2019 Lake Norman

Aquatic Vegetation Survey

North Carolina 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 in 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 had 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. In early October of 2019, a second whole lake survey was completed by North Carolina State University to determine grass carp efficacy from previous year's stockings.

Methods

The survey was completed in early October of 2019. During the survey timeframe, the lake elevation remained at 95.8 ft (based on full pool of 100 ft and target elevation of 97.8 ft) [2]. Rake samples were collected in water 4 to 12 ft (1.2 to 3.6 m) deep.

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 888 points were sampled south of the Hwy 150 bridges at approximately 1,600 ft (500 m) intervals around the shoreline (Figure 1). Areas north of the Hwy 150 bridges were sampled by Duke Energy Aquatic Plant Management Program contractors. 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. The sonar data was processed by a third party data processing company to better quantify standing biomass of all plants. This data was combined with the point intercept results using ArcMap (version 10.7.1) to estimate the total hydrilla acreage.

Results

Submersed plant species observed included many that are common in Piedmont reservoirs across North Carolina. These native species included chara / muskgrass (*Chara spp*.), spikerush (*Eleocharis baldwinii*), Southern naiad (*Najas guadalupensis*), and eel grass / tape grass (*Vallisneria americana*). These were found relatively evenly distributed throughout the lake (Figures 2 – 8).

Species occurrence declined drastically from 2018 to 2019 with chara and Vallisneria being the exceptions (Figure 10). These two species are less preferred by grass carp than several others that were found previously. Spikerush occurrence also declined from the previous year's survey; however, this was in large part due to lower lake levels during the 2019 survey. Plants believed to be spikerush were observed from a distance at multiple sites, but these plants could not be accessed for positive identification due to low water levels. Naiad and pondweed occurrence likely declined as these are preferred species for grass carp foraging along with hydrilla.

Hydrilla populations significantly declined in 2019. Hydrilla point occurrence dropped by 98% from 2018 to 2019 (Figure 10). Hydrilla was only observed at two point-intercept locations in 2019 (Figure 5). Multiple rake tosses were thrown in these locations to confirm population extent. However, only a single 3 inch stem was found in each of the two locations.

Conclusions / Implications

- The current hydrilla management plan is working well. Minimal amounts of hydrilla were found and some other vegetation remains that could maintain a grass carp population.
- Vallisneria can provide a number of ecosystem services and is desirable among some user groups which value submersed aquatic habitat. Decreasing hydrilla while

maintaining Vallisneria populations may help promote the multiple use aspects of Lake Norman.

- Yearly surveys should continue in order to monitor the management program and allow for adaptive changes to be rapidly implemented as necessary.

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/Deta

Figure 1. Individual survey points on Lake Norman.

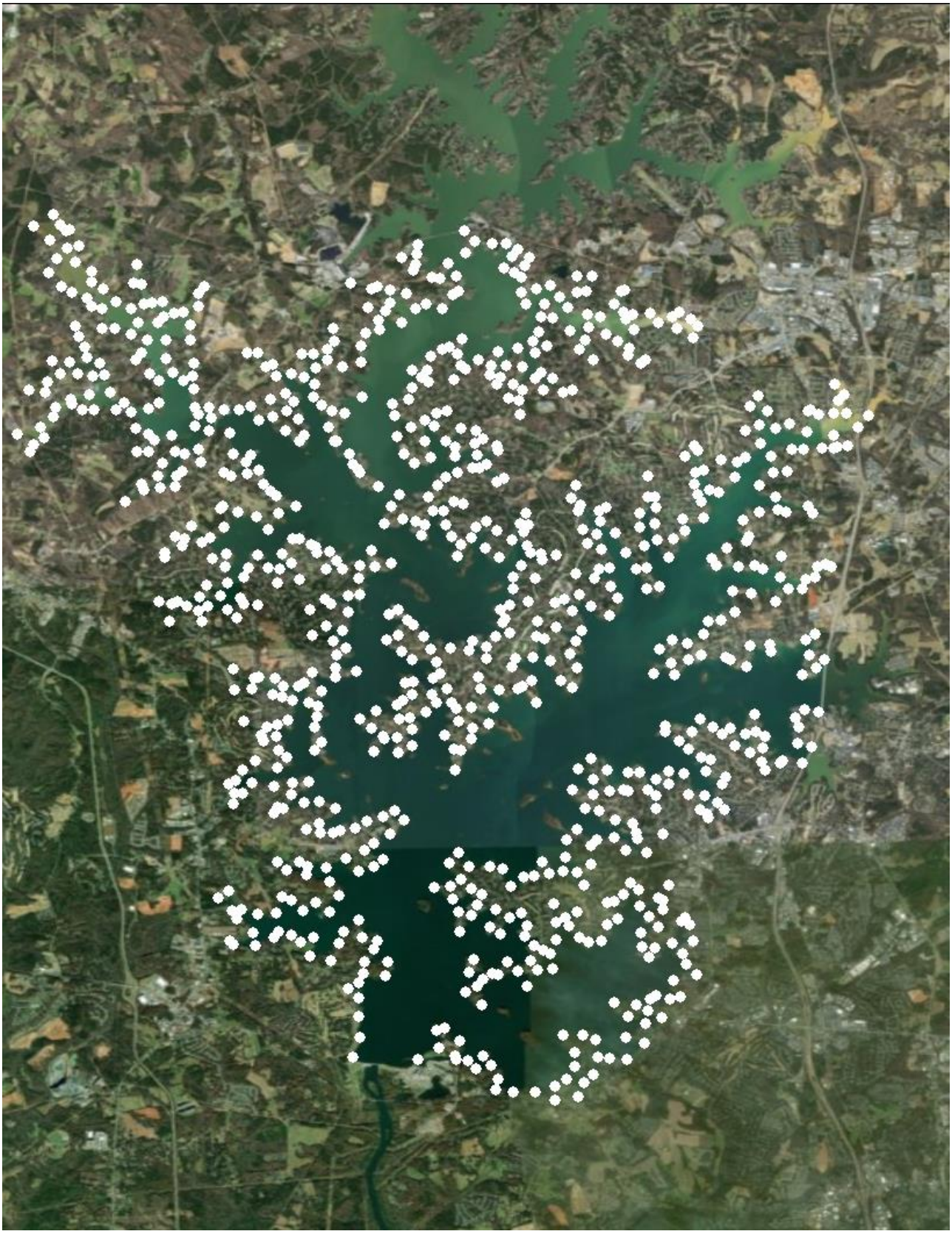

Figure 2. Chara / muskgrass (*Chara spp*.) locations and densities.

Density -- 1 = 2 = 3 = 4 =

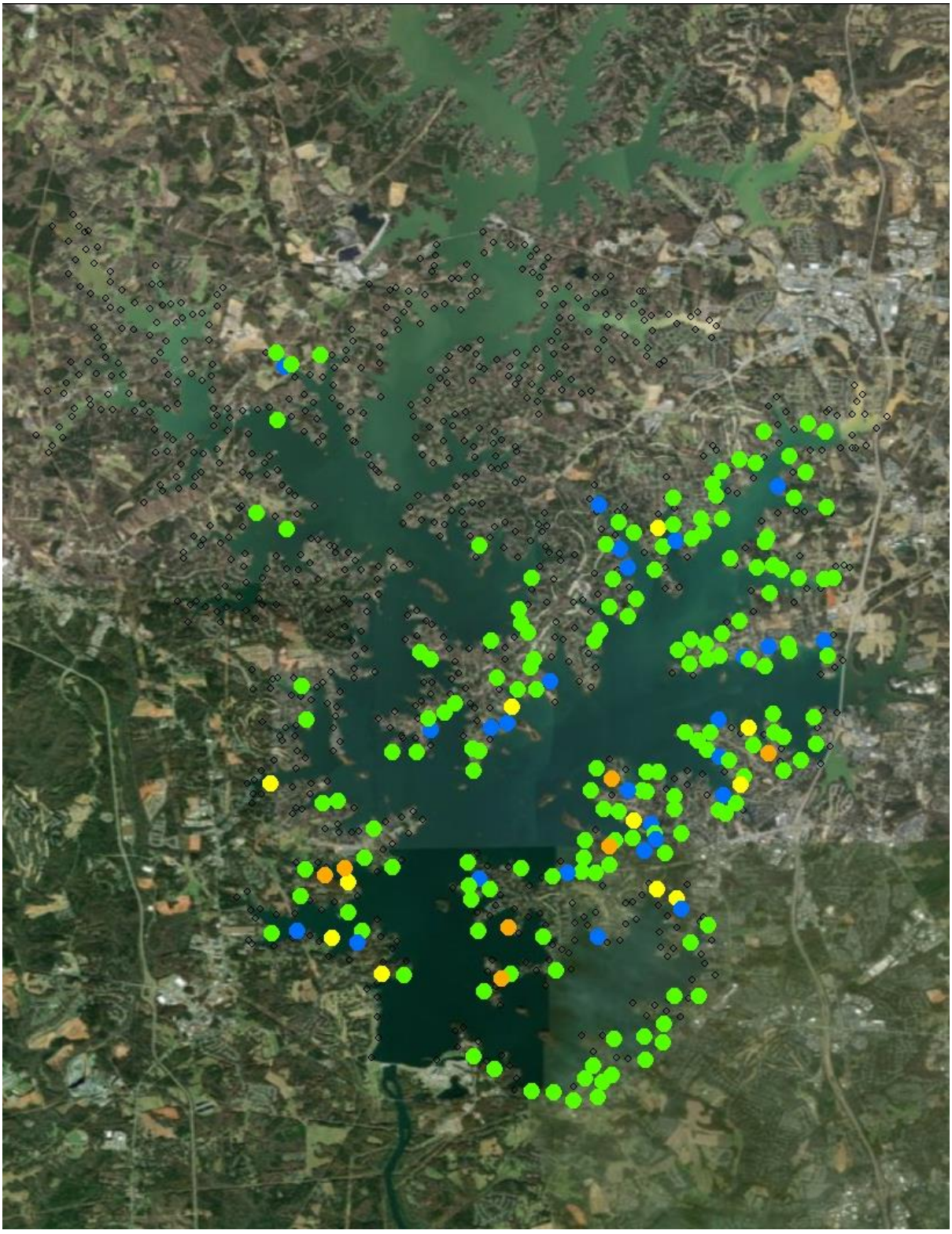

Figure 3. Spikerush (*Eleocharis baldwinii*) locations and densities.

Density -- 1 = 2 = 3 = 4 =

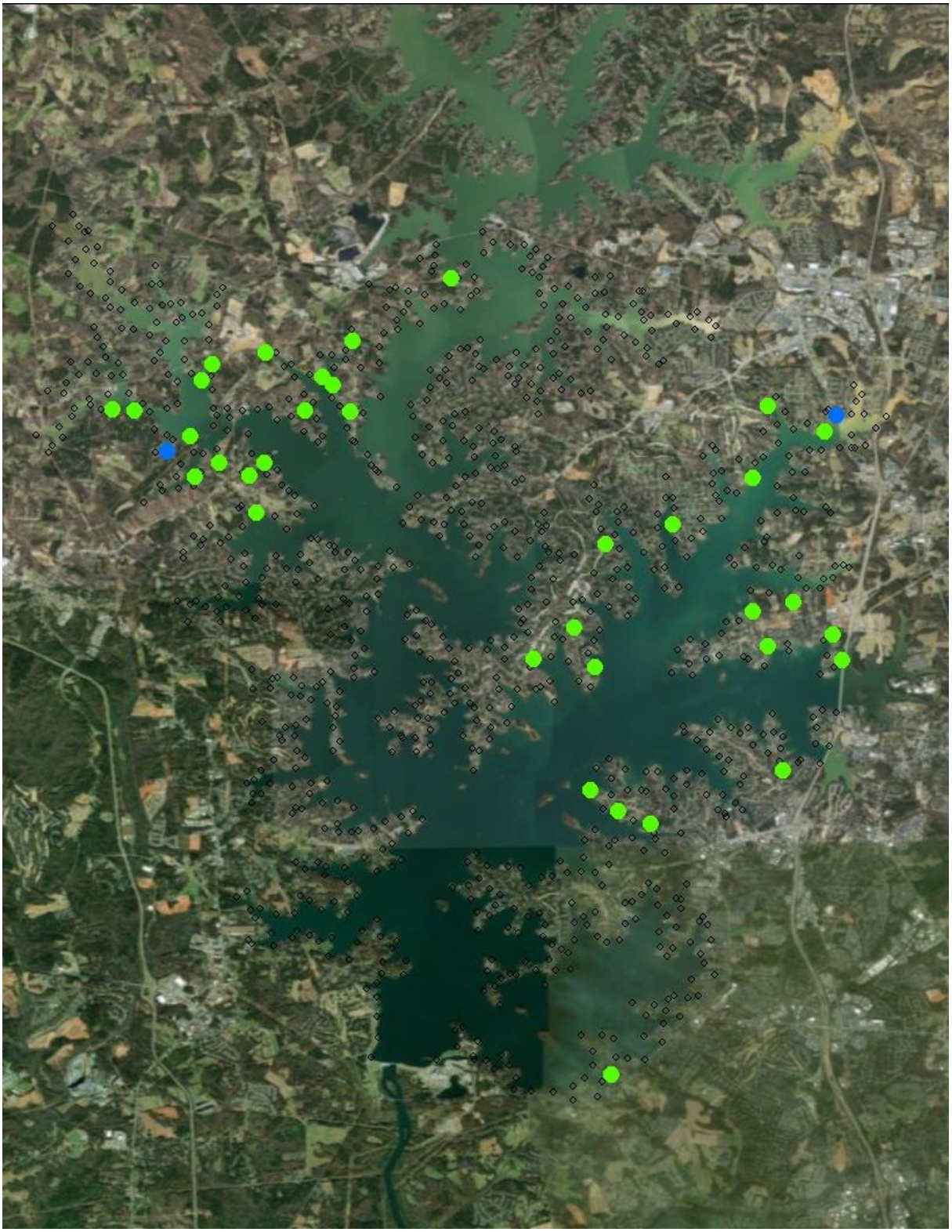

Figure 4. Southern naiad (*Najas guadalupensis*) locations and densities.

Density -- 1 = 2 = 3 = 4 =

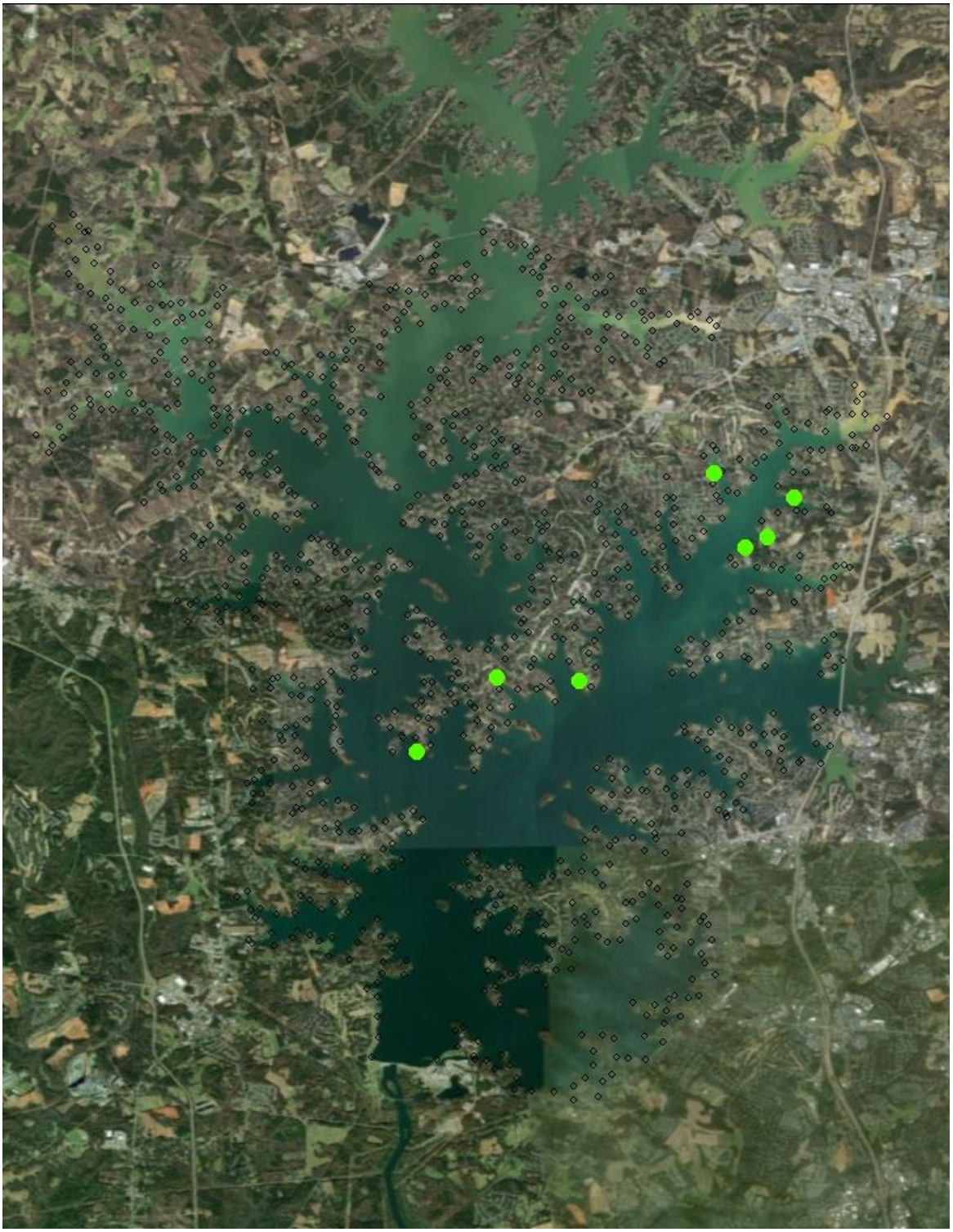

Figure 5. Hydrilla (*Hydrilla verticillata*) locations and densities.

Density -- 1 = 2 = 3 = 4 =

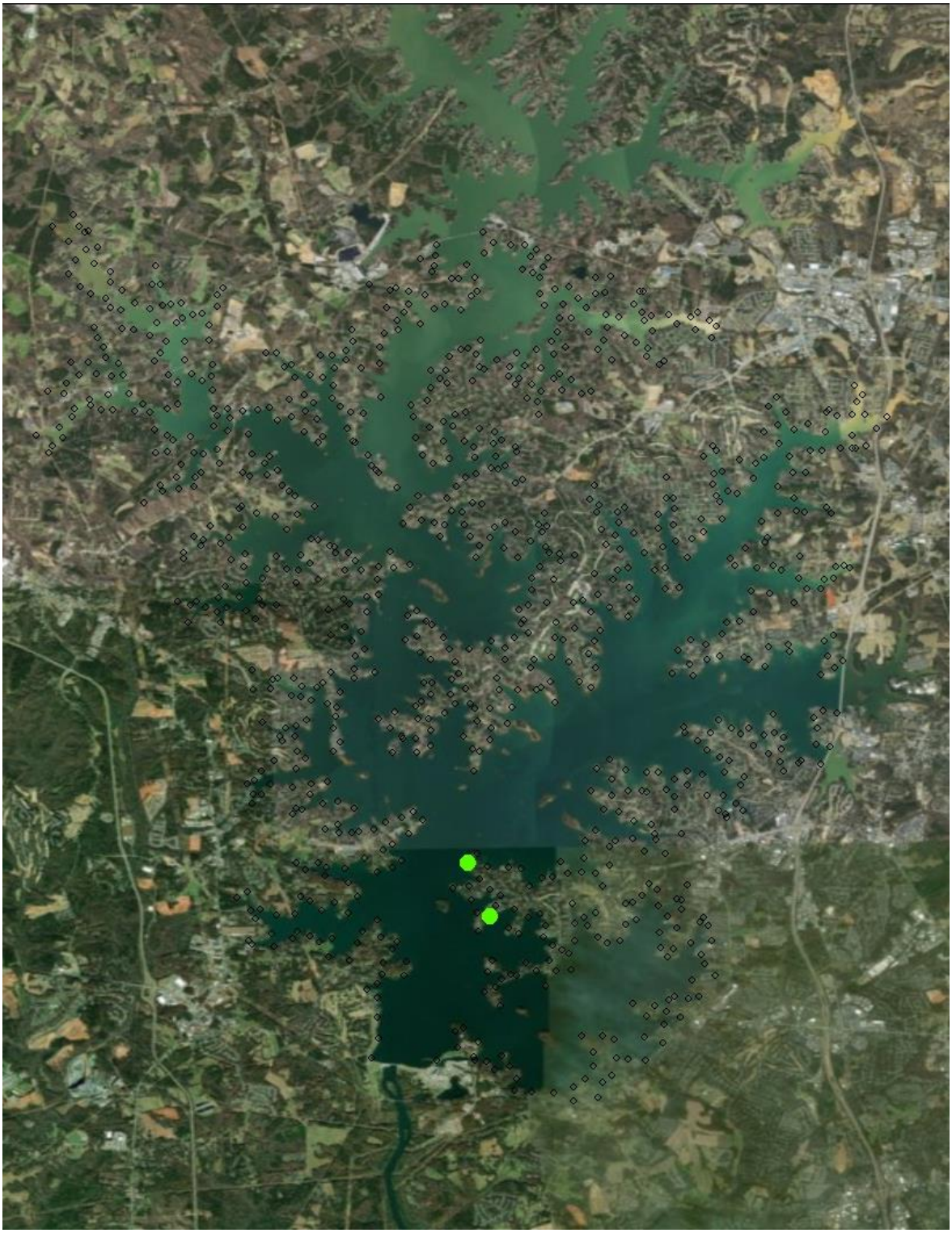

Figure 6. Eel grass / tape grass (*Vallisneria americana*) locations and densities.

Density -- 1 = 2 = 3 = 4 =

Figure 7. Lake Norman Vallisneria population in Ramsey Creek 2019 (10.6 acres).

Figure 8. Lake Norman Vallisneria northern population 2019 (0.74 acres).

Figure 9. Number of survey points by species.

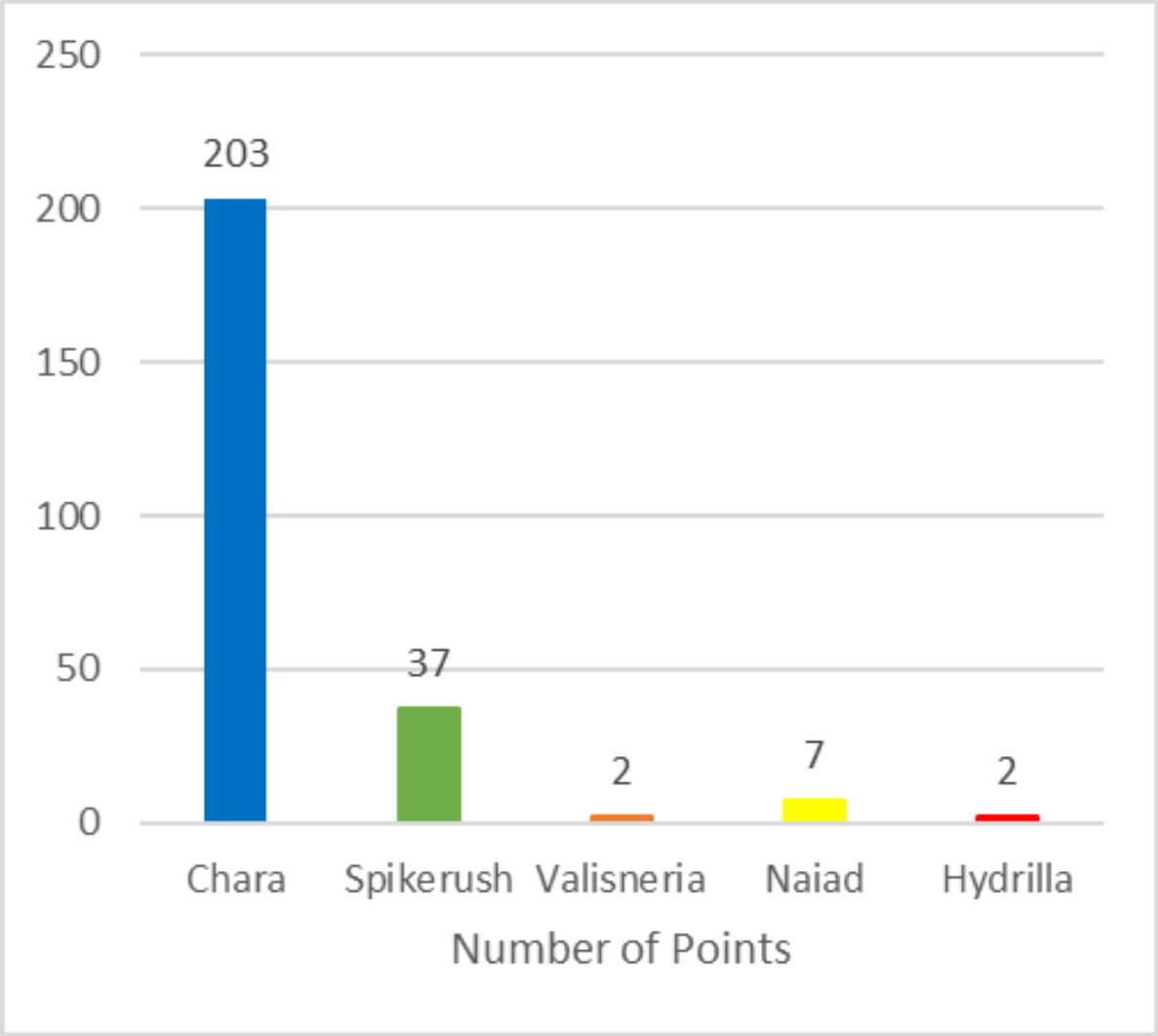

Figure 10. Percent change by species from 2018 to 2019.

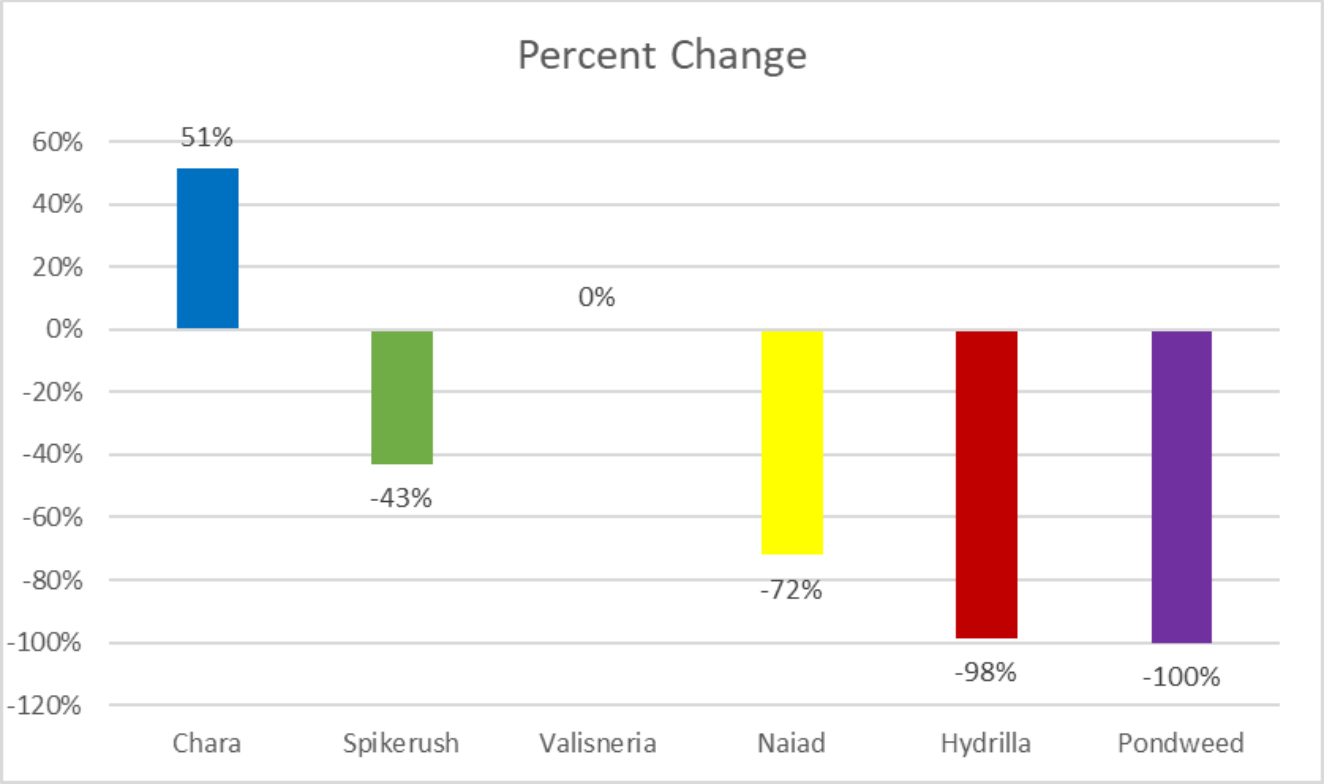

Figure 11. Images of Vallisneria in Ramsey Creek, Lake Norman. These densities would constitute a rating of 4 on the 0-4 abundance scale. Images from Lake Norman 2019 field survey taken by Kara Foley.