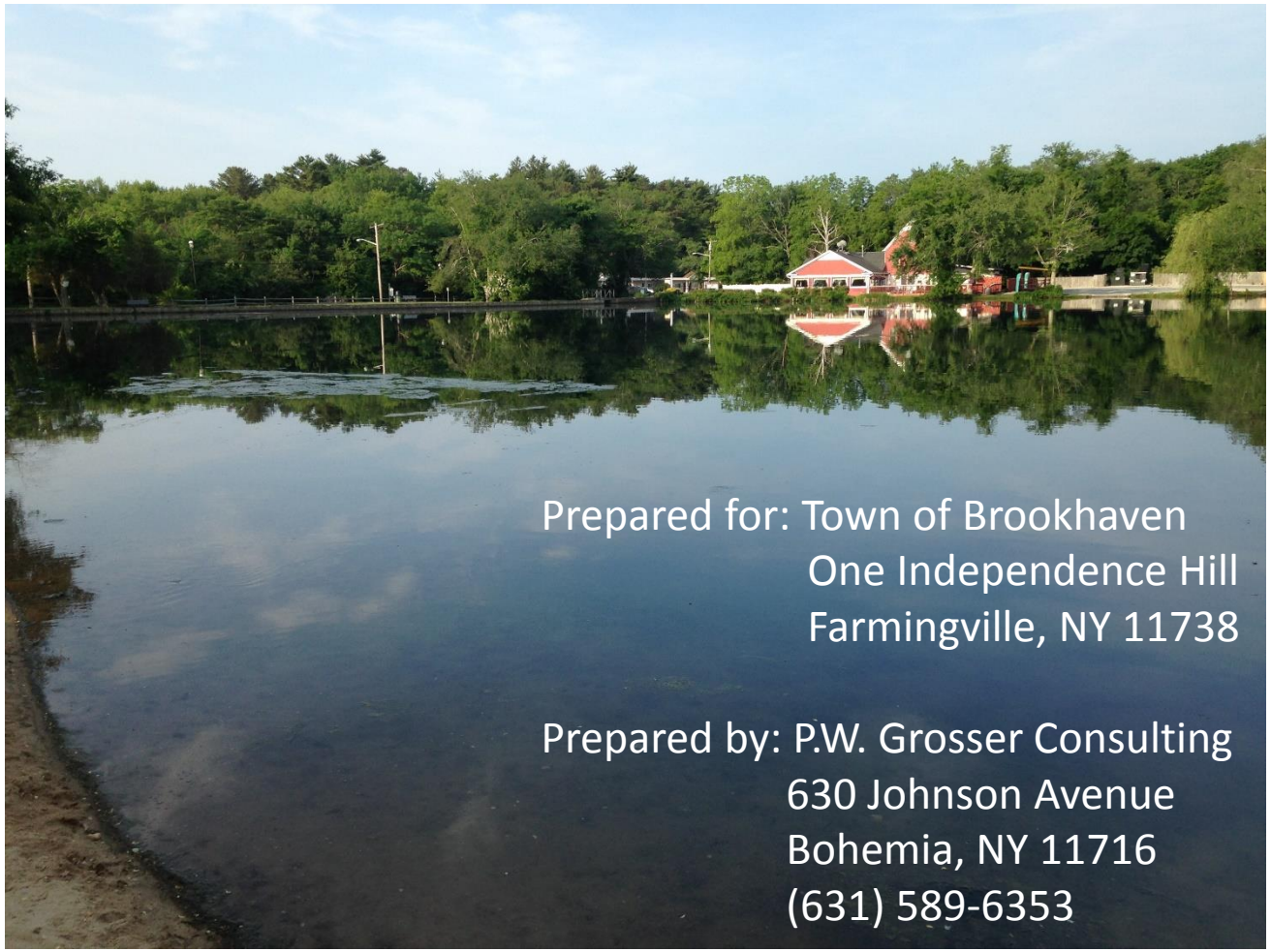
Ecological Study to Measure the Effectiveness of Soft Sediment Dredging to Eradicate Invasive and Nuisance Species

Upper Lake – Yaphank, New York

June 2015



PWGC
Strategic Environmental Engineering Solutions

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Project Overview:

Upper Lake, located in Yaphank, NY was dredged during the summer of 2013 in an attempt to remove invasive and nuisance plant species and restore the lake to its previous condition as a recreational and scenic resource.

In an effort to measure the effectiveness of the dredging operations, PWGC conducted an ecological study of Upper Lake during June 2015. The study consisted of collecting field measurements in order to develop bathymetric contours of the lake hard bottom and soft sediment thickness, and the density and distribution of both invasive and native plant species. Results were then compared to previous studies that were performed prior to dredging.

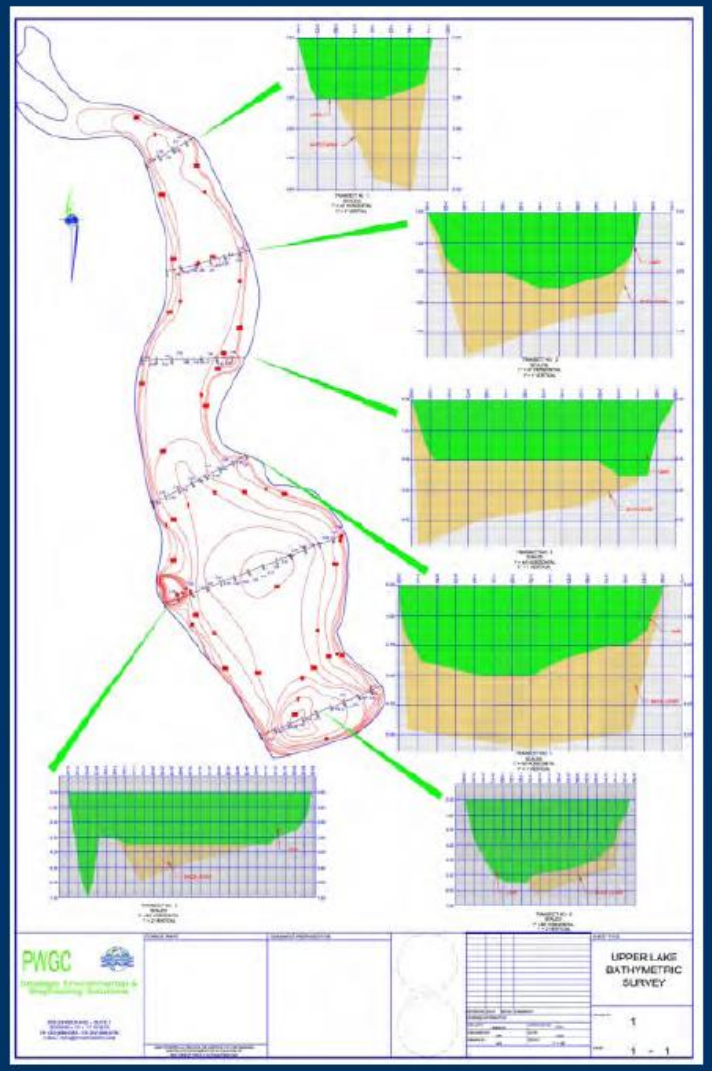
The work was performed in accordance with the procedure followed during the "*Feasibility Study to Eradicate Aquatic Invasive/Nuisance Species in Cannan Lake, North Patchogue and Upper and Lower Lakes, Yaphank.*"

Methodology:

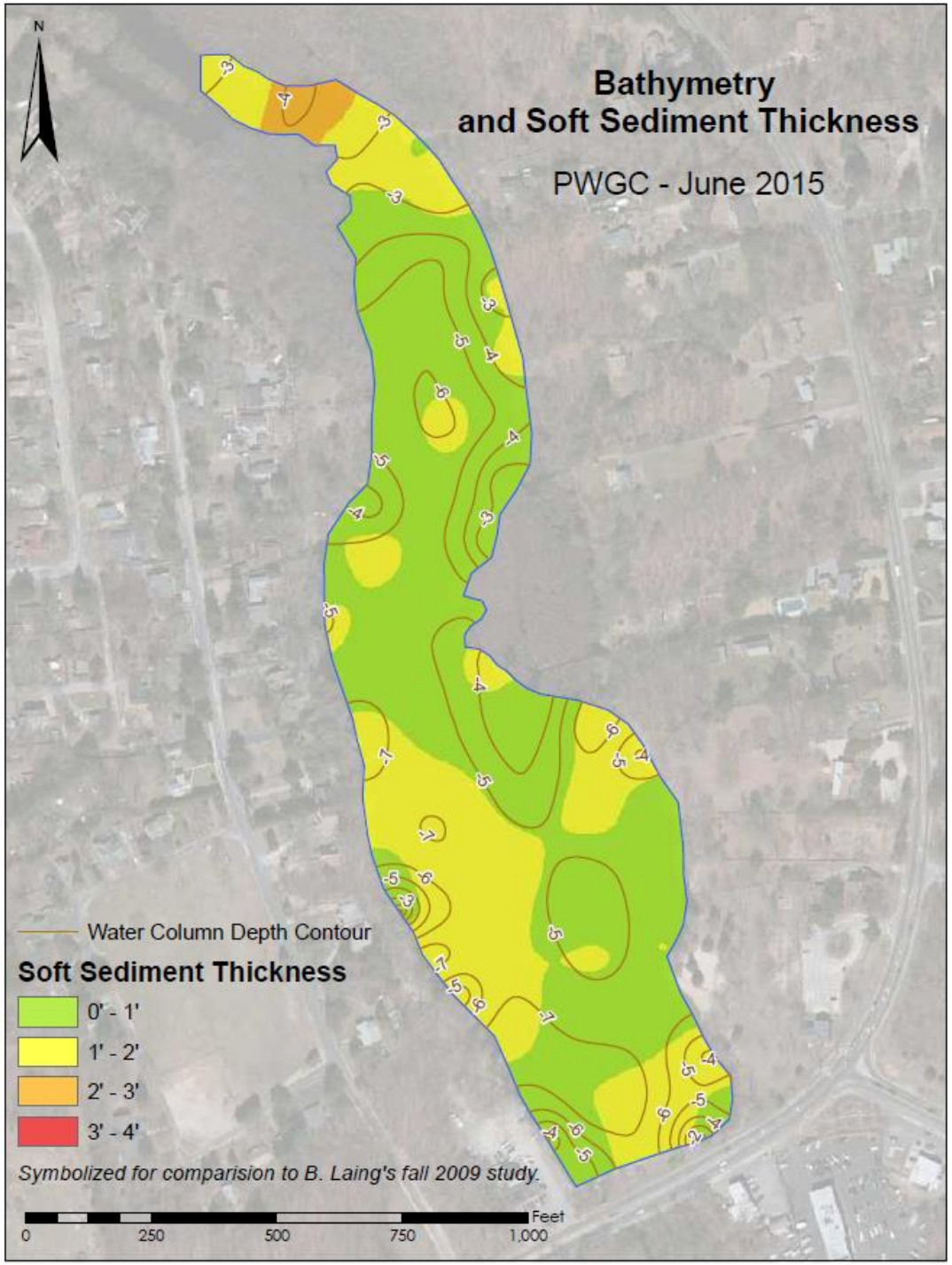
- In order to keep data collection consistent with previous studies, the Upper Lake was divided into 61 grids (150’ x 150’), similar to the Fall 2009 (B. Laing) study.
- A team of two scientists navigated a row boat to the approximate center of each grid square for an even distribution of sample locations.
- At each location a measuring pole was used to measure the depth to soft sediment and hard bottom. The location and depth measurements were recorded utilizing a mapping grade GPS. For the plant survey, a weed anchor (*“Rake Toss Aquatic Vegetation Surveys” based upon Point Intercept Methods developed by ACOE, 1999 and Cornell, 2006)* was tossed and allowed to sink to the lake bottom. Plants recovered in the rake toss were then identified and the relative density observed. Photographs (both underwater and above) were taken from each sample location.
- Results of the field study were then merged into a Geographic Information System in order to analyze, visualize, and help interpret the findings.
- Results of the June 2015 ecological study were then compared to previous investigations to evaluate the effectiveness of soft sediment dredging.

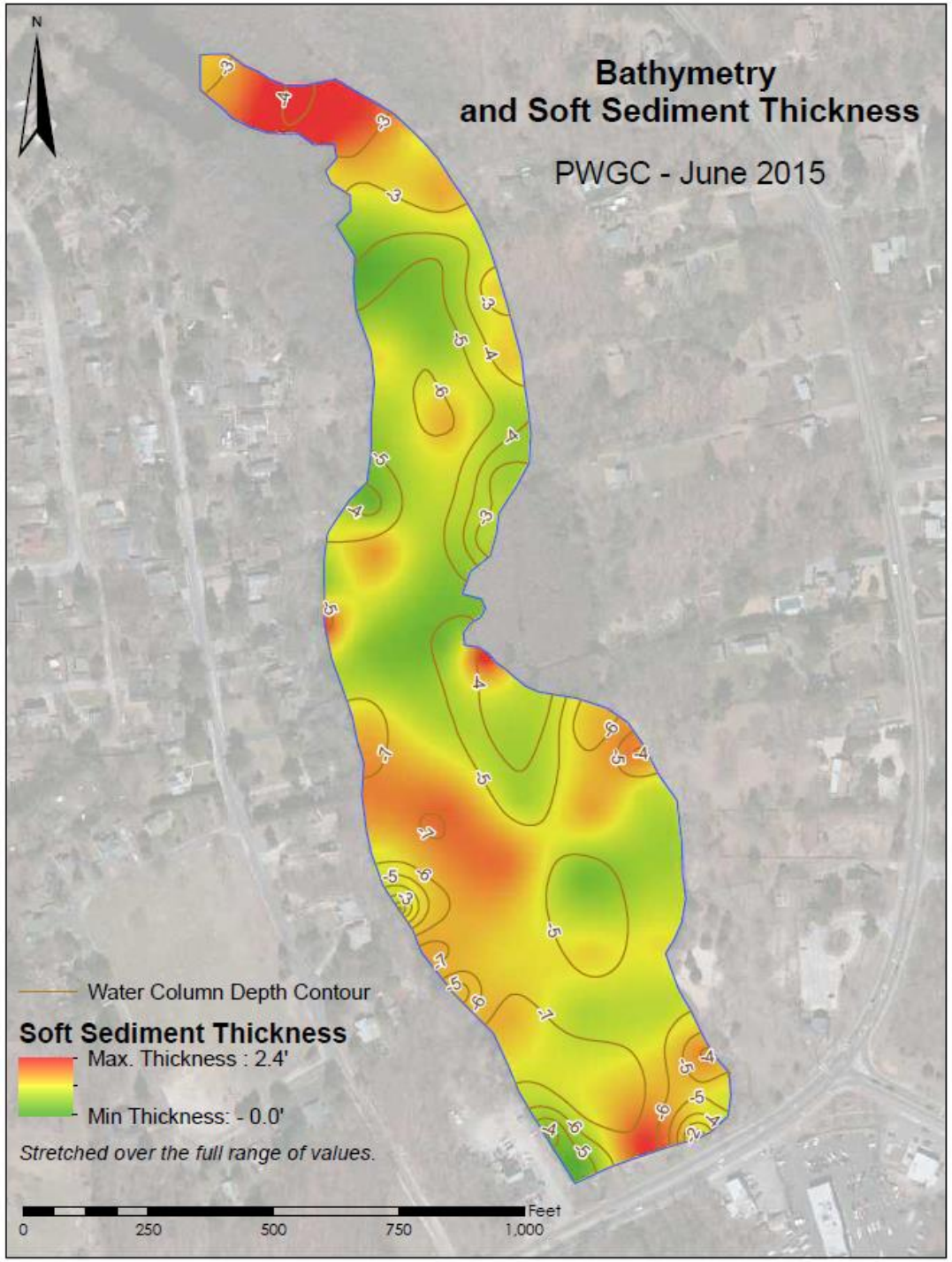
Bathymetry & Muck Depth – Upper Lake

Fall 2009 (B. Laing)



January 2008 (PWG)

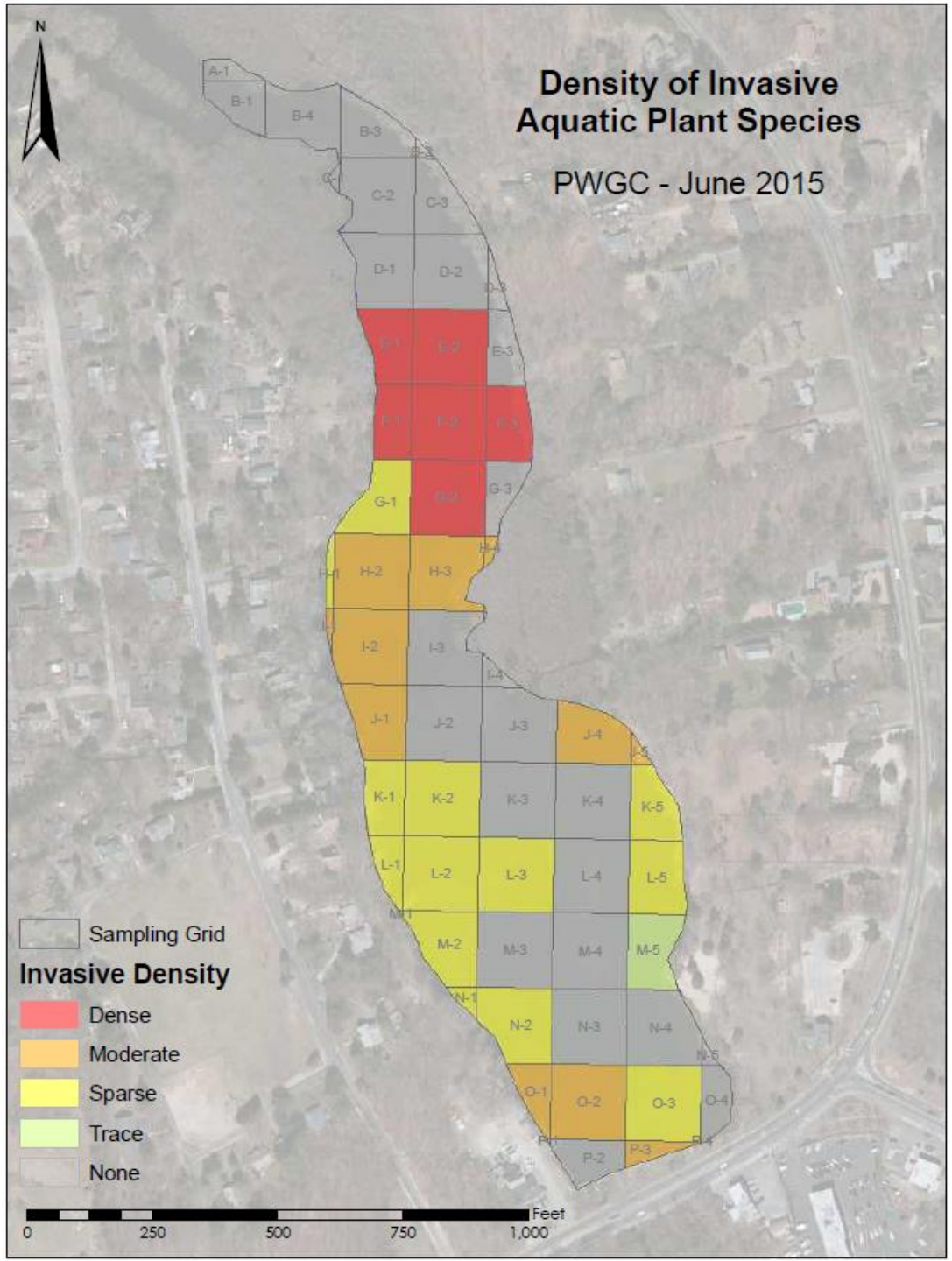

N
Bathymetry
and Soft Sediment Thickness
PWGC - June 2015
Water Column Depth Contour
Soft Sediment Thickness
0' - 1'
1' - 2'
2' - 3'
3' - 4'
Symbolized for comparision to B. Laing's fall 2009 study.
0
250
500
750
1,000
Feet

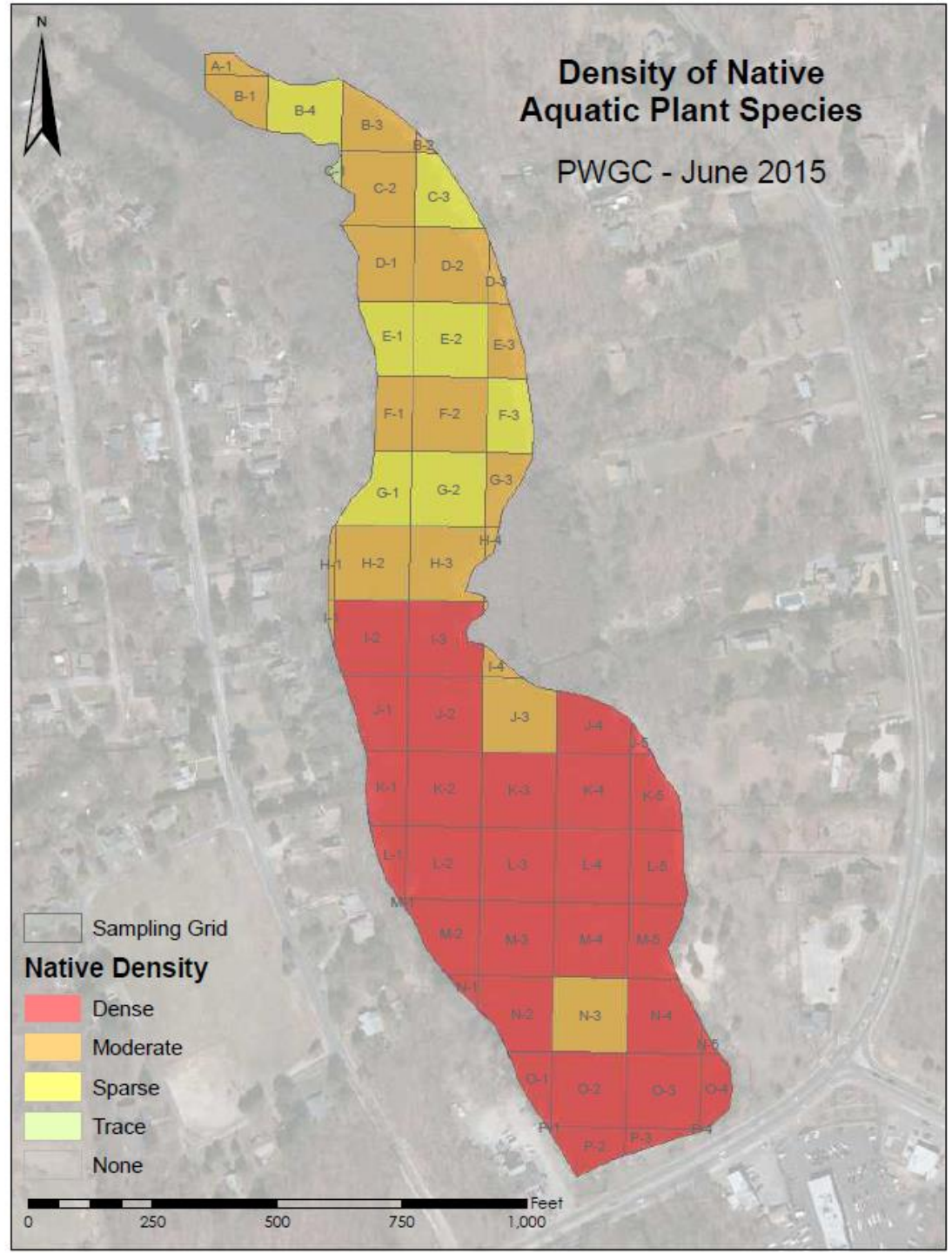

N
Bathymetry
and Soft Sediment Thickness
PWGC - June 2015
Water Column Depth Contour
Soft Sediment Thickness
Max. Thickness : 2.4'
Min Thickness: - 0.0'
Stretched over the full range of values.
0
250
500
750
1,000
Feet

Density of Aquatic Invasive Plants – Upper Lake

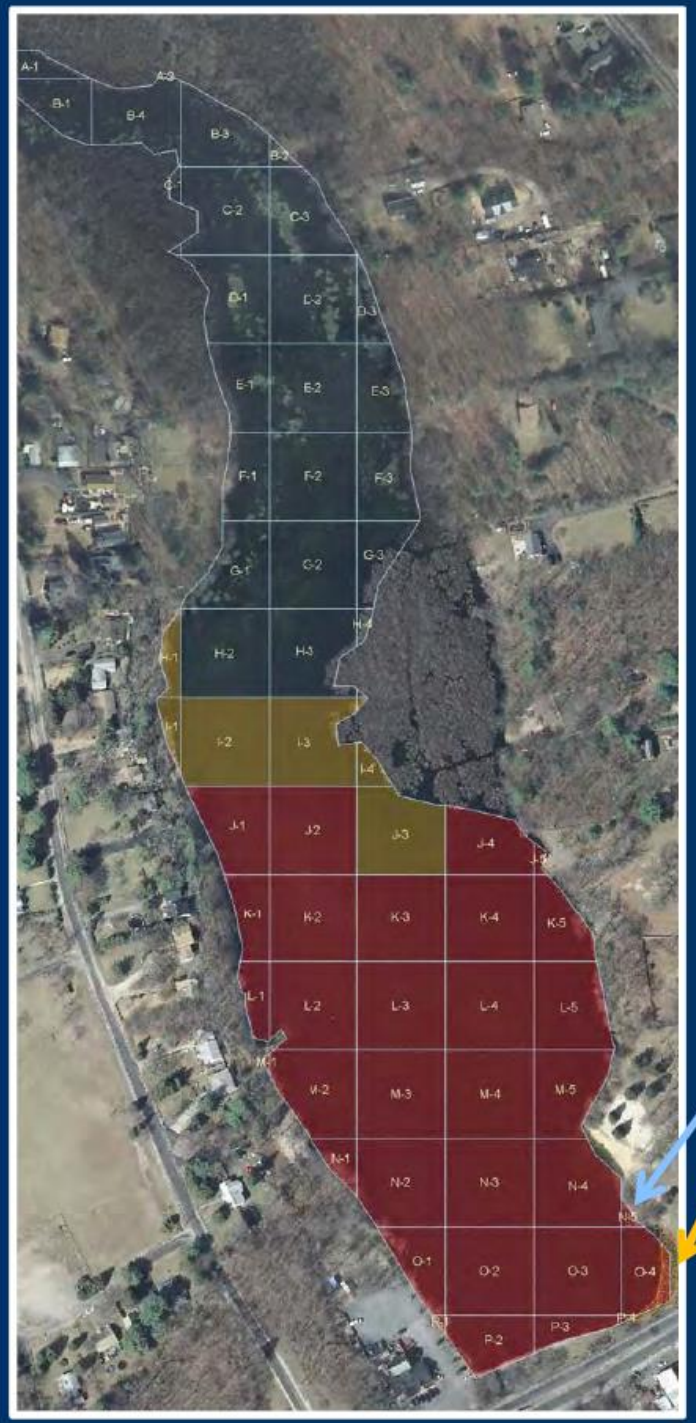
Fall 2007 (Town)

Fall 2009 (B. Laing)


Density of Invasive Aquatic Plant Species
PWGC - June 2015
N
Sampling Grid
Invasive Density
Dense
Moderate
Sparse
Trace
None
0
250
500
750
1,000
Feet


Density of Native Aquatic Plant Species
PWGC - June 2015
N
Sampling Grid
Native Density
Dense
Moderate
Sparse
Trace
None
0
250
500
750
1,000
Feet

2009
Invasive Plant Distribution Map – Upper Lake



Legend

Phragmites Density (81-100%)

Myriophyllum Density

None (0%)

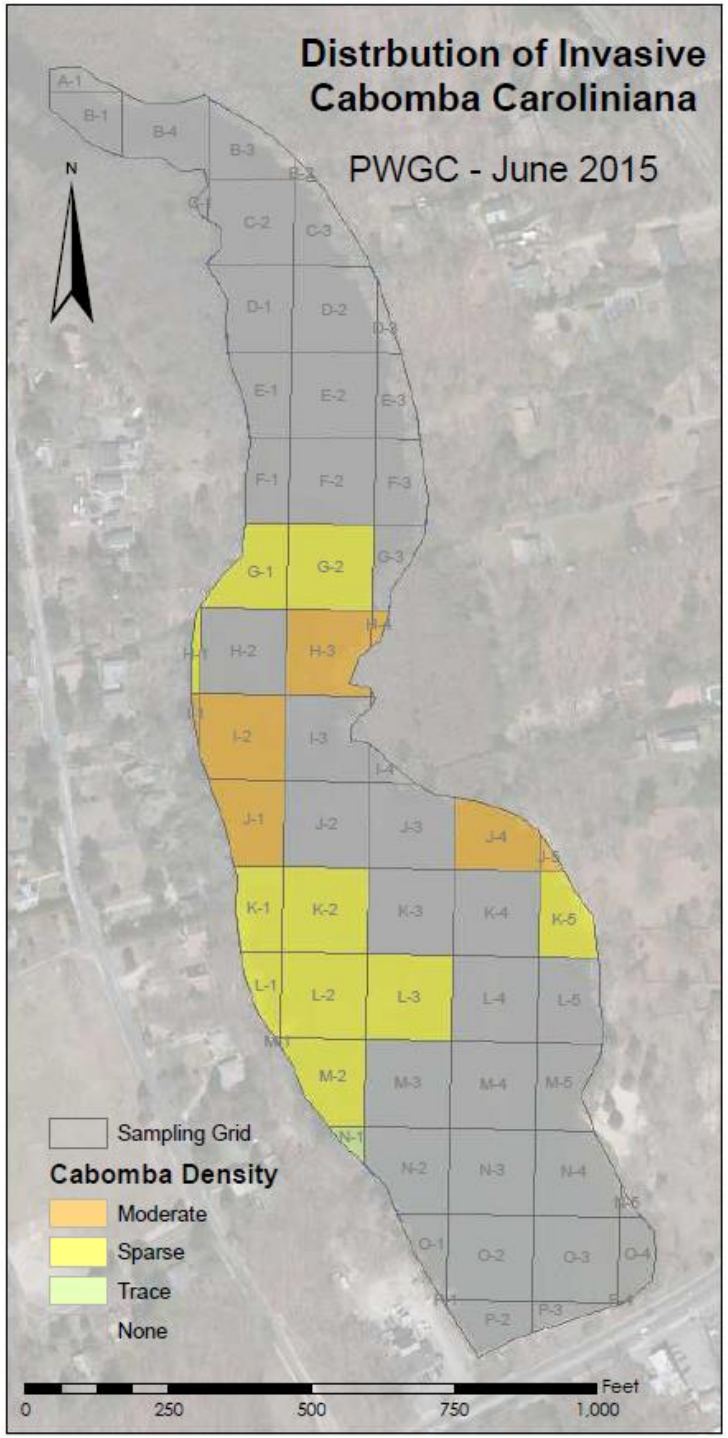
Sparse (1-20%)

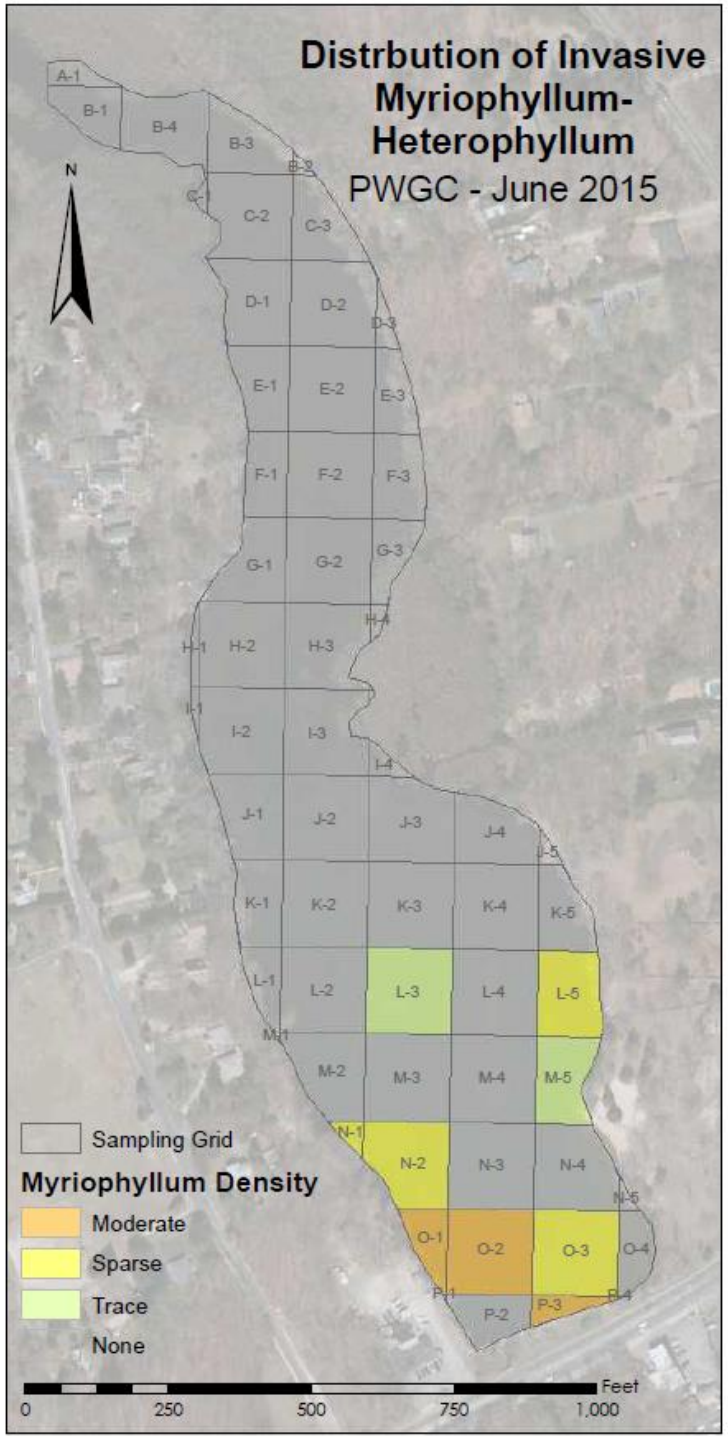
Cabomba Density

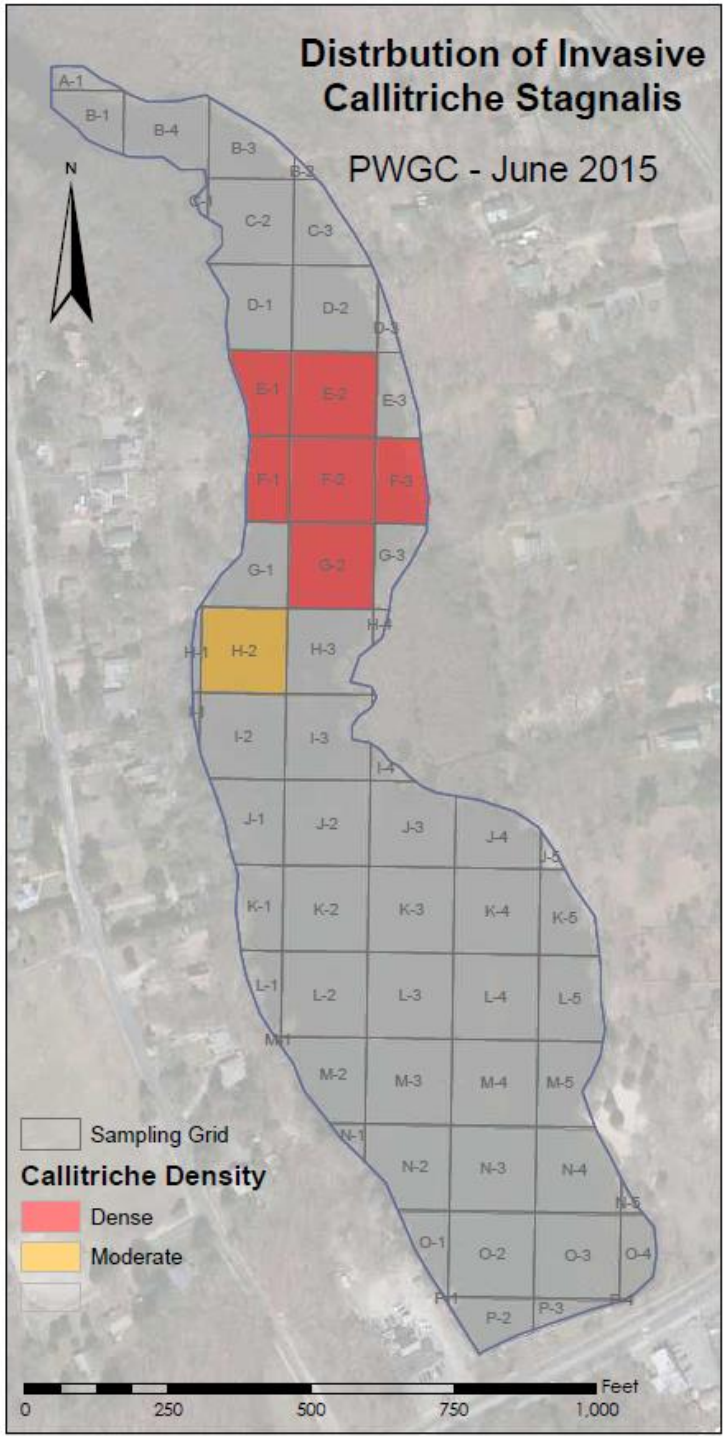
None (0%)

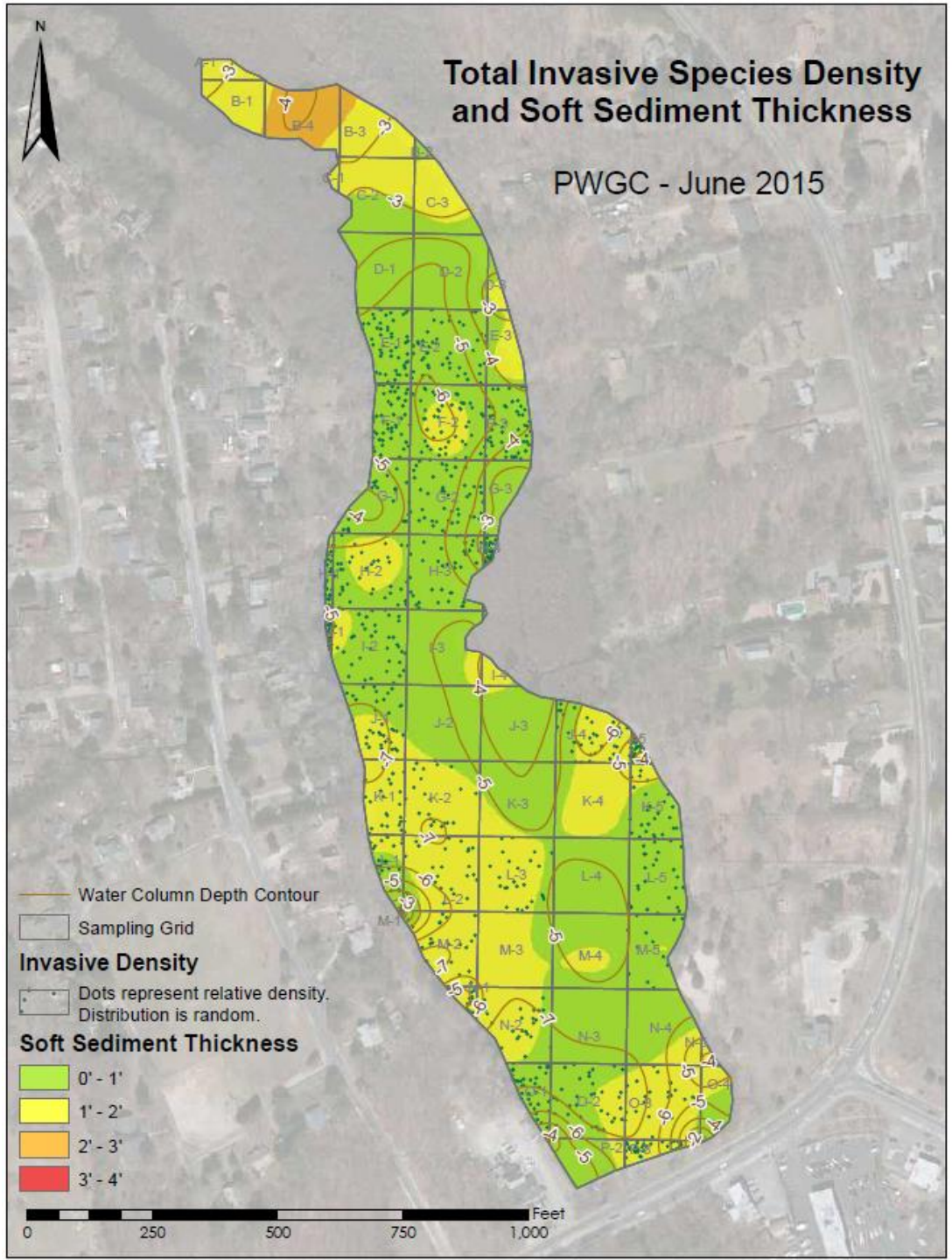
Moderate (21-80%)

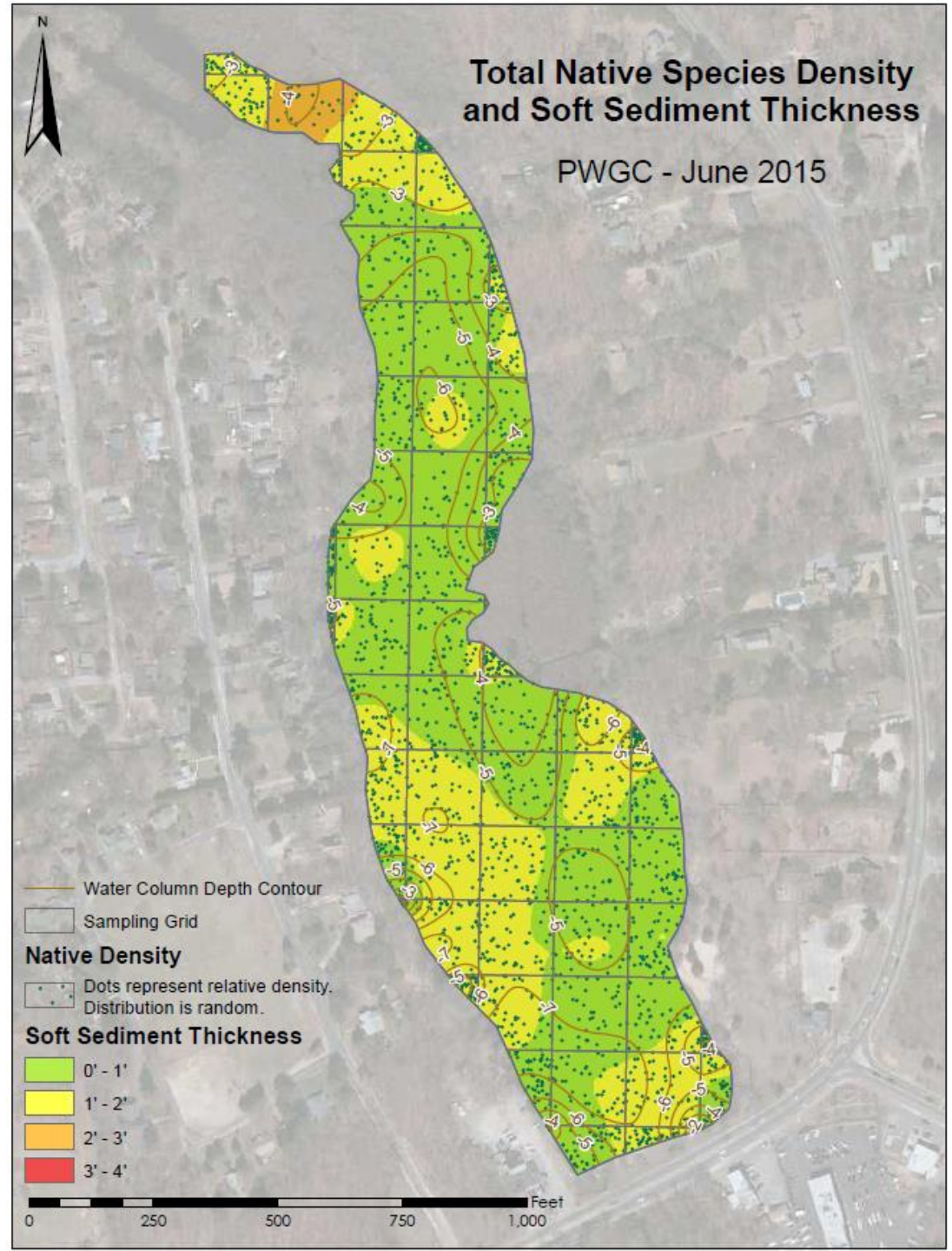
Dense (81-100%)


Distrbution of Invasive
Cabomba Caroliniana
PWGC - June 2015
N
Sampling Grid
Cabomba Density
Moderate
Sparse
Trace
None
0
250
500
750
1,000
Feet


Distrbution of Invasive
Myriophyllum-
Heterophyllum
PWGC - June 2015
N
Sampling Grid
Myriophyllum Density
Moderate
Sparse
Trace
None
0
250
500
750
1,000
Feet


Distrbution of Invasive
Callitriche Stagnalis
PWGC - June 2015
N
Sampling Grid
Callitriche Density
Dense
Moderate
0
250
500
750
1,000
Feet


Total Invasive Species Density
and Soft Sediment Thickness
PWGC - June 2015
N
Water Column Depth Contour
Sampling Grid
Invasive Density
Dots represent relative density.
Distribution is random.
Soft Sediment Thickness
0' - 1'
1' - 2'
2' - 3'
3' - 4'
0
250
500
750
1,000
Feet


Total Native Species Density
and Soft Sediment Thickness
PWGC - June 2015
N
Water Column Depth Contour
Sampling Grid
Native Density
Dots represent relative density.
Distribution is random.
Soft Sediment Thickness
0' - 1'
1' - 2'
2' - 3'
3' - 4'
0
250
500
750
1,000
Feet

Conclusions:

- Dredging operations may have altered the hard bottom slightly. However, the overall depth did not change dramatically throughout the lake.
- The Fall 2009 (B. Laing) study found soft sediment thickness from zero to greater than three feet. The majority of the lake was found to have a soft sediment thickness from one to three feet, with an area of shoaling in the narrow middle portion of the lake. The June 2015 PWGC study found soft sediment thickness from zero to approximately two and a half feet. The majority of the lake (central and lower portion) was found to be one foot or less, with some areas up to two feet in thickness. A similar area of shoaling was observed in the field in the narrow central portion of the lake.

Conclusions Continued:

- It appears that dredging has removed a significant portion of the soft sediment found in Upper Lake.
- The Fall 2009 (B. Laing) study found invasive aquatic species (Cabomba Caroliniana and Myriophyllum Heterophyllum) mainly distributed densely throughout the southern portion of the lake. Results of the June 2015 PWGC study indicate that the density and distribution of invasive aquatic species was reduced significantly in the lower portion of the lake. However, an invasive species not previously identified, Callitriche Stagnalis was identified in a dense distribution in the middle portion of the lake, north of where the shoaling was observed.
- A large portion of invasive aquatic plant species were removed from the lower portion of the lake; however, as a likely results, a dense growth of the native green algae species Chara Vulgaris has established itself throughout the lower portion of the lake.

Rake Toss Density Evaluation

1. Trace

2. Sparse

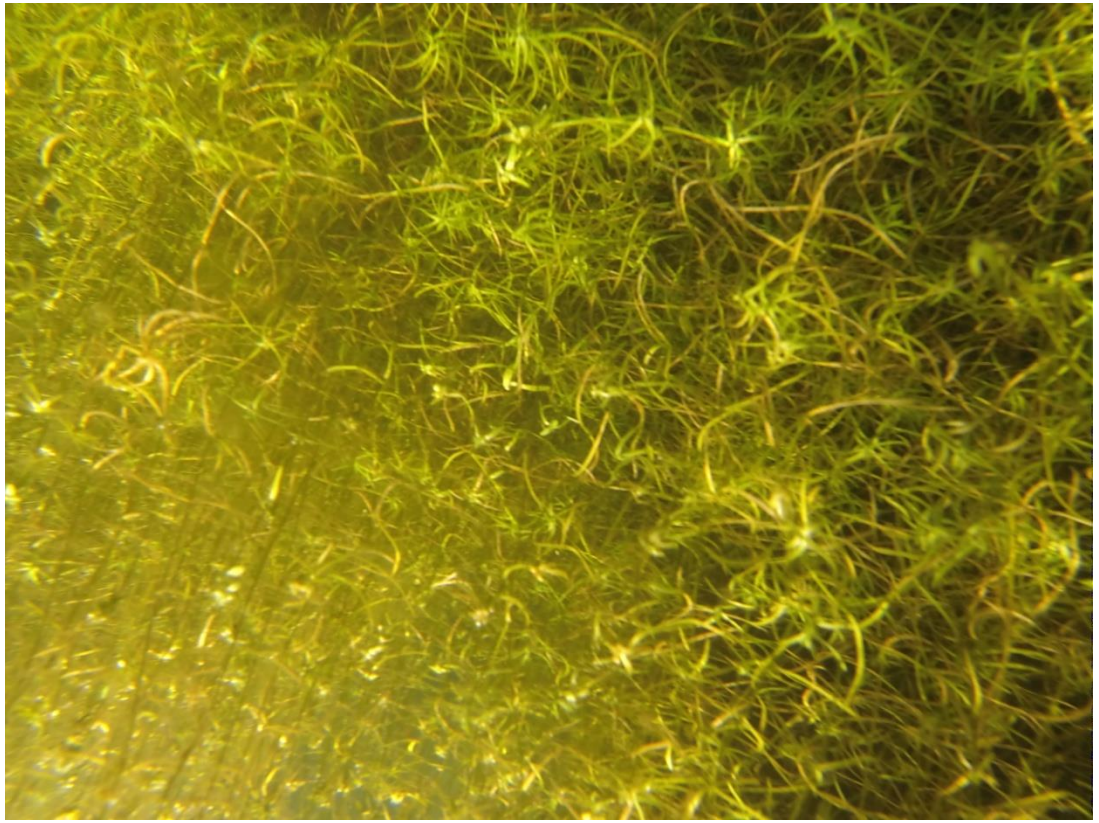
3. Medium

4. Dense

Callitriche Stagnalis

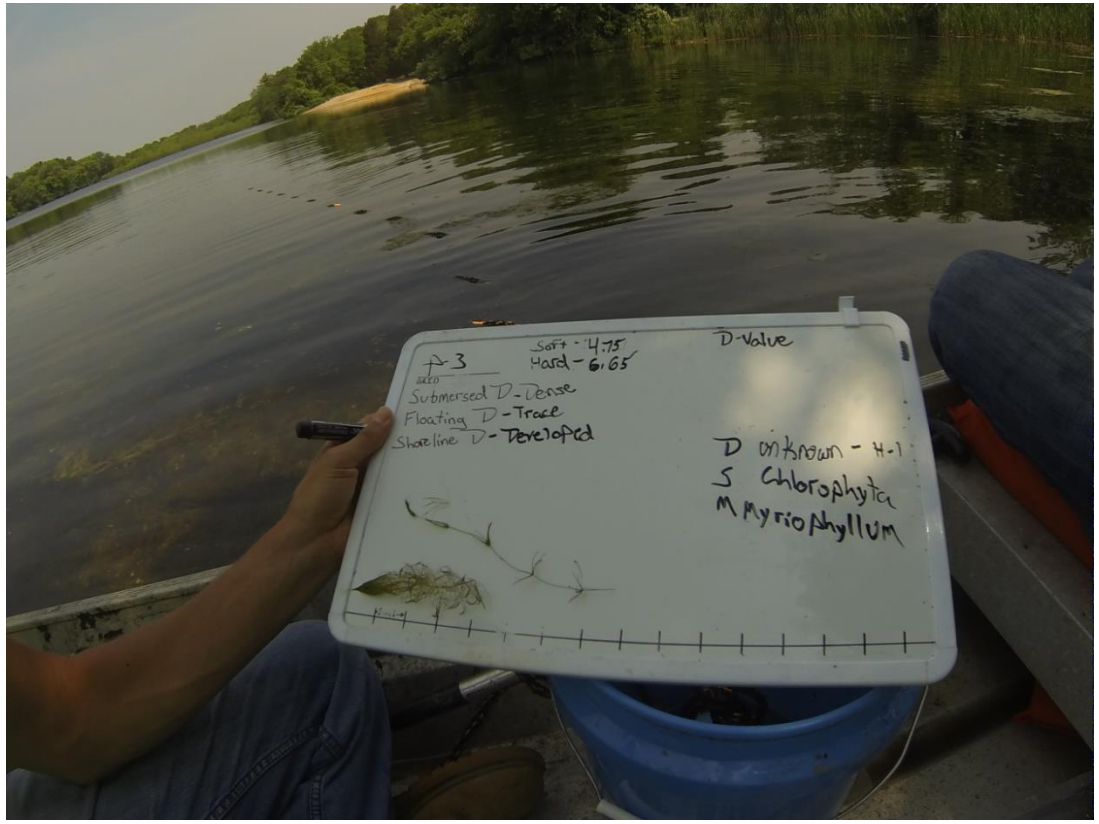
- Characterization
  - Floating leaves
    - Opposite
    - Spoon or oval shaped
  - Submerged leaves
    - Narrower than floating leaves (picture on following slide)

Callitriche sp. Observed Density



Plant Evaluation Methodology

- Submerged plants were collected using rake toss method (30’).
- Samples were sorted and identified on the boat.
- Species were then characterized, photographed, and sampled.

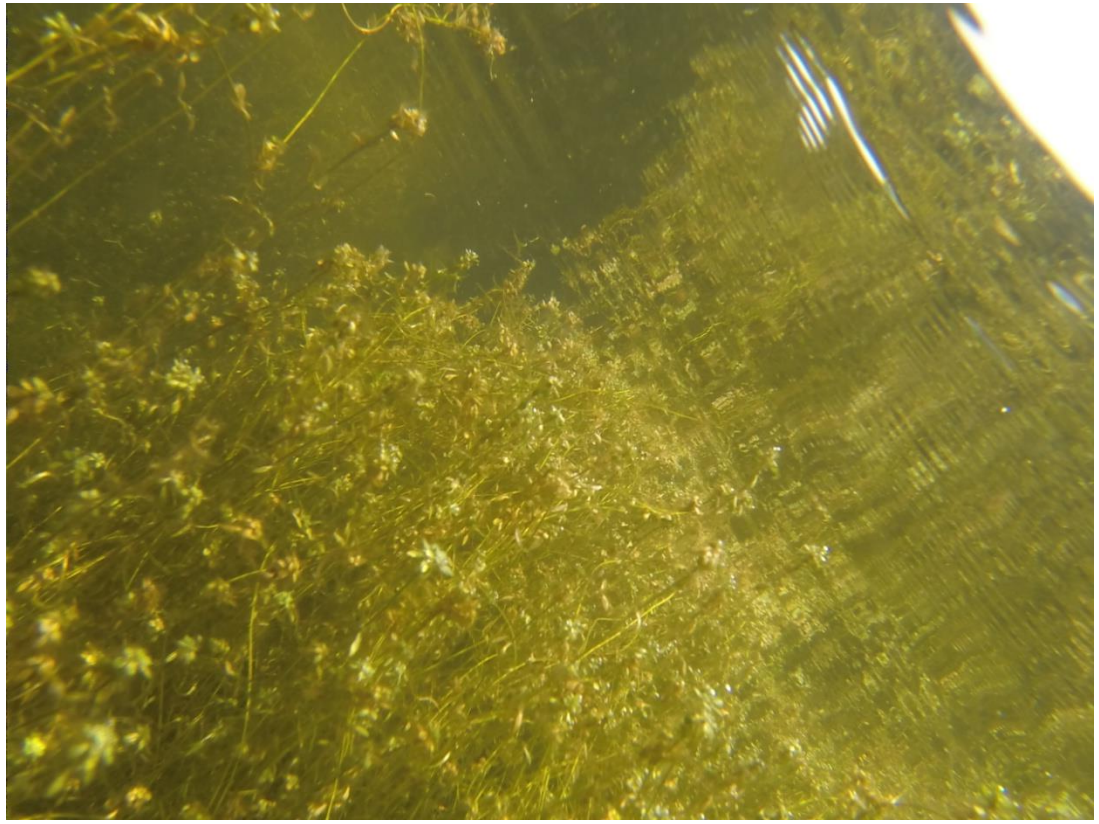


Underwater Photo

- Photo depicting sparse submerged vegetation.

Underwater Photo Cont.

- Photo presenting dense submerged vegetation.



Chara Vulgaris

- Green algae species
- Appears to have taken a very dominant role in the southern half of the lake post dredging.
- Quadrant P-3 rake toss filled with Chara Vulgaris.

Recommendations:

- Annual monitoring for the next three to five years to document aquatic plant communities in the lake.
- Consider a pilot scale Diver Assisted Suction Harvesting (DASH) project to selectively remove invasive plants.
- Monitor Suffolk County's project to remove sediment and invasive species from Canaan Lake in Patchogue in order to apply lessons learned to future Town projects such as Lower Yaphank Lake.
- Contact Suffolk County DPW to determine the status of repairs to the low level outlet at Lower Yaphank Lake; once repaired the low level outlet may allow additional options to address invasive aquatic plants in the lake to be considered.