

Lake Oscawana Management Advisory Commission
Town of Putnam Valley, NY

Lake Oscawana

Management Update
June 13, 2026

Hillary Kenyon, M.S.

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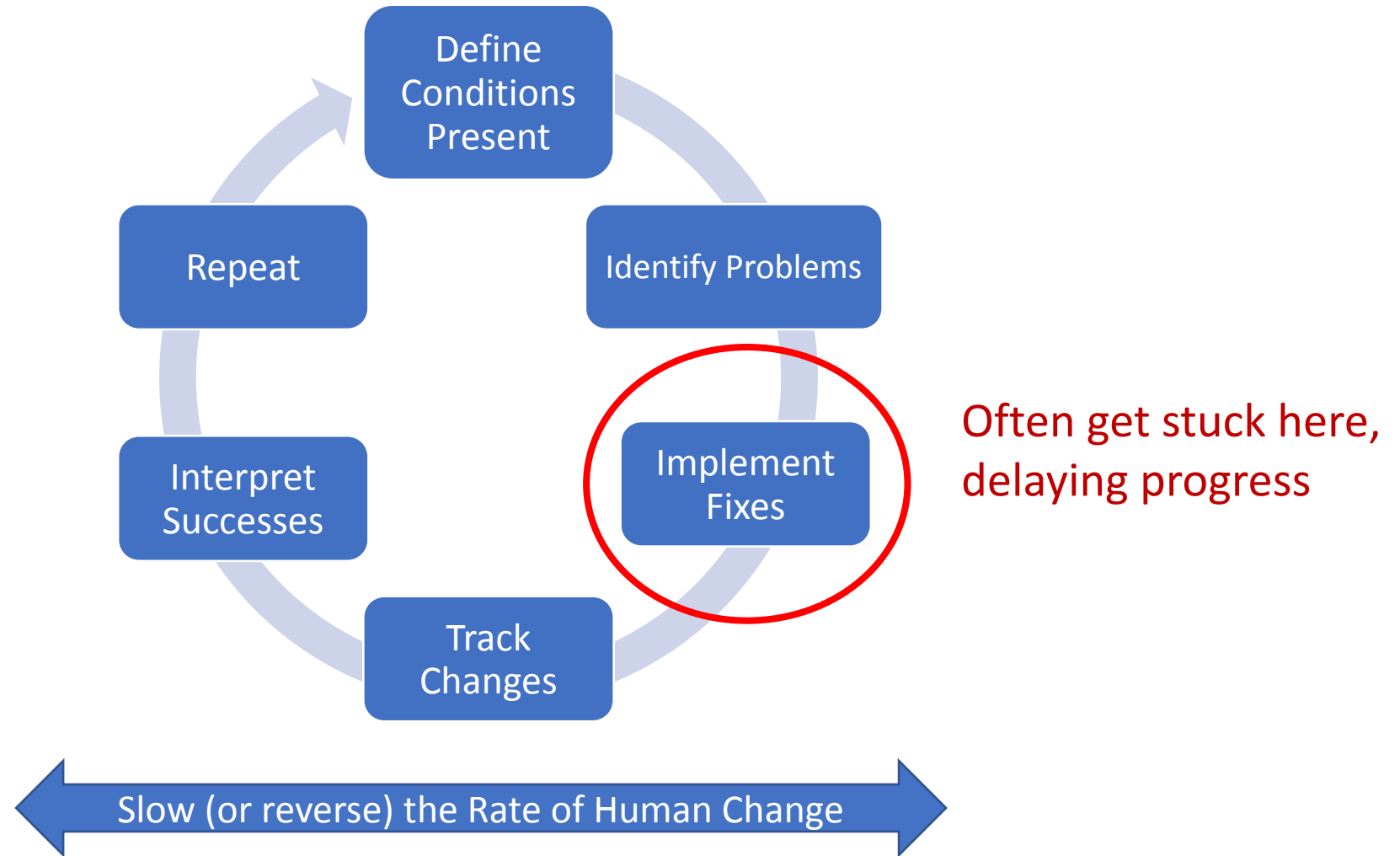


APPLIED WATERSHED
SCIENCES

Lake Management Process

An attempt to find harmony between nature and human use of nature...

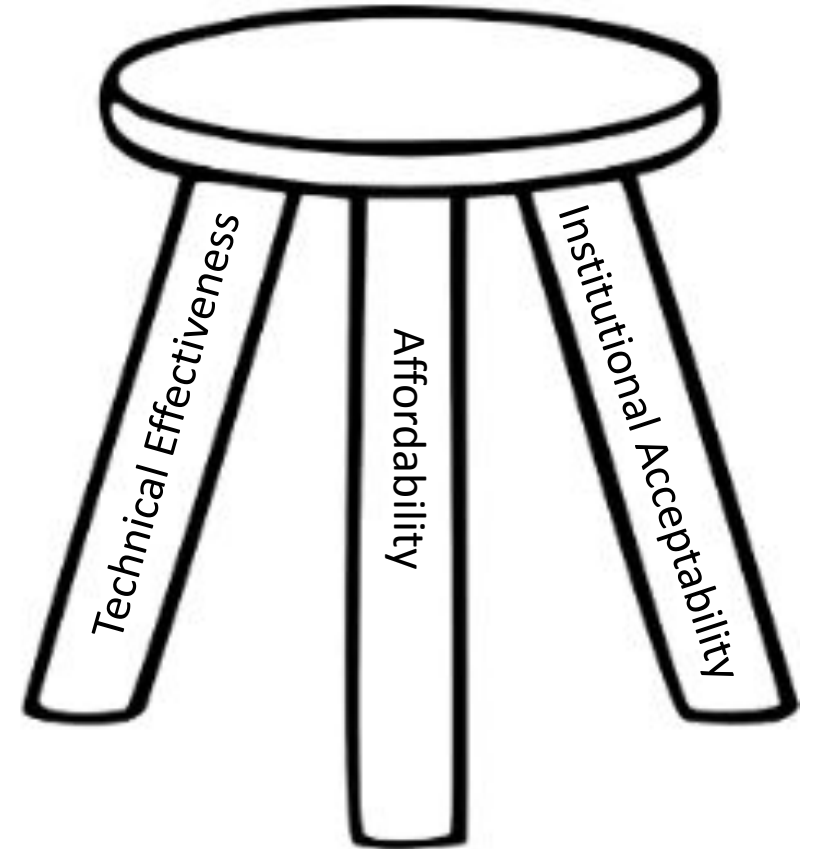
Management maintains lake uses; inaction allows for continued lake quality decline



Lake Management Process

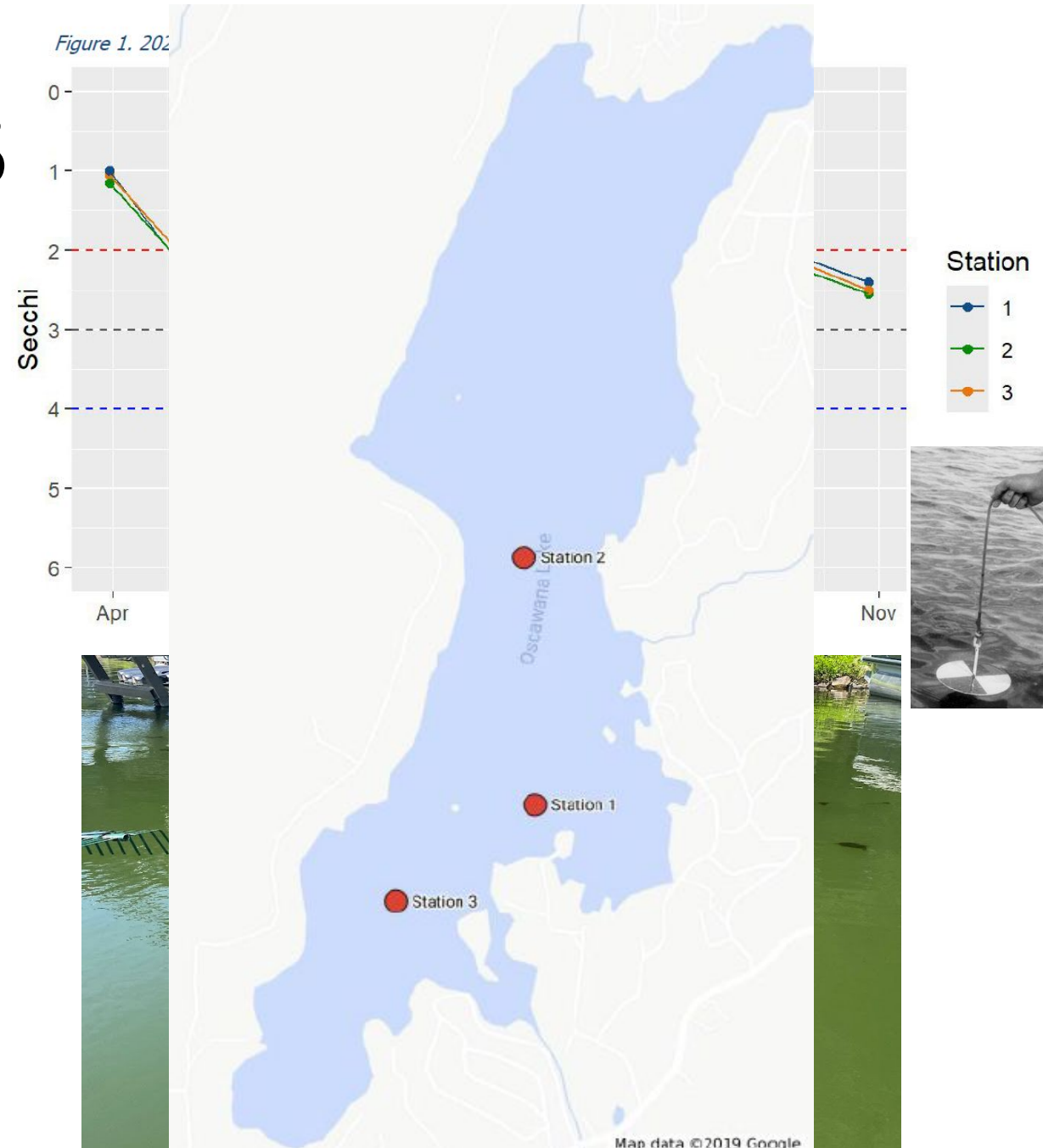
3-legged stool of management (K. Wagner)

1. Technical effectiveness
 - Science... will it work?
 - Potential consequences/ non-target impacts
2. Affordability/Economic Feasibility
 - Cost
 - Access to funding, cost vs. benefit, longevity of implementation
3. Institutional Acceptability
 - Community acceptance?
 - Regulatory pathway?



Lake Oscawana in 2025

- 4 of 12 SWQI points in 2025 (8 in 2024)
- Multiple months <2.0m clarity (minimum target threshold for **open water monitoring stations**)
- No early summer 'clear-water' phase
- Water temperature did not directly explain the poor 2025 water quality
 - High-resolution logger data compared
- Dissolved oxygen loss (anoxia) was worse than normal, presenting a greater impact of internal nutrient load
- Nutrients higher than normal (N & P)
 - Expected impact of the decline of littoral vegetation: less retention of septic nutrients in the littoral zone
- Cyanobacteria moderate blooms; several beach closures for fecal bacteria; zooplankton moderate
- Aquatic plant diversity low; remaining species Tapegrass & Waterlilies. Grass carp harvesting is proposed.



Surface Nutrients (Phosphorus & Nitrogen)

Figure 15. Combined Stations 2016-2025 Surface TP Boxplots

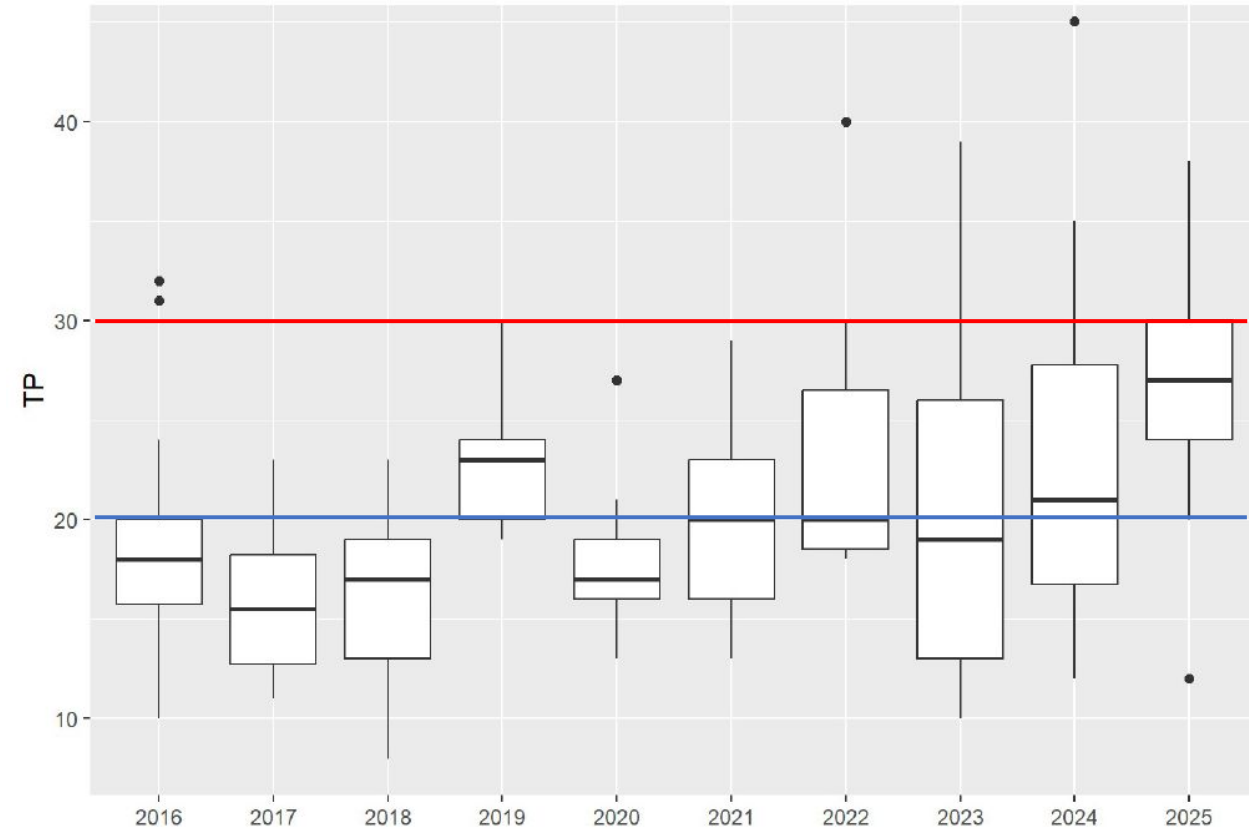
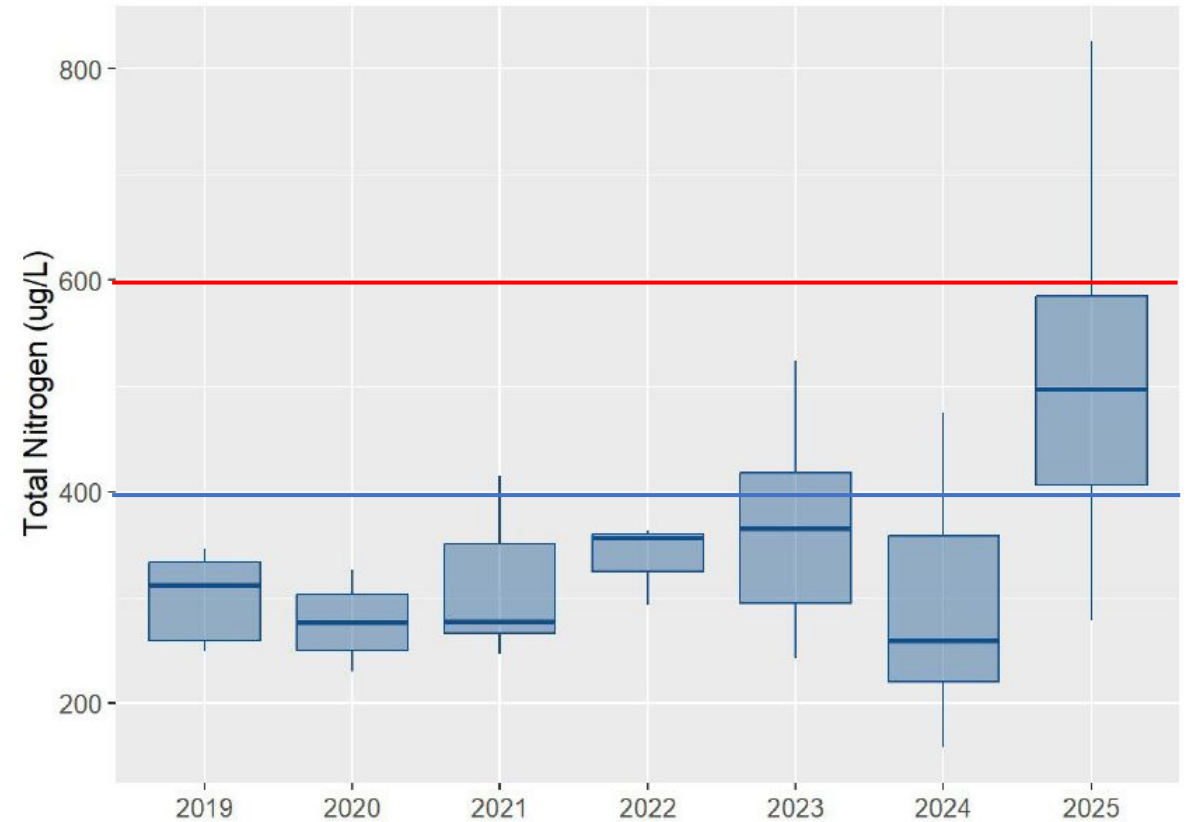
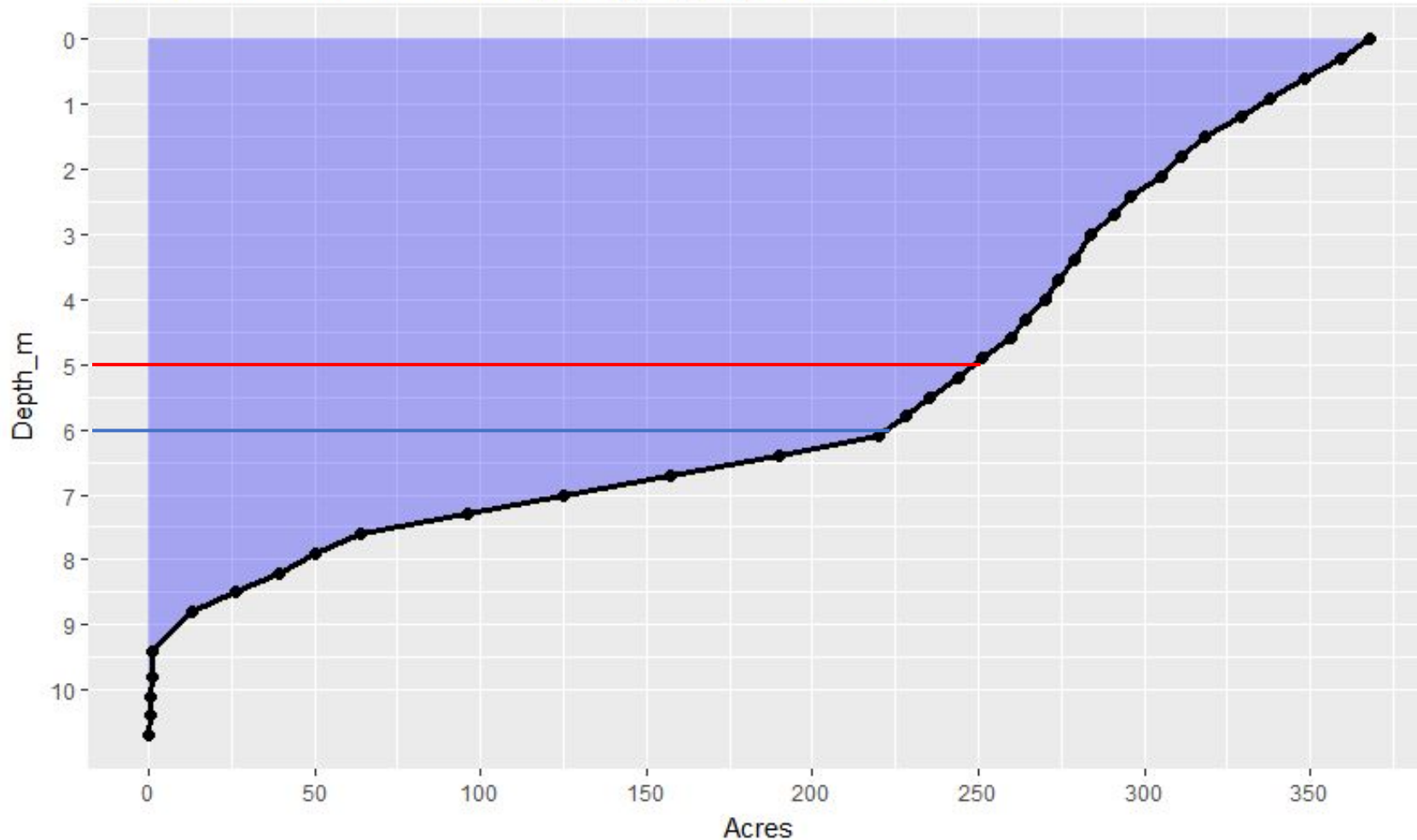


Figure 19. Historical Comparison of Surface Total Nitrogen



Severity of Annual Anoxia: Key Importance

Oscawana Surface Area vs. Depth Hypsographic Curve



- Target 6m maximum anoxic boundary
- In 2023 & 2025, the anoxic boundary reached 5m
- Results in an extra 25+ acres of anoxic sediment surface that then contributes to internal P and N release in that season
- When anoxic boundary is above 6m, it interacts with the lake thermocline
- Results: more P released, easier for epilimnetic (above thermocline) algae to access that P

Cyanobacteria “Scum” Formation

- Typical surface bloom formation – **when cyanobacteria respond to environmental conditions:**

- Weather (temperature, light, wind)
- Availability of nutrients (primarily nitrogen and phosphorus)
- More evidence about cyanobacteria also responding to physical disturbance of sediments and resuspension from boat traffic

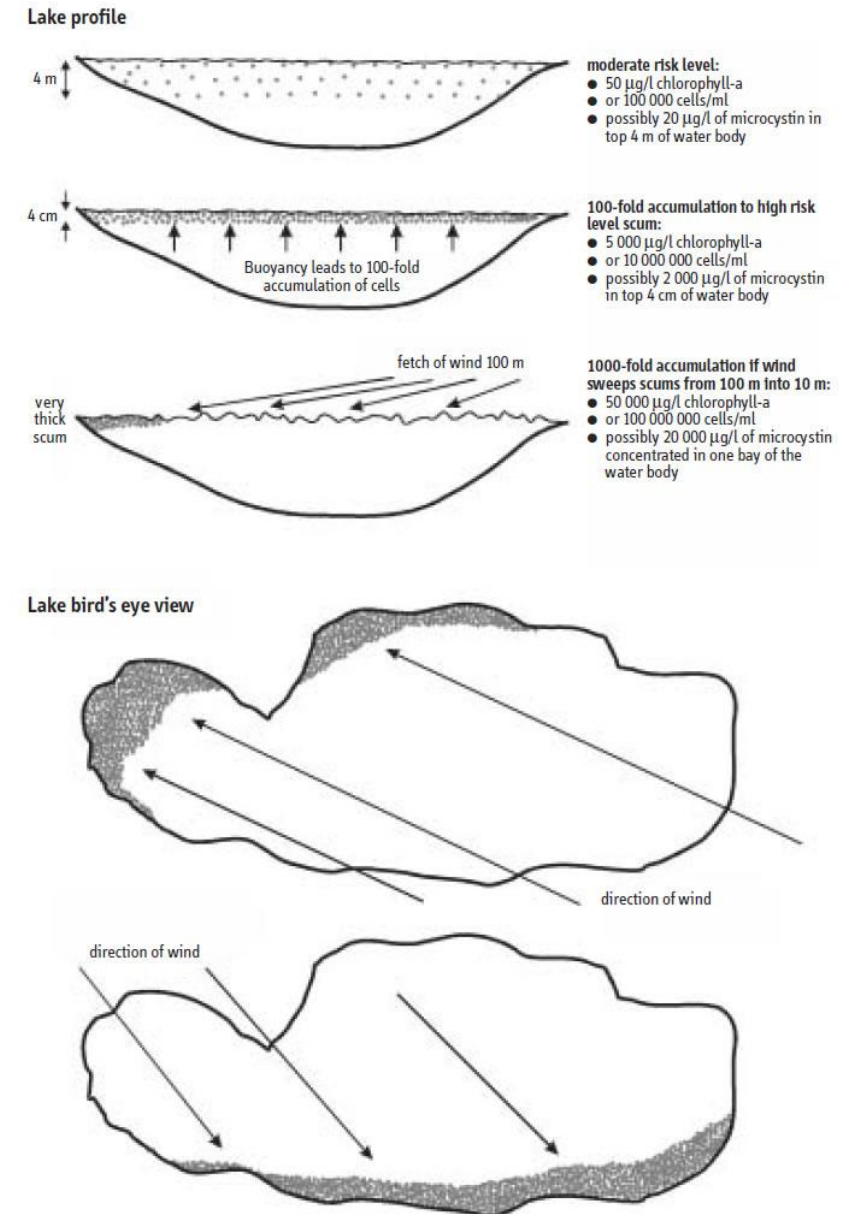
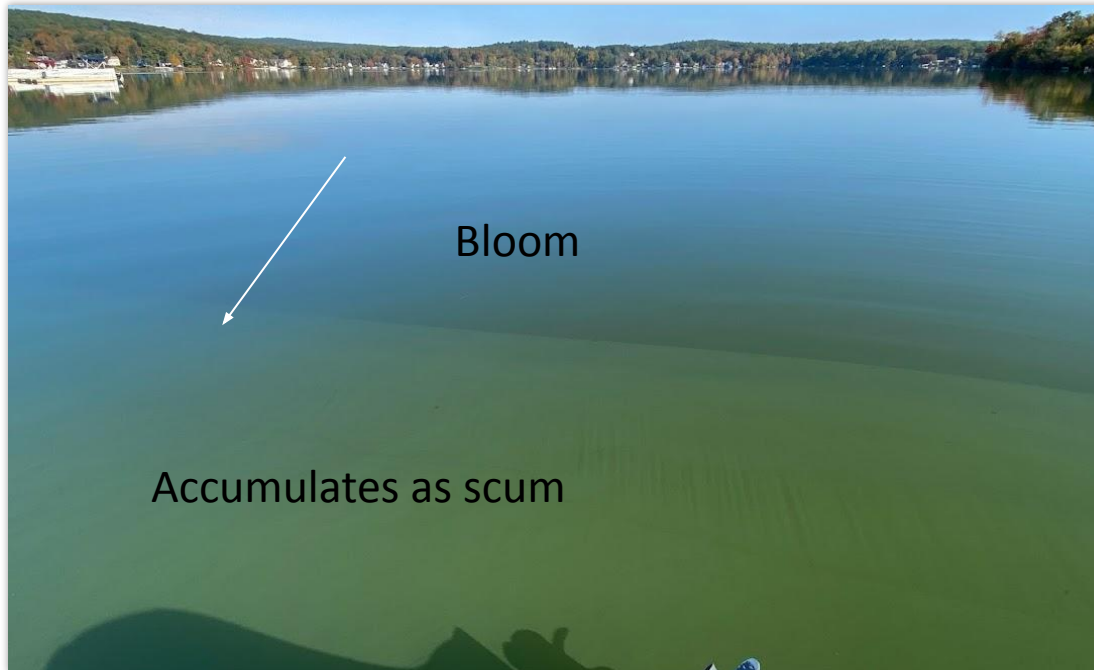
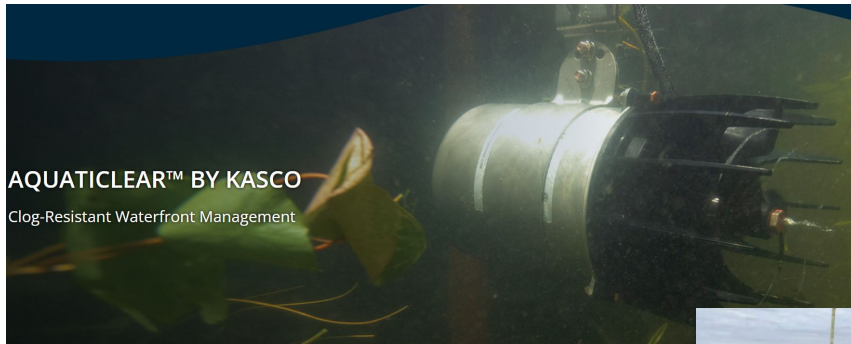


FIGURE 8.1. SCHEMATIC ILLUSTRATION OF SCUM FORMATION CHANGING THE CYANOTOXIN RISK FROM MODERATE TO HIGH (CHORUS & BARTRAM, 1999)

District Swimming Beaches

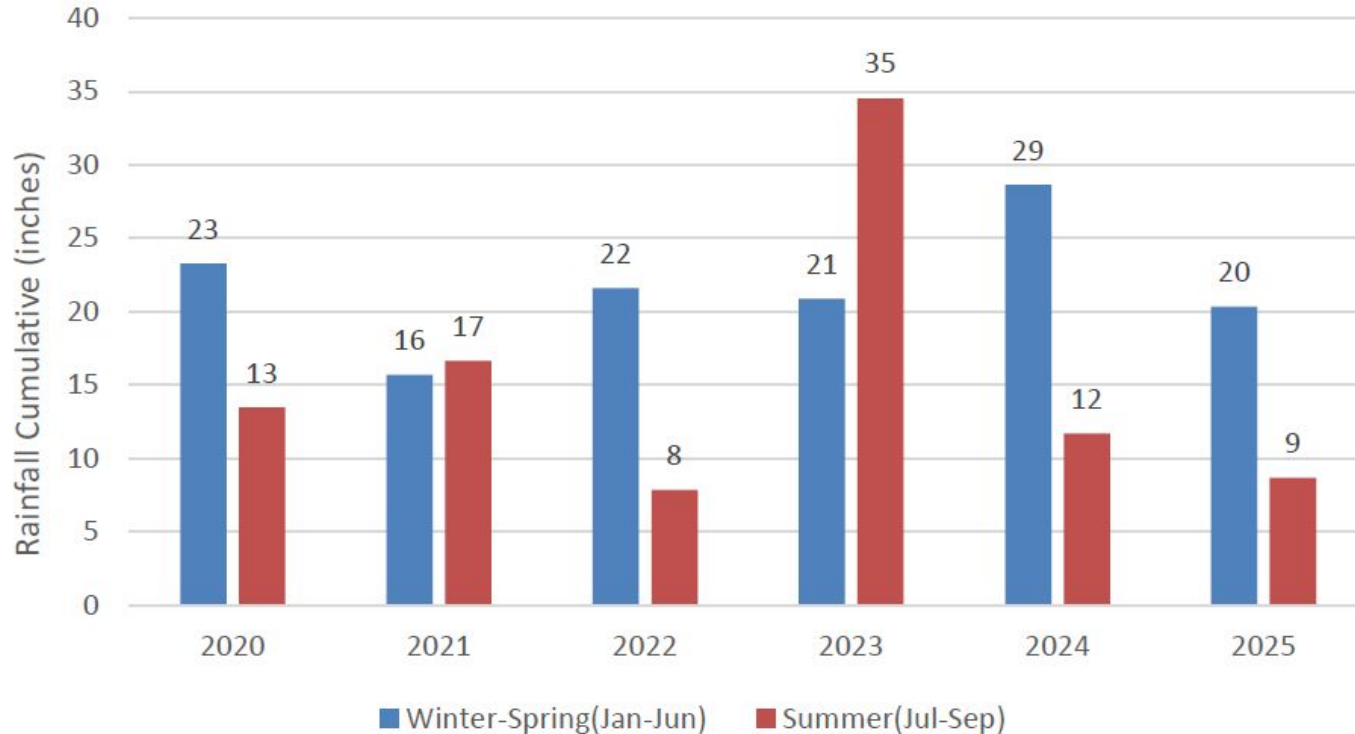
- Managing stagnant water to prevent surface algae/cyanobacteria buildup
- Move the water around
- Small-scale solar power



Revisit Phosphorus Load Model %'s

Both 2023 and 2025 had poor lake quality, worse anoxia, and summer cyanobacteria blooms – despite drastically different weather (high vs. low summer rainfall)

Figure 21. Seasonal Cumulative Rainfall Patterns (RainDrop Application, NOAA/NASA data)



NEAR 2018 Estimates	kgP	%Load
Internal P Load	212	33%
Surface Runoff P Load	254	39%
Septic System P Load	182	28%
Total	648	100%

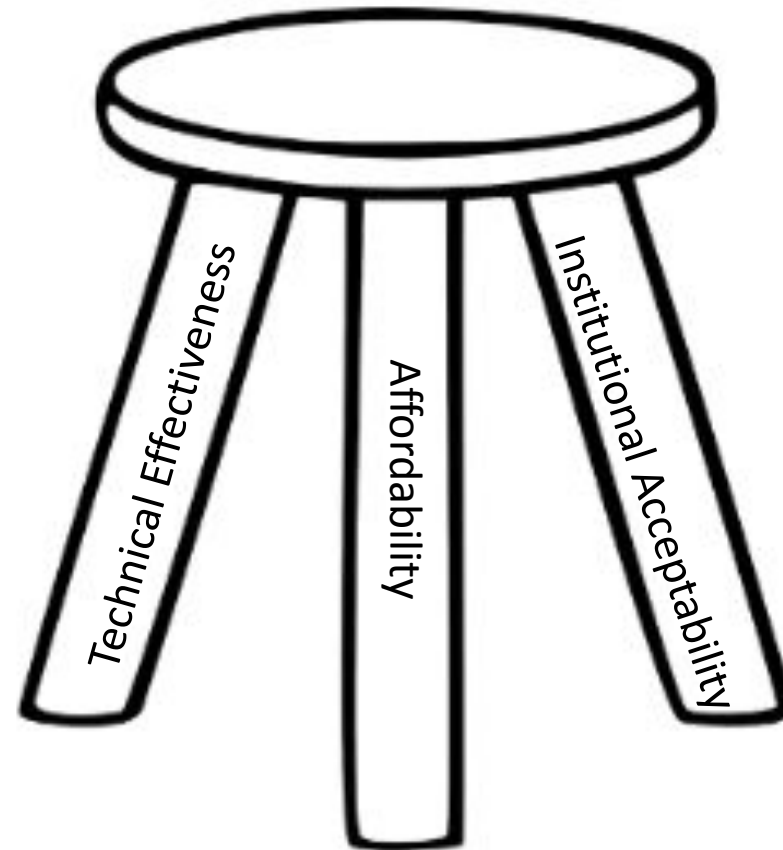
Yet Nitrogen appears to be more dependent on septic-system N input and internal N recycling.

In 2020, we had no path towards managing internal load, but we may in the near future due to state regulatory changes.

In-Lake Options for Future

- Lake Ooscawana watershed is not natural; the lake is impaired by human pollution – it is unrealistic to expect “natural” solutions
- **Nutrient inactivation:** Alum (at the correct dosage) is highly effective and provides rapid water quality improvement
- High cost, but considerably more effective than algaecides; likely a quarter the cost of updating all failing/short-circuiting septic systems
- Comparable cost to a **hypolimnetic aeration/oxygenation** system – but likely different results (hydrogen sulfide gas buildup only controlled by aeration)
- **Not yet ‘institutionally acceptable’ in NY**
 - Community vs. Regulators
- Lake Carmi, VT: excellent recent circulation aeration vs. Alum treatment case study

Nutrient inactivation vs. Aeration/Oxygenation



Spring 2026
sediment cores

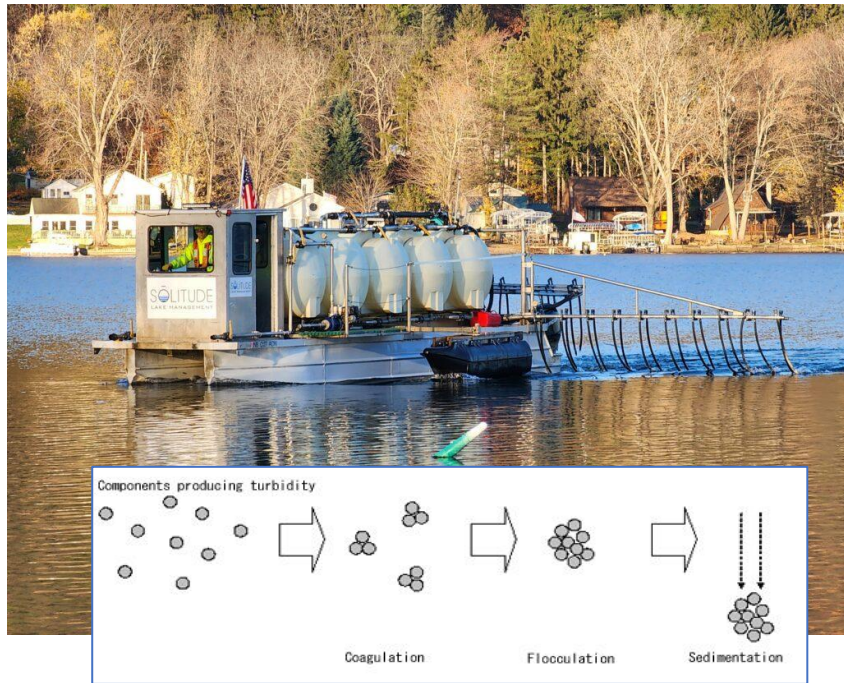


Just so you know: What does Alum treatment look like?

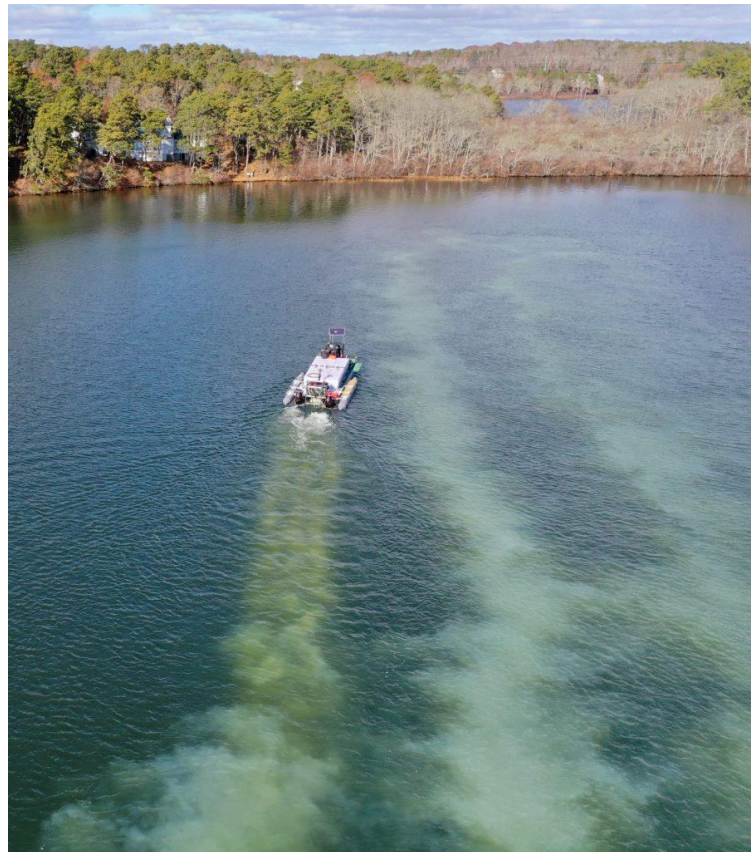
Aluminum Sulfate [$\text{Al}_2(\text{SO}_4)_3$] and Sodium Aluminate [NaAlO_2].

<https://www.solitudelakemanagement.com/how-alum-works-in-large-lakes-in-3-phases/>

1. Treatment Application



2. Floc Formation/P-Binding



3. P-Nutrient Locking



Other aluminum clays and lanthanum-based clays and flocculant products are also available, but these are more costly and would not be financially feasible unless a research grant were awarded.

Septic Systems Nutrient Pollution (~1/3 P load)

- Putnam County residential septic files and records are organized by parcel ID's
- You can match the parcel ID on the Putnam Valley tax parcel to a property on the Town GIS site
- Handwritten pdf files need to be digitized into a .csv that can be used in GIS (with address data)
- Need to be able to sort septic data by available information, which sites have plans on file, and which do not? Years?
- Map and color code vulnerable properties, or properties with limited information that need follow-up

Public Documents Folder > Health Dept > Well & Septic > Putnam Valley > Residential 4256 Entries

Name	Page count	Template name
<input type="checkbox"/> 19-2-12		
<input type="checkbox"/> 19-2-14		
<input type="checkbox"/> 19-2-17		
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Property Type: Single Family Multi-Family Commercial Industrial Other

Indicate the number of each type of component evacuated and the gallons evacuated from each component as indicated below:

System Component	No. of components	Volume (Gal) of each tank	Sludge Layer (approx. depth in inches and % of total depth)	Volume Evacuated (Gal)	Material of Construction (concrete, steel, HDPE, other)	Structural Integrity (Good, Fair, Poor)
Septic Tank	1	1180	3' 12"	1180	concrete	Good
Cesspool						
Seepage Pit			N/A			
Other			N/A			

Septage Receiving Facility: Putnam Valley

Describe condition of Inlet and Outlet baffles: Inlet: OK Outlet: OK

Is there any evidence of exposed or discharge sewage on the ground surface near the tank or Absorption Area? (Check one) Yes No

Is there substantial wastewater drainback from drainfield during pump out? (Check one) Yes No

Are there any other visual observable signs of potential septic system malfunction? (Check one) Yes No

Describe visual observation by Registered Waste Transporter: OK

Signature of Septage Hauler: [Signature] Date: 6/13/24

White - County Copy Yellow - Town Copy Pink - Vendor Copy Gold - Customer Copy

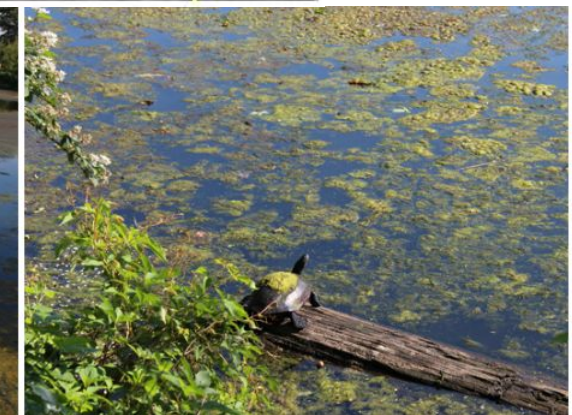
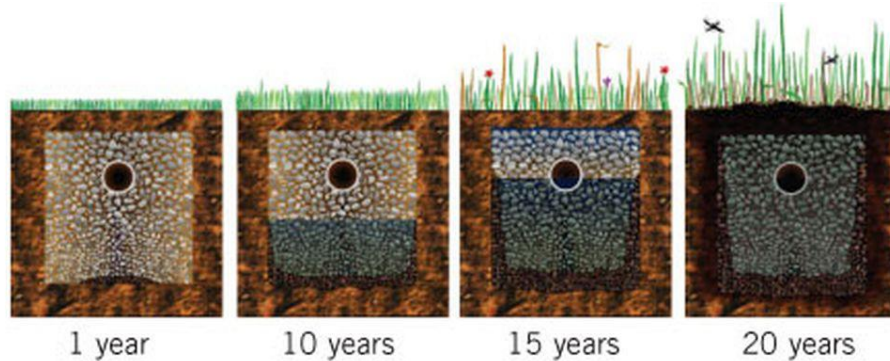
Putnam County Septic System Data and Inspection Form 0912

Low-elevation properties likely experience periodic failure, unless the system is a new advanced treatment unit.

- **How to know if your septic system is failing?**

- Sewage backups, slowly draining water, surfacing wastewater (wetness/spongy lawn), high N or coliform bacteria, dense filamentous algae mats on shoreline, bad odors

- **Obvious signs of 'failure' will not always be present**



Water Level

- Spring to end of October 2025 water level down ~14 inches
- Water level should ideally be about 1-2 inches above the Abele spillway elevation in spring, maintaining that level for as long as possible
 - Only opening in spring in anticipation of heavy rainfall, to prevent flooding
- Formal MOU needed for how to proceed with outlet opening/closing procedures – data-driven



4/29/2024



3/31/2025



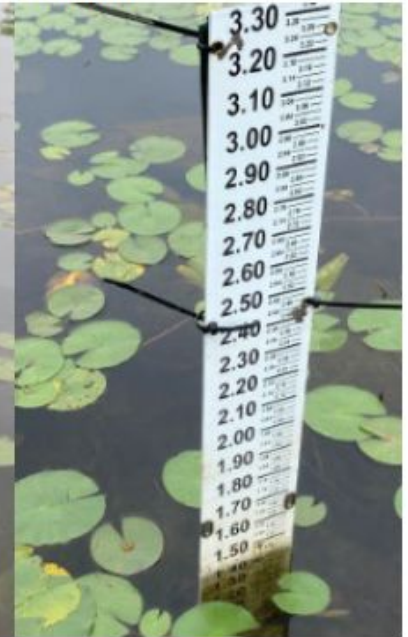
04-29-2025



05-30-2025



6-27-2025



7-29-2025



10-02-2025

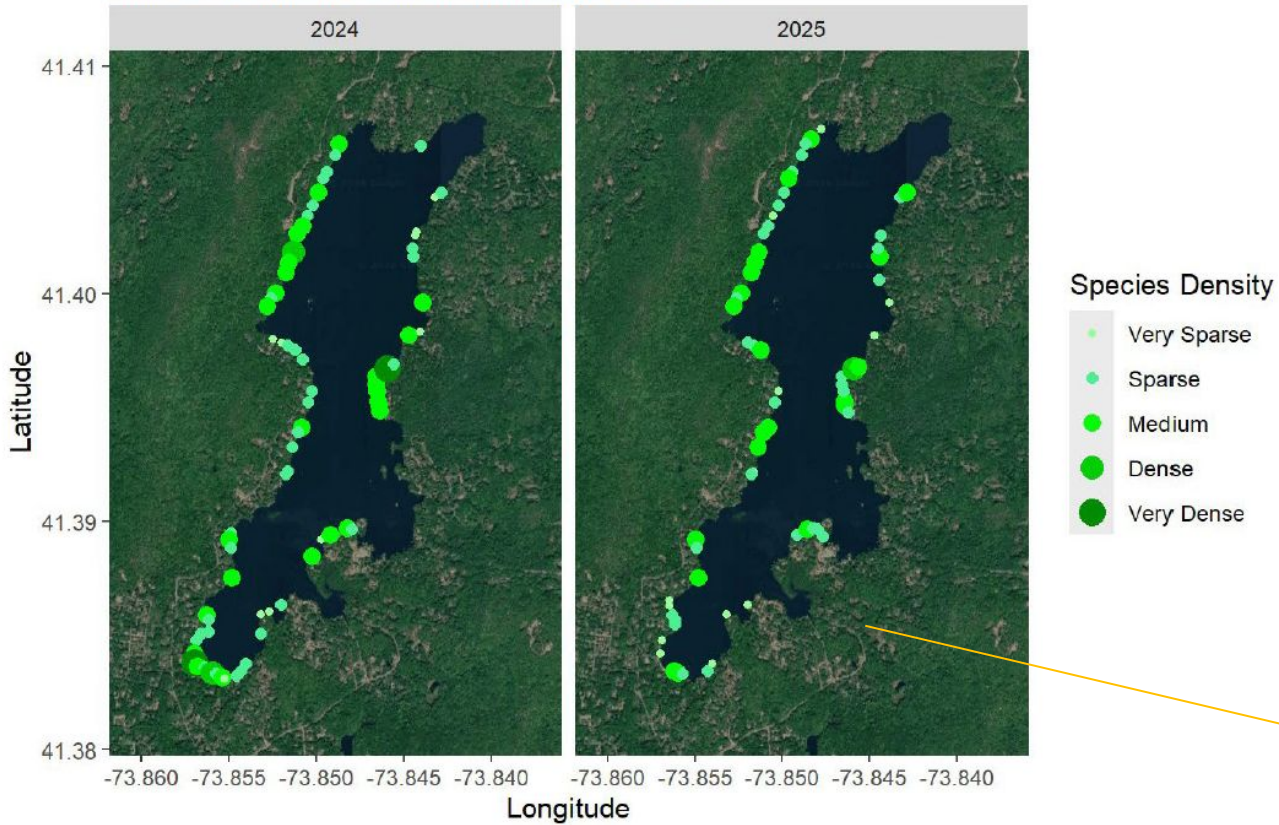


10-29-2-25



Aquatic Plants & Grass carp management

Map 3. Tapegrass (*Vallisneria americana*) 2024-2025



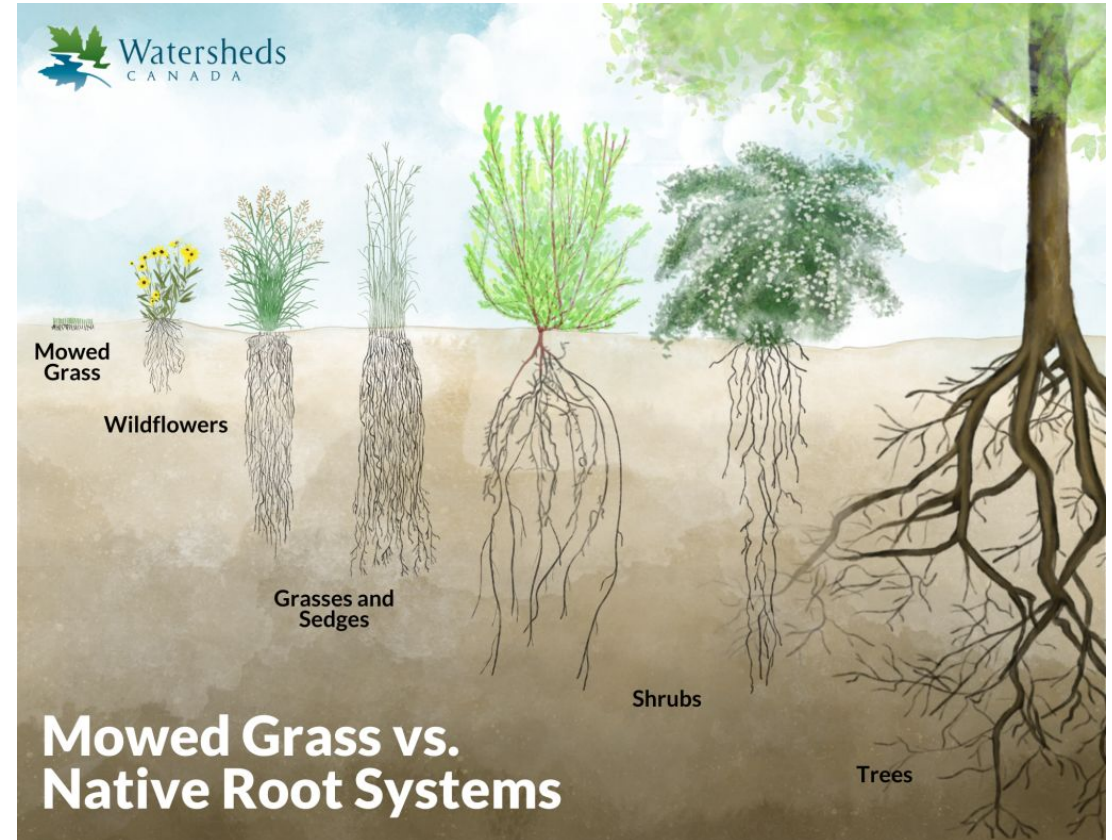
- Tapegrass & Waterlilies remain widespread
- Milfoil & most Pondweeds eaten
- Emergent plants unaffected
- Increase in algae & bottom cyano-mats
- 10% carp mortality model = >50% less Grass carp expected in 2025 than in 2021
- Grass carp limited harvesting warranted; goal to push carp natural decline/mortality several years ahead
- High surface N and excess filamentous algae mats are problematic, likely related to loss of vegetation



Shoreline Property Runoff & Rain Capture

- Homeowner practices matter!
- The woes of a grass lawn around lakes (even if you don't fertilize it)
 - **Shallow Roots**
 - **Soil Compaction**
 - **Often unsustainable without fertilizer**
- UCONN rain garden app resource

<https://nemo.uconn.edu/raingardens/>



<https://naturaledge.watersheds.ca/2023/06/taking-the-first-step-to-protect-your-local-freshwater/>

Shoreline Property Maintenance work

- NH Lakes: LakeSmart properties program resources
- <https://nhlakes.org/lakesmart/> □ LakeSmart Resource Library
- If you have someone managing your yard, share these resources with them! Emphasize natural, native plants, and rain infiltration



Rain Gardens (Design/Instal...

Description
a sunken, flat-bottomed garden that uses soil and plants to capture, absorb, and clean-up runoff water (from Soak Up the Rain New ...

More Info:

Resource URL
<https://nhlakes.org/wp-content/upl...>

Section(s)
Yard, Lawn, & Garden



Rain Gardens (Plants)

Description
A comprehensive list of native plants that are proven to be successful in New England yards and gardens

More Info:

Resource URL
<https://nhlakes.org/wp-content/upl...>

Section(s)
Yard, Lawn, & Garden



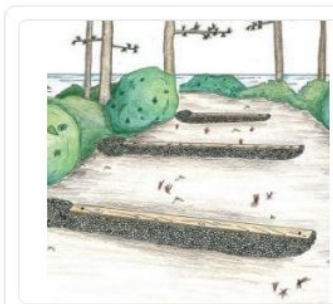
Vegetated Swale

Description
A shallow channel with native vegetation that slows runoff water and directs it to an area where it can soak into the ground (from Soak U...

More Info:

Resource URL
<https://nhlakes.org/wp-content/upl...>

Section(s)
Yard, Lawn, & Garden



Water Bar

Description
Intercepts runoff water traveling down moderately steep walkways, paths, and gravel driveways and diverts it into vegetated areas (from...

More Info:

Resource URL
<https://nhlakes.org/wp-content/upl...>

Section(s)
Yard, Lawn, & Garden

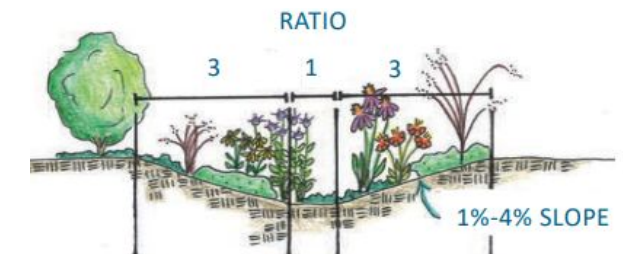


Figure 1. Profile of vegetated swale.



Figure 2. Check dams within a swale slow the flow, allowing sediments to settle out and some infiltration to occur.

Action Items for next several years...

- Gauge community perception of phosphorus inactivation treatments
- Re-evaluate costs and dosing for a possible future in-lake alum treatment – use sediment data collected in April 2026
 - For if/when in-lake nutrient inactivation laws change and reclassify phosphorus-binding products and allow for a formal permit process
 - Likely still 3+ years away from a treatment, even if you started an application today
 - Will likely need a dose-response curve test for the final dose approval via DEC
- Continue pH monitoring, collect several baseline Dissolved Organic Carbon (DOC), total hardness, and alkalinity samples (some collected in 2025 and spring 2026)
- Get a serious quote ballpark for a hypolimnetic aeration/oxygenation system (prefer side stream supersaturation technology) – compare to Alum cost projections
- Engage a student or intern to assemble and digitize Town septic records from the county database – develop a system hierarchy and GIS-based tracking method; follow up with improved septic pump out reporting requirements (ideally electronic records moving forward)
 - Compare with watershed E. coli data
- Institute a ‘LakeSmart’ property evaluation program
 - individual classifications and property recommendations
- Grass carp limited harvesting effort proposed in 2026 and 2027

Thank you! Questions?

Hillary Kenyon, M.S.

*Limnologist, Certified Lake Manager,
Watershed Planner, Plant & Soil Scientist*



Lake and watershed management is a collaborative and ongoing effort.
Thank you to all residents, Town elected officials, Town staff, and LOMAC.

Table 2. Laboratory Total Phosphorus Concentrations 2025 ($\mu\text{g/L}$)

Total Phosphorus								
Depth_m	3/31/2025	4/29/2025	5/30/2025	6/27/2025	7/29/2025	8/29/2025	10/2/2025	10/29/2025
Station 1								
1	24	21	26	25	28	12*	32	36
4	26	25	37	47	34	27	30	31
6	34	34	69	55	57	250	35	32
9.5-10.2	41	74	240	384	-	1088	822	34
Station 2								
1	27	21	26	28	34	20	29	27
7-7.5	29	29	29	180	289	387	284	26
Station 3								
1	24	23	28	24	28	25	32	33
6.5-7.7	37	35	120	237	414	536	97	32

[Concentrations displayed in $\mu\text{g/L}$, ~ppb equivalent; NSS = Not Sampled, ND = Not Detected (below laboratory detection limits; * = possible laboratory error, - = lab error)]

Table 3. Nitrogen, Station 1 - 2025

Total Nitrogen (TN)								
Depth_m	3/31/2025	4/29/2025	5/30/2025	6/27/2025	7/29/2025	8/29/2025	10/2/2025	10/29/2025
1	440	<i>291</i>	<i>389</i>	<i>494</i>	<i>628</i>	<i>497</i>	<i>571</i>	<i>810</i>
4	341	285	374	570	491	527	558	809
6	391	300	452	500	3279	2193	548	889
~9.5-10.2	456	401	745	1578	3209	4162	4827	799
Total Ammonia Nitrogen (tNH3)								
Bottom		0	404	863	2496	NS	3605	264

Values in *italics* are averages of the field duplicate surface samples taken for lab QA/QC purposes. Duplicate sample TP and TN concentrations were within reasonable error ranges, with differences <10% between samples and most <5%. NS = Not Sampled.