2012 Year End Report

Mount Kemble Lake Association, Inc.
Morristown, New Jersey

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November 16, 2012

Ruth Chaney
Mt. Kemble Lake Association Inc.
28 Lake Trail West
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2012 Year End Report

Lake Management Program
Mount Kemble Lake

Summary:

The 2012 Lake Management Program for Mount Kemble Lake focused on the nuisance growth of aquatic plants and algae, specifically Southern Naiad (*Najas guadalupensis*), Curlyleaf Pondweed (*Potamogeton crispus*), and planktonic algae. Aquatic biologists were on site to complete bi-weekly surveys of aquatic vegetation from April to May. During each site visit, biologists would analyze lake conditions, formulate the need for herbicide or algaecide applications, and upon approval from the association, treatments were administered. In addition, three site visits were to conduct a water quality assessment. The 2012 water quality monitoring program consisted of *in-situ* parameters, nutrient and chemistry samples collected for laboratory analysis, phytoplankton samples, and a detailed lake survey.

The 2012 management season focused on the nuisance density of phytoplankton. Laboratory phytoplankton results displayed an elevated density present in the June sampling with an assemblage of green and blue green algae species. Two applications of copper sulfate were warranted to control the algal blooms in June and August. Water quality monitoring results revealed three criteria exceeding the lake management acceptable limits including nitrate, total phosphorus, and ammonia. This year end report details the lake management procedures completed for Mount Kemble Lake in 2012. The following pages include detailed survey reports, treatment comments, analysis of water quality conditions, discussion of conditions encountered from previous years, and recommendations to consider proceeding with for the management for the 2013 season.

Lake Management:
Survey and Treatment Details

Allied Biological followed a bi-weekly schedule of survey visits from May to August totaling eight days for the 2012 season. Surveys were conducted by boat, making visual observations, further inspection utilizing a weed sampling anchor, and collection of basic water quality parameters needed to formulate treatment specifics. Tabulated below are the survey and treatment dates along with target vegetation and algae species present on each date.

2012 Mount Kemble Lake Survey and Treatment Log			
Date	**Product Applied**	**Aquatic Plant Species**	**Algae Species**
5/4/2012	Survey	None observed	None observed
5/17/2012	Survey	Curlyleaf Pondweed, Southern Naiad	Unicellular
6/1/2012	Survey	Southern Naiad, Leafy Pondweed	Filamentous, Unicellular
6/27/2012	Survey	Southern Naiad, Duckweed	Filamentous, Unicellular
7/10/2012	Copper Sulfate	Southern Naiad	Unicellular
7/23/2012	Survey	Southern Naiad, Leafy Pondweed	Filamentous
8/7/2012	Survey	Southern Naiad, Leafy Pondweed	Filamentous
8/23/2012	Copper Sulfate	Southern Naiad	Unicellular

The target areas of control in Mount Kemble Lake include shoreline and beach areas, which compose the littoral zone of the lake. These are areas where aquatic vegetation have the greatest probability of inhabiting. In early May, the growth of an annual plant species Southern Naiad was observed in the northern inlet area. Biologists permitted the plant growth in an effort to create a buffer for the absorption of nutrients from the inlet. The June survey displayed trace density of plant growth along shoreline areas, and began to observe more dense algal communities. The beach area remained clear of plants and algae growth. Unicellular algae growth in July had diminished water clarity below a four foot depth. Copper Sulfate was applied to control the nuisance algae growth throughout the lake.

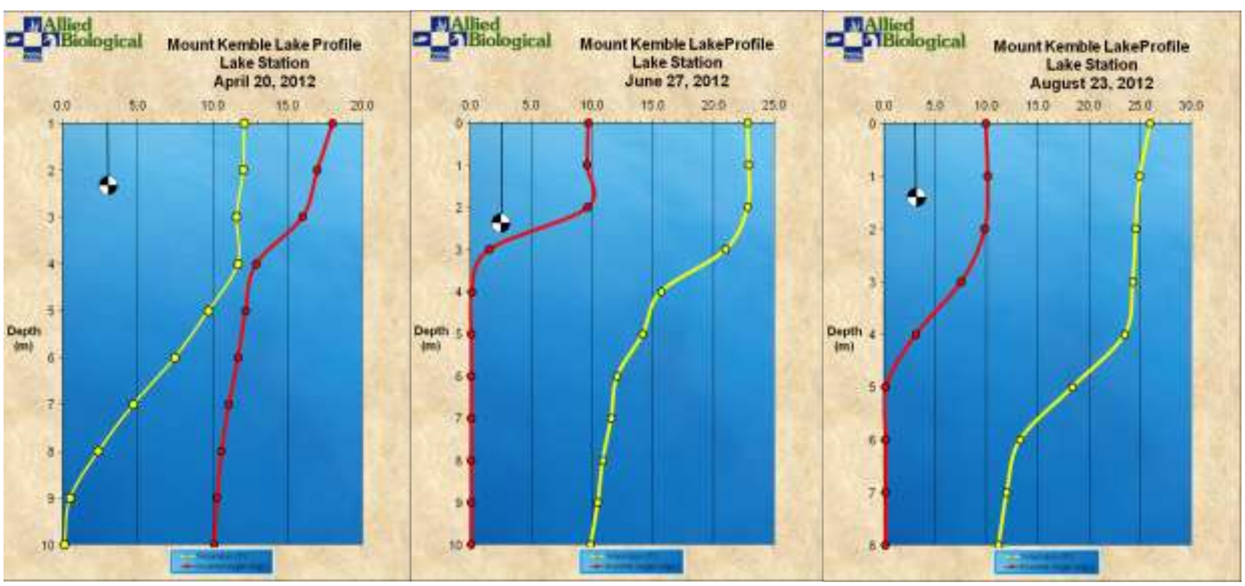
The plant community inhabiting the lake basin for July and August was comprised of Southern Naiad and Leafy Pondweed in trace quantities. This minimal plant growth was located in shoreline areas and in the northern inlet area. The final treatment survey of the season displayed a large density of unicellular algae growth warranting a final algaecide application. For in depth descriptions an aquatic macrophyte species guide specific for Mount Kemble Lake is provided in Appendix A.

Water Quality Results:

The water quality surveys were conducted at Mount Kemble Lake on April 20th, June 27th, and August 23rd. During these three dates, laboratory samples and data were collected from two locations with an additional sample location collected at depth in the deeper portion of the lake basin. Site A (North Station) was positioned in the northern end of the lake near the inlet and Site B (Lake Station) was positioned in the deeper central portion of the lake. Temperature and dissolved oxygen profiles were collected at Site B at two meter intervals. Water clarity, alkalinity, pH, and total hardness were measured on site at each sample station. During the April sampling, an inlet stream and an outlet stream sample were collected for analysis of total phosphorus to begin baseline data for future Total Maximum Daily Load thresholds. Aqua Pro-Tech Laboratories (Fairfield, NJ) conducted the offsite analysis of ammonia, carbon dioxide, conductivity, nitrate, nitrite, total phosphorus, and total suspended solids. A detailed guide to water quality parameters is included in the Appendix B.

Dissolved Oxygen Profile Description

Dissolved oxygen profiles allow biologists to analyze the oxygen freely available throughout the water column. The data recorded in April displayed a decline of oxygen values starting at a three meter depth. Anoxic conditions were reached at a depth of eight meters. The June profile displayed a decrease in available oxygen in the water column. A decline in oxygen began at two meters, and settled to zero at four meters which continued to the lake bottom. It is probable, warmer surface temperatures created a lack of mixing in spring causing the stratifying of water layers. These anoxic conditions can be harmful to many desirable species of aquatic life and could be a source of phosphorus release at the sediment water interface. The final August profile revealed satisfactory oxygen values to a two meter depth where a gradual decrease to zero was reached at five meters.



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Laboratory analysis

In 2012, Mount Kemble Lake's water quality parameters were within the desired lake management values with the exception of the nutrients phosphorus, nitrates, and ammonia. Phosphorous, although, usually present in freshwater in low concentrations can be attributed to man-made sources including septic system leaching, fertilizer runoff, and improperly treated wastewater. These phosphorous inputs usually enter a freshwater lake system during rain events, and bank erosion. The phosphorus values at Mount Kemble Lake for both sampling locations ranged from 0.03 to 0.16 mg/L. Conditions greater than 0.03mg/L typically lead to high productivity of plant and algae growth which could lead to diminished water quality. The sample collected from the lake bottom ranged from 0.07 to 0.29mg/L during all three sampling collection dates.

In an effort to gain baseline data for the nutrient levels entering the lake system, total phosphorus samples was collected from an upstream location, as well as, from a downstream location. Results for these two samples were found exceeding criteria with values of 0.11mg/L and 0.14 mg/L.

Nitrates enter a lake system during plant and animal decomposition, from man-made sources, and from livestock and waterfowl sources. Man-made sources of nitrates include septic system leaching, fertilizer runoff, and improperly treated wastewater. A nitrate level greater than 0.3 mg/L can promote excessive growth of aquatic plants and algae. The 2012 Mount Kemble Lake nitrate values exceeded criteria in all sampling locations during the April 20^{th} survey. A value of 0.6 mg/L was recorded which is doubled the acceptable limit. Additionally, the surface sample collected in the inlet station in June also exceeded criteria.

Ammonia is a type of nitrogen compound used by plants and algae to support growth. Ammonia content in a body of water is influenced by decaying plants and animals, animal waste, industrial waste effluent, agricultural runoff, and atmospheric nitrogen gas transfer. A concentration exceeding 0.3 mg/L can promote excessive plant and algae growth. During each sampling event ammonia was detected above the detectable limit in the lake station bottom sample. Values ranging from 0.39 to 0.68mg/L were elevated above the acceptable limit.

All laboratory results for the sampling events are tabulated on the following page with a column provided depicting the acceptable limits for all parameters. The values highlighted in red are those which have exceeded criteria for a healthy lake system. Laboratory data sheets a provided in Appendix C.

North Station					
Parameter	**Unit**	**20-Apr**	**27-Jun**	**23-Aug**	**Limits**
Temperature	°C	17.6	22.1	28.1	
Dissolved Oxygen	mg/L	11.66	9.83	16.21	6-10
pH	SU	8.75	8	9	9
Transparency	feet	4	5	6	<4
Alkalinity	mg/L	80	76	88	>200
Hardness	mg/L	150	120	120	120
Ammonia	mg/L	<0.2	<0.2	<0.2	0.3
Conductivity	umhos/cm	290	236	243	1500
Nitrate	mg/L	0.6	0.6	<0.2	0.3
Total Phosphorus	mg/L	0.16	0.06	0.05	0.03
Total Suspended Solids	mg/L	7	4.2	6	25

Table 1. Site A North Station Water Quality Results

Lake Station Surface					
Parameter	**Unit**	**20-Apr**	**27-Jun**	**23-Aug**	**Limits**
Temperature	°C	18	22.8	26	
Dissolved Oxygen	mg/L	12.12	9.71	9.94	6-10
pH	SU	9	8.5	9	9
Transparency	feet	4	5	4.5	<4
Alkalinity	mg/L	90	60	80	>200
Hardness	mg/L	150	120	100	120
Ammonia	mg/L	<0.2	<0.2	<0.2	0.3
Conductivity	umhos/cm	290	227	253	1500
Nitrate	mg/L	0.6	<0.2	<0.2	0.3
Total Phosphorus	mg/L	0.16	0.05	0.03	0.03
Total Suspended Solids	mg/L	3	6.68	4	25

Table 2. Site B Lake Station Surface Sample

Lake Station Bottom					
Parameter	**Unit**	**20-Apr**	**27-Jun**	**23-Aug**	**Limits**
Temperature	°C	10.1	9.9	11.2	
Dissolved Oxygen	mg/L	0.13	0.06	0.12	6-10
pH	SU	7.75	7	8	9
Alkalinity	mg/L	80	56	1.14	>200
Hardness	mg/L	150	120	120	120
Ammonia	mg/L	0.39	0.64	0.68	0.3
Conductivity	umhos/cm	288	295	290	1500
Nitrate	mg/L	0.6	<0.2	<0.2	0.3
Total Phosphorus	mg/L	0.29	0.09	0.07	0.03
Total Suspended Solids	mg/L	5	7.26	12	25

Table 3. Lake Station Bottom Sample.

Phytoplankton Analysis

During the 2012 water quality monitoring program phytoplankton samples were collected at the north station and the lake station survey sites. Samples were collected from one foot below the surface in a decontaminated sampling bottle, and then are placed on ice for transport. Samples are examined under a microscope for phytoplankton species identification and enumeration.

The April algae count identified a favorable mix of Chlorophyta (green algae) and Bacillariophyta (diatoms) with a low total density count of 430 and 230 organisms per milliliter. Water clarity at that time, was considered fair recording a four foot depth. During the June sampling round algal densities increased with a diversity dominated by Chlorophyta and a large percentage of nuisance Cyanophyta (blue-green algae). Totals for this sampling date recorded 3220 and 2790 organisms per milliliter. The final algae collection date displayed a slight decrease in algal density to 1770 and 1230 organisms per milliliter but, displayed a positive decrease in density of nuisance Cyanophyta. The predominate classification of phytoplankton were the favorable mixture of Chlorophyta and Bacillariophyta. Phytoplankton enumeration tables and distribution graphs are provided in Appendix D.

Recommendations:

The 2013 management program of Mount Kemble Lake will continue to focus on the control of nuisance densities of plant and algae growth. The target aquatic macrophyte species observed at Mount Kemble Lake in 2012 was the growth of southern naiad. Additional attention should be focused towards a possible early season growth of Curly leaf Pondweed due to the historical evidence of the plant species inhabiting the lake basin. It is recommended that an application of the contact aquatic herbicide Reward be utilized in the early season for its ability to selectively control nuisance submerged vegetation by rapid absorption into the target plant. Since southern naiad is an annual aquatic plant, a supplemental application of a contact herbicide may be advised. An alternative herbicide to consider would be a systemic herbicide such as Sonar. This would provide an effective sustained dosage to the target plant species. However, due to the greater water depths, so little of the lake basin is littoral zone leading to the perspective that a contact herbicide would be highly encouraged. In addition, it is beneficial to allow certain amounts of plants to persist in the lake to provide dissolved oxygen, habitat and compete for nutrients required for nuisance plant and algae development. The growth of leafy pondweed (*Potamogeton foliosus*), should be encouraged in areas of the lake such as the northern end where they are not interrupting recreational activities or reducing the aesthetic appeal of the lake. The ideal location for allowing native plant species to persist would be in the northern inlet portion of the lake.

Efforts in the restoration of Mount Kemble Lake should focus on a nutrient inactivation treatment to bind elevated levels of phosphorus and other suspended particles in the water column to provide a nutrient barrier over lake sediments which will reduce sediment release of phosphorus proven in the lake bottom sampling site. Water quality sampling has documented elevated phosphorus in the water column, which is a main nutrient source of plant and algae growth. Alum treatments in previous years have displayed a dramatic improvement in water clarity, which typically lasts until the next significant water exchange period. This process should be considered for the 2013 lake management year. In comparison of 2010 and 2012 nutrient sampling data, an increase of phosphorus levels was recorded. An additional measure to reduce the phosphorus levels within the system could be the use of an algaecide with a water quality enhancing component designed to assimilate phosphorus released from decomposing algae cells. A copper based product SeClear will control the growth of nuisance algae and assist in reducing the elevated nutrient levels.

Water quality monitoring allows for proactive management of the lakes' environment and reduces the opportunity for the development of problematic situations. Samples should be collected from both ends of Mt Kemble Lake at surface and near the lake bottom in the deepest area for a total of three samples per sampling date. Samples should continue to be analyzed for the standard historical parameters. Water quality monitoring should to be continued on a regular yearly basis over the long-term for greatest analytical results. In addition, Zooplankton sampling and quantification should be considered. Zooplanktons are an important role in a lake system for their consumption of phytoplankton, and acting as a food supply for fish. A study would provide insight to the forage base of the lake with respect to the fishery and will indicate the trophic state of the lake.

We at Allied Biological genuinely appreciate the opportunity to assist in the lake management efforts at Mount Kemble Lake and look forward to being of service for the 2013 season.

Sincerely,

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Appendix

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Appendix A: Aquatic Macrophyte Species Guide

Leafy Pondweed (*Potamogeton foliosus*: Common Name: leafy pondweed. **Native**.): Leafy pondweed has freely branched stems that hold slender submersed leaves that become slightly more narrow as they approach the stem. The leaf contains 3-5 veins and often tapers to a point. No floating leaves are produced. It produces early season fruits in tight clusters on short stalks in the leaf axils. These early season fruits are often the first grazed upon by waterfowl during the season. Muskrat, beaver, deer and even moose also graze on the fruit. It inhabits a wide range of habitats, but usually prefers shallow water. It has a high tolerance for eutrophic conditions, allowing it to even colonize secondary water treatment ponds.
Fish and waterfowl graze on Stonewort.

Southern Naiad (*Najas guadalupensis*. Common Names: Southern water nymph, bushy pondweed. **Native**.): Southern naiad is an annual aquatic plant that can form dense stands of rooted vegetation. Its ribbon-like leaves are dark-green to greenish-purple, and are wider and less pointed than slender naiad. Flowers occur at the base of the leaves, but are so small, they usually require magnification to detect. Southern naiad is widely distributed, but is less common than slender naiad in northern zones. Southern naiad reproduces by seeds and fragmentation.

Curly-leaf Pondweed (*Potamogeton crispus*. Common Name: curly-leaf pondweed. **Invasive.**): Curly-leaf pondweed has spaghetti-like stems that often reach the surface by mid-June. Its submersed leaves are oblong, and attached directly to the stem in an alternate pattern. The margins of the leaves are wavy and finely serrated, hence its name. No floating leaves are produced. Curly-leaf pondweed can tolerate turbid water conditions better than most other macrophytes. In late summer, Curly-leaf pondweed enters its summer dormancy stage. It naturally dies off (often creating a sudden loss of habitat and releasing nutrients into the water to fuel algae growth) and produces vegetative buds called turions. These turions germinate when the water gets cooler in the autumn and give way to a winter growth form that allows it to thrive under ice and snow cover, providing habitat for fish and invertebrates.

Small Duckweed (*Lemna minor*. Common Names: Small duckweed, water lentil, lesser duckweed. **Native.**). Small duckweed is a free floating plant, with round to oval-shaped leaf bodies typically referred to as fronds. The fronds are small (typically less than 0.5 cm in diameter), and it can occur in large densities that can create a dense mat on the water's surface. Each frond contains three faint nerves, a single root (a characteristic used to distinguish it from other duckweeds), and no stem. Although it can produce flowers, it usually reproduces via budding at a tremendous rate. Its population can double in three to five days. Since it is free floating, it drifts with the wind or water current, and is often found intermixed with other duckweeds. Since it's not attached to the sediment, it derives nutrients directly from the water, and is often associated with eutrophic conditions. It over winters by producing turions late in the season. Small duckweed is extremely nutritious and can provide up to 90% of the dietary needs for waterfowl. It's also consumed by muskrat, beaver and fish, and dense mats of duckweed can actually inhibit mosquito breeding.

Appendix B: Water Quality Parameter Descriptions

Temperature

Temperature is measured in degrees Celsius, and is very important to aquatic biota. Several factors affect temperature in a lake system, including air temperature, season, wind, water flow through the system, and shade trees. Turbidity can also increase water temperature as suspended particles absorb sun rays more efficiently. Water depth also affects temperature. In general, deeper water remains cooler during the summer months.

Temperature preferences vary among aquatic biota. Since water temperature typically varies between 5 ºC and 30 ºC during the season, most aquatic biota can flourish under this wide range of temperatures. Of more concern is thermal shock, which occurs when temperature rapidly changes in a short amount of time. Some aquatic biota can become stressed when temperature changes as little as 1-2 ºC in a 24 hour period.

Dissolved Oxygen

Dissolved Oxygen is the measurement of the amount of oxygen freely available to aquatic biota in water. Several factors play a role in affecting the amount of dissolved oxygen in the water. These factors include temperature, low atmospheric pressure (such as higher altitude), the mineral content of the water, and water mixing (via wind, flow over rocks, or thermal upwelling). Warmer temperatures, low atmospheric pressure, and increased mineral content all conspire to decrease the solubility of oxygen in water. Lower temperatures and increased water mixing tend to increase the dissolved oxygen solubility in water. In addition, an over abundance of organic matter, such as dead algae or plants causes rapid aerobic bacteria growth. During this growth, bacteria consume oxygen during respiration, which can cause the water's dissolved oxygen to decrease.

Dissolved oxygen has a wide range, from 0 mg/L to 20 mg/L. To support diverse aquatic biota, 5-6 mg/L is minimally required, but 9-10 mg/L is an indicator of better overall water quality. A dissolved oxygen reading of below 4 mg/L is stressful to most aquatic organisms, especially fish.

Water Clarity

Transparency (or visibility) is easily measured in lakes with a Secchi disc, and can provide an experienced biologist with a quick determination of a lake's water quality. In short, higher visibility indicates a cleaner (and healthier) aquatic system. Cloudy conditions could indicate nutrient rich sediments entering the lake or excessive algal blooms due to nutrient availability, leading to a degradation of water quality. Clear conditions allow greater light penetration and the establishment of a deeper photic zone. The photic zone is the depth of active photosynthesis carried out by plants and algae. A byproduct of photosynthesis is dissolved oxygen, required for use by higher aquatic organisms, such as zooplankton and fish.

pH

The measurement of acidity or alkalinity of the water is called pH (the "potential for hydrogen"). Several factors can impact the pH of a lake, including precipitation in a short amount of time, rock and soil composition of the watershed, algal blooms (increase the pH), and aquatic plant decomposition (decreases the pH). A pH level of 6.5 to 7.5 is considered excellent, but most lake systems fall in the range of 6.0 to 8.5. Aquatic biota can become stressed if the pH drops below 6.0, or increases above 8.5 for an extended amount of time.

Most aquatic biota are adapted to specific pH ranges. When the pH fluctuates rapidly, it can cause changes in aquatic biota diversity. Immature stages of aquatic insects and juvenile fish are more sensitive to low pH values than their adult counterparts. Therefore, a low pH can actually inhibit the hatch rate and early development of these organisms.

Nitrate

Nitrates are chemical compounds derived from nitrogen and oxygen. Nitrogen is needed by all plants and animals to make proteins needed for growth and reproduction. Nitrates are generated during plant and animal decomposition, from man-made sources, and from livestock and waterfowl sources. Man-made sources of nitrates include septic system leaching, fertilizer runoff, and improperly treated wastewater. Freshwater lake systems can potentially receive large nitrate inputs from waterfowl, specifically large flocks of Canada geese. An increase in nitrate levels can in turn cause an increase in total phosphorous levels. A nitrate level greater than 0.3 mg/L can promote excessive growth of aquatic plants and algae.

Nitrite

Nitrite, like nitrate, is a chemical compound derived from nitrogen and oxygen. Many of the sources of nitrite are similar for nitrate. These include nitrite generated during plant and animal decomposition, man-made sources (such as septic system leaching, fertilizer runoff, industrial discharge), and animal and waterfowl excretion. An elevated nitrite level can cause aquatic plants and algae to more efficiently utilize available phosphorous. In water, nitrite is usually quickly converted to nitrate, therefore nitrite levels are typically undetectable in water. A nitrite level 0.3 mg/L can promote excessive aquatic plant and algae growth. A nitrite level exceeding 5.0 mg/L can induce stress to warm water fish species and contribute to a reduced diversity of such aquatic biota.

Ammonia

Ammonia is a type of nitrogen compound used by plants and algae to support growth. Ammonia content in a body of water is influenced by decaying plants and animals, animal waste, industrial waste effluent, agricultural runoff, and atmospheric nitrogen gas transfer. A concentration exceeding 0.30 mg/L can promote excessive plant and algae growth. Elevated ammonia levels can increase nitrification, which in turn depletes the oxygen content of water. Extremely high ammonia levels can be toxic to aquatic biota (such as fish).

Total Phosphorous

Total phosphorous is a chemical compound derived from phosphorous and oxygen. Total phosphorous is usually present in freshwater in low concentrations, and is often the limiting nutrient to aquatic plant growth. However, man-made sources of phosphorous include septic system leaching, fertilizer runoff, and improperly treated wastewater. These phosphorous inputs usually enter a freshwater lake system during rain events, and bank erosion.

A total phosphorous level greater than 0.03 mg/L can promote excessive aquatic plant growth and decomposition, either in the form of algal blooms, or nuisance quantities of aquatic plants. This process is called eutrophication, and when induced or sped up by man-made nutrient inputs, it is called cultural eutrophication. As a result of this excessive growth, recreational activities, such as swimming, boating, and fishing in the lake can be negatively impacted. In addition, aerobic bacteria will thrive under these conditions, causing a decrease in dissolved oxygen levels which can negatively impact aquatic biota such as fish.

Appendix C: Laboratory Data Results

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CERTIFICATIONS
NJ DEP 07010 / NY DOH 11634 / CT PH-0233
US ARMY CORPS (USACE)

ANALYTICAL RESULTS SUMMARY

Client	**Allied Biological Inc** 580 Rockport Rd. Hackettstown, NJ 07840	**APL Order ID Number**	**12040617**
		Date Sampled	04/20/2012 10:20
		Date Received	04/20/2012 11:52
Contact	Chris Doyle	**Matrix**	Lake
Project		**Site**	Mt Kemble Lake
Report Date	04/30/2012 13:17	**Customer Service Rep.**	

Sample Number/ Parameter	Method	Analysis Time	Analyst	Result	Units	MDL
12040617-001 North Station						
Ammonia	SM 4500NH3C	04/26/2012 11:00	JVAGHELA	<0.2	mg/L	0.2
Conductivity	SM 2510B	04/24/2012 16:00	JVAGHELA	290	µmhos/cm	1
Nitrate as N	EPA 300	04/20/2012 15:41	ASTOICA	0.6	mg/L	0.2
Phosphorus, Total	SM4500P E	04/24/2012 9:30	YKIZNER	0.16	mg/L	0.01
Total Suspended Solids	EPA 160.2/ SM 2540 D	04/27/2012 11:00	MARK	7	mg/L	3
12040617-002 Lake Station Surface						
Ammonia	SM 4500NH3C	04/26/2012 11:00	JVAGHELA	<0.2	mg/L	0.2
Conductivity	SM 2510B	04/24/2012 16:00	JVAGHELA	290	umhos/cm	1
Nitrate as N	EPA 300	04/20/2012 15:41	ASTOICA	0.6	mg/L	0.2
Phosphorus, Total	SM4500P E	04/24/2012 9:30	YKIZNER	0.16	mg/L	0.01
Total Suspended Solids	EPA 160.2/ SM 2540 D	04/27/2012 11:00	MARK	3	mg/L	3
12040617-003 Lake Station Bottom						
Ammonia	SM 4500NH3C	04/26/2012 11:00	JVAGHELA	0.39	mg/L	0.2
Conductivity	SM 2510B	04/24/2012 16:00	JVAGHELA	285	umhos/cm	1
Nitrate as N	EPA 300	04/20/2012 15:41	ASTOICA	0.6	mg/L	0.2
Phosphorus, Total	SM4500P E	04/24/2012 9:30	YKIZNER	0.29	mg/L	0.01
Total Suspended Solids	EPA 160.2/ SM 2540 D	04/27/2012 11:00	MARK	5	mg/L	3
12040617-004 Inlet Stream						
Phosphorus, Total	SM4500P E	04/24/2012 9:30	YKIZNER	0.11	mg/L	0.01
12040617-005 Outlet Stream						
Phosphorus, Total	SM4500P E	04/24/2012 9:30	YKIZNER	0.14	mg/L	0.01

SA: See attached report

Brian Wood
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QA

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US ARMY CORPS (USACE)

ANALYTICAL RESULTS SUMMARY

Client	**Allied Biological Inc** 580 Rockport Rd. Hackettstown, NJ 07840	**APL Order ID Number**	**12060983**
		Date Sampled	06/27/2012 7:30
		Date Received	06/28/2012 15:58
Contact	Chris Doyle	**Matrix**	Lake
Project		**Site**	Mt Kemble Lake
Report Date	07/05/2012 15:27	**Customer Service Rep.**	

Sample Number/ Parameter	Method	Analysis Time	Analyst	Result	Units	MDL
12060983-001 North Station						
Ammonia	SM 4500NH3C	07/03/2012 11:00	YKIZNER	<0.2	mg/L	0.2
Conductivity	SM 2510B	06/29/2012 11:00	JVAGHELA	236	µmhos/cm	1
Nitrate as N	EPA 300	06/28/2012 18:00	RSWAMY	0.6	mg/L	0.2
Phosphorus, Total	SM4500P-E	07/03/2012 9:30	YKIZNER	0.06	mg/L	0.01
12060983-002 Lake Station-Surface						
Ammonia	SM 4500NH3C	07/03/2012 11:00	YKIZNER	<0.2	mg/L	0.2
Conductivity	SM 2510B	06/29/2012 11:00	JVAGHELA	227	µmhos/cm	1
Nitrate as N	EPA 300	06/28/2012 18:00	RSWAMY	<0.2	mg/L	0.2
Phosphorus, Total	SM4500P-E	07/03/2012 9:30	YKIZNER	0.05	mg/L	0.01
12060983-003 Lake Station-Bottom						
Ammonia	SM 4500NH3C	07/03/2012 11:00	YKIZNER	0.64	mg/L	0.2
Conductivity	SM 2510B	06/29/2012 11:00	JVAGHELA	295	µmhos/cm	1
Nitrate as N	EPA 300	06/28/2012 18:00	RSWAMY	<0.2	mg/L	0.2
Phosphorus, Total	SM4500P-E	07/03/2012 9:30	YKIZNER	0.09	mg/L	0.01

SA: See attached report

Brian Wood
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ANALYTICAL RESULTS SUMMARY

Client	**Allied Biological Inc** 580 Rockport Rd. Hackettstown, NJ 07840	**APL Order ID Number**	**12080838**
		Date Sampled	08/23/2012 13:35
		Date Received	08/24/2012 14:45
Contact	Chris Doyle	**Matrix**	Lake
Project		**Site**	Mt Kemble Lake
Report Date	09/01/2012 7:47	**Customer Service Rep.**	

Sample Number/ Parameter	Method	Analysis Time	Analyst	Result	Units	MDL
12080838-001 North Station (Inlet)						
Ammonia	SM 4500NH3C	08/27/2012 14:00	YKIZNER	<0.2	mg/L	0.2
Conductivity	SM 2510B	08/28/2012 16:30	JVAGHELA	243	µmhos/cm	1
Nitrate as N	EPA 300	08/24/2012 21:43	ASTOICA	<0.2	mg/L	0.2
Phosphorus, Total	SM4500P-E	08/28/2012 10:00	YKIZNER	0.05	mg/L	0.01
Total Suspended Solids	EPA 160.2/ SM 2540 D	08/29/2012 14:30	MARK	6	mg/L	3
12080838-002 Lake Station-Surface						
Ammonia	SM 4500NH3C	08/27/2012 14:00	YKIZNER	<0.2	mg/L	0.2
Conductivity	SM 2510B	08/28/2012 16:30	JVAGHELA	253	µmhos/cm	1
Nitrate as N	EPA 300	08/24/2012 21:43	ASTOICA	<0.2	mg/L	0.2
Phosphorus, Total	SM4500P-E	08/28/2012 10:00	YKIZNER	0.03	mg/L	0.01
Total Suspended Solids	EPA 160.2/ SM 2540 D	08/29/2012 14:30	MARK	4	mg/L	3
12080838-003 Lake Station-Bottom						
Ammonia	SM 4500NH3C	08/27/2012 14:00	YKIZNER	0.68	mg/L	0.2
Conductivity	SM 2510B	08/28/2012 16:30	JVAGHELA	290	µmhos/cm	1
Nitrate as N	EPA 300	08/24/2012 21:43	ASTOICA	<0.2	mg/L	0.2
Phosphorus, Total	SM4500P-E	08/28/2012 10:00	YKIZNER	0.07	mg/L	0.01
Total Suspended Solids	EPA 160.2/ SM 2540 D	08/29/2012 14:30	MARK	12	mg/L	3

SA: See attached report

Brian Wood
Laboratory Director

QA

1275 BLOOMFIELD AVENUE, BLDG. 8, FAIRFIELD, NJ 07004 TEL 973 227 0422 FAX 973 227 2813

APL
AQUA PRO-TECH LABORATORIES
Commitment to Excellence in Chemistry

Order Information	
Allied Biological Inc	
APL Order ID :	12060983
Site Name :	Mt Kemble Lake
Date to Lab :	6/28/2012 3:58:00 PM

Samples List

Field ID	Lab ID	Matrix
North Station	12060983-001	Lake
Lake Station-Surface	12060983-002	Lake
Lake Station-Bottom	12060983-003	Lake

Printing Options

Page Breaks Off

Turning **Page Breaks** on prints each sample on a new page.
Turning **Page Breaks** off prints the report on the minimum number of pages.

North Station 12060983-001 6/27/2012, 7:40:00 AM Lake

Click here to request additional or contingent analyses for this Sample ID.

Test	Method	Date Posted	MDL	Result	Units	Limit
Phosphorus, Total	SM4500P-E	7/5/2012	0.01	0.06	mg/L	-
Nitrate as N	EPA 300	6/29/2012	0.2	0.6	mg/L	-
Ammonia	SM 4500NH3C	7/3/2012	0.2	<0.2	mg/L	-
Conductivity	SM 2510B	6/29/2012	1	236	µmhos/cm	-
Total Suspended Solids	EPA 160.2/ SM 2540 D	6/29/2012	1	4.30	mg/L	-

Lake Station-Surface 12060983-002 6/27/2012, 7:45:00 AM Lake

Click here to request additional or contingent analyses for this Sample ID.

Test	Method	Date Posted	MDL	Result	Units	Limit
Phosphorus, Total	SM4500P-E	7/5/2012	0.01	0.03	mg/L	-
Nitrate as N	EPA 300	6/29/2012	0.2	<0.2	mg/L	-
Ammonia	SM 4500NH3C	7/3/2012	0.2	<0.2	mg/L	-
Conductivity	SM 2510B	6/29/2012	1	227	µmhos/cm	-
Total Suspended Solids	EPA 160.2/ SM 2540 D	6/29/2012	1	[illegible]	mg/L	-

Lake Station-Bottom 12060983-003 6/27/2012, 7:55:00 AM Lake

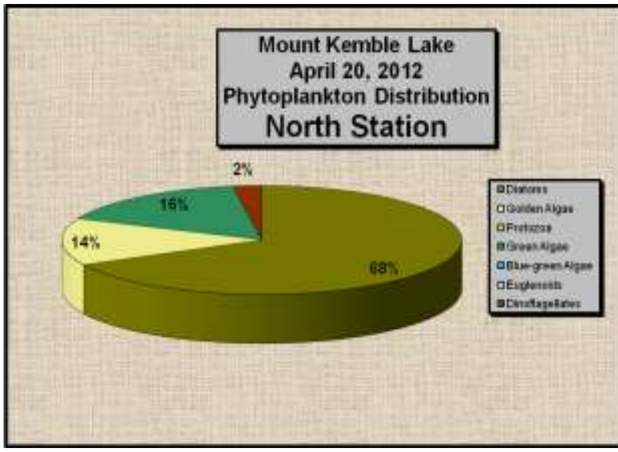
Click here to request additional or contingent analyses for this Sample ID.

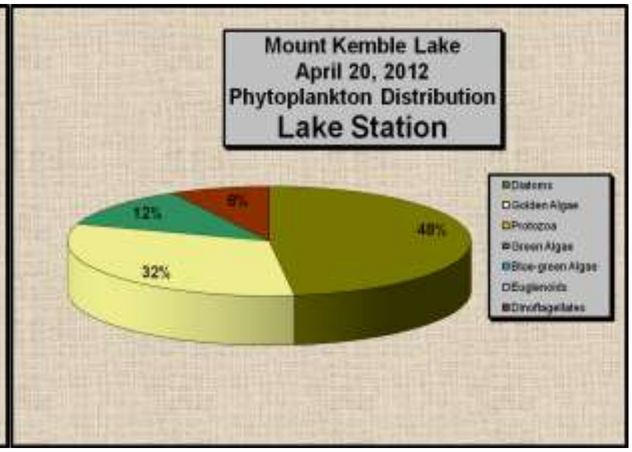
Test	Method	Date Posted	MDL	Result	Units	Limit
Phosphorus, Total	SM4500P-E	7/5/2012	0.01	0.09	mg/L	-
Nitrate as N	EPA 300	6/29/2012	0.2	<0.2	mg/L	-
Ammonia	SM 4500NH3C	7/3/2012	0.2	0.64	mg/L	-
Conductivity	SM 2510B	6/29/2012	1	205	µmhos/cm	-
Total Suspended Solids	EPA 160.2/ SM 2540 D	6/29/2012	1	7.35	mg/L	-

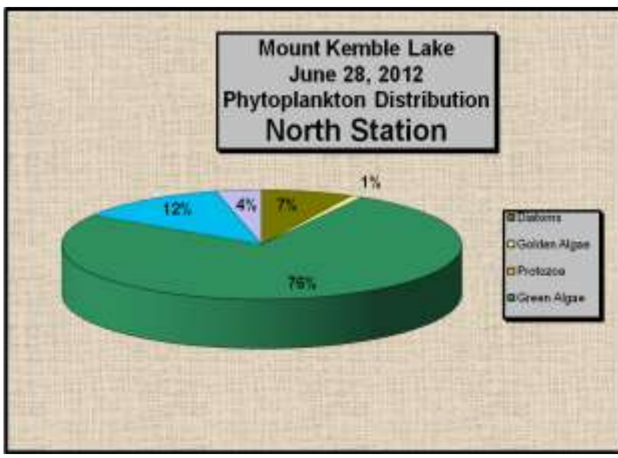
Report Key:

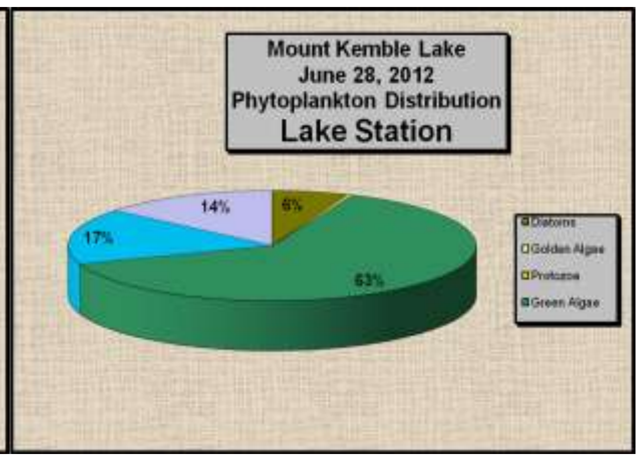
Corp Office: 580 Rockport Road Hackettstown, NJ 07840 908-850-0303 Fax 908-850-4994
NY Office: 984 County Highway 35 Maryland, NY 12116 607-286-7257 Fax 607-286-7332

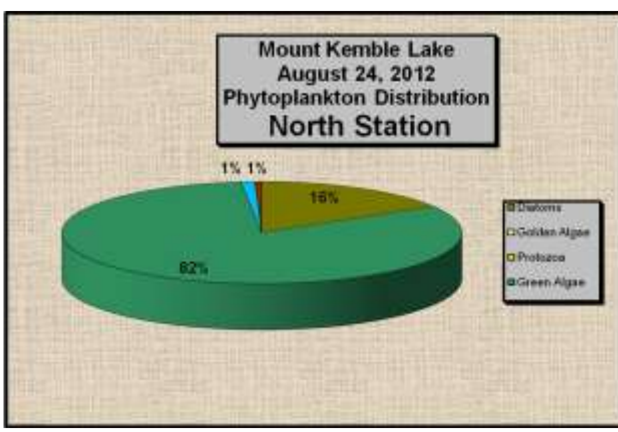
Appendix D: Phytoplankton Data Results

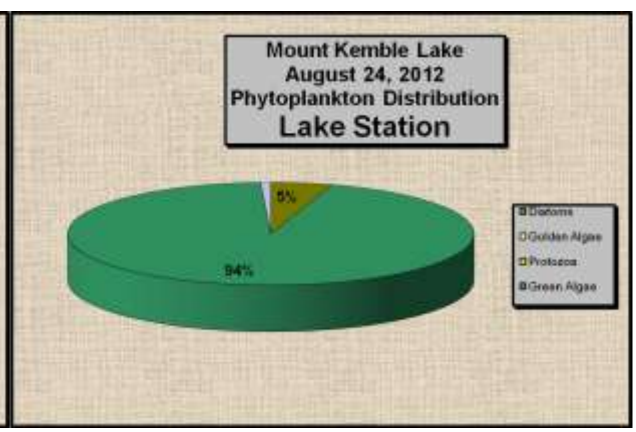












MICROSCOPIC EXAMINATION OF WATER

Sample from: Mt. Kemble Lake		
Collection Date: 4/20/12	Examination Date: 4/20/12	Amount Examined: 200 ml.
Site A: North Station (inlet)	Site B: Lake Station	Site C:

BACILLARIOPHYTA (Diatoms)	**A**	**B**	**C**
Asterionella	60	30	
Cyclotella	20		
Cymbella			
Diatoma			
Fragilaria	170	70	
Melosira			
Navicula	20		
Nitzschia			
Pinnularia		10	
Urosolenia			
Stephanodiscus			
Stauroneis			
Synedra	20	10	
Tabellaria			
Cocconeis			

CHRYSOPHYTA (Golden Algae)	**A**	**B**	**C**
Dinobryon			
Mallomonas	60	80	
Synura			
Tribonema			
Uroglenopsis			

CHLOROPHYTA (Green Algae)	**A**	**B**	**C**
Ankistrodesmus			
Chlamydomonas			
Chlorella			
Chlorococcum			
Closterium		10	
Coelastrum			
Eudorina			
Mougeotia			
Oedogonium			
Oocystis			
Pandorina			
Pediastrum			
Phytoconis			
Rhizoclonium			
Scenedesmus	30	20	
Spirogyra			
Staurastrum	40		
Sphaerocystis			
Ulothrix			
Volvox			
Zygnema			
Aulacoseira			
Microtinium			
Cosmerium			

CYANOPHYTA (Blue-green Algae)	**A**	**B**	**C**
Anabaena			
Anacystis			
Aphanizomenon			
Coelosphaerium			
Gomphosphseria			
Lyngbya			
Microcystis			
Oscillatoria			
Pseudoanabaena			
Synechocystis			
Agmenellum			
PROTOZOA			
Actinophyrs			

EUGLENOPHYTA (Euglenoids)	**A**	**B**	**C**
Euglena			
Phacus			
Trachelomonas			

PYRRHOPHYTA (Dinoflagellates)	**A**	**B**	**C**
Ceratium			
Peridinium	10	20	

SITE	**A**	**B**	**C**
TOTAL GENERA:	9	8	
TRANSPARENCY:	4'est	4'	
ORGANISMS PER MILLILITER:	**430**	**250**	

NOTES: The algal density is considered low at both sites during the April sampling. Algal assemblage is a favorable mix of green algae and diatoms. No blue green algae werefound at this time. Diversity is moderate at both locations with total genera between eight and nine. Water clarity is considered fair with a Secchi reading of four feet at both locations.

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MICROSCOPIC EXAMINATION OF WATER

Sample from: Mt. Kemble Lake

Collection Date: 6/27/12	Examination Date: 6/28/12	Amount Examined: 200 ml.
Site A: North Station (inlet)	Site B: Lake Station	Site C:

BACILLARIOPHYTA (Diatoms)	**A**	**B**	**C**	**CHLOROPHYTA (Green Algae)**	**A**	**B**	**C**	**CYANOPHYTA (Blue-green Algae)**	**A**	**B**	**C**
Asterionella				*Ankistrodesmus*				*Anabaena*	290	260	
Cyclotella	170	140		*Chlamydomonas*				*Anacystis*			
Cymbella				*Chlorella*	1110	560		*Aphanizomenon*		10	
Diatoma				*Chlorococcum*				*Coelosphaerium*	10		
Fragilaria	10	10		*Closterium*	210	200		*Gomphosphseria*			
Melosira				*Coelastrum*		60		*Lyngbya*			
Navicula	10			*Eudorina*				*Microcystis*	100	190	
Nitzschia				*Mougeotia*				*Oscillatoria*			
Pinnularia				*Oedogonium*				*Pseudoanabaena*			
Urosolenia	50	20		*Oocystis*	10	20		*Synechocystis*			
Stephanodiscus				*Pandorina*	60			*Agmenellum*			
Stauroneis				*Pediastrum*	10	10					
Synedra				*Phytoconis*	540	440		**PROTOZOA**			
Tabellaria				*Rhizoclonium*				*Actinophyrs*			
Cocconeis				*Scenedesmus*	420	410					
CHRYSOPHYTA (Golden Algae)	**A**	**B**	**C**	*Spirogyra*				**EUGLENOPHYTA (Euglenoids)**	**A**	**B**	**C**
				Staurastrum	20	20					
Dinobryon				*Sphaerocystis*	60	20		*Euglena*			
Mallomonas	30	10		*Ulothrix*	10	20		*Phacus*			
Synura				*Volvox*				*Trachelomonas*	120	390	
Tribonema				*Zygnema*							
Uroglenopsis				*Aulacoseira*							
								PYRRHOPHYTA (Dinoflagellates)	**A**	**B**	**C**
								Ceratium			
								Peridinium			

SITE	**A**	**B**	**C**
TOTAL GENERA:	19	18	
TRANSPARENCY:	5'est	5.0'	
ORGANISMS PER MILLILITER:	**3220**	**2790**	

NOTES: The algal density at both sites is considered high with very high diversity. The algal density has increased significantly since the last sampling event. The assemblage at each site is dominated by a mixture of green algae. Some nuisance blue-green algae were present in each sample, in addition to diatoms and euglenoids. Trace golden algae were also present in each sample. Water clarity was fair at each site, and unicellular algae could be observed in the water column during sampling. An algaecide application is recommended.

MICROSCOPIC EXAMINATION OF WATER

Sample from: Mt. Kemble Lake

Collection Date: 8/23/12	Examination Date: 8/24/12	Amount Examined: 200 ml.
Site A: North Station (inlet)	Site B: Lake Station	Site C:

BACILLARIOPHYTA (Diatoms)	**A**	**B**	**C**	**CHLOROPHYTA (Green Algae)**	**A**	**B**	**C**	**CYANOPHYTA (Blue-green Algae)**	**A**	**B**	**C**
Asterionella				*Ankistrodesmus*				*Anabaena*	20		
Cyclotella	20	30		*Chlamydomonas*				*Anacystis*			
Cymbella				*Chlorella*	1120	1030		*Aphanizomenon*			
Diatoma				*Chlorococcum*				*Coelosphaerium*			
Fragilaria		10		*Closterium*	10			*Gomphosphseria*			
Melosira				*Coelastrum*				*Lyngbya*			
Navicula				*Eudorina*				*Microcystis*			
Nitzschia				*Mougeotia*				*Oscillatoria*			
Pinnularia				*Oedogonium*				*Pseudoanabaena*			
Urosolenia				*Oocystis*				*Synechocystis*			
Stephanodiscus	20			*Pandorina*				*Agmenellum*			
Stauroneis				*Pediastrum*							
Synedra	50	20		*Phytoconis*				**PROTOZOA**			
Tabellaria	200			*Rhizoclonium*				*Actinophyrs*			
Cocconeis				*Scenedesmus*	20						
CHRYSOPHYTA (Golden Algae)	**A**	**B**	**C**	*Spirogyra*				**EUGLENOPHYTA (Euglenoids)**	**A**	**B**	**C**
				Staurastrum	120	110					
Dinobryon				*Sphaerocystis*	40	20		*Euglena*			
Mallomonas				*Ulothrix*	120			*Phacus*			
Synura				*Volvox*				*Trachelomonas*		10	
Tribonema				*Zygnema*							
Uroglenopsis				*Aulacoseira*							
				Microtinium	10			**PYRRHOPHYTA (Dinoflagellates)**	**A**	**B**	**C**
				Cosmerium	10						
								Ceratium			
								Peridinium	10		

SITE	**A**	**B**	**C**
TOTAL GENERA:	14	7	
TRANSPARENCY:	6'est	4.5'	
ORGANISMS PER MILLILITER:	**1770**	**1230**	

NOTES: The algal density has decreased significantly at both sites since the last sampling in June. Algal density is still considered high but the assemblage is a favorable mix of green algae and diatoms with only a trace of nuisance blue-green algae. The diversity decreased slightly at the north station and is still considered high. At the lake station the diversity decreased significantly and is now considered moderate. Water clarity remains about the same at both sites.

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