Manasquan Reservoir

2017 Delineation of Hydrilla and other Submersed Aquatic Vegetation (SAV) in the Manasquan Reservoir

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2017 *Delineation of Hydrilla and other Submersed Aquatic Vegetation (SAV) in the Manasquan Reservoir* Report

Manasquan Reservoir (NJWSA)
Monmouth County, New Jersey

Introduction

Hydrilla (*Hydrilla verticillata*) was confirmed to occur in the Manasquan Reservoir by New Jersey Water Supply (NJWSA) staff. Due to health and safety concerns for the drinking water and ecosystem stability of the Reservoir, NJWSA contracted SŌLitude Lake Management (SŌLitude) to survey the extent of Hydrilla within the Reservoir and the six (6) surrounding wetlands. Hydrilla is a highly invasive submersed aquatic plant that can result in significant negative ecological, recreational and economic impacts. Hydrilla is a recent invader in the Northeast (and in New Jersey), although few confirmed infestations have been confirmed. The first step in developing a Management Action Plan for this infestation is the delineation of hydrilla within the Reservoir, along with the other submersed aquatic vegetation (SAV).

The Reservoir was formed in 1990 by damming Timber Swamp Brook, created primarily for drinking water with the benefit of an enhanced fishery. Standing timber was left along the perimeter of the Reservoir to improve the potential for fishery habitat. According to NJ Department of Fish & Wildlife, stump fields and cabled trees were anchored into the Reservoir to provide further habitat. Five of the six wetlands act as inflow for the Reservoir. However, StreamStats analysis shows a small watershed for the size of the Reservoir – a likely contributor to the historic struggle with blooms of cyanobacteria and other algae.

SŌLitude recommended a multi-faceted approach to hydrilla/SAV mapping. Recreational grade bathymetry and acoustic SAV mapping of the entire littoral zone was completed during Point-intercept mapping in the open basin. Additional Point-intercept mapping of the six wetlands was also conducted. Hydrilla tuber monitoring was conducted to establish baseline tuber densities in the sediment which can be tracked over time to determine the efficacy of future control programs.

Methodology

Point Intercept Submersed Aquatic Plant Mapping

The Point Intercept Method (PIM) of sampling macrophytes is designed to determine the extent of aquatic growth within an area of concern. The total number of sample locations is typically based on the total acreage of the lake, where one sample location per acre is surveyed at a given site. However, the littoral zone is restricted to the shoreline of Manasquan Reservoir due to its expanse (770 acres), average depth, and presumably water clarity. Point-intercept locations within the main reservoir and the surrounding wetlands were predetermined by

NJWSA and supplied to SŌLitude Lake Management. A total of 502 sites were sampled for this facet of the project. Table 1, below is a summary of the main reservoir and the six (6) bordering wetlands.

Table 1: Manasquan Reservoir 2017 Sample Section Summary				
Section	**Description**	**Date**	**# Sites**	**Notes**
Main Reservoir	Main basin of the Reservoir	9/12-14/17 & 9/18/17	342	Shoreline, standing timber. Boat/Wade
Wetland 1	North of Reservoir	9/18/17	15	Contains inlet to main basin. Canoe/Wade
Wetland 2	Northwest of Reservoir	9/12/17	56	Contains inlet to main basin. Canoe/Wade
Wetland 3	West of Reservoir	9/18/17	15	Contains inlet to main basin. Canoe/Wade
Wetland 4	Southwest of Reservoir	9/13/17	51	Contains inlet to main basin. Canoe/Wade
Wetland 5	Southeast of Reservoir	9/18/17	12	Contains inlet to main basin. Wade
Wetland 6	Southeast of Reservoir, south of dam	9/18/17	11	Wetland, no inlet. Wade

During the survey, each predetermined georeferenced point was accessed by boat in a feasible locational order. At each point, the real-time GPS coordinates of the sample location were recorded using a Trimble Geo 7X, a handheld GNSS system.

The Rake Toss Methodology, developed by the US Army Corps of Engineers and modified by Cornell University was used for this survey (Lord and Johnson 2006). However, the referred methodology only requires one rake toss. For this project, **two rake tosses** were executed at each site for enhanced detection of target species and other species occurring infrequently. The tosses were conducted from opposite sides of the boat and were recorded A and B, respectively (Table 2, in the Appendix). The following data was collected for each rake toss: overall abundance of submersed macrophyte growth, relative abundance of each species, and any other pertinent field notes regarding the sample location (such as notes on bottom substrate and nearby emergent aquatic plant growth. The abundance scale defined by this methodology was used to categorize the observed macrophyte growth for each rake toss:

- Z Zero: no plants on rake
- T Trace: Fingerful on rake
- S Sparse: Handful on rake
- M Medium: Rakeful of plants
- D Dense: Difficult to bring into boat

Whenever possible, water depth was recorded at each sample location as appropriate to the conditions. A boat-mounted Lowrance HDS5 was used in the Main Basin of the Reservoir; however, due to extensive SAV growth at or just below the surface, accurate water depth measurements could not consistently be recorded. A calibrated pole was used to measure the approximate depths within the Wetland sections, where appropriate.

The overall and relative abundance values from the two rake tosses were translated into a numeric value before further data analysis: 0 for no plants, 1 for trace, 2 for sparse, 3 for medium, and 4 for dense plants. For example, if toss A was Dense (4), and toss B was Sparse (2) for the same macrophyte, the mean abundance would be Medium (4+2=6/2=3). Raw abundance data with mean calculations can be found in Appendix A.

Any macrophyte specimen requiring further identification was collected and placed in a Ziploc-type bag with a reference to the documented data for the site. No species required further identification.

Acoustic Bathymetry & Submersed Aquatic Plant Mapping

Using a Lowrance™ HDS5 unit, the areas of the Reservoir marked for point-intercept sampling were mapped. The unit has a 200 KHz echosounder frequency, and a ping rate of 20 pulses (dynamic and optimized to water depth) per second. The boat was piloted at 5 mph (or less), and data collection was conducted in hour-interval mapping runs, to keep the data file size manageable during the upload process.

Following field collection, the data was uploaded to CI Biobase and processed to display aquatic plant percent bio-volume and bathymetry. The collected data was uploaded to CI Biobase quality control verification and interpolation. The processed data was then downloaded and reprocessed using Spatial Analyst in ArcMap 10.2. The methodology was performed according to the CI Biobase User reference guide (Contour Innovations LLC, 2012).

Aquatic plant percent bio-volume is the percentage of the water column inhabited by aquatic plants. For example, aquatic plants at the surface would have a bio-volume of 100%, while 5-foot tall plants in 10 feet of water would have a bio-volume of 50%. Bio-volume data can be displayed on interactive maps or PDF maps of select areas of the reservoir.

Hydrilla Tuber Monitoring

Methods established by Johnson (2013) were employed for tuber sampling at Manasquan Reservoir. A post hole digger ('corer') modified with longer handles was used to obtain all sediment core samples. The corer removes a consistent plug of sediment with a surface area of 187 cm^2 to a depth of 20 cm. The core size is slightly larger than that utilized by Johnson (173 cm^2), and can be compensated for in calculation of the final tuber density, expressed in tubers/m^2.

Five sampling sites were selected based off of the Hydrilla abundance documented during the macrophyte survey. Three to five cores were intended per site and combined as a composite into a site-specific 5.0-gallon HDPE bucket for transport and processing.

Processing of the site composites is accomplished through the use of a custom-designed sieve with a 0.16-inch (0.4 cm) metal mesh. One composite is processed at a time, where all or some of the composite is deposited within the sieve which is then placed in the water and gently shaken to remove sediment particles. The remaining sediment and plant material within the sieve is examined for hydrilla tubers and turions. Any hydrilla tubers or turions observed are collected and placed in a Ziploc-type bag, labeled with the sample location, site number, number of cores per composite and date. Remaining organic and inorganic material is discarded, and the rest of the composite (if any) is identically processed.

The tubers and turions are transported to the laboratory and counted and photographed for each site. Tuber density per m^2 is calculated from the number of cores and the surface area per core.

Results & Analysis

Survey Area Summary

In general, macrophyte growth was found throughout the surrounding wetlands and littoral zone of the reservoir. A total of 38 aquatic macrophytes (including filamentous algae, macro-algae, and floating-leaf species) were identified throughout the entire 2017 survey area (Table 2). The overall frequency for each documented species are located below in Table 2 in order of frequency within the survey area. Macrophyte descriptions and distribution maps are located in Appendices B and C, respectively, organized alphabetically. The distribution maps were not broken out by section (individual Reservoir and Wetlands) due to the diverse distribution of multiple species. However, the macrophyte percent abundance data for each section are organized in individual tables located in Appendix D.

Due to the habitat within the Wetland sections, emergent aquatic and wetland species were also noted during the survey.

Table 2: Species Present During Manasquan Reservoir 2017 Survey

Common Name	Scientific Name	# Frequency	% Frequency
Overall SAV		**436**	**87%**
Hydrilla	*Hydrilla verticillata*	228	45%
Benthic Filamentous Algae		220	44%
Common Bladderwort	*Utricularia vulgaris*	107	21%
Fanwort	*Cabomba caroliniana*	106	21%
Eurasian Watermilfoil	*Myriophyllum spicatum*	94	19%
Coontail	*Ceratophyllum demersum*	91	18%
Spikerush	*Eleocharis sp.*	86	17%
Small Pondweed	*Potamogeton pusillus*	77	15%
Mudmat	*Glossostigma cleistanthum*	70	14%
Creeping Bladderwort	*Utricularia gibba*	62	12%
White Waterlily	*Nymphaea odorata*	59	12%
Common Waterweed	*Elodea canadensis*	49	10%
Low-water Milfoil	*Myriophyllum humile*	47	9%
Water Primrose	*Ludwigia palustris*	39	8%
Waterthread	*Potamogeton diversifolius*	37	7%
Muskgrass	*Chara sp.*	36	7%
Water-Bulrush	*Schoenoplectus subterminalis*	34	7%

Slender Naiad	*Najas flexilis*	33	7%
Thin-leaf Pondweed	*Potamogeton sp.* likely *P. foliosus* or *P. pusillus*	29	6%
Stonewort	*Nitella sp.*	27	5%
Snailseed Pondweed	*Potamogeton bicupulatus*	20	4%
Small Duckweed	*Lemna minor*	19	4%
Spiny Hornwort	*Ceratophyllum echinatum*	19	4%
Waterwort	*Elatine minima*	18	3%
Leafy Pondweed	*Potamogeton foliosus*	16	3%
Water Moss	*Fontinalis sp.*	12	2%
Golden Hedge-Hyssop	*Gratiola aurea*	9	2%
Flatleaf Bladderwort	*Utricularia intermedia*	8	1%
Spatterdock	*Nuphar variegata*	6	1%
Watershield	*Brasenia schreberi*	6	1%
Greater Duckweed	*Spirodela polyrhiza*	4	1%
Northern Naiad	*Najas gracillima*	4	1%
Arrowhead	*Sagittaria sp.*	2	1%
Curly-leaf Pondweed	*Potamogeton crispus*	2	1%
Naiad Sp.	*Najas sp.*	2	1%
Southern Naiad	*Najas guadalupensis*	2	1%
Watermeal	*Wolffia sp.*	1	1%
Wild Celery	*Vallisneria americana*	1	1%

Red entries indicate invasive species

Hydrilla Tuber Sampling Summary

Hydrilla tuber monitoring at Manasquan Reservoir was conducted on October 25, 2017 by two SŌLitude field teams. A map of the 2017 tuber sampling locations and pictures of the tubers and turions collected at each site are included in Appendix E. The table below displays a summary of the five sampling stations (Table 3).

Table 3: Manasquan Reservoir Tuber & Turion Summary						
Site	**Description**	**# Cores**	**# Tubers**	**Tubers (m^2)**	**# Turions**	**Turions (m^2)**
MR-1	Main Basin, 3ft deep, Moderate hydrilla	5	9	96.5	1	10.7
MR-2	Wetland 2, 0.5ft deep, Trace-Sparse hydrilla	3	35	623.0	13	231.4
MR-3	Main basin, 3.5ft deep, large rocks, Dense hydrilla	3	19	338.2	0	0
MR-4	Main basin, Dense hydrilla cove, 3.5ft deep	3	66	1,174.8	2	35.6
MR-5	Main Basin, East Launch, 5.0ft deep, Dense Hydrilla	2	83	2,216.1	48	1,281.6

The tuber sites were determined from the results of the aquatic vegetation survey: MR-1 in the northeast corner of the Reservoir, MR-2 in the Wetland 2 hydrilla location, MR-3 at the Northwest shoreline of the Reservoir, MR-4 at a southwestern shoreline cove of the Reservoir, and MR-5 at the East Launch marina. Most sites had a mix of sand and clay substrate, with few sites noted as rocky. Two to five cores were sampled per site, rather than the intended core-minimum of three. However, only two cores were collected at site MR-5 due to the volume of tubers and turions within the sample.

Tuber density ranged from 95.5 to 2,216.1 tubers/m^2 and turion density ranged from 0.0-1281.6 turions/m^2. Both the highest tuber and turion densities occurred at site MR-5, near the launch. The lowest tuber density was located station MR-1, which also had the second lowest turion density. No turions were found at MR-3, however the site contained a relatively high count of tubers.

Discussion

Acoustic Mapping

The areas of the Reservoir marked for Point-intercept sampling were acoustically mapped simultaneous of the SAV mapping by SŌLitude. Acoustic mapping was not conducted for the Wetland sections since most sample locations were shallow and accessed by waders. Appendix F contains a map displaying the aquatic plant biovolume data. Limitations are present within the data for biovolume due to shallow depth, density of standing timber, and extent of high biovolume. For this reason, bathymetry through acoustic mapping is not included in this report. The artifacts present within the depth data were too severe to accurately analyze. However, depth data was manually recorded when possible during the point-intercept survey – a depth map is also included in Appendix F. Point locations without a depth indicate no depth data was acquired.

Aquatic plant biovolume is depicted in color contours, using 10% intervals. As displayed on the map, biovolume ranges from red to green on the color spectrum: red displaying the highest biovolume and green displaying little to no biovolume. For example, a measurement of 100% represents aquatic plants reaching the water’s surface. Some artifacts may be present within the data and therefore displayed within the map, especially when considering the depths were too inaccurate to display. Areas of high biovolume overwhelm the sonar device with data, which then stops reading.

The shorelines of the Reservoir appear to support the highest volume of macrophyte growth. Based off of the percent abundance table for the Reservoir (Appendix D), Hydrilla is the likely culprit, especially when considering the hydrilla distribution map for the Reservoir (Appendix C). However, a high biovolume does not necessarily indicate Dense readings from the Point-intercept survey. For example, a plant could be pulled up as Dense on the rake, but be matted across the bottom and therefore have a low biovolume.

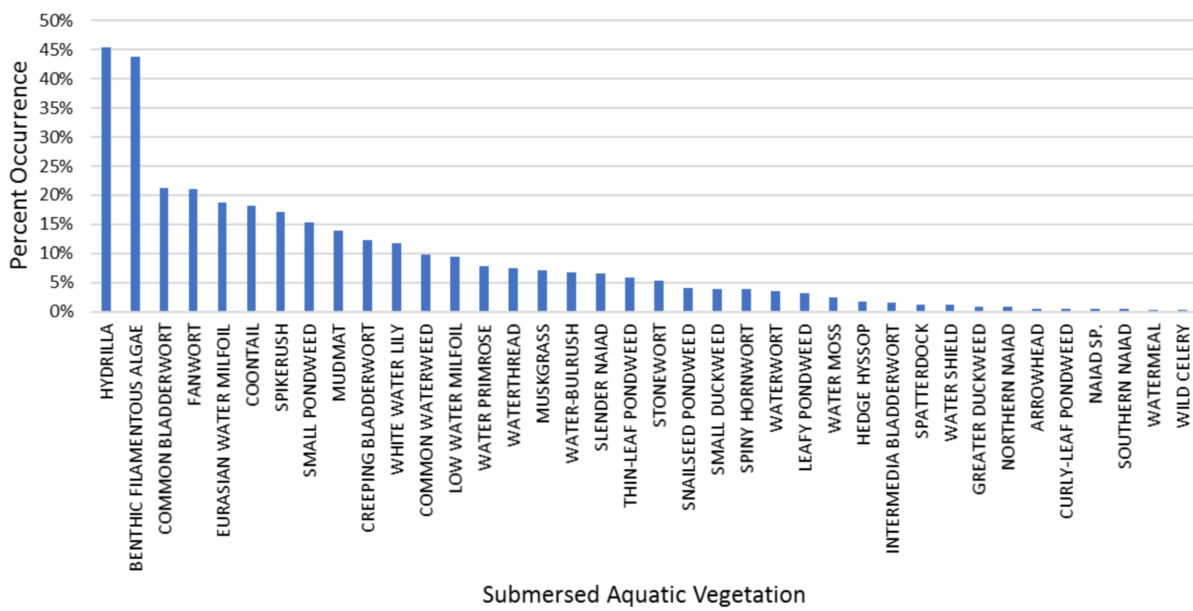
The Reservoir was approximately three feet into drawdown, decreasing the overall depth and creating large, shallow expanses. Due to the lowered volume, the biovolume may appear higher than if the acoustic mapping were completed during bankfull. While the depth data can be altered to accommodate the difference in depth, adjusting the data for the loss of three feet would attenuate any real effect the lower water depth actually had on the plant growth. Furthermore, completing this type of manipulation would result in no areas with 100% biovolume within the Reservoir. As the growth had reached the surface with the lower water levels, its certainly likely that much of the growth would have continued growing if the water was deeper, and still reached 100% biovolume. Biovolume data collection in subsequent years would need to be noted with depth changes for adequate comparison.

Macrophyte Abundance and Distribution

Manasquan Reservoir and the surrounding Wetlands were surveyed in mid-September for the presence of submersed aquatic vegetation (SAV) and specifically for the delineation of hydrilla.

Overall, submersed aquatic vegetation was documented at 436 of the 502 sites, representing 87% of the sample area, with the majority of Z sites located in the Main Reservoir. Figure 1 below displays the frequency of occurrence for each documented aquatic macrophyte – a graph representation of Table 2 above.

Figure 1. Percent Occurrence at All Sites



The dominant documented species is hydrilla, the target species, at 228 (or 45%) of the total sites. The majority of hydrilla sites are located in the Main Reservoir, and only four hydrilla sites were documented in one of the six Wetland sections at the time of the survey. Benthic filamentous algae (BFA) is also common, documented at 220 sites (44%) and nearly as frequent as hydrilla. However, BFA was observed throughout six of the seven sections – Main Reservoir and Wetlands 1-5 – whereas hydrilla was mostly documented in the Main Reservoir. While technically not classified as SAV, the growth habit of BFA is similar to aquatic vegetation and can be categorized likewise.

Both common bladderwort and fanwort were documented at 21% (106 and 107 sites, respectively) throughout the sample area. Although considered a native species, common bladderwort was noted at nuisance abundance (defined as Medium or Dense) at multiple locations. Fanwort is considered an invasive species within New Jersey, and appeared to be most common within two of the inlet Wetlands (#2 & 4) and thinly spread throughout the Main Reservoir. Wetlands 1, 3, and 5-6 did not support any fanwort growth at the time of the survey.

The remaining aquatic macrophytes were documented at less than 20% of the total sites, most of which are native macrophytes. See Table 2 above or Appendix D for the full list. Notable species found across the survey area were Eurasian watermilfoil, mudmat, and curly-leaf pondweed, all considered invasive species in New Jersey. Each were documented at 94 sites (19%), 70 sites (14%), and 2 sites (0%), respectively. While not found extensively throughout the study area, all species are concerning due to their invasive growth habits. It is unknown if the infestations are small due to an early establishment-growth, because of suppression by the extensive macrophyte growth, or simply the timing of the survey. For example, curly-leaf pondweed has an offset life cycle from typical northern species, and usually dies back by early June-July in its northern region. A wider distribution across the Reservoir likely occurs earlier in the season.

Most of the highly desirable native aquatic plants (such as pondweeds, less common bladderworts, and low watermilfoil) all occur at low abundances and distribution. It is likely that the hydrilla growth is suppressing native species abundance and distribution, and overall diversity will continue to decrease over time.

The following three aquatic plants were only observed at one (0.2%) of the sites surveyed: watermeal and wild celery. Both species are managed throughout New Jersey for nuisance-level growth.

Overall, Manasquan Reservoir contains high aquatic plant diversity, despite high hydrilla abundance. Water chemistry could also be a limited factor, but was not part of this survey. Manasquan is known to suffer from algal blooms, which create extreme fluctuations in various water chemistry parameters – most notably dissolved oxygen (DO).

Wetland/emergent plants were documented primarily in the smaller Wetland sections: Wetlands 1, 3, 5-6. Multiple coves and flats along the Main Reservoir also contained such species. The support of widespread emergent and wetland plants typically stabilizes the area for further emergent and wetland species growth. Over time, aquatic species may become confined to a smaller area within the Wetland sections, or fully removed due to spread of emergent species. Wetland systems provide a buffer for elements coming (flood) and going to (pollution) the Main Reservoir. Care should be taken with the establishment of *Phragmites* or like invasive species. Water willow (*Decodon verticillatus*), found throughout the survey area, is often managed for overabundance and density within wetland edge habitats and waterbody perimeters.

The specific distribution and abundance data for each section is explained below.

The Main Reservoir

The Main Reservoir, excluding the Wetland sections, was the primary focus for the survey. The Reservoir deepens gradually and has shallower coves that harbor and promote vegetation growth. According to NJWSA data, the water level was down an average of three feet at the time of the Main Reservoir survey. This extent of drawdown created large expanses of exposed shoreline and wetlands that would otherwise contain water. Due to this, many cove and shoreline points required wading or were noted as 'on-shore' or 'land' due to lack of water. Also, the drawdown likely increased the extent of the littoral zone within the Reservoir than if the Reservoir remained at bankfull.

The percentages used for the Main Reservoir only represent a likely distribution of SAV, since the points were not necessarily displayed across the entire littoral zone.

In the Main Reservoir, 22 of the 38 SAV species were documented. Of which, all the invasive species documented within the survey area were also found within the Main Reservoir. SAV species were documented at 276 of the 342 sites (81%) within the Main Reservoir. Just over half the sites 144 (or 52%) are considered at nuisance level (Medium or Dense). 96 of the 144 sites supported nuisance hydrilla, whereas all other species fell below 20% nuisance level. This suggests that when hydrilla is present in high, nuisance quantities, other SAV abundance is reduced.

Of those 276 vegetated points, 224 points support hydrilla growth (81%, or 65% of the Main Reservoir points). Slightly under half of the hydrilla sites are categorized as Medium and Dense (47%). Based off of the abundance data collected during the survey, the distribution of Hydrilla appears most Dense at the main inlet (from Wetland 2) to the Reservoir and gradually decreases abundance easterly until the outlet dam, where abundance increases back to Dense. This makes sense, as the majority of flow goes from West to East. Also, the extent of standing timber along the western and southern shorelines appear to generally coincide with lesser amounts of hydrilla growth, suggesting that the presence of standing timber somehow decreases hydrilla abundance. Whether it is a result of the actual timber or herbivorous fish that use the timber as habitat is unknown. Various coves along the southern shoreline appear to be hotspots for hydrilla growth – the southern-most inlet and the Eastern Launch are most notable. Although its assumed that the initial point of introduction of hydrilla occurred at the eastern boat launch (due to its high use and the tuber data collected-see below), SAV caught on motor propellers and recreational equipment could be deposited at the launch. The launch and docks are also high-use areas, creating disturbance which allows for more opportunity for invasive growth.

Similar to the Overall Abundance, BFA remains the second-most abundant species at 45% of the Reservoir points. Eurasian watermilfoil, small pondweed, and coontail were all documented above 20% of the Reservoir points, however, all were found mostly at Trace abundance. Also, 17 of the 22 SAV species found in the Main Reservoir fall below 20% occurrence, and are categorized mostly at Trace abundance. This further suggests that other SAV diversity suffers in addition to abundance when hydrilla is present in high, nuisance quantities.

Wetland 1

Wetland 1 is located north of the Main Reservoir. A small culvert was noted between the Main Reservoir and Wetland 1, which may allow surface water exchange at a higher Reservoir volume. No exchange was occurring during the time of the survey. The water depth throughout Wetland 1 was extremely shallow, requiring wading to reach multiple sites. A canoe was used to access the deeper sites.

On September 18th, 15 sites were surveyed in Wetland 1. 11 of the 38 overall SAV species were documented throughout 14 sites, **all of which are native species**. The site without aquatic vegetation contained a stand of rice-cut grass (*Leersia oryzoides*), a native wetland grass species. White waterlily and small duckweed were documented as the two most abundant aquatic species, both of which are floating-leaf species. All other species aside from white waterlily were documented at Trace or Sparse abundance. **No hydrilla was observed in Wetland 1.**

Spikerush, great duckweed, common bladderwort and watershield were all documented at or above 20% of the Wetland 1 sites. All other species fell below 13%: BFA, water primrose, coontail, northern naiad, and wild celery. The floating-leaf species (white waterlily, duckweed species, and watershield) combined with the shallow depth appear to inhibit the growth of fully submersed species.

Many wetland and emergent plants were noted within Wetland 1. The southeastern corner of the wetland supported a large stand of Bur-reed (*Sparganium eurycarpum*). Various rush and sedge species, along with water willow were noted at multiple sites throughout Wetland 1. The site containing rice-cut grass would be an opportune site for *Phragmites* establishment.

Wetland 2

Wetland 2 is located northwest of the Main Reservoir, also containing an inlet to the Main Reservoir. Due to drawdown, no flow was occurring through the small culvert between Wetland 2 and the Main Reservoir. However, there is likely surface water exchange between the two sides with higher Reservoir volume. Considering the low flow from the inlet, backfill from the Main Reservoir may flow into Wetland 2 when water levels are higher. Both canoe and waders were used to access the sample sites.

On September 12th, 56 sites were documented within in Wetland 2, where 20 of the 38 overall SAV species were documented. All 56 sites supported submersed plants with 92% of the sites considered at nuisance (Medium or Dense) levels. Only 8% of the overall points were categorized as Trace or Sparse.

Fanwort was the dominant aquatic plant occurring at 44 of the 56 sites (79%), where nearly half of the sites were considered at nuisance levels. Wetland 2 is a likely contributor to the fanwort infestation within the Main Reservoir. Common bladderwort and creeping bladderwort are the next most common species within Wetland 2, however, both were mostly found at Trace and Sparse abundance.

Notably, two other invasive species were present within Wetland 2: mudmat and hydrilla. Mudmat was more common than hydrilla, at 25% of the sites and found at Trace-Dense abundance. **Hydrilla was found at four sites** within Wetland 2, two of which were located near the culvert accessing the Reservoir at Sparse and Dense abundance. The two other locations were south of the island and in deeper water. It's likely that the hydrilla is spreading into this wetland from the main basin. Although this is the only wetland that contained hydrilla, the high biomass of hydrilla in the main basin could eventually spread into the any of the other five wetlands and become established.

Wetland 3

Located west of the Main Reservoir, Wetland 3 also contains an inlet to the Main Reservoir. A large culvert was present, but supplied no surface water exchange between the two sides. As with Wetlands 1 and 2, both canoe and waders were used to access the sample sites.

15 sample sites were accessed on September 18th, where only 6 of the 38 overall SAV species were documented. All sample sites supported white waterlily growth, of which 87% of the points were considered at nuisance level. Also fairly common within Wetland 3, BFA, common bladderwort, and watershield occurred at 13 (87%), 12 (80%), and 6 (40%) of the sites, respectively. The last two species identified within the Wetland were spikerush and mudmat, at 2 (13%) and 1 (7%) sites, respectively. Mudmat was documented solely in a center point of Wetland 3. **No hydrilla was observed in Wetland 3.**

The combination of the Dense white waterlily, BFA, and common bladderwort appear to suppress the growth of other aquatic vegetation. Species richness, or plant diversity, is low compared to the other Wetland sections around the Main Reservoir.

Few wetland and emergent species were noted within Wetland 3. Similar to the growth in Wetland 1, Bur-reed and water willow were noted at multiple sites. As stated previously, the support of emergent/wetland species typically stabilizes the area for further emergent/wetland species growth.

Wetland 4

Wetland 4 is located southwest of the Main Reservoir and south of Wetland 3. While considered an inlet, very little water was entering Wetland 4. No culvert was noted, though not necessarily absent. Surface water exchange between Wetland 4 and the Main Reservoir may occur when the Reservoir is at a higher volume, however, no visible exchange was noted during the survey. The water depth varied within Wetland 4, requiring both waders and canoe to access all sites.

On September 13th, 51 sites were surveyed within Wetland 4, where 18 of the 38 overall SAV species were identified. All 51 sites contained aquatic plant growth. Low watermilfoil was documented as the most abundant aquatic species at 36 (71%) sites, however were mostly found at Trace and Sparse abundance (61%). Common bladderwort and fanwort were also abundant in Wetland 4, both documented at 33 sites (65%). While common bladderwort was mostly documented as Trace like low watermilfoil, Fanwort was documented mostly as Dense. Three other species were found above 20% of the points: creeping bladderwort (63%), BFA (55%), and mudmat (22%). Referring to the Distribution Maps, fanwort and mudmat appear to grow in separate places within Wetland 4 – fanwort documented typically on the perimeter with mudmat growing in the middle sites (Appendix C).

The other 12 species identified in Wetland 4 appeared at less than 20% of the sites, and typically at Trace abundance when present. **No hydrilla was observed in Wetland 4.**

Notably, the most abundant macrophytes in Wetland 4 are not considered floating-leaf species. While low watermilfoil is a native species, it is often not managed for nuisance growth, whereas fanwort and bladderwort species is often managed especially at nuisance abundances.

Wetland 5

Wetland 5 is located southeast of the Main Reservoir, and just east of the Eastern Launch. During the survey, a culvert was noted connecting Wetland 5 and Main Reservoir, which may allow surface water exchange at a higher Reservoir volume. No exchange was occurring during the time of the survey, regardless of the small stream that was flowing into the Wetland from the Park parking lot. Water depth was shallow throughout, and only wading was required to access the sample sites.

On September 18th, 12 sites were surveyed in Wetland 5. 11 of the 38 overall SAV species were documented throughout the Wetland. **All 12 sample sites contained macrophyte growth**. Coontail was the most abundant species, found at 100% of the sample sites mostly at Medium or Dense abundance. Although coontail is a native species it is often managed for nuisance level growth. Common bladderwort, small duckweed, and watermeal were found at 11 of the 12 sites (or 92%) growing at Trace to Dense abundance.

Leafy pondweed, mudmat, spikerush, and water primrose were documented at or above 20% of the Wetland 5 sites. All other species fell below 17%: BFA, southern naiad, and muskgrass. The floating-leaf species (watermeal and duckweed) combined with the shallow depth may inhibit the growth of the fully submersed species. **No hydrilla was observed in Wetland 5.**

As with Wetland 3, few wetland and emergent plants were documented within Wetland 5. Water willow was identified at multiple sites between Sparse to Dense growth.

Wetland 6

Wetland 6 is located southeast of the Main Reservoir and south of the outlet dam. A controlled outflow was present and closed at the time of the survey; no exchange was occurring during the time of the survey. As with the other wetlands, the water depth was shallow and required wading to reach each site.

On September 18th, 11 sites were documented in Wetland 6. Nine of the 38 overall SAV species were documented across all 11 sites, **all of which are native aquatic species**. The majority of sites (91%) were categorized as overall nuisance level, and none of which were categorized as Trace overall. Low watermilfoil was the most abundant species at the time of the survey – identified at all sample sites within the Wetland at Trace to Dense abundance.

Eight of the nine SAV species identified within Wetland 6 were found above 20% of the sample sites: common bladderwort, waterthread pondweed, coontail, leafy pondweed, spikerush, water primrose, and watershield. Muskgrass was the only species identified below 20% of the sample points in Wetland 6. **No hydrilla was observed in Wetland 6.**

As with Wetlands 3 and 5, few wetland and emergent species were documented within Wetland 6. Water willow and sedge species were identified at multiple sites between Trace to Sparse growth. *Phragmites* (*P. australis*), an invasive species common across New Jersey, was documented in a moderate stand in the area of aquatic vegetation with overall Dense abundance. Further establishment of *Phragmites* could be detrimental to the Wetland sections. The plant is an aggressive invasive species that quickly outcompetes other species present. Of the multiple modes of reproduction, seeds are easily spread through water and wind.

Hydrilla Tuber Density

While the tuber sampling sites were determined based off of high hydrilla growth documented during the aquatic vegetation survey, the density of potential reproduction (tubers and turions) varies greatly. Overall, the sampling sites ranged from low to high density for both tubers and turions.

Of the sites, the highest tuber and turion density was calculated for MR-5, also quite possibly the highest our staff has collected at a single site in the Northeast. The values indicate that if all of the tubers and turions collected from that site were to produce a new plant next year (however unlikely), nearly 3,500 new plants would grow in a square meter area. A high density of reproduction is reasonable, considering the launch site was one of the highest abundance areas located during the aquatic vegetation survey. This suggests that the boat launch was the initial point of introduction of hydrilla to the Reservoir, which is typical of infestations of aquatic invasive species. The disturbance at such a high-use area also creates opportunity for 'hardy', typically invasive, species.

The lowest tuber density was located in Wetland 2 (MR-2), and yet had the second highest turion density at 231.4 turions/m^2. Field notes indicate that the hydrilla growth was between Trace and Sparse abundance, further indicating that tuber production may be lower. The high turion density suggests that continued spread may occur within Wetland 2. Typically, tuber production is seen as growth for year-over-year in a singular area, whereas turion production is a means of spread from that area.

Overall, a substantial volume of reproduction is occurring within the hydrilla infestation of Manasquan Reservoir. Based on the calculated tuber densities from Manasquan Reservoir, numerous years (5+) of intensive management should be expected to reduce the tuber density, and therefore the extent of hydrilla growth and reproduction. Over time, the hydrilla tuber density can be used to determine the efficacy of hydrilla management programs. Two to four cores at each site were appropriate for establishing a baseline density at Manasquan Reservoir, whereas three to four cores per site are suggested to monitor Hydrilla density during future management. However, effective management should reduce hydrilla growth and reproduction, and requiring increased effort (10 to 20 cores per site) will likely be needed in the future (Johnson 2013 and Nawrocki *et al* 2016).

Summary of Findings

- Based off of the acoustic mapping, less biovolume appears to grow within the standing timber on the southern shore of the Reservoir. However, such result could be effect of various or multiple factors.
- Full extent of littoral zone within the Main Reservoir is unknown based off of depth fluctuation in addition to the limitations of the predetermined points.
- Extensive hydrilla growth is present throughout the Main Reservoir, with hotspots near Wetland 2, the northern corner of the outlet dam, and various coves along the southern shoreline. No hydrilla was observed in Wetlands 1 and 3-6.
- Hydrilla was documented at 52% of the total vegetated points surveyed in 2017, of which most were at nuisance level.
- Without management, the current macrophyte abundance and distribution within Manasquan Reservoir may become suppressed by hydrilla. Overall diversity will likely decrease over time.
- The distribution of hydrilla, along with the tuber and turion production, throughout the Reservoir implies long-term establishment, foremost at the boat launch and small coves along the shoreline of the Main Reservoir.
- Highest tuber density occurred at the East Launch (MR-5). Coupled with the hydrilla abundance and distribution in this section, it's possible the boat launch was the site of initial introduction.
- The launch and docks are also high-use areas, creating disturbance which allows for more opportunity for invasive growth.
- Various invasive species appear on both sides of the culverts present between the Main Reservoir and the surrounding Wetland sections. Fanwort may be seeding from Wetlands 2 and 4 at periods of inflow to the Reservoir.
- Wetlands 1 and 6 contain no invasive aquatic species. However, Wetland 6 has a small stand of *Phragmites*, an invasive emergent. Any wetland areas in relation to the Reservoir area are at a higher risk of infestation due to proximity to Wetland 6.
- All Wetland sections appear to perform as catch basins in case of overflow from the Main Reservoir, while also providing inflow to the Reservoir during periods of high flow.

- The Wetland section systems seem to be transitioning from open water to wetland ecosystems, where emergent species will begin or continue to dominate. Wetland ecosystems are a positive reinforcement to the Reservoir system by providing filtration from roads and development before the water enters the Main Reservoir.
- The Wetland sections should be maintained for any invasive emergent species, as establishment of quickly growing species such as *Phragmites* would be detrimental to the ecosystem and would further nullify the purpose of the Wetlands as overflow and filtration areas.

Management Recommendations

Management Program

The Point-intercept mapping within the approximate littoral zone of the Reservoir revealed a large extent of established hydrilla, in addition to areas containing plant growth outside of the approximate littoral zone. Additionally, a small *Phragmites* stand was noted in Wetland 6.

A management program is highly recommended in 2018. Managers should focus resources on depleting the greatest hydrilla tuber densities first, and using less intensive management on sites with lower tuber counts (Nawrocki et. al., 2016). Based off of the 2017 point-intercept mapping, we suggest prompt management of the Hydrilla infestation within Manasquan Reservoir and Wetland 2, in addition to the *Phragmites* stand in Wetland 6.

Hydrilla management should primarily start at the most-upstream location of hydrilla establishment and the primary source of hydrilla spread, the established infestation near Wetland 2 and the boat launch/marine, respectively. Wetland 2 is considered an inlet for Manasquan Reservoir at periods of high flow, and every boater is bottle-necked to the launch and marina areas. Management within the remaining Reservoir should target 'Hot spots' determined from the SAV and biovolume mapping.

Generalized options available for hydrilla control include herbicides, grass carp stocking, benthic barriers, diver assisted suction harvesting (DASH), and hand pulling. Of which, initial management using DASH, and mechanical hydrilla control is not recommended due to fragmentation, costs, and other negative impacts (Nawrocki et. al., 2016). Hand pulling and benthic barriers is an option typically only suitable for small (less than one acre) infestations. Grass carp stocking is New Jersey is prohibited in basins that exceed 10 surface acres, so that is not an option at this site. Options for small-size Phragmites control include herbicides, cutting and mulching, cutting and tarping, and control burning. Due to efficacy experience, herbicides are the primary suggestion.

Aquatic Plant Monitoring

In 2018, we highly recommend a repetition of the SAV mapping within the Main Reservoir and Wetland 2 due to the extent of hydrilla establishment. Based off of the potential for exchange between the Reservoir and the other Wetland sections, annual monitoring should also continue in all wetland sections. Monitoring is important for examining abundance and distribution of hydrilla and other macrophytes throughout the reservoir, identifying seasonal changes and also to direct long-term management efforts in a cost-effective manner.

The biovolume maps generated, professional grade bathymetry data collected, and visual observations all collected in 2017 can be used for the development of a comprehensive monitoring program for 2018. BioBase can also be utilized on an annual basis for all open-water areas (not within standing timber) to monitor biovolume extent. Acoustic mapping of the entire littoral zone will fully determine depth and extent of vegetation. This is especially pertinent with regards to hydrilla, as it is capable of growing in unhospitable conditions. Due to the extent of water level fluctuations, mapping the open water may show small areas of growth within the old riverbed/flood zone that contain vegetation. It is also recommended that the client subscribe to CI BioBase to be able to access the interactive features of the bio-volume data collected in 2017 and any future data collected through BioBase.

Assuming that management efforts are employed at the Reservoir, these efforts should be monitored for post-management hydrilla growth through a point-intercept survey and tuber density sampling. Subsequent management years could include pre- and post-management point-intercept surveys, but at a minimum post-treatment surveys (in September to October). Any transition in management strategy should be combined with extensive and rigorous monitoring to ensure no biomass is allowed to persist long enough to produce tubers and extend management needs (Nawrocki et. al., 2016).

With regards to tuber sampling, a minimum of the five sites established in 2017 should be re-sampled. If 2018 control programs are employed (especially limited acreage pilot projects), tuber monitoring sites should be established directly in the control area in an effort to track efficacy. This could be crucial for monitoring efficacy if different control techniques are employed (or even if different herbicides and application rates, if applicable).

Based off of 2018 SAV mapping, 9 to 10 days of vegetation monitoring at a minimum is recommended at this site. An additional two days of tuber monitoring should be included as well assuming an increase in the number of cores to be collected per site. Effort for both of these monitoring programs may increase in order to assess management programs.

Monitoring of the *Phragmites* stand is also recommended, and would be completed during the aquatic vegetation survey of Wetland 6.

Control Programs

An intensive hydrilla control program is highly recommended, starting in 2018. Mangers should focus resources on depleting the greatest tuber densities – within the most upstream locations and primary sources of spread. Less intensive management can be employed in sites with lower tuber numbers (Nawrocki et. al., 2016). These could be wide-scale control options or smaller scale pilot studies as determined by budget, logistics, or water use restrictions.

Peer-reviewed journal articles recently published (2016) in the *Journal of Aquatic Plant Management*. Nawrocki et. al. (2016) provide information regarding hydrilla tuber dynamics following management, while True-Meadows et. al. (2016) provides a review of monoecious hydrilla literature including a control/management summary. In short, aggressive use of herbicides early in the multi-year program, followed by shifting to smaller scale no-chemical control options should be the focus of the SAV management plan. There are several registered aquatic herbicides available for use, including differing formulations which should be fully vetted with regard to water uses and water use restrictions in the basin. Control in the main basin could be different from control options used in the Wetland areas.

Immediate control of the small Phragmites stand within Wetland 6 is additionally recommended for the 2018 season. As a small stand, minimal management efforts would be required.

Education/Outreach

There are a few educational programs that should be employed during the long-term management of hydrilla at this site. The first would be improved signage at both boat launches and other high use areas used by boaters and fishermen that utilize the Reservoir. Additionally, supplying informational hydrilla brochures in the Educational Center and the Park Office would be a great outreach opportunity. Surveying the fishermen for input on the state of the reservoir and hydrilla infestation could provide information to the Park on a more constant basis. Annual public stakeholder meetings at the facilities near the launch could be crucial to getting public buy-in for any type of SAV control program established.

We recommend that all recreational equipment be cleaned when leaving Manasquan Reservoir. The Reservoir is a popular location for fishermen, since the Reservoir is stocked with and produces trophy-size fish. Due to the popularity of the Reservoir, the Reservoir is ultimately acting as a seed for the surrounding waterbodies that the fishermen frequent. Perhaps a small storage shed with a power washer and a container of gas could be installed at the boat launch for recreationalists to use before leaving the site. If not employed when the power washer is installed, we further suggest that all equipment should be cleaned before entering the Reservoir as well once adequate control and reduction of the hydrilla population has occurred. Establishing a boat steward program at the launch would be a great boon, although such a program in New Jersey currently does not exist.

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Appendix A: Raw Data Tables

Appendix B: Macrophyte Descriptions

Appendix C: Distribution Maps

Appendix D: Abundance Tables

Appendix E: Hydrilla Tuber Data

Appendix F: Acoustic Mapping

AQUATIC MACROPHYTE PICTURE LIBRARY WITH SUMMARIES (A-I)

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Hydrilla (*Hydrilla verticillata*)

Hydrilla 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 climates).

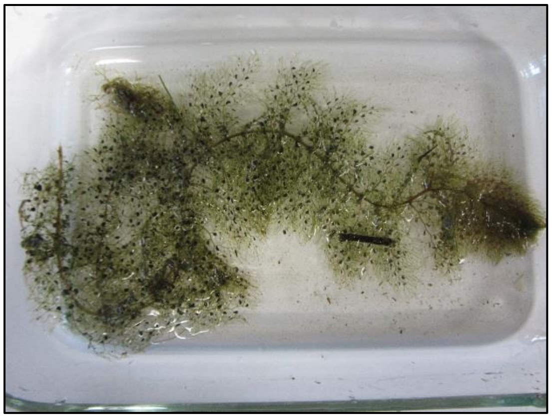
Filamentous Algae

Floating Filamentous Algae, Benthic Filamentous Algae

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 Bladderwort (*Utricularia vulgaris*)

Great bladderwort



Common Bladderwort Native: Common bladderwort is a free-floating plant that can reach 2-3 meters in length. Since the plant is free-floating, bottom sediment can vary. Finely divided leaf-like branches, forked 3-7 times grow along the main stem. Mechanisms called 'bladders' are scattered about the branches, which capture planktonic prey ranging – from the size of unicellular protozoans (such as Euglena), to mosquito larvae. The prey is slowly digested by enzymes inside the bladders. Common bladderwort produces small yellow flowers that protrude above the water. Stems of common bladderwort provide food and cover for various fish species.

Fanwort (*Cabomba caroliniana*)

Fanwort Invasive: Fanwort is a submerged rooted macrophyte, native to Southeastern United States, from Virginia to South Florida. A popular aquarium plant, fanwort has since spread invasively through much of the Northeast, and even parts of the Northwest. Fanwort prefers acidic ponds and lakes or sluggish streams. In optimal conditions, fanwort can reach six feet long, and can colonize water in an average of ten feet deep. Fanwort has slender stems protected with a thin gelatinous coating, 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, no more than a half inch in length. Fanwort blooms in the fall, producing small white flowers that eventually give way to seeds. Fanwort can also reproduce by fragmentation – the stems become brittle and break easily in late summer/fall. 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 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 Watermilfoil (*Myriophyllum spicatum*)

Asian Water Milfoil

Eurasian Watermilfoil 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 watermilfoil 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 watermilfoil, and its vegetation provides habitat for invertebrates. However, studies have determined mixed beds of pondweeds and wild celery can support more diverse invertebrate populations.

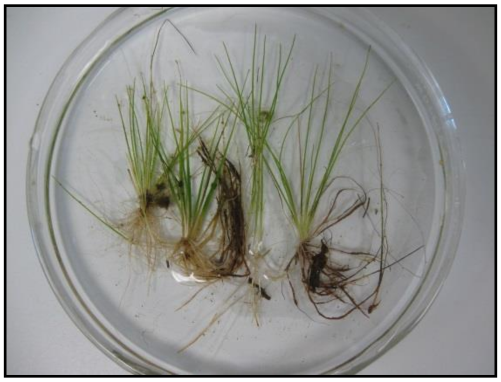
Coontail (*Ceratophyllum demersum*)

Hornwort

Coontail **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 and turion (winter bud) production. Bushy stems of coontail provide valuable habitat for invertebrates and fish (especially during winter), and the leaves are grazed on by waterfowl.

Needle Spikerush (*Eleocharis acicularis*)

Hairgrass, Least Spikerush, Slender Spikerush



Needle Spikerush Native: The stems of needle spikerush are usually slender and short (up to 12 cm long), that emerge from tufts of fine spreading rhizomes. Sometimes the stems are topped with a spikelet of a tight spiral of flowers and eventually nutlets. The nutlets widely vary in surface patterns, and this characteristic is needed for identification to species level. Needle spikerush nutlets have a surface detail that appears as a fine ceramic vase, and the body of the nutlet is topped with a tubercule (or cap). Needle spikerush prefers firmer substrates of most shorelines or into the water up to 2 meters deep, and can tolerate turbid conditions. The leaves provide suitable food for waterfowl, and excellent habitat and shelter for aquatic invertebrates.

Small Pondweed (*Potamogeton pusillus*)

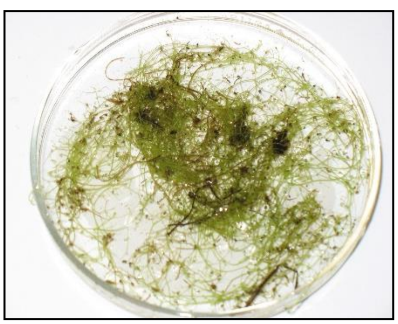
Small Pondweed Native: Small pondweed has slender stems and a slight rhizome that branches repeatedly near the ends. Only submersed leaves are produced, and these are linear, attaching directly to the stem of the plant. The leaves have three veins and the mid-vein is usually bordered by several rows 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.

Mudmat (*Glossostigma cleistanthum*)

Mudmat Invasive: Mudmat is a newer invasive, and has only been identified in the Northeastern in specific sections of PA, NJ, CT, RI, and MA. It can be easily confused with mudwort (Limosella australis), a protected species in many sites. Mudmat is named for its growth habit, forming dense mats of growth along mudflats and shoreline. While it may not grow tall, the density of growth extirpates other species within the area. Densities of the growth are found upwards of 25,000 plants in a square meter. Mudmat grows along a rhizome, promoting the dense growth and acting as a mode of reproduction. Mudmat also produces a small white flower that is self-fertilized, further enhancing its invasiveness within a waterbody. All parts of the plant are grazed upon by waterfowl.

Creeping Bladderwort (*Utricularia gibba*)

Humped bladderwort, cone-spur bladderwort



Creeping 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 branches 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.

White Water Lily (*Nymphaea* odorata)

Fragrant Water Lily

White 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.

Common Waterweed (*Elodea canadensis*)

Elodea

Common Waterweed **Native**: Common waterweed has slender stems that can reach a meter in length, and a shallow root system. The stem is adorned with lance-like leaves that are attached directly to the stalk that tend to congregate near the stem tip. The leaves are populated by a variety of aquatic invertebrates. Male and female flowers occur on separate plants, but it can also reproduce via stem fragmentation. Since common waterweed is disease resistant, and tolerant to low-light conditions, it can reach nuisance levels, creating dense mats that can obstruct fish movement, and the operation of boat motors.

Low Watermilfoil (*Myriophyllum humile*)

Lowly Water Milfoil

Low Watermilfoil 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 emersed 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.

Water Primrose (*Ludwigia palustris*)

Ludwigia

Water Primrose Native: Water primrose 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. Water primrose 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. Water primrose offers some habitat for juvenile fish and aquatic invertebrates, but its leaves and fruit provide little nutritional value for grazing waterfowl.

Waterthread (*Potamogeton diversifolius*)

Variable-leaved Pondweed

Waterthread **Native**: Waterthread 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, waterthread 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.

Muskgrass (*Chara* sp.)

Muskgrass **Native**: Muskgrass is a macroalgae that appears as a vascular plant. It is simple in structure and has rhizoids instead of true roots. The branches of muskgrass 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. Muskgrass 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.

Water Bulrush (*Schoenoplectus subterminalis)*

Swaying Bulrush, Water Club-rush

Water bulrush Native: Water bulrush is a truly aquatic bulrush, with only the tips of fertile stems poking above the water's surface, if any. The slender, limp stems originate from a delicate rhizome, typically less than 2.0 mm diameter. The hair-like stems can reach lengths up to 1.0 meter, and occur in flowing or still-water environments. The leaves are sheathed at the base, and become crescent-shaped above the sheath. This basal sheathing is a distinct characteristic that sets water bulrush apart from spikerush species. The leaves have one to five length-wise veins and scattered cross-veins. The leaves are often covered with a fine coating of algae in nutrient-poor environments. Researchers believe the bulrush plants are a phosphorus source for the algae. When nutlets are produced, they are three-angled with a slender beak. Water bulrush prefers shallow water, but can become established in depths exceeding 1.0 meter. Water bulrush stands produce grass-like meadows which provide suitable habitat for invertebrates and juvenile fish.

Slender Naiad (*Najas flexilis*)

Bushy Pondweed

Slender Naiad 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.

Stonewort (*Nitella* sp.)

Stonewort Native: Stonewort is a macroalgae, similar to muskgrass, that appears as a vascular 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. Stonewort has smooth stems and branches, and lacks the distinct musky odor that muskgrass emits. 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.

Snailseed Pondweed (*Potamogeton bicupulatus*)

Snailseed Pondweed Native: Sometimes confused with other thin-leaf pondweeds (such as leafy pondweed, small pondweed, and waterthread), snailseed pondweed is native to the northeastern region of the United States. Snailseed pondweed gets its name from its distinctive seed morphology; the tiny seeds are spiral-shaped like a snail shell. The submersed leaves are narrow and linear. The floating leaves are shaped like an ellipse, with a rounded leaf tip. 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.

Small Duckweed (*Lemna minor*)

Water Lentil, Lesser Duckweed

Small 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.

Spiny Hornwort (*Ceratophyllum echinatum*)

Spiny Hornwort Native: Spiny hornwort is a species 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.

Waterwort (*Elatine minima*)

Small Waterwort

Waterwort Native: Waterworts are truly tiny aquatic plants, usually no more than a few centimeters in total length when growing completely submersed. Submersed stems emerge from tufted root masses. The tiny leaves (usually only 3-8 mm long) are oval to oblong and are attached directly to the stem without a stalk. Waterwort can also grow on exposed mudflats in a spreading form. It usually inhabits sandy substrates with low disturbance. It relies on seed production to over winter each year, requiring good water clarity and low disturbance for successful germination. The moss-like mats of waterwort growth are grazed upon by many types of waterfowl, and the tiny stems and leaves provide zooplankton habitat.

Leafy Pondweed (*Potamogeton foliosus*)

Leafy Pondweed Native: Leafy pondweed has freely branched stems that hold slender submersed leaves that become slightly narrower 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.

Water Moss (*Fontinalis* sp.)

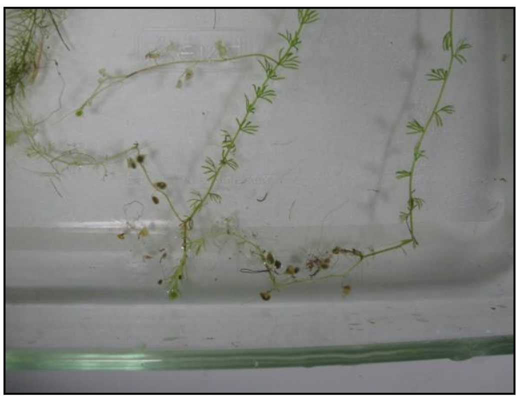
Water Moss Native: Water mosses are submerged mosses that are attached to rocks, trees, logs, and other hard substrates by false rootlets located at the base of their stems. The stems are dark-green to brown, and about one foot long. The leaves share a similar color as the stems, and are usually ovate 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.

Golden Hedge-hyssop (*Gratiola aurea*)

Golden Hedge-hyssop **Native**: Golden hedge-hyssop is a low-growing (5-30 cm) macrophyte found mostly in sandy shorelines habitats. The toothed (serrated) leaves are short (5mm) and placed opposite along the length of the stem. In the summer, Golden hedge-hyssop produces a yellow, tubular flower that often emerges above the water's surface. Golden hedge-hyssop has been found both emergent and submersed, where the emergent stems tend to branch and produce flowers more readily.

Intermedia Bladderwort (*Utricularia intermedia*)

Flat-leaf Bladderwort, Northern Bladderwort



Intermedia Bladderwort **Native**: Intermedia bladderwort stems are typically short, less than 0.5 meters long. The leaves are alternately arranged in a tight radiating pattern, similar to a whorl. The finely divided leaves are flattened, serrated, and typically fork one to three times. Bladders only occur on separate leafless stems (often under the sediment), a distinct characteristic of this bladderwort. Flowers are bright yellow, each being five-patterned and two-lipped (similar to a snap dragon flower), and typically occur in clusters of two to four emerging out of the water adorned along stalks. Small, flattened turions are produced at the tips of the stems late in the season. Northern bladderwort prefers bogs, fens, and mucky lakes, often intermixed with other bladderworts and plants. It can also be found creeping along exposed mudflats, along lake and pond margins, and adorning sediment "hummocks" exposed due to nuisance water lily growth. It provides adequate shade, foraging, and cover opportunities, and fine invertebrate habitat.

Spatterdock (*Nuphar variegata*)

Yellow waterlily, Bullhead Pond Lily

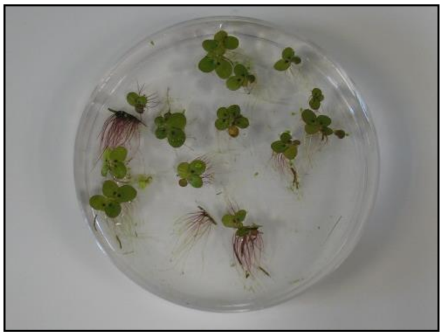
Spatterdock **Native**: Spatterdock leaf stalks emerge directly from a submerged fleshy rhizome. Spatterdock has heart-shaped leaves with a prominent notch. Depending on the habitat, these leaves can be held aloft via erect stems. A distinguishing characteristic of spatterdock is the leaf stalk, which bears a winged margin. Flowering occurs in the summer and, the flowers open during the day and close at night. Spatterdock typically inhabits quiet water less than two meters deep with a soft substrate, 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*)

Watershield **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.

Great Duckweed (*Spirodela polyrhiza*)

Large Duckweed, Greater Duckweed



Great Duckweed Native: Great duckweed is the largest of the duckweeds, but it is still very small compared to other aquatic macrophytes. It has simple flattened fronds with irregular oval shapes, often up to 1 cm in length and 2.5 to 8.0 mm long. The frond surface is usually green with a conspicuous purple dot. The underside of the frond is magenta with a cluster of 5-12 roots that dangle into the water. Indeed, peering at great duckweed from under the water grants it the appearance a tiny jellyfish. Although great duckweed produces flowers, it usually reproduces via budding, and like other duckweeds, it is capable of rapid growth. It often occurs with other duckweeds, and since it is free floating, it can be moved via the wind or water currents. It derives its nutrients from the water column and often occurs in eutrophic systems. It's an excellent food source for waterfowl, and is also used by muskrat and fish. The dense mats offer shade and cover for fish.

Northern Naiad (*Najas gracillima*)

Thread-like Naiad, Slender Waternymph

Northern Naiad Native: Northern naiad is similar in shape and form to Slender naiad. It 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. It prefers softer water and is highly sensitive to pollutants. The leaves are short (1-4 cm long) and serrated, tapering to a point with a jagged lobe at the leaf base. 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.

Arrowhead – submersed rosette (*Sagittara* sp.)

Arrowhead (Submersed Rosette) Native: This plant is the submersed rosette of a species of arrowhead. The submersed rosette lacks both flowers and seeds, so further identification is not possible. Arrowhead has emergent leaves, and usually inhabits shallow waters at pond or lake edges, or along sluggish streams. It can tolerate a wide variety of sediment types and pH ranges. Arrowhead is very suitable for constructed wetland development due to its tolerance of habitats, and ability to act as a nutrient sink for phosphorous. Typical arrowhead reproduction is via rhizomes and tubers although seed production is possible if conditions are ideal. Arrowhead has high wildlife value, providing high-energy food sources for waterfowl, muskrats and beavers. Arrowhead beds provide suitable shelter and forage opportunities for juvenile fish as well.

Curly-leaf Pondweed (*Potamogeton crispus*)

Curly Pondweed, Curled Pondweed

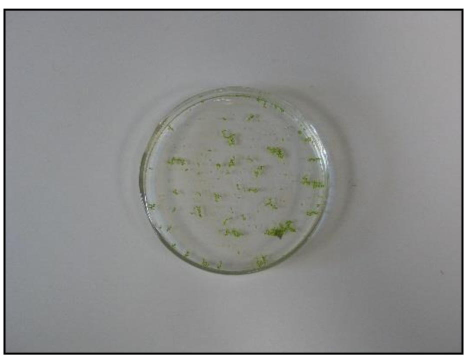
Curly-leaf Pondweed Invasive: Curly-leaf pondweed has spaghetti-like stems that often reach the surface by mid-June. Its submersed leaves are oblong, and attached directly to the stem in an alternate pattern. The margins of the leaves are wavy and finely serrated, hence its name. No floating leaves are 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.

Southern Naiad (*Najas guadalupensis*)

Southern Waternymph, Guadalupe Waternymph

Southern Naiad 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.

Watermeal (*Wolffia* sp.)



Watermeal Native: Watermeal appears as pale green globes of vegetative matter without roots, stems or true leaves. Its 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.

Wild Celery (*Vallisneria americana*)

Water celery, Tape-grass

Wild Celery Native: Wild celery has long flowing ribbon-like leaves that have a basal arrangement from a creeping rhizome. The leaves can be up to two meters long, have a cellophane-like texture, with a prominent center stripe and finely serrated edges. The leaves are mostly submersed, although they can reach the surface allowing the tips to trail. Male and female flowers are produced on separate plants, but reproduction is usually via over wintering rhizomes and tubers. Wild celery usually inhabits hard substrate bottoms in shallow to deep water. It can tolerate a wide variety of water chemistries. Wild celery is the premiere food source for waterfowl, which greedily consume all parts of the plant. Canvasback ducks (*Aythya valisneria*) enjoy a strong relationship with tape-grass, going so far to alter their migration routes based on tape-grass abundance. Extensive beds of tape-grass are considered good shade, habitat and feeding opportunities for fish.

Manasquan Reservoir
Aquatic Macrophyte Abundance Distribution
September 12-14 and 18, 2017

	Total		Trace		Sparse		Medium		Dense	
	Sites	%	Sites	%	Sites	%	Sites	%	Sites	%
Total Sites	342									
OVERALL	276	81%	41	15%	91	33%	70	25%	74	27%
HYDRILLA	224	65%	69	31%	59	26%	41	18%	55	25%
BENTHIC FILAMENTOUS ALGAE	153	45%	70	46%	55	36%	19	12%	9	6%
EURASIAN WATER MILFOIL	94	27%	65	69%	22	23%	7	7%	0	0%
SMALL PONDWEED	77	23%	56	73%	16	21%	4	5%	1	1%
COONTAIL	67	20%	58	87%	8	12%	1	1%	0	0%
COMMON WATERWEED	47	14%	44	94%	3	6%	0	0%	0	0%
SPIKERUSH	35	10%	23	66%	11	31%	1	3%	0	0%
SLENDER NAIAD	33	10%	21	64%	10	30%	2	6%	0	0%
MUDMAT	30	9%	14	47%	4	13%	10	33%	2	7%
FANWORT	29	8%	23	79%	5	17%	0	0%	1	3%
THIN-LEAF PONDWEED	29	8%	21	72%	6	21%	2	7%	0	0%
STONEWORT	27	8%	19	70%	7	26%	1	4%	0	0%
MUSKGRASS	23	7%	15	65%	5	22%	2	9%	1	4%
SNAILSEED PONDWEED	20	6%	18	90%	2	10%	0	0%	0	0%
WATERWORT	11	3%	10	91%	1	9%	0	0%	0	0%
GOLDEN HEDGE HYSSOP	9	3%	7	78%	1	11%	1	11%	0	0%
COMMON BLADDERWORT	4	1%	3	75%	1	25%	0	0%	0	0%
WATER MOSS	4	1%	4	100%	0	0%	0	0%	0	0%
NORTHERN NAIAD	3	1%	3	100%	0	0%	0	0%	0	0%
WHITE WATER LILY	3	1%	2	67%	1	33%	0	0%	0	0%
CURLY-LEAF PONDWEED	2	1%	2	100%	0	0%	0	0%	0	0%
WATER PRIMROSE	2	1%	2	100%	0	0%	0	0%	0	0%
ARROWHEAD	0	0%	0	0%	0	0%	0	0%	0	0%
CREEPING BLADDERWORT	0	0%	0	0%	0	0%	0	0%	0	0%
GREATER DUCKWEED	0	0%	0	0%	0	0%	0	0%	0	0%
INTERMEDIA BLADDERWORT	0	0%	0	0%	0	0%	0	0%	0	0%
LEAFY PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
LOW WATER MILFOIL	0	0%	0	0%	0	0%	0	0%	0	0%
NAIAD SP.	0	0%	0	0%	0	0%	0	0%	0	0%
SMALL DUCKWEED	0	0%	0	0%	0	0%	0	0%	0	0%
SOUTHERN NAIAD	0	0%	0	0%	0	0%	0	0%	0	0%
SPATTERDOCK	0	0%	0	0%	0	0%	0	0%	0	0%
SPINY HORNWORT	0	0%	0	0%	0	0%	0	0%	0	0%
WATER SHIELD	0	0%	0	0%	0	0%	0	0%	0	0%
WATER-BULRUSH	0	0%	0	0%	0	0%	0	0%	0	0%
WATERMEAL	0	0%	0	0%	0	0%	0	0%	0	0%
WATERTHREAD	0	0%	0	0%	0	0%	0	0%	0	0%
WILD CELERY	0	0%	0	0%	0	0%	0	0%	0	0%

Manasquan Reservoir
Aquatic Vegetation Survey
September 12-14 and 18, 2017

SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD 83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER MOSS	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
Res	1	A				D				T	S			S				D									T		T																		
Res	1	B				D					D			T				S																														
Res	1	M	40.182679°	-74.194136°		D				T	M			S				M									T		T																		
Res	2	A				D		M		S				T				D												S																		
Res	2	B				D									S				D																														
Res	2	M	40.183128°	-74.194134°		D		S		T				S				D												T																		
Res	3	A				D		D		T								D																														
Res	3	B				D		D											D																														
Res	3	M	40.183559°	-74.194259°		D		D		T								D																														
Res	4	A				D		M											S													D						S									
Res	4	B				M		M											S																				S									
Res	4	M	40.183538°	-74.194767°		D		M											S													S						S									
Res	5	A				S		S		S								S												S																		
Res	5	B				M		S											M												S																		
Res	5	M	40.183103°	-74.194758°		M		S		T								M												S																		
Res	6	A				M															M												T																		
Res	6	B				M					T			T				M												T																		
Res	6	M	40.182646°	-74.194656°		M					T			T				M												T																		
Res	7	A				D															S							D						T																		
Res	7	B				D																							D																								
Res	7	M	40.18264°	-74.195362°		D															T							D						T																		
Res	8	A				M		S											M																														
Res	8	B				D		D						S																T	T																	
Res	8	M	40.183154°	-74.195338°		D		M						T				S												T	T																	
Res	9	A				S								T				S													S																	
Res	9	B				S		S											S																				S									
Res	9	M	40.183543°	-74.195345°		S		T						T				S													T						T									
Res	10	A				M		S															M																S									
Res	10	B				S		S															S																											
Res	10	M	40.18348°	-74.195955°		M		S															M																T									
Res	11	A				M															S																				M									
Res	11	B				M															M																				M									
Res	11	M	40.183118°	-74.195928°		M															M																				M									
Res	12	A				S		S											S							S																							
Res	12	B				S		S			T							S							S																							
Res	12	M	40.182642°	-74.195852°		S		S			T							S							S																							
Res	13	A				S		S																																										
Res	13	B				T		T																																										
Res	13	M	40.182665°	-74.196516°	14.5	S		S																																										
Res	14	A				S		S											T								T																				
Res	14	B				S		S											T																														
Res	14	M	40.183093°	-74.196467°		S		S											T								T																				
Res	15	A				M								T				S				S	M																								T		
Res	15	B				S															T							S																							
Res	15	M	40.183508°	-74.19652°	2.3	M								T				S				T	M																								T		
Res	16	A				D		S											S				D										S			S									
Res	16	B				M		S															M							T																	
Res	16	M	40.183501°	-74.19708°		D		S											T				D							T			T			T									
Res	17	A				S		S			T							T												T																		
Res	17	B				S		S			T							T							T																							
Res	17	M	40.183091°	-74.196998°		S		S			T							T							T						T																		
Res	18	A																																												
Res	18	B																																												
Res	18	M	40.182682°	-74.197053°	16.2																																						
Res	19	A																																												
Res	19	B																																												
Res	19	M	40.182649°	-74.197715°	21.1																																						
Res	20	A																																												
Res	20	B				T															T																														
Res	20	M	40.18316°	-74.197704°	16.4	T															T																														
Res	21	A				M																			M												S													
Res	21	B				T															T				S												S													
Res	21	M	40.183548°	-74.197672°		S															T				M												S													

Manasquan Reservoir
Aquatic Vegetation Survey
September 12-14 and 18, 2017

SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD 83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER MOSS	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
Res	22	A				M												T				T										S			M									
Res	22	B				S																										T			S									
Res	22	M	40.183526°	-74.198289°	16.7	M												T				T										S			M									
Res	23	A																																										
Res	23	B				T												T																										
Res	23	M	40.183086°	-74.19826°	18.1	T												T																										
Res	24	A																																										
Res	24	B																																										
Res	24	M	40.182624°	-74.198187°	21.1																																							
Res	25	A																																										
Res	25	B																																										
Res	25	M	40.182692°	-74.198805°	16.4																																							
Res	26	A				S		S			T							S																										
Res	26	B				S					S							T								T									S									
Res	26	M	40.183167°	-74.198826°	11.4	S		T			S							S								T									T									
Res	27	A				S		T																											S									
Res	27	B				S		S										T											T						S									
Res	27	M	40.18354°	-74.19889°		S		S										T											T						S									
Res	28	A				S		S										T				S										S			S									
Res	28	B				S		S			T																					T			S									
Res	28	M	40.183513°	-74.199441°	2	S		S			T							T				T										S			S									
Res	29	A				S		S		T								T										T																
Res	29	B																																										
Res	29	M	40.183119°	-74.199425°	10.6	T		T		T								T										T																
Res	30	A																																										
Res	30	B																																										
Res	30	M	40.182628°	-74.199471°	18.5																																							
Res	31	A																																										
Res	31	B																																										
Res	31	M	40.182218°	-74.199402°	17.3																																							
Res	32	A																																										
Res	32	B																																										
Res	32	M	40.182242°	-74.200031°	18.5																																							
Res	33	A																																										
Res	33	B																																										
Res	33	M	40.182698°	-74.200037°	20.1																																							
Res	34	A				S		S		T								S										T																
Res	34	B				S		S										S																										
Res	34	M	40.183124°	-74.200009°	12.6	S		S		T								S										T																
Res	35	A				S		S										S										T																
Res	35	B				S		S						T														T																
Res	35	M	40.183147°	-74.200562°	11.2	S		S						T				T										T																
Res	36	A																																										
Res	36	B																																										
Res	36	M	40.182667°	-74.200518°	19.8																																							
Res	37	A																																										
Res	37	B																																										
Res	37	M	40.18226°	-74.200494°	20.8																																							
Res	38	A																																										
Res	38	B																																										
Res	38	M	40.182272°	-74.201168°	19.8																																							
Res	39	A																																										
Res	39	B																																										
Res	39	M	40.182687°	-74.201191°	19.1																																							
Res	40	A				T								T																														
Res	40	B				S		S										S																										
Res	40	M	40.183133°	-74.201176°	12.4	S		T						T				T																										
Res	41	A						S										T																	T									
Res	41	B				M		M						S																														
Res	41	M	40.183474°	-74.201203°	1	S		M						T				T																	T									
Res	42	A				S																										S			S									
Res	42	B				S		S																																				
Res	42	M	40.183471°	-74.201839°	1.5	S		T																								T			T									

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SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD 83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER MOSS	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
Res	43	A				S		T			T			T				S																										
Res	43	B				S		S										T																	T									
Res	43	M	40.183127°	-74.201736°	7.8	S		S			T			T				S																	T									
Res	44	A																																										
Res	44	B																																										
Res	44	M	40.182676°	-74.201716°	19.1																																							
Res	45	A																																										
Res	45	B																																										
Res	45	M	40.182227°	-74.201788°	18.1																																							
Res	46	A																																										
Res	46	B																																										
Res	46	M	40.182696°	-74.202367°	18																																							
Res	47	A				T		T										T										T																
Res	47	B				S		S										S										T																
Res	47	M	40.18314°	-74.20236°	13.5	S		S										S										T																
Res	48	A				M		M						T				S																										
Res	48	B				M		M						S				S										T																
Res	48	M	40.183492°	-74.202371°	2.4	M		M						S				S										T																
Res	49	A				S		S		T								T																										
Res	49	B				S		S										T																										
Res	49	M	40.18312°	-74.202962°	13.5	S		S		T								T																										
Res	50	A				S		S															T																					
Res	50	B																																										
Res	50	M	40.182702°	-74.202876°	15.2	T		T															T																					
Res	51	A				D								M				D										M																
Res	51	B				D		M						M				M																										
Res	51	M	40.183165°	-74.20354°	4	D		S						M				D										S																
Res	52	A				T		T																				T																
Res	52	B				M		S			T			S														S																
Res	52	M	40.182681°	-74.203491°	12	S		S			T			T														S																
Res	53	A				M		M			S							T										M																
Res	53	B				S		S						T														S																
Res	53	M	40.182222°	-74.203538°	10.6	M		M			T			T				T										M																
Res	54	A				S		S		T																		T																
Res	54	B				S		S		T								T																										
Res	54	M	40.18179°	-74.203494°	14.8	S		S		T								T										T																
Res	55	A				T		T																																				
Res	55	B				S		S										T										T																
Res	55	M	40.18137°	-74.203486°	15.4	S		S										T										T																
Res	56	A				T		T																																				
Res	56	B				S		S																																				
Res	56	M	40.180868°	-74.203543°	13.5	S		S																																				
Res	57	A																																										
Res	57	B																																										
Res	57	M	40.180478°	-74.204038°	18																																							
Res	58	A				T		T																																				
Res	58	B				T		T																																				
Res	58	M	40.18092°	-74.204149°	14	T		T																																				
Res	59	A				S		T			T							S																										
Res	59	B				S		T										S																										
Res	59	M	40.181372°	-74.204124°	14.4	S		T			T							S																										
Res	60	A				D		D										D																										
Res	60	B				D		D						S				D																										
Res	60	M	40.181828°	-74.204076°	7	D		D						T				D																										
Res	61	A				D		D						T				D																										
Res	61	B				D		D						S				D											T															
Res	61	M	40.182271°	-74.204146°		D		D						S				D											T															
Res	62	A				D		S										D																										
Res	62	B				D		D		S	T							S																										
Res	62	M	40.182727°	-74.204089°	7	D		M		T	T							M																										
Res	63	A				M		S		T				S				S										S																
Res	63	B				M		M						S				S																										
Res	63	M	40.18268°	-74.204626°	4	M		M		T				S				S										T																

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SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD 83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER MOSS	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
Res	64	A				D				T												D										T												
Res	64	B				S																S										S												
Res	64	M	40.182237°	-74.204476°		M				T												M										S												
Res	65	A				D		D										D																										
Res	65	B				D		D		S								M																										
Res	65	M	40.181829°	-74.204743°	9	D		D		T								D																										
Res	66	A				M		S						T				M																										
Res	66	B				M		S			T				T			S										T																
Res	66	M	40.181389°	-74.204766°		M		S			T			T	T			M										T																
Res	67	A																																										
Res	67	B																																										
Res	67	M	40.180894°	-74.2047°	16.8																																							
Res	68	A				T												T																										
Res	68	B				T		T										T																										
Res	68	M	40.180457°	-74.204715°	16.1	T		T										T																										
Res	69	A				T		T			T							T																										
Res	69	B				T		T										T																										
Res	69	M	40.180028°	-74.204781°	16.8	T		T			T							T																										
Res	70	A																																										
Res	70	B																																										
Res	70	M	40.179575°	-74.20528°	18.2																																							
Res	71	A																																										
Res	71	B																																										
Res	71	M	40.180063°	-74.205242°	17.6																																							
Res	72	A				S												S					T																					
Res	72	B				S		S										S					T																					
Res	72	M	40.180461°	-74.205258°	13.5	S		T										S					T																					
Res	73	A						T			S							S																										
Res	73	B				M												M																										
Res	73	M	40.180916°	-74.205322°	10.6	S		T			T							M																										
Res	74	A									S							M																										
Res	74	B				M		T										M																										
Res	74	M	40.181364°	-74.205258°	12	S		T			T							M																										
Res	75	A						S							T			D																										
Res	75	B				D		D						S				M																										
Res	75	M	40.181807°	-74.205331°	5	S		M						T	T			D																										
Res	76	A				M		S										S				M						T																
Res	76	B				D		M		S								M											S															
Res	76	M	40.181787°	-74.205867°	5	D		M		T								M				S						T	T															
Res	77	A						T										M										T																
Res	77	B				S		T			T				T			S																										
Res	77	M	40.181322°	-74.20581°	13.9	T		T			T				T			M										T																
Res	78	A																D																										
Res	78	B				S									S			S																										
Res	78	M	40.180899°	-74.205831°	11.1	T									T			M																										
Res	79	A				S												S																										
Res	79	B				T																						T																
Res	79	M	40.180463°	-74.205858°	13.6	S												T										T																
Res	80	A				T		T																																				
Res	80	B				T		T																				T																
Res	80	M	40.180021°	-74.205937°	16	T		T																				T																
Res	81	A																																										
Res	81	B																																										
Res	81	M	40.17954°	-74.205863°	18.9																																							
Res	82	A																																										
Res	82	B																																										
Res	82	M	40.179118°	-74.206509°	17.4																																							
Res	83	A																																										
Res	83	B																																										
Res	83	M	40.179585°	-74.206417°	18.4																																							
Res	84	A				T												T																										
Res	84	B				T												T																										
Res	84	M	40.180025°	-74.206531°	17.2	T												T																										

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SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD 83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER MOSS	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
Res	85	A				T		T																																				
Res	85	B				S		S										S																										
Res	85	M	40.180459°	-74.20643°	14.6	S		S										T																										
Res	86	A				T		T			T							T																										
Res	86	B				M												M																										
Res	86	M	40.180911°	-74.206478°	11.6	S		T			T							S																										
Res	87	A				D									T			D																										
Res	87	B				M					T			T				M																										
Res	87	M	40.181393°	-74.206522°	8	D					T			T	T			D																										
Res	88	A				S		S														M										T												
Res	88	B				S		S														S																						
Res	88	M	40.181748°	-74.206427°	5	S		S														M										T												
Res	89	A				-																																						
Res	89	B				-																																						
Res	89	M	40.182275°	-74.206474°																																								
Res	90	A				S												T				S													S									
Res	90	B				M												S				M										T			S									
Res	90	M	40.182261°	-74.207057°		M												S				M										T			S									
Res	91	A						S										T										T																
Res	91	B				S		S										T																										
Res	91	M	40.181829°	-74.207029°		T		S										T										T																
Res	92	A				D												D																										
Res	92	B				D												D																										
Res	92	M	40.181364°	-74.207038°	5	D												D																										
Res	93	A						T							T			T																										
Res	93	B				S		S										S																										
Res	93	M	40.180925°	-74.207052°	14.1	T		S							T			S																										
Res	94	A				S		T										S																										
Res	94	B				S		S																																				
Res	94	M	40.180456°	-74.207077°	14.1	S		S										T																										
Res	95	A																																										
Res	95	B				T		T																																				
Res	95	M	40.179988°	-74.207017°	16.5	T		T																																				
Res	96	A																																										
Res	96	B																																										
Res	96	M	40.179562°	-74.207022°	17.8																																							
Res	97	A																																										
Res	97	B																																										
Res	97	M	40.179134°	-74.207066°	17.5																																							
Res	98	A																																										
Res	98	B																																										
Res	98	M	40.179559°	-74.207629°	17.6																																							
Res	99	A				T		T																																				
Res	99	B				T		T																																				
Res	99	M	40.179993°	-74.207681°	15.3	T		T																																				
Res	100	A				T		T										T																										
Res	100	B																																										
Res	100	M	40.180461°	-74.207682°	14.5	T		T										T																										
Res	101	A				S		S			T							S																										
Res	101	B				S		T			T				S																													
Res	101	M	40.180914°	-74.207621°	13.8	S		S			T				T			T																										
Res	102	A				D												D																										
Res	102	B				D												D																										
Res	102	M	40.181373°	-74.20767°	10	D												D																										
Res	103	A				S		S										S										T																
Res	103	B				S		S										T																										
Res	103	M	40.181816°	-74.207631°	5	S		S										S										T																
Res	104	A				D												S				S							T			S			S									
Res	104	B				M												M				S										S			T									
Res	104	M	40.182486°	-74.207588°		D												M				S							T			S			S									
Res	105	A				D												D																										
Res	105	B				M												M																	T									
Res	105	M	40.182674°	-74.208214°		D												D																	T									

SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD 83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER MOSS	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
Res	106	A				-																																						
Res	106	B				-																																						
Res	106	M	40.182258°	-74.208214°																																								
Res	107	A				D								T				D																										
Res	107	B				D		D						S				S										S																
Res	107	M	40.18185°	-74.208205°		D		S						S				M										T																
Res	108	A				M												M																										
Res	108	B				M					S				T			S																										
Res	108	M	40.181388°	-74.20822°	9.9	M					T				T			M																										
Res	109	A				M		T		T								M																										
Res	109	B				S												S																										
Res	109	M	40.180884°	-74.208191°	7.8	M		T		T								M																										
Res	110	A				T		T			T							T																										
Res	110	B				S												S																										
Res	110	M	40.180473°	-74.20818°	14.7	S		T			T							S																										
Res	111	A				T									T																													
Res	111	B																																										
Res	111	M	40.18004°	-74.20825°	17.5	T									T																													
Res	112	A																																										
Res	112	B				T												T																										
Res	112	M	40.179577°	-74.208244°	17.2	T												T																										
Res	113	A				T		T																																				
Res	113	B																																										
Res	113	M	40.179562°	-74.208799°	16.9	T		T																																				
Res	114	A																																										
Res	114	B				T		T		T																																		
Res	114	M	40.180013°	-74.208776°	17	T		T		T																																		
Res	115	A				S		S																											T									
Res	115	B				S		S																																				
Res	115	M	40.180509°	-74.208808°	14.4	S		S																											T									
Res	116	A				S		S			T							S																	T									
Res	116	B				T												T																										
Res	116	M	40.180891°	-74.208732°	9.8	S		T			T							S																	T									
Res	117	A				S					S							S																										
Res	117	B				D												D																										
Res	117	M	40.181375°	-74.208807°	10.4	M					T							M																										
Res	118	A				M		M						T				S																										
Res	118	B				D		D										D																										
Res	118	M	40.181792°	-74.208841°	4	D		D						T				M																										
Res	119	A				D		D														M										M											T		
Res	119	B				D		D														D										S													
Res	119	M	40.182169°	-74.208782°		D		D														D										M											T		
Res	120	A				-																																						
Res	120	B				-																																						
Res	120	M	40.182268°	-74.209392°																																								
Res	121	A				S		S																																				
Res	121	B				S		S																																				
Res	121	M	40.18173°	-74.209496°	1	S		S																																				
Res	122	A				M												M																										
Res	122	B				D												D																										
Res	122	M	40.18134°	-74.209402°	7.2	D												D																										
Res	123	A				M												M																										
Res	123	B				S		T										S																										
Res	123	M	40.180913°	-74.209428°	8.1	M		T										M																										
Res	124	A				T												T										T																
Res	124	B																																										
Res	124	M	40.180469°	-74.209345°	15.7	T												T										T																
Res	125	A																																										
Res	125	B																																										
Res	125	M	40.180003°	-74.209368°	17.2																																							
Res	126	A																																										
Res	126	B																																										
Res	126	M	40.180045°	-74.210014°	18.4																																							

Manasquan Reservoir
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September 12-14 and 18, 2017

SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD 83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER MOSS	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
Res	127	A				T					T																																				
Res	127	B																																									
Res	127	M	40.18047°	-74.209949°	16.2	T					T																																				
Res	128	A				S												S																											
Res	128	B				T		T										T					T																						
Res	128	M	40.180907°	-74.209967°	12.6	S		T										S					T																						
Res	129	A				D												D																											
Res	129	B				D												D																											
Res	129	M	40.18137°	-74.209945°	4.6	D												D																											
Res	130	A				S		S														T										T										T		
Res	130	B				S		S										T										T																
Res	130	M	40.181803°	-74.209986°	1	S		S										T				T						T				T										T		
Res	131	A				-																																						
Res	131	B				-																																						
Res	131	M	40.18227°	-74.209998°																																								
Res	132	A				T		T																																					
Res	132	B				T		T																																					
Res	132	M	40.182264°	-74.210569°		T		T																																					
Res	133	A				S		S						T				S										T																
Res	133	B				M		M						T																															
Res	133	M	40.181786°	-74.210575°	4	M		M						T				T										T																
Res	134	A				S												S																	T									
Res	134	B				M												M																											
Res	134	M	40.181372°	-74.210578°	5	M												M																	T									
Res	135	A				M												M																											
Res	135	B				M												M					T																						
Res	135	M	40.180927°	-74.210586°	7.6	M												M					T																						
Res	136	A				S									T			S																											
Res	136	B				S					T				T			S																											
Res	136	M	40.180915°	-74.211199°	12.6	S					T				T			S																											
Res	137	A				S					T							S																											
Res	137	B				S												S																											
Res	137	M	40.181381°	-74.211128°	7.8	S					T							S																											
Res	138	A				S		T										S																											
Res	138	B				S		S										T																											
Res	138	M	40.181819°	-74.211128°	3.1	S		S										S																											
Res	139	A				S												S										T				T													
Res	139	B				M		S						T				M										T																
Res	139	M	40.182265°	-74.211149°	2	M		T						T				M										T				T													
Res	140	A				D		S										D																											
Res	140	B				D		T										D																											
Res	140	M	40.182242°	-74.211742°	5	D		S										D																											
Res	141	A				D					T							D																											
Res	141	B				D								S				D																											
Res	141	M	40.181852°	-74.21174°	7	D					T			T				D																											
Res	142	A				D		T										D																											
Res	142	B				D												D																											
Res	142	M	40.181364°	-74.2117°	8.2	D		T										D																											
Res	143	A				S		T										S																											
Res	143	B				S		T			T							S																											
Res	143	M	40.181803°	-74.212333°	11.4	S		T			T							S																											
Res	144	A				D												D																											
Res	144	B				D								T				D																											
Res	144	M	40.182294°	-74.212318°	6	D								T				D																											
Res	145	A				M												M																											
Res	145	B				D												D																											
Res	145	M	40.18275°	-74.212296°	2	D												D																											
Res	146	A				-																																						
Res	146	B				-																																						
Res	146	M	40.183181°	-74.212327°																																								
Res	147	A				-																																						
Res	147	B				-																																						
Res	147	M	40.183579°	-74.212207°																																								

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SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD 83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER MOSS	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
Res	148	A				-																																						
Res	148	B				-																																						
Res	148	M	40.183625°	-74.21291°																																								
Res	149	A				-																																						
Res	149	B				-																																						
Res	149	M	40.18323°	-74.212924°																																								
Res	150	A				D												D																										
Res	150	B				D												D																										
Res	150	M	40.182726°	-74.213004°		D												D																										
Res	151	A				M												M																										
Res	151	B				M												M																										
Res	151	M	40.182249°	-74.212943°	11.9	M												M																										
Res	152	A				M												M																										
Res	152	B				M												M																										
Res	152	M	40.182759°	-74.213529°	5.6	M												M																										
Res	153	A				D												D																										
Res	153	B				D												D																										
Res	153	M	40.183162°	-74.21348°		D												D																										
Res	154	A				M										T		T				M																				T		
Res	154	B				M										T		T				M																						
Res	154	M	40.183627°	-74.213517°		M										T		T				M																				T		
Res	155	A				M										T						M																				S		
Res	155	B				M										T						M																				T		
Res	155	M	40.183621°	-74.214088°		M										T						M																				S		
Res	156	A				D		S			T			T																														
Res	156	B				D		S																																				
Res	156	M	40.183182°	-74.214056°		D		S			T			T																														
Res	157	A				D																																						
Res	157	B				D																																						
Res	157	M	40.183197°	-74.214684°		D																																						
Res	158	A				M										T						M																				T		
Res	158	B				M																M																						
Res	158	M	40.183636°	-74.214677°		M										T						M																				T		
Res	159	A				-																																						
Res	159	B				-																																						
Res	159	M	40.184527°	-74.215271°																																								
Res	160	A				-																																						
Res	160	B				-																																						
Res	160	M	40.184089°	-74.215264°																																								
Res	161	A				S		S		T								M																										
Res	161	B				M					T			T				M																										
Res	161	M	40.183649°	-74.215211°	4	M		T		T	T			T				M																										
Res	162	A				D					T							D																										
Res	162	B				D												D																										
Res	162	M	40.18321°	-74.215238°		D					T							D																										
Res	163	A				D		S						S				D																										
Res	163	B				D		D										D																										
Res	163	M	40.183178°	-74.215834°		D		M						T				D																										
Res	164	A				D		S										D																										
Res	164	B				D		M										D																										
Res	164	M	40.183637°	-74.215857°		D		M										D																										
Res	165	A				-																																						
Res	165	B				-																																						
Res	165	M	40.18407°	-74.215852°																																								
Res	166	A				-																																						
Res	166	B				-																																						
Res	166	M	40.184536°	-74.215851°																																								
Res	167	A				S												S																										
Res	167	B				S		S										S																										
Res	167	M	40.184544°	-74.21643°		S		T										S																										
Res	168	A				S										T		S																	T									
Res	168	B				S		T										S																	T									
Res	168	M	40.184054°	-74.216446°		S		T								T		S																	T									

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September 12-14 and 18, 2017

SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD 83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER MOSS	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
Res	169	A				D												D																										
Res	169	B				D												D																										
Res	169	M	40.183627°	-74.216383°		D												D																										
Res	170	A				D												D																										
Res	170	B				D												D																										
Res	170	M	40.183192°	-74.216432°		D												D																										
Res	171	A				D		S										D																										
Res	171	B				M		T						T				M																										
Res	171	M	40.183604°	-74.217025°		D		S						T				D																										
Res	172	A				S												S																										
Res	172	B				M		M						T				M																										
Res	172	M	40.184058°	-74.217001°		M		S						T				M																										
Res	173	A				T												T											T						T									
Res	173	B				S		S						T				T																										
Res	173	M	40.184037°	-74.217671°		S		T						T				T											T						T									
Res	174	A				D		D										D																										
Res	174	B				D		D										D																										
Res	174	M	40.183645°	-74.217578°		D		D										D																										
Res	175	A				D		T			T							D																										
Res	175	B				D		S										D																										
Res	175	M	40.183592°	-74.218152°		D		S			T							D																										
Res	176	A				D		T										D																										
Res	176	B				D												D																										
Res	176	M	40.18316°	-74.218169°		D		T										D																										
Res	177	A				S		S			T							S																										
Res	177	B				S		S										S																										
Res	177	M	40.181833°	-74.217637°	6.6	S		S			T							S																										
Res	178	A				D		M										D																										
Res	178	B				D		D			S			T				D																										
Res	178	M	40.181899°	-74.218319°	8	D		D			T			T				D																										
Res	179	A				D					T							D																										
Res	179	B				D												D																										
Res	179	M	40.181966°	-74.218728°		D					T							D																										
Res	180	A				D		D										M																										
Res	180	B				D		D										S																										
Res	180	M	40.181854°	-74.219394°		D		D										M																										
Res	181	A				D		S										D																										
Res	181	B				M		T										M																										
Res	181	M	40.18138°	-74.219382°		D		S										D																										
Res	182	A				M		M										M																										
Res	182	B				M		S										M																										
Res	182	M	40.181393°	-74.218804°		M		M										M																										
Res	183	A				D					S							D																										
Res	183	B				D					S							D																										
Res	183	M	40.181414°	-74.218119°		D					S							D																										
Res	184	A				M												M																										
Res	184	B				M												M																										
Res	184	M	40.181412°	-74.217625°	6.5	M												M																										
Res	185	A				D												D																										
Res	185	B				D												D																										
Res	185	M	40.180921°	-74.217666°	6.3	D												D																										
Res	186	A				D		M										D																										
Res	186	B				D		S										D																										
Res	186	M	40.180933°	-74.218214°		D		M										D																										
Res	187	A				T		T										T																										
Res	187	B																																										
Res	187	M	40.180945°	-74.218799°		T		T										T																										
Res	188	A				T		T										T															T			T									
Res	188	B																																										
Res	188	M	40.180487°	-74.218711°		T		T										T															T			T									
Res	189	A				D												D																										
Res	189	B				D												D																										
Res	189	M	40.180502°	-74.218231°		D												D																										

SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD 83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER MOSS	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
Res	190	A				S		T			T				T			S																										
Res	190	B				S									T			S																										
Res	190	M	40.180495°	-74.217595°	11.1	S		T			T				T			S																										
Res	191	A				D								T				D																										
Res	191	B				D												D																										
Res	191	M	40.180066°	-74.218259°		D								T				D																										
Res	192	A				D		T										D																										
Res	192	B				D												D																										
Res	192	M	40.180067°	-74.218767°		D		T										D																										
Res	193	A				-																																						
Res	193	B				-																																						
Res	193	M	40.180055°	-74.219388°																																								
Res	194	A				D												D																										
Res	194	B				D												D																										
Res	194	M	40.179549°	-74.218865°		D												D																										
Res	195	A				T		T										T																										
Res	195	B																																										
Res	195	M	40.179591°	-74.219396°		T		T										T																										
Res	196	A				D												D																										
Res	196	B				D												D																										
Res	196	M	40.179159°	-74.219414°		D												D																										
Res	197	A				S		S										T																										
Res	197	B				D												D																										
Res	197	M	40.179187°	-74.2198°		M		T										M																										
Res	198	A				S								T	T			S																										
Res	198	B				S												S																										
Res	198	M	40.178729°	-74.221034°		S								T	T			S																										
Res	199	A				D												D																										
Res	199	B				D												D										T																
Res	199	M	40.178705°	-74.220545°		D												D										T																
Res	200	A				D		S										D																										
Res	200	B				D		S			T			T				D																										
Res	200	M	40.17869°	-74.220009°		D		S			T			T				D																										
Res	201	A				D		S										D										T																
Res	201	B				D												D																										
Res	201	M	40.178285°	-74.219961°		D		T										D										T																
Res	202	A				D					T							D																										
Res	202	B				D												D																										
Res	202	M	40.178369°	-74.21934°		D					T							D																										
Res	203	A				D												D																										
Res	203	B				D												D																										
Res	203	M	40.178656°	-74.21935°		D												D																										
Res	204	A				D		T			T							D																										
Res	204	B				D		S										D																										
Res	204	M	40.178711°	-74.218826°		D		S			T							D																										
Res	205	A				M		M						T				M										T																
Res	205	B				D		S						T				D																										
Res	205	M	40.178765°	-74.218203°		D		M						T				D										T																
Res	206	A				D		S										D																										
Res	206	B				D		D										D																										
Res	206	M	40.179144°	-74.217655°		D		M										D																										
Res	207	A				D		M			T			T				D																										
Res	207	B				D		S			T			T				D																										
Res	207	M	40.178715°	-74.217614°		D		M			T			T				D																										
Res	208	A				D												D																										
Res	208	B				D												D																										
Res	208	M	40.179158°	-74.217018°		D												D																										
Res	209	A				S								T		S		S				S										T			T									
Res	209	B				M												T														M												
Res	209	M	40.178792°	-74.21699°		M								T		T		S				T										S			T									
Res	210	A				S												S														T												
Res	210	B				M		S						T				M																										
Res	210	M	40.179123°	-74.216519°		M		T						T				M														T												

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SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD 83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER MOSS	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
Res	211	A				S					T							S																T										
Res	211	B				S												S																										
Res	211	M	40.179156°	-74.215897°	7.5	S					T							S																T										
Res	212	A				T		T																								T												
Res	212	B				T		T																										T										
Res	212	M	40.178695°	-74.21648°		T		T																								T		T										
Res	213	A																																										
Res	213	B				T								T																														
Res	213	M	40.178241°	-74.216992°	4	T								T																														
Res	214	A				T									T																													
Res	214	B				S									S			T																										
Res	214	M	40.177778°	-74.217078°	11.8	S									S			T																										
Res	215	A				D												D																										
Res	215	B				M								T				M																										
Res	215	M	40.177748°	-74.217683°	6.7	D								T				D																										
Res	216	A				S									S			T																										
Res	216	B				S									T			S																										
Res	216	M	40.17731°	-74.218179°	7	S									S			S																										
Res	217	A				T																										T												
Res	217	B				T																										T												
Res	217	M	40.17681°	-74.218611°	6.5	T																										T												
Res	218	A				S		S						T				T																										
Res	218	B				S					T							S																	T									
Res	218	M	40.176947°	-74.218256°	5.1	S		T			T			T				S																	T									
Res	219	A				T									T																													
Res	219	B				M									M			T																										
Res	219	M	40.176892°	-74.217633°	12	S									S			T																										
Res	220	A				S									S			T																										
Res	220	B				S									S			T																										
Res	220	M	40.176459°	-74.217023°	13.3	S									S			T																										
Res	221	A				S																												S										
Res	221	B				T																												T										
Res	221	M	40.176442°	-74.217702°	3	S																												S										
Res	222	A				-																																						
Res	222	B				-																																						
Res	222	M	40.175981°	-74.218241°																																								
Res	223	A				T																										T			T									
Res	223	B				T																								T			T												
Res	223	M	40.175976°	-74.217587°		T																								T			T			T									
Res	224	A				S								S																					S									
Res	224	B				S								T																					S									
Res	224	M	40.175976°	-74.217013°		S								S																					S									
Res	225	A				S				T				S				T																T	S									
Res	225	B				T								T				T																										
Res	225	M	40.175961°	-74.216506°	3.8	S				T				S				T																T	T									
Res	226	A				M																	M					M																
Res	226	B				S												S					T					T																
Res	226	M	40.175497°	-74.215818°		M												T					S					S																
Res	227	A				T		T										T																										
Res	227	B				S								S				T																										
Res	227	M	40.175466°	-74.216501°		S		T						T				T																										
Res	228	A				S		S		T				S				T										T																
Res	228	B				M		S						M				T																										
Res	228	M	40.175537°	-74.217125°		M		S		T				M				T										T																
Res	229	A				-																																						
Res	229	B				-																																						
Res	229	M	40.175528°	-74.217646°																																								
Res	230	A				-																																						
Res	230	B				-																																						
Res	230	M	40.175543°	-74.218243°																																								
Res	231	A				-																																						
Res	231	B				-																																						
Res	231	M	40.175538°	-74.218823°																																								

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SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD 83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER MOSS	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
Res	232	A				-																																						
Res	232	B				-																																						
Res	232	M	40.175086°	-74.218816°																																								
Res	233	A				-																																						
Res	233	B				-																																						
Res	233	M	40.175084°	-74.218245°																																								
Res	234	A				S		S														T				T								T										
Res	234	B				S		S						S				S										S																
Res	234	M	40.175124°	-74.217608°	6	S		S						T				T				T				T		T						T										
Res	235	A				M				S				T												M																		
Res	235	B				S								T				S										T																
Res	235	M	40.175076°	-74.217118°	5.7	M				T				T				T								S		T																
Res	236	A				S																						S																
Res	236	B				M												M					T					T																
Res	236	M	40.175085°	-74.216467°	8.2	M												S					T					S																
Res	237	A				M																	M					S																
Res	237	B				M																	M																					
Res	237	M	40.175059°	-74.215836°	8.9	M																	M					T																
Res	238	A				M																	M					M																
Res	238	B				S												S																										
Res	238	M	40.17465°	-74.216451°	9.2	M												T					S					S																
Res	239	A				M		S		S																S		M																
Res	239	B				S		S						T														T																
Res	239	M	40.174621°	-74.217032°	6.5	M		S		T				T												T		S																
Res	240	A				D		T		T				T				T								M		M																
Res	240	B				M		S						S														S																
Res	240	M	40.174631°	-74.217616°	4.9	D		S		T				S				T								S		M																
Res	241	A				-																																						
Res	241	B				-																																						
Res	241	M	40.17464°	-74.218247°																																								
Res	242	A				-																																						
Res	242	B				-																																						
Res	242	M	40.174641°	-74.218818°																																								
Res	243	A				-																																						
Res	243	B				-																																						
Res	243	M	40.174196°	-74.21882°																																								
Res	244	A				-																																						
Res	244	B				-																																						
Res	244	M	40.174195°	-74.218258°																																								
Res	245	A				S		S			T		T	S												T																		
Res	245	B				T					T			T																														
Res	245	M	40.174204°	-74.217689°	5.2	S		T			T		T	S												T																		
Res	246	A				D		S		T	T			T												M		M																
Res	246	B				S								T				T								S		T																
Res	246	M	40.174203°	-74.21698°	10.6	M		T		T	T			T				T								M		S																
Res	247	A				T				T								T																										
Res	247	B				S		S						T														S																
Res	247	M	40.173713°	-74.217115°	10.3	S		T		T				T				T										T																
Res	248	A				S		S	S		S			T	T											S		S																
Res	248	B				S			T					S												S																		
Res	248	M	40.173721°	-74.217698°	8.8	S		T	S		T			S	T											S		T																
Res	249	A				S					T			S				S								S		S																
Res	249	B				S				T	T							S								S		S																
Res	249	M	40.173744°	-74.218217°	8.3	S				T	T			T				S								S		S																
Res	250	A				M				S	S							S										S																
Res	250	B				S																				S		T																
Res	250	M	40.173737°	-74.218832°	6.5	M				T	T							T								T		S																
Res	251	A				M				T								T				M												T										
Res	251	B				S		S						T				S											T					T										
Res	251	M	40.173717°	-74.219321°	4	M		T		T				T				S				S							T					T										
Res	252	A				T								T														T																
Res	252	B																																										
Res	252	M	40.173284°	-74.218753°		T								T														T																

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SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD 83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER MOSS	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
Res	253	A				S		T										T								S		S																
Res	253	B				S								T														T																
Res	253	M	40.173265°	-74.218249°	5.2	S		T						T				T								T		S																
Res	254	A				S					T															S		S																
Res	254	B				M					T																	M																
Res	254	M	40.17283°	-74.218287°	7.7	M					T															T		M																
Res	255	A				T								T														T						T										
Res	255	B				M		M						T														T																
Res	255	M	40.172811°	-74.218894°		S		S						T														T						T										
Res	256	A				S		T														T										S										T		
Res	256	B				D		S						T				D								T																		
Res	256	M	40.172829°	-74.219463°		M		S						T				S				T				T						T										T		
Res	257	A				D								T				D																										
Res	257	B				M					T							M					T																					
Res	257	M	40.172364°	-74.219483°	4.7	D					T			T				D					T																					
Res	258	A				M					T							M																										
Res	258	B				S		S						T																		S												
Res	258	M	40.172456°	-74.219801°		M		T			T			T				S														T												
Res	259	A																																										
Res	259	B																																										
Res	259	M	40.171473°	-74.219383°																																								
Res	260	A				D				S	S			S	T			T								M		D																
Res	260	B				S		S						T														S																
Res	260	M	40.171473°	-74.218793°		M		T		T	T			S	T			T								S		M																
Res	261	A				S				T	T				T			S				S			S			T				T										T		
Res	261	B				S		S			S			T	T			T				S																						
Res	261	M	40.171103°	-74.218878°		S		T		T	S			T	T			S				S			T			T				T										T		
Res	262	A				M		S										S				M										S											S	
Res	262	B				M		M										S				S																					S	
Res	262	M	40.170582°	-74.218264°		M		M										S				M										T											S	
Res	263	A				T																												T	T									
Res	263	B				S		S														S																						
Res	263	M	40.171032°	-74.218239°		S		T														T												T	T									
Res	264	A				T												T								T		T																
Res	264	B				T		T										T																										
Res	264	M	40.171509°	-74.218276°	5.7	T		T										T								T		T																
Res	265	A				D					T			T				D																										
Res	265	B				S				T	S							T								S		S																
Res	265	M	40.171487°	-74.217664°		M				T	S			T				M								T		T																
Res	266	A				S				T				S				T										T																
Res	266	B				S		T						S				S																										
Res	266	M	40.171003°	-74.217674°		S		T		T				S				S										T																
Res	267	A				S		S										T				T										T												
Res	267	B				T		T																								T												
Res	267	M	40.170647°	-74.217095°		S		S										T				T										T												
Res	268	A				M					S			S				T								M		S																
Res	268	B				M		S			T			M				S																										
Res	268	M	40.171024°	-74.21711°		M		T			S			M				S								S		T																
Res	269	A				M			S	T	T			M	S			S																										
Res	269	B				M		S						M				S																										
Res	269	M	40.17147°	-74.21702°	7	M		T	T	T	T			M	T			S																										
Res	270	A				T								T	T																													
Res	270	B				S				T								S								T																		
Res	270	M	40.171975°	-74.217063°	8.3	S				T				T	T			T								T																		
Res	271	A				S		S			T							T														T			S									
Res	271	B				S		T						S																														
Res	271	M	40.171061°	-74.216455°		S		S			T			T				T														T			T									
Res	272	A				S		S								T		T														T												
Res	272	B				S		S								S																T												
Res	272	M	40.170675°	-74.216518°		S		S								S		T														T												
Res	273	A				M									M													S				T												
Res	273	B				D									D													T				T											T	
Res	273	M	40.170555°	-74.215905°		D									D													S				T											T	

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SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD 83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER MOSS	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
Res	274	A				D				S	S			S				M								T																		
Res	274	B				D					T			M				M																										
Res	274	M	40.17105°	-74.215937°		D				T	S			M				M								T																		
Res	275	A				S		T	T	S								T										S				S		T										
Res	275	B				S		S							T			T				T						T				S												
Res	275	M	40.171072°	-74.215323°		S		S	T	T					T			T				T						S				S		T										
Res	276	A				S								S				S					S					S						S										
Res	276	B				M								M				T					S																					
Res	276	M	40.171506°	-74.215301°	8	M								M				S					S					T						T										
Res	277	A				M				T	T							S								M																		
Res	277	B				M				T								T								M		T																
Res	277	M	40.171944°	-74.215291°	16.8	M				T	T							S								M		T																
Res	278	A				D												D																										
Res	278	B				D												D																										
Res	278	M	40.171976°	-74.214754°	9.2	D												D																										
Res	279	A				S		S								T																S										T		
Res	279	B				S		S							T																	S										T		
Res	279	M	40.171467°	-74.214778°		S		S							T	T																S										T		
Res	280	A				S			S					S	T			S								S																		
Res	280	B				M								S	M			M														T					T						T	
Res	280	M	40.171145°	-74.214645°		M			T					S	S			M								T						T					T						T	
Res	281	A				S		S						S	T							S																				T		
Res	281	B				M								S	T			M										T																
Res	281	M	40.171599°	-74.21424°		M		T						S	T			S				T						T														T		
Res	282	A				M					S			T				M																										
Res	282	B				M		T						M				T																										
Res	282	M	40.171933°	-74.214156°		M		T			T			S				S																										
Res	283	A				S												S																										
Res	283	B				S												S																										
Res	283	M	40.172438°	-74.213518°	10.8	S												S																										
Res	284	A				T								T											T							T		T										
Res	284	B				S		T																	T							S												
Res	284	M	40.172366°	-74.212988°		S		T						T											T							S		T										
Res	285	A				S								S				S																										
Res	285	B				S								S															T															
Res	285	M	40.17275°	-74.212941°		S								S				T											T															
Res	286	A				M				S	T							S								S								S										
Res	286	B				M																												M										
Res	286	M	40.173307°	-74.212399°		M				T	T							T								T								M										
Res	287	A				M		T		S	T			S				S								S		T																
Res	287	B				S								T				S								S																		
Res	287	M	40.172873°	-74.212433°		M		T		T	T			S				S								S		T																
Res	288	A				M					S							M					T																					
Res	288	B				M								S				M					T																					
Res	288	M	40.172418°	-74.212354°		M					T			T				M					T																					
Res	289	A				S																	T											S										
Res	289	B				S								S																				S										
Res	289	M	40.171911°	-74.212501°		S								T									T											S										
Res	290	A				M		T								M																S										T		
Res	290	B				M										M																T												
Res	290	M	40.171536°	-74.212353°		M		T								M																S										T		
Res	291	A				T								T														T								T								
Res	291	B				M								M																														
Res	291	M	40.171962°	-74.21178°		S								S														T								T								
Res	292	A																																										
Res	292	B																																										
Res	292	M	40.17193°	-74.211223°																																								
Res	293	A				T										T																												
Res	293	B				T										T						T										T		T										
Res	293	M	40.172019°	-74.210611°		T										T						T										T		T										
Res	294	A				T				T																										T								
Res	294	B				S				S																																		
Res	294	M	40.172434°	-74.210643°	10.5	S				S																										T								

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SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD 83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER MOSS	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
Res	295	A				S				T								S										T																
Res	295	B				S												S								S																		
Res	295	M	40.172362°	-74.210032°	10.7	S				T								S								T		T																
Res	296	A				S												S					S					T								S								
Res	296	B				S		S						S				S																										
Res	296	M	40.172362°	-74.209437°	11	S		T						T				S					T					T								T								
Res	297	A																																										
Res	297	B				S								S				T																										
Res	297	M	40.172833°	-74.208845°		T								T				T																										
Res	298	A				-																																						
Res	298	B				-																																						
Res	298	M	40.172911°	-74.208182°																																								
Res	299	A				M				T	T							T								M		S																
Res	299	B				S		T		S	S																																	
Res	299	M	40.1733°	-74.208247°		M		T		S	S							T								S		T																
Res	300	A				S												S					T																					
Res	300	B				M																	T											M										
Res	300	M	40.173254°	-74.20767°	17.8	M												T					T											S										
Res	301	A				M								S				M								T								T										
Res	301	B				S								S				S																										
Res	301	M	40.172809°	-74.20773°		M								S				M								T								T										
Res	302	A				S				T	T							T								S																		
Res	302	B				S												S					T			S		T																
Res	302	M	40.172355°	-74.207696°		S				T	T							S					T			S		T																
Res	303	A				M												M							T				T			S			S									
Res	303	B				S												S				T							T					T										
Res	303	M	40.171958°	-74.208219°		M												M				T			T				T			T		T	T									
Res	304	A				M		S						T				M											T															
Res	304	B				S		S						T				T																										
Res	304	M	40.172024°	-74.207628°		M		S						T				S											T															
Res	305	A				T												T																										
Res	305	B				T												T																										
Res	305	M	40.172363°	-74.207079°	18.8	T												T																										
Res	306	A				S				S								T														S		S										
Res	306	B				S		S																					T			T		T										
Res	306	M	40.17202°	-74.206525°		S		T		T								T											T			S		S										
Res	307	A																																										
Res	307	B																																										
Res	307	M	40.172342°	-74.20594°	8.3																																							
Res	308	A				S												S					T					T																
Res	308	B				T												T					T									T												
Res	308	M	40.172366°	-74.205335°	6.8	S												S					T					T				T												
Res	309	A				D												D										S						S										
Res	309	B				T												T																T										
Res	309	M	40.172791°	-74.204141°		M												M										T						S										
Res	310	A				D												D																										
Res	310	B				D												S										M						M										
Res	310	M	40.17282°	-74.203592°	18.1	D												M										S						S										
Res	311	A				D									T			D																										
Res	311	B				D							T					D					T																					
Res	311	M	40.172368°	-74.203564°		D							T		T			D					T																					
Res	312	A				S				T								S										T						S	T									
Res	312	B				M				T								M																										
Res	312	M	40.17236°	-74.202995°		M				T								M										T						T	T									
Res	313	A				S					T							T								S								S										
Res	313	B				S					S			T				T								T								T										
Res	313	M	40.172359°	-74.20241°		S					S			T				T								S								S										
Res	314	A				S				T				T	T			T											S															
Res	314	B				S		S						S				S										T																
Res	314	M	40.171882°	-74.201801°		S		T		T				S	T			S										T	T															
Res	315	A				D																D																						
Res	315	B				S		S														S																						
Res	315	M	40.171535°	-74.201202°		M		T														M																						

Manasquan Reservoir
Aquatic Vegetation Survey
September 12-14 and 18, 2017

SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD 83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER MOSS	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
Res	316	A				D												S											D								T							
Res	316	B				M												M																										
Res	316	M	40.171473°	-74.200683°		D												M											S								T							
Res	317	A				M				T	T			T	S			S																		S								
Res	317	B				M		M						T				T					T			S																		
Res	317	M	40.171617°	-74.199959°		M		S		T	T			T	T			S					T			T										T								
Res	318	A				M		S						M																														
Res	318	B				M		M						M																														
Res	318	M	40.171905°	-74.200081°	12	M		M						M																														
Res	319	A				S				T								S										S						T										
Res	319	B				S				S								S								T		T																
Res	319	M	40.172325°	-74.199974°	12	S				S								S								T		S						T										
Res	320	A																																										
Res	320	B																																										
Res	320	M	40.172425°	-74.199522°																																								
Res	321	A																																										
Res	321	B																																										
Res	321	M	40.17278°	-74.199521°																																								
Res	322	A				T												T										T																
Res	322	B																																										
Res	322	M	40.173221°	-74.19948°		T												T										T																
Res	323	A				T																												T										
Res	323	B				T																												T										
Res	323	M	40.17373°	-74.199439°		T																												T										
Res	324	A				D												D																										
Res	324	B				D												D																										
Res	324	M	40.173696°	-74.198877°		D												D																										
Res	325	A				-																																						
Res	325	B				-																																						
Res	325	M	40.173243°	-74.198877°																																								
Res	326	A				S								S				S																	T									
Res	326	B				S								S				T																										
Res	326	M	40.173689°	-74.198307°		S								S				S																	T									
Res	327	A																																										
Res	327	B																																										
Res	327	M	40.175954°	-74.196499°																																								
Res	328	A																																										
Res	328	B																																										
Res	328	M	40.176406°	-74.195915°																																								
Res	329	A																																										
Res	329	B																																										
Res	329	M	40.175969°	-74.195882°																																								
Res	330	A				S												S										T																
Res	330	B				T												T																										
Res	330	M	40.175494°	-74.195912°	11.6	S												S										T																
Res	331	A				T												T										T																
Res	331	B				T								T				T																										
Res	331	M	40.175013°	-74.195931°		T								T				T										T																
Res	332	A				T																T																						
Res	332	B																																										
Res	332	M	40.175435°	-74.195334°		T																T																						
Res	333	A				D												T					T					D																
Res	333	B				M												T					S					M																
Res	333	M	40.175973°	-74.195378°		D												T					S					D																
Res	334	A																																										
Res	334	B																																										
Res	334	M	40.176345°	-74.195325°																																								
Res	335	A																																										
Res	335	B																																										
Res	335	M	40.175932°	-74.194851°																																								
Res	336	A				S								T				S										T																
Res	336	B				D												D								T		S						T										
Res	336	M	40.176383°	-74.194708°		M								T				M								T		S						T										

Manasquan Reservoir
Aquatic Vegetation Survey
September 12-14 and 18, 2017

SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD 83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER MOSS	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
Res	337	A																																										
Res	337	B																																										
Res	337	M	40.176812°	-74.194706°																																								
Res	338	A																																										
Res	338	B																																										
Res	338	M	40.17735°	-74.194713°																																								
Res	339	A																																										
Res	339	B																																										
Res	339	M	40.177337°	-74.194224°																																								
Res	340	A				T				T																																		
Res	340	B																																										
Res	340	M	40.176856°	-74.194169°		T				T																																		
Res	341	A				-																																						
Res	341	B				-																																						
Res	341	M	40.176512°	-74.194158°																																								
Res	342	A				T								T														T																
Res	342	B																																										
Res	342	M	40.176855°	-74.193622°		T								T														T																

Manasquan Wetland 1
Aquatic Macrophyte Abundance Distribution
September 18, 2017

	Total		Trace		Sparse		Medium		Dense	
	Sites	%	Sites	%	Sites	%	Sites	%	Sites	%
Total Sites	15									
OVERALL	14	93%	3	21%	6	43%	3	21%	2	14%
WHITE WATER LILY	9	60%	1	11%	6	67%	0	0%	2	22%
SMALL DUCKWEED	6	40%	6	100%	0	0%	0	0%	0	0%
SPIKERUSH	5	33%	2	40%	3	60%	0	0%	0	0%
GREATER DUCKWEED	4	27%	4	100%	0	0%	0	0%	0	0%
COMMON BLADDERWORT	3	20%	2	67%	1	33%	0	0%	0	0%
WATER SHIELD	3	20%	2	67%	0	0%	1	33%	0	0%
BENTHIC FILAMENTOUS ALGAE	2	13%	0	0%	2	100%	0	0%	0	0%
WATER PRIMROSE	2	13%	0	0%	1	50%	1	50%	0	0%
COONTAIL	1	7%	0	0%	1	100%	0	0%	0	0%
NORTHERN NAIAD	1	7%	1	100%	0	0%	0	0%	0	0%
WILD CELERY	1	7%	1	100%	0	0%	0	0%	0	0%
COMMON WATERWEED	0	0%	0	0%	0	0%	0	0%	0	0%
CREEPING BLADDERWORT	0	0%	0	0%	0	0%	0	0%	0	0%
CURLY-LEAF PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
EURASIAN WATER MILFOIL	0	0%	0	0%	0	0%	0	0%	0	0%
FANWORT	0	0%	0	0%	0	0%	0	0%	0	0%
GOLDEN HEDGE HYSSOP	0	0%	0	0%	0	0%	0	0%	0	0%
HYDRILLA	0	0%	0	0%	0	0%	0	0%	0	0%
INTERMEDIA BLADDERWORT	0	0%	0	0%	0	0%	0	0%	0	0%
LEAFY PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
LOW WATER MILFOIL	0	0%	0	0%	0	0%	0	0%	0	0%
MUDMAT	0	0%	0	0%	0	0%	0	0%	0	0%
MUSKGRASS	0	0%	0	0%	0	0%	0	0%	0	0%
NAIAD SP.	0	0%	0	0%	0	0%	0	0%	0	0%
ARROWHEAD	0	0%	0	0%	0	0%	0	0%	0	0%
SLENDER NAIAD	0	0%	0	0%	0	0%	0	0%	0	0%
SMALL PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
SNAILSEED PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
SOUTHERN NAIAD	0	0%	0	0%	0	0%	0	0%	0	0%
SPATTERDOCK	0	0%	0	0%	0	0%	0	0%	0	0%
SPINY HORNWORT	0	0%	0	0%	0	0%	0	0%	0	0%
STONEWORT	0	0%	0	0%	0	0%	0	0%	0	0%
THIN-LEAF PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
WATER-BULRUSH	0	0%	0	0%	0	0%	0	0%	0	0%
WATERMEAL	0	0%	0	0%	0	0%	0	0%	0	0%
WATERMOSS	0	0%	0	0%	0	0%	0	0%	0	0%
WATERTHREAD	0	0%	0	0%	0	0%	0	0%	0	0%
WATERWORT	0	0%	0	0%	0	0%	0	0%	0	0%

Manasquan Wetland 1
Aquatic Vegetation Survey
September 18, 2017

SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERMOSS	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
W1	1	A				T																			T							T												T
W1	1	B				T																			T							T												T
W1	1	M	40.184527°	-74.205867°	0.17	T																			T							T												T
W1	2	A																																										
W1	2	B				T																					T																T	
W1	2	M	40.184061°	-74.205922°	1.5	T																					T																T	
W1	3	A																																										
W1	3	B				T																										T												
W1	3	M	40.183614°	-74.205881°	2	T																										T												
W1	4	A				S											T										T																S	
W1	4	B				S											T										T																S	
W1	4	M	40.183629°	-74.205291°	2	S											T										T																S	
W1	5	A																																										
W1	5	B																																										
W1	5	M	40.183512°	-74.204675°	2																																							
W1	6	A				D			S		T																																D	
W1	6	B				D			S		S																																D	
W1	6	M	40.183623°	-74.204121°	2	D			S		S																																D	
W1	7	A				S																										S				S								
W1	7	B				S																										S				T								
W1	7	M	40.183573°	-74.207038°	0.17	S																										S				S								
W1	8	A				S																										S												
W1	8	B				S																										S												
W1	8	M	40.183991°	-74.206436°	0.33	S																										S												
W1	9	A				D			T																																		D	
W1	9	B				D																																					D	
W1	9	M	40.184049°	-74.204153°	3.5	D			T																																		D	
W1	10	A				S		S	T																																		S	
W1	10	B				S		S																																			S	
W1	10	M	40.184043°	-74.204662°	3.5	S		S	T																																		S	
W1	11	A				S		S																			T																S	
W1	11	B				S		S																																			T	
W1	11	M	40.18432°	-74.204636°	2	S		S																			T																S	
W1	12	A				S											T										T										T						S	
W1	12	B				T																																					T	
W1	12	M	40.184484°	-74.205302°	1.5	S											T										T										T						S	
W1	13	A				S											T										T										S						S	
W1	13	B				M																					T										M						T	
W1	13	M	40.184022°	-74.205294°	3.5	M											T										T										M						S	
W1	14	A				S											T										T																S	
W1	14	B				M																																					T	
W1	14	M	40.183598°	-74.206423°	1	M											T										T																S	
W1	15	A				M																										S				M	S							
W1	15	B				S																										S				S								
W1	15	M	40.184466°	-74.206426°	0.17	M																										S				M	T							

Manasquan Wetland 2
Aquatic Macrophyte Abundance Distribution
September 12, 2017

	Total		Trace		Sparse		Medium		Dense	
	Sites	%	Sites	%	Sites	%	Sites	%	Sites	%
Total Sites	56									
OVERALL	56	100%	2	4%	2	4%	26	46%	26	46%
FANWORT	44	79%	12	27%	11	25%	12	27%	9	20%
COMMON BLADDERWORT	34	61%	15	44%	9	26%	7	21%	3	9%
CREEPING BLADDERWORT	30	54%	21	70%	7	23%	2	7%	0	0%
WATER SHIELD	25	45%	2	8%	6	24%	3	12%	14	56%
BENTHIC FILAMENTOUS ALGAE	22	39%	9	41%	4	18%	8	36%	1	5%
WHITE WATER LILY	20	36%	3	15%	6	30%	9	45%	2	10%
SPINY HORNWORT	19	34%	15	79%	4	21%	0	0%	0	0%
SPIKERUSH	18	32%	11	61%	4	22%	3	17%	0	0%
WATERMEAL	17	30%	9	53%	7	41%	0	0%	1	6%
MUDMAT	14	25%	5	36%	3	21%	5	36%	1	7%
WATERTHREAD	12	21%	7	58%	3	25%	0	0%	2	17%
INTERMEDIA BLADDERWORT	8	14%	7	88%	1	13%	0	0%	0	0%
COONTAIL	4	7%	2	50%	1	25%	1	25%	0	0%
HYDRILLA	4	7%	2	50%	1	25%	0	0%	1	25%
WATER PRIMROSE	3	5%	1	33%	1	33%	1	33%	0	0%
COMMON WATERWEED	2	4%	2	100%	0	0%	0	0%	0	0%
SMALL DUCKWEED	2	4%	2	100%	0	0%	0	0%	0	0%
LEAFY PONDWEED	1	2%	0	0%	0	0%	0	0%	1	100%
MUSKGRASS	1	2%	0	0%	1	100%	0	0%	0	0%
SPATTERDOCK	1	2%	1	100%	0	0%	0	0%	0	0%
ARROWHEAD	0	0%	0	0%	0	0%	0	0%	0	0%
CURLY-LEAF PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
EURASIAN WATER MILFOIL	0	0%	0	0%	0	0%	0	0%	0	0%
GREATER DUCKWEED	0	0%	0	0%	0	0%	0	0%	0	0%
HEDGE HYSSOP	0	0%	0	0%	0	0%	0	0%	0	0%
LOW WATER MILFOIL	0	0%	0	0%	0	0%	0	0%	0	0%
NAIAD SP.	0	0%	0	0%	0	0%	0	0%	0	0%
NORTHERN NAIAD	0	0%	0	0%	0	0%	0	0%	0	0%
SLENDER NAIAD	0	0%	0	0%	0	0%	0	0%	0	0%
SMALL PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
SNAILSEED PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
SOUTHERN NAIAD	0	0%	0	0%	0	0%	0	0%	0	0%
STONEWORT	0	0%	0	0%	0	0%	0	0%	0	0%
THIN-LEAF PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
WATER-BULRUSH	0	0%	0	0%	0	0%	0	0%	0	0%
WATERMOSS	0	0%	0	0%	0	0%	0	0%	0	0%
WATERWORT	0	0	0	0%	0	0%	0	0%	0	0%
WILD CELERY	0	0	0	0%	0	0%	0	0%	0	0%

Manasquan Wetland 2
Aquatic Vegetation Survey
September 12, 2017

SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERMOSS	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
W2	1	A				D			S						M																						D		S				M	
W2	1	B				D			S						M																						D		S				M	
W2	1	M	40.185913°	-74.227001°	1.5	D			S						M																						D		S				M	
W2	2	A				D			S						D																						S						M	
W2	2	B				D			S			T			D																						S		T				M	
W2	2	M	40.185902°	-74.226404°	1.5	D			S			T			D																						S		T				M	
W2	3	A				D			T			T			D																		T				T		T				D	
W2	3	B				M			T						M																						T		T				M	
W2	3	M	40.185919°	-74.225829°	0.5	D			T			T			D																		T				T		T				D	
W2	4	A				D			S			T			M																						D						M	
W2	4	B				D			S			T			M																						D						M	
W2	4	M	40.185917°	-74.225242°	0.5	D			S			T			M																						D						M	
W2	5	A				D			T			T							T																		D							
W2	5	B				D			T			T							T																		D							
W2	5	M	40.186358°	-74.225218°	1.5	D			T			T							T																		D							
W2	6	A				D						T			S																		T										D	
W2	6	B				D									S																												D	
W2	6	M	40.185459°	-74.225233°	1.5	D						T			S																		T										D	
W2	7	A				D			T			S			D																													
W2	7	B				D						S			D																													
W2	7	M	40.185008°	-74.224648°	1.5	D			T			S			D																													
W2	8	A				D			M			T			S				T														T				D		T					
W2	8	B				D						T			S				T																		D		T					
W2	8	M	40.185432°	-74.22458°	1.5	D			S			T			S				T														T				D		T					
W2	9	A				D						S							T																		D						T	
W2	9	B				D						S							T																		D						T	
W2	9	M	40.185887°	-74.224646°	0.5	D						S							T																		D						T	
W2	10	A				D						M																									D						M	
W2	10	B				D																															D							
W2	10	M	40.185763°	-74.223921°	2	D						S																									D						S	
W2	11	A				D		S	D						D																		S						T		D			
W2	11	B				D		S	D			T			D																		S						T		D			
W2	11	M	40.185441°	-74.224078°	0.5	D		S	D			T			D																		S						T		D			
W2	12	A				D			S			T			S							T										M				S	D		T				M	
W2	12	B				D			S			T			S							T										M				S	D						M	
W2	12	M	40.185017°	-74.224038°	0.5	D			S			T			S							T										M				S	D		T				M	
W2	13	A				D			S			T																									D				D		T	
W2	13	B				D			S			T																									D				D			
W2	13	M	40.185458°	-74.223487°	0.5	D			S			T																									D				D		T	
W2	14	A				D		T	D			S			D				T														T				M		T				M	
W2	14	B				D			D			S			D																								S					
W2	14	M	40.184871°	-74.22353°	1.5	D		T	D			S			D				T														T				S		S				S	
W2	15	A				D						S							M														T				D		S					
W2	15	B				D																															D		T					
W2	15	M	40.18451°	-74.223427°		D						T							S														T				D		S					
W2	16	A				D						S			D																	T				T			S				M	
W2	16	B				D									D																					T			S					
W2	16	M	40.184222°	-74.223996°		D						T			D																	T				T			S				S	
W2	17	A				D			T			T			S																		T				D		T					
W2	17	B				D			T			T			S																						D							
W2	17	M	40.18416°	-74.223357°		D			T			T			S																		T				D		T					
W2	18	A				T		T							T																	T												
W2	18	B				T																										T												
W2	18	M	40.183157°	-74.223473°		T		T							T																	T												
W2	19	A				T													T													T												
W2	19	B				T													T													T												
W2	19	M	40.183706°	-74.223569°		T													T													T												
W2	20	A				D						T			T																		S				D							
W2	20	B				D																											S				D							
W2	20	M	40.183565°	-74.222924°	2	D						T			T																		S				D							
W2	21	A				M									T							M																						

Manasquan Wetland 2
Aquatic Vegetation Survey
September 12, 2017

SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERMOSS	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
W2	21	B				M																M																						
W2	21	M	40.183062°	-74.222907°	2	M									T							M																						
W2	22	A				M		T	S			S			M																		S				M						M	
W2	22	B				M		T	S			S			M																		S				M							
W2	22	M	40.182819°	-74.223065°	0.5	M		T	S			S			M																		S				M						S	
W2	23	A				D									D							D									T					M	M		T				T	
W2	23	B				D						T			D							D														S			T		S			
W2	23	M	40.182269°	-74.222395°	0.5	D						T			D							D									T					M	S		T		T		T	
W2	24	A				M		S	M						M			T																										
W2	24	B				M		S							M			T																										
W2	24	M	40.182807°	-74.222336°	0.5	M		S	S						M			T																										
W2	25	A				M			M						M			S															T				M		T				M	
W2	25	B				M			M						M																		T				M		T				M	
W2	25	M	40.183197°	-74.222333°	1.5	M			M						M			T															T				M		T				M	
W2	26	A				M		M	M						M																		T											
W2	26	B				M			M						M																													
W2	26	M	40.184076°	-74.22236°	0.5	M		S	M						M																		T											
W2	27	A				M																M										T											S	
W2	27	B				S																S																					S	
W2	27	M	40.18464°	-74.222204°	0.5	M																M										T											S	
W2	28	A				M			T	T		T			S																	S					S				M		M	
W2	28	B				M																T										S					S						M	
W2	28	M	40.184554°	-74.221679°	0.5	M			T	T		T			T							T										S					S				S		M	
W2	29	A				M		M																									T											
W2	29	B				M		M																									T											
W2	29	M	40.184151°	-74.221755°	0.5	M		M																									T											
W2	30	A				M			M						T																		T											
W2	30	B				M			M						T																		T											
W2	30	M	40.183655°	-74.221722°	1.5	M			M						T																		T											
W2	31	A				M			S						M																		T											
W2	31	B				S									S																		S											
W2	31	M	40.183213°	-74.221708°	2	M			T						M																		S											
W2	32	A				M		M	S						T																	T												
W2	32	B				S									S																													
W2	32	M	40.18269°	-74.221762°		M		S	T						S																	T												
W2	33	A				D									S					D		T															M		D				S	
W2	33	B				D		S				T			S					D																			D		T		S	
W2	33	M	40.182095°	-74.221731°		D		T				T			S					D		T															S		D		T		S	
W2	34	A				M						M			T							M											T								T			
W2	34	B				M						M										M										T									T			
W2	34	M	40.182294°	-74.221077°		M						M			T							M										T	T								T			
W2	35	A				M			M			M			T																	T	T								T			
W2	35	B				M			M			M																													T			
W2	35	M	40.182785°	-74.221116°		M			M			M			T																	T	T								T			
W2	36	A				M			M																								S											
W2	36	B				S			S																																			
W2	36	M	40.183178°	-74.220964°		M			M																								T											
W2	37	A				S			T																																S			
W2	37	B				S																																			S			
W2	37	M	40.183657°	-74.221108°	1.5	S			T																																S			
W2	38	A				M		S	T			T			T																	M											M	
W2	38	B				M																										M											M	
W2	38	M	40.184174°	-74.22104°	0.5	M		T	T			T			T																	M											M	
W2	39	A				M		M	T			T			T																										T		M	
W2	39	B				M		M				T			T																												M	
W2	39	M	40.184135°	-74.22056°		M		M	T			T			T																										T		M	
W2	40	A				M		M							T							T										T												
W2	40	B				M		M														T										T												
W2	40	M	40.183635°	-74.220534°		M		M							T							T										T												
W2	41	A				M			M						M				T																									
W2	41	B				M			M						M																													

Manasquan Wetland 2
Aquatic Vegetation Survey
September 12, 2017

SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERMOSS	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
W2	41	M	40.183116°	-74.220541°	1.5	M			M						M				T																									
W2	42	A				M		T	M						S				T																									
W2	42	B				M			M						T				T																									
W2	42	M	40.182697°	-74.220576°		M		T	M						S				T																									
W2	43	A				M		T	T	T					M							S	S									S									T			
W2	43	B				S									S							S	S									S									S			
W2	43	M	40.182203°	-74.220542°		M		T	T	T					M							S	S									S									S			
W2	44	A				S			T			T			S																		T				D		T					
W2	44	B				D			T						S																		T				D		T					
W2	44	M	40.181915°	-74.22057°		M			T			T			S																		T				D		T					
W2	45	A				D			T		T	S			M																						D		S					
W2	45	B				D					T																T										D		S					
W2	45	M	40.181818°	-74.219992°		D			T		T	T			S												T										D		S					
W2	46	A				D			T			S			T																		S				D		S					
W2	46	B				D			T						T																						D		S					
W2	46	M	40.182333°	-74.219807°		D			T			T			T																		T				D		S					
W2	47	A				D		D	D			S			M																													
W2	47	B				D		D	D			S			M																													
W2	47	M	40.182852°	-74.220029°		D		D	D			S			M																													
W2	48	A				M		M			T				S																	T												
W2	48	B				T		S			T				S																													
W2	48	M	40.18326°	-74.219985°		S		M			T				S																	T												
W2	49	A				M		S														M										S												
W2	49	B				M																M										S												
W2	49	M	40.183695°	-74.219935°		M		T														M										S												
W2	50	A				M		M	S						M							M										S									T			
W2	50	B				M		M	S						M																													
W2	50	M	40.184149°	-74.21989°		M		M	S						M							S										T									T			
W2	51	A				M		M							S							T										M					T				T			
W2	51	B				M		M							S							T															T							
W2	51	M	40.184095°	-74.219356°		M		M							S							T										S					T				T			
W2	52	A				M		M							T							M										M												
W2	52	B				M		M														S										S												
W2	52	M	40.18391°	-74.218838°		M		M							T							M										M												
W2	53	A				M		M														T										T												
W2	53	B				S		S														S										T												
W2	53	M	40.183572°	-74.219251°		M		M														S										T												
W2	54	A				D		S			S				D			S																										
W2	54	B				D					S				D			S																										
W2	54	M	40.183083°	-74.219377°		D		T			S				D			S																										
W2	55	A				D			T		M	S			M																						D		M					
W2	55	B				M					M	S			M																													
W2	55	M	40.182727°	-74.219471°		D			T		M	S			M																						S		S					
W2	56	A				D									D			D									T										M						M	
W2	56	B				D									D			D									T										M						M	
W2	56	M	40.182819°	-74.219313°		D									D			D									T										M						M	

Manasquan Wetland 3
Aquatic Macrophyte Abundance Distribution
September 18, 2017

	Total		Trace		Sparse		Medium		Dense	
	Sites	%	Sites	%	Sites	%	Sites	%	Sites	%
Total Sites	15									
OVERALL	15	100%	0	0%	1	7%	2	13%	12	80%
WHITE WATER LILY	15	100%	1	7%	1	7%	4	27%	9	60%
BENTHIC FILAMENTOUS ALGAE	13	87%	1	8%	5	38%	2	15%	5	38%
COMMON BLADDERWORT	12	80%	1	8%	6	50%	1	8%	4	33%
WATER SHIELD	6	40%	1	17%	1	17%	1	17%	3	50%
SPIKERUSH	2	13%	1	50%	1	50%	0	0%	0	0%
MUDMAT	1	7%	0	0%	1	100%	0	0%	0	0%
ARROWHEAD	0	0%	0	0%	0	0%	0	0%	0	0%
COMMON WATERWEED	0	0%	0	0%	0	0%	0	0%	0	0%
COONTAIL	0	0%	0	0%	0	0%	0	0%	0	0%
CREEPING BLADDERWORT	0	0%	0	0%	0	0%	0	0%	0	0%
CURLY-LEAF PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
EURASIAN WATER MILFOIL	0	0%	0	0%	0	0%	0	0%	0	0%
FANWORT	0	0%	0	0%	0	0%	0	0%	0	0%
GREATER DUCKWEED	0	0%	0	0%	0	0%	0	0%	0	0%
HEDGE HYSSOP	0	0%	0	0%	0	0%	0	0%	0	0%
HYDRILLA	0	0%	0	0%	0	0%	0	0%	0	0%
INTERMEDIA BLADDERWORT	0	0%	0	0%	0	0%	0	0%	0	0%
LEAFY PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
LOW WATER MILFOIL	0	0%	0	0%	0	0%	0	0%	0	0%
MUSKGRASS	0	0%	0	0%	0	0%	0	0%	0	0%
NAIAD SP.	0	0%	0	0%	0	0%	0	0%	0	0%
NORTHERN NAIAD	0	0%	0	0%	0	0%	0	0%	0	0%
SLENDER NAIAD	0	0%	0	0%	0	0%	0	0%	0	0%
SMALL DUCKWEED	0	0%	0	0%	0	0%	0	0%	0	0%
SMALL PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
SNAILSEED PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
SOUTHERN NAIAD	0	0%	0	0%	0	0%	0	0%	0	0%
SPATTERDOCK	0	0%	0	0%	0	0%	0	0%	0	0%
SPINY HORNWORT	0	0%	0	0%	0	0%	0	0%	0	0%
STONEWORT	0	0%	0	0%	0	0%	0	0%	0	0%
THIN-LEAF PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
WATER PRIMROSE	0	0%	0	0%	0	0%	0	0%	0	0%
WATER-BULRUSH	0	0%	0	0%	0	0%	0	0%	0	0%
WATERMEAL	0	0%	0	0%	0	0%	0	0%	0	0%
WATERMOSS	0	0%	0	0%	0	0%	0	0%	0	0%
WATERTHREAD	0	0%	0	0%	0	0%	0	0%	0	0%
WATERWORT	0	0%	0	0%	0	0%	0	0%	0	0%
WILD CELERY	0	0%	0	0%	0	0%	0	0%	0	0%

Manasquan Wetland 3
Aquatic Vegetation Survey
September 18, 2017

SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERMOSS	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
W3	1	A				D		D	D																												D						D	
W3	1	B																																										
W3	1	M	40.179152°	-74.221707°	1	D		D	D																												D						D	
W3	2	A				D		D	D																												D						M	
W3	2	B																																										
W3	2	M	40.179305°	-74.222129°	0.5	D		D	D																												D						M	
W3	3	A				D		S	M													S															D						M	
W3	3	B																																										
W3	3	M	40.179177°	-74.222322°	0.5	D		S	M													S															D						M	
W3	4	A				D																															T						D	
W3	4	B																																										
W3	4	M	40.179408°	-74.222586°	0.5	D																															T						D	
W3	5	A				D			T																																		D	
W3	5	B																																										
W3	5	M	40.179566°	-74.223487°	0.25	D			T																																		D	
W3	6	A				D		D																																			D	
W3	6	B																																										
W3	6	M	40.179372°	-74.223863°	0.25	D		D																																			D	
W3	7	A				D		D	D																																		S	
W3	7	B																																										
W3	7	M	40.179173°	-74.223552°	1	D		D	D																																		S	
W3	8	A				D		S	D																																		D	
W3	8	B																																										
W3	8	M	40.179267°	-74.223213°	2.5	D		S	D																																		D	
W3	9	A				D		S																								S											D	
W3	9	B																																										
W3	9	M	40.179106°	-74.22288°	1	D		S																								S											D	
W3	10	A				D		D	S																												M						D	
W3	10	B																																										
W3	10	M	40.178945°	-74.222533°	2.5	D		D	S																												M						D	
W3	11	A				M		M	S																							T					S						M	
W3	11	B																																										
W3	11	M	40.178914°	-74.222066°	1	M		M	S																							T					S						M	
W3	12	A				D		M	S																																		D	
W3	12	B																																										
W3	12	M	40.178587°	-74.222062°	0.5	D		M	S																																		D	
W3	13	A				M		S	S																																		M	
W3	13	B																																										
W3	13	M	40.178674°	-74.22285°	0.5	M		S	S																																		M	
W3	14	A				D		S	S																																		D	
W3	14	B																																										
W3	14	M	40.178558°	-74.22244°	1.5	D		S	S																																		D	
W3	15	A				S		T	S																																		T	
W3	15	B																																										
W3	15	M	40.178415°	-74.222374°	2	S		T	S																																		T	

Manasquan Wetland 4
Aquatic Macrophyte Abundance Distribution
September 13, 2017

	Total		Trace		Sparse		Medium		Dense	
	Sites	%	Sites	%	Sites	%	Sites	%	Sites	%
Total Sites	51									
OVERALL	51	100%	0	0%	8	16%	17	33%	26	51%
LOW WATER MILFOIL	36	71%	8	22%	14	39%	11	31%	3	8%
COMMON BLADDERWORT	33	65%	10	30%	11	33%	9	27%	3	9%
FANWORT	33	65%	9	27%	5	15%	5	15%	14	42%
CREEPING BLADDERWORT	32	63%	30	94%	2	6%	0	0%	0	0%
BENTHIC FILAMENTOUS ALGAE	28	55%	15	54%	8	29%	5	18%	0	0%
MUDMAT	22	43%	13	59%	6	27%	2	9%	1	5%
SPIKERUSH	19	37%	15	79%	3	16%	1	5%	0	0%
WATERTHREAD	17	33%	8	47%	5	29%	3	18%	1	6%
WHITE WATER LILY	12	24%	5	42%	5	42%	1	8%	1	8%
MUSKGRASS	9	18%	9	100%	0	0%	0	0%	0	0%
WATERWORT	7	14%	4	57%	3	43%	0	0%	0	0%
WATER-BULRUSH	6	12%	1	17%	2	33%	1	17%	2	33%
SPATTERDOCK	5	10%	4	80%	1	20%	0	0%	0	0%
WATER SHIELD	3	6%	2	67%	1	33%	0	0%	0	0%
ARROWHEAD	2	4%	2	100%	0	0%	0	0%	0	0%
NAIAD SP.	2	4%	2	100%	0	0%	0	0%	0	0%
LEAFY PONDWEED	1	2%	1	100%	0	0%	0	0%	0	0%
WATERMEAL	1	2%	1	100%	0	0%	0	0%	0	0%
COMMON WATERWEED	0	0%	0	0%	0	0%	0	0%	0	0%
COONTAIL	0	0%	0	0%	0	0%	0	0%	0	0%
CURLY-LEAF PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
EURASIAN WATER MILFOIL	0	0%	0	0%	0	0%	0	0%	0	0%
GREATER DUCKWEED	0	0%	0	0%	0	0%	0	0%	0	0%
HEDGE HYSSOP	0	0%	0	0%	0	0%	0	0%	0	0%
HYDRILLA	0	0%	0	0%	0	0%	0	0%	0	0%
INTERMEDIA BLADDERWORT	0	0%	0	0%	0	0%	0	0%	0	0%
NORTHERN NAIAD	0	0%	0	0%	0	0%	0	0%	0	0%
SLENDER NAIAD	0	0%	0	0%	0	0%	0	0%	0	0%
SMALL DUCKWEED	0	0%	0	0%	0	0%	0	0%	0	0%
SMALL PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
SNAILSEED PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
SOUTHERN NAIAD	0	0%	0	0%	0	0%	0	0%	0	0%
SPINY HORNWORT	0	0%	0	0%	0	0%	0	0%	0	0%
STONEWORT	0	0%	0	0%	0	0%	0	0%	0	0%
THIN-LEAF PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
WATER MOSS	0	0%	0	0%	0	0%	0	0%	0	0%
WATER PRIMROSE	0	0%	0	0%	0	0%	0	0%	0	0%
WILD CELERY	0	0%	0	0%	0	0%	0	0%	0	0%

Manasquan Wetland 4
Aquatic Vegetation Survey
September 13, 2017

SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GREATER DUCKWEED	GOLDEN HEDGE HYSSOP	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER MOSS	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
W4	1	A				D			M			T			D							T																					T	
W4	1	B				D						T			D							T																						
W4	1	M	40.172863°	-74.223943°	0.5	D			S			T			D							T																					T	
W4	2	A				D									D						T	T																					S	
W4	2	B				D									D						T	T																					S	
W4	2	M	40.172397°	-74.223928°	0.5	D									D						T	T																					S	
W4	3	A				D		M	M			T			D																												T	
W4	3	B				D			M			T			D																													
W4	3	M	40.173421°	-74.223589°	0.5	D		S	M			T			D																												T	
W4	4	A				T		T	T												T	T										T												
W4	4	B				S			T			T										S																						
W4	4	M	40.172804°	-74.223507°	0.25	S		T	T			T									T	S										T												
W4	5	A				D			T			T			M									T																	D	T	S	
W4	5	B				D			T			T			M									T																	D	T	S	
W4	5	M	40.17192°	-74.223563°	0.5	D			T			T			M									T																	D	T	S	
W4	6	A				M		S	T			T			T									T															M		M		T	
W4	6	B				M		S	S			S																											S		M		T	
W4	6	M	40.171493°	-74.222933°	0.5	M		S	S			S			T									T															M		M		T	
W4	7	A				D			T						D																										T		S	
W4	7	B				D									D																										S		S	
W4	7	M	40.171964°	-74.222915°	0.5	D			T						D																										S		S	
W4	8	A				D		T	T			T			S					T																					T		D	
W4	8	B				D		T	T						T																												D	
W4	8	M	40.171895°	-74.222345°	0.5	D		T	T			T			S					T																					T		D	
W4	9	A				M			T			T			M						T																				M		S	
W4	9	B				S			S			T			S						S																				S		S	
W4	9	M	40.171441°	-74.222381°	1	M			S			T			M						S																				M		S	
W4	10	A				D			S			T			T																T								D	T	M			
W4	10	B				D			T			T																											D	T	S			
W4	10	M	40.17104°	-74.222347°	1	D			S			T			T																T								D	T	M			
W4	11	A				D		T	T			T			T						T																		D		T			
W4	11	B				D		T							T						T										T								D		T			
W4	11	M	40.171075°	-74.221786°	0.5	D		T	T			T			T						T										T								D		T			
W4	12	A				D			T			T			D						M		T																		T			
W4	12	B				M									M						M		T																		T			
W4	12	M	40.171524°	-74.221735°	1.5	D			T			T			D						M		T																		T			
W4	13	A				M						T			T						M		T									T						S			S		M	
W4	13	B				M									S						T		T									T						S			T		M	
W4	13	M	40.171872°	-74.221738°	1.5	M						T			S						S		T									T						S			S		M	
W4	14	A				D			T			T			D																S	T									T		S	
W4	14	B				D			T						D																S												S	
W4	14	M	40.171976°	-74.221244°	0.5	D			T			T			D																S	T									T		S	
W4	15	A				M			T			T			M						T		T																		T			
W4	15	B				M			S			T			M								T																		T			
W4	15	M	40.171415°	-74.221139°	1.5	M			S			T			M						T		T																		T			
W4	16	A				M		S	M																							T						T	S		T	T	T	
W4	16	B				M		T	M																							T									T	T		
W4	16	M	40.171054°	-74.221097°	1	M		S	M																							T						T	T		T	T	T	
W4	17	A				D		S	M			T			D						T																		S		T			
W4	17	B				D		S				T			D						T																		S		S			
W4	17	M	40.171033°	-74.220657°	1	D		S	S			T			D						T																		S		S			
W4	18	A				D		T	D			T			T						M										S										T			
W4	18	B				M		T	S			T			T						M																				S			
W4	18	M	40.171527°	-74.220594°	1.5	D		T	M			T			T						M										T										S			
W4	19	A				D			M						D																													
W4	19	B				D			M						D																													
W4	19	M	40.171948°	-74.220635°	1.5	D			M						D																													
W4	20	A				D		T	T			T			D						T																							
W4	20	B				D		T	T						D																													
W4	20	M	40.171938°	-74.220058°	1.5	D		T	T			T			D						T																							
W4	21	A				D			S			T			D						S										T							T					T	
W4	21	B				D			S			T			D						T																							
W4	21	M	40.171437°	-74.219978°	0.5	D			S			T			D						S										T							T					T	

Manasquan Wetland 4
Aquatic Vegetation Survey
September 13, 2017

SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GREATER DUCKWEED	GOLDEN HEDGE HYSSOP	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER MOSS	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
W4	22	A				D		T	M			T			D						M																							
W4	22	B				D		T							D						S																							
W4	22	M	40.172428°	-74.220579°	1.5	D		T	S			T			D						M																							
W4	23	A				S		S				T									S											S									M			
W4	23	B				S		S													S	S																						
W4	23	M	40.172447°	-74.221197°	0.17	S		S				T									S	T										T									S			
W4	24	A				M		T													T	M																						
W4	24	B				M		T													S	M																						
W4	24	M	40.172405°	-74.221783°	1.5	M		T													S	M																						
W4	25	A				D		M							T						M	D																						
W4	25	B				D		M													M	D																						
W4	25	M	40.172428°	-74.222346°	2	D		M							T						M	D																						
W4	26	A				M		T													M	S																						
W4	26	B				M		T													M	S																						
W4	26	M	40.172391°	-74.222929°	1	M		T													M	S																						
W4	27	A				S		M													S	T										T												
W4	27	B				S		M													S																							
W4	27	M	40.172833°	-74.222947°	1	S		M													S	T										T												
W4	28	A				M		M													S	M																						
W4	28	B				M		M													S	M																						
W4	28	M	40.172807°	-74.222361°	1	M		M													S	M																						
W4	29	A				D		T				T									D	T																						
W4	29	B				D		T				T									D																							
W4	29	M	40.172836°	-74.221783°	1.5	D		T				T									D	T																						
W4	30	A				M		M				T			T						S																							
W4	30	B				S		M													M																							
W4	30	M	40.172824°	-74.22114°	0.5	M		M				T			T						M																							
W4	31	A				M		M				T			M						S																							
W4	31	B				M		M				T									T		T																					
W4	31	M	40.172824°	-74.220546°	1.5	M		M				T			S						S		T																					
W4	32	A				S	T	T	T						T						S	T																						
W4	32	B				S	T	T	T												S	T																						
W4	32	M	40.172866°	-74.220051°	1.5	S	T	T	T						T						S	T																						
W4	33	A				S		S													S	T																						
W4	33	B				T		T														T																						
W4	33	M	40.173344°	-74.220016°	1.5	S		S													T	T																						
W4	34	A				D			D						M								T																					
W4	34	B				M			M						S																													
W4	34	M	40.173265°	-74.220672°	1.5	D			D						M								T																					
W4	35	A				D		T				T									D	T										T												
W4	35	B				D		T													D	T										T												
W4	35	M	40.173292°	-74.221209°	1	D		T				T									D	T										T												
W4	36	A				D		T													D	T										T									T			
W4	36	B				S		T													S	T										S									T			
W4	36	M	40.173308°	-74.221814°	1	M		T													M	T										S									T			
W4	37	A				T		T													T	T										T												
W4	37	B				S		T													S	S																						
W4	37	M	40.173292°	-74.222382°	1.5	S		T													S	S										T												
W4	38	A				S		T													T	S										T												
W4	38	B				S		T													S	T										S												
W4	38	M	40.173336°	-74.222929°	1.5	S		T													S	S										S												
W4	39	A				D		T	M			T			D																	T												
W4	39	B				D			M						D																	T												
W4	39	M	40.173734°	-74.223442°	0.5	D		T	M			T			D																	T												
W4	40	A				D			D			T			S																	T												
W4	40	B				M			M			T			T																													
W4	40	M	40.173768°	-74.222917°	0.5	D			D			T			S																	T												
W4	41	A				M			M			T			T																								S			S		
W4	41	B				M			M			T			T																								T			S		
W4	41	M	40.173799°	-74.222271°	0.5	M			M			T			T																								S			S		
W4	42	A				D			D			S										S	T									T												
W4	42	B				T			S			T											T									T												
W4	42	M	40.173702°	-74.22167°	0.5	M			M			S										T	T									T												

Manasquan Wetland 4
Aquatic Vegetation Survey
September 13, 2017

SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GREATER DUCKWEED	GOLDEN HEDGE HYSSOP	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER MOSS	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
W4	43	A				S			T												T	S										T										T		
W4	43	B				T															S	S																				T		
W4	43	M	40.173665°	-74.221082°	0.5	S			T												S	S										T										T		
W4	44	A				D			D			T			T						S	T										M												
W4	44	B				M			M			T			T						S	T										S												
W4	44	M	40.173746°	-74.220599°	1.5	D			D			T			T						S	T										M												
W4	45	A				M		S													M	T																				T		
W4	45	B				S		S													S	T																				T		
W4	45	M	40.173722°	-74.219942°	0.5	M		S													M	T																				T		
W4	46	A				M	T														M	S										T												
W4	46	B				S															S	T										S												
W4	46	M	40.174209°	-74.219973°		M	T														M	S										S												
W4	47	A				M		T	M			T									S	T	T									T										S		
W4	47	B				S		S				T									S	T										T										S		
W4	47	M	40.174186°	-74.220662°		M		S	S			T									S	T	T									T										S		
W4	48	A				M			S			T			M						M											S												
W4	48	B				D			S						D						M																							
W4	48	M	40.174441°	-74.221221°		D			S			T			D						M											T												
W4	49	A				D			D			T			D						M		T																		T	S		
W4	49	B				D			S			T									D		T																		T	S		
W4	49	M	40.174593°	-74.2217°		D			M			T			S						D		T																		T	S		
W4	50	A				D			M			T			D						T											T												
W4	50	B				M			T			T			M						T											T												
W4	50	M	40.174643°	-74.222393°		D			S			T			D						T											T												
W4	51	A				M			D						M						M		T																					
W4	51	B				S			S						S						M		T																					
W4	51	M	40.174175°	-74.223003°		M			M						M						M		T																					

Manasquan Wetland 5
Aquatic Macrophyte Abundance Distribution
September 18, 2017

	Total		Trace		Sparse		Medium		Dense	
	Sites	%	Sites	%	Sites	%	Sites	%	Sites	%
Total Sites	12									
OVERALL	12	100%	0	0%	0	0%	6	50%	6	50%
COONTAIL	12	100%	3	25%	1	8%	1	8%	7	58%
COMMON BLADDERWORT	11	92%	0	0%	4	36%	4	36%	3	27%
SMALL DUCKWEED	11	92%	3	27%	4	36%	1	9%	3	27%
WATERMEAL	11	92%	3	27%	4	36%	1	9%	3	27%
LEAFY PONDWEED	8	67%	3	38%	3	38%	2	25%	0	0%
MUDMAT	3	25%	1	33%	1	33%	0	0%	1	33%
SPIKERUSH	3	25%	0	0%	2	67%	1	33%	0	0%
WATER PRIMROSE	3	25%	0	0%	3	100%	0	0%	0	0%
BENTHIC FILAMENTOUS ALGAE	2	17%	1	50%	1	50%	0	0%	0	0%
SOUTHERN NAIAD	2	17%	0	0%	2	100%	0	0%	0	0%
MUSKGRASS	1	8%	1	100%	0	0%	0	0%	0	0%
ARROWHEAD	0	0%	0	0%	0	0%	0	0%	0	0%
COMMON WATERWEED	0	0%	0	0%	0	0%	0	0%	0	0%
CREEPING BLADDERWORT	0	0%	0	0%	0	0%	0	0%	0	0%
CURLY-LEAF PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
EURASIAN WATER MILFOIL	0	0%	0	0%	0	0%	0	0%	0	0%
FANWORT	0	0%	0	0%	0	0%	0	0%	0	0%
GREATER DUCKWEED	0	0%	0	0%	0	0%	0	0%	0	0%
HEDGE HYSSOP	0	0%	0	0%	0	0%	0	0%	0	0%
HYDRILLA	0	0%	0	0%	0	0%	0	0%	0	0%
INTERMEDIA BLADDERWORT	0	0%	0	0%	0	0%	0	0%	0	0%
LOW WATER MILFOIL	0	0%	0	0%	0	0%	0	0%	0	0%
NAIAD SP.	0	0%	0	0%	0	0%	0	0%	0	0%
STONEWORT	0	0%	0	0%	0	0%	0	0%	0	0%
NORTHERN NAIAD	0	0%	0	0%	0	0%	0	0%	0	0%
SLENDER NAIAD	0	0%	0	0%	0	0%	0	0%	0	0%
SMALL PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
SNAILSEED PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
SPATTERDOCK	0	0%	0	0%	0	0%	0	0%	0	0%
SPINY HORNWORT	0	0%	0	0%	0	0%	0	0%	0	0%
THIN-LEAF PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
WATER SHIELD	0	0%	0	0%	0	0%	0	0%	0	0%
WATER-BULRUSH	0	0%	0	0%	0	0%	0	0%	0	0%
WATERMOSS	0	0	0	0%	0	0%	0	0%	0	0%
WATERTHREAD	0	0%	0	0%	0	0%	0	0%	0	0%
WATERWORT	0	0%	0	0%	0	0%	0	0%	0	0%
WHITE WATER LILY	0	0	0	0%	0	0%	0	0%	0	0%
WILD CELERY	0	0	0	0%	0	0%	0	0%	0	0%

Manasquan Wetland 5
Aquatic Vegetation Survey
September 18, 2017

SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLANT ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERMOSS	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
W5	1	A				D			S		D									S							D												D					
W5	1	B																																										
W5	1	M	40.170108°	-74.20257°	1.5	D			S		D									S							D												D					
W5	2	A				D			M		D									M			T				S												S					
W5	2	B																																										
W5	2	M	40.170014°	-74.201831°	1	D			M		D									M			T				S												S					
W5	3	A				D					T																M												M					
W5	3	B																																										
W5	3	M	40.169692°	-74.201299°	0.25	D					T																M												M					
W5	4	A				M			D		D									S							S			S									S					
W5	4	B																																										
W5	4	M	40.170004°	-74.2013°	1.5	M			D		D									S							S			S									S					
W5	5	A				M		S	M		M																			S														
W5	5	B																																										
W5	5	M	40.170523°	-74.201777°	1	M		S	M		M																			S														
W5	6	A				M			D		D									T							T												T					
W5	6	B																																										
W5	6	M	40.170549°	-74.201299°	2.5	M			D		D									T							T												T					
W5	7	A				M		T	D		D									T		T					T												T					
W5	7	B																																										
W5	7	M	40.170579°	-74.200615°	2.5	M		T	D		D									T		T					T												T					
W5	8	A				D			M		D									T							T												T					
W5	8	B																																										
W5	8	M	40.17043°	-74.200056°	1	D			M		D									T							T												T					
W5	9	A				M			S		T									M		D					S					M				S			S					
W5	9	B																																										
W5	9	M	40.170987°	-74.200682°	0.25	M			S		T									M		D					S					M				S			S					
W5	10	A				M			M		T									S		S					S									S			S					
W5	10	B																																										
W5	10	M	40.170971°	-74.201243°	0.25	M			M		T									S		S					S									S			S					
W5	11	A				D			S		D																D					S				S			D					
W5	11	B																																										
W5	11	M	40.171242°	-74.201246°	0.25	D			S		D																D					S				S			D					
W5	12	A				D			S		S																D					S							D					
W5	12	B																																										
W5	12	M	40.17127°	-74.200651°	0.25	D			S		S																D					S							D					

Manasquan Wetland 6
Aquatic Macrophyte Abundance Distribution
September 18, 2017

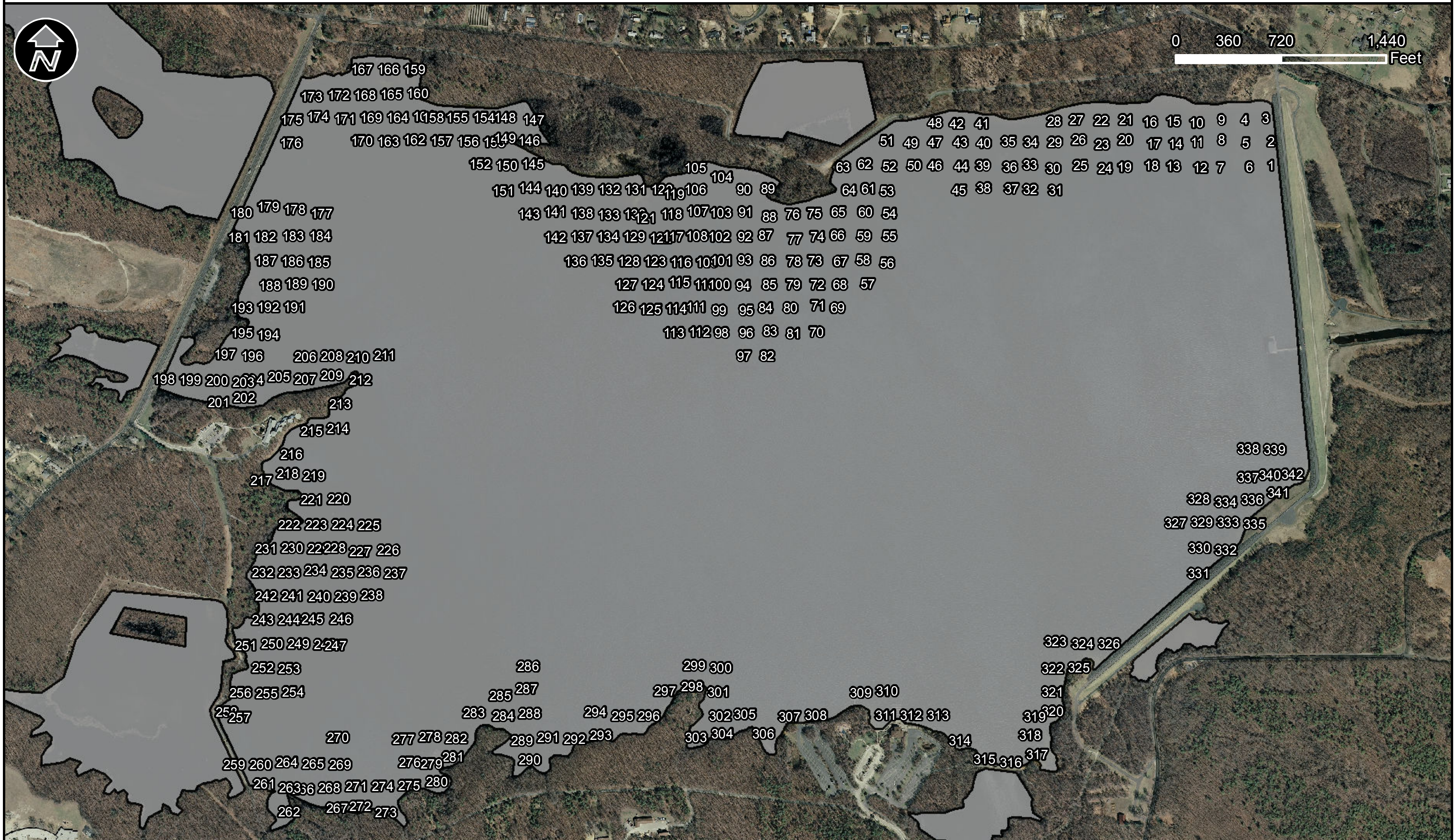
	Total		Trace		Sparse		Medium		Dense	
	Sites	%	Sites	%	Sites	%	Sites	%	Sites	%
Total Sites	11									
OVERALL	11	100%	0	0%	1	9%	5	45%	5	45%
LOW WATER MILFOIL	11	100%	1	9%	2	18%	4	36%	4	36%
COMMON BLADDERWORT	10	91%	0	0%	1	10%	4	40%	5	50%
WATERTHREAD	8	73%	2	25%	2	25%	4	50%	0	0%
COONTAIL	7	64%	5	71%	1	14%	1	14%	0	0%
LEAFY PONDWEED	6	55%	3	50%	3	50%	0	0%	0	0%
SPIKERUSH	4	36%	2	50%	2	50%	0	0%	0	0%
WATER PRIMROSE	3	27%	2	67%	0	0%	1	33%	0	0%
WATER SHIELD	3	27%	3	100%	0	0%	0	0%	0	0%
MUSKGRASS	2	18%	1	50%	0	0%	1	50%	0	0%
ARROWHEAD	0	0%	0	0%	0	0%	0	0%	0	0%
BENTHIC FILAMENTOUS ALGAE	0	0%	0	0%	0	0%	0	0%	0	0%
COMMON WATERWEED	0	0%	0	0%	0	0%	0	0%	0	0%
CREEPING BLADDERWORT	0	0%	0	0%	0	0%	0	0%	0	0%
CURLY-LEAF PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
EURASIAN WATER MILFOIL	0	0%	0	0%	0	0%	0	0%	0	0%
FANWORT	0	0%	0	0%	0	0%	0	0%	0	0%
GREATER DUCKWEED	0	0%	0	0%	0	0%	0	0%	0	0%
HEDGE HYSSOP	0	0%	0	0%	0	0%	0	0%	0	0%
HYDRILLA	0	0%	0	0%	0	0%	0	0%	0	0%
INTERMEDIA BLADDERWORT	0	0%	0	0%	0	0%	0	0%	0	0%
MUDMAT	0	0%	0	0%	0	0%	0	0%	0	0%
NAIAD SP.	0	0%	0	0%	0	0%	0	0%	0	0%
NORTHERN NAIAD	0	0%	0	0%	0	0%	0	0%	0	0%
SLENDER NAIAD	0	0%	0	0%	0	0%	0	0%	0	0%
SMALL DUCKWEED	0	0%	0	0%	0	0%	0	0%	0	0%
SMALL PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
SNAILSEED PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
SOUTHERN NAIAD	0	0%	0	0%	0	0%	0	0%	0	0%
SPATTERDOCK	0	0%	0	0%	0	0%	0	0%	0	0%
SPINY HORNWORT	0	0%	0	0%	0	0%	0	0%	0	0%
STONEWORT	0	0%	0	0%	0	0%	0	0%	0	0%
THIN-LEAF PONDWEED	0	0%	0	0%	0	0%	0	0%	0	0%
WATER MOSS	0	0%	0	0%	0	0%	0	0%	0	0%
WATER-BULRUSH	0	0%	0	0%	0	0%	0	0%	0	0%
WATERMEAL	0	0	0	0%	0	0%	0	0%	0	0%
WATERWORT	0	0%	0	0%	0	0%	0	0%	0	0%
WHITE WATER LILY	0	0	0	0%	0	0%	0	0%	0	0%
WILD CELERY	0	0	0	0%	0	0%	0	0%	0	0%

Manasquan Wetland 6
Aquatic Vegetation Survey
September 18, 2017

SECTION	SAMPLE POINT	SAMPLE NUMBER	LATITUDE (NAD83)	LONGITUDE (NAD83)	DEPTH (FT)	OVERALL PLATN ABUNDANCE	ARROWHEAD	BENTHIC FILAMENTOUS ALGAE	COMMON BLADDERWORT	COMMON WATERWEED	COONTAIL	CREEPING BLADDERWORT	CURLY-LEAF PONDWEED	EURASIAN WATER MILFOIL	FANWORT	GOLDEN HEDGE HYSSOP	GREATER DUCKWEED	HYDRILLA	INTERMEDIA BLADDERWORT	LEAFY PONDWEED	LOW WATER MILFOIL
W6	1	A				D			M											S	D
W6	1	B																			
W6	1	M	40.172985°	-74.197367°	1	D			M											S	D
W6	2	A				M			M											S	D
W6	2	B																			
W6	2	M	40.1732°	-74.197526°	1.5	M			M											S	D
W6	3	A				D			S		M										D
W6	3	B																			
W6	3	M	40.173371°	-74.197337°	2	D			S		M										D
W6	4	A				D			D		T										M
W6	4	B																			
W6	4	M	40.17351°	-74.196991°	1	D			D		T										M
W6	5	A				M			M		S									T	D
W6	5	B																			
W6	5	M	40.173615°	-74.196509°	1.5	M			M		S									T	D
W6	6	A				M			D		T										S
W6	6	B																			
W6	6	M	40.173898°	-74.196251°	1	M			D		T										S
W6	7	A				S														T	S
W6	7	B																			
W6	7	M	40.174082°	-74.195947°	1	S														T	S
W6	8	A				D			D		T										T
W6	8	B																			
W6	8	M	40.17398°	-74.195353°	1.5	D			D		T										T
W6	9	A				M			D		T									T	M
W6	9	B																			
W6	9	M	40.173896°	-74.195645°	1	M			D		T									T	M
W6	10	A				M			M											S	M
W6	10	B																			
W6	10	M	40.17368°	-74.195923°	0.5	M			M											S	M
W6	11	A				D			D		T										M
W6	11	B																			
W6	11	M	40.173223°	-74.197074°	2	D			D		T										M

SECTION	SAMPLE POINT	SAMPLE NUMBER	MUDMAT	MUSKGRASS	NAIAD SP.	NORTHERN NAIAD	SLENDER NAIAD	SMALL DUCKWEED	SMALL PONDWEED	SNAILSEED PONDWEED	SOUTHERN NAIAD	SPATTERDOCK	SPIKERUSH	SPINY HORNWORT	STONEWORT	THIN-LEAF PONDWEED	WATER MOSS	WATER PRIMROSE	WATER SHIELD	WATER-BULRUSH	WATERMEAL	WATERTHREAD	WATERWORT	WHITE WATER LILY	WILD CELERY
W6	1	A																M							
W6	1	B																							
W6	1	M																M							
W6	2	A																T							
W6	2	B																							
W6	2	M																T							
W6	3	A																				M			
W6	3	B																							
W6	3	M																				M			
W6	4	A											S									M			
W6	4	B																							
W6	4	M											S									M			
W6	5	A																				M			
W6	5	B																							
W6	5	M																				M			
W6	6	A																	T						
W6	6	B																							
W6	6	M																	T						
W6	7	A		T									T						T			S			
W6	7	B																							
W6	7	M		T									T						T			S			
W6	8	A											T									T			
W6	8	B																							
W6	8	M											T									T			
W6	9	A																				S			
W6	9	B																							
W6	9	M																				S			
W6	10	A		M									S						T			M			
W6	10	B																							
W6	10	M		M									S						T			M			
W6	11	A																T				T			
W6	11	B																							
W6	11	M																T				T			

RESERVOIR - SAMPLE POINT LOCATIONS



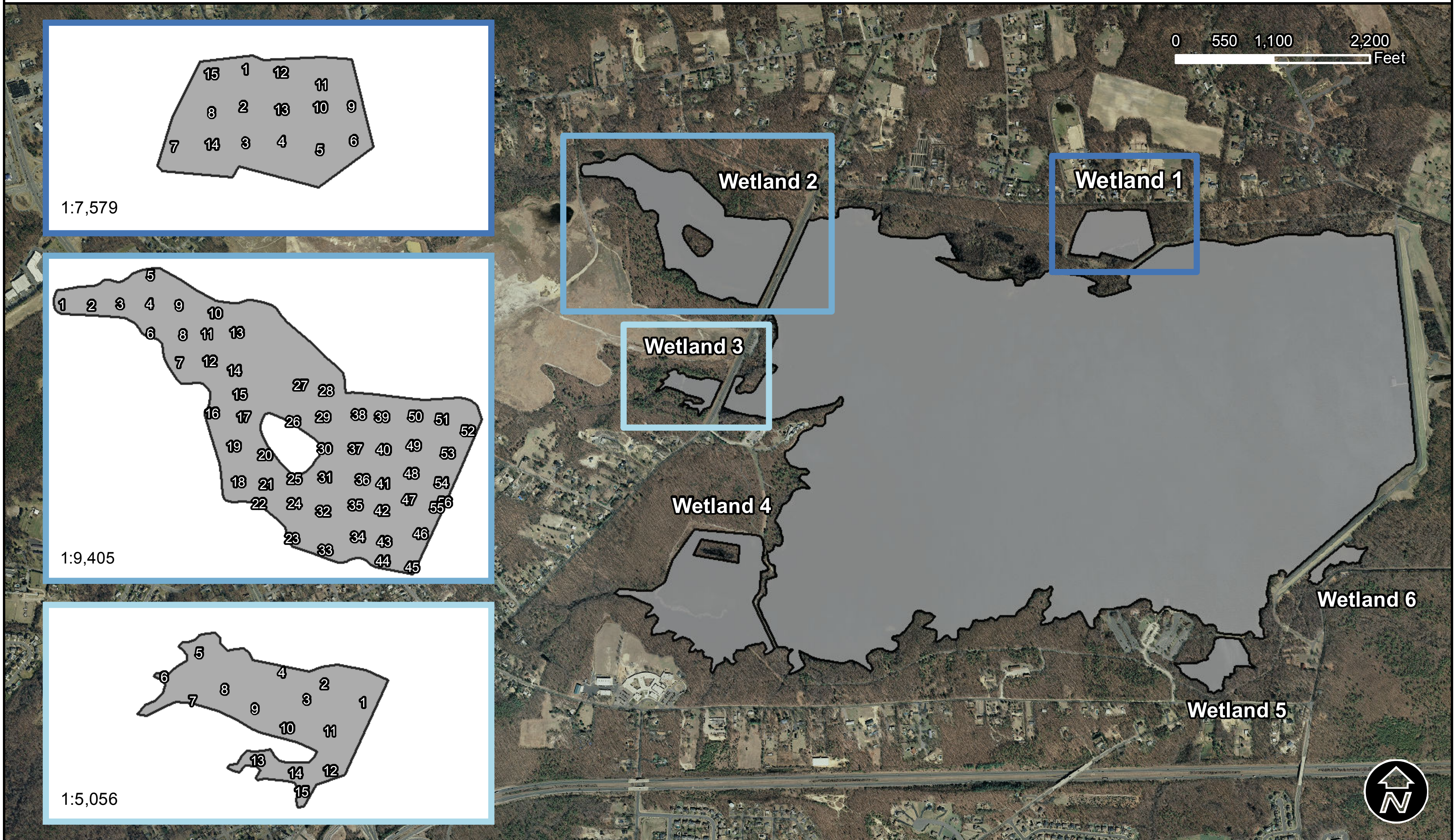
MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Total Sample Points: 342

SOLITUDE
LAKE MANAGEMENT

Date: 11/18/2017
File Name: Manasquan_ResWet_SampleLoc_Reservoir_2017
Prepared by: KM
Office: Washington, NJ

WETLANDS 1-3: SAMPLE POINT LOCATIONS



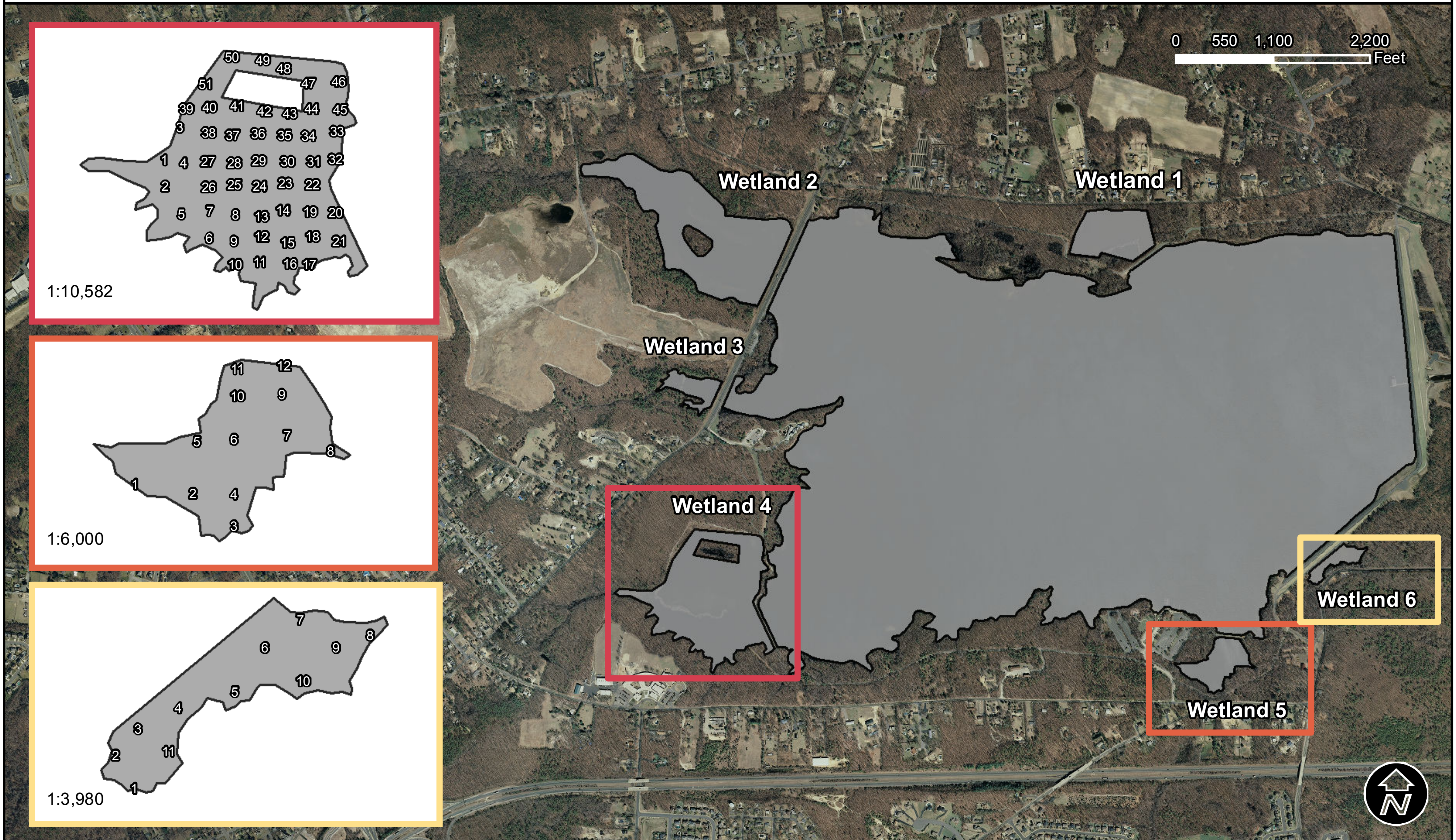
MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Wetland	Sample Points
1	15
2	56
3	15

SOLITUDE LAKE MANAGEMENT

Date: 11/18/2017
File Name: Manasquan_ResWet_SampleLoc_Wetlands_1-3_2017
Prepared by: KM
Office: Washington, NJ

WETLANDS 4-6: SAMPLE POINT LOCATION



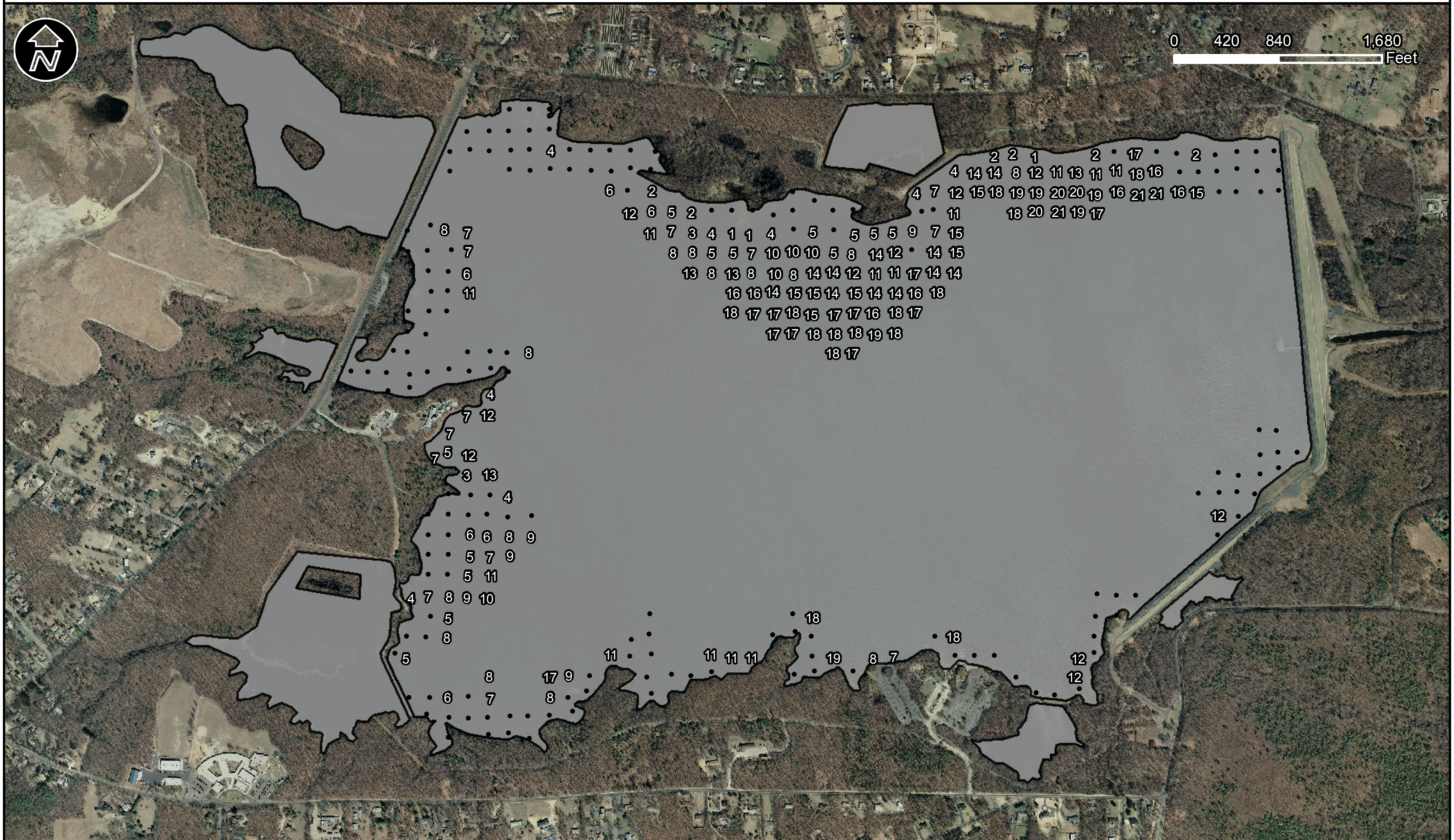
MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Wetland	Sample Points
4	51
5	12
6	11

SOLITUDE
LAKE MANAGEMENT

Date: 11/18/2017
File Name: Manasquan_ResWet_SampleLoc-Wetlands_2-4_2017
Prepared by: KM
Office: Washington, NJ

RESERVOIR - WATER DEPTH (FT)



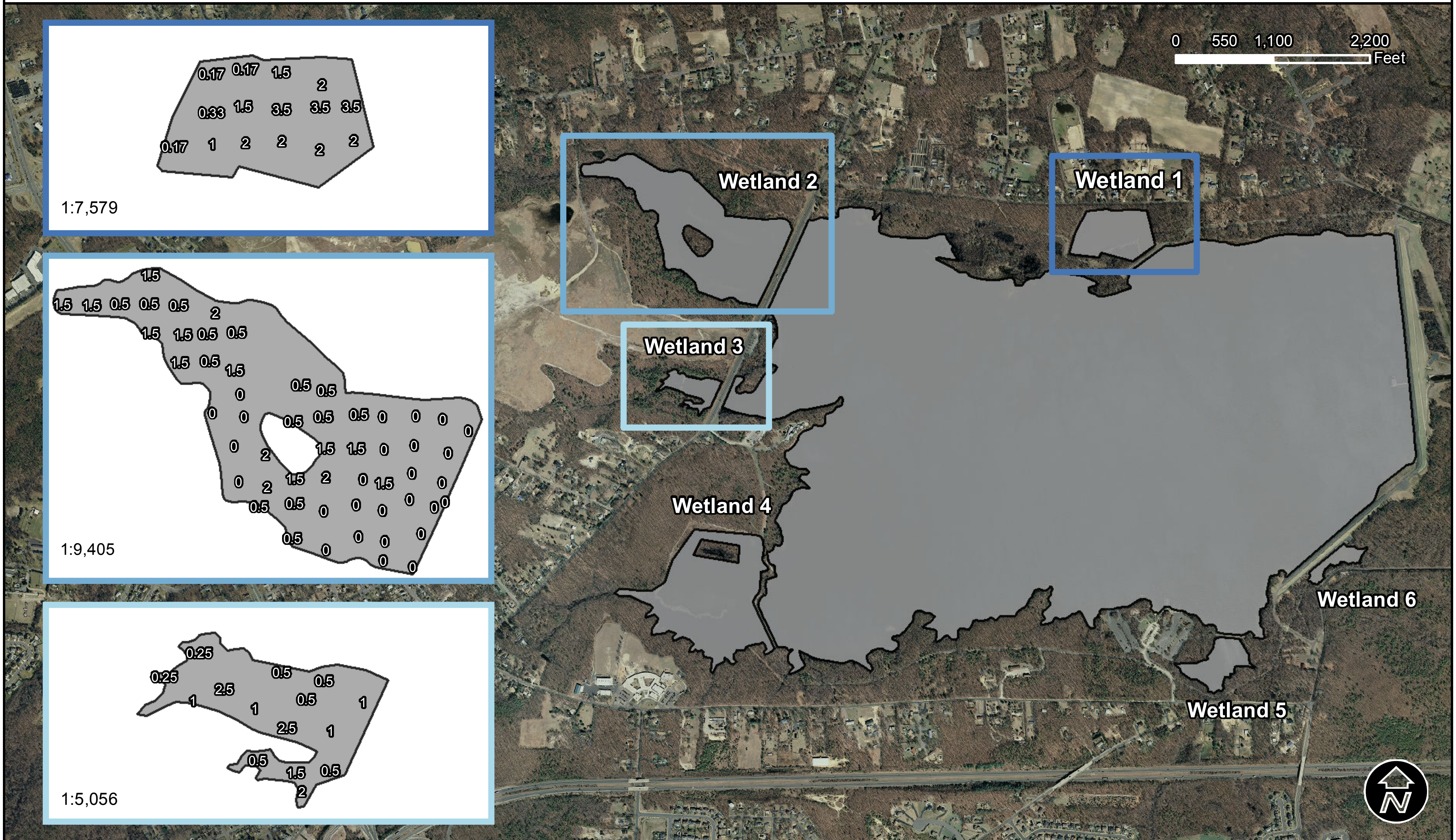
MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Water depth rounded to nearest foot displayed at sampling points.

SOLITUDE
LAKE MANAGEMENT

Date: 11/18/2017
File Name: Manasquan_ResWet_Depth-Reservoir_2017
Prepared by: KM
Office: Washington, NJ

WETLANDS 1-3: WATER DEPTH (FT)



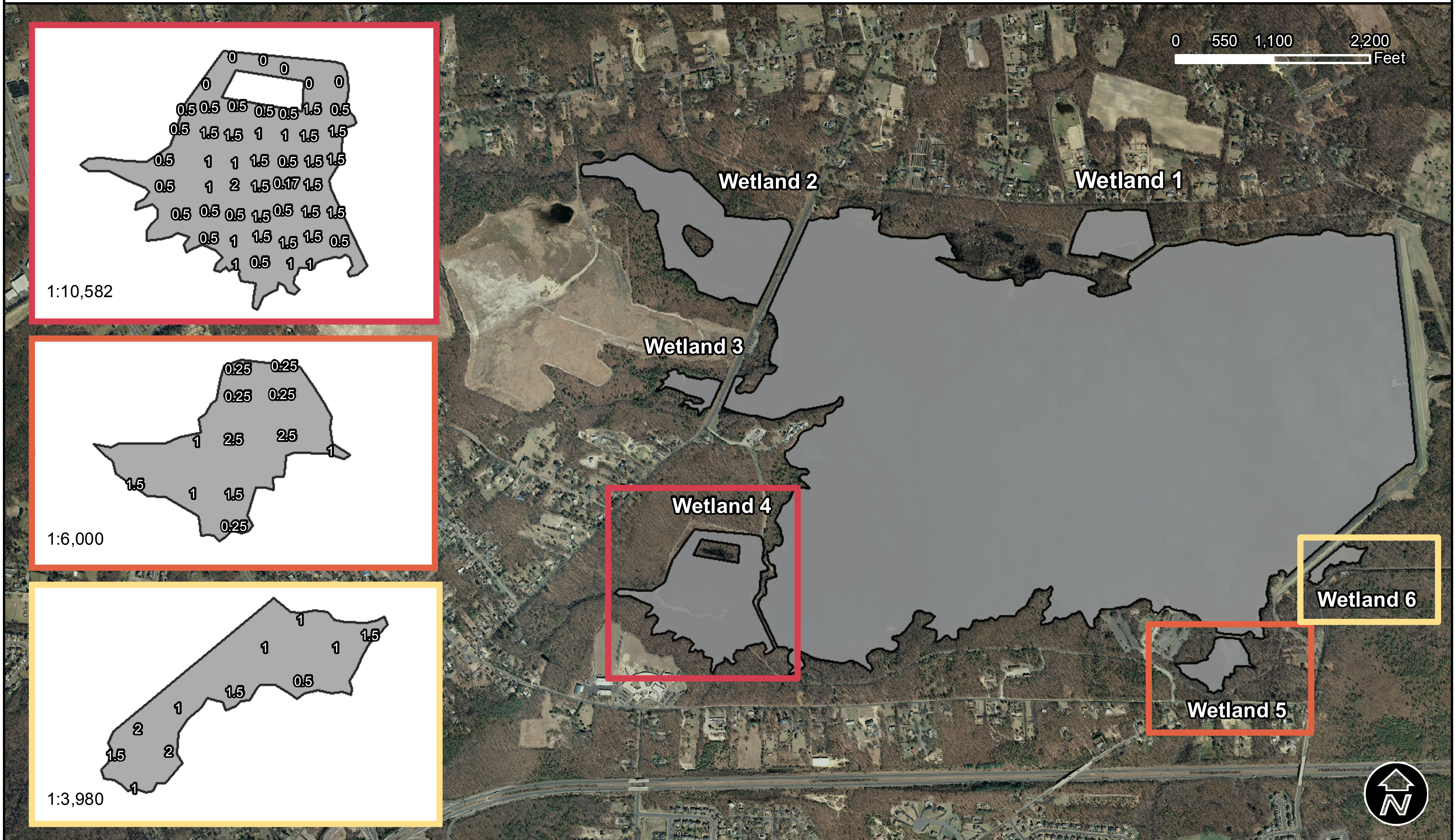
MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Water depth in feet displayed at each sample site.

SOLITUDE
LAKE MANAGEMENT

Date: 11/18/2017
File Name: Manasquan_ResWet_Depth-Wetlands_1-3_2017
Prepared by: KM
Office: Washington, NJ

WETLANDS 4-6: WATER DEPTH (FT)



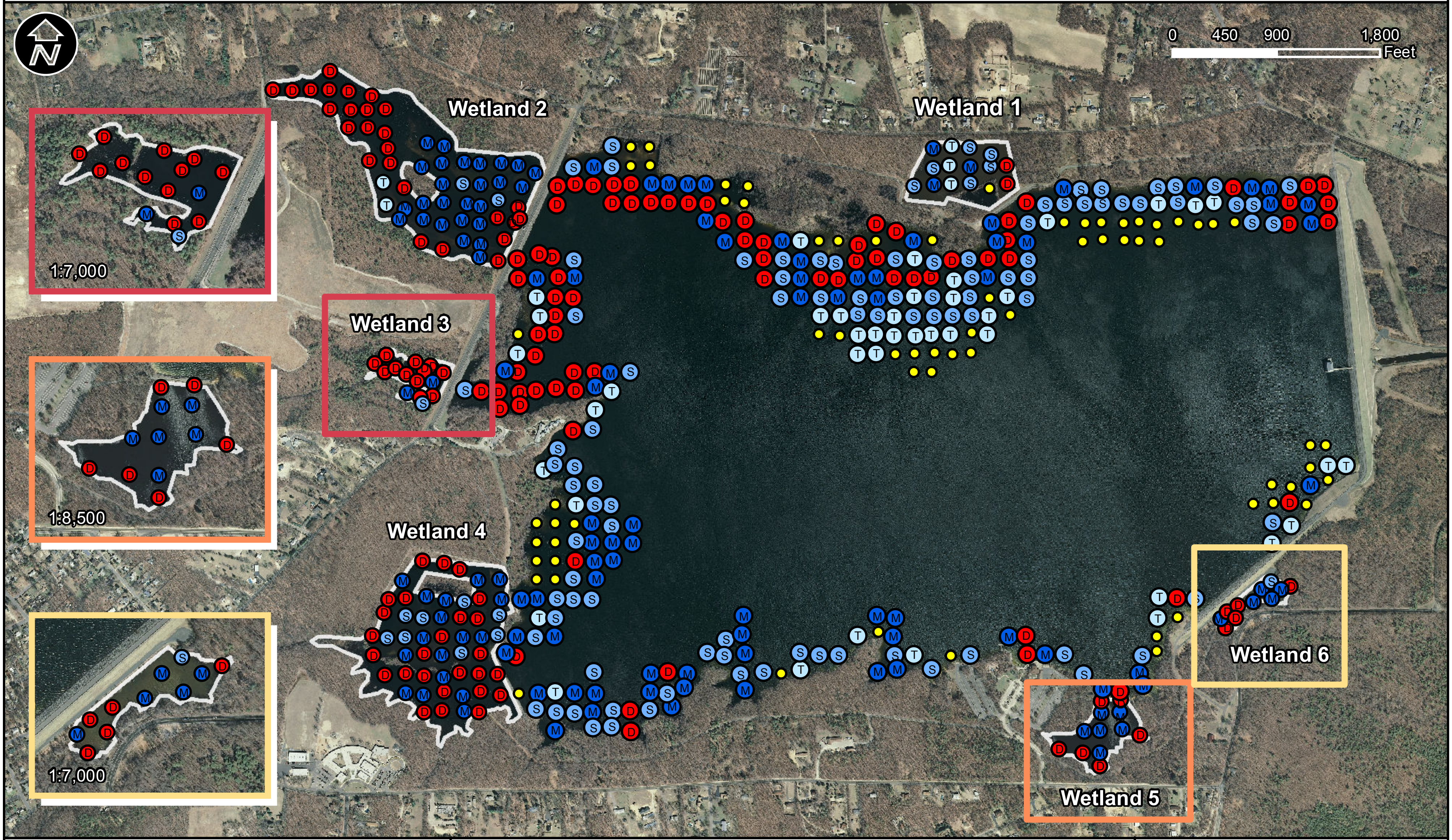
MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Water depth in feet displayed at each sample site.

SOLITUDE
LAKE MANAGEMENT

Date: 11/18/2017
File Name: Manasquan_ResWet_Depth-Wetlands_2-4_2017
Prepared by: KM
Office: Washington, NJ

OVERALL PLANT ABUNDANCE



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

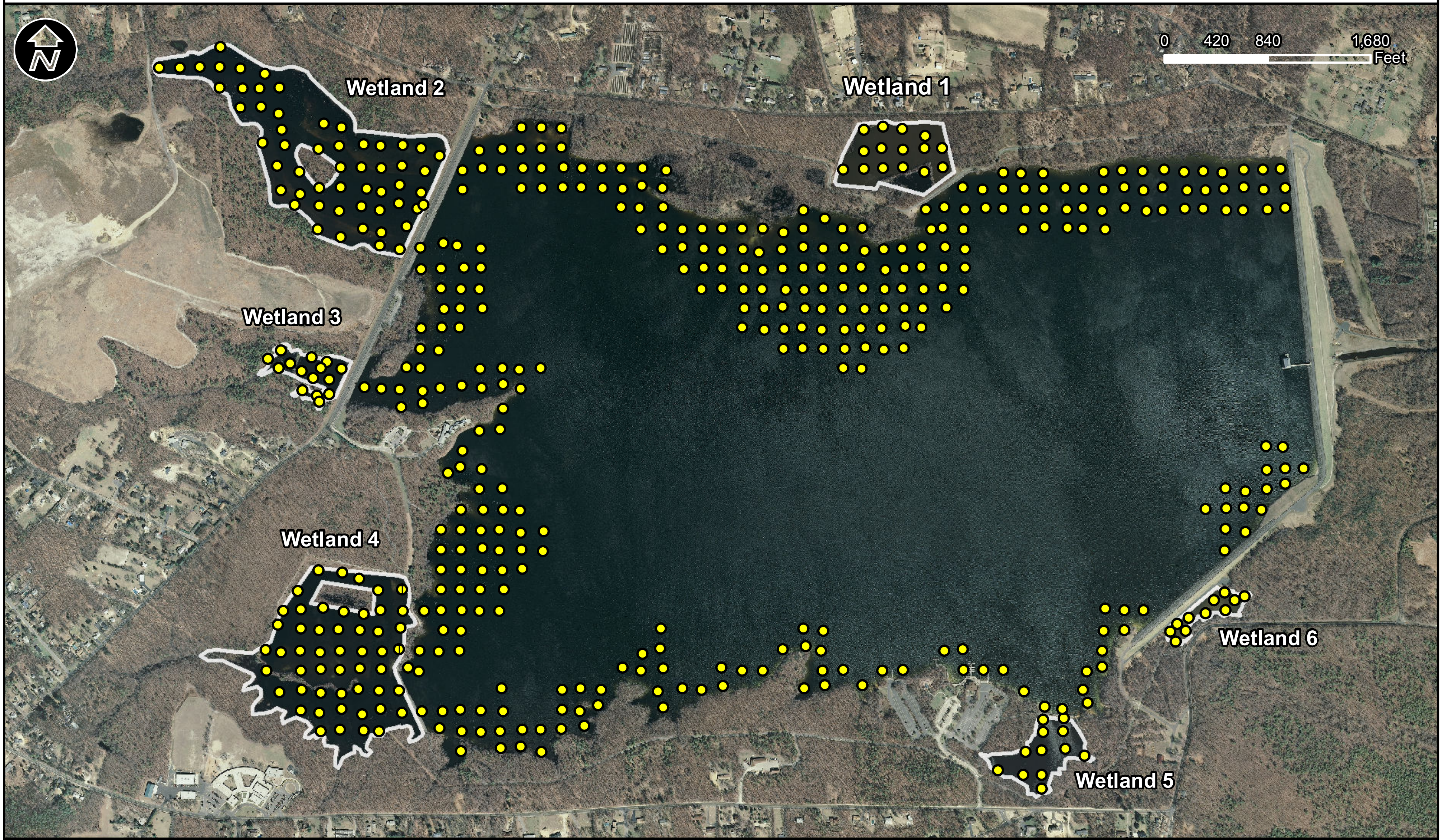
Plant Density

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

SOLITUDE LAKE MANAGEMENT

Date: 11/20/2017
File Name: Manasquan_ResWet_Overall_2017
Prepared by: KM
Office: Washington, NJ

ARROWHEAD ROSETTE (*Sagittaria* sp.) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

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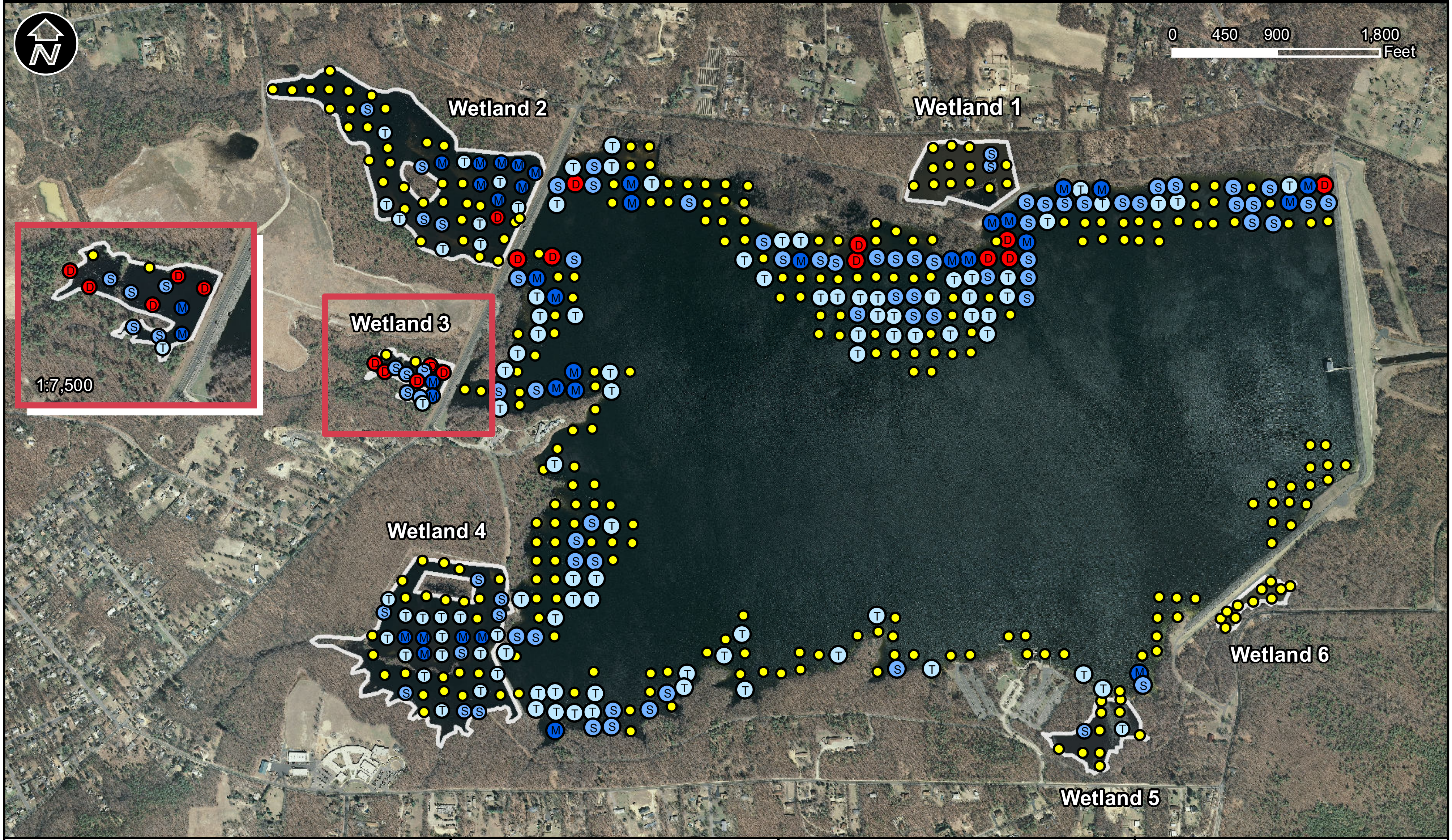
SŌLITUDE LAKE MANAGEMENT

Date: 11/15/2017
File Name: Manasquan_ResWet_Arrowhead_2017
Prepared by: KM
Office: Washington, NJ

BENTHIC FILAMENTOUS ALGAE DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

Plant Density
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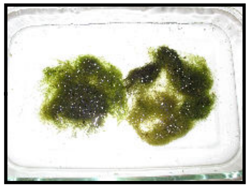
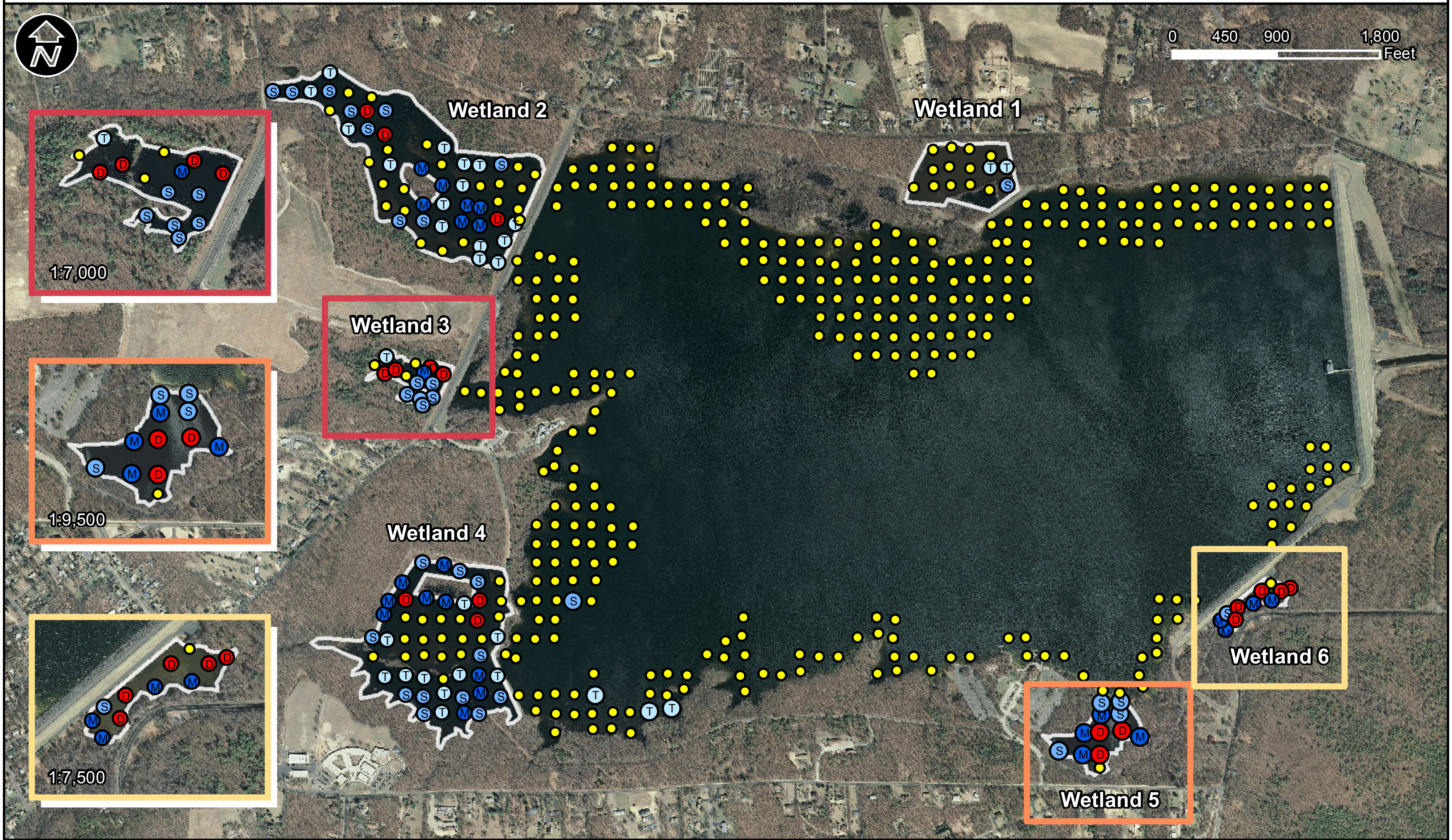


SOLITUDE LAKE MANAGEMENT

Date: 11/18/2017
File Name: Manasquan_ResWet_BFA_2017
Prepared by: KM
Office: Washington, NJ

COMMON BLADDERWORT (*Utricularia vulgaris*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

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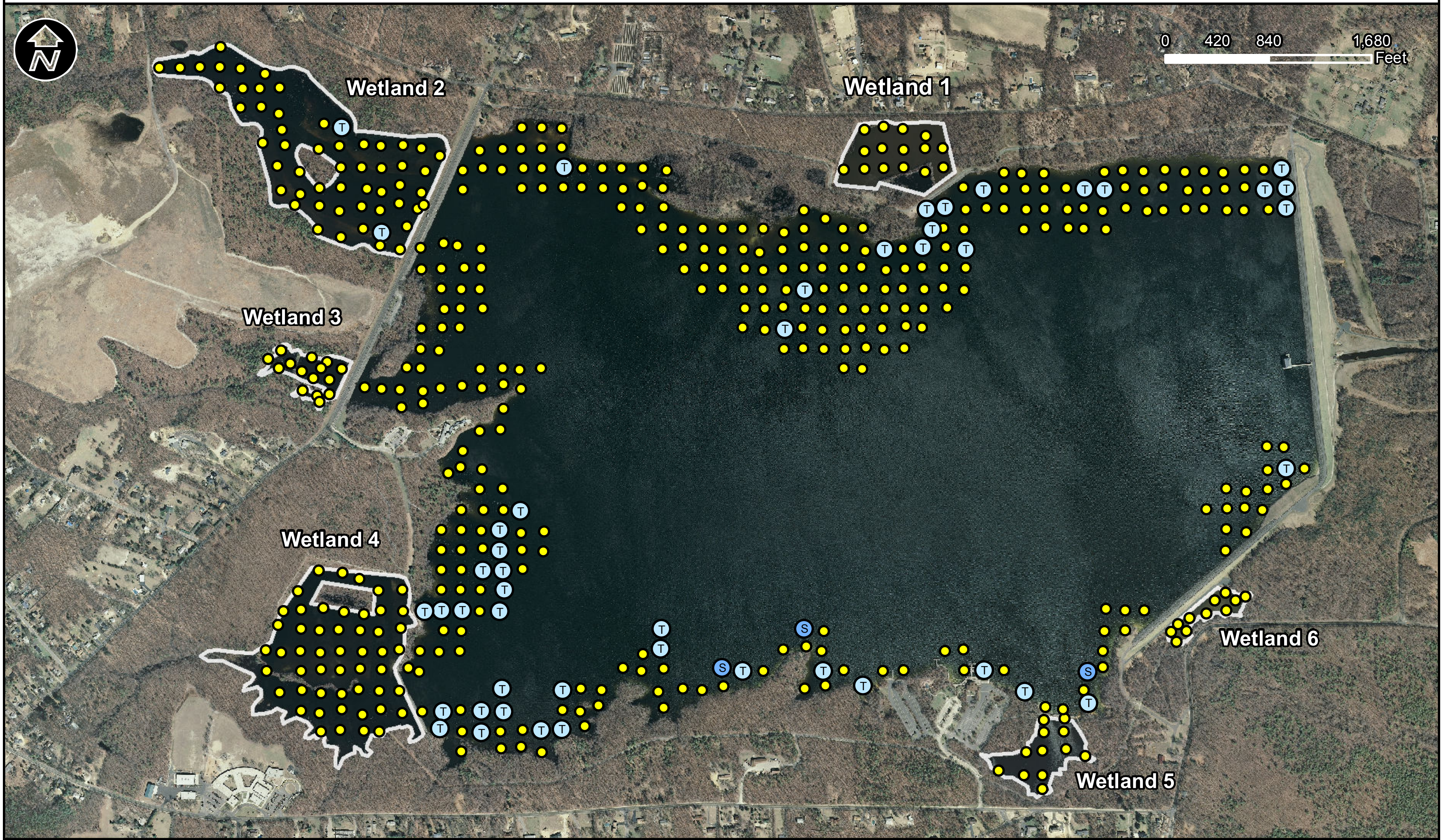
SŌLITUDE LAKE MANAGEMENT

Date: 11/18/2017
File Name: Manasquan_ResWet_ComBladderwt_2017
Prepared by: KM
Office: Washington, NJ

COMMON WATERWEED (*Elodea canadensis*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

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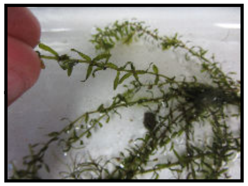
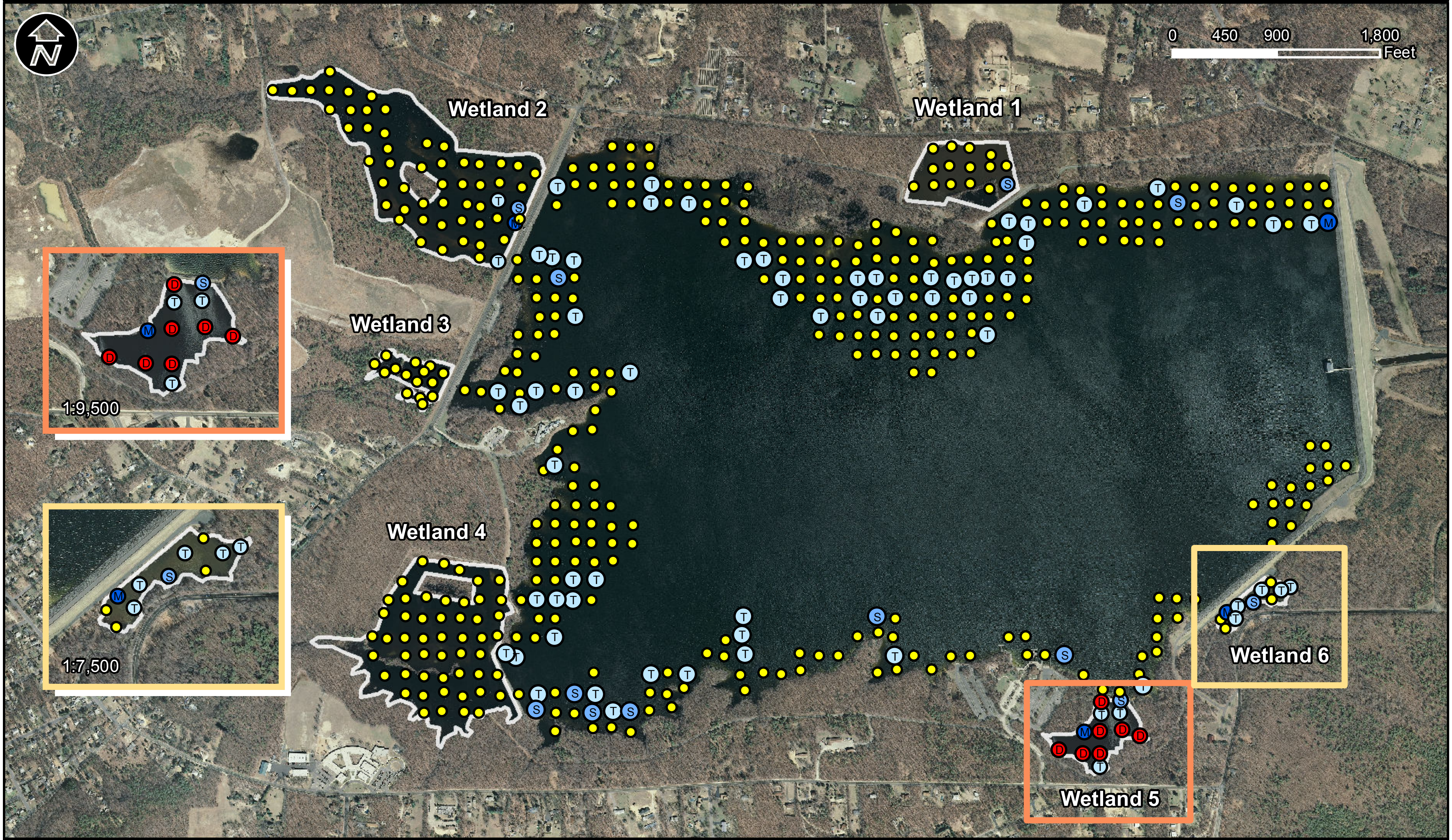


SŌLITUDE
LAKE MANAGEMENT

Date: 11/14/2017
File Name: Manasquan_ResWet_ComWaterwd_2017
Prepared by: KM
Office: Washington, NJ

COONTAIL (*Ceratophyllum demersum*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

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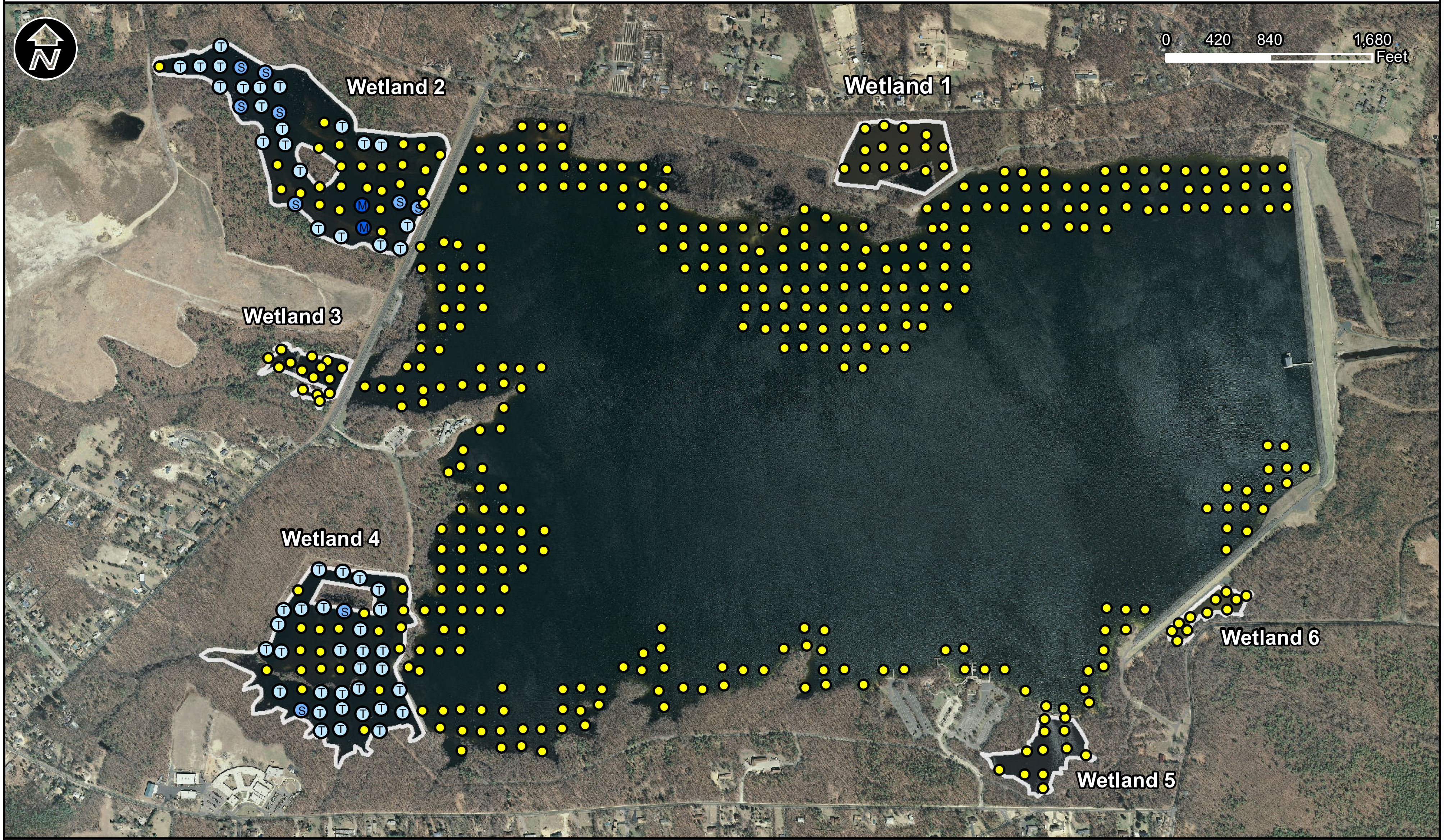
SOLITUDE LAKE MANAGEMENT

Date: 11/18/2017
File Name: Manasquan_ResWet_Coontail_2017
Prepared by: KM
Office: Washington, NJ

CREEPING BLADDERWORT (*Utricularia gibba*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

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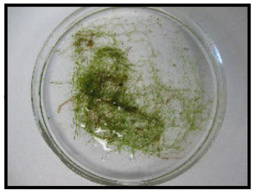
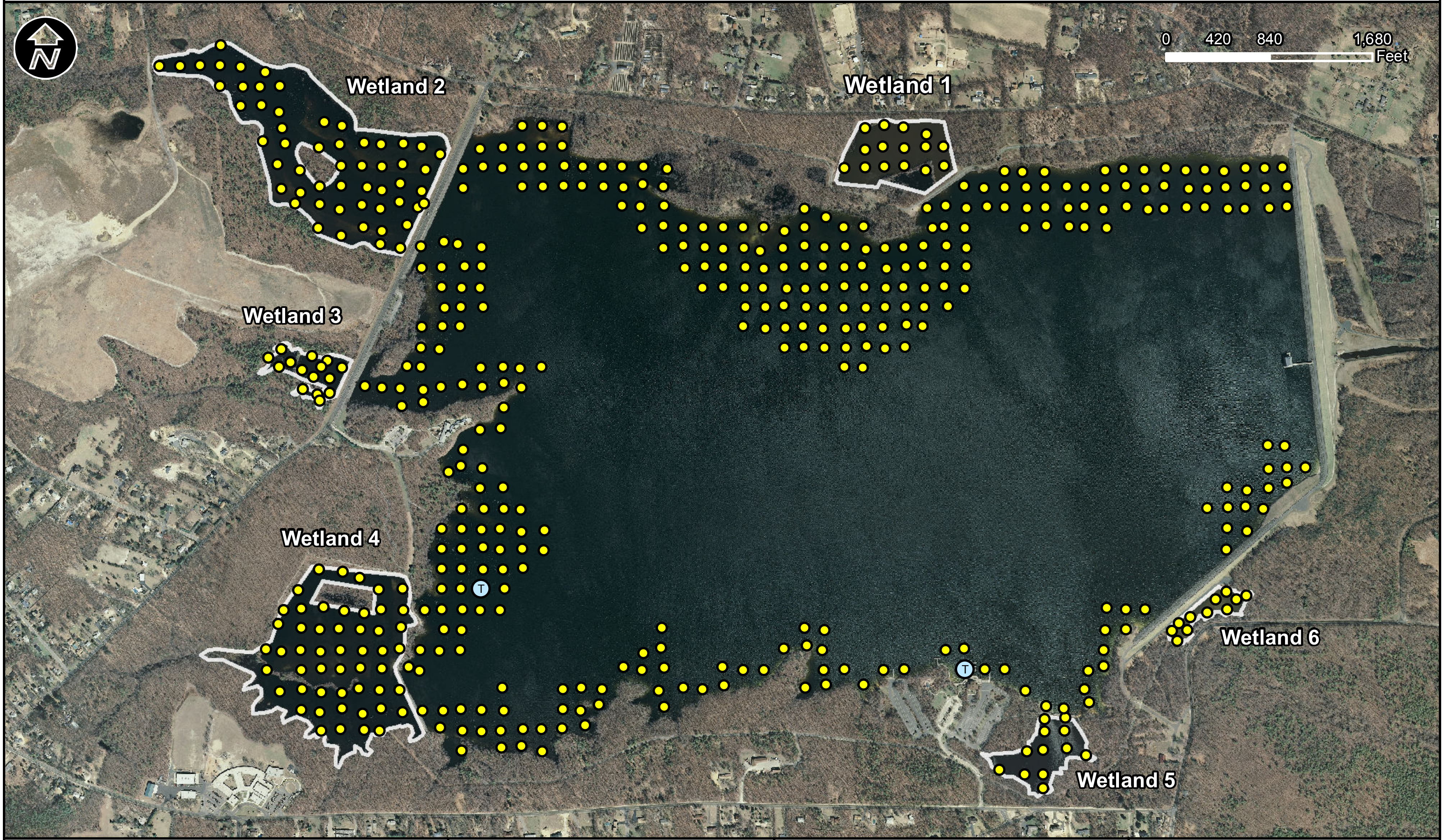


SŌLITUDE LAKE MANAGEMENT

Date: 11/15/2017
File Name: Manasquan_ResWet_CreepBladderwt_2017
Prepared by: KM
Office: Washington, NJ

CURLY-LEAF PONDWEED (*Potamogeton crispus*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

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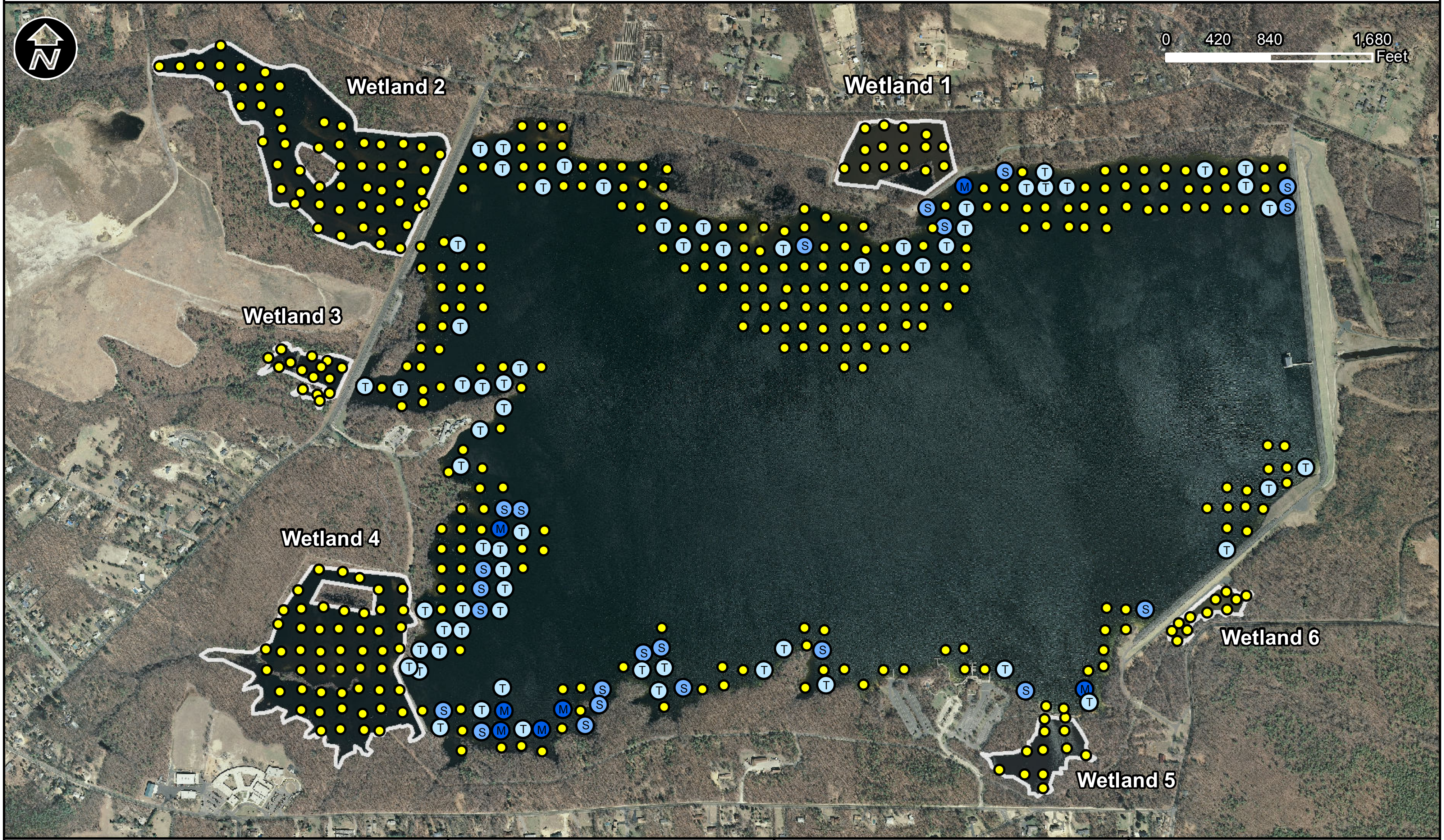
SŌLITUDE
LAKE MANAGEMENT

Date: 11/15/2017
File Name: Manasquan_ResWet_CurlylfPdwd_2017
Prepared by: KM
Office: Washington, NJ

EURASIAN WATER MILFOIL (*Myriophyllum spicatum*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

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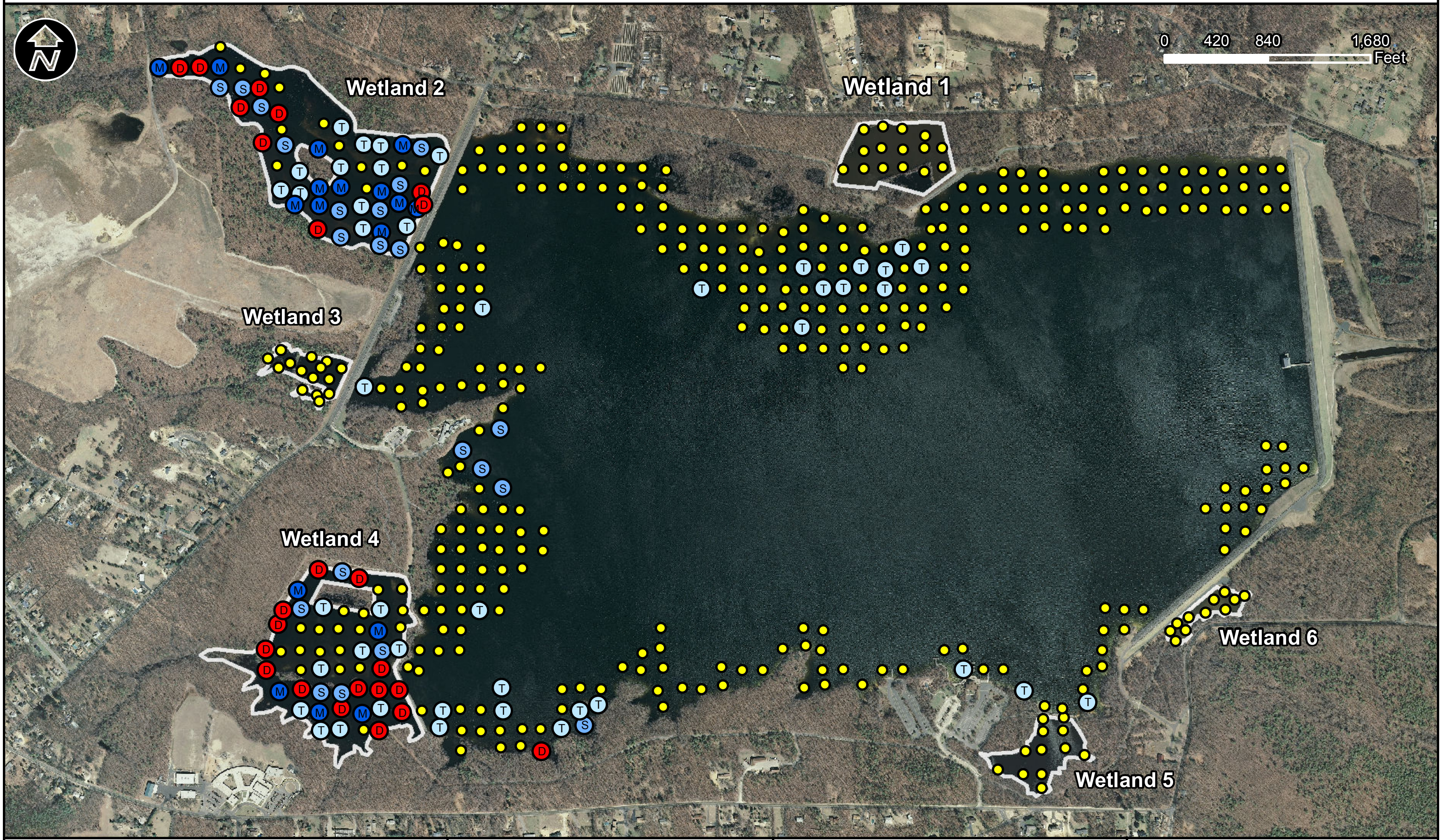
SOLITUDE
LAKE MANAGEMENT

Date: 11/14/2017
File Name: Manasquan_ResWet_EMilfoil_2017
Prepared by: KM
Office: Washington, NJ

FANWORT (*Cabomba caroliniana*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

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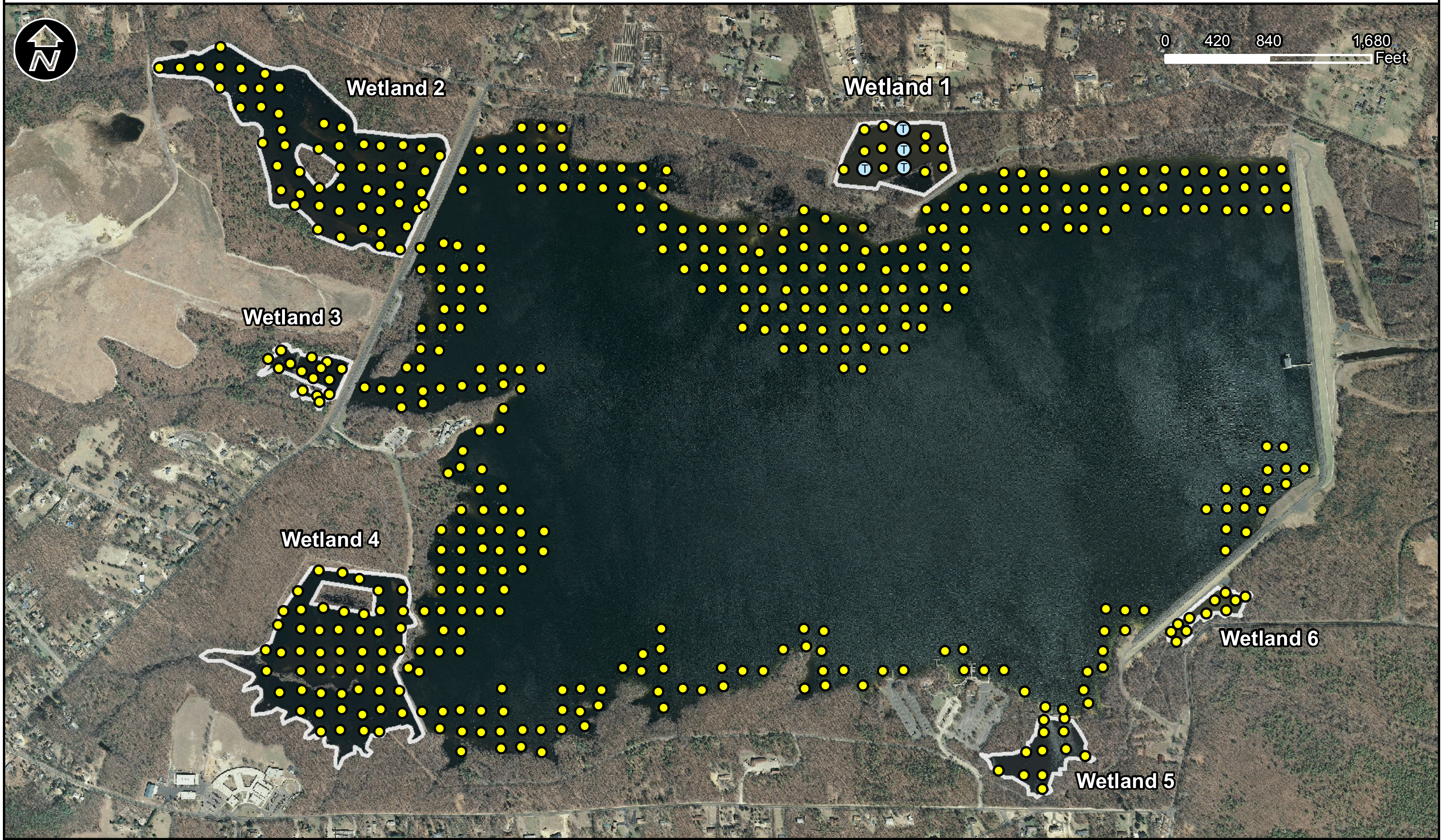
SOLITUDE LAKE MANAGEMENT

Date: 11/14/2017
File Name: Manasquan_ResWet_Fanwort_2017
Prepared by: KM
Office: Washington, NJ

GREATER DUCKWEED (*Spirodela polyrhiza*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

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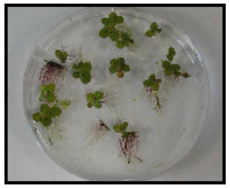
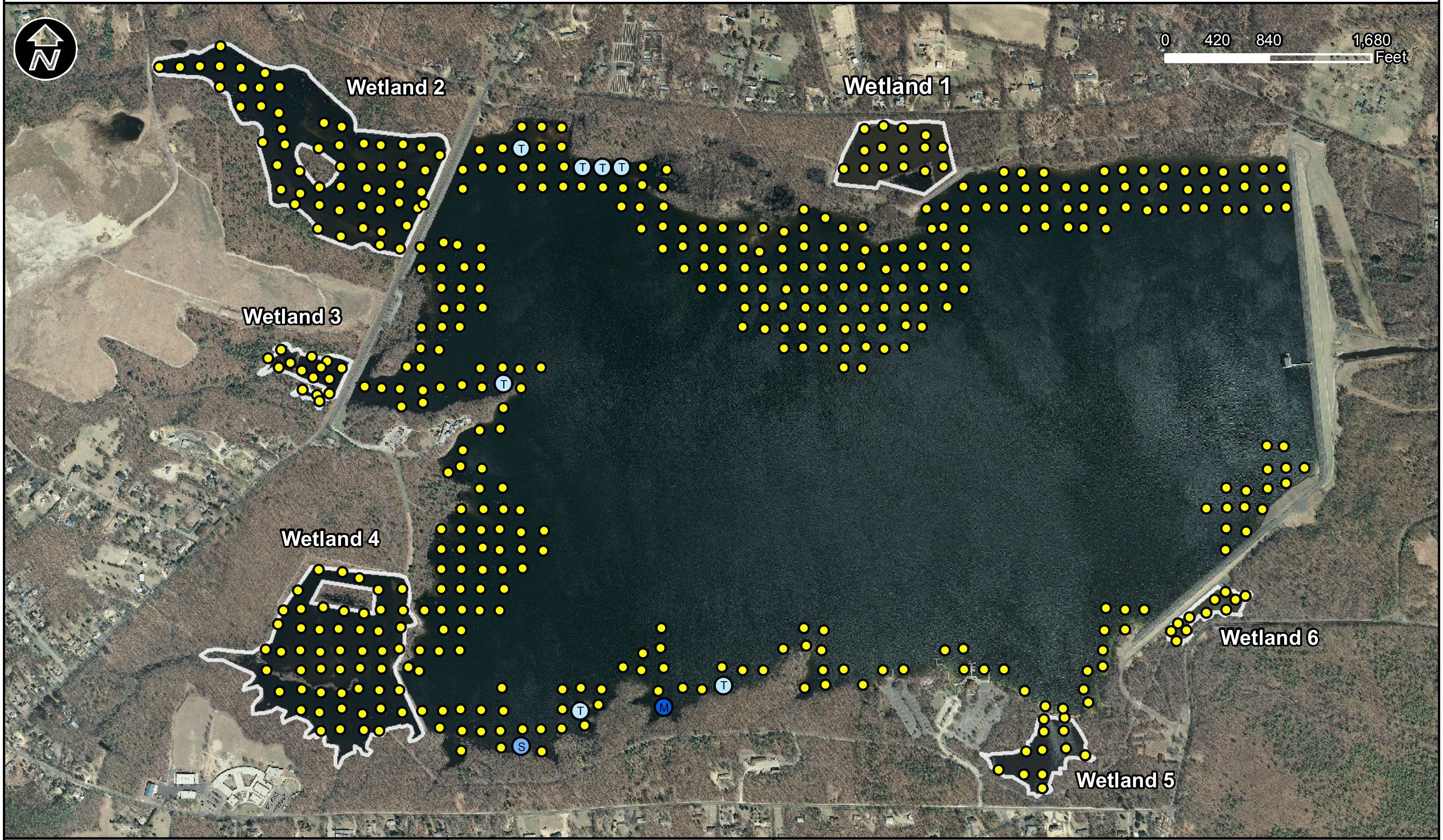


SOLITUDE
LAKE MANAGEMENT

Date: 11/15/2017
File Name: Manasquan_ResWet_GreatDuckwd_2017
Prepared by: KM
Office: Washington, NJ

GOLDEN HEDGE HYSSOP (*Gratiola aurea*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

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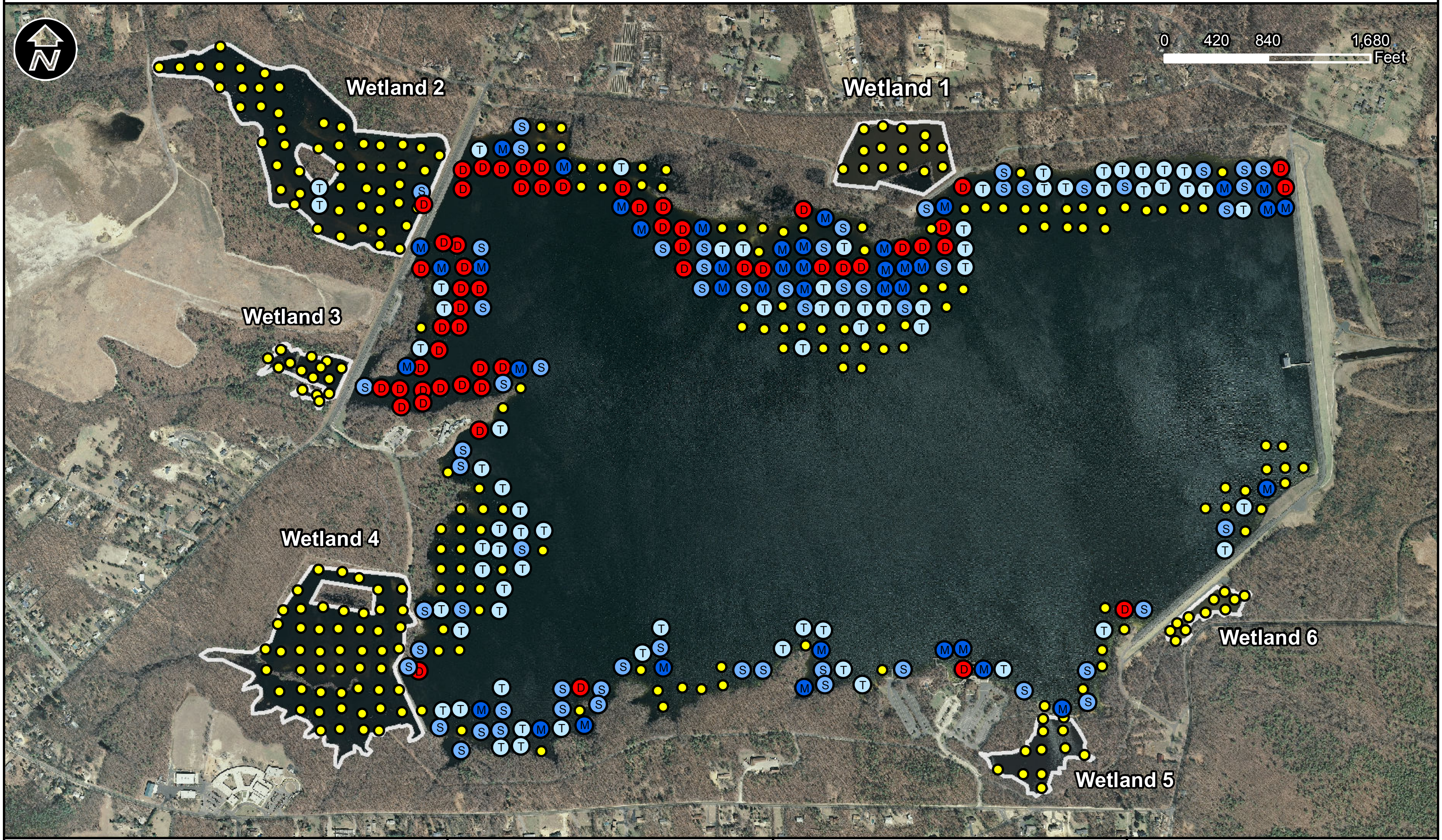
SOLITUDE
LAKE MANAGEMENT

Date: 11/15/2017
File Name: Manasquan_ResWet_HedgeHyssop_2017
Prepared by: KM
Office: Washington, NJ

HYDRILLA (*Hydrilla verticillata*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

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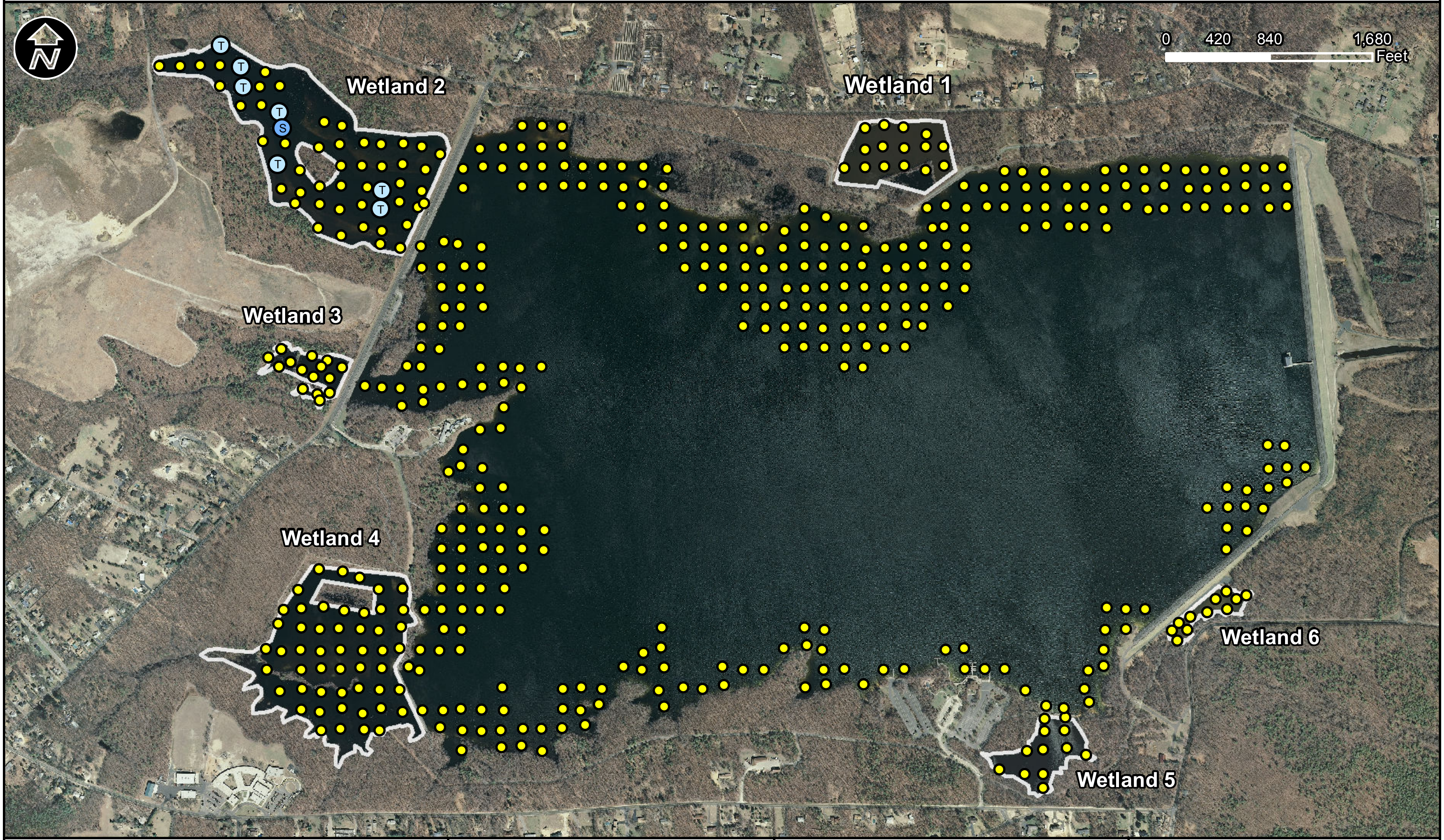
SŌLITUDE
LAKE MANAGEMENT

Date: 11/15/2017
File Name: Manasquan_ResWet_Hydrilla_2017
Prepared by: KM
Office: Washington, NJ

INTERMEDIA BLADDERWORT (*Utricularia intermedia*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

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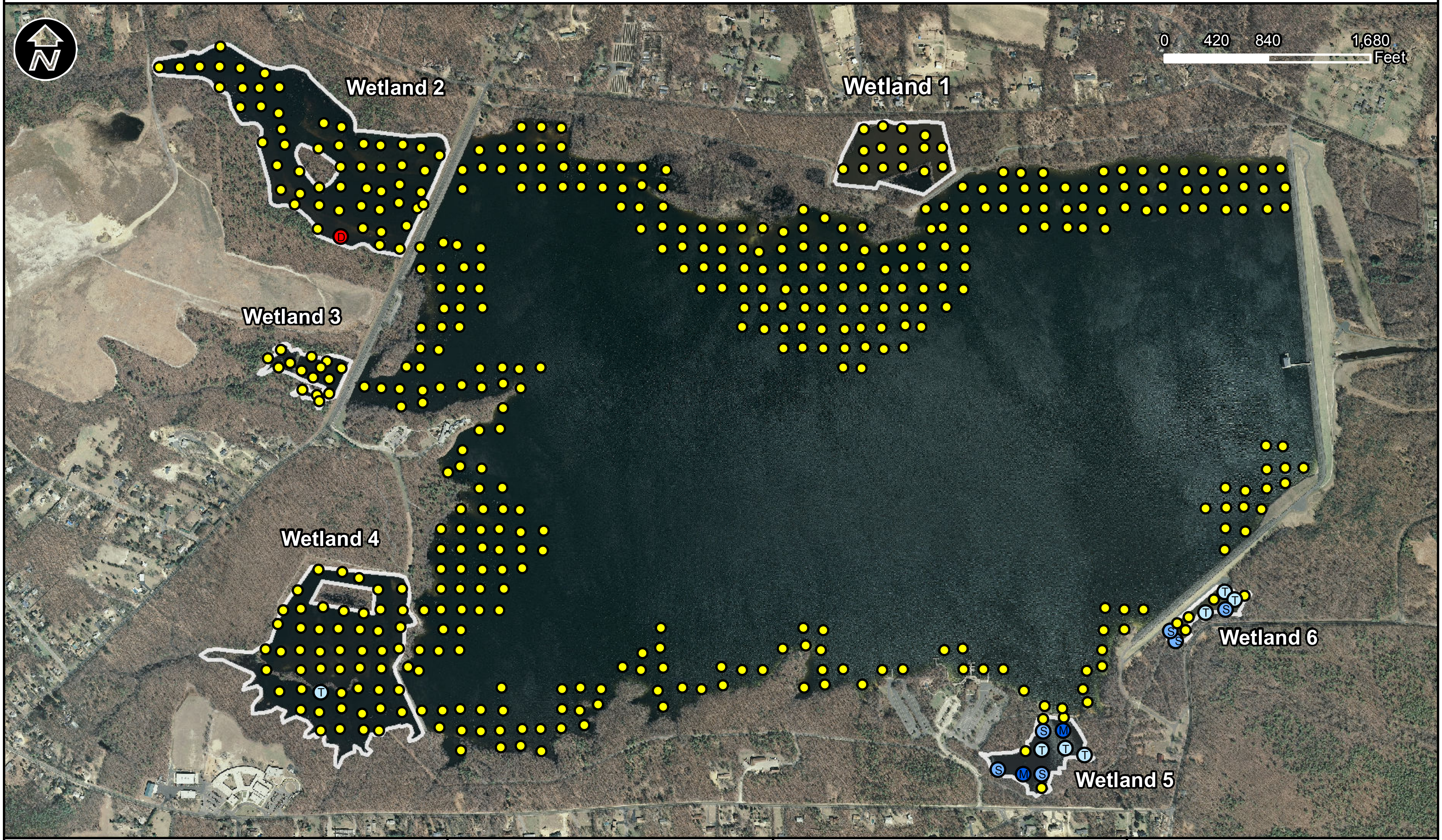
SOLITUDE LAKE MANAGEMENT

Date: 11/15/2017
File Name: Manasquan_ResWet_IntermBladderwt_2017
Prepared by: KM
Office: Washington, NJ

LEAFY PONDWEED (*Potamogeton foliosus*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

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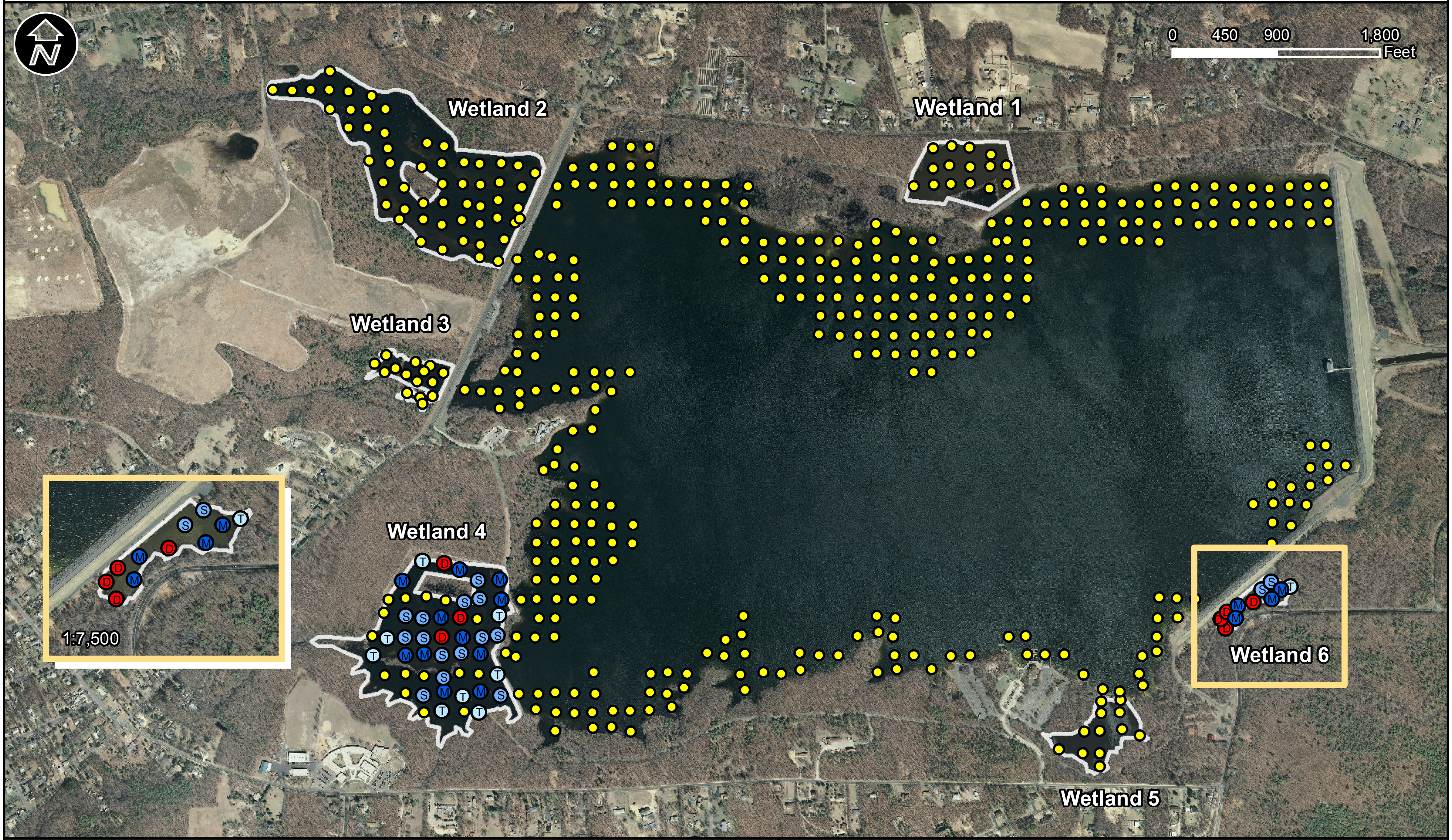
SOLITUDE LAKE MANAGEMENT

Date: 11/15/2017
File Name: Manasquan_ResWet_LeafyPdwd_2017
Prepared by: KM
Office: Washington, NJ

LOW WATER MILFOIL (*Myriophyllum humile*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

Plant Density

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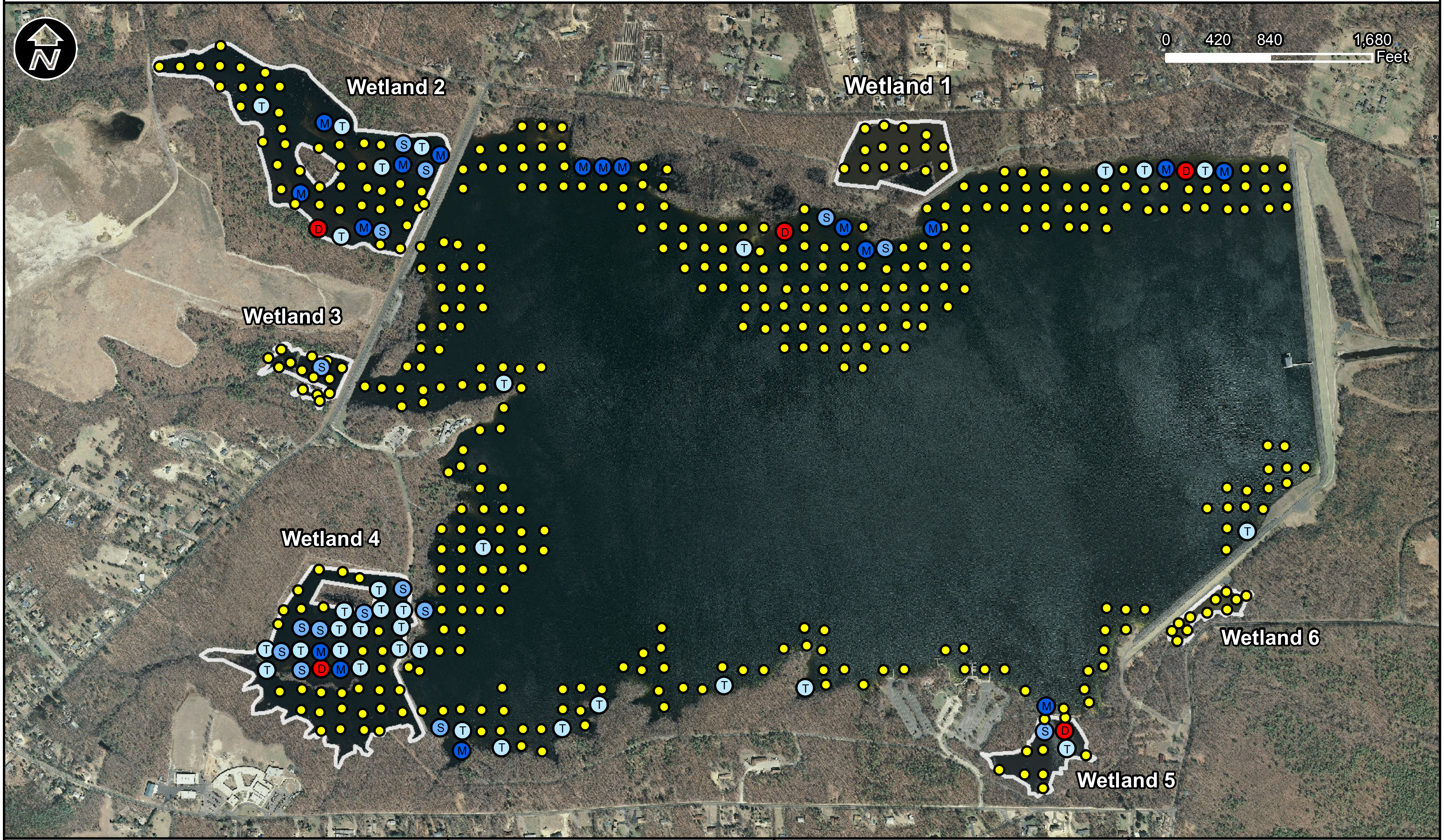
SOLITUDE LAKE MANAGEMENT

Date: 11/18/2017
File Name: Manasquan_ResWet_LowMilfoil_2017
Prepared by: KM
Office: Washington, NJ

MUDMAT (*Glossostigma cleistanthum*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

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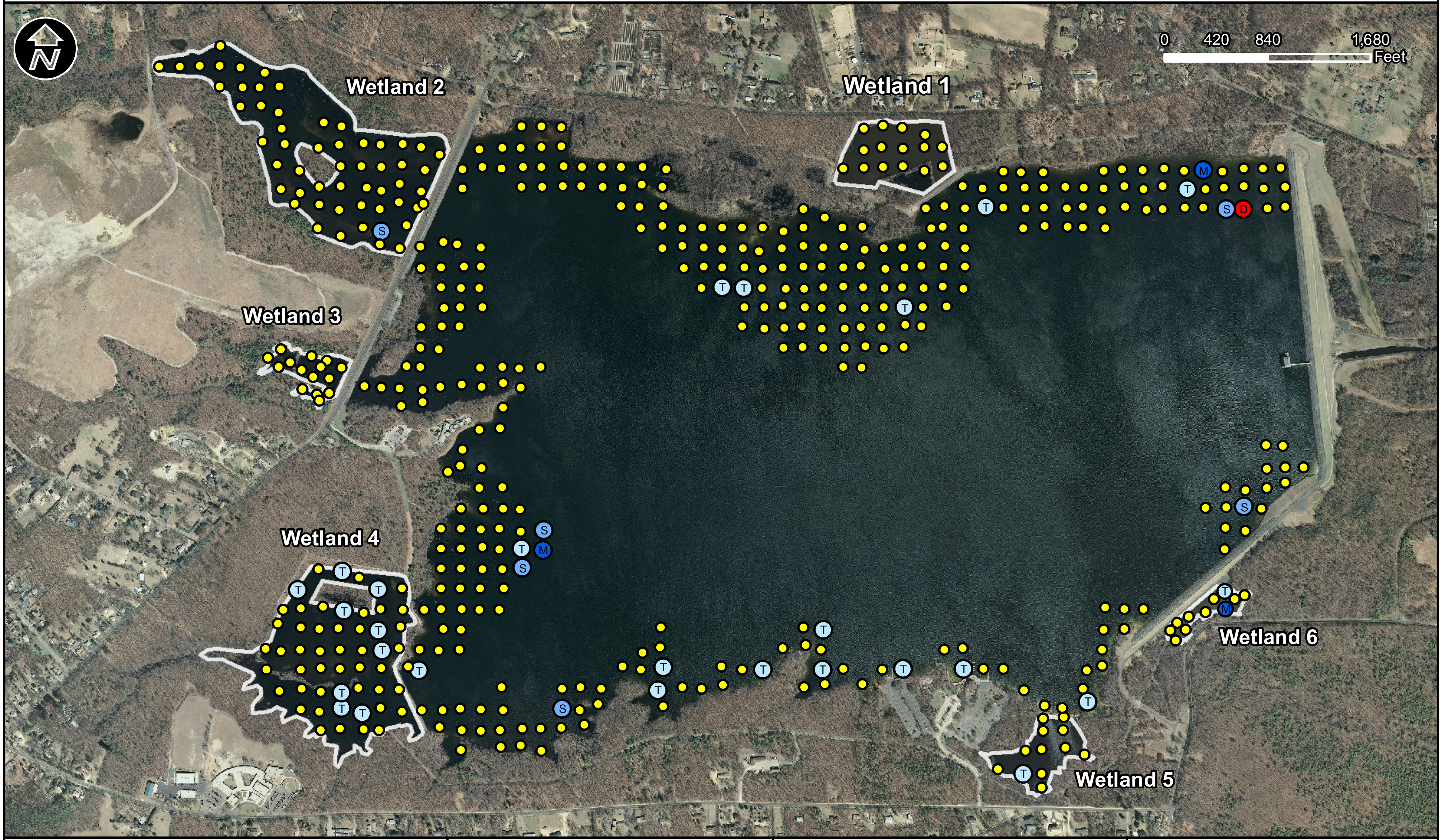
SOLITUDE
LAKE MANAGEMENT

Date: 11/15/2017
File Name: Manasquan_ResWet_Mudmat_2017
Prepared by: KM
Office: Washington, NJ

MUSKGRASS (*Chara* sp.) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

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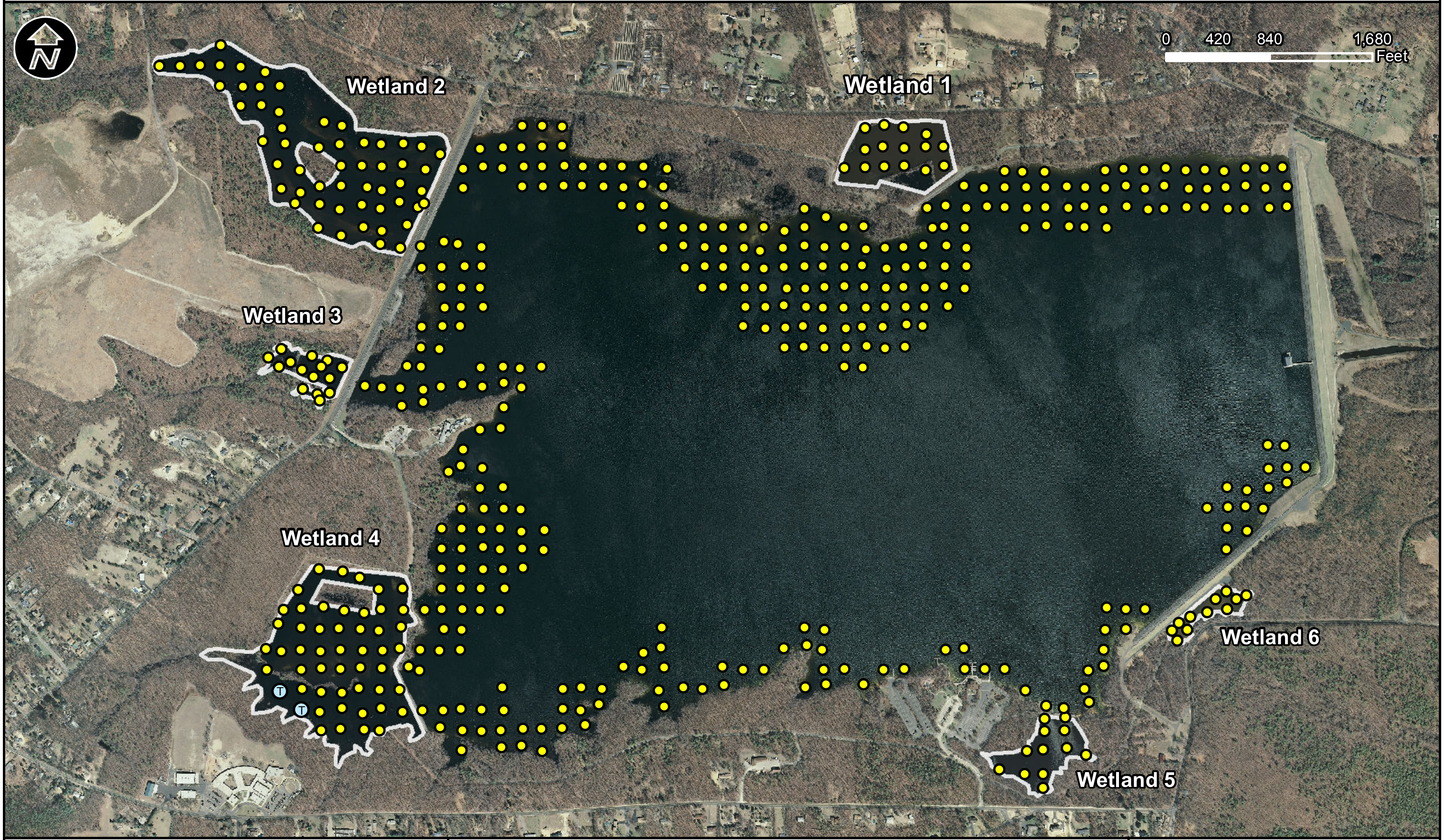
SŌLITUDE
LAKE MANAGEMENT

Date: 11/14/2017
File Name: Manasquan_ResWet_Muskgrass_2017
Prepared by: KM
Office: Washington, NJ

NAIAD SPECIES (*Najas* sp.) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

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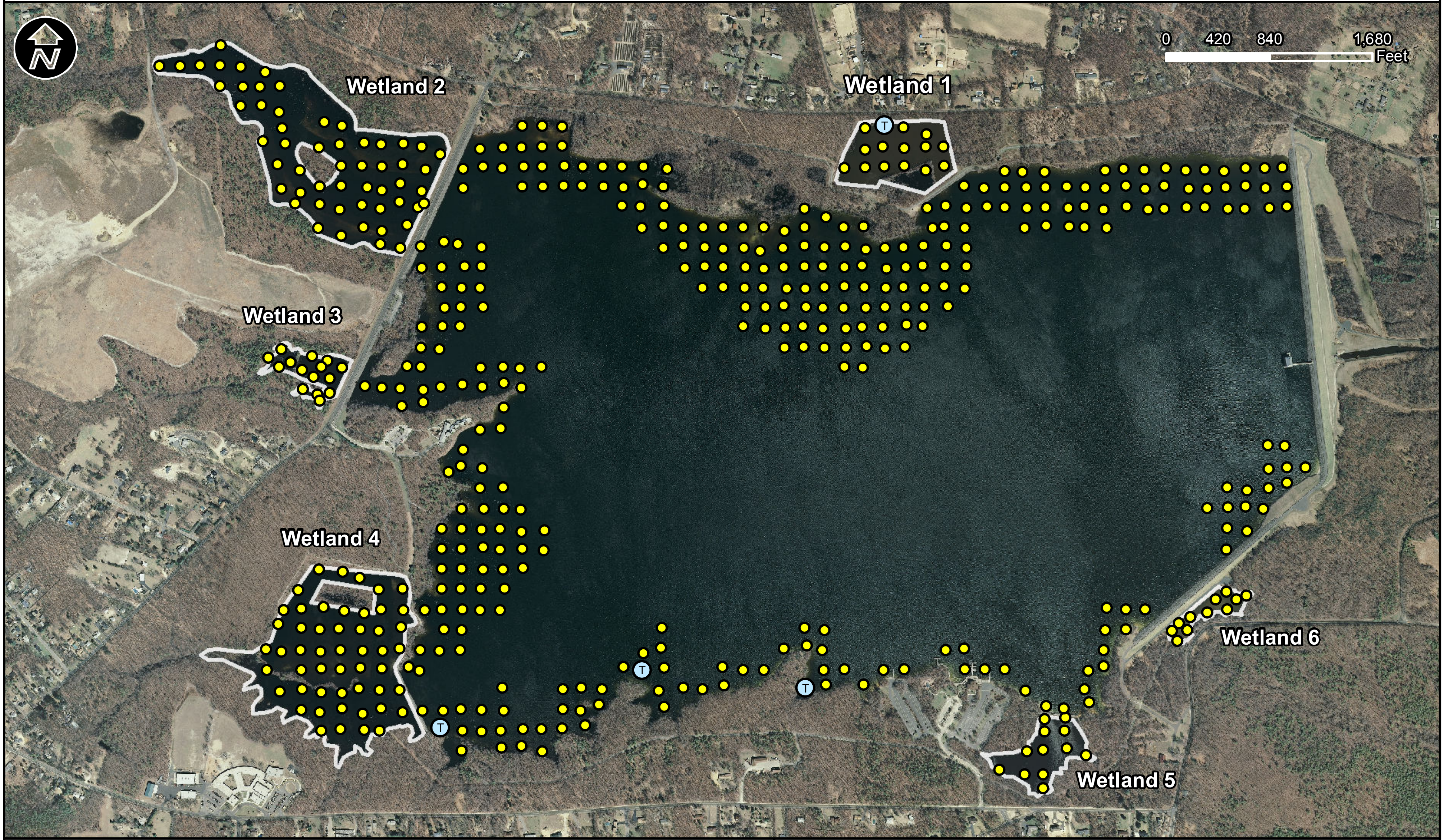
SOLITUDE LAKE MANAGEMENT

Date: 11/17/2017
File Name: Manasquan_ResWet_Naiadsp_2017
Prepared by: KM
Office: Washington, NJ

NORTHERN NAIAD (*Najas gracillima*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

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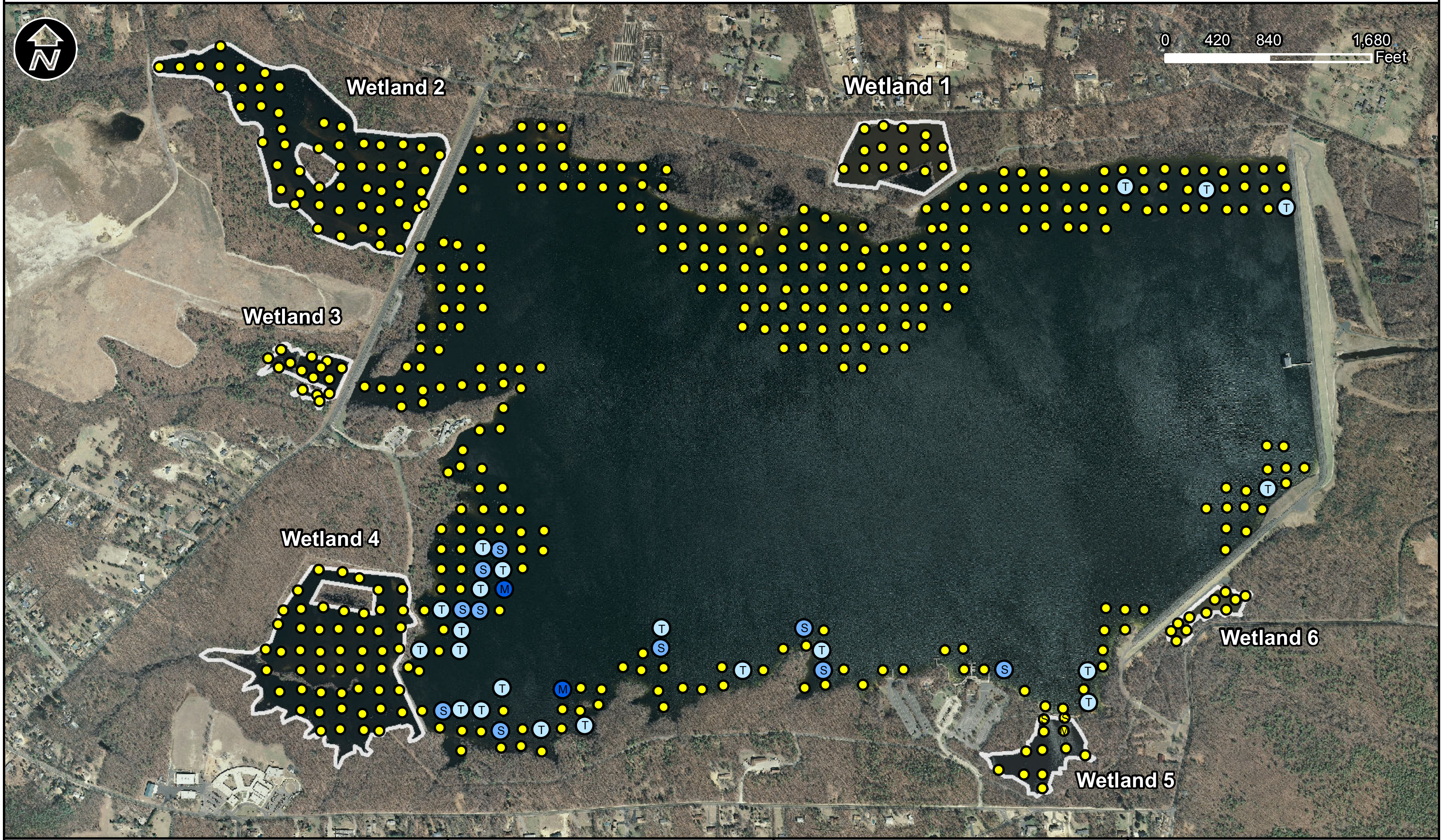
SŌLITUDE
LAKE MANAGEMENT

Date: 11/20/2017
File Name: Manasquan_ResWet_NorthNaiad_2017
Prepared by: KM
Office: Washington, NJ

SLENDER NAIAD (*Najas flexilis*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
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September 12-14 and 18, 2017

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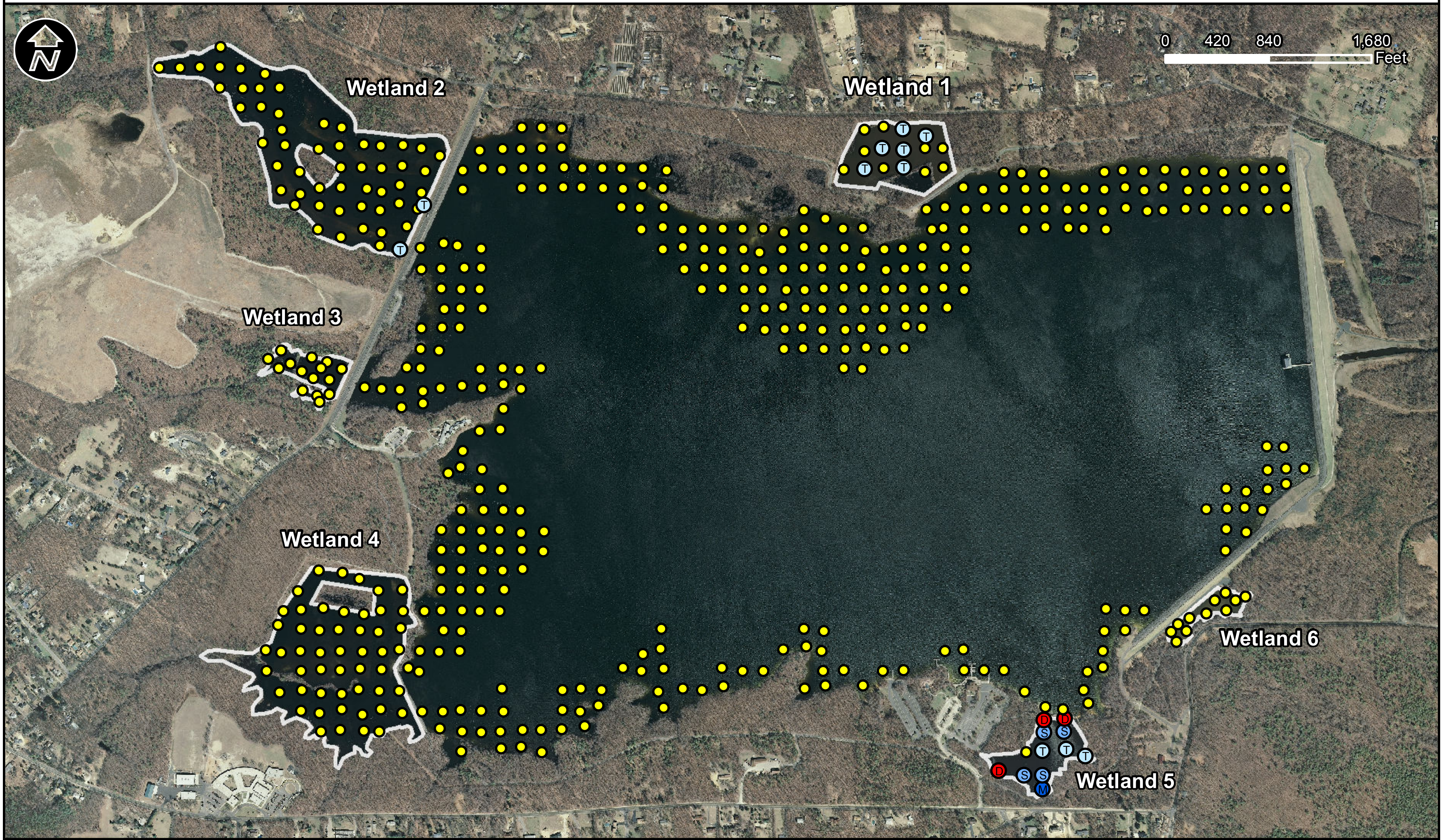
SŌLITUDE
LAKE MANAGEMENT

Date: 11/14/2017
File Name: Manasquan_ResWet_SlenderNaiad_2017
Prepared by: KM
Office: Washington, NJ

SMALL DUCKWEED (*Lemna minor*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

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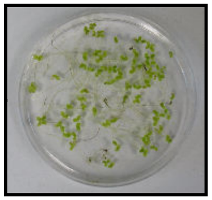
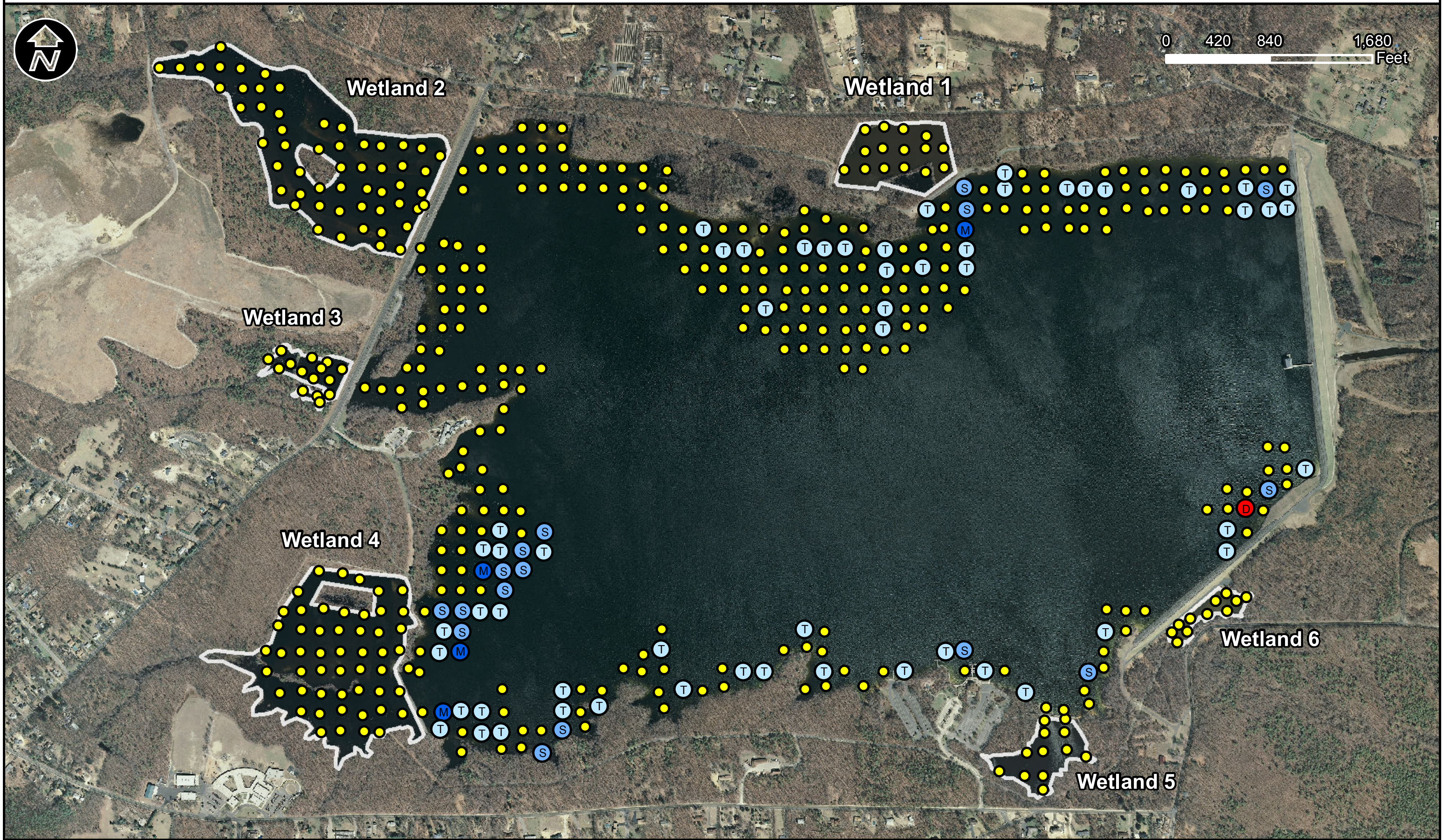


SOLITUDE LAKE MANAGEMENT

Date: 11/15/2017
File Name: Manasquan_ResWet_SmallDuckwd_2017
Prepared by: KM
Office: Washington, NJ

SMALL PONDWEED (*Potamogeton pusillus*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

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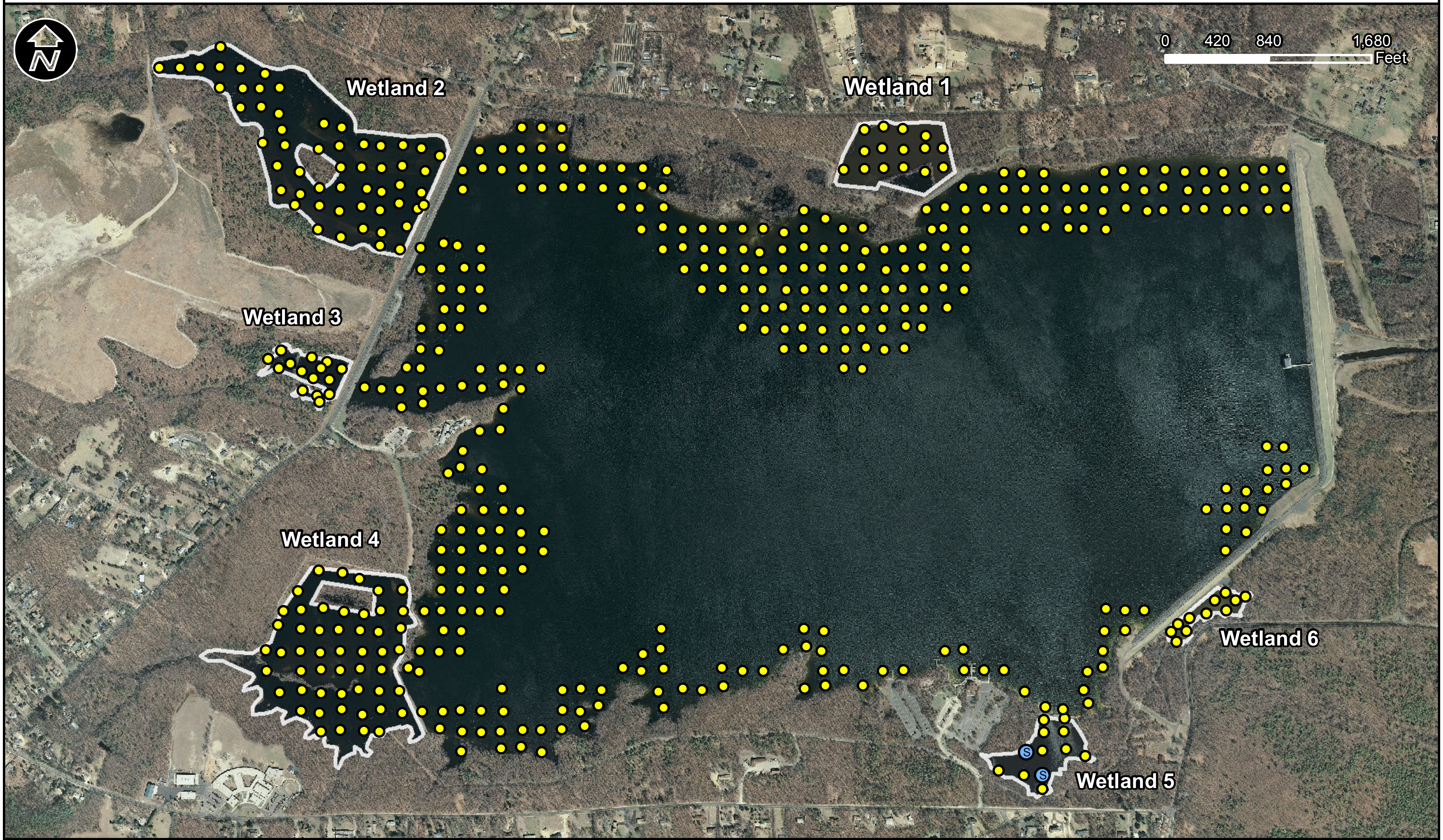
SOLITUDE
LAKE MANAGEMENT

Date: 11/14/2017
File Name: Manasquan_ResWet_SmallPdwd_2017
Prepared by: KM
Office: Washington, NJ

SOUTHERN NAIAD (*Najas guadalupensis*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

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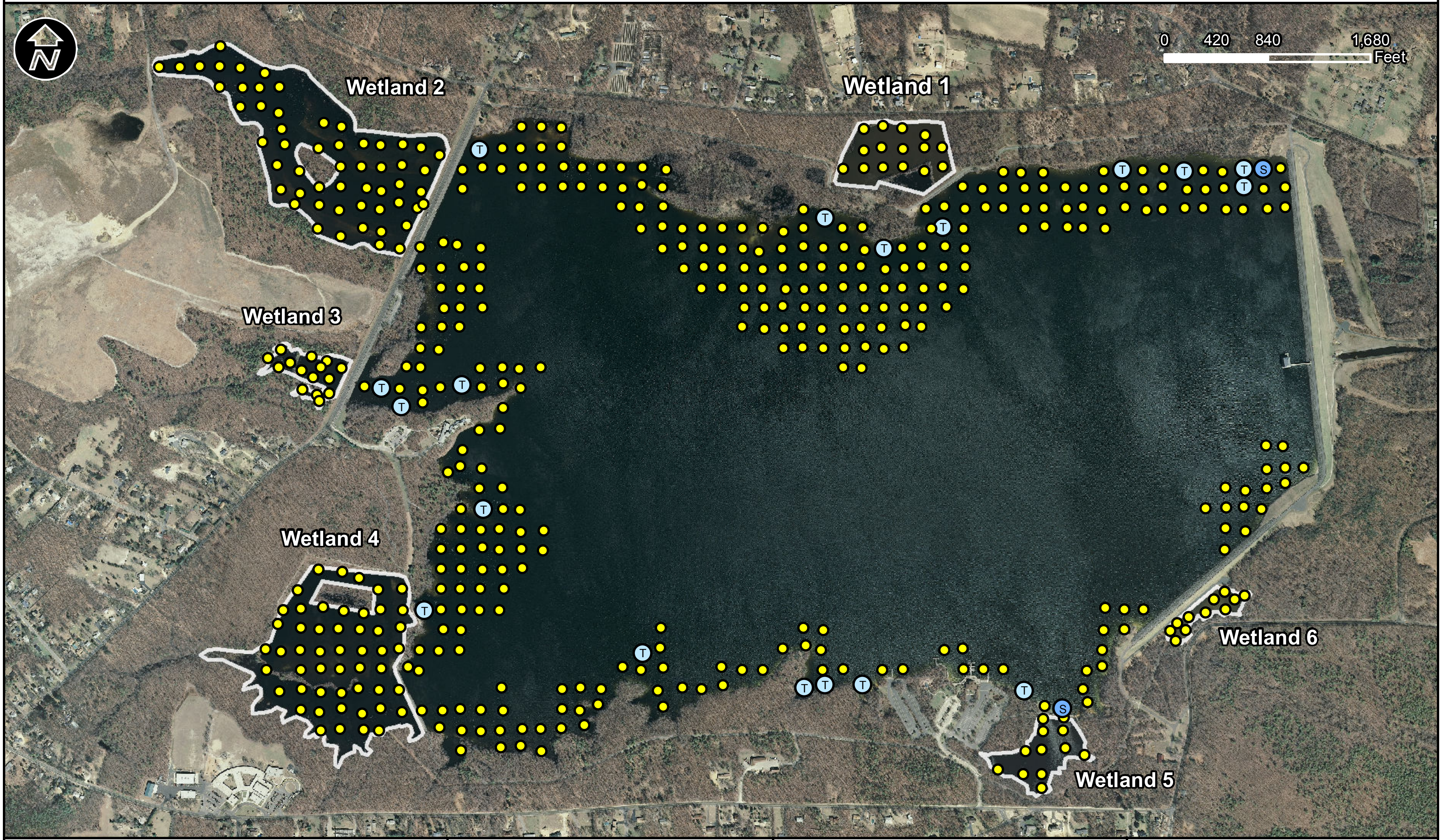
SŌLITUDE LAKE MANAGEMENT

Date: 11/15/2017
File Name: Manasquan_ResWet_SNaiad_2017
Prepared by: KM
Office: Washington, NJ

SNAILSEED PONDWEED (*Potamogeton bicupulatus*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
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September 12-14 and 18, 2017

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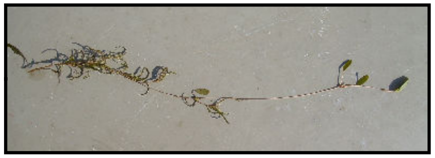
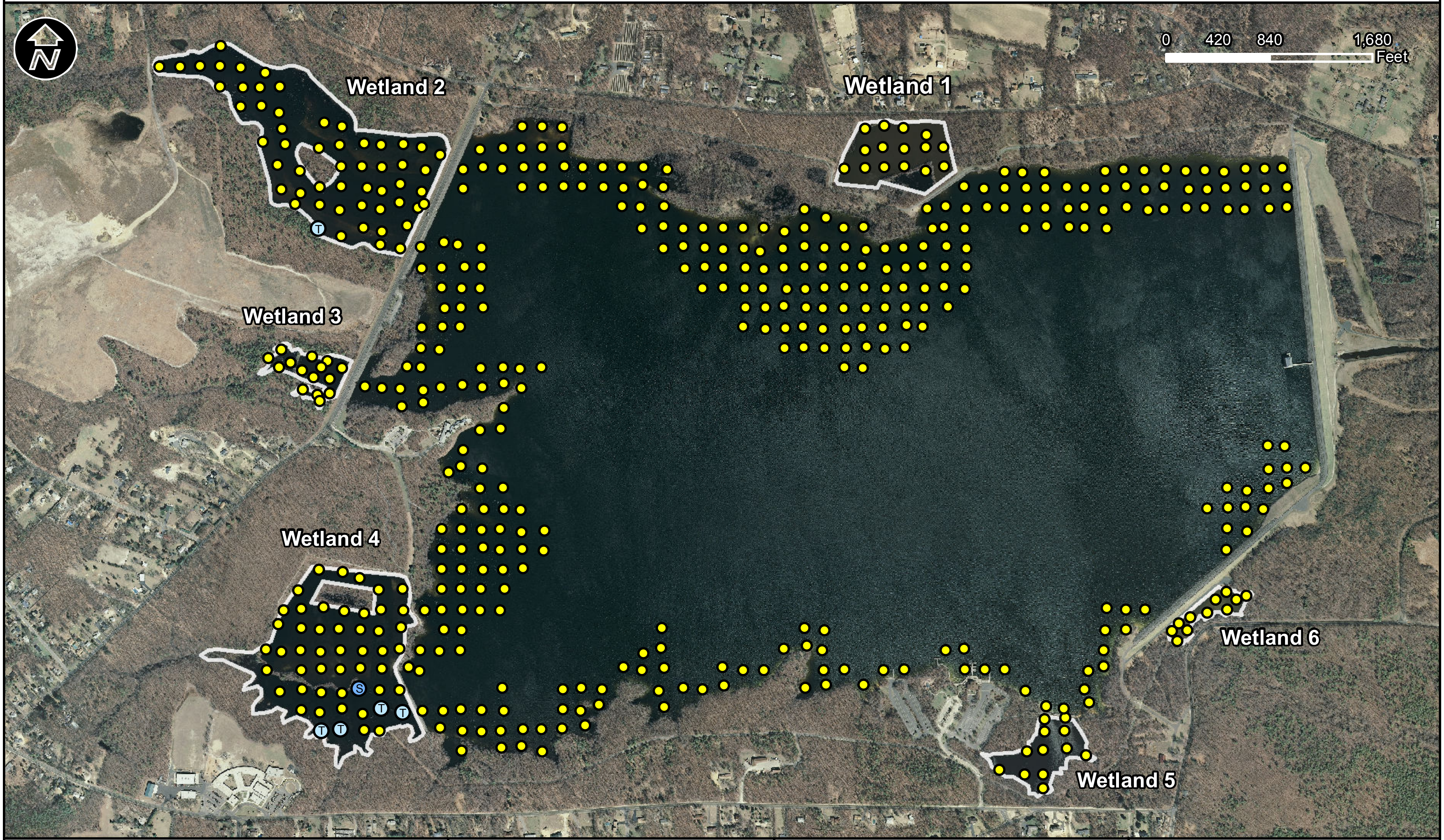


SOLITUDE
LAKE MANAGEMENT

Date: 11/15/2017
File Name: Manasquan_ResWet_SnailseedPdwd_2017
Prepared by: KM
Office: Washington, NJ

SPATTERDOCK (*Nuphar variegata*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

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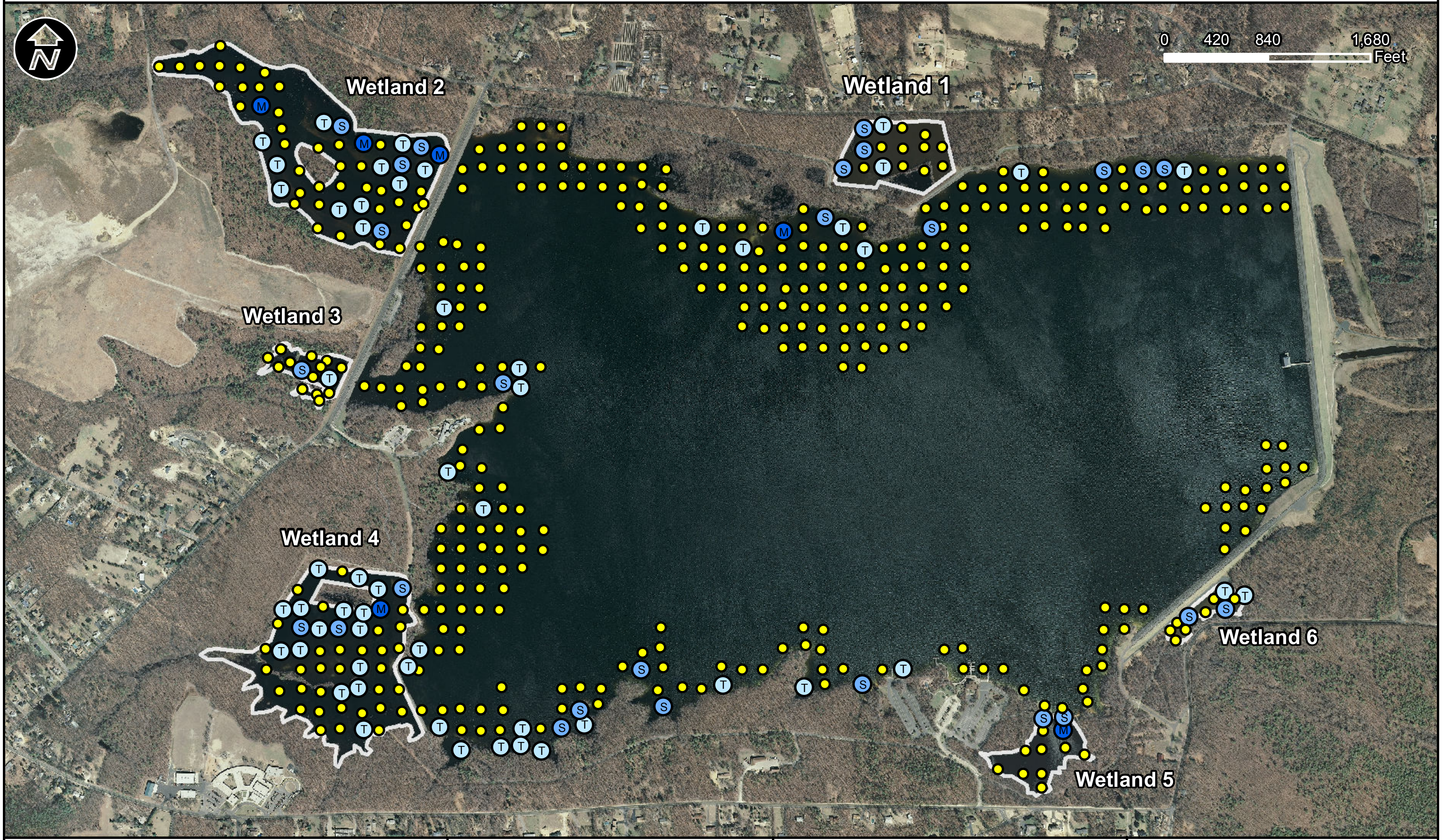
SOLITUDE LAKE MANAGEMENT

Date: 11/15/2017
File Name: Manasquan_ResWet_Spatterdock_2017
Prepared by: KM
Office: Washington, NJ

SPIKERUSH (*Eleocharis* sp.) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

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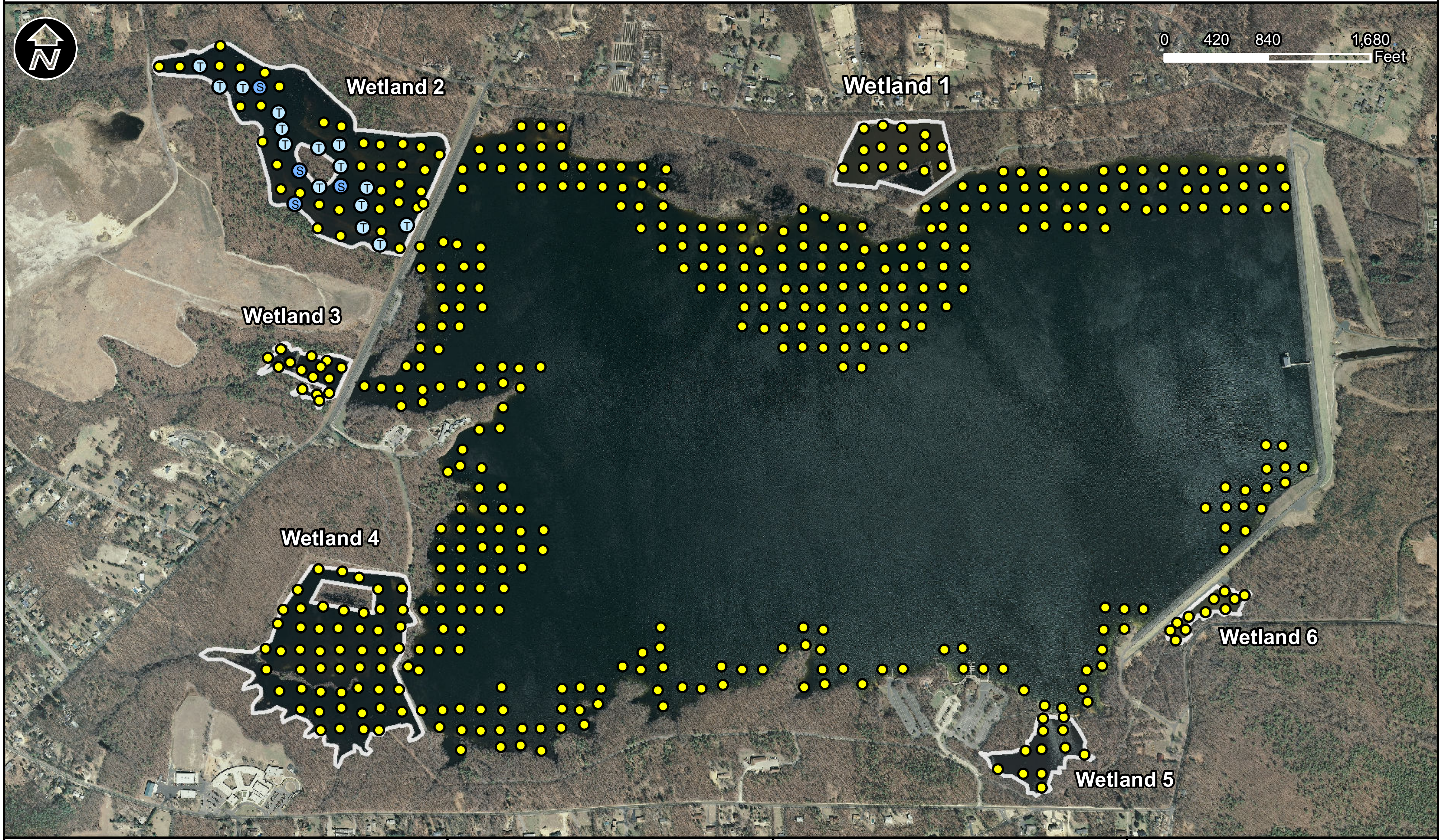
SŌLITUDE
LAKE MANAGEMENT

Date: 11/14/2017
File Name: Manasquan_ResWet_SpikeRush_2017
Prepared by: KM
Office: Washington, NJ

SPINY HORNWORT (*Ceratophyllum echinatum*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

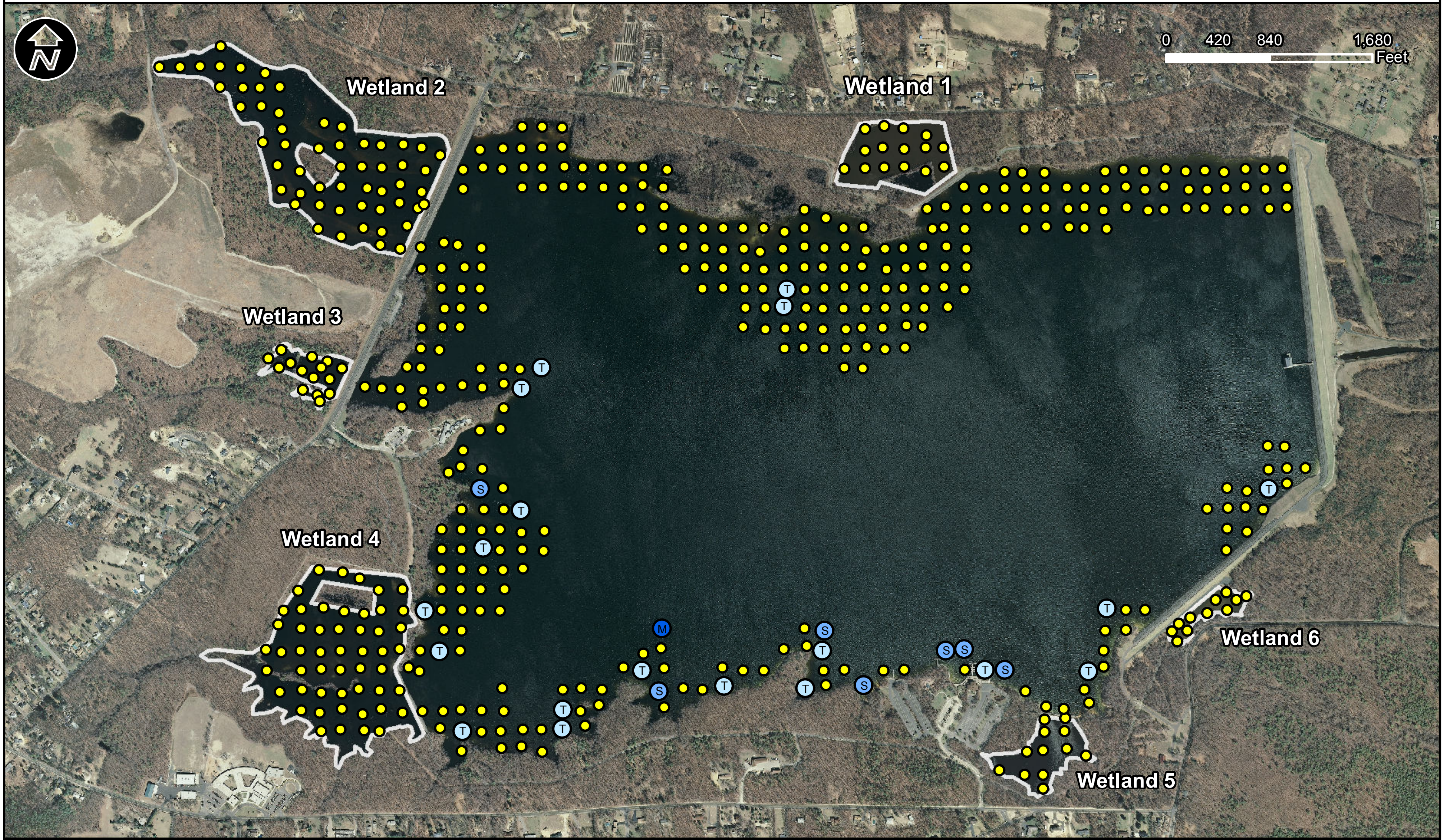
Plant Density

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

SOLITUDE
LAKE MANAGEMENT

Date: 11/15/2017
File Name: Manasquan_ResWet_SpinyHornwt_2017
Prepared by: KM
Office: Washington, NJ

STONEWORT (*Nitella* sp.) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

Plant Density

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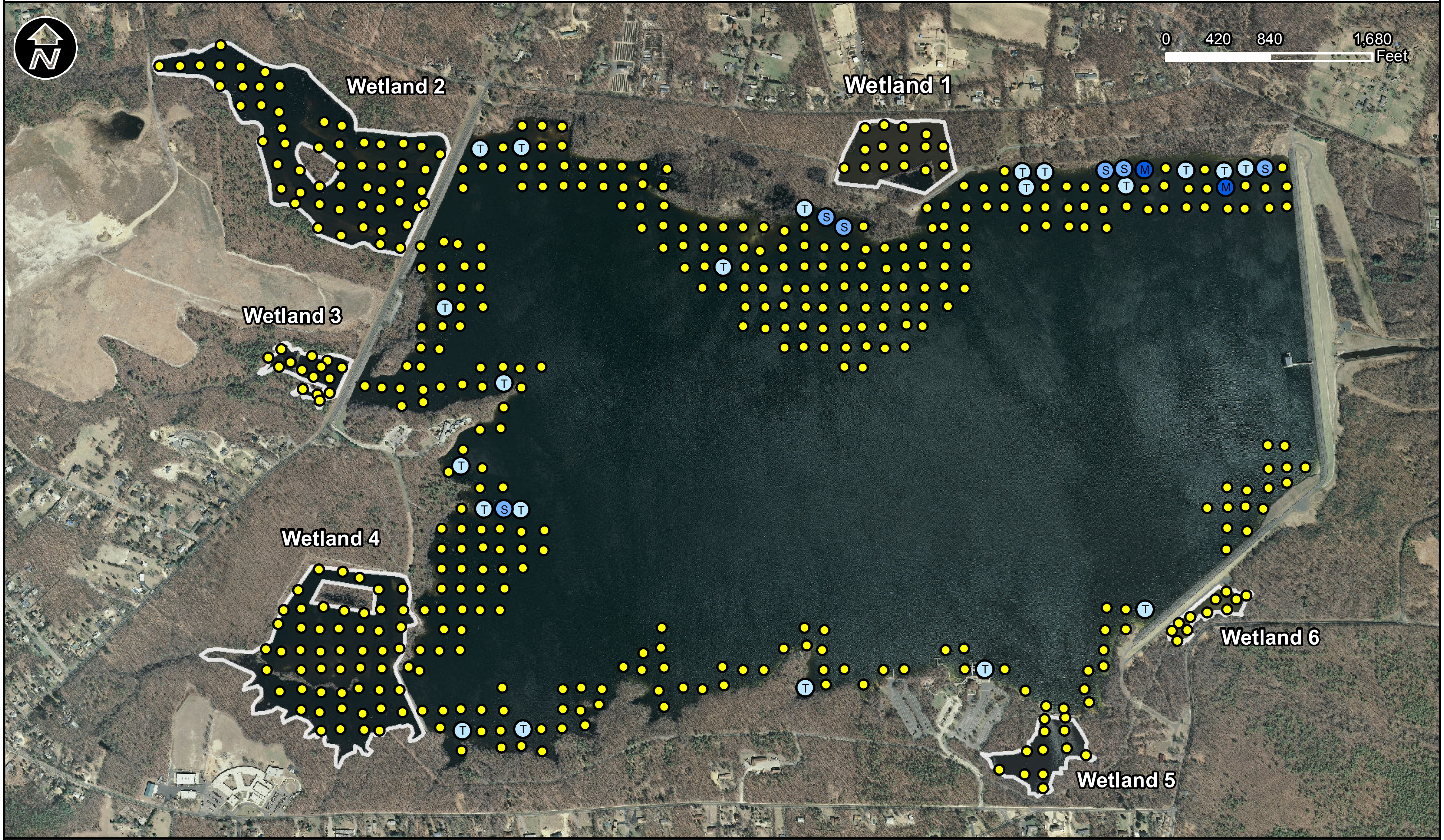
SOLITUDE
LAKE MANAGEMENT

Date: 11/14/2017
File Name: Manasquan_ResWet_Stonewort_2017
Prepared by: KM
Office: Washington, NJ

THIN-LEAF PONDWEED SPECIES (*Potamogeton* sp.) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

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SOLITUDE LAKE MANAGEMENT

Date: 11/17/2017
File Name: Manasquan_ResWet_ThinleafPdwd_2017
Prepared by: KM
Office: Washington, NJ

HYDRILLA TUBER SAMPLING LOCATIONS

MANASQUAN RESERVOIR and WETLANDS
Hydrilla Tuber Monitoring
October 25, 2017

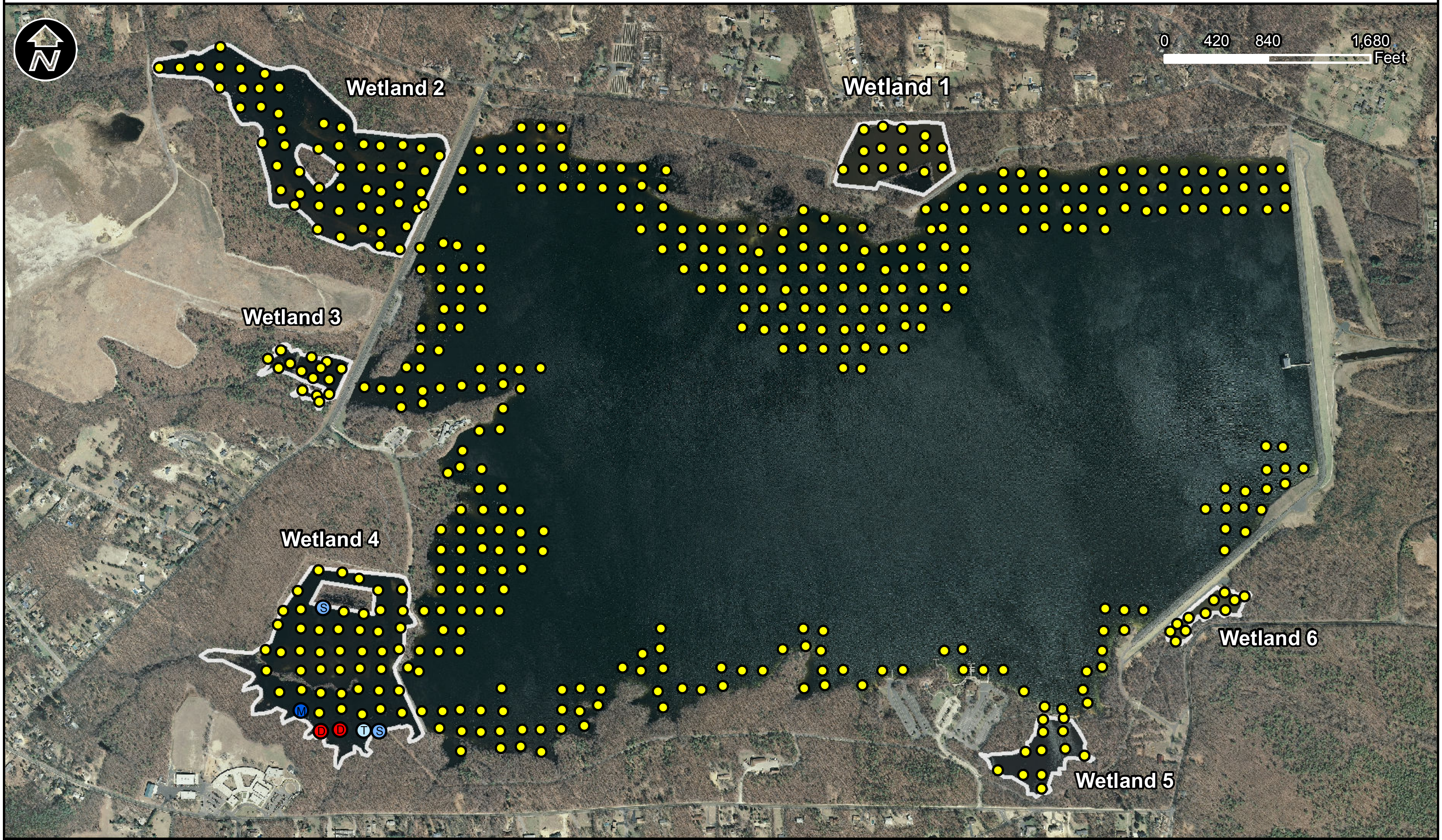
Sample Points: 5

Site	Latitude	Longitude
MR1	40.183388°	-74.196167°
MR2	40.182848°	-74.219306°
MR3	40.182626°	-74.211918°
MR4	40.171086°	-74.215251°
MR5	40.172311°	-74.203236°

SŌLITUDE
LAKE MANAGEMENT

Date: 11/18/2017
File Name: Manasquan_ResWet_TuberPts_2017
Prepared by: KM
Office: Washington, NJ

WATER BULRUSH (*Schoenoplectus subterminalis*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

Plant Density

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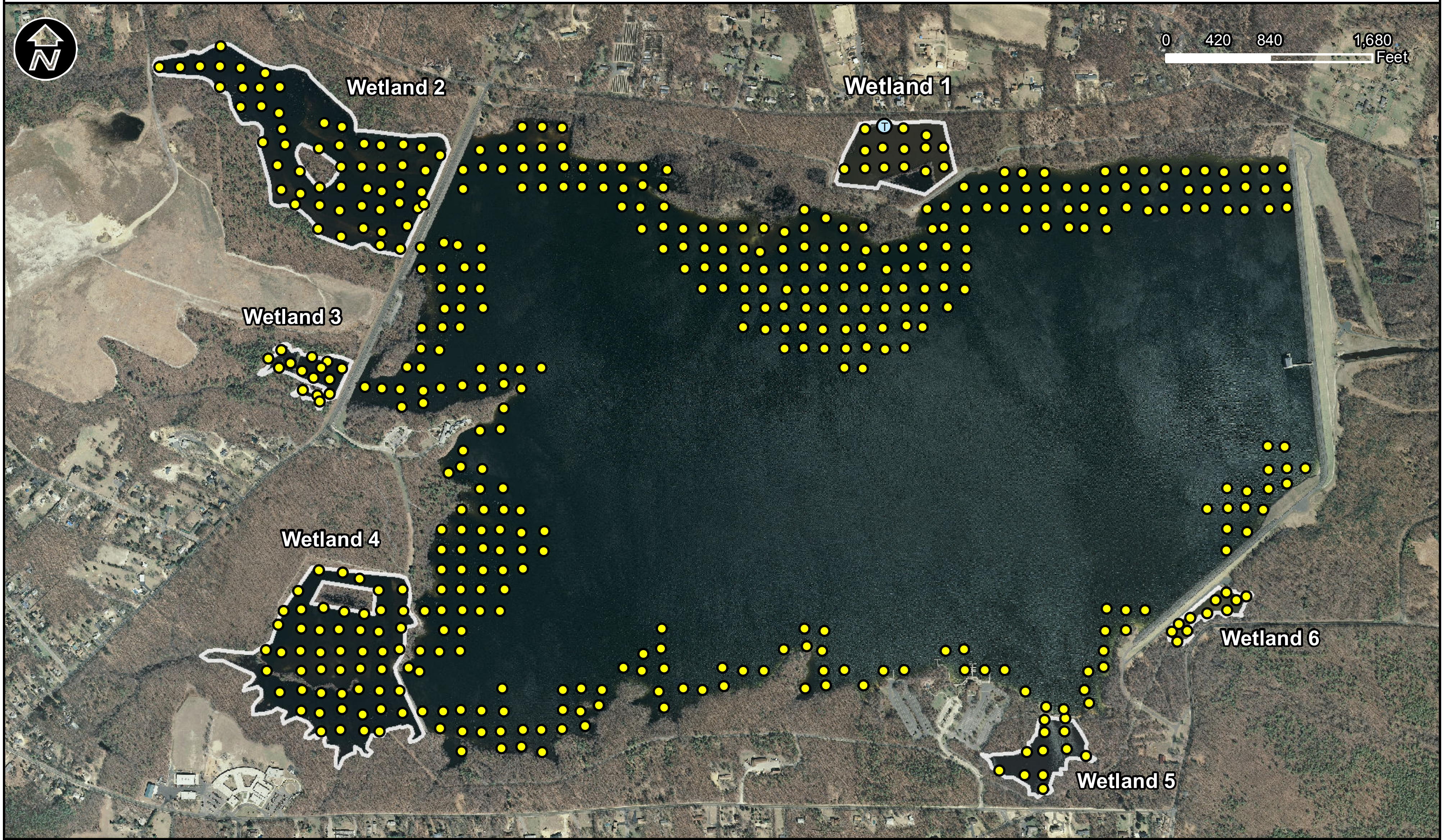
- D = Dense Plants

SŌLITUDE LAKE MANAGEMENT

Date: 11/17/2017
File Name: Manasquan_ResWet_WaterBulrush_2017
Prepared by: KM
Office: Washington, NJ

WATER CELERY (*Vallisneria americana*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

Plant Density

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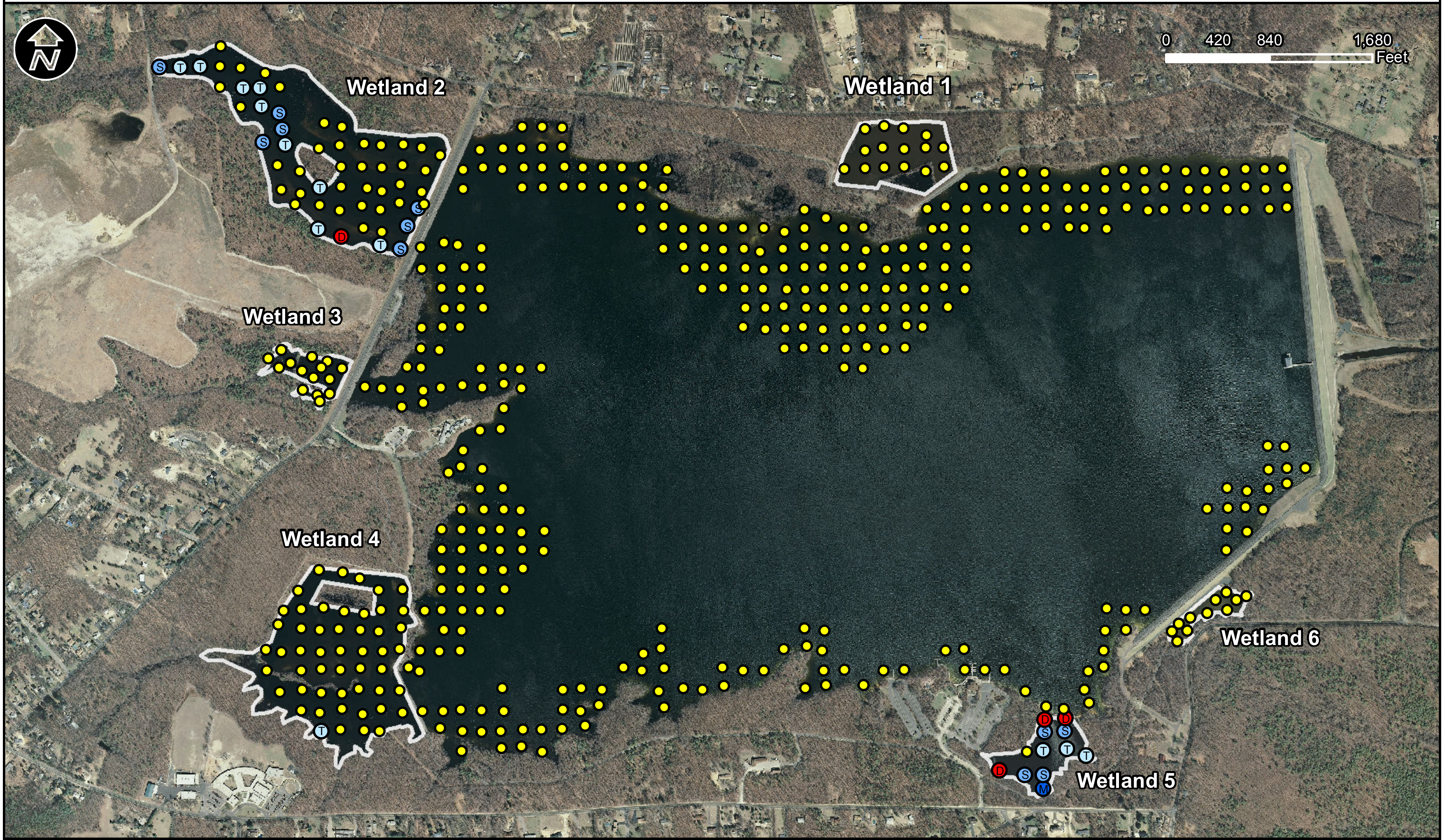
- D = Dense Plants

SŌLITUDE
LAKE MANAGEMENT

Date: 11/15/2017
File Name: Manasquan_ResWet_WaterCelery_2017
Prepared by: KM
Office: Washington, NJ

WATERMEAL (*Wolffia* sp.) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

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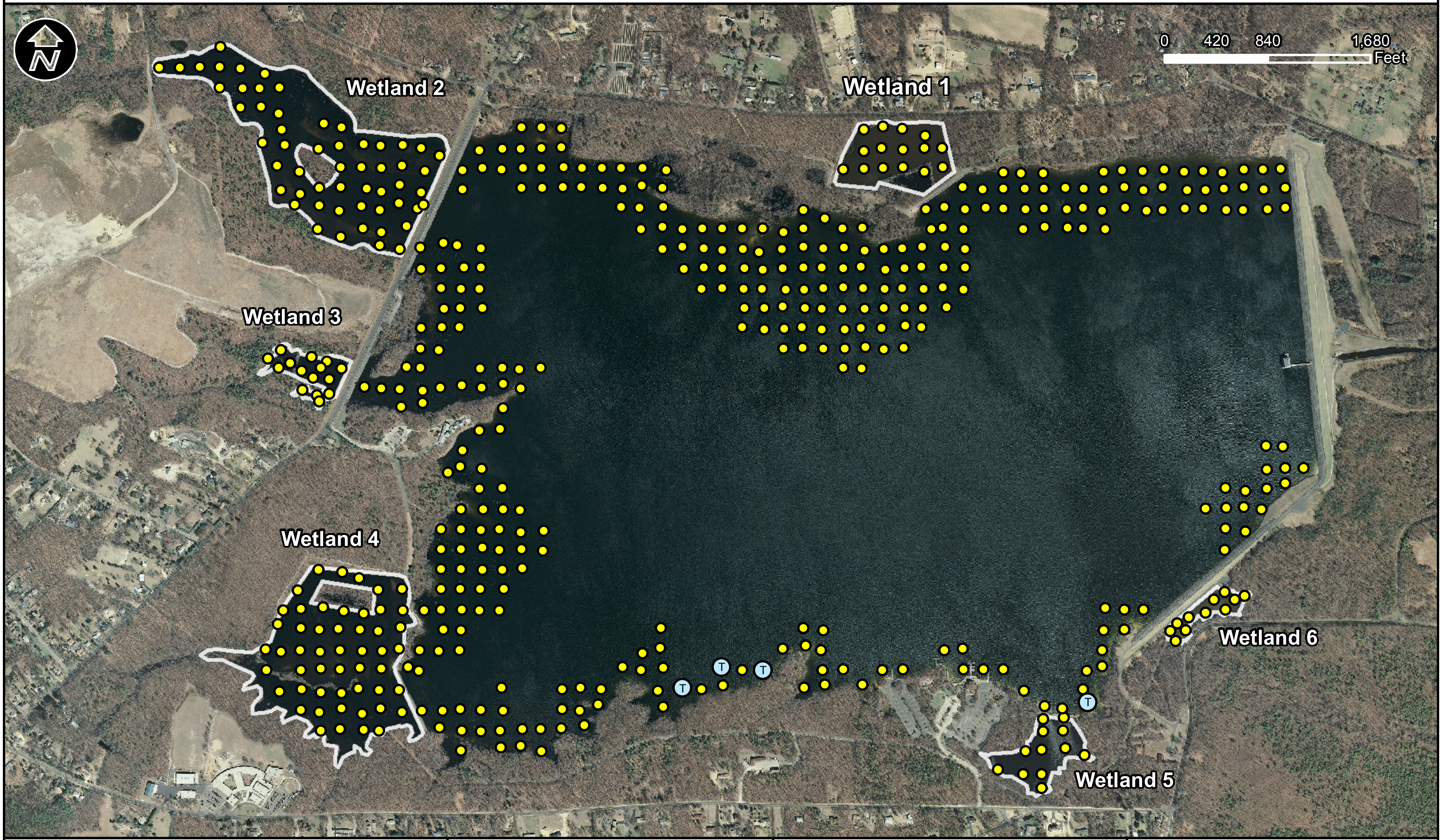
SŌLITUDE
LAKE MANAGEMENT

Date: 11/15/2017
File Name: Manasquan_ResWet_Watermeal_2017
Prepared by: KM
Office: Washington, NJ

WATERMOSS (*Fontinalis* sp.) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

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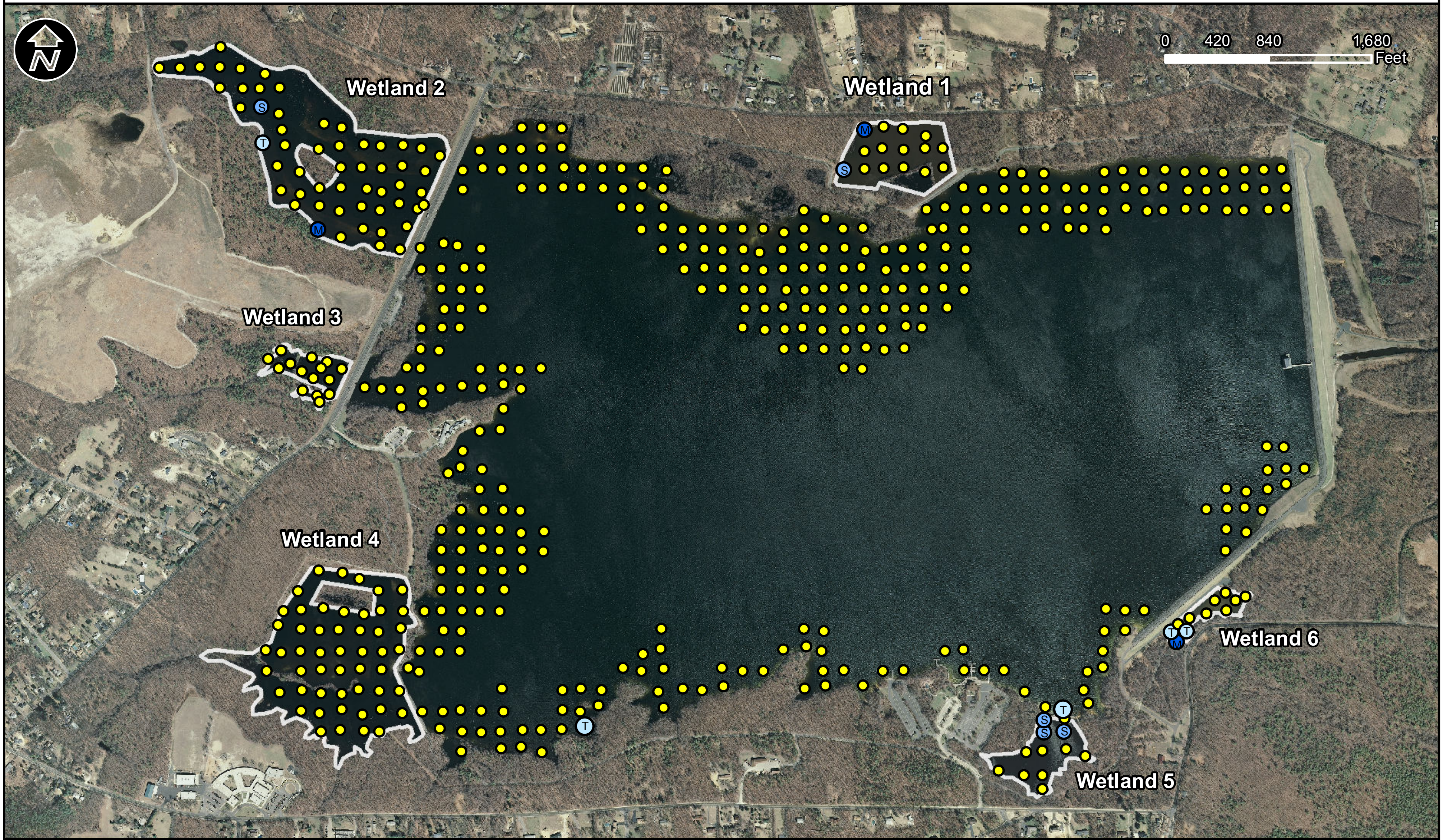
SŌLITUDE
LAKE MANAGEMENT

Date: 11/14/2017
File Name: Manasquan_ResWet_Watermoss_2017
Prepared by: KM
Office: Washington, NJ

WATER PRIMROSE (*Ludwigia* sp.) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

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SŌLITUDE
LAKE MANAGEMENT

Date: 11/15/2017
File Name: Manasquan_ResWet_WaterPrimrose_2017
Prepared by: KM
Office: Washington, NJ

WATERSHIELD (*Brasenia schreberi*) DISTRIBUTION

MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

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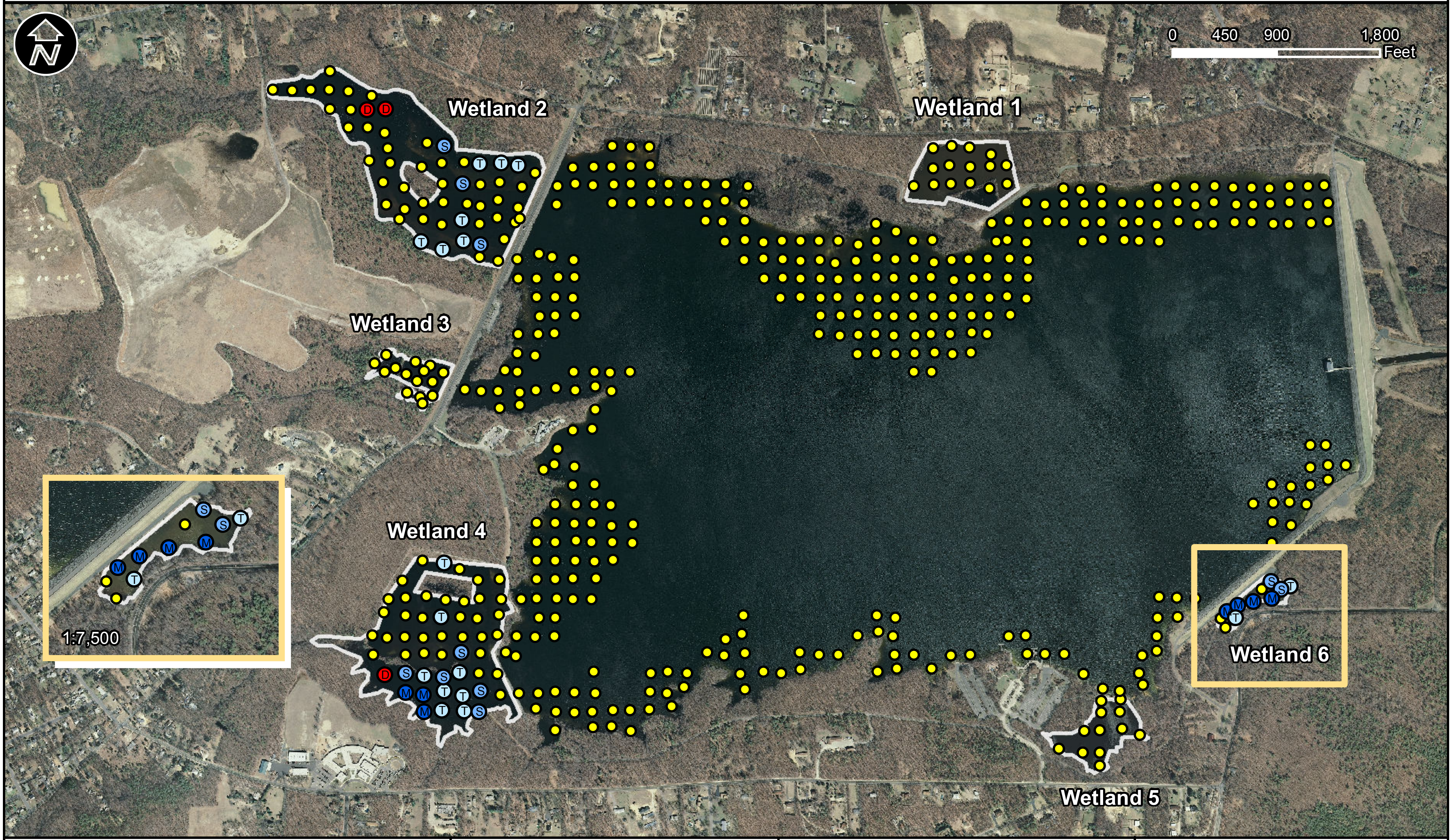
SOLITUDE
LAKE MANAGEMENT

Date: 11/15/2017
File Name: Manasquan_ResWet_Watershield_2017
Prepared by: KM
Office: Washington, NJ

WATERTHREAD (*Potamogeton diversifolius*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

Plant Density

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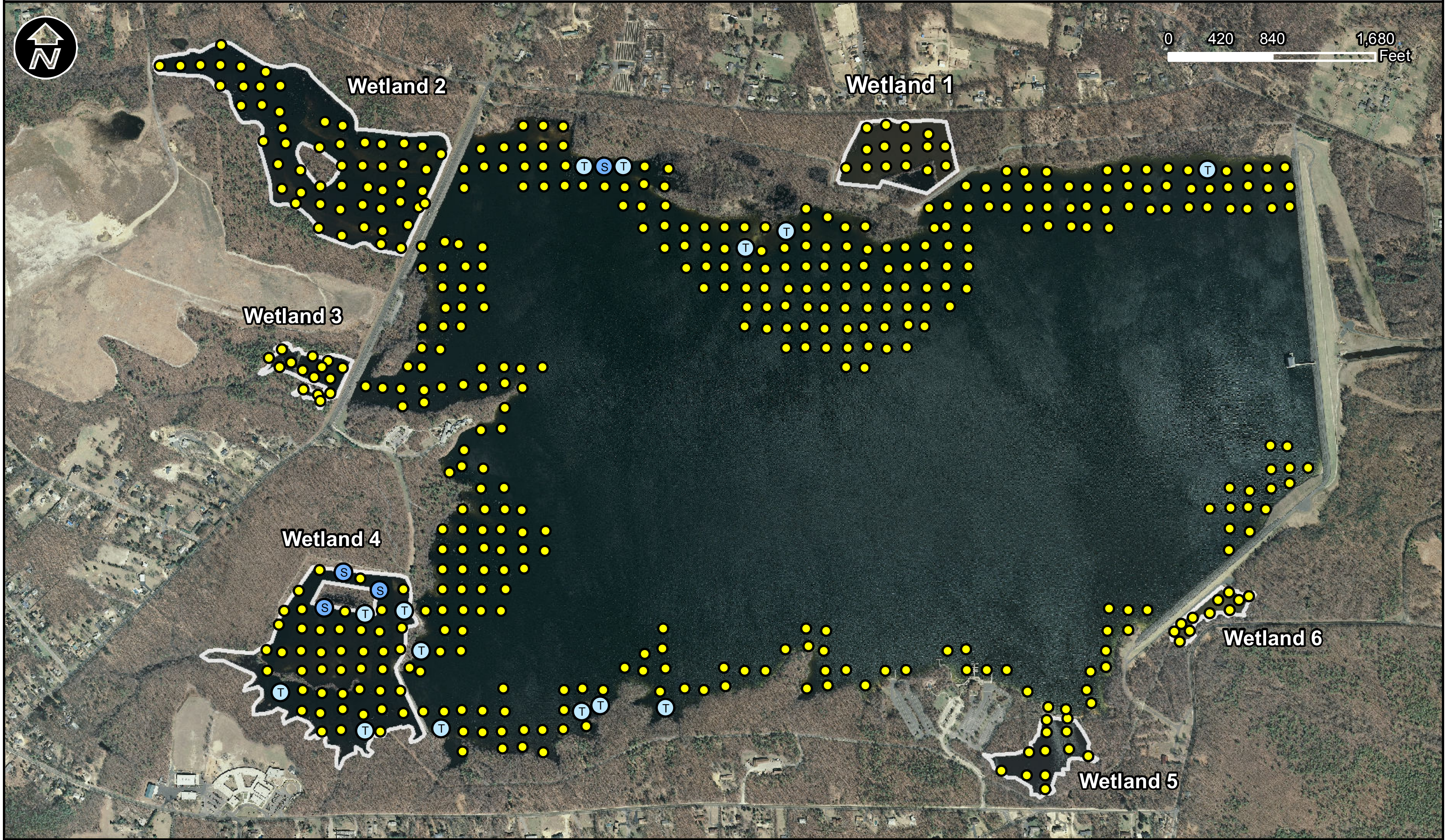
- D = Dense Plants

SOLITUDE
LAKE MANAGEMENT

Date: 11/18/2017
File Name: Manasquan_ResWet_Waterthreadl_2017
Prepared by: KM
Office: Washington, NJ

WATERWORT (*Elatine minima*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

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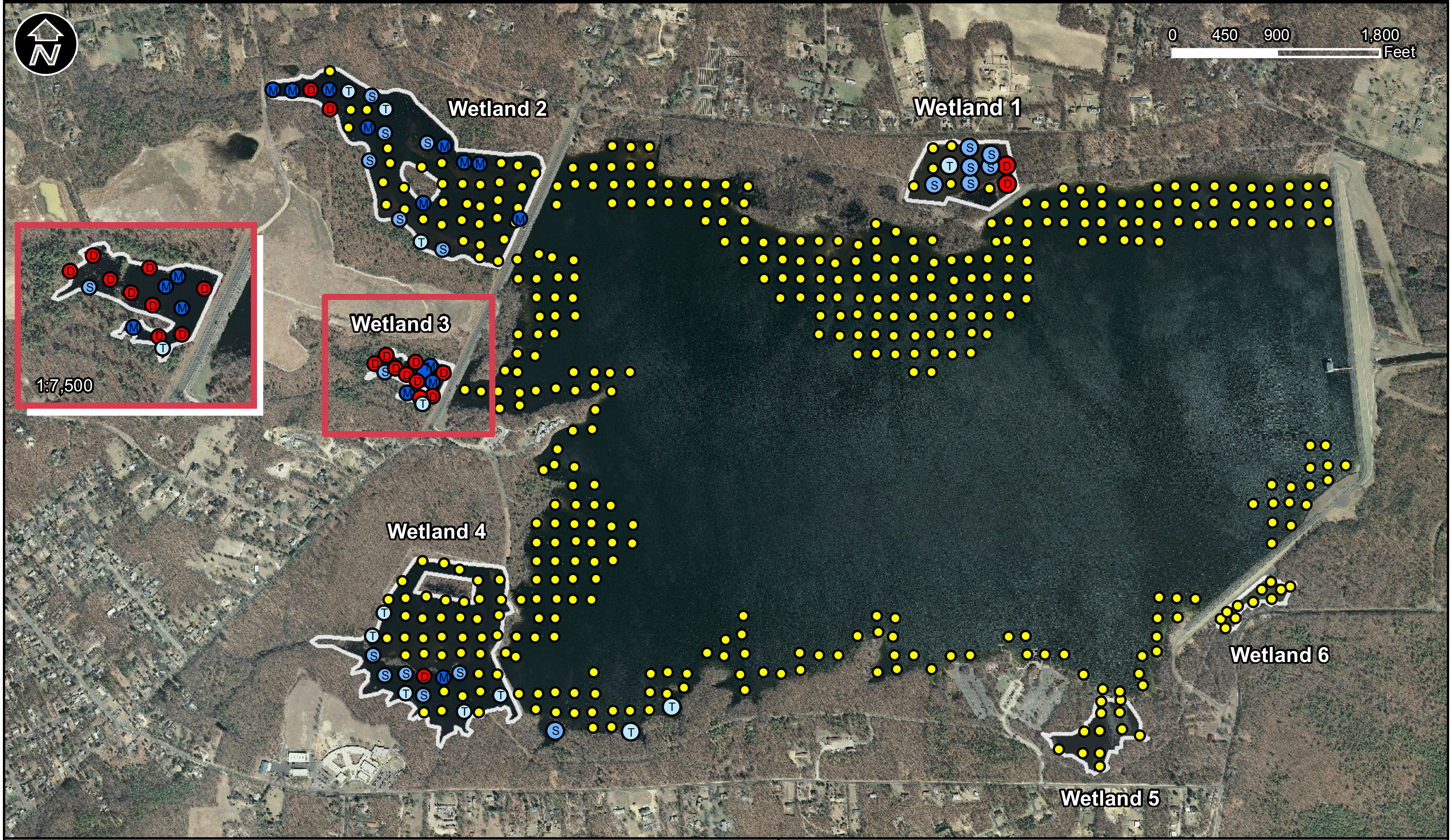
SOLITUDE LAKE MANAGEMENT

Date: 11/17/2017
File Name: Manasquan_ResWet_Waterwort_2017
Prepared by: KM
Office: Washington, NJ

WHITE WATER LILY (*Nymphaea odorata*) DISTRIBUTION



MANASQUAN RESERVOIR and WETLANDS
Aquatic Vegetation Survey
September 12-14 and 18, 2017

Sample Points: 502

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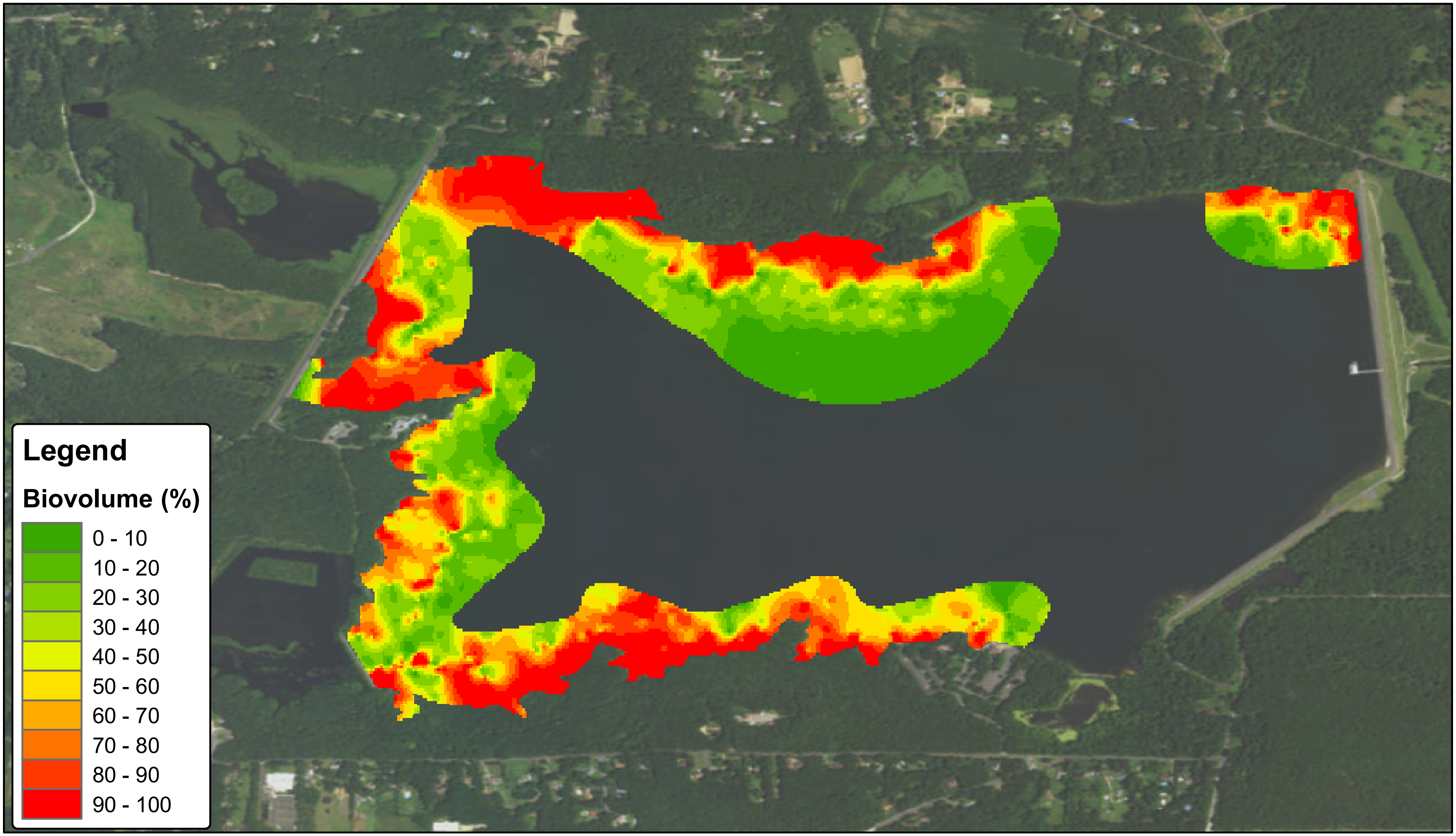
- D = Dense Plants

SOLITUDE LAKE MANAGEMENT

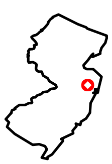
Date: 11/18/2017
File Name: Manasquan_ResWet_WhiteLily_2017
Prepared by: KM
Office: Washington, NJ

Manasquan Reservoir: Submersed Aquatic Vegetation Biovolume

SOLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com



Manasquan Reservoir
Howell, NJ
Monmouth County
40.17744°,-74.20854°



Manasquan Reservoir

1:16,000

0 500 1,000 2,000 Feet

N

Map Date: 11/15/17
File: ManasquanRes17_Biovolume
Prepared by: MS
Office: Shrewsbury, MA

HYDRILLA TUBER SAMPLING LOCATIONS

MANASQUAN RESERVOIR and WETLANDS
Hydrilla Tuber Monitoring
October 25, 2017

Sample Points: 5

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SOLITUDE
LAKE MANAGEMENT

Date: 11/18/2017
File Name: Manasquan_ResWet_TuberPts_2017
Prepared by: KM
Office: Washington, NJ

Appendix E: Tuber & Turion Pictures from Manasquan Reservoir 2017 Sampling