2014 Aquatic Macrophyte Survey Report

ALCYON LAKE, PITMAN, NJ

AUGUST 28, 2014

REPORT FOR: Pitman Environmental Commission

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2014 Aquatic Macrophyte Survey Report

Alcyon Lake
Pitman, NJ

Summary

On August 28, 2014, Allied Biological, Inc. was pleased to conduct a detailed aquatic macrophyte survey at Alcyon Lake in Pitman, New Jersey. The primary goal of the detailed survey was to document and map the diverse vegetation present in the lake basin, including both native and non-native species, and to determine the best management practices moving forward at Alcyon Lake. The mapping survey was requested by the Pitman Environmental Commission following resident complaints regarding nuisance level aquatic plant growth in the basin. In the Appendix of this report are a total of 18 maps representing the distribution and abundance of the aquatic plant and algae species observed, the sample points utilized for the survey and the water depth taken at each sample location.

Procedures

The total number of sample locations is typically based on the total acreage of the lake. As a rule of thumb, one sample location per acre (minimum 50 sample locations) is surveyed. If the lake is over 100 acres in size, the number of sample locations is typically reduced to about 100 if one field day is anticipated for the data collection. The basin at Alcyon Lake is approximately 20 acres in size. Based on this, random sample locations were plotted on a grid overlay map of the lake, with a total number of sampling locations equaling 87.

The area of a lake that can support submersed aquatic plant growth is referred to as the littoral zone. In NJ, this is usually depths less than 12 feet. Vegetation growth is effected by a number of factors including water clarity and time of the year. Clarity is often better early in the season allowing for plant growth in deeper areas of the basin, but as clarity decreases

vegetation in deeper areas often dies back due to lack of light penetration. During the survey water depth was measured at each potential site throughout the basin to determine the depth of current vegetation growth. At Alcyon Lake the entire basin is considered to be littoral zone with the deepest recorded site having a depth of 11.5 feet.

Using the overlay grid loaded onto the GPS unit, the survey boat was piloted to the first sample location. Due to nuisance level plant growth at the water surface in the basin, a canoe was used to complete the survey. On arrival, the GPS coordinates of the sample location was recorded using a Trimble GeoXH 2008 series handheld GPS unit with sub-meter accuracy. The water depth was also measured, using a boat mounted depth finder, a handheld depth gun (HawkEye digital sonar system, or equivalent), or a calibrated metal pole, as appropriate to the conditions. The water depth was recorded on a field log, and is depicted on a map in the Appendix. Any other pertinent field notes regarding the sample location were also recorded on a field log.

Next, a weed anchor attached to a 10 meter-long piece of rope was tossed from a random side of the boat. It is important to toss the weed anchor the full 10 meters (a loop at the end of the rope is attached to the boat to prevent losing the anchor). The weed anchor is slowly retrieved along the bottom, and carefully hoisted into the boat. To determine the overall submersed vegetation amount, the weed mass is assigned one of five densities, based on semi-quantitative metrics developed by Cornell University (Lord, et al, 2005). These densities are: **No Plants** (empty anchor), **Trace** (one or two stems per anchor, or the amount that can be held between two fingers), **Sparse** (three to 10 stems, but lightly covering the anchor, or about a handful), **Medium** (more than 10 stems, and covering all the tines of the anchor), or **Dense** (entire anchor full of stems, and one has trouble getting the mass into the boat). See the Appendix of this report for pictures of these representative densities. These densities are abbreviated in the field notes as 0, T, S, M, and D. Next the submersed weed mass is sorted by genus (or species if possible) and one of the five densities (as described above) is assigned to each genus and/or species. Finally, overall floating macrophyte density within a 10 meter diameter of the survey boat is assigned a density, as well as an estimated density for each separate genus (or species) observed. This data is recorded in the field notes. This procedure is then repeated for the remaining sample points.

A sample of each different macrophyte is collected and placed in a bottle with a letter or number code (A, B, 1, 2, etc.). If possible, these samples included both submersed and floating leaves (if any), seeds, and flowers (if present), to facilitate identification. These bottles are placed in a cooler stocked with blue-ice packs or ice, and returned to Allied Biological's lab for positive identification and photographing. Regionally appropriate taxonomic keys are used to

identify the aquatic macrophytes (a list of references is included in the appendix) to the lowest practical taxa, typically to species.

The weed anchor used for aquatic macrophyte surveys has a specific design. It is constructed with two 13.5-inch wide metal garden rakes attached back to back with several hose clamps. The wooden handles are removed and a 10 meter-long nylon rope is attached to the rake heads.

Macrophyte Summary

At Alcyon Lake, during the 2014 macrophyte survey, 87 sites were assessed to determine the abundance and distribution of submersed and floating aquatic vegetation. Submersed vegetation was collected at 84 sites or at 97% abundance in the basin. Ten submersed macrophyte species were collected, including benthic filamentous algae. Nuisance level submersed vegetation (defined as medium and dense abundance) was supported at over half, 57% of all sites surveyed and 59% of all vegetated sites. Trace and sparse density vegetation were observed at 17 sites each or 20% each of total vegetated sites.

Four species of floating macrophyte (including floating filamentous algae) were also observed during the survey. Nuisance level abundance was observed at 27 sites with 16 sites supporting moderate abundance and 11 sites supporting dense abundance, 28% and 19% respectively. Trace abundance was noted at 11 sites (19%) and sparse abundance was noted at 19 sites (33%).

Water depth was measured at each sampling location in Alcyon Lake. The maximum depth observed was 12 feet which occurred in the northern end of the basin. The minimum depth observed was 0.5 feet, this depth was observed in a number of location adjacent to the shoreline. The average depth of the basin, based on the data collected from all 87 sampling locations, was 4.79 feet.

The Appendix of this report contains a chart showing percent abundance as well as separate maps of each species distribution and abundance. These maps are suitable to design as aquatic macrophyte control program if desired.

The dominant submersed aquatic macrophyte observed during the 2014 survey was coontail (*Ceratophyllum demersum*). Coontail was noted at 79 sites or 91% of sites surveyed. Nuisance level abundance was observed at 37% of the sites where the plant was present; 12 sites (15%) supported moderate abundance while 17 sites (22%) supported dense abundance. The heaviest densities were observed close to the launch area and north to the dam. Though a few sites supported moderate density in the southern portion of the basin, no sites supported

dense coontail in that area of the basin. Although coontail is a native plant species it can grow to nuisance levels, impeding recreational activities within a basin such as fishing and boating.

Hydrilla (*Hydrilla verticillata*) was the second most common species observed at Alcyon Lake. Hydrilla occurred at 72 sites (83%) throughout the lake basin. This invasive species was noted at nuisance density at 26 of the sites surveyed; 17 sites (24%) supported moderate abundance and 9 sites (13%) supported dense abundance. Of the remaining 46 sites where hydrilla was observed, 31 sites (43%) supported trace density and 15 sites (21%) supported sparse density. This aggressive, invasive species outcompetes many desirable native plants and often forms dense mats creating a monoculture with little or no value to the other lake biota (Fig 1). The moderate and dense abundance areas were concentrated in the southern half of the basin with large patches in the small cove just south of the launch and again along the eastern shoreline south of the cove. However, it should be noted that at least trace abundance was noted through most parts the basin.

Figure 1: Alcyon Lake 2014 Macrophyte Survey - Dense Hydrilla at the Lake Surface

Hydrilla is a recent invader to New Jersey and New York, and its occurrence is increasing in the Northeast. Hydrilla was first observed at Alcyon Lake in 2012 by Allied Biological during a visual plant survey on numerous NJ lakes. In 2012, hydrilla only occurred at Alcyon Lake near the boat launce in an area perhaps 0.5 acres in size. In two years, it has spread throughout much of the basin. Hydrilla is extremely invasive, and produces an overwintering tuber that can persist in the sediment for several years and remain visable. Allied Biological recommends aggressive herbicide use to target hydrilla in 2015. It should be noted that hydrilla can be easily confused with a native waterweed (*Elodea canadensis*). All samples of hydrilla were examined in the field and confirmed as hydrilla via serrated edges and leaf whorls (Fig 2). No tubers were found.

Figure 2: Hydrilla - Serrated edges and leaf whorls.

The next most abundant species was the desirable native, northern naiad (*Najas gracillima*). Northern naiad was observed at 40 sites (46%) throughout the basin but was more concentrated in shallow shoreline areas, and around the launch. The majority of sites

contained trace (48%) or sparse (40%) abundance with only five sites supporting heavy abundance, 3 (8%) medium and 2 (5%) dense. Northern naiad is a desirable, native plant species which supplies food for waterfowl and habitat for fish.

Benthic filamentous algae (BFA) was observed at 32 sites (37%) during the survey. Six sites supported nuisance level growth, 7 (22%) were observed with moderate abundance and 1 site (3%) was observed with dense abundance. Sparse abundance was noted at the majority of sites, 16 sites (50%), most located adjacent to the shoreline. Eight sites (25%) supported trace abundance. Benthic filamentous algae was most often observed mixed with submersed vegetation.

Water-thread pondweed (*Potamogeton diversifolius*), another desirable native, was noted at 30 sites (34%) with most sites, 24 out of 30 (80%) supporting only trace or sparse abundance; 20 sites (67%) supported trace abundance and 4 sites (13%) supported sparse abundance. Moderate abundance was observed at 2 sites (7%) and dense abundance was noted at 4 sites (13%). The water-thread pondweed was most noted in the northern portion of the lake. The area that contained the heavier densities was in the central portion of the northern half of the basin.

Six sites (7%) contained trace amounts of common water starwort (*Callitriche* sp.). Three sites in the cove just south of the launch and the other three sites at the southern end of the basin. Three sites (3%) supported leafy pondweed (*Potamogeton foliosus*), 2 sites with trace abundance and 1 site with sparse abundance.

Spiny hornwort (*Ceratophyllum demersum*) and common bladderwort (*Utricularia vulgaris*) were each observed at one site. Spiny hornwort was collected at sparse density adjacent to the dam while common bladderwort was noted at the eastern side of the basin at the north end. There is some question regarding the identification of spiny hornwort since the sample did not have any seeds or flowers. These are both desirable native species which help the overall ecology of the lake and support native biota.

Common bur-reed (*Sparganium eurycarpum*), is an emergent reed found along the shoreline at Alcyon Lake, at the southern end of the basin. It was observed at one site, at trace density (Fig 3).

Figure 3: Alcyon Lake - Common Bur-reed

The floating macrophytes at Alcyon Lake were dominated by floating filamentous algae (FFA). FFA was observed at 54 sites in the basin or 62% of the sites surveyed. Twenty-six sites (48%) contained nuisance level density, with 17 sties (31%) supporting moderate abundance and 9 sites (17%) supporting dense abundance. The FFA was concentrated along the shoreline

throughout the basin with the heaviest density centering on the eastern side of the basin mixed with surface level vegetation.

Common watermeal (*Wolffia columbiana*) and small duckweed (*Lemna minor*) are both free floating plants that depend on vegetative matter to gather on the surface of a lake basin. The common watermeal was observed at 44 sites (51%) and was seen mostly in conjunction with surface level submersed macrophytes and FFA. Trace abundance was observed at 27 sites (61%) and sparse abundance was noted at 13 sites (30%), while moderate abundance was supported at 4 sites (9%). Small duckweed was observed at 43 sites (49%) whit 25 sites (58%) supporting trace abundance, 17 sites (40%) supporting sparse abundance and 1 site (2%) supporting moderate abundance. No dense abundance was observed of either macrophyte.

Spatterdock is the final floating macrophyte observed at Alcyon Lake. This native lily was observed at 8 sites (9%) within the basin, 6 sites supported trace density and 2 sites supported sparse density. No nuisance level areas were noted during the survey.

In 2012, the invasive submersed plant, parrot feather (*Myriophyllum aquaticum*) was found along the east shore of Alcyon Lake opposite the launch. In 2012, the single observed plant was hand pulled by Allied Biological biologists, and since it was not observed in 2014, appears to have been eradicated.

Three wetland terrestrial species were noted along the shoreline that should be mentioned; American frogbit (*Limnobium spongia*)(Fig 4), water pennywort (*Hydrocotyle spp.*)(Fig 5), and creeping water primrose (*Ludwigia peploides*)(Fig 6). Creeping water primrose is non-native while the others are native to the area. All three can be aggressive growers and quickly form large areas of dense growth along shoreline areas. The American frogbit was noted on either side of the boat launch area in two small patches. The water pennywort was scattered along the shoreline near the dam and scattered in smaller patches along both the eastern and western shorelines. Creeping water primrose was only noted at the north-east end of the basin adjacent to the dam in one small patch. These plants should be monitored moving forward and management strategies should be considered if they increase in density.

Figure 4: Alcyon Lake - American Frogbit

Figure 5: Alcyon Lake - Water Pennywort

Figure 6: Alcyon Lake - Creeping Water Primrose

Recommendations

In 2014, the Alcyon Lake aquatic macrophyte survey was performed to assess the macrophyte population abundance and distribution, and determine the best management practices moving forward. The two dominant macrophytes in the basin are the native coontail and the invasive hydrilla. The primary focus of the 2015 management plan should be control of the hydrilla population in the basin. Allied Biological would recommend the application of the herbicide Sonar (Fluridone) in granular form, which is more effective in higher flow environments. Sonar is a systemic herbicide which helps with extended control of nuisance invasive plants by working in the root system of the target species. The granular form allows for an extended release for longer contact time with target species. Recommended application schedule would include an initial application in June with a follow up application in July if necessary. A second application in October may be needed to gain suitable seasonal control of the hydrilla. With a reduction of the density in the hydrilla population it is hoped that the native aquatic macrophytes already present in the basin will be able to expand. Native vegetation provides a greater range of benefits to the local biota including fish and water fowl.

Since hydrilla produces tubers (unaffected by herbicide), several consecutive years of Sonar applications are likely needed of this site to exhaust the tuber population in the sediment bank. We would expect repeating the Sonar treatments in 2016. In late 2016, Allied Biological recommends a repeat of the aquatic macrophyte survey, plus tuber monitoring, to determine the need for additional control methods in 2017 and beyond.

We would like to take this time to thank the Pitman Environmental Commission for the opportunity to assist in the management program at Alcyon Lake. We look forward to working with you again in the 2015 season. Please feel free to contact our office with any questions you may have.

Appendix

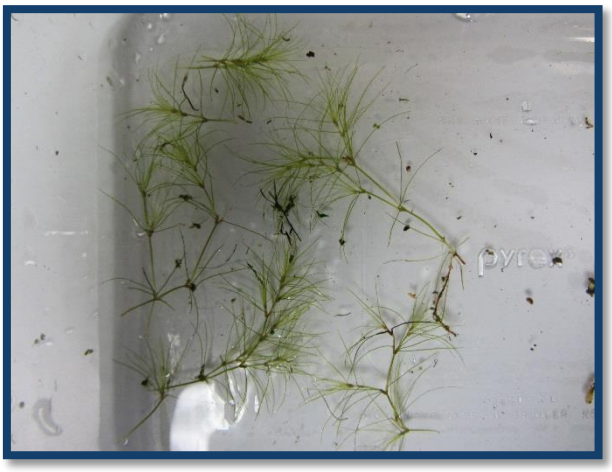
Aquatic Macrophyte Index

The following aquatic macrophytes were observed at Alcyon Lake on August 28th. The respective macrophyte percent abundance and data are summarized in Table 1 in the Appendix. The distribution of all the aquatic macrophytes is summarized in Table 2. Below is a short description and picture of each macrophyte observed. When possible, the pictures of macrophytes represent the actual plants located in Alcyon Lake, either taken in the field, or from samples returned to Allied Biological's laboratory. Al other photos are from the archives at Allied Biological.

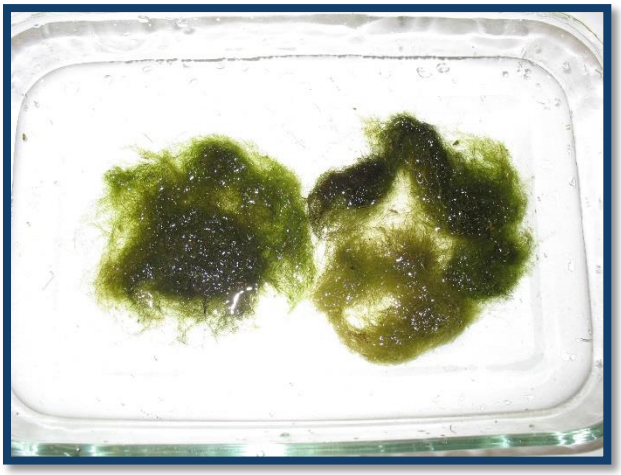
Coontail (*Ceratophyllum demersum*. Common Names: coontail, hornwort. **Native.**): Coontail has long trailing stems that lack true roots, although it can become loosely anchored to sediment by modified leaves. The leaves are stiff, and arranged in whorls of 5-12 at each node. Each leaf is forked once 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.

Hydrilla (*Hydrilla verticillata*) Common Name: Hydrilla, waterweed. **Exotic, Invasive.**): Hydrilla is native to parts of Asia, and was introduced to the Northeast region in the mid-1900's. Hydrilla is the perfect weedy species, able to outcompete desirable native species due to an array of adaptations. These include growing in a variety of substrates, moving or still waters, tolerating up to 10 ppt salinity, and adept at low-light growth. It is typically rooted in the substrate, but can persist in

drifting mats. Although similar to common waterweed, hydrilla has strongly serrated leaves (visible with the naked eye), and has barbs on the underside of the midrib. The leaves are typically arranged in whorls of 4 to 8, but lower parts of the plant can be in whorls of three, or even opposite in arrangement. Hydrilla readily reproduces via stem fragmentation, and produces turions and hardy tubers to overwinter. Two distinct forms occur in the Northeast: monoecious (generally found in the north) and dioecious (generally more robust and found in southern climes.



Northern Naiad (*Najas gracillima*: Common Name: Northern Naiad. **Native.**): Northern naiad has fine branched that can reach lengths of up to one meter. These stems emerge from a delicate rootstalk. The leaves are thread-like with a jagged lobed base, a distinguishing characteristic. The leaves are usually in pairs, but can be bunched at the ends of stems. Growing conditions can affect the overall structure of naiad growth. Reproduction is by seed production and stem fragmentation. Seeds are light brown with 20 to 45 rows of stretched pits. Northern naiad prefers soft-water lakes, and is extremely sensitive to pollution. Like other naiads, northern naiad is an important food source for waterfowl, as the seeds, stems and leaves are all consumed. The submersed growth is also prime food and shelter for fish.



Benthic 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.

Water-thread pondweed - (*Potamogeton diversifolius*. Common Names: Variable-leaf Pondweed, variable-leaf pondweed, snailseed pondweed. **Native**.): Variable-leaf pondweed have 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.

Water Starwort (*Callitriche heterophylla*. Common Name: Large water starwort. **Native**.): Water starwort is a shallow-rooted submersed plant with a fine stem, usually less than a meter long. Submersed leaves are opposite and ribbon-like, while floating are rounded and crowded at the top, forming a floating rosette at the surface. Different species of water starwort can be discerned by examining the fruiting bodies, produced by mid- to late summer. It is well adapted to cool water temperatures, and often starts growing early in the spring. Water starwort provides suitable food for a variety of waterfowl, and the stem clusters offer shelter and forage opportunities for herbivorous fish.

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.

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.

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

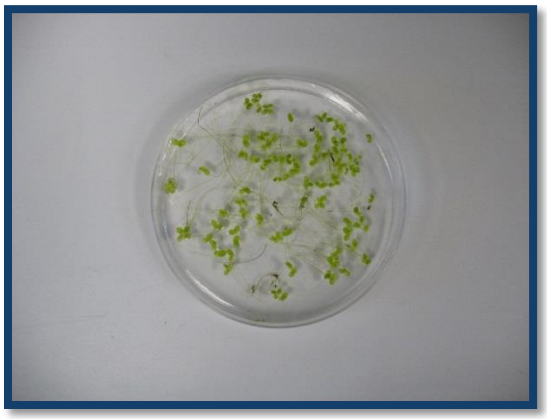
ranging from the size of unicellular protozoans (such as *Euglena*), to mosquito larvae. Prey is slowly digested inside the bladders by enzymes. Common bladderwort produces small yellow flowers that protrude above the water. Stems of common bladderwort provide food and cover for fish.

Bur-reed (*Sparganium* sp. Common Names: floating bur-reed. **Native**): Bur-reed is an aquatic perennial herb that grows from long rhizomes. The stems are usually submerged and can reach lengths up to 2 meters long. The leaves are alternate, limp, unkeeled and ribbon-like, and can reach 1 meter long, often floating on the surface. Leaves often originate from the base or lower portion of the stem. Only the flowering part of the plant pokes above the water. Bur-reeds often inhabit lakes, ponds, or slow moving stream edges.

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.

Common Watermeal (*Wolffia columbiana*. Common Names: common watermeal. **Native**.): Common watermeal appears as pale green globes of vegetative matter without roots, stems or true leaves. It's one of the world's smallest flowering plants, but flowers are rarely found and require magnification to see. Watermeal usually reproduces by budding. Watermeal is typically found on the surface, intermingled with duckweeds. Its drifts with the

water's current or wind, and therefore it grows independent of water depth, clarity or sediment type. In the fall it produces winter buds that sink to the bottom. In the spring, the buds become buoyant and float to the surface. Waterfowl, fish, and muskrats all include watermeal in their diets.



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.

Spatterdock (*Nuphar variegata*. Common Name: yellow lily, yellow pond lily, bullhead pond lily. **Native.**): Spatterdock leaf stalks emerge directly from a submerged fleshy rhizome. The leaf stalk has a winged margin, which is a distinguishing characteristic. Spatterdock has heart-shaped leaves with a prominent notch. Flowers are globular in shape with five to six yellow sepals. 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.

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.

Submersed Aquatic Plant Density

Trace

Medium

Sparse

Dense

Allied Biological

Floating Aquatic Plant Density

Trace

Medium

Sparse

Dense

Allied Biological

Sample Point Location

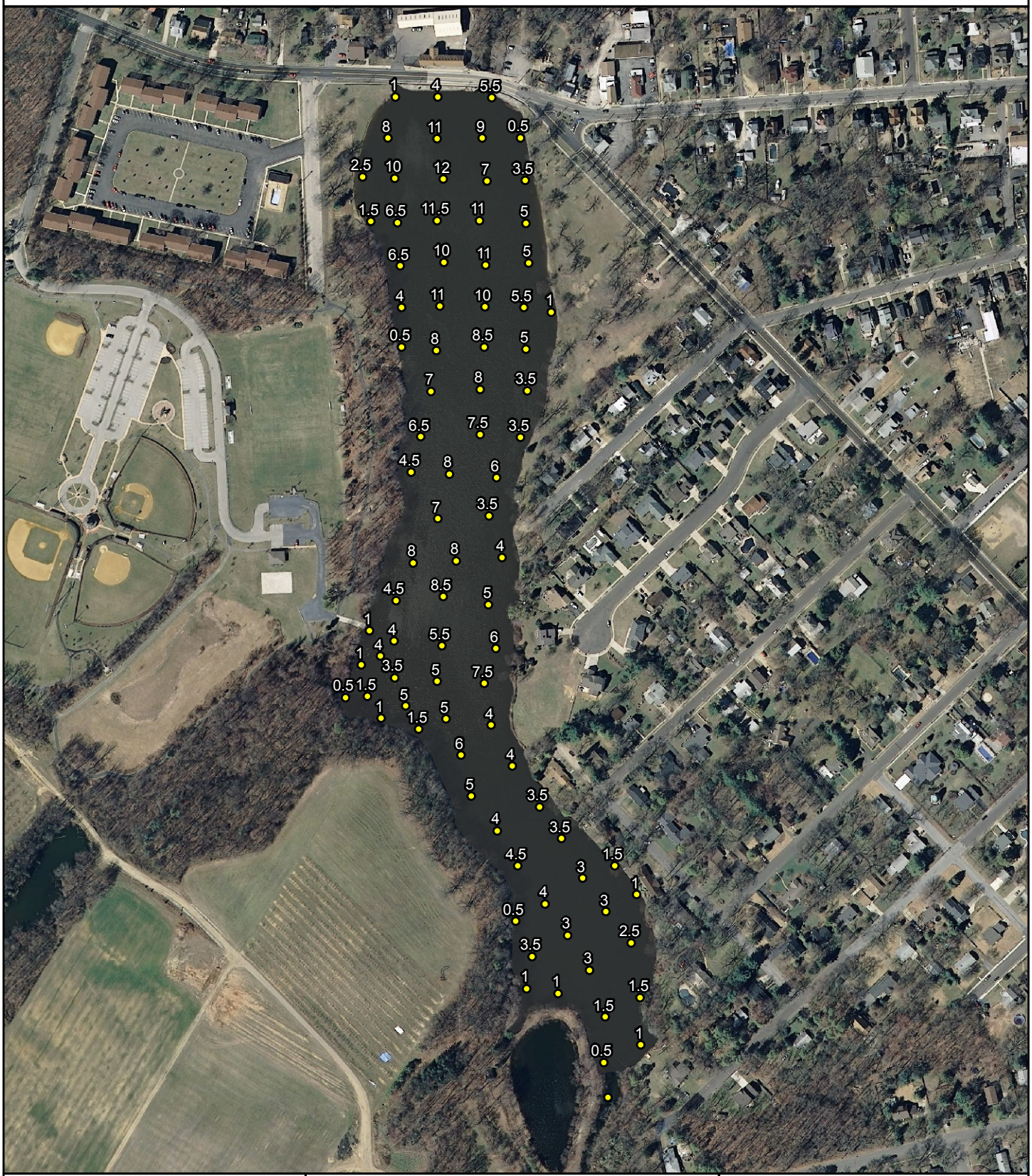
ALCYON LAKE
Aquatic Vegetation Survey
August 28, 2014

87 sampling points

Sample Point

0 205 410 Feet

Water Depth



ALCYON LAKE
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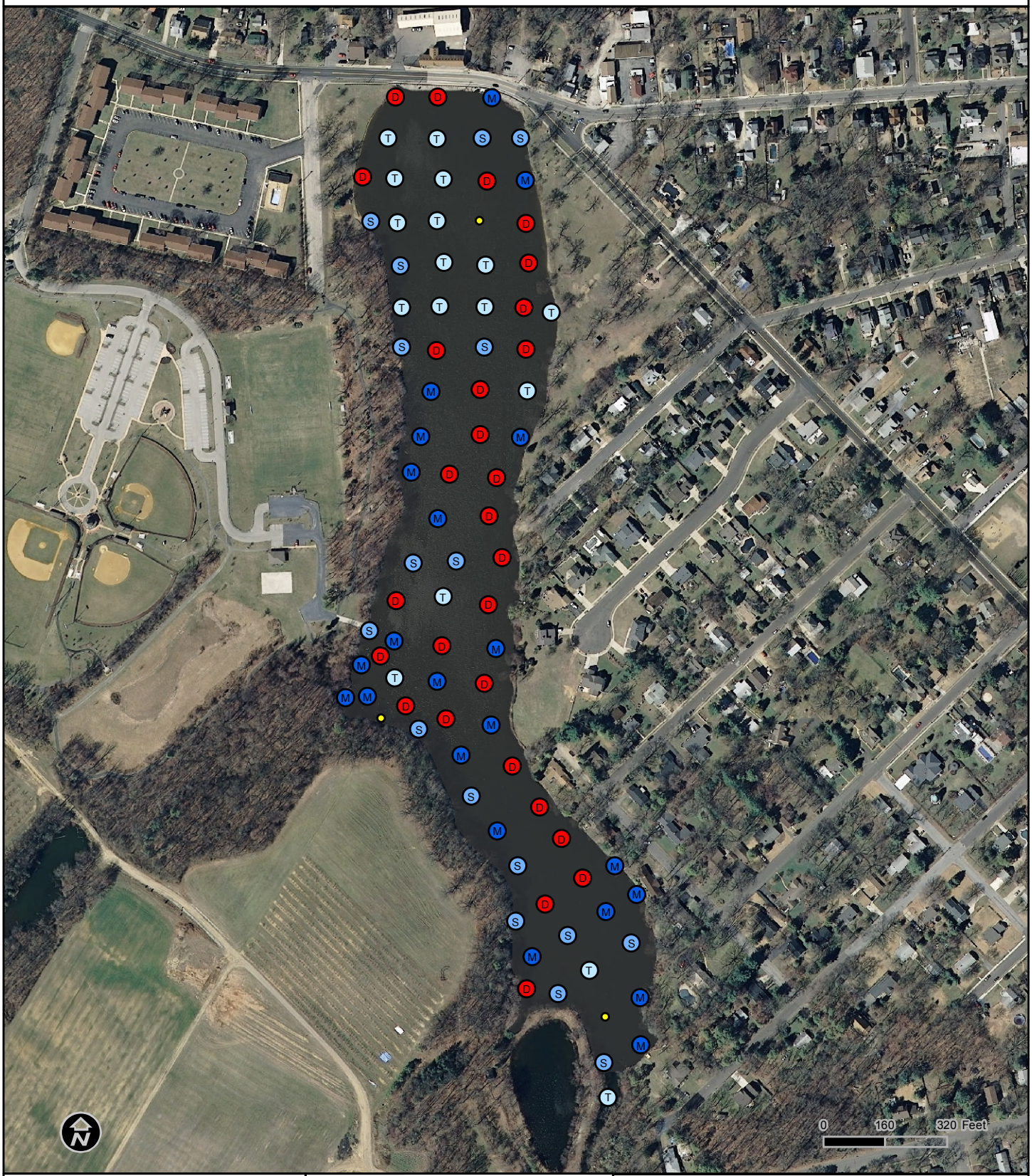
August 28, 2014

87 sampling points

Water Depth in Feet

0 205 410 Feet

Total Submersed Vegetation Distribution



ALCYON LAKE
Aquatic Vegetation Survey
August 28, 2014

87 sampling points

Plant Density

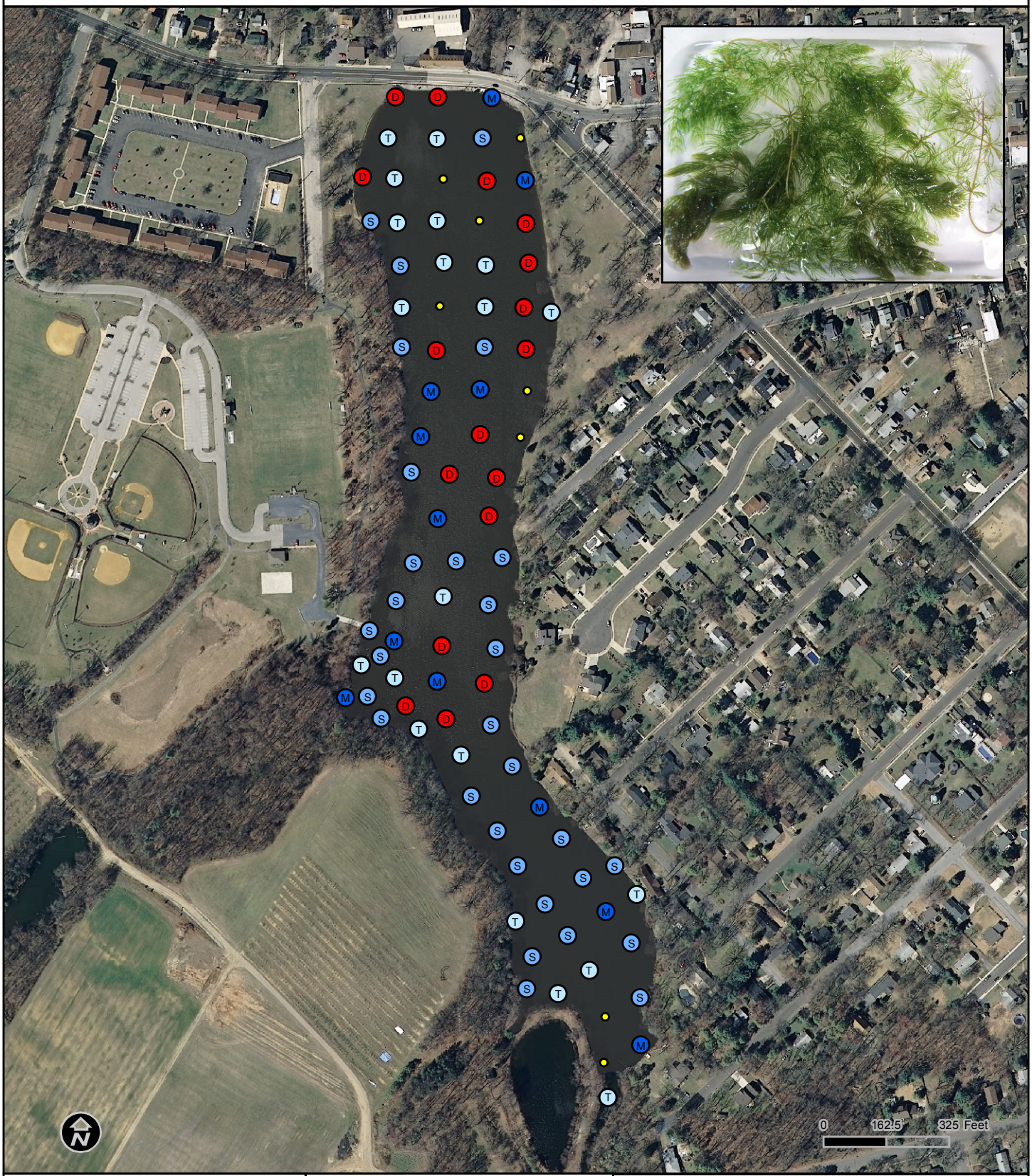
- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	84	97%
Trace	17	20%
Sparse	17	20%
Medium	22	26%
Dense	28	33%

Coontail (*Ceratophyllum demersum*) Distribution

Allied Biological



ALCYON LAKE
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87 sampling points

Plant Density

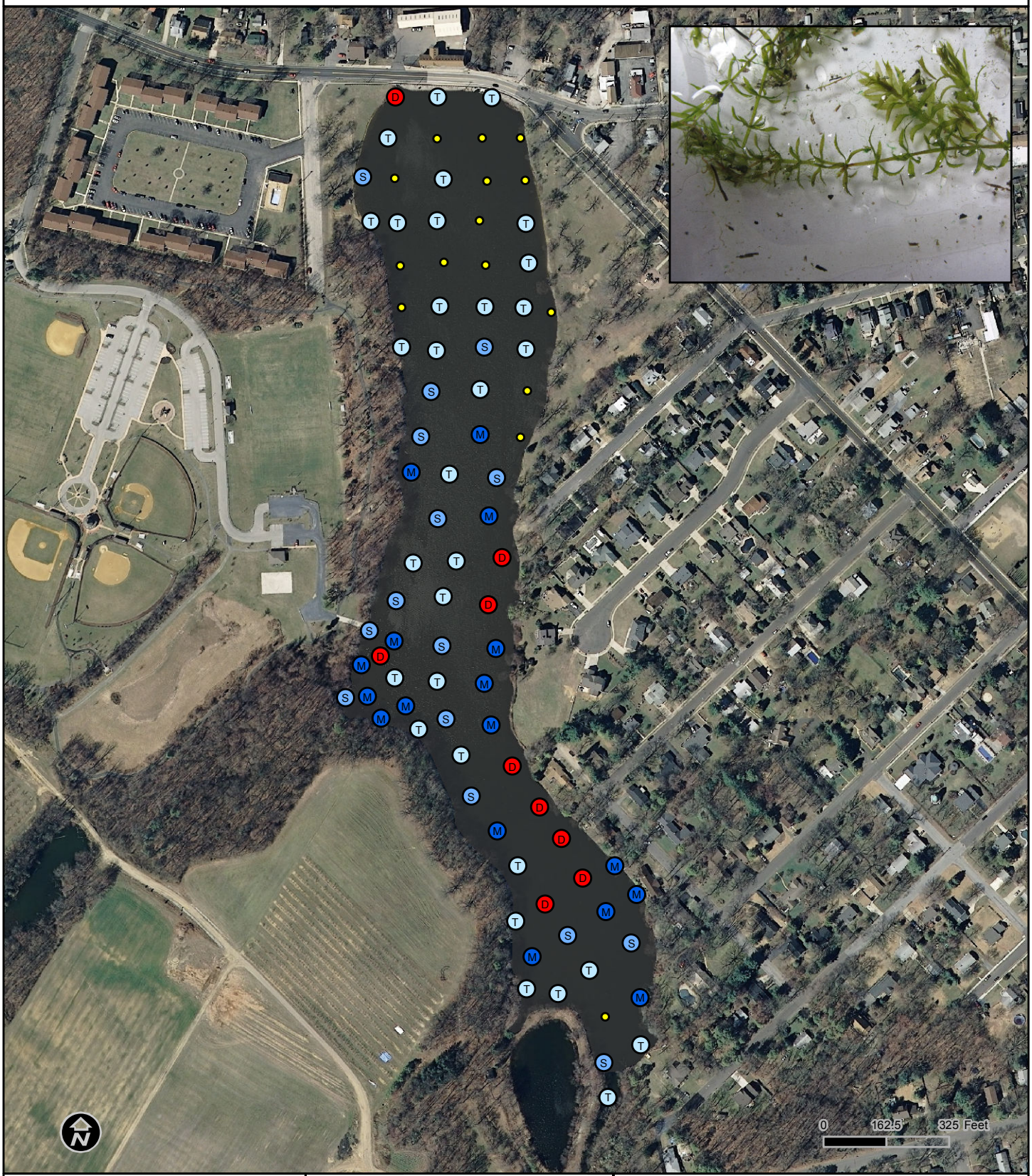
- = No Plants
- = Trace Plants
- = Sparse Plants
- = Medium Plants
- = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	79	91%
Trace	20	25%
Sparse	30	38%
Medium	12	15%
Dense	17	22%

Hydrilla (*Hydrilla verticillata*) Distribution

Allied Biological



ALCYON LAKE
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87 sampling points

Plant Density

- = No Plants
- = Trace Plants
- = Sparse Plants
- = Medium Plants
- = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	72	83%
Trace	31	43%
Sparse	15	21%
Medium	17	24%
Dense	9	13%

Northern Naiad (*Najas gracillima*) Distribution

Allied Biological

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Aquatic Vegetation Survey
August 28, 2014

87 sampling points

Plant Density

- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	40	46%
Trace	19	48%
Sparse	16	40%
Medium	3	8%
Dense	2	5%

Benthic Filamentous Algae Distribution

Allied Biological

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87 sampling points

Plant Density

- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	32	37%
Trace	8	25%
Sparse	16	50%
Medium	7	22%
Dense	1	3%

Water-thread Pondweed (*Potamogeton diversifolius*) Distribution

Allied Biological

ALCYON LAKE
Aquatic Vegetation Survey
August 28, 2014

87 sampling points

Plant Density

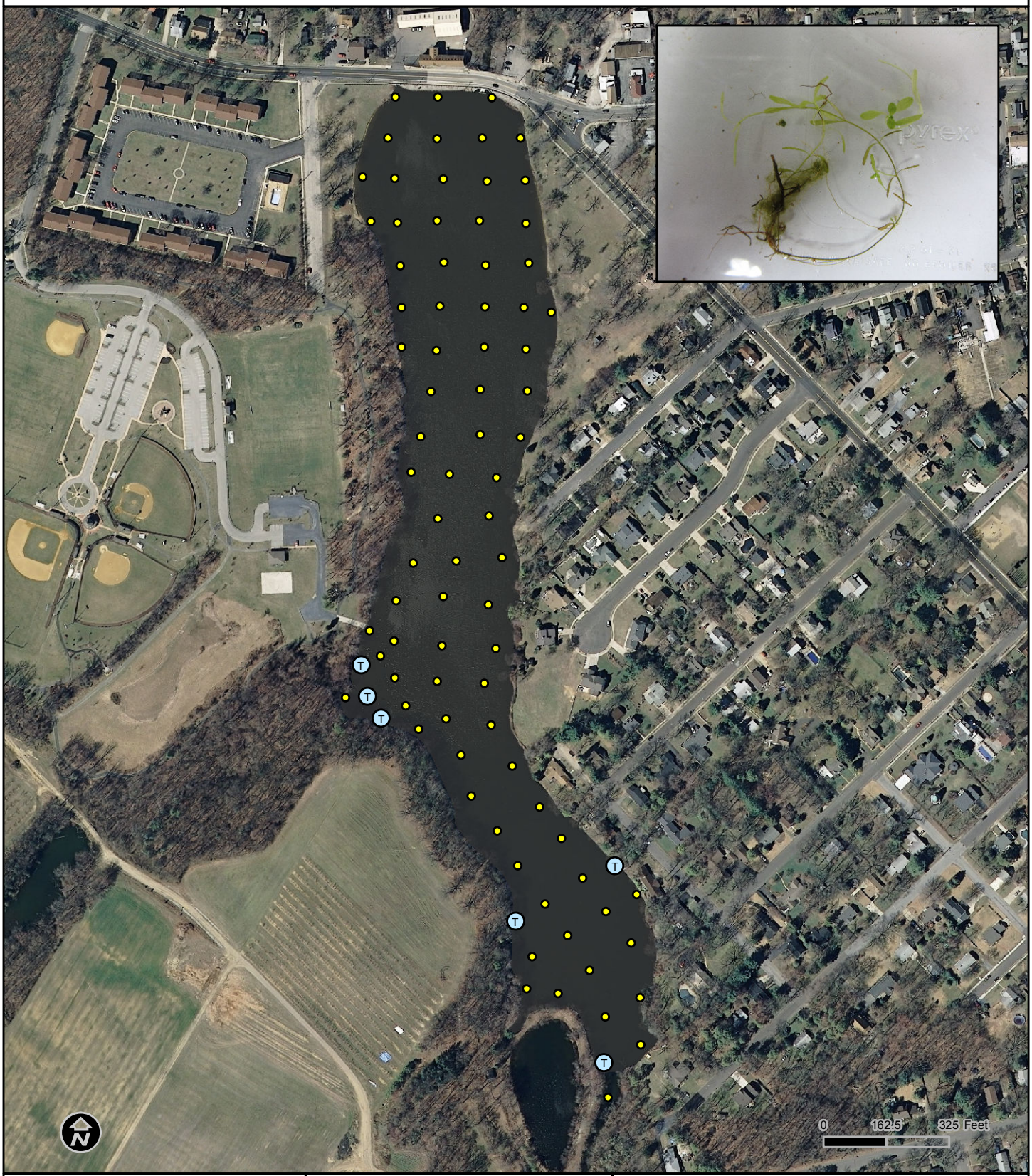
- = No Plants
- = Trace Plants
- = Sparse Plants
- = Medium Plants
- = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	30	34%
Trace	20	67%
Sparse	4	13%
Medium	2	7%
Dense	4	13%

Common Water Starwort (*Callitriche* sp.) Distribution

Allied Biological



ALCYON LAKE
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August 28, 2014

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Plant Density

- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	6	7%
Trace	6	100%
Sparse	0	0%
Medium	0	0%
Dense	0	0%

Leafy Pondweed (*Potamogeton foliosus*) Distribution

Allied Biological

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Plant Density

- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	3	3%
Trace	2	67%
Sparse	1	33%
Medium	0	0%
Dense	0	0%

Spiny Hornwort (*Ceratophyllum echinatum*) Distribution

Allied Biological

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August 28, 2014

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Plant Density

- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	1	1%
Trace	0	0%
Sparse	1	100%
Medium	0	0%
Dense	0	0%

Common Bladderwort (*Utricularia vulgaris*) Distribution

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Plant Density

- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	1	1%
Trace	1	100%
Sparse	0	0%
Medium	0	0%
Dense	0	0%

Common Bur-reed (*Sparganium eurycarpum*) Distribution

Allied Biological

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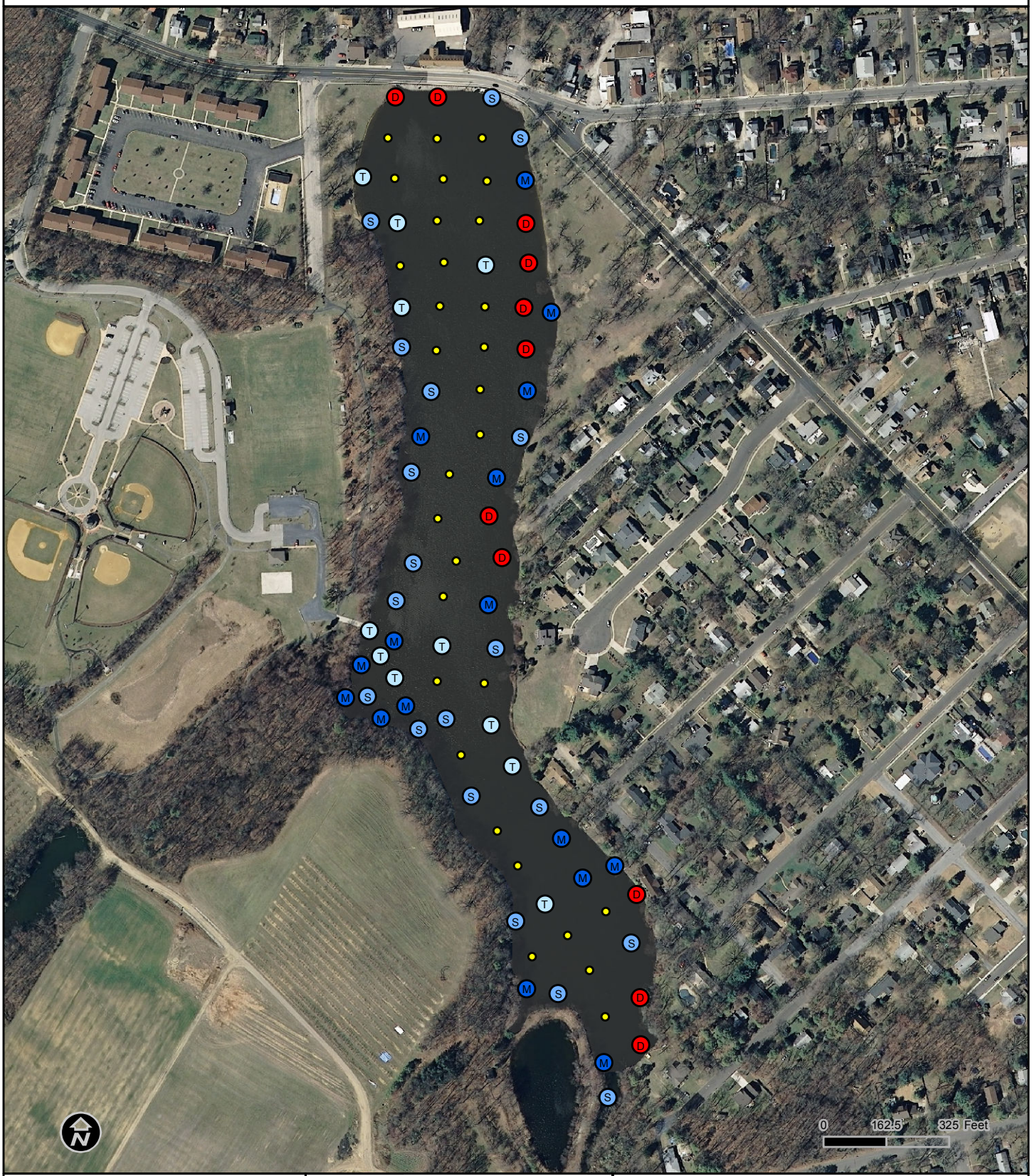
Plant Density

- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	1	1%
Trace	1	100%
Sparse	0	0%
Medium	0	0%
Dense	0	0%

Total Floating Vegetation Distribution



ALCYON LAKE
Aquatic Vegetation Survey
August 28, 2014

87 sampling points

Plant Density

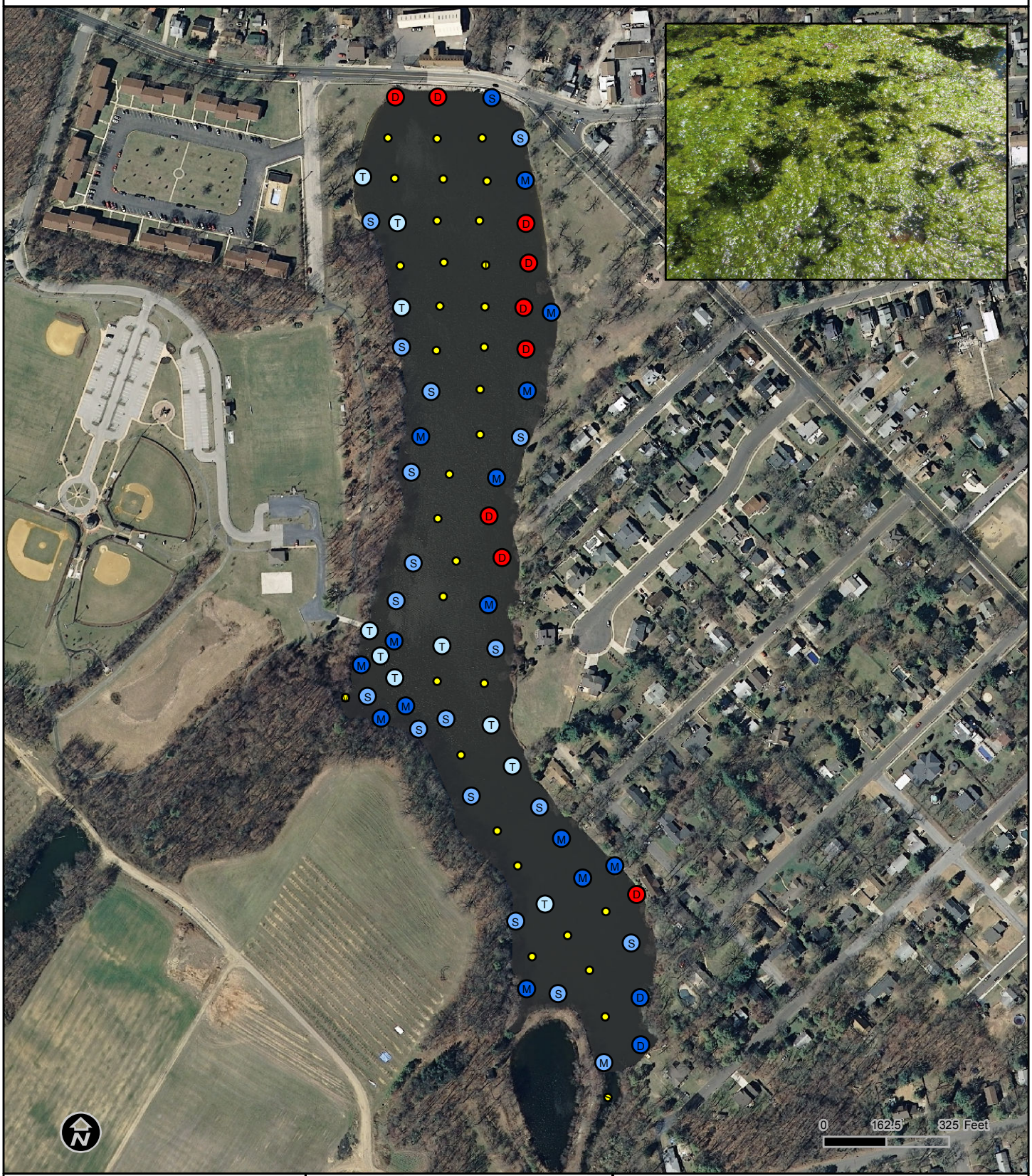
- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	57	66%
Trace	11	19%
Sparse	19	33%
Medium	16	28%
Dense	11	19%

Floating Filamentous Algae Distribution

Allied Biological



ALCYON LAKE
Aquatic Vegetation Survey
August 28, 2014

87 sampling points

Plant Density

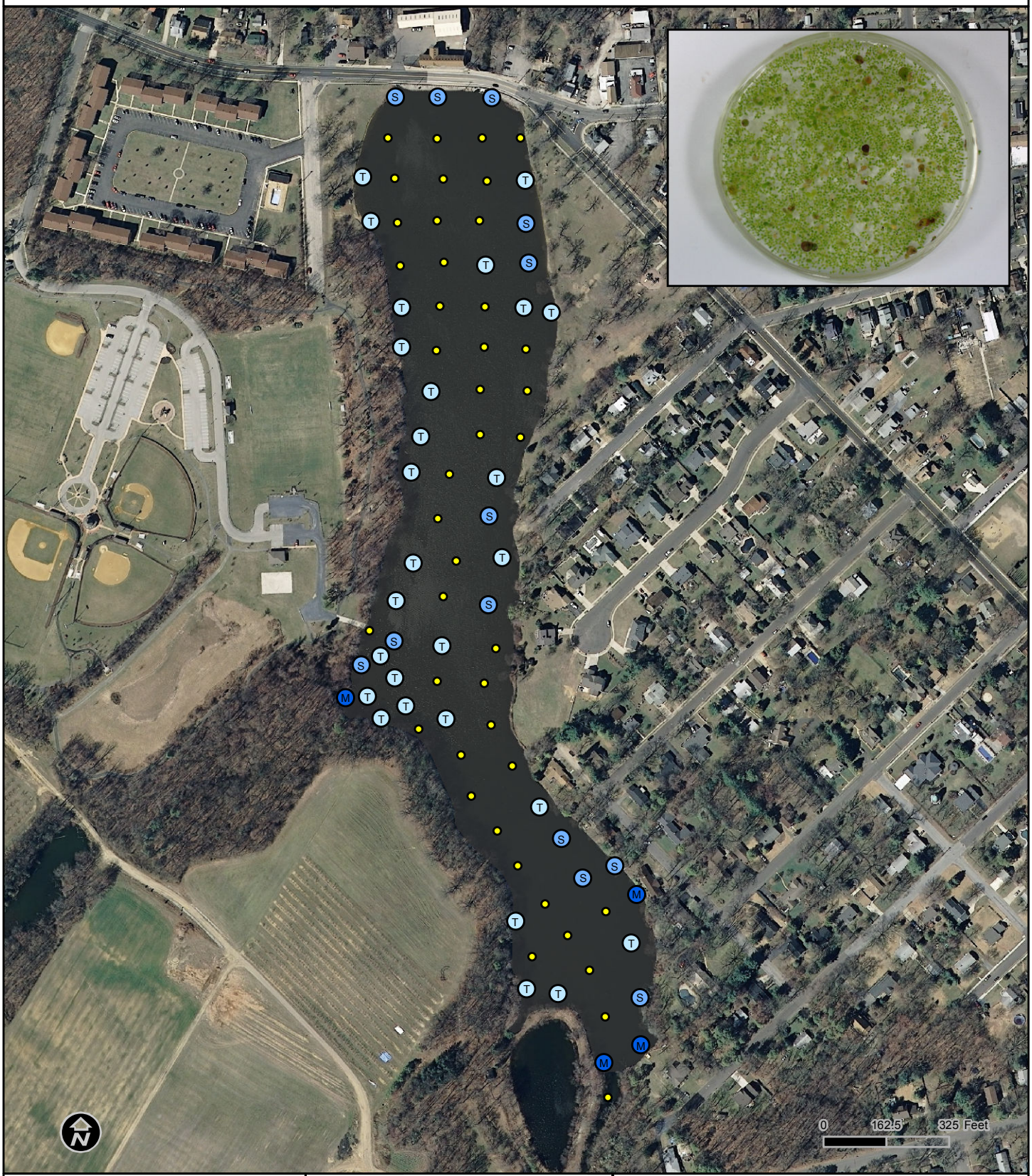
- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	54	62%
Trace	10	19%
Sparse	18	33%
Medium	17	31%
Dense	9	17%

Common Watermeal (*Wolffia columbiana*) Distribution

Allied Biological



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August 28, 2014

87 sampling points

Plant Density

- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	44	51%
Trace	27	61%
Sparse	13	30%
Medium	4	9%
Dense	0	0%

Small Duckweed (*Lemna minor*) Distribution

Allied Biological

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Plant Density

- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	43	49%
Trace	25	58%
Sparse	17	40%
Medium	1	2%
Dense	0	0%

Spatterdock (*Nuphar variegata*) Distribution

Allied Biological

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Plant Density

- = No Plants
- T = Trace Plants
- S = Sparse Plants
- M = Medium Plants
- D = Dense Plants

Percent Distribution

Abundance	Sites	Percent
Total	8	9%
Trace	6	75%
Sparse	2	25%
Medium	0	0%
Dense	0	0%