

# IN-LAKE MANAGEMENT TREATMENTS FOR CYANOBACTERIA

June 5, 2025 | NH Lakes Congress



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FB Environmental Associates





# THE PROBLEM



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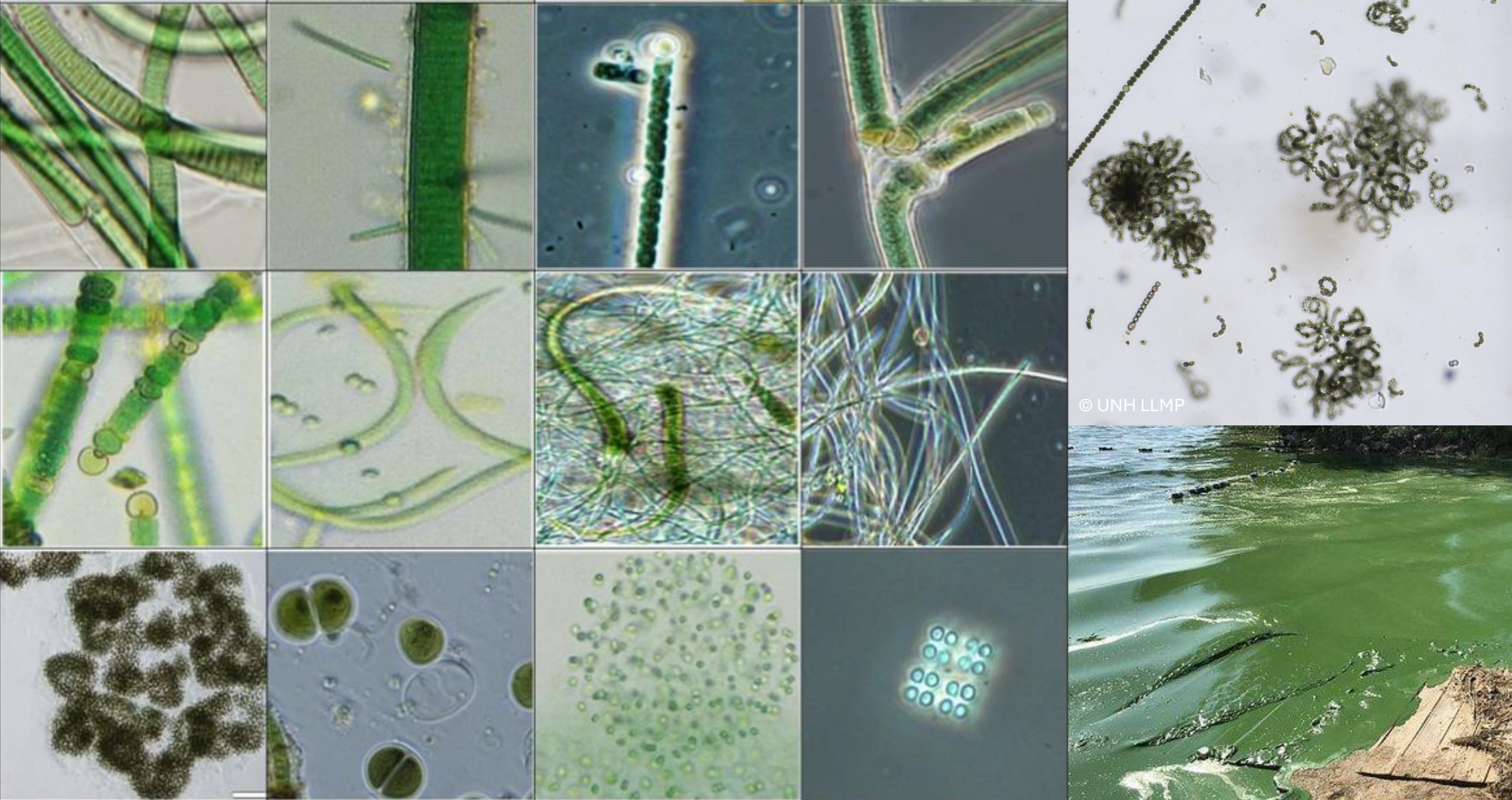


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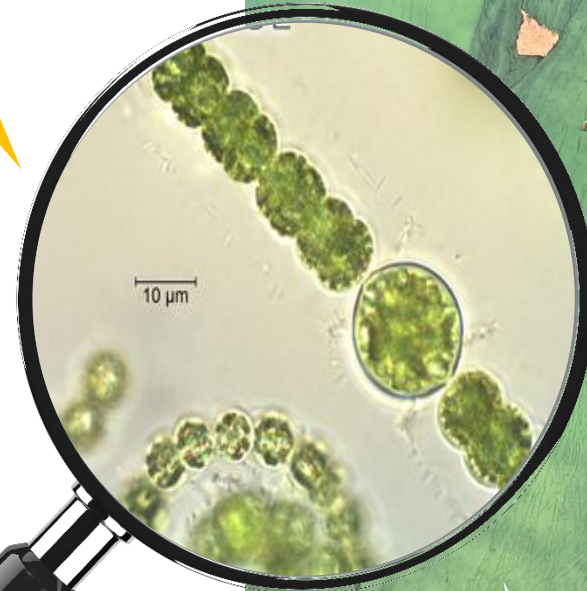
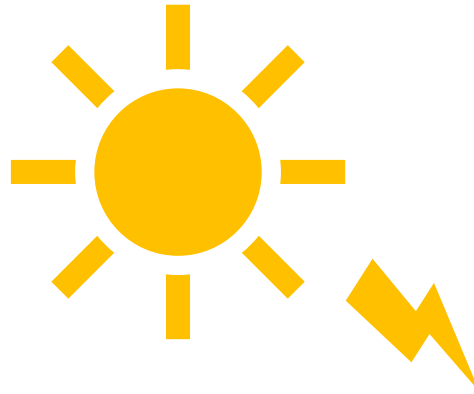
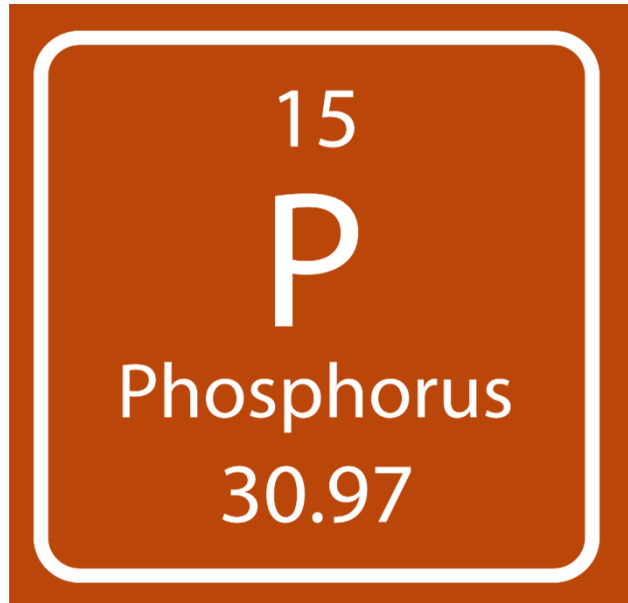


Collage of various cyanobacteria. Image source: Partial Fig. 1 of Tatters et al. 2017 *Toxins*

© Clean Lakes Alliance



# THE CAUSE





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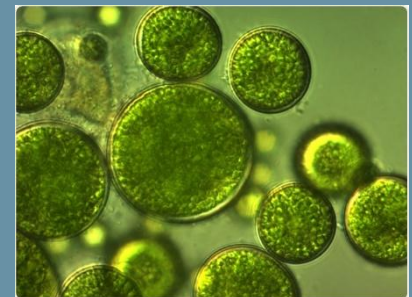




# THE CAUSE

Excess  
Watershed  
P Loading

Water  
Quality  
Decline





# THE CAUSE





# THE CAUSE



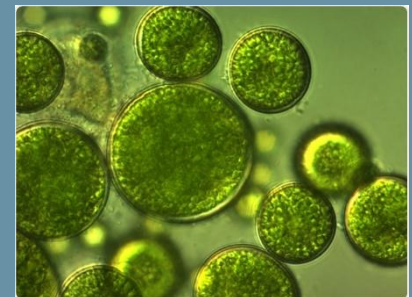


# THE CAUSE

Excess  
Watershed  
P Loading

Internal P  
Loading

Water  
Quality  
Decline







# WE ARE IN A NEW ERA WITH ENHANCED EFFECTS FROM CLIMATE CHANGE

**The world has surpassed a heat threshold that scientists have been warning about**

How is climate change affecting cyanobacteria in N.H. lakes, ponds and other waters?

New Hampshire Public Radio | By Mara Hoplamazian, Bol Nakdimio  
Published July 15, 2022 at 4:50 PM EDT



**NOAA says New England's temps are warming, sea levels rising faster than the global rate**

Hadley Barndollar USA TODAY NETWORK

CLIMATE CRISIS

CONNECT THE WORLD

**EXPERTS: GLOBAL TEMPERATURES BROKE RECORDS IN JULY**  
Findings from European Union's Copernicus Climate Change Service







© Cathy Bergstrom



**STORM  
WATCH 9**

**FLASH FLOODING IN S And H WEST NEW HAMPSHIRE  
LEAVES ROADS WASHED OUT, EVACUATION AT CAMP**



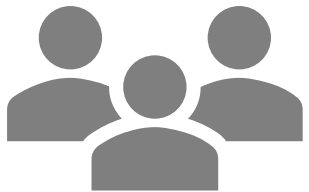
© Cathy Bergstrom



# DEVELOP A WATERSHED PLAN



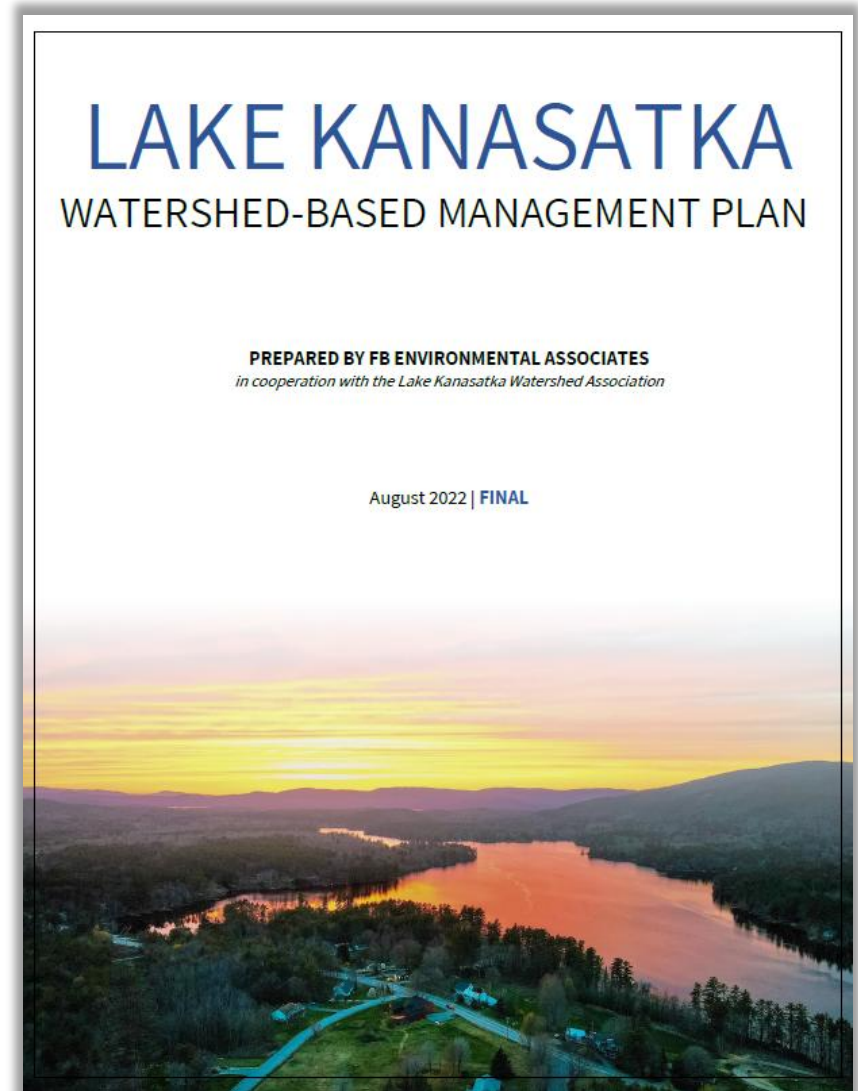
**1** Identifies Sources



**2** Sets WQ Goal



**3** Prioritizes Actions





# EXAMPLE #1

**ADDRESS  
EXTERNAL  
WATERSHED  
SOURCES**

Excess  
Watershed  
P Loading

Internal P  
Loading



# EXAMPLE #2

**ADDRESS BOTH  
EXTERNAL  
WATERSHED &  
INTERNAL SOURCES**

Excess  
Watershed  
P Loading

Internal P  
Loading

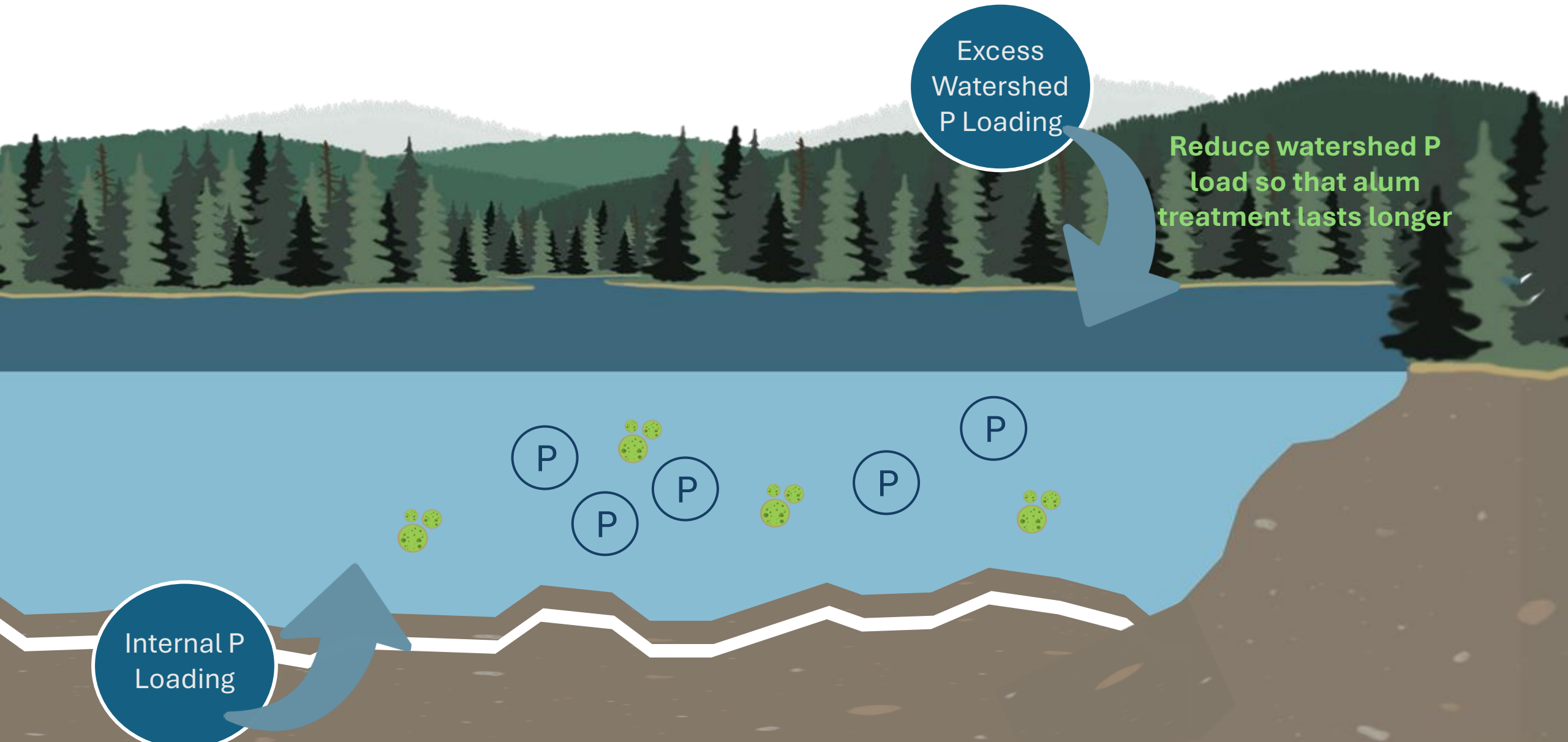


# MANAGEMENT SOLUTION: ALUM





# ALUM TREATMENT PRIMER





# 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 (may see a reduction in plankton populations in the first year that will rebound in 2-3 years)





# TO MINIMIZE RISK TO AQUATIC LIFE

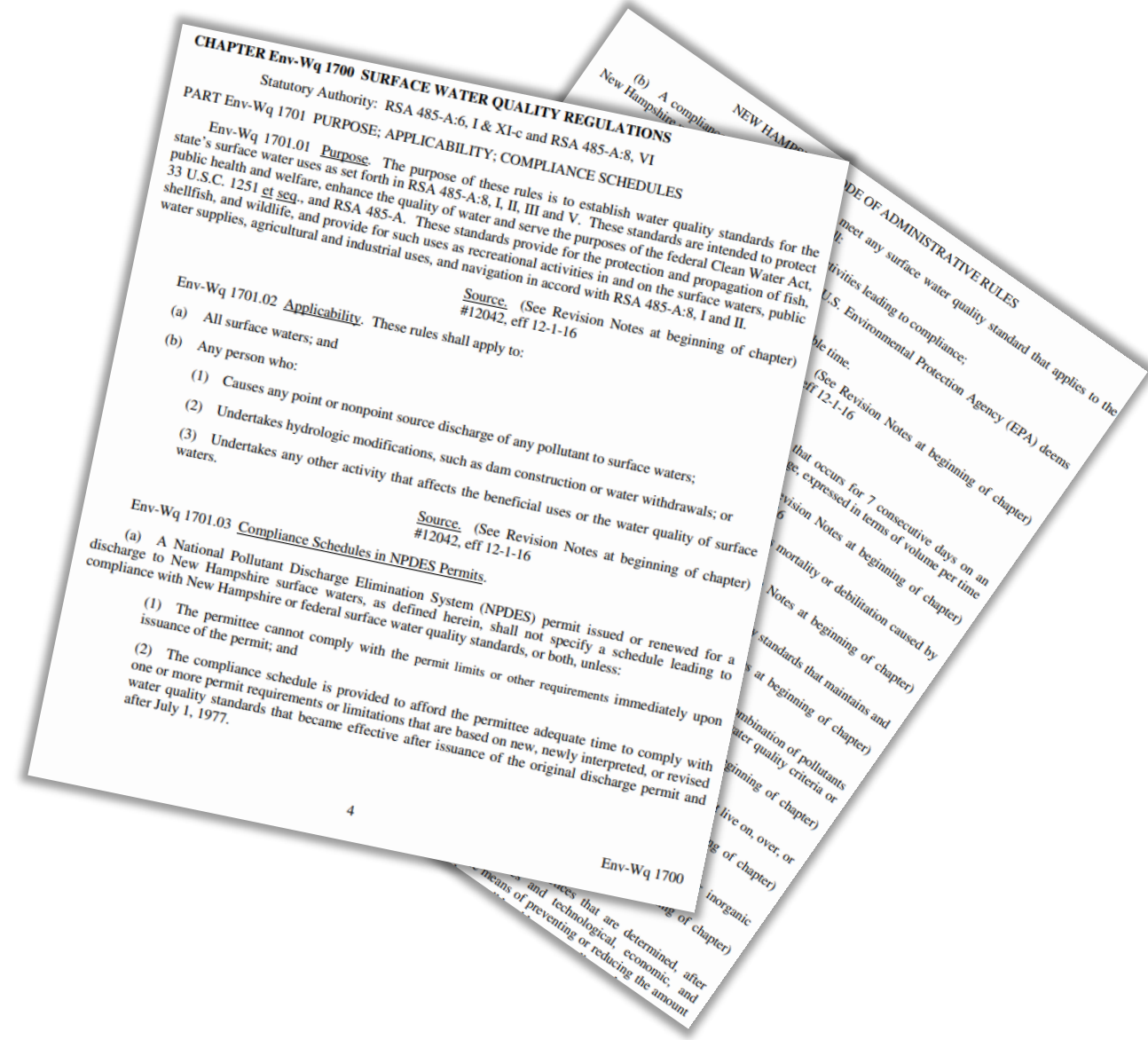
1. Control pH
2. Optimize Conditions
3. Allow for Refuge & Rest
4. Monitor





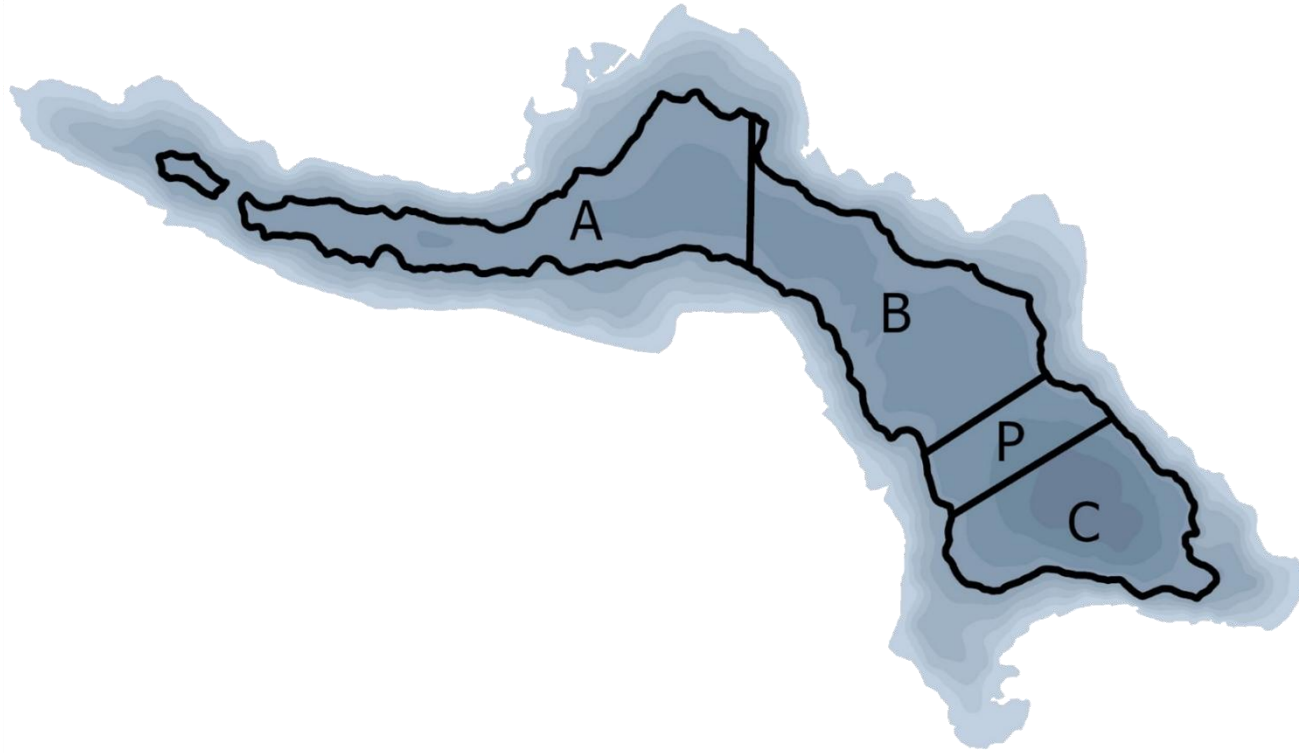
# RECEIVING WATER LIMITS

Parameter	Limit
Aluminum (EPA)	Depends on pH, hardness, and diss. organic carbon
pH	6.5 – 8.0 SU
Turbidity	10 NTUs above baseline

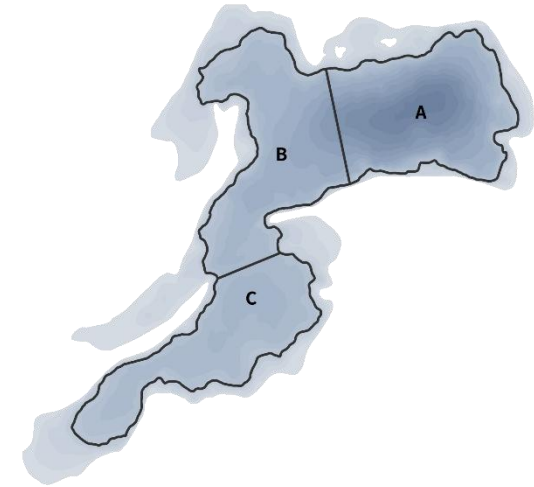




# TREATMENT EXAMPLES



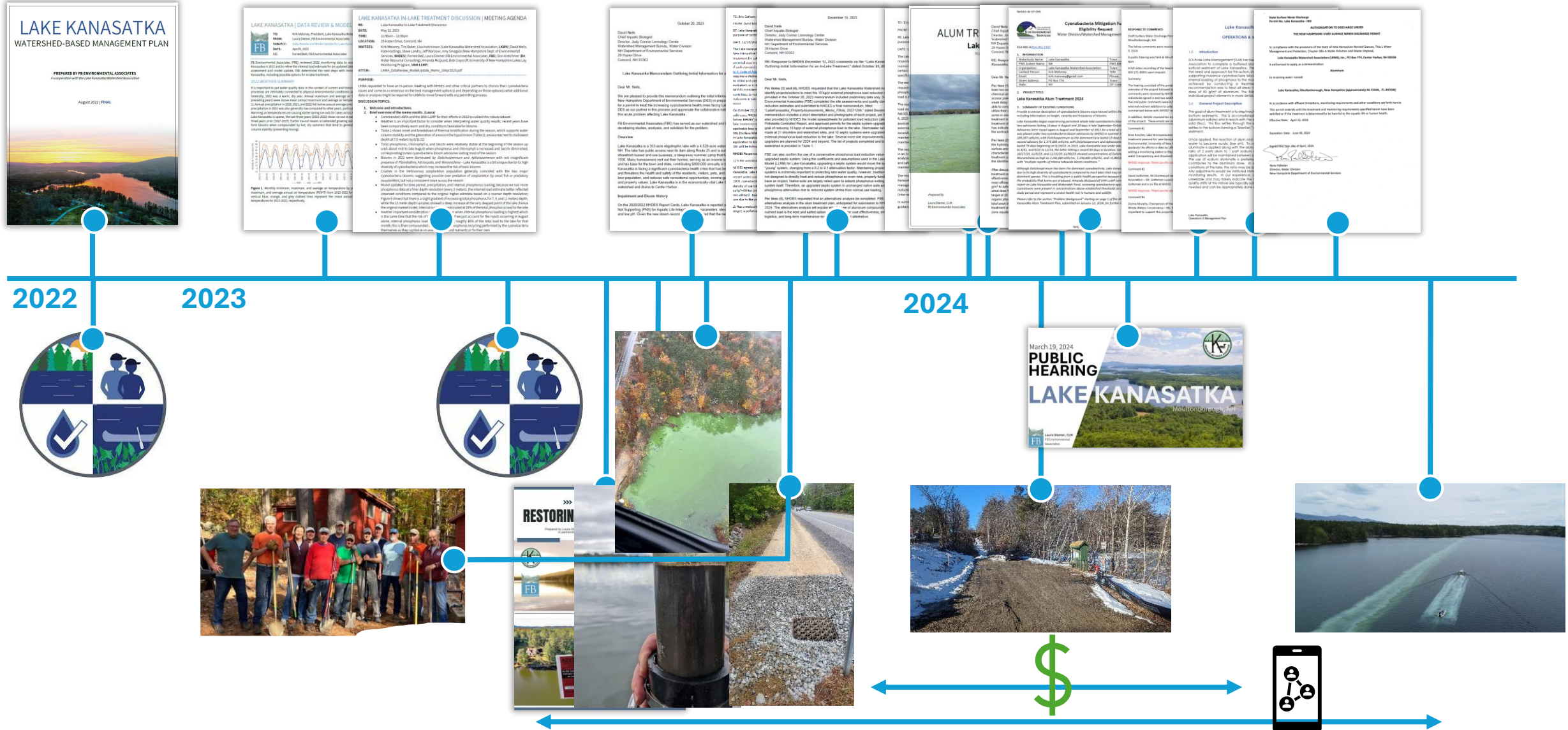
Total Lake Area: **353 acres**  
Total Treated Area: **158 (45%)**  
Treatment Dose: **50 g/m<sup>2</sup> (49 g/m<sup>2</sup> actual)**  
Treatment Depth: **7.5m+**



Total Lake Area: **103 acres**  
Total Treated Area: **64 (62%)**  
Treatment Dose: **25-50 g/m<sup>2</sup>**  
Treatment Depth: **4m+**



# THE REGULATORY PROCESS





# STAGING LOGISTICS















# WHAT WE EXPECT

- **Immediate water quality improvements** and likely record deep water clarity in the first summer and minimal to no blooms
  - May facilitate growth of benthic cyanobacteria and aquatic plants, be particularly vigilant with weed watchers
- Long-term may decelerate the expansion of low oxygen area in the lake
- Short-term impacts to plankton 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, putting the lake at risk for severe whole lake blooms again; **important to continue watershed P load reduction efforts** to extend the life of the treatment



# LAKE KANASATKA COSTS

- Watershed Management Plan - \$76,000
- 2022-23 Monitoring (Cash + In-kind) & Sediment Analysis - \$20,000
- Treatment Planning & Permitting (FBE) - \$41,000
- Volunteer Work - Watershed BMPs (Cash + In-kind) - \$23,000
- LKWA capital campaign costs and professional services - \$10,000
- CDS Grant via LWA for BMP work (Cash + In-kind) - \$150,000
- 319 Grant – Watershed BMPs (Cash + In-kind) - \$167,000
- Treatment Application by SOLitude - \$482,000
- 2024 Monitoring (UNH, FBE, Lab fees, no in-kind) - \$64,000



**\$487,000**



**\$546,000**

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**\$1,033,000**



# PARTRIDGE LAKE COSTS

- Watershed Restoration Plan (2022) - \$75,000
- Sediment Analysis - \$19,000
- Treatment Planning & Permitting - \$40,500
- Volunteer Work - Watershed BMPs (319+), Septic Upgrades, Outreach, & Land Purchases (Cash + In-kind) - \$621,000
- Treatment Application by SOLitude - \$168,000
- 2025 Monitoring (FBE, Lab fees) - \$108,000

} **\$755,500**

} **\$276,000**

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**\$1,031,500**



# FINAL CONSIDERATIONS

*Alum not appropriate in all cases!*





# FINAL CONSIDERATIONS

*Alum is not a silver bullet solution!*

*Photos courtesy of LKWA*





# FINAL CONSIDERATIONS

*Do not take matters into your own hands!*



AquaThruster Nexa 360 - Lake Muck and Weed Blower  
\$1,399.95 - \$3,910.95



AquaThruster™ - Lake Muck & Weed Blower  
★★★★★  
\$1,374.99 - \$3,904.99



Core Tech Muck Reducer Probiotic  
Lake & Pond Sludge Removal Bacteria  
★★★★★  
\$54.98 - \$529.00



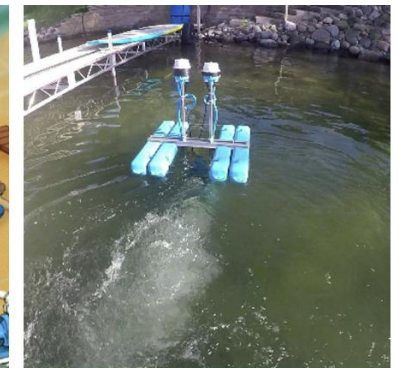
Muck Reducer Tablets Advanced Probiotic | Eradicator Plus  
★★★★★  
\$62.00 - \$392.00



Oxygen Based Pond Rock & Feature Algae Remover  
★★★★★  
\$13.95 - \$39.95



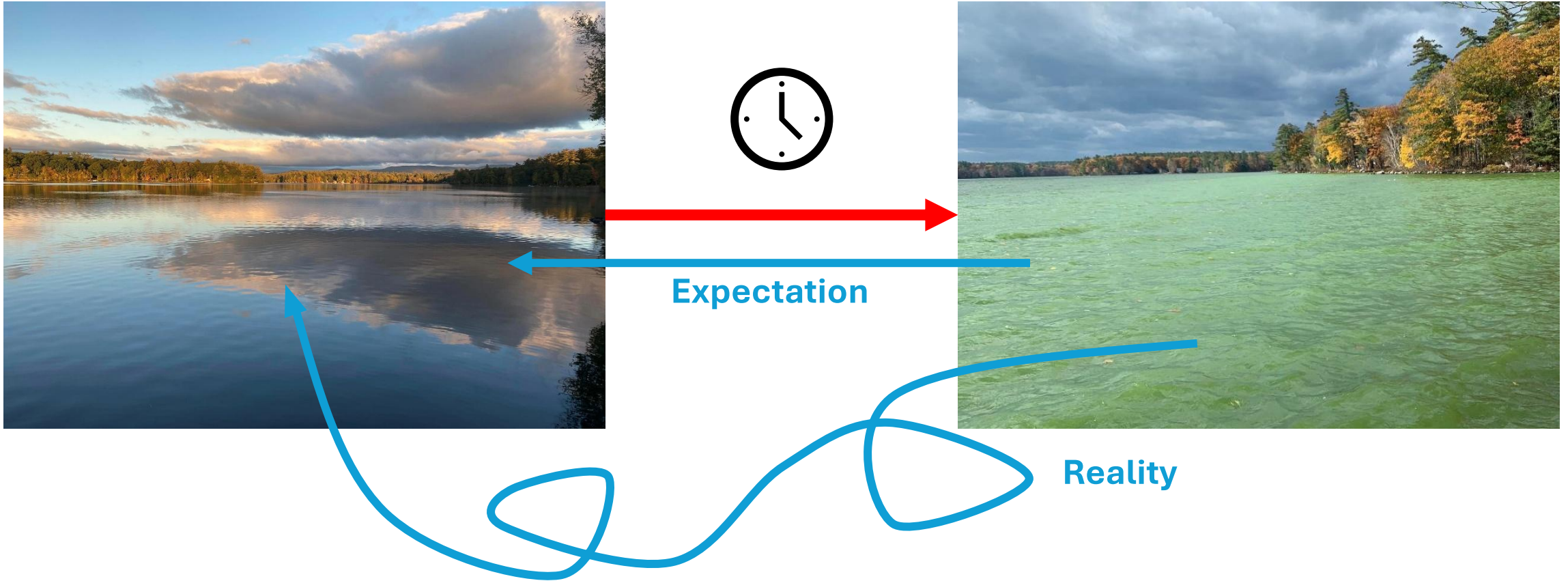
Neptune Rake | Aquatic Weed Harvester & Muck Dredge  
Now: \$5,339.00 Was: ~~\$6,399.00~~





# FINAL CONSIDERATIONS

*There are no quick fixes!*



*Have patience, have hope. Do this for the next generation!*



# THANK YOU! QUESTIONS?

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