



Overview of Alum Treatments in Maine

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Water Quality Standards Workshop

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MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION

Protecting Maine's Air, Land and Water

Outline

- Background - lake water quality
- Prevention strategies
- Alum treatments
- Permitting
- Funding
- Examples of alum use in Maine lakes



Water Quality Criteria – Class GPA

§465-A. Standards for classification of lakes and ponds

- A. Class GPA waters must be of such quality that they are suitable ... ***as habitat for fish and other aquatic life. The habitat must be characterized as natural.***
- B. ... described by their trophic state (chlorophyll "a", Secchi disk transparency, total phosphorus, etc.). ... stable or decreasing trophic state, subject only to natural fluctuations, and must be free of culturally induced algal blooms that impair their use and enjoyment.
- C. No discharges allowed – except chemical discharges for restoring water quality



Threats to Water Quality

- Excess nutrients (phosphorus)
- Pathogens
- Stormwater runoff
- Warming waters
- Invasive species



Photo: Alex Wall, 7 Lakes Alliance (North Pond)



Sources of Phosphorus Loading

- Natural, internal, & external
- External Sources

Atmosphere

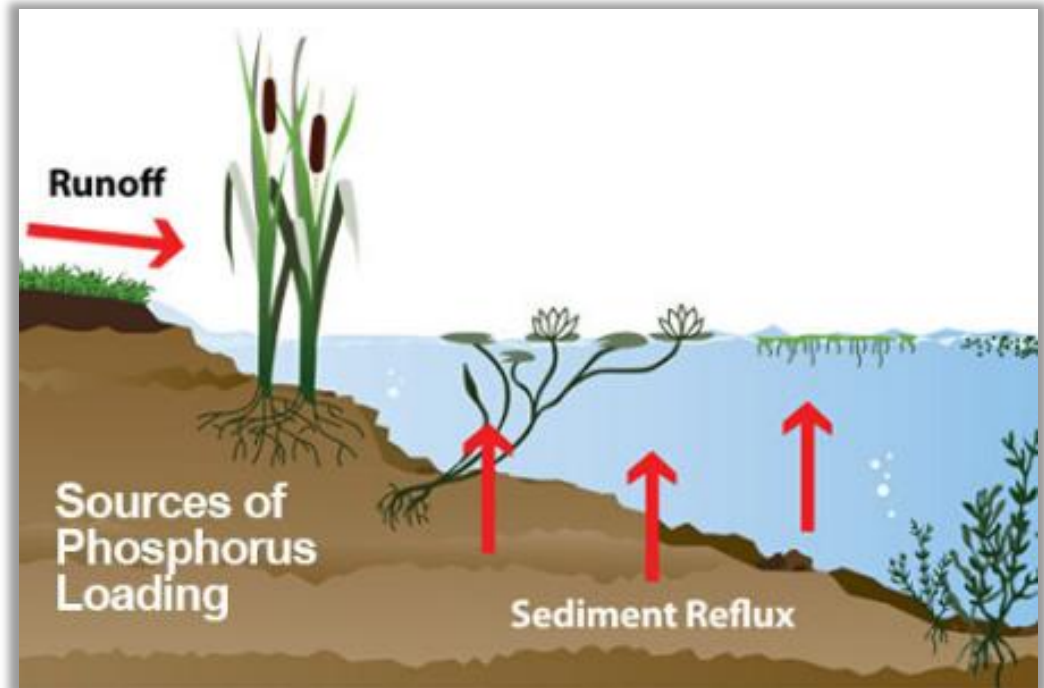
Manure

Pet waste

Fertilizers

Septic waste

Soil Erosion



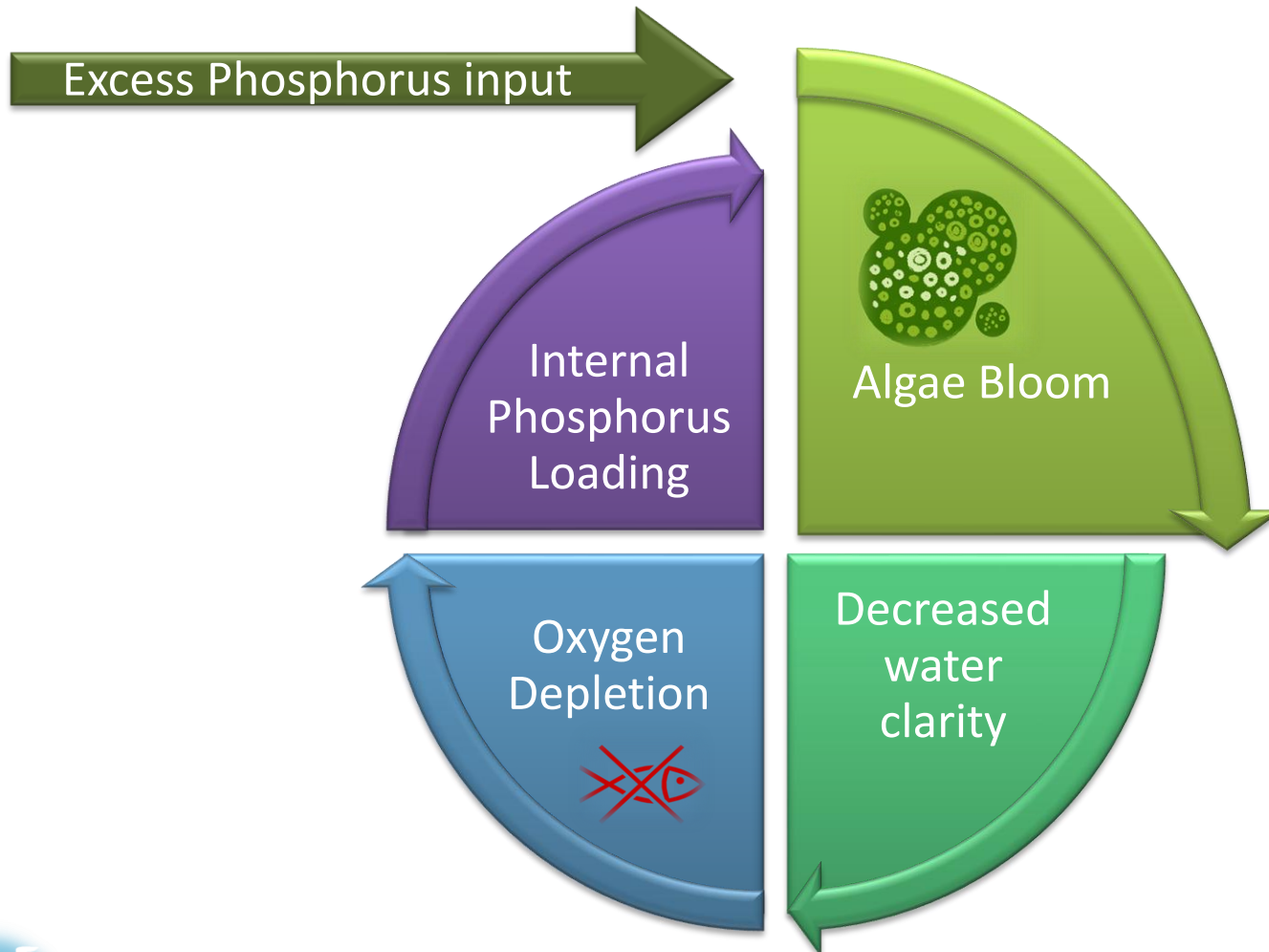
Solitude Lake Management



Soil Erosion



Impacts of Excess Phosphorus to Lake Water Quality



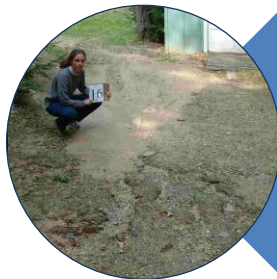
Impact of Algae Blooms

- Reduce aesthetic and recreational value.
- Sometimes produce cyanotoxins that can be harmful to humans and animals.
- Reduce property values on lakefront.



Phosphorus Management

- Effective control = combination of watershed approaches & in-lake treatment (when appropriate)
- Maximize effectiveness and longevity



Watershed Planning

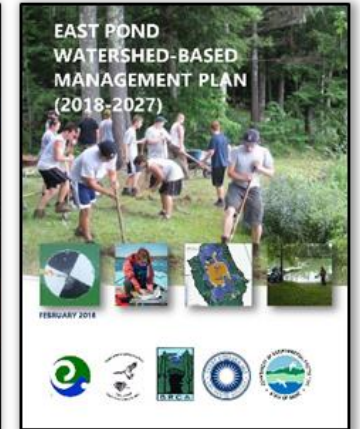
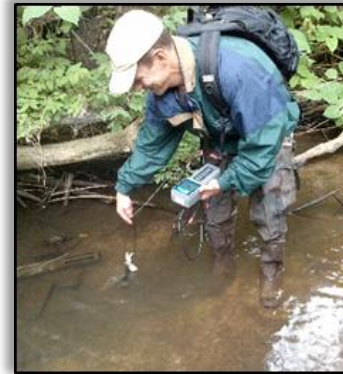


Phased
Implementation
Projects



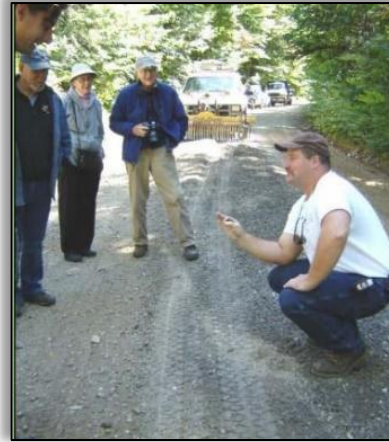
Watershed Planning Grants

- Develop 10-year plan to guide restoration & protection
- Plan required to apply for implementation grants
- Include an evaluation to determine nutrient contributions (internal & external)



Watershed Implementation Grants

- Implement activities called for in DEP-accepted watershed plan.
- Can be carried out in multiple phases.



In-Lake Treatment - Alum

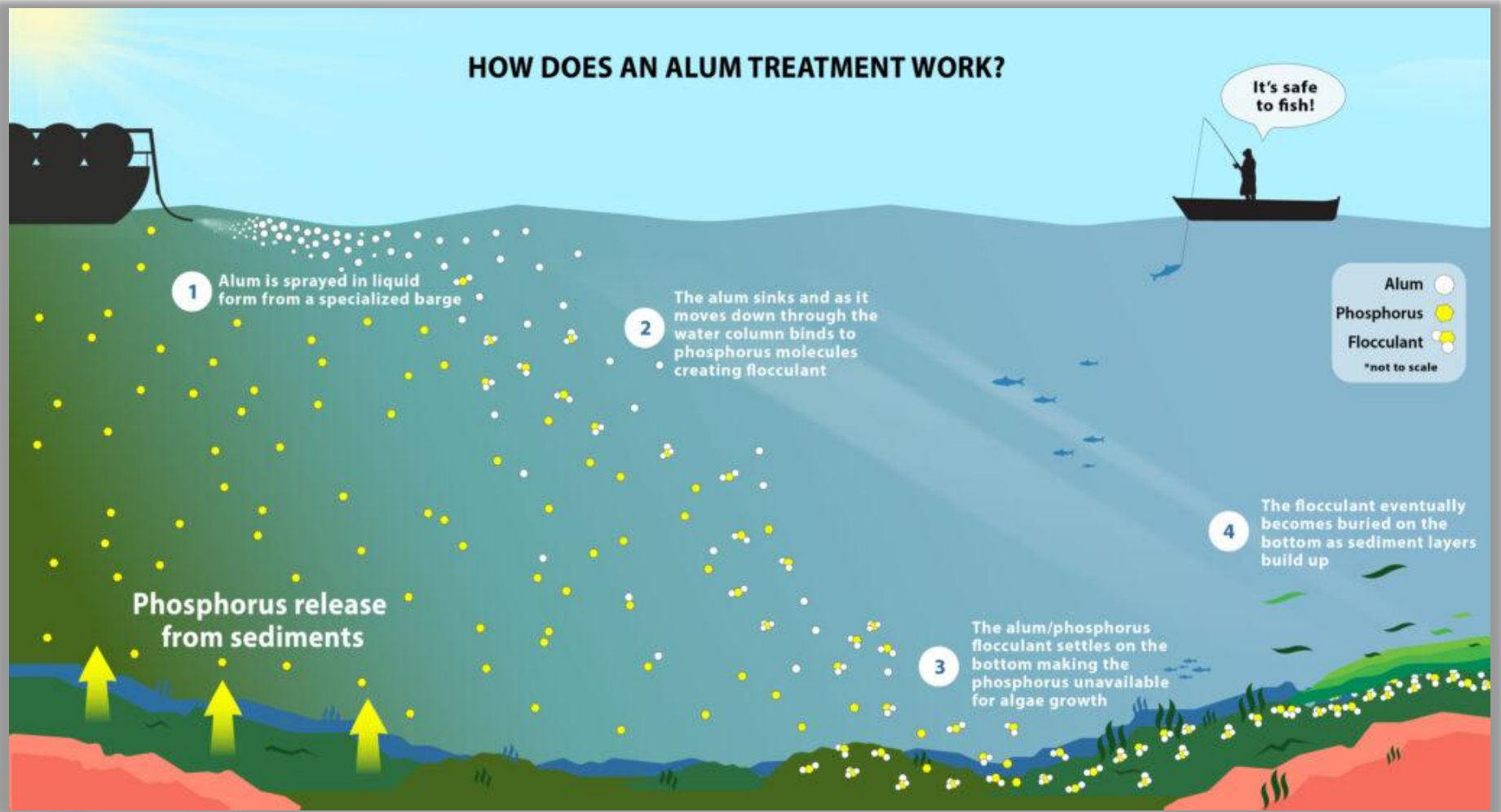
- What is alum?
 - Aluminum sulfate and sodium aluminate
 - Binds with P and forms floc
 - Settles out of water column
- Why use it?
 - Controls internal P cycling inputs from sediments, reducing P available for algal growth
 - Non-toxic to plants and fish



Photo: Ryan Burton



How Does It Work?



Permitting Requirements

§465-A. Standards for classification of lakes and ponds

- C. There may be no new direct discharge of pollutants into Class GPA waters. ... the following are exempt from this provision:

(1) Chemical discharges for the purpose of restoring water quality approved by the department;

- MEPDES permit and WDL required
- Review by Lakes Unit & public review
- Chemical discharge management plan



STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
17 STATE HOUSE STATION
AUGUSTA, ME 04333

DEPARTMENT ORDER

IN THE MATTER OF

WORROMONTOGUS LAKE ASSOCIATION)	MAINE POLLUTANT DISCHARGE
AUGUSTA, KENNEBEC COUNTY, MAINE)	ELIMINATION SYSTEM PERMIT
CHEMICAL TREATMENT DISCHARGE)	AND
ME0002844)	WASTE DISCHARGE LICENSE
W009257-5U-A-N)	NEW
	APPROVAL	

Pursuant to the provisions of the *Federal Water Pollution Control Act*, Title 33 USC, §1251, *Conditions of Licenses*, 38 M.R.S. § 414-A, and applicable regulations, the Department of Environmental Protection (Department hereinafter) has considered the application of the WORROMONTOGUS LAKE ASSOCIATION (WLA/permittee hereinafter), with its supportive data, agency review comments, and other related material on file and FINDS THE FOLLOWING FACTS:

Maine DEP Alum Monitoring SOP

- Generic protocol tailored as needed
- Document before, during, and after treatment
- Ensure treatment parameters met and lake health maintained



In-lake Aluminum Treatment Monitoring Standard Operating Procedure
Bureau of Water Quality
Version 1.0 Origin Date: March 7, 2024

Bureau of Water Quality
Division of Environmental Assessment
Lake Assessment Program
Standard Operating Procedure

Monitoring of In-lake Aluminum Treatments for Water Column and Sediment Phosphorus Inactivation

1. Applicability

This standard operating procedure (SOP) covers monitoring conducted in associated with the application of aluminum to strip phosphorus from the water column and inactivate phosphorus in sediment to control growth of cyanobacteria, otherwise known as an 'Alum' treatment. This SOP is used by staff in the Department of Environmental Protection (DEP) Lake Assessment Section, staff and volunteers associated with Lake Stewards of Maine Volunteer Lake Monitoring Program (LSM-VLMP), lake assessment cooperators, and consultants in Maine. This is a generic protocol that may need to be tailored to the lake being treated based on physical lake characteristics (depth, surface area, treatment area, flushing rate), chemical characteristics (phosphorus mass annually released by sediments and geochemistry of those sediments), and restoration goals. Note that although aluminum is generally thought of as the third most common element in the Earth's crust, variations due to local geology are common. Some Maine lakes have naturally high concentrations of aluminum and are thus more resilient to phosphorus additions from their watersheds; others do not have high aluminum concentrations and may benefit from this treatment.

To implement an alum treatment in the State of Maine, a Maine Pollutant Discharge Elimination System (MPDES) Permit and Waste Discharge License must be obtained through the Maine Department of Environmental Protection Division of Water Quality Management. Internal sources must account for a significant portion of phosphorus loading to a lake for this treatment option to be considered. Extensive lake monitoring data and watershed surveys are necessary to make this determination. This SOP does not address this type of diagnostic monitoring.

A permit and license are sought after internal and external phosphorus loadings have been evaluated and sediments have been analyzed to determine dosing rates. Once permit applications have been submitted, draft permits are reviewed internally then are posted for public review; concerns are addressed prior to issuance of a permit and license. Applications require a Chemical Discharge Management Plan that includes a Pre, During, and Post-treatment monitoring details (addressed by this SOP), which will become part of the final permit/license. This SOP can be referenced within the application (along with all justified deviations) and be included in the Appendix.

2. Purpose

The purpose of this monitoring protocol is to document lake conditions immediately before, during and following an alum treatment, to 1) monitor effectiveness, 2) provide immediate feedback to treatment operators regarding conditions during treatment, and 3) assure minimum impacts to non-target



Funding Mechanisms

- Combination of state, federal, and local funds
- Federal
 - EPA Section 314 (Clean Lakes Program), 319 (NPS), CDS
- State
 - Maine State Lake Restoration and Protection Fund
 - Lake Restoration Grants
 - Clean Water State Revolving Fund



And many local organizations!

History of Maine Alum Treatments

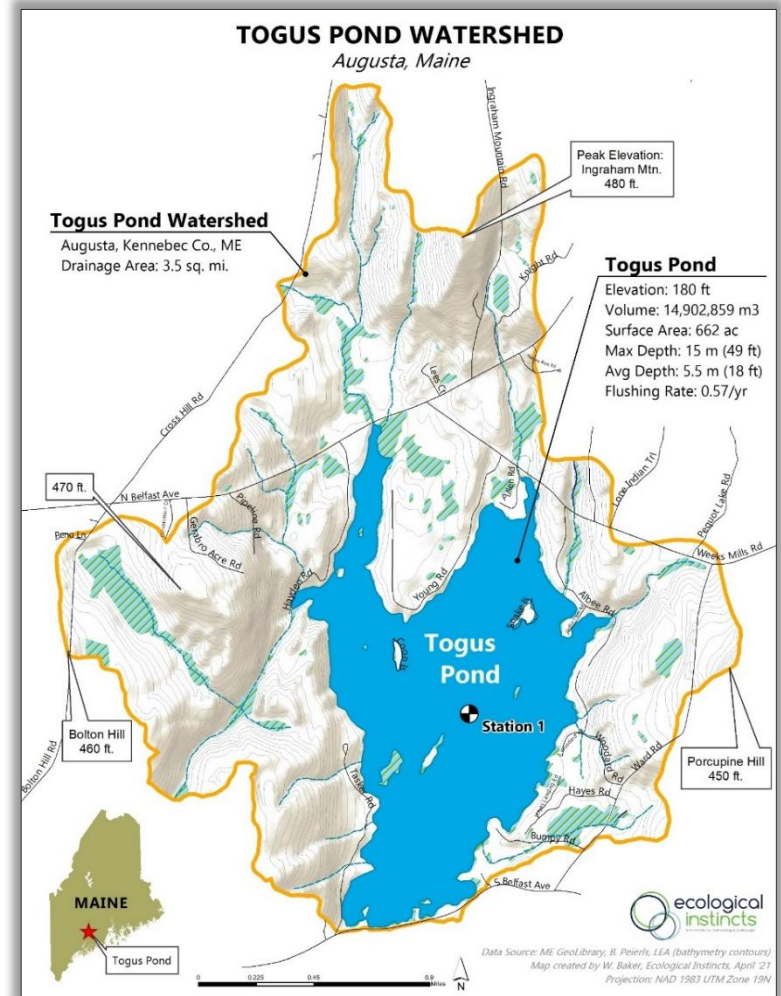
- 10 treatments since 1978
- 6 of the 10 since 2018
- Largely successful
 - Exception - Threemile Pond
- Examples
 - Togus Pond (1st half – 2024)
 - Cochnewagon (1986; 2019)
 - Lake Auburn (2019)

Lake	Year	Longevity
Annabessacook <i>Monmouth, ME</i>	1978	30 years
Cochnewagon <i>Monmouth, ME</i>	1986	20 years
ThreeMile <i>China, ME</i>	1989	2 years
Chickawaukie <i>Rockland, ME</i>	1992	25 years
East Pond <i>Smithfield, ME</i>	2018	7 years and ongoing
Lake Auburn <i>Auburn, ME</i>	2019	6 years and ongoing
Cochnewagon <i>Monmouth, ME</i>	2019	6 years and ongoing
Georges Pond <i>Franklin, ME</i>	2020 & 2021	4 years and ongoing
Long Pond <i>Parsonsfield, ME</i>	2022	3 years and ongoing
Togus Pond <i>Augusta, ME</i>	2024	1 year and ongoing



Togus Pond

- Pond Area (acres): 674
- Shallow (90% <10m)
- Long history of WQ issues
 - Declining clarity
 - Inc. P, *Chl a*, conductivity
 - Anoxic conditions
- Impaired Lakes Priority List



Togus Pond

- Internal loading = largest P source
- MEPDES Permit & WDL



Photo: Ecological Instincts

Form DEPLW0105-B2003
Revised May 1, 2020

DEPARTMENT OF ENVIRONMENTAL PROTECTION
STATE OF MAINE

Maine Department of Environmental Protection

**General Application for
Waste Discharge License (WDL) /
Maine Pollutant Discharge Elimination System (MEPDES) Permit**

Regulatory requirements for the preparation and filing of applications may be found in Chapters 2, 521 and 522 of the Department's rules.

GENERAL INSTRUCTIONS

1. This general form is to be used to make application for the discharge of pollutants to the surface waters of the State, from all source except from privately owned discharges subject to the Over Board Discharge Program requirements.
2. Applicants are responsible for publishing public notice of their application at the time it is filed with the Department. See pages 7 and 8.
3. For a proposed new discharge of wastewater of more than 25,000 gallons per day or a project involving licenses from more than two bureaus in DEP, an applicant must conduct a public informational meeting before submitting an application to the Department. See page 7.
4. In some circumstances an applicant must have a pre-application or pre-submission meeting with the Department prior to filing of an application. See page 9.
5. At the time an application is filed with the Department, a copy must be provided to the municipal office and notice provided to all abutters by certified mail. See page 7.
6. Application fees must be paid at the time an application for a new discharge or permit is filed. Contact the Department for additional information and calculation of the fee amount. For existing discharges, fees are charged on an annual basis and application fees are not required with an application for permit renewal.
7. Attach additional sheets as necessary in answering specific questions. Be sure to number each sheet to identify the question to which it pertains.
8. Failure to fully complete all required forms or to pay necessary application fees will result in the application being returned.
9. After completing the application, submit 2 copies to:

Maine Department of Environmental Protection
Bureau of Water Quality
Division of Water Quality Management
State House Station 17
Augusta, Maine 04333-0017
10. Please read the entire application form before furnishing any information. If you need any assistance in filling out the form or required attachments, please contact the Department at the above address or by calling (207) 287-7688.

Togus Pond

- Funding: mix of state grants and local/private
- Treated (1st half): 338 acres in 2024 (\$800k total)





Photo: Ecological Instincts

TOGUS POND

CHEMICAL DISCHARGE MANAGEMENT PLAN

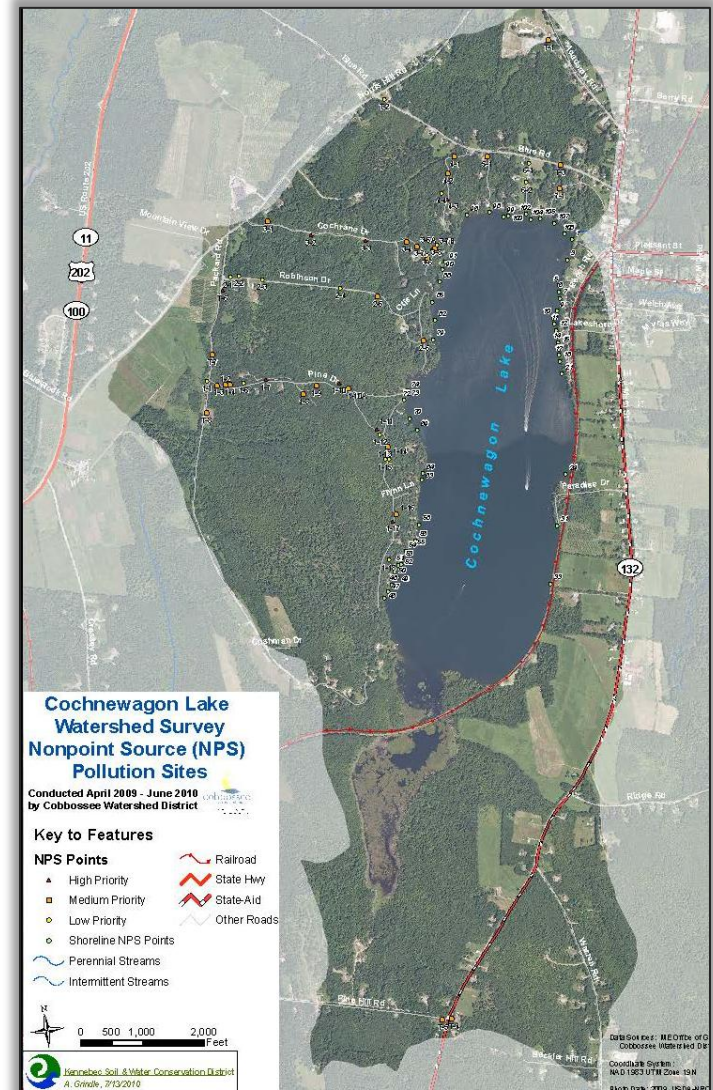
Togus Pond Aluminum Treatment



WORROMONTOGUS LAKE ASSOCIATION
P.O. Box 2582 ~ Augusta, ME 04338
Web: www.toguspond.org

Cochnewagon Lake

- Lake Area (acres): 394
- Depth: 22 m (mean);
28 (max)
- Long history of algal blooms
(since 1980)
- Internal loading = largest P
source
- 2012 –impaired lakes list



Cochnewagon Lake

- Treated: 1986 (\$150k) & 2019 - 225 acres (\$350k)
- Funding: EPA (Clean Lakes Program; 319) and DEP
- 2019 treatment after 10 years of watershed work



Photo: Andy Molloy – Kennebec Journal

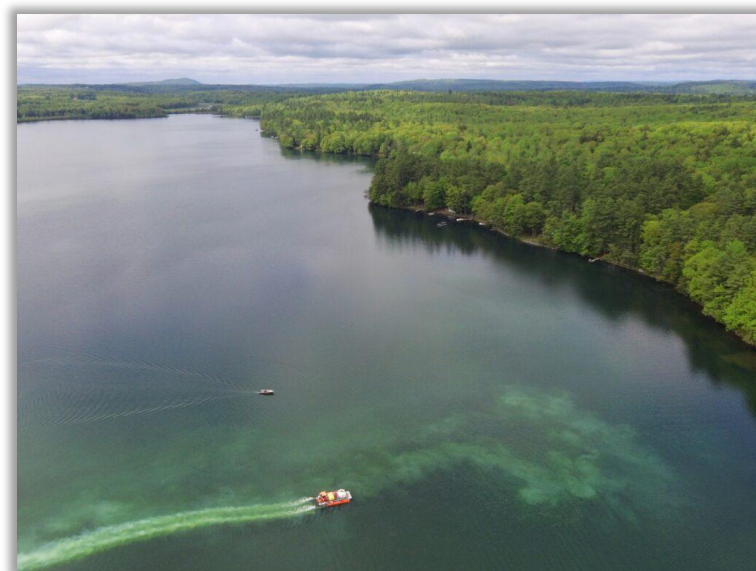
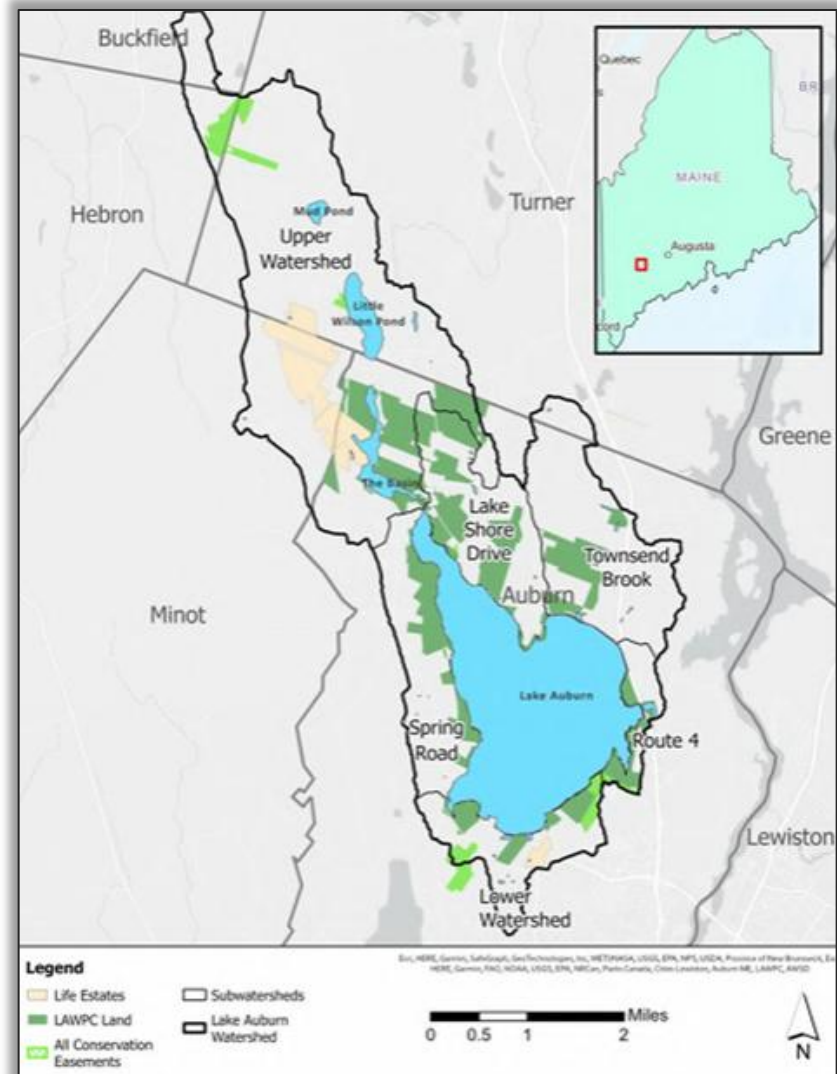


Photo: Ryan Burton



Lake Auburn

- Lake Area (acres): 2,260
- Drinking water supply since 1875
- Depth: 12.2 m (mean); 36.6 (max)
- Poor WQ: transparency, turbidity, pH, DO
- Fish kills and algal blooms



Lake Auburn

- Treated: Copper sulfate algaecide & low dose alum of 1,168 acres in 2019 (\$800k)
- Goal: stunt growth of algae; other efforts ongoing
- Funding: CWSRF (\$400k); local funding



Photo: Lake Auburn Watershed Protection Commission



Photo: Maine DEP



Final Thoughts

- Alum treatments are costly & effectiveness is finite (10 - 20+ years)
- Watershed source control must be prioritized
- China Lake, Unity Pond, North Pond, and others



Photo: Waldo County SWCD – Unity Pond



Photo: Alex Wall, 7 Lakes Alliance (North Pond)

For More Information

- **Maine DEP Lakes Program:**

<https://www.maine.gov/dep/water/lakes/index.html>

- **Maine Volunteer Lake Monitoring Program:**

<https://www.lakestewardsofmaine.org/>

- **Maine DEP Algal Blooms Information:**

<https://www.maine.gov/dep/water/lakes/algalbloom.html>

- **Map of Maine Lakes at Risk of Having an Algal Bloom:**

<https://maine.maps.arcgis.com/apps/webappviewer/index.html?id=3da4a1846f674d3fb416a8557c550a79>





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[*www.maine.gov/dep*](http://www.maine.gov/dep)

