March 19, 2024

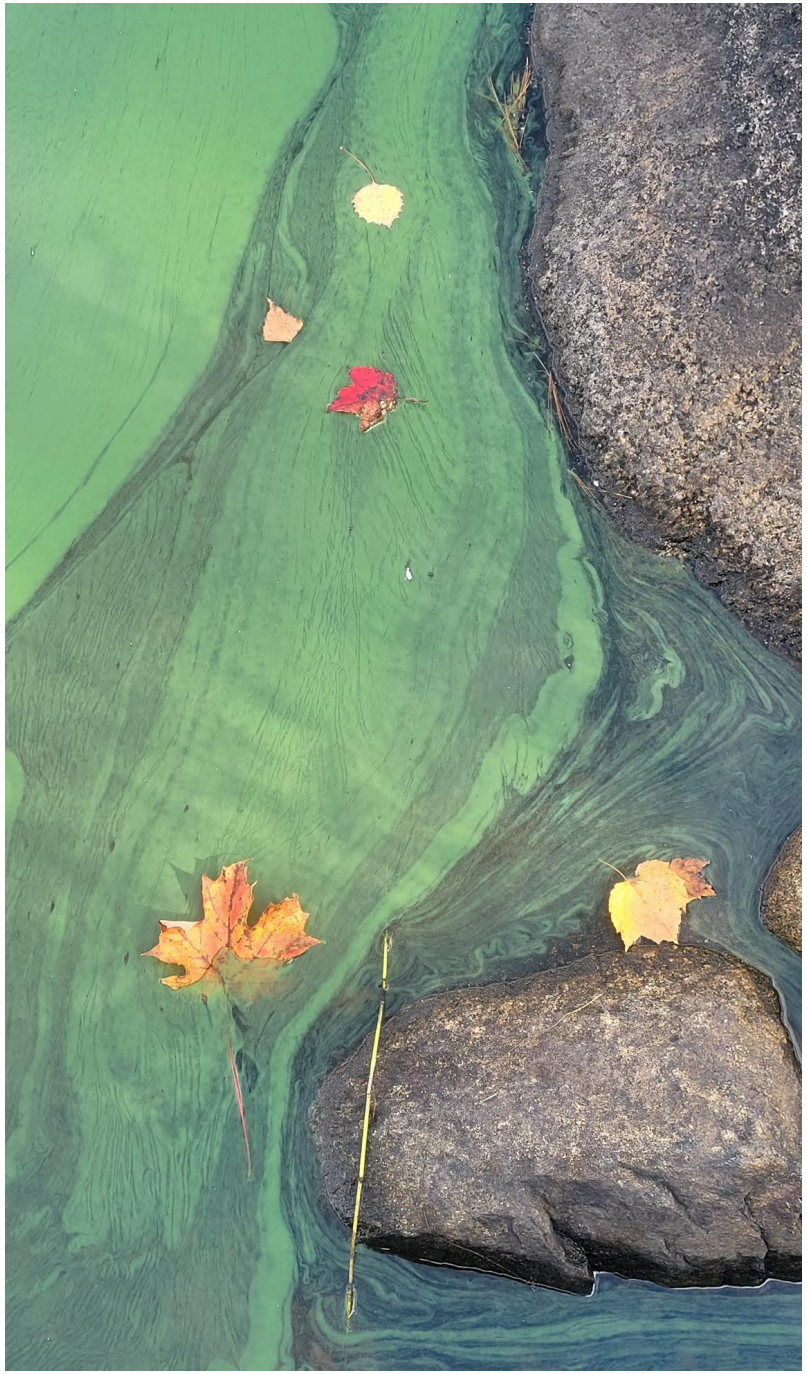
PUBLIC HEARING

LAKE KANASATKA

Moultonborough, NH

Laura Diemer, CLM
FB Environmental Associates

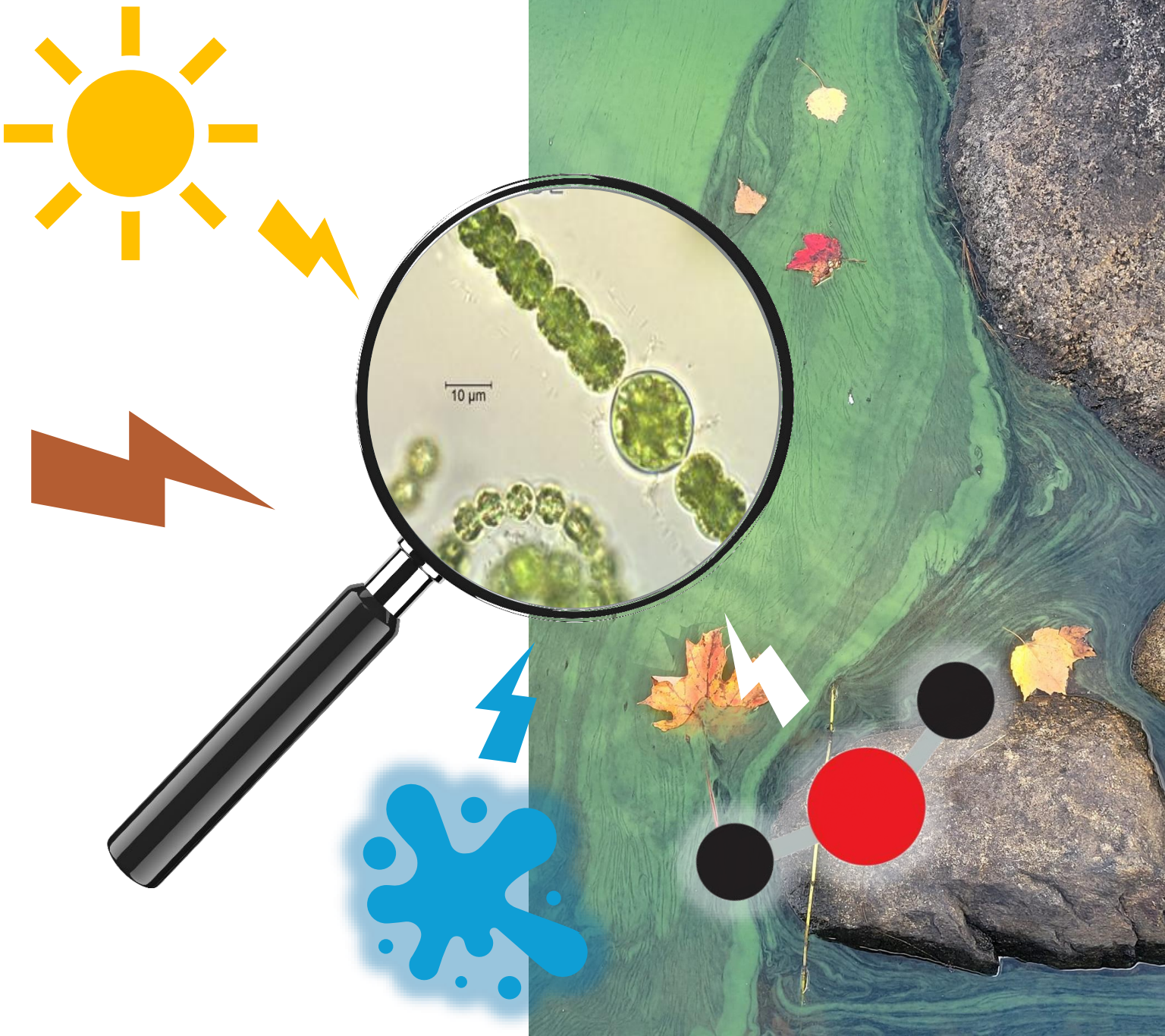
THE PROBLEM




LAKE K
LAKE WINNI

THE CAUSE

15
P
Phosphorus
30.97



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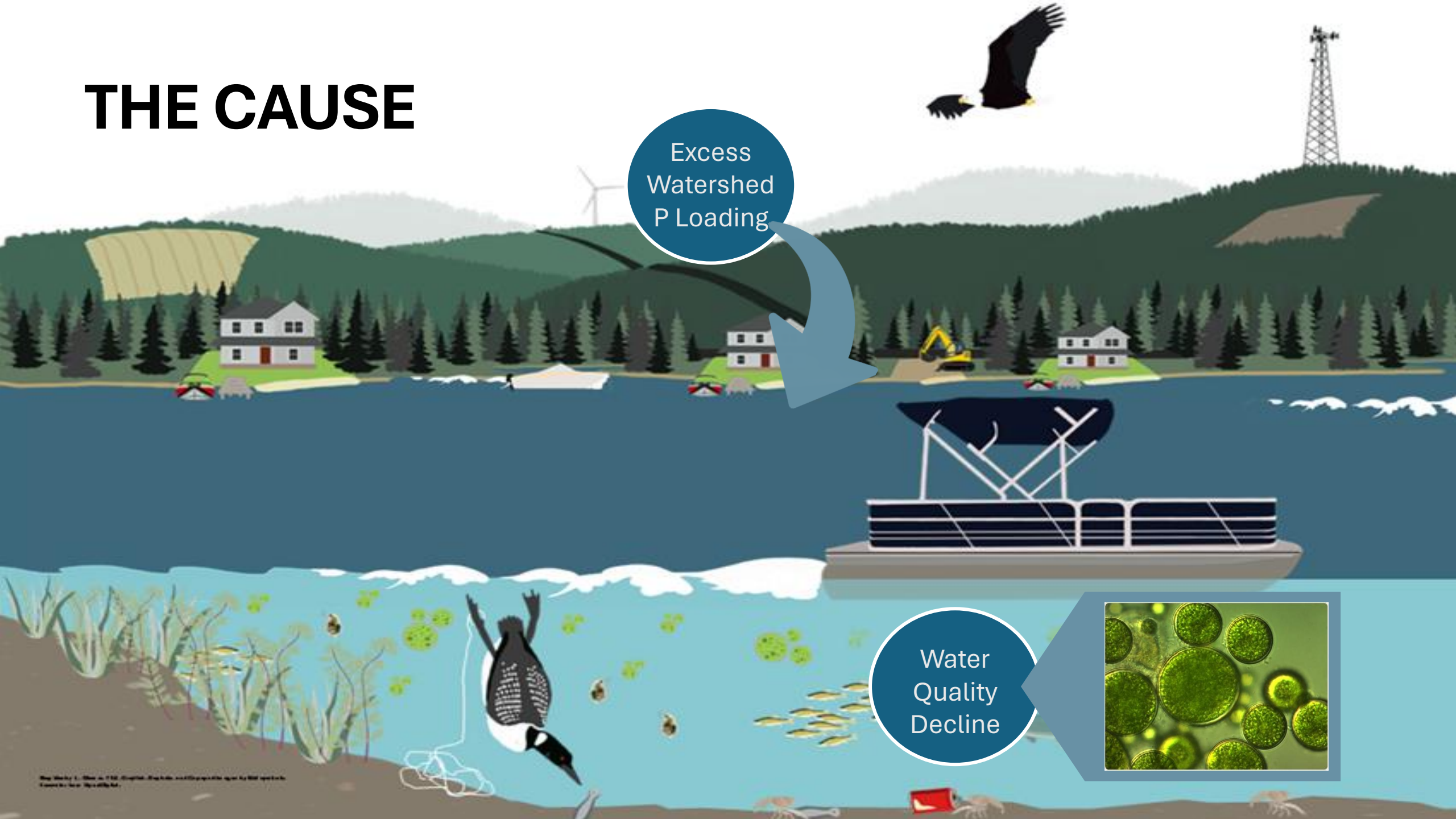

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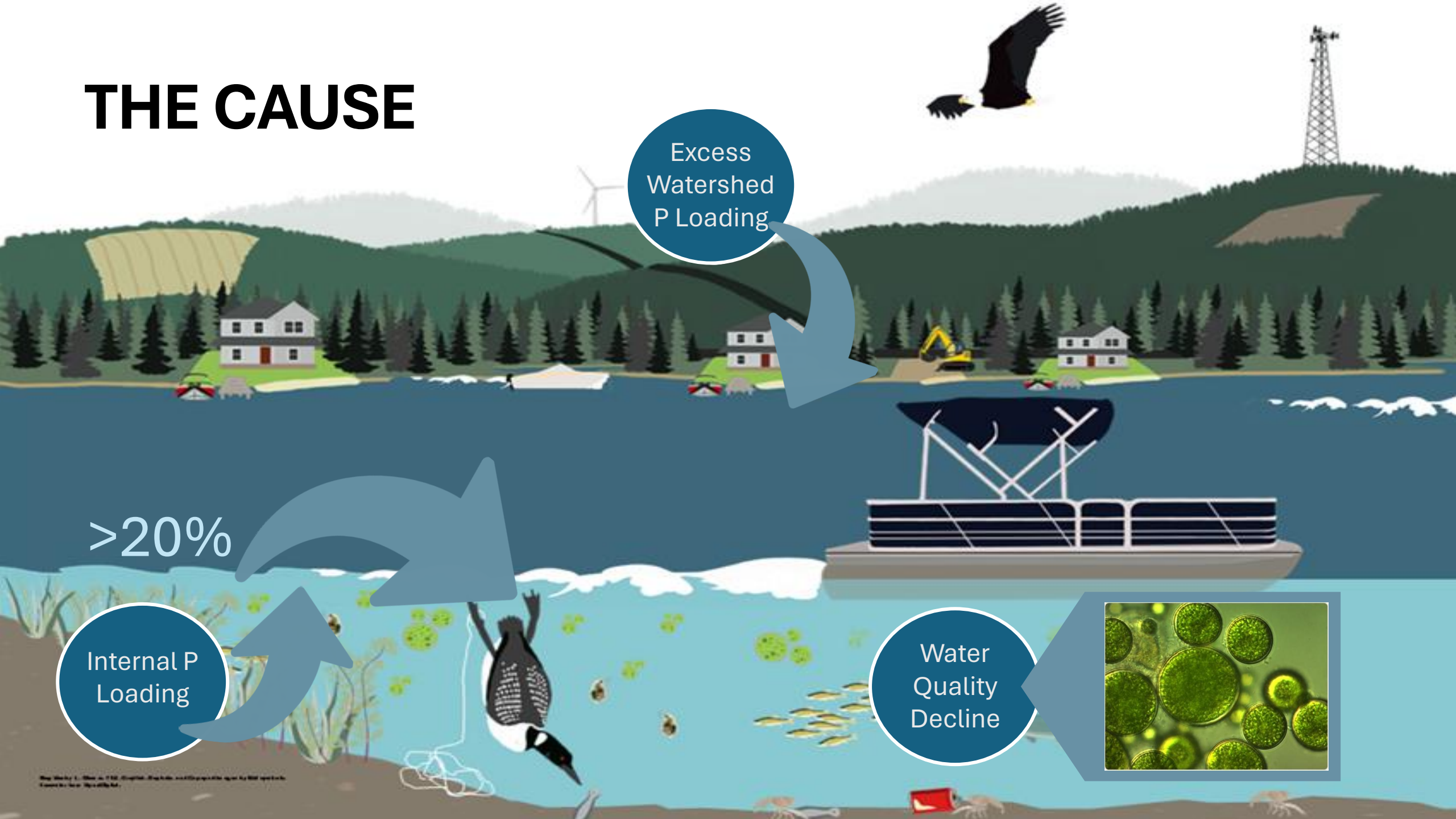
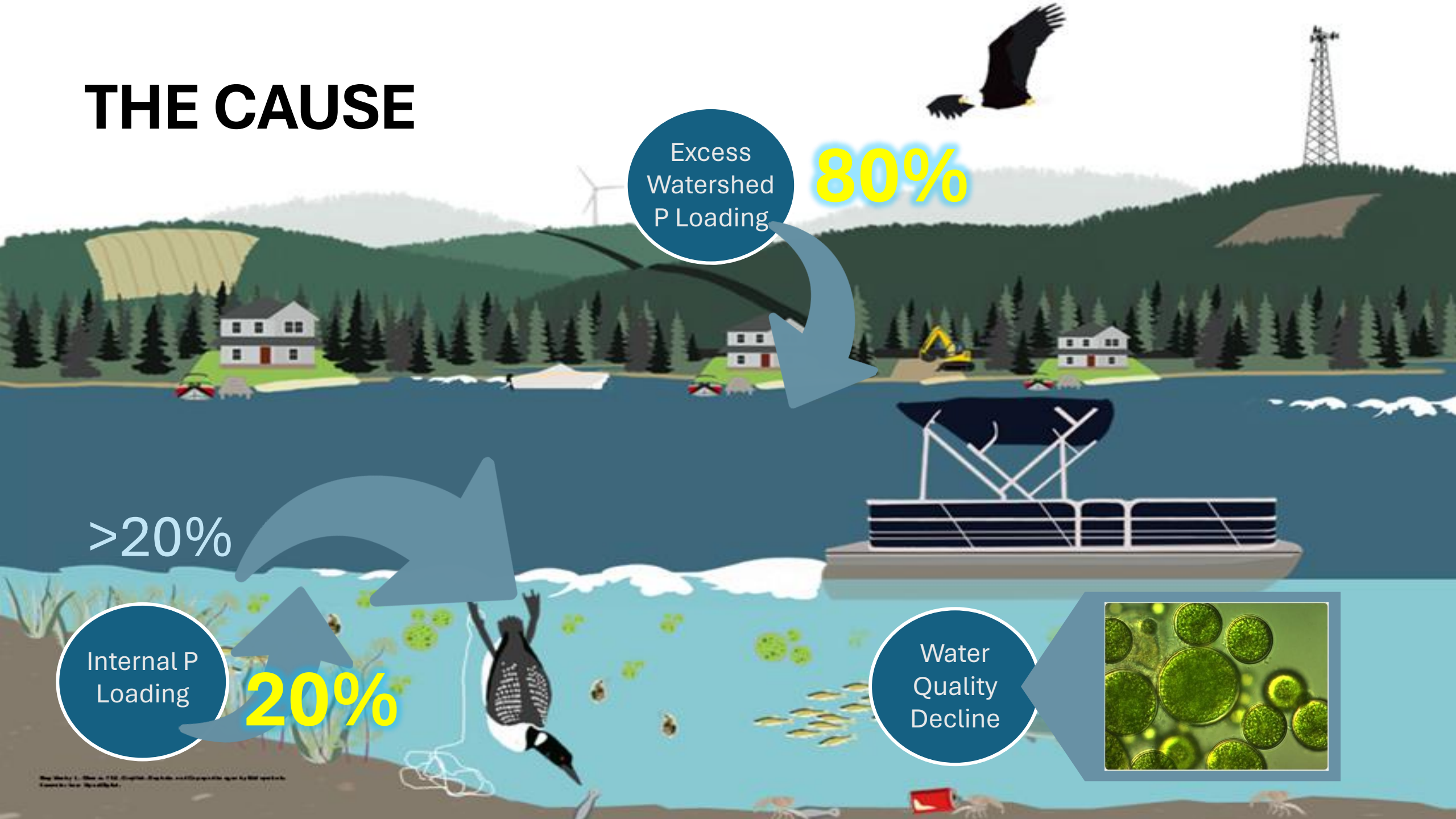
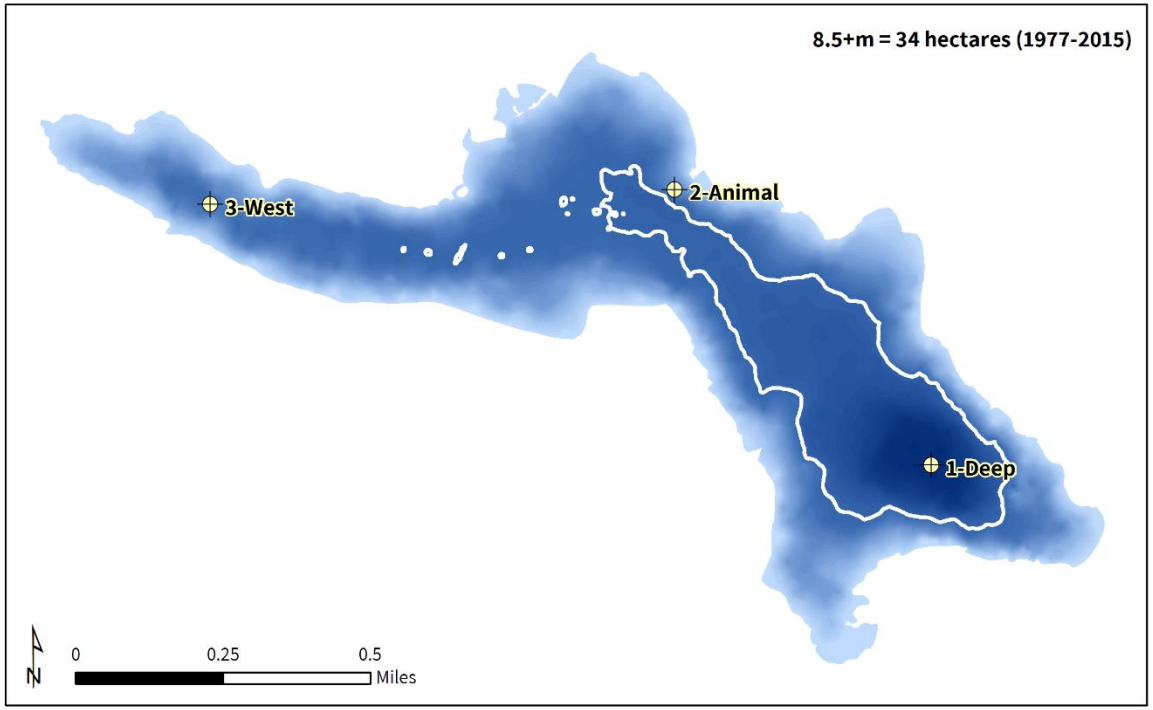
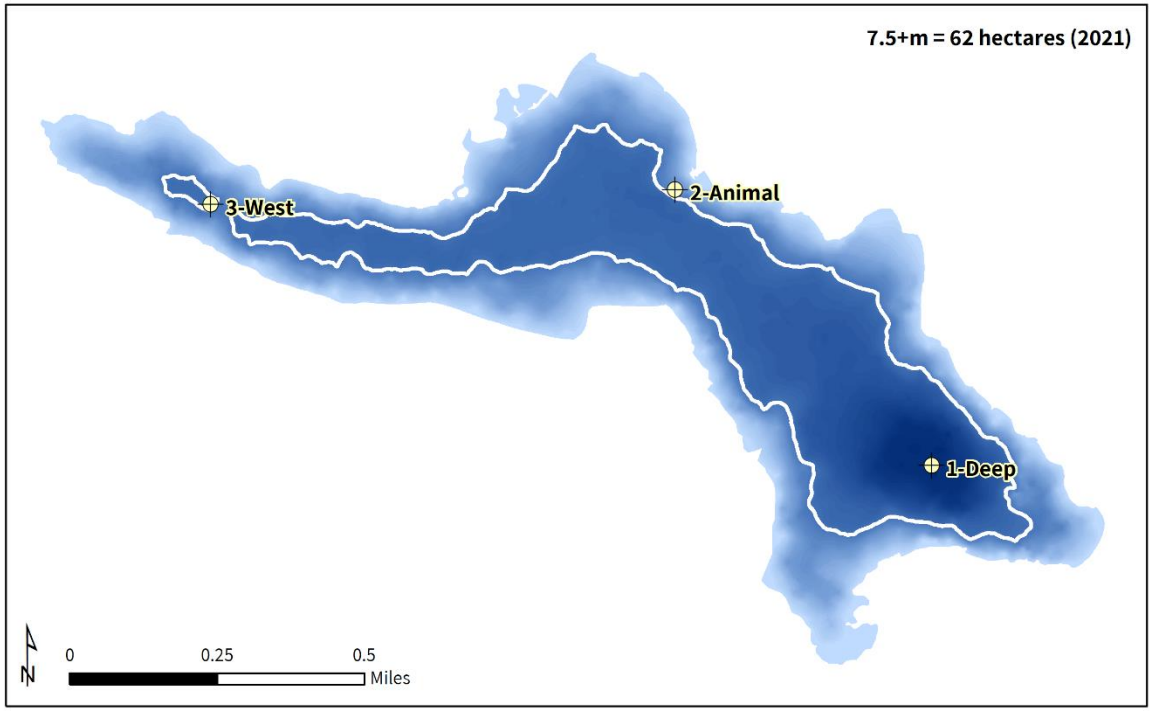

Excess Watershed P Loading
>20%
Internal P Loading
Water Quality Decline

THE CAUSE


Excess Watershed P Loading
80%
>20%
Internal P Loading
20%
Water Quality Decline

THE CAUSE

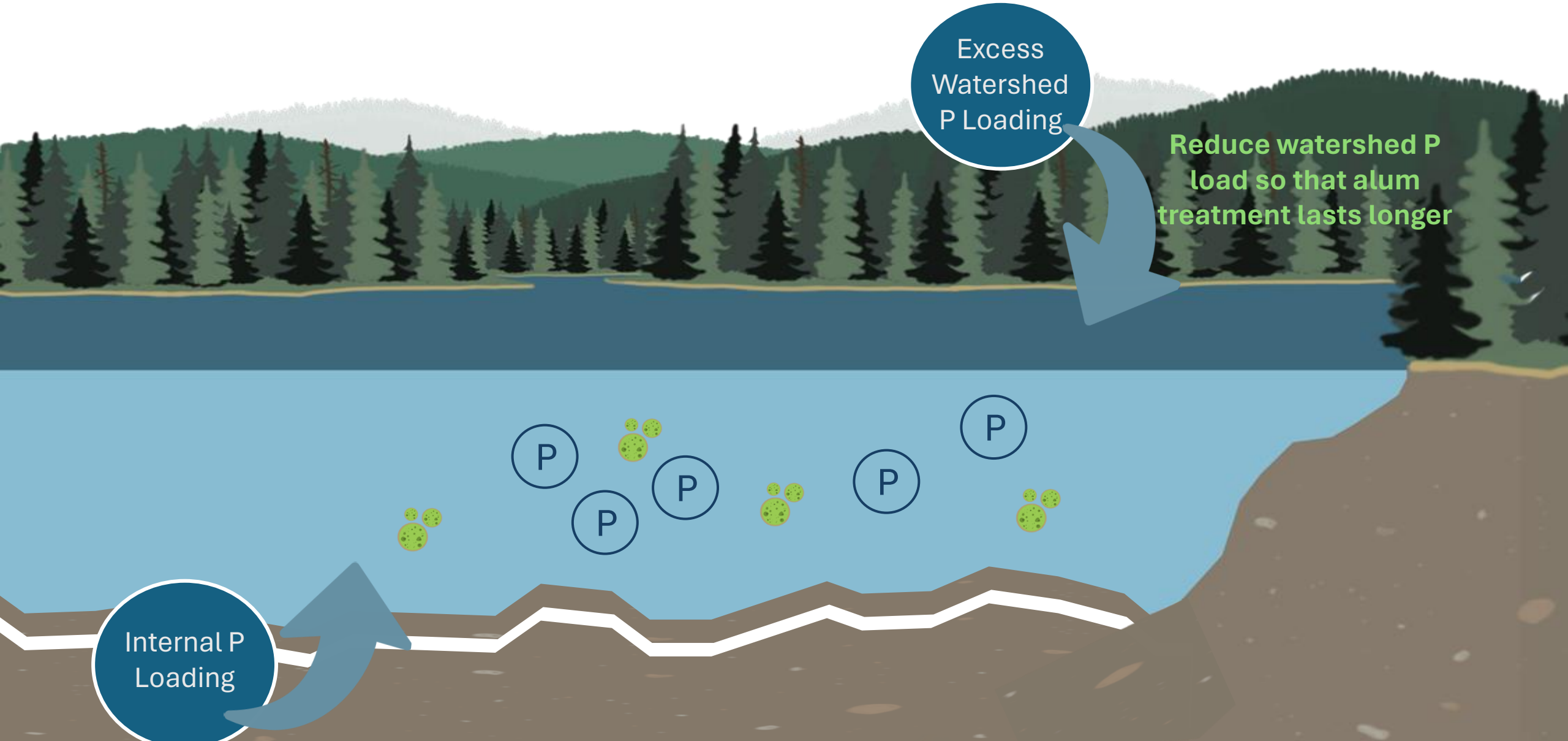




If the trend of worsening low oxygen conditions continues, the extension of low oxygen into even shallower depths could support even greater internal loading and more severe blooms in the future.

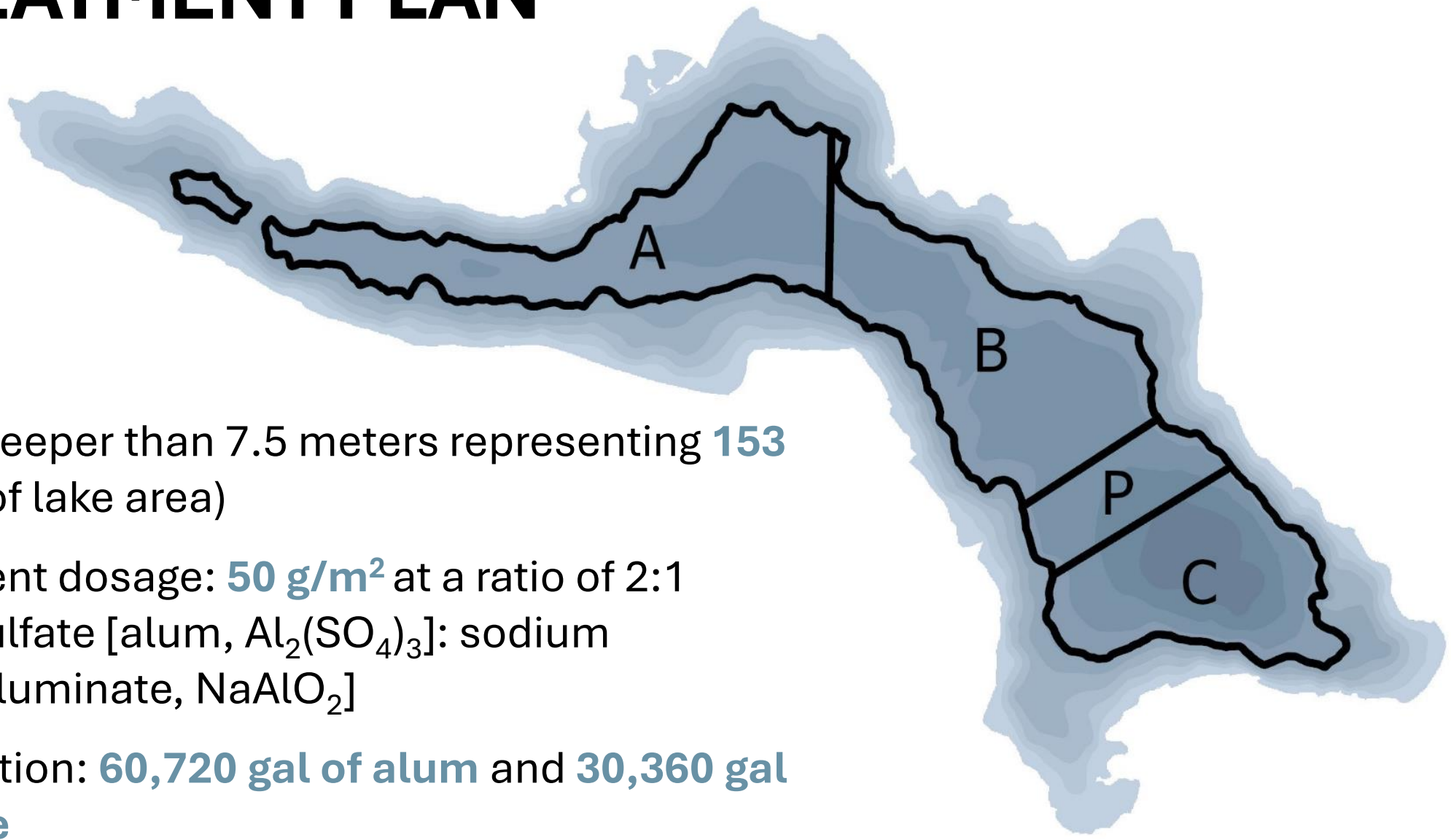
MANAGEMENT SOLUTION: ALUM

ALUM TREATMENT PRIMER



WATERSHED P LOAD REDUCTIONS BY VOLUNTEERS

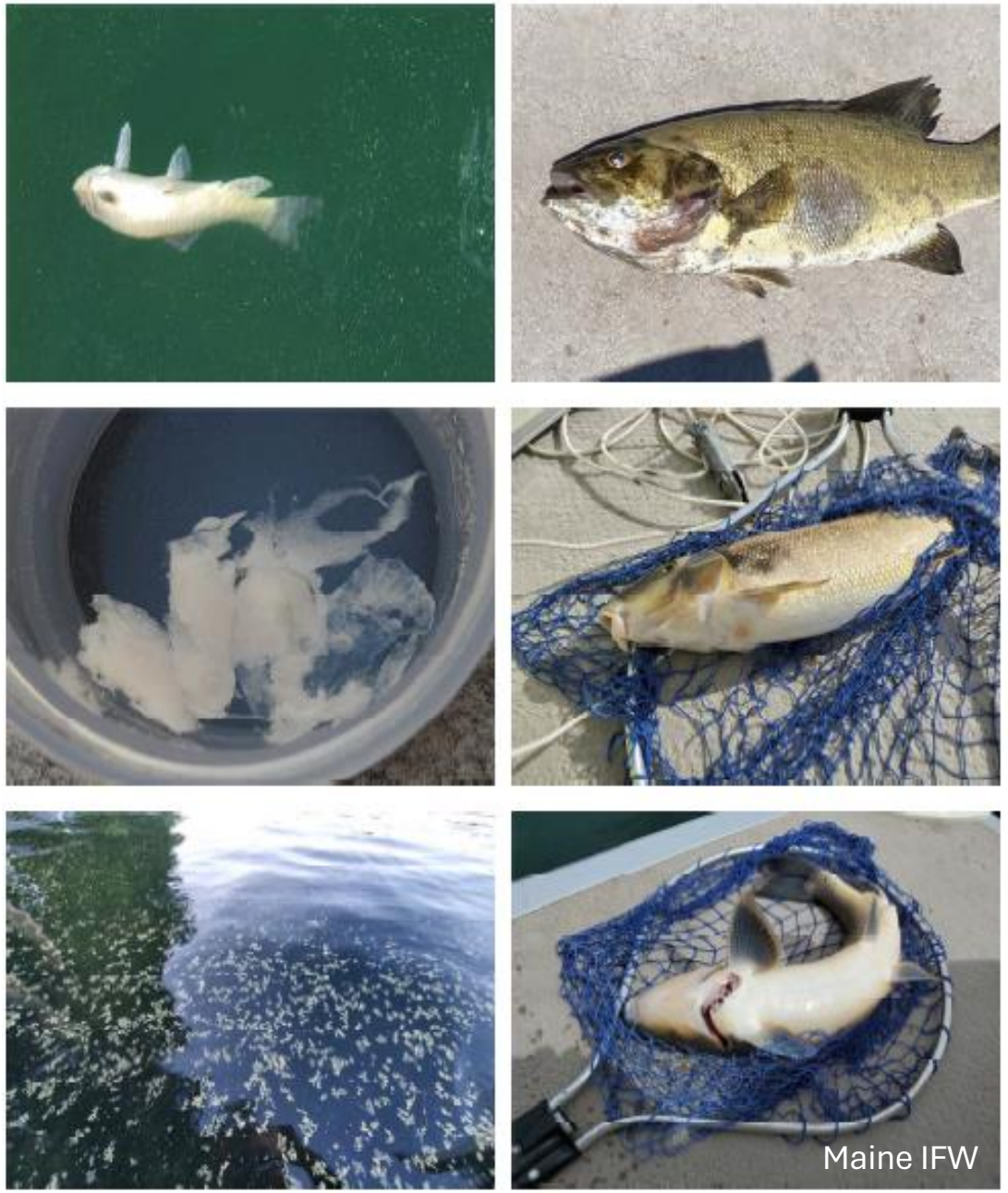
THE TREATMENT PLAN



- Treat areas deeper than 7.5 meters representing **153 acres** (43% of lake area)
- Total treatment dosage: **50 g/m^2** at a ratio of 2:1 aluminum sulfate [alum, $Al_2(SO_4)_3$]: sodium aluminate [aluminate, $NaAlO_2$]
- Total application: **60,720 gal of alum** and **30,360 gal of aluminate**

ECOLOGICAL AND HUMAN HEALTH CONSIDERATIONS

- Al can be toxic to aquatic life in high concentrations, especially at low pH, which is most risky when the Al is first added to the water (before it quickly hydrolyzes and forms the white, fluffy floc)
- Once floc is formed, no longer toxic
- Physical presence of floc can be stressful to fish and can bind with microscopic organisms as it settles (will likely see a reduction in plankton populations in the first year that will rebound in 2-3 years)



TO MINIMIZE RISK TO AQUATIC LIFE

1. Control pH

- 2:1 alum:aluminate application is used to stabilize pH between 6.0 and 8.5
- Aluminate acts as a buffer against changes in pH from the hydrolyzation of alum once injected into the water
- Applicator and third-party monitor continuously monitor pH during active treatment; applicator adjusts the 2:1 ratio in real-time to keep the pH close to background conditions
- Application ceases immediately if pH drops below 6.0

TO MINIMIZE RISK TO AQUATIC LIFE

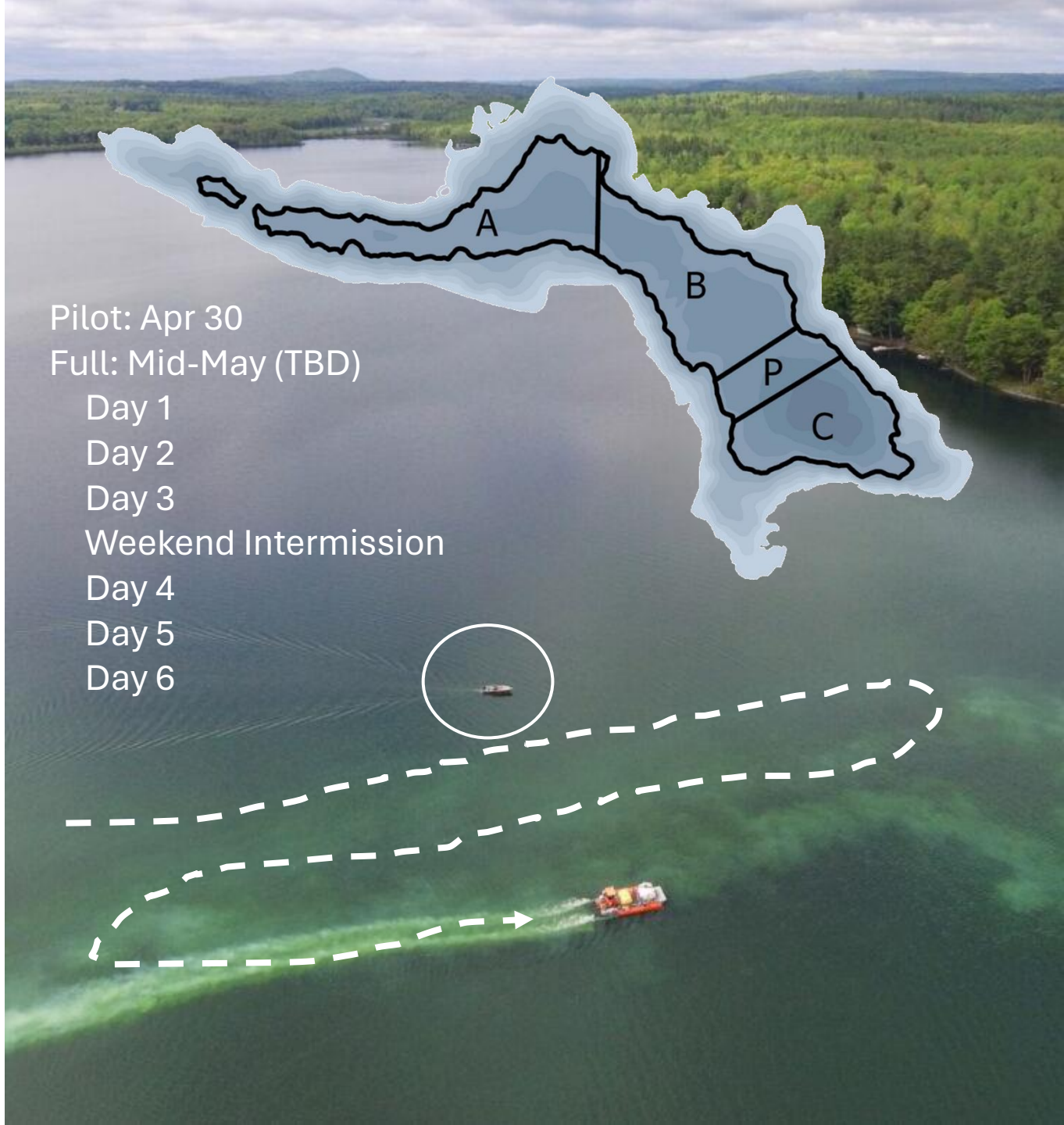
2. Optimize Conditions

- Time of treatment (spring) conducive to even distribution and mixing; applying alum to waters with temperatures at least 4.4 deg C allows faster **floc formation**
- Treating in spring when bloom risk is low allows for proper **floc settling**; particulates can otherwise interfere with floc settling
- Treating in spring when waters are cooler and more oxygenated allows greater freedom of movement for aquatic organisms to avoid treatment areas
- Wind and rain not major concerns for application, though will only operate in winds <15 mph and minor rain

TO MINIMIZE RISK TO AQUATIC LIFE

3. Allow for Refuge & Rest

- Three main treatment zones created so that no more than 15% of the lake area is treated on a given day; portion of zone C treated during pilot
- Low dosages (25 g/m^2) applied per zone per day to achieve <5 mg/L Al in the short-term; thus, each zone treated by two passes over two days
- Within the treatment zone, every other strip in the zone is treated first before filling in the alternate strips to allow refuge to mobile organisms (barge uses GPS to navigate and track treated area)
- Two-week “rest” period between pilot and full treatment; two-day “rest” period between first and second passes during full treatment (5 days)



TO MINIMIZE RISK TO AQUATIC LIFE

4. Monitor

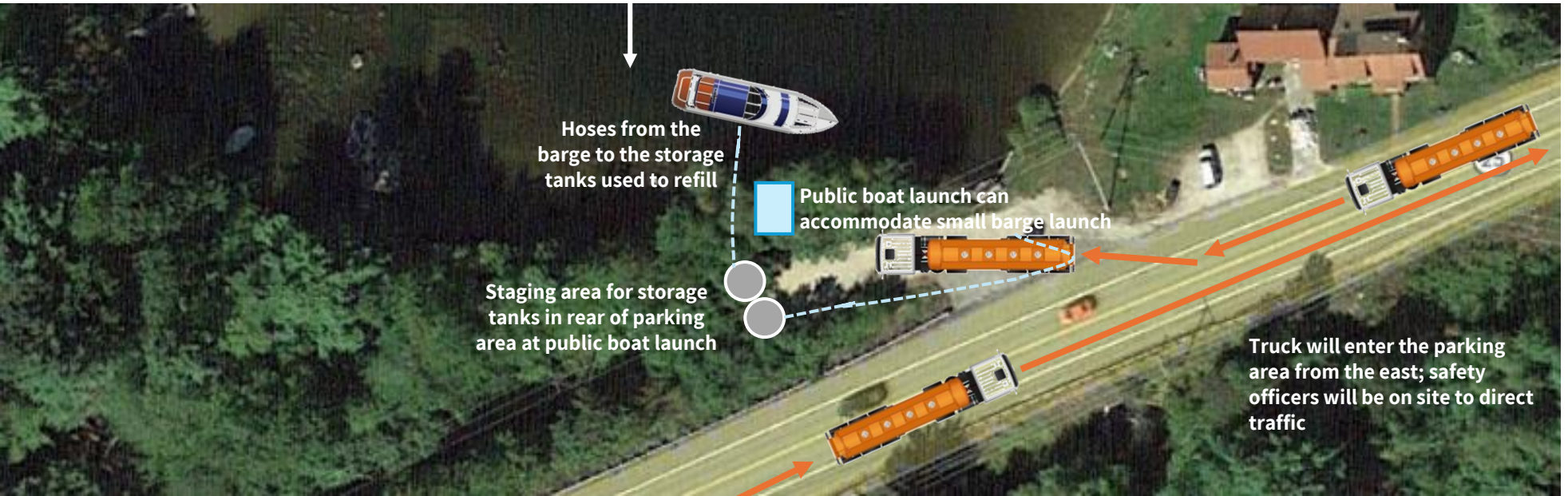
- Intensive monitoring will occur before, during, and after treatment by UNH, FBE, and NHDES (19 monitoring days total)
- We will monitor:
  - Water clarity
  - Dissolved oxygen
  - Temperature
  - Conductivity
  - Turbidity
  - **pH**
  - Alkalinity
  - Hardness
  - Dissolved Organic Carbon
  - **Total Aluminum**
  - **Acid Soluble Aluminum**
  - Total Phosphorus
  - Total Kjeldahl Nitrogen
  - Nitrate-Nitrite
  - Chlorophyll-a
  - Phytoplankton
  - Zooplankton
  - **Fish & Aquatic life observations**
  - Floc evaluation with camera

USE RESTRICTIONS DURING TREATMENT

- Alum will be applied in deep, offshore areas, so there is little to no risk to shoreline residents (even those withdrawing water from the lake)
- As a precaution and for the safety of personnel, NHDES is requesting that the public refrain from recreational use of, or water withdrawal from, the lake during and within 24 hours of the completed treatment
    - NHDES plans to close the public boat launch during the day while personnel are on site
- Public notification letters to all shorefront property owners around Lake Kanasatka and adjacent to the stream outlet at Blackey Cove will be sent out by LKWA
- Notifications will also be posted at the public boat launch and all roads leading to the waterfront
- LKWA will provide notification information and updates on their Facebook page, website, and via email

STAGING LOGISTICS


Large Barge Launch & Docking Area
Lake Kanasatka
Avon Shores Rd
Vonhurst Rd
Nettie Way
Glidden Rd
Small Barge Launch, Staging Area, Truck Access
Image © 2024 Airbus
Private beach launch and overnight docking
Back down gravel road to the private beach
Turnaround Loop
Velma Dr
Vonhurst Rd


Hoses from the barge to the storage tanks used to refill
Public boat launch can accommodate small barge launch
Staging area for storage tanks in rear of parking area at public boat launch
Truck will enter the parking area from the east; safety officers will be on site to direct traffic

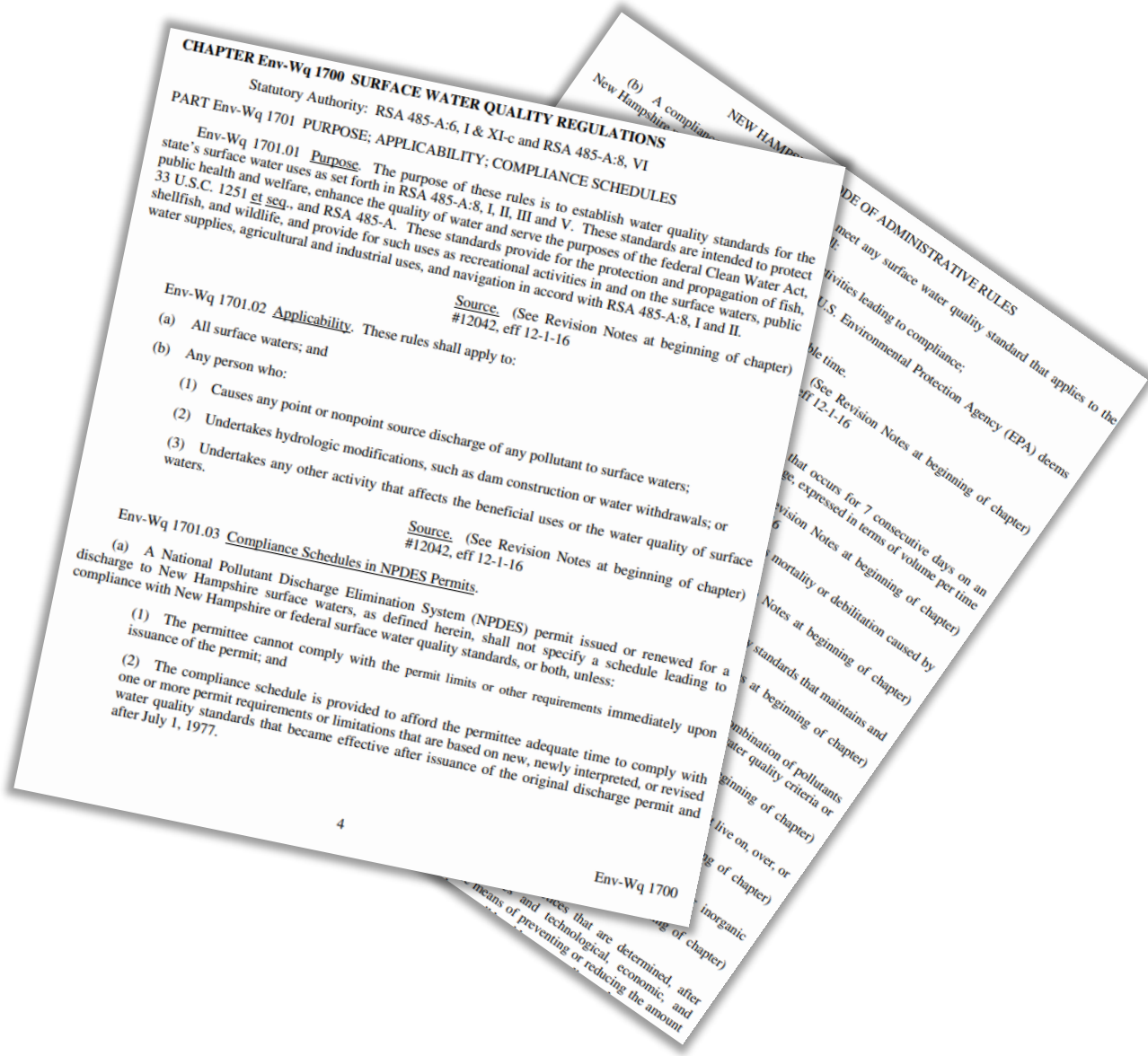
REPORTING AND RECORD KEEPING

- Record chemical names, composition, and suppliers
- Account for daily chemical treatment volumes, mass, and ratios
- Generate maps showing treatment area and boat route of passage
- Record pH readings within the treatment zone during treatment
- Note any equipment failures or deviations from operations and management plan
- All lab results and field data
- Final report summarizing all components of the project

RECEIVING WATER LIMITS

Parameter	Limit*
Aluminum (NH)	Acute: 750 µg/L daily avg. Chronic: 87 µg/L weekly avg.
Aluminum (EPA)	Depends on pH, hardness, and diss. organic carbon
pH	6.5 – 8.0 SU
Turbidity	10 NTUs above baseline

* Attainment of aluminum acute criteria will be the average of measures at the end of each day and chronic criteria will be average of measures over a 4-day period. Attainment of pH and turbidity limits will be determined as the average of all discrete measures at the end of each "treatment phase".



CHAPTER Env-Wq 1700 SURFACE WATER QUALITY REGULATIONS

Statutory Authority: RSA 485-A:6, I & XI-c and RSA 485-A:8, VI

PART Env-Wq 1701 PURPOSE; APPLICABILITY; COMPLIANCE SCHEDULES

Env-Wq 1701.01 Purpose. The purpose of these rules is to establish water quality standards for the state's surface water uses as set forth in RSA 485-A:8, I, II, III and V. These standards are intended to protect public health and welfare, enhance the quality of water and serve the purposes of the federal Clean Water Act, 33 U.S.C. 1251 et seq., and RSA 485-A. These standards provide for the protection and propagation of fish, shellfish, and wildlife, and provide for such uses as recreational activities in and on the surface waters, public water supplies, agricultural and industrial uses, and navigation in accord with RSA 485-A:8, I and II.

Source. (See Revision Notes at beginning of chapter) #12042, eff 12-1-16

Env-Wq 1701.02 Applicability. These rules shall apply to:

(a) All surface waters; and

(b) Any person who:

(1) Causes any point or nonpoint source discharge of any pollutant to surface waters;

(2) Undertakes hydrologic modifications, such as dam construction or water withdrawals; or

(3) Undertakes any other activity that affects the beneficial uses or the water quality of surface waters.

Source. (See Revision Notes at beginning of chapter) #12042, eff 12-1-16

Env-Wq 1701.03 Compliance Schedules in NPDES Permits.

(a) A National Pollutant Discharge Elimination System (NPDES) permit issued or renewed for a discharge to New Hampshire surface waters, as defined herein, shall not specify a schedule leading to compliance with New Hampshire or federal surface water quality standards, or both, unless:

(1) The permittee cannot comply with the permit limits or other requirements immediately upon issuance of the permit; and

(2) The compliance schedule is provided to afford the permittee adequate time to comply with one or more permit requirements or limitations that are based on new, newly interpreted, or revised water quality standards that became effective after issuance of the original discharge permit and after July 1, 1977.

WHAT TO EXPECT

- **Immediate water quality improvements** and likely record deep water clarity in the first summer and minimal to no blooms
- Long-term may decelerate the expansion of low oxygen area in the lake
- Short-term impacts to plankton will lead to long-term beneficial shifts in biological communities in favor of more balanced food webs
- Eventually the alum treatment's effectiveness will deteriorate to pre-treatment conditions (estimating 13 years), putting the lake at risk for blooms again; **important to continue watershed P load reduction efforts** to extend the life of the treatment
- It is **possible that a second smaller treatment may be needed** in a few years as a supplement to this first treatment; monitoring will inform us

COSTS

- Watershed Management Plan - $76,000
- 2022-23 Monitoring (Cash + In-kind) & Sediment Analysis - $19,000
- Treatment Planning & Permitting thru Feb - $27,000
- Volunteer Work - Watershed BMPs (Cash + In-kind) - $23,000

$145,000

- 319 Grant – Watershed BMPs (Cash + In-kind) - $167,000
- Treatment Planning & Permitting - $13,000
- Treatment Application by SOLitude - $482,000
- 2024 Monitoring (UNH, FBE, Lab fees) - $61,000

$723,000

-$500K

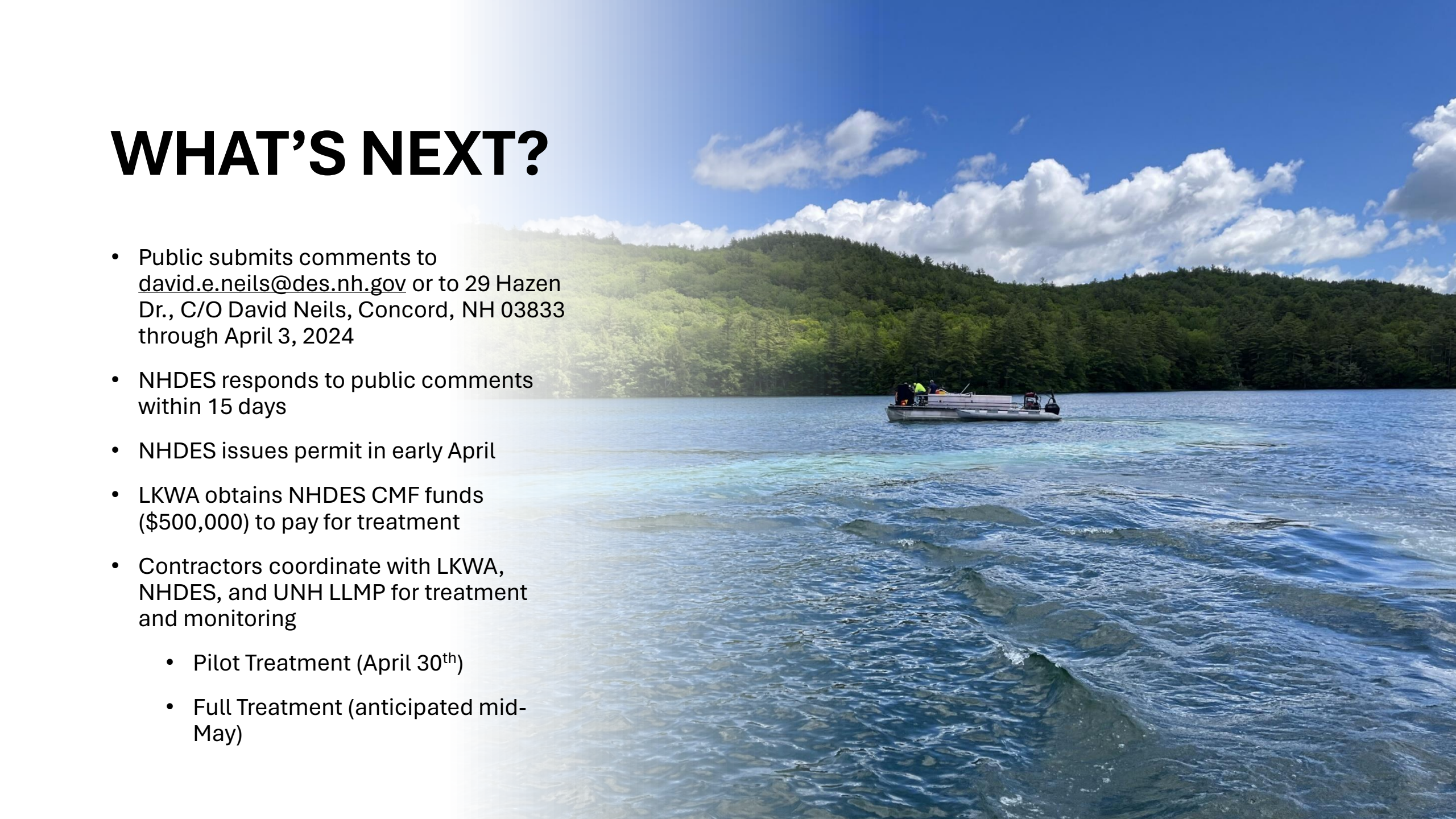
-$100K

$868,000

Awarded $500,000 grant by NHDES

WHAT'S NEXT?

- Public submits comments to david.e.neils@des.nh.gov or to 29 Hazen Dr., C/O David Neils, Concord, NH 03833 through April 3, 2024
- NHDES responds to public comments within 15 days
- NHDES issues permit in early April
- LKWA obtains NHDES CMF funds ($500,000) to pay for treatment
- Contractors coordinate with LKWA, NHDES, and UNH LLMP for treatment and monitoring
    - Pilot Treatment (April 30th)
    - Full Treatment (anticipated mid-May)



March 19, 2024

PUBLIC HEARING

THANK YOU!

Laura Diemer, CLM
FB Environmental Associates