BOROUGH OF MOUNTAIN LAKES
MORRIS COUNTY, NJ

2016 YEAR-END REPORT
LAKES MANAGEMENT PROGRAM
BOROUGH OF MOUNTAIN LAKES

SOLITUDE LAKE MANAGEMENT

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Introduction

The following report is submitted to the Borough of Mountain Lakes as a Year End Report summarizing the Aquatic Vegetation Management Program for Mountain Lakes in 2016. As in previous years, the program included weekly surveys of all lakes, biweekly unicellular phytoplankton sampling during June through August, herbicide and algaecide applications to control nuisance plants and phytoplankton, and a water quality monitoring program. Each lake shall be discussed individually regarding aquatic plant and phytoplankton management and water chemistry results.

After the 2016 summary discussions, additional topics such as the fecal coliform sampling that occurred at Birchwood and Mountain Lake, water clarity at Mountain Lake, the Lakes Cleaning Program, and nutrient loading in all of the lakes will be discussed. Finally, a 2016 summary is presented as well as specific Lake Management strategies for 2017. Copies of all of the graphs and data utilized in this report are included in the Appendix of this report.

Submersed Aquatic Macrophyte Summaries

Scientific Name	Common Name	Observed 2016	Last Observed
Myriophyllum spicatum	Eurasian Water milfoil	X	
Potamogeton epihydrus	Ribbon-leaf Pondweed	X	
Utricularia vulgaris	Common Bladderwort		2012
Ceratophyllum echinatum	Spiny Hornwort		2009
Ceratophyllum demersum	Coontail		2012
Najas guadalupensis	Southern Naiad	X	
Najas flexilis	Slender Naiad		2015
Potamogeton foliosus	Leafy Pondweed	X	
Nymphaea odorata	White Water Lily	X	
Nuphar variegata	Spatterdock	X	
Brasenia schreberi	Watershield	X	
Chara sp.	Muskgrass	X	
Potamogeton robbinsii	Robbin's Pondweed	X	
Myriophyllum humile	Low Water Milfoil		2011
Lemna minor	Small Duckweed	X	
Potamogeton amplifolius	Bass Weed	X	
Ludwigia sp.	Red Ludwigia	X	
Utricularia gibba	Creeping Bladderwort	X	
Potamogeton crispus	Curly-leaf Pondweed	X	
Riccia fluitans	Slender Riccia	X	
Potamogeton diversifolius	Variable-leaf Pondweed		2013
Nitella sp.	Stonewort	X	
Fontinalis sp.	Watermoss		2013
Ludwigia peploides	Creeping Water Primrose	X	
Najas minor	Brittle Naiad	X	
Potamogeton pusillus	Small Pondweed	X	
Cabomba caroliniana	Fanwort	X	

The table above depicts a list of aquatic plants observed at Mountain Lakes in 2016 and in recent (back to 2006) seasons. The table lists the scientific name and common name, and should be used as reference while reading this report. Note that this table only includes submersed and floating aquatic plants. See below for a discussion and list of emergent plants observed in 2016. Following this table are brief descriptions of each aquatic macrophyte and a picture. Red font indicates exotic species.

Fanwort Invasive (*Cabomba caroliniana*. Common Name: fanwort. **Aggressive, Exotic, Invasive**)**:** Fanwort is a submerged rooted herb, native to Southeastern United States, from Virginia to South Florida. A popular aquarium plant, fanwort has since spread to much of the Northeast, and even parts of the Northwest, and is considered a non-native invasive species in these regions. Fanwort prefers sluggish streams, or acidic ponds and lakes. It can reach six feet long, and can colonize water up to ten feet deep. Fanwort has slender stems covered with a thin gelatinous slime, and two types of leaves. Submerged leaves are green and situated in a whorl pattern, similar to a fan. The floating leaves are alternate and linear, about one half to one inch in diameter. Fanwort blooms in the fall, producing small white flowers with a slight pinkish tint. Although it can reproduce via seed germination, it can also reproduce by fragmentation. In late summer, the stems become brittle, and break easily. The loose fragments can then rapidly move throughout the aquatic system due to natural flow patterns. Unattached plants can even continue to grow, indicating it removes most of its nutrients directly from the water column instead of the sediment. Due to its rapid spreading, it can occur in dense stands, clogging streams or canals, and impairing aquatic systems. Fanwort provides suitable habitat for aquatic invertebrates and fish.

Eurasian Water Milfoil (*Myriophyllum spicatum*. Common Names: Asian Water milfoil. **Aggressive, Exotic, Invasive**.): Eurasian water milfoil has long (2 meters or more) spaghetti-like stems that grow from submerged rhizomes. The stems often branch repeatedly at the water's surface creating a canopy that can crowd out other vegetation, and obstruct recreation and navigation. The leaves are arranged in whorls of 4 to 5, and spread out along the stem. The leaves are divided like a feather, resembling the bones on a fish spine. Eurasian water milfoil is an exotic originating in Europe and Asia, but its range now includes most of the United States. It's ability to grow in cool water and at low light conditions gives it an early season advantage over other native submersed plants. In addition to reproducing via fruit production, it can also reproduce via fragmentation. Waterfowl graze on Eurasian water milfoil, and its vegetation provides habitat for invertebrates. However, studies have determined mixed beds of pondweeds and wild celery can support more diverse invertebrate populations.

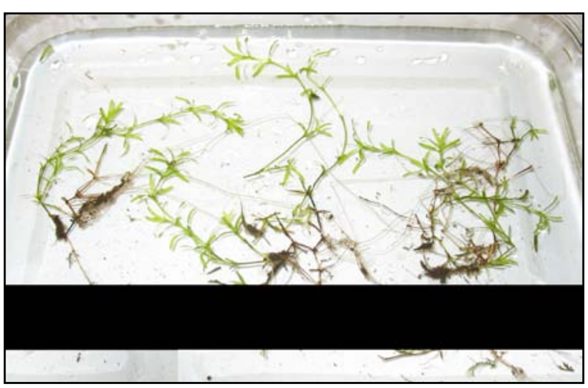
Ribbon-leaf Pondweed (*Potamogeton epihydrus*: Common Name: ribbon-leaf pondweed. **Native**.): Ribbon-leaf pondweed has flattened stems and two types of leaves. The submersed leaves are alternate on the stem, lack a leaf stalk, and are long tape-like in shape. Each leaf has a prominent stripe of pale green hollow cells flanking the midvein. The floating leaves are egg or ellipse-shaped and supported by a leaf stalk about as long as the leaf itself. Fruiting stalks are located at the top of the stem and packed with flattened disk-shaped fruits. It is typically found growing in low alkalinity environments, and a variety of substrates.

Common Bladderwort (*Utricularia vulgaris*: Common Names: common bladderwort, great bladderwort. **Native.**): Common bladderwort is a free-floating plant that can reach 2-3 meters in length. Since they are free-floating, they can grow in areas with very loose sediment. Along its stem are finely divided leaf-like branches, forked 3-7 times. Scattered about the branches are numerous bladders, used to capture prey ranging from the size of unicellular protozoans (such as *Euglena*), to mosquito larvae. Prey is slowly digested inside the bladders by enzymes. Common bladderwort produces small yellow flowers that protrude above the water. Stems of common bladderwort provide food and cover for fish.

Spiny Hornwort (*Ceratophyllum echinatum*: Common Names: coontail, hornwort. **Native**.): Spiny hornwort is a type of coontail that inhabits low-pH, soft water lakes. It has long trailing stems that lack true root systems. Its stiff leaves are arranged in whorls. Spiny hornwort leaves are forked 3-4 times and possess small spines. The fruit of spiny hornwort has numerous spines of various lengths around its margin, and a rough surface. Due to its tolerance for cool water, and low-light conditions, plus its ability to reproduce by fragmentation, spiny hornwort can reach nuisance levels. Waterfowl graze on its foliage and fruit, and its leaves host a myriad of aquatic insects.

Coontail (*Ceratophyllum demersum*. Common Names: coontail, hornwort. **Native**.): Coontail has long trailing stems that lack true roots, although it can become loosely anchored to sediment by modified leaves. The leaves are stiff, and arranged in whorls of 5-12 at each node. Each leaf is forked once or twice, and has teeth along the margins. The whorls of leaves are spaced closer at the end of the stem, creating a raccoon tail appearance. Coontail is tolerant of low light conditions, and since it is not rooted, it can drift into different depth zones. Coontail can also tolerate cool water and can over winter as a green plant under the ice. Typically, it reproduces via fragmentation. Bushy stems of coontail provide valuable habitat for invertebrates and fish (especially during winter), and the leaves are grazed on by waterfowl.

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.

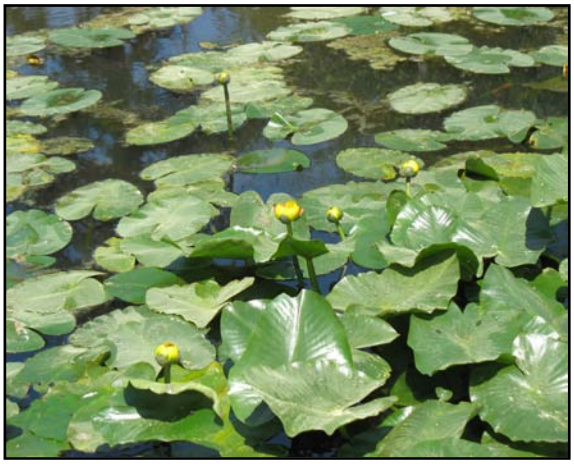


Southern Naiad (*Najas guadalupensis*. Common Names: Southern water nymph, bushy pondweed. **Native**.): Southern naiad is an annual aquatic plant that can form dense stands of rooted vegetation. Its ribbon-like leaves are dark-green to greenish-purple, and are wider and less pointed than slender naiad. 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.

Slender Naiad (*Najas flexilis*: Common Names: slender naiad, bushy pondweed. **Native**.): Slender naiad has fine-branched stems that can taper to lengths of one meter, originating from delicate rootstalks. Plant shape varies; sometimes compact and bushy, other times long and slender, depending on growing conditions. The leaves are short (1-4 cm long) and finely serrated, tapering to a point. It is found in a variety of habitats, and can colonize sandy or gravelly substrates. If conditions are ideal, it can reach nuisance densities. It is a true annual, and dies off in the fall, relying on seed dispersal to return the next year. It is an important food source for waterfowl.

White Water Lily (*Nymphaea* sp. Common Name: white water lily, fragrant water lily. **Native**.): White water lily leaf stalks emerge directly from a submerged fleshy rhizome. White water lilies have round floating leaves. Flowering occurs during the summer, and the flowers open during the day, and close during the night. Water lilies typically inhabit quiet water less than two meters deep, such as ponds, shallow lakes and slow-moving streams. The leaves offer shade and protection for fish, and the leaves, stems, and flowers are grazed upon by muskrats, beaver, and sometimes even deer. One subspecies of white water lily (*Nymphaea odorata ssp. tuberosa*) that occurs in New Jersey is listed as a plant species of concern. It carries a state rank of S2 (imperiled with only 6 to 20 occurrences), and is protected by the Highlands Water Protection and Planning Act.

Spatterdock (*Nuphar variegata*. Common Name: yellow pond lily, bullhead pond lily, spatterdock. **Native.**): Yellow water lily leaf stalks emerge directly from a submerged fleshy rhizome. Yellow water lilies have heart-shaped leaves with a prominent notch. Flowering occurs in the summer and, the flowers open during the day and close at night. Water lilies typically inhabit quiet water less than two meters deep, such as ponds, shallow lakes and slow-moving streams. The leaves offer shade and protection for



fish, and the leaves, stems, and flowers are grazed upon by muskrats, beaver, and sometimes, even deer.

Watershield (*Brasenia schreberi*. Common Names: common water shield, water target. **Native**.): Watershield is a floating-leaf aquatic plant similar to water lilies. Its stem and leaves are elastic, and are attached to a rooted rhizome that acts as an anchor and source of stored nutrients. The leaf stalks are attached to the middle of the leaf, creating a bull's eye effect, hence its name water target. The leaves are green on the upper surface, and purple underneath. Maroon to purple flowers peak above the water's surface on short, stout stalks. Watershield is usually coated with a clear gelatinous slime on the stem and underside of the leaves. Watershield prefers soft-water lakes and ponds in sediments containing decomposing organic matter. The whole plant is consumed by waterfowl, and the floating leaves provide shade and cover for fish.

Muskgrass (*Chara* sp. Common Names: muskgrass, stonewort, chara. **Native**.): Chara is actually a multi-branched algae that appears as a higher plant. It is simple in structure and has rhizoids instead of true roots. The branches of chara have ridges that are often encrusted with calcium carbonate. This grants the entire plant a "crusty" feel and appearance. The side branches develop in whorls that look like the spoke in a wheel. Chara is easily identified by a pungent, skunky odor. It prefers softer sediments, and can often be found in deeper water than other plants. As such, it's considered an early pioneer, the first species to colonize a disturbed lakebed.

Benthic and Floating Filamentous Algae: Filamentous algae is a chain or series of similar algae cells arranged in an end to end manner. Benthic filamentous algae is attached to a hard substrate, such as logs, rocks, a lake bottom, or even other aquatic plants. When growing in heavy densities, benthic filamentous algae can appear as brown or green mats of vegetation that can reach the surface. When large pieces break off the bottom substrate they become floating filamentous algae patches. Benthic filamentous algae can comprise an entire range of morphologies, but flagellated taxa are far less common.

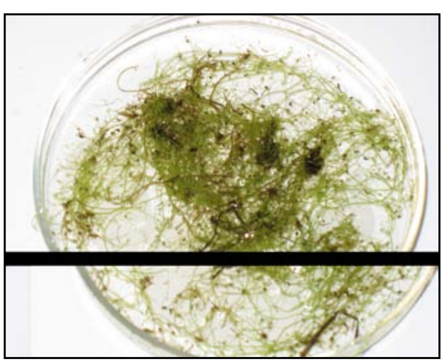
Robbins Pondweed (*Potamogeton robbinsii*. Common Name: Fern Pondweed. **Native**.). Robbins pondweed has robust stems that emerge from spreading rhizomes. The leaves are strongly ranked creating a fern-like appearance most clearly seen while still submerged. Its distinct closely-spaced fern-like leaves give it a unique appearance among the pondweeds of our region. Each leaf is firm and linear, with a base that wraps around the stem. At the stem it has ear-like lobes fused with a fibrous stipule. No floating leaves are produced. Robbins pondweed thrives in deeper water, and under some circumstances, it can over winter green. Robbins pondweed creates suitable invertebrate habitat, and cover for lie-in-wait predaceous fish, such as pickerel and pike. Robbin's pondweed is listed as Endangered in New Jersey. It carries a state rank of S2 (imperiled with only 6 to 20 occurrences) and is protected by the Highlands Water Protection and Planning Act, and the Pinelands Commission.

Low Milfoil (*Myriophyllum humile*. Common Name: Lowly water milfoil. **Native**.). Low milfoil is a submersed perennial with delicate stems usually less than one meter long. From these stems are mainly alternate short stalks, with 4 to 8 pairs of capillary-divided leaves. The minute fruit are round-backed and smooth, a distinguishing characteristic of this milfoil. Flowers are produced in axils of submersed and emerged leaves. Low milfoil inhabits shallow ponds and streams, preferring muddy banks after water recedes. The entire low milfoil plant is considered a low grade duck food, and beds of low milfoil provide cover and suitable habitat for small fish and aquatic 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.

Bass Weed (*Potamogeton amplifolius*. Common Names: Large-leaf Pondweed, Bass Weed, Musky Weed. **Native.**): Bass weed has robust stems that originate from black-scaled rhizomes. The submersed leaves of bass weed are among the broadest in the region. The submersed leaves are arched and slightly folded, attached to stems via stalks, and possess many (25-37 veins). Floating leaves are produced on long stalks (8-30 cm). Stipules are large, free and taper to a sharp point. Flowers, and later in the season fruit are densely packed onto a spike. Bass weed prefers soft sediments in water one to 4 meters deep. This plant is sensitive to increased turbidity and also has difficulty recovering from top-cutting, from such devices as boat propellers and aquatic plant harvesters. As its name implies the broad leaves of this submersed plant provides abundant shade, shelter and foraging opportunities for fish. The high number of nutlets produced per plant makes it an excellent waterfowl food source.

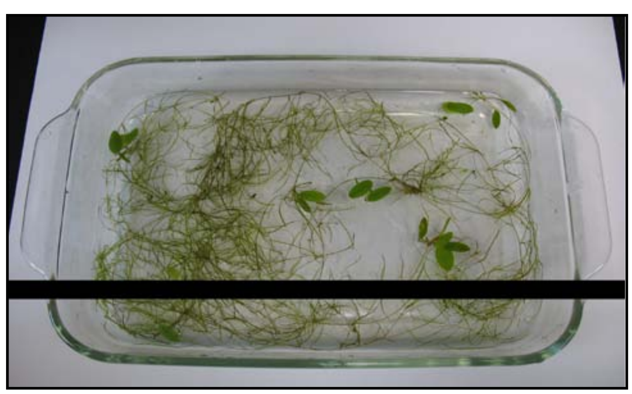
Water Primrose (*Ludwigia* sp. Common Name: Red ludwigia, water primrose. **Native.**): Ludwigia is a perennial plant that often grows along lake shorelines or in moist habitats. There is also a submersed form with only the tips exposed. Ludwigia usually is less than 50 cm in total length and has opposite elliptical leaves. It often takes on a reddish to purple hue, and has small green to red flowers. It commonly occurs in shallow waters, such as ditches, ponds streams and freshwater marshes. Submersed ludwigia offers some habitat for juvenile fish and aquatic invertebrates, but its leaves and fruit provides little nutritional value for grazing waterfowl.



Creeping Bladderwort (*Utricularia gibba*. Common Names: creeping bladderwort, humped bladderwort, cone-spur bladderwort. **Native**.). Creeping bladderwort is a small (usually less than 10 cm long), delicate, free-floating stem. It often forms tangled mats in quiet shallow waters, often associated with bogs, or stranded on soil. It is sometimes mistaken for algae. It has short side braches that fork once or twice, a defining characteristic. Small bladders, used to capture live prey, are situated on these side branches. Small yellow snap-dragon-like flowers are produce on a short stalk. Mats of creeping bladderwort offer limited cover and foraging opportunities for fish.

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.

Slender Riccia (*Riccia fluitans*. Common Names: Riccia. **Native**.): Slender riccia is a rootless liverwort with forked stems often intertwined like a jigsaw puzzle. Closer examination of the flattened thallus (the forked stem-like body), it appears to be a miniature set of antlers. Since it is rootless, it moves about its habitat based wind and/or water movement much like duckweed. Thus it is not dependant on sediment depth or type, although it requires high water nutrients to sustain its growth. Slender riccia is a non-flowering plant that reproduces via spores. Although it is consumed by waterfowl, it's probably just a byproduct of grazing as the waterfowl target duckweed species intermingled with it. The floating "footloose liverwort" does provide shade and shelter opportunities for fish.



Variable-leaf Pondweed (*Potamogeton diversifolius*. Common Names: Water-thread pondweed, variable-leaf pondweed, snailseed pondweed. **Native**.): Variable-leaf pondweed has freely-branched stems emerging from slender rhizomes. The submersed leaves are narrow and linear with one obvious midvein bordered by a row of hollow cells. The floating leaves are shaped like an ellipse, but are usually less than 4 cm long, Variable-leaf pondweed fruit spikes are produced in two distinct forms. It occurs in lakes, ponds, rivers and streams and prefers soft sediment and water less than 2 meters deep. Waterfowl graze on the fruit, and local fauna often graze on the stems and leaves.

Creeping Water Primrose (*Ludwigia peploides*). Common names: Floating water willow, floating primrose willow. **Invasive.** Creeping water primrose is native to South America, but has become introduced to many locations in the Northeast. The leaves are alternate can vary in shape from long and thin to round or egg-shape. They are dark green with a lighter green midrib. It has fleshy stems that can be emergent on mud flats, or a floating form. Bright yellow flowers with five petals are produced. Its creeping stems and hardy nature classifies it as an aggressive spreader. It typically occurs in slow moving streams, canals, and along the margins of marshes and lakes.

Stonewort (*Nitella* sp. Common Names: stonewort, nitella. **Native**.): Stonewort is actually a multi-branched algae that appears as a higher plant. It lacks conductive tissue and roots, using simple anchoring structures called rhizoids. Stem lengths can reach 0.5 meters, and leaves are arranged in whorls. Although similar in appearance to muskgrass, stonewort has smooth stems and branches, and lacks the distinct musky odor. Nitella inhabits soft sediments in the deeper water of lakes. It can be found as deep as 10 meters. Fish and waterfowl graze on Stonewort.

Water Moss (*Fontinalis* sp. Common Name: water moss. **Native**.): Water mosses are submerged mosses that are attached to rocks, trees, logs, and other hard substrates by false rootlets located at the base of their stems. The stems are dark-green to brown, and about one foot long. The leaves share a similar color as the stems, and are usually ovate with fine-toothed margins. Water moss is utilized by aquatic invertebrates, and as a breeding site for small fish. Water moss rarely reaches nuisance levels.

Brittle Naiad (*Najas minor*. Common Names: brittle water nymph, European naiad. **Exotic, Invasive**): Brittle naiad is a submersed annual that flowers in August to October. It resembles other naiads, except its leaves are highly toothed with 6-15 spinules on each side of the leaf, visible without the aid of magnification. The leaves are opposite, simple, thread-like, and usually lime-green in color, often with a "brittle" feel to them. Brittle naiad fruit are narrow, slightly curved, and marked with 10-18 longitudinal ribs, resembling a ladder. Brittle Naiad has been introduced from Europe in the early 1900's, and can be found in most of the northeastern states. Brittle naiad prefers sandy and gravel substrates, but can tolerate a wide range of bottom types. It's tolerant of turbid and eutrophic conditions. Waterfowl graze on the fruit.

Small Pondweed (*Potamogeton pusillus*. Common Name: Small Pondweed. **Native**.): Small pondweed has slender stems and a slight rhizome that branches repeatedly near the ends. Only submersed leaves are produced, and these are linear, attaching directly to the stem of the plant. The leaves have three veins and the mid-vein is usually bordered by several rows of lacunar (hollow) cells. There is usually a pair of raised glands at the base of the leaf attachment. Membranous stipules are wrapped around the stem in early growth, but as the plant ages, these tend to break down and becoming shredded in appearance and free. Flowers and fruits are produced in 1 to 4 whorls on a slender stalk. The fruit is plump with a smooth back and a short hooked beak. Small pondweed can tolerate turbid environments and inhabits shallow zones to a depth of 3 meters. Small pondweed is grazed upon by waterfowl, muskrat, deer, beaver, and even moose. Locally, it can be a very important link in the ecological balance of a lake system. It also provides suitable grazing opportunities and cover for numerous fish.

2016 Aquatic Macrophyte Management

The following sections provide a summary of aquatic macrophyte and algae control tasks conducted by SOLitude Lake Management in 2016.

Birchwood Lake

Date	Product Applied	Acres Treated	Target Species
5/24/16	Copper Sulfate	3.0	Filamentous Algae

	Clipper	0.5	Pondweeds/lilies
6/13/16	AquaNeat	1.0	Water lilies

At Birchwood Lake in 2016, two herbicide applications were conducted in the basin. The first application occurred in the early season (May 24th) targeting nuisance water lilies (white lilies, spatterdock and watershield) and assorted pondweeds, including the invasive curly-leaf pondweed in 0.5 acres. The target area was in and around the swim lanes and the product was applied via a backpack sprayer. For the fourth consecutive year, we utilized Clipper (a.i. Flumioxazin), which has once again provided suitable control of target plants throughout the season. Also on this date we had to apply copper sulfate to the water column to control nuisance filamentous algae in the swim lanes and accumulating along the dock structures. In mid-June, we applied a topical herbicide to 1.0 acre of the water lilies in the northern reach of the basin to open up the water column and improve water flow.

Crystal Lake			
Date	**Product Applied**	**Acres Treated**	**Target Species**
5/19/16	Copper Sulfate	1.0	Filamentous Algae
7/22/16	Schooner	0.56	Bassweed/pondweeds
8/18/16	Aquathol K	0.85	Bassweed/pondweeds
	Copper Sulfate	0.10	Filamentous Algae

At Crystal Lake in 2016, two algaecide applications were required, and two herbicide applications were required to control nuisance pondweed growth, notably bassweed. Bassweed is a desirable native aquatic plant, so our goal was to manage only nuisance areas of this plant. Copper sulfate was the algaecide product of choice and provided suitable control of filamentous algae control throughout this year. We targeted 1.0 acre of scattered filamentous algae patches in May, and then another 0.10 acre of filamentous growth scattered along the shoreline and among docks. In June we targeted 0.56 acres of bassweed around the island and the inlet area. In August we treated another 0.85 acres supporting nuisance bassweed growth around the docks in the basin.

Sunset Lake			
Date	**Product Applied**	**Acres Treated**	**Target Species**
4/28/16	Copper Sulfate	3.0	Filamentous Algae
7/27/16	Copper Sulfate	2.0	Filamentous Algae
8/18/16	Copper Sulfate	4.0	Filamentous Algae
	Reward	4.0	Naiad sp.

At Sunset Lake in 2016, one herbicide application (limited to 4.0 surface acres) was required to control nuisance naiad growth along the shorelines and a band in the central part of the basin. On three dates, copper sulfate was applied to the lake to control scattered patches of filamentous growth. Total acreage that required control for algae in 2016 was 9.0 acres. Treatment areas focused on areas in front of houses.

Olive Lake			
Date	**Product Applied**	**Acres Treated**	**Target Species**
7/14/16	Clipper	0.4	Watermeal
8/5/16	SeClear	0.4	Unicellular Algae

At Olive Lake in 2016, one herbicide application and one algaecide application was required. In July, watermeal (a tiny vascular non-rooted aquatic plant) covered approximately half the lake's surface, requiring a Clipper treatment. One unicellular algae treatment was required in early August targeted nuisance unicellular algae. A small patch of water lilies has taken root in this pond and should be encouraged.

Shadow Lake			
Date	**Product Applied**	**Acres Treated**	**Target Species**
4/19/16	SeClear	1.3	Filamentous Algae
7/14/16	Clipper	0.8	Watermeal/duckweeds
8/5/16	SeClear	1.3	Unicellular Algae

In previous seasons, this basin often required numerous algaecide applications to control nuisance algae growth. In 2016, Shadow Lake required two algaecide applications to maintain suitable conditions. In mid-March, a SeClear application was conducted to control 1.3 acres of filamentous algae. In early August, an algaecide application was required to target nuisance unicellular algae in the water column. A single herbicide application was conducted in mid-July targeting a one foot wide strip of watermeal/duckweed accumulating along some of the shorelines.

Cove Lake			
Date	**Product Applied**	**Acres Treated**	**Target Species**
5/24/16	Copper Sulfate	0.45	Filamentous Algae

At Cove Lake in 2015, no algaecide or herbicide applications were required to maintain suitable conditions. This year, a single algaecide application was needed in May to control nuisance filamentous algae. Copper sulfate was applied for this growth, which was scattered about the basin.

Grunden's Pond			
Date	**Product Applied**	**Acres Treated**	**Target Species**
5/4/16	Reward	1.0	Curly-leaf Pondweed
5/24/16	Copper Sulfate	0.86	Filamentous Algae
6/21/16	Clipper	0.5	Duckweeds
9/8/16	Clipper	1.25	Pondweeds

At Grunden's Pond in 2016, one algaecide application and three herbicide applications were required. The algaecide application occurred in late May and targeted 0.86 acres of nuisance filamentous algae growth. Also on May 24th, we conducted a Reward treatment targeting nuisance curly-leaf pondweed growth throughout the basin. In June, we conducted a Clipper treatment targeting 0.5 acres of duckweed and watermeal growth. In early September, nuisance pondweed growth required a 1.25 acre Clipper treatment.

Mountain Lake			
Date	**Product Applied**	**Acres Treated**	**Target Species**
4/16/16	Sonar AS	76.6	Eurasian Water Milfoil
	Copper Sulfate	9.6	Filamentous Algae
5/23/16	Copper Sulfate	13.0	Filamentous Algae
6/17/16	Copper Sulfate	3.7	Filamentous Algae
9/7/16	Copper Sulfate	38.3	Unicellular Algae

In 2016, Mountain Lake was treated with the systemic herbicide Sonar AS (liquid formulation) for the control of Eurasian water milfoil. This growth was tracked for several years before deciding to apply a systemic product lake-wide. FastTest sampling revealed suitable Sonar concentrations for a minimum of 60 days, so a supplemental "bump" application was not required. This application also provided early season curly-leaf pondweed control. In August, nuisance density bassweed required touch up treatment, but was not conducted due to low DO (ranged from 3.5 mg/L to 4.0 mg/L). Four algaecide applications were required in 2016, totaling 64.6 acres. This is high for this basin, but likely was influenced by the weather (hot and reduced rainfall) and the basin-wide systemic herbicide application. In March we targeted 9.6 acres of filamentous growth on the plants. In late May, we targeted 13.0 acres of scattered filamentous growth. In June, we targeted 3.7 acres along the northern shoreline and the southern coves. In September, we needed to conduct a half lake treatment for unicellular algae control. Copper sulfate was the product of choice for algaecide applications this year.

Wildwood Lake			
Date	**Product Applied**	**Acres Treated**	**Target Species**
4/20/16	Reward	5.0	Curly-leaf Pondweed
4/28/16	Alum	15.7	Nutrient Inactivation
6/23/16	Reward	4.0	Leafy Pondweed
	Copper Sulfate	4.0	Filamentous Algae
7/19/16	Reward	7.85	Naiad sp.
8/3/16	Alum	15.7	Nutrient Inactivation
Canal			
6/21/16	Reward	0.4	Coontail
8/25/16	Clipper	1.0	Fanwort

In 2016, Wildwood Lake required numerous management efforts to maintain suitable conditions throughout the season, which is typical for this shallow-water basin which traditionally is quite productive.

Filamentous algae was targeted on one date in 2016. This was a 4.0 acre application in late June to target scattered growth of filamentous algae. Three herbicide applications were required in the main basin in 2016. This included a 5.0 acre early season curly-leaf pondweed application, a late June 4.0 acre treatment targeting leafy pondweed, and a July application targeting naiad growth. Naiad growth was at nuisance abundance late in the season (September to October), and the plan is to more aggressively manage it in 2017.

A typical lake management practice has been the use of Alum early in the season and late in the season at Wildwood Lake. The early season application is typically conducted in late April, which is typical. The late season Alum application was conducted on August 3rd.

In 2016, the canal between Wildwood Lake and Mountain Lake was treated twice for nuisance plant growth. The first treatment occurred in late June to target nuisance coontail growth. The second was a rapid response treatment to attempt eradication of fanwort, an aggressive exotic submersed plant not documented at Mountain Lakes previously. Silt barriers were installed at either end of the canal in an attempt to limit potential fragment spread. Follow-up surveys of the canal did not locate any fanwort, but three rooted fanwort plants were removed from the main basin (Wildwood Lake) in October. The canal and Wildwood Lake will require additional survey effort in 2017 to monitor any re-growth of fanwort.

Water Quality Monitoring Program

In 2016, the water quality monitoring program consisted of weekly surveys, phytoplankton analysis, and water chemistry analysis. Phytoplankton samples were examined bi-weekly for Birchwood Lake, Crystal Lake, Sunset Lake, Shadow Lake, Mountain Lake and Wildwood Lake from June through August. Phytoplankton samples for Olive Pond, Cove Pond and Grunden's Pond were examined monthly from June through August. Phytoplankton data sheets for these examinations are in the Appendix of this report. Water chemistry sampling occurred on three dates: June 6, July 11, and August 15. The water chemistry data sheets from a NJ certified laboratory are located in the Appendix of this report.

Below is a brief description of the different water quality parameters measured at Mountain Lakes in 2016, and a primer on phytoplankton. Following these descriptions are brief summaries of the 2016 results for each lake in question, including a table of this season's results, and comments regarding the previous season. We anticipate a similar water quality program in 2017.

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.

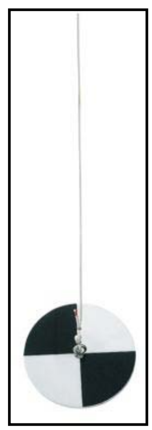
Temperature preferences vary among aquatic biota. Since water temperature typically varies between 5 ºC and 30 ºC during the season, most aquatic biota can flourish under this wide range of temperatures. Of more concern is thermal shock, which occurs when temperature rapidly changes in a short amount 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 (warmer water holds less dissolved oxygen), low atmospheric pressure (such as higher altitude) decreases the solubility of oxygen, mineral content of the water can reduce the water's dissolved oxygen capacity, and water mixing (via wind, flow over rocks, or thermal upwelling) increases dissolved oxygen in the 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 0.0 mg/L to 20.0 mg/L. To support diverse aquatic biota, 5.0-6.0 mg/L is minimally required, but 9.0-10.0 mg/L is an indicator of better overall water quality. A dissolved oxygen below 4.0 mg/L is stressful to most aquatic organisms, especially fish.

Water Clarity



Water clarity (sometimes referred to as 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.

Alkalinity

Alkalinity is the measure of the water's capacity to neutralize acids. A higher alkalinity can buffer the water against rapid pH changes, which in turn prevents undue stress on aquatic biota due to fluctuating pH levels. The alkalinity of a lake is primarily a function of the watersheds soil and rock composition. Limestone, dolomite and calcite are all a source of alkalinity. High levels of precipitation in a short amount of time can decrease the waters alkalinity. A typical freshwater lake has an alkalinity of 20-200 mg/L. A lake with a low alkalinity typically also has a low pH, which can limit the diversity of aquatic biota.

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 Phosphorus levels. A nitrate level greater than 0.3 mg/L can promote excessive growth of aquatic plants and algae.

Total Phosphorus

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

A total phosphorus 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.

Turbidity

Turbidity is the measurement of lack of water clarity, and is measured in NTU. Suspended solids in the water column cause an increase in turbidity. Therefore, the lower the turbidity measurement, the clearer the water is. The leading sources of turbidity include soil erosion, waste discharge, urban runoff, flooding, dredging operations, increased flow rates, or algae blooms. An overabundance of bottom feeding fish, such as carp, can also increase turbidity due to constant grazing and disturbing of fine bottom sediments. A turbidity of 25 NTU or less is desirable for a lake. Ideal trout waters have a turbidity of 10 NTU or less, but most aquatic biota can be sustained in water with a turbidity of 50 NTU or less. Although a turbidity level of 5.0 NTU or greater is generally considered visible to the observer, there is some industry discussion on value of turbidity measurements in relation to aesthetics

Turbidity can affect a lake in many ways. These include temperature increases (as suspended particles absorb more sunlight), reduced light penetration (which reduces aquatic plant habitat in the littoral zone), and negative fish impacts. Negative impacts on fish population include suspended solids clogging and damaging fish gills, reduced clarity affecting the ability of predatory fish to locate food by sight, and inhibit proper egg and larval development.

A Phytoplankton Primer

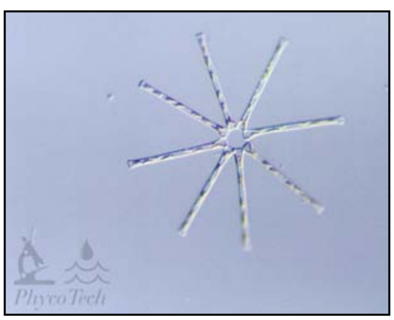
Lakes typically contain three broad categories of phytoplankton (also sometimes referred to as algae). These include filamentous phytoplankton, macroscopic multi-branched phytoplankton (which appear similar to submersed plants), and unicellular phytoplankton. Each category shall be discussed in turn, although the results of the 2013 sampling will focus on the unicellular phytoplankton population.

Filamentous phytoplankton are typically macroscopic (that is, visible with the naked eye), composed of long chains of cells that are attached to a substrate, typically the lake bottom, submersed or emergent vegetation, or rocks. This is called benthic filamentous algae (BFA), and rampant growth can become visible at the surface. As pieces of benthic filamentous algae break apart, it often floats on the surface as dense unsightly mats called floating filamentous algae (FFA). Typically, genera of green algae or blue-green algae develop into nuisance filamentous mats. Abundant nuisance growth of filamentous phytoplankton creates numerous negative impacts to a lake. These can include a decrease in aesthetics, a decrease in recreational uses, increased fishing frustration, and water quality degradation.

Macroscopic multi-branched phytoplankton appears to be submersed plants, especially when viewed in the water column. Physical examination reveals simple structures, no conductive tissue, and a lack of roots (instead having simplified rhizoids). Although typically only reaching heights of a few inches, under ideal conditions, this type of phytoplankton can reach lengths of several feet, and create a dense carpet on the bottom of a lake. Therefore, it typically does not reach nuisance levels in a lake, save for high use areas such as beaches and other popular swim areas. Since this phytoplankton occupies a similar ecological niche as submersed plants, it's often included in detailed and visual aquatic plant surveys. It provides numerous benefits to a lake system, including sediment stabilization, acting as a nutrient sink, providing invertebrate and fish shelter and habitat, and is one of the first to re-colonize a disturbed area. In the Northeast, muskgrass (*Chara* sp.) and stonewort (*Nitella* sp.) are two of the most common macroscopic multi-branched phytoplankton.

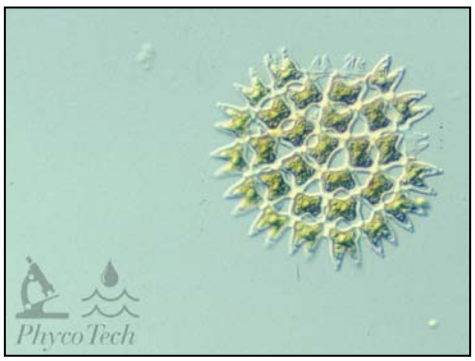
Unicellular phytoplankton are typically microscopic, and consist of individual cells or colonies of cells suspended in the water column. At high enough densities (often called a bloom), they can impart a green or brown (and sometimes, even red) tint to the water column. Unicellular phytoplankton belongs to several taxonomic groups with density and diversity of these groups often varying due to seasonality. When unicellular phytoplankton density becomes elevated it can reduce water clarity (giving the water a "pea soup" appearance), and impart undesirable odors. Usually blue-green algae are responsible for these odors, but other groups or extremely elevated densities can impart them as well. In addition to decreased aesthetics, unicellular phytoplankton blooms can cause degradation of water quality, increase the water temperature (turbid water warms faster than clear water), and can possibly produce a variety of toxins (in the case of blue-green algae), depending on the type of genera present and environmental conditions. Numerous groups of unicellular phytoplankton are common in the Northeast, including diatoms, golden algae, green algae, blue-green algae, euglenoids and dinoflagellates.

Phytoplankton Group Summary



Diatoms are ubiquitous as a group, and often possess a rigid silica shell with ornate cell wall markings or etchings. The silica shells settle to the bottom substrate after they die, and under ideal conditions can become stratified. Limnologists can then study historical (and possibly even ancient) population characteristics of diatoms. Some are round and cylindrical (centric) in shape, while others are long and wing-shaped (pennales). They are usually brown in color, and reach maximum abundance in colder or acidic water. Therefore, they tend to dominate in winter and early spring. Common diatoms in the Northeast include *Fragilaria, Cyclotella, Navicula*, and *Asterionella* (pictured).

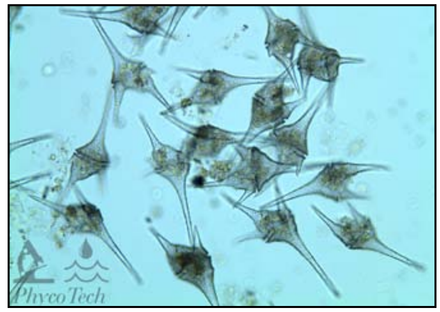
Golden Algae are typically yellow or light brown in color. Cell size is usually small oval shaped with a partially empty area, but several genera create colonies of smaller cells. Most have two flagella, and some type of scales or a rigid coating that grants it a fuzzy appearance. However, a few filamentous forms are possible as well. They typically prefer cooler water, so they dominate in the late fall, winter, or early spring. They also tend to bloom at deeper (cooler) depths. They are common in low nutrient water, and numerous forms produce taste and odor compounds. Common golden algae in the Northeast include *Dinobryon* (pictured), *Mallomonas*, and *Synura*.



Green Algae are a very diverse group of unicellular phytoplankton. There is tremendous variability in this group which varies from family to family and sometimes even genus to genus. There are flagellated single cells, multi-cell colonies (some motile), filamentous forms and attached forms, typically with distinct cell shapes light green in color. Some prefer acidic waters, and others highly eutrophic (sewage) conditions. A green algae bloom usually occurs in water with high nitrogen levels. Green algae typically dominate in mid to late summer in the Northeast. Common genera include *Chlorella*, *Scenedesmus*, *Spirogyra* and *Pediastrum* (pictured).

Blue-green algae are actually photosynthetic bacteria. Therefore, they tend to be small, simple in structure and lacking interior cell details. Blue-green algae are typically encased in a mucilaginous outer layer. Some genera are adorned with heterocysts, swollen structures capable of fixing nitrogen, a competitive advantage. These types tend to bloom in nitrogen-poor or eutrophic systems. Yet, blue-green algae are tolerant of a wide variety of water chemistries, and boast many oligotrophic forms as well. Blue-green algae often have gas vesicles which provide increased buoyancy another competitive advantage over other groups of phytoplankton, due to their propensity to shade out others by blooming at the surface. Numerous blue-green algae are documented taste and odor (T&O) producers, and under certain environmental conditions and high enough densities, can produce toxins dangerous to fish, livestock, and possibly humans. Blue-green algae typically dominate a lake system in late summer to early fall. Common blue-green algae that occur in the Northeast include *Anabaena* (pictured), *Aphanizomenon*, *Microcystis* and *Coelosphaerium.*

Euglenoids are typically motile with 0 to 3 (typically 2) flagella, one of which is longer. Euglenoids has plasticity of shape, and usually are grass green in color (although sometime they are clear or even red). Most forms have a distinct red “eyespot. They are often associated with high organic content water, and eutrophic conditions. Common euglenoids that occur in the Northeast include *Euglena* (pictured), *Phacus,* and *Trachelomonas*.



Dinoflagellates are very common in marine environments, in which they often cause toxic blooms. However, toxin production in freshwater genera is very rare. Dinoflagellates are typically single ovoid to spherical cells, but large compared to phytoplankton from other groups. They usually possess two flagella (one wrapped around the middle of the cell) which grant them rotation while they move through the water column. Cellulose plates (armored dinoflagellates) are more common, but genera without cellulose plates (naked dinoflagellates) also occur. They generally prefer organic-rich or acidic waters, and can impart a coffee-like brown tint to the water at high enough densities. Common dinoflagellates in the Northeast include *Ceratium* (pictured) and *Peridinium*.

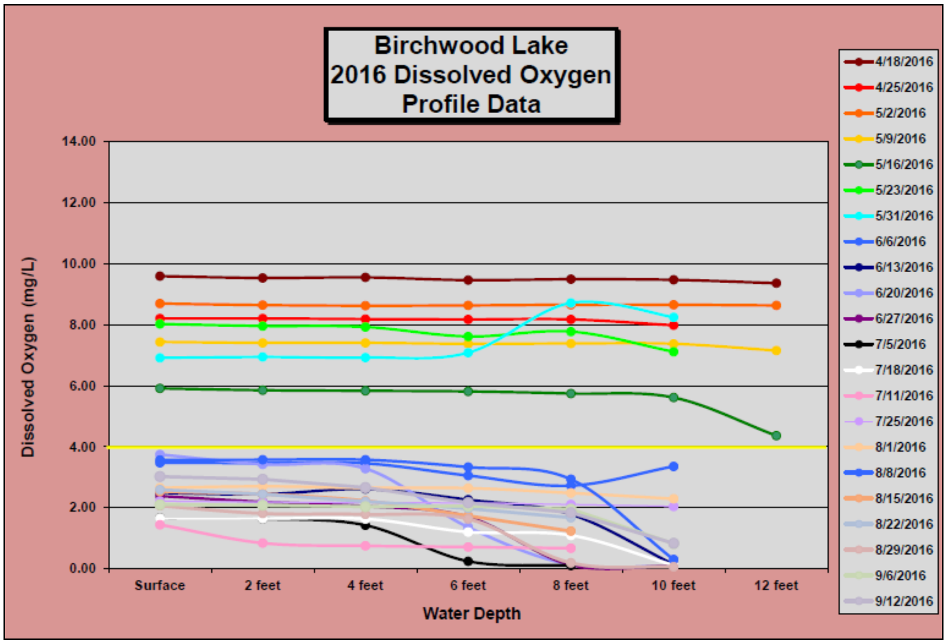
2016 Water Quality Results for Mountain Lakes

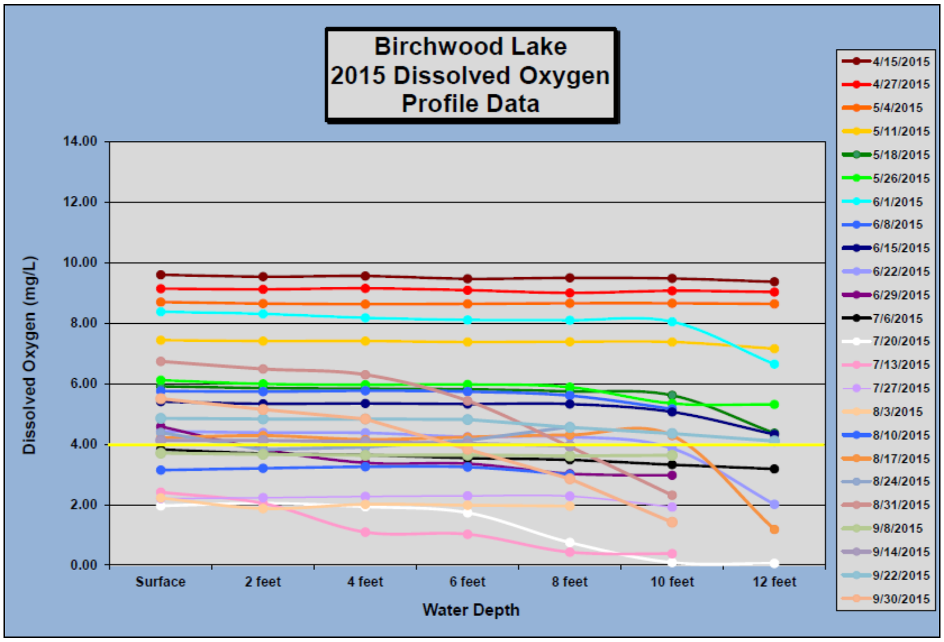
Birchwood Lake

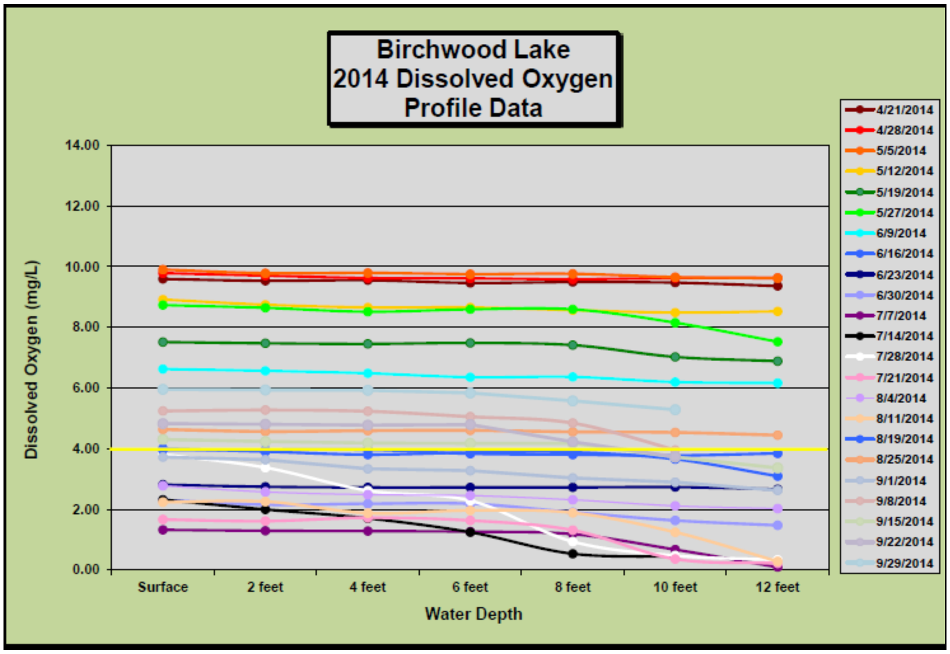
Birchwood Lake	units	6/6/16	7/11/16	8/15/16
Temperature	ºC	22.5	23.54	26.9
Dissolved Oxygen	mg/L	**3.47**	**1.44**	**2.53**
Alkalinity	mg/L	40	62	42
pH	SU	6.5	6.5	6.5
Nitrate	mg/L	<0.2	<0.2	<0.2
Total Phosphorus	mg/L	**0.05**	0.03	0.02
Turbidity	NTU	1.8	<1.0	1.6
Water Clarity	feet	7.0 est.	7.0 est.	6.0

In 2016, water temperature readings were seasonally appropriate in Birchwood Lake, ranging from 22.5 °C in June to 23.54 °C in July, and finally 26.9 °C in August. Surface water temperatures were elevated compared to data collected in 2015. Despite the addition of a second compressor a few seasons ago, dissolved oxygen values throughout the water column continue to be depressed, especially on weeks later than early June. This pattern has been observed over the past several years. There has been quite a bit of discussion on this topic in 2016, and there is the potential to see further upgrades to the aeration system in this basin and re-purposing the existing units for other basins.

On the next page is a graph depicting all of the dissolved oxygen profiles conducted at Birchwood Lake in 2016, followed by graphs of the 2008 through 2015 profile data. The 2015 data was similar to data collected in previous years. Early season dissolved oxygen is suitable, then by late June, surface dissolved oxygen is about 4.0 mg/L or less, and possibly becomes limiting for aquatic biota. Still, the depressed oxygen values have been puzzling to us for several years, and this year we solicited an aeration specialist to examine the data we have collected and provide specifications for unit upgrades.






Birchwood Lake
2014 Dissolved Oxygen
Profile Data
Dissolved Oxygen (mg/L)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Surface
2 feet
4 feet
6 feet
8 feet
10 feet
12 feet
Water Depth
4/21/2014
4/28/2014
5/5/2014
5/12/2014
5/19/2014
5/27/2014
6/9/2014
6/16/2014
6/23/2014
6/30/2014
7/7/2014
7/14/2014
7/28/2014
7/21/2014
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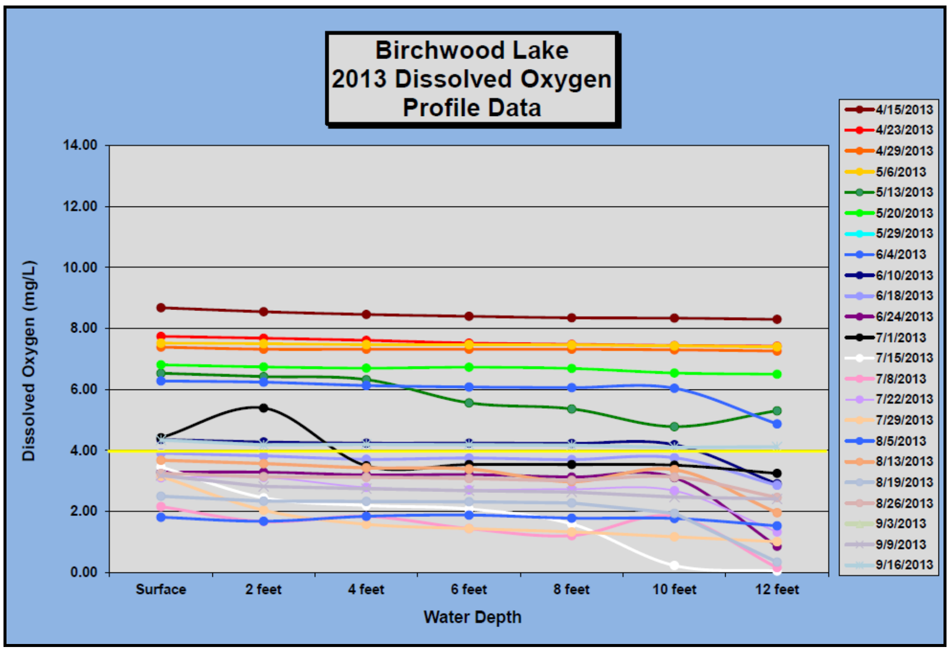
9/15/2014
9/22/2014
9/29/2014


Birchwood Lake
2013 Dissolved Oxygen
Profile Data
Dissolved Oxygen (mg/L)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Surface
2 feet
4 feet
6 feet
8 feet
10 feet
12 feet
Water Depth
4/15/2013
4/23/2013
4/29/2013
5/6/2013
5/13/2013
5/20/2013
5/29/2013
6/4/2013
6/10/2013
6/18/2013
6/24/2013
7/1/2013
7/15/2013
7/8/2013
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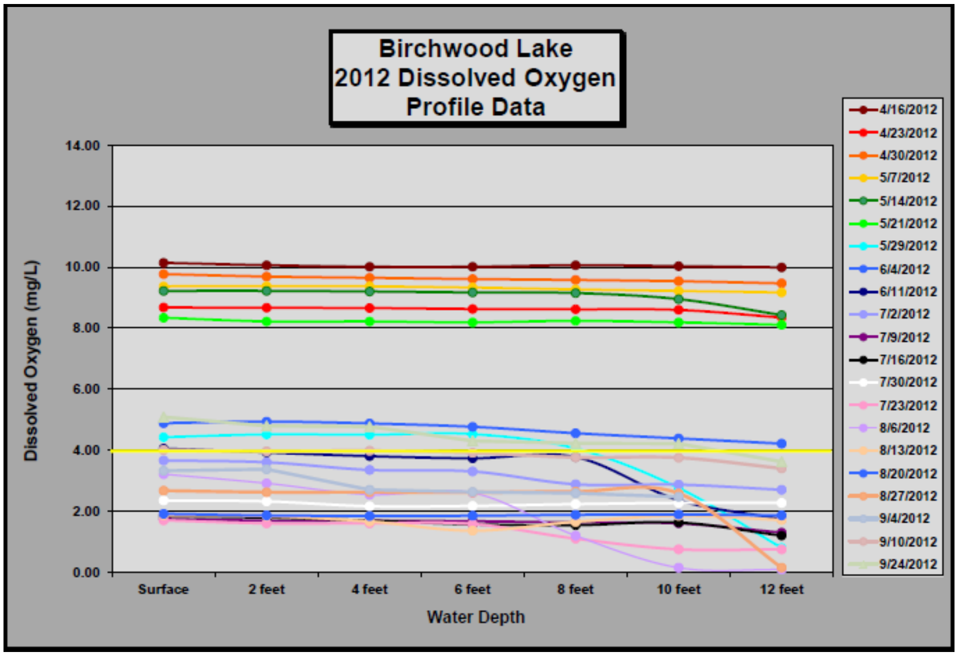
9/9/2013
9/16/2013


Birchwood Lake
2012 Dissolved Oxygen
Profile Data
Dissolved Oxygen (mg/L)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Surface
2 feet
4 feet
6 feet
8 feet
10 feet
12 feet
Water Depth
4/16/2012
4/23/2012
4/30/2012
5/7/2012
5/14/2012
5/21/2012
5/29/2012
6/4/2012
6/11/2012
7/2/2012
7/9/2012
7/16/2012
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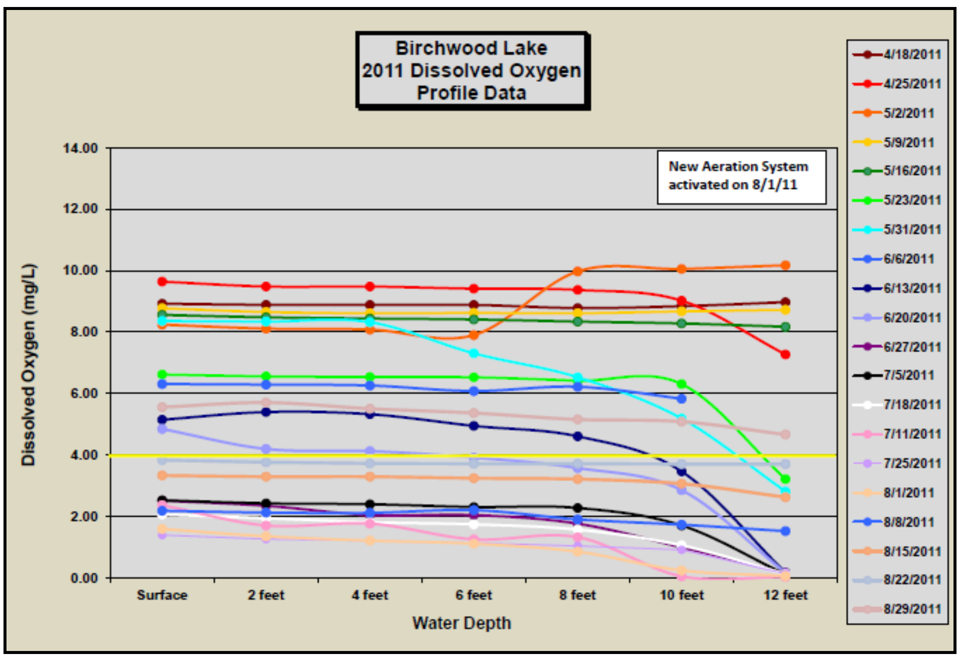
9/10/2012
9/24/2012


Birchwood Lake
2011 Dissolved Oxygen
Profile Data
New Aeration System
activated on 8/1/11
Dissolved Oxygen (mg/L)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Surface
2 feet
4 feet
6 feet
8 feet
10 feet
12 feet
Water Depth
4/18/2011
4/25/2011
5/2/2011
5/9/2011
5/16/2011
5/23/2011
5/31/2011
6/6/2011
6/13/2011
6/20/2011
6/27/2011
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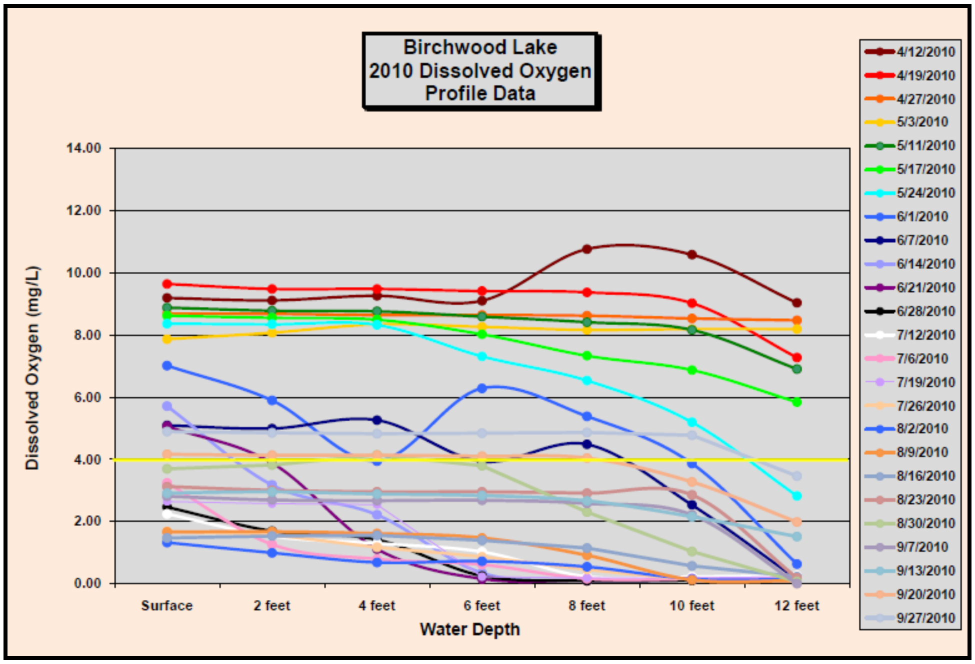
8/22/2011
8/29/2011


Birchwood Lake
2010 Dissolved Oxygen
Profile Data
Dissolved Oxygen (mg/L)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Surface
2 feet
4 feet
6 feet
8 feet
10 feet
12 feet
Water Depth
4/12/2010
4/19/2010
4/27/2010
5/3/2010
5/11/2010
5/17/2010
5/24/2010
6/1/2010
6/7/2010
6/14/2010
6/21/2010
6/28/2010
7/12/2010
7/6/2010
7/19/2010
7/26/2010
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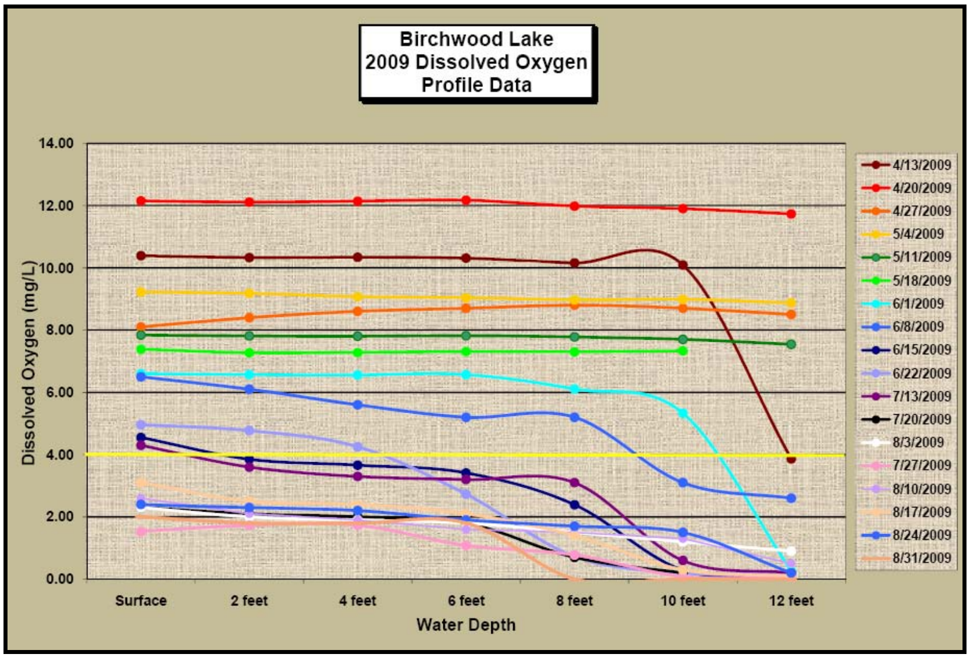
9/20/2010
9/27/2010


Birchwood Lake
2009 Dissolved Oxygen
Profile Data
Dissolved Oxygen (mg/L)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Surface
2 feet
4 feet
6 feet
8 feet
10 feet
12 feet
Water Depth
4/13/2009
4/20/2009
4/27/2009
5/4/2009
5/11/2009
5/18/2009
6/1/2009
6/8/2009
6/15/2009
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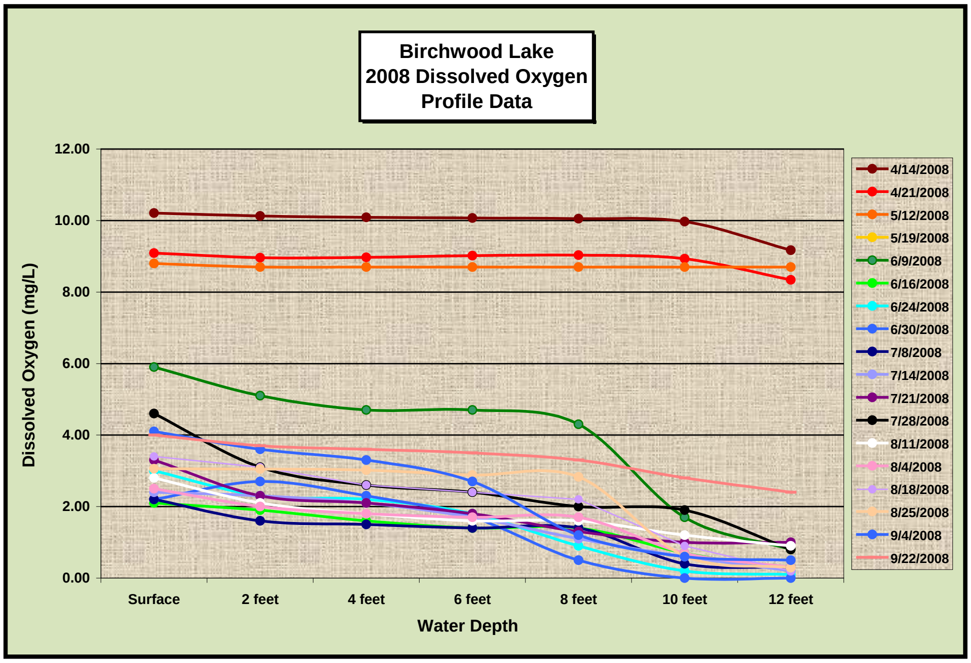
8/24/2009
8/31/2009



The alkalinity of Birchwood Lake continues to be the lowest in the Mountain Lakes chain. In 2016, it ranged from 40 mg/L to 62 mg/L, another slight increase when compared to historic measurements in this basin. The annual average alkalinity was calculated at 47.3 mg/L, slightly higher than the 2015 annual average, and continuing the increasing trend. We have observed increase alkalinity at several other basins in the borough, so this could be a reflection of watershed changes. Birchwood Lake also traditionally has the lowest pH (slightly acidic) of all the Mountain Lakes. In 2016, the pH was 6.50 on all dates, the exact same as in 2015. This is suitable when compared to historical pH values in this basin. Nitrate levels were undetected throughout the three sampling events in 2016, continuing a nine year trend in this basin. The total phosphorus in Birchwood Lake was elevated in June but suitable in July and August. It's likely the elevated total phosphorus was the cause for excessive algal growth, the first seen in eight years in the basin. Turbidity at Birchwood Lake was consistent all season long, at or below 1.8 NTU on all dates which is well within acceptable values. Water clarity ranged from 6.0 feet to 7.0 feet, which is typical for this basin.

Birchwood Lake	6/6/16	6/20/16	7/5/16	7/18/16	8/8/16	8/22/16
Diatoms	20.0%	9.1%			**52.9%**	9.1%
Golden Algae	**80.0%**	18.1%		10.0%		**36.4%**
Green Algae		**63.4%**	28.6%	**90.0%**	47.1%	27.3%
Blue-green Algae			**71.4%**			9.1%
Protozoa						
Euglenoids		9.1%				18.1%
Dinoflagellates						
Total Phytoplankton	**100**	**110**	**140**	**100**	**170**	**110**

In 2016, phytoplankton assemblages at Birchwood Lake were light and favorable on all four sampling dates, typically occurring at less than 170 organisms per mL. Group dominance in this basin varied throughout the season. Golden algae (two dates) dominated early and late, while green algae (two dates) dominated in mid-season. In early July, despite low overall counts, blue-green algae dominated the assemblage. And diatoms dominated in early August, which is somewhat unusual.

Crystal Lake

Crystal Lake	units	6/6/16	7/11/16	8/8/16
Temperature	ºC	24.4	25.23	**29.5**
Dissolved Oxygen	mg/L	8.54	7.59	8.20
Alkalinity	mg/L	40	44	46
pH	SU	7.5	7.0	**8.75**
Nitrate	mg/L	<0.2	<0.2	<0.2
Total Phosphorus	mg/L	0.03	0.02	**0.04**
Turbidity	NTU	1.0	1.1	2.4
Water Clarity	feet	6.0 est.	7.0 est.	6.0 est.

In 2016, surface water temperature and dissolved oxygen varied throughout the season. Temperature was elevated in August. Dissolved oxygen values were suitable on all three dates this season, ranging from 7.59 mg/L to 8.54 mg/L. Alkalinity ranged from 40 mg/L to 46 mg/L, which is typical for this basin and similar to last season. The tight range (6.0 mg/L over all three dates) continues to be outstanding and we did not observe any abnormal increases here versus other basins this season. The pH of Crystal Lake ranged from 7.0 (in July) to 8.75 in August. The August value was likely influenced by excessive algal production in the basin. Water clarity was considered moderate to excellent throughout much of the season this year. It was estimated on all dates, ranging from 6.0 feet to 7.0 feet. Nitrate was undetected on all three sampling dates at Crystal Lake in 2015, similar to the previous six years. Total phosphorus was suitable on early in the season (June and July), but was slightly elevated in August. This coincided with the elevated temperatures and pH. Turbidity values were suitable all season, ranging from 1.0 NTU to 2.4 NTU. The 2.4 NTU occurred in August.

Crystal Lake	6/6/16	6/20/16	7/5/16	7/18/16	8/8/16	8/22/16
Diatoms		26.7%	4.5%	**68.2%**	**59.1%**	
Golden Algae	26.7%		4.5%	9.1%		4.3%
Green Algae	16.7%	**46.7%**	**86.4%**	18.1%	31.9%	**82.6%**
Blue-green Algae	**50.0%**		4.5%		9.1%	13.0%
Protozoa						
Euglenoids						
Dinoflagellates	6.7%	26.7%		4.5%		
Total Phytoplankton	**300**	**150**	**220**	**220**	**220**	**230**

In 2016, phytoplankton abundance at Crystal Lake was considered light and favorable on all six sampling dates, similar to 2016. This year, phytoplankton abundance ranged from 150 organisms per mL to 300 organisms per mL. On most dates overall phytoplankton abundance was less than 220 organisms per mL. On three of the sampling dates, green algae were the dominant group observed, ranging from 46.7% to 86.4%. Blue-green algae dominated early in the season, but it did not persist and overall counts were low. In July and August, diatoms were the dominant group observed although this I somewhat unusual. Diatoms typically dominate cooler waters of spring or fall. Golden algae were observed on four dates, although typically at low overall amounts.

Sunset Lake

Sunset Lake	units	6/6/16	7/11/16	8/8/16
Temperature	ºC	25.1	25.37	**29.5**
Dissolved Oxygen	mg/L	6.72	8.60	6.97
Alkalinity	mg/L	40	40	40
pH	SU	7.0	7.23	9.0
Nitrate	mg/L	<0.2	<0.2	<0.2
Total Phosphorus	mg/L	**0.05**	**0.04**	0.03
Turbidity	NTU	1.8	1.3	3.4
Water Clarity	feet	6.0 est.	4.0 est.	8.0 est.

In 2016, surface water temperatures varied throughout the season. In August the surface water temperature was elevated at 29.5 °C. Dissolved oxygen measurements all fell within acceptable seasonal ranges at Sunset Lake in 2016, ranging from 6.72 mg/L to 8.60 mg/L. Alkalinity results in 2016 displayed no variation, measured at 40 mg/Lon all dates. This seasonal average for 2016 was similar to results for 2015. In 2016, the pH ranged from 7.0 (in June) to 9.0 in August. Although the pH was suitable in June and July, the august value was elevated and likely influenced by excessive growth in the basin. Nitrate was again undetected on all three sampling dates this season, a similar trend observed the last several seasons in this basin. Total phosphorus decreased throughout the three dates. It was elevated in June and July, but the August measurement was suitable. Turbidity levels this year were suitable on all three dates, ranging 1.3 NTU to 3.4 NTU in August. Water clarity was suitable in June and August, but was depressed in July. Based on the phytoplankton counts, unicellular algae was likely not a cause for the decreased water clarity.

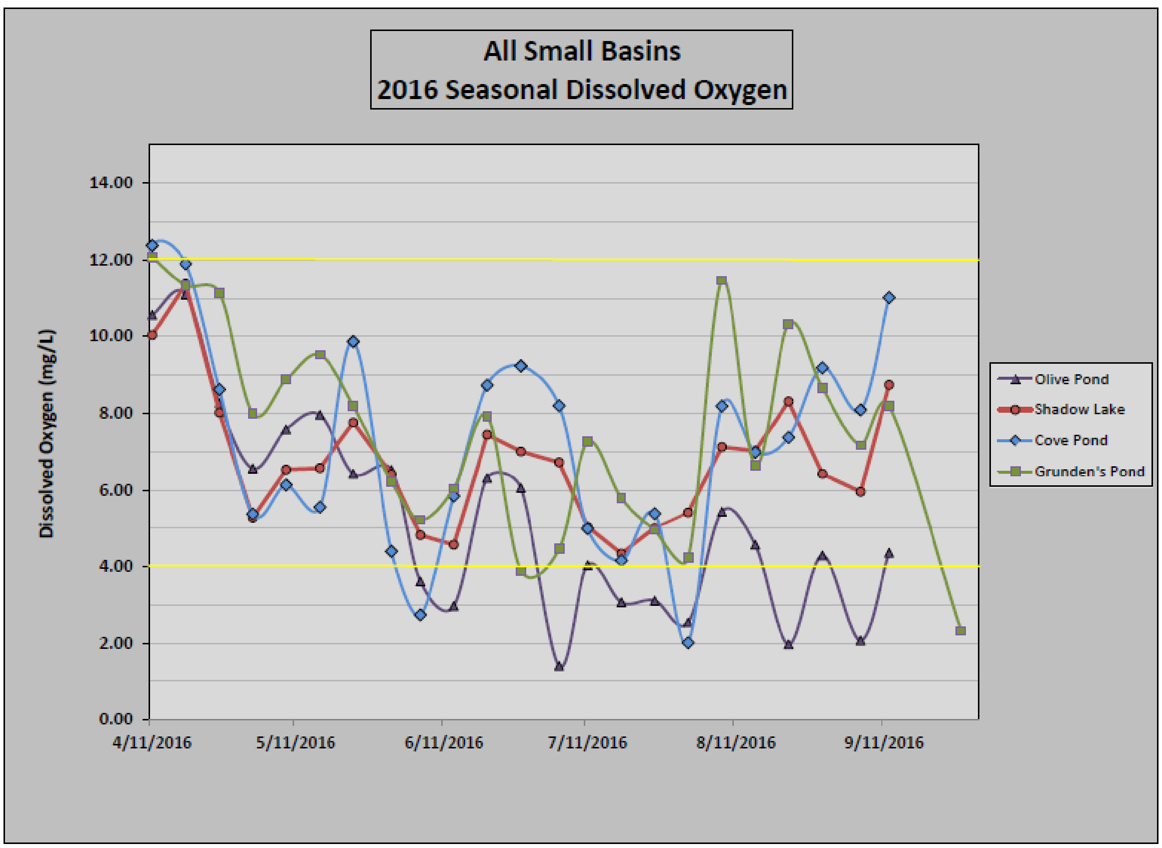
Sunset Lake	6/6/16	6/20/16	7/5/16	7/18/16	8/8/16	8/22/16
Diatoms				15.8%		
Golden Algae	7.1%		11.1%	21.1%		6.9%
Green Algae	**78.6%**	42.1%	**88.9%**	**47.3%**	17.9%	**89.7%**
Blue-green Algae		**57.9%**		15.8%	**82.1%**	3.4%
Protozoa						
Euglenoids						
Dinoflagellates	14.2%					
Total Phytoplankton	**140**	**190**	**90**	**190**	**670**	**290**

Phytoplankton abundance was suitable on all six of the sampling dates in 2016, similar to results observed in upstream basins and similar to last season. Sunset Lake and Crystal Lake seem to have similar phytoplankton communities for the past few seasons. On all dates, the abundance was considered light with counts less than 300 organisms per mL on all dates save one. As is typical for this site, on most dates (four) this season, green algae were the dominant group in the assemblage. But in 2016, nuisance blue-green algae dominated on two dates (June and August). The August counts required an algaecide application to control. Very few diatoms were observed in samples this year, although golden algae were observed on four dates.

Olive Lake

Olive Lake	units	6/6/16	7/11/16	8/8/16
Temperature	ºC	22.7	25.37	28.5
Dissolved Oxygen	mg/L	**3.61**	4.04	4.57
Alkalinity	mg/L	60	40	60
pH	SU	7.0	7.0	7.5
Nitrate	mg/L	<0.2	<0.2	<0.2
Total Phosphorus	mg/L	**0.110**	**0.130**	**0.09**
Turbidity	NTU	2.8	2.6	**6.1**
Water Clarity	feet	4.0 est.	3.0 est.	3.5 est.

In 2016, surface water temperature measurements varied on all dates yet fell within acceptable seasonal ranges at Olive Lake. Dissolved oxygen values in Olive Lake were depressed but adequate in July and August in this basin. However, June's dissolved oxygen was less than 4.0 mg/L, which is getting close to the threshold. The dissolved oxygen for this basin is depicted on the graph, below in purple. This depicts that dissolved oxygen was lower than the acceptable threshold (4.0 mg/L) on seven dates and close to the threshold on three additional dates. This condition, especially if it persists, could be stressful to aquatic biota in the basin, and these depressed values have been occasionally observed at this site in previous seasons. This basin could benefit from the addition of aeration, and should be a top priority of all the small basins.



The alkalinity at Olive Lake ranged from 40 mg/L to 60 mg/L, for a 2016 annual average of 53.3 mg/L. This increase in alkalinity is similar to previous data on record. The pH at Olive Lake was suitable on all three dates, ranging from 7.0 (two dates) to 7.5. Nitrate was undetected throughout the 2015 season, and this marks the ninth consecutive year this parameter has been undetected during the growing season. Similar to previous seasons, the total phosphorus was elevated throughout 2015, although slightly reduced in June and July as compared to previous seasons. It ranged from 0.11 mg/L in June, and then increased throughout in July to 0.13 mg/L, and in August it decreased to 0.09 mg/L. This values (although not the seasonal trend) was similar to data collected in 2015. Despite this excess of nutrients available during the peak of the growing season, only a slight increase in phytoplankton productivity was observed in this basin. Turbidity was suitable for this small basin early in the season (>3.0 NTU). But in August, it increased to 6.1 NTU, which is slightly elevated. If this value persists over time, it could negatively impact biota diversity.

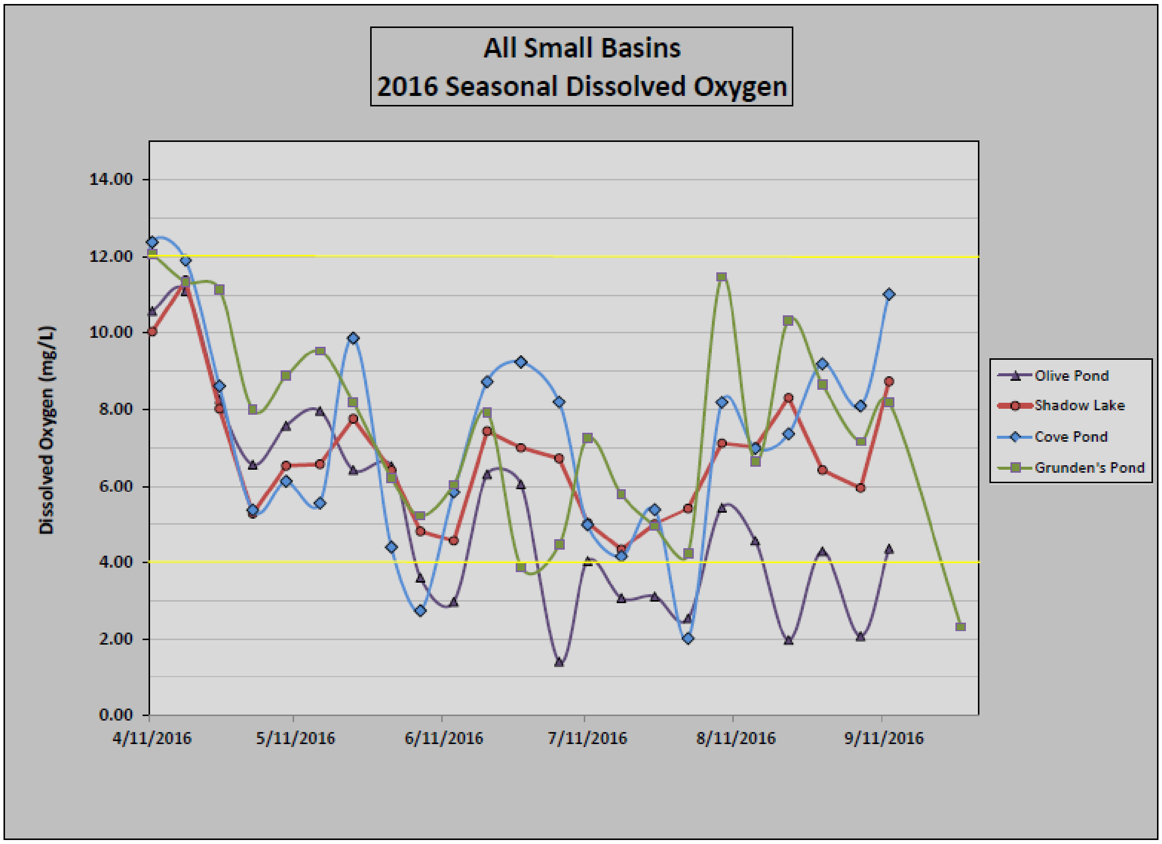
Olive Lake	6/6/16	7/5/16	8/8/16
Diatoms			**92.7%**
Golden Algae	19.0%		
Green Algae	23.8%		4.9%
Blue-green Algae	4.8%	**92.3%**	2.4%
Protozoa			
Euglenoids			
Dinoflagellates	**52.4%**	7.3%	
Total Phytoplankton	**210**	**130**	**410**

In 2016, phytoplankton density was suitable for all dates, typically occurring at less than 420 organisms per mL. In June, the phytoplankton community was dominated by dinoflagellates. In July, the overall phytoplankton abundance decreased to 130 organisms per mL (which is considered low), with nuisance blue-green algae comprising greater than 90% of the assemblage. In early August, overall phytoplankton abundance increased to 410 organisms per mL, the highest of the season. The assemblage on this date was dominated by diatoms (92.7%), although trace blue-green algae was observed. At least trace blue-green algae were observed on all three dates.

Shadow Lake

Shadow Lake	units	6/6/16	7/11/16	8/8/16
Temperature	ºC	23.3	24.23	28.0
Dissolved Oxygen	mg/L	4.82	5.04	7.50
Alkalinity	mg/L	64	42	60
pH	SU	7.0	7.02	7.5
Nitrate	mg/L	<0.2	<0.2	<0.2
Total Phosphorus	mg/L	**0.09**	**0.39**	**0.09**
Turbidity	NTU	2.2	3.0	3.3
Water Clarity	feet	4.0 est.	**2.5 est.**	4.0 est.

In 2016, surface water temperature measurements fell within acceptable seasonal ranges at Shadow Lake, and mimicked the ambient air temperatures. Dissolved oxygen values were considered suitable throughout the season, although slightly depressed in both June and July. Dissolved oxygen values throughout the season are depicted on the graph below in red. Alkalinity in 2016 returned to more typical levels, ranging from 42 mg/L to 64 mg/L. The 2016 annual average was calculated at 54.0 mg/L, which continues an increasing trend. The pH at Shadow Lake ranged from 7.0 in June to 7.02 in July and finally 7.5 in August. These measurements are suitable for this basin, when compared to the typical previous season. In 2016, nitrate was undetected on all three sampling dates. Total phosphorus levels were elevated once again the entire 2016 season at Shadow Lake. In June it was 0.09 mg/L, before increasing to 0.39 mg/L in July and then back down to 0.09 mg/L in August. It’s likely that the July reading at 0.39 mg/L was a sampling error (disturbing the bottom while collecting) or lab error, based o the value and the fact we did not see an increase in productivity. Yet again, these increased nutrient values did not translate into additional needed treatments for nuisance algae or weeds. Turbidity levels continued to be suitable in 2016, and ranged from 2.2 NTU (in June) to 3.0 NTU in July, and finally peaking at 3.3 NTU in August. Despite this late season increase, these values are still suitable, and we confirmed they are not tied solely to phytoplankton abundance as the peak of unicellular growth this season corresponded with the lowest turbidity.



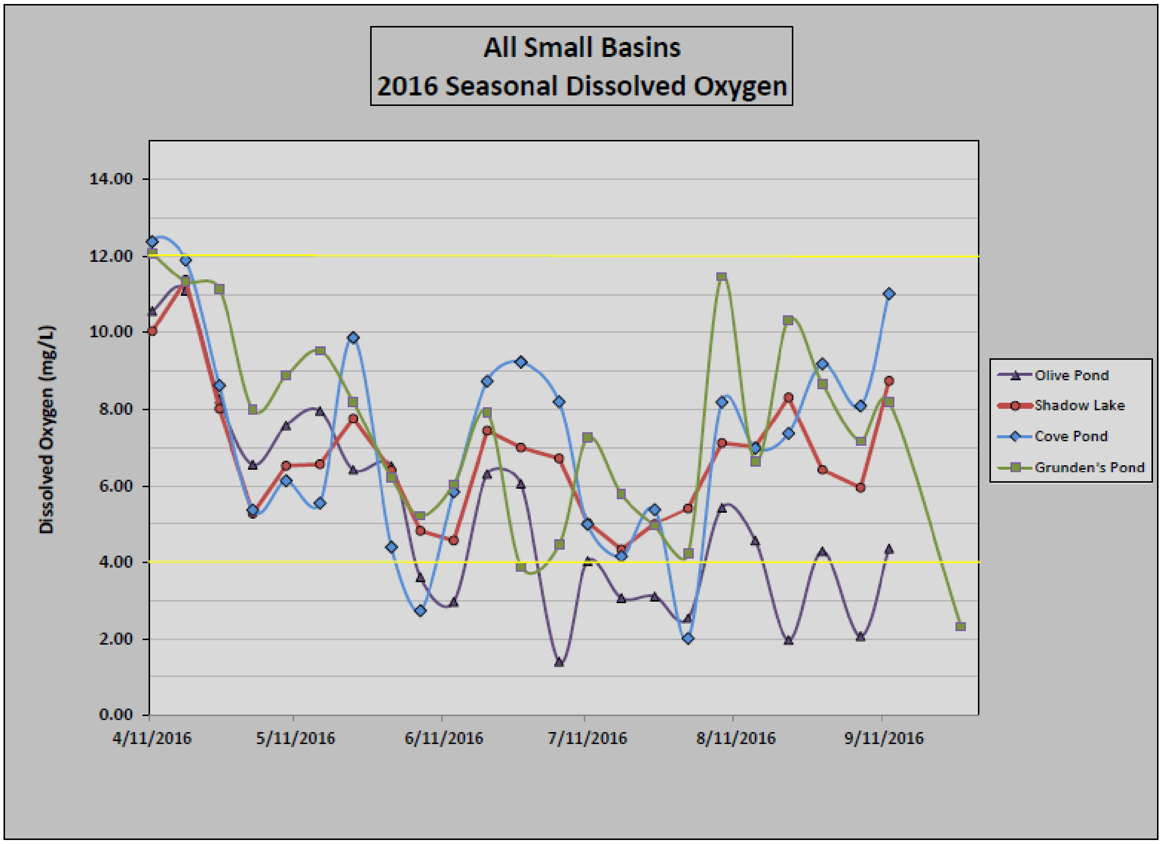
Shadow Lake	6/6/16	6/20/16	7/5/16	7/18/16	8/8/16	8/22/16
Diatoms		7.2%	0.4%	3.7%	**54.1%**	
Golden Algae	**54.5%**	15.9%				5.4%
Green Algae	27.3%	**42.0%**	1.8%	37.0%	37.8%	5.4%
Blue-green Algae			**97.8%**	**48.1%**	8.1%	2.7%
Protozoa						
Euglenoids						
Dinoflagellates	18.1%	34.8%		11.1%		**86.5%**
Total Phytoplankton	**110**	**690**	**2250**	**270**	**370**	**370**

Phytoplankton conditions in 2016 were suitable on most dates. On four of the dates, the total phytoplankton was less than 370 organisms per mL. These dates occurred in early June and late July through August. In early July we did observe a nuisance bloom of blue green algae (2,250 organisms per mL, with over 97% being blue-green algae. But by the middle of the month, following treatment, phytoplankton conditions were once again suitable (reduced by 90%) and remained that way throughout August. Various groups were dominant throughout the season, including Golden algae in June, Green algae in late June, Blue-green algae in July (both dates) and then diatoms (early August) and dinoflagellates (late August). These characteristic of mixed group dominance is encouraging.

Cove Lake

Cove Lake	units	6/6/16	7/11/16	8/8/16
Temperature	ºC	21.7	23.09	26.6
Dissolved Oxygen	mg/L	**2.74**	4.99	6.98
Alkalinity	mg/L	**92**	40	60
pH	SU	6.5	7.0	7.5
Nitrate	mg/L	**0.5**	<0.2	<0.2
Total Phosphorus	mg/L	**0.06**	**0.07**	**0.05**
Turbidity	NTU	3.4	1.9	2.8
Water Clarity	feet	3.0 est.	**2.0 est.**	3.0 est.

In 2016, surface water temperature measurements fell within acceptable seasonal ranges at Cove Lake, likely facilitated by the abundant shade. Dissolved oxygen levels were somewhat depressed for most of this season, and are depicted on the graph below in light blue. In June, the dissolved oxygen was 2.74 mg/L, which is below the 4.0 mg/L threshold and if it persists could negatively impact aquatic biota. In July, dissolved oxygen increased to 4.99 mg/L, which is suitable, but yet not ideal. We observed an increase in August, when dissolved oxygen values increased to 6.98 mg/L. These measurements are similar to data recorded in 2015. No treatments were postponed due to low dissolved oxygen this season. But it's likely that if additional algaecides or herbicides were needed, low dissolved oxygen could have been a deterrent.



In 2016, alkalinity ranged from 40 mg/L to 92 mg/L, for an annual average of 64.3 mg/L. We continue to see an annual average has increase from 2013, when the annual average was 32.0 mg/L. However, our data was skewed by the single reading of 92 mg/L. It's possible that additional sampling of this parameter is needed to confirm this increasing trend. Nitrate was detected in June at 0.5 mg/L, which is elevated. But nitrate levels decreased to undetected for the rest of the season. The total phosphorus at Cove Lake was elevated on all three sampling dates in 2016, similar to previous seasons. Yet, the values were less extreme than observed in previous seasons, ranging from 0.05 mg/L to 0.07 mg/L. This is a favorable trend in this basin, and these elevated phosphorus measurements did not translate into excessive aquatic plant or phytoplankton growth during the season. Turbidity was similar to data collected in 2012-2015, and was considered suitable on all three dates. It ranged from 1.9 NTU to 3.4 NTU this season, which is slightly elevated.

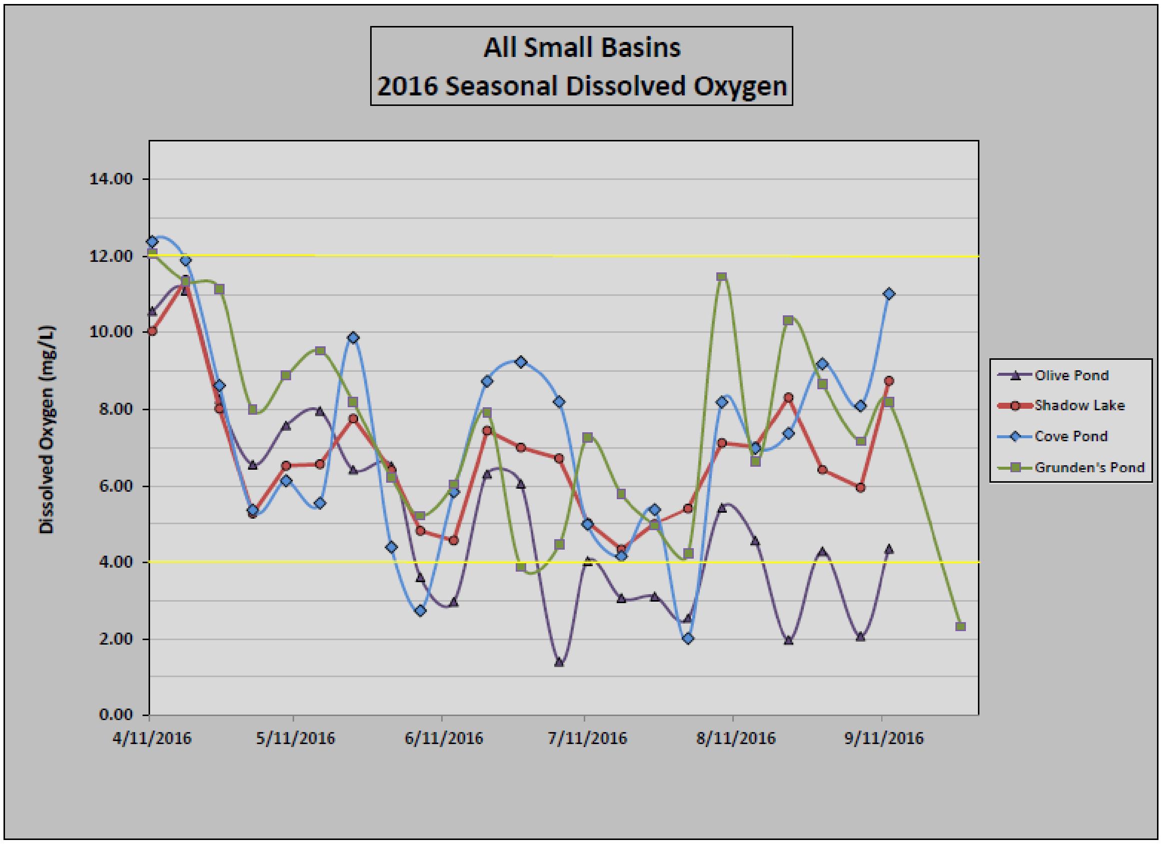
Cove Lake	6/6/16	7/5/16	8/8/16
Diatoms	16.7%	12.5%	
Golden Algae	**50.0%**	25.0%	30.0%
Green Algae	16.7%		**65.0%**
Blue-green Algae			
Protozoa			
Euglenoids			
Dinoflagellates	16.7%	**62.5%**	5.0%
Total Phytoplankton	**120**	**80**	**200**

In 2016, unicellular phytoplankton abundance at Cove Lake was light and favorable throughout the season. On all dates, overall phytoplankton abundance was less than 200 organisms per mL which is excellent. On no dates did we observe blue-green algae. In June, the overall phytoplankton was low, with golden algae dominating the phytoplankton community. In July, overall abundance remained low, but group dominance shifted to dinoflagellates. In early August, the group dominance again shifted, this time to green algae at 65.0%.

Grunden's Pond

Grunden's Pond	units	6/6/16	7/11/16	8/8/16
Temperature	ºC	24.0	23.4	**30.2**
Dissolved Oxygen	mg/L	5.23	7.25	6.64
Alkalinity	mg/L	80	40	80
pH	SU	7.0	7.14	7.75
Nitrate	mg/L	<0.2	<0.2	<0.2
Total Phosphorus	mg/L	**0.09**	0.03	**0.10**
Turbidity	NTU	**9.6**	1.5	6.5
Water Clarity	feet	3.0 est.	3.0 est.	3.0 est.

In 2016, surface water temperature measurements fell within acceptable seasonal ranges at Grunden's Pond in June and July. Like several other basins, in August the surface temperature was elevated at 30.2 °C. Weekly dissolved oxygen measurements were collected at this site again in 2016 as depicted on the graph below (the green line). Dissolved oxygen was lower than the ideal threshold (4.0 mg/L) on three dates, but also exceeded the ideal threshold (12.0 mg/L) on two dates, which could indicate overabundance of growth in the basin. This was likely not caused by phytoplankton abundance (see discussion, below), but more likely from filamentous algae or aquatic plant growth (pondweeds or naiads).



Alkalinity in 2016 at Grunden's Pond ranged from 40 mg/L to 80 mg/L this year, which is higher than observed in 2015. Furthermore, on two dates, the alkalinity was 80 mg/L. The annual average was calculated at 66.7 mg/L, representing a significant increase as compared to the previous season. It's possible we need to increase the sampling frequency of this parameter to get a better grasp on its potential increase and fluctuation. The pH values in 2016 were suitable early in the season at 7.0 in June and 7.14 in July. In August, the pH increased to 7.75, but this is still acceptable. Nitrate was undetected on all three dates in 2016. Total phosphorus was elevated on only two sampling dates this season. In June, it was 0.09 mg/L, with a decrease to 0.03 mg/L in July. In August, total phosphorus peaked at 0.10 mg/L. These values are nearly identical to data recorded in 2015. Turbidity was elevated on two dates I this basin, and this was supported with visual observations. In June the turbidity was 9.6 NTU. In July it was suitable, but then again it was elevated in August at 6.5 NTU.

Grunden's Pond	6/6/16	7/5/16	8/8/16
Diatoms		**45.5%**	
Golden Algae	40.0%	27.3%	47.4%
Green Algae	**50.0%**		1.8%
Blue-green Algae		27.3%	
Protozoa			
Euglenoids			1.8%
Dinoflagellates	10.0%		**49.4%**
Total Phytoplankton	**100**	**110**	**570**

In 2016, total phytoplankton abundance varied throughout the entire season, but early in the season it was light and favorable. Overall abundance was low in June, with green algae dominance which is typical. Phytoplankton abundance was similar in July, and the group dominance shifted to diatoms. In August the phytoplankton peaked at this site to 570 organisms per mL, which is considered low-moderate. The assemblage was dominated by dinoflagellates on this date.

Mountain Lake

Mountain Lake	units	6/6/16	7/11/16	8/8/16
Temperature	ºC	24.4	23.74	30.2
Dissolved Oxygen	mg/L	7.66	5.76	6.23
Alkalinity	mg/L	56	45	60
pH	SU	7.5	7.0	7.5
Nitrate	mg/L	<0.2	<0.2	<0.2
Total Phosphorus	mg/L	0.02	**0.05**	0.03
Turbidity	NTU	1.4	1.3	3.3
Water Clarity	feet	7.5	7.0	5.5

In 2016, surface water temperature measurements fell within acceptable seasonal ranges at Mountain Lake, except for August. On this date, the surface water temperature was elevated. Dissolved oxygen values were ideal throughout the entire 2016 season, which is typical for this basin. In June, the dissolved oxygen was 7.66 mg/L, which is equivalent to 90% saturation. In July, the dissolved oxygen decreased to 5.76 mg/L. In august, it was 6.23 mg/L. Both of these values are suitable yet slightly depressed. In addition, on one additional date in August, dissolved oxygen values were borderline low, and required postponing a weed treatment. See below for a discussion of the water clarity at Mountain Lake in 2015.

Alkalinity at Mountain Lake in 2016 ranged from 45 mg/L (in July) to 60 mg/L (in August), for an annual average of 53.6 mg/L. This is slightly higher than data recorded in 2015, but from a historical standpoint is still suitable. In 2016, pH was consistent throughout the season, ranging from 7.0 to 7.5, which is ideal. Nitrate levels were undetectable throughout the entire 2016 season, similar to last season. Total phosphorus levels varied throughout the 2016 season at this site. Total phosphorus was 0.02 mg/L in June and increased to 0.05 mg/L in July. In August the total phosphorus decreased to 0.03 mg/L, which is fine for this basin. This elevated late season phosphorus did translate into increased phytoplankton abundance that required treatment in September. Turbidity measurements this season were ideal on all dates this season, ranging from 1.3 NTU to 3.3 NTU.

Mountain Lake	6/6/16	6/20/16	7/5/16	7/18/16	8/8/16	8/22/16
Diatoms	10.0%				5.9%	5.7%
Golden Algae	10.0%	7.1%	16.7%	31.6%		2.9%
Green Algae		35.6%	**83.3%**	**68.4%**	20.6%	17.1%
Blue-green Algae		**57.1%**			**70.6%**	**74.3%**
Protozoa						
Euglenoids						
Dinoflagellates	**80.0%**				2.9%	
Total Phytoplankton	**100**	**140**	**120**	**190**	**340**	**350**

The phytoplankton abundance data was light and favorable throughout the 2016 season. Total phytoplankton counts ranged from 100 organisms per mL to 350 organisms per mL, very similar to 2014 and 2015. Green algae dominated the phytoplankton community on two dates (both in July). However, nuisance blue-green algae dominated the assemblage on three dates (late June and both in August). Since the overall phytoplankton counts were low (less than 370 organisms per mL) on each date, these abundances were considered non-problematic and did not require treatment. However, it set the stage for an algae bloom in September that required extensive treatment to control. This basin would have benefited from a mid-summer Alum application.

Wildwood Lake

Wildwood Lake	units	6/6/16	7/11/16	8/8/16
Temperature	ºC	25.2	25.62	**30.0**
Dissolved Oxygen	mg/L	10.14	7.25	7.22
Alkalinity	mg/L	60	40	60
pH	SU	8.0	7.0	7.5
Nitrate	mg/L	**0.5**	<0.2	**0.6**
Total Phosphorus	mg/L	0.03	0.03	0.02
Turbidity	NTU	1.6	1.4	>1.0
Water Clarity	feet	7.0 est.	5.75 est.	7.5

In 2016, surface water temperature measurements fell within acceptable seasonal ranges at Wildwood Lake in both June and July. But as observed in other basins, the August surface temperature was elevated. Dissolved oxygen ranged from 7.22 mg/L in August to 10.14 mg/L in June. These values are seasonally ideal for this basin, and similar to results obtained in previous seasons.

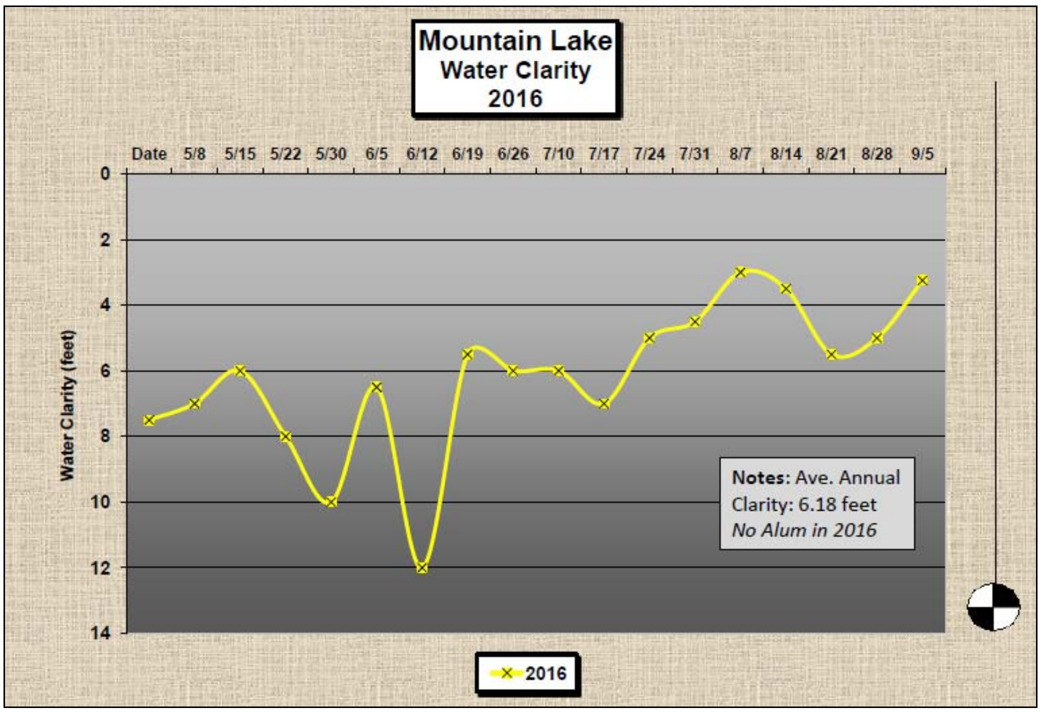
Alkalinity levels in 2016 ranged from 40 mg/L to 60 mg/L, for a seasonal average of 53.3 mg/L. This is very similar to data collected in 2014 and 2015. Wildwood Lake typically has the highest pH of the lakes in the Mountain Lakes chain. In 2016 the pH was recorded at 8.0 in June, and it decreased to 7.0 in July. In August, the pH was 7.5. In 2016, nitrate was elevated on two dates, June and August. This is unusual, and although the August increase could have been explained by a recent Alum application (and phytoplankton die-off via flocking) we don't have a suitable explanation in June. Total phosphorus measurements were ideal throughout the 2016 season, ranging from 0.02 to 0.03 mg/L. Turbidity was much improved again this season, ranging from undetected in August, to 1.6 NTU in June. Turbidity decreased throughout the season.

Wildwood Lake	6/6/16	6/20/16	7/5/16	7/18/16	8/8/16	8/22/16
Diatoms		4.2%				
Golden Algae	**38.5%**	8.4%		5.3%		
Green Algae	**38.5%**	**87.5%**	**100.0%**	42.1%	**80.0%**	**81.8%**
Blue-green Algae				5.3%		
Protozoa						
Euglenoids						
Dinoflagellates	23.1%			**47.4%**	20.0%	18.2%
Total Phytoplankton	**130**	**240**	**70**	**190**	**100**	**110**

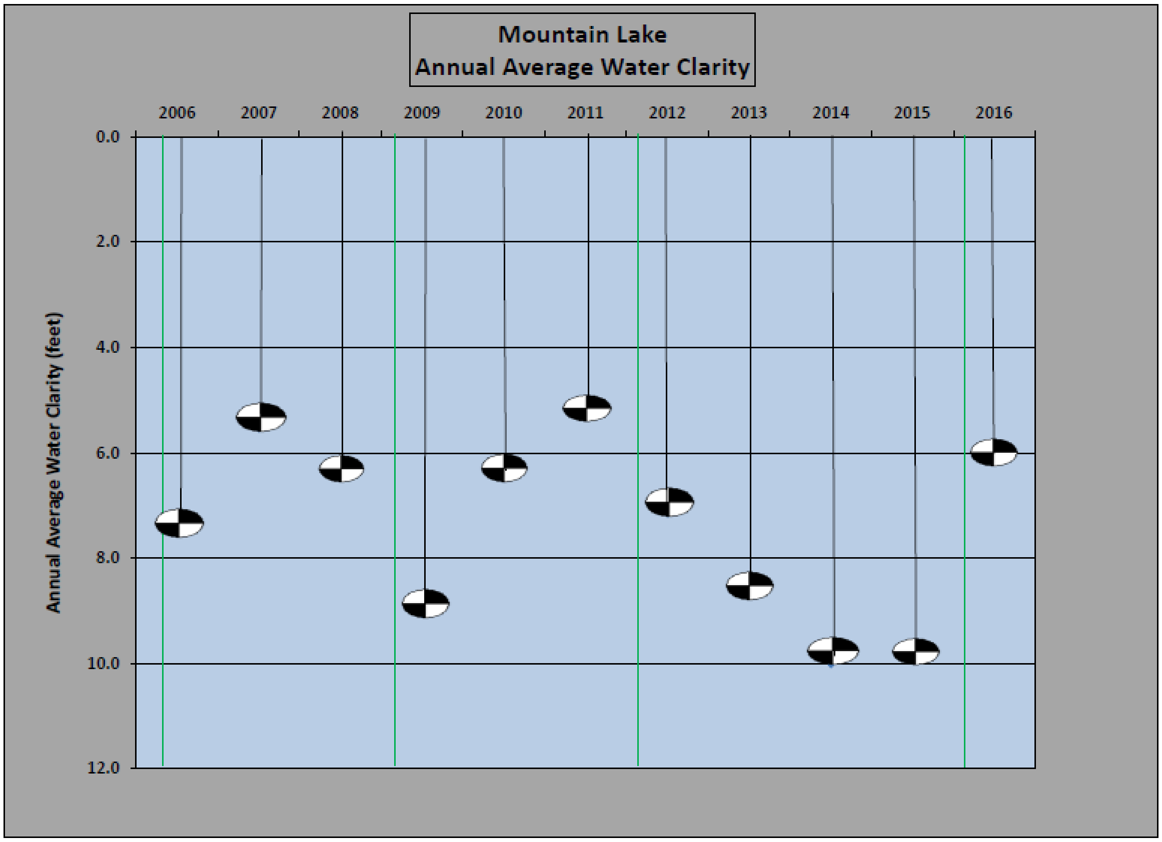
In 2016, overall unicellular phytoplankton counts at Wildwood Lake were low on all dates, ranging from 70 organisms per mL to 190 organisms per mL. On five dates, green algae were the dominant group, as expected. In mid-July, trace amounts of blue-green algae were observed in the sample, but these were non-problematic, and this was the only date this nuisance group was observed. On this date, dinoflagellates were the dominant group we observed. In the past few years, unicellular phytoplankton have been non-problematic in this basin.

2006 to 2016 Water Clarity at Mountain Lake

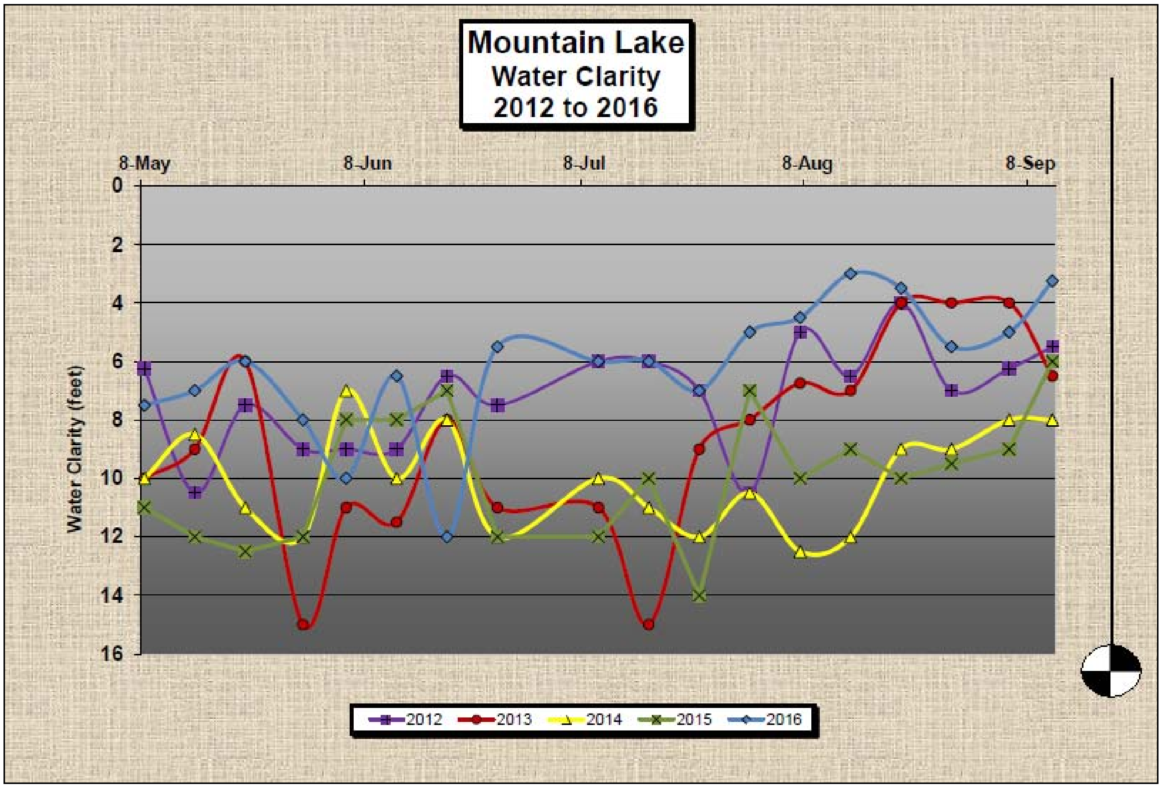
Below is a graph that depicts the water clarity at Mountain Lake in 2016. Keep in mind the x axis is reversed, representing the water line at the top and deeper water (and therefore greater water clarity) as one travels down the x-axis. This graph is also included in the Appendix at the end of this report. There was no Alum application in this basin again this year, the third consecutive year. However, Alum use was likely justified based on the water clarity, total phosphorus results in July and algal conditions later I the season. As can be seen on the graph, water clarity in 2016 ranged from 3.5 feet to 12.0 feet (estimated) throughout the season. Water clarity was estimated on most sampling dates because the clarity exceeded water depth at the standardized sampling location (the end of the dock at the Midvale launch). On two dates water clarity equaled or exceeded 10 feet, which is significantly less than the readings in 2015 (n=9).



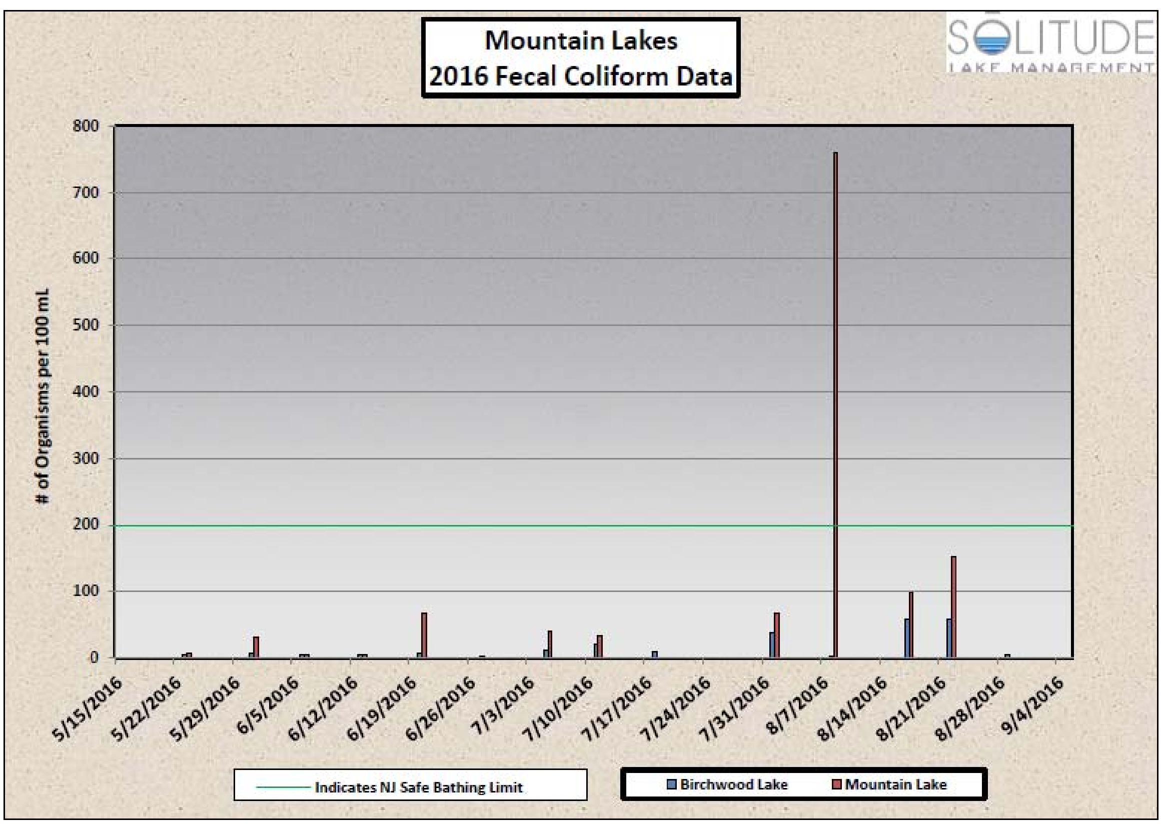
In 2016, the annual average water clarity was 6.18 feet, which represents a significant decrease compared to the 2015 annual average of 9.94 feet. Since the water clarity measurements are collected at the same site, using a standard Secchi disc, and on the roughly the same dates from season to season, these values are an accurate representation of the water clarity of the lake. Several factors negatively impact the water clarity of a lake. These include unicellular phytoplankton in the water column, suspended solids, or nutrient-rich sediments entering via storm runoff. Unicellular phytoplankton abundance was light and favorable in this basin this year, although we did observe non-problematic blue-green algae on several dates. Submersed plant abundance also plays a major role in the water clarity of a lake. It’s likely the systemic herbicide use in this basin this year played a role in decreased clarity, but the dry conditions and high regional air temperatures were factors.



Below is another graph depicting the annual water clarity for 2012 through 2016. Although the graph is somewhat cluttered by the five data lines, the 2016 data set (blue) displays an obvious trend. Water clarity was suitable early in the season typically exceeding 6.0 feet. But by early July the water clarity was at or below 6.0 feet on all dates. Although this is suitable in most basins in northern New Jersey, this has not been the trend at this site in recent years.

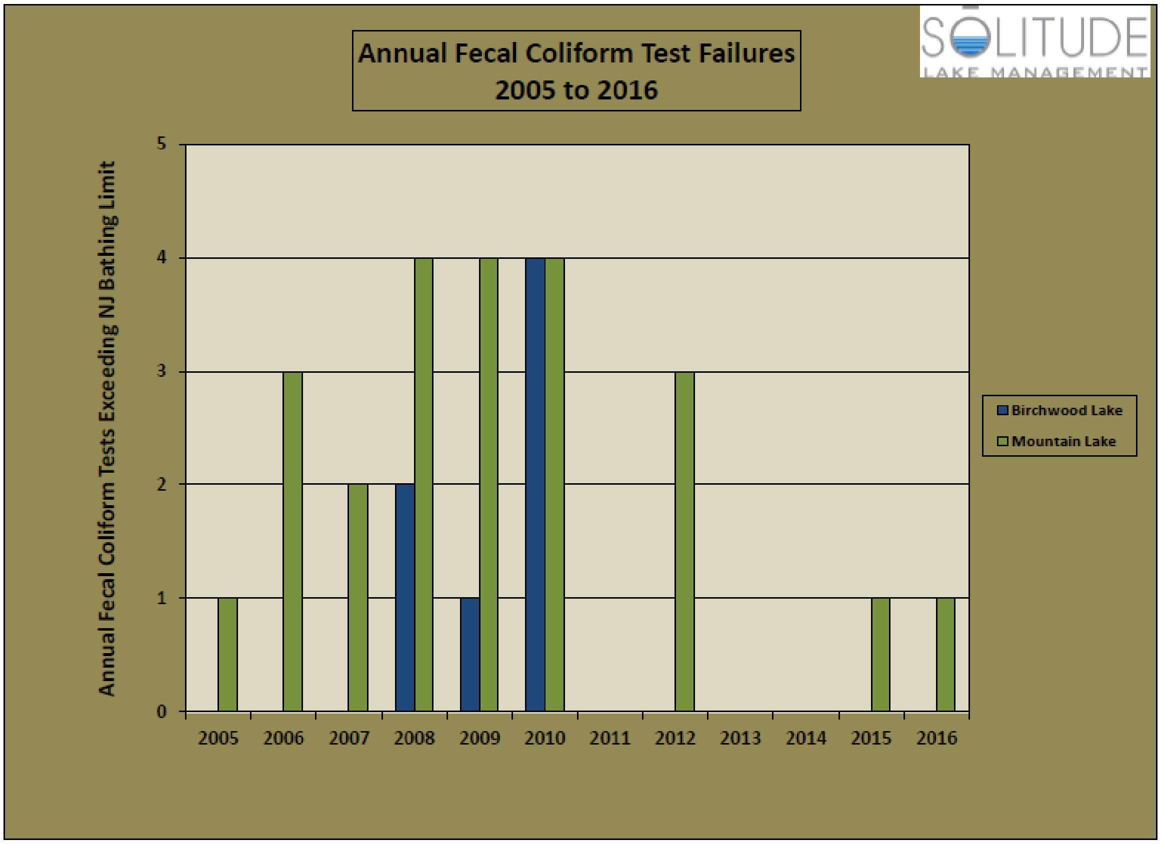


2016 Fecal Coliform Testing at Birchwood and Mountain Lake



Fecal coliform sampling was performed at Birchwood Lake's beach and Mountain Lake's Island Beach in 2016. Sampling occurred weekly during surveys, and was conducted from Memorial Day through August 29th (the week before Labor Day). Fecal Coliform counts are measured as a number of colony forming units (cfu) per 100 mL sample, and New Jersey has set a safe bathing limit of 200 cfu per 100 mL, depicted by the green line on the graph presented above. Consult the graph for a summary of the fecal coliform counts at both sites for 2016. The Appendix of this report contains a reproduction of this graph, and a table summarizing the 2016 data. On these tables, numbers highlighted in red exceed the NJ bathing limit of 200 cfu per 100 ml. In 2016, field biologists once again donned hip waders on all dates and entered the water to a depth of about mid-thigh. Alternatively, life guards were asked to enter the water to conduct the sampling following supervision. The sample container was then submerged in front of the body and opened under water. The container was then sealed securely underwater, and the sample was promptly placed in a dark cooler stocked with blue ice packs.

In 2016, no failures were observed at Birchwood Lake, the sixth consecutive year that no failures occurred at this site. This is a promising trend. At Mountain Lake, one failure occurred in 2016, in early August with a measurement of nearly 760 cfu per 100 ml. This site was re-sampled the following day and the re-test passed at 13 cfu per 100 ml. The last failures at this site occurred in 2015, with one elevated fecal count in mid-August. As can be seen by the chart below, two to four failures is typical per year at this basin, but that is not the case since 2011 with three out of six years not reporting any failures , and only one failure in 2015 and 2016. Waterfowl continues to be the likely source of bacteria loading at Island Beach, but the effects of rainfall can't be ignored. The graph below depicts the number of failures at each site from 2005 through 2016. This graph depicts very different conditions in the first six years of the dataset as compared to the last six years.



2016 Discovery of Fanwort in the Canal

In late August during a routine canal survey, a SLM biologist discovered an extensive infestation of the exotic invasive submersed aquatic plant fanwort (*Cabomba caroliniana*). The plants were well-developed with floating leaves and in flower. This invasive species is aggressive and has the potential to outcompete not only desirable native submersed plants but also such as invasive species Eurasian water milfoil. Although uncommon in Northern New Jersey, there are a few infestations, notably in Greenwood Lake.

In a classic example of Early Detection/Rapid Response (EDRR), SLM immediately confirmed the identification of the plant and the extent of the infestation. Information was communicated to the Borough Manager, and the basin permit was modified for the addition of Clipper, an herbicide that demonstrates excellent control. The permit modification (with the State of NJ) took a few days, but three days later we applied Clipper at the maximum label rate in the canal. In addition, the DPW install sediment barriers at each end of the canal. The purpose of this was to reduce water exchange and reduce the potential of fragment spread, the primary mode of reproduction for this plant. It also was a clear indication to paddlers to stay out of the canal, also reducing potential spread. Barriers were removed 8 days later (before the holiday weekend). Follow up surveys revealed 100% control in the canal, but a late season survey in Wildwood Lake revealed three rooted plants (hand pulled) and a few floating fragments.

In 2017, we will increase our survey efforts in the Canal, Wildwood Lake and the northern reaches of Mountain Lake. It is imperative we keep fanwort from becoming established in either Wildwood or Mountain Lake to protect the natural ecology of the lakes. Although water chemistry of these basins does not favor fanwort growth, other basins in the borough (such as Birchwood Lake) would be ideal for nuisance growth of fanwort. We also recommend resident education regarding fanwort and other potential emerging invasive species.

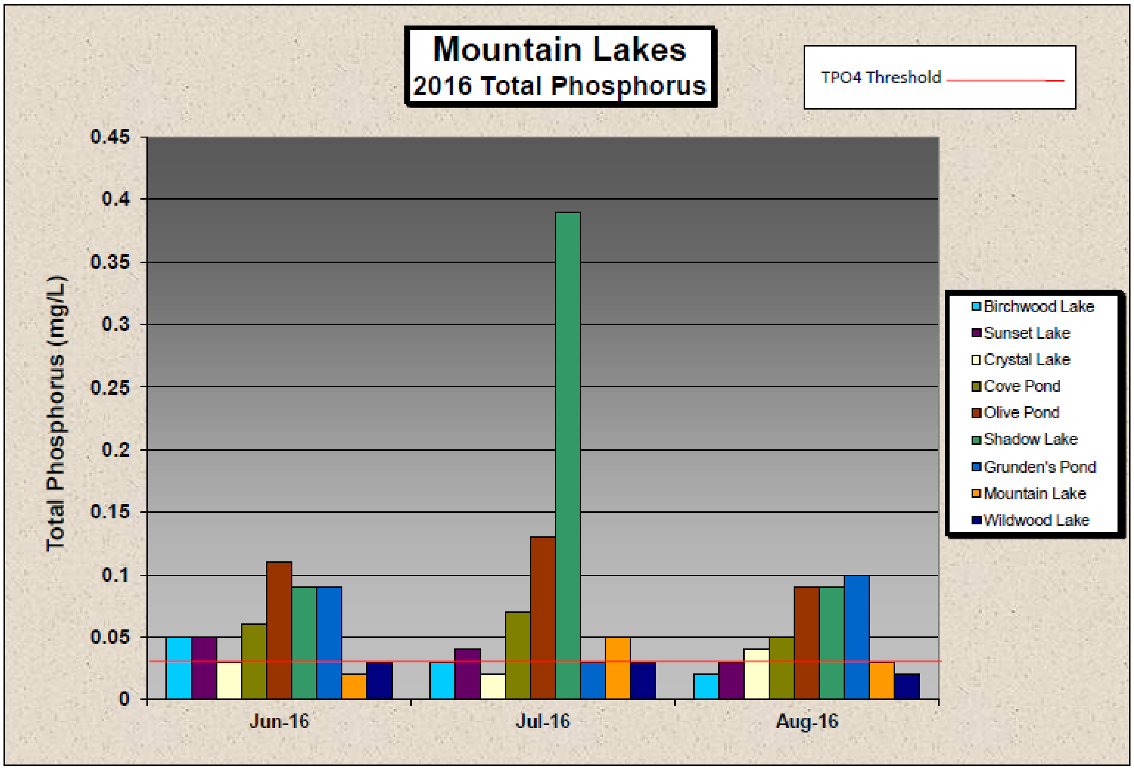
2016 Lakes Cleaning Project

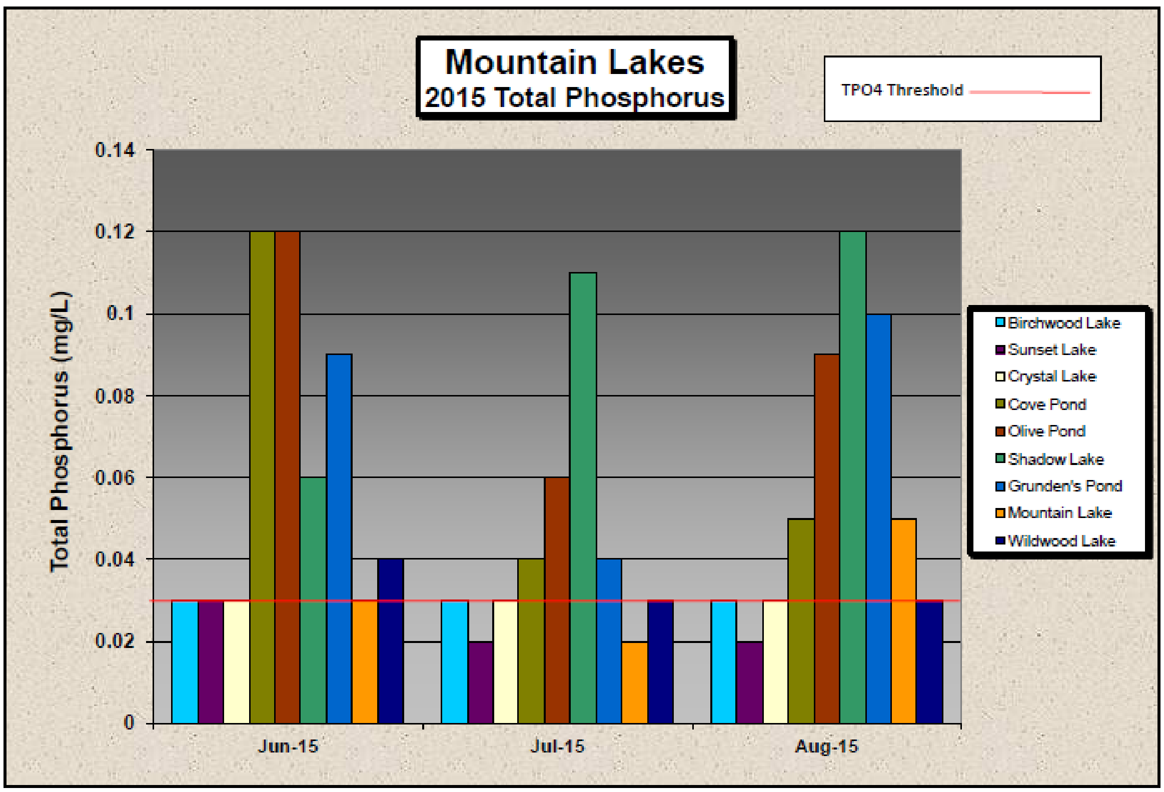
In 2016, the Lakes Cleaning Project was planned for Wildwood Lake and Shadow Lake/Olive Pond. At Wildwood Lake, the plan was to remove nuisance stands of cattails, in addition to general unconsolidated organic debris in the northern part of the basin. In Shadow Lake and Olive Pond, target areas would include the shorelines, and the canal between the two basins in an effort to improve water flow and exchange. Sediment probing was conducted in August at Shadow Lake, Olive Pond, and Cove Pond to identify priority hydro-rake sites.

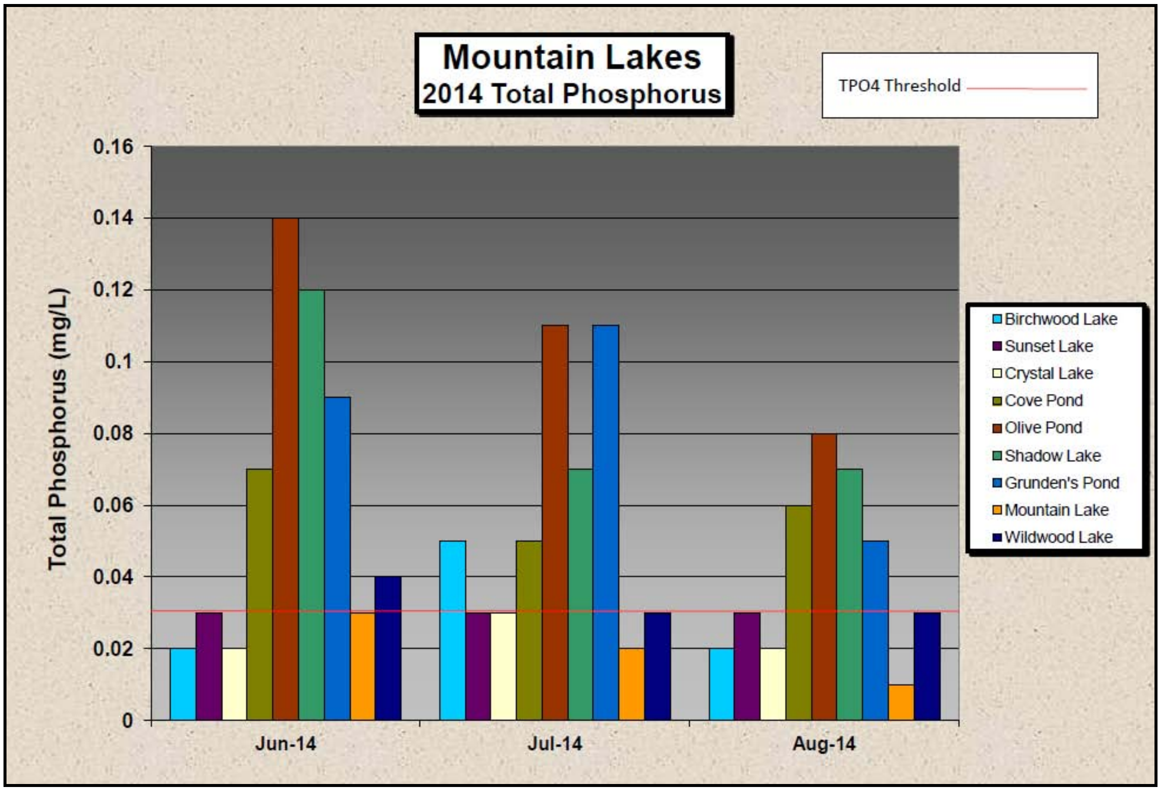
However, due to late season high temperatures in the region, and very little rainfall, the water levels dropped by over two feet in all basins in the borough. This reduced water depth prevented the launch of the hydro-rake. We postponed the lakes cleaning for 2016, following consultation with the Borough Manager. The plan is to target these basins in early spring, immediately following ice-out (March-April).

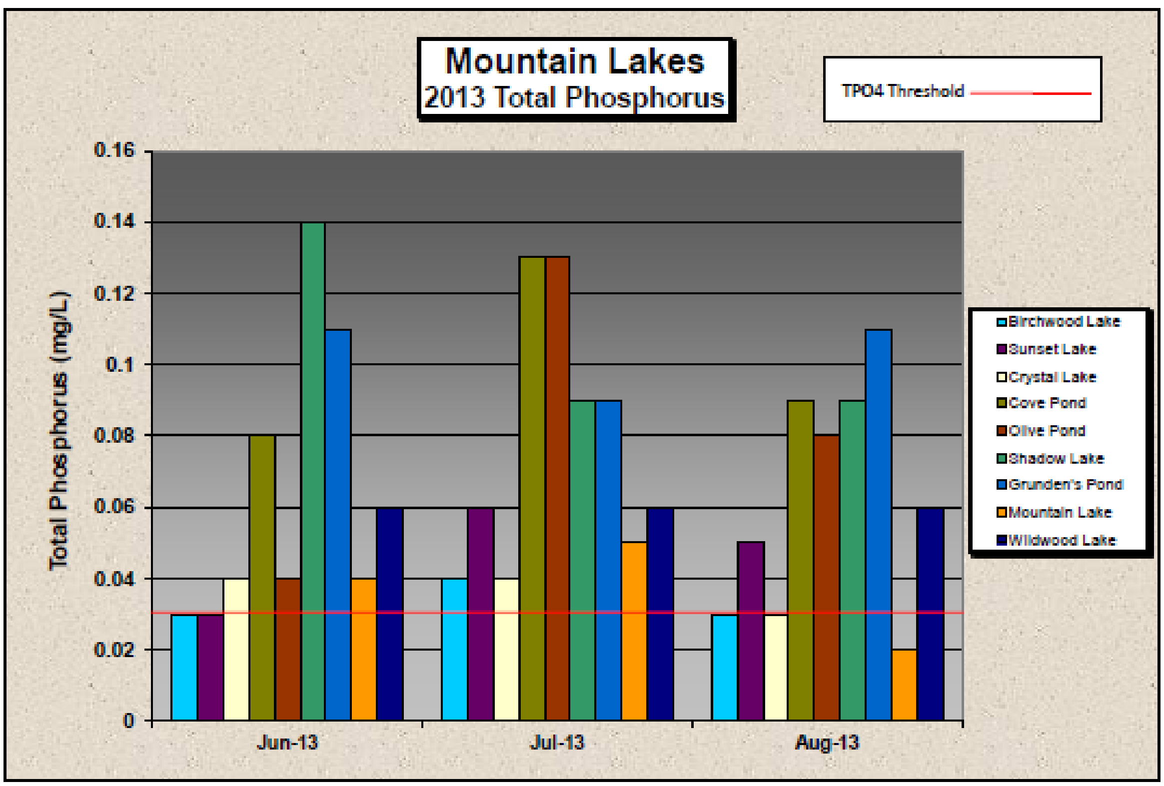
2006 to 2016 Total Phosphorus at Mountain Lakes

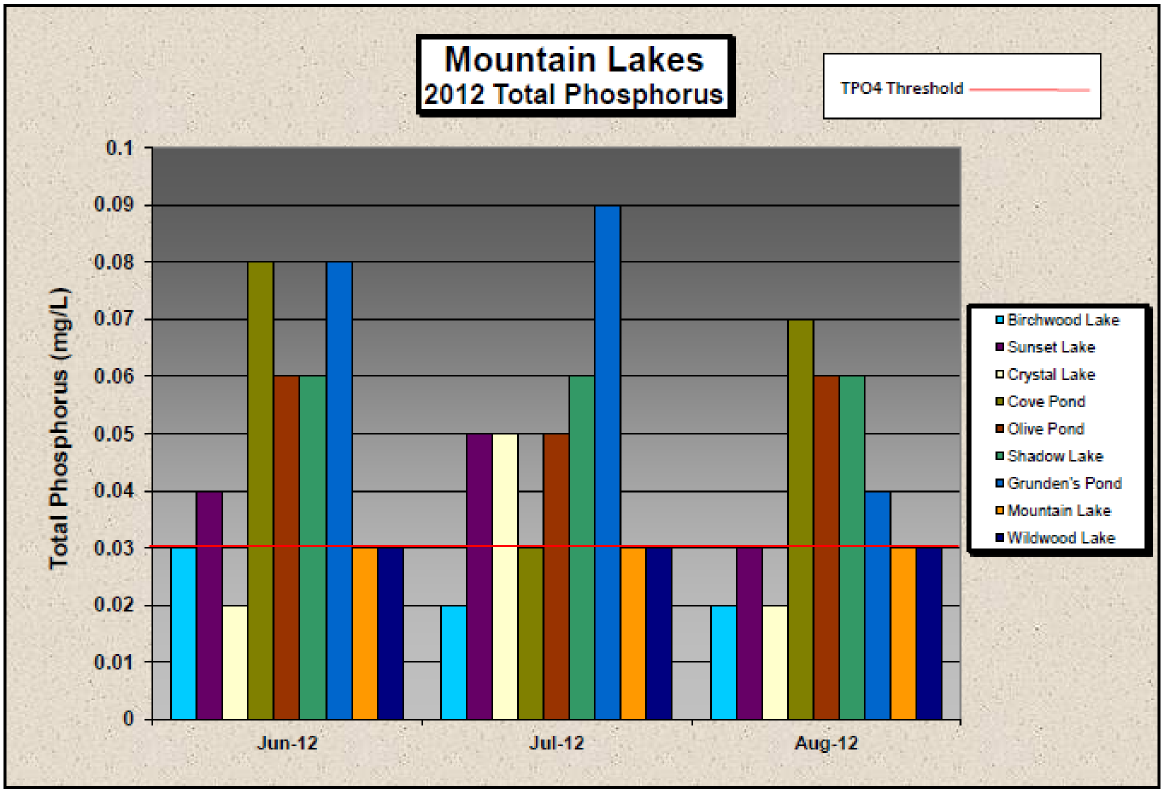
Below are 10 graphs, each representing total phosphorus data collected at all nine lakes for all three seasonal sampling events. Each graph depicts a different year, 2006 through 2016. Total phosphorus in 2016 continues to be elevated at the smaller basins on all three dates. We did see some decreased total phosphorus measurements at these smaller basins, especially Cove Pond all season and Grunden’s Pond in mid-season. The July Shadow Lake result (0.39 mg/L) was likely caused by a sampling or analytical error. Meanwhile, the larger basins all had suitable total phosphorus levels on nearly all of the dates. The exception was Mountain Lake in July, with total phosphorus of 0.05 mg/L. Wildwood Lake had ideal total phosphorus on all dates in 2016. The acceptable total phosphorus threshold for lakes is 0.03 mg/L, depicted with the red line on the graphs below.

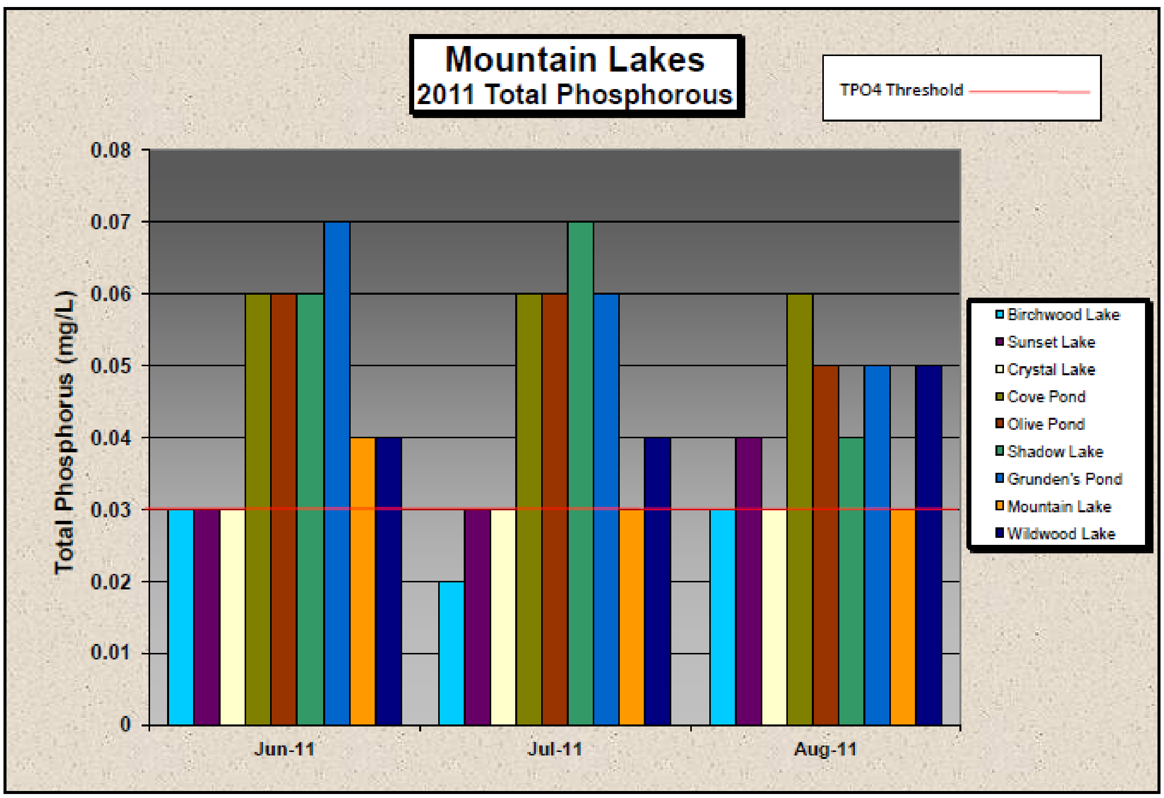

Mountain Lakes
2016 Total Phosphorus
TPO4 Threshold
Total Phosphorus (mg/L)
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Jun-16
Jul-16
Aug-16
Birchwood Lake
Sunset Lake
Crystal Lake
Cove Pond
Olive Pond
Shadow Lake
Grunden's Pond
Mountain Lake
Wildwood Lake

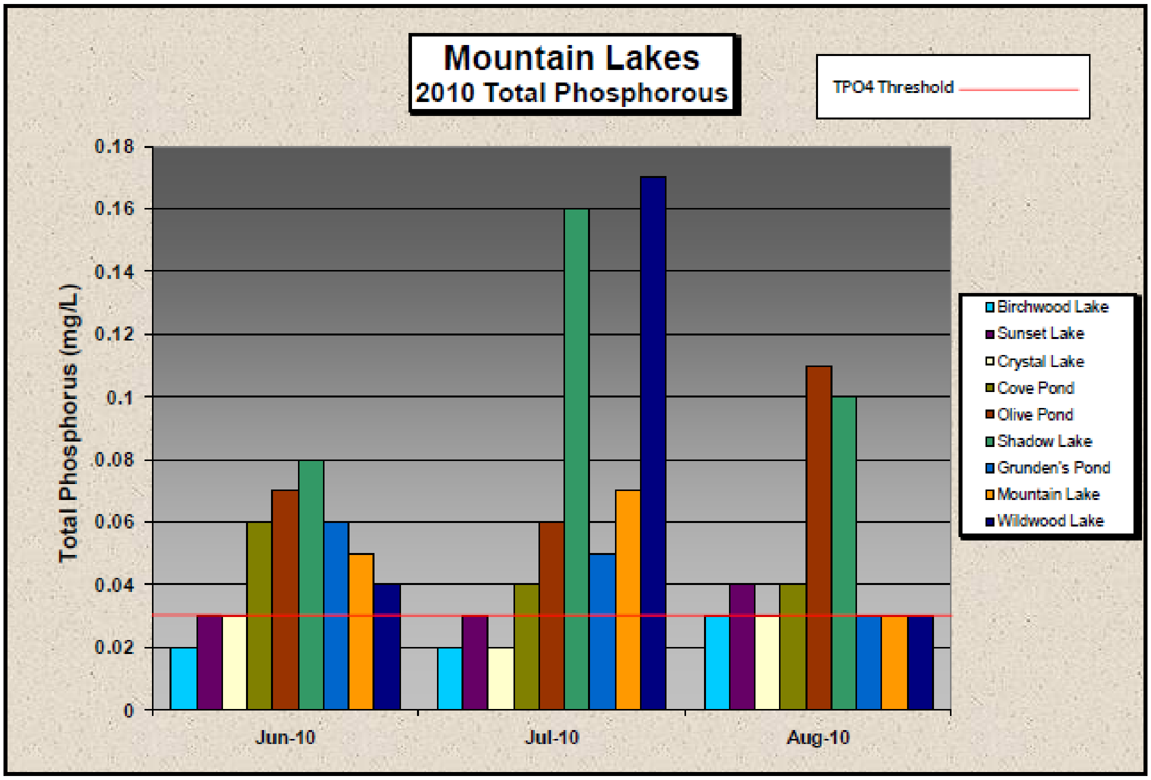

Mountain Lakes
2015 Total Phosphorus
TPO4 Threshold
Total Phosphorus (mg/L)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jun-15
Jul-15
Aug-15
Birchwood Lake
Sunset Lake
Crystal Lake
Cove Pond
Olive Pond
Shadow Lake
Grunden's Pond
Mountain Lake
Wildwood Lake

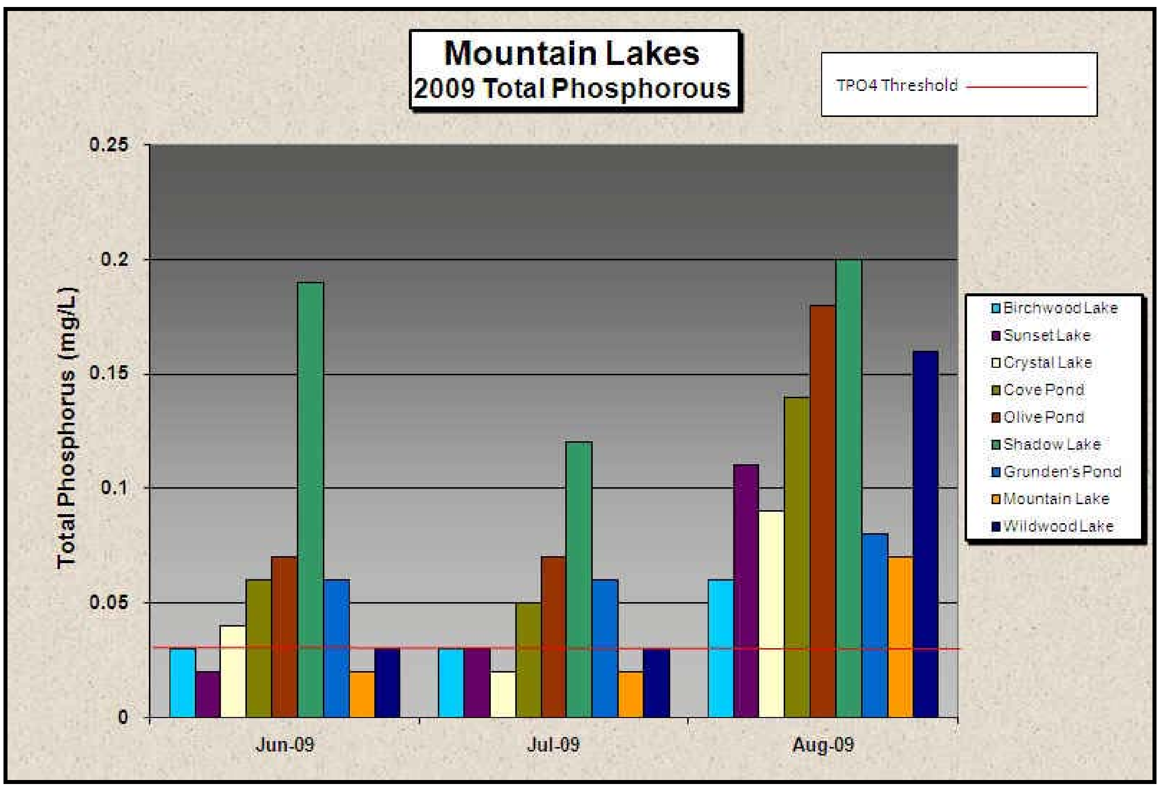

Mountain Lakes
2014 Total Phosphorus
TPO4 Threshold
Total Phosphorus (mg/L)
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jun-14
Jul-14
Aug-14
Birchwood Lake
Sunset Lake
Crystal Lake
Cove Pond
Olive Pond
Shadow Lake
Grunden's Pond
Mountain Lake
Wildwood Lake

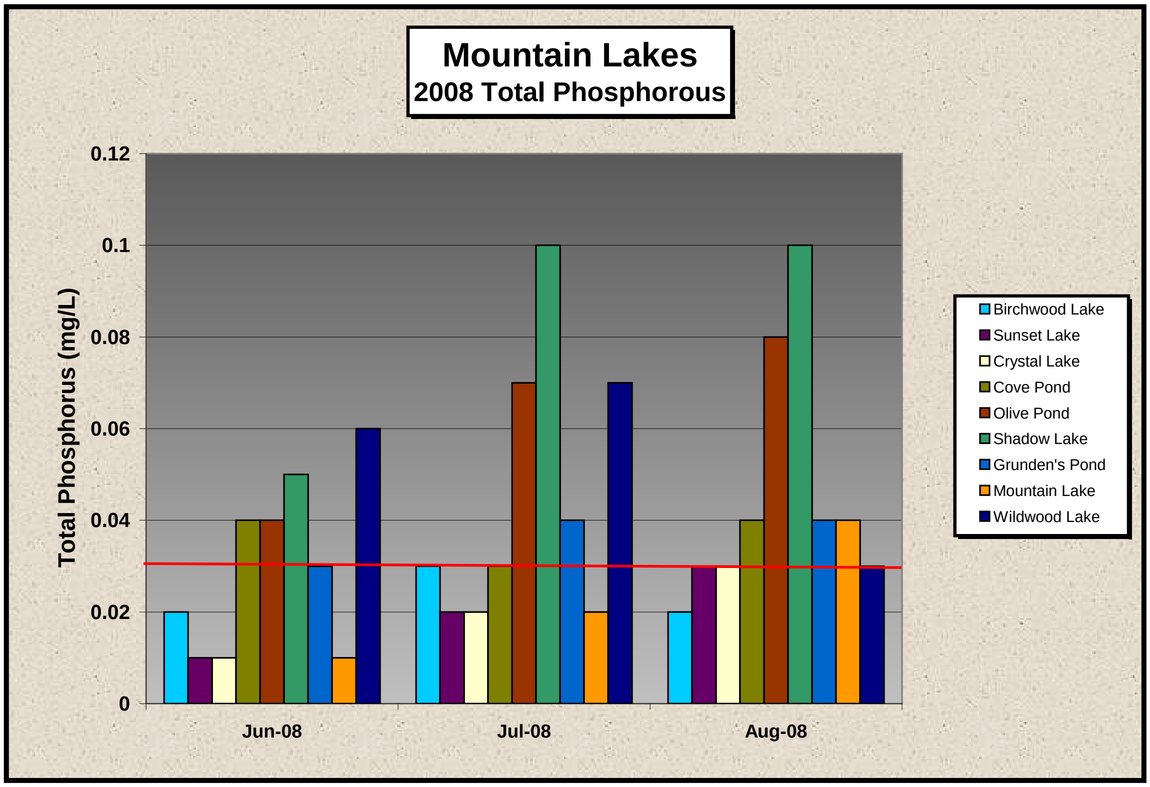

Mountain Lakes
2013 Total Phosphorus
TPO4 Threshold
Total Phosphorus (mg/L)
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jun-13
Jul-13
Aug-13
Birchwood Lake
Sunset Lake
Crystal Lake
Cove Pond
Olive Pond
Shadow Lake
Grunden's Pond
Mountain Lake
Wildwood Lake

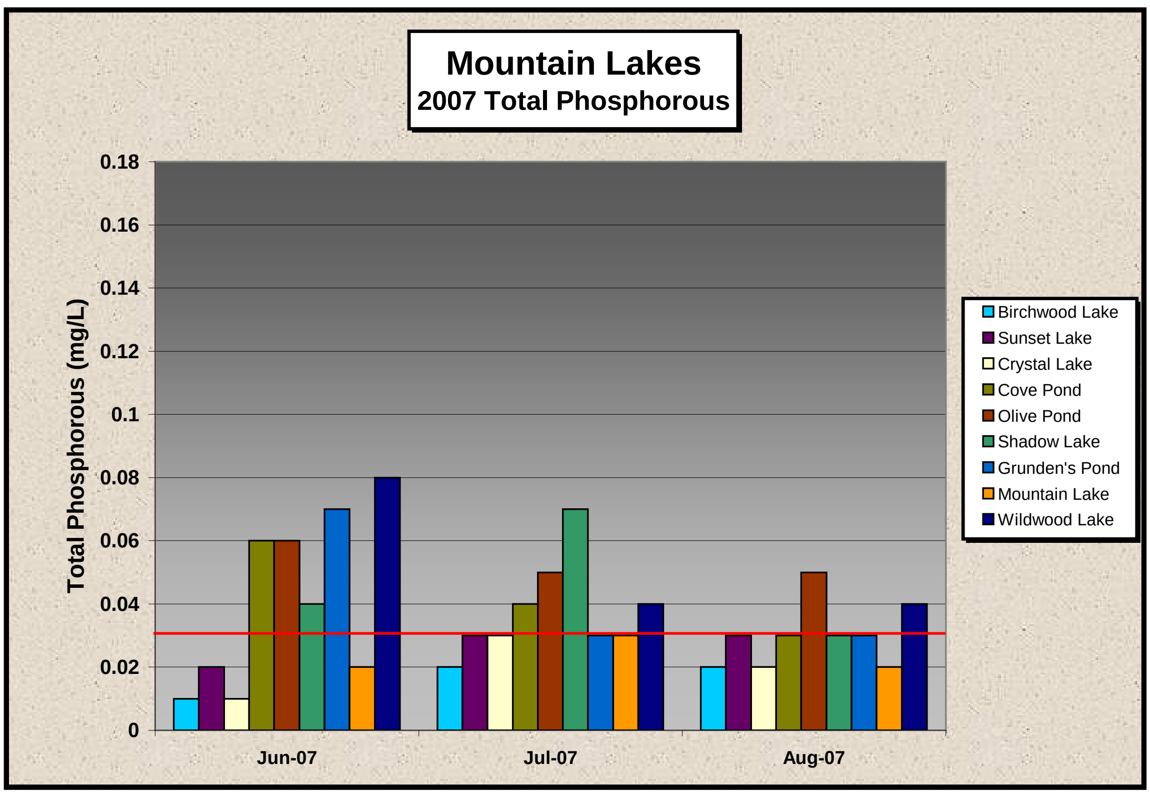

Mountain Lakes
2012 Total Phosphorus
TPO4 Threshold
Total Phosphorus (mg/L)
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Jun-12
Jul-12
Aug-12
Birchwood Lake
Sunset Lake
Crystal Lake
Cove Pond
Olive Pond
Shadow Lake
Grunden's Pond
Mountain Lake
Wildwood Lake

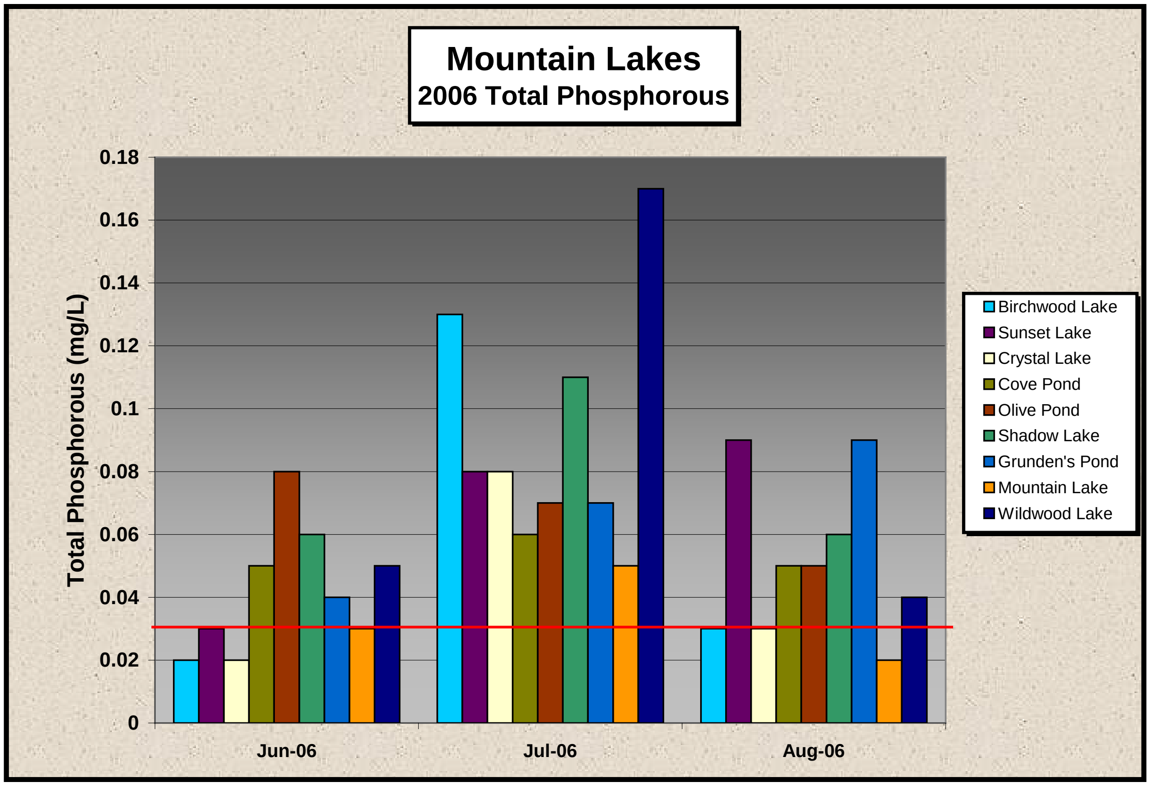

Mountain Lakes
2011 Total Phosphorous
TPO4 Threshold
Total Phosphorus (mg/L)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Jun-11
Jul-11
Aug-11
Birchwood Lake
Sunset Lake
Crystal Lake
Cove Pond
Olive Pond
Shadow Lake
Grunden's Pond
Mountain Lake
Wildwood Lake


Mountain Lakes
2010 Total Phosphorous
TPO4 Threshold
Total Phosphorus (mg/L)
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jun-10
Jul-10
Aug-10
Birchwood Lake
Sunset Lake
Crystal Lake
Cove Pond
Olive Pond
Shadow Lake
Grunden's Pond
Mountain Lake
Wildwood Lake


Mountain Lakes
2009 Total Phosphorous
TPO4 Threshold
Total Phosphorus (mg/L)
0.25
0.2
0.15
0.1
0.05
0
Jun-09
Jul-09
Aug-09
Birchwood Lake
Sunset Lake
Crystal Lake
Cove Pond
Olive Pond
Shadow Lake
Grunden's Pond
Mountain Lake
Wildwood Lake


Mountain Lakes
2008 Total Phosphorous
Total Phosphorus (mg/L)
0.12
0.1
0.08
0.06
0.04
0.02
0
Jun-08
Jul-08
Aug-08
Birchwood Lake
Sunset Lake
Crystal Lake
Cove Pond
Olive Pond
Shadow Lake
Grunden's Pond
Mountain Lake
Wildwood Lake


Mountain Lakes
2007 Total Phosphorous
Total Phosphorous (mg/L)
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jun-07
Jul-07
Aug-07
Birchwood Lake
Sunset Lake
Crystal Lake
Cove Pond
Olive Pond
Shadow Lake
Grunden's Pond
Mountain Lake
Wildwood Lake



2016 Summary of Lake Management Activities

- In 2016, temperature departures were much higher than average starting in December (2015) through the winter on most months in 2016.
- For the most part, monthly rainfall averages were below average in 2016.
- Clipper was again used to control lilies and pondweeds in the swim lanes at Birchwood Lake. The results were suitable, although in 2017 we might need to treat the abundant water lilies in the northern part of the basin to thin them out again.
- Sonar (a systemic herbicide) was used at Mountain Lake for the multi-season control of Eurasian water milfoil. FASTest sampling revealed suitable target dosage for 60 days.
- Fanwort was discovered in the canal between Mountain Lake and Wildwood Lake. We aggressively treated the canal with Clipper.
- Hydro-raking was planned for the fall at Wildwood Lake, Shadow Lake, and Olive Pond. However, water levels (down at least 2.0 feet) prevented the safe launch of the hydro-rake this year.
- Overall, total phosphorus levels were elevated at the smaller basins in 2016. For nearly all dates, total phosphorus levels were suitable at the larger basins this season. The exceptions were single dates at Mountain Lake and Birchwood Lake.
- Overall, unicellular phytoplankton abundance was favorable (low to moderate) at all of the larger basins this season. Non-problematic blue-green algae were

observed on several dates at Mountain Lake this season, requiring a September treatment.

- SLM contacted an aeration specialist to create specifications for a new aeration system at Birchwood Lake. These specifications were presented to the Borough in October.
- All fecal coliform tests passed at Birchwood Lake. However, on one early August date at Mountain Lakes, the fecal coliform counts exceeded the safe bathing limits. A re-test the following day revealed suitable fecal coliform counts, so no beach closures were required.
- Alum was applied on two dates at Wildwood Lake.
- Alum **was not** applied at Mountain Lake this season. Alum use was justified based on clarity and nutrient data collecting.

2017 Recommendations

The water quality monitoring program continues to be an important facet of the lake management program. The current program seems to be fulfilling the needs of the lakes and providing suitable datasets. In 2016, it is recommended that weekly dissolved oxygen monitoring continue at the smaller basins. For the past several years, dissolved oxygen levels have been depressed on select dates throughout the season, and each of these basins could benefit from the use of aeration. Dissolved oxygen continues to be depressed throughout the water column with an onset of mid-June. If a new system is installed at Birchwood Lake, we could re-purpose the two existing units to Olive Pond and one other basin. The additional phytoplankton sampling at Shadow Lake will continue in 2017.

Herbicide and algaecide use will continue in many of the Mountain Lakes basins to control nuisance densities of aquatic plants and algae. In Birchwood Lake, a limited application of Clipper is planned for the nuisance water lilies and pondweeds around the swimming docks. We will include additional stands of water lilies encroaching in on the beach area. In addition, Birchwood Lake would also benefit from another limited acreage topical spray of water lilies in the northern reach of the basin this season. At Crystal Lake, we will monitor the nuisance pondweed growth to determine how aggressive we need to be to maintain suitable conditions, yet encouraging desirable native growth such as bassweed. We anticipate contact herbicides this season at this site. At Sunset Lake, depending on the growth of water lilies in the open basin, a systemic product might be a better option for plant control in 2017. Since Sonar (systemic) was used at Mountain Lake in 2016, the use of contact products will be used in 2017. Conditions shall be confirmed with on-water surveys. The increased submersed aquatic vegetation growth and the potential appearance of fanwort (see below) at Wildwood Lake will likely require more aggressive herbicide use or even a systemic product.

In the smaller basins, we expect to continue the use of copper sulfate and/or SeClear to control nuisance algae growth. Contact herbicides will be employed for any nuisance aquatic plant growth.

The use of Alum at Wildwood Lake (early and late season applications) continues to be beneficial to the basin. Two Wildwood Lake applications will occur as planned in 2017. In the past, the use of Alum at Mountain Lake has provided numerous benefits. However conditions (notably water clarity and total phosphorus) have been suitable and Alum has not been applied in several years. Its likely Mountain Lake will require the use of Alum but as always, we will provide a review of total phosphorus data, water clarity data and phytoplankton conditions.

Since hydro-raking was not conducted in the fall of 2016 due to low water levels, hydro-raking is planned for Wildwood Lake and Shadow Lake/Olive Pond early in the spring. Sediment probing is scheduled for August/September in the Mountain Lakes Coves, and in Grunden's Pond to identify suitable sites for the fall of 2017.

With the discovery of fanwort in the canal, we shall increase our survey efforts in the canal and in Wildwood Lake and the northern part of Mountain Lake. Any discoveries of fanwort will be swiftly treated with aggressive herbicide use with the single goal of eradication. The design of an Aquatic Plant Brochure and assistance in invasive species education will accompany these efforts in 2017.

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Johnson, Robert L. 2009. *Cazenovia Lake Plant Community Response to the 2009 Application of the Herbicide Triclopyr to Control Eurasian Water Milfoil.* Racine-Johnson Ecologists.

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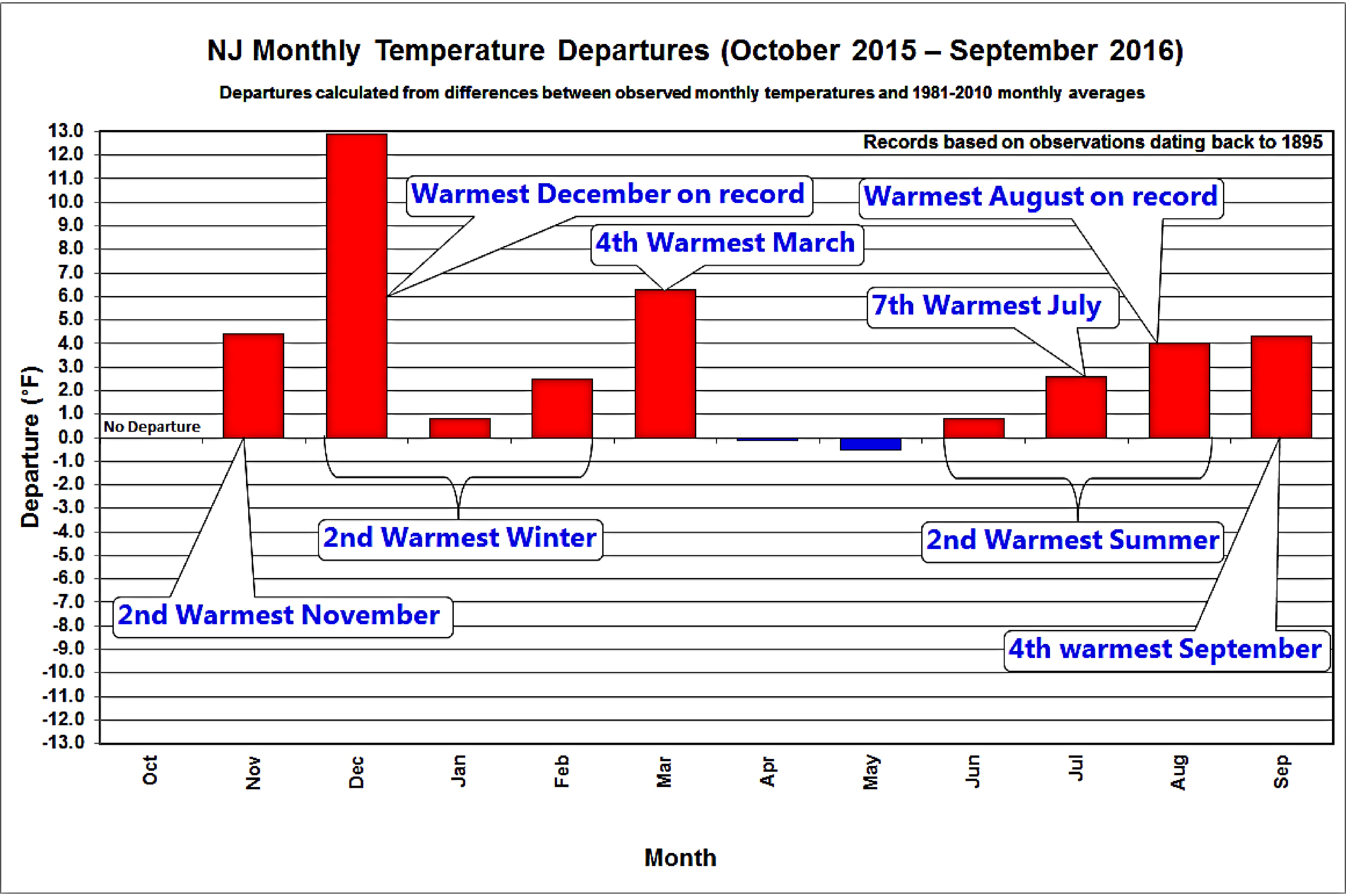
APPENDIX

2016 Rainfall and Temperature Data
2016 Water Quality Graphs
2016 TPO4 Graph for Mountain Lakes
2014 TPO4 Graph for Mountain Lakes
2013 TPO4 Graph for Mountain Lakes
2012 TPO4 Graph for Mountain Lakes
2011 TPO4 Graph for Mountain Lakes
2010 TPO4 Graph for Mountain Lakes
2009 TPO4 Graph for Mountain Lakes
2008 TPO4 Graph for Mountain Lakes
2007 TPO4 Graph for Mountain Lakes
2006 TPO4 Graph for Mountain Lakes
2016 Water Chemistry Data
2007 to 2016 Treatment History Graphs
2016 Phytoplankton Distribution Graphs
2015 APL Water Chemistry Data Sheets
2016 Phytoplankton Data
2016 Fecal Coliform Data
2016 Weekly Surveys



NJ Monthly Temperature Departures (October 2015 – September 2016)
Departures calculated from differences between observed monthly temperatures and 1981-2010 monthly averages
Records based on observations dating back to 1895
Warmest December on record
Warmest August on record
4th Warmest March
7th Warmest July
No Departure
2nd Warmest Winter
2nd Warmest Summer
2nd Warmest November
4th warmest September
Departure (°F)
13.0
12.0
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-7.0
-8.0
-9.0
-10.0
-11.0
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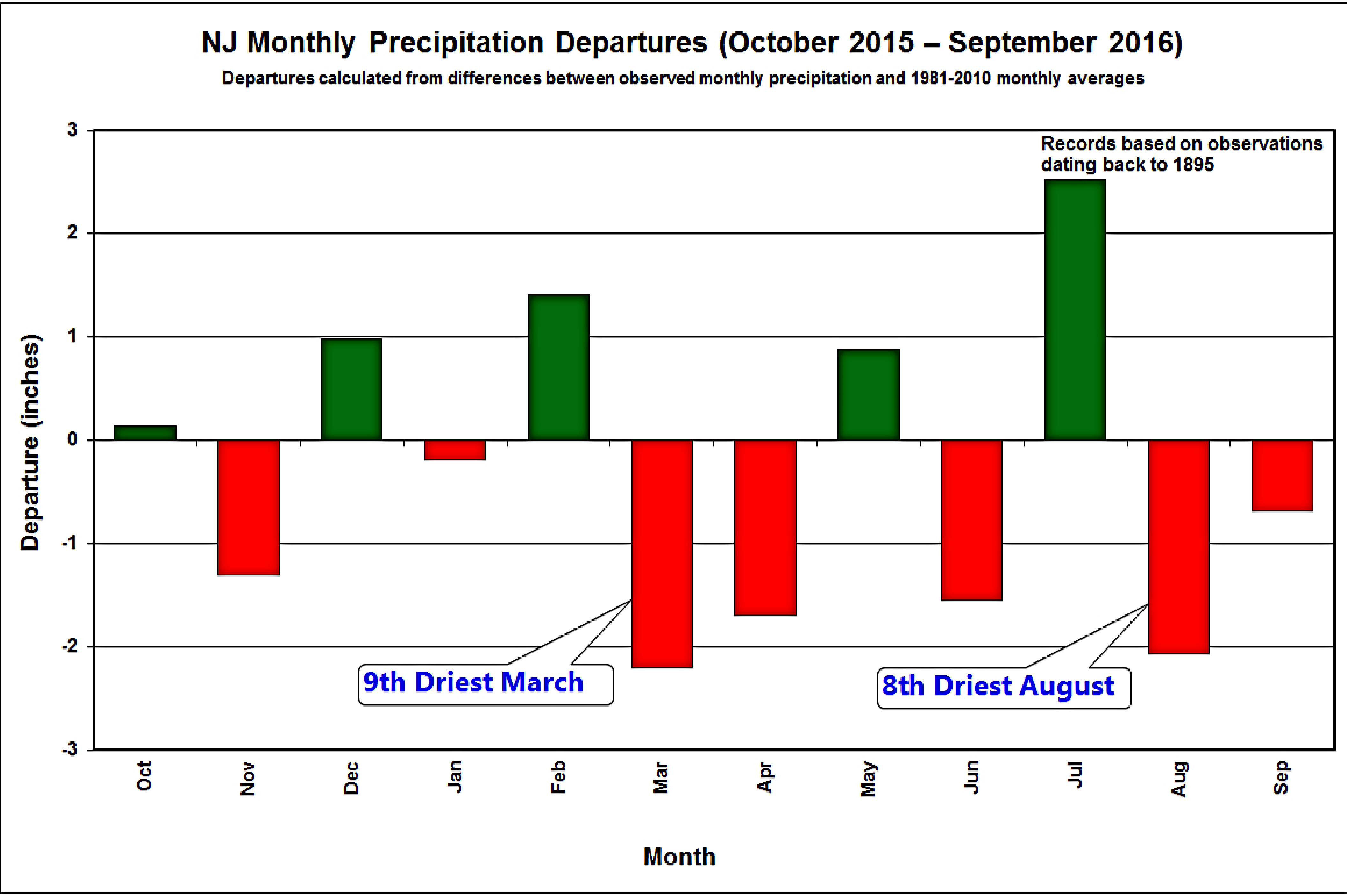
-13.0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Month



NJ Monthly Precipitation Departures (October 2015 – September 2016)
Departures calculated from differences between observed monthly precipitation and 1981-2010 monthly averages
Records based on observations dating back to 1895
Departure (inches)
3
2
1
0
-1
-2
-3
9th Driest March
8th Driest August
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Month

2016 Rainfall Data-Mt Lakes NJ

Total Monthly Rainfall

Month	2016	
	Inches	Days
April	2.40	10
May	3.77	19
June	1.68	10
July	2.70	12
August	1.40	10
September	2.00	10
October	1.71	8

Date	Rainfall
4/2/2016	0.35
4/3/2016	0.08
4/4/2016	0.49
4/7/2016	0.16
4/9/2016	0.04
4/11/2016	0.02
4/12/2016	0.32
4/23/2016	0.51
4/25/2016	0.39
4/29/2016	0.04

Date	Rainfall
5/1/2016	0.28
5/2/2016	0.02
5/3/2016	0.67
5/4/2016	0.1
5/6/2016	0.5
5/7/2016	0.02
5/8/2016	0.38
5/13/2016	0.21
5/14/2016	0.04
5/16/2016	0.01
5/19/2016	0.02
5/21/2016	0.2
5/22/2016	0.32
5/23/2016	0.02
5/24/2016	0.33
5/27/2016	0.02
5/28/2016	0.06
5/29/2016	0.02
5/30/2016	0.55

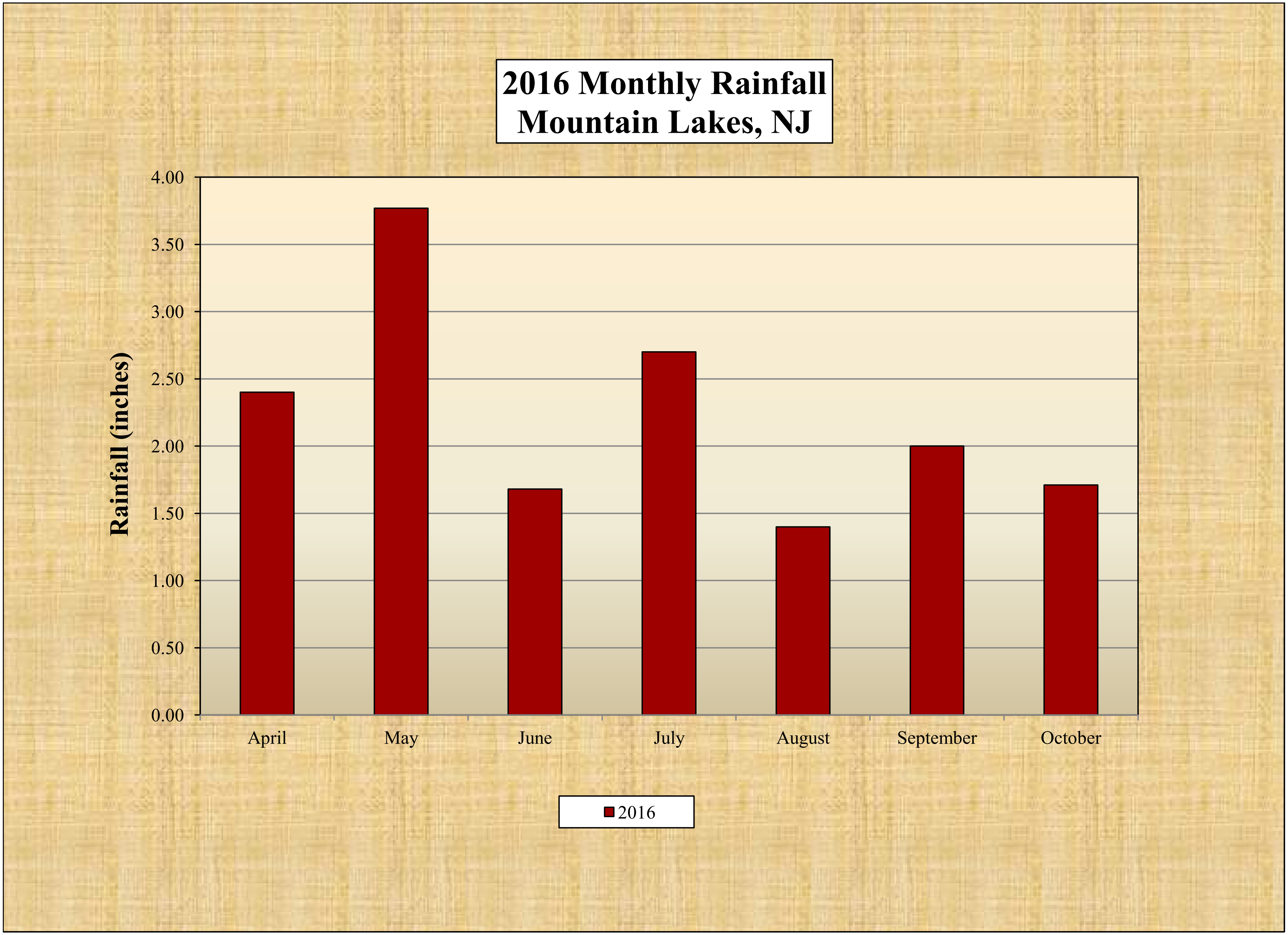
Date	Rainfall
6/3/2016	0.15
6/4/2016	0.03
6/5/2016	0.43
6/8/2016	0.35
6/16/2016	0.2
6/17/2016	0.01
6/21/2016	0.07
6/27/2016	0.16
6/28/2016	0.25
6/29/2016	0.03

Date	Rainfall
7/1/2016	0.15
7/4/2016	0.06
7/5/2016	0.37
7/8/2016	0.09
7/9/2016	0.2
7/14/2016	0.04
7/19/2016	0.01
7/25/2016	0.2
7/28/2016	0.04
7/29/2016	0.52
7/30/2016	0.62
7/31/2016	0.4

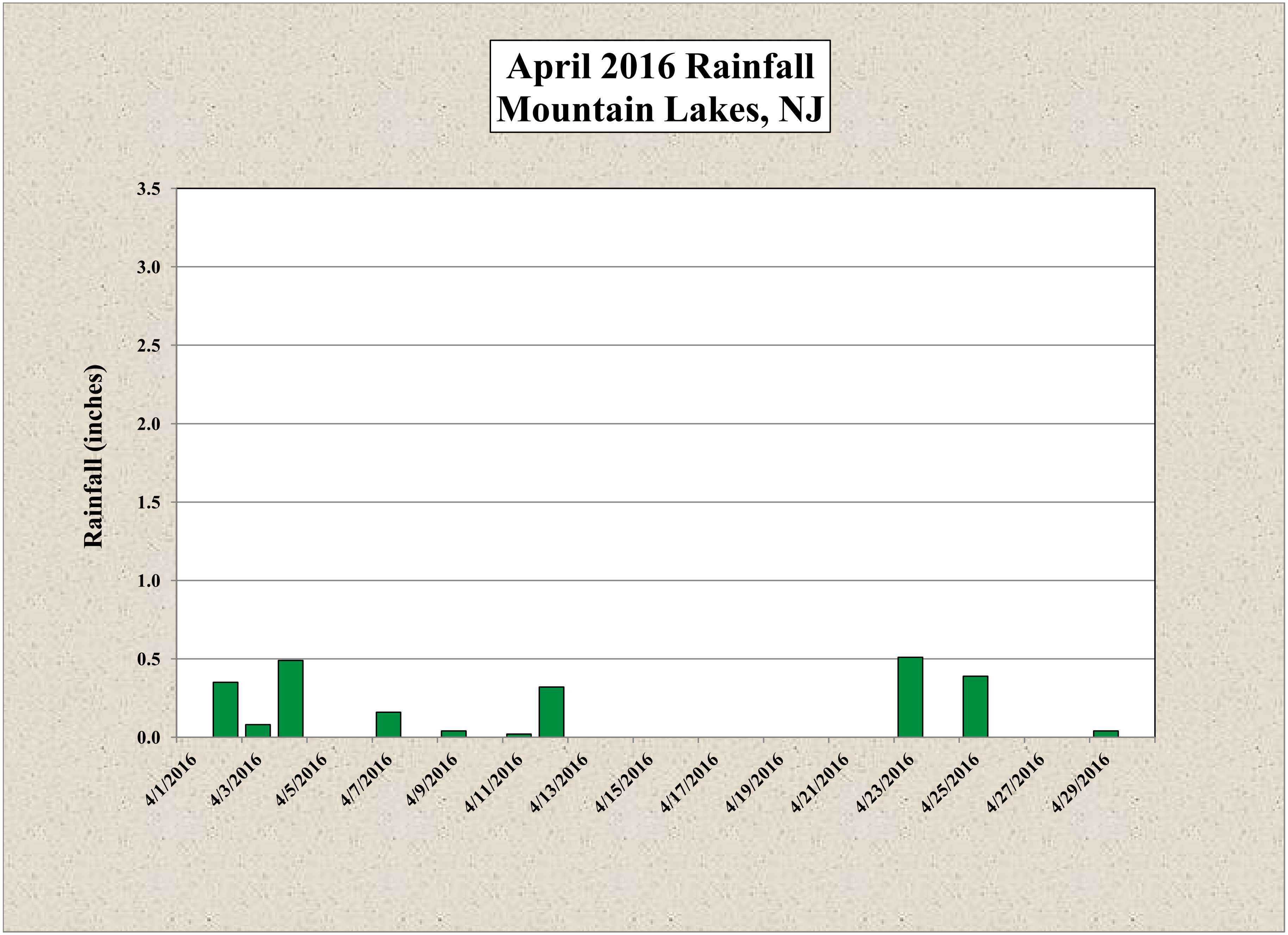
Date	Rainfall
8/6/2016	0.03
8/10/2016	0.09
8/11/2016	0.04
8/12/2016	0.66
8/14/2016	0.06
8/15/2016	0.01
8/16/2016	0.03
8/17/2016	0.08
8/18/2016	0.05
8/21/2016	0.35

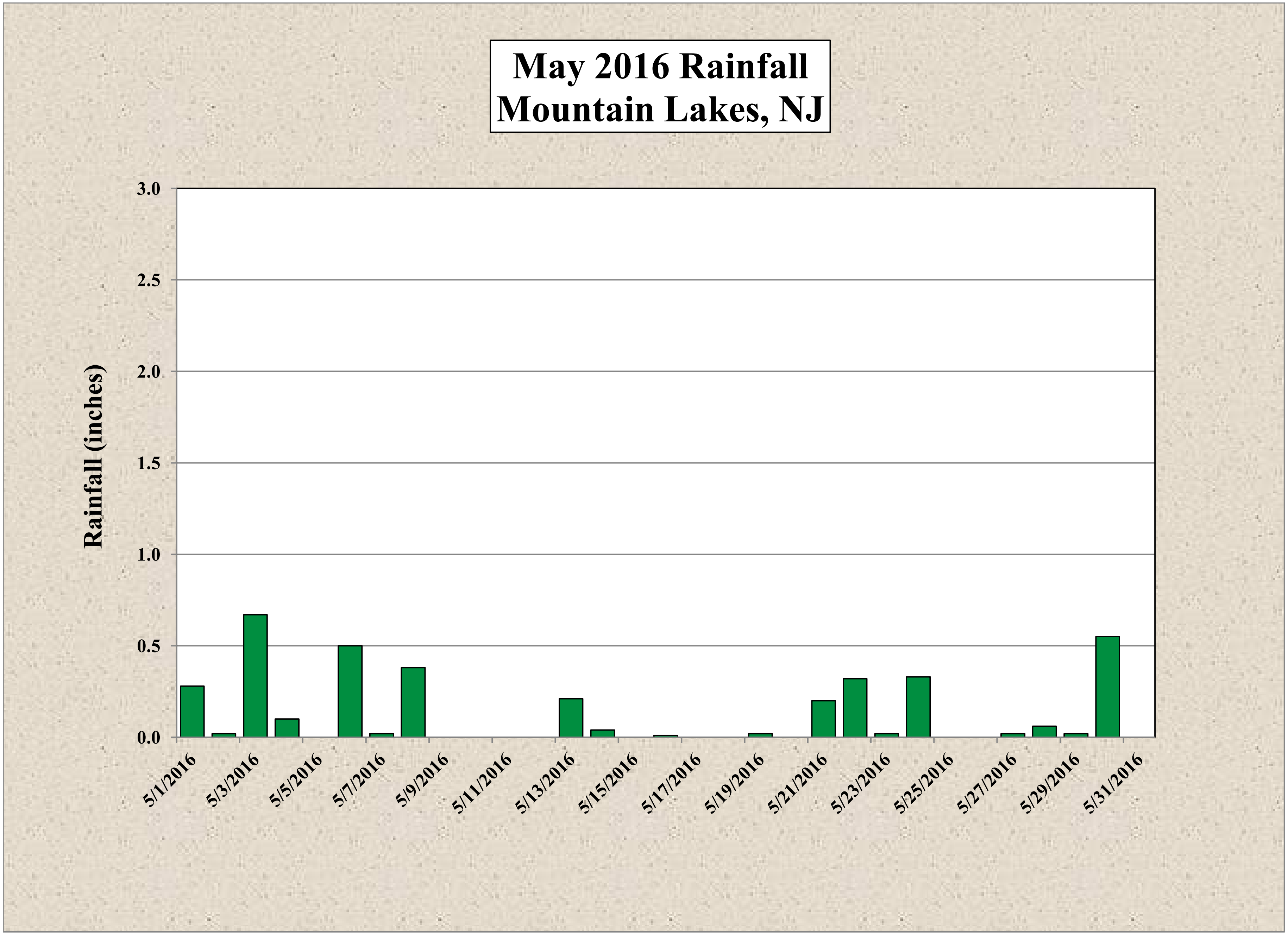
Date	Rainfall
9/1/2016	0.19
9/7/2016	0.04
9/9/2016	0.01
9/14/2016	0.17
9/19/2016	0.44
9/23/2016	0.02
9/24/2016	0.46
9/27/2016	0.45
9/29/2016	0.06
9/30/2016	0.16

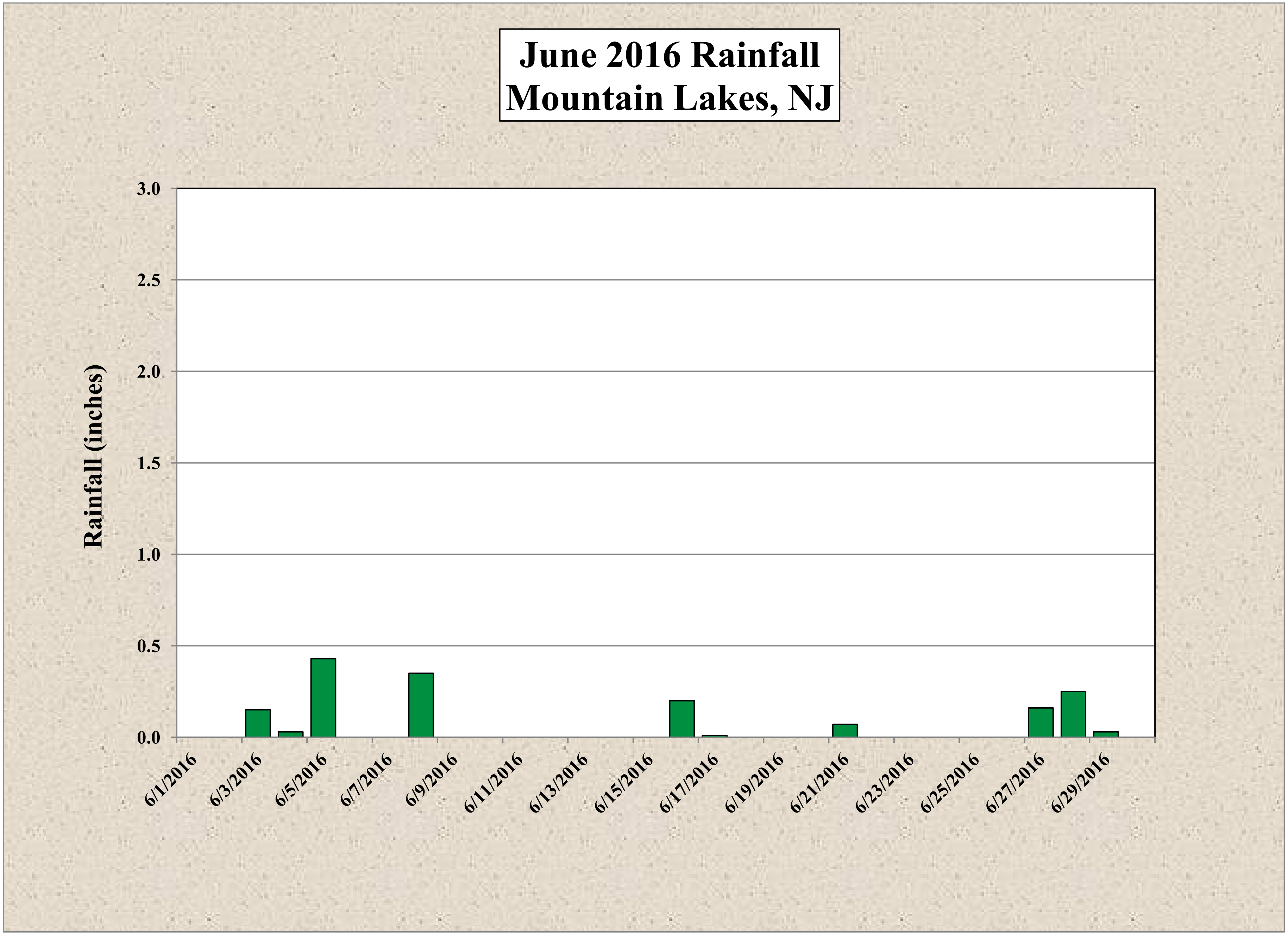
Date	Rainfall
10/3/2016	0.06
10/4/2016	0.02
10/9/2016	0.1
10/13/2016	0.04
10/21/2016	0.03
10/22/2016	0.7
10/27/2016	0.52
10/30/2016	0.24

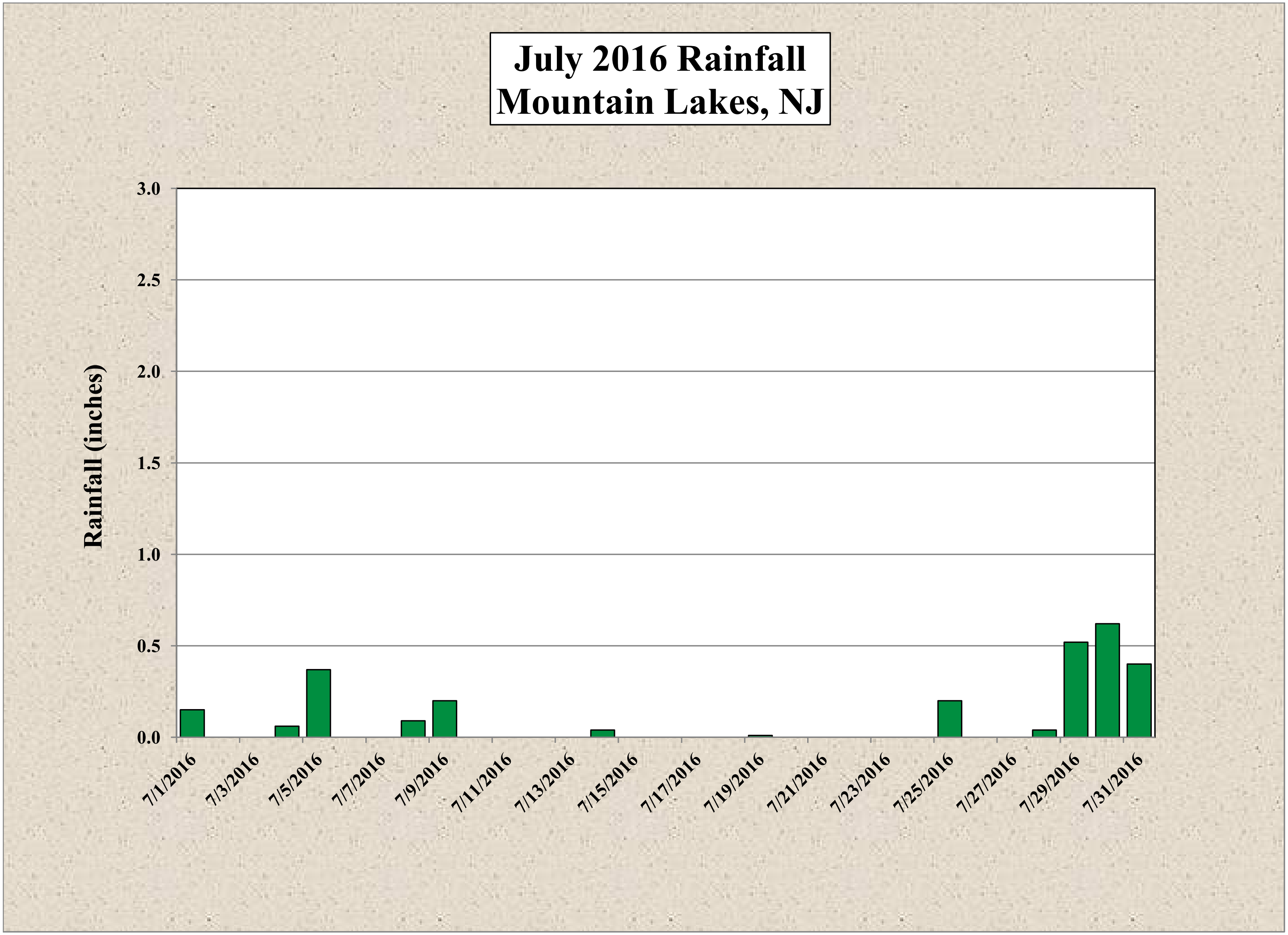


2016 Monthly Rainfall
Mountain Lakes, NJ
Rainfall (inches)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
April
May
June
July
August
September
October
2016

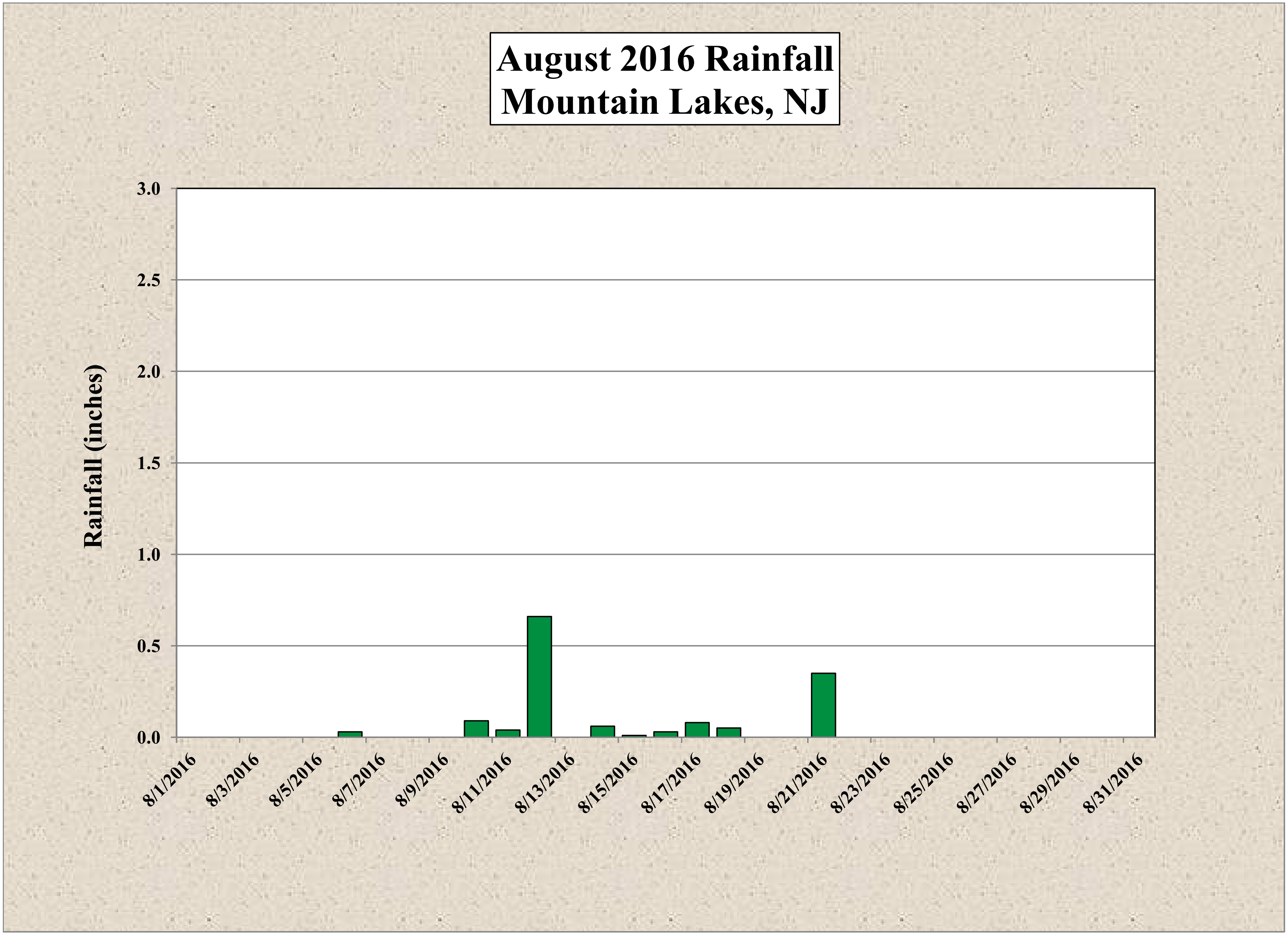

April 2016 Rainfall
Mountain Lakes, NJ
Rainfall (inches)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
4/1/2016
4/3/2016
4/5/2016
4/7/2016
4/9/2016
4/11/2016
4/13/2016
4/15/2016
4/17/2016
4/19/2016
4/21/2016
4/23/2016
4/25/2016
4/27/2016
4/29/2016

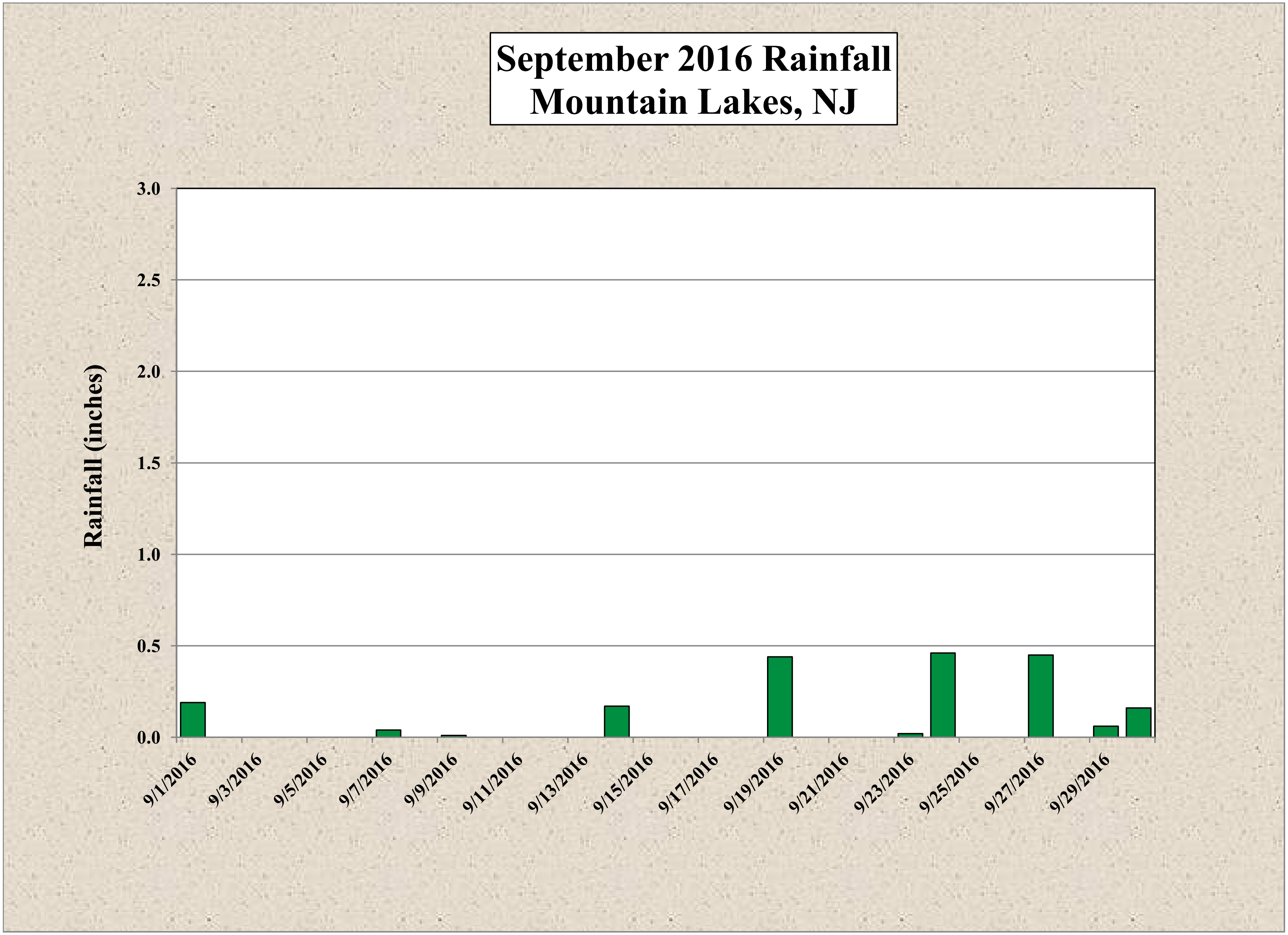

May 2016 Rainfall
Mountain Lakes, NJ
Rainfall (inches)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
5/1/2016
5/3/2016
5/5/2016
5/7/2016
5/9/2016
5/11/2016
5/13/2016
5/15/2016
5/17/2016
5/19/2016
5/21/2016
5/23/2016
5/25/2016
5/27/2016
5/29/2016
5/31/2016

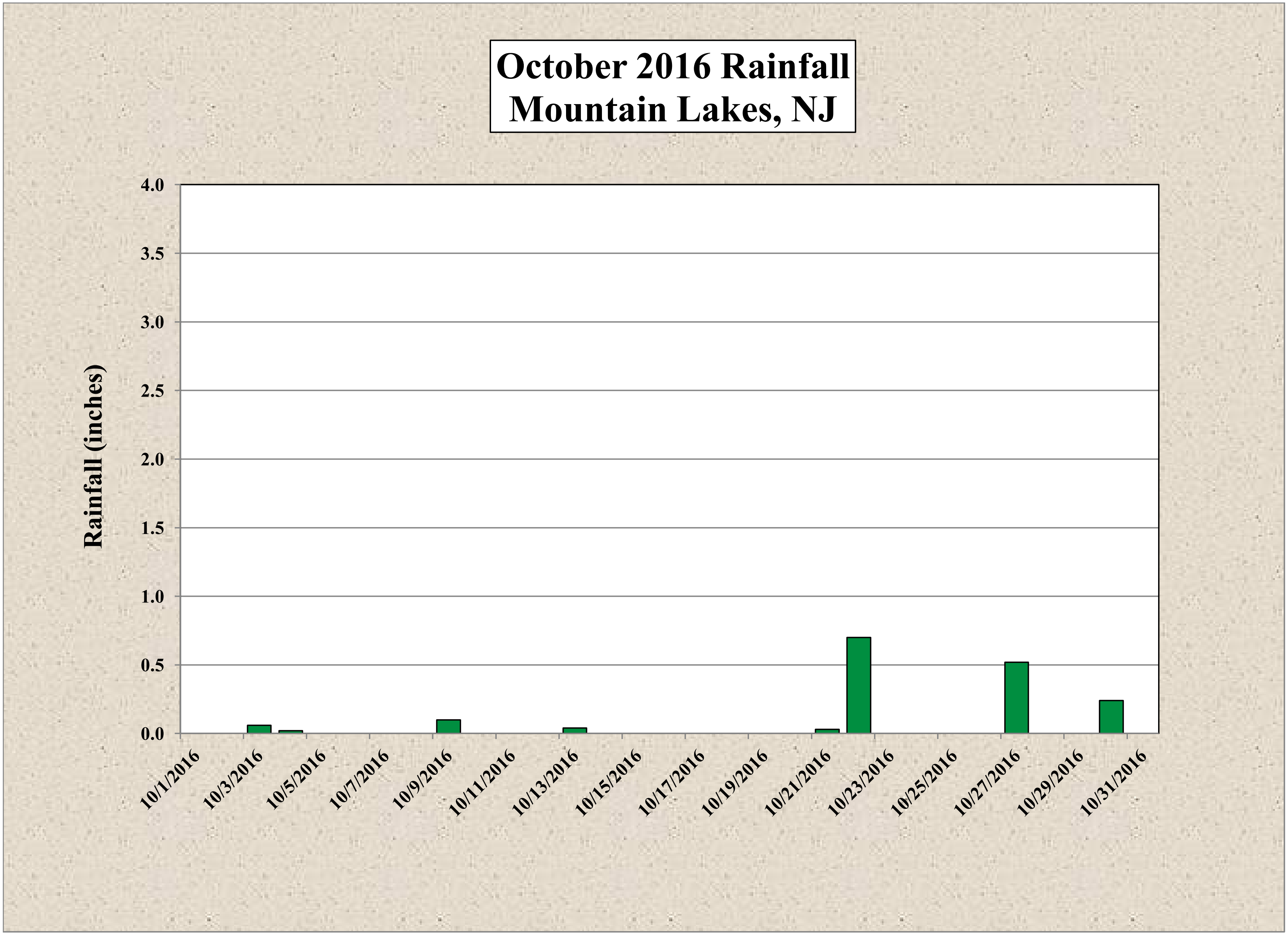

June 2016 Rainfall
Mountain Lakes, NJ
Rainfall (inches)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
6/1/2016
6/3/2016
6/5/2016
6/7/2016
6/9/2016
6/11/2016
6/13/2016
6/15/2016
6/17/2016
6/19/2016
6/21/2016
6/23/2016
6/25/2016
6/27/2016
6/29/2016

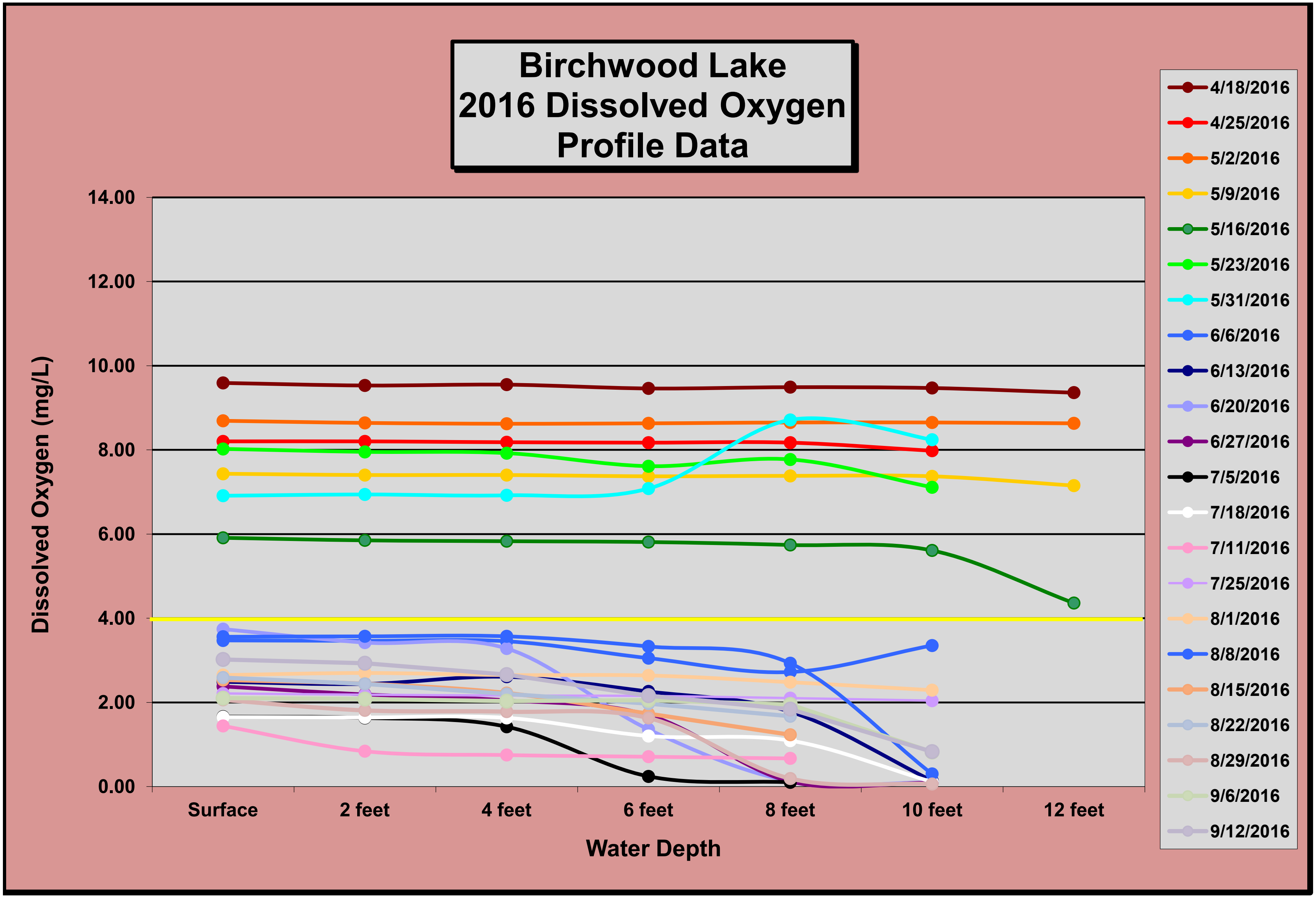


July 2016 Rainfall
Mountain Lakes, NJ
Rainfall (inches)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
7/1/2016
7/3/2016
7/5/2016
7/7/2016
7/9/2016
7/11/2016
7/13/2016
7/15/2016
7/17/2016
7/19/2016
7/21/2016
7/23/2016
7/25/2016
7/27/2016
7/29/2016
7/31/2016

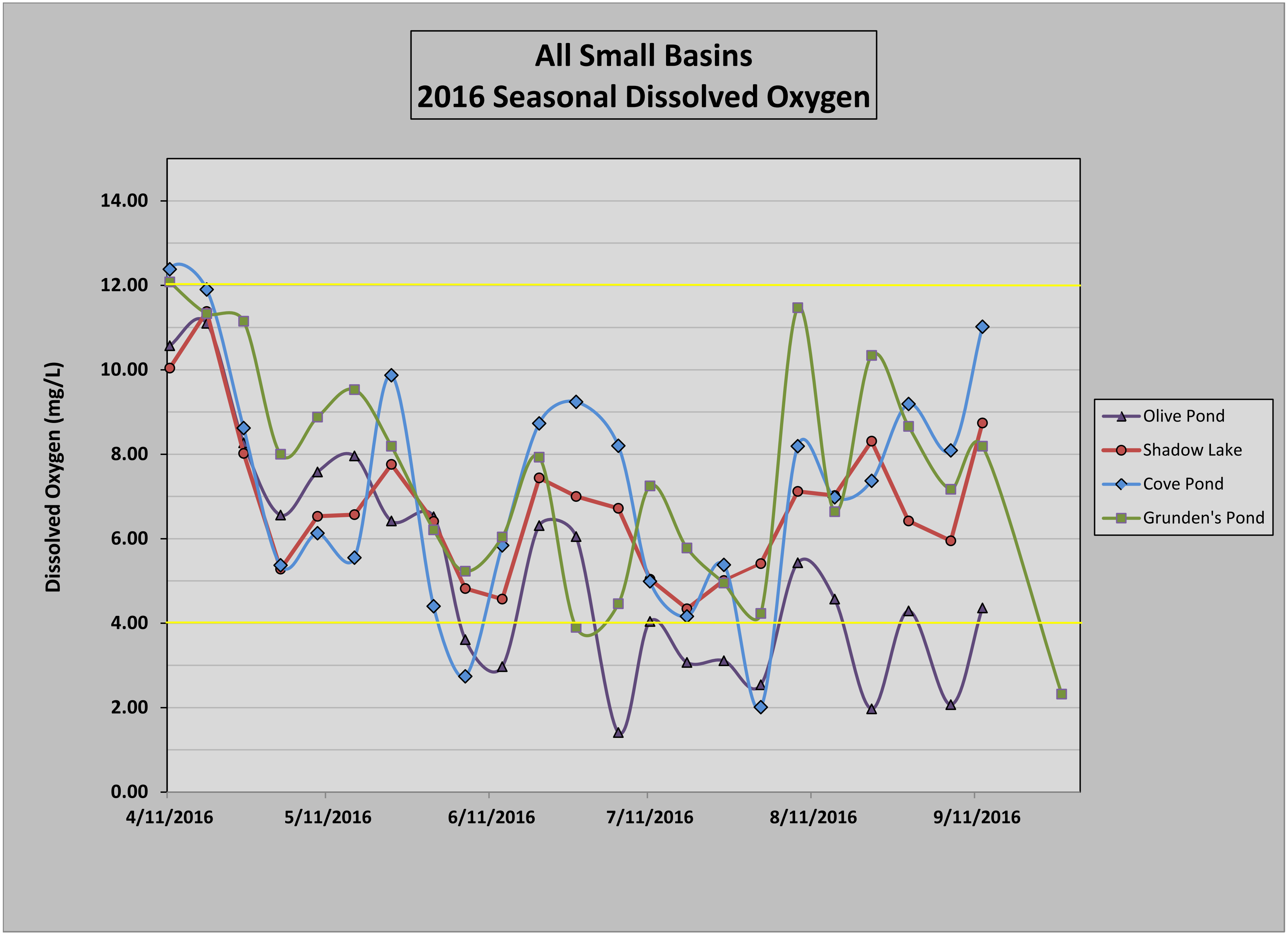

August 2016 Rainfall
Mountain Lakes, NJ
Rainfall (inches)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
8/1/2016
8/3/2016
8/5/2016
8/7/2016
8/9/2016
8/11/2016
8/13/2016
8/15/2016
8/17/2016
8/19/2016
8/21/2016
8/23/2016
8/25/2016
8/27/2016
8/29/2016
8/31/2016

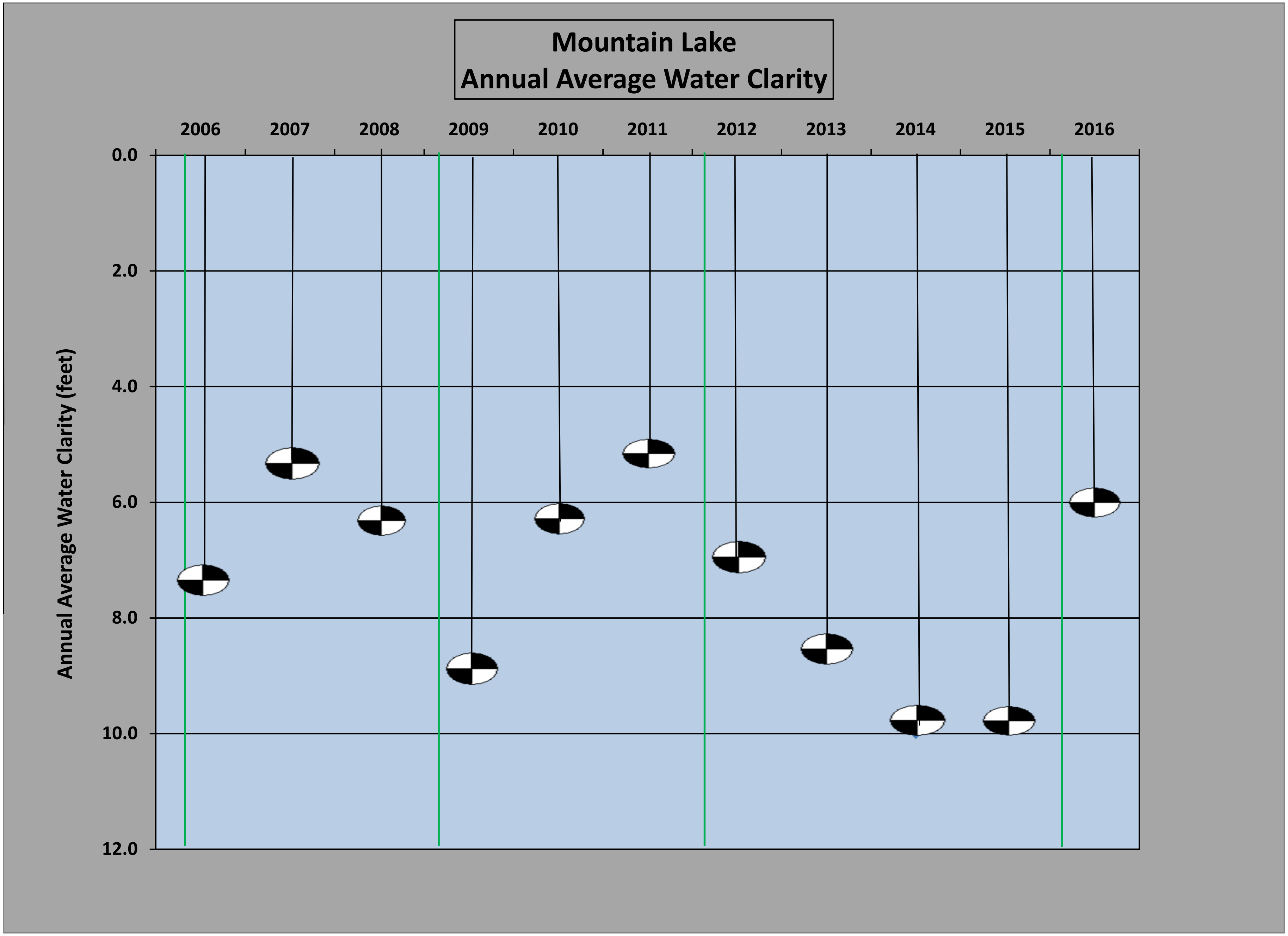

September 2016 Rainfall
Mountain Lakes, NJ
Rainfall (inches)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9/1/2016
9/3/2016
9/5/2016
9/7/2016
9/9/2016
9/11/2016
9/13/2016
9/15/2016
9/17/2016
9/19/2016
9/21/2016
9/23/2016
9/25/2016
9/27/2016
9/29/2016

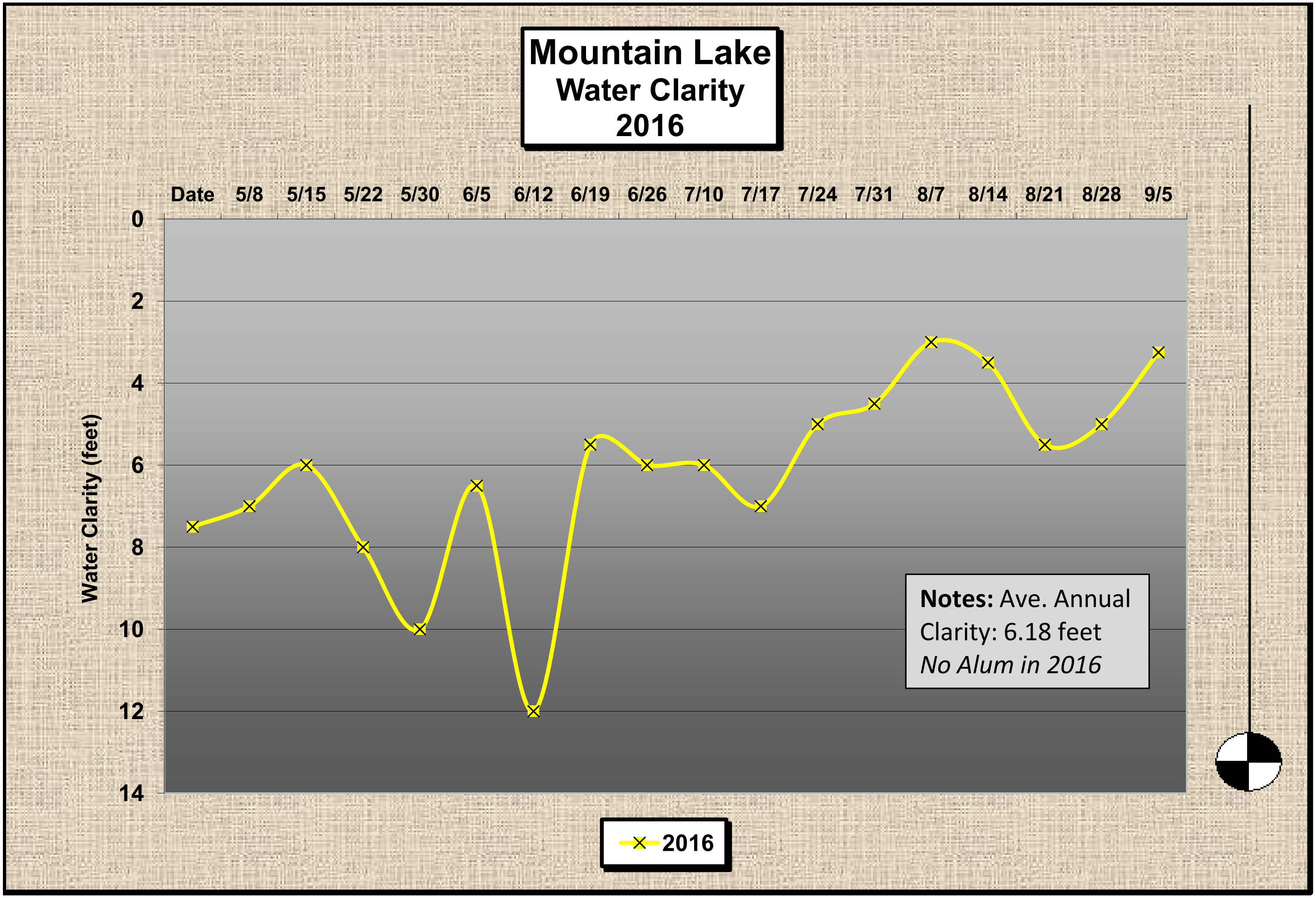

October 2016 Rainfall
Mountain Lakes, NJ
Rainfall (inches)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
10/1/2016
10/3/2016
10/5/2016
10/7/2016
10/9/2016
10/11/2016
10/13/2016
10/15/2016
10/17/2016
10/19/2016
10/21/2016
10/23/2016
10/25/2016
10/27/2016
10/29/2016
10/31/2016



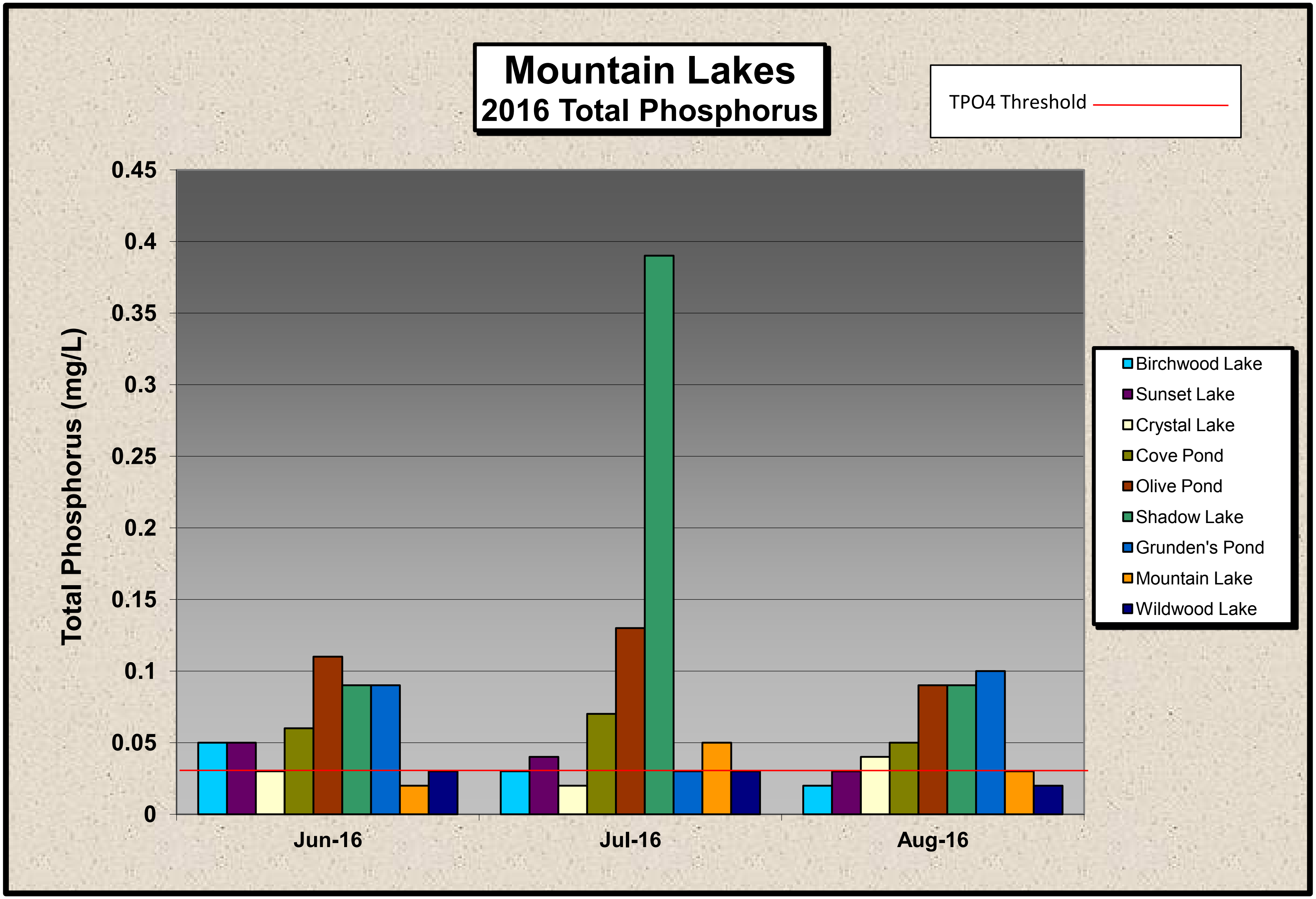
Birchwood Lake
2016 Dissolved Oxygen
Profile Data
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Dissolved Oxygen (mg/L)
Surface
2 feet
4 feet
6 feet
8 feet
10 feet
12 feet
Water Depth
4/18/2016
4/25/2016
5/2/2016
5/9/2016
5/16/2016
5/23/2016
5/31/2016
6/6/2016
6/13/2016
6/20/2016
6/27/2016
7/5/2016
7/18/2016
7/11/2016
7/25/2016
8/1/2016
8/8/2016
8/15/2016
8/22/2016
8/29/2016
9/6/2016
9/12/2016


All Small Basins
2016 Seasonal Dissolved Oxygen
Dissolved Oxygen (mg/L)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
4/11/2016
5/11/2016
6/11/2016
7/11/2016
8/11/2016
9/11/2016
Olive Pond
Shadow Lake
Cove Pond
Grunden's Pond

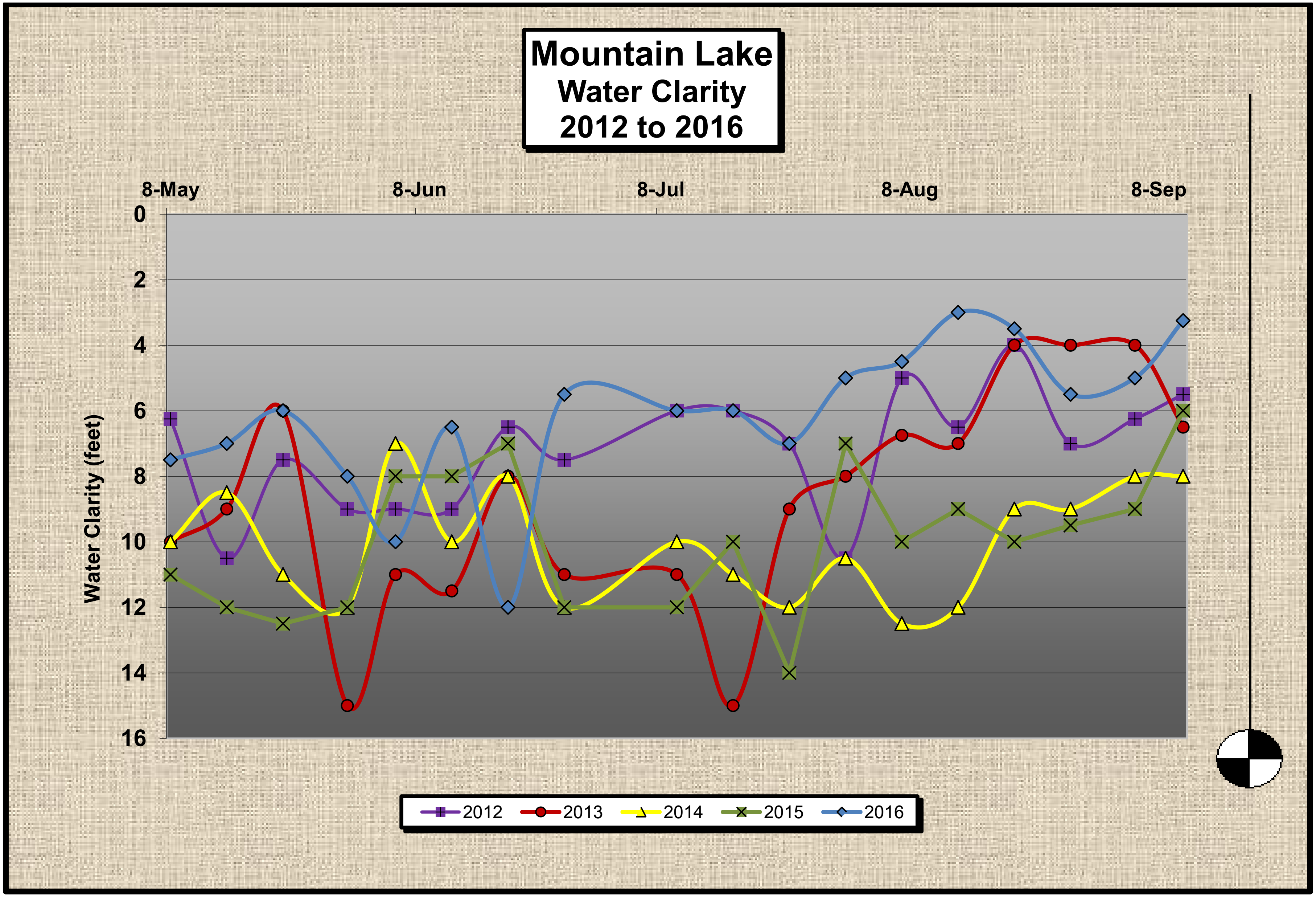

Mountain Lake
Annual Average Water Clarity
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Annual Average Water Clarity (feet)

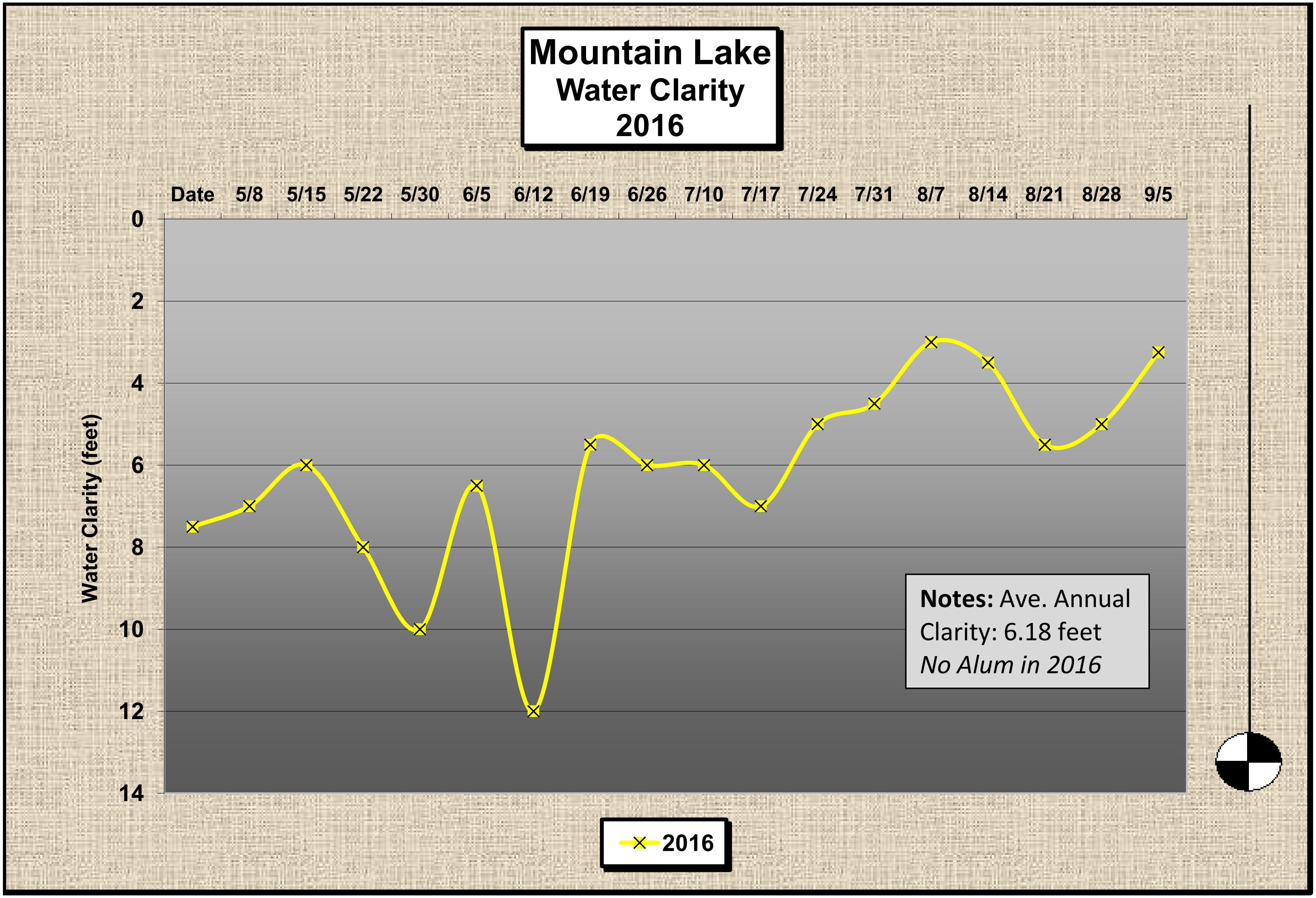


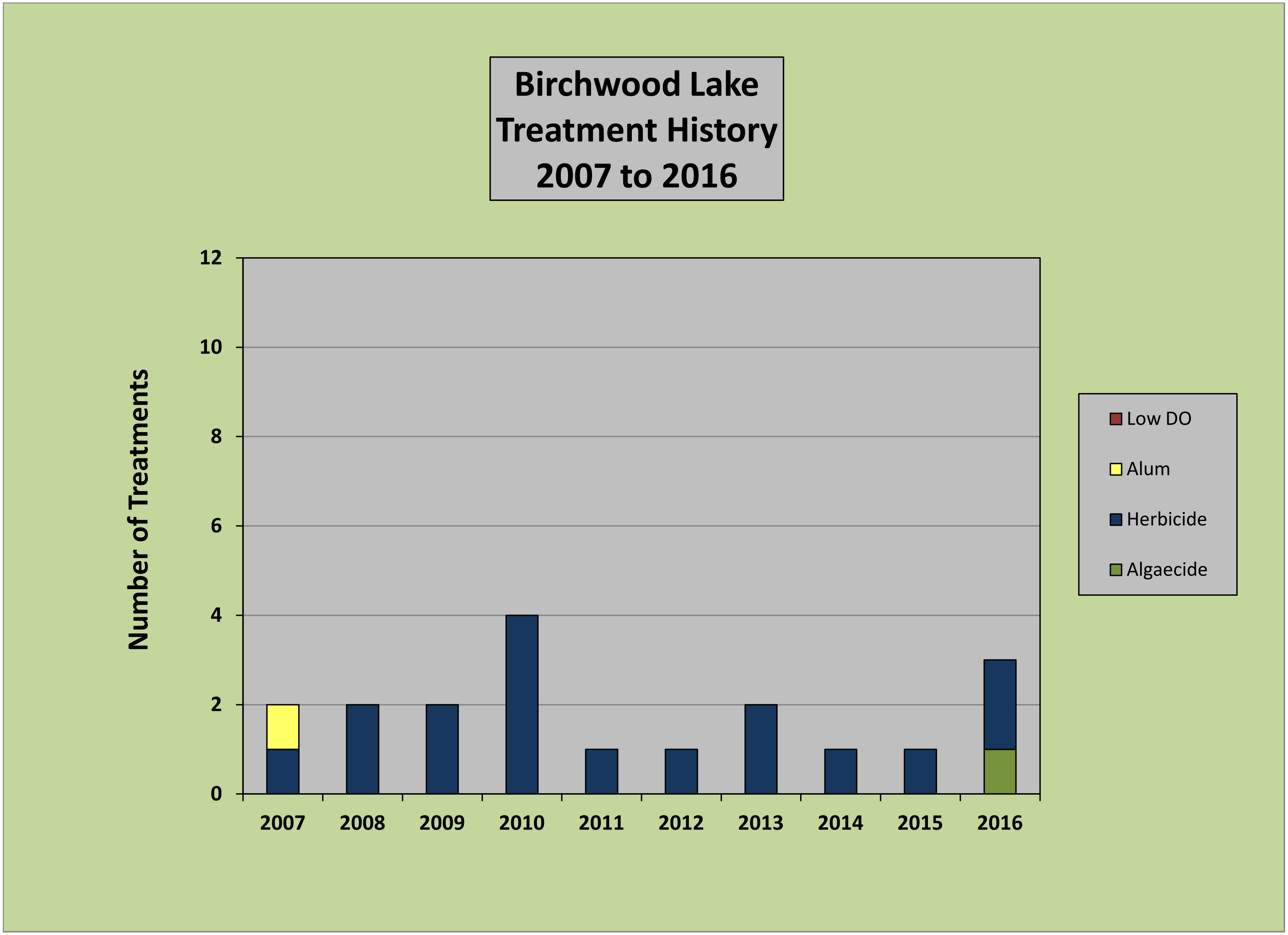
Mountain Lake
Water Clarity
2016
Date
5/8
5/15
5/22
5/30
6/5
6/12
6/19
6/26
7/10
7/17
7/24
7/31
8/7
8/14
8/21
8/28
9/5
0
2
4
6
8
10
12
14
Water Clarity (feet)
Notes: Ave. Annual Clarity: 6.18 feet
No Alum in 2016
2016

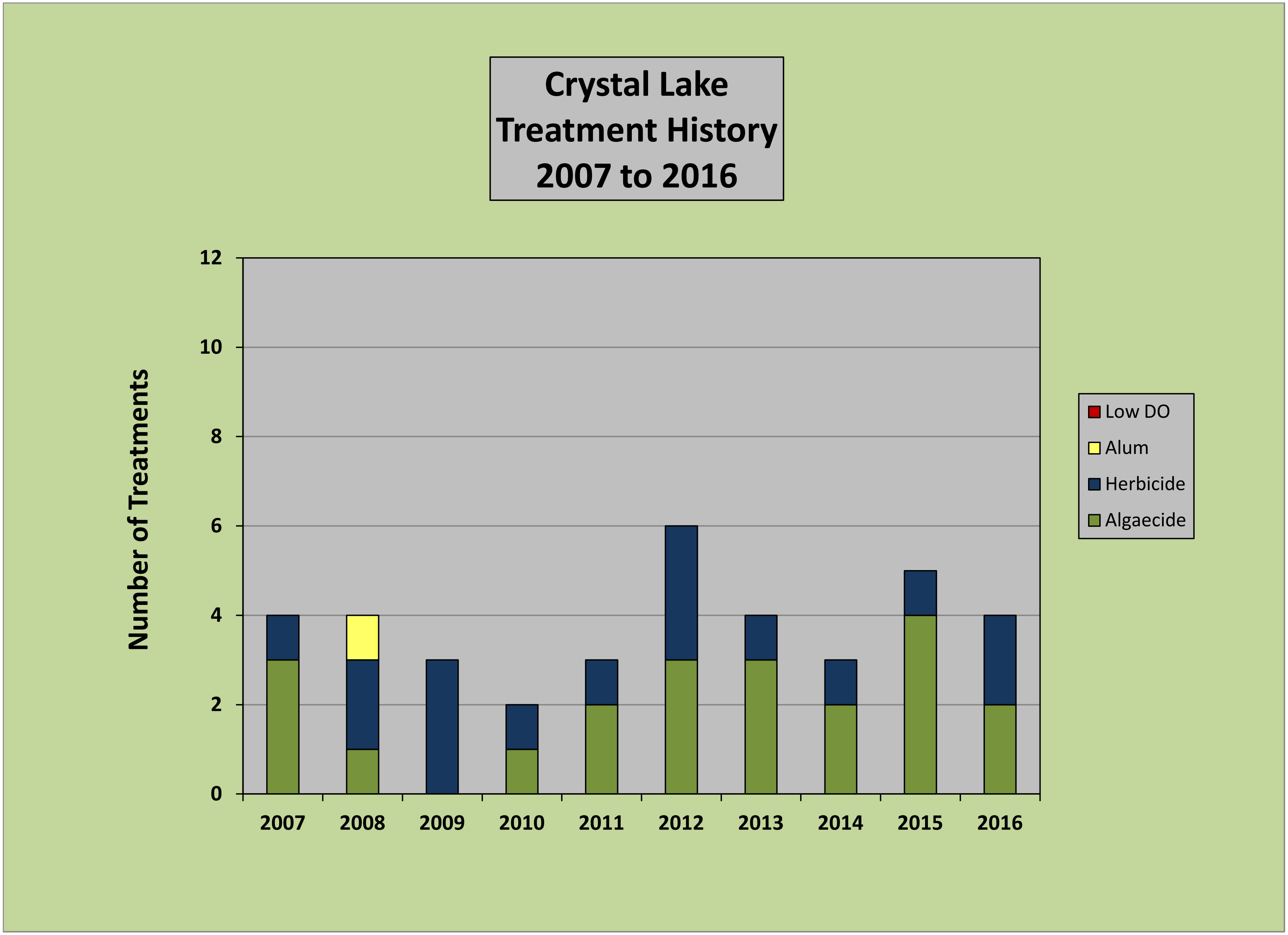


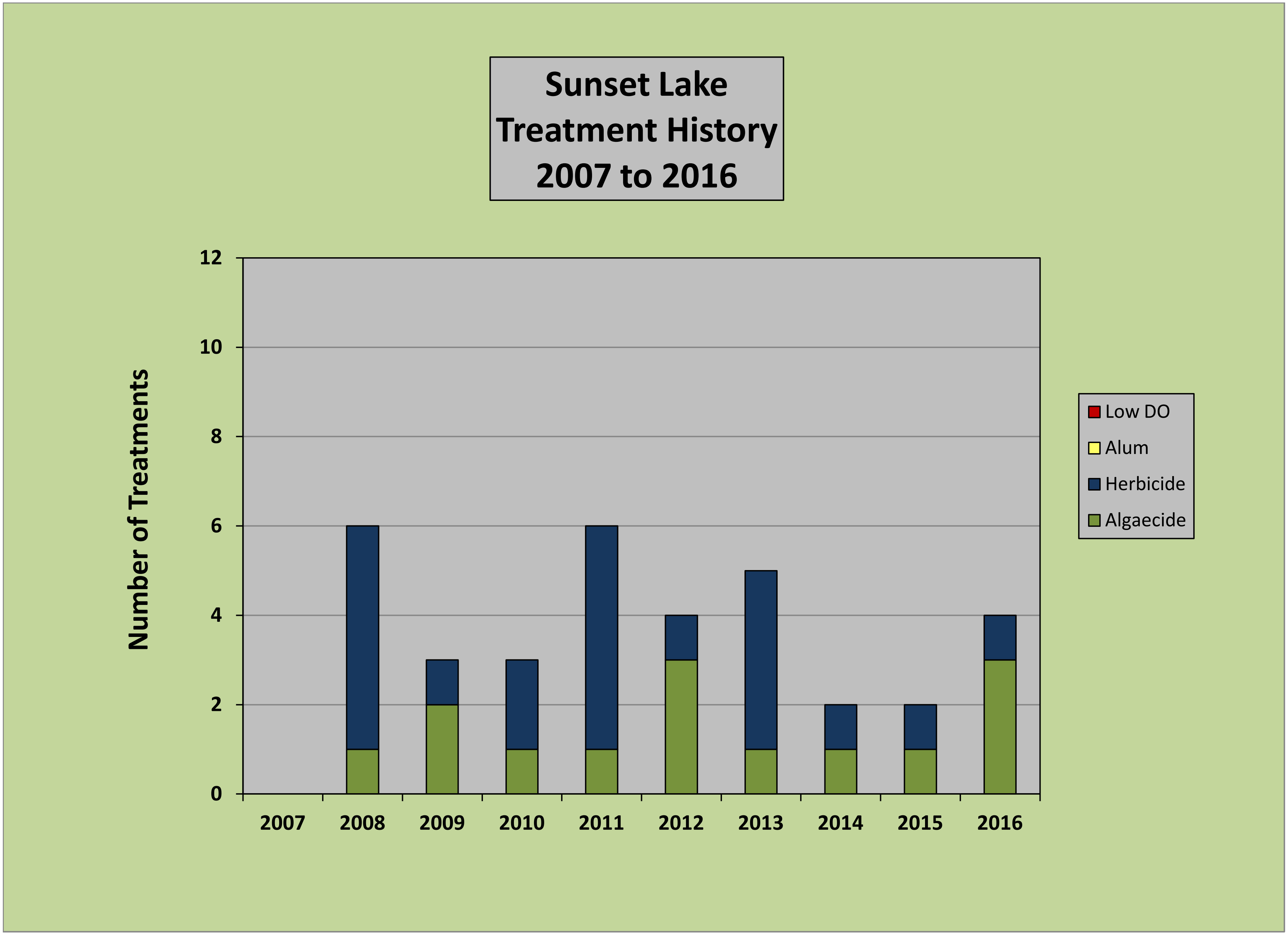
Mountain Lakes
2016 Total Phosphorus
TPO4 Threshold
Total Phosphorus (mg/L)
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Jun-16
Jul-16
Aug-16
Birchwood Lake
Sunset Lake
Crystal Lake
Cove Pond
Olive Pond
Shadow Lake
Grunden's Pond
Mountain Lake
Wildwood Lake

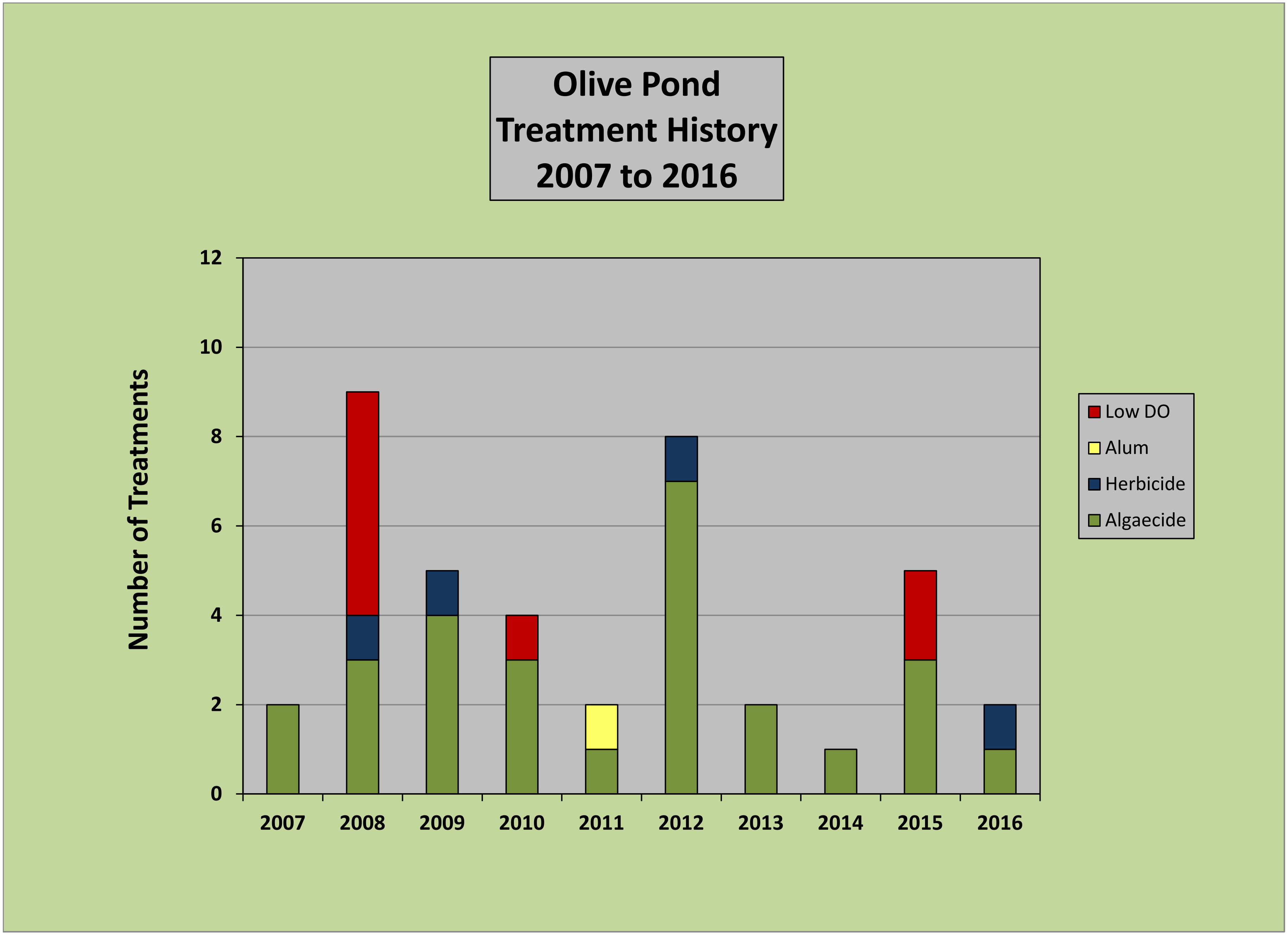

Mountain Lake
Water Clarity
2012 to 2016
8-May
8-Jun
8-Jul
8-Aug
8-Sep
0
2
4
6
8
10
12
14
16
Water Clarity (feet)
2012
2013
2014
2015
2016

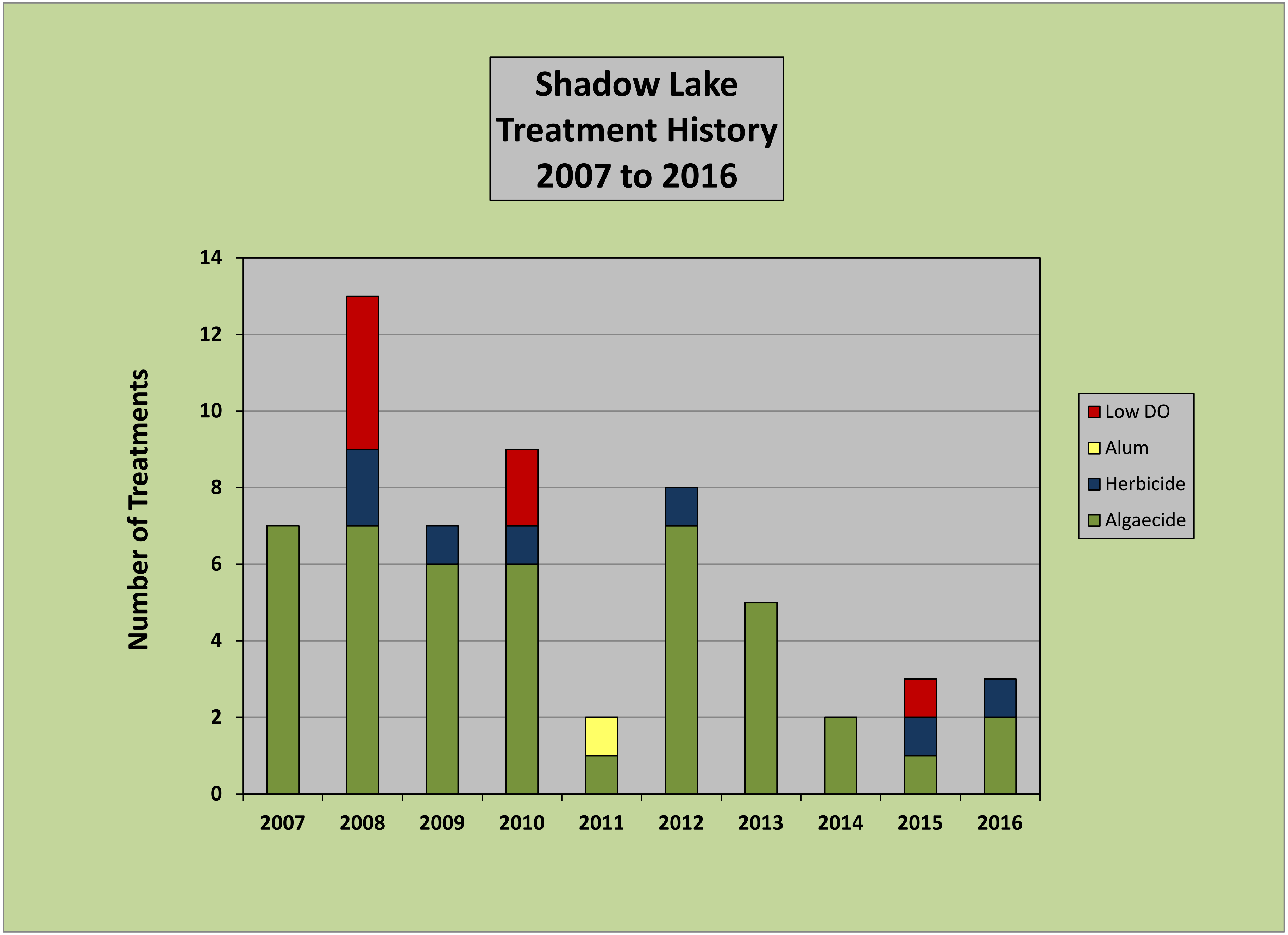

Mountain Lake
Water Clarity
2016
Date
5/8
5/15
5/22
5/30
6/5
6/12
6/19
6/26
7/10
7/17
7/24
7/31
8/7
8/14
8/21
8/28
9/5
0
2
4
6
8
10
12
14
Water Clarity (feet)
Notes: Ave. Annual
Clarity: 6.18 feet
No Alum in 2016
2016


Birchwood Lake
Treatment History
2007 to 2016
Number of Treatments
0
2
4
6
8
10
12
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Low DO
Alum
Herbicide
Algaecide

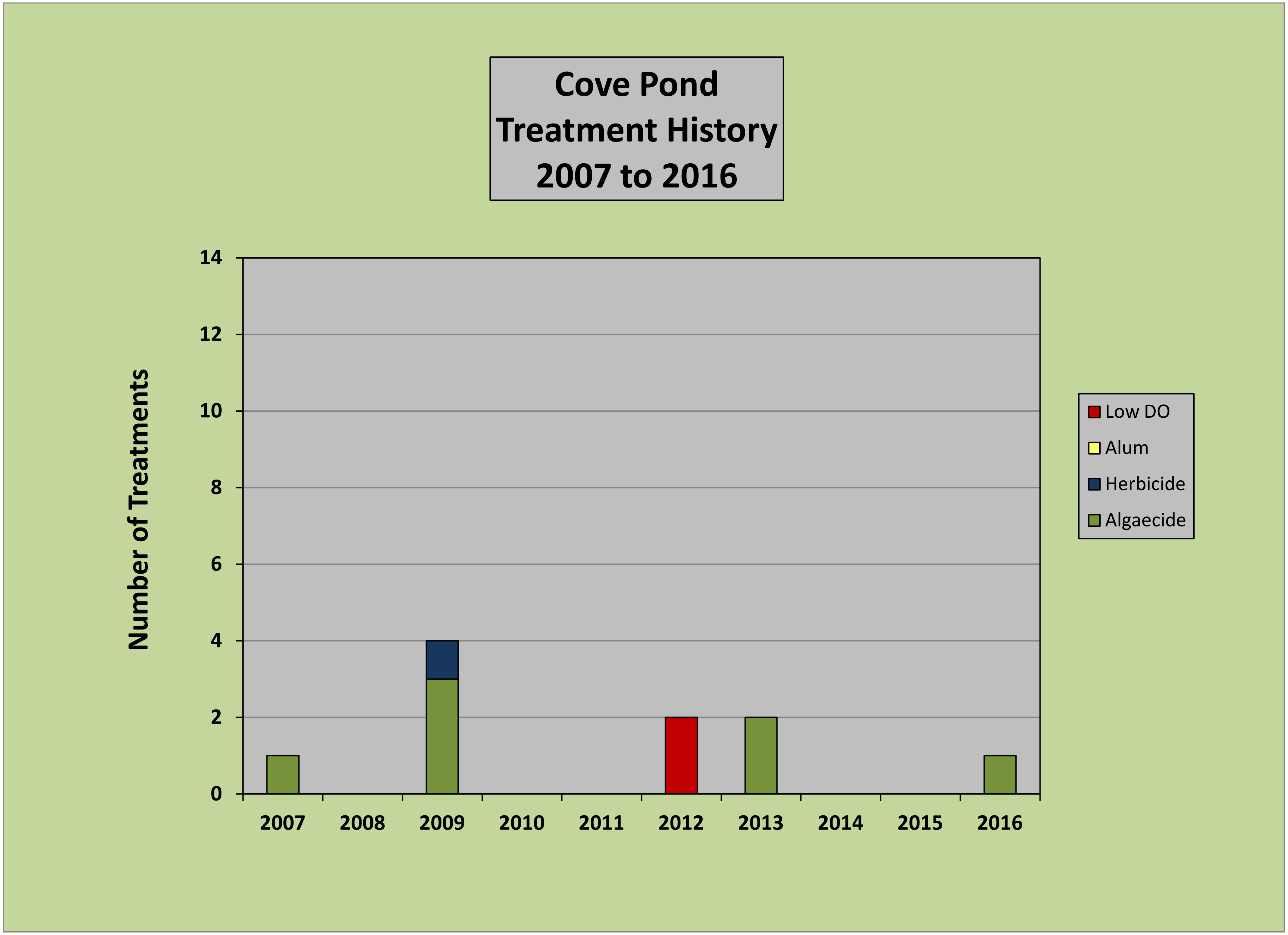

Crystal Lake
Treatment History
2007 to 2016
Number of Treatments
0
2
4
6
8
10
12
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Low DO
Alum
Herbicide
Algaecide


Sunset Lake
Treatment History
2007 to 2016
Number of Treatments
0
2
4
6
8
10
12
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Low DO
Alum
Herbicide
Algaecide

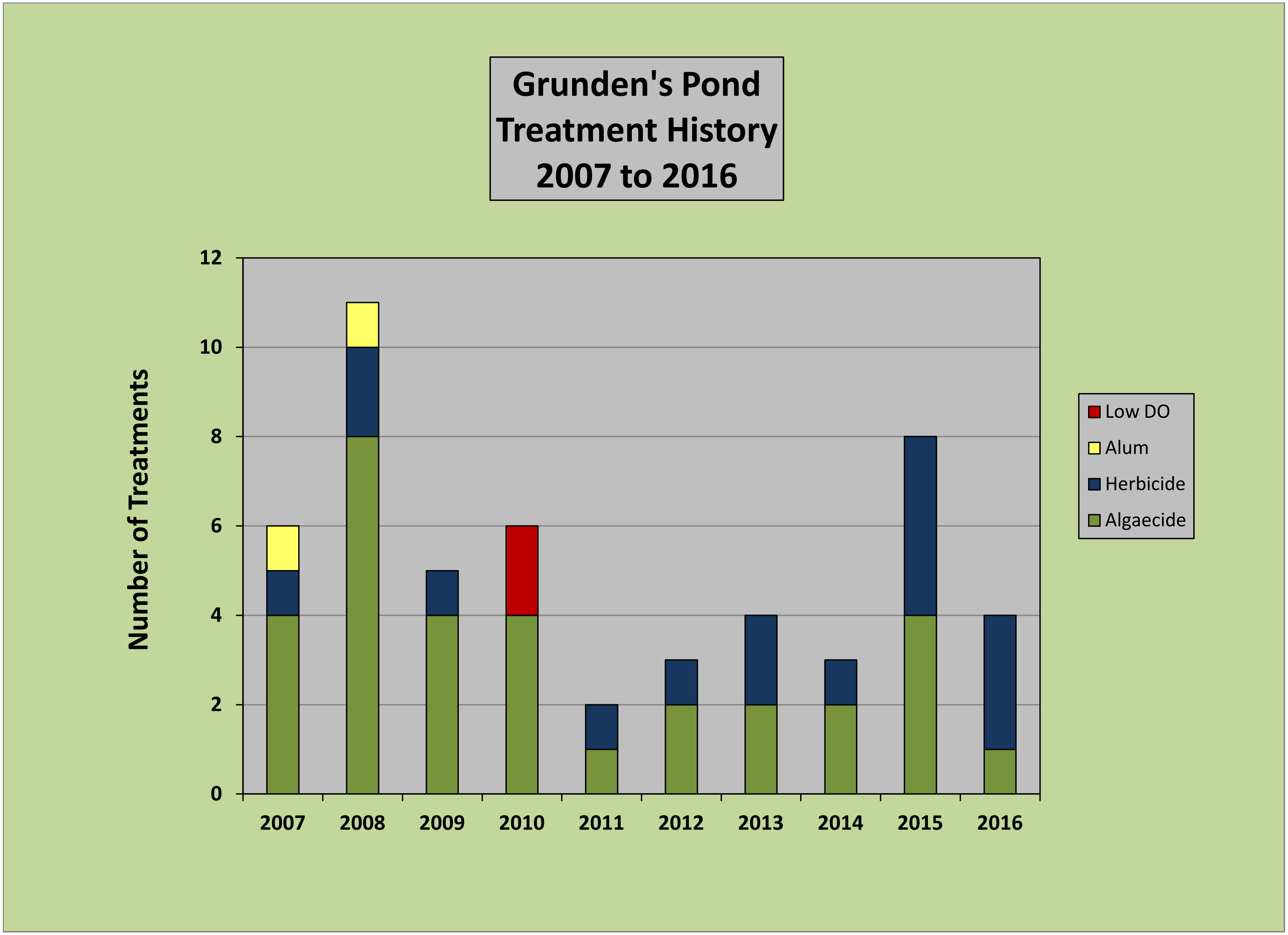

Olive Pond
Treatment History
2007 to 2016
Number of Treatments
0
2
4
6
8
10
12
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Low DO
Alum
Herbicide
Algaecide

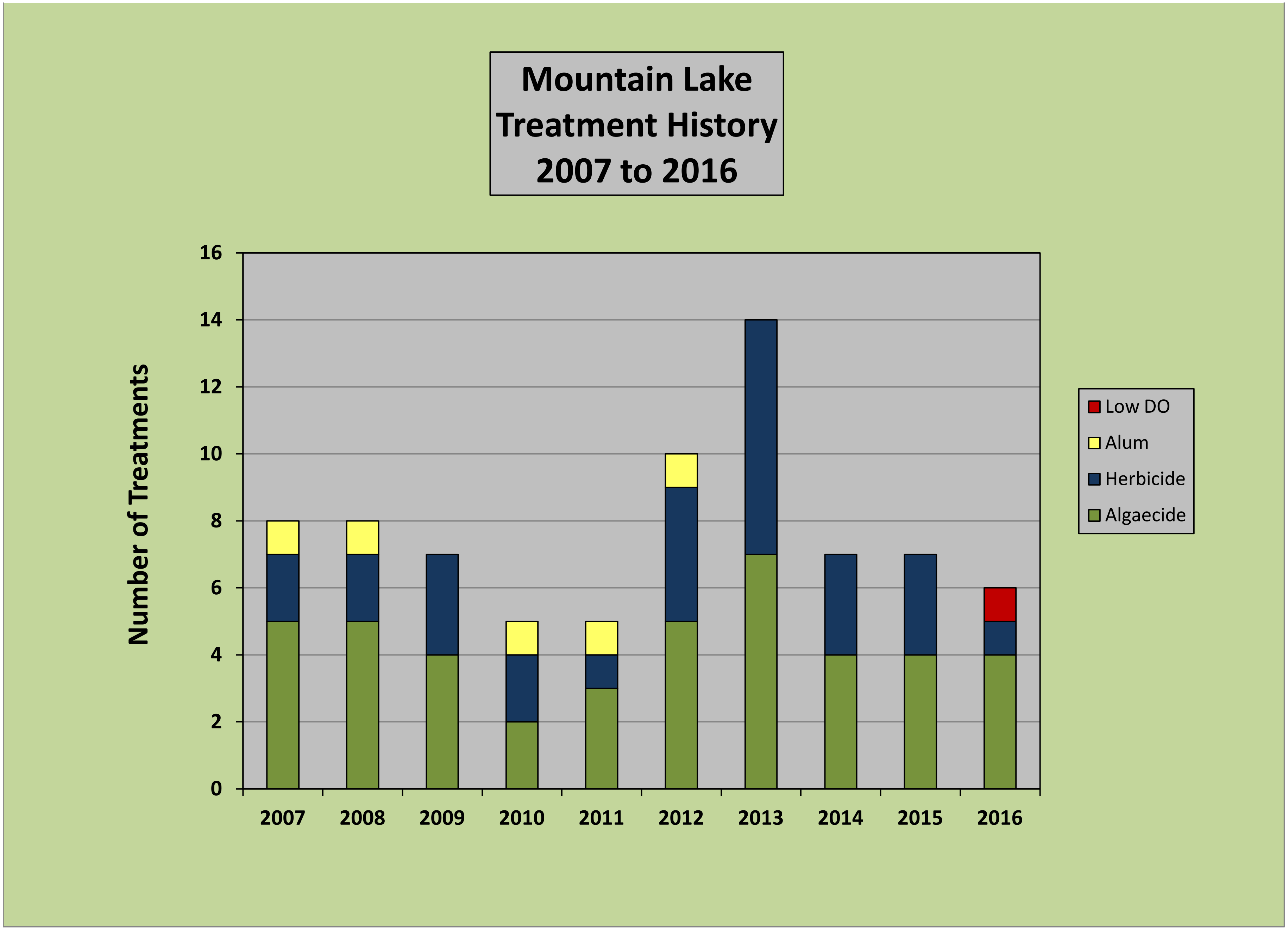


Shadow Lake
Treatment History
2007 to 2016
Number of Treatments
0
2
4
6
8
10
12
14
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Low DO
Alum
Herbicide
Algaecide

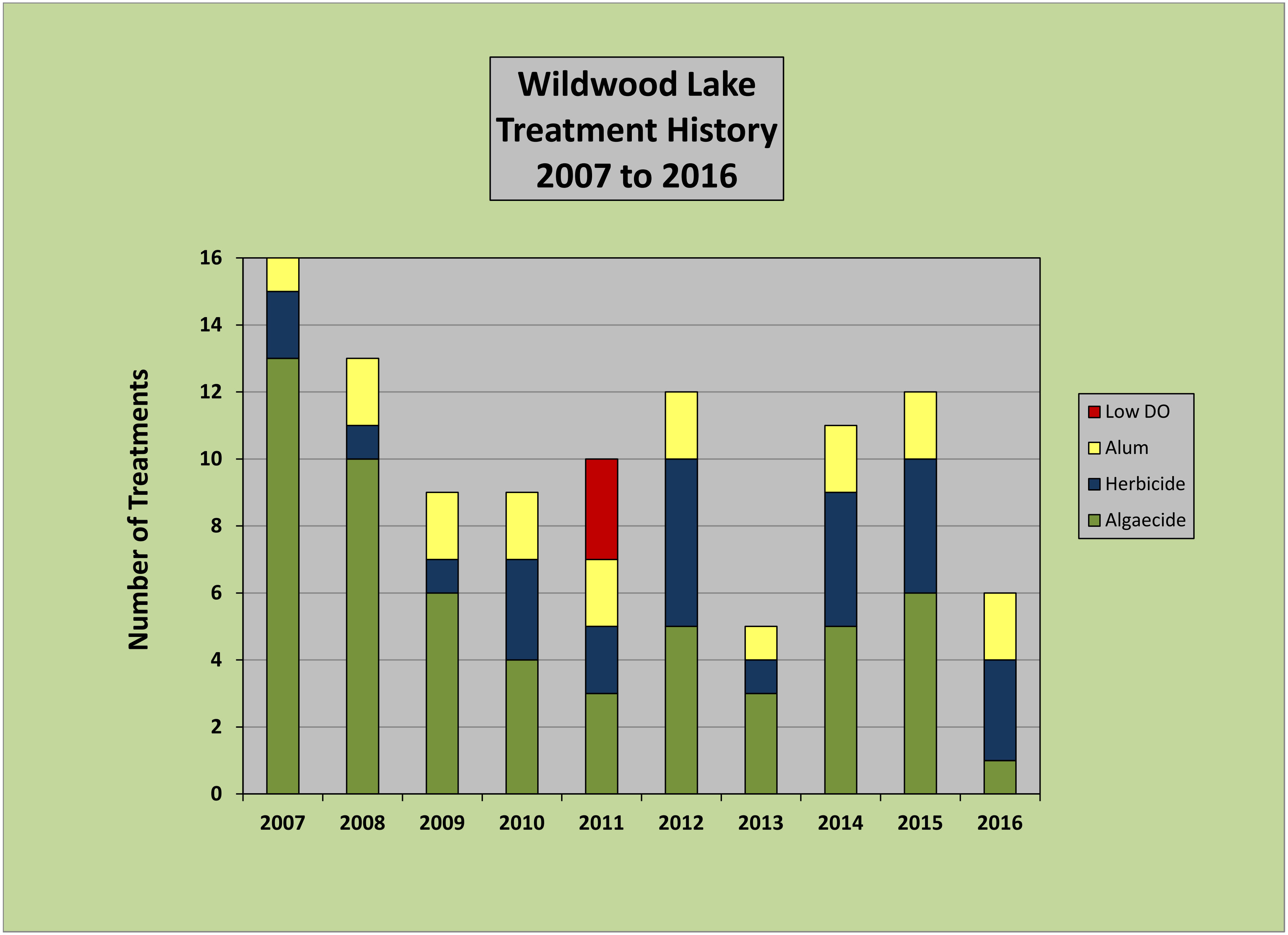


Cove Pond
Treatment History
2007 to 2016
Number of Treatments
14
12
10
8
6
4
2
0
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Low DO
Alum
Herbicide
Algaecide


Grunden's Pond
Treatment History
2007 to 2016
Number of Treatments
0
2
4
6
8
10
12
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Low DO
Alum
Herbicide
Algaecide



Mountain Lake
Treatment History
2007 to 2016
Number of Treatments
0
2
4
6
8
10
12
14
16
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Low DO
Alum
Herbicide
Algaecide



Wildwood Lake
Treatment History
2007 to 2016
Number of Treatments
0
2
4
6
8
10
12
14
16
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Low DO
Alum
Herbicide
Algaecide

Mountain Lakes
2016 Phytoplankton Summary

Birchwood Lake

Date	Diatoms	Golden Algae	Green Algae	Blue-green Algae	Protozoa	Euglenoids	Dinoflagellates	Total Algae
6/6/2016	20	80						**100**
6/20/2016	10	20	70			10		**110**
7/5/2016			40	100				**140**
7/18/2016		10	90					**100**
8/8/2016	90		80					**170**
8/22/2016	10	40	30	10		20		**110**

Crystal Lake

Date	Diatoms	Golden Algae	Green Algae	Blue-green Algae	Protozoa	Euglenoids	Dinoflagellates	Total Algae
6/6/2016		80	50	150			20	**300**
6/20/2016	40		70				40	**150**
7/5/2016	10	10	190	10				**220**
7/18/2016	150	20	40				10	**220**
8/8/2016	130		70	20				**220**
8/22/2016		10	190	30				**230**

Sunset Lake

Date	Diatoms	Golden Algae	Green Algae	Blue-green Algae	Protozoa	Euglenoids	Dinoflagellates	Total Algae
6/6/2016		10	110				20	**140**
6/20/2016			80	110				**190**
7/5/2016		10	80					**90**
7/18/2016	30	40	90	30				**190**
8/8/2016			120	550				**670**
8/22/2016		20	260	10				**290**

Olive Pond

Date	Diatoms	Golden Algae	Green Algae	Blue-green Algae	Protozoa	Euglenoids	Dinoflagellates	Total Algae
6/6/2016		40	50	10			110	**210**
7/5/2016				120			10	**130**
8/8/2016	380		20	10				**410**

Shadow Lake

Date	Diatoms	Golden Algae	Green Algae	Blue-green Algae	Protozoa	Euglenoids	Dinoflagellates	Total Algae
6/6/2016		60	30				20	**110**
6/20/2016	50	110	290				240	**690**
7/5/2016	10		40	2200				**2250**
7/18/2016	10		100	130			30	**270**
8/8/2016	200		140	30				**370**
8/22/2016		20	20	10			320	**370**

Cove Pond

Date	Diatoms	Golden Algae	Green Algae	Blue-green Algae	Protozoa	Euglenoids	Dinoflagellates	Total Algae
6/6/2016	20	60	20				20	**120**
7/5/2016	10	20					50	**80**
8/8/2016		60	130				10	**200**

Grunden's Pond

Date	Diatoms	Golden Algae	Green Algae	Blue-green Algae	Protozoa	Euglenoids	Dinoflagellates	Total Algae
6/6/2016		40	50				10	**100**
7/5/2016	50	30		30				**110**
8/8/2016		270	10			10	280	**570**

Mountain Lake

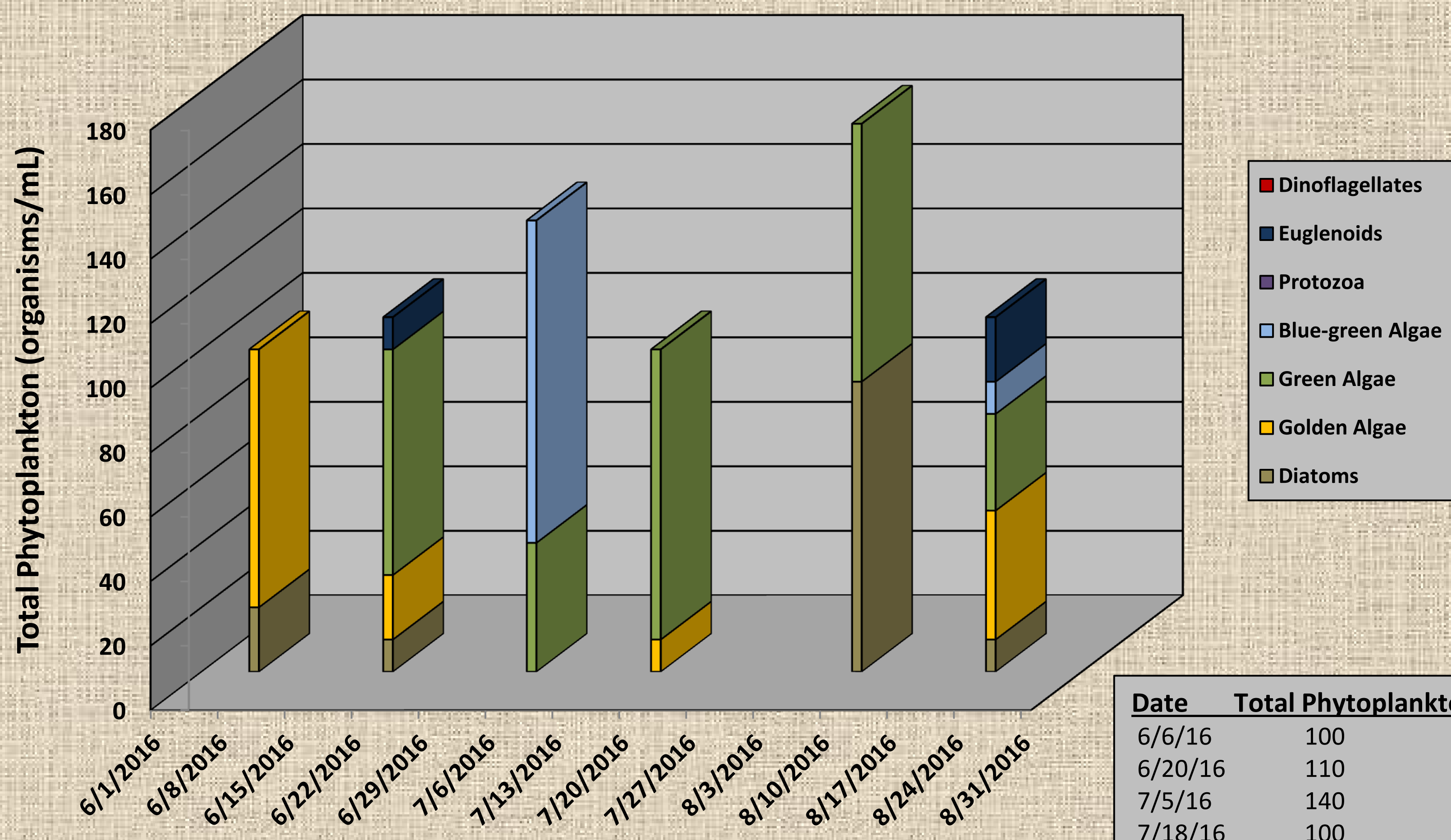
Date	Diatoms	Golden Algae	Green Algae	Blue-green Algae	Protozoa	Euglenoids	Dinoflagellates	Total Algae
6/6/2016	10	10					80	**100**
6/20/2016		10	50	80				**140**
7/5/2016		20	100					**120**
7/18/2016		60	130					**190**
8/8/2016	20		70	240			10	**340**
8/22/2016	20	10	60	260				**350**

Wildwood Lake

Date	Diatoms	Golden Algae	Green Algae	Blue-green Algae	Protozoa	Euglenoids	Dinoflagellates	Total Algae
6/6/2016		50	50				30	**130**
6/20/2016	10	20	210					**240**
7/5/2016			70					**70**
7/18/2016		10	80	10			90	**190**
8/8/2016			80				20	**100**
8/22/2016			90				20	**110**

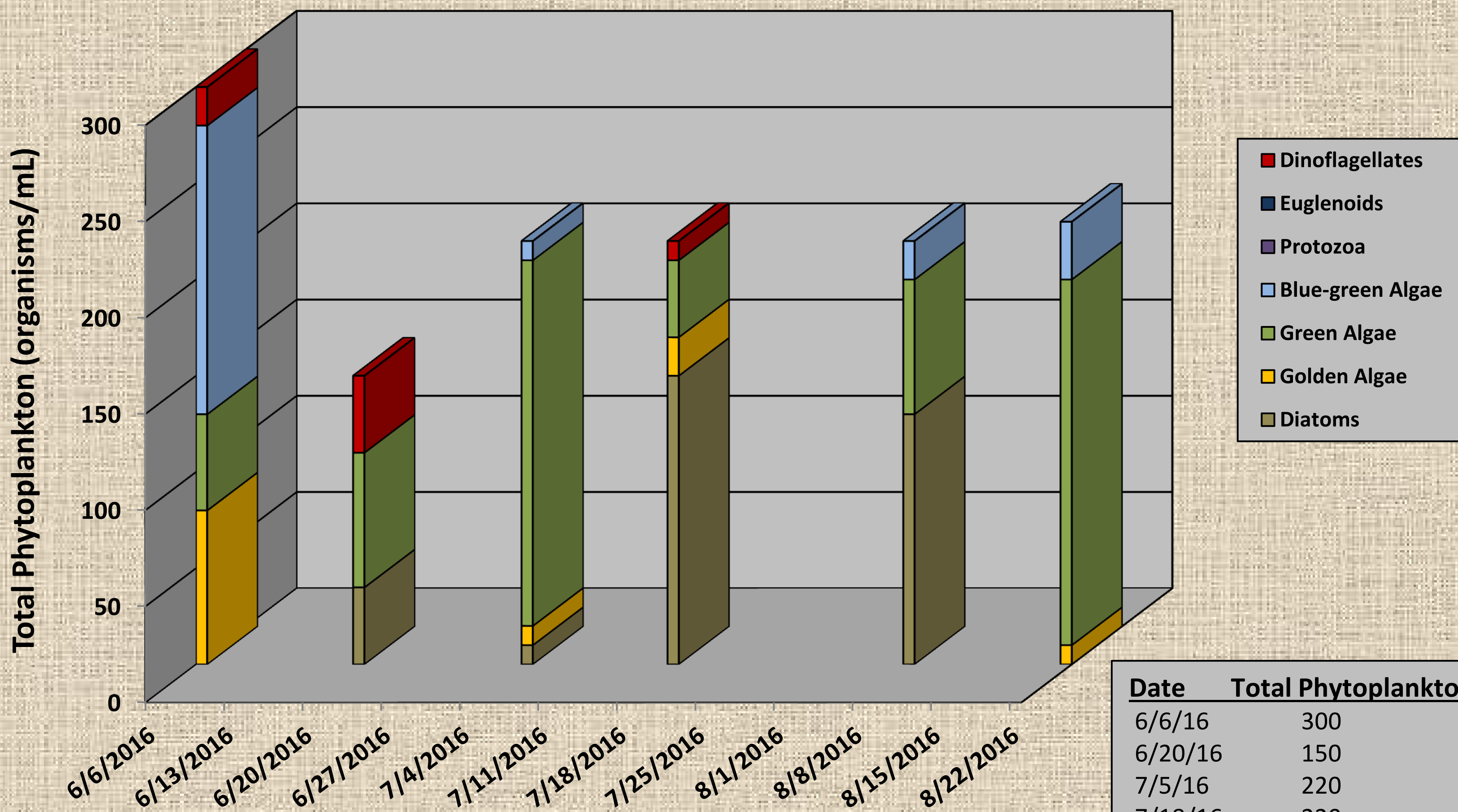
SOLITUDE LAKE MANAGEMENT

Birchwood Lake
2016 Phytoplankton Distribution



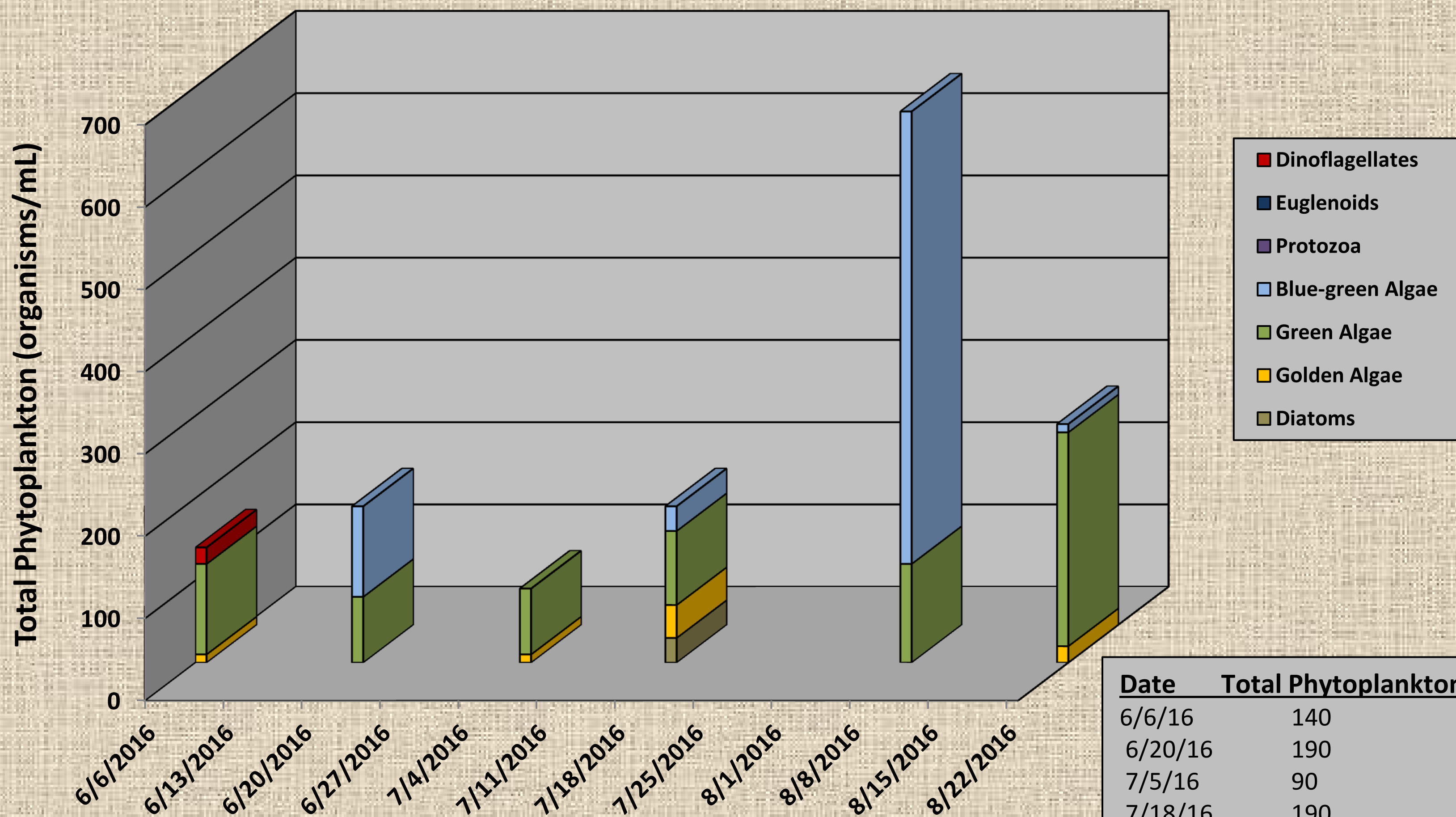
Date	Total Phytoplankton
6/6/16	100
6/20/16	110
7/5/16	140
7/18/16	100
8/8/16	170
8/22/16	110

Crystal Lake
2016 Phytoplankton Distribution



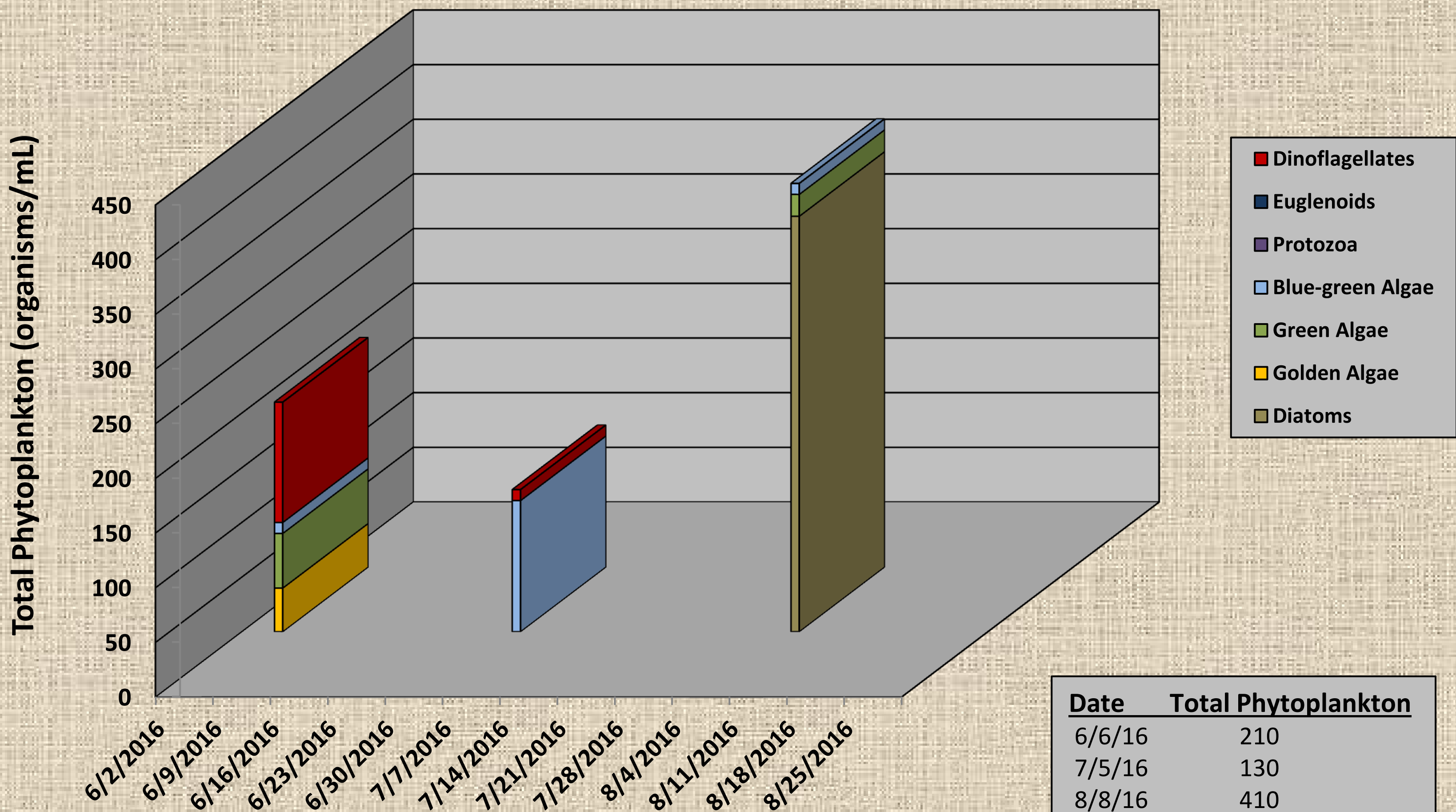
Date	Total Phytoplankton
6/6/16	300
6/20/16	150
7/5/16	220
7/18/16	220
8/8/16	220
8/22/16	230

Sunset Lake
2016 Phytoplankton Distribution



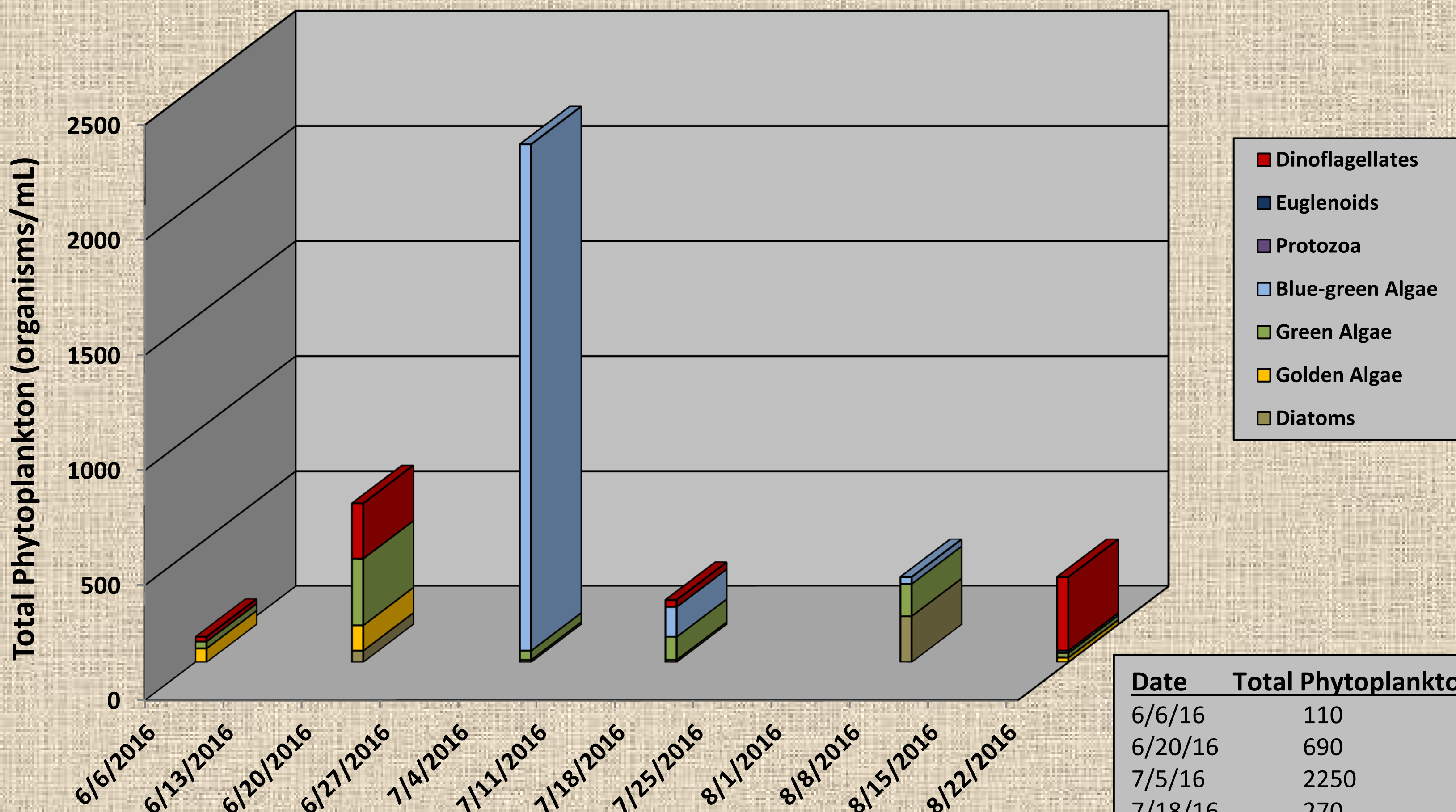
Date	Total Phytoplankton
6/6/16	140
6/20/16	190
7/5/16	90
7/18/16	190
8/8/16	670
8/22/16	290

Olive Pond
2016 Phytoplankton Distribution



Date	Total Phytoplankton
6/6/16	210
7/5/16	130
8/8/16	410

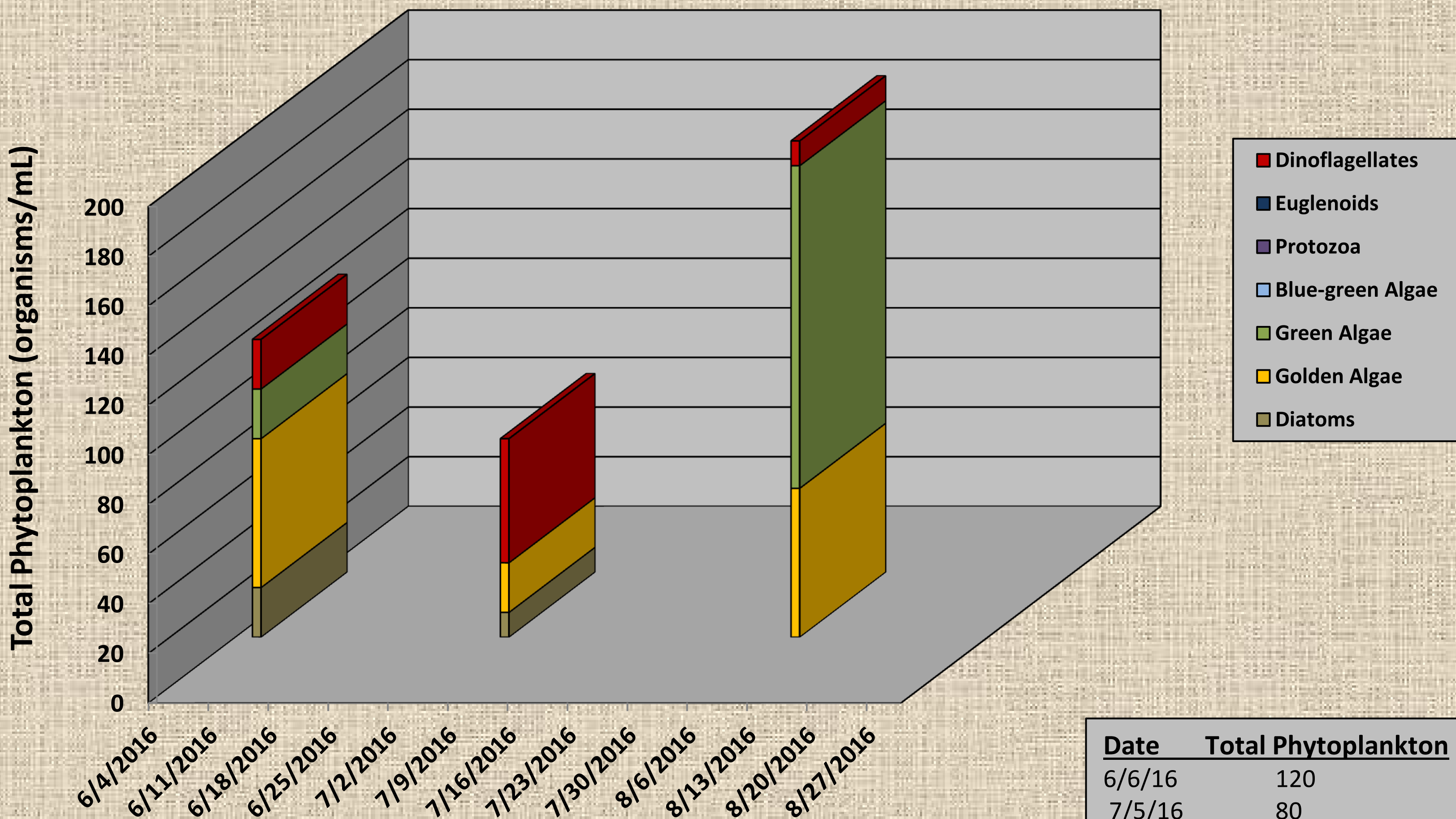
Shadow Lake
2016 Phytoplankton Distribution



Date	Total Phytoplankton
6/6/16	110
6/20/16	690
7/5/16	2250
7/18/16	270
8/8/16	370
8/22/16	370

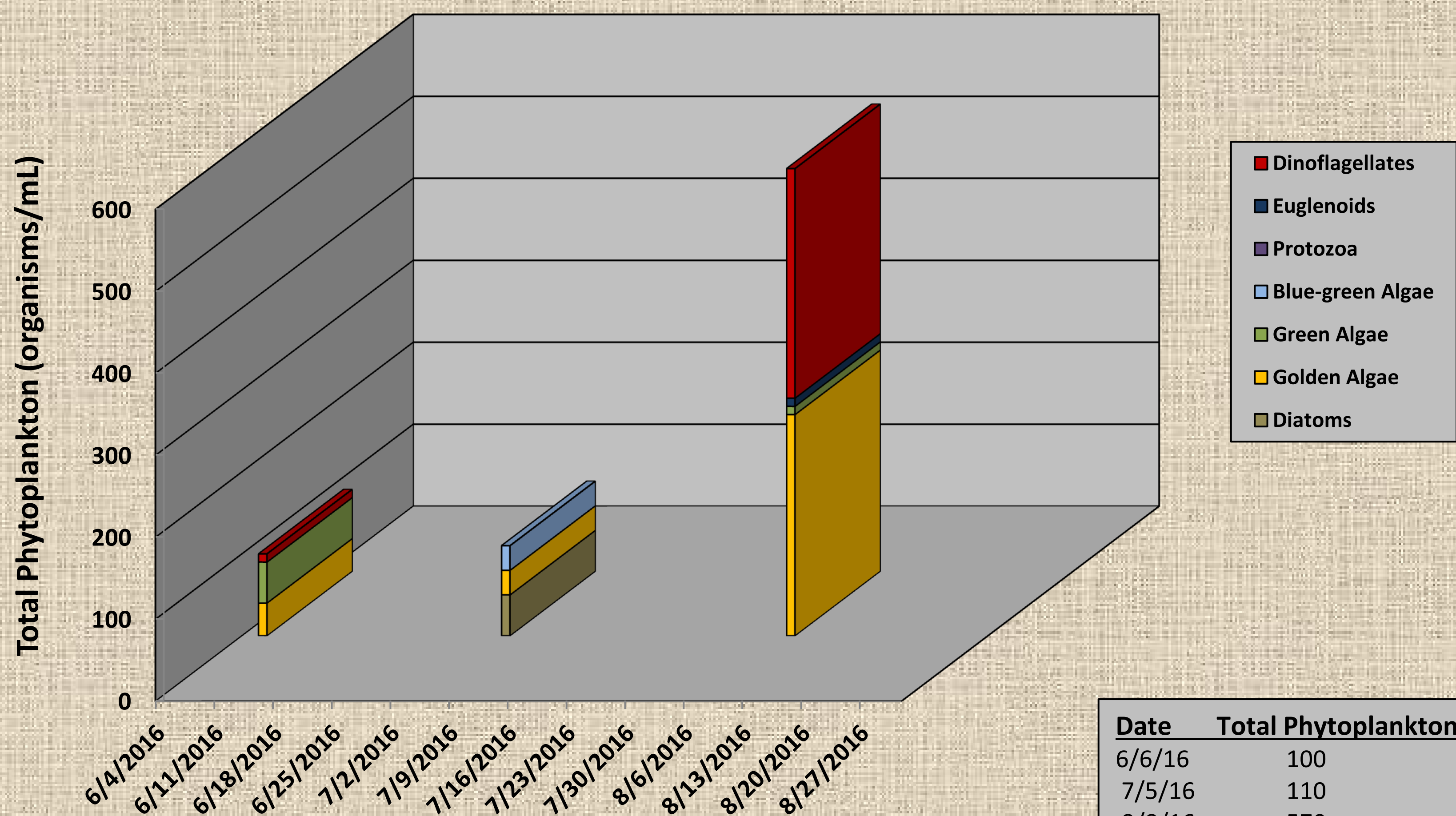
SOLITUDE LAKE MANAGEMENT

Cove Pond
2016 Phytoplankton Distribution



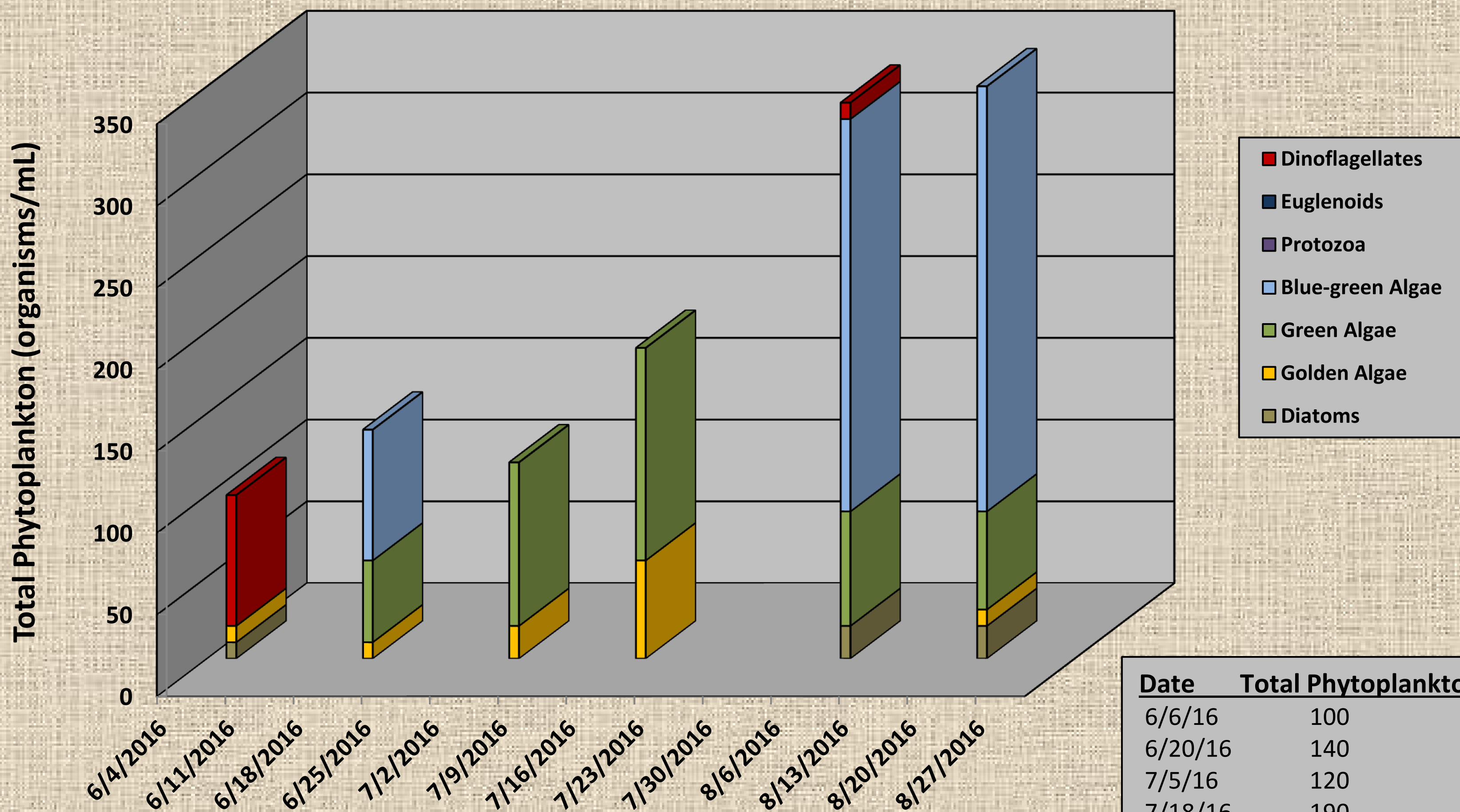
Date	Total Phytoplankton
6/6/16	120
7/5/16	80
8/8/16	200

Grunden's Pond
2016 Phytoplankton Distribution



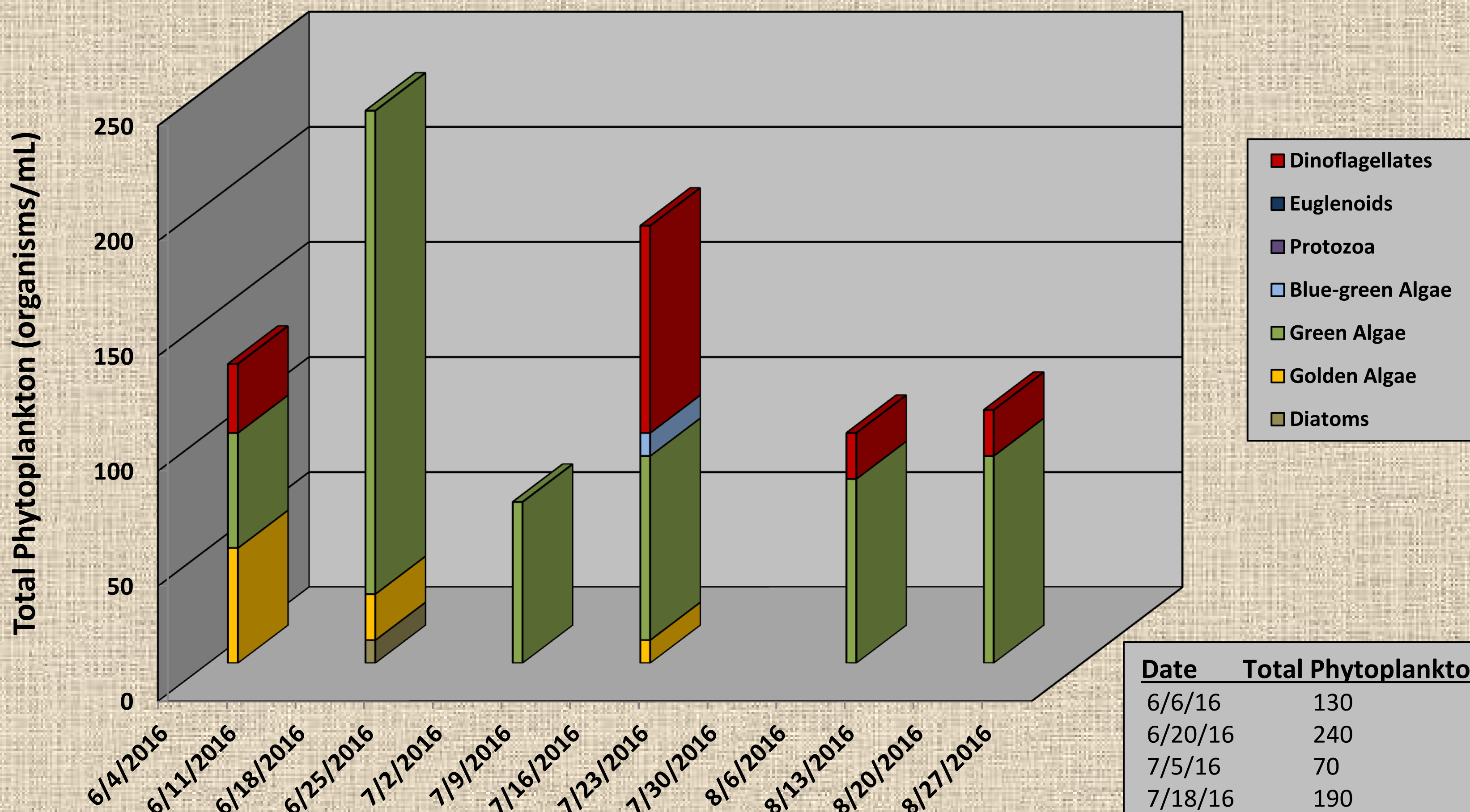
Date	Total Phytoplankton
6/6/16	100
7/5/16	110
8/8/16	570

Mountain Lake
2016 Phytoplankton Distribution



Date	Total Phytoplankton
6/6/16	100
6/20/16	140
7/5/16	120
7/18/16	190
8/8/16	340
8/22/16	350

Wildwood Lake
2016 Phytoplankton Distribution



Date	Total Phytoplankton
6/6/16	130
6/20/16	240
7/5/16	70
7/18/16	190
8/8/16	100
8/22/16	110

APL
AQUA PRO-TECH LABORATORIES
Certified Environmental Testing

ANALYTICAL RESULTS

STANDARD DELIVERABLES FORMAT

APL WORK ORDER NUMBER: 6060137

Solitude Lake Management

Project: Mountain Lakes

Brian Wood
Laboratory Director

All Results meet the requirements of the National Environmental Laboratory Accreditation Conference and/or State specific certifications as applicable.

1275 Bloomfield Ave., Bldg. 6, Fairfield, New Jersey 07004
(t) 973.227.0422 (f) 973.227.2813 (w) www.aquaprotechlabs.com

NELAC National Environmental Laboratory Accreditation Conference
NJDEP #07010 / NYDOH #11634

APL
AQUA PRO-TECH LABORATORIES
Certified Environmental Testing

Analytical Results Summary
Mountain Lakes

Client:	**Solitude Lake Management**	**Contact:**	**Chris Doyle**
APL Order ID:	**6060137**	**Received:**	**6/6/16 14:53**

Sample ID/Analysis	Method	Prepared	Analyzed	Result	Qual	MDL	RL	Units
6060137-01 (Lake)	Wildwood Lake			Collected:	6/6/2016 12:54			
General Chemistry								
Phosphorus Total	4500PE	6/14/16 10:00	6/14/16 10:00	**0.0300**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	6/6/16 16:00	6/6/16 16:00	**0.500**			**0.200**	**mg/L**
Turbidity	SM 2130 B	6/7/16 10:00	6/7/16 10:00	**1.6**			**1.0**	**NTU**
6060137-02 (Lake)	Shadow Pond			Collected:	6/6/2016 11:30			
General Chemistry								
Phosphorus Total	4500PE	6/14/16 10:00	6/14/16 10:00	**0.0900**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	6/6/16 16:00	6/6/16 16:00	ND			0.200	mg/L
Turbidity	SM 2130 B	6/7/16 10:00	6/7/16 10:00	**2.2**			**1.0**	**NTU**
6060137-03 (Lake)	Cove Pond			Collected:	6/6/2016 11:49			
General Chemistry								
Phosphorus Total	4500PE	6/14/16 10:00	6/14/16 10:00	**0.0600**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	6/6/16 16:00	6/6/16 16:00	**0.500**			**0.200**	**mg/L**
Turbidity	SM 2130 B	6/7/16 10:00	6/7/16 10:00	**3.4**			**1.0**	**NTU**
6060137-04 (Lake)	Olive Pond			Collected:	6/6/2016 11:13			
General Chemistry								
Phosphorus Total	4500PE	6/14/16 10:00	6/14/16 10:00	**0.110**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	6/6/16 16:00	6/6/16 16:00	ND			0.200	mg/L
Turbidity	SM 2130 B	6/7/16 10:00	6/7/16 10:00	**2.8**			**1.0**	**NTU**
6060137-05 (Lake)	Sunset Lake			Collected:	6/6/2016 10:34			
General Chemistry								
Phosphorus Total	4500PE	6/14/16 10:00	6/14/16 10:00	**0.0500**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	6/6/16 16:00	6/6/16 16:00	ND			0.200	mg/L
Turbidity	SM 2130 B	6/7/16 10:00	6/7/16 10:00	**1.8**			**1.0**	**NTU**
6060137-06 (Lake)	Birchwood Lake			Collected:	6/6/2016 10:12			
General Chemistry								
Phosphorus Total	4500PE	6/14/16 10:00	6/14/16 10:00	**0.0300**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	6/6/16 16:00	6/6/16 16:00	ND			0.200	mg/L
Turbidity	SM 2130 B	6/7/16 10:00	6/7/16 10:00	**1.2**			**1.0**	**NTU**
6060137-07 (Lake)	Grundens Pond			Collected:	6/6/2016 12:00			

FootNotes

RL - Reporting limit
MDL - Minimum detection limit
ND - Indicates compound analyzed for but not detected
J - Indicates estimated value
B - Indicates compound found in associated blank
E - Concentration exceeds highest calibration standard
D - Indicates result is based on a dilution
P - Greater than 25% diff. between 2 GC columns.

APL
AQUA PRO-TECH LABORATORIES
Certified Environmental Testing

Analytical Results Summary
Mountain Lakes

Client:	**Solitude Lake Management**	**Contact:**	**Chris Doyle**
APL Order ID:	**6060137**	**Received:**	**6/6/16 14:53**

Sample ID/Analysis	Method	Prepared	Analyzed	Result	Qual	MDL	RL	Units
6060137-07 (Lake)	Grundens Pond			Collected:	6/6/2016 12:00			
General Chemistry								
Phosphorus Total	4500PE	6/14/16 10:00	6/14/16 10:00	**0.0900**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	6/6/16 16:00	6/6/16 16:00	ND			0.200	mg/L
Turbidity	SM 2130 B	6/7/16 10:00	6/7/16 10:00	**9.6**			**1.0**	**NTU**
6060137-08 (Lake)	Crystal Lake			Collected:	6/6/2016 10:57			
General Chemistry								
Phosphorus Total	4500PE	6/14/16 10:00	6/14/16 10:00	**0.0300**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	6/6/16 16:00	6/6/16 16:00	ND			0.200	mg/L
Turbidity	SM 2130 B	6/7/16 10:00	6/7/16 10:00	**1.0**			**1.0**	**NTU**
6060137-09 (Lake)	Mountain Lake			Collected:	6/6/2016 12:31			
General Chemistry								
Phosphorus Total	4500PE	6/14/16 10:00	6/14/16 10:00	**0.0200**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	6/6/16 16:00	6/6/16 16:00	ND			0.200	mg/L
Turbidity	SM 2130 B	6/7/16 10:00	6/7/16 10:00	**1.4**			**1.0**	**NTU**

FootNotes

RL - Reporting limit
MDL - Minimum detection limit
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E - Concentration exceeds highest calibration standard
D - Indicates result is based on a dilution
P - Greater than 25% diff. between 2 GC columns.

APL 6060137

AQUA PRO-TECH LABORATORIES

www.aquaprotechlabs.com

1275 BLOOMFIELD AVENUE • BUILDING 6
FAIRFIELD, NEW JERSEY 07004

TEL: 973.227.0422
FAX: 973.227.2813

CHAIN OF CUSTODY

CLIENT: Solitude Lake Mgmt	SEND REPORT TO: Chris Doyle
ADDRESS: 580 Rockport Rd	ADDRESS: 580 Rockport Rd
Hackettstown NJ 07840	Hackettstown NJ 07840
PHONE: 908 850 0303	PHONE: " "
E-MAIL: cdoyle@solitudelake.com	FAX:
PROJECT NAME: Mountain Lakes	SEND INVOICE TO: Deb
PROJECT MGR: Chris Doyle	ADDRESS: " "
PROJECT or PO #:	SAMPLED BY: GB

TURN-AROUND TIME

- [X] APL STANDARD 2 weeks
- [ ] RUSH (choose one below)
  - [ ] 24 hr. date & time required
  - [ ] 48 hr. date & time required
  - [ ] 72 hr. date & time required
  - [ ] 1 week

REPORT FORMAT

- [X] RESULTS ONLY
- [ ] NJ DEP REDUCED
- [ ] NJ DEP FULL
- [ ] STATE FORMS/E2 REPORTING

PWSID#

ELECTRONIC FORMAT

- [ ] EMAIL DELIVERY
- [ ] HAZSITE EDD
- [ ] EXCEL

SRP#

CONTAMINATION LEVEL

[ ] HIGH [ ] MEDIUM [X] LOW

MATRIX ABBREVIATIONS: D - DRINKING WATER G - GROUNDWATER W - WASTEWATER S - SOIL SL - SLUDGE C - CONCRETE L - LAKE

APL Lab ID#	Sample Source: Field ID	Date	Time	Sample Type: GRAB	Sample Type: COMP	MATRIX	No. of Bottles	Preservative	Analysis Requested
6060137-01	Wildwood Lake	6/6/16	12:54	X		L	2	H_2SO_4	Turb. NO_3 TPO_4
-02	Shadow Pond	6/6/16	11:30	X		L	2	H_2SO_4	Turb. NO_3 TPO_4
-03	Cove Pond	6/6/16	11:49	X		L	2	H_2SO_4	Turb NO_3 TPO_4
-04	Olive Pond	6/6/16	11:13	X		L	2	H_2SO_4	Turb NO_3 TPO_4
-05	Sunset Lake	6/6/16	10:34	X		L	2	H_2SO_4	Turb NO_3 TPO_4
-06	Birchwood Lake	6/6/16	10:12	X		L	2	H_2SO_4	Turb NO_3 TPO_4
-07	Grunders Pond	6/6/16	12:00	X		L	2	H_2SO_4	Turb NO_3 TPO_4
-08	Crystal Lake	6/6/16	10:57	X		L	2	H_2SO_4	Turb NO_3 TPO_4
-09	Mountain Lake	6/6/16	12:31	X		L	2	H_2SO_4	Turb NO_3 TPO_4

RELINQUISHED BY (Print) Evgeny Burlyaev	DATE 6/6/16	RECEIVED BY (Print) C. Falcone
Signature [signature]	Time 14:10	Signature [signature]
RELINQUISHED BY (Print)	DATE	RECEIVED BY (Print)
Signature	Time	Signature
RELINQUISHED BY (Print)	DATE	RECEIVED BY (Print)
Signature	Time	Signature

COMMENTS/SPECIAL INSTRUCTIONS

Cooler Temp. upon receipt at lab 3.7

CERTIFICATIONS: NELAP (National Environmental Laboratory Accredation Program) NJDEP #07010 PADEP #68-02903 NYDOH #11634 CTPH #0233 US ARMY

By signing this Chain of Custody Agreement, customer expressly agrees to pay APL for all charges, reasonably incurred in connection with analysis and reporting for these samples

Ref. No: G 930400024

APL

AQUA PRO-TECH LABORATORIES

Certified Environmental Testing

ANALYTICAL RESULTS

STANDARD DELIVERABLES FORMAT

APL WORK ORDER NUMBER: 6080242

Solitude Lake Management

Project: mountain lakes

Brian Wood
Laboratory Director

All Results meet the requirements of the National Environmental Laboratory Accreditation Conference and/or State specific certifications as applicable.

Analytical Results Summary
mountain lakes

Client:	**Solitude Lake Management**	**Contact:**	**Chris Doyle**
APL Order ID:	**6080242**	**Received:**	**8/8/16 13:50**

Sample ID/Analysis	Method	Prepared	Analyzed	Result	Qual	MDL	RL	Units
6080242-01 (Lake)	BIRCHWOOD LAKE			Collected:	8/8/2016 11:01			
General Chemistry								
Phosphorus Total	4500PE	8/12/16 13:00	8/12/16 16:00	**0.0200**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	8/9/16 13:40	8/9/16 13:40	ND			0.200	mg/L
Turbidity	SM 2130 B	8/9/16 11:00	8/9/16 11:00	**1.6**			**1.0**	**NTU**
6080242-02 (Lake)	SUNSET LAKE			Collected:	8/8/2016 11:20			
General Chemistry								
Phosphorus Total	4500PE	8/12/16 13:00	8/12/16 16:00	**0.0300**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	8/9/16 13:40	8/9/16 13:40	ND			0.200	mg/L
Turbidity	SM 2130 B	8/9/16 11:00	8/9/16 11:00	**3.4**			**1.0**	**NTU**
6080242-03 (Lake)	CRYSTAL LAKE			Collected:	8/8/2016 11:30			
General Chemistry								
Phosphorus Total	4500PE	8/12/16 13:00	8/12/16 16:00	**0.0400**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	8/9/16 13:40	8/9/16 13:40	ND			0.200	mg/L
Turbidity	SM 2130 B	8/9/16 11:00	8/9/16 11:00	**2.4**			**1.0**	**NTU**
6080242-04 (Lake)	OLIVE POND			Collected:	8/8/2016 11:39			
General Chemistry								
Phosphorus Total	4500PE	8/12/16 13:00	8/12/16 16:00	**0.0900**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	8/9/16 13:40	8/9/16 13:40	ND			0.200	mg/L
Turbidity	SM 2130 B	8/9/16 11:00	8/9/16 11:00	**6.1**			**1.0**	**NTU**
6080242-05 (Lake)	SHADOW LAKE			Collected:	8/8/2016 11:46			
General Chemistry								
Phosphorus Total	4500PE	8/12/16 13:00	8/12/16 16:00	**0.0900**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	8/9/16 13:40	8/9/16 13:40	ND			0.200	mg/L
Turbidity	SM 2130 B	8/9/16 11:00	8/9/16 11:00	**3.3**			**1.0**	**NTU**
6080242-06 (Lake)	COVE POND			Collected:	8/8/2016 12:00			
General Chemistry								
Phosphorus Total	4500PE	8/12/16 13:00	8/12/16 16:00	**0.0500**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	8/9/16 13:40	8/9/16 13:40	ND			0.200	mg/L
Turbidity	SM 2130 B	8/9/16 11:00	8/9/16 11:00	**2.8**			**1.0**	**NTU**
6080242-07 (Lake)	GRUDENS POND			Collected:	8/8/2016 12:07			

FootNotes

RL - Reporting limit
MDL - Minimum detection limit
ND - Indicates compound analyzed for but not detected
J - Indicates estimated value
B - Indicates compound found in associated blank
E - Concentration exceeds highest calibration standard
D - Indicates result is based on a dilution
P - Greater than 25% diff. between 2 GC columns.

APL
AQUA PRO-TECH LABORATORIES
Certified Environmental Testing

Analytical Results Summary
mountain lakes

Client:	**Solitude Lake Management**	**Contact:**	**Chris Doyle**
APL Order ID:	**6080242**	**Received:**	**8/8/16 13:50**

Sample ID/Analysis	Method	Prepared	Analyzed	Result	Qual	MDL	RL	Units
6080242-07 (Lake)	GRUDENS POND			Collected:	8/8/2016 12:07			
General Chemistry								
Phosphorus Total	4500PE	8/12/16 13:00	8/12/16 16:00	**0.100**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	8/9/16 13:40	8/9/16 13:40	ND			0.200	mg/L
Turbidity	SM 2130 B	8/9/16 11:00	8/9/16 11:00	**6.5**			**1.0**	**NTU**
6080242-08 (Lake)	MOUNTAIN LAKE			Collected:	8/8/2016 12:30			
General Chemistry								
Phosphorus Total	4500PE	8/12/16 13:00	8/12/16 16:00	**0.0300**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	8/9/16 13:40	8/9/16 13:40	ND			0.200	mg/L
Turbidity	SM 2130 B	8/9/16 11:00	8/9/16 11:00	**3.3**			**1.0**	**NTU**
6080242-09 (Lake)	WILDWOOD LAKE			Collected:	8/8/2016 12:45			
General Chemistry								
Phosphorus Total	4500PE	8/12/16 13:00	8/12/16 16:00	**0.0200**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	8/9/16 13:40	8/9/16 13:40	**0.600**			**0.200**	**mg/L**
Turbidity	SM 2130 B	8/9/16 11:00	8/9/16 11:00	ND			1.0	NTU

FootNotes

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ND - Indicates compound analyzed for but not detected
J - Indicates estimated value
B - Indicates compound found in associated blank
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D - Indicates result is based on a dilution
P - Greater than 25% diff. between 2 GC columns.

APL 6080242

AQUA PRO-TECH LABORATORIES

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..., NEW JERSEY 07004

TEL: 973.227.0422
FAX: 973.227.2813

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT: Solitude Lake Mgmt	SEND REPORT TO: Chris Doyle
ADDRESS: 580 Rockport Rd Hackettstown NJ 07840	ADDRESS: " "
PHONE: (908) 850-0303	PHONE:
E-MAIL: cdoyle@solitudelake.com	FAX:
PROJECT NAME: Mountain Lakes	SEND INVOICE TO: Deb
PROJECT MGR: Chris Doyle	ADDRESS: " "
PROJECT or PO #:	SAMPLED BY: GB

TURN-AROUND TIME

- [X] APL STANDARD 2 weeks
- [ ] RUSH (choose one below)
  - [ ] 24 hr. date & time required
  - [ ] 48 hr. date & time required
  - [ ] 72 hr. date & time required
  - [ ] 1 week

REPORT FORMAT

- [X] RESULTS ONLY
- [ ] NJ DEP REDUCED
- [ ] NJ DEP FULL
- [ ] STATE FORMS/E2 REPORTING

PWSID#

ELECTRONIC FORMAT

- [ ] EMAIL DELIVERY
- [ ] HAZSITE EDD
- [ ] EXCEL

SRP#

CONTAMINATION LEVEL

[ ] HIGH [ ] MEDIUM [X] LOW

MATRIX ABBREVIATIONS: D - DRINKING WATER G - GROUNDWATER W - WASTEWATER S - SOIL SL - SLUDGE C - CONCRETE L - LAKE

APL Lab ID#	Sample Source: Field ID	Date	Time	Sample Type: GRAB	Sample Type: COMP	MATRIX	No. of Bottles	Preservative	Analysis Requested
6080242-01	Birchwood Lake	8/8/16	11:01	X		L	2	H_2SO_4	TPO_4, NO_3, Turb
-02	Sunset Lake	↓	11:20	X		L	2	H_2SO_4	"
-03	Crystal Lake		11:30	X		L	2	H_2SO_4	"
-04	Olive Pond		11:39	X		L	2	H_2SO_4	"
-05	Shadow Lake		11:46	X		L	2	H_2SO_4	"
-06	Cove Pond		12:00	X		L	2	H_2SO_4	"
-07	Grunden's Pond		12:07	X		L	2	H_2SO_4	"
-08	Mountain Lake		12:30	X		L	2	H_2SO_4	"
-09	Wildwood Lake		12:45	X		L	2	H_2SO_4	"

RELINQUISHED BY (Print) Evgeny Borlyzev	DATE 8/8/16	RECEIVED BY (Print) [signature]	
Signature [signature]	Time 1350	Signature [signature]	
RELINQUISHED BY (Print)	DATE	RECEIVED BY (Print)	
Signature	Time	Signature	
RELINQUISHED BY (Print)	DATE	RECEIVED BY (Print)	
Signature	Time	Signature	

COMMENTS/SPECIAL INSTRUCTIONS

Cooler Temp. upon receipt at lab 4.0

CERTIFICATIONS: NELAP (National Environmental Laboratory Accredation Program) NJDEP #07010 PADEP #68-02903 NYDOH #11634 CTPH #0233 US ARMY

Ref. No. C 93040024

APL
AQUA PRO-TECH LABORATORIES
Certified Environmental Testing

ANALYTICAL RESULTS

STANDARD DELIVERABLES FORMAT

APL WORK ORDER NUMBER: 6070242

Solitude Lake Management

Project: MT LAKES

Brian Wood
Laboratory Director

All Results meet the requirements of the National Environmental Laboratory Accreditation Conference and/or State specific certifications as applicable.

1275 Bloomfield Ave., Bldg. 6, Fairfield, New Jersey 07004
(t) 973.227.0422 (f) 973.227.2813 (w) www.aquaprotechlabs.com

NELAC National Environmental Laboratory Accreditation Conference
NJDEP #07010 / NYDOH #11634

APL
AQUA PRO-TECH LABORATORIES
Certified Environmental Testing

Analytical Results Summary
MT LAKES

Client:	**Solitude Lake Management**	**Contact:**	**Chris Doyle**
APL Order ID:	**6070242**	**Received:**	**7/11/16 13:20**

Sample ID/Analysis	Method	Prepared	Analyzed	Result	Qual	MDL	RL	Units
6070242-01 (Lake)	WILDWOOD LAKE			Collected:	7/11/2016 12:49			
General Chemistry								
Phosphorus Total	4500PE	7/22/16 9:30	7/22/16 14:00	**0.0300**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	7/11/16 15:00	7/11/16 15:00	ND			0.200	mg/L
Turbidity	SM 2130 B	7/12/16 10:00	7/12/16 10:00	**1.4**			**1.0**	**NTU**
6070242-02 (Lake)	BIRCHWOOD LAKE			Collected:	7/11/2016 10:00			
Microbiology								
Fecal Coliform	SM 9222D	7/11/16 14:22	7/11/16 14:22	**20**			**1**	**CFU/100 ml**
6070242-02 (Lake)	BIRCHWOOD LAKE			Collected:	7/11/2016 10:00			
General Chemistry								
Phosphorus Total	4500PE	7/22/16 9:30	7/22/16 14:00	**0.0300**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	7/11/16 15:00	7/11/16 15:00	ND			0.200	mg/L
Turbidity	SM 2130 B	7/12/16 10:00	7/12/16 10:00	ND			1.0	NTU
6070242-03 (Lake)	SUNSET LAKE			Collected:	7/11/2016 10:40			
General Chemistry								
Phosphorus Total	4500PE	7/22/16 9:30	7/22/16 14:00	**0.0400**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	7/11/16 15:00	7/11/16 15:00	ND			0.200	mg/L
Turbidity	SM 2130 B	7/12/16 10:00	7/12/16 10:00	**1.3**			**1.0**	**NTU**
6070242-04 (Lake)	CRYSTAL LAKE			Collected:	7/11/2016 11:01			
General Chemistry								
Phosphorus Total	4500PE	7/22/16 9:30	7/22/16 14:00	**0.0200**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	7/11/16 15:00	7/11/16 15:00	ND			0.200	mg/L
Turbidity	SM 2130 B	7/12/16 10:00	7/12/16 10:00	**1.1**			**1.0**	**NTU**
6070242-05 (Lake)	OLIVE POND			Collected:	7/11/2016 0:00			
General Chemistry								
Phosphorus Total	4500PE	7/22/16 9:30	7/22/16 14:00	**0.130**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	7/11/16 15:00	7/11/16 15:00	ND			0.200	mg/L
Turbidity	SM 2130 B	7/12/16 10:00	7/12/16 10:00	**2.6**			**1.0**	**NTU**
6070242-06 (Lake)	SHADOW LAKE			Collected:	7/11/2016 0:00			
General Chemistry								

FootNotes

RL - Reporting limit
MDL - Minimum detection limit
ND - Indicates compound analyzed for but not detected
J - Indicates estimated value

B - Indicates compound found in associated blank
E - Concentration exceeds highest calibration standard
D - Indicates result is based on a dilution
P - Greater than 25% diff. between 2 GC columns.

APL
AQUA PRO-TECH LABORATORIES
Certified Environmental Testing

Analytical Results Summary
MT LAKES

Client:	**Solitude Lake Management**	**Contact:**	**Chris Doyle**
APL Order ID:	**6070242**	**Received:**	**7/11/16 13:20**

Sample ID/Analysis	Method	Prepared	Analyzed	Result	Qual	MDL	RL	Units
6070242-06 (Lake)	SHADOW LAKE			Collected:	7/11/2016 0:00			
General Chemistry								
Phosphorus Total	4500PE	7/22/16 9:30	7/22/16 14:00	**0.390**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	7/11/16 15:00	7/11/16 15:00	ND			0.200	mg/L
Turbidity	SM 2130 B	7/12/16 10:00	7/12/16 10:00	**3.0**			**1.0**	**NTU**
6070242-07 (Lake)	GRUDENS POND			Collected:	7/11/2016 11:49			
General Chemistry								
Phosphorus Total	4500PE	7/22/16 9:30	7/22/16 14:00	**0.0300**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	7/11/16 15:00	7/11/16 15:00	ND			0.200	mg/L
Turbidity	SM 2130 B	7/12/16 10:00	7/12/16 10:00	**1.5**			**1.0**	**NTU**
6070242-08 (Lake)	MOUNTAIN LAKE			Collected:	7/11/2016 12:10			
Microbiology								
Fecal Coliform	SM 9222D	7/11/16 14:22	7/11/16 14:22	**34**			**1**	**CFU/100 ml**
6070242-08 (Lake)	MOUNTAIN LAKE			Collected:	7/11/2016 12:10			
General Chemistry								
Phosphorus Total	4500PE	7/22/16 9:30	7/22/16 14:00	**0.0500**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	7/11/16 15:00	7/11/16 15:00	ND			0.200	mg/L
Turbidity	SM 2130 B	7/12/16 10:00	7/12/16 10:00	**1.3**			**1.0**	**NTU**
6070242-09 (Lake)	COVE POND			Collected:	7/11/2016 11:37			
General Chemistry								
Phosphorus Total	4500PE	7/22/16 9:30	7/22/16 14:00	**0.0700**			**0.0100**	**mg/L**
Nitrate	EPA 300.0	7/11/16 15:00	7/11/16 15:00	ND			0.200	mg/L
Turbidity	SM 2130 B	7/12/16 10:00	7/12/16 10:00	**1.9**			**1.0**	**NTU**

FootNotes

RL - Reporting limit
MDL - Minimum detection limit
ND - Indicates compound analyzed for but not detected
J - Indicates estimated value

B - Indicates compound found in associated blank
E - Concentration exceeds highest calibration standard
D - Indicates result is based on a dilution
P - Greater than 25% diff. between 2 GC columns.

APL 6070242

AQUA PRO-TECH LABORATORIES

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FAIRFIELD, NEW JERSEY 07004

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FAX: 973.227.2813

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT: Solitude Lake Man.	SEND REPORT TO: Chris Doyle
ADDRESS: 580 Rockport Rd Hackettstown, NJ 07840	ADDRESS: "
PHONE: 908-850-0303	PHONE:
E-MAIL: Cdoyle@solitudelake.com	FAX:
PROJECT NAME: Mt. Lakes	SEND INVOICE TO: DEP
PROJECT MGR: Chris Doyle	ADDRESS: "
PROJECT or PO #:	SAMPLED BY: EM

TURN-AROUND TIME

- [x] APL STANDARD 2 weeks
- [ ] RUSH (choose one below)
  - [ ] 24 hr. date & time required
  - [ ] 48 hr. date & time required
  - [ ] 72 hr. date & time required
  - [ ] 1 week

REPORT FORMAT

- [x] RESULTS ONLY
- [ ] NJ DEP REDUCED
- [ ] NJ DEP FULL
- [ ] STATE FORMS/E2 REPORTING

PWSID#

ELECTRONIC FORMAT

- [ ] EMAIL DELIVERY
- [ ] HAZSITE EDD
- [ ] EXCEL

SRP#

CONTAMINATION LEVEL

☐ HIGH ☐ MEDIUM ☒ LOW

MATRIX ABBREVIATIONS: D - DRINKING WATER G - GROUNDWATER W - WASTEWATER S - SOIL SL - SLUDGE C - CONCRETE L - LAKE

APL Lab ID#	Sample Source: Field ID	Date	Time	Sample Type GRAB	Sample Type COMP	MATRIX	No. of Bottles	Preservative	Analysis Requested
6070242-01	Wildwood Lake	7/11/16	12:49	X		L	2	H_2SO_4	NO_3, Turb., TPO_4
-02	Birchwood Lake	7/11/16	10:00AM	X		L	3	H_2SO_4	NO_3, Turb., TPO_4, fecal Coliform
-03	Sunset Lake	7/11/16	10:40AM	X		L	2	H_2SO_4	NO_3, Turb, TPO_4
-04	Crystal Lake	7/11/16	11:01 AM	X		L	2	H_2SO_4	NO_3, Turb, TPO_4
-05	Olive Pond	7/11/16		X		L	2	"	NO_3, Turb., TPO_4
-06	Shadow Lake	7/11/16		X		L	2	"	NO_3, Turb., TPO_4
-07	Grunden's Pond	7/11/16	11:49	X		L	2	"	NO_3, Turb., TPO_4
-08	Mountain Lake	7/11/16	12:10	X		L	3	"	NO_3, Turb, TPO_4, fecal Coliform
-09	Love Pond	7/11	11:37	X		L	2		NO_3, Turb, TPO_4

RELINQUISHED BY (Print) Emily Mayer	DATE 7/11/16	RECEIVED BY (Print) Drew McMahon	
Signature [signed]	Time 1320	Signature [signed]	
RELINQUISHED BY (Print)	DATE	RECEIVED BY (Print)	
Signature	Time	Signature	
RELINQUISHED BY (Print)	DATE	RECEIVED BY (Print)	
Signature	Time	Signature	

COMMENTS/SPECIAL INSTRUCTIONS

Cooler Temp. upon receipt at lab 3.7

CERTIFICATIONS: NELAP (National Environmental Laboratory Accredation Program) NJDEP #07010 PADEP #68-02903 NYDOH #11634 CTPH #0233 US ARMY

Ref. No: G 930400024

MICROSCOPIC EXAMINATION OF WATER

Sample from: Mountain Lakes		
Collection Date: 06/06/16	Examination Date: 06/07/16	Amount Examined: 200 ml.
Site A: Birchwood Lake	Site B: Crystal Lake	Site C: Sunset Lake

BACILLARIOPHYTA (Diatoms)	**A**	**B**	**C**
Asterionella			
Cyclotella			
Cymbella			
Diatoma			
Fragilaria			
Melosira			
Navicula	10		
Nitzschia			
Pinnularia			
Urosolenia			
Stephanodiscus			
Stauroneis			
Synedra	10		
Tabellaria			

CHRYSOPHYTA (Golden Algae)	**A**	**B**	**C**
Dinobryon	50	60	
Mallomonas	30	20	10
Synura			
Tribonema			
Uroglenopsis			

CHLOROPHYTA (Green Algae)	**A**	**B**	**C**
Ankistrodesmus			
Chlamydomonas			
Chlorella			
Chlorococcum			
Closterium			
Coelastrum			70
Eudorina			
Mougeotia			
Oedogonium			
Oocystis			
Pandorina			
Pediastrum			20
Phytoconis			
Rhizoclonium			
Scenedesmus			
Spirogyra			
Staurastrum		10	20
Gloeoocystis		20	
Ulothrix			
Volvox			
Zygnema			
Gloeocystis			
Sphareocystis			
Cosmarium		20	
Tetraedron			
Dictyosphaerium			

CYANOPHYTA (Blue-green Algae)	**A**	**B**	**C**
Anabaena		150	
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		20	20
Peridinium			

SITE	**A**	**B**	**C**
TOTAL GENERA:	4	7	5
TRANSPARENCY:	6.5’	6’est	6’est
ORGANISMS PER MILLILITER:	**100**	**300**	**140**

NOTES: This is the first sampling event of 2016. Algal density is considered to be low at all sites. Algal diversity is considered to be low at sites A and C while site B is moderate. A light and favorable mixture of golden algae and green algae dominates the assemblage at sites A and C. Traces amounts of diatoms were observed at site A only. Dinoflagellates were also observed at sites B and C only. Blue green algae was observed at site B only, but is considered to be non-problematic at this time. Water clarity is considered to be good at each site.

SOLitude Lake Management, Inc.
580 Rockport Road Hackettstown, NJ 07840 Phone (908) 850-0303 Fax (908) 850-4994

MICROSCOPIC EXAMINATION OF WATER

Sample from: Mountain Lakes		
Collection Date: 6/20/16	Examination Date: 6/20/16	Amount Examined: 200 ml.
Site A: Birchwood Lake	Site B: Crystal Lake	Site C: Sunset Lake

BACILLARIOPHYTA (Diatoms)	**A**	**B**	**C**	**CHLOROPHYTA (Green Algae)**	**A**	**B**	**C**	**CYANOPHYTA (Blue-green Algae)**	**A**	**B**	**C**
Asterionella		30		*Ankistrodesmus*				*Anabaena*			110
Cyclotella				*Chlamydomonas*				*Anacystis*			
Cymbella				*Chlorella*				*Aphanizomenon*			
Diatoma				*Chlorococcum*				*Coelosphaerium*			
Fragilaria	10	10		*Closterium*			10	*Gomphosphseria*			
Melosira				*Coelastrum*		10	30	*Lyngbya*			
Navicula				*Eudorina*				*Microcystis*			
Nitzschia				*Mougeotia*				*Oscillatoria*			
Pinnularia				*Oedogonium*			20	*Pseudoanabaena*			
Urosolenia				*Oocystis*				*Synechocystis*			
Stephanodiscus				*Pandorina*				*Agmenellum*			
Stauroneis				*Pediastrum*			10				
Synedra				*Phytoconis*				**PROTOZOA**			
Tabellaria				*Rhizoclonium*				*Actinophyrs*			
				Scenedesmus							
CHRYSOPHYTA (Golden Algae)	**A**	**B**	**C**	*Spirogyra*				**EUGLENOPHYTA (Euglenoids)**	**A**	**B**	**C**
				Staurastrum		10					
Dinobryon	10			*Sphaerocystis*				*Euglena*			
Mallomonas	10			*Ulothrix*				*Phacus*	10		
Synura				*Volvox*				*Trachelomonas*			
Tribonema				*Zygnema*							
Uroglenopsis				*Gloeocystis*	70	50	10				
				Sphareocystis				**PYRRHOPHYTA (Dinoflagellates)**	**A**	**B**	**C**
				Cosmarium							
				Tetraedron				*Ceratium*		40	
				Dictyosphaerium				*Peridinium*			

SITE	**A**	**B**	**C**
TOTAL GENERA:	5	7	5
TRANSPARENCY:	5.5’	7’est	5’est
ORGANISMS PER MILLILITER:	**110**	**150**	**240**

NOTES: Algal density increased at sites A and C while site B decreased. The density continues to be low at all sites. Algal diversity continues to be the same at sites B and C while site A increased. The diversity continues to be low at sites A and C whereas site B is moderate. The assemblage at sites A and B is dominated by green algae. Blue green algae was observed at site C only and dominates that assemblage. However, it is considered to be non-problematic at this time. Trace amounts of golden algae (A only), diatoms (sites A and B only), euglenoids (site A only) and dinoflagellates (site B only) were observed. Water clarity decreased at sites A and C while site B increased. Clarity is now considered to be fair at sites A and C while site B is good.

MICROSCOPIC EXAMINATION OF WATER

Sample from: Mountain Lakes

Collection Date: 07/05/16	Examination Date: 07/07/16	Amount Examined: 200 ml.
Site A: Birchwood Lake	Site B: Crystal Lake	Site C: Sunset Lake

BACILLARIOPHYTA (Diatoms)	**A**	**B**	**C**
Asterionella			
Cyclotella			
Cymbella			
Diatoma			
Fragilaria			
Melosira			
Navicula			
Nitzschia			
Pinnularia			
Urosolenia			
Stephanodiscus			
Stauroneis			
Synedra			
Tabellaria		10	

CHRYSOPHYTA (Golden Algae)	**A**	**B**	**C**
Dinobryon			
Mallomonas			10
Synura		10	
Tribonema			
Uroglenopsis			

CHLOROPHYTA (Green Algae)	**A**	**B**	**C**
Ankistrodesmus			
Chlamydomonas			
Chlorella			
Chlorococcum			
Closterium			10
Coelastrum	20	170	10
Eudorina			
Mougeotia			
Oedogonium	20	10	50
Oocystis			
Pandorina			
Pediastrum		10	10
Phytoconis			
Rhizoclonium			
Scenedesmus			
Spirogyra			
Staurastrum			
Sphaerocystis			
Ulothrix			
Volvox			
Zygnema			
Gloeocystis			
Sphareocystis			
Cosmarium			
Tetraedron			
Dictyosphaerium			

CYANOPHYTA (Blue-green Algae)	**A**	**B**	**C**
Anabaena			
Anacystis			
Aphanizomenon	100	10	
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			

SITE	**A**	**B**	**C**
TOTAL GENERA:	3	6	5
TRANSPARENCY:	6'est	6'est	4'
ORGANISMS PER MILLILITER:	**140**	**220**	**90**

NOTES: Algal density increased at sites A and B while site C decreased. The density continues to be to be low. Algal diversity decreased at sites A and B while site C has not changed since the last sampling level. The diversity is now considered to be low at sites A and C while site B is moderate. The assemblage is dominated by green algae. Blue green algae (sites A and B only) and golden algae (sites B and C only) were observed. Trace amounts of diatoms were observed at site B only. Water clarity decreased at sites B and C while site A increased. Clarity is now considered to be good at sites A and B while site C is fair.

MICROSCOPIC EXAMINATION OF WATER

Sample from: Mountain Lakes

Collection Date: 07/18/16	Examination Date: 07/18/16	Amount Examined: 200 ml.
Site A: Birchwood Lake	Site B: Crystal Lake	Site C: Sunset Lake

BACILLARIOPHYTA (Diatoms)	**A**	**B**	**C**	**CHLOROPHYTA (Green Algae)**	**A**	**B**	**C**	**CYANOPHYTA (Blue-green Algae)**	**A**	**B**	**C**
Asterionella				*Ankistrodesmus*			10	*Anabaena*			30
Cyclotella				*Chlamydomonas*				*Anacystis*			
Cymbella				*Chlorella*				*Aphanizomenon*			
Diatoma				*Chlorococcum*				*Coelosphaerium*			
Fragilaria				*Closterium*	50		10	*Gomphosphseria*			
Melosira				*Coelastrum*	20			*Lyngbya*			
Navicula				*Eudorina*				*Microcystis*			
Nitzschia				*Mougeotia*				*Oscillatoria*			
Pinnularia				*Oedogonium*				*Pseudoanabaena*			
Urosolenia				*Oocystis*				*Synechocystis*			
Stephanodiscus				*Pandorina*				*Agmenellum*			
Stauroneis				*Pediastrum*			20				
Synedra				*Phytoconis*				**PROTOZOA**			
Tabellaria		150	30	*Rhizoclonium*				*Actinophyrs*			
				Scenedesmus		10					
CHRYSOPHYTA (Golden Algae)	**A**	**B**	**C**	*Spirogyra*				**EUGLENOPHYTA (Euglenoids)**	**A**	**B**	**C**
				Staurastrum	20	30	50				
Dinobryon		10		*Sphaerocystis*				*Euglena*			
Mallomonas	10	10	40	*Ulothrix*				*Phacus*			
Synura				*Volvox*				*Trachelomonas*			
Tribonema				*Zygnema*							
Uroglenopsis				*Gloeocystis*							
				Sphareocystis				**PYRRHOPHYTA (Dinoflagellates)**	**A**	**B**	**C**
				Cosmarium							
				Tetraedron				*Ceratium*		10	
				Dictyosphaerium				*Peridinium*			

SITE	**A**	**B**	**C**
TOTAL GENERA:	4	6	7
TRANSPARENCY:	4.5'	6'est	6'est
ORGANISMS PER MILLILITER:	**100**	**220**	**190**

NOTES: Algal diversity increased at sites A and C while site B has not changed since the last sampling event. The diversity is now considered to be moderate at sites B and C while site A is low. Algal density decreased at site A, increased at site C and has not changed at site B. The density continues to be low at all sites. A light and favorable mixture of green algae and golden algae dominates the assemblage this week. Diatoms were observed at sites B and C only. Trace amounts of blue green algae (site C only) and dinoflagellates (site B only) were observed. Water clarity decreased at site A, increased at site C and did not change at site B. Clarity is now considered to be good at sites B and C while site A is fair.

MICROSCOPIC EXAMINATION OF WATER

Sample from: Mountain Lakes

Collection Date: 08/08/16	Examination Date: 08/08/16	Amount Examined: 200 ml.
Site A: Birchwood Lake	Site B: Crystal Lake	Site C: Sunset Lake

BACILLARIOPHYTA (Diatoms)	**A**	**B**	**C**
Asterionella			
Cyclotella	90		
Cymbella			
Diatoma			
Fragilaria			
Melosira			
Navicula			
Nitzschia			
Pinnularia			
Urosolenia			
Stephanodiscus			
Stauroneis			
Synedra			
Tabellaria		130	

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

CHLOROPHYTA (Green Algae)	**A**	**B**	**C**
Ankistrodesmus			
Chlamydomonas			
Chlorella			
Chlorococcum			
Closterium	20	10	10
Coelastrum	50		40
Eudorina			
Mougeotia			
Oedogonium			
Oocystis			
Pandorina			
Pediastrum			30
Phytoconis			
Rhizoclonium			
Scenedesmus			
Spirogyra			
Staurastrum	10	60	40
Sphaerocystis			
Ulothrix			
Volvox			
Zygnema			
Gloeocystis			
Sphareocystis			
Cosmarium			
Tetraedron			
Dictyosphaerium			

CYANOPHYTA (Blue-green Algae)	**A**	**B**	**C**
Anabaena		20	370
Anacystis			
Aphanizomenon			150
Coelosphaerium			
Gomphosphseria			
Lyngbya			
Microcystis			30
Oscillatoria			
Pseudoanabaena			
Synechocystis			
Agmenellum			

PROTOZOA			
Actinophyrs			

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

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

SITE	**A**	**B**	**C**
TOTAL GENERA:	4	4	7
TRANSPARENCY:	4'	5'est	6'est
ORGANISMS PER MILLILITER:	**170**	**220**	**670**

NOTES: Algal density increased at sites A and C while site B has not changed. The density is now considered to be low at sites A and B whereas site C is moderate. Algal diversity has not changed at sites A and C since the last sampling event, while site B decreased. The diversity is now considered to be low at sites A and B whereas site C is moderate. Sites A and B are dominated by diatoms, while site C is dominated by the blue green algae *Anabaena.* However, blue-green algae counts are non-problematic at this time. Water clarity decreased at sites A and B whereas site C has not changed. Clarity is now considered to be fair at sites A and B while site C is good.

Solitude Lake Management, Inc.
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MICROSCOPIC EXAMINATION OF WATER

Sample from: Mountain Lakes

Collection Date: 06/06/16	Examination Date: 06/07/16	Amount Examined: 200 ml.
Site A: Grunden's Pond	Site B: Mountain Lake	Site C: Wildwood Lake

BACILLARIOPHYTA (Diatoms)	**A**	**B**	**C**
Asterionella			
Cyclotella			
Cymbella			
Diatoma			
Fragilaria			
Melosira			
Navicula			
Nitzschia			
Pinnularia			
Urosolenia			
Stephanodiscus			
Stauroneis			
Synedra			
Tabellaria			
Surriella			

CHRYSOPHYTA (Golden Algae)	**A**	**B**	**C**
Dinobryon	10	10	10
Mallomonas	30		40
Synura			
Tribonema			
Uroglenopsis			

CHLOROPHYTA (Green Algae)	**A**	**B**	**C**
Ankistrodesmus			
Chlamydomonas			
Chlorella			
Chlorococcum			
Closterium			
Coelastrum	10		20
Eudorina			
Mougeotia			
Oedogonium		10	10
Oocystis	10		
Pandorina			
Pediastrum	10		20
Phytoconis			
Rhizoclonium			
Scenedesmus			
Spirogyra	10		
Staurastrum			
Sphaerocystis			
Ulothrix			
Scenedesmus			
Zygnema			
Gloeocystis	10		
Cosmarium			
Quadriguia			
Tetraspora			

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

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

PYRRHOPHYTA (Dinoflagellates)	**A**	**B**	**C**
Ceratium	10	80	30
Peridinium			

SITE	**A**	**B**	**C**
TOTAL GENERA:	8	3	6
TRANSPARENCY:	3'est	7.5'	7'est
ORGANISMS PER MILLILITER:	**100**	**100**	**130**

NOTES: This is the first sampling event of 2016. Algal diversity is considered to be moderate at sites A and C white site B is low. Algal density is considered to be light and favorable at all sites. A mixture of golden algae and dinoflagellates dominates the assemblages at these sites this week. Trace amounts of green algae were also observed at all three sites. Water clarity is considered to be good at sites B and C while site A is poor to fair.

MICROSCOPIC EXAMINATION OF WATER

Sample from: Mountain Lakes		
Collection Date: 06/20/16	Examination Date: 6/20/16	Amount Examined: 200 ml.
Site A: Shadow Lake	Site B: Mountain Lake	Site C: Wildwood Lake

BACILLARIOPHYTA (Diatoms)	**A**	**B**	**C**	**CHLOROPHYTA (Green Algae)**	**A**	**B**	**C**	**CYANOPHYTA (Blue-green Algae)**	**A**	**B**	**C**
Asterionella	10			*Ankistrodesmus*				*Anabaena*		80	
Cyclotella				*Chlamydomonas*				*Anacystis*			
Cymbella				*Chlorella*				*Aphanizomenon*			
Diatoma				*Chlorococcum*				*Coelosphaerium*			
Fragilaria	10			*Closterium*				*Gomphosphseria*			
Melosira	10			*Coelastrum*	10		150	*Lyngbya*			
Navicula				*Eudorina*				*Microcystis*			
Nitzschia				*Mougeotia*				*Oscillatoria*			
Pinnularia	10			*Oedogonium*	280			*Pseudoanabaena*			
Urosolenia				*Oocystis*				*Synechocystis*			
Stephanodiscus				*Pandorina*				*Scytonema*			
Stauroneis				*Pediastrum*			20				
Synedra	10		10	*Phytoconis*				**PROTOZOA**			
Tabellaria				*Rhizoclonium*				*Actinophyrs*			
Surriella				*Scenedesmus*							
CHRYSOPHYTA (Golden Algae)	**A**	**B**	**C**	*Spirogyra*				**EUGLENOPHYTA (Euglenoids)**	**A**	**B**	**C**
				Staurastrum							
Dinobryon	80	10		*Gloeocystis*		40		*Euglena*			
Mallomonas	30		20	*Ocanthium*				*Phacus*			
Synura				*Scenedesmus*				*Trachelomonas*			
Tribonema				*Zygnema*							
Uroglenopsis				*Gloeocystis*			40				
				Cosmarium		10		**PYRRHOPHYTA (Dinoflagellates)**	**A**	**B**	**C**
				Quadriguia							
				Tetraspora				*Ceratium*	240		
								Peridinium			

SITE	**A**	**B**	**C**
TOTAL GENERA:	10	4	5
TRANSPARENCY:	3'est	12'est	6'est
ORGANISMS PER MILLILITER:	**700**	**140**	**240**

NOTES: Algal diversity is considered to be low at sites B and C while site A is moderate. Algal density is considered to be low at sites B and C while site A is moderate. The assemblage is dominated by green algae this week. Golden algae were also observed. Trace amounts of diatoms were observed at sites A and C only. Dinoflagellates (site A only) and trace blue green algae (site B only) were observed. Water clarity is considered to be poor to fair at site A, excellent at site B, and good at site C.

Solitude Lake Management, Inc.
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MICROSCOPIC EXAMINATION OF WATER

Sample from: Mountain Lakes

Collection Date: 07/05/16	Examination Date: 07/07/16	Amount Examined: 200 ml.
Site A: Grunden's Pond	Site B: Mountain Lake	Site C: Wildwood Lake

BACILLARIOPHYTA (Diatoms)	**A**	**B**	**C**
Asterionella	50		
Cyclotella			
Cymbella			
Diatoma			
Fragilaria			
Melosira			
Navicula			
Nitzschia			
Pinnularia			
Urosolenia			
Stephanodiscus			
Stauroneis			
Synedra			
Tabellaria			
Surriella			
CHRYSOPHYTA (Golden Algae)	**A**	**B**	**C**
Dinobryon		10	
Mallomonas	30	10	
Synura			
Tribonema			
Uroglenopsis			

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

CYANOPHYTA (Blue-green Algae)	**A**	**B**	**C**
Anabaena			
Anacystis			
Aphanizomenon	30		
Coelosphaerium			
Gomphosphseria			
Lyngbya			
Microcystis			
Oscillatoria			
Pseudoanabaena			
Synechocystis			
Scytonema			
PROTOZOA			
Actinophyrs			
EUGLENOPHYTA (Euglenoids)	**A**	**B**	**C**
Euglena			
Phacus			
Trachelomonas			
PYRRHOPHYTA (Dinoflagellates)	**A**	**B**	**C**
Ceratium			
Peridinium			

SITE	**A**	**B**	**C**
TOTAL GENERA:	3	5	4
TRANSPARENCY:	2'est	6'	7'
ORGANISMS PER MILLILITER:	**110**	**120**	**70**

NOTES: Algal density decreased at sites B and C while site A increased. The density continues to be low at all sites. Algal diversity decreased at sites A and C while site B increased. The diversity is considered to be low at all sites. A mixture of green algae and golden algae dominated the assemblage this week. Diatoms and blue green algae were observed at site A only. Water clarity decreased at sites A and B while site C increased. Clarity is now considered to be good at sites B and C while site A is poor.

MICROSCOPIC EXAMINATION OF WATER

Sample from: Mountain Lakes		
Collection Date: 07/18/16	Examination Date: 07/18/16	Amount Examined: 200 ml.
Site A: Shadow Lake	Site B: Mountain Lake	Site C: Wildwood Lake

BACILLARIOPHYTA (Diatoms)	**A**	**B**	**C**
Asterionella			
Cyclotella			
Cymbella			
Diatoma			
Fragilaria	10		
Melosira			
Navicula			
Nitzschia			
Pinnularia			
Urosolenia			
Stephanodiscus			
Stauroneis			
Synedra			
Tabellaria			
Surriella			

CHRYSOPHYTA (Golden Algae)	**A**	**B**	**C**
Dinobryon		60	10
Mallomonas			
Synura			
Tribonema			
Uroglenopsis			

CHLOROPHYTA (Green Algae)	**A**	**B**	**C**
Ankistrodesmus		20	
Chlamydomonas			
Chlorella			
Chlorococcum			
Closterium	10		20
Coelastrum		10	
Eudorina			
Mougeotia			
Oedogonium			
Oocystis			
Pandorina			
Pediastrum		20	50
Phytoconis			
Rhizoclonium			
Scenedesmus			10
Spirogyra			
Staurastrum	90	80	
Gloeocystis			
Ocanthium			
Scenedesmus			
Zygnema			
Gloeocystis			
Cosmarium			
Quadriguia			
Tetraspora			

CYANOPHYTA (Blue-green Algae)	**A**	**B**	**C**
Anabaena	50		
Anacystis			
Aphanizomenon	80		
Coelosphaerium			
Gomphosphseria			
Lyngbya			
Microcystis			10
Oscillatoria			
Pseudoanabaena			
Synechocystis			
Scytonema			

PROTOZOA			
Actinophyrs			

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

PYRRHOPHYTA (Dinoflagellates)	**A**	**B**	**C**
Ceratium	30		90
Peridinium			

SITE	**A**	**B**	**C**
TOTAL GENERA:	6	5	6
TRANSPARENCY:	4'est	5'	5'est
ORGANISMS PER MILLILITER:	**270**	**190**	**190**

NOTES: Algal diversity increased at sites B and C while site A decreased. The diversity is now considered to be moderate sites A and C while site B is low. Algal density decreased at sites A and C while site B increased. The density is now considered to be low at all sites. The assemblage at sites B and C continues to be dominated by green algae. Site A is dominated by blue-green algae but overall counts are non-problematic at this time. Golden algae was observed at sites B and C only. Blue green algae and dinoflagellates were observed at sites A and C only. Trace amounts of diatoms were observed at site A only. Water clarity decreased at sites B and C while site A increased. Water Clarity is now considered to be fair at all sites.

MICROSCOPIC EXAMINATION OF WATER

Sample from: Mountain Lakes

Collection Date: 08/08/16	Examination Date: 08/08/16 & 08/09/16	Amount Examined: 200 ml.
Site A: Grunden's Pond	Site B: Mountain Lake	Site C: Wildwood Lake

BACILLARIOPHYTA (Diatoms)	**A**	**B**	**C**
Asterionella			
Cyclotella			
Cymbella			
Diatoma			
Fragilaria		20	
Melosira			
Navicula			
Nitzschia			
Pinnularia			
Urosolenia			
Stephanodiscus			
Stauroneis			
Synedra			
Tabellaria			
Surriella			

CHRYSOPHYTA (Golden Algae)	**A**	**B**	**C**
Dinobryon			
Mallomonas	270		
Synura			
Tribonema			
Uroglenopsis			

CHLOROPHYTA (Green Algae)	**A**	**B**	**C**
Ankistrodesmus			
Chlamydomonas			
Chlorella			
Chlorococcum			
Closterium			
Coelastrum		20	
Eudorina			
Mougeotia			
Oedogonium			
Oocystis			
Pandorina			
Pediastrum		30	
Phytoconis			
Rhizoclonium			
Scenedesmus			
Spirogyra			
Staurastrum	10	20	
Sphaerocystis			
Ulothrix			
Scenedesmus			
Zygnema			
Gloeocystis			
Cosmarium			
Quadriguia			
Tetraspora			

CYANOPHYTA (Blue-green Algae)	**A**	**B**	**C**
Anabaena			
Anacystis			
Aphanizomenon		230	
Coelosphaerium			
Gomphosphseria			
Lyngbya			
Microcystis		10	
Oscillatoria			
Pseudoanabaena			
Synechocystis			
Scytonema			
PROTOZOA			
Actinophyrs			

EUGLENOPHYTA (Euglenoids)	**A**	**B**	**C**
Euglena	10		
Phacus			
Trachelomonas			

PYRRHOPHYTA (Dinoflagellates)	**A**	**B**	**C**
Ceratium	280	10	
Peridinium			

SITE	**A**	**B**	**C**
TOTAL GENERA:	5	7	3
TRANSPARENCY:	3'est	3.5'	10'est
ORGANISMS PER MILLILITER:	**590**	**340**	**100**

NOTES: Algal diversity increased at sites A and B while site C decreased. The diversity is now considered to be low at sites A and C whereas site B is moderate. Algal density is considered to be low at sites B and C while site A is moderate. A light and favorable mixture of dinoflagellates, blue green algae and green algae dominates the assemblage this week. Golden algae and euglenoids were observed at site A only. Water clarity increased at sites A and C whereas site B decreased. Clarity is now considered to be poor at site A, fair at site B and excellent at site C. Blue-green algae is non-problematic at site B at this time.

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MICROSCOPIC EXAMINATION OF WATER

Sample from: Mountain Lakes

Collection Date: 06/06/16	Examination Date: 06/07/16	Amount Examined: 200 ml.
Site A: Olive Pond	Site B: Shadow Lake	Site C: Cove Pond

BACILLARIOPHYTA (Diatoms)	**A**	**B**	**C**
Asterionella			10
Cyclotella			
Cymbella			
Diatoma			
Fragilaria			
Melosira			
Navicula			
Nitzschia			
Pinnularia			
Rhizosolenia			
Stephanodiscus			
Stauroneis			
Synedra			10
Tabellaria			
Cocconeis			

CHRYSOPHYTA (Golden Algae)	**A**	**B**	**C**
Dinobryon	40	60	60
Mallomonas			
Synura			
Tribonema			
Uroglenopsis			

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

CYANOPHYTA (Blue-green Algae)	**A**	**B**	**C**
Anabaena	10		
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	110	20	20
Peridinium			

SITE	**A**	**B**	**C**
TOTAL GENERA:	6	3	5
TRANSPARENCY:	4'est	4'est	3'est
ORGANISMS PER MILLILITER:	**200**	**110**	**120**

NOTES: This is the first sampling event of 2016. Algal diversity is considered to be low at sites B and C while site A is moderate. Algal density is considered to be light and favorable at each site. Sites B and C are dominated by golden algae, specifically *Dinobryon*. Meanwhile, site A is dominated by dinoflagellates. Green algae were also observed this week at all sites. Trace amounts of diatoms (site C only) and blue green algae (site A only) were observed. Water clarity is considered to fair at sites A and B, whereas site C is poor-fair.

MICROSCOPIC EXAMINATION OF WATER

Sample from: Mountain Lakes		
Collection Date: 07/05/16	Examination Date: 07/07/16	Amount Examined: 200 ml.
Site A: Olive Pond	Site B: Shadow Lake	Site C: Cove Pond

BACILLARIOPHYTA (Diatoms)	**A**	**B**	**C**	**CHLOROPHYTA (Green Algae)**	**A**	**B**	**C**	**CYANOPHYTA (Blue-green Algae)**	**A**	**B**	**C**
Asterionella				*Ankistrodesmus*				*Anabaena*	90	1,810	
Cyclotella				*Chlamydomonas*				*Anacystis*			
Cymbella				*Chlorella*				*Aphanizomenon*	30	390	
Diatoma				*Chlorococcum*				*Coelosphaerium*			
Fragilaria				*Closterium*		10		*Gomphosphseria*			
Melosira				*Coelastrum*				*Lyngbya*			
Navicula			10	*Eudorina*				*Microcystis*			
Nitzschia				*Mougeotia*				*Oscillatoria*			
Pinnularia		10		*Oedogonium*		30		*Pseudoanabaena*			
Rhizosolenia				*Oocystis*				*Synechocystis*			
Stephanodiscus				*Pandorina*				*Agmenellum*			
Stauroneis				*Pediastrum*							
Synedra				*Phytoconis*				**PROTOZOA**			
Tabellaria				*Rhizoclonium*				*Actinophyrs*			
Cocconeis				*Scenedesmus*							
CHRYSOPHYTA (Golden Algae)	**A**	**B**	**C**	*Spirogyra*				**EUGLENOPHYTA (Euglenoids)**	**A**	**B**	**C**
				Staurastrum							
Dinobryon				*Sphaerocystis*				*Euglena*			
Mallomonas				*Ulothrix*				*Phacus*			
Synura			20	*Volvox*				*Trachelomonas*			
Tribonema				*Zygnema*							
Uroglenopsis				*Quadrigula*							
				Gloeocystis				**PYRRHOPHYTA (Dinoflagellates)**	**A**	**B**	**C**
				Cosmarium							
				Treubaria				*Ceratium*	10		50
								Peridinium			

SITE	**A**	**B**	**C**
TOTAL GENERA:	2	6	3
TRANSPARENCY:	2'est	2'est	2'est
ORGANISMS PER MILLILITER:	**120**	**2,260**	**80**

NOTES: Algal diversity decreased at all sites since the last sampling event. The diversity is considered to be low at sites A and C while site B id moderate. Algal density decreased at sites A and C while site B increased. The density is considered to be low at sites A and C whereas site B is very high. Sites A and B are both dominated by blue green algae. Site C is dominated by dinoflagellates. Diatoms were observed at sites B and C only. Traces of green algae (site B only) and golden algae (site C only). Water clarity decreased at all sites and is now considered to be poor.

MICROSCOPIC EXAMINATION OF WATER

Sample from: Mountain Lakes		
Collection Date: 08/08/16	Examination Date: 08/09/16	Amount Examined: 200 ml.
Site A: Olive Pond	Site B: Shadow Lake	Site C: Cove Pond

BACILLARIOPHYTA (Diatoms)	**A**	**B**	**C**
Asterionella			
Cyclotella	380	200	
Cymbella			
Diatoma			
Fragilaria			
Melosira			
Navicula			
Nitzschia			
Pinnularia			
Rhizosolenia			
Stephanodiscus			
Stauroneis			
Synedra			
Tabellaria			
Cocconeis			

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

CHLOROPHYTA (Green Algae)	**A**	**B**	**C**
Ankistrodesmus			
Chlamydomonas			
Chlorella			
Chlorococcum			
Closterium			
Coelastrum		30	
Eudorina			
Mougeotia			110
Oedogonium			
Oocystis			
Pandorina			
Pediastrum		60	10
Phytoconis			
Rhizoclonium			
Scenedesmus		40	
Spirogyra			
Staurastrum	10	10	10
Sphaerocystis	10		
Ulothrix			
Volvox			
Zygnema			
Quadrigula			
Gloeocystis			
Cosmarium			
Treubaria			

CYANOPHYTA (Blue-green Algae)	**A**	**B**	**C**
Anabaena		10	
Anacystis			
Aphanizomenon	10	20	
Coelosphaerium			
Gomphosphseria			
Lyngbya			
Microcystis			
Oscillatoria			
Pseudoanabaena			
Synechocystis			
Agmenellum			
PROTOZOA			
Actinophyrs			

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

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

SITE	**A**	**B**	**C**
TOTAL GENERA:	4	7	5
TRANSPARENCY:	4'est	4'est	4'est
ORGANISMS PER MILLILITER:	**410**	**370**	**220**

NOTES: Since the last sampling event the algal diversity increased at all sites. The diversity is now considered to be low at sites A and C while site B is moderate. Algal density increased at sites A and C while site B decreased. The density is now considered to be low at all sites. Sites A and B are both dominated by the diatom called *Cyclotella*. Site C is dominated by green algae. Traces of blue green algae were observed at sites A and B only. Traces of golden algae and dinoflagellates were observed at site C only. Water clarity increased at each site and is now considered to be fair.

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Mountain Lakes

2016 Fecal Coliform Data

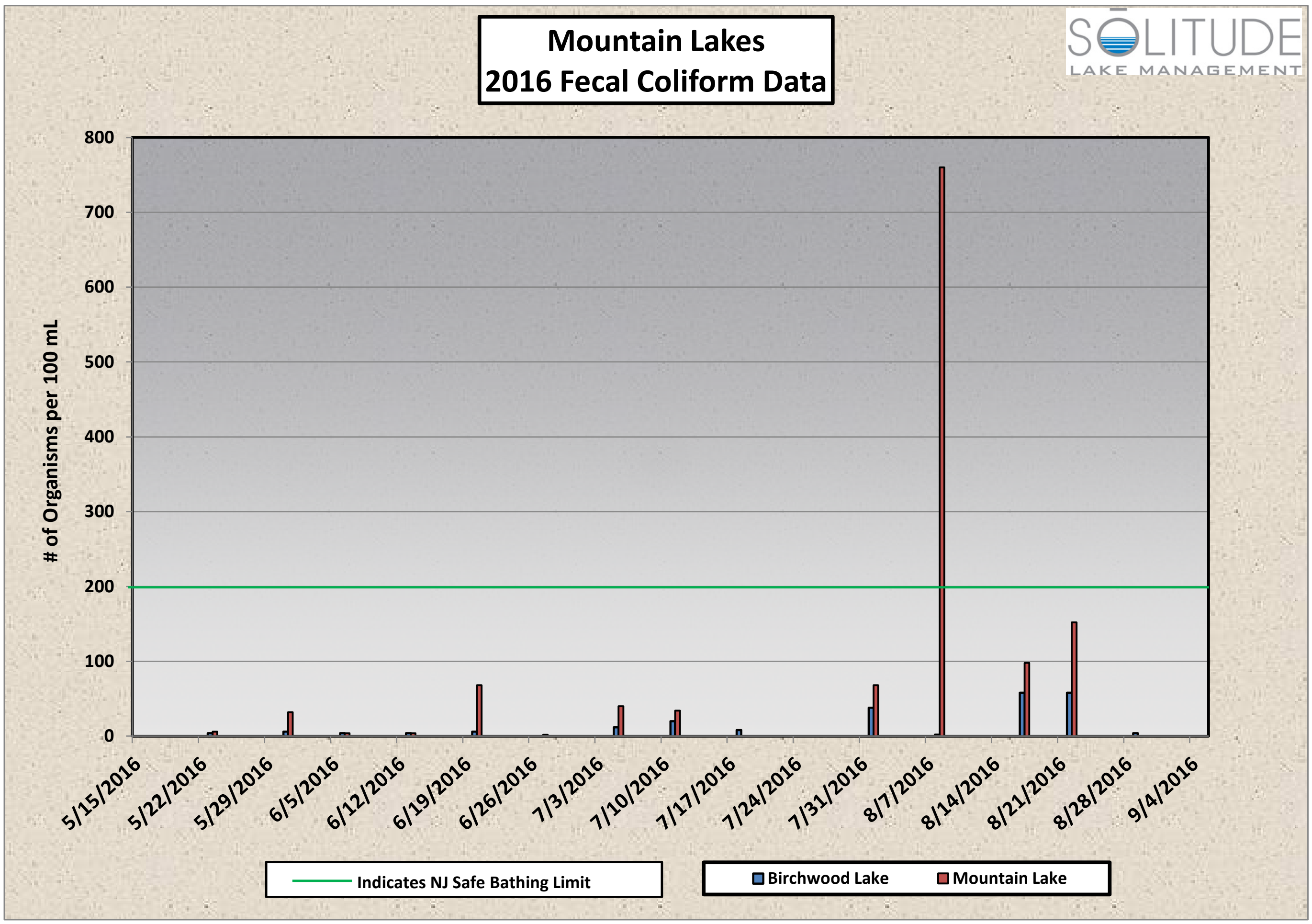
Date	Birchwood Lake	Mountain Lake	New Jersey Health Limit
5/23/2016	4	6	200
5/31/2016	6	32	200
6/6/2016	4	4	200
6/13/2016	4	4	200
6/20/2016	6	68	200
6/27/2016	<2	2	200
7/5/2016	12	40	200
7/11/2016	20	34	200
7/18/2016	8	<2	200
7/25/2016	<2	<2	200
8/1/2016	38	68	200
8/8/2016	2	760	200
8/17/2016	58	98	200
8/22/2016	58	152	200
8/29/2016	4	<2	200
			200

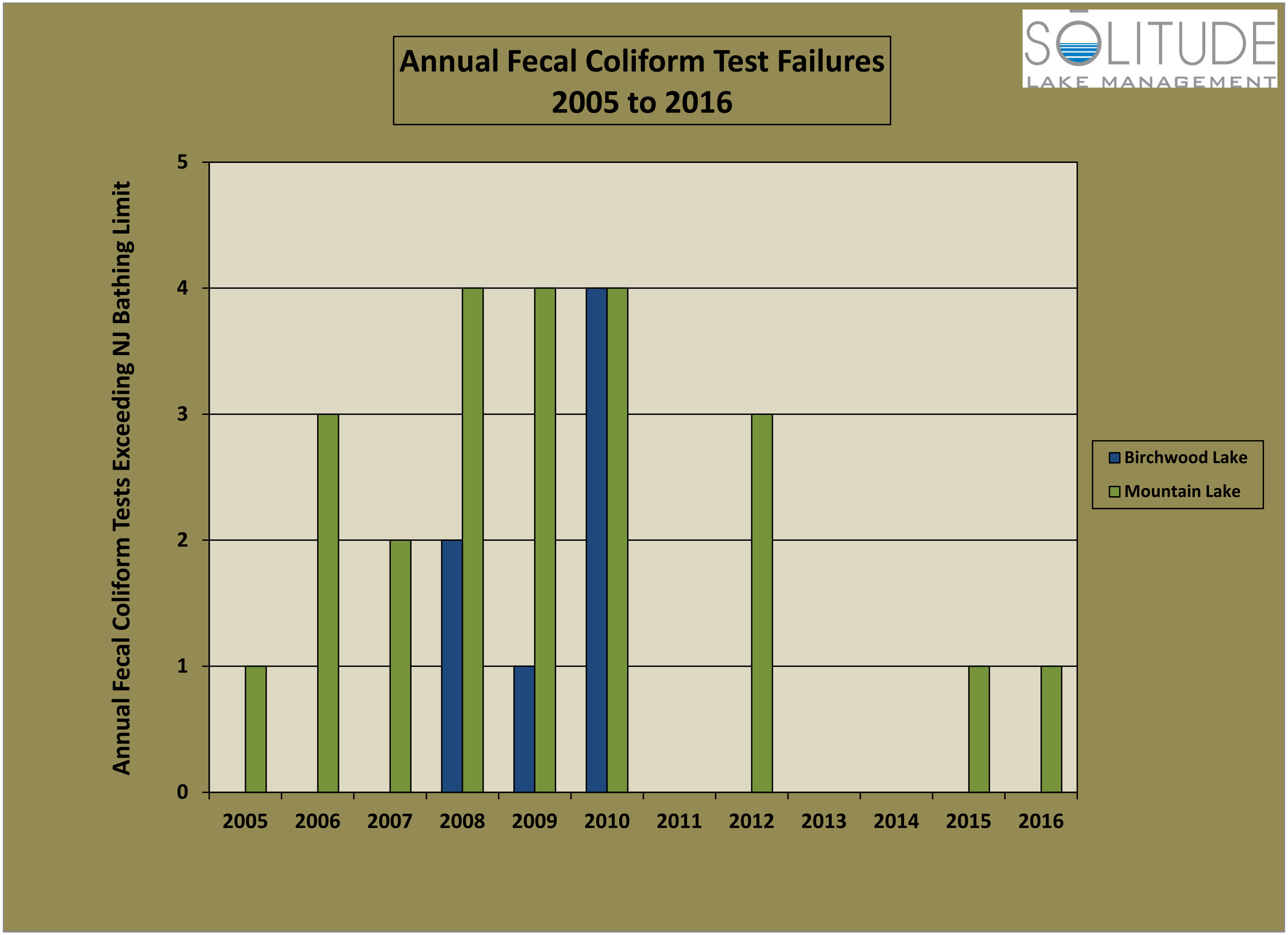
Retest Results

Date	Mountain Lake
8/9/2016	13

Date	Birchwood
NA	NA

Note: All results are in organisms per 100 mL


Mountain Lakes
2016 Fecal Coliform Data
SOLITUDE
LAKE MANAGEMENT
# of Organisms per 100 mL
800
700
600
500
400
300
200
100
0
5/15/2016
5/22/2016
5/29/2016
6/5/2016
6/12/2016
6/19/2016
6/26/2016
7/3/2016
7/10/2016
7/17/2016
7/24/2016
7/31/2016
8/7/2016
8/14/2016
8/21/2016
8/28/2016
9/4/2016
Indicates NJ Safe Bathing Limit
Birchwood Lake
Mountain Lake


Annual Fecal Coliform Test Failures
2005 to 2016
SOLITUDE
LAKE MANAGEMENT
Annual Fecal Coliform Tests Exceeding NJ Bathing Limit
0
1
2
3
4
5
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Birchwood Lake
Mountain Lake