Lake Gaston Aquatic Plant Management Program Report
2014 Management Activities to Date

Executive Summary

This report summarizes all management activities pertaining to aquatic plants on Lake Gaston in the treatment year 2014, with particular focus on hydrilla. Management activities and timing, aquatic plant and tuber surveys are all included in this report.

Treatment year 2014 included the management of **1067 acres** of water for hydrilla with herbicides. There were **620 acres** designated as **Long Term Treatment Areas** (LTTAs) as a part of the existing Long Term management Plan. Subsequently, **447 acres** were treated as **Annual Priority Treatment Areas** (APTAs). Treatments were completed during the summer season of 2014 from the months of May through July. No grass carp were stocked in 2014.

Two surveys were completed to provide information about the aquatic plant community present on Lake Gaston. A hydroacoustic survey was performed by members of the NC State Aquatic Weed Control Program to provide information on aquatic plant coverage while a second survey, completed by the Lake Gaston Association volunteers, provided information on various species distributions across the lake. Both surveys covered the entire lake's littoral zone estimated at **6,563 acres**. A total of **546 acres of total submersed aquatic vegetation** (SAV) was estimated, of which there were **335 acres of hydrilla** and **36 acres of lyngbya**.

A preliminary tuber survey has been conducted of LTTA sites, as well as a single MMA and control site. Preliminary results suggest a **substantial decline in overall tuber density in 2014**.

Maps, tables, and figures are included in the following report to aid in interpretation of the summary presented above.

1. 2014 Treatment Site Selection

2014 Treatment Site selection was completed during the months of February and March of 2014. The Lake Gaston Technical Advisory Committee met on February 20th, 2014 and reviewed the 2013 annual revegetation report provided by Remetrix and tuber surveys conducted by NC State University. A subsequent meeting of the TAG Site Selection Committee was held the first week of March to determine what sites would be treated for the 2014 treatment year. Long Term Treatment Area (LTTA) and Annual Priority Treatment Area (APTA) selection are described below:

1.1. LTTA Site Selection Process

It was recommended by TAG that LTTA Sites Poplar, Sledge, Woodland Hurst, Pretty, Jimmies and Big Stonehouse be treated in accordance with the revised Lake Gaston Long-term aquatic plant. LTTA sites selected for continued treatment in 2014 were identified to have existing tubers within the treatment boundaries (totals from 18 to 47 T/m2), therefore treatment in those areas during 2014 was necessary to continue reductions in each site specific tuber bank (table 1). The Timberline shores site, however, was selected to be removed as an LTTA and would now be defined as an MMA (Monitoring and Maintenance Area) as tuber numbers have reached 0 in all sites sampled. An intensive survey was performed on the Timberline Shores areas in July of 2014 and will be summarized at a later point in this document. LTTA sites encompassed 620 acres of the 2014 treatment plan (figure 1). Individual site maps can be found in the Appendix of the final report given in December.

1.2. APTA Site Selection Process

In accordance with the Long Term Management Plan, sites selected as APTAs were selected based on need, current LTTA county distributions, county funding contribution, treatment area size, and recreation and/or tourism value. Thirty six sites across the lake were considered for APTA selection by the treatment site selection committee. In reviewing the 2013 survey conducted by Remetrix, several sites were identified based on need (past year hydrilla coverage). A poor growing year and revised management in 2013 led to a major reduction in hydrilla coverage lakewide. Partial coverage of hydrilla existent in the Beechwood flats area, Great Creek, Hubquarter Creek, and Stillhouse Branch led to the selection of those sites as APTAs in 2014 making up approximately 447 acres of the 2014 treatment plan (figure 2). Individual site maps can be found in the Appendix of the final report given in December.

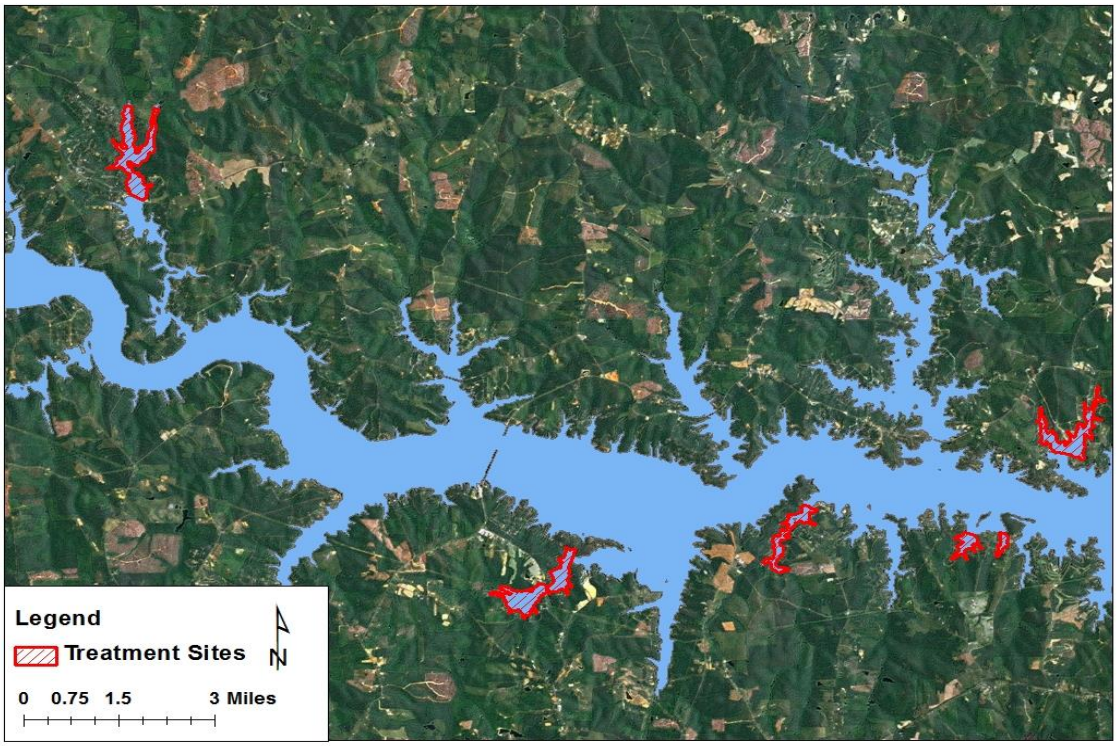


Figure 1. LTTA sites selected for treatment in 2014

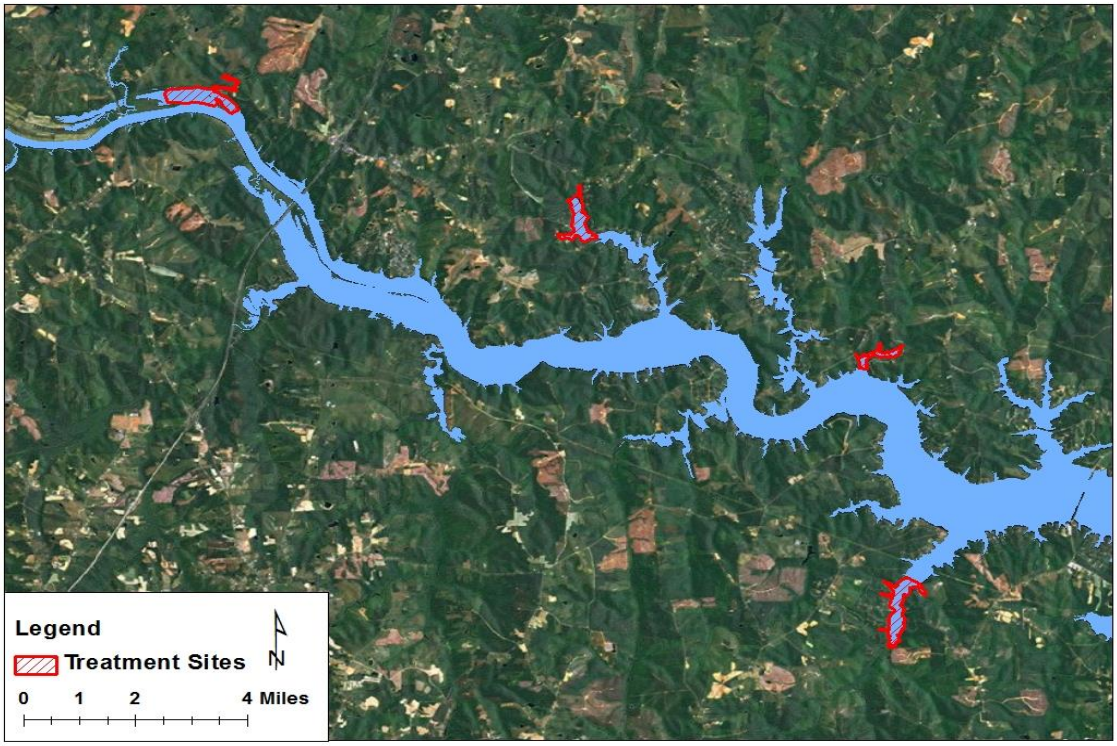


Figure 2. APTA sites selected for treatment in 2014

1.3. MMA Designation of Timberline Shores Site

Timberline Shores, an LTTA in 2012 and 2013, was removed from the 2014 LTTA sites to be treated. After reviewing the tuber bank and treatment history of the site, it was determined that the tuber bank in Timberline Shores had been reduced to the point to warrant designation as a Monitoring and Maintenance Area (MMA) for 2014 (in yellow, table 1). In accordance with the Long Term Management Plan, Timberline shores was intensively surveyed using both hydroacoustics and point sampling during the 2014 growing season in an attempt to identify and locate any potential regrowth of hydrilla within the treatment area. A survey completed by NC State University on July 9th, 2014. The point survey revealed no regrowth of hydrilla, and growth of a single native, Chara sp. throughout much of the treatment area. A map of the area sampled is seen below in figure 3.

LTTA Sites							**Spring 13**	**Fall 13**
Sledge	-	-	-	-	-	-	86 ± 9	**64 ± 13****
Woodland Hurst	-	-	-	-	-	-	140 ± 23	**34 ± 10****
Pretty	-	-	-	-	-	-	58 ± 11	**46 ± 8****
Jimmies	-	-	-	-	-	-	36 ± 10	**12 ± 5*****
Timberline Shores	-	-	-	-	-	-	2 ± 2	**0 ± 0****
Big Stonehouse	-	-	-	-	-	-	31 ± 16	**22 ± 4****
Poplar	-	-	-	-	-	-	75 ± 25	**25 ± 11****
Baseline Year	Decrease	Increase						
Bold = Treatment								
* = 1st Year	** = 2nd Year	*** = 3rd Year						

Table 1. LTTA 2013 tuber surveys

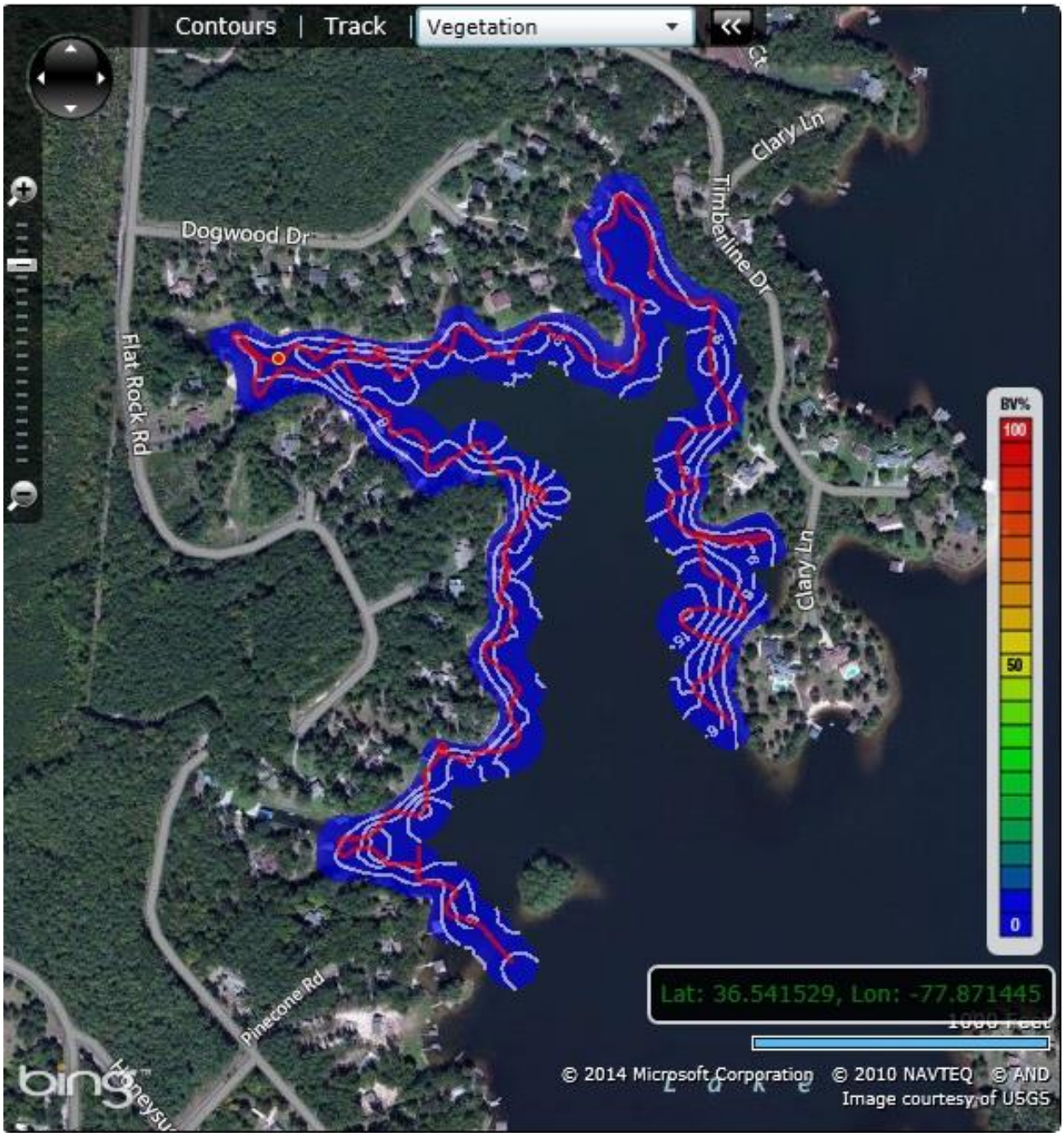


Figure 3. Timberline shores survey July 9th, 2014

2. Treatment Applications by Cycle

Treatments for hydrilla were administered by Skip's Aquatic Solutions, the contracted applicator, over three separate treatment cycles during the summer growing season. Treatments of all LTTA and APTA sites were completed for both treatment cycle 1 and 2. A funding shortage did not allow for treatment of all LTTA sites during treatment 3, therefore an emergency meeting of the site selection committee was required and adjustments were made with the consent of the TAG. Changes in the 2014 treatment plan during treatment cycle 3 will be summarized below. Products used for LTTA and APTA sites included Sonar PR, Sonar SRP, and Sonar Q. Komeen was used to treat hydrants when needed.

2.1. Cycle 1 (5/27-5/28)

Sites Completed on 5/27 included Jimmies Creek, Pretty Creek, Sledge Creek, Woodland Hurst, Big Stonehouse, Beechwood Flats and Hubquarter Creek. Two boats were used for the first treatment including one skiff (single spreader) and one pontoon boat (double spreader) . Treatments began at 8:26am on 5/27 and ended at 5:19 pm. Treatments resumed at 8:10am on 5/28 and concluded at 10:15 am. Problems arose several times with hoppers working effectively on both vessels. These issues were communicated to the applicator following the first treatment and adjustments were made. No delays were encountered in the first treatment cycle and all product designated for that cycle was used.

2.2. Cycle 2 (6/23-6/24)

Sites completed on 6/23 included Jimmies, Pretty, Sledge, Woodland Hurst, Big Stonehouse, Beechwood Flats, and Hubquarter Creeks. Treatments began at 845am on 6/23 and ended at 4:57pm. Treatments resumed the following day in Stillhouse, Poplar and Great Creek. Two boats were used to complete all treatments. No delays were encountered during the 2nd cycle of treatments.

2.3. Cycle 3 (8/4, 8/6)

Treatment cycle 3 reduced treatment areas to include only APTA sites after a funding shortage occurred. An emergency meeting of the site selection committee was called to discuss options for the third and final treatment. Two options were considered: 1) The LGWCC would go into red and potentially suffer further shortages which could affect ALL of treatment year 2015 OR 2) some treatment areas would not receive a third herbicide application. After discussing during-treatment surveys, lakewide observation of NO hydrilla in LTTAs during any part of the 2014 growing season, and poor growing conditions for hydrilla in 2013 and 2014, the site selection committee decided that option 1 was not feasible as it could negatively impact 2015 management and that option 2 was the most viable alternative. This included conducting the third application on APTAs and not treating the LTTAs. This recommendation was then sent to the TAG where it received approval. The revision to the 2014 treatment season recouped approximately $100,000 spent over budget (if all sites were treated – option 1)and instead left approximately $70,000 in a 2014 reserve pool. The reserve pool was then available to treat ANY hydrilla that might be observed in LTTAs. All LTTAs were monitored every 2 weeks during and

after the third treatment period until growing degree days and water temperature began to decline, thus preventing further sprouting of unsprouted tubers in LTTAs. Concern was expressed by some homeowners that this decision strayed from the Long Term Management Plan (LTMP), however the LTMP states that funding shortages will require adaptive management strategies. LTTAs will maintain priority during site selection at the beginning of a treatment season, however a decisions might be made not to treat areas in which no hydrilla biomass has been observed. Not treating such areas does not deviate from the mission and goals of the LTMP. Beechwood Flats, Hubquarter Creek, and Stillhouse Branch were treated on 8/4 using both boats while Great Creek was treated on 8/6 using the pontoon boat.

3. Aquatic Plant Survey

Two surveys of the entire 350+ miles of shoreline of Lake Gaston were completed during the months of September, October, and November. These surveys included a hydroacoustics survey and a point-transect survey, each of which were combined to estimate relative amounts of submersed aquatic plants in Lake Gaston following growing year 2014. Each survey is explained in the following sections.

3.1. Hydroacoustics Survey

A hydroacoustics survey using a Lowrance HDS was employed by members of the NC State Aquatic Weed Control Program throughout the entirety of the Lake from the Kerr Lake Dam located on the far west side of the Lake to the Lake Gaston Dam on the far east. The hydroacoustics survey was used solely to estimate the existing coverage and biovolume of *ALL* submersed aquatic plants present in the lake. An estimated 6,563 acres of the Lake Gaston littoral zone were surveyed for aquatic plants using a "zig-zag" coverage approach from the 5 ft contour to the 15 ft contour in areas surveyed. The transect used for hydroacoustic sampling can be found in figure 4.

Figure 4. Transect(s) of area surveyed during the hydroacoustic survey.

3.2. LGA Volunteer Survey

The annual Lake Gaston Association Volunteer survey was also completed during the months of September through early November, occurring alongside the hydroacoustic survey, and covered the entirety of the Lake. A total of 47 volunteers collected 5,258 points across the lake encompassing 800+ hours/ 20+ days of active labor. Contrary to the hydroacoustic survey, the volunteer survey provides information on species presence/ absence in the lake and was therefore used as supplementary data to the coverage and biovolume data provided from the hydroacoustic survey. The volunteers noted the presence or absence of 9 submersed species and 6 emergent or floating species as well as taking note of water depth, hydrilla length (if present)and whether or not hydrilla present in a given area was topped out. All data points collected by the LGA volunteer survey can be seen in figure 5.

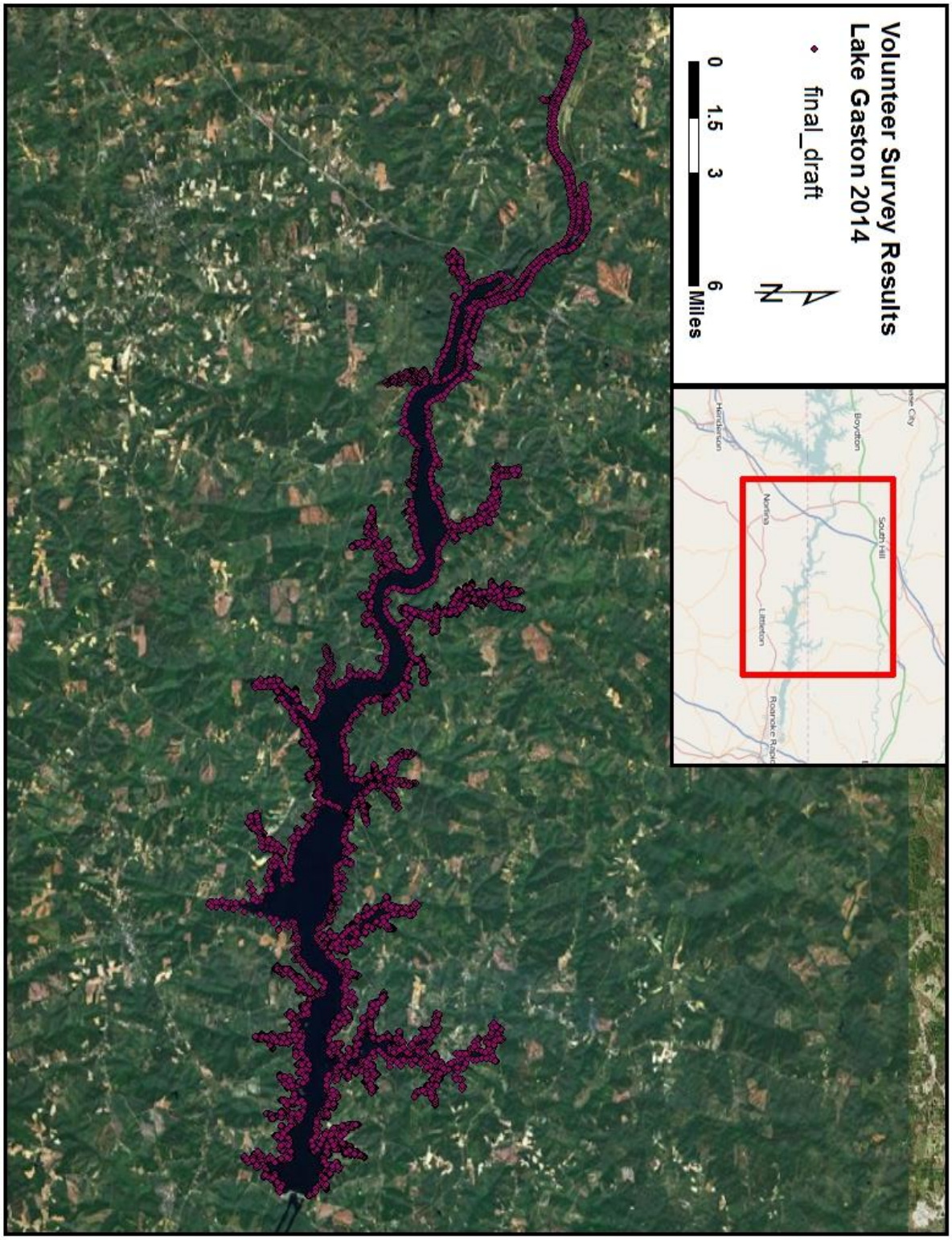


Figure 5. All data points sampled by LGA volunteers during their annual survey.

Overall, the volunteer survey suggests a decrease in relatively all species from the previous year (appendix figure 1). The hydroacoustics survey results estimate that approximately **546 acres** of total submersed aquatic vegetation (8% of the area surveyed) were present during the time of survey (figure 6). In terms of biolvolume, or the ratio of plant height to water depth, the majority of submersed plant biovolume was identified in Lizard Creek and in the undeveloped area Northwest of I-85. Of particular interest to this report is the relative abundance and coverage estimates of hydrilla and lyngbya, therefore the remainder of this report will focus on those two species. Presence/ absence maps of all other species can be found in the Appendix.

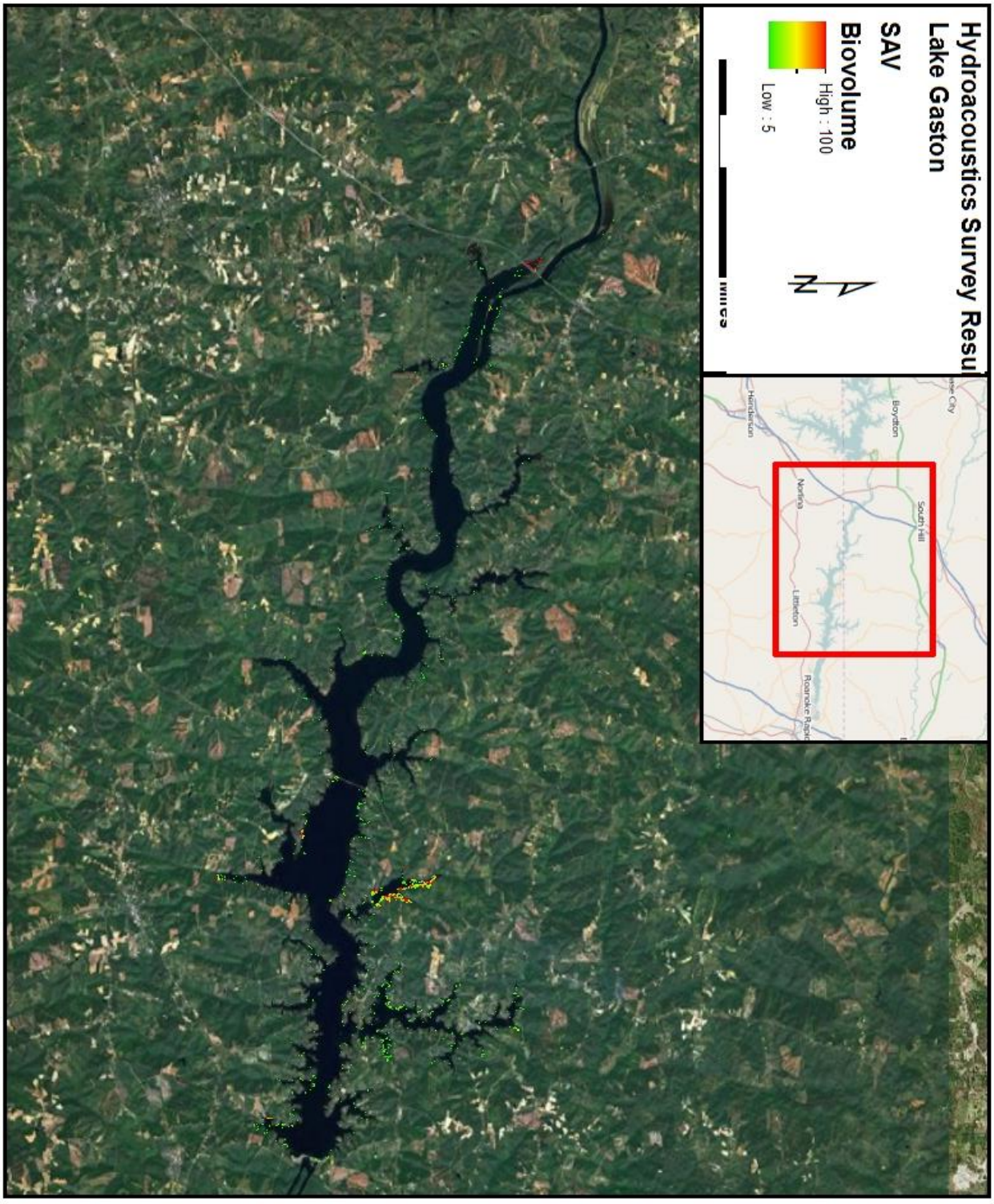


Figure 6. SAV biovolume as determined by the hydroacoustics survey.

3.3. Hydrilla

Hydrilla was identified in the volunteer survey to have occurred at 20.46% of all points sampled by the LGA volunteers (Figure 7). This is a notable decrease from the 2013 survey in which 47.57% of all data points were positive for hydrilla presence. Furthermore, the average length of hydrilla in 2014 was found to be 1.2 inches (figure 8), down 11.4 inches from 2013. Lastly, topped out hydrilla was found to be present at one-tenth of a percent (0.1 %) off all data points collected (figure 9), down roughly 9.04% from the previous year. The hydroacoustics survey results, using the volunteer data as a guide, estimates that approximately **335 acres** of hydrilla (roughly 61% of all SAV) was present during the survey (figure 10). The majority of hydrilla acreage was identified within the Lizard Creek area.

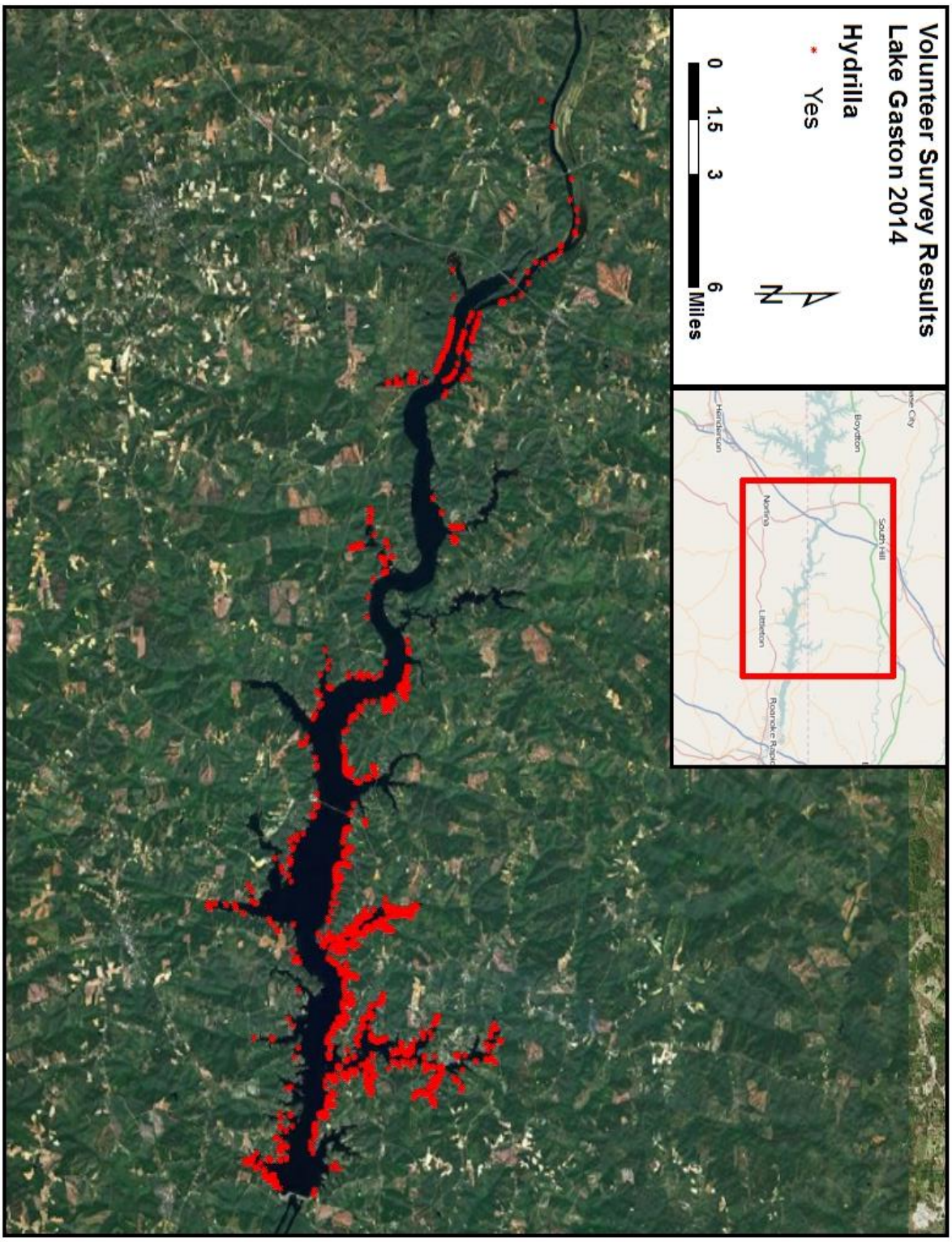


Figure 7. Hydrilla presence (in red) lake-wide as determined by the LGA volunteer survey.

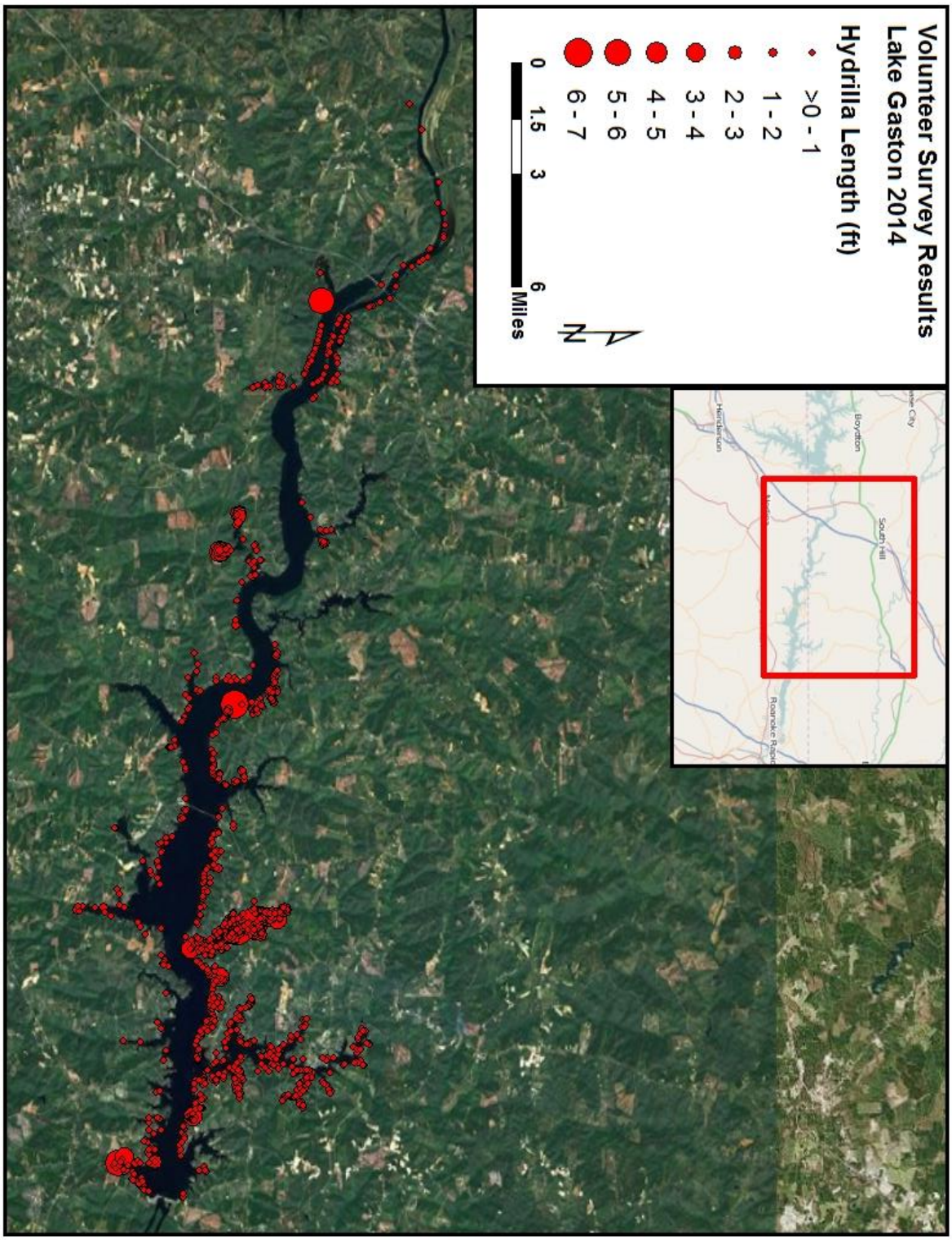


Figure 8. Hydrilla length lake-wide as determined by the LGA volunteer survey.

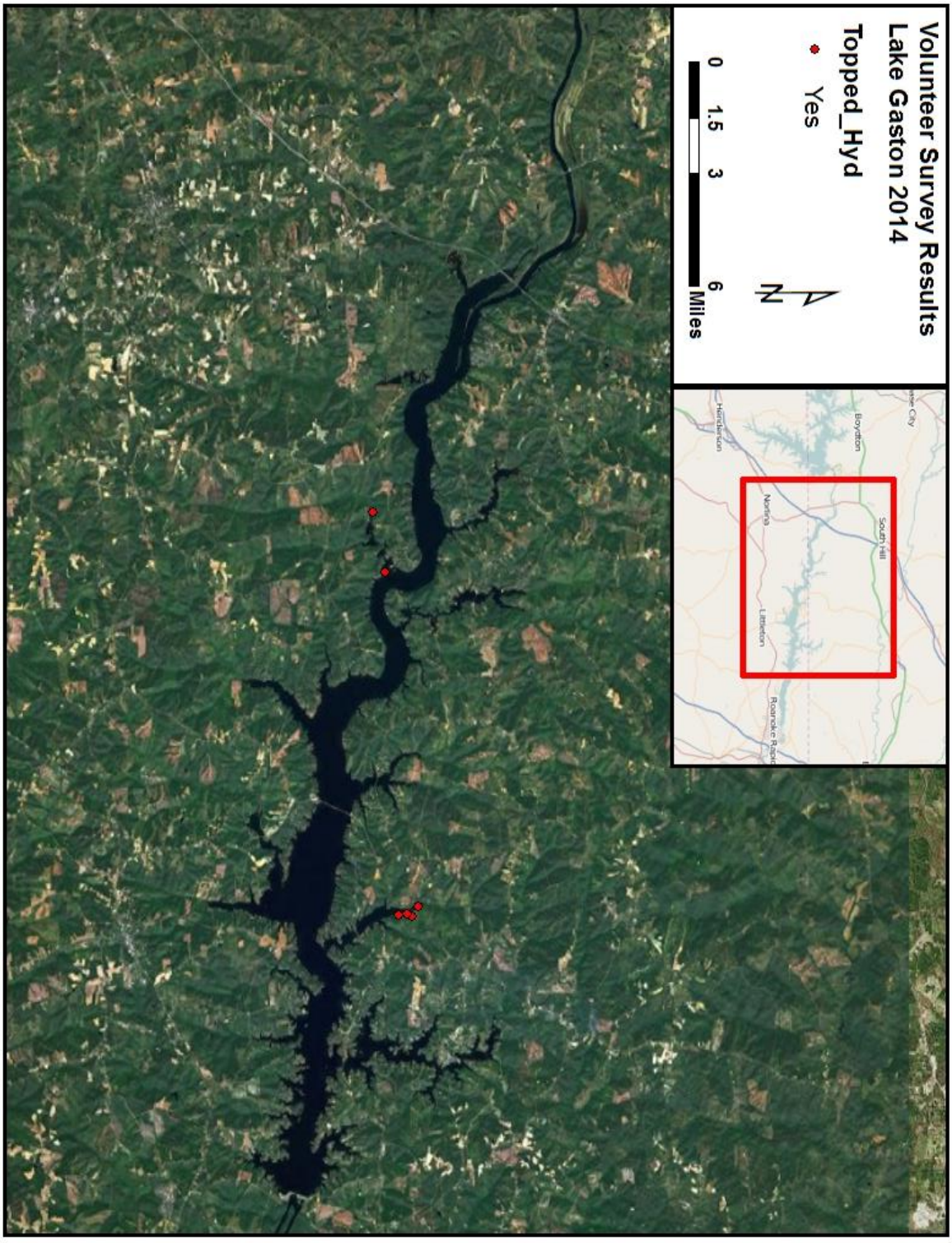


Figure 9. Topped-out hydrilla lake-wide as determined by the LGA volunteer survey.

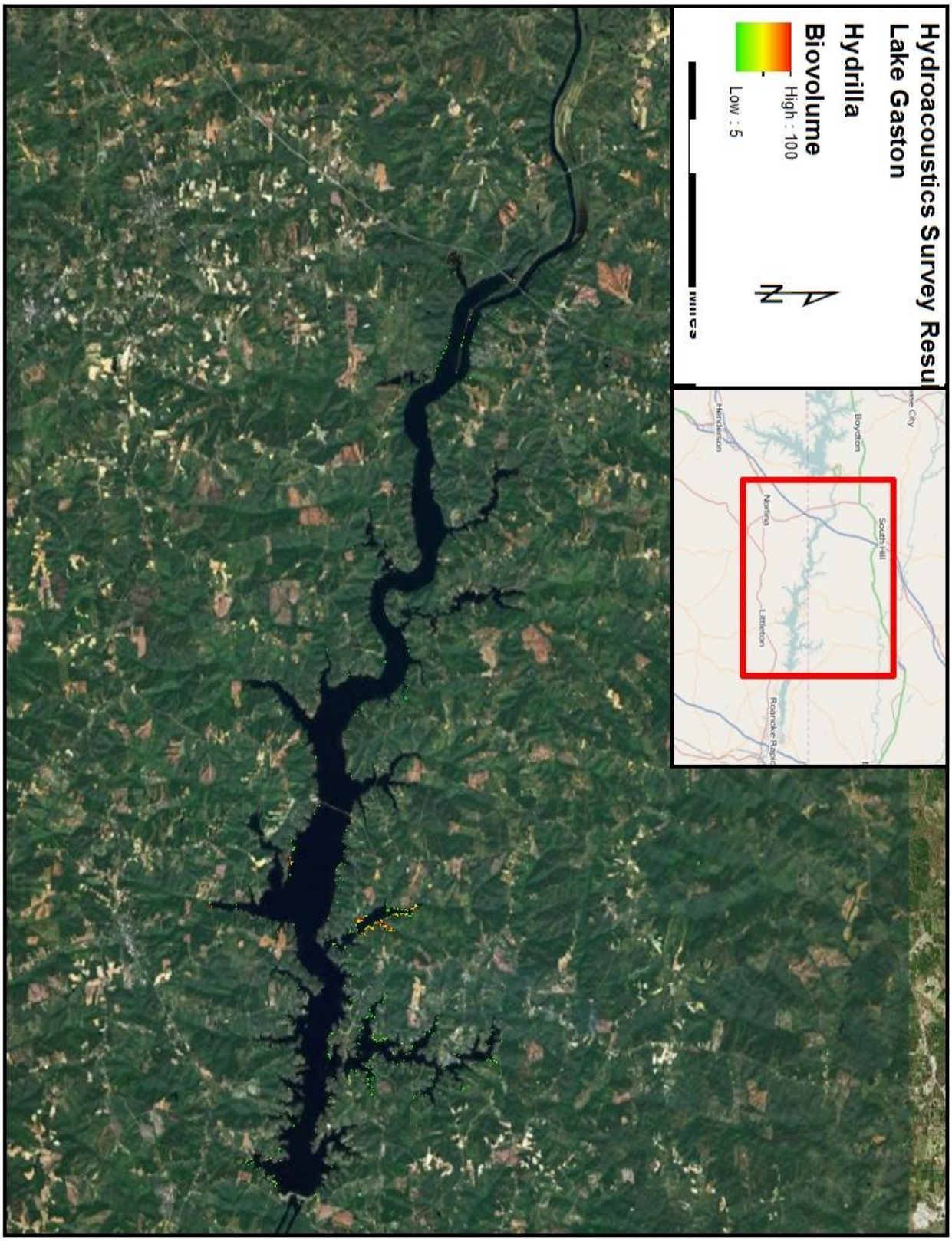


Figure 10. Hydrilla biovolume as determined by the hydroacoustics survey.

3.4. Lyngbya

Lyngbya was identified in the volunteer survey to have occurred at 5.15% of all points sampled by the (Figure 11). This number is relatively stable when compared to the 2013 survey in which 5.18% of all data points were positive for lyngbya presence. This is not however, an indication of the biovolume of lyngbya as lyngbya can become difficult to quantify using hydroacoustic techniques. The hydroacoustic survey results, using the volunteer data as a guide, estimates that approximately **36 acres** of lyngbya (roughly 7% of all SAV) was present during the survey (figure 12). Lyngbya seemed to be scattered across the lake.

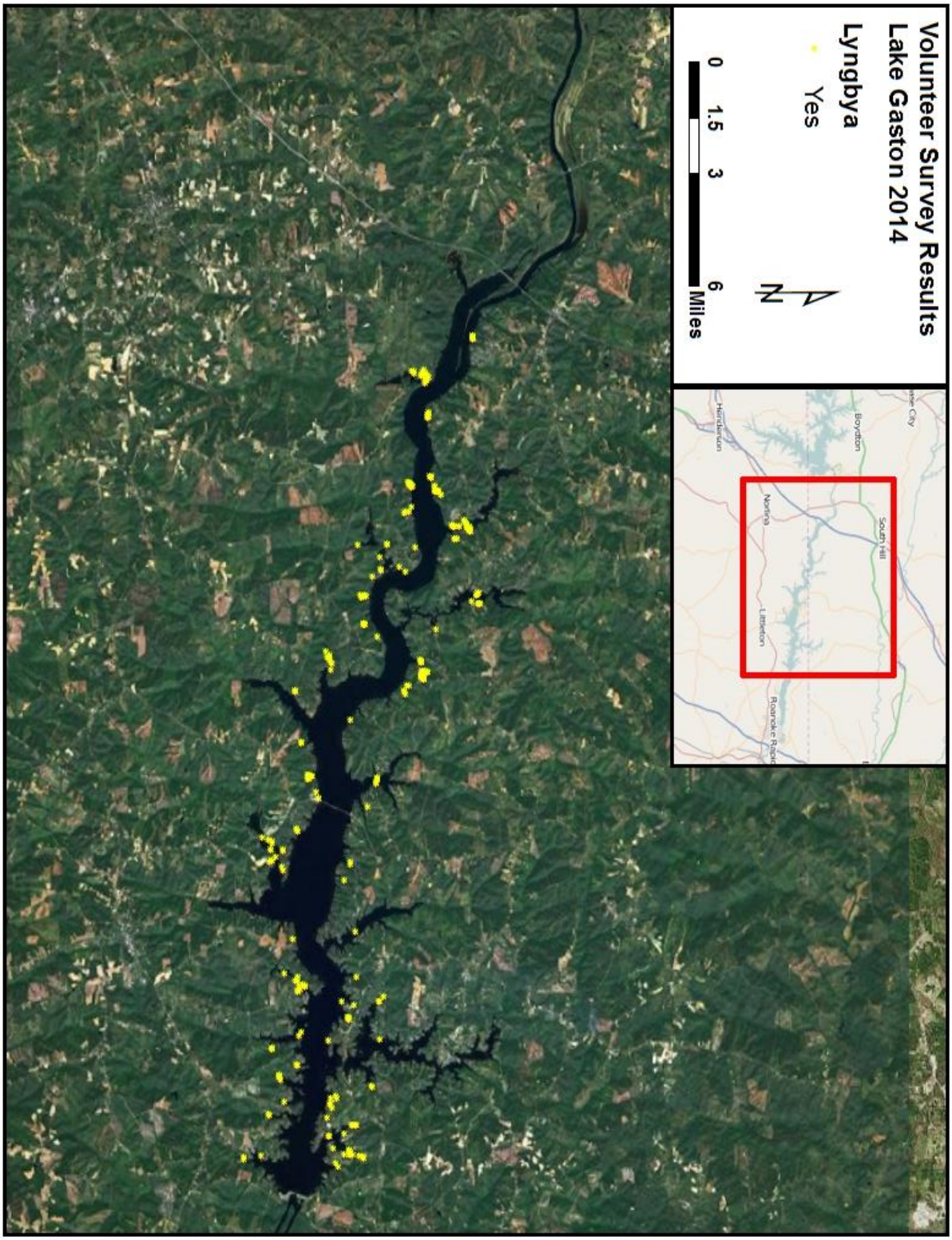


Figure 11. Lyngbya presence/ absence as designated by the LGA volunteer survey.

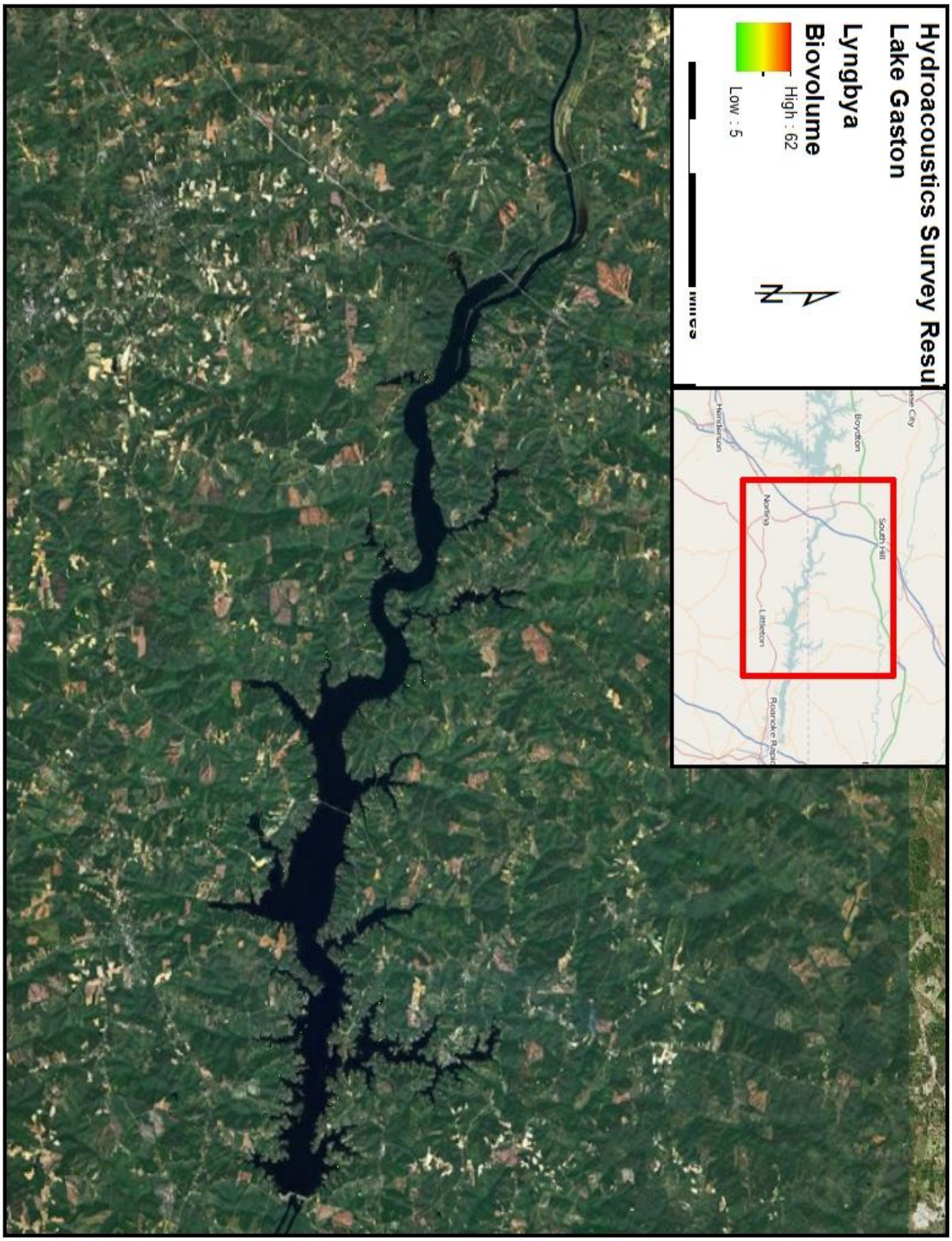


Figure 12. Lyngbya COVERAGE as determined by the hydroacoustic survey.

3.5. Other noted species

While most all submersed species declined or remained stable in 2014, those that were most prevalent included chara sp., brittle naiad, and coontail at 5.21, 3.23, and 1.88% of all points respectively. Water willow continues to be the dominant emergent plant in the lake, having been identified at 36.88% of all points sampled (down 8% from 2013). Too see a distribution map of all other species, see the appendix.

3.6. Historical comparison of methodologies

In 2014, it should be noted that the hydroacoustic data collection sensor and post processing methodology were altered to account for a decrease in overall funding available to the Lake Gaston Weed Control Council. In the past 7 years, a private company known as Remetrix has completed all hydroacoustic mapping of SAV in Lake Gaston with the use of a BioSonics 420kH transducer. In 2014, NC State University completed the hydroacoustic mapping of Lake Gaston with a Lowrance transducer and used the 3rd party data processor, Navico Biobase (formerly Contour Innovations), to complete very basic data processing of sonar files. While somewhat different, the two sensors and processing platforms provide very similar outputs of which a comparative analysis was developed in 2013. While biobase algorithms were used to delineate the initial raw data collected, final data processing and refinement was at the discretion of the NC State University Aquatic Weed Control Program. To ensure seemless transition between the two platforms, a comparative table of SAV and hydrilla acreage estimations are provided in tables 2 and 3 alongside percentage estimates of the LGA volunteer survey.

SAV	2007	2008	2009	2010	2011	2012	2013	2014
Remetrix (A)	1438	1504	1652	1752	1617	1753	759	
%change		*4.59*	*9.84*	*6.05*	*-7.71*	*8.41*	*-56.70*	
Volunteers (%)					64.72	73.10	61.09	33.35
%change						*12.94*	*-16.42*	*-45.42*
Biobase (A)								546
%change								-28.0632

Table 2. Comparative table of SAV change from 2007 - 2014

Hydrilla	2007	2008	2009	2010	2011	2012	2013	2014
Remetrix (A)	1235	1244	1477	1665	1449	1541	671	
%change		*0.73*	*18.73*	*12.73*	*-12.97*	*6.35*	*-56.46*	
Volunteers (%)					83.25	63	47	20.46
%change						*-24.32*	*-25.40*	*-56.47*
Biobase (A								**335**
%change								-50.07

Table 3. Comparative table of hydrilla change from 2007 - 2014

4. Preliminary Tuber Survey

Tuber sampling of the Long Term Treatment Areas (LTTAs), a single Maintenance and Management Area (MMA), and a single control area was conducted on December 9th-12th in which samples were taken at LTTAs: Sledge Creek, Woodland Hurst, Pretty Creek, Jimmies Creek, Big Stonehouse Creek, MMA: Timberline Shores, and Control: Hamlin Creek. Substantial declines in tuber numbers were noted at all sites (table 4). Tuber collected yielded Tubers per square meter values in the single digits for LTTA sites Woodland Hurst, Pretty Creek, and Bigstonehouse. LTTAs Sledge and Jimmies Creeks yielded no tubers during the preliminary survey. MMA Timberline shores also yielded no tubers for the second year in a row. Sprouting was noted however, at LTTA site Sledge Creek and MMA Timberline shores. Control site Hamlin yielded only a third of the previous year's number with 103 T/m2 (2013 = 336 T/m2). LTTA Poplar Creek, all APTAs and other long term tuber monitoring sites have yet to be collected and should be addressed in the coming months.

LTTA Site	Spring 13	Fall 13	Fall 14
Sledge	86	64	0**
Woodland Hurst	140	34	1
Pretty	58	46	3
Jimmies	36	12	0
Timberline Shores	2	0	0**
Big Stonehouse	31	22	6
Poplar	75	25	TBD
*Hamlin	446	336	103

Table 4. Tubers/ m2 for LTTA, MMA and control sites sampled.

5. Conclusions

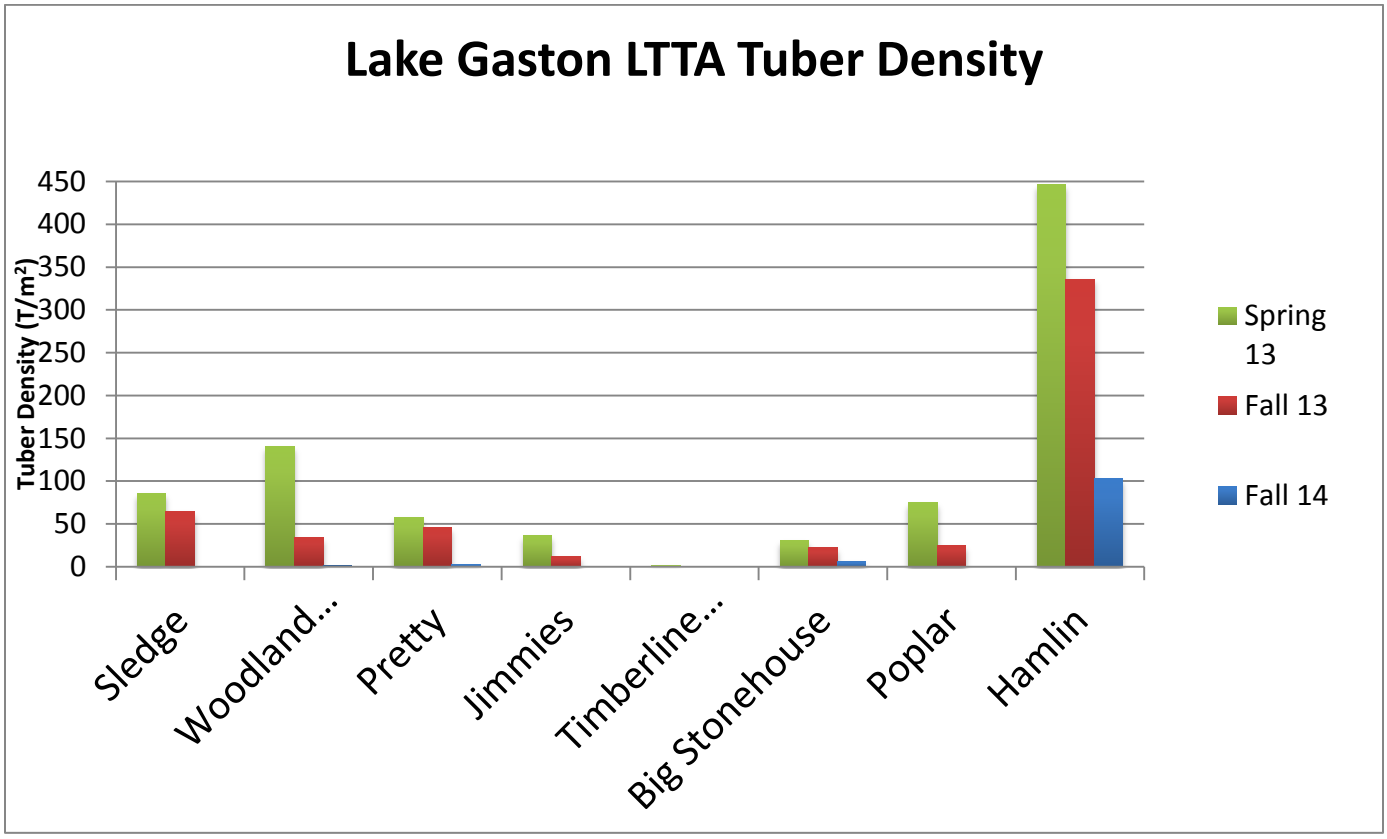
Based on post treatment site assessments, surveys conducted by the LGA volunteers and NC State University, and preliminary tuber sampling data, it is believed that 2014 can be considered a successful year for the management of hydrilla on Lake Gaston. Lower than usual summer temperatures, excess rain in the spring, and the apparent grazing of grass carp, alongside intensive management through the use of herbicides, are believed to have contributed to the decline of hydrilla during growing season.

APPENDIX

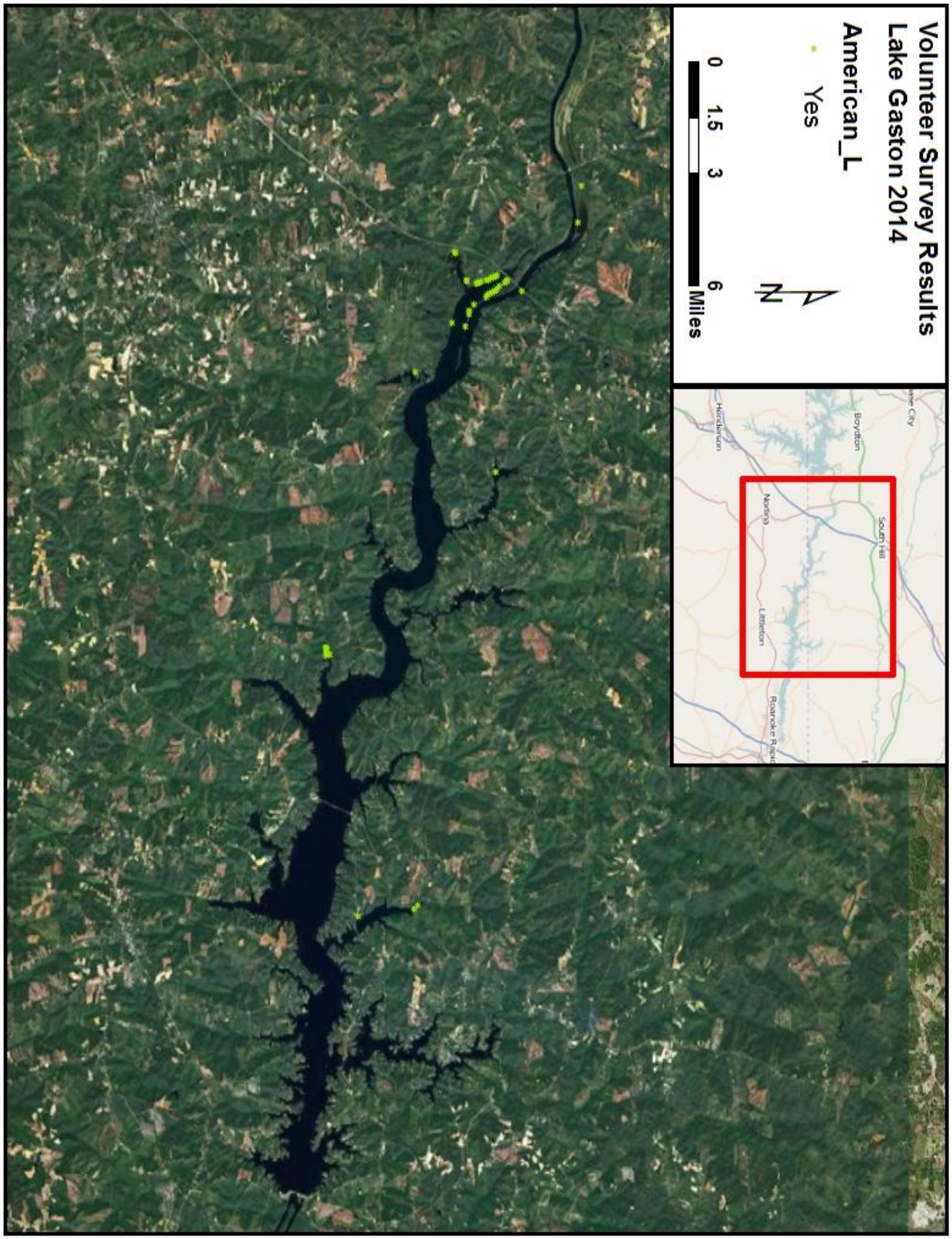
	Species	2007	2008	2009	2010	2011	2012	2013	2014
Submersed	Hydrilla	61.46%	73.36%	58.35%	62.13%	53.89%	63.05%	47.57%	20.46%
	Lyngbya	4.89%	4.78%	7.58%	3.38%	5.17%	8.10%	5.18%	5.55%
	Brittle Naiad	5.47%	9.85%	7.39%	3.58%	5.67%	10.41%	8.90%	3.23%
	Compsopogon	n/a	n/a	n/a	n/a	n/a	4.04%	5.53%	0.30%
	Coontail	4.31%	0.07%	2.22%	0.76%	3.28%	3.17%	3.96%	1.88%
	Egeria	0.66%	0.00%	1.36%	0.10%	3.82%	3.88%	7.28%	0.13%
	EWM	0.00%	0.07%	0.12%	0.00%	0.09%	0.19%	0.21%	0.30%
	Chara	16.72%	13.43%	4.31%	6.45%	9.40%	13.02%	11.93%	5.21%
	Native naiad	n/a	0.00%	0.06%	0.05%	0.88%	1.29%	0.70%	0.27%
Emergent	Water Willow	n/a	28.49%	37.38%	33.06%	42.01%	47.59%	44.23%	36.88%
	Cattail	n/a	5.97%	2.65%	0.96%	5.96%	6.95%	8.26%	4.18%
	Lotus	n/a	0.00%	0.62%	0.91%	1.67%	2.25%	2.16%	0.86%
	Rush	n/a	1.11%	5.17%	0.96%	3.89%	11.39%	8.65%	4.09%
	Pondweed	n/a	2.39%	8.50%	0.35%	3.64%	6.32%	7.11%	1.65%
	N	1371	1341	1624	1984	5572	5743	6565	5387

Decrease
Increase
Stable

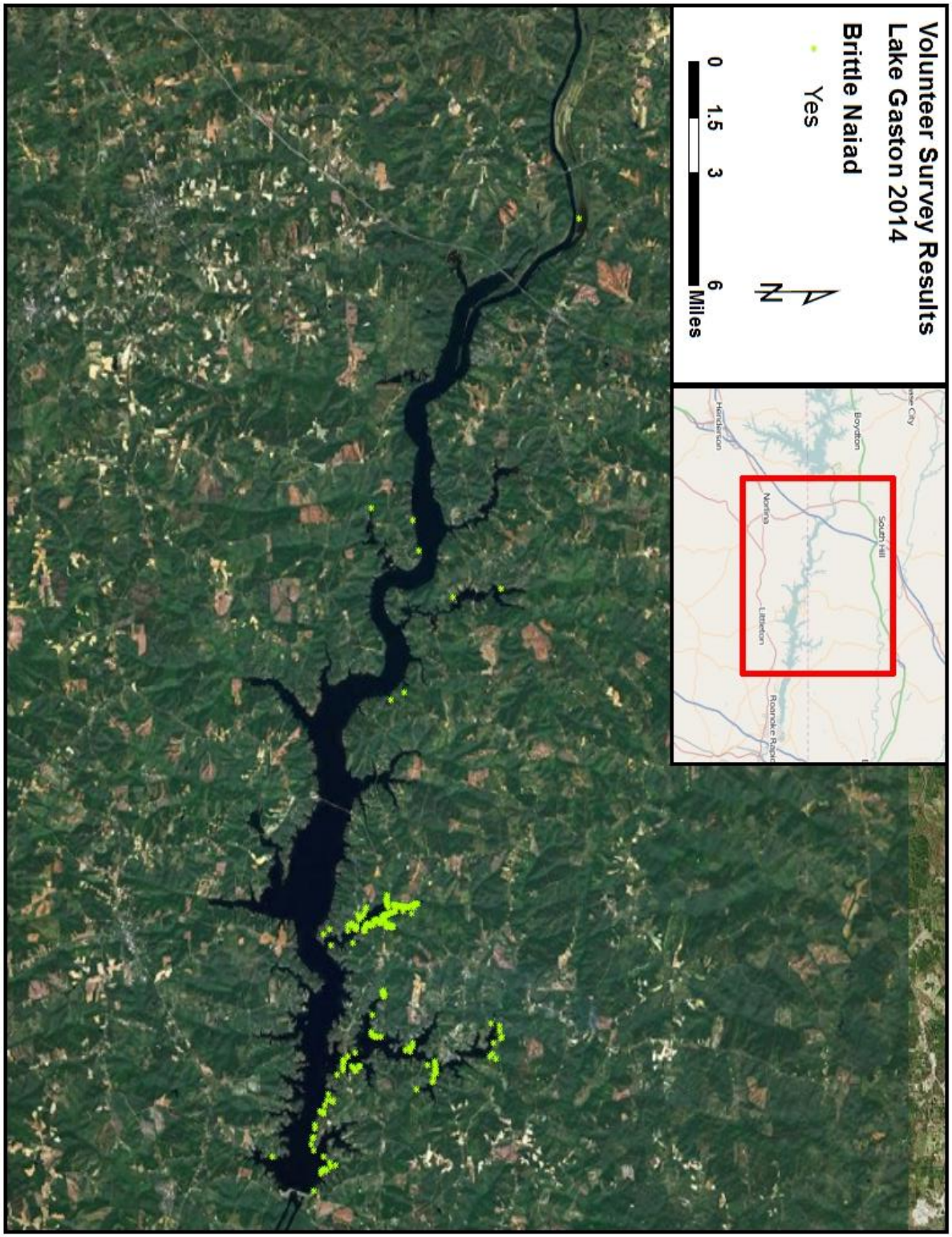
Appendix Table 1. All species as a percentage of all points sampled (2007 – 2014)



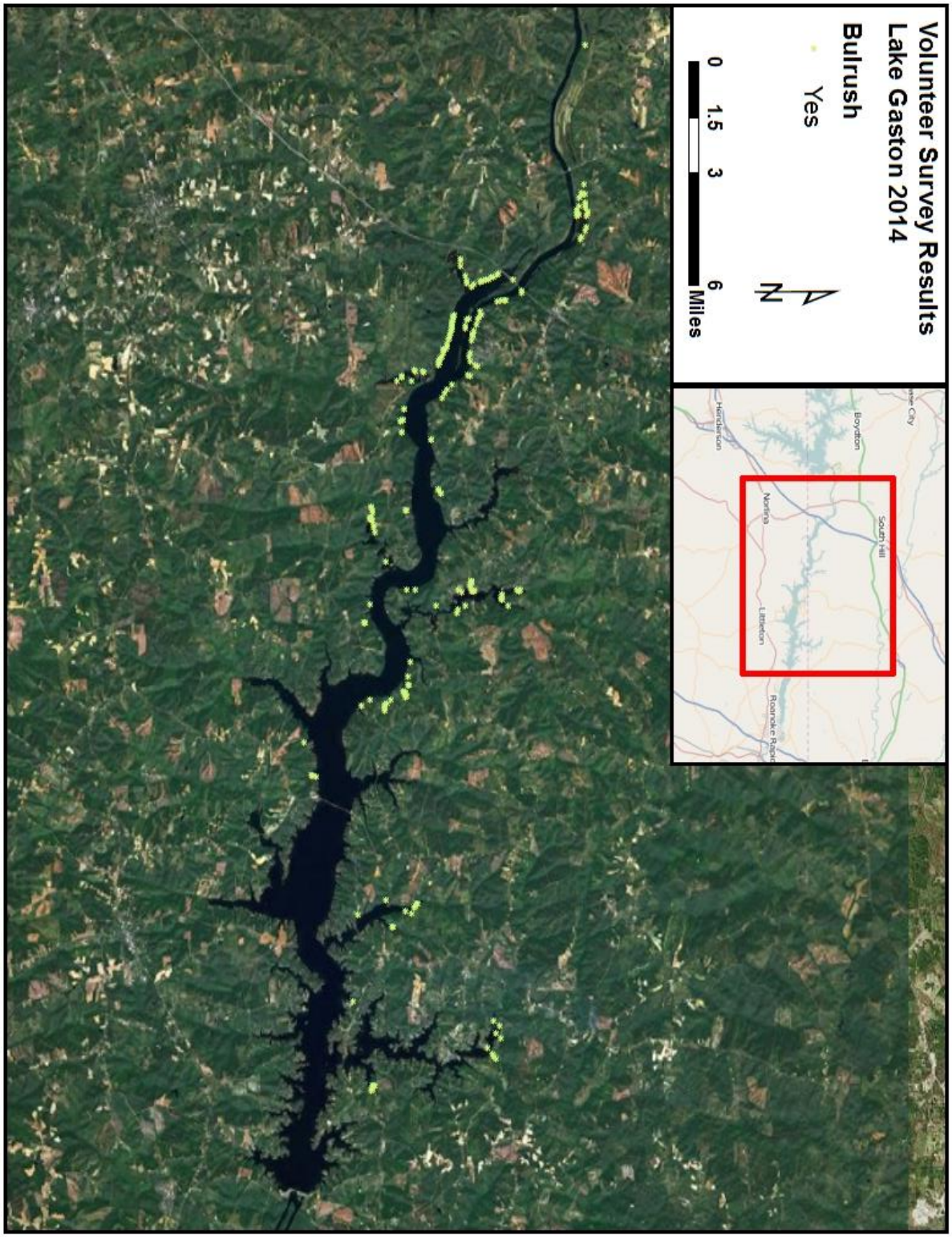
Appendix Figure 1. Tuber densities across LTTAs and control (Spring 2013 – Fall 2014)



Appendix Figure 2. American Lotus distribution in 2014 as determined by the LGA survey

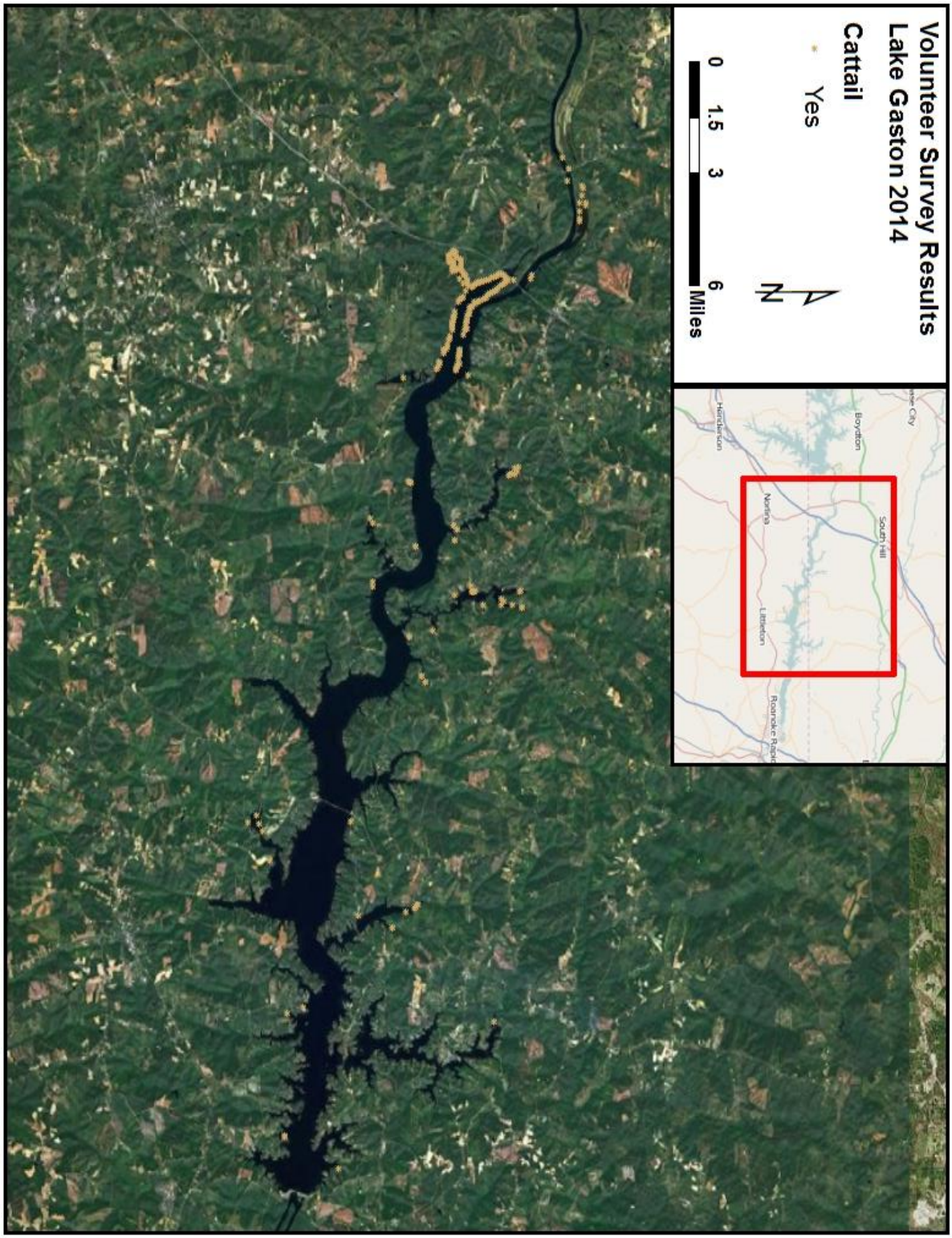


Appendix Figure 3. Brittle naiad distribution in 2014 as determined by the LGA survey

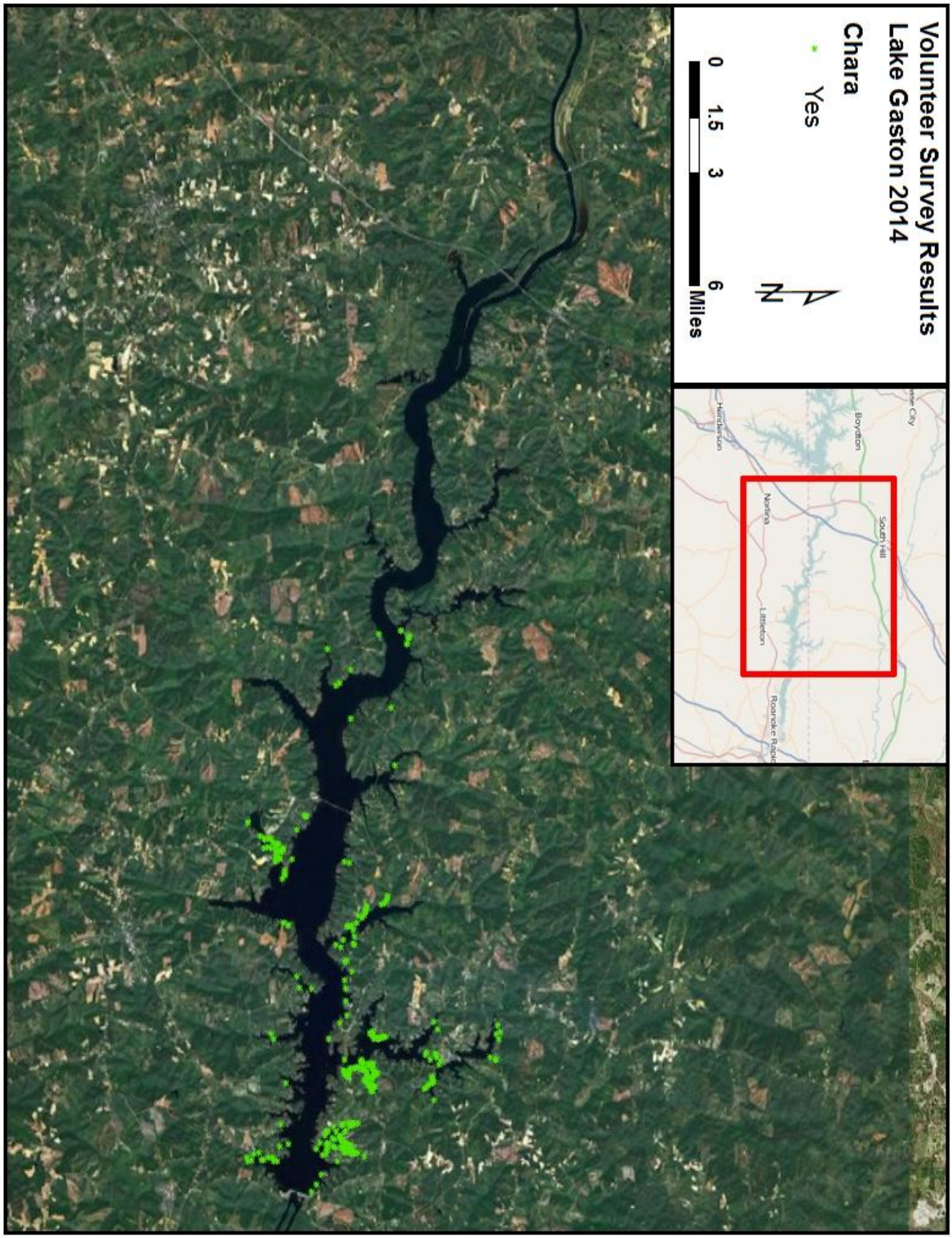


Appendix Figure 4. Rush distribution in 2014 as determined by the LGA survey

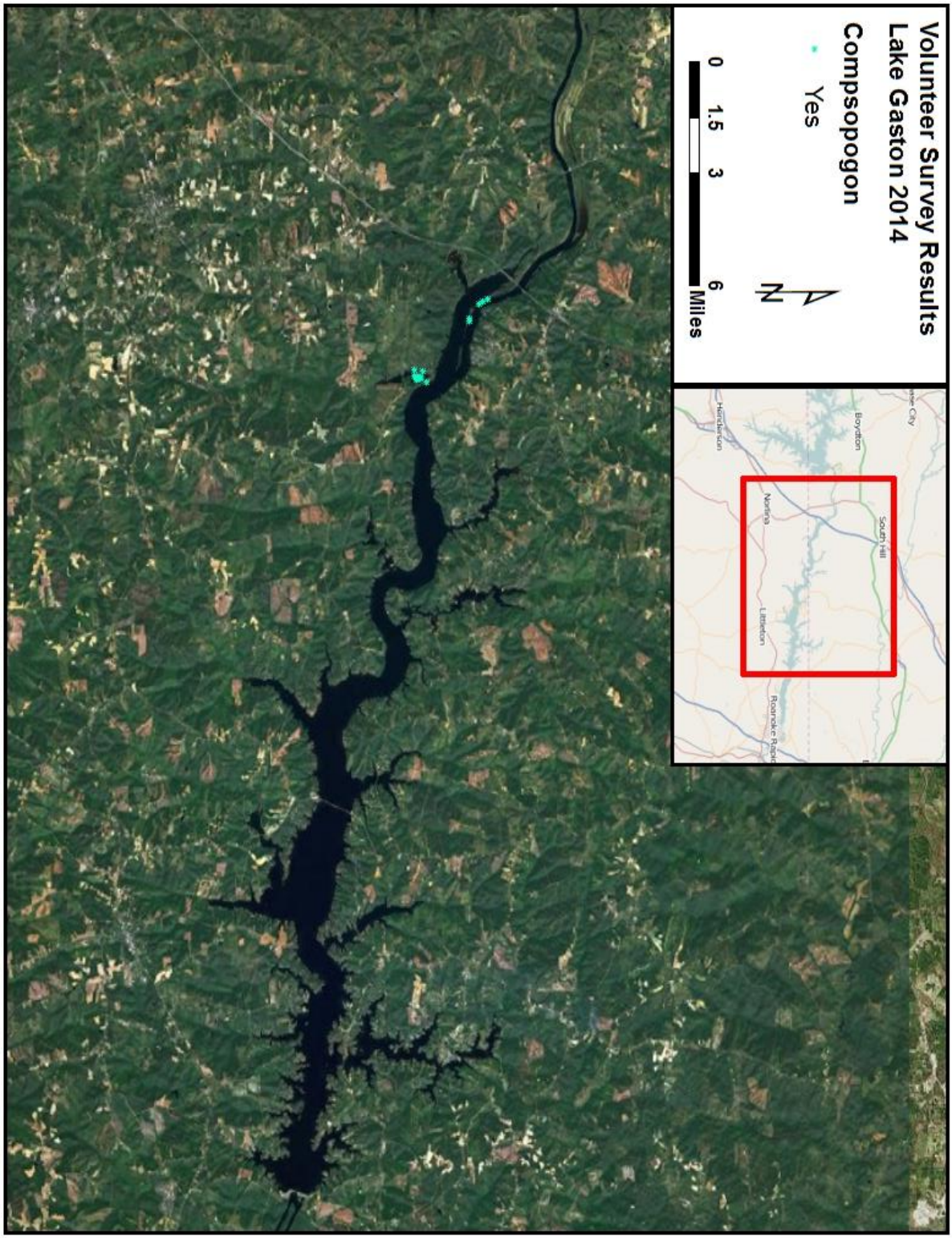
Appendix Figure 2. American Lotus distribution in 2014 as determined by the LGA survey



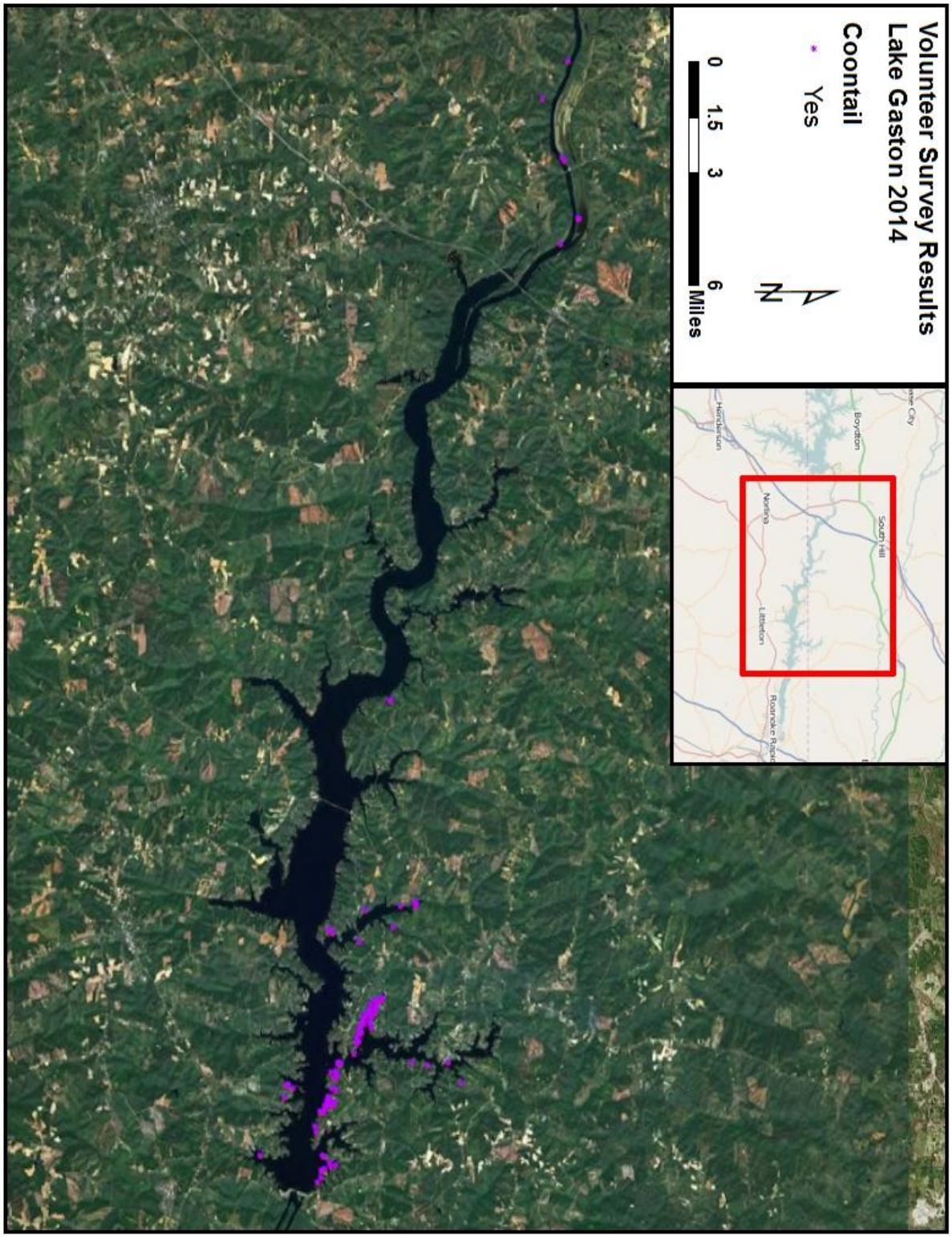
Appendix Figure 5. Cattail distribution in 2014 as determined by the LGA survey



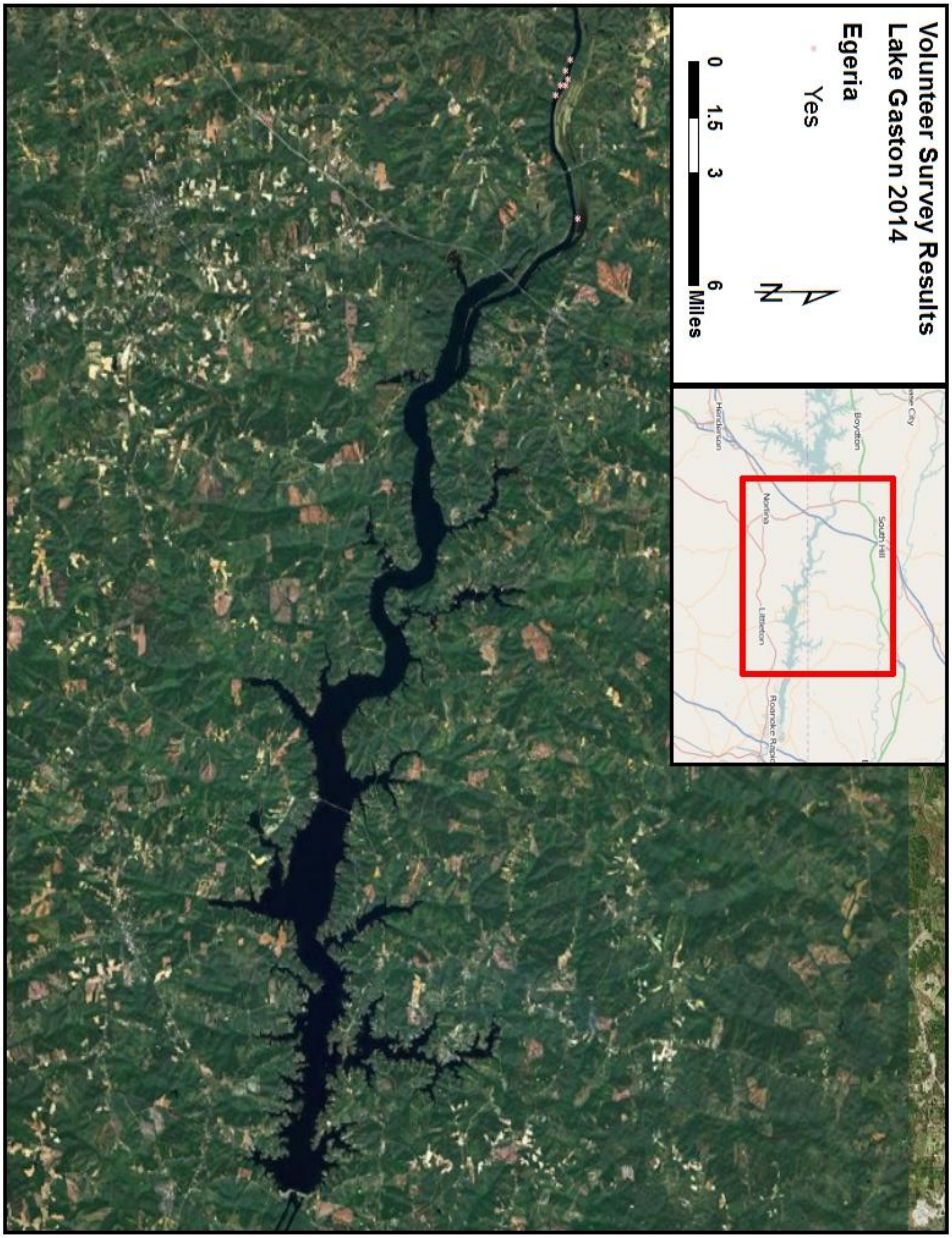
Appendix Figure 6. Chara distribution in 2014 as determined by the LGA survey



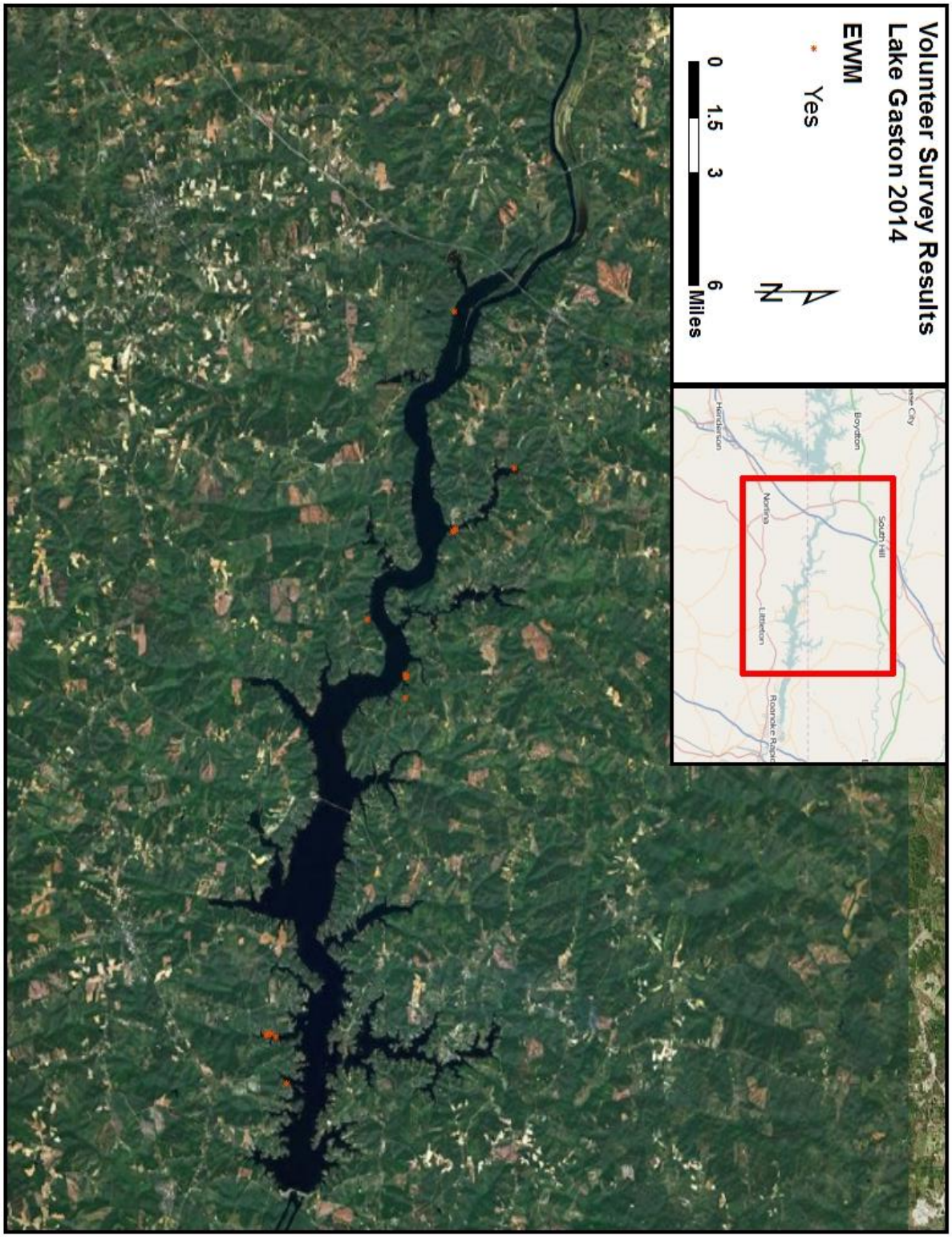
Appendix Figure 7. Compsopogon distribution in 2014 as determined by the LGA survey



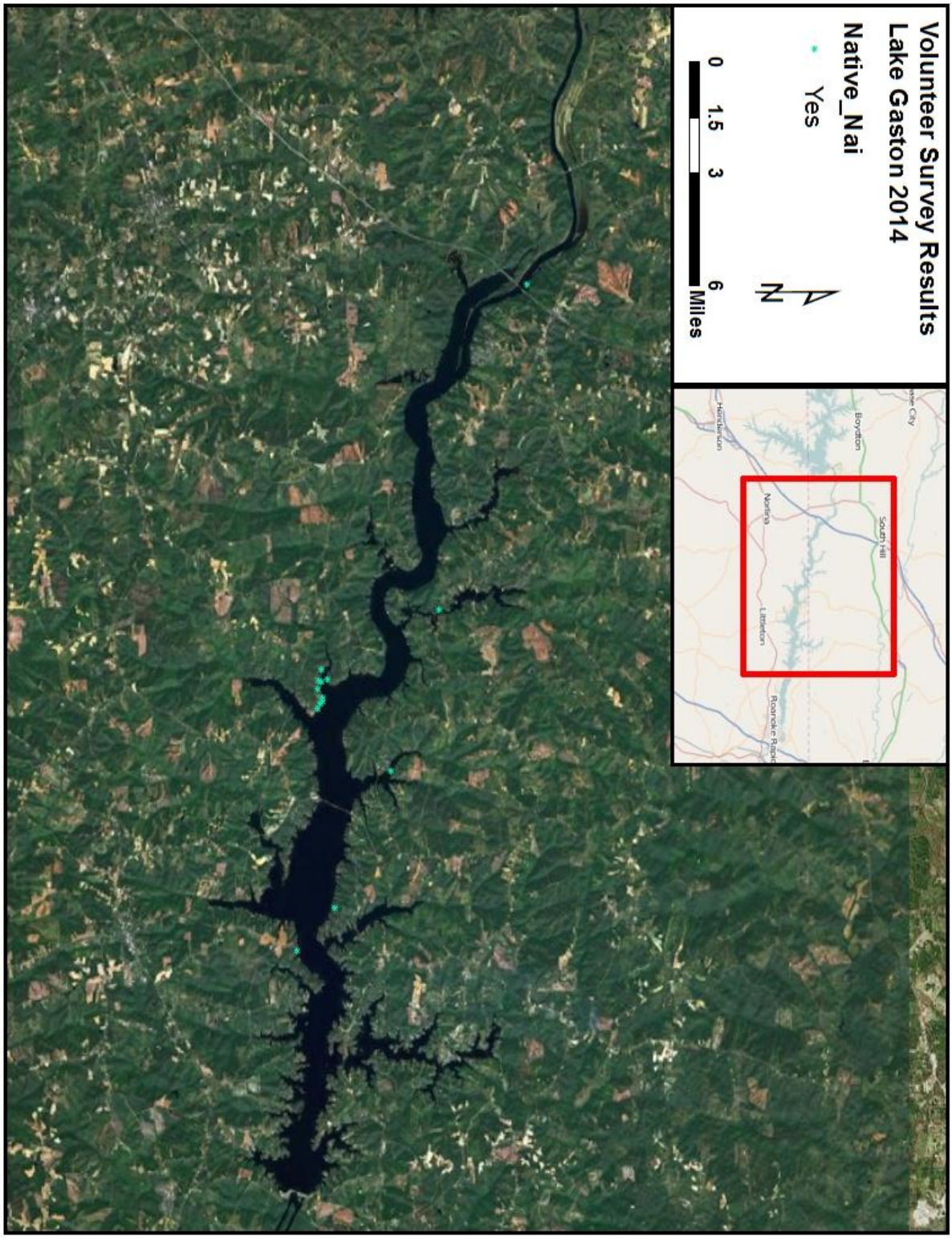
Appendix Figure 8. Coontail distribution in 2014 as determined by the LGA survey



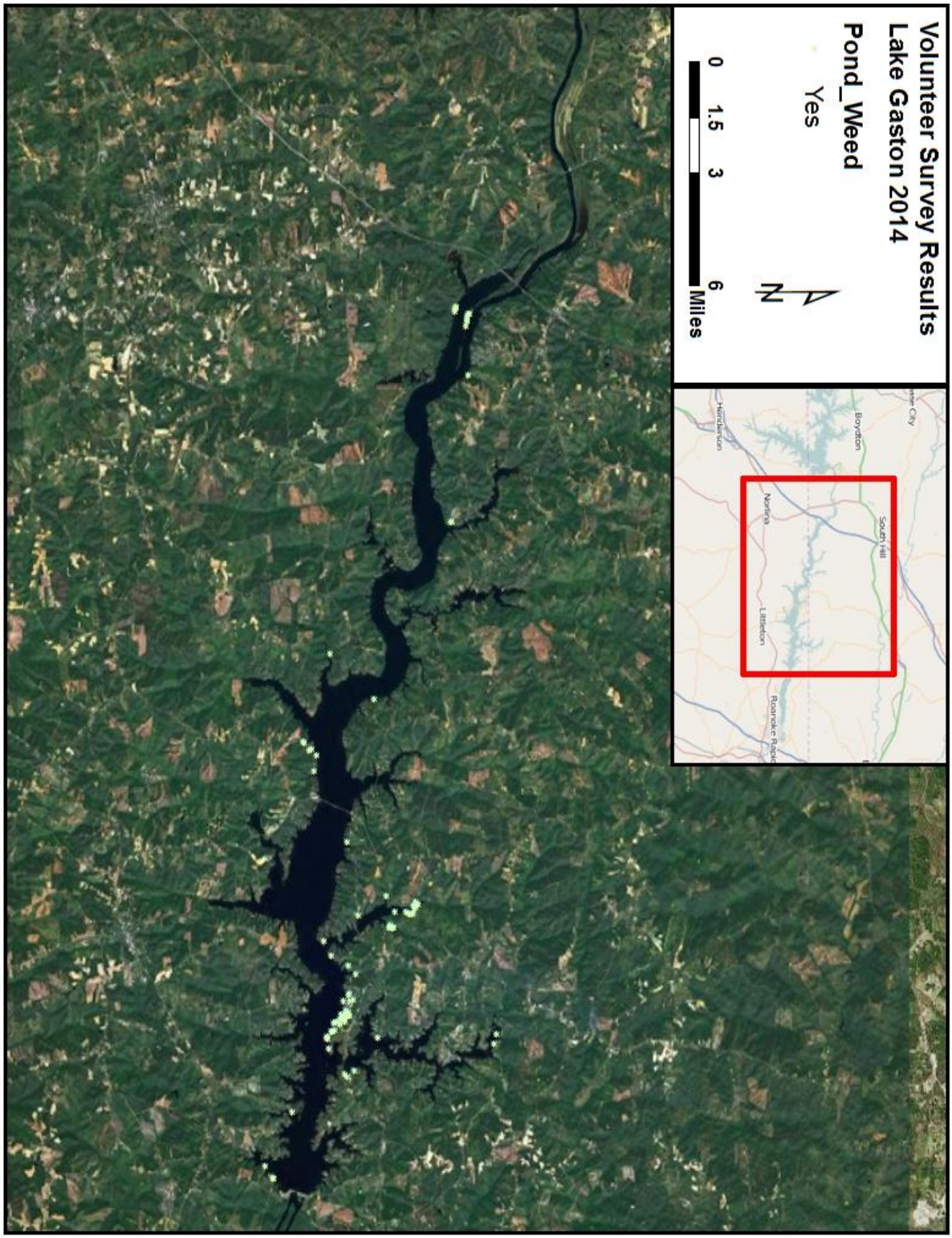
Appendix Figure 9. Egeria distribution in 2014 as determined by the LGA survey



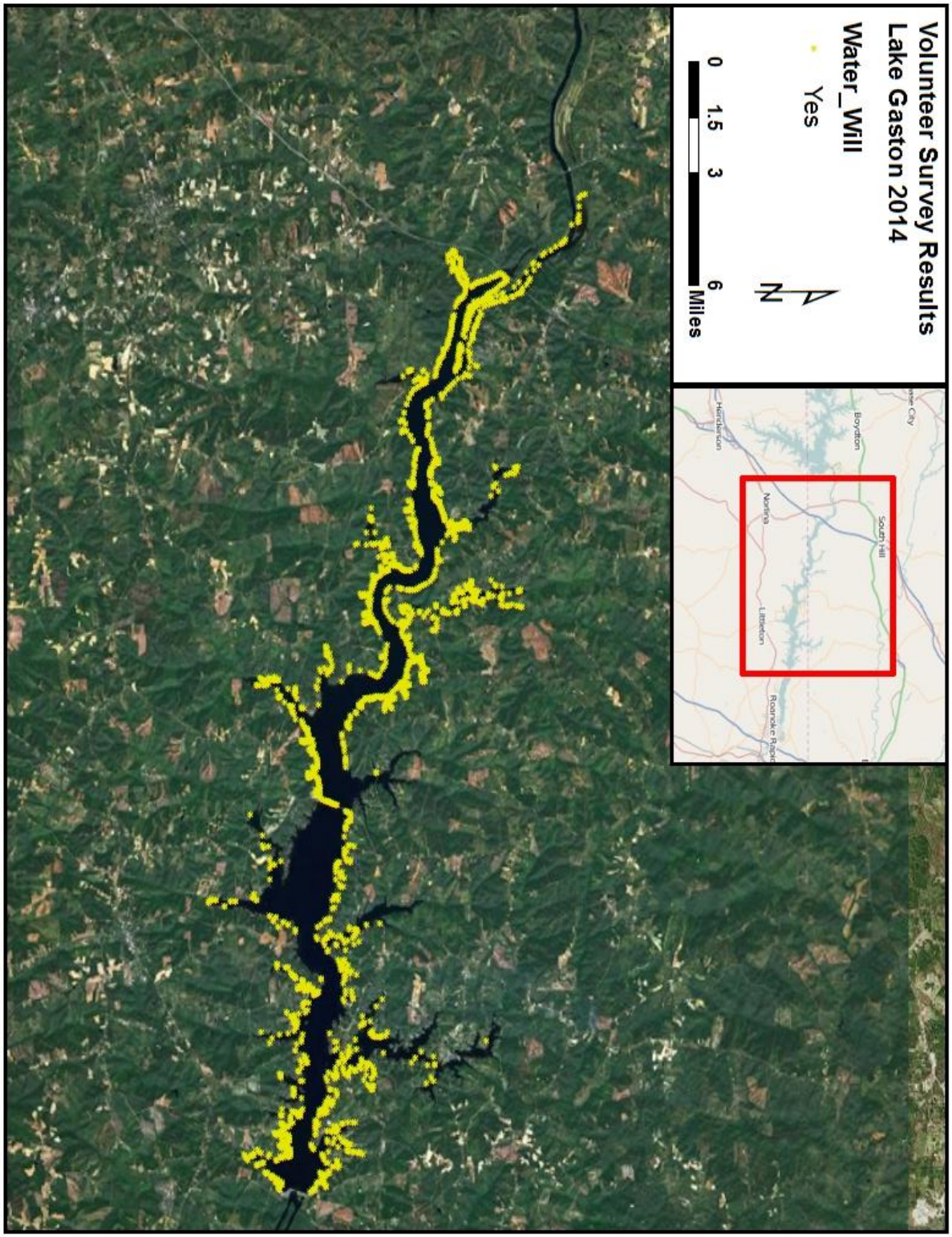
Appendix Figure 10. Eurasian watermilfoil distribution in 2014 as determined by the LGA survey



Appendix Figure 11. Native naiad distribution in 2014 as determined by the LGA survey



Appendix Figure 12. Native pondweed distribution in 2014 as determined by the LGA survey



Appendix Figure 13. Water willow distribution in 2014 as determined by the LGA survey