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)

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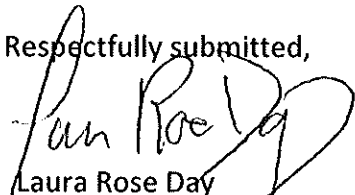
Exhibit A Testimony of Dr. Danielle Wain, Lake Science Director, 7 Lakes Alliance, January 24, 2025

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

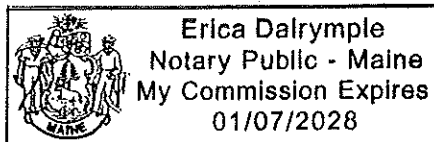|		
_____	_____	1-24-25
Signature	Laura Ann Rose Day	January 24, 2025

State of Maine
County of Kennebec

The foregoing instrument was acknowledged before me this _____ 24th _____ [date], at
_Janvary_____, Maine, by Dalrymple (and) passport_____ Laura Ann Rose Day to be her free act and deed.

_____
[Notary Public Signature]

Erica Dalrymple
Notary Public, State of Maine
My Commission Expires: _1|7|28_

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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

**North
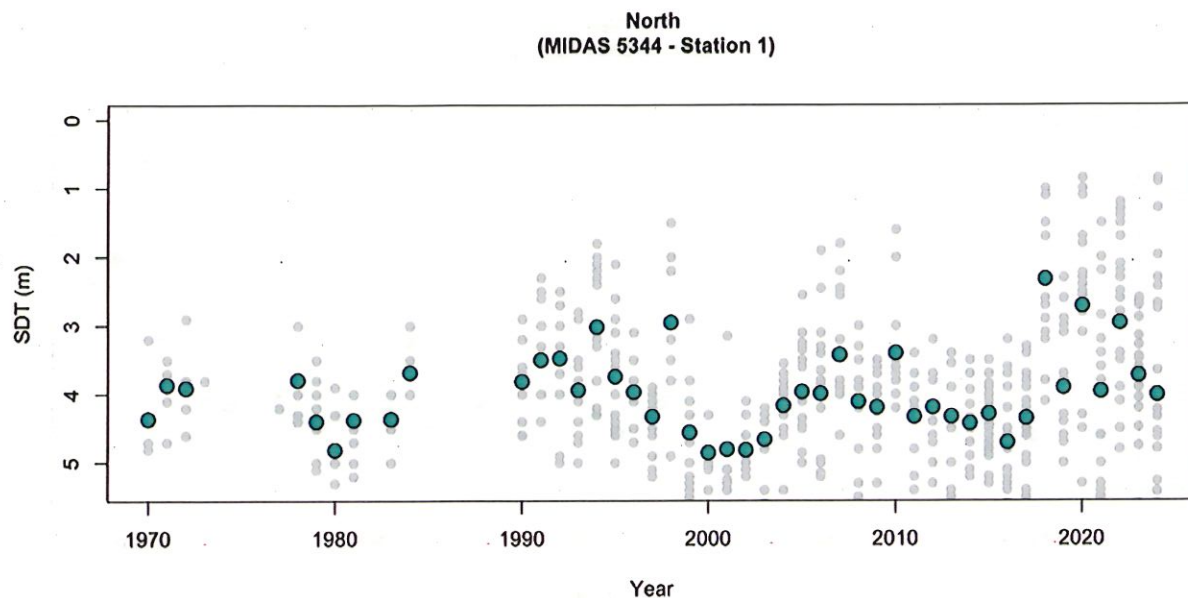(MIDAS 5344 - Station 1)**

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.
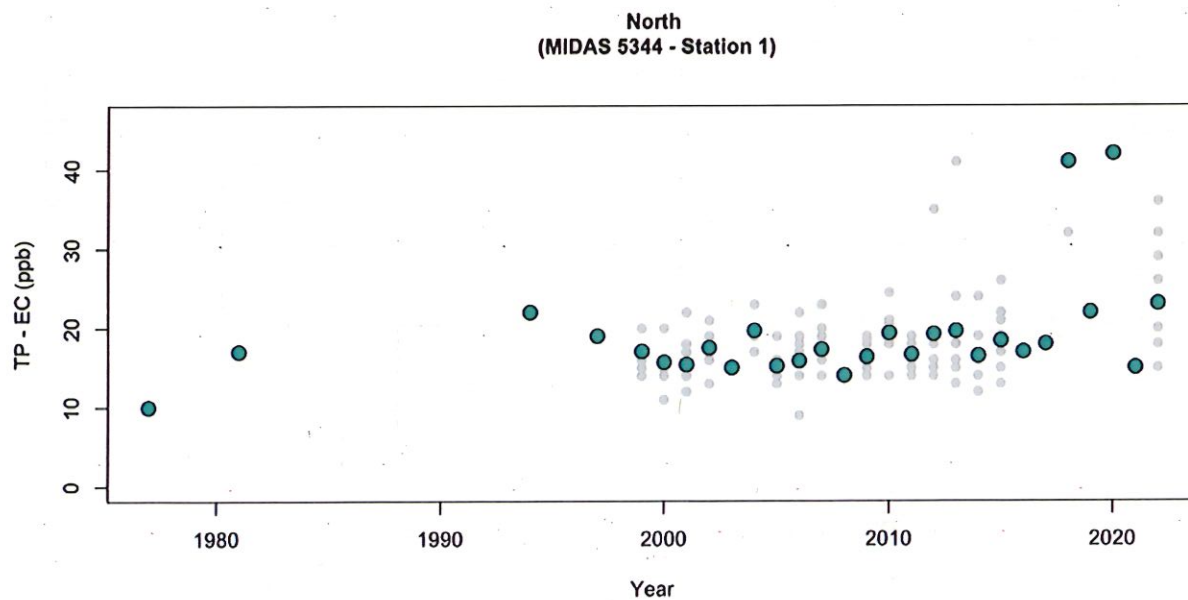
**North
(MIDAS 5344 - Station 1)**

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.

Kennebec - JJA Average - Temperature

tau=0.362   p=0.000

min=63.2
mean=66.0
med=66.2
max=69.0
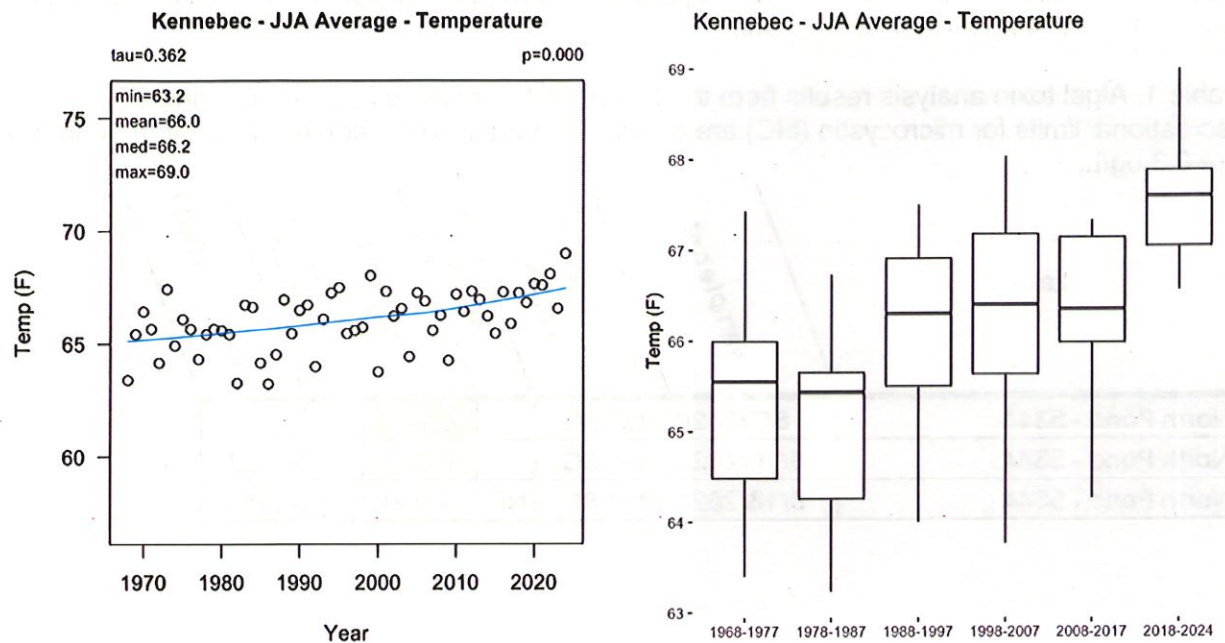
Kennebec - JJA Average - Temperature

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.

North - Aug - Surface Temperature
(MIDAS 5344 - Station 1)

tau=0.299   p=0.021

min=20.0
mean=24.2
med=24.1
max=28.6

North - Aug - Surface Temperature
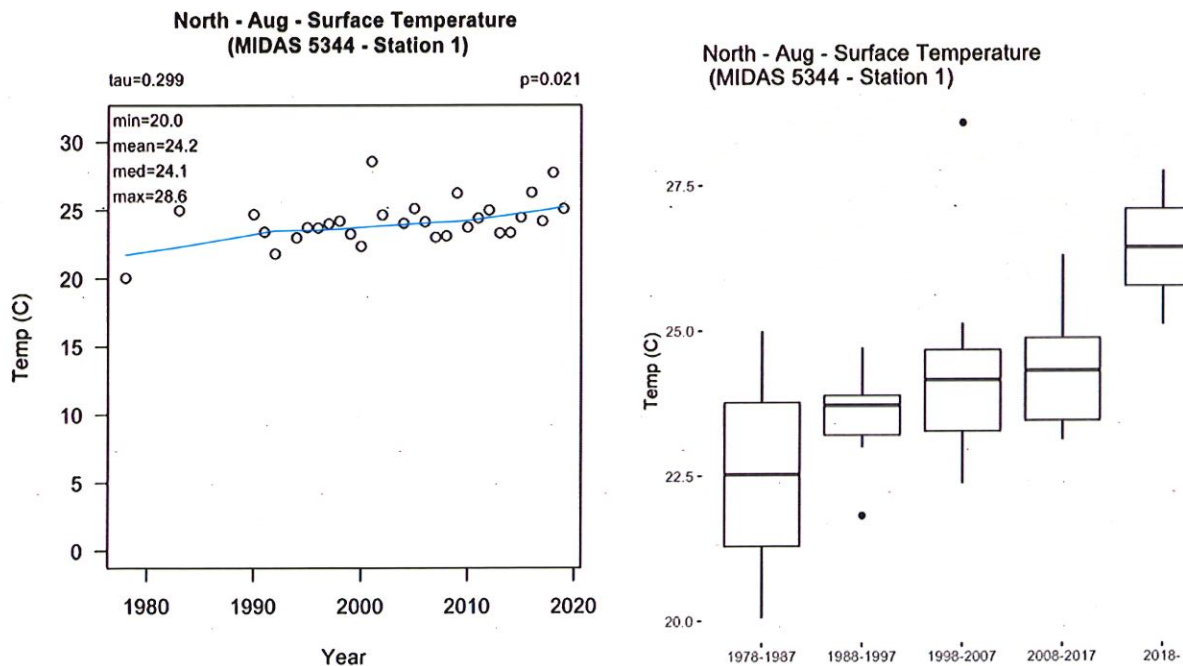**(MIDAS 5344 - Station 1)**

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

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)

(2022), The human factor: Weather bias in manual lake water quality monitoring, *Limnol. Oceanogr. Methods*, 20(5), 288-303, doi:10.1002/lom3.10488

Sharma, S., Filazzola, A., Nguyen, T., Arshad Imrit, M., Blagrave, K., Bouffard, D., Daly, J., Feldman, H., Felsine, N., Hendricks-Franssen, H.J., Granin, N., Hecock, R, Henning L'Abée-Lund, Hopkins, E., Howk, N., Iacono, M., Knoll, L.B., Korhonen, J., Malmquist, H.J., Marszelewski, W., Matsuzaki, S-I. S., Miyabara, Y., Miyasaka, K., Mills, A., Olson, L., Peters, T.W., Richardson, D.C., Robertson, D.M., Rudstam, L., **Wain, D.**, Waterfield H., Weyhenmeyer, G.A., Wiltse, B., Yao, H., Zhdanov, A., and Magnuson, J.J. (2022), Long-term ice phenology records spanning up to 578 years for 78 lakes around the Northern Hemisphere, *Sci. Data*, 9, 318, doi: 10.1038/s41597-022-01391-6

Slavin, E.I., **Wain, D.J.**, Bryant, L.D., Amani, M., Perkins, R.G., Blenkinsopp, C., Simoncelli S., and Hurley, S. (2022), The physical effects of a surface mixer and cyanobacteria response in a shallow eutrophic reservoir, *Water Resour. Res.*, 58(7), e2021WR030068, doi: 10.1029/2021WR030068

Weyhenmeyer, G.A., Obertegger, U., Rudebeck, H., Jakobsson, E., Jansen, J., Zdorovennova, G., Bansal, S., Block, B.D., Carey, C.C., Doubek, J.P., Dugan, H., Erina, O., Fedorova, I., Fischer, J.M., Grinberga, G., Grossart, H.-P., Kangur, K., Knoll, L.B., Laas, A., Lepori, F., Meier, J., Palshin, N., Peternell, P., Pulkkanen, M., Rusak, J.A., Sharma, S., **Wain, D.**, and Zdorovennov, R. (2022), Towards critical white ice conditions in lakes under global warming, *Nat. Commun.*, 13, 4974, doi:10.1038/s41467-022-32633-1

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

Jabbari, A., Boegman, L., Valipour, R., **Wain, D.**, and Bouffard, D. (2020), Dissipation of turbulent kinetic energy in the oscillating bottom boundary layer of a large shallow lake, *J. Atmos. Ocean.Tech.*, 37(3), 517-531, doi: 10.1175/JTECH-D-19-0083.1

Perkins, R.G., **Slavin, E.I.**, Andrade, T.M.C., Blenkinsopp, C., Pearson, P., Froggatt, T., Godwin, G., Parslow, J., Hurley, S., Luckwell, R. and **Wain, D.J.** (2019), Managing taste and odour metabolite production in drinking water reservoirs: The importance of ammonium as a key nutrient trigger, *J. Environ. Manag.*, 244, 276–284, doi: 10.1016/j.jenvman.2019.04.123

Simoncelli, S., Thackeray, S.J., and **Wain, D.J.** (2019), Effect of temperature on zooplankton vertical migration, *Hydrobiol.*, 829, 143–166, doi: 10.1007/s10750-018-3827-1

Wynne, Z.*, Reynolds, T., Bouffard, D., Schladow, G., and **Wain, D.** (2019), A novel technique for experimental modal analysis of barotropic seiches for assessing lake energetics, *Environ. Fluid. Mech.*, 19(6), 1527-1556, doi: 10.1007/s10652-019-09677-x

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

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

2016 – 2018	Bath Science Café Organizing Committee
2015 – 2018	Bristol Water Challenge Panel Member
2017	Co-Convener, Special Session on Water Quality in Reservoirs, Symposium 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

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

Signature   Lynn M Geiger-Ortiz   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]
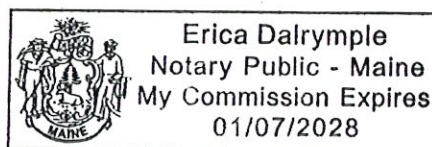
Erica Dalrymple
Erica Dalrymple
Notary Public, State of Maine
My Commission Expires: ___1/27/28___

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.

2016 Erosion Survey

Shoreline 44%
Not Shoreline 56%

2022 Erosion Survey Update

Shoreline 25%
Not Shoreline 75%
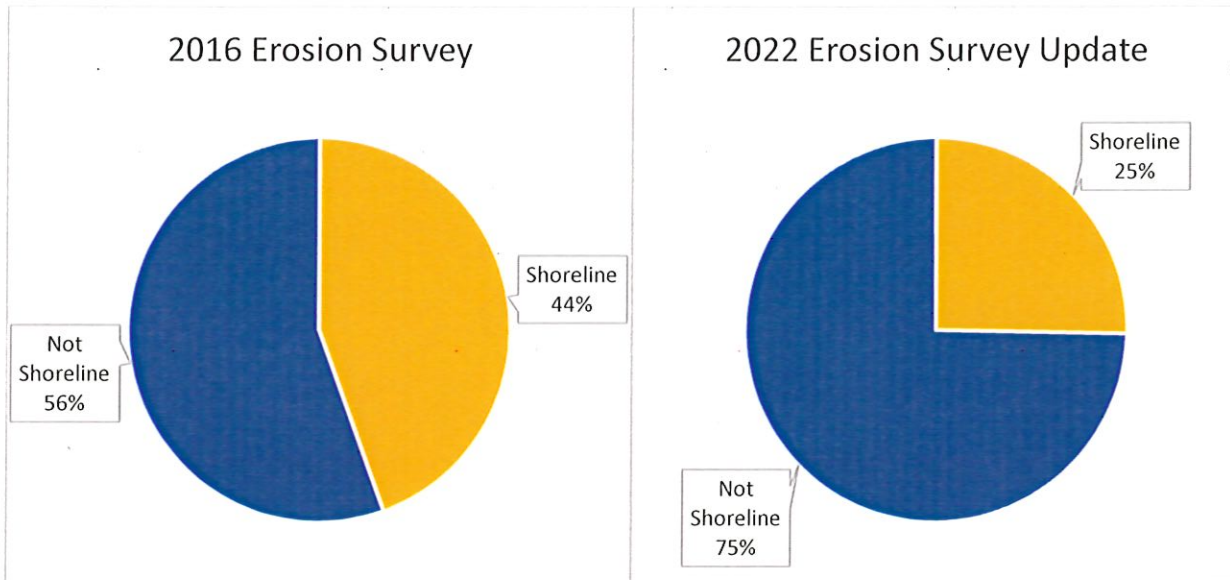
1b) Breakdown of erosion severity: Comparing the 2022 Watershed Survey shoreline erosion sites to erosion identified elsewhere. The shoreline has a greater percentage of low impact erosion than found elsewhere.

Watershed Survey Erosion Sites by Impact Score

Legend: Low | Medium | High | Remediated

Shoreline Erosion: 48%, 19%, 11%, 22%
Elsewhere: 36%, 42%, 8%, 14%
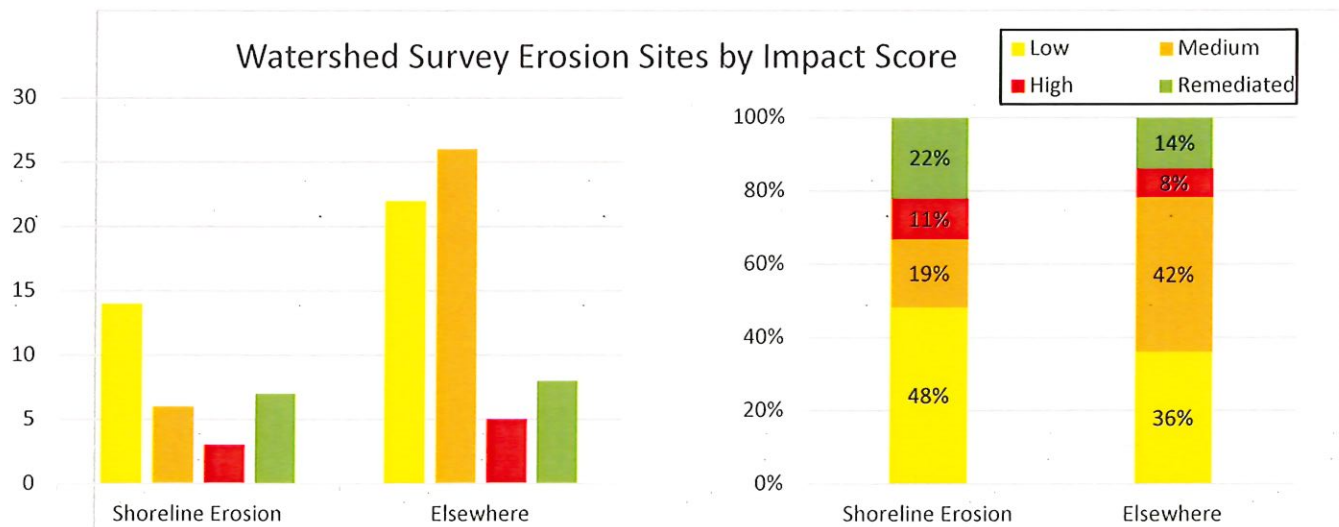
Figure 2: 2022 Watershed Survey Update Erosion Sites. Note: erosion is not uniform around the lake
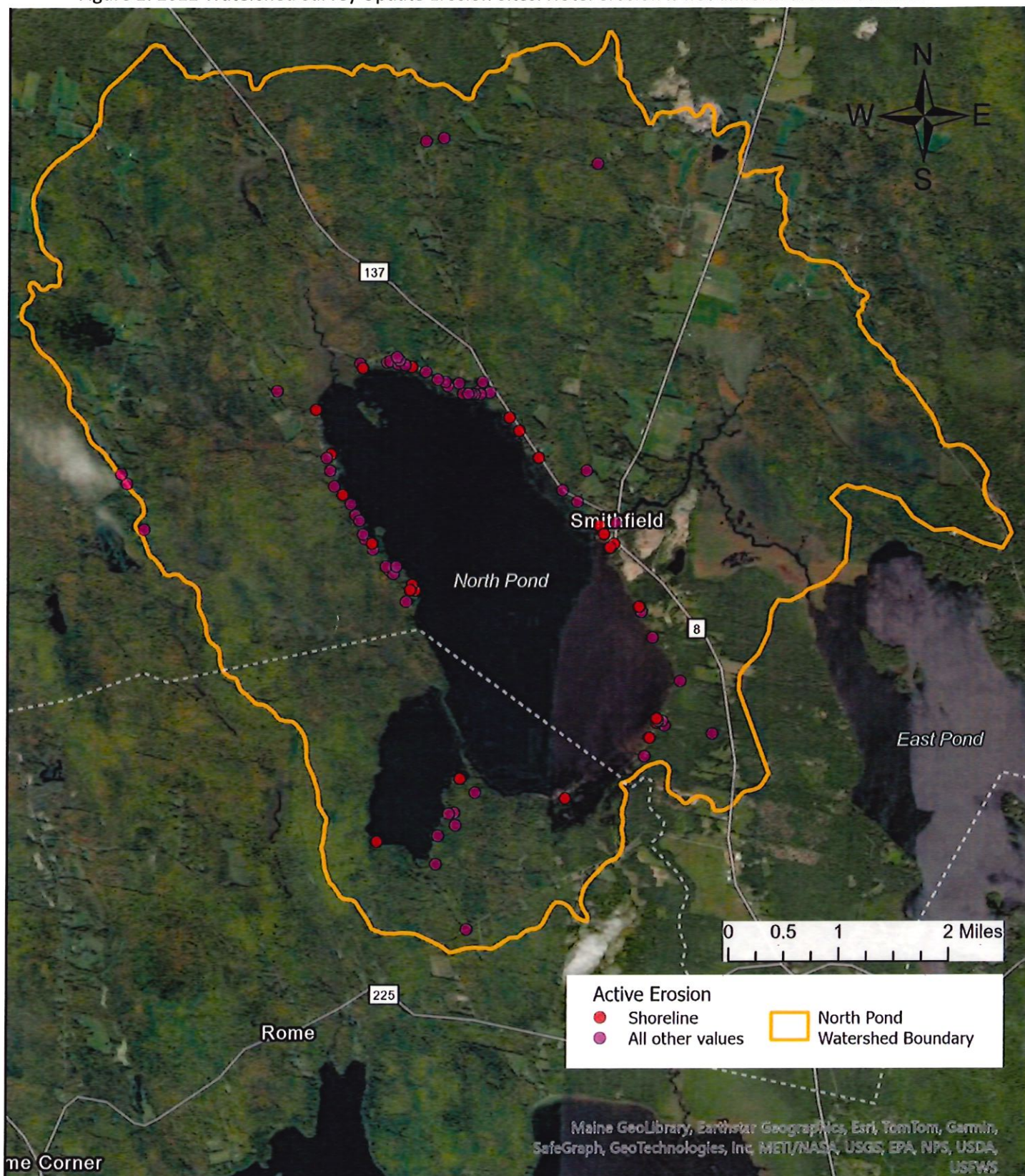
Figure 3: Active Erosion Sites 2022 Survey - Shoreline Erosion Photographs. Most erosion stems from human activity or winter ice. See next page for large images.
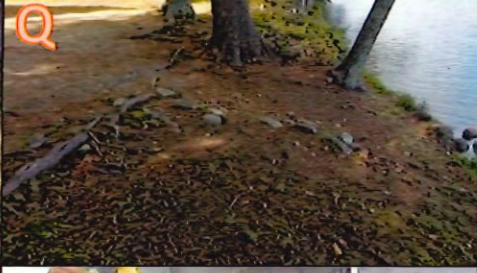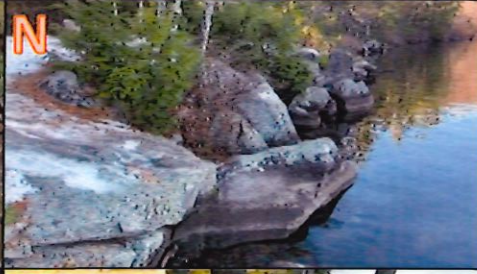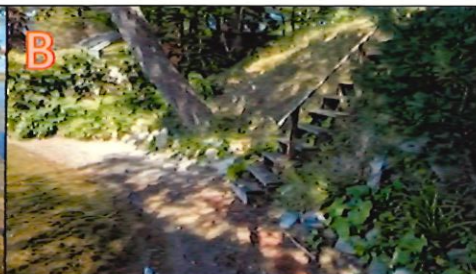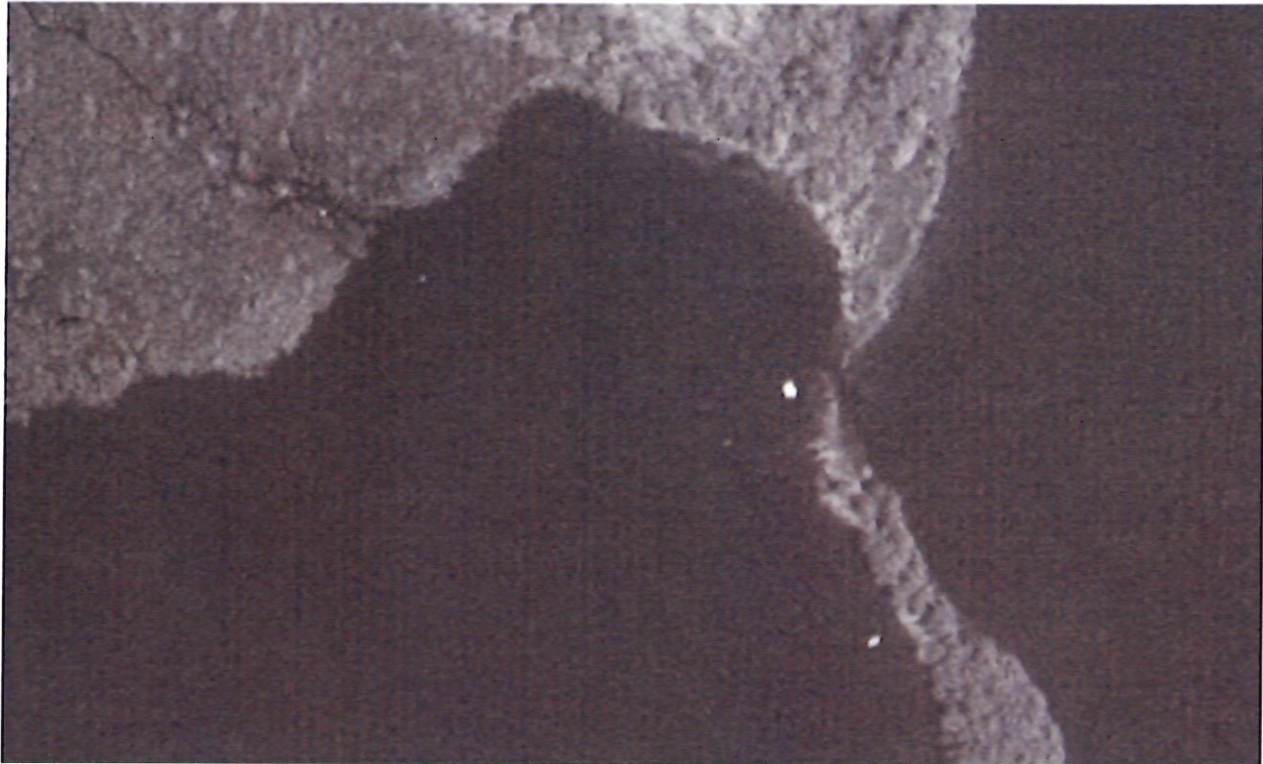
Figure 4: Satellite imagery of "permanent damage to bog area". Taken from Google Earth