meeting, PFAS and Related Compounds in Terrestrial and Aquatic Wildlife: Exposure, Uptake, Tissue Distribution, and Toxic Effects, Pittsburgh, PA, November 13-17, 2022
  - SETAC North America 44<sup>th</sup> Annual Meeting, Toxic Effects of Per- and Poly-fluorinated Compounds: From the Molecular to Ecosystem levels, Louisville, KY, November 12-16, 2023
- Associate Editor, Lake Erie Special Issue Series in *Aquatic Ecosystem Health and Management*, to be published in 2023 – 2024
- Led diverse group of scientists in two University of Michigan Cooperative Institute for Great Lakes Research-funded projects, to examine potential for increased use of conceptual frameworks in Great Lakes restoration and protection efforts (2018-2019), and to consider alternative approaches to Great Lakes indicator development (2020-2021)

- Co-Chair of Toxic Pollution Committee of Ohio River Restoration Planning effort (2022-2023)
- Co-organizer of Great Lakes Ecoregion Network (coalition of NGO representatives and interested individuals), and Vice President (2022 – present); Co-Chair of Toxics-Free Great Lakes Binational Network (2017 – present)
- Organized/co-organized with other researchers five sessions (toxic chemicals policy, multiple stressors, restoration prioritization, Lake Erie nutrients/impacts) at conferences of the International Association for Great Lakes Research (1998, 2006, 2010, 2013, 2018)
- Co-organized two restoration prioritization workshops for Great Lakes researchers (2006, 2009), and science/science-policy sessions at 2<sup>nd</sup>, 3<sup>rd</sup>, 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup>, 10<sup>th</sup> and 11<sup>th</sup> Annual Healing Our Waters Great Lakes Coalition Restoration Conferences
- Co-chair of Healing Our Waters (HOW) Great Lakes Coalition Technical Advisory Committee (2008-2015), including reviewing restoration implementation proposals
- Chair of Policy Coordination Committee of Great Lakes Panel on Aquatic Nuisance Species (2008-2012), with activities including coordinating development of committee work plans and priorities document, and multiple panel recommendation letters
- One of lead nongovernmental organization participants in Canada-U.S. Binational Toxics Strategy (1997-2010), active in Mercury Work Group and Integration Work Group; founding member of Great Lakes Wind Collaborative, Steering Committee (2008-2013), and co-organizer of workshop on offshore wind energy (2012)
- Earlier work on other literature synthesis efforts, including regarding mercury cycling, exposures and effects in humans and wildlife; development of a mercury monitoring framework; and implications of climate change for Great Lakes fisheries

### **Teaching/Advising/Academic Service**

#### **Teaching**

- Environmental Biology (Biol 1102), Augusta University, Department of Biological Sciences (19 terms to date); draw on extensive non-academic work experience and multiple sources in this non-science major course
- Three courses in Augusta University, Master of Public Health Program (online): Environmental Aquatic Sciences (MPHE 8904) (three terms, including significant redesign of course, 2016-2018); Fundamentals of Air Pollution (MPHE 8900) (one term, 2017); Introduction to Environmental Health (MPHC 8700) (summer term, 2023)
- Water Resource Policy (NRE 558), University of Michigan School of Natural Resources and Environment (winter terms 2011, 2013)
- Environmental Chemistry (EHS 574), University of Michigan School of Public Health, team taught/guest lectured with Dr. Jerome Nriagu (1998-2012)
- Water Quality Management (EHS 570), University of Michigan SPH, principal lecturer, including in significant redesign of course (2005-06)

- Guest lecturer in EHS 570, EHS 574, and Great Lakes Water Quality and Human Health (EHS 615), NRE 558, and other courses, including at Henry Ford Community College

### Student Advising and Service

- Advising through Augusta University, including:
  - Faculty advisor on Medical College of Georgia (MCG) project, *The Impacts of Environmental Health Discussions on the Public Health Literacy of Medical Students* (Christopher Watson, PI); Advisor on MCG student research project (2022 – present)
  - Faculty advisor to Friends of MSF (Doctors Without Borders) at Augusta University (student chapter, 2019 – present)
  - MPH Capstone program: William Ealick; also advised several MPH students on capstone projects and career options (2016-2018)
- Advised University of Michigan Graham Scholars students Eden Blutstein, Christina Brietzke, Georgina Broyles, Madeline Peery, and Harrison Suchyta on research project for NWF examining chemicals of emerging concern in the Great Lakes, resulting in report released in summer 2021
- Co-advised six University of Michigan EHS OJ/OC students on M.S. theses: John Raflowski (2002), April Wendling (2002), Andrew Webster (2003), Pamela Pugh (2005), Nancy Bobola (2006), and Mazen Boughanem (2006)
- Advised as client organization (with SNRE Faculty members Dr. Gloria Helfand and Dr. Michael Moore) Kathleen Cardamone, Stephanie Cuttler and Nikole Reaksecker on SNRE M.S. mercury emissions reduction project (2001-2002); advised several SNRE and Public Policy students on projects, coursework, and/or career issues
- Have spoken at several student career panels (including Graham Scholars virtual meeting in fall 2021), and advised numerous NWF interns and students from UM and AU on career options
- Vice President of American Association of University Professors, Augusta University Chapter (2022 – present); active in discussions on multiple issues, including shared governance, artificial intelligence and academia, and University policy document review
- Active member of Augusta University Green Team, including serving on multi-organization local Earth Day Planning Committee (2016 – present), and taking lead in reinvigorating Green Team around campus sustainability issues, including managing small budget (2022 – present)

### Publications

#### Technical/Science-Policy Papers, Book Chapters (peer-reviewed)

Collingsworth, P.D., Bunnell, D.B., **Murray, M.W.**, Kao, Y-C., Feiner, Z.S., Claramunt, R.M., Lofgren, B.M., Höök, T.O., Ludsins, S.A., 2017. Climate change as a long-term stressor for the fisheries of the Laurentian Great Lakes of North America, *Reviews in Fish Biology and Fisheries*, 27(2):363-391.

- Kalcic, M.M., Kirchhoff, C., Bosch, N., Muenich, R.L., **Murray, M.W.**, Gardner, J.G., Scavia, D., 2016. Engaging stakeholders to define feasible and desirable agricultural conservation in Western Lake Erie watersheds, *Environmental Science and Technology*, 50:8135-8145.
- Watson, S. B., Miller, C. J., Arhonditsis, G., Boyer, G.L., Carmichael, W., Charlton, M.N., Confessor, R., Depew, D.C., Höök, T.O., Ludsins, S.A., Matisoff, G., McElmurry, S. P., **Murray, M.W.**, Richards, R.P., Rao, Y.R., Steffen, M.M., Wilhelm, S.W. 2016. The re-eutrophication of Lake Erie: Harmful algal blooms and hypoxia, *Harmful Algae*, 56:44-66.
- Abbasi, G., Buser, A.M., Soehl, A., **Murray, M.W.**, Diamond, M.L. 2015. Stocks and flows of PBDEs in products from use to waste in the U.S. and Canada from 1970 to 2020, *Environmental Science and Technology*, 49:1521-1528.
- Mergler, D., Anderson, H.A., Chan, L.H.M., Mahaffey, K.R., **Murray, M.**, Sakamoto, M., Stern, A.H. 2007. Methylmercury exposure and health effects in humans: A worldwide concern, *Ambio*, 33(1):3-11.
- Scheuhammer, A., Meyer, M.W., Sandheinrich, M.B. **Murray, M.W.** 2007. Effects of environmental methylmercury on the health of wild birds, mammals, and fish, *Ambio*, 33(1):12-18.
- Harris, R., Krabbenhoft, D.P., Mason, R.F., **Murray, M.W.**, Reash, R.J., Saltman, T., 2007. Introduction, In: Harris, R., Krabbenhoft, D.P., Mason, R.F., Murray, M.W., Reash, R.J., Saltman, T. (Eds.), *Ecosystem Responses to Mercury Contamination: Indicators of Change*. Society of Environmental Toxicology and Chemistry, Pensacola, FL, and Taylor & Francis, New York, NY, pp. 1-11.
- Wolfe, M.F., Atkeson, T., Bowerman, W., Burger, J., Evers, D.C., **Murray, M.W.**, Zillioux, E., 2007. Wildlife indicators, In: Harris, R., Krabbenhoft, D.P., Mason, R.F., Murray, M.W., Reash, R.J., Saltman, T. (Eds.), *Ecosystem Responses to Mercury Contamination: Indicators of Change*, Society of Environmental Toxicology and Chemistry, Pensacola, FL, and Taylor & Francis, New York, NY, pp. 123-189.
- Saltman, T., Harris, R., **Murray, M.W.**, Reash, R.J., 2007. An integrated framework for ecological mercury assessments, In: Harris, R., Krabbenhoft, D.P., Mason, R.F., Murray, M.W., Reash, R.J., Saltman, T. (Eds.), *Ecosystem Responses to Mercury Contamination: Indicators of Change*, Society of Environmental Toxicology and Chemistry, Pensacola, FL, and Taylor & Francis, New York, NY, pp. 191-207.
- Mason, R.F., Abbott, M.L., Bodaly, R.A., Bullock, O.R., Driscoll, C.T., Evers, D., Lindberg, S.E., **Murray, M.**, Swain, E.B., 2005. Monitoring the response to changing mercury deposition, *Environmental Science & Technology*, 39(1):16A-22A.
- Murray, M.** and Holmes, S.A., 2004. Assessment of mercury emissions inventories for the Great Lakes states, *Environmental Research*, 95:282-297.

Boethling, B., Buccini, J., Cowan-Ellsberry, C., Graham, D., Hansen, B., **Murray, M.**, Rampy, L., Rodan, B., Wahlstrom, B., 2000. Framework and criteria for evaluating persistent and long-range transport, *In* Evaluation of Persistence and Long-range Transport of Organic Chemicals in the Environment, Klecka, G., Boethling, B., Franklin, J., Grady, L., Graham, D., Howard, P.H., Kannan, K., Larson, R.J., Mackay, D., Muir, D., van de Meent, D. (Eds.), Society of Environmental Toxicology and Chemistry, Pensacola, FL, pp. 315-334.

**Murray, M. W.** and Andren, A. W., 1992. Evaluation of a precipitation collector for PCB analysis, *Atmospheric Environment*, 26A(6):1097-1101.

**Murray, M. W.** and Andren, A. W., 1992. Precipitation scavenging of polychlorinated biphenyl congeners in the Great Lakes Region, *Atmospheric Environment*, 26A(5):883-897.

**Murray, M. W.** and Andren, A. W., 1991. Preliminary evaluation of the potential of gas purging for investigating the air-water transfer of PCBs, *In* Organic Substances and Sediments in Water, Baker, R.A. (Ed.), Lewis Publishers, Inc., Chelsea, MI, pp. 3-13.

Several papers in development, drawing on collaborative efforts noted above on conceptual frameworks, Great Lakes indicators, and addressing Lake Erie eutrophication.

#### **Committee/Workgroup/Other Reports**

(29 reports as lead author, co-author, or contributor; selected reports since 2006 listed here)

**Murray, M.W.**, Bratton, J.F., Elgin, A.K., Godwin, C.M., Riseng, C.M., 2021. Great Lakes indicators: Exploring alternative approaches through stakeholder input: A white paper. National Wildlife Federation, Great Lakes Regional Center, Ann Arbor, MI.

**Murray, M.W.**, Bratton, J., Elgin, A., Godwin, C., Riseng, C. 2021. Great Lakes indicators: Background and overview for a HOW Coalition leadership meeting.

**Murray, M.W.**, Bratton, J., Elgin, A., Godwin, C., Riseng, C. 2021. Great Lakes indicators: Exploring alternative approaches through stakeholder input, background document. (Prepared for Great Lakes Indicators: Exploring Alternative Approaches Through Stakeholder Input Virtual Summit, February 23-24, 2021.)

**Murray, M.W.** and Rau, E. 2020. Seizing the day for Ohio River restoration: A vision for science-based ecosystem restoration integrated with equity and justice. Background document for virtual session, Ohio River Basin Symposium & Summit 2020, October 2, 2020.

**Murray, M.W.** and Salim, O. 2019. The science and policy of PFASs in the Great Lakes Region: A roadmap for local, state and federal action, National Wildlife Federation, Great Lakes Regional Center, Ann Arbor, MI.

**Murray, M.W.**, Steinman, A.D., Allan, J.D., Bratton, J.F., Johnson, L.B., Ciborowski, J.J.H., Stow, C.A. 2019. Conceptual frameworks and Great Lakes restoration and protection: A white paper. National Wildlife Federation, Great Lakes Regional Center, Ann Arbor, MI.

**Murray, M.W.**, Allan, J.D. and M. Child, 2018. Potential ecological impacts of crude oil transport in the Great Lakes Basin. Prepared by the Great Lakes Science Advisory Board for the International Joint Commission.

- International Joint Commission, 2018. Fertilizer application patterns and trends, and their implications for water quality in the western Lake Erie basin. Prepared by the Great Lakes Science Advisory Board for the International Joint Commission (Allan, J.D., **Murray, M.** and M. Child, co-authors).
- Murray, M.W.**, Kirchhoff, C., Kalcic, M.M., Steiner, A., Bosch, N., Lopez, F., Scavia, D., 2016. Guidance addressing Lake Erie eutrophication in a changing climate based on a case study with agricultural and coastal managers.
- Great Lakes Science Advisory Board, Science Priority Committee, Communication Indicator Workgroup, An assessment of the communicability of the International Joint Commission ecosystem indicators and metrics, June 2016 (contributor on PBTs in biota, and chemicals of mutual concern in water).
- Pebbles, V., Braun, H., Leduc-Lapierre, M., **Murray, M.**, Koslow, M., Hoffman, J., 2014. Best practices for climate change adaptation: Spotlight on Michigan coastal wetlands. Great Lakes Commission and National Wildlife Federation.
- Abbasi, G., Diamond, M., Soehl, A., **Murray, M.** 2014. Great Lakes PBDE reduction project, Summary paper no. 1, PBDE product inventory.
- Murray, M.**, Soehl, A., Abbasi, G., Diamond, M. 2014. Great Lakes PBDE reduction project, Summary paper no. 2, PBDE alternatives assessment.
- Diamond, M., Abbasi, G., Soehl, A., **Murray, M.** 2014. Great Lakes PBDE reduction project, Summary paper no. 3, PBDE reduction metrics.
- Koslow, M., Berrio, J., Glick, P., Hoffman, J., Inkley, D., Kane, A., **Murray, M.**, and Reeve, K. 2014. Restoring the Great Lakes' coastal future: Technical guidance for the design and implementation of climate-smart restoration projects with seven case studies. National Wildlife Federation, Reston, VA and National Oceanic and Atmospheric Administration, Silver Spring, MD.
- Work Group Report to the International Joint Commission, Technical Report on Ecosystem Indicators: Assessment of Progress Towards Restoring the Great Lakes, Great Lakes Water Quality Agreement, 2012-2015 Priority Cycle, July 2013.
- Murray, M. Lake Erie coastal wetlands and implications for nutrient loadings, draft report as part of International Joint Commission Lake Erie Ecosystem Priority Work Group, 2013.
- Murray, M. Identifying restoration and protection focus areas for the Healing Our Waters – Great Lakes Coalition: A report to the Healing Our Waters – Great Lakes Coalition Steering Committee, March 2010.
- U.S. Environmental Protection Agency (EPA) Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs, December 2007.
- U.S. EPA Science Advisory Board, EPI Suite Review Panel report, September 2007.
- Agreement Review Committee, 2006. Report to the Great Lakes Binational Executive Committee Volume 2. (Contributor to Review Working Group B and Special Issues Working Group Final Reports). December 2006.

Axler, R., Bails, J. Elliott, K., Fahnenstiel, G., Gannon, J., Krantzberg, G., Mackey, S., **Murray, M.**, Morrison, L., Ruetz, C., Savino, J., Scavia, D., Taylor, J., Todd, T. 2006. Future of the Great Lakes: Prioritizing prevention, protection, and restoration activities, July 2006.

Bails, J., Beeton, A., Bulkley, J., DePhilip, M., Gannon, J., **Murray, M.**, Regier, H., and Scavia, D. 2006. Prescription for Great Lakes ecosystem protection and restoration. (Also edited, and co-coordinated endorsement by initial group of 62 Great Lakes scientists in late fall 2005, then expanded to over 200 endorsements in 2006.)

Report to be released summer, 2023:

Great Lakes Science Advisory Board, 2023. Nutrients in Lake Erie and Lake Ontario: Synthesis of International Joint Commission Recommendations and Assessment of Domestic Action Plans. (Murray, M.W., Livernois, J., Wood, G., co-authors)

### Dissertation/Thesis

Murray, M.W. Laboratory studies of physical-chemical properties and field measures of several parameters affecting the transport and fate of polychlorinated biphenyls in the environment, Ph.D. Dissertation, Water Chemistry Program, University of Wisconsin, Madison, WI, 1996.

Murray, M.W. Precipitation scavenging of PCBs: Collector evaluation and event analysis, M.S. Thesis, Water Chemistry Program, University of Wisconsin, Madison, WI, 1987.

### Policy Papers/Other Publications

**Murray, M.** 2010. Human health implications of the Gulf oil spill, *Therapeutics and Toxins News* (newsletter for the Therapeutic Drug Management and Toxicology Division of American Association for Clinical Chemistry), Summer 2010.

Stadler, F., **Murray, M.** 2001. Mercury rising, *Forum for Applied Research and Public Policy*, 16(3): 43-51.

**Murray, M.W.**, Lawther, J.H., DeFalco, T.S., Wolk, J.C., Cholewiak, D.M., Reyer, J.E. 1999. Technical and policy issues related to the development of a total maximum daily load plan for mercury in the St. Louis River, MN: Development of a case study, Air & Waste Management Association, Mercury in the Environment, Proceedings of A Specialty Conference, September 15-17, 1999, Minneapolis, MN, pp. 63-74.

Billups, S., Eder, T., Jackson, J., Muldoon, P., **Murray, M.** 1998. Treading water: A review of government progress under the Great Lakes Water Quality Agreement, *The Toledo Journal of Great Lakes Law, Science & Policy*, Spring 1998, pp. 91-178.

### Policy, Education, and Advocacy Reports/Fact Sheets

(Over 20 publications (not including blogs), with those since 2011 listed here. Project coordinator or co-lead on most reports)

**Murray, M.W.** Compilation of recent studies on pollinators and neonicotinoids, 2017.



Inkley, D., Losoff, T., Rowland, J., Ellenberger, D., Glick, P., Murphy, J., **Murray, M.**, Ritter, J., Szollosi, F., Yancey, M. Wildlife in hot water: America's waterways and climate change, National Wildlife Federation, 2015.

Lazaroff, C., Weinmann, A., **Murray, M.**, Goldman-Carter, J. Harmful algal bloom state survey: Summary of results and recommendations, Resource Media and National Wildlife Federation, 2014.

Whitney, P., Heller, G., **Murray, M.**, Goldman-Carter, J., Watkins, G., Whelan, A. Toxic algae: Coming soon to a lake near you? Resource Media and National Wildlife Federation, 2013.

**Murray, M.W.**, Ruszaj, A., O'Shea, C., Radcliffe, C., Guadagnino, A. From the Great Lakes Water Quality Agreement to the Binational Toxics Strategy: An assessment of NGO perspectives on chemicals policies in the Great Lakes, National Wildlife Federation, 2011.

Mida Hinderer, J., **Murray, M.W.**, and Becker, T. Feast and famine in the Great Lakes: How nutrients and invasive species interact to overwhelm the coasts and starve offshore waters, National Wildlife Federation, 2011.

### **Group Policy Letters/Position Statements**

(Coordinator and/or contributor on over 30 comment letters, with example letters listed here)

Great Lakes Panel on Aquatic Nuisance Species: Letters/Statements to Aquatic Nuisance Species Task Force (ANSTF):

- Comments on ANSTF draft Strategic Plan (2013-2017) (2012)
- Position Statement on Governance Issues Involving the Great Lakes Water Quality Agreement (2010)

Healing Our Waters – Great Lakes Coalition comments on diverse topics:

- Letter to U.S. EPA on an independent science structure to advise the agency on the Great Lakes Restoration Initiative (2012)
- Letter on U.S. EPA draft 2011 – 2015 Strategic Plan (2010)

Great Lakes Water Quality Agreement, Annex 3, Chemicals of Mutual Concern: Policy and technical comment letters concerning binational strategies for five chemicals/groups (2017-2021)

National Wildlife Federation comment letters:

- Letters to U.S. EPA concerning proposed addition of certain PFAS to reporting program through Toxics Release Inventory, and preliminary regulatory determinations for certain chemicals under the Fourth Drinking Water Contaminant Candidate List (2020)
- Letter to the Great Lakes Observing System on the GLOS 5-Year IOSS Program, 2021-2026 (2020)

### **Presentations**

(Over 60 oral conference and other meeting presentations; presentations since 2011 listed here)

- Murray, M., Environmental indicators: Thoughts on contributing to sustainability and equity in the Great Lakes and beyond, presented at International E-Conference on Mitigating Contemporary Environmental Issues by Sustainable Approaches (Keynote address, virtual conference, University of Delhi, India), February 24, 2022.
- Murray, M.W., Toxic chemicals and fish in the Great Lakes, as part of webinar organized by Toxics-Free Great Lakes Binational Network and Fish Health Network, October 14, 2021.
- Jackson, J. and Murray, M., The Canada-Ontario Agreement and the Great Lakes Water Quality Agreement – An ENGO perspective, webinar organized by Toxics-Free Great Lakes Binational Network and Fish Health Network, July 7, 2021.
- Murray, M.W., Bratton, J., Godwin, C., Riseng, C., and McNeil, L. 2021. Great Lakes indicators & alternative approaches: Input from Healing Our Waters Great Lakes Coalition leadership, Overview presentation for meeting as part of UM CIGLR-sponsored summit, June 16, 2021.
- Murray, M.W., Bratton, J., Elgin, A., Godwin, C., Riseng, C. 2021. Great Lakes indicators: Exploring alternative approaches through stakeholder input. Overview presentation for virtual summit sponsored by UM CIGLR, February 23, 2021.
- Murray, M.W., PFASs and the Great Lakes: Brief overview of science and U.S. policies. presentation as part of PFAS "the Forever Chemicals" Contamination in the Great Lakes Basin webinar, organized by Toxic-Free Great Lakes Network and Healthy Great Lakes Program, June 22, 2020.
- Salim, O., and Murray, M.W., PFAS, PFAS everywhere: Problems and solutions, River Rally 2019, Cleveland, OH, June 21-24, 2019.
- Murray, M.W., Revisiting the *Prescription*: Identifying a conceptual framework for approaches to restoring and protecting the Great Lakes, CIGLR All Partners Meeting, Ann Arbor, MI, September 21, 2018.
- Murray, M.W. PBDEs and other PBTs in the Great Lakes: Breaking the cycle, PBDEs in the Great Lakes Workshop, Windsor, ON, February 22, 2017.
- Murray, M.W. Harmful algal blooms in Lake Erie: A mini-review of recent science, 11<sup>th</sup> Annual Great Lakes Restoration Conference, Chicago, IL, September 29 – October 1, 2015.
- Murray, M.W., Kirchhoff, C. Enhancing manager and stakeholder awareness of and responses to changing climatic conditions and their impacts on Lake Erie, poster presented at National Adaptation Forum, St. Louis, MO, May 11-14, 2015.
- Murray, M., deBarros, C., Krantzberg, G., Ridal, J., Swackhamer, D. Re-evaluation of indicators of toxic chemicals in the Great Lakes, 57<sup>th</sup> Conference on Great Lakes Research, Hamilton, ON, May 26-30, 2014.
- Murray, M.W., Watson, S.B., Bejankiwar, R. Overview of binational approaches to address nutrients in Lake Erie, National Conference on Ecosystem Restoration, Schaumburg, IL, July 29 – August 2, 2013.

- Murray, M.W., Watson, S.B., Carpenter, D., Casselman, J., Miller, C. Lake Erie Ecosystem Priority: Taking Action on Lake Erie (TAcLE), 56<sup>th</sup> Conference on Great Lakes Research, West Lafayette, IN, June 2-6, 2013.
- Murray, M.W., Koslow, M. Guiding restoration in a changing Great Lakes climate: Steps and tools, 56<sup>th</sup> Conference on Great Lakes Research, West Lafayette, IN, June 2-6, 2013.
- Murray, M.W. Addressing climate, nutrients and interacting impacts in Lake Erie, Great Lakes, Great Challenges Conference, Rochester, MI, March 14, 2013.
- Murray, M.W. PBDEs in the Great Lakes: Filling in the picture, BIFMA Furniture Issues Summit, Ann Arbor, MI, October 16, 2012.
- Murray, M.W. Healing Our Waters – Great Lakes Coalition: Research, education and advocacy in support of restoration and protection, Society for Freshwater Sciences, 2012 Annual Meeting, Louisville, KY, May 21-24, 2012.
- Murray, M.W. Feast and famine in the Great Lakes: the interaction of nutrient pollution and invasive species, National Caucus of Environmental Legislators, Great Lakes/Midwest 10<sup>th</sup> Annual Meeting, Chicago, IL, December 8-10, 2011.
- Murray, M.W. Overview of offshore wind energy in the Great Lakes, 7<sup>th</sup> Annual Great Lakes Restoration Conference, Detroit, MI, October 12-14, 2011.
- Murray, M.W. Great Lakes wetland restoration and climate change: Vulnerability and adaptation considerations, Michigan Wetlands Association Annual Conference, Acme, MI, August 30 - September 2, 2011.

### **Grants Received (as Principal Investigator (PI) or Co-PI)**

*Toxics-Free Great Lakes Binational Network* (2021). Awarded \$3,437 from the Canadian Environmental Law Association for coordination of binational NGO toxic chemicals work.

*Great Lakes Indicators: Exploring Alternative Approaches Through Stakeholder Input* (2020-2021). Awarded \$20,000 for expenses associated with organizing summit through University of Michigan Cooperative Institute for Great Lakes Research, virtual summit in February 2021.

*Revisiting the Prescription: Assessing recent progress, understanding of stresses and responses, and needs concerning restoring and protecting the Great Lakes* (2018-2019). Awarded \$20,000 for expenses associated with organizing summit through Cooperative Institute for Great Lakes Research, University of Michigan, June 2018.

*Toxics Free Great Lakes Network* (2017-2018). Awarded \$2,500, as part of larger grant from Freshwater Future to Canadian Environmental Law Association.

*Enhancing manager and stakeholder awareness of and responses to changing climatic conditions and their impacts on Lake Erie* (2013-2015) National Oceanic and Atmospheric Administration. Awarded \$296,709 to full project team, Co-PIs Dr. Christine Kirchhoff, Dr. Donald Scavia, Dr. Allison Steiner, Dr. Nate Bosch, Melinda Koslow, and Heather Elmer.

*Use of Environmental Management Systems to Address Chemicals of Concern in the Great Lakes Region* (2007-09). Awarded \$35,000 from U.S. Environmental Protection Agency; supplemental funding (\$15,000, through 2010) awarded in May 2009.

*Enhancing Reduction of Mercury and Other PBT Chemicals in the Great Lakes Region* (2005-06). Awarded \$35,000 from U.S. Environmental Protection Agency.

*Addressing Mercury Reductions in the Great Lakes* (2004-2005). Awarded \$35,000 from U.S. Environmental Protection Agency.

Also partner/collaborator on several other successfully funded proposals, including *A Self-Scaling Market Mechanism to Reduce Indirect Electricity Pollution* (WattTime *et al.*); *Real-Time Energy Impact Monitors for Residential, Industrial and Policy Use* (Dr. Carol Miller, Wayne State University, PI); *Forecasting Climate-Change Induced Effects on Recreational and Commercial Fish Populations in the Great Lakes* (Dr. David Bunnell, U.S. Geological Survey, PI); *Great Lakes PBDE Institutional Reduction project* (Anna Soehl, Great Lakes Commission, PI).

Also collaborated on numerous other successful NWF grant applications, including to the National Oceanic and Atmospheric Administration, U.S. EPA, the Wege Foundation, the Joyce Foundation, the Erb Family Foundation, the George Gund Foundation, the C.S. Mott Foundation, the Garfield Foundation, and the Great Lakes Fishery Trust.

### **Technical/Advisory/Review Committees**

(Over 50 to date; Committees since 2006 listed here, in addition to committees noted on p. 2)

International Joint Commission, Science Advisory Board/Science Priority Committee (2012 – 2023):

Communication Indicators Work Group, including Co-lead on PBTs in biota indicator (2014-2016), and lead role in added indicator on chemicals of mutual concern in water (2016)

Taking Action on Lake Erie Work Group (Co-lead, Climate Change Implications for Total Phosphorus, Dissolved Reactive Phosphorus Inputs/Outputs and Excessive Algal Blooms in Lake Erie subgroup (2012-2013))

Environmental Indicators Work Group, including lead on Chemicals of Mutual Concern in Water subgroup (2012-2013)

Society of Environmental Toxicology and Chemistry (SETAC) Technical Committee (1998 – present); Vice-Chair (2020), Chair (2021), Past Chair (2022); Member of Peer-Review Subcommittee (on wildlife toxicity assessments) (2017-2018)

Great Lakes Water Quality Agreement, Annex 3 (Chemicals of Mutual Concern), Extended Subcommittee (2013 – present)

2022 Great Lakes Public Forum Planning Advisory Committee (2021 – 2022)

Cooperative Institute for Great Lakes Research, Council of Fellows (2018-2021); reviewed proposals for new organizational members, fellowship applications.

Ludington Pumped Storage Project, Technical Work Group (2017)

Healing Our Waters Great Lakes Coalition, Technical Advisory Committee, Co-chair (2008-2015)

Mercury Science in the Great Lakes Workshop, U.S. EPA and U.S. Geological Survey (2012-2013)

Asian Carp Technical and Policy Workgroup (2011-2013)

Lake Michigan Biodiversity Conservation Strategy, Steering Committee (The Nature Conservancy-led project) (2011-2012)

Lake Erie Biodiversity Conservation Strategy, Steering Committee (The Nature Conservancy-led project) (2011-2012)

SETAC Gulf Oil Spill Focused Topic Meeting, Pensacola Beach, FL, Steering Committee (2010-2011)

Cooperative Institute for Limnology and Ecosystems Research, External Review Panel for NOAA Great Lakes Environmental Research Laboratory, Great Lakes Restoration Initiative Projects (2011)

Evaluating US Army Corps of Engineer Protocols to Quantifying Aquatic Ecosystem Significance at Regional and National Scales, Review Workshop (2010)

International Joint Commission, Expert Consultation on Chemicals of Emerging Concern (2009)

Minnesota Pollution Control Agency, Minnesota Department of Agriculture, American Association of Pesticide Control Officials/State FIFRA Issues Research and Evaluation Group, and U.S. EPA Region V, Development of Community-Level Pesticide Aquatic Life and Plant Benchmarks Using Great Lakes Initiative Methodologies: A Pilot Project for AAPCO/SFIREG & EPA Region 5 (Phase 2 review group) (2009)

Canada – U.S. Binational Toxics Strategy, 10 Year Anniversary Workshop Planning Committee (2006-2007)

Ecological team for research in support of economic analysis for Austin J.C., Anderson, S., Courant, P.N., Litan, R.E., America's North Coast: A Benefit-Cost Analysis of a Program to Protect and Restore the Great Lakes, September 2007 (2006-2007)

Michigan Department of Environmental Quality, Michigan Mercury Rules Workgroup (2006-2007)

Great Lakes Water Quality Agreement review, Governance and Institutions Working Group (2006-2007)

Health Risks and Toxicological Effects of Methylmercury panel; findings presented at 2006 Conference on Mercury as a Global Pollutant in Madison, WI (2005-2007)

U.S. EPA, Federal Advisory Committee on Detection and Quantitation for Uses in Clean Water Act Programs (2005-2007)

SETAC/U.S. EPA Mercury Monitoring and Assessment Workshop, Pensacola, FL (with book development), Steering Committee (2003-2007)

Great Lakes Water Quality Agreement review, Review Working Group B (Toxic Chemicals) (2006)

Great Lakes Water Quality Agreement review, Special Issues Working Group (2006)

U.S. EPA, Science Advisory Board, EPI Suite Review Panel (2006)

### **Additional Review Activities**

Have reviewed manuscripts for *Atmospheric Environment*, *Chemistry and Ecology*, *Environmental Engineering Science*, *Environmental Health Perspectives*, *Environmental Monitoring and Assessment*, *Environmental Pollution*, *Environmental Practice*, *Environmental Research*, and *Environmental Science and Technology*; have served as technical peer reviewer on grant proposals to U.S. EPA, Great Lakes Fishery Trust, and Great Lakes Protection Fund

Served as NWF staff commentator on resolutions for NWF annual meetings, including concerning moratorium on neonicotinoid insecticides (2017), and alternatives to single-use plastics (2018)

Have reviewed multiple agency and NGO reports, including (since 2006) the following:

International Joint Commission, Atmospheric deposition of phosphorus to freshwater lakes (2012); Review of atmospheric deposition of mercury in the Great Lakes Basin (2015); and subsection of Triennial assessment of progress report (2017)

Great Lakes One Health, A Convening at the John G. Shedd Aquarium, May 20, 2011

Commission for Environmental Cooperation, Taking stock: North American pollutant releases and transfers, 2006; and Taking stock: North American pollutant releases and transfers, Feature analysis: Pollutant releases to surface waters, 2011

Great Lakes Regional Collaboration, 2010, Great Lakes mercury emission reduction strategy

Canadian Environmental Law Association and Lowell Center for Sustainable Production, 2009. The challenge of substances of emerging concern in the Great Lakes Basin: A review of chemicals policies and programs in Canada and the United States, A report prepared for the International Joint Commission Multi-Board Work Group on Chemicals of Emerging Concern in the Great Lakes Basin

Technical input (via comment letters) on numerous additional agency reports, rulemakings, and guidance, including to U.S. EPA, U.S. Coast Guard, IJC, and numerous state and provincial agencies, and served as expert witness (concerning mercury cycling and exposure and effects in fish and wildlife, for Environmental Law and Policy Center) before the Illinois Pollution Control Board on proposed rule addressing large combustion sources (mercury) (35 Ill. Adm. Code 225) (2006)

Reviews of over 50 additional reports and comment letters from NWF, Healing Our Waters – Great Lakes Coalition, and other nonprofit groups/coalitions

### **Awards/Honors/Professional Societies**

Advisor of the Year nominee, for advisory work with Friends of MSF at Augusta University (2021-2022)

Opening keynote address, Climate change: Addressing inequities and the importance of youth voices, given at Augusta Junior Model United Nations meeting (for area middle school students), Augusta University, March 9, 2022

Society of Environmental Chemistry and Toxicology, Presidential Citation for Exemplary Service, SETAC 39<sup>th</sup> North America Annual Meeting, 4-8 November, 2018, Sacramento, CA

Scheuhammer et al. 2007 paper cited as New Hot Paper by Thomson Reuters ScienceWatch.com in 2008; Scheuhammer et al. 2007 and Mergler et al. 2007 each have over 1,000 citations (Google Scholar)

Runner-up for the **HydroLab Best Student Paper** award at the 33rd Conference on Great Lakes Research (1990)

Selected for membership in Sigma Xi (1993)

### **Society Memberships:**

American Association of University Professors  
American Chemical Society  
Association for Environmental Studies and Sciences  
American Geophysical Union  
American Public Health Association  
International Association for Great Lakes Research  
Society of Environmental Toxicology and Chemistry

### **Languages, Other Activities**

- Speaking/reading/writing proficiency in French; moderate proficiency in Spanish
- Georgia Carolina Toastmasters Club, Competent Communicator, IP3, and President (2017-2018) (2016 – present)
- Augusta Choral Society, singer and Chorus Council member (2017 – present)
- Accomplished distance cyclist, including two-timer finisher of Paris-Brest-Paris; multiple other outdoor interests include strong age-group runner (5 km, 10 km), hiking, cross-country skiing, birding, gardening, stargazing, travel