IN THE MATTER OF

| | | |
|---|---|---|
| TIMOTHY DOWNING, | ) | REGULATION OF WATER |
| SMITHFIELD, MERCER, ROME, | ) | LEVELS AND MINIMUM FLOWS |
| KENNEBEC AND SOMERSET COUNTIES | ) | |
| NORTH POND | ) | PRE-FILED TESTIMONY |
| L-30629-36-A-N | ) | |

Pre-filed Testimony of
7 Lakes Alliance Intervenor
Laura Rose Day
Chief Conservation Officer and
Spokesperson for 7 Lakes Alliance

Submitted January 24, 2025

I am Laura Rose Day, Chief Conservation and Special Initiatives Officer, 7 Lakes Alliance and Spokesperson for 7 Lakes Alliance (7 Lakes) pursuant to its designation as Intervenor in the above-captioned proceeding. 7 Lakes is a nonprofit organization located in Belgrade Lakes, Maine. Our mission is to conserve the lands and waters of the Belgrade Lakes Region for all. 7 Lakes develops and implements science-based, community-centered, and collaborative approaches to protect and restore the health of all of the Belgrade Lakes, including North Pond and related lands and waterways.

We have worked to ensure the health of the North Pond watershed through all of our programs, including but not limited to water quality research and monitoring, water quality protection and remediation; erosion control prevention, remediation and policy; prevention and remediation of aquatic invasive plants and other infestations; watershed education; and land conservation and stewardship. We are particularly focused on addressing reoccurring, potentially harmful algal blooms. We work with citizens, local lake associations, Colby College, towns, state and federal agencies, and numerous private and public entities to help sustain the many benefits of a healthy lake, including water quality, wildlife, recreational use and other factors to be considered in this proceeding.

7 Lakes' recent focus on North Pond has included the enhancement of our longstanding water quality data monitoring program and data analysis through our partnership with Colby College; service on the North Pond Watershed-based Plan Technical Advisory Committee and Steering Committee (2024), participation in the North Pond Watershed Survey (2022, referenced in the North Pond Watershed-based Plan (NPWP (2024)) to assess erosion threats; work with public and private partners to fund and implement erosion control best practices with willing landowners; and planning to implement the NP Watershed Plan's recommendation for an alum treatment to address recurring algal blooms in North Pond.

Through intervention in this proceeding, 7 Lakes aims to provide relevant factual information and analysis relevant to Maine Department of Environmental Protection's (the Department's)

determination of a minimum flow and lake level for North Pond that appropriately balances relevant factors including the lake ecology, water quality and human uses. Therefore, 7 Lakes offers testimony, attached, from the following two witnesses:

Exhibit A Testimony of Dr. Danielle Wain, Lake Science Director, 7 Lakes Alliance, January 24, 2025

Exhibit B Testimony of Lynn Geiger-Ortiz, Erosion Control Policy Manager, 7 Lakes Alliance, January 24, 2025

This testimony refers in part to documents already entered into the record by the Department of Environmental Protection, particularly the North Pond Watershed- Based Plan (2024).

7 Lakes appreciates the opportunity to contribute to the consideration of an appropriate establishment and implementation of a minimum flow and lake levels for the North Pond Dam. 7 Lakes requests a total of 20 minutes to summarize direct testimony during the hearing.

Respectfully submitted,

Laura Rose Day
Chief Conservation and Special Initiatives Officer
7 Lakes Alliance

Attachments: Exhibit A Testimony of Danielle Wain, 7 Lakes Alliance
Exhibit B Testimony of Lynn Geiger-Ortiz, 7 Lakes Alliance

Signature Laura Ann Rose Day 1-24-25 January 24, 2025

State of Maine
County of Kennebec
The foregoing instrument was acknowledged before me this 24th [date], at January, Maine, by Erica Dalrymple (and) passport Laura Ann Rose Day to be her free act and deed.

Erica Dalrymple
[Notary Public Signature]

Erica Dalrymple
Notary Public - Maine
My Commission Expires
01/07/2028

Erica Dalrymple
Notary Public, State of Maine
My Commission Expires: 1/7/28

**Attachment 1 for Pre-Filed Testimony by 7 Lakes Alliance**
**L-30629-36-A-N**

**Testimony of**
**Dr. Danielle Wain**
**Lake Science Director**
**7 Lakes Alliance**

I am Dr. Danielle Wain, Lake Science Director for the 7 Lakes Alliance. My background includes a BS, MS, and PhD (all in civil engineering with an emphasis in environmental and water engineering) and 25 years of experience in the field (see attached CV). I am also currently Secretary of the North American Lake Management Society. With this testimony, 7 Lakes intends to provide information that will aid the Maine Department of Environmental Protection in any determinations it might make regarding both minimum flow at the North Pond Dam and also lake levels on North Pond.

The Petitioners comment that "water quality has been degrading since the onset of North Pond Association's management of said dam." NPA has been managing the dam since the upgrade of the dam in 1987. While it is true that water quality in North Pond has declined since the 1980s, the most severe decline in water quality has occurred since 2018, thirty years after NPA began managing the dam (Figures 1 – 3). There is also no evidence that the changes are due to dam management as opposed to climate change and increased development around the lake, which are key drivers of declining water quality across the state of Maine (Figures 4 – 6).

The 7 Lakes Alliance recognizes that minimum flows play an important role in ensuring ecological health of lake ecosystems. We therefore support the Department's establishment of minimum flows alongside a range of lake levels required to support the ecology of both the lake and Great Meadows Stream. We encourage the DEP to enlist the advice of its various natural resource management agencies to inform its decisions in this matter.

But it is crucial that there is flexibility in dam management in response to water quality conditions that might be harmful to public health. The recurring algal blooms on North Pond led to development of a Watershed Based Plan in conjunction with the state. During periods in North Pond when there are excessive algal blooms, water should not be released downstream into Great Meadow Stream and into Great Pond. While the dominant strain of cyanobacteria that bloom in North Pond do not appear to produce toxins, the Maine DEP has detected the presence of the microcystin toxin when there is a mixed community of cyanobacteria (Table 1). While the levels observed did not exceed the EPA standards for recreational use, they do exceed the limits for consumption by children under 6, who ingest more water when swimming than older children and adults. It is not well-known what triggers toxin production, and it is and it is irresponsible from a management perspective to pass potentially toxic water downstream. Additionally, flexibility in dam management is needed to facilitate some remediation efforts, including the proposed upcoming alum treatment in North Pond (the recommended action in the DEP and EPA approved Watershed Based Management Plan for dealing with the cyanobacterial blooms) and ensuring the active invasive aquatic plant remediation efforts that are ongoing in Great Meadow Stream can be conducted safely.

Additionally, lowering the water level beyond the current operational range on the lake will have ecological and water quality impacts. The littoral habitat of the lake could be lost, leading to colonization by weedy plants, including invasive species. Lower water levels will likely lead to

resuspension of shallow sediments by wind waves and boat wakes which can introduce phosphorus from the bed into the water column. Lastly, a smaller volume of water in the lake will be more rapidly warmed by higher summer air temperatures than a larger volume of water, leading to warmer surface water temperatures, conditions under which potentially toxic cyanobacteria thrive.

Finally, a careful analysis of the historical record of algal blooms on North Pond does not support the most petitioner's statement that East Pond's dam operation "created abnormally low stagnant warm waters throughout the summer and may also have created our pond's first full algae bloom." The Maine DEP defines a full lake algal bloom as a Secchi disk transparency of less than 2 m. Prior to 2018, this has occurred on at least 6 other instances, as documented by the DEP data (Figure 1). The Technical Advisory Committee (comprised of experts from the DEP, 7 Lakes, Colby, and outside consultants) formed for the Watershed Based Plan development did not attribute the 2018 bloom to dam management and considered, but did not recommend, dam management as a remediation tool for the blooms.

I do hereby attest this submission in entirety and content thereof is true accurate, and complete to the best of my knowledge.

Respectfully submitted,

Danielle J Wain
Lake Science Director
7 Lakes Alliance

D Wain 1/24/25

Signature Danielle J Wain January 24, 2025

State of Maine
County of Kennebec

The foregoing instrument was acknowledged before me this 24th [date], at January, Maine, by Erica Dalrymple (and) Drivers Lic. Danielle J Wain to be her free act and deed.

Erica Dalrymple
[Notary Public Signature]

Erica Dalrymple
Notary Public - Maine
My Commission Expires
01/07/2028

Erica Dalrymple
Erica Dalrymple
Notary Public, State of Maine
My Commission Expires: 1/7/28

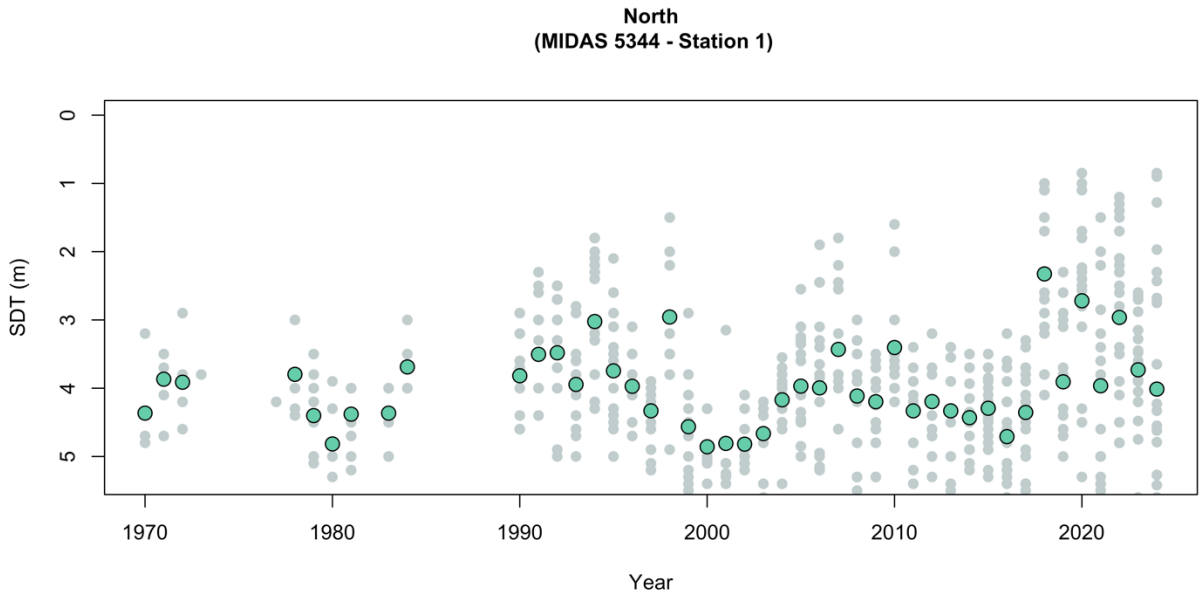


Figure 1. All Secchi disk measurements and their annual average on North Pond from 1970-2024. All data comes from the Maine DEP or was collected by 7 Lakes and has been approved by the DEP based on the Secondary Data Quality Assurance Guide that was approved as part of the North Pond Watershed Based Plan process. Note that Mann Kendall trend tests of the yearly averages show no statistically significant trend and T-tests of the pre- and post-dam upgrade in 1987 show no statistically significant change.

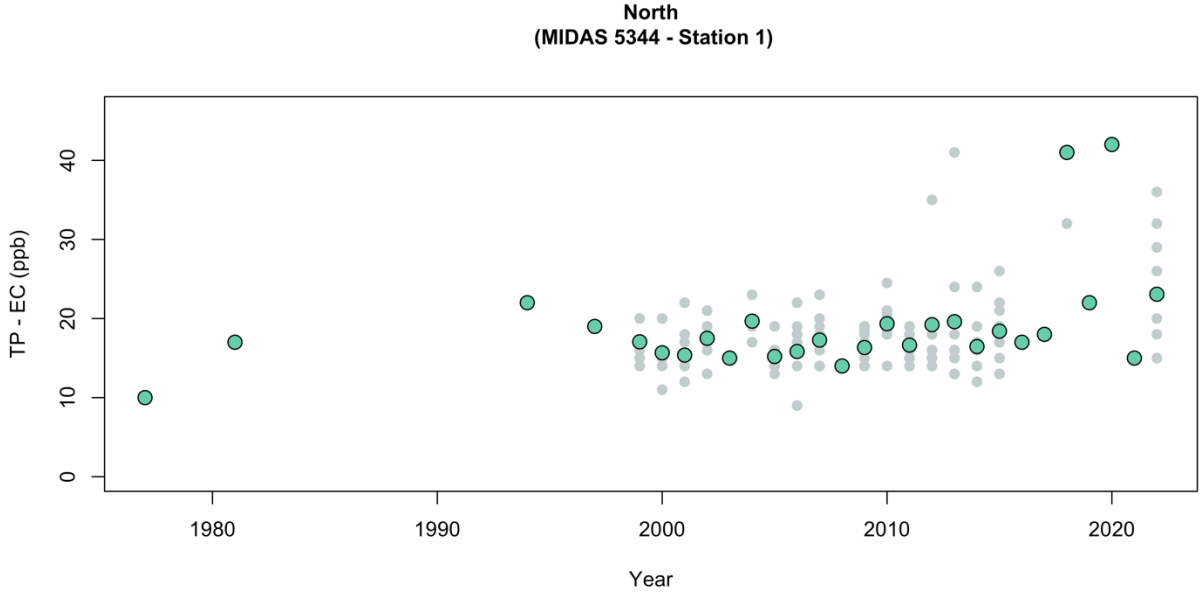


Figure 2. All total phosphorus measurements from epicores and their annual average on North Pond from 1977-2022. All data comes from the Maine DEP. Note that due to the lack of data before the dam was upgraded in 1987, no statistically significant comparison can be made pre- and post- dam.

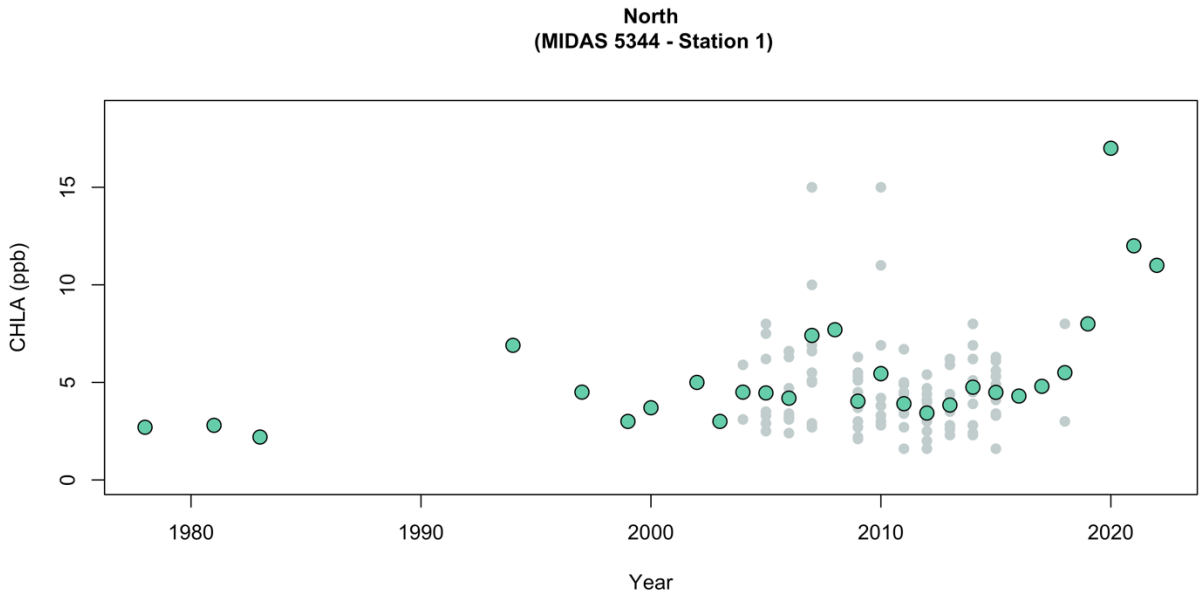


Figure 3. All chlorophyll-a measurements from epicores and their annual average on North Pond from 1977-2022. All data comes from the Maine DEP. Note that due to the lack of data before the dam was upgraded, no statistically significant comparison can be made pre- and post- dam.

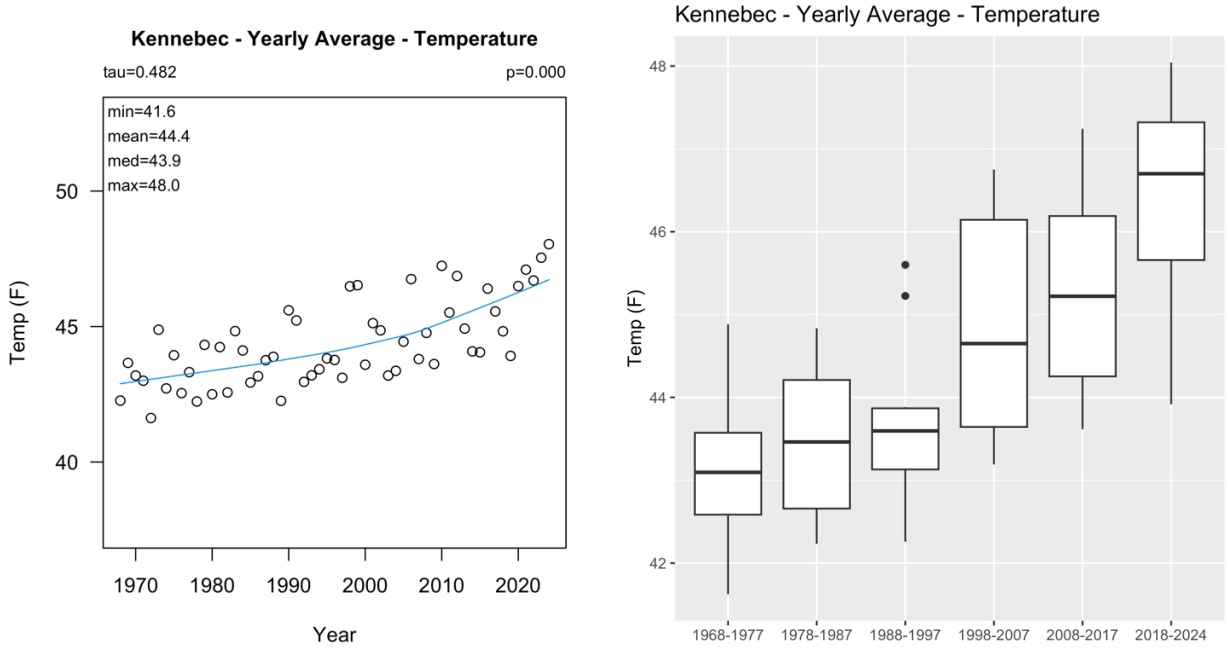


Figure 4. (left) Yearly average temperatures for Kennebec County (from the National Oceanic and Atmospheric Administration). Since the late 1960s, a Mann Kendall trend test shows that there has been a statistically significant increase in average annual air temperature. (right) Decadal box plots of air temperature (spilt by the year of the dam upgrade in 1987) shows a clear shift in air temperatures since 1997.

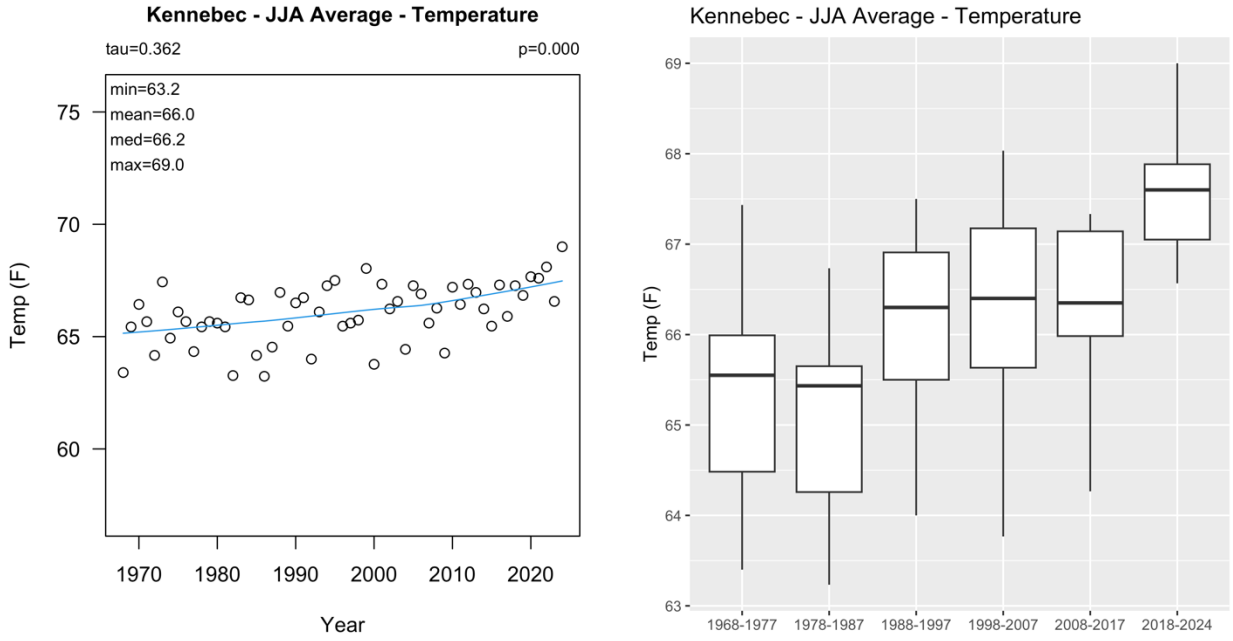


Figure 5. (left) Average summer (June, July, August) temperatures for Kennebec County (from NOAA). Since the late 60s, a Mann Kendall trend test shows that there has been a statistically significant increase in average summer air temperature. (right) Decadal box plots of summer air temperature (spilt by the year of the dam upgrade in 1987) shows a clear shift in summer air temperatures since 1987.

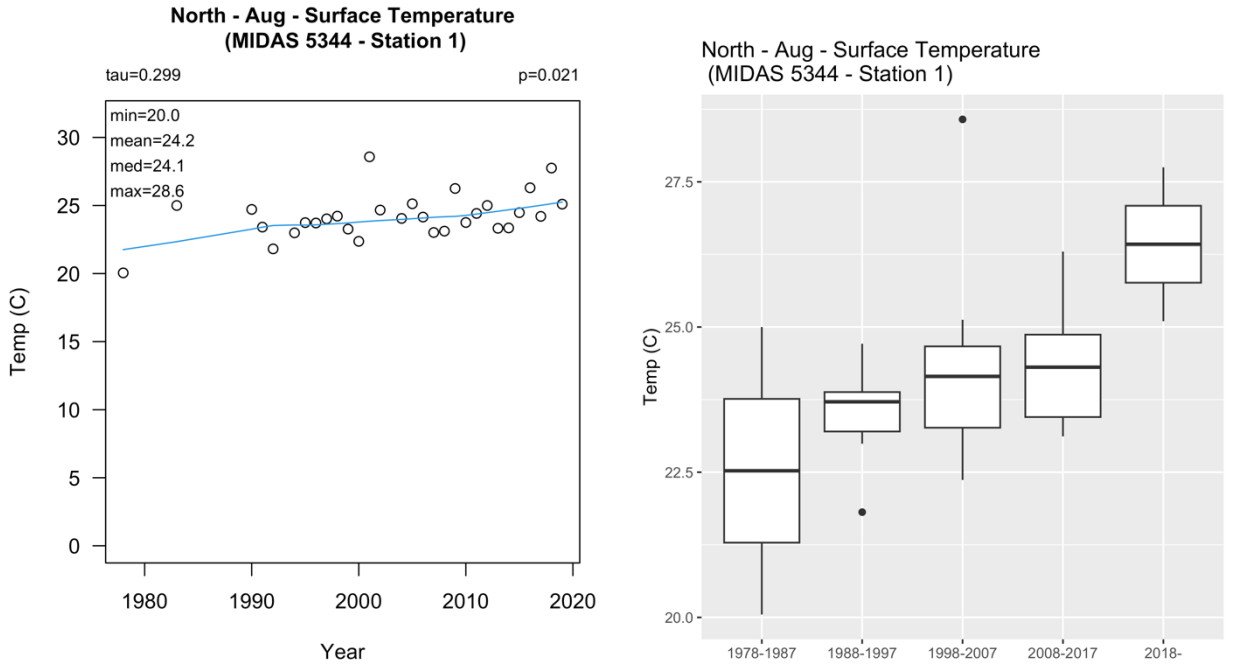


Figure 6. (left) August water surface temperatures for North Pond (from Maine DEP data) Since the late 70s, a Mann Kendall trend test shows that there has been a statistically significant increase in August water surface temperature. (right) Decadal box plots of August water surface

temperature (spilt by the year of the dam upgrade in 1987) also shows this increase, with data since 2018 showing a clear upward shift.

Table 1. Algal toxin analysis results from the Maine DEP (provided by Linda Bacon). EPA recreational limits for microcystin (MC) are 8 ug/L. EPA drinking water limits for children under 6 are 0.3 ug/L.

| Lake | sampledate | Sample Location | MC Qual | MC (ug/L) | Ana Qual | Anatoxin (ug/L) |
|---|---|---|---|---|---|---|
| North Pond - 5344 | 8/7/2020 | Sta1 SG | | 0.761 | | |
| North Pond - 5344 | 8/10/2021 | Sta1 SG | | 0.231 | | 0.022 |
| North Pond - 5344 | 8/18/2021 | Sta1 SG | ND | 0.000 | < | 0.000 |

**DANIELLE JULIA WAIN**
danielle.wain@7lakesalliance.org
207-205-8341

## EDUCATION

**Dec. 2009** **PhD in Civil Engineering, Iowa State University,** Ames, IA, USA
*Emphasis:* Environmental Engineering and Water Resources
*Dissertation:* Fate of fluid mixed at the boundary of a lake
*Advisor:* Dr. Chris Rehmann

**Aug. 2004** **MS in Civil Engineering, University of Illinois,** Urbana, IL, USA
*Emphasis:* Environmental Hydrology and Hydraulic Engineering
*Thesis:* Eddy diffusivity near bubble plumes
*Advisor:* Dr. Chris Rehmann

**May 1999** **BS in Civil Engineering, Cornell University,** Ithaca, NY, USA
*Emphasis:* Environmental Engineering
*Minor:* Geology

## CURRENT POSITIONS

**2018 –** **Lake Science Director**
7 Lakes Alliance, Belgrade Lakes, ME, USA

**2018 –** **Research Associate/Visiting Instructor**
Department of Chemistry, Colby College, Waterville, ME, USA

## PREVIOUS POSITIONS

**2013 – 2018** **Lecturer (Assistant Professor) in Water Quality Engineering**
Department of Architecture and Civil Engineering, University of Bath, UK

**2012 – 2013** **Postdoctoral Fellow**
*Advisor:* Dr. Brian Ward
Air-Sea Interaction Laboratory, School of Physics, National University of Ireland at Galway, Ireland
- Changing Earth Science Network Postdoctoral Fellowship (European Space Agency)
- Enterprise Partnership Scheme Postdoctoral Fellowship (Irish Research Council for Science, Engineering, and Technology)

**2009 – 2012** **Postdoctoral Research Associate**
*Advisor:* Dr. Michael Gregg
Ocean Physics Department, Applied Physics Laboratory, University of Washington, USA

## PROFESSIONAL CERTIFICATION

2016 Fellow of the Higher Education Academy (UK)

1999 Engineer-in-Training (USA)

**PEER REVIEWED PUBLICATIONS**
**(my name and that of students for whom I am/was primary supervisor are bolded)**
***Undergraduate**

Cherif, M., Brose, U., Hirt, M.R., Ryser, R., Silve, V., Albert, G., **Arnott, R.**, Berti, E., Cirtwill, A., Dyer, A., Gauzens, B., Gupta, A., Ho, H.-C., Portalier, S.M.J., **Wain, D.**, Wooten, K. (2024), The environment to the rescue: can physics help predict predator-prey interactions? *Biol. Rev.*, doi:10.1111/brv.13105

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**Arnott, R.N**, Cherif, M., Bryant, L.D., and **Wain, D.J.** (2021), Artificially generated turbulence: A review of phycological nanocosm, microcosm, and mesocosm experiments, *Hydrobiol.,* 848, 961–991, doi: 10.1007/s10750-020-04487-5

**Birt, D.**, **Wain, D.**, **Slavin, E.**, Zang, J., Luckwell, R., and Bryant, L. (2021), Stratification in a reservoir mixed by bubble plumes under future climate scenarios, *Water*, 13(18), 2467, doi:10.3390/w13182467

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**Simoncelli, S.**, Thackeray, S.J., and **Wain, D.J.** (2018), On biogenic turbulence and mixing from vertically migrating zooplankton in a lake, *Aquat. Sci.*, 80: 35, doi: 10.1007/s00027-018-0586-z

**Simoncelli, S.**, Thackeray, S.J., and **Wain, D.J.** (2017), Can small zooplankton mix lakes? *Limnol. Oceanogr. Lett.,* 2, 167–176, doi: 10.1002/lol2.10047

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Hall, R.A., Alford, M.H., Carter G.S., Gregg, M.C., Lien R.-C., **Wain, D.J.**, and Zhao, Z. (2014), Transition from partly standing to progressive internal tides in Monterey Submarine Canyon, *Deep Sea Res II,* 104, 164-173, doi: 10.1016/j.dsr2.2013.05.039

**Wain, D.J.**, Gregg, M.C., Alford, M.H., Lien, R.-C, Hall, R.A., and Carter, G.S. (2013), Propagation and dissipation of the internal tide in upper Monterey Canyon, *J. of Geophysical Res. – Oceans,* 118, doi: 10.1002/jgrc.20368

**Wain, D.J.**, Kohn, M.S., Scanlon, J.A., and Rehmann, C.R. (2013), Internal wave driven transport of fluid away from the boundary of a lake, *Limnol. Oceanogr.* 58(2), 429-442, doi: 10.4319/lo.2013.58.2.0429.

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**Wain, D.J.** and Rehmann, C.R. (2010), Transport by an intrusion generated by boundary mixing in a lake, *Water Resour. Res.*, 46, W08517, doi:10.1029/2009WR008391.

**Wain, D.J.** and Rehmann, C.R. (2005), Eddy diffusivity near bubble plumes, *Water Resour. Res.*, 41, W09409, doi:10.1029/2004WR003896.

**OTHER PUBLICATIONS**

Wain, D.J. and Bryant, L.D. (Eds.), *Proceedings of the 19th International Workshop on Physical Processes in Natural Waters: PPNW2016, Bath, UK, 12-15 July 2016,* ISBN: 0-86197-193-0

Wain, D.J., Kohn, M.S., Scanlon, J.A., and Rehmann, C.R. 2011 Transport of fluid from the boundary of a lake. *Proceedings of the 7th International Symposium on Stratified Flows*

Rehmann, C.R. and Wain, D.J. 2007 Characterization of vegetative flow resistance in the Kissimmee River, Final report for the South Florida Water Management District

Wain, D.J. and Rehmann, C.R. 2005 Evaluation of oceanographic microstructure measurements for hydraulic problems. *Proceedings of the 2005 World Water and Environmental Resources Congress: Impacts of Global Climate Change*, doi:10.1061/40792(173)411

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Rehmann, C.R., Wain, D.J., and Soga, C.L.M. 2004 Estimates of the dissipation of turbulent kinetic energy from temperature microstructure, *Proceedings of the 2004*

*World Water and Environmental Resources Congress: Critical Transitions in Water and Environmental Resources Management*, doi:10.1061/40737(2004)265

## EXTERNAL FUNDING

| | |
|---|---|
| 2024 – 2025 | Co-PI: Investigating shoreline impacts of boat wakes and understanding stakeholder response: A case study of East Pond, Maine Water Resources Research Institute - FY24 Water Resources Sustainability Research Grants (USGS 104b), $40,000 |
| 2022 – 2023 | Co-PI: Relative impacts of human-induced and natural wave erosion and deposition processes on large alum treated lakes: A case study on East Pond, Maine Water Resources Research Institute - FY22 Water Resources Sustainability Research Grants (USGS 104b), $26,456 |
| 2018 | PI: The role of morphology and size in the response of phytoplankton to turbulence, UK Royal Society, £10,800 |
| 2018 | PI: Stirring things up: Do surface mixers in drinking water reservoirs improve water quality? UK Natural Environment Research Council Industrial Mobility Fellowship, £66,800 |
| 2018 | Group Leader: The role of morphology and size in the response of phytoplankton to turbulence, AQUACOSM (European Commission), Facilities and Travel Support, £7,000 |
| 2017 – 2018 | Lead: Special Interest Group on Surface and Internal Waves, UK Fluids Network (Engineering and Physical Sciences Research Council), £12,000 |
| 2016 – 2018 | Co-PI: Linking pollution dynamics in lake sediments to overlying water chemistry, UK Royal Society, £12,000 |
| 2014 – 2018 | PI: Zooplankton generated mixing in stratified lakes, European Commission Marie Curie Career Integration Grant, €100,000 |
| 2014 – 2015 | PI: Zooplankton generated mixing in stratified lakes: A pilot study, UK Royal Society, £15,000 |

## INVITED PRESENTATIONS

New Hampshire Drinking Water Source Protection Conference, Concord, NH, USA, 2019
Environmental Fluid Mechanics Symposium, Cardiff University, UK, 2018
Department of Ecology and Environmental Sciences, Umea University, Sweden, 2017
Department of Mechanical Engineering, University of Bristol, UK, 2016
National Oceanography Centre – Liverpool, UK, 2016
Centre for Landscape and Climate Research Seminar Series, University of Leicester, UK, 2014
Ocean and Climate Seminar Series, University of East Anglia, UK, 2014
Physical Oceanography and Climate Seminar Series, National Oceanography Centre, Southampton, UK, 2013
NortekUSA Users Symposium, Seattle, WA, USA, 2010

## MOST RECENT CONFERENCE PRESENTATIONS

Wain, D.J., Ortiz, A.C., Bates, A., Oct. 2023, A case study of the impact of boat wakes vs wind waves on the alum treatment of East Pond, Maine, North American Lake Management Society, Erie, PA, USA

Wain, D.J., Nov. 2021, Measuring the impacts of wake boats: A pilot study From East Pond, North American Lake Management Society, Virtual

Wain, D.J., King, D.W., Baeder, C., and Wagner, K., Nov. 2019, The East Pond alum treatment II: Monitoring and evaluation, North American Lake Management Society, Burlington, VT, USA

Wain, D.J., Baeder, C., and King, D.W., Apr. 2019, The East Pond alum treatment: A multi-stakeholder approach to lake management, New England Interstate Water Pollution Control Conference, Portsmouth, NH, USA

Wain, D.J., King, D.W., and Kallin, P., Mar. 2019, Early indications of climate impacts on Maine lakes: A case study from the Belgrades, Maine Water and Sustainability Conference, Augusta, ME, USA

## PROFESSIONAL SERVICE

| | |
|---|---|
| 2021 – | Secretary, North American Lake Management Society (NALMS) |
| 2021 – | NALMS Justice, Equity, Diversity, and Inclusion (JEDI) Program |
| 2020 – | National Water Quality Monitoring Council JEDI Committee |
| 2020 – | Full Member, SCOR Working Group on Analyzing Ocean Turbulence Observations to Quantify Mixing |
| 2016 – | International Steering Committee Member, Physical Processes in Natural Waters |
| 2014 – | External PhD Examiner: University College London, Stellenbosch University |
| 2013 – | Proposal Reviewer: U.S. National Science Foundation (also Review Panel Member), Canadian Natural Sciences and Engineering Research Council |
| 2007 – | Article Reviewer: *Aquatic Sciences, Biogeosciences, Hydrology and Earth System Sciences and Ocean Sciences* (EGU), *Canadian Journal of Civil Engineering, Continental Shelf Research*, *Deep Sea Research, Environmental Research Communications, Environmental Research Letters, Experiments in Fluids, Geophysical Research Letters*, *Journal of Geophysical Research – Oceans* and *Water Resources Research* (AGU), *Inland Waters* (SIL), *Journal of Great Lakes Research* (IAGLR), *Journal of Hydraulic Engineering* (ASCE), *Journal of Limnology*, *Journal of Marine Science and Engineering, Journal of Physical Oceanography* (AMS), *Limnologica*, *Limnology and Oceanography* (ASLO), *Marine Ecology Progress Series, Oceanography* (TOS), *Physics of Fluids* (AIP), *Water*, *Water Quality Research Journal of Canada* (CAWQ) |
| 2017 – 2018 | UK Engineering and Physical Sciences Research Council Associate Peer Review College |
| 2016 – 2018 | University of Bath Point of Contact, UK Fluids Network |

2016 – 2018 Bath Science Café Organizing Committee
2015 – 2018 Bristol Water Challenge Panel Member
2017 Co-Convener, Special Session on Water Quality in Reservoirs, Symposum for European Freshwater Sciences, Olomouc, CZ
2016 Co-Chair, 19th International Workshop on Physical Processes in Natural Waters, Bath UK, ~50 participants
2016 Water Efficiency Conference Scientific Committee, Coventry UK
2010 – 2011 Student Liaison, Engineers Without Borders – Puget Sound Professional Partners

## RELEVANT WORK EXPERIENCE

***Engineer***
J. Robert Folchetti & Associates, Somers, NY, USA, Nov. 2001 – Jun. 2002

***Water Sanitation Engineer***
United States Peace Corps, Las Charcas de Azua, Dominican Republic, Jul. 1999 – Oct. 2001

## TEACHING EXPERIENCE

2019 – Visiting Instructor – Water and Sanitation in Developing Communities, Colby, 20 students/yr, all years
2015 – 2018 Lecturer – Public Health Engineering for Developing Communities, Bath, 20 student/yr, Y4
2013 – 2018 Lecturer – Civil Engineering Hydraulics 2, Bath, 100 students/yr, Y3
2013 – 2018 Tutor – Surveying and Geology Field Course, Bath, 100 students/yr, Y2
2017 Lecturer – Coastal and Water Engineering, Bath, 125 students/yr, Y3
2015 – 2016 Tutor – Civil Infrastructure Design Project, Bath, 50 students/yr, Y4
2014 – 2015 Tutor – Group Design Project, Bath, 200 students/yr, Y4
2007 – 2008 Teaching Assistant, Civil Engineering Design I/II, Iowa State, 60 students/yr, Y4
2007 Lecturer – Contractor Organization and Management (Statistics Unit), Iowa State, 30 students/yr, Y2

## PHD STUDENT SUPERVISION

**Lead Supervisor**
David Birt (Bath), Drinking water reservoir resilience in a changing climate, 2018 – 2023
Russell Arnott (Bath), The influence of phytoplankton morphology on dominance in turbulent regimes, 2016 – 2021
Emily Slavin (Bath), Using artificial circulation for in-reservoir management of cyanobacteria and taste and odour metabolite production, 2016 – 2020
Stefano Simoncelli (Bath), Hydrodynamics of migrating zooplankton in lakes, 2014 – 2018

**External Supervisor**

James Rand (Bath), An underwater micro glider for autonomous lake inspection, 2019 – present

Jeffrey Nielson (Washington State University), Lacustrine boundary mixing and lateral transport driven by internal waves, 2017 – 2022

## UNIVERSITY SERVICE AT BATH

2016 – 2018 Academic Senate Elected Member
2016 – 2018 Disability Changes Working Group Member
2013 – 2015 Bath Course representative on the Bath Scheme Committee

## DEPARTMENT/FACULTY SERVICE AT BATH

2015 – 2018 Department ACE2Zambia Student Team Advisor
2015 – 2018 Student Women's Engineering Society Committee Member
2014 – 2018 Department Equality and Diversity Officer
2014 – 2018 Student Engineers Without Borders Advisor
2013 – 2018 Department Athena SWAN Committee Member
2013 – 2018 Personal Tutor (Advisor) to 30 undergraduates/year
2013 – 2018 Placement Tutor (Advisor) to 3 undergraduates/year
2014 – 2017 Department Research Seminar Organizer

**Attachment B for Pre-Filed Testimony by 7 Lakes Alliance**
**L-30629-36-A-N**

**Testimony of**
**Lynn Marie Geiger-Ortiz**
**Erosion Control Policy Manager**
**7 Lakes Alliance**

I, Lynn Geiger-Ortiz, am the Erosion Control Policy Manager at 7 Lakes Alliance. The Erosion Control Program is tasked with tracking erosion throughout the Belgrade Lakes Watershed and assisting landowners with non-point source (NPS) pollution mitigation and prevention. I am currently the project manager for an active Federal Clean Water Act Section 319 Watershed Restoration Grant for North Pond. A stipulation of that grant is tracking the list of NPS sites documented in the 2024 Watershed-Based Plan. NPS sites are locations with active erosion and the potential for run-off to carry soil and nutrients into the lake.

The petition has claimed the erosion seen around North Pond is due to high water levels, without providing scientific evidence. The purpose of this testimony is to supply a more accurate account of the erosion documented around North Pond.

A watershed wide NPS (erosion) survey was conducted around North Pond in 2016 and followed up in 2022. The survey focused on the shoreland zone (within 250 feet of the shore) and on roadways, since drainage ditches often have a direct path to the lake. In the 2016 survey, 44% of the sites found included shoreline erosion. In 2022, the portion of shoreline erosion decreased to 25%, which indicates shoreline erosion is not getting worse and that erosion further inland is having a larger impact on nutrient loading (See Figure 1).

The map provided by the petitioners shows yellow highlighting around the entire perimeter of North Pond, which they claim is “severe shore & beach erosion significant damage & loss of shoreline tree canopy”. The 2022 North Pond Watershed Survey did not find uniform erosion around the perimeter of North Pond as the petitioners suggest. Figure 2 shows the location of all erosion sites from the survey. Shoreline erosion is denoted with red, and purple denotes inland erosion. Shoreline erosion is absent from large portions of the lake.

I was able to find images for 21 of the 23 active shoreline erosion sites (see Figure 3). The majority of these erosion sites are caused by human activity. For example, sites P and Q are caused by foot traffic on a poorly defined path, and sites C, D, E, I, J, K, L have structures built too close to the water. Lack of proper vegetation and ground cover is a factor for almost every site and steep topography exacerbates the surface erosion on sites B, D, H, I, J, K, L, and S. Site A is a classic example of an iceberm (caused by winter ice, when the dam is open). Only site T, and potentially site F, is truly susceptible to the major wave erosion described by the petitioners. If the landowners had not removed the native vegetation, the erosion would probably not have occurred.

Much of the intense shoreline erosion seen on North Pond is recently is due to ice action in the winter, when the dam is open. All lakes in our watershed experienced above average erosion during the 2023-2024 winter; the erosion control team received more requests to assess damage than previous years. The winter had several severe storms and warm temperatures. Incomplete ice cover during high winds will cause movement in the lake ice, pilling up and buldozing the shoreline down wind.

The petitioners claim tree falls and bank erosion is caused by dam management. The high number of tree falls seen recently is more likely tied to severe storms (exacerbated by climate change). The saturated soil and high

groundwater table, due to increased percipitation events, decrease the integrity of the root systems and allow trees to be uprooted at a lower wind speeds than under normal conditions.

The petitioners claim permanent damage to "bog areas" on the isthmus separating Little from North Pond and partway up Bog Stream. Aside from the fact that neither area is a bog, satellite imagery shows an inlet has existed between Little and North at the marked location since at least 1996, and current satellite imagery shows health canopy, see Figure 4.

The photograph provided by the petitioner is of a gully in a grassy area. The shore cannot be seen in the image, and the vegetation appears to be terrestrial. Since the erosion feature is uphill from a tree trunk, it is highly unlikely that the energy source causing the erosion is from the lake. It could possibly be caused by slumping, but the gully should not have a flat bottom in that case.

The petitioners claim different dam management will reduce shoreline erosion and the introduction of external phosphorus. However, the majority of shoreline erosion found on North Pond is actually caused by human activity and the removal of littoral vegetation. Most of the external phosphorus load is introduced by stormwater runoff. The 2022 North Pond Watershed survey found three times as many non-point source pollution (erosion) sources inland than on the shoreline itself and the shoreline had a higher proportion of low severity erosion than found elsewhere in the watershed. The decision to change dam management should not be structured around shoreline erosion, as the current management practices are not the root cause of the documented shoreline erosion on North Pond.

I do hereby attest this submission in entirety and content thereof is truem accurate, and complete to the best of my knowledge.

Respectfully Submitted,

Lynn Geiger-Ortiz,
Erosion Control Policy Manager, 7 Lakes Alliance

Signature Lynn M Geiger-Ortiz 1-24-2025 January 24, 2025

State of Maine
County of Kennebec
The foregoing instrument was acknowledged before me this 24th [date], at January, Maine, by Erica Dalrymple (and) Drivers lic. Lynn M Geiger-Ortiz to be her free act and deed.

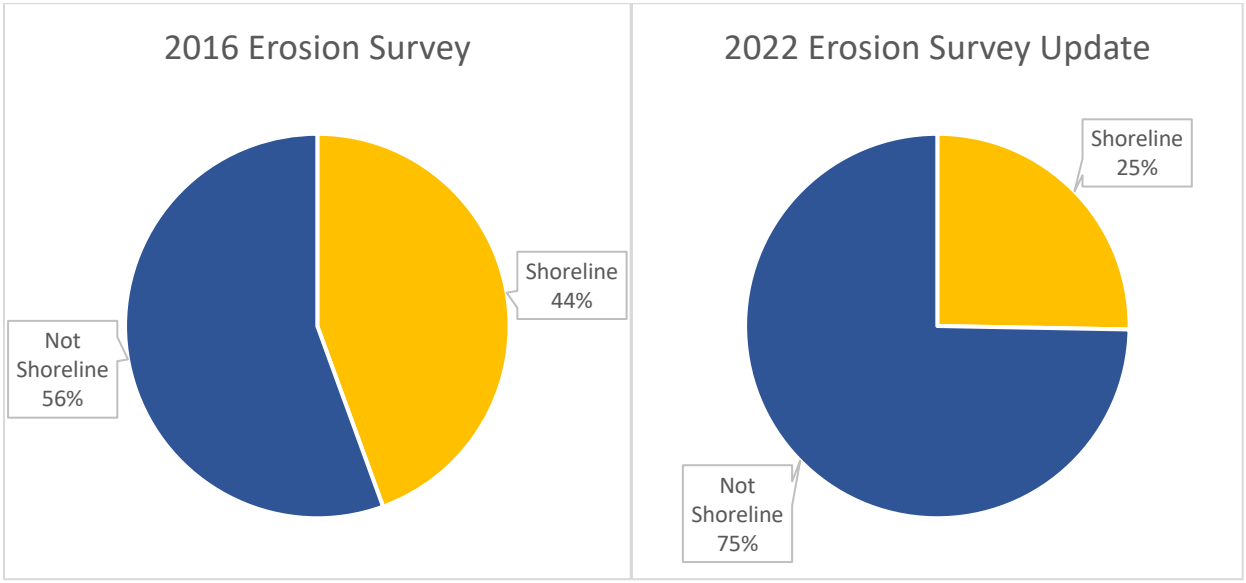
Erica Dalrymple
[Notary Public Signature]

Erica Dalrymple
Notary Public - Maine
My Commission Expires
01/07/2028

Erica Dalrymple
Erica Dalrymple
Notary Public, State of Maine
My Commission Expires: 1/27/28

FIGURE 1a) North Pond Watershed NPS (Erosion) Survey Results.

Of the 135 erosion sites found in 2016, 60 sites had shoreline erosion, including undercut shorelines or unstable access. During the 2022 survey update, only 22 of the 65 identified sites had shoreline erosion. Shoreline erosion is only a fraction of the erosion occurring in the North Pond watershed.




1b) Breakdown of erosion severity: Comparing the 2022 Watershed Survey shoreline erosion sites to erosion identified elsewhere. The shoreline has a greater percentage of low impact erosion than found elsewhere.

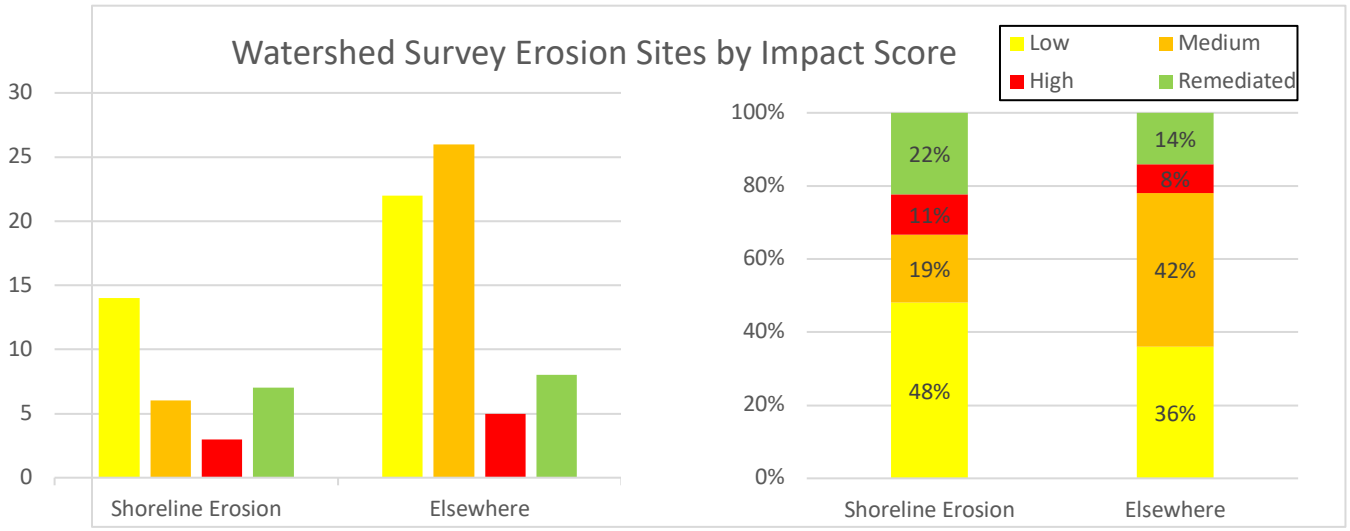


Figure 2: 2022 Watershed Survey Update Erosion Sites. Note: erosion is not uniform around the lake

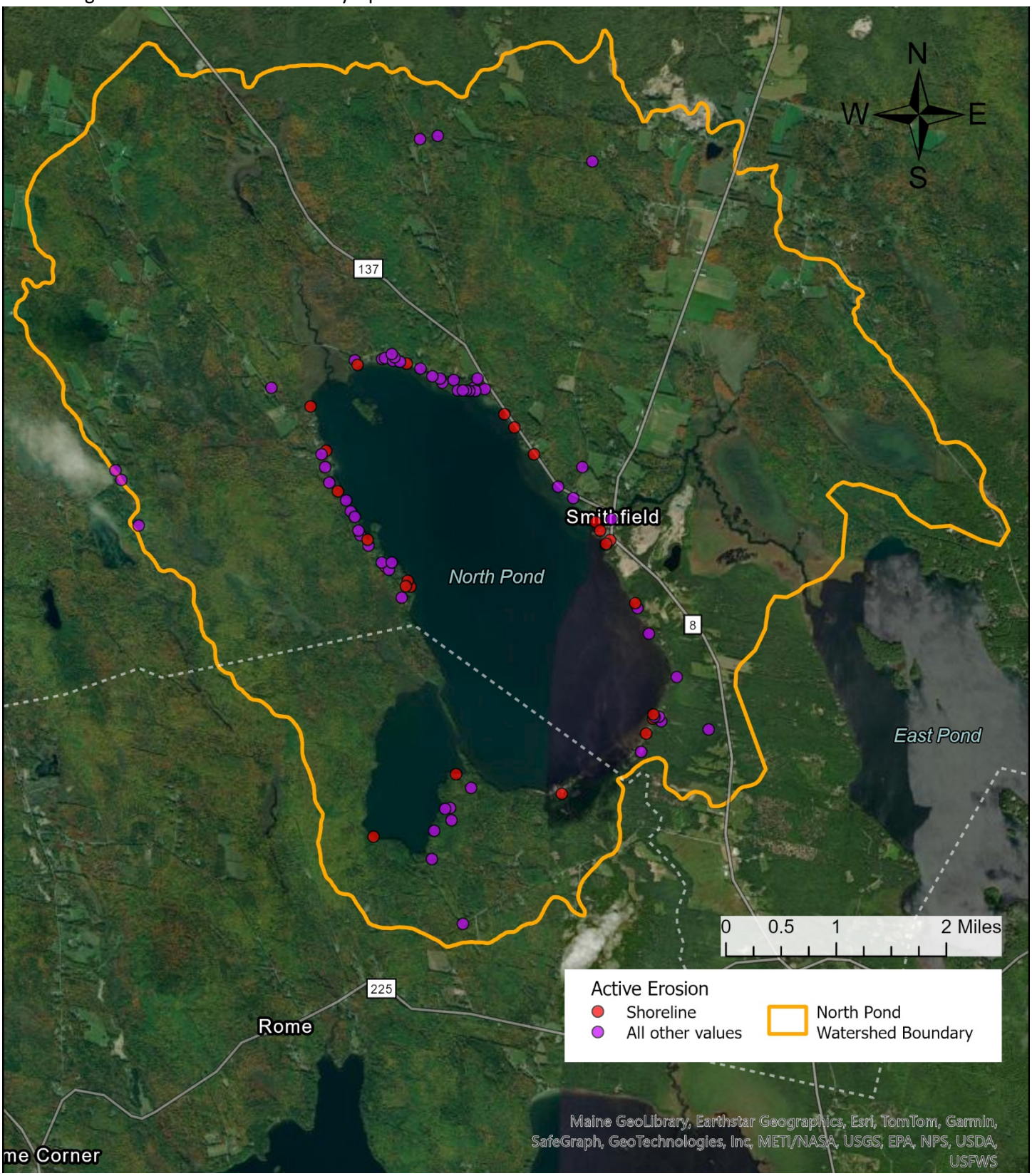
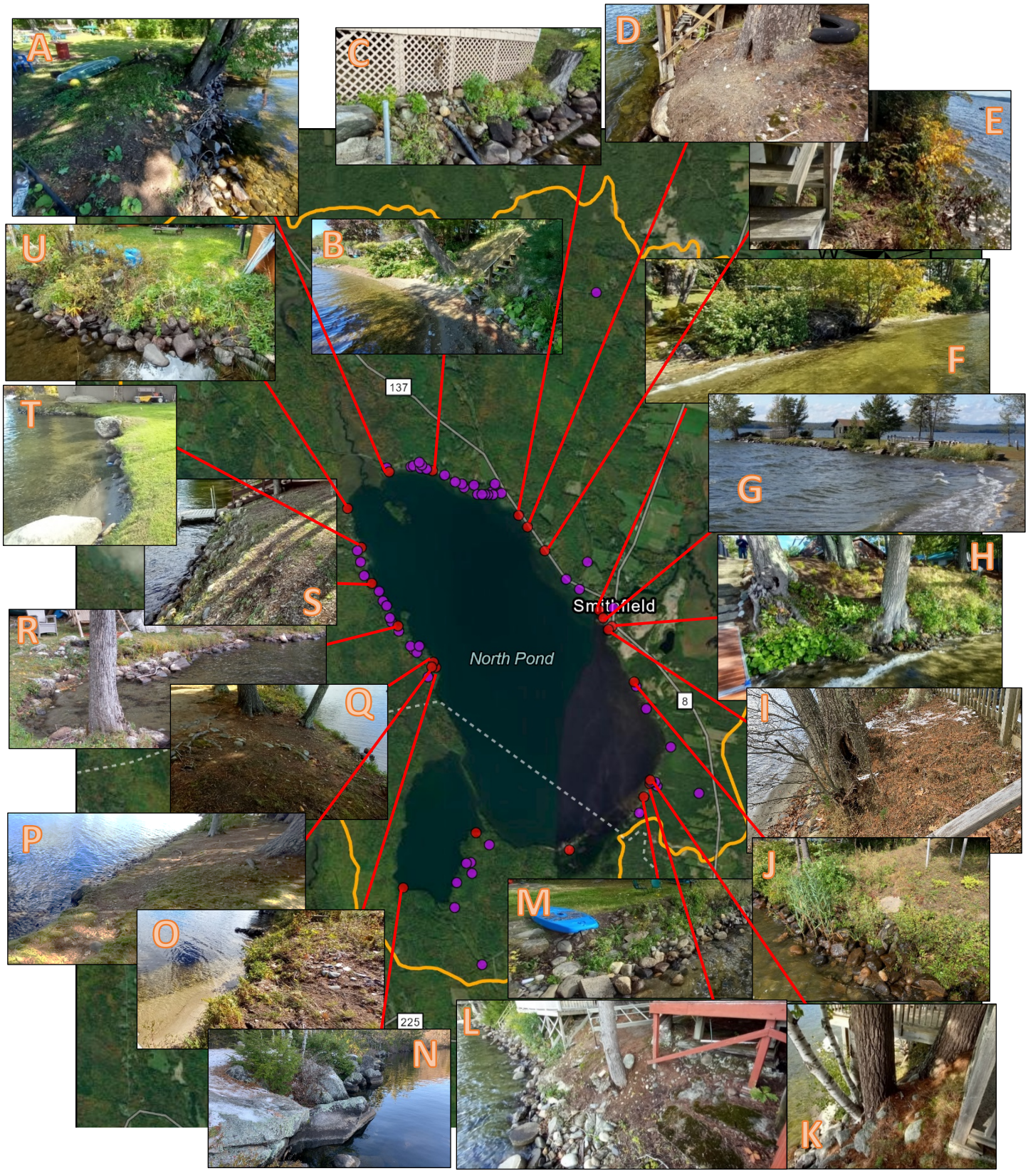
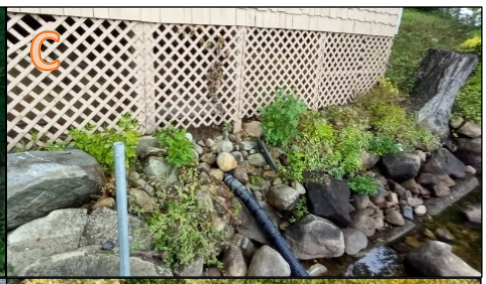


Figure 3: Active Erosion Sites 2022 Survey - Shoreline Erosion Photographs. Most erosion stems from human activity or winter ice. See next page for large images.

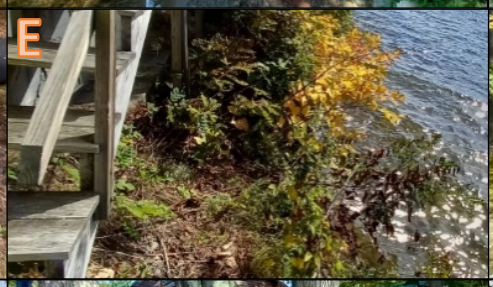



A


B


C


D


E


F


G


H


I


J


K

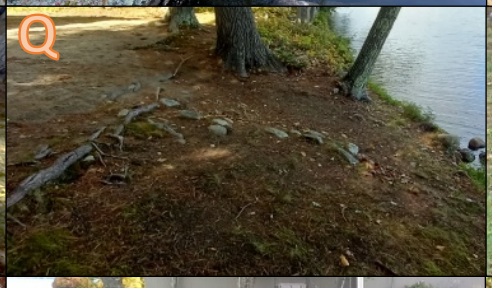

L

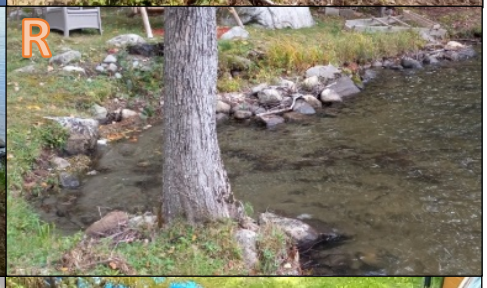

M


N

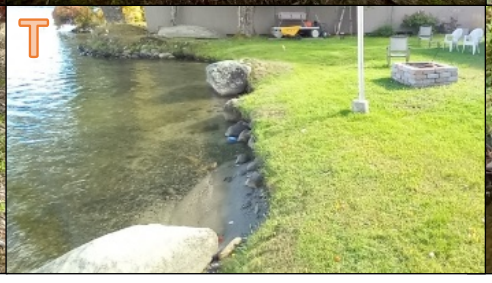

O


P


Q


R


S


T


U

Figure 4: Satellite imagery of “permanent damage to bog area”. Taken from Google Earth