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2026 Water Quality & Phytoplankton Assessment Report

Lake Sagamore (Kent, NY)

In 2026, at the request of the Lake Sagamore Community Association (LSCA), Aquatic Ecosystems Consulting (AEC) continued seasonal water quality monitoring of Lake Sagamore in Kent, NY. Field sampling was conducted during late spring (June) and mid-summer (August) across two established monitoring stations: Site 1 (Dam / Deep-Water Station) and Site 2 (Croton River Inlet). In addition, AEC performed a site investigation on September 15, 2026, following resident reports of a potential localized cyanobacteria surface bloom.

In-situ physical parameters (pH, surface dissolved oxygen, temperature, and specific conductivity) indicate that Lake Sagamore maintains good baseline physical water quality. However, comprehensive biological and vertical profile analyses indicate that Lake Sagamore is transitioning from a mesotrophic state toward an increasingly meso-eutrophic/eutrophic condition. Multi-year phytoplankton monitoring demonstrates persistent blooms of nitrogen-fixing filamentous cyanobacteria (*Dolichospermum* species) spanning continuously from June through August, alongside co-occurring chrysophytes (Dinobryon species).

While routine nutrient sampling (nitrogen and phosphorus) was previously suspended after 2024 because surface concentrations were below public health threshold triggers, the extended presence of nitrogen-fixing cyanobacteria and hypolimnetic anoxia observed in 2026 strongly point to elevated dissolved phosphorus levels in the lake. This phosphorus availability is driven primarily by internal benthic loading during summer thermal stratification.

> **Key 2026 Finding & Management Priority:**
>
> While routine surface physical indicators suggest good baseline water quality, vertical depth profiles reveal hypolimnetic anoxia (<0.5 mg/L O2) expanding to 2.5 meters below the surface by mid-summer. This drives internal phosphorus release from benthic sediments, which can fuel blooms of nitrogen-fixing cyanobacteria (*Dolichospermum* spp.) as was observed in the phytoplankton assessment.

1. Sampling Methodology & Analytical Framework

Sampling evaluated physical, chemical, and biological water quality variables across two primary stations: Site 1 (Dam) and Site 2 (Croton River Inlet). Surface water (0.5 m) and 1.0-meter phytoplankton samples were collected on June 19 and August 16, 2026. Vertical temperature and oxygen profiles were recorded at 0.5-meter intervals down to the lake bottom (5.0 to 5.5 m) at Site 1.

Table 1. Monitored Variables, Analytical Methods, and Abundance Metrics

Variable / Metric	Analytical Method / Scale Description
pH	YSI Multi-Meter calibrated prior to field deployment
Specific Conductivity	YSI Multi-Meter (measured in µS/cm)
Water Clarity (Turbidity)	Secchi Disc transparency depth (meters)
Chlorophyll-a	Acetone extraction followed by Shimadzu Spectrophotometric analysis
Temperature & Oxygen Profiles	YSI Multi-Meter recorded at 0.5-meter intervals to bottom (5.0 - 5.5 m)
Phytoplankton Relative Abundance Rank (0–5)	0 = Absent; 1 = Rare (<1%); 2 = Occasional (1–5%); 3 = Common (6–25%); 4 = Abundant/Dominant (26–50%); 5 = Massive/Bloom (>50%)
Cyano Index (% Biovolume)	Proportional biovolume percentage of cyanobacteria relative to total phytoplankton assemblage (0–100%)

2. Water Quality

Water quality variables are categorized into physical and biological parameters. We monitored and measured these variables to characterize water quality and inform on any emerging or current adverse conditions affecting aesthetics, recreation, or public health. For the two sampling dates (Late Spring, Mid-Summer) and two sample sites (Dam, Croton River Inlet) AEC measured water temperature, oxygen, pH, and conductivity.

A. Physical Parameters

Table 2. Comparison of water quality variables (2026 vs 2025)

Sampling Event / Site	Temp (°C)	DO (mg/L)	O2 Sat (%)	pH	Cond (µS/cm)
LATE SPRING 2026					
Site 1 (Dam)	24.30	6.70	82.0%	7.64	241
Site 2 (Croton River Inlet)	22.40	5.60	67.0%	7.33	239
Mean 2026 (Late Spring)	**23.35**	**6.15**	**74.5%**	**7.49**	**240**
Mean 2025 Baseline	26.90	8.10	103.0%	7.70	184
MID-SUMMER 2026					
Site 1 (Dam)	24.70	8.20	100.0%	7.59	168
Site 2 (Croton River Inlet)	23.20	6.80	82.0%	7.41	140
Mean 2026 (Mid-Summer)	**23.95**	**7.50**	**91.0%**	**7.50**	**154**
Mean 2025 Baseline	28.10	7.10	93.0%	7.80	210

Analysis of Surface Parameters

Dissolved Oxygen (DO): Dissolved oxygen at the surface remained within target ranges for aquatic life (>6.5 mg/L) across most dates. A slight reduction at Site 2 during spring (5.60 mg/L) was most likely due to organic loading following spring rain events.

pH Stability: Water pH values (7.33 – 7.64) were fully within the optimal range of 7.0 to 9.0 required for survival and reproduction of freshwater aquatic life.

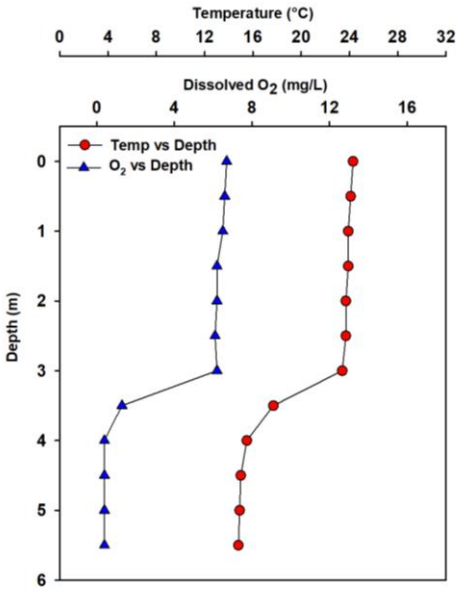
Specific Conductivity: Specific conductivity (140 – 241 µS/cm) was within expected background levels for regional lakes, with no evidence of acute runoff contamination or road salt surges.

Vertical Profile Dynamics & Thermal Stratification

Vertical temperature and dissolved oxygen depth profiles collected at Site 1 (Dam, maximum depth ~5.5 m) demonstrate strong seasonal stratification and progressive benthic oxygen depletion between June and August 2026.

June 2026 Profile Analysis (Late Spring)

Epilimnion (0.0 – 3.0 m): Surface water temperature was uniform at 24.3°C down to 3.0 meters, accompanied by stable dissolved oxygen levels of 6.1 to 6.7 mg/L.



Thermocline / Metalimnion (3.0 – 4.0 m): A sharp thermocline formed between 3.0 and 4.0 meters, where temperature dropped rapidly from 23.5°C to 15.5°C.

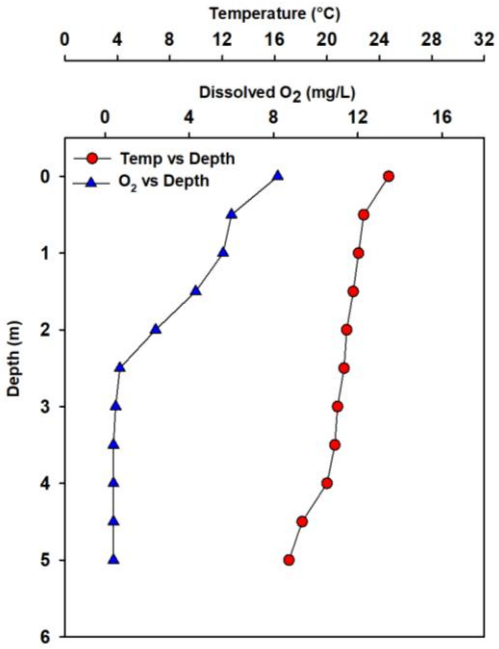
Anoxic Hypolimnion (3.5 – 5.5 m): Dissolved oxygen dropped precipitously below 3.0 meters (6.2 mg/L at 3.0 m → 1.2 mg/L at 3.5 m), reaching anoxia (<0.5 mg/L) from 4.0 meters down to the lake bottom at 5.5 meters.

August 2026 Profile Analysis (Mid-Summer)

Surface Boundary (0.0 – 0.5 m): Surface water reached 24.7°C with elevated surface oxygen (8.2 mg/L) supported by atmospheric reaeration and surface primary productivity.

Oxycline Compression (0.5 – 2.5 m): Unlike June, oxygen depletion migrated significantly higher into the water column. Dissolved oxygen decreased steadily from 6.0 mg/L at 0.5 m down to 2.2 mg/L at 2.0 m.

Expanded Anoxia Layer (2.5 – 5.0 m): By August, anoxia (DO < 1.0 mg/L) expanded upward to encompass all depths below 2.5 meters down to the bottom (5.0 m).

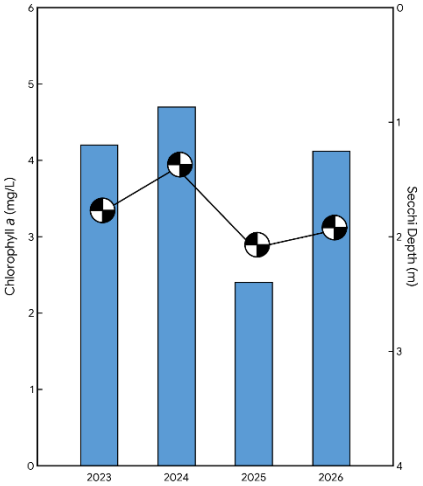


Ecological Implications of Stratification Data:

1. Habitat Compression: By mid-summer, the oxygenated zone suitable for fish (>6.5 mg/L O2) was compressed into a narrow upper layer (<1.5 m depth).
2. Internal Phosphorus Release: Anoxic conditions across the sediment-water interface cause chemical reduction of ferric iron, releasing bound phosphorus from benthic sediments into the water column.
3. Driver of Filamentous Cyanobacteria: Buoyant, nitrogen-fixing cyanobacteria (*Dolichospermum* spp.) utilize this upwelled benthic phosphorus to sustain multi-month surface blooms from June through August.

B. Biological Parameters

Chlorophyll-a & Water Clarity (Secchi Depth)



Mean chlorophyll-a concentrations in 2026 align with a mesotrophic to moderately productive lake condition. Chlorophyll-a levels were higher in spring 2026 compared to Summer 2026, heavily weighted by increased phytoplankton biomass at Site 2 (Croton River Inlet) in the spring. Secchi disk water clarity measured at Site 1 (Dam) was greater in spring than in summer, likely due to more free-floating algae in the water column (Chlorophyll-a was greater as well).

Submerged Aquatic Vegetation (SAV) Status

Prior to the introduction of triploid grass carp for vegetation management, Lake Sagamore exhibited dense submerged aquatic vegetation (SAV) in the shallow southern basin and moderate coverage in northern shallow areas, impacting recreational access. In 2026, AEC observed minimal (<1%) submerged and emergent aquatic plant coverage. A formal vegetation survey was not performed in 2026 due to the lack of plant biomass. Consequently, primary productivity in Lake Sagamore has shifted almost entirely into water column phytoplankton.

3. Phytoplankton Assessment

Background & Indicator Concept

Monitoring programs routinely utilize phytoplankton abundance (biomass) and species composition because freely-floating algal communities integrate water quality over longer timeframes than single-date chemical samples. A diverse assemblage composed of diatoms, green algae, dinoflagellates, and flagellates without single-species dominance reflects low nutrient levels and a healthy ecosystem. Conversely, a low-diversity community dominated by cyanobacteria indicates elevated nutrient loading (eutrophication) and impaired water quality.

Microscopic analysis of Lugol's-fixed phytoplankton samples revealed distinct ecological successions and persistent bloom dynamics across the 2026 season:

Filamentous Cyanobacteria (Dolichospermum spp.): In both June and August 2026, Sagamore Lake experienced blooms dominated by filamentous cyanobacteria belonging to the genus *Dolichospermum*. Identified species include *Dolichospermum cf. affine*, *Dolichospermum planctonicum*, and an uncharacterized taxon designated as D. 'species 4'.

Newly Recognized Taxon: D. 'species 4' represents a newly recognized addition to Lake Sagamore's phytoplankton assemblage, identified from an opportunistic surface scum sample collected on September 15, 2026.

Nitrogen Fixation & Competitive Advantage: All identified *Dolichospermum* species possess heterocysts capable of fixing atmospheric nitrogen (N2). This functional adaptation gives them a strong competitive advantage in nitrogen-limited environments where dissolved phosphorus is abundant.

Co-occurring Chrysophytes (*Dinobryon* spp.): *Dolichospermum* co-occurred with colonial chrysophyte species, specifically *Dinobryon divergens* (observed in 2025) and *Dinobryon bavaricum* (observed in 2026). While chrysophytes do not produce cyanotoxins, dense growths can cause distinct taste and odor issues (often described as a 'fishy' smell), which is particularly relevant if lake water is utilized for domestic purposes.

The multi-year occurrence of *Dolichospermum* species and the continuous extension of the bloom period from June through August 2026 indicate an ecological issue driven by elevated dissolved phosphorus in the lake column.

Common phytoplankton species observed in Sagamore Lake in 2026.

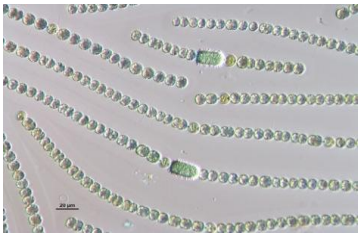
Dolichospermum cf. affine / macrosporum



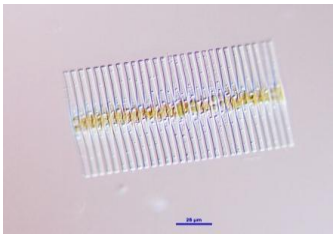
Dolichospermum planctonicum



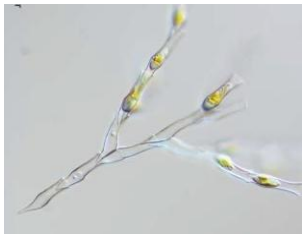
Dolichospermum "sp.4"



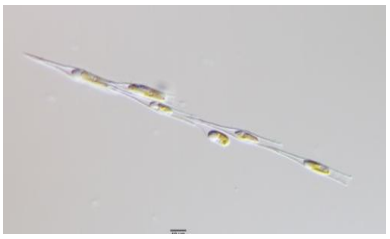
Fragilaria crotonensis



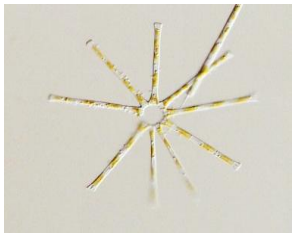
Dinobryon divergens



Dinobryon bavaricum



Asterionella formosa



Four-Year Biovolume Trends (2023–2026)

Table 3 presents the 4-year comparative percentage biovolume breakdown across seven major taxonomic groups at both inlet and dam stations during June and August monitoring.

Table 3. Four-Year Comparative Phytoplankton Biovolume Trends (% Biovolume, 2023–2026)

	Jun 2023		Aug 2023		Jun 2024		Aug 2024		Jun 2025		Aug 2025		Jun 2026		Aug 2026	
	Inlet	Dam	Inlet	Dam	Inlet	Dam	Inlet	Dam	Inlet	Dam	Inlet	Dam	Inlet	Dam	Inlet	Dam
% Cyano	**13.3**	**12.0**	**53.0**	**57.4**	**40.8**	**36.9**	**23.5**	**27.1**	**65.8**	**58.5**	**58.1**	**49.3**	**45.1**	**32.4**	**59.1**	**45.8**
% Greens	1.5	0.6	1.4	1.7	3.5	8.5	8.0	6.8	3.8	6.5	2.6	5.2	6.1	7.7	6.7	17.2
% Euglenos	0.6	0.3	0.9	3.4	2.3	1.9	1.1	10.2	1.4	4.3	2.6	6.7	0.5	4.4	2.1	0.0
% Chrysos	59.8	65.1	30.6	13.6	11.9	16.8	19.8	23.7	8.7	9.2	15.4	16.7	15.0	11.4	11.5	12.0
% Diatoms	24.1	21.3	13.7	20.4	38.8	32.5	25.1	18.6	18.9	11.4	10.3	11.1	23.8	42.6	16.4	13.3
% Dinos	0.6	0.6	0.5	3.0	0.4	1.7	19.3	11.9	1.4	9.8	11.0	11.1	8.2	1.1	2.1	0.6
% Cryptos	0.0	0.0	0.0	0.4	2.3	1.7	3.2	1.7	0.0	0.3	0.0	0.0	1.4	0.4	1.8	9.7

Interpretation of Four-Year Trends

Multi-Year Expansion: In 2023, cyanobacteria dominated only in August (~53–57%). In 2024, dominance shifted to June (~37–41%). In 2025 and 2026, cyanobacteria persisted at dominant levels continuously across both June and August monitoring.

2026 Modest Reduction: While 2026 cyanobacteria biovolume percentages (32.4%–59.1%) represent a modest reduction from 2025 peak levels (49.3%–65.8%), blue-green algae remain the primary contributor to summer biovolume.

Co-occurring Taxa: Green algae biovolume increased in August 2026 at the Dam station (17.2%), and diatoms provided substantial spring biovolume (42.6% at Dam in June), indicating temporary community diversity during turnover windows.

Table 4. List of common phytoplankton (algal) species by taxonomic group

Table 1 lists species from Sagamore Lake in June and August 2026, with relative abundances given as rank scores. Name of species that have major increased abundance are highlighted yellow; major decreases in blue.

0 = absent or not seen	1 = rare (<1%)	2 = occasional (1-5%)	3 = common (6-25%)	4 = abundant or dominant (26-50%)	5 = massive or blooms (> 50%)

Taxonomic Group	Species Name	June Inlet	June Dam	Aug Inlet	Aug Dam
Cyanobacteria	*Aphanizomenon flos-aquae*	2	2	2	2
Cyanobacteria	*Aphanothece sp. 1*	3	2	1	2
Cyanobacteria	*Aphanocapsa sp. 1*	2	2	2	0
Cyanobacteria	*Aphanothece sp. 1*	3	2	1	2
Cyanobacteria	*Dactylococcopsis cf. smithii*	1	1	1	0
Cyanobacteria	*Dolichospermum cf. affine / macrosporum*	4	3	4	3
Cyanobacteria	Dolichospermum cf. flos-aquae; coiled	o	o	o	o
Cyanobacteria	*Dolichospermum planctonicum*	3	3	4	4
Cyanobacteria	*Dolichospermum sp. 4 (New Taxon)*	3	2	4	3
Cyanobacteria	*Planktolyngbya cf. limnetica (1-15.um; ends rounded)*	0	0	0	0
Cyanobacteria	*Limnothrix sp. 2 cf. vacuolifera*	0	0	0	2
Cyanobacteria	*Pseudanabaena sp. 1*	0	1	0	0
Cyanobacteria	*Merismopedia tenuissimia*	0	2	0	0
Cyanobacteria	*Microcystis cf. aeruginosa*	0	2	2	1
Cyanobacteria	*Microcystis wesenbergii*	0	0	1	2
Cyanobacteria	*Oscillatoria sp. 1 (4-5 um)*	0	1	0	0
Cyanobacteria	*Woronichinia naegeliana*	2	1	1	2
Chlorphyta	*Ankistrodesmus falcatus*	1	0	0	0
Chlorophyta	*Botryococcus braunii*	2	0	0	1
Chlorophyta	*Crucigenia sp. 1*	0	2	1	1
Chlorophyta	*Euastrum sp. 1*	0	0	1	0
Chlorophyta	*Eudorina elegans*	0	0	0	0

Taxonomic Group	Species Name	June Inlet	June Dam	Aug Inlet	Aug Dam
Chlorophyta	*Gonium sp. 1*	0	0	1	0
Chlorophyta	*Kirchneriella sp.1 cf. subsolitaria*	0	0	1	1
Chlorophyta	*Oocystis lacustris*	1	0	1	2
Chlorophyta	*Pediastrum tetras*	0	1	1	1
Chlorophyta	*Planktosphaeria gelatinosa*	2	2	1	1
Chlorophyta	*Quadrigula lacustris*	2	1	2	2
Chlorophyta	*Scenedesmus spp.*	1	2	1	2
Chlorophyta	*Sphaerocystis schroeteri*	2	2	2	3
Chlorophyta	*Staurastrum sp. 1*	0	0	1	1
Chlorophyta	*Tetraedon gracile*	0	1	1	0
Chlorophyta	*Tetraedon minimum*	0	0	1	0
Euglenophyta	*Euglena cf. mutabilis*	0	0	0	0
Euglenophyta	*Phacus sp. 1*	0	2	1	0
Euglenophyta	*Strombomonas sp. 1*	0	0	1	0
Euglenophyta	*Trachelomonas cf. hispida*	1	2	1	0
Euglenophyta	*Trachelomonas volvocina*	1	0	2	0
Chrysophyta	*Centritractus sp. 1 (cf. africanus)*	0	0	1	0
Chrysophyta	*Chrysosphaerella cf. longispina*	0	0	0	0
Chrysophyta	*Dinobryon bavaricum*	0	0	3	3
Chrysphyta	*Dinobryon bavaricum*	0	0	3	3
Chrysophyta	*Dinobryon divergens*	4	3	2	1
Chrysophyta	*Mallomonas cf. akrokomos*	0	0	0	0
Chrysophyta	*Mallomonas sp. 1*	0	0	1	2
Chrysophyta	*Synura sp. 1*	2	1	0	0
Bacillariophyta	*Acanthoceras zachariasii*	0	0	2	0
Bacillariophyta	*Achnanthidium cf. minutissimum*	0	0	0	0
Bacillariophyta	*Amphora sp. 1*	0	1	0	0
Bacillariophyta	*Asterionella formosa*	3	3	0	0
Bacillariophyta	*Aulacoseira granulata & var. angustissima*	3	3	2	1
Bacillariophyta	*Fragilaria cf. capucina*	0	2	0	0

Taxonomic Group	Species Name	June Inlet	June Dam	Aug Inlet	Aug Dam
Bacillariophyta	*Fragilaria crotonensis*	3	3	3	3
Bacillariophyta	*Fragilaria mesolepta*	0	0	0	0
Bacillariophyta	*Gomphonema sp. 1*	0	1	0	0
Bacillariophyta	*Gomphonema acuminatum*	0	0	0	0
Bacillariophyta	*Gyrosigma sp. 1*	1	0	0	0
Bacillariophyta	*Melosira varians*	0	0	1	0
Bacillariophyta	*Nitzschia sp. 1*	0	0	0	1
Bacillariophyta	*Rhoicosphenia abbreviata*	0	1	0	1
Bacillariophyta	*Tabellaria fenestrata*	2	2	2	2
Bacillariophyta	*Ulnaria delicatissima*	1	1	1	0
Bacillariophyta	*Ulnaria ulna*	1	1	1	1
Bacillariophyta	*Urosolenia eriensis*	0	0	0	1
Pyrrophyta	*Ceratium hirundinella*	3	1	1	1
Pyrrophyta	*Peridinium sp. A (small: 20-22 um long)*	2	1	0	0
Pyrrophyta	*Peridinium sp. B (larger, with spine; 45-50 um)*	0	1	2	0
Cryptophyta	*Cryptomonas sp. A*	2	1	2	3

4. Actionable Management Recommendations for 2027

Rapid Response & Cyanotoxin Screening: Maintain the rapid-response protocol for resident-reported surface scums. Integrate rapid microcystin test strips during scum events to differentiate harmless chrysophyte taste/odor blooms from toxic cyanobacteria scums.

Resident Communication & Advisory Protocol: Provide LSCA community members with educational guidance regarding surface algae scums and potential taste/odor fluctuations caused by Dinobryon chrysophytes during warm summer months.

Vegetation Survey Timing & Visual Inspections: Because submerged aquatic vegetation (SAV) coverage remained below 1% in 2026, AEC is **not** recommending a vegetation survey for 2027. However, if AEC observes a noticeable re-establishment of aquatic plants in Lake Sagamore during our August 2027 sampling, we will revisit this recommendation with the board members.

Proactive Aquatic Algaecide Permitting (Contingency Response): AEC recommends that the LSCA once again proactively apply for a NYSDEC Article 15 Aquatic Pesticide Permit for targeted algaecide

applications. Obtaining regulatory approval in advance establishes a pre-cleared contingency plan, eliminating administrative delays if an acute bloom threatens public health or recreational access. AEC emphasizes that chemical algaecide deployment should serve strictly as a **last-resort strategy**—reserved only for severe, localized bloom conditions—while long-term management prioritizes internal nutrient mitigation.

Evaluation of Phoslock (Benthic Phosphorus Inactivation): AEC recommends evaluating **Phoslock** (lanthanum-modified bentonite clay) as a potential long-term water quality restoration tool for Lake Sagamore. If regulatory approvals and community feasibility line up, Phoslock can serve as an exceptionally effective method for neutralizing internal phosphorus loads and in turn preventing recurring cyanobacteria (algae) blooms.

How Phoslock Works:

Think of Phoslock as a specialized nutrient sponge. Phoslock consists of natural clay combined with lanthanum, an element that has a powerful, specific chemical attraction to phosphate (the primary food source for algae). When applied to the lake surface, Phoslock drifts down through the water column, binding dissolved phosphorus along the way, before forming a thin protective layer on the bottom sediments. Once on the lake floor, it permanently locks phosphorus into an insoluble, non-toxic mineral bond that cannot break apart, even when bottom waters lose all oxygen during hot summer months. By permanently "starving" cyanobacteria of their primary nutrient supply, Phoslock interrupts internal nutrient recycling without harming fish, aquatic organisms, or water clarity.