Lake Norman Vegetation Survey

October 26, 2018

Report submitted by NC State University

Background

Hydrilla (*Hydrilla verticillata*) is a non-native invasive submersed aquatic plant. In North Carolina, this plant was first documented in Wake County in 1980. Initial infestations were confined to small ponds and lakes; however, by 1988 it had spread into Lake Gaston. The plant continued to spread to numerous Piedmont reservoirs across North Carolina and reached the large lakes on the Catawba River system in the early 2000's.

Lake Norman covers 36,472 acres (14,760 ha) and was impounded during 1963. Hydrilla was first detected in this heavily developed reservoir during 2000. The infestation was aggressively treated with herbicides for the next 4 years. In addition to herbicide treatments, approximately 6,120 triploid grass carp were stocked during 2004, and all 444 acres (180 ha) of hydrilla were eliminated within a year[1]. Supplemental grass carp stockings in following years and depleted the tuber bank by 2012, effectively eradicating the infestation and suggesting a successful strategy for future hydrilla management in Piedmont Reservoirs. Since then, a resurgence of hydrilla has occurred with numerous reports in 2018. In October of 2018, a whole lake survey was conducted by North Carolina State University, with the objective of delineating the total acreage of hydrilla in the lake so that accurate grass carp stocking rates could be determined.

Methods

The survey was initiated October 8, 2018 and was completed on October 17, 2018. During the survey timeframe, the lake elevation ranged between approximately 98 and 99.7 ft (based on full pool of 100 ft and target elevation of 97.6 ft) [2]. Unusually high water levels (following heavy rainfall) occurred during the middle part of the survey, but did not prevent the survey from being completed. Rake samples were collected in water 8 to 12 ft (2.5 to 3.6 m) deep. Few plants of any species were found in shallow water less than 3 ft (1 m) in depth.

In order to quantify submersed plant abundance and locations, a point intercept method was utilized to determine species presence/absence and provide a basis for comparison in determining future hydrilla spread or reductions. A total of 942 points were placed at approximately 1,600 ft (500 m) intervals around the shoreline (Figure 1). The sample method included visual observation of sample area and 2 rake tosses at each point. Plant abundance

was also assessed at each point with a 0 to 4 rating scale, (0 = no plants present on the rake, 1 = plants present at low densities < 25% cover, 2 = plants present at moderate densities 25-50% cover, 3 = plants present a moderate to high densities 50-75% cover, 4 = plants present at extremely high densities 75-100% cover (see Figure 13)). In addition, hydroacoustic (Sonar) track data was collected using twin transducers and individual GPS receivers around the perimeter of the lake. In total, 589 miles of Sonar track data was recorded totaling 11,488 acres. The sonar data was processed by BioBase to better quantify standing biomass of all plants. This data was combined with the point intercept results using ArcMap (version 10.5.1) to estimate the total amount of hydrilla acreage.

During an on-site meeting it was noted that surveys by Duke Energy and others have not documented any submersed plants to the north of the Hwy 150 bridges. In light of this, samples were not collected above the Hwy 150 bridges. This resulted in a new total of 888 points surveyed (Figure 1).

Results

Species of submersed plants observed included many that are common in Piedmont reservoirs across North Carolina. These native species included chara / muskgrass (*Chara spp*.), spikerush (*Eleocharis baldwinii*), slender pondweed (*Potamogeton pusillus*), Southern naiad (*Najas guadalupensis*), eel grass / tape grass (*Vallisneria americana*), and filamentous algae (*Spirogyra*) and were found mainly in the southern portion of the lake (Figures 2 – 7).

Hydrilla was found at 17 points occurring in mixed populations with chara. One location had hydrilla mixed with eel grass. In two locations, hydrilla was found mixed with chara and naiad or pondweed. In the majority of points (106) where hydrilla was found, it occurred as a monoculture.

Hydrilla was observed in several sections of the lake in varying densities. The largest and most dense areas were in the Ramsey Creek arm, with scattered locations outside that area (Figure 8). We currently estimate 640 total acres of hydrilla within Lake Norman based on 2018 field data (Figure 9).

References:

1 Manuel, K.L., J.P. Kirk, D.H. Barwick, and T.W. Bowen. 2013. Hydrilla management in Piedmont reservoirs using herbicides and triploid Grass Carp: a case study. North American Journal of Fisheries Management 33:488–492.

2 https://lakes.duke-energy.com/index.html#/detail/4/Detail

Figure 1. Individual survey points on Lake Norman.

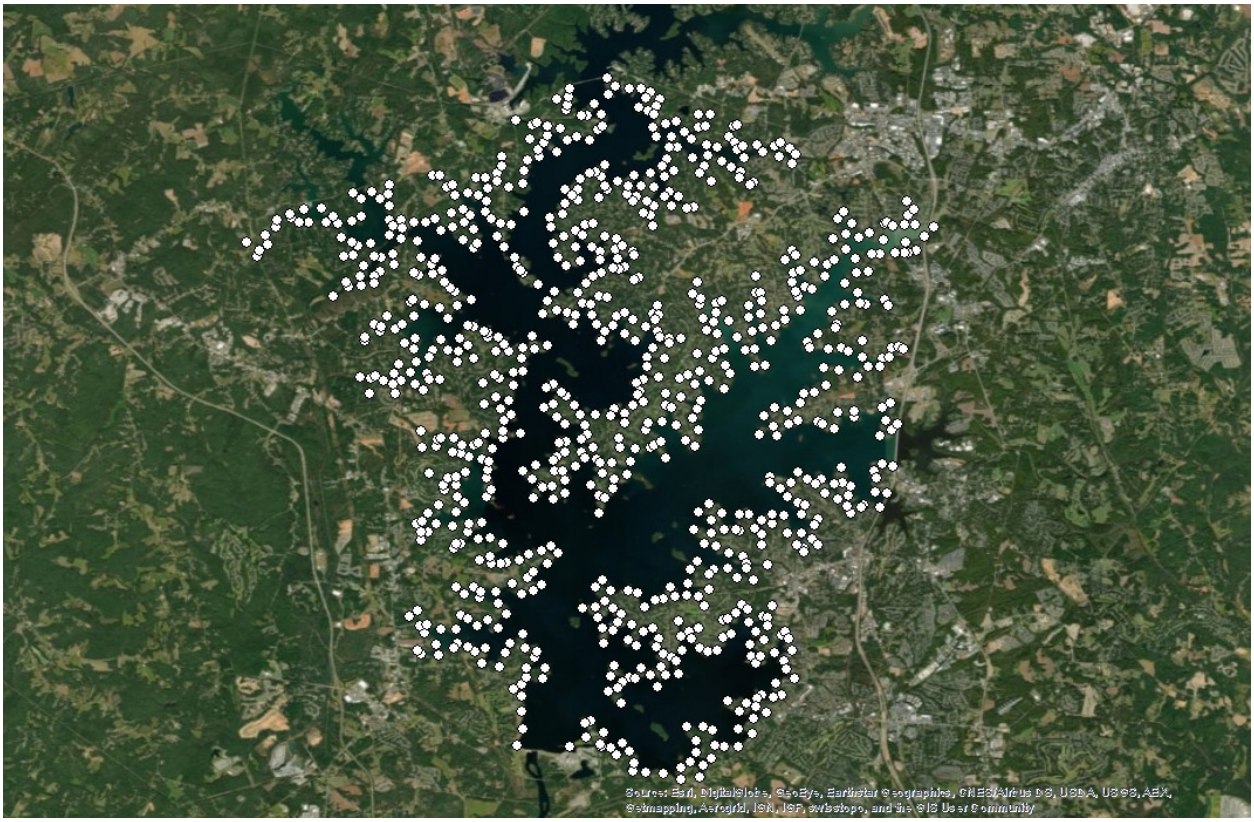

Figure 2. Chara / muskgrass (*Chara spp*.) locations and densities.

Density -- 1 = 2 = 3 = 4 =

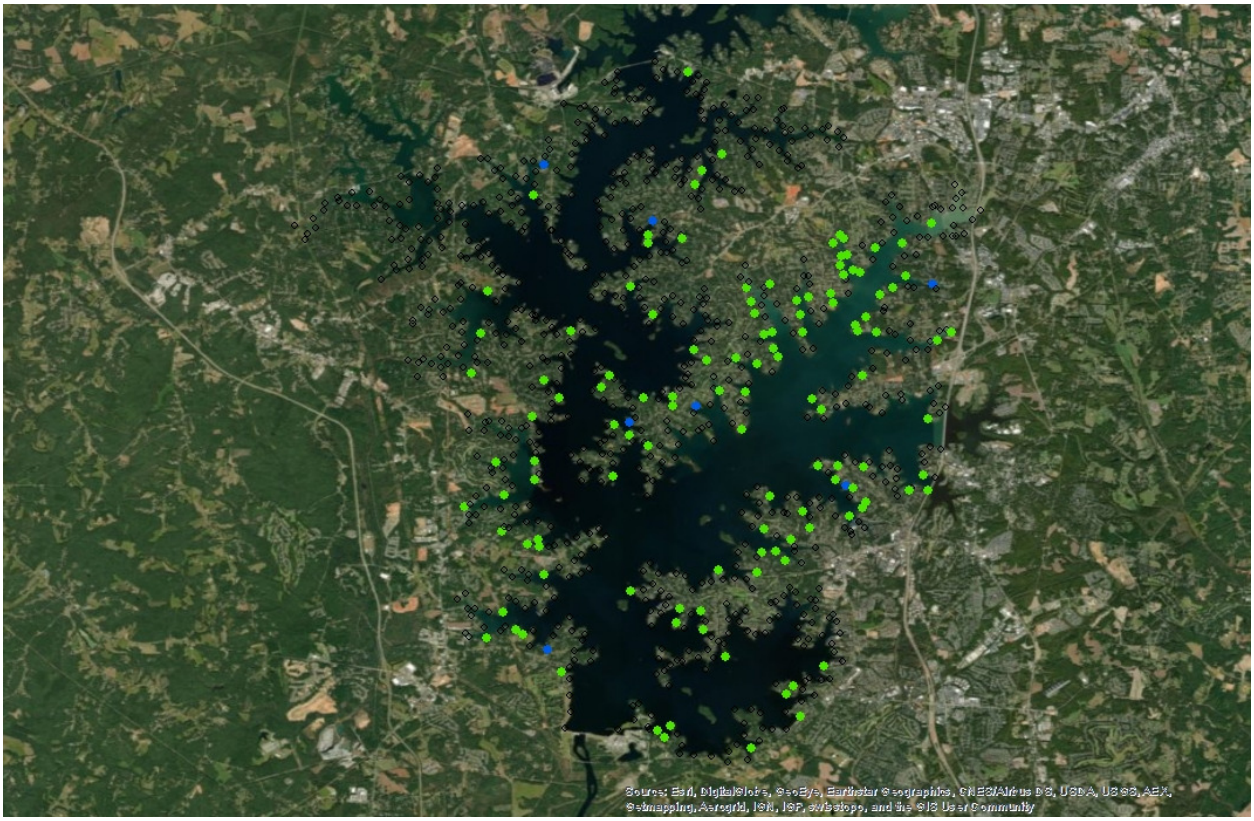

Figure 3. Spikerush (*Eleocharis baldwinii*) locations and densities.

Density -- 1 = 2 = 3 = 4 =

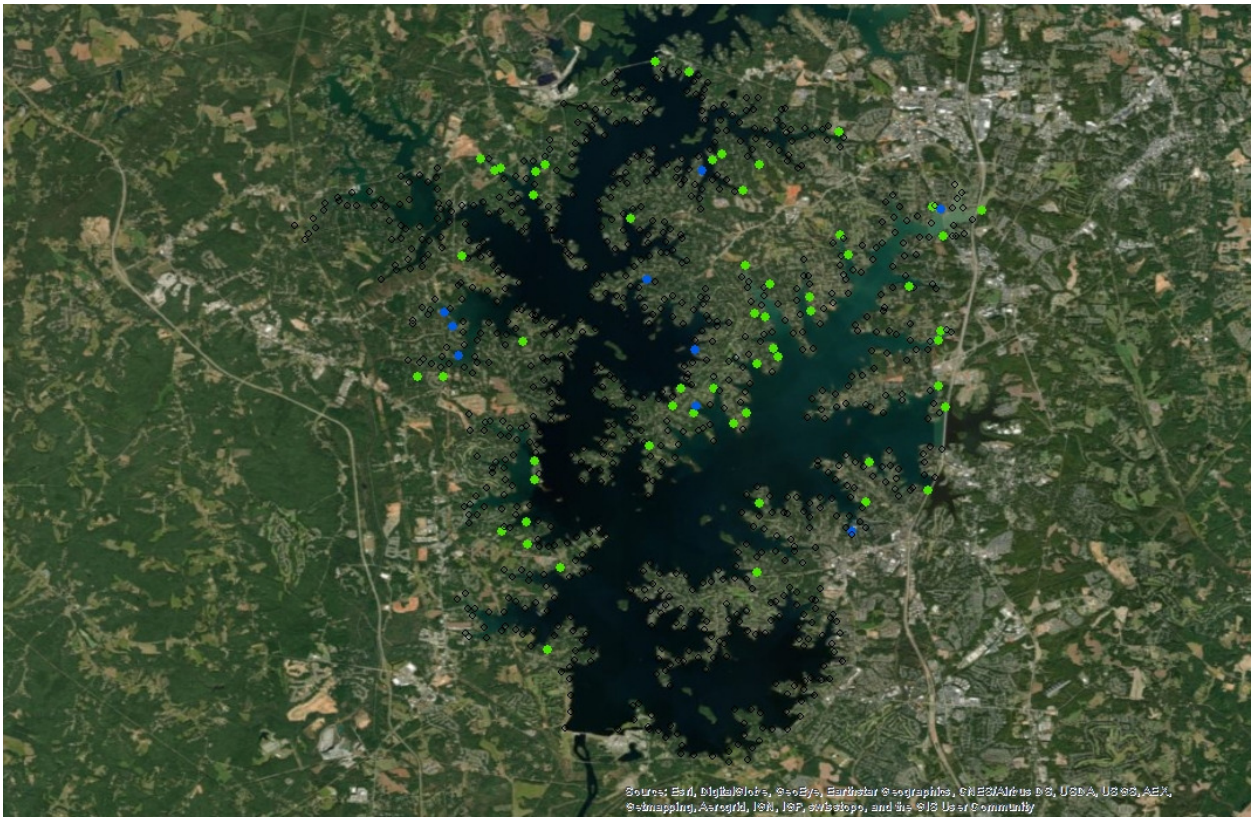

Figure 4. Slender pondweed (*Potamogeton pusillus*) locations and densities.

Density -- 1 = 2 = 3 = 4 =

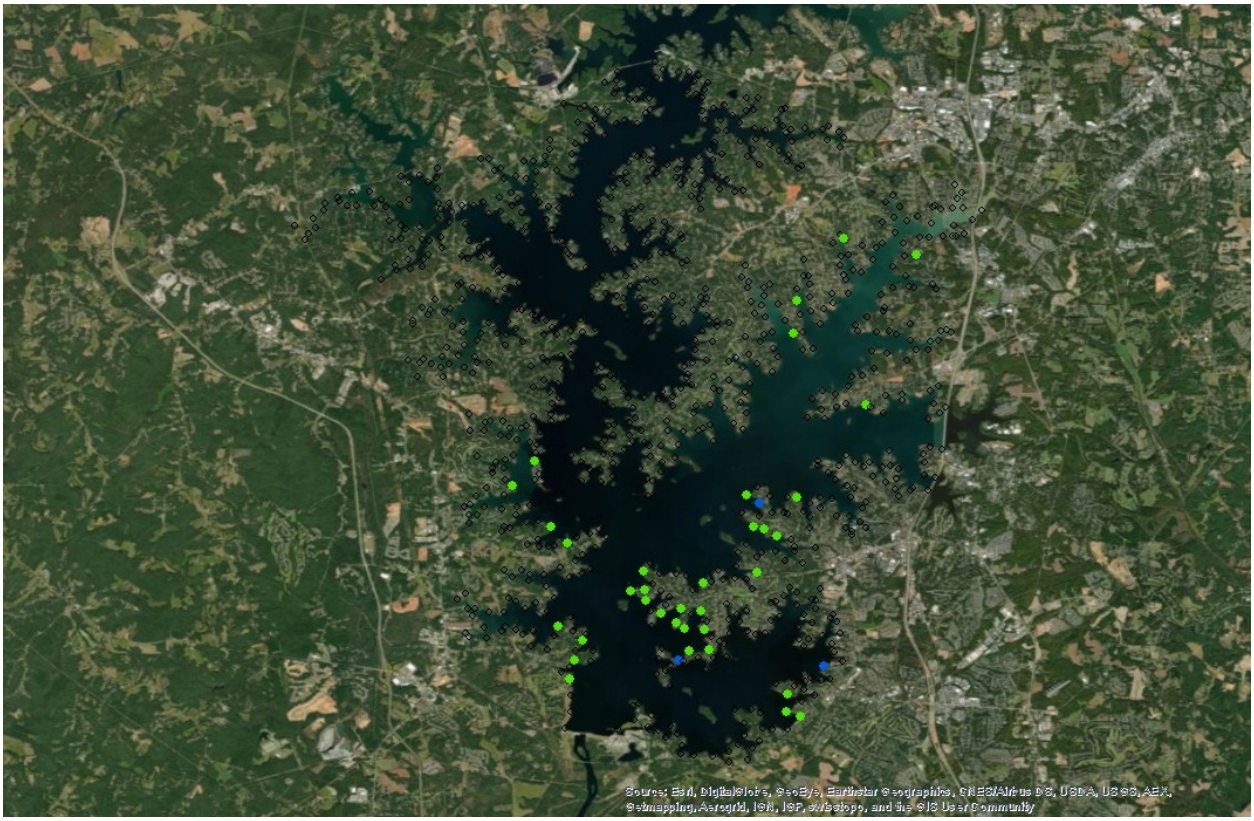

Figure 5. Southern naiad (*Najas guadalupensis*) locations and densities.

Density -- 1 = 2 = 3 = 4 =

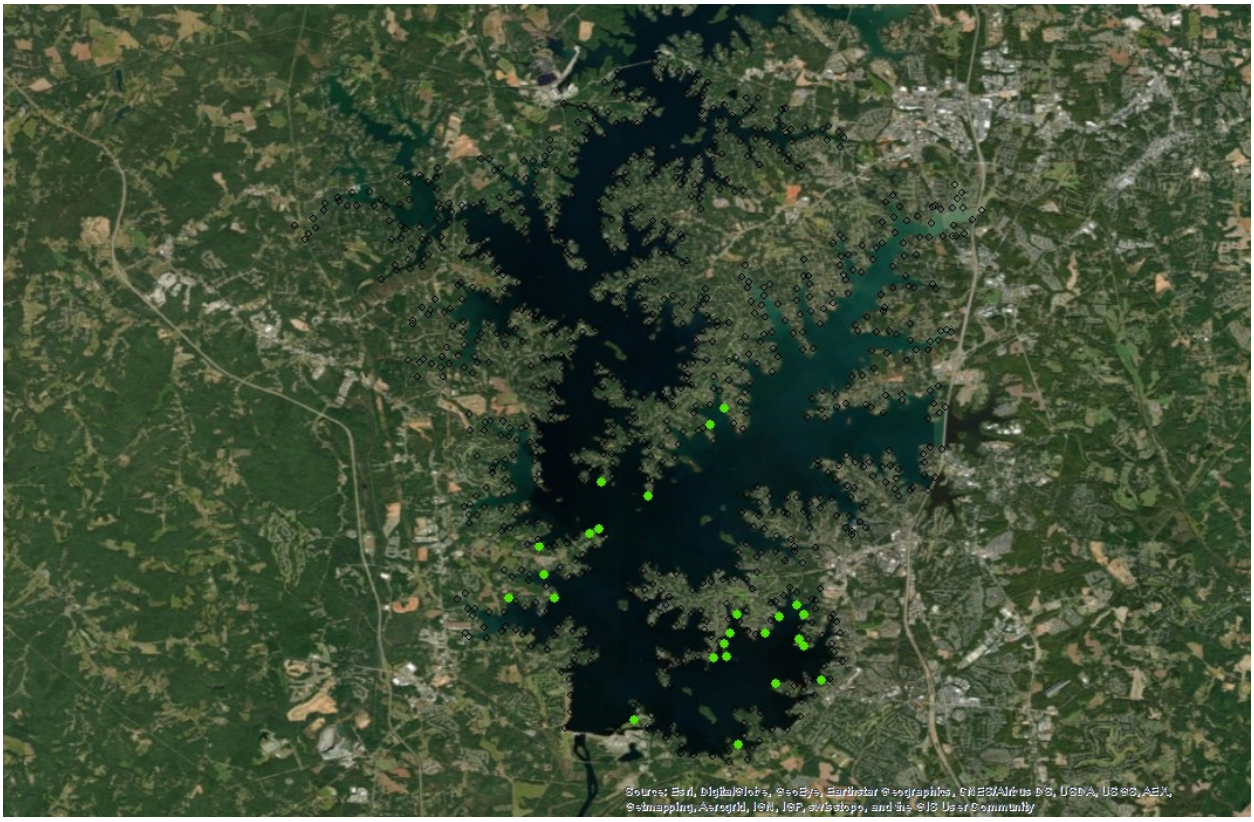

Figure 6. Eel grass / tape grass (*Vallisneria americana*) locations and densities.

Density -- 1 = 2 = 3 = 4 =

Figure 7. Filamentous algae (*Spirogyra*) locations and densities.

Density -- 1 = 2 = 3 = 4 =

Figure 8. Hydrilla (*Hydrilla verticillata*) locations and densities.

Density -- 1 = 2 = 3 = 4 =

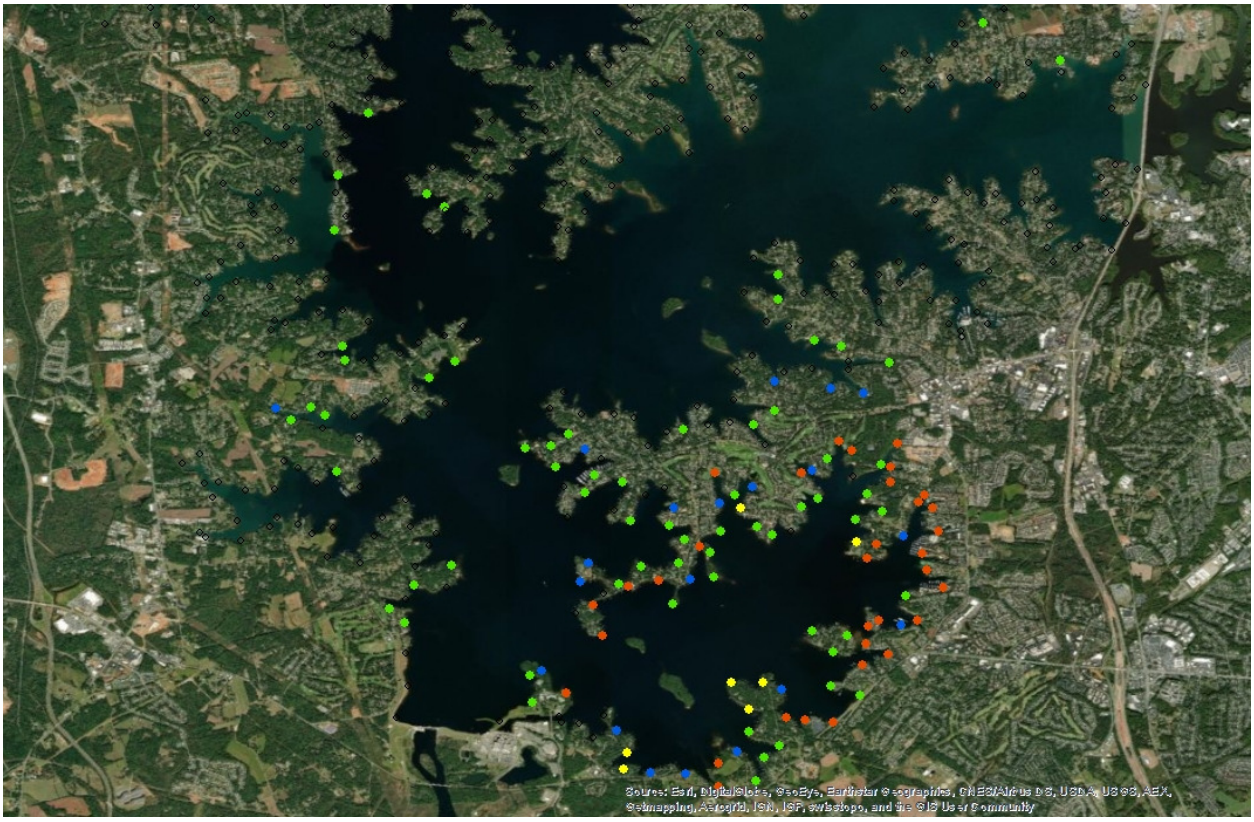

Figure 9. Lake Norman Hydrilla infestation 2018 (640 acres).

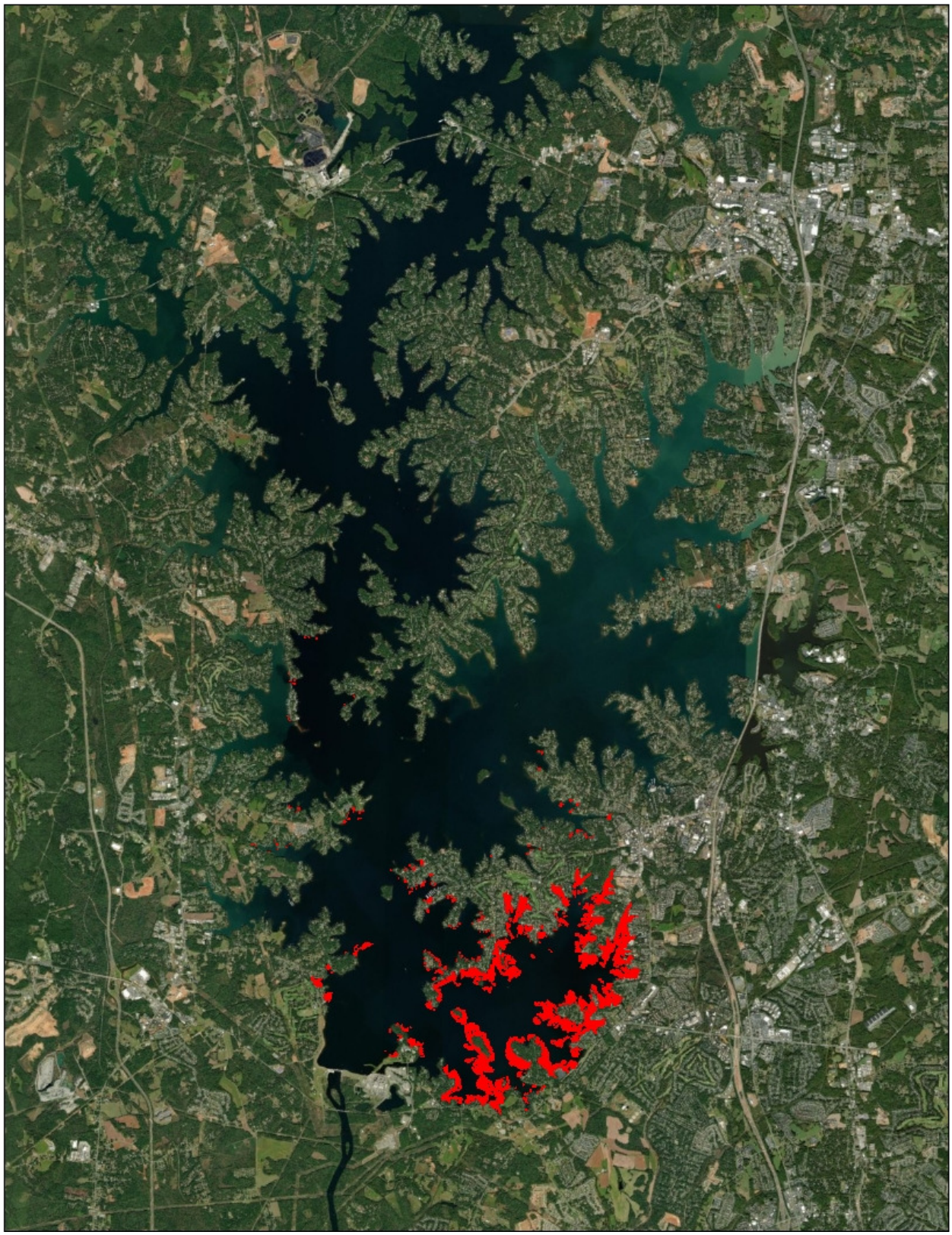

Figure 10. Number of survey points by species.

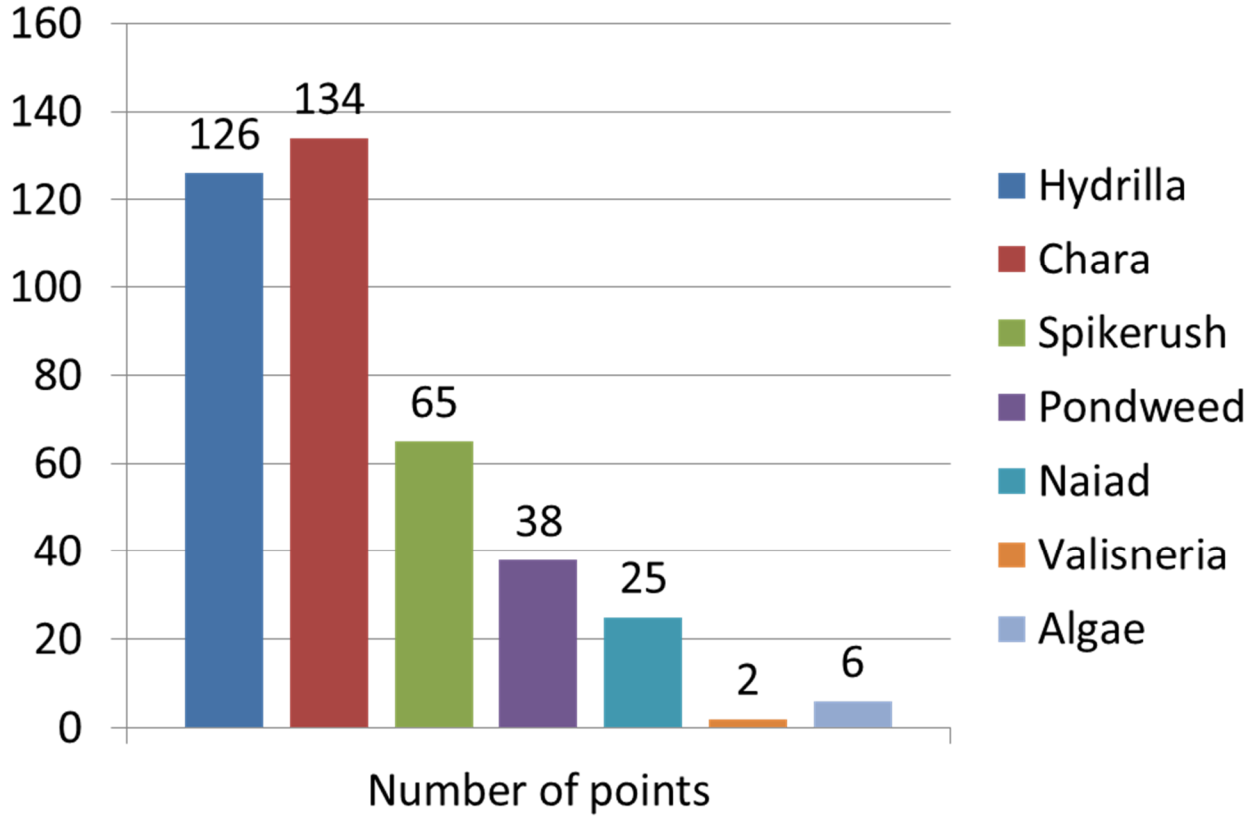

Figure 11. Percent occurrence by species.

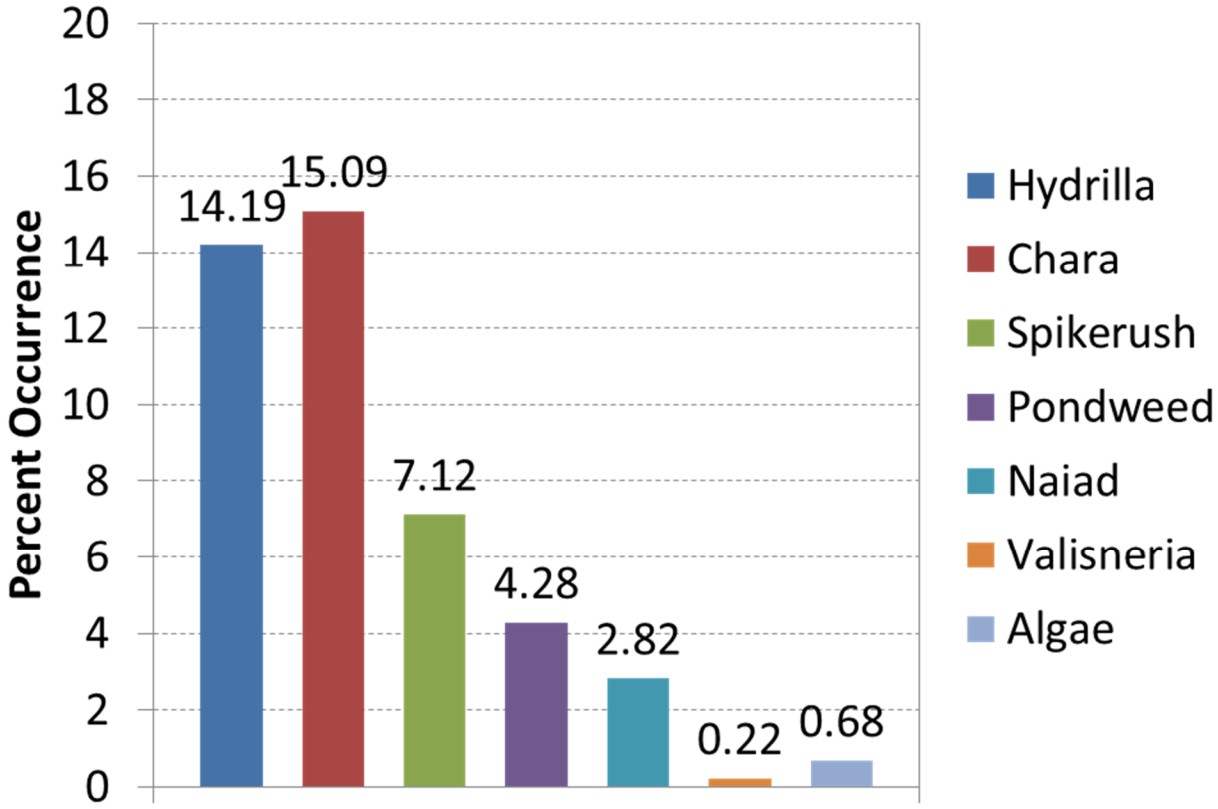

Figure 12. Percent occurrence native species vs hydrilla.

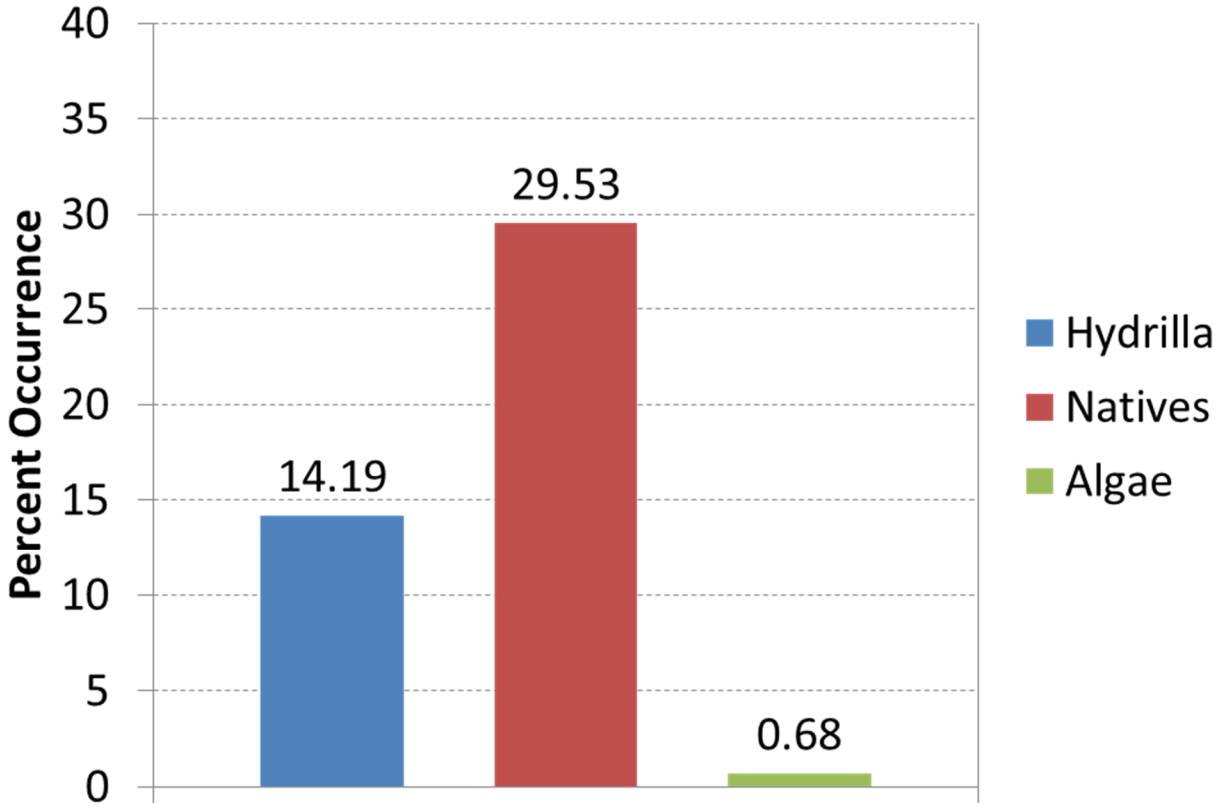

Figure 13. Images of hydrilla in Ramsey Creek, Lake Norman. These densities would constitute a rating of 4 on the 0-4 abundance scale. Images from Lake Norman 2018 field survey taken by Dr. Erika Haug.